Robinson+Cole

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Also admitted in Massachusetts

EM-VER-033-140819

ORIGINAL

August 19, 2014

RECEIVED
AUG 19 2014
CONNECTICUT
SITING COUNCIL

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

Re: **Notice of Exempt Modification – Facility Modification**
179 Shunpike Road, Cromwell, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 101-foot level on the existing 170-foot tower at 172 Shunpike Road in Cromwell, Connecticut (the "Property"). The tower and the Property are owned by the Cromwell Fire District. The Council approved Cellco's use of this tower in 2007. Cellco now intends to modify its facility by replacing six (6) of its antennas with three (3) model LNX-6514DS-VTM, 850 MHz antennas, and three (3) model HBX-6517DS-VTM, 2100 MHz antennas, all at the same 101-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. 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 Jonathan Sistare, Town Manager for the Town of Cromwell.

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

13083530-v1

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's new antennas and RRHs will be installed at the 101-foot level of the existing 170-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 replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table 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* Detailed Structural Analysis Evaluation 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:
Jonathan Sistare, Cromwell Town Manager
Sandy M. Carter

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

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

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	17.6 kg | 38.8 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry to minimize any sector overlap
- Rugged, reliable design with excellent passive intermodulation suppression
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.9
Gain by all Beam Tilts Tolerance, dB	±0.2	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.3	0 ° | 18.4	0 ° | 18.8
	3 ° | 18.6	3 ° | 18.7	3 ° | 19.1
	6 ° | 18.4	6 ° | 18.6	6 ° | 18.7
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Horizontal Tolerance, degrees	±1.8	±0.9	±2.8
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.2	±0.2	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	19	19	18
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	11	11	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	2

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom

Product Specifications

HBX-6517DS-VTM

RF Connector Quantity, total	2
Wind Loading, maximum	393.0 N @ 150 km/h 88.3 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	83.0 mm | 3.3 in
Length	1902.0 mm | 74.9 in
Width	166.0 mm | 6.5 in
Net Weight	6.2 kg | 13.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBX-6517DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBX-6517DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

DB390 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Use for narrow panel antennas. Includes two pipe mounts.

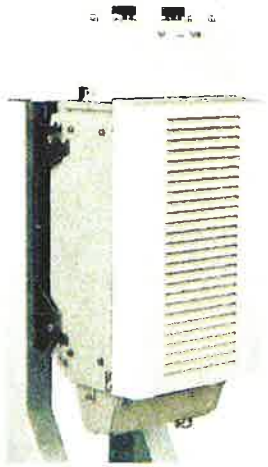
DB5098E — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members

Alcatel·Lucent

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

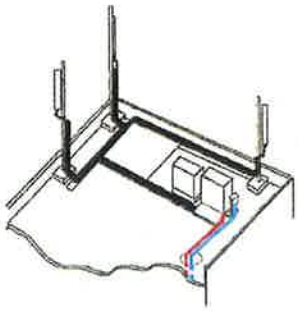
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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

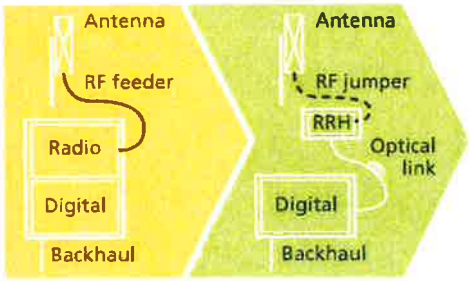
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

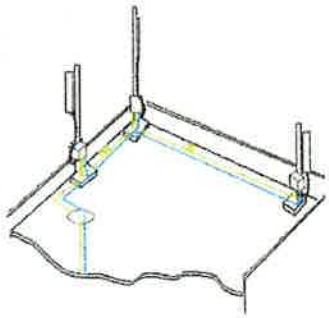
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

CPG2809100912 (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 CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

* This data is provisional and subject to change

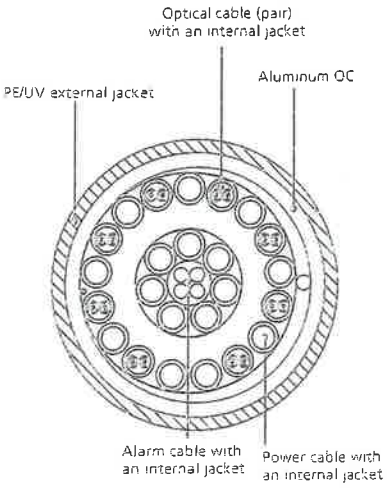


Figure 2: Construction Detail

ATTACHMENT 2

	General	Power	Density					
Site Name: Cromwell N								
Tower Height: Verizon @ 170 ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	115	0.0307	880	0.5867	5.24%	
*AT&T UMTS	2	875	115	0.0476	1900	1.0000	4.76%	
*AT&T GSM	1	283	115	0.0077	880	0.5867	1.31%	
*AT&T GSM	4	525	115	0.0571	1900	1.0000	5.71%	
*AT&T LTE	1	1313	115	0.0357	734	0.4893	7.30%	
*T-Mobile GSM/UMTS	2	12	125	0.0006	1950	1.0000	0.06%	
*T-Mobile UMTS	2	12	125	0.0006	2100	1.0000	0.06%	
*T-Mobile LTE	2	24	125	0.0011	2100	1.0000	0.11%	
*CR Police Dept	1	635	159	0.0090	635	0.4233	2.13%	
*CR Fire Dept	1	100	128	0.0022	46	0.2000	1.10%	
*CR Fire Dept	1	110	135	0.0022	154	0.2000	1.09%	
*CR Fire Alarm	1	500	127	0.0111	460	0.3067	3.63%	
*Clearwire	2	153	134	0.0061	2496	1.0000	0.61%	
*Clearwire	1	211	134	0.0042	11 GHz	1.0000	0.42%	
*Sprint CDMA/LTE	4	693	170	0.0345	1900	1.0000	3.45%	
*Sprint CDMA/LTE	1	390	170	0.0049	850	0.5667	0.86%	
Verizon	**11**	**446**	**100**	**0.1764**	**1970**	**1.0000**	**17.64%**	
Verizon	**9**	**382**	**100**	**0.1236**	**869**	**0.5793**	**21.34%**	
Verizon	**1**	**1918**	**100**	**0.0690**	**2145**	**1.0000**	**6.90%**	
Verizon	**1**	**857**	**100**	**0.0308**	**698**	**0.4973**	**6.20%**	
								89.90%
* Source: Siting Council								

ATTACHMENT 3

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF AN EXISTING 170' SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

Address: **179 Shunpike Road**
Cromwell, CT

prepared for

Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

prepared by

URS

URS CORPORATION
500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CT 06067
TEL. 860-529-8882

36917427.00000
VZ5-178 (Rev. 1)

August 12, 2014

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 170' self supporting lattice tower located at 179 Shunpike Road in Cromwell, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code which requires a three second gust wind speed of 100 mph which converts to an 80 mph fastest mile per 2003 IBC (Table 1609.3.1) and the TIA/EIA-222-F standard for a wind velocity of 85 mph (fastest mile). The wind speed from the Connecticut State Building Code governs the design at 85 mph (fastest mile) and 74 mph (fastest mile) concurrent with ½ " ice. The antenna loading considered in the analysis consists of all existing and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction Section of this report.

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove: **(6) Swedcom SC-E 6014 Rev2 Panel Antenna**	**Verizon (Existing)**	**@ 101'**
Install: **(1) Andrew HBX-6517DS-VTM_04DT_2110 Panel Antenna (Alpha Sector)** **(2) Andrew HBX-6517DS-VTM_02DT_2110 Panel Antennas (Beta & Gamma Sectors)** **(3) AWS RRH Units** **(1) DB-T1-6Z-8AB-0Z Distribution Box** **(1) Andrew LNX-6514DS-VTM_03DT_0850 Panel Antenna (Alpha Sector)** **(1) Andrew LNX-6514DS-VTM_04DT_0850 Panel Antenna (Beta Sector)** **(1) Andrew LNX-6514DS-VTM_05DT_0850 Panel Antenna (Gamma Sector)** **(1) 1 5/8" Fiber Optic Cable**	**Verizon (Proposed)**	**@ 101'**

The results of the analysis indicate that the existing tower and its foundation have the capacity to support the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the wind load classification specified above and the proposed antenna loading.**

This analysis is based on:

1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry, structural member sizes, and Foundation information taken from a tower report prepared by PiROD Inc., ENG. File No. A-116398, dated November 18, 1999.
3) Structural analysis performed by URS Corp., project number VZ5-133 / 36922291.00000 signed and sealed on November 21, 2012.
4) Structural analysis performed by URS Corp, project number CFD-003 / 36924489 signed and sealed May 29, 2012.
5) Existing inventory taken from a tower mapping and inventory prepared by Northeast Towers, Inc performed on February 9, 2012.
6) Structural analysis performed by URS Corp, project number MXN-004 / 36924397 signed and sealed August 16, 2010.
7) Foundation modification drawings prepared by Teconic, dated May 5, 2004.
8) Proposed additional antenna and mount configuration as specified in Section 2 of this report.

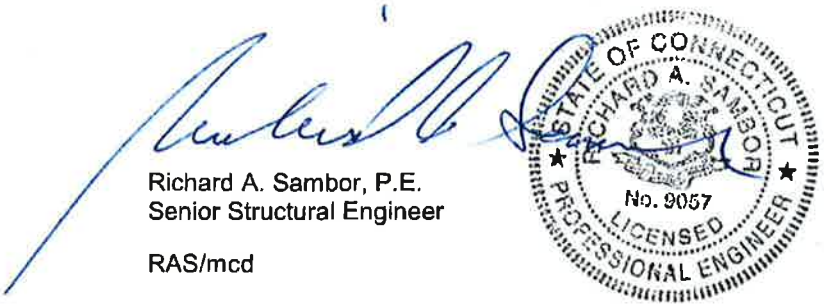
1. EXECUTIVE SUMMARY (continued)

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

If you should have any questions, please call.

Sincerely,

URS Corporation



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

RAS/mcd

2. INTRODUCTION

The subject tower is located at 179 Shunpike Road in Cromwell, Connecticut. The structure is a 170' self supporting lattice tower designed and manufactured by PiROD Inc.

The current inventory with proposed modification is summarized in the table below:

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) Tx Rx 101-90-08 antenna	Town (existing)	15' Mast pipe on 9 Arm Halo Mount	183'	(1) 7/8"
(1) 8 Bay Dipole (3" dia x 20')	Town (existing)	9 Arm Halo Mount	178'	(1) 7/8"
(1) 2 ½" dia x 20' Whip	Town (existing)	9 Arm Halo Mount	178'	(1) 1 1/2"
(3) 2 ½" dia x 15' Whip	Town (existing)	9 Arm Halo Mount	175'	(3) 7/8"
1 ½" dia x 12' Whip	Town (existing)	9 Arm Halo Mount	174'	(1) 7/8"
(3) RFS APXVSPP18-C-A20 Antennas (6) RRU RRH's (3) 800 MHz Filters	Sprint (existing)	9 Arm Halo Mount	170'	(3) RFS HB114-1-0804-MSF Hybrid Cables
(1) Radiowaves HPD2-4.7 w/ Radome (1) Cambium PTP49600 Antenna	CPD (existing)	Leg Mounted	168'	(1) WB3176A – Copper Clad Outdoor Cable (2) 4' long 1/2" Jumper Cables
(1) SU-RA-HP-2.4 (1' x 1' Antenna)	Town (existing)	9 Arm Halo Mount	168'	(1) 3/8"
(6) Decibel 950G65VTZE-M antennas	Sprint (existing)	9 Arm Halo Mount	168'	(6) 1 5/8"
(3) APXV18-206517S	Unknown (existing)	Leg Mount	159'-6"	(6) 1 5/8"
(1) Sinclair SC420-HF1LDF Omni	CPD (existing)	Pipe mount	158'-6"	(1) 1 5/8" Low Density Foam Cable
(2) 3" dia x 20' Whip	Town (existing)	20' Platform	144'	(2) 7/8"
(1) 2 ½" x 20' Whip	Town (existing)	20' Platform	144'	(1) 1/2"
2" dia x 15' Whip	Town (existing)	20' Platform	141'	(1) 1/2"
(1) 1.5" dia x 10' Whip	Town (existing)	20' Platform	139'	(1) 1/2"
(1) 3.5" dia x 9' Whip	Town (existing)	20' Platform	138'-6"	---
(3) Argus LLPX310R antennas (3) Samsung Remote Radio Heads U-RAS	Clearwire (existing)	20' Platform	134'	(6) CAT 5 cable
(3) Andrew VHLP2.5 dish (2.5' dia.) (1) Andrew VHLP2 dish (2' dia.) (Gamma Sector)		20' Platform	134'	(4) 1/2"
(6) Ericsson AIR21 B4A|B2P Antennas (3) Twin PCS TMAs	T-Mobile (existing)	(3) Existing T-Frames	125'	(18) 1 5/8" (1) 1-5/8" Hybrid Cable

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(6) Powerwave 7770 (12) TMA's (3) KMW AM-X-CD-16-65-00T-RET (6) RRU (1) Surge Suppressor	AT&T (existing)	(3) T-Frames	115'	(12) 1 5/8" (3) Optic Fiber & (6) DC Cables (Located within 3" dia Flex Conduit)
(1) HBX-6517DS-VTM_04DT_2110 Panel Antenna (Alpha Sector) **(2) HBX-6517DS-VTM_02DT_2110 Panel Antennas (Beta & Gamma Sectors)** **(3) AWS RRH Units** **(1) DB-T1-6Z-8AB-0Z Distribution Box** **(1) LNX-6514DS-VTM_03DT_0850 Panel Antenna (Alpha Sector)** **(1) LNX-6514DS-VTM_04DT_0850 Panel Antenna (Beta Sector)** **(1) LNX-6514DS-VTM_05DT_0850 Panel Antenna (Gamma Sector)**	**Verizon (Proposed)**	**Shared with Below**	**101'**	**(1) 1 5/8" F.O Cable**
(2) SWCP 2x5514 antennas (Alpha & Gamma Sector) (1) BXA-70063-6CF-2 antenna (Beta Sector) (3) BXA-171063-12BF_2 antennas (6) FD9R6004/2C-3L Diplexers	Verizon (existing)	(3) T-Frames (PiROD part #800093)	101'	(12) 1 5/8"
(1) 3" x 2" x 22" Panel (1) TMA	AT&T (existing)	Pipe Mount	87'	(2) CAT 5
(1) 3' Dish (1) TMA	AT&T (existing)	3' Stand-off	83'	(2) CAT 5
(1) 3" x 2" x 22" Panel (1) TMA	AT&T (existing)	3' Stand-off	80'	(2) CAT 5
(1) Camera	Unknown (existing)	Leg Mounted	30'	(2) 1/2" (estimated from photographs)
(1) 3' Yagi	Unknown (existing)	Leg Mounted	24'	(1) 1/2"

This structural analysis of the communications tower was performed by URS Corporation (URS) for the Cromwell Fire District. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

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

The analysis was conducted using TNX Tower 6.0.0.8. Two load conditions were evaluated as shown below which were compared to allowable stresses according to AISC and TIA/EIA.

Basic Wind Speed:

- Middlesex County; v = **85** mph (fastest mile) [Section 16 of TIA/EIA-222-F-1996]
- Cromwell; v = 100mph (3 second gust) equivalent to 80mph (fastest mile) [Appendix K, 2005 Connecticut State Building Code Supplement]

Loading Cases:

Load Condition 1 = 85 mph (fastest mile) Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 74 mph (fastest mile) Wind Load (with ice) + Ice Load + Tower Dead Load

Please note that wind pressure is a function of velocity squared. Under Load Condition 2, a 25 percent reduction in wind pressure is allowed by code to account for the unlikelihood of the full wind pressure and ice load occurring at the same time. The same results may be achieved by utilizing a lower wind pressure without taking the 25 percent reduction, as shown above.

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

4. FINDINGS AND EVALUATION

Stresses on the tower structure and previously modified foundation were evaluated to compare with allowable stresses in accordance with AISC. The results of the analysis indicate that the calculated stresses on the structure with the proposed loading are within the allowable stresses. Additionally, the anchor bolts were found to be within the allowable limits.

TABLE 1: Tower Component Stress vs. Capacity Summary:

Component/ (Section No.)	Existing Component Size	Controlling Component/Elevation	Percent Capacity	Pass/Fail
Tower Leg (T8)	PiROD Truss Leg	Compression 40'-60'	**97.6 %**	**Pass**
Diagonal (T4)	L3x3x3/16	Compression 100'-120'	**95.9 %**	**Pass**
Top Girt (T2)	L3x3x3/16	Compression 140'-150'	**2.0 %**	**Pass**
Bottom Girt (T1)	7/8" SR	Compression 150'-170'	**4.6 %**	**Pass**
Mid Girt (T4)	L3x3x3/16	Compression 100'-120'	**30.0 %**	**Pass**
Bolt Checks				
Anchor Bolts	(6) 1-1/4"	Tension	**84.0 %**	**Pass**

TABLE 2: Foundation Summary

Foundation	Component	Stress (% capacity/FOS)	Pass/Fail	Comments:
Previously Modified Drilled Concrete Caisson	Uplift	98.5 %/2.03	**Pass**	Min. F.O.S of 2.0 req'd per IBC 2003 Section 3108.4.2

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the analysis indicate that the existing tower and its foundation have the capacity to support the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the wind load classification specified above and the proposed antenna loading.**

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations were properly constructed to support original design loads as specified in the original design documents.
10. All coaxial cable is installed as specified in Section 6 of this report.

URS is not responsible for any changes/alterations completed prior to or hereafter in which URS is not or was not directly involved. Changes/alterations include but are not limited to:

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

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

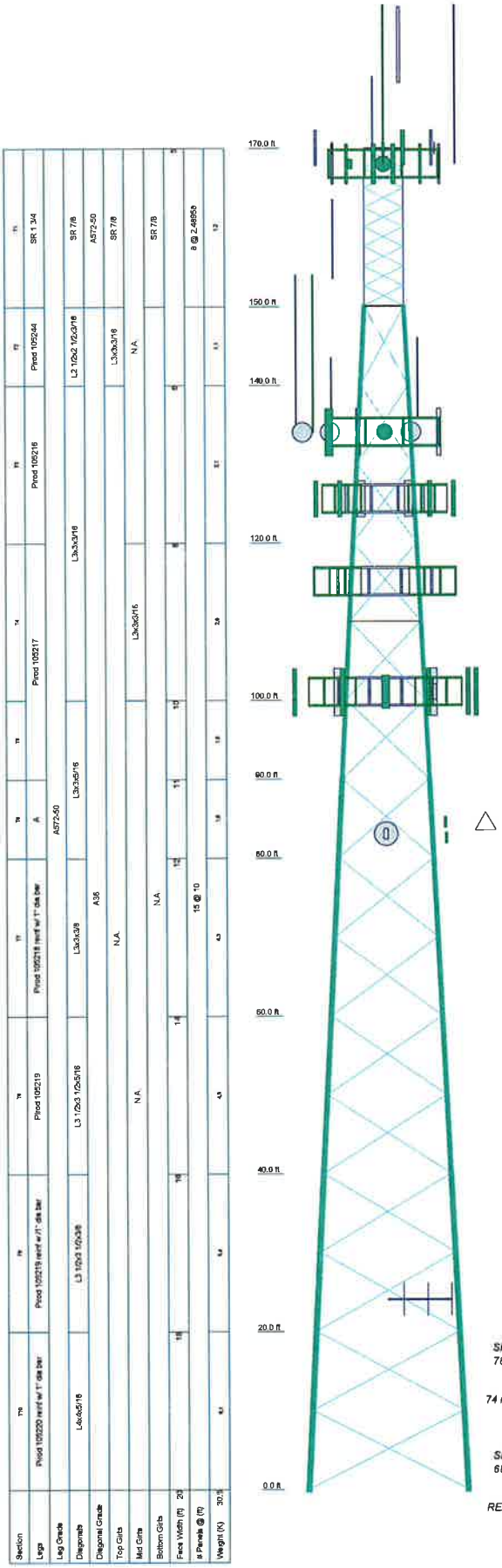
Ongoing and Periodic Inspection and Maintenance:

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

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

6. DRAWINGS AND DATA

TNX TOWER INPUT/OUTPUT SUMMARY



Section	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	Prod 105220 reinf w/ 1" dia bar	Prod 105219 reinf w/ 1" dia bar	Prod 105219	Prod 105218 reinf w/ 1" dia bar	A	Prod 105217	Prod 105216	Prod 105244	SR 1 3/4
Leg Grade	A572-50								
Diagonals	L4x4x5/16		L3 1/2x3 1/2x5/16	L3x3x3/8	L3x3x5/16	L3x3x3/16		L2 1/2x2 1/2x3/16	SR 7/8
Diagonal Grade	A36							A572-50	
Top Girts	N.A.							L3x3x3/16	SR 7/8
Mid Girts	N.A.						L3x3x3/16	N.A.	
Bottom Girts	N.A.								SR 7/8
Face Width (ft) 20	16		14	12	11	10	8	6	5
# Panels @ (ft)	15 @ 10								8 @ 2.48958
Weight (K) 30.3	6.2	5.8	4.9	4.3	3.8	3.3	2.7	2.1	1.2

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
101-60-06-0-01 (Municipal)	183	PIROD 10' Lightweight T-Frame (T-Mobile)	125.5
15' Mount Pipe (Municipal)	178.75	PIROD 10' Lightweight T-Frame (T-Mobile)	125.5
3' Dia 20' Omni (Municipal)	178	PIROD 10' Lightweight T-Frame (T-Mobile)	125.5
2.5' x 20'6" Whip (Municipal)	178	(2) TMA (shielded) (AT&)	115
2.5' x 14' Omni (Municipal)	175	(2) TMA (shielded) (AT&)	115
2.5' x 14' Omni (Municipal)	175	(2) TMA (shielded) (AT&)	115
2.5' x 14' Omni (Municipal)	175	(2) TMA (shielded) (AT&)	115
1.5' x 12' Omni (Municipal)	174	(2) TMA (shielded) (AT&)	115
APXV18-209014-C-A20 (Sprint)	170	7770.00 (AT&)	115
APXV18-209014-C-A20 (Sprint)	170	7770.00 (AT&)	115
APXV18-209014-C-A20 (Sprint)	170	7770.00 (AT&)	115
(2) REMOTE RADIO HEAD (RRH) (Sprint)	170	7770.00 (AT&)	115
(2) REMOTE RADIO HEAD (RRH) (Sprint)	170	7770.00 (AT&)	115
(2) REMOTE RADIO HEAD (RRH) (Sprint)	170	7770.00 (AT&)	115
800 MHz Filter (Sprint)	170	AM-X-CD-16-65-00T-RET (6') (AT&)	115
800 MHz Filter (Sprint)	170	AM-X-CD-16-65-00T-RET (6') (AT&)	115
800 MHz Filter (Sprint)	170	AM-X-CD-16-65-00T-RET (6') (AT&)	115
9 Arm Halo Mount (Municipal)	168	(2) REMOTE RADIO HEAD (RRH) (AT&)	115
8U-RX-HP-2.4 Antenna (Municipal)	168	(2) REMOTE RADIO HEAD (RRH) (AT&)	115
950G65VTZE-M (Sprint)	168	(2) REMOTE RADIO HEAD (RRH) (AT&)	115
950G65VTZE-M (Sprint)	168	Surge Suppressor (AT&)	115
950G65VTZE-M (Sprint)	168	(2) TMA (shielded) (AT&)	115
950G65VTZE-M (Sprint)	168	PIROD 12' Lightweight T-Frame (AT&)	115
950G65VTZE-M (Sprint)	168	PIROD 12' Lightweight T-Frame (AT&)	115
950G65VTZE-M (Sprint)	168	PIROD 12' Lightweight T-Frame (AT&)	115
PTP40600 (CPD)	168	(2) Diplexer (Verizon)	101
HPD3-4.7	168	(2) Diplexer (Verizon)	101
APXV18-206517B-C w/ mounting hardware	159.5	(2) Diplexer (Verizon)	101
APXV18-206517B-C w/ mounting hardware	158.5	BXA-171063-12BF (Verizon)	101
APXV18-206517B-C w/ mounting hardware	152.5	SWCP 2x5514 (Verizon)	101
SC420-HF1LDF (Municipal)	158.5	BXA-171063-12BF (Verizon)	101
2.5' x 20'6" Whip (Municipal)	144	BXA-171063-12BF (Verizon)	101
3' Dia 20' Omni (Municipal)	144	SWCP 2x5514 (Verizon)	101
3' Dia 20' Omni (Municipal)	144	PIROD 12' Lightweight T-Frame (Verizon)	101
2' Dia 15' Omni (Municipal)	141	PIROD 12' Lightweight T-Frame (Verizon)	101
1.5' x 10' Omni (Municipal)	139	PIROD 12' Lightweight T-Frame (Verizon)	101
8' Whip (Municipal)	138.5	BXA-70063-6CF (Verizon)	101
PIROD 20' Universal Platform (Municipal)	134	HBX-6517DS-VTM (Verizon - AWS)	101
Argus LLPX310R (Clearwire)	134	HBX-6517DS-VTM (Verizon - AWS)	101
Argus LLPX310R (Clearwire)	134	HBX-6517DS-VTM (Verizon - AWS)	101
Argus LLPX310R (Clearwire)	134	RH_2X40-AWS (Verizon - AWS)	101
REMOTE RADIO HEAD (RRH) (Clearwire)	134	RH_2X40-AWS (Verizon - AWS)	101
REMOTE RADIO HEAD (RRH) (Clearwire)	134	RH_2X40-AWS (Verizon - AWS)	101
REMOTE RADIO HEAD (RRH) (Clearwire)	134	DB-T1-6Z-8AB-0Z (Verizon - AWS)	101
VHLP2.5-180 (Clearwire)	134	LNX-6514DS-T4M (Verizon - 850)	101
VHLP2.5-180 (Clearwire)	134	LNX-6514DS-T4M (Verizon - 850)	101
VHLP2.5-180 (Clearwire)	134	LNX-6514DS-T4M (Verizon - 850)	101
VHLP2-180 (Clearwire)	134	3'x2'x22" Panel	87
AIR 82A/B4P (T-Mobile)	125.5	TMA	84.5
AIR 82A/B4P (T-Mobile)	125.5	3' Stand-off	83.5
AIR 82A/B4P (T-Mobile)	125.5	3' Stand-off	83.5
AIR 82A/B4P (T-Mobile)	125.5	3' Dish	83
AIR 82A/B4P (T-Mobile)	125.5	TMA	83
AIR 82A/B4P (T-Mobile)	125.5	TMA	82.5
Twin PCS TMA (T-Mobile)	125.5	3'x2'x22" Panel	80
Twin PCS TMA (T-Mobile)	125.5	Camera	30
Twin PCS TMA (T-Mobile)	125.5	PC9013N	24

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Prod 105217 reinf w/ 1" dia bar		

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: 97.6%

MAX. CORNER REACTIONS AT BASE:
DOWN: 463 K
UPLIFT: -400 K
SHEAR: 53 K

AXIAL 90 K
SHEAR 78 K
MOMENT 7493 kip-ft
TORQUE 20 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL 53 K
SHEAR 68 K
MOMENT 6564 kip-ft
TORQUE 13 kip-ft
REACTIONS - 85 mph WIND

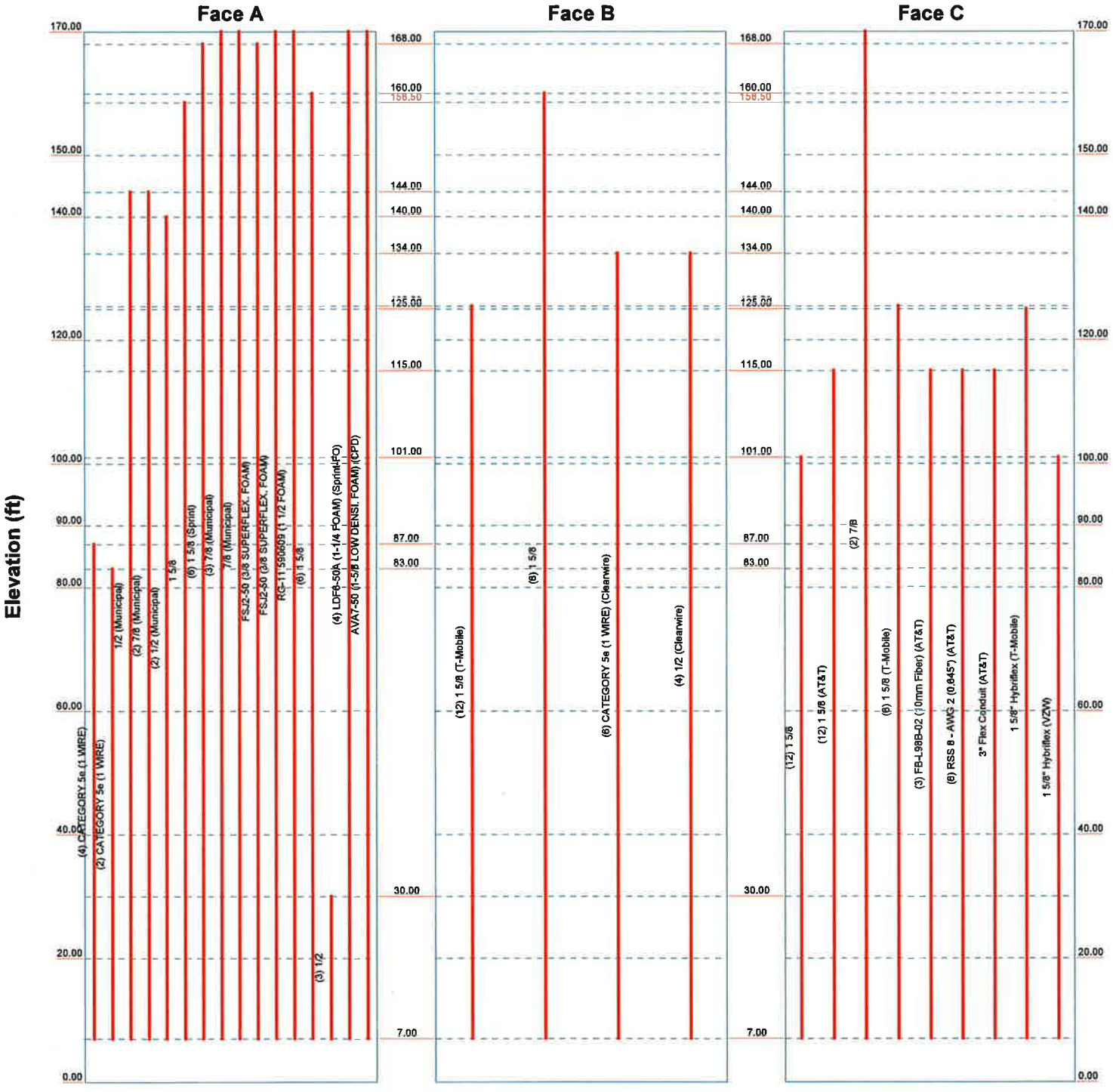
URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: 860-529-8882
FAX: 860-529-3991

Job:	PiROD U20'-0"x170' Lattice Tower
Project:	VZS-178 / Cromwell, CT Tower
Client: Verizon	Drawn by: MCD / App'd
Code: TIA/EIA-222-F	Date: 03/28/14 / Scale: NTS
Path:	Dwg No. E-1

TNX TOWER FEEDLINE DISTRIBUTION CHART

Feedline Distribution Chart
0' - 170'

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



URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: 860-529-8882
FAX: 860-529-3991

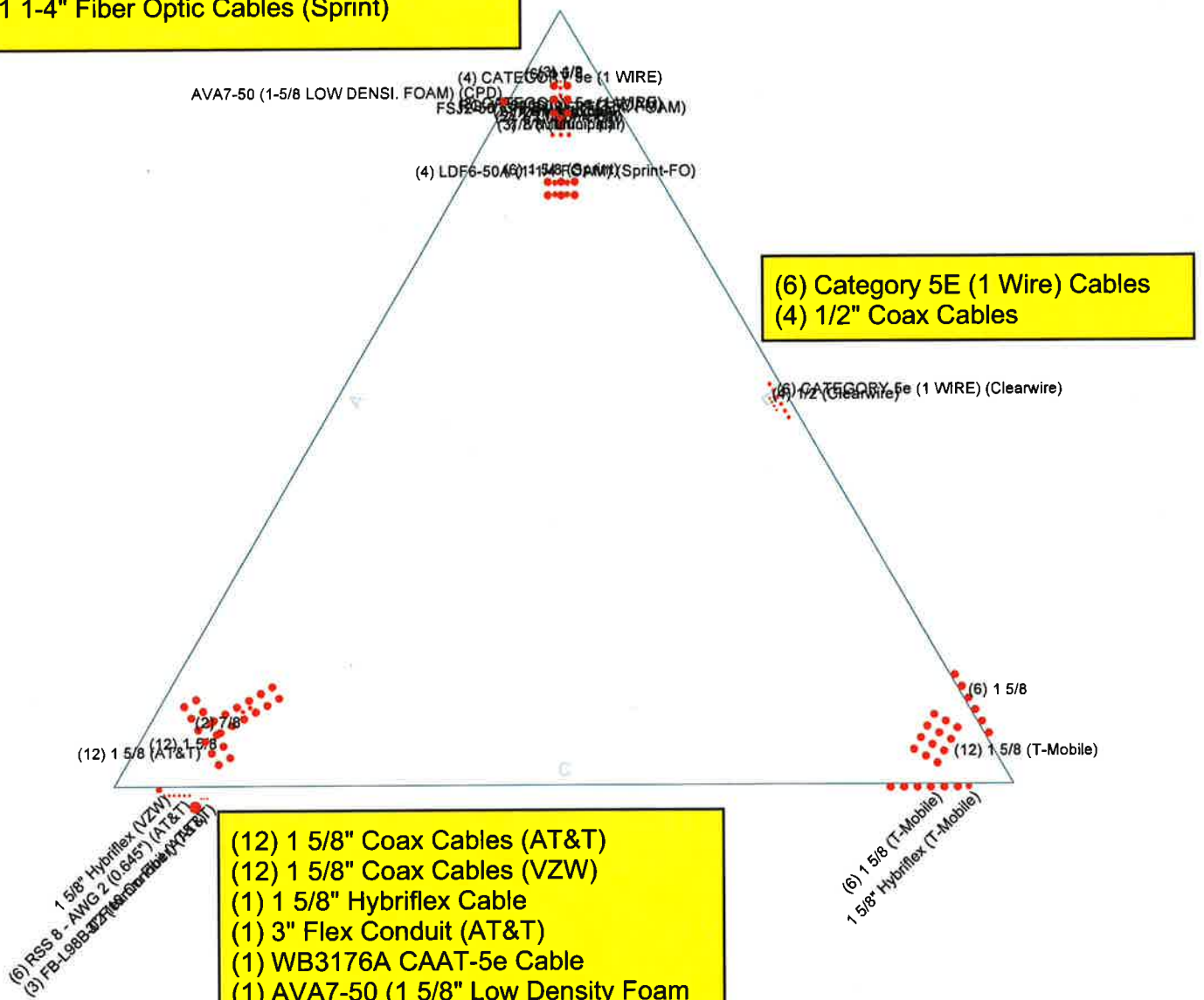
Job: PiROD U20'-0"x170' Lattice Tower		
Project: VZ5-178 / Cromwell, CT Tower		
Client: Verizon	Drawn by: MCD	App'd:
Code: TIA/EIA-222-F	Date: 03/28/14	Scale: NTS
Path:		Dwg No. E-7

TNX TOWER FEEDLINE PLAN

Feedline Plan

Round Flat App In Face App Out Face Truss-Leg

(6) Category 5E (1 Wire) Cables
(6) 7/8" Coax Cables (Municipal)
(6) 1/2" Coax Cables (Municipal)
(13) 1 5/8" Coax Cables (Sprint & Municipal)
(2) FSJ2-50 Cables
(1) RG-11 590609 (1-1/2" Foam) Cable
(1) AVA7-50 (1-5/8" Low Density Foam Cable) (CFD)
(4) 1 1-4" Fiber Optic Cables (Sprint)



(6) Category 5E (1 Wire) Cables
(4) 1/2" Coax Cables

(12) 1 5/8" Coax Cables (AT&T)
(12) 1 5/8" Coax Cables (VZW)
(1) 1 5/8" Hybriflex Cable
(1) 3" Flex Conduit (AT&T)
(1) WB3176A CAAT-5e Cable
(1) AVA7-50 (1 5/8" Low Density Foam Coax Cable)
(2) 7/8" Coax Cables
(6) RSS 8 - AWG 2 Cables (AT&T)
(3) FB-L98B-02 (10mm Fiber) (AT&T)

URS Corporation
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Rocky Hill, CT 06067
Phone: 860-529-8882
FAX: 860-529-3991

Job: *PiROD U20'-0"x170' Lattice Tower*		
Project: *VZ5-178 / Cromwell, CT Tower*		
Client: Verizon	Drawn by: MCD	App'd:
Code: TIA/EIA-222-F	Date: 03/28/14	Scale: NTS
Path:		Dwg No. E-7

TNX TOWER DETAILED OUTPUT

tnxTower	Job	Page
	PiROD U20'-0"x170' Lattice Tower	1 of 43
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: 860-529-8882 FAX: 860-529-3991	Project VZ5-178 / Cromwell, CT Tower	Date 14:33:53 03/28/14
	Client Verizon	Designed by MCD

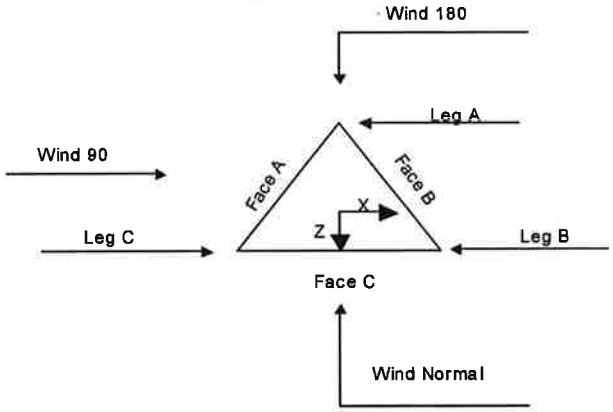
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 170.00 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 20.00 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 ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	170.00-150.00			5.00	1	20.00
T2	150.00-140.00		U6.0 105244	5.00	1	10.00
T3	140.00-120.00		U8.0 105216	6.00	1	20.00
T4	120.00-100.00		U10.0 105217 L3x3/16	8.00	1	20.00
T5	100.00-90.00		U12.0 105216	10.00	1	10.00
T6	90.00-80.00		U12.0 105216	11.00	1	10.00
T7	80.00-60.00		U14.0 105218	12.00	1	20.00
T8	60.00-40.00		U16.0 105219	14.00	1	20.00
T9	40.00-20.00		U18.0 105219	16.00	1	20.00
T10	20.00-0.00		U20.0 105219 L4x1/4	18.00	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	170.00-150.00	2.49	X Brace	No	No	0.0000	1.0000
T2	150.00-140.00	10.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	10.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	10.00	X Brace	No	No	0.0000	0.0000
T5	100.00-90.00	10.00	X Brace	No	No	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	90.00-80.00	10.00	X Brace	No	No	0.0000	0.0000
T7	80.00-60.00	10.00	X Brace	No	No	0.0000	0.0000
T8	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T9	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T10	20.00-0.00	10.00	X Brace	No	No	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 170.00-150.00	Solid Round	1 3/4	A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T2 150.00-140.00	Truss Leg	Pirod 105244	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 140.00-120.00	Truss Leg	Pirod 105216	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T4 120.00-100.00	Truss Leg	Pirod 105217	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T5 100.00-90.00	Truss Leg	Pirod 105217	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T6 90.00-80.00	Truss Leg	Pirod 105217 reinf w/ 1" dia bar	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T7 80.00-60.00	Truss Leg	Pirod 105218 reinf w/ 1" dia bar	A572-50 (50 ksi)	Single Angle	L3x3x3/8	A36 (36 ksi)
T8 60.00-40.00	Truss Leg	Pirod 105219	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x5/16	A36 (36 ksi)
T9 40.00-20.00	Truss Leg	Pirod 105219 reinf w /1" dia bar	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x3/8	A36 (36 ksi)
T10 20.00-0.00	Truss Leg	Pirod 105220 reinf w/ 1" dia bar	A572-50 (50 ksi)	Single Angle	L4x4x5/16	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 170.00-150.00	Solid Round	7/8	A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T2 150.00-140.00	Single Angle	L3x3x3/16	A36 (36 ksi)	Single Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T4 120.00-100.00	1	Single Angle	L3x3x3/16	A36 (36 ksi)	Single Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 170.00-150.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T2 150.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T5 100.00-90.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T6 90.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T7 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T8 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T9 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt
T10 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt

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 170.00-150.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 150.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 100.00-90.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 90.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T7	Yes	Yes	1	1	1	1	1	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	Truss-Leg K Factors: Truss-Legs Used As Leg Members — Leg Panels	X Brace Diagonals	Z Brace Diagonals	Truss-Legs Used As Inner Members — Leg Panels	X Brace Diagonals	Z Brace Diagonals
T2	1	0.5	0.85	1	0.5	0.85
150.00-140.00						
T3	1	0.5	0.85	1	0.5	0.85
140.00-120.00						
T4	1	0.5	0.85	1	0.5	0.85
120.00-100.00						
T5	1	0.5	0.85	1	0.5	0.85
100.00-90.00						
T6	1	0.5	0.85	1	0.5	0.85
90.00-80.00						
T7	1	0.5	0.85	1	0.5	0.85
80.00-60.00						
T8	1	0.5	0.85	1	0.5	0.85
60.00-40.00						
T9	1	0.5	0.85	1	0.5	0.85
40.00-20.00						
T10	1	0.5	0.85	1	0.5	0.85
20.00-0.00						

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	U	Diagonal Net Width Deduct in	U	Top Girt Net Width Deduct in	U	Bottom Girt Net Width Deduct in	U	Mid Girt Net Width Deduct in	U	Long Horizontal Net Width Deduct in	U	Short Horizontal Net Width Deduct in	U
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
170.00-150.00														

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
T2 150.00-140.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 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
T4 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
T5 100.00-90.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 90.00-80.00	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 170.00-150.00	Flange	0.7500 A325N	0	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 150.00-140.00	Flange	1.0000 A325N	6	1.0000 A325N	1	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-90.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 90.00-80.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 80.00-60.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 60.00-40.00	Flange	1.2500 A325N	6	1.2500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 40.00-20.00	Flange	1.2500 A325N	6	1.2500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T10 20.00-0.00	Flange	0.0000 A325N	0	1.2500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	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
CATEGORY	A	No	Ar (Leg)	87.00 - 7.00	0.0000	0.1	4	4	1.0000	1.0000		0.21

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
5e (1 WIRE) CATEGORY	A	No	Ar (Leg)	83.00 - 7.00	0.0000	0.12	2	2	1.0000	1.0000		0.21
5e (1 WIRE) 1/2 (Municipal)	A	No	Ar (Leg)	144.00 - 7.00	0.0000	0.125	1	1	0.5800	0.5800		0.25
7/8 (Municipal)	A	No	Ar (Leg)	144.00 - 7.00	0.0000	0.125	2	1	1.0000	1.1100		0.54
1/2 (Municipal)	A	No	Ar (Leg)	140.00 - 7.00	0.0000	0.13	2	1	0.5800	0.5800		0.25
1 5/8	A	No	Ar (Leg)	158.50 - 7.00	0.0000	0.13	1	1	1.5000	1.9800		1.04
1 5/8 (Sprint)	A	No	Ar (Leg)	168.00 - 7.00	0.0000	0.2	6	2	1.5000	1.9800		1.04
7/8 (Municipal)	A	No	Ar (Leg)	170.00 - 7.00	0.0000	0.14	3	1	1.0000	1.1100		0.54
7/8 (Municipal)	A	No	Ar (Leg)	170.00 - 7.00	0.0000	0.14	1	1	1.1100	1.1100		0.54
FSJ2-50 (3/8 SUPERFLEX. FOAM)	A	No	Ar (Leg)	168.00 - 7.00	0.0000	0.12	1	1	0.4300	0.4300		0.08
FSJ2-50 (3/8 SUPERFLEX. FOAM)	A	No	Ar (Leg)	170.00 - 7.00	0.0000	0.12	1	1	0.4300	0.4300		0.08
RG-11 590609 (1 1/2 FOAM)	A	No	Ar (Leg)	170.00 - 7.00	0.0000	0.12	1	1	1.5000	1.5900		0.94
1 5/8 (T-Mobile)	B	No	Ar (Leg)	125.50 - 7.00	0.0000	0.1	12	3	1.5000	1.9800		1.04
1 5/8	B	Yes	Ar (CfAe)	160.00 - 7.00	0.0000	0.4	6	6	1.5000	1.9800		1.04
1 5/8	C	No	Ar (Leg)	101.00 - 7.00	0.0000	0.17	12	6	1.5000	1.9800		1.04
1 5/8 (AT&T)	C	No	Ar (Leg)	115.00 - 7.00	0.0000	0.12	12	2	1.5000	1.9800		1.04
7/8	C	No	Ar (Leg)	170.00 - 7.00	0.0000	0.17	2	2	1.0000	1.1100		0.54
1 5/8	A	No	Ar (Leg)	160.00 - 7.00	0.0000	0.1	6	3	1.5000	1.9800		1.04
1 5/8 (T-Mobile)	C	Yes	Ar (CfAe)	125.50 - 7.00	0.0000	-0.4	6	6	1.5000	1.9800		1.04
CATEGORY 5e (1 WIRE) (Clearwire)	B	Yes	Ar (CfAe)	134.00 - 7.00	-2.0000	0	6	6	1.0000	1.0000		0.21
1/2 (Clearwire)	B	Yes	Ar (CfAe)	134.00 - 7.00	-4.0000	0	4	4	0.5800	0.5800		0.25
FB-L98B-02 (10mm Fiber) (AT&T)	C	Yes	Ar (CfAe)	115.00 - 7.00	3.0000	0.4	3	3	0.3937	0.3937		0.03
RSS 8 - AWG 2 (0.645") (AT&T)	C	Yes	Ar (CfAe)	115.00 - 7.00	2.0000	0.43	6	6	0.6450	0.6450		0.30
3" Flex Conduit (AT&T)	C	Yes	Ar (CfAe)	115.00 - 7.00	4.0000	0.41	1	1	0.0000	3.0000		3.00
1/2	A	No	Ar (Leg)	30.00 - 7.00	0.0000	0.08	3	1	0.5800	0.5800		0.25
LDF6-50A (1-1/4 FOAM) (Sprint-FO)	A	No	Ar (Leg)	170.00 - 7.00	0.0000	0.2	4	2	1.5500	1.5500		0.66
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CPD)	A	Yes	Ar (CfAe)	170.00 - 7.00	0.0000	0.38	1	1	1.5000	1.9800		0.72
1 5/8" Hybriflex (T-Mobile)	C	Yes	Ar (CfAe)	125.00 - 7.00	0.0000	-0.45	1	1	1.5000	1.6250		0.21
1 5/8"	C	Yes	Ar (CfAe)	101.00 - 7.00	0.0000	0.45	1	1	1.6250	1.6250		0.21

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
Hybriflex (VZW)												

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	170.00-150.00	A	52.481	0.000	0.000	0.000	0.32
		B	55.381	0.000	0.000	0.000	0.06
		C	3.700	0.000	0.000	0.000	0.02
T2	150.00-140.00	A	33.039	0.000	0.000	0.000	0.21
		B	39.439	0.000	0.000	0.000	0.06
		C	1.850	0.000	0.000	0.000	0.01
T3	140.00-120.00	A	70.812	0.000	0.000	0.000	0.44
		B	99.977	0.000	0.000	0.000	0.23
		C	16.480	0.000	0.000	0.000	0.06
T4	120.00-100.00	A	97.111	0.000	0.000	0.000	0.44
		B	121.691	0.000	0.000	0.000	0.42
		C	86.919	0.000	0.000	0.000	0.42
T5	100.00-90.00	A	68.280	0.000	0.000	0.000	0.22
		B	60.845	0.000	0.000	0.000	0.21
		C	66.148	0.000	0.000	0.000	0.38
T6	90.00-80.00	A	71.114	0.000	0.000	0.000	0.23
		B	63.679	0.000	0.000	0.000	0.21
		C	66.148	0.000	0.000	0.000	0.38
T7	80.00-60.00	A	146.560	0.000	0.000	0.000	0.46
		B	131.691	0.000	0.000	0.000	0.42
		C	132.296	0.000	0.000	0.000	0.75
T8	60.00-40.00	A	146.560	0.000	0.000	0.000	0.46
		B	131.691	0.000	0.000	0.000	0.42
		C	132.296	0.000	0.000	0.000	0.75
T9	40.00-20.00	A	148.010	0.000	0.000	0.000	0.47
		B	133.141	0.000	0.000	0.000	0.42
		C	132.296	0.000	0.000	0.000	0.75
T10	20.00-0.00	A	97.149	0.000	0.000	0.000	0.31
		B	87.484	0.000	0.000	0.000	0.27
		C	85.992	0.000	0.000	0.000	0.49

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	170.00-150.00	A	0.500	70.173	3.517	0.000	0.000	0.84
		B		76.589	0.000	0.000	0.000	0.15
		C		3.517	3.517	0.000	0.000	0.07
T2	150.00-140.00	A	0.500	43.948	1.758	0.000	0.000	0.54
		B		54.606	0.000	0.000	0.000	0.15
		C		1.758	1.758	0.000	0.000	0.03
T3	140.00-120.00	A	0.500	98.262	3.517	0.000	0.000	1.17
		B		130.872	15.727	0.000	0.000	0.64
		C		19.922	3.517	0.000	0.000	0.16
T4	120.00-100.00	A	0.500	125.895	3.517	0.000	0.000	1.17

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
		B		151.424	22.467	0.000	0.000	1.16
		C		100.220	13.548	0.000	0.000	1.09
T5	100.00-90.00	A	0.500	83.672	1.758	0.000	0.000	0.58
		B		75.712	11.233	0.000	0.000	0.58
		C		74.379	8.446	0.000	0.000	0.96
T6	90.00-80.00	A	0.500	85.339	5.758	0.000	0.000	0.63
		B		77.379	15.233	0.000	0.000	0.58
		C		74.379	8.446	0.000	0.000	0.96
T7	80.00-60.00	A	0.500	174.010	16.850	0.000	0.000	1.33
		B		158.091	35.800	0.000	0.000	1.16
		C		148.759	16.891	0.000	0.000	1.91
T8	60.00-40.00	A	0.500	174.010	16.850	0.000	0.000	1.33
		B		158.091	35.800	0.000	0.000	1.16
		C		148.759	16.891	0.000	0.000	1.91
T9	40.00-20.00	A	0.500	177.260	16.850	0.000	0.000	1.36
		B		161.341	35.800	0.000	0.000	1.16
		C		148.759	16.891	0.000	0.000	1.91
T10	20.00-0.00	A	0.500	117.332	10.953	0.000	0.000	0.90
		B		106.984	23.270	0.000	0.000	0.75
		C		96.693	10.979	0.000	0.000	1.24

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	170.00-150.00	A	0.239	0.771	0.000	0.000
		B	0.717	2.313	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	150.00-140.00	A	0.000	0.106	0.184	0.277
		B	0.000	0.639	1.103	1.659
		C	0.000	0.000	0.000	0.000
T3	140.00-120.00	A	0.000	0.145	0.289	0.435
		B	0.000	1.449	2.581	4.348
		C	0.000	0.271	0.536	0.813
T4	120.00-100.00	A	0.000	0.145	0.288	0.434
		B	0.000	1.696	2.942	5.088
		C	0.000	1.550	2.858	4.650
T5	100.00-90.00	A	0.000	0.057	0.114	0.171
		B	0.000	0.670	1.162	2.010
		C	0.000	0.732	1.334	2.197
T6	90.00-80.00	A	0.000	0.055	0.109	0.165
		B	0.000	0.643	1.115	1.929
		C	0.000	0.703	1.280	2.109
T7	80.00-60.00	A	0.000	0.105	0.208	0.314
		B	0.000	1.225	2.125	3.676
		C	0.000	1.339	2.439	4.018
T8	60.00-40.00	A	0.000	0.100	0.231	0.348
		B	0.000	1.167	2.361	4.084
		C	0.000	1.276	2.710	4.465
T9	40.00-20.00	A	0.000	0.096	0.223	0.336
		B	0.000	1.126	2.279	3.942
		C	0.000	1.231	2.615	4.309
T10	20.00-0.00	A	0.000	0.061	0.162	0.243
		B	0.000	0.713	1.649	2.852
		C	0.000	0.779	1.892	3.118

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	170.00-150.00	1.0981	-7.1497	1.1346	-6.5406
T2	150.00-140.00	1.7470	-5.8894	1.8153	-5.4635
T3	140.00-120.00	4.2397	-6.4647	4.0862	-6.3656
T4	120.00-100.00	3.4527	-1.2549	3.8930	-2.1140
T5	100.00-90.00	-0.6537	1.2502	0.6723	-0.0469
T6	90.00-80.00	-0.6747	0.5864	0.7210	-0.8024
T7	80.00-60.00	-0.7201	0.0575	0.8074	-1.3915
T8	60.00-40.00	-0.8377	0.0155	0.8881	-1.6218
T9	40.00-20.00	-0.9088	-0.2595	1.0023	-2.2309
T10	20.00-0.00	-0.8582	-0.5069	0.8726	-2.4335

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft / ft / ft	°	ft		ft^2	ft^2	K
PC9013N	A	From Leg	1.00 0.00 0.00	0.0000	24.00	No Ice 1/2" Ice	0.46 0.52	0.46 0.52	0.00 0.00
3"x2"x22" Panel	B	From Leg	2.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	0.65 0.81	0.47 0.61	0.05 0.05
TMA	B	From Leg	2.00 0.00 0.00	0.0000	82.50	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
TMA	B	From Leg	2.00 0.00 0.00	0.0000	84.50	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
3"x2"x22" Panel	B	From Leg	2.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice	0.65 0.81	0.47 0.61	0.05 0.05
3' Stand-off	B	From Leg	1.50 0.00 0.00	0.0000	83.50	No Ice 1/2" Ice	1.00 1.20	2.00 2.70	0.05 0.07
3' Stand-off	A	From Leg	1.50 0.00 0.00	0.0000	83.50	No Ice 1/2" Ice	1.00 1.20	2.00 2.70	0.05 0.07
TMA	A	From Leg	2.00 0.00 0.00	0.0000	83.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
BXA-171063-12BF (Verizon)	A	From Leg	4.00 0.00 0.00	0.0000	101.00	No Ice 1/2" Ice	4.73 5.18	3.57 4.01	0.02 0.04
SWCP 2x5514 (Verizon)	A	From Leg	4.00 -4.00 0.00	0.0000	101.00	No Ice 1/2" Ice	7.01 7.44	5.70 6.12	0.02 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
BXA-171063-12BF	B	From Leg	4.00	0.0000	101.00	No Ice	4.73	3.57	0.02
(Verizon)			0.00			1/2" Ice	5.18	4.01	0.04
			0.00						
BXA-171063-12BF	C	From Leg	4.00	0.0000	101.00	No Ice	4.73	3.57	0.02
(Verizon)			0.00			1/2" Ice	5.18	4.01	0.04
			0.00						
SWCP 2x5514	C	From Leg	4.00	0.0000	101.00	No Ice	7.01	5.70	0.02
(Verizon)			-4.00			1/2" Ice	7.44	6.12	0.07
			0.00						
PiROD 12' Lightweight	A	From Leg	2.00	0.0000	101.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(Verizon)			0.00						
PiROD 12' Lightweight	B	From Leg	2.00	0.0000	101.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(Verizon)			0.00						
PiROD 12' Lightweight	C	From Leg	2.00	0.0000	101.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(Verizon)			0.00						
(2) TMA (shielded)	A	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
(2) TMA (shielded)	A	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			-6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
(2) TMA (shielded)	B	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
(2) TMA (shielded)	B	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			-6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
(2) TMA (shielded)	C	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
(2) TMA (shielded)	C	From Leg	4.00	0.0000	115.00	No Ice	0.00	0.00	0.01
(AT&T)			-6.00			1/2" Ice	0.00	0.00	0.01
			0.00						
PiROD 12' Lightweight	A	From Leg	2.00	0.0000	115.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(AT&T)			0.00						
PiROD 12' Lightweight	B	From Leg	2.00	0.0000	115.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(AT&T)			0.00						
PiROD 12' Lightweight	C	From Leg	2.00	0.0000	115.00	No Ice	10.20	10.20	0.25
T-Frame			0.00			1/2" Ice	16.20	16.20	0.35
(AT&T)			0.00						
PiROD 10' Lightweight	A	From Leg	2.00	0.0000	125.50	No Ice	9.30	9.30	0.25
T-Frame			0.00			1/2" Ice	14.50	14.50	0.34
(T-Mobile)			0.00						
PiROD 10' Lightweight	B	From Leg	2.00	0.0000	125.50	No Ice	9.30	9.30	0.25
T-Frame			0.00			1/2" Ice	14.50	14.50	0.34
(T-Mobile)			0.00						
PiROD 10' Lightweight	C	From Leg	2.00	0.0000	125.50	No Ice	9.30	9.30	0.25
T-Frame			0.00			1/2" Ice	14.50	14.50	0.34
(T-Mobile)			0.00						
3" Dia 20' Omni	C	From Face	6.00	0.0000	144.00	No Ice	6.00	6.00	0.06
(Municipal)			9.00			1/2" Ice	8.03	8.03	0.10
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
PiROD 20' Universal Platform (Municipal)	C	None		0.0000	134.00	No Ice 1/2" Ice	33.10 47.10	33.10 47.10	2.27 2.70
3" Dia 20' Omni (Municipal)	A	From Face	6.00 -9.00 0.00	0.0000	144.00	No Ice 1/2" Ice	6.00 8.03	6.00 8.03	0.06 0.10
9' Whip (Municipal)	A	From Face	6.00 0.00 0.00	0.0000	138.50	No Ice 1/2" Ice	5.85 7.66	5.85 7.66	0.12 0.17
2.5" x 20'6" Whip (Municipal)	A	From Face	6.00 9.00 0.00	0.0000	144.00	No Ice 1/2" Ice	5.14 7.24	5.14 7.24	0.15 0.19
2" Dia 15' Omni (Municipal)	B	From Face	6.00 -5.00 0.00	0.0000	141.00	No Ice 1/2" Ice	3.20 4.83	3.20 4.83	0.04 0.06
1.5" x 10' Omni (Municipal)	B	From Face	6.00 5.00 0.00	0.0000	139.00	No Ice 1/2" Ice	1.50 2.52	1.50 2.52	0.06 0.07
SC420-HF1LDF (Municipal)	A	From Face	6.00 0.00 0.00	0.0000	158.50	No Ice 1/2" Ice	2.14 3.02	2.14 3.02	0.02 0.03
APXV18-206517S-C w/ mounting hardware	A	From Leg	1.00 0.00 0.00	0.0000	159.50	No Ice 1/2" Ice	5.08 5.53	4.46 5.39	0.05 0.09
APXV18-206517S-C w/ mounting hardware	B	From Leg	1.00 0.00 0.00	0.0000	159.50	No Ice 1/2" Ice	5.08 5.53	4.46 5.39	0.05 0.09
APXV18-206517S-C w/ mounting hardware	C	From Leg	1.00 0.00 0.00	0.0000	159.50	No Ice 1/2" Ice	5.08 5.53	4.46 5.39	0.05 0.09
9 Arm Halo Mount (Municipal)	C	None		0.0000	168.00	No Ice 1/2" Ice	62.60 80.40	62.60 80.40	3.60 4.80
SU-RA-HP-2.4 Antenna (Municipal)	B	From Face	3.00 2.50 0.00	0.0000	168.00	No Ice 1/2" Ice	0.80 0.93	0.37 0.47	0.00 0.01
950G65VTZE-M (Sprint)	B	From Face	6.00 1.25 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
950G65VTZE-M (Sprint)	B	From Leg	2.50 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
950G65VTZE-M (Sprint)	C	From Face	6.00 -1.25 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
950G65VTZE-M (Sprint)	C	From Face	6.00 1.25 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
950G65VTZE-M (Sprint)	C	From Leg	2.50 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
950G65VTZE-M (Sprint)	A	From Face	6.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	0.01 0.03
101-90-08-0-01 (Municipal)	A	From Leg	2.50 2.00 0.00	0.0000	183.00	No Ice 1/2" Ice	3.33 4.31	3.33 4.31	0.04 0.06
3" Dia 20' Omni	B	From Face	9.00	0.0000	178.00	No Ice	6.00	6.00	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
(Municipal)			0.00			1/2" Ice	8.03	8.03	0.10
			0.00						
2.5" x 20'6" Whip	C	From Face	0.00	0.0000	178.00	No Ice	5.14	5.14	0.15
(Municipal)			0.00			1/2" Ice	7.24	7.24	0.19
			0.00						
2.5" x 14' Omni	C	From Face	0.00	0.0000	175.00	No Ice	3.50	3.50	0.03
(Municipal)			0.00			1/2" Ice	4.93	4.93	0.06
			0.00						
2.5" x 14' Omni	C	From Face	0.00	0.0000	175.00	No Ice	3.50	3.50	0.03
(Municipal)			0.00			1/2" Ice	4.93	4.93	0.06
			0.00						
15' Mount Pipe	A	From Leg	2.50	0.0000	179.75	No Ice	4.50	4.50	0.09
(Municipal)			2.00			1/2" Ice	6.03	6.03	0.12
			0.00						
2.5" x 14' Omni	C	From Face	0.00	0.0000	175.00	No Ice	3.50	3.50	0.03
(Municipal)			0.00			1/2" Ice	4.93	4.93	0.06
			0.00						
1.5" x 12' Omni	A	From Face	2.50	0.0000	174.00	No Ice	1.50	1.50	0.06
(Municipal)			4.00			1/2" Ice	2.52	2.52	0.07
			0.00						
AIR B2A/B4P	A	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
AIR B2A/B4P	B	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
AIR B2A/B4P	C	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
AIR B2A/B4P	A	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			-3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
AIR B2A/B4P	B	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			-3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
AIR B2A/B4P	C	From Leg	4.00	0.0000	125.50	No Ice	6.42	4.22	0.08
(T-Mobile)			-3.00			1/2" Ice	6.86	4.64	0.12
			0.00						
Twin PCS TMA	A	From Leg	4.00	0.0000	125.50	No Ice	0.77	0.36	0.01
(T-Mobile)			3.00			1/2" Ice	0.96	0.52	0.02
			0.00						
Twin PCS TMA	B	From Leg	4.00	0.0000	125.50	No Ice	0.77	0.36	0.01
(T-Mobile)			3.00			1/2" Ice	0.96	0.52	0.02
			0.00						
Twin PCS TMA	C	From Leg	4.00	0.0000	125.50	No Ice	0.77	0.36	0.01
(T-Mobile)			3.00			1/2" Ice	0.96	0.52	0.02
			0.00						
Argus LLPX310R	A	From Face	6.00	0.0000	134.00	No Ice	4.86	3.46	0.03
(Clearwire)			7.00			1/2" Ice	5.22	3.80	0.06
			0.00						
Argus LLPX310R	B	From Face	6.00	0.0000	134.00	No Ice	4.86	3.46	0.03
(Clearwire)			0.00			1/2" Ice	5.22	3.80	0.06
			0.00						
Argus LLPX310R	C	From Face	6.00	0.0000	134.00	No Ice	4.86	3.46	0.03
(Clearwire)			7.00			1/2" Ice	5.22	3.80	0.06
			0.00						
REMOTE RADIO HEAD	A	From Face	6.00	0.0000	134.00	No Ice	1.82	0.83	0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(RRH)			7.00			1/2" Ice	2.00	0.97	0.04
(Clearwire)			0.00						
REMOTE RADIO HEAD	B	From Face	6.00	0.0000	134.00	No Ice	1.82	0.83	0.03
(RRH)			0.00			1/2" Ice	2.00	0.97	0.04
(Clearwire)			0.00						
REMOTE RADIO HEAD	C	From Face	6.00	0.0000	134.00	No Ice	1.82	0.83	0.03
(RRH)			7.00			1/2" Ice	2.00	0.97	0.04
(Clearwire)			0.00						
7770.00	A	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
7770.00	A	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			-6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
7770.00	B	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
7770.00	B	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			-6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
7770.00	C	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
7770.00	C	From Leg	4.00	0.0000	115.00	No Ice	10.03	5.60	0.02
(AT&T)			-6.00			1/2" Ice	10.61	6.15	0.07
			0.00						
AM-X-CD-16-65-00T-RET	A	From Leg	4.00	0.0000	115.00	No Ice	8.26	4.64	0.05
(6')			0.00			1/2" Ice	8.81	5.09	0.10
(AT&T)			0.00						
AM-X-CD-16-65-00T-RET	B	From Leg	4.00	0.0000	115.00	No Ice	8.26	4.64	0.05
(6')			0.00			1/2" Ice	8.81	5.09	0.10
(AT&T)			0.00						
AM-X-CD-16-65-00T-RET	C	From Leg	4.00	0.0000	115.00	No Ice	8.26	4.64	0.05
(6')			0.00			1/2" Ice	8.81	5.09	0.10
(AT&T)			0.00						
(2) REMOTE RADIO HEAD	A	From Leg	0.00	0.0000	115.00	No Ice	1.82	0.83	0.03
(RRH)			0.00			1/2" Ice	2.00	0.97	0.04
(AT&T)			0.00						
(2) REMOTE RADIO HEAD	B	From Leg	0.00	0.0000	115.00	No Ice	1.82	0.83	0.03
(RRH)			0.00			1/2" Ice	2.00	0.97	0.04
(AT&T)			0.00						
(2) REMOTE RADIO HEAD	C	From Leg	0.00	0.0000	115.00	No Ice	1.82	0.83	0.03
(RRH)			0.00			1/2" Ice	2.00	0.97	0.04
(AT&T)			0.00						
Surge Suppressor	C	From Leg	0.00	0.0000	115.00	No Ice	0.80	0.80	0.03
(AT&T)			0.00			1/2" Ice	0.94	0.94	0.04
			0.00						
Camera	A	From Leg	0.00	0.0000	30.00	No Ice	0.50	0.50	0.01
			0.00			1/2" Ice	0.60	0.60	0.02
			0.00						
(2) Diplexer	A	From Leg	4.00	0.0000	101.00	No Ice	0.23	0.17	0.01
(Verizon)			6.00			1/2" Ice	0.30	0.24	0.01
			0.00						
(2) Diplexer	B	From Leg	4.00	0.0000	101.00	No Ice	0.23	0.17	0.01
(Verizon)			6.00			1/2" Ice	0.30	0.24	0.01
			0.00						
(2) Diplexer	C	From Leg	4.00	0.0000	101.00	No Ice	0.23	0.17	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon)			6.00 0.00			1/2" Ice	0.30	0.24	0.01
PTP49600 (CPD)	C	From Leg	2.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	2.04 2.24	0.53 0.65	0.01 0.02
APXV18-209014-C-A20 (Sprint)	A	From Face	7.00 -2.50 0.00	0.0000	170.00	No Ice 1/2" Ice	3.51 3.85	2.00 2.33	0.02 0.04
APXV18-209014-C-A20 (Sprint)	B	From Face	7.00 -2.50 0.00	0.0000	170.00	No Ice 1/2" Ice	3.51 3.85	2.00 2.33	0.02 0.04
APXV18-209014-C-A20 (Sprint)	C	From Face	7.00 -2.50 0.00	0.0000	170.00	No Ice 1/2" Ice	3.51 3.85	2.00 2.33	0.02 0.04
(2) REMOTE RADIO HEAD (RRH) (Sprint)	A	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	1.82 2.00	0.83 0.97	0.03 0.04
(2) REMOTE RADIO HEAD (RRH) (Sprint)	B	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	1.82 2.00	0.83 0.97	0.03 0.04
(2) REMOTE RADIO HEAD (RRH) (Sprint)	C	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	1.82 2.00	0.83 0.97	0.03 0.04
800 MHz Filter (Sprint)	A	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	0.52 0.65	0.38 0.50	0.01 0.01
800 MHz Filter (Sprint)	B	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	0.52 0.65	0.38 0.50	0.01 0.01
800 MHz Filter (Sprint)	C	From Face	6.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	0.52 0.65	0.38 0.50	0.01 0.01
BXA-70063-6CF (Verizon)	B	From Leg	4.00 -4.00 0.00	0.0000	101.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
HBX-6517DS-VTM (Verizon - AWS)	A	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	5.24 5.71	3.24 3.69	0.01 0.04
HBX-6517DS-VTM (Verizon - AWS)	B	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	5.24 5.71	3.24 3.69	0.01 0.04
HBX-6517DS-VTM (Verizon - AWS)	C	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	5.24 5.71	3.24 3.69	0.01 0.04
RH_2X40-AWS (Verizon - AWS)	A	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RH_2X40-AWS (Verizon - AWS)	B	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RH_2X40-AWS (Verizon - AWS)	C	From Leg	4.00 6.00 0.00	0.0000	101.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
DB-T1-6Z-8AB-0Z (Verizon - AWS)	C	None		0.0000	101.00	No Ice 1/2" Ice	5.35 5.75	2.40 2.72	0.04 0.07
LNX-6514DS-T4M (Verizon - 850)	A	From Leg	4.00 -6.00	0.0000	101.00	No Ice 1/2" Ice	8.38 8.93	5.41 5.86	0.04 0.09

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						
LNX-6514DS-T4M	B	From Leg	4.00	0.0000	101.00	No Ice	8.38	5.41	0.04
(Verizon - 850)			-6.00			1/2" Ice	8.93	5.86	0.09
			0.00						
LNX-6514DS-T4M	C	From Leg	4.00	0.0000	101.00	No Ice	8.38	5.41	0.04
(Verizon - 850)			-6.00			1/2" Ice	8.93	5.86	0.09
			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
3' Dish	A	Paraboloid w/o Radome	From Leg	2.00	0.0000		83.00	3.00	No Ice	7.07	0.23
				0.00					1/2" Ice	7.47	0.27
				0.00							
VHLP2.5-180	A	Paraboloid w/o Radome	From Face	6.00	0.0000		134.00	2.50	No Ice	4.90	0.07
(Clearwire)				0.00					1/2" Ice	5.24	0.10
				0.00							
VHLP2.5-180	A	Paraboloid w/o Radome	From Face	6.00	0.0000		134.00	2.50	No Ice	4.90	0.07
(Clearwire)				-7.00					1/2" Ice	5.24	0.10
				0.00							
VHLP2.5-180	B	Paraboloid w/o Radome	From Face	6.00	0.0000		134.00	2.50	No Ice	4.90	0.07
(Clearwire)				-7.00					1/2" Ice	5.24	0.10
				0.00							
VHLP2-180	C	Paraboloid w/o Radome	From Face	6.00	0.0000		134.00	2.00	No Ice	3.14	0.03
(Clearwire)				0.00					1/2" Ice	3.41	0.04
				0.00							
HPD2-4.7	C	Paraboloid w/Radome	From Face	2.00	0.0000		168.00	2.00	No Ice	3.14	0.03
				0.00					1/2" Ice	3.41	0.04
				0.00							

Truss-Leg Properties

Section Designation	Area in^2	Area Ice in^2	Self Weight K	Ice Weight K	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in^2
Pirod 105244	1026.8606	1727.9786	0.56	0.21	7.1310	11.9999	3.6816
Pirod 105216	1998.0891	3357.4497	0.51	0.43	6.9378	11.6578	3.6816
Pirod 105217	2130.7479	3520.4599	0.62	0.44	7.3984	12.2238	5.3014
Pirod 105217	2130.7479	3520.4599	0.62	0.44	7.3984	12.2238	5.3014
Pirod 105217 reinf w/ 1" dia bar	2291.5652	3727.7657	0.79	0.46	7.9568	12.9436	7.6570
Pirod 105218 reinf w/ 1" dia bar	2425.8928	3907.6826	0.95	0.48	8.4232	13.5683	9.9280

Section Designation	Area	Area Ice	Self Weight	Ice Weight	Equiv. Diameter	Equiv. Diameter Ice	Leg Area
	in^2	in^2	K	K	in	in	in^2
Pirod 105219	2441.8688	3942.2854	0.94	0.49	8.4787	13.6885	9.4248
Pirod 105219 reinf w /1" dia bar	2571.0468	4121.6676	1.11	0.50	8.9272	14.3113	11.7803
Pirod 105220 reinf w/ 1" dia bar	2697.7688	4300.8949	1.29	0.51	9.3673	14.9337	14.2843

Tower Pressures - No Ice

$G_H = 1.125$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
T1	160.00	1.57	29	102.917	A	0.000	65.110	5.833	8.96	0.000	0.000
170.00-150.00					B	0.000	67.531		8.64	0.000	0.000
					C	0.000	16.568		35.21	0.000	0.000
T2	145.00	1.526	28	66.055	A	5.292	44.944	11.905	23.70	0.000	0.000
150.00-140.00					B	4.373	51.344		21.37	0.000	0.000
					C	5.476	13.755		61.91	0.000	0.000
T3	130.00	1.48	27	162.111	A	10.178	93.976	23.165	22.24	0.000	0.000
140.00-120.00					B	7.886	123.141		17.68	0.000	0.000
					C	9.931	39.645		46.72	0.000	0.000
T4	110.00	1.411	26	202.528	A	13.676	121.814	24.703	18.23	0.000	0.000
120.00-100.00					B	11.023	146.393		15.69	0.000	0.000
					C	11.106	111.622		20.13	0.000	0.000
T5	95.00	1.353	25	116.264	A	6.447	80.631	12.351	14.18	0.000	0.000
100.00-90.00					B	5.399	73.197		15.71	0.000	0.000
					C	5.227	78.499		14.75	0.000	0.000
T6 90.00-80.00	85.00	1.31	24	126.517	A	6.849	84.397	13.283	14.56	0.000	0.000
					B	5.844	76.962		16.04	0.000	0.000
					C	5.679	79.431		15.61	0.000	0.000
T7 80.00-60.00	70.00	1.24	23	283.450	A	14.936	174.685	28.124	14.83	0.000	0.000
					B	13.019	159.815		16.27	0.000	0.000
					C	12.705	160.420		16.24	0.000	0.000
T8 60.00-40.00	50.00	1.126	21	323.362	A	19.403	174.870	28.309	14.57	0.000	0.000
					B	17.274	160.000		15.97	0.000	0.000
					C	16.925	160.605		15.95	0.000	0.000
T9 40.00-20.00	30.00	1	18	363.756	A	21.437	177.817	29.807	14.96	0.000	0.000
					B	19.382	162.948		16.35	0.000	0.000
					C	19.045	162.103		16.45	0.000	0.000
T10 20.00-0.00	10.00	1	18	404.134	A	26.964	128.425	31.276	20.13	0.000	0.000
					B	25.476	118.760		21.68	0.000	0.000
					C	25.233	117.269		21.95	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.125$

Section Elevation	z	K_Z	q_z	t_Z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2

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 170.00-150.00	160.00	1.57	22	0.5000	104.583	A	3.517	93.642	9.167	9.43	0.000	0.000
						B	0.000	98.516		9.30	0.000	0.000
						C	3.517	27.757		29.31	0.000	0.000
T2 150.00-140.00	145.00	1.526	21	0.5000	66.890	A	6.957	65.983	20.033	27.46	0.000	0.000
						B	3.816	76.109		25.06	0.000	0.000
						C	7.234	23.901		64.34	0.000	0.000
T3 140.00-120.00	130.00	1.48	21	0.5000	163.780	A	13.549	140.530	38.924	25.26	0.000	0.000
						B	21.845	171.835		20.10	0.000	0.000
						C	13.171	62.064		51.74	0.000	0.000
T4 120.00-100.00	110.00	1.411	20	0.5000	204.197	A	17.047	171.219	40.814	21.68	0.000	0.000
						B	31.343	195.197		18.02	0.000	0.000
						C	22.861	144.139		24.44	0.000	0.000
T5 100.00-90.00	95.00	1.353	19	0.5000	117.098	A	8.148	106.209	20.407	17.85	0.000	0.000
						B	15.784	97.636		17.99	0.000	0.000
						C	12.810	96.241		18.71	0.000	0.000
T6 90.00-80.00	85.00	1.31	18	0.5000	127.351	A	12.553	109.212	21.609	17.75	0.000	0.000
						B	20.263	100.664		17.87	0.000	0.000
						C	13.296	97.605		19.48	0.000	0.000
T7 80.00-60.00	70.00	1.24	17	0.5000	285.119	A	31.681	224.257	45.303	17.70	0.000	0.000
						B	47.268	207.217		17.80	0.000	0.000
						C	28.017	197.770		20.06	0.000	0.000
T8 60.00-40.00	50.00	1.126	16	0.5000	325.031	A	36.137	225.225	45.704	17.49	0.000	0.000
						B	51.351	208.238		17.61	0.000	0.000
						C	32.062	198.797		19.80	0.000	0.000
T9 40.00-20.00	30.00	1	14	0.5000	365.425	A	38.175	231.137	47.784	17.74	0.000	0.000
						B	53.519	214.187		17.85	0.000	0.000
						C	34.243	201.500		20.27	0.000	0.000
T10 20.00-0.00	10.00	1	14	0.5000	405.803	A	37.834	173.914	49.862	23.55	0.000	0.000
						B	47.543	162.914		23.69	0.000	0.000
						C	34.987	152.557		26.59	0.000	0.000

Tower Pressure - Service

$G_H = 1.125$

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 170.00-150.00	160.00	1.57	10	102.917	A	0.000	65.110	5.833	8.96	0.000	0.000
					B	0.000	67.531		8.64	0.000	0.000
					C	0.000	16.568		35.21	0.000	0.000
T2 150.00-140.00	145.00	1.526	10	66.055	A	5.292	44.944	11.905	23.70	0.000	0.000
					B	4.373	51.344		21.37	0.000	0.000
					C	5.476	13.755		61.91	0.000	0.000
T3 140.00-120.00	130.00	1.48	9	162.111	A	10.178	93.976	23.165	22.24	0.000	0.000
					B	7.886	123.141		17.68	0.000	0.000
					C	9.931	39.645		46.72	0.000	0.000
T4 120.00-100.00	110.00	1.411	9	202.528	A	13.676	121.814	24.703	18.23	0.000	0.000
					B	11.023	146.393		15.69	0.000	0.000
					C	11.106	111.622		20.13	0.000	0.000
T5 100.00-90.00	95.00	1.353	9	116.264	A	6.447	80.631	12.351	14.18	0.000	0.000
					B	5.399	73.197		15.71	0.000	0.000
					C	5.227	78.499		14.75	0.000	0.000
T6 90.00-80.00	85.00	1.31	8	126.517	A	6.849	84.397	13.283	14.56	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
					B	5.844	76.962		16.04	0.000	0.000
					C	5.679	79.431		15.61	0.000	0.000
T7 80.00-60.00	70.00	1.24	8	283.450	A	14.936	174.685	28.124	14.83	0.000	0.000
					B	13.019	159.815		16.27	0.000	0.000
					C	12.705	160.420		16.24	0.000	0.000
T8 60.00-40.00	50.00	1.126	7	323.362	A	19.403	174.870	28.309	14.57	0.000	0.000
					B	17.274	160.000		15.97	0.000	0.000
					C	16.925	160.605		15.95	0.000	0.000
T9 40.00-20.00	30.00	1	6	363.756	A	21.437	177.817	29.807	14.96	0.000	0.000
					B	19.382	162.948		16.35	0.000	0.000
					C	19.045	162.103		16.45	0.000	0.000
T10 20.00-0.00	10.00	1	6	404.134	A	26.964	128.425	31.276	20.13	0.000	0.000
					B	25.476	118.760		21.68	0.000	0.000
					C	25.233	117.269		21.95	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	0.40	1.16	A	0.633	1.787	0.774	1	1	50.403	3.10	154.98	B
170.00-150.00			B	0.656	1.78	0.79	1	1	53.322			
			C	0.161	2.732	0.583	1	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	1	1	44.167	3.08	307.82	B
150.00-140.00			B	0.843	1.855	0.933	1	1	52.269			
			C	0.291	2.32	0.613	1	1	13.910			
T3	0.72	2.09	A	0.642	1.784	0.781	1	1	83.529	6.68	334.02	B
140.00-120.00			B	0.808	1.822	0.903	1	1	119.103			
			C	0.306	2.281	0.618	1	1	34.420			
T4	1.28	2.60	A	0.669	1.777	0.798	1	1	110.914	7.38	368.79	B
120.00-100.00			B	0.777	1.801	0.878	1	1	139.571			
			C	0.606	1.8	0.757	1	1	95.635			
T5	0.81	1.48	A	0.749	1.787	0.856	1	1	75.475	3.80	379.56	A
100.00-90.00			B	0.676	1.777	0.803	1	1	64.181			
			C	0.72	1.779	0.834	1	1	70.734			
T6	0.81	1.76	A	0.721	1.779	0.835	1	1	77.345	3.75	375.05	A
90.00-80.00			B	0.655	1.78	0.788	1	1	66.526			
			C	0.673	1.777	0.801	1	1	69.288			
T7	1.64	4.33	A	0.669	1.777	0.798	1	1	154.376	7.08	353.81	A
80.00-60.00			B	0.61	1.798	0.76	1	1	134.417			
			C	0.611	1.798	0.76	1	1	134.666			
T8	1.64	4.45	A	0.601	1.804	0.754	1	1	151.270	6.39	319.54	A
60.00-40.00			B	0.548	1.845	0.723	1	1	132.998			
			C	0.549	1.844	0.724	1	1	133.159			
T9	1.64	5.44	A	0.548	1.846	0.723	1	1	150.004	5.76	287.97	A
40.00-20.00			B	0.501	1.898	0.698	1	1	133.141			
			C	0.498	1.903	0.696	1	1	131.947			
T10	1.07	6.08	A	0.384	2.096	0.645	1	1	109.849	4.79	239.43	A
20.00-0.00			B	0.357	2.156	0.635	1	1	100.885			
			C	0.353	2.165	0.633	1	1	99.512			
Sum Weight:	10.29	30.51						OTM	4337.00 kip-ft	51.80		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.40	1.16	A	0.633	1.787	0.774	0.825	1	50.403	3.10	154.98	B
170.00-150.00			B	0.656	1.78	0.79	0.825	1	53.322			
			C	0.161	2.732	0.583	0.825	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.825	1	43.241	3.03	303.31	B
150.00-140.00			B	0.843	1.855	0.933	0.825	1	51.504			
			C	0.291	2.32	0.613	0.825	1	12.952			
T3	0.72	2.09	A	0.642	1.784	0.781	0.825	1	81.748	6.60	330.15	B
140.00-120.00			B	0.808	1.822	0.903	0.825	1	117.723			
			C	0.306	2.281	0.618	0.825	1	32.682			
T4	1.28	2.60	A	0.669	1.777	0.798	0.825	1	108.521	7.27	363.69	B
120.00-100.00			B	0.777	1.801	0.878	0.825	1	137.642			
			C	0.606	1.8	0.757	0.825	1	93.692			
T5	0.81	1.48	A	0.749	1.787	0.856	0.825	1	74.347	3.74	373.88	A
100.00-90.00			B	0.676	1.777	0.803	0.825	1	63.236			
			C	0.72	1.779	0.834	0.825	1	69.819			
T6	0.81	1.76	A	0.721	1.779	0.835	0.825	1	76.146	3.69	369.23	A
90.00-80.00			B	0.655	1.78	0.788	0.825	1	65.503			
			C	0.673	1.777	0.801	0.825	1	68.294			
T7	1.64	4.33	A	0.669	1.777	0.798	0.825	1	151.762	6.96	347.82	A
80.00-60.00			B	0.61	1.798	0.76	0.825	1	132.139			
			C	0.611	1.798	0.76	0.825	1	132.442			
T8	1.64	4.45	A	0.601	1.804	0.754	0.825	1	147.874	6.25	312.37	A
60.00-40.00			B	0.548	1.845	0.723	0.825	1	129.975			
			C	0.549	1.844	0.724	0.825	1	130.197			
T9	1.64	5.44	A	0.548	1.846	0.723	0.825	1	146.253	5.62	280.77	A
40.00-20.00			B	0.501	1.898	0.698	0.825	1	129.749			
			C	0.498	1.903	0.696	0.825	1	128.614			
T10	1.07	6.08	A	0.384	2.096	0.645	0.825	1	105.130	4.58	229.15	A
20.00-0.00			B	0.357	2.156	0.635	0.825	1	96.426			
			C	0.353	2.165	0.633	0.825	1	95.096			
Sum Weight:	10.29	30.51						OTM	4276.92 kip-ft	50.84		

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	0.40	1.16	A	0.633	1.787	0.774	0.8	1	50.403	3.10	154.98	B
170.00-150.00			B	0.656	1.78	0.79	0.8	1	53.322			
			C	0.161	2.732	0.583	0.8	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.8	1	43.109	3.03	302.67	B
150.00-140.00			B	0.843	1.855	0.933	0.8	1	51.395			
			C	0.291	2.32	0.613	0.8	1	12.815			
T3	0.72	2.09	A	0.642	1.784	0.781	0.8	1	81.494	6.59	329.60	B
140.00-120.00			B	0.808	1.822	0.903	0.8	1	117.526			
			C	0.306	2.281	0.618	0.8	1	32.434			
T4	1.28	2.60	A	0.669	1.777	0.798	0.8	1	108.179	7.26	362.97	B
120.00-100.00			B	0.777	1.801	0.878	0.8	1	137.366			
			C	0.606	1.8	0.757	0.8	1	93.414			
T5	0.81	1.48	A	0.749	1.787	0.856	0.8	1	74.186	3.73	373.07	A
100.00-90.00			B	0.676	1.777	0.803	0.8	1	63.101			

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	0.72	1.779	0.834	0.8	1	69.689			
T6	0.81	1.76	A	0.721	1.779	0.835	0.8	1	75.975	3.68	368.40	A
90.00-80.00			B	0.655	1.78	0.788	0.8	1	65.357			
			C	0.673	1.777	0.801	0.8	1	68.152			
T7	1.64	4.33	A	0.669	1.777	0.798	0.8	1	151.389	6.94	346.97	A
80.00-60.00			B	0.61	1.798	0.76	0.8	1	131.813			
			C	0.611	1.798	0.76	0.8	1	132.125			
T8	1.64	4.45	A	0.601	1.804	0.754	0.8	1	147.389	6.23	311.34	A
60.00-40.00			B	0.548	1.845	0.723	0.8	1	129.543			
			C	0.549	1.844	0.724	0.8	1	129.774			
T9	1.64	5.44	A	0.548	1.846	0.723	0.8	1	145.717	5.59	279.74	A
40.00-20.00			B	0.501	1.898	0.698	0.8	1	129.265			
			C	0.498	1.903	0.696	0.8	1	128.138			
T10	1.07	6.08	A	0.384	2.096	0.645	0.8	1	104.456	4.55	227.68	A
20.00-0.00			B	0.357	2.156	0.635	0.8	1	95.789			
			C	0.353	2.165	0.633	0.8	1	94.465			
Sum Weight:	10.29	30.51						OTM	4268.34 kip-ft	50.71		

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	0.40	1.16	A	0.633	1.787	0.774	0.85	1	50.403	3.10	154.98	B
170.00-150.00			B	0.656	1.78	0.79	0.85	1	53.322			
			C	0.161	2.732	0.583	0.85	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.85	1	43.373	3.04	303.96	B
150.00-140.00			B	0.843	1.855	0.933	0.85	1	51.613			
			C	0.291	2.32	0.613	0.85	1	13.089			
T3	0.72	2.09	A	0.642	1.784	0.781	0.85	1	82.003	6.61	330.70	B
140.00-120.00			B	0.808	1.822	0.903	0.85	1	117.921			
			C	0.306	2.281	0.618	0.85	1	32.930			
T4	1.28	2.60	A	0.669	1.777	0.798	0.85	1	108.863	7.29	364.42	B
120.00-100.00			B	0.777	1.801	0.878	0.85	1	137.918			
			C	0.606	1.8	0.757	0.85	1	93.969			
T5	0.81	1.48	A	0.749	1.787	0.856	0.85	1	74.508	3.75	374.70	A
100.00-90.00			B	0.676	1.777	0.803	0.85	1	63.371			
			C	0.72	1.779	0.834	0.85	1	69.950			
T6	0.81	1.76	A	0.721	1.779	0.835	0.85	1	76.317	3.70	370.07	A
90.00-80.00			B	0.655	1.78	0.788	0.85	1	65.649			
			C	0.673	1.777	0.801	0.85	1	68.436			
T7	1.64	4.33	A	0.669	1.777	0.798	0.85	1	152.135	6.97	348.68	A
80.00-60.00			B	0.61	1.798	0.76	0.85	1	132.464			
			C	0.611	1.798	0.76	0.85	1	132.760			
T8	1.64	4.45	A	0.601	1.804	0.754	0.85	1	148.360	6.27	313.39	A
60.00-40.00			B	0.548	1.845	0.723	0.85	1	130.407			
			C	0.549	1.844	0.724	0.85	1	130.620			
T9	1.64	5.44	A	0.548	1.846	0.723	0.85	1	146.788	5.64	281.80	A
40.00-20.00			B	0.501	1.898	0.698	0.85	1	130.234			
			C	0.498	1.903	0.696	0.85	1	129.090			
T10	1.07	6.08	A	0.384	2.096	0.645	0.85	1	105.805	4.61	230.62	A
20.00-0.00			B	0.357	2.156	0.635	0.85	1	97.063			
			C	0.353	2.165	0.633	0.85	1	95.727			

tnxTower	Job: PiROD U20'-0"x170' Lattice Tower	Page: 22 of 43
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: 860-529-8882 FAX: 860-529-3991	Project: VZ5-178 / Cromwell, CT Tower	Date: 14:33:53 03/28/14
	Client: Verizon	Designed by: MCD

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	10.29	30.51						OTM	4285.50 kip-ft	50.98		

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 ft^2	F K	w plf	Ctrl. Face
T1	1.06	1.49	A	0.929	1.968	1	1	1	97.158	4.80	240.06	B
170.00-150.00			B	0.942	1.99	1	1	1	98.516			
			C	0.299	2.299	0.616	1	1	20.604			
T2	0.73	1.64	A	1	2.1	1	1	1	72.941	3.19*	318.60	B
150.00-140.00			B	1	2.1	1	1	1	79.926			
			C	0.465	1.949	0.68	1	1	23.498			
T3	1.97	3.77	A	0.941	1.988	1	1	1	154.079	7.56*	378.07	B
140.00-120.00			B	1	2.1	1	1	1	193.681			
			C	0.459	1.958	0.678	1	1	55.227			
T4	3.41	4.44	A	0.922	1.957	1	1	1	188.266	8.99*	449.40	B
120.00-100.00			B	1	2.1	1	1	1	226.539			
			C	0.818	1.83	0.911	1	1	154.189			
T5	2.12	2.39	A	0.977	2.053	1	1	1	114.357	4.94*	494.28	A
100.00-90.00			B	0.969	2.037	1	1	1	113.420			
			C	0.931	1.972	1	1	1	109.050			
T6	2.17	2.70	A	0.956	2.014	1	1	1	121.764	5.01	501.49	A
90.00-80.00			B	0.95	2.003	1	1	1	120.927			
			C	0.871	1.885	0.957	1	1	106.679			
T7	4.40	6.30	A	0.898	1.921	0.981	1	1	251.665	9.35	467.46	A
80.00-60.00			B	0.893	1.914	0.976	1	1	249.573			
			C	0.792	1.81	0.89	1	1	204.000			
T8	4.40	6.58	A	0.804	1.819	0.9	1	1	238.786	7.63	381.58	A
60.00-40.00			B	0.799	1.815	0.895	1	1	237.787			
			C	0.71	1.777	0.827	1	1	196.523			
T9	4.43	7.67	A	0.737	1.783	0.847	1	1	233.948	6.51	325.54	B
40.00-20.00			B	0.733	1.782	0.844	1	1	234.230			
			C	0.645	1.783	0.782	1	1	191.867			
T10	2.90	8.52	A	0.522	1.873	0.709	1	1	161.115	4.77	238.31	B
20.00-0.00			B	0.519	1.877	0.707	1	1	162.751			
			C	0.462	1.954	0.679	1	1	138.562			
Sum Weight:	27.59	45.51			*$2A_g$ limit			OTM	5376.66 kip-ft	62.75		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	1.06	1.49	A	0.929	1.968	1	0.825	1	96.543	4.80	240.06	B
170.00-150.00			B	0.942	1.99	1	0.825	1	98.516			
			C	0.299	2.299	0.616	0.825	1	19.988			

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	0.73	1.64	A	1	2.1	1	0.825	1	71.723	3.19*	318.60	B
150.00-140.00			B	1	2.1	1	0.825	1	79.258			
			C	0.465	1.949	0.68	0.825	1	22.232			
T3	1.97	3.77	A	0.941	1.988	1	0.825	1	151.708	7.56*	378.07	B
140.00-120.00			B	1	2.1	1	0.825	1	189.858			
			C	0.459	1.958	0.678	0.825	1	52.922			
T4	3.41	4.44	A	0.922	1.957	1	0.825	1	185.282	8.99*	449.40	B
120.00-100.00			B	1	2.1	1	0.825	1	221.054			
			C	0.818	1.83	0.911	0.825	1	150.189			
T5	2.12	2.39	A	0.977	2.053	1	0.825	1	112.931	4.89	489.25	A
100.00-90.00			B	0.969	2.037	1	0.825	1	110.658			
			C	0.931	1.972	1	0.825	1	106.809			
T6	2.17	2.70	A	0.956	2.014	1	0.825	1	119.568	4.92	492.44	A
90.00-80.00			B	0.95	2.003	1	0.825	1	117.381			
			C	0.871	1.885	0.957	0.825	1	104.352			
T7	4.40	6.30	A	0.898	1.921	0.981	0.825	1	246.121	9.14	457.16	A
80.00-60.00			B	0.893	1.914	0.976	0.825	1	241.301			
			C	0.792	1.81	0.89	0.825	1	199.096			
T8	4.40	6.58	A	0.804	1.819	0.9	0.825	1	232.462	7.43	371.47	A
60.00-40.00			B	0.799	1.815	0.895	0.825	1	228.801			
			C	0.71	1.777	0.827	0.825	1	190.913			
T9	4.43	7.67	A	0.737	1.783*	0.847	0.825	1	227.268	6.32	316.09	A
40.00-20.00			B	0.733	1.782	0.844	0.825	1	224.864			
			C	0.645	1.783	0.782	0.825	1	185.874			
T10	2.90	8.52	A	0.522	1.873	0.709	0.825	1	154.494	4.52	226.13	B
20.00-0.00			B	0.519	1.877	0.707	0.825	1	154.431			
			C	0.462	1.954	0.679	0.825	1	132.439			
Sum Weight:	27.59	45.51			*$2A_g$ limit			OTM	5331.56 kip-ft	61.77		

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	1.06	1.49	A	0.929	1.968	1	0.8	1	96.455	4.80	240.06	B
170.00-150.00			B	0.942	1.99	1	0.8	1	98.516			
			C	0.299	2.299	0.616	0.8	1	19.901			
T2	0.73	1.64	A	1	2.1	1	0.8	1	71.549	3.19*	318.60	B
150.00-140.00			B	1	2.1	1	0.8	1	79.162			
			C	0.465	1.949	0.68	0.8	1	22.051			
T3	1.97	3.77	A	0.941	1.988	1	0.8	1	151.369	7.56*	378.07	B
140.00-120.00			B	1	2.1	1	0.8	1	189.312			
			C	0.459	1.958	0.678	0.8	1	52.593			
T4	3.41	4.44	A	0.922	1.957	1	0.8	1	184.856	8.99*	449.40	B
120.00-100.00			B	1	2.1	1	0.8	1	220.271			
			C	0.818	1.83	0.911	0.8	1	149.617			
T5	2.12	2.39	A	0.977	2.053	1	0.8	1	112.727	4.88	488.36	A
100.00-90.00			B	0.969	2.037	1	0.8	1	110.263			
			C	0.931	1.972	1	0.8	1	106.489			
T6	2.17	2.70	A	0.956	2.014	1	0.8	1	119.254	4.91	491.15	A
90.00-80.00			B	0.95	2.003	1	0.8	1	116.874			
			C	0.871	1.885	0.957	0.8	1	104.020			
T7	4.40	6.30	A	0.898	1.921	0.981	0.8	1	245.329	9.11	455.69	A
80.00-60.00			B	0.893	1.914	0.976	0.8	1	240.119			

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
			C	0.792	1.81	0.89	0.8	1	198.396			
T8	4.40	6.58	A	0.804	1.819	0.9	0.8	1	231.559	7.40	370.03	A
60.00-40.00			B	0.799	1.815	0.895	0.8	1	227.517			
			C	0.71	1.777	0.827	0.8	1	190.111			
T9	4.43	7.67	A	0.737	1.783	0.847	0.8	1	226.313	6.30	314.77	A
40.00-20.00			B	0.733	1.782	0.844	0.8	1	223.526			
			C	0.645	1.783	0.782	0.8	1	185.018			
T10	2.90	8.52	A	0.522	1.873	0.709	0.8	1	153.548	4.49	224.39	A
20.00-0.00			B	0.519	1.877	0.707	0.8	1	153.243			
			C	0.462	1.954	0.679	0.8	1	131.565			
Sum Weight:	27.59	45.51			*2A_g limit			OTM	5324.98 kip-ft	61.63		

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 ft^2	F K	w plf	Ctrl. Face
T1	1.06	1.49	A	0.929	1.968	1	0.85	1	96.631	4.80	240.06	B
170.00-150.00			B	0.942	1.99	1	0.85	1	98.516			
			C	0.299	2.299	0.616	0.85	1	20.076			
T2	0.73	1.64	A	1	2.1	1	0.85	1	71.897	3.19*	318.60	B
150.00-140.00			B	1	2.1	1	0.85	1	79.353			
			C	0.465	1.949	0.68	0.85	1	22.413			
T3	1.97	3.77	A	0.941	1.988	1	0.85	1	152.047	7.56*	378.07	B
140.00-120.00			B	1	2.1	1	0.85	1	190.404			
			C	0.459	1.958	0.678	0.85	1	53.252			
T4	3.41	4.44	A	0.922	1.957	1	0.85	1	185.709	8.99*	449.40	B
120.00-100.00			B	1	2.1	1	0.85	1	221.838			
			C	0.818	1.83	0.911	0.85	1	150.760			
T5	2.12	2.39	A	0.977	2.053	1	0.85	1	113.135	4.90	490.13	A
100.00-90.00			B	0.969	2.037	1	0.85	1	111.053			
			C	0.931	1.972	1	0.85	1	107.129			
T6	2.17	2.70	A	0.956	2.014	1	0.85	1	119.882	4.94	493.73	A
90.00-80.00			B	0.95	2.003	1	0.85	1	117.888			
			C	0.871	1.885	0.957	0.85	1	104.685			
T7	4.40	6.30	A	0.898	1.921	0.981	0.85	1	246.913	9.17	458.64	A
80.00-60.00			B	0.893	1.914	0.976	0.85	1	242.483			
			C	0.792	1.81	0.89	0.85	1	199.797			
T8	4.40	6.58	A	0.804	1.819	0.9	0.85	1	233.366	7.46	372.92	A
60.00-40.00			B	0.799	1.815	0.895	0.85	1	230.085			
			C	0.71	1.777	0.827	0.85	1	191.714			
T9	4.43	7.67	A	0.737	1.783	0.847	0.85	1	228.222	6.35	317.42	A
40.00-20.00			B	0.733	1.782	0.844	0.85	1	226.202			
			C	0.645	1.783	0.782	0.85	1	186.730			
T10	2.90	8.52	A	0.522	1.873	0.709	0.85	1	155.440	4.56	227.87	B
20.00-0.00			B	0.519	1.877	0.707	0.85	1	155.620			
			C	0.462	1.954	0.679	0.85	1	133.314			
Sum Weight:	27.59	45.51			*2A_g limit			OTM	5338.15 kip-ft	61.91		

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	0.40	1.16	A	0.633	1.787	0.774	1	1	50.403	1.07	53.63	B
170.00-150.00			B	0.656	1.78	0.79	1	1	53.322			
			C	0.161	2.732	0.583	1	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	1	1	44.167	1.07	106.51	B
150.00-140.00			B	0.843	1.855	0.933	1	1	52.269			
			C	0.291	2.32	0.613	1	1	13.910			
T3	0.72	2.09	A	0.642	1.784	0.781	1	1	83.529	2.31	115.58	B
140.00-120.00			B	0.808	1.822	0.903	1	1	119.103			
			C	0.306	2.281	0.618	1	1	34.420			
T4	1.28	2.60	A	0.669	1.777	0.798	1	1	110.914	2.55	127.61	B
120.00-100.00			B	0.777	1.801	0.878	1	1	139.571			
			C	0.606	1.8	0.757	1	1	95.635			
T5	0.81	1.48	A	0.749	1.787	0.856	1	1	75.475	1.31	131.34	A
100.00-90.00			B	0.676	1.777	0.803	1	1	64.181			
			C	0.72	1.779	0.834	1	1	70.734			
T6	0.81	1.76	A	0.721	1.779	0.835	1	1	77.345	1.30	129.77	A
90.00-80.00			B	0.655	1.78	0.788	1	1	66.526			
			C	0.673	1.777	0.801	1	1	69.288			
T7	1.64	4.33	A	0.669	1.777	0.798	1	1	154.376	2.45	122.43	A
80.00-60.00			B	0.61	1.798	0.76	1	1	134.417			
			C	0.611	1.798	0.76	1	1	134.666			
T8	1.64	4.45	A	0.601	1.804	0.754	1	1	151.270	2.21	110.57	A
60.00-40.00			B	0.548	1.845	0.723	1	1	132.998			
			C	0.549	1.844	0.724	1	1	133.159			
T9	1.64	5.44	A	0.548	1.846	0.723	1	1	150.004	1.99	99.64	A
40.00-20.00			B	0.501	1.898	0.698	1	1	133.141			
			C	0.498	1.903	0.696	1	1	131.947			
T10	1.07	6.08	A	0.384	2.096	0.645	1	1	109.849	1.66	82.85	A
20.00-0.00			B	0.357	2.156	0.635	1	1	100.885			
			C	0.353	2.165	0.633	1	1	99.512			
Sum Weight:	10.29	30.51						OTM	1500.69 kip-ft	17.92		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.40	1.16	A	0.633	1.787	0.774	0.825	1	50.403	1.07	53.63	B
170.00-150.00			B	0.656	1.78	0.79	0.825	1	53.322			
			C	0.161	2.732	0.583	0.825	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.825	1	43.241	1.05	104.95	B
150.00-140.00			B	0.843	1.855	0.933	0.825	1	51.504			
			C	0.291	2.32	0.613	0.825	1	12.952			
T3	0.72	2.09	A	0.642	1.784	0.781	0.825	1	81.748	2.28	114.24	B
140.00-120.00			B	0.808	1.822	0.903	0.825	1	117.723			
			C	0.306	2.281	0.618	0.825	1	32.682			
T4	1.28	2.60	A	0.669	1.777	0.798	0.825	1	108.521	2.52	125.85	B
120.00-100.00			B	0.777	1.801	0.878	0.825	1	137.642			
			C	0.606	1.8	0.757	0.825	1	93.692			
T5	0.81	1.48	A	0.749	1.787	0.856	0.825	1	74.347	1.29	129.37	A
100.00-90.00			B	0.676	1.777	0.803	0.825	1	63.236			

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	0.72	1.779	0.834	0.825	1	69.819			
T6	0.81	1.76	A	0.721	1.779	0.835	0.825	1	76.146	1.28	127.76	A
90.00-80.00			B	0.655	1.78	0.788	0.825	1	65.503			
			C	0.673	1.777	0.801	0.825	1	68.294			
T7	1.64	4.33	A	0.669	1.777	0.798	0.825	1	151.762	2.41	120.35	A
80.00-60.00			B	0.61	1.798	0.76	0.825	1	132.139			
			C	0.611	1.798	0.76	0.825	1	132.442			
T8	1.64	4.45	A	0.601	1.804	0.754	0.825	1	147.874	2.16	108.09	A
60.00-40.00			B	0.548	1.845	0.723	0.825	1	129.975			
			C	0.549	1.844	0.724	0.825	1	130.197			
T9	1.64	5.44	A	0.548	1.846	0.723	0.825	1	146.253	1.94	97.15	A
40.00-20.00			B	0.501	1.898	0.698	0.825	1	129.749			
			C	0.498	1.903	0.696	0.825	1	128.614			
T10	1.07	6.08	A	0.384	2.096	0.645	0.825	1	105.130	1.59	79.29	A
20.00-0.00			B	0.357	2.156	0.635	0.825	1	96.426			
			C	0.353	2.165	0.633	0.825	1	95.096			
Sum Weight:	10.29	30.51						OTM	1479.90 kip-ft	17.59		

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	0.40	1.16	A	0.633	1.787	0.774	0.8	1	50.403	1.07	53.63	B
170.00-150.00			B	0.656	1.78	0.79	0.8	1	53.322			
			C	0.161	2.732	0.583	0.8	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.8	1	43.109	1.05	104.73	B
150.00-140.00			B	0.843	1.855	0.933	0.8	1	51.395			
			C	0.291	2.32	0.613	0.8	1	12.815			
T3	0.72	2.09	A	0.642	1.784	0.781	0.8	1	81.494	2.28	114.05	B
140.00-120.00			B	0.808	1.822	0.903	0.8	1	117.526			
			C	0.306	2.281	0.618	0.8	1	32.434			
T4	1.28	2.60	A	0.669	1.777	0.798	0.8	1	108.179	2.51	125.59	B
120.00-100.00			B	0.777	1.801	0.878	0.8	1	137.366			
			C	0.606	1.8	0.757	0.8	1	93.414			
T5	0.81	1.48	A	0.749	1.787	0.856	0.8	1	74.186	1.29	129.09	A
100.00-90.00			B	0.676	1.777	0.803	0.8	1	63.101			
			C	0.72	1.779	0.834	0.8	1	69.689			
T6	0.81	1.76	A	0.721	1.779	0.835	0.8	1	75.975	1.27	127.48	A
90.00-80.00			B	0.655	1.78	0.788	0.8	1	65.357			
			C	0.673	1.777	0.801	0.8	1	68.152			
T7	1.64	4.33	A	0.669	1.777	0.798	0.8	1	151.389	2.40	120.06	A
80.00-60.00			B	0.61	1.798	0.76	0.8	1	131.813			
			C	0.611	1.798	0.76	0.8	1	132.125			
T8	1.64	4.45	A	0.601	1.804	0.754	0.8	1	147.389	2.15	107.73	A
60.00-40.00			B	0.548	1.845	0.723	0.8	1	129.543			
			C	0.549	1.844	0.724	0.8	1	129.774			
T9	1.64	5.44	A	0.548	1.846	0.723	0.8	1	145.717	1.94	96.80	A
40.00-20.00			B	0.501	1.898	0.698	0.8	1	129.265			
			C	0.498	1.903	0.696	0.8	1	128.138			
T10	1.07	6.08	A	0.384	2.096	0.645	0.8	1	104.456	1.58	78.78	A
20.00-0.00			B	0.357	2.156	0.635	0.8	1	95.789			
			C	0.353	2.165	0.633	0.8	1	94.465			

tnxTower	Job: PiROD U20'-0"x170' Lattice Tower	Page: 27 of 43
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: 860-529-8882 FAX: 860-529-3991	Project: VZ5-178 / Cromwell, CT Tower	Date: 14:33:53 03/28/14
	Client: Verizon	Designed by: MCD

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:	10.29	30.51						OTM	1476.93 kip-ft	17.55		

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 ft²	F K	w plf	Ctrl. Face
T1	0.40	1.16	A	0.633	1.787	0.774	0.85	1	50.403	1.07	53.63	B
170.00-150.00			B	0.656	1.78	0.79	0.85	1	53.322			
			C	0.161	2.732	0.583	0.85	1	9.663			
T2	0.28	1.12	A	0.761	1.792	0.865	0.85	1	43.373	1.05	105.18	B
150.00-140.00			B	0.843	1.855	0.933	0.85	1	51.613			
			C	0.291	2.32	0.613	0.85	1	13.089			
T3	0.72	2.09	A	0.642	1.784	0.781	0.85	1	82.003	2.29	114.43	B
140.00-120.00			B	0.808	1.822	0.903	0.85	1	117.921			
			C	0.306	2.281	0.618	0.85	1	32.930			
T4	1.28	2.60	A	0.669	1.777	0.798	0.85	1	108.863	2.52	126.10	B
120.00-100.00			B	0.777	1.801	0.878	0.85	1	137.918			
			C	0.606	1.8	0.757	0.85	1	93.969			
T5	0.81	1.48	A	0.749	1.787	0.856	0.85	1	74.508	1.30	129.65	A
100.00-90.00			B	0.676	1.777	0.803	0.85	1	63.371			
			C	0.72	1.779	0.834	0.85	1	69.950			
T6	0.81	1.76	A	0.721	1.779	0.835	0.85	1	76.317	1.28	128.05	A
90.00-80.00			B	0.655	1.78	0.788	0.85	1	65.649			
			C	0.673	1.777	0.801	0.85	1	68.436			
T7	1.64	4.33	A	0.669	1.777	0.798	0.85	1	152.135	2.41	120.65	A
80.00-60.00			B	0.61	1.798	0.76	0.85	1	132.464			
			C	0.611	1.798	0.76	0.85	1	132.760			
T8	1.64	4.45	A	0.601	1.804	0.754	0.85	1	148.360	2.17	108.44	A
60.00-40.00			B	0.548	1.845	0.723	0.85	1	130.407			
			C	0.549	1.844	0.724	0.85	1	130.620			
T9	1.64	5.44	A	0.548	1.846	0.723	0.85	1	146.788	1.95	97.51	A
40.00-20.00			B	0.501	1.898	0.698	0.85	1	130.234			
			C	0.498	1.903	0.696	0.85	1	129.090			
T10	1.07	6.08	A	0.384	2.096	0.645	0.85	1	105.805	1.60	79.80	A
20.00-0.00			B	0.357	2.156	0.635	0.85	1	97.063			
			C	0.353	2.165	0.633	0.85	1	95.727			
Sum Weight:	10.29	30.51						OTM	1482.87 kip-ft	17.64		

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	19.74					
Bracing Weight	10.77					
Total Member Self-Weight	30.51			-3.24	0.15	

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
Total Weight	52.94			-3.24	0.15	
Wind 0 deg - No Ice		-0.03	-68.16	-6520.30	2.28	-1.44
Wind 30 deg - No Ice		33.58	-58.27	-5598.10	-3222.94	-7.39
Wind 45 deg - No Ice		47.65	-47.37	-4552.38	-4586.60	-9.08
Wind 60 deg - No Ice		58.29	-33.35	-3205.20	-5616.56	-10.03
Wind 90 deg - No Ice		67.37	0.23	24.94	-6474.31	-10.99
Wind 120 deg - No Ice		59.10	34.36	3279.10	-5657.20	-9.11
Wind 135 deg - No Ice		47.66	47.65	4569.00	-4587.48	-7.04
Wind 150 deg - No Ice		33.86	58.39	5597.70	-3260.13	-4.14
Wind 180 deg - No Ice		0.21	67.28	6468.61	-25.21	3.65
Wind 210 deg - No Ice		-33.67	58.32	5589.63	3238.58	7.63
Wind 225 deg - No Ice		-47.53	47.55	4558.57	4573.52	9.69
Wind 240 deg - No Ice		-58.99	34.25	3268.91	5644.12	11.91
Wind 270 deg - No Ice		-67.30	0.09	10.10	6465.11	13.22
Wind 300 deg - No Ice		-58.21	-33.54	-3226.27	5602.63	11.16
Wind 315 deg - No Ice		-47.59	-47.50	-4567.15	4575.81	8.78
Wind 330 deg - No Ice		-33.64	-58.34	-5605.42	3227.40	4.95
Member Ice	15.00					
Total Weight Ice	90.43			-8.16	-1.59	
Wind 0 deg - Ice		-0.02	-78.14	-7440.63	-0.20	5.14
Wind 30 deg - Ice		38.58	-66.91	-6408.14	-3691.07	-5.09
Wind 45 deg - Ice		54.67	-54.44	-5218.83	-5242.31	-9.33
Wind 60 deg - Ice		66.88	-38.37	-3681.15	-6419.57	-12.83
Wind 90 deg - Ice		77.33	0.18	14.09	-7402.70	-17.96
Wind 120 deg - Ice		67.74	39.29	3726.60	-6448.94	-18.44
Wind 135 deg - Ice		54.67	54.66	5220.16	-5242.63	-16.52
Wind 150 deg - Ice		38.80	67.00	6396.07	-3720.43	-13.31
Wind 180 deg - Ice		0.16	77.19	7391.24	-21.60	-3.30
Wind 210 deg - Ice		-38.65	66.94	6389.92	3700.30	5.28
Wind 225 deg - Ice		-54.57	54.59	5212.26	5228.49	9.83
Wind 240 deg - Ice		-67.65	39.21	3718.99	6435.36	14.39
Wind 270 deg - Ice		-77.28	0.07	2.84	7391.91	19.75
Wind 300 deg - Ice		-66.80	-38.51	-3697.48	6404.66	19.97
Wind 315 deg - Ice		-54.62	-54.55	-5230.21	5229.77	17.92
Wind 330 deg - Ice		-38.62	-66.96	-6413.68	3690.67	13.96
Total Weight	52.94			-3.24	0.15	
Wind 0 deg - Service		-0.01	-23.58	-2260.45	1.67	-0.50
Wind 30 deg - Service		11.62	-20.16	-1941.35	-1114.32	-2.56
Wind 45 deg - Service		16.49	-16.39	-1579.51	-1586.18	-3.14
Wind 60 deg - Service		20.17	-11.54	-1113.36	-1942.56	-3.47
Wind 90 deg - Service		23.31	0.08	4.34	-2239.36	-3.80
Wind 120 deg - Service		20.45	11.89	1130.35	-1956.62	-3.15
Wind 135 deg - Service		16.49	16.49	1576.68	-1586.48	-2.44
Wind 150 deg - Service		11.72	20.20	1932.63	-1127.19	-1.43
Wind 180 deg - Service		0.07	23.28	2233.98	-7.84	1.26
Wind 210 deg - Service		-11.65	20.18	1929.84	1121.50	2.64
Wind 225 deg - Service		-16.45	16.45	1573.07	1583.42	3.35
Wind 240 deg - Service		-20.41	11.85	1126.82	1953.87	4.12
Wind 270 deg - Service		-23.29	0.03	-0.79	2237.95	4.57
Wind 300 deg - Service		-20.14	-11.60	-1120.65	1939.51	3.86
Wind 315 deg - Service		-16.47	-16.44	-1584.62	1584.21	3.04
Wind 330 deg - Service		-11.64	-20.19	-1943.88	1117.63	1.71

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	170 - 150	Leg	Max Tension	22	30.48	-0.37	0.26
			Max. Compression	19	-36.34	0.02	0.48
			Max. Mx	30	-35.29	0.39	-0.27

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	19	-36.34	0.02	0.48
			Max. Vy	30	-4.11	0.39	-0.27
			Max. Vx	19	-4.88	0.02	0.48
		Diagonal	Max Tension	34	3.95	0.00	0.00
			Max. Compression	34	-4.00	0.00	0.00
			Max. Mx	19	3.21	-0.00	0.00
			Max. My	33	-3.64	-0.00	0.00
			Max. Vy	19	0.01	-0.00	0.00
			Max. Vx	33	0.00	0.00	0.00
		Top Girt	Max Tension	21	0.02	0.00	0.00
			Max. Compression	32	-0.04	0.00	0.00
			Max. Mx	18	-0.02	0.01	0.00
			Max. My	31	0.01	0.00	-0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
		Bottom Girt	Max Tension	22	0.15	0.00	0.00
			Max. Compression	19	-0.16	0.00	0.00
			Max. Mx	18	-0.01	0.01	0.00
			Max. My	31	-0.01	0.00	-0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
T2	150 - 140	Leg	Max Tension	22	36.33	-0.45	0.04
			Max. Compression	19	-42.89	2.91	0.24
			Max. Mx	22	35.78	-3.39	0.27
			Max. My	31	-4.37	-0.23	-4.01
			Max. Vy	27	0.61	-3.34	-0.28
			Max. Vx	31	0.81	-0.23	-4.01
		Diagonal	Max Tension	32	5.95	0.00	0.00
			Max. Compression	24	-6.51	0.00	0.00
			Max. Mx	22	4.42	0.05	0.00
			Max. My	33	-5.28	-0.02	-0.02
			Max. Vy	22	0.02	0.05	0.00
			Max. Vx	33	0.01	0.00	0.00
		Top Girt	Max Tension	22	0.41	0.00	0.00
			Max. Compression	19	-0.35	0.00	0.00
			Max. Mx	18	0.03	-0.02	0.00
			Max. My	31	0.03	0.00	0.00
			Max. Vy	18	-0.02	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	32	74.05	-3.65	-0.22
			Max. Compression	19	-87.77	3.10	-0.05
			Max. Mx	32	73.01	-3.89	-0.13
			Max. My	23	-8.85	-0.36	5.79
			Max. Vy	27	0.65	-3.60	-0.10
			Max. Vx	14	0.73	0.02	-3.30
		Diagonal	Max Tension	28	9.36	0.00	0.00
			Max. Compression	29	-9.88	0.00	0.00
			Max. Mx	19	6.47	0.12	0.00
			Max. My	22	-6.94	-0.03	0.03
			Max. Vy	19	-0.03	0.12	0.00
			Max. Vx	22	-0.01	0.00	0.00
T4	120 - 100	Leg	Max Tension	22	122.79	-5.18	-0.00
			Max. Compression	19	-143.03	4.31	-0.04
			Max. Mx	19	-114.08	6.10	-0.02
			Max. My	31	-11.74	-0.43	-8.03
			Max. Vy	32	1.06	-5.15	-0.27
			Max. Vx	31	1.76	-0.43	-8.03
		Diagonal	Max Tension	33	11.91	0.00	0.00
			Max. Compression	25	-12.73	0.00	0.00
			Max. Mx	19	7.77	0.10	-0.01
			Max. My	33	-11.29	-0.03	-0.04

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	22	0.03	0.10	0.00
			Max. Vx	33	0.01	0.00	0.00
		Mid Girt	Max Tension	22	3.47	0.00	0.00
			Max. Compression	19	-2.76	0.00	0.00
			Max. Mx	22	3.47	-0.07	0.00
			Max. My	31	0.29	0.00	0.00
			Max. Vy	22	0.03	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
T5	100 - 90	Leg	Max Tension	22	151.76	-5.15	0.16
			Max. Compression	19	-175.79	4.36	-0.01
			Max. Mx	22	151.76	-5.15	0.16
			Max. My	31	-12.99	-0.43	-8.03
			Max. Vy	32	-0.26	-5.15	-0.27
			Max. Vx	31	-0.52	-0.43	-8.03
		Diagonal	Max Tension	26	13.94	0.00	0.00
			Max. Compression	26	-14.32	0.00	0.00
			Max. Mx	19	11.22	0.18	0.01
			Max. My	31	-7.14	0.04	-0.02
			Max. Vy	19	-0.05	0.18	0.01
			Max. Vx	31	0.00	0.00	0.00
T6	90 - 80	Leg	Max Tension	22	181.80	-4.24	-0.04
			Max. Compression	19	-209.27	6.13	-0.03
			Max. Mx	24	-208.26	6.13	0.11
			Max. My	23	-14.92	0.02	4.71
			Max. Vy	27	0.46	-6.07	0.04
			Max. Vx	31	0.26	0.03	-4.70
		Diagonal	Max Tension	26	13.97	0.00	0.00
			Max. Compression	26	-14.33	0.00	0.00
			Max. Mx	19	11.22	0.15	-0.01
			Max. My	24	-0.55	0.08	0.02
			Max. Vy	19	-0.05	0.15	-0.01
			Max. Vx	24	0.00	0.00	0.00
T7	80 - 60	Leg	Max Tension	22	238.83	-5.23	-0.01
			Max. Compression	19	-273.53	5.81	-0.00
			Max. Mx	24	-239.87	6.13	0.11
			Max. My	20	-15.72	-0.10	-5.42
			Max. Vy	27	-0.25	-6.07	0.04
			Max. Vx	20	0.22	-0.10	-5.42
		Diagonal	Max Tension	26	15.00	0.00	0.00
			Max. Compression	26	-15.41	0.00	0.00
			Max. Mx	19	12.03	0.15	-0.01
			Max. My	32	-13.33	0.03	-0.02
			Max. Vy	22	0.05	0.15	0.01
			Max. Vx	32	0.00	0.00	0.00
T8	60 - 40	Leg	Max Tension	22	292.84	-5.34	-0.02
			Max. Compression	19	-335.50	5.88	-0.02
			Max. Mx	22	292.12	-7.37	0.02
			Max. My	20	-20.58	0.05	-6.32
			Max. Vy	22	0.33	-7.37	0.02
			Max. Vx	23	-0.22	0.06	6.32
		Diagonal	Max Tension	26	15.41	0.00	0.00
			Max. Compression	26	-15.81	0.00	0.00
			Max. Mx	24	11.94	0.22	0.01
			Max. My	32	-13.64	0.02	-0.03
			Max. Vy	24	-0.06	0.22	0.01
			Max. Vx	32	0.00	0.00	0.00
T9	40 - 20	Leg	Max Tension	22	342.01	-3.46	-0.02
			Max. Compression	24	-395.60	0.15	-0.01
			Max. Mx	22	341.20	-12.02	-0.02
			Max. My	23	-22.13	-0.76	6.23
			Max. Vy	22	0.97	-12.02	-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. Vx	23	0.27	2.47	6.13
		Diagonal	Max Tension	26	16.80	0.00	0.00
			Max. Compression	26	-16.44	0.00	0.00
			Max. Mx	24	12.17	0.23	0.02
			Max. My	32	-12.68	0.07	-0.02
			Max. Vy	22	0.08	0.22	0.02
			Max. Vx	32	0.00	0.00	0.00
T10	20 - 0	Leg	Max Tension	22	384.57	3.26	-0.03
			Max. Compression	24	-452.30	-0.00	-0.00
			Max. Mx	24	-420.97	15.88	0.00
			Max. My	23	-31.59	9.51	10.70
			Max. Vy	24	1.65	15.88	0.00
			Max. Vx	23	1.17	9.51	10.70
		Diagonal	Max Tension	33	20.58	0.00	0.00
			Max. Compression	26	-18.35	0.00	0.00
			Max. Mx	22	9.09	0.30	0.02
			Max. My	32	-16.83	0.14	-0.04
			Max. Vy	22	0.09	0.30	0.02
			Max. Vx	32	0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	461.86	36.91	-21.80
	Max. H_x	13	395.69	37.14	-21.85
	Max. H_z	21	-385.14	-43.49	26.67
	Min. Vert	22	-399.70	-45.35	26.61
	Min. H_x	22	-399.70	-45.35	26.61
	Min. H_z	13	395.69	37.14	-21.85
Leg B	Max. Vert	24	462.77	-36.91	-21.94
	Max. H_x	32	-399.42	45.24	26.79
	Max. H_z	33	-384.83	43.36	26.89
	Min. Vert	32	-399.42	45.24	26.79
	Min. H_x	7	396.64	-37.26	-21.84
	Min. H_z	24	462.77	-36.91	-21.94
Leg A	Max. Vert	19	462.33	0.15	42.85
	Max. H_x	31	29.99	4.58	-5.00
	Max. H_z	2	395.57	-0.04	43.07
	Min. Vert	27	-399.18	-0.10	-52.61
	Min. H_x	23	29.34	-4.53	-5.06
	Min. H_z	27	-399.18	-0.10	-52.61

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	52.94	0.00	0.00	-3.25	0.15	-0.00
Dead+Wind 0 deg - No Ice	52.94	-0.03	-68.16	-6545.87	2.29	-1.44
Dead+Wind 30 deg - No Ice	52.94	33.58	-58.27	-5620.15	-3235.59	-7.40
Dead+Wind 45 deg - No Ice	52.94	47.65	-47.37	-4570.35	-4604.63	-9.12

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 60 deg - No Ice	52.94	58.29	-33.35	-3217.89	-5638.65	-10.10
Dead+Wind 90 deg - No Ice	52.94	67.37	0.23	24.92	-6499.74	-11.08
Dead+Wind 120 deg - No Ice	52.94	59.10	34.36	3291.82	-5679.39	-9.16
Dead+Wind 135 deg - No Ice	52.94	47.66	47.65	4586.84	-4605.53	-7.07
Dead+Wind 150 deg - No Ice	52.94	33.86	58.39	5619.62	-3272.95	-4.16
Dead+Wind 180 deg - No Ice	52.94	0.21	67.28	6494.00	-25.28	3.65
Dead+Wind 210 deg - No Ice	52.94	-33.67	58.32	5611.51	3251.35	7.64
Dead+Wind 225 deg - No Ice	52.94	-47.53	47.55	4576.37	4591.54	9.73
Dead+Wind 240 deg - No Ice	52.94	-58.99	34.25	3281.60	5666.28	11.96
Dead+Wind 270 deg - No Ice	52.94	-67.30	0.09	10.04	6490.51	13.31
Dead+Wind 300 deg - No Ice	52.94	-58.21	-33.54	-3239.04	5624.65	11.22
Dead+Wind 315 deg - No Ice	52.94	-47.59	-47.50	-4585.16	4593.78	8.82
Dead+Wind 330 deg - No Ice	52.94	-33.64	-58.34	-5627.48	3240.07	4.97
Dead+Ice+Temp	90.43	0.00	0.00	-8.23	-1.59	-0.00
Dead+Wind 0 deg+Ice+Temp	90.43	-0.02	-78.14	-7485.71	-0.24	5.16
Dead+Wind 30 deg+Ice+Temp	90.43	38.58	-66.91	-6447.12	-3713.48	-5.11
Dead+Wind 45 deg+Ice+Temp	90.43	54.67	-54.44	-5250.65	-5274.16	-9.41
Dead+Wind 60 deg+Ice+Temp	90.43	66.88	-38.37	-3703.68	-6458.60	-12.96
Dead+Wind 90 deg+Ice+Temp	90.43	77.33	0.18	13.95	-7447.64	-18.15
Dead+Wind 120 deg+Ice+Temp	90.43	67.74	39.29	3748.91	-6488.01	-18.58
Dead+Wind 135 deg+Ice+Temp	90.43	54.67	54.66	5251.64	-5274.51	-16.62
Dead+Wind 150 deg+Ice+Temp	90.43	38.80	67.00	6434.72	-3743.06	-13.37
Dead+Wind 180 deg+Ice+Temp	90.43	0.16	77.19	7436.04	-21.75	-3.33
Dead+Wind 210 deg+Ice+Temp	90.43	-38.65	66.94	6428.55	3722.78	5.31
Dead+Wind 225 deg+Ice+Temp	90.43	-54.57	54.59	5243.71	5260.26	9.90
Dead+Wind 240 deg+Ice+Temp	90.43	-67.65	39.21	3741.28	6474.34	14.51
Dead+Wind 270 deg+Ice+Temp	90.43	-77.28	0.07	2.64	7436.77	19.94
Dead+Wind 300 deg+Ice+Temp	90.43	-66.80	-38.51	-3720.12	6443.54	20.11
Dead+Wind 315 deg+Ice+Temp	90.43	-54.62	-54.55	-5262.11	5261.49	18.01
Dead+Wind 330 deg+Ice+Temp	90.43	-38.62	-66.96	-6452.70	3713.02	14.02
Dead+Wind 0 deg - Service	52.94	-0.01	-23.58	-2267.23	0.89	-0.50
Dead+Wind 30 deg - Service	52.94	11.62	-20.16	-1946.89	-1119.52	-2.58
Dead+Wind 45 deg - Service	52.94	16.49	-16.39	-1583.62	-1593.24	-3.16
Dead+Wind 60 deg - Service	52.94	20.17	-11.54	-1115.63	-1951.04	-3.50
Dead+Wind 90 deg - Service	52.94	23.31	0.08	6.49	-2249.01	-3.82
Dead+Wind 120 deg - Service	52.94	20.45	11.89	1136.93	-1965.14	-3.18
Dead+Wind 135 deg - Service	52.94	16.49	16.49	1585.04	-1593.55	-2.46
Dead+Wind 150 deg - Service	52.94	11.72	20.20	1942.40	-1132.44	-1.45
Dead+Wind 180 deg - Service	52.94	0.07	23.28	2244.96	-8.66	1.26
Dead+Wind 210 deg - Service	52.94	-11.65	20.18	1939.60	1125.16	2.66
Dead+Wind 225 deg - Service	52.94	-16.45	16.45	1581.42	1588.90	3.38
Dead+Wind 240 deg - Service	52.94	-20.41	11.85	1133.39	1960.80	4.14
Dead+Wind 270 deg - Service	52.94	-23.29	0.03	1.34	2246.01	4.59
Dead+Wind 300 deg - Service	52.94	-20.14	-11.60	-1122.94	1946.39	3.88
Dead+Wind 315 deg - Service	52.94	-16.47	-16.44	-1588.75	1589.68	3.06
Dead+Wind 330 deg - Service	52.94	-11.64	-20.19	-1949.43	1121.26	1.73

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-52.94	0.00	0.00	52.94	0.00	0.000%
2	-0.03	-52.94	-68.16	0.03	52.94	68.16	0.000%
3	33.58	-52.94	-58.27	-33.58	52.94	58.27	0.000%
4	47.65	-52.94	-47.37	-47.65	52.94	47.37	0.000%
5	58.29	-52.94	-33.35	-58.29	52.94	33.35	0.000%
6	67.37	-52.94	0.23	-67.37	52.94	-0.23	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
7	59.10	-52.94	34.36	-59.10	52.94	-34.36	0.000%
8	47.66	-52.94	47.65	-47.66	52.94	-47.65	0.000%
9	33.86	-52.94	58.39	-33.86	52.94	-58.39	0.000%
10	0.21	-52.94	67.28	-0.21	52.94	-67.28	0.000%
11	-33.67	-52.94	58.32	33.67	52.94	-58.32	0.000%
12	-47.53	-52.94	47.55	47.53	52.94	-47.55	0.000%
13	-58.99	-52.94	34.25	58.99	52.94	-34.25	0.000%
14	-67.30	-52.94	0.09	67.30	52.94	-0.09	0.000%
15	-58.21	-52.94	-33.54	58.21	52.94	33.54	0.000%
16	-47.59	-52.94	-47.50	47.59	52.94	47.50	0.000%
17	-33.64	-52.94	-58.34	33.64	52.94	58.34	0.000%
18	0.00	-90.43	0.00	0.00	90.43	-0.00	0.000%
19	-0.02	-90.43	-78.14	0.02	90.43	78.14	0.000%
20	38.58	-90.43	-66.91	-38.58	90.43	66.91	0.000%
21	54.67	-90.43	-54.44	-54.67	90.43	54.44	0.000%
22	66.88	-90.43	-38.37	-66.88	90.43	38.37	0.000%
23	77.33	-90.43	0.18	-77.33	90.43	-0.18	0.000%
24	67.74	-90.43	39.29	-67.74	90.43	-39.29	0.000%
25	54.67	-90.43	54.66	-54.67	90.43	-54.66	0.000%
26	38.80	-90.43	67.00	-38.80	90.43	-67.00	0.000%
27	0.16	-90.43	77.19	-0.16	90.43	-77.19	0.000%
28	-38.65	-90.43	66.94	38.65	90.43	-66.94	0.000%
29	-54.57	-90.43	54.59	54.57	90.43	-54.59	0.000%
30	-67.65	-90.43	39.21	67.65	90.43	-39.21	0.000%
31	-77.28	-90.43	0.07	77.28	90.43	-0.07	0.000%
32	-66.80	-90.43	-38.51	66.80	90.43	38.51	0.000%
33	-54.62	-90.43	-54.55	54.62	90.43	54.55	0.000%
34	-38.62	-90.43	-66.96	38.62	90.43	66.96	0.000%
35	-0.01	-52.94	-23.58	0.01	52.94	23.58	0.000%
36	11.62	-52.94	-20.16	-11.62	52.94	20.16	0.000%
37	16.49	-52.94	-16.39	-16.49	52.94	16.39	0.000%
38	20.17	-52.94	-11.54	-20.17	52.94	11.54	0.000%
39	23.31	-52.94	0.08	-23.31	52.94	-0.08	0.000%
40	20.45	-52.94	11.89	-20.45	52.94	-11.89	0.000%
41	16.49	-52.94	16.49	-16.49	52.94	-16.49	0.000%
42	11.72	-52.94	20.20	-11.72	52.94	-20.20	0.000%
43	0.07	-52.94	23.28	-0.07	52.94	-23.28	0.000%
44	-11.65	-52.94	20.18	11.65	52.94	-20.18	0.000%
45	-16.45	-52.94	16.45	16.45	52.94	-16.45	0.000%
46	-20.41	-52.94	11.85	20.41	52.94	-11.85	0.000%
47	-23.29	-52.94	0.03	23.29	52.94	-0.03	0.000%
48	-20.14	-52.94	-11.60	20.14	52.94	11.60	0.000%
49	-16.47	-52.94	-16.44	16.47	52.94	16.44	0.000%
50	-11.64	-52.94	-20.19	11.64	52.94	20.19	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000072
7	Yes	4	0.00000001	0.00000001

8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000070
14	Yes	4	0.00000001	0.00000075
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000076
20	Yes	4	0.00000001	0.00000117
21	Yes	4	0.00000001	0.00000113
22	Yes	4	0.00000001	0.00000115
23	Yes	4	0.00000001	0.00000138
24	Yes	4	0.00000001	0.00000110
25	Yes	4	0.00000001	0.00000109
26	Yes	4	0.00000001	0.00000115
27	Yes	4	0.00000001	0.00000109
28	Yes	4	0.00000001	0.00000117
29	Yes	4	0.00000001	0.00000106
30	Yes	4	0.00000001	0.00000109
31	Yes	4	0.00000001	0.00000141
32	Yes	4	0.00000001	0.00000118
33	Yes	4	0.00000001	0.00000112
34	Yes	4	0.00000001	0.00000116
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	170 - 150	6.460	35	0.3567	0.0553
T2	150 - 140	4.979	35	0.3281	0.0471
T3	140 - 120	4.296	35	0.3080	0.0395
T4	120 - 100	3.080	35	0.2526	0.0227
T5	100 - 90	2.074	35	0.2018	0.0114
T6	90 - 80	1.666	35	0.1711	0.0089
T7	80 - 60	1.315	40	0.1482	0.0070
T8	60 - 40	0.741	40	0.1098	0.0044
T9	40 - 20	0.335	40	0.0663	0.0025
T10	20 - 0	0.099	40	0.0302	0.0011

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
183.00	101-90-08-0-01	35	6.460	0.3567	0.0553	97248
179.75	15' Mount Pipe	35	6.460	0.3567	0.0553	97248
178.00	3" Dia 20' Omni	35	6.460	0.3567	0.0553	97248
175.00	2.5" x 14' Omni	35	6.460	0.3567	0.0553	97248
174.00	1.5" x 12' Omni	35	6.460	0.3567	0.0553	97248
170.00	APXV18-209014-C-A20	35	6.460	0.3567	0.0553	97248
168.00	HPD2-4.7	35	6.309	0.3541	0.0547	97248
159.50	APXV18-206517S-C w/ mounting hardware	35	5.670	0.3428	0.0519	46308
158.50	SC420-HF1LDF	35	5.596	0.3414	0.0515	42281
144.00	3" Dia 20' Omni	35	4.563	0.3169	0.0428	23960
141.00	2" Dia 15' Omni	35	4.362	0.3104	0.0403	23768
139.00	1.5" x 10' Omni	35	4.230	0.3056	0.0386	23711
138.50	9' Whip	35	4.197	0.3044	0.0382	23710
134.00	VHLP2.5-180	35	3.910	0.2924	0.0343	23826
125.50	PiROD 10' Lightweight T-Frame	35	3.394	0.2679	0.0271	24117
115.00	(2) TMA (shielded)	35	2.807	0.2400	0.0191	22234
101.00	BXA-171063-12BF	35	2.119	0.2048	0.0117	18147
87.00	3"x2"x22" Panel	35	1.555	0.1633	0.0083	22528
84.50	TMA	35	1.467	0.1576	0.0078	24880
83.50	3' Stand-off	35	1.432	0.1554	0.0076	25952
83.00	3' Dish	35	1.415	0.1543	0.0075	26497
82.50	TMA	40	1.398	0.1533	0.0075	27039
80.00	3"x2"x22" Panel	40	1.315	0.1482	0.0070	29329
30.00	Camera	40	0.196	0.0471	0.0017	28749
24.00	PC9013N	40	0.133	0.0368	0.0014	29208

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	170 - 150	20.923	19	1.1424	0.1976
T2	150 - 140	16.171	19	1.0562	0.1644
T3	140 - 120	13.967	19	0.9929	0.1343
T4	120 - 100	10.044	19	0.8170	0.0793
T5	100 - 90	6.795	24	0.6550	0.0424
T6	90 - 80	5.471	24	0.5566	0.0339
T7	80 - 60	4.329	24	0.4834	0.0273
T8	60 - 40	2.446	24	0.3596	0.0179
T9	40 - 20	1.108	24	0.2182	0.0104
T10	20 - 0	0.328	24	0.0996	0.0049

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
183.00	101-90-08-0-01	19	20.923	1.1424	0.1976	32983
179.75	15' Mount Pipe	19	20.923	1.1424	0.1976	32983
178.00	3" Dia 20' Omni	19	20.923	1.1424	0.1976	32983
175.00	2.5" x 14' Omni	19	20.923	1.1424	0.1976	32983
174.00	1.5" x 12' Omni	19	20.923	1.1424	0.1976	32983
170.00	APXV18-209014-C-A20	19	20.923	1.1424	0.1976	32983
168.00	HPD2-4.7	19	20.438	1.1347	0.1952	32983
159.50	APXV18-206517S-C w/ mounting hardware	19	18.391	1.1009	0.1837	15706
158.50	SC420-HF1LDF	19	18.153	1.0966	0.1821	14340
144.00	3" Dia 20' Omni	19	14.830	1.0210	0.1469	7611
141.00	2" Dia 15' Omni	19	14.180	1.0003	0.1375	7375
139.00	1.5" x 10' Omni	19	13.755	0.9852	0.1312	7305
138.50	9' Whip	19	13.650	0.9813	0.1297	7299
134.00	VHLP2.5-180	19	12.722	0.9432	0.1163	7360
125.50	PiROD 10' Lightweight T-Frame	19	11.059	0.8655	0.0930	7533
115.00	(2) TMA (shielded)	19	9.163	0.7770	0.0679	6983
101.00	BXA-171063-12BF	24	6.938	0.6644	0.0436	5654
87.00	3"x2"x22" Panel	24	5.112	0.5317	0.0318	7107
84.50	TMA	24	4.824	0.5132	0.0301	7833
83.50	3' Stand-off	24	4.711	0.5063	0.0295	8162
83.00	3' Dish	24	4.656	0.5029	0.0292	8329
82.50	TMA	24	4.600	0.4996	0.0288	8494
80.00	3"x2"x22" Panel	24	4.329	0.4834	0.0273	9189
30.00	Camera	24	0.649	0.1552	0.0075	8726
24.00	PC9013N	24	0.440	0.1212	0.0059	8842

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	170	Diagonal	A325N	0.6250	1	4.00	6.44	0.622 ✓	1.333	Bolt Shear
T2	150	Leg	A325N	1.0000	6	6.05	34.56	0.175 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	5.95	9.52	0.625 ✓	1.333	Member Bearing
		Top Girt	A325N	1.0000	1	0.41	9.52	0.044 ✓	1.333	Member Bearing
T3	140	Leg	A325N	1.0000	6	8.98	34.56	0.260 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	9.36	9.52	0.984 ✓	1.333	Member Bearing
T4	120	Leg	A325N	1.0000	6	16.20	34.56	0.469 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	11.91	9.52	1.251 ✓	1.333	Member Bearing
		Mid Girt	A325N	1.0000	1	3.47	9.52	0.364 ✓	1.333	Member Bearing
T5	100	Leg	A325N	1.0000	6	25.29	34.56	0.732 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	13.94	15.86	0.879 ✓	1.333	Member Bearing
T6	90	Leg	A325N	1.0000	6	30.30	34.56	0.877 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	13.97	15.86	0.881 ✓	1.333	Member Bearing

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
T7	80	Leg	A325N	1.0000	6	35.05	34.56	1.014 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	15.41	16.49	0.934 ✓	1.333	Bolt Shear
T8	60	Leg	A325N	1.2500	6	44.41	54.00	0.823 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.2500	1	15.41	20.39	0.756 ✓	1.333	Member Bearing
T9	40	Leg	A325N	1.2500	6	53.20	54.00	0.985 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.2500	1	16.81	24.47	0.687 ✓	1.333	Member Bearing
T10	20	Diagonal	A325N	1.2500	1	20.58	20.39	1.009 ✓	1.333	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	170 - 150	1 3/4	20.00	2.49	68.3 K=1.00	21.253	2.4053	-36.34	51.12	0.711 ✓
T2	150 - 140	Pirod 105244	10.02	10.02	45.4 K=1.00	25.051	3.6816	-42.89	92.23	0.465 ✓
T3	140 - 120	Pirod 105216	20.03	10.02	45.4 K=1.00	25.051	3.6816	-87.77	92.23	0.952 ✓
T4	120 - 100	Pirod 105217	20.03	10.02	37.8 K=1.00	26.132	5.3014	-143.03	138.54	1.032 ✓
T5	100 - 90	Pirod 105217	10.02	10.02	37.8 K=1.00	26.132	5.3014	-175.79	138.54	1.269 ✓
T6	90 - 80	Pirod 105217 reinf w/ 1" dia bar	10.02	10.02	31.5 K=1.00	26.968	7.6570	-209.27	206.49	1.013 ✓
T7	80 - 60	Pirod 105218 reinf w/ 1" dia bar	20.03	10.02	27.6 K=1.00	27.439	9.9280	-273.53	272.41	1.004 ✓
T8	60 - 40	Pirod 105219	20.03	10.02	28.4 K=1.00	27.351	9.4248	-335.50	257.78	1.301 ✓
T9	40 - 20	Pirod 105219 reinf w /1" dia bar	20.03	10.02	25.4 K=1.00	27.705	11.7803	-395.60	326.37	1.212 ✓
T10	20 - 0	Pirod 105220 reinf w/ 1" dia bar	20.03	10.02	24.3 K=1.00	27.824	14.2843	-452.30	397.44	1.138 ✓

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V K	Allow. V_a K	Stress Ratio
T2	150 - 140	0.5	1.48	121.0	10.193	0.1963	0.88	2.24	0.393

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V K	Allow. V_a K	Stress Ratio
T3	140 - 120	0.5	1.48	121.0	10.133	0.1963	0.74	2.23	0.334
T4	120 - 100	0.5	1.47	120.0	10.279	0.1963	1.76	2.26	0.780
T5	100 - 90	0.5	1.47	120.0	10.279	0.1963	0.52	2.26	0.230
T6	90 - 80	0.5	1.46	118.8	10.452	0.1963	0.46	2.30	0.199
T7	80 - 60	0.5	1.44	117.8	10.592	0.1963	0.25	2.33	0.106
T8	60 - 40	0.625	1.45	94.4	13.671	0.3068	0.33	4.69	0.071
T9	40 - 20	0.625	1.44	93.7	16.133	0.3068	0.97	5.54	0.176
T10	20 - 0	0.625	1.42	93.0	13.845	0.3068	1.72	4.75	0.361

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	170 - 150	7/8	5.59	2.71	111.6 K=0.75	12.001	0.6013	-4.00	7.22	0.555
T2	150 - 140	L2 1/2x2 1/2x3/16	11.42	5.00	121.3 K=1.00	10.097	0.9020	-6.51	9.11	0.715
T3	140 - 120	L3x3x3/16	12.50	5.65	115.3 K=1.01	10.840	1.0900	-9.88	11.82	0.836
T4	120 - 100	L3x3x3/16	13.80	6.35	127.8 K=1.00	9.141	1.0900	-12.73	9.96	1.278
T5	100 - 90	L3x3x5/16	14.50	6.72	136.9 K=1.00	7.969	1.7800	-14.32	14.19	1.010
T6	90 - 80	L3x3x5/16	15.24	7.10	144.7 K=1.00	7.132	1.7800	-14.33	12.69	1.129
T7	80 - 60	L3x3x3/8	16.80	7.90	161.6 K=1.00	5.721	2.1100	-15.41	12.07	1.276
T8	60 - 40	L3 1/2x3 1/2x5/16	18.45	8.70	151.3 K=1.00	6.527	2.0900	-15.81	13.64	1.159
T9	40 - 20	L3 1/2x3 1/2x3/8	20.16	9.56	167.0 K=1.00	5.353	2.4800	-15.12	13.28	1.139
T10	20 - 0	L4x4x5/16	21.03	10.01	151.8 K=1.00	6.477	2.4000	-18.35	15.54	1.180

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 P / P_a
T1	170 - 150	7/8	5.00	4.85	186.4 K=0.70	4.298	0.6013	-0.04	2.58	0.014 ✔
T2	150 - 140	L3x3x3/16	5.00	4.48	105.1 K=1.17	12.131	1.0900	-0.35	13.22	0.027 ✔

Bottom 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 P / P_a
T1	170 - 150	7/8	5.00	4.85	186.4 K=0.70	4.298	0.6013	-0.16	2.58	0.061 ✔

Mid 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 P / P_a
T4	120 - 100	L3x3x3/16	9.00	7.63	153.5 K=1.00	6.336	1.0900	-2.76	6.91	0.400 ✔

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 P / P_a
T1	170 - 150	1 3/4	20.00	2.49	68.3	30.000	2.4053	30.48	72.16	0.422 ✔
T2	150 - 140	Pirod 105244	10.02	10.02	45.4	30.000	3.6816	36.33	110.45	0.329 ✔
T3	140 - 120	Pirod 105216	20.03	10.02	45.4	30.000	3.6816	74.05	110.45	0.670 ✔
T4	120 - 100	Pirod 105217	20.03	10.02	37.8	30.000	5.3014	122.79	159.04	0.772 ✔
T5	100 - 90	Pirod 105217	10.02	10.02	37.8	30.000	5.3014	151.76	159.04	0.954 ✔
T6	90 - 80	Pirod 105217 reinf w/ 1" dia bar	10.02	10.02	31.5	30.000	7.6570	181.80	229.71	0.791 ✔
T7	80 - 60	Pirod 105218 reinf w/ 1" dia bar	20.03	10.02	27.6	30.000	9.9280	238.83	297.84	0.802 ✔
T8	60 - 40	Pirod 105219	20.03	10.02	28.4	30.000	9.4248	292.85	282.74	1.036

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T9	40 - 20	Pirod 105219 reinf w /1" dia bar	20.03	10.02	25.4	30.000	11.7803	342.01	353.41	0.968
T10	20 - 0	Pirod 105220 reinf w/ 1" dia bar	20.03	10.02	24.3	30.000	14.2843	384.57	428.53	0.897

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V K	Allow. V_a K	Stress Ratio
T2	150 - 140	0.5	1.48	121.0	10.193	0.1963	0.88	2.24	0.393
T3	140 - 120	0.5	1.48	121.0	10.133	0.1963	0.74	2.23	0.334
T4	120 - 100	0.5	1.47	120.0	10.279	0.1963	1.76	2.26	0.780
T5	100 - 90	0.5	1.47	120.0	10.279	0.1963	0.52	2.26	0.230
T6	90 - 80	0.5	1.46	118.8	10.452	0.1963	0.46	2.30	0.199
T7	80 - 60	0.5	1.44	117.8	10.592	0.1963	0.25	2.33	0.106
T8	60 - 40	0.625	1.45	94.4	13.671	0.3068	0.33	4.69	0.071
T9	40 - 20	0.625	1.44	93.7	16.133	0.3068	0.97	5.54	0.176
T10	20 - 0	0.625	1.42	93.0	13.845	0.3068	1.72	4.75	0.361

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	170 - 150	7/8	5.59	2.71	148.7	30.000	0.6013	3.95	18.04	0.219
T2	150 - 140	L2 1/2x2 1/2x3/16	11.42	5.00	80.1	21.600	0.9020	5.95	19.48	0.305
T3	140 - 120	L3x3x3/16	12.50	5.65	74.6	21.600	1.0900	9.36	23.54	0.398
T4	120 - 100	L3x3x3/16	13.80	6.35	83.5	21.600	1.0900	11.91	23.54	0.506
T5	100 - 90	L3x3x5/16	14.50	6.72	89.9	21.600	1.7800	13.94	38.45	0.363
T6	90 - 80	L3x3x5/16	15.24	7.10	94.9	21.600	1.7800	13.97	38.45	0.363

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	80 - 60	L3x3x3/8	16.80	7.90	106.3	21.600	2.1100	15.00	45.58	0.329 ✔
T8	60 - 40	L3 1/2x3 1/2x5/16	18.45	8.70	99.2	21.600	2.0900	15.41	45.14	0.341 ✔
T9	40 - 20	L3 1/2x3 1/2x3/8	20.16	9.56	109.8	21.600	2.4800	16.81	53.57	0.314 ✔
T10	20 - 0	L4x4x5/16	21.92	10.45	103.3	21.600	2.4000	20.58	51.84	0.397 ✔

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	170 - 150	7/8	5.00	4.85	266.3	30.000	0.6013	0.02	18.04	0.001 ✔
T2	150 - 140	L3x3x3/16	5.00	4.48	62.0	21.600	1.0900	0.41	23.54	0.018 ✔

Bottom 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	170 - 150	7/8	5.00	4.85	266.3	30.000	0.6013	0.15	18.04	0.008 ✔

Mid 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 $\frac{P}{P_a}$
T4	120 - 100	L3x3x3/16	9.00	7.63	102.2	21.600	1.0900	3.47	23.54	0.147 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	170 - 150	Leg	1 3/4	3	-36.34	68.14	53.3	Pass
T2	150 - 140	Leg	Pirod 105244	60	-42.89	122.94	34.9	Pass
T3	140 - 120	Leg	Pirod 105216	72	-87.77	122.94	71.4	Pass

tnxTower	Job: PiROD U20'-0"x170' Lattice Tower	Page: 43 of 43
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: 860-529-8882 FAX: 860-529-3991	Project: VZ5-178 / Cromwell, CT Tower	Date: 14:33:53 03/28/14
	Client: Verizon	Designed by: MCD

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T4	120 - 100	Leg	Pirod 105217	87	-143.03	184.67	77.5	Pass
T5	100 - 90	Leg	Pirod 105217	105	-175.79	184.67	95.2	Pass
T6	90 - 80	Leg	Pirod 105217 reinf w/ 1" dia bar	114	-209.27	275.26	76.0	Pass
T7	80 - 60	Leg	Pirod 105218 reinf w/ 1" dia bar	123	-273.53	363.13	75.3	Pass
T8	60 - 40	Leg	Pirod 105219	138	-335.50	343.62	97.6	Pass
T9	40 - 20	Leg	Pirod 105219 reinf w /1" dia bar	152	-395.60	435.06	90.9	Pass
T10	20 - 0	Leg	Pirod 105220 reinf w/ 1" dia bar	167	-452.30	529.79	85.4	Pass
T1	170 - 150	Diagonal	7/8	13	-4.00	9.62	41.6	Pass
T2	150 - 140	Diagonal	L2 1/2x2 1/2x3/16	66	-6.51	12.14	53.7	Pass
T3	140 - 120	Diagonal	L3x3x3/16	78	-9.88	15.75	62.7	Pass
T4	120 - 100	Diagonal	L3x3x3/16	93	-12.73	13.28	95.9	Pass
T5	100 - 90	Diagonal	L3x3x5/16	108	-14.32	18.91	75.7	Pass
T6	90 - 80	Diagonal	L3x3x5/16	117	-14.33	16.92	84.7	Pass
T7	80 - 60	Diagonal	L3x3x3/8	126	-15.41	16.09	95.8	Pass
T8	60 - 40	Diagonal	L3 1/2x3 1/2x5/16	141	-15.81	18.18	87.0	Pass
T9	40 - 20	Diagonal	L3 1/2x3 1/2x3/8	156	-15.12	17.70	85.4	Pass
T10	20 - 0	Diagonal	L4x4x5/16	177	-18.35	20.72	88.5	Pass
T1	170 - 150	Top Girt	7/8	6	-0.04	3.45	1.0	Pass
T2	150 - 140	Top Girt	L3x3x3/16	61	-0.35	17.63	2.0	Pass
T1	170 - 150	Bottom Girt	7/8	7	-0.16	3.45	4.6	Pass
T4	120 - 100	Mid Girt	L3x3x3/16	88	-2.76	9.21	30.0	Pass
							Summary	
						Leg (T8)	97.6	Pass
						Diagonal (T4)	95.9	Pass
						Top Girt (T2)	2.0	Pass
						Bottom Girt (T1)	4.6	Pass
						Mid Girt (T4)	30.0	Pass
						Bolt Checks	93.9	Pass
						RATING =	**97.6**	**Pass**

ANCHOR BOLT EVALUATION

ANCHOR BOLT ANALYSIS

Input Data

Max Pier Reactions:

Uplift:	Uplift := 400·kips	user input	
Shear:	Shear := 53·kips	user input	
Compression:	Compression := 463·kips	user input	

Anchor Bolt Data:

Use ASTM A687 Grade

Number of Anchor Bolts = N	N := 6	user input	
Bolt Ultimate Strength:	F_u := 150·ksi	user input	
Bolt Yield Strength:	Fy := 105·ksi	user input	
Bolt Modulus:	E := 29000·ksi	user input	
Thickness of Anchor Bolts	D := 1.25in	user input	
Threads per Inch:	n := 7	user input	
Coefficient of Friction:	μ := 0.55	user input	(for baseplate with grout ASCE 10-97)

Anchor Bolt Area:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 1.227\cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 0.969\cdot in^2$$

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$$AllowableTension := 1.33\cdot\left(0.33\cdot A_g\cdot F_u\right) \qquad AllowableTension = 80.8\cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$$F_{net.area} := 1.33\cdot\left(0.60\cdot A_n\cdot Fy\right) \qquad F_{net.area} = 81.2\cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{Uplift}{N} \qquad MaxTension = 66.7\cdot kips$$

Check Stresses:

$$\frac{MaxTension}{F_{net.area}} = 0.82$$

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

Condition1 = "OK"

Check Anchor Bolt Area:

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

Required Area:

$$A_{s1} := \frac{Uplift}{Fy} + \frac{Shear}{\mu \cdot 0.85 \cdot Fy} \qquad A_{s1} = 4.9 \cdot in^2$$

$$A_{s2} := \left| \frac{Shear - (0.3 \cdot Compression)}{\mu \cdot 0.85 \cdot Fy} \right| \qquad A_{s2} = 1.7 \cdot in^2$$

Provided Area:

$$A_{sprovided} := A_n \cdot N \qquad A_{sprovided} = 5.8 \cdot in^2$$

$$Condition2 := if\left(\frac{A_{s1}}{A_{sprovided}} \le 1.00, "OK", "Overstressed" \right) \qquad \frac{A_{s1}}{A_{sprovided}} = 0.84$$

Condition2 = "OK"

$$Condition3 := if\left(\frac{A_{s2}}{A_{sprovided}} \le 1.00, "OK", "Overstressed" \right) \qquad \frac{A_{s2}}{A_{sprovided}} = 0.30$$

Condition3 = "OK"

FOUNDATION EVALUATION

FOUNDATION ANALYSIS

Input Data

Maximum Pier Reactions:

Compression: $C_t := 463 \cdot kips$ *user input*

Uplift: $U_t := 400 \cdot kips$ *user input*

Foundation Dimensions:

Drilled Caisson Length: $C_{Length} := 41.5 \cdot ft$ *user input*

Diameter of Pier: $d_p := 5.5ft$ *user input*

Extension of Pier Above Grade: $L_{pag} := 0.5ft$ *user input*

Additional Concrete $Conc_{addl} := 5ft \cdot \left(13ft \cdot 13ft - \frac{\pi \cdot d_p^{\,2}}{4} \right)$

$Conc_{addl} = 726.2 \cdot ft^3$

Material Properties:

Unit Weight of Concrete: $\gamma c := 150pcf$ *user input*

Unit Weight of Water: $\gamma w := 62.4pcf$ *user input*

Unit Weight of Soil: $\gamma s := 100pcf$ *user input*

Allowable Soil Bearing Capacity (Allowable Bearing Pressure at Depth 41') $q_s := 6 \cdot ksf$ *user input*

Water Table Below Grade: $Wd := 41 \cdot ft$ *user input*

Average Allowable Shear: $fl := 859 \cdot psf$ *user input*

Depth Neglected for Skin Friction at Top: $Depthunbond := 4 \cdot ft$ *user input*

Foundation reinforcement per drawings by Tectonic, dated May 5, 2004

Loading:

$$TotalDownLoad := C_t + \pi \cdot \frac{d_p^{\,2}}{4} \cdot \left[L_{pag} \cdot \gamma c + \left[\gamma c \cdot \left(C_{Length} - L_{pag} \right) \right] \right]$$

$TotalDownLoad = 610.9 \cdot kips$

$$PierWeight := \pi \cdot \frac{d_p^{\,2}}{4} \cdot \left[\left(Wd + L_{pag} \right) \cdot \gamma c + \left(C_{Length} - Wd - L_{pag} \right) \cdot \left(\gamma c - \gamma w \right) \right] + Conc_{addl} \cdot \gamma c$$

$PierWeight = 256.8 \cdot kips$

$SoilShear := \pi \, d_p \cdot \left[fl \cdot \left(C_{Length} - Depthunbond \right) \right]$

$SoilShear = 556.6 \cdot kips$

Compression Capacity:

$$TotalDownLoadCapacity := SoilShear + q_s \cdot \left(\pi \cdot \frac{d_p^{\,2}}{4} \right)$$

$TotalDownLoadCapacity = 699.1 \cdot kips$

$CheckDownLoadCapacity := if(TotalDownLoad < TotalDownLoadCapacity, "Okay", "No Good")$

$CheckDownLoadCapacity = "Okay"$

Tension Capacity:

$TotalUpLiftCapacity := SoilShear + PierWeight$

$TotalUpLiftCapacity = 813.4 \cdot kips$

$CheckUpLiftCapacity := if\left(U_t < TotalUpLiftCapacity, "Okay", "No Good"\right)$

$CheckUpLiftCapacity = "Okay"$

$$SafetyFactor_{provided} := \frac{TotalUpLiftCapacity}{U_t}$$

$SafetyFactor_{provided} = 2.03$

Check Cone Failure:

$$ConeFailureCapacity := \frac{\left[\left(C_{Length} - L_{pag}\right) \cdot \tan(30deg) \cdot 2 + d_p\right]^2 \cdot \pi}{4} \cdot \frac{C_{Length} - L_{pag}}{3} \cdot \gamma_s$$

$ConeFailureCapacity = 2997.25 \cdot kips$

$CheckConeFailureCapacity := if\left(U_t < ConeFailureCapacity, "Okay", "No Good"\right)$

$CheckConeFailureCapacity = "Okay"$

$$ConeSafetyFactor_{provided} := \frac{ConeFailureCapacity}{U_t}$$

$ConeSafetyFactor_{provided} = 7.49$