ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

March 21, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
55 King Spring Road, Windsor Locks, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 90-foot level of the existing 100-foot tower at 55 King Spring Road in Windsor Locks, Connecticut (the "Property"). The tower and underlying property are owned by KINGSPRING TOWER LLC. The Council approved Cellco's use of the existing tower in 2008. Cellco now intends to modify its facility by adding three (3) model 742 213V01, 2100 MHz antennas, at the same 90-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its new 2100 MHz antennas and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's additional 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 Steve Wawruck, First Selectman of the Town of Windsor Locks.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. The new antennas and RRHs will be located at the 90-foot level on the 100-foot tower.

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

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

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions limits established by the FCC.

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Steve Wawruck, Windsor Locks First Selectman
Sandy M. Carter

ATTACHMENT 1

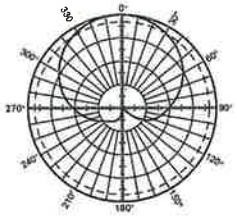
KATHREIN
SCALA DIVISION

742 213V01

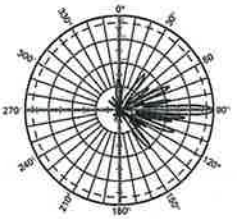
65° Panel Antenna

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

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



Horizontal pattern
±45°- polarization



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

General specifications:

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

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

RoHS Lead-Free

11271-B
936.3740/b

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

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

KATHREIN
SCALA DIVISION

742 213V01

65° Panel Antenna

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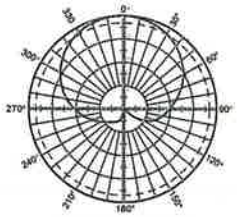
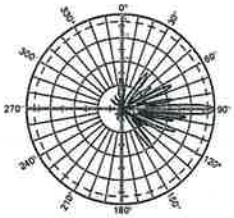


Horizontal pattern
±45°- polarization



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

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RoHS
Lead-Free

11271-B
936.3740/b

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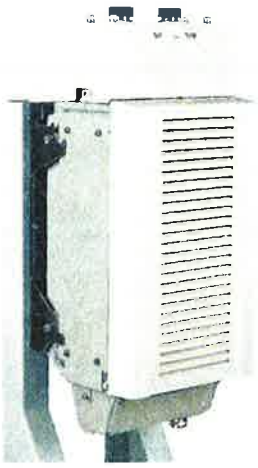
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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



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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

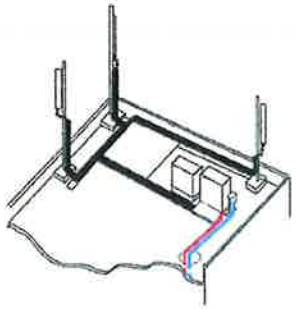
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

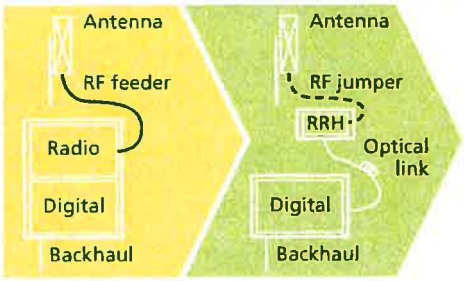
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

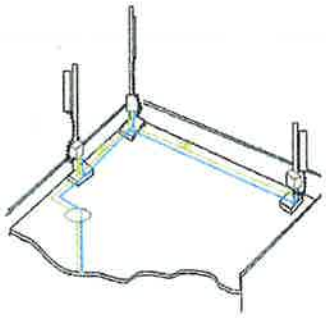
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

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)

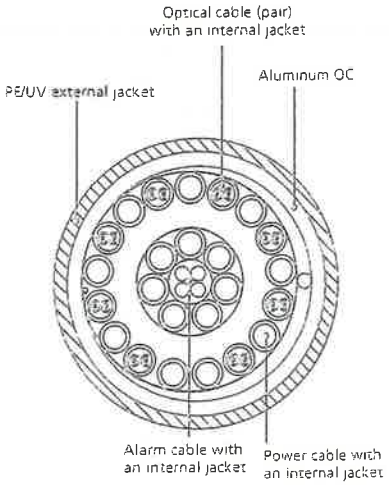


Figure 2: Construction Detail

- This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

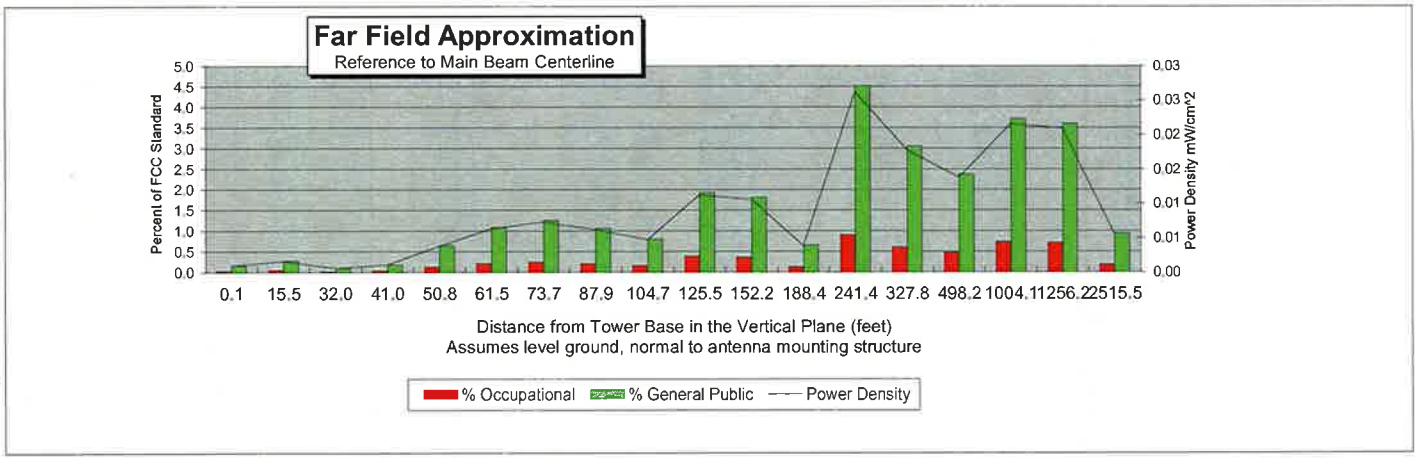
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Suffield S, CT
Site #:	
Date:	03/19/14
Name:	Mark Brauer
File Name:	Suffield S, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**90.8**
Antenna Gain (dBi):	**16.2**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**3791.0**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	87.8	89.2	93.5	96.9	101.4	107.2	114.7	124.2	136.7	153.1	175.7	207.9	256.8	339.4	505.9	1007.9	1259.3	2517.1	
Distance from Antenna Structure Base in Horizontal plane	0.1	15.5	32.0	41.0	50.8	61.5	73.7	87.9	104.7	125.5	152.2	188.4	241.4	327.8	498.2	1004.1	1256.2	2515.5	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.03	0.02	0.01	0.02	0.02	0.01	
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0.1	0.9	0.6	0.5	0.7	0.7	0.2	
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.6	1.1	1.3	1.1	0.8	1.9	1.8	0.7	4.5	3.1	2.4	3.7	3.6	0.9	

Antenna Type LPA-70063-6CF
Max% 4.52%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

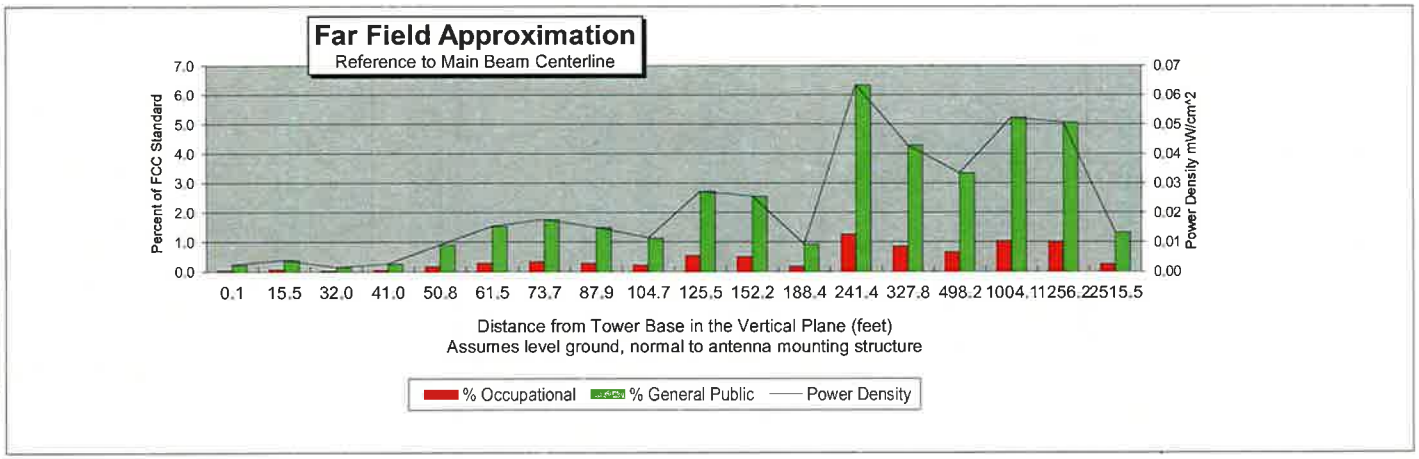
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Suffield S, CT
Site #:	
Date:	03/19/14
Name:	Mark Brauer
File Name:	Suffield S, CT - FF Power

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**90.8**
Antenna Gain (dBi):	**18.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**5163.0**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	87.8	89.2	93.5	96.9	101.4	107.2	114.7	124.2	136.7	153.1	175.7	207.9	256.8	339.4	505.9	1007.9	1259.3	2517.1	
Distance from Antenna Structure Base in Horizontal plane	0.1	15.5	32.0	41.0	50.8	61.5	73.7	87.9	104.7	125.5	152.2	188.4	241.4	327.8	498.2	1004.1	1256.2	2515.5	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.01	0.03	0.03	0.01	0.06	0.04	0.03	0.05	0.05	0.01	
Percent of Occupational Standard	0.0	0.1	0.0	0.1	0.2	0.3	0.4	0.3	0.2	0.5	0.5	0.2	1.3	0.9	0.7	1.0	1.0	0.3	
Percent of General Population Standard	0.2	0.4	0.1	0.3	0.9	1.5	1.8	1.5	1.1	2.7	2.5	0.9	6.3	4.3	3.3	5.2	5.1	1.3	

Antenna Type BXA-171063-12BF
Max% 6.34%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

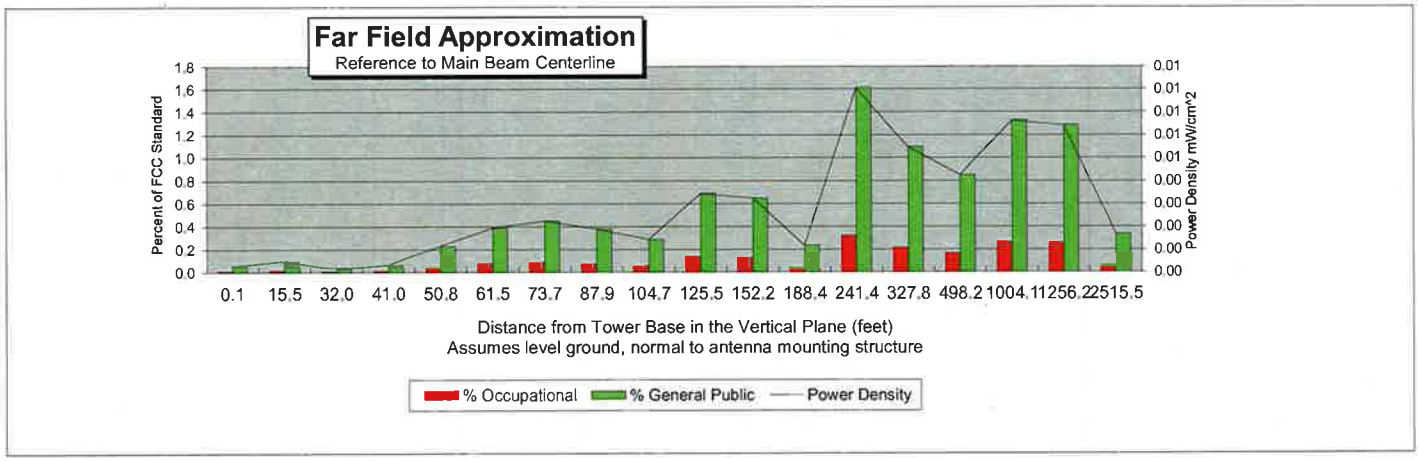
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Suffield S, CT
Site #:	
Date:	03/19/14
Name:	Mark Brauer
File Name:	Suffield S, CT - FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**90.8**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1050.0**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	87.8	89.2	93.5	96.9	101.4	107.2	114.7	124.2	136.7	153.1	175.7	207.9	256.8	339.4	505.9	1007.9	1259.3	2517.1
Distance from Antenna Structure Base in Horizontal plane	0.1	15.5	32.0	41.0	50.8	61.5	73.7	87.9	104.7	125.5	152.2	188.4	241.4	327.8	498.2	1004.1	1256.2	2515.5
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.2	0.2	0.3	0.3	0.1
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.2	0.4	0.4	0.4	0.3	0.7	0.6	0.2	1.6	1.1	0.9	1.3	1.3	0.3

Antenna Type BXA-70063-6CF
Max% 1.62%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

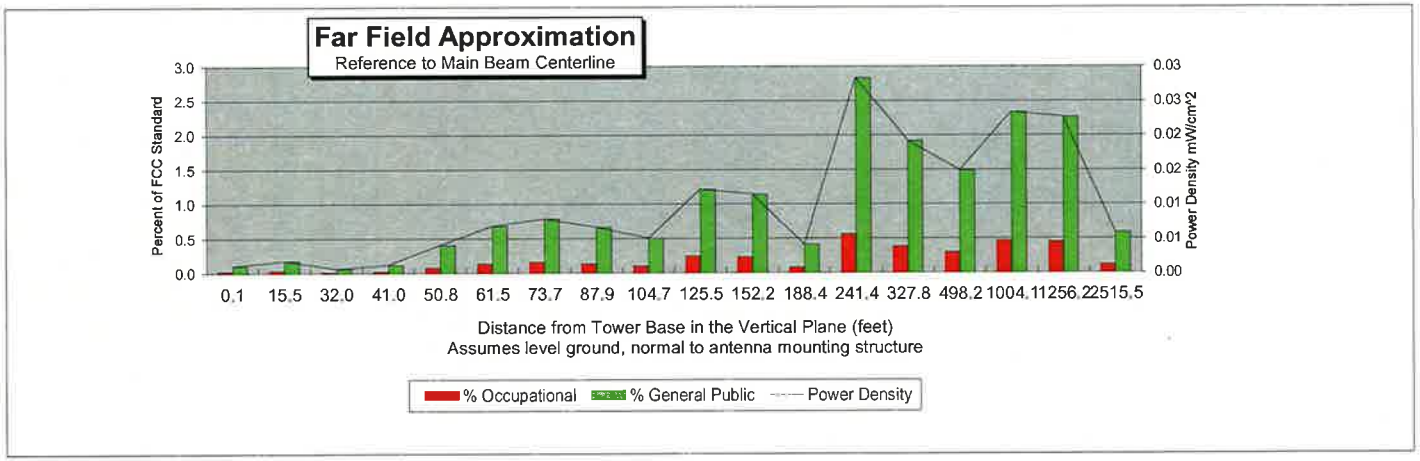
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Suffield South, CT
Site #:	
Date:	03/19/14
Name:	Mark Brauer
File Name:	Suffield S, CT - FF Power

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**90.8**
Antenna Gain (dBi):	**19.9**
Antenna Size (in.):	**77.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1750.0**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	87.8	89.2	93.5	96.9	101.4	107.2	114.7	124.2	136.7	153.1	175.7	207.9	256.8	339.4	505.9	1007.9	1259.3	2517.1	
Distance from Antenna Structure Base in Horizontal plane	0.1	15.5	32.0	41.0	50.8	61.5	73.7	87.9	104.7	125.5	152.2	188.4	241.4	327.8	498.2	1004.1	1256.2	2515.5	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.02	0.01	0.02	0.02	0.01	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.6	0.4	0.3	0.5	0.5	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.7	0.8	0.7	0.5	1.2	1.1	0.4	2.8	1.9	1.5	2.3	2.3	0.6	

Antenna Type 742213
Max% 2.83%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

100-ft Existing ROHN Lattice Tower

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Suffield South

55 King Spring Road
Windsor Locks, CT

Centek Project No. 14001.009

Date: January 6, 2014

Prepared for:

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

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

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing lattice (tower) located in Windsor Locks, CT.

The host tower is a 100-ft, three legged, tapered lattice tower originally designed and manufactured by ROHN Industries Inc. ROHN's design documents were not available for use in this report. The tower geometry, structure member sizes and foundation system information were taken from a previous structural report prepared by Centek Engineering. job no. 12001.CO91 dated August 10, 2012

Antenna and appurtenance information were obtained from the aforementioned structural report, visual verification from grade conducted by Centek personnel on January 6, 2014 and a Verizon RF data sheet.

The tower is made of five (5) tapered vertical sections consisting of A572-50 steel pipe legs. Horizontal and diagonal lateral support bracing consists of A36 steel angle shapes. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by welded and bolted gusset connections. The width of the tower face is 6.52-ft at the top and 14.7-ft at the base.

Verizon proposes the installation of three (3) panel antennas, three (3) remote radio heads and one (1) main distribution box mounted to the existing three (3) 12-ft T-Frames. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- AT&T (EXISTING):
  Antennas: Three (3) Kathrein 800-10121 panel antennas, two (2) Powerwave P65-17-XLH-RR panel antennas, one (1) KMW AMX-CD-16-65-00T-RET panel antenna, six (6) Powerwave LGP21401 TMA's and six (6) Ericsson RRUS-11 mounted on three (3) existing dual standoff mounts with a RAD center elevation of 100-ft above grade.
  Coax Cables: Six (6) 7/8" ∅ coax cables running on a leg/face of the existing tower.
- AT&T (EXISTING):
  Antennas: One (1) Raycap DC6-48-60-18-8F surge arrestor leg mounted with an elevation of elevation of 100-ft above exiting grade.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running on a face of the existing tower as specified in Section 3 of this report.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Six (6) Antel LPA-70063-6CF panel antennas, three (3) Antel BXA-70063-6CF panel antennas, three (3) Antel BXA-171063-12BF panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on three (3) existing 12-ft T-Frames with a RAD center elevation of 90-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg of the existing tower.

- **VERIZON (PROPOSED):**
  Antennas: Three (3) Kathrein 742-213 panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on three (3) existing 12-ft T-Frames with a RAD center elevation of 90-ft above grade.
  Coax Cables: One (1) 1-5/8" Ø fiber cable running on the exterior of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Windsor Locks; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F wind speed controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 2, per tnxTower "Section Capacity Table", this tower was found to be at **88.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T4)	20.00'-40.00'	85.3%	**PASS**
Diagonal (T4)	20.00'-40.00'	88.8%	**PASS**

Foundation and Anchors

The existing foundation consists of three (3) 1.5-ft square x 5.0-ft long reinforced concrete piers on 8.5-ft square x 2.5-ft thick reinforced concrete pads bearing directly on existing sub grade. The foundation was reinforced with a 4-ft thick concrete mat placed on the interior of the three (3) original pad and pier foundations per Natcomm drawing S-2; job no. 08070 dated 11/30/2009. Tower legs are connected to the foundation by means of (4) 7/8"∅, ASTM A354-BC anchor bolts per leg, embedded into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 2 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	16 kips
	Compression	18 kips
	Moment	1016 kip-ft
Leg	Compression	86 kips
	Uplift	74 kips
	Shear	10 kips

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	54.5%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Mat and Piers (3)	OTM[2]	2.0	2.24	**PASS**

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

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16264
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

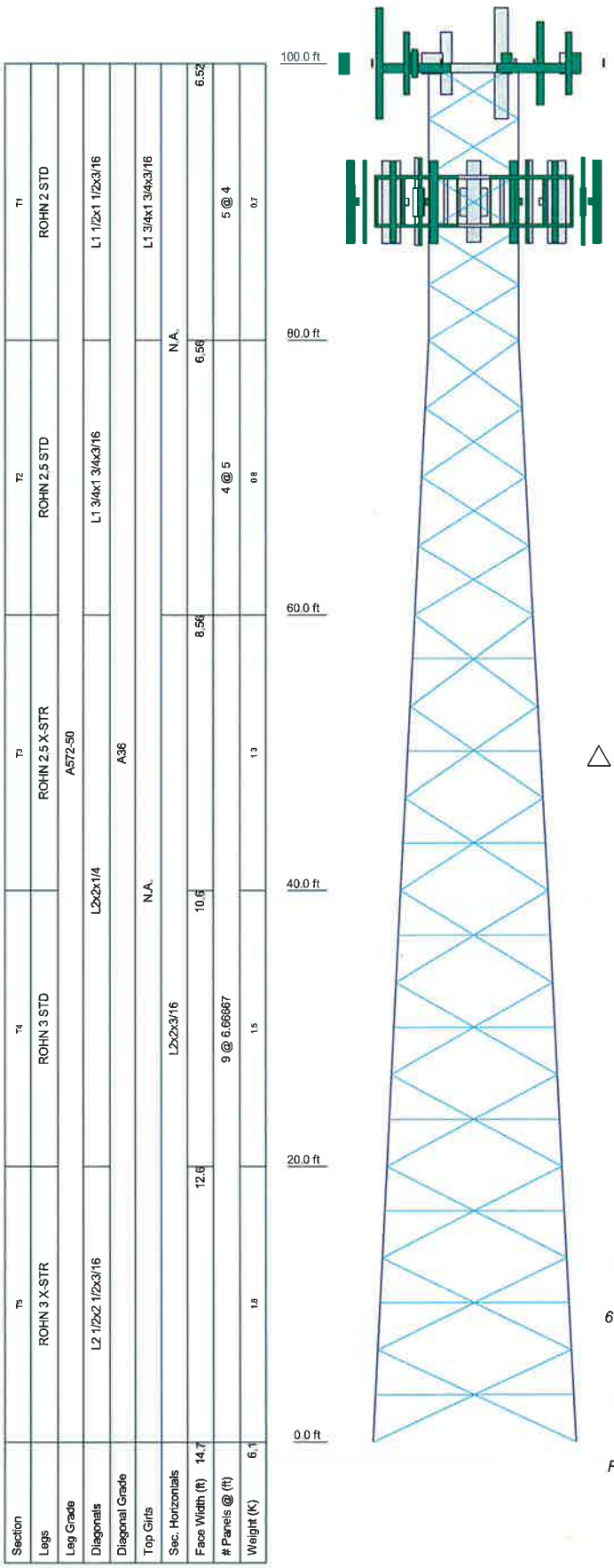
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or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

General Description of Structural Analysis Program

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

tnxTower Features:

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



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
800-10121 (ATI - Existing)	100	LPA-70063-6CF (Verizon - Existing)	90
800-10121 (ATI - Existing)	100	BXA-70063/6CF (Verizon - Existing)	90
800-10121 (ATI - Existing)	100	BXA-171063-12BF (Verizon - Existing)	90
(2) 860 10025 RCU (ATI - Existing)	100	LPA-70063-6CF (Verizon - Existing)	90
(2) 860 10025 RCU (ATI - Existing)	100	LPA-70063-6CF (Verizon - Existing)	90
(2) 860 10025 RCU (ATI - Existing)	100	BXA-70063/6CF (Verizon - Existing)	90
P65-17-XLH-RR (ATI - Existing)	100	BXA-171063-12BF (Verizon - Existing)	90
AM-X-CD-16-65-00T-RET(72") (ATI - Existing)	100	LPA-70063-6CF (Verizon - Existing)	90
		(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	90
P65-17-XLH-RR (ATI - Existing)	100	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	90
(2) LPG21401 TMA (ATI - Existing)	100		
(2) LPG21401 TMA (ATI - Existing)	100	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	90
(2) LPG21401 TMA (ATI - Existing)	100		
(2) RRUS-11 (ATI - Existing)	100	742-213 (Verizon - Proposed)	90
(2) RRUS-11 (ATI - Existing)	100	742-213 (Verizon - Proposed)	90
(2) RRUS-11 (ATI - Existing)	100	742-213 (Verizon - Proposed)	90
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	100	RRH2x40-AWS (Verizon - Proposed)	90
Site Pro Compact Tower Mount CWT8 (ATI - Existing)	100	RRH2x40-AWS (Verizon - Proposed)	90
		RRH2x40-AWS (Verizon - Proposed)	90
Site Pro Compact Tower Mount CWT8 (ATI - Existing)	100	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	90
Site Pro Compact Tower Mount CWT8 (ATI - Existing)	100	Pirod 12' T-Frame Sector Mount (1) (Verizon - Existing)	90
LPA-70063-6CF (Verizon - Existing)	90	Pirod 12' T-Frame Sector Mount (1) (Verizon - Existing)	90
BXA-70063/6CF (Verizon - Existing)	90		
BXA-171063-12BF (Verizon - Existing)	90	Pirod 12' T-Frame Sector Mount (1) (Verizon - Existing)	90
LPA-70063-6CF (Verizon - Existing)	90		

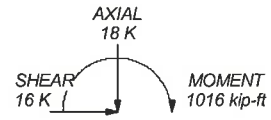
MATERIAL STRENGTH

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

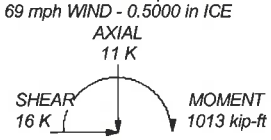
TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 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: 88.8%

MAX. CORNER REACTIONS AT BASE:
DOWN: 86 K
UPLIFT: -74 K
SHEAR: 10 K



TORQUE 9 kip-ft
69 mph WIND - 0.5000 in ICE



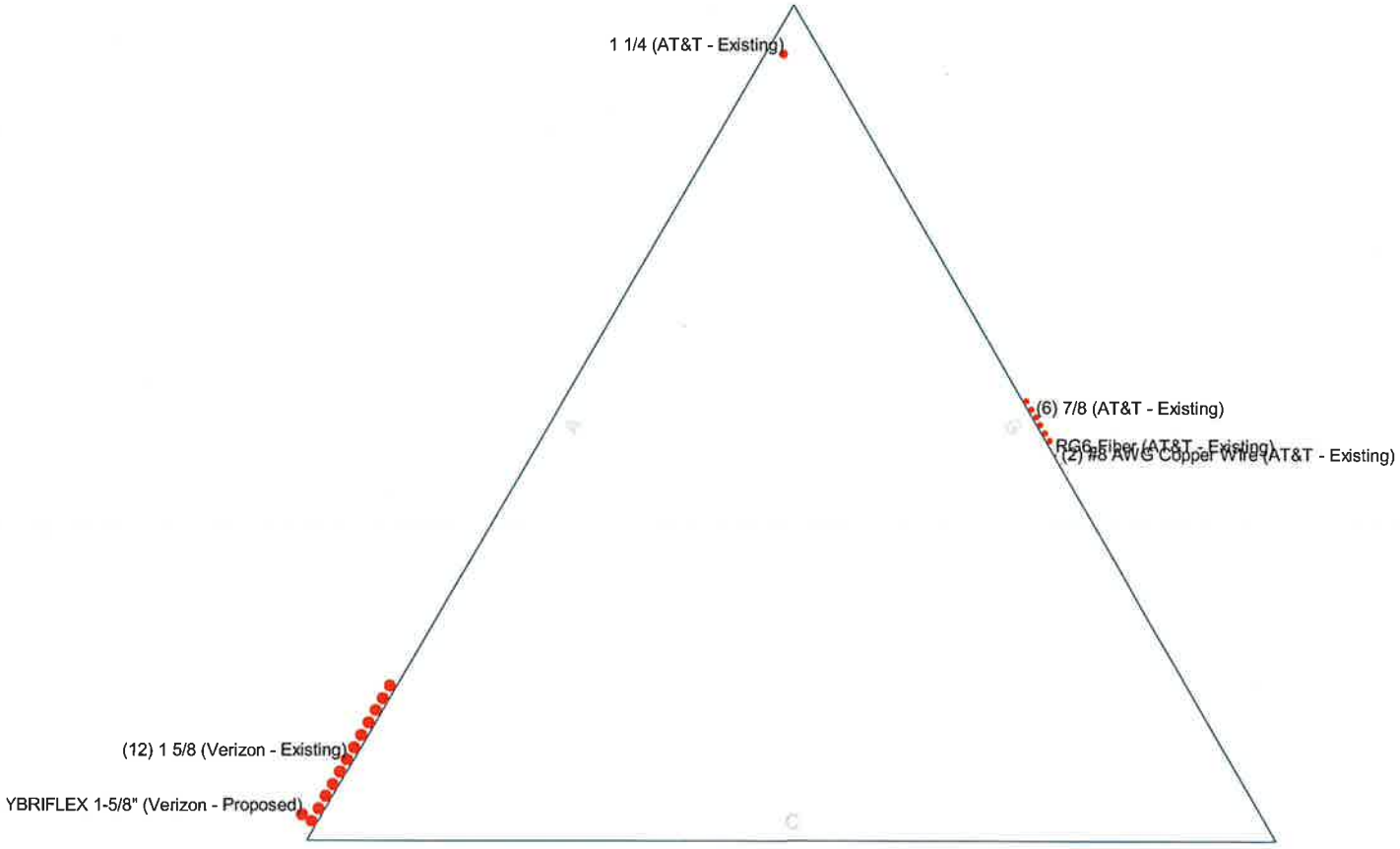
TORQUE 11 kip-ft
REACTIONS - 80 mph WIND

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

Job: *14001.009 - Suffield South*			
Project: *100' ROHN Lattice - 55 King Spring Road, Windsor Locks, CT*			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 01/06/14	Scale: NTS	
Path:		Dwg No. E-1	

Feedline Plan

Round Flat App In Face App Out Face



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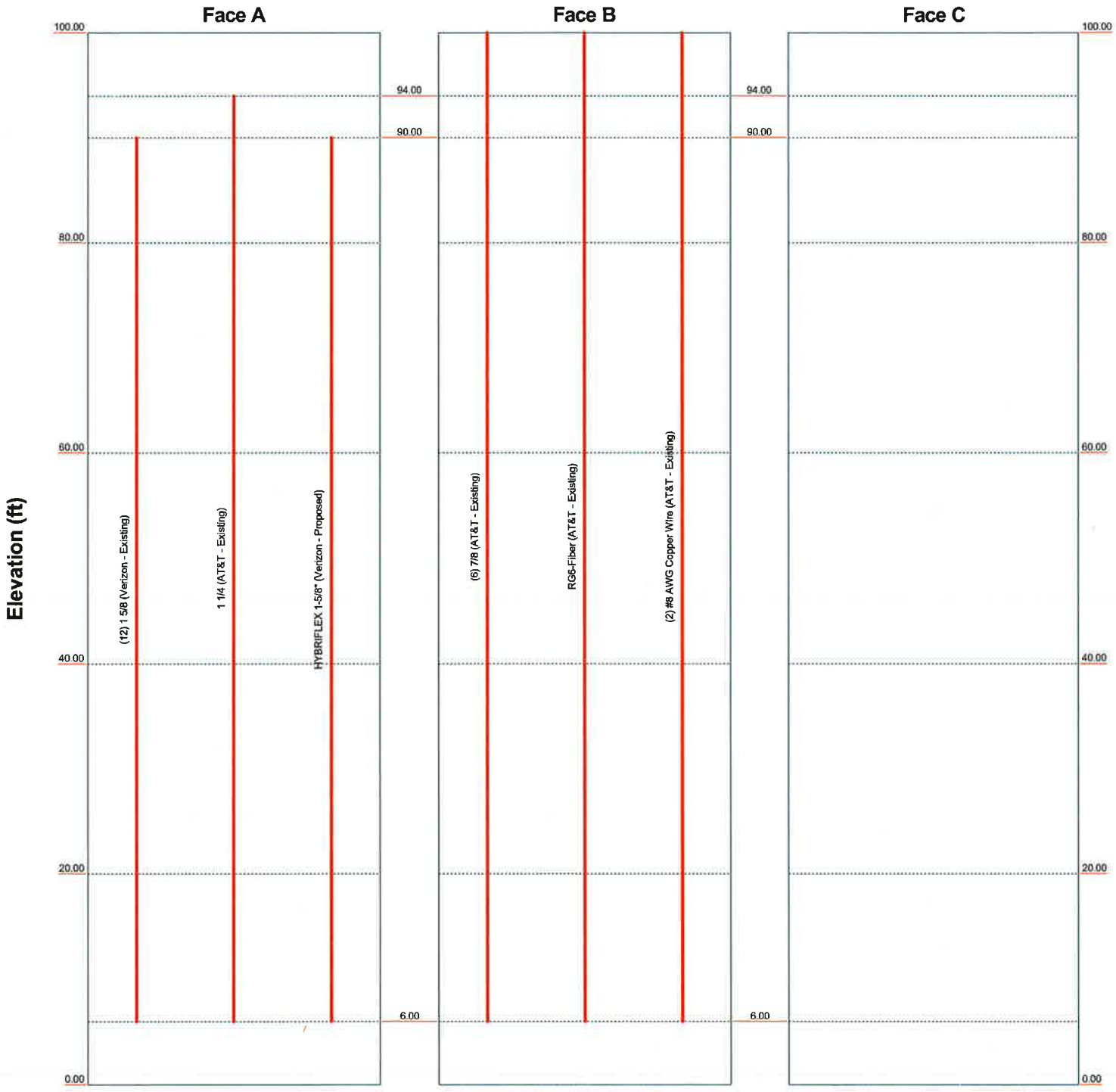
Code: TIA/EIA-222-F	Date: 01/06/14	Scale: NTS
Path:		Dwg No. E-7

Feedline Distribution Chart
0' - 100'

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



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Job:	***14001.009 - Suffield South***		
Project:	***100' ROHN Lattice - 55 King Spring Road, Windsor Locks, CT***		
Client: Verizon Wireless		Drawn by: TJL	App'd:
Code: TIA/EIA-222-F		Date: 01/06/14	Scale: NTS
Path:			Dwg No. E-7

tnxTower	Job	Page
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	14001.009 - Suffield South	1 of 28
	Project 100' ROHN Lattice - 55 King Spring Road, Windsor Locks, CT	Date 15:15:57 01/06/14
	Client Verizon Wireless	Designed by TJL

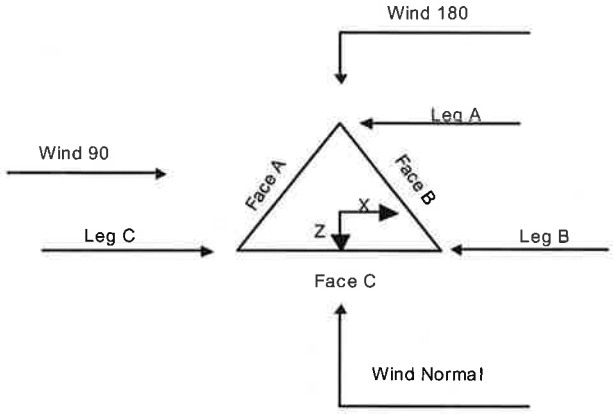
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 100.00 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 6.52 ft at the top and 14.70 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 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	100.00-80.00			6.52	1	20.00
T2	80.00-60.00			6.56	1	20.00
T3	60.00-40.00			8.56	1	20.00
T4	40.00-20.00			10.60	1	20.00
T5	20.00-0.00			12.60	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	100.00-80.00	4.00	X Brace	No	No	0.0000	0.0000
T2	80.00-60.00	5.00	X Brace	No	No	0.0000	0.0000
T3	60.00-40.00	6.67	X Brace	No	Yes	0.0000	0.0000
T4	40.00-20.00	6.67	X Brace	No	Yes	0.0000	0.0000
T5	20.00-0.00	6.67	X Brace	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 100.00-80.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T2 80.00-60.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T3 60.00-40.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T4 40.00-20.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T5 20.00-0.00	Pipe	ROHN 3 X-STR	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	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 100.00-80.00	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T3 60.00-40.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T4 40.00-20.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T5 20.00-0.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 40.00-20.00	0.00	0.0000	A36	1	1	1	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T5 20.00-0.00	0.00	0.0000	(36 ksi) A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T1	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1	1	1	1	1
T3	No	Yes	1	1	1	1	1	1	1	1	1	0.5	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1	1	1	1	1
T4	No	Yes	1	1	1	1	1	1	1	1	1	0.5	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1	1	1	1	1
T5 20.00-0.00	No	Yes	1	1	1	1	1	1	1	1	1	0.5	1	1	1
				1	1	1	1	1	1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
100.00-80.00														
T2 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
T3 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
T4 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
T5 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	Flange	0.6250	4	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0	0.5000	1
100.00-80.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T2 80.00-60.00	Flange	0.6250	4	0.5000	1	0.5000	0	0.6250	0	0.6250	0	0.6250	0	0.5000	1
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T3 60.00-40.00	Flange	0.7500	4	0.5000	1	0.5000	0	0.0000	0	0.6250	0	0.6250	0	0.5000	1
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T4 40.00-20.00	Flange	0.8750	4	0.5000	1	0.5000	0	0.0000	0	0.6250	0	0.6250	0	0.5000	1
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T5 20.00-0.00	Flange	0.8750	4	0.5000	1	0.5000	0	0.0000	0	0.6250	0	0.6250	0	0.5000	1
		A354-BC		A325N		A325N		A325N		A325N		A325N		A325N	

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
7/8 (AT&T - Existing)	B	Yes	Ar (CfAe)	100.00 - 6.00	0.0000	0	6	6	0.5000	1.1100		0.54
1 5/8 (Verizon - Existing)	A	Yes	Ar (CfAe)	90.00 - 6.00	0.0000	-0.4	12	12	0.5000	1.9800		1.04
RG6-Fiber (AT&T - Existing)	B	Yes	Ar (CfAe)	100.00 - 6.00	0.0000	0.04	1	1	0.5000	0.5000		1.00
#8 AWG Copper WIre (AT&T - Existing)	B	Yes	Ar (CfAe)	100.00 - 6.00	0.0000	0.05	2	1	0.2500	0.1285		0.05
1 1/4 (AT&T - Existing)	A	Yes	Ar (CfAe)	94.00 - 6.00	-2.0000	0.45	1	1	1.5500	1.5500		0.66
HYBRIFLEX 1-5/8" (Verizon - Proposed)	A	Yes	Ar (CfAe)	90.00 - 6.00	2.0000	-0.48	1	1	1.9800	1.9800		1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	100.00-80.00	A	23.258	0.000	0.000	0.000	0.15
		B	12.148	0.000	0.000	0.000	0.09
		C	0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	45.483	0.000	0.000	0.000	0.30
		B	12.148	0.000	0.000	0.000	0.09
		C	0.000	0.000	0.000	0.000	0.00
T3	60.00-40.00	A	45.483	0.000	0.000	0.000	0.30
		B	12.148	0.000	0.000	0.000	0.09

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	0.000	0.000	0.000	0.000	0.00
T4	40.00-20.00	A	45.483	0.000	0.000	0.000	0.30
		B	12.148	0.000	0.000	0.000	0.09
		C	0.000	0.000	0.000	0.000	0.00
T5	20.00-0.00	A	31.838	0.000	0.000	0.000	0.21
		B	8.503	0.000	0.000	0.000	0.06
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	100.00-80.00	A	0.500	7.942	22.733	0.000	0.000	0.39
		B		7.898	13.417	0.000	0.000	0.23
		C		0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	0.500	14.183	45.467	0.000	0.000	0.76
		B		7.898	13.417	0.000	0.000	0.23
		C		0.000	0.000	0.000	0.000	0.00
T3	60.00-40.00	A	0.500	14.183	45.467	0.000	0.000	0.76
		B		7.898	13.417	0.000	0.000	0.23
		C		0.000	0.000	0.000	0.000	0.00
T4	40.00-20.00	A	0.500	14.183	45.467	0.000	0.000	0.76
		B		7.898	13.417	0.000	0.000	0.23
		C		0.000	0.000	0.000	0.000	0.00
T5	20.00-0.00	A	0.500	9.928	31.827	0.000	0.000	0.53
		B		5.528	9.392	0.000	0.000	0.16
		C		0.000	0.000	0.000	0.000	0.00

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	100.00-80.00	A	0.000	1.626	1.874	2.471
		B	0.000	1.130	0.979	1.717
		C	0.000	0.000	0.000	0.000
T2	80.00-60.00	A	0.000	2.389	3.188	4.181
		B	0.000	0.854	0.851	1.494
		C	0.000	0.000	0.000	0.000
T3	60.00-40.00	A	0.000	2.565	3.912	5.130
		B	0.000	0.917	1.045	1.833
		C	0.000	0.000	0.000	0.000
T4	40.00-20.00	A	0.000	2.467	3.762	4.934
		B	0.000	0.881	1.005	1.763
		C	0.000	0.000	0.000	0.000
T5	20.00-0.00	A	0.000	1.684	3.012	3.950
		B	0.000	0.602	0.804	1.411
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	100.00-80.00	-5.6966	1.3349	-3.7247	0.5756
T2	80.00-60.00	-12.5117	4.1277	-9.4619	2.7870
T3	60.00-40.00	-13.5453	4.5334	-10.2288	3.0606
T4	40.00-20.00	-14.7714	4.9900	-11.2717	3.4078
T5	20.00-0.00	-11.4475	3.8893	-8.8429	2.6902

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
800-10121 (AT&T - Existing)	A	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.46 5.88	3.29 3.64	0.05 0.08
800-10121 (AT&T - Existing)	B	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.46 5.88	3.29 3.64	0.05 0.08
800-10121 (AT&T - Existing)	C	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.46 5.88	3.29 3.64	0.05 0.08
(2) 860 10025 RCU (AT&T - Existing)	A	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.16 0.22	0.13 0.19	0.00 0.00
(2) 860 10025 RCU (AT&T - Existing)	B	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.16 0.22	0.13 0.19	0.00 0.00
(2) 860 10025 RCU (AT&T - Existing)	C	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.16 0.22	0.13 0.19	0.00 0.00
P65-17-XLH-RR (AT&T - Existing)	A	From Leg	3.00 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	11.47 12.08	6.80 7.38	0.06 0.12
AM-X-CD-16-65-00T-RET(72") (AT&T - Existing)	B	From Leg	3.00 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	0.05 0.10
P65-17-XLH-RR (AT&T - Existing)	C	From Leg	3.00 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	11.47 12.08	6.80 7.38	0.06 0.12
(2) LPG21401 TMA (AT&T - Existing)	A	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) LPG21401 TMA (AT&T - Existing)	B	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) LPG21401 TMA (AT&T - Existing)	C	From Leg	3.00 -2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) RRUS-11 (AT&T - Existing)	A	From Leg	3.00 2.00	0.0000	100.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07

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						
(2) RRUS-11	B	From Leg	3.00	0.0000	100.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			2.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	C	From Leg	3.00	0.0000	100.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			2.00			1/2" Ice	3.23	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge	C	From Leg	0.00	0.0000	100.00	No Ice	2.23	2.23	0.02
Arrestor			2.00			1/2" Ice	2.45	2.45	0.04
(AT&T - Existing)			0.00						
Site Pro Compact Tower	A	From Leg	1.00	0.0000	100.00	No Ice	2.85	2.85	0.15
Mount CWT8			0.00			1/2" Ice	4.05	4.05	0.20
(AT&T - Existing)			0.00						
Site Pro Compact Tower	B	From Leg	1.00	0.0000	100.00	No Ice	2.85	2.85	0.15
Mount CWT8			0.00			1/2" Ice	4.05	4.05	0.20
(AT&T - Existing)			0.00						
Site Pro Compact Tower	C	From Leg	1.00	0.0000	100.00	No Ice	2.85	2.85	0.15
Mount CWT8			0.00			1/2" Ice	4.05	4.05	0.20
(AT&T - Existing)			0.00						
LPA-70063-6CF	A	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			-6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
BXA-70063/6CF	A	From Leg	3.00	0.0000	90.00	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	A	From Leg	3.00	0.0000	90.00	No Ice	4.73	3.57	0.02
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
LPA-70063-6CF	A	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
LPA-70063-6CF	B	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			-6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
BXA-70063/6CF	B	From Leg	3.00	0.0000	90.00	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	B	From Leg	3.00	0.0000	90.00	No Ice	4.73	3.57	0.02
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
LPA-70063-6CF	B	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
LPA-70063-6CF	C	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			-6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
BXA-70063/6CF	C	From Leg	3.00	0.0000	90.00	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	C	From Leg	3.00	0.0000	90.00	No Ice	4.73	3.57	0.02
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
LPA-70063-6CF	C	From Leg	3.00	0.0000	90.00	No Ice	10.51	9.06	0.03
(Verizon - Existing)			6.00			1/2" Ice	11.07	9.61	0.10
			0.00						
(2) FD9R6004/2C-3L	A	From Leg	3.00	0.0000	90.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01

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
(Verizon - Existing)			0.00						
(2) FD9R6004/2C-3L	B	From Leg	3.00	0.0000	90.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon - Existing)			0.00						
(2) FD9R6004/2C-3L	C	From Leg	3.00	0.0000	90.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon - Existing)			0.00						
742-213	A	From Leg	3.00	0.0000	90.00	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	B	From Leg	3.00	0.0000	90.00	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	C	From Leg	3.00	0.0000	90.00	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
RRH2x40-AWS	A	From Leg	3.00	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Leg	3.00	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Leg	3.00	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
DB-T1-6Z-8AB-0Z	A	From Leg	3.00	0.0000	90.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
Pirod 12' T-Frame Sector	A	From Leg	1.00	0.0000	90.00	No Ice	12.60	12.60	0.36
Mount (1)			0.00			1/2" Ice	17.60	17.60	0.49
(Verizon - Existing)			0.00						
Pirod 12' T-Frame Sector	B	From Leg	1.00	0.0000	90.00	No Ice	12.60	12.60	0.36
Mount (1)			0.00			1/2" Ice	17.60	17.60	0.49
(Verizon - Existing)			0.00						
Pirod 12' T-Frame Sector	C	From Leg	1.00	0.0000	90.00	No Ice	12.60	12.60	0.36
Mount (1)			0.00			1/2" Ice	17.60	17.60	0.49
(Verizon - Existing)			0.00						

Tower Pressures - No Ice

$G_H = 1.162$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	90.00	1.332	22	134.758	A	8.341	31.175	7.917	20.03	0.000	0.000
100.00-80.00					B	9.236	20.064		27.02	0.000	0.000
					C	10.215	7.917		43.66	0.000	0.000
T2 80.00-60.00	70.00	1.24	20	155.998	A	7.066	55.083	9.599	15.45	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	9.402	21.747		30.82	0.000	0.000
					C	10.254	9.599		48.35	0.000	0.000
T3 60.00-40.00	50.00	1.126	18	196.398	A	12.138	55.083	9.600	14.28	0.000	0.000
					B	15.005	21.747		26.12	0.000	0.000
					C	16.049	9.600		37.43	0.000	0.000
T4 40.00-20.00	30.00	1	16	237.841	A	14.944	57.169	11.686	16.21	0.000	0.000
					B	17.702	23.834		28.14	0.000	0.000
					C	18.706	11.686		38.45	0.000	0.000
T5 20.00-0.00	10.00	1	16	278.841	A	22.250	43.526	11.688	17.77	0.000	0.000
					B	24.457	20.191		26.18	0.000	0.000
					C	25.262	11.688		31.63	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.162$

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 100.00-80.00	90.00	1.332	16	0.5000	136.425	A	30.477	24.288	11.250	20.54	0.000	0.000
						B	21.915	24.740		24.11	0.000	0.000
						C	10.215	17.972		39.91	0.000	0.000
T2 80.00-60.00	70.00	1.24	15	0.5000	157.666	A	51.539	30.592	12.938	15.75	0.000	0.000
						B	22.176	25.841		26.94	0.000	0.000
						C	10.254	18.797		44.54	0.000	0.000
T3 60.00-40.00	50.00	1.126	14	0.5000	198.067	A	56.386	32.582	12.939	14.54	0.000	0.000
						B	27.633	27.945		23.28	0.000	0.000
						C	16.049	20.964		34.96	0.000	0.000
T4 40.00-20.00	30.00	1	12	0.5000	239.509	A	59.239	36.095	15.025	15.76	0.000	0.000
						B	30.360	31.394		24.33	0.000	0.000
						C	18.706	24.378		34.87	0.000	0.000
T5 20.00-0.00	10.00	1	12	0.5000	280.510	A	53.139	34.044	15.028	17.24	0.000	0.000
						B	33.242	30.726		23.49	0.000	0.000
						C	25.262	25.800		29.43	0.000	0.000

Tower Pressure - Service

$G_H = 1.162$

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	90.00	1.332	9	134.758	A	8.341	31.175	7.917	20.03	0.000	0.000
100.00-80.00					B	9.236	20.064		27.02	0.000	0.000
					C	10.215	7.917		43.66	0.000	0.000
T2 80.00-60.00	70.00	1.24	8	155.998	A	7.066	55.083	9.599	15.45	0.000	0.000
					B	9.402	21.747		30.82	0.000	0.000
					C	10.254	9.599		48.35	0.000	0.000
T3 60.00-40.00	50.00	1.126	7	196.398	A	12.138	55.083	9.600	14.28	0.000	0.000
					B	15.005	21.747		26.12	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	16.049	9.600		37.43	0.000	0.000
T4 40.00-20.00	30.00	1	6	237.841	A	14.944	57.169	11.686	16.21	0.000	0.000
					B	17.702	23.834		28.14	0.000	0.000
					C	18.706	11.686		38.45	0.000	0.000
T5 20.00-0.00	10.00	1	6	278.841	A	22.250	43.526	11.688	17.77	0.000	0.000
					B	24.457	20.191		26.18	0.000	0.000
					C	25.262	11.688		31.63	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	0.24	0.67	A	0.293	2.314	0.614	1	1	27.478	1.61	80.63	A
100.00-80.00			B	0.217	2.539	0.594	1	1	21.157			
			C	0.135	2.829	0.579	1	1	14.800			
T2	0.39	0.81	A	0.398	2.067	0.651	1	1	42.921	2.09	104.71	A
80.00-60.00			B	0.2	2.597	0.59	1	1	22.240			
			C	0.127	2.857	0.578	1	1	15.805			
T3	0.39	1.34	A	0.342	2.19	0.63	1	1	46.826	2.20	109.92	A
60.00-40.00			B	0.187	2.64	0.588	1	1	27.789			
			C	0.131	2.844	0.579	1	1	21.605			
T4	0.39	1.48	A	0.303	2.288	0.617	1	1	50.211	2.19	109.35	A
40.00-20.00			B	0.175	2.683	0.586	1	1	31.657			
			C	0.128	2.855	0.578	1	1	25.465			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	1	1	48.296	2.28	114.05	A
			B	0.16	2.735	0.583	1	1	36.231			
			C	0.133	2.837	0.579	1	1	32.029			
Sum Weight:	1.67	6.06						OTM	490.07 kip-ft	10.37		

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	0.24	0.67	A	0.293	2.314	0.614	0.825	1	26.018	1.53	76.35	A
100.00-80.00			B	0.217	2.539	0.594	0.825	1	19.540			
			C	0.135	2.829	0.579	0.825	1	13.013			
T2	0.39	0.81	A	0.398	2.067	0.651	0.825	1	41.685	2.03	101.70	A
80.00-60.00			B	0.2	2.597	0.59	0.825	1	20.595			
			C	0.127	2.857	0.578	0.825	1	14.010			
T3	0.39	1.34	A	0.342	2.19	0.63	0.825	1	44.702	2.10	104.93	A
60.00-40.00			B	0.187	2.64	0.588	0.825	1	25.163			
			C	0.131	2.844	0.579	0.825	1	18.796			
T4	0.39	1.48	A	0.303	2.288	0.617	0.825	1	47.596	2.07	103.65	A
40.00-20.00			B	0.175	2.683	0.586	0.825	1	28.560			
			C	0.128	2.855	0.578	0.825	1	22.191			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.825	1	44.402	2.10	104.85	A
			B	0.16	2.735	0.583	0.825	1	31.951			
			C	0.133	2.837	0.579	0.825	1	27.608			

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:	1.67	6.06						OTM	467.90 kip-ft	9.83		

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 ft^2	F K	w plf	Ctrl. Face
T1	0.24	0.67	A	0.293	2.314	0.614	0.8	1	25.810	1.51	75.74	A
100.00-80.00			B	0.217	2.539	0.594	0.8	1	19.309			
			C	0.135	2.829	0.579	0.8	1	12.757			
T2	0.39	0.81	A	0.398	2.067	0.651	0.8	1	41.508	2.03	101.27	A
80.00-60.00			B	0.2	2.597	0.59	0.8	1	20.360			
			C	0.127	2.857	0.578	0.8	1	13.754			
T3	0.39	1.34	A	0.342	2.19	0.63	0.8	1	44.399	2.08	104.22	A
60.00-40.00			B	0.187	2.64	0.588	0.8	1	24.788			
			C	0.131	2.844	0.579	0.8	1	18.395			
T4	0.39	1.48	A	0.303	2.288	0.617	0.8	1	47.222	2.06	102.84	A
40.00-20.00			B	0.175	2.683	0.586	0.8	1	28.117			
			C	0.128	2.855	0.578	0.8	1	21.723			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.8	1	43.846	2.07	103.54	A
			B	0.16	2.735	0.583	0.8	1	31.339			
			C	0.133	2.837	0.579	0.8	1	26.976			
Sum Weight:	1.67	6.06						OTM	464.73 kip-ft	9.75		

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 ft^2	F K	w plf	Ctrl. Face
T1	0.24	0.67	A	0.293	2.314	0.614	0.85	1	26.227	1.54	76.96	A
100.00-80.00			B	0.217	2.539	0.594	0.85	1	19.771			
			C	0.135	2.829	0.579	0.85	1	13.268			
T2	0.39	0.81	A	0.398	2.067	0.651	0.85	1	41.862	2.04	102.13	A
80.00-60.00			B	0.2	2.597	0.59	0.85	1	20.830			
			C	0.127	2.857	0.578	0.85	1	14.267			
T3	0.39	1.34	A	0.342	2.19	0.63	0.85	1	45.005	2.11	105.64	A
60.00-40.00			B	0.187	2.64	0.588	0.85	1	25.538			
			C	0.131	2.844	0.579	0.85	1	19.197			
T4	0.39	1.48	A	0.303	2.288	0.617	0.85	1	47.970	2.09	104.46	A
40.00-20.00			B	0.175	2.683	0.586	0.85	1	29.002			
			C	0.128	2.855	0.578	0.85	1	22.659			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.85	1	44.958	2.12	106.17	A
			B	0.16	2.735	0.583	0.85	1	32.562			
			C	0.133	2.837	0.579	0.85	1	28.239			
Sum Weight:	1.67	6.06						OTM	471.06 kip-ft	9.91		

tnxTower	Job	Page
	14001.009 - Suffield South	13 of 28
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 100' ROHN Lattice - 55 King Spring Road, Windsor Locks, CT	**Date** 15:15:57 01/06/14
	Client Verizon Wireless	**Designed by** TJL

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	0.61	1.17	A	0.401	2.061	0.652	1	1	46.317	1.82	90.79	A
100.00-80.00			B	0.342	2.19	0.63	1	1	37.492			
			C	0.207	2.574	0.592	1	1	20.850			
T2	0.98	1.31	A	0.521	1.874	0.708	1	1	73.210	2.43	121.46	A
80.00-60.00			B	0.305	2.284	0.617	1	1	38.128			
			C	0.184	2.649	0.587	1	1	21.294			
T3	0.98	2.04	A	0.449	1.975	0.673	1	1	78.310	2.49	124.34	A
60.00-40.00			B	0.281	2.349	0.61	1	1	44.683			
			C	0.187	2.64	0.588	1	1	28.372			
T4	0.98	2.29	A	0.398	2.068	0.651	1	1	82.730	2.44	122.15	A
40.00-20.00			B	0.258	2.414	0.604	1	1	49.319			
			C	0.18	2.665	0.587	1	1	33.004			
T5 20.00-0.00	0.69	2.78	A	0.311	2.268	0.619	1	1	74.221	2.40	120.17	A
			B	0.228	2.505	0.597	1	1	51.571			
			C	0.182	2.657	0.587	1	1	40.404			
Sum Weight:	4.25	9.59						OTM	555.13 kip-ft	11.58		

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	0.61	1.17	A	0.401	2.061	0.652	0.825	1	40.984	1.61	80.34	A
100.00-80.00			B	0.342	2.19	0.63	0.825	1	33.657			
			C	0.207	2.574	0.592	0.825	1	19.063			
T2	0.98	1.31	A	0.521	1.874	0.708	0.825	1	64.191	2.13	106.49	A
80.00-60.00			B	0.305	2.284	0.617	0.825	1	34.247			
			C	0.184	2.649	0.587	0.825	1	19.499			
T3	0.98	2.04	A	0.449	1.975	0.673	0.825	1	68.443	2.17	108.67	A
60.00-40.00			B	0.281	2.349	0.61	0.825	1	39.848			
			C	0.187	2.64	0.588	0.825	1	25.563			
T4	0.98	2.29	A	0.398	2.068	0.651	0.825	1	72.363	2.14	106.84	A
40.00-20.00			B	0.258	2.414	0.604	0.825	1	44.006			
			C	0.18	2.665	0.587	0.825	1	29.731			
T5 20.00-0.00	0.69	2.78	A	0.311	2.268	0.619	0.825	1	64.922	2.10	105.12	A
			B	0.228	2.505	0.597	0.825	1	45.754			
			C	0.182	2.657	0.587	0.825	1	35.983			
Sum Weight:	4.25	9.59						OTM	487.50 kip-ft	10.15		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.61	1.17	A	0.401	2.061	0.652	0.8	1	40.222	1.58	78.84	A
100.00-80.00			B	0.342	2.19	0.63	0.8	1	33.109			
			C	0.207	2.574	0.592	0.8	1	18.807			
T2	0.98	1.31	A	0.521	1.874	0.708	0.8	1	62.902	2.09	104.36	A
80.00-60.00			B	0.305	2.284	0.617	0.8	1	33.693			
			C	0.184	2.649	0.587	0.8	1	19.243			
T3	0.98	2.04	A	0.449	1.975	0.673	0.8	1	67.033	2.13	106.43	A
60.00-40.00			B	0.281	2.349	0.61	0.8	1	39.157			
			C	0.187	2.64	0.588	0.8	1	25.162			
T4	0.98	2.29	A	0.398	2.068	0.651	0.8	1	70.882	2.09	104.66	A
40.00-20.00			B	0.258	2.414	0.604	0.8	1	43.247			
			C	0.18	2.665	0.587	0.8	1	29.263			
T5 20.00-0.00	0.69	2.78	A	0.311	2.268	0.619	0.8	1	63.593	2.06	102.97	A
			B	0.228	2.505	0.597	0.8	1	44.923			
			C	0.182	2.657	0.587	0.8	1	35.351			
Sum Weight:	4.25	9.59						OTM	477.84 kip-ft	9.95		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.61	1.17	A	0.401	2.061	0.652	0.85	1	41.746	1.64	81.83	A
100.00-80.00			B	0.342	2.19	0.63	0.85	1	34.205			
			C	0.207	2.574	0.592	0.85	1	19.318			
T2	0.98	1.31	A	0.521	1.874	0.708	0.85	1	65.479	2.17	108.63	A
80.00-60.00			B	0.305	2.284	0.617	0.85	1	34.802			
			C	0.184	2.649	0.587	0.85	1	19.756			
T3	0.98	2.04	A	0.449	1.975	0.673	0.85	1	69.852	2.22	110.91	A
60.00-40.00			B	0.281	2.349	0.61	0.85	1	40.538			
			C	0.187	2.64	0.588	0.85	1	25.964			
T4	0.98	2.29	A	0.398	2.068	0.651	0.85	1	73.844	2.18	109.03	A
40.00-20.00			B	0.258	2.414	0.604	0.85	1	44.765			
			C	0.18	2.665	0.587	0.85	1	30.198			
T5 20.00-0.00	0.69	2.78	A	0.311	2.268	0.619	0.85	1	66.250	2.15	107.27	A
			B	0.228	2.505	0.597	0.85	1	46.585			
			C	0.182	2.657	0.587	0.85	1	36.614			
Sum Weight:	4.25	9.59						OTM	497.16 kip-ft	10.35		

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	0.24	0.67	A	0.293	2.314	0.614	1	1	27.478	0.63	31.50	A
100.00-80.00			B	0.217	2.539	0.594	1	1	21.157			
			C	0.135	2.829	0.579	1	1	14.800			

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	0.39	0.81	A	0.398	2.067	0.651	1	1	42.921	0.82	40.90	A
80.00-60.00			B	0.2	2.597	0.59	1	1	22.240			
			C	0.127	2.857	0.578	1	1	15.805			
T3	0.39	1.34	A	0.342	2.19	0.63	1	1	46.826	0.86	42.94	A
60.00-40.00			B	0.187	2.64	0.588	1	1	27.789			
			C	0.131	2.844	0.579	1	1	21.605			
T4	0.39	1.48	A	0.303	2.288	0.617	1	1	50.211	0.85	42.71	A
40.00-20.00			B	0.175	2.683	0.586	1	1	31.657			
			C	0.128	2.855	0.578	1	1	25.465			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	1	1	48.296	0.89	44.55	A
			B	0.16	2.735	0.583	1	1	36.231			
			C	0.133	2.837	0.579	1	1	32.029			
Sum Weight:	1.67	6.06						OTM	191.43 kip-ft	4.05		

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	0.24	0.67	A	0.293	2.314	0.614	0.825	1	26.018	0.60	29.82	A
100.00-80.00			B	0.217	2.539	0.594	0.825	1	19.540			
			C	0.135	2.829	0.579	0.825	1	13.013			
T2	0.39	0.81	A	0.398	2.067	0.651	0.825	1	41.685	0.79	39.73	A
80.00-60.00			B	0.2	2.597	0.59	0.825	1	20.595			
			C	0.127	2.857	0.578	0.825	1	14.010			
T3	0.39	1.34	A	0.342	2.19	0.63	0.825	1	44.702	0.82	40.99	A
60.00-40.00			B	0.187	2.64	0.588	0.825	1	25.163			
			C	0.131	2.844	0.579	0.825	1	18.796			
T4	0.39	1.48	A	0.303	2.288	0.617	0.825	1	47.596	0.81	40.49	A
40.00-20.00			B	0.175	2.683	0.586	0.825	1	28.560			
			C	0.128	2.855	0.578	0.825	1	22.191			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.825	1	44.402	0.82	40.96	A
			B	0.16	2.735	0.583	0.825	1	31.951			
			C	0.133	2.837	0.579	0.825	1	27.608			
Sum Weight:	1.67	6.06						OTM	182.77 kip-ft	3.84		

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	0.24	0.67	A	0.293	2.314	0.614	0.8	1	25.810	0.59	29.58	A
100.00-80.00			B	0.217	2.539	0.594	0.8	1	19.309			
			C	0.135	2.829	0.579	0.8	1	12.757			
T2	0.39	0.81	A	0.398	2.067	0.651	0.8	1	41.508	0.79	39.56	A
80.00-60.00			B	0.2	2.597	0.59	0.8	1	20.360			
			C	0.127	2.857	0.578	0.8	1	13.754			

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
T3	0.39	1.34	A	0.342	2.19	0.63	0.8	1	44.399	0.81	40.71	A
60.00-40.00			B	0.187	2.64	0.588	0.8	1	24.788			
			C	0.131	2.844	0.579	0.8	1	18.395			
T4	0.39	1.48	A	0.303	2.288	0.617	0.8	1	47.222	0.80	40.17	A
40.00-20.00			B	0.175	2.683	0.586	0.8	1	28.117			
			C	0.128	2.855	0.578	0.8	1	21.723			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.8	1	43.846	0.81	40.44	A
			B	0.16	2.735	0.583	0.8	1	31.339			
			C	0.133	2.837	0.579	0.8	1	26.976			
Sum Weight:	1.67	6.06						OTM	181.53 kip-ft	3.81		

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	0.24	0.67	A	0.293	2.314	0.614	0.85	1	26.227	0.60	30.06	A
100.00-80.00			B	0.217	2.539	0.594	0.85	1	19.771			
			C	0.135	2.829	0.579	0.85	1	13.268			
T2	0.39	0.81	A	0.398	2.067	0.651	0.85	1	41.862	0.80	39.89	A
80.00-60.00			B	0.2	2.597	0.59	0.85	1	20.830			
			C	0.127	2.857	0.578	0.85	1	14.267			
T3	0.39	1.34	A	0.342	2.19	0.63	0.85	1	45.005	0.83	41.27	A
60.00-40.00			B	0.187	2.64	0.588	0.85	1	25.538			
			C	0.131	2.844	0.579	0.85	1	19.197			
T4	0.39	1.48	A	0.303	2.288	0.617	0.85	1	47.970	0.82	40.81	A
40.00-20.00			B	0.175	2.683	0.586	0.85	1	29.002			
			C	0.128	2.855	0.578	0.85	1	22.659			
T5 20.00-0.00	0.27	1.76	A	0.236	2.48	0.598	0.85	1	44.958	0.83	41.47	A
			B	0.16	2.735	0.583	0.85	1	32.562			
			C	0.133	2.837	0.579	0.85	1	28.239			
Sum Weight:	1.67	6.06						OTM	184.01 kip-ft	3.87		

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	2.10					
Bracing Weight	3.96					
Total Member Self-Weight	6.06			1.30	4.66	
Total Weight	10.57			1.30	4.66	
Wind 0 deg - No Ice		0.01	-15.97	-1009.62	3.47	-10.79
Wind 30 deg - No Ice		7.71	-13.43	-858.31	-487.91	-7.70
Wind 45 deg - No Ice		10.85	-10.91	-698.68	-689.09	-5.51
Wind 60 deg - No Ice		13.21	-7.68	-492.51	-841.82	-2.97
Wind 90 deg - No Ice		15.41	-0.01	0.12	-978.43	2.50

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 120 deg - No Ice		13.74	7.97	505.74	-862.59	7.69
Wind 135 deg - No Ice		10.83	10.90	699.61	-687.41	9.01
Wind 150 deg - No Ice		7.69	13.42	859.73	-485.86	10.20
Wind 180 deg - No Ice		-0.01	15.35	986.88	5.84	10.19
Wind 210 deg - No Ice		-7.71	13.43	860.92	497.23	7.70
Wind 225 deg - No Ice		-10.85	10.91	701.29	698.40	5.51
Wind 240 deg - No Ice		-13.75	7.99	507.79	873.09	3.10
Wind 270 deg - No Ice		-15.41	0.01	2.49	987.74	-2.50
Wind 300 deg - No Ice		-13.20	-7.66	-490.46	849.95	-7.22
Wind 315 deg - No Ice		-10.83	-10.90	-697.00	696.72	-9.01
Wind 330 deg - No Ice		-7.69	-13.42	-857.12	495.17	-10.20
Member Ice	3.53					
Total Weight Ice	18.46			3.10	11.39	
Wind 0 deg - Ice		0.01	-16.41	-1001.52	10.55	-9.07
Wind 30 deg - Ice		7.56	-13.15	-817.14	-459.31	-6.22
Wind 45 deg - Ice		10.55	-10.60	-660.04	-647.01	-4.51
Wind 60 deg - Ice		12.74	-7.39	-461.29	-786.31	-2.56
Wind 90 deg - Ice		15.11	-0.01	2.27	-928.56	1.66
Wind 120 deg - Ice		14.14	8.20	504.69	-852.42	6.21
Wind 135 deg - Ice		10.53	10.59	665.06	-645.84	6.79
Wind 150 deg - Ice		7.55	13.15	822.51	-457.87	7.89
Wind 180 deg - Ice		-0.01	14.78	930.43	12.22	7.84
Wind 210 deg - Ice		-7.56	13.15	823.34	482.08	6.22
Wind 225 deg - Ice		-10.55	10.60	666.24	669.78	4.51
Wind 240 deg - Ice		-14.15	8.21	506.13	876.02	2.86
Wind 270 deg - Ice		-15.11	0.01	3.93	951.33	-1.66
Wind 300 deg - Ice		-12.73	-7.38	-459.85	808.25	-5.28
Wind 315 deg - Ice		-10.53	-10.59	-658.87	668.61	-6.79
Wind 330 deg - Ice		-7.55	-13.15	-816.31	480.64	-7.89
Total Weight	10.57			1.30	4.66	
Wind 0 deg - Service		0.00	-6.24	-395.21	-0.33	-4.22
Wind 30 deg - Service		3.01	-5.25	-336.11	-192.28	-3.01
Wind 45 deg - Service		4.24	-4.26	-273.75	-270.86	-2.15
Wind 60 deg - Service		5.16	-3.00	-193.22	-330.52	-1.16
Wind 90 deg - Service		6.02	-0.00	-0.78	-383.88	0.98
Wind 120 deg - Service		5.37	3.11	196.72	-338.63	3.00
Wind 135 deg - Service		4.23	4.26	272.46	-270.20	3.52
Wind 150 deg - Service		3.00	5.24	335.00	-191.47	3.99
Wind 180 deg - Service		-0.00	5.99	384.67	0.60	3.98
Wind 210 deg - Service		-3.01	5.25	335.47	192.54	3.01
Wind 225 deg - Service		-4.24	4.26	273.11	271.13	2.15
Wind 240 deg - Service		-5.37	3.12	197.53	339.36	1.21
Wind 270 deg - Service		-6.02	0.00	0.14	384.15	-0.98
Wind 300 deg - Service		-5.16	-2.99	-192.41	330.33	-2.82
Wind 315 deg - Service		-4.23	-4.26	-273.10	270.47	-3.52
Wind 330 deg - Service		-3.00	-5.24	-335.64	191.74	-3.99

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

Comb. No.	Description
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	100 - 80	Leg	Max Tension	10	11.95	0.11	-0.00
			Max. Compression	2	-14.53	0.10	0.01
			Max. Mx	10	2.81	0.89	-0.00
			Max. My	6	-0.55	-0.00	-0.91
			Max. Vy	2	-0.66	0.43	0.00
			Max. Vx	14	-0.67	-0.00	-0.42
		Diagonal	Max Tension	3	2.90	0.00	0.00
			Max. Compression	11	-2.87	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	29	1.49	0.01	-0.00
			Max. My	11	-2.85	0.00	-0.00
			Max. Vy	29	-0.01	0.01	-0.00
			Max. Vx	11	0.00	0.00	0.00
		Top Girt	Max Tension	2	0.40	0.00	0.00
			Max. Compression	10	-0.38	0.00	0.00
			Max. Mx	18	0.03	-0.02	0.00
			Max. My	19	-0.14	0.00	0.00
			Max. Vy	18	0.01	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00
T2	80 - 60	Leg	Max Tension	10	30.36	-0.05	-0.01
			Max. Compression	2	-33.95	0.02	0.03
			Max. Mx	19	-18.90	0.11	0.01
			Max. My	17	-1.58	0.00	0.12
			Max. Vy	24	0.04	0.11	-0.01
			Max. Vx	17	-0.05	-0.01	0.11
		Diagonal	Max Tension	3	2.63	0.00	0.00
			Max. Compression	3	-2.64	0.00	0.00
			Max. Mx	30	1.92	0.02	-0.00
			Max. My	11	-2.60	-0.00	-0.00
			Max. Vy	30	-0.01	0.02	-0.00
			Max. Vx	28	0.00	0.00	0.00
T3	60 - 40	Leg	Max Tension	10	45.09	0.07	-0.03
			Max. Compression	30	-50.28	-0.26	-0.01
			Max. Mx	30	-50.28	-0.26	-0.01
			Max. My	17	-2.14	-0.02	0.31
			Max. Vy	30	0.16	0.26	0.00
			Max. Vx	17	-0.15	-0.02	0.31
		Diagonal	Max Tension	20	3.00	0.00	0.00
			Max. Compression	3	-3.03	0.00	0.00
			Max. Mx	30	2.06	0.04	-0.00
			Max. My	27	-2.29	0.01	-0.01
			Max. Vy	30	-0.02	0.04	-0.00
			Max. Vx	27	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	30	0.87	0.00	0.00
			Max. Compression	30	-0.87	0.00	0.00
			Max. Mx	30	-0.20	-0.06	0.00
			Max. My	19	0.86	0.00	0.00
			Max. Vy	30	0.02	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00
T4	40 - 20	Leg	Max Tension	10	59.29	0.13	-0.02
			Max. Compression	30	-67.05	0.03	-0.00
			Max. Mx	30	-66.83	-0.41	-0.01
			Max. My	17	-2.83	-0.02	0.40
			Max. Vy	30	-0.25	0.37	0.00
			Max. Vx	17	0.20	-0.02	0.39
		Diagonal	Max Tension	20	3.27	0.00	0.00
			Max. Compression	19	-3.59	0.00	0.00
			Max. Mx	30	2.20	0.05	-0.00
			Max. My	19	-3.03	0.00	0.01
			Max. Vy	27	0.02	0.05	-0.00
			Max. Vx	19	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	30	1.16	0.00	0.00
			Max. Compression	30	-1.16	0.00	0.00
			Max. Mx	18	0.09	-0.08	0.00
			Max. My	19	1.15	0.00	0.00
			Max. Vy	18	-0.03	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00
T5	20 - 0	Leg	Max Tension	10	72.13	0.12	-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. Compression	30	-83.85	-0.00	0.00
			Max. Mx	32	61.75	0.56	0.01
			Max. My	17	-3.28	-0.03	0.50
			Max. Vy	27	-0.27	-0.32	0.01
			Max. Vx	17	-0.22	-0.03	0.50
		Diagonal	Max Tension	20	3.95	0.00	0.00
			Max. Compression	20	-3.78	0.00	0.00
			Max. Mx	33	1.85	0.07	-0.00
			Max. My	19	-3.75	0.04	0.01
			Max. Vy	33	0.03	0.07	-0.00
			Max. Vx	19	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	30	1.45	0.00	0.00
			Max. Compression	30	-1.45	0.00	0.00
			Max. Mx	18	0.11	-0.11	0.00
			Max. My	19	1.44	0.00	0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	85.96	7.97	-4.74
	Max. H_x	13	83.07	8.37	-4.97
	Max. H_z	21	-64.08	-7.59	4.90
	Min. Vert	5	-73.29	-7.55	4.50
	Min. H_x	22	-65.76	-7.92	4.69
	Min. H_z	12	78.78	7.65	-5.00
Leg B	Max. Vert	24	84.29	-8.12	-4.40
	Max. H_x	32	-67.20	8.09	4.44
	Max. H_z	33	-65.51	7.82	4.54
	Min. Vert	15	-73.77	7.75	4.15
	Min. H_x	7	82.28	-8.56	-4.59
	Min. H_z	7	82.28	-8.56	-4.59
Leg A	Max. Vert	19	85.16	-0.37	9.28
	Max. H_x	30	-33.77	1.14	-5.33
	Max. H_z	2	83.04	-0.43	9.76
	Min. Vert	10	-74.20	0.40	-8.84
	Min. H_x	5	42.32	-1.08	4.85
	Min. H_z	27	-67.24	0.30	-9.26

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	10.57	0.00	0.00	1.30	4.66	0.00
Dead+Wind 0 deg - No Ice	10.57	0.01	-15.97	-1012.31	3.51	-10.82
Dead+Wind 30 deg - No Ice	10.57	7.71	-13.43	-860.62	-489.20	-7.72
Dead+Wind 45 deg - No Ice	10.57	10.85	-10.91	-700.57	-690.92	-5.52
Dead+Wind 60 deg - No Ice	10.57	13.21	-7.68	-493.84	-844.07	-2.98

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 90 deg - No Ice	10.57	15.40	-0.01	0.12	-981.04	2.51
Dead+Wind 120 deg - No Ice	10.57	13.74	7.97	507.10	-864.87	7.71
Dead+Wind 135 deg - No Ice	10.57	10.83	10.90	701.50	-689.23	9.02
Dead+Wind 150 deg - No Ice	10.57	7.69	13.42	862.04	-487.13	10.22
Dead+Wind 180 deg - No Ice	10.57	-0.01	15.35	989.52	5.89	10.21
Dead+Wind 210 deg - No Ice	10.57	-7.71	13.43	863.21	498.57	7.72
Dead+Wind 225 deg - No Ice	10.57	-10.85	10.91	703.16	700.28	5.52
Dead+Wind 240 deg - No Ice	10.57	-13.75	7.99	509.14	875.42	3.11
Dead+Wind 270 deg - No Ice	10.57	-15.40	0.01	2.50	990.38	-2.51
Dead+Wind 300 deg - No Ice	10.57	-13.20	-7.66	-491.76	852.24	-7.23
Dead+Wind 315 deg - No Ice	10.57	-10.83	-10.90	-698.86	698.60	-9.02
Dead+Wind 330 deg - No Ice	10.57	-7.69	-13.42	-859.41	496.52	-10.22
Dead+Ice+Temp	18.46	0.00	0.00	3.11	11.44	-0.00
Dead+Wind 0 deg+Ice+Temp	18.46	0.01	-16.41	-1005.74	10.62	-9.12
Dead+Wind 30 deg+Ice+Temp	18.46	7.56	-13.15	-820.63	-461.24	-6.26
Dead+Wind 45 deg+Ice+Temp	18.46	10.55	-10.60	-662.87	-649.76	-4.53
Dead+Wind 60 deg+Ice+Temp	18.46	12.74	-7.39	-463.27	-789.66	-2.57
Dead+Wind 90 deg+Ice+Temp	18.46	15.11	-0.01	2.27	-932.50	1.67
Dead+Wind 120 deg+Ice+Temp	18.46	14.14	8.20	506.82	-855.99	6.24
Dead+Wind 135 deg+Ice+Temp	18.46	10.53	10.59	667.91	-648.57	6.84
Dead+Wind 150 deg+Ice+Temp	18.46	7.55	13.15	826.01	-459.79	7.93
Dead+Wind 180 deg+Ice+Temp	18.46	-0.01	14.78	934.40	12.29	7.89
Dead+Wind 210 deg+Ice+Temp	18.46	-7.56	13.15	826.83	484.14	6.26
Dead+Wind 225 deg+Ice+Temp	18.46	-10.55	10.60	669.07	672.64	4.53
Dead+Wind 240 deg+Ice+Temp	18.46	-14.15	8.21	508.25	879.71	2.88
Dead+Wind 270 deg+Ice+Temp	18.46	-15.11	0.01	3.95	955.37	-1.67
Dead+Wind 300 deg+Ice+Temp	18.46	-12.73	-7.38	-461.80	811.71	-5.31
Dead+Wind 315 deg+Ice+Temp	18.46	-10.53	-10.59	-661.67	671.47	-6.84
Dead+Wind 330 deg+Ice+Temp	18.46	-7.55	-13.15	-819.78	482.70	-7.93
Dead+Wind 0 deg - Service	10.57	0.00	-6.24	-394.64	4.21	-4.23
Dead+Wind 30 deg - Service	10.57	3.01	-5.25	-335.39	-188.25	-3.02
Dead+Wind 45 deg - Service	10.57	4.24	-4.26	-272.86	-267.05	-2.16
Dead+Wind 60 deg - Service	10.57	5.16	-3.00	-192.11	-326.88	-1.16
Dead+Wind 90 deg - Service	10.57	6.02	-0.00	0.84	-380.38	0.98
Dead+Wind 120 deg - Service	10.57	5.37	3.11	198.88	-335.00	3.01
Dead+Wind 135 deg - Service	10.57	4.23	4.26	274.82	-266.39	3.53
Dead+Wind 150 deg - Service	10.57	3.00	5.24	337.53	-187.45	3.99
Dead+Wind 180 deg - Service	10.57	-0.00	5.99	387.33	5.14	3.99
Dead+Wind 210 deg - Service	10.57	-3.01	5.25	337.99	197.60	3.02
Dead+Wind 225 deg - Service	10.57	-4.24	4.26	275.47	276.40	2.16
Dead+Wind 240 deg - Service	10.57	-5.37	3.12	199.68	344.81	1.21
Dead+Wind 270 deg - Service	10.57	-6.02	0.00	1.77	389.72	-0.98
Dead+Wind 300 deg - Service	10.57	-5.16	-2.99	-191.30	335.75	-2.82
Dead+Wind 315 deg - Service	10.57	-4.23	-4.26	-272.20	275.74	-3.52
Dead+Wind 330 deg - Service	10.57	-3.00	-5.24	-334.92	196.80	-3.99

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-10.57	0.00	0.00	10.57	0.00	0.000%
2	0.01	-10.57	-15.97	-0.01	10.57	15.97	0.000%
3	7.71	-10.57	-13.43	-7.71	10.57	13.43	0.000%
4	10.85	-10.57	-10.91	-10.85	10.57	10.91	0.000%
5	13.21	-10.57	-7.68	-13.21	10.57	7.68	0.000%
6	15.41	-10.57	-0.01	-15.40	10.57	0.01	0.000%
7	13.74	-10.57	7.97	-13.74	10.57	-7.97	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
8	10.83	-10.57	10.90	-10.83	10.57	-10.90	0.000%
9	7.69	-10.57	13.42	-7.69	10.57	-13.42	0.001%
10	-0.01	-10.57	15.35	0.01	10.57	-15.35	0.000%
11	-7.71	-10.57	13.43	7.71	10.57	-13.43	0.000%
12	-10.85	-10.57	10.91	10.85	10.57	-10.91	0.000%
13	-13.75	-10.57	7.99	13.75	10.57	-7.99	0.000%
14	-15.41	-10.57	0.01	15.40	10.57	-0.01	0.000%
15	-13.20	-10.57	-7.66	13.20	10.57	7.66	0.000%
16	-10.83	-10.57	-10.90	10.83	10.57	10.90	0.001%
17	-7.69	-10.57	-13.42	7.69	10.57	13.42	0.001%
18	0.00	-18.46	0.00	-0.00	18.46	0.00	0.000%
19	0.01	-18.46	-16.41	-0.01	18.46	16.41	0.000%
20	7.56	-18.46	-13.15	-7.56	18.46	13.15	0.000%
21	10.55	-18.46	-10.60	-10.55	18.46	10.60	0.000%
22	12.74	-18.46	-7.39	-12.74	18.46	7.39	0.000%
23	15.11	-18.46	-0.01	-15.11	18.46	0.01	0.000%
24	14.14	-18.46	8.20	-14.14	18.46	-8.20	0.000%
25	10.53	-18.46	10.59	-10.53	18.46	-10.59	0.000%
26	7.55	-18.46	13.15	-7.55	18.46	-13.15	0.000%
27	-0.01	-18.46	14.78	0.01	18.46	-14.78	0.000%
28	-7.56	-18.46	13.15	7.56	18.46	-13.15	0.000%
29	-10.55	-18.46	10.60	10.55	18.46	-10.60	0.000%
30	-14.15	-18.46	8.21	14.15	18.46	-8.21	0.000%
31	-15.11	-18.46	0.01	15.11	18.46	-0.01	0.000%
32	-12.73	-18.46	-7.38	12.73	18.46	7.38	0.000%
33	-10.53	-18.46	-10.59	10.53	18.46	10.59	0.000%
34	-7.55	-18.46	-13.15	7.55	18.46	13.15	0.000%
35	0.00	-10.57	-6.24	-0.00	10.57	6.24	0.000%
36	3.01	-10.57	-5.25	-3.01	10.57	5.25	0.000%
37	4.24	-10.57	-4.26	-4.24	10.57	4.26	0.001%
38	5.16	-10.57	-3.00	-5.16	10.57	3.00	0.000%
39	6.02	-10.57	-0.00	-6.02	10.57	0.00	0.000%
40	5.37	-10.57	3.11	-5.37	10.57	-3.11	0.000%
41	4.23	-10.57	4.26	-4.23	10.57	-4.26	0.000%
42	3.00	-10.57	5.24	-3.00	10.57	-5.24	0.000%
43	-0.00	-10.57	5.99	0.00	10.57	-5.99	0.000%
44	-3.01	-10.57	5.25	3.01	10.57	-5.25	0.000%
45	-4.24	-10.57	4.26	4.24	10.57	-4.26	0.000%
46	-5.37	-10.57	3.12	5.37	10.57	-3.12	0.000%
47	-6.02	-10.57	0.00	6.02	10.57	-0.00	0.000%
48	-5.16	-10.57	-2.99	5.16	10.57	2.99	0.000%
49	-4.23	-10.57	-4.26	4.23	10.57	4.26	0.000%
50	-3.00	-10.57	-5.24	3.00	10.57	5.24	0.000%

Non-Linear Convergence Results

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

9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000257
20	Yes	4	0.00000001	0.00000377
21	Yes	4	0.00000001	0.00000439
22	Yes	4	0.00000001	0.00000456
23	Yes	4	0.00000001	0.00000374
24	Yes	4	0.00000001	0.00000251
25	Yes	4	0.00000001	0.00000280
26	Yes	4	0.00000001	0.00000387
27	Yes	4	0.00000001	0.00000468
28	Yes	4	0.00000001	0.00000390
29	Yes	4	0.00000001	0.00000284
30	Yes	4	0.00000001	0.00000262
31	Yes	4	0.00000001	0.00000389
32	Yes	4	0.00000001	0.00000469
33	Yes	4	0.00000001	0.00000451
34	Yes	4	0.00000001	0.00000390
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	100 - 80	2.817	46	0.2311	0.0224
T2	80 - 60	1.850	46	0.2093	0.0192
T3	60 - 40	1.044	46	0.1584	0.0141
T4	40 - 20	0.467	46	0.1063	0.0098
T5	20 - 0	0.123	46	0.0466	0.0050

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.00	800-10121	46	2.817	0.2311	0.0224	107440
90.00	LPA-70063-6CF	46	2.322	0.2232	0.0210	53720

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	7.166	2	0.5880	0.0573
T2	80 - 60	4.706	2	0.5325	0.0492
T3	60 - 40	2.654	2	0.4025	0.0361
T4	40 - 20	1.188	2	0.2699	0.0251
T5	20 - 0	0.316	30	0.1183	0.0129

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.00	800-10121	2	7.166	0.5880	0.0573	42216
90.00	LPA-70063-6CF	2	5.908	0.5678	0.0538	21108

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	100	Leg	A325N	0.6250	4	2.99	13.50	0.221 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.90	4.12	0.704 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.5000	1	0.40	4.12	0.097 ✔	1.333	Bolt Shear
T2	80	Leg	A325N	0.6250	4	7.59	13.50	0.562 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.64	4.12	0.640 ✔	1.333	Bolt Shear
T3	60	Leg	A325N	0.7500	4	11.26	19.44	0.579 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.03	4.12	0.736 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.5000	1	0.87	4.12	0.211 ✔	1.333	Bolt Shear
T4	40	Leg	A325N	0.8750	4	14.81	26.46	0.560 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.59	4.12	0.870 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.5000	1	1.16	4.12	0.282 ✔	1.333	Bolt Shear
T5	20	Leg	A354-BC	0.8750	4	18.01	24.80	0.726 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.95	4.12	0.957 ✔	1.333	Bolt Shear

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
		Secondary Horizontal	A325N	0.5000	1	1.45	4.12	0.353 ✔	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	100 - 80	ROHN 2 STD	20.00	4.00	61.0 K=1.00	22.549	1.0745	-14.53	24.23	0.600 ✔
T2	80 - 60	ROHN 2.5 STD	20.03	5.01	63.4 K=1.00	22.122	1.7040	-33.95	37.70	0.901 ✔
T3	60 - 40	ROHN 2.5 X-STR	20.03	3.47	45.0 K=1.00	25.108	2.2535	-50.28	56.58	0.889 ✔
T4	40 - 20	ROHN 3 STD	20.03	3.44	35.5 K=1.00	26.449	2.2285	-67.05	58.94	1.138 ✔
T5	20 - 0	ROHN 3 X-STR	20.04	3.43	36.2 K=1.00	26.351	3.0159	-83.85	79.47	1.055 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	100 - 80	L1 1/2x1 1/2x3/16	7.67	3.61	147.6 K=1.00	6.854	0.5273	-2.87	3.61	0.793 ✔
T2	80 - 60	L1 3/4x1 3/4x3/16	9.70	4.74	165.7 K=1.00	5.442	0.6211	-2.64	3.38	0.780 ✔
T3	60 - 40	L2x2x1/4	12.24	6.18	189.6 K=1.00	4.153	0.9380	-3.03	3.90	0.779 ✔
T4	40 - 20	L2x2x1/4	13.96	7.01	215.0 K=1.00	3.231	0.9380	-3.59	3.03	1.183 ✔
T5	20 - 0	KL/R > 200 (C) - 101 L2 1/2x2 1/2x3/16	15.82	7.94	192.6 K=1.00	4.026	0.9020	-3.57	3.63	0.982 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	60 - 40	L2x2x3/16	10.25	10.01	194.7 K=1.00	3.941	0.7150	-0.87	2.82	0.309 ✔
T4	40 - 20	L2x2x3/16	12.26	11.97	232.7 K=1.00	2.757	0.7150	-1.16	1.97	0.590 ✔
T5	20 - 0	L2x2x3/16	14.34	14.05	273.3 K=1.00	2.000	0.7150	-1.45	1.43	1.017 ✔
		KL/R > 250 (C) - 133								

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	L1 3/4x1 3/4x3/16	6.52	6.09	212.9 K=1.00	3.295	0.6211	-0.38	2.05	0.186 ✔
		KL/R > 200 (C) - 4								

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	ROHN 2 STD	20.00	4.00	61.0	30.000	1.0745	11.95	32.24	0.371 ✔
T2	80 - 60	ROHN 2.5 STD	20.03	5.01	63.4	30.000	1.7040	30.36	51.12	0.594 ✔
T3	60 - 40	ROHN 2.5 X-STR	20.03	3.47	45.0	30.000	2.2535	45.09	67.61	0.667 ✔
T4	40 - 20	ROHN 3 STD	20.03	3.44	35.5	30.000	2.2285	59.29	66.85	0.887 ✔
T5	20 - 0	ROHN 3 X-STR	20.04	3.43	36.2	30.000	3.0159	72.13	90.48	0.797 ✔

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	100 - 80	L1 1/2x1 1/2x3/16	7.67	3.61	97.8	21.600	0.5273	2.90	11.39	0.255 ✔
T2	80 - 60	L1 3/4x1 3/4x3/16	9.70	4.74	108.5	21.600	0.6211	2.63	13.42	0.196

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	60 - 40	L2x2x1/4	12.24	6.18	121.7	21.600	0.9380	3.00	20.26	0.148 ✔
T4	40 - 20	L2x2x1/4	13.38	6.72	132.3	21.600	0.9380	3.27	20.26	0.162 ✔
T5	20 - 0	L2 1/2x2 1/2x3/16	15.82	7.94	122.5	21.600	0.9020	3.95	19.48	0.203 ✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	60 - 40	L2x2x3/16	10.25	10.01	194.7	21.600	0.7150	0.87	15.44	0.056 ✔
T4	40 - 20	L2x2x3/16	12.26	11.97	232.7	21.600	0.7150	1.16	15.44	0.075 ✔
T5	20 - 0	L2x2x3/16	14.34	14.05	273.3	21.600	0.7150	1.45	15.44	0.094 ✔

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	100 - 80	L1 3/4x1 3/4x3/16	6.52	6.09	141.3	21.600	0.6211	0.40	13.42	0.030 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	100 - 80	Leg	ROHN 2 STD	3	-14.53	32.30	45.0	Pass
T2	80 - 60	Leg	ROHN 2.5 STD	39	-33.95	50.25	67.6	Pass
T3	60 - 40	Leg	ROHN 2.5 X-STR	64	-50.28	75.42	66.7	Pass
T4	40 - 20	Leg	ROHN 3 STD	94	-67.05	78.57	85.3	Pass
T5	20 - 0	Leg	ROHN 3 X-STR	124	-83.85	105.94	79.1	Pass
T1	100 - 80	Diagonal	L1 1/2x1 1/2x3/16	18	-2.87	4.82	59.5	Pass
T2	80 - 60	Diagonal	L1 3/4x1 3/4x3/16	44	-2.64	4.51	58.5	Pass
T3	60 - 40	Diagonal	L2x2x1/4	71	-3.03	5.19	58.4	Pass
T4	40 - 20	Diagonal	L2x2x1/4	101	-3.59	4.04	88.8	Pass
T5	20 - 0	Diagonal	L2 1/2x2 1/2x3/16	131	-3.57	4.84	73.7	Pass
T3	60 - 40	Secondary Horizontal	L2x2x3/16	75	-0.87	3.76	23.2	Pass
T4	40 - 20	Secondary Horizontal	L2x2x3/16	103	-1.16	2.63	44.2	Pass
T5	20 - 0	Secondary Horizontal	L2x2x3/16	135	-1.45	1.91	76.3	Pass
T1	100 - 80	Top Girt	L1 3/4x1 3/4x3/16	4	-0.38	2.73	13.9	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
						Summary		
						Leg (T4)	85.3	Pass
						Diagonal (T4)	88.8	Pass
						Secondary Horizontal (T5)	76.3	Pass
						Top Girt (T1)	13.9	Pass
						Bolt Checks	71.8	Pass
						RATING =	**88.8**	**Pass**

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

Subject:	Foundation Analysis
Location:	Windsor Locks, CT
Rev. 0: 1/6/14	Prepared by: TJL. Checked by: C.F.C. Job No. 14001.009

Foundation Analysis:

Input Data:

Tower Data

Max Uplift Force =	Uplift := 74·kips	(User Input from tnxTower)	(Leg)
Max Shear Force =	Shear := 10·kips	(User Input from tnxTower)	(Leg)
Max Compressive Force =	Compression := 86·kips	(User Input from tnxTower)	(Leg)
Base Shear =	$Shear_{tot}$:= 16·kips	(User Input from tnxTower)	(Tower)
Base Compression =	$Comp_{tot}$:= 18·kips	(User Input from tnxTower)	(Tower)
Base Moment =	Moment := 1016·ft·kips	(User Input from tnxTower)	(Tower)
Tower Height =	H_t := 100·ft	(User Input)	

Footing Data:

Overall Depth of Footing =	D_f := 6.5ft	(User Input)	
Length of Pier =	L_p := 5.0ft	(User Input)	
Extension of Pier Above Grade =	L_{pag} := 1.0ft	(User Input)	
Diameter of Pier =	W_p := 1.5ft	(User Input)	
Thickness of Footing =	T_f := 2.5ft	(User Input)	
Width of Footing =	W_f := 8.5·ft	(User Input)	

Material Properties:

Internal Friction Angle of Soil =	Φ_s := 30·deg	(User Input)	
Allowable Soil Bearing Capacity =	q_s := 4000·psf	(User Input)	
Unit Weight of Soil =	γ_{soil} := 100·pcf	(User Input)	
Unit Weight of Concrete =	γ_{conc} := 150·pcf	(User Input)	
Foundation Bouyancy =	Bouyancy := 0	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	n := 0·ft	(User Input)	
Cohesion of Clay Type Soil =	c := 0·ksf	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)	

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Subject:	Foundation Analysis
Location:	Windsor Locks, CT
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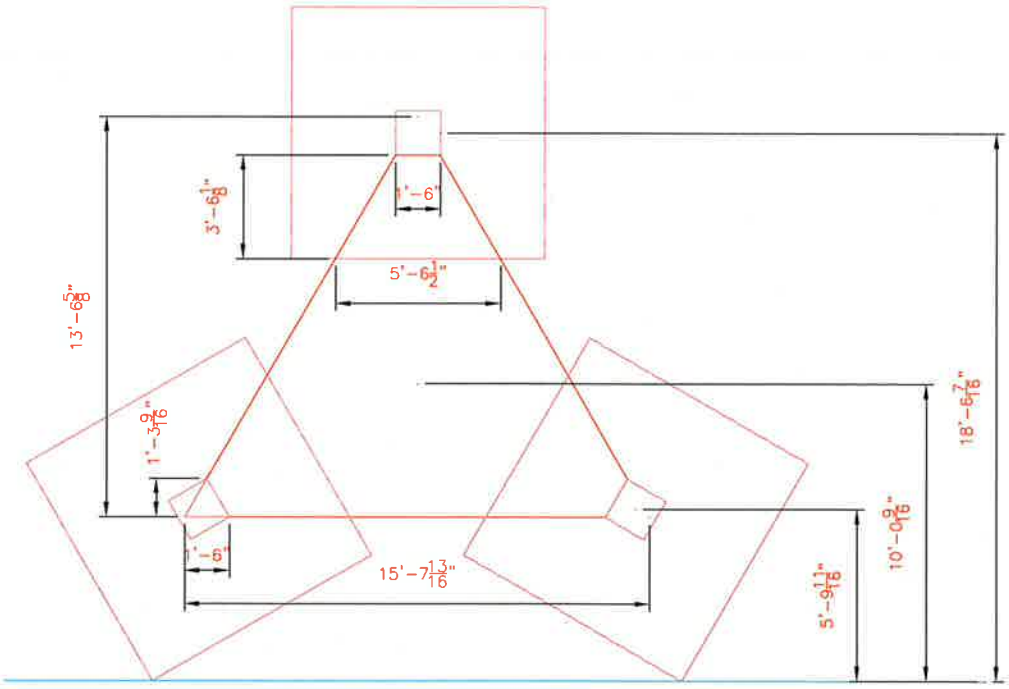
Concrete Mat Propperties:

Triangle One Width =	$T1_w := 15.65ft$	(User Input)
Triangle One Height =	$T1_h := 13.55ft$	(User Input)
Triangle Two Width =	$T2_w := 1.5ft$	(User Input)
Triangle Two Height =	$T2_h := 1.3ft$	(User Input)
Triangle Three Width =	$T3_w := 5.54ft$	(User Input)
Triangle Three Height =	$T3_h := 3.51ft$	(User Input)
Thickness of Mat =	$Mat_t := 4ft$	(User Input)

Distance To Centroids:

	$d_1 := 18.54ft$	(User Input)
	$d_2 := 10.05ft$	(User Input)
	$d_3 := 5.81ft$	(User Input)



Overturning Moment Check:

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

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 100 \cdot pcf$

Volume of Concrete Pad and Pier = $V_{pp} := \left[\left(W_f^2 \cdot T_f\right) + W_p^2 \cdot L_p\right] = 191.9 \cdot ft^3$

Total Volume of the Concrete Mat = $V_{mat.tot} := \frac{1}{2} \cdot \left[T1_w \cdot T1_h - \left(T2_w \cdot T2_h\right) \cdot 3\right] \cdot Mat_t = 412 \cdot ft^3$

Volume of Soil Above Footing = $V_{soilAF} := \left[W_f^2 - W_p^2 - \frac{\left(T3_w + W_p\right)}{2} \cdot T3_h\right] \cdot Mat_t = 231 \cdot ft^3$

Volume of Soil (Three Sides) = $V_{soilBF} := \frac{1}{2} \tan\left(\Phi_s\right) \cdot \left(L_p - L_{pag}\right)^2 \cdot W_f \cdot 3 = 117.779 \cdot ft^3$

Volume of Soil = $V_{soil} := V_{soilAF} + V_{soilBF}$

Weight of Soil = $WT_s := V_{soil} \cdot \gamma_s = 34.8 \cdot kip$

Weight of Concrete Mat = $WT_{mat.tot} := V_{mat.tot} \cdot \gamma_c = 61.9 \cdot kips$

Weight of Concrete Pad and Pier = $WT_{pp} := V_{pp} \cdot \gamma_c = 28.8 \cdot kips$

Resisting Moment = $M_r := \left(WT_{pp} + WT_s\right) \cdot d_1 + \left(WT_{pp} + WT_s\right) \cdot d_3 \cdot 2 + WT_{mat.tot} \cdot d_2 = 2540 ft \cdot kips$

Overturning Moment = $M_{ot} := Moment + Shear_{tot} \cdot \left(L_p + T_f\right) = 1136 \cdot kip \cdot ft$

Factor of Safety = $\frac{M_r}{M_{ot}} = 2.24$

$Overturning\_Moment := if\left(\frac{M_r}{M_{ot}} > 2, "OK", "NG"\right)$

Overturning_Moment = "OK"

Bearing Pressure Check:

Area of the Pad =

$$A_{pad} := W_f^{\,2} = 72.25\,ft^2$$

Weight of Soil Above Footing =

$$WT_{soil} := \left[\left[W_f^{\,2} - W_p^{\,2} - \frac{\left(T3_w + W_p\right)}{2}\cdot T3_h\right]\cdot\left(L_p - L_{pag} - n\right)\right]\cdot\gamma_s = 23.1\cdot kips$$

Cross Sectional Area of Mat =

$$A_{mat} := \frac{1}{2}\cdot\left[T1_w\cdot T1_h - \left(T2_w\cdot T2_h\right)\cdot 3 - \left(T3_w + W_p\right)\cdot T3_h\cdot 3\right] = 66\,ft^2$$

Cross Sectional Area of Base =

$$A := A_{pad}\cdot 3 + A_{mat} = 282.788\,ft^2$$

Section Modulus of Foundation =

$$S := \frac{A_{pad}\cdot d_1^{\,2} + A_{pad}\cdot d_3^{\,2}\cdot 2 + A_{mat}\cdot d_2^{\,2}}{d_2} = 3620.1\cdot ft^3$$

Total Weight =

$$P := \left(WT_{pp}\right)\cdot 3 + Comp_{tot} + WT_{mat.tot} = 166.2\cdot kips$$

Max Pressure =

$$q_{max} := \frac{P}{A} + \frac{M_{ot}}{S} = 0.9\cdot ksf$$

$$Max\_Pressure\_Check := if\left(q_{max} < q_s, "OK", "NG"\right)$$

Max_Pressure_Check = "OK"

Minimum Pressure in Mat =

$$P_{min} := \frac{P}{A} - \frac{M_{ot}}{S} = 0.274\cdot ksf$$

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

Min_Pressure_Check = "Okay"

SITE NAME	SUFFIELD S CT	ECP & CELL #	8	0252
Note: AWS Add (Root Metric Site)		LATITUDE	41-56-48.01 N	
		LONGITUDE	72-39-54.32 W	
		STRUCTURE TYPE	Lattice	

AWS - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	742213_2110_P45_02.0	742213_2110_P45_02.0	742213_2110_P45_02.0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL	1 x ALU RH_2X40-AWS	1 x ALU RH_2X40-AWS	1 x ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX	1 x DB-T1-6Z-8AB-0Z		

700 LTE - CURRENT CONFIG	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 eNodeB	700 eNodeB	700 eNodeB
ANTENNA TYPE	BXA-70063-6CF-6-750MHZ	BXA-70063-6CF-6-750MHZ	BXA-70063-6CF-6-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

700 Mhz - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 eNodeB	700 eNodeB	700 eNodeB
ANTENNA TYPE	BXA-70063-6CF-6-750MHZ	BXA-70063-6CF-6-750MHZ	BXA-70063-6CF-6-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL			

850 CELLULAR - CURRENT CONFIG	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B
ANTENNA TYPE	LPA-70063-6CF-EDIN-2	LPA-70063-6CF-EDIN-2	LPA-70063-6CF-EDIN-2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	2 x FD9R6004/2C-3L	2 x FD9R6004/2C-3L	2 x FD9R6004/2C-3L

850 CELLULAR - FUTURE CONFIG	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B
ANTENNA TYPE	LPA-70063-6CF-EDIN-2	LPA-70063-6CF-EDIN-2	LPA-70063-6CF-EDIN-2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	2 x FD9R6004/2C-3L	2 x FD9R6004/2C-3L	2 x FD9R6004/2C-3L
DIPLEX WITH LTE CABLE			

1900 PCS - CURRENT CONFIG	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	1	1	2
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	YES	YES	YES

1900 PCS - FUTURE CONFIG	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	290
DOWN TILT (MECH/DEG)	1	1	2
RAD CTR (FT AGL)	90.8	90.8	90.8
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	YES	YES	YES

NUMBER OF CABLES NEEDED						FIBER LINES MODEL NUMBER			
TOTAL # FIBER LINES	1	TOTAL # OF MAINLINES	12			FIBER LINE MODEL #		HB158-1-08U8-S8J18	
TOTAL # TOP JUMPERS	3	TOTAL # OF TOP JUMPERS	18			FIBER TOP JUMPER MODEL #		HB114-1-08U4-S4J18	
EQUIPMENT CABLE ORDERING		MAIN CABLE #	12	+	0	TOP JUMPER #	18	+	0

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

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

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

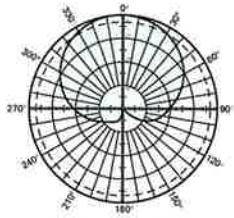
KATHREIN
SCALA DIVISION

742 213V01

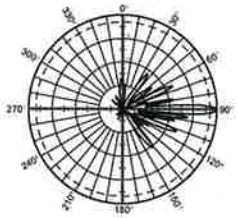
65° Panel Antenna

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

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



Horizontal pattern
±45°- polarization



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

General specifications:

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

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

RoHS Lead-Free

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

11271-B
936.3740/b

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

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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

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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

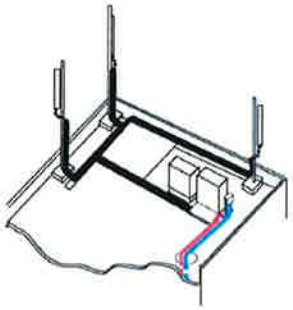
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

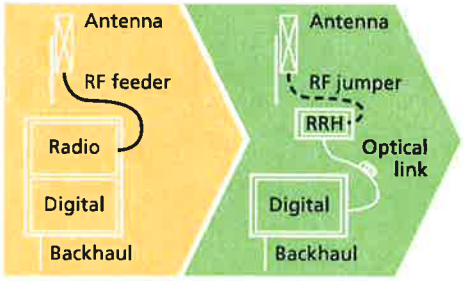
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

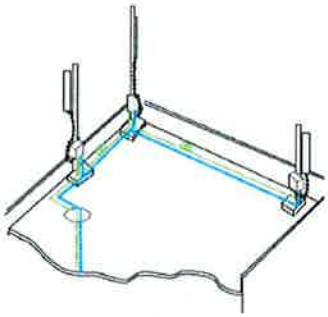
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

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Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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

Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.