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**
32 Valley Street, Bristol, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas on an existing lattice tower on the roof of the building at 32 Valley Street in Bristol, Connecticut (the "Property"). Nine (9) of Cellco's antennas are mounted at a centerline height of 100-feet above ground level and six (6) of Cellco's antennas are mounted at a centerline height of 110-feet above ground level. The tower, the building and underlying property are owned by The Carpenter Realty Company. The Council approved Cellco's use of the roof-top tower in 1992. Cellco now intends to modify its facility by replacing the six (6) existing antennas at the 110-foot level with three (3) model 742 213V01, 1900 MHz antennas and three (3) model 742 213V01, 2100 MHz antennas. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Kenneth B. Cockayne, Mayor of the City of Bristol.

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

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1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be located on Cellco's existing antenna mounting platform at the 110-foot level.

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 roof-top tower, with certain modifications, can support Cellco's proposed modifications. (*See* Structural Analysis Report and Reinforcement Design 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:
Kenneth B. Cockayne, Bristol Mayor
Sandy M. Carter

ATTACHMENT 1

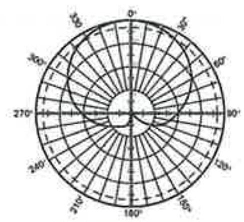
KATHREIN
SCALA DIVISION

742 213V01

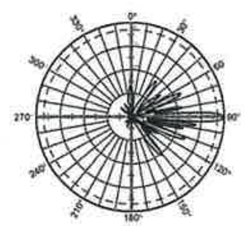
65° Panel Antenna

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

TÜV RoHS Lead-Free

11271-B
936.3740/b

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

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

KATHREIN SCALA DIVISION

742 213V01

65° Panel Antenna

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- Optional remote downtilt Control.
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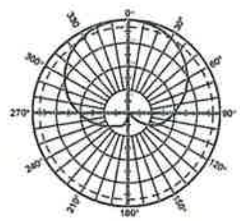
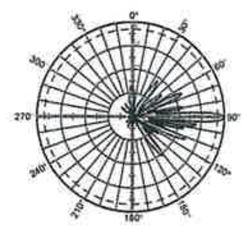


Horizontal pattern
±45°- polarization



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

RoHS Lead-Free

11271-B
936.3740/b

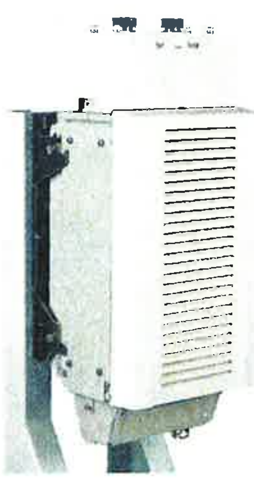
Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel·Lucent

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

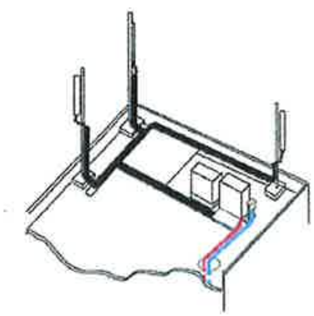
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

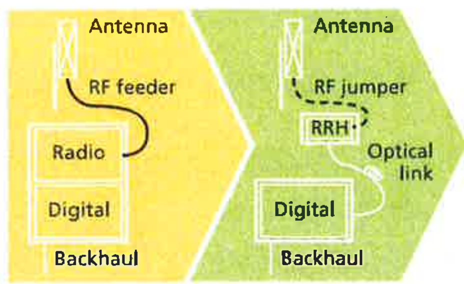
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

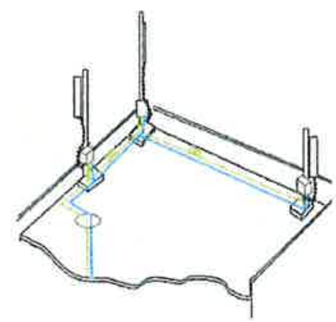
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

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.

Features/Benefits

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

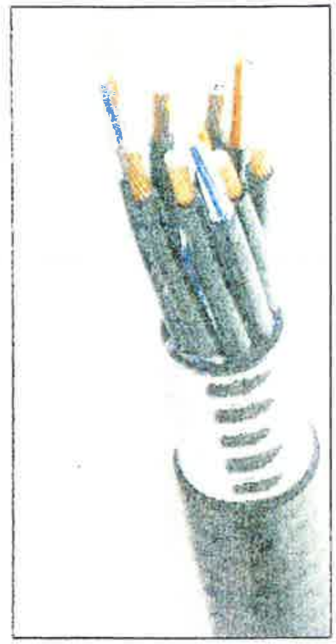


Figure 1: HYBRIFLEX Series

Technical Specifications

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

* This data is provisional and subject to change

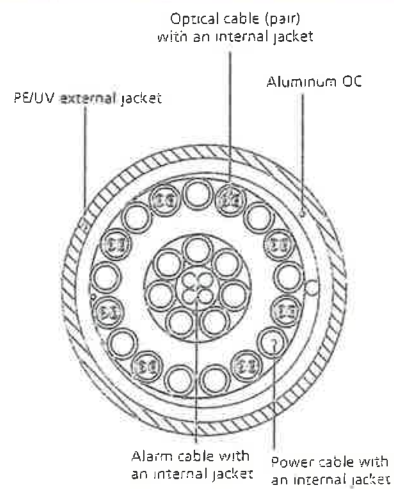


Figure 2: Construction Detail

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

ATTACHMENT 2

Far Field Approximation
with downtilt variation

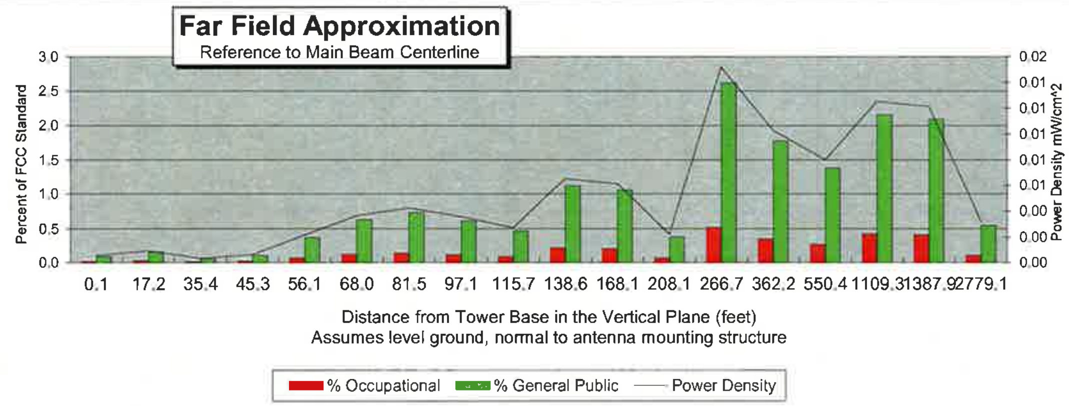
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

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

Operating Freq. (MHz)	869.0
Antenna Height (ft):	100.0
Antenna Gain (dBi):	14.7
Antenna Size (in.):	48.0
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	3795.0



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	97.0	98.5	103.2	107.1	112.0	118.5	126.7	137.2	151.0	169.2	194.1	229.6	283.7	375.0	558.9	1113.5	1391.3	2780.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	17.2	35.4	45.3	56.1	68.0	81.5	97.1	115.7	138.6	168.1	208.1	266.7	362.2	550.4	1109.3	1387.9	2779.1	
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	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.5	0.4	0.3	0.4	0.4	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.6	0.7	0.6	0.5	1.1	1.1	0.4	2.6	1.8	1.4	2.2	2.1	0.5	

Antenna Type LPA-80080-4CF
Max% 2.62%

Instructions:

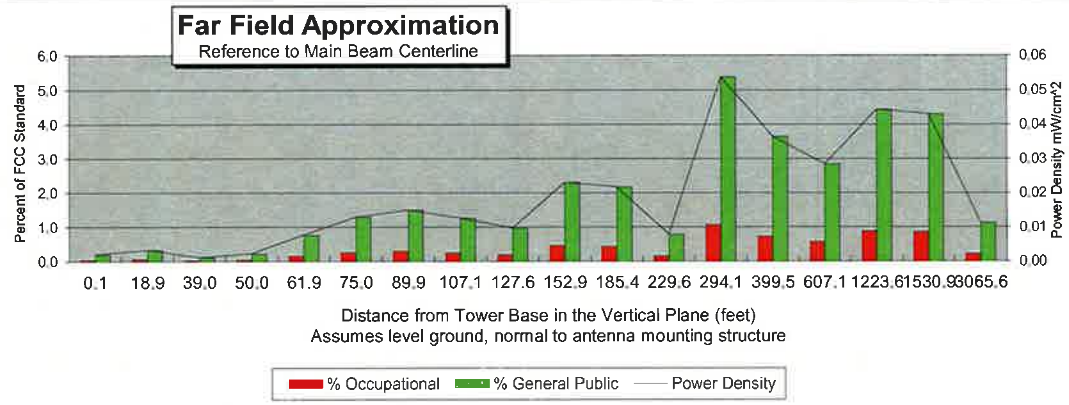
1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements 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:	Bristol, CT
Site #:	
Date:	03/19/14
Name:	Mark Brauer
File Name:	Bristol, CT - FF Power

Operating Freq. (MHz)	1970.0
Antenna Height (ft):	110.0
Antenna Gain (dBi):	19.7
Antenna Size (in.):	72.0
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	5173.0



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	107.0	108.7	113.9	118.1	123.6	130.7	139.7	151.4	166.5	186.6	214.1	253.3	313.0	413.6	616.5	1228.3	1534.7	3067.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.9	39.0	50.0	61.9	75.0	89.9	107.1	127.6	152.9	185.4	229.6	294.1	399.5	607.1	1223.6	1530.9	3065.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.05	0.04	0.03	0.04	0.04	0.01	
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.4	0.2	1.1	0.7	0.6	0.9	0.9	0.2	
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.8	1.3	1.5	1.3	1.0	2.3	2.2	0.8	5.4	3.6	2.8	4.4	4.3	1.1	

Antenna Type 742213
Max% 5.38%

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 Po
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

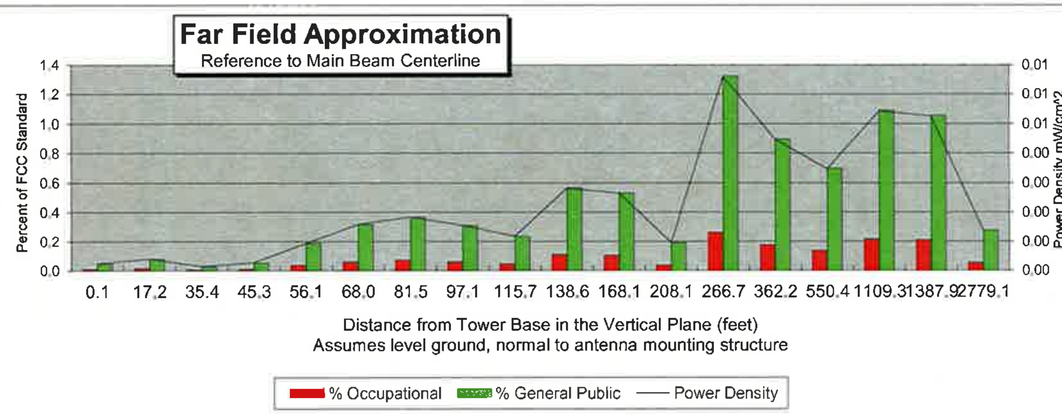
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

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

Operating Freq. (MHz)	746.0
Antenna Height (ft):	100.0
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	97.0	98.5	103.2	107.1	112.0	118.5	126.7	137.2	151.0	169.2	194.1	229.6	283.7	375.0	558.9	1113.5	1391.3	2780.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	17.2	35.4	45.3	56.1	68.0	81.5	97.1	115.7	138.6	168.1	208.1	266.7	362.2	550.4	1109.3	1387.9	2779.1	
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	0.00	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	0.0	0.1	0.1	0.0	0.3	0.2	0.1	0.2	0.2	0.1	
Percent of General Population Standard	0.0	0.1	0.0	0.1	0.2	0.3	0.4	0.3	0.2	0.6	0.5	0.2	1.3	0.9	0.7	1.1	1.1	0.3	

Antenna Type BXA-70063-6CF
Max% 1.32%

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 Po
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

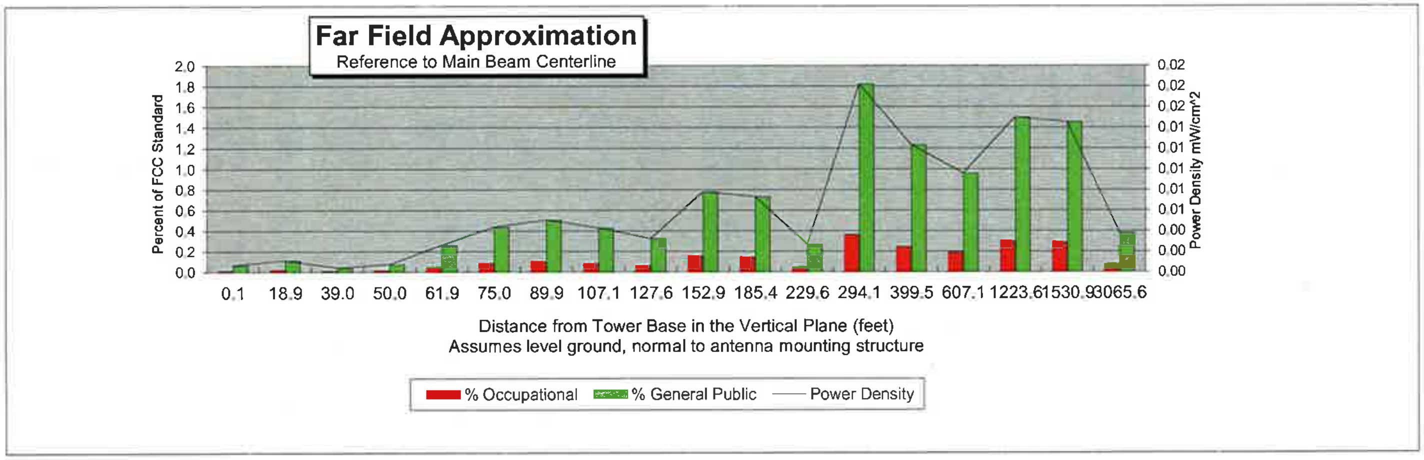
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

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

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**110.0**
Antenna Gain (dBi):	**19.7**
Antenna Size (in.):	**72.0**
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	107.0	108.7	113.9	118.1	123.6	130.7	139.7	151.4	166.5	186.6	214.1	253.3	313.0	413.6	616.5	1228.3	1534.7	3067.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.9	39.0	50.0	61.9	75.0	89.9	107.1	127.6	152.9	185.4	229.6	294.1	399.5	607.1	1223.6	1530.9	3065.6	
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	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.4	0.2	0.2	0.3	0.3	0.1	
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.4	0.5	0.4	0.3	0.8	0.7	0.3	1.8	1.2	1.0	1.5	1.5	0.4	

Antenna Type 742213
Max% 1.82%

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 Po
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

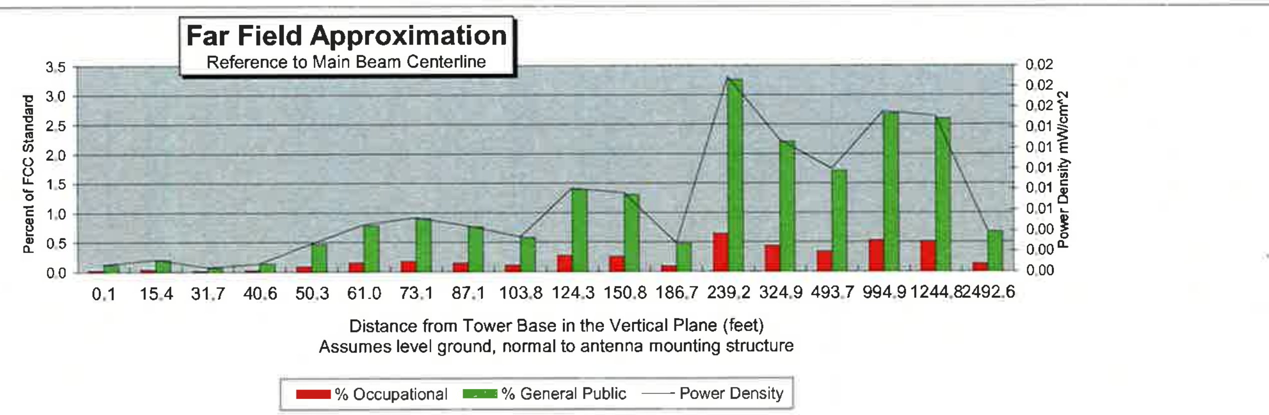
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bristol, CT
Site #:	
Date:	03/18/14
Name:	Mark Brauer
File Name:	Bristol, CT - FF Power

Operating Freq. (MHz)	869.0
Antenna Height (ft):	90.0
Antenna Gain (dBi):	14.7
Antenna Size (in.):	48.0
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	3795.0



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	87.0	88.4	92.6	96.0	100.5	106.2	113.6	123.1	135.4	151.7	174.1	206.0	254.5	336.3	501.3	998.7	1247.8	2494.1	
Distance from Antenna Structure Base in Horizontal plane	0.1	15.4	31.7	40.6	50.3	61.0	73.1	87.1	103.8	124.3	150.8	186.7	239.2	324.9	493.7	994.9	1244.8	2492.6	
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	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.7	0.4	0.3	0.5	0.5	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.5	0.8	0.9	0.8	0.6	1.4	1.3	0.5	3.3	2.2	1.7	2.7	2.6	0.7	

Antenna Type LPA-80080-4CF
Max% 3.26%

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

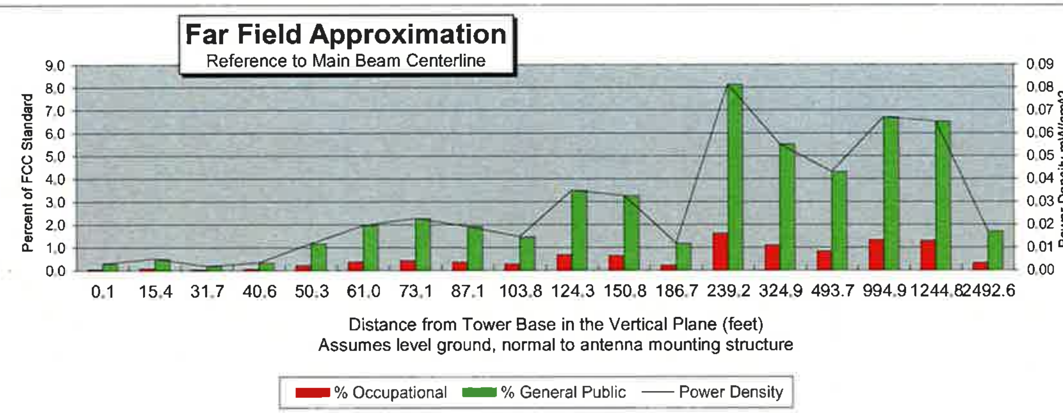
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bristol, CT
Site #:	
Date:	03/18/14
Name:	Mark Brauer
File Name:	Bristol, CT - FF Power

Operating Freq. (MHz)	1970.0
Antenna Height (ft):	90.0
Antenna Gain (dBi):	19.7
Antenna Size (in.):	72.0
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	5173.0



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	87.0	88.4	92.6	96.0	100.5	106.2	113.6	123.1	135.4	151.7	174.1	206.0	254.5	336.3	501.3	998.7	1247.8	2494.1
Distance from Antenna Structure Base in Horizontal plane	0.1	15.4	31.7	40.6	50.3	61.0	73.1	87.1	103.8	124.3	150.8	186.7	239.2	324.9	493.7	994.9	1244.8	2492.6
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	0.02	0.01	0.03	0.03	0.01	0.08	0.06	0.04	0.07	0.06	0.02
Percent of Occupational Standard	0.1	0.1	0.0	0.1	0.2	0.4	0.5	0.4	0.3	0.7	0.7	0.2	1.6	1.1	0.9	1.3	1.3	0.3
Percent of General Population Standard	0.3	0.5	0.2	0.3	1.2	2.0	2.3	1.9	1.5	3.5	3.3	1.2	8.1	5.5	4.3	6.7	6.5	1.7

Antenna Type 742213
Max% 8.14%

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 Po
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

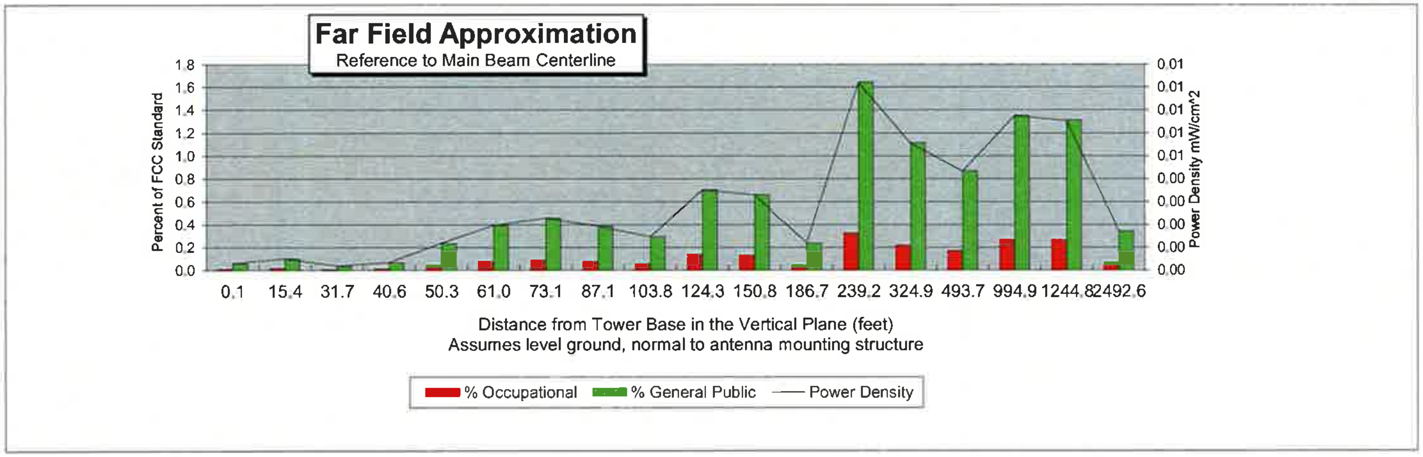
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bristol, CT
Site #:	
Date:	03/18/14
Name:	Mark Brauer
File Name:	Bristol, CT - FF Power

Operating Freq. (MHz)	746.0
Antenna Height (ft):	90.0
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	87.0	88.4	92.6	96.0	100.5	106.2	113.6	123.1	135.4	151.7	174.1	206.0	254.5	336.3	501.3	998.7	1247.8	2494.1
Distance from Antenna Structure Base in Horizontal plane	0.1	15.4	31.7	40.6	50.3	61.0	73.1	87.1	103.8	124.3	150.8	186.7	239.2	324.9	493.7	994.9	1244.8	2492.6
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	0.5	0.4	0.3	0.7	0.7	0.2	1.6	1.1	0.9	1.4	1.3	0.3

Antenna Type BXA-70063-6CF
Max% 1.65%

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 Po
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

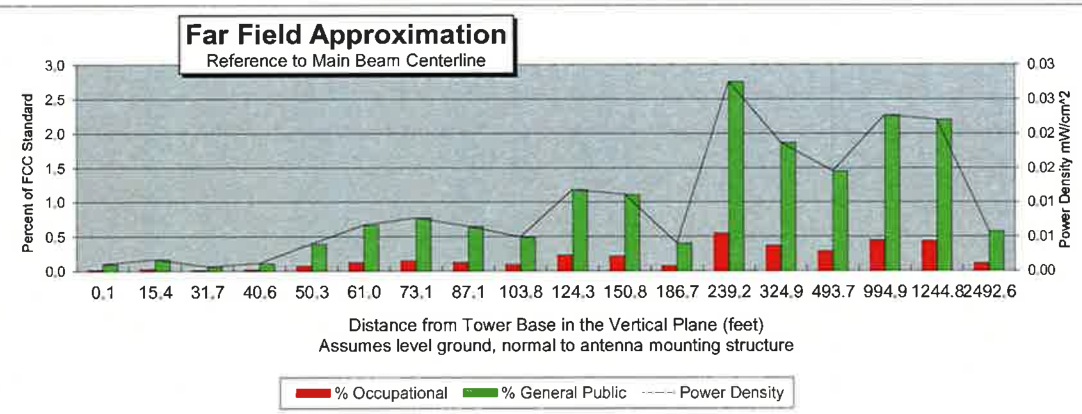
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bristol, CT
Site #:	
Date:	03/18/14
Name:	Mark Brauer
File Name:	Bristol, CT - FF Power

Operating Freq. (MHz)	2145.0
Antenna Height (ft):	90.0
Antenna Gain (dBi):	19.7
Antenna Size (in.):	72.0
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	87.0	88.4	92.6	96.0	100.5	106.2	113.6	123.1	135.4	151.7	174.1	206.0	254.5	336.3	501.3	998.7	1247.8	2494.1	
Distance from Antenna Structure Base in Horizontal plane	0.1	15.4	31.7	40.6	50.3	61.0	73.1	87.1	103.8	124.3	150.8	186.7	239.2	324.9	493.7	994.9	1244.8	2492.6	
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	0.0	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	0.4	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.7	0.8	0.6	0.5	1.2	1.1	0.4	2.8	1.9	1.5	2.3	2.2	0.6	

Antenna Type 742213
Max% 2.75%

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 Po
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 and Reinforcement Design

40-ft Existing Rohn Lattice Tower

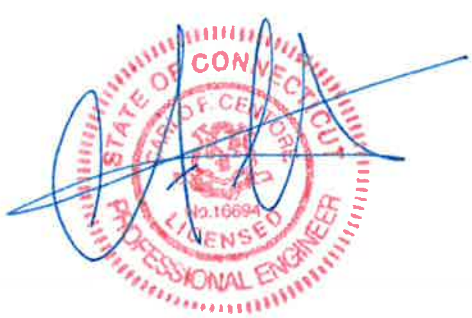
Proposed Verizon Wireless Antenna Upgrade

Verizon Site Ref: Bristol

32 Valley Street
Bristol, CT

Centek Project No. 14001.002

Date: January 3, 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 Bristol, CT.

The host tower is a 40-ft, three-section, three legged, self-supporting lattice tower originally designed and manufactured by Rohn Industries, attached to a structural steel platform located on the roof of the host building. The tower geometry, structure member sizes, anchor bolt properties and reinforcement information were obtained from a previous structural analysis report prepared by Centek Engineering. job no. 12001.CO41 dated June 7, 2012. The platform geometry and structure member sizes were obtained from the platform modification drawings prepared by L&W Engineering drawing no. S-1 thru S-3 dated January 28, 1992 and construction drawings prepared by Centek Engineering dated January 19, 2004.

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

The tower is made up of three (3) vertical sections consisting of ASTM A572-50 steel pipe legs and ASTM A36 steel angle diagonal and horizontal bracing. The vertical tower sections are connected by bolted flange plates with the diagonal and horizontal bracing to pipe legs consisting of bolted connections. The width of the tower face is 8.56-ft.

Verizon proposes the removal of six (6) existing leg mounted panel antennas and the installation of six (6) panel antennas, three (3) sector distribution boxes and one (1) main distribution box mounted on three (3) proposed mounts. 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:

- VERIZON (Existing to Remain):
  Antennas: Three (3) Antel BXA-70063-6CF, four (4) Antel LPA-80080-4CF, two (2) Antel LPA-80063-4CF, and three (3) 4-ft panel antennas on three (3) 13' wireless frames with a RAD center elevation of 100-ft above grade level (27.5-ft ATB).
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables (face mounted). Refer to Coax Feedline Plan in Section 3 of this report for configuration.

- VERIZON (Existing to Remove):
  Antennas: Six (6) Antel LPA-171063-8CF panel antennas leg mounted with a RAD center elevation of 110-ft above grade level (37.5-ft ATB).

- **VERIZON (Proposed):**
  Antennas: Six (6) Kathrein 742-213 panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on three (3) proposed Site Pro WiMax Compact Tower Mounts p/n CWT8 with a RAD center elevation of 110-ft above grade level (37.5-ft ATB).
  Coax Cables: One (1) 1-5/8" ∅ 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]*
	Bristol; 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 wind speed controls.	
Load Cases:	<u>Load Case 1</u>; 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]*
	<u>Load Case 2</u>; 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]*
	<u>Load Case 3</u>; 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 **with the proposed tower reinforcements outlined in Section 4 of this report** were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **111.1%** (Diagonal T2) of its total capacity without reinforcement and **60.6%** (Diagonal T3 bolts) with the proposed reinforcements.

Component / Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T3)	0.0'-20.0' (72.5'-92.5' AGL)	50.0%	**PASS**
Diagonal (T3)	0.0'-20.0' (72.5'-92.5' AGL)	60.6%	**PASS**
Top Girt (T3)	0.0'-20.0' (72.5'-92.5' AGL)	22.1%	**PASS**

Steel Support Frame and Anchors

The existing steel support frame consists of W12 horizontal beams and W8 vertical columns attached to the existing host building. Tower legs are connected to the steel support frame W beam flanges by means of four (4) 5/8"∅, ASTM A325 bolts per leg.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	7 kips
	Compression	4 kips
	Moment	191 kip-ft
Leg	Compression	23 kips
	Uplift	27 kips
	Shear	4 kips

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	28.8%	**PASS**

- The steel support frame was found to be within allowable limits.

Component	Design Limit	Stress Ratio (percentage of capacity)	Result
W12 Beam	Bending	93.9%	**PASS**
W8 Column	Bending	30.4%	**PASS**

Conclusion

This analysis shows that with the implementation of the reinforcements outlined in drawings T-1, N-1, N-2 and S-1, marked Revision #0, dated 1/3/14 located within Section 4 of this report, the subject tower **is adequate** to support the proposed modified Verizon 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

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:

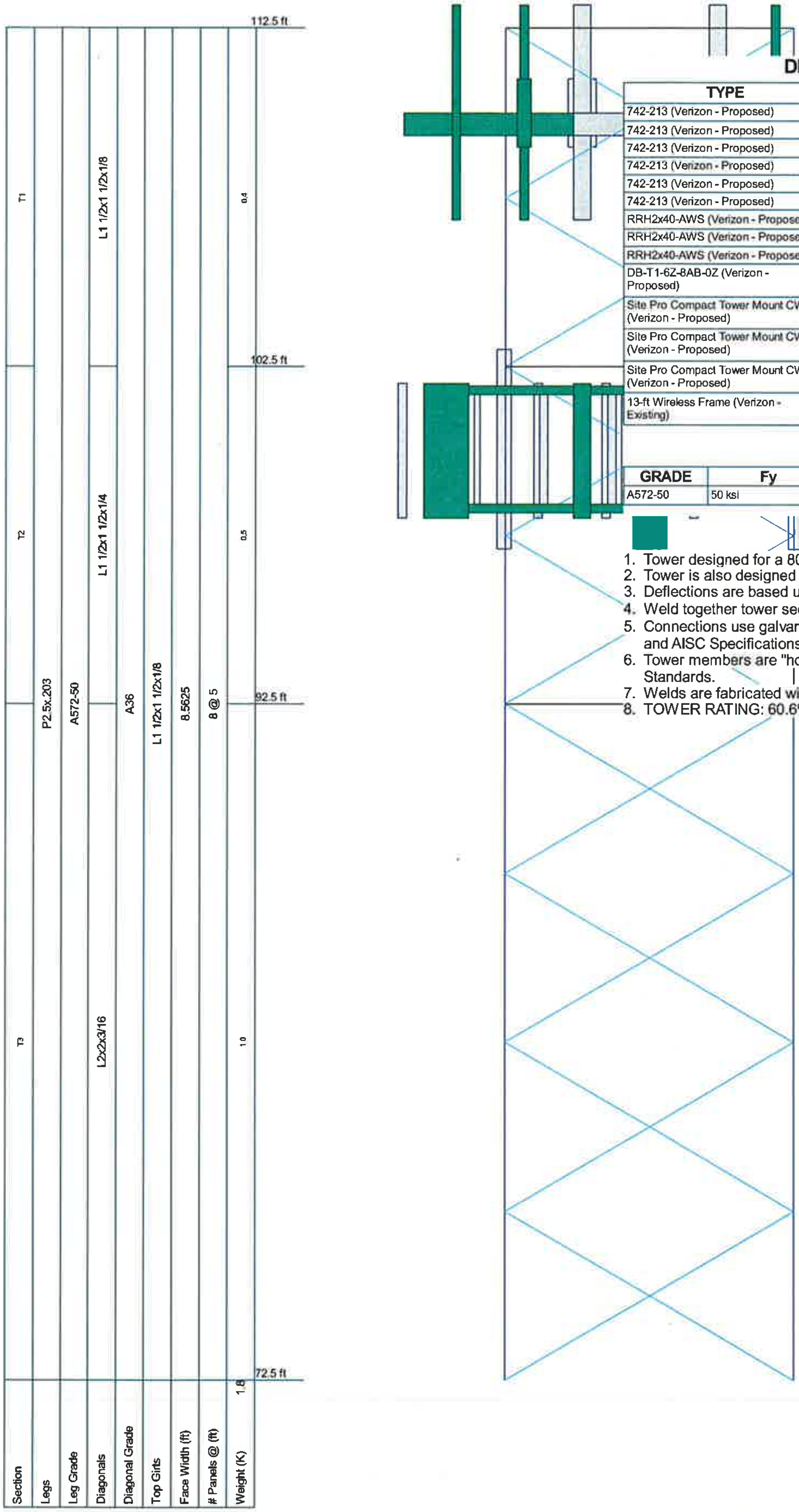
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or 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
742-213 (Verizon - Proposed)	110	13-ft Wireless Frame (Verizon - Existing)	100
742-213 (Verizon - Proposed)	110	LPA-80080/4CF (Verizon - Existing)	100
742-213 (Verizon - Proposed)	110	48"x6"x8" Panel (Verizon - Existing)	100
742-213 (Verizon - Proposed)	110	BXA-70063/6CF (Verizon - Existing)	100
742-213 (Verizon - Proposed)	110	LPA-80080-4CF (Verizon - Existing)	100
742-213 (Verizon - Proposed)	110	LPA-80080/4CF (Verizon - Existing)	100
RRH2x40-AWS (Verizon - Proposed)	110	48"x6"x8" Panel (Verizon - Existing)	100
RRH2x40-AWS (Verizon - Proposed)	110	BXA-70063/6CF (Verizon - Existing)	100
RRH2x40-AWS (Verizon - Proposed)	110	LPA-80080-4CF (Verizon - Existing)	100
DB-T1-6Z-8AB-0Z (Verizon - Proposed)	110	LPA-80063/4CF (Verizon - Existing)	100
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	110	48"x6"x8" Panel (Verizon - Existing)	100
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	110	BXA-70063/6CF (Verizon - Existing)	100
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	110	LPA-80063-4CF (Verizon - Existing)	100
13-ft Wireless Frame (Verizon - Existing)	100	13-ft Wireless Frame (Verizon - Existing)	100

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: 60.6%

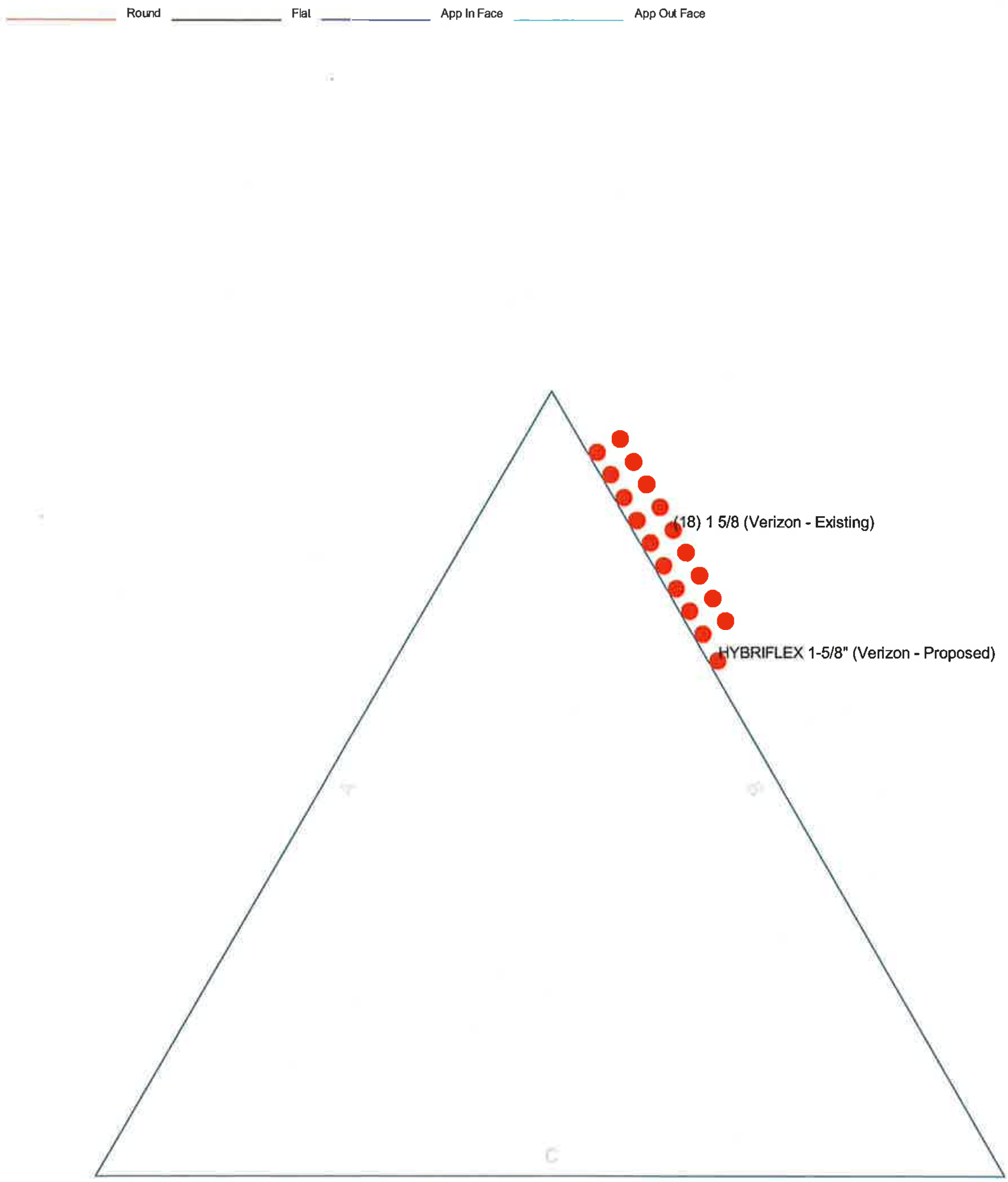
MAX. CORNER REACTIONS AT BASE:
DOWN: 27 K
UPLIFT: -23 K
SHEAR: 4 K

AXIAL 7 K
SHEAR 7 K
MOMENT 184 kip-ft
TORQUE 3 kip-ft
69 mph WIND - 0.5000 in ICE

AXIAL 4 K
SHEAR 7 K
MOMENT 191 kip-ft
TORQUE 3 kip-ft
REACTIONS - 80 mph WIND

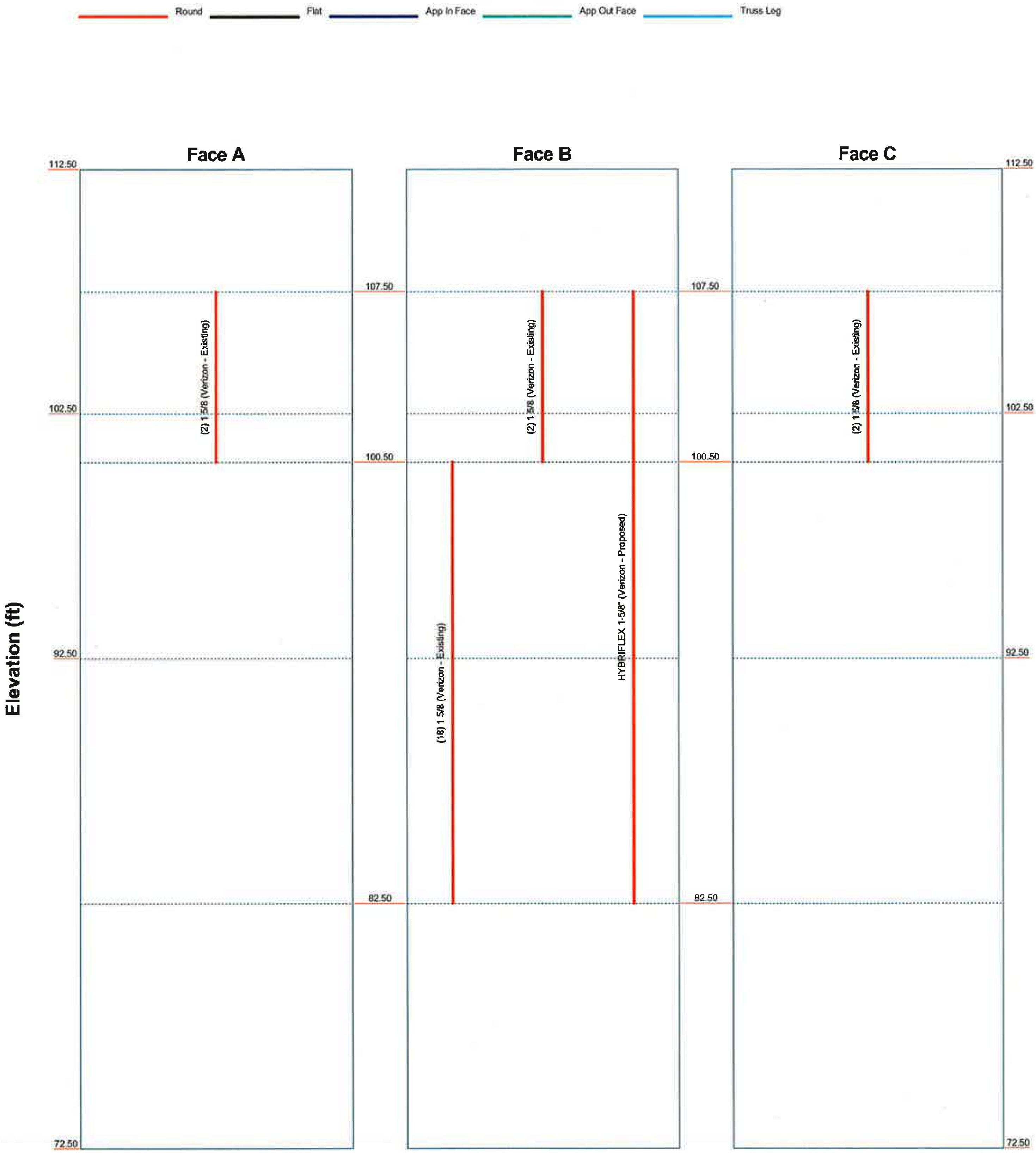
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **14001.002 - Bristol**		
	Project: **40' Lattice Tower - 32 Valley St. Bristol, CT**		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 01/03/14	Scale: NTS
	Path:		Dwg No. E-1

Feedline Plan



Centek Engineering Inc.	Job: ***14001.002 - Bristol***		
63-2 North Branford Rd.	Project: ***40' Lattice Tower - 32 Valley St. Bristol, CT***		
Branford, CT 06405	Client: Verizon Wireless	Drawn by: TJL	App'd:
Phone: (203) 488-0580	Code: TIA/EIA-222-F	Date: 01/03/14	Scale: NTS
FAX: (203) 488-8587	Path:		Dwg No. E-7

Feedline Distribution Chart
72'6" - 112'6"



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***14001.002 - Bristol***		
	Project: ***40' Lattice Tower - 32 Valley St. Bristol, CT***		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 01/03/14	Scale: NTS
	Path:		Dwg No. E-7

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 112.50 ft above the ground line.
The base of the tower is set at an elevation of 72.50 ft above the ground line.
The face width of the tower is 8.56 ft at the top and 8.56 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

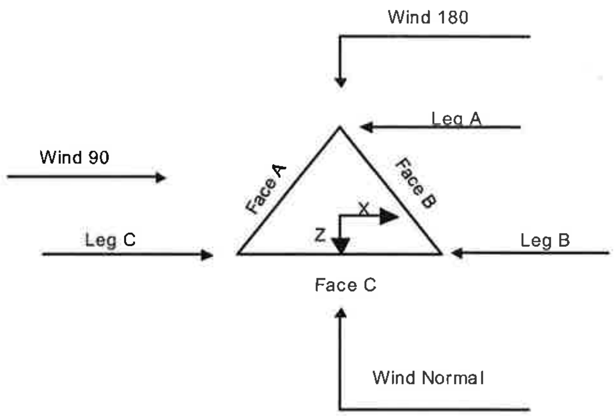
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
Add IBC .6D+W Combination

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
√ Retension Guys To Initial Tension
Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
√ Autocalc Torque Arm Areas
SR Members Have Cut Ends
√ Sort Capacity Reports By Component
√ Triangulate Diamond Inner Bracing

Treat Feedline Bundles As Cylinder
Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feedline Torque
Include Angle Block Shear Check

Poles

Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation* (ft)	*Assembly Database*	*Description*	*Section Width* (ft)	*Number of Sections*	*Section Length* (ft)
T1	112.50-102.50			8.56	1	10.00
T2	102.50-92.50			8.56	1	10.00
T3	92.50-72.50			8.56	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	112.50-102.50	5.00	X Brace	No	Yes	0.0000	0.0000
T2	102.50-92.50	5.00	X Brace	No	Yes	0.0000	0.0000
T3	92.50-72.50	5.00	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 112.50-102.50	Pipe	P2.5x.203	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T2 102.50-92.50	Pipe	P2.5x.203	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/4	A36 (36 ksi)
T3 92.50-72.50	Pipe	P2.5x.203	A572-50 (50 ksi)	Single Angle	L2x2x3/16	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 112.50-102.50	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 102.50-92.50	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 92.50-72.50	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)	Solid Round		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*
T1 112.50-102.50	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T2 102.50-92.50	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T3 92.50-72.50	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	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 112.50-102.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 102.50-92.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 92.50-72.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*K Factors[1]* *Legs*	*X Brace Diags* *X* *Y*	*K Brace Diags* *X* *Y*	*Single Diags* *X* *Y*	*Girts* *X* *Y*	*Horiz.* *X* *Y*	*Sec. Horiz.* *X* *Y*	*Inner Brace* *X* *Y*
T1 112.50-102.50	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 102.50-92.50	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 92.50-72.50	Yes	Yes	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 112.50-102.50	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 102.50-92.50	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 92.50-72.50	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Leg Connection Type*	*Leg* *Bolt Size* *in*	*Leg* *No.*	*Diagonal* *Bolt Size* *in*	*Diagonal* *No.*	*Top Girt* *Bolt Size* *in*	*Top Girt* *No.*	*Bottom Girt* *Bolt Size* *in*	*Bottom Girt* *No.*	*Mid Girt* *Bolt Size* *in*	*Mid Girt* *No.*	*Long Horizontal* *Bolt Size* *in*	*Long Horizontal* *No.*	*Short Horizontal* *Bolt Size* *in*	*Short Horizontal* *No.*
T1 112.50-102.50	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.3750 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T2 102.50-92.50	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.3750 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T3 92.50-72.50	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.3750 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (Verizon - Existing)	B	Yes	Ar (CfAe)	100.50 - 82.50	0.0000	-0.3	18	9	1.0000	1.9800		1.04
1 5/8 (Verizon - Existing)	A	No	Ar (Leg)	107.50 - 100.50	0.0000	0	2	1	1.9800	1.9800		1.04
1 5/8 (Verizon - Existing)	B	No	Ar (Leg)	107.50 - 100.50	0.0000	0	2	1	1.9800	1.9800		1.04
1 5/8 (Verizon - Existing)	C	No	Ar (Leg)	107.50 - 100.50	0.0000	0	2	1	1.9800	1.9800		1.04
HYBRIFLEX 1-5/8" (Verizon - Proposed)	B	Yes	Ar (CfAe)	107.50 - 82.50	0.0000	-0.15	1	1	1.9800	1.9800		1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	112.50-102.50	A	1.650	0.000	0.000	0.000	0.01
		B	2.475	0.000	0.000	0.000	0.02
		C	1.650	0.000	0.000	0.000	0.01
T2	102.50-92.50	A	0.660	0.000	0.000	0.000	0.00
		B	14.190	0.000	0.000	0.000	0.17
		C	0.660	0.000	0.000	0.000	0.00
T3	92.50-72.50	A	0.000	0.000	0.000	0.000	0.00
		B	16.500	0.000	0.000	0.000	0.21
		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 ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	112.50-102.50	A	0.500	2.483	0.000	0.000	0.000	0.03
		B		3.725	0.000	0.000	0.000	0.04
		C		2.483	0.000	0.000	0.000	0.03
T2	102.50-92.50	A	0.500	0.993	0.000	0.000	0.000	0.01
		B		5.463	15.893	0.000	0.000	0.51
		C		0.993	0.000	0.000	0.000	0.01
T3	92.50-72.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		4.967	19.867	0.000	0.000	0.61
		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	112.50-102.50	A	0.000	0.000	0.000	0.000
		B	0.000	0.058	0.058	0.087
		C	0.000	0.000	0.000	0.000
T2	102.50-92.50	A	0.000	0.000	0.000	0.000
		B	0.000	0.956	0.953	1.434
		C	0.000	0.000	0.000	0.000
T3	92.50-72.50	A	0.000	0.000	0.000	0.000
		B	0.000	1.062	1.377	2.072
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	112.50-102.50	0.3835	-0.5838	0.3608	-0.5492
T2	102.50-92.50	3.5710	-11.1001	3.0545	-9.3762
T3	92.50-72.50	2.3095	-7.3111	2.0460	-6.4075

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
LPA-80080/4CF (Verizon - Existing)	A	From Face	2.50 6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.62 2.92	6.06 6.45	0.01 0.05
48"x6"x8" Panel (Verizon - Existing)	A	From Face	2.50 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.03 0.06
BXA-70063/6CF (Verizon - Existing)	A	From Face	2.50 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-80080-4CF (Verizon - Existing)	A	From Face	2.50 -6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.62 2.92	6.06 6.45	0.01 0.05
LPA-80080/4CF (Verizon - Existing)	B	From Face	2.50 6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.62 2.92	6.06 6.45	0.01 0.05
48"x6"x8" Panel (Verizon - Existing)	B	From Face	2.50 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.03 0.06
BXA-70063/6CF (Verizon - Existing)	B	From Face	2.50 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-80080-4CF (Verizon - Existing)	B	From Face	2.50 -6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.62 2.92	6.06 6.45	0.01 0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
LPA-80063/4CF (Verizon - Existing)	C	From Face	2.50 6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
48"x6"x8" Panel (Verizon - Existing)	C	From Face	2.50 2.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.03 0.06
BXA-70063/6CF (Verizon - Existing)	C	From Face	2.50 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-80063-4CF (Verizon - Existing)	C	From Face	2.50 -6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.00 7.41	6.04 6.43	0.02 0.07
13-ft Wireless Frame (Verizon - Existing)	A	From Face	0.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	9.00 11.50	9.00 11.50	0.28 0.35
13-ft Wireless Frame (Verizon - Existing)	B	From Face	0.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	9.00 11.50	9.00 11.50	0.28 0.35
13-ft Wireless Frame (Verizon - Existing)	C	From Face	0.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	9.00 11.50	9.00 11.50	0.28 0.35
742-213 (Verizon - Proposed)	A	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
742-213 (Verizon - Proposed)	A	From Leg	0.50 2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
742-213 (Verizon - Proposed)	B	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
742-213 (Verizon - Proposed)	B	From Leg	0.50 2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
742-213 (Verizon - Proposed)	C	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
742-213 (Verizon - Proposed)	C	From Leg	0.50 2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.17 5.65	2.99 3.57	0.02 0.05
RRH2x40-AWS (Verizon - Proposed)	A	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RRH2x40-AWS (Verizon - Proposed)	B	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RRH2x40-AWS (Verizon - Proposed)	C	From Leg	0.50 -2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
DB-T1-6Z-8AB-0Z (Verizon - Proposed)	A	From Leg	0.50 2.00 0.00	0.0000	110.00	No Ice 1/2" Ice	5.60 5.92	2.33 2.56	0.04 0.08
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	A	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.85 4.05	2.85 4.05	0.15 0.20
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	B	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.85 4.05	2.85 4.05	0.15 0.20

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
Site Pro Compact Tower Mount CWT8 (Verizon - Proposed)	C	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.85 4.05	2.85 4.05	0.15 0.20

Tower Pressures - No Ice

$G_H = 1.234$

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 112.50-102.50	107.50	1.401	23	88.021	A	5.859	6.442	4.792	38.95	0.000	0.000
					B	5.801	7.267		36.67	0.000	0.000
					C	5.859	6.442		38.95	0.000	0.000
T2 102.50-92.50	97.50	1.363	22	88.021	A	5.859	5.452	4.792	42.36	0.000	0.000
					B	4.907	18.982		20.06	0.000	0.000
					C	5.859	5.452		42.36	0.000	0.000
T3 92.50-72.50	82.50	1.299	21	176.042	A	13.891	9.583	9.583	40.82	0.000	0.000
					B	12.514	26.083		24.83	0.000	0.000
					C	13.891	9.583		40.82	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.234$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	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 112.50-102.50	107.50	1.401	17	0.5000	88.854	A	5.859	12.848	6.458	34.52	0.000	0.000
						B	5.772	14.031		32.61	0.000	0.000
						C	5.859	12.848		34.52	0.000	0.000
T2 102.50-92.50	97.50	1.363	17	0.5000	88.854	A	5.859	11.358	6.458	37.51	0.000	0.000
						B	20.319	14.872		18.35	0.000	0.000
						C	5.859	11.358		37.51	0.000	0.000
T3 92.50-72.50	82.50	1.299	16	0.5000	177.708	A	13.891	20.036	12.917	38.07	0.000	0.000
						B	31.685	23.940		23.22	0.000	0.000
						C	13.891	20.036		38.07	0.000	0.000

Tower Pressure - Service

$G_H = 1.234$

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 112.50-102.50	107.50	1.401	9	88.021	A	5.859	6.442	4.792	38.95	0.000	0.000
					B	5.801	7.267		36.67	0.000	0.000
					C	5.859	6.442		38.95	0.000	0.000
T2 102.50-92.50	97.50	1.363	9	88.021	A	5.859	5.452	4.792	42.36	0.000	0.000
					B	4.907	18.982		20.06	0.000	0.000
					C	5.859	5.452		42.36	0.000	0.000
T3 92.50-72.50	82.50	1.299	8	176.042	A	13.891	9.583	9.583	40.82	0.000	0.000
					B	12.514	26.083		24.83	0.000	0.000
					C	13.891	9.583		40.82	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 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	1	1	9.595	0.79	78.86	B
			B	0.148	2.777	0.581	1	1	10.025			
			C	0.14	2.81	0.58	1	1	9.595			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	1	1	9.013	1.08	107.55	B
			B	0.271	2.375	0.608	1	1	16.439			
			C	0.129	2.852	0.578	1	1	9.013			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	1	1	19.440	1.86	93.20	B
			B	0.219	2.533	0.595	1	1	28.021			
			C	0.133	2.834	0.579	1	1	19.440			
Sum Weight:	0.43	1.79						OTM	73.13 kip-ft	3.73		

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 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.825	1	8.570	0.71	70.88	B
			B	0.148	2.777	0.581	0.825	1	9.010			
			C	0.14	2.81	0.58	0.825	1	8.570			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.825	1	7.987	1.02	101.93	B
			B	0.271	2.375	0.608	0.825	1	15.581			
			C	0.129	2.852	0.578	0.825	1	7.987			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.825	1	17.010	1.72	85.92	B
			B	0.219	2.533	0.595	0.825	1	25.831			
			C	0.133	2.834	0.579	0.825	1	17.010			
Sum Weight:	0.43	1.79						OTM	67.47 kip-ft	3.45		

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 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.8	1	8.423	0.70	69.73	B
			B	0.148	2.777	0.581	0.8	1	8.865			
			C	0.14	2.81	0.58	0.8	1	8.423			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.8	1	7.841	1.01	101.13	B
			B	0.271	2.375	0.608	0.8	1	15.458			
			C	0.129	2.852	0.578	0.8	1	7.841			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.8	1	16.662	1.70	84.88	B
			B	0.219	2.533	0.595	0.8	1	25.518			
			C	0.133	2.834	0.579	0.8	1	16.662			
Sum Weight:	0.43	1.79						OTM	66.66 kip-ft	3.41		

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 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.85	1	8.716	0.72	72.02	B
			B	0.148	2.777	0.581	0.85	1	9.155			
			C	0.14	2.81	0.58	0.85	1	8.716			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.85	1	8.134	1.03	102.73	B
			B	0.271	2.375	0.608	0.85	1	15.703			
			C	0.129	2.852	0.578	0.85	1	8.134			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.85	1	17.357	1.74	86.96	B
			B	0.219	2.533	0.595	0.85	1	26.144			
			C	0.133	2.834	0.579	0.85	1	17.357			
Sum Weight:	0.43	1.79						OTM	68.28 kip-ft	3.49		

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 112.50-102.50	0.09	0.64	A	0.211	2.561	0.593	1	1	13.473	0.76	75.66	B
			B	0.223	2.521	0.595	1	1	14.125			
			C	0.211	2.561	0.593	1	1	13.473			
T2 102.50-92.50	0.53	0.77	A	0.194	2.617	0.589	1	1	12.551	1.28	128.35	B
			B	0.396	2.072	0.65	1	1	29.986			
			C	0.194	2.617	0.589	1	1	12.551			
T3 92.50-72.50	0.61	1.58	A	0.191	2.627	0.589	1	1	25.684	2.07	103.65	B
			B	0.313	2.262	0.62	1	1	46.528			
			C	0.191	2.627	0.589	1	1	25.684			
Sum Weight:	1.23	2.99						OTM	79.30 kip-ft	4.11		

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 112.50-102.50	0.09	0.64	A	0.211	2.561	0.593	0.825	1	12.448	0.70	70.25	B
			B	0.223	2.521	0.595	0.825	1	13.115			
			C	0.211	2.561	0.593	0.825	1	12.448			
T2 102.50-92.50	0.53	0.77	A	0.194	2.617	0.589	0.825	1	11.525	1.13	113.13	B
			B	0.396	2.072	0.65	0.825	1	26.430			
			C	0.194	2.617	0.589	0.825	1	11.525			
T3 92.50-72.50	0.61	1.58	A	0.191	2.627	0.589	0.825	1	23.253	1.83	91.30	B
			B	0.313	2.262	0.62	0.825	1	40.983			
			C	0.191	2.627	0.589	0.825	1	23.253			
Sum Weight:	1.23	2.99						OTM	71.13 kip-ft	3.66		

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 ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.09	0.64	A	0.211	2.561	0.593	0.8	1	12.301	0.69	69.48	B
			B	0.223	2.521	0.595	0.8	1	12.971			
			C	0.211	2.561	0.593	0.8	1	12.301			
T2 102.50-92.50	0.53	0.77	A	0.194	2.617	0.589	0.8	1	11.379	1.11	110.96	B
			B	0.396	2.072	0.65	0.8	1	25.922			
			C	0.194	2.617	0.589	0.8	1	11.379			
T3 92.50-72.50	0.61	1.58	A	0.191	2.627	0.589	0.8	1	22.906	1.79	89.53	B
			B	0.313	2.262	0.62	0.8	1	40.190			
			C	0.191	2.627	0.589	0.8	1	22.906			
Sum Weight:	1.23	2.99						OTM	69.96 kip-ft	3.60		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.09	0.64	A	0.211	2.561	0.593	0.85	1	12.594	0.71	71.02	B
			B	0.223	2.521	0.595	0.85	1	13.259			
			C	0.211	2.561	0.593	0.85	1	12.594			
T2 102.50-92.50	0.53	0.77	A	0.194	2.617	0.589	0.85	1	11.672	1.15	115.31	B
			B	0.396	2.072	0.65	0.85	1	26.938			
			C	0.194	2.617	0.589	0.85	1	11.672			
T3 92.50-72.50	0.61	1.58	A	0.191	2.627	0.589	0.85	1	23.600	1.86	93.06	B
			B	0.313	2.262	0.62	0.85	1	41.775			
			C	0.191	2.627	0.589	0.85	1	23.600			
Sum Weight:	1.23	2.99						OTM	72.30 kip-ft	3.72		

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 ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	1	1	9.595	0.31	30.81	B
			B	0.148	2.777	0.581	1	1	10.025			
			C	0.14	2.81	0.58	1	1	9.595			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	1	1	9.013	0.42	42.01	B
			B	0.271	2.375	0.608	1	1	16.439			
			C	0.129	2.852	0.578	1	1	9.013			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	1	1	19.440	0.73	36.41	B
			B	0.219	2.533	0.595	1	1	28.021			
			C	0.133	2.834	0.579	1	1	19.440			
Sum Weight:	0.43	1.79						OTM	28.57 kip-ft	1.46		

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 ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.825	1	8.570	0.28	27.69	B
			B	0.148	2.777	0.581	0.825	1	9.010			
			C	0.14	2.81	0.58	0.825	1	8.570			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.825	1	7.987	0.40	39.82	B
			B	0.271	2.375	0.608	0.825	1	15.581			
			C	0.129	2.852	0.578	0.825	1	7.987			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.825	1	17.010	0.67	33.56	B
			B	0.219	2.533	0.595	0.825	1	25.831			
			C	0.133	2.834	0.579	0.825	1	17.010			
Sum Weight:	0.43	1.79						OTM	26.36 kip-ft	1.35		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.8	1	8.423	0.27	27.24	B
			B	0.148	2.777	0.581	0.8	1	8.865			
			C	0.14	2.81	0.58	0.8	1	8.423			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.8	1	7.841	0.40	39.50	B
			B	0.271	2.375	0.608	0.8	1	15.458			
			C	0.129	2.852	0.578	0.8	1	7.841			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.8	1	16.662	0.66	33.15	B
			B	0.219	2.533	0.595	0.8	1	25.518			
			C	0.133	2.834	0.579	0.8	1	16.662			
Sum Weight:	0.43	1.79						OTM	26.04	1.33		

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
									kip-ft			

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 112.50-102.50	0.04	0.35	A	0.14	2.81	0.58	0.85	1	8.716	0.28	28.13	B
			B	0.148	2.777	0.581	0.85	1	9.155			
			C	0.14	2.81	0.58	0.85	1	8.716			
T2 102.50-92.50	0.18	0.48	A	0.129	2.852	0.578	0.85	1	8.134	0.40	40.13	B
			B	0.271	2.375	0.608	0.85	1	15.703			
			C	0.129	2.852	0.578	0.85	1	8.134			
T3 92.50-72.50	0.21	0.96	A	0.133	2.834	0.579	0.85	1	17.357	0.68	33.97	B
			B	0.219	2.533	0.595	0.85	1	26.144			
			C	0.133	2.834	0.579	0.85	1	17.357			
Sum Weight:	0.43	1.79						OTM	26.67 kip-ft	1.36		

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	0.70					
Bracing Weight	1.10					
Total Member Self-Weight	1.79			-1.43	-0.50	
Total Weight	4.02			-1.43	-0.50	
Wind 0 deg - No Ice		0.00	-7.49	-190.78	-0.50	1.02
Wind 30 deg - No Ice		3.46	-6.28	-161.21	-87.66	-0.35
Wind 45 deg - No Ice		4.86	-5.10	-131.32	-123.19	-1.00
Wind 60 deg - No Ice		5.92	-3.58	-92.87	-150.06	-1.56
Wind 90 deg - No Ice		6.91	0.00	-1.43	-174.82	-2.41
Wind 120 deg - No Ice		6.19	3.74	93.24	-155.66	-2.70
Wind 135 deg - No Ice		4.86	5.10	128.45	-123.19	-2.38
Wind 150 deg - No Ice		3.46	6.28	158.34	-87.66	-2.05
Wind 180 deg - No Ice		0.00	7.17	181.45	-0.50	-0.97
Wind 210 deg - No Ice		-3.46	6.28	158.34	86.65	0.35
Wind 225 deg - No Ice		-4.86	5.10	128.45	122.18	1.00
Wind 240 deg - No Ice		-6.19	3.74	93.24	154.65	1.68
Wind 270 deg - No Ice		-6.91	0.00	-1.43	173.81	2.41
Wind 300 deg - No Ice		-5.92	-3.58	-92.87	149.06	2.53
Wind 315 deg - No Ice		-4.86	-5.10	-131.32	122.18	2.38
Wind 330 deg - No Ice		-3.46	-6.28	-161.21	86.65	2.05
Member Ice	1.20					
Total Weight Ice	7.08			-4.08	-1.37	
Wind 0 deg - Ice		0.00	-7.36	-183.78	-1.37	0.96
Wind 30 deg - Ice		3.35	-6.03	-153.64	-83.80	-0.35
Wind 45 deg - Ice		4.70	-4.88	-125.37	-117.12	-0.93

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 60 deg - Ice		5.70	-3.42	-89.26	-142.13	-1.43
Wind 90 deg - Ice		6.71	0.00	-4.08	-166.24	-2.22
Wind 120 deg - Ice		6.15	3.68	85.77	-150.21	-2.59
Wind 135 deg - Ice		4.70	4.88	117.21	-117.12	-2.16
Wind 150 deg - Ice		3.35	6.03	145.48	-83.80	-1.88
Wind 180 deg - Ice		0.00	6.84	166.29	-1.37	-0.86
Wind 210 deg - Ice		-3.35	6.03	145.48	81.06	0.35
Wind 225 deg - Ice		-4.70	4.88	117.21	114.38	0.93
Wind 240 deg - Ice		-6.15	3.68	85.77	147.47	1.64
Wind 270 deg - Ice		-6.71	0.00	-4.08	163.50	2.22
Wind 300 deg - Ice		-5.70	-3.42	-89.26	139.39	2.29
Wind 315 deg - Ice		-4.70	-4.88	-125.37	114.38	2.16
Wind 330 deg - Ice		-3.35	-6.03	-153.64	81.06	1.88
Total Weight	4.02			-1.43	-0.50	
Wind 0 deg - Service		0.00	-2.93	-74.08	-0.08	0.40
Wind 30 deg - Service		1.35	-2.45	-62.53	-34.13	-0.14
Wind 45 deg - Service		1.90	-1.99	-50.86	-48.00	-0.39
Wind 60 deg - Service		2.31	-1.40	-35.84	-58.50	-0.61
Wind 90 deg - Service		2.70	0.00	-0.12	-68.17	-0.94
Wind 120 deg - Service		2.42	1.46	36.86	-60.69	-1.06
Wind 135 deg - Service		1.90	1.99	50.62	-48.00	-0.93
Wind 150 deg - Service		1.35	2.45	62.29	-34.13	-0.80
Wind 180 deg - Service		0.00	2.80	71.32	-0.08	-0.38
Wind 210 deg - Service		-1.35	2.45	62.29	33.97	0.14
Wind 225 deg - Service		-1.90	1.99	50.62	47.84	0.39
Wind 240 deg - Service		-2.42	1.46	36.86	60.53	0.66
Wind 270 deg - Service		-2.70	0.00	-0.12	68.01	0.94
Wind 300 deg - Service		-2.31	-1.40	-35.84	58.34	0.99
Wind 315 deg - Service		-1.90	-1.99	-50.86	47.84	0.93
Wind 330 deg - Service		-1.35	-2.45	-62.53	33.97	0.80

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp

Comb. No.	Description
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	112.5 - 102.5	Leg	Max Tension	5	0.67	-0.12	0.08
			Max. Compression	19	-1.60	0.00	0.25
			Max. Mx	14	-0.33	-0.48	-0.00
			Max. My	2	-0.20	-0.00	-0.51
			Max. Vy	6	0.26	-0.15	-0.00
			Max. Vx	2	-0.28	-0.00	0.16
		Diagonal	Max Tension	9	0.71	0.00	0.00
			Max. Compression	17	-0.72	0.00	0.00
			Max. Mx	31	0.43	0.01	-0.00
			Max. My	16	-0.65	0.00	-0.00
			Max. Vy	31	-0.01	0.01	-0.00
			Max. Vx	16	-0.00	0.00	0.00
		Top Girt	Max Tension	2	0.05	0.00	0.00
			Max. Compression	10	-0.06	0.00	0.00
			Max. Mx	18	-0.01	-0.03	0.00
			Max. Vy	18	0.01	0.00	0.00
T2	102.5 - 92.5	Leg	Max Tension	10	4.76	-0.01	-0.36
			Max. Compression	19	-7.23	0.00	-0.08
			Max. Mx	14	-0.87	-0.67	-0.00
			Max. My	10	-2.15	0.00	0.74
			Max. Vy	6	0.42	-0.33	-0.00
			Max. Vx	2	-0.45	0.00	0.36
		Diagonal	Max Tension	9	2.19	0.00	0.00
			Max. Compression	17	-2.21	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	34	2.07	0.01	-0.00
			Max. My	16	-2.04	0.01	-0.00
			Max. Vy	34	-0.01	0.01	-0.00
			Max. Vx	16	-0.00	0.00	0.00
		Top Girt	Max Tension	19	0.08	0.00	0.00
			Max. Compression	10	-0.05	0.00	0.00
			Max. Mx	18	0.04	-0.03	0.00
			Max. Vy	18	0.01	0.00	0.00
T3	92.5 - 72.5	Leg	Max Tension	10	20.76	-0.00	-0.04
			Max. Compression	19	-25.14	0.00	0.00
			Max. Mx	22	-9.12	-0.14	-0.00
			Max. My	19	-19.33	0.00	0.15
			Max. Vy	22	0.06	-0.14	-0.00
			Max. Vx	19	-0.06	0.00	0.15
		Diagonal	Max Tension	26	3.33	0.00	0.00
			Max. Compression	26	-3.09	0.00	0.00
			Max. Mx	21	0.94	0.03	-0.00
			Max. My	6	-2.45	-0.00	0.00
			Max. Vy	21	0.02	0.03	-0.00
			Max. Vx	6	-0.00	0.00	0.00
		Top Girt	Max Tension	27	0.43	0.00	0.00
			Max. Compression	2	-0.15	0.00	0.00
			Max. Mx	18	0.30	-0.03	0.00
			Max. Vy	18	0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	13	25.70	3.23	-2.02
	Max. H_x	13	25.70	3.23	-2.02
	Max. H_z	20	-17.80	-3.17	2.44
	Min. Vert	5	-22.46	-3.04	1.90
	Min. H_x	22	-20.27	-3.71	2.27
	Min. H_z	11	22.15	2.52	-2.10
Leg B	Max. Vert	7	25.82	-3.20	-2.08
	Max. H_x	32	-19.95	3.68	2.32
	Max. H_z	34	-17.48	3.12	2.53
	Min. Vert	15	-22.34	3.00	1.95
	Min. H_x	7	25.82	-3.20	-2.08
	Min. H_z	9	22.27	-2.46	-2.20
Leg A	Max. Vert	19	27.16	0.07	2.97
	Max. H_x	14	1.53	1.16	0.03
	Max. H_z	2	27.08	0.07	3.94
	Min. Vert	10	-23.14	-0.07	-3.71
	Min. H_x	6	1.53	-1.16	0.03
	Min. H_z	27	-20.08	-0.06	-4.44

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	4.02	0.00	0.00	-1.43	-0.50	0.00
Dead+Wind 0 deg - No Ice	4.02	0.00	-7.49	-190.89	-0.50	1.02
Dead+Wind 30 deg - No Ice	4.02	3.46	-6.28	-161.31	-87.71	-0.35
Dead+Wind 45 deg - No Ice	4.02	4.86	-5.10	-131.40	-123.27	-1.00
Dead+Wind 60 deg - No Ice	4.02	5.92	-3.58	-92.93	-150.16	-1.56
Dead+Wind 90 deg - No Ice	4.02	6.91	0.00	-1.43	-174.92	-2.41
Dead+Wind 120 deg - No Ice	4.02	6.19	3.74	93.29	-155.76	-2.70
Dead+Wind 135 deg - No Ice	4.02	4.86	5.10	128.53	-123.27	-2.38
Dead+Wind 150 deg - No Ice	4.02	3.46	6.28	158.44	-87.71	-2.06
Dead+Wind 180 deg - No Ice	4.02	-0.00	7.17	181.56	-0.50	-0.97
Dead+Wind 210 deg - No Ice	4.02	-3.46	6.28	158.44	86.71	0.35
Dead+Wind 225 deg - No Ice	4.02	-4.86	5.10	128.53	122.26	1.00
Dead+Wind 240 deg - No Ice	4.02	-6.19	3.74	93.30	154.75	1.68
Dead+Wind 270 deg - No Ice	4.02	-6.91	0.00	-1.43	173.92	2.41
Dead+Wind 300 deg - No Ice	4.02	-5.92	-3.58	-92.93	149.15	2.53
Dead+Wind 315 deg - No Ice	4.02	-4.86	-5.10	-131.40	122.26	2.38
Dead+Wind 330 deg - No Ice	4.02	-3.46	-6.28	-161.31	86.71	2.05
Dead+Ice+Temp	7.08	-0.00	0.00	-4.08	-1.37	0.00
Dead+Wind 0 deg+Ice+Temp	7.08	0.00	-7.36	-183.90	-1.37	0.96
Dead+Wind 30 deg+Ice+Temp	7.08	3.35	-6.03	-153.75	-83.86	-0.35
Dead+Wind 45 deg+Ice+Temp	7.08	4.70	-4.88	-125.46	-117.21	-0.93
Dead+Wind 60 deg+Ice+Temp	7.08	5.70	-3.42	-89.33	-142.23	-1.44
Dead+Wind 90 deg+Ice+Temp	7.08	6.71	0.00	-4.08	-166.36	-2.23
Dead+Wind 120 deg+Ice+Temp	7.08	6.15	3.68	85.83	-150.32	-2.60
Dead+Wind 135 deg+Ice+Temp	7.08	4.70	4.88	117.30	-117.21	-2.17
Dead+Wind 150 deg+Ice+Temp	7.08	3.35	6.03	145.59	-83.87	-1.88
Dead+Wind 180 deg+Ice+Temp	7.08	0.00	6.84	166.41	-1.37	-0.86
Dead+Wind 210 deg+Ice+Temp	7.08	-3.35	6.03	145.59	81.12	0.35
Dead+Wind 225 deg+Ice+Temp	7.08	-4.70	4.88	117.30	114.47	0.93
Dead+Wind 240 deg+Ice+Temp	7.08	-6.15	3.68	85.83	147.58	1.64
Dead+Wind 270 deg+Ice+Temp	7.08	-6.71	0.00	-4.08	163.62	2.23
Dead+Wind 300 deg+Ice+Temp	7.08	-5.70	-3.42	-89.33	139.49	2.30
Dead+Wind 315 deg+Ice+Temp	7.08	-4.70	-4.88	-125.46	114.46	2.17
Dead+Wind 330 deg+Ice+Temp	7.08	-3.35	-6.03	-153.75	81.12	1.88
Dead+Wind 0 deg - Service	4.02	0.00	-2.93	-75.44	-0.50	0.40
Dead+Wind 30 deg - Service	4.02	1.35	-2.45	-63.88	-34.57	-0.14
Dead+Wind 45 deg - Service	4.02	1.90	-1.99	-52.20	-48.46	-0.39
Dead+Wind 60 deg - Service	4.02	2.31	-1.40	-37.17	-58.96	-0.61
Dead+Wind 90 deg - Service	4.02	2.70	0.00	-1.43	-68.64	-0.94
Dead+Wind 120 deg - Service	4.02	2.42	1.46	35.57	-61.15	-1.06
Dead+Wind 135 deg - Service	4.02	1.90	1.99	49.33	-48.46	-0.93
Dead+Wind 150 deg - Service	4.02	1.35	2.45	61.02	-34.57	-0.80
Dead+Wind 180 deg - Service	4.02	0.00	2.80	70.05	-0.50	-0.38
Dead+Wind 210 deg - Service	4.02	-1.35	2.45	61.02	33.56	0.14
Dead+Wind 225 deg - Service	4.02	-1.90	1.99	49.33	47.45	0.39
Dead+Wind 240 deg - Service	4.02	-2.42	1.46	35.57	60.14	0.66
Dead+Wind 270 deg - Service	4.02	-2.70	0.00	-1.43	67.63	0.94
Dead+Wind 300 deg - Service	4.02	-2.31	-1.40	-37.17	57.95	0.99
Dead+Wind 315 deg - Service	4.02	-1.90	-1.99	-52.20	47.45	0.93
Dead+Wind 330 deg - Service	4.02	-1.35	-2.45	-63.88	33.56	0.80

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	-4.02	0.00	0.00	4.02	0.00	0.000%
2	0.00	-4.02	-7.49	-0.00	4.02	7.49	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
3	3.46	-4.02	-6.28	-3.46	4.02	6.28	0.000%
4	4.86	-4.02	-5.10	-4.86	4.02	5.10	0.000%
5	5.92	-4.02	-3.58	-5.92	4.02	3.58	0.005%
6	6.91	-4.02	0.00	-6.91	4.02	-0.00	0.000%
7	6.19	-4.02	3.74	-6.19	4.02	-3.74	0.000%
8	4.86	-4.02	5.10	-4.86	4.02	-5.10	0.000%
9	3.46	-4.02	6.28	-3.46	4.02	-6.28	0.000%
10	0.00	-4.02	7.17	0.00	4.02	-7.17	0.003%
11	-3.46	-4.02	6.28	3.46	4.02	-6.28	0.000%
12	-4.86	-4.02	5.10	4.86	4.02	-5.10	0.000%
13	-6.19	-4.02	3.74	6.19	4.02	-3.74	0.000%
14	-6.91	-4.02	0.00	6.91	4.02	-0.00	0.000%
15	-5.92	-4.02	-3.58	5.92	4.02	3.58	0.003%
16	-4.86	-4.02	-5.10	4.86	4.02	5.10	0.000%
17	-3.46	-4.02	-6.28	3.46	4.02	6.28	0.000%
18	0.00	-7.08	0.00	0.00	7.08	-0.00	0.000%
19	0.00	-7.08	-7.36	-0.00	7.08	7.36	0.000%
20	3.35	-7.08	-6.03	-3.35	7.08	6.03	0.000%
21	4.70	-7.08	-4.88	-4.70	7.08	4.88	0.000%
22	5.70	-7.08	-3.42	-5.70	7.08	3.42	0.000%
23	6.71	-7.08	0.00	-6.71	7.08	-0.00	0.000%
24	6.15	-7.08	3.68	-6.15	7.08	-3.68	0.000%
25	4.70	-7.08	4.88	-4.70	7.08	-4.88	0.000%
26	3.35	-7.08	6.03	-3.35	7.08	-6.03	0.000%
27	0.00	-7.08	6.84	-0.00	7.08	-6.84	0.000%
28	-3.35	-7.08	6.03	3.35	7.08	-6.03	0.000%
29	-4.70	-7.08	4.88	4.70	7.08	-4.88	0.000%
30	-6.15	-7.08	3.68	6.15	7.08	-3.68	0.000%
31	-6.71	-7.08	0.00	6.71	7.08	-0.00	0.000%
32	-5.70	-7.08	-3.42	5.70	7.08	3.42	0.000%
33	-4.70	-7.08	-4.88	4.70	7.08	4.88	0.000%
34	-3.35	-7.08	-6.03	3.35	7.08	6.03	0.000%
35	0.00	-4.02	-2.93	-0.00	4.02	2.93	0.000%
36	1.35	-4.02	-2.45	-1.35	4.02	2.45	0.000%
37	1.90	-4.02	-1.99	-1.90	4.02	1.99	0.000%
38	2.31	-4.02	-1.40	-2.31	4.02	1.40	0.000%
39	2.70	-4.02	0.00	-2.70	4.02	-0.00	0.000%
40	2.42	-4.02	1.46	-2.42	4.02	-1.46	0.000%
41	1.90	-4.02	1.99	-1.90	4.02	-1.99	0.000%
42	1.35	-4.02	2.45	-1.35	4.02	-2.45	0.000%
43	0.00	-4.02	2.80	-0.00	4.02	-2.80	0.000%
44	-1.35	-4.02	2.45	1.35	4.02	-2.45	0.000%
45	-1.90	-4.02	1.99	1.90	4.02	-1.99	0.000%
46	-2.42	-4.02	1.46	2.42	4.02	-1.46	0.000%
47	-2.70	-4.02	0.00	2.70	4.02	-0.00	0.000%
48	-2.31	-4.02	-1.40	2.31	4.02	1.40	0.000%
49	-1.90	-4.02	-1.99	1.90	4.02	1.99	0.000%
50	-1.35	-4.02	-2.45	1.35	4.02	2.45	0.000%

Non-Linear Convergence Results

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

4	Yes	6	0.00000001	0.00000001
5	Yes	6	0.00000001	0.00000001
6	Yes	6	0.00000001	0.00000001
7	Yes	6	0.00000001	0.00000001
8	Yes	6	0.00000001	0.00000001
9	Yes	6	0.00000001	0.00000001
10	Yes	6	0.00000001	0.00000001
11	Yes	6	0.00000001	0.00000001
12	Yes	6	0.00000001	0.00000001
13	Yes	6	0.00000001	0.00000001
14	Yes	6	0.00000001	0.00000001
15	Yes	6	0.00000001	0.00000001
16	Yes	6	0.00000001	0.00000001
17	Yes	6	0.00000001	0.00000001
18	Yes	6	0.00000001	0.00000001
19	Yes	6	0.00000001	0.00000001
20	Yes	6	0.00000001	0.00000001
21	Yes	6	0.00000001	0.00001716
22	Yes	6	0.00000001	0.00001788
23	Yes	6	0.00000001	0.00000001
24	Yes	6	0.00000001	0.00000001
25	Yes	6	0.00000001	0.00000001
26	Yes	6	0.00000001	0.00000001
27	Yes	6	0.00000001	0.00001790
28	Yes	6	0.00000001	0.00002021
29	Yes	6	0.00000001	0.00001871
30	Yes	6	0.00000001	0.00000001
31	Yes	6	0.00000001	0.00000001
32	Yes	6	0.00000001	0.00001831
33	Yes	6	0.00000001	0.00000001
34	Yes	6	0.00000001	0.00000001
35	Yes	6	0.00000001	0.00000001
36	Yes	6	0.00000001	0.00000001
37	Yes	6	0.00000001	0.00000001
38	Yes	6	0.00000001	0.00000001
39	Yes	6	0.00000001	0.00000001
40	Yes	6	0.00000001	0.00000001
41	Yes	6	0.00000001	0.00000001
42	Yes	6	0.00000001	0.00000001
43	Yes	6	0.00000001	0.00000001
44	Yes	6	0.00000001	0.00000001
45	Yes	6	0.00000001	0.00000001
46	Yes	6	0.00000001	0.00000001
47	Yes	6	0.00000001	0.00000001
48	Yes	6	0.00000001	0.00000001
49	Yes	6	0.00000001	0.00000001
50	Yes	6	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	*Elevation* *ft*	*Horz. Deflection* *in*	*Gov. Load Comb.*	*Tilt* *°*	*Twist* *°*
T1	112.5 - 102.5	0.258	35	0.0352	0.0047
T2	102.5 - 92.5	0.179	35	0.0346	0.0042
T3	92.5 - 72.5	0.101	35	0.0305	0.0033

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.00	742-213	35	0.238	0.0351	0.0046	301894
100.00	LPA-80080/4CF	35	0.159	0.0341	0.0040	600632

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	112.5 - 102.5	0.652	2	0.0887	0.0121
T2	102.5 - 92.5	0.454	2	0.0872	0.0107
T3	92.5 - 72.5	0.255	2	0.0769	0.0085

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.00	742-213	2	0.603	0.0886	0.0118	118476
100.00	LPA-80080/4CF	2	0.402	0.0861	0.0102	256507

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	112.5	Leg	A325N	0.6250	4	0.17	13.50	0.012 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	0.71	3.17	0.223 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	0.06	4.12	0.015 ✔	1.333	Bolt Shear
T2	102.5	Leg	A325N	0.6250	4	1.19	13.50	0.088 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.21	4.12	0.535 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.5000	1	0.08	3.17	0.025 ✔	1.333	Member Bearing
T3	92.5	Leg	A325N	0.6250	4	5.19	13.50	0.384 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.33	4.12	0.808 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.5000	1	0.43	3.17	0.137 ✔	1.333	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	112.5 - 102.5	P2.5x.203	10.00	5.00	63.3 K=1.00	22.141	1.7040	-1.60	37.73	0.042 ✔
T2	102.5 - 92.5	P2.5x.203	10.00	5.00	63.3 K=1.00	22.141	1.7040	-7.23	37.73	0.192 ✔
T3	92.5 - 72.5	P2.5x.203	20.00	5.00	63.3 K=1.00	22.141	1.7040	-25.14	37.73	0.666 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	112.5 - 102.5	L1 1/2x1 1/2x1/8	9.92	4.70	190.6 K=1.00	4.111	0.3594	-0.72	1.48	0.485 ✔
T2	102.5 - 92.5	L1 1/2x1 1/2x1/4	9.92	4.70	193.3 K=1.00	3.996	0.6875	-2.21	2.75	0.804 ✔
T3	92.5 - 72.5	L2x2x3/16	9.92	4.70	143.3 K=1.00	7.274	0.7150	-3.09	5.20	0.593 ✔

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	112.5 - 102.5	L1 1/2x1 1/2x1/8 KL/R > 200 (C) - 4	8.56	8.09	327.9 K=1.00	1.389	0.3594	-0.06	0.50	0.128 ✔
T2	102.5 - 92.5	L1 1/2x1 1/2x1/8 KL/R > 200 (C) - 22	8.56	8.09	327.9 K=1.00	1.389	0.3594	-0.05	0.50	0.100 ✔
T3	92.5 - 72.5	L1 1/2x1 1/2x1/8 KL/R > 200 (C) - 40	8.56	8.09	327.9 K=1.00	1.389	0.3594	-0.15	0.50	0.295 ✔

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	112.5 - 102.5	P2.5x.203	10.00	5.00	63.3	30.000	1.7040	0.67	51.12	0.013 ✔
T2	102.5 - 92.5	P2.5x.203	10.00	5.00	63.3	30.000	1.7040	4.76	51.12	0.093 ✔
T3	92.5 - 72.5	P2.5x.203	20.00	5.00	63.3	30.000	1.7040	20.76	51.12	0.406 ✔

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	112.5 - 102.5	L1 1/2x1 1/2x1/8	9.92	4.70	124.3	29.000	0.2109	0.71	6.12	0.116 ✔
T2	102.5 - 92.5	L1 1/2x1 1/2x1/4	9.92	4.70	128.8	29.000	0.3984	2.19	11.55	0.189 ✔
T3	92.5 - 72.5	L2x2x3/16	9.92	4.70	93.7	29.000	0.4484	3.33	13.00	0.256 ✔

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	112.5 - 102.5	L1 1/2x1 1/2x1/8	8.56	8.09	214.7	29.000	0.2109	0.05	6.12	0.007 ✔
T2	102.5 - 92.5	L1 1/2x1 1/2x1/8	8.56	8.09	214.7	29.000	0.2109	0.08	6.12	0.013 ✔
T3	92.5 - 72.5	L1 1/2x1 1/2x1/8	8.56	8.09	214.7	29.000	0.2109	0.43	6.12	0.071 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF^*P_{allow} K	% Capacity	Pass Fail
T1	112.5 - 102.5	Leg	P2.5x.203	3	-1.60	50.29	3.2	Pass
T2	102.5 - 92.5	Leg	P2.5x.203	21	-7.23	50.29	14.4	Pass
T3	92.5 - 72.5	Leg	P2.5x.203	39	-25.14	50.29	50.0	Pass
T1	112.5 - 102.5	Diagonal	L1 1/2x1 1/2x1/8	10	-0.72	1.97	36.4	Pass
T2	102.5 - 92.5	Diagonal	L1 1/2x1 1/2x1/4	28	-2.21	3.66	60.3	Pass
T3	92.5 - 72.5	Diagonal	L2x2x3/16	51	-3.09	6.93	44.5 60.6 (b)	Pass
T1	112.5 - 102.5	Top Girt	L1 1/2x1 1/2x1/8	4	-0.06	0.67	9.6	Pass
T2	102.5 - 92.5	Top Girt	L1 1/2x1 1/2x1/8	22	-0.05	0.67	7.5	Pass

Section No.	*Elevation ft*	*Component Type*	*Size*	*Critical Element*	*P K*	*SF*P_{allow} K*	*% Capacity*	*Pass Fail*
T3	92.5 - 72.5	Top Girt	L1 1/2x1 1/2x1/8	40	-0.15	0.67	22.1	Pass
							Summary	
						Leg (T3)	50.0	Pass
						Diagonal (T3)	60.6	Pass
						Top Girt (T3)	22.1	Pass
						Bolt Checks	60.6	Pass
						RATING =	**60.6**	**Pass**

verizon wireless

TOWER REINFORCEMENT DESIGN
BRISTOL
32 VALLEY STREET
BRISTOL, CT 06010

VICINITY MAP

PROJECT SUMMARY

SITE ADDRESS:	32 VALLEY STREET BRISTOL, CT 06010
PROJECT COORDINATES:	LAT: 41°-40'-34.40"N LON: 72°-56'-51.60"W ELEV: ±312' AMSL
TOWER OWNER:	CARPENTER REALTY 67 RACE STREET BRISTOL, CT 06010
VERIZON SITE REF.:	BRISTOL
VERIZON CONTACT:	BRIAN RAGOZZINE 860.982.4246
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	CARLO F. CENTORE, PE 203.488.0580 ext. 122

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS & GENERAL NOTES	0
N-2	STRUCTURAL STEEL NOTES	0
MI-1	MODIFICATION INSPECTION REQUIREMENTS	0
S-1	TOWER ELEVATION AND PLAN	0

DESIGNED BY: TJL
DRAWN BY: TJL
CHK'D BY: CFC

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	01/03/14	TJL	CFC	ISSUED FOR CONSTRUCTION

CENTEK engineering
www.Centekeng.com

VERIZON WIRELESS
BRISTOL
40-ft ROHN SSV TOWER
REINFORCEMENT DESIGN FOR
ANTENNA INSTALLATION
32 VALLEY STREET
BRISTOL, CT 06010

DATE: 01/03/14
SCALE: AS SHOWN
JOB NO. 14001.002

TITLE SHEET

SHEET NO.
T-1
Sheet No. 1 of 5

DESIGN BASIS

1. GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CT STATE BUILDING CODE AND 2009 AMENDMENTS.
2. TIA/EIA-222-F-1996 "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".
3. DESIGN CRITERIA

   WIND LOAD: (TIA/EIA-222-F-1996)
   BASIC WIND SPEED (V) = 80 MPH (FASTEST MILE)

   WIND LOAD: (2005 CT STATE BUILDING CODE APPENDIX K)
   BASIC WIND SPEED (V) = 95 MPH (3-SECOND GUST)
   EQUIVALENT TO (V) = 77.5 MPH (FASTEST MILE)

   TIA/EIA-222-F-1996 WIND SPEED CONTROLS

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS AND REINFORCEMENT DESIGN PREPARED BY CENTEK ENGINEERING, INC., DATED 1/3/14.
2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM A PREVIOUS STRUCTURAL REPORT PREPARED BY CENTEK ENGINEERING JOB #12001.C041, DATED JUNE 7, 2012.
3. PROVIDE TEMPORARY ANCHORS, GUYING AND/OR BRACING AS REQUIRED TO SAFELY CONDUCT THE WORK.
4. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES".
5. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIE-DOWNS, WHICH MIGHT BE NECESSARY.
6. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
7. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
8. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
10. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.
11. TOWER ERECTION SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.
12. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER WORK.
13. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

DESIGNED BY: TJL
DRAWN BY: TJL
CHK'D BY: CFC

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/03/14	TJL	CFC	ISSUED FOR CONSTRUCTION

CENTEK engineering
www.CentekEng.com

VERIZON WIRELESS
BRISTOL
40-ft ROHN SSV TOWER
REINFORCEMENT DESIGN FOR
ANTENNA INSTALLATION

DATE: 01/03/14
SCALE: AS SHOWN
JOB NO. 14001.002

DESIGN BASIS & GENERAL NOTES

SHEET NO. N-1
Sheet No. 2 of 5

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).

2. MATERIAL SPECIFICATIONS

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   E. PIPE---ASTM A53 GRADE B (FY = 35 KSI)

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B. U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.

4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.

5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.

8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.

10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.

15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.

16. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.

17. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.

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

19. FABRICATE BEAMS WITH MILL CAMBER UP.

20. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.

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

DESIGNED BY:	TJL
DRAWN BY:	TJL
CHK'D BY:	CFC

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	01/03/14	TJL	CFC	ISSUED FOR CONSTRUCTION

CENTEK engineering

VERIZON WIRELESS
BRISTOL
40-ft ROHN SSV TOWER
REINFORCEMENT DESIGN FOR
ANTENNA INSTALLATION

DATE:	01/03/14
SCALE:	AS SHOWN
JOB NO.	14001.002

STRUCTURAL STEEL NOTES

SHEET NO.
N-2

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTUCTION		DURING CONSTRUCTION		POST-CONSTRUCTION	
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM
X	EOR MODIFICATION INSPECTION DRAWING	–	FOUNDATIONS	X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING
X	EOR APPROVED SHOP DRAWINGS	–	EARTHWORK: BACKFILL MATERIAL & COMPACTION	–	POST–INSTALLED ANCHOR ROD PULL–OUT TEST
–	EOR APPROVED POST–INSTALLED ANCHOR MPII	–	CONCRETE TESTING	X	PHOTOGRAPHS
–	FABRICATION INSPECTION	X	STEEL INSPECTION		
–	FABRICATOR CERTIFIED WELDER INSPECTION	–	POST INSTALLED ANCHOR ROD VERIFICATION		
X	MATERIAL CERTIFICATIONS	–	BASE PLATE GROUT VERIFICATION		
		–	CONTRACTOR'S CERTIFIED WELD INSPECTION		
		X	ON–SITE COLD GALVANIZING/PAINTING VERIFICATION		
		–	GUY WIRE TENSION REPORT		
		X	CONTRACTOR AS–BUILT REDLINE DRAWINGS		

NOTES:
1. REFER TO MODIFICATION INSPECTION NOTES FOR ADDITIONAL REQUIREMENTS
2. "X" DENOTES DOCUMENT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
3. "–" DENOTES DOCUMENT NOT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
4. EOR – ENGINEER OF RECORD
4. MPII – "MANUFACTURER'S PRINTED INSTALLATION GUIDELINES"

GENERAL

1. THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPILATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).

2. THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.

3. TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.

4. THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.

5. WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

1. THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON–SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

1. THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

1. SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:

   – CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
   – WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS–BUILT CONDITION.

REQUIRED PHOTOGRAPHS

1. THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:

   – PRE–CONSTRUCTION: GENERAL CONDITION OF THE SITE.
   – DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
   – POST–CONSTRUCTION: FINAL CONDITION OF THE SITE

DESIGNED BY:	TJL
DRAWN BY:	TJL
CHK'D BY:	CFC

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	01/03/14	TJL	CFC	ISSUED FOR CONSTRUCTION

CENTEK engineering
www.CentekEng.com

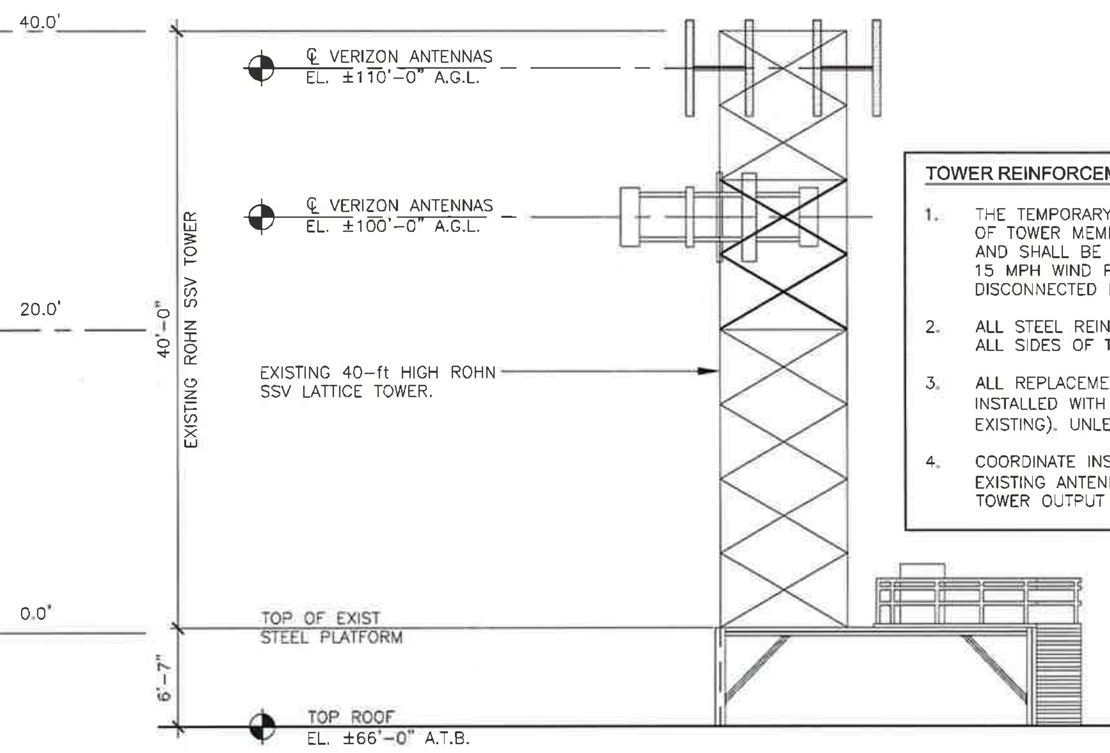
VERIZON WIRELESS
BRISTOL
40-ft ROHN SSV TOWER
REINFORCEMENT DESIGN FOR
ANTENNA INSTALLATION
38 VALLEY STREET
BRISTOL, CT 06010

DATE:	01/03/14
SCALE:	AS SHOWN
JOB NO.	14001.002

MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1

SECTION	T1	T2	T3
LEGS	P2.5X0.203		
LEG GRADE	A572-50		
DIAGONALS	L1-1/2X1-1/2X1/8	A	L2X2X3/16
DIAGONAL GRADE	A36		
TOP GIRTS	L1-1/2 X1-1/2 X 1/8		



TOWER REINFORCEMENT NOTES:

1. THE TEMPORARY DETACHMENT AND/OR REPLACEMENT OF TOWER MEMBERS SHALL BE DONE ONE AT A TIME AND SHALL BE CONDUCTED ON DAYS WITH LESS THAN 15 MPH WIND PRESENT. NO MEMBER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY.
2. ALL STEEL REINFORCEMENT SHOWN HEREIN APPLIES TO ALL SIDES OF THE TOWER.
3. ALL REPLACEMENT STEEL MEMBERS SHALL BE INSTALLED WITH A325-N BOLTS (SIZE TO MATCH EXISTING). UNLESS OTHERWISE NOTED BELOW.
4. COORDINATE INSTALLATION OF REINFORCEMENT WITH EXISTING ANTENNAS/APPURTENANCES. REFER TO RISA TOWER OUTPUT GRAPHIC SUMMARY FOR INFORMATION.

LEGEND:

1. A.G.L.= ABOVE GROUND LEVEL
2. A.T.B.= BELOW TOWER TOP

TXX DENOTES tnxTOWER OUTPUT SECTION NUMBER

MAX. TOWER STEEL USAGE w/ ABOVE REINFORCEMENTS:
LOAD CASE #1 = 60.6%
(DIAGONAL SECTION T3 0'-0"-20'-0" ATB)

REINFORCEMENT SCHEDULE KEY:

A. REPLACE EXISTING DIAGONALS w/ L1-1/2X1-1/2X1/4.

1 S-1 TOWER ELEVATION - PROPOSED

SCALE: NOT TO SCALE

DESIGNED BY: TJL
DRAWN BY: TJL
CHK'D BY: CFC

A 01/03/14 TJL CFC ISSUED FOR CONSTRUCTION

CENTEK engineering

VERIZON WIRELESS
BRISTOL
40-ft ROHN SSV TOWER
REINFORCEMENT DESIGN FOR
ANTENNA INSTALLATION

DATE: 01/03/14
SCALE: AS SHOWN
JOB NO. 14001.002

TOWER ELEVATION AND PLAN

SHEET NO. S-1

SITE NAME	BRISTOL CT	ECP & CELL #	8	0017
Note: AWS Add (Root Metric Site)		LATITUDE	41-40-34.35 N	
		LONGITUDE	72-56-51.37 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_00.0	742213_2110_P45_00.0	742213_2110_P45_02.0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	90	90	90
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-2-750MHZ	BXA-70063-6CF-2-750MHZ	BXA-70063-6CF-2-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	4
RAD CTR (FT AGL)	90	90	90
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-2-750MHZ	BXA-70063-6CF-2-750MHZ	BXA-70063-6CF-2-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	4
RAD CTR (FT AGL)	90	90	90
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-80080-4CF	LPA-80080-4CF	LPA-80063-4CF-EDIN-4
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	2
RAD CTR (FT AGL)	90	90	90
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	<Unset> x FD9R6004/2C-3L	<Unset> x FD9R6004/2C-3L	<Unset> 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-80080-4CF	LPA-80080-4CF	LPA-80063-4CF-EDIN-4
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	2
RAD CTR (FT AGL)	90	90	90
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			
1900 PCS - CURRENT CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	LPA-171063-8CF-2	LPA-171063-8CF-2	LPA-171063-8CF-2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	88	88	88
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	YES	YES	YES
1900 PCS - FUTURE CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	742213_1950_P45_02.0	742213_1950_P45_02.0	742213_1950_P45_02.0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	88	88	88
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE			

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

EQUIPMENT CABLE ORDERING	MAIN CABLE #	18	+	0	TOP JUMPER #	18	+	0

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

ALPHA				BETA				GAMMA			
AnL	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

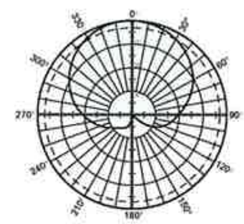
KATHREIN
SCALA DIVISION

742 213V01

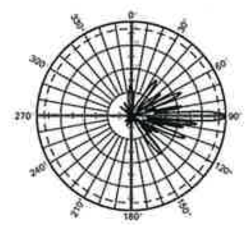
65° Panel Antenna

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° 2° 4° 6° T 18 18 16 15 dB	0° 2° 4° 6° T 18 18 17 16 dB	0° 2° 4° 6° T 18 18 18 18 dB

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

RoHS
Lead-Free

11271-B
936.3740/b

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

Alcatel·Lucent

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

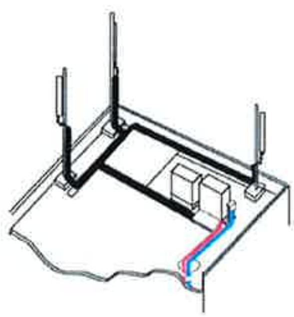
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

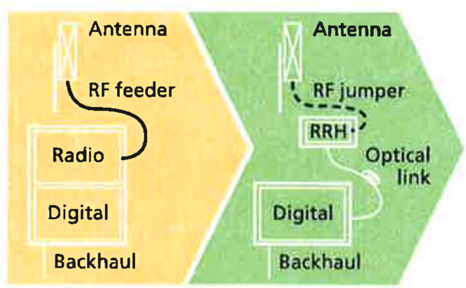
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

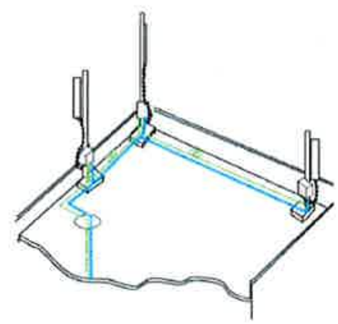
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

RFS

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.