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KENNETH C. BALDWIN

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Also admitted in Massachusetts

May 8, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
160 West Street, Cromwell, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) antennas at the 64-foot level of the existing 76-foot tower at 160 West Street in Cromwell, Connecticut (the "Property"). The tower is owned by SBA. The Council approved Cellco's use of this tower in 2007 (Docket No. 338). Cellco now intends to replace six (6) of its existing antennas with three (3) model 742 213V01, 1900 MHz antennas and three (3) model 742 213V01, 2100 MHz antennas, all at the same 64-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable inside the monopole. 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 Cromwell Mayor, Enzo Faienza. A copy of this letter is being sent to 160 West Street LLC, the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's six (6) replacement antennas and RRHs will be located at the 64-foot level on the 76-foot tower.

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

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

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

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis 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:
Enzo Faienza, Cromwell Mayor
160 West Street LLC
Sandy M. Carter

ATTACHMENT 1

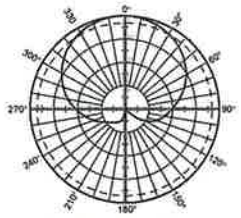
KATHREIN
SCALA DIVISION

742 213V01

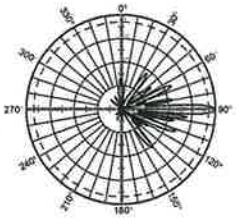
65° Panel Antenna

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

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



Horizontal pattern
±45°- polarization



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

General specifications:

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

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

RoHS
Lead-Free

11271-B
936.3740/b

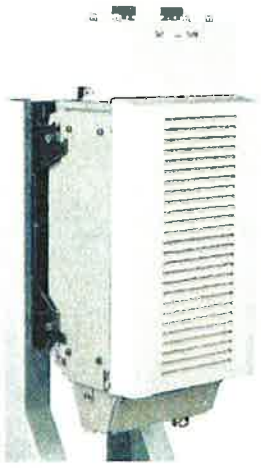
*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

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

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

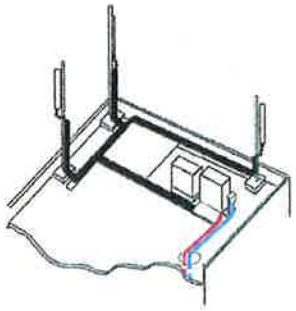
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

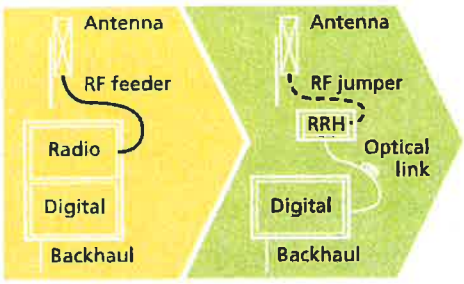
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

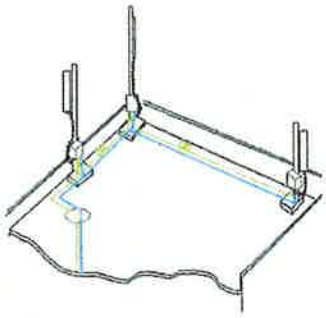
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

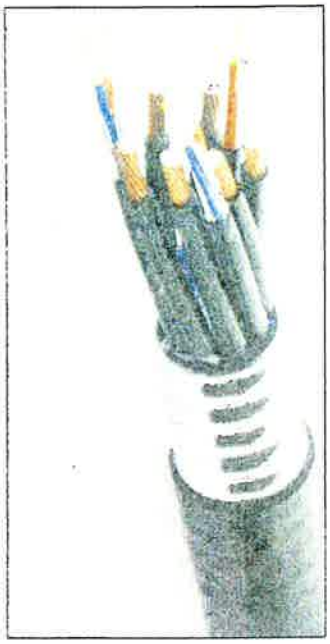


Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

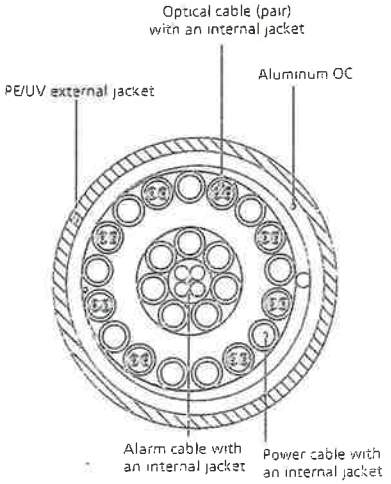


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

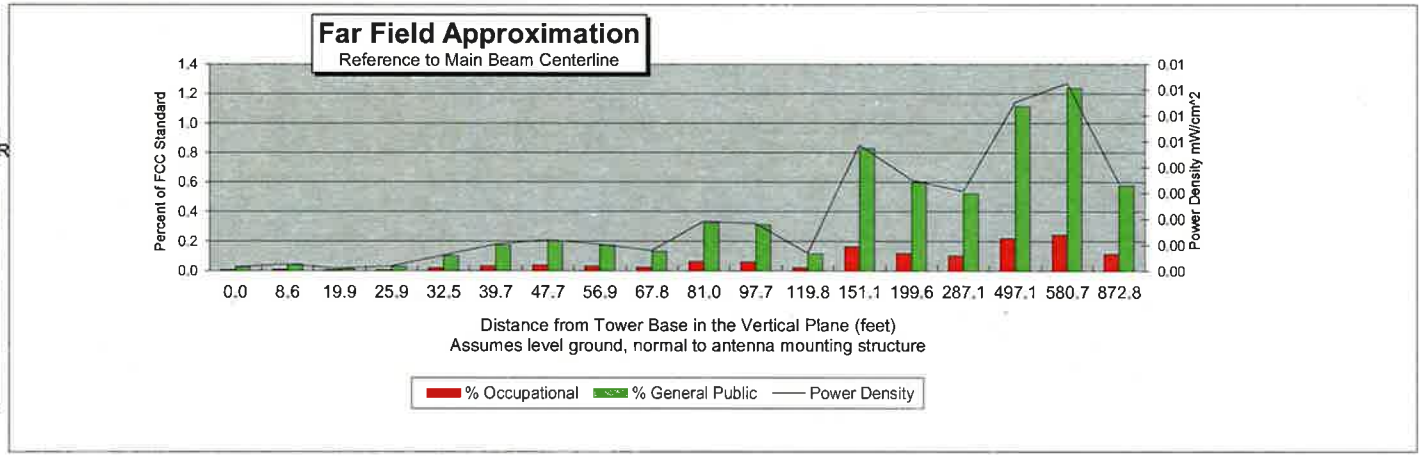
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	CROMWELL, CT
Site #:	
Date:	04/24/14
Name:	Jaime Laredo
File Name:	CROMWELL, CT - FF POWER

Operating Freq. (MHz)	**878.5**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**14.5**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**419.0**



This approximation is only valid in the far field, which begins at: 64.4 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0	
Solve for r, dx to antenna	61.0	61.6	64.2	66.3	69.1	72.8	77.4	83.4	91.2	101.4	115.2	134.4	162.9	208.7	293.5	500.8	583.9	874.9	
Distance from Antenna Structure Base in Horizontal plane	0.0	8.6	19.9	25.9	32.5	39.7	47.7	56.9	67.8	81.0	97.7	119.8	151.1	199.6	287.1	497.1	580.7	872.8	#NUM!
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	0
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	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	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.1	#NUM!
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.8	0.6	0.5	1.1	1.2	0.6	#NUM!

Antenna Type DB846F65ZAXY
Max% 1.24%

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 P<
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

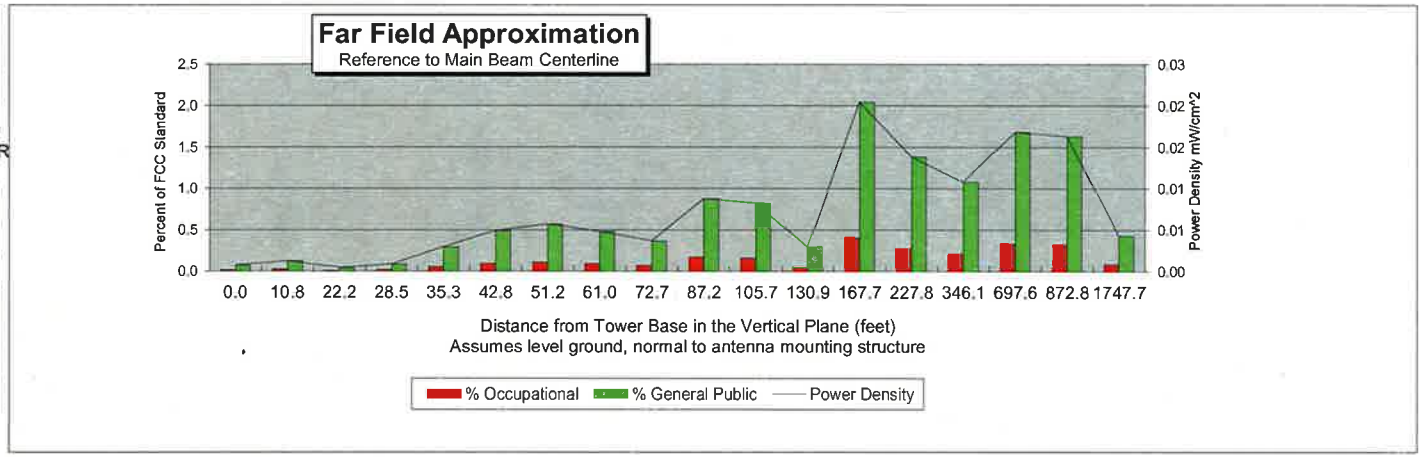
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	CROMWELL, CT
Site #:	
Date:	04/24/14
Name:	Jaime Laredo
File Name:	CROMWELL, CT - FF POWER

Operating Freq. (MHz)	**1973.8**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**14.5**
Antenna Size (in.):	**76.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**2114.0**



This approximation is only valid in the far field, which begins at: 73.4 Feet

Enter Main Beam Distance in feet below:

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	61.0	61.9	64.9	67.3	70.5	74.5	79.7	86.3	94.9	106.4	122.1	144.4	178.4	235.8	351.5	700.3	874.9	1748.8	
Distance from Antenna Structure Base in Horizontal plane	0.0	10.8	22.2	28.5	35.3	42.8	51.2	61.0	72.7	87.2	105.7	130.9	167.7	227.8	346.1	697.6	872.8	1747.7	#NUM!
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	0
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	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	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	#NUM!
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	0.4	0.3	0.2	0.3	0.3	0.1	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.8	0.3	2.0	1.4	1.1	1.7	1.6	0.4	#NUM!

Antenna Type KATHREIN 742213
Max% 2.04%

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.
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Far Field Approximation
with downtilt variation

Estimated Radiated Emission

Single Emitter Far Field Model

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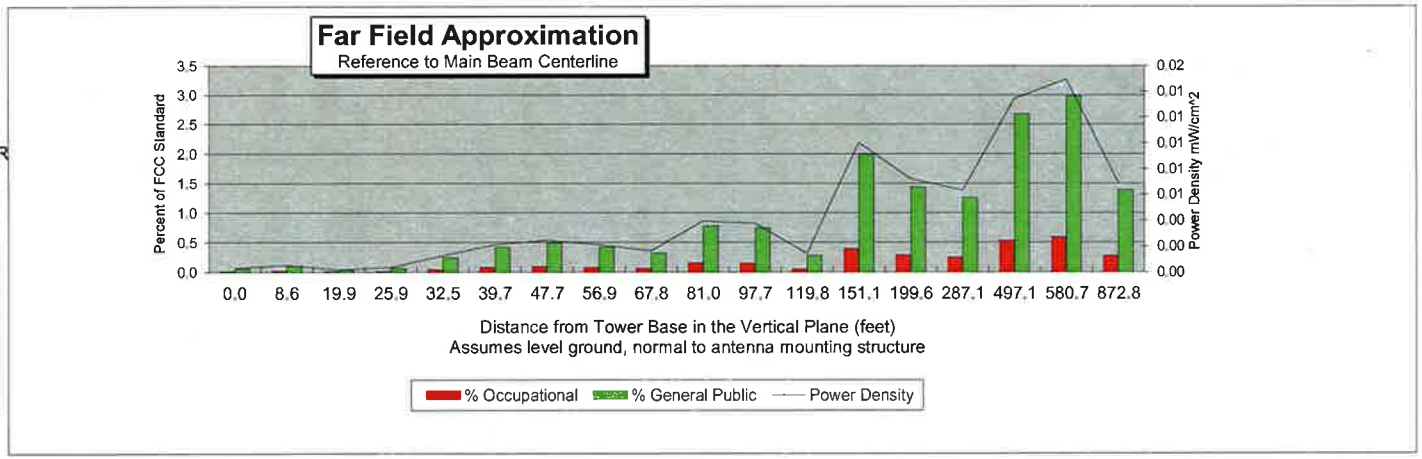
Location:	CROMWELL, CT
Site #:	
Date:	04/24/14
Name:	Jaime Laredo
File Name:	CROMWELL, CT - FF POWER

Operating Freq. (MHz)	**751.0**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**14.5**
Antenna Size (in.):	**71.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**862.0**



This approximation is only valid in the far field, which begins at: 62.6 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0	
Solve for r, dx to antenna	61.0	61.6	64.2	66.3	69.1	72.8	77.4	83.4	91.2	101.4	115.2	134.4	162.9	208.7	293.5	500.8	583.9	874.9	
Distance from Antenna Structure Base in Horizontal plane	0.0	8.6	19.9	25.9	32.5	39.7	47.7	56.9	67.8	81.0	97.7	119.8	151.1	199.6	287.1	497.1	580.7	872.8	#NUM!
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	0
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	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	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.3	0.5	0.6	0.3	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.2	0.4	0.5	0.4	0.3	0.8	0.8	0.3	2.0	1.4	1.3	2.7	3.0	1.4	#NUM!

Antenna Type BXA-70063-6CF-2
Max% 2.98%

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 P<
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

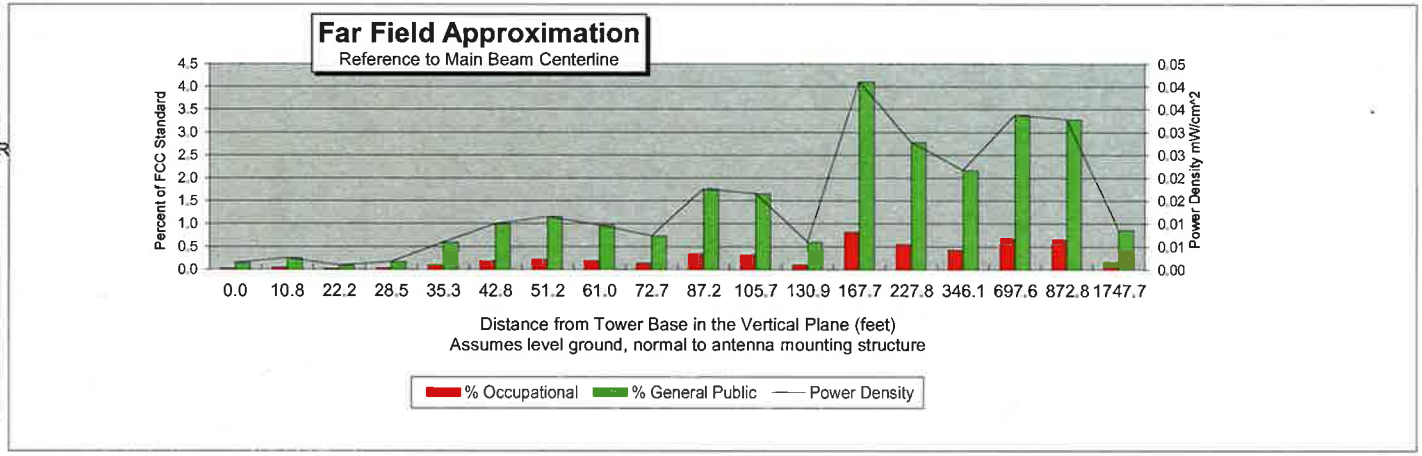
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	CROMWELL, CT
Site #:	
Date:	04/24/14
Name:	Jaime Laredo
File Name:	CROMWELL, CT - FF POWER

Operating Freq. (MHz)	**2120.0**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**17.5**
Antenna Size (in.):	**76.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**2114.0**



This approximation is only valid in the far field, which begins at: 73.4 Feet

Enter Main Beam Distance in feet below:

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	61.0	61.9	64.9	67.3	70.5	74.5	79.7	86.3	94.9	106.4	122.1	144.4	178.4	235.8	351.5	700.3	874.9	1748.8	
Distance from Antenna Structure Base in Horizontal plane	0.0	10.8	22.2	28.5	35.3	42.8	51.2	61.0	72.7	87.2	105.7	130.9	167.7	227.8	346.1	697.6	872.8	1747.7	#NUM!
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	0
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	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	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	0.04	0.03	0.02	0.03	0.03	0.01	#NUM!
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.4	0.3	0.1	0.8	0.6	0.4	0.7	0.7	0.2	#NUM!
Percent of General Population Standard	0.1	0.3	0.1	0.2	0.6	1.0	1.1	1.0	0.7	1.8	1.6	0.6	4.1	2.8	2.2	3.4	3.3	0.9	#NUM!

Antenna Type KATHREIN 742213
Max% 4.11%

Instructions:

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

ATTACHMENT 3

FDH Engineering, Inc., 6521 Meridien Drive Raleigh, NC 27616, Ph. 919.755.1012

Structural Analysis for SBA Network Services, Inc.

76' Monopole Tower

SBA Site Name: Middletown North
SBA Site ID: CT46122-A-01
Verizon Site Name: Cromwell

FDH Project Number 1425N61400

Analysis Results

Tower Components	64.2%	Sufficient
Foundation	80.4%	Sufficient

Prepared By:

Luis A Mendoza, EIT
Project Engineer

Reviewed By:

J. Darrin Holt, PhD, PE
Principal
CT PE License No. 22988

3/27/14

FDH Engineering, Inc.
6521 Meridien Drive
Raleigh, NC 27616
(919) 755-1012
info@fdh-inc.com

March 28, 2014

Prepared pursuant to TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 Connecticut State Building Code

TABLE OF CONTENTS

EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Engineering, Inc. performed a structural analysis of the monopole located in Cromwell, CT to determine whether the tower is structurally adequate to support both the existing and proposed loads pursuant to the *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, TIA/EIA-222-F* and the *2005 Connecticut State Building Code*. Information pertaining to the existing/proposed antenna loading, current tower geometry, geotechnical data, foundation dimensions, and member sizes was obtained from:

- TransAmerican Power Products, Inc. (Order No. TP-8949) original design drawings dated July 19, 2010
- Cell Trees, Inc. (Job No. 10-031) original design drawings dated February 17, 2010
- Clarence Welti Associates, Inc. (Job No. TW2-001) Geotechnical Study for Proposed Transcend Wirelss Tower dated February 1, 2010
- Vertical Solutions, Inc. (Project No. 110718.01 Rev 0) Rigorous Structural Analysis dated June 8, 2011
- SBA Network Services, Inc.

The *basic design wind speed* per the *TIA/EIA-222-F* standards and the *2005 Connecticut State Building Code* is 85 mph without ice and 50 mph with 3/4" radial ice. Ice is considered to increase in thickness with height.

Conclusions

With the existing and proposed antennas from Verizon in place at 64 ft, the tower meets the requirements of the *TIA-EIA-222-F* standards and the *2005 Connecticut State Building Code* provided the **Recommendations** listed below are satisfied. Furthermore, provided the foundation was designed and constructed to support the original design reactions (see Cell Trees Job No. 10-031), the foundation should have the necessary capacity to support the existing and proposed loading. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

Our structural analysis has been performed assuming all information provided to FDH Engineering, Inc. is accurate (i.e., the steel data, tower layout, existing antenna loading, and proposed antenna loading) and that the tower has been properly erected and maintained per the original design drawings.

Recommendations

To ensure the requirements of the *TIA/EIA-222-F* standards and the *2005 Connecticut State Building Code* are met with the existing and proposed loading in place, we have the following recommendations:

1. The proposed feed lines should be installed inside of the pole's shaft.
2. RRU/RRH Stipulation: The equipment may be installed in any configuration as determined by the client.

APPURTENANCE LISTING

The proposed and existing antennas with their corresponding cables/coax lines are shown in **Table 1**. *If the actual layout determined in the field deviates from the layout, FDH Engineering, Inc. should be contacted to perform a revised analysis.*

Table 1 - Appurtenance Loading

Existing Loading:

Antenna Elevation (ft)	Description	Feed Lines[1]	Carrier	Mount Elevation (ft)	Mount Type
---	4-ft Branches	---	---	75.5	Direct
75	(6) Andrew HBX-6516DS-VTM (6) Andrew ATM200-A20 RETs	(12) 7/8" (6) 3/8"	Metro PCS	75	(3) T-Arms (Assumed C_AA_A = 7.28 ft² ea.)
---	Antenna Branches	---	---	74	Direct
	6-ft Branches			67.1	
64	(6) Antel LPA-185063/8CF (4) Andrew DB846F65ZAXY (3) Antel BXA-70063/6CF (2) Andrew DB846H80E-SX	(18) 1-5/8"	Verizon	64	(3) T-Arms (Assumed C_AA_A = 7.28 ft² ea.)
---	8-ft Branches	---	---	55.4	Direct
	10-ft Branches			42.3	

1. Feed lines installed inside the pole's shaft unless otherwise noted.

Proposed Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
64	(6) Kathrein 742 213 (4) Andrew DB846F65ZAXY (2) Andrew DB846H80E-SX (3) Antel BXA-70063-6CF (3) Alcatel Lucent RRH2x40-AWS RRHs (1) RFS DB-T1-6Z-8AB-0Z Distribution Box	(18) 1-5/8" (1) 1-5/8" Hybrid	Verizon	64	(3) T-Arms (Assumed C_AA_A = 7.28 ft² ea.)

RESULTS

The following yield strength of steel for individual members was used for analysis:

Table 2 - Material Strength

Member Type	Yield Strength
Tower Shaft Sections	65 ksi
Base Plate	60 ksi
Anchor Bolts	75 ksi

Table 3 displays the summary of the ratio (as a percentage) of force in the member to their capacities. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. **Table 4** displays the maximum foundation reactions.

If the assumptions outlined in this report differ from actual field conditions, FDH Engineering, Inc. should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the existing or proposed appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information

Table 3 - Summary of Working Percentage of Structural Components

Section No.	Elevation ft	Component Type	Size	% Capacity	Pass Fail
L1	76 - 23	Pole	TP38.039x22x0.25	62.7	Pass
L2	23 - 0	Pole	TP44.5x35.9502x0.3125	64.2	Pass
		Anchor Bolts	(10) 2.625"Ø w/BC = 54"	48.4	Pass
		Base Plate	PL 60"Ø x 2" Thick	63.2	Pass

*Capacities include 1/3 allowable stress increase for wind per the *TIA/EIA-222-F* standards.

Table 4 - Maximum Base Reactions

Base Reactions	Current Analysis *(TIA/EIA-222-F)*	Original Design *(TIA/EIA-222-F)*
Axial	12 k	21 k
Shear	23 k	31 k
Moment	1,319 k-ft	1,641 k-ft

GENERAL COMMENTS

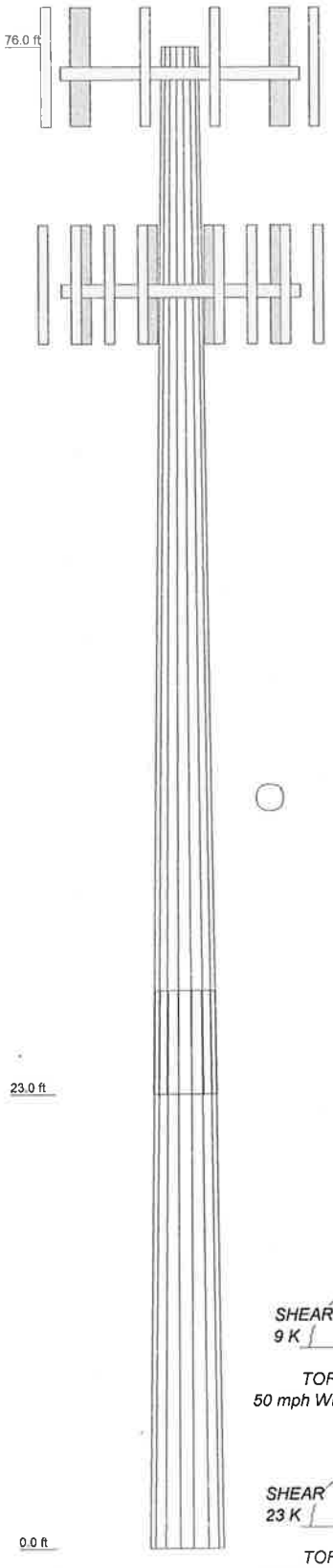
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading information) modeled. If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, FDH Engineering, Inc. should be notified immediately to perform a revised analysis.

LIMITATIONS

All opinions and conclusions are considered accurate to a reasonable degree of engineering certainty based upon the evidence available at the time of this report. All opinions and conclusions are subject to revision based upon receipt of new or additional/updated information. All services are provided exercising a level of care and diligence equivalent to the standard and care of our profession. No other warranty or guarantee, expressed or implied, is offered. Our services are confidential in nature and we will not release this report to any other party without the client's consent. The use of this engineering work is limited to the express purpose for which it was commissioned and it may not be reused, copied, or distributed for any other purpose without the written consent of FDH Engineering, Inc.

APPENDIX

Section	1	2
Length (ft)	53.00	28.25
Number of Sides	18	18
Thickness (in)	0.2500	0.3125
Socket Length (ft)	5.25	
Top Dia (in)	22.0000	35.9502
Bot Dia (in)	38.0390	44.5000
Grade	A572-65	
Weight (K)	4.3	3.8



AXIAL
18 K
SHEAR
9 K
MOMENT
547 kip-ft
TORQUE 0 kip-ft
50 mph WIND - 0.7500 in ICE

AXIAL
12 K
SHEAR
23 K
MOMENT
1319 kip-ft
TORQUE 1 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
4-ft Branches	75.45	DB846F65ZAXY w/ Mount Pipe	64
(2) HBX-6516DS-VTM w/ Mount Pipe	75	DB846F65ZAXY w/ Mount Pipe	64
(2) HBX-6516DS-VTM w/ Mount Pipe	75	DB846H80E-SX w/ Mount Pipe	64
(2) HBX-6516DS-VTM w/ Mount Pipe	75	DB846H80E-SX w/ Mount Pipe	64
(2) ATM200-A20	75	BXA-70063-6CF w/ Mount Pipe	64
(2) ATM200-A20	75	BXA-70063-6CF w/ Mount Pipe	64
(2) ATM200-A20	75	BXA-70063-6CF w/ Mount Pipe	64
(3) T-Arms	75	RRH2x40-AWS	64
Antenna Branches	74	RRH2x40-AWS	64
6-ft Branches	67.06	RRH2x40-AWS	64
(2) 742 213 w/ Mount Pipe	64	DB-T1-6Z-8AB-0Z	64
(2) 742 213 w/ Mount Pipe	64	(3) T-Arms	64
(2) 742 213 w/ Mount Pipe	64	8-ft Branches	55.44
(2) DB846F65ZAXY w/ Mount Pipe	64	10-ft Branches	42.31

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. TOWER RATING: 64.2%

FDH Engineering, Inc.
6521 Meridien Drive
Raleigh, North Carolina
Phone: 9197551012
FAX: 9197551031
Tower Analysis

Job: Middletown North, CT46122-A-01			
Project: 1425N61400			
Client: SBA Network Services, Inc.	Drawn by: LMendoza	App'd:	
Code: TIA/EIA-222-F	Date: 03/27/14	Scale: NTS	
Path:		Dwg No. E-1	