

September 25, 2015

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:

On May 29, 2014, the Council acknowledged the Cellco Partnership d/b/a Verizon Wireless (“Cellco”) notice of intent to modify its facility at 160 West Street in Cromwell (EM-VER-033-140512). To date, that work described in that filing has not been completed. Cellco has since revised the scope of its planned modifications to the 160 West Street facility and submits this modified notice for your review.

As discussed, 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 SBNHH-1D65B, 1900 MHz antennas and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) existing remote radio heads (“RRHs”), and install six (6) new RRHs 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 Cromwell Mayor, Anthony J. Salvatore. A copy of this letter is also being sent to 160 West Street LLC, the owner of the Property and SBA, the tower owner.

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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 replacement antennas and RRH's will be located on its existing platform at the 64-foot level on the 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. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions safety 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:

Anthony J. Salvatore, Cromwell Mayor
160 West Street LLC
Victoria Barrios, SBA
Tim Parks

ATTACHMENT 1



SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR Return Loss, dB	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0° 14.6	0° 14.5	0° 17.4	0° 17.8	0° 18.1	0° 18.2
	7° 14.6	7° 14.4	3° 17.5	3° 17.9	3° 18.3	3° 18.4
	14° 14.2	14° 13.6	7° 17.4	7° 17.9	7° 18.2	7° 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® Teletilt®
Operating Frequency Band	1695 – 2360 MHz 698 – 896 MHz
Performance Note	Outdoor usage

SBNHH-1D65B

POWERED BY



Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h 150.0 mph

Dimensions

Depth	181.0 mm 7.1 in
Length	1851.0 mm 72.9 in
Width	301.0 mm 11.9 in
Net Weight	18.4 kg 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female 8-pin DIN Male
RET Interface, quantity	1 female 1 male
RET System	Teletilt®

Packed Dimensions

Depth	299.0 mm 11.8 in
Length	1970.0 mm 77.6 in
Width	409.0 mm 16.1 in
Shipping Weight	31.0 kg 68.3 lb

Regulatory Compliance/Certifications

Agency

RoHS 2011/65/EU
China RoHS SJ/T 11364-2006
ISO 9001:2008

Classification

Compliant by Exemption
Above Maximum Concentration Value (MCV)
Designed, manufactured and/or distributed under this quality management system



Included Products

Product Specifications

COMMSCOPE®

SBNHH-1D65B



BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* **Footnotes**

Performance Note Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.



The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

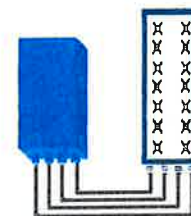
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R
Can be switched between
modes via SW w/o site
visit

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)
Volume in L	38 (with solar shield)
Weight in kg (lb) (w/o mounting HW)	26 (57.2) (with solar shield)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions	-40°C (-40°F) / +55°C (+131°F)
Wind load (@150km/h or 93mph)	IP65 Frontal: <200N / Lateral : <150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

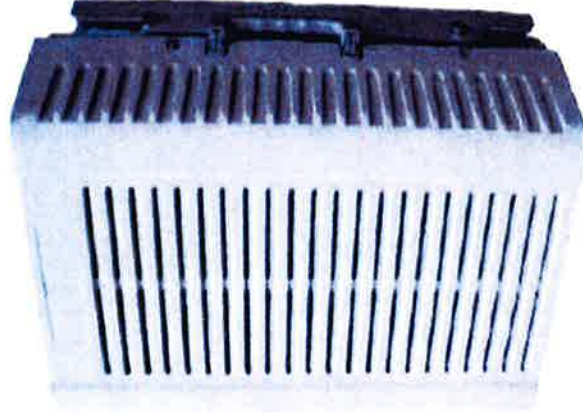
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PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

RRH2x60	
RF Output Power	2X60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features	AISG 2.0 for RET/TMA Internal Smart Bias-T
Power	-48VDC
CPRI Ports	2 CPRI Rate 3 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (top mounted)



** Not a Verizon Wireless deployed product

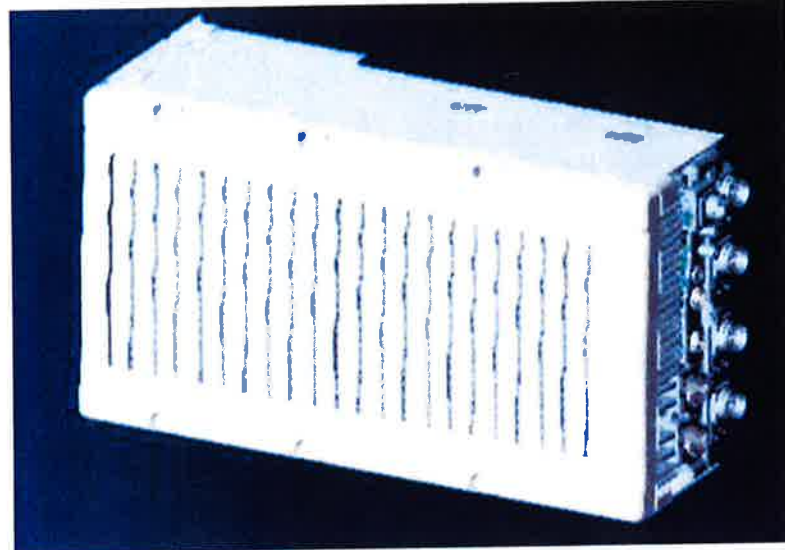
ALCATEL-LUCENT – CONFIDENTIAL – SOLELY FOR AUTHORIZED PERSONS HAVING A NEED TO KNOW – PROPRIETARY – USE PURSUANT TO COMPANY INSTRUCTION

NEW PCS RF MODULES FOR VZW

RRH2X60 - HW CHARACTERISTICS

LR14.3

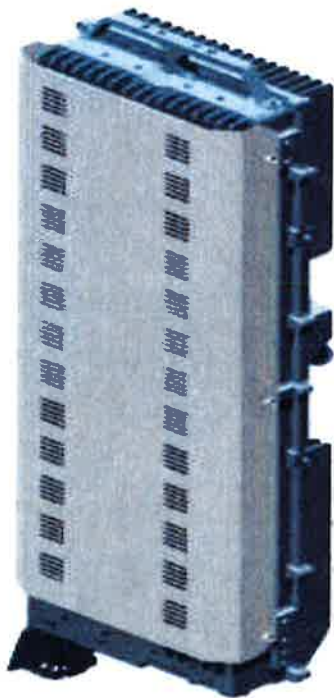
RRH2X60	
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w) x 9.4" (d)**
Weight	55lb**



** - Includes solar shield but not mounting brackets (8 lbs.)

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.



A distributed Node B expands the 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 a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-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.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

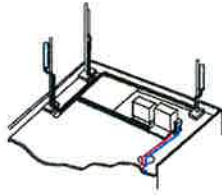
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

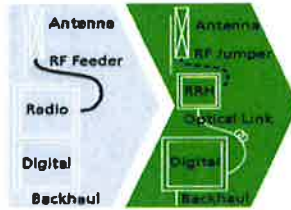
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

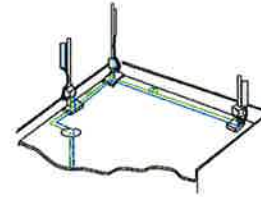
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and

silent solutions, with minimum impact on the neighborhood, which ease the deployment

- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisy chaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

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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

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 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)
Resistance Properties			
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	068 (0.205)
DC-Resistance Power Cable, 8.4mm ² (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
Fiber 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
Operating Temperature			
Installation Temperature	(°C (°F))		-40 to +65 (-40 to 149)
Operation Temperature	(°C (°F))		-40 to +65 (-40 to 149)

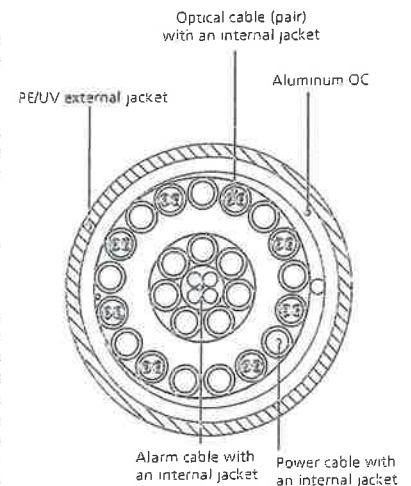


Figure 2: Construction Detail

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

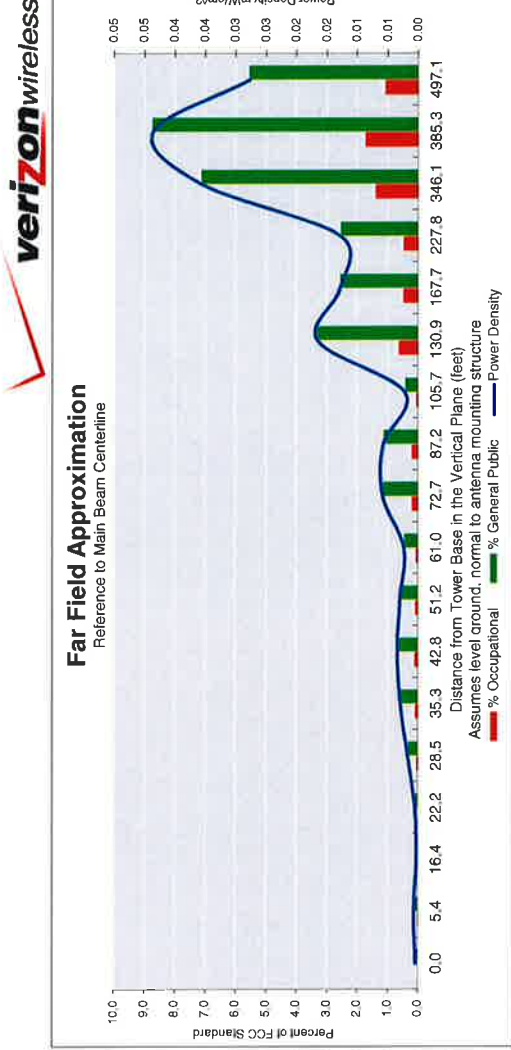
* This data is provisional and subject to change

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 #:	8-0556
Date:	09/18/15
Name:	Jaime Laredo
File Name:	CROMWELL CT - FF POWER (LTE-700).xlsx
Operating Freq. (MHz):	746.0
Antenna Height (ft):	64.0
Antenna Gain (dBi):	14.8
Antenna Size (in.):	72.0
Downtilt (degrees):	5.0
Feedline Loss (dB):	0.0
ERP (W):	1050.0
No. of Channels:	1



Calc Angle	90.0	85.0	80.0	75.0	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	9.0	7.0
Solve for r, dx to antenna	61.0	61.2	63.2	64.9	67.3	70.5	70.5	74.5	79.7	86.3	94.9	106.4	122.1	144.4	178.4	235.8	351.5	390.1	500.8
Distance from Antenna Structure Base in Horizontal plane	0.0	5.4	16.4	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	385.3	497.1	
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/cm²)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.04	0.04	0.03
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.7	0.5	0.5	1.4	1.8	1.1
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.6	0.7	0.6	0.5	1.2	1.2	1.2	0.4	3.3	2.6	2.6	7.1	8.8	5.6

Antenna Type: 5BNHH-1D65B
Max%: 8.78%

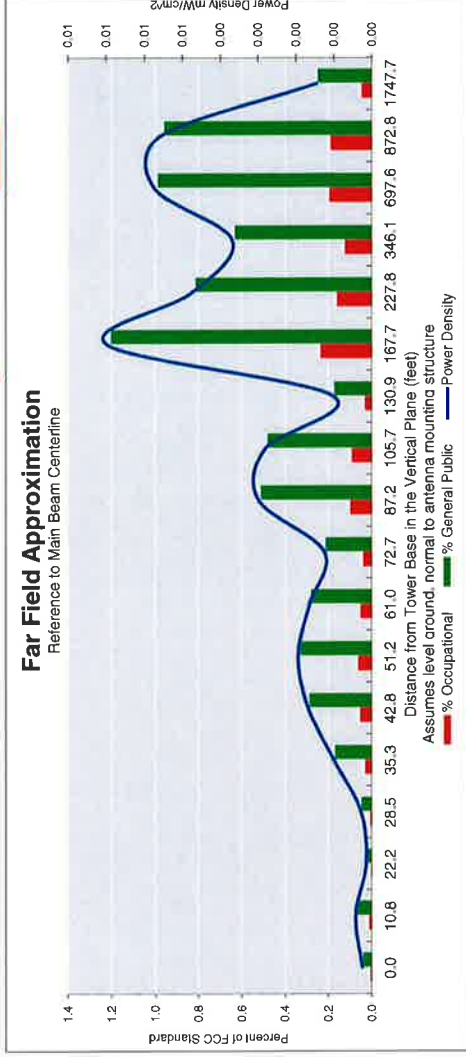


Far Field Approximation
with downtilt variation

**Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types**



Location:	CROMWELL CT
Site #:	8-0556
Date:	09/18/15
Name:	Jaime Laredo
File Name:	CROMWELL CT - FF POWER (Cellular).xlsx
Operating Freq. (MHz):	869.0
Antenna Height (ft):	64.0
Antenna Gain (dBi):	16.7
Antenna Size (in.):	72.0
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
ERP (W):	438.3
No. of Channels:	9



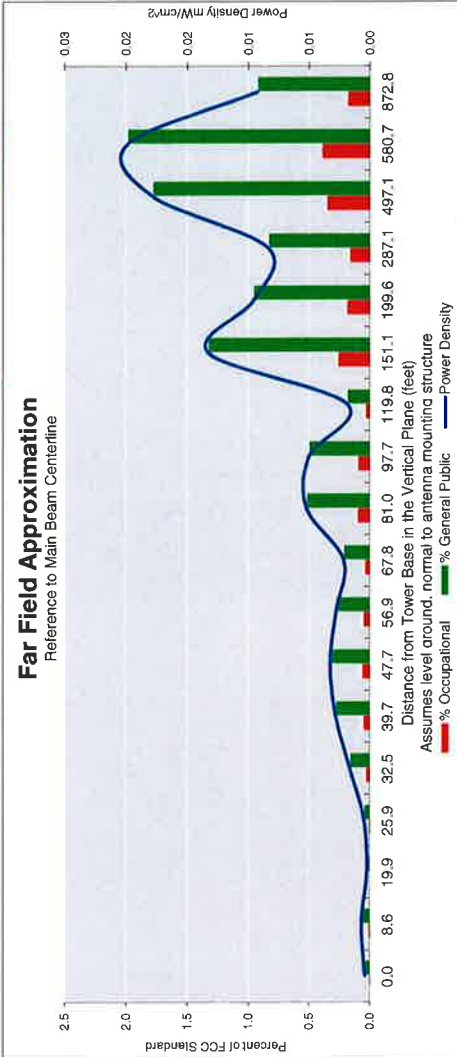
Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	61.0	61.9	64.9	67.3	70.5	74.5	79.7	86.3	94.9	106.4	122.1	144.4	178.4	235.8	351.5	700.3	874.9	1748.8
Distance from Antenna Structure Base in Horizontal plane	0.0	10.8	22.2	28.5	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
Angle from Main Beam (referenced 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	0.2	0.2	0.1	0.2	0.2	0.1
Percent of General Population Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.5	0.2	1.2	0.8	0.6	1.0	1.0	0.3

Antenna Type: DB846F65ZAXY
MaxRx: 1.21%

Far Field Approximation
with downtilt variation

**Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types**

Location:	CROMWELL CT
Site #:	8-0556
Date:	09/18/15
Name:	Jaime Laredo
File Name:	CROMWELL CT - FF POWER (PCS).xlsx
Operating Freq. (MHz):	1970.0
Antenna Height (ft):	64.0
Antenna Gain (dBi):	18.4
Antenna Size (in.):	72.0
Downtilt (degrees):	2.0
Feedline Loss (dB):	0.0
ERP (W):	468.6
No. of Channels:	11



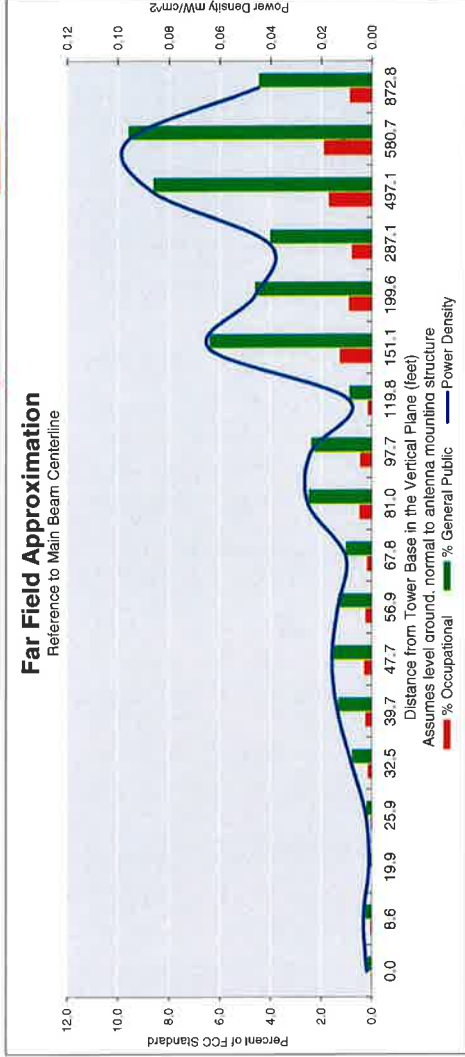
Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	61.0	61.6	64.2	66.3	69.1	72.8	77.4	83.4	91.2	101.4	115.2	134.4	162.9	208.7	293.5	500.8	583.9	874.9
Distance from Antenna Structure Base in Horizontal plane	0.0	8.6	19.9	25.9	32.5	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
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	2.56	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	0.00	2.56	0.00	2.56	0.00	2.56	0.00	2.56	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.01
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	0.01	0.01	0.01	0.01	0.02	0.02	0.01
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	0.1	0.3	0.2	0.2	0.4	0.4	0.2
Percent of General Population Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.5	0.2	1.3	1.0	0.8	1.8	2.0	0.9

Antenna Type: **SBNHH-1D65B**
Max%: **1.99%**

**Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types**



Location:	CROMWELL CT
Site #:	8-0556
Date:	09/18/15
Name:	Jaime Laredo
File Name:	CROMWELL CT - FF POWER (LTE-AWS).xlsx
Operating Freq. (MHz):	2145.0
Antenna Height (ft):	64.0
Antenna Gain (dBi):	18.3
Antenna Size (in.):	72.0
Downtilt (degrees):	2.0
Feedline Loss (dB):	0.0
ERP (W):	2306.5
No. of channels:	1



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	206.7	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
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/cm²)	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.03	0.02	0.01	0.06	0.05	0.04	0.09	0.10	0.04
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.2	0.2	1.3	0.9	0.8	1.7	1.9	0.9
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.8	1.4	1.6	1.3	1.0	2.5	2.4	0.9	6.4	4.6	4.1	8.6	9.6	4.5

Antenna Type: 5BNHH-1065B
Max%: 9.61%

ATTACHMENT 3



FDH Velocitel, 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 ID: Cromwell**

FDH Velocitel Project Number 15BXUI1400

Analysis Results

Tower Components	71.7%	Sufficient
Foundation	88.4%	Sufficient

Prepared By:

Cary J. Webb, PE
Project Engineer II

Reviewed By:

Dennis D. Abel, PE
Director of Structural Engineering
CT PE License No. 23247

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



August 13, 2015

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

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EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Velocitel 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 constructed per the original design drawings (see Cell Trees Job No. 10-031), and given the soil parameters (see Clarence Welti Associates, Inc. Job No. TW2-001), 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 Velocitel 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.

Recommendation

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 recommendation:

1. The proposed feed lines should be installed inside of the pole's shaft.
2. RRU/RRH Stipulation: The proposed and existing equipment may be installed in any arrangement 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 Velocitel 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
75	(3) Ericsson Air 21 B2A/B4P (3) Ericsson Air 21 B4A/B2P (6) Andrew ATM200-A20	(12) 7/8" (1) 1-5/8" Fiber (6) 3/8"	T-Mobile	75	(3) 12.5" T-Arms (Valmont Site Pro P/N RMV12-3xx)
64	(6) Kathrein 742 213 (4) Andrew DB846F65ZAXY (2) Andrew DB846H80E-SX (3) Antel BXA-70063-6CF (3) Alcatel Lucent RRH2x40-AWS (1) RFS DB-T1-6Z-8AB-0Z	(18) 1-5/8" (1) 1-5/8" Hybrid	Verizon	64	(3) T-Arms (Assumed C _A A _A = 7.28 ft ² ea.)

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

Proposed Carrier Final Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
64	(4) Andrew DB846F65ZAXY (2) Andrew DB846H80E-SX (9) Commscope SBNHH-1D65B (3) Alcatel Lucent RRH2x60-AWS (3) Alcatel Lucent RRH2x60-700 (3) Alcatel Lucent RRH2x60-PCS (2) RFS DB-T1-6Z-8AB-0Z	(18) 1-5/8" (2) 1-5/8" Hybrid	Verizon	64	(3) T-Arms (Assumed C _A A _A = 7.28 ft ² 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 Velocitel 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	70.9	Pass
L2	23 - 0	Pole	TP44.5x35.9502x0.3125	71.7	Pass
		Anchor Bolts	(10) 2.625"Ø w/BC = 54"	53.9	Pass
		Base Plate	PL 60"Ø x 2" Thick	70.5	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	14 k	21 k
Shear	25 k	31 k
Moment	1,472 k-ft	1,641 k-ft

*Foundation determined adequate per independent analysis.

GENERAL COMMENTS

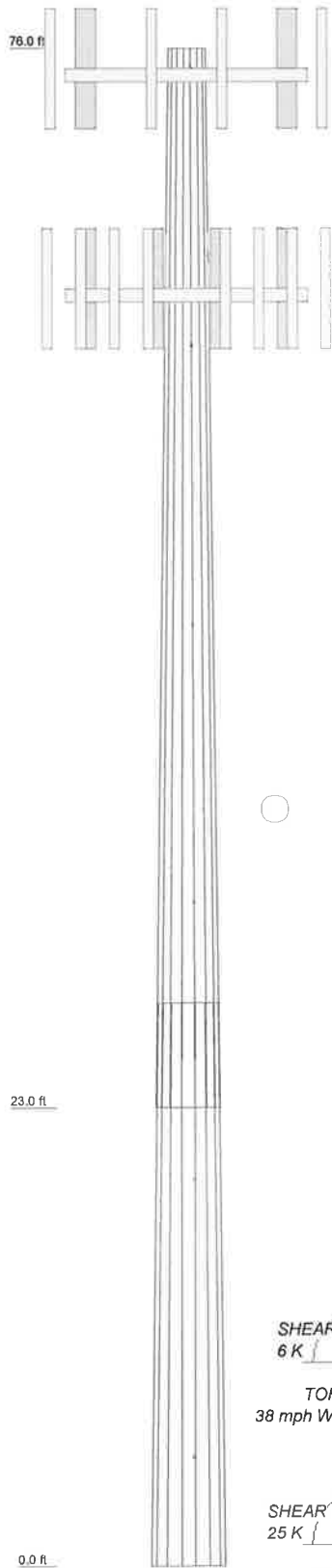
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading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

APPENDIX

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



DESIGNED APPURTENANCE LOADING

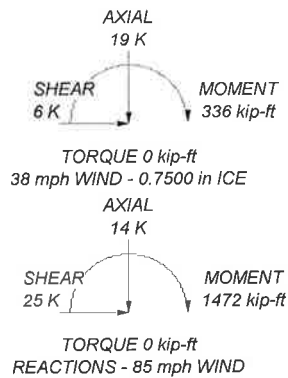
TYPE	ELEVATION	TYPE	ELEVATION
4-ft Branches	75.45	(3) SBNHH-1D65B w/ Mount Pipe	64
AIR 21 B2A/B4P w/Mount Pipe	75	(3) SBNHH-1D65B w/ Mount Pipe	64
AIR 21 B2A/B4P w/Mount Pipe	75	(3) SBNHH-1D65B w/ Mount Pipe	64
AIR 21 B2A/B4P w/Mount Pipe	75	RRH2X60-AWS	64
AIR 21 B4A/B2P w/Mount Pipe	75	RRH2X60-AWS	64
AIR 21 B4A/B2P w/Mount Pipe	75	RRH2X60-AWS	64
AIR 21 B4A/B2P w/Mount Pipe	75	RRH2X60-PCS	64
(2) ATM200-A20	75	RRH2X60-PCS	64
(2) ATM200-A20	75	RRH2X60-PCS	64
(2) ATM200-A20	75	RRH2x60-700	64
(3) T-Arms	75	RRH2x60-700	64
Antenna Branches	74	RRH2x60-700	64
6-ft Branches	67.06	DB-T1-6Z-8AB-0Z	64
(2) DB846F65ZAXY w/ Mount Pipe	64	DB-T1-6Z-8AB-0Z	64
DB846F65ZAXY w/ Mount Pipe	64	(3) T-Arms	64
DB846F65ZAXY w/ Mount Pipe	64	8-ft Branches	55.44
DB846H80E-SX w/ Mount Pipe	64	10-ft Branches	42.31
DB846H80E-SX w/ Mount Pipe	64		

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 38 mph basic wind with 0.75 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 71.7%



	FDH Velocitel		Job: Middletown North, CT46122-A-01	
	6521 Meriden Drive, Suite 107 Raleigh, North Carolina 27616		Project: 15BXUI1400	
Tower Analysis	Phone: 9197551012	Client: SBA Network Services, Inc.	Drawn by: Cary Webb	App'd:
FAX: 9197551031		Code: TIA/EIA-222-F	Date: 08/13/15	Scale: NTS
		Path:		Dwg No. E-1