Robinson+Cole

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Also admitted in Massachusetts

May 4, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
101 Burbank Road, Ellington, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 177-foot level on an existing 189-foot self-supporting lattice tower at 101 Burbank Road in Ellington (the "Property"). The tower is owned by SBA. Cellco's use of the tower was approved by the Council in 2000. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model BXA-70080-4CF, 850 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the 177-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs"), one (1) each behind its 1900 MHz and 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Maurice W. Blanchette, First Selectman of the Town of Ellington. A copy of this letter is also being sent to Donald E. and Rosalie M. Stavens, Trustees, the owners 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. The replacement antennas and RRHs will be installed on Cellco's existing antenna height of 177 feet.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table with Cellco's modified facility is included in Attachment 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* 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:
Maurice W. Blanchette, Ellington First Selectman
Donald E. and Rosalie M. Stavens, Trustees
Tim Parks

ATTACHMENT 1

BXA-70080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 dBd

Replace "X" with desired electrical downtilt.

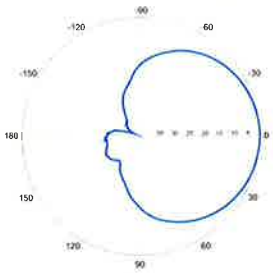
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	82°	80°
Vertical beamwidth	17°	15°
Gain	11.5 dBd (13.6 dBi)	12.0 dBd (14.1 dBi)
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-11.8 dB	-13.1 dB
Front-to-back ratio (+/-30°)	-30.3 dB	-36.7 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -30 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	

Mechanical Characteristics				
Dimensions Length x Width x Depth	1206 x 204 x 151 mm		47.5 x 8.0 x 5.9 in	
Depth with z-brackets	196 mm		7.7 in	
Weight without mounting brackets	5.4 kg		12 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.25 m²	Side: 0.18 m²	Front: 2.6 ft²	Side: 1.9 ft²
Wind load @ 161 km/hr (100 mph)	Front: 351 N	Side: 280 N	Front: 79 lbf	Side: 61 lbf

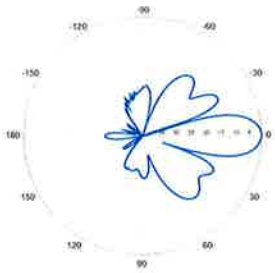
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit	36210006	40-115 mm 1.57-4.5 in	4.1 kg 9 lbs
Concealment Configurations	For concealment configurations, order BXA-70080-4CF-EDIN-X-FP		

BXA-70080-4CF-EDIN-X



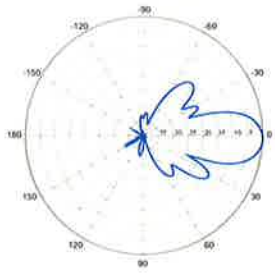
Horizontal | 750 MHz

BXA-70080-4CF-EDIN-0

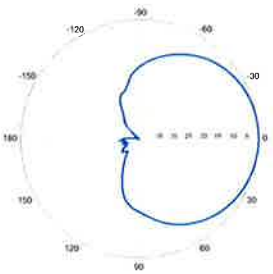


0° | Vertical | 750 MHz

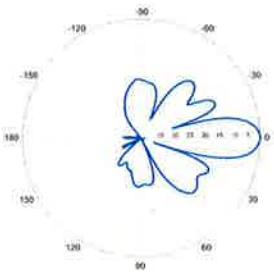
BXA-70080-4CF-EDIN-2



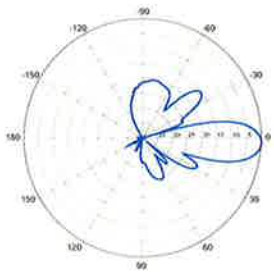
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

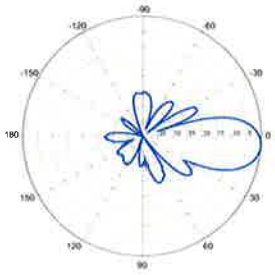


2° | Vertical | 850 MHz

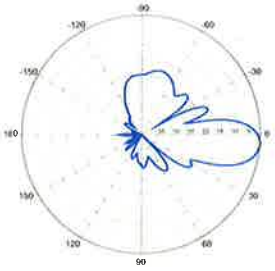
BXA-70080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 dBd

BXA-70080-4CF-EDIN-4

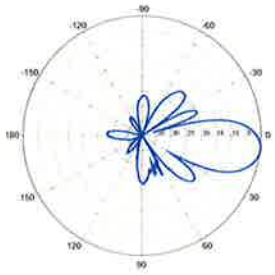


4° | Vertical | 750 MHz

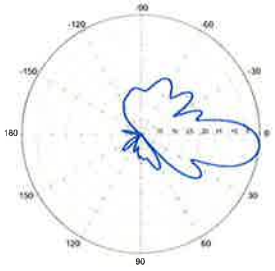


4° | Vertical | 850 MHz

BXA-70080-4CF-EDIN-6

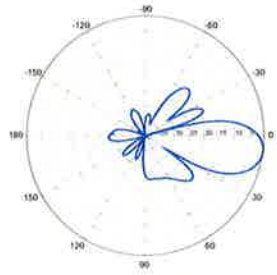


6° | Vertical | 750 MHz

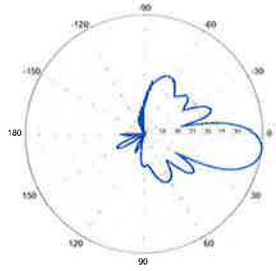


6° | Vertical | 850 MHz

BXA-70080-4CF-EDIN-8

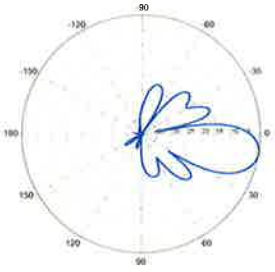


8° | Vertical | 750 MHz

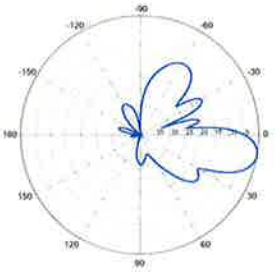


8° | Vertical | 850 MHz

BXA-70080-4CF-EDIN-10

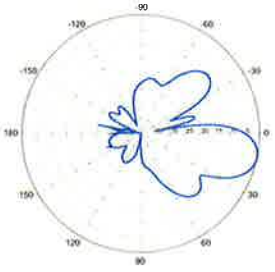


10° | Vertical | 750 MHz

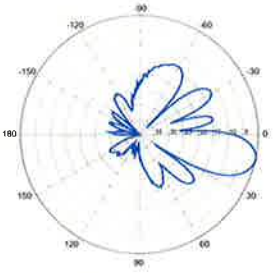


10° | Vertical | 850 MHz

BXA-70080-4CF-EDIN-12

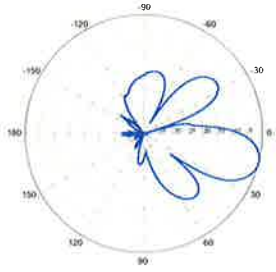


12° | Vertical | 750 MHz

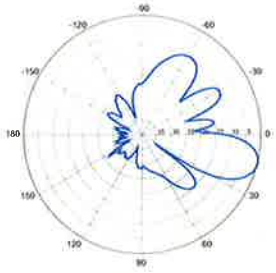


12° | Vertical | 850 MHz

BXA-70080-4CF-EDIN-14



14° | Vertical | 750 MHz



14° | Vertical | 850 MHz

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	11	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4	0 ° | 18.4	0 ° | 18.7
	3 ° | 18.7	3 ° | 18.7	3 ° | 18.9
	6 ° | 18.4	6 ° | 18.5	6 ° | 18.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9

* 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® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6517DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1903.0 mm | 74.9 in
Width	305.0 mm | 12.0 in
Net Weight	19.5 kg | 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

600899A-2 — 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.

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	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)

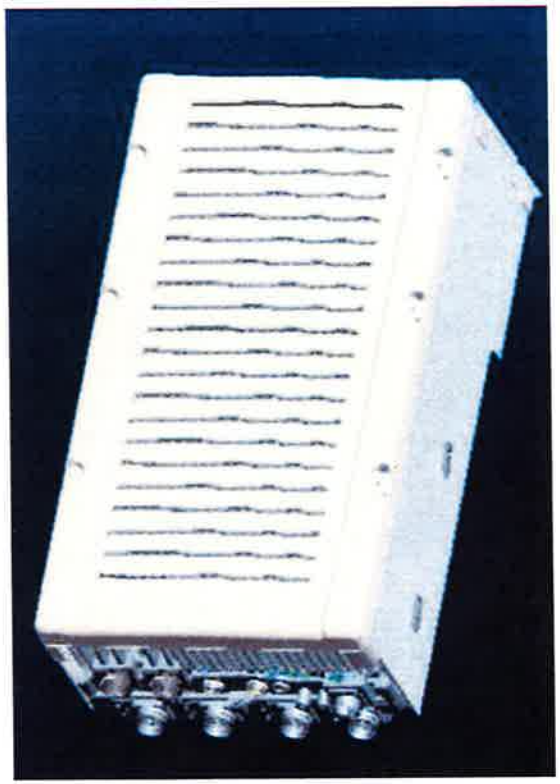
** Not a Verizon Wireless deployed product

Alcatel·Lucent

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

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.

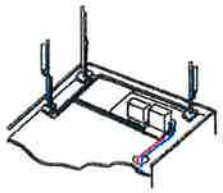
EASY INSTALLATION

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.

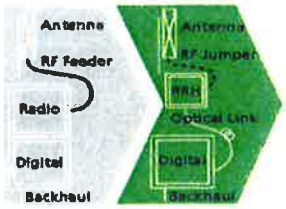
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

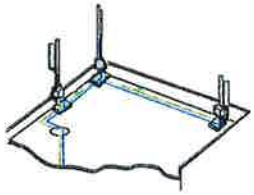
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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 daisychaining 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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

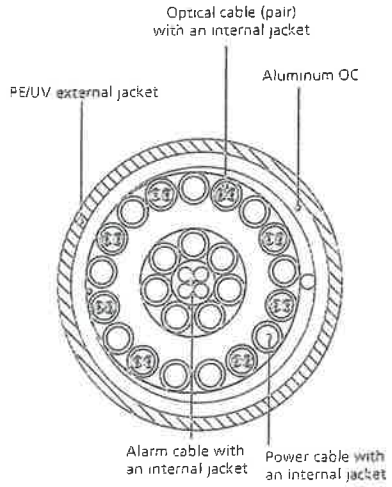


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Ellington								
Tower Height: 181.5Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*T-Mobile-LTE	1	865	182.5	0.0093	700	0.4667	2.00%	
*T-Mobile GSM/UMTS/LTE	6	1102	182.5	0.0714	1900	1.0000	7.14%	
*Crossroads	1	500	196	0.0047	152.35	0.2000	2.34%	
*Crossroads	backup for above antenna							
*AT&T UMTS	2	565	156	0.0167	880	0.5867	2.85%	
*AT&T UMTS	2	1077	156	0.0318	1900	1.0000	3.18%	
*AT&T GSM	1	647	156	0.0096	880	0.5867	1.63%	
*AT&T GSM	4	813	156	0.0480	1900	1.0000	4.80%	
*AT&T LTE	1	1615	156	0.0239	734	0.4893	4.88%	
Verizon PCS	**11**	**383**	**177**	**0.0484**	**1970**	**1.0000**	**4.84%**	
Verizon Cellular	**9**	**371**	**177**	**0.0383**	**869**	**0.5793**	**6.61%**	
Verizon AWS	**1**	**1750**	**177**	**0.0201**	**2145**	**1.0000**	**2.01%**	
Verizon 700	**1**	**1050**	**177**	**0.0121**	**746**	**0.4973**	**2.42%**	
								44.70%
* Source: Siting Council								

ATTACHMENT 3

FDH VELOCITEL
ENGINEERING INNOVATION

FDH Velocitel, 6521 Meridien Drive Raleigh, NC 27616, Ph. 919.755.1012, Fax 919.755.1031

Structural Analysis for SBA Network Services, Inc.

181.5' Self-Support Tower (189' AGL)

SBA Site Name: Ellington
SBA Site ID: CT10008-A-04
Verizon Site Name: Ellington
Site Address: 101 Burbank Road, Ellington, CT 06029

FDH Project Number 15BJUS1400

Analysis Results

Tower Components	64.4 %	Sufficient
Foundation	71.3 %	Sufficient

Prepared By:

Anne E. Vago, EI
Project Engineer

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

09-14-2015

April 14, 2015

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Velocitel performed a structural analysis of the existing self-supported tower located in Ellington, 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, soil parameters, current tower geometry, the member sizes, and foundation dimensions was obtained from:

- Rohn Industries (File No. 42895AE) original tower and foundation drawings dated April 3, 2000
- Applied Earth Technologies (Site Address 101 Burbank Rd. Ellington ,CT) Report on Subsurface Investigation dated February 14, 2000
- FDH Inc. (Project No. 07-0316T) TIA Inspection Report dated April 11, 2007
- 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 38 mph with 1 " radial ice. Ice is considered to increase in thickness with height.

Conclusions

With the existing and proposed antennas from Verizon in place at 78 ft and 177 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 foundations were designed and constructed to support the original design reactions (see Rohn Industries File No. 42895AE), the foundations 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.

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. Feed lines must be installed as shown in **Figure 1**.
2. RRU/RRH Stipulation: The proposed 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
194.5	(1) Decibel DB222-A Dipole	(1) 1-1/4"	NE Site Management	189	Direct Mount
182.5	(3) EMS RR90-17-02DP (3) Commscope LNX-6515DS (3) Ericsson KRY 112 144/1 (3) Kathrein 782 11056	(12) 1-5/8"	T-Mobile	186	(3) 13' T-Frames
177	(2) Antel BXA-70063-4CF-EDIN-X (1) Antel BXA-70080-4CF-EDIN-0 (6) Antel LPA-80080/4CF (3) Antel BXA-171085-8BF-EDIN-0 (1) RFS DB-T1-6Z-8AB-0Z (6) RFS Celwave FD9R6004/2C-3L	(12) 1-5/8"	Verizon	177	(3) 14' T-Frames
156	(3) Kathrein 800-10121 (4) Powerwave P65-17-XLH-RR (2) KMW AM-X-CD-16-65-005-RET (3) Powerwave 7770.00 (6) Powerwave TT19-08BP111-001 (6) CCI DTMABP7819VG12A (6) Kathrein 860-10025 (6) Ericsson RRUS-11 (1) Raycap DC6-48-60-18-8F	(12) 1-5/8" (1) 3/8" RET (1) 3" Flex Conduit	AT&T	157	(3) 12' T-Frames
78	(1) Andrew GPS	(1) 1/2"	Verizon	78	Direct Mount
32	(1) GPS	(1) 1/2"	Cingular	32	Direct Mount

1. Feed lines installed as shown in **Figure 1**.

Proposed Carrier Final Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
177	(2) Antel BXA-70063-4CF-EDIN-X (4) Antel BXA-70080-4CF-EDIN-0 (6) Commscope HBXX-6517DS-A2M (3) Alcatel Lucent 1900 RRH 2x60W (3) Alcatel Lucent RRH AWS (6) RFS Celwave FD9R6004/2C-3L	(12) 1-5/8" (1) Fiber Cable	Verizon	177	(3) 14' T-Frames
78	(1) Andrew GPS	(1) 1/2"		78	Direct Mount

RESULTS

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

Table 2 - Material Strength

Member Type	Yield Strength
Legs	50 ksi
Bracing	50 ksi & 36 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. *Note: Capacities up to 100% are considered acceptable.* **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
T1	189 - 168.833	Leg	ROHN 2.5 STD	41.1	Pass
T2	168.833 - 148.667	Leg	ROHN 3 EH	58.7	Pass
T3	148.667 - 128.5	Leg	ROHN 4 EH	63.3	Pass
T4	128.5 - 108.334	Leg	ROHN 5 EH	60.4	Pass
T5	108.334 - 88.167	Leg	ROHN 6 EHS	64.3	Pass
T6	88.167 - 68.0004	Leg	ROHN 6 EH	60.8	Pass
T7	68.0004 - 47.8338	Leg	ROHN 8 EHS	60.9	Pass
T8	47.8338 - 27.6672	Leg	ROHN 8 EH	52.6 53.8 (b)	Pass
T9	27.6672 - 7.5	Leg	ROHN 8 EH	58.5	Pass
T1	189 - 168.833	Diagonal	L2x2x1/4	23.9 48.1 (b)	Pass
T2	168.833 - 148.667	Diagonal	L2x2x1/4	32.5 54.4 (b)	Pass
T3	148.667 - 128.5	Diagonal	L2x2x1/4	50.9 56.4 (b)	Pass
T4	128.5 - 108.334	Diagonal	L2 1/2x2 1/2x1/4	45.2 58.2 (b)	Pass
T5	108.334 - 88.167	Diagonal	L2 1/2x2 1/2x1/4	62.6	Pass
T6	88.167 - 68.0004	Diagonal	L3x3x1/4	51.1	Pass
T7	68.0004 - 47.8338	Diagonal	L3 1/2x3 1/2x1/4	52.0 53.3 (b)	Pass
T8	47.8338 - 27.6672	Diagonal	L4x4x1/4	48.5 63.2 (b)	Pass
T9	27.6672 - 7.5	Diagonal	L4x4x1/4	58.8 64.4 (b)	Pass
T1	189 - 168.833	Top Girt	L3x3x1/4	2.0	Pass
T2	168.833 - 148.667	Top Girt	L2x2x1/4	0.3	Pass

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

Table 4 - Maximum Base Reactions

Load Type	Direction	Current Analysis *(TIA/EIA-222-F)*	Original Design *(TIA/EIA-222-F)*
Individual Foundation	Horizontal	27 k	39 k
	Uplift	223 k	333 k
	Compression	261 k	369 k
Overturning Moment	---	4,515 k-ft	6,330 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 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

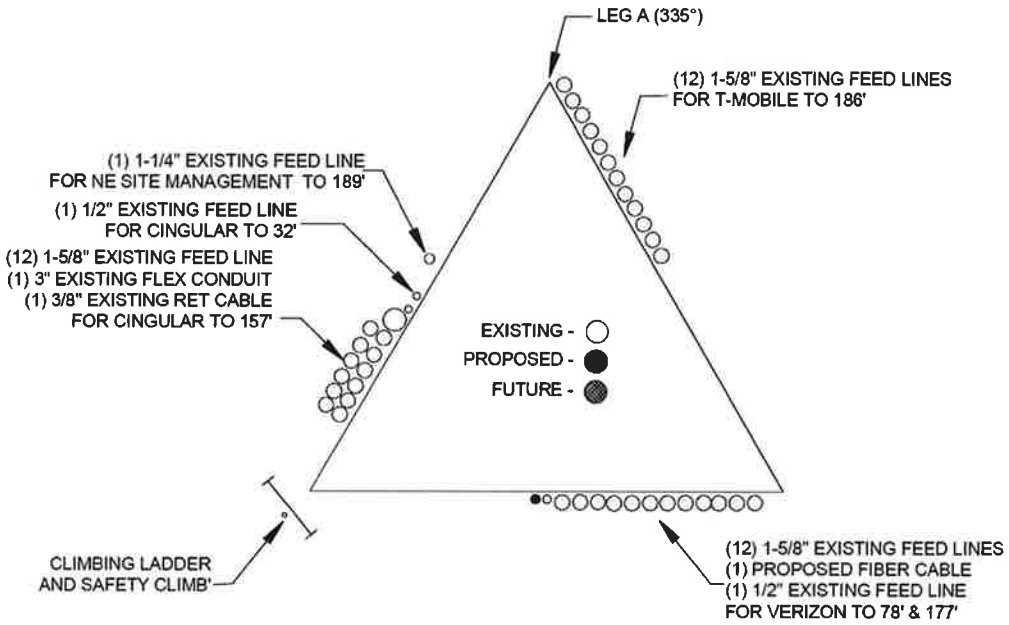
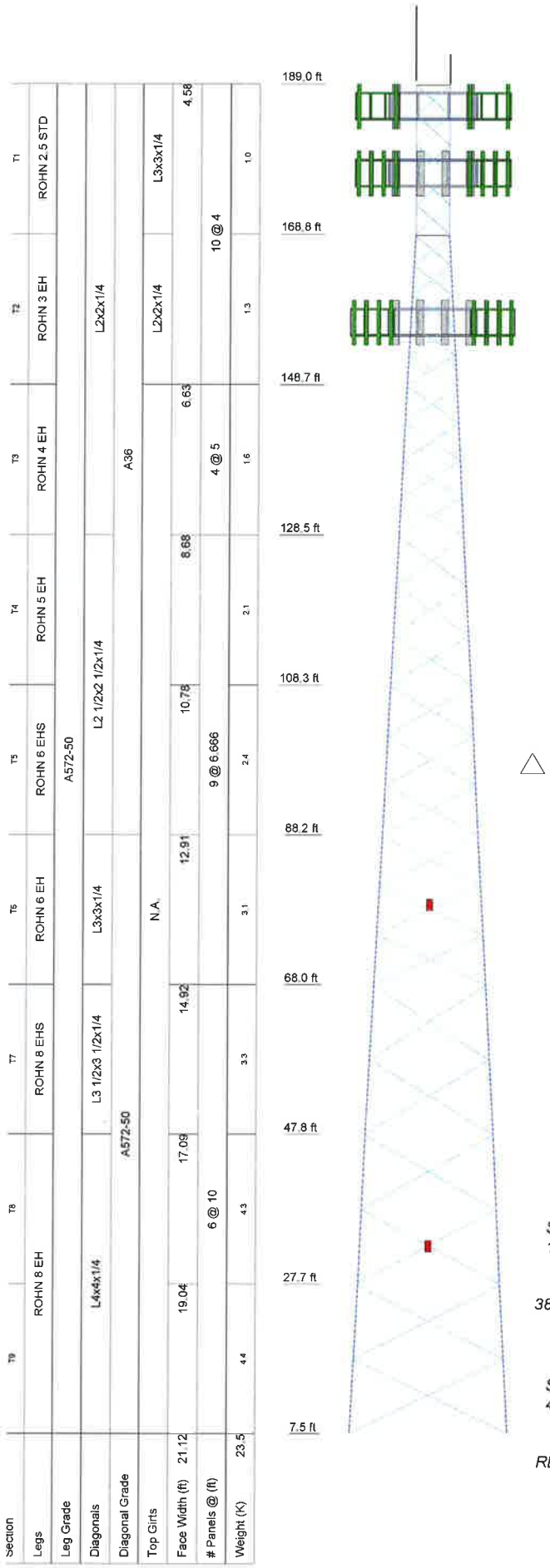


Figure 1 – Feed Line Layout



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x4'	189	1900 RRH 2x60W	177
DB222-A	189	RRH AWS	177
(3) 13' T-Frames	186	RRH AWS	177
RR90-17-02DP w/Mount Pipe	186	RRH AWS	177
RR90-17-02DP w/Mount Pipe	186	(2) FD9R6004/2C-3L Diplexer	177
RR90-17-02DP w/Mount Pipe	186	(2) FD9R6004/2C-3L Diplexer	177
LNX-6515DS w/ Mount Pipe	186	(2) FD9R6004/2C-3L Diplexer	177
LNX-6515DS w/ Mount Pipe	186	800 10121 w/ Mount Pipe	157
LNX-6515DS w/ Mount Pipe	186	800 10121 w/ Mount Pipe	157
KTY 112-114/1	186	800 10121 w/ Mount Pipe	157
KTY 112-114/1	186	(2) P65-17-XLH-RR w/Mount Pipe	157
KTY 112-114/1	186	P65-17-XLH-RR w/Mount Pipe	157
782 11056	186	P65-17-XLH-RR w/Mount Pipe	157
782 11056	186	AM-X-CD-16-65-005-RET w/ Mount Pipe	157
782 11056	186		
(2) Pipe Mount	186	AM-X-CD-16-65-005-RET w/ Mount Pipe	157
(2) Pipe Mount	186		
(2) Pipe Mount	186	7770.00 w/Mount Pipe	157
(3) 14' T-Frames	177	7770.00 w/Mount Pipe	157
BXA-70063-4CF-EDIN-X w/ Mount Pipe	177	7770.00 w/Mount Pipe	157
		(2) TT19-08BP111-001 TMA	157
BXA-70063-4CF-EDIN-X w/ Mount Pipe	177	(2) TT19-08BP111-001 TMA	157
		(2) TT19-08BP111-001 TMA	157
BXA-70080-4CF-EDIN-0 w/ Mount Pipe	177	(2) DTMA7819VG12A TMA	157
		(2) DTMA7819VG12A TMA	157
BXA-70080-4CF-EDIN-0 w/ Mount Pipe	177	(2) DTMA7819VG12A TMA	157
BXA-70080-4CF-EDIN-0 w/ Mount Pipe	177	(2) 860 10025 RET	157
		(2) 860 10025 RET	157
BXA-70080-4CF-EDIN-0 w/ Mount Pipe	177	(2) 860 10025 RET	157
		(2) RRUS-11	157
(2) HBXX-6517DS-A2M w/ Mount Pipe	177	(2) RRUS-11	157
(2) HBXX-6517DS-A2M w/ Mount Pipe	177	(2) RRUS-11	157
(2) HBXX-6517DS-A2M w/ Mount Pipe	177	DC6-48-60-18-8F	157
1900 RRH 2x60W	177	(3) 12' T-Frames	157
1900 RRH 2x60W	177	GPS	78
		GPS	32

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Tolland 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 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 64.4%

MAX. CORNER REACTIONS AT BASE:
DOWN: 261 K
SHEAR: 27 K

UPLIFT: -223 K
SHEAR: 24 K

AXIAL
100 K
SHEAR 14 K *MOMENT 1488 kip-ft*
TORQUE 2 kip-ft
38 mph WIND - 1.0000 in ICE
AXIAL
42 K
SHEAR 43 K *MOMENT 4515 kip-ft*
TORQUE 11 kip-ft
REACTIONS - 85 mph WIND

FDH Velocitel
6521 Meridien Drive, Suite 107
Raleigh, North Carolina 27616
Phone: 9197551012
FAX: 9197551031
Tower Analysis

Job: Ellington, CT10008-A-04			
Project: 15BJUS1400			
Client: SBA	Drawn by: AVago	App'd:	
Code: TIA/EIA-222-F	Date: 04/14/15	Scale: N	
Path:		Dwg No.	