

July 7, 2014

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

**Re: Notice of Exempt Modification – Facility Modification  
26 Mell Road, Lisbon, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) antennas at the 159-foot level of the existing 195-foot tower at 26 Mell Road in Lisbon, Connecticut (the “Property”). The tower is owned by SBA. The Council approved Cellco’s use of this tower in 2000. Cellco now intends to modify its facility by removing six (6) 850 MHz antennas and replacing them with three (3) model BXA-70080-4CF, 850 MHz antennas and three (3) model WBX065X19x050, 2100 MHz antennas, all at the same 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 tower. 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 Thomas W. Sparkman, First Selectman for the Town of Lisbon. A copy of this letter is also being sent to Stanley Wildowsky, Jr. and David Geer, 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).

13011476-v1

# Robinson+Cole

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's new antennas and RRHs will be installed at a centerline height of 159 feet on the existing 195-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. A cumulative General Power Density table for 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:

Thomas W. Sparkman, Lisbon First Selectman  
Stanley Wildowsky, Jr. and David Geer  
Sandy M. Carter

# **ATTACHMENT 1**

## BXA-70080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 dBd

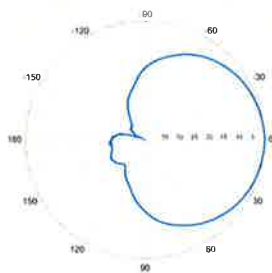
Replace "X" with desired electrical downtilt

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



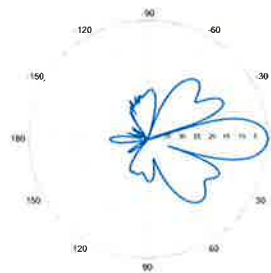
Electrical Characteristics	696-900 MHz		
Frequency bands	696-806 MHz	806-900 MHz	
Polarization	±45°		
Horizontal beamwidth	82°	80°	
Vertical beamwidth	17°	15°	
Gain	11.5 dBd (13.6 dBi)	12.0 dBd (14.1 dBi)	
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe 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 m <sup>2</sup> Side: 0.18 m <sup>2</sup>	Front: 2.6 ft <sup>2</sup> Side: 1.9 ft <sup>2</sup>	
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**



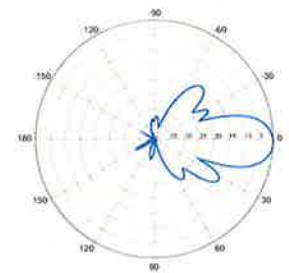
Horizontal | 750 MHz

**BXA-70080-4CF-EDIN-0**

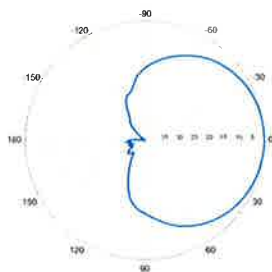


0° | Vertical | 750 MHz

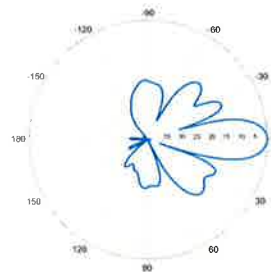
**BXA-70080-4CF-EDIN-2**



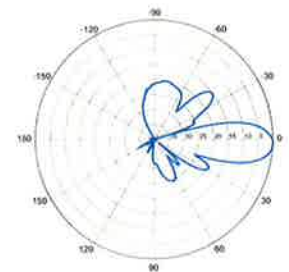
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



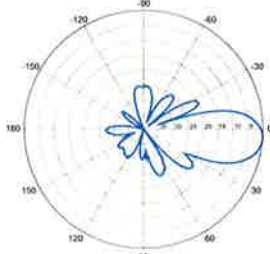
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

**BXA-70080-4CF-EDIN-X**

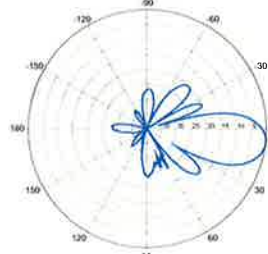
X-Pol | FET Panel | 80° | 12.0 dBd

**BXA-70080-4CF-EDIN-4**



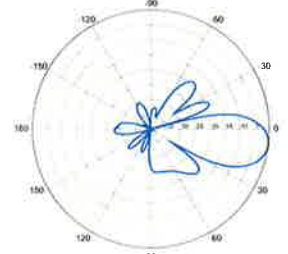
4° | Vertical | 750 MHz

**BXA-70080-4CF-EDIN-6**

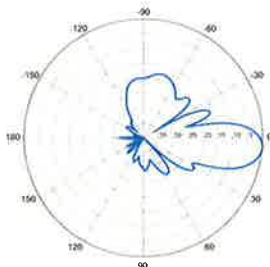


6° | Vertical | 750 MHz

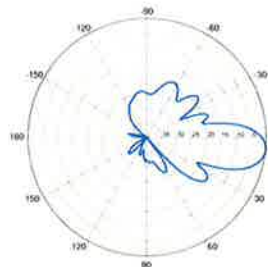
**BXA-70080-4CF-EDIN-8**



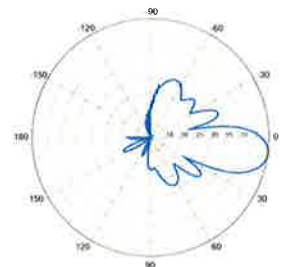
8° | Vertical | 750 MHz



4° | Vertical | 850 MHz

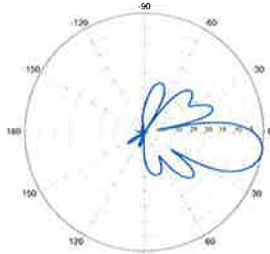


6° | Vertical | 850 MHz



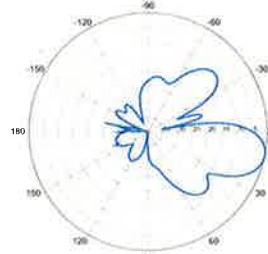
8° | Vertical | 850 MHz

**BXA-70080-4CF-EDIN-10**



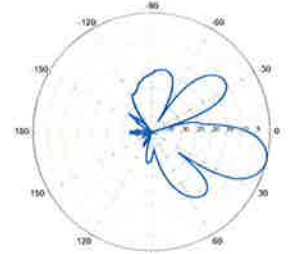
10° | Vertical | 750 MHz

**BXA-70080-4CF-EDIN-12**

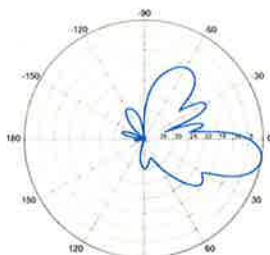


12° | Vertical | 750 MHz

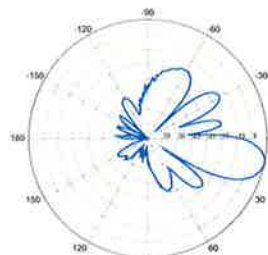
**BXA-70080-4CF-EDIN-14**



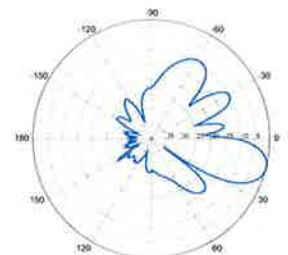
14° | Vertical | 750 MHz



10° | Vertical | 850 MHz



12° | Vertical | 850 MHz



14° | Vertical | 850 MHz

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## WBX065X19x050

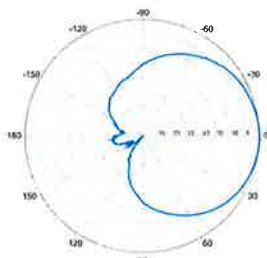
X-Pol | VET Panel | 65° | 19.0 dBi



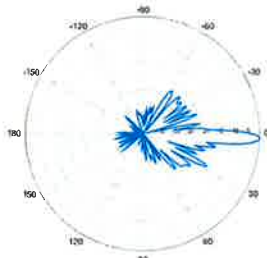
Model Number Options  
 WBX065X19M150 - Manual Electrical Tilt Antenna (aka 5142100)  
 WBX065X19R150 - Remote Electrical Tilt Antenna (aka 5142000)

Electrical Characteristics		1710-2170 MHz			
Frequency bands	1710-1880 MHz	1850-1990 MHz	1900-2170 MHz		
Polarization	± 45°	± 45°	± 45°		
Horizontal beamwidth	69°	66°	63°		
Vertical beamwidth	4.9°	4.6°	4.3°		
Gain	15.9 dBd / 18.0 dBi	16.4 dBd / 18.5 dBi	16.9 dBd / 19.0 dBi		
Electrical downtilt	2°-10° Variable Electrical Tilt				
Impedance	50Ω				
VSWR	< 1.4:1				
Upper sidelobe suppression	< -18 dB				
Front-to-Back ratio	> 25 dB				
First null	> -20 dB typical				
Inter-port isolation	> 30 dB				
IM3 (2x20W carrier)	< -153 dBc				
Input power	2 x 160 W				
Connector(s)	2 Ports / 7/16 DIN / Female / Bottom				
Operating temperature	-40° to +60° C (-40° to +140° F)				
Mechanical Characteristics					
Dimensions HxWxD	1950 x 157 x 69 mm		76.8 x 6.2 x 2.7 in		
Weight without brackets	9.5 kg		20.9 lbs		
Survival wind speed	241 km/hr		150 mph		
Wind load @ 161 km/hr (100 mph)	Front: 405 N	Side: 176 N	Front: 91 lbf	Side: 40 lbf	
RET type / Part number	Internal / RETU-CA01				
Mounting Options		Part Number	Fits Pipe Diameter	Weight	
Pole mounting bracket kit		MKS05P01	40-115 mm 1.6-4.5 in	2.9 kg	6.5 lbs
Scissor tilt bracket kit		MKS05T03	40-115 mm 1.6-4.5 in	4.1 kg	9.1 lbs
Bar tilt bracket kit		MKS05T04	40-115 mm 1.6-4.5 in	4.0 kg	8.8 lbs
Concealment Options					
UNICELL module	UNX14-19	UNX20-19			
Azimuth swivel	± 30°	± 30°			
Elevation tilt	Fixed	Fixed			
Required mounting kit	UNX14-WBX-AZ	UNX20-WBX-AZ			
FP mounting configuration	None				

1710-1880 MHz

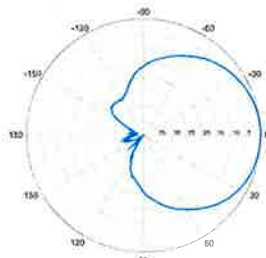


Horizontal

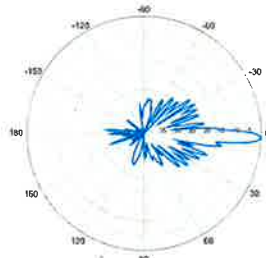


2° | Vertical

1850-1990 MHz

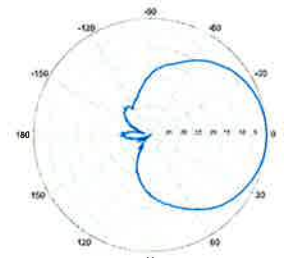


Horizontal

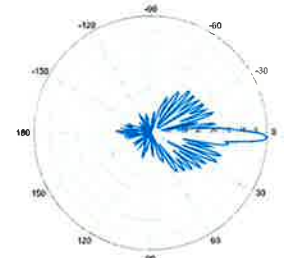


2° | Vertical

1900-2170 MHz



Horizontal



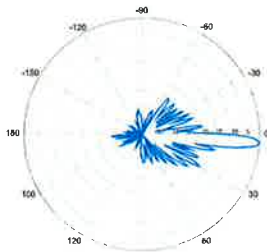
2° | Vertical

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## WBX065X19x050

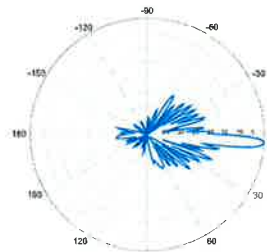
X-Pol | VET Panel | 65° | 19.0 dBi

1710-1880 MHz



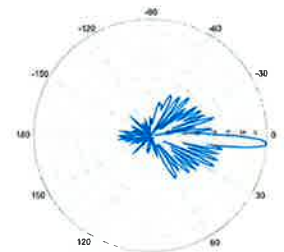
4° | Vertical

1850-1990 MHz

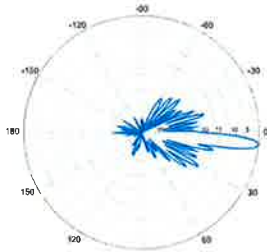


4° | Vertical

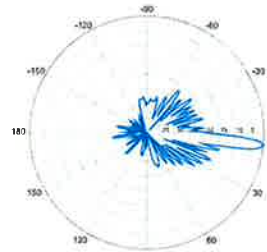
1900-2170 MHz



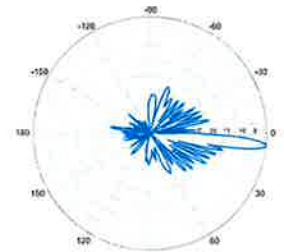
4° | Vertical



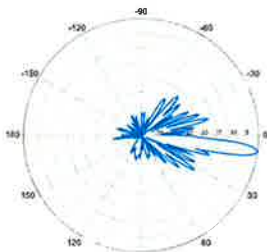
6° | Vertical



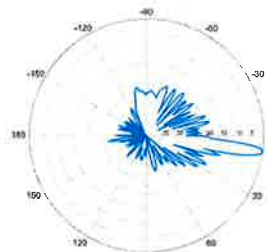
6° | Vertical



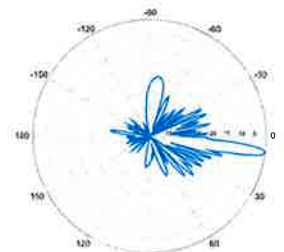
6° | Vertical



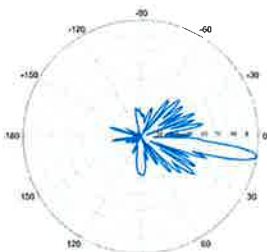
8° | Vertical



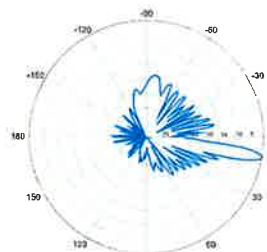
8° | Vertical



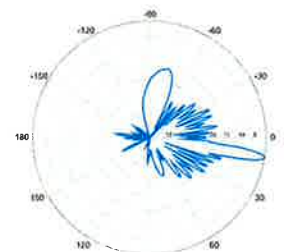
8° | Vertical



10° | Vertical



10° | Vertical



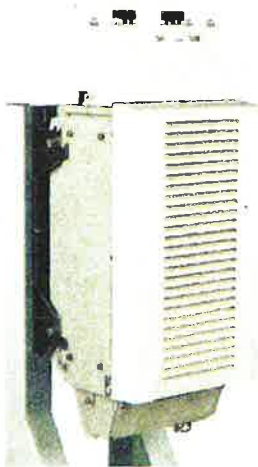
10° | Vertical

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## 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.

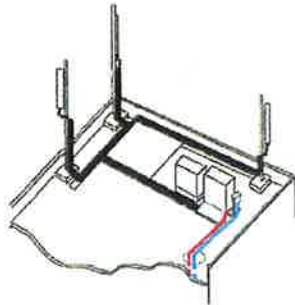
#### Fast, low-cost installation and deployment

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

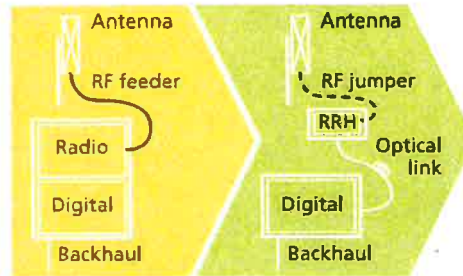
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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



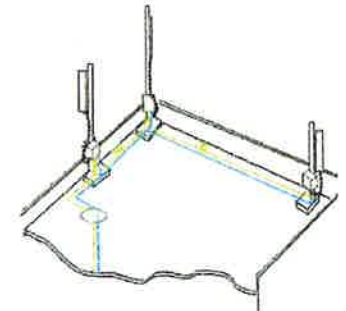
Macro

## 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



RRH for space-constrained cell sites



Distributed

## 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

## Technical specifications

### Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170mm (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

**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
<b>Mechanical Properties</b>			
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)
<b>Electrical Properties</b>			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	0.68 (0.205)
DC-Resistance Power Cable, 8 4mm <sup>2</sup> (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
<b>Other Properties</b>			
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)			UL34-V0 UL1566, RoHS Compliant
<b>Power Cable Properties</b>			
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), IEEE 1202/FT4, RoHS Compliant
<b>Temperature Properties</b>			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)

\* This data is provisional and subject to change

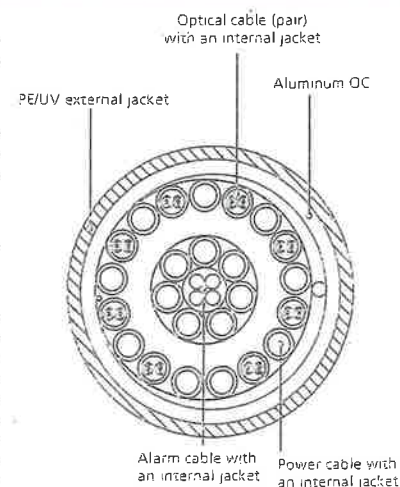


Figure 2: Construction Detail

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

# **ATTACHMENT 2**

Site Name: Lisbon Tower Height: 195'		General	Power	Density				
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	PERMISS. EXP.	FRACTION MPE	Total
*Sprint CDMA/LTE	3	778	173	0.0280	1900	1.0000	2.80%	
*Sprint CDMA/LTE	1	438	173	0.0053	850	0.5667	0.93%	
*Nextel			183	0.0027	851	0.5673	0.48%	
*MetroPCS	3	443.61	145	0.0228	2140	1.0000	2.28%	
*T-Mobile LTE	2	24	195	0.0005	2100	1.0000	0.05%	
*T-Mobile GSM/UMTS	2	12	195	0.0002	1950	1.0000	0.02%	
*T-Mobile UMTS	2	16	195	0.0003	2100	1.0000	0.03%	
Verizon	11	399	159	0.0624	1970	1.0000	6.24%	
Verizon	9	380	159	0.0486	869	0.5793	8.40%	
Verizon	1	1750	159	0.0249	2145	1.0000	2.49%	
Verizon	1	1050	159	0.0149	698	0.4973	3.00%	
								26.7%
* Source: Siting Council								

# **ATTACHMENT 3**



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

**Structural Analysis for  
SBA Network Services, Inc.**

**195' Monopole Tower**

**SBA Site Name: Lisbon  
SBA Site ID: CT00167-S-05  
Verizon Site ID: 117746  
Verizon Site Name: Lisbon CT**

FDH Project Number 1423601400

**Analysis Results**

Tower Components	92.7%	Sufficient
Foundation	81.7%	Sufficient

Prepared By:

Jeffrey B. Ray, EI  
Project Engineer

Reviewed By:

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

**FDH Engineering, Inc.**  
6521 Meridien Drive  
Raleigh, NC 27616  
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February 24, 2014

02-24-2014

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

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## EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Engineering, Inc. performed a structural analysis of the monopole located in Lisbon, 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 Building Code*. Information pertaining to the existing/proposed antenna loading, current tower geometry, foundation dimensions, geotechnical data, and member sizes was obtained from:

- Fred A. Nudd Corporation (Project No. 6531) original design drawings dated February 4, 1999
- Semaan Engineering Solutions (Site No. CT00167S) Structural Analysis and Modification Package dated May 7, 2002
- SBA Network Services, Inc.

The *basic design wind speed* per the *TIA/EIA-222-F* standards and the *2005 Connecticut Building Code* is 85 mph without ice and 38 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 159 ft, the tower meets the requirements of the *TIA/EIA-222-F* standards and the *2005 Connecticut Building Code* provided the **Recommendations** listed below are satisfied. Furthermore, provided the foundation was designed and constructed to support the original design reactions (see Fred A. Nudd Project No. 6531), 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 Building Code* are met with the existing and proposed loading in place, we have the following recommendations:

1. The proposed coax should be installed inside the pole's shaft.
2. RRU/RRH Stipulation: The 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 Engineering, Inc. should be contacted to perform a revised analysis.*

**Table 1 - Appurtenance Loading**

**Existing Loading:**

Antenna Elevation (ft)	Description	Coax and Lines <sup>1</sup>	Carrier	Mount Elevation (ft)	Mount Type
195	(6) EMS RR90-17-02DP	(12) 1-5/8"	T-Mobile	195	(3) T-Arms w/ Grating
183	(9) Swedcom ALP9212	(9) 1-5/8"	Nextel	183	(3) T-Arms w/ Grating
173	(3) RFS APXVSP18-C-A20 (3) Alcatel Lucent 1900 MHz RRUs (3) Alcatel Lucent 800 MHz RRUs (3) Alcatel Lucent 800 MHz Filters (4) RFS ACU-A20-N RETs	(3) 1-1/4"	Sprint	173	(3) T-Frames
159	(3) Antel BXA-70063/6CF (6) Antel LPA-80080/4CF (3) Antel BXA-171085/8BF (6) RFS FD9R6004/2C-3L Diplexers	(12) 1-5/8"	Verizon	159	(1) LP Platform
153	---	---	---	153	(3) Standoffs
143	(6) Kathrein 742 351	(12) 1-5/8" (1) 3/8"	Metro PCS	143	(3) T-Arms

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

**Proposed Loading:**

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
161	(1) RFS DB-T1-6Z-8AB-0Z Distribution Box			161	(1) Collar Mount
159	(3) Antel BXA-70063/6CF (3) Antel BXA-171085/8BF (3) Antel WBX065X19R050 (3) Antel BXA-70080-4CF (3) ALU RRH2x40-AWS RRHs (6) RFS FD9R6004/2C-3L Diplexers	(12) 1-5/8" (1) 1-5/8" Fiber	Verizon	159	(1) LP Platform

**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
	66 ksi
	75 ksi
	76 ksi
Tower Extension Section	36 ksi
Flange Plates	50 ksi
Flange Bolts	Fu = 120 ksi
Base Plate	50 ksi
Anchor Bolts	Fu = 140 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	195 - 180	Pole	TP24x24x0.2813	26.1	Pass
---	180	Flange Bolts	(18) 0.5" $\varnothing$ w/ BC = 27"	54.6	Pass
		Flange Plates	0.625" thk.	42.4	Pass
L2	180 - 140	Pole	TP33x24x0.25	84.1	Pass
L3	140 - 135	Pole	TP34.125x33x0.375	60.2	Pass
L4	135 - 130	Pole	TP35.25x34.125x0.75	33.2	Pass
L5	130 - 91	Pole	TP44.025x35.25x0.375	82.6	Pass
L6	91 - 85	Pole	TP45.375x44.025x0.75	43.3	Pass
L7	85 - 81	Pole	TP46.275x45.375x0.375	85.5	Pass
L8	81 - 48	Pole	TP53.7x46.275x0.375	80.7	Pass
L9	48 - 41	Pole	TP55.275x53.7x0.75	41.3	Pass
L10	41 - 18	Pole	TP60.45x55.275x0.375	88.3	Pass
L11	18 - 0	Pole	TP64.5x60.45x0.4375	74.4	Pass
		Anchor Bolts	(26) 2.0" $\varnothing$ w/ BC = 58" BC	92.7	Pass
		Base Plate	1.75" thk. w/ PL 1" x 5.5" x 26" stiffeners	46.1	Pass

\*Capacities include 1/3 allowable increase for wind per 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	53 k*	36 k
Shear	38 k	46 k
Moment	4,915 k-ft	6,014 k-ft

\*Given our experience with similar projects, the vertical load will not control the analysis of the foundation.

**GENERAL COMMENTS**

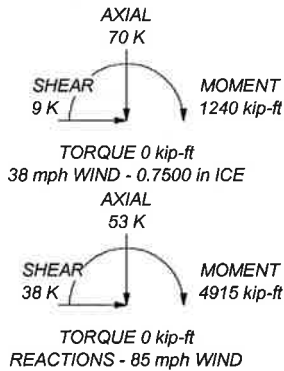
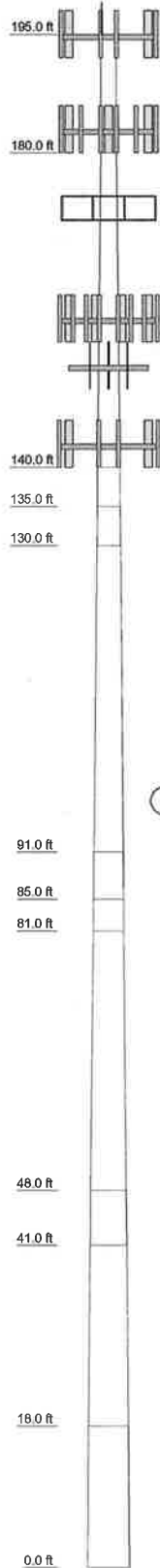
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading 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	Length (ft)	Number of Sides	Thickness (in)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	15.00	1	0.2813	24.0000	24.0000	A36	1.1
2	40.00	18	0.2500	24.0000	33.0000	A572-65	3.1
3	5.00	18	0.7500	34.1250	35.2500	Fy=66	0.7
4	5.00	18	0.3750	35.2500	44.0250	Fy=66	1.4
5	39.00	18	0.3750	35.2500	44.0250	Fy=66	6.2
6	6.00	18	0.3750	45.3750	46.2750	Fy=76	2.1
7	4.00	18	0.3750	45.3750	46.2750	Fy=76	0.7
8	33.00	18	0.3750	46.2750	53.7000	Fy=76	6.6
9	7.00	18	0.7500	53.7000	55.2750	Fy=76	3.0
10	23.00	18	0.3750	55.2750	60.4500	Fy=75	5.4
11	18.00	18	0.4375	60.4500	64.5000	Fy=75	5.3
							35.6



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	195	ACU-A20-N RET	173
RR90-17-02DP w/Mount Pipe	195	DB-T1-6Z-8AB-0Z	161
RR90-17-02DP w/Mount Pipe	195	(1) Collar Mount	161
RR90-17-02DP w/Mount Pipe	195	BXA-70063/6CF W/Mount Pipe	159
RR90-17-02DP w/Mount Pipe	195	BXA-171085-8BF w/ Mount Pipe	159
RR90-17-02DP w/Mount Pipe	195	BXA-171085-8BF w/ Mount Pipe	159
RR90-17-02DP w/Mount Pipe	195	BXA-171085-8BF w/ Mount Pipe	159
(3) T-Arms w/ Grating	195	WBX065X19R050 w/ Mount Pipe	159
(3) ALP 9212 w/Mount Pipe	183	WBX065X19R050 w/ Mount Pipe	159
(3) ALP 9212 w/Mount Pipe	183	WBX065X19R050 w/ Mount Pipe	159
(3) ALP 9212 w/Mount Pipe	183	BXA-70080/4CF w/ Mount Pipe	159
Antenna Mount Pipe	183	BXA-70080/4CF w/ Mount Pipe	159
Antenna Mount Pipe	183	BXA-70080/4CF w/ Mount Pipe	159
Antenna Mount Pipe	183	RRH2X40-AWS	159
(3) T-Arms w/ Grating	183	RRH2X40-AWS	159
(3) T-Frames	173	RRH2X40-AWS	159
APXVSP18-C-A20 w/Mount Pipe	173	(2) FD9R6004/2C-3L Diplexer	159
APXVSP18-C-A20 w/Mount Pipe	173	(2) FD9R6004/2C-3L Diplexer	159
APXVSP18-C-A20 w/Mount Pipe	173	(2) FD9R6004/2C-3L Diplexer	159
1900 MHz RRH	173	LP Platform	159
1900 MHz RRH	173	BXA-70063/6CF W/Mount Pipe	159
1900 MHz RRH	173	BXA-70063/6CF W/Mount Pipe	159
800 MHz RRH	173	Pipe Mount	153
800 MHz RRH	173	Pipe Mount	153
800 MHz RRH	173	Pipe Mount	153
800 MHz External Notch Filter	173	(3) Standoffs	153
800 MHz External Notch Filter	173	(2) 742 351 w/ mount pipe	143
800 MHz External Notch Filter	173	(2) 742 351 w/ mount pipe	143
(2) ACU-A20-N RET	173	(2) 742 351 w/ mount pipe	143
ACU-A20-N RET	173	(3) T-Arms	143

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	Fy=76	76 ksi	91 ksi
A572-65	65 ksi	80 ksi	Fy=75	75 ksi	90 ksi
Fy=66	66 ksi	81 ksi			

### TOWER DESIGN NOTES

1. Tower is located in New London 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. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. The existing tower modifications are included for wind loading purposes only.

<p><b>FDH Engineering, Inc.</b> 6521 Meridien Drive, Suite 107 Raleigh, North Carolina Phone: 9197551012 FAX: 9197551031</p>	<p>Job: <b>LISBON, CT - CT00167-S</b></p>
	<p>Project: <b>1423601400</b></p>
	<p>Client: <b>SBA Network Services, Inc.</b> Drawn by: <b>Jeffrey B. Ray</b> App'd:</p>
	<p>Code: <b>TIA/EIA-222-F</b> Date: <b>02/24/14</b> Scale: <b>NTS</b></p>
<p>Tower Analysis</p>	<p>Path: _____ Dwg No. <b>E-1</b></p>