

January 9, 2014

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

Re: **Notice of Exempt Modification – Antenna Swap  
12 Carpenter Road, Bolton, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 137-foot level on the existing 139-foot tower at the above-referenced address. The tower is owned by SBA. Cellco’s shared use of this tower was approved in 2007. Cellco now intends to replace six (6) of its existing antennas with two (2) model BXA-70080-6BF 850 MHz antennas; one (1) model BXA-70063-4CF 850 MHz antenna; two (2) model BXA-171085-12BF 2100 MHz antennas; and one (1) model BXA-171063-12BF 2100 MHz antenna, at the 137-foot level on the tower. Cellco also intends to install three (3) remote radio heads (“RRHs”) behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for the 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 Robert Morra, First Selectman for the Town of Bolton. A copy of this letter is also being sent to Terry L. Veo, Trustee, the owner of the property at 12 Carpenter Road.

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



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# ROBINSON & COLE<sub>LLP</sub>

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's proposed antennas and RRHs will be located at the 137-foot level on the 139-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 modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included behind 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:

Robert Morra, Bolton First Selectman  
Terry L. Veo, Trustee  
Sandy M. Carter



# **ATTACHMENT 1**

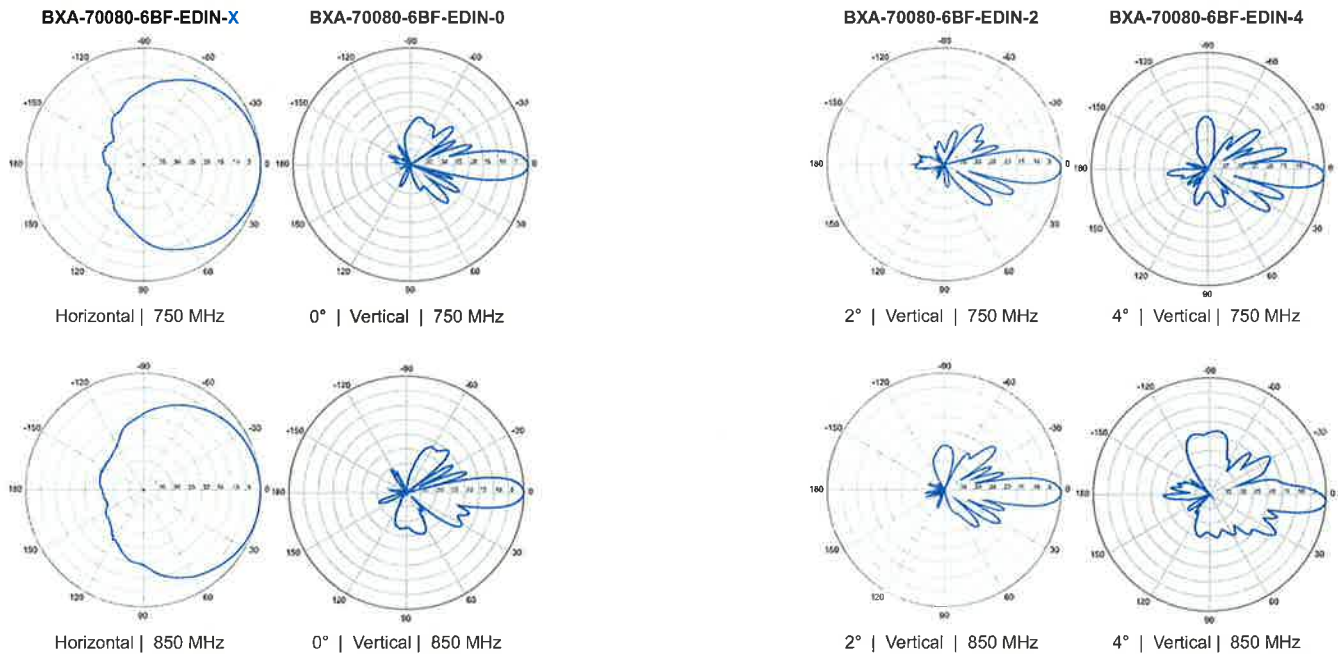
## BXA-70080-6BF-EDIN-X

X-Pol | FET Panel | 80° | 13.5 dBd

Replace "X" with desired electrical downtilt.

Antenna is also available with N connector(s).  
Replace "EDIN" with "N" 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	12°	10°	
Gain	13.0 dBd (15.1 dBi)	13.5 dBd (15.6 dBi)	
Electrical downtilt (X)	0, 2, 4, 6, 8, 10		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe suppression (0°)	-18.3 dB	-18.6 dB	
Front-to-back ratio (+/-30°)	-26.9 dB	-25.6 dB	
Null fill	5% (-26.02 dB)		
Isolation between ports	< -30 dB		
Input power with EDIN connectors	500 W		
Input power with N connectors	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or N / Female / Bottom		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1719 x 204 x 150 mm	67.7 x 8.0 x 5.9 in	
Depth with z-brackets	190 mm	7.5 in	
Weight without mounting brackets	6.7 kg	14.8 lbs	
Survival wind speed	> 201 km/hr		
Wind area	Front: 0.35 m <sup>2</sup> Side: 0.26 m <sup>2</sup>	Front: 3.8 ft <sup>2</sup> Side: 2.8 ft <sup>2</sup>	
Wind load @ 161 km/hr (100 mph)	Front: 504 N Side: 426 N	Front: 113 lbf Side: 96 lbf	
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70080-6BF-EDIN-X-FP		

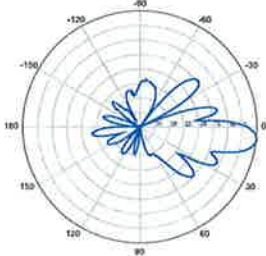


Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product.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

**BXA-70080-6BF-EDIN-X**

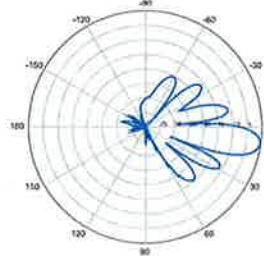
X-Pol | FET Panel | 80° | 13.5 dBd

**BXA-70080-6BF-EDIN-6**



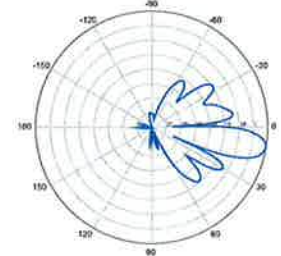
6° | Vertical | 750 MHz

**BXA-70080-6BF-EDIN-8**

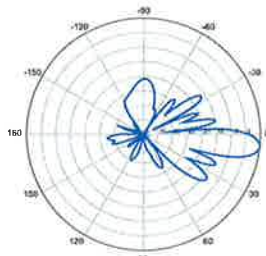


8° | Vertical | 750 MHz

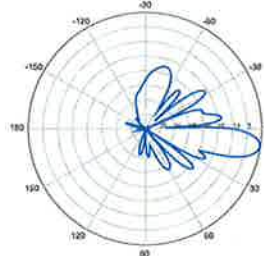
**BXA-70080-6BF-EDIN-10**



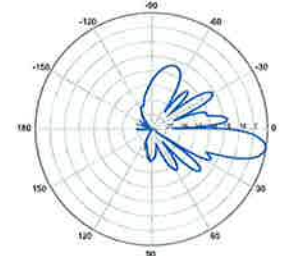
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

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## BXA-70063-4CF-EDIN-X

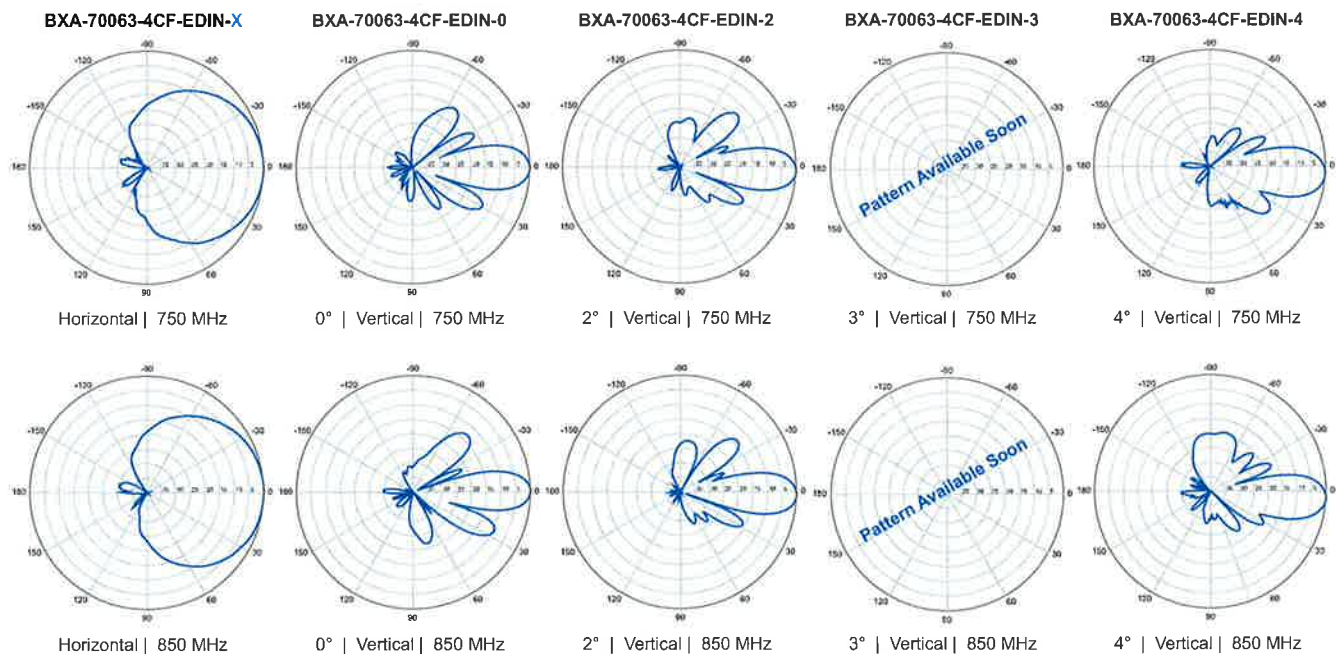
X-Pol | FET Panel | 63° | 13.0 dBd

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	65°	63°	
Vertical beamwidth	17°	15°	
Gain	12.5 dBd (14.6 dBi)	13.0 dBd (15.1 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe suppression (0°)	-16.3 dB	-22.1 dB	
Front-to-back ratio (+/-30°)	-36.1 dB	-34.9 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	1205 x 285 x 133 mm	47.4 x 11.2 x 5.2 in	
Depth with z-brackets	173 mm	6.8 in	
Weight without mounting brackets	4.5 kg	9.9 lbs	
Survival wind speed	> 201 km/hr	> 125 mph	
Wind area	Front: 0.34 m <sup>2</sup> Side: 0.16 m <sup>2</sup>	Front: 3.7 ft <sup>2</sup> Side: 1.7 ft <sup>2</sup>	
Wind load @ 161 km/hr (100 mph)	Front: 498 N Side: 260 N	Front: 111 lbf Side: 55 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-70063-4CF-EDIN-X-FP		



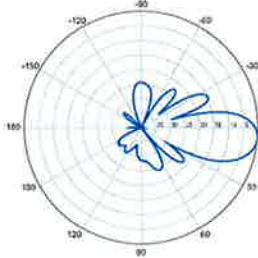
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**BXA-70063-4CF-EDIN-X**

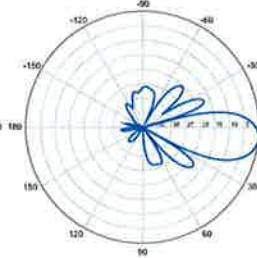
X-Pol | FET Panel | 63° | 13.0 dBd

**BXA-70063-4CF-EDIN-5**



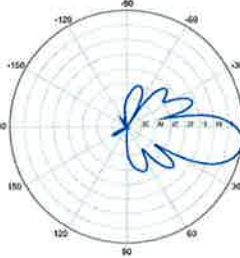
5° | Vertical | 750 MHz

**BXA-70063-4CF-EDIN-6**



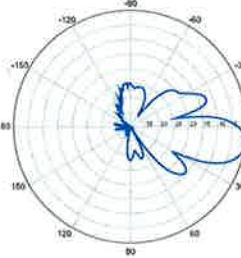
6° | Vertical | 750 MHz

**BXA-70063-4CF-EDIN-8**



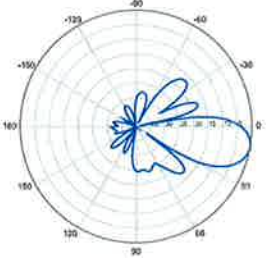
8° | Vertical | 750 MHz

**BXA-70063-4CF-EDIN-9**

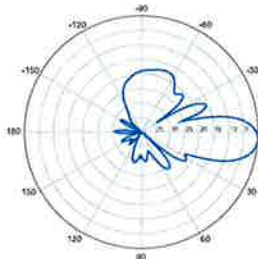


9° | Vertical | 750 MHz

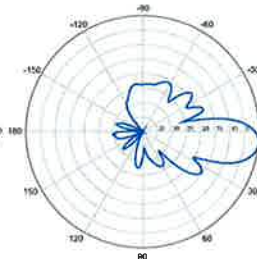
**BXA-70063-4CF-EDIN-10**



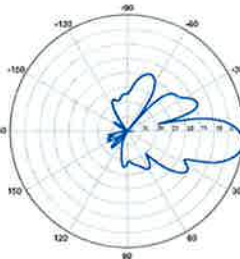
10° | Vertical | 750 MHz



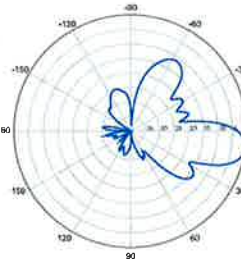
5° | Vertical | 850 MHz



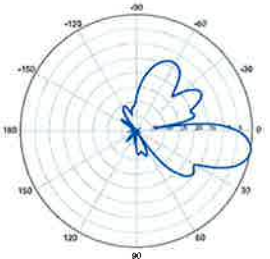
6° | Vertical | 850 MHz



8° | Vertical | 850 MHz

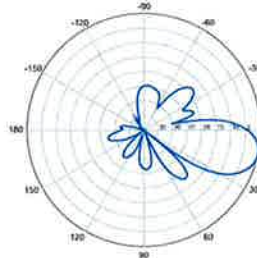


9° | Vertical | 850 MHz



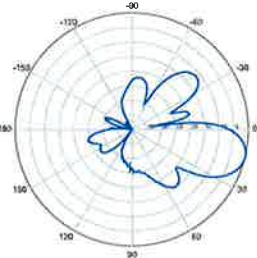
10° | Vertical | 850 MHz

**BXA-70063-4CF-EDIN-12**

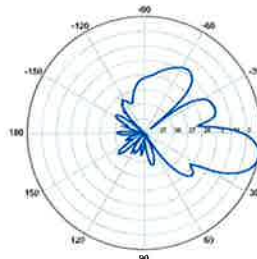


12° | Vertical | 750 MHz

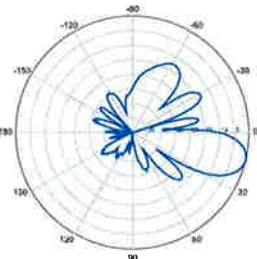
**BXA-70063-4CF-EDIN-14**



14° | Vertical | 750 MHz



12° | Vertical | 850 MHz



14° | Vertical | 850 MHz

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## BXA-171085-12BF-EDIN-X

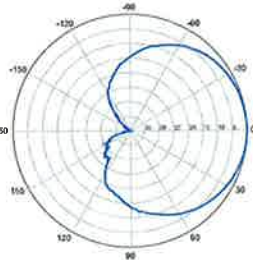
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 85° | 18.0 dBi

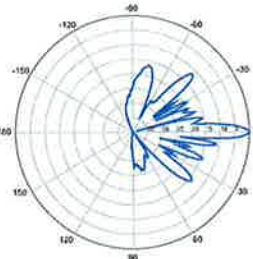
Electrical Characteristics	1710-2170 MHz			
	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz	
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz	
Polarization	±45°	±45°	±45°	
Horizontal beamwidth	88°	85°	80°	
Vertical beamwidth	4.5°	4.5°	4.5°	
Gain	15.1 dBd / 17.2 dBi	15.5 dBd / 17.6 dBi	15.9 dBd / 18.0 dBi	
Electrical downtilt (X)	0, 2, 4			
Impedance	50Ω			
VSWR	≤1.5:1			
First upper sidelobe	< -17 dB			
Front-to-back ratio	> 30 dB			
In-band isolation	> 28 dB			
IM3 (2x20W carrier)	< -150 dBc			
Input power	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN / Female / Bottom			
Operating temperature	-40° to +60° C / -40° to +140° F			
Mechanical Characteristics	1842 x 154 x 105 mm		72.5 x 6.1 x 4.1 in	
Dimensions Length x Width x Depth	133 mm		5.2 in	
Depth with z-brackets	5.8 kg		12.8 lbs	
Weight without mounting brackets	> 201 km/hr		> 125 mph	
Survival wind speed	Front: 0.28 m <sup>2</sup> Side: 0.19 m <sup>2</sup>	Front: 3.1 ft <sup>2</sup> Side: 2.1 ft <sup>2</sup>		
Wind area	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf		
Wind load @ 161 km/hr (100 mph)	Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm	2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm	2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171085-12BF-EDIN-X-FP			



**BXA-171085-12BF-EDIN-X**

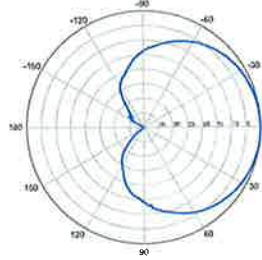


Horizontal | 1710-1880 MHz  
**BXA-171085-12BF-EDIN-0**

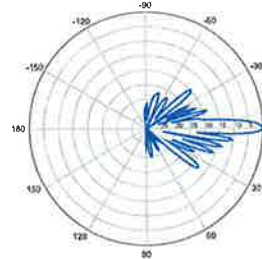


0° | Vertical | 1710-1880 MHz

**BXA-171085-12BF-EDIN-X**

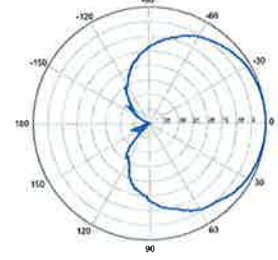


Horizontal | 1850-1990 MHz  
**BXA-171085-12BF-EDIN-0**

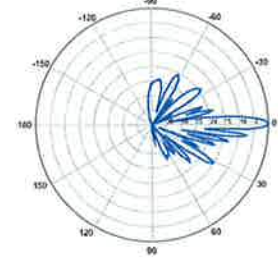


0° | Vertical | 1850-1990 MHz

**BXA-171085-12BF-EDIN-X**



Horizontal | 1920-2170 MHz  
**BXA-171085-12BF-EDIN-0**



0° | Vertical | 1920-2170 MHz

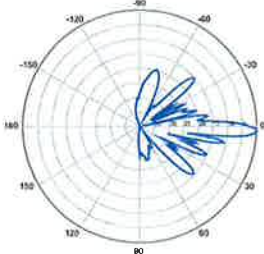
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# BXA-171085-12BF-EDIN-X

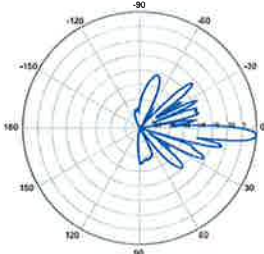
X-Pol | FET Panel | 85° | 18.0 dBi

**BXA-171085-12BF-EDIN-2**



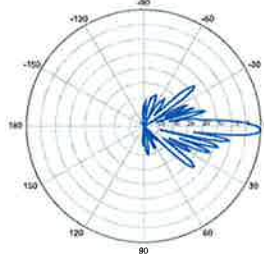
2° | Vertical | 1710-1880 MHz

**BXA-171085-12BF-EDIN-4**



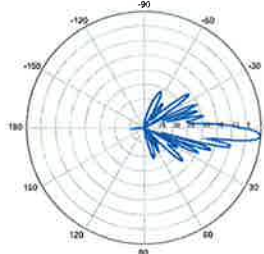
4° | Vertical | 1710-1880 MHz

**BXA-171085-12BF-EDIN-2**



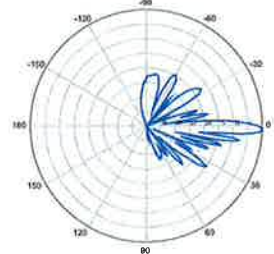
2° | Vertical | 1850-1990 MHz

**BXA-171085-12BF-EDIN-4**



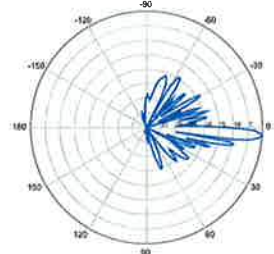
4° | Vertical | 1850-1990 MHz

**BXA-171085-12BF-EDIN-2**



2° | Vertical | 1920-2170 MHz

**BXA-171085-12BF-EDIN-4**



4° | Vertical | 1920-2170 MHz

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## BXA-171063-12BF-EDIN-X

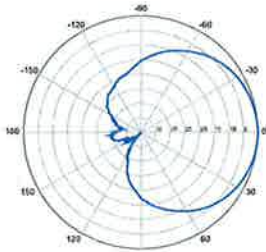
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 19.0 dBi

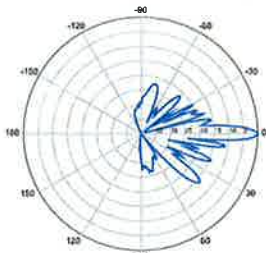
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1842 x 154 x 105 mm		72.5 x 6.1 x 4.1 in
Depth with z-brackets	133 mm		5.2 in
Weight without mounting brackets	5.8 kg		12.8 lbs
Survival wind speed	> 201 km/hr		> 125 mph
Wind area	Front: 0.28 m <sup>2</sup> Side: 0.19 m <sup>2</sup>	Front: 3.1 ft <sup>2</sup> Side: 2.1 ft <sup>2</sup>	
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf	
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		



**BXA-171063-12BF-EDIN-X**

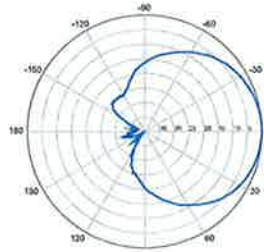


Horizontal | 1710-1880 MHz  
**BXA-171063-12BF-EDIN-0**

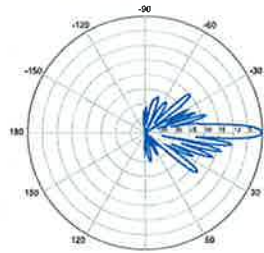


0° | Vertical | 1710-1880 MHz

**BXA-171063-12BF-EDIN-X**

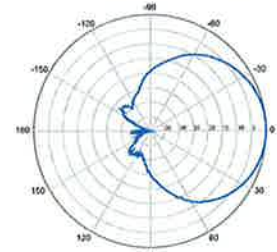


Horizontal | 1850-1990 MHz  
**BXA-171063-12BF-EDIN-0**

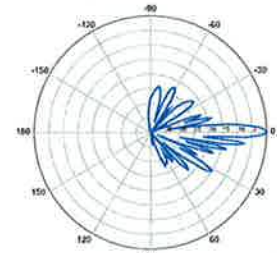


0° | Vertical | 1850-1990 MHz

**BXA-171063-12BF-EDIN-X**



Horizontal | 1920-2170 MHz  
**BXA-171063-12BF-EDIN-0**



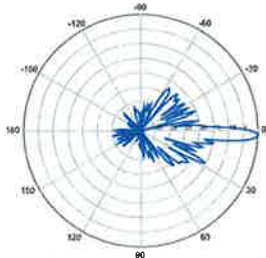
0° | Vertical | 1920-2170 MHz

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-171063-12BF-EDIN-X

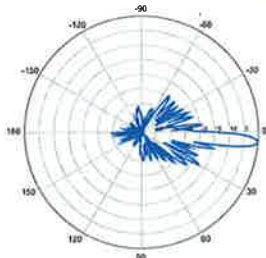
X-Pol | FET Panel | 63° | 19.0 dBi

**BXA-171063-12BF-EDIN-2**



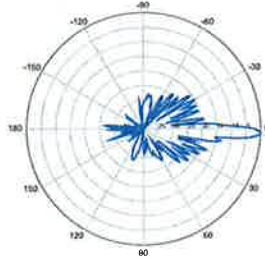
2° | Vertical | 1710-1880 MHz

**BXA-171063-12BF-EDIN-5**



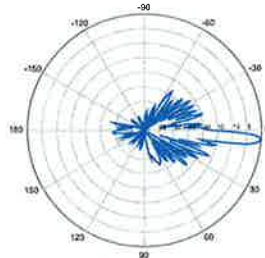
5° | Vertical | 1710-1880 MHz

**BXA-171063-12BF-EDIN-2**



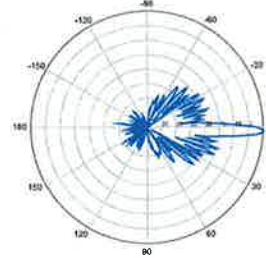
2° | Vertical | 1850-1990 MHz

**BXA-171063-12BF-EDIN-5**



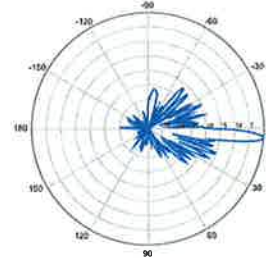
5° | Vertical | 1850-1990 MHz

**BXA-171063-12BF-EDIN-2**



2° | Vertical | 1920-2170 MHz

**BXA-171063-12BF-EDIN-5**



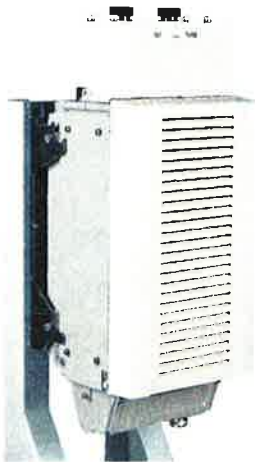
5° | Vertical | 1920-2170 MHz

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.

## 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.

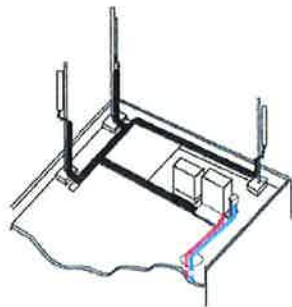
#### Fast, low-cost installation and deployment

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

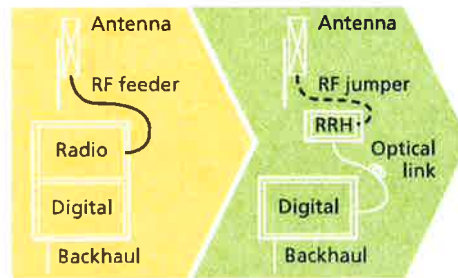
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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



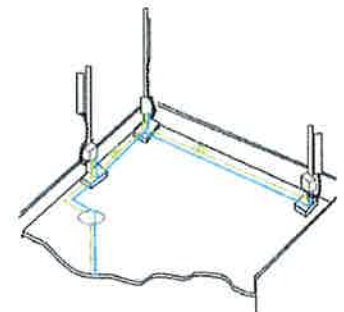
Macro

## 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

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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
<b>Approximate Values</b>			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in.)]	200 (7.8)
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, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
<b>Optical 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)			UL94-V0 UL1666 RoHS Compliant
<b>UL Properties (Alarm &amp; Power)</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), IEEE1202/FT4 RoHS Compliant
<b>Operating Limits</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

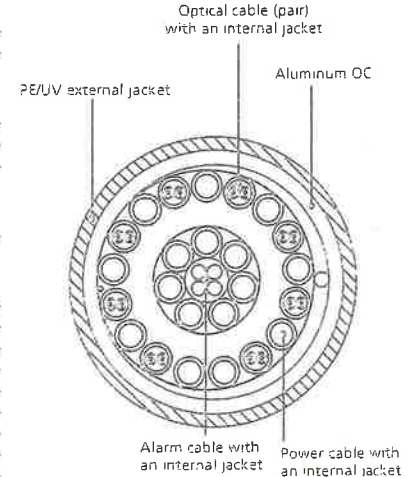


Figure 2: Construction Detail

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

# **ATTACHMENT 2**



# **ATTACHMENT 3**



FDH Engineering, Inc., 6521 Meridien Dr., NC 27616, Ph. 919.755.1012, Fax 919.755.1031

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

**139' Monopole Tower**

**SBA Site Name: Bolton 2  
SBA Site ID: CT11558-A-00  
Verizon Site ID: 119653  
Verizon Site Name: Manchester 2**

FDH Project Number 13SFSI1400

**Analysis Results**

Tower Components	57.5 %	Sufficient
Foundation	72.9 %	Sufficient

Prepared By:

Adam Bryan, EI  
Project Engineer

Reviewed By:

Christopher M. Murphy, PE  
President  
CT PE License No. 25842

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



November 1, 2013

*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 Bolton, 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 *2005 Connecticut Building Code (CBC)*. Information pertaining to the existing/proposed antenna loading, current tower geometry, foundation dimensions, and member sizes was obtained from:

- Fred A. Nudd Corporation (Project No. 207-13312) original design drawings dated September 5, 2007
- FDH, Inc. (Job No. 08-08057T) TIA Inspection Report dated September 16, 2008
- SBA Network Services, Inc.

The *basic design wind speed* per the *TIA/EIA-222-F* standards and *2005 CBC* 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 137 ft, the tower meets the requirements of the *TIA/EIA-222-F* standards and *2005 CBC* 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 Corporation Project No. 207-13312), 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 *2005 CBC* are met with the existing and proposed loading in place, we have the following recommendations:

1. The proposed coax should be installed inside the monopole's shaft.
2. RRU/RRH Stipulation: The proposed equipment may be installed in any arrangement 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
137	(3) Antel BXA-70063/6CF (4) Antel LPA-80080/6CF (2) Antel BXA-171085/12BF (1) Antel BXA-171063/12BF (2) Antel LPA-80063/4CF (6) RFS FD9R6004/2C-3L Diplexers	(12) 1-5/8"	Verizon	137	(1) 12.5' Low Profile Platform
126.5	(3) RFS APX16PV-16PVL-C (3) Comm DTMA1819-00-12 TMAs (9) Powerwave 7770	(6) 1-5/8" (1) 1/4"	T-Mobile	126.5	(1) 12.5' Low Profile Platform
110	(3) KMW AM-X-CD-16-65-00T (12) Powerwave LGP2140X TMAs (6) Ericsson RRUS11 RRUs (1) Raycap DC6-48-60-18-8F Surge Arrestor	(12) 1-5/8" (1) 3/8" RET <sup>2</sup> (2) DC <sup>2</sup>	AT&T	108.3	(1) 13.5' Low Profile Platform
97 <sup>3</sup>	(3) RFS APXV18-206517S-C	(6) 1-5/8"	MetroPCS	97	(3) Pipe Mounts

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

2. AT&T currently has (1) 3/8" RET cable and (2) DC cables installed inside (1) 3" conduit inside the pole shaft.

3. MetroPCS currently has (6) 1-5/8" coax installed outside the pole shaft in a single row.

### Proposed Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
137	(3) Antel BXA-70063/6CF (4) Antel BXA-171085/12BF (2) Antel BXA-171063/12BF (2) Antel BXA-70080-6BF (1) Antel BXA-70063-4CF (3) ALU RRH2X40-AWS RRHs (1) RFS DB-T1-6Z-8AB-0Z Junction Box	(12) 1-5/8" (1) 1-5/8" Fiber	Verizon	137	(1) 12.5' Low Profile 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
Base Plate	50 ksi
Anchor Bolts	105 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	139 - 114	Pole	TP29.875x24x0.25	19.9	Pass
L2	114 - 89	Pole	TP35.8125x29.875x0.25	40.3	Pass
L3	89 - 69	Pole	TP40x34.125x0.3125	48.6	Pass
L4	69 - 44	Pole	TP45.875x40x0.3125	56.1	Pass
L5	44 - 25	Pole	TP49.75x43.84x0.375	53.9	Pass
L6	25 - 0	Pole	TP55.625x49.75x0.375	57.5	Pass
	0	Anchor Bolts	(20) 2"Ø on 62" BC	48.4	Pass
	0	Base Plate	PL 68"Ø x 2.5" thk.	38.7	Pass

\* Capacities include a 1/3 allowable stress increase for wind.

**Table 4 - Maximum Base Reactions**

Base Reactions	Current Analysis (TIA/EIA-222-F)	Original Design (ANSI/TIA-222-G)
Axial	31 k	67 k
Shear	23 k	39 k
Moment	2,201 k-ft	4,076 k-ft

## **GENERAL COMMENTS**

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

## **LIMITATIONS**

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



## **APPENDIX**

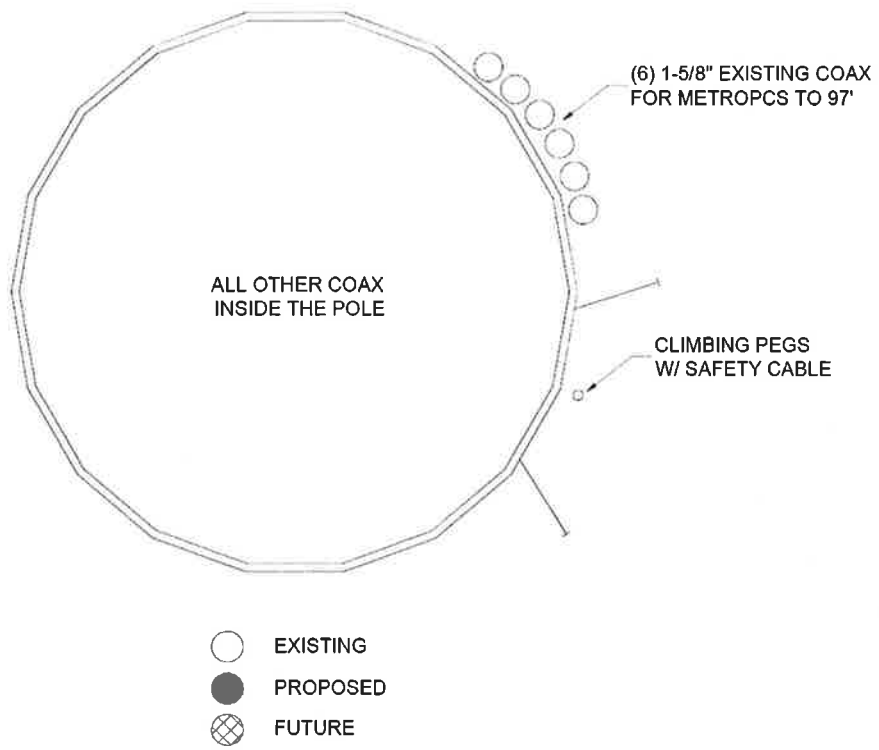
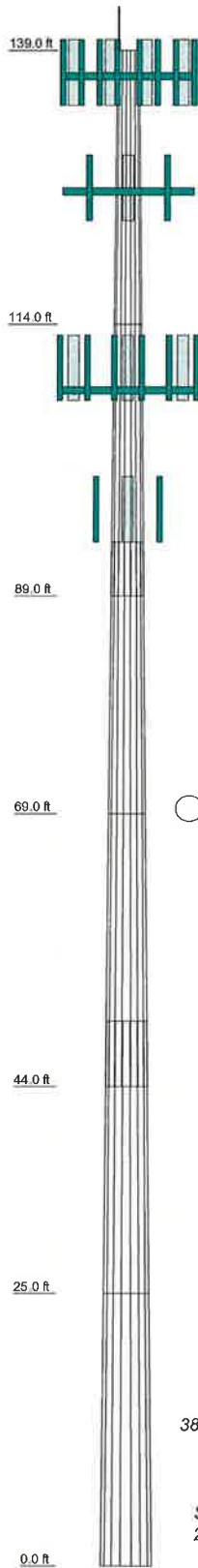


Figure 1—Assumed Coax Layout

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	25.00	18	0.2500	5.00	24.0000	29.8750	A572-65	1.8
2	25.00	18	0.2500	5.00	29.8750	35.8125	A572-65	2.2
3	25.00	18	0.3125	6.00	34.1250	40.0000	A572-65	3.1
4	25.00	18	0.3125	6.00	40.0000	45.8750	A572-65	3.6
5	25.00	18	0.3750	6.00	43.8400	49.7500	A572-65	4.7
6	25.00	18	0.3750	6.00	49.7500	55.8250	A572-65	5.3
								20.7



### DESIGNED APPURTENANCE LOADING

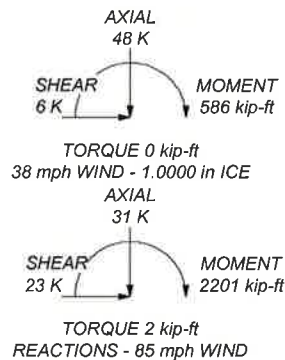
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	139	DTMA1819-00-12 TMA	126.5
BXA-70063/6CF W/Mount Pipe	137	(1) 12.5' Low Profile Platform	126.5
BXA-70063/6CF W/Mount Pipe	137	(3) Powerwave 7770.00 w/Mount Pipe	108.25
BXA-70063/6CF W/Mount Pipe	137	(3) Powerwave 7770.00 w/Mount Pipe	108.25
(2) BXA-171085-12BF w/ Mount Pipe	137	(3) Powerwave 7770.00 w/Mount Pipe	108.25
BXA-171085-12BF w/ Mount Pipe	137	KMW AM-X-CD-16-6500T w/Mount Pipe	108.25
BXA-171085-12BF w/ Mount Pipe	137	KMW AM-X-CD-16-6500T w/Mount Pipe	108.25
BXA-171063-12BF w/ Mount Pipe	137	KMW AM-X-CD-16-6500T w/Mount Pipe	108.25
BXA-171063-12BF w/ Mount Pipe	137	KMW AM-X-CD-16-6500T w/Mount Pipe	108.25
BXA-70080-6BF w/ Mount Pipe	137	(4) Powerwave LGP2140X	108.25
BXA-70063-4CF w/ Mount Pipe	137	(4) Powerwave LGP2140X	108.25
RRH2X40-AWS	137	(4) Powerwave LGP2140X	108.25
RRH2X40-AWS	137	(2) Ericsson RRUS-11 RRU	108.25
RRH2X40-AWS	137	(2) Ericsson RRUS-11 RRU	108.25
DB-T1-6Z-8AB-0Z	137	(2) Ericsson RRUS-11 RRU	108.25
(1) 12.5' Low Profile Platform	137	Raycap DC6-48-60-18-8F	108.25
APX16PV-16PVL-C W/Mount Pipe	126.5	(1) 13.5' Low Profile Platform	108.25
APX16PV-16PVL-C W/Mount Pipe	126.5	APXV18-206517S-C W/Mount Pipe	97
APX16PV-16PVL-C W/Mount Pipe	126.5	APXV18-206517S-C W/Mount Pipe	97
DTMA1819-00-12 TMA	126.5	APXV18-206517S-C W/Mount Pipe	97
DTMA1819-00-12 TMA	126.5		


### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 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: 57.5%



 <b>FDH Engineering, Inc.</b> 6521 Meridian Drive, Suite 107 Raleigh, NC 27616 Phone: 919-7551012 FAX: 919-7551031	<b>Job: Bolton 2, CT11558-A-00</b>		
	Project: 13SFS11400		
	Client: SBA Network Services, Inc.	Drawn by: Adam Bryan	App'd:
	Code: TIA/EIA-222-F	Date: 11/01/13	Scale: NTS
	Path:	Dwg No. E-1	