Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

June 30, 2014

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

Re: **EM-VER-116-130220 – Cellco Partnership d/b/a Verizon Wireless**
154 Sayles Avenue, Putnam, Connecticut

Dear Ms. Bachman:

On March 12, 2013, the Siting Council acknowledged receipt of Cellco's notice of intent to modify its telecommunications facility at 154 Sayles Avenue in Putnam. The modification involved the replacement of certain antennas and the installation of remote radio heads and a fiber optic cable.

As a condition of the acknowledgement, Cellco was required to provide the Council with a letter stating that the recommendations specified in the structural report were implemented. Attached is a Tower Modification Certification Letter verifying that these conditions have been satisfied. All construction associated with these modifications has now been completed.

If you have any questions please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Sandy M. Carter
Brian Ragozzine
Mark Gauger

13002171-v1

CENTEK engineering

Centered on Solutions℠

June 27, 2014

Mr. Mark Gauger
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re: Existing Telecommunications Facility Tower Modification Certification Letter

Project:	**Verizon Putnam** 154 Sayles Avenue Putnam, CT
Tower Owner:	**SBA Communications**
Engineer:	**FDH Engineering** 6521 Meridien Drive Raleigh, NC 27616

Centek Project No.: 14055.005

Dear Mr. Gauger,

We are providing this "Existing Telecommunications Facility Tower Modification Certification Letter" with regard to the antenna upgrade by Verizon Wireless at the above referenced project.

The following are the basis for substantiating compliance with the FDH Engineering structural analysis report (FDH Project No. 12-01602E S5) dated January 28, 2013:

- Review of the FDH structural analysis report dated 01/28/2013.
- Field observations by Centek personnel of the coax, diplexer and RRH installation on 06/26/2014 which determined all coax lines, diplexers and RRH's were installed in general compliance with the recommendations of the structural analysis report prepared by FDH Engineering on 01/28/2013.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,

Carlo F. Centore, PE
Principal ~ Structural Engineer

CC: Rachel Mayo, Tim Parks, Jim Smith

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

March 12, 2013

Kenneth C. Baldwin, Esq.
Robinson & Cole
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-116-130220** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 154 Sayles Avenue, Putnam, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- The proposed coax and accessory equipment shall be installed in accordance with the recommendations made in the Structural Analysis Report prepared by FDH Engineering dated January 28, 2013 and stamped by Christopher Murphy;
- Within 45 days following completion of the antenna installation, Verizon shall provide documentation certified by a professional engineer that its installation complied with the recommendation of the structural analysis;
- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated February 20, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/CDM/jb

c: The Honorable Richard "Pete" Place, Mayor, Town of Putnam
Gerard Cotnoir, Planning Chairman, Town of Putnam
Sean Gormley, SBA

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
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www.ct.gov/csc

February 25, 2013

The Honorable Richard "Pete" Place
Mayor
Town of Putnam
Town Hall
126 Church Street
Putnam, CT 06260

RE: **EM-VER-116-130220 -** Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 154 Sayles Avenue, Putnam, Connecticut.

Dear Mayor Place:

The Connecticut Siting Council (Council) received a request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72, a copy of which has already been provided to you.

If you have any questions or comments regarding the proposal, please call me or inform the Council by March 11, 2013.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts
Executive Director

LR/jb

c: Gerard Cotnoir, Planning Chairman, Town of Putnam

CONNECTICUT SITING COUNCIL

ROBINSON & CO

EM-VER-116-130220

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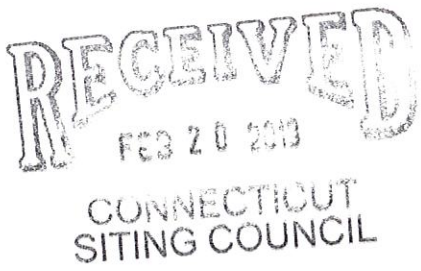
Also admitted in Massachusetts

February 20, 2013



Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
154 Sayles Avenue, Putnam, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 147-foot level on an existing 175-foot tower at the above-referenced address. The tower is owned by SBA. The Council approved Cellco's shared use of this tower in 1999. Cellco now intends to replace six (6) of its antennas with three (3) model BXA-80080-4CF cellular antennas and three (3) model BXA-171063-12CF AWS antennas, at the same 147-foot level. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its antennas and one (1) HYBRIFLEX™ fiber cable. Attached behind Tab 1 are the 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 Peter Place, Mayor for the Town of Putnam. A copy of this letter is also being sent to William Moser and Ronald Blain, the owners of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located at the 147-foot level on the 175-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) adopted safety standard. A cumulative power density table for Cellco's modified facility is included behind Tab 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 attached behind Tab 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:
Peter Place, Putnam Mayor
William Moser and Ronald Blain
Sandy M. Carter

BXA-80080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 dBd

Replace "X" with desired electrical downtilt.

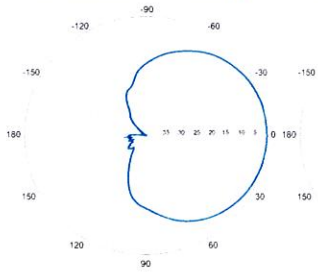
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	
Frequency bands	806-900 MHz*
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)
Polarization	±45°
Horizontal beamwidth	80°
Vertical beamwidth	15°
Gain	12.0 dBd (14.1 dBi)
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14
Impedance	50Ω
VSWR	≤1.4:1
Upper sidelobe suppression (0°)	-13.1 dB
Front-to-back ratio (+/-30°)	-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^2 Side: 0.18 m^2	Front: 2.6 ft^2 Side: 1.9 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 351 N Side: 280 N	Front: 79 lbf Side: 61 lbf

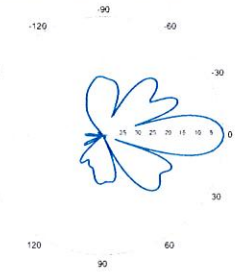
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	36210002	50-160 mm 2.0-6.3 in	4.5 kg 10 lbs
2-Point Downtilt Bracket Kit (0-20°)	36114003	50-160 mm 2.0-6.3 in	4.9 kg 11 lbs
Downtilt Mounting Applications	A mounting bracket and downtilt bracket kit must be ordered for downtilt applications		
Concealment Configurations	For concealment configurations, order BXA-80080-4CF-EDIN-X-FP		

BXA-80080-4CF-EDIN-X



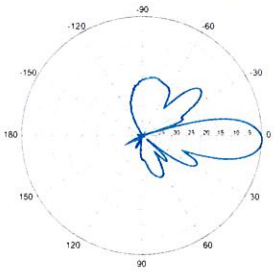
Horizontal

BXA-80080-4CF-EDIN-0



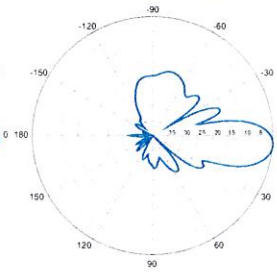
0° | Vertical

BXA-80080-4CF-EDIN-2



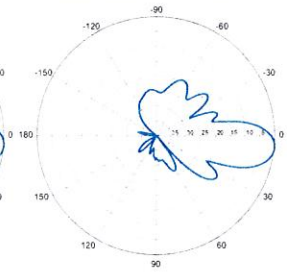
2° | Vertical

BXA-80080-4CF-EDIN-4



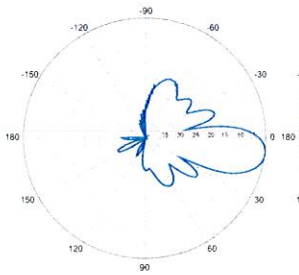
4° | Vertical

BXA-80080-4CF-EDIN-6



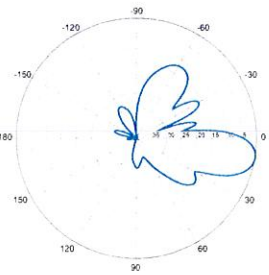
6° | Vertical

BXA-80080-4CF-EDIN-8



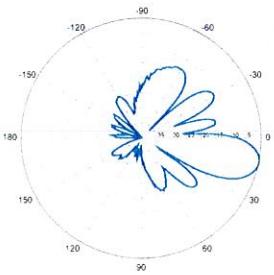
8° | Vertical

BXA-80080-4CF-EDIN-10



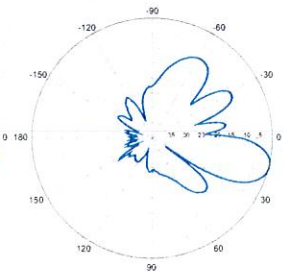
10° | Vertical

BXA-80080-4CF-EDIN-12



12° | Vertical

BXA-80080-4CF-EDIN-14



14° | Vertical

BXA-171063-12CF-EDIN-X

Replace "X" with desired electrical downtilt

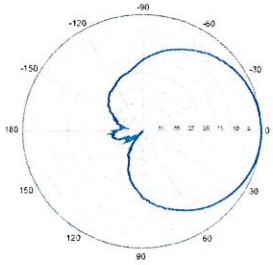
X-Pol | FET Panel | 63° | 19.0 dBi

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 / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1840 x 154 x 105 mm	72.4 x 6.1 x 4.1 in
Depth with z-brackets	133 mm	5.2 in
Weight without mounting brackets	6.8 kg	15 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.28 m² Side: 0.19 m²	Front: 3.1 ft² Side: 2.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf

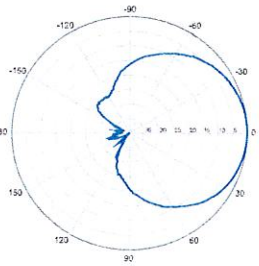
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



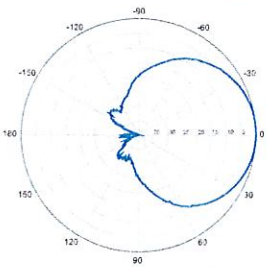
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



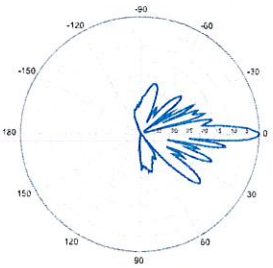
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



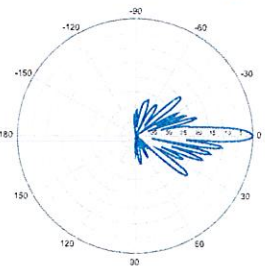
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



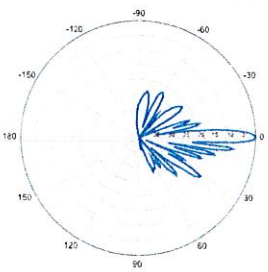
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

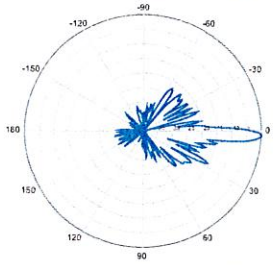


0° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-X

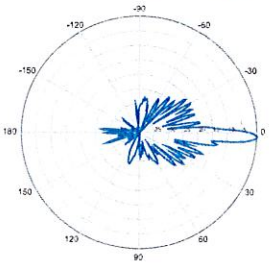
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2



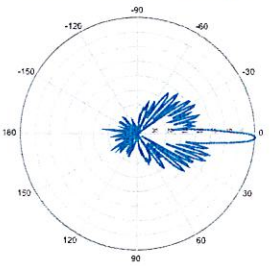
2° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2



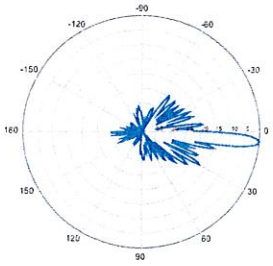
2° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



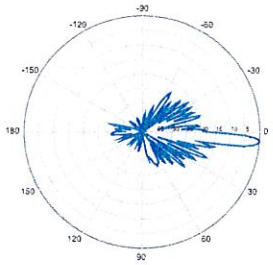
2° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-5



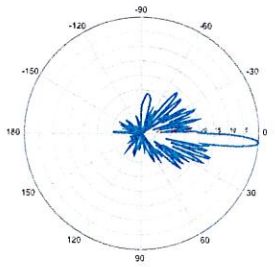
5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-5

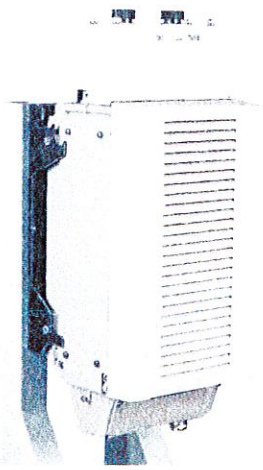


5° | Vertical | 1920-2170 MHz

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

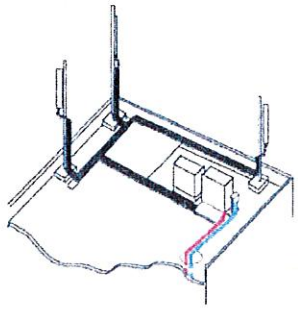
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced.
The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

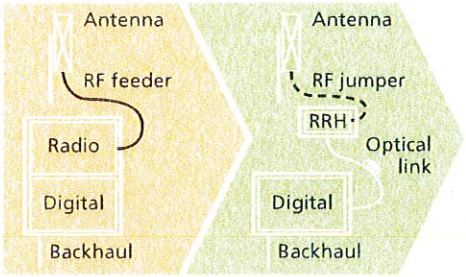
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

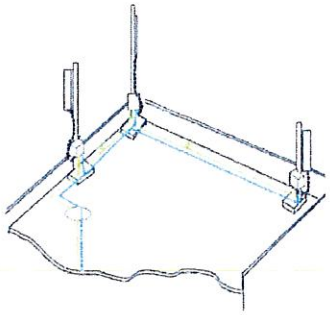
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - ¬ TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - ¬ One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - ¬ Single mode dual fiber (SM/DF)
- Multi-mode variant
  - ¬ Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

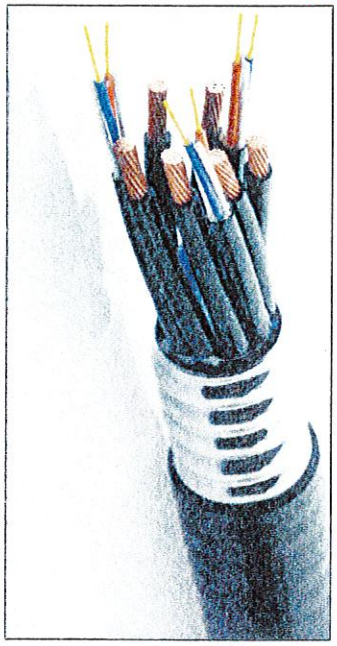


Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

Structure			
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
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
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)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[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
Environment			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change.

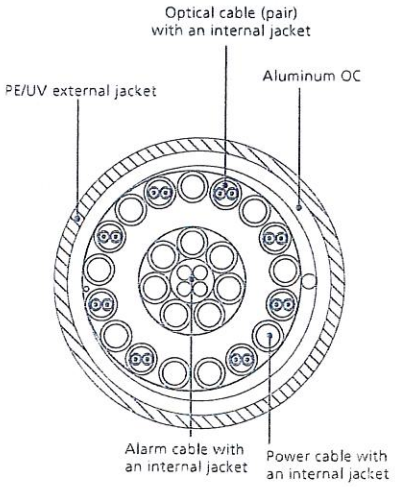


Figure 2: Construction Detail

	General	Power	Density					
Site Name: Putnam								
Tower Height: Verizon @ 147ft								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T UMTS	2	565	134	0.0226	880	0.5867	3.86%	
*AT&T UMTS	2	875	134	0.0350	1900	1.0000	3.50%	
*AT&T GSM	1	283	134	0.0057	880	0.5867	0.97%	
*AT&T GSM	4	525	134	0.0421	1900	1.0000	4.21%	
*AT&T LTE	1	1771	134	0.0355	734	0.4893	7.25%	
*MetroPCS	3	443.61	124	0.0311	2140	1.0000	3.11%	
*Sprint CDMA/LTE	4	625.2	180	0.0278	1900	1.0000	2.78%	
*Nextel	9	100	159	0.0128	858	0.5720	2.24%	
*VoiceStream	4	277	187	0.0114	1930	1.0000	1.14%	
Verizon PCS	**11**	**246**	**147**	**0.0450**	**1970**	**1.0000**	**4.50%**	
Verizon Cellular	**9**	**254**	**147**	**0.0380**	**869**	**0.5793**	**6.57%**	
Verizon AWS	**1**	**1750**	**147**	**0.0291**	**2145**	**1.0000**	**2.91%**	
Verizon 700	**1**	**1050**	**147**	**0.0175**	**698**	**0.4653**	**3.75%**	
								46.78%
* Source: Siting Council								

Structural Analysis for SBA Network Services, Inc.

175' Monopole Tower

SBA Site Name: Putnam
SBA Site ID: CT00680-S
Verizon Site ID: 118597

FDH Project Number 12-01602E S5 (R1)

Analysis Results

Tower Components	99.7%	Sufficient
Foundation	85.2%	Sufficient

Prepared By:

Logan Poe, EI
Project Engineer

Reviewed By:

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

FDH Engineering, Inc.
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info@fdh-inc.com

January 28, 2013

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Engineering, Inc. performed a structural analysis of the monopole located in Putnam, 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, geotechnical data, and member sizes was obtained from:

- ❑ Fred A. Nudd Corporation (Drawing No. 98-6220-1) original design drawings dated November 12, 1998
- ❑ Fred A. Nudd Corporation (Drawing No. 98-6220-2) Foundation Details dated November 12, 1998
- ❑ Jaworski Geotech, Inc. (Project No. C98291G) Geotechnical Evaluation dated August 4, 1998
- ❑ Vertical Structures, Inc. (Job No. 2008-007-034) Structural Analysis Report dated November 21, 2008
- ❑ o2wireless Solutions (Job No. 2230-019) Monopole Tower Rework Construction Drawings dated May 30, 2002
- ❑ o2wireless Solutions (Job No. 2230-019B) Monopole Tower Structural Analysis Report dated May 28, 2002
- ❑ FDH Engineering, Inc. (Job No. 12-004253T C1) TIA Inspection Report dated July 27, 2012
- ❑ FDH Engineering, Inc. (Job No. 12-01602E S2) Modification Drawings dated April 30, 2012
- ❑ FDH Engineering, Inc. (Job No. 12-04253TC1) Modification Inspection Report dated July 24, 2012
- ❑ 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 147 ft and 148 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 foundations were constructed per the original design drawings (see Fred A. Nudd Corporation Drawing No. 98-6220-2) and utilizing the existing soil parameters (see Jaworski Geotech, Inc. Project No. C98291G), 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 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 pole's shaft.
2. RRU/RRH Stipulation: The equipment may be installed in any arrangement as determined by the client.
3. The existing diplexers should be installed directly behind the existing and proposed panel antennas.

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[1]	Carrier	Mount Elevation (ft)	Mount Type
191.5	(6) EMS RR90-17-02DP w/ Mount Pipe (6) Allen Telecom FE15501P77/75 TMAs	(12) 1-5/8"	T-Mobile	175	(3) 24' x 4.5" Pipe Mounts
179	(6) Decibel DB980H90 w/ Mount Pipe	(6) 1-5/8"	Sprint	175	(1) 14.5' Low Profile Platform
162	(9) Allgon ALP 9212 w/ Mount Pipe	(9) 1-5/8"	Nextel	160	(1) 14.5' Low Profile Platform
147	(3) Antel BXA-70063/6CF w/ Mount Pipe (6) Antel LPA-80080/4CF w/ Mount Pipe (3) Antel BXA-171085-12BF w/ Mount Pipe (6) RFS FD9R6004/2C-3L Diplexers	(12) 1-5/8"	Verizon	147	(1) 14.5' Low Profile Platform
134	(6) Powerwave 7770.00 w/Mount Pipe (3) KMW AM-X-CD-17-65-00T w/ Mount Pipe (1) Nokia CS72188.01 (6) Powerwave LGP21401 TMAs (6) Powerwave LGP21901 Diplexers	(12) 1-5/8" (2) 3/4" DC Power (1) 7/16" Fiber (1) 1/2" RET	AT&T	135	(1) 14.5' Low Profile Platform
	(6) Ericsson RRUS 11 RRUs (1) Raycap DC2-48-60-18-8F Surge Arrestor			133	(1) Valmont Universal Ring Mount

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
148	(3) ALU RRH 2x40-AWS RRUs	(12) 1-5/8" (1) 1-5/8" Hybrid Fiber Cable	Verizon	148	(3) Pipe Mounts
147	(3) Antel BXA-70063/6CF w/ Mount Pipe (3) Antel BXA-80080/4CF w/ Mount Pipe (3) Antel BXA-171085-12BF w/ Mount Pipe (3) Antel BXA-171063-12CF w/ Mount Pipe (6) RFS FD9R6004/2C-3L Diplexers (1) RFS DB-T1-6Z-8AB-0Z Distribution Box			147	(1) 14.5' 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	56 ksi & 65 ksi
Base Plate	50 ksi
Anchor Bolts	Fu = 125 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 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	175 - 150	Pole	TP27.625x18x0.25	36.9	Pass
L2	150 - 125	Pole	TP31.425x25.2x0.25	95.1	Pass
L3	125 - 115	Pole	TP33.5x31.425x0.3125	82.4	Pass
L4	115 - 80	Pole (w/Modifications)	TP39.3819x31.8375x0.3125	99.6	Pass
L5	80 - 70	Pole (w/Modifications)	TP41.0625x39.3819x0.375	83.2	Pass
L6	70 - 35	Pole (w/Modifications)	TP46.8125x39.4722x0.375	97.8	Pass
L7	35 - 0	Pole (w/Modifications)	TP52.3x44.9615x0.4375	99.7	Pass
		Anchor Bolts	(18) 2"ø and (18) 1.25" w/BC=61"	93.4	Pass
		Base Plate	67"ø PL. x 1.5" Thk. w/stiffeners	75.9	Pass

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

Table 4 - Maximum Base Reactions

Base Reactions	Current Analysis *(TIA/EIA-222-F)*
Axial	54 k
Shear	44 k
Moment	5,202 k-ft

* Foundation determined to be adequate per independent analysis.

GENERAL COMMENTS

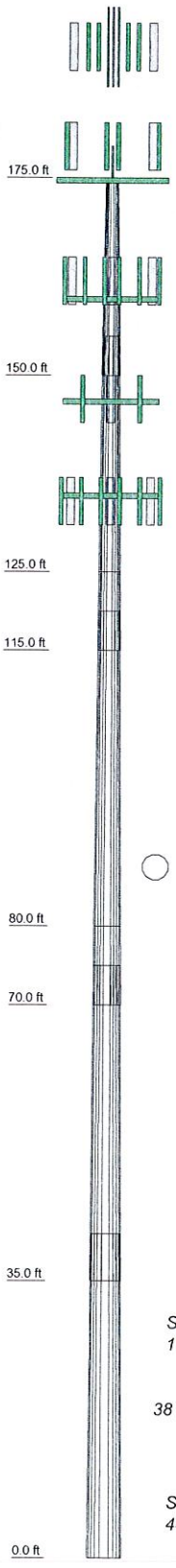
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading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

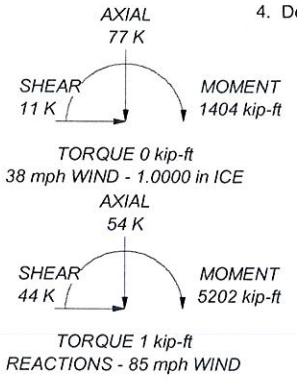
LIMITATIONS

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

APPENDIX

Section	1	2	3	4	5	6	7
Length (ft)	25.00	30.00	10.00	40.00	10.00	40.00	41.00
Number of Sides	12	12	12	12	12	12	12
Thickness (in)	0.2500	0.2500	0.3125	0.3125	0.3750	0.3750	0.4375
Socket Length (ft)	5.00	5.00	5.00	5.00	5.00	6.00	
Top Dia (in)	18.0000	25.2000	31.4250	31.8375	39.3819	39.4722	44.9615
Bot Dia (in)	27.6250	31.4250	33.5000	39.3819	41.0625	46.8125	52.3000
Grade	A572-65						A36M-56
Weight (K)	1.5	2.3	1.1	4.8	1.6	7.0	9.5





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	175	(2) FD9R6004/2C-3L Diplexer (Verizon)	147
(2) RR90-17-02DP w/ Mount Pipe (T-Mobile)	175	(2) FD9R6004/2C-3L Diplexer (Verizon)	147
(2) RR90-17-02DP w/ Mount Pipe (T-Mobile)	175	(2) FD9R6004/2C-3L Diplexer (Verizon)	147
(2) RR90-17-02DP w/ Mount Pipe (T-Mobile)	175	BXA-70063/6CF W/Mount Pipe (Verizon)	147
(2) Allen Telecom FE15501P77/75 MHAs (T-Mobile)	175	BXA-70063/6CF W/Mount Pipe (Verizon)	147
(2) Allen Telecom FE15501P77/75 MHAs (T-Mobile)	175	BXA-70063/6CF W/Mount Pipe (Verizon)	147
(2) Allen Telecom FE15501P77/75 MHAs (T-Mobile)	175	RFS DB-T1-6Z-8AB-0Z Distribution Box (Verizon)	147
Pipe Mount (T-Mobile)	175	BXA-80080/4CF w/ Mount Pipe (Verizon)	147
Pipe Mount (T-Mobile)	175	BXA-80080/4CF w/ Mount Pipe (Verizon)	147
Pipe Mount (T-Mobile)	175	BXA-80080/4CF w/ Mount Pipe (Verizon)	147
(2) Decibel DB980H90 w/ Mount Pipe (Sprint)	175	Low Profile Platform (Verizon)	147
(2) Decibel DB980H90 w/ Mount Pipe (Sprint)	175	(2) 7770.00 w/Mount Pipe (ATI)	135
(2) Decibel DB980H90 w/ Mount Pipe (Sprint)	175	(2) 7770.00 w/Mount Pipe (ATI)	135
Low Profile Platform (Sprint)	175	(2) 7770.00 w/Mount Pipe (ATI)	135
(3) Allgon ALP 9212 w/ Mount Pipe (Nextel)	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe (ATI)	135
(3) Allgon ALP 9212 w/ Mount Pipe (Nextel)	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe (ATI)	135
(3) Allgon ALP 9212 w/ Mount Pipe (Nextel)	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe (ATI)	135
Low Profile Platform (Nextel)	160	CS72188.01 LMU (ATI)	135
ALU RRH2X40-AWS (Verizon)	148	(2) LGP21401 TMA (ATI)	135
ALU RRH2X40-AWS (Verizon)	148	(2) LGP21401 TMA (ATI)	135
ALU RRH2X40-AWS (Verizon)	148	(2) LGP21401 TMA (ATI)	135
Empty Mount Pipe (Verizon)	148	(2) RRUS 11 (ATI)	135
Empty Mount Pipe (Verizon)	148	(2) RRUS 11 (ATI)	135
Empty Mount Pipe (Verizon)	148	(2) RRUS 11 (ATI)	135
BXA-171085-12BF w/Mount Pipe (Verizon)	147	(2) Powerwave LGP21901 Diplexer (ATI)	135
BXA-171085-12BF w/Mount Pipe (Verizon)	147	(2) Powerwave LGP21901 Diplexer (ATI)	135
BXA-171085-12BF w/Mount Pipe (Verizon)	147	(2) Powerwave LGP21901 Diplexer (ATI)	135
BXA-171063-12BF w/ Mount Pipe (Verizon)	147	Raycap DC2-48-60-18-8F Surge Arrestor (ATI)	135
BXA-171063-12BF w/ Mount Pipe (Verizon)	147	Empty Pipe Mount (ATI)	135
BXA-171063-12BF w/ Mount Pipe (Verizon)	147	Low Profile Platform (ATI)	135
		Universal Ring Mount (ATI)	133

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	A36M-56	56 ksi	65 ksi

TOWER DESIGN NOTES

1. Tower is located in Windham 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.

FDH Engineering, Inc.
6521 Meridien Drive
Raleigh, NC 27616
Phone: 919-7551012
FAX: 919-7552031
Tower Analysis

Job: Putnam, CT00680-S			
Project: 12-01602E S5 (R1)			
Client: SBA Network Services, Inc	Drawn by: Logan Poe		App'd:
Code: TIA/EIA-222-F	Date: 01/28/13		Scale: NTS
Path:			Dwg No. E-1