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Also admitted in Massachusetts

June 6, 2014

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

Re: **Notice of Exempt Modification – Facility Modification  
151 Sand Hill Road, South Windsor, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) antennas at the 140-foot level of the existing 187-foot tower at 151 Sand Hill Road in South Windsor, Connecticut (the “Property”). The tower is owned by SBA. The Council approved Cellco’s use of this tower in 2002. Cellco now intends to modify its facility by removing six (6) 850 MHz antennas and replacing them with three (3) model LNX-6514DS, 850 MHz antennas, and three (3) model HBX-6517DS, 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. Included in Attachment 1 are specifications for Cellco’s replacement antenna, 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 Matthew B. Galligan, Manager of the Town of South Windsor. The Town of South Windsor is the owner 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).



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

Melanie A. Bachman  
June 6, 2014  
Page 2

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 140 feet on the existing 187-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 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:

Matthew B. Galligan, Town Manager  
Sandy M. Carter



# **ATTACHMENT 1**

# Product Specifications



## Andrew Solutions LNX-6514DS-T6M

**DualPol® Antenna, 698–896 MHz, 65° horizontal beamwidth, fixed electrical tilt**

- Broadband, providing future-ready single antenna for application in 700 MHz and existing 850 MHz cellular operation
- Air dielectric design provides superior PIM performance with repeatable antenna-to-antenna gain and pattern consistency
- Single piece radome provides long term mechanical stability
- Proven core design technology, with over 1,000,000 similar antennas deployed
- Exceptional USLS pattern shaping for optimizing coverage and interference mitigation for LTE applications
- Specifically designed to have physical dimensions similar to most existing cellular antennas

## Electrical Specifications

### Frequency Band, MHz

|                                      | 698–806       | 806–896       |
|--------------------------------------|---------------|---------------|
| Gain, dBi                            | 15.8          | 16.6          |
| Beamwidth, Horizontal, degrees       | 65            | 65            |
| Beamwidth, Vertical, degrees         | 12.6          | 11.0          |
| Beam Tilt, degrees                   | 6             | 6             |
| USLS, typical, dB                    | 18            | 18            |
| Front-to-Back Ratio at 180°, dB      | 34            | 34            |
| Isolation, dB                        | 30            | 30            |
| VSWR   Return Loss, dB               | 1.35:1   16.5 | 1.35:1   16.5 |
| PIM, 3rd Order, 2 x 20 W, dBc        | -150          | -150          |
| Input Power per Port, maximum, watts | 500           | 500           |
| Polarization                         | ±45°          | ±45°          |
| Impedance                            | 50 ohm        | 50 ohm        |
| Lightning Protection                 | dc Ground     | dc Ground     |

## Mechanical Specifications

|   |  |
|---|--|
| Color   Radome Material                   | Light gray   Fiberglass, UV resistant      |
| Connector Interface   Location   Quantity | 7-16 DIN Female   Bottom   2               |
| Wind Loading, maximum                     | 617.7 N @ 150 km/h<br>138.9 lbf @ 150 km/h |
| Wind Speed, maximum                       | 241.0 km/h   149.8 mph                     |

## Dimensions

|            |                       |
|------------|-----------------------|
| Depth      | 181.0 mm   7.1 in     |
| Length     | 1847.00 mm   72.72 in |
| Width      | 301.00 mm   11.85 in  |
| Net Weight | 17.40 kg   38.36 lb   |

## Regulatory Compliance/Certifications

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

# Product Specifications

COMMSCOPE®

LNx-6514DS-T6M

 on the go



## Included Products

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

# Product Specifications

COMMSCOPE®

POWERED BY



## HBX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry to minimize any sector overlap
- Rugged, reliable design with excellent passive intermodulation suppression
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

### Electrical Specifications

| Frequency Band, MHz                         | 1710–1880  | 1850–1990  | 1920–2180  |
|---|------------|------------|------------|
| Gain by all Beam Tilts, average, dBi        | 18.5       | 18.6       | 18.9       |
| Gain by all Beam Tilts Tolerance, dB        | ±0.2       | ±0.3       | ±0.4       |
|   | 0 °   18.3 | 0 °   18.4 | 0 °   18.8 |
| Gain by Beam Tilt, average, dBi             | 3 °   18.6 | 3 °   18.7 | 3 °   19.1 |
|   | 6 °   18.4 | 6 °   18.6 | 6 °   18.7 |
| Beamwidth, Horizontal, degrees              | 67         | 66         | 64         |
| Beamwidth, Horizontal Tolerance, degrees    | ±1.8       | ±0.9       | ±2.8       |
| Beamwidth, Vertical, degrees                | 5.0        | 4.7        | 4.4        |
| Beamwidth, Vertical Tolerance, degrees      | ±0.2       | ±0.2       | ±0.3       |
| Beam Tilt, degrees                          | 0–6        | 0–6        | 0–6        |
| USLS, dB                                    | 19         | 19         | 18         |
| Front-to-Back Total Power at 180° ± 30°, dB | 26         | 26         | 26         |
| CPR at Boresight, dB                        | 22         | 22         | 22         |
| CPR at Sector, dB                           | 11         | 11         | 9          |
| Isolation, dB                               | 30         | 30         | 30         |
| VSWR   Return Loss, dB                      | 1.4   15.6 | 1.4   15.6 | 1.4   15.6 |
| PIM, 3rd Order, 2 x 20 W, dBc               | -153       | -153       | -153       |
| Input Power per Port, maximum, watts        | 350        | 350        | 350        |
| Polarization                                | ±45°       | ±45°       | ±45°       |
| Impedance                                   | 50 ohm     | 50 ohm     | 50 ohm     |

### General Specifications

|                            |                      |
|----------------------------|----------------------|
| Antenna Brand              | Andrew®              |
| Antenna Type               | DualPol®             |
| Band                       | Single band          |
| Brand                      | DualPol®   Teletilt® |
| Operating Frequency Band   | 1710 – 2180 MHz      |
| Number of Ports, all types | 2                    |

### Mechanical Specifications

|                        |                        |
|------------------------|------------------------|
| Color                  | Light gray             |
| Lightning Protection   | dc Ground              |
| Radiator Material      | Low loss circuit board |
| Radome Material        | PVC, UV resistant      |
| RF Connector Interface | 7-16 DIN Female        |
| RF Connector Location  | Bottom                 |

# Product Specifications

COMMSCOPE®

HBX-6517DS-VTM



|                              |   |
|------------------------------|---|
| RF Connector Quantity, total | 2   |
| Wind Loading, maximum        | 393.0 N @ 150 km/h<br>88.3 lbf @ 150 km/h |
| Wind Speed, maximum          | 241.0 km/h   149.8 mph                    |

## Dimensions

|            |                     |
|------------|---------------------|
| Depth      | 83.0 mm   3.3 in    |
| Length     | 1902.0 mm   74.9 in |
| Width      | 166.0 mm   6.5 in   |
| Net Weight | 6.2 kg   13.7 lb    |

## Remote Electrical Tilt (RET) Information

|  |                |
|--|----------------|
| Model with Factory Installed AISG 1.1 Actuator | HBX-6517DS-R2M |
| Model with Factory Installed AISG 2.0 Actuator | HBX-6517DS-A1M |
| RET System                                     | Teletilt®      |

## Regulatory Compliance/Certifications

### Agency

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

### Classification

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



## Included Products

DB390 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Use for narrow panel antennas. Includes two pipe mounts.

DB5098E — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members



**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

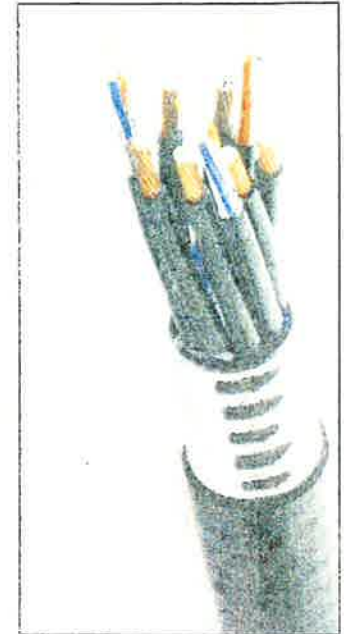


Figure 1: HYBRIFLEX Series

**Technical Specifications**

|  |                                |                   |   |
|--|--------------------------------|-------------------|---|
| <b>Structure</b>                         |                                |                   |   |
| 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 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<br>RoHS Compliant  |
| <b>Power and Alarm 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<br>UL Type XHHW-2, UL 44<br>UL-LS Limited Smoke, UL VW-1<br>IEEE-383 (1974), IEEE1202/FT4<br>RoHS Compliant |
| <b>Operating Range</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

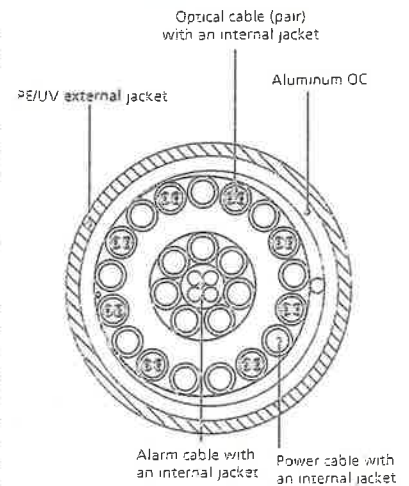


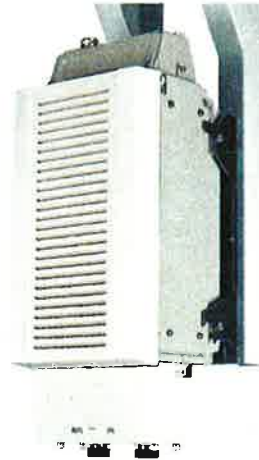
Figure 2: Construction Detail

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



# 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 (O&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.

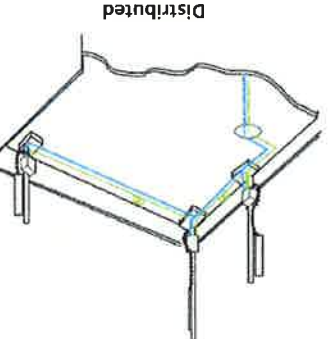
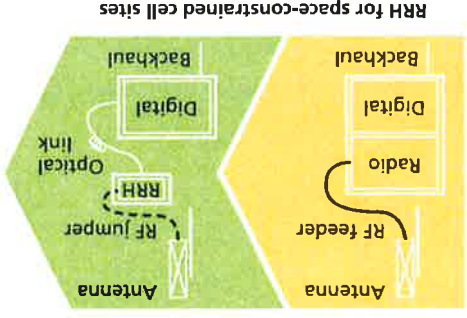
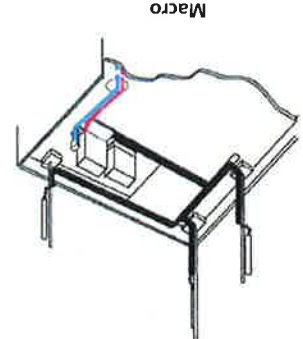
Technical specifications

- Physical dimensions**
- Height: 620 mm (24.4 in.)
  - Width: 270 mm (10.63 in.)
  - Depth: 170 mm (6.7 in.)
  - Weight (without mounting kit): less than 20 kg (44 lb)
- Power**
- Power supply: -48VDC
- Operating environment**
- Outdoor temperature range: -40°C to +50°C (-40°F to +122°F)
  - Without solar load: -40°C to +55°C (-40°F to +131°F)

- RF characteristics**
- Passive convection cooling (no fans)
  - Enclosure protection (IP65 (International Protection rating))
  - 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**
- Single-mode variant
  - Single-mode dual fiber (SM/DF)
    - One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - Multi-mode variant
    - Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

- Digital Ports and Alarms**
- Two optical ports to support daisy-chaining
  - Six external alarms
- Optical fiber length**
- Up to 500 m (0.31 mi), using MM fiber
  - Up to 20 km (12.43 mi), using SM fiber



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

# **ATTACHMENT 2**

General Power Density

Site Name: South Windsor 3, CT  
 Cumulative Power Density

| Operator     | Operating Frequency (MHz) | Number of Trans. | ERP Per Trans. (watts) | Total ERP (watts) | Distance to Target (feet) | Calculated Power Density (mW/cm <sup>2</sup> ) | Maximum Permissible Exposure* (mW/cm <sup>2</sup> ) | Fraction of MPE (%) |
|--------------|---------------------------|------------------|------------------------|-------------------|---------------------------|--|---|---------------------|
| VZW PCS      | 1970                      | 11               | 408                    | 4492.754          | 140                       | 0.0824   | 1.0   | 8.24%               |
| VZW Cellular | 869                       | 9                | 386                    | 3472.822          | 140                       | 0.0637   | 0.5793333333  | 11.00%              |
| VZW AWS      | 2145                      | 1                | 1750                   | 1750              | 140                       | 0.0321   | 1.0   | 3.21%               |
| VZW 700      | 746                       | 1                | 1050                   | 1050              | 140                       | 0.0193   | 0.4973333333  | 3.87%               |

**Total Percentage of Maximum Permissible Exposure**

26.33%

\*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz

mW/cm<sup>2</sup> = milliwatts per square centimeter

ERP = Effective Radiated Power

Absolute worst case maximum values used.

# **ATTACHMENT 3**



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

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

**187' Monopole Tower**

**SBA Site Name: South Windsor  
SBA Site ID: CT07824-S-00  
Verizon Site Name: South Windsor 3  
Verizon ID:**

FDH Project Number 1423RK1400

**Analysis Results**

|                  |       |            |
|------------------|-------|------------|
| Tower Components | 82.1% | Sufficient |
| Foundation       | 84.6% | Sufficient |

Prepared By:

Jeffrey B. Ray, EI  
Project Engineer

Reviewed By:

J. Darrin Holt, PhD, PE  
Principal  
CT PE License No. 22988

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



March 5, 2014

*Prepared pursuant to TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the 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 South Windsor, 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 (CBC)*. Information pertaining to the existing/proposed antenna loading, foundation dimensions, current tower geometry, geotechnical data, and member sizes was obtained from:

- Sabre Communications Corporation (Job No. 02-10062 Revision B) Structural Design Report dated November 1, 2001
- Sabre Communications Corporation (Job No. 02-10062) Erection Drawings dated November 7, 2001
- Clarence Welti Associates, Inc. (Project Name: Nextel Tower @ Police Station) Geotechnical Study dated September 29, 2000
- SBA Network Services, Inc.

The *basic design wind speed* per the *TIA/EIA-222-F* standards and the *2005 CBC* is 80 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 140 ft, the tower meets the requirements of the *TIA/EIA-222-F* standards and the *2005 CBC* provided the **Recommendations** listed below are satisfied. Furthermore, provided the foundation was designed and constructed to support the original design reactions (see Sabre Communications Corporation Job No. 02-10062 Revision B), 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 CBC* are met with the existing and proposed loading in place, we have the following recommendations:

1. The proposed feed lines 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  | Feed Lines <sup>1</sup>             | Carrier               | Mount Elevation (ft) | Mount Type                |
|------------------------|--|-------------------------------------|-----------------------|----------------------|---------------------------|
| 187                    | (2) Scala MF-900B Dishes<br>(2) Telewave ANT900D6-9 Omnis<br>(1) Telewave ANT450F6 Omni<br>(2) Decibel DB201 Dipoles   | (3) 7/8"<br>(4) 1/2"                | Town of South Windsor | 187                  | (1) Low Profile Platform  |
| 180                    | (3) Kathrein 742 213   | (6) 1-5/8"                          | Pocket Communications | 180                  | (1) Collar Mount          |
| 170                    | (3) Powerwave 7770.00<br>(9) KMW AM-X-CD-16-65-00T-RET<br>(6) CCI DTMABP7819VG12A TMAs<br>(6) Ericsson RRUS 11 RRUs<br>(12) Kathrein 782 10250 Combiners<br>(3) CSS DBC-750 Diplexers<br>(1) Raycap DC6-48-60-18-8F Surge Arrestor<br>(3) Andrew ABT-DFDM-ADBH | (12) 1-5/8"<br>(1) 3" Conduit       | New Cingular          | 170                  | (1) Low Profile Platform  |
| 160                    | (3) RFS APX16PV-16PVL-C<br>(3) EMS RR90-17-02DPL2<br>(6) Andrew OneBase Twin Dual Duplex TMAs  | (12) 1-5/8"                         | T-Mobile              | 160                  | (1) Low Profile Platform  |
| 150                    | (9) Decibel DB844H90E-XY<br>(3) Kathrein 840 10054<br>(2) Andrew VHLP2.5 Dishes<br>(3) Samsung U-RAS Flexible RRH Radios<br>(2) Dragonwave Horizon Duo ODU's   | (12) 1-5/8"<br>(6) 3/8"<br>(2) 1/2" | Nextel                | 150                  | (1) Platform w/ Handrails |
| 140                    | (6) Antel RWA-80014<br>(3) Antel BXA-70063/6CF<br>(3) Antel BXA-185090/8CF-2<br>(6) RFS FD9R6004/2C-3L Diplexers<br>(1) Alcatel Lucent KS24019-L112A GPS   | (12) 1-5/8"<br>(1) 1/2"             | Verizon               | 140                  | (1) Low Profile Platform  |
| 130                    | (3) RFS APXVSP18-C-A20<br>(3) RFS APXVTM14-C-I20<br>(3) Alcatel Lucent TD-RRH8x20-25 RRHs<br>(3) Alcatel Lucent 1900MHz RRUs<br>(3) Alcatel Lucent 800MHz RRUs<br>(3) Alcatel Lucent 800MHz Filters<br>(3) RF Filters<br>(4) RFS ACU-A20-N RETs                | (3) 1-1/4"<br>(1) 0.7" Fiber        | Sprint                | 130                  | (1) Low Profile Platform  |
| 92                     | (2) Scala MF-900B Dishes<br>(1) Telewave ANT4506-9 Omni<br>(1) Telewave ANT150D3 Omni<br>(1) Telewave ANT450Y10-WR Omni<br>(1) Decibel DB205 Omni  | (6) 1/2"                            | Town of South Windsor | 92                   | (1) Low Profile Platform  |

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

**Proposed Loading:**

| Antenna Elevation (ft) | Description  | Feed Lines   | Carrier | Mount Elevation (ft) | Mount Type               |
|------------------------|--|--|---------|----------------------|--------------------------|
| 140                    | (3) Antel BXA-185090/8CF-2<br>(3) Antel BXA-70063/6CF<br>(3) Commscope HBX-6517DS-VTM<br>(3) Commscope LNX-6514DS-VTM<br>(3) Alcatel Lucent RRH2x40-AWS RRHs<br>(6) RFS FD9R6004/2C-3L Diplexers<br>(1) RFS DB-T1-6Z-8AB-0Z Distribution Box<br>(1) Alcatel-Lucent KS24019 GPS | (12) 1-5/8"<br>(1) 1/2"<br>(1) 1-5/8"<br>Hybriflex | Verizon | 140                  | (1) 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           | 60 ksi         |
| Anchor Bolts         | 75 ksi         |

**Table 3** displays the summary of the ratio (as a percentage) of force in the member to their capacities. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. **Table 4** displays the maximum foundation reactions. **Table 5** displays the maximum antenna rotations at service wind speed (dishes only).

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          | 187 - 142.75   | Pole           | TP34.17x24x0.25          | 40.6        | Pass      |
| L2          | 142.75 - 93.75 | Pole           | TP44.94x32.6358x0.375    | 72.8        | Pass      |
| L3          | 93.75 - 46.25  | Pole           | TP55.12x42.8101x0.4375   | 82.1        | Pass      |
| L4          | 46.25 - 0      | Pole           | TP64.88x52.6344x0.5      | 79.9        | Pass      |
|             |                | Anchor Bolts   | (26) 2.25" Ø w/ BC = 72" | 71.5        | Pass      |
|             |                | Base Plate     | PL 78" Ø x 2.5" Thk      | 65.4        | Pass      |

\*Capacities include a 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) | Original Design (TIA/EIA-222-F) |
|----------------|----------------------------------|---------------------------------|
| Axial          | 65 k                             | 83 k                            |
| Shear          | 42 k                             | 48 k                            |
| Moment         | 5,532 k-ft                       | 6,541 k-ft                      |

**Table 5 - Maximum Antenna Rotations at Service Wind Speeds (Dishes Only)**

| Centerline Elevation (ft) | Antenna                   | Tilt* (deg) | Twist* (deg) |
|---------------------------|---------------------------|-------------|--------------|
| 187                       | (2) Scala MF-900B Dishes  | 2.0424      | 0.0031       |
| 150                       | (2) Andrew VHLP2.5 Dishes | 1.8629      | 0.0022       |
| 92                        | (2) Scala MF-900B Dishes  | 1.1433      | 0.0009       |

\*Allowable tilt and twist values to be determined by the carrier.

## **GENERAL COMMENTS**

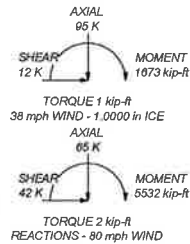
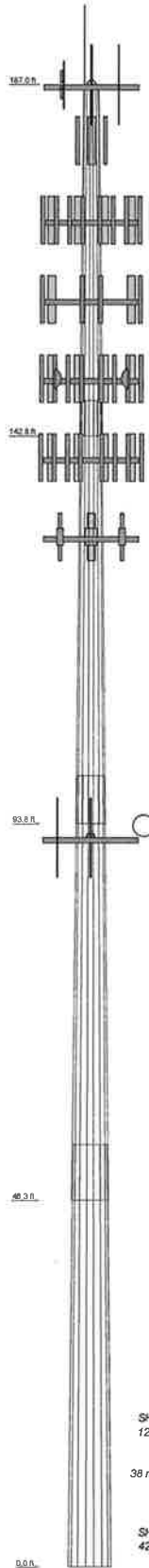
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading 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            | 4       | 3       | 2       | 1       |
|--------------------|---------|---------|---------|---------|
| Length (ft)        | 53.25   | 53.50   | 53.50   | 44.25   |
| Number of Stiles   | 16      | 16      | 16      | 16      |
| Thickness (in)     | 0.2000  | 0.4375  | 0.5750  | 0.2500  |
| Socket Length (ft) |         | 1.00    | 6.00    | 4.50    |
| Top Dia (in)       | 52.8544 | 42.8101 | 32.8538 | 24.0000 |
| Bot Dia (in)       | 64.8800 | 58.1200 | 44.8400 | 34.1700 |
| Grade              |         |         | AS72-45 |         |
| Weight (K)         | 18.9    | 12.3    | 8.3     | 3.4     |



DESIGNED APPURTENANCE LOADING

| TYPE                                  | ELEVATION | TYPE                        | ELEVATION |
|---------------------------------------|-----------|-----------------------------|-----------|
| Lighting Rod                          | 187       | Anchor VMLP23 Dia           | 150       |
| (2) DB251-A                           | 187       | Anchor VMLP23 Dia           | 150       |
| (2) AN10005-9                         | 187       | BXA-18500-MCF w/Mount Pipe  | 140       |
| ANT400B Dia                           | 187       | BXA-2003-MCF w/Mount Pipe   | 140       |
| (4) Empty Mount Pipe                  | 187       | BXA-2003-MCF w/Mount Pipe   | 140       |
| (4) Empty Mount Pipe                  | 187       | BXA-2003-MCF w/Mount Pipe   | 140       |
| (4) Empty Mount Pipe                  | 187       | BXA-2003-MCF w/Mount Pipe   | 140       |
| (4) Empty Mount Pipe                  | 187       | BXA-2003-MCF w/Mount Pipe   | 140       |
| Low Profile Platform                  | 187       | HDX-6517DS-STM w/Mount Pipe | 140       |
| (2) Scale MF-3003 Dia                 | 187       | HDX-6517DS-STM w/Mount Pipe | 140       |
| 742 213 w/Mount Pipe                  | 180       | LX-6514DS-STM w/Mount Pipe  | 140       |
| 742 213 w/Mount Pipe                  | 180       | LX-6514DS-STM w/Mount Pipe  | 140       |
| Conical Mount                         | 180       | LX-6514DS-STM w/Mount Pipe  | 140       |
| 742 213 w/Mount Pipe                  | 180       | RRQX60-AWB                  | 140       |
| 7770 00 w/Mount Pipe                  | 170       | RRQX60-AWB                  | 140       |
| 7770 00 w/Mount Pipe                  | 170       | RRQX60-AWB                  | 140       |
| (3) AM-X-CD-1645-00T-RET w/Mount Pipe | 170       | (2) FDR6004C-3, Diplexer    | 140       |
| (3) AM-X-CD-1645-00T-RET w/Mount Pipe | 170       | (2) FDR6004C-3, Diplexer    | 140       |
| (2) AM-X-CD-1645-00T-RET w/Mount Pipe | 170       | (2) FDR6004C-3, Diplexer    | 140       |
| (2) DTMBP218V12A TMA                  | 170       | DB-T14-3-SAB-G2             | 140       |
| (2) DTMBP218V12A TMA                  | 170       | K524019-L12A                | 140       |
| (2) DTMBP218V12A TMA                  | 170       | Low Profile Platform        | 140       |
| (2) RRU5 11                           | 170       | BXA-18500-MCF w/Mount Pipe  | 140       |
| (2) RRU5 11                           | 170       | BXA-18500-MCF w/Mount Pipe  | 140       |
| (2) RRU5 11                           | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| (4) 782 1070 Combiner                 | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| (4) 782 1070 Combiner                 | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| DBC-700 Diplexer                      | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| DBC-700 Diplexer                      | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| DBC-700 Diplexer                      | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| DBC-700 Diplexer                      | 170       | APXVTM14-C-00 w/Mount Pipe  | 130       |
| OCB-48-40 18-SP Surge Arrestor        | 170       | TD-SRH420-25                | 130       |
| Low Profile Platform                  | 170       | TD-SRH420-25                | 130       |
| 7770 00 w/Mount Pipe                  | 170       | RF Filter                   | 130       |
| RR50-17-02DPL2 w/Mount Pipe           | 160       | RF Filter                   | 130       |
| RR50-17-02DPL2 w/Mount Pipe           | 160       | RF Filter                   | 130       |
| APX18P1-MPVL-C W/Mount Pipe           | 160       | RRU-ALU 1000MHZ             | 130       |
| APX18P1-MPVL-C W/Mount Pipe           | 160       | RRU-ALU 1000MHZ             | 130       |
| APX18P1-MPVL-C W/Mount Pipe           | 160       | RRU-ALU 1000MHZ             | 130       |
| APX18P1-MPVL-C W/Mount Pipe           | 160       | RRU-ALU 1000MHZ             | 130       |
| Empty Mount Pipe                      | 160       | RRU-ALU 800MHZ              | 130       |
| Empty Mount Pipe                      | 160       | RRU-ALU 800MHZ              | 130       |
| Empty Mount Pipe                      | 160       | RRU-ALU 800MHZ              | 130       |
| (2) OneBase Tern Dual Duplex TMA      | 160       | Fiber-ALU 800MHZ            | 130       |
| (2) OneBase Tern Dual Duplex TMA      | 160       | Fiber-ALU 800MHZ            | 130       |
| (2) OneBase Tern Dual Duplex TMA      | 160       | Fiber-ALU 800MHZ            | 130       |
| Low Profile Platform                  | 150       | (2) ACU-A20-N-RET           | 130       |
| RR50-17-02DPL2 w/Mount Pipe           | 150       | ACU-A20-N-RET               | 130       |
| (3) DB644-600-XY w/Mount Pipe         | 150       | ACU-A20-N-RET               | 130       |
| (3) DB644-600-XY w/Mount Pipe         | 150       | Low Profile Platform        | 130       |
| 840 1005A w/Mount Pipe                | 150       | ANT450Y10-WR                | 92        |
| 840 1005A w/Mount Pipe                | 150       | (4) Empty Mount Pipe        | 92        |
| 840 1005A w/Mount Pipe                | 150       | (4) Empty Mount Pipe        | 92        |
| 840 1005A w/Mount Pipe                | 150       | (4) Empty Mount Pipe        | 92        |
| URAS Flexible RRH Radio               | 150       | (4) Empty Mount Pipe        | 92        |
| URAS Flexible RRH Radio               | 150       | Low Profile Platform        | 92        |
| URAS Flexible RRH Radio               | 150       | DR205-A                     | 92        |
| HDR20N DUO                            | 150       | ANT4505-9                   | 92        |
| HDR20N DUO                            | 150       | ANT1500-3                   | 92        |
| Platform w/ Handrails                 | 150       | (2) Stair MF-5009 Dia       | 92        |
| (3) DB644-600-XY w/Mount Pipe         | 150       |                             |           |

MATERIAL STRENGTH

| GRADE   | Fy     | Fu     | GRADE | Fy | Fu |
|---------|--------|--------|-------|----|----|
| AD72-45 | 65 ksi | 80 ksi |       |    |    |

TOWER DESIGN NOTES

- Tower is located in Hartford County, Connecticut.
- Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
- Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
- Deflections are based upon a 50 mph wind.
- TOWER RATING: 82.1%

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**South Windsor, CT07824-S-00**  
 Project: 1423RX1400  
 Client: SBA Network Services, Inc. Drawn by: Jeffrey B. Ray  
 Code: TIA/EIA-222-F Date: 03/05/14  
 Scale: NTS  
 App'd: [Signature]  
 Check'd: [Signature]  
 Date: [Signature]  
 Draw No: E-1