

December 29, 2014

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

Re: **Notice of Exempt Modification – Facility Modification
1662 Gold Star Memorial Highway, Groton, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) antennas at the top of the existing 150-foot tower at 1662 Gold Star Memorial Highway in Groton (the “Property”). The tower is owned by SBA. Cellco’s shared use of this tower was approved by the Council in 2007 (Petition No. 822). Cellco now intends to replace nine (9) of its existing antennas with three (3) model LNX-6512DS-VTM, 850 MHz antennas; three (3) model HBXX-6516DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 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, installed inside the monopole. Included in Attachment 1 are specifications for the replacement antennas, RRHs and HYBRIFLEX™ cables.

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 Groton’s Town Manager, Mark R. Oefinger. A copy of this letter is also being sent to Chester Crouch, Jr., 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).

Robinson+Cole

Melanie A. Bachman
December 29, 2014
Page 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 installed on its existing antenna platform at the top of the tower.
2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support Cellco's proposed modifications. (See Structural Analysis included in Attachment 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

Mark R. Oefinger, Groton Town Manager
Chester Crouch, Jr.
Sandy M. Carter

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY



LNX-6512DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Ideal choice for site collocations and tough zoning restrictions
- Extended elevation tilt for maximum flexibility in urban core areas
- Remote beam tilt management is an optional feature using Andrew's Teletilt® system
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	14.1	15.0
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	19.0	17.0
Beam Tilt, degrees	0–15	0–15
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	28	28
CPR at Boresight, dB	12	12
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR Return Loss, dB	1.4 15.6	1.4 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, maximum	379.8 N @ 150 km/h 85.4 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

Product Specifications

COMMSCOPE®

LNx-6512DS-VTM



Depth	181.0 mm 7.1 in
Length	1232.0 mm 48.5 in
Width	301.0 mm 11.9 in
Net Weight	13.0 kg 28.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator LNx-6512DS-R2M

Model with Factory Installed AISG 2.0 Actuator LNx-6512DS-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

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



HBXX-6516DS-VTM

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

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity
- 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	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
	0° 17.0	0° 17.1	0° 17.4
Gain by Beam Tilt, average, dBi	5° 17.3	5° 17.4	5° 17.7
	10° 17.0	10° 17.0	10° 17.2
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	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® single band, quad
Band	Single band
Brand	DualPol® Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	4

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

Product Specifications

COMMSCOPE®

HBXX-6516DS-VTM



RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

Depth	166.0 mm 6.5 in
Length	1294.0 mm 50.9 in
Width	305.0 mm 12.0 in
Net Weight	13.9 kg 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator HBXX-6516DS-R2M

Model with Factory Installed AISG 2.0 Actuator HBXX-6516DS-A2M

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

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

Product Specifications

COMMScope®

HBXX-6517DS-VTM

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

POWERED BY



Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° 18.4	0 ° 18.4	0 ° 18.7
	3 ° 18.7	3 ° 18.7	3 ° 18.9
	6 ° 18.4	6 ° 18.5	6 ° 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
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°

*Values calculated using NGMN Alliance N-P-BASTA v9.6

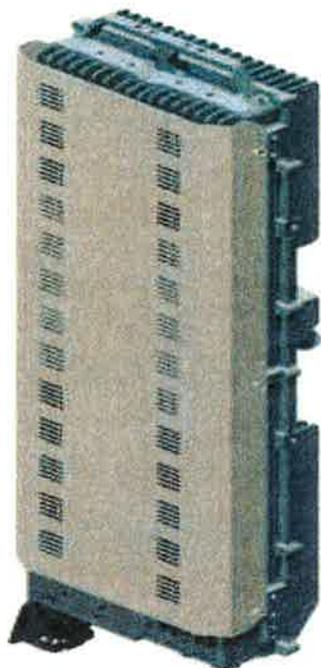
Mechanical Specifications

Color Radome Material	Light gray PVC, UV resistant
Connector Interface Location Quantity	7-16 DIN Female Bottom 4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph
Antenna Dimensions, L x W x D	1903.0 mm x 305.0 mm x 166.0 mm 74.9 in x 12.0 in x 6.5 in
Net Weight	19.5 kg 43.0 lb
Model with factory installed AISG 2.0 RET	HBXX-6517DS-A2M



ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.



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

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals

along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

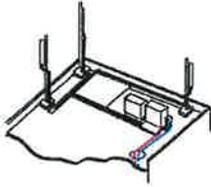
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

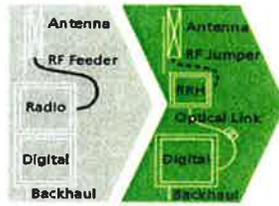
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

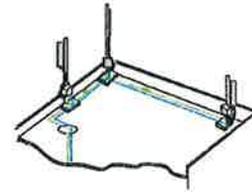
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and

silent solutions, with minimum impact on the neighborhood, which ease the deployment

- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisy chaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein.

Copyright © 2012 Alcatel-Lucent. All rights reserved. M2012XXXXXX (March)

.....Alcatel-Lucent

AT THE SPEED OF IDEAS™

.....Alcatel-Lucent





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
Weight, Approximate		(kg/m (lb/ft))	1.9 (1.30)
Minimum Bending Radius, Single Bending		(mm (in.))	200 (8)
Minimum Bending Radius, Repeated Bending		(mm (in.))	500 (20)
Recommended/Maximum Clamp Spacing		(m (ft))	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	0.68 (0.205)
DC-Resistance Power Cable, 3.4mm ² (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		(μm)	50/125
Primary Coating (Acrylate)		(μm)	245
Buffer Diameter, Nominal		(μm)	900
Secondary Protection, Jacket, Nominal		(mm (in.))	2.0 (0.08)
Minimum Bending Radius		(mm (in.))	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0 UL1666 RoHS Compliant
Size (Power)		(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-95-652 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEC-383 (1974), IEEE1292/FT4 RoHS Compliant
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

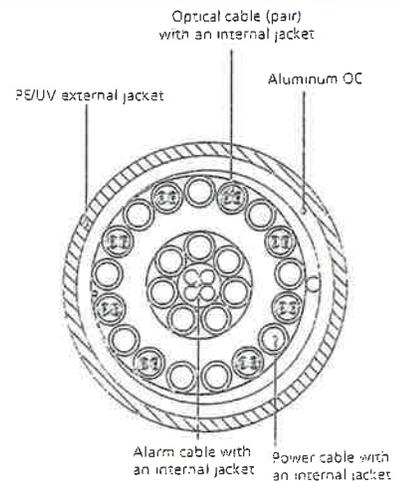


Figure 2: Construction Detail

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

ATTACHMENT 2

		General		Power	Density					
Site Name: Groton 6 Tower Height: 150ft										
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total		
*AT&T UMTS	2	565	128	0.0248	880	0.5867	4.23%			
*AT&T UMTS	2	875	128	0.0384	1900	1.0000	3.84%			
*AT&T GSM	1	283	128	0.0062	880	0.5867	1.06%			
*AT&T GSM	4	525	128	0.0461	1900	1.0000	4.61%			
*AT&T LTE	1	1375	128	0.0302	734	0.4893	6.17%			
*Clearwire	6	285.76	139	0.0319	2500	1.0000	3.19%			
Verizon PCS	15	383	149	0.0930	1970	1.0000	9.30%			
Verizon Cellular	9	259	149	0.0378	869	0.5793	6.52%			
Verizon AWS	1	1585	149	0.0257	2145	1.0000	2.57%			
Verizon 700	1	847	149	0.0137	746	0.4973	2.76%			44.24%
* Source: Siting Council										

ATTACHMENT 3



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

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

150' Monopole Tower

**SBA Site Name: Groton North
SBA Site ID: CT13073-A
Verizon Site Name: Groton 6**

FDH Project Number 146GSC1400

Analysis Results

Tower Components	42.4%	Sufficient
Foundation	55.1%	Sufficient

Prepared By:

Trace Allard, EI
Project Engineer

Reviewed By:

Bradley R. Newman, PE
Senior Project Engineer
CT PE License No. 29630

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



November 18, 2014

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY3
 Conclusions3
 Recommendations3
APPURTENANCE LISTING4
RESULTS5
GENERAL COMMENTS6
LIMITATIONS6
APPENDIX7

EXECUTIVE SUMMARY

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

- Radian Communications Services (Eng. File No. 060-3663) erection drawings dated September 12, 2007
- Radian Communications Services (Eng. File No. 060-3663) Pier and Foundation Details dated March 16, 2007
- Radian Communications Services (Eng. File No. 060-3663) tower design drawings dated March 16, 2007
- FDH Engineering, Inc. (Job No. 08-07138T) TIA Inspection Report dated September 8, 2008
- Gemini Geotechnical Associates, Inc. (Project No. 07022CT) Geotechnical Engineering Report dated March 13, 2007
- 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 3/4" radial ice. Ice is considered to increase in thickness with height.

Conclusions

With the existing and proposed antennas from Verizon in place at 149 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 Radian Eng. File No. 060-3663), 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 diplexers should be installed directly behind the proposed antennas.
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	Feedlines ¹	Carrier	Mount Elevation (ft)	Mount Type
149	(3) Antel BXA-185063/8CF (6) Antel LPA-80063/4CF (3) Antel BXA-70063/6CF (6) RFS FD9R6004/2C-3L	(12) 1-5/8"	Verizon	149	(1) 12' Low Profile Platform
139	(3) KMW HB-X-AW-17-65-00T (3) TTLNA	(6) 1-5/8"	Clearwire	139	(3) Dual Mount Standoffs
128	(6) Powerwave 7770 (1) KMW AM-X-CD-14-65-00T-RET (2) Andrew SBNH 1D6565C (6) Powerwave LGP21401 (6) Ericsson RRUS 11 (6) Powerwave LGP21903 (1) Raycap DC6-48-60-18-8F	(12) 1-5/8" (2) 3/4" DC Power (1) 7/16" Fiber	AT&T	128	(1) 14' Low Profile Platform

1. All feedlines are installed inside the monopole shaft unless otherwise noted.

Proposed Carrier Final Loading:

Antenna Elevation (ft)	Description	Feedlines ¹	Carrier	Mount Elevation (ft)	Mount Type
149	(3) Antel BXA-70063-6CF (3) Commscope HBXX-6517DS-VTM (3) Commscope HBXX-6516DS-VTM (3) Commscope LNX-6512DS-A1M (3) ALU RRH 2X60-AWS (6) RFS FD9R6004/2C-3L (1) RFS DB-T1-6Z-8AB-OZ	(12) 1-5/8" (1) 1-5/8" Hybrid	Verizon	149	(1) 12' Low Profile Platform

1. All feedlines are installed inside the monopole shaft unless otherwise noted.

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
Flange Plate	50 ksi
Flange Bolts	Fu=120 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. *Note: Capacities up to 105% 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	150 - 130	Pole	TP34.243x30x0.1875	18.4	Pass
---	130	Flange Bolts	(8) 1" Ø on a 38" BC	34.1	Pass
---	130	Flange Plates	41.25" Ø PL. x 1.75" THK.	6.5	Pass
L2	130 - 84	Pole	TP44.001x34.243x0.3125	36.2	Pass
L3	84 - 41.5	Pole	TP52.231x42.2093x0.4375	38.6	Pass
L4	41.5 - 0	Pole	TP60x49.9989x0.5	42.4	Pass
---	0	Anchor Bolts	(34) 1.5" Ø on a 65" BC	33.6	Pass
---	0	Base Plate	69.5" Ø PL. x 1.75" THK.	45.9	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)	Original Design (ANSI/TIA-222-G)
Axial	42 k	95 k
Shear	24 k	56 k
Moment	2,495 k-ft	6,114 k-ft

* Current analysis reactions are within an allowable reduction factor of 1.35 per the ANSI/TIA-222-G standard when the original design reactions are based on a load and resistance factor design.

GENERAL COMMENTS

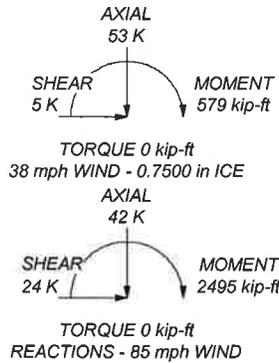
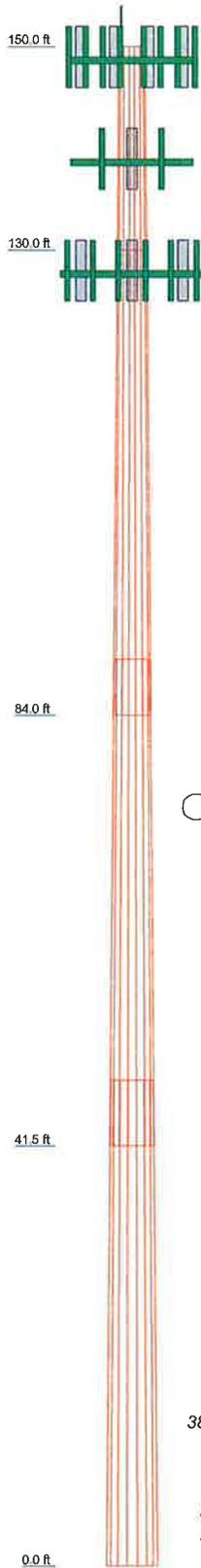
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading 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
Length (ft)	20.00	46.00	48.00	48.00
Number of Sides	18	18	18	18
Thickness (in)	0.1875	0.3125	0.4375	0.5000
Socket Length (ft)		5.50	6.50	
Top Dia (in)	30.0000	34.2430	42.2093	49.9989
Bot Dia (in)	34.2430	44.0010	52.2310	60.0000
Grade			A572-65	
Weight (K)	1.3	6.0	10.6	14.1



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	150	TTLNA	139
BXA-70063-6CF-2 w/ Mount Pipe	149	(3) Dual Mount Standoffs	139
BXA-70063-6CF-2 w/ Mount Pipe	149	HB-X-AW-17-65-00T w/ mount pipe	139
BXA-70063-6CF-2 w/ Mount Pipe	149	HB-X-AW-17-65-00T w/ mount pipe	139
HBXX-6517DS-VTM w/ Mount Pipe	149	HB-X-AW-17-65-00T w/ mount pipe	139
HBXX-6517DS-VTM w/ Mount Pipe	149	KMW AM-X-CD-14-65-00T-RET w/ Mount Pipe	128
HBXX-6517DS-VTM w/ Mount Pipe	149		
HBXX-6516DS-VTM w/ Mount Pipe	149	SBNH-1D6565C w/ Mount Pipe	128
HBXX-6516DS-VTM w/ Mount Pipe	149	SBNH-1D6565C w/ Mount Pipe	128
HBXX-6516DS-VTM w/ Mount Pipe	149	(2) LGP21401 TMA	128
HBXX-6516DS-VTM w/ Mount Pipe	149	(2) LGP21401 TMA	128
LNX-6512DS-A1M w/ Mount Pipe	149	(2) LGP21401 TMA	128
LNX-6512DS-A1M w/ Mount Pipe	149	(2) RRUS 11	128
LNX-6512DS-A1M w/ Mount Pipe	149	(2) RRUS 11	128
2x60 AWS	149	(2) LGP21903 Diplexer	128
2x60 AWS	149	(2) LGP21903 Diplexer	128
2x60 AWS	149	(2) LGP21903 Diplexer	128
(2) FD9R6004/2C-3L Diplexer	149	DC6-48-60-1B-8F Surge Arrestor	128
(2) FD9R6004/2C-3L Diplexer	149	Platform Mount [LP 304-1]	128
(2) FD9R6004/2C-3L Diplexer	149	(2) 7770.00 w/ mount pipe	128
DB-T1-6Z-8AB-0Z	149	(2) 7770.00 w/ mount pipe	128
Platform Mount [LP 303-1]	149	TTLNA	139
TTLNA	139	(2) 7770.00 w/ mount pipe	128
TTLNA	139	TTLNA	139
		(2) 7770.00 w/ mount pipe	128

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 42.4%



FDH Engineering, Inc.
 6521 Meridien Drive, Suite 107
 Raleigh, North Carolina 27616
 Phone: 9197551012
 FAX: 9197551031

Tower Analysis

Job: CT13073-A, Groton North	Project: 146GSC1400	Client: SBA Network Services, Inc.	Drawn by: Trace G. Allard	App'd:
Code: TIA/EIA-222-F	Date: 11/14/14	Scale: NTS	Dwg No. E-1	