

September 23, 2015

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

Re: **Notice of Exempt Modification – Facility Modification
257 Norman Road, Griswold (Jewett City), Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains fifteen (15) antennas at the top of the existing 160-foot lattice tower at 257 Norman Road in Jewett City, Connecticut (the “Property”). The tower is owned by SBA. The Council approved Cellco’s use of this tower in 1999. Cellco now intends to replace nine (9) of its existing antennas with three (3) model LNX-6514DS, 700 MHz antennas; three (3) model HBXX-6517DS, 1900 MHz antennas; and three (3) model HBXX-6516DS, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) existing remote radio heads (“RRHs”), and install six (6) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco’s replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Kevin Skulczyck, First Selectman for the Town of Griswold. A copy of this letter is also being sent to Ernest R. Norman, the owner of the Property and SBA, the tower owner.

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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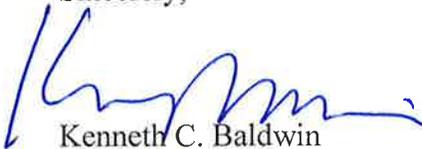
Robinson+Cole

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRH's will be located at the top of the existing 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 worst-case 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

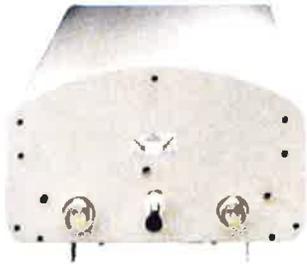
Enclosures

Copy to:

Kevin Skulczyck, Griswold First Selectman
Ernest R. Norman
Victoria Barrios, SBA
Tim Parks

ATTACHMENT 1

Product Specifications



LNX-6514DS-VTM

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

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- 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	15.8	15.9
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	12.4	11.2
Beam Tilt, degrees	0–10	0–10
USLS, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	23	23
CPR at Sector, dB	12	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

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896
Gain by all Beam Tilts, average, dBi	15.6	15.7
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.5
	0 ° 15.7	0 ° 15.9
Gain by Beam Tilt, average, dBi	5 ° 15.7	5 ° 15.8
	10 ° 15.3	10 ° 15.3
Beamwidth, Horizontal Tolerance, degrees	±0.9	±1.4
Beamwidth, Vertical Tolerance, degrees	±0.8	±0.6
USLS, dB	18	20
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	25	24
CPR at Sector, dB	15	12

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® Teletilt®

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM



Operating Frequency Band 698 – 896 MHz
Performance Note Outdoor usage

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 617.7 N @ 150 km/h
138.9 lbf @ 150 km/h
Wind Speed, maximum 241.0 km/h | 149.8 mph

Dimensions

Depth 180.5 mm | 7.1 in
Length 1851.0 mm | 72.9 in
Width 301.0 mm | 11.9 in
Net Weight 14.2 kg | 31.3 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator LNX-6514DS-A1M
RET System Teletilt®

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



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.

* Footnotes

Performance Note Severe environmental conditions may degrade optimum performance

Product Specifications

COMMSCOPE®

POWERED BY



HBXX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	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

Electrical Specifications, BASTA*

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 Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
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

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM



Performance Note

Outdoor usage

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
RF Connector Quantity, total	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

Dimensions

Depth	166.0 mm 6.5 in
Length	1903.0 mm 74.9 in
Width	305.0 mm 12.0 in
Net Weight	19.5 kg 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
RET System	Teletilt®

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



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.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance
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HBXX-6516DS-VTM

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

- Fully supports PCS 1900, GSM 1800, UMTS 2100, and AWS spectrum
- 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

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	65	63
Beamwidth, Vertical, degrees	7.5	7.0	6.5
Beam Tilt, degrees	0–10	0–10	0–10
USLS, typical, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
Isolation, dB	30	30	30
VSWR Return Loss, dB	1.4:1 15.6	1.4:1 15.6	1.4:1 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
Lightning Protection	dc Ground	dc Ground	dc Ground

Mechanical Specifications

Color Radome Material	Light gray PVC, UV resistant
Connector Interface Location Quantity	7-16 DIN Female Bottom 4
Wind Loading, maximum	419.5 N @ 150 km/h 94.3 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

Depth	166.0 mm 6.5 in
Length	1294.00 mm 50.94 in
Width	305.00 mm 12.01 in
Net Weight	13.90 kg 30.64 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

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)

Product Specifications

COMMSCOPE®



HBXX-6516DS-VTM

ISO 9001:2008

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

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

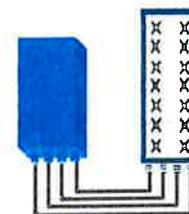


FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)
Volume in L	38 (with solar shield)
Weight in kg (lb) (w/o mounting HW)	26 (57.2) (with solar shield)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	Frontal: <200N / Lateral : <150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

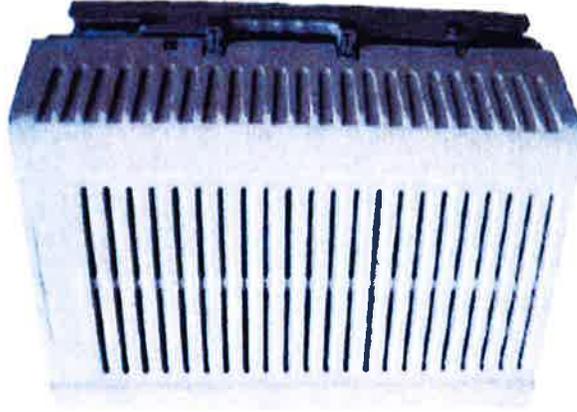
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PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

RRH2x60	
RF Output Power	2X60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver	1900 HW version 1900A HW version
Features	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3 AISG 2.0 for RET/TMA
Power	Internal Smart Bias-T -48VDC
CPRI Ports	2 CPRI Rate 3 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (top mounted)



** Not a Verizon Wireless deployed product

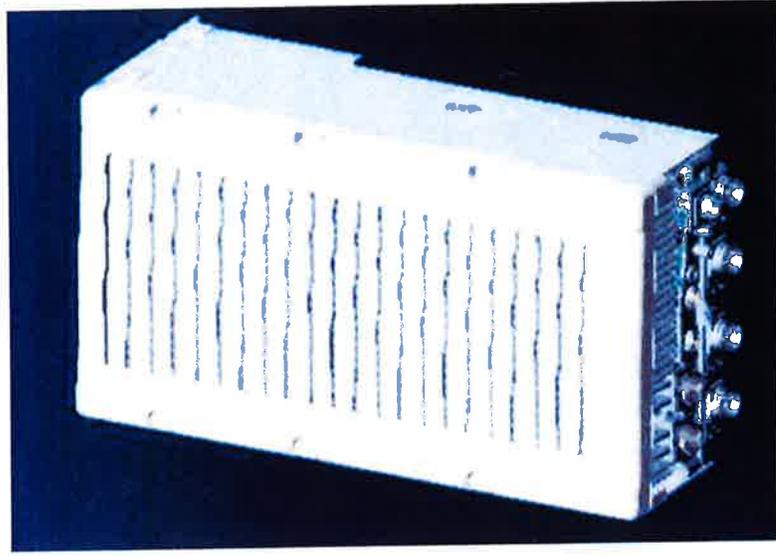
NEW PCS RF MODULES FOR VZW

RRH2X60 - HW CHARACTERISTICS

LR14.3

RRH2X60	
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w) x 9.4" (d)**
Weight	55lb**

** - Includes solar shield but not mounting brackets (8 lbs.)



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.

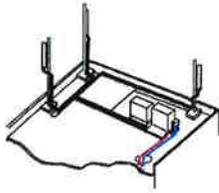
EASY INSTALLATION

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.

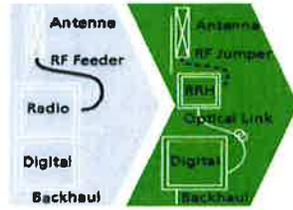
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

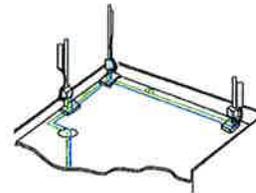
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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

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

Product Description

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

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

Features/Benefits

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



Figure 1: HYBRIFLEX Series

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	(mm (in))	46.5 (1.83)
Jacket	Polyethylene, PE	(mm (in))	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Minimum Bend Radius			
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, 8.4mm ² (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
Optical 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)		(mm (AWG))	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		(mm (AWG))	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		(mm (in))	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHVV-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Operating Range			
Installation Temperature		(°C (°F))	-40 to +65 (-40 to 149)
Operation Temperature		(°C (°F))	-40 to +65 (-40 to 149)

* This data is provisional and subject to change

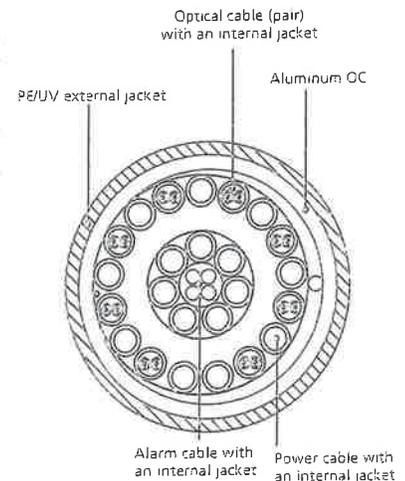


Figure 2: Construction Detail

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

ATTACHMENT 2

ATTACHMENT 3



ENGINEERING INNOVATION

Velocitel, Inc., d.b.a. FDH Velocitel, 6521 Meridien Drive Raleigh, NC 27616, Ph. 919.755.1012

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

160' Self-Support Tower

**SBA Site Name: Griswold 2
SBA Site ID: CT10012-A-03
Verizon Site ID: 117858**

FDH Velocitel Project Number 15BVKZ1400

Analysis Results

Tower Components	95.3 %	Sufficient
Foundation	99.7 %	Sufficient

Prepared By:

Justin Barnes, EI
Project Engineer

Reviewed By:

Dennis D. Abel, PE
Director – Structural Engineering
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07-10-2015

July 10, 2015

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

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EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Velocitel performed a structural analysis of the existing self-supported tower located in Griswold, 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 State Building Code (CSBC)*. Information pertaining to the existing/proposed antenna loading, current tower geometry, the member sizes, and foundation dimensions was obtained from:

- Rohn Industries, Inc. (File No. 37696SP001) original design drawings dated April 6, 1999
- FDH, Inc. (Job No. 07-0317T) TIA Inspection Report dated April 6, 2007
- SBA Network Services, Inc.

The *basic design wind speed* per the *TIA/EIA-222-F* standards and *2005 CSBC* 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 158 ft, the tower meets the requirements of the *TIA/EIA-222-F* standards and the *2005 CSBC* provided the **Recommendations** listed below are satisfied. Furthermore, provided the foundation was designed and constructed to support the original design reactions (see Rohn, Inc. File No. 37696SP001), the foundation should be adequate 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 Velocitel 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 CSBC* are met with the existing and proposed loading in place, we have the following recommendations:

1. Feed lines must be installed as shown in **Figure 1**.
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 Velocitel should be contacted to perform a revised analysis.*

Table 1 - Appurtenance Loading

Existing Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
169	(2) Decibel 20' x 2" Dipoles	(2) 7/8"	Quinebaug Comm 911	160	Direct Mount
163	(1) Andrew DB201-C	(1) 1/2"			
158	(3) Antel BXA-70063/6CF (3) RFS APL869012-T0 (3) Antel BXA-70080/4CF (3) Antel BXA-171085/12BF (3) Antel WBX065X19R050 (3) Alcatel Lucent RRH2X40-AWS	(18) 1-5/8" (1) 1-5/8" Hybrid Fiber	Verizon	158	(3) 15' T-Frames
	(1) RFS DB-T1-6Z-8AB-0Z				
149	(6) Powerwave 63SSFL	(6) 1-5/8"	T-Mobile	148	(3) 10.5' T-Frames
148	(6) Dapa 59212				
135	(9) Powerwave 7770.00 (2) Powerwave P65-17-XLH-RR (1) KMW AM-X-CD-16-65-00T-RET (6) Powerwave LGP17201 (6) Ericsson RRUS-11 (6) Powerwave LGP21901 (1) Raycap DC6-48-60-18-8F	(12) 1-1/4" (2) DC Cables (1) Fiber Cable	New Cingular	137	(3) 12' T-Frames
	128				
82	(1) Yagi	(1) 1/2"	Quinebaug Comm 911	82	Direct Mount
76	(1) GPS	(1) 1/2"	Verizon	76	(1) 3' Standoff
68	(1) 6' Trombone	(1) 1/2"	Quinebaug Comm 911	65	Direct Mount

Proposed Carrier Final Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
158	(3) Commscope LNX-6514DS-AIM (3) Commscope HBXX-6517DS-A2M (3) Commscope HBXX-6516DS-A2M (3) Antel BXA-70080/4CF-EDIN-0 (3) Alcatel Lucent RRH2X60-AWS (3) Alcatel Lucent RRH 2x60-700U (3) Alcatel Lucent RRH 2x60-PCS (1) RFS DB-T1-6Z-8AB-0Z	(12) 1-5/8" (1) 1-5/8" Hybrid Fiber (1) 1-5/8" Hybriflex	Verizon	158	(3) 15' T-Frames
	(1) RFS DB-T1-6Z-8AB-0Z				

RESULTS

The following yield strength of steel for individual members was used for analysis:

Table 2 - Material Strength

Member Type	Yield Strength
Legs	50 ksi
Bracing	36 ksi & 50 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 Velocitel 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
T1	160 - 140	Leg	ROHN 2.5 STD	40.9	Pass
		Diagonal	L1 3/4x1 3/4x3/16	46.2 69.5 (b)	Pass
		Top Girt	L1 3/4x1 3/4x3/16	4.9	Pass
T2	140 - 120	Leg	ROHN 3 STD	79.1	Pass
		Diagonal	L2x2x3/16	76.8 87.2 (b)	Pass
		Top Girt	L1 3/4x1 3/4x3/16	5.6	Pass
T3	120 - 100	Leg	ROHN 3.5 EH	80.9	Pass
		Diagonal	L2 1/2x2 1/2x3/16	67.8 83.6 (b)	Pass
T4	100 - 80	Leg	ROHN 4 EH	85.8	Pass
		Diagonal	L2 1/2x2 1/2x3/16	92.0	Pass
T5	80 - 60	Leg	ROHN 5 EH	71.8	Pass
		Diagonal	L3x3x1/4	55.7 74.6 (b)	Pass
T6	60 - 40	Leg	ROHN 6 EHS	81.7	Pass
		Diagonal	L3 1/2x3 1/2x1/4	59.9 61.5 (b)	Pass
T7	40 - 20	Leg	ROHN 6 EH	76.1	Pass
		Diagonal	L3 1/2x3 1/2x1/4	78.6	Pass
T8	20 - 0	Leg	ROHN 6 EH	86.1	Pass
		Diagonal	L3 1/2x3 1/2x1/4	95.3	Pass

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

Table 4 - Maximum Base Reactions

Load Type	Direction	Current Analysis (TIA/EIA-222-F)	Original Design (TIA/EIA-222-F)
Individual Foundation	Horizontal	26 k	28 k
	Uplift	204 k	214 k
	Compression	234 k	240 k
Overturning Moment	---	4,043 k-ft	4,053 k-ft

GENERAL COMMENTS

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

APPENDIX

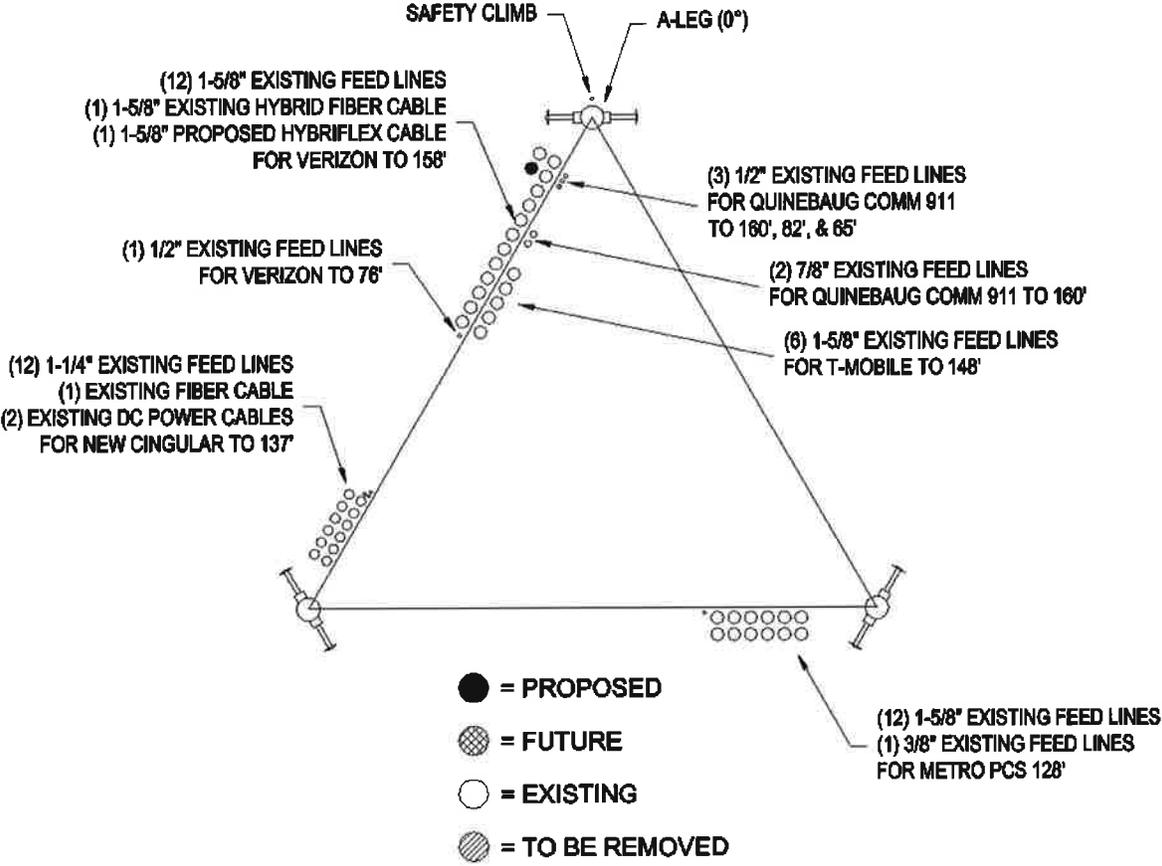


Figure 1 – Feed Line Layout

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	160	(2) 59212 w/ Mount Pipe	148
Beacon	160	(2) 59212 w/ Mount Pipe	148
Andrew DB201-C Yagi	160	(2) 59212 w/ Mount Pipe	148
Leg Extension	160	(2) Powerwave 63SSFL TMAs	148
Decibel 20' x 2' Dipole	160	(2) Powerwave 63SSFL TMAs	148
Decibel 20' x 2' Dipole	160	(2) Powerwave 63SSFL TMAs	148
LNx-6514DS-A1M w/ Mount Pipe	158	(3) 10.5' T-Frames MNT	148
LNx-6514DS-A1M w/ Mount Pipe	158	(3) 7770.00A w/Mount Pipe	137
LNx-6514DS-A1M w/ Mount Pipe	158	(3) 7770.00A w/Mount Pipe	137
HBXX-6517DS-A2M w/ Mount Pipe	158	(3) 7770.00A w/Mount Pipe	137
HBXX-6517DS-A2M w/ Mount Pipe	158	P65-17-XLH-RR w/Mount Pipe	137
HBXX-6517DS-A2M w/ Mount Pipe	158	P65-17-XLH-RR w/Mount Pipe	137
HBXX-6516DS-A2M w/ Mount Pipe	158	AM-X-CD-16-65-00T-RET w/ Mount Pipe	137
HBXX-6516DS-A2M w/ Mount Pipe	158	(2) Powerwave LGP17201 TMAs	137
HBXX-6516DS-A2M w/ Mount Pipe	158	(2) Powerwave LGP17201 TMAs	137
BXA-70080-8CF-EDIN-0 w/ Mount Pipe	158	(2) Powerwave LGP17201 TMAs	137
BXA-70080-8CF-EDIN-0 w/ Mount Pipe	158	(2) RRUS-11	137
BXA-70080-8CF-EDIN-0 w/ Mount Pipe	158	(2) RRUS-11	137
RRH2X60-AWS	158	(2) RRUS-11	137
RRH2X60-AWS	158	(2) Powerwave LGP21901 Diplexers	137
RRH2X60-AWS	158	(2) Powerwave LGP21901 Diplexers	137
RRH2x60-700U	158	(2) Powerwave LGP21901 Diplexers	137
RRH2x60-700U	158	DC6-48-60-18-8F Surge Arrestor	137
RRH2x60-700U	158	(3) 12' T-Frames MNT	137
RRH2x60-700U	158	(2) 742 351 w/ Mount Pipe	128
RRH2x60-700U	158	(2) 742 351 w/ Mount Pipe	128
RRH2X60-PCS	158	(2) 742 351 w/ Mount Pipe	128
RRH2X60-PCS	158	(3) 12' T-Frames MNT	128
RRH2X60-PCS	158	Yagi	82
DB-T1-6Z-8AB-0Z Distribution Box	158	GPS	76
DB-T1-6Z-8AB-0Z Distribution Box	158	(1) 3' Standoff MNT	76
Sabre Universal Pipe Mount Kil	158	6' Trombone	65
(3) 15' T-Frames	158		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

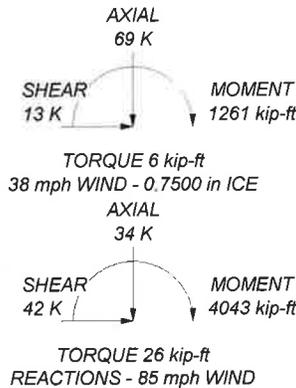
TOWER DESIGN NOTES

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: 95.3%

MAX. CORNER REACTIONS AT BASE:

DOWN: 234 K
SHEAR: 26 K

UPLIFT: -204 K
SHEAR: 23 K



Section	T1	T2	T3	T4	T5	T6	T7	T8
Legs	ROHN 2.5 STD	ROHN 3 STD	ROHN 3.5 EH	ROHN 4 EH	ROHN 5 EH	ROHN 6 EHS	ROHN 6 EH	ROHN 6 EH
Leg Grade					A572-50			
Diagonals	L1 3/4x1 3/4x3/16	L2x2x3/16	L2 1/2x2 1/2x3/16	L2 1/2x2 1/2x3/16	L3x3x1/4	L3 1/2x3 1/2x1/4	L3 1/2x3 1/2x1/4	L3 1/2x3 1/2x1/4
Diagonal Grade		A36				A572-50		
Top Girts	L1 3/4x1 3/4x3/16				N.A.			
Face Width (ft)	6.56		6.59	10.65	12.74	14.83	16.92	18.86
# Panels @ (ft)	5 @ 4	4 @ 5		9 @ 6.66667		6 @ 2.6	6 @ 10	6 @ 10
Weight (K)	0.9	1.0	1.4	1.6	2.8	2.7	3.1	3.3
	160.0 ft	140.0 ft	120.0 ft	100.0 ft	80.0 ft	60.0 ft	40.0 ft	20.0 ft
								0.0 ft

<p>ENGINEERING INNOVATION</p> <p>Tower Analysis</p>	<p>FDH Velocitel</p> <p>6521 Meridien Drive</p> <p>Raleigh, NC 27616</p> <p>Phone: (919) 755-1012</p> <p>FAX: (919) 755-1031</p>	<p>Job: Griswold 2, CT10012-A-03</p> <p>Project: 15BVKZ1400</p> <p>Client: SBA Network Services, Inc.</p> <p>Code: TIA/EIA-222-F</p> <p>Path:</p>	<p>Drawn by: Justin Barnes</p> <p>Date: 07/10/15</p> <p>Scale: N</p> <p>Dwg No.:</p>
	<p>App'd:</p> <p>Scale: N</p> <p>Dwg No.:</p>		