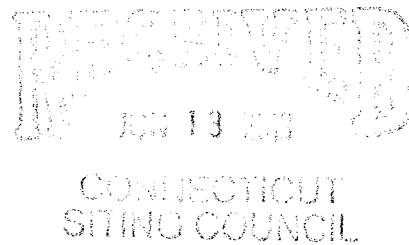


280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

June 12, 2013

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



Re: **Request of Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of an Existing Tower at 770 Long Cove Road, Ledyard, Connecticut**

Dear Ms. Bachman:

Pursuant to Connecticut General Statutes §16-50aa, as amended, Cellco Partnership d/b/a Verizon Wireless (“Cellco”) hereby requests an order from the Connecticut Siting Council (“Council”) to approve the shared use by Cellco of an existing telecommunications tower, owned by SBA, at 770 Long Cove Road in Ledyard, Connecticut. Cellco requests that the Council find that the proposed shared use of the SBA tower satisfies the criteria of Connecticut General Statutes § 16-50aa and issue an order approving the proposed shared use. In accordance with the Council’s directives, a copy of this letter is being sent to Ledyard Mayor, John A. Rodolico and Nathaniel Woody and Julie DuPont, the owners of the property on which the tower is located.

Background

The existing SBA facility consists of a 165-foot monopole tower within a fenced compound. According to the Structural Analysis the tower is currently used by an entity identified only as Calvary Chapel, with an antenna located at the 130-foot level.



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June 12, 2013
Page 2

Cellco is licensed by the Federal Communications Commission (“FCC”) to provide wireless services throughout the State of Connecticut. Cellco and SBA have agreed to the proposed shared use of the Long Cove Road tower pursuant to mutually acceptable terms and conditions, and SBA has authorized Cellco to apply for all necessary local, state and federal permits and approvals that may be required for the shared use of this tower. (*See* Owner’s authorization letter attached behind Tab 1).

Cellco proposes to install twelve (12) panel-type antennas at the 162-foot level on the SBA tower. Cellco will also install six (6) remote radio heads (RRHs) (two (2) per sector), behind its AWS and LTE antennas, one (1) main distribution box on its antenna mounting structure and two (2) HYBRIFLEX™ antenna cables located inside the monopole tower. Equipment associated with Cellco’s antennas and a propane-fueled back-up generator will be located inside a 12’ x 30’ shelter. Cellco’s shelter and a 1,000 gallon propane tank will be located within the fenced facility compound. Included behind Tab 2 are Cellco’s project plans showing the location of all proposed site improvements as well as specifications for Cellco’s antennas, RRHs and HYBRIFLEX™ cables.

C.G.S. § 16-50aa(c)(1) provides that, upon written request for approval of a proposed shared use, “if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use.” Cellco respectfully submits that the shared use of the tower satisfies these criteria.

A. Technical Feasibility. The existing tower is structurally capable of supporting Cellco’s antennas. The proposed shared use of this tower therefore is technically feasible. A Structural Analysis confirming that the tower is capable of supporting all existing and Cellco’s proposed antennas and related equipment is attached to this filing behind Tab 3.

B. Legal Feasibility. Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the proposed shared use of an existing tower facility such as the SBA facility in Ledyard. This authority complements the Council’s prior-existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council’s jurisdiction. In addition, § 16-50x(a) directs the Council to “give such consideration to other state laws and municipal regulations as it shall deem appropriate” in ruling on requests for the shared use of existing tower facilities. Under the statutory authority vested in the



Melanie A. Bachman
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Page 3

Council, an order by the Council approving the requested shared use would permit the Applicant to obtain a building permit for the proposed installations.

C. **Environmental Feasibility.** The proposed shared use of the SBA tower would have a minimal environmental effect, for the following reasons:

1. The proposed installations would have an insignificant incremental visual impact and would not cause any significant change or alteration in the physical or environmental characteristics of the existing site. The proposed installation of Cellco's shelter and propane tank would not require expansion of the existing fenced compound.
2. The proposed installations would not increase the noise levels at the existing facility by six decibels or more.
3. Operation of the proposed Cellco antennas at this site would not exceed the RF emissions standards adopted by the Federal Communications Commission. The cumulative "worst-case" RF emissions for the operation of the Cellco's proposed antennas would be 14.20% of the FCC standard. *See* the General Power Density Table included behind Tab 4.
4. Under ordinary operating conditions, the proposed installation would not require the use of any water or sanitary facilities and would not generate air emissions or discharges to water bodies or sanitary facilities. After construction is complete the proposed installations would not generate any increased traffic to the SBA property other than periodic (monthly) maintenance visits.

The proposed use of the Long Cove Road facility would, therefore, have a minimal environmental effect, and is environmentally feasible.

D. **Economic Feasibility.** As previously mentioned, SBA and Cellco have entered into a lease to share the existing tower on mutually agreeable terms. The proposed tower sharing is therefore economically feasible. (*See* Tab 1).



Melanie A. Bachman

June 12, 2013

Page 4

E. **Public Safety Concerns.** As stated above, the tower is structurally capable of supporting all existing antennas, as well as Cellco's proposed antennas and related equipment. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing SBA tower. In fact, the provision of new or improved wireless service through shared use of the existing tower is expected to enhance the safety and welfare of area residents.

Conclusion

For the reasons discussed above, the proposed shared use of the existing SBA tower at 770 Long Cove Road in Ledyard satisfies the criteria stated in C.G.S. § 16-50aa and advances the General Assembly's and the Siting Council's goal of preventing the unnecessary proliferation of towers in Connecticut. The Applicant, therefore, requests that the Council issue an order approving the proposed shared use of the SBA tower.

Thank you for your consideration of this matter.

Very truly yours,



Kenneth C. Baldwin

Enclosures

Copy to:

John A. Rodolico, Ledyard Mayor
Nathaniel Woody and Julie DuPont
Sandy M. Carter





LETTER OF AUTHORIZATION

Date: June 5, 2013

SBA Site ID: CT02720-S-01/Ledyard South

Property Located at: 770 Long Cove Road, Ledyard, CT 06335-2005

THE CITY/COUNTY OF: LEDYARD / NEW LONDON

APPLICATION FOR ZONING/USE/BUILDING PERMIT

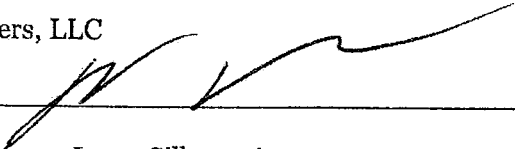
To Whom It May Concern:

This letter authorizes Verizon and its authorized agents to file for all necessary zoning, planning and building permits (local, state and federal) for the purposes of installing, operating and maintaining a telecommunications facility at the site/property referenced above on behalf of William G. Atkinson, Jr.

All approval conditions that may be granted to Verizon in connection with this facility relating to this specific application are the sole responsibility of Verizon.

Thank you,

SBA Towers, LLC


By: 

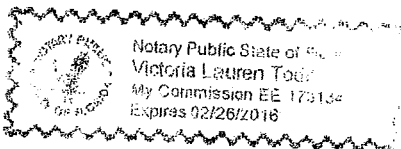
Name: Jason Silberstein

Its: Sr. VP, Property Management

Date: 06 / 05 / 2013

Sworn and subscribed this 5 day of June, 2013


NOTARY PUBLIC



Cellco Partnership



d.b.a. **verizon** wireless

WIRELESS COMMUNICATIONS FACILITY

LEDYARD SOUTH, CT
770 LONG COVE ROAD
GALES FERRY, CT 06335

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT **TO:** 770 LONG COVE ROAD, LEDYARD, CONNECTICUT

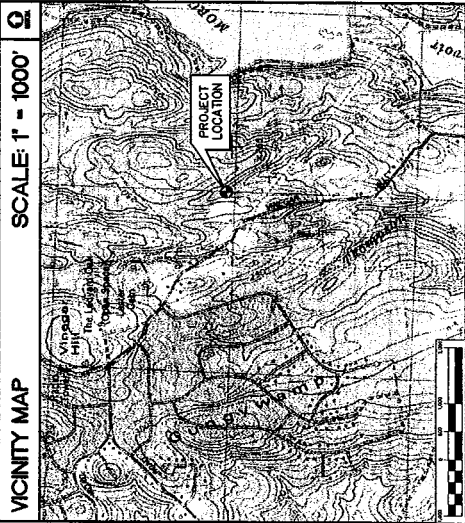
1. Head southwest on E. River Dr. toward Rhinix St.
2. Turn right to merge onto CT-2 E. toward Norwich
3. Take exit 285 for I-395 S/Connecticut 2A S toward New Haven
4. Merge onto Connecticut 2A E/I-395 S
5. Take exit 79A for Connecticut 2 Alternates E toward Preston/Ledyard
6. Merge onto Connecticut 2A E
7. Turn right onto CT-12 S (signs for Connecticut 12 S/Ledyard/Gales Ferry/Groton) toward Hill Rd
8. Turn left onto Long Cove Rd
9. Turn left onto Long Cove Rd
10. Turn right to stay on Long Cove Rd (Destination will be on the left)

GENERAL NOTES

1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A 2.500' PRE-FABRICATED WIRELESS EQUIPMENT SHELTER ON A CONCRETE FOUNDATION LOCATED WITHIN THE EXISTING WIRELESS COMMUNICATIONS FENCED COMPOUND AREA.
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE TO BE MOUNTED AT A CENTERLINE ELEVATION OF ±162' ON THE EXISTING 165' TALL MONOPOLE TOWER.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM AN EXISTING UTILITY BACKYARD LOCATED WITHIN TO THE FENCED COMPOUND.



PROJECT SUMMARY

SITE NAME: LEDYARD SOUTH, CT
SITE ADDRESS: 770 LONG COVE ROAD, GALES FERRY, CT
LESSEE/TENANT: CELCO PARTNERSHIP, d.b.a. VERIZON WIRELESS, 99 EAST RIVER DRIVE, EAST HARTFORD, CT 06108
CONTACT PERSON: SANDY CARTER, CELCO PARTNERSHIP, d.b.a. VERIZON WIRELESS, 99 EAST RIVER DRIVE, EAST HARTFORD, CT 06108
ENGINEER: CENTEX ENGINEERING, INC., 127 W. BRANFORD ROAD, BRANFORD, CT 06405, (203) 488-0580
TOWER COORDINATES: LATITUDE 41°-25'-0.73", LONGITUDE 72°-02'-39.47", GROUND ELEVATION: 240 ± A.M.S.L.
COORDINATES TAKEN FROM TERRAIN NAVIGATOR TOPOGRAPHY SOFTWARE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	0
C-1	COMPOUND PLAN AND ELEVATION	0

DESIGNED BY: CFC	DATE: 06/11/13	SCALE: AS NOTED	LEDYARD SOUTH, CT WIRELESS COMMUNICATIONS FACILITY 770 LONG COVE ROAD GALES FERRY, CT 06335
DRAWN BY: CFC	ISSUED FOR: CSC-CLIENT REVIEW	JOB NO. 10111	
CHECKED BY: CFC			Cellco Partnership d/b/a Verizon Wireless 1003 488-0599 437 North Branford Road Branford, CT 06405 www.cellco.com
			CENTEX ENGINEERING, INC. 127 W. BRANFORD ROAD BRANFORD, CT 06405 (203) 488-0580
			Cellco Partnership d/b/a Verizon Wireless TITLE SHEET SHEET T-1

REV#	DATE	BY	CHK'D BY	DESCRIPTION
A	06/11/13	TMD	CFC	ISSUED FOR CSC-CLIENT REVIEW

DESIGNED BY: CFC
 DRAWN BY: TMD
 CHECKED BY: CFC

Celco Partnership
 d/b/a Verizon Wireless

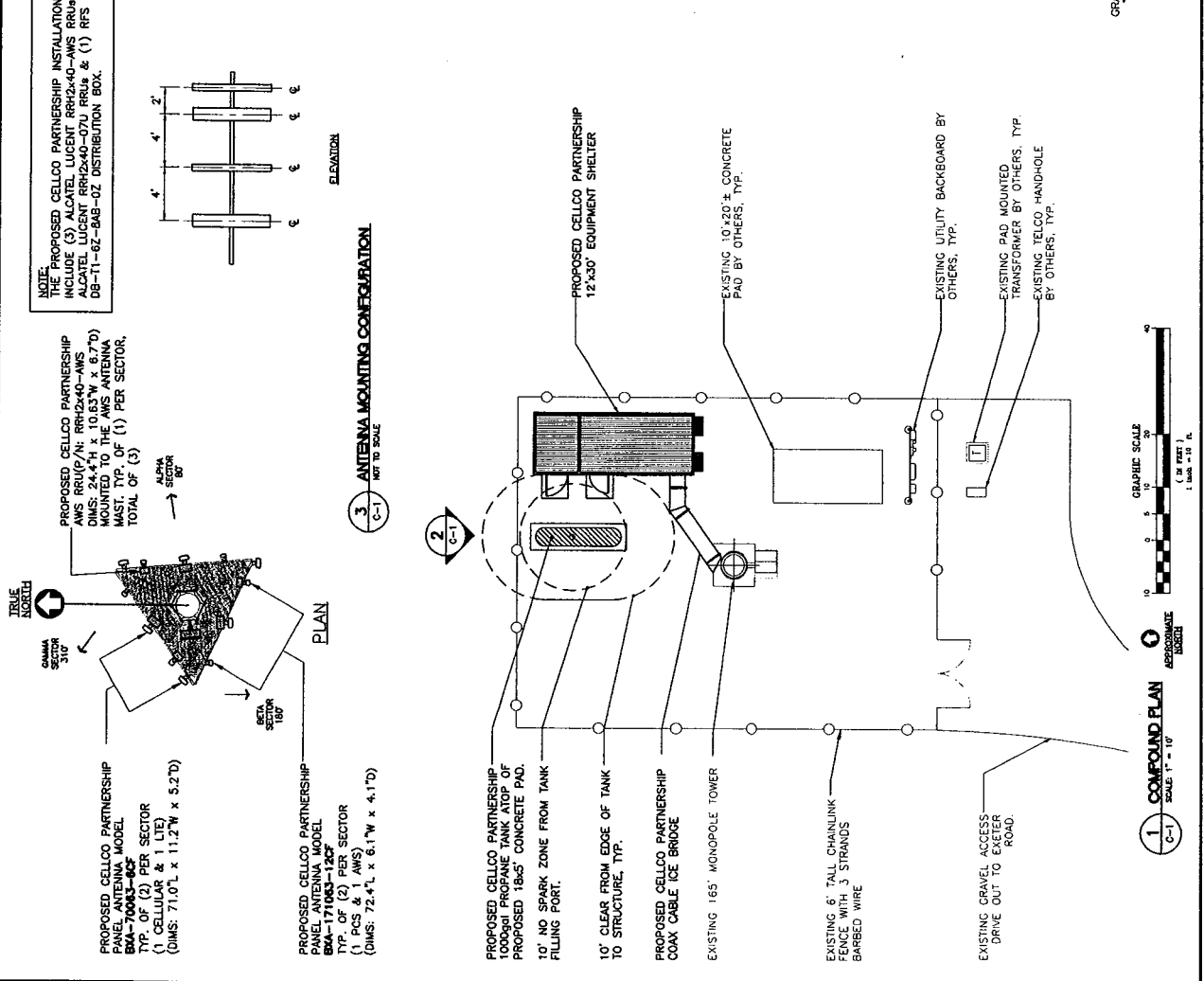
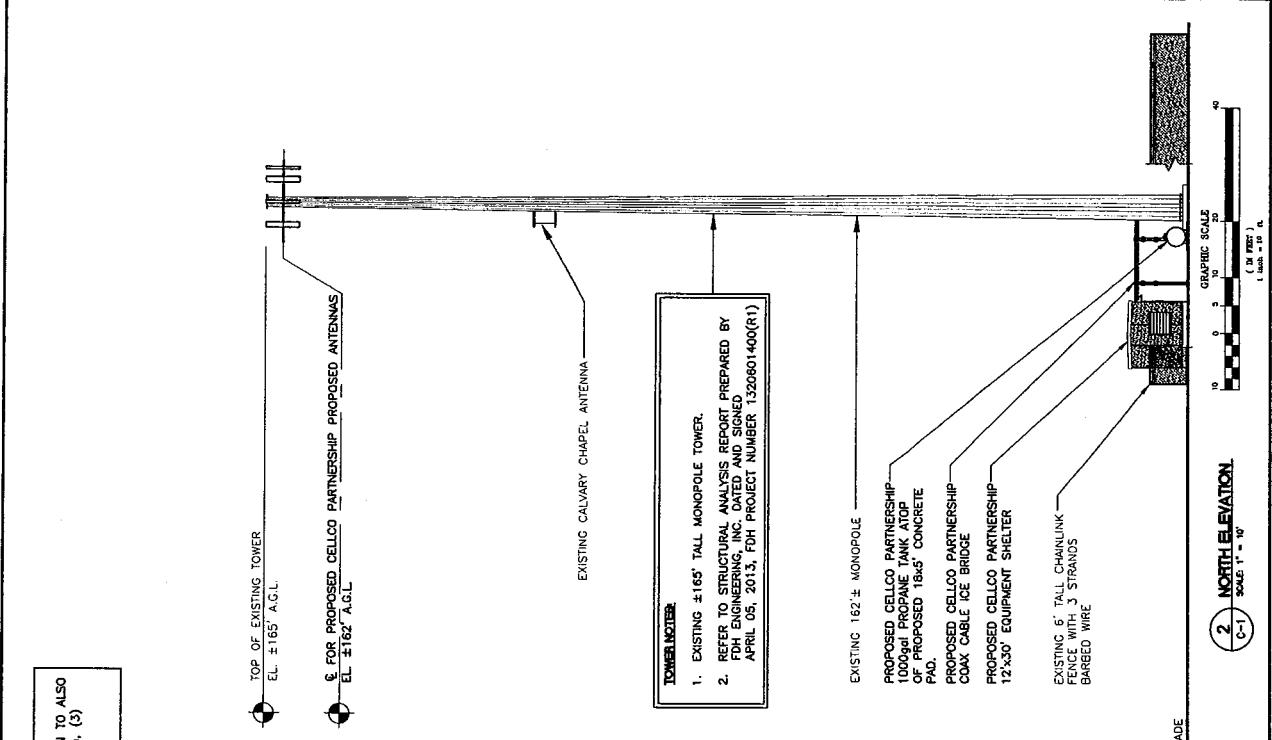
C-1
 770 LONG COVE ROAD
 GALEY FERRY, CT 06335

WIRELESS COMMUNICATIONS FACILITY
 LEDYARD SOUTH, CT

DATE: 06/11/13
 SCALE: AS NOTED
 JOB NO. 10111

COMPOUND
 PLAN AND
 ELEVATION

C-1
 SHEET NO. 2 OF 2



BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

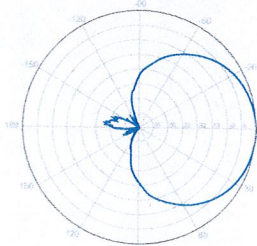
Replace "X" with desired electrical downtilt.

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



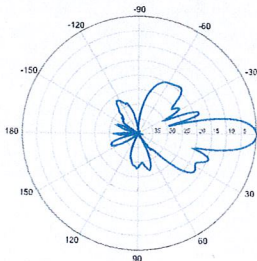
Electrical Characteristics	696-900 MHz		
	696-806 MHz	806-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz	
Polarization	±45°		
Horizontal beamwidth	65°	63°	
Vertical beamwidth	13°	11°	
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB	
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB	
Null fill	5% (-26.02 dB)		
Isolation between ports	< -25 dB		
Input power with EDIN connectors	500 W		
Input power with NE connectors	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm	6.8 in	
Weight without mounting brackets	7.9 kg	17 lbs	
Survival wind speed	> 201 km/hr	> 125 mph	
Wind area	Front: 0.51 m ² Side: 0.24 m ²	Front: 5.5 ft ² Side: 2.6 ft ²	
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf	
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



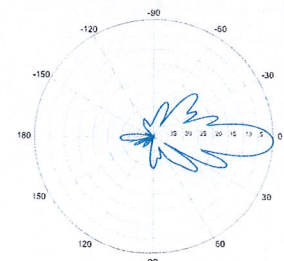
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

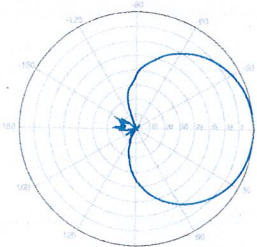


0° | Vertical | 750 MHz

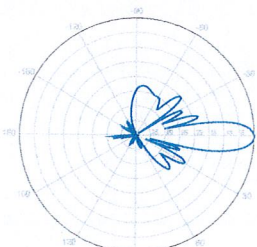
BXA-70063-6CF-EDIN-2



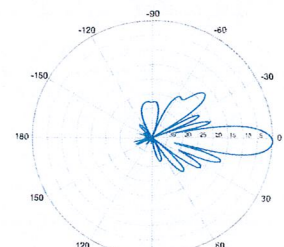
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



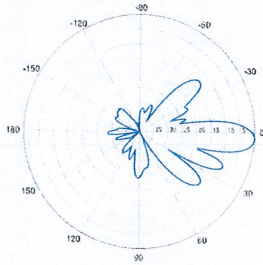
2° | Vertical | 850 MHz

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

BXA-70063-6CF-EDIN-X

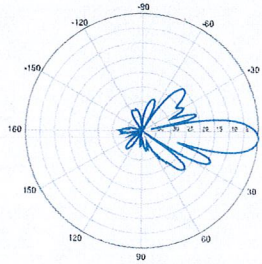
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



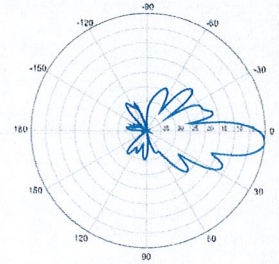
3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4

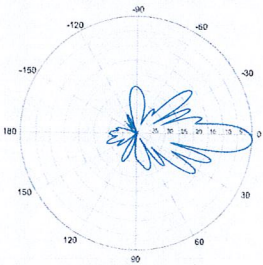


4° | Vertical | 750 MHz

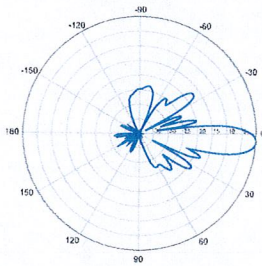
BXA-70063-6CF-EDIN-5



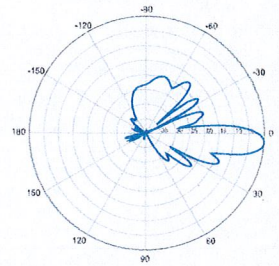
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

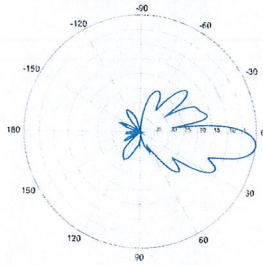


4° | Vertical | 850 MHz



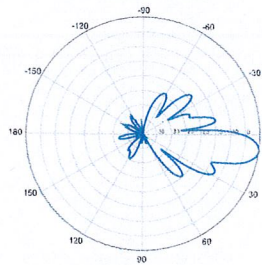
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



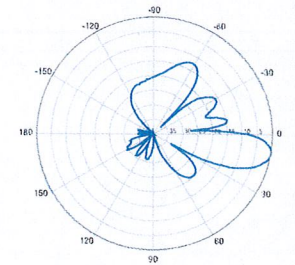
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

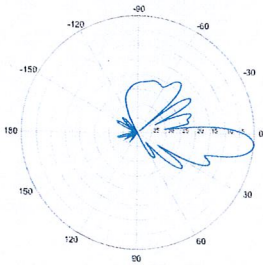


8° | Vertical | 750 MHz

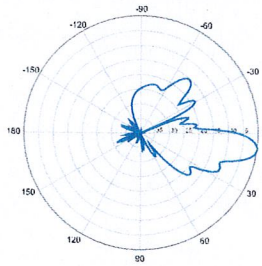
BXA-70063-6CF-EDIN-10



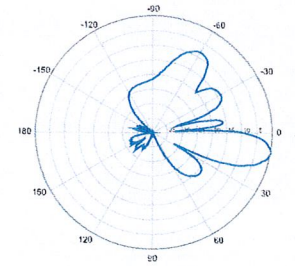
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

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

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

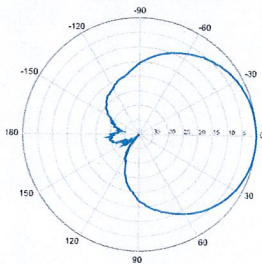
Replace "X" with desired electrical downtilt.

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

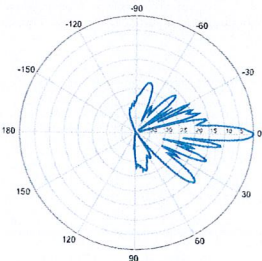


Electrical Characteristics	1710-2170 MHz		
	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi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

BXA-171063-12CF-EDIN-X

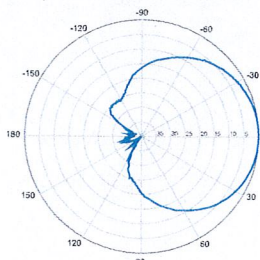


Horizontal | 1710-1880 MHz
BXA-171063-12CF-EDIN-0

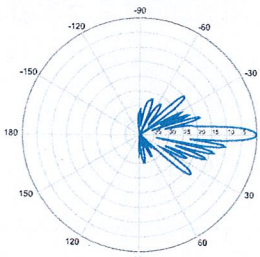


0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-X

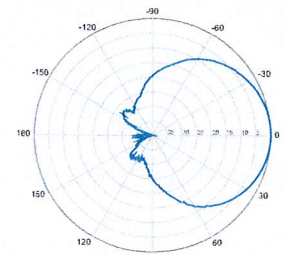


Horizontal | 1850-1990 MHz
BXA-171063-12CF-EDIN-0

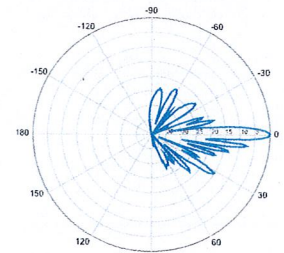


0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



Horizontal | 1920-2170 MHz
BXA-171063-12CF-EDIN-0



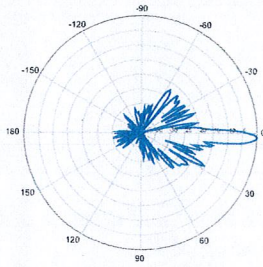
0° | Vertical | 1920-2170 MHz

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

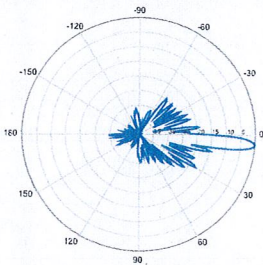
BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2

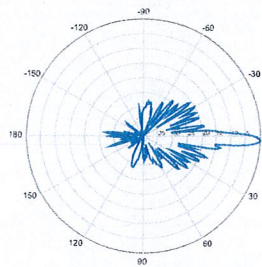


2° | Vertical | 1710-1880 MHz
BXA-171063-12CF-EDIN-5

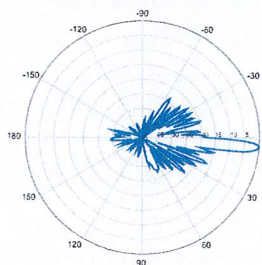


5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2

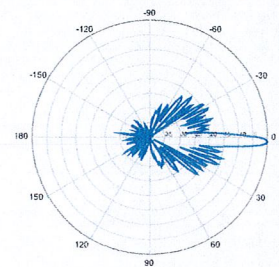


2° | Vertical | 1850-1990 MHz
BXA-171063-12CF-EDIN-5

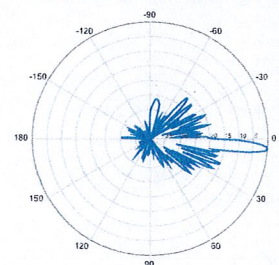


5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



2° | Vertical | 1920-2170 MHz
BXA-171063-12CF-EDIN-5



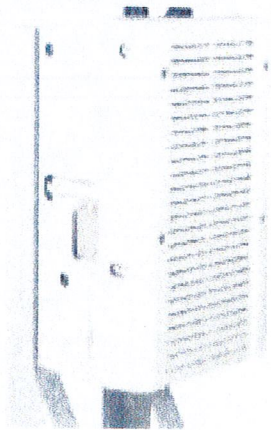
5° | Vertical | 1920-2170 MHz

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

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U 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 RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low

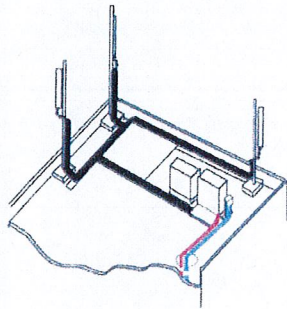
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U 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 RRH2x40-07-U 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 RRH2x40-07-U is compact and weighs less than 23 kg (50 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U 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 RRH2x40-07-U provides more RF power while at the same time consuming less electricity.



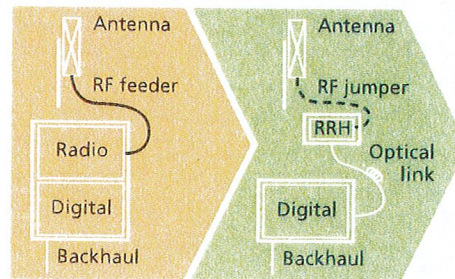
Macro

Features

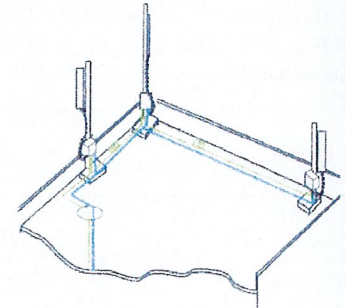
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

- Outdoor temperature range:
 - With solar load: -40°C to +50°C (-40°F to +122°F)
 - Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)

- Enclosure protection

→ IP65 (International Protection rating)

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
 - 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
 - TMA
 - Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
 - One SM fiber (9/125 μm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
 - Two MM fibers (50/125 μm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

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

Alarms and ports

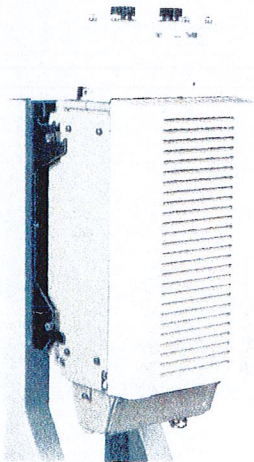
- Six external alarms
- Two optical ports to support daisy-chaining

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Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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



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

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

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low

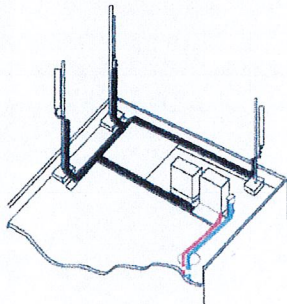
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent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

Fast, low-cost installation and deployment

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

Excellent RF performance

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



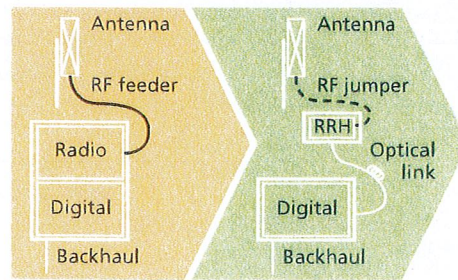
Macro

Features

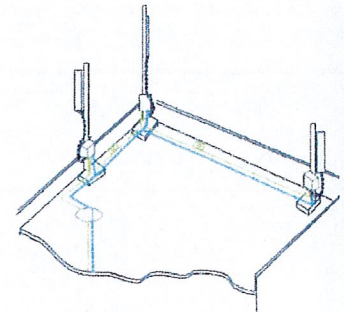
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

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



RRH for space-constrained cell sites



Distributed

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:
 - With solar load: -40°C to +50°C (-40°F to +122°F)
 - Without solar load: -40°C to +55°C (-40°F to +131°F)

- Passive convection cooling (no fans)
- Enclosure protection
 - IP65 (International Protection rating)

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

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

Product Description

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

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

Features/Benefits

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

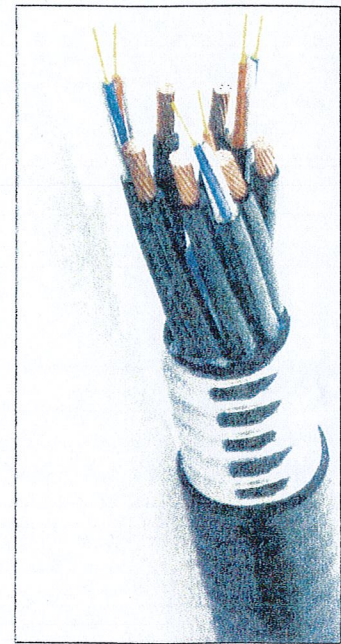


Figure 1: HYBRIFLEX Series

Technical Specifications

Structure			
Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm ² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[μm]	50/125
Primary Coating (Acrylate)		[μm]	245
Buffer Diameter, Nominal		[μm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environment			
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

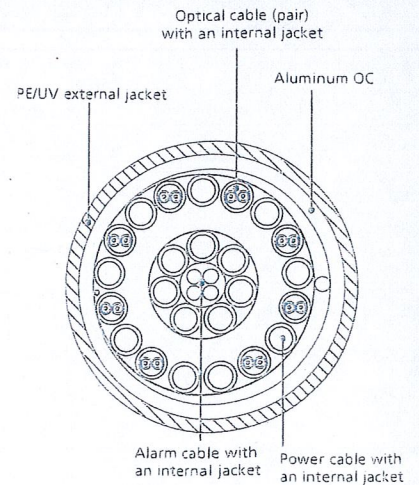


Figure 2: Construction Detail

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



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

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

165' Monopole Tower

**SBA Site Name: Ledyard South
SBA Site ID: CT02720-S-03
Verizon Site Name: Ledyard South CT**

FDH Project Number 1320601400 (R1)

Analysis Results

Tower Components	92.1%	Sufficient
Foundation	25.1%	Sufficient

Prepared By:

Andrew Reynolds, EI
Project Engineer

Reviewed By:

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

FDH Engineering, Inc.
6521 Meriden Drive
Raleigh, NC 27616
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info@fdh-inc.com



April 5, 2013

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

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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 Ledyard, CT to determine whether the tower is structurally adequate to support both the existing and proposed loads pursuant to the *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, TIA/EIA-222-F and 2005 Connecticut Building Code (CBC)*. Information pertaining to the existing/proposed antenna loading, current tower geometry, geotechnical data, foundation dimensions, and member sizes was obtained from:

- Fred A. Nudd Corporation (Drawing No. 00-7489-1) 165'/190' MJ-160 Monopole Design dated August 7, 2000
- FDH Engineering, Inc. (Project No. 1302621600) Geotechnical Evaluation of Subsurface Conditions dated April 5, 2013.
- 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 162 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 constructed per the original design drawings (see Fred A. Nudd Corporation Drawing No. 00-7489-1), and given the soil parameters (see FDH Engineering, Inc. Project No. 1302621600), the foundation should have the necessary capacity to support both the proposed and existing loading. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

Our structural analysis has been performed assuming all information provided to FDH Engineering, Inc. is accurate (i.e., the steel data, tower layout, existing antenna loading, and proposed antenna loading) and that the tower has been properly erected and maintained per the original design drawings.

Recommendations

To ensure the requirements of the *TIA/EIA-222-F* standards and *2005 CBC* are met with the existing and proposed loading in place, we have the following recommendations:

1. The proposed coax should be installed inside the pole's shaft.
2. RRU/RRH Stipulation: The proposed equipment may be installed in any arrangement determined by the client.

APPURTENANCE LISTING

The proposed and existing antennas with their corresponding cables/coax lines are shown in **Table 1**. *If the actual layout determined in the field deviates from the layout, FDH Engineering, Inc. should be contacted to perform a revised analysis.*

Table 1 - Appurtenance Loading

Existing Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
130	(1) Shively 6812-1 FM Antenna	(1) 1/2"	Calvary Chapel	130	Direct

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

Proposed Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
162	(6) Antel BXA-70063-6CF (6) Antel BXA-171063-12CF (3) Alcatel Lucent RRH2X40-AWS RRUs (3) Alcatel Lucent RRH2x40-07U RRUs (1) RFS DB-T1-6Z-8AB-0Z Distribution Box	(2) 1-5/8" Hybriflex	Verizon	162	(1) 12.5' Low Profile Platform (Valmont P/N: RMQP-463)

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	Fu=125 ksi

Table 3 displays the summary of the ratio (as a percentage) of force in the member to their capacities. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. *Note: Capacities up to 100% are considered acceptable.* **Table 4** displays the maximum foundation reactions.

If the assumptions outlined in this report differ from actual field conditions, FDH Engineering, Inc. should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the existing or proposed appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information

Table 3 - Summary of Working Percentage of Structural Components

Section No.	Elevation ft	Component Type	Size	% Capacity*	Pass Fail
L1	165 - 160	Pole	TP24x24x0.2813	2.4	Pass
	160	Flange Bolts	(18) .75" Ø on 27" BC	4.0	Pass
	160	Flange Plate	PL 30" Ø x .625" Thk.	8.8	Pass
L2	160 - 110	Pole	TP35.25x24x0.25	35.6	Pass
L3	110 - 65	Pole	TP45.3936x33.625x0.3125	42.1	Pass
L4	65 - 21	Pole	TP55.3387x43.3564x0.375	42.1	Pass
L5	21 - 0	Pole	TP60x52.9112x0.375	46.5	Pass
		Anchor Bolts	(18) 2" Ø on 67" BC	45.5	Pass
		Base Plate	PL 73" Ø x 1.5" Thk.	92.1	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	30 k	---
Shear	20 k	30 k
Moment	2,015 k-ft	3,489 k-ft

*Foundation determined adequate per independent analysis.

GENERAL COMMENTS

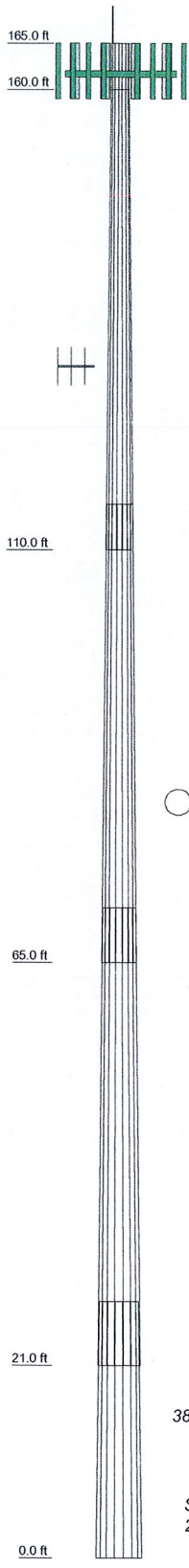
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading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

LIMITATIONS

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

APPENDIX

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	5.00	18	0.2813					0.4
2	50.00	18	0.2500	5.00	24.0000	35.2500	A572-65	4.0
3	50.00	18	0.3125	6.00	33.6250	45.3936	A572-65	6.6
4	50.00	18	0.3750	7.00	43.3564	55.3387	A572-65	9.9
5	28.00	18	0.3750		52.9112	60.0000	A572-65	6.4



DESIGNED APPURTENANCE LOADING

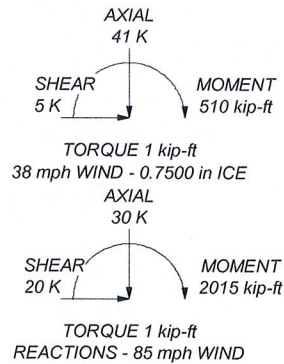
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	165	RRH2X40-AWS	162
(2) BXA-70063-6CF w/ Mount Pipe	162	RRH2x40-07U	162
(2) BXA-70063-6CF w/ Mount Pipe	162	RRH2x40-07U	162
(2) BXA-70063-6CF w/ Mount Pipe	162	RRH2x40-07U	162
(2) BXA-171063-12CF w/ Mount Pipe	162	DB-T1-6Z-8AB-0Z	162
(2) BXA-171063-12CF w/ Mount Pipe	162	12.5' Low Profile Platform (Valmont RMQP-463)	162
(2) BXA-171063-12CF w/ Mount Pipe	162	Shively 6812-1 FM Antenna	130
RRH2X40-AWS	162		
RRH2X40-AWS	162		

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.



FDH Engineering, Inc.
 6521 Meridian Drive, Suite 107
 Raleigh, NC 27616
 Phone: 9197551012
 FAX: 9197551031

Job: Ledyard South, CT02720-S-03			
Project: 1320601400 (R1)			
Client: SBA Network Services, Inc.	Drawn by: Andrew Reynolds	App'd:	
Code: TIA/EIA-222-F	Date: 04/05/13	Scale: NTS	
Path:		Dwg No. E-1	

General Power Density

Site Name: LEDYARD SOUTH, 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 ²)	Maximum Permissible Exposure (mW/cm ²)	Fraction of MPE (%)
VZW PCS	1970	11	232	2548.43	162	0.0349	1.0	3.49%
VZW Cellular	869	9	245	2204.532	162	0.0302	0.579333333	5.21%
VZW AWS	2145	1	1750	1750	162	0.0240	1.0	2.40%
VZW 700	698	1	1050	1050	162	0.0144	0.465333333	3.09%

Total Percentage of Maximum Permissible Exposure

14.20%

*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/cm² = milliwatts per square centimeter

ERP = Effective Radiated Power

Absolute worst case maximum values used.