Board of Architectural Review (BAR)
Certificate of Appropriateness

Please Return To: City of Charlottesville
Department of Neighborhood Development Services
P.O. Box 911, City Hall
Charlottesville, Virginia 22902
Telephone (434) 970-3130 Email scala@charlottesville.org

RECEIVED
APR 21 2016
NEIGHBORHOOD DEVELOPMENT SERVICES

Please submit ten (10) hard copies and one (1) digital copy of application form and all attachments.
Please include application fee as follows: New construction project $375; Demolition of a contributing structure $375; Appeal of BAR decision $125; Additions and other projects requiring BAR approval $125; Administrative approval $100.
Make checks payable to the City of Charlottesville.
The BAR meets the third Tuesday of the month.
Deadline for submittals is Tuesday 3 weeks prior to next BAR meeting by 3:30 p.m.

Owner Name Southern Railway Company Applicant Name Verizon

Project Name/Description Verizon - Downtown Charlottesville Upgrades Parcel Number 320144200

Project Property Address 819 West Main Street

Applicant Information

Address: Verizon Wireless - C/O Stephen Waller, AICP
536 Pantops Center, PMB #405, Charlottesville, VA 22911
Email: stephen.waller@gdnsites.com
Phone: (W) 434-825-9617 (C) _____

Property Owner Information (if not applicant)

American Tower Corporation / Norfolk-Southern
Address: 116 Huntington Ave. 11th Floor
Boston, MA 02116
Email: _____
Phone: (W) 617-375-7500 (C) _____

Do you intend to apply for Federal or State Tax Credits for this project? No

Signature of Applicant

I hereby attest that the information I have provided is, to the best of my knowledge, correct.

Signature 4/18/2016 Date

Stephen Waller, AICP April 18, 2016
Print Name Date

Property Owner Permission (if not applicant)

I have read this application and hereby give my consent to its submission.

Signature Date

Print Name Date

For Office Use Only

Received by: L. Barnard
Fee paid: $100.00 Cash/Ck. # 1345
Date Received: 4/21/2016
Revised 2016
P16-0070

Approved/Disapproved by: M. J. Scala
Date: May 2, 2016
Conditions of approval: _____

Scala, Mary Joy

From: Schweller, Lori H. <Lori.Schweller@leclairryan.com>
Sent: Thursday, April 14, 2016 9:06 AM
To: Scala, Mary Joy; Robertson, Lisa
Cc: Creasy, Missy; Brodhead, Read; Stephen Waller (stephen.waller@gdnsites.com)
Subject: RE: Eligible Facilities Modification Request (Verizon Wireless)

Mary Joy,
I understand.
Thank you,
Lori

From: Scala, Mary Joy
Sent: Thursday, April 14, 2016 9:01:44 AM
To: Schweller, Lori H.; Robertson, Lisa
Cc: Creasy, Missy; Brodhead, Read; Stephen Waller (stephen.waller@gdnsites.com)
Subject: RE: Eligible Facilities Modification Request (Verizon Wireless)

For this application we have determined that a limited review is required, to verify that the relevant Eligible Facilities criteria are satisfied, and that BAR review is probably not required.

On a different application, should there be any issue as to whether concealment elements are defeated, or whether conditions of some prior COA have been adhered to, BAR review may be required.

Mary Joy Scala, AICP
Preservation and Design Planner
City of Charlottesville
Department of Neighborhood Development Services
City Hall – 610 East Market Street
P.O. Box 911
Charlottesville, VA 22902
Ph 434.970.3130 FAX 434.970.3359
scala@charlottesville.org

From: Schweller, Lori H. [mailto:Lori.Schweller@leclairryan.com]
Sent: Tuesday, April 12, 2016 5:58 PM
To: Scala, Mary Joy; Robertson, Lisa
Cc: Creasy, Missy; Brodhead, Read; Stephen Waller (stephen.waller@gdnsites.com)
Subject: RE: Eligible Facilities Modification Request (Verizon Wireless)

Thank you, Mary Joy. To be sure I understand -- does your request reflect the City's decision, then, that antenna replacements (with no increase in the number or size) do require BAR review but that, in this case, the review will be administrative and not require a hearing?

Thanks,
Lori

Lori H. Schweller
Attorney at Law

LECLAIRRYAN
123 East Main Street, Eighth Floor
Charlottesville, Virginia 22902
(434) 245-3448 Direct
(434) 296-0905 Fax
(804) 248-8700 Mobile
Lori.Schweller@leclairryan.com
https://www.leclairryan.com

LinkedIn

From: Scala, Mary Joy [mailto:scala@charlottesville.org]
Sent: Tuesday, April 12, 2016 3:56 PM
To: Schweller, Lori H.; Robertson, Lisa
Cc: Creasy, Missy; Brodhead, Read; Stephen Waller (stephen.waller@gdnsites.com)
Subject: RE: Eligible Facilities Modification Request (Verizon Wireless)

Lori,

Thank you for your email of March 24 below.

In response, we believe the application is incomplete, and ask that you provide the following missing document(s) and information:

- Application for COA (form attached);
- Application fee of $100 for administrative approval;
- Drawings, scaled, illustrating the change(s) in dimension of in a manner that allows staff to compare existing conditions to the conditions that will be present after the modification, for (A) the facilities mounted on the tower structure, and (B) for ground equipment. If there are no changes to ground equipment, please confirm that.

Let me know if you have any questions.

Mary Joy Scala, AICP
Preservation and Design Planner
City of Charlottesville
Department of Neighborhood Development Services
City Hall – 610 East Market Street
P.O. Box 911
Charlottesville, VA 22902
Ph 434.970.3130 FAX 434.970.3359
scala@charlottesville.org

From: Schweller, Lori H. [mailto:Lori.Schweller@leclairryan.com]
Sent: Thursday, March 24, 2016 10:54 AM
To: Robertson, Lisa
Cc: Scala, Mary Joy; Creasy, Missy; Brodhead, Read; Stephen Waller (stephen.waller@gdnsites.com)
Subject: Eligible Facilities Modification Request (Verizon Wireless)

Good Morning, Lisa,

We're delivering to you today a request on behalf of Verizon Wireless to replace some antennas at the 185' level on the 225' Norfolk Southern tower off West Main Street. This site has been modified a number of times over the years, so it has received many previous BAR approvals. We believe that the proposed modifications are such that there will be no visible difference to the public.

In addition to past BAR approval information, the letter contains specific information provided by Stephen Waller, Verizon Wireless' zoning consultant, about the antennas being removed and the new equipment being attached, along with product specification sheets for the new equipment. Also enclosed for your reference are recent photos of the existing equipment.

Attached is a copy of the package you'll receive this afternoon.

Please don't hesitate to call any time with questions.

Thank you,
Lori

Lori H. Schweller
Attorney at Law
LECLAIRRYAN
123 East Main Street, Eighth Floor
Charlottesville, Virginia 22902
(434) 245-3448 Direct
(434) 296-0905 Fax
(804) 248-8700 Mobile
Lori.Schweller@leclairryan.com
https://www.leclairryan.com

LinkedIn

* This e-mail may contain confidential or privileged information. If you are not the intended recipient, please notify the sender immediately by return e-mail with a copy to emailadministrator@leclairryan.com and delete this e-mail and all copies and attachments.

LECLAIRRYAN

March 24, 2016

HAND DELIVER

Lisa Robertson, Esq.
Deputy City Attorney
City Attorney's Office
P.O. Box 911
Charlottesville, VA 22902

Re: "Downtown Charlottesville" Eligible Facility Request for Antenna Replacement and Equipment Modifications to Existing Tower

Dear Ms. Robertson:

Verizon Wireless plans to modify transmission equipment on an existing wireless transmission tower in the City of Charlottesville. Enclosed are materials to support our representation that the proposed equipment changes would be a modification to an Eligible Facility that does not substantially change its physical dimensions, as such terms are defined in the Spectrum Act (Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012) and so must be approved by the locality within sixty days of submission of the request.

This wireless facility has been the subject of six previous Board of Architectural Review applications and approvals -- most recently, BAR 10-11-03 for which the BAR approved adding four new antennas at 185 feet and adding cross bracing between 125-131 feet levels, approved on November 16, 2010; approval of the addition of nine antennas and compound expansion on September 20, 2011; BAR 12-06-05 approved on June 19, 2012 for adding three antennas at the 185' level; and, most recently, BAR 13-10-02, approved on October 15, 2013, for collocation of 16 antennas at the 185' level. I have enclosed for reference the following documents relating to the 2013 approval because the proposed changes are for equipment installed at the same (185') level:

- Notice of BAR approval via 10/31/13 e-mail from Mary Joy Scala
- Construction Drawings submitted with the 2013 application
- Photosimulation from the 2013 application
- Letter from Stuart Squier regarding the building permit for the current configuration
- E-mail from Francis Vineyard regarding the building permit

Also enclosed are photographs of the existing tower and attachments.

E-mail: Lori.Schweller@leclairryan.com
Direct Phone: (434) 245-3448
Direct Fax: (434) 296-0905

123 East Main Street, Suite 800
Charlottesville, Virginia 22902
Phone: (434) 245-3444 \ Fax: (434) 296-0905

We respectfully request the City's approval of the proposal described below and request confirmation that no further review or approval is required.

Downtown Charlottesville - AWS and PCS Upgrades / Antenna Modifications:
Verizon Wireless is proposing upgrades to one existing antenna array on the existing 225' lattice tower located at 811 West Main Street within the Norfolk Southern Railroad right-of-way. The property is identified as Tax Map 31 parcel 184.13. The existing tower was built in the late 1960's for railroad communications. American Tower Corporation manages and administers leasing for this site and several others owned by Norfolk Southern. Since the mid-1990s the tower has also been used by wireless service providers including Verizon Wireless (originally as Alltel) and nTelos to support their wireless networks.

The planned antenna reconfiguration will involve the removal of 14 of the 16 existing antennas at the 185' level, and replacing them with 14 new antennas in the vacated mounting spaces. The existing and proposed antennas and other equipment are set out in the following charts.

Existing Configuration at 185' Centerline Level:

Quantity	Antennas	Height	Width	Status
4	Antel BXA-171063/12CF	72.4"	6.1"	To Be Removed
2	Antel BXA-185040/12CF	48.8"	11.8"	To Be Removed
2	Antel BXA-185063/12CF	72.4"	6.1"	To Be Removed
2	Antel BXA-70040/8CF	94.6"	23.9"	**To Remain**
2	Antel BXA-70063/8CF	94.7"	11.2"	To Be Removed
2	Antel BXA-80040/8CF	94.7"	23.6"	To Be Removed
2	Antel BXA-80063/8CF	94.7"	11.2"	To Be Removed
Quantity	**Supporting Connectors (mounted behind antennas)**	**Height**	**Width**	**To Be Removed / Remain**
4	Celwave ATMAP-120 (Amplifiers)	10.1"	8.7"	**To Remain**
8	Celwave FDR6004/1C-3L (Diplexers)	5.8"	6.5"	**To Remain**

Proposed Configuration at 185' Centerline Level:

Quantity	Antennas	Height	Width	Proposed / Existing
8	Andrew HBXX-6517DS-A2M	79.4"	12.0"	**Proposed**
2	Antel BXA-70063-8CF-DIN-X	95.6"	8.0"	**Proposed**
4	Antel QXW-636X6312XBF-EDIN	82.5"	12.0"	**Proposed**

2	Antel BXA-70040/8CF	94.6"	23.9"	Existing

Quantity	Supporting Connectors (mounted behind antennas)	Height	Width	Proposed / Existing
4	Alcatel Lucent RRH2x60-AWS BTS (Remote Radio Heads)	22.0"	12.0"	**Proposed**
4	Alcatel Lucent RRH4x30-B25 BTS (Remote Radio Heads)	**36.6"**	**10.6"**	**Proposed**
4	Celwave ATMAP-120 (Amplifiers)	10.1"	8.7"	Existing
8	Celwave FDR6004/1C-3L (Diplexers)	5.8"	6.5"	Existing

We have enclosed the product specification sheets for the antennas, remote radio heads and other equipment listed above.

Design Parameters:
The proposed changes will allow for the integration of new advances in both data and voice services with the integration of remote radio head support for Verizon's 4G Advanced Wireless Services (AWS), which was added to the network in 2013, and also for the Personal Communication Service (PCS) network that has been in use for several years. The proposed changes will provide enhanced services within a large portion of the downtown area and along West Main Street in the City of Charlottesville. No new ground equipment or ground disturbance is required to accommodate this modification.

Please refer to the attached construction drawings for an elevation view and the photosimulations of the tower that show the current design and locations of previously approved mounting frames and pipes that will be kept in place and reused for the proposed replacement antennas. As indicated in the chart above, sizes of the proposed antennas are comparable to those currently attached to the tower; the remote radio heads and other connectors are also smaller than the antennas that they are to be installed behind. All antennas and connectors will be colored to match that of the existing tower, as well as the existing antennas and mounting structures. Therefore, the proposed antenna replacements will not create any apparent visual changes requiring further review by the Board of Architectural Review.

Eligibility under the Spectrum Act:
The tower fits within the FCC's definition of an "eligible support structure" for purposes of the Spectrum Act. The proposed modification – to replace fourteen (14) antennas and add remote radio heads and related equipment -- will not "substantially change the physical dimensions of the tower" as the modification will not meet any of the following criteria, as set out in FCC 14-153:

"(1) for towers outside of public rights-of-way, it increases the height of the tower by more than 10%, or by the height of one additional antenna array with separation from the nearest existing antenna not to exceed twenty feet, whichever is greater; for those towers in the rights-of-way and for all base stations, it increases the height of the tower or base station by more than 10% or 10 feet, whichever is greater;

(2) for towers outside of public rights-of-way, it protrudes from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater; for those towers in the rights-of way and for all base stations, it protrudes from the edge of the structure more than six feet;

(3) it involves installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets;

(4) it entails any excavation or deployment outside the current site of the tower or base station;

(5) it would defeat the existing concealment elements of the tower or base station; or

(6) it does not comply with conditions associated with the prior approval of construction or modification of the tower or base station unless the non-compliance is due to an increase in height, increase in width, additional of cabinets or new excavation that does not exceed the corresponding "substantial change" thresholds identified above."

Under the Spectrum Act, "a local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower (or base station) that does not substantially change the physical dimensions of such tower (or base station)."

Further, the antenna replacements will not change the appearance of the tower in any appreciable manner. Since there are no antenna additions, just replacements with antennas of similar size, we suggest that the modification should not require further review by the BAR.

Conclusion

The proposed modifications will not substantially change the size or appearance of the existing tower. Verizon Wireless is confident that the proposed antenna upgrades will continue to be in compliance with the City of Charlottesville's Board of Architectural Review's most recent approval for 2013 upgrades that were found to comply with the West Main Street District's guidelines for scale, size, design, screening, and color. The proposed antenna upgrades meet all of the requirements for the district and will not create a detrimental impact upon the district.

There will be no additional ground disturbance or construction, and all work will be done on the existing tower using the existing mounts and without increasing its height.

Please contact me if you have any questions or will require any additional information in reviewing this application.

Very truly yours,

Lori H. Schweller

Lori H. Schweller

Enclosures

cc: Mary Joy Scala (via email)
Missy Creasy (via email)
Read Broadhead (via email)
Stephen Waller, GDNsites (via email)

GDN sites
Consultants to Verizon Wireless
536 Pantops Center - PMB #405
Charlottesville, Virginia 22911

Mary Joy Scala, AICP
Preservation and Design Planner
City of Charlottesville
610 East Market Street
Charlottesville, Virginia 22902

Re: "Downtown Charlottesville - AWS and PCS Upgrades / Antenna Replacement and Modifications

Dear Ms. Scala:

As you already know, Verizon intends to modify the antennas and supporting transmission equipment on the existing wireless transmission tower located at 819 West Main Street. Per your instructions I am submitting an application on behalf of Verizon Wireless, who has a lease and licensing agreement with American Tower Corporation and Norfolk Southern for the existing antenna array that is mounted at the 185' level on the existing tower.

The existing tower was built in the late 1960's for railroad communications. Since the mid-1990s the tower has also been used by wireless service providers including Verizon (originally as Alltel) and nTelos to support their wireless networks.

This reconfiguration will involve the removal of fourteen (14) of the sixteen (16) existing antennas, and replacing them with 14 new antennas all to be located on the existing 225' self-supporting tower in the same mounting spaces to be vacated at the 185' level. The Existing and Proposed antenna configurations are provided in the following charts.

Existing Configuration at 185' Centerline Level:

Quantity	Antennas	Height	Width	To Be Removed / Remain
4	Antel BXA-171063/12CF	72.4"	6.1"	To Be Removed
2	Antel BXA-185040/12CF	48.8"	11.8"	To Be Removed
2	Antel BXA-185063/12CF	72.4"	6.1"	To Be Removed
2	Antel BXA-70040/8CF	94.6"	23.9"	**To Remain**
2	Antel BXA-70063/8CF	94.7"	11.2"	To Be Removed
2	Antel BXA-80040/8CF	94.7"	23.6"	To Be Removed
2	Antel BXA-80063/8CF	94.7"	11.2"	To Be Removed
Quantity	**Supporting Connectors (mounted behind antennas)**	**Height**	**Width**	**To Be Removed / Remain**
4	Celwave ATMAP-120 (Amplifiers)	10.1"	8.7"	**To Remain**
8	Celwave FDR6004/1C-3L (Diplexers)	5.8"	6.5"	**To Remain**

GDN sites
Consultants to Verizon Wireless
536 Pantops Center - PMB #405
Charlottesville, Virginia 22911

Proposed Configuration at 185' Centerline Level:

Quantity	Antennas	Height	Width	Proposed / Existing
8	Andrew HBXX-6517DS-A2M	79.4"	12.0"	**Proposed**
2	Antel BXA-70063-8CF-DIN-X	95.6"	8.0"	**Proposed**
4	Antel QXW-636X6312XBF-EDIN	82.5"	12.0"	**Proposed**
2	Antel BXA-70040/8CF	94.6"	23.9"	Existing
Quantity	**Supporting Connectors (mounted behind antennas)**	**Height**	**Width**	**Proposed / Existing**
4	Alcatel Lucent RRH2x60-AWS BTS (Remote Radio Heads)	22.0"	12.0"	**Proposed**
4	Alcatel Lucent RRH4x30-B25 BTS (Remote Radio Heads)	**36.6"**	**10.6"**	**Proposed**
4	Celwave ATMAP-120 (Amplifiers)	10.1"	8.7"	Existing
8	Celwave FDR6004/1C-3L (Diplexers)	5.8"	6.5"	Existing

Design Parameters:

The proposed changes will allow for the integration of new advances in both data and voice services with the integration of Remote Radio Head support for Verizon's 4G Advanced Wireless Services (AWS) that was added to the network in 2013, and also for the Personal Communication Service (PCS) network that has been in use for several years. The proposed changes will provide enhanced services within a large portion of the downtown area and along West Main Street in the City of Charlottesville. There will be no new base station equipment or ground disturbance required in order to accommodate this modification.

Please refer to the attached construction drawings for an elevation view and the photosimulations of the tower that were approved in order to allow the current design and locations of previously approved mounting frames and pipes that will be kept in place and also reused for the proposed replacement antennas. As indicated in the two charts above, sizes of the proposed antennas are very comparable to those that are currently attached on the tower, the Remote Radio Heads and other connectors are also smaller than the antennas that they are to be installed behind. All antennas and connectors will be colored to match that of the existing tower, antennas and their mounting frames that are currently attached to it.

Conclusion

The proposed modifications will not result in any significant changes to the size or appearance of the existing tower. The antenna array to be modified is well above the ground level and at a distance that is out of direct sight at eye level. All work will be done on the existing tower, using the existing mounts and without increasing its height, so there will be no ground disturbance or additional construction, as all new radio equipment will be installed inside base station shelter.

GDN sites
Consultants to Verizon Wireless
536 Pantops Center - PMB #405
Charlottesville, Virginia 22911

For the reasons that are stated above Verizon is confident that the proposed antenna upgrades will still be in compliance with the most recent upgrades that received approval from the City of Charlottesville's Board of Architectural Review, and the guidelines for facilities that are in accordance with the West Main Street District's guidelines for scale, size, design, screening, and color. The proposed antenna upgrades will not create a detrimental impact upon the district and also been demonstrated to comply with the Federal Government's Spectrum Act (Section 6409 of the Middle Class Tax Relief and Job Creation Act).

Please contact me if you have any questions or will require any additional information in reviewing this application.

Sincerely,

Stephen Waller, AICP
Planner / Site Development Consultant
For Verizon Wireless
(434)825-0617

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

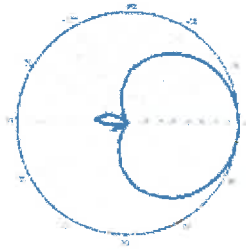
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
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 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

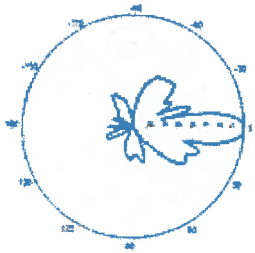
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



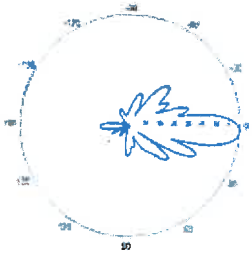
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

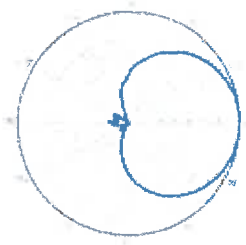


0° | Vertical | 750 MHz

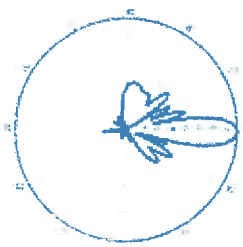
BXA-70063-6CF-EDIN-2



2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

2° | Vertical | 850 MHz

Amphenol ANTENNA SOLUTIONS

696-900 MHz

BXA-70040-8CF-EDIN-X

Single Band | Panel Antenna | X-Pol | 40° | 18.0 dBd | Fixed Tilt

- Single band, panel antenna with fixed electrical tilt
- Available with a variety of fixed tilt options

Ordering Options

When ordering, replace the "X" in the model number with the electrical downtilt. Select from the options listed in the Electrical Downtilt section below.

Electrical Characteristics		696-900 MHz	
Frequency Bands		696-806 MHz	806-900 MHz
Polarization		±45°	
Horizontal Beamwidth		42°	40°
Vertical Beamwidth		9°	7°
Gain		17.5 dBd (19.6 dBi)	18.0 dBd (20.1 dBi)
Electrical Downtilt		0(X) 0, 2, 3, 4, 5, 6, 7, 8, 10	
Impedance		50Ω	
IM3 (2x20W carrier)		< -153 dBc	
Upper Sidelobe Suppression (0°)		-15.4 dB	-19.5 dB
Front-to-Back Ratio (±30°)		-37.7 dB	-34.0 dB
VSWR		≤ 1.35:1	
Null Fill		5% (-26.02 dB)	
Isolation Between Ports		> 25 dB	
Input Power		500 W	
Total Number of Connectors		Antenna has 2 connectors located on the center (back) of the antenna	
Connectors Per Band	696-900 MHz	2 Connectors, Elongated 7/16-DIN Female (EDIN)	
Lightning Protection		Direct Ground	

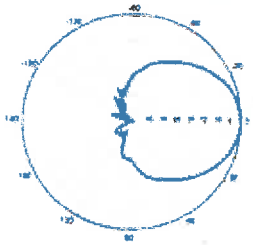
Mechanical Characteristics					
Dimensions (Length x Width x Depth)		2404 x 606 x 200	mm	94.6 x 23.9 x 7.9	in
Depth with z-brackets		240	mm	9.4	in
Weight without Mounting Brackets		23	kg	50	lbs
Wind Area	Front	1.46	m²	15.7	ft²
	Side	0.48	m²	5.2	ft²
Survival Wind Speed		> 201	km/hr	> 125	mph
Wind Load (161 km/hr or 100 mph)	Front	2093	N	471	lbf
	Side	794	N	179	lbf

BXA-70040-8CF-EDIN-X

Single Band | Panel Antenna | X-Pol | 40° | 18.0 dBd | Fixed Tilt

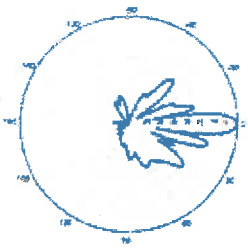
Mounting Options	Part Number	Image	Fits Pipe Diameter	Weight
All mounting bracket kits are ordered separately unless otherwise indicated. Select from the options listed below.				
3-Point Mounting and Downtilt Bracket Kit	36210008		40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs

BXA-70040-8CF-EDIN-X



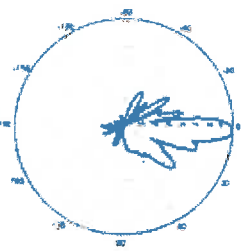
Horizontal | 750 MHz

BXA-70040-8CF-EDIN-0



0° | Vertical | 750 MHz

BXA-70040-8CF-EDIN-2

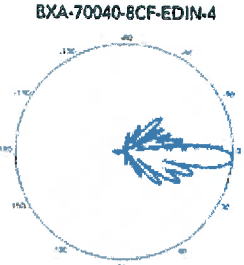


2° | Vertical | 750 MHz

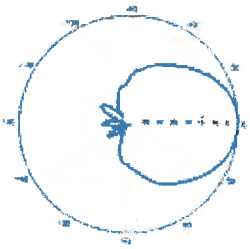
BXA-70040-8CF-EDIN-3

3° | Vertical | 750 MHz

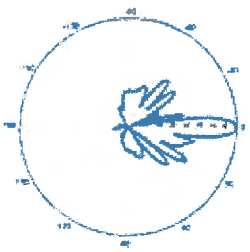
BXA-70040-8CF-EDIN-4



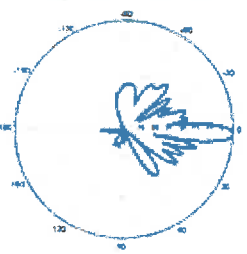
4° | Vertical | 750 MHz



Horizontal | 850 MHz

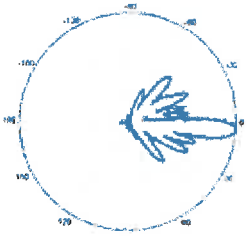


0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

3° | Vertical | 850 MHz



4° | Vertical | 850 MHz

QXW-636X6312XBF-EDIN

Replace "X" with desired electrical downtilt.

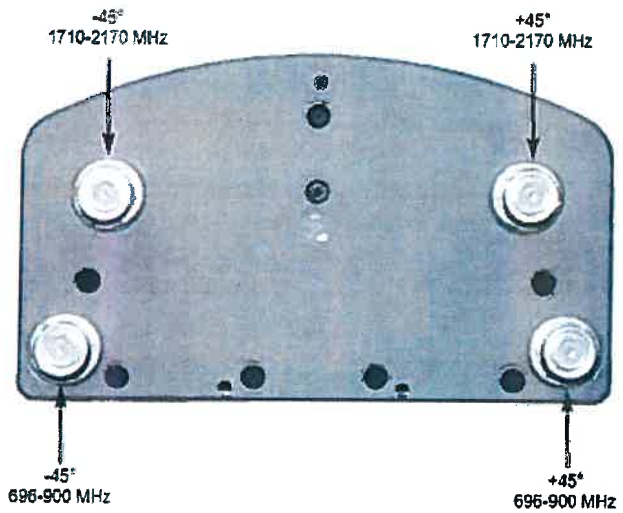
XX-Pol | Dual Band FET Panel | 65° / 65° | 16.6 / 19.0 dBi

Electrical Characteristics	696-900 MHz		1710-2170 MHz		
Frequency bands	696-806	806-900	1710-1880	1850-1990	1900-2170
Polarization	±45°		±45°		
Horizontal beamwidth	70°	65°	68°	65°	60°
Vertical beamwidth	10°	8°	4.7°	4.5°	4.3°
Gain	14 dBd/16.1 dBi	14.5 dBd/16.6 dBi	16.1 dBd/18.2 dBi	16.5 dBd/18.6 dBi	16.9 dBd/19.0 dBi
Electrical downtilt (X)	0,2,4,6,8,10		0,2,4,6,8,10		
Impedance	50Ω		50Ω		
VSWR	≤1.4:1		≤1.5:1		
Isolation between ports	> 25 dB		> 25 dB		
Input power	500 W		300 W		
Lightning protection	Direct ground				
Connector(s)	4 / EDIN / Female / Bottom				

Mechanical Characteristics				
Dimensions Length x Width x Depth	2095 x 305 x 180 mm		82.5 x 12.0 x 7.1 in	
Weight without mounting brackets	17.2 kg		38.0 lbs	
Survival wind speed	201 km/hr		125 mph	
Wind area	Front: 0.64 m²	Side: 0.38 m²	Front: 6.9 ft²	Side: 4.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 760 N	Side: 462 N	Front: 175 lbf	Side: 104 lbf

Mounting Options	Part Number	For Pipe Diameter		Weight	
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm	1.57-4.5 in	6.9 kg	15.2 lbs

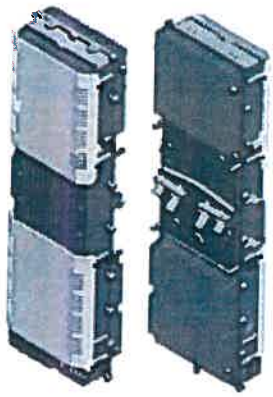
Antenna Bottom View



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
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.

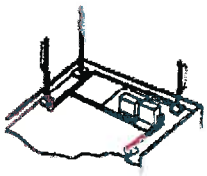
EASY INSTALLATION

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.

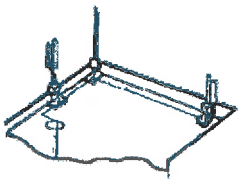
The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 25 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.



Micro

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 : 930x270x146 mm (with solar shield)
- Weight : 25 kg (55 lbs) (with solar shield)

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 (3-6) optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 300m using MM fiber, up to 15km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Four 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

AT THE SPEED OF IDEAS™

Alcatel·Lucent

Alcatel-Lucent Remote Radio Head B25 RRH 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 B25 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 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, LTE carriers from 3MHz up to 20MHz and up to 65MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

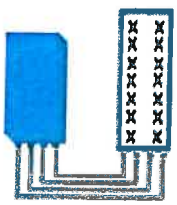
Its compactness and slim design makes the Alcatel-Lucent B25 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 3, 5, 10, 15 or 20MHz LTE carrier with 4Rx Diversity
- Up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- 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 PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diveristy 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

Alcatel·Lucent

Product Data Sheet ATMAP-1A20

AWS/PCS Dual Duplex UltraAmp Tower Mounted Amplifier, AISG 2.0 Compatible and CWA

Product Description

Designed for use in AWS/PCS deployments, the UltraAmp Tower Mounted Amplifier (TMA) improves base station receiver sensitivity and enhances coverage. Use of these TMAs can increase data rates without a reduction in capacity. These TMAs are wideband and cover the entire 60 MHz in the AWS and PCS frequency bands. The unit is extremely lightweight, weighing just 3.8 kg (8.4 lbs) for a twin unit. It is easy to install and meets IP67 requirements for ingress protection. The TMA is made of cast aluminum and has a light grey painted housing to blend with antenna radomes. Its dual-duplex configuration enables the use of a single feeder for both Tx and Rx. It is also AISG 2.0 compatible.

Features/Benefits

- **Two TMAs in a single enclosure – reduces tower loading and installation time**
- **Very Low Noise Figure – overcomes feeder losses and enhances site coverage**
- **AISG 2.0 protocol compatible – enables TMA alarm reporting and supports easy remote tilt connection**
- **Dual-duplex configuration – enables use of a single feeder for both Tx and Rx**
- **Low insertion loss Tx filter – helps maintain good downlink coverage**
- **Lightest weight high performance TMA available – reduces tower loading and facilitates installation**
- **Equipped with breather valves – guards against internal condensation**
- **Auto Bypass Switch – increases the reliability of the system**
- **Dual mode alarm system – flexible for both CWA and AISG**

Technical Specifications

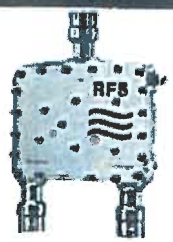
Product Type	Tower Mounted Amplifier
Frequency Band, MHz	1710-2170
Noise Figure, Typical, dB	< 1.05 midband (AWS); < 1.10 midband (PCS)
Gain, dB	12 ± 1
Power Supply Voltage, VDC	10-30
Configuration	Twin, Dual Duplexed, with auto bypass function
Mounting	Wall, pole
Gain Ripple, dB	+/- 0.8 Rx; +/- 0.1 Tx (AWS), +/- 0.15 Tx (PCS)
Uplink Frequency, MHz	1710-1770 (PCS), 1850-1910 (AWS)
Downlink Frequency, MHz	1930-1990 (PCS), 2110-2170 (AWS)
Bandwidth Tx & Rx, MHz	60
Output IP3, Min, dBm	+25
Tx Loss, Max, dB	0.4
Tx Loss, Typical, dB	0.25
Return Loss All Ports, Min, dB	18
Bypass Return Loss, dB	> 14 typical
Bypass Insertion Loss, Max, dB	<0.9
Tx Rejection in Rx Branch, Min, dB	80
Rx Rejection in Tx Branch, Min, dB	60 (AWS), 50 (PCS)
Tx Power Handling, Max, W	250 cw, 5000 peak
IMP Level at the ANT Port, Min, dBm	-117 @ 2 * 43
Antenna Port Power Handling Rx, dBm	17
Voltage Ripple Handling	150 mVp-p amplitude
Impedance, Ohms	50
Insertion Loss, dB	< 0.3 (PCS), < 0.2 (AWS)
Group Delay, ns	< 120 Rx; < 42 Tx (PCS), < 20 Tx (AWS)
Group Delay Variation, ns	< 100 Rx; < 25 Tx (PCS), < 5 Tx (AWS)
Temperature Range, °C (°F)	-40 to +65 (-40 to +149)
Environmental	ETSI 300 019 1-4 Class 4.1E
Ingress Protection	IP67
Lightning Protection	IEC 61000-4-5 10 kA, 8/20 us / IEC 1312-1 50 kA, 10/350 us
Connectors	7-16 Female Long-neck
AISG Connectors	8-pin Circular Multi-pole, IEC 30130-9; IP67, Hex Nut
Weight, kg (lb)	3.8 (8.4)

Product Data Sheet FD9R6004/1C-3L

ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, full DC/AISG pass

Product Description

The ShareLite FD9R6004 Series of diplexers are designed to enable feeder sharing between systems in the 698-960 MHz range and in the 1710-2200 MHz range. The diplexer is equipped with in-line connector placement so it can be installed in the BTS cabinet or at the tower top. This is especially valuable in crowded sites or when the feeders are not easily accessible. Due to its wideband design, the FD9R6004 Series can accommodate many combining solutions between 698-960 MHz and 1710-2200 MHz systems such as LTE 700 MHz, Cellular 800 MHz with PCS, GSM900 with GSM1800, or GSM900 with UMTS. This diplexer features a highly selective filter. It provides a high level of isolation between ports, while keeping the insertion loss on both paths at an extremely low level. The FD9R6004 diplexers are available with various DC pass options, helpful in configurations with or without the Tower Mount Amplifiers installed.



Features/Benefits

- **LTE ready design**
- **Extremely Low Insertion Loss**
- **High level of Rejection between bands – Protection against interferences**
- **Extremely High Power Handling Capability**
- **DC/AISG 1.1/2.0 pass through all ports**
- **Very compact & small size design – Easy installation and reduced tower load**
- **In-line long-neck connectors for easy connection & waterproofing**
- **Exceptional reliability & environmental protection (IP 67)**
- **Equipped with 1 * Breathable Vent – Prevent any humidity inside the product**
- **Mounting hardware for Wall and Pole mount provided (P/N SEM2-1A)**
- **Grounding already provided through the mounting bracket**
- **Kit available for easy dual mount**

Technical Specifications

Product Type	Diplexer/Cross Band Coupler
Application	LTE700, GSM900, UMTS, GSM1800, Cellular 800, PCS
Frequency Range 1, MHz	698-960
Frequency Range 2, MHz	1710-2200
Configuration	Sharelite Single diplexer, outdoor, full DC pass, with mounting hardware SEM2-1A
Mounting	Wall Mounting: With 4 screws (maximum 6mm diameter); Pole Mounting: With included clamp set 40-110mm (1.57-4.33)
Return Loss All Ports Min/Typ, dB	19/23
Power Handling Continuous, Max, W	1250 at common port; 750 in low frequency path & 500 in high frequency path
Power Handling Peak, Max, W	15000 in low frequency path & 8000 in high frequency path
Impedance, Ohms	50
Insertion Loss, Path 1, dB	0.07 typ.
Insertion Loss, Path 2, dB	0.13 typ.
Rejection Between Bands Min/Typ, dB	58/64@698-960MHz; 57/70@1710-2200MHz
IMP Level at the COM Port, Typ, dBm	-112 @ 2x43
DC Pass in Low Frequency Path	Yes
DC Pass in High Frequency Path	Yes
Temperature Range, °C (°F)	-40 to +60 (-40 to +140)
Environmental	ETSI 300-019-2-4 Class 4.1E
Ingress Protection	IP 67
Lightning Protection	EN/IEC61000-4-5 Level 4
Connectors	In-line long-neck 7-16-Female
Weight, kg (lb)	1.2 (2.6)
Shipping Weight, kg (lb)	3.2 (7) for 2 * single units in 1 * box, 9.8 (21.6) for 6 * units = 3 * Boxes in 1 * overwrap
Dimensions, H x W x D, mm (in)	147 x 164 x 37 (5.8 x 6.5 x 1.5)
Shipping Dimensions, H x W x D, mm (in)	254 x 406 x 82 (10 x 16 x 3.2) for 2 * Single Units in 1 * box, 280 x 406 x 241 (11 x 16 x 9.5) for 6 * units = 3 * Boxes in 1 * overwrap
Volume, L	0.43
Housing	Aluminum

Notes

Product Specifications

COMMSCOPE®

on the go

HBX-6516DS-VTM

DualPol® Teletilt® Antenna, 1710–2170 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry to minimize any sector overlap
- Field adjustable electrical tilt
- Rugged, reliable design with excellent passive intermodulation suppression
- Fully compatible with Andrew Teletilt® remote control system

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2170**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	65	65	65
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 | 2
Wind Loading, maximum	256.8 N @ 150 km/h 57.7 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	83.0 mm | 3.3 in
Length	1306.00 mm | 51.42 in
Width	166.00 mm | 6.54 in
Net Weight	4.70 kg | 10.36 lb

Remote Electrical Tilt (RET) Information

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

Model with Factory Installed AISG 2.0 Actuator HBX-6516DS-A1M

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2002/95/EC	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

Date: **August 31, 2015**

Geoff Middlebrooks
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Cary, NC 27518
(919) 466-5149

Vertical Structures, Inc.
309 Spangler Dr, Suite E
Richmond, KY 40475
(859) 624-8360
csandlin@verticalstructures.com

Subject: **Structural Analysis Report**

Carrier Designation:	***Alltel Communications* Change-Out**	
	Carrier Site Number:	301
	Carrier Site Name:	Charlottesville DT
American Tower Designation:	**American Tower Site Number:**	375137
	American Tower Site Name:	Charlottesville 2
Norfolk Southern Designation:	**Norfolk Southern Site Number:**	KLQ98
	Norfolk Southern Site Name:	Charlottesville Downtown
Engineering Firm Designation:	**Vertical Structures, Inc. Project Number:**	2015-002-021
Site Data:	**819 W Main Street, Charlottesville, VA, Albermarle County** **Latitude *38.0323°*, Longitude *-78.4918°*** **225 Foot - Self Support Tower**	

Dear Geoff Middlebrooks,

Vertical Structures, Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with American Tower Purchase Order Number 373182.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC4: Modified Structure w/ Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2012 International Building Code based upon an ultimate 3-second gust wind speed of 115 mph converted to a nominal 3-second gust wind speed of 89 mph per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category B with a topographic category 1 and crest height of 0 feet, and Risk Category II were used in this analysis.

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at *Vertical Structures, Inc.* appreciate the opportunity of providing our continuing professional services to you and American Tower. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Chris Sandlin, P.E.
Project Engineer

JOHN IRVING MATHIS
Lic. No. 016124
PROFESSIONAL ENGINEER
8/31/15

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 225 ft Self Support tower. The original design specifications are unavailable. The tower has been reworked multiple times, most recently in 2014, to accommodate additional loading. However, part of the pre-2010 reinforcement was considered to be ineffective. For the purpose of this analysis, the modifications detailed in Vertical Structures Job No. 2015-002-020 are considered complete.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 89 mph with no ice, 30 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category B with topographic category 1 and crest height of 0 feet.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
183.0	185.0	4	alcatel lucent	RRH2x60-AWS BTS	2	1 5/8	
		4	alcatel lucent	RRH4x30W-B25 BTS			
		8	andrew	HBXX-6517DS-A2M w/ Mount Pipe			
		2	antel	BXA-70063-8CF-DIN-X-FP w/ Mount Pipe			
		4	antel	QXW-636X6312XBF-EDIN w/ Mount Pipe			
		2	raycap	RHSDC-3315-PF-48			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
225.0	230.0	1	decibel	DB589-Y	1	7/8	2
221.0	221.0	1		8' H.P. Dish	1	WE65	2
		1		D8E-21	1	EW63	1
		1		Face Mount			
		1		Face Mount			2
195.0	206.0	1	celwave	PD340-1	1	7/8	2
	195.0	1		3' Sidearm			
183.0	185.0	4	antel	BXA-171063/12CF w/ Mount Pipe			3
		2	antel	BXA-185040/12CF w/ Mount Pipe			
		2	antel	BXA-185063/12CF w/ Mount Pipe			
		2	antel	BXA-70040/8CF w/ Mount Pipe			1
		2	antel	BXA-70063/8CF w/ Mount Pipe			3
		2	antel	BXA-80040/8CF w/ Mount Pipe			
		2	antel	BXA-80063/8CF w/ Mount Pipe			
		4	celwave	ATMAP-1A20 TMA	24	1 5/8	1
		8	celwave	FD9R6004/1C-3L Diplexer			
	183.0	1	pirod	15' T-Frame Sector Mount (3)			
173.0	173.0	3	alcatel lucent	1900 MHz 4X45 RRH	3	1.4	2
		3	alcatel lucent	RRH2X50-08			
		3	alcatel lucent	TD-RRH8X20			
		3	andrew	HBX-6517DS-VTM w/ Mount Pipe	6	1 5/8	4
		1	better metal	12' V-Mount (3)			2
		3	commscope	SBNHH-1D65A w/ Mount Pipe			
		3	commscope	TTTT65AP-1XR w/ Mount Pipe			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment To Be Removed
4) Equipment to be Relocated to Reserved Mounts

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
Unknown						

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks
Proposed Loading	ATC Application dated March 3, 2015
Existing Loading	Vertical Structures 'June 2, 2010' Tower Audit
Existing Loading	Vertical Structures 'January 15, 2014' Site Visit
Tower Information	Vertical Structures 'June 2, 2010' Tower Audit
Foundation Information	Vertical Structures Job No. 2010-999-099
Geotechnical Report	WEI Project No. 2010-1211
Rework Drawings	Vertical Structures Job No. 2010-999-099
Rework Drawings	TEP Job No. 110011.086 Revision 1 Dated "11-21-11"
Post Modification Inspection Report	Vertical Structures Job No. 2012-225-008
Rework Drawings	Vertical Structures Job No. 2014-237-005
Rework Drawings	Vertical Structures Job No. 2015-002-020

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.

This analysis may be affected if any assumptions are not valid or have been made in error. Vertical Structures, Inc. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
T1	225 - 200	Leg	P3x.216	1	-12292.70	29897.10	41.1	Pass
T2	200 - 175	Leg	P3.5x.318	19	-32378.90	58885.30	55.0	Pass
T3	175 - 162.5	Leg	P4x.237	38	-49231.00	60210.50	81.8	Pass
T4	162.5 - 150	Leg	P4x.237	50	-66352.90	88076.70	75.3	Pass
T5	150 - 143.75	Leg	P5x.375	65	-75203.60	136780.00	55.0	Pass
T6	143.75 - 137.5	Leg	P5x.375	74	-83497.60	136780.00	61.0	Pass
T7	137.5 - 131.25	Leg	P5x.375	80	-92142.90	136780.00	67.4	Pass
T8	131.25 - 125	Leg	P5x.375	86	-100275.00	136780.00	73.3	Pass
T9	125 - 112.5	Leg	P5x.375	92	-104864.00	136780.00	76.7	Pass
T10	112.5 - 100	Leg	P5x.375	104	-120519.00	136780.00	88.1	Pass
T11	100 - 87.5	Leg	P5x.375	116	-135903.00	136780.00	99.4	Pass
T12	87.5 - 75	Leg	P5x.375	128	-150827.00	173273.00	87.0	Pass
T13	75 - 50	Leg	P6x.375	152	-182234.00	183213.00	99.5	Pass
T14	50 - 37.5	Leg	P6x.375	173	-196511.00	218659.00	89.9	Pass
T15	37.5 - 25	Leg	P6x.375	197	-211701.00	215687.00	98.2	Pass
T16	25 - 12.5	Leg	P8x.5	221	-228244.00	349675.00	65.3	Pass
T17	12.5 - 0	Leg	P8x.5	233	-243055.00	349674.00	69.5	Pass
T1	225 - 200	Diagonal	P2x.154	8	-4170.09	11227.50	37.1	Pass
T2	200 - 175	Diagonal	P2x.154	27	-7527.38	7583.86	99.3	Pass
T3	175 - 162.5	Diagonal	2L3x2 1/2x1/4x3/8	45	-10446.20	14944.60	69.9	Pass
T4	162.5 - 150	Diagonal	2L3x2 1/2x1/4x3/8	57	-10845.20	12589.30	86.1	Pass
T5	150 - 143.75	Diagonal	2L3x3x1/4x3/8	72	-11512.50	18666.30	61.7	Pass
T6	143.75 - 137.5	Diagonal	2L3x3x1/4x3/8	77	-11585.20	16194.50	71.5	Pass
T7	137.5 - 131.25	Diagonal	2L3x3x1/4x3/8	84	-11982.60	14995.20	79.9	Pass
T8	131.25 - 125	Diagonal	2L3x3x1/4x3/8	89	-11987.10	13918.00	86.1	Pass
T9	125 - 112.5	Diagonal	P2.5x.203	98	-10238.40	11094.50	92.3	Pass
T10	112.5 - 100	Diagonal	2L3x3x1/4x3/8	110	-10276.70	17171.70	59.8	Pass
T11	100 - 87.5	Diagonal	2L3x3x1/4x3/8	122	-10547.60	15353.40	68.7	Pass
T12	87.5 - 75	Diagonal	2L3x3x1/4x3/8	138	-10973.10	14588.90	75.2	Pass
T13	75 - 50	Diagonal	P3x.216	159	-11155.40	17130.10	65.1	Pass
T14	50 - 37.5	Diagonal	P3x.216	186	-11741.30	16304.70	72.0	Pass
T15	37.5 - 25	Diagonal	P3x.216	210	-11916.40	15463.90	77.1	Pass
T16	25 - 12.5	Diagonal	P3x.216	228	-11435.60	14863.20	76.9	Pass
T17	12.5 - 0	Diagonal	P3x.216	240	-11989.60	14141.30	84.8	Pass
T4	162.5 - 150	Horizontal	L3x3x1/4	59	-1150.77	5206.67	22.1	Pass
T9	125 - 112.5	Horizontal	2L2 1/2x3 1/2x1/4x3/8	100	-11251.60	18307.10	61.5	Pass
T10	112.5 - 100	Horizontal	L2 1/2x3 1/2x1/4	109	-6003.09	9561.36	62.8	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
T11	100 - 87.5	Horizontal	L2 1/2x3 1/2x1/4	121	-6390.68	8249.00	77.5	Pass
T12	87.5 - 75	Horizontal	L3x4x1/4	137	-6834.44	12084.80	56.6	Pass
T13	75 - 50	Horizontal	L3x4x1/4	157	-7512.39	9495.28	79.1	Pass
T14	50 - 37.5	Horizontal	L3 1/2x5x1/4	182	-7901.85	14442.90	54.7	Pass
T15	37.5 - 25	Horizontal	L3 1/2x5x1/4	206	-8156.24	12962.50	62.9	Pass
T16	25 - 12.5	Horizontal	L3 1/2x5x5/16	226	-8222.65	14387.30	57.2	Pass
T17	12.5 - 0	Horizontal	L4x6x3/8	238	-8738.04	24425.90	35.8	Pass
T1	225 - 200	Top Girt	L2 1/2x2 1/2x3/16	5	-733.52	11955.30	6.1 6.3 (b)	Pass
T2	200 - 175	Top Girt	L2 1/2x2 1/2x3/16	23	-357.82	5506.96	6.5	Pass
T3	175 - 162.5	Top Girt	L3 1/2x3 1/2x1/4	40	-1087.58	11686.70	9.3	Pass
T5	150 - 143.75	Top Girt	L4x4x1/4	67	-374.23	11432.50	3.3	Pass
T12	87.5 - 75	Redund Horz 1 Bracing	L2 1/2x2 1/2x3/16	135	-2615.82	14731.80	17.8	Pass
T14	50 - 37.5	Redund Horz 1 Bracing	L2x2x1/4	180	-3408.12	7120.20	47.9	Pass
T15	37.5 - 25	Redund Horz 1 Bracing	L2 1/2x2 1/2x3/16	208	-3671.57	9823.44	37.4	Pass
T12	87.5 - 75	Redund Diag 1 Bracing	L2 1/2x2 1/2x3/16	136	-2059.08	6361.30	32.4	Pass
T14	50 - 37.5	Redund Diag 1 Bracing	L2x2x1/4	181	-2421.12	3546.95	68.3	Pass
T15	37.5 - 25	Redund Diag 1 Bracing	L2 1/2x2 1/2x3/16	205	-2537.90	5165.70	49.1	Pass
							Summary	
						Leg (T13)	99.5	Pass
						Diagonal (T2)	99.3	Pass
						Horizontal (T13)	79.1	Pass
						Top Girt (T3)	9.3	Pass
						Redund Horz 1 Bracing (T14)	47.9	Pass
						Redund Diag 1 Bracing (T14)	68.3	Pass
						Bolt Checks	66.6	Pass
						Rating =	99.5	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC4

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	64.7	Pass
1, 3	Base Foundation Soil Interaction	0	105.1	Acceptable
1	Redundant Member End Connections	87.5 - 25	39.0	Pass

Structure Rating (max from all components) =	105.1%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity.
2) Tower steel capacities up to 105% are considered acceptable based on analysis methods used.
3) Soil capacities up to 110% are considered acceptable based on analysis methods used.

4.1) Recommendations

Perform the modifications detailed in Vertical Structures Job No. 2015-002-020.


* The sixtenn (16) Verizon antennas are mounted in four (4) sectors in this array at the 185' mounting level.

Existing Condition

Proposed Condition

verizonwireless

CLARK • NEXSEN
Architecture & Engineering

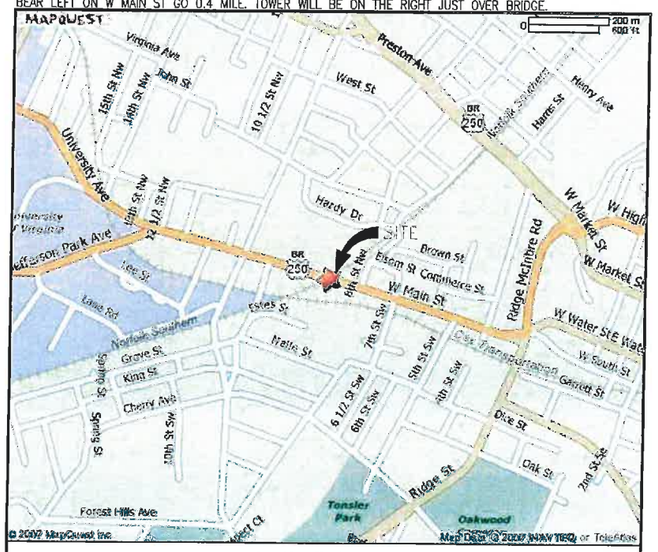
Downtown Charlottesville
Comm. # 3036.070.AWS

verizon wireless

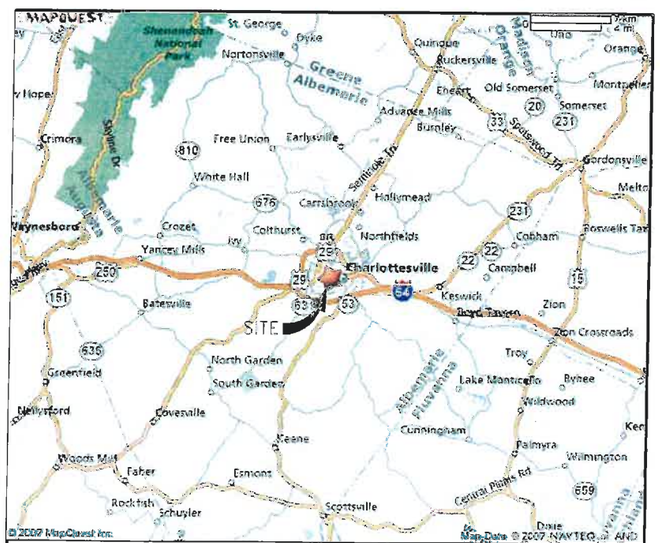
DIRECTIONS TO SITE:

FROM RICHMOND:

TAKE I-95 N TO I-64W MERGE ONTO I-64 W TOWARDS CHARLOTTESVILLE TAKE EXIT 121 TOWARDS CHARLOTTESVILLE/SCOTTSVILLE. TURN RIGHT ON VA-20 N. GO ±1 MILE CONTINUE ON MONTICELLO AVE. GO 0.3 MILE, TURN RIGHT ON 2ND ST. SE GO 0.2 MILES AND TURN LEFT ON WATER ST. GO 0.2 MILES AND BEAR LEFT ON W MAIN ST GO 0.4 MILE. TOWER WILL BE ON THE RIGHT JUST OVER BRIDGE.



LOCAL MAP SCALE: 1" = 2,000'



VICINITY MAP NOT TO SCALE

N

N

DOWNTOWN CHARLOTTESVILLE

WEST MAIN STREET
CHARLOTTESVILLE, VA 22911

PROJECT DESCRIPTION:

COLLOCATION OF ANTENNAS AND ASSOCIATED EQUIPMENT ON AN EXISTING SELF SUPPORT TOWER

RECEIVED
APR 21 2016
NEIGHBORHOOD DEVELOPMENT SERVICES

2 WORKING DAYS BEFORE YOU DIG 1-800-552-7001 TOLL FREE MISS UTILITY

APPROVAL

A/E PROJECT MANAGER	SIGNATURE	PHONE NUMBER	DATE
CONSTRUCTION MANAGER	SIGNATURE	PHONE NUMBER	DATE
RF ENGINEERING	SIGNATURE	PHONE NUMBER	DATE
SITE ACQUISITION	SIGNATURE	PHONE NUMBER	DATE

REV. NO.	DESCRIPTION	BY	DATE
1	REVIEW SET	SPP	5/14/12
2	APPLICATION DRAWINGS	SPP	9/18/13

REV. NO.	DESCRIPTION	BY	DATE

CONSULTING TEAM

ARCHITECTURE AND ENGINEERING:
CLARK NEXSEN
5510 CHEROKEE AVE, SUITE 110
ALEXANDRIA, VA 22312
PROJECT MANAGER: JUSTIN Y. YOON, PE
TELEPHONE: (703) 256-3344
FAX NUMBER: (703) 256-6622

SURVEY:
CAUSEWAY CONSULTANTS, P.C.
1005 S. BATTLEFIELD BLVD.
CHESAPEAKE, VA 23322
CONTACT: EDDIE R. WHITE
TELEPHONE: (757) 482-0474
FAX NUMBER: (757) 482-9870

SOIL ENGINEER:
NONE

STRUCTURAL ENGINEERING:
CLARK NEXSEN
6160 KEMPSVILLE CIR, SUITE-200A
NORFOLK, VA 23502
CONTACT: WILLIAM R MELGAARD, PE
TELEPHONE: (757) 455-5800
FAX NUMBER: (757) 455-5638

UTILITIES:
POWER COMPANY:
DOMINION VIRGINIA POWER
CONTACT: CUSTOMER SERVICE
TELEPHONE: 1-888-667-3000

TELEPHONE COMPANY:
VERIZON:
CONTACT: CUSTOMER SERVICE
TELEPHONE: 1-800-826-2355

PROJECT SUMMARY

SITE INFORMATION:
DOWNTOWN CHARLOTTESVILLE
WEST MAIN STREET.
CHARLOTTESVILLE, VA 22911

PROPERTY OWNER:
NORFOLK SOUTHERN RAILWAY COMPANY

TOWER INFORMATION:
NORFOLK SOUTHERN RAILROAD COMPANY
CONTACT: JIM LOVE
TELEPHONE: 1-434-531-8282

APPLICANT INFORMATION:
VERIZON WIRELESS
1831 RADY COURT
RICHMOND, VA 23222
CONTACT: VINCENT CRUTE
TELEPHONE: (804) 543-7580
FAX NUMBER: (804) 321-0398

PROJECT DATA:	
ZONING	WEST MAIN NORTH CORRIDOR
JURISDICTION	CITY OF CHARLOTTESVILLE
TAX MAP/PARCEL	TAX MAP 32, PARCEL 144.2
PARCEL ID #	320144200
SITE TYPE	COLLOCATION
TOWER TYPE	SELF SUPPORT TOWER
TOWER HEIGHT	225'
ACREAGE	N/A
LEASE AREA	707 SF

GEOGRAPHIC COORDINATES:
LATITUDE: 38° 01' 56.54" N
LONGITUDE: 78° 29' 30.29" W
GROUND ELEV (AMSL): 496.50'

ADA COMPLIANCE:
FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION.
SITE WILL NOT BE SERVED BY CITY SEWER OR WATER.

SHEET INDEX

SHEET:	DESCRIPTION:
G-1	COVER SHEET
C-1	ELEVATION VIEW

SHEET TOTAL: 2

CLARK NEXSEN
Architecture & Engineering
5510 CHEROKEE AVENUE SUITE 110
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703-256-3344 FAX 703-256-6622
WWW.CLARKNEXSEN.COM

verizon wireless
1831 RADY COURT
RICHMOND, VA 23222

COMMONWEALTH OF VIRGINIA
JUSTIN Y. YOON
Lic. No. 42897
9/18/13
PROFESSIONAL ENGINEER

SITE INFO.:
DOWNTOWN CHARLOTTESVILLE

COLLOCATE SELF SUPPORT TOWER
WEST MAIN STREET
CHARLOTTESVILLE, VA 22911
ALBEMARLE COUNTY

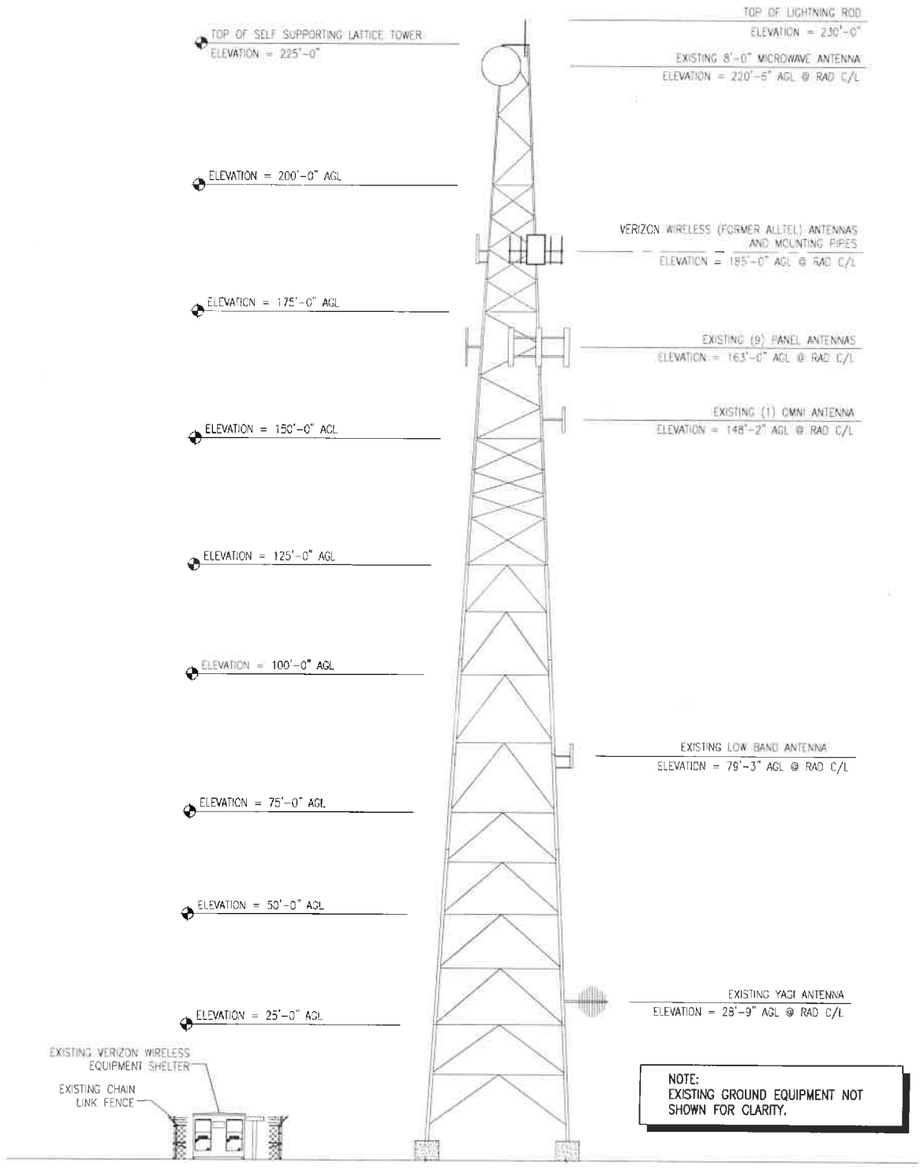
DESIGN:	SPP
DRAWN:	MSA
REVIEW:	SPP
TTV DATE:	07/19/07
COMM. NO.	3036.070

SUBMITTALS

SYM.	DESCRIPTION	DATE
1	REVIEW SET	05/14/12
2	APPLICATION DWGS	9/18/13

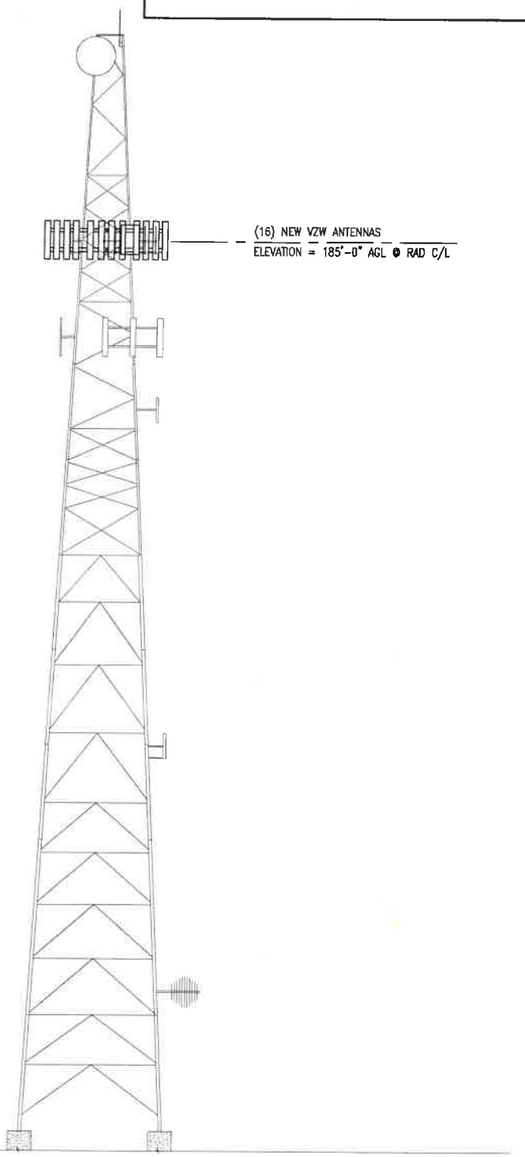
SHEET NAME:
COVER SHEET

SHEET NO.:
G-1



NOTE:
EXISTING GROUND EQUIPMENT NOT SHOWN FOR CLARITY.

EXISTING



PROPOSED

SITE NOTES

1. NO SIGNS SHALL BE PERMITTED EXCEPT AS MAY BE REQUIRED FOR PUBLIC SAFETY PURPOSES, OR AS REQUIRED BY THE FAA OR FCC.
2. NO MATERIALS OR MARKINGS CONTAINING ANY ADVERTISING OR ADVERTISEMENT SHALL BE PERMITTED.
3. ALL STRUCTURES AND APPURTENANCES SHALL BE GALVANIZED FINISH OR PAINTED GRAY ABOVE THE SURROUNDING TREELINE.

ELEVATION VIEW

NO SCALE

CLARK • NEXSEN
Architecture & Engineering
5510 CHEROKEE AVENUE SUITE 110
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verizon wireless
1831 RADY COURT
RICHMOND, VA 23222

COMMONWEALTH OF VIRGINIA
JUSTIN Y. YOON
Lic. No. 42897
9/18/13
PROFESSIONAL ENGINEER

SITE INFO.:
DOWNTOWN CHARLOTTESVILLE

COLLOCATE SELF SUPPORT TOWER

WEST MAIN STREET
CHARLOTTESVILLE, VA
22911
ALBEMARLE COUNTY

DESIGN:	SPP
DRAWN:	MSA
REVIEW:	SPP
TTV DATE:	07/19/07
COMM. NO.	3036.070

SUBMITTALS

SYM.	DESCRIPTION	DATE
1	REVIEW SET	05/14/12
2	APPLICATION DWGS	9/18/13

SHEET NAME:
ELEVATION VIEW

SHEET NO.:
C-1