

STATE OF CONNECTICUT  
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP	:	SUB-PETITION NO. 1133
D/B/A VERIZON WIRELESS FOR A	:	1102 HORSE HILL ROAD
DECLARATORY RULING FOR	:	WESTBROOK, CT
APPROVAL OF AN ELIGIBLE FACILITY	:	
REQUEST FOR MODIFICATIONS TO AN	:	
EXISTING TELECOMMUNICATIONS	:	
TOWER AT 1102 HORSE HILL ROAD,	:	
WESTBROOK, CONNECTICUT	:	JUNE 7, 2017

SUB-PETITION FOR DECLARATORY RULING:  
ELIGIBLE FACILITIES REQUEST FOR MODIFICATIONS  
THAT WILL NOT SUBSTANTIALLY CHANGE THE  
PHYSICAL DIMENSIONS OF AN EXISTING TOWER

I. Introduction

Pursuant to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, codified at 47 U.S.C. § 1455(a) (“Section 6409(a)”) and the October 21, 2014 Report and Order (FCC-14-153) issued by the Federal Communications Commission (“FCC”) (the “FCC Order”), Cellco Partnership d/b/a Verizon Wireless (“Cellco”) hereby petitions the Connecticut Siting Council (the “Council”) for a declaratory ruling (“Sub-Petition”) that the proposed modifications to an existing Crown Castle (“Crown”) tower at 1102 Horse Hill Road in Westbrook, Connecticut constitutes an Eligible Facilities Request (“EFR”) under the FCC Order. Cellco has designated this site as its “Westbrook North Facility”.

II. Factual Background

Crown maintains a 159-foot monopole tower on a 58-acre parcel at 1102 Horse Hill Road in Westbrook, Connecticut (the “Property”). See Attachment 1 – Site Vicinity Map and Site Schematic (Aerial Photograph). AT&T maintains antennas at the top of the tower. Equipment

associated with the AT&T antennas is located near the base of the tower within a fenced facility compound.

### III. Proposed Westbrook North Facility

Cellco intends to install twelve (12) antennas and nine (9) remote radio heads (“RRHs”) on an antenna platform at a height of 147 feet above ground level (“AGL”) on the Crown tower. Cellco will also install a 9’-4” x 16’ steel platform with a canopy to support its equipment cabinets, battery back-up system and a 20 kW diesel-fueled back-up generator. Power and telephone service to Cellco’s equipment will extend from the existing utility backboard at the tower site. Project Plans for the Westbrook North Facility are included in Attachment 2. Specifications for Cellco’s antennas, RRHs and generator are included in Attachment 3. A Structural Analysis Report confirming that the tower can accommodate Cellco’s proposed modifications is included in Attachment 4.

### IV. Discussion

#### A. The Proposed Modification Will Not Cause a Substantial Change to the Physical Dimensions of the Existing Tower or Base Station

Section 6409(a) provides, in relevant part, that “a State or 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.” Pursuant to the FCC Order, the proposed modification does not substantially change the physical dimensions of the tower or base station if the following criteria are satisfied.

1. *The proposed modified facility will not increase the height of the tower by more than ten (10) percent or by the height of one additional antenna array with separation from the nearest existing antenna not to exceed twenty (20) feet, whichever is greater.* Cellco proposes to install its antennas and RRHs at 147 feet AGL on the existing 159-foot tower.

2. *The proposed facility will not protrude from the edge of the structure more than six (6) feet. The proposed antennas and RRHs will not protrude more than six (6) feet from the face of the tower.*

3. *The proposed facility does not involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets. Cellco intends to install only two (2) equipment cabinets to house its radio equipment.*

4. *The proposed facility does not entail any excavation or deployment outside the current site of the base station. All of Cellco's site improvements will remain within the limits of the existing facility compound.*

5. *The proposed facility does not defeat the existing concealment elements of the base station. None of the existing antennas on the Crown tower are currently concealed in any fashion. Likewise, Cellco's antennas and related equipment will not be concealed.*

6. *The proposed facility complies with conditions associated with the prior approval of construction or modification of the base station. The Crown tower was approved for AT&T in Council Docket No. 289. Cellco's proposed shared use of this tower is consistent with the conditions of the Council's approval in that proceeding.*

B. FCC Compliance

Operation of Cellco's Westbrook North Facility will not increase the radio frequency ("RF") emissions at the Crown tower site to a level at or above the FCC Safety standard. A cumulative General Power Density table, including Cellco's proposed modifications is included in Attachment 5.

C. Notice to the Town, Property Owner and Abutting Landowners

On June 7, 2017, a copy of this Sub-Petition was sent to Westbrook's First Selectman

Noel Bishop; Meg Parulis, Westbrook's Town Planner; Norwich RC Diocesan Corp., the owners of the Property; and Crown, the tower owner. Copies of the letters sent to Mr. Bishop, Ms. Parulis, Norwich RC Diocesan Corp. and Crown are included in Attachment 6. A copy of this Sub-Petition was also sent to each owner of land that abuts the Property. A sample abutter's cover letter and the list of those abutting landowners who were sent notice and a copy of the Sub-Petition is included in Attachment 7.

V. Conclusion

Based on the information provided above, Cellco respectfully submits that the proposed modification of the existing base station at the Property constitutes an "eligible facilities request" under Section 6409(a) and the FCC Order.

Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON  
WIRELESS

By  \_\_\_\_\_

Kenneth C. Baldwin, Esq.  
Robinson & Cole LLP  
280 Trumbull Street  
Hartford, CT 06103-3597  
(860) 275-8200  
Its Attorneys

# **ATTACHMENT 1**



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Legend**
- X Proposed Verizon Wireless Collocation Facility
  - Surrounding Verizon Wireless Facilities
  - Municipal Boundary
  - ~ Watercourse (CTDEEP)
  - █ Waterbody (CTDEEP)

Base Map Source: CT 2016 Aerial Imagery (CTECO)  
 Map Scale: 1 inch = 5,000 feet  
 Map Date: April 2017



**Site Vicinity Map**

Proposed Wireless Telecommunications Facility  
 Westbrook North CT  
 Crown Castle #857011  
 1102 Horse Hill Road  
 Westbrook, Connecticut





**Legend**

- Existing Fenced Tower Compound
- Proposed Verizon Wireless 26'x12' Lease Area
- Existing Access
- Approximate Subject Property
- Approximate Parcel Boundary (CTDEEP GIS)

**Site Schematic**

Proposed Wireless Telecommunications Facility  
 Westbrook North CT  
 Crown Castle #857011  
 1102 Horse Hill Road  
 Westbrook, Connecticut



**Map Notes:**  
 Base Map Source: CT 2016 Aerial Imagery (CTECO)  
 Map Scale: 1 inch = 450 feet  
 Map Date: April 2017



# **ATTACHMENT 2**





# WIRELESS COMMUNICATIONS FACILITY

SITE NAME: WESTBROOK NORTH CT

CROWN CASTLE #857011  
1102 HORSE HILL RD.  
WESTBROOK, CT 06498

MONOPOLE CO-LOCATION

**verizon**  
WIRELESS COMMUNICATIONS FACILITY  
99 EAST RIVER DRIVE  
EAST HARTFORD, CT 06108

**On Air Engineering, LLC**  
88 Foundry Pond Rd.  
Cold Spring, NY 10516  
onair@optonline.net  
201-456-4624

LICENSURE

DAVID WEINPAHL, P.E.  
CT LIC. NO. 22144

NO.	DATE	SUBMISSIONS
0	04.28.17	REVIEW
1	05.28.17	REVISED PER ATTORNEY COMMENTS

DRAWN BY:	CHECKED BY:
AS	DW

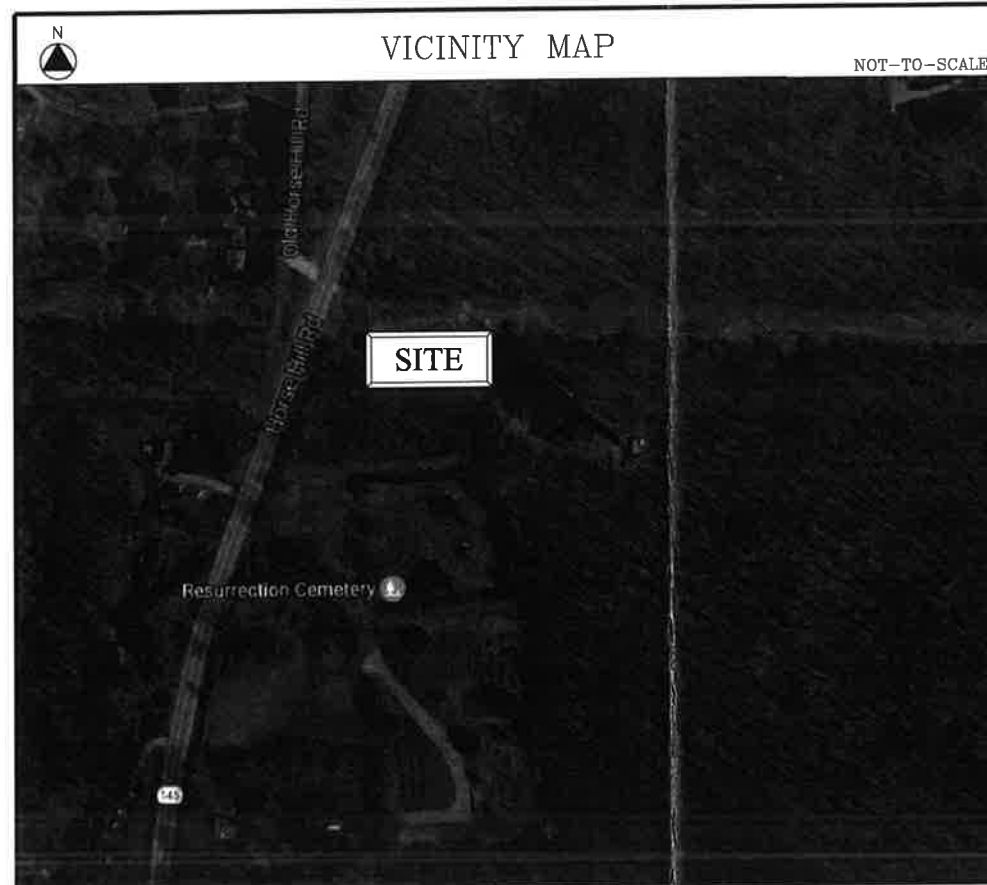
SITE NAME:  
**WESTBROOK NORTH CT**

PROJECT DESCRIPTION:  
**NEW BUILD MACRO**

PROJECT INFORMATION:  
**CROWN CASTLE #857011  
1102 HORSE HILL RD.  
WESTBROOK, CT 06498**

DRAWING TITLE:  
**TITLE SHEET**

SHEET NUMBER:  
**T-1**



PROJECT SUMMARY	
SITE NAME:	WESTBROOK NORTH CT
SITE ADDRESS:	1102 HORSE HILL RD. WESTBROOK, CT 06498
PROPERTY OWNER & MAILING ADDRESS:	NORWICH RC DIOCESAN CORP. RESURRECTION CEMETARY 815 BOSWELL AVE, NORWICH, CT 06360
TOWER OWNER:	CROWN CASTLE # 857011
TOWER COORDINATES:	41° 19' 25.68" N 72° 29' 28.26" W
APPLICANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DR., 9TH FL. EAST HARTFORD, CT 06108
VERIZON WIRELESS CONTACTS:	MIKE HUMPHREYS - CONSTR. (860) 560-6410 STEVE SCHADLER - SAC (508) 887-0357
LEGAL/REGULATORY COUNSEL:	KENNETH C. BALDWIN, ESQ. ROBINSON & COLE, LLP (860) 275-8345

DRAWING SCHEDULE	
SHEET NO.	SHEET DESCRIPTION
T-1	TITLE SHEET
C-1	COMPOUND PLAN, SOUTH ELEVATION & ANTENNA PLAN
C-2	2,500 FT. RADIUS MAP, ABUTTERS MAP & PROPERTY OWNER LIST

PROJECT DESCRIPTION
<ul style="list-style-type: none"> <li>- INSTALLATION OF OUTDOOR CABINETS AND A DIESEL FUELED BACK-UP EMERGENCY GENERATOR ON A 16'-0"x9'-4" EQUIPMENT PLATFORM WITHIN THE EXISTING FENCED COMPOUND AT GRADE</li> <li>- INSTALLATION OF (12) PANEL ANTENNAS AND ASSOCIATED DEVICES ON AN EXISTING MONOPOLE</li> <li>- INSTALLATION OF CABLING FROM EQUIP. CABINETS TO ANTENNAS</li> <li>- ELECTRICAL &amp; TELEPHONE CONNECTIONS TO EXISTING UTILITY DEMARCATION POINTS</li> </ul>

NO.	DATE	SUBMISSIONS
0	04.28.17	REVIEW
1	05.28.17	REVISED PER ATTORNEY COMMENTS

DRAWN BY:	CHECKED BY:
AS	DW

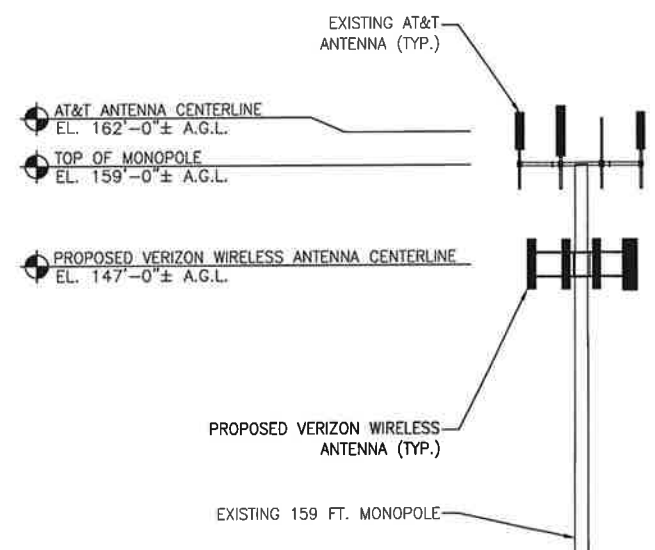
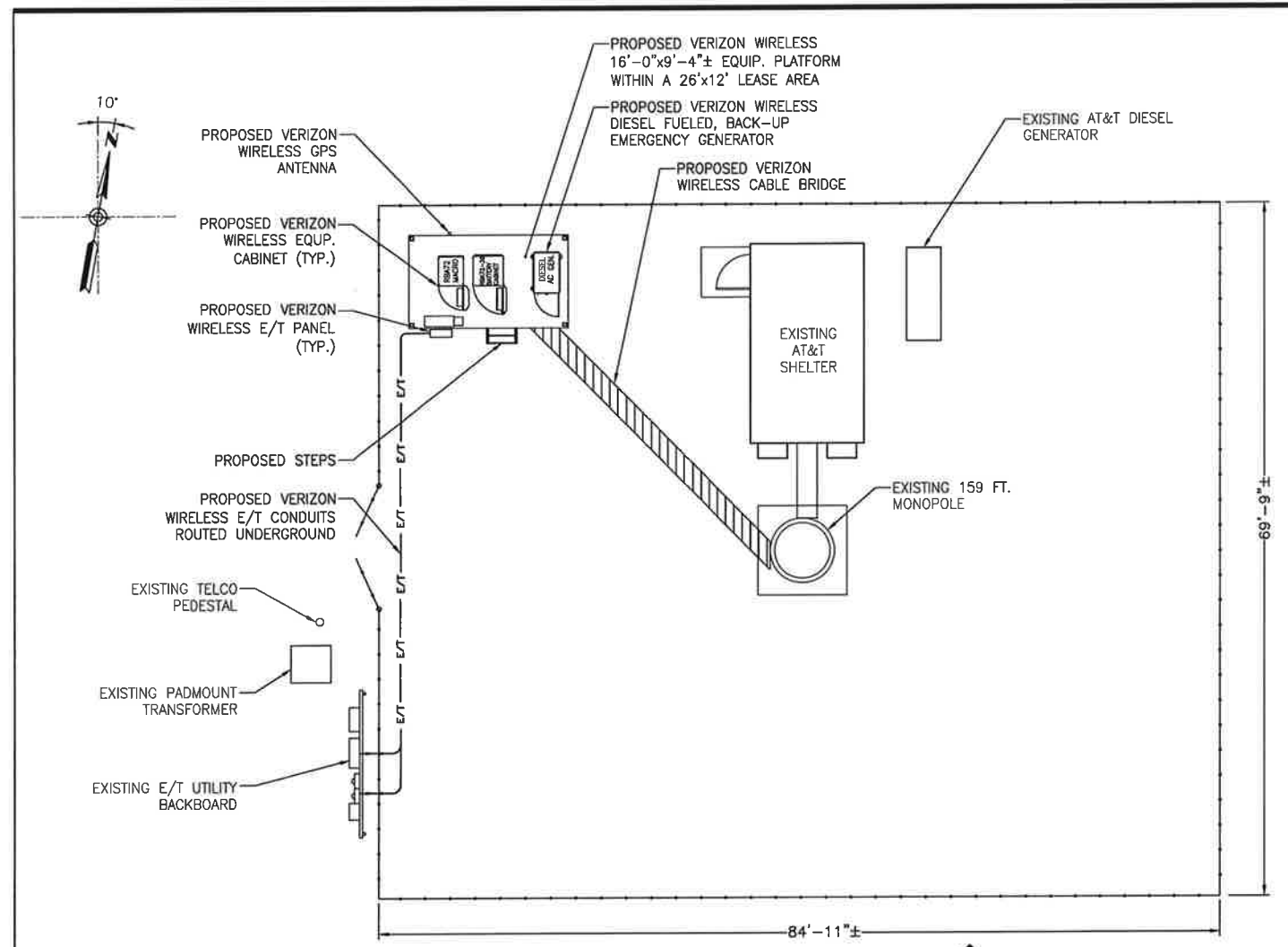
SITE NAME:  
**WESTBROOK NORTH CT**

PROJECT DESCRIPTION:  
**NEW BUILD MACRO**

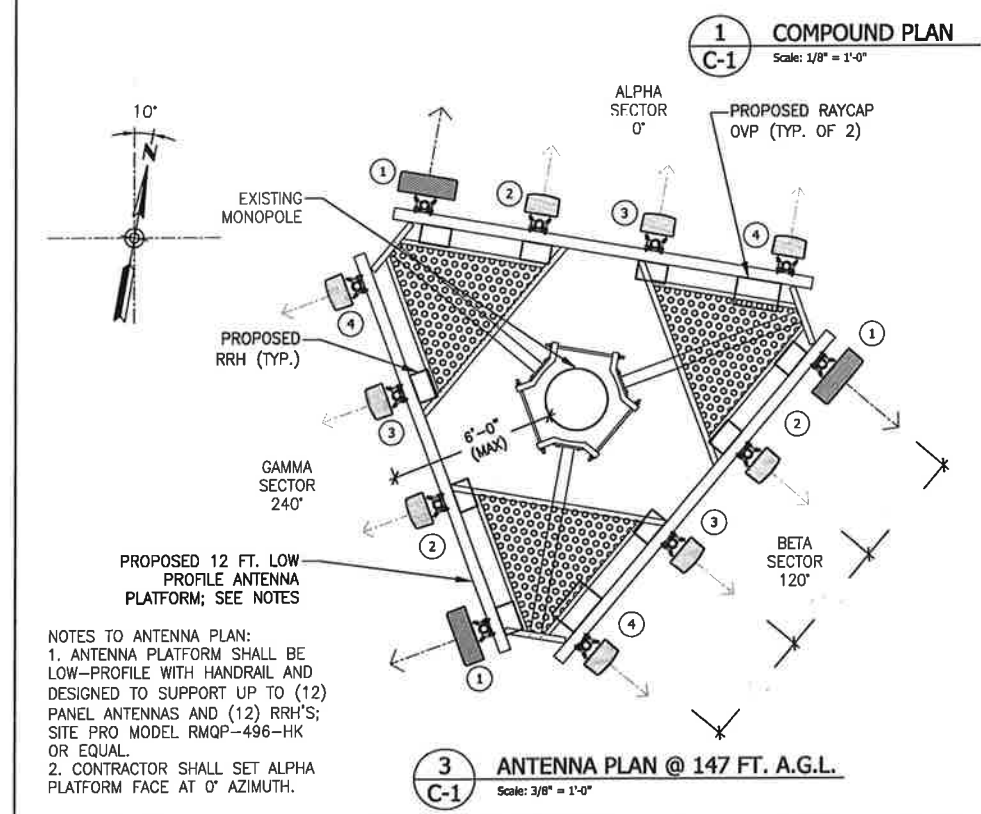
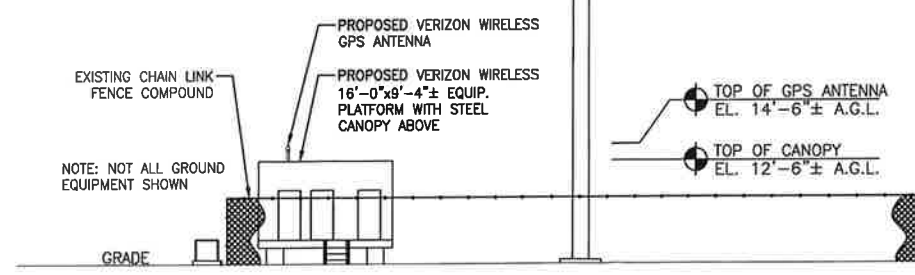
PROJECT INFORMATION:  
**CROWN CASTLE #857011  
1102 HORSE HILL RD.  
WESTBROOK, CT 06498**

DRAWING TITLE:  
**COMPOUND PLAN,  
SOUTH ELEVATION  
& ANTENNA PLAN**

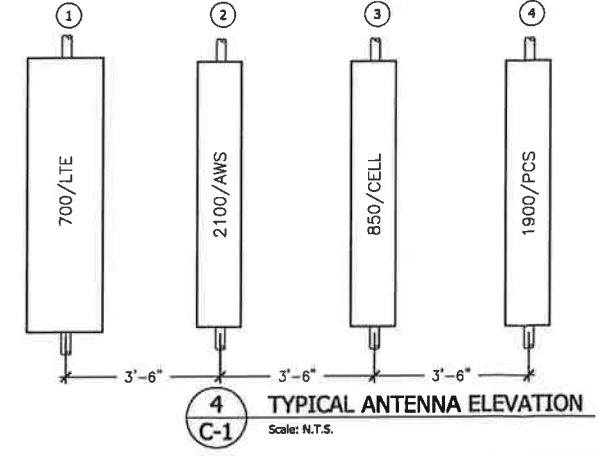
SHEET NUMBER:  
**C-1**



**TOWER NOTES:**  
1. EXISTING 159 FT. TALL MONOPOLE TOWER.  
2. REFER TO STRUCTURAL ANALYSIS REPORT BY CROWN CASTLE DATED 9/29/16.



ANTENNA SPECIFICATIONS (TYP. AT 3 SECTORS)				
POS.	FREQUENCY BAND	MODEL #	SIZE	ACCESSORY EQUIPMENT
1	700-LTE	QUAD656C0000X	74.4"Hx20.5"Wx7.2"D; 54.7 LBS.	ALU RH_2x60-700U
2	2100-AWS	SBNHH-1D65B	72.0"Hx11.9Wx7.1"D; 40.6 LBS.	ALU RH_4x45-AWS
3	850-CELL	SBNHH-1D65B	72.0"Hx11.9Wx7.1"D; 40.6 LBS.	---
4	1900-PCS	SBNHH-1D65B	72.0"Hx11.9Wx7.1"D; 40.6 LBS.	ALU RH_2x60-PCS



2 **SOUTH ELEVATION**  
Scale: 3/32" = 1'-0"



WIRELESS COMMUNICATIONS FACILITY

99 EAST RIVER DRIVE  
EAST HARTFORD, CT 06108



88 Foundry Pond Rd.  
Cold Spring, NY 10516  
onair@optonline.net  
201-456-4624

LICENSURE

DAVID WEINPAHL, P.E.  
CT LIC. NO. 22144

NO. DATE SUBMISSIONS

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AS	DW

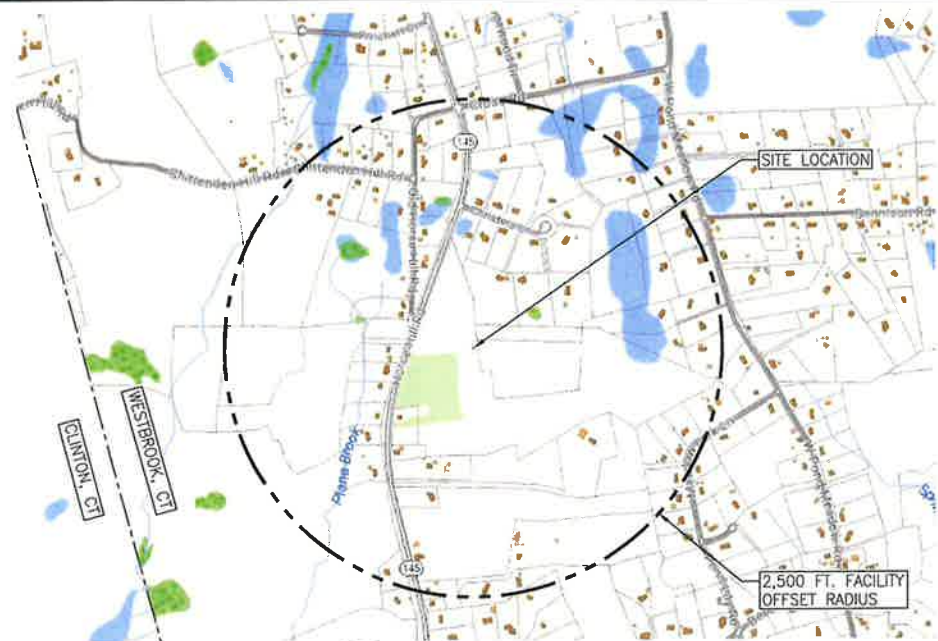
SITE NAME:  
**WESTBROOK NORTH CT**

PROJECT DESCRIPTION:  
**NEW BUILD MACRO**

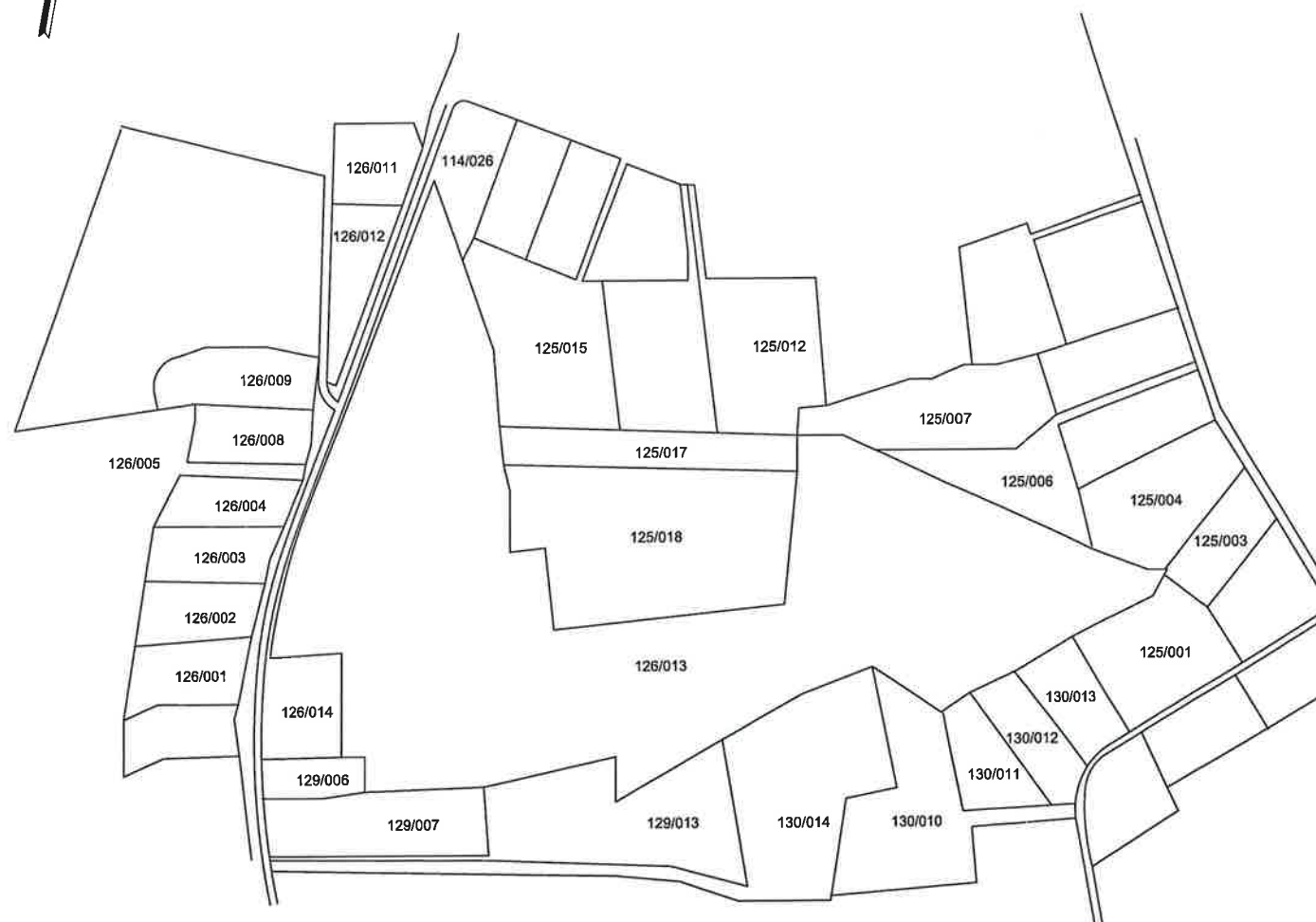
PROJECT INFORMATION:  
**CROWN CASTLE #857011  
1102 HORSE HILL RD.  
WESTBROOK, CT 06498**

DRAWING TITLE:  
**2,500 FT. RADIUS MAP,  
ABUTTERS MAP &  
PROPERTY OWNER LIST**

SHEET NUMBER:  
**C-2**



**2** 2,500 FT. RADIUS MAP  
Scale: N.T.S.



**1** ABUTTERS MAP  
Scale: 1"=300'

**ABUTTERS LIST FROM PARCEL 126/013**

MBLU	OWNER NAME	OWNER MAILING ADDRESS	PROPERTY ADDRESS
114/026	HOLLIS ROBERT SCOTT & AMY MARIE	7 CHRISTINA LANE, WESTBROOK, CT 06498	7 CHRISTINA LN
125/015	BECKER DONALD A & DAVID W	49 CHRISTINA LANE, WESTBROOK, CT 06498	49 CHRISTINA LN
125/017	CONN LIGHT & POWER CO THE	PO BOX 270, HARTFORD, CT 06141	W POND MEADOW RD
125/018	NORWICH R C DIOCESAN CORP	815 BOSWELL AVE, NORWICH, CT 06360	HORSE HILL RD
125/012	HANSEN NEIL ERIC	69 CHRISTINA LANE, WESTBROOK, CT 06498	69 CHRISTINA LN
125/007	BROMSON MICHAEL W TTEE	675 W POND MEADOW RD, WESTBROOK, CT 06498	675 W POND MEADOW RD
125/006	RILEY ROBERT T & MCGEE MURIEL P	667 W POND MEADOW RD, WESTBROOK, CT 06498	667 W POND MEADOW RD
125/004	TRENT LARAMIE	639 W POND MEADOW RD, WESTBROOK, CT 06498	639 W POND MEADOW RD
125/003	BULLENKAMP PETER I & LOLA M	623 W POND MEADOW RD, WESTBROOK, CT 06498	623 W POND MEADOW RD
125/001	RAND JOSEPH W III & DONNA J	76 MEADOWLARK LN, WESTBROOK, CT 06498	76 MEADOWLARK LN
130/013	SELVAGGIO JOSEPH & KATHERINE A	98 MEADOWLARK LN, WESTBROOK, CT 06498	98 MEADOWLARK LN
130/012	BRALEY PATRICK J & ROBERT & CHERIE A. ST ARNAULD	PO BOX 246, CENTERBROOK, CT 06409	114 MEADOWLARK LN
130/011	MORRIS TERENCE M & KAREN C	120 MEADOWLARK LN, WESTBROOK, CT 06498	120 MEADOWLARK LN
130/010	TAYLOR JOHN E TTEE	122 MEADOWLARK LN, WESTBROOK, CT 06498	122 MEADOWLARK LN
130/014	BROWN KEVIN & PATRICIA	122 MEADOWLARK LN, WESTBROOK, CT 06498	1000 HORSE HILL RD
129/013	CANOVA MATTHEW & WININGER ALBERTA H &	PO BOX 950, ESSEX, CT 06426	HORSE HILL RD
129/007	WOYNAR MARY LOU & MICHAEL	1050 HORSE HILL RD, WESTBROOK, CT 06498	1050 HORSE HILL RD
129/006	MCKAY MOIRA	1072 HORSE HILL RD, WESTBROOK, CT 06498	1072 HORSE HILL RD
126/014	CASULA JEFFREY T	1080 HORSE HILL RD, WESTBROOK, CT 06498	1080 HORSE HILL RD
126/001	LEMELIN ADELARD & MACCULLOCH HEATHER	974 ESSEX RD, WESTBROOK, CT 06498	1109 HORSE HILL RD
126/002	KURJAN MICHAEL S	1115 HORSE HILL RD, WESTBROOK, CT 06498	1115 HORSE HILL RD
126/003	BERG TERRY H	1129 HORSE HILL RD, WESTBROOK, CT 06498	1129 HORSE HILL RD
126/004	CAHILL CYNTHIA L & DAVID S	1135 HORSE HILL RD, WESTBROOK, CT 06498	1135 HORSE HILL RD
126/005	WESTBROOK TOWN OF	866 BOSTON POST RD, WESTBROOK, CT 06498	HORSE HILL RD
126/008	CONN LIGHT & POWER CO THE	PO BOX 270, HARTFORD, CT 06141	HORSE HILL RD
126/009	PYTLIK NANCY B	3 OLD HORSE HILL RD, WESTBROOK, CT 06498	3 OLD HORSE HILL RD
126/012	KNOBELSDORFF KERRY E ESQ TTEE & PICCHIONI	PO BOX 809, OLD SAYBROOK, CT 06475	56 OLD HORSE HILL RD
126/011	MOTT CLIFFORD P & ANNMARIE	80 OLD HORSE HILL RD, WESTBROOK, CT 06498	80 OLD HORSE HILL RD

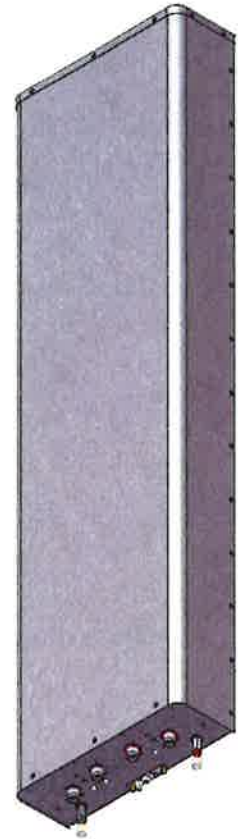
NOTES TO ABUTTERS MAP & OWNERS LIST:  
1. ALL INFORMATION TAKEN FROM TOWN OF WESTBROOK ONLINE "GIS" DATABASE, MARCH 2017.

# **ATTACHMENT 3**

# QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

- Twin band, quad-port panel antenna with variable electrical tilt
- 4x4 MIMO
- Patented internal RET actuator adds no additional length to the antenna





Ordering Options		Model Number	
When ordering, replace "x" in the model number with one of the options listed below.			
Manual Electrical Tilt		QUAD656C0000M	
Remote Electrical Tilt AISG v2.0 / 3GPP with an MDCU RET Actuator		QUAD656C0000G	
Remote Electrical Tilt AISG v2.0 / 3GPP with an MDDU RET Actuator		QUAD656C0000L	
Mounting bracket kits and other accessories are ordered separately.			
Electrical Characteristics		(2x) 696-900 MHz	
Frequency Bands		696-806 MHz	806-900 MHz
Polarization		(2x) ±45° (Quad-Pol)	
Horizontal Beamwidth		67°	66°
Vertical Beamwidth		13.6°	12.4°
Gain		14.5 dBi	15.0 dBi
Electrical Downtilt		0-12°	
Impedance		50Ω	
VSWR		≤ 1.5:1	
Upper Sidelobe Suppression		18 dB	18 dB
Front-to-Back Ratio		> 25 dB	> 25 dB
Inband Isolation		25 dB	
Isolation Between Bands		28 dB	
IM3 (2x20W carrier)		< -153 dBc	
Input Power		(4x) 500 W	
Total Number of Connectors		Antennas has 4 connectors located at the bottom	
Connectors Per Band	696-900 MHz	(2x) 7/16-DIN Female	
	696-900 MHz	(2x) 7/16-DIN Female	
Diplexed		No	
Lightning Protection		Direct Ground	
Operating Temperature		-40° to +60° C (-40° to +140° F)	
Mechanical Characteristics			
Dimensions (Length x Width x Depth)		1889 x 520 x 182 mm	74.4 x 20.5 x 7.2 in
Depth with Z-Brackets		227 mm	8.9 in
Weight without Mounting Brackets: MET		24.5 kg	54.0 lbs
Weight without Mounting Brackets: RET		24.8 kg	54.7 lbs
Survival Wind Speed		> 241 km/hr	> 150 mph
Wind Area	Front	0.98 m <sup>2</sup>	10.6 ft <sup>2</sup>
	Side	0.34 m <sup>2</sup>	3.7 ft <sup>2</sup>
Wind Loads (160 km/hr or 100 mph)	Front	1200 N	270 lbf
	Side	415 N	93 lbf

Quoted performance parameters are provided to offer typical, peak or range values only and may vary as a result of normal testing, 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 products may be made without notice.

# QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

Electrical Downtilt Control				
Electrical downtilt for each band can be controlled separately. Tilt indicator(s) are covered by removable transparent cap(s).				
Manual Electrical Tilt (MET) Control	A colored knob at the end of the tilt indicator allows change of the tilt without need of a tool. The knob color is identical to the corresponding connector ring color. To access the knob, remove the cap by turning it counter-clockwise. It is re-installed by opposite rotation. Do not remove the transparent cap(s) from the antenna.			
Remote Electrical Tilt (RET) Control	The remote control of the electrical tilt is managed by either a Multi-Device Control Unit (MDCU) or a Multi-Device Dual Unit (MDDU) inserted in the bottom of the antenna. A single actuator individually controls the tilt of each band (no need for daisy chain cables between the bands). This module does not add any additional length to the antenna. For RET control, the transparent caps must be in place and locked. The tilt angle indicators always remain visible and the antenna still has manual tilt control (manual override).			
RET Actuator	Select one of the following RET actuators when ordering this antenna.			
	Multi-Device Control Unit (MDCU)	The MDCU is an electronic module that allows the remote control of the electrical downtilt (RET) in Amphenol antennas with factory embedded motors. The MDCU is factory installed. Refer to ordering options.		
	Multi-Device Dual Unit (MDDU)	The MDDU allows two separate RET Controllers to independently drive the RETs in Amphenol antennas with factory installed motors (for antenna sharing). The MDDU is factory installed. Refer to ordering options.		
Important Installation Instructions 	In order to operate RET control, the transparent caps covering the tilt adjustment indicators must be engaged and locked. Do not cut them from the antenna.			
	Do not install the antenna with the connectors facing upward.			
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 1.6-4.5 in	6.9 kg 15.2 lbs
Configuration Options				
This antenna model cannot be used with Amphenol's UNICELL 3-sector antenna enclosures.				

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# QUAD656C0000x


Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

**Bottom View of Antenna**

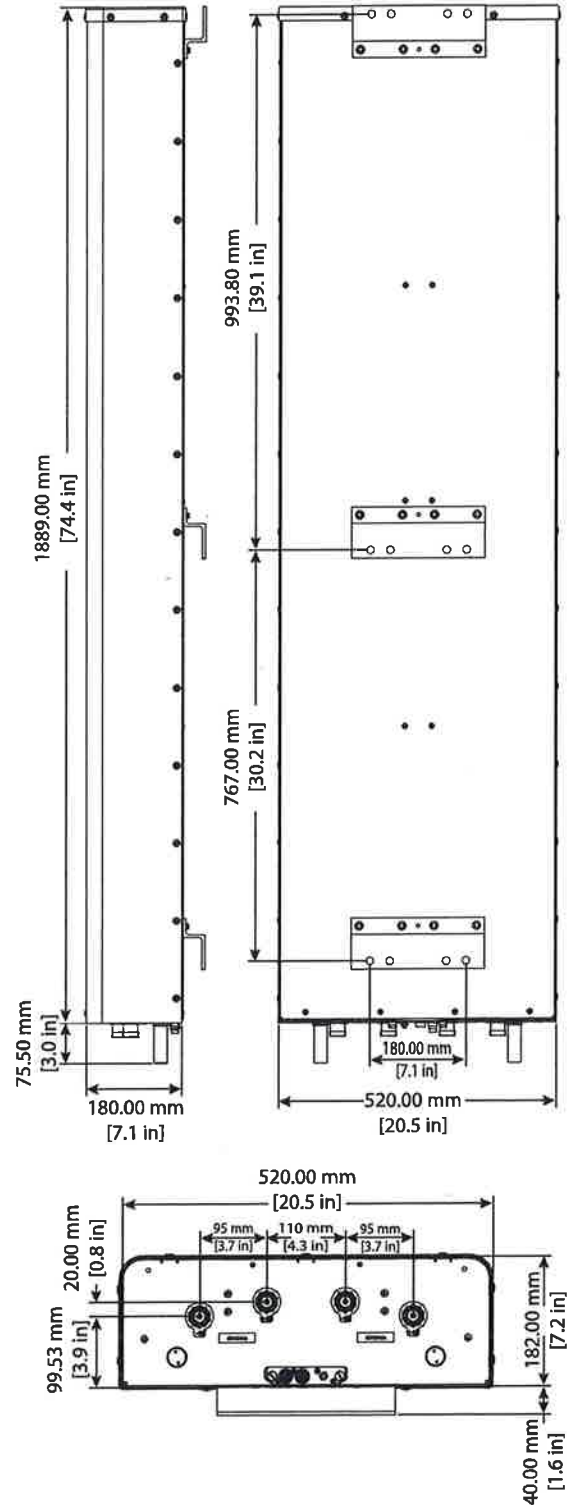


Location of the MDCU or MDDU for RET Control (MDCU shown)

Tilt indicators covered by transparent caps. Manual adjustment is accessed by removing the caps. Knob colors are the same as the connectors.

 In order to operate RET control, the transparent caps covering the tilt adjustment indicators must be engaged and locked. Do not cut them from the antenna.

**Dimensions**

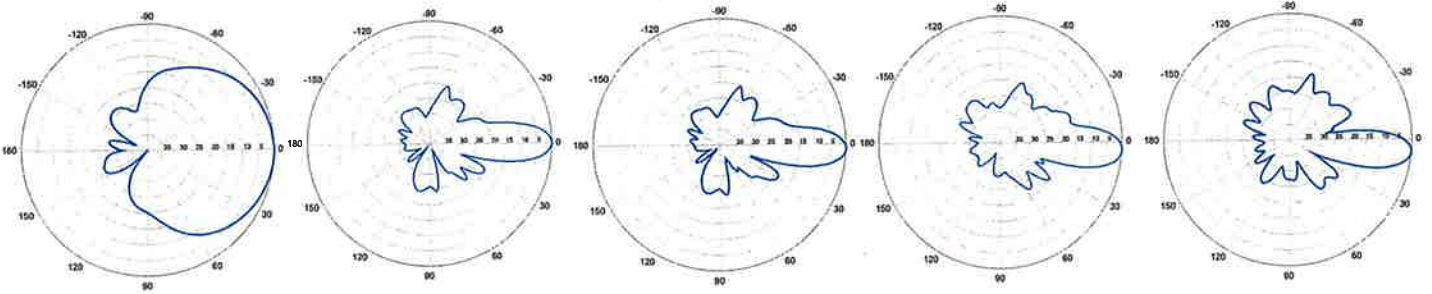


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**QUAD656C0000x**

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

696-900 MHz



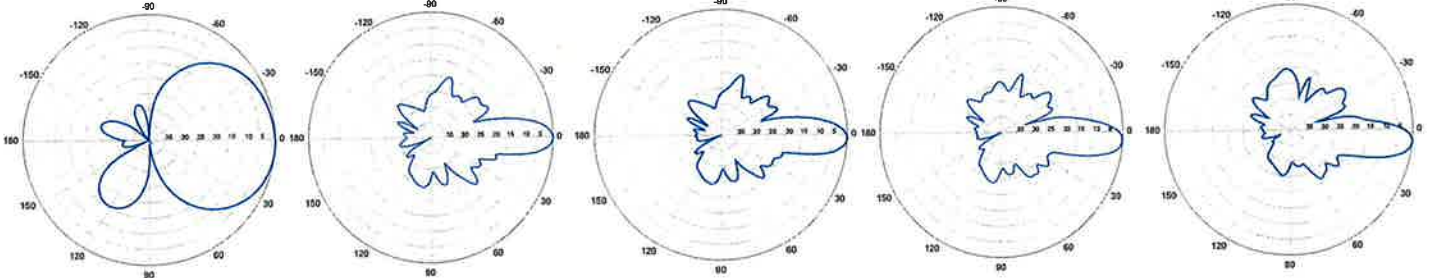
Horizontal | 750 MHz

0° | Vertical | 750 MHz

2° | Vertical | 750 MHz

4° | Vertical | 750 MHz

6° | Vertical | 750 MHz



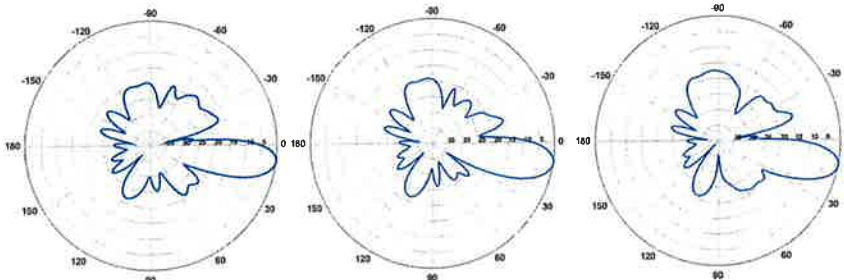
Horizontal | 850 MHz

0° | Vertical | 850 MHz

2° | Vertical | 850 MHz

4° | Vertical | 850 MHz

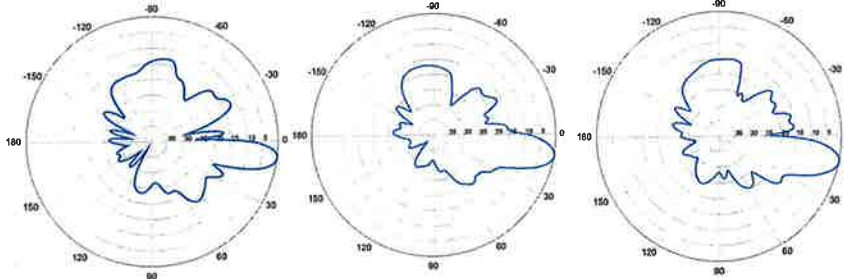
6° | Vertical | 850 MHz



8° | Vertical | 750 MHz

10° | Vertical | 750 MHz

12° | Vertical | 750 MHz



8° | Vertical | 850 MHz

10° | Vertical | 850 MHz

12° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical, peak or range values only and may vary as a result of normal testing, 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 products may be made without notice.





## SBNHH-1D65B

**Multiband Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.**

- Interleaved dipole technology providing for attractive, low wind load mechanical package

### Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR   Return Loss, dB	1.5   14.0	1.5   14.0	1.5   14.0	1.5   14.0	1.5   14.0	1.5   14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

### Electrical Specifications, BASTA\*

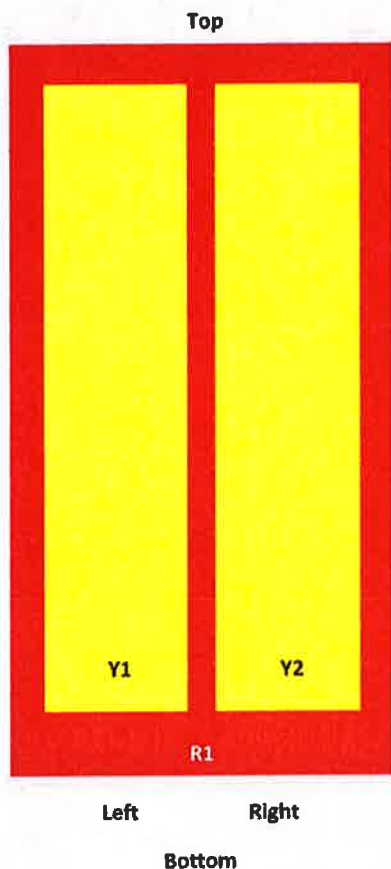
Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0°   14.6	0°   14.5	0°   17.4	0°   17.8	0°   18.1	0°   18.2
	7°   14.6	7°   14.4	3°   17.5	3°   17.9	3°   18.3	3°   18.4
	14°   14.2	14°   13.6	7°   17.4	7°   17.9	7°   18.2	7°   18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

### Array Layout

SBNHH-1D65B

**SBNHH 65**



Array	Freq (MHz)	Conns	RET (MRET)	AISG RET UID
R1	698-896	1-2	1	AXXXXXXXXXXXXXXXXX.1
Y1	1695-2360	3-4	2	AXXXXXXXXXXXXXXXXX.2
Y2	1695-2360	5-6		

View from the front of the antenna  
 (Sizes of colored boxes are not true depictions of array sizes)

## General Specifications

Operating Frequency Band	1695 – 2360 MHz   698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

## Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female

SBNHH-1D65B

Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum   Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h   150 mph

## Dimensions

Length	1851.0 mm   72.9 in
Width	301.0 mm   11.9 in
Depth	180.0 mm   7.1 in
Net Weight, without mounting kit	18.4 kg   40.6 lb

## Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (1)   Low band (1)
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female   8-pin DIN Male
RET Interface, quantity	1 female   1 male

## Packed Dimensions

Length	2025.0 mm   79.7 in
Width	390.0 mm   15.4 in
Depth	296.0 mm   11.7 in
Shipping Weight	31.0 kg   68.3 lb

## Regulatory Compliance/Certifications

### Agency

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

### Classification

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



# ALCATEL-LUCENT B13 RRH4X30-4R

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

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



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

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

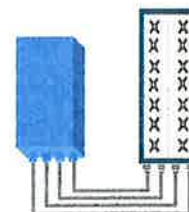
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

## FEATURES

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

## BENEFITS

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



4x30W with 4T4R  
or  
2x60W with 2T4R  
Can be switched between modes via SW w/o site visit

# TECHNICAL SPECIFICATIONS

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

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# ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new 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 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 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 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 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 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.

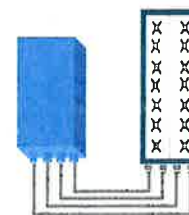


## FEATURES

- 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
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 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 and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options (Pole or Wall)



4x30W with 4T4R  
or  
2x60W with 2T4R  
Can be switched between  
modes via SW w/o site  
visit

## TECHNICAL SPECIFICATIONS

Features & performance	
<b>Number of TX/RX paths</b>	4 duplexed (either 4T4R or 2T4R by SW)
<b>Frequency band</b>	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
<b>Instantaneous bandwidth - #carriers</b>	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
<b>LTE carrier bandwidth</b>	3, 5, 10, 15 or 20 MHz
<b>RF output power</b>	2x60W or 4x30W (by SW)
<b>Noise figure (3GPP band 2)</b>	2.0 dB typ. (<2.5 dB max)
<b>RX Diversity scheme</b>	2 or 4 way Rx diversity
<b>Sizes (HxWxD)(w/ solar shield) in mm (in.)</b>	538 x 304 x 182 (21.2" x 12.0" x 7.2")
<b>Volume (w/ solar shield) in L</b>	30
<b>Weight (w/ solar shield) in kg (lb)</b>	24 (53)
<b>DC voltage range</b>	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
<b>DC power consumption</b>	580W typical @100% RF load
<b>Environmental conditions</b>	-40°C (-40°F) / +55°C (+131°F) IP65
<b>Wind load (@150km/h or 93mph)</b>	Frontal: <200N / Lateral : <150N
<b>Antenna ports</b>	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5 (> 14dB)
<b>CPRI ports</b>	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
<b>AISG interfaces</b>	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
<b>Misc. Interfaces</b>	1 external alarms connector (4 alarms) 4 RF Tx & 4 RF Rx monitor ports 1 DC connector (2 pins)
<b>Installation conditions</b>	Pole and wall mounting
<b>Regulatory compliance</b>	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

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# ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 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. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

**Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity**, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.



The Alcatel-Lucent B66a RRH4x45 is a compact (near zero-footprint) solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

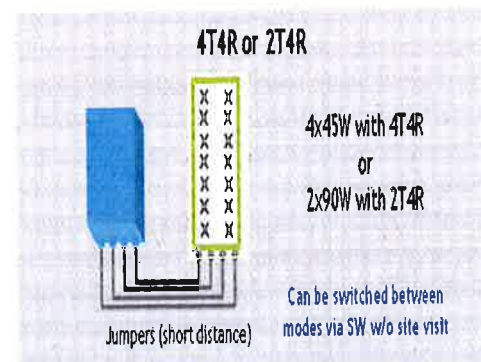
Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

## FEATURES

- Supporting LTE in 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

## BENEFITS

- Compact to reduce additional footprint when adding LTE in AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall





## TECHNICAL SPECIFICATIONS

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (In 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme Receiver Sensivity (FRC A1-3)	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.)	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield)
Volume in Liters	35.5 (with solar shield) 29.7 (without solar shield)
Weight in kg (lb) (w/o mounting HW)	25.8kg (56.8lb) (with solar shield)
DC voltage range	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	750W typical @100% RF load (In 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) UL50E Type 4 Enclosure
Wind load (@150km/h or 93mph)	250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

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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<sup>®</sup> accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

**Features/Benefits**

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



Figure 1: HYBRIFLEX Series

**Technical Specifications**

Outer Conductor Armor	Corrugated Aluminum	(mm (in))	46.5 (1.83)
Jacket	Polyethylene, PE	(mm (in))	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		(kg/m (lb/ft))	1.9 (1.30)
Minimum Bending Radius, Single Bending		(mm (in))	200 (8)
Minimum Bending Radius, Repeated Bending		(mm (in))	500 (20)
Recommended/Maximum Clamp Spacing		(m (ft))	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	0.68 (0.205)
DC-Resistance Power Cable, 8.4mm <sup>2</sup> (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		(μm)	50/125
Primary Coating (Acrylate)		(μm)	245
Buffer Diameter, Nominal		(μm)	900
Secondary Protection, Jacket, Nominal		(mm (in))	2.0 (0.08)
Minimum Bending Radius		(mm (in))	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		(mm (AWG))	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		(mm (AWG))	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		(mm (in))	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		(°C (°F))	-40 to +65 (-40 to 149)
Operation Temperature		(°C (°F))	-40 to +65 (-40 to 149)

\* This data is provisional and subject to change

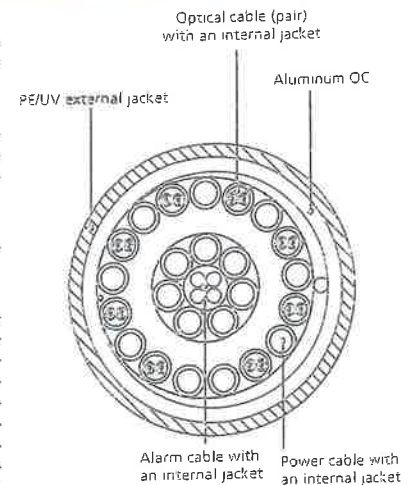


Figure 2: Construction Detail

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

# SDC20 | 2.5L | 20 kW - AC

## INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

### Standby Power Rating

20 kW AC, 60 Hz



Image used for illustration purposes only



\*Built in the USA using domestic and foreign parts

## Codes and Standards

Generac products are designed to the following standards:



UL2200, UL508, UL142, UL489



NFPA 37, 70, 99, 110



NEC700, 701, 702, 708



ISO 3046, 7637, 8528, 9001



NEMA ICS10, MG1, 250, ICS6, AB1



ANSI C62.41

## Powering Ahead

For over 50 years, Generac has provided innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial applications under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

**STANDARD OPTIONS****ENGINE SYSTEM**

- Oil Drain Extension
- Air Cleaner with Service Indicator
- Fan Guard
- Stainless Steel Flexible Exhaust Connection
- Exhaust Silencer with Drain
- Factory Filled Oil & Coolant

**Fuel System**

- Primary Fuel Filter

**Cooling System**

- 120V AC Coolant Heater
- Closed Coolant Recovery System
- UV/Ozone Resistant Hoses
- Factory-Installed Radiator
- 50/50 Ethylene Glycol Antifreeze
- Radiator Drain Extension

**Electrical System**

- Battery Charging Alternator
- AGM Spill Proof Battery
- Battery Cables
- Rubber-Booted Engine Electrical Connections
- Solenoid Activated Starter Motor

**ALTERNATOR SYSTEM**

- Class H Insulation Material
- Vented Rotor
- 2/3 Pitch
- Skewed Stator
- Auxiliary Voltage Regulator Power Winding
- Amortisseur Winding
- Brushless Excitation
- Sealed Bearings
- Automated Manufacturing (Winding, Insertion, Lacing and Varnishing)
- Rotor Dynamically Spin Balanced
- Full Load Capacity Alternator
- Protective Thermal Switch

**GENERATOR SET**

- Single-Side Service
- Internal Genset Puck Style Vibration Isolators
- Separation of Circuits- High/Low Voltage
- Silencer Heat Shield
- High Heat Wrapped Exhaust Piping
- Silencer Enclosed Within Generator
- 5 Year Extended Warranty
- Extended Factory Testing
- 12 Gallon System Spill Containment
- 2.5 Gallon Fuel Fill Spill Containment

**ENCLOSURE**

- Serviceable Items Accessible Through Single Lift-Off Side Door
- High Performance Sound-Absorbing Material
- Gasketed Door
- Stamped Air-Intake Louvers
- Single Door Latch Lockable with Key & Padlock
- Rhino Coat™ - Textured Polyester Powder Coat
- 150 MPH Wind Rating
- 36" Snow Rating
- 4 Point Lift System

**FUEL TANK**

- UL 142 Compliant
- Double Wall Construction
- Thermal Valve (Fusible Link)
- Factory Pressure Tested (5 psi)
- Rupture Basin Alarm
- Fuel Level Gauge and Sender
- Check Valve in Supply Line
- Fire Rated Hose
- Rhino Coat™ - Textured Polyester Powder Coat
- Stainless Steel Hardware
- Integrated Fork Pockets

**CONTROL SYSTEM**

- Digital H Control Panel - Dual 4x20 Display
- Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable PLC
- RS-232/485
- All-Phase Sensing DVR
- Full System Status
- Utility Monitoring
- 2-Wire Start Compatible
- Power Output (kW)
- Power Factor
- kW Hours, Total & Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Speed

- Battery Voltage
- Frequency
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/Sealed Connectors
- Audible Alarms and Shutdowns
- Not in Auto (Flashing Light)
- Auto/Off/Manual Switch
- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
- Customizable Alarms, Warnings, and Events
- Modbus protocol
- Predictive Maintenance Algorithm
- Sealed Boards
- Password Parameter Adjustment Protection
- Single Point Ground
- 15 Channel Data Logging
- 0.2 msec High Speed Data Logging
- Alarm Information Automatically Comes Up On the Display

**Alarms**

- Generator Run- Dry Contact
- Major Alarm- Dry Contact
- Minor Alarm- Dry Contact
- Low Fuel Alarm- Dry Contact
- Generator Fluid Spill Alarm- Dry Contact
- Alarms & Warnings Time and Date Stamped
- Alarms & Warnings for Transient and Steady State Conditions
- Snap Shots of Key Operation Parameters During Alarms & Warnings
- Alarms and Warnings Spelled Out (No Alarm Codes)

**MODEL OPTIONS****CONTROL SYSTEM**

- 21 Light Annunciator- Shipped Loose Kit and Field Installed
- External E-Stop-Shipped Loose Kit and Field Installed

**ENCLOSURE**

- Aluminum Enclosure
- Extreme Cold Weather Kit (-40°C)- Shipped Loose Kit and Field Installed

**TANKS**

- MDEQ 5 Gallon Fuel Spill Box with 90% Fill Alarm- Shipped Loose Kit and Field Installed
- MDEQ Fuel Vent- Shipped Loose Kit and Field Installed

**APPLICATION AND ENGINEERING DATA**

**ENGINE SPECIFICATIONS**

**General**

Make	Mitsubishi
EPA Emissions Compliance	Interim Tier 4
Cylinder #	4
Type	In-Line
Displacement - L (Cu In)	2.5 (158)
Bore - mm (in)	88 (3.5)
Stroke - mm (in)	103 (4.1)
Compression Ratio	22:1
Intake Air Method	Naturally Aspirated

**Engine Governing**

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	± 0.25%

**Lubrication System**

Oil Pump Type	Trochoid Gear Pump
Oil Filter Type	Filtering Paper, Full Flow
Crankcase Capacity - L (qts)	6.5 (6.9)

**Cooling System**

Cooling System Type	Forced Circulation
Water Pump Type	Centrifugal Pump
Fan Type	Pusher
Fan Speed (rpm)	2376
Fan Diameter - mm (in)	380 (15)
Coolant Heater Wattage	1000
Coolant Heater Standard Voltage	120

**Fuel System**

Fuel Type	Ultra Low Sulfur Diesel #2
Fuel Specifications	ASTM
Fuel Filtering (microns)	6
Fuel Inject Pump Make	Bosch
Injector Type	Engine Driven Gear
Engine Type	Diesel
Fuel Supply Line - mm (in.)	6.6 (0.26)

**Engine Electrical System**

System Voltage	12 VDC
Battery Charger Alternator	12V-50A
Battery Size	650 CCA
Battery Group	35
Battery Voltage	12 VDC
Ground Polarity	Negative

**ALTERNATOR SPECIFICATIONS**

Standard Model	Mecc Alte ECP 28-2L/4
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<45
Standard Excitation	Brushless

Bearings	Dual Sealed
Coupling	Belt, Pulley
Load Capacity - Standby	100%
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	± 1.0%

**RATING DEFINITIONS**

Standby - Applicable for a varying emergency load for the duration of a utility power outage with no overload capability.

# SDC20 | 2.5L | 20 kW - AC

## INDUSTRIAL DC DIESEL GENERATOR SET

EPA Certified Stationary Emergency

### OPERATING DATA

#### POWER RATINGS

Single-Phase 120/240 VAC @1.0pf	20 kW*	Amps: 83
Circuit Breaker	100A	

\*18 kW output until 50 hour break-in complete

#### FUEL CONSUMPTION RATES\*

Diesel - gph (lph)	
Percent Load	Standby
50%	1.02 (3.78)
75%	1.37 (5.18)
100%	1.81 (6.85)

\* Fuel supply installation must accommodate fuel consumption rates at 100% load.

#### COOLING

		Standby
Coolant Flow per Minute	gpm (lpm)	15.9 (60)
Coolant System Capacity	gal (L)	6 (22.7)
Heat Rejection to Coolant	BTU/hr	238,200
Inlet Air	cfm (m <sup>3</sup> /min)	67.1 (1.9)
Max. Operating Ambient Temperature (Before Derate)	°F (°C)	104° (40°)
Maximum Radiator Backpressure	in H <sub>2</sub> O	0.50

#### COMBUSTION AIR REQUIREMENTS

	Standby
Flow at Rated Power cfm (m <sup>3</sup> /min)	88 (2.49)

#### ENGINE

		Standby
Rated Engine Speed	rpm	1800
Horsepower at Rated kW**	hp	33.5
Piston Speed	ft/min	1220.47
BMEP	psi	96.5

#### EXHAUST

		Standby
Exhaust Flow (Rated Output)	cfm (m <sup>3</sup> /min)	193 (328)
Max. Backpressure (Post Silencer)	inHg (kPa)	1.96 (6.67)
Exhaust Temp (Rated Output - Post Silencer)	°F (°C)	928 (497.7)

\*\* Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

# **ATTACHMENT 4**

Date: September 29, 2016

Sean Dempsey  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277



Crown Castle  
2000 Corporate Drive  
Canonsburg, PA, 15317  
724-416-2000

**Subject:** Structural Analysis Report

**Carrier Designation:** Verizon Wireless Co-Locate  
**Carrier Site Number:** 3000038  
**Carrier Site Name:** Westbrook North, C T

**Crown Castle Designation:** Crown Castle BU Number: 857011  
Crown Castle Site Name: WESTBROOK NORTH HORSE HILL ROA  
Crown Castle JDE Job Number: 393412  
Crown Castle Work Order Number: 1304828  
Crown Castle Application Number: 359309 Rev. 4

**Engineering Firm Designation:** Crown Castle Project Number: 1304828

**Site Data:** 1102 HORSE HILL ROAD, WESTBROOK, Middlesex County, CT  
Latitude 41° 19' 25.71", Longitude -72° 29' 28.1"  
159.08 Foot - Monopole Tower

Dear Sean Dempsey,

Crown Castle 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 the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 1304828, in accordance with application 359309, revision 4.

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:

LC5: Existing + Proposed Equipment

**Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 135 mph converted to a nominal 3-second gust wind speed of 105 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category B 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 Crown Castle appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Mark E. Mlynarski, E.I.T./ AGH

Respectfully submitted by:

Maham Barimani, P.E.  
Sr. Project Engineer  
tnxTower Report - version  
7.0.5.1



10-03-2016



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## 1) INTRODUCTION

This tower is a 159.08 ft Monopole tower designed by UNKNOWN in November of 2000. The tower was originally designed for a wind speed of 80 mph per UBC 1997.

## 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 105 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category B.

**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
147.0	147.0	3	alcatel lucent	B13 RRH 4X30	2	1-5/8	
		3	alcatel lucent	B25 RRH4X30			
		3	alcatel lucent	B66A RRH4X45			
		3	amphenol	QUAD656C0000X w/ Mount Pipe			
		9	commscope	SBNHH-1D65B w/ Mount Pipe			
		2	rfs celwave	DB-T1-6Z-8AB-0Z			
		1	tower mounts	Sector Mount [SM 801-3]			

**Table 2 - Existing 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
159.0	163.0	3	ericsson	RRUS 11	1 2 12 1	3/8 7/8 1-5/8 2" Conduit	1
		2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		6	powerwave technologies	7334.02B w/ Mount Pipe			
		6	powerwave technologies	LGP13519			
		6	powerwave technologies	LGP21402			
		1	powerwave technologies	P65-15-XLH-RR w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
	159.0	1	tower mounts	Platform Mount [LP 714-1]			

Notes:

- Existing Equipment

**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	Reference	Source
4-GEOTECHNICAL REPORTS	GPD Group	4306672	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	GPD Group (Mapping)	4723512	CCISITES
4-TOWER MANUFACTURER DRAWINGS	GPD Group (Mapping)	5177796	CCISITES

#### 3.1) Analysis Method

tnxTower (version 7.0.5.1), 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. Crown Castle 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 (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	159.08 - 139.33	Pole	TP24.1x18.43x0.188	1	-6	961	33.0	Pass
L2	139.33 - 91.24	Pole	TP40.49x22.861x0.313	2	-13	2669	40.5	Pass
L3	91.24 - 44.66	Pole	TP54.61x38.119x0.375	3	-25	4156	39.2	Pass
L4	44.66 - 0	Pole	TP69.47x51.679x0.375	4	-43	4820	44.4	Pass
							Summary	
						Pole (L4)	44.4	Pass
						Rating =	44.4	Pass

**Table 6 - Tower Component Stresses vs. Capacity – LC5**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	36.7	Pass
1	Base Plate	0	32.9	Pass
1	Base Foundation	0	58.2	Pass
1	Base Foundation Soil Interaction	0	25.7	Pass

<b>Structure Rating (max from all components) =</b>	<b>58.2%</b>
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Notes:

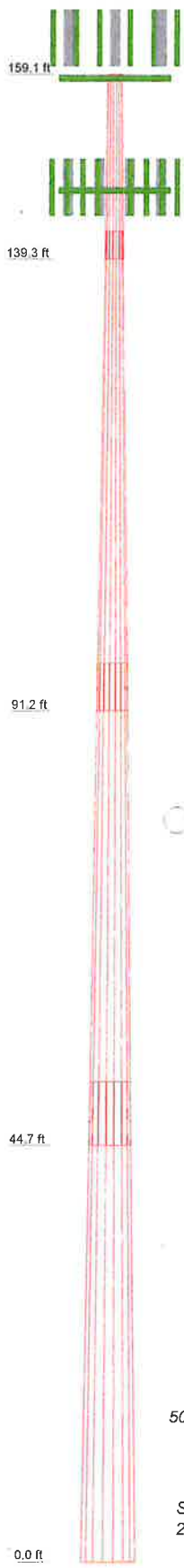
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

#### **4.1) Recommendations**

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

**APPENDIX A**  
**TNXTOWER OUTPUT**

Length (ft)	19.75	51.10	51.64	51.49	28.4
Number of Sides	18	18	18	18	18
Thickness (in)	0.188	0.313	0.375	0.375	0.375
Socket Length (ft)	3.01	5.06	6.83	51.679	69.470
Top Dia (in)	18.430	22.861	38.119	51.679	69.470
Bot Dia (in)	24.100	40.490	54.610	51.679	69.470
Grade					
Weight (K)	0.8	5.4	9.6	12.6	28.4



**DESIGNED APPURTENANCE LOADING**

TYPE	ELEVATION	TYPE	ELEVATION
(2) 7334.02B w/ Mount Pipe	159	6' x 2" Mount Pipe	159
(2) 7334.02B w/ Mount Pipe	159	Platform Mount [LP 714-1]	159
(2) 7334.02B w/ Mount Pipe	159	QUAD656C0000X w/ Mount Pipe	147
AM-X-CD-16-65-00T-RET w/ Mount Pipe	159	QUAD656C0000X w/ Mount Pipe	147
AM-X-CD-16-65-00T-RET w/ Mount Pipe	159	QUAD656C0000X w/ Mount Pipe	147
(3) SBNHH-1D65B w/ Mount Pipe	147	(3) SBNHH-1D65B w/ Mount Pipe	147
(3) SBNHH-1D65B w/ Mount Pipe	147	(3) SBNHH-1D65B w/ Mount Pipe	147
(3) SBNHH-1D65B w/ Mount Pipe	147	(3) SBNHH-1D65B w/ Mount Pipe	147
P65-15-XLH-RR w/ Mount Pipe	159	B66A RRH4X45	147
(2) LGP21402	159	B66A RRH4X45	147
(2) LGP21402	159	B66A RRH4X45	147
(2) LGP21402	159	B66A RRH4X45	147
RRUS 11	159	B13 RRH 4X30	147
RRUS 11	159	B13 RRH 4X30	147
RRUS 11	159	B13 RRH 4X30	147
(2) LGP13519	159	B13 RRH 4X30	147
(2) LGP13519	159	B25 RRH4X30	147
(2) LGP13519	159	B25 RRH4X30	147
(2) LGP13519	159	B25 RRH4X30	147
DC6-48-60-18-8F	159	B25 RRH4X30	147
6' x 2" Mount Pipe	159	DB-T1-6Z-8AB-0Z	147
6' x 2" Mount Pipe	159	DB-T1-6Z-8AB-0Z	147
		Sector Mount [SM 801-3]	147

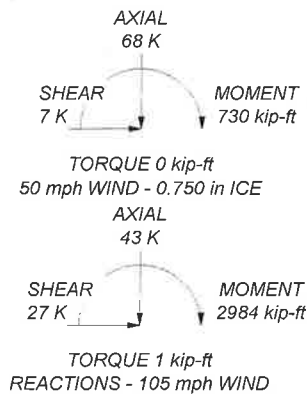
**MATERIAL STRENGTH**

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

**TOWER DESIGN NOTES**

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 105 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 44.4%

ALL REACTIONS ARE FACTORED



<p><b>Crown Castle</b> 2000 Corporate Drive Canonsburg, PA, 15317 Phone: 724-416-2000 FAX: 724-416-4623</p>	Job: BU# 857011
	Project:
	Client: Crown Castle    Drawn by: agholami    App'd:
	Code: TIA-222-G    Date: 09/29/16    Scale: NTS
Path:	Dwg No. E-1

## Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- 2) Tower is located in Middlesex County, Connecticut.
- 3) Basic wind speed of 105 mph.
- 4) Structure Class II.
- 5) Exposure Category B.
- 6) Topographic Category 1.
- 7) Crest Height 0.00 ft.
- 8) Nominal ice thickness of 0.750 in.
- 9) Ice thickness is considered to increase with height.
- 10) Ice density of 56 pcf.
- 11) A wind speed of 50 mph is used in combination with ice.
- 12) Temperature drops of 50 °F.
- 13) Deflections calculated using a wind speed of 60 mph.
- 14) A non-linear (P-delta) analysis was used.
- 15) Pressures are calculated at each section.
- 16) Stress ratio used in pole design is 1.
- 17) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile  Include Bolts In Member Capacity  Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt.  Autocalc Torque Arm Areas  Add IBC .6D+W Combination ✓ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder	Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption  <div style="text-align: center;">Poles</div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	159.08-139.33	19.75	3.01	18	18.430	24.100	0.188	0.750	A572-65 (65 ksi)
L2	139.33-91.24	51.10	5.06	18	22.861	40.490	0.313	1.250	A572-65 (65 ksi)
L3	91.24-44.66	51.64	6.83	18	38.119	54.610	0.375	1.500	A572-65 (65 ksi)
L4	44.66-0.00	51.49		18	51.679	69.470	0.375	1.500	A572-65 (65 ksi)

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
L1	18.714	10.857	456.456	6.476	9.362	48.754	913.512	5.429	2.914	15.54
	24.472	14.231	1028.065	8.489	12.243	83.973	2057.483	7.117	3.912	20.862
L2	24.268	22.365	1436.612	8.005	11.613	123.704	2875.114	11.185	3.474	11.115
	41.115	39.851	8127.241	14.263	20.569	395.122	16265.175	19.929	6.576	21.044
L3	40.348	44.925	8085.949	13.399	19.365	417.563	16182.538	22.467	6.049	16.131
	55.452	64.553	23989.134	19.253	27.742	864.726	48009.834	32.283	8.951	23.87
L4	54.872	61.064	20306.130	18.213	26.253	773.482	40638.979	30.538	8.435	22.495
	70.542	82.240	49603.864	24.529	35.291	1405.577	99272.997	41.128	11.567	30.845

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft <sup>2</sup>	in					in	in	in
L1 159.08-139.33				1	1	1			
L2 139.33-91.24				1	1	1			
L3 91.24-44.66				1	1	1			
L4 44.66-0.00				1	1	1			

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C <sub>A</sub> A <sub>A</sub>	Weight
				ft		ft <sup>2</sup> /ft	plf
*****							
LDF2-50(3/8")	B	No	Inside Pole	159.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
LDF5-50A(7/8")	B	No	Inside Pole	159.00 - 0.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
LDF7-50A(1-5/8")	A	No	Inside Pole	159.00 - 0.00	12	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
HB158-1-08U8-S8J18(1-5/8")	B	No	Inside Pole	147.00 - 0.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
3" Flex Conduit	B	No	Inside Pole	159.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00

### Feed Line/Linear Appurtenances Section Areas

Tower Section n	Tower Elevation	Face	A <sub>R</sub>	A <sub>F</sub>	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face	Weight
	ft		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	159.08-139.33	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0
L2	139.33-91.24	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0
L3	91.24-44.66	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0



Tower Section n	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L4	44.66-0.00	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	159.08-139.33	A	1.744	0.000	0.000	0.000	0.000	0
		B		0.000	0.000	0.000	0.000	0
		C		0.000	0.000	0.000	0.000	0
L2	139.33-91.24	A	1.697	0.000	0.000	0.000	0.000	0
		B		0.000	0.000	0.000	0.000	0
		C		0.000	0.000	0.000	0.000	0
L3	91.24-44.66	A	1.611	0.000	0.000	0.000	0.000	0
		B		0.000	0.000	0.000	0.000	0
		C		0.000	0.000	0.000	0.000	0
L4	44.66-0.00	A	1.438	0.000	0.000	0.000	0.000	0
		B		0.000	0.000	0.000	0.000	0
		C		0.000	0.000	0.000	0.000	0

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	159.08-139.33	0.000	0.000	0.000	0.000
L2	139.33-91.24	0.000	0.000	0.000	0.000
L3	91.24-44.66	0.000	0.000	0.000	0.000
L4	44.66-0.00	0.000	0.000	0.000	0.000

### Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K <sub>a</sub> No Ice	K <sub>a</sub> Ice

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft, Vert ft	Azimuth Adjustmen t	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
***159***								
(2) 7334.02B w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 6.01 1/2" 6.51 Ice 7.01	4.17 4.91 5.59	0 0 0
(2) 7334.02B w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.000	159.00	1" Ice No Ice 6.01 1/2" 6.51 Ice 7.01	4.17 4.91 5.59	0 0 0

159.08 Ft Monopole Tower Structural Analysis  
 Project Number 1304828, Application 359309, Revision 4

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz	Lateral						ft
							ft <sup>2</sup>	ft <sup>2</sup>	K	
(2) 7334.02B w/ Mount Pipe	C	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	6.01	4.17	0
							1/2"	6.51	4.91	0
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00	0.00	0.000	159.00	Ice	7.01	5.59	0
							1" Ice			
							No Ice	8.26	6.30	0
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00	0.00	0.000	159.00	1/2"	8.82	7.48	0
							Ice	9.35	8.37	0
							1" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.00	0.00	0.000	159.00	No Ice	8.26	6.30	0
							1/2"	8.82	7.48	0
							Ice	9.35	8.37	0
P65-15-XLH-RR w/ Mount Pipe	C	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	5.30	3.67	0
							1/2"	5.69	4.28	0
(2) LGP21402	A	From Leg	4.00	0.00	0.000	159.00	Ice	6.09	4.90	0
							1" Ice			
							No Ice	1.05	0.23	0
(2) LGP21402	B	From Leg	4.00	0.00	0.000	159.00	1/2"	1.18	0.30	0
							Ice	1.32	0.37	0
							1" Ice			
(2) LGP21402	B	From Leg	4.00	0.00	0.000	159.00	No Ice	1.05	0.23	0
							1/2"	1.18	0.30	0
							Ice	1.32	0.37	0
(2) LGP21402	C	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	1.05	0.23	0
							1/2"	1.18	0.30	0
RRUS 11	A	From Leg	4.00	0.00	0.000	159.00	Ice	1.32	0.37	0
							1" Ice			
							No Ice	2.78	1.19	0
RRUS 11	B	From Leg	4.00	0.00	0.000	159.00	1/2"	2.99	1.33	0
							Ice	3.21	1.49	0
							1" Ice			
RRUS 11	B	From Leg	4.00	0.00	0.000	159.00	No Ice	2.78	1.19	0
							1/2"	2.99	1.33	0
							Ice	3.21	1.49	0
RRUS 11	C	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	2.78	1.19	0
							1/2"	2.99	1.33	0
(2) LGP13519	A	From Leg	4.00	0.00	0.000	159.00	Ice	3.21	1.49	0
							1" Ice			
							No Ice	0.29	0.18	0
(2) LGP13519	B	From Leg	4.00	0.00	0.000	159.00	1/2"	0.36	0.24	0
							Ice	0.44	0.31	0
							1" Ice			
(2) LGP13519	B	From Leg	4.00	0.00	0.000	159.00	No Ice	0.29	0.18	0
							1/2"	0.36	0.24	0
							Ice	0.44	0.31	0
(2) LGP13519	C	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	0.29	0.18	0
							1/2"	0.36	0.24	0
DC6-48-60-18-8F	A	From Leg	4.00	0.00	0.000	159.00	Ice	0.44	0.31	0
							1" Ice			
							No Ice	0.79	0.79	0
6' x 2" Mount Pipe	A	From Leg	4.00	0.00	0.000	159.00	1/2"	1.27	1.27	0
							Ice	1.45	1.45	0
							1" Ice			
6' x 2" Mount Pipe	A	From Leg	4.00	0.00	0.000	159.00	No Ice	1.43	1.43	0
							1/2"	1.92	1.92	0
							Ice	2.29	2.29	0
6' x 2" Mount Pipe	B	From Leg	4.00	0.00	0.000	159.00	1" Ice			
							No Ice	1.43	1.43	0
							1/2"	1.92	1.92	0
6' x 2" Mount Pipe	B	From Leg	4.00	0.00	0.000	159.00	Ice	2.29	2.29	0
							1" Ice			
							1" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t	Placement ft		C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
6' x 2" Mount Pipe	C	From Leg	4.00	0.000	159.00	No Ice	1.43	1.43	0
			0.00			1/2"	1.92	1.92	0
			4.00			Ice	2.29	2.29	0
						1" Ice			
Platform Mount [LP 714-1]	C	None		0.000	159.00	No Ice	37.47	37.47	2
						1/2"	44.23	44.23	2
						Ice	50.99	50.99	2
						1" Ice			
***147*** QUAD656C0000X w/ Mount Pipe	A	From Leg	4.00	0.000	147.00	No Ice	15.07	7.33	0
			0.00			1/2"	15.79	8.55	0
			0.00			Ice	16.48	9.50	0
						1" Ice			
QUAD656C0000X w/ Mount Pipe	B	From Leg	4.00	0.000	147.00	No Ice	15.07	7.33	0
			0.00			1/2"	15.79	8.55	0
			0.00			Ice	16.48	9.50	0
						1" Ice			
QUAD656C0000X w/ Mount Pipe	C	From Leg	4.00	0.000	147.00	No Ice	15.07	7.33	0
			0.00			1/2"	15.79	8.55	0
			0.00			Ice	16.48	9.50	0
						1" Ice			
(3) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00	0.000	147.00	No Ice	8.39	7.08	0
			0.00			1/2"	8.95	8.28	0
			0.00			Ice	9.48	9.19	0
						1" Ice			
(3) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00	0.000	147.00	No Ice	8.39	7.08	0
			0.00			1/2"	8.95	8.28	0
			0.00			Ice	9.48	9.19	0
						1" Ice			
(3) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00	0.000	147.00	No Ice	8.39	7.08	0
			0.00			1/2"	8.95	8.28	0
			0.00			Ice	9.48	9.19	0
						1" Ice			
B66A RRH4X45	A	From Leg	4.00	0.000	147.00	No Ice	2.58	1.63	0
			0.00			1/2"	2.79	1.81	0
			0.00			Ice	3.01	2.00	0
						1" Ice			
B66A RRH4X45	B	From Leg	4.00	0.000	147.00	No Ice	2.58	1.63	0
			0.00			1/2"	2.79	1.81	0
			0.00			Ice	3.01	2.00	0
						1" Ice			
B66A RRH4X45	C	From Leg	4.00	0.000	147.00	No Ice	2.58	1.63	0
			0.00			1/2"	2.79	1.81	0
			0.00			Ice	3.01	2.00	0
						1" Ice			
B13 RRH 4X30	A	From Leg	4.00	0.000	147.00	No Ice	2.06	1.32	0
			0.00			1/2"	2.24	1.48	0
			0.00			Ice	2.43	1.64	0
						1" Ice			
B13 RRH 4X30	B	From Leg	4.00	0.000	147.00	No Ice	2.06	1.32	0
			0.00			1/2"	2.24	1.48	0
			0.00			Ice	2.43	1.64	0
						1" Ice			
B13 RRH 4X30	C	From Leg	4.00	0.000	147.00	No Ice	2.06	1.32	0
			0.00			1/2"	2.24	1.48	0
			0.00			Ice	2.43	1.64	0
						1" Ice			
B25 RRH4X30	A	From Leg	4.00	0.000	147.00	No Ice	2.20	1.74	0
			0.00			1/2"	2.39	1.92	0
			0.00			Ice	2.59	2.11	0
						1" Ice			
B25 RRH4X30	B	From Leg	4.00	0.000	147.00	No Ice	2.20	1.74	0
			0.00			1/2"	2.39	1.92	0
			0.00			Ice	2.59	2.11	0
						1" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral					
			ft	ft		ft	ft <sup>2</sup>	ft <sup>2</sup>	K
B25 RRH4X30	C	From Leg	4.00	0.000	147.00	No Ice	2.20	1.74	0
			0.00			1/2"	2.39	1.92	0
			0.00			Ice	2.59	2.11	0
DB-T1-6Z-8AB-0Z	B	From Leg	4.00	0.000	147.00	No Ice	4.80	2.00	0
			0.00			1/2"	5.07	2.19	0
			0.00			Ice	5.35	2.39	0
DB-T1-6Z-8AB-0Z	C	From Leg	4.00	0.000	147.00	No Ice	4.80	2.00	0
			0.00			1/2"	5.07	2.19	0
			0.00			Ice	5.35	2.39	0
Sector Mount [SM 801-3]	C	None		0.000	147.00	1" Ice	20.40	20.40	1
						1/2"	26.30	26.30	1
						Ice	32.20	32.20	2
						1" Ice			

### Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp

Comb. No.	Description
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	159.08 - 139.33	Pole	Max Tension	26	0	0	0
			Max. Compression	26	-18	0	0
			Max. Mx	8	-6	-147	0
			Max. My	14	-6	0	-146
			Max. Vy	8	13	-147	0
			Max. Vx	14	13	0	-146
			Max. Torque	24			-1
L2	139.33 - 91.24	Pole	Max Tension	1	0	0	0
			Max. Compression	26	-28	0	0
			Max. Mx	8	-13	-844	-1
			Max. My	14	-13	-1	-839
			Max. Vy	8	17	-844	-1
			Max. Vx	14	17	-1	-839
			Max. Torque	14			1
L3	91.24 - 44.66	Pole	Max Tension	1	0	0	0
			Max. Compression	26	-44	0	0
			Max. Mx	8	-25	-1719	-1
			Max. My	14	-25	-1	-1708
			Max. Vy	8	22	-1719	-1
			Max. Vx	14	22	-1	-1708
			Max. Torque	14			1
L4	44.66 - 0	Pole	Max Tension	1	0	0	0
			Max. Compression	26	-68	0	0
			Max. Mx	8	-43	-2984	-1
			Max. My	14	-43	-1	-2968
			Max. Vy	8	27	-2984	-1
			Max. Vx	14	27	-1	-2968
			Max. Torque	14			1

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	68	0	0
	Max. H <sub>x</sub>	20	43	27	0
	Max. H <sub>z</sub>	2	43	0	27
	Max. M <sub>x</sub>	2	2967	0	27
	Max. M <sub>z</sub>	8	2984	-27	0
	Max. Torsion	14	1	0	-27
	Min. Vert	17	32	14	-24
	Min. H <sub>x</sub>	8	43	-27	0

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. H <sub>z</sub>	14	43	0	-27
	Min. M <sub>x</sub>	14	-2968	0	-27
	Min. M <sub>z</sub>	20	-2984	27	0
	Min. Torsion	2	-1	0	27

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturing Moment, M <sub>x</sub> kip-ft	Overturing Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	36	0	0	0	0	0
1.2 Dead+1.6 Wind 0 deg - No Ice	43	0	-27	-2967	1	1
0.9 Dead+1.6 Wind 0 deg - No Ice	32	0	-27	-2951	1	1
1.2 Dead+1.6 Wind 30 deg - No Ice	43	14	-24	-2569	-1491	0
0.9 Dead+1.6 Wind 30 deg - No Ice	32	14	-24	-2555	-1483	0
1.2 Dead+1.6 Wind 60 deg - No Ice	43	24	-14	-1483	-2583	0
0.9 Dead+1.6 Wind 60 deg - No Ice	32	24	-14	-1475	-2569	0
1.2 Dead+1.6 Wind 90 deg - No Ice	43	27	0	1	-2984	0
0.9 Dead+1.6 Wind 90 deg - No Ice	32	27	0	1	-2968	0
1.2 Dead+1.6 Wind 120 deg - No Ice	43	24	14	1485	-2585	0
0.9 Dead+1.6 Wind 120 deg - No Ice	32	24	14	1477	-2571	0
1.2 Dead+1.6 Wind 150 deg - No Ice	43	14	24	2571	-1493	-1
0.9 Dead+1.6 Wind 150 deg - No Ice	32	14	24	2557	-1485	-1
1.2 Dead+1.6 Wind 180 deg - No Ice	43	0	27	2968	-1	-1
0.9 Dead+1.6 Wind 180 deg - No Ice	32	0	27	2951	-1	-1
1.2 Dead+1.6 Wind 210 deg - No Ice	43	-14	24	2569	1491	0
0.9 Dead+1.6 Wind 210 deg - No Ice	32	-14	24	2555	1483	0
1.2 Dead+1.6 Wind 240 deg - No Ice	43	-24	14	1483	2583	0
0.9 Dead+1.6 Wind 240 deg - No Ice	32	-24	14	1475	2569	0
1.2 Dead+1.6 Wind 270 deg - No Ice	43	-27	0	-1	2984	0
0.9 Dead+1.6 Wind 270 deg - No Ice	32	-27	0	-1	2967	0
1.2 Dead+1.6 Wind 300 deg - No Ice	43	-24	-14	-1485	2584	0
0.9 Dead+1.6 Wind 300 deg - No Ice	32	-24	-14	-1477	2570	0
1.2 Dead+1.6 Wind 330 deg - No Ice	43	-14	-24	-2571	1493	1
0.9 Dead+1.6 Wind 330 deg - No Ice	32	-14	-24	-2557	1485	1
1.2 Dead+1.0 Ice+1.0 Temp	68	0	0	0	0	0
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	68	0	-7	-726	-1	0
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	68	3	-6	-629	-365	0
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	68	6	-3	-363	-632	0

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 90	68	7	0	0	-730	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 120	68	6	3	363	-632	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 150	68	3	6	629	-365	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 180	68	0	7	727	0	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 210	68	-3	6	629	364	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 240	68	-6	3	364	631	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 270	68	-7	0	1	729	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 300	68	-6	-3	-363	631	0
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 330	68	-3	-6	-629	364	0
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	36	0	-5	-540	0	0
Dead+Wind 30 deg - Service	36	2	-4	-468	-271	0
Dead+Wind 60 deg - Service	36	4	-2	-270	-470	0
Dead+Wind 90 deg - Service	36	5	0	0	-543	0
Dead+Wind 120 deg - Service	36	4	2	270	-471	0
Dead+Wind 150 deg - Service	36	2	4	468	-272	0
Dead+Wind 180 deg - Service	36	0	5	540	0	0
Dead+Wind 210 deg - Service	36	-2	4	468	271	0
Dead+Wind 240 deg - Service	36	-4	2	270	470	0
Dead+Wind 270 deg - Service	36	-5	0	0	543	0
Dead+Wind 300 deg - Service	36	-4	-2	-270	470	0
Dead+Wind 330 deg - Service	36	-2	-4	-468	272	0

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0	-36	0	0	36	0	0.000%
2	0	-43	-27	0	43	27	0.000%
3	0	-32	-27	0	32	27	0.000%
4	14	-43	-24	-14	43	24	0.000%
5	14	-32	-24	-14	32	24	0.000%
6	24	-43	-14	-24	43	14	0.000%
7	24	-32	-14	-24	32	14	0.000%
8	27	-43	0	-27	43	0	0.000%
9	27	-32	0	-27	32	0	0.000%
10	24	-43	14	-24	43	-14	0.000%
11	24	-32	14	-24	32	-14	0.000%
12	14	-43	24	-14	43	-24	0.000%
13	14	-32	24	-14	32	-24	0.000%
14	0	-43	27	0	43	-27	0.000%
15	0	-32	27	0	32	-27	0.000%
16	-14	-43	24	14	43	-24	0.000%
17	-14	-32	24	14	32	-24	0.000%
18	-24	-43	14	24	43	-14	0.000%
19	-24	-32	14	24	32	-14	0.000%
20	-27	-43	0	27	43	0	0.000%
21	-27	-32	0	27	32	0	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
22	-24	-43	-14	24	43	14	0.000%
23	-24	-32	-14	24	32	14	0.000%
24	-14	-43	-24	14	43	24	0.000%
25	-14	-32	-24	14	32	24	0.000%
26	0	-68	0	0	68	0	0.000%
27	0	-68	-7	0	68	7	0.000%
28	3	-68	-6	-3	68	6	0.000%
29	6	-68	-3	-6	68	3	0.000%
30	7	-68	0	-7	68	0	0.000%
31	6	-68	3	-6	68	-3	0.000%
32	3	-68	6	-3	68	-6	0.000%
33	0	-68	7	0	68	-7	0.000%
34	-3	-68	6	3	68	-6	0.000%
35	-6	-68	3	6	68	-3	0.000%
36	-7	-68	0	7	68	0	0.000%
37	-6	-68	-3	6	68	3	0.000%
38	-3	-68	-6	3	68	6	0.000%
39	0	-36	-5	0	36	5	0.000%
40	2	-36	-4	-2	36	4	0.000%
41	4	-36	-2	-4	36	2	0.000%
42	5	-36	0	-5	36	0	0.000%
43	4	-36	2	-4	36	-2	0.000%
44	2	-36	4	-2	36	-4	0.000%
45	0	-36	5	0	36	-5	0.000%
46	-2	-36	4	2	36	-4	0.000%
47	-4	-36	2	4	36	-2	0.000%
48	-5	-36	0	5	36	0	0.000%
49	-4	-36	-2	4	36	2	0.000%
50	-2	-36	-4	2	36	4	0.000%

### Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00015223
3	Yes	4	0.00000001	0.00009590
4	Yes	5	0.00000001	0.00007538
5	Yes	5	0.00000001	0.00003336
6	Yes	5	0.00000001	0.00007338
7	Yes	5	0.00000001	0.00003236
8	Yes	4	0.00000001	0.00005902
9	Yes	4	0.00000001	0.00003517
10	Yes	5	0.00000001	0.00007239
11	Yes	5	0.00000001	0.00003187
12	Yes	5	0.00000001	0.00007634
13	Yes	5	0.00000001	0.00003379
14	Yes	4	0.00000001	0.00015968
15	Yes	4	0.00000001	0.00010060
16	Yes	5	0.00000001	0.00007221
17	Yes	5	0.00000001	0.00003182
18	Yes	5	0.00000001	0.00007433
19	Yes	5	0.00000001	0.00003284
20	Yes	4	0.00000001	0.00006506
21	Yes	4	0.00000001	0.00003912
22	Yes	5	0.00000001	0.00007582
23	Yes	5	0.00000001	0.00003353
24	Yes	5	0.00000001	0.00007177
25	Yes	5	0.00000001	0.00003160
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00085378
28	Yes	4	0.00000001	0.00096104
29	Yes	4	0.00000001	0.00096191
30	Yes	4	0.00000001	0.00086043
31	Yes	4	0.00000001	0.00096056



32	Yes	4	0.0000001	0.00096367
33	Yes	4	0.0000001	0.00085548
34	Yes	4	0.0000001	0.00095619
35	Yes	4	0.0000001	0.00095892
36	Yes	4	0.0000001	0.00085652
37	Yes	4	0.0000001	0.00095918
38	Yes	4	0.0000001	0.00095254
39	Yes	4	0.0000001	0.00000796
40	Yes	4	0.0000001	0.00002641
41	Yes	4	0.0000001	0.00002385
42	Yes	4	0.0000001	0.00000570
43	Yes	4	0.0000001	0.00002293
44	Yes	4	0.0000001	0.00002762
45	Yes	4	0.0000001	0.00000801
46	Yes	4	0.0000001	0.00002281
47	Yes	4	0.0000001	0.00002495
48	Yes	4	0.0000001	0.00000571
49	Yes	4	0.0000001	0.00002675
50	Yes	4	0.0000001	0.00002248

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	159.08 - 139.33	11.17	42	0.753	0.002
L2	142.34 - 91.24	8.65	42	0.672	0.001
L3	96.3 - 44.66	3.55	42	0.377	0.000
L4	51.49 - 0	0.96	42	0.175	0.000

### Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	(2) 7334.02B w/ Mount Pipe	42	11.16	0.753	0.002	26363
147.00	QUAD656C0000X w/ Mount Pipe	42	9.32	0.696	0.001	10912

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	159.08 - 139.33	61.38	8	4.134	0.011
L2	142.34 - 91.24	47.50	8	3.692	0.004
L3	96.3 - 44.66	19.53	8	2.070	0.001
L4	51.49 - 0	5.25	8	0.961	0.000

### Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	(2) 7334.02B w/ Mount Pipe	8	61.31	4.132	0.011	4856
147.00	QUAD656C0000X w/ Mount Pipe	8	51.23	3.825	0.006	2009

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	$L_u$ ft	$KI/r$	A in <sup>2</sup>	$P_u$ K	$\phi P_n$ K	Ratio $\frac{P_u}{\phi P_n}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	19.75	0.00	0.0	13.717	-6	961	0.006
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	51.10	0.00	0.0	38.120	-13	2669	0.005
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	51.64	0.00	0.0	61.957	-25	4156	0.006
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	51.49	0.00	0.0	82.240	-43	4820	0.009

### Pole Bending Design Data

Section No.	Elevation ft	Size	$M_{ux}$ kip-ft	$\phi M_{nx}$ kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	$M_{uy}$ kip-ft	$\phi M_{ny}$ kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	147	455	0.322	0	455	0.000
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	844	2109	0.400	0	2109	0.000
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	1719	4451	0.386	0	4451	0.000
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	2984	6865	0.435	0	6865	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V_u$ K	$\phi V_n$ K	Ratio $\frac{V_u}{\phi V_n}$	Actual $T_u$ kip-ft	$\phi T_n$ kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	13	480	0.028	0	911	0.000
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	17	1335	0.013	0	4223	0.000
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	22	2078	0.011	0	8914	0.000
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	27	2410	0.011	0	13747	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	159.08 - 139.33 (1)	0.006	0.322	0.000	0.028	0.000	0.330	1.000	4.8.2 ✓
L2	139.33 - 91.24 (2)	0.005	0.400	0.000	0.013	0.000	0.405	1.000	4.8.2 ✓

159.08 Ft Monopole Tower Structural Analysis  
 Project Number 1304828, Application 359309, Revision 4

Section No.	Elevation ft	Ratio $P_u$	Ratio $M_{ux}$	Ratio $M_{uy}$	Ratio $V_u$	Ratio $T_u$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\phi P_n$	$\phi M_{nx}$	$\phi M_{ny}$	$\phi V_n$	$\phi T_n$			
L3	91.24 - 44.66 (3)	0.006	0.386	0.000	0.011	0.000	0.392	1.000	4.8.2 ✓
L4	44.66 - 0 (4)	0.009	0.435	0.000	0.011	0.000	0.444	1.000	4.8.2 ✓

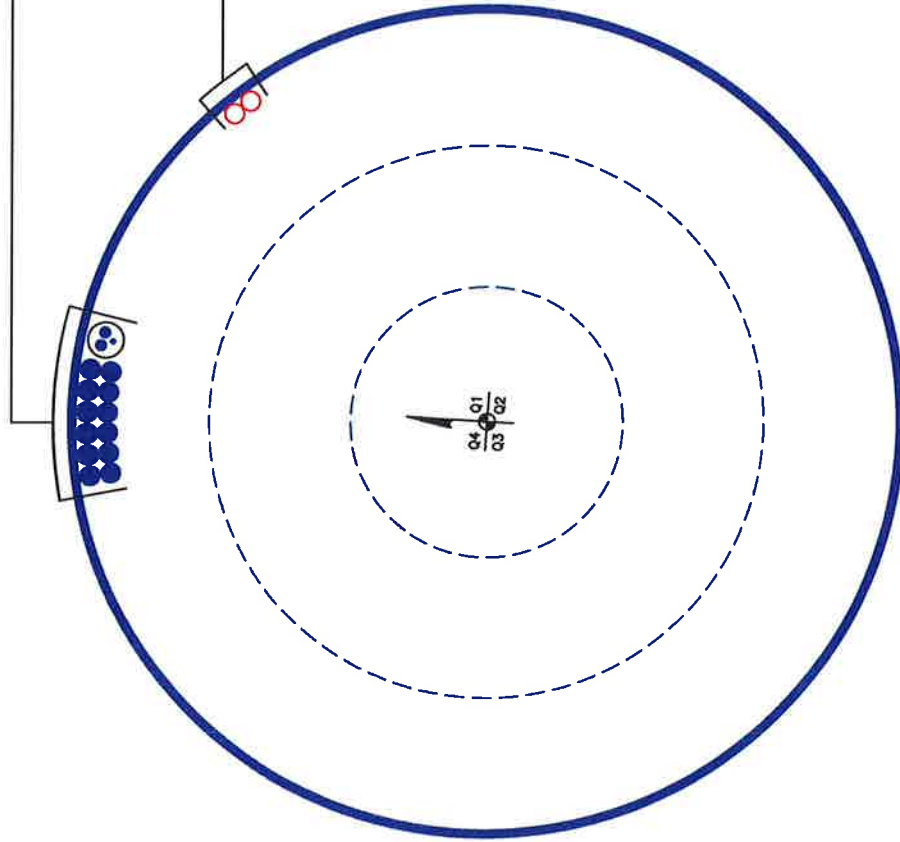
### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ K	% Capacity	Pass Fail
L1	159.08 - 139.33	Pole	TP24.1x18.43x0.188	1	-6	961	33.0	Pass
L2	139.33 - 91.24	Pole	TP40.49x22.861x0.313	2	-13	2669	40.5	Pass
L3	91.24 - 44.66	Pole	TP54.61x38.119x0.375	3	-25	4156	39.2	Pass
L4	44.66 - 0	Pole	TP69.47x51.679x0.375	4	-43	4820	44.4	Pass
Summary								
Pole (L4)							44.4	Pass
<b>RATING =</b>							<b>44.4</b>	<b>Pass</b>

**APPENDIX B**  
**BASE LEVEL DRAWING**



(INSTALLED-IN CONDUIT)  
(1) 3/8" TO 159 FT LEVEL  
(2) 7/8" TO 159 FT LEVEL  
(INSTALLED)  
(12) 1-5/8" TO 159 FT LEVEL



(PROPOSED)  
(2) 1-5/8" TO 147 FT LEVEL

**APPENDIX C**  
**ADDITIONAL CALCULATIONS**

# Mapped Pole Dimensions

BU #: 857011

Site Name: WESTBROOK NORTH HORSE HILL ROA

App No.: 359309 Rev. 4

Dimension Given:	<b>Width Across Flats</b>
Bottom Dimension of Each Section Given?	<b>Yes</b>
Number of Sections:	<b>4</b>

Number of Sides:	<b>18</b>
Width Across Flats at Top (in):	<b>3.25</b>

## Dimensions from Mapping

Section	Mapped Length (ft)	Thickness (in)	Width Across Flats at Bottom of Section (in.)
1	19.75	0.1875	4.3
2	48.08	0.3125	7.1
3	46.58	0.375	9.6
4	44.66	0.375	12.3

## tnxTower Geometry Inputs

Section Length (ft)	Lap Splice Length (ft)	Top Diameter (in)	Bottom Diameter (in)
19.75	3.01	18.43	24.10
51.10	5.06	-	40.49
51.64	6.83	-	54.61
51.49	-	-	69.47

## Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F / G

- Assumptions:**
- 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
  - 2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
  - 3) Clear space between bottom of leveling nut and top of concrete **not** exceeding  $(1) \times (\text{Rod Diameter})$

### Site Data

BU#: 857011

Site Name: WESTBROOK NORTH HORS

App #: 359309 Rev. 4

### Anchor Rod Data

Eta Factor, $\eta$	0.5	TIA G (Fig. 4-4)
Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, $F_y$ :	75	ksi
Strength, $F_u$ :	100	ksi
Bolt Circle:	78.97	in
Anchor Spacing:	6	in

### Plate Data

W=Side:	86.209	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	6	in

### Stiffener Data (Welding at both sides)

Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

### Pole Data

Diam:	69.47	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

### Base Reactions

TIA Revision:	G	
Factored Moment, $M_u$ :	2984	ft-kips
Factored Axial, $P_u$ :	43	kips
Factored Shear, $V_u$ :	27	kips

### Anchor Rod Results

TIA G --> Max Rod ( $C_u + V_u/\eta$ ): 95.5 Kips  
 Axial Design Strength,  $\Phi * F_u * A_{net}$ : 260.0 Kips  
 Anchor Rod Stress Ratio: 36.7% **Pass**

### Base Plate Results

Base Plate Stress: 14.8 ksi  
 PL Design Bending Strength,  $\Phi * F_y$ : 45.0 ksi  
 Base Plate Stress Ratio: 32.9% **Pass**

### Flexural Check

### PL Ref. Data

Yield Line (in):	52.45
Max PL Length:	52.45

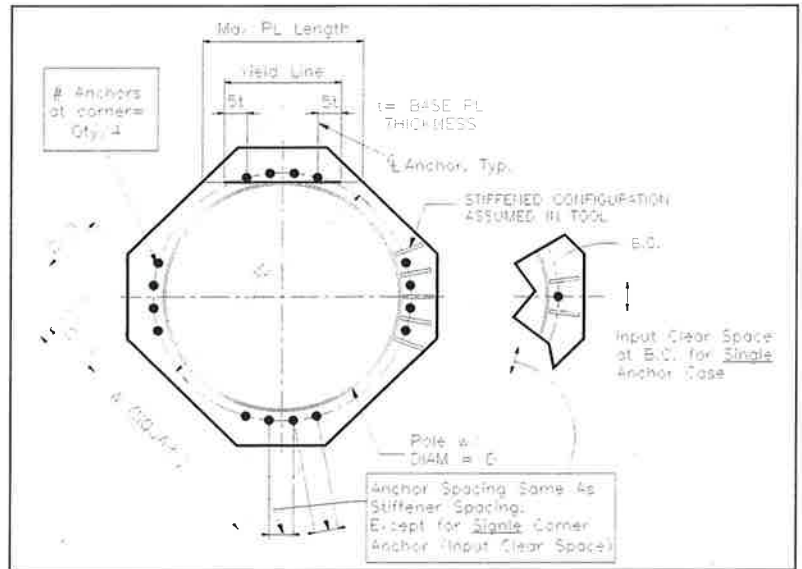
### N/A - Unstiffened

### Stiffener Results

Horizontal Weld : N/A  
 Vertical Weld: N/A  
 Plate Flex+Shear,  $f_b/F_b + (f_v/F_v)^2$ : N/A  
 Plate Tension+Shear,  $f_t/F_t + (f_v/F_v)^2$ : N/A  
 Plate Comp. (AISC Bracket): N/A

### Pole Results

Pole Punching Shear Check: N/A



\*\* Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes



# Monopole Pier and Pad Foundation

BU #: 857011  
 Site Name: WESTBROOK NORTH HOR  
 App. Number: 359309 Rev.4



TIA-222 Revision: **G**

Design Reactions		
Shear, <b>S:</b>	27	kips
Moment, <b>M:</b>	2984	ft-kips
Tower Height, <b>H:</b>	159.1	ft
Tower Weight, <b>Wt:</b>	43	kips
Base Diameter, <b>BD:</b>	5.78	ft

Foundation Dimensions		
Depth, <b>D:</b>	8	ft
Pad Width, <b>W:</b>	28	ft
Neglected Depth, <b>N:</b>	5	ft
Thickness, <b>T:</b>	3.00	ft
Pier Diameter, <b>Pd:</b>	9.00	ft
Ext. Above Grade, <b>E:</b>	0.50	ft
BP Dist. Above Pier:	4.5	in.
Clear Cover, <b>Cc:</b>	3.0	in

Soil Properties		
Soil Unit Weight, <b>γ:</b>	0.130	kcf
Ult. Bearing Capacity, <b>Bc:</b>	12.0	ksf
Angle of Friction, <b>Φ:</b>	38	deg
Cohesion, <b>Co:</b>	0.000	ksf
Passive Pressure, <b>Pp:</b>	0.000	ksf
Base Friction, <b>μ:</b>	0.35	

Material Properties		
Rebar Yield Strength, <b>Fy:</b>	60000	psi
Concrete Strength, <b>F'c:</b>	3000	psi
Concrete Unit Weight, <b>δc:</b>	0.150	kcf
Seismic Zone, <b>z:</b>	1	

Rebar Properties		
Pier Rebar Size, <b>Sp:</b>	10	
Pier Rebar Quantity, <b>mp:</b>	37	37
Pad Rebar Size, <b>Spad:</b>	6	
Pad Rebar Quantity, <b>mpad:</b>	25	25
Pier Tie Size, <b>St:</b>	3	3
Tie Quantity, <b>mt:</b>	6	6

Design Checks			
	Capacity/Availability	Demand/Limits	Check
<i>Req'd Pier Diam. (ft)</i>	9	7.78	OK
<i>Overtuning (ft-kips)</i>	11598.86	2984.00	25.7%
<i>Shear Capacity (kips)</i>	281.39	27.00	9.6%
<i>Bearing (ksf)</i>	9.00	1.97	21.9%
<i>Pad Shear - 1-way (kips)</i>	900.62	386.00	42.9%
<i>Pad Shear - 2-way (kips)</i>	2368.34	124.11	5.2%
<i>Pad Moment Capacity (k-ft)</i>	1595.87	928.05	58.2%
<i>Pier Moment Capacity (k-ft)</i>	9853.53	3132.50	31.8%

# Maximum Allowable Moment of a Circular Pier

Axial Load (Negative for Compression) =  kips

<u>Pier Properties</u>		<u>Material Properties</u>	
<b>Concrete:</b>		Concrete compressive strength =	<input type="text" value="3000"/> psi
Pier Diameter =	<input type="text" value="9.0"/> ft	Reinforcement yield strength =	<input type="text" value="60000"/> psi
Concrete Area =	9160.9 in <sup>2</sup>	Modulus of elasticity =	<input type="text" value="29000"/> ksi
<b>Reinforcement:</b>		Reinforcement yield strain =	0.00207
Clear Cover =	<input type="text" value="3.00"/> in	Limiting compressive strain =	<input type="text" value="0.003"/>
Cage Diameter =	8.39 ft	<b><u>Seismic Properties</u></b>	
Bar Size =	<input type="text" value="10"/>	Seismic Zone =	<input type="text" value="1"/>
Bar Diameter =	1.27 in		
Bar Area =	1.27 in <sup>2</sup>		
Number of Bars =	<input type="text" value="37"/>		

## Minimum Area of Steel

Required area of steel = 45.80 in<sup>2</sup>

Provided area of steel = 46.99 in<sup>2</sup>

OK

## Axial Loading

Load factor =

Reduction factor = 0.9

Factored axial load = -47.7778 kips

## Neutral Axis

Distance from extreme edge to neutral axis = 15.76 in

Equivalent compression zone factor = 0.85

Distance from extreme edge to equivalent compression zone factor = 13.39 in

Distance from centroid to neutral axis = 38.24 in

## Compression Zone

Area of steel in compression zone = 8.89 in<sup>2</sup>

Angle from centroid of pier to intersection of equivalent compression zone and edge of pier = 41.24 deg

Area of concrete in compression = 653.28 in<sup>2</sup>

Force in concrete = 0.85 \* f<sub>c</sub> \* Acc = 1665.86 kips

Total reinforcement forces = -1618.08 kips

Factored axial load = -47.78 kips

Force in concrete = -1665.86 kips

Sum of the forces in concrete = 0.00 kips

OK

## Maximum Moment

First moment of the concrete

area in compression about the centroid = 30067.60 in<sup>3</sup>

Distance between centroid of concrete in compression and centroid of pier = 46.03 in

Moment of concrete in compression = 76672.39 in-kips

Total reinforcement moment = 54708.04 in-kips

Nominal moment strength of column = 131380.44 in-kips

Factored moment strength of column = 118242.39 in-kips

**Maximum Allowable Moment =  ft-kips**

**Individual Bars**

Bar #	Angle from first bar (deg)	Distance to centroid (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compressi on (in^2)	Stress (ksi)	Axial force (kips)
1	0.00	0.00	-38.24	-40.61	-0.0072817	0.00	-60.00	-76.20
2	9.73	8.51	-29.73	-32.10	-0.0056611	0.00	-60.00	-76.20
3	19.46	16.78	-21.47	-23.83	-0.004087	0.00	-60.00	-76.20
4	29.19	24.56	-13.68	-16.04	-0.0026049	0.00	-60.00	-76.20
5	38.92	31.64	-6.60	-8.97	-0.0012573	0.00	-36.46	-46.31
6	48.65	37.81	-0.44	-2.80	-8.306E-05	0.00	-2.41	-3.06
7	58.38	42.89	4.64	2.28	0.0008841	1.27	25.64	29.32
8	68.11	46.73	8.49	6.13	0.0016164	1.27	46.87	56.29
9	77.84	49.23	10.99	8.63	0.0020927	1.27	60.00	72.96
10	87.57	50.32	12.08	9.71	0.0022992	1.27	60.00	72.96
11	97.30	49.96	11.71	9.35	0.0022302	1.27	60.00	72.96
12	107.03	48.16	9.91	7.55	0.0018875	1.27	54.74	66.28
13	116.76	44.97	6.73	4.36	0.0012811	1.27	37.15	43.94
14	126.49	40.49	2.25	-0.11	0.0004283	0.00	12.42	15.77
15	136.22	34.85	-3.39	-5.76	-0.0006463	0.00	-18.74	-23.80
16	145.95	28.20	-10.04	-12.40	-0.0019118	0.00	-55.44	-70.41
17	155.68	20.75	-17.50	-19.86	-0.0033317	0.00	-60.00	-76.20
18	165.41	12.69	-25.55	-27.92	-0.0048653	0.00	-60.00	-76.20
19	175.14	4.27	-33.97	-36.34	-0.0064684	0.00	-60.00	-76.20
20	184.86	-4.27	-42.52	-44.88	-0.008095	0.00	-60.00	-76.20
21	194.59	-12.69	-50.93	-53.30	-0.0096981	0.00	-60.00	-76.20
22	204.32	-20.75	-58.99	-61.35	-0.0112317	0.00	-60.00	-76.20
23	214.05	-28.20	-66.45	-68.81	-0.0126516	0.00	-60.00	-76.20
24	223.78	-34.85	-73.09	-75.46	-0.0139171	0.00	-60.00	-76.20
25	233.51	-40.49	-78.74	-81.10	-0.0149917	0.00	-60.00	-76.20
26	243.24	-44.97	-83.22	-85.58	-0.0158445	0.00	-60.00	-76.20
27	252.97	-48.16	-86.40	-88.76	-0.016451	0.00	-60.00	-76.20
28	262.70	-49.96	-88.20	-90.56	-0.0167936	0.00	-60.00	-76.20
29	272.43	-50.32	-88.56	-90.93	-0.0168627	0.00	-60.00	-76.20
30	282.16	-49.23	-87.48	-89.84	-0.0166561	0.00	-60.00	-76.20
31	291.89	-46.73	-84.98	-87.34	-0.0161798	0.00	-60.00	-76.20
32	301.62	-42.89	-81.13	-83.49	-0.0154475	0.00	-60.00	-76.20
33	311.35	-37.81	-76.05	-78.41	-0.0144803	0.00	-60.00	-76.20
34	321.08	-31.64	-69.88	-72.25	-0.0133061	0.00	-60.00	-76.20
35	330.81	-24.56	-62.81	-65.17	-0.0119585	0.00	-60.00	-76.20
36	340.54	-16.78	-55.02	-57.39	-0.0104764	0.00	-60.00	-76.20
37	350.27	-8.51	-46.76	-49.12	-0.0089024	0.00	-60.00	-76.20

# USGS Design Maps Summary Report

## User-Specified Input

**Building Code Reference Document** 2012/2015 International Building Code  
(which utilizes USGS hazard data available in 2008)

**Site Coordinates** 41.3238°N, 72.4911°W

**Site Soil Classification** Site Class D – “Stiff Soil”

**Risk Category** I/II/III

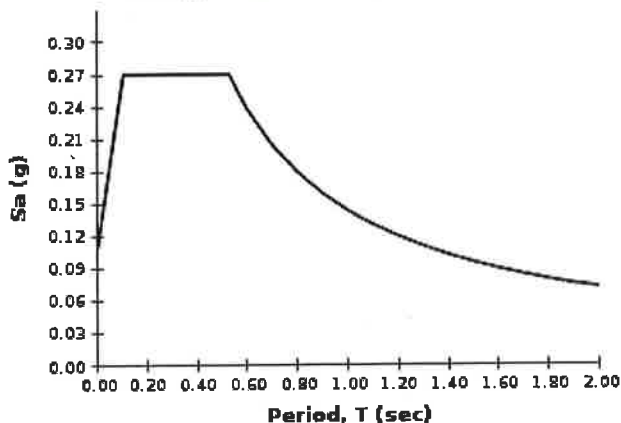


## USGS-Provided Output

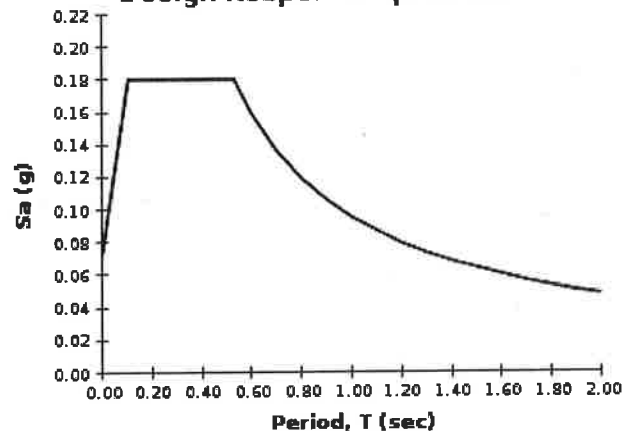
$$\begin{array}{lll}
 S_s = 0.169 \text{ g} & S_{MS} = 0.270 \text{ g} & S_{DS} = 0.180 \text{ g} \\
 S_1 = 0.060 \text{ g} & S_{M1} = 0.143 \text{ g} & S_{D1} = 0.095 \text{ g}
 \end{array}$$

For information on how the  $S_s$  and  $S_1$  values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the “2009 NEHRP” building code reference document.

**MCE<sub>R</sub> Response Spectrum**



**Design Response Spectrum**



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

# CCISeismic - Design Category

Per 2012/2015 IBC

Site BU: 857011  
 Work Order: 1304828  
 Application: 359309 Rev. 4



	Degrees	Minutes	Seconds		
Site Latitude =	41	19	25.71	41.3238	degrees
Site Longitude =	-72	29	28.10	-72.4911	degrees
Ground Supported Structure =	Yes				
Structure Class =	II				(Table 2-1)
Site Class =	D - Stiff Soil				(Table 2-11)

Spectral response acceleration short periods, $S_s$ =	0.169	USGS Seismic Tool
Spectral response acceleration 1 s period, $S_1$ =	0.060	

Importance Factor, $I$ =	1.0	(Table 2-3)
Acceleration-based site coefficient, $F_a$ =	1.6	(Table 2-12)
Velocity-based site coefficient, $F_v$ =	2.4	(Table 2-13)

Design spectral response acceleration short period, $S_{DS}$ =	0.180	(2.7.6)
Design spectral response acceleration 1 s period, $S_{D1}$ =	0.096	(2.7.6)

Seismic Design Category - Short Period Response =	B	ASCE 7-05 Table 11.6-1
Seismic Design Category - 1s Period Response =	B	ASCE 7-05 Table 11.6-2

Worst Case Seismic Design Category =	B	ASCE 7-05 Tables 11.6-1 and 6-2
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# **ATTACHMENT 5**



# ATTACHMENT 6



June 7, 2017

*Via Certificate of Mailing*

Noel Bishop, First Selectman  
Town of Westbrook  
866 Boston Post Road  
Westbrook, CT 06498

Re: **Proposed Shared Use of an Existing Telecommunications Facility at 1102 Horse Hill Road, Westbrook, Connecticut**

Dear First Selectman Bishop:

This firm represents Cellco Partnership d/b/a Verizon Wireless (“Cellco”). Today, Cellco filed a Sub-Petition for Declaratory Ruling (“Sub-Petition”) with the Connecticut Siting Council (“Council”) seeking approval for shared use of an existing telecommunications facility at 1102 Horse Hill Road in Westbrook (the “Property”). Cellco intends to install twelve (12) antennas and nine (9) remote radio heads on an antenna platform at a height of 147 feet above ground level. Equipment associated with Cellco’s antennas and a back-up generator will be located on a 9’-4” x 16’ steel platform located within the facility compound, near the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

Noel Bishop, First Selectman  
June 7, 2017  
Page 2

**Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.**

Please contact me if you have any questions regarding this proposal.

Sincerely,



Kenneth C. Baldwin

Attachment

June 7, 2017

*Via Certificate of Mailing*

Meg Parulis, Town Planner  
Town of Westbrook  
866 Boston Post Road  
Westbrook, CT 06498

Re: **Proposed Shared Use of an Existing Telecommunications Facility at 1102 Horse Hill Road, Westbrook, Connecticut**

Dear Ms. Parulis:

This firm represents Cellco Partnership d/b/a Verizon Wireless (“Cellco”). Today, Cellco filed a Sub-Petition for Declaratory Ruling (“Sub-Petition”) with the Connecticut Siting Council (“Council”) seeking approval for shared use of an existing telecommunications facility at 1102 Horse Hill Road in Westbrook (the “Property”). Cellco intends to install twelve (12) antennas and nine (9) remote radio heads on an antenna platform at a height of 147 feet above ground level. Equipment associated with Cellco’s antennas and a back-up generator will be located on a 9’-4” x 16’ steel platform located within the facility compound, near the base of the tower.

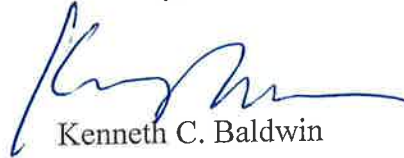
As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

Meg Parulis, Town Planner  
June 7, 2017  
Page 2

**Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.**

Please contact me if you have any questions regarding this proposal.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Ken Baldwin', with a long horizontal flourish extending to the right.

Kenneth C. Baldwin

Attachment

June 7, 2017

*Via Certificate of Mailing*

Norwich RC Diocesan Corp.  
c/o Resurrection Cemetery  
815 Boswell Avenue  
Norwich, CT 06360

Re: **Proposed Shared Use of an Existing Telecommunications Facility at 1102 Horse Hill Road, Westbrook, Connecticut**

Dear Sir or Madam:

This firm represents Cellco Partnership d/b/a Verizon Wireless (“Cellco”). Today, Cellco filed a Sub-Petition for Declaratory Ruling (“Sub-Petition”) with the Connecticut Siting Council (“Council”) seeking approval for shared use of an existing telecommunications facility at 1102 Horse Hill Road in Westbrook (the “Property”). Cellco intends to install twelve (12) antennas and nine (9) remote radio heads on an antenna platform at a height of 147 feet above ground level. Equipment associated with Cellco’s antennas and a back-up generator will be located on a x 9’-4” x 16’ steel platform located within the facility compound, near the base of the tower.


As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

Norwich RC Diocesan Corp.  
June 7, 2017  
Page 2

**Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.**

Please contact me if you have any questions regarding this proposal.

Sincerely,



Kenneth C. Baldwin

Attachment

June 7, 2017

*Via Electronic Mail*  
*(Heather.hilton@crowncastle.com)*

Heather Hilton  
Crown Castle  
3530 Toringdon Way, Suite 300  
Charlott, NC 28277

Re: **Proposed Shared Use of an Existing Telecommunications Facility at 1102 Horse Hill Road, Westbrook, Connecticut**

Dear Ms. Hilton:

This firm represents Cellco Partnership d/b/a Verizon Wireless (“Cellco”). Today, Cellco filed a Sub-Petition for Declaratory Ruling (“Sub-Petition”) with the Connecticut Siting Council (“Council”) seeking approval for shared use of an existing telecommunications facility at 1102 Horse Hill Road in Westbrook (the “Property”). Cellco intends to install twelve (12) antennas and nine (9) remote radio heads on an antenna platform at a height of 147 feet above ground level. Equipment associated with Cellco’s antennas and a back-up generator will be located on a 9’-4” x 16’ steel platform located within the facility compound, near the base of the tower.

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Heather Hilton  
June 7, 2017  
Page 2

**Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.**

Please contact me if you have any questions regarding this proposal.

Sincerely,



Kenneth C. Baldwin

Attachment



# **ATTACHMENT 7**

KENNETH C. BALDWIN

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 7, 2017

*Via Certificate of Mailing*

«Name\_and\_Address»

**Re: Proposed Shared Use of an Existing Telecommunications Facility at 1102 Horse Hill Road, Westbrook, Connecticut**

Dear «Salutation»:

This firm represents Cellco Partnership d/b/a Verizon Wireless (“Cellco”). Today, Cellco filed a Sub-Petition for Declaratory Ruling (“Sub-Petition”) with the Connecticut Siting Council (“Council”) seeking approval for shared use of an existing telecommunications facility at 1102 Horse Hill Road in Westbrook (the “Property”). Cellco intends to install twelve (12) antennas and nine (9) remote radio heads on an antenna platform at a height of 147 feet above ground level. Equipment associated with Cellco’s antennas and a back-up generator will be located on a 9’-4” x 16’ steel platform located within the facility compound, near the base of the tower.

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June 7, 2017  
Page 2

**Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.**

This notice is being sent to you because you are listed as an owner of land that abuts the Property. If you have any questions regarding the Sub-Petition, the Council's process for reviewing the Sub-Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact the Council directly at 860-827-2935.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth C. Baldwin". The signature is fluid and cursive, with a long horizontal stroke at the end.

Kenneth C. Baldwin

Attachment

**CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS**

**ABUTTERS LIST**

**1102 HORSE HILL ROAD  
WESTBROOK, CONNECTICUT**

	<u>Property Address</u>	<u>Owner and Mailing Address</u>
1.	80 Old Horse Hill Road	Clifford P. and Ann Marie Mott 80 Old Horse Hill Road Westbrook, CT 06498
2.	56 Old Horse Hill Road	Kerry E. Knobelsdorff, Esq. and Frances Picchioni Frances J. PiccLoni P.O. Box 809 Old Saybrook, CT 06475
3.	3 Old Horse Hill Road	Nancy B. Pytlik 3 Old Horse Hill Road Westbrook, CT 06498
4.	Horse Hill Road	Connecticut Light and Power P.O. Box 270 Hartford, CT 06141
5.	Horse Hill Road	Town of Westbrook 866 Boston Post Road Westbrook, CT 06498
6.	1135 Horse Hill Road	Cynthia L. and David S. Cahill 1135 Horse Hill Road Westbrook, CT 06498
7.	1129 Horse Hill Road	Terry H. Berg 1129 Horse Hill Road Westbrook, CT 06498
8.	1115 Horse Hill Road	Michael S. Kurjan 1115 Horse Hill Road Westbrook, CT 06498
9.	1109 Horse Hill Road	Adelard Lemelin and Heather MacCulloch 974 Essex Road Westbrook, CT 06498

	<u>Property Address</u>	<u>Owner and Mailing Address</u>
10.	1080 Horse Hill Road	Jeffrey T. Casula 1080 Horse Hill Road Westbrook, CT 06498
11.	1072 Horse Hill Road	Moira McKay 1072 Horse Hill Road Westbrook, CT 06498
12.	1050 Horse Hill Road	Michael and Mary Lou Woynar 1050 Horse Hill Road Westbrook, CT 06498
13.	Horse Hill Road	Matthew Canova and Alberta H. Winninger Essex Savings Bank P.O. Box 950 Essex, CT 06426
14.	1000 Horse Hill Road	Kevin and Patricia Brown 122 Meadowlark Lane Westbrook, CT 06498
15.	122 Meadowlark Lane	John E. Taylor 122 Meadowlark Lane Westbrook, CT 06498
16.	120 Meadowlark Lane	Terence M. and Karen C. Morris 120 Meadowlark Lane Westbrook, CT 06498
17.	114 Meadowlark Lane	Robert and Patrick J. Braley and Cherie A. St. Arnauld P.O. Box 246 Centerbrook, CT 06409
18.	98 Meadowlark Lane	Joseph and Katherine A. Selvaggio 98 Meadowlark Lane Westbrook, CT 06498
19.	76 Meadowlark Lane	Donna J. and Joseph W. Rand III 76 Meadowlark Lane Westbrook, CT 06498
20.	623 West Pond Meadow Road	Peter I. and Lola M. Bullenkamp 623 West Pond Meadow Road Westbrook, CT 06498

	<u>Property Address</u>	<u>Owner and Mailing Address</u>
21.	639 West Pond Meadow Road	Laramie Trent 639 West Pond Meadow Road Westbrook, CT 06498
22.	667 West Pond Meadow Road	Robert T. Riley and Muriel P. McGee 667 West Pond Meadow Road Westbrook, CT 06498
23.	675 West Pond Meadow Road	Michael W. Bromson 675 West Pond Meadow Road Westbrook, CT 06498
24.	69 Christina Lane	Neil Eric Hansen 69 Christina Lane Westbrook, CT 06498
25.	West Pond Meadow Road	Connecticut Light and Power P.O. Box 270 Hartford, CT 06141
26.	49 Christina Lane	Donald A. and David W. Becker 49 Christina Lane Westbrook, CT 06498
27.	7 Christina Lane	Robert Scott and Amy Marie Hollis 7 Christina Lane Westbrook, CT 06498
28.	Horse Hill Road	Norwich RC Diocesan Corp. Resurrection Cemetery 815 Boswell Avenue Norwich, CT 06360