Robinson+Cole

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Also admitted in Massachusetts

January 7, 2015

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

Re: **Notice of Exempt Modification – Antenna Swap**
54 Waterbury Road, Prospect, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 135-foot level of the existing 160-foot guyed-lattice tower at 54 Waterbury Road in Prospect, Connecticut (the "Property"). The tower is owned by Charles E. Bradshaw. The Council approved Cellco's shared use of this tower in 2006.[1]

Cellco now intends to modify its 54 Waterbury Road facility by replacing six (6) of its existing antennas with two (2) model SWCP 2x5514, 850 MHz antennas; one (1) model LNX-8514DS-VTM, 850 MHz antenna; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same 135-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and two (2) HYBRIFLEX™ antenna cables. Included in Attachment 1 are specifications for the replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Robert Chatfield, Mayor for the Town of Prospect. A copy of this letter is being sent to Charles E. and Averyll B. Bradshaw, the owners of the Property.

[1] On June 18, 2013, the Council approved Cellco's EM-VER-115-130524 filing. The antenna modification work approved in EM-VER-115-130524 was not completed.

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The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas will be located at the 135-foot level on the 160-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table for Cellco's modified facility is included behind Tab 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Report attached behind Tab 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Robert Chatfield, Prospect Mayor
Charles E. and Averyll B. Bradshaw
Sandy M. Carter

ATTACHMENT 1

Swedcom

SWCP 2x5514

698 - 896 MHz Dual (2x) CP log-periodic antenna

Features

- Transmit Diversity Gain
- Can be configured to combine space & polarization diversity
- Outstanding performance over the entire band (698 - 896 MHz)
- Excellent Axial Ratio
- Optimized for 4G & 3G systems
- Low intermodulation
- Improved Side-to-side rejection
- Fading reduction
- Excellent isolation between ports

Electrical specifications

Frequency range:	**698-896 MHz**	
Impedance:	**50 ohm**	
Connector type:	**7/16 Din**	
Return loss:	**18 dB**	
Polarization:	**Circular**	
Gain ea. port [Circular]:	**2x14 dBdC**	
Gain ea. port [Linear]:	**2x11 dBdL**	
Axial Ratio:	**2 dB**	
Isolation between ports (TX band):	**30 dB**	
Front-to-back ratio:	**30 dB**	
Intermodulation (2x20W):	**IM3**	**150 dB**
	IM5	**160 dB**
	IM7/9	**170 dB**
Power rating:	**2x 500 W**	
H-plane (-3 dB point):	**2x 55°**	
V-plane (-3 dB point):	**2x 16°**	
Lightning protection:	**DC grounded**	

Mechanical specifications

Overall height:	**51.9 in**	**[1318 mm]**
Width:	**13.9 in**	**[353 mm]**
Depth:	**11.3 in**	**[287 mm]**
Weight (excluding brackets):	**20 lbs**	**[9 Kg]**
Wind load measured up to:	**150 mph**	**[240 Km/h]**
Wind area (front of antenna):	**5.01 sq. ft.**	**[0.46 sq.m]**
Lateral thrust at 113 mph/ 180 Km/h (worst case):	**256 lbs**	**[1138 N]**

Materials

Radiating Elements:	**Aluminum**
Transformer (Power distribution)	**Ceramic PCB**
Chassis:	**Aluminum**
Radome:	**Grey Fiberglass/PVC**
Mounting bolts:	**Stainless steel**

The SWCP 2x5514 is made in the U.S.A.

Product Specifications

COMMSCOPE®

LNX-8514DS-VTM

Andrew® Teletilt® Antenna, 698–896 MHz, 85° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain by all Beam Tilts, average, dBi	15.7	16.2
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.2
Gain by Beam Tilt, average, dBi	0 ° | 15.7 4 ° | 15.7 8 ° | 15.5	0 ° | 16.3 4 ° | 16.3 8 ° | 16.1
Beamwidth, Horizontal, degrees	85	84
Beamwidth, Horizontal Tolerance, degrees	±1.2	±1.3
Beamwidth, Vertical, degrees	8.6	7.8
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4
Beam Tilt, degrees	0–8	0–8
USLS, dB	20	22
Front-to-Back Total Power at 180° ± 30°, dB	22	23
CPR at Boresight, dB	18	18
CPR at Sector, dB	12	11
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

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

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	879.0 N @ 150 km/h 197.6 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	2449.0 mm x 301.0 mm x 181.0 mm | 96.4 in x 11.9 in x 7.1 in
Net Weight	23.1 kg | 50.9 lb
Model with factory installed AISG 2.0 RET	LNX-8514DS-A1M

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

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

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°

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

Mechanical Specifications

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

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

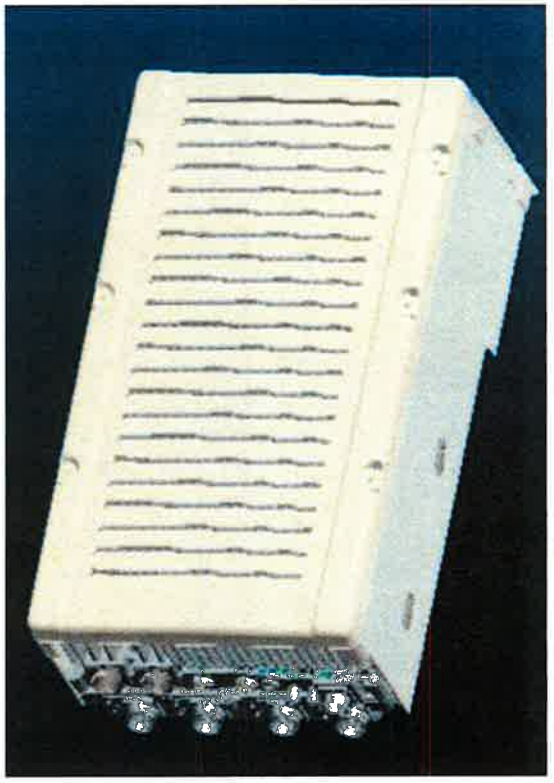
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version 1900A HW version	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**

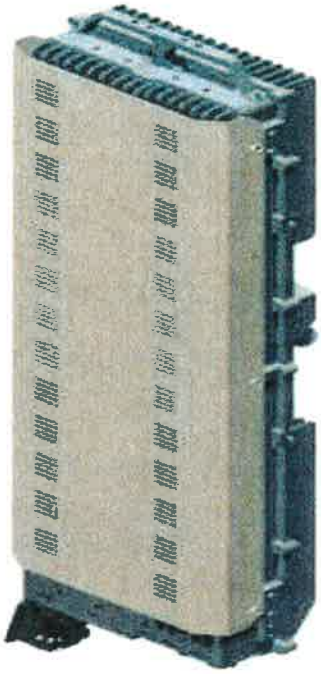


**- Includes solar shield but not mounting brackets (8 lbs.)

Alcatel·Lucent

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

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



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

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

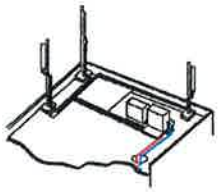
EASY INSTALLATION

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

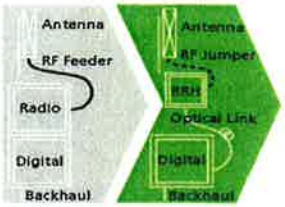
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

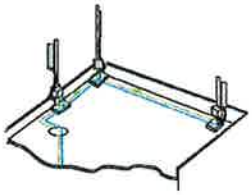
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

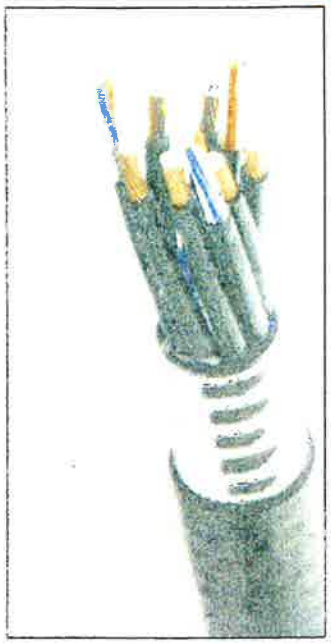


Figure 1: HYBRIFLEX Series

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

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)]	.068 (0.205)
DC-Resistance Power Cable, 8.4mm²/8AWG)		[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)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (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-93-658 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 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

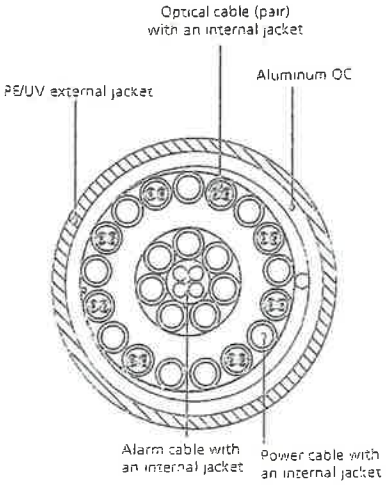


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Prospect N								
Tower Height: 160ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*F&S Oil				0.0031	451	0.3007	1.03%	
*New Haven Transit				0.0031	451	0.3007	1.03%	
*US Post Office				0.0031	415	0.2767	1.12%	
*Central Comm.				0.0031	452	0.3013	1.03%	
*CT Motor Club				0.0381	150.92	0.2000	19.05%	
*Sprint-Nextel iDEN	9	100	146	0.0152	851	0.5673	2.68%	
*Sprint-Nextel CDMA	11	421	146	0.0781	1962.5	1.0000	7.81%	
*Clearwire	2	153	146	0.0052	2496	1.0000	0.52%	
*Clearwire	1	211	151	0.0033	23 GHz	1.0000	0.33%	
*AT&T UMTS	2	1077	126	0.0488	880	0.5867	8.32%	
*AT&T UMTS	2	1556	126	0.0705	1900	1.0000	7.05%	
*AT&T GSM	1	538	126	0.0122	880	0.5867	2.08%	
*AT&T GSM	4	934	126	0.0846	1900	1.0000	8.46%	
*AT&T LTE	1	1375	126	0.0311	734	0.4893	6.36%	
Verizon PCS	**7**	**423**	**135**	**0.0584**	**1970**	**1.0000**	**5.84%**	
Verizon Cellular	**9**	**348**	**135**	**0.0618**	**869**	**0.5793**	**10.67%**	
Verizon AWS	**1**	**2691**	**135**	**0.0531**	**2145**	**1.0000**	**5.31%**	
Verizon 700	**1**	**819**	**135**	**0.0162**	**746**	**0.4973**	**3.25%**	
								91.93%
* Source: Siting Council								

ATTACHMENT 3

ARMOR TOWER ENGINEERING

Reanalysis of a 160 ft Guyed Tower

Site Number: ECP-2-0144

Site Name: Prospect North
County: New Haven
Location: Prospect, CT

Checked By:

Patrick Propert

Patrick Propert
Structural Engineer

06/11/2014

McPHEE ELECTRIC Ltd.
ELECTRICAL CONTRACTORS

505 Main Street

Farmington, CT 06032

June 2014

9 North Main Street, 2nd Floor, Cortland, NY 13045
(607)591-5381 Fax: (866)870-0840 www.ArmorTower.com

June 10, 2014

Douglas Barker
McPhee Electric Ltd.
505 Main Street
Farmington, CT 06032

RE: Verizon Wireless – Prospect North
54 Waterbury Road, Prospect, CT 06712

Douglas:

We have completed the structural analysis of the subject tower and **have found it to be adequate within the scope of this analysis to support the proposed antenna loading**. The tower was analyzed according to the requirements of TIA/EIA 222-F standard for New Haven County for 85 mph (fastest mile) wind speed with no ice and 74 mph wind with ½" ice.

The subject tower is a 160' guyed tower consisting of welded sections with pipe legs and pipe bracing. The tower has been previously reinforced. Tower face dimension is 30" the full height above a 80" tapered base. The tower mast is laterally supported by three levels of guying attached to one set of three guy anchors. Foundation details have not been provided for our review and are therefore considered unknown.

The loading used in the analysis consisted of the existing antennas/lines as well as the following for Verizon Wireless at 135' on existing antenna frames:

- Keep (3) BXA-70063-6CF antennas (1 per sector).
- Keep (3) BXA-171063-12BF antennas (1 per sector) and add (3) Alcatel-Lucent RH-2X60-PCS RRH units (1 per sector).
- Add (3) Commscope HBXX-6517DS-A2M antennas, (3) Alcatel-Lucent RH-2X40-AWS RRH units, and (1) RFS DB-T1-6Z-8AB-0Z distribution box.
- Replace (4) SE-C 6014 antennas with (2) SWCP 2X5514 antennas (1 alpha and 1 beta sector) and (2) LPA-80080/6CF with (1) LNX-8514DS-VTM (gamma sector).
- Keep (18) 1-5/8" coax and Add (2) HB158-1-08U8-S8J18 hybrid fiber cable to 135'.

The proposed feed line is to be located as shown on drawing E-7.

The results of the analysis showed all tower elements to be loaded within allowable limits with a maximum stress rating of 88%. We recommend a post-construction inspection be completed by an engineer to document that tower-mounted equipment has been placed in compliance with the requirements of this analysis. For a detailed listing of the tower's performance, please see pages 9 to 11 of the calculations.

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We appreciate the opportunity to provide our services to McPhee Electric Ltd. and Verizon Wireless, and if you have any questions concerning this analysis, please contact us.

Sincerely,

ARMOR TOWER, INC.

Archan Shah
Structural Engineer

06/11/2014

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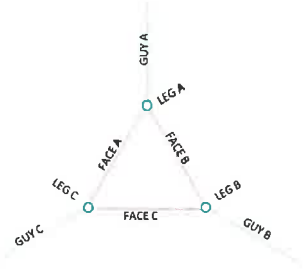
PRIMARY ASSUMPTIONS USED IN THE ANALYSIS



1. Leg A is assumed to be oriented north.
2. Allowable steel stresses are defined by AISC-ASD 9th Edition and all welds conform to AWS D1.1 specifications.
3. Armor Tower has been commissioned to analyze the tower according to the requirements of TIA/EIA 222-F for New Haven County, CT. Per this code, a basic wind speed of 85 mph (fastest mile) without ice and 74 mph with ½" ice is recommended. This site is not within a special wind region according to the ASCE 7 wind map. It is the client's responsibility to check with local authorities or the tower owner if a greater wind or ice loading is required to be considered in the analysis. Note that Section 3108.4 of the International Building Code states that "Towers shall be designed to resist wind loads according to TIA/EIA-222".
4. The acceptability of the analyzed antenna loading is the responsibility of Verizon Wireless and its affiliates to confirm with the respective carriers or the tower owner.
5. Any deviation from the analyzed antenna loading will require a re-analysis of the tower for verification of structural integrity. The proposed feed line is to be located as shown on drawing E-7.
6. This analysis assumes all tower members are galvanized adequately to prevent corrosion of the steel and that all tower members are in "like new" condition with no physical deterioration. This analysis also assumes the tower has been maintained properly per TIA/EIA 222-F Annex E recommended inspection and maintenance procedures for tower owners and is in a plumb condition. Armor Tower has not completed a condition assessment of the tower. Site observations indicate chipping paint and surface rust on the galvanizing.
7. No accounting for residual stresses due to incorrect tower erection can be made. This analysis assumes all bolts are appropriately tightened providing necessary connection continuity and that the installation of the tower was performed by a qualified tower erector.
8. This certification does not include foundations. Geotechnical or foundation information was not provided to Armor Tower to complete a foundation review. Armor Tower therefore does not accept responsibility for foundation adequacy.
9. No conclusions, expressed or implied, shall indicate that Armor Tower has made an evaluation of the original design, materials, fabrication, or potential installation or erection deficiencies. Any information contrary to that assumed for the purpose of preparing this analysis could alter the findings and conclusions stated herein. The scope of the initial structural mapping of this tower was to identify the members required to numerically model the tower for our analysis. We recommend that a details mapping be completed to determine the dimensional constraints of the potentially upgraded elements to minimize field construction issues.
10. Tower member sizes, geometry, are based on a tower reinforcement design completed by Bay State Design in January 2011. Existing antenna loading is based on customer supplied data. It is our assumption that this data is complete and accurately reflects the existing conditions of the tower and equipment. Armor Tower has not been commissioned to field validate the data. Armor Tower reserves the right to add to or modify this report as more information becomes available. Proposed equipment was outlined in an RF design dated May 2014.

11. The investigation of the load carrying capacities of the antenna supporting frames/mounts is outside the scope of this analysis. Antenna mount certification can be completed under separate contract.
12. This tower does not have an industry-approved fall protection system installed. For the safety of workers climbing this tower, we recommend a flexible cable safety climb be installed.

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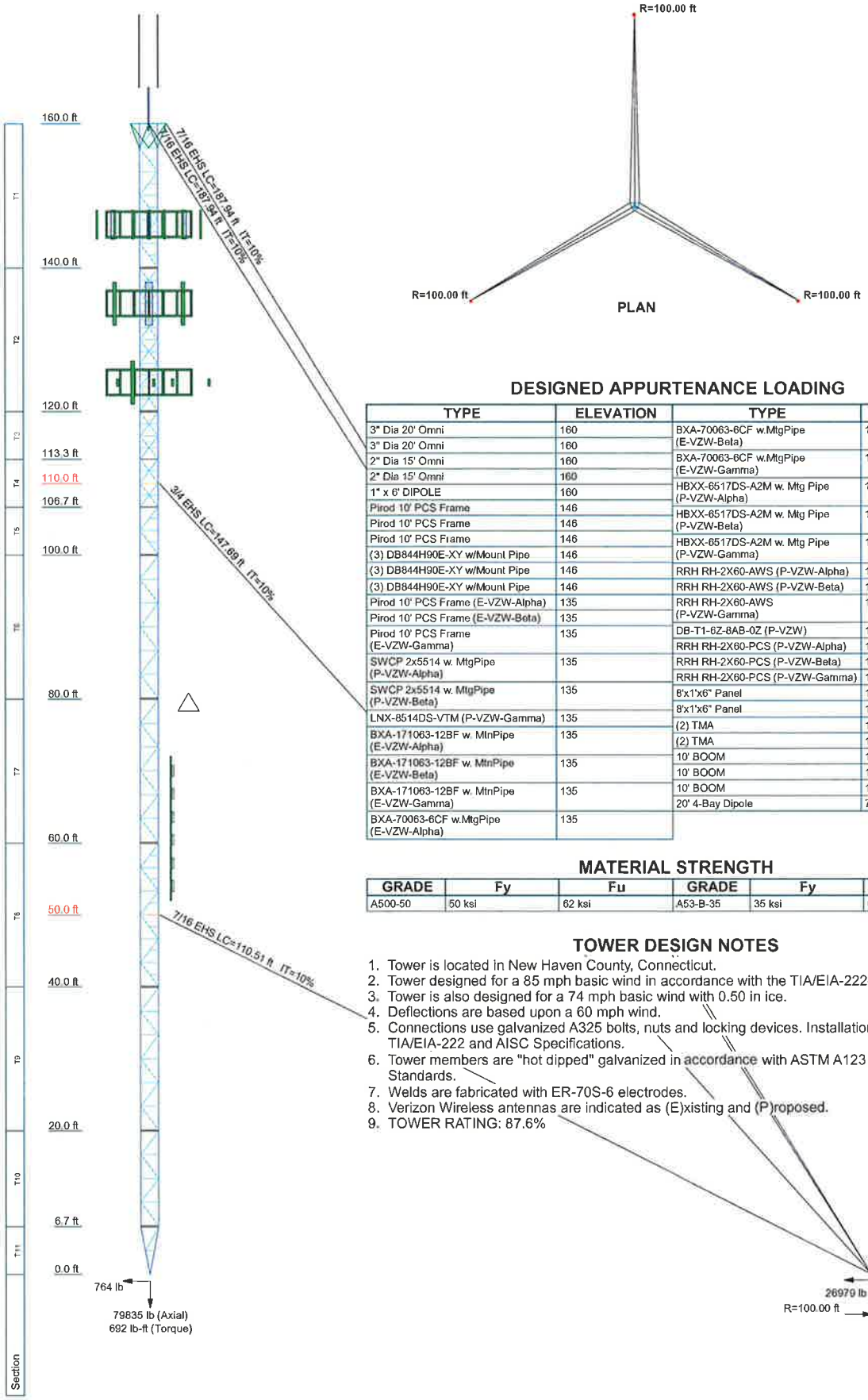

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
3" Dia 20' Omni	160	BXA-70063-6CF w.MtgPipe (E-VZW-Beta)	135
3" Dia 20' Omni	160	BXA-70063-6CF w.MtgPipe (E-VZW-Gamma)	135
2" Dia 15' Omni	160	HBXX-6517DS-A2M w. Mtg Pipe (P-VZW-Alpha)	135
2" Dia 15' Omni	160	HBXX-6517DS-A2M w. Mtg Pipe (P-VZW-Beta)	135
1" x 6' DIPOLE	160	HBXX-6517DS-A2M w. Mtg Pipe (P-VZW-Gamma)	135
Pirod 10' PCS Frame	146	RRH RH-2X60-AWS (P-VZW-Alpha)	135
Pirod 10' PCS Frame	146	RRH RH-2X60-AWS (P-VZW-Beta)	135
Pirod 10' PCS Frame	146	RRH RH-2X60-AWS (P-VZW-Gamma)	135
(3) DB844H90E-XY w/Mount Pipe	146	DB-T1-6Z-8AB-0Z (P-VZW)	135
(3) DB844H90E-XY w/Mount Pipe	146	RRH RH-2X60-PCS (P-VZW-Alpha)	135
(3) DB844H90E-XY w/Mount Pipe	146	RRH RH-2X60-PCS (P-VZW-Beta)	135
Pirod 10' PCS Frame (E-VZW-Alpha)	135	RRH RH-2X60-PCS (P-VZW-Gamma)	135
Pirod 10' PCS Frame (E-VZW-Beta)	135	8'x1'x6" Panel	124
Pirod 10' PCS Frame (E-VZW-Gamma)	135	8'x1'x6" Panel	124
SWCP 2x5514 w. MtgPipe (P-VZW-Alpha)	135	(2) TMA	124
SWCP 2x5514 w. MtgPipe (P-VZW-Beta)	135	(2) TMA	124
LNX-8514DS-VTM (P-VZW-Gamma)	135	10' BOOM	124
BXA-171063-12BF w. MtnPipe (E-VZW-Alpha)	135	10' BOOM	124
BXA-171063-12BF w. MtnPipe (E-VZW-Beta)	135	10' BOOM	124
BXA-171063-12BF w. MtnPipe (E-VZW-Gamma)	135	20' 4-Bay Dipole	72 - 52
BXA-70063-6CF w.MtgPipe (E-VZW-Alpha)	135		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A53-B-35	35 ksi	63 ksi

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. Verizon Wireless antennas are indicated as (E)xisting and (P)roposed.
9. TOWER RATING: 87.6%

ARMOR TOWER
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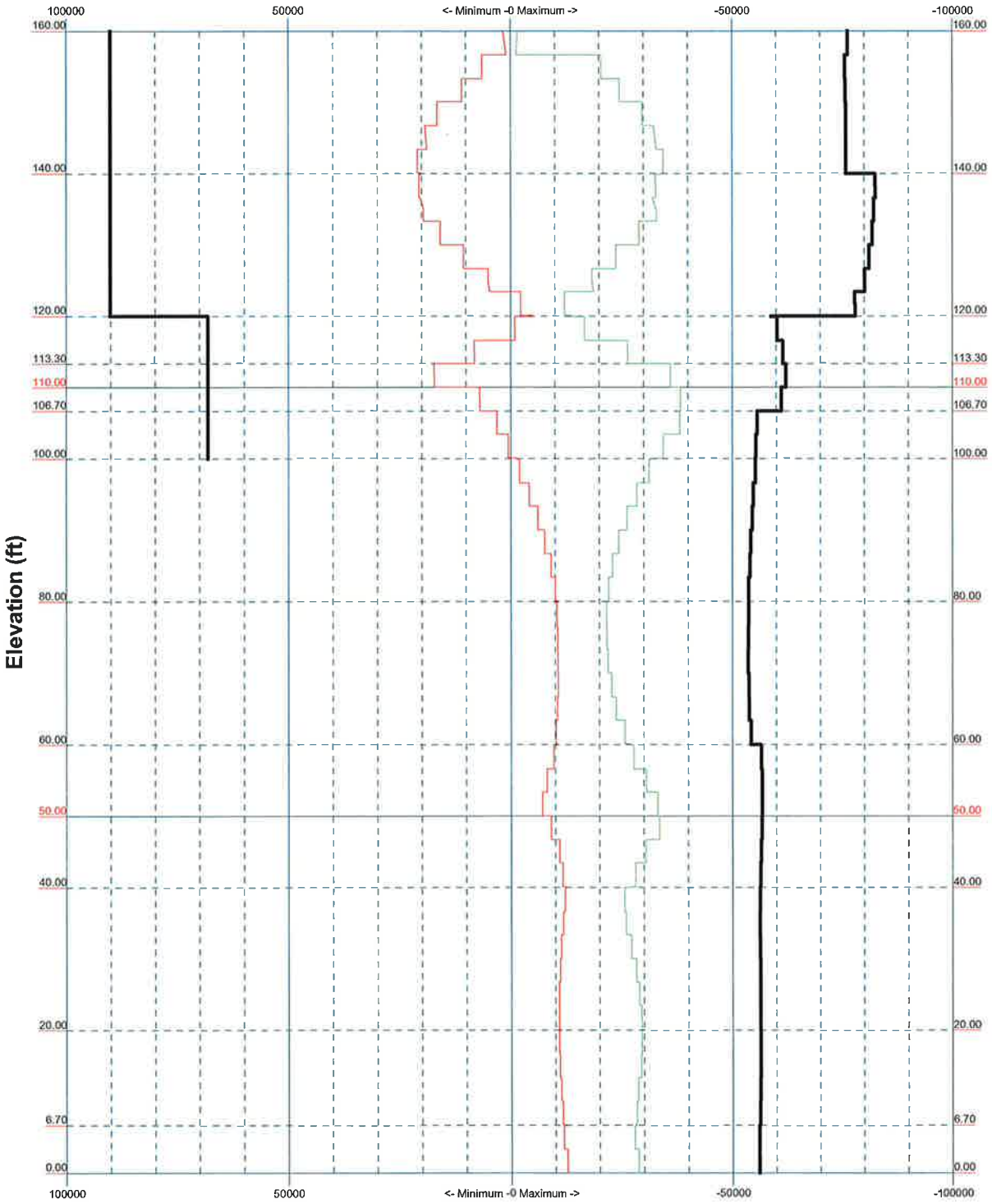
Job: **REANALYSIS OF 160' GUYED TOWER**			
Project: **Prospect North, CT**			
Client: Verizon Wireless	Drawn by: Archan Shah	App'd:	
Code: TIA/EIA-222-F	Date: 06/10/14	Scale: NTS	
Path: Z:\Jobs Files\Active\Prospect\CT\Mar2014 Reanalysis\Tnx\CT81XC010 Prospect(CT_e		Dwg No. E-1	

TIA/EIA-222-F - 85 mph/74 mph 0.5000 in Ice

Leg Capacity ——— **Leg Compression (lb)**



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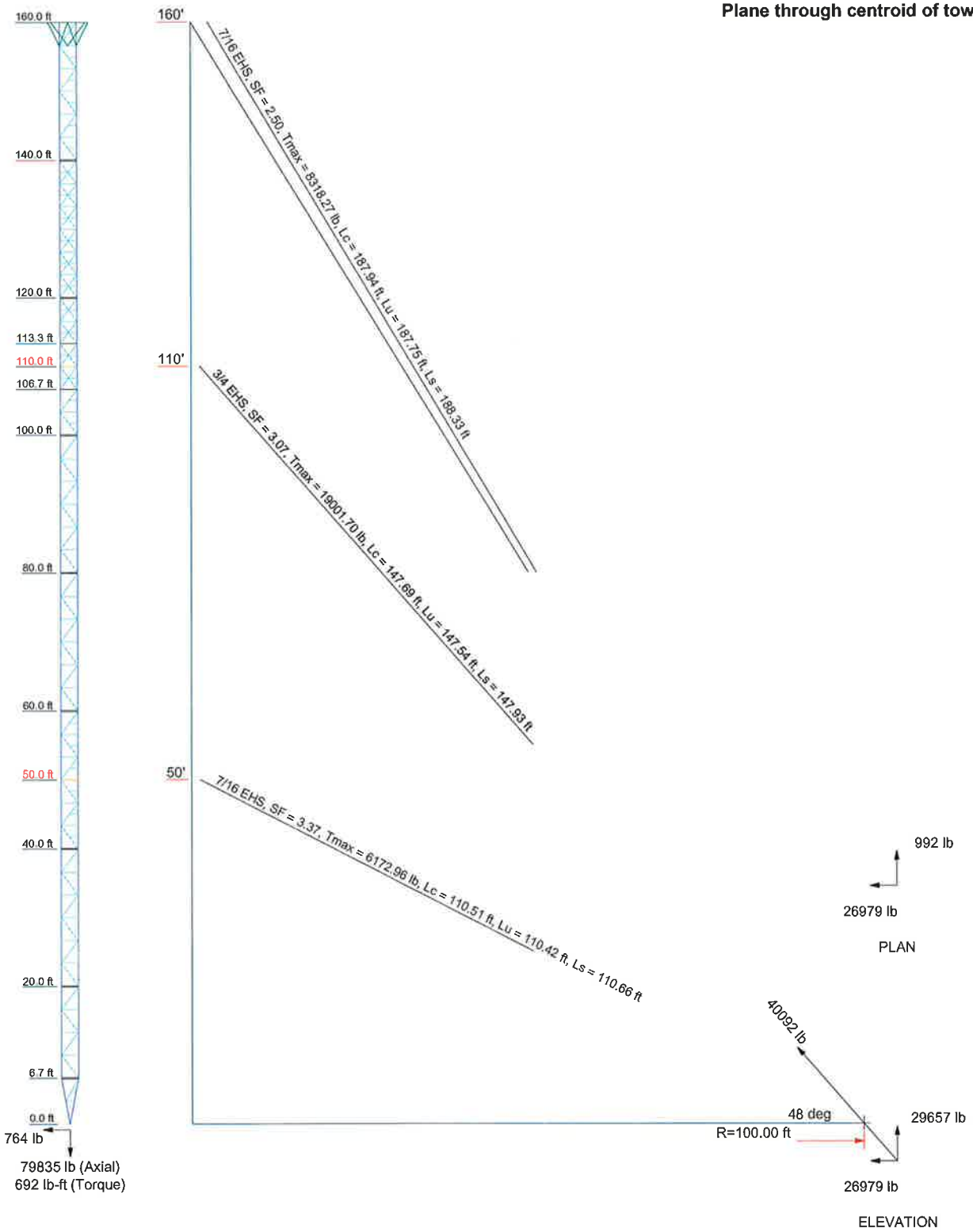
Job: ***REANALYSIS OF 160' GUYED TOWER***			
Project: ***Prospect North, CT***			
Client: Verizon Wireless	Drawn by: Archan Shah		App'd:
Code: TIA/EIA-222-F	Date: 06/09/14		Scale: NTS
Path:			Dwg No. E-3

Guy Tensions and Tower Reactions

TIA/EIA-222-F - 85 mph/74 mph 0.5000 in Ice

Maximum Values
Anchor 'C'@100 ft Azimuth 240 deg Elev 0 ft
Plane through centroid of tower



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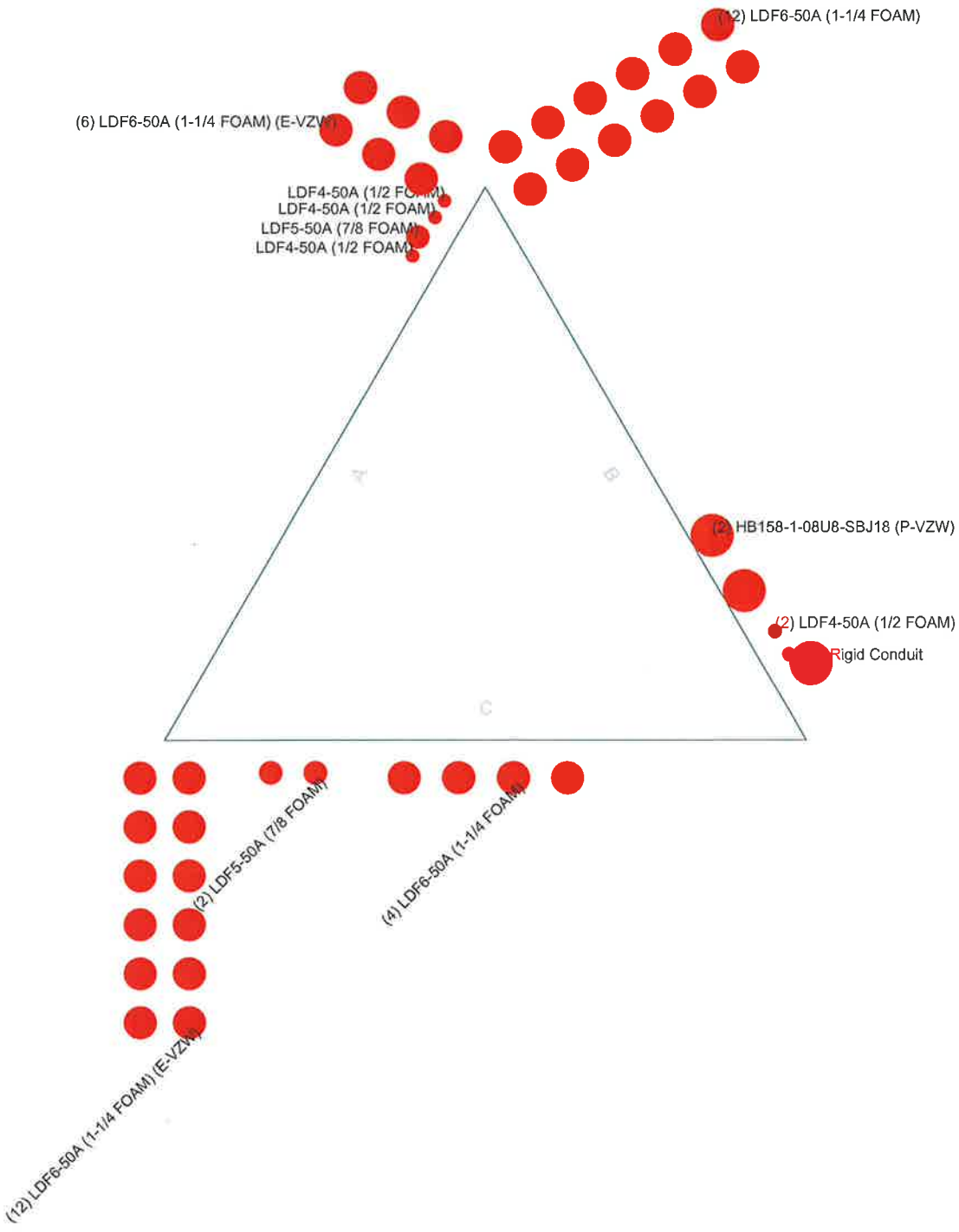
Job: **REANALYSIS OF 160' GUYED TOWER**			
Project: **Prospect North, CT**			
Client: Verizon Wireless	Drawn by: Archan Shah		App'd:
Code: TIA/EIA-222-F	Date: 06/09/14		Scale: NTS
Path:			Dwg No. E-6

Feed Line Plan

Round Flat App In Face App Out Face



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Job:	***REANALYSIS OF 160' GUYED TOWER***		
Project:	***Prospect North, CT***		
Client: Verizon Wireless		Drawn by: Archan Shah	App'd:
Code: TIA/EIA-222-F		Date: 06/09/14	Scale: NTS
Path:			Dwg No. E-7

ARMOR TOWER ENGINEERING *Armor Tower, Inc.* *9 N Main St.,* *Cortland, NY 13045* *Phone: (607) 591-5381* *FAX: (866) 870-0840*	**Job** REANALYSIS OF 160' GUYED TOWER	**Page** 1 of 11
	Project Prospect North, CT	**Date** 16:23:15 06/09/14
	Client Verizon Wireless	**Designed by** Archan Shah

Load Combinations

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

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load*	*Tilt*	*Twist*
	ft	*in*	*Comb.*	°	°
T1	160 - 140	3.157	29	0.0079	0.5414
T2	140 - 120	3.052	29	0.1107	0.8189
T3	120 - 113.3	2.266	29	0.2251	0.9261
T4	113.3 - 106.7	1.934	29	0.2058	0.9029
T5	106.7 - 100	1.677	29	0.1577	0.8831
T6	100 - 80	1.501	29	0.1226	0.8577
T7	80 - 60	1.127	29	0.0827	0.7818
T8	60 - 40	0.789	37	0.0758	0.6967
T9	40 - 20	0.544	37	0.0463	0.5967
T10	20 - 6.7	0.337	37	0.0652	0.5000
T11	6.7 - 0	0.124	37	0.0824	0.4185

Critical Deflections and Radius of Curvature - Service Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	°	°	*ft*
160.00	Guy	29	3.157	0.0079	0.5414	19566
146.00	Pirod 10' PCS Frame	29	3.142	0.0731	0.7451	6988
135.00	Pirod 10' PCS Frame	29	2.917	0.1481	0.8688	6128
124.00	10' BOOM	29	2.464	0.2170	0.9271	13699
110.00	Guy	29	1.794	0.1826	0.8927	5739
72.00	20' 4-Bay Dipole	29	0.987	0.0811	0.7500	152279
67.00	20' 4-Bay Dipole	29	0.901	0.0803	0.7288	66152
62.00	20' 4-Bay Dipole	37	0.820	0.0778	0.7062	42987
57.00	20' 4-Bay Dipole	37	0.746	0.0718	0.6821	39258
52.00	20' 4-Bay Dipole	37	0.679	0.0631	0.6569	43348
50.00	Guy	37	0.654	0.0595	0.6467	45331

Maximum Tower Deflections - Design Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
T1	160 - 140	13.890	23	0.3154	1.3055
T2	140 - 120	12.389	23	0.5221	1.8069
T3	120 - 113.3	9.557	23	0.7311	1.9941
T4	113.3 - 106.7	8.501	23	0.6717	1.9383
T5	106.7 - 100	7.643	23	0.5496	1.8948
T6	100 - 80	6.985	23	0.4667	1.8357
T7	80 - 60	5.362	15	0.3842	1.6599
T8	60 - 40	3.751	15	0.3657	1.4654
T9	40 - 20	2.480	15	0.2525	1.2400
T10	20 - 6.7	1.422	15	0.2961	1.0316
T11	6.7 - 0	0.509	15	0.3458	0.8622

Critical Deflections and Radius of Curvature - Design Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	°	°	*ft*
160.00	Guy	23	13.890	0.3154	1.3055	9787
146.00	Pirod 10' PCS Frame	23	12.954	0.4473	1.6735	3495
135.00	Pirod 10' PCS Frame	23	11.796	0.5957	1.8983	3088
124.00	10' BOOM	23	10.196	0.7230	2.0014	7263
110.00	Guy	23	8.043	0.6117	1.9159	2167
72.00	20' 4-Bay Dipole	15	4.707	0.3849	1.5870	15763
67.00	20' 4-Bay Dipole	15	4.298	0.3829	1.5384	11895
62.00	20' 4-Bay Dipole	15	3.903	0.3729	1.4869	9645
57.00	20' 4-Bay Dipole	15	3.533	0.3508	1.4322	9239
52.00	20' 4-Bay Dipole	15	3.192	0.3189	1.3751	9883
50.00	Guy	15	3.063	0.3052	1.3520	10179

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Client	**Designed by**
Verizon Wireless	Archan Shah

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	5013.26	19437.50	0.258 ✓	1.333	Bolt Tension
T2	140	Leg	A325N	0.00	19427.70	0.000 ✓	1.333	Bolt Tension
T5	106.7	Leg	A325N	0.00	19437.10	0.000 ✓	1.333	Bolt Tension
T6	100	Leg	A325N	0.00	19438.60	0.000 ✓	1.333	Bolt Tension
T7	80	Leg	A325N	0.00	19437.10	0.000 ✓	1.333	Bolt Tension
T8	60	Leg	A325N	0.00	19437.00	0.000 ✓	1.333	Bolt Tension
T9	40	Leg	A325N	0.00	19438.50	0.000 ✓	1.333	Bolt Tension
T10	20	Leg	A325N	0.00	19387.20	0.000 ✓	1.333	Bolt Tension
T11	6.7	Leg	A325N	0.00	19438.20	0.000 ✓	1.333	Bolt Tension

Guy Design Data

Section No.	Elevation ft	Initial Tension lb	Breaking Load lb	Actual T lb	Allowable T_a lb	Required S.F.	Actual S.F.
T1	160.00 (A) (429)	2080.00	20800.02	8154.35	10400.00	2.000	2.551 ✓
	160.00 (A) (430)	2080.00	20800.02	7931.24	10400.00	2.000	2.623 ✓
	160.00 (B) (423)	2080.00	20800.02	8199.99	10400.00	2.000	2.537 ✓
	160.00 (B) (424)	2080.00	20800.02	7876.89	10400.00	2.000	2.641 ✓
	160.00 (C) (417)	2080.00	20800.02	7777.64	10400.00	2.000	2.674 ✓
	160.00 (C) (418)	2080.00	20800.02	8318.27	10400.00	2.000	2.501 ✓
T4	110.00 (A) (437)	5830.00	58299.91	18879.80	29150.00	2.000	3.088 ✓
	110.00 (B) (436)	5830.00	58299.91	18983.70	29150.00	2.000	3.071 ✓
	110.00 (C) (435)	5830.00	58299.91	19001.70	29150.00	2.000	3.068 ✓
T8	50.00 (A) (440)	2080.00	20800.02	6153.68	10400.00	2.000	3.380 ✓
	50.00 (B) (439)	2080.00	20800.02	6172.96	10400.00	2.000	3.370 ✓
	50.00 (C) (438)	2080.00	20800.02	6168.62	10400.00	2.000	3.372 ✓

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	Mast Stability Index	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	160 - 140	20.00	3.32	43.1 K=1.00	0.99	25.224	2.2535	-34509.80	56842.80	0.607 ✓
T2	140 - 120	20.00	1.65	21.5	0.97	27.432	2.2535	-34010.60	61820.00	0.550 ✓

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Verizon Wireless	Archan Shah

Section No.	Elevation ft	L ft	L_u ft	Kl/r	Mast Stability Index	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$	
T3	120 - 113.3	6.70	1.65	21.0 K=1.00	0.96	27.063	1.7040	-26439.00	46116.70	0.573	✔
T4	113.3 - 106.7	6.60	1.65	20.9 K=1.00	0.95	26.918	1.7040	-38403.10	45869.40	0.837	✔
T5	106.7 - 100	6.70	3.31	41.9 K=1.00	0.96	24.495	1.7040	-38193.30	41741.10	0.915	✔
T6	100 - 80	20.00	3.31	41.9 K=1.00	0.95	24.298	1.7040	-33035.00	41404.90	0.798	✔
T7	80 - 60	20.00	3.31	41.9 K=1.00	0.93	23.864	1.7040	-27038.90	40665.90	0.665	✔
T8	60 - 40	20.00	3.31	41.9 K=1.00	0.98	24.942	1.7040	-33494.00	42501.50	0.788	✔
T9	40 - 20	20.00	3.31	41.9 K=1.00	0.97	24.797	1.7040	-29924.40	42255.00	0.708	✔
T10	20 - 6.7	13.30	3.28	41.6 K=1.00	0.97	24.811	1.7040	-29925.90	42279.90	0.708	✔
T11	6.7 - 0	6.85	3.38	42.9 K=1.00	0.97	24.678	1.7040	-28849.00	42052.60	0.686	✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$	
T1	160 - 140	4.16	3.76	94.6 K=0.70	13.429	0.3326	-5215.04	4466.99	1.167	✔
T2	140 - 120	4.14	1.87	67.4 K=1.00	16.329	0.3326	-4624.31	5431.46	0.851	✔
T3	120 - 113.3	4.15	1.87	67.4 K=1.00	16.325	0.3326	-4936.50	5430.30	0.909	✔
T4	113.3 - 106.7	4.14	1.87	67.3 K=1.00	16.336	0.3326	-5236.35	5433.78	0.964	✔
T5	106.7 - 100	4.15	3.75	94.4 K=0.70	13.453	0.3326	-3397.52	4474.80	0.759	✔
T6	100 - 80	4.14	3.75	94.3 K=0.70	13.458	0.3326	-3147.61	4476.75	0.703	✔
T7	80 - 60	4.14	3.75	94.3 K=0.70	13.458	0.3326	-2371.85	4476.75	0.530	✔
T8	60 - 40	4.14	3.75	94.3 K=0.70	13.458	0.3326	-3232.25	4476.75	0.722	✔
T9	40 - 20	4.14	3.75	94.3 K=0.70	13.458	0.3326	-2711.42	4476.75	0.606	✔
T10	20 - 6.7	4.13	3.73	93.9 K=0.70	13.505	0.3326	-2217.67	4492.30	0.494	✔
T11	6.7 - 0	3.81	3.32	83.7 K=0.70	14.655	0.3326	-1801.53	4874.67	0.370	✔

Horizontal Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$

ARMOR TOWER ENGINEERING

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Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140	2.50	2.26	81.3 K=1.00	14.912	0.3326	-1418.29	4960.30	0.286 ✔
T2	140 - 120	2.50	2.26	81.3 K=1.00	14.912	0.3326	-804.55	4960.30	0.162 ✔
T5	106.7 - 100	2.50	2.26	81.3 K=1.00	14.912	0.3326	-661.53	4960.30	0.133 ✔
T6	100 - 80	2.50	2.26	81.3 K=1.00	14.912	0.3326	-572.18	4960.30	0.115 ✔
T7	80 - 60	2.50	2.26	81.3 K=1.00	14.912	0.3326	-468.33	4960.30	0.094 ✔
T8	60 - 40	2.50	2.26	81.3 K=1.00	14.912	0.3326	-580.13	4960.30	0.117 ✔
T9	40 - 20	2.50	2.26	81.3 K=1.00	14.912	0.3326	-518.31	4960.30	0.104 ✔
T10	20 - 6.7	2.50	2.26	81.3 K=1.00	14.912	0.3326	-518.33	4960.30	0.104 ✔
T11	6.7 - 0	1.23	0.99	35.8 K=1.00	19.013	0.3326	-508.20	6324.27	0.080 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140	1.25	1.13	72.3 K=1.00	20.499	0.4418	-0.01	9056.00	0.000 ✔
T2	140 - 120	2.50	2.26	144.7 K=1.00	7.135	0.4418	-589.08	3152.29	0.187 ✔
T3	120 - 113.3	2.50	2.26	144.7 K=1.00	7.135	0.4418	-457.94	3152.29	0.145 ✔
T4	113.3 - 106.7	2.50	2.26	144.7 K=1.00	7.135	0.4418	-665.16	3152.29	0.211 ✔
T5	106.7 - 100	1.25	1.13	72.3 K=1.00	20.499	0.4418	-0.01	9056.00	0.000 ✔
T8	60 - 40	1.25	1.13	40.7 K=1.00	18.650	0.3326	-0.01	6203.62	0.000 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T2	140 - 120	2.50	2.26	81.3 K=1.00	14.912	0.3326	-289.07	4960.30	0.058 ✔
T4	113.3 - 106.7	2.50	2.26	81.3 K=1.00	14.912	0.3326	-217.43	4960.30	0.044 ✔
T5	106.7 - 100	2.50	2.26	81.3 K=1.00	14.912	0.3326	-169.97	4960.30	0.034 ✔

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Bottom Girt Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft	ft	ft		ksi	in^2	lb	lb	
T1	160 - 140	2.50	2.26	81.3 K=1.00	14.912	0.3326	-380.07	4960.30	0.077 ✓

Top Guy Pull-Off Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft	ft	ft		ksi	in^2	lb	lb	
T1	160 - 140	2.50	2.26	86.8 K=1.00	17.618	1.2272	-1489.09	21621.00	0.069 ✓

Torque-Arm Bottom Design Data

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft	ft	ft		ksi	in^2	lb	lb	
T1	160 - 140 (421)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10065.50	32192.10	0.313 ✓
T1	160 - 140 (422)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10261.80	32192.10	0.319 ✓
T1	160 - 140 (427)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10873.10	32192.10	0.338 ✓
T1	160 - 140 (428)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10839.80	32192.10	0.337 ✓
T1	160 - 140 (433)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10431.40	32192.10	0.324 ✓
T1	160 - 140 (434)	4.16	3.96	80.9 K=1.00	15.257	2.1100	-10502.20	32192.10	0.326 ✓

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft	ft	ft		ksi	in^2	lb	lb	
T1	160 - 140	20.00	3.32	43.1	30.000	2.2535	20919.30	67606.20	0.309 ✓
T2	140 - 120	20.00	1.65	21.5	30.000	2.2535	20599.20	67606.20	0.305 ✓
T3	120 - 113.3	6.70	1.65	21.0	30.000	1.7040	8126.77	51121.50	0.159 ✓
T4	113.3 - 106.7	6.60	1.65	20.9	30.000	1.7040	17180.20	51121.50	0.336 ✓
T5	106.7 - 100	6.70	3.31	41.9	30.000	1.7040	3130.74	51121.50	0.061 ✓

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Diagonal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$	
	ft	ft	ft		ksi	in^2	lb	lb		
T1	160 - 140	4.16	3.76	135.1	21.000	0.3326	4836.87	6985.33	0.692	✓
T2	140 - 120	4.14	1.87	67.4	21.000	0.3326	3223.72	6985.33	0.461	✓
T3	120 - 113.3	4.15	1.87	67.4	21.000	0.3326	3111.45	6985.33	0.445	✓
T4	113.3 - 106.7	4.14	1.87	67.3	21.000	0.3326	3450.91	6985.33	0.494	✓
T5	106.7 - 100	4.15	3.75	134.8	21.000	0.3326	2421.22	6985.33	0.347	✓
T6	100 - 80	4.14	3.75	134.8	21.000	0.3326	1801.81	6985.33	0.258	✓
T7	80 - 60	4.14	3.75	134.8	21.000	0.3326	882.55	6985.33	0.126	✓
T8	60 - 40	4.14	3.75	134.8	21.000	0.3326	1566.90	6985.33	0.224	✓
T9	40 - 20	4.14	3.75	134.8	21.000	0.3326	1066.22	6985.33	0.153	✓
T10	20 - 6.7	4.13	3.73	134.2	21.000	0.3326	587.61	6985.33	0.084	✓

Horizontal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$	
	ft	ft	ft		ksi	in^2	lb	lb		
T1	160 - 140	2.50	2.26	81.3	21.000	0.3326	1517.83	6985.33	0.217	✓
T2	140 - 120	2.50	2.26	81.3	21.000	0.3326	1876.59	6985.33	0.269	✓
T3	120 - 113.3	2.50	2.26	81.3	21.000	0.3326	1556.48	6985.33	0.223	✓
T5	106.7 - 100	2.50	2.26	81.3	21.000	0.3326	661.53	6985.33	0.095	✓
T6	100 - 80	2.50	2.26	81.3	21.000	0.3326	583.76	6985.33	0.084	✓
T7	80 - 60	2.50	2.26	81.3	21.000	0.3326	595.40	6985.33	0.085	✓
T8	60 - 40	2.50	2.26	81.3	21.000	0.3326	580.13	6985.33	0.083	✓
T9	40 - 20	2.50	2.26	81.3	21.000	0.3326	621.35	6985.33	0.089	✓
T10	20 - 6.7	2.50	2.26	81.3	21.000	0.3326	679.24	6985.33	0.097	✓
T11	6.7 - 0	1.23	0.99	35.8	21.000	0.3326	597.20	6985.33	0.085	✓

Secondary Horizontal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$	
	ft	ft	ft		ksi	in^2	lb	lb		
T1	160 - 140	1.25	1.13	72.3	30.000	0.4418	0.01	13253.60	0.000	✓
T2	140 - 120	2.50	2.26	144.7	30.000	0.4418	589.08	13253.60	0.044	✓
T3	120 - 113.3	2.50	2.26	144.7	30.000	0.4418	457.94	13253.60	0.035	✓
T4	113.3 - 106.7	2.50	2.26	144.7	30.000	0.4418	665.16	13253.60	0.050	✓
T5	106.7 - 100	1.25	1.13	72.3	30.000	0.4418	0.02	13253.60	0.000	✓
T8	60 - 40	1.25	1.13	40.7	21.000	0.3326	0.01	6985.33	0.000	✓

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Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$

Top Girt Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T2	140 - 120	2.50	2.26	81.3	21.000	0.3326	629.00	6985.33	0.090 ✓
T3	120 - 113.3	2.50	2.26	81.3	21.000	0.3326	510.12	6985.33	0.073 ✓
T4	113.3 - 106.7	2.50	2.26	81.3	21.000	0.3326	2080.36	6985.33	0.298 ✓
T5	106.7 - 100	2.50	2.26	81.3	21.000	0.3326	2146.09	6985.33	0.307 ✓
T6	100 - 80	2.50	2.26	81.3	21.000	0.3326	285.62	6985.33	0.041 ✓
T7	80 - 60	2.50	2.26	81.3	21.000	0.3326	267.14	6985.33	0.038 ✓
T8	60 - 40	2.50	2.26	81.3	21.000	0.3326	349.97	6985.33	0.050 ✓
T9	40 - 20	2.50	2.26	81.3	21.000	0.3326	306.98	6985.33	0.044 ✓
T10	20 - 6.7	2.50	2.26	81.3	21.000	0.3326	327.04	6985.33	0.047 ✓
T11	6.7 - 0	2.47	2.23	80.2	21.000	0.3326	2041.19	6985.33	0.292 ✓

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140	2.50	2.26	81.3	21.000	0.3326	701.01	6985.33	0.100 ✓
T2	140 - 120	2.50	2.26	81.3	21.000	0.3326	611.95	6985.33	0.088 ✓
T5	106.7 - 100	2.50	2.26	81.3	21.000	0.3326	343.08	6985.33	0.049 ✓
T6	100 - 80	2.50	2.26	81.3	21.000	0.3326	296.79	6985.33	0.042 ✓
T7	80 - 60	2.50	2.26	81.3	21.000	0.3326	262.71	6985.33	0.038 ✓
T8	60 - 40	2.50	2.26	81.3	21.000	0.3326	365.64	6985.33	0.052 ✓
T9	40 - 20	2.50	2.26	81.3	21.000	0.3326	320.20	6985.33	0.046 ✓
T10	20 - 6.7	2.50	2.26	81.3	21.000	0.3326	2054.57	6985.33	0.294 ✓

Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140	2.50	2.26	86.8	30.000	1.2272	1486.64	36815.50	0.040 ✓
T4	113.3 - 106.7	2.50	2.26	86.8	30.000	1.2272	6347.64	36815.50	0.172 ✓
T8	60 - 40	2.50	2.26	86.8	30.000	1.2272	3581.38	36815.50	0.097 ✓

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Torque-Arm Top Design Data

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140 (419)	2.50	2.38	31.3	21.600	2.1100	6030.71	45576.00	0.132 ✓
T1	160 - 140 (420)	2.50	2.38	31.3	21.600	2.1100	5987.18	45576.00	0.131 ✓
T1	160 - 140 (425)	2.50	2.38	31.3	21.600	2.1100	5989.77	45576.00	0.131 ✓
T1	160 - 140 (426)	2.50	2.38	31.3	21.600	2.1100	5949.47	45576.00	0.131 ✓
T1	160 - 140 (431)	2.50	2.38	31.3	21.600	2.1100	6177.34	45576.00	0.136 ✓
T1	160 - 140 (432)	2.50	2.38	31.3	21.600	2.1100	5864.40	45576.00	0.129 ✓

Torque-Arm Bottom Design Data

Section No.	Elevation ft	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	160 - 140 (421)	4.16	3.96	52.0	21.600	2.1100	1122.50	45576.00	0.025 ✓
T1	160 - 140 (422)	4.16	3.96	52.0	21.600	2.1100	1096.63	45576.00	0.024 ✓
T1	160 - 140 (427)	4.16	3.96	52.0	21.600	2.1100	1628.62	45576.00	0.036 ✓
T1	160 - 140 (428)	4.16	3.96	52.0	21.600	2.1100	1656.66	45576.00	0.036 ✓
T1	160 - 140 (433)	4.16	3.96	52.0	21.600	2.1100	1348.43	45576.00	0.030 ✓
T1	160 - 140 (434)	4.16	3.96	52.0	21.600	2.1100	1373.31	45576.00	0.030 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	160 - 140	Leg	1	-34509.80	75771.45	45.5	Pass
T2	140 - 120	Leg	51	-34010.60	82406.06	41.3	Pass
T3	120 - 113.3	Leg	128	-26439.00	61473.56	43.0	Pass
T4	113.3 - 106.7	Leg	155	-38403.10	61143.91	62.8	Pass
T5	106.7 - 100	Leg	182	-38193.30	55640.89	68.6	Pass
T6	100 - 80	Leg	202	-33035.00	55192.73	59.9	Pass
T7	80 - 60	Leg	243	-27038.90	54207.64	49.9	Pass
T8	60 - 40	Leg	285	-33494.00	56654.50	59.1	Pass
T9	40 - 20	Leg	335	-29924.40	56325.91	53.1	Pass
T10	20 - 6.7	Leg	377	-29925.90	56359.10	53.1	Pass
T11	6.7 - 0	Leg	407	-28849.00	56056.12	51.5	Pass
T1	160 - 140	Diagonal	31	-5215.04	5954.50	87.6	Pass
T2	140 - 120	Diagonal	59	-4624.31	7240.14	63.9	Pass
T3	120 - 113.3	Diagonal	134	-4936.50	7238.59	68.2	Pass
T4	113.3 - 106.7	Diagonal	172	-5236.35	7243.23	72.3	Pass
T5	106.7 - 100	Diagonal	198	-3397.52	5964.91	57.0	Pass
T6	100 - 80	Diagonal	241	-3147.61	5967.51	52.7	Pass
T7	80 - 60	Diagonal	252	-2371.85	5967.51	39.7	Pass
T8	60 - 40	Diagonal	310	-3232.25	5967.51	54.2	Pass
T9	40 - 20	Diagonal	374	-2711.42	5967.51	45.4	Pass

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Section No.	Elevation ft	Component Type	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T10	20 - 6.7	Diagonal	384	-2217.67	5988.24	37.0	Pass
T11	6.7 - 0	Diagonal	415	-1801.53	6497.93	27.7	Pass
T1	160 - 140	Horizontal	42	-1418.29	6612.08	21.4	Pass
T2	140 - 120	Horizontal	114	1876.59	9311.44	20.2	Pass
T3	120 - 113.3	Horizontal	139	1556.48	9311.44	16.7	Pass
T5	106.7 - 100	Horizontal	195	-661.53	6612.08	10.0	Pass
T6	100 - 80	Horizontal	214	-572.18	6612.08	8.7	Pass
T7	80 - 60	Horizontal	255	-468.33	6612.08	7.1	Pass
T8	60 - 40	Horizontal	305	-580.13	6612.08	8.8	Pass
T9	40 - 20	Horizontal	346	-518.31	6612.08	7.8	Pass
T10	20 - 6.7	Horizontal	389	-518.33	6612.08	7.8	Pass
T11	6.7 - 0	Horizontal	412	597.20	9311.44	6.4	Pass
T1	160 - 140	Secondary Horizontal	13	-0.01	12071.65	0.0	Pass
T2	140 - 120	Secondary Horizontal	68	-589.08	4202.00	14.0	Pass
T3	120 - 113.3	Secondary Horizontal	143	-457.94	4202.00	10.9	Pass
T4	113.3 - 106.7	Secondary Horizontal	169	-665.16	4202.00	15.8	Pass
T5	106.7 - 100	Secondary Horizontal	193	-0.01	12071.65	0.0	Pass
T8	60 - 40	Secondary Horizontal	297	-0.01	8269.43	0.1	Pass
T2	140 - 120	Top Girt	53	629.00	9311.44	6.8	Pass
T3	120 - 113.3	Top Girt	130	510.12	9311.44	5.5	Pass
T4	113.3 - 106.7	Top Girt	157	2080.36	9311.44	22.3	Pass
T5	106.7 - 100	Top Girt	186	2146.09	9311.44	23.0	Pass
T6	100 - 80	Top Girt	206	285.62	9311.44	3.1	Pass
T7	80 - 60	Top Girt	246	267.14	9311.44	2.9	Pass
T8	60 - 40	Top Girt	288	349.97	9311.44	3.8	Pass
T9	40 - 20	Top Girt	338	306.98	9311.44	3.3	Pass
T10	20 - 6.7	Top Girt	379	327.04	9311.44	3.5	Pass
T11	6.7 - 0	Top Girt	408	2041.19	9311.44	21.9	Pass
T1	160 - 140	Bottom Girt	8	701.01	9311.44	7.5	Pass
T2	140 - 120	Bottom Girt	55	611.95	9311.44	6.6	Pass
T5	106.7 - 100	Bottom Girt	189	343.08	9311.44	3.7	Pass
T6	100 - 80	Bottom Girt	209	296.79	9311.44	3.2	Pass
T7	80 - 60	Bottom Girt	249	262.71	9311.44	2.8	Pass
T8	60 - 40	Bottom Girt	293	365.64	9311.44	3.9	Pass
T9	40 - 20	Bottom Girt	339	320.20	9311.44	3.4	Pass
T10	20 - 6.7	Bottom Girt	381	2054.57	9311.44	22.1	Pass
T1	160 - 140	Guy A@160	429	8154.35	10400.00	78.4	Pass
T4	113.3 - 106.7	Guy A@110	437	18879.80	29150.00	64.8	Pass
T8	60 - 40	Guy A@50	440	6153.68	10400.00	59.2	Pass
T1	160 - 140	Guy B@160	423	8199.99	10400.00	78.8	Pass
T4	113.3 - 106.7	Guy B@110	436	18983.70	29150.00	65.1	Pass
T8	60 - 40	Guy B@50	439	6172.96	10400.00	59.4	Pass
T1	160 - 140	Guy C@160	418	8318.27	10400.00	80.0	Pass
T4	113.3 - 106.7	Guy C@110	435	19001.70	29150.00	65.2	Pass
T8	60 - 40	Guy C@50	438	6168.62	10400.00	59.3	Pass
T1	160 - 140	Top Guy Pull-Off@160	5	-1489.09	28820.79	5.2	Pass
T4	113.3 - 106.7	Top Guy Pull-Off@110	166	6347.64	49075.06	12.9	Pass
T8	60 - 40	Top Guy Pull-Off@50	313	3581.38	49075.06	7.3	Pass
T1	160 - 140	Torque Arm Top@160	431	6177.34	60752.81	10.2	Pass
T1	160 - 140	Torque Arm Bottom@160	427	-10873.10	42912.07	25.3	Pass
						Summary	
					Leg (T5)	68.6	Pass
					Diagonal (T1)	87.6	Pass
					Horizontal (T1)	21.4	Pass
					Secondary Horizontal (T4)	15.8	Pass

ARMOR TOWER ENGINEERING *Armor Tower, Inc.* *9 N Main St.,* *Cortland, NY 13045* *Phone: (607) 591-5381* *FAX: (866) 870-0840*	**Job** REANALYSIS OF 160' GUYED TOWER	**Page** 11 of 11
	Project Prospect North, CT	**Date** 16:23:15 06/09/14
	Client Verizon Wireless	**Designed by** Archan Shah

Section No.	*Elevation ft*	*Component Type*	*Critical Element*	*P lb*	*SF*P_{allow} lb*	*% Capacity*	*Pass Fail*
					Top Girt (T5)	23.0	Pass
					Bottom Girt (T10)	22.1	Pass
					Guy A (T1)	78.4	Pass
					Guy B (T1)	78.8	Pass
					Guy C (T1)	80.0	Pass
					Top Guy Pull-Off (T4)	12.9	Pass
					Torque Arm Top (T1)	10.2	Pass
					Torque Arm Bottom (T1)	25.3	Pass
					Bolt Checks	19.3	Pass
					RATING =	**87.6**	**Pass**