STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Internet: ct.gov/csc

Daniel F. Caruso
Chairman

May 7, 2008

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-079-080314** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at North Main Street, Marlborough, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies.

The proposed modifications are to be implemented as specified here and in your notice dated March 14, 2008, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP

c: Honorable Bill Black, First Selectman, Town of Marlborough
Peter F. Hughes, Zoning Enforcement Officer, Town of Marlborough
Crown Castle International

ROBINSON & COLE LLP

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

EM-VER-079-080314

ORIGINAL

March 14, 2008

Via Hand Delivery

S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
North Main Street, Marlborough, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility at the above referenced location. The Council approved Cellco's shared use of this facility in Docket No. 169. On April 19, 2005 the Council granted Cellco's request to replace its existing antennas with six newer model cellular antennas and six PCS antennas. Cellco now intends to modify its installation further by replacing the six (6) ALP9212 cellular antennas with six (6) LPA-80080/6CF cellular antennas at the 158-foot level on the 160-foot tower. The tower is owned by Crown Castle International. Attached behind Tab 1 are the specifications for the proposed replacement antennas.

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 William Black, First Selectman of the Town of Marlborough. Pursuant to a Council directive, a copy of this letter is being sent to Country Barn Properties LLC, the owner of the property on which the tower is located.

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 any increase in the overall height of the existing structure. Cellco's replacement antennas will be located at the 158-foot level of the 160-foot tower.

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

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for the facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower can support the proposed modifications. (See 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:
William Black, Marlborough First Selectman
Country Barn Properties LLC
Sandy M. Carter

Vertically Polarized, Log Periodic 80° / 14 dBd

LPA-80080/6CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1800 mm	70.9 in
Width	140 mm	5.5 in
Depth	335 mm	13.2 in
Depth with z-bracket	375 mm	14.8 in
[4] Weight	9.5 kg	21.0 lbs
Wind Area		
Fore/Aft	0.25 m^2	2.7 ft^2
Side	0.60 m^2	6.5 ft^2
Rated Wind Velocity (Safety factor 2.0)	>295 km/hr	>183 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	415 N	93.3 lbs
Side	870 N	195.6 lbs

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome.

Mounting and Downtilting

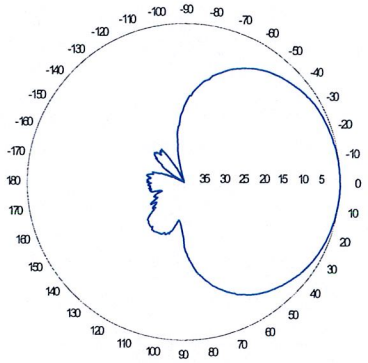
Mounting brackets attach to a pipe diameter of Ø50-102 mm (2.0-4.0 in). If the lock-down brace is used, the maximum diameter is Ø88.9 mm (3.5 in)

Mounting Bracket & Downtilt Bracket Kit #21699999

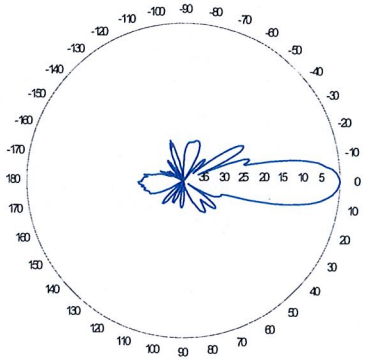
Electrical specifications

	Frequency Range	806-960 MHz
	Impedance	50Ω
[3]	Connector(s)	NE or E-DIN 1 port / center
[1]	VSWR	≤ 1.4:1
	Polarization	Vertical
[1]	Gain	14 dBd
[2]	Power Rating	500 W
[1]	Half Power Angle	
	H-Plane	80°
	E-Plane	10°
[1]	Electrical Downtilt	0°
[1]	Null Fill	10%
	Lightning Protection	Direct Ground

Radiation pattern[1]



Horizontal

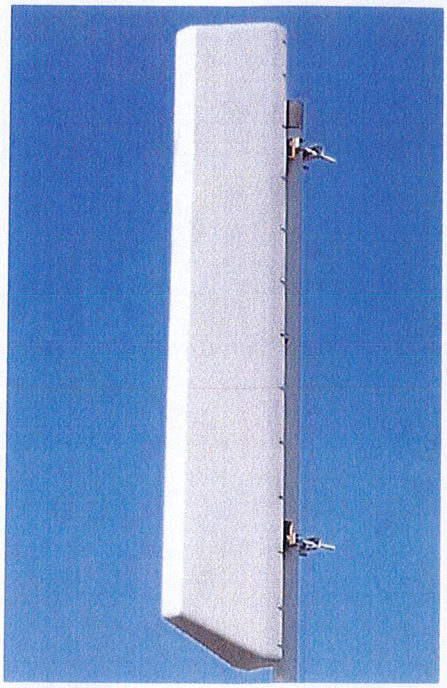


Vertical

Featuring upper side lobe suppression.

Radiation patterns for all antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back ratio.



Amphenol Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

This Amphenol Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.

1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) The antenna weight listed above does not include the bracket weight.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

CF Denotes a Center-Fed Connector.

806-960 MHz

Amphenol Antel, Inc. 1300 Capital Drive Rockford, Illinois 61109 USA Tel. (815) 399-0001
Toll-Free (888) 417-9562 Fax. (815) 399-0156 antel@antelinc.com www.antelinc.com

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/5/07

	General	Power	Density					
Site Name: Marlborough								
Tower Height: Verizon @ 158Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Cingular/TDMA	16	100	147	0.0266	880	0.5867	4.54%	
*Cingular/GSM	2	296	147	0.0099	880	0.5867	1.68%	
*Cingular/GSM	2	427	147	0.0142	1930	1.0000	1.42%	
*Omnipoint			100	0.0351	1930	1.0000	3.51%	
*Town			130				6.03%	
*Sprint Nextel - iDEN	12	100	164	0.0160	851	0.5673	2.83%	
*Sprint Nextel -CDMA	11	411	132	0.0933	1962	1.0000	9.33%	
Verizon	**9**	**397**	**158**	**0.0515**	**880**	**0.5866**	**8.77%**	
Verizon	**3**	**361**	**158**	**0.0156**	**1900**	**1.0000**	**1.56%**	
								39.67%
* Source: Siting Council								

Date: **February 18, 2008**

Veronica Harris
Crown Castle International
2000 Corporate Dr.
Canonsburg, PA 15317

FDH Engineering, Inc.
2730 Rowland Rd., Suite 100
Raleigh, NC 27615
(919) 755-1012
info@FDH-Inc.com

Subject: Structural Analysis Report

Carrier Designation:	**Verizon Co-Locate**	
	Carrier Site Number:	HRT107C
	Carrier Site Name:	Marlborough, CT
Crown Castle Designation:	**Crown Castle BU Number:**	806366
	Crown Castle Site Name:	HRT 107 (C) 943204
	Crown Castle JDE Job Number:	101950
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number: *08-02029E***	
Site Data:	**North Main Street, Marlborough, CT, Hartford Co.** **Latitude 41°-*37'-47.3"*, Longitude -*72°-27'-59.4"*** **155.5 Foot – Monopole with 10' Extension**	

Dear Veronica,

FDH Engineering, Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the aforementioned 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 275594, in accordance with application 59388, revision 0.

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:

LC1: Existing + Reserved + Proposed Equipment — Sufficient Capacity
Note: See Table I and Table II for the proposed and existing/reserved loading.

The analysis has been performed in accordance with the EIA/TIA-222-F standard based upon a wind speed of 80 mph without ice and 69 mph with 1/2" ice (fastest mile).

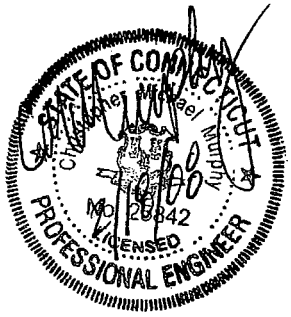
All equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at FDH Engineering, Inc. appreciate the opportunity of providing our continuing professional services to you and Crown Castle International. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Krystyn Wagner, EI
Project Engineer

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



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1) INTRODUCTION

The subject tower is a 155.5 foot monopole with a 10 ft extension. The original tower was manufactured by FWT in 1997.

2) ANALYSIS CRITERIA

- TIA-222-F – Structural Standard for Antenna Supporting Structures and Antennas
- TIA-222-F – Wind speed without ice: 80 mph (fastest mile)
- TIA-222-F – Wind speed with 1/2" ice: 69 mph (fastest mile)

Table 1 – Proposed Antenna and Cable Information

Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Mount Information	Number of Feed Lines	Feed Line Size (in)
158[1]	6 6	Antel Decibel	LPA-80080/6CF DB948F85T2E-M	Existing	12	1-5/8"

1. This represents the final configuration for Verizon at 158'. According to information provided by Crown Castle, Verizon will remove (6) Swedcom ALP 9212-N antennas, (3) Decibel DB809K-Y omnis, and (3) 1-5/8" coax, and replace with (6) Antel LPA-80080/6CF antennas for a final configuration of (12) antennas and (12) coax at 158'.

Table 2 – Existing and Reserved Antenna and Cable Information

Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
168	12	Decibel	DB846G90A-XY	12	1-5/8"
158[1]	6 6 3	Swedcom Decibel Decibel	ALP 9212-N DB948F85T2E-M DB809K-Y	15	1-5/8"
147	9 6	CSS TMA	DU04-8670 TMA	9	1-1/4"
135	3	EMS	RR90-17-02DP	6	1-1/4"
126[2,3]	9 ---	Decibel *SLA*	DB980H90E-M ---	6 *9*	1-1/4" *1-5/8"*
120	3	Decibel	DB809K-Y	5	1/2"
100	6	EMS	RR90-17-02DP	6	1-1/4"
50	1	GPS	GPS	1	1/2"

1 The loading at 158 ft will be altered. See the proposed loading above.
2 The (9) SLA coax control this analysis.
3 There are currently (6) Decibel DB980H90E-M antennas installed at 126 ft. According to information provided by Crown Castle, the carrier may install up to (9) antennas. Analysis performed with total leased loading in place.

Table 3 – Design Antenna and Cable Information

Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
157.75	12	Swedcom	ALP-9212-N	---	---
144.25	9	Swedcom	ALP-9212-N	---	---
132	9 2 1 2	Decibel Celwave Celwave Celwave	DB980 PD1142 PD201 PD220	---	---

3) ANALYSIS PROCEDURE

Table 4 – Documents Provided

Document	Remarks	Reference	Source
Tower Manufacturer Drawings	FWT Job No. 15829	Doc # 823126	Crown Castle
Tower Foundation Drawing	FWT Job No. 15829	Doc # 823125	Crown Castle
Geotechnical Report	FDH Engineering, Inc. Job No. 08-02029G	---	Crown Castle
Structural Analysis Report	GPD Associates	Doc # 1292582	Crown Castle
CCC & CAD loading tables	BU874866	---	Crown Castle

3.1) Analysis Method

RISA Tower (version 5.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. All loads were computed in accordance with the ANSI/TIA-222-F and the local building code requirements. 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 specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the reference drawings.
4. The flange plate and bolts for the extension were designed to support the extension at capacity.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and FDH Engineering, Inc. should be allowed to review any new information to determine its effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 – Tower Component Stresses vs. Capacity – LC1

Notes	Component	Elevation (ft)	% Capacity	Pass/Fail
RISA Tower Analysis Summary:(Monopole)				
			Summary	
Notes:	**Component**	**Elevation**	**% Capacity**	**Pass/Fail**
	L1	165.5 – 155.5	2.6%	Pass
	L2	155.5 – 110	19.3%	Pass
	L3	110 – 72.5	33.8%	Pass
	L4	72.5 – 36	43.6%	Pass
	L5	36 – 0	64.7%	Pass
Individual Components:				
Notes:	**Component**	**Elevation**	**% Capacity**	**Pass/Fail**
	Anchor Rods	---	63.7%	Pass
	Base Plate	---	51.1%	Pass
	Base Foundation (Compared w/ Design Loads)	---	82.7%	Pass
Structure Rating (max from all components) =				**82.7%**

*Notes:

1) The following components listed in the RISA Tower Analysis Summary were analyzed separately to determine the percent capacity consumed (see attached calculations):
2) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity listed.

4.1) Recommendations

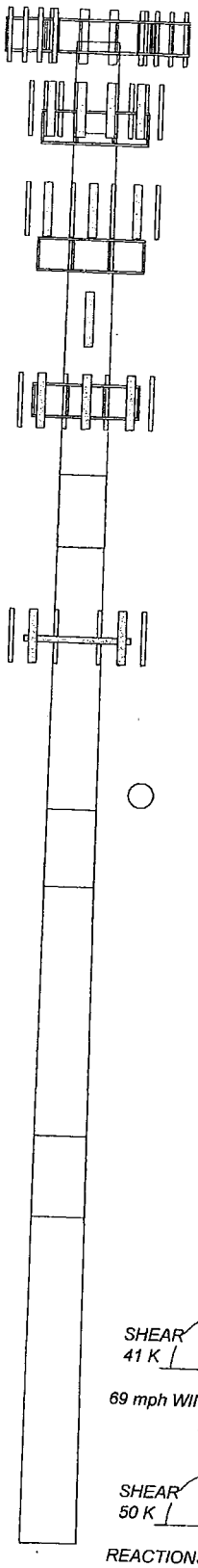
1. The proposed coax should be installed per the Base Level Drawing. See Appendix B.

APPENDIX A

RISA TOWER OUTPUT

Section	5	4	3	2	1
Length (ft)	45.00	45.00	45.50	45.50	10.00
Number of Sides	12	12	12	12	1
Thickness (in)	0.5000	0.5000	0.4375	0.3750	0.3750
Lap Splice (ft)		9.00	8.50	8.00	
Top Dia (in)	70.5600	66.8082	62.8000	58.6000	58.6000
Bot Dia (in)	76.5000	72.7480	68.8050	64.6060	58.6000
Grade			A572-65		
Weight (K)	63.1	18.0	17.1	14.3	11.4	2.3

165.5 ft
155.5 ft
110.0 ft
72.5 ft
36.0 ft
0.0 ft



AXIAL
91 K
SHEAR
41 K
MOMENT
4487 kip-ft
69 mph WIND - 0.5000 in ICE
AXIAL
79 K
SHEAR
50 K
MOMENT
5390 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(4) DB846G90A-XY w/Mount Pipe	168	Platform w/handrails (Monopole)	142
(4) DB846G90A-XY w/Mount Pipe	168	RR90-17-02DP w/Mount Pipe	135
(4) DB846G90A-XY w/Mount Pipe	168	RR90-17-02DP w/Mount Pipe	135
Platform w/handrails (Monopole)	166	RR90-17-02DP w/Mount Pipe	135
(2) Antel LPA-80080/6cf	158	(3) DB980H90E-M w/Mount Pipe	126
(2) Antel LPA-80080/6cf	158	(3) DB980H90E-M w/Mount Pipe	126
(2) Antel LPA-80080/6cf	158	(3) T-Frames	126
(2) DB948F85T2E-M w/Mount Pipe	158	(3) DB980H90E-M w/Mount Pipe	126
(2) DB948F85T2E-M w/Mount Pipe	158	(3) 5' T-Arms	100
(2) DB948F85T2E-M w/Mount Pipe	158	(2) RR90-17-02DP w/Mount Pipe	100
Platform w/handrail	156	(2) RR90-17-02DP w/Mount Pipe	100
(3) DU04-8670 w/Mount Pipe	147	(2) RR90-17-02DP w/Mount Pipe	100
(3) DU04-8670 w/Mount Pipe	147	GPS 6" x 3.5"	50
(3) DU04-8670 w/Mount Pipe	147		

MATERIAL STRENGTH

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

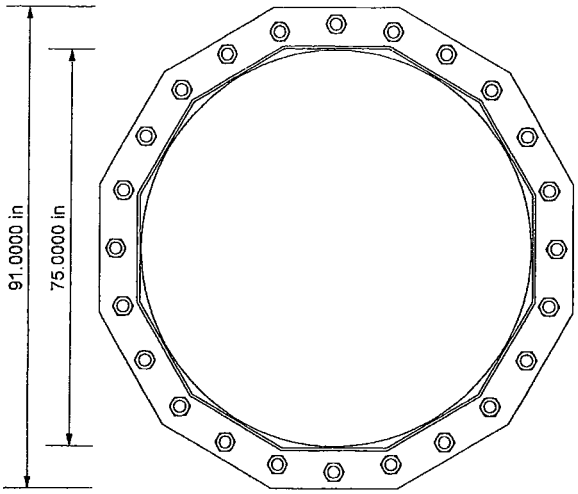
TOWER DESIGN NOTES

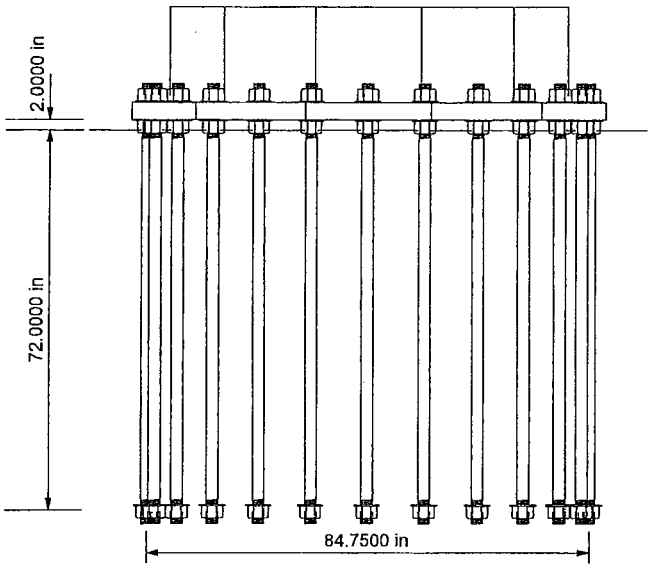
1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.

FDH Engineering
2730 Rowland Road, Suite 100
Raleigh, NC 27615
Phone: (919) 755-1012
FAX: (919) 755-1031

Tower Analysis

Job: 806366 (NNJ Denville 842112)		
Project: 08-02029E		
Client: Crown Castle International	Drawn by: Krystyn Wagner	App'd:
Code: TIA/EIA-222-F	Date: 02/20/08	Scale: NTS
Path: \\Fdh-server\projects\2008 Projects\2- Feb\08-02029GA\EVHRT 107(C) 943204\Analysis\806366.eri		Dwg No. E-1





FOUNDATION NOTES

1. Plate thickness is 3.2500 in.
2. Plate grade is A633-60.
3. Anchor bolt grade is A615-75.
4. f'c is 4 ksi.

FDH Engineering
2730 Rowland Road, Suite 100
Raleigh, NC 27615
Phone: (919) 755-1012
FAX: (919) 755-1031

Tower Analysis

Job: ***806366 (NNJ Denville 842112)***		
Project: ***08-02029E***		
Client: Crown Castle International	Drawn by: Krystyn Wagner	App'd:
Code: TIA/EIA-222-F	Date: 02/20/08	Scale: NTS
Path: \\Fdh-server\projects\2008 Projects\2. Feb\08-02029G3 EHRT 107(C) 942204\Analysis\806366.eri		Dwg No. F-1

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

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	165.50-155.50	10.00	0.00	Round	58.6000	58.6000	0.3750		A572-65 (65 ksi)
L2	155.50-110.00	45.50	8.00	12	58.6000	64.6060	0.3750	1.5000	A572-65 (65 ksi)
L3	110.00-72.50	45.50	8.50	12	62.8000	68.8050	0.4375	1.7500	A572-65 (65 ksi)
L4	72.50-36.00	45.00	9.00	12	66.8082	72.7480	0.5000	2.0000	A572-65 (65 ksi)
L5	36.00-0.00	45.00		12	70.5600	76.5000	0.5000	2.0000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	58.6000	68.5599	29090.5753	20.6117	29.3000	992.8524	58101.8996	34.2769	0.0000	0
	58.6000	68.5599	29090.5753	20.6117	29.3000	992.8524	58101.8996	34.2769	0.0000	0
L2	60.6672	70.3067	30422.9680	20.8446	30.3548	1002.2457	61645.1813	34.6028	14.6998	39.199
	66.8851	77.5589	40842.0131	22.9947	33.4659	1220.4065	82756.9913	38.1721	16.3094	43.492
L3	66.1084	87.8532	43610.4361	22.3258	32.5304	1340.6056	88366.5670	43.2387	15.6579	35.789
	71.2322	96.3127	57460.4440	24.4756	35.6410	1612.2011	116430.437 8	47.4022	17.2672	39.468
L4	70.3265	106.7562	59911.9268	23.7383	34.6066	1731.2263	121397.806 6	52.5421	16.5646	33.129
	75.3143	116.3193	77497.7893	25.8648	37.6835	2056.5463	157031.531 8	57.2488	18.1565	36.313
L5	74.2790	112.7967	70668.0184	25.0815	36.5501	1933.4563	143192.564 3	55.5151	17.5701	35.14
	79.1986	122.3600	90209.5680	27.2080	39.6270	2276.4673	182789.041 8	60.2219	19.1620	38.324

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 165.50-155.50				1	1	1		
L2 155.50-110.00				1	1	1		
L3 110.00-72.50				1	1	1		
L4 72.50-36.00				1	1	1		
L5 36.00-0.00				1	1	1		

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	24
Embedment length	72.0000 in
f'_c	4 ksi
Grout space	2.0000 in
Base plate grade	A633-60
Base plate thickness	3.2500 in
Bolt circle diameter	84.7500 in
Outer diameter	91.0000 in
Inner diameter	75.0000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 1/4	C	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1/2	C	No	Inside Pole	50.00 - 0.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1 1/4	C	No	Inside Pole	135.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1 5/8	C	No	Inside Pole	155.50 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 1/4	C	No	Inside Pole	142.00 - 0.00	9	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1 5/8	C	No	Inside Pole	155.50 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1/2	C	No	Inside Pole	120.00 - 0.00	5	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1 5/8 (SLA)	C	No	Inside Pole	126.00 - 0.00	9	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	165.50-155.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
L2	155.50-110.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.59
L3	110.00-72.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.81
L4	72.50-36.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.81
L5	36.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.79

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	165.50-155.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
L2	155.50-110.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.59
L3	110.00-72.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.81
L4	72.50-36.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
		C		0.000	0.000	0.000	0.000	1.81
L5	36.00-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.79

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
GPS 6" x 3.5"	A	None			0.0000	50.00	No Ice	0.20	0.20	0.02
							1/2" Ice	0.27	0.27	0.02
(2) RR90-17-02DP w/Mount Pipe	A	From Face	3.00		0.0000	100.00	No Ice	4.91	3.64	0.04
			0.00				1/2" Ice	5.57	4.70	0.08
			0.00							
(2) RR90-17-02DP w/Mount Pipe	B	From Face	3.00		0.0000	100.00	No Ice	4.91	3.64	0.04
			0.00				1/2" Ice	5.57	4.70	0.08
			0.00							
(2) RR90-17-02DP w/Mount Pipe	C	From Face	3.00		0.0000	100.00	No Ice	4.91	3.64	0.04
			0.00				1/2" Ice	5.57	4.70	0.08
			0.00							
(3) 5' T-Arms	C	None			0.0000	100.00	No Ice	10.50	10.50	0.30
							1/2" Ice	12.60	12.60	0.50
(3) DB980H90E-M w/Mount Pipe	A	From Face	3.00		0.0000	126.00	No Ice	4.27	3.86	0.03
			0.00				1/2" Ice	4.86	4.95	0.07
			0.00							
(3) DB980H90E-M w/Mount Pipe	B	From Face	3.00		0.0000	126.00	No Ice	4.27	3.86	0.03
			0.00				1/2" Ice	4.86	4.95	0.07
			0.00							
(3) DB980H90E-M w/Mount Pipe	C	From Face	3.00		0.0000	126.00	No Ice	4.27	3.86	0.03
			0.00				1/2" Ice	4.86	4.95	0.07
			0.00							
(3) T-Frames	C	None			0.0000	126.00	No Ice	12.20	12.20	0.36
							1/2" Ice	17.60	17.60	0.49
RR90-17-02DP w/Mount Pipe	A	None			0.0000	135.00	No Ice	4.91	3.64	0.04
							1/2" Ice	5.57	4.70	0.08
RR90-17-02DP w/Mount Pipe	B	None			0.0000	135.00	No Ice	4.91	3.64	0.04
							1/2" Ice	5.57	4.70	0.08
RR90-17-02DP w/Mount Pipe	C	None			0.0000	135.00	No Ice	4.91	3.64	0.04
							1/2" Ice	5.57	4.70	0.08
(3) DU04-8670 w/Mount Pipe	A	From Face	3.00		0.0000	147.00	No Ice	7.25	5.86	0.06
			0.00				1/2" Ice	7.96	6.96	0.11
			0.00							
(3) DU04-8670 w/Mount Pipe	B	From Face	3.00		0.0000	147.00	No Ice	7.25	5.86	0.06
			0.00				1/2" Ice	7.96	6.96	0.11
			0.00							
(3) DU04-8670 w/Mount Pipe	C	From Face	3.00		0.0000	147.00	No Ice	7.25	5.86	0.06
			0.00				1/2" Ice	7.96	6.96	0.11
			0.00							
Platform w/handrails (Monopole)	C	None			0.0000	142.00	No Ice	31.30	31.30	1.82
							1/2" Ice	40.20	40.20	2.45
(2) Antel LPA-80080/6cf	A	From Face	3.00		0.0000	158.00	No Ice	4.32	9.10	0.02
			0.00				1/2" Ice	4.76	9.65	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
			0.00						
(2) Antel LPA-80080/6cf	B	From Face	3.00	0.0000	158.00	No Ice	4.32	9.10	0.02
			0.00			1/2" Ice	4.76	9.65	0.07
			0.00						
(2) Antel LPA-80080/6cf	C	From Face	3.00	0.0000	158.00	No Ice	4.32	9.10	0.02
			0.00			1/2" Ice	4.76	9.65	0.07
			0.00						
(2) DB948F85T2E-M w/Mount Pipe	A	From Face	3.00	0.0000	158.00	No Ice	2.62	4.92	0.03
			0.00			1/2" Ice	3.23	6.01	0.07
			0.00						
(2) DB948F85T2E-M w/Mount Pipe	B	From Face	3.00	0.0000	158.00	No Ice	2.62	4.92	0.03
			0.00			1/2" Ice	3.23	6.01	0.07
			0.00						
(2) DB948F85T2E-M w/Mount Pipe	C	From Face	3.00	0.0000	158.00	No Ice	2.62	4.92	0.03
			0.00			1/2" Ice	3.23	6.01	0.07
			0.00						
Platform w/handrail	C	None		0.0000	156.00	No Ice	31.30	31.30	1.82
						1/2" Ice	40.20	40.20	2.45
(4) DB846G90A-XY w/Mount Pipe	A	From Face	3.00	0.0000	168.00	No Ice	5.23	7.53	0.04
			0.00			1/2" Ice	5.78	8.72	0.09
			0.00						
(4) DB846G90A-XY w/Mount Pipe	B	From Face	3.00	0.0000	168.00	No Ice	5.23	7.53	0.04
			0.00			1/2" Ice	5.78	8.72	0.09
			0.00						
(4) DB846G90A-XY w/Mount Pipe	C	From Face	3.00	0.0000	168.00	No Ice	5.23	7.53	0.04
			0.00			1/2" Ice	5.78	8.72	0.09
			0.00						
Platform w/handrails (Monopole)	C	None		0.0000	166.00	No Ice	31.30	31.30	1.82
						1/2" Ice	40.20	40.20	2.45

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
3.2500	24	2.2500	123.91	130.49	30.533		Bolt T	0.94 ✓
			~~131.21~~	217.81	45.000			
			~~0.94~~ 0.637	0.60	0.68			

TALLOW = 194.5 K

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	165.5 - 155.5 (1)	TP58.6x58.6x0.375	10.00	165.50	96.4	16.085	68.5599	-6.52	1102.78	0.006
L2	155.5 - 110 (2)	TP64.606x58.6x0.375	45.50	165.50	87.8	19.082	76.2838	-20.69	1455.62	0.014
L3	110 - 72.5 (3)	TP68.805x62.8x0.4375	45.50	165.50	82.5	20.867	94.7324	-36.45	1976.77	0.018
L4	72.5 - 36 (4)	TP72.748x66.8082x0.5	45.00	165.50	78.1	22.295	114.4070	-54.69	2550.69	0.021
L5	36 - 0 (5)	TP76.5x70.56x0.5	45.00	165.50	73.0	23.868	122.3600	-78.92	2920.48	0.027

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	165.5 - 155.5 (1)	TP58.6x58.6x0.375	71.20	-0.861	30.264	0.028	0.00	0.000	30.264	0.000
L2	155.5 - 110 (2)	TP64.606x58.6x0.375	751.12	-7.635	31.415	0.243	0.00	0.000	31.415	0.000
L3	110 - 72.5 (3)	TP68.805x62.8x0.4375	1893.15	-14.567	33.742	0.432	0.00	0.000	33.742	0.000
L4	72.5 - 36 (4)	TP72.748x66.8082x0.5	3302.55	-19.922	35.568	0.560	0.00	0.000	35.568	0.000
L5	36 - 0 (5)	TP76.5x70.56x0.5	5390.02	-28.413	34.010	0.835	0.00	0.000	34.010	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	165.5 - 155.5 (1)	TP58.6x58.6x0.375	0.006	0.028	0.000	0.034 ✓	1.333	H1-3 ✓
L2	155.5 - 110 (2)	TP64.606x58.6x0.375	0.014	0.243	0.000	0.257 ✓	1.333	H1-3 ✓
L3	110 - 72.5 (3)	TP68.805x62.8x0.4375	0.018	0.432	0.000	0.450 ✓	1.333	H1-3 ✓
L4	72.5 - 36 (4)	TP72.748x66.8082x0.5	0.021	0.560	0.000	0.582 ✓	1.333	H1-3 ✓
L5	36 - 0 (5)	TP76.5x70.56x0.5	0.027	0.835	0.000	0.862 ✓	1.333	H1-3 ✓

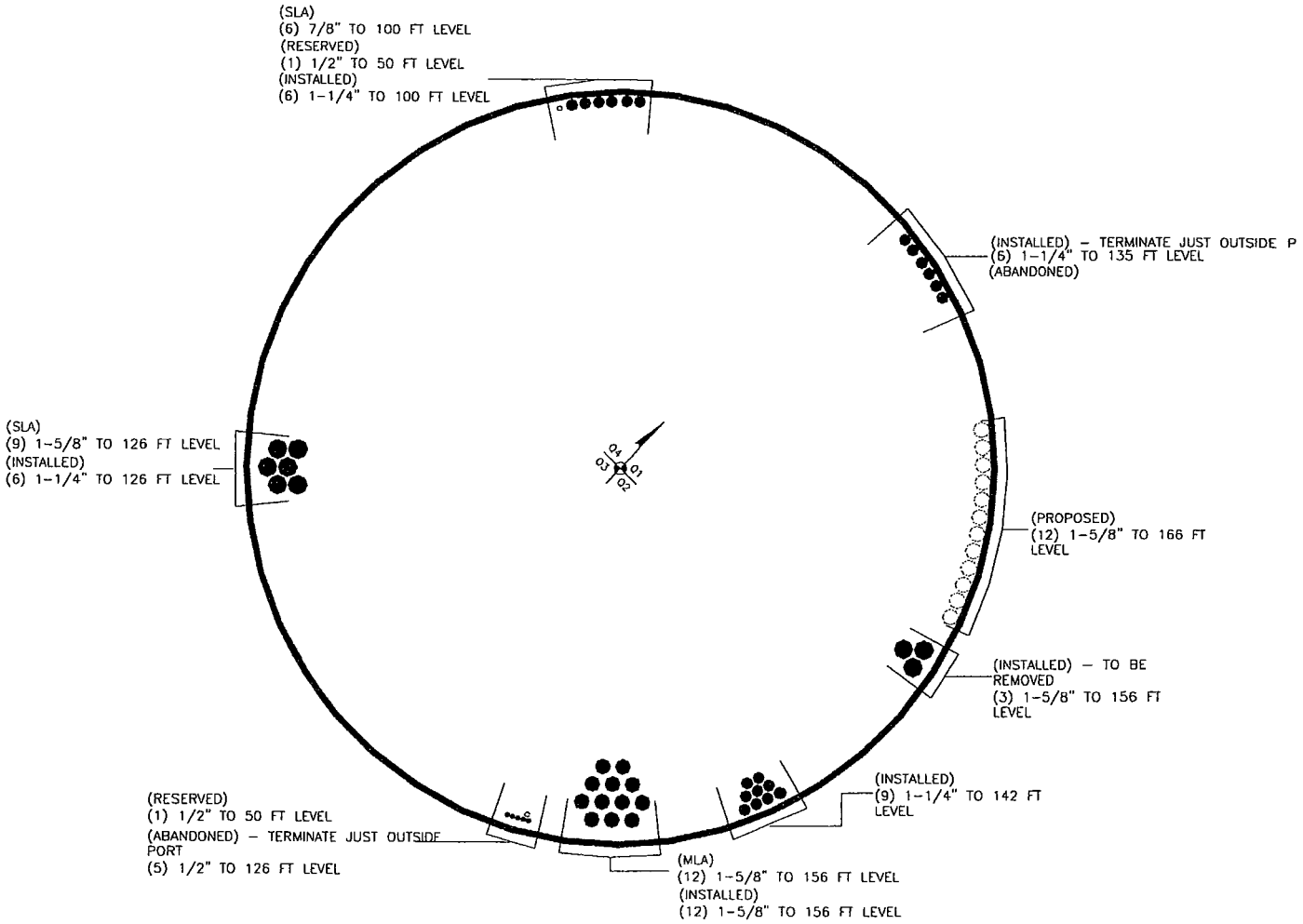
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	165.5 - 155.5	Pole	TP58.6x58.6x0.375	1	-6.52	1470.01	2.6	Pass
L2	155.5 - 110	Pole	TP64.606x58.6x0.375	2	-20.69	1940.34	19.3	Pass
L3	110 - 72.5	Pole	TP68.805x62.8x0.4375	3	-36.45	2635.03	33.8	Pass
L4	72.5 - 36	Pole	TP72.748x66.8082x0.5	4	-54.69	3400.07	43.6	Pass
L5	36 - 0	Pole	TP76.5x70.56x0.5	5	-78.92	3893.00	64.7	Pass
						Summary		
						Pole (L5)	64.7	Pass
						Base Plate	~~70.8~~	~~Pass~~
						RATING =	~~70.8~~	~~Pass~~

63.7 Pass
⇒ See previous page for anchor bolt calculations

APENDIX B

BASE LEVEL DRAWING



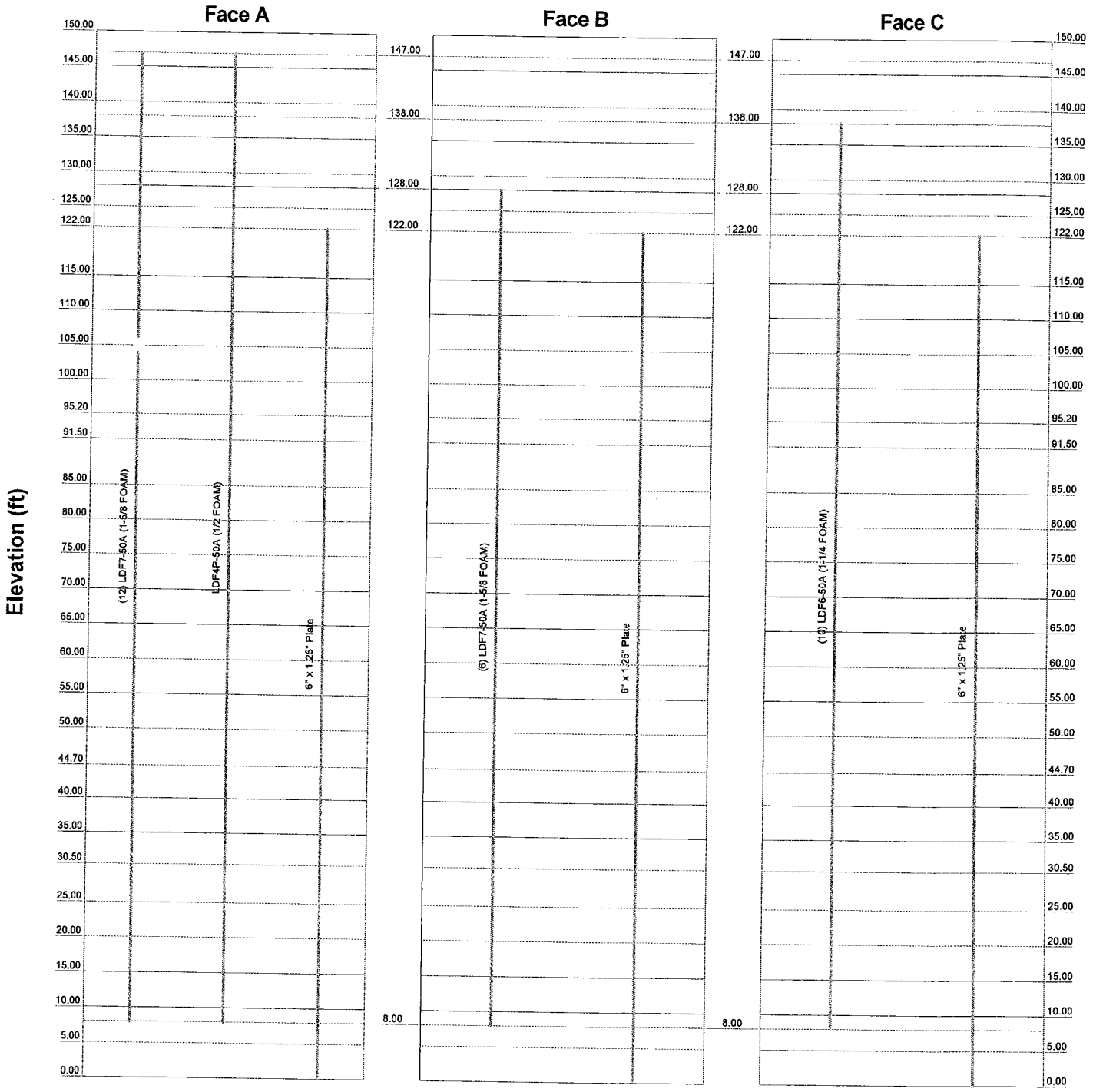
Base Level Drawing

APPENDIX C

ADDITIONAL CALCULATIONS

Feedline Distribution Chart
0' - 150'

Round Flat App In Face App Out Face Truss Leg



GPD GROUP
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520 South Main St. Suite 2531
Akron, OH 44311
Phone: (330) 572-2100
FAX: (330) 572-2101

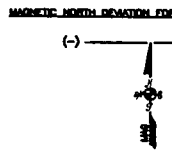
Job: ***NHV 102 943127 - BU# 806361***			
Project: ***2006181.43***			
Client: Crown Castle	Drawn by: dherriott	App'd:	
Code: TIA/EIA-222-F	Date: 02/19/08	Scale: NTS	
Path: G:\Telecom\2006179\19\RISA Model\806361.eri		Dwg No. E-7	

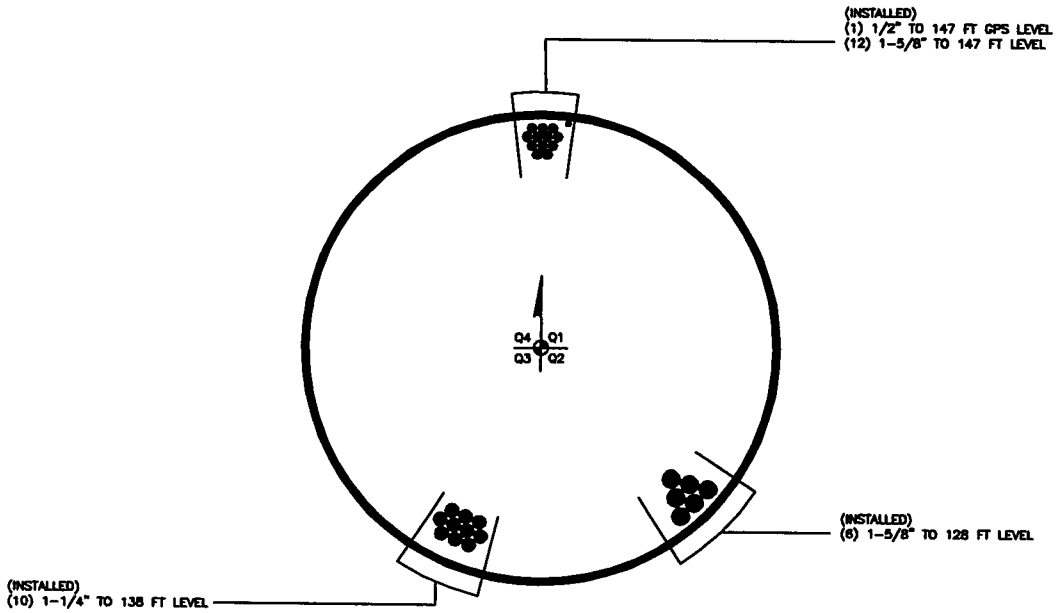
APPENDIX D

Base Level Drawing

MAGNETIC NORTH DEVIATION FOR TRUE NORTH -14.61 DEGREES

(-) (+)





BUSINESS UNIT: 806361 TOWER ID: C_BASELEVEL

: SCALE :

LEGEND: FEEDLINES

- ● SOLID BLUE CIRCLE DENOTES EXISTING FEEDLINE
- ○ OPEN RED CIRCLE DENOTES PROPOSED FEEDLINE
- ○ OPEN BLUE CIRCLE DENOTES RESERVED FEEDLINE
- X BLUE "X" DENOTES LOCATION NOT GIVEN

NOTE: ASSUME FEEDLINE ATTACHMENT HEIGHT TO TOWER STEEL AT 8-FEET ABOVE FINISHED GRADE UNLESS OTHERWISE SPECIFIED

BASE LEVEL DRAWING

SCALE 1" = 1'-0" | 1

APPENDIX E

Base Plate & Anchor Rod Analysis

520 South Main Street . Suite 2531 . Akron, Ohio 44311 • PHONE 330-572-2100 • FAX 330-572-2102

GPD GROUP
Engineers . Architects . Planners

Job 2008171.19 (Bluff 806361) Calculated By DMH Date 2/18/08

Sheet No. ____ Of ____ Checked By ____ Date ____

Base Plate w/ new Anchor rods + stiffeners

modified Bolt force = 123K

123K < 195K ∴ OK

Base Plate stress

$\ell = 4.89$

$b = 9.14$

$f_c = \frac{123K}{4.89 \cdot 9.14}$

$f_c = 2.74$

$\frac{\ell}{b} = .532$

$M_x = .0744 f_c b^2 = 7.96$

$M_y = .221 f_c \ell^2 = 19.72$

$f_b = \frac{6 \cdot M_{max}}{t_{BP}^2} = \frac{6 \cdot 19.72}{2.75^2} = 15.65$

15.65 ksi < 60 ksi ∴ OK

APPENDIX F

Foundation Analysis

CAISSON Version 4.46 Tue Feb 19 08:13:42 2008
U.W. Short Course - 1998

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*************************************************************************
*                                                                       *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995, POWER LINE SYSTEMS, INC.*
*                                                                       *
*************************************************************************
```

*** ANALYSIS IDENTIFICATION : Crown Castle - BU#806361 NHV 102
NOTES : 2008179.19 - Rebar

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 3.00 STEEL STRENGTH (ksi) = 60.00
DIAMETER (ft) = 6.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	C	5.00	0.00	135.0	0.0		
2	S	5.00	5.00	135.0		4.200	37.98
3	S	25.00	10.00	75.0		4.200	37.98

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 2740.0 VERTICAL (k) = 25.0 SHEAR (k) = 26.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 1.30

*** CALCULATED PIER LENGTH (ft) = 18.500

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	0.50	5.00	135.0	0.0		0.00	3.00
S	5.50	5.00	135.0		4.200	382.72	8.28
S	10.50	2.94	75.0		4.200	324.73	12.01
S	13.44	5.06	75.0		4.200	-673.19	16.06

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	34.3	3745.2	26.4	2880.9
1.85	34.3	3808.5	26.4	2929.6
3.70	34.3	3871.9	26.4	2978.4
5.55	31.7	3935.2	24.4	3027.1
7.40	-81.1	3894.9	-62.4	2996.1
9.25	-228.9	3613.6	-176.0	2779.7
11.10	-410.7	3026.7	-315.9	2328.3
12.95	-615.5	2080.5	-473.5	1600.3
14.80	-506.6	961.2	-389.7	739.4
16.65	-263.0	246.3	-202.3	189.5

18.50	-0.0	0.0	-0.0	0.0

*** TOTAL REINFORCEMENT PCT = 0.60 REINFORCEMENT AREA (in^2) = 24.43
*** USABLE AXIAL CAP. (k) = 25.0 USABLE MOMENT CAP. (ft-k) = 3077.5

*** US Standard Re-Bars (Select one of the following):

123	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in)	AT SPACING (in) =	1.58
79	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in)	AT SPACING (in) =	2.47
56	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in)	AT SPACING (in) =	3.48
41	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in)	AT SPACING (in) =	4.75
31	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in)	AT SPACING (in) =	6.28
25	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in)	AT SPACING (in) =	7.79
20	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in)	AT SPACING (in) =	9.74
16	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in)	AT SPACING (in) =	12.17
11	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in)	AT SPACING (in) =	17.71

*** PRESSURE UNDER CAISSON DUE TO DESIGN AXIAL LOAD (psf) = 884.2