

PWSF -1-2016

CLMB 194

CITY OF GAHANNA, OHIO
DEPARTMENT OF DEVELOPMENT
REQUEST FOR PERSONAL WIRELESS SERVICE FACILITIES ("PWSF")
PREVIOUSLY APPROVED CO-LOCATION
(Pursuant to City of Gahanna Codified Ordinance Chapter 1181
also known as City of Gahanna Personal Wireless Service
Facilities Ordinance ("PWSF Ordinance"))

RECEIVED
JAN 07 2016

Permit# 16010005
Date 12-28-15
Tier _____

INFORMATION (Please print or type)

Business Name: VERIZON WIRELESS Phone Number: _____
Contact Person: PAUL NICHOLS, AGENT Fax Number: _____
Business Address: _____ Email: _____

Agent Name: PAUL NICHOLS Phone Number: 513-233-1884
Business Address: 8970 MINNOSA LN Fax Number: 313-203-0235
WESTCHESTER OH Email: PNICHOLS@PFWWS.COM
43069

24 Hour System Representative(s) (in order to be contacted):
Name Business # Mobile # Email
#1 ON FILE _____
#2 _____
#3 _____

Is Co-Location on: ☒ a Mount ☐ the ground?

Location and Siting Information 213-215 W. JOHNSTOWN RD
40.81629167, -82.88599167
Parcel # 025-00299200

Narrative Information (Section 1181.08.E) ASR 1287556 38.1 METERS AGL

On behalf of PAUL NICHOLS (Applicant), I hereby acknowledge that I have reviewed the City of Gahanna Codified Ordinance Chapter 1181 and certify that to the best of my knowledge the above and all attached information is complete and correct and conforms to Chapter 1181, as of this 1 day of JAN, 2015.

Paul Nichols
PAUL NICHOLS AGENT
Name Title

STATE OF OHIO :
COUNTY OF Hamilton : ss.

Before me, a Notary Public in and for said State and County, personally appeared Paul Nichols (Name), on behalf of Paul Nichols (Applicant), its Agent (Title), who acknowledged the signing of the foregoing Application, who states that this is the free act and will of the Applicant and that they are authorized by the Applicant to sign this Application.

IN WITNESS WHEREOF, I have hereunto signed my name and affixed my official seal on the 5th day of

January



ANDOTUS D. TATE
Notary Public, State of Ohio
My Comm. Expires 05/18/2020

Andotus D. Tate
Notary Public

(H1324863.1)

Planning & Zoning Administrator Bonnie Gard Jan 20, 2016



CITY OF GAHANNA

Agreement to Construct as Approved

Your signature below affirms that, as the contractor PAUL NICHOLS
(Please print Contractor Name)

AGENT for VERIZON WIRELESS,
(Business Name and/or Address)

the above named project will be built as approved and specified by the City of Gahanna Planning Commission. As the contractor, you also agree that any proposed change to the approved plans must be reported to the Planning and Zoning Administrator. Significant changes to the project, as determined by the Planning and Zoning Administrator, must be approved by Planning Commission.

Contractor Name/Representative Paul Nichols
(Please sign)

Date 1/3/18

[Signature]
(Signature of Notary)

01/03/18
(Date)



ANDOTUS D. TATE
Notary Public, State of Ohio
My Comm. Expires 05/18/2020

Stamp/Seal

CLMB194 Generator Statement and Frequency Information

No generator will be used permanently

A generator may only be used temporarily and only under emergency circumstances or following the occurrence of force majeure events with and a description of the type, placement and rating of generator that could be used temporarily.

A copy of the Material Safety Data Sheets (MSDS) is placed on-site in this existing tower.

SPECTRUM	LICENSED?	TX FREQ (MHz)	RX FREQ (MHz)
CELLULAR_A_25MHz	Y	869-892	824-847
CELLULAR_B_25MHz		880-894	835-849
PCS_D_10MHz		1945-1950	1865-1870
PCS_B_30MHz		1950-1965	1870-1885
PCS_E_10MHz		1965-1970	1885-1890
PCS_F_10MHz	Y	1970-1975	1890-1895
PCS_C-1_15MHz		1982.5-1990	1902.5-1910
PCS_C-2_15MHz		1975-1982.5	1895-1902.5
PCS_C-3_10MHz	Y	1975-1980	1895-1900
PCS_C-4_10MHz		1980-1985	1900-1905
PCS_C-5_10MHz		1985-1990	1905-1910
AWS_A_20MHz (CMA)		2110-2120	1710-1720
AWS_F_20MHz (REAG)	Y	2145-2155	1745-1755
700_A_12MHz (EA)		728-734	698-704
700_B_12MHz (CMA)		734-740	704-710
700_C_22MHz (REAG)	Y	746-757	776-787
GENERATOR INFORMATION			
MANUFACTURER	GENERAC		
MODEL	6290		
CAPACITY (KW)	48		
FUEL TYPE	DIESEL		
TANK SIZE	210		
LOCATION	INDOOR		

HARPER ENGINEERING, Inc.

815 Superior Ave.
Suite 1514
Cleveland, OH 44114
Ph: 216.344.3855
Email: dwharper@harperengineering.org

STRUCTURAL EVALUATION LETTER

SITE INFORMATION

Site Name: Ridenour Park
Site Type: Monopole
Site Address: 213 Johnstown Road, Columbus, Ohio 43230
Verizon Site No.: CLMB194
HPE Site No.: 9-151-788 (Rev.2)

CURRENT WIND CRITERIA

1. Meets Ohio Building Code 2011/IBC 2009.
2. ANSI/TIA/EIA-222-G - Code.

DATA SOURCES

1. Original tower and foundation design of existing 120 ft. monopole by EEI dated 10/27/2010.
2. Verizon RF information sheet dated 12/03/2015.
3. ATC site photos dated 12/17/2015.

PROPOSED MODIFICATIONS

1. Remove three (3) X7C-FRO-660-4 existing antennas at 123 ft. elevation.
2. Remove three (3) AXP18-60-0 existing antennas at 123 ft. elevation.
3. Relocate six (6) SBNHH-1D65C existing panel antennas at 121 ft. elevation.
4. Install six (6) SBNHH-1D65C new panel antennas at 121 ft. elevation.
5. Remove six (6) RRHs behind antennas at 123 ft. elevation
6. Install nine (9) new RRHs behind antennas at 123 ft. elevation
7. Install one (1) OVP distribution boxes on one (1) pipe mount at 123 ft. elevation
8. Install one (1) 1 5/8" Hybrid cable on outside of monopole to 123 ft. elevation

ASSUMPTIONS

1. Existing structure and its foundation are in good condition and without any structural defects.
2. The original structural design was performed in accordance with the Telecommunication Industry Association standard TIA/EIA 222 and governing building code.

TOWER LOADING:

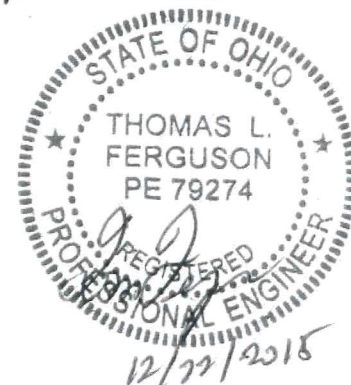
Elev.	Antenna loading	Coax	Carrier
123 ft.	(9) RRHs (1) OVP distribution box (1) Pipe mount (1) OVP distribution box (1) Pipe mount	(1) Hybrid cable (1-5/8") (Outside) (1) Hybrid cable (1-5/8") (Outside)	Verizon
121 ft.	(6) SBNHH-1D65C panel antennas (6) SBNHH-1D65C panel antennas (1) Low profile platform	(18) LDF7 coax cables (1-5/8") (Inside)	

CONCLUSION

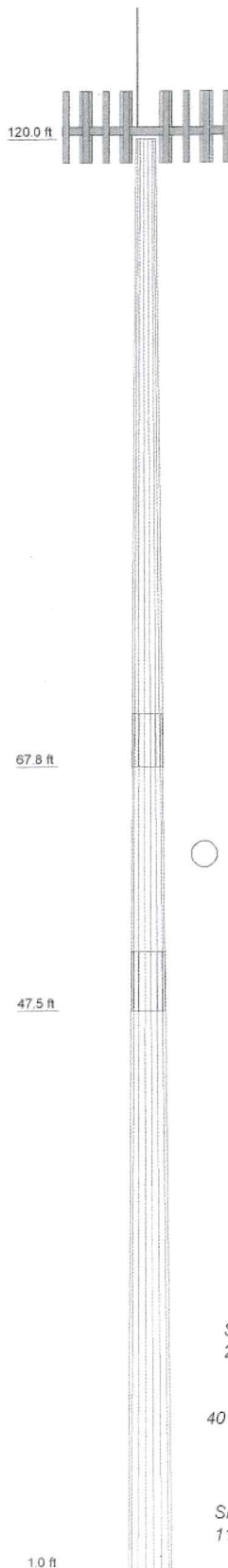
Harper Engineering performed a structural analysis of the existing 120 ft. monopole using TIA/EIA-222-G Standard with above tower loading. The results show that the tower is loaded to 46.8% capacity and the base plate is loaded to 48.1% capacity. Base reactions are within original foundation design limits. Therefore Harper Engineering can conclude that the existing monopole and foundation are adequate to support proposed Verizon modifications.

ATTACHMENTS

1. Harper Engineering, Inc. Structural Analysis Report.
2. Original tower and foundation design by EEI.



Section	1	2	3	
Length (ft)	52.210	24.670	51.453	
Number of Sides	18	18	18	
Thickness (in)	0.188	0.313	0.375	
Socket Length (ft)	4.417	4.917	33.228	
Top Dia (in)	20.000	29.768	44.000	
Bot Dia (in)	31.080	34.870		
Grade		A572-65		
Weight (K)	2.7	2.7	8.0	13.3



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(3) RRH (Verizon)	123	(4) SBNHH-1D65C (Verizon)	121
(3) RRH (Verizon)	123	(4) SBNHH-1D65C (Verizon)	121
(3) RRH (Verizon)	123	PIROD 12' Low Profile Platform (Monopole) (Verizon)	121
OVP Distribution (Verizon)	123	Lightning Rod 7'	121
OVP Distribution (Verizon)	123	(4) SBNHH-1D65C (Verizon)	121
3' Pipe Mount (Verizon)	123		
3' Pipe Mount (Verizon)	123		

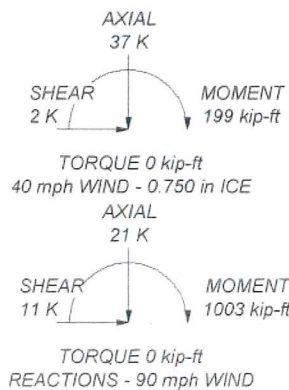
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Franklin County, Ohio.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 48.1%

ALL REACTIONS
ARE FACTORED



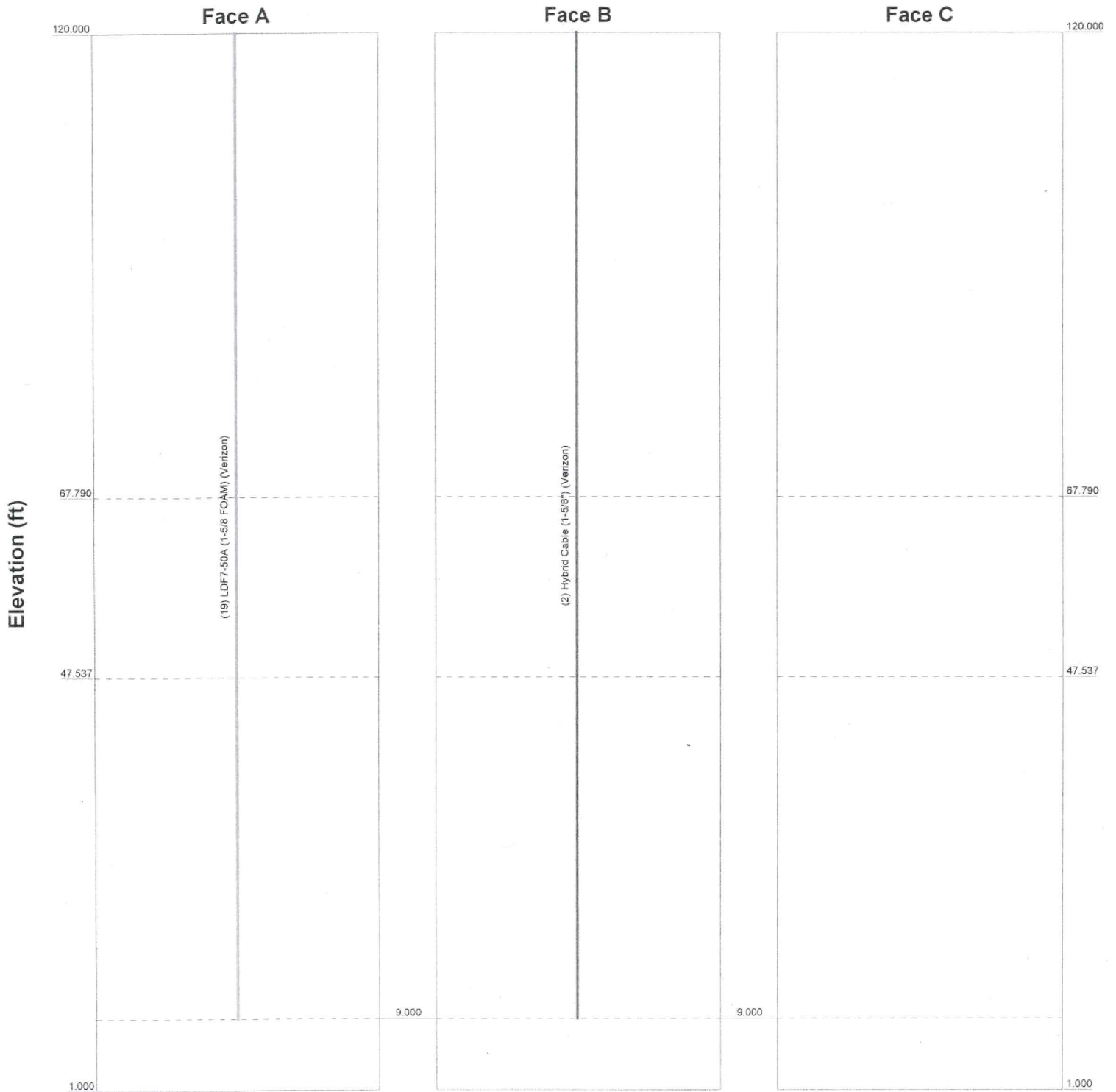
Harper Engineering
815 Superior Ave. Suite 1514
Cleveland, OH 44114
Phone: (216) 344-3855
FAX: (216) 344-3856

Job: CLMB194	Project: 9-151-788 (Rev.2)	Client: Verizon	Drawn by: D.Mecaj	App'd:
Code: TIA-222-G	Date: 12/18/15	Scale: NTS	Path:	Dwg No. E-1

Feedline Distribution Chart

1' - 120'

Round* Flat App In Face App Out Face Truss Leg



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Project: 9-151-788 (Rev.2)			
Client: Verizon	Drawn by: D.Mecaj	App'd:	
Code: TIA-222-G	Date: 12/18/15	Scale: NTS	
Path:		Dwg No. E-7	

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	Client	Verizon	Designed by	D.Mecaj

Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in Franklin County, Ohio.

Basic wind speed of 90 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.000 ft.

Nominal ice thickness of 0.750 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

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	120.000-67.790	52.210	4.417	18	20.000	31.080	0.188	0.750	A572-65 (65 ksi)
L2	67.790-47.537	24.670	4.917	18	29.768	34.870	0.313	1.250	A572-65 (65 ksi)
L3	47.537-1.000	51.453		18	33.228	44.000	0.375	1.500	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 ³	w in	w/t
L1	20.309	11.791	584.741	7.033	10.160	57.553	1170.251	5.897	3.190	17.013
	31.559	18.385	2216.689	10.967	15.789	140.398	4436.295	9.194	5.140	27.414
L2	31.154	29.216	3202.433	10.457	15.122	211.773	6409.080	14.611	4.689	15.005
	35.408	34.277	5171.557	12.268	17.714	291.948	10349.920	17.142	5.587	17.879
L3	34.786	39.103	5332.190	11.663	16.880	315.890	10671.397	19.555	5.188	13.835
	44.679	51.925	12484.811	15.487	22.352	558.555	24986.049	25.967	7.084	18.891

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Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontal
ft	ft ²	in					in	in
L1 120.000- 67.790				1	1	1		
L2 67.790- 47.537				1	1	1		
L3 47.537- 1.000				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	2.250 in
Number of bolts	12
Embedment length	72.000 in
f_c	3.000 ksi
Grout space	3.000 in
Base plate grade	A572-50
Base plate thickness	2.250 in
Bolt circle diameter	52.000 in
Outer diameter	58.000 in
Inner diameter	34.000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
			ft				in	in	klf
Hybrid Cable (1-5/8") (Verizon)	B	Surface Ar (CaAa)	120.000 - 9.000	2	2	0.000 0.000	1.980		0.001

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	$C_A A_A$	Weight
				ft		ft ² /ft	klf
LDF7-50A (1-5/8" FOAM) (Verizon)	A	No	Inside Pole	120.000 - 9.000	19	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.001

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	A_R	A_F	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
	ft		ft ²	ft ²	ft ²	ft ²	K

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Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	120.000-67.790	A	0.000	0.000	0.000	0.000	0.813
		B	0.000	0.000	20.675	0.000	0.086
		C	0.000	0.000	0.000	0.000	0.000
L2	67.790-47.537	A	0.000	0.000	0.000	0.000	0.316
		B	0.000	0.000	8.020	0.000	0.033
		C	0.000	0.000	0.000	0.000	0.000
L3	47.537-1.000	A	0.000	0.000	0.000	0.000	0.600
		B	0.000	0.000	15.261	0.000	0.063
		C	0.000	0.000	0.000	0.000	0.000

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	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	120.000-67.790	A	1.663	0.000	0.000	0.000	0.000	0.813
		B		0.000	0.000	47.546	0.000	0.623
		C		0.000	0.000	0.000	0.000	0.000
L2	67.790-47.537	A	1.586	0.000	0.000	0.000	0.000	0.316
		B		0.000	0.000	18.444	0.000	0.242
		C		0.000	0.000	0.000	0.000	0.000
L3	47.537-1.000	A	1.455	0.000	0.000	0.000	0.000	0.600
		B		0.000	0.000	34.351	0.000	0.436
		C		0.000	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation ft	CP_x in	CP_z in	CP_x Ice in	CP_z Ice in
L1	120.000-67.790	0.461	-0.266	0.676	-0.390
L2	67.790-47.537	0.470	-0.271	0.741	-0.428
L3	47.537-1.000	0.393	-0.227	0.664	-0.383

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	2	Hybrid Cable (1-5/8")	67.79 - 120.00	1.0000	1.0000
L2	2	Hybrid Cable (1-5/8")	47.54 - 67.79	1.0000	1.0000

Discrete Tower Loads

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
Lightning Rod 7'	C	From Leg	0.000	0.000	121.000	No Ice	1.000	1.000	0.040
			0.000			1/2" Ice	2.017	2.017	0.049
			5.000			1" Ice	3.050	3.050	0.065
(4) SBNHH-1D65C (Verizon)	A	From Leg	4.000	0.000	121.000	No Ice	11.389	7.656	0.050
			0.000			1/2" Ice	12.005	8.246	0.115
			0.000			1" Ice	12.629	8.843	0.188
(4) SBNHH-1D65C (Verizon)	B	From Leg	4.000	0.000	121.000	No Ice	11.389	7.656	0.050
			0.000			1/2" Ice	12.005	8.246	0.115
			0.000			1" Ice	12.629	8.843	0.188
(4) SBNHH-1D65C (Verizon)	C	From Leg	4.000	0.000	121.000	No Ice	11.389	7.656	0.050
			0.000			1/2" Ice	12.005	8.246	0.115
			0.000			1" Ice	12.629	8.843	0.188
PiROD 12' Low Profile Platform (Monopole) (Verizon)	C	None		0.000	121.000	No Ice	15.700	15.000	1.330
						1/2" Ice	20.100	20.100	1.760
						1" Ice	24.500	24.500	2.230
(3) RRH (Verizon)	A	From Leg	3.000	0.000	123.000	No Ice	3.745	1.995	0.055
			0.000			1/2" Ice	4.052	2.270	0.078
			0.000			1" Ice	4.368	2.553	0.104
(3) RRH (Verizon)	B	From Leg	3.000	0.000	123.000	No Ice	3.745	1.995	0.055
			0.000			1/2" Ice	4.052	2.270	0.078
			0.000			1" Ice	4.368	2.553	0.104
(3) RRH (Verizon)	C	From Leg	3.000	0.000	123.000	No Ice	3.745	1.995	0.055
			0.000			1/2" Ice	4.052	2.270	0.078
			0.000			1" Ice	4.368	2.553	0.104
OVP Distribution (Verizon)	B	From Leg	2.000	0.000	123.000	No Ice	3.517	2.292	0.042
			0.000			1/2" Ice	3.773	2.512	0.068
			0.000			1" Ice	4.037	2.740	0.098
OVP Distribution (Verizon)	C	From Leg	2.000	0.000	123.000	No Ice	3.517	2.292	0.042
			0.000			1/2" Ice	3.773	2.512	0.068
			0.000			1" Ice	4.037	2.740	0.098
3' Pipe Mount (Verizon)	B	From Leg	2.000	0.000	123.000	No Ice	1.052	1.052	0.036
			0.000			1/2" Ice	1.269	1.269	0.047
			0.000			1" Ice	1.517	1.517	0.061
3' Pipe Mount (Verizon)	C	From Leg	2.000	0.000	123.000	No Ice	1.052	1.052	0.036
			0.000			1/2" Ice	1.269	1.269	0.047
			0.000			1" Ice	1.517	1.517	0.061

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp

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Comb. No.	Description
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	120 - 67.79	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-16.084	-0.521	-0.436
			Max. Mx	4	-6.787	-320.630	-0.235
			Max. My	6	-6.790	-0.061	-318.540
			Max. Vy	4	7.701	-320.630	-0.235
			Max. Vx	6	7.656	-0.061	-318.540
			Max. Torque	4			-0.366
L2	67.79 - 47.5367	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-21.117	-0.810	-0.269
			Max. Mx	4	-10.094	-483.310	-0.211
			Max. My	6	-10.096	-0.108	-480.263
			Max. Vy	4	8.763	-483.310	-0.211
			Max. Vx	6	8.718	-0.108	-480.263
			Max. Torque	4			-0.365
L3	47.5367 - 1	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-36.760	-1.538	0.151
			Max. Mx	4	-21.411	-1002.895	-0.143
			Max. My	6	-21.411	-0.232	-997.378
			Max. Vy	4	11.330	-1002.895	-0.143
			Max. Vx	6	11.287	-0.232	-997.378
			Max. Torque	4			-0.365

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	8	36.760	-0.000	-0.000
	Max. H _x	14	17.847	0.000	-2.803
	Max. H _z	2	21.416	0.000	11.276
	Max. M _x	2	997.091	0.000	11.276
	Max. M _z	4	1002.895	-11.320	0.000
	Max. Torsion	2	0.028	0.000	11.276
	Min. Vert	3	16.062	0.000	11.276
	Min. H _x	4	21.416	-11.320	0.000
	Min. H _z	6	21.416	0.000	-11.276
	Min. M _x	6	-997.378	0.000	-11.276
	Min. M _z	7	0.173	0.000	-11.276
	Min. Torsion	4	-0.365	-11.320	0.000

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Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	17.847	0.000	0.000	0.112	-0.190	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	21.416	0.000	-11.276	-997.091	-0.232	-0.028
0.9 Dead+1.6 Wind 0 deg - No Ice	16.062	0.000	-11.276	-991.333	-0.173	-0.027
1.2 Dead+1.6 Wind 90 deg - No Ice	21.416	11.320	0.000	0.143	-1002.895	0.365
0.9 Dead+1.6 Wind 90 deg - No Ice	16.062	11.320	0.000	0.105	-997.004	0.361
1.2 Dead+1.6 Wind 180 deg - No Ice	21.416	0.000	11.276	997.378	-0.232	0.028
0.9 Dead+1.6 Wind 180 deg - No Ice	16.062	0.000	11.276	991.544	-0.173	0.027
1.2 Dead+1.0 Ice+1.0 Temp	36.760	0.000	0.000	-0.151	-1.538	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	36.760	0.000	-2.346	-197.068	-1.606	-0.015
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	36.760	2.352	0.000	-0.136	-199.303	0.078
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	36.760	0.000	2.346	196.797	-1.606	0.015
Dead+Wind 0 deg - Service	17.847	0.000	-2.803	-246.868	-0.193	-0.007
Dead+Wind 90 deg - Service	17.847	2.813	0.000	0.118	-248.524	0.090
Dead+Wind 180 deg - Service	17.847	0.000	2.803	247.104	-0.193	0.007

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-17.847	0.000	0.000	17.847	0.000	0.000%
2	0.000	-21.416	-11.276	0.000	21.416	11.276	0.000%
3	0.000	-16.062	-11.276	0.000	16.062	11.276	0.000%
4	11.320	-21.416	0.000	-11.320	21.416	0.000	0.000%
5	11.320	-16.062	0.000	-11.320	16.062	0.000	0.000%
6	0.000	-21.416	11.276	0.000	21.416	-11.276	0.000%
7	0.000	-16.062	11.276	0.000	16.062	-11.276	0.000%
8	0.000	-36.760	0.000	-0.000	36.760	-0.000	0.000%
9	0.000	-36.760	-2.346	-0.000	36.760	2.346	0.000%
10	2.352	-36.760	0.000	-2.352	36.760	-0.000	0.000%
11	0.000	-36.760	2.346	-0.000	36.760	-2.346	0.000%
12	0.000	-17.847	-2.803	0.000	17.847	2.803	0.000%
13	2.813	-17.847	0.000	-2.813	17.847	0.000	0.000%
14	0.000	-17.847	2.803	0.000	17.847	-2.803	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00005690

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3	Yes	4	0.00000001	0.00002829
4	Yes	4	0.00000001	0.00013977
5	Yes	4	0.00000001	0.00008761
6	Yes	4	0.00000001	0.00005696
7	Yes	4	0.00000001	0.00002832
8	Yes	4	0.00000001	0.00000001
9	Yes	5	0.00000001	0.00010417
10	Yes	5	0.00000001	0.00010623
11	Yes	5	0.00000001	0.00010538
12	Yes	4	0.00000001	0.00001257
13	Yes	4	0.00000001	0.00001518
14	Yes	4	0.00000001	0.00001262

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 67.79	9.759	13	0.818	0.002
L2	72.2067 - 47.5367	3.160	13	0.427	0.000
L3	52.4533 - 1	1.641	13	0.298	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.000	(3) RRH	13	9.759	0.818	0.002	46076
121.000	Lightning Rod 7'	13	9.759	0.818	0.002	46076

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 67.79	39.405	4	3.306	0.007
L2	72.2067 - 47.5367	12.759	4	1.724	0.001
L3	52.4533 - 1	6.625	4	1.201	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.000	(3) RRH	4	39.405	3.306	0.007	11456
121.000	Lightning Rod 7'	4	39.405	3.306	0.007	11456

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Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	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
in		in						
2.250	12	2.250	75.362	78.930	21.656		Plate	0.48 ✓
			223.654	371.266	45.000			
			0.34	0.21	0.48			

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	120 - 67.79 (1)	TP31.08x20x0.188	52.210	0.000	0.0	17.827	-6.787	1126.190	0.006
L2	67.79 - 47.5367 (2)	TP34.87x29.768x0.313	24.670	0.000	0.0	33.268	-10.094	2426.610	0.004
L3	47.5367 - 1 (3)	TP44x33.228x0.375	51.453	0.000	0.0	51.925	-21.410	3700.340	0.006

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	120 - 67.79 (1)	TP31.08x20x0.188	320.631	694.810	0.461	0.000	694.810	0.000
L2	67.79 - 47.5367 (2)	TP34.87x29.768x0.313	483.310	1671.225	0.289	0.000	1671.225	0.000
L3	47.5367 - 1 (3)	TP44x33.228x0.375	1002.892	3317.050	0.302	0.000	3317.050	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T _u kip-ft	φT _n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	120 - 67.79 (1)	TP31.08x20x0.188	7.701	563.095	0.014	0.365	1391.317	0.000
L2	67.79 - 47.5367 (2)	TP34.87x29.768x0.313	8.763	1213.300	0.007	0.365	3346.542	0.000
L3	47.5367 - 1 (3)	TP44x33.228x0.375	11.330	1850.170	0.006	0.365	6642.217	0.000

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Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	120 - 67.79 (1)	0.006	0.461	0.000	0.014	0.000	0.468 ✓	1.000	4.8.2 ✓
L2	67.79 - 47.5367 (2)	0.004	0.289	0.000	0.007	0.000	0.293 ✓	1.000	4.8.2 ✓
L3	47.5367 - 1 (3)	0.006	0.302	0.000	0.006	0.000	0.308 ✓	1.000	4.8.2 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	120 - 67.79	Pole	TP31.08x20x0.188	1	-6.787	1126.190	46.8	Pass
L2	67.79 - 47.5367	Pole	TP34.87x29.768x0.313	2	-10.094	2426.610	29.3	Pass
L3	47.5367 - 1	Pole	TP44x33.228x0.375	3	-21.410	3700.340	30.8	Pass
							Summary	
							Pole (L1)	46.8 Pass
							Base Plate	48.1 Pass
							RATING =	48.1 Pass



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The Experienced Point of View

Customer: VERIZON WIRELESS

Description: 150' MONOPOLE

EEI Job Number: 16239

SITE INFORMATION

Location: GAHANNA, OH
Site Name: RIDENOUR PARK
Site Number: CLMB-194

DESIGN INFORMATION

Designed By: MRM
Design Date: 4/5/2010
Status: REVISION 1

ANTENNA LOADING

- (1) 7' LIGHTNING ROD AT TOP
- (12) ALP 9212 PANEL ANTENNAS MOUNTED ON A 12' LOW PROFILE PLATFORM AT 150' ϵ
- (12) ALP 9212 PANEL ANTENNAS MOUNTED ON A 12' LOW PROFILE PLATFORM AT 135' ϵ
- (12) ALP 9212 PANEL ANTENNAS MOUNTED ON A 12' LOW PROFILE PLATFORM AT 120' ϵ
- (2) 8' $\varnothing$ HP MICROWAVE DISHES AT 100' ϵ

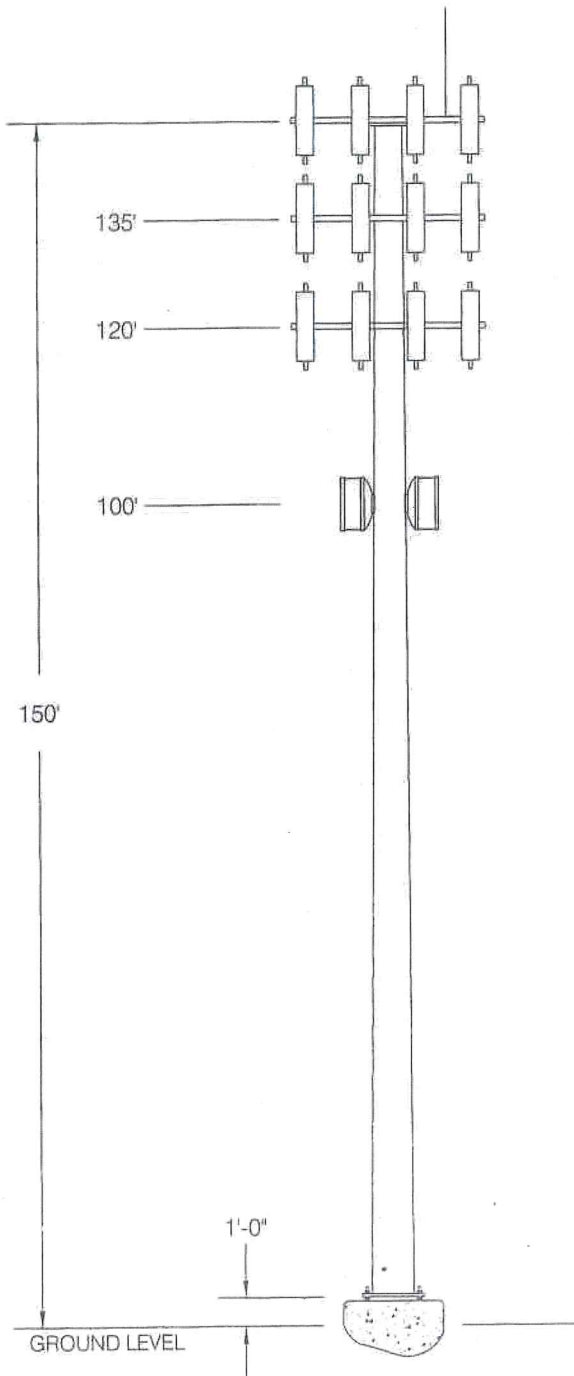
NOTES

MONOPOLE DESIGNED WITH A THEORETICAL 0' FALL RADIUS, HIGH STRESS POINT IS AT THE 98' ELEVATION

DESIGN CRITERIA

DESIGNED IN ACCORDANCE WITH THE TIA 222-G AND ASCE 7 FOR 90 MPH 3-SECOND GUST WIND SPEED

- STRUCTURE CLASSIFICATION - II
- EXPOSURE - C
- TOPOGRAPHIC CATEGORY - 1



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