Rigorous Structural Analysis Report

AT&T - West Hardford South Main Site #CTL01076

Owner: Frontier Communications - West Hardford #2 CO

West Hardford, Connecticut

September 13, 2018

MEI PROJECT ID: CT05516M-18V0

MALOUF ENGINEERING INTL., INC.

STRUCTURAL CONSULTANTS

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MALOUF ENGINEERING INTL., INC.

STRUCTURAL CONSULTANTS

September 13, 2018

Ms. Kristen LeDuc
Smartlink, LLC
North Billerica, Massachusetts 01862

RIGOROUS STRUCTURAL ANALYSIS

Structure/Make/Model:	105 ft **Monopole**		Engineered Endeavors Inc. / 18-Sided	
Client/Site Name/#:	**Smartlink, LLC / AT&T**		**West Hardford South Main #CTL01076**	
Owner/Site Name/#:	Frontier Communications		West Hardford #2 CO	
MEI Project ID:	**CT05516M-18V0**			
Location:	125 Main Street West Hardford, Connecticut 06107		Hartford County FCC #N/A	
	LAT	41-45-11.0 N	LON	72-44-39.0 W

EXECUTIVE SUMMARY:

Malouf Engineering Int'l (MEI), as requested, has performed a rigorous structural analysis of the above-mentioned structure to assess the impact of the changed condition as noted in Table 1.

Based on the stress analysis performed, the existing structure **is in conformance** with the Int'l Building Code (IBC) / ANSI/TIA-**222-G** Standard for the loading considered under the criteria listed and referenced in the report sections – tower rated at 98.3% - Foundation.

The installation of the proposed changed condition as noted in Table 1 is structurally acceptable. Please refer to Appendix 1 for Schematic Lines Layout.

MEI appreciates the opportunity of providing our continuing professional services to you. If you have any questions or need further assistance on this or other projects, please contact us.

Respectfully submitted,

MALOUF ENGINEERING INT'L, INC.

Analysis performed by:

Krishna Manda, PE
Sr. Project Engineer

Reviewed & Approved by:

STATE OF CONNECTICUT
E. MARK MALOUF
No. 17715
LICENSED
PROFESSIONAL ENGINEER

E. Mark Malouf, PE
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9/13/2018

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1. INTRODUCTION & SCOPE

A rigorous structural analysis was performed by Malouf Engineering Int'l (MEI), as requested and authorized by Ms. Kristen LeDuc, Smartlink, LLC, on behalf of AT&T, to determine the acceptance of the proposed changed conditions in conformance with the IBC / ANSI/TIA-222-G Standard, "*Structural Standard for Antenna Supporting Structures and Antennas*".

The scope of this independent analysis is to determine the overall stability and the adequacy of structural members, foundations, and member connections, as available and stated. This analysis considers the structure to have been properly installed and maintained with no structural defects. Installation procedures and related loading are not within the scope of this analysis and should be performed and evaluated by a competent person of the erection contractor.

The different report sections detail the applicable information used in this evaluation, relating to the tower data, the appurtenances configuration and the wind and ice loading considered.

2. SOURCE OF DATA

The following information has been used in this evaluation as source data that accurately represent the existing structure and the related appurtenances:

	Source	Information	Reference
STRUCTURE			
Tower	Frontier Communications Ms. Elissa McOmber	Previous Structural Analysis & Mods / B&T Group	B&T #84416.000.0005 Dated 08/17/2012
	MEI Mapping	Tower Mapping [HTS Sub]	Dated 09/06/2018
Foundation	Frontier Communications Ms. Elissa McOmber	Partial Foundation Drawings / Girard & Co.	Dated 05/06/1998
Material Grade	Not available from supplied documents-Assumed based on typical towers of this type-refer to Appendix		
CURRENT APPURTENANCES			
	MEI Mapping	Tower Mapping [HTS Sub]	Dated 09/06/2018
CHANGED CONDITION			
	Frontier Communications Ms. Elissa McOmber	AT&T PDQ Data Sheet	Dated 07/10/2018

Background Information:

Based on available information, the following is known regarding this structure:

DESIGNER / FABRICATOR	Engineered Endeavors Inc. / 18-Sided
ORIGINAL DESIGN CRITERIA	TIA 222-F - Unknown
PRIOR STRUCTURAL MODIFICATIONS	Modified tower by B+T group as per report & Mods drawings dated Aug. 17, 2012

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3. ANALYSIS CRITERIA

The structural analysis performed used the following criteria:

CODE / STANDARD	2016 CT Building Code / 2012 IBC / NDS / ANSI/TIA-222-G Standard	
LOADING CASES	*Full Wind*:	122 Mph Ult. Gust [equiv. 94.5 Mph (3-sec gust)] w/No Radial Ice**
	Iced Case:	50 Mph + 1" Radial Ice
	Service:	60 Mph
	Seismic:	S_s = 0.179 / S_1 = 0.064 / Site Class: D – Stiff Soil
STRUCTURE CRITERIA	*Risk Category (Structural Class)*: Class II	
	Exposure Category: 'C' – *Topographic Category:* 1	

Appurtenances Configuration

The following appurtenances configuration is denoted by the *summation of Tables 1 & 2*:

Table 1: Tenant with Changed Condition Appurtenances Configuration

Elev (ft) ^	Tenant	Ants Qty	Appurtenance Model / Description	Mount Description	Lines Qty	Line size & Location
104	AT&T	1	Raycap DC6-48-60-18-8F Supressor	[Existing Mounts]		[Existing Lines]
102.67		3	QS66512-2 Panel Antennas			
		3	RRUS-32 B2 Boxes			
		3	RRUS-32 Boxes			
		3	DBC0061F1V51-2 Diplexer's			
Appurtenances to Remain						
104	AT&T	1	Raycap DC6-48-60-18-8F Supressor	Platform with Rails and Ladder + (3) Empty Pipe Mounts	2	3/8" Fiber Cable
103.75		3	RRUS-11 B12 Boxes			
102.67		3	AM-X-CD-16-65-00T-RET Boxes		4	3/4" DC Power Cable
102.67		3	7770.00 Panel Antennas			
102.67		6	LGP21401 TMA's		2	2" Flex Conduit
					6	7/8
70		1	GPS Box	2ft Standoff Mount	1	1/2
50.5		1	GPS Box	2ft Standoff Mount	1	1/2
Appurtenances to be Removed						
102.67	AT&T	3	7770.00 Panel Antennas		6	7/8
		6	LGP21401 TMA'S			

Table 2: Remaining Tenants Current and Reserved/Future Appurtenances

Elev (ft)	Tenant	Ants Qty	Appurtenance Model / Description	Mount Description	Lines Qty	Line size & Location
103.25		1	Lightning Rod			
79.25	*Clearwire	1	19x17x11" Junction Box	(3) Dual Standoff Mounts	6	5/16"
		3	LLPX310R Panel Antennas		2	2" FLEX Conduit
79		3	Horizon Duo		3	½"-
79*	Celwave [Reserved]	3	A-ANT-18G-2-C HP Dishes			
76.75	Clearwire	3	RRH-2WB Boxes			
2.5		1	19x17x11" Junction Box			

Notes:

1. **Included Clearwire reserved lease loading for analysis. Existing loading different.*
2. **As per 2015 IBC for ultimate 3-sec gust wind speed converted to nominal 3-sec gust wind speed as per Sect. 1609.3.1 as required to be used in ANSI/TIA-222-G Standard per exception 5 of Sect. 1609.1.1.
3. *^ All elevations are measured from tower base. Datum/Pole base is 2.33ft above grade.*
4. Please note appurtenances not listed above are to be removed/not present as per data supplied.
5. (I) = Internal; (E) = External; (FZ) = Within Face Zone; (OFZ) = Outside Face Zone - as per TIA-222-G.
6. The above appurtenances represent MEI's understanding of the appurtenances configuration. If different than above, the analysis is invalid. Please contact MEI if any discrepancies are found.

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4. ANALYSIS PROCEDURE

The subject structure is analyzed for feasibility of the installation of the proposed changed condition previously noted. The data records furnished were reviewed and a computer stress analysis was performed in accordance with the TIA-222 Standard provisions and with the agreed scope of work terms and the results of this analysis are reported.

Analysis Program

The computer program used to model the structure is a rigorous Finite Element Analysis program, tnxTower (ver. 8.04), a commercially available program by Tower Numerics Inc. The latticed structures members are modeled using beam/truss and cable members and the pole members using tubular beam elements. The structural parameters and geometry of the members are included in the model. The dead and temperature loads and the wind loads are internally calculated by the program for the different wind directions and then applied as external loads on the structure. Any applicable exemptions, as per Section 15.6 of the TIA-222-G Standard for existing structures originally designed in accordance with a previous revision of the TIA-222 Standard, have been taken.

Assumptions

This engineering study is based on the theoretical capacity of the members and is not a condition assessment of the structure. This analysis is based on information supplied, and therefore, its results are based on and as accurate as that supplied data. MEI has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural stress analysis:

- This existing tower is assumed, for the purpose of this analysis, to have been properly maintained and to be in good condition with no structural defects and with no deterioration to its member capacities ('as-new' condition).
- The tower member sizes and configuration are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated.
- The appurtenances configuration is as supplied and/or as stated in the report. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
- Some assumptions are made regarding antennas and mounts sizes and their projected areas based on best interpretation of data supplied and of best knowledge of antenna type & industry practice.
- Mounts/Platforms are considered adequate to support the loading. No actual analysis of the platform/mount itself is performed, with the analysis being limited to analyzing the structure.
- The soil parameters are as per data supplied or as assumed and stated in the calculations. Refer to the Appendix. If no data is available, the foundation system is assumed to support the structure with its new reactions.
- All welds and connections are assumed to develop at least the member capacity, unless determined otherwise and explicitly stated in this report.
- Assumed, anchor bolts have been designed to develop to the capacity of the bolts. Foundation to be in good condition.
- All prior structural modifications, if any, are assumed to be as per data supplied/available, and to have been properly installed and to be fully effective.

If any of the above assumptions are not valid or have been made in error, this analysis results may be invalided, MEI should be contacted to review any contradictory information to determine its effect.

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5. ANALYSIS RESULTS

The results of the structural stress analysis based on data available and with the previous listed criteria, indicated the following:

Note: The Wind loading controls over the Seismic loading as per TIA Section 2.7.

Table 3: Stress Analysis Results

Component Type	Maximum Stress Ratio	Controlling Elev. (ft) / Component	Pass/Fail	Comment
POLE	71.8%	48.333 - 2.333	**Pass**	
REINFORCING	79.4%	48.333 - 13.083	**Pass**	
BASE PLATE	69.1%	Stiffener	**Pass**	
ANCHOR RODS	42%	Tension	**Pass**	
FOUNDATION	**98.3%**	**Bearing**	**Pass**	**Geotechnical report not provided. Assumed soil parameters. (*)**

Table 4: Serviceability Requirements

	Maximum Value	TIA Requirement (10dB)	Pass/Fail	Comment
TWIST/SWAY	1.1567 Deg.	0.9393 Deg.	**Marginal**	A-ANT-18G-2-C HP Dish Elev. 81.33ft
	1.5438 Deg.	4 Deg. from Vert. or Horiz. Axis	**Pass**	
HORIZONTAL DISPLACEMENT	16.587 In./ 1.31% of Ht.	3.0% of Height	**Pass**	

Notes:

1. **(*) – Assumed soil parameters, Ultimate bearing of 8ksf, Passive pressure of 400pcf, angle of internal friction of 28 degrees and water below the foundation.**
2. The Maximum Stress Ratio is the percentage that the maximum load in the member is relative to the allowable load as determined by Code requirements.
3. Refer to the Appendix 1 for more details on the member loads.
4. A maximum stress ratio between 100% and 105% may be considered as *Acceptable* according to industry standard practice.

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6. FINDINGS & RECOMMENDATIONS

- Based on the rigorous stress analysis results, the subject structure is **rated at 98.3%** of its support capacity (controlling component: Foundation) with the proposed changed condition considered. Please refer to Table 3 and to Appendix 1 for more details of the analysis results.
- Based on the stress analysis performed, the existing structure **is in conformance** with the IBC / ANSI/TIA **222-G** Standard for the loading considered under the criteria listed and referenced in the report sections.
- Please note that no geotechnical data is available. However, based on assumed soil parameters (Ultimate bearing of 8ksf, Passive Pressure 400pcf, Angle of Internal Friction 28 Deg. and water below foundation), foundation can be considered acceptable.
- ***The installation of the proposed changed condition as noted in Table 1 is structurally acceptable***. Please refer to Appendix 1 for Schematic Lines Layout.
- This structure is near its maximum support capacity for the appurtenances and loading criteria considered. Hence, no changes to the configuration considered should be made without performing a new proper evaluation.

Rigging and temporary supports required for the erection/modification shall be determined, documented, furnished and installed by the erector/contractor accounting for the loads imposed on the structure due to the proposed construction method.

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7. REPORT DISCLAIMER

The engineering services rendered by **M**alouf **E**ngineering **I**nternational, Inc. *('MEI') in connection with this Structural Analysis are limited to a computer analysis of the tower structure, size and capacity of its members. MEI does not analyze the fabrication, including welding and connection capacities, except as included in this Report.*

The analysis performed, and the conclusions contained herein are based on the assumption that the tower has been properly installed and maintained, including, but not limited to the following:

1. Proper alignment and plumbness.
2. Correct guy tensions, as applicable.
3. Correct bolt tightness or slip jacking of sleeved connections.
4. No significant deterioration or damage to any structural component.

Furthermore, the information and conclusions contained in this Report were determined by application of the current "state-of-the-art" engineering and analysis procedures and formulae. MALOUF ENGINEERING INTERNATIONAL, INC. assumes no obligation to revise any of the information or conclusions contained in this Report in the event that such engineering and analysis procedures and formulae are hereafter modified or revised. In addition, under no circumstances will MALOUF ENGINEERING INTERNATIONAL, INC. have any obligation or responsibility whatsoever for or on account of consequential or incidental damages sustained by any person, firm or organization as a result of any information or conclusions contained in the Report, and the maximum liability of MALOUF ENGINEERING INTERNATIONAL, INC., if any, pursuant to this Report shall be limited to the total funds actually received by MALOUF ENGINEERING INTERNATIONAL, INC. for preparation of this Report.

Customer has requested MALOUF ENGINEERING INTERNATIONAL, INC. to prepare and submit to Customer an engineering analysis with respect to the Subject Tower and has further requested MALOUF ENGINEERING INTERNATIONAL, INC. to make appropriate recommendations regarding suggested structural modifications and changes to the Subject Tower. In making such request of MALOUF ENGINEERING INTERNATIONAL, INC., Customer has informed MALOUF ENGINEERING INTERNATIONAL, INC. that Customer will make a determination as to whether or not to implement any of the changes or modifications which may be suggested by MALOUF ENGINEERING INTERNATIONAL, INC. and that Customer will have any such changes or modifications made by riggers, erectors and other subcontractors of Customer's choice. MALOUF ENGINEERING INTERNATIONAL, INC. shall have the right to rely upon the accuracy of the information supplied by the customer and shall not be held responsible for the Customer's misrepresentation or omission of relevant fact whether intentional or otherwise.

Customer hereby agrees and acknowledges that MALOUF ENGINEERING INTERNATIONAL, INC. shall have no liability whatsoever to Customer or to others for any work or services performed by any persons other than MALOUF ENGINEERING INTERNATIONAL, INC. in connection with the implementation of services including but not limited to any services rendered for Customer or for others by riggers, erectors or other subcontractors. Customer acknowledges and agrees that any riggers, erectors or subcontractors retained or employed by Customer shall be solely responsible to Customer and to others for the quality of work performed by them and that MALOUF ENGINEERING INTERNATIONAL, INC. shall have no liability or responsibility whatsoever as a result of any negligence or breach of contract by any such rigger, erector or subcontractor and that Customer and rigger, erector, or subcontractor will provide MALOUF ENGINEERING INTERNATIONAL, INC. with a Certificate of Insurance naming MALOUF ENGINEERING INTERNATIONAL, INC. as additional insured.

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APPENDIX 1 - ANALYSIS PRINTOUT & GRAPHICS

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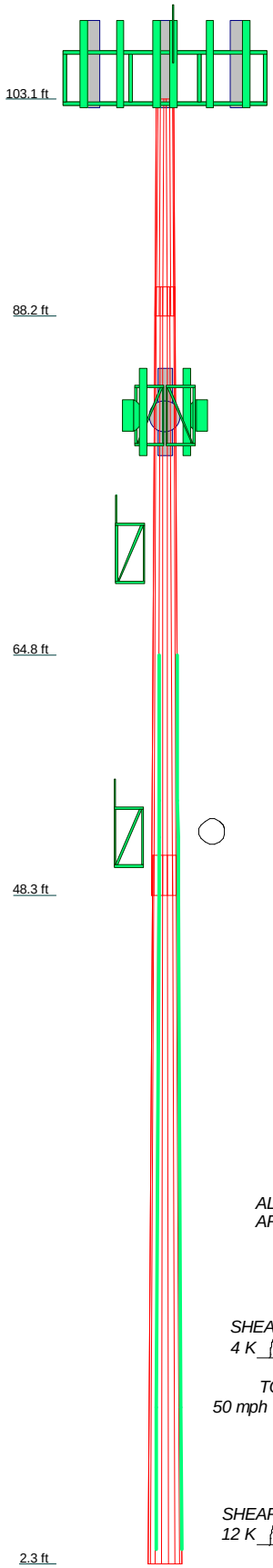
Section	1	2	3
Length (ft)	14.92	41.83	48.75
Number of Sides	18	18	18
Thickness (in)	0.1875	0.2500	0.3125
Socket Length (ft)	2.00	2.75	
Top Dia (in)	14.1782	15.6209	20.9714
Bot Dia (in)	16.2774	21.8830	28.3564
Grade	A572-65		
Tube Length (ft)		10.00	35.25
Reinf Size		AERO MP303	AERO MP304
Reinf Grade			A572-65
Weight (K)	0.5	2.1	4.1

Tube Length (ft): 2.50, 4.00, 9.75; Reinf Size: AERO MP303; Weight (K): 6.7



ALL REACTIONS ARE FACTORED

AXIAL 45 K
SHEAR 4 K
MOMENT 330 kip-ft
TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 19 K
SHEAR 12 K
MOMENT 841 kip-ft
TORQUE 0 kip-ft
REACTIONS - 95 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Raycap DC6-48-60-18-8F SUPRESSOR (ATT / E / #12)	106.333	Empty Pipe Mount (ATT / E / #9-12)	104.583
		Empty Pipe Mount (ATT / E / #9-12)	104.583
Raycap DC6-48-60-18-8F SUPRESSOR (ATT / P)	106.333	Platform with Rails and Ladder (ATT / E / #9-12)	104.583
RRUS-11 B12 (ATT / E / #11)	106.083	19x17x11" Junction Box (Clearwire / E / #7)	81.583
RRUS-11 B12 (ATT / E / #11)	106.083		
RRUS-11 B12 (ATT / E / #11)	106.083	LLPX310R w/ Pipe Mount (Clearwire / E / #6)	81.583
Lightning Rod (E / #13)	105.583		
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105	LLPX310R w/ Pipe Mount (Clearwire / E / #6)	81.583
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105	LLPX310R w/ Pipe Mount (Clearwire / E / #6)	81.583
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105	Horizon Duo (Clearwire / E / F / #5,7)	81.333
		Horizon Duo (Clearwire / E / F / #5,7)	81.333
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105	Horizon Duo (Clearwire / E / F / #5,7)	81.333
		Dual Standoff Mount (Clearwire / E / #4-8)	81.333
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105		
		Dual Standoff Mount (Clearwire / E / #4-8)	81.333
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105		
		Dual Standoff Mount (Clearwire / E / #4-8)	81.333
(2) LGP21401 TMA'S (ATT / E / #9)	105		
(2) LGP21401 TMA'S (ATT / E / #9)	105	A-ANT-18G-2-C HP Dish (Celwave / E / R)	81.333
(2) LGP21401 TMA'S (ATT / E / #9)	105		
QS66512-2 w/ Pipe Mount (ATT / P)	105	A-ANT-18G-2-C HP Dish (Celwave / E / R)	81.333
QS66512-2 w/ Pipe Mount (ATT / P)	105		
QS66512-2 w/ Pipe Mount (ATT / P)	105	A-ANT-18G-2-C HP Dish (Celwave / E / R)	81.333
RRUS-32 B2 (ATT / P)	105		
RRUS-32 B2 (ATT / P)	105	RRH-2WB (Clearwire / E / #4)	79.083
RRUS-32 B2 (ATT / P)	105	RRH-2WB (Clearwire / E / #4)	79.083
		RRH-2WB (Clearwire / E / #4)	79.083
RRUS-32 (ATT / P)	105	GPS (ATT / E / #3)	72.333
RRUS-32 (ATT / P)	105	2ft Standoff Mount (ATT / E / #3)	71.333
RRUS-32 (ATT / P)	105	GPS (ATT / E / #2)	52.833
DBC0061F1V51-2 Diplexer (ATT / P)	105	2ft Standoff Mount (ATT / E / #2)	51.583
DBC0061F1V51-2 Diplexer (ATT / P)	105	19x17x11" Junction Box (Clearwire / E / #1)	4.833
DBC0061F1V51-2 Diplexer (ATT / P)	105		
Empty Pipe Mount (ATT / E / #9-12)	104.583		

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 Exposure B to the TIA-222-G Standard.
3. Tower designed for a 95 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. OWNER: FRONTIER COMMUNICATIONS - WEST HARTFORD #2 CO SITE
9. 2016 CT SBC / 2012 IBC / ULTIMATE WIND 122 MPH / RISK CAT. 2
10. TOWER RATING: 79.4%

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Job: **100.75ft MP - West Hartford South Main Site #CTL01076**			
Project: **CT05516M-18V0**			
Client: Smartlink / AT&T	Drawn by: KM	App'd:	
Code: TIA-222-G	Date: 09/13/18	Scale: NTS	
Path: C:\MEI\Projects\2018\CBCT05516M\CT05516M-18V0_AT&T_West Hartford South Main #CTL01076\2-Working Data\CT05516M-18V0.en		Dwg No. E-1	

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No.	QTY.	DESCRIPTION	ELEV.	TENANT
1	2	2" FLEX Conduit	79'	Clearwire / E / #1-2
2	6	5/16	79'	Clearwire / E / F
3	3	1/2	79'	Clearwire / E / F / #3,4
4	6	7/8	100'	ATT / E / #6-11
5	2	2" FLEX Conduit	100'	ATT / E / #18,19
6	4	3/4" DC Power Cable	100'	ATT / E / F
7	2	3/8" Fiber Cable	100'	ATT / E / F
8	1	1/2	70'	ATT / E / #5
9	1	1/2	50'	ATT / E / #21

LEGEND:

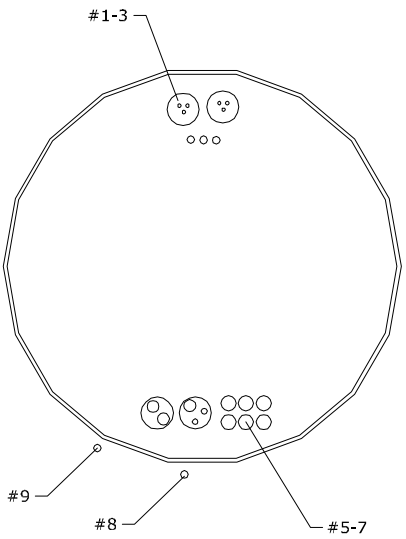
E = EXISTING #X

P = PROPOSED ***#X***

F = FUTURE *#X*

R = REMOVE *#X*

TO RELOCATE



CONTACT MEI IF LINE LAYOUT IS DIFFERENT FROM WHAT IS SHOWN BELOW.

18-SIDED
28.356" @ BASE

101 PLAN: SCHEMATIC Tx-LINE LAYOUT

SCALE: NOT TO SCALE

NOTES:
1. Tx LINE LAYOUT IS SCHEMATIC ONLY, BASED UPON MEI MAPPING (SUB: HTS) DATED 9/6/18 .
2. NEW BRACKET SUPPORT SPECIFICATION BY OTHERS.

09/13/2018

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AT&T

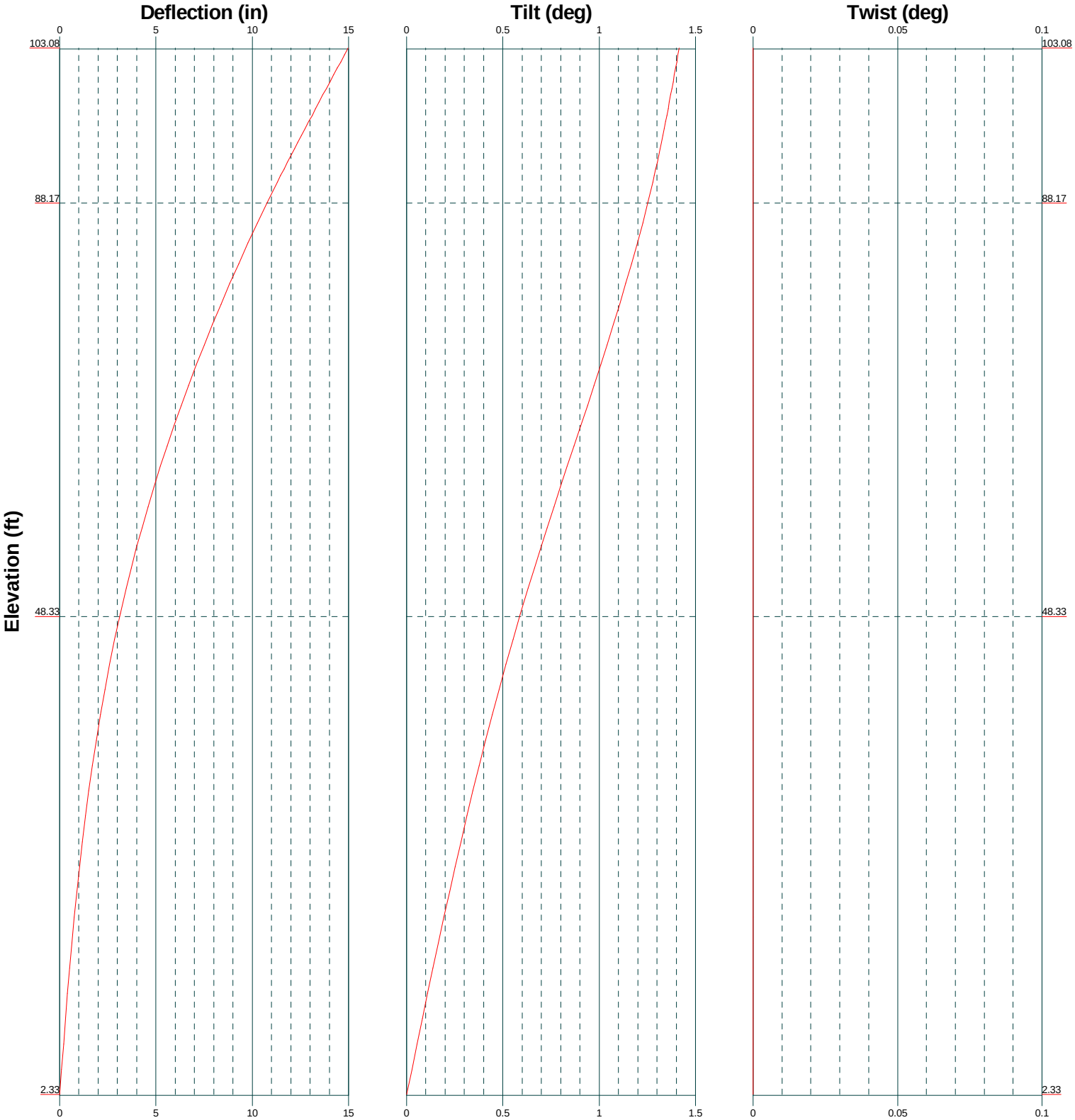
100.75ft MP - West Hartford South Main Site #CTL01076

MONOPOLE TxLINE LAYOUT

MEI PROJECT ID	SHEET NUMBER	REV.
CT05516M-18V0	**L01**	0

TIA-222-G - Service - 60 mph

Maximum Values



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FAX: (972) 783 2583

Job: ***100.75ft MP - West Hartford South Main Site #CTL01076***		
Project: ***CT05516M-18V0***		
Client: Smartlink / AT&T	Drawn by: KM	App'd:
Code: TIA-222-G	Date: 09/13/18	Scale: NTS
Path: C:\MEI\Projects\2018\QB\CT05516M\CT05516M-18V0_AT&T_West Hartford South Main #CTL01076\2-Working Data\CT05516M-18V0.en		Dwg No. E-5

Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Tower is located in Hartford County, Connecticut.
ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
Basic wind speed of 95 mph.
Structure Class II.
Exposure Category B.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
OWNER: FRONTIER COMMUNICATIONS - WEST HARTFORD #2 CO SITE.
2016 CT SBC / 2012 IBC / ULTIMATE WIND 122 MPH / RISK CAT. 2.
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, feed line supports, and appurtenance mounts are not considered.

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	*Sector*	*Exclude From Torque Calculation*	*Component Type*	*Placement ft*	*Total Number*	*Number Per Row*	*Start/End Position*	*Width or Diameter in*	*Perimeter in*	*Weight plf*
1/2 (ATT / E / #5)	B	Yes	Surface Ar (CaAa)	72.33 - 2.33	1	1	0.100 0.100	0.5800		0.25
1/2 (ATT / E / #21)	B	Yes	Surface Ar (CaAa)	52.83 - 2.33	1	1	0.200 0.200	0.5800		0.25

Feed Line/Linear Appurtenances - Entered As Area

Description	*Placement ft*	*Total Number*	*Weight plf*
2" FLEX Conduit (Clearwire / E / #1-2)	81.58 - 2.33	2	0.71 0.71 0.71
5/16 (Clearwire / E / F)	81.58 - 2.33	6	0.03 0.03 0.03
1/2 (Clearwire / E / F / #3,4)	81.33 - 2.33	3	0.25 0.25 0.25
7/8 (ATT / E / #6-11)	103.08 - 2.33	6	0.54 0.54 0.54
2" FLEX Conduit (ATT / E / #18,19)	103.08 - 2.33	2	0.71 0.71 0.71
3/4" DC Power Cable (ATT / E / F)	103.08 - 2.33	4	1.00 1.00 1.00
3/8" Fiber Cable (ATT / E / F)	103.08 - 2.33	2	0.08 0.08 0.08

Discrete Tower Loads

Description	Placement	Weight
	ft	K
Lightning Rod	105.58	0.01
(E / #13)		0.01
		0.02
Raycap DC6-48-60-18-8F	106.33	0.02
SUPRESSOR		0.04
(ATT / E / #12)		0.05
Raycap DC6-48-60-18-8F	106.33	0.02
SUPRESSOR		0.04
(ATT / P)		0.05
RRUS-11 B12	106.08	0.05
(ATT / E / #11)		0.07
		0.10
RRUS-11 B12	106.08	0.05
(ATT / E / #11)		0.07
		0.10
RRUS-11 B12	106.08	0.05
(ATT / E / #11)		0.07
		0.10
AM-X-CD-16-65-00T-RET	105.00	0.07
w/ PIPE MOUNT		0.14
(ATT / E / #10)		0.21
AM-X-CD-16-65-00T-RET	105.00	0.07
w/ PIPE MOUNT		0.14
(ATT / E / #10)		0.21
AM-X-CD-16-65-00T-RET	105.00	0.07
w/ PIPE MOUNT		0.14
(ATT / E / #10)		0.21
7770.00 Panels w/ Pipe	105.00	0.04
Mount		0.09
(ATT / E / #9)		0.15
7770.00 Panels w/ Pipe	105.00	0.04
Mount		0.09
(ATT / E / #9)		0.15
7770.00 Panels w/ Pipe	105.00	0.04
Mount		0.09
(ATT / E / #9)		0.15
(2) LGP21401 TMA'S	105.00	0.02
(ATT / E / #9)		0.03
		0.04
(2) LGP21401 TMA'S	105.00	0.02
(ATT / E / #9)		0.03
		0.04
(2) LGP21401 TMA'S	105.00	0.02
(ATT / E / #9)		0.03
		0.04
QS66512-2 w/ Pipe Mount	105.00	0.16
(ATT / P)		0.23
		0.32
QS66512-2 w/ Pipe Mount	105.00	0.16
(ATT / P)		0.23
		0.32
QS66512-2 w/ Pipe Mount	105.00	0.16
(ATT / P)		0.23
		0.32
RRUS-32 B2	105.00	0.05
(ATT / P)		0.07

Description	Placement	Weight
	ft	K
		0.10
RRUS-32 B2	105.00	0.05
(ATT / P)		0.07
		0.10
RRUS-32 B2	105.00	0.05
(ATT / P)		0.07
		0.10
RRUS-32	105.00	0.08
(ATT / P)		0.10
		0.14
RRUS-32	105.00	0.08
(ATT / P)		0.10
		0.14
RRUS-32	105.00	0.08
(ATT / P)		0.10
		0.14
DBC0061F1V51-2 Diplexer	105.00	0.01
(ATT / P)		0.01
		0.02
DBC0061F1V51-2 Diplexer	105.00	0.01
(ATT / P)		0.01
		0.02
DBC0061F1V51-2 Diplexer	105.00	0.01
(ATT / P)		0.01
		0.02
Empty Pipe Mount	104.58	0.02
(ATT / E / #9-12)		0.04
		0.06
Empty Pipe Mount	104.58	0.02
(ATT / E / #9-12)		0.04
		0.06
Empty Pipe Mount	104.58	0.02
(ATT / E / #9-12)		0.04
		0.06
Platform with Rails and	104.58	2.25
Ladder		3.10
(ATT / E / #9-12)		3.95
19x17x11" Junction Box	81.58	0.03
(Clearwire / E / #7)		0.05
		0.08
LLPX310R w/ Pipe Mount	81.58	0.05
(Clearwire / E / #6)		0.09
		0.14
LLPX310R w/ Pipe Mount	81.58	0.05
(Clearwire / E / #6)		0.09
		0.14
LLPX310R w/ Pipe Mount	81.58	0.05
(Clearwire / E / #6)		0.09
		0.14
RRH-2WB	79.08	0.04
(Clearwire / E / #4)		0.06
		0.08
RRH-2WB	79.08	0.04
(Clearwire / E / #4)		0.06
		0.08
RRH-2WB	79.08	0.04

Description	Placement	Weight
	ft	K
(Clearwire / E / #4)		0.06
		0.08
Horizon Duo	81.33	0.01
(Clearwire / E / F / #5,7)		0.02
		0.03
Horizon Duo	81.33	0.01
(Clearwire / E / F / #5,7)		0.02
		0.03
Horizon Duo	81.33	0.01
(Clearwire / E / F / #5,7)		0.02
		0.03
Dual Standoff Mount	81.33	0.12
(Clearwire / E / #4-8)		0.17
		0.23
Dual Standoff Mount	81.33	0.12
(Clearwire / E / #4-8)		0.17
		0.23
Dual Standoff Mount	81.33	0.12

Description	Placement	Weight
	ft	K
(Clearwire / E / #4-8)		0.17
		0.23
GPS	72.33	0.00
(ATT / E / #3)		0.01
		0.01
2ft Standoff Mount	71.33	0.05
(ATT / E / #3)		0.08
		0.11
GPS	52.83	0.00
(ATT / E / #2)		0.01
		0.01
2ft Standoff Mount	51.58	0.05
(ATT / E / #2)		0.08
		0.11
19x17x11" Junction Box	4.83	0.03
(Clearwire / E / #1)		0.05
		0.08

Dishes

Description	Elevation	Weight
	ft	K
A-ANT-18G-2-C HP	81.33	0.02
Dish		0.04
(Celwave / E / R)		0.06
A-ANT-18G-2-C HP	81.33	0.02
Dish		0.04
(Celwave / E / R)		0.06
A-ANT-18G-2-C HP	81.33	0.02
Dish		0.04
(Celwave / E / R)		0.06

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	103.083 - 88.1663	14.976	45	1.4135	0.0016
L2	90.1663 - 48.333	11.295	45	1.2798	0.0012
L3	51.083 - 2.333	3.453	45	0.6310	0.0006

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
106.33	Raycap DC6-48-60-18-8F SUPRESSOR	45	14.976	1.4135	0.0016	22219
106.08	RRUS-11 B12	45	14.976	1.4135	0.0016	22219
105.58	Lightning Rod	45	14.976	1.4135	0.0016	22219
105.00	AM-X-CD-16-65-00T-RET w/ PIPE MOUNT	45	14.976	1.4135	0.0016	22219
104.58	Empty Pipe Mount	45	14.976	1.4135	0.0016	22219
81.58	19x17x11" Junction Box	45	9.107	1.1600	0.0011	3406
81.33	A-ANT-18G-2-C HP Dish	45	9.047	1.1561 (3 dB) 0.9393	0.0011 (3 dB) 0.9393	3405
79.08	RRH-2WB	45	8.518	1.1205	0.0011	3395
72.33	GPS	45	7.040	1.0066	0.0009	3367
71.33	2ft Standoff Mount	45	6.835	0.9890	0.0009	3362
52.83	GPS	45	3.686	0.6604	0.0006	3288
51.58	2ft Standoff Mount	45	3.518	0.6393	0.0006	3293
4.83	19x17x11" Junction Box	45	0.103	0.0278	0.0000	63963

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	103.083 - 88.1663	67.587	14	6.3865	0.0071
L2	90.1663 - 48.333	50.983	14	5.7851	0.0055
L3	51.083 - 2.333	15.584	14	2.8486	0.0027

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
2.7500	8	2.2500	93.34 223.65 0.42	98.12 371.27 0.26	11.484 54.000 0.21	37.294 54.000 0.69	Stiff	0.69 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
L1	103.083 - 88.1663	Pole	TP16.2774x14.1782x0.1875	1	-4.72	698.97	34.4	Pass
L2	88.1663 - 48.333	Pole	TP21.883x15.6209x0.25	2	-7.76	1129.72	56.3	Pass
L3	48.333 - 2.333	Pole	TP28.3564x20.9714x0.3125	3	-19.11	2066.59	71.7	Pass
L2	64.833 - 54.833	Reinforcing	AERO MP303	17	-81.81	145.04	59.9	Pass
	54.833 - 52.333	Reinforcing	AERO MP303	14	-88.93	145.04	63.3	Pass
	52.333 - 48.333	Reinforcing	AERO MP304	11	-85.13	205.06	47.2	Pass
L3	48.333 - 13.083	Reinforcing	AERO MP304	8	-126.74	205.06	79.4	Pass
	13.083 - 3.333	Reinforcing	AERO MP303	5	-108.57	145.04	75.2	Pass
							Summary	
						Pole (L3)	71.7	Pass
						Reinforcing (L3)	79.4	Pass
						Base Plate	69.1	Pass
						RATING =	**79.4**	**Pass**

APPENDIX 2 – SOURCE / CHANGED CONDITION

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Preliminary Data Questionnaire (PDQ)

Application Date: 7/10/2018

Name and Mailing Address of Applicant:
(Street, City, State, Zip Code)
NEW CINGULAR WIRELESS PCS, LCC
575 MOROSGO DRIVE 13 F WEST TOWER
ATLANTA, GA 30324
Telephone Number:

Requested Site:
Frontier Site Name: West Hartford #2 CO
125 MAIN STREET WEST HARTFORD CT

Applicant Site Name: West Hartford South Main / CTL01076

Contact Information: (if different from applicant)
Name: Kristen LeDuc
Phone #: 978-828-3264
Email: Kristen.LeDuc@martlinkllc.com

Project Description:

AT&T LTE Equipment upgrades. Swap GSM antenna with 12 PORT antenna. Install LTE PCS RRUS-32 B2 and LTE WCS RRUS-32 at top.GSM is Decomm. Replace Top diplexers with Low Band combiners. Add Fiber/DC Squid- Swap DUL with 5216 and add XMU.// Move existing LTE Antenna to Pos2.

Are copies of all necessary permits attached?

USFS, BLM, Municipality Permits:
Yes
No N/A

FCC License:
Yes
No N/A

If no, have they been applied for?
Yes ⇨ ⇨ Application Date:
No N/A

Additional Notes on Permits:

Frontier Commercial Power Section

Existing Tenants

Are you using our commercial power? Yes: X No: ⇨ ⇨ What is your contractual amount?
AC or DC? AC
Volts 240 Requested Amps: 200

Are you using emergency power for existing service? Yes: X No: ⇨ ⇨ Amps: 200 AT&T doesn't know

Do you require additional commercial power? Yes: No: X ⇨ ⇨ What do you need in total? (existing + proposed)
(Amps must be provided in increments of 20)
AC or DC?
Volts Requested Amps:

Do you require additional amps of emergency service? Yes: No: X ⇨ ⇨ What do you need in total? (existing + proposed)
Amps:

Proposed Tenants

Is power required for equipment use? Yes: No: ⇨ ⇨ AC or DC?
(Amps must be provided in increments of 20)
Volts Requested Amps: 0

Is emergency power required? Yes: No: ⇨ ⇨ Requested Amps: 0
These amps should be the same as the commercial power request. If not, please note in project description.

Building / Ground Space Section

Existing Tenants

Please document your actual footprint:

	Indoor Space Area 1	Indoor Space Area 2	Outdoor Space Area 1	Outdoor Space Area 2
Length:	18' 11.5"			
Width:	17'10" & 18'5"			
Height:	378 sq ft total - basement			

	Indoor Space Area 3	Indoor Space Area 4	Outdoor Space Area 3	Outdoor Space Area 4
Length:				
Width:				
Height:				

Do you require additional space? Yes: No: X ⇨ ⇨ What additional space do you need? proposed only

Indoor?
Outdoor?
(check one)

	Area 1	Area 2
Length:		
Width:		
Height:		

Proposed Tenants

Please complete the below for the type of space you need. (Indoor / Outdoor)

	Indoor Space Area 1	Indoor Space Area 2	Outdoor Space Area 1	Outdoor Space Area 2
Length:				
Width:				
Height:				

Additional Notes on Power & Space:

Tower / Radio Information - Call Sign information needs to be tied to a specific antenna(s). Adjust letters as needed.

A	Call Sign	KNKA239
	Radio Service	CL
	Emission Designator	5M00G7W
	Transmit Frequency	880-890; 891.5-894
	Output Power (watts)	316
	Transmitter ERP (dBm)	55
	Receive Frequency	835-845; 846.5-849

A	Call Sign	WPSL626
	Radio Service	CW-PCS
	Emission Designator	5M00G7W
	Transmit Frequency	1930-1935
	Output Power (watts)	632 per sector
	Transmitter ERP (dBm)	55
	Receive Frequency	1850-1855

A	Call Sign	WQXQ394
	Radio Service	CW-PCS
	Emission Designator	15M0G7W
	Transmit Frequency	1930-1945
	Output Power (watts)	632 per sector
	Transmitter ERP (dBm)	55
	Receive Frequency	1850-1865

B	Call Sign	WQJU451
	Radio Service	WY 700 MHz
	Emission Designator	5M00W7D
	Transmit Frequency	734-740
	Output Power (watts)	501 per sector
	Transmitter ERP (dBm)	57
	Receive Frequency	704-710

Please attach frequency coordination data (PCN)

A	Call Sign	KNLG442
	Radio Service	CW-PCS
	Emission Designator	5M00G7W
	Transmit Frequency	1965-1970
	Output Power (watts)	632 per sector
	Transmitter ERP (dBm)	55
	Receive Frequency	1885-1890

A	Call Sign	WPTF536
	Radio Service	CW-PCS
	Emission Designator	5M00G7W
	Transmit Frequency	1982.5-1990
	Output Power (watts)	632 per sector
	Transmitter ERP (dBm)	55
	Receive Frequency	1902.5-1910

B	Call Sign	WPWV366
	Radio Service	WZ 700 MHz
	Emission Designator	5M00W7D
	Transmit Frequency	740-746
	Output Power (watts)	501 per sector
	Transmitter ERP (dBm)	57
	Receive Frequency	710-716

C	Call Sign	WPZA235 - proposed
	Radio Service	WZ 700 MHz
	Emission Designator	5M00W7D
	Transmit Frequency	716-722
	Output Power (watts)	501 per sector
	Transmitter ERP (dBm)	57
	Receive Frequency	716-722

Coax / Waveguide / Cable Feedline Information

Type:	Coax
Size:	7/8"
Length:	200ft
# of runs:	6 (E)
Type:	DC Cable
Size:	3/4"
Length:	200ft
# of runs:	4 (E)
Type:	Fiber
Size:	3/8"
Length:	200ft
# of runs:	2 (E)
Type:	
Size:	
Length:	
# of runs:	

	Antenna & Ancillary Equipment Information		**Check one**					**Heights** - Above Ground Level (feet)			**Notes:** (including removals, ice shields, etc.)
@	Make	Model	Existing	Proposed	Size / Dimensions	Weight	Azimuth	RAD Center	Attachment	Tip	
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	25	107'	105'	109'	
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	25	107'	105'	109'	
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	144	107'	105'	109'	
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	144	107'	105'	109'	To Be Removed
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	267	107'	105'	109'	To Be Removed
A	Powerwave	7770	X		55" x 11" x 5"	35 lbs	267	107'	105'	109'	To Be Removed
B	KMW	AM-X-CD-16-65-00T-RET	X		72" x 12" x 8"	49 lbs	25	107'	105'	110'	
B	KMW	AM-X-CD-16-65-00T-RET	X		72" x 12" x 8"	49 lbs	144	107'	105'	110'	
B	KMW	AM-X-CD-16-65-00T-RET	X		72" x 12" x 8"	49 lbs	267	107'	105'	110'	
C	QUINTEL	QS66512-2		X	72" x 12" 9.6"	111 lbs	25	107'	105'	110'	
C	QUINTEL	QS66512-2		X	72" x 12" 9.6"	111 lbs	144	107'	105'	110'	
C	QUINTEL	QS66512-2		X	72" x 12" 9.6"	111 lbs	267	107'	105'	110'	
	GPS Antenna		X						75'		
	GPS Antenna		X						65'		
	Ericsson	RRUS-11	X		19" x 16" x 7"	50 lbs		107'	105'	107'	Three (3) RRU units
	Ericsson	RRUS-32 B2		X	27" x 12" x 7"	53 lbs		107'	105'	107'	Three (3) RRU units
	Ericsson	RRUS-32		X	27" x 12" x 7"	60 lbs		107'	105'	107'	Three (3) RRU units
	Powerwave	LGP 21401	X		10" x 8.6" x 4.7"	22 lbs		107'	105'	106'	Six (6) TMA units
	Kaleaus	DBC0061F1V51-2		X	8" x 6.2" x 3.2"	9.5 lbs		107'	105'	106'	Three (3) diplexers
	Rayap - DC/Fiber Squid	DC6-48-60-18-8F		X	9.7" x 11" x 26.2"	32 lbs		107	105	107	Two (2) surge suppressors