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# Rigorous Structural Analysis Report

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**AT&T - West Hartford South Main Site #CTL01076**  
Owner: Frontier Communications - West Hartford #2 CO  
West Hartford, Connecticut



September 13, 2018

MEI PROJECT ID: CT05516M-18V0

**MALOUF ENGINEERING INTL., INC.**



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September 13, 2018

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

**RIGOROUS STRUCTURAL ANALYSIS**

Structure/Make/Model:	105 ft <b>Monopole</b>	Engineered Endeavors Inc. / 18-Sided	
Client/Site Name/#:	<b>Smartlink, LLC / AT&amp;T</b>	<b>West Hartford South Main #CTL01076</b>	
Owner/Site Name/#:	Frontier Communications	West Hartford #2 CO	
MEI Project ID:	<b>CT05516M-18V0</b>		
Location:	125 Main Street West Hartford, 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.

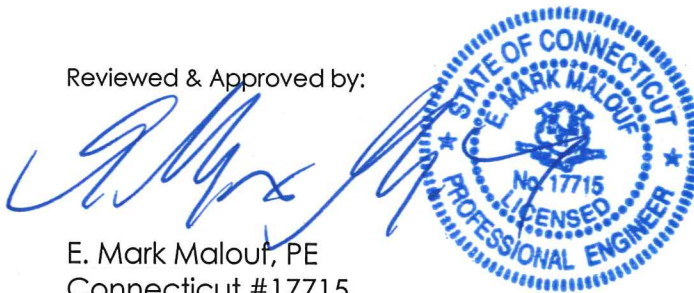
Respectfully submitted,

**MALOUF ENGINEERING INT'L, INC.**

Analysis performed by:

Krishna Manda, PE  
 Sr. Project Engineer

Reviewed & Approved by:



E. Mark Malouf, PE  
 Connecticut #17715  
 972-783-2578 ext. 106  
 mmalouf@maloufengineering.com

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
<b>STRUCTURE</b>			
<b>Tower</b>	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
<b>Foundation</b>	Frontier Communications Ms. Elissa McOmber	Partial Foundation Drawings / Girard & Co.	Dated 05/06/1998
<b>Material Grade</b>	Not available from supplied documents-Assumed based on typical towers of this type-refer to Appendix		
<b>CURRENT APPURTENANCES</b>			
	MEI Mapping	Tower Mapping [HTS Sub]	Dated 09/06/2018
<b>CHANGED CONDITION</b>			
	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:

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

### 3. ANALYSIS CRITERIA

The structural analysis performed used the following criteria:

<b>CODE / STANDARD</b>	2016 CT Building Code / 2012 IBC / NDS / ANSI/TIA-222-G Standard	
<b>LOADING CASES</b>	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 <sub>s</sub> = 0.179 / S <sub>1</sub> = 0.064 / Site Class: D – Stiff Soil
<b>STRUCTURE CRITERIA</b>	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 Suppressor	[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					
<b>Appurtenances to Remain</b>								
104	AT&T	1	Raycap DC6-48-60-18-8F Suppressor	Platform with Rails and Ladder + (3) Empty Pipe Mounts	2	3/8" Fiber Cable 3/4" DC Power Cable 2" Flex Conduit 7/8		
103.75		3	RRUS-11 B12 Boxes					
102.67		3	AM-X-CD-16-65-00T-RET Boxes					
102.67		3	7770.00 Panel Antennas					
102.67		6	LGP21401 TMA's					
70		1	GPS Box		2ft Standoff Mount		1	1/2
50.5		1	GPS Box		2ft Standoff Mount		1	1/2
<b>Appurtenances to be Removed</b>								
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	1/2"-
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:**

- \*Included Clearwire reserved lease loading for analysis. Existing loading different.
- \*\*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.
- ^ All elevations are measured from tower base. Datum/Pole base is 2.33ft above grade.
- Please note appurtenances not listed above are to be removed/not present as per data supplied.
- (I) = Internal; (E) = External; (FZ) = Within Face Zone; (OFZ) = Outside Face Zone - as per TIA-222-G.
- 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.



## 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, trnTower (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 invalidated, MEI should be contacted to review any contradictory information to determine its effect.

## 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	<b>98.3%</b>	<b>Bearing</b>	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:**

- (\*) – Assumed soil parameters, Ultimate bearing of 8ksf, Passive pressure of 400pcf, angle of internal friction of 28 degrees and water below the foundation.
- 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.
- Refer to the Appendix 1 for more details on the member loads.
- A maximum stress ratio between 100% and 105% may be considered as *Acceptable* according to industry standard practice.

## 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.*



## 7. REPORT DISCLAIMER

The engineering services rendered by Malouf Engineering International, 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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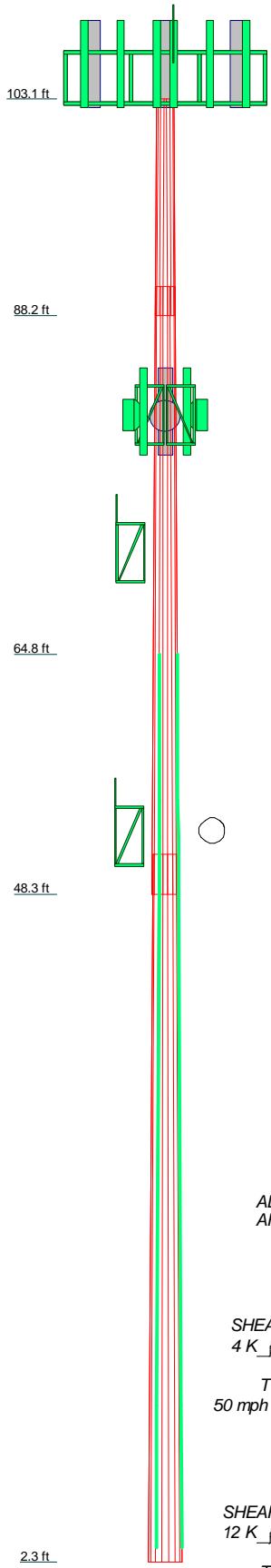
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**APPENDIX 1 - ANALYSIS PRINTOUT & GRAPHICS**

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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	20.9714
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



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Raycap DC6-48-60-18-8F SUPPRESSOR (ATT / E / #12)	106.333	Empty Pipe Mount (ATT / E / #9-12)	104.583
Raycap DC6-48-60-18-8F SUPPRESSOR (ATT / P)	106.333	Empty Pipe Mount (ATT / E / #9-12)	104.583
RRUS-11 B12 (ATT / E / #11)	106.083	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	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
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105	Horizon Duo (Clearwire / E / F / #5,7)	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	Dual Standoff Mount (Clearwire / E / #4-8)	81.333
(2) LGP21401 TMA'S (ATT / E / #9)	105	Dual Standoff Mount (Clearwire / E / #4-8)	81.333
(2) LGP21401 TMA'S (ATT / E / #9)	105	A-ANT-18G-2-C HP Dish (Celwave / E / R)	81.333
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	A-ANT-18G-2-C HP Dish (Celwave / E / R)	81.333
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
RRUS-32 B2 (ATT / P)	105	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		

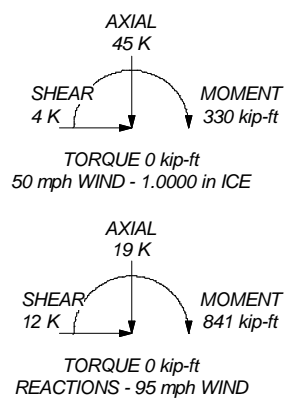
### MATERIAL STRENGTH


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%

ALL REACTIONS ARE FACTORED





**Malouf Engineering Int'l Inc.**  
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FAX: (972) 783 2583

maloufengineering.com

Job: **100.75ft MP - West Hartford South Main Site #CTL01076**

Project: **CT05516M-18V0**






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Code: TIA-222-G	Date: 09/13/18	Scale: NTS
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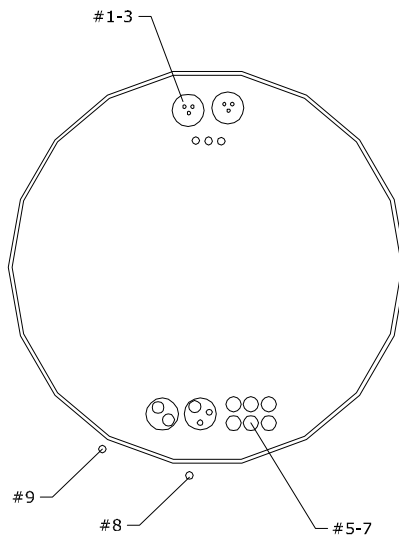
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No.	QTY.	DESCRIPTION	ELEV.	TENANT
1	2	2" FLEX Conduit	79'	Clearwire / E / #1-2
2	6	5/16	79'	Clearwire / E / F
3	3	1/2	79'	Clearwire / E / F / #3,4
4	6	7/8	100'	ATT / E / #6-11
5	2	2" FLEX Conduit	100'	ATT / E / #18,19
6	4	3/4" DC Power Cable	100'	ATT / 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  #X




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.

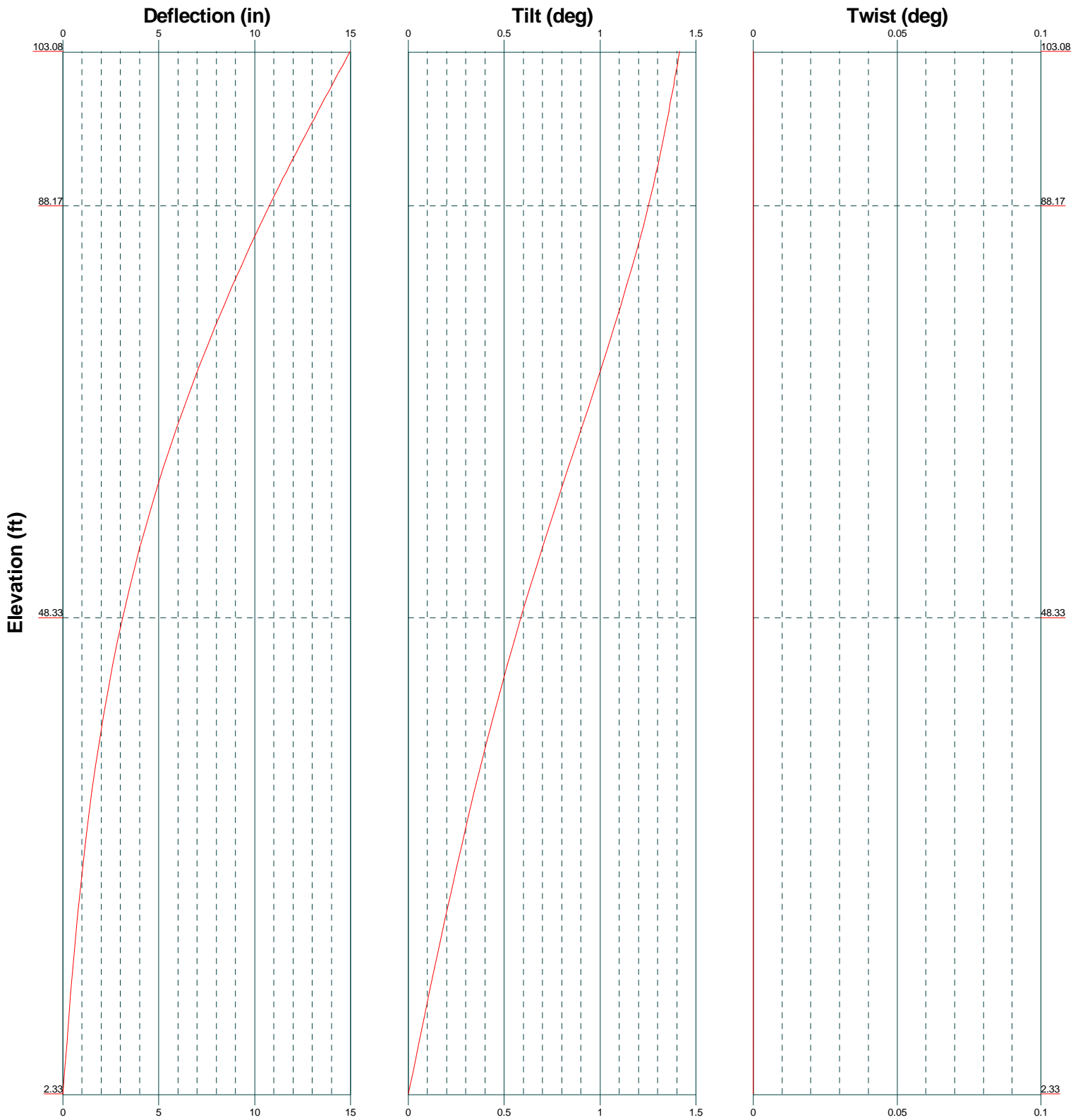
09/13/2018

MALOUF ENGINEERING INTERNATIONAL, INC.  
  
 STRUCTURAL CONSULTANTS

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100.75ft MP - West Hartford South Main Site #CTL01076  
**MONOPOLE TxLINE LAYOUT**  
 MEI PROJECT ID CT05516M-18V0 SHEET NUMBER **L01** REV. **0**



**Malouf Engineering Int'l Inc.**  
 17950 Preston Road, STE 720  
 Dallas, Texas 75252  
 Phone: (972) 783 2578  
 FAX: (972) 783 2583

Job: <b>100.75ft MP - West Hartford South Main Site #CTL01076</b>		
Project: <b>CT05516M-18V0</b>		
Client: Smartlink / AT&T	Drawn by: KM	App'd:
Code: TIA-222-G	Date: 09/13/18	Scale: NTS
Path:	Dwg No. E-5	

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<b>tnxTower</b>  <b>Malouf Engineering Int'l Inc.</b> 17950 Preston Road, STE 720 Dallas, Texas 75252 Phone: (972) 783 2578 FAX: (972) 783 2583	<b>Job</b> 100.75ft MP - West Hartford South Main Site #CTL01076	<b>Page</b> 1 of 5
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	<b>Client</b> Smartlink / AT&T	<b>Designed by</b> KM

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

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## Discrete Tower Loads

Description	Placement	Weight	Description	Placement	Weight
	<i>ft</i>	<i>K</i>		<i>ft</i>	<i>K</i>
Lightning Rod (E / #13)	105.58	0.01 0.01 0.02			0.10 0.05 0.07 0.10
Raycap DC6-48-60-18-8F SUPPRESSOR (ATT / E / #12)	106.33	0.02 0.04 0.05	RRUS-32 B2 (ATT / P)	105.00	0.05 0.07 0.10
Raycap DC6-48-60-18-8F SUPPRESSOR (ATT / P)	106.33	0.02 0.04 0.05	RRUS-32 B2 (ATT / P)	105.00	0.05 0.07 0.10
RRUS-11 B12 (ATT / E / #11)	106.08	0.05 0.07 0.10	RRUS-32 (ATT / P)	105.00	0.08 0.10 0.14
RRUS-11 B12 (ATT / E / #11)	106.08	0.05 0.07 0.10	RRUS-32 (ATT / P)	105.00	0.08 0.10 0.14
RRUS-11 B12 (ATT / E / #11)	106.08	0.05 0.07 0.10	RRUS-32 (ATT / P)	105.00	0.08 0.10 0.14
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105.00	0.07 0.14 0.21	DBC0061F1V51-2 Diplexer (ATT / P)	105.00	0.01 0.01 0.02
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105.00	0.07 0.14 0.21	DBC0061F1V51-2 Diplexer (ATT / P)	105.00	0.01 0.01 0.02
AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (ATT / E / #10)	105.00	0.07 0.14 0.21	DBC0061F1V51-2 Diplexer (ATT / P)	105.00	0.01 0.01 0.02
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105.00	0.04 0.09 0.15	Empty Pipe Mount (ATT / E / #9-12)	104.58	0.02 0.04 0.06
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105.00	0.04 0.09 0.15	Empty Pipe Mount (ATT / E / #9-12)	104.58	0.02 0.04 0.06
7770.00 Panels w/ Pipe Mount (ATT / E / #9)	105.00	0.04 0.09 0.15	Empty Pipe Mount (ATT / E / #9-12)	104.58	0.02 0.04 0.06
(2) LGP21401 TMA'S (ATT / E / #9)	105.00	0.02 0.03 0.04	Platform with Rails and Ladder (ATT / E / #9-12)	104.58	2.25 3.10 3.95
(2) LGP21401 TMA'S (ATT / E / #9)	105.00	0.02 0.03 0.04	19x17x11" Junction Box (Clearwire / E / #7)	81.58	0.03 0.05 0.08
(2) LGP21401 TMA'S (ATT / E / #9)	105.00	0.02 0.03 0.04	LLPX310R w/ Pipe Mount (Clearwire / E / #6)	81.58	0.05 0.09 0.14
QS66512-2 w/ Pipe Mount (ATT / P)	105.00	0.16 0.23 0.32	LLPX310R w/ Pipe Mount (Clearwire / E / #6)	81.58	0.05 0.09 0.14
QS66512-2 w/ Pipe Mount (ATT / P)	105.00	0.16 0.23 0.32	RRH-2WB (Clearwire / E / #4)	79.08	0.04 0.06 0.08
QS66512-2 w/ Pipe Mount (ATT / P)	105.00	0.16 0.23 0.32	RRH-2WB (Clearwire / E / #4)	79.08	0.04 0.06 0.08
RRUS-32 B2 (ATT / P)	105.00	0.05 0.07	RRH-2WB	79.08	0.08 0.04

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<i>Description</i>	<i>Placement</i>	<i>Weight</i>	<i>Description</i>	<i>Placement</i>	<i>Weight</i>
	<i>ft</i>	<i>K</i>		<i>ft</i>	<i>K</i>
(Clearwire / E / #4)		0.06	(Clearwire / E / #4-8)		0.17
		0.08			0.23
Horizon Duo	81.33	0.01	GPS	72.33	0.00
(Clearwire / E / F / #5,7)		0.02	(ATT / E / #3)		0.01
		0.03			0.01
Horizon Duo	81.33	0.01	2ft Standoff Mount	71.33	0.05
(Clearwire / E / F / #5,7)		0.02	(ATT / E / #3)		0.08
		0.03			0.11
Horizon Duo	81.33	0.01	GPS	52.83	0.00
(Clearwire / E / F / #5,7)		0.02	(ATT / E / #2)		0.01
		0.03			0.01
Dual Standoff Mount	81.33	0.12	2ft Standoff Mount	51.58	0.05
(Clearwire / E / #4-8)		0.17	(ATT / E / #2)		0.08
		0.23			0.11
Dual Standoff Mount	81.33	0.12	19x17x11" Junction Box	4.83	0.03
(Clearwire / E / #4-8)		0.17	(Clearwire / E / #1)		0.05
		0.23			0.08
Dual Standoff Mount	81.33	0.12			

## Dishes

<i>Description</i>	<i>Elevation</i>	<i>Weight</i>
	<i>ft</i>	<i>K</i>
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



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### 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)	0.0011 (3 dB)	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

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### Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual Allowable Bolt Tension K	Actual Allowable Bolt Compression K	Actual Allowable Plate Stress ksi	Actual Allowable Stiffener Stress ksi	Controlling Condition	Ratio
2.7500 <i>in</i>	8	2.2500 <i>in</i>	93.34	98.12	11.484	37.294	Stiff	0.69
			223.65	371.27	54.000	54.000		✓
			0.42	0.26	0.21	0.69		

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ 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
							<b>RATING =</b>	<b>79.4</b>	<b>Pass</b>

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**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	⇒ ⇒	What is your contractual amount?
	No	_____		AC or DC? AC
				Volts 240 Requested Amps: 200
Are you using emergency power for existing service?	Yes	X	⇒ ⇒	Amps: 200 AT&T doesn't know
	No	_____		
Do you require additional commercial power? <i>(Amps must be provided in increments of 20)</i>	Yes	_____	⇒ ⇒	What do you need in total? <i>(existing + proposed)</i>
	No	X		AC or DC? _____
				Volts _____ Requested Amps: _____
Do you require additional amps of emergency service?	Yes	_____	⇒ ⇒	What do you need in total? <i>(existing + proposed)</i>
	No	X		Amps: _____

**Proposed Tenants**

Is power required for equipment use?	Yes	_____	⇒ ⇒	AC or DC? _____
	No	_____		Volts _____ Requested Amps: 0
				<i>(Amps must be provided in increments of 20)</i>
Is emergency power required?	Yes	_____	⇒ ⇒	Requested Amps: 0
	No	_____		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:

	<b>Indoor Space</b>			<b>Outdoor Space</b>	
	Area 1	Area 2		Area 1	Area 2
Length:	18' 11.5"		_____	Length:	
Width:	17'10" & 18'5"		_____	Width:	
Height:	378 sq ft total - basement		_____	Height:	
	Area 3	Area 4		Area 3	Area 4
Length:			_____	Length:	
Width:			_____	Width:	
Height:			_____	Height:	

Do you require additional space?	Yes	_____	⇒ ⇒	What additional space do you need? <i>proposed only</i>
	No	X		Area 1
				Area 2
				Length: _____
				Width: _____
				Height: _____
				Area 1
				Area 2
				Length: _____
				Width: _____
				Height: _____
				Area 1
				Area 2
				Length: _____
				Width: _____
				Height: _____

*(check one)*

**Proposed Tenants**

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

	<b>Indoor Space</b>			<b>Outdoor Space</b>	
	Area 1	Area 2		Area 1	Area 2
Length:			_____	Length:	
Width:			_____	Width:	
Height:			_____	Height:	

**Additional Notes on Power & Space:**

