



10 INDUSTRIAL AVE,  
SUITE 3  
MAHWAH NJ 07430

PHONE: 201.684.0055  
FAX: 201.684.0066

August 29, 2016

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

Notice of Exempt Modification  
10 Willard Road, Norwalk, CT 06855  
Latitude- 41.12851800  
Longitude- -73.38993200

Dear Ms. Bachman,

T-Mobile currently maintains (6) existing antennas at the 262' level of the existing 350' lattice tower at 10 Willard Road in Norwalk, CT. The tower and property is owned by Frontier Communications. T-Mobile now intends to replace (3) existing antennas with (3) new 1900 MHz antennas, and add (3) 700 MHz antennas. These antennas would be installed at the same 262' level of the tower. T-Mobile also intends to add (3) remote radio-heads and (3) hybrid fiber cables.

This facility was approved by the City of Norwalk with the condition that the facility area needs to be fenced-in, and the antennas be painted to match the existing equipment. This modification complies with the aforementioned conditions.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. 16-50j-72(b)(2). In accordance with R.C.S.A. 16-50j-73, a copy of this letter is being sent to Harry W. Rilling, Mayor of the City of Norwalk, as well as the property and tower owner.

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

1. The proposed modification will not result in an increase in the height of the existing structure
2. The proposed modifications will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

5. The proposed modification will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading with certain modifications.

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

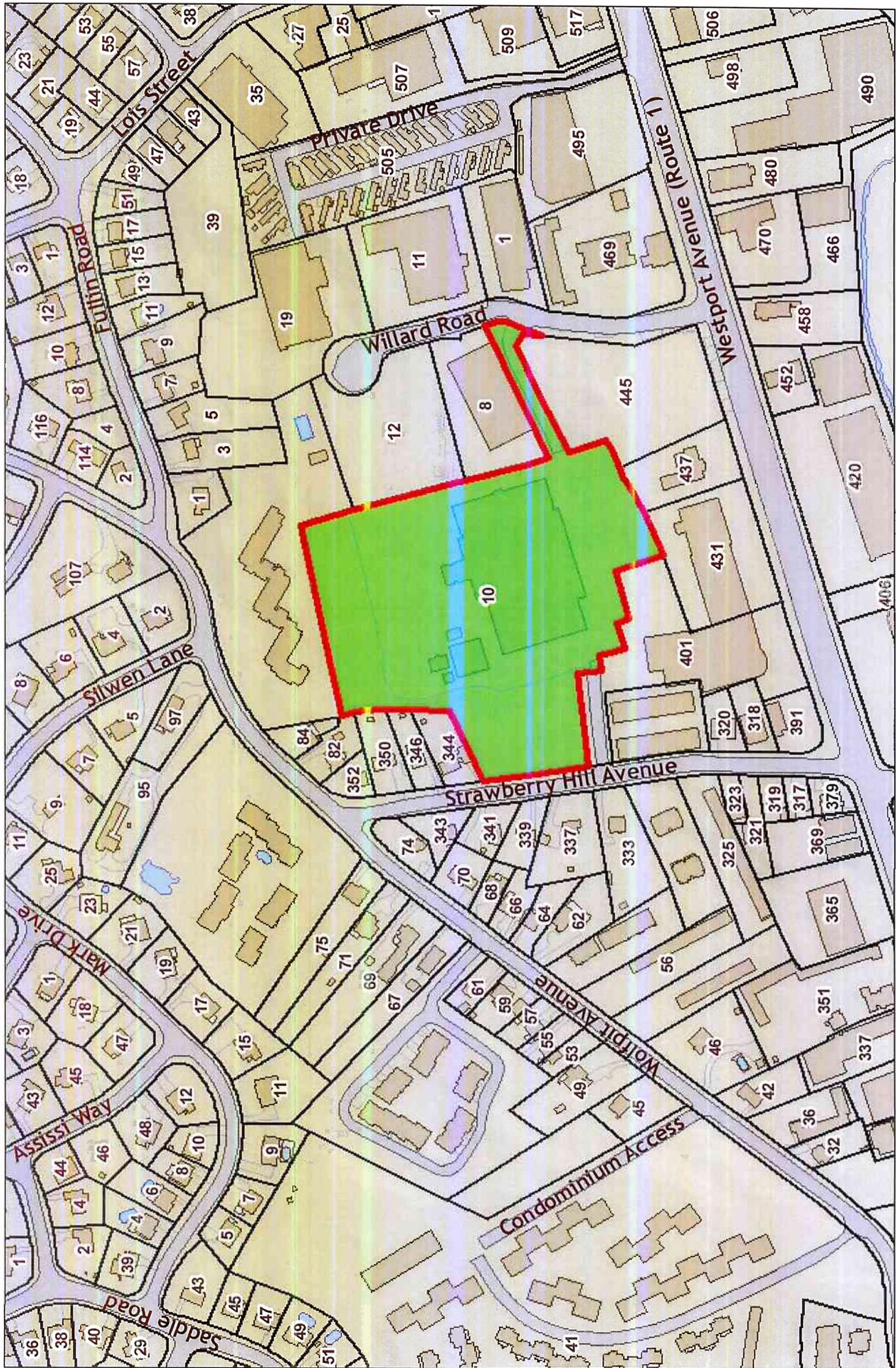
Sincerely,

*Kyle Richers*

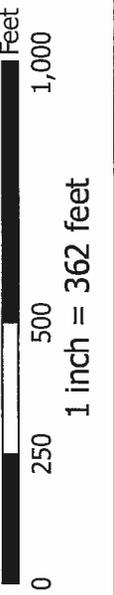
Kyle Richers  
Transcend Wireless  
10 Industrial Ave., Suite 3  
Mahwah, New Jersey 07430  
908-447-4716  
[krichers@transcendwireless.com](mailto:krichers@transcendwireless.com)

Attachments:

cc: Harry Rilling- as elected official  
Frontier Communications- as tower and property owner



# Norwalk, CT



**10 WILLARD RD**

**Location** 10 WILLARD RD

**Mblu** 5/ 17/ 2/ 0/

**Acct#** 11273

**Owner** SOUTHERN NEW ENG TEL CO

**Assessment** \$3,967,780

**Appraisal** \$5,668,250

**PID** 11273

**Building Count** 3

**Assessing Distr...**

**Current Value**

Appraisal			
Valuation Year	Improvements	Land	Total
2015	\$1,175,000	\$4,493,250	\$5,668,250

Assessment			
Valuation Year	Improvements	Land	Total
2015	\$822,500	\$3,145,280	\$3,967,780

**Owner of Record**

**Owner** SOUTHERN NEW ENG TEL CO  
**Co-Owner** PROPERTY TAX ADMIN  
**Address** ONE SBC CENTER RM 36-M-01  
 ST LOUIS, MO 63101

**Sale Price** \$0  
**Certificate**  
**Book & Page** 401/370  
**Sale Date** 03/10/1954

**Ownership History**

Ownership History				
Owner	Sale Price	Certificate	Book & Page	Sale Date
SOUTHERN NEW ENG TEL CO	\$0		401/370	03/10/1954

**Building Information**

**Building 1 : Section 1**

**Year Built:** 1956  
**Living Area:** 46,692  
**Replacement Cost:** \$2,157,385  
**Building Percent** 43  
**Good:**  
**Replacement Cost**  
**Less Depreciation:** \$927,680

**Building Photo**

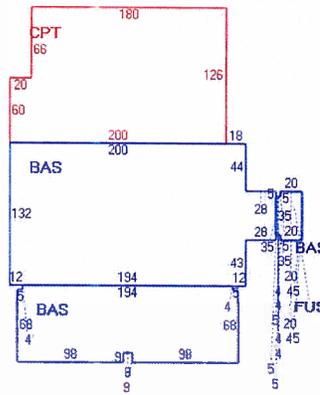
Building Attributes	
Field	Description
STYLE	Warehouse

MODEL	Industrial
Stories:	1.00
Occupancy	2.00
Exterior Wall 1	Brick Veneer
Exterior Wall 2	
Roof Structure	Flat
Roof Cover	Rolled Compos
Interior Wall 1	Drywall
Interior Wall 2	Minimum
Interior Floor 1	Concrete
Interior Floor 2	Vinyl
Heating Fuel	Oil
Heating Type	Forced Air
AC Percent	35
Heat Percent	100
Bldg Use	Utility
Total Rooms	0
Bedrooms	0
FBM Area	
Heat/AC	Heat/AC Split
Frame	Steel
Plumbing	Average
Foundation	Slab
Partitions	Average
Wall Height	12.00
% Sprinkler	65.00



(http://images.vgsi.com/photos/NorwalkCTPhotos//00\00\31\78.jpg)

**Building Layout**



Building Sub-Areas (sq ft)			Legend	
Code	Description	Gross Area	Living Area	
BAS	First Floor	45,652	45,652	
FUS	Finished Upper Story	1,040	1,040	
CPT	Carport	23,880	0	
		70,572	46,692	

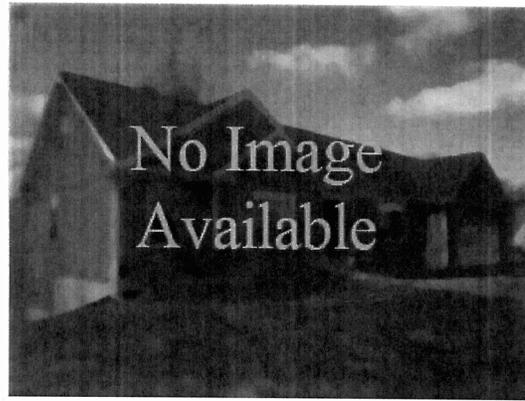
**Building 2 : Section 1**

**Year Built:** 1972  
**Living Area:** 988  
**Replacement Cost:** \$91,686  
**Building Percent Good:** 47  
**Replacement Cost Less Depreciation:** \$43,090

Building Attributes : Bldg 2 of 3	
Field	Description
STYLE	Commercial

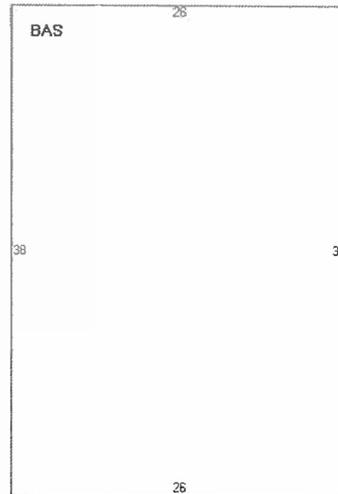
**Building Photo**

MODEL	Industrial
Stories:	1.00
Occupancy	1.00
Exterior Wall 1	Concrete
Exterior Wall 2	
Roof Structure	Flat
Roof Cover	Tar and Gravel
Interior Wall 1	Minimum
Interior Wall 2	
Interior Floor 1	Vinyl
Interior Floor 2	
Heating Fuel	None
Heating Type	None
AC Percent	100
Heat Percent	100
Bldg Use	Utility
Total Rooms	0
Bedrooms	0
FBM Area	
Heat/AC	None
Frame	Typical
Plumbing	Average
Foundation	Slab
Partitions	Light
Wall Height	12.00
% Sprinkler	0.00



(<http://images.vgsi.com/photos/NorwalkCTPhotos//default.jpg>)

**Building Layout**



Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	988	988
		988	988

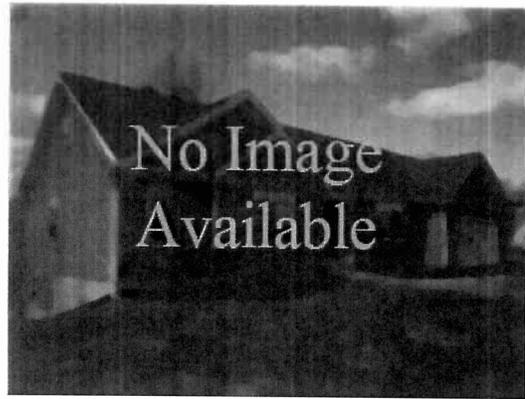
**Building 3 : Section 1**

**Year Built:** 1988  
**Living Area:** 560  
**Replacement Cost:** \$36,019  
**Building Percent Good:** 55  
**Replacement Cost Less Depreciation:** \$19,810

Building Attributes : Bldg 3 of 3	
Field	Description
STYLE	Telephone Bldg
MODEL	Industrial
Stories:	1.00
Occupancy	1.00

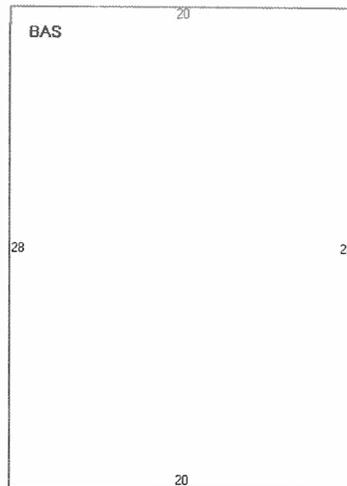
**Building Photo**

Exterior Wall 1	Precast Panel
Exterior Wall 2	
Roof Structure	Flat
Roof Cover	Rolled Compos
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Vinyl
Interior Floor 2	
Heating Fuel	None
Heating Type	None
AC Percent	100
Heat Percent	100
Bldg Use	Utility
Total Rooms	0
Bedrooms	0
FBM Area	
Heat/AC	None
Frame	Typical
Plumbing	Average
Foundation	Slab
Partitions	Average
Wall Height	
% Sprinkler	0.00



(<http://images.vgsi.com/photos/NorwalkCTPhotos//default.jpg>)

**Building Layout**



Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	560	560
		560	560

**Extra Features**

Extra Features		Legend
No Data for Extra Features		

**Land**

**Land Use**

<b>Use Code</b>	401
<b>Description</b>	Utility
<b>Zone</b>	B2
<b>Neighborhood</b>	C330

**Land Line Valuation**

<b>Size (Acres)</b>	8.29
<b>Frontage</b>	
<b>Depth</b>	
<b>Assessed Value</b>	\$3,145,280
<b>Appraised Value</b>	\$4,493,250

**Outbuildings**

Outbuildings						Legend
Code	Description	Sub Code	Sub Description	Size	Value	Bldg #
PAV1	Paving Asph.			12000.00 S.F.	\$12,600	1
PAV1	Paving Asph.			60300.00 S.F.	\$63,320	1
FN6	Fence 6'			3000.00 L.F.	\$21,000	1
TNK1	Tank Under Grn			10000.00 GALS	\$7,500	1
CEL1	Cell Tower			1.00 UNITS	\$80,000	1

**Valuation History**

Appraisal			
Valuation Year	Improvements	Land	Total
2014	\$1,175,000	\$4,493,250	\$5,668,250
2013	\$1,175,000	\$4,493,250	\$5,668,250
2012	\$1,703,300	\$4,289,700	\$5,993,000

Assessment			
Valuation Year	Improvements	Land	Total
2014	\$822,500	\$3,145,280	\$3,967,780
2013	\$822,500	\$3,145,280	\$3,967,780
2012	\$1,192,310	\$3,002,790	\$4,195,100

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RADIO FREQUENCY EMISSIONS ANALYSIS REPORT  
EVALUATION OF HUMAN EXPOSURE POTENTIAL  
TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CT11011D

Westport-SNET LL  
10 Willard Road (SNET LL)  
Norwalk, CT 06851

**August 23, 2016**

**EBI Project Number: 6216003717**

Site Compliance Summary	
Compliance Status:	<b>COMPLIANT</b>
Site total MPE% of FCC general public allowable limit:	<b>8.05 %</b>

August 23, 2016

T-Mobile USA  
Attn: Jason Overbey, RF Manager  
35 Griffin Road South  
Bloomfield, CT 06002

Emissions Analysis for Site: **CT11011D – Westport-SNET LL**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **10 Willard Road (SNET LL), Norwalk, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The number of  $\mu\text{W}/\text{cm}^2$  calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The general population exposure limit for the 700 MHz Band is approximately 467  $\mu\text{W}/\text{cm}^2$ , and the general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) bands is 1000  $\mu\text{W}/\text{cm}^2$ . Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

## **CALCULATIONS**

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **10 Willard Road (SNET LL), Norwalk, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

- 1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 2) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 3) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 4) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 5) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 6) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.

- 7) Since the 2100 MHz UMTS radios are ground mounted there are additional cabling losses accounted for. For each ground mounted 2100 MHz UMTS RF path an additional 3.18 dB of additional cable loss was factored into the calculations. This is based on manufacturers Specifications for 300 feet of 1-5/8" coax cable on each path.
- 8) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
- 9) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 10) The antennas used in this modeling are the **Ericsson AIR32 B66Aa/B2A & Ericsson AIR21 B2A/B4P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-VTM** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR32 B66Aa/B2A** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Ericsson AIR21 B2A/B4P** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Commscope LNX-6515DS-VTM** has a maximum gain of **14.6 dBd** at its main lobe at 700 MHz. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 11) The antenna mounting height centerline of the proposed antennas is **262 feet** above ground level (AGL).
- 12) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.
- 13) All calculations were done with respect to uncontrolled / general public threshold limits.

### T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR32 B66Aa/B2A	Make / Model:	Ericsson AIR32 B66Aa/B2A	Make / Model:	Ericsson AIR32 B66Aa/B2A
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	262	Height (AGL):	262	Height (AGL):	262
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	240	Total TX Power(W):	240	Total TX Power(W):	240
ERP (W):	9,337.08	ERP (W):	9,337.08	ERP (W):	9,337.08
Antenna A1 MPE%	0.51	Antenna B1 MPE%	0.51	Antenna C1 MPE%	0.51
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	262	Height (AGL):	262	Height (AGL):	262
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	6	Channel Count	6	Channel Count	6
Total TX Power(W):	180	Total TX Power(W):	180	Total TX Power(W):	180
ERP (W):	5,790.95	ERP (W):	5,790.95	ERP (W):	5,790.95
Antenna A2 MPE%	0.32	Antenna B2 MPE%	0.32	Antenna C2 MPE%	0.32
Antenna #:	3	Antenna #:	3	Antenna #:	3
Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	262	Height (AGL):	262	Height (AGL):	262
Frequency Bands	700 MHz	Frequency Bands	700 MHz	Frequency Bands	700 MHz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power(W):	30	Total TX Power(W):	30	Total TX Power(W):	30
ERP (W):	865.21	ERP (W):	865.21	ERP (W):	865.21
Antenna A3 MPE%	0.10	Antenna B3 MPE%	0.10	Antenna C3 MPE%	0.10

Site Composite MPE%	
Carrier	MPE%
T-Mobile (Per Sector Max)	0.93 %
PageNet	0.05 %
SNET TMRS	0.06 %
SkyTel	0.11 %
RAM Mobile Data	0.01 %
PageNet 900 MHz	0.97 %
Sprint	0.25 %
Clearwire	0.06 %
AT&T	0.26 %
MediaFLO	3.87%
XM Sat Radio	0.02%
American Mobile Com.	0.01%
GNARC	0.01%
WSHU-AM	1.00%
MetroPCS	0.44%
<b>Site Total MPE %:</b>	<b>8.05 %</b>

T-Mobile Sector A Total:	0.93 %
T-Mobile Sector B Total:	0.93 %
T-Mobile Sector C Total:	0.93 %
<b>Site Total:</b>	<b>8.05 %</b>

**T-Mobile Per Sector Maximum Power Values**

T-Mobile_per sector	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ( $\mu\text{W}/\text{cm}^2$ )	Frequency (MHz)	Allowable MPE ( $\mu\text{W}/\text{cm}^2$ )	Calculated % MPE
T-Mobile AWS - 2100 MHz LTE	2	2,334.27	262	2.56	AWS - 2100 MHz	1000	0.26%
T-Mobile PCS - 1900 MHz LTE	2	2,334.27	262	2.56	PCS - 1900 MHz	1000	0.26%
T-Mobile AWS - 2100 MHz UMTS	2	561.20	262	0.62	AWS - 2100 MHz	1000	0.06%
T-Mobile PCS - 1950 MHz UMTS	2	1,167.14	262	1.28	PCS - 1950 MHz	1000	0.13%
T-Mobile PCS - 1950 MHz GSM	2	1,167.14	262	1.28	PCS - 1950 MHz	1000	0.13%
T-Mobile 700 MHz LTE	1	865.21	262	0.47	700 MHz	467	0.10%
						<b>Total*:</b>	<b>0.93%</b>

\*NOTE: Totals may vary by 0.01% due to summing of remainders

## Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general public exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general public exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	0.93 %
Sector B:	0.93 %
Sector C:	0.93 %
T-Mobile Per Sector Maximum:	0.93 %
Site Total:	8.05 %
Site Compliance Status:	<b>COMPLIANT</b>

The anticipated composite MPE value for this site assuming all carriers present is **8.05%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

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# Structural Analysis Report

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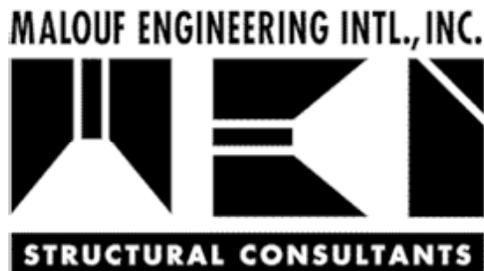


AT&T – East Norwalk #CT2132 / FA #10034993  
T-Mobile – Norwalk\_Willard Rd Site #CT11011D  
Owner: Frontier Tower - Norwalk Tower Site  
Norwalk, Connecticut



July 01, 2016

MEI PROJECT ID: CT04761S-16V0



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17950 PRESTON ROAD, SUITE 720 ■ DALLAS, TEXAS 75252 ■ TEL. 972-783-2578 FAX 972-783-2583  
[www.maloufengineering.com](http://www.maloufengineering.com)

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July 01, 2016

Mr. David Cooper  
**Empire Telecom / AT&T**  
 Billerica, MA 01862

Mr. Kyle Richers  
**Transcend Wireless / T-Mobile**  
 Mahwah, NJ 07430

**STRUCTURAL ANALYSIS**

Structure/Make/Model:	351.67 ft <b>Self-Supporting Tower</b>	Not Known / Not Known	
Client/Site Name/#:	<b>Empire Telecom / AT&amp;T</b>	<b>East Norwalk #CT2132 / FA #10034993</b>	
	<b>Transcend Wireless / T-Mobile</b>	<b>Norwalk Willard #CT11011D</b>	
Owner/Site Name/#:	Frontier Tower	Norwalk Tower	
MEI Project ID:	<b>CT04761S-16V0</b>		
Location:	10 Willard Rd Norwalk, CT 06851	Fairfield County FCC #1046320	
	LAT	41-07-41.8 N	LON

**EXECUTIVE SUMMARY:**

Malouf Engineering Int'l (MEI), as requested, has performed a structural analysis and modification design 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-F** Standard for the loading considered under the criteria listed and referenced in the report sections **after proper installation of the recommended structural strengthening modifications outlined** – tower rated at 99.8% - Legs.

**The addition of the proposed changed condition as noted in Table 1 is structurally acceptable after proper installation of the proposed strengthening modifications.** Please refer to modification drawings for details.

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:

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



07/01/2016

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## 1. INTRODUCTION & SCOPE

A structural analysis and modification design were performed by Malouf Engineering Int'l (MEI), as requested and authorized by Mr. David Cooper, Empire Telecom, on behalf of AT&T and Mr. Kyle Richers, Transcend Wireless, on behalf of T-Mobile, to determine the acceptance of the proposed changed conditions in conformance with the IBC / ANSI/TIA-222-F Standard, "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures".

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>	MEI Mapping	Mapping Report [Sub: HTS]	Dated 11/30/2015
	Frontier Comm. / Ms. Elissa McOmber	GPD Engineering Analysis GPD Modification Design	Dated 09/11/2015 Job #2012766.02 Dated 06/27/2012
<b>Foundation</b>	Frontier Comm. / Ms. Elissa McOmber	GPD Analysis Report – No geotech report available	Dated 09/11/2015
<b>Material Grade</b>	As per supplied documents (GPD Analysis included specific material grades for the different components) - Refer to Appendix		
<b>CURRENT APPURTENANCES</b>			
	MEI Mapping	Mapping Report [Sub: HTS]	Dated 11/30/2015
<b>CHANGED CONDITION</b>			
	Sprint / Ms. Michelle Hisert	E-mail Instructions	Dated 01/25/2016
	Frontier Wireless / Ms. Elissa McOmber	Frontier T-Mobile Collo App	Dated 05/04/2016
	Frontier Wireless / Ms. Elissa McOmber	Frontier AT&T Collo App - revised	Dated 06/30/2016

### Background Information:

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

<b>DESIGNER / FABRICATOR</b>	Not Known / Not Known
<b>ORIGINAL DESIGN CRITERIA</b>	TIA/EIA 222-Unknown
<b>PRIOR STRUCTURAL MODIFICATIONS</b>	As per GPD modification design Job #2012766.02 dated 06/27/2012 – considered properly installed.

### 3. ANALYSIS CRITERIA

The structural analysis performed used the following criteria:

<b>CODE / STANDARD</b>	2003 Int'l Building Code with 2005 CT Amendments / ANSI/TIA-222-F-96 Standard	
<b>LOADING CASES</b>	<i>Full Wind:</i>	85 Mph (3-Sec Gust) - with No Radial Ice
	<i>Iced Case:</i>	73.61 Mph + 0.50" Radial Ice
	<i>Service:</i>	50 Mph

#### Appurtenances Configuration

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

**Table 1: Proposed Changed Condition Appurtenances**

Elev (ft)	Tenant	Ant #	Ants Qty	Appurtenance Model / Description	Mount Description	Line #	Lines Qty	Line size & Location
347	AT&T	-	3	OPA-65R-LCUU-H4 Panel Antennas	(3) Sector Mounts w/V-Stabilizer (Commscope MTC3615 AD A)	-	4	3/4" DC Power Cables 5/8" Fiber Cable-(FZ)
			3	RRUS-32 Boxes				
			3	RRUS-11 Boxes				
			1	DC6-48-60-18-8F Suppressors				
			1	DC6-48-60-0-8F Suppressor				
262	T-Mobile	-	3	AIR32 B66Aa/B2a Panel Antennas	(3) 10.5ft Sector Mounts (Sitepro1 #VFA10-U)	-	3	1" (6x12) Hybrid Cables-(FZ)
			3	LNX-6515DS-VTM Panel Antennas				
			3	RRUS-11 Boxes				
<b>To Be Removed (See Below)</b>								
346.5*	AT&T	24	3	7770.00 Panel Antennas	(3) 10ft Sector Mounts onto Walkway & Platform with Support Mount Supports (Pipes)			
			-	3				
341.33	AT&T	28	1	FC12-PC6-10E				
339.5	AT&T	26	3	Raycap DC2-48-60-0-9E Boxes				
262	T-Mobile	18-19	3	AIR21 B4A B2P Panel Antennas	(3) 13ft Sector Mounts	11 8-10, 12-14	1 6	0.38" Cable 1-5/8"-(FZ)
260	T-Mobile [Dead]					15	1	1-5/8"-(FZ)

**Table 2: Remaining Current Appurtenances**

Elev (ft)	Tenant	Ant #	Ants Qty	Appurtenance Model / Description	Mount Description	Line #	Lines Qty	Line size & Location	
365		40	1	12ft Whip Antenna + TMA	10ft Pipe Mount	25	1	7/8"-(FZ)	
369.5		38	1	Whip Antenna	15ft Pipe Mount w/ Guys	34	1	1/2"-(FZ)	
357	[Dead]	39	1	15ft Whip Antenna	4ft Pipe Mount	-	-	-	
362			42	1	4ft Lightning Rod	14ft Mount	-	1	Grounding
			41	1	Beacon / Strobe				
355.5		31	1	4ft Whip Antenna	8ft Pipe Mount	38	1	1-5/8"-(FZ)	
354.5		32	1	15ft Whip Antenna	8ft Pipe Mount	39	1	1-5/8"-(FZ)	
354.5		30	1	10ft 4-Element Dipole Antenna	8ft Pipe Mount	24	1	7/8"-(FZ)	
352			1	Top Stub Tower					
350.5		35			3ft Empty Sidearm Mount				
					Top Platform w/ Rails				
350	[Dead]					35-36	2	0.25" Cables	
350	[Dead]					44	1	0.8" SO Cord	
349.75		34	1	8ft Whip Antenna	Railing Mounted	32	1	7/8"-(FZ)	
349.5		36	1	21ft Whip Antenna	Railing Mounted	37	1	7/8"-(FZ)	
349		37			8ft Empty Pipe Mount				
348.25		29	1	20ft 4-Element Dipole Antenna	6ft Pipe Mount	21	1	7/8"-(FZ)	

(Appurtenances continue on next page.)

Table 2: Remaining Current Appurtenances – Cont'd

Elev (ft)	Tenant	Ant #	Ants Qty	Appurtenance Model / Description	Mount Description	Line #	Lines Qty	Line size & Location
347	AT&T [Relocate to Elev. 347ft]	25,22	6	RRUS-11 Boxes	[Relocated onto New Mounts]	49-60	12	1-5/8" 3/4" DC Power 5/8" Fiber-(FZ)
		24	3	7770.00 Panel Antennas		46-47	2	
			12	LGP21401 TMAs				
		23	3	AM-X-CD-16-65-00T-RET Panel Ants.		48	1	
			1*	DC6-48-60-18-8F Suppressors				
344.5	AT&T [Relocate to Elev. 344.5ft]	-	2	7020 RET Motors	[Relocated onto New Mounts]			
343.67		27	1	3ft 3-Elem Yagi Antenna	8ft Pipe Mount on Sector Mount	30	1	1/2"-(FZ)
343.25		33	3	TA-2335-DAB Panel Antennas	8ft Pipe Mount	19	1	EW4.75"x2.5"-(FZ)
339.5					4-Way Walkway Platform w/ Rails			
338	[Dead]					45	1	3/4" R.C.
325					(4) Face Frames			
306		21			(4) 14ft Empty Pipe Mounts			
299	[Dead]					23	1	1-1/4"-(FZ)
269.25		20	2	OB Lights		40	1	0.6" SO Cord
262	T-Mobile	18-19	3	AIR21 B2A B4P Panel Antennas	[Relocated onto New Mounts]	2-7	6	1-5/8" 1" (3x6) Hybrid Cables-(FZ)
			3	ATMAA1412D-1A20 TMAs		16-18	3	
255.5		17	1	12in Square Panel Antenna	Pipe Mount	1	1	7/8"-(FZ)
253		16			(2) 25ft Rest Platform w/ Rails			
245	Sprint	15	3	ALU-RRH 4x45 Boxes	(3) 13ft Sector Mounts	26-28	3	HB114-1 1-1/4" Hybrid Cables-(FZ)
243.5	Sprint	14	3	APXVSPP18-C-A20 Panel Antennas				
242.25	Sprint	13	3	RRH Boxes				
			3	800 Ext. Notch Filters				
208.5		12	1	7ft 5-Elem Yagi Antenna	5ft Pipe Mount	31	1	1/2"-(FZ)
191.5		11			(4) Corner Rest Platforms			
186		10	2	Beacon Ice Shield	Leg Mounted			
182.5		9	2	Beacon / Strobe		41-42	2	0.6" SO Cords
125	[Dead]					22	1	0.95"-(FZ)
		8			(2) 41ft Rest Platform w/ Rails			
100		7			4ft Rest Platform w/ Rails			
93		6	2	OB Lights		40		[Shared]
50.25		5			4ft Rest Platform w/ Rails			
47.5		4	1	3ft Dia. Dish (Az. 220°±)	4ft Sidearm Mount-NW Leg	20	1	7/8"-(FZ)
31		1	1	4ft Dia. Dish (Az. 200°±)	10ft Pipe Mount/Standoff-S Face	33	1	1/2"-(FZ)
26		2	1	GPS Antenna	Pipe Mount	29	1	1/2"-(FZ)
25		3			(4) Corner Rest Platforms			
16.67					(4) Face Frames			

**Notes:**

- \* items was not present at the time of the inspection – considered existing as per PDQ listing.
- All elevations are measured from tower base.
- 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.
- 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 Programs

The two computer programs used to model the structure are rigorous Finite Element Analysis programs, the first is tnxTower (ver. 7.0.5) (formerly RISATower), a commercially available program by Tower Numerics Inc. and the second is STAADPro v8i FEA program, a structural finite element program by Bentley Systems, Carlsbad, CA. The structure members are modeled using beam/truss members. 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 programs for the different loading directions and then applied as external loads on the structure. This analysis comprised of the two different analytical models with combination of the above noted 2 software programs in order to evaluate the different portions of the tower accounting for the geometrical limitation in the tnxTower software.

### 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 considered, 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 obtained or supplied. The material grade is as per data supplied and/or as assumed and as stated.
- The appurtenances configuration is as obtained 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 themselves are 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.
- All welds and connections are assumed to develop at least the member capacity, unless determined otherwise and explicitly stated in this report.
- All prior structural modifications, if any, are considered 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 structure will require structural strengthening as follows: (Refer to the attached drawings for details.)

<b>STRUCTURAL STRENGTHENING REQUIRED</b>	
1	Elev. 250 to 275ft: Add Internal hip braces reinforcing diagonals.
2	Elev. 225 to 250ft: Reinforce diagonals as detailed.
3	Elev. 200 to 250ft: Add sub braces and internals reinforcing horizontals.
4	Elev. 175 to 200ft: Add internals reinforcing horizontals.
5	Elev. 150 to 175ft: Add sub braces and internals reinforcing horizontals. Reinforce Sub diagonals as detailed. Replace end bolts of Sub horizontal and the diagonals.
6	Elev. 125 to 150ft: Add sub braces and internals reinforcing horizontals. Reinforce diagonals and replace end bolts. Reinforce sub diagonals and replace end bolts. Replace sub diagonals 2 with bigger size members. Add internal kicker reinforcing sub horizontals as detailed.
7	Elev. 100 to 125ft: Add sub braces and internals reinforcing horizontals. Replace diagonal end bolts. Reinforce sub diagonals. Add internal kicker reinforcing sub horizontals as detailed. Replace leg splice bolts at Elev. 103.5ft±.
8	Elev. 75 to 100ft: Reinforce horizontals as detailed. Replace sub diagonals 2 with bigger size members. Add internal kicker reinforcing sub horizontals as detailed. Replace leg splice bolts at Elev. 78.5ft±.
9	Elev. 50 to 75ft: Reinforce horizontals as detailed. Add sub members reinforcing Leg. Reinforce sub diagonals. Add internal kicker reinforcing sub horizontals as detailed. Replace leg splice bolts at Elev. 53.5ft±.
10	Elev. 25 to 50ft: Reinforce horizontals as detailed. Reinforce sub diagonals. Add internal kicker reinforcing sub horizontals as detailed. Replace leg splice bolts at Elev. 28.5ft±.
11	Elev. 0 to 25ft: Reinforce inner vertical and hip sub internal as detailed. Replace leg splice bolts at Elev. 3.5ft±.
12	Re-locate and bundle existing coaxes as shown in the schematic Tx-Line Layout.
13	Provide temporary bracing as required for stability of structure during reinforcement / replacement of members / bolts. Replace one member of bolt each at a time.
14	Perform Maintenance work as required to bring the structure into good operational condition.
15	<i>Field determination/verification before any fabrication and installation is recommended.</i>

Prior to implementation of the changed conditions and modifications, the data designated on the design documents requiring field verification shall be validated. 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.

**Table 3: Stress Analysis Results – AFTER PROPER INSTALLATION OF MODS**

Component Type	Maximum Stress Ratio	Controlling Elev. (ft) / Component	Pass/Fail	Comment
LEGS	99.8%	50 – 25	Pass	
	99.8%	25 – 0	Pass	
DIAGONALS	94.4%	150 – 125	Pass	
HORIZONTALS	97.0%	150 – 125	Pass	Bolts Control
SECONDARY HORIZONTALS	13.2%	351.67 - 337.5	Pass	
BRACINGS	98.8%	50 – 25	Pass	
FOUNDATION	84.1%	Uplift	Pass	Geotechnical report not available. Based on soil parameters in supplied calcs in prev. SA.

**Table 4: Serviceability Requirements**

	Maximum Value	TIA Requirement (10dB)	Pass/Fail	Comment
TWIST/SWAY	0.0137 Deg.	1.7125 Deg.	Pass	4ft Dish Elev. 31.00ft
	0.0216 Deg.	2.35 Deg.	Pass	3ft Dish Elev. 47.50ft
	0.0423 Deg.	4 Deg. from Vert. or Horiz. Axis	Pass	
HORIZONTAL DISPLACEMENT	1.124 In./ 2.66% of Ht.	3.0% of Height	Pass	

**Notes:**

1. Please note that the analysis results noted above are based on the combined analytical models using the 2 noted FEA programs.
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.



## 6. FINDINGS & RECOMMENDATIONS

- Based on the stress analysis results, the subject structure is **rated at 99.8%** of its support capacity (controlling component: Legs) with the proposed changed condition considered after strengthening. 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-F** Standard for the loading considered under the criteria listed and referenced in the report sections **after proper installation of the recommended structural strengthening modifications outlined**.
- Please note that no geotechnical data is available. However based on soil parameters included in supplied data, the foundation is considered acceptable.
- *The addition of the proposed changed condition as noted in Table 1 is structurally acceptable after proper installation of the proposed strengthening modifications.* Please refer to modification drawings for details.
- This structure would be near its maximum support capacity for the appurtenances and loading criteria considered, after its modification. Therefore, 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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**APPENDIX 1 - ANALYSIS PRINTOUT & GRAPHICS**

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**AFTER NOTED MODIFICATIONS**

**SYMBOL LIST**

MARK	SIZE	MARK	SIZE
A	2L2 1/2x2 1/2x1/4x3/8	B	L2 1/2x2 1/2x3/16

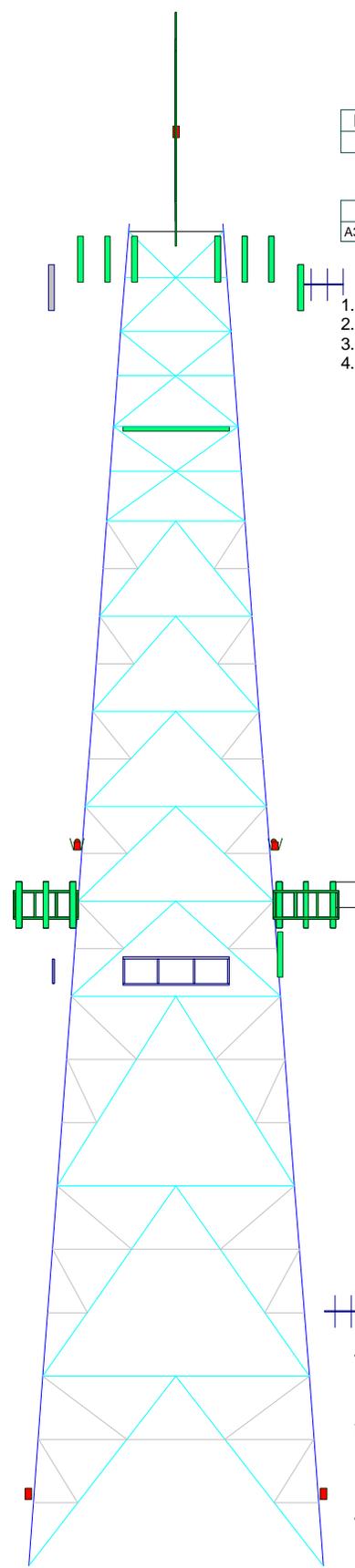
**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	A500-46	46 ksi	62 ksi

**TOWER DESIGN NOTES**

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.

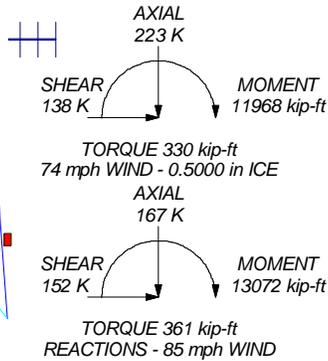
351.7 ft
337.5 ft
325.0 ft
312.5 ft
300.0 ft
287.5 ft
275.0 ft
262.5 ft
250.0 ft
225.0 ft
200.0 ft
175.0 ft



**MAX. CORNER REACTIONS AT BASE:**

DOWN: 281 K  
SHEAR: 56 K

UPLIFT: -197 K  
SHEAR: 45 K



Section	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	L8x8x1 1/8	L8x8x7/8	L8x8x3/4	L6x6x7/8	L6x6x5/8						
Leg Grade	A500-46										
Diagonals	2L2.5x3.5x5/16 + 2L3x3.5x3/8	2L2.5x3.5x5/16 + 2L3x3x3/8	2L2 1/2x2 1/2x1/4x3/8	2L2 1/2x2 1/2x5/16x3/8	A36	A	L3 1/2x4x5/16	L3 1/2x3 1/2x5/16			
Diagonal Grade											
Top Girts	2L3 1/2x2 1/2x1/4x3/8	2L3x2 1/2x1/4x3/8	N.A.	2L2 1/2x2 1/2x1/4x3/8							
Horizontals	2L3 1/2x2 1/2x1/4x3/8	2L1 3/4x1 3/4x3/16	N.A.	2L2 1/2x2 1/2x1/4							
Sec. Horizontals	2L2x2x3/16	2L2x2x3/16		L2 1/2x2 1/2x1/4							
Red. Horizontals	2L2 1/2x3x1/4x3/8	2L2 1/2x2 1/2x1/4x3/8		L2 1/2x2 1/2x1/4							
Red. Diagonals	2L3x2 1/2x1/4x3/8	2L3x3x1/4		L2 1/2x2 1/2x1/4							
Red. Sub-Horiz	2L3x2 1/2x1/4x3/8	2L2 1/2x2 1/2x1/4x3/8		L2 1/2x2 1/2x1/4							
Red. Hips	2L3x2 1/2x1/4x3/8	2L2 1/2x2 1/2x1/4x3/8		L2 1/2x2 1/2x1/4							
Inner Bracing	2L3x2 1/2x1/4x3/8	2L2 1/2x2 1/2x3/16x3/8		L2 1/2x2 1/2x1/4							
Face Width (ft)	38.6645	34.938	31.2115	27.485	23.7584	21.8952	20.0319	18.1687	16.3054	14.4422	12.33
# Panels @ (ft)	100.9	3 @ 25	3 @ 25	7 @ 12.5	7 @ 12.5	7 @ 12.5	7 @ 12.5	7 @ 12.5	7 @ 12.5	7 @ 12.5	7 @ 12.5
Weight (K)	100.9	19.7	17.7	6.5	6.3	5.7	5.5	4.8	5.0	3.8	3.9

<p>maloufengineering.com</p>	<p><b>Malouf Engineering Int'l Inc.</b> 17950 Preston Road, STE 720 Dallas, Texas 75252 Phone: (972) 783 2578 FAX: (972) 783 2583</p>	Job: <b>350ft SST / NORWALK TOWER SITE</b>	Project: <b>CT04761S-16V0-RUN-I (MODIFICATION ANALYSIS)</b>	
		Client: <b>EMPIRE TELECOM / AT&amp;T / T-MOBILE</b>	Drawn by: <b>KM</b>	App'd:
		Code: <b>TIA/EIA-222-F</b>	Date: <b>06/30/16</b>	Scale: <b>NTS</b>
		Path:		Dwg No. <b>E-1</b>
		<small>C:\E:\Projects\2016\22-CT04761S\CT04761S-16V0-RUN-I\Tower2\Holding\Draw\TopTower\PLAN\CT04761S-16V0-RUN-I.dwg</small>		



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Job No  
**CT04761S-16V**

Sheet No  
**1**

Rev  
 RUN-I

Part MODIFICATION ANALYSIS

Job Title 351.7ft Self Supporting Tower

Ref

By KM

Date 9-Jun-16

Chd HML

Client Empire Telecom / AT&T / T-Mobile

File CT04761S-16V0-RUN-I.sl

Date/Time 30-Jun-2016 12:28

175ft

150ft

125ft

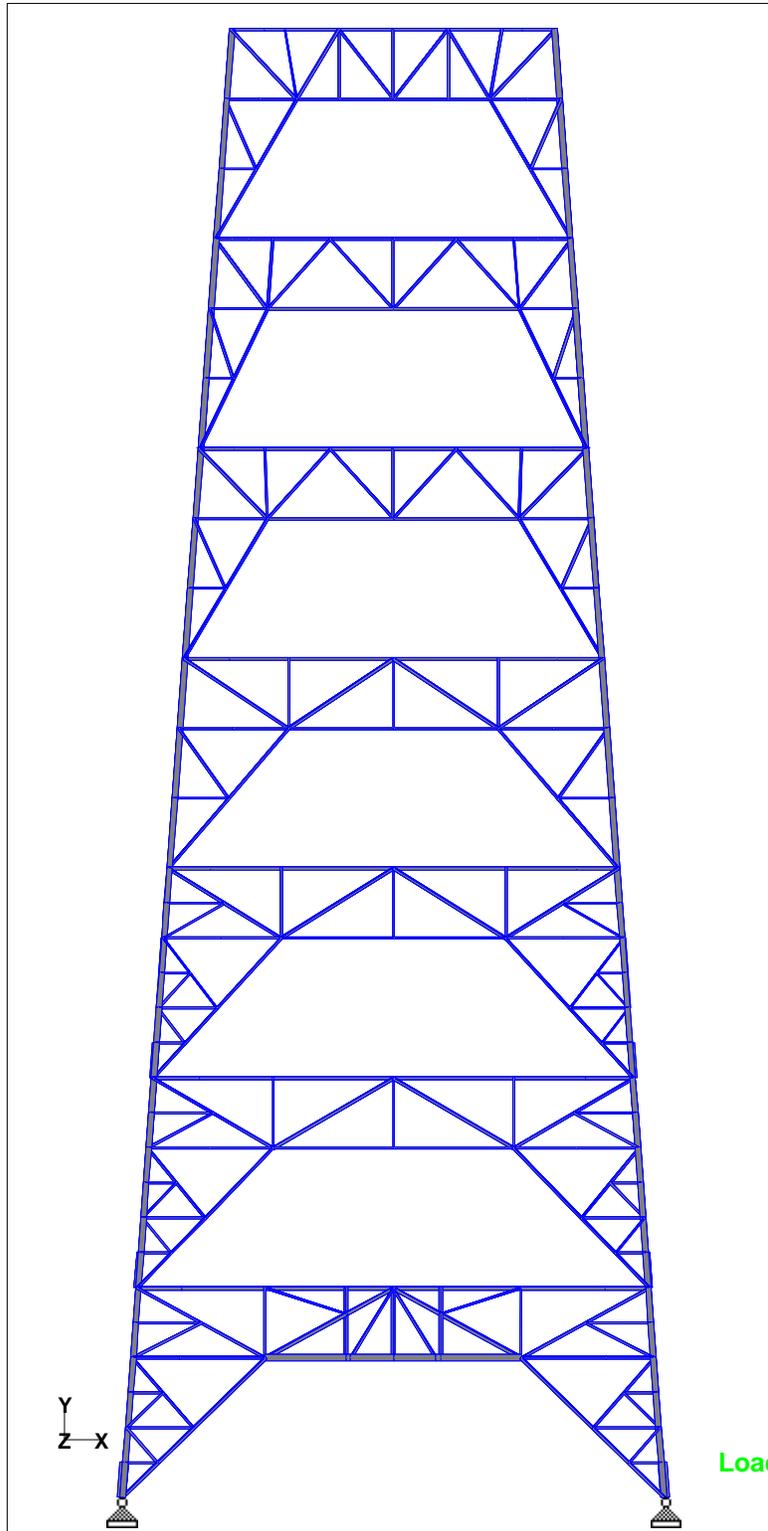
100ft

75ft

50ft

25ft

0ft



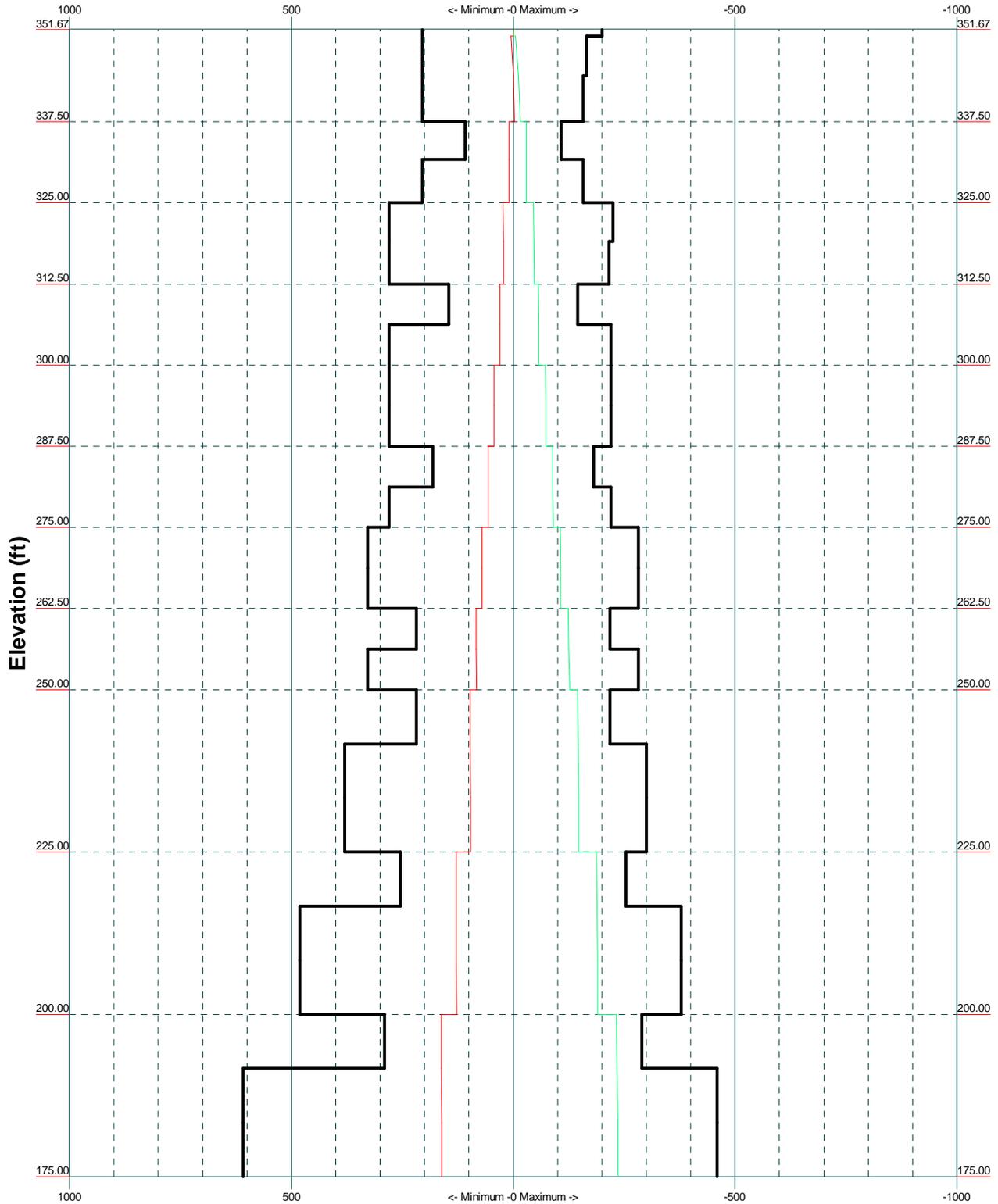
Tower Elevation



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

Leg Capacity ———

Leg Compression (K)



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

Job: <b>350ft SST / NORWALK TOWER SITE</b>	
Project: <b>CT04761S-16V0-RUN-I (MODIFICATION ANALYSIS)</b>	
Client: <b>EMPIRE TELECOM / AT&amp;T / T-MOBILE</b>	Drawn by: <b>KM</b>
Code: <b>TIA/EIA-222-F</b>	Date: <b>06/30/16</b>
Path:	Scale: <b>NTS</b>
Dwg No. <b>E-3</b>	

C:\E\Projects\2016\CT04761S\CT04761S-16V0-RUN-I\Drawings\Tower\Tower\PLANT\CT04761S-16V0-RUN-I.dwg

<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> 350ft SST / NORWALK TOWER SITE	<b>Page</b> 1 of 16
	<b>Project</b> CT04761S-16V0-RUN-I (MODIFICATION ANALYSIS)	<b>Date</b> 11:06:18 06/30/16
	<b>Client</b> EMPIRE TELECOM / AT&T / T-MOBILE	<b>Designed by</b> KM

## Tower Input Data

The main tower is a 4x free standing tower with an overall height of 351.67 ft above the ground line.

The base of the tower is set at an elevation of 0.00 ft above the ground line.

The face width of the tower is 12.33 ft at the top and 64.75 ft at the base.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in Fairfield County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.5000 in.

Ice density of 56 pcf.

A wind speed of 74 mph is used in combination with ice.

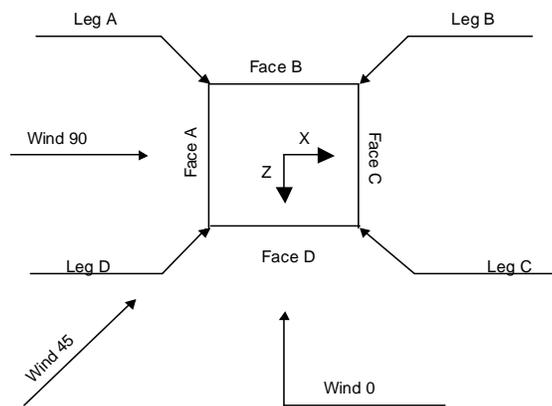
Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Pressures are calculated at each section.

Stress ratio used in tower member design is 1.333.

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



**Square Tower**

## Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Placement <i>ft</i>	#	Weight <i>plf</i>	Description	Placement <i>ft</i>	#	Weight <i>plf</i>
Conduit Shield (E)	35.00 - 12.00	1	18.50	#2-7)			
Unused Coduit Supports (E / WG "G")	320.00 - 37.00	1	9.56	1" (3x6)	262.00 - 6.00	3	0.78
Unused Waveguide Brackets (E / WG "H")	200.00 - 27.00	1	1.25	Hybrid Cables (T-Mobile / E / #16 - 18)	262.00 - 6.00	3	0.85
7/8 (E / #1)	255.50 - 6.00	1	0.54	1" (6x12)	262.00 - 6.00	3	0.85
1 5/8 (Rework - Bundle / T-Mobile / E /	262.00 - 6.00	6	1.04	Hybrid Cables (T-Mobile / P)			
				Feedline Ladder (Af)	265.00 - 8.50	1	8.40
				(T-Mobile / E / WG "A")			
				EW 4.75" x 2.5"	343.25 - 6.00	1	1.85
				(E / #19)			

<p style="text-align: center;"><b>tnxTower</b></p> <p><b>Malouf Engineering Int'l Inc.</b> 17950 Preston Road, STE 720 Dallas, Texas 75252 Phone: (972) 783 2578 FAX: (972) 783 2583</p>	<b>Job</b>	350ft SST / NORWALK TOWER SITE	<b>Page</b>	2 of 16
	<b>Project</b>	CT04761S-16V0-RUN-I (MODIFICATION ANALYSIS)	<b>Date</b>	11:06:18 06/30/16
	<b>Client</b>	EMPIRE TELECOM / AT&T / T-MOBILE	<b>Designed by</b>	KM

<i>Description</i>	<i>Placement</i>	<i>#</i>	<i>Weight</i>	<i>Description</i>	<i>Placement</i>	<i>#</i>	<i>Weight</i>
	<i>ft</i>		<i>plf</i>		<i>ft</i>		<i>plf</i>
7/8 (E / #20)	47.50 - 6.00	1	0.54	(E / WG "D") Climbing Ladder (E)	350.00 - 0.50	1	9.50
7/8 (E / #21)	348.25 - 6.00	1	0.54	Safety Rail (E)	350.00 - 0.00	1	2.75
0.95" Dead Cable (E / #22)	125.00 - 6.00	1	0.49	0.6" SO Cords (E / #40-43)	182.50 - 0.00	4	0.35
1 1/4 Dead Cable (E / #23)	299.00 - 6.00	1	0.66	0.6" SO Cords (E / #40,43)	269.25 - 182.50	2	0.35
7/8 (E / #24, 25)	350.00 - 6.00	2	0.54	0.6" SO Cord (E / #43)	350.00 - 269.25	1	0.35
Feedline Ladder (Af) (E / WG "B")	345.00 - 8.50	1	8.50	0.8" Dead SO Cord (E / #44)	350.00 - 14.00	1	0.40
HB114-1 1 1/4" Hybrid Cable (Sprint / E / #26-28)	244.00 - 0.00	3	1.08	3/4" Rigid Conduit Unused (E / #45)	338.00 - 0.00	1	1.13
LDF4-50A (1/2 FOAM) (E / #29)	26.00 - 0.00	1	0.15	Conduit Shield (E)	35.00 - 12.00	1	18.50
Feedline Ladder (Af) (Sprint / E / WG "C")	241.00 - 2.00	1	8.45	Unused Coduit Supports (E / WG "E")	320.00 - 37.00	1	9.56
1/2 (E / #30)	343.67 - 6.00	1	0.25	Grounding Cable (E)	350.00 - 0.00	1	0.25
1/2 (E / #31)	208.50 - 6.00	1	0.25	3/4" DC Power Cable (ATT / P / E / #46,47)	347.00 - 6.00	6	0.80
7/8 (E / #32)	349.75 - 6.00	1	0.54	1 5/8 (ATT / E / #49-60)	347.00 - 6.00	12	1.04
1/2 (E / #33, 34)	31.00 - 6.00	2	0.25	5/8" Fiber Cable (ATT / P / E / #48)	347.00 - 6.00	2	0.50
0.25" Dead Cables (E / #35, 36)	350.00 - 6.00	2	0.26	Feedline Ladder (Af) (ATT / E / WG "F")	345.00 - 14.50	1	13.50
7/8 (E / #37)	349.50 - 6.00	1	0.54				
1 5/8 (E / #38, 39)	350.00 - 6.00	2	1.04				
Waveguide Brackets	348.00 - 15.00	1	1.15				

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## Discrete Tower Loads

Description	Placement	Weight	Description	Placement	Weight
	ft	K		ft	K
4ft Lightning Rod (E / #42)	364.00	0.01	(E / #29)		0.05
Beacon / Strobe (E / #41)	363.00	0.04	Top Platform w/ Rails (E)	350.50	17.00
14ft Mount (E / #41 / 42)	355.00	0.17	3ft 3-Elem Yagi (Unknown / E / #27)	343.67	0.02
12ft Whip Antenna (E / #40)	371.00	0.02	8ft Pipe Mount on Sector Mount (Unknown / E / #27)	341.00	0.02
TMA (E / #40)	353.00	0.03	Raycap DC6-48-60-18-8F SUPRESSOR (ATT / P)	347.00	0.02
10ft Pipe Mount (E / #40)	360.00	0.05	Raycap DC6-48-60-18-8F SUPRESSOR (ATT / P)	347.00	0.02
15ft Whip Antenna (E / #39)	364.50	0.03	Raycap DC6-48-60-0-8F SUPRESSOR (ATT / P)	347.00	0.02
4ft Pipe Mount (E / #39)	356.25	0.02	RRUS-11 (Relocate / ATT / E / #25)	347.00	0.05
Top Stub Tower (E)	352.00	0.66	RRUS-11	347.00	0.05
Whip (E / #38)	369.50	0.02	(Relocate / ATT / E / #25)		0.07
15ft Pipe Mount w/ Guys (E / #38)	355.50	0.13	RRUS-11	347.00	0.05
8ft Empty Pipe Mount (E / #37)	349.00	0.04	(Relocate / ATT / E / #25)		0.07
21ft Whip Antenna (E / #36)	349.50	0.03	RRUS-11	347.00	0.05
3ft Empty Side Arm Mount (E / #35)	350.50	0.17	(Relocate / ATT / E / #25)		0.07
8ft Whip Antenna (E / #34)	349.75	0.02	7770.00 Panels w/ Pipe Mount	347.00	0.04
TA-2335-DAB Panel w/ Pipe Mount (E / #33)	343.25	0.06	7770.00 Panels w/ Pipe Mount	347.00	0.09
TA-2335-DAB Panel w/ Pipe Mount (E / #33)	343.25	0.06	(Relocate / ATT / E / #24)		0.09
TA-2335-DAB Panel w/ Pipe Mount (E / #33)	343.25	0.06	(4) LGP21401 TMA'S	347.00	0.02
15ft Whip Antenna (E / #32)	354.50	0.03	(Relocate / ATT / E / #24)		0.03
8ft Pipe Mount (E / #32)	351.00	0.04	(4) LGP21401 TMA'S	347.00	0.02
4ft Whip Antenna (E / #31)	355.50	0.01	(Relocate / ATT / E / #24)		0.03
8ft Pipe Mount (E / #31)	351.00	0.04	(4) LGP21401 TMA'S	347.00	0.02
10ft 4-Element Dipole (E / #30)	354.50	0.03	(Relocate / ATT / E / #24)		0.03
8ft Pipe Mount (E / #30)	351.00	0.04	7020 RET Motor (Relocate / ATT / E)	344.50	0.00
20ft 4-Element Dipole (E / #29)	348.25	0.04	7020 RET Motor (Relocate / ATT / E)	344.50	0.00
6ft Pipe Mount	351.00	0.04	AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (Relocate / ATT / E / #23)	347.00	0.07
			AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (Relocate / ATT / E / #23)	347.00	0.14
			AM-X-CD-16-65-00T-RET w/ PIPE MOUNT (Relocate / ATT / E / #23)	347.00	0.07
			RRUS-11 (Relocate / ATT / E / #22)	347.00	0.05
			RRUS-11	347.00	0.07
				347.00	0.05

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	<b>Client</b>	EMPIRE TELECOM / AT&T / T-MOBILE		<b>Designed by</b>	KM

<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>
(Relocate / ATT / E / #22)		0.07	(Relocate / T-Mobile / E / #19)		
RRUS-11	347.00	0.05	ATMAA1412D-1A20	262.00	0.01
(Relocate / ATT / E / #22)		0.07	TMA'S		0.02
OPA-65R-LCUU-H4 w/ Pipe	347.00	0.08	(Relocate / T-Mobile / E / #19)		
MOUNTS		0.13	ATMAA1412D-1A20	262.00	0.01
(ATT / P)			TMA'S		0.02
OPA-65R-LCUU-H4 w/ Pipe	347.00	0.08	(Relocate / T-Mobile / E / #19)		
MOUNTS		0.13	ATMAA1412D-1A20	262.00	0.01
(ATT / P)			TMA'S		0.02
OPA-65R-LCUU-H4 w/ Pipe	347.00	0.08	(Relocate / T-Mobile / E / #19)		
MOUNTS		0.13	ATMAA1412D-1A20	262.00	0.01
(ATT / P)			TMA'S		0.02
RRUS-11	347.00	0.05	(Relocate / T-Mobile / E / #19)		
(ATT / P)		0.07	LNx-6515DS-VTM w/ Pipe	262.00	0.08
RRUS-11	347.00	0.05	Mnt.		0.17
(ATT / P)		0.07	(T-Mobile / P)		
RRUS-11	347.00	0.05	LNx-6515DS-VTM w/ Pipe	262.00	0.08
(ATT / P)		0.07	Mnt.		0.17
RRUS-32	347.00	0.08	(T-Mobile / P)		
(ATT / P)		0.10	LNx-6515DS-VTM w/ Pipe	262.00	0.08
RRUS-32	347.00	0.08	Mnt.		0.17
(ATT / P)		0.10	(T-Mobile / P)		
RRUS-32	347.00	0.08	RRUS-11	262.00	0.05
(ATT / P)		0.10	(T-Mobile / P)		0.07
Sector Mount w V-Stabilizer	347.00	0.72	RRUS-11	262.00	0.05
(Commscope MTC3615 AD		0.95	(T-Mobile / P)		0.07
A)			RRUS-11	262.00	0.05
(ATT / P)			(T-Mobile / P)		0.07
Sector Mount w V-Stabilizer	347.00	0.72	RRUS-11	262.00	0.05
(Commscope MTC3615 AD		0.95	(T-Mobile / P)		0.07
A)			AIR32 B66Aa/B2a Panel w/	262.00	0.15
(ATT / P)			Pipe Mount		0.22
Sector Mount w V-Stabilizer	347.00	0.72	(T-Mobile / P)		
(Commscope MTC3615 AD		0.95	AIR32 B66Aa/B2a Panel w/	262.00	0.15
A)			Pipe Mount		0.22
(ATT / P)			(T-Mobile / P)		
4-Way Walkway Platform w/	339.00	10.25	AIR32 B66Aa/B2a Panel w/	262.00	0.15
Rails		13.32	Pipe Mount		0.22
(E)			(T-Mobile / P)		
Corner Ladder	350.00 - 339.00	0.45	10.5ft Sector Mount (Sitepro1	262.00	0.35
(E)		0.59	#VFA10-U)		0.48
4-Way Face Frame	325.00	3.00	(T-Mobile / P)		
(E)		3.90	10.5ft Sector Mount (Sitepro1	262.00	0.35
(4) 14ft Empty Pipe Mounts	306.00	0.06	#VFA10-U)		0.48
(E / #21)		0.09	(T-Mobile / P)		
OB Light	269.25	0.01	10.5ft Sector Mount (Sitepro1	262.00	0.35
(E / #20)		0.01	#VFA10-U)		0.48
OB Light	269.25	0.01	(T-Mobile / P)		
(E / #20)		0.01	12" Square Panel w/ Pipe	255.50	0.01
AIR21 B2A B4P w/ pipe	262.00	0.13	MOUNT		0.02
Mount		0.18	(E / #17)		
(Relocate / T-Mobile / E / #19)			25ft Rest Platform w/ Rails	251.50	2.65
AIR21 B2A B4P w/ pipe	262.00	0.13	(E / #16)		3.58
Mount		0.18	25ft Rest Platform w/ Rails	251.50	2.65
(Relocate / T-Mobile / E / #19)			(E / #16)		3.58
(Relocate / T-Mobile / E / #19)			ALU-RRH 4x45	245.00	0.06
AIR21 B2A B4P w/ pipe	262.00	0.13	(Sprint / E / #15)		0.08
Mount		0.18	ALU-RRH 4x45	245.00	0.06
			(Sprint / E / #15)		0.08
			ALU-RRH 4x45	245.00	0.06

<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>	350ft SST / NORWALK TOWER SITE	<b>Page</b>	5 of 16	
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Description	Placement	Weight	Description	Placement	Weight
	ft	K		ft	K
(Sprint / E / #15)		0.08	Corner Rest Platform	191.50	0.75
APXVSP18-C-A20 w / Pipe Mount	243.50	0.09	(E / #11)		1.01
(Sprint / E / #14)		0.16	Beacon Ice Shield	186.00	0.10
APXVSP18-C-A20 w / Pipe Mount	243.50	0.09	(E / #10)		0.14
(Sprint / E / #14)		0.16	Beacon Ice Shield	186.00	0.10
APXVSP18-C-A20 w / Pipe Mount	243.50	0.09	(E / #10)		0.14
(Sprint / E / #14)		0.16	Beacon / Strobe	182.50	0.14
RRH	242.25	0.05	(E / #9)		0.18
(Sprint / E / #13)		0.07	Beacon / Strobe	182.50	0.14
RRH	242.25	0.05	(E / #9)		0.18
(Sprint / E / #13)		0.07	41ft Rest Platform w/ Rails	125.00	3.75
RRH	242.25	0.05	(E / #8)		5.50
(Sprint / E / #13)		0.07	41ft Rest Platform w/ Rails	125.00	3.75
RRH	242.25	0.05	(E / #8)		5.50
(Sprint / E / #13)		0.07	4ft Rest Platform w/ Rails	100.00	0.45
800 Ext. Notch Filter	242.25	0.01	(E / #7)		0.61
(Sprint / E / #13)		0.02	OB Light	93.00	0.01
800 Ext. Notch Filter	242.25	0.01	(E / #6)		0.01
(Sprint / E / #13)		0.02	OB Light	93.00	0.01
800 Ext. Notch Filter	242.25	0.01	(E / #6)		0.01
(Sprint / E / #13)		0.02	4ft Rest Platform w/ Rails	50.25	0.45
13ft Sector Mount	244.25 - 241.50	0.57	(E / #5)		0.61
(Sprint / E / #13-15)		0.78	4ft Side Arm	46.50	0.55
13ft Sector Mount	244.25 - 241.50	0.57	(E / #4)		0.78
(Sprint / E / #13-15)		0.78	Corner Rest Platform	26.00	0.75
13ft Sector Mount	244.25 - 241.50	0.57	(E / #3)		1.01
(Sprint / E / #13-15)		0.78	Corner Rest Platform	26.00	0.75
7ft 5-Elem Yagi	208.50	0.01	(E / #3)		1.01
(E / #12)		0.02	Corner Rest Platform	26.00	0.75
5ft Pipe Mount	204.50	0.03	(E / #3)		1.01
(E / #12)		0.03	Corner Rest Platform	26.00	0.75
Corner Rest Platform	191.50	0.75	(E / #3)		1.01
(E / #11)		1.01	GPS w/ Pipe Mount	26.00	0.01
Corner Rest Platform	191.50	0.75	(E / #2)		0.01
(E / #11)		1.01	10ft Pipe Mount w/ Standoff	34.00 - 24.00	0.12
Corner Rest Platform	191.50	0.75	(E / #1)		0.16
(E / #11)		1.01	Face Frame w/ Knee Braces	25.00 - 16.67	8.50
(E / #11)		1.01	(E)		11.05

## Dishes

Description	Elevation	Weight
	ft	K
3ft Dish	47.50	0.09
(E / #4)		0.13
4ft Dish	31.00	0.10
(E / #1)		0.17

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## Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 45 deg - No Ice
4	Dead+Wind 90 deg - No Ice
5	Dead+Wind 135 deg - No Ice
6	Dead+Wind 180 deg - No Ice
7	Dead+Wind 225 deg - No Ice
8	Dead+Wind 270 deg - No Ice
9	Dead+Wind 315 deg - No Ice
10	Dead+Ice+Temp
11	Dead+Wind 0 deg+Ice+Temp
12	Dead+Wind 45 deg+Ice+Temp
13	Dead+Wind 90 deg+Ice+Temp
14	Dead+Wind 135 deg+Ice+Temp
15	Dead+Wind 180 deg+Ice+Temp
16	Dead+Wind 225 deg+Ice+Temp
17	Dead+Wind 270 deg+Ice+Temp
18	Dead+Wind 315 deg+Ice+Temp
19	Dead+Wind 0 deg - Service
20	Dead+Wind 45 deg - Service
21	Dead+Wind 90 deg - Service
22	Dead+Wind 135 deg - Service
23	Dead+Wind 180 deg - Service
24	Dead+Wind 225 deg - Service
25	Dead+Wind 270 deg - Service
26	Dead+Wind 315 deg - Service

## Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	351.67 - 337.5	1.124	20	0.0405	0.0123
T2	337.5 - 325	0.996	20	0.0401	0.0118
T3	325 - 312.5	0.879	20	0.0386	0.0112
T4	312.5 - 300	0.765	20	0.0367	0.0106
T5	300 - 287.5	0.649	20	0.0346	0.0095
T6	287.5 - 275	0.544	20	0.0317	0.0085
T7	275 - 262.5	0.446	20	0.0281	0.0074
T8	262.5 - 250	0.350	20	0.0249	0.0062
T9	250 - 225	0.259	20	0.0214	0.0048
T10	225 - 200	0.141	24	0.0140	0.0031
T11	200 - 175	0.055	24	0.0075	0.0015

## Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
371.00	12ft Whip Antenna	20	1.124	0.0405	0.0123	593012
369.50	Whip	20	1.124	0.0405	0.0123	593012
364.50	15ft Whip Antenna	20	1.124	0.0405	0.0123	593012
364.00	4ft Lightning Rod	20	1.124	0.0405	0.0123	593012
363.00	Beacon / Strobe	20	1.124	0.0405	0.0123	593012

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
360.00	10ft Pipe Mount	20	1.124	0.0405	0.0123	593012
356.25	4ft Pipe Mount	20	1.124	0.0405	0.0123	593012
355.50	15ft Pipe Mount w/ Guys	20	1.124	0.0405	0.0123	593012
355.00	14ft Mount	20	1.124	0.0405	0.0123	593012
354.50	15ft Whip Antenna	20	1.124	0.0405	0.0123	593012
353.00	TMA	20	1.124	0.0405	0.0123	593012
352.00	Top Stub Tower	20	1.124	0.0405	0.0123	593012
351.00	8ft Pipe Mount	20	1.118	0.0405	0.0123	593012
350.50	3ft Empty Side Arm Mount	20	1.114	0.0405	0.0123	593012
350.00	Corner Ladder	20	1.109	0.0405	0.0123	593012
349.75	8ft Whip Antenna	20	1.107	0.0405	0.0123	593012
349.50	21ft Whip Antenna	20	1.105	0.0405	0.0122	593012
349.00	8ft Empty Pipe Mount	20	1.101	0.0405	0.0122	593012
348.25	20ft 4-Element Dipole	20	1.094	0.0405	0.0122	593012
347.00	Raycap DC6-48-60-18-8F SUPRESSOR	20	1.083	0.0405	0.0122	593012
344.50	7020 RET Motor	20	1.060	0.0404	0.0121	413536
343.67	3ft 3-Elem Yagi	20	1.053	0.0404	0.0121	370631
343.25	TA-2335-DAB Panel w/ Pipe Mount	20	1.049	0.0404	0.0120	352146
341.00	8ft Pipe Mount on Sector Mount	20	1.028	0.0403	0.0120	279765
339.00	4-Way Walkway Platform w/ Rails	20	1.010	0.0402	0.0119	252125
325.00	4-Way Face Frame	20	0.879	0.0386	0.0112	289020
306.00	(4) 14ft Empty Pipe Mounts	20	0.704	0.0357	0.0101	456081
269.25	OB Light	20	0.402	0.0267	0.0069	Inf
262.00	AIR21 B2A B4P w/ pipe Mount	20	0.346	0.0248	0.0061	Inf
255.50	12" Square Panel w/ Pipe Mount	20	0.297	0.0230	0.0054	104374
251.50	25ft Rest Platform w/ Rails	20	0.268	0.0218	0.0049	66965
245.00	ALU-RRH 4x45	20	0.229	0.0199	0.0043	70477
244.25	13ft Sector Mount	20	0.225	0.0197	0.0043	73393
243.50	APXVSPPI8-C-A20 w / Pipe Mount	20	0.221	0.0194	0.0042	76562
242.88	13ft Sector Mount	20	0.218	0.0193	0.0042	79420
242.25	RRH	20	0.214	0.0191	0.0041	82499
241.50	13ft Sector Mount	20	0.211	0.0188	0.0041	86524
208.50	7ft 5-Elem Yagi	24	0.082	0.0097	0.0021	214047
204.50	5ft Pipe Mount	24	0.068	0.0087	0.0018	168553
191.50	Corner Rest Platform	24	0.033	0.0051	0.0010	206072
186.00	Beacon Ice Shield	24	0.021	0.0034	0.0007	309108
182.50	Beacon / Strobe	24	0.014	0.0023	0.0004	453360

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	351.67 - 337.5	3.168	3	0.1119	0.0356
T2	337.5 - 325	2.812	3	0.1111	0.0342
T3	325 - 312.5	2.485	3	0.1070	0.0325
T4	312.5 - 300	2.166	3	0.1017	0.0307
T5	300 - 287.5	1.843	3	0.0960	0.0275
T6	287.5 - 275	1.547	3	0.0879	0.0245
T7	275 - 262.5	1.271	3	0.0780	0.0215
T8	262.5 - 250	1.000	3	0.0692	0.0178
T9	250 - 225	0.741	3	0.0594	0.0137
T10	225 - 200	0.409	7	0.0391	0.0090
T11	200 - 175	0.156	7	0.0209	0.0044

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### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
T1	351.67 - 337.5	Leg	L6x6x5/8	3	-16.17	157.06	10.3	Pass
		Diagonal	L3 1/2x3 1/2x5/16	14	-7.33	18.21	40.2	Pass
		Secondary Horizontal	L3x3x1/4	18	-1.85	13.98	13.2	Pass
		Top Girt	C8x11.5	6	-0.10	40.98	0.3	Pass
						0.6 (b)		
T2	337.5 - 325	Leg	L6x6x5/8	23	-30.09	157.88	19.1	Pass
		Diagonal	L3 1/2x3 1/2x5/16	34	-9.13	16.91	54.0	Pass
		Horizontal	C7x9.8	26	1.83	77.88	2.3	Pass
						5.0 (b)		
T3	325 - 312.5	Secondary Horizontal	L3x2 1/2x1/4	37	-0.44	7.46	5.9	Pass
		Leg	L6x6x7/8	43	-47.37	215.85	21.9	Pass
		Diagonal	L3 1/2x4x5/16	59	-10.01	17.74	56.4	Pass
		Horizontal	2L2 1/2x2 1/2x1/4x3/8	46	2.47	56.32	4.4	Pass
						7.0 (b)		
T4	312.5 - 300	Secondary Horizontal	L3x2 1/2x1/4	63	-0.69	6.18	11.2	Pass
		Inner Bracing	2L2x2 1/2x1/4x3/8	53	0.01	46.01	0.4	Pass
		Leg	L6x6x7/8	68	-58.11	220.41	26.4	Pass
		Diagonal	2L2 1/2x2 1/2x1/4x3/8	88	-13.34	19.03	70.1	Pass
						40.0 (b)		
T5	300 - 287.5	Horizontal	2L2 1/2x2 1/2x1/4x3/8	84	-8.30	28.17	29.5	Pass
		Redund Horz 1	L2 1/2x2 1/2x3/16	82	-0.87	13.70	6.4	Pass
		Bracing						
		Redund Diag 1	L2 1/2x2x3/16	83	-0.72	4.14	17.4	Pass
T6	287.5 - 275	Inner Bracing	2L2x2 1/2x1/4x3/8	99	-0.03	4.69	0.6	Pass
		Leg	L6x6x7/8	105	-73.69	220.41	33.4	Pass
		Diagonal	2L2 1/2x2 1/2x5/16x3/8	125	-14.11	22.07	63.9	Pass
		Horizontal	2L2 1/2x2 1/2x1/4x3/8	121	-9.20	23.54	39.1	Pass
T7	275 - 262.5	Redund Horz 1	L2 1/2x2 1/2x1/4	119	-1.11	16.73	6.6	Pass
		Bracing						
		Redund Diag 1	L2 1/2x2 1/2x1/4	120	-0.86	7.41	11.6	Pass
		Bracing						
T8	262.5 - 250	Inner Bracing	2L2 1/2x2 1/2x1/4x3/8	139	-0.01	3.64	0.7	Pass
		Leg	L6x6x7/8	142	-90.05	220.41	40.9	Pass
		Diagonal	2L2 1/2x2 1/2x5/16x3/8	162	-14.63	20.47	71.5	Pass
		Horizontal	2L2 1/2x2 1/2x1/4x3/8	158	-9.96	20.25	49.2	Pass
T9	250 - 237.5	Redund Horz 1	L2 1/2x2 1/2x1/4	156	-1.35	14.53	9.3	Pass
		Bracing						
		Redund Diag 1	L2 1/2x2 1/2x1/4	161	-0.99	6.82	14.5	Pass
		Bracing						
T10	237.5 - 225	Inner Bracing	2L2 1/2x2 1/2x1/4x3/8	176	-0.01	3.04	0.8	Pass
		Leg	L8x8x3/4	179	-107.10	281.86	38.0	Pass
		Diagonal	2L2 1/2x2 1/2x1/4x3/8	201	-15.41	27.06	57.0	Pass
		Horizontal	2L2 1/2x2 1/2x1/4x3/8	197	-10.87	17.61	61.8	Pass
T11	225 - 212.5	Redund Horz 1	L2 1/2x2 1/2x3/16	193	-1.61	9.72	16.6	Pass
		Bracing						
		Redund Diag 1	L2 1/2x2 1/2x3/16	194	-1.13	4.84	23.3	Pass
		Bracing						
T12	212.5 - 200	Redund Hip 1	L3x3x1/4	195	0.00	0.00	0.2	Pass
		Bracing						
		Redund Hip Diagonal 1	2L2 1/2x2 1/2x1/4x3/8	196	0.08	51.41	0.4	Pass
		Bracing						
T13	200 - 187.5	Inner Bracing	2L2 1/2x2 1/2x3/16x3/8	218	-0.06	4.00	1.6	Pass
		Leg	L8x8x3/4	224	-127.20	281.86	45.1	Pass
						58.4 (b)		

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail			
T9	250 - 225	Diagonal	2L2 1/2x2 1/2x1/4x3/8	246	-17.37	25.49	68.1	Pass			
							73.7 (b)				
		Horizontal	2L2 1/2x2 1/2x1/4x3/8	242	-12.70	15.63	81.3	Pass			
		Redund Horz 1 Bracing	L2 1/2x2 1/2x3/16	238	-1.91	8.29	23.1	Pass			
		Redund Diag 1 Bracing	L2 1/2x2 1/2x3/16	239	-1.29	4.60	28.0	Pass			
		Redund Hip 1 Bracing	L3x3x1/4	240	0.00	0.00	0.3	Pass			
		Redund Hip Diagonal 1 Bracing	2L2 1/2x2 1/2x1/4x3/8	250	0.08	51.41	0.4	Pass			
		Inner Bracing	2L2 1/2x2 1/2x3/16x3/8	263	-0.07	3.44	2.0	Pass			
		Leg	L8x8x7/8	269	-147.68	299.73	49.3	Pass			
								67.9 (b)			
		Diagonal	2L2.5x3x5/16 + 2L3x3x3/8	303	-31.05	51.66	60.1	Pass			
								87.9 (b)			
		Horizontal	2L3x2 1/2x1/4x3/8	297	-16.05	21.76	73.8	Pass			
		Redund Horz 1 Bracing	2L1 3/4x1 3/4x3/16	290	-2.22	17.06	13.0	Pass			
		Redund Horz 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	300	-2.22	24.96	8.9	Pass			
		Redund Diag 1 Bracing	2L2x2x3/16	292	-2.24	10.47	21.4	Pass			
		Redund Diag 2 Bracing	2L2 1/2x2x3/16x3/8	293	-1.45	10.68	13.6	Pass			
		Redund Hip 2 Bracing	L3 1/2x3 1/2x5/16	295	0.00	0.00	0.3	Pass			
		Redund Hip Diagonal 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	296	0.11	51.41	0.4	Pass			
		Redund Sub Horz Bracing	2L2 1/2x2 1/2x1/4x3/8	282	0.00	0.00	0.3	Pass			
T10	225 - 200	Inner Bracing	2L2 1/2x2 1/2x1/4x3/8	331	-0.01	7.73	1.0	Pass			
		Leg	L8x8x1 1/8	334	-190.47	378.30	50.3	Pass			
								75.0 (b)			
		Diagonal	2L2.5x3x5/16 + 2L3x3x3/8	368	-33.49	47.92	69.9	Pass			
								71.1 (b)			
		Horizontal	2L3x2 1/2x1/4x3/8	362	-18.75	46.83	40.0	Pass			
								53.1 (b)			
		Redund Horz 1 Bracing	2L1 3/4x1 3/4x3/16	355	-2.86	16.02	17.9	Pass			
		Redund Horz 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	356	-2.86	19.18	14.9	Pass			
		Redund Diag 1 Bracing	2L2x2x3/16	357	-2.62	9.62	27.3	Pass			
		Redund Diag 2 Bracing	2L2 1/2x2x3/16x3/8	367	-1.77	9.12	19.4	Pass			
		Redund Hip 2 Bracing	L4x4x3/8	360	0.00	0.00	0.4	Pass			
		Redund Hip Diagonal 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	361	0.11	51.41	0.5	Pass			
		Redund Sub Horz Bracing	2L2 1/2x2 1/2x1/4x3/8	347	0.00	0.00	0.3	Pass			
		T11	200 - 175	Inner Bracing	L3x3x1/4	393	-0.15	4.30	3.5	Pass	
				Leg	L8x8x1 1/8	399	-236.57	458.83	51.6	Pass	
										81.5 (b)	
				Diagonal	2L2.5x3.5x5/16 + 2L3x3.5x3/8	433	-37.37	65.12	57.4	Pass	
										63.5 (b)	
				Horizontal	2L3 1/2x2 1/2x1/4x3/8	427	-22.25	48.17	46.2	Pass	
								63.0 (b)			
Redund Horz 1 Bracing	2L1 3/4x1 3/4x3/16			420	-3.56	14.87	23.9	Pass			

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
		Redund Horz 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	430	-3.56	15.20	23.4	Pass
		Redund Diag 1 Bracing	2L2x2x3/16	431	-3.01	8.86	34.0	Pass
		Redund Diag 2 Bracing	2L2 1/2x2x3/16x3/8	423	-2.11	7.82	27.0	Pass
		Redund Hip 2 Bracing	L4x4x3/8	425	0.00	0.00	0.4	Pass
		Redund Hip Diagonal 2 Bracing	2L2 1/2x2 1/2x1/4x3/8	426	0.11	51.41	0.6	Pass
		Redund Sub Horz Bracing	2L2 1/2x3x1/4x3/8	412	0.00	0.00	0.3	Pass
		Inner Bracing	2L3x2 1/2x1/4x3/8	461	-0.02	7.98	1.3	Pass

\*Elev. 175-351.67ft – Modelled in TnxTower.

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Section No.	Elevation ft	Component Type	Member Size	P kips	Pallow kips	% Member	% Bolt	Pass Fail
T12	175 - 150	*Legs - A	ST L808018	247.95	463.77	53.46	93.98	Pass
		*Diagonals - B / Bolt Replacement One End Only	2L2.5x3x5/16 + 2L3x3x3/8	58.55	90.13	64.96	69.04	Pass
		*Horizontals - O / Added Redundant Braces	LD L35255 SP 0.4375	37.16	57.66	64.44	65.73	Pass
		*Red Horiz 1 - C (LLV)	ST L25203	1.31	11.89	11.01	9.27	Pass
		*Red Diag 1 - D	ST L30303	1.43	7.21	19.84	10.12	Pass
		*Red Horiz 2 - E	LD L25254 SP 0.375	1.69	47.73	3.54	5.98	Pass
		*Red Diag 2 - L	LD L30306 SP 0.4375	26.13	33.69	77.56	46.22	Pass
		*Red Sub Diagonal - M / New Reinforcement	2L3x2.5x1/4 + L3.5x2.5x3/8	38.99	52.82	73.82	45.98	Pass
		*Red Vertical - N	ST L30304	0.02	10.06	0.2	0.14	Pass
		*Red Sub Horizontal - F / Bolt Replacement	LD L30304 SP 0.4375	31.79	41.27	77.03	44.98	Pass
		*Hip Horizontal 2 - G	LD L40304 SP 0.375	3.8	79.1	4.8	13.44	Pass
		*Hip Diagonal 2 - K	LD L25254 SP 0.375	6.74	15.07	44.73	23.84	Pass
		*Hip Horz 2 Sub Braces - H (LLV)	ST L30254	0.23	15.77	1.46	1.63	Pass
		*Level 1 Internal Sub Diagonals - J	ST L30304	2.36	11.68	20.2	16.7	Pass
		*Level 1 Internal Horizontal - I	LD L40304 SP 0.375	5.46	63.46	8.6	19.32	Pass
		*Level 2 Internal Corner Diagonals - Q	ST L30304	2.33	8.53	27.32	16.49	Pass
		*Level 2 Internal Middle Diagonals - S	ST L30304	2.33	8.35	27.89	16.49	Pass
		*Level 2 Internal Corner Diagonals Sub Braces - P	ST L30254	1.74	10.81	16.09	12.31	Pass
		*Level 2 Internal Horizontal - R	LD L40304 SP 0.375	2.02	41.54	4.86	7.15	Pass
T13	150 - 125	*Legs - A	ST L808018	259.27	463.41	55.95	82.51	Pass
		*Diagonals - B / Reinforcement / Bolt Replacement	2L3x3.5x3/8 + 2L3x3.5x3/8	82.83	87.72	94.43	83.72	Pass
		*Horizontals - K / Added Redundant Braces	LD L35305 SP 0.4375	54.82	71.23	76.96	96.97	Pass
		*Red Horiz 1 - C (LLV)	ST L25204	1.38	19.58	7.05	9.76	Pass
		*Red Diag 1 - D	ST L30303	1.94	7.68	25.28	13.73	Pass
		*Red Horiz 2 - E	SD L25203 SP 0.375	4.48	14.92	30.03	15.85	Pass
		*Red Diag 2 - I / Replace Existing	LD L35356 SP 0.4375	53.39	63.14	84.55	94.44	Pass
		*Red Sub Diagonal - J / New Reinf. - Replace Bolts	2L3x2.5x1/4 + L3.5x2.5x3/8	43.65	49.13	88.85	41.18	Pass
		*Red Sub Horizontal - F / Add Kicker Internal	LD L40406 SP 0.5	39.91	49.24	81.05	70.59	Pass
		*Hip Horizontal 2 - G	SD L30254 SP 0.375	0	20.73	0	0	Pass
		*Hip Diagonal 2 - H	LD L25254 SP 0.375	0.01	14.5	0.07	0.04	Pass
		*Internal Corner Diagonals - M (LLH)	ST L35304	1.74	9.22	18.88	12.31	Pass
		*Internal Middle Diagonals - N (LLV)	ST L35304	1.54	8.38	18.38	10.9	Pass
		*Internal Corner Diagonals Sub Braces - L (LLV)	ST L30254	4.79	9.24	51.84	33.89	Pass

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		*Internal Horizontal - O (LLV)	LD L40304 SP 0.375	3.81	35.21	10.82	13.48	Pass
T14	125 - 100	*Legs - A / Replace Bolts @ 103.5ft Approx.	ST L808016	332.37	441.54	75.28	49.36	Pass
		*Diagonals - B / Bolt Replacement One End Only	2L3x3.5x3/8 + 2L3x3.5x3/8	75.27	81.66	92.17	53.26	Pass
		*Horizontals - K / Added Redundant Braces	LD L40355 SP 0.4375	56.08	82.34	68.1	79.36	Pass
		*Red Horiz 1 - C (LLV)	ST L25203	1.45	11.47	12.64	10.26	Pass
		*Red Diag 1 - D	ST L30303	1.61	7.12	22.61	11.39	Pass
		*Red Horiz 2 - E	LD L25254 SP 0.4375	1.82	23.65	7.7	6.44	Pass
		*Red Diag 2 - I	LD L35356 SP 0.4375	47.03	56.47	83.28	83.19	Pass
		*Red Sub Diagonal - J / New Reinforcement	2L3x3x3/8 + L3.5x3x3/8	44.83	90.68	49.44	52.86	Pass
		*Red Sub Horizontal - F / Add Kicker Internal	LD L40406 SP 0.5	43.49	50.34	86.39	51.28	Pass
		*Hip Horizontal 2 - G	SD L30254 SP 0.375	0.01	13.18	0.08	0.04	Pass
		*Hip Diagonal 2 - H	LD L25254 SP 0.375	0	13.37	0	0	Pass
		*Internal Corner Diagonals - M	ST L35354	2.9	9.36	30.99	20.52	Pass
		*Internal Middle Diagonals - N	ST L35354	2.58	9.7	26.6	18.25	Pass
		*Internal Corner Diagonals Sub Braces - L	ST L35354	6.15	15.14	40.62	43.51	Pass
		*Internal Horizontal - O	LD L40354 SP 0.375	5.07	33.49	15.14	17.94	Pass
T15	100 - 75	*Legs - A / Replace Bolts @ 78.5ft Approx.	ST L808016	435.06	441.54	98.53	56.54	Pass
		*Diagonals - B	2L3x3.5x3/8 + 2L3x3.5x3/8	57.93	135.49	42.76	81.97	Pass
		*Horizontals - Q / New Reinforcement	2L3.5x3x5/16 + L4x3.5x3/8	46.91	86.87	54	82.98	Pass
		*Red Horiz 1 - C	ST L25253	1.4	8.31	16.84	9.91	Pass
		*Red Diag 1 - D	LD L25253 SP 0.375	1.15	13.66	8.42	4.07	Pass
		*Red Horiz 2 - E	LD L25254 SP 0.5	1.65	35.56	4.64	5.84	Pass
		*Red Diag 2 - M / Replace Existing Member	LD L35356 SP 0.4375	24.16	33.71	71.66	42.73	Pass
		*Red Sub Diagonal - O	LD L40408 SP 0.4375	58.23	67.11	86.77	41.2	Pass
		*Red Sub Horizontal - F / Add Kicker Internal	SD L35304 SP 0.5	15.85	22.16	71.52	56.07	Pass
		*Red Vertical Outside - N	ST L25254	0.04	5.75	0.7	0.28	Pass
		*Red Vertical Center - P	ST L25254	0	5.75	0	0	Pass
		*Hip Horizontal 1 - CC	ST L30303	0.06	6.3	0.95	0.42	Pass
		*Hip Horizontal 2 - G	LD L35254 SP 0.375	0.04	43.87	0.09	0.14	Pass
		*Hip Diagonal 2 - J	LD L25254 SP 0.375	0.01	29.28	0.03	0.04	Pass
		*Hip SubDiagonal 2 - K	ST L25253	0	5.88	0	0	Pass
		*Hip SubVertical 2 - L	ST L25253	0	15.2	0	0	Pass
		*Hip SubInternal 2 - I	ST L30303	0	6.3	0	0	Pass
		*Hip SubInternal 2 - H	ST L25253	0	7.19	0	0	Pass
		*Internal Corner Horizontal 1 - V	ST L30303	0.06	9.03	0.66	0.42	Pass
		*Internal Corner Diagonal 1 - U	ST L25253	0.05	7.8	0.64	0.35	Pass
		*Internal Corner Horizontal 2 - T	LD L30254 SP 0.375	3.99	35.55	11.22	14.12	Pass

<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> 350ft SST / NORWALK TOWER SITE	<b>Page</b> 13 of 16
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		*Internal Corner Diagonal 2 - S	SD L30254 SP 0.375	2.33	38.79	6.01	8.24	Pass
		*Internal Corner Diagonal 2 - W	ST L30303	3.45	6.94	49.71	24.41	Pass
		*Internal Corner Horizontal 3 - R	LD L35254 SP 0.4375	5.71	47.83	11.94	20.2	Pass
		*Internal Corner Diagonal 3 - X	LD L30304 SP 0.375	4.88	41.7	11.7	17.26	Pass
T16	75 - 50	*Legs - A / Add Redundants / Replace Bolts	ST L808016	492.56	554.88	88.77	56.9	Pass
		*Diagonals - B	2L3x3.5x3/8 + 2L3x3.5x3/8	58.94	125.89	46.82	83.4	Pass
		*Horizontals - Q / New Reinforcement	2L4x3x1/4 + L4x3.5x3/8	48.71	67.75	71.9	68.93	Pass
		*Red Horiz 1 - C	ST L25253	1.04	7.73	13.45	7.36	Pass
		*Red Diag 1 - D	LD L25254 SP 0.375	4.78	34.23	13.96	16.91	Pass
		*Red Horiz 2 - E	LD L30254 SP 0.5	1.69	45.67	3.7	5.98	Pass
		*Red Diag 2 - M	LD L35356 SP 0.4375	26	62.7	41.47	66.23	Pass
		*Red Sub Diagonal - O / New Reinforcement	2L4x4x1/2 + L4x4x3/8	60.13	145.13	41.43	42.54	Pass
		*Red Sub Horizontal - F / Add Kicker Internal	SD L35304 SP 0.5	16.76	19.46	86.13	59.29	Pass
		*Red Vertical Outside - N	ST L25254	0.05	5.75	0.87	0.35	Pass
		*Red Vertical Center - P	ST L25254	0	5.75	0	0	Pass
		*Hip Horizontal 1 - CC	ST L30303	0.09	5.49	1.64	0.64	Pass
		*Hip Horizontal 2 - G	LD L35254 SP 0.375	0.05	41.07	0.12	0.18	Pass
		*Hip Diagonal 2 - J	LD L25254	0.03	26.52	0.11	0.11	Pass
		*Hip SubDiagonal 2 - K	ST L25253	0.01	5.3	0.19	0.07	Pass
		*Hip SubVertical 2 - L	ST L25253	0	15.2	0	0	Pass
		*Hip SubInternal 2 - I	ST L30303	0	5.49	0	0	Pass
		*Hip SubInternal 2 - H	ST L25253	0	6.27	0	0	Pass
		*Internal Corner Horizontal 1 - V	ST L30303	0.05	10.88	0.46	0.35	Pass
		*Internal Corner Diagonal 1 - U	ST L25253	0.05	6.43	0.78	0.35	Pass
		*Internal Corner Horizontal 2 - T	LD L30254 SP 0.375	4.74	32.85	14.43	16.77	Pass
		*Internal Corner Diagonal 2 - S	SD L30254 SP 0.375	2.8	35.95	7.79	9.91	Pass
		*Internal Corner Diagonal 2 - W	ST L30303	4.35	6.01	72.4	30.78	Pass
		*Internal Corner Horizontal 3 - R	LD L40356 SP 0.375	5.61	94.65	5.93	19.85	Pass
		*Internal Corner Diagonal 3 - X	LD L30304 SP 0.375	6.18	38.17	16.19	21.86	Pass
T17	50 - 25	*Legs - A / Replace Bolts @ 28.5ft Approx.	ST L808016	553.55	554.53	99.82	63.94	Pass
		*Diagonals - B	2L3x4x3/8 + 2L3x4x3/8	62.11	114.38	54.3	87.89	Pass
		*Horizontals - X / New Reinforcement	2L4x3x5/16 + L4x3.5x3/8	52.34	70.17	74.59	74.06	Pass
		*Red Horiz 1 - E	ST L25254	1.15	8.83	13.03	8.14	Pass
		*Red Diag 1 - G	LD L25253 SP 0.4375	4.9	32.7	14.98	17.33	Pass
		*Red Horiz 2 - M	LD L25254 SP 0.5	2.89	29.79	9.7	10.22	Pass
		*Red Diag 2 - T	LD L35356 SP 0.4375	28.64	81.84	35	50.66	Pass
		*Red Sub Horiz 1 - C	ST L25254	2.49	22.05	11.29	17.62	Pass

<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>	350ft SST / NORWALK TOWER SITE	<b>Page</b>	14 of 16
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	<b>Client</b>	EMPIRE TELECOM / AT&T / T-MOBILE	<b>Designed by</b>	KM

		*Red Sub Diag 1 - D	ST L25254	2.67	13.64	19.58	27.2	Pass
		*Red Sub Diag 2 - F	ST L25254	4.75	11.78	40.31	48.4	Pass
		*Red Sub Horiz 2 - H	ST L25254	4.45	22.04	20.19	45.34	Pass
		*Red Sub Diag 3 - R	ST L25254	1.97	5.12	38.44	20.07	Pass
		*Red Sub Horiz 3 - S	ST L25254	2.59	7.15	36.21	26.39	Pass
		*Red Sub Diagonal - V / New Reinforcement	2L4x4x1/2 + L4x4x3/8	63.63	134.69	47.24	45.02	Pass
		*Red Sub Horizontal - N / Add Kicker Internal	SD L40304 SP 0.5	18.77	19.01	98.76	66.4	Pass
		*Red Vertical Outside - U	ST L25254	0.05	5.75	0.87	0.35	Pass
		*Red Vertical Center - W	ST L25254	0	5.75	0	0	Pass
		*Hip Horizontal 1 - I	ST L40406	0.08	22.14	0.36	0.57	Pass
		*Hip Horizontal 2 - J	LD L35255 SP 0.375	0.07	46.51	0.15	0.25	Pass
		*Hip Diagonal 2 - O	LD L25254 SP 0.375	0.01	24.08	0.04	0.04	Pass
		*Hip SubDiagonal 2 - Q	ST L25253	0	4.79	0	0	Pass
		*Hip SubVertical 2 - P	ST L25253	0	15.2	0	0	Pass
		*Hip SubInternal 2 - K	ST L30304	0	6.29	0	0	Pass
		*Hip SubInternal 2 - L	ST L25253	0	5.51	0	0	Pass
		*Internal Corner Horizontal 1 - C1	ST L30304	0.05	10.97	0.46	0.35	Pass
		*Internal Corner Diagonal 1 - B1	ST L30304	0.04	13.11	0.31	0.28	Pass
		*Internal Corner Horizontal 2 - A1	LD L30254 SP 0.375	4.72	28.97	16.29	16.7	Pass
		*Internal Corner Diagonal 2 - Z	LD L25254 SP 0.375	2.82	30.37	9.29	9.98	Pass
		*Internal Corner Diagonal 2 - D1	LD L25253 SP 0.375	4.31	13.8	31.24	15.25	Pass
		*Internal Corner Horizontal 3 - Y	LD L35255 SP 0.4375	5.39	50.26	10.72	19.07	Pass
		*Internal Corner Diagonal 3 - E1	LD L30304 SP 0.4375	6.1	35.17	17.34	21.58	Pass
T18	25 - 0	*Legs - A / Replace Splice Bolts @ 3.5ft Approx.	ST L808018	616.7	617.85	99.81	64.11	Pass
		*Diagonals - B	SD L60406 SP 0.5	62.27	90.57	68.75	75.53	Pass
		*Horizontals - L1	LD L50356 SP 0.4375	55.32	84.24	65.67	78.28	Pass
		*Red Horiz 1 - E	ST L25254	1.42	8.82	16.1	10.05	Pass
		*Red Diag 1 - G	LD L25254 SP 0.5	4.79	41.53	11.53	16.95	Pass
		*Red Horiz 2 - O	LD L35256 SP 0.4375	5.5	58.56	9.39	19.46	Pass
		*Red Diag 2 - T	LD L35356 SP 0.4375	28.82	79.14	36.42	33.99	Pass
		*Red Sub Horiz 1 - C	ST L25254	2.77	20.9	13.26	28.22	Pass
		*Red Sub Diag 1 - D	ST L25254	3.1	13.01	23.82	31.58	Pass
		*Red Sub Diag 2 - F	ST L25254	4.51	11.15	40.44	45.95	Pass
		*Red Sub Horiz 2 - H	ST L25254	4.3	20.9	20.58	43.81	Pass
		*Red Sub Diag 3 - R	ST L25254	1.77	4.71	37.56	18.03	Pass
		*Red Sub Horiz 3 - S	ST L25254	2.28	6.37	35.79	23.23	Pass
		*Red Sub Diagonal - V	LD L50506 SP 0.4375	55.39	138.34	40.04	28.79	Pass

<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>	350ft SST / NORWALK TOWER SITE	<b>Page</b>	15 of 16
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		*Red Sub Horizontal - Q	ST C9X13	25.17	28.94	86.97	11.13	Pass
		*Red Vertical Outside - U	ST L25254	5.34	5.72	93.32	37.78	Pass
		*Red Vertical Center - Z	LD L30254 SP 0.5	0.02	38.47	0.05	0.07	Pass
		*Red Vertical Inner 1 - X	LD L25254 SP 0.375	13.75	45.44	30.26	48.64	Pass
		*Red Vertical Inner 2 - Y / Reinforcement DBL L	LD L30304 SP 0.5	17.19	32.84	52.35	60.81	Pass
		*Red Vertical Sub Diagonal - W	LD L25254 SP 0.5	16.73	18.18	92.02	59.19	Pass
		*Hip Horizontal 1 - I	ST L40406	0.11	19.72	0.56	0.78	Pass
		*Hip Diagonal 1 - J	LD L25254 SP 0.5	0.11	12.8	0.86	0.39	Pass
		*Hip Horizontal 2 - L	LD L35354 SP 0.4375	2.51	41	6.12	8.88	Pass
		*Hip Diagonal 2 - A1	LD L25254 SP 0.375	1.66	22.01	7.54	5.87	Pass
		*Hip SubDiagonal 2 - C1	ST L25253	0	4.32	0	0	Pass
		*Hip SubVertical 2 - B1	ST L25253	0	15.15	0	0	Pass
		*Hip SubInternal 2-1 - KK	LD L25253 SP 0.4375	3.23	21.47	15.05	11.43	Pass
		*Hip SubInternal 2-2 - K / Reinforcement DBL L	LD L25253 SP 0.4375	5.69	19.58	29.06	20.13	Pass
		*Internal-1 Sub Braces - N	ST L30304	1.79	7.93	22.56	12.66	Pass
		*Internal-1 Inner Horiz - M	LD L60355 SP 0.375	7.51	75.84	9.9	26.57	Pass
		*Internal-2 Corner Horizontal 1 - H1	LD L25253 SP 0.4375	0.1	24.02	0.42	0.35	Pass
		*Internal-2 Corner Diagonal 1 - G1	ST L25254	0.06	6.26	0.96	0.42	Pass
		*Internal-2 Corner Horizontal 2 - F1	LD L30254 SP 0.375	3.44	25.61	13.43	12.17	Pass
		*Internal-2 Corner Diagonal 2-1 - E1	LD L25254 SP 0.375	1.92	26.74	7.18	6.79	Pass
		*Internal-2 Corner Diagonal 2-2 - I1	LD L25253 SP 0.4375	2.65	12.19	21.74	9.37	Pass
		*Internal-2 Corner Horizontal 3 - D1	LD L35255 SP 0.4375	4.28	45.82	9.34	15.14	Pass
		*Internal-2 Corner Diagonal 3 - K2	LD L30254 SP 0.5	3.71	42.61	8.71	13.12	Pass
		*Internal-2 Corner Diagonal 3 - Sub1 - J1	ST L30304	0.16	11.32	1.41	1.13	Pass
		*Internal-2 Corner Diagonal 3 - Sub2 - K1	LD L30304 SP 0.5	0.01	47.08	0.02	0.04	Pass
T12	175-150	*Reinforcement / Redundant Vertical / RV12	ST L25254	0.11	5.56	1.98	1.12	Pass
		*Reinforcement / Internal / RI12	ST L25254	0.83	9.7	8.56	8.46	Pass
T13	150-125	*Reinforcement / Redundant Vertical / RV13	ST L25254	0.19	5.72	3.32	1.94	Pass
		*Reinforcement / Internal / RI13	ST L25254	1.22	8.51	14.33	12.43	Pass
		*Reinforcement / Internal Kicker / RK13	ST L30304	0.01	5.63	0.18	0.07	Pass
T14	100-125	*Reinforcement / Redundant Vertical / RV14	ST L30304	0.17	10.1	1.68	1.2	Pass
		*Reinforcement / Internal / RI14	ST L30304	1.07	11.6	9.22	7.57	Pass
		*Reinforcement / Internal Kicker / RK14	ST L30304	0.01	5.03	0.2	0.07	Pass
T15	75-100	*Reinforcement / Internal Kicker / RK15	ST L30304	0.01	6.06	0.17	0.07	Pass
T16	50-75	*Reinforcement / Internal Kicker / RK16	ST L30304	0.01	5.73	0.17	0.07	Pass
		*Reinforcement / Red Sub Horiz 1 - C16	ST L25254	2.02	23.25	8.69	14.29	Pass
		*Reinforcement / Red Sub Diag 1 - D16	ST L25254	2.46	14.32	17.18	17.41	Pass

<p style="text-align: center;"><b><i>tnxTower</i></b></p> <p><b>Malouf Engineering Int'l Inc.</b>  17950 Preston Road, STE 720  Dallas, Texas 75252  Phone: (972) 783 2578  FAX: (972) 783 2583</p>	<b>Job</b>	350ft SST / NORWALK TOWER SITE	<b>Page</b>	16 of 16
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		*Reinforcement / Red Sub Diag 2 - F16	ST L25254	4.54	12.46	36.45	32.12	Pass
		*Reinforcement / Red Sub Horiz 2 - H16	ST L25254	3.94	23.25	16.95	27.88	Pass
		*Reinforcement / Red Sub Diag 3 - R16	ST L25254	1.74	5.63	30.9	12.31	Pass
		*Reinforcement / Red Sub Horiz 3 - S16	ST L25254	2	8.13	24.59	14.15	Pass
T17	25-50	*Reinforcement / Internal Kicker / RK17	ST L30304	0.01	5.42	0.18	0.07	Pass
T9	250-225	Red Horiz 1 - C	ST L25203	2.22	10.97	20.23	15.71	Pass
		Red Diag 1 - D	ST L30303	2.24	7.49	29.89	15.85	Pass
T10	225-200	Red Horiz 1 - C	ST L25204	2.84	11.18	25.4	20.09	Pass
		Red Diag 1 - D	ST L30303	2.6	6.9	37.71	18.4	Pass
T11	200-175	Red Horiz 1 - C	ST L25253	3.52	10.2	34.5	24.91	Pass
		Red Diag 1 - D	ST L30304	2.98	8.26	36.07	21.08	Pass

\*Elev. 0-175ft – Tower modelled in Staad. Tower Members were considered as truss members and Loads are from Staad Analysis.

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	Part MODIFICATION ANALYSIS		
Job Title 351.7ft Self Supporting Tower	Ref		
	By KM	Date 9-Jun-16	Chd HML
Client Empire Telecom / AT&T / T-Mobile	File CT04761S-16V0-RUN-I.sl	Date/Time 30-Jun-2016 12:28	

## Job Information

	Engineer	Checked	Approved
<b>Name:</b>	KM	HML	MM
<b>Date:</b>	9-Jun-16	27-Jun-16	30-Jun-16

### Comments

TIA/EIA-222-F 85MPH + 0" ICE / 74MPH + 0.5" ICE  
0 to 175ft of Tower Modelled

**Structure Type** SPACE FRAME

Number of Nodes	804	Highest Node	820
Number of Elements	2008	Highest Beam	2024

Number of Basic Load Cases	-2
Number of Combination Load Cases	0

Included in this printout are data for:

**All** The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD ONLY
Primary	2	DEAD+WIND 0 DEG - NO ICE
Primary	3	DEAD+WIND 45 DEG - NO ICE
Primary	4	DEAD+WIND 90 DEG - NO ICE
Primary	5	DEAD+WIND 135 DEG - NO ICE
Primary	6	DEAD+WIND 180 DEG - NO ICE
Primary	7	DEAD+WIND 225 DEG - NO ICE
Primary	8	DEAD+WIND 270 DEG - NO ICE
Primary	9	DEAD+WIND 315 DEG - NO ICE
Primary	10	DEAD+ICE+TEMP
Primary	11	DEAD+WIND 0 DEG+ICE+TEMP
Primary	12	DEAD+WIND 45 DEG+ICE+TEMP
Primary	13	DEAD+WIND 90 DEG+ICE+TEMP
Primary	14	DEAD+WIND 135 DEG+ICE+TEMP
Primary	15	DEAD+WIND 180 DEG+ICE+TEMP
Primary	16	DEAD+WIND 225 DEG+ICE+TEMP
Primary	17	DEAD+WIND 270 DEG+ICE+TEMP
Primary	18	DEAD+WIND 315 DEG+ICE+TEMP
Primary	19	DEAD+WIND 0 DEG - SERVICE
Primary	20	DEAD+WIND 45 DEG - SERVICE
Primary	21	DEAD+WIND 90 DEG - SERVICE
Primary	22	DEAD+WIND 135 DEG - SERVICE
Primary	23	DEAD+WIND 180 DEG - SERVICE
Primary	24	DEAD+WIND 225 DEG - SERVICE

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	Part MODIFICATION ANALYSIS		
Job Title 351.7ft Self Supporting Tower	Ref		
	By KM	Date 9-Jun-16	Chd HML
Client Empire Telecom / AT&T / T-Mobile	File CT04761S-16V0-RUN-I.sl	Date/Time 30-Jun-2016 12:28	

## Job Information Cont...

Type	L/C	Name
Primary	25	DEAD+WIND 270 DEG - SERVICE
Primary	26	DEAD+WIND 315 DEG - SERVICE

## Supports

Node	X (lbf/ft)	Y (lbf/ft)	Z (lbf/ft)	rX (kip`ft/deg)	rY (kip`ft/deg)	rZ (kip`ft/deg)
224	Fixed	Fixed	Fixed	-	-	-
227	Fixed	Fixed	Fixed	-	-	-
230	Fixed	Fixed	Fixed	-	-	-
233	Fixed	Fixed	Fixed	-	-	-

## Node Displacement Summary

	Node	L/C	X (in)	Y (in)	Z (in)	Resultant (in)	rX (rad)	rY (rad)	rZ (rad)
Max X	476	4:DEAD+WIND	<b>6.069</b>	-0.907	0.093	6.137	-0.000	-0.001	-0.003
Min X	478	8:DEAD+WIND	<b>-6.054</b>	-0.894	0.099	6.120	-0.000	0.001	0.003
Max Y	423	3:DEAD+WIND	2.718	<b>0.706</b>	-2.764	3.940	-0.003	-0.000	-0.003
Min Y	476	12:DEAD+WIND	4.406	<b>-1.265</b>	-4.346	6.317	-0.003	-0.000	-0.003
Max Z	474	6:DEAD+WIND	-0.056	-0.885	<b>6.012</b>	6.077	0.003	-0.001	-0.000
Min Z	476	2:DEAD+WIND	-0.051	-0.907	<b>-6.034</b>	6.102	-0.003	0.001	-0.000
Max rX	798	5:DEAD+WIND	0.827	-0.692	0.975	1.454	<b>0.014</b>	0.015	-0.004
Min rX	798	9:DEAD+WIND	-0.874	0.400	-0.996	1.384	<b>-0.010</b>	-0.010	0.003
Max rY	798	5:DEAD+WIND	0.827	-0.692	0.975	1.454	0.014	<b>0.015</b>	-0.004
Min rY	795	7:DEAD+WIND	-0.869	-0.684	0.945	1.455	0.014	<b>-0.015</b>	0.004
Max rZ	462	8:DEAD+WIND	-4.064	0.304	-0.104	4.077	-0.000	0.001	<b>0.005</b>
Min rZ	467	4:DEAD+WIND	4.062	0.314	-0.096	4.076	-0.000	-0.001	<b>-0.005</b>
Max Rst	476	9:DEAD+WIND	-4.916	-0.331	-4.951	<b>6.985</b>	-0.003	0.001	0.002

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	Part MODIFICATION ANALYSIS		
Job Title 351.7ft Self Supporting Tower	Ref		
	By KM	Date 9-Jun-16	Chd HML
Client Empire Telecom / AT&T / T-Mobile	File CT04761S-16V0-RUN-I.sl	Date/Time 30-Jun-2016 12:28	

## Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (lb-ft)	MY (lb-ft)	MZ (lb-ft)
224	1:DEAD ONLY	9.913	106.932	-9.992	0.000	0.000	0.000
	2:DEAD+WIND	-24.273	-254.884	55.596	0.000	0.000	0.000
	3:DEAD+WIND	-69.661	-472.422	70.308	0.000	0.000	0.000
	4:DEAD+WIND	-55.178	-254.383	24.451	0.000	0.000	0.000
	5:DEAD+WIND	-14.960	107.189	-34.968	0.000	0.000	0.000
	6:DEAD+WIND	44.030	468.655	-75.589	0.000	0.000	0.000
	7:DEAD+WIND	89.521	686.225	-90.217	0.000	0.000	0.000
	8:DEAD+WIND	74.962	468.289	-44.501	0.000	0.000	0.000
	9:DEAD+WIND	34.722	106.530	15.025	0.000	0.000	0.000
	10:DEAD+ICE-	12.899	138.614	-13.010	0.000	0.000	0.000
	11:DEAD+WIND	-17.910	-187.424	46.030	0.000	0.000	0.000
	12:DEAD+WIND	-59.682	-388.156	60.250	0.000	0.000	0.000
	13:DEAD+WIND	-45.660	-186.957	18.061	0.000	0.000	0.000
	14:DEAD+WIND	-9.983	138.859	-35.988	0.000	0.000	0.000
	15:DEAD+WIND	43.655	464.584	-72.057	0.000	0.000	0.000
	16:DEAD+WIND	85.507	665.340	-86.211	0.000	0.000	0.000
	17:DEAD+WIND	71.427	464.219	-44.131	0.000	0.000	0.000
	18:DEAD+WIND	35.725	138.255	9.996	0.000	0.000	0.000
	19:DEAD+WIND	-1.922	-18.310	12.720	0.000	0.000	0.000
	20:DEAD+WIND	-17.608	-93.490	17.779	0.000	0.000	0.000
	21:DEAD+WIND	-12.623	-18.126	1.931	0.000	0.000	0.000
	22:DEAD+WIND	1.314	107.018	-18.625	0.000	0.000	0.000
	23:DEAD+WIND	21.724	232.139	-32.706	0.000	0.000	0.000
	24:DEAD+WIND	37.446	307.337	-37.740	0.000	0.000	0.000
	25:DEAD+WIND	32.436	232.008	-21.938	0.000	0.000	0.000
	26:DEAD+WIND	18.486	106.797	-1.348	0.000	0.000	0.000
227	1:DEAD ONLY	-9.869	108.639	-10.192	0.000	0.000	0.000
	2:DEAD+WIND	23.006	-254.748	56.980	0.000	0.000	0.000
	3:DEAD+WIND	-35.694	106.619	16.096	0.000	0.000	0.000
	4:DEAD+WIND	-74.922	469.680	-44.721	0.000	0.000	0.000
	5:DEAD+WIND	-88.416	689.037	-91.732	0.000	0.000	0.000
	6:DEAD+WIND	-42.812	472.102	-77.330	0.000	0.000	0.000
	7:DEAD+WIND	16.003	110.520	-36.423	0.000	0.000	0.000
	8:DEAD+WIND	55.132	-252.268	24.319	0.000	0.000	0.000
	9:DEAD+WIND	68.624	-471.779	71.425	0.000	0.000	0.000
	10:DEAD+ICE-	-12.839	141.805	-13.374	0.000	0.000	0.000
	11:DEAD+WIND	16.806	-185.814	47.106	0.000	0.000	0.000
	12:DEAD+WIND	-36.593	139.977	10.790	0.000	0.000	0.000
	13:DEAD+WIND	-71.379	467.269	-44.527	0.000	0.000	0.000
	14:DEAD+WIND	-84.505	669.759	-87.789	0.000	0.000	0.000
	15:DEAD+WIND	-42.536	469.484	-73.831	0.000	0.000	0.000
	16:DEAD+WIND	10.952	143.524	-37.495	0.000	0.000	0.000
	17:DEAD+WIND	45.661	-183.558	17.764	0.000	0.000	0.000
	18:DEAD+WIND	58.778	-386.154	61.100	0.000	0.000	0.000

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	Part MODIFICATION ANALYSIS		
Job Title 351.7ft Self Supporting Tower	Ref		
	By KM	Date 9-Jun-16	Chd HML
Client Empire Telecom / AT&T / T-Mobile	File CT04761S-16V0-RUN-I.sl	Date/Time 30-Jun-2016 12:28	

## Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (lb-ft)	MY (lb-ft)	MZ (lb-ft)
	19:DEAD+WIND	1.507	-17.139	13.070	0.000	0.000	0.000
	20:DEAD+WIND	-18.795	107.947	-1.109	0.000	0.000	0.000
	21:DEAD+WIND	-32.390	233.594	-22.141	0.000	0.000	0.000
	22:DEAD+WIND	-37.037	309.433	-38.396	0.000	0.000	0.000
	23:DEAD+WIND	-21.268	234.442	-33.441	0.000	0.000	0.000
	24:DEAD+WIND	-0.926	109.286	-19.257	0.000	0.000	0.000
	25:DEAD+WIND	12.637	-16.273	1.751	0.000	0.000	0.000
	26:DEAD+WIND	17.277	-92.154	18.037	0.000	0.000	0.000
230	1:DEAD ONLY	-10.315	112.947	10.235	0.000	0.000	0.000
	2:DEAD+WIND	-43.188	476.785	77.449	0.000	0.000	0.000
	3:DEAD+WIND	-90.717	695.536	90.209	0.000	0.000	0.000
	4:DEAD+WIND	-77.689	476.267	42.704	0.000	0.000	0.000
	5:DEAD+WIND	-38.110	112.686	-17.666	0.000	0.000	0.000
	6:DEAD+WIND	22.542	-250.790	-56.934	0.000	0.000	0.000
	7:DEAD+WIND	70.097	-469.588	-69.688	0.000	0.000	0.000
	8:DEAD+WIND	57.072	-250.423	-22.247	0.000	0.000	0.000
	9:DEAD+WIND	17.461	113.357	38.218	0.000	0.000	0.000
	10:DEAD+ICE-	-13.544	148.586	13.434	0.000	0.000	0.000
	11:DEAD+WIND	-43.172	476.446	73.936	0.000	0.000	0.000
	12:DEAD+WIND	-86.906	678.293	86.368	0.000	0.000	0.000
	13:DEAD+WIND	-74.213	475.964	42.674	0.000	0.000	0.000
	14:DEAD+WIND	-39.110	148.336	-12.232	0.000	0.000	0.000
	15:DEAD+WIND	16.071	-179.201	-47.036	0.000	0.000	0.000
	16:DEAD+WIND	59.825	-381.082	-59.462	0.000	0.000	0.000
	17:DEAD+WIND	47.134	-178.832	-15.816	0.000	0.000	0.000
	18:DEAD+WIND	12.005	148.953	39.164	0.000	0.000	0.000
	19:DEAD+WIND	-21.694	238.889	33.512	0.000	0.000	0.000
	20:DEAD+WIND	-38.124	314.487	37.891	0.000	0.000	0.000
	21:DEAD+WIND	-33.642	238.699	21.474	0.000	0.000	0.000
	22:DEAD+WIND	-19.925	112.859	0.590	0.000	0.000	0.000
	23:DEAD+WIND	1.058	-12.958	-13.025	0.000	0.000	0.000
	24:DEAD+WIND	17.498	-88.579	-17.406	0.000	0.000	0.000
	25:DEAD+WIND	13.018	-12.827	-1.008	0.000	0.000	0.000
	26:DEAD+WIND	-0.712	113.085	19.909	0.000	0.000	0.000
233	1:DEAD ONLY	10.271	110.123	9.948	0.000	0.000	0.000
	2:DEAD+WIND	44.458	471.490	75.481	0.000	0.000	0.000
	3:DEAD+WIND	-16.385	108.907	36.551	0.000	0.000	0.000
	4:DEAD+WIND	-57.067	-252.922	-22.607	0.000	0.000	0.000
	5:DEAD+WIND	-71.199	-470.270	-68.658	0.000	0.000	0.000
	6:DEAD+WIND	-23.933	-251.326	-55.605	0.000	0.000	0.000
	7:DEAD+WIND	36.946	111.485	-16.577	0.000	0.000	0.000
	8:DEAD+WIND	77.609	473.044	42.432	0.000	0.000	0.000
	9:DEAD+WIND	91.729	690.532	88.586	0.000	0.000	0.000
	10:DEAD+ICE-	13.484	143.873	12.950	0.000	0.000	0.000



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Part MODIFICATION ANALYSIS

Job Title 351.7ft Self Supporting Tower

Ref

By KM

Date 9-Jun-16

Chd HML

Client Empire Telecom / AT&T / T-Mobile

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## Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (lb-ft)	MY (lb-ft)	MZ (lb-ft)
11:DEAD+WIND		44.310	469.669	71.955	0.000	0.000	0.000
12:DEAD+WIND		-11.052	142.763	37.430	0.000	0.000	0.000
13:DEAD+WIND		-47.166	-183.398	-16.372	0.000	0.000	0.000
14:DEAD+WIND		-60.866	-384.077	-58.771	0.000	0.000	0.000
15:DEAD+WIND		-17.353	-181.990	-46.073	0.000	0.000	0.000
16:DEAD+WIND		38.037	145.096	-11.470	0.000	0.000	0.000
17:DEAD+WIND		74.136	471.049	42.217	0.000	0.000	0.000
18:DEAD+WIND		87.825	671.823	84.689	0.000	0.000	0.000
19:DEAD+WIND		22.102	235.201	32.641	0.000	0.000	0.000
20:DEAD+WIND		1.056	109.697	19.142	0.000	0.000	0.000
21:DEAD+WIND		-13.043	-15.526	-1.316	0.000	0.000	0.000
22:DEAD+WIND		-17.910	-90.669	-17.240	0.000	0.000	0.000
23:DEAD+WIND		-1.567	-14.982	-12.750	0.000	0.000	0.000
24:DEAD+WIND		19.493	110.596	0.779	0.000	0.000	0.000
25:DEAD+WIND		33.586	235.733	21.189	0.000	0.000	0.000
26:DEAD+WIND		38.446	310.913	37.143	0.000	0.000	0.000



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Part MODIFICATION ANALYSIS

Job Title 351.7ft Self Supporting Tower

Ref

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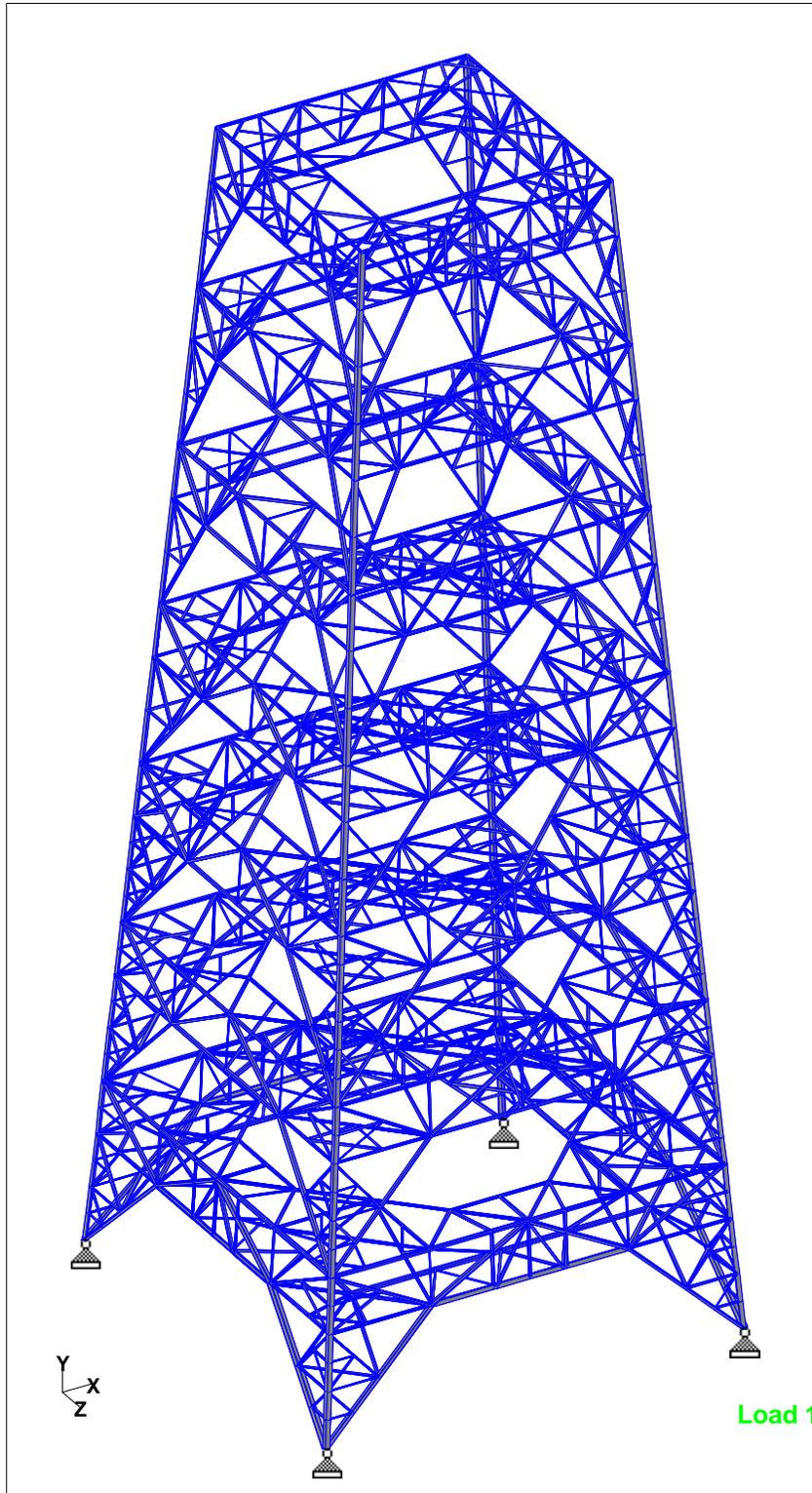
Date 9-Jun-16

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Whole Structure (ISOMETRIC VIEW)



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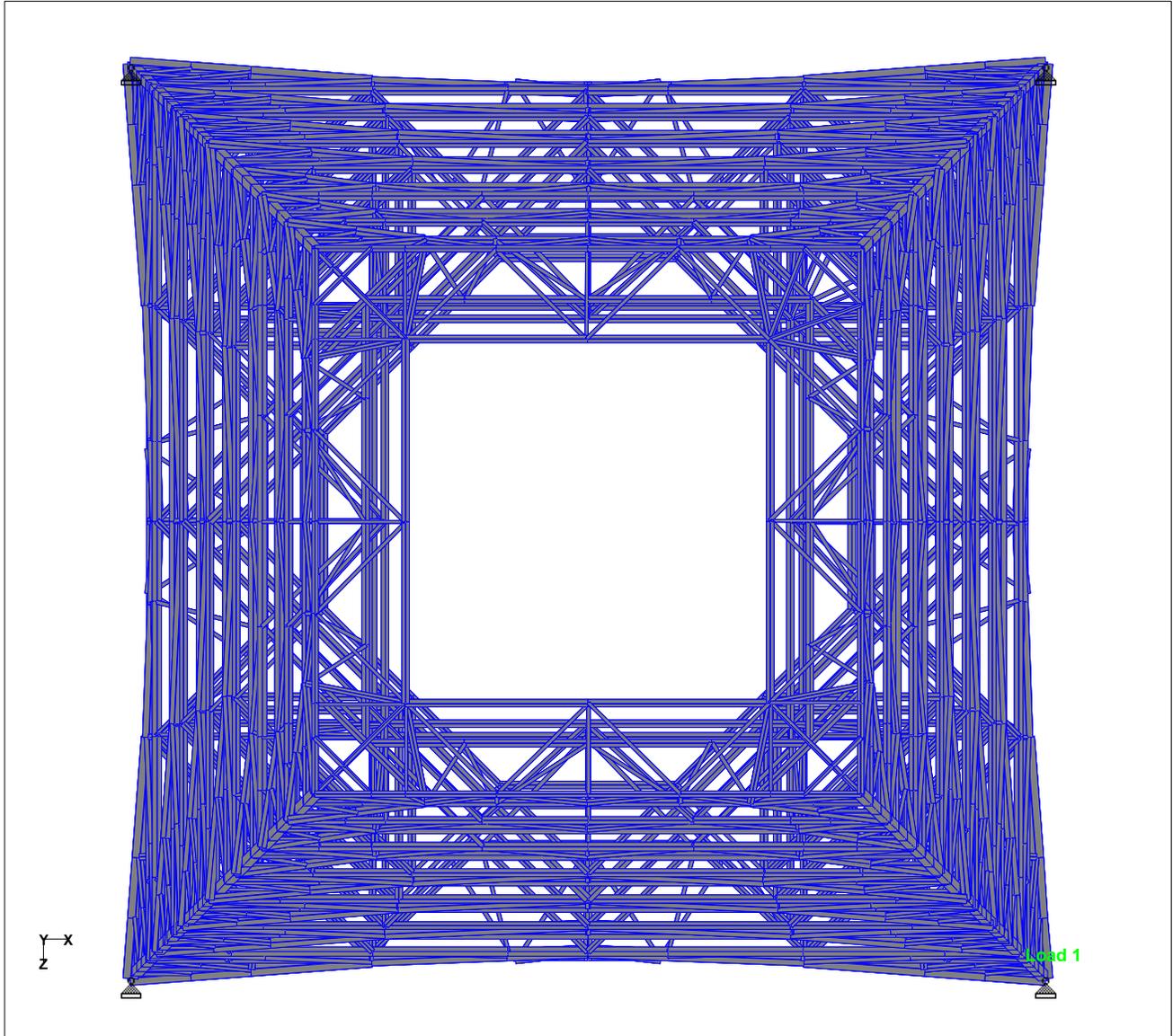
Date 9-Jun-16

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Whole Structure (PLAN VIEW)



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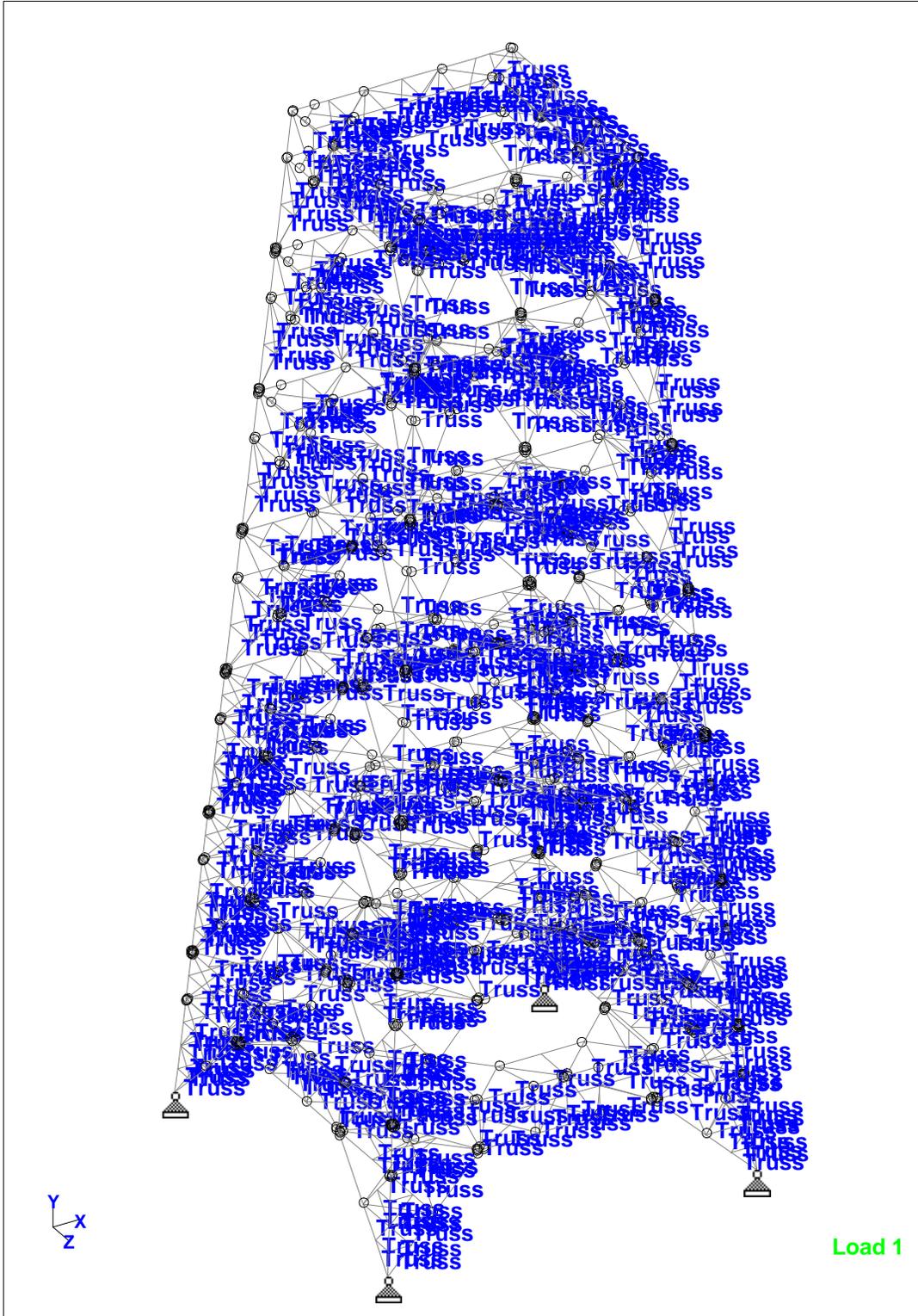
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Whole Structure - Truss Members / Releases



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Ref

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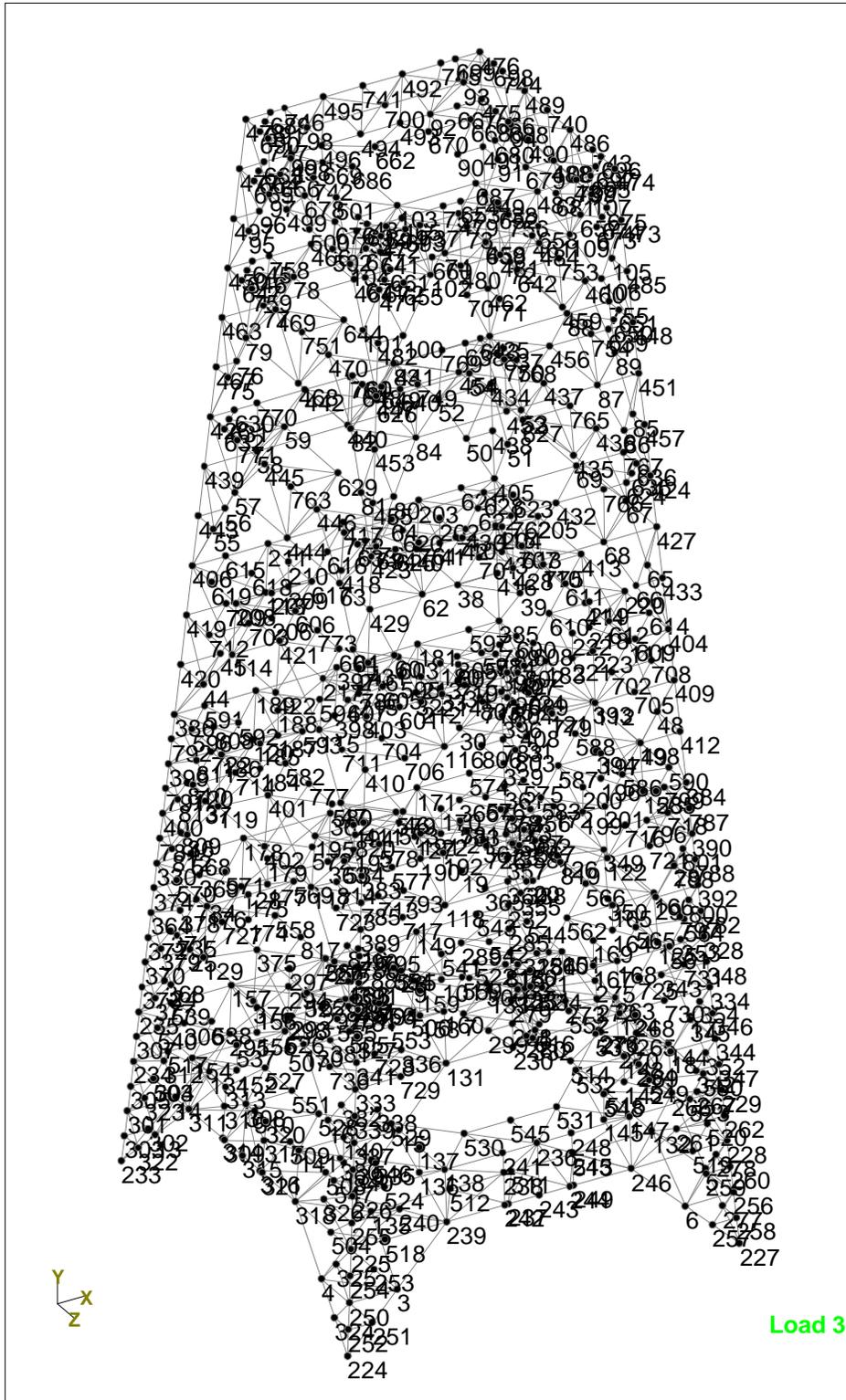
Date 9-Jun-16

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Whole Structure (Node Numbers)



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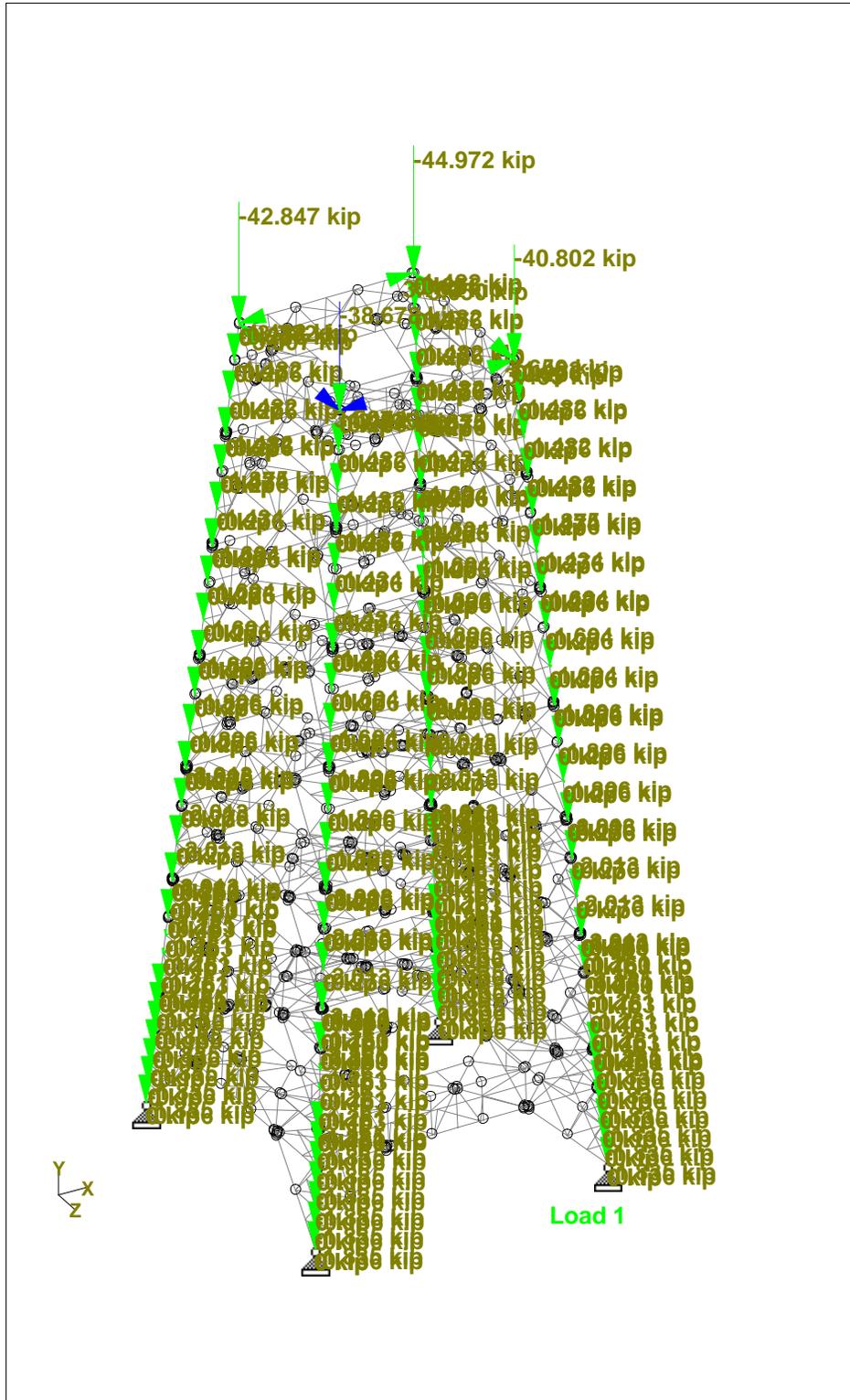
Date 9-Jun-16

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Whole Structure Loads 0.133698kip:1in 1 DEAD ONLY



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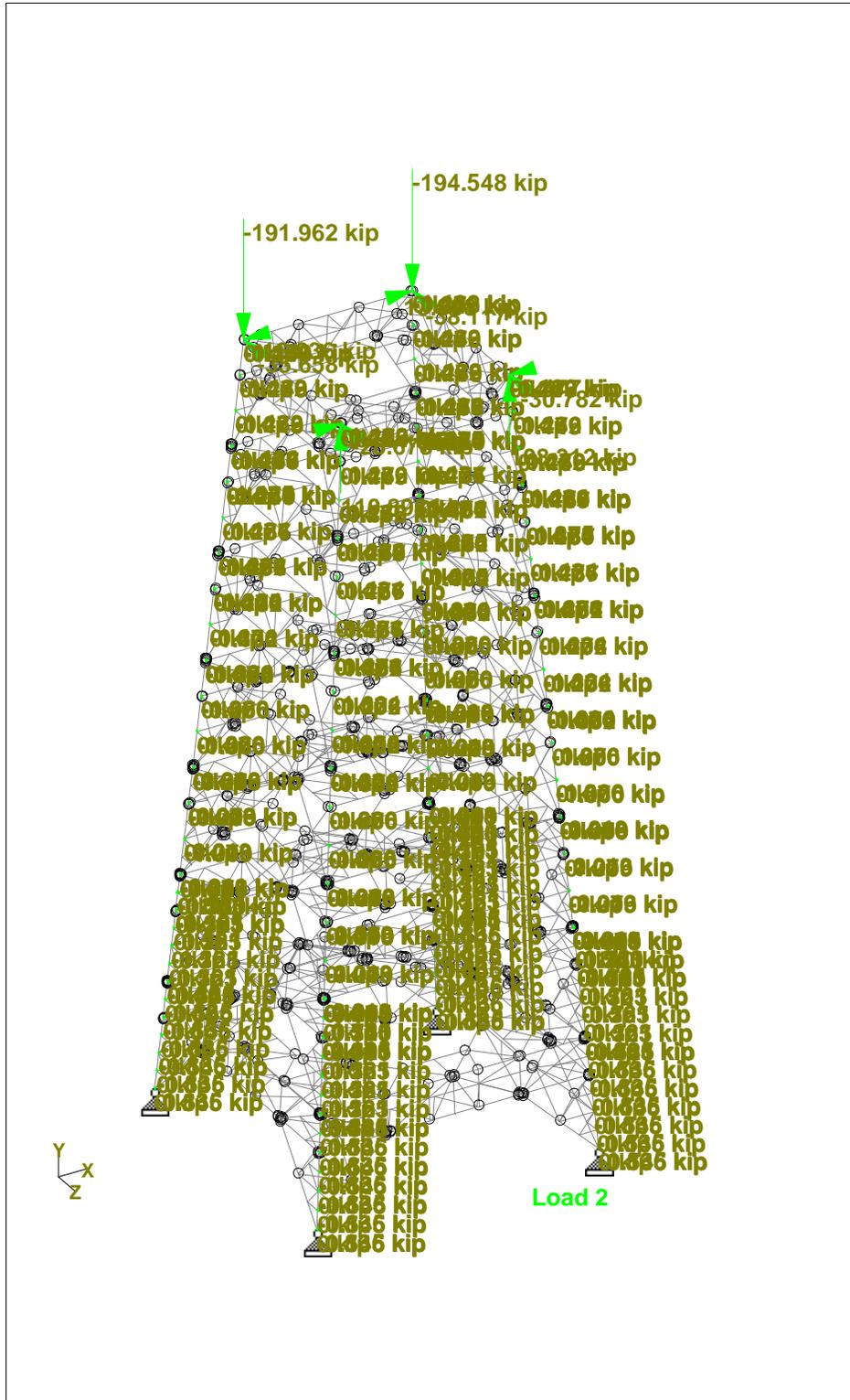
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Whole Structure Loads 0.578378kip:1in 2 DEAD+WIND 0 DEG - NO ICE



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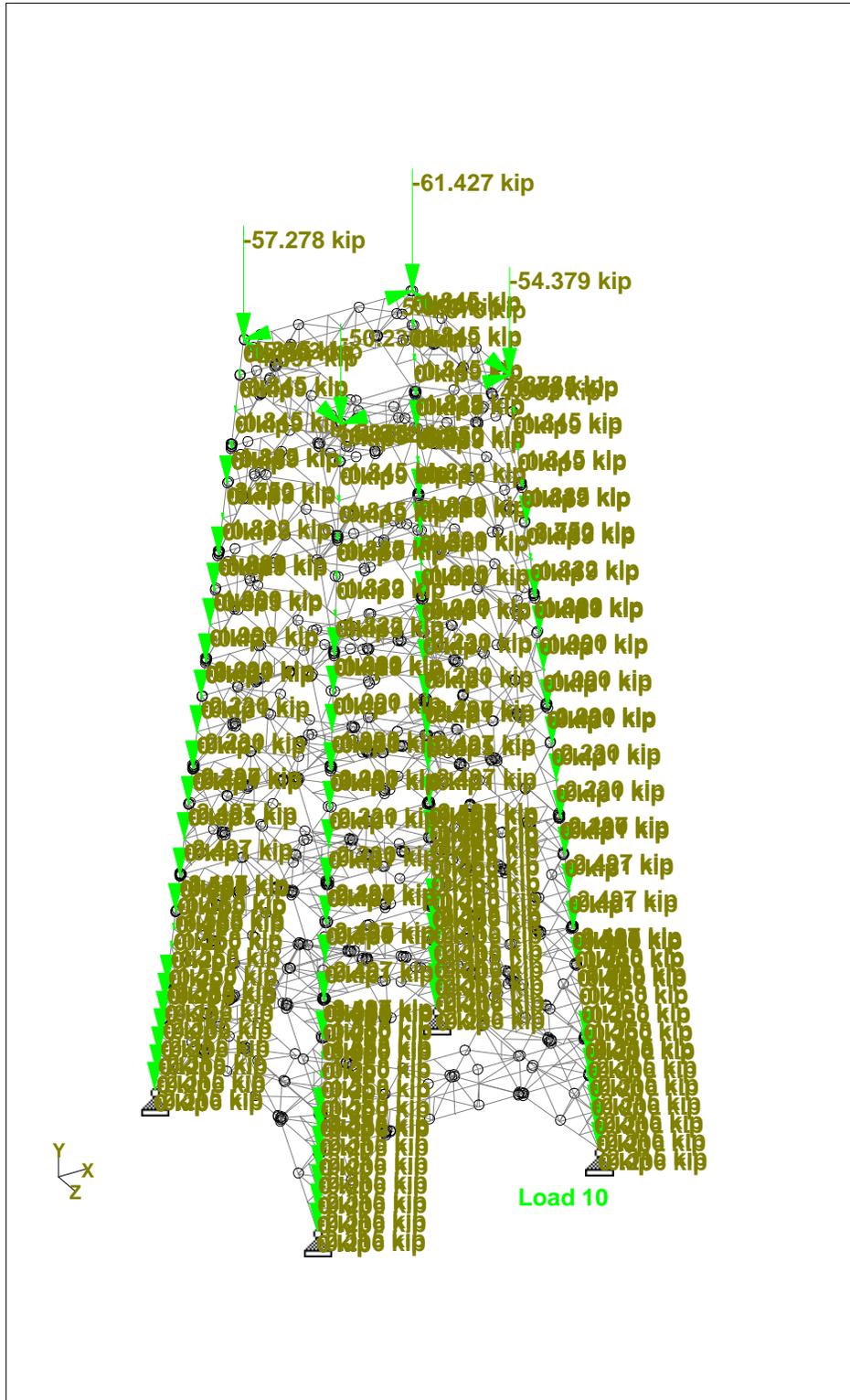
By KM

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Chd HML

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Whole Structure Loads 0.182618kip:1in 10 DEAD+ICE+TEMP



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Whole Structure Loads 0.816649kip: 1in 12 DEAD+WIND 45 DEG+ICE+TEMP



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Whole Structure Loads 0.28754kip:1in 21 DEAD+WIND 90 DEG - SERVICE



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**CT04761S-16V**

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Job Title 351.7ft Self Supporting Tower

Ref

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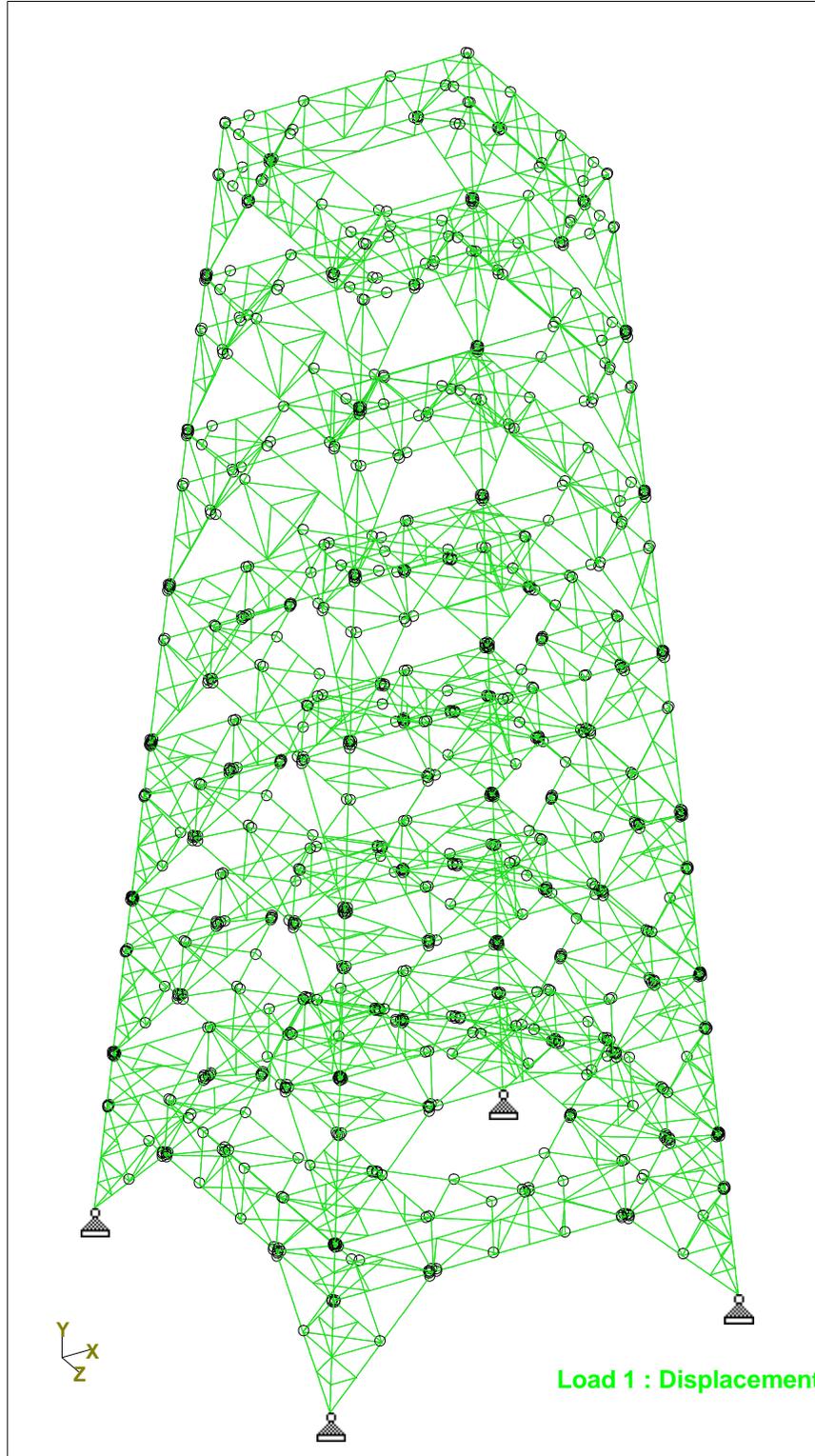
Date 9-Jun-16

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Whole Structure Displacements 1in:1in 1 DEAD ONLY



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Part MODIFICATION ANALYSIS

Job Title 351.7ft Self Supporting Tower

Ref

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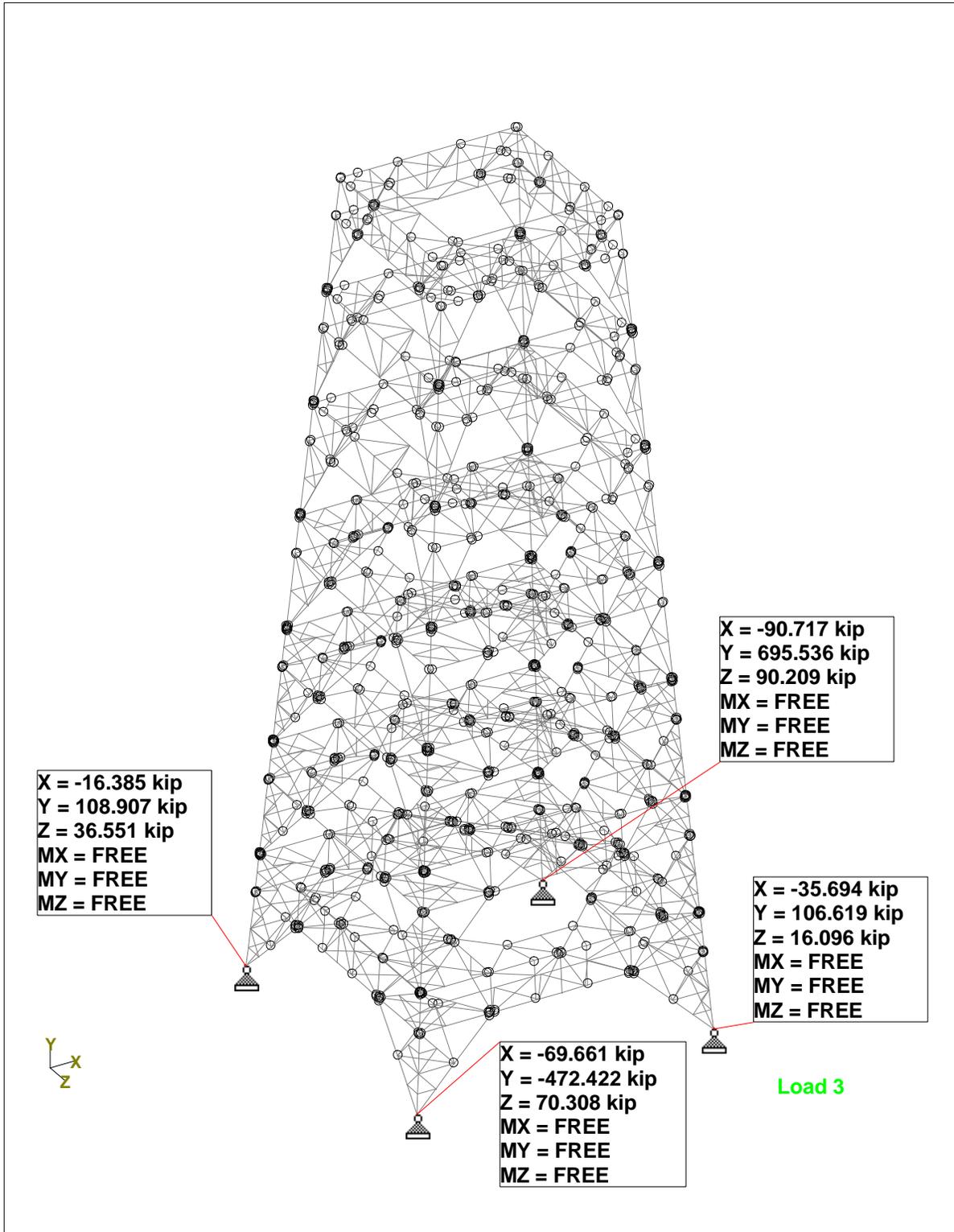
Date 9-Jun-16

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Maximum Stress Ratios

## FOUNDATION DESIGN PRINTOUT

Version: FDN2-D72/AP

```
*****
*          FOUNDATION ANALYSIS PROGRAM          *
*          Spread Footing Analysis              *
*          (c) 1999, Malouf Engineering Intl., Inc. *
*****
```

```
-----
MEI JOB NUMBER = CT-04761S-16V0
DESCRIPTION    = 350' S.S.TOWER / FOUNDATION
SITE NAME     = NORWALK SITE, FAIRFIELD CO., CT
CLIENT NAME   = EMPIRE TELECOM
TIME/DATE/FILE = 13:42:22 / 06-30-2016 / CT04761S.dat
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=====

INPUT DATA

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*LOADS*
COMPRESSION FORCE (1 PEDESTAL) = 695.600 KIPS
UPLIFT FORCE (1 PEDESTAL)     = 472.500 KIPS
SHEAR FORCE (1 PEDESTAL)     = 127.940 KIPS
MOMENT                       = .000 KIP-FT
ECCENTRICTY OF AXIAL LOADS   = .000 FT
```

\*FOOTING DIMENSIONS AND PROPERTIES\*

```
DEPTH OF FOOTING           = 14.000 FT
FOOTING DIMENSIONS (L X B) = 20.000 x 20.000 FT
THICKNESS OF FOOTING      = 3.000 FT (FOOTING HAS NO TOE)
NUMBER OF PEDESTALS / TYPE = 1 / SQUARE
PEDESTAL WIDTH            = 6.500 FT
EXTENSION ABOVE GRADE     = .500 FT
CONCRETE DENSITY          = .150 KCF
GROUNDWATER LEVEL BELOW BOTTOM OF FOUNDATION
```

\*FACTOR OF SAFETY VALUES\*

```
F.O.S. BEARING PRESSURE   = 2.000
F.O.S. CONCRETE WEIGHT    = 1.250 / 1.500
F.O.S. SOIL WEIGHT        = 2.000 / 1.500
F.O.S. UPLIFT             = 2.000
```

\*SOIL PROPERTIES\*

```
ULTIMATE BEARING CAPACITY = 12.000 KSF
SOIL DENSITY              = .100 KCF
INTERNAL ANGLE OF FRICTION = 30.000 DEG
SOIL COHESION (FOR UPLIFT) = .000 KSF (PAD PERIMETER)
PASSIVE PRESSURE          = .300 KCF (Kp= 3.00)
DEPTH NEGLECTED FOR PASSIVE PR. = 4.000 FT
BASE SOIL/CONCRETE FRICTION = .150
```

\*\*\* COMMENTS \*\*\*

```
-FOUNDATION DRAWING NOT MADE AVAILABLE. SOIL STABILITY CHECK ONLY
-FOUNDATION DETAILS AS PER GPD FOUNDATION CALCULATIONS
-GEOTECHNICAL REPORT NOT MADE AVAILABLE. SOIL PARAMETERS
AS PER GPD FOUNDATION CALCULATIONS
```

```
=====
RESULTS
=====
VOL./WT. OF SOIL ABOVE   = 3935.3 FT3 / 393.525 KIPS
VOL./WT. OF SOIL WEDGE  = 698.6 FT3 / 69.859 KIPS (FOR OVERTURNING)
                          = 3259.0 FT3 / 325.898 KIPS (FOR UPLIFT)
VOL./WT. OF PEDESTAL(S) = 485.9 FT3 / 72.881 KIPS
VOL./WT. OF FOOTING     = 1200.0 FT3 / 180.000 KIPS

TOTAL RESISTING MOMENT   = 15158.5 KIP-FT
TOTAL OVERTURNING MOMENT = 1855.1 KIP-FT
F.O.S. OVERTURNING      = 8.171 > 1.500 (OK) R= .184
```

```
SOIL PRESSURES (KSF) = 4.921 GROSS / 1.575 IN-SITU / 2.138 PMIN
FRICTION RESISTANCE(ALLW) = .000 KIPS (SKF= .000KSF)
TOTAL DOWNLOAD CAPACITY = 6.000 KSF > 3.346 KSF (OK) R= .558
SOIL SHEAR CAPACITY     = 153.00 (PASSIVE) + 129.63 (FRICTION)
                          = 282.6 KIPS > 127.9 KIPS (OK) R= .453
UPLIFT CAPACITY         = 562.0 KIPS > 472.5 KIPS (OK) R= .841
PUNCHING CHECK (WIDE BEAM)= 93.1 PSI > 74.4 PSI (OK) R= .799
(2-WAY)                 = 186.2 PSI > 40.9 PSI (OK) R= .220
```

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**APPENDIX 2 – SOURCE / CHANGED CONDITION**

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## AT&T Loading Changes

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

A	Call Sign	KNKA259
	Class of Station	CL
	Emission Type	cellular
	Transmit Frequency	880-890, 891.5-894
	Output Power (watts)	63
	Transmitter ERP (dBm)	48
	Receive Frequency	835-845, 846.5-849

D	Call Sign	KNLB297
	Class of Station	WS
	Emission Type	LTE 2300
	Transmit Frequency	2345-2350
	Output Power (watts)	631 per sector
	Transmitter ERP (dBm)	58
	Receive Frequency	2345-2350

Coax / Waveguide / Cable Information	
Type:	andrew
Size:	1 5/8"
Length:	347'
# of runs:	12

A	Call Sign	WPSL626
	Class of Station	CW-PCS
	Emission Type	GSM / UMTS
	Transmit Frequency	1930-1940
	Output Power (watts)	502 per sector
	Transmitter ERP (dBm)	54
	Receive Frequency	1850-1860

D	Call Sign	KNLB312
	Class of Station	WS
	Emission Type	LTE2300
	Transmit Frequency	2350-2355
	Output Power (watts)	631 per sector
	Transmitter ERP (dBm)	58
	Receive Frequency	2305-2310

Type:	DC Trunk line	for squids
Size:	3/4"	
Length:	347'	
# of runs:	6	

A	Call Sign	KNLGS02
	Class of Station	CW-PCS
	Emission Type	GSM / UMTS
	Transmit Frequency	1965-1790
	Output Power (watts)	502 per sector
	Transmitter ERP (dBm)	54
	Receive Frequency	1885-1890

D	Call Sign	KNLB204
	Class of Station	WS
	Emission Type	LTE2300
	Transmit Frequency	2310-2315
	Output Power (watts)	631 per sector
	Transmitter ERP (dBm)	58
	Receive Frequency	2355-2360

Type:	Fiber trunk	for squids
Size:	5/8"	
Length:	347'	
# of runs:	2	

B	Call Sign	WPWV368
	Class of Station	WZ 700 MHz
	Emission Type	LTE (C)
	Transmit Frequency	740-746
	Output Power (watts)	631 per sector
	Transmitter ERP (dBm)	58
	Receive Frequency	710-716

B	Call Sign	WQUJ459
	Class of Station	WY 700 MHz
	Emission Type	LTE (B)
	Transmit Frequency	734-740
	Output Power (watts)	631 per sector
	Transmitter ERP (dBm)	58
	Receive Frequency	704-710

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	
B	KMW	AM-X-CD-16-65-00T-RET	x		72" x 11.8" x 5.9"	48.5 lbs	116	347'	347'	349'	
B	KMW	AM-X-CD-16-65-00T-RET	x		72" x 11.8" x 5.9"	48.5 lbs	234	347'	347'	349'	
B	KMW	AM-X-CD-16-65-00T-RET	x		72" x 11.8" x 5.9"	48.5 lbs	346	347'	347'	349'	
B	Powerwave	P65-16-XLH-RR	x		72"x12"x6"	64 lbs ea	116	347'	347'	350'	Removed
B	Powerwave	P65-16-XLH-RR	x		72"x12"x6"	64 lbs ea	234	347'	347'	350'	Removed
B	Powerwave	P65-16-XLH-RR	x		72"x12"x6"	64 lbs ea	346	347'	347'	350'	Removed
A	Powerwave	7770	x		55"x11"x5"	35 lbs	116	347'	347'	349'	
A	Powerwave	7770	x		55"x11"x5"	35 lbs	234	347'	347'	349'	
A	Powerwave	7770	x		55"x11"x5"	35 lbs	346	347'	347'	349'	
A	Powerwave	7770	x		55"x11"x5"	35 lbs	116	347'	347'	349'	to be removed
A	Powerwave	7770	x		55"x11"x5"	35 lbs	234	347'	347'	349'	to be removed
A	Powerwave	7770	x		55"x11"x5"	35 lbs	346	347'	347'	349'	to be removed
	Powerwave	LGP 21401	x		6"x8"x2"	7.7 lbs ea		347'	347'		12 total 4 per sector (TMA)
	Powerwave	7020	x		2.2"x1"x6"	.5 lbs ea			347'		2 (In total) RET Motor attached to bottom of antenna
D	CCI	OPA-65R-LCUU-H4		x	48" x 14.4" x 7.3"	57 lbs	116	347'	347'	349'	
D	CCI	OPA-65R-LCUU-H4		x	48" x 14.4" x 7.3"	57 lbs	234	347'	347'	349'	
D	CCI	OPA-65R-LCUU-H4		x	48" x 14.4" x 7.3"	57 lbs	346	347'	347'	349'	
	Ericsson	RRUS-11	x		17" x 17" x 6"	60 lbs ea	116/234/346	347'	347'		6 radio heads 2 per sector
	Ericsson	RRUS-32		x	17" x 17" x 6"	71 lbs ea	116/234/346	347'	347'		3 radio heads 1 per sector
	RAYCAP	DC6-48-60-18-8F	x		8.3" diameter X 26" Tall	25lbs	116		347'		fiber and DC junction box
	RAYCAP	DC6-48-60-18-8F		x	8.3" diameter X 26" Tall	25lbs	234		347'		fiber and DC junction box
	Commscope	MTC3615 AD A		x	12.5" T-arm	2293lbs			347'		mounting hardware to replace existing
	Ericsson	RRUS-11		x	17" x 17" x 6"	50 lbs ea	116/234/346	347'	347'		3 radio heads 1 per sector
	RAYCAP	DC6-48-60-18-8F		x	8.3" diameter X 26" Tall	25lbs	346		347'		fiber and DC junction box
	Raycap	FC12-PC6-10E	x		16" x 16" x 7"	6 lbs			347'		to be removed
	Raycap	DC2-48-60-0-9E	x		10" x 11" x 6"	3.5 lbs			347'		3 to be removed

AT&T confirmed (6/9/16) new mounts will be used



---

**From:** Hisert, Michelle [CNO] [<mailto:Michelle.Hisert@sprint.com>]  
**Sent:** Monday, January 25, 2016 3:36 PM  
**To:** Dave Cooper; McOmber, Elissa; [krichers@transcendwireless.com](mailto:krichers@transcendwireless.com)  
**Cc:** 'Richard Pretorius'; Monell, Gillian; 'Liz Adkins'; 'Mark Malouf'  
**Subject:** RE: AT&T / T-Mobile / Sprint - Frontier's Norwalk Tower - Mapping & SA - 01/05/2016  
**Importance:** High

Dave,

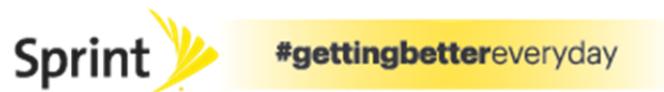
I have been advised to inform you that Sprint will not be adding the additional equipment at this time. I am revising the PDQ to reflect just the removal of the legacy equipment.

Thank you

**Michelle Hisert**

Real Estate Manager III  
Upstate NY, Buffalo, Rochester and Southern Connecticut  
Sprint, Regional Site Development  
O: 518-862-6903 / M: 518-844-5434  
[michelle.hisert@sprint.com](mailto:michelle.hisert@sprint.com)

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# SITE NAME: WESTPORT-SNET LL

10 WILLARD ROAD (SNET LL)  
 NORWALK, CT 06855  
 FAIRFIELD COUNTY

**SITE NUMBER: CT11011D**

**RF DESIGN GUIDELINE: 702CU & 792DB**

### T-MOBILE TECHNICIAN SITE SAFETY NOTES

LOCATION	SPECIAL RESTRICTIONS
SECTOR A: ANTENNA/TMA	ACCESS NOT PERMITTED
SECTOR B: ANTENNA/TMA	ACCESS NOT PERMITTED
SECTOR C: ANTENNA/TMA	ACCESS NOT PERMITTED
GPS/LMU:	CAUTION: OSHA-APPROVED PORTABLE 8' STEP-LADDER REQUIRED
RADIO CABINETS:	UNRESTRICTED
PPC DISCONNECT:	UNRESTRICTED
MAIN CIRCUIT D/C:	UNRESTRICTED
NIU/T DEMARC:	UNRESTRICTED
OTHER/SPECIAL:	NONE

### T-MOBILE NORTHEAST LLC

15 COMMERCE WAY, SUITE B  
 NORTON, MA 02766  
 OFFICE: (508) 286-2700  
 FAX: (508) 286-2893

TRANSCEND WIRELESS  
 10 INDUSTRIAL AVE  
 MAHWAH, NJ 07430  
 TEL: (201) 684-0055  
 FAX: (201) 684-0066



1600 OSGOOD STREET  
 BUILDING 20 NORTH, SUITE 3090  
 N. ANDOVER, MA 01845  
 TEL: (978) 557-5553  
 FAX: (978) 336-5586



CHECKED BY: DR

APPROVED BY: DJC

### SUBMITTALS

REV.	DATE	DESCRIPTION	BY
2	08/29/16	ISSUED FOR CONSTRUCTION	VP
1	08/16/16	ISSUED FOR CONSTRUCTION	VP
0	08/09/16	ISSUED FOR REVIEW	VP

SITE NUMBER:  
 CT11011D  
 SITE NAME:  
 WESTPORT-SNET  
 LL  
 SITE ADDRESS:  
 10 WILLARD ROAD (SNET LL)  
 NORWALK, CT 06855  
 FAIRFIELD COUNTY

SHEET TITLE  
 TITLE SHEET  
 (L700 & L1900)

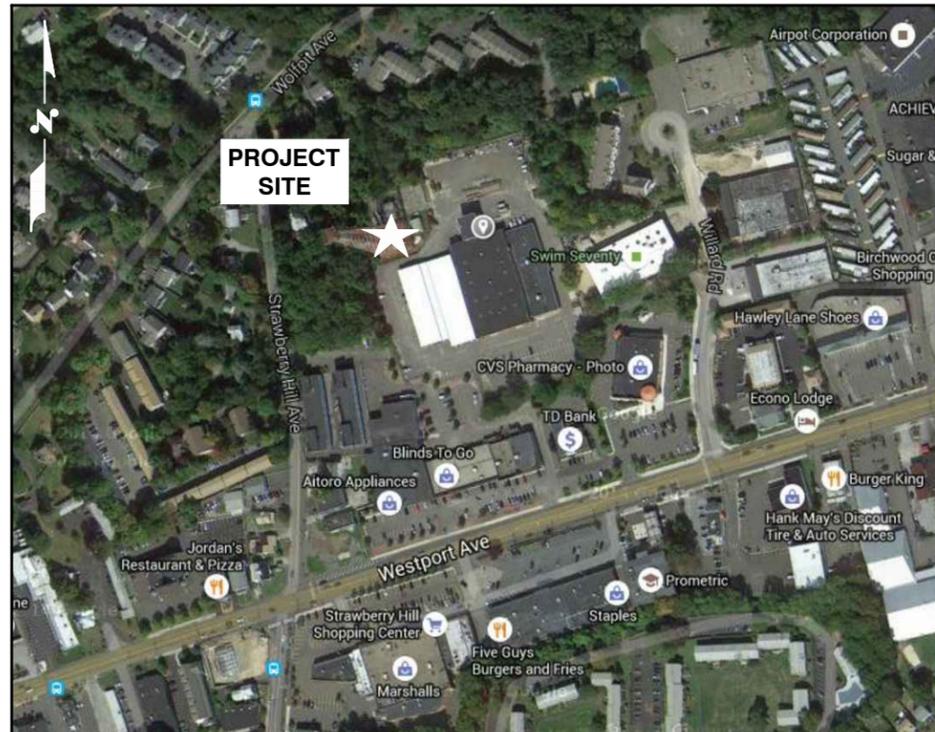
SHEET NUMBER  
**T-1**

### GENERAL NOTES

THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF T-MOBILE. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.

THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.

CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE T-MOBILE NORTHEAST, LLC REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.



### PROJECT SUMMARY

SCOPE OF WORK: UNMANNED TELECOMMUNICATIONS FACILITY T-MOBILE EQUIPMENT MODERNIZATION

ZONING JURISDICTION: (CITY OF NORWALK) BASED ON INFORMATION PROVIDED BY T-MOBILE, THIS TELECOMMUNICATIONS EQUIPMENT DEPLOYMENT IS AN ELIGIBLE FACILITY UNDER THE TAX RELIEF ACT OF 2012, 47 USC 1455(A), AND IS SUBJECT TO AN EXPEDITED ELIGIBLE FACILITIES REQUEST/REVIEW AND ZONING PRE-EMPTION FOR LOCAL DISCRETIONARY PERMITS (VARIANCE, SPECIAL PERMIT, SITE PLAN REVIEW).

SITE ADDRESS: 10 WILLARD ROAD (SNET LL)  
 NORWALK, CT 06855

LATITUDE: 41° 07' 41.80" N

LONGITUDE: 73° 23' 24.90" W

JURISDICTION: NATIONAL, STATE & LOCAL CODES OR ORDINANCES

CURRENT USE: TELECOMMUNICATIONS FACILITY

PROPOSED USE: TELECOMMUNICATIONS FACILITY

### APPROVALS

PROJECT MANAGER	DATE
CONSTRUCTION	DATE
RF ENGINEERING	DATE
ZONING / SITE ACQ.	DATE
OPERATIONS	DATE
TOWER OWNER	DATE

72 HOURS

CALL BEFORE YOU DIG  
 CALL TOLL FREE 1-800-922-4455  
 OR CALL 811

**UNDERGROUND SERVICE ALERT**

### DRAWING INDEX

SHEET NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	2
GN-1	GENERAL NOTES	2
A-1	COMPOUND & EQUIPMENT PLANS	2
A-2	ANTENNA LAYOUTS & ELEVATION	2
A-3	DETAILS	2
E-1	ONE-LINE DIAGRAM AND GROUNDING DETAILS	2

**GROUNDING NOTES**

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTNING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.
2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.
3. THE SUBCONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR NEW GROUND ELECTRODE SYSTEMS. THE SUBCONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.
4. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.
5. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS 2 AWG STRANDED COPPER FOR OUTDOOR BTS.
6. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.
7. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.
8. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO GROUND BAR.
9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.
10. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.
11. METAL CONDUIT SHALL BE MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWS COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.
12. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE OF 1/2 IN. OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID BARE TINNED COPPER GROUND WIRE, PER NEC 250.50

**GENERAL NOTES**

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:  
 CONTRACTOR – TRANSCEND WIRELESS  
 SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)  
 OWNER – T-MOBILE
2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CONTRACTOR.
3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
4. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.
5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.
7. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.
9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.
10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.
11. SUBCONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.
12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.
13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.

14. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.
15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.
16. CONSTRUCTION SHALL COMPLY WITH SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF T-MOBILE SITES."
17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.
19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

20. APPLICABLE BUILDING CODES:  
 SUBCONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.  
 BUILDING CODE: 2003 IBC WITH 2005 CT SUPPLEMENT, + 2009 & 2013 CT AMENDMENTS  
 ELECTRICAL CODE: REFER TO ELECTRICAL DRAWINGS  
 LIGHTENING CODE: REFER TO ELECTRICAL DRAWINGS

SUBCONTRACTOR'S WORK SHALL COMPLY WITH THE LATEST EDITION OF THE FOLLOWING STANDARDS:

AMERICAN CONCRETE INSTITUTE (ACI) 318; BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE;

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

MANUAL OF STEEL CONSTRUCTION, ASD, FOURTEENTH EDITION;

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 222-F, STRUCTURAL STANDARDS FOR STEEL

EQUIPMENT AND ANTENNA SUPPORTING STRUCTURES; REFER TO ELECTRICAL DRAWINGS FOR SPECIFIC ELECTRICAL STANDARDS.

FOR ANY CONFLICTS BETWEEN SECTIONS OF LISTED CODES AND STANDARDS REGARDING MATERIAL, METHODS OF CONSTRUCTION, OR OTHER REQUIREMENTS, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. WHERE THERE IS CONFLICT BETWEEN A GENERAL REQUIREMENT AND A SPECIFIC REQUIREMENT, THE SPECIFIC REQUIREMENT SHALL GOVERN.

ABBREVIATIONS					
AGL	ABOVE GRADE LEVEL	EQ	EQUAL	REQ	REQUIRED
AWG	AMERICAN WIRE GAUGE	GC	GENERAL CONTRACTOR	RF	RADIO FREQUENCY
BBU	BATTERY BACKUP UNIT	GRC	GALVANIZED RIGID CONDUIT	TBD	TO BE DETERMINED
BTCW	BARE TINNED SOLID COPPER WIRE	MGB	MASTER GROUND BAR	TBR	TO BE REMOVED
BGR	BURIED GROUND RING	MIN	MINIMUM	TBRR	TO BE REMOVED AND REPLACED
BTS	BASE TRANSCEIVER STATION	P	PROPOSED	TYP	TYPICAL
E	EXISTING	NTS	NOT TO SCALE	UG	UNDER GROUND
EGB	EQUIPMENT GROUND BAR	RAD	RADIATION CENTER LINE (ANTENNA)	VIF	VERIFY IN FIELD
EGR	EQUIPMENT GROUND RING	REF	REFERENCE		

**T-MOBILE NORTHEAST LLC**

15 COMMERCE WAY, SUITE B  
 NORTON, MA 02766  
 OFFICE: (508) 286-2700  
 FAX: (508) 286-2893

TRANSCEND WIRELESS  
 10 INDUSTRIAL AVE  
 MAHWAH, NJ 07430  
 TEL: (201) 684-0055  
 FAX: (201) 684-0066

1600 OSGOOD STREET  
 BUILDING 20 NORTH, SUITE 3090  
 N. ANDOVER, MA 01845  
 TEL: (978) 557-5553  
 FAX: (978) 336-5566



CHECKED BY: DR

APPROVED BY: DJC

SUBMITTALS			
REV.	DATE	DESCRIPTION	BY
2	08/29/16	ISSUED FOR CONSTRUCTION	VP
1	08/16/16	ISSUED FOR CONSTRUCTION	VP
0	08/09/16	ISSUED FOR REVIEW	VP

SITE NUMBER:  
 CT11011D  
 SITE NAME:  
 WESTPORT-SNET  
 LL  
 SITE ADDRESS:  
 10 WILLARD ROAD (SNET LL)  
 NORWALK, CT 06855  
 FAIRFIELD COUNTY

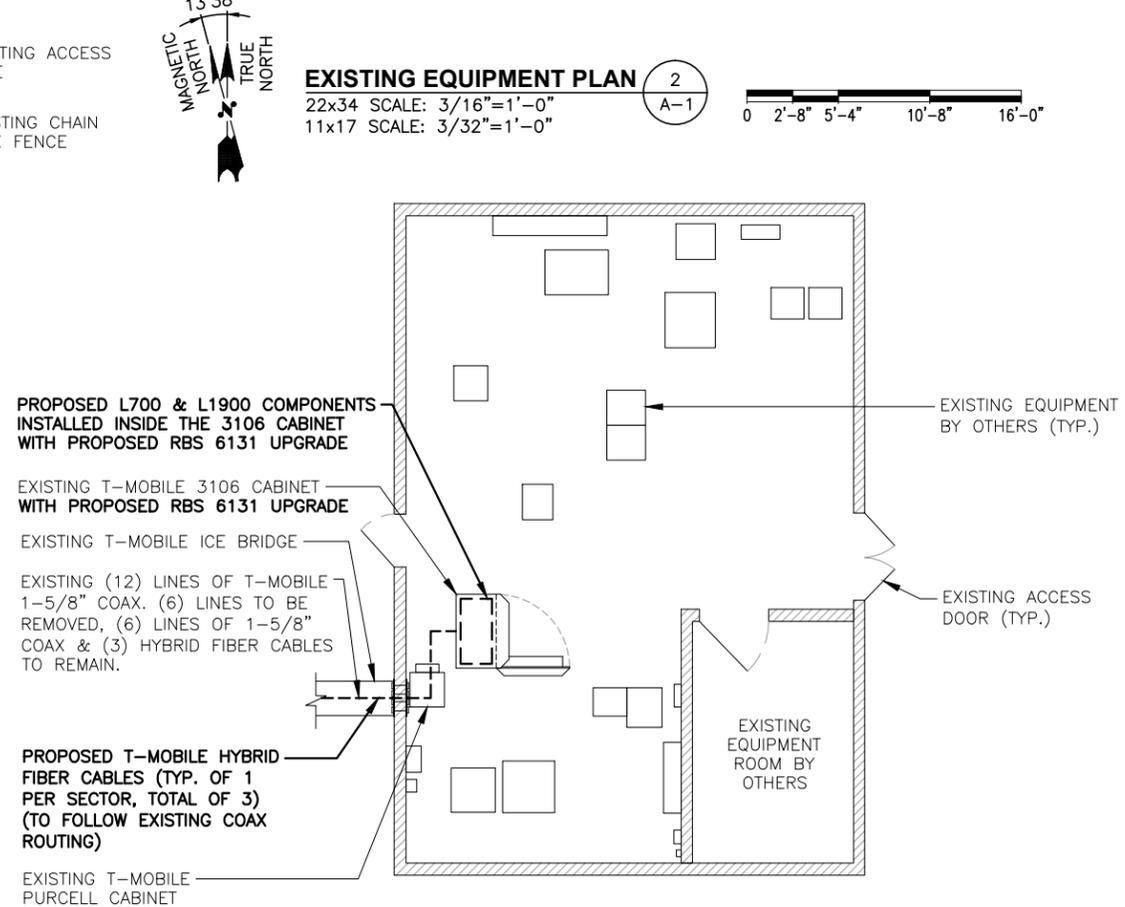
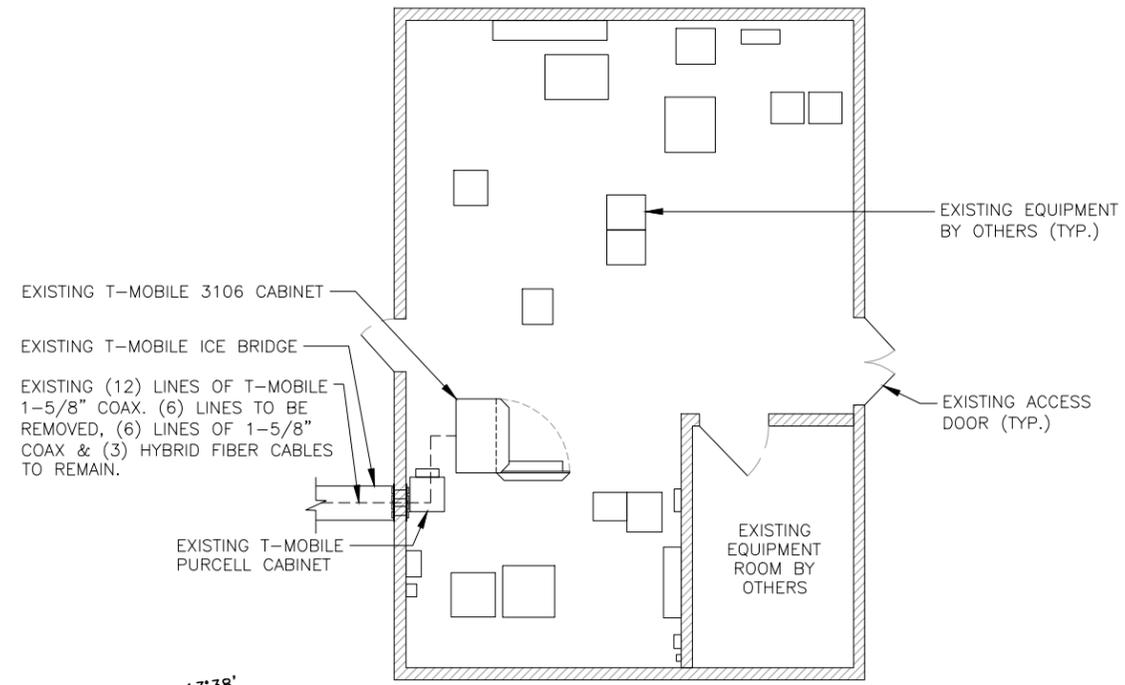
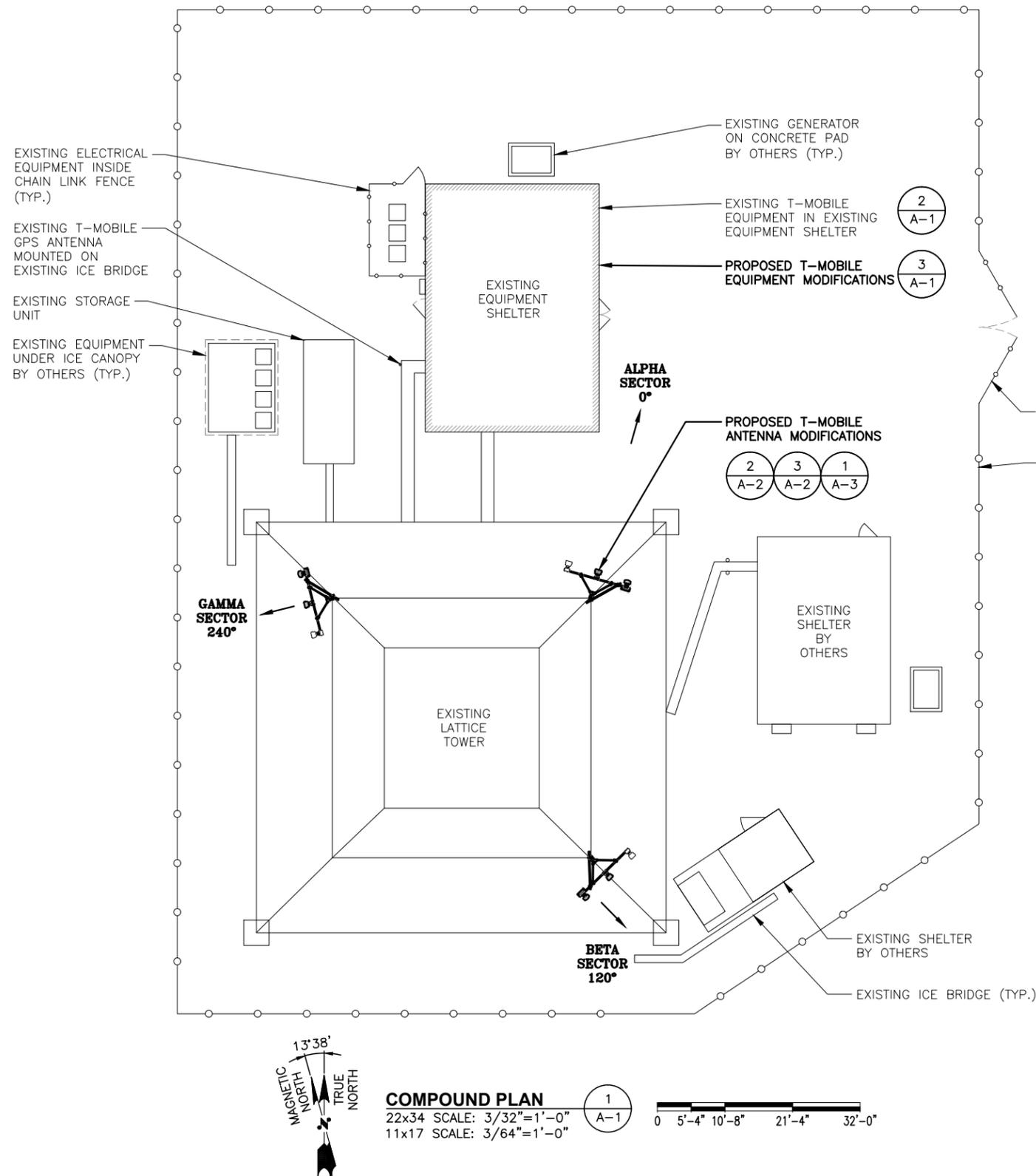
SHEET TITLE  
 GENERAL NOTES  
 (L700 & L1900)

SHEET NUMBER  
**GN-1**

**STRUCTURAL NOTES:**  
 PRIOR TO COMMENCING CONSTRUCTION, GC SHALL REFER TO STRUCTURAL ANALYSIS PROVIDED BY MALOUF ENGINEERING INTL., INC. DATED: JULY 1, 2016 TO DETERMINE IF THERE ANY SUPPLEMENTAL OR SPECIAL INSTALLATION REQUIREMENTS, OR RELOCATION ARRANGEMENTS.

**NOTE:**  
 REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

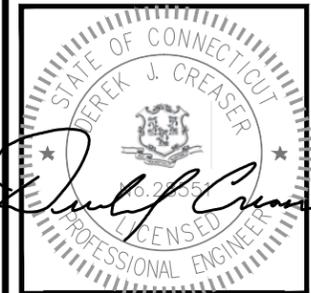
**NOTE:**  
 PROPOSED T-MOBILE ANTENNAS TO BE PAINTED TO MATCH THE EXISTING.



**T-MOBILE NORTHEAST LLC**  
 15 COMMERCE WAY, SUITE B  
 NORTON, MA 02766  
 OFFICE: (508) 286-2700  
 FAX: (508) 286-2893

TRANSCEND WIRELESS  
 10 INDUSTRIAL AVE  
 MAHWAH, NJ 07430  
 TEL: (201) 684-0055  
 FAX: (201) 684-0066

**Hudson Design Group, Inc.**  
 1600 OSGOOD STREET  
 BUILDING 20 NORTH, SUITE 3090  
 N. ANDOVER, MA 01845  
 TEL: (978) 557-5553  
 FAX: (978) 336-5566



CHECKED BY: DR

APPROVED BY: DJC

**SUBMITTALS**

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**CT11011D**  
 SITE NAME:  
**WESTPORT-SNET LL**  
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 10 WILLARD ROAD (SNET LL)  
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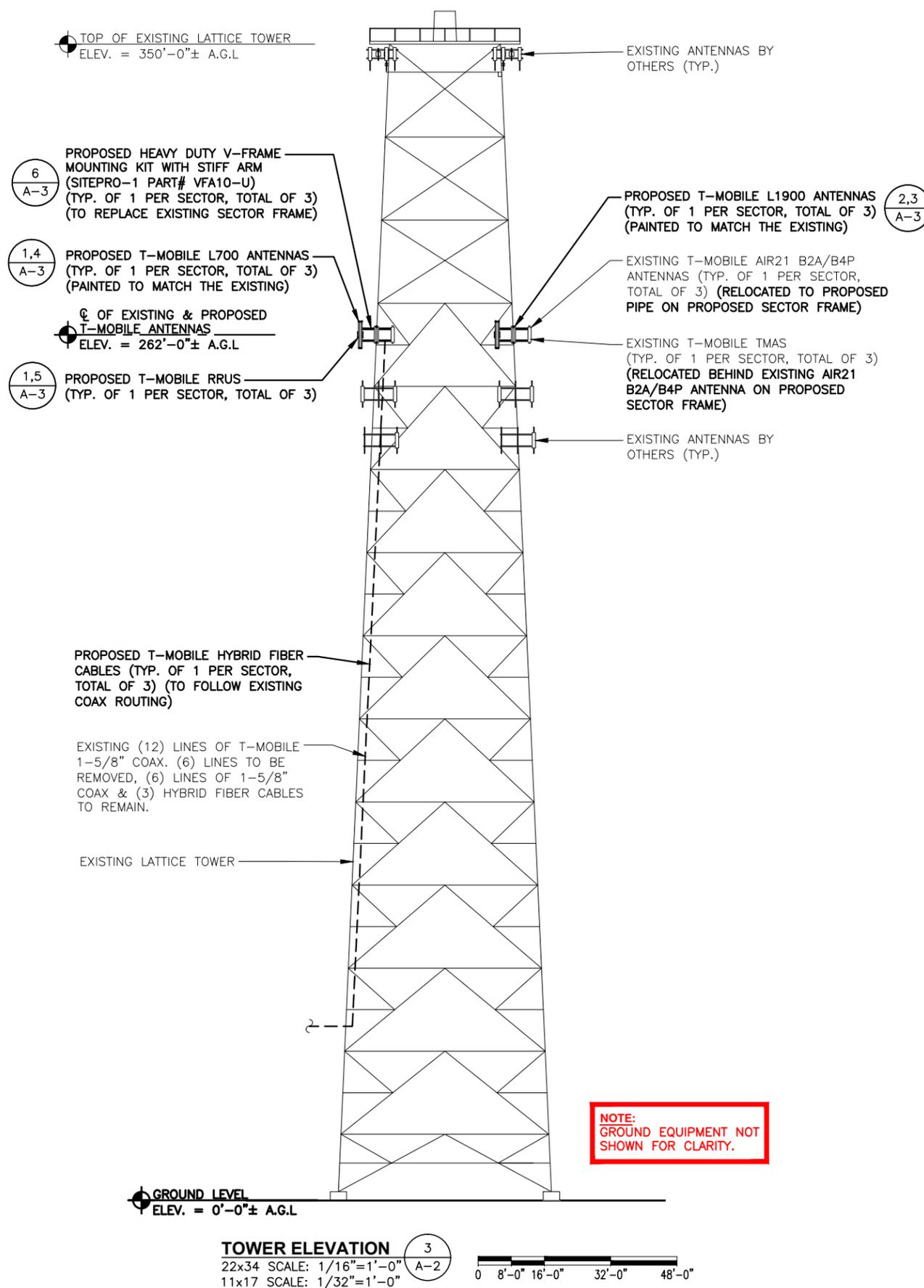
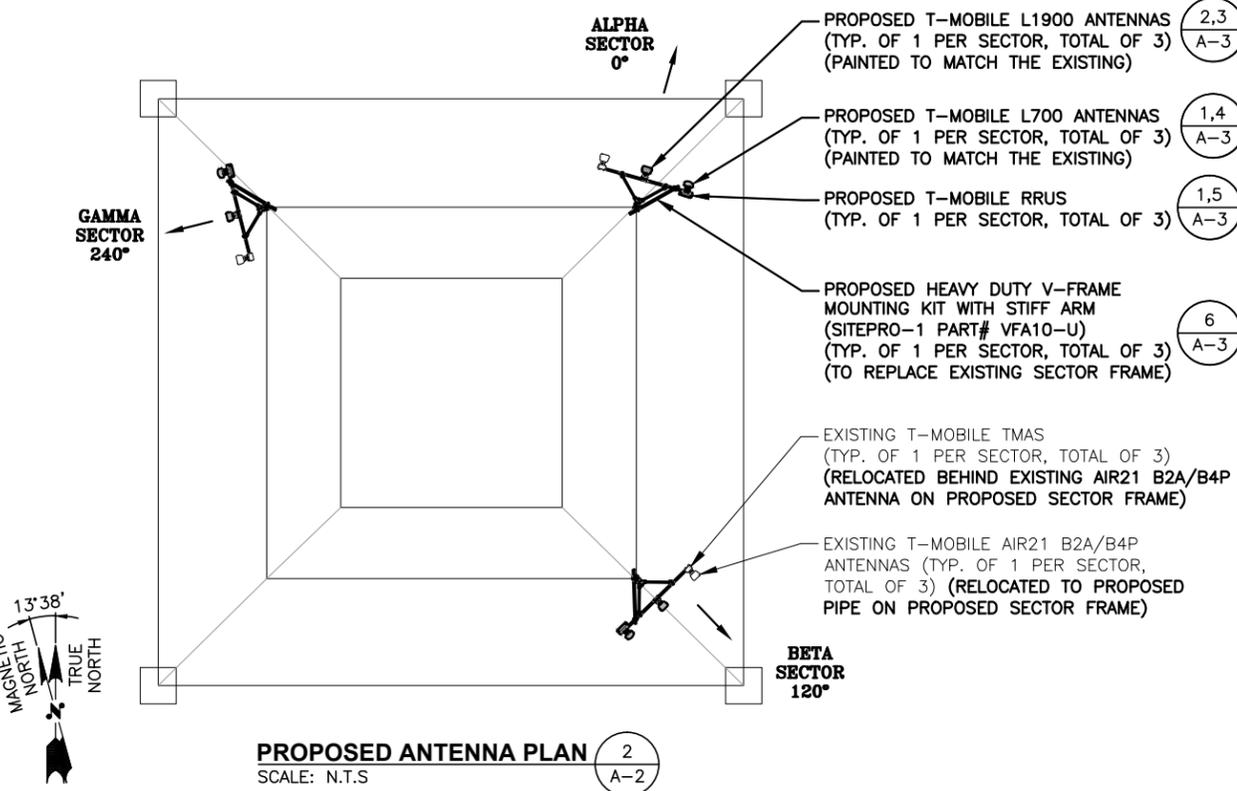
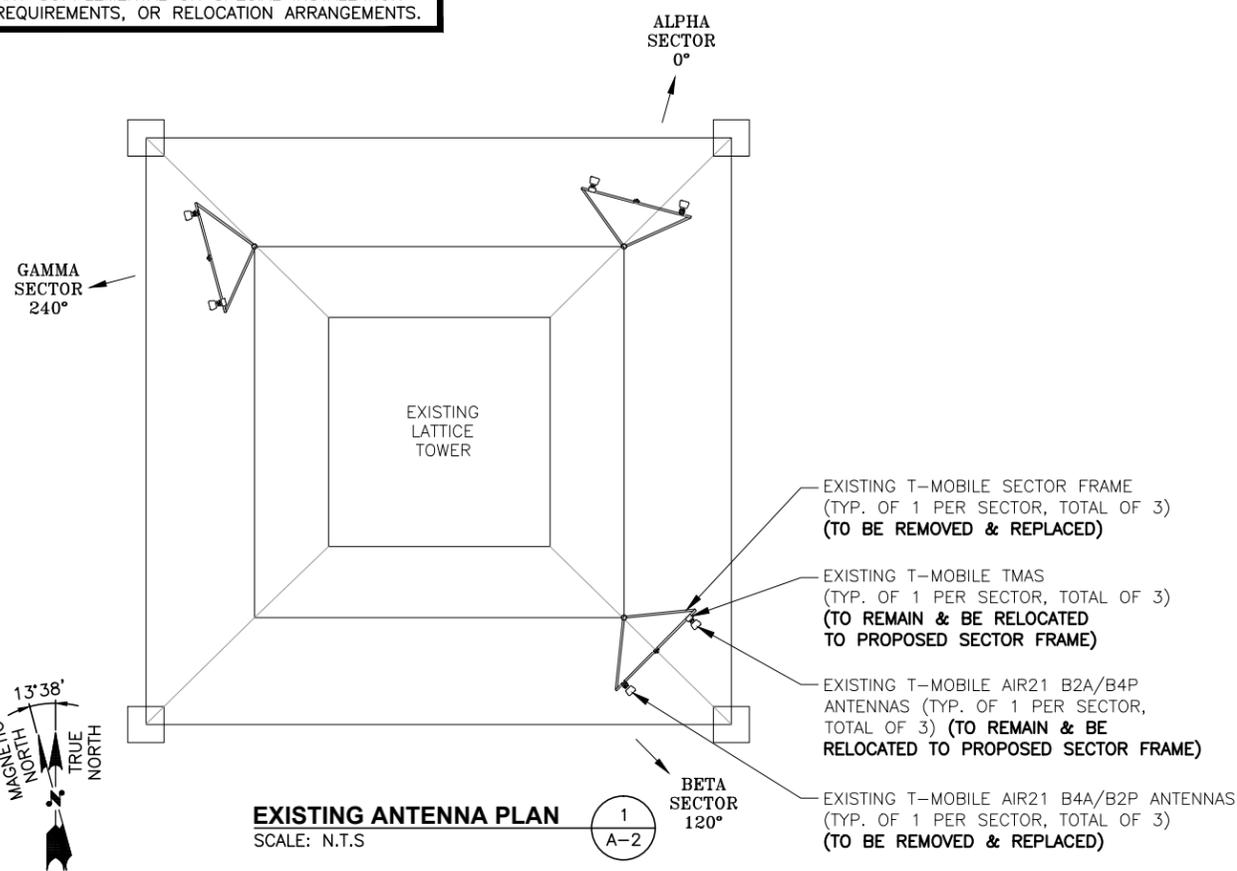
SHEET TITLE  
**COMPOUND & EQUIPMENT PLAN (L700 & L1900)**

SHEET NUMBER  
**A-1**

**STRUCTURAL NOTES:**  
 PRIOR TO COMMENCING CONSTRUCTION, GC SHALL REFER TO STRUCTURAL ANALYSIS PROVIDED BY MALOUF ENGINEERING INTL., INC. DATED: JULY 1, 2016 TO DETERMINE IF THERE ANY SUPPLEMENTAL OR SPECIAL INSTALLATION REQUIREMENTS, OR RELOCATION ARRANGEMENTS.

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**NOTE:**  
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 BUILDING 20 NORTH, SUITE 3090  
 N. ANDOVER, MA 01845  
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CHECKED BY: DR

APPROVED BY: DJC

**SUBMITTALS**

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 NORWALK, CT 06855  
 FAIRFIELD COUNTY

SHEET TITLE  
 ANTENNA LAYOUT & ELEVATION  
 (L700 & L1900)

SHEET NUMBER  
**A-2**

**NOTE:**  
 GROUND EQUIPMENT NOT SHOWN FOR CLARITY.

**STRUCTURAL NOTES:**  
 PRIOR TO COMMENCING CONSTRUCTION, GC SHALL REFER TO STRUCTURAL ANALYSIS PROVIDED BY MALOUF ENGINEERING INTL., INC. DATED: JULY 1, 2016 TO DETERMINE IF THERE ANY SUPPLEMENTAL OR SPECIAL INSTALLATION REQUIREMENTS, OR RELOCATION ARRANGEMENTS.

**NOTE:**  
 REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

**NOTE:**  
 PROPOSED T-MOBILE ANTENNAS TO BE PAINTED TO MATCH THE EXISTING.

**T-MOBILE  
 NORTHEAST LLC**

15 COMMERCE WAY, SUITE B  
 NORTON, MA 02766  
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1600 OSGOOD STREET  
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 TEL: (978) 557-5553  
 FAX: (978) 336-5586



CHECKED BY: DR

APPROVED BY: DJC

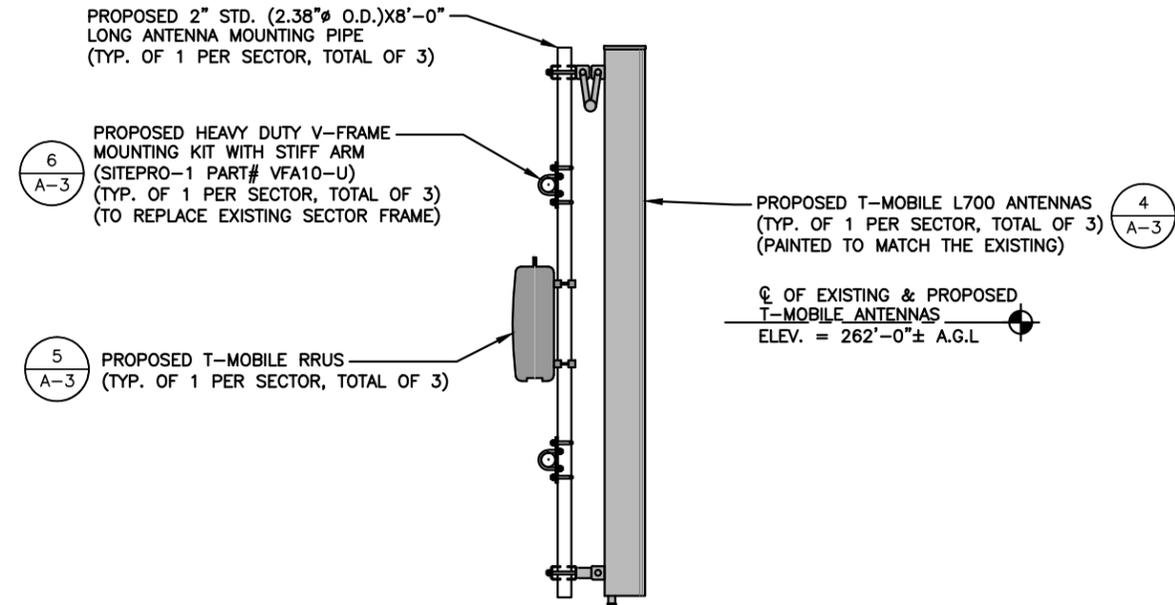
**SUBMITTALS**

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1	08/16/16	ISSUED FOR CONSTRUCTION	VP
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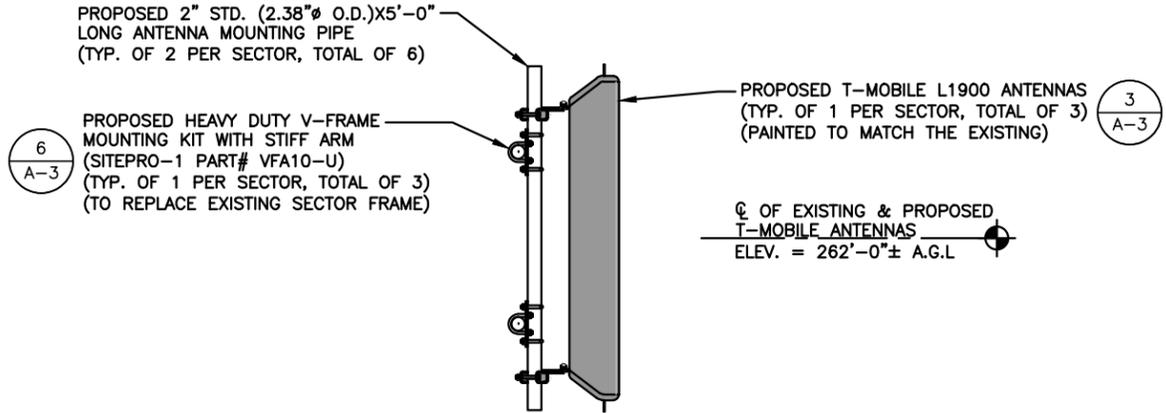
SITE NUMBER:  
 CT11011D  
 SITE NAME:  
 WESTPORT-SNET  
 LL  
 SITE ADDRESS:  
 10 WILLARD ROAD (SNET LL)  
 NORWALK, CT 06855  
 FAIRFIELD COUNTY

SHEET TITLE  
 DETAILS  
 (L700 & L1900)

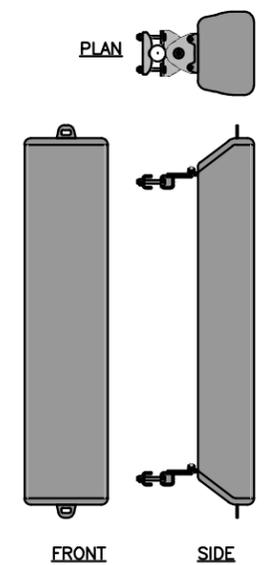
SHEET NUMBER  
**A-3**



**L700 ANTENNA MOUNTING DETAIL** 1  
 22x34 SCALE: 3/4"=1'-0"  
 11x17 SCALE: 3/8"=1'-0"  
 0 8" 1'-4" 2'-8" 4'-0"



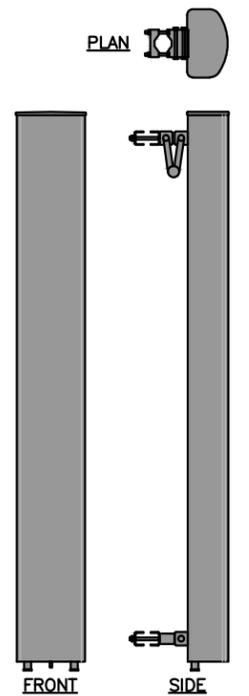
**L1900 ANTENNA MOUNTING DETAIL** 2  
 22x34 SCALE: 3/4"=1'-0"  
 11x17 SCALE: 3/8"=1'-0"  
 0 8" 1'-4" 2'-8" 4'-0"



**L1900 ANTENNA DIMENSIONS**

MODEL #	AIR 32 B66Aa/B2a
MANUF.	ERICSSON
WIDTH	12.9"
DEPTH	8.7"
HEIGHT	56.6"
WEIGHT	132.2 LBS

**L1900 ANTENNA DETAIL** 3  
 SCALE: N.T.S.



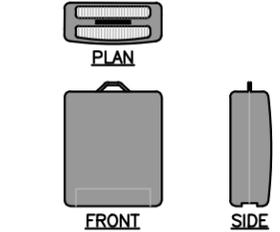
**L700 ANTENNA DIMENSIONS**

MODEL #	LNX-6515DS-A1M
MANUF.	COMMSCOPE
WIDTH	11.9"
DEPTH	7.1"
HEIGHT	96.6"
WEIGHT	43.7 LBS

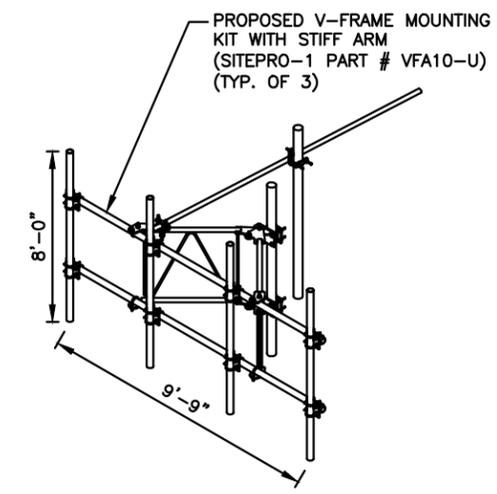
**L700 ANTENNA DETAIL** 4  
 SCALE: N.T.S.

**RRU DIMENSIONS**

MODEL #	RRUS11 B12
MANUF.	ERICSSON
WIDTH	17"
DEPTH	7"
HEIGHT	20"
WEIGHT	50.6 LBS



**PROPOSED RRU DETAIL** 5  
 SCALE: N.T.S.



**ANTENNA MOUNTING KIT** 6  
 SCALE: N.T.S.

