Robinson+Cole

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Also admitted in Massachusetts

March 23, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
236 Gates Road, Lebanon, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) antennas at the top of the existing 120-foot guyed-lattice tower at 236 Gates Road in Lebanon, Connecticut (the "Property"). The tower and underlying property are owned by GHT, LLC ("GHT"). The Council approved Cellco's shared use of this tower in 2012. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model LNX-6514DS-VTM, 700 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and two (2) HYBRIFLEX™ antenna cables. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Joyce Okonuk, First Selectman for the Town of Lebanon. A copy of this letter is also being sent to GHT, the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on its existing antenna platform at the top level on the tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, 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 (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A General Power Density table for Cellco's modified facility is included in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation, with certain modifications, can support Cellco's proposed modifications. (*See* Structural Analysis Report and Reinforcement Design included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Joyce Okonuk, Lebanon First Selectman
GHT, LLC
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896
Beamwidth, Horizontal Tolerance, degrees	±3	±3

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	14.2 kg | 31.3 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M

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Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°

**Values calculated using NGMN Alliance N-P-BASTA v9.6*

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1903.0 mm x 305.0 mm x 166.0 mm | 74.9 in x 12.0 in x 6.5 in
Net Weight	19.5 kg | 43.0 lb
Model with factory installed AISG 2.0 RET	HBXX-6517DS-A2M

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All specifications are subject to change. See www.commscope.com for the most current information. Revised: February 24, 2014

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

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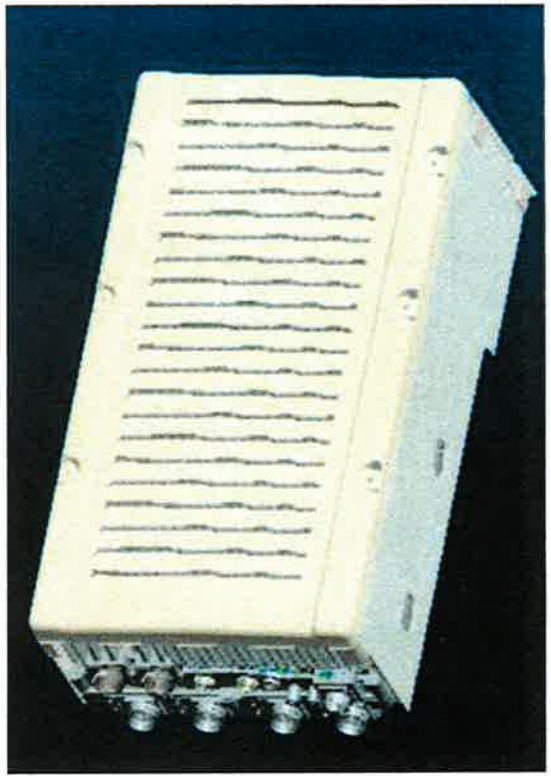
NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

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ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

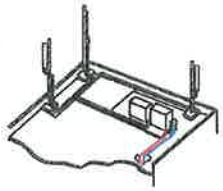
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

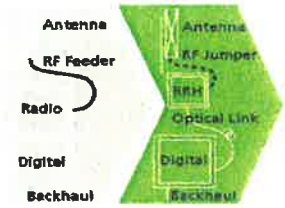
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

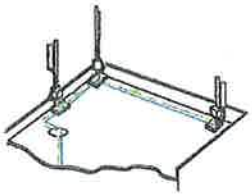
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights
- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data
- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics
- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity
- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications
- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data
- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

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Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

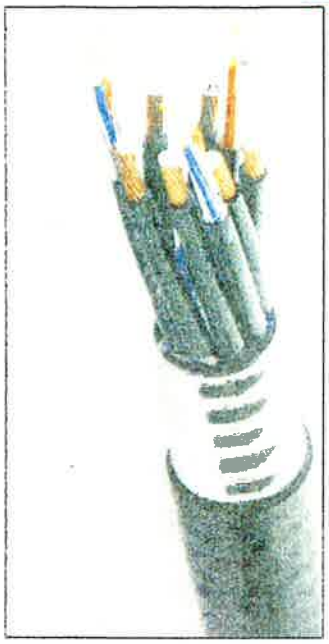


Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	.068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environmental			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

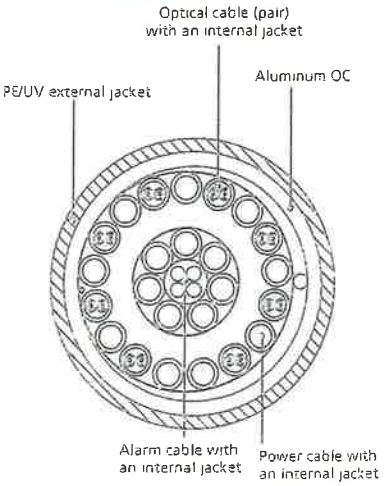


Figure 2: Construction Detail

* This data is provisional and subject to change

All information contained in the present datasheet is subject to confirmation at time of ordering

ATTACHMENT 2

Site Name: Lebanon ,CT
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW PCS	1970	11	474	5214	120	0.1302	1.0	13.02%
VZW Cellular	869	9	619	5571	120	0.1391	0.579333333	24.02%
VZW AWS	2145	1	2762	2762	120	0.0690	1.0	6.90%
VZW 700	746	1	714	714	120	0.0178	0.497333333	3.59%

Total Percentage of Maximum Permissible Exposure 47.52%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used.

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report and Reinforcement Design

120-ft Existing Guyed Lattice Tower

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Lebanon

236 Gates Road,
Lebanon, CT

CENTEK Project No. 15001.015

Date: March 5, 2015

Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

SECTION 4 – TOWER REINFORCEMENT DRAWINGS

SECTION 5 – REFERENCE MATERIALS

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing guyed lattice tower located in Lebanon, Connecticut.

The host tower is a 120-ft, three legged, guyed steel lattice tower. The original tower designer and manufacturer are unknown. The tower geometry, structure member sizes and foundation information were obtained from a previous structural analysis report prepared by Centek Engineering, Inc., project no. 11123 dated May 16, 2012.

Antenna and appurtenance inventory were obtained from the aforementioned structural analysis report prepared by Centek Engineering and a Verizon RF data sheet.

The tower consists of six (6) 20-ft long vertical sections constructed of steel pipe legs with assumed minimum yield strength of 35ksi per ASTM A53 Gr. B. Diagonal and horizontal lateral support bracing consists of steel pipe construction also assumed to conform to ASTM A53 Gr. B. The vertical tower sections are connected by internal triangular bolted flange plates with three (3) ¾" ∅ bolts per leg. Diagonal and horizontal bracing connections to the pipe legs consist of fully welded connections. The width of the tower face is 3.125-ft throughout its length.

Verizon Wireless proposes the removal of nine (9) panel antennas and the installation of nine (9) panel antennas, six (6) remote radio heads and two (2) distribution boxes mounted on three (3) Valmont 15-ft T-frames. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The proposed loads considered in the analysis consist of the following:

- VERIZON (Existing to Remain):
  Antennas: Four (4) Antel LPA-80063/6CF and two (2) Swedcom SCE6016 rev2 panel antennas mounted on three (3) 15-ft T-Frames with a RAD center elevation of 120-ft above the existing tower base.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coaxial cables equally distributed on three faces of the tower.
- VERIZON (Existing to Remove):
  Antennas: Two (2) Antel BXA 70063/6CF, one (1) Swedcom SLCP 2x6015, four (4) LPA171063-12CF EDIN-2 and two (2) Swedcom SPW5017 panel antennas mounted on three (3) 15-ft T-Frames with a RAD center elevation of 120-ft above the existing tower base.
- **VERIZON (Proposed):**
  Antennas: Three (3) Andrew LNX-6514DS panel antennas, six (6) Andrew HBXX-6517DS panel antennas, three (3) Alcatel-Lucent RRH2x60-AWS remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads and two (2) RFS DB-T1-6Z-8AB-0Z main distribution boxes mounted on three (3) 15-ft T-Frames with a RAD center elevation of 120-ft above the existing tower base.
  Coax Cables: Two (2) 1-5/8" ∅ fiber cable running on a two (2) faces of the existing tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables routed as specified in Section 3 of this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation of the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	New London; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Lebanon; v = 105 mph (3 second gust) equivalent to v = 85 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F and Appendix-K wind speeds are equal.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses **with the reinforcements detailed in section 4 of this report were found to be within allowable limits**. In Load Case 2, per tnxTower "Section Capacity Table", this tower was found to be at **97.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T6)	0'-0"-20'-0"	97.7%	**PASS**
Diagonal (T2)	80'-0"-100'-0"	97.0%	**PASS**
Guy C @ 86-ft radius (T1)	120'-0"	67.3%	**PASS**

Foundation and Anchors

The existing tower base foundation consists of a 7'-2"-ft square x 3.5-ft deep concrete pedestal bearing directly on the existing sub grade. The existing guy anchor foundations consist of three (3) 8-ft long x 3.6-ft wide x 2.8-ft thick concrete anchor blocks buried 6.25-ft below existing grade and bearing directly on the existing sub grade. An allowable soil bearing capacity of 4000psf was used in the verification of the tower foundation system.

- The worst case tower base and guy anchor reactions developed from the governing Load Case 2 were used in the verification of the anchorage foundations:

Tower Guy Reactions	
Vector	**Proposed Reactions Guy Anchor C @ Radius of 86-ft**
Horizontal (In Plane of GW)	**14.6 kips**
Horizontal (Out of Plane of GW)	**0.4 kips**
Vertical	**16.5 kips**
Resultant Force at end of Guy Wire	**22.1 kips**
Tower Base Reactions	
Vector	**Proposed Reaction**
Horizontal Shear	**2.4 kips**
Axial Compression	**45.8 kips**
Moment	**70 kip-ft**

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinf. Conc. Anchor Block (C) at 86-ft radius.	Uplift	2.0	2.01	**PASS**
	Sliding	2.0	3.0	**PASS**
		Allowable	**Proposed**	
Base Foundation	Bearing	4.0 ksf	2.69 ksf	**PASS**
	Overturning	2.0	3.48	**PASS**
	Sliding	2.0	17.9	**PASS**

Note 1: FS denotes 'Factor of Safety'.

Conclusion and Recommendations

This analysis shows that the subject tower **with the proposed reinforcement detailed in section 4 of this report is adequate** to support the proposed antenna configuration with the below recommendations.

- **All coax cables routed as specified in Section 3 of this report.**

The analysis is based, in part, on the information provided to this office by Verizon Wireless. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

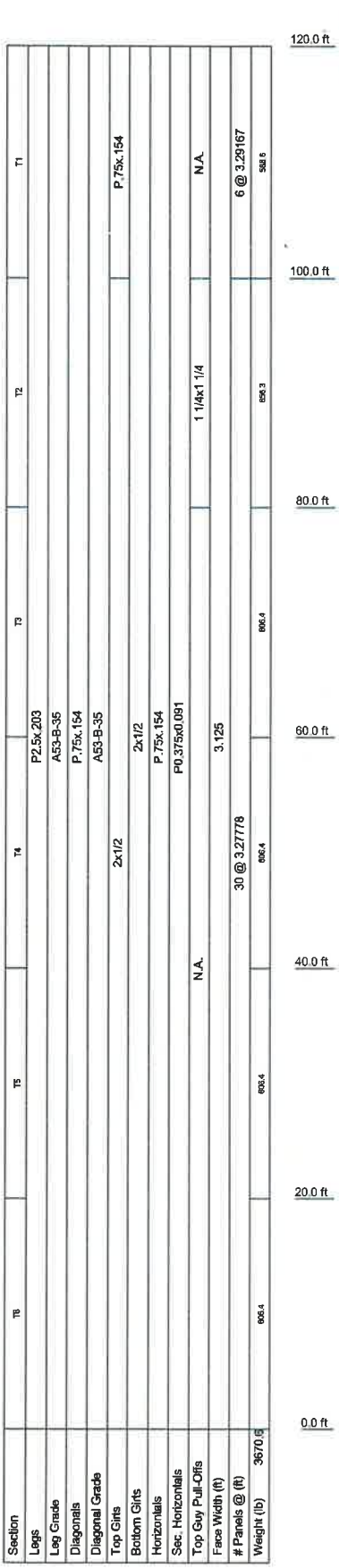
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

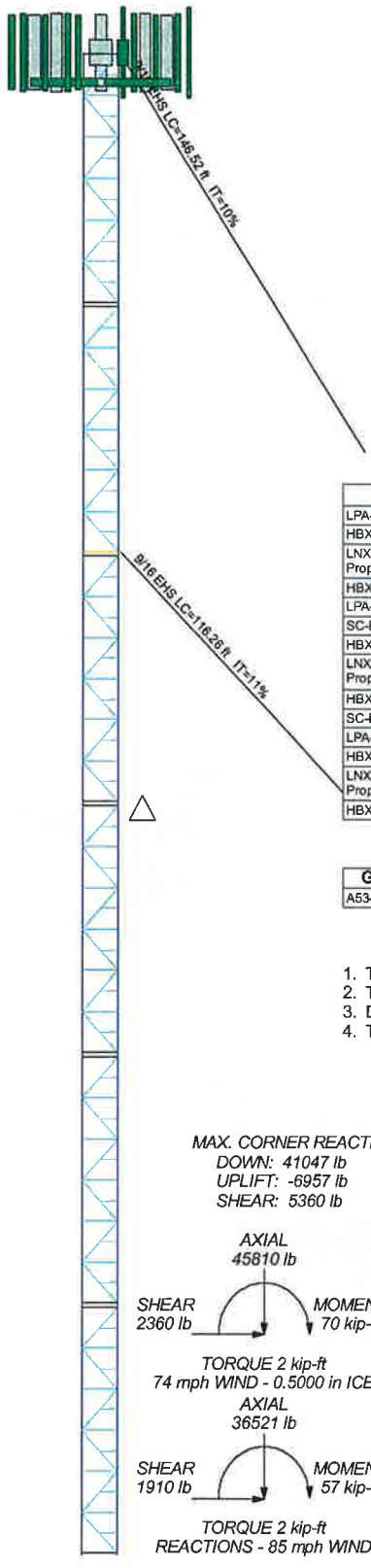
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

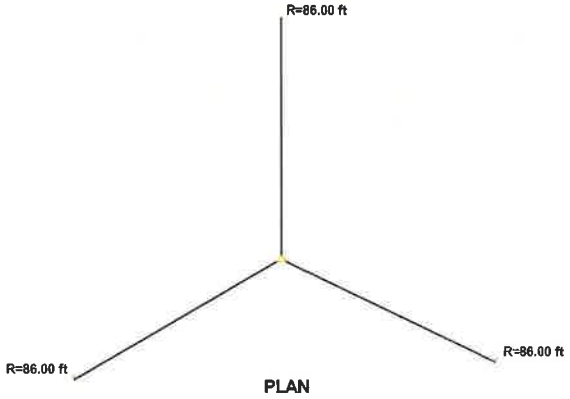
TnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, TnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

TnxTower Features:

- TnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- TnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.







DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80063/6CF (Verizon - Existing)	120	LPA-80063/6CF (Verizon - Existing)	120
HBXX-6517DS (Verizon - Proposed)	120	RRH2x60-AWS (Verizon - Proposed)	120
LNX-6514DS-VTM (Verizon - Proposed)	120	RRH2x60-AWS (Verizon - Proposed)	120
		RRH2x60-AWS (Verizon - Proposed)	120
HBXX-6517DS (Verizon - Proposed)	120	RRH2x60-PCS (Verizon - Proposed)	120
LPA-80063/6CF (Verizon - Existing)	120	RRH2x60-PCS (Verizon - Proposed)	120
SC-E 6016 rev2 (Verizon - Existing)	120	RRH2x60-PCS (Verizon - Proposed)	120
HBXX-6517DS (Verizon - Proposed)	120	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	120
LNX-6514DS-VTM (Verizon - Proposed)	120	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	120
HBXX-6517DS (Verizon - Proposed)	120		
SC-E 6016 rev2 (Verizon - Existing)	120	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	118
LPA-80063/6CF (Verizon - Existing)	120		
HBXX-6517DS (Verizon - Proposed)	120	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	118
LNX-6514DS-VTM (Verizon - Proposed)	120	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	118
HBXX-6517DS (Verizon - Proposed)	120		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi			

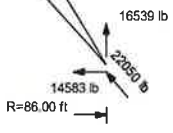
TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. TOWER RATING: 97.7%

MAX. CORNER REACTIONS AT BASE:
DOWN: 41047 lb
UPLIFT: -6957 lb
SHEAR: 5360 lb

TORQUE 2 kip-ft
74 mph WIND - 0.5000 in ICE

TORQUE 2 kip-ft
REACTIONS - 85 mph WIND

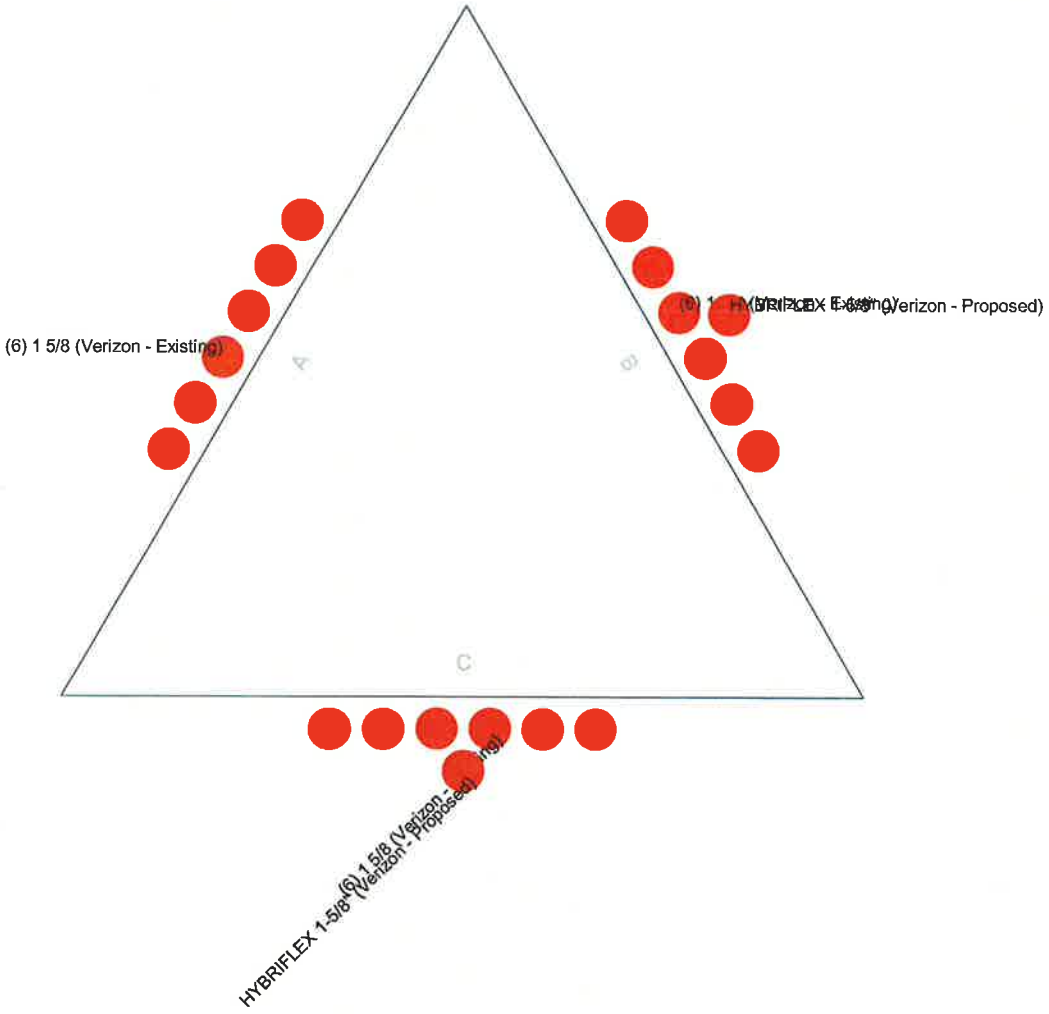


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 15001.015 - Lebanon		
Project: 120' Guyed Tower - 236 Gates Rd., Lebanon, CT		
Client: Verizon	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-1

Feedline Plan

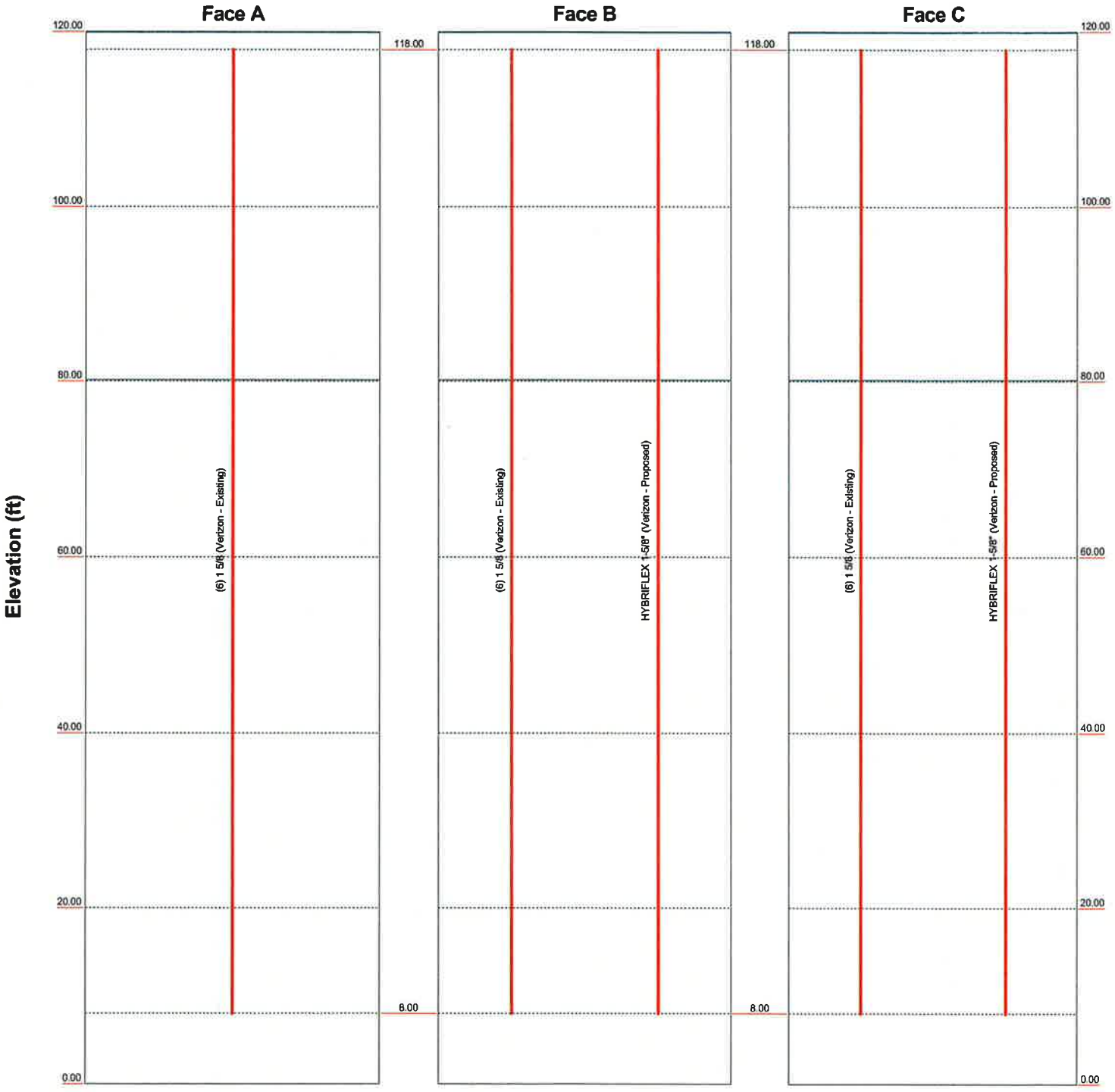
Round Flat App In Face App Out Face



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **15001.015 - Lebanon**	
	Project: ***120' Guyed Tower - 236 Gates Rd., Lebanon, CT***	
	Client: Verizon	Drawn by: TJL / App'd:
	Code: TIA/EIA-222-F	Date: 03/05/15 / Scale: NTS
	Path:	Dwg No. E-7

Feedline Distribution Chart
0' - 120'

Round | Flat | App In Face | App Out Face | Truss Leg



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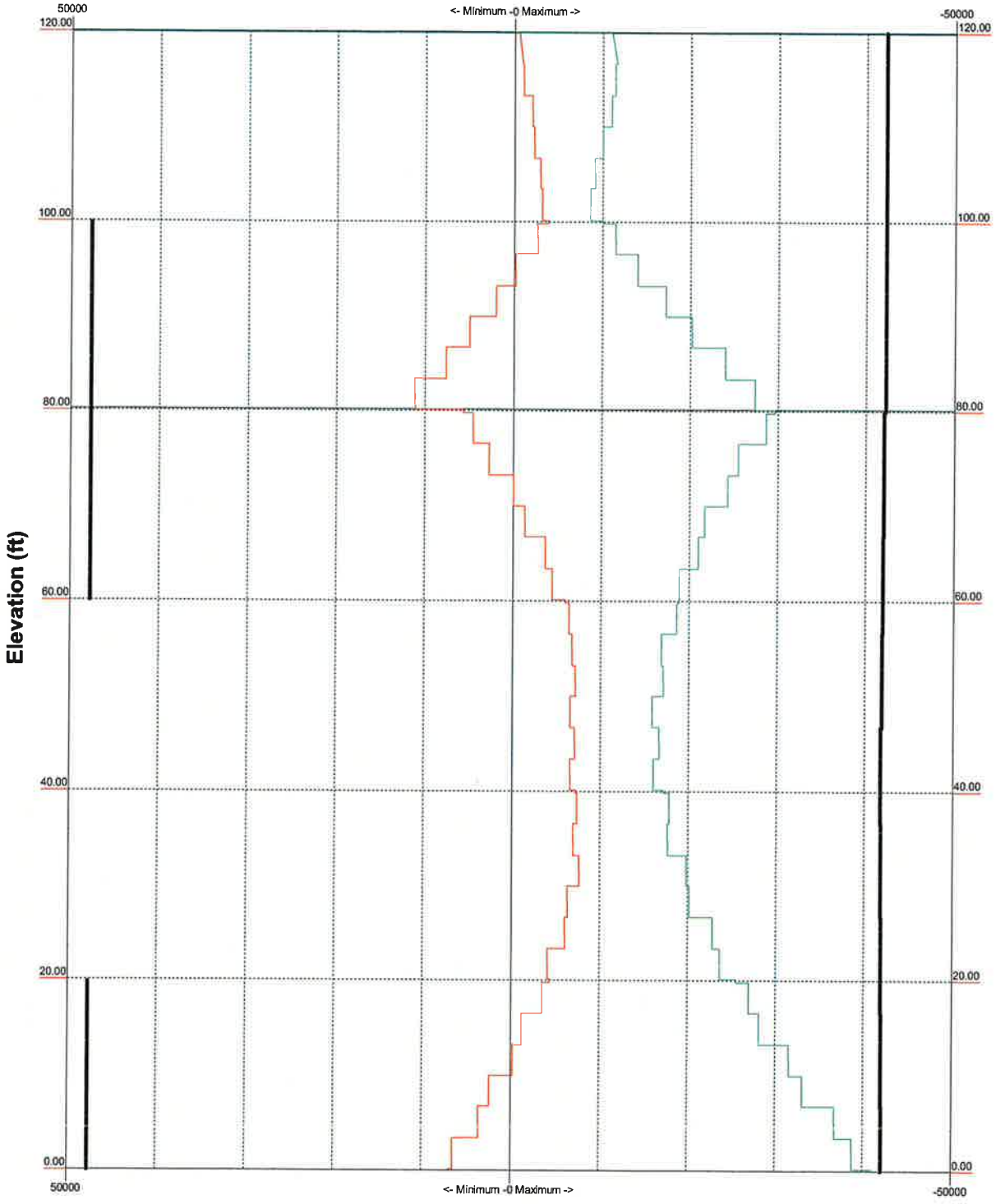
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-7

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

Leg Capacity ——— **Leg Compression (lb)**



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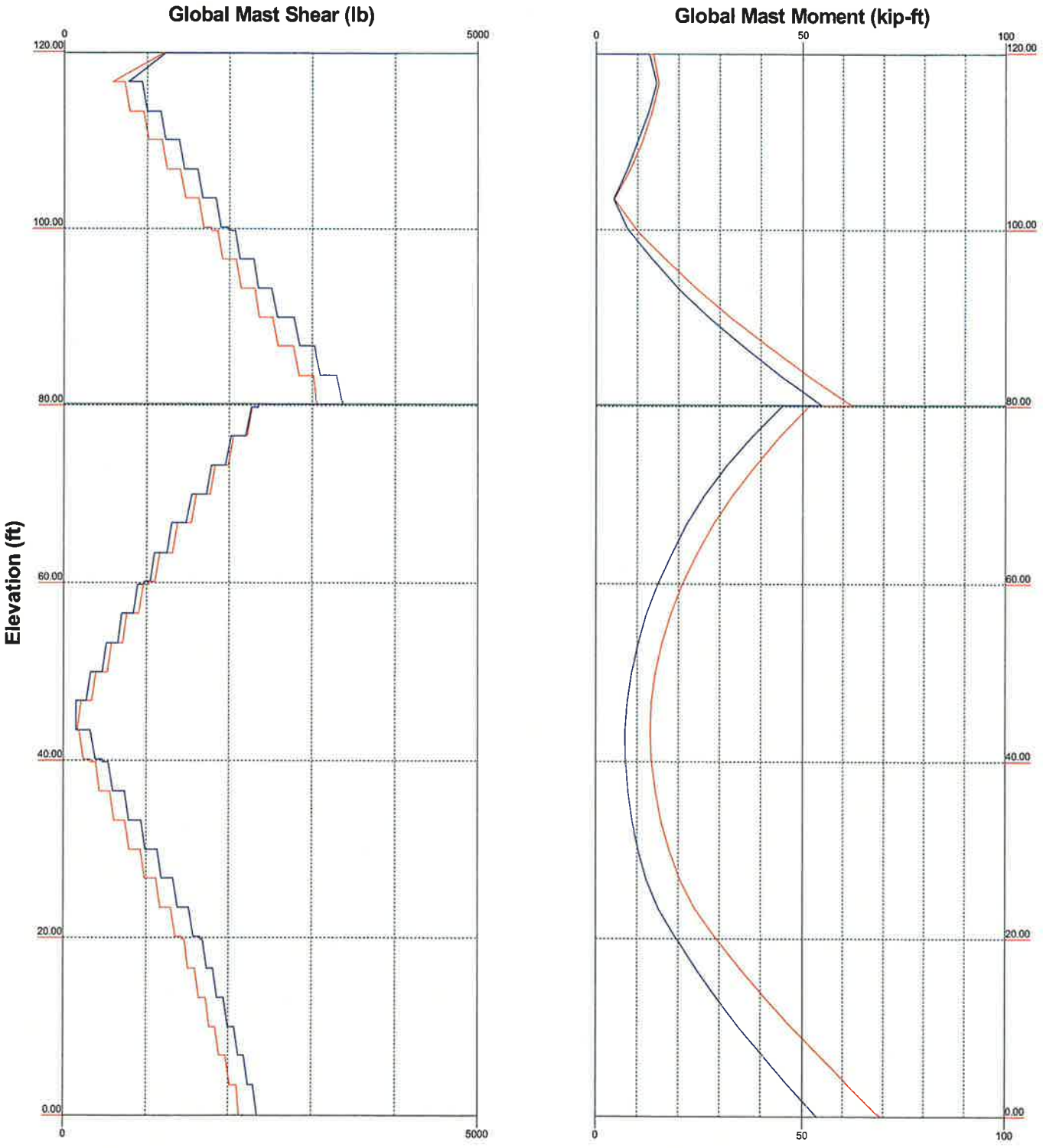
Project: ***120' Guyed Tower - 236 Gates Rd., Lebanon, CT***		
Client: Verizon	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-3

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

Vx Vz

Maximum Values

Mx Mz



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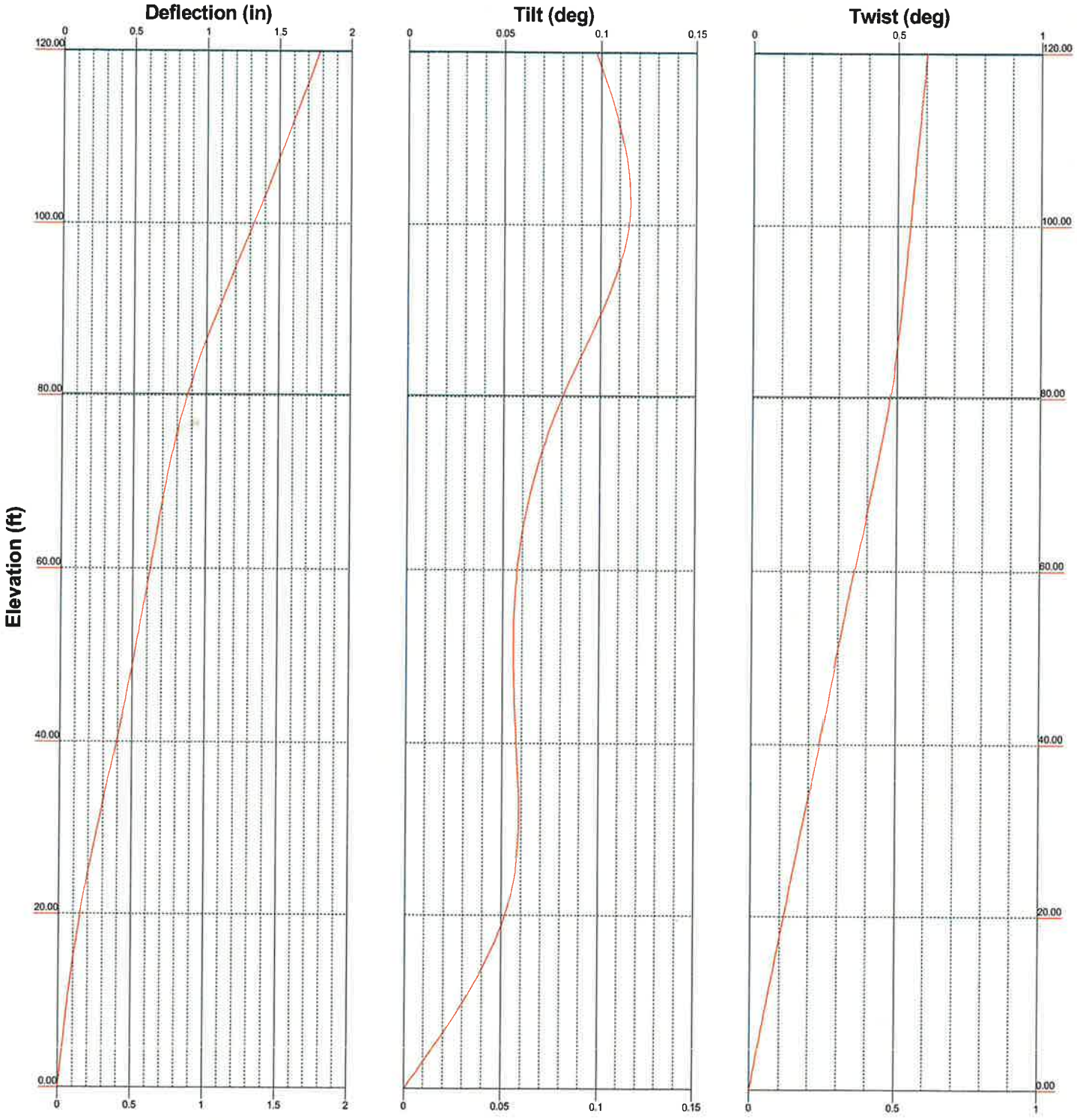
FAX: (203) 488-8587

Job: ***15001.015 - Lebanon***		
Project: ***120' Guyed Tower - 236 Gates Rd., Lebanon, CT***		
Client: Verizon	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-4

TIA/EIA-222-F - Service - 50 mph

Maximum Values



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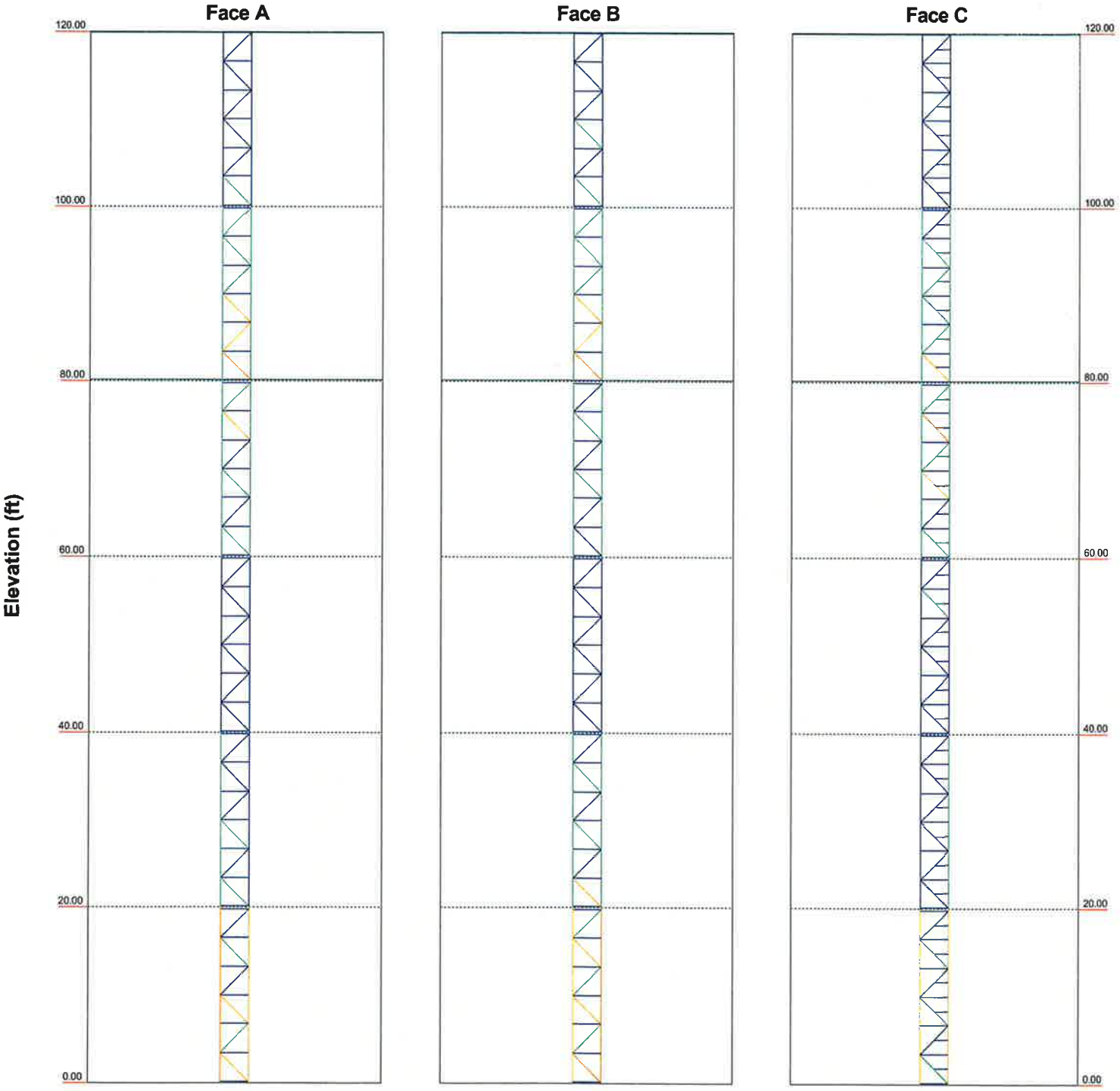
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 15001.015 - Lebanon			
Project: 120' Guyed Tower - 236 Gates Rd., Lebanon, CT			
Client: Verizon	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS	
Path:		Dwg No. E-5	

Stress Distribution Chart
0' - 120'

> 100% | 90%-100% | 75%-90% | 50%-75% | < 50% Overstress



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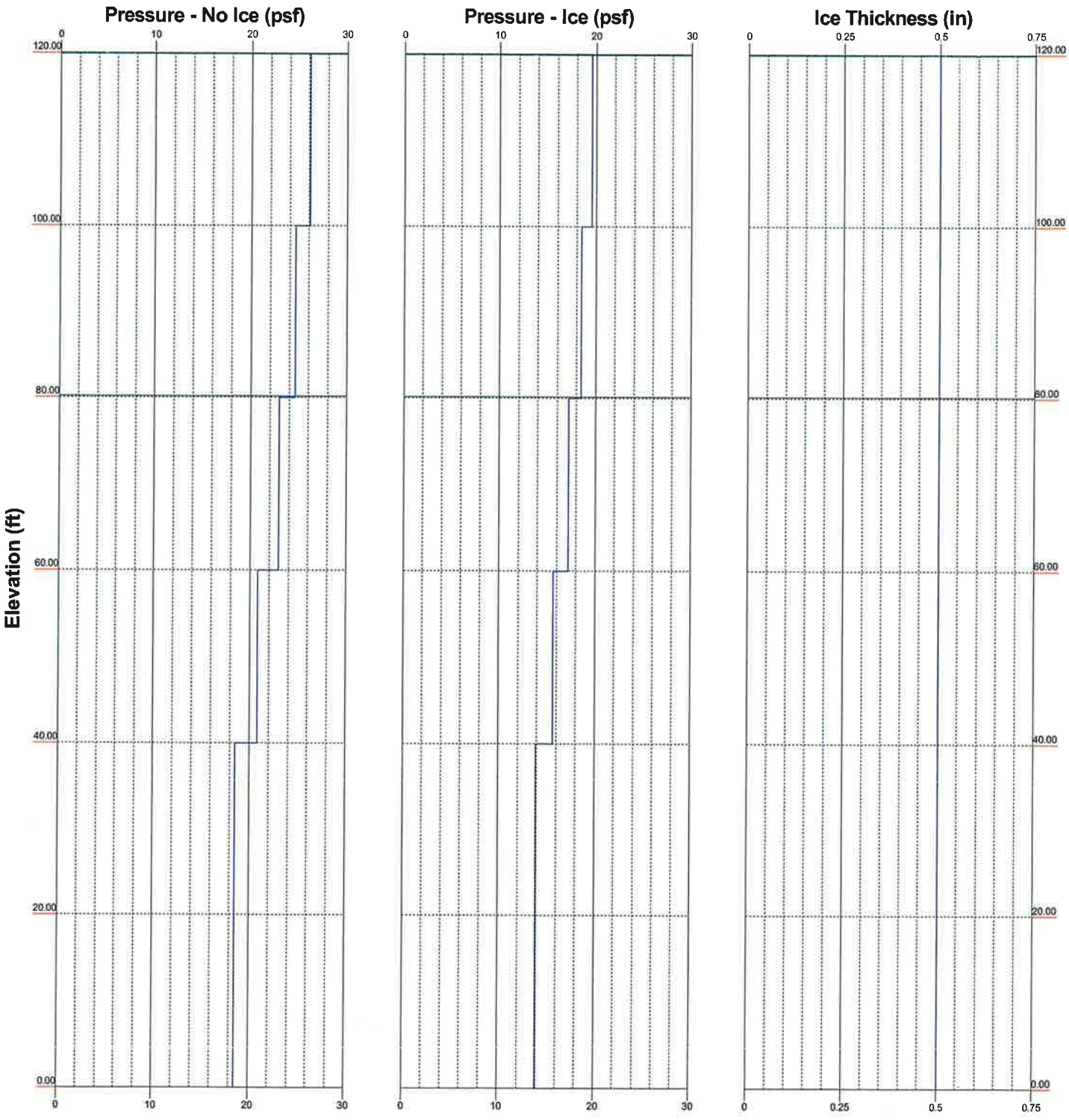
FAX: (203) 488-8587

Job: *15001.015 - Lebanon*		
Project: *120' Guyed Tower - 236 Gates Rd., Lebanon, CT*		
Client: Verizon	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-8

Wind Pressures and Ice Thickness

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



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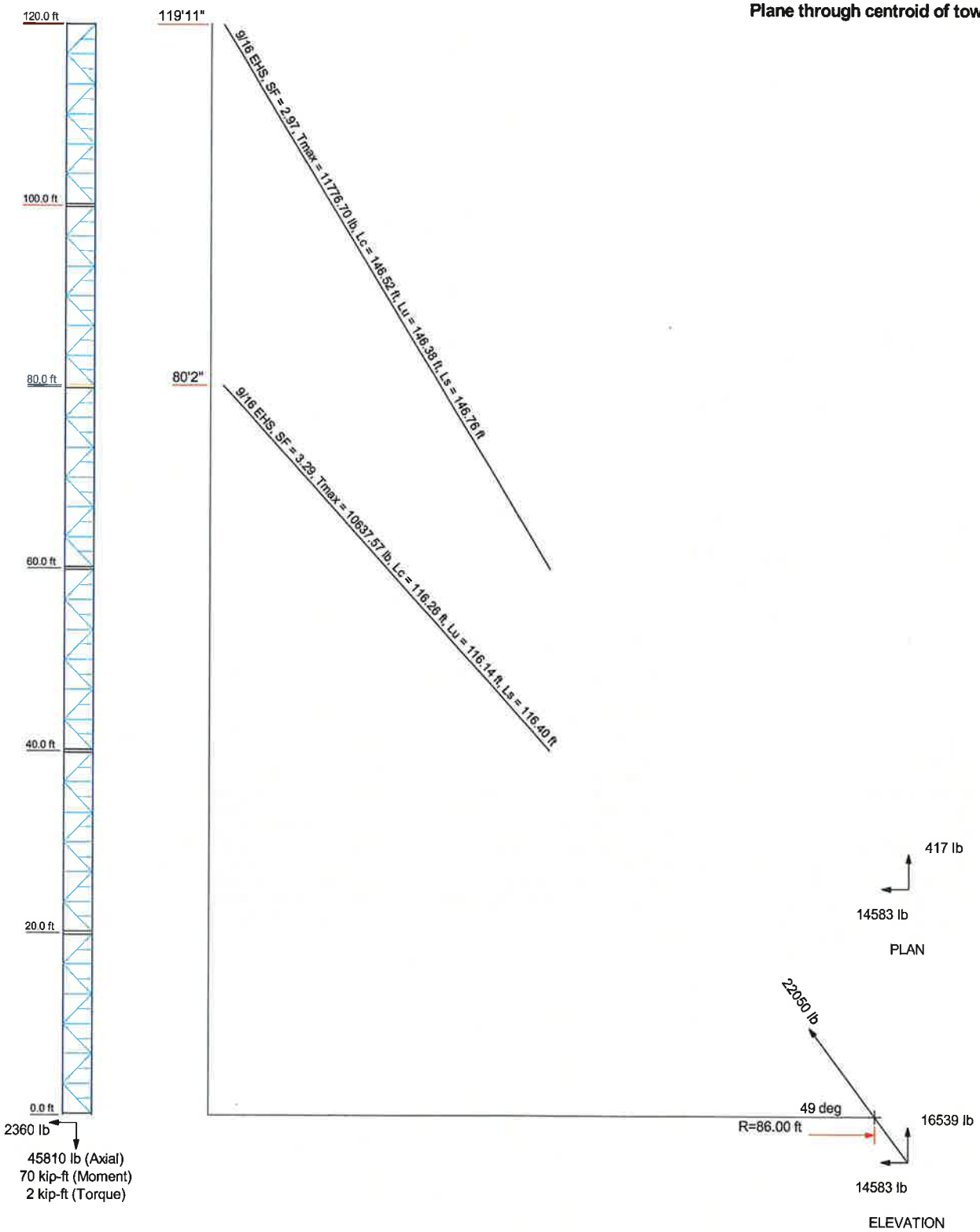
FAX: (203) 488-8587

Job: *15001.015 - Lebanon*		
Project: *120' Guyed Tower - 236 Gates Rd., Lebanon, CT*		
Client: Verizon	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS
Path:		Dwg No. E-9

Guy Tensions and Tower Reactions

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

Maximum Values
Anchor 'C'@86 ft Azimuth 240 deg Elev 0 ft
Plane through centroid of tower



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Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: *15001.015 - Lebanon*			
Project: *120' Guyed Tower - 236 Gates Rd., Lebanon, CT*			
Client: Verizon	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/15	Scale: NTS	
Path:		Dwg No. E-6	

tnxTower	Job	Page
	15001.015 - Lebanon	1 of 37
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 120' Guyed Tower - 236 Gates Rd., Lebanon, CT	Date 09:58:09 03/05/15
	Client Verizon	Designed by TJL

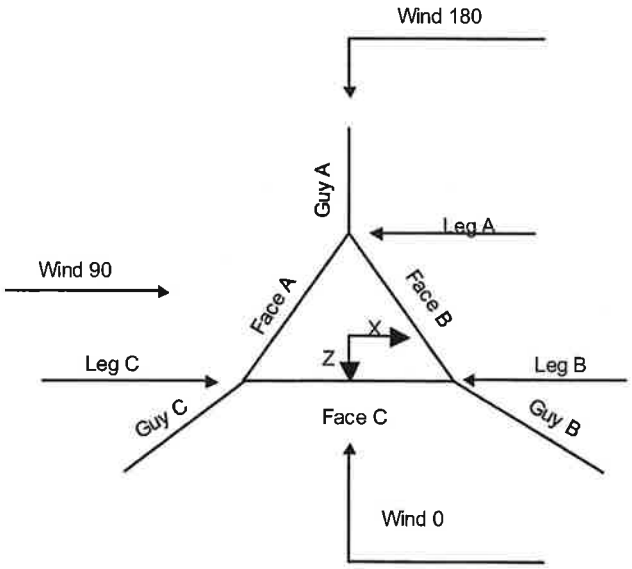
Tower Input Data

The main tower is a 3x guyed tower with an overall height of 120.00 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 3.13 ft at the top and 3.13 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

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.
Safety factor used in guy design is 2.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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



Corner & Starmount Guyed Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	120.00-100.00			3.13	1	20.00
T2	100.00-80.00			3.13	1	20.00
T3	80.00-60.00			3.13	1	20.00
T4	60.00-40.00			3.13	1	20.00
T5	40.00-20.00			3.13	1	20.00
T6	20.00-0.00			3.13	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	120.00-100.00	3.29	K Brace Right	No	Yes+Steps	1.0000	2.0000
T2	100.00-80.00	3.28	K Brace Right	No	Yes+Steps	2.0000	2.0000
T3	80.00-60.00	3.28	K Brace Right	No	Yes+Steps	2.0000	2.0000
T4	60.00-40.00	3.28	K Brace Right	No	Yes+Steps	2.0000	2.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T5	40.00-20.00	3.28	K Brace Right	No	Yes+Steps	2.0000	2.0000
T6	20.00-0.00	3.28	K Brace Right	No	Yes+Steps	2.0000	2.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 120.00-100.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T2 100.00-80.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T3 80.00-60.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T4 60.00-40.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T5 40.00-20.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T6 20.00-0.00	Pipe	P2.5x.203	A53-B-35 (35 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 120.00-100.00	Pipe	P.75x.154	A53-B-35 (35 ksi)	Flat Bar	2x1/2	A36 (36 ksi)
T2 100.00-80.00	Flat Bar	2x1/2	A36 (36 ksi)	Flat Bar	2x1/2	A36 (36 ksi)
T3 80.00-60.00	Flat Bar	2x1/2	A36 (36 ksi)	Flat Bar	2x1/2	A36 (36 ksi)
T4 60.00-40.00	Flat Bar	2x1/2	A36 (36 ksi)	Flat Bar	2x1/2	A36 (36 ksi)
T5 40.00-20.00	Flat Bar	2x1/2	A36 (36 ksi)	Flat Bar	2x1/2	A36 (36 ksi)
T6 20.00-0.00	Flat Bar	2x1/2	A36 (36 ksi)	Flat Bar	2x1/2	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 120.00-100.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T2 100.00-80.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T3 80.00-60.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T4 60.00-40.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T5 40.00-20.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)
T6 20.00-0.00	None	Single Angle		A36 (36 ksi)	Pipe	P.75x.154	A53-B-35 (35 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 120.00-100.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)
T2 100.00-80.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)
T3 80.00-60.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)
T4 60.00-40.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)
T5 40.00-20.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)
T6 20.00-0.00	Pipe	P0.375x0.091	A53-B-35 (35 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T1	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1	1	1	1	1
T6 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1	1	1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
120.00-100.00														
T2	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
100.00-80.00														
T3 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T1	Flange	0.7500	3	0.0000	0	0.0000	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
120.00-100.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T2	Flange	0.7500	3	0.0000	0	0.0000	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
100.00-80.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	

Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T3 80.00-60.00	Flange	0.7500 A325N	3	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 60.00-40.00	Flange	0.7500 A325N	3	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 40.00-20.00	Flange	0.7500 A325N	3	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 20.00-0.00	Flange	0.7500 A325N	3	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Guy Data

Guy Elevation ft	Guy Grade		Guy Size	Initial Tension lb	%	Guy Modulus ksi	Guy Weight plf	L_u ft	Anchor Radius ft	Anchor Azimuth Adj. °	Anchor Elevation ft	End Fitting Efficiency %
119.917	EHS	A	9/16	3500.00	10%	21000	0.671	146.40	86.00	0.0000	0.00	100%
		B	9/16	3500.00	10%	21000	0.671	146.40	86.00	-5.0000	0.00	100%
		C	9/16	3500.00	10%	21000	0.671	146.40	86.00	0.0000	0.00	100%
80.1667	EHS	A	9/16	3850.00	11%	21000	0.671	116.15	86.00	0.0000	0.00	100%
		B	9/16	3850.00	11%	21000	0.671	116.15	86.00	-5.0000	0.00	100%
		C	9/16	3850.00	11%	21000	0.671	116.15	86.00	0.0000	0.00	100%

Guy Data(cont'd)

Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
119.917	Corner						
80.1667	Corner						

Guy Data (cont'd)

Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
119.92	A53-B-42 (42 ksi)	Pipe				A36 (36 ksi)	Flat Bar	
80.17	A53-B-42 (42 ksi)	Pipe			Yes	A36 (36 ksi)	Flat Bar	1 1/4x1 1/4

Guy Data (cont'd)

Guy Elevation ft	Cable Weight A lb	Cable Weight B lb	Cable Weight C lb	Cable Weight D lb	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
119.917	98.23	98.24	98.23		2.03 2.5 sec/pulse	2.03 2.5 sec/pulse	2.03 2.5 sec/pulse	
80.1667	77.93	77.94	77.93		1.17 1.9 sec/pulse	1.17 1.9 sec/pulse	1.17 1.9 sec/pulse	

Guy Data (cont'd)

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm K_x	Torque Arm K_y	Pull Off K_x	Pull Off K_y	Diagonal K_x	Diagonal K_y
119.917	No	No			1	1	1	1
80.1667	No	No			1	1	1	1

Guy Data (cont'd)

Guy Elevation ft	Torque-Arm Bolt Size in	Torque-Arm Number	Torque-Arm Net Width Deduct in	Torque-Arm U	Pull Off Bolt Size in	Pull Off Number	Pull Off Net Width Deduct in	Pull Off U	Diagonal Bolt Size in	Diagonal Number	Diagonal Net Width Deduct in	Diagonal U
119.917	0.5000 A325N	4	0.0000	1	0.0000 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75
80.1667	0.6250 A325N	0	0.0000	0.75	0.0000 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75

Guy Pressures

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
119.917	A	59.96	22	16	0.5000
	B	59.96	22	16	0.5000
	C	59.96	22	16	0.5000
80.1667	A	40.08	20	15	0.5000
	B	40.08	20	15	0.5000
	C	40.08	20	15	0.5000

Guy-Mast Forces (Excluding Wind) - No Ice

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top Bottom lb	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		lb	lb	lb	kip-ft	kip-ft	kip-ft
119.917	A	54.9266	3580.39 3500.00	0.00	2946.44	-2034.14	-5.32	0.00	0.00
	B	54.9244	3580.39 3500.00	1843.65	2946.37	859.71	2.66	0.32	-4.60
	C	54.9266	3580.39 3500.00	-1761.61	2946.44	1017.07	2.66	0.00	4.60
			Sum:	**82.04**	8839.25	**-157.36**	-0.00	**0.32**	0.00
80.1667	A	43.5958	3903.74 3850.00	0.00	2712.30	-2807.60	-4.89	0.00	0.00
	B	43.5935	3903.74 3850.00	2544.65	2712.19	1186.59	2.45	0.44	-4.24
	C	43.5958	3903.74 3850.00	-2431.45	2712.30	1403.80	2.45	-0.00	4.24
			Sum:	**113.19**	8136.79	**-217.21**	-0.00	**0.44**	0.00

Guy-Mast Forces (Excluding Wind) - Ice

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top Bottom lb	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		lb	lb	lb	kip-ft	kip-ft	kip-ft
119.917	A	54.9266	4990.77 4832.61	0.00	4116.34	-2821.96	-7.43	0.00	0.00
	B	54.9244	4990.77 4832.62	2557.71	4116.24	1192.68	3.71	0.44	-6.43
	C	54.9266	4990.77 4832.61	-2443.89	4116.34	1410.98	3.71	-0.00	6.43
			Sum:	**113.82**	12348.93	**-218.30**	-0.00	**0.44**	0.00
80.1667	A	43.5958	5297.88 5192.16	0.00	3693.38	-3798.22	-6.66	0.00	0.00
	B	43.5935	5297.89 5192.17	3442.49	3693.24	1605.26	3.33	0.60	-5.77
	C	43.5958	5297.88 5192.16	-3289.36	3693.38	1899.11	3.33	-0.00	5.77
			Sum:	**153.14**	11080.00	**-293.85**	-0.00	**0.60**	0.00

Guy-Mast Forces (Excluding Wind) - Service

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top Bottom lb	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		lb	lb	lb	kip-ft	kip-ft	kip-ft
119.917	A	54.9266	3580.39 3500.00	0.00	2946.44	-2034.14	-5.32	0.00	0.00
	B	54.9244	3580.39 3500.00	1843.65	2946.37	859.71	2.66	0.32	-4.60
	C	54.9266	3580.39	-1761.61	2946.44	1017.07	2.66	0.00	4.60

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top / Bottom	F_x	F_y	F_z	M_x	M_y	M_z
ft		°	lb	lb	lb	lb	kip-ft	kip-ft	kip-ft
			3500.00						
			Sum:	82.04	8839.25	-157.36	-0.00	0.32	0.00
80.1667	A	43.5958	3903.74	0.00	2712.30	-2807.60	-4.89	0.00	0.00
			3850.00						
	B	43.5935	3903.74	2544.65	2712.19	1186.59	2.45	0.44	-4.24
			3850.00						
	C	43.5958	3903.74	-2431.45	2712.30	1403.80	2.45	-0.00	4.24
			3850.00						
			Sum:	113.19	8136.79	-217.21	-0.00	0.44	0.00

Guy-Tensioning Information

Guy Elevation		H	V	Temperature At Time Of Tensioning: 0 F Initial Tension	0 F Intercept	20 F Initial Tension	20 F Intercept	40 F Initial Tension	40 F Intercept	60 F Initial Tension	60 F Intercept	80 F Initial Tension	80 F Intercept	100 F Initial Tension	100 F Intercept	120 F Initial Tension	120 F Intercept
ft		ft	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft
119.917	A	84.20	119.92	4016	1.77	3843	1.85	3671	1.94	3500	2.03	3329	2.14	3159	2.25	2990	2.38
	B	84.20	119.92	4016	1.77	3843	1.85	3671	1.94	3500	2.03	3329	2.14	3159	2.25	2990	2.38
	C	84.20	119.92	4016	1.77	3843	1.85	3671	1.94	3500	2.03	3329	2.14	3159	2.25	2990	2.38
80.1667	A	84.20	80.17	4674	0.96	4399	1.02	4124	1.09	3850	1.17	3577	1.26	3306	1.36	3037	1.48
	B	84.20	80.17	4674	0.96	4399	1.02	4124	1.09	3850	1.17	3577	1.26	3306	1.36	3037	1.48
	C	84.20	80.17	4674	0.96	4399	1.02	4124	1.09	3850	1.17	3577	1.26	3306	1.36	3037	1.48

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (Verizon - Existing)	A	Yes	Ar (CfAe)	118.00 - 8.00	0.5000	0	6	6	0.5000 1.0000	1.9800		1.04
1 5/8 (Verizon - Existing)	B	Yes	Ar (CfAe)	118.00 - 8.00	0.5000	0	6	6	0.5000 1.0000	1.9800		1.04
1 5/8 (Verizon - Existing)	C	Yes	Ar (CfAe)	118.00 - 8.00	0.5000	0	6	6	0.5000 1.0000	1.9800		1.04
HYBRIFLEX 1-5/8" (Verizon - Proposed)	B	Yes	Ar (CfAe)	118.00 - 8.00	2.5000	0	1	1	1.9800	1.9800		1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	Yes	Ar (CfAe)	118.00 - 8.00	2.5000	0	1	1	1.9800	1.9800		1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	120.00-100.00	A	17.820	0.000	0.000	0.000	112.32
		B	20.790	0.000	0.000	0.000	146.52
		C	20.790	0.000	0.000	0.000	146.52
T2	100.00-80.00	A	19.800	0.000	0.000	0.000	124.80
		B	23.100	0.000	0.000	0.000	162.80
		C	23.100	0.000	0.000	0.000	162.80
T3	80.00-60.00	A	19.800	0.000	0.000	0.000	124.80
		B	23.100	0.000	0.000	0.000	162.80
		C	23.100	0.000	0.000	0.000	162.80
T4	60.00-40.00	A	19.800	0.000	0.000	0.000	124.80
		B	23.100	0.000	0.000	0.000	162.80
		C	23.100	0.000	0.000	0.000	162.80
T5	40.00-20.00	A	19.800	0.000	0.000	0.000	124.80
		B	23.100	0.000	0.000	0.000	162.80
		C	23.100	0.000	0.000	0.000	162.80
T6	20.00-0.00	A	11.880	0.000	0.000	0.000	74.88
		B	13.860	0.000	0.000	0.000	97.68
		C	13.860	0.000	0.000	0.000	97.68

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	120.00-100.00	A	0.500	4.470	18.600	0.000	0.000	290.49
		B		8.940	18.600	0.000	0.000	351.95
		C		8.940	18.600	0.000	0.000	351.95
T2	100.00-80.00	A	0.500	4.967	20.667	0.000	0.000	322.76
		B		9.933	20.667	0.000	0.000	391.06
		C		9.933	20.667	0.000	0.000	391.06
T3	80.00-60.00	A	0.500	4.967	20.667	0.000	0.000	322.76
		B		9.933	20.667	0.000	0.000	391.06
		C		9.933	20.667	0.000	0.000	391.06
T4	60.00-40.00	A	0.500	4.967	20.667	0.000	0.000	322.76
		B		9.933	20.667	0.000	0.000	391.06
		C		9.933	20.667	0.000	0.000	391.06
T5	40.00-20.00	A	0.500	4.967	20.667	0.000	0.000	322.76
		B		9.933	20.667	0.000	0.000	391.06
		C		9.933	20.667	0.000	0.000	391.06
T6	20.00-0.00	A	0.500	2.980	12.400	0.000	0.000	193.66
		B		5.960	12.400	0.000	0.000	234.64
		C		5.960	12.400	0.000	0.000	234.64

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	120.00-100.00	A	1.147	2.996	0.148	0.192
		B	1.338	3.576	0.173	0.230
		C	1.514	4.153	0.173	0.230
T2	100.00-80.00	A	1.186	3.319	0.433	0.561
		B	1.384	3.962	0.505	0.669

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
		C	1.579	4.603	0.505	0.669
T3	80.00-60.00	A	1.186	3.212	0.330	0.427
		B	1.384	3.835	0.385	0.510
		C	1.579	4.475	0.385	0.510
T4	60.00-40.00	A	1.186	3.212	0.330	0.427
		B	1.384	3.835	0.385	0.510
		C	1.579	4.475	0.385	0.510
T5	40.00-20.00	A	1.186	3.212	0.330	0.427
		B	1.384	3.835	0.385	0.510
		C	1.579	4.475	0.385	0.510
T6	20.00-0.00	A	0.712	1.927	0.198	0.256
		B	0.830	2.301	0.231	0.306
		C	0.947	2.685	0.231	0.306

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	120.00-100.00	0.3530	0.1809	0.3655	0.1553
T2	100.00-80.00	0.3619	0.1853	0.3754	0.1585
T3	80.00-60.00	0.3659	0.1875	0.3817	0.1619
T4	60.00-40.00	0.3659	0.1875	0.3817	0.1619
T5	40.00-20.00	0.3659	0.1875	0.3817	0.1619
T6	20.00-0.00	0.2871	0.1471	0.2912	0.1235

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
Valmont 15' T-Frame P/N 860109	A	From Leg	2.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice	13.90 20.00	13.90 20.00	387.00 530.00
(Verizon - Existing)									
Valmont 15' T-Frame P/N 860109	B	From Leg	2.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice	13.90 20.00	13.90 20.00	387.00 530.00
(Verizon - Existing)									
Valmont 15' T-Frame P/N 860109	C	From Leg	2.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice	13.90 20.00	13.90 20.00	387.00 530.00
(Verizon - Existing)									
LPA-80063/6CF	A	From Leg	4.00 6.00 0.00	0.0000	120.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	27.00 100.95
(Verizon - Existing)									
HBXX-6517DS	A	From Leg	4.00 4.00 0.00	0.0000	120.00	No Ice 1/2" Ice	8.74 9.31	5.24 5.71	50.00 100.49
(Verizon - Proposed)									
LNX-6514DS-VTM	A	From Leg	4.00 0.00	0.0000	120.00	No Ice 1/2" Ice	8.41 8.96	5.41 5.86	39.00 89.51
(Verizon - Proposed)									

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
			0.00						
HBXX-6517DS	A	From Leg	4.00	0.0000	120.00	No Ice	8.74	5.24	50.00
(Verizon - Proposed)			-4.00			1/2" Ice	9.31	5.71	100.49
			0.00						
LPA-80063/6CF	A	From Leg	4.00	0.0000	120.00	No Ice	10.31	9.01	27.00
(Verizon - Existing)			-6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
SC-E 6016 rev2	B	From Leg	4.00	0.0000	120.00	No Ice	7.63	7.29	25.00
(Verizon - Existing)			6.00			1/2" Ice	8.18	7.82	76.54
			0.00						
HBXX-6517DS	B	From Leg	4.00	0.0000	120.00	No Ice	8.74	5.24	50.00
(Verizon - Proposed)			4.00			1/2" Ice	9.31	5.71	100.49
			0.00						
LNX-6514DS-VTM	B	From Leg	4.00	0.0000	120.00	No Ice	8.41	5.41	39.00
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	89.51
			0.00						
HBXX-6517DS	B	From Leg	4.00	0.0000	120.00	No Ice	8.74	5.24	50.00
(Verizon - Proposed)			-4.00			1/2" Ice	9.31	5.71	100.49
			0.00						
SC-E 6016 rev2	B	From Leg	4.00	0.0000	120.00	No Ice	7.63	7.29	25.00
(Verizon - Existing)			-6.00			1/2" Ice	8.18	7.82	76.54
			0.00						
LPA-80063/6CF	C	From Leg	4.00	0.0000	120.00	No Ice	10.31	9.01	27.00
(Verizon - Existing)			6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
HBXX-6517DS	C	From Leg	4.00	0.0000	120.00	No Ice	8.74	5.24	50.00
(Verizon - Proposed)			4.00			1/2" Ice	9.31	5.71	100.49
			0.00						
LNX-6514DS-VTM	C	From Leg	4.00	0.0000	120.00	No Ice	8.41	5.41	39.00
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	89.51
			0.00						
HBXX-6517DS	C	From Leg	4.00	0.0000	120.00	No Ice	8.74	5.24	50.00
(Verizon - Proposed)			-4.00			1/2" Ice	9.31	5.71	100.49
			0.00						
LPA-80063/6CF	C	From Leg	4.00	0.0000	120.00	No Ice	10.31	9.01	27.00
(Verizon - Existing)			-6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
RRH2x60-AWS	A	From Leg	4.00	0.0000	120.00	No Ice	0.00	2.07	55.00
(Verizon - Proposed)			4.00			1/2" Ice	0.00	2.35	78.25
			0.00						
RRH2x60-AWS	B	From Leg	4.00	0.0000	120.00	No Ice	0.00	2.07	55.00
(Verizon - Proposed)			4.00			1/2" Ice	0.00	2.35	78.25
			0.00						
RRH2x60-AWS	C	From Leg	4.00	0.0000	120.00	No Ice	0.00	2.07	55.00
(Verizon - Proposed)			4.00			1/2" Ice	0.00	2.35	78.25
			0.00						
RRH2x60-PCS	A	From Leg	4.00	0.0000	120.00	No Ice	0.00	1.55	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	0.00	1.74	72.75
			0.00						
RRH2x60-PCS	B	From Leg	4.00	0.0000	120.00	No Ice	0.00	1.55	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	0.00	1.74	72.75
			0.00						
RRH2x60-PCS	C	From Leg	4.00	0.0000	120.00	No Ice	0.00	1.55	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	0.00	1.74	72.75
			0.00						
DB-T1-6Z-8AB-0Z	A	From Leg	0.50	0.0000	120.00	No Ice	5.60	2.33	44.00
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	80.13

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
DB-T1-6Z-8AB-0Z	B	From Leg	0.00 0.50 0.00 0.00	0.0000	120.00	No Ice	5.60	2.33	44.00
(Verizon - Proposed)						1/2" Ice	5.92	2.56	80.13

Tower Pressures - No Ice

$G_H = 1.149$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 120.00-100.00	110.00	1.411	26	67.292	A	0.332	29.971	9.583	31.62	0.000	0.000
					B	0.308	32.750		28.99	0.000	0.000
					C	0.308	33.062		28.72	0.000	0.000
T2 100.00-80.00	90.00	1.332	25	67.292	A	0.829	31.655	9.583	29.50	0.000	0.000
					B	0.757	34.757		26.98	0.000	0.000
					C	0.757	35.049		26.76	0.000	0.000
T3 80.00-60.00	70.00	1.24	23	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T4 60.00-40.00	50.00	1.126	21	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T5 40.00-20.00	30.00	1	18	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T6 20.00-0.00	10.00	1	18	67.292	A	0.764	24.209	9.583	38.37	0.000	0.000
					B	0.731	26.071		35.76	0.000	0.000
					C	0.731	26.441		35.27	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.149$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 120.00-100.00	110.00	1.411	20	0.5000	68.958	A	18.889	21.885	12.917	31.68	0.000	0.000
						B	18.851	25.774		28.94	0.000	0.000
						C	18.851	26.406		28.54	0.000	0.000
T2 100.00-80.00	90.00	1.332	18	0.5000	68.958	A	21.368	22.036	12.917	29.76	0.000	0.000
						B	21.260	26.360		27.12	0.000	0.000
						C	21.260	26.928		26.81	0.000	0.000
T3 80.00-60.00	70.00	1.24	17	0.5000	68.958	A	21.201	21.903	12.917	29.97	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						B	21.118	26.247		27.27	0.000	0.000
						C	21.118	26.815		26.95	0.000	0.000
T4 60.00-40.00	50.00	1.126	16	0.5000	68.958	A	21.201	21.903	12.917	29.97	0.000	0.000
						B	21.118	26.247		27.27	0.000	0.000
						C	21.118	26.815		26.95	0.000	0.000
T5 40.00-20.00	30.00	1	14	0.5000	68.958	A	21.201	21.903	12.917	29.97	0.000	0.000
						B	21.118	26.247		27.27	0.000	0.000
						C	21.118	26.815		26.95	0.000	0.000
T6 20.00-0.00	10.00	1	14	0.5000	68.958	A	13.105	21.201	12.917	37.65	0.000	0.000
						B	13.056	23.808		35.04	0.000	0.000
						C	13.056	24.632		34.27	0.000	0.000

Tower Pressure - Service

$G_H = 1.149$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	110.00	1.411	9	67.292	A	0.332	29.971	9.583	31.62	0.000	0.000
120.00-100.00					B	0.308	32.750		28.99	0.000	0.000
					C	0.308	33.062		28.72	0.000	0.000
T2	90.00	1.332	9	67.292	A	0.829	31.655	9.583	29.50	0.000	0.000
100.00-80.00					B	0.757	34.757		26.98	0.000	0.000
					C	0.757	35.049		26.76	0.000	0.000
T3 80.00-60.00	70.00	1.24	8	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T4 60.00-40.00	50.00	1.126	7	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T5 40.00-20.00	30.00	1	6	67.292	A	0.632	31.655	9.583	29.68	0.000	0.000
					B	0.577	34.757		27.12	0.000	0.000
					C	0.577	35.049		26.90	0.000	0.000
T6 20.00-0.00	10.00	1	6	67.292	A	0.764	24.209	9.583	38.37	0.000	0.000
					B	0.731	26.071		35.76	0.000	0.000
					C	0.731	26.441		35.27	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	1	1	20.516	1330.75	66.54	C
120.00-100.00			B	0.491	1.912	0.693	1	1	23.006			
			C	0.496	1.905	0.695	1	1	23.299			
T2	450.40	656.27	A	0.483	1.923	0.689	1	1	22.634	1359.41	67.97	C
100.00-80.00			B	0.528	1.867	0.712	1	1	25.506			
			C	0.532	1.862	0.714	1	1	25.796			
T3	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	1255.86	62.79	C

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
80.00-60.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T4	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	1140.75	57.04	C
60.00-40.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T5	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	1013.05	50.65	C
40.00-20.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	1	1	16.264	786.69	39.33	C
			B	0.398	2.067	0.651	1	1	17.700			
			C	0.404	2.057	0.653	1	1	18.001			
Sum Weight:	2477.20	3670.61								6886.50		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	0.8	1	20.449	1327.24	66.36	C
120.00-100.00			B	0.491	1.912	0.693	0.8	1	22.945			
			C	0.496	1.905	0.695	0.8	1	23.238			
T2	450.40	656.27	A	0.483	1.923	0.689	0.8	1	22.469	1351.43	67.57	C
100.00-80.00			B	0.528	1.867	0.712	0.8	1	25.354			
			C	0.532	1.862	0.714	0.8	1	25.645			
T3	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	1250.19	62.51	C
80.00-60.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T4	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	1135.60	56.78	C
60.00-40.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T5	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	1008.48	50.42	C
40.00-20.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	0.8	1	16.111	780.30	39.02	C
			B	0.398	2.067	0.651	0.8	1	17.554			
			C	0.404	2.057	0.653	0.8	1	17.854			
Sum Weight:	2477.20	3670.61								6853.24		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	0.85	1	20.466	1328.12	66.41	C
120.00-100.00			B	0.491	1.912	0.693	0.85	1	22.960			
			C	0.496	1.905	0.695	0.85	1	23.253			
T2	450.40	656.27	A	0.483	1.923	0.689	0.85	1	22.510	1353.43	67.67	C
100.00-80.00			B	0.528	1.867	0.712	0.85	1	25.392			
			C	0.532	1.862	0.714	0.85	1	25.682			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T3	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	1251.61	62.58	C
80.00-60.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T4	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	1136.89	56.84	C
60.00-40.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T5	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	1009.62	50.48	C
40.00-20.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	0.85	1	16.149	781.90	39.09	C
			B	0.398	2.067	0.651	0.85	1	17.591			
			C	0.404	2.057	0.653	0.85	1	17.891			
Sum Weight:	2477.20	3670.61								6861.55		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	994.39	861.65	A	0.591	1.81	0.748	1	1	35.265	1588.73	79.44	C
120.00-100.00			B	0.647	1.782	0.784	1	1	39.048			
			C	0.656	1.78	0.79	1	1	39.703			
T2	1104.88	944.21	A	0.629	1.789	0.772	1	1	38.382	1633.03	81.65	C
100.00-80.00			B	0.691	1.776	0.813	1	1	42.696			
			C	0.699	1.776	0.819	1	1	43.314			
T3	1104.88	882.38	A	0.625	1.791	0.769	1	1	38.050	1509.09	75.45	C
80.00-60.00			B	0.687	1.776	0.811	1	1	42.395			
			C	0.695	1.776	0.816	1	1	43.011			
T4	1104.88	882.38	A	0.625	1.791	0.769	1	1	38.050	1370.77	68.54	C
60.00-40.00			B	0.687	1.776	0.811	1	1	42.395			
			C	0.695	1.776	0.816	1	1	43.011			
T5	1104.88	882.38	A	0.625	1.791	0.769	1	1	38.050	1217.32	60.87	C
40.00-20.00			B	0.687	1.776	0.811	1	1	42.395			
			C	0.695	1.776	0.816	1	1	43.011			
T6 20.00-0.00	662.93	882.38	A	0.497	1.903	0.696	1	1	27.866	908.04	45.40	C
			B	0.535	1.859	0.716	1	1	30.096			
			C	0.547	1.847	0.722	1	1	30.848			
Sum Weight:	6076.85	5335.38								8226.98		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	994.39	861.65	A	0.591	1.81	0.748	0.8	1	31.487	1437.86	71.89	C
120.00-100.00			B	0.647	1.782	0.784	0.8	1	35.277			
			C	0.656	1.78	0.79	0.8	1	35.933			
T2	1104.88	944.21	A	0.629	1.789	0.772	0.8	1	34.108	1472.72	73.64	C
100.00-80.00			B	0.691	1.776	0.813	0.8	1	38.444			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.699	1.776	0.819	0.8	1	39.063			
T3	1104.88	882.38	A	0.625	1.791	0.769	0.8	1	33.810	1360.90	68.04	C
80.00-60.00			B	0.687	1.776	0.811	0.8	1	38.171			
			C	0.695	1.776	0.816	0.8	1	38.787			
T4	1104.88	882.38	A	0.625	1.791	0.769	0.8	1	33.810	1236.16	61.81	C
60.00-40.00			B	0.687	1.776	0.811	0.8	1	38.171			
			C	0.695	1.776	0.816	0.8	1	38.787			
T5	1104.88	882.38	A	0.625	1.791	0.769	0.8	1	33.810	1097.78	54.89	C
40.00-20.00			B	0.687	1.776	0.811	0.8	1	38.171			
			C	0.695	1.776	0.816	0.8	1	38.787			
T6 20.00-0.00	662.93	882.38	A	0.497	1.903	0.696	0.8	1	25.245	831.18	41.56	C
			B	0.535	1.859	0.716	0.8	1	27.485			
			C	0.547	1.847	0.722	0.8	1	28.237			
Sum Weight:	6076.85	5335.38								7436.60		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	994.39	861.65	A	0.591	1.81	0.748	0.85	1	32.432	1475.58	73.78	C
120.00-100.00			B	0.647	1.782	0.784	0.85	1	36.220			
			C	0.656	1.78	0.79	0.85	1	36.876			
T2	1104.88	944.21	A	0.629	1.789	0.772	0.85	1	35.176	1512.80	75.64	C
100.00-80.00			B	0.691	1.776	0.813	0.85	1	39.507			
			C	0.699	1.776	0.819	0.85	1	40.126			
T3	1104.88	882.38	A	0.625	1.791	0.769	0.85	1	34.870	1397.95	69.90	C
80.00-60.00			B	0.687	1.776	0.811	0.85	1	39.227			
			C	0.695	1.776	0.816	0.85	1	39.843			
T4	1104.88	882.38	A	0.625	1.791	0.769	0.85	1	34.870	1269.81	63.49	C
60.00-40.00			B	0.687	1.776	0.811	0.85	1	39.227			
			C	0.695	1.776	0.816	0.85	1	39.843			
T5	1104.88	882.38	A	0.625	1.791	0.769	0.85	1	34.870	1127.67	56.38	C
40.00-20.00			B	0.687	1.776	0.811	0.85	1	39.227			
			C	0.695	1.776	0.816	0.85	1	39.843			
T6 20.00-0.00	662.93	882.38	A	0.497	1.903	0.696	0.85	1	25.900	850.39	42.52	C
			B	0.535	1.859	0.716	0.85	1	28.137			
			C	0.547	1.847	0.722	0.85	1	28.890			
Sum Weight:	6076.85	5335.38								7634.19		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	1	1	20.516	460.47	23.02	C
120.00-100.00			B	0.491	1.912	0.693	1	1	23.006			
			C	0.496	1.905	0.695	1	1	23.299			
T2	450.40	656.27	A	0.483	1.923	0.689	1	1	22.634	470.38	23.52	C

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
100.00-80.00			B	0.528	1.867	0.712	1	1	25.506			
			C	0.532	1.862	0.714	1	1	25.796			
T3	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	434.55	21.73	C
80.00-60.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T4	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	394.72	19.74	C
60.00-40.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T5	450.40	606.43	A	0.48	1.928	0.687	1	1	22.391	350.54	17.53	C
40.00-20.00			B	0.525	1.87	0.711	1	1	25.276			
			C	0.529	1.865	0.713	1	1	25.565			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	1	1	16.264	272.21	13.61	C
			B	0.398	2.067	0.651	1	1	17.700			
			C	0.404	2.057	0.653	1	1	18.001			
Sum Weight:	2477.20	3670.61								2382.87		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	0.8	1	20.449	459.25	22.96	C
120.00-100.00			B	0.491	1.912	0.693	0.8	1	22.945			
			C	0.496	1.905	0.695	0.8	1	23.238			
T2	450.40	656.27	A	0.483	1.923	0.689	0.8	1	22.469	467.62	23.38	C
100.00-80.00			B	0.528	1.867	0.712	0.8	1	25.354			
			C	0.532	1.862	0.714	0.8	1	25.645			
T3	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	432.59	21.63	C
80.00-60.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T4	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	392.94	19.65	C
60.00-40.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T5	450.40	606.43	A	0.48	1.928	0.687	0.8	1	22.265	348.95	17.45	C
40.00-20.00			B	0.525	1.87	0.711	0.8	1	25.160			
			C	0.529	1.865	0.713	0.8	1	25.450			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	0.8	1	16.111	270.00	13.50	C
			B	0.398	2.067	0.651	0.8	1	17.554			
			C	0.404	2.057	0.653	0.8	1	17.854			
Sum Weight:	2477.20	3670.61								2371.36		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	405.36	588.62	A	0.45	1.973	0.673	0.85	1	20.466	459.56	22.98	C
120.00-100.00			B	0.491	1.912	0.693	0.85	1	22.960			
			C	0.496	1.905	0.695	0.85	1	23.253			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T2	450.40	656.27	A	0.483	1.923	0.689	0.85	1	22.510	468.31	23.42	C
100.00-80.00			B	0.528	1.867	0.712	0.85	1	25.392			
			C	0.532	1.862	0.714	0.85	1	25.682			
T3	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	433.08	21.65	C
80.00-60.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T4	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	393.39	19.67	C
60.00-40.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T5	450.40	606.43	A	0.48	1.928	0.687	0.85	1	22.297	349.35	17.47	C
40.00-20.00			B	0.525	1.87	0.711	0.85	1	25.189			
			C	0.529	1.865	0.713	0.85	1	25.478			
T6 20.00-0.00	270.24	606.43	A	0.371	2.124	0.64	0.85	1	16.149	270.55	13.53	C
			B	0.398	2.067	0.651	0.85	1	17.591			
			C	0.404	2.057	0.653	0.85	1	17.891			
Sum Weight:	2477.20	3670.61								2374.24		

Force Totals (Does not include forces on guys)

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques kip-ft
Leg Weight	2087.47			
Bracing Weight	1583.14			
Total Member Self-Weight	3670.61			
Guy Weight	528.51			
Total Weight	8830.32			
Wind 0 deg - No Ice		-18.08	-12183.42	-0.19
Wind 30 deg - No Ice		6023.82	-10520.50	-0.30
Wind 60 deg - No Ice		10444.44	-6059.41	-0.34
Wind 90 deg - No Ice		12078.96	18.08	-0.29
Wind 120 deg - No Ice		10491.34	6107.37	-0.15
Wind 150 deg - No Ice		6055.14	10538.58	0.02
Wind 180 deg - No Ice		18.08	12150.15	0.19
Wind 210 deg - No Ice		-6023.82	10520.50	0.30
Wind 240 deg - No Ice		-10473.25	6076.05	0.34
Wind 270 deg - No Ice		-12078.96	-18.08	0.29
Wind 300 deg - No Ice		-10462.53	-6090.74	0.15
Wind 330 deg - No Ice		-6055.14	-10538.58	-0.02
Member Ice	1664.77			
Guy Ice	511.22			
Total Weight Ice	16083.60			
Wind 0 deg - Ice		-14.28	-12831.20	-0.03
Wind 30 deg - Ice		6076.39	-10591.63	-0.14
Wind 60 deg - Ice		10367.77	-6008.04	-0.20
Wind 90 deg - Ice		12177.51	14.28	-0.20
Wind 120 deg - Ice		11066.54	6427.96	-0.15
Wind 150 deg - Ice		6101.12	10605.91	-0.06
Wind 180 deg - Ice		14.28	12040.81	0.06
Wind 210 deg - Ice		-6076.39	10591.63	0.14
Wind 240 deg - Ice		-11052.27	6403.23	0.18
Wind 270 deg - Ice		-12177.51	-14.28	0.20
Wind 300 deg - Ice		-10382.05	-6032.77	0.15
Wind 330 deg - Ice		-6101.12	-10605.91	0.06
Total Weight	8830.32			

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques kip-ft
Wind 0 deg - Service		-6.26	-4215.72	-0.06
Wind 30 deg - Service		2084.37	-3640.31	-0.11
Wind 60 deg - Service		3613.99	-2096.68	-0.12
Wind 90 deg - Service		4179.57	6.26	-0.10
Wind 120 deg - Service		3630.22	2113.28	-0.05
Wind 150 deg - Service		2095.20	3646.57	0.01
Wind 180 deg - Service		6.26	4204.20	0.06
Wind 210 deg - Service		-2084.37	3640.31	0.11
Wind 240 deg - Service		-3623.96	2102.44	0.12
Wind 270 deg - Service		-4179.57	-6.26	0.10
Wind 300 deg - Service		-3620.25	-2107.52	0.05
Wind 330 deg - Service		-2095.20	-3646.57	-0.01

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice+Guy
3	Dead+Wind 30 deg - No Ice+Guy
4	Dead+Wind 60 deg - No Ice+Guy
5	Dead+Wind 90 deg - No Ice+Guy
6	Dead+Wind 120 deg - No Ice+Guy
7	Dead+Wind 150 deg - No Ice+Guy
8	Dead+Wind 180 deg - No Ice+Guy
9	Dead+Wind 210 deg - No Ice+Guy
10	Dead+Wind 240 deg - No Ice+Guy
11	Dead+Wind 270 deg - No Ice+Guy
12	Dead+Wind 300 deg - No Ice+Guy
13	Dead+Wind 330 deg - No Ice+Guy
14	Dead+Ice+Temp+Guy
15	Dead+Wind 0 deg+Ice+Temp+Guy
16	Dead+Wind 30 deg+Ice+Temp+Guy
17	Dead+Wind 60 deg+Ice+Temp+Guy
18	Dead+Wind 90 deg+Ice+Temp+Guy
19	Dead+Wind 120 deg+Ice+Temp+Guy
20	Dead+Wind 150 deg+Ice+Temp+Guy
21	Dead+Wind 180 deg+Ice+Temp+Guy
22	Dead+Wind 210 deg+Ice+Temp+Guy
23	Dead+Wind 240 deg+Ice+Temp+Guy
24	Dead+Wind 270 deg+Ice+Temp+Guy
25	Dead+Wind 300 deg+Ice+Temp+Guy
26	Dead+Wind 330 deg+Ice+Temp+Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy

Comb. No.	Description
38	Dead+Wind 330 deg - Service+Guy

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	120 - 100	Leg	Max Tension	17	0.00	-0.00	-0.00
			Max. Compression	25	-11637.60	0.02	0.11
			Max. Mx	24	-10568.62	-0.33	0.00
			Max. My	15	-9704.67	0.00	-0.33
			Max. Vy	5	1389.12	-0.12	-0.00
			Max. Vx	2	-1406.30	0.00	0.12
		Diagonal	Max Tension	3	1621.18	0.00	0.00
			Max. Compression	13	-2319.10	0.00	0.00
			Max. Mx	15	1182.61	0.00	0.00
			Max. My	26	-123.45	0.00	-0.00
			Max. Vy	15	-3.82	0.00	0.00
			Max. Vx	26	0.07	0.00	0.00
		Horizontal	Max Tension	17	521.17	0.00	0.00
			Max. Compression	23	-388.97	0.00	0.00
			Max. Mx	23	165.39	0.00	0.00
			Max. My	26	197.33	0.00	0.00
			Max. Vy	23	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.01	-0.00	-0.00
			Max. Compression	24	-0.01	-0.00	-0.00
			Max. Mx	16	0.00	-0.00	0.00
			Max. My	2	-0.00	-0.00	0.00
			Max. Vy	16	1.26	-0.00	0.00
			Max. Vx	2	-0.00	0.00	0.00
		Top Girt	Max Tension	15	4493.35	0.00	0.00
			Max. Compression	12	-498.30	0.00	0.00
			Max. Mx	23	3486.18	0.00	0.00
			Max. My	26	1889.74	0.00	0.00
			Max. Vy	23	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	10	540.72	0.00	0.00
			Max. Compression	4	-302.98	0.00	0.00
			Max. Mx	19	-103.37	0.01	0.00
			Max. My	26	465.38	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Guy A	Bottom Tension	21	11488.11		
			Top Tension	21	11645.13		
			Top Cable Vert	21	9626.31		
			Top Cable Norm	21	6553.10		
			Top Cable Tan	21	2.40		
			Bot Cable Vert	21	-9266.67		
			Bot Cable Norm	21	6790.11		
			Bot Cable Tan	21	2.40		
		Guy B	Bottom Tension	26	11600.79		
			Top Tension	26	11757.05		
			Top Cable Vert	26	9707.46		
			Top Cable Norm	26	6632.43		
			Top Cable Tan	26	65.59		
			Bot Cable Vert	26	-9367.26		
			Bot Cable Norm	26	6841.73		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Bot Cable Tan	26	153.21		
		Guy C	Bottom Tension	16	11620.21		
			Top Tension	16	11776.70		
			Top Cable Vert	16	9726.55		
			Top Cable Norm	16	6639.39		
			Top Cable Tan	16	58.52		
			Bot Cable Vert	16	-9380.57		
			Bot Cable Norm	16	6856.94		
			Bot Cable Tan	16	129.00		
T2	100 - 80	Leg	Max Tension	12	11120.63	-0.03	0.03
			Max. Compression	2	-29587.72	-0.22	0.19
			Max. Mx	24	6201.87	0.49	-0.09
			Max. My	15	725.09	-0.06	0.51
			Max. Vy	24	1467.07	0.49	-0.09
			Max. Vx	21	-1252.83	-0.12	-0.37
		Diagonal	Max Tension	13	2929.81	0.00	0.00
			Max. Compression	26	-3433.07	0.00	0.00
			Max. Mx	15	1763.10	0.00	0.00
			Max. My	26	-579.65	0.00	-0.00
			Max. Vy	15	-3.82	0.00	0.00
			Max. Vx	26	0.07	0.00	0.00
		Horizontal	Max Tension	2	512.47	0.00	0.00
			Max. Compression	2	-512.47	0.00	0.00
			Max. Mx	19	135.06	0.00	0.00
			Max. My	26	460.76	0.00	0.00
			Max. Vy	19	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.01	-0.00	-0.00
			Max. Compression	24	-0.01	-0.00	-0.00
			Max. Mx	16	0.00	-0.00	0.00
			Max. My	2	0.00	-0.00	0.00
			Max. Vy	16	1.26	-0.00	0.00
			Max. Vx	2	-0.00	-0.00	0.00
		Top Girt	Max Tension	4	480.67	0.00	0.00
			Max. Compression	10	-515.34	0.00	0.00
			Max. Mx	19	285.58	0.01	0.00
			Max. My	26	-411.83	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	15	1727.09	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	23	1388.16	0.01	0.00
			Max. My	26	1213.40	0.00	0.00
			Max. Vy	23	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Guy A	Bottom Tension	21	10340.33		
			Top Tension	21	10445.64		
			Top Cable Vert	21	7283.71		
			Top Cable Norm	21	7487.24		
			Top Cable Tan	21	1.11		
			Bot Cable Vert	21	-7025.11		
			Bot Cable Norm	21	7587.50		
			Bot Cable Tan	21	1.11		
		Guy B	Bottom Tension	26	10482.52		
			Top Tension	26	10587.50		
			Top Cable Vert	26	7378.44		
			Top Cable Norm	26	7592.87		
			Top Cable Tan	26	45.91		
			Bot Cable Vert	26	-7124.43		
			Bot Cable Norm	26	7688.73		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Bot Cable Tan	26	95.27		
		Guy C	Bottom Tension	16	10532.47		
			Top Tension	16	10637.57		
			Top Cable Vert	16	7414.24		
			Top Cable Norm	16	7627.92		
			Top Cable Tan	16	41.35		
			Bot Cable Vert	16	-7157.94		
			Bot Cable Norm	16	7725.98		
			Bot Cable Tan	16	77.72		
		Top Guy Pull-Off	Max Tension	15	2698.58	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	23	2168.99	0.01	0.00
			Max. My	26	1895.94	0.00	0.00
			Max. Vy	23	-10.30	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T3	80 - 60	Leg	Max Tension	8	5720.09	-0.05	-0.16
			Max. Compression	2	-29588.52	-0.20	0.08
			Max. Mx	17	-17663.74	-0.30	0.04
			Max. My	15	-4656.49	0.02	0.33
			Max. Vy	24	1465.86	0.25	-0.08
			Max. Vx	21	-1251.55	-0.09	-0.16
		Diagonal	Max Tension	24	2918.17	0.00	0.00
			Max. Compression	24	-3240.76	0.00	0.00
			Max. Mx	15	-1511.49	0.00	0.00
			Max. My	26	1669.83	0.00	-0.00
			Max. Vy	15	3.81	0.00	0.00
			Max. Vx	26	0.05	0.00	0.00
		Horizontal	Max Tension	2	512.49	0.00	0.00
			Max. Compression	2	-512.49	0.00	0.00
			Max. Mx	19	251.26	0.00	0.00
			Max. My	26	460.78	0.00	0.00
			Max. Vy	19	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.01	-0.00	-0.00
			Max. Compression	23	-0.00	-0.00	-0.00
			Max. Mx	16	0.00	-0.00	0.00
			Max. My	2	0.00	-0.00	0.00
			Max. Vy	16	1.26	-0.00	0.00
			Max. Vx	2	-0.00	-0.00	0.00
		Top Girt	Max Tension	19	910.85	0.00	0.00
			Max. Compression	11	-639.27	0.00	0.00
			Max. Mx	23	-192.68	0.01	0.00
			Max. My	26	580.48	0.00	0.00
			Max. Vy	23	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	25	585.35	0.00	0.00
			Max. Compression	6	-170.65	0.00	0.00
			Max. Mx	19	236.19	0.01	0.00
			Max. My	26	124.31	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T4	60 - 40	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	2	-18882.94	-0.18	-0.01
			Max. Mx	26	-16327.64	-0.28	-0.04
			Max. My	23	-12679.62	0.09	0.23
			Max. Vy	11	809.89	0.09	-0.11
			Max. Vx	15	641.84	0.08	0.19
		Diagonal	Max Tension	11	1693.55	0.00	0.00
			Max. Compression	24	-1943.90	0.00	0.00
			Max. Mx	15	-336.83	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	26	970.77	0.00	-0.00
			Max. Vy	15	3.81	0.00	0.00
			Max. Vx	26	-0.04	0.00	0.00
		Horizontal	Max Tension	26	376.83	0.00	0.00
			Max. Compression	2	-327.06	0.00	0.00
			Max. Mx	19	280.63	0.00	0.00
			Max. My	26	300.48	0.00	0.00
			Max. Vy	19	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.01	-0.00	-0.00
			Max. Compression	24	-0.00	-0.00	-0.00
			Max. Mx	15	0.00	-0.00	0.00
			Max. My	15	0.00	-0.00	0.00
			Max. Vy	15	1.26	-0.00	0.00
			Max. Vx	15	-0.00	-0.00	0.00
		Top Girt	Max Tension	19	300.21	0.00	0.00
			Max. Compression	12	-322.45	0.00	0.00
			Max. Mx	19	29.67	0.01	0.00
			Max. My	26	40.09	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	24	384.03	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	19	98.84	0.01	0.00
			Max. My	26	378.87	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T5	40 - 20	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	15	-25564.68	-0.27	0.04
			Max. Mx	26	-22830.22	-0.35	-0.08
			Max. My	23	-20010.66	0.07	0.32
			Max. Vy	25	-752.33	-0.20	0.04
			Max. Vx	15	-815.17	-0.27	0.04
		Diagonal	Max Tension	26	1584.86	0.00	0.00
			Max. Compression	26	-2724.22	0.00	0.00
			Max. Mx	15	865.54	0.00	0.00
			Max. My	15	409.88	0.00	-0.00
			Max. Vy	15	-3.80	0.00	0.00
			Max. Vx	15	0.03	0.00	0.00
		Horizontal	Max Tension	15	442.79	0.00	0.00
			Max. Compression	15	-442.79	0.00	0.00
			Max. Mx	19	281.61	0.00	0.00
			Max. My	26	395.45	0.00	0.00
			Max. Vy	19	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.01	-0.00	-0.00
			Max. Compression	24	-0.00	-0.00	-0.00
			Max. Mx	15	0.00	-0.00	0.00
			Max. My	2	0.00	-0.00	0.00
			Max. Vy	15	1.26	-0.00	0.00
			Max. Vx	2	-0.00	-0.00	0.00
		Top Girt	Max Tension	18	223.59	0.00	0.00
			Max. Compression	24	-206.06	0.00	0.00
			Max. Mx	19	186.46	0.01	0.00
			Max. My	26	-190.56	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	15	645.19	0.00	0.00
			Max. Compression	18	-144.05	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	19	-46.06	0.01	0.00
			Max. My	26	593.70	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T6	20 - 0	Leg	Max Tension	12	6958.26	-0.09	-0.06
			Max. Compression	15	-41043.30	-0.00	0.00
			Max. Mx	24	3285.23	-0.76	-0.41
			Max. My	20	3210.48	0.08	0.89
			Max. Vy	24	-4584.47	0.00	-0.00
			Max. Vx	20	5328.89	-0.00	-0.00
		Diagonal	Max Tension	26	2393.65	0.00	0.00
			Max. Compression	26	-3334.53	0.00	0.00
			Max. Mx	15	1854.60	0.00	0.00
			Max. My	15	476.12	0.00	-0.00
			Max. Vy	15	-3.80	0.00	0.00
			Max. Vx	15	0.02	0.00	0.00
		Horizontal	Max Tension	15	710.89	0.00	0.00
			Max. Compression	15	-710.89	0.00	0.00
			Max. Mx	14	208.55	0.00	0.00
			Max. Vy	14	-3.78	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	19	0.00	-0.00	-0.00
			Max. Compression	23	-0.00	-0.00	-0.00
			Max. Mx	15	0.00	-0.00	0.00
			Max. My	15	0.00	-0.00	0.00
			Max. Vy	15	1.26	-0.00	0.00
			Max. Vx	15	-0.00	-0.00	0.00
		Top Girt	Max Tension	17	422.99	0.00	0.00
			Max. Compression	15	-433.70	0.00	0.00
			Max. Mx	19	297.81	0.01	0.00
			Max. My	26	-395.35	0.00	0.00
			Max. Vy	19	-7.31	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	15	3475.88	0.00	0.00
			Max. Compression	4	-392.80	0.00	0.00
			Max. Mx	14	2848.81	0.01	0.00
			Max. Vy	14	-7.31	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	23	34712.98	-3163.58	1191.26
	Max. H_x	10	27262.90	509.10	-858.03
	Max. H_z	16	-3767.10	-4400.84	2952.82
	Min. Vert	4	-6887.45	-565.62	606.51
	Min. H_x	17	-5861.24	-4470.38	2867.88
	Min. H_z	9	24493.09	437.59	-953.98
Leg B	Max. Vert	19	37572.21	2785.86	1977.51
	Max. H_x	24	-3265.12	4595.48	2448.19
	Max. H_z	15	2273.55	3606.60	2775.65
	Min. Vert	12	-6956.65	521.11	368.38
	Min. H_x	5	25822.92	-857.16	-5.09
	Min. H_z	8	18240.60	-91.87	-291.65
Leg A	Max. Vert	15	41046.71	568.06	-3308.95

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
	Max. H_x	25	24736.64	911.26	-3560.16
	Max. H_z	13	29433.12	725.36	927.92
	Min. Vert	8	-6506.37	-172.88	-752.01
	Min. H_x	19	3234.46	-647.11	-5179.01
	Min. H_z	20	-3189.06	-458.43	-5340.70
Guy C @ 86 ft Elev 0 ft Azimuth 240 deg	Max. Vert	10	-393.09	-205.58	118.55
	Max. H_x	10	-393.09	-205.58	118.55
	Max. H_z	16	-16538.51	-12525.82	7470.48
	Min. Vert	16	-16538.51	-12525.82	7470.48
	Min. H_x	16	-16538.51	-12525.82	7470.48
	Min. H_z	10	-393.09	-205.58	118.55
Guy B @ 86 ft Elev 0 ft Azimuth 115 deg	Max. Vert	6	-355.24	195.15	78.44
	Max. H_x	25	-16432.66	13122.23	6172.64
	Max. H_z	26	-16491.69	13064.06	6366.04
	Min. Vert	26	-16491.69	13064.06	6366.04
	Min. H_x	6	-355.24	195.15	78.44
	Min. H_z	6	-355.24	195.15	78.44
Guy A @ 86 ft Elev 0 ft Azimuth 0 deg	Max. Vert	2	-294.31	0.11	-160.33
	Max. H_x	24	-7524.10	396.64	-6597.61
	Max. H_z	2	-294.31	0.11	-160.33
	Min. Vert	21	-16291.78	-3.51	-14377.61
	Min. H_x	18	-8524.55	-402.45	-7460.31
	Min. H_z	21	-16291.78	-3.51	-14377.61

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	25218.58	4.36	-18.13	-1.09	-0.41	0.61
Dead+Wind 0 deg - No Ice+Guy	36520.55	9.00	-1815.66	-56.93	0.35	1.18
Dead+Wind 30 deg - No Ice+Guy	33439.95	986.68	-1564.79	-46.38	-21.78	0.65
Dead+Wind 60 deg - No Ice+Guy	28545.74	1653.76	-952.77	-23.22	-37.85	0.03
Dead+Wind 90 deg - No Ice+Guy	32194.81	1821.89	-83.07	1.04	-46.56	-0.15
Dead+Wind 120 deg - No Ice+Guy	34684.06	1545.05	887.72	24.79	-42.94	-0.07
Dead+Wind 150 deg - No Ice+Guy	32846.70	846.91	1611.38	40.09	-25.15	0.10
Dead+Wind 180 deg - No Ice+Guy	29329.47	-5.34	1892.39	44.07	-1.01	0.40
Dead+Wind 210 deg - No Ice+Guy	31775.72	-842.03	1595.67	38.07	21.46	0.94
Dead+Wind 240 deg - No Ice+Guy	33028.44	-1535.93	863.35	21.53	38.36	1.43
Dead+Wind 270 deg - No Ice+Guy	30871.38	-1824.15	-100.76	-2.07	43.34	1.69
Dead+Wind 300 deg - No	29264.67	-1666.37	-932.66	-25.34	37.59	1.68

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
Ice+Guy						
Dead+Wind 330 deg - No Ice+Guy	34515.29	-969.59	-1570.60	-48.52	22.16	1.52
Dead+Ice+Temp+Guy	34645.53	4.35	-21.36	-1.28	-0.52	0.68
Dead+Wind 0 deg+Ice+Temp+Guy	45810.00	5.70	-2359.65	-69.76	0.34	1.36
Dead+Wind 30 deg+Ice+Temp+Guy	43048.27	1138.87	-1850.13	-52.82	-26.12	0.87
Dead+Wind 60 deg+Ice+Temp+Guy	40102.80	1862.19	-1078.84	-27.57	-44.17	0.26
Dead+Wind 90 deg+Ice+Temp+Guy	41819.02	2142.60	-75.93	0.15	-53.98	-0.07
Dead+Wind 120 deg+Ice+Temp+Guy	44073.29	2007.37	1157.68	31.01	-53.60	-0.04
Dead+Wind 150 deg+Ice+Temp+Guy	42851.71	1019.29	1890.61	47.29	-29.03	0.16
Dead+Wind 180 deg+Ice+Temp+Guy	40972.23	-3.19	2135.17	51.48	-1.54	0.42
Dead+Wind 210 deg+Ice+Temp+Guy	41791.41	-1013.66	1874.35	45.15	24.81	0.85
Dead+Wind 240 deg+Ice+Temp+Guy	42476.89	-1991.80	1126.68	27.28	48.48	1.39
Dead+Wind 270 deg+Ice+Temp+Guy	41035.14	-2151.25	-90.44	-2.99	51.22	1.74
Dead+Wind 300 deg+Ice+Temp+Guy	40769.55	-1869.79	-1073.45	-30.17	43.55	1.75
Dead+Wind 330 deg+Ice+Temp+Guy	44026.20	-1127.17	-1856.71	-55.06	26.32	1.59
Dead+Wind 0 deg - Service+Guy	25066.02	4.71	-712.05	-16.85	-0.29	0.72
Dead+Wind 30 deg - Service+Guy	25108.78	346.79	-610.32	-14.46	-7.89	0.55
Dead+Wind 60 deg - Service+Guy	25182.78	595.82	-356.51	-8.65	-13.43	0.37
Dead+Wind 90 deg - Service+Guy	25231.75	690.35	-14.43	-0.83	-15.54	0.26
Dead+Wind 120 deg - Service+Guy	25315.21	603.78	330.13	7.03	-13.66	0.27
Dead+Wind 150 deg - Service+Guy	25482.97	346.10	575.74	12.61	-8.04	0.37
Dead+Wind 180 deg - Service+Guy	25582.11	3.10	664.27	14.54	-0.54	0.51
Dead+Wind 210 deg - Service+Guy	25546.09	-339.58	574.22	12.33	7.01	0.68
Dead+Wind 240 deg - Service+Guy	25455.33	-594.99	326.48	6.53	12.70	0.86
Dead+Wind 270 deg - Service+Guy	25403.41	-681.10	-18.53	-1.40	14.72	0.97
Dead+Wind 300 deg - Service+Guy	25337.07	-586.74	-359.43	-9.13	12.75	0.96
Dead+Wind 330 deg - Service+Guy	25199.64	-337.37	-611.95	-14.74	7.29	0.86

Solution Summary

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
1	0.00	-8830.28	0.00	0.03	8830.28	-0.06	0.001%
2	-24.04	-8850.27	-12962.63	24.02	8850.26	12962.18	0.003%
3	6394.00	-8815.41	-11186.89	-6394.01	8815.40	11186.64	0.002%
4	11090.54	-8788.70	-6436.84	-11090.65	8788.70	6436.47	0.002%
5	12830.16	-8827.40	25.13	-12829.96	8827.39	-25.01	0.002%
6	11149.61	-8861.80	6498.40	-11149.26	8861.79	-6498.20	0.003%
7	6439.18	-8834.16	11215.41	-6439.00	8834.15	-11215.31	0.001%
8	24.04	-8810.29	12929.36	-23.69	8810.29	-12929.21	0.002%
9	-6394.00	-8845.15	11186.89	6393.79	8845.15	-11186.76	0.002%
10	-11119.35	-8871.86	6453.47	11119.22	8871.86	-6453.39	0.001%
11	-12830.16	-8833.16	-25.13	12829.99	8833.15	25.26	0.001%
12	-11120.80	-8798.76	-6481.77	11120.86	8798.75	6481.27	0.003%
13	-6439.18	-8826.40	-11215.41	6439.16	8826.39	11215.13	0.002%
14	0.00	-16083.52	0.00	-0.05	16083.52	0.27	0.002%
15	-26.68	-16125.16	-14454.55	26.66	16125.15	14454.10	0.002%
16	6847.59	-16052.54	-11979.95	-6847.65	16052.53	11979.35	0.003%
17	11713.80	-15996.89	-6794.34	-11713.98	15996.89	6793.78	0.003%
18	13742.52	-16077.52	28.95	-13742.36	16077.52	-28.85	0.001%
19	12437.95	-16149.19	7242.62	-12437.60	16149.18	-7242.43	0.002%
20	6901.19	-16091.60	12015.97	-6900.74	16091.59	-12015.75	0.002%
21	26.68	-16041.88	13664.17	-26.49	16041.87	-13664.10	0.001%
22	-6847.59	-16114.50	11979.95	6847.44	16114.50	-11979.86	0.001%
23	-12398.30	-16170.15	7189.54	12397.94	16170.14	-7189.28	0.002%
24	-13742.52	-16089.52	-28.95	13742.10	16089.51	29.36	0.003%
25	-11753.46	-16017.85	-6847.42	11753.54	16017.85	6846.88	0.003%
26	-6901.19	-16075.44	-12015.97	6901.18	16075.44	12015.74	0.001%
27	-8.32	-8837.20	-4485.34	8.22	8837.19	4485.48	0.002%
28	2212.46	-8825.13	-3870.90	-2212.59	8825.13	3870.87	0.001%
29	3837.56	-8815.89	-2227.28	-3837.59	8815.89	2227.33	0.001%
30	4439.50	-8829.28	8.69	-4439.48	8829.28	-8.48	0.002%
31	3858.00	-8841.19	2248.58	-3857.95	8841.18	-2248.41	0.002%
32	2228.09	-8831.62	3880.76	-2227.98	8831.62	-3880.56	0.002%
33	8.32	-8823.36	4473.83	-8.34	8823.36	-4473.56	0.003%
34	-2212.46	-8835.42	3870.90	2212.42	8835.42	-3870.81	0.001%
35	-3847.53	-8844.67	2233.04	3847.49	8844.67	-2232.91	0.001%
36	-4439.50	-8831.27	-8.69	4439.47	8831.27	8.84	0.001%
37	-3848.03	-8819.37	-2242.83	3848.01	8819.37	2242.91	0.001%
38	-2228.09	-8828.94	-3880.76	2228.03	8828.94	3880.88	0.001%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	9	0.00000001	0.00003105
2	Yes	16	0.00000001	0.00007915
3	Yes	16	0.00000001	0.00004891
4	Yes	12	0.00000001	0.00006029
5	Yes	15	0.00000001	0.00004964
6	Yes	15	0.00000001	0.00007753
7	Yes	15	0.00000001	0.00004104
8	Yes	11	0.00000001	0.00006464
9	Yes	14	0.00000001	0.00005368
10	Yes	15	0.00000001	0.00003351
11	Yes	14	0.00000001	0.00004679
12	Yes	13	0.00000001	0.00008655
13	Yes	16	0.00000001	0.00005244

14	Yes	9	0.00000001	0.00007349
15	Yes	16	0.00000001	0.00007110
16	Yes	15	0.00000001	0.00009669
17	Yes	12	0.00000001	0.00007795
18	Yes	15	0.00000001	0.00003398
19	Yes	15	0.00000001	0.00006855
20	Yes	14	0.00000001	0.00008681
21	Yes	12	0.00000001	0.00003393
22	Yes	14	0.00000001	0.00003304
23	Yes	14	0.00000001	0.00008269
24	Yes	13	0.00000001	0.00009409
25	Yes	13	0.00000001	0.00007813
26	Yes	16	0.00000001	0.00003808
27	Yes	9	0.00000001	0.00007626
28	Yes	9	0.00000001	0.00005353
29	Yes	9	0.00000001	0.00003304
30	Yes	9	0.00000001	0.00005881
31	Yes	9	0.00000001	0.00005224
32	Yes	9	0.00000001	0.00006452
33	Yes	9	0.00000001	0.00008118
34	Yes	10	0.00000001	0.00003233
35	Yes	10	0.00000001	0.00004542
36	Yes	10	0.00000001	0.00005077
37	Yes	10	0.00000001	0.00003186
38	Yes	9	0.00000001	0.00008223

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	120 - 100	1.781	38	0.0967	0.5988
T2	100 - 80	1.323	27	0.1140	0.5441
T3	80 - 60	0.870	27	0.0819	0.4775
T4	60 - 40	0.621	27	0.0552	0.3551
T5	40 - 20	0.392	27	0.0574	0.2339
T6	20 - 0	0.147	27	0.0498	0.1133

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
120.00	LPA-80063/6CF	38	1.781	0.0967	0.5988	202558
119.92	Guy	38	1.779	0.0968	0.5986	202558
118.00	Valmont 15' T-Frame P/N 860109	38	1.736	0.0997	0.5932	202558
80.17	Guy	27	0.873	0.0822	0.4783	14700

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	120 - 100	10.107	2	0.6505	1.1094
T2	100 - 80	7.242	2	0.6751	1.0034
T3	80 - 60	4.781	15	0.5150	0.8801
T4	60 - 40	3.180	15	0.3537	0.6566
T5	40 - 20	1.824	15	0.3083	0.4356
T6	20 - 0	0.624	15	0.2285	0.2173

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
120.00	LPA-80063/6CF	2	10.107	0.6505	1.1094	75259
119.92	Guy	2	10.095	0.6508	1.1090	75259
118.00	Valmont 15' T-Frame P/N 860109	2	9.822	0.6577	1.0986	75259
80.17	Guy	15	4.798	0.5166	0.8815	3716

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	120	Leg	A325N	0.7500	3	0.00	19425.50	0.000 ✔	1.333	Bolt Tension
T2	100	Leg	A325N	0.7500	3	1906.96	19421.00	0.098 ✔	1.333	Bolt Tension
T3	80	Leg	A325N	0.7500	3	0.00	19429.80	0.000 ✔	1.333	Bolt Tension
T4	60	Leg	A325N	0.7500	3	0.00	19435.20	0.000 ✔	1.333	Bolt Tension
T5	40	Leg	A325N	0.7500	3	0.00	19425.30	0.000 ✔	1.333	Bolt Tension
T6	20	Leg	A325N	0.7500	3	2319.42	19433.60	0.119 ✔	1.333	Bolt Tension

Guy Design Data

Section No.	Elevation ft	Size	Initial Tension lb	Breaking Load lb	Actual T lb	Allowable T_a lb	Required S.F.	Actual S.F.
T1	119.92 (A) (291)	9/16 EHS	3500.00	35000.04	11645.10	17500.00	2.000	3.006 ✔
	119.92 (B) (290)	9/16 EHS	3500.00	35000.04	11757.10	17500.00	2.000	2.977 ✔
	119.92 (C) (289)	9/16 EHS	3500.00	35000.04	11776.70	17500.00	2.000	2.972 ✔
T2	80.17 (A) (297)	9/16 EHS	3850.00	35000.04	10445.60	17500.00	2.000	3.351 ✔
	80.17 (B) (296)	9/16 EHS	3850.00	35000.04	10587.50	17500.00	2.000	3.306 ✔

Section No.	Elevation ft	Size	Initial Tension lb	Breaking Load lb	Actual T lb	Allowable T_a lb	Required S.F.	Actual S.F.
	80.17 (C) (292)	9/16 EHS	3850.00	35000.04	10637.60	17500.00	2.000	3.290 ✔

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	Mast Stability Index	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P2.5x.203	20.00	3.29	41.7 K=1.00	1.00	18.570	1.7040	-11637.60	31644.50	0.368 ✔
T2	100 - 80	P2.5x.203	20.00	3.28	41.5 K=1.00	1.00	18.584	1.7040	-29587.70	31667.60	0.934 ✔
T3	80 - 60	P2.5x.203	20.00	3.28	41.5 K=1.00	1.00	18.518	1.7040	-29588.50	31556.40	0.938 ✔
T4	60 - 40	P2.5x.203	20.00	3.28	41.5 K=1.00	0.99	18.474	1.7040	-18882.90	31481.20	0.600 ✔
T5	40 - 20	P2.5x.203	20.00	3.28	41.5 K=1.00	0.99	18.460	1.7040	-25564.70	31456.30	0.813 ✔
T6	20 - 0	P2.5x.203	20.00	3.28	41.5 K=1.00	1.00	18.502	1.7040	-41043.30	31528.00	1.302 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	4.54	4.19	156.5 K=1.00	6.100	0.4335	-2319.10	2644.47	0.877 ✔
T2	100 - 80	P.75x.154	4.53	4.18	156.1 K=1.00	6.128	0.4335	-3433.07	2656.23	1.292 ✔
T3	80 - 60	P.75x.154	4.53	4.18	156.1 K=1.00	6.128	0.4335	-3240.76	2656.23	1.220 ✔
T4	60 - 40	P.75x.154	4.53	4.18	156.1 K=1.00	6.128	0.4335	-1943.90	2656.23	0.732 ✔
T5	40 - 20	P.75x.154	4.53	4.18	156.1 K=1.00	6.128	0.4335	-2724.22	2656.23	1.026 ✔
T6	20 - 0	P.75x.154	4.53	4.18	156.1 K=1.00	6.128	0.4335	-3334.53	2656.23	1.255 ✔

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-388.97	5131.40	0.076 ✔
T2	100 - 80	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-512.47	5131.40	0.100 ✔
T3	80 - 60	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-512.49	5131.40	0.100 ✔
T4	60 - 40	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-327.06	5131.40	0.064 ✔
T5	40 - 20	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-442.79	5131.40	0.086 ✔
T6	20 - 0	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-710.89	5131.40	0.139 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.01	2461.56	0.000 ✔
T2	100 - 80	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.01	2461.56	0.000 ✔
T3	80 - 60	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.00	2461.56	0.000 ✔
T4	60 - 40	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.00	2461.56	0.000 ✔
T5	40 - 20	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.00	2461.56	0.000 ✔
T6	20 - 0	P0.375x0.091	1.56	1.44	82.9 K=1.00	14.744	0.1670	-0.00	2461.56	0.000 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	3.13	2.89	107.7 K=1.00	11.837	0.4335	-498.30	5131.40	0.097 ✔
T2	100 - 80	2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-515.34	2594.96	0.199 ✔
T3	80 - 60	KL/R > 200 (C) - 54 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-639.27	2594.96	0.246 ✔
T4	60 - 40	KL/R > 200 (C) - 100 2x1/2	3.13	2.89	239.9	2.595	1.0000	-322.45	2594.96	0.124

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
					K=1.00					✓
T5	40 - 20	KL/R > 200 (C) - 148 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-206.07	2594.96	0.079 ✓
T6	20 - 0	KL/R > 200 (C) - 198 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-433.70	2594.96	0.167 ✓
		KL/R > 200 (C) - 245								

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-302.98	2594.96	0.117 ✓
T3	80 - 60	KL/R > 200 (C) - 9 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-170.65	2594.96	0.066 ✓
T5	40 - 20	KL/R > 200 (C) - 103 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-144.05	2594.96	0.056 ✓
T6	20 - 0	KL/R > 200 (C) - 201 2x1/2	3.13	2.89	239.9 K=1.00	2.595	1.0000	-392.80	2594.96	0.151 ✓
		KL/R > 200 (C) - 249								

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T2	100 - 80	P2.5x.203	20.00	3.28	41.5	21.000	1.7040	11120.60	35785.10	0.311 ✓
T3	80 - 60	P2.5x.203	20.00	3.28	41.5	21.000	1.7040	5720.09	35785.10	0.160 ✓
T6	20 - 0	P2.5x.203	20.00	3.28	41.5	21.000	1.7040	6958.26	35785.10	0.194 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	4.54	4.19	156.5	21.000	0.4335	1621.18	9103.28	0.178 ✔
T2	100 - 80	P.75x.154	4.53	4.18	156.1	21.000	0.4335	2929.81	9103.28	0.322 ✔
T3	80 - 60	P.75x.154	4.53	4.18	156.1	21.000	0.4335	2918.17	9103.28	0.321 ✔
T4	60 - 40	P.75x.154	4.53	4.18	156.1	21.000	0.4335	1693.55	9103.28	0.186 ✔
T5	40 - 20	P.75x.154	4.53	4.18	156.1	21.000	0.4335	1584.86	9103.28	0.174 ✔
T6	20 - 0	P.75x.154	4.53	4.18	156.1	21.000	0.4335	2393.65	9103.28	0.263 ✔

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	3.13	2.89	107.7	21.000	0.4335	521.17	9103.28	0.057 ✔
T2	100 - 80	P.75x.154	3.13	2.89	107.7	21.000	0.4335	512.47	9103.28	0.056 ✔
T3	80 - 60	P.75x.154	3.13	2.89	107.7	21.000	0.4335	512.49	9103.28	0.056 ✔
T4	60 - 40	P.75x.154	3.13	2.89	107.7	21.000	0.4335	376.83	9103.28	0.041 ✔
T5	40 - 20	P.75x.154	3.13	2.89	107.7	21.000	0.4335	442.79	9103.28	0.049 ✔
T6	20 - 0	P.75x.154	3.13	2.89	107.7	21.000	0.4335	710.89	9103.28	0.078 ✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.01	3506.09	0.000 ✔
T2	100 - 80	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.01	3506.09	0.000 ✔
T3	80 - 60	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.01	3506.09	0.000 ✔
T4	60 - 40	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.01	3506.09	0.000 ✔
T5	40 - 20	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.01	3506.09	0.000 ✔
T6	20 - 0	P0.375x0.091	1.56	1.44	82.9	21.000	0.1670	0.00	3506.09	0.000 ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
										✓

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	P.75x.154	3.13	2.89	107.7	21.000	0.4335	4493.35	9103.28	0.494 ✓
T2	100 - 80	2x1/2	3.13	2.89	239.9	21.600	1.0000	480.67	21600.00	0.022 ✓
T3	80 - 60	2x1/2	3.13	2.89	239.9	21.600	1.0000	910.85	21600.00	0.042 ✓
T4	60 - 40	2x1/2	3.13	2.89	239.9	21.600	1.0000	300.21	21600.00	0.014 ✓
T5	40 - 20	2x1/2	3.13	2.89	239.9	21.600	1.0000	223.59	21600.00	0.010 ✓
T6	20 - 0	2x1/2	3.13	2.89	239.9	21.600	1.0000	422.99	21600.00	0.020 ✓

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	120 - 100	2x1/2	3.13	2.89	239.9	21.600	1.0000	540.72	21600.00	0.025 ✓
T2	100 - 80	2x1/2	3.13	2.89	239.9	21.600	1.0000	1727.09	21600.00	0.080 ✓
T3	80 - 60	2x1/2	3.13	2.89	239.9	21.600	1.0000	585.35	21600.00	0.027 ✓
T4	60 - 40	2x1/2	3.13	2.89	239.9	21.600	1.0000	384.03	21600.00	0.018 ✓
T5	40 - 20	2x1/2	3.13	2.89	239.9	21.600	1.0000	645.19	21600.00	0.030 ✓
T6	20 - 0	2x1/2	3.13	2.89	239.9	21.600	1.0000	2854.19	21600.00	0.132* ✓

* DL controls

Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T2	100 - 80	1 1/4x1 1/4	3.13	2.89	96.0	21.600	1.5625	2698.58	33750.00	0.080 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	120 - 100	Leg	P2.5x.203	2	-11637.60	42182.12	27.6	Pass
T2	100 - 80	Leg	P2.5x.203	51	-29587.70	42212.91	70.1	Pass
T3	80 - 60	Leg	P2.5x.203	99	-29588.50	42064.68	70.3	Pass
T4	60 - 40	Leg	P2.5x.203	147	-18882.90	41964.44	45.0	Pass
T5	40 - 20	Leg	P2.5x.203	195	-25564.70	41931.25	61.0	Pass
T6	20 - 0	Leg	P2.5x.203	243	-41043.30	42026.82	97.7	Pass
T1	120 - 100	Diagonal	P.75x.154	11	-2319.10	3525.08	65.8	Pass
T2	100 - 80	Diagonal	P.75x.154	59	-3433.07	3540.75	97.0	Pass
T3	80 - 60	Diagonal	P.75x.154	134	-3240.76	3540.75	91.5	Pass
T4	60 - 40	Diagonal	P.75x.154	182	-1943.90	3540.75	54.9	Pass
T5	40 - 20	Diagonal	P.75x.154	203	-2724.22	3540.75	76.9	Pass
T6	20 - 0	Diagonal	P.75x.154	251	-3334.53	3540.75	94.2	Pass
T1	120 - 100	Horizontal	P.75x.154	42	-388.97	6840.16	5.7	Pass
T2	100 - 80	Horizontal	P.75x.154	64	-512.47	6840.16	7.5	Pass
T3	80 - 60	Horizontal	P.75x.154	112	-512.49	6840.16	7.5	Pass
T4	60 - 40	Horizontal	P.75x.154	160	-327.06	6840.16	4.8	Pass
T5	40 - 20	Horizontal	P.75x.154	207	-442.79	6840.16	6.5	Pass
T6	20 - 0	Horizontal	P.75x.154	262	-710.89	6840.16	10.4	Pass
T1	120 - 100	Secondary Horizontal	P0.375x0.091	20	-0.01	3281.26	0.1	Pass
T2	100 - 80	Secondary Horizontal	P0.375x0.091	82	-0.01	3281.26	0.1	Pass
T3	80 - 60	Secondary Horizontal	P0.375x0.091	144	0.01	4673.62	0.1	Pass
T4	60 - 40	Secondary Horizontal	P0.375x0.091	192	0.01	4673.62	0.1	Pass
T5	40 - 20	Secondary Horizontal	P0.375x0.091	240	0.01	4673.62	0.1	Pass
T6	20 - 0	Secondary Horizontal	P0.375x0.091	288	0.00	4673.62	0.1	Pass
T1	120 - 100	Top Girt	P.75x.154	4	4493.35	12134.67	37.0	Pass
T2	100 - 80	Top Girt	2x1/2	54	-515.34	3459.08	14.9	Pass
T3	80 - 60	Top Girt	2x1/2	100	-639.27	3459.08	18.5	Pass
T4	60 - 40	Top Girt	2x1/2	148	-322.45	3459.08	9.3	Pass
T5	40 - 20	Top Girt	2x1/2	198	-206.07	3459.08	6.0	Pass
T6	20 - 0	Top Girt	2x1/2	245	-433.70	3459.08	12.5	Pass
T1	120 - 100	Bottom Girt	2x1/2	9	-302.98	3459.08	8.8	Pass
T2	100 - 80	Bottom Girt	2x1/2	55	1727.09	28792.80	6.0	Pass
T3	80 - 60	Bottom Girt	2x1/2	103	-170.65	3459.08	4.9	Pass
T4	60 - 40	Bottom Girt	2x1/2	152	384.03	28792.80	1.3	Pass
T5	40 - 20	Bottom Girt	2x1/2	201	-144.05	3459.08	4.2	Pass
T6	20 - 0	Bottom Girt	2x1/2	249	2854.19	21600.00	13.2	Pass
T1	120 - 100	Guy A@119.917	9/16	291	11645.10	17500.00	66.5	Pass
T2	100 - 80	Guy A@80.1667	9/16	297	10445.60	17500.00	59.7	Pass
T1	120 - 100	Guy B@119.917	9/16	290	11757.10	17500.00	67.2	Pass
T2	100 - 80	Guy B@80.1667	9/16	296	10587.50	17500.00	60.5	Pass
T1	120 - 100	Guy C@119.917 (-5 deg)	9/16	289	11776.70	17500.00	67.3	Pass
T2	100 - 80	Guy C@80.1667 (-5 deg)	9/16	292	10637.60	17500.00	60.8	Pass
T2	100 - 80	Top Guy Pull-Off@80.1667	1 1/4x1 1/4	293	2698.58	44988.75	6.0	Pass
							Summary	
						Leg (T6)	97.7	Pass
						Diagonal	97.0	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
						(T2) Horizontal	10.4	Pass
						(T6) Secondary Horizontal	0.1	Pass
						(T1) Top Girt	37.0	Pass
						(T1) Bottom Girt	13.2	Pass
						(T6) Guy A (T1)	66.5	Pass
						Guy B (T1)	67.2	Pass
						Guy C (T1)	67.3	Pass
						Top Guy Pull-Off (T2)	6.0	Pass
						Bolt Checks	9.0	Pass
						RATING =	**97.7**	**Pass**

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Job :	Verizon ~ Lebanon: 120-ft Guyed Lattice Tower	**Project No.**	15001.015	**Sheet**	1 of 2
Address:	236 Gates Rd., Lebanon, CT	**Computed by**	TJL	**Date**	3/5/15
Description:	Guy Anchor Evaluation - 2005 CSBC 3108.4.2/TIA Req	**Checked by**	CFC	**Date**	

CHECK UPLIFT RESISTANCE

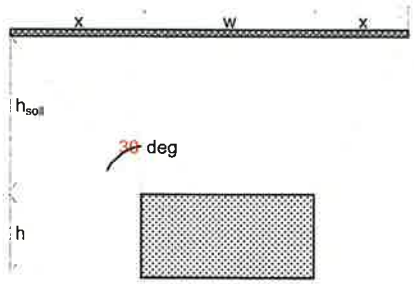
ANCHOR (C) AT 86.0ft RADIUS

RESULTS FROM COMPUTER ANALYSIS:

Uplift =	16.5	kips
Sliding =	14.6	kips

CONCRETE PARAMETERS:

γ conc =	150	pcf
w =	3.58	ft
h =	2.83	ft
d =	8	ft
Vol. =	*81.05*	ft^3
Wc =	*12.16*	kips



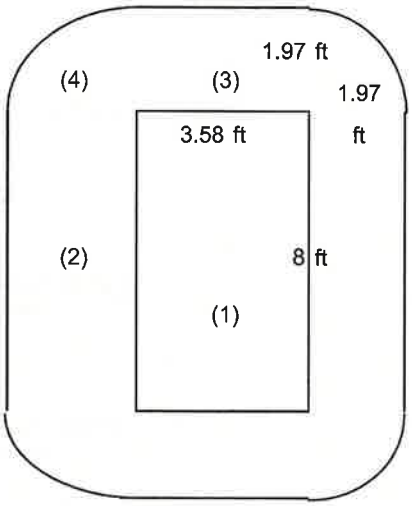
Foundation Section

SOIL PARAMETERS:

γ_{soil} =	110	pcf
h_{soil} =	3.42	ft
x =	*1.97*	ft

Soil Weight (Wr):

(1) =	10.77	kips
(2) =	5.94	kips
(3) =	2.66	kips
(4) =	1.54	kips
*(5) Anchor Reinf. =	0	kips
Total =	20.91	kips



Foundation Plan View

CHECK UPLIFT (PER EIA/TIA-222-F STANDARD AND 2005 CT BUILDING CODE):

Wr / 2.0 + Wc / 2.0 > UPLIFT				(Wr + Wc) / 2.0 > UPLIFT			
16.53	>	*16.5*	**OK**	*16.53*	>	*16.5*	**OK**

→ ***GUY ANCHORS AGAINST UPLIFT ARE ADEQUATE***

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Job :	Verizon ~ Lebanon: 120-ft Guyed Lattice Tower	**Project No.**	15001.015	**Sheet**	2 of 2
Address:	236 Gates Rd., Lebanon, CT	**Computed by**	TJL	**Date**	3/5/15
Description:	Guy Anchor Evaluation - 2005 CSBC 3108.4.2/TIA Req	**Checked by**	CFC	**Date**	

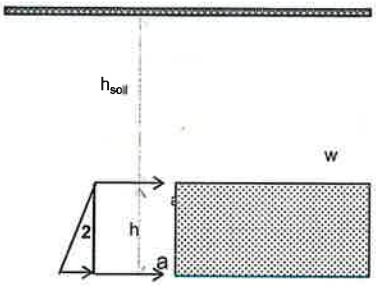
CHECK SLIDING RESISTANCE

SOIL PARAMETERS

$\gamma soil$ =	110	pcf
h_{soil} =	3.42	ft
h =	2.83	ft
ϕ =	30	degrees

ANCHOR PARAMETERS

w =	3.6	ft
h =	2.8	ft
d =	8.0	ft



Foundation Elevation View

K_p = 3.00

HORIZONTAL FORCES

1 =	25.55 k
2 =	10.57 k
RESIST TO SLIDING =	36.12 k

SOIL & CONCRETE WEIGHT =	Wr + Wc =	33.07 k
UPLIFT REACTIONS =		-16.5 k
SUM =		16.57 k

COEF. OF FRICTION, (0.45) =	7.46 k
RESIST TO SLIDING =	36.12 k
SUM =	43.58 k

SF AGAINST SLIDING

SF = 3.0 > 2 OK

→ ***GUY ANCHORS AGAINST SLIDING ARE ADEQUATE***

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Subject:	Base Foundation Analysis
Location:	120-ft Guyed Lattice Tower Lebanon, CT
Rev. 0: 3/5/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15001.015

Guyed Tower Foundation:

Input Data:

Tower Data

Shear Force =	Shear := 2.36·kip	(User Input from tnxTower)	
Axial Force =	Axial := 45.81·kip	(User Input from tnxTower)	
Axial Force =	Moment := 70·kip·ft	(User Input from tnxTower)	
Tower Height =	H_t := 120.0·ft	(User Input)	

Footing Data:

Overall Depth of Footing =	D_f := 3.00·ft	(User Input)	
Length of Pier =	L_p := 0.00·ft	(User Input)	
Extension of Pier Above Grade =	L_{pag} := 0.00·ft	(User Input)	
Width of Pier =	d_p := 0.00·ft	(User Input)	
Thickness of Footing =	T_f := 3.50·ft	(User Input)	
Width of Footing =	W_f := 7.17·ft	(User Input)	

Material Properties:

Concrete Compressive Strength =	f_c := 3000·psi	(User Input)	
Steel Reinforcement Yield Strength =	f_y := 60000·psi	(User Input)	
Internal Friction Angle of Soil =	Φ_s := 30·deg	(User Input)	
Allowable Soil Bearing Capacity =	q_s := 4000·psf	(User Input)	
Unit Weight of Soil =	γ_{soil} := 110·pcf	(User Input)	
Unit Weight of Concrete =	γ_{conc} := 150·pcf	(User Input)	
Foundation Bouyancy =	Bouyancy := 0	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	n := 1.0·ft	(User Input)	
Cohesion of Clay Type Soil =	c := 0·ksf	(User Input)	(Use 0 for Sandy Soil)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)	
Overturning/Sliding Factor of Safety Required =	FS_{req} := 2	(User Input)	

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$$

Load Factor =

$$LF := \begin{cases} 1.333 \text{ if } H_t \le 700\cdot ft \\ 1.7 \text{ if } H_t \ge 1200\cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right)\cdot 0.4 \text{ otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150\cdot pcf$$

Adjusted Soil Unit Weight =

$$\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 110\cdot pcf$$

Passive Pressure =

$$P_{pn} := K_p\cdot\gamma_s\cdot n + c\cdot 2\cdot\sqrt{K_p} = 0.33\cdot ksf$$

$$P_{pt} := K_p\cdot\gamma_s\cdot(D_f - T_f) + c\cdot 2\cdot\sqrt{K_p} = -0.165\cdot ksf$$

$$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 0.33\cdot ksf$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 0.99\cdot ksf$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.66\cdot ksf$$

$$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 2$$

$$A_p := W_f\cdot T_p = 14.34$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 9.464\cdot kip$$

Weight of Concrete =

$$WT_c := \left[\left(W_f^2\cdot T_f\right) + d_p^2 L_p\right]\cdot\gamma_c = 26.99\cdot kip$$

Total Weight =

$$WT_{tot} := WT_c + Axial = 72.8\cdot kip$$

Resisting Moment =

$$M_r := \left(WT_{tot}\right)\cdot\frac{W_f}{2} + S_u\cdot\frac{T_f}{3} = 272\cdot kip\cdot ft$$

Overturning Moment =

$$M_{ot} := Moment + Shear\cdot\left(L_p + T_f\right) = 78\cdot kip\cdot ft$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 3.48$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$OverTurning\_Moment\_Check := if\left(FS \ge FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$$

OverTurning_Moment_Check = "Okay"

Soil/Concrete Friction Resistance = $Sl_2 := \mu \cdot WT_{tot} = 32.76 \cdot kips$

Total Sliding Resistance = $Sl_{tot} := S_u + Sl_2 = 42.22 \cdot kips$

Factor of Safety Actual = $FS := \frac{Sl_{tot}}{Shear} = 17.89$

$Sliding\_Resistance\_Check := if\left(FS \geq FS_{req}, "Okay", "No\ Good"\right)$

Sliding_Resistance_Check = "Okay"

Bearing Pressure Caused by Footing:

Overturning Moment = $M_{ot} := Moment + Shear \cdot \left(L_p + T_f\right) = 78 \cdot kip \cdot ft$

Area of the Mat = $A_{mat} := W_f^{\,2} = 51.41$

Section Modulus of Mat = $S := \frac{W_f^{\,3}}{6} = 61.43 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 2.69 \cdot ksf$

$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No\ Good"\right)$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.142 \cdot ksf$

$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), "Okay", "No\ Good"\right]$

Min_Pressure_Check = "Okay"

verizonwireless

TOWER REINFORCEMENT DESIGN

VERIZON WIRELESS - LEBANON
236 GATES ROAD
LEBANON, CT 06249

VICINITY MAP

NORTH

PROJECT SUMMARY

SITE ADDRESS:	236 GATES ROAD LEBANON, CT 06249
PROJECT COORDINATES:	LAT: 41°-40'-59.31"N LON: 72°-12'-54.80"W ELEV: ±670 AMSL
VERIZON SITE REF.:	LEBANON
VERIZON CONTACT:	JEFF YORK 860.550.0513
ANTENNA CL HEIGHT:	120'-0"
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	CARLO F. CENTORE, PE 203.488.0580 ext. 122

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS & GENERAL NOTES	0
N-2	STRUCTURAL STEEL NOTES	0
MI-1	MODIFICATION INSPECTION REQUIREMENTS	0
S-1	TOWER ELEVATION AND FEEDLINE PLAN	0

3 3/5/15 CFC ISSUED FOR CONSTRUCTION
REV. DATE DESCRIPTION OF REVISION

PROFESSIONAL ENGINEER SEAL

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CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

LEBANON

236 GATES ROAD
LEBANON, CT 06249

DATE: 3/5/15
SCALE: AS SHOWN
JOB NO. 15001.015

TITLE SHEET

SHEET NO.
T-1
Sheet No. 1 of 8

DESIGN BASIS

1. GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CT STATE BUILDING CODE AND 2009 AMENDMENTS.

2. TIA/EIA-222-F-1996 "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".

3. DESIGN CRITERIA

   WIND LOAD: (TIA/EIA-222-F-1996)
   BASIC WIND SPEED (V) = 85 MPH (FASTEST MILE)

   WIND LOAD: (2005 CT STATE BUILDING CODE APPENDIX K)
   BASIC WIND SPEED (V) = 105 MPH (3-SECOND GUST)
   EQUIVALENT TO (V) = 85 MPH (FASTEST MILE)

   APPENDIX-K AND TIA/EIA-222-F WIND SPEEDS ARE EQUAL

PROJECT SCOPE

1. REMOVAL OF NINE (9) EXISTING PANEL ANTENNAS MOUNTED ON THREE (3) T-FRAMES WITH A RAD CENTER ELEVATION OF 120'-0" AGL.

2. INSTALLATION OF THREE (3) ANDREW LNX-6514DS PANEL ANTENNAS, SIX (6) ANDREW HBXX-6517DS PANEL ANTENNAS, THREE (3) ALCATEL-LUCENT RRH2X60-AWS REMOTE RADIO HEADS, THREE (3) ALCATEL-LUCENT RRH2X60-PCS REMOTE RADIO HEADS AND TWO (2) RFS DB-T1-6Z-8AB-0Z MAIN DISTRIBUTION BOXES MOUNTED ON THREE (3) T-FRAMES WITH A RAD CENTER ELEVATION OF 120'-0" AGL.

3. INSTALLATION OF TWO (2) 1-5/8" ø FIBER CABLES MOUNTED ON TWO (2) SEPARATE FACES OF THE EXISTING TOWER.

4. REPLACEMENT OF THREE (3) EXISTING 1/2" ø EHS GUY WIRES WITH THREE (3) 9/16" ø GUY WIRES AND ASSOCIATED HARDWARE.

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS AND REINFORCEMENT DESIGN PREPARED BY CENTEK ENGINEERING, INC., DATED 3/5/15.

2. THE TOWER GEOMETRY, STRUCTURE MEMBER SIZES AND FOUNDATION INFORMATION WERE OBTAINED FROM A PREVIOUS STRUCTURAL REPORT PREPARED BY CENTEK JOB NO. 11123 DATED MAY 16, 2012.

3. ALL STEEL REINFORCEMENT SHOWN HEREIN APPLIES TO ALL SIDES OF THE TOWER.

4. PROVIDE TEMPORARY ANCHORS, GUYING AND/OR BRACING AS REQUIRED TO SAFELY CONDUCT THE WORK.

5. ALL WORK SHALL BE IN ACCORDANCE WITH TIA-222-F "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".

6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIE-DOWNS, WHICH MIGHT BE NECESSARY.

7. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

8. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.

9 ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

10. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

11. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

12. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.

13. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	3/6/15	JJL	GPC	ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

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LEBANON

688 HATFIELD ROAD
LEBANON, CT 06249

DATE: 3/3/15
SCALE: AS SHOWN
JOB NO. 15001.015

DESIGN BASIS AND GENERAL NOTES

SHEET NO.
N-1
Sheet No. 2 of 2

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).

2. MATERIAL SPECIFICATIONS

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
   C. STRUCTURAL STEEL (TOWER REINF. SOLID ROUND BAR)--- ASTM A572_GR50 (50 KSI)
   D. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   E. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   F. PIPE---ASTM A53 GRADE B (FY = 35 KSI)

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.
   E. BLIND BOLTS---AS1252 PROPERTY CLASS 8.8 (FU=120 KSI).

4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.

5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.

8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.

10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.

15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.

16. ALL BOLTS SHALL BE INSTALLED PER THE REQUIREMENTS OF AISC 14TH EDITION & RCSC "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS".

17. ALL BOLTS SHALL BE INSTALLED AS SNUG-TIGHT CONNECTIONS UNLESS OTHERWISE INDICATED. CONNECTIONS SPECIFIED AS PRETENSIONED OR SLIP-CRITICAL SHALL BE TIGHTENED TO A BOLT TENSION NOT LESS THAN THAT GIVEN IN TABLE J3.1 OF AISC 14TH EDITION.

18. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.

19. LOAD INDICATOR WASHERS SHALL BE UTILIZED ON ALL PRETENSIONED OR SLIP-CRITICAL CONNECTIONS.

20. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.

21. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

22. FABRICATE BEAMS WITH MILL CAMBER UP.

23. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.

24. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

REV.	DATE	DRAWN BY	DESCRIPTION
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DATE: 3/6/15
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STRUCTURAL STEEL NOTES

SHEET NO.
N-2

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTUCTION		DURING CONSTRUCTION		POST-CONSTRUCTION	
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM
X	EOR MODIFICATION INSPECTION DRAWING	-	FOUNDATIONS	X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING
X	EOR APPROVED SHOP DRAWINGS	-	EARTHWORK\ BACKFILL MATERIAL & COMPACTION	-	POST-INSTALLED ANCHOR ROD PULL-OUT TEST
-	EOR APPROVED POST-INSTALLED ANCHOR MPII	-	REBAR & FORMWORK GEOMETRY VERIFICATION	X	PHOTOGRAPHS
-	FABRICATION INSPECTION	-	CONCRETE TESTING	X	GUY WIRE TENSION TEST
-	FABRICATOR CERTIFIED WELDER INSPECTION	X	STEEL INSPECTION		
X	MATERIAL CERTIFICATIONS	-	POST INSTALLED ANCHOR ROD VERIFICATION		
		-	BASE PLATE GROUT VERIFICATION		
		-	CONTRACTOR'S CERTIFIED WELD INSPECTION		
		X	ON-SITE COLD GALVANIZING VERIFICATION		
		X	CONTRACTOR AS-BUILT REDLINE DRAWINGS		

NOTES:
1. REFER TO MODIFICATION INSPECTION NOTES FOR ADDITIONAL REQUIREMENTS
2. 'X' DENOTES DOCUMENT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
3. '-' DENOTES DOCUMENT NOT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
4. EOR - ENGINEER OF RECORD
5. MPII - 'MANUFACTURER'S PRINTED INSTALLATION GUIDELINES'

GENERAL

1. THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPILATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).
2. THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.
3. TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.
4. THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.
5. WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

1. THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:

   - REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   - WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON-SITE INSPECTIONS.
   - DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON-SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

1. THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:

   - REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   - WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON-SITE INSPECTIONS.
   - DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

1. SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:

   - CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
   - WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS-BUILT CONDITION.

REQUIRED PHOTOGRAPHS

1. THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:

   - PRE-CONSTRUCTION: GENERAL CONDITION OF THE SITE.
   - DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
   - POST-CONSTRUCTION: FINAL CONDITION OF THE SITE

0 3/5/15 SAL ISSUED FOR CONSTRUCTION
REV. DATE DRAWN BY DESCRIPTION

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

LEBANON

89 GATES ROAD
LEBANON, CT 06249

DATE: 3/5/15
SCALE: AS SHOWN
JOB NO. 15001.015

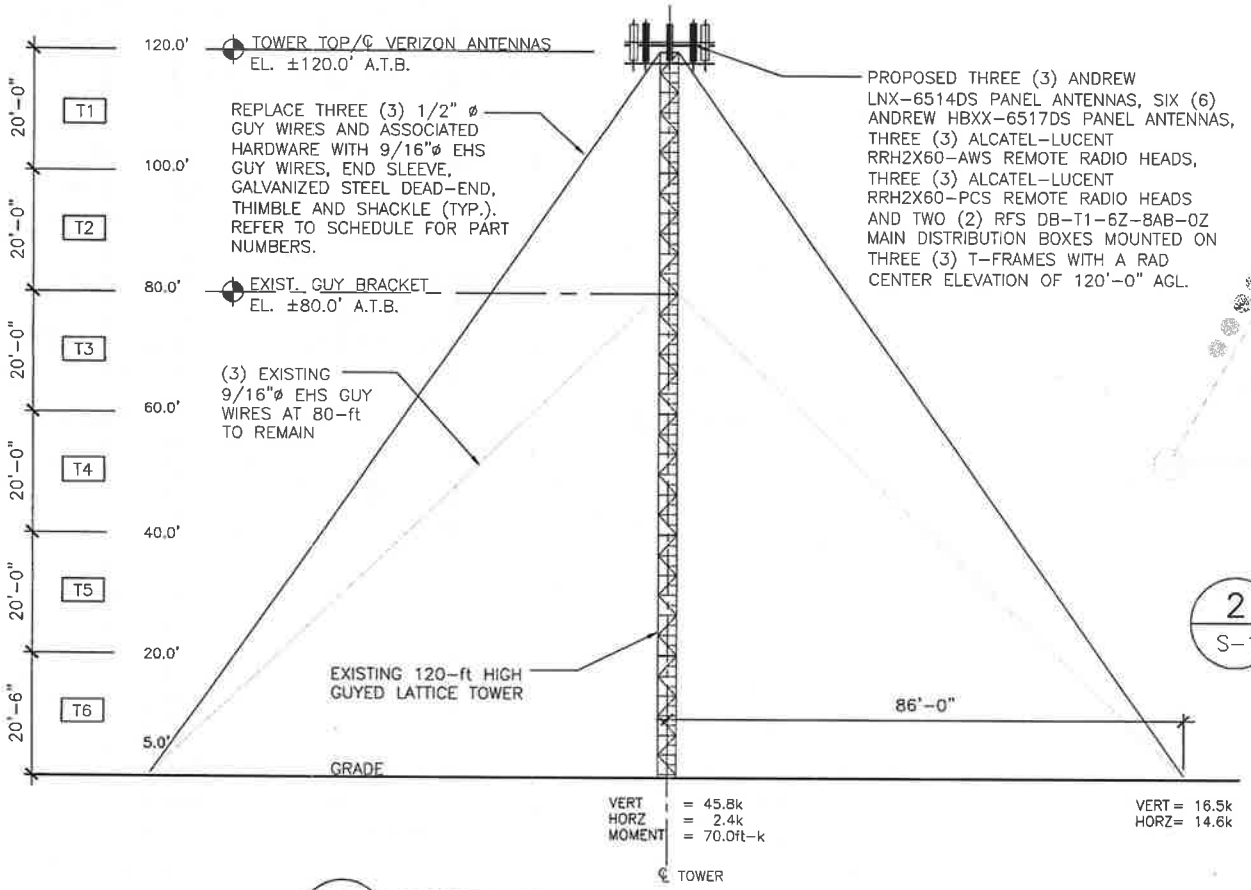
MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1
Sheet No. 1 of 1

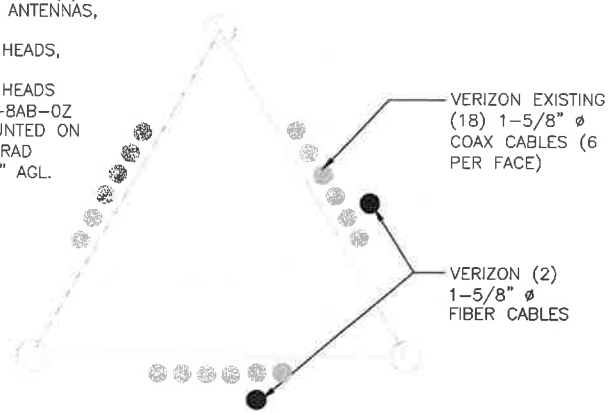
TOWER GUY WIRE COMPONENT SCHEDULE

ELEVATION	GUY WIRE SIZE	GUY WIRE ATTACHMENT TO TOWER P/N	BOLT TYPE SHACKLE P/N	END SLEEVE (ICE CLIP) P/N	GALV. DEAD END (BIG GRIP) P/N	THIMBLE P/N	TURNBUCKLE P/N	ANCHOR ROD P/N
120.0' (A.T.B)	9/16" (916AEHS)	EXIST.	5/8" (1019490)	9/16" (GC65267)	9/16" (BG2116)	3/4" (1037773)	7/8" JAW/JAW (1032750)	EXIST.

NOTE: ALL PART NUMBERS SHOWN ABOVE ARE BASED ON PRIMUS MATERIALS UNLESS OTHERWISE SPECIFIED.



1 / S-1 **TOWER ELEVATION - PROPOSED**
SCALE: 1" = 20'-0"



2 / S-1 **FEEDLINE PLAN**
SCALE: 1" = 1'-0"

APPROX TRUE NORTH

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS	LEBANON
DATE:	3/5/15
SCALE:	AS SHOWN
JOB NO.	15001.015

TOWER ELEVATION & FEEDLINE PLAN

SHEET NO. **S-1**

SITE NAME	LEBANON CT	ECP - CELL #	2	596
LATITUDE	41-40-59.00 N	LONGITUDE	72-12-59.00 W	
Additional Comments: 2015 AWS ADD.		SAVE BUTTON		
		STRUCTURE TYPE	Guytower	

AWS - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	HBXX-6517DS-VTM	HBXX-6517DS-VTM	HBXX-6517DS-VTM
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/ELEC)	0M/4E	0M/3E	0M/1E
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-AWS	1 ALU RH_2X60-AWS	1 ALU RH_2X60-AWS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX	2		DB-T1-6Z-8AB-0Z

700 Mhz - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70063-6CF_4	SLCP 2X6015	BXA-70063-6CF_2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/DEG)	2	4	2
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

700 Mhz - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	LNX-6514DS-VTM	LNX-6514DS-VTM	LNX-6514DS-VTM
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/DEG)	0M/6E	0M/4E	0M/4E
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	LPA-80630/6CF_2	SCE6016 REV2	LPA-80630/6CF_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/DEG)	4	2	2
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	LPA-80630/6CF_2	SCE6016 REV2	LPA-80630/6CF_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/ELEC)	4	2	2
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	LPA-171063-12BF_2	LPA-171063-12BF_2	LPA-171063-12BF_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/DEG)	2	0	0
RAD CTR (FT AGL)	120	120	120
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	HBXX-6517DS-VTM	HBXX-6517DS-VTM	HBXX-6517DS-VTM
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	100	190	280
DOWN TILT (MECH/DEG)	0M/4E	0M/3E	0M/1E
RAD CTR (FT AGL)	120	120	120
RRH - QTY/MODEL	1 ALU RRH_2X60-PCS	1 ALU RRH_2X60-PCS	1 ALU RRH_2X60-PCS
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE			

NUMBER OF CABLE'S NEEDED				ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES	18	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	18	TOP JUMPER (FT)			12
Equipment Cable Ordering		MAIN CABLE	18 + 0	TOP JUMPER #	18	+	0
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES	2	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS	3	TOP JUMPER MODEL #			HB058-1-08U1-S1J18
Fiber Cable Ordering		FIBER CABLE	0 + 2	TOP JUMPER #	0	+	3

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - B	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-21	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-17	RX - 776-787	LTE (Watts)	60

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Mark Brauer	Rob Hesselbach	MB	3/17/2014

Site Configuration

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® single band, quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	4

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom

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All specifications are subject to change. See www.commscope.com for the most current information. Revised: February 24, 2014

Product Specifications

HBXX-6517DS-VTM

RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1903.0 mm | 74.9 in
Width	305.0 mm | 12.0 in
Net Weight	19.5 kg | 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6517DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

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Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity, total	2
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

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Product Specifications

LNX-6514DS-VTM

Dimensions

Depth	181.0 mm | 7.1 in
Length	1847.0 mm | 72.7 in
Width	301.0 mm | 11.9 in
Net Weight	17.6 kg | 38.8 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6514DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

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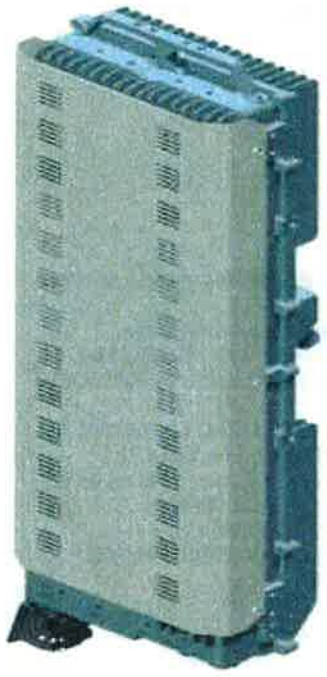
ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.



A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

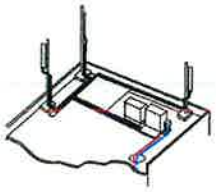
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

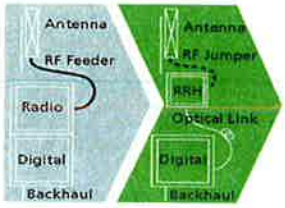
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

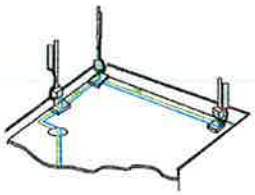
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

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Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage		48 VDC	
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs		N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs		N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs		N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC		N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V		N/A
Protection Class as per IEC 61643-1	Class 1		N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed		N/A
	IEEE C62.41		N/A
	NEMA LS-1		N/A
	IEC 61643-1		N/A
	IEC 61643-12		N/A
	EN 61643-11		N/A

* This data is provisional and subject to change.

All information contained in the present datasheet is subject to confirmation at time of ordering.