Robinson+Cole

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Also admitted in Massachusetts

March 4, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
**577 Bell Street, Glastonbury, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the top of the existing 104-foot self-supporting lattice tower at 577 Bell Street in Glastonbury, Connecticut (the "Property"). The tower is owned by Insite Towers, LLC. The Council approved Cellco's shared use of this tower in 2011 (Petition No. 990). Cellco now intends to modify its facility by replacing all of its existing antennas with three (3) model BXA-70063-6CF, 700 MHz antennas; three (3) model LNX-8514DS-VTM, 850 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 three (3) remote radio heads ("RRHs") behind its 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 Richard M. Johnson, Town Manager of the Town of Glastonbury. A copy of this letter is also being sent to John B. Spencer Trust, 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 of 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 cumulative 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 can support Cellco's proposed modifications. (*See* Structural Analysis 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:
Richard M. Johnson, Glastonbury Town Manager
John B. Spencer Trust
Timothy Parks

# ATTACHMENT 1

Amphenol ANTENNA SOLUTIONS

# BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

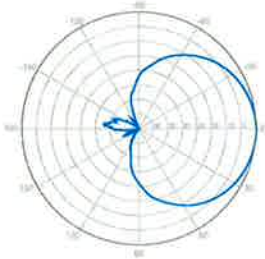
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

| Electrical Characteristics | 696-900 MHz | |
|---|---|---|
| Frequency bands | 696-806 MHz | 806-900 MHz |
| Polarization | ±45° | |
| Horizontal beamwidth | 65° | 63° |
| Vertical beamwidth | 13° | 11° |
| Gain | 14.0 dBd (16.1 dBi) | 14.5 dBd (16.6 dBi) |
| Electrical downtilt (X) | 0, 2, 3, 4, 5, 6, 8, 10 | |
| Impedance | 50Ω | |
| VSWR | ≤1.35:1 | |
| Upper sidelobe suppression (0°) | -18.3 dB | -18.2 dB |
| Front-to-back ratio (+/-30°) | -33.4 dB | -36.3 dB |
| Null fill | 5% (-26.02 dB) | |
| Isolation between ports | < -25 dB | |
| Input power with EDIN connectors | 500 W | |
| Input power with NE connectors | 300 W | |
| IM3 (2x20W carriers) | < -153 dBc | |
| Lightning protection | Direct Ground | |
| Connector(s) | 2 Ports / EDIN or NE / Female / Center (Back) | |
| **Mechanical Characteristics** | | |
| Dimensions Length x Width x Depth | 1804 x 285 x 132 mm | 71.0 x 11.2 x 5.2 in |
| Depth with z-brackets | 172 mm | 6.8 in |
| Weight without mounting brackets | 7.9 kg | 17 lbs |
| Survival wind speed | > 201 km/hr | > 125 mph |
| Wind area | Front: 0.51 $m^2$ Side: 0.24 $m^2$ | Front: 5.5 $ft^2$ Side: 2.6 $ft^2$ |
| Wind load @ 161 km/hr (100 mph) | Front: 759 N Side: 391 N | Front: 169 lbf Side: 89 lbf |

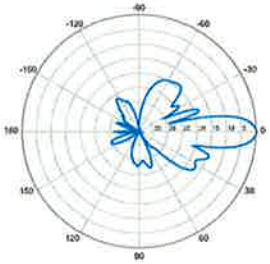
| Mounting Options | Part Number | Fits Pipe Diameter | Weight |
|---|---|---|---|
| 3-Point Mounting & Downtilt Bracket Kit | 36210008 | 40-115 mm 1.57-4.5 in | 6.9 kg 15.2 lbs |
| Concealment Configurations | For concealment configurations, order BXA-70063-6CF-EDIN-X-FP | | |

**BXA-70063-6CF-EDIN-X**



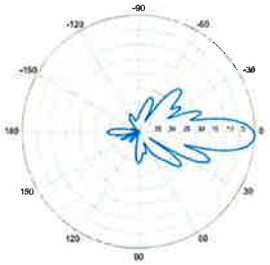
Horizontal | 750 MHz

**BXA-70063-6CF-EDIN-0**

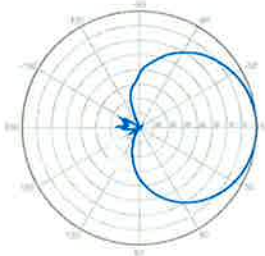


0° | Vertical | 750 MHz

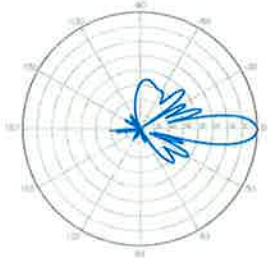
**BXA-70063-6CF-EDIN-2**



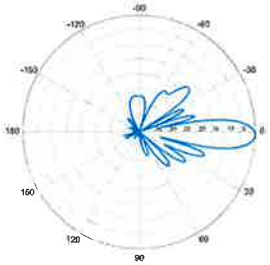
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

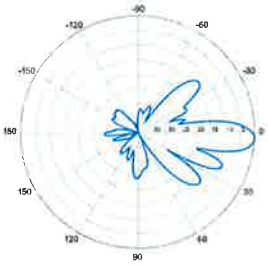


2° | Vertical | 850 MHz

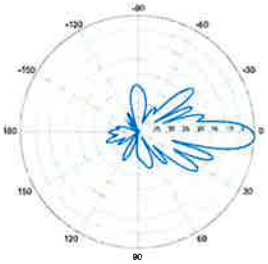
# BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

**BXA-70063-6CF-EDIN-3**

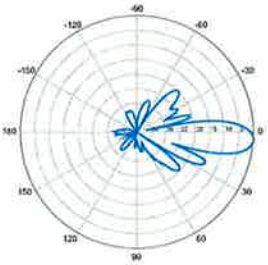


3° | Vertical | 750 MHz

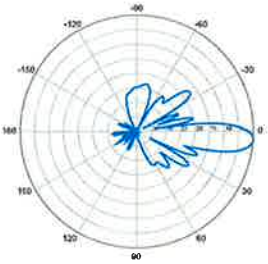


3° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-4**

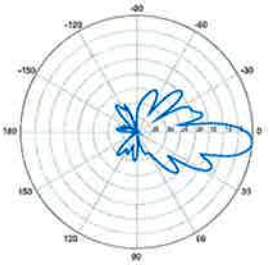


4° | Vertical | 750 MHz

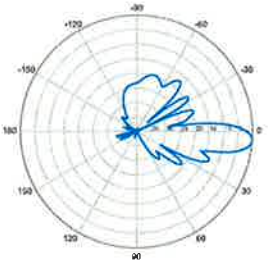


4° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-5**

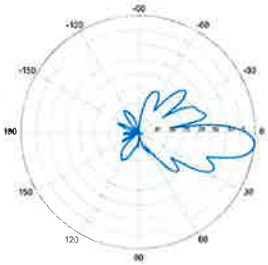


5° | Vertical | 750 MHz

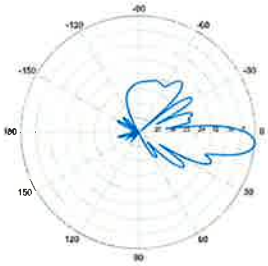


5° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-6**

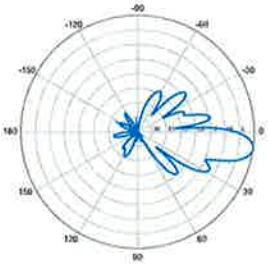


6° | Vertical | 750 MHz

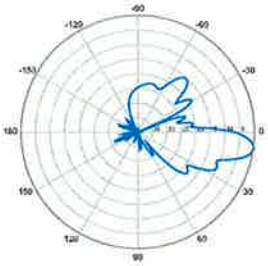


6° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-8**

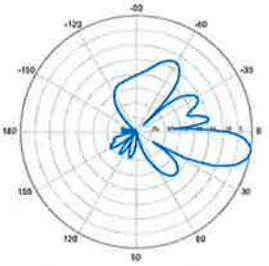


8° | Vertical | 750 MHz

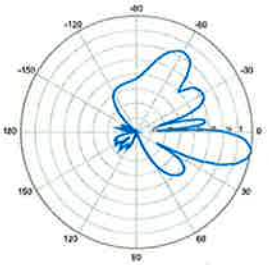


8° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-10**



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

# Product Specifications

COMMSCOPE®

## LNX-8514DS-VTM

**Andrew® Teletilt® Antenna, 698–896 MHz, 85° horizontal beamwidth, RET compatible**

POWERED BY ANDREW.

## Electrical Specifications

| Frequency Band, MHz | 698–806 | 806–896 |
|---|---|---|
| Gain by all Beam Tilts, average, dBi | 15.7 | 16.2 |
| Gain by all Beam Tilts Tolerance, dB | ±0.3 | ±0.2 |
| Gain by Beam Tilt, average, dBi | 0 ° \| 15.7<br>4 ° \| 15.7<br>8 ° \| 15.5 | 0 ° \| 16.3<br>4 ° \| 16.3<br>8 ° \| 16.1 |
| Beamwidth, Horizontal, degrees | 85 | 84 |
| Beamwidth, Horizontal Tolerance, degrees | ±1.2 | ±1.3 |
| Beamwidth, Vertical, degrees | 8.6 | 7.8 |
| Beamwidth, Vertical Tolerance, degrees | ±0.5 | ±0.4 |
| Beam Tilt, degrees | 0–8 | 0–8 |
| USLS, dB | 20 | 22 |
| Front-to-Back Total Power at 180° ± 30°, dB | 22 | 23 |
| CPR at Boresight, dB | 18 | 18 |
| CPR at Sector, dB | 12 | 11 |
| 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° |

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

## Mechanical Specifications

| | |
|---|---|
| Color \| Radome Material | Light gray \| Fiberglass, UV resistant |
| Connector Interface \| Location \| Quantity | 7-16 DIN Female \| Bottom \| 2 |
| Wind Loading, maximum | 879.0 N @ 150 km/h<br>197.6 lbf @ 150 km/h |
| Wind Speed, maximum | 241.0 km/h \| 149.8 mph |
| Antenna Dimensions, L x W x D | 2449.0 mm x 301.0 mm x 181.0 mm \| 96.4 in x 11.9 in x 7.1 in |
| Net Weight | 23.1 kg \| 50.9 lb |
| Model with factory installed AISG 2.0 RET | LNX-8514DS-A1M |

# 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<br>3 ° \| 18.7<br>6 ° \| 18.4 | 0 ° \| 18.4<br>3 ° \| 18.7<br>6 ° \| 18.5 | 0 ° \| 18.7<br>3 ° \| 18.9<br>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° |

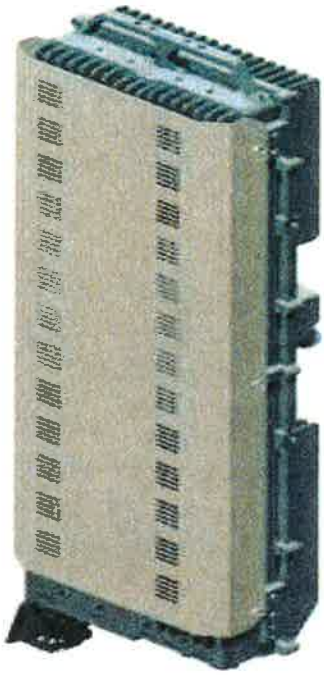
**Values calculated using NGMN Alliance N-P-BASTA v9.6*

## 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<br>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 |

# 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.

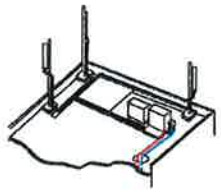
### EASY INSTALLATION

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.

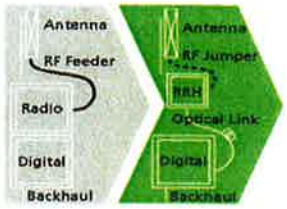
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

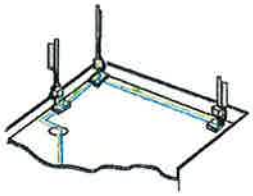
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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



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) |
| **Optical 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<br>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<br>UL Type XHHW-2, UL 44<br>UL-LS Limited Smoke, UL VW-1<br>IEEE-383 (1974), IEEE1202/FT4<br>RoHS Compliant |
| **Environment** | | | |
| Installation Temperature | | [°C (°F)] | -40 to +65 (-40 to149) |
| Operation Temperature | | [°C (°F)] | -40 to +65 (-40 to149) |

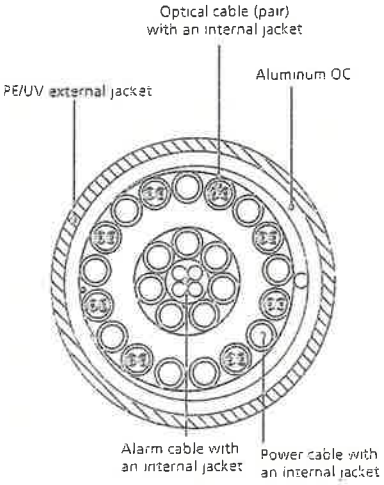



Figure 2: Construction Detail

- This data is provisional and subject to change

# ATTACHMENT 2

| | General | Power | Density | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site Name:** Manchester S (Glastonbury) | | | | | | | | |
| **Tower Height:** 104Ft. | | | | | | | | |
| **CARRIER** | **# OF CHAN.** | **WATTS ERP** | **HEIGHT** | **CALC. POWER DENS** | **FREQ.** | **MAX. PERMISS. EXP.** | **FRACTION MPE** | **Total** |
| *Town | 1 | 16.829 | 75 | 0.0011 | 960 | 0.6400 | 0.17% | |
| *Clearwire | 2 | 153 | 55 | 0.0364 | 2496 | 1.0000 | 3.64% | |
| *Clearwire | 1 | 211 | 55 | 0.0251 | 11 GHz | 1.0000 | 2.51% | |
| *MetroPCS/T-Mobile LTE | 2 | 24 | 65 | 0.0041 | 2100 | 1.0000 | 0.41% | |
| *MetroPCS/T-Mobile GSM/ | 2 | 12 | 65 | 0.0020 | 1950 | 1.0000 | 0.20% | |
| *MetroPCS/T-Mobile UMTS | 2 | 12 | 65 | 0.0020 | 2100 | 1.0000 | 0.20% | |
| *AT&T UMTS | 2 | 565 | 89 | 0.0513 | 880 | 0.5867 | 0.87% | |
| *AT&T UMTS | 2 | 1077 | 89 | 0.0978 | 1900 | 1.0000 | 0.98% | |
| *AT&T GSM | 1 | 647 | 89 | 0.0294 | 880 | 0.5867 | 0.50% | |
| *AT&T GSM | 4 | 934 | 89 | 0.1696 | 1900 | 1.0000 | 1.70% | |
| *AT&T LTE | 1 | 1615 | 89 | 0.0733 | 734 | 0.4893 | 1.50% | |
| *Cox | 1 | 100 | 94 | 0.0041 | 451 | 0.3007 | 1.35% | |
| *Cox | 6 | 100 | 70 | 0.0440 | 452 | 0.3013 | 14.61% | |
| **Verizon PCS** | **11** | **457** | **102** | **0.1737** | **1970** | **1.0000** | **17.37%** | |
| **Verizon Cellular** | **9** | **414** | **102** | **0.1288** | **869** | **0.5793** | **22.23%** | |
| **Verizon AWS** | **1** | **1750** | **102** | **0.0605** | **2145** | **1.0000** | **6.05%** | |
| **Verizon 700** | **1** | **1050** | **102** | **0.0363** | **698** | **0.4973** | **7.30%** | |
| | | | | | | | | **81.59%** |
| | | | | | | | | |
| * Source: Siting Council | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# ATTACHMENT 3

bennett&pless
Experience Structural Expertise

August 28, 2014

Ms. Tracy Lee
Insite Towers, LLC
1199 N. Fairfax St., Ste. 700
Alexandria, VA 22314

**Re: Tower Structural Analysis- Verizon Antenna Installation**

| | | | |
|---|---|---|---|
| **Site Number:** | CT901 | **Site Address:** | 577 Bell Street<br>Glastonbury, CT |
| **Site Name:** | Glastonbury | | |
| **Tower Owner:** | N/A | **Lat/Long:** | 41.7338/-72.5497 |
| **Tower Type:** | 104-ft Self-Support Tower | **B&P Job No:** | 14013.003 |
| **Tower Status:** | Passed (99.3% capacity) | **Foundation Status:** | Passed |

We have completed our structural analysis of the proposed equipment installation on the foregoing tower to determine its ability to support the new loads proposed by Verizon Antennas.

The following information was provided for our tower structural analysis:

- Tower: Member sizes and configuration were obtained from the previous structural analysis by Bennett & Pless dated 5/29/2014.
- Foundation: Foundation details were obtained from the previous structural analysis listed above.
- Geotechnical: A geotechnical report was not available for this site.
- Antennas: Proposed antenna loading was obtained from the tenant application provided by Insite Towers, LLC dated 08/05/2014. Existing antenna loading was obtained from the structural analysis listed above.
- Other: General photographs of the tower

Table 1 summarizes the antenna, attachment, and transmission line loading proposed and Table 2 summarizes the design criteria used for our structural analysis. Attached is a copy of the structural calculations, which in addition to detailed results of the analysis also includes a tower profile with member sizes and configuration, and the existing/proposed equipment list with types and location.

**Table 1 – Proposed Equipment Loading**

| Status | Antennas/Attachments | | | | Transmission Lines[1,2] | |
|---|---|---|---|---|---|---|
| | Rad Center | Quantity | Manufacturer | Model | # of Feed lines | Feed line Size (in) |
| New Antenna | 102 | 6 | Andrew | HBXX-6517DS-A2M | 2 | 1 5/8" Fiber |
| New Antenna | 102 | 3 | Antel | BXA-70063-6CF | | |
| New Antenna | 102 | 3 | Andrew | LNX-8514DS | | |
| New Antenna | 102 | 3 | ALU | RRH_2x60-AW | | |
| New Antenna | 102 | 1 | Raycap | RC2DC-3315-PF-48 | | |

[1]Note: See attachment for transmission line layout

[2]Note: Existing (18) 1 5/8" Verizon feed lines to remain

**Table 2 – Design Criteria Used for Structural Analysis**

| Criterion | Information Used |
|---|---|
| State Building Code | Connecticut (IBC 2003) |
| Tower Standard | EIA/TIA-222-F |
| County | Montgomery |
| Basic Wind Speed | 80 mph, no ice |
| | 69 mph, 1/2" ice |
| Steel Grade Assumed | 50 ksi SR legs, 36 ksi all others, A325 bolts |
| Tower Analysis Software | tnxTower (version 6.1.4.1) |

Based on the foregoing information, our structural analysis determined that **the existing tower is structurally capable of supporting the proposed equipment loads without modification.** The foundation reactions as a result of the proposed installation are less than the designed foundation modification reactions and as such the existing foundation is structurally capable of supporting the proposed Verizon loads.

The following assumptions were made in conducting our structural analysis:

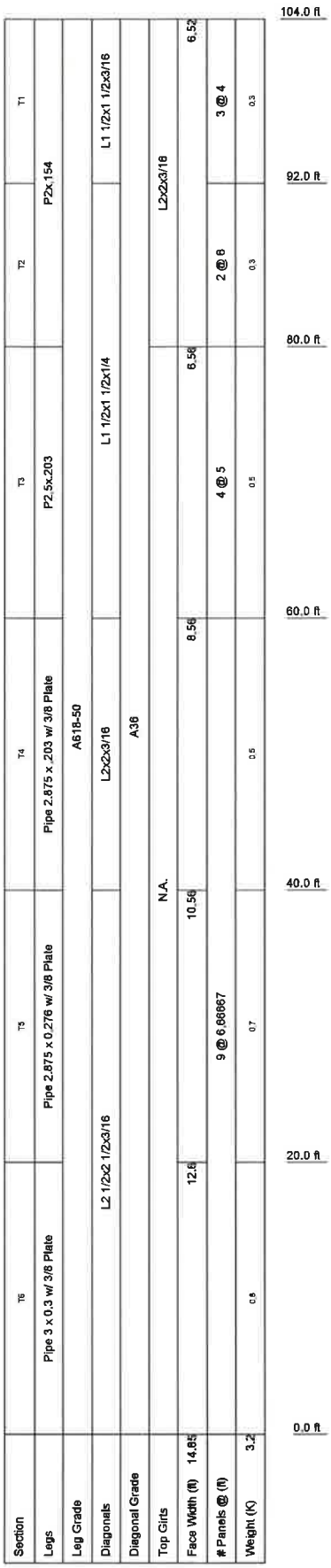
1. The existing tower has been maintained to manufacturer's specifications and is in good condition.
2. All member connections are assumed to have been designed to meet the load carrying capacity of the connected member.
3. Antenna mount loads have been estimated based on typical industry standards.
4. The new feed lines for the proposed Verizon antennas are assumed to be mounted across one tower face opposite of the existing feed lines.
5. The mounts for the proposed antennas have been analyzed and designed by others.
6. **Existing antennas (6 Antel LPA-80063/6CF and 6 Antel LPA-171063-12CF) at 100' have been removed prior to the Verizon Antennas Installation.**
7. See additional assumptions contained in the report attached.

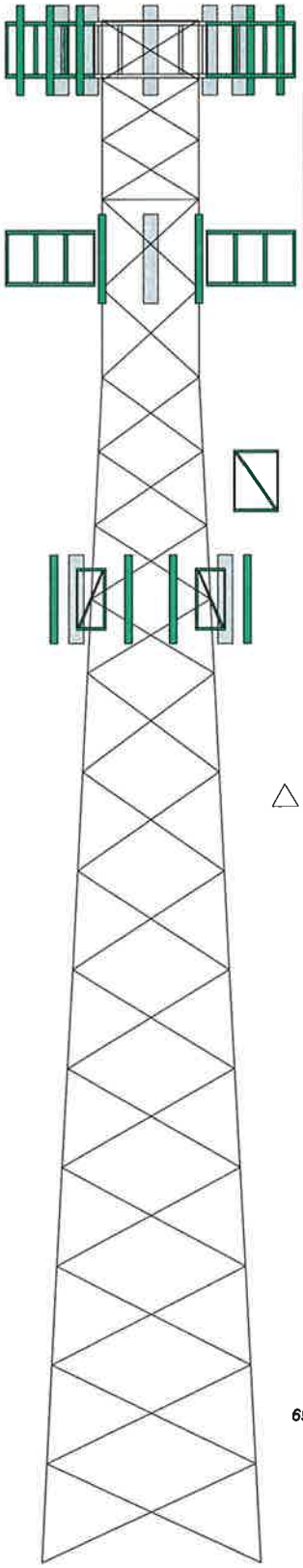
Bennett & Pless, Inc. makes no warranties, expressed or implied, in connection with this report, and disclaims any liability arising from material, fabrication and erection of this tower. Bennett & Pless, Inc. will not be responsible whatsoever for or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of Bennett & Pless, Inc. pursuant to this report will be limited to the total fee received for preparation of this report.

We appreciate the opportunity of providing our continuing professional services to you. If you have any questions or need further assistance on this please call us anytime.

Yours very truly,
**Bennett & Pless, Inc.**


Mike De Boer, P.E.
Senior Technical Director, Telecom



## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| T-Frame Sector (Verizon) | 102 | Andrew SBNH-1D6565C (ATI) | 88 |
| T-Frame Sector (Verizon) | 102 | Andrew SBNH-1D6565C (ATI) | 88 |
| T-Frame Sector (Verizon) | 102 | (2) TMA (ATI) | 88 |
| BXA-70063-6CF (Verizon) | 102 | (2) TMA (ATI) | 88 |
| BXA-70063-6CF (Verizon) | 102 | (2) TMA (ATI) | 88 |
| BXA-70063-6CF (Verizon) | 102 | (2) RRU-11 (ATI) | 88 |
| (2) HBXX-6517DS-A2M (Verizon) | 102 | (2) RRU-11 (ATI) | 88 |
| (2) HBXX-6517DS-A2M (Verizon) | 102 | (2) RRU-11 (ATI) | 88 |
| (2) HBXX-6517DS-A2M (Verizon) | 102 | Demarcation Box DC6-4860-188F (ATI) | 88 |
| LNX-6514DS (Verizon) | 102 | | |
| LNX-6514DS (Verizon) | 102 | T-Frame Sector (ATI) | 88 |
| LNX-6514DS (Verizon) | 102 | T-Frame Sector (ATI) | 88 |
| RC2DC-3315-PF-48 (Verizon) | 102 | DB806-XT (Town of Glastonbury) | 79 |
| RRH_2x60-AW (Verizon) | 102 | PR-950 (Town of Glastonbury) | 73 |
| RRH-2x60-AW (44lb) (Verizon) | 102 | PiROD 6' Side Mount Standoff (Town of Glastonbury) | 73 |
| RRH-2x60-AW (44lb) (Verizon) | 102 | 3' Stand-Off (Metro PCS) | 65 |
| Powerwave P65-17-XLH-RR (ATI) | 88 | 3' Stand-Off (Metro PCS) | 65 |
| Powerwave P65-17-XLH-RR (ATI) | 88 | 3' Stand-Off (Metro PCS) | 65 |
| Powerwave P65-17-XLH-RR (ATI) | 88 | (2) AIR 21 (Metro PCS) | 65 |
| KMW AX-X-CD-1665-OOT (ATI) | 88 | (2) AIR 21 (Metro PCS) | 65 |
| KMW AX-X-CD-1665-OOT (ATI) | 88 | (2) AIR 21 (Metro PCS) | 65 |
| KMW AX-X-CD-1665-OOT (ATI) | 88 | | |
| Andrew SBNH-1D6565C (ATI) | 88 | | |

## MATERIAL STRENGTH

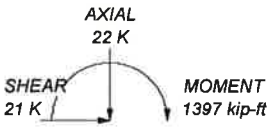
| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A618-50 | 50 ksi | 70 ksi | A36 | 36 ksi | 58 ksi |

## TOWER DESIGN NOTES

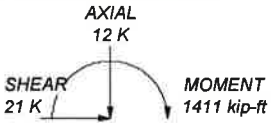
1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 60 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 99.3%

*MAX. CORNER REACTIONS AT BASE:*
*DOWN: 117 K*
*SHEAR: 12 K*

*UPLIFT: -104 K*
*SHEAR: 12 K*




*TORQUE 16 kip-ft*
*69 mph WIND - 0.5000 in ICE*




*TORQUE 16 kip-ft*
*REACTIONS - 80 mph WIND*


**Bennett & Pless**
3395 Northeast Expressway NE
Atlanta, GA 30341
Phone: 678-990-8700
FAX: 678-990-8701


| | | | |
|---|---|---|---|
| Job: CT901 Glastonbury | | | |
| Project: SST Analysis | | | |
| Client: Insite Towers, LLC | Drawn by: J. Turner | App'd: | |
| Code: TIA/EIA-222-F | Date: 08/28/14 | Scale: NTS | |
| Path: | | Dwg No. E-1 | |

| tnxTower | Job | Page |
|---|---|---|
| | CT901 Glastonbury | 1 of 24 |
| **Bennett & Pless**<br>3395 Northeast Expressway NE<br>Atlanta, GA 30341<br>Phone: 678-990-8700<br>FAX: 678-990-8701 | **Project**<br>SST Analysis | **Date**<br>09:03:15 08/28/14 |
| | **Client**<br>Insite Towers, LLC | **Designed by**<br>J. Turner |

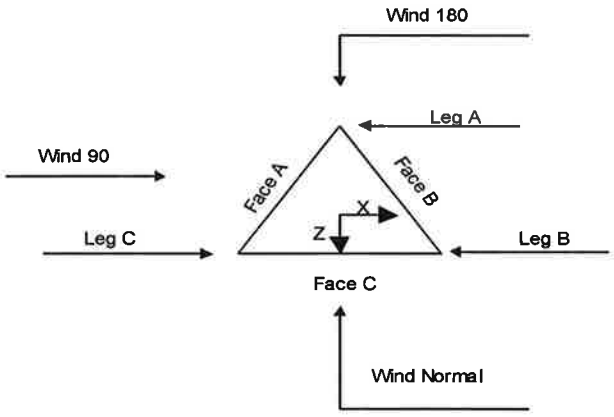
## Tower Input Data

The main tower is a 3x free standing tower with an overall height of 104.00 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 6.52 ft at the top and 14.65 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## 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 | Use TIA-222-G Tension Splice Capacity Exemption | |




***Triangular Tower***

## Tower Section Geometry

| Tower Section | Tower Elevation | Assembly Database | Description | Section Width | Number of Sections | Section Length |
|---|---|---|---|---|---|---|
| | ft | | | ft | | ft |
| T1 | 104.00-92.00 | | | 6.52 | 1 | 12.00 |
| T2 | 92.00-80.00 | | | 6.52 | 1 | 12.00 |
| T3 | 80.00-60.00 | | | 6.56 | 1 | 20.00 |
| T4 | 60.00-40.00 | | | 8.56 | 1 | 20.00 |
| T5 | 40.00-20.00 | | | 10.56 | 1 | 20.00 |
| T6 | 20.00-0.00 | | | 12.60 | 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 | 104.00-92.00 | 4.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T2 | 92.00-80.00 | 6.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T3 | 80.00-60.00 | 5.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T4 | 60.00-40.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |
| T5 | 40.00-20.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |
| T6 | 20.00-0.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |

## Tower Section Geometry *(cont'd)*

| Tower Elevation ft | Leg Type | Leg Size | Leg Grade | Diagonal Type | Diagonal Size | Diagonal Grade |
|---|---|---|---|---|---|---|
| T1 104.00-92.00 | Pipe | P2x.154 | A618-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x3/16 | A36 (36 ksi) |
| T2 92.00-80.00 | Pipe | P2x.154 | A618-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/4 | A36 (36 ksi) |
| T3 80.00-60.00 | Pipe | P2.5x.203 | A618-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/4 | A36 (36 ksi) |
| T4 60.00-40.00 | Arbitrary Shape | Pipe 2.875 x .203 w/ 3/8 Plate | A618-50 (50 ksi) | Single Angle | L2x2x3/16 | A36 (36 ksi) |
| T5 40.00-20.00 | Arbitrary Shape | Pipe 2.875 x 0.276 w/ 3/8 Plate | A618-50 (50 ksi) | Single Angle | L2 1/2x2 1/2x3/16 | A36 (36 ksi) |
| T6 20.00-0.00 | Arbitrary Shape | Pipe 3 x 0.3 w/ 3/8 Plate | A618-50 (50 ksi) | Single Angle | L2 1/2x2 1/2x3/16 | A36 (36 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 104.00-92.00 | Single Angle | L2x2x3/16 | A36 (36 ksi) | Solid Round | | A36 (36 ksi) |
| T2 92.00-80.00 | Single Angle | L2x2x3/16 | A36 (36 ksi) | Solid Round | | A36 (36 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 104.00-92.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 1 | 1 | 36.0000 | 36.0000 |
| T2 92.00-80.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 1 | 1 | 36.0000 | 36.0000 |
| T3 80.00-60.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 1 | 1 | 36.0000 | 36.0000 |
| T4 60.00-40.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 1 | 1 | 36.0000 | 36.0000 |
| T5 40.00-20.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 1 | 1 | 36.0000 | 36.0000 |
| T6 20.00-0.00 | 0.00 | 0.2500 | A36 (36 ksi) | 1.02 | 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 Brace Diags X | K Brace Diags Y | Single Diags X | 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 | 1 | 1 |
| 104.00-92.00 | | | | 1 | 1 | 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 | 1 | 1 |
| 92.00-80.00 | | | | 1 | 1 | 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 | 1 | 1 |
| 80.00-60.00 | | | | 1 | 1 | 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 | 1 | 1 |
| 60.00-40.00 | | | | 1 | 1 | 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 | 1 | 1 |
| 40.00-20.00 | | | | 1 | 1 | 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 | 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 |
| 104.00-92.00 | | | | | | | | | | | | | | |
| T2 92.00-80.00 | 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 |
| 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 | 0.6250 | 4 | 0.5000 | 1 | 0.5000 | 1 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| 104.00-92.00 | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T2 92.00-80.00 | Flange | 0.6250 | 4 | 0.5000 | 1 | 0.5000 | 1 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T3 80.00-60.00 | Flange | 0.6250 | 4 | 0.5000 | 1 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T4 60.00-40.00 | Flange | 0.6250 | 4 | 0.5000 | 1 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T5 40.00-20.00 | Flange | 0.6250 | 4 | 0.5000 | 1 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |

| Tower Elevation ft | Leg Connection Type | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. |
| T6 20.00-0.00 | Flange | 0.7500 A325N | 4 | 0.5000 A325N | 1 | 0.0000 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feedline Ladder (Tower) | C | Yes | Ar (CfAe) | 65.00 - 6.00 | 0.0000 | 0.43 | 1 | 1 | 0.5000 | 3.0000 | | 8.40 |
| LDF7-50A (1 5/8 FOAM) | B | Yes | Ar (CfAe) | 100.00 - 6.00 | -6.0000 | -0.25 | 18 | 9 | 0.5000 | 1.9800 | | 0.82 |
| Feedline Ladder (Tower) | B | Yes | Ar (CfAe) | 100.00 - 6.00 | -2.0000 | -0.25 | 1 | 1 | 0.5000 | 3.0000 | | 8.40 |
| Hybrid Flex ( 1 5/8 Fiber) (Metro PCS) | A | Yes | Ar (CfAe) | 65.00 - 6.00 | 0.0000 | 0.43 | 1 | 1 | 1.9800 | 1.9800 | | 0.82 |
| 1 5/8" (1.63", 41.3 mm) Fiber (Verizon) | C | Yes | Ar (CfAe) | 102.00 - 6.00 | 0.0000 | 0 | 1 | 1 | 1.6300 | 1.6300 | | 0.82 |
| 1 5/8" (1.63", 41.3 mm) Fiber (Verizon) | A | Yes | Ar (CfAe) | 102.00 - 6.00 | 0.0000 | 0 | 1 | 1 | 1.6300 | 1.6300 | | 0.82 |

## Feed Line/Linear Appurtenances - Entered As Area

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | | $C_AA_A$ $ft^2/ft$ | Weight plf |
|---|---|---|---|---|---|---|---|---|---|---|
| LDF7-50A (1 5/8 FOAM) | A | No | CaAa (In Face) | 92.00 - 6.00 | -4.0000 | 0.43 | 12 | No Ice | 0.16 | 0.82 |
| | | | | | | | | 1/2" Ice | 0.26 | 2.05 |

## 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 K |
|---|---|---|---|---|---|---|---|
| T1 | 104.00-92.00 | A | 1.358 | 0.000 | 0.000 | 0.000 | 0.01 |
| | | B | 13.880 | 0.000 | 0.000 | 0.000 | 0.19 |
| | | C | 1.358 | 0.000 | 0.000 | 0.000 | 0.01 |
| T2 | 92.00-80.00 | A | 1.630 | 0.000 | 23.401 | 0.000 | 0.13 |
| | | B | 20.820 | 0.000 | 0.000 | 0.000 | 0.28 |
| | | C | 1.630 | 0.000 | 0.000 | 0.000 | 0.01 |

| 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 K |
|---|---|---|---|---|---|---|---|
| T3 | 80.00-60.00 | A | 3.542 | 0.000 | 39.001 | 0.000 | 0.22 |
| | | B | 34.700 | 0.000 | 0.000 | 0.000 | 0.46 |
| | | C | 3.967 | 0.000 | 0.000 | 0.000 | 0.06 |
| T4 | 60.00-40.00 | A | 6.017 | 0.000 | 39.001 | 0.000 | 0.23 |
| | | B | 34.700 | 0.000 | 0.000 | 0.000 | 0.46 |
| | | C | 7.717 | 0.000 | 0.000 | 0.000 | 0.18 |
| T5 | 40.00-20.00 | A | 6.017 | 0.000 | 39.001 | 0.000 | 0.23 |
| | | B | 34.700 | 0.000 | 0.000 | 0.000 | 0.46 |
| | | C | 7.717 | 0.000 | 0.000 | 0.000 | 0.18 |
| T6 | 20.00-0.00 | A | 4.212 | 0.000 | 27.301 | 0.000 | 0.16 |
| | | B | 24.290 | 0.000 | 0.000 | 0.000 | 0.32 |
| | | C | 5.402 | 0.000 | 0.000 | 0.000 | 0.13 |

## 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 K |
|---|---|---|---|---|---|---|---|---|
| T1 | 104.00-92.00 | A | 0.500 | 2.192 | 0.000 | 0.000 | 0.000 | 0.02 |
| | | B | | 4.653 | 13.227 | 0.000 | 0.000 | 0.41 |
| | | C | | 2.192 | 0.000 | 0.000 | 0.000 | 0.02 |
| T2 | 92.00-80.00 | A | 0.500 | 2.630 | 0.000 | 37.800 | 0.000 | 0.32 |
| | | B | | 6.980 | 19.840 | 0.000 | 0.000 | 0.62 |
| | | C | | 2.630 | 0.000 | 0.000 | 0.000 | 0.03 |
| T3 | 80.00-60.00 | A | 0.500 | 5.625 | 0.000 | 63.000 | 0.000 | 0.55 |
| | | B | | 11.633 | 33.067 | 0.000 | 0.000 | 1.03 |
| | | C | | 6.050 | 0.000 | 0.000 | 0.000 | 0.10 |
| T4 | 60.00-40.00 | A | 0.500 | 9.350 | 0.000 | 63.000 | 0.000 | 0.58 |
| | | B | | 11.633 | 33.067 | 0.000 | 0.000 | 1.03 |
| | | C | | 11.050 | 0.000 | 0.000 | 0.000 | 0.25 |
| T5 | 40.00-20.00 | A | 0.500 | 9.350 | 0.000 | 63.000 | 0.000 | 0.58 |
| | | B | | 11.633 | 33.067 | 0.000 | 0.000 | 1.03 |
| | | C | | 11.050 | 0.000 | 0.000 | 0.000 | 0.25 |
| T6 | 20.00-0.00 | A | 0.500 | 6.545 | 0.000 | 44.100 | 0.000 | 0.41 |
| | | B | | 8.143 | 23.147 | 0.000 | 0.000 | 0.72 |
| | | C | | 7.735 | 0.000 | 0.000 | 0.000 | 0.18 |

## 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 | 104.00-92.00 | A | 0.000 | 0.122 | 0.118 | 0.191 |
| | | B | 0.000 | 0.998 | 1.211 | 1.559 |
| | | C | 0.000 | 0.122 | 0.118 | 0.191 |
| T2 | 92.00-80.00 | A | 0.000 | 0.117 | 0.115 | 0.185 |
| | | B | 0.000 | 1.197 | 1.466 | 1.889 |
| | | C | 0.000 | 0.117 | 0.115 | 0.185 |
| T3 | 80.00-60.00 | A | 0.000 | 0.225 | 0.213 | 0.338 |
| | | B | 0.000 | 1.790 | 2.085 | 2.686 |
| | | C | 0.000 | 0.242 | 0.238 | 0.363 |
| T4 | 60.00-40.00 | A | 0.000 | 0.285 | 0.367 | 0.571 |
| | | B | 0.000 | 1.364 | 2.118 | 2.728 |
| | | C | 0.000 | 0.337 | 0.471 | 0.674 |

| Section | Elevation | Face | $A_R$ | $A_R$ Ice | $A_F$ | $A_F$ Ice |
|---|---|---|---|---|---|---|
| | ft | | $ft^2$ | $ft^2$ | $ft^2$ | $ft^2$ |
| T5 | 40.00-20.00 | A | 0.000 | 0.270 | 0.434 | 0.675 |
| | | B | 0.000 | 1.290 | 2.504 | 3.226 |
| | | C | 0.000 | 0.319 | 0.557 | 0.797 |
| T6 | 20.00-0.00 | A | 0.000 | 0.182 | 0.293 | 0.456 |
| | | B | 0.000 | 0.871 | 1.691 | 2.178 |
| | | C | 0.000 | 0.215 | 0.376 | 0.538 |

## Feed Line Center of Pressure

| Section | Elevation | $CP_X$ | $CP_Z$ | $CP_X$ Ice | $CP_Z$ Ice |
|---|---|---|---|---|---|
| | ft | in | in | in | in |
| T1 | 104.00-92.00 | 0.7906 | -6.2203 | 0.4207 | -4.4099 |
| T2 | 92.00-80.00 | 0.5791 | -9.4112 | 0.3840 | -8.6655 |
| T3 | 80.00-60.00 | 0.4551 | -10.7402 | 0.2402 | -9.9641 |
| T4 | 60.00-40.00 | -0.1229 | -14.7086 | -0.3502 | -13.7276 |
| T5 | 40.00-20.00 | -0.1223 | -16.8463 | -0.4301 | -15.9509 |
| T6 | 20.00-0.00 | -0.1137 | -17.3403 | -0.4607 | -16.5629 |

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral<br>Vert | Azimuth Adjustment | Placement | | $C_AA_A$ Front | $C_AA_A$ Side | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | | ft<br>ft<br>ft | ° | ft | | $ft^2$ | $ft^2$ | K |
| T-Frame Sector (Verizon) | A | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 9.00<br>9.30 | 9.00<br>9.30 | 0.47<br>0.61 |
| T-Frame Sector (Verizon) | B | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 9.00<br>9.30 | 9.00<br>9.30 | 0.47<br>0.61 |
| T-Frame Sector (Verizon) | C | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 9.00<br>9.30 | 9.00<br>9.30 | 0.47<br>0.61 |
| BXA-70063-6CF (Verizon) | A | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 7.59<br>8.13 | 4.04<br>4.48 | 0.02<br>0.06 |
| BXA-70063-6CF (Verizon) | B | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 7.59<br>8.13 | 4.04<br>4.48 | 0.02<br>0.06 |
| BXA-70063-6CF (Verizon) | C | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 7.59<br>8.13 | 4.04<br>4.48 | 0.02<br>0.06 |
| (2) HBXX-6517DS-A2M (Verizon) | A | From Leg | 4.00<br>-6.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 8.74<br>9.31 | 5.24<br>5.71 | 0.04<br>0.09 |
| (2) HBXX-6517DS-A2M (Verizon) | A | From Leg | 4.00<br>6.00<br>0.00 | 0.0000 | 102.00 | No Ice<br>1/2" Ice | 8.74<br>9.31 | 5.24<br>5.71 | 0.04<br>0.09 |

| 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 K |
|---|---|---|---|---|---|---|---|---|---|
| (2) HBXX-6517DS-A2M | A | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 8.74 | 5.24 | 0.04 |
| (Verizon) | | | -4.00 | | | 1/2" Ice | 9.31 | 5.71 | 0.09 |
| | | | 0.00 | | | | | | |
| LNX-8514DS | B | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 11.45 | 7.70 | 0.05 |
| (Verizon) | | | -4.00 | | | 1/2" Ice | 12.06 | 8.29 | 0.12 |
| | | | 0.00 | | | | | | |
| LNX-8514DS | C | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 11.45 | 7.70 | 0.05 |
| (Verizon) | | | -4.00 | | | 1/2" Ice | 12.06 | 8.29 | 0.12 |
| | | | 0.00 | | | | | | |
| LNX-8514DS | A | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 11.45 | 7.70 | 0.05 |
| (Verizon) | | | 4.00 | | | 1/2" Ice | 12.06 | 8.29 | 0.12 |
| | | | 0.00 | | | | | | |
| RC2DC-3315-PF-48 | C | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 2.29 | 3.52 | 0.04 |
| (Verizon) | | | 4.00 | | | 1/2" Ice | 2.51 | 3.77 | 0.07 |
| | | | 0.00 | | | | | | |
| T-Frame Sector | B | From Leg | 4.00 | 0.0000 | 88.00 | No Ice | 9.00 | 9.00 | 0.47 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 9.30 | 9.30 | 0.61 |
| | | | 0.00 | | | | | | |
| T-Frame Sector | C | From Leg | 4.00 | 0.0000 | 88.00 | No Ice | 9.00 | 9.00 | 0.47 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 9.30 | 9.30 | 0.61 |
| | | | 0.00 | | | | | | |
| DB806-XT | B | From Leg | 4.00 | 0.0000 | 79.00 | No Ice | 1.14 | 1.14 | 0.02 |
| (Town of Glastonbury) | | | 0.00 | | | 1/2" Ice | 1.68 | 1.68 | 0.03 |
| | | | 0.00 | | | | | | |
| PR-950 | B | From Leg | 4.00 | 0.0000 | 73.00 | No Ice | 6.35 | 6.35 | 0.04 |
| (Town of Glastonbury) | | | 0.00 | | | 1/2" Ice | 11.43 | 11.43 | 0.05 |
| | | | 0.00 | | | | | | |
| PiROD 6' Side Mount | B | From Leg | 4.00 | 0.0000 | 73.00 | No Ice | 4.97 | 4.97 | 0.07 |
| Standoff | | | 0.00 | | | 1/2" Ice | 6.12 | 6.12 | 0.13 |
| (Town of Glastonbury) | | | 0.00 | | | | | | |
| (2) AIR 21 | A | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 6.53 | 5.72 | 0.12 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 6.98 | 6.42 | 0.18 |
| | | | 0.00 | | | | | | |
| (2) AIR 21 | B | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 6.53 | 5.72 | 0.12 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 6.98 | 6.42 | 0.18 |
| | | | 0.00 | | | | | | |
| (2) AIR 21 | C | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 6.53 | 5.72 | 0.12 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 6.98 | 6.42 | 0.18 |
| | | | 0.00 | | | | | | |
| 3' Stand-Off | A | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 4.00 | 8.00 | 0.05 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 4.25 | 8.50 | 0.07 |
| | | | 0.00 | | | | | | |
| 3' Stand-Off | B | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 4.00 | 8.00 | 0.05 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 4.25 | 8.50 | 0.07 |
| | | | 0.00 | | | | | | |
| 3' Stand-Off | C | From Leg | 0.00 | 0.0000 | 65.00 | No Ice | 4.00 | 8.00 | 0.05 |
| (Metro PCS) | | | 0.00 | | | 1/2" Ice | 4.25 | 8.50 | 0.07 |
| | | | 0.00 | | | | | | |
| Powerwave P65-17-XLH-RR | A | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.70 | 8.94 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.42 | 10.45 | 0.12 |
| | | | 0.00 | | | | | | |
| Powerwave P65-17-XLH-RR | B | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.70 | 8.94 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.42 | 10.45 | 0.12 |
| | | | 0.00 | | | | | | |
| Powerwave P65-17-XLH-RR | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.70 | 8.94 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.42 | 10.45 | 0.12 |
| | | | 0.00 | | | | | | |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft<br>Vert ft<br>ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight K |
|---|---|---|---|---|---|---|---|---|---|
| KMW AX-X-CD-1665-OOT | A | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 8.50 | 6.30 | 0.07 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 9.15 | 7.48 | 0.09 |
| | | | 0.00 | | | | | | |
| KMW AX-X-CD-1665-OOT | B | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 8.50 | 6.30 | 0.07 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 9.15 | 7.48 | 0.09 |
| | | | 0.00 | | | | | | |
| KMW AX-X-CD-1665-OOT | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 8.50 | 6.30 | 0.07 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 9.15 | 7.48 | 0.09 |
| | | | 0.00 | | | | | | |
| Andrew SBNH-1D6565C | A | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.64 | 9.84 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.37 | 11.37 | 0.18 |
| | | | 0.00 | | | | | | |
| Andrew SBNH-1D6565C | B | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.64 | 9.84 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.37 | 11.37 | 0.18 |
| | | | 0.00 | | | | | | |
| Andrew SBNH-1D6565C | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 11.64 | 9.84 | 0.09 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 12.37 | 11.37 | 0.18 |
| | | | 0.00 | | | | | | |
| (2) TMA | A | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 1.69 | 0.85 | 0.02 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 1.87 | 0.98 | 0.03 |
| | | | 0.00 | | | | | | |
| (2) TMA | B | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 1.69 | 0.85 | 0.02 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 1.87 | 0.98 | 0.03 |
| | | | 0.00 | | | | | | |
| (2) TMA | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 1.69 | 0.85 | 0.02 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 1.87 | 0.98 | 0.03 |
| | | | 0.00 | | | | | | |
| (2) RRU-11 | A | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 4.42 | 1.19 | 0.06 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 4.71 | 1.35 | 0.08 |
| | | | 0.00 | | | | | | |
| (2) RRU-11 | B | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 4.42 | 1.19 | 0.06 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 4.71 | 1.35 | 0.08 |
| | | | 0.00 | | | | | | |
| (2) RRU-11 | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 4.42 | 1.19 | 0.06 |
| (AT&T) | | | 0.00 | | | 1/2" Ice | 4.71 | 1.35 | 0.08 |
| | | | 0.00 | | | | | | |
| Demarcation Box | C | From Leg | 0.00 | 0.0000 | 88.00 | No Ice | 4.45 | 0.89 | 0.02 |
| DC6-4860-188F | | | 0.00 | | | 1/2" Ice | 4.76 | 1.04 | 0.05 |
| (AT&T) | | | 0.00 | | | | | | |
| RRH_2x60-AW | C | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 2.52 | 1.59 | 0.03 |
| (Verizon) | | | 0.00 | | | 1/2" Ice | 2.75 | 1.80 | 0.04 |
| | | | 0.00 | | | | | | |
| RRH-2x60-AW (44lb) | C | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 2.52 | 1.59 | 0.04 |
| (Verizon) | | | 0.00 | | | 1/2" Ice | 2.75 | 1.80 | 0.06 |
| | | | 0.00 | | | | | | |
| RRH-2x60-AW (44lb) | C | From Leg | 4.00 | 0.0000 | 102.00 | No Ice | 2.52 | 1.59 | 0.04 |
| (Verizon) | | | 0.00 | | | 1/2" Ice | 2.75 | 1.80 | 0.06 |
| | | | 0.00 | | | | | | |

## Tower Pressures - No Ice

$G_H = 1.159$

| 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 | 98.00 | 1.365 | 22 | 80.615 | A | 6.630 | 6.108 | 4.750 | 37.29 | 0.000 | 0.000 |
| 104.00-92.00 | | | | | B | 5.538 | 18.630 | | 19.65 | 0.000 | 0.000 |
| | | | | | C | 6.630 | 6.108 | | 37.29 | 0.000 | 0.000 |
| T2 92.00-80.00 | 86.00 | 1.315 | 22 | 80.855 | A | 5.349 | 6.380 | 4.750 | 40.50 | 23.401 | 0.000 |
| | | | | | B | 3.998 | 25.570 | | 16.06 | 0.000 | 0.000 |
| | | | | | C | 5.349 | 6.380 | | 40.50 | 0.000 | 0.000 |
| T3 80.00-60.00 | 70.00 | 1.24 | 20 | 155.998 | A | 8.752 | 13.141 | 9.599 | 43.85 | 39.001 | 0.000 |
| | | | | | B | 6.880 | 44.299 | | 18.76 | 0.000 | 0.000 |
| | | | | | C | 8.726 | 13.566 | | 43.06 | 0.000 | 0.000 |
| T4 60.00-40.00 | 50.00 | 1.126 | 18 | 197.250 | A | 11.196 | 6.017 | 0.000 | 0.00 | 39.001 | 0.000 |
| | | | | | B | 9.445 | 34.700 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 11.092 | 7.717 | | 0.00 | 0.000 | 0.000 |
| T5 40.00-20.00 | 30.00 | 1 | 16 | 237.659 | A | 16.208 | 6.017 | 0.000 | 0.00 | 39.001 | 0.000 |
| | | | | | B | 14.138 | 34.700 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 16.086 | 7.717 | | 0.00 | 0.000 | 0.000 |
| T6 20.00-0.00 | 10.00 | 1 | 16 | 279.593 | A | 18.604 | 4.212 | 0.000 | 0.00 | 27.301 | 0.000 |
| | | | | | B | 17.207 | 24.290 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 18.522 | 5.402 | | 0.00 | 0.000 | 0.000 |

## Tower Pressure - With Ice

$G_H = 1.159$

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 104.00-92.00 | 98.00 | 1.365 | 17 | 0.5000 | 81.615 | A | 6.558 | 13.055 | 6.750 | 34.42 | 0.000 | 0.000 |
| | | | | | | B | 18.416 | 14.640 | | 20.42 | 0.000 | 0.000 |
| | | | | | | C | 6.558 | 13.055 | | 34.42 | 0.000 | 0.000 |
| T2 92.00-80.00 | 86.00 | 1.315 | 16 | 0.5000 | 81.855 | A | 5.279 | 12.658 | 6.750 | 37.63 | 37.800 | 0.000 |
| | | | | | | B | 23.415 | 15.928 | | 17.16 | 0.000 | 0.000 |
| | | | | | | C | 5.279 | 12.658 | | 37.63 | 0.000 | 0.000 |
| T3 80.00-60.00 | 70.00 | 1.24 | 15 | 0.5000 | 157.666 | A | 8.627 | 24.197 | 12.938 | 39.42 | 63.000 | 0.000 |
| | | | | | | B | 39.346 | 28.640 | | 19.03 | 0.000 | 0.000 |
| | | | | | | C | 8.601 | 24.605 | | 38.96 | 0.000 | 0.000 |
| T4 60.00-40.00 | 50.00 | 1.126 | 14 | 0.5000 | 198.919 | A | 10.992 | 14.733 | 0.000 | 0.00 | 63.000 | 0.000 |
| | | | | | | B | 41.901 | 15.937 | | 0.00 | 0.000 | 0.000 |
| | | | | | | C | 10.888 | 16.381 | | 0.00 | 0.000 | 0.000 |
| T5 40.00-20.00 | 30.00 | 1 | 12 | 0.5000 | 239.328 | A | 15.968 | 15.607 | 0.000 | 0.00 | 63.000 | 0.000 |
| | | | | | | B | 46.483 | 16.869 | | 0.00 | 0.000 | 0.000 |
| | | | | | | C | 15.845 | 17.257 | | 0.00 | 0.000 | 0.000 |
| T6 20.00-0.00 | 10.00 | 1 | 12 | 0.5000 | 281.262 | A | 18.442 | 13.774 | 0.000 | 0.00 | 44.100 | 0.000 |
| | | | | | | B | 39.866 | 14.683 | | 0.00 | 0.000 | 0.000 |
| | | | | | | C | 18.359 | 14.930 | | 0.00 | 0.000 | 0.000 |

## Tower Pressure - Service

$G_H = 1.159$

| 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 | 98.00 | 1.365 | 13 | 80.615 | A | 6.630 | 6.108 | 4.750 | 37.29 | 0.000 | 0.000 |
| 104.00-92.00 | | | | | B | 5.538 | 18.630 | | 19.65 | 0.000 | 0.000 |
| | | | | | C | 6.630 | 6.108 | | 37.29 | 0.000 | 0.000 |
| T2 92.00-80.00 | 86.00 | 1.315 | 12 | 80.855 | A | 5.349 | 6.380 | 4.750 | 40.50 | 23.401 | 0.000 |
| | | | | | B | 3.998 | 25.570 | | 16.06 | 0.000 | 0.000 |
| | | | | | C | 5.349 | 6.380 | | 40.50 | 0.000 | 0.000 |
| T3 80.00-60.00 | 70.00 | 1.24 | 11 | 155.998 | A | 8.752 | 13.141 | 9.599 | 43.85 | 39.001 | 0.000 |
| | | | | | B | 6.880 | 44.299 | | 18.76 | 0.000 | 0.000 |
| | | | | | C | 8.726 | 13.566 | | 43.06 | 0.000 | 0.000 |
| T4 60.00-40.00 | 50.00 | 1.126 | 10 | 197.250 | A | 11.196 | 6.017 | 0.000 | 0.00 | 39.001 | 0.000 |
| | | | | | B | 9.445 | 34.700 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 11.092 | 7.717 | | 0.00 | 0.000 | 0.000 |
| T5 40.00-20.00 | 30.00 | 1 | 9 | 237.659 | A | 16.208 | 6.017 | 0.000 | 0.00 | 39.001 | 0.000 |
| | | | | | B | 14.138 | 34.700 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 16.086 | 7.717 | | 0.00 | 0.000 | 0.000 |
| T6 20.00-0.00 | 10.00 | 1 | 9 | 279.593 | A | 18.604 | 4.212 | 0.000 | 0.00 | 27.301 | 0.000 |
| | | | | | B | 17.207 | 24.290 | | 0.00 | 0.000 | 0.000 |
| | | | | | C | 18.522 | 5.402 | | 0.00 | 0.000 | 0.000 |

## Tower Forces - No Ice - Wind Normal To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 1 | 1 | 10.190 | 1.01 | 84.39 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 1 | 1 | 17.011 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 1 | 1 | 10.190 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 1 | 1 | 9.054 | 1.67 | 139.00 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 1 | 1 | 20.317 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 1 | 1 | 9.054 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 1 | 1 | 16.374 | 2.73 | 136.41 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 1 | 1 | 34.562 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 1 | 1 | 16.600 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 1 | 1 | 14.648 | 2.46 | 122.80 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 1 | 1 | 30.110 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 1 | 1 | 15.526 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 1 | 1 | 19.665 | 2.44 | 121.90 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 1 | 1 | 34.665 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 1 | 1 | 20.524 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 1 | 1 | 21.019 | 2.17 | 108.55 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 1 | 1 | 31.325 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 1 | 1 | 21.621 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 651.31 kip-ft | 12.47 | | |

## Tower Forces - No Ice - Wind 60 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 0.8 | 1 | 8.864 | 0.95 | 78.89 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 0.8 | 1 | 15.904 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 0.8 | 1 | 8.864 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 0.8 | 1 | 7.985 | 1.63 | 135.45 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 0.8 | 1 | 19.517 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 0.8 | 1 | 7.985 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 0.8 | 1 | 14.624 | 2.66 | 132.81 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 0.8 | 1 | 33.186 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 0.8 | 1 | 14.855 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 0.8 | 1 | 12.409 | 2.35 | 117.71 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 0.8 | 1 | 28.221 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 0.8 | 1 | 13.308 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 0.8 | 1 | 16.423 | 2.30 | 114.97 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 0.8 | 1 | 31.837 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 0.8 | 1 | 17.306 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 0.8 | 1 | 17.298 | 1.99 | 99.47 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 0.8 | 1 | 27.884 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 0.8 | 1 | 17.916 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 625.08 kip-ft | 11.87 | | |

## Tower Forces - No Ice - Wind 90 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 0.85 | 1 | 9.195 | 0.96 | 80.27 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 0.85 | 1 | 16.181 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 0.85 | 1 | 9.195 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 0.85 | 1 | 8.252 | 1.64 | 136.34 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 0.85 | 1 | 19.717 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 0.85 | 1 | 8.252 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 0.85 | 1 | 15.061 | 2.67 | 133.71 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 0.85 | 1 | 33.530 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 0.85 | 1 | 15.291 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 0.85 | 1 | 12.969 | 2.38 | 118.98 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 0.85 | 1 | 28.693 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 0.85 | 1 | 13.862 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 0.85 | 1 | 17.233 | 2.33 | 116.70 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 0.85 | 1 | 32.544 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 0.85 | 1 | 18.111 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 0.85 | 1 | 18.229 | 2.03 | 101.74 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 0.85 | 1 | 28.744 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 0.85 | 1 | 18.842 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 631.63 kip-ft | 12.02 | | |

## Tower Forces - With Ice - Wind Normal To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.45 | 0.61 | A | 0.24 | 2.467 | 0.599 | 1 | 1 | 14.383 | 1.12 | 93.13 | B |
| 104.00-92.00 | | | B | 0.405 | 2.054 | 0.654 | 1 | 1 | 27.986 | | | |
| | | | C | 0.24 | 2.467 | 0.599 | 1 | 1 | 14.383 | | | |
| T2 | 0.96 | 0.56 | A | 0.219 | 2.533 | 0.594 | 1 | 1 | 12.804 | 1.95 | 162.34 | B |
| 92.00-80.00 | | | B | 0.481 | 1.926 | 0.688 | 1 | 1 | 34.371 | | | |
| | | | C | 0.219 | 2.533 | 0.594 | 1 | 1 | 12.804 | | | |
| T3 | 1.67 | 0.97 | A | 0.208 | 2.569 | 0.592 | 1 | 1 | 22.954 | 3.18 | 159.02 | B |
| 80.00-60.00 | | | B | 0.431 | 2.006 | 0.665 | 1 | 1 | 58.387 | | | |
| | | | C | 0.211 | 2.561 | 0.593 | 1 | 1 | 23.183 | | | |
| T4 | 1.86 | 0.92 | A | 0.129 | 2.849 | 0.579 | 1 | 1 | 19.515 | 2.93 | 146.71 | B |
| 60.00-40.00 | | | B | 0.291 | 2.321 | 0.613 | 1 | 1 | 51.672 | | | |
| | | | C | 0.137 | 2.82 | 0.58 | 1 | 1 | 20.382 | | | |
| T5 | 1.86 | 1.30 | A | 0.132 | 2.839 | 0.579 | 1 | 1 | 25.002 | 2.83 | 141.56 | B |
| 40.00-20.00 | | | B | 0.265 | 2.394 | 0.606 | 1 | 1 | 56.702 | | | |
| | | | C | 0.138 | 2.815 | 0.58 | 1 | 1 | 25.850 | | | |
| T6 20.00-0.00 | 1.30 | 1.47 | A | 0.115 | 2.906 | 0.577 | 1 | 1 | 26.385 | 2.44 | 121.82 | B |
| | | | B | 0.194 | 2.616 | 0.589 | 1 | 1 | 48.517 | | | |
| | | | C | 0.118 | 2.891 | 0.577 | 1 | 1 | 26.976 | | | |
| Sum Weight: | 8.12 | 5.83 | | | | | | OTM | 755.69 kip-ft | 14.45 | | |

## Tower Forces - With Ice - Wind 60 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.45 | 0.61 | A | 0.24 | 2.467 | 0.599 | 0.8 | 1 | 13.072 | 0.97 | 80.88 | B |
| 104.00-92.00 | | | B | 0.405 | 2.054 | 0.654 | 0.8 | 1 | 24.303 | | | |
| | | | C | 0.24 | 2.467 | 0.599 | 0.8 | 1 | 13.072 | | | |
| T2 | 0.96 | 0.56 | A | 0.219 | 2.533 | 0.594 | 0.8 | 1 | 11.748 | 1.78 | 148.26 | B |
| 92.00-80.00 | | | B | 0.481 | 1.926 | 0.688 | 0.8 | 1 | 29.688 | | | |
| | | | C | 0.219 | 2.533 | 0.594 | 0.8 | 1 | 11.748 | | | |
| T3 | 1.67 | 0.97 | A | 0.208 | 2.569 | 0.592 | 0.8 | 1 | 21.229 | 2.90 | 145.08 | B |
| 80.00-60.00 | | | B | 0.431 | 2.006 | 0.665 | 0.8 | 1 | 50.518 | | | |
| | | | C | 0.211 | 2.561 | 0.593 | 0.8 | 1 | 21.462 | | | |
| T4 | 1.86 | 0.92 | A | 0.129 | 2.849 | 0.579 | 0.8 | 1 | 17.317 | 2.62 | 131.11 | B |
| 60.00-40.00 | | | B | 0.291 | 2.321 | 0.613 | 0.8 | 1 | 43.292 | | | |
| | | | C | 0.137 | 2.82 | 0.58 | 0.8 | 1 | 18.205 | | | |
| T5 | 1.86 | 1.30 | A | 0.132 | 2.839 | 0.579 | 0.8 | 1 | 21.808 | 2.51 | 125.71 | B |
| 40.00-20.00 | | | B | 0.265 | 2.394 | 0.606 | 0.8 | 1 | 47.405 | | | |
| | | | C | 0.138 | 2.815 | 0.58 | 0.8 | 1 | 22.681 | | | |
| T6 20.00-0.00 | 1.30 | 1.47 | A | 0.115 | 2.906 | 0.577 | 0.8 | 1 | 22.697 | 2.14 | 106.96 | B |
| | | | B | 0.194 | 2.616 | 0.589 | 0.8 | 1 | 40.544 | | | |
| | | | C | 0.118 | 2.891 | 0.577 | 0.8 | 1 | 23.304 | | | |
| Sum Weight: | 8.12 | 5.83 | | | | | | OTM | 679.16 kip-ft | 12.93 | | |

## Tower Forces - With Ice - Wind 90 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.45 | 0.61 | A | 0.24 | 2.467 | 0.599 | 0.85 | 1 | 13.400 | 1.01 | 83.94 | B |
| 104.00-92.00 | | | B | 0.405 | 2.054 | 0.654 | 0.85 | 1 | 25.224 | | | |
| | | | C | 0.24 | 2.467 | 0.599 | 0.85 | 1 | 13.400 | | | |
| T2 | 0.96 | 0.56 | A | 0.219 | 2.533 | 0.594 | 0.85 | 1 | 12.012 | 1.82 | 151.78 | B |
| 92.00-80.00 | | | B | 0.481 | 1.926 | 0.688 | 0.85 | 1 | 30.859 | | | |
| | | | C | 0.219 | 2.533 | 0.594 | 0.85 | 1 | 12.012 | | | |
| T3 | 1.67 | 0.97 | A | 0.208 | 2.569 | 0.592 | 0.85 | 1 | 21.660 | 2.97 | 148.57 | B |
| 80.00-60.00 | | | B | 0.431 | 2.006 | 0.665 | 0.85 | 1 | 52.485 | | | |
| | | | C | 0.211 | 2.561 | 0.593 | 0.85 | 1 | 21.893 | | | |
| T4 | 1.86 | 0.92 | A | 0.129 | 2.849 | 0.579 | 0.85 | 1 | 17.867 | 2.70 | 135.01 | B |
| 60.00-40.00 | | | B | 0.291 | 2.321 | 0.613 | 0.85 | 1 | 45.387 | | | |
| | | | C | 0.137 | 2.82 | 0.58 | 0.85 | 1 | 18.749 | | | |
| T5 | 1.86 | 1.30 | A | 0.132 | 2.839 | 0.579 | 0.85 | 1 | 22.607 | 2.59 | 129.67 | B |
| 40.00-20.00 | | | B | 0.265 | 2.394 | 0.606 | 0.85 | 1 | 49.729 | | | |
| | | | C | 0.138 | 2.815 | 0.58 | 0.85 | 1 | 23.473 | | | |
| T6 20.00-0.00 | 1.30 | 1.47 | A | 0.115 | 2.906 | 0.577 | 0.85 | 1 | 23.619 | 2.21 | 110.68 | B |
| | | | B | 0.194 | 2.616 | 0.589 | 0.85 | 1 | 42.537 | | | |
| | | | C | 0.118 | 2.891 | 0.577 | 0.85 | 1 | 24.222 | | | |
| Sum Weight: | 8.12 | 5.83 | | | | | | OTM | 698.29 kip-ft | 13.31 | | |

## Tower Forces - Service - Wind Normal To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 1 | 1 | 10.190 | 0.57 | 47.47 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 1 | 1 | 17.011 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 1 | 1 | 10.190 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 1 | 1 | 9.054 | 0.94 | 78.19 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 1 | 1 | 20.317 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 1 | 1 | 9.054 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 1 | 1 | 16.374 | 1.53 | 76.73 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 1 | 1 | 34.562 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 1 | 1 | 16.600 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 1 | 1 | 14.648 | 1.38 | 69.07 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 1 | 1 | 30.110 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 1 | 1 | 15.526 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 1 | 1 | 19.665 | 1.37 | 68.57 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 1 | 1 | 34.665 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 1 | 1 | 20.524 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 1 | 1 | 21.019 | 1.22 | 61.06 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 1 | 1 | 31.325 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 1 | 1 | 21.621 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 366.36 kip-ft | 7.02 | | |

## Tower Forces - Service - Wind 60 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 0.8 | 1 | 8.864 | 0.53 | 44.38 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 0.8 | 1 | 15.904 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 0.8 | 1 | 8.864 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 0.8 | 1 | 7.985 | 0.91 | 76.19 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 0.8 | 1 | 19.517 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 0.8 | 1 | 7.985 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 0.8 | 1 | 14.624 | 1.49 | 74.70 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 0.8 | 1 | 33.186 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 0.8 | 1 | 14.855 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 0.8 | 1 | 12.409 | 1.32 | 66.21 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 0.8 | 1 | 28.221 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 0.8 | 1 | 13.308 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 0.8 | 1 | 16.423 | 1.29 | 64.67 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 0.8 | 1 | 31.837 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 0.8 | 1 | 17.306 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 0.8 | 1 | 17.298 | 1.12 | 55.95 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 0.8 | 1 | 27.884 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 0.8 | 1 | 17.916 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 351.61 kip-ft | 6.68 | | |

## Tower Forces - Service - Wind 90 To Face

| Section Elevation ft | Add Weight K | Self Weight K | Face | e | $C_F$ | $R_R$ | $D_F$ | $D_R$ | $A_E$ ft² | F K | w plf | Ctrl. Face |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 0.20 | 0.29 | A | 0.158 | 2.742 | 0.583 | 0.85 | 1 | 9.195 | 0.54 | 45.15 | B |
| 104.00-92.00 | | | B | 0.3 | 2.297 | 0.616 | 0.85 | 1 | 16.181 | | | |
| | | | C | 0.158 | 2.742 | 0.583 | 0.85 | 1 | 9.195 | | | |
| T2 | 0.42 | 0.30 | A | 0.145 | 2.79 | 0.581 | 0.85 | 1 | 8.252 | 0.92 | 76.69 | B |
| 92.00-80.00 | | | B | 0.366 | 2.136 | 0.638 | 0.85 | 1 | 19.717 | | | |
| | | | C | 0.145 | 2.79 | 0.581 | 0.85 | 1 | 8.252 | | | |
| T3 | 0.74 | 0.51 | A | 0.14 | 2.807 | 0.58 | 0.85 | 1 | 15.061 | 1.50 | 75.21 | B |
| 80.00-60.00 | | | B | 0.328 | 2.224 | 0.625 | 0.85 | 1 | 33.530 | | | |
| | | | C | 0.143 | 2.798 | 0.58 | 0.85 | 1 | 15.291 | | | |
| T4 | 0.88 | 0.51 | A | 0.087 | 3.016 | 0.574 | 0.85 | 1 | 12.969 | 1.34 | 66.93 | B |
| 60.00-40.00 | | | B | 0.224 | 2.518 | 0.596 | 0.85 | 1 | 28.693 | | | |
| | | | C | 0.095 | 2.983 | 0.575 | 0.85 | 1 | 13.862 | | | |
| T5 | 0.88 | 0.74 | A | 0.094 | 2.99 | 0.574 | 0.85 | 1 | 17.233 | 1.31 | 65.65 | B |
| 40.00-20.00 | | | B | 0.205 | 2.578 | 0.592 | 0.85 | 1 | 32.544 | | | |
| | | | C | 0.1 | 2.963 | 0.575 | 0.85 | 1 | 18.111 | | | |
| T6 20.00-0.00 | 0.61 | 0.84 | A | 0.082 | 3.039 | 0.573 | 0.85 | 1 | 18.229 | 1.14 | 57.23 | B |
| | | | B | 0.148 | 2.777 | 0.581 | 0.85 | 1 | 28.744 | | | |
| | | | C | 0.086 | 3.023 | 0.574 | 0.85 | 1 | 18.842 | | | |
| Sum Weight: | 3.72 | 3.19 | | | | | | OTM | 355.29 kip-ft | 6.76 | | |

## Force Totals

| Load Case | Vertical Forces K | Sum of Forces X K | Sum of Forces Z K | Sum of Overturning Moments, $M_x$ kip-ft | Sum of Overturning Moments, $M_z$ kip-ft | Sum of Torques kip-ft |
|---|---|---|---|---|---|---|
| Leg Weight | 0.00 | | | | | |
| Bracing Weight | 3.19 | | | | | |
| Total Member Self-Weight | 3.19 | | | -6.85 | 0.96 | |
| Total Weight | 12.09 | | | -6.85 | 0.96 | |
| Wind 0 deg - No Ice | | 0.06 | -20.81 | -1407.90 | -4.27 | 1.20 |
| Wind 90 deg - No Ice | | 19.88 | -0.06 | -12.08 | -1330.37 | -16.06 |
| Wind 180 deg - No Ice | | -0.06 | 20.21 | 1367.97 | 6.19 | -1.19 |
| Member Ice | 2.64 | | | | | |
| Total Weight Ice | 21.67 | | | -22.21 | -0.03 | |
| Wind 0 deg - Ice | | 0.04 | -21.30 | -1392.02 | -4.10 | 1.38 |
| Wind 90 deg - Ice | | 19.79 | -0.04 | -26.28 | -1273.86 | -15.64 |
| Wind 180 deg - Ice | | -0.04 | 19.78 | 1271.06 | 4.04 | -1.39 |
| Total Weight | 12.09 | | | -6.85 | 0.96 | |
| Wind 0 deg - Service | | 0.03 | -11.71 | -785.29 | -2.78 | 0.67 |
| Wind 90 deg - Service | | 11.18 | -0.03 | -0.14 | -748.72 | -9.04 |
| Wind 180 deg - Service | | -0.03 | 11.37 | 776.14 | 3.10 | -0.67 |

## Load Combinations

| Comb. No. | Description |
|---|---|
| 1 | Dead Only |
| 2 | Dead+Wind 0 deg - No Ice |
| 3 | Dead+Wind 90 deg - No Ice |
| 4 | Dead+Wind 180 deg - No Ice |
| 5 | Dead+Ice+Temp |
| 6 | Dead+Wind 0 deg+Ice+Temp |
| 7 | Dead+Wind 90 deg+Ice+Temp |
| 8 | Dead+Wind 180 deg+Ice+Temp |
| 9 | Dead+Wind 0 deg - Service |
| 10 | Dead+Wind 90 deg - Service |
| 11 | Dead+Wind 180 deg - Service |

## Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | Leg | Max Tension | 4 | 4.72 | -0.01 | 0.24 |
| | | | Max. Compression | 6 | -7.01 | -0.01 | 0.43 |
| | | | Max. Mx | 3 | -0.95 | 1.23 | 0.00 |
| | | | Max. My | 2 | -0.56 | -0.01 | -1.01 |
| | | | Max. Vy | 3 | 0.93 | -0.60 | 0.00 |
| | | | Max. Vx | 2 | -0.77 | -0.01 | 0.51 |
| | | Diagonal | Max Tension | 4 | 1.73 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -1.71 | 0.00 | 0.00 |
| | | | Max. Mx | 6 | 1.27 | 0.01 | -0.00 |
| | | | Max. My | 3 | -1.40 | 0.00 | 0.00 |
| | | | Max. Vy | 6 | -0.01 | 0.01 | -0.00 |
| | | | Max. Vx | 3 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 4 | 0.17 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -0.16 | 0.00 | 0.00 |
| | | | Max. Mx | 5 | 0.01 | -0.02 | 0.00 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. My | 7 | 0.00 | 0.00 | 0.00 |
| | | | Max. Vy | 5 | 0.01 | 0.00 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |
| T2 | 92 - 80 | Leg | Max Tension | 4 | 16.51 | -0.57 | -0.01 |
| | | | Max. Compression | 2 | -19.59 | -0.15 | 0.00 |
| | | | Max. Mx | 2 | -11.39 | -0.94 | 0.00 |
| | | | Max. My | 3 | -1.45 | 0.00 | -0.83 |
| | | | Max. Vy | 4 | 0.76 | -0.57 | -0.01 |
| | | | Max. Vx | 3 | -0.69 | 0.00 | 0.53 |
| | | Diagonal | Max Tension | 4 | 3.97 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -4.11 | 0.00 | 0.00 |
| | | | Max. Mx | 6 | 3.08 | 0.02 | 0.00 |
| | | | Max. My | 3 | -1.56 | 0.00 | 0.00 |
| | | | Max. Vy | 6 | -0.01 | 0.02 | 0.00 |
| | | | Max. Vx | 3 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 2 | 0.24 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -0.29 | 0.00 | 0.00 |
| | | | Max. Mx | 5 | -0.06 | -0.02 | 0.00 |
| | | | Max. My | 7 | -0.06 | 0.00 | 0.00 |
| | | | Max. Vy | 5 | 0.01 | 0.00 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |
| T3 | 80 - 60 | Leg | Max Tension | 4 | 42.48 | -0.09 | -0.01 |
| | | | Max. Compression | 2 | -47.70 | 0.05 | -0.00 |
| | | | Max. Mx | 8 | 19.14 | -0.18 | 0.07 |
| | | | Max. My | 8 | -17.12 | 0.05 | -0.18 |
| | | | Max. Vy | 4 | -0.47 | -0.09 | -0.01 |
| | | | Max. Vx | 3 | 0.44 | 0.00 | 0.02 |
| | | Diagonal | Max Tension | 4 | 3.39 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -3.45 | 0.00 | 0.00 |
| | | | Max. Mx | 8 | 2.90 | 0.02 | 0.00 |
| | | | Max. My | 7 | -2.00 | 0.01 | 0.00 |
| | | | Max. Vy | 8 | 0.01 | 0.02 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |
| T4 | 60 - 40 | Leg | Max Tension | 4 | 64.59 | -0.06 | -0.00 |
| | | | Max. Compression | 2 | -71.71 | 0.12 | -0.00 |
| | | | Max. Mx | 8 | 55.21 | -0.22 | -0.00 |
| | | | Max. My | 3 | -2.97 | -0.01 | 0.15 |
| | | | Max. Vy | 8 | 0.04 | -0.22 | -0.00 |
| | | | Max. Vx | 3 | 0.05 | -0.01 | 0.15 |
| | | Diagonal | Max Tension | 6 | 3.61 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -3.74 | 0.00 | 0.00 |
| | | | Max. Mx | 8 | 3.12 | 0.03 | 0.00 |
| | | | Max. My | 7 | -2.36 | 0.02 | 0.01 |
| | | | Max. Vy | 8 | 0.02 | 0.03 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |
| T5 | 40 - 20 | Leg | Max Tension | 4 | 84.19 | -0.10 | -0.00 |
| | | | Max. Compression | 6 | -93.26 | 0.42 | 0.00 |
| | | | Max. Mx | 6 | -93.26 | 0.42 | 0.00 |
| | | | Max. My | 3 | -4.32 | -0.01 | 0.17 |
| | | | Max. Vy | 8 | -0.09 | -0.32 | -0.00 |
| | | | Max. Vx | 3 | -0.04 | -0.01 | 0.17 |
| | | Diagonal | Max Tension | 6 | 3.74 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -4.05 | 0.00 | 0.00 |
| | | | Max. Mx | 6 | 3.12 | 0.06 | -0.00 |
| | | | Max. My | 7 | -2.81 | 0.04 | 0.01 |
| | | | Max. Vy | 8 | 0.03 | 0.06 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |
| T6 | 20 - 0 | Leg | Max Tension | 4 | 101.43 | -0.11 | -0.00 |
| | | | Max. Compression | 6 | -114.75 | 0.00 | 0.00 |
| | | | Max. Mx | 8 | 86.05 | -0.71 | -0.00 |
| | | | Max. My | 3 | -4.88 | -0.01 | 0.30 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|---|---|---|---|---|---|---|---|
| | | Diagonal | Max. Vy | 8 | -0.18 | -0.71 | -0.00 |
| | | | Max. Vx | 3 | -0.07 | -0.01 | 0.30 |
| | | | Max Tension | 8 | 4.40 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -4.31 | 0.00 | 0.00 |
| | | | Max. Mx | 8 | 2.64 | 0.07 | 0.00 |
| | | | Max. My | 7 | -3.30 | 0.06 | 0.01 |
| | | | Max. Vy | 8 | 0.03 | 0.07 | 0.00 |
| | | | Max. Vx | 7 | -0.00 | 0.00 | 0.00 |

## Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|---|---|---|---|---|---|
| Leg C | Max. Vert | 4 | 58.50 | 4.76 | -4.27 |
| | Max. $H_x$ | 4 | 58.50 | 4.76 | -4.27 |
| | Max. $H_z$ | 7 | -81.09 | -9.44 | 5.23 |
| | Min. Vert | 3 | -87.48 | -8.60 | 4.80 |
| | Min. $H_x$ | 7 | -81.09 | -9.44 | 5.23 |
| | Min. $H_z$ | 4 | 58.50 | 4.76 | -4.27 |
| Leg B | Max. Vert | 3 | 94.58 | -9.07 | -5.05 |
| | Max. $H_x$ | 6 | -47.56 | 5.27 | 4.77 |
| | Max. $H_z$ | 6 | -47.56 | 5.27 | 4.77 |
| | Min. Vert | 2 | -51.30 | 4.31 | 4.17 |
| | Min. $H_x$ | 3 | 94.58 | -9.07 | -5.05 |
| | Min. $H_z$ | 3 | 94.58 | -9.07 | -5.05 |
| Leg A | Max. Vert | 6 | 117.35 | 0.05 | 11.83 |
| | Max. $H_x$ | 6 | 117.35 | 0.05 | 11.83 |
| | Max. $H_z$ | 2 | 115.27 | 0.04 | 12.53 |
| | Min. Vert | 4 | -104.06 | -0.05 | -11.62 |
| | Min. $H_x$ | 3 | 4.99 | -2.20 | 0.31 |
| | Min. $H_z$ | 8 | -93.34 | -0.05 | -12.32 |

## Tower Mast Reaction Summary

| Load Combination | Vertical K | $Shear_x$ K | $Shear_z$ K | Overturning Moment, $M_x$ kip-ft | Overturning Moment, $M_z$ kip-ft | Torque kip-ft |
|---|---|---|---|---|---|---|
| Dead Only | 12.09 | -0.00 | -0.00 | -6.85 | 0.96 | 0.00 |
| Dead+Wind 0 deg - No Ice | 12.09 | 0.06 | -20.81 | -1411.34 | -4.28 | 1.19 |
| Dead+Wind 90 deg - No Ice | 12.09 | 19.88 | -0.06 | -12.15 | -1333.60 | -16.08 |
| Dead+Wind 180 deg - No Ice | 12.09 | -0.06 | 20.21 | 1371.33 | 6.20 | -1.19 |
| Dead+Ice+Temp | 21.67 | 0.00 | 0.00 | -22.28 | -0.03 | -0.00 |
| Dead+Wind 0 deg+Ice+Temp | 21.67 | 0.04 | -21.30 | -1397.19 | -4.13 | 1.38 |
| Dead+Wind 90 deg+Ice+Temp | 21.67 | 19.79 | -0.04 | -26.42 | -1278.60 | -15.72 |
| Dead+Wind 180 deg+Ice+Temp | 21.67 | -0.04 | 19.78 | 1275.84 | 4.06 | -1.39 |
| Dead+Wind 0 deg - Service | 12.09 | 0.03 | -11.71 | -796.89 | -1.99 | 0.67 |
| Dead+Wind 90 deg - Service | 12.09 | 11.18 | -0.03 | -9.83 | -749.73 | -9.05 |
| Dead+Wind 180 deg - Service | 12.09 | -0.03 | 11.37 | 768.38 | 3.91 | -0.67 |

## Solution Summary

| Load Comb. | Sum of Applied Forces PX K | PY K | PZ K | Sum of Reactions PX K | PY K | PZ K | % Error |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | -12.09 | 0.00 | 0.00 | 12.09 | 0.00 | 0.000% |
| 2 | 0.06 | -12.09 | -20.81 | -0.06 | 12.09 | 20.81 | 0.001% |
| 3 | 19.88 | -12.09 | -0.06 | -19.88 | 12.09 | 0.06 | 0.002% |
| 4 | -0.06 | -12.09 | 20.21 | 0.06 | 12.09 | -20.21 | 0.002% |
| 5 | 0.00 | -21.67 | 0.00 | -0.00 | 21.67 | -0.00 | 0.000% |
| 6 | 0.04 | -21.67 | -21.30 | -0.04 | 21.67 | 21.30 | 0.002% |
| 7 | 19.79 | -21.67 | -0.04 | -19.79 | 21.67 | 0.04 | 0.002% |
| 8 | -0.04 | -21.67 | 19.78 | 0.04 | 21.67 | -19.78 | 0.002% |
| 9 | 0.03 | -12.09 | -11.71 | -0.03 | 12.09 | 11.71 | 0.001% |
| 10 | 11.18 | -12.09 | -0.03 | -11.18 | 12.09 | 0.03 | 0.001% |
| 11 | -0.03 | -12.09 | 11.37 | 0.03 | 12.09 | -11.37 | 0.001% |

## Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|---|---|---|---|---|
| 1 | Yes | 6 | 0.00000001 | 0.00000001 |
| 2 | Yes | 8 | 0.00000001 | 0.00007668 |
| 3 | Yes | 8 | 0.00000001 | 0.00008540 |
| 4 | Yes | 8 | 0.00000001 | 0.00009461 |
| 5 | Yes | 7 | 0.00000001 | 0.00006683 |
| 6 | Yes | 8 | 0.00000001 | 0.00013258 |
| 7 | Yes | 8 | 0.00000001 | 0.00014119 |
| 8 | Yes | 8 | 0.00000001 | 0.00014928 |
| 9 | Yes | 8 | 0.00000001 | 0.00008034 |
| 10 | Yes | 8 | 0.00000001 | 0.00008506 |
| 11 | Yes | 8 | 0.00000001 | 0.00009064 |

## Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| T1 | 104 - 92 | 4.090 | 9 | 0.3500 | 0.0850 |
| T2 | 92 - 80 | 3.204 | 9 | 0.3389 | 0.0691 |
| T3 | 80 - 60 | 2.372 | 9 | 0.2930 | 0.0552 |
| T4 | 60 - 40 | 1.296 | 9 | 0.1898 | 0.0370 |
| T5 | 40 - 20 | 0.585 | 9 | 0.1227 | 0.0222 |
| T6 | 20 - 0 | 0.165 | 9 | 0.0553 | 0.0110 |

## Critical Deflections and Radius of Curvature - Service Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|

| Elevation<br>ft | Appurtenance | Gov. Load Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|---|---|---|---|---|---|---|
| 102.00 | T-Frame Sector | 9 | 3.942 | 0.3494 | 0.0823 | 103515 |
| 88.00 | T-Frame Sector | 9 | 2.916 | 0.3274 | 0.0642 | 21397 |
| 79.00 | DB806-XT | 9 | 2.308 | 0.2879 | 0.0542 | 10869 |
| 73.00 | PR-950 | 9 | 1.948 | 0.2561 | 0.0483 | 11261 |
| 65.00 | (2) AIR 21 | 9 | 1.528 | 0.2135 | 0.0411 | 12377 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| T1 | 104 - 92 | 7.255 | 2 | 0.6203 | 0.1512 |
| T2 | 92 - 80 | 5.683 | 2 | 0.6017 | 0.1229 |
| T3 | 80 - 60 | 4.205 | 2 | 0.5200 | 0.0982 |
| T4 | 60 - 40 | 2.298 | 2 | 0.3363 | 0.0657 |
| T5 | 40 - 20 | 1.037 | 2 | 0.2172 | 0.0395 |
| T6 | 20 - 0 | 0.293 | 6 | 0.0980 | 0.0195 |

## Critical Deflections and Radius of Curvature - Design Wind

| Elevation<br>ft | Appurtenance | Gov. Load Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|---|---|---|---|---|---|---|
| 102.00 | T-Frame Sector | 2 | 6.991 | 0.6195 | 0.1464 | 61298 |
| 88.00 | T-Frame Sector | 2 | 5.172 | 0.5813 | 0.1141 | 12173 |
| 79.00 | DB806-XT | 2 | 4.091 | 0.5110 | 0.0963 | 6156 |
| 73.00 | PR-950 | 2 | 3.453 | 0.4543 | 0.0858 | 6364 |
| 65.00 | (2) AIR 21 | 2 | 2.707 | 0.3784 | 0.0731 | 6963 |

## Bolt Design Data

| Section No. | Elevation<br>ft | Component Type | Bolt Grade | Bolt Size<br>in | Number Of Bolts | Maximum Load per Bolt<br>K | Allowable Load<br>K | Ratio Load / Allowable | Allowable Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 | Leg | A325N | 0.6250 | 4 | 0.06 | 13.49 | 0.004 ✓ | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 1.73 | 4.08 | 0.425 ✓ | 1.333 | Member Bearing |
| | | Top Girt | A325N | 0.5000 | 1 | 0.17 | 4.08 | 0.042 ✓ | 1.333 | Member Bearing |
| T2 | 92 | Leg | A325N | 0.6250 | 4 | 2.15 | 13.49 | 0.160 ✓ | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 4.11 | 4.12 | 0.997 ✓ | 1.333 | Bolt Shear |
| | | Top Girt | A325N | 0.5000 | 1 | 0.29 | 4.12 | 0.069 ✓ | 1.333 | Bolt Shear |
| T3 | 80 | Leg | A325N | 0.6250 | 4 | 6.15 | 13.50 | 0.456 ✓ | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 3.45 | 4.12 | 0.837 ✓ | 1.333 | Bolt Shear |
| T4 | 60 | Leg | A325N | 0.6250 | 4 | 12.40 | 13.50 | 0.918 ✓ | 1.333 | Bolt Tension |

| Section No. | Elevation ft | Component Type | Bolt Grade | Bolt Size in | Number Of Bolts | Maximum Load per Bolt K | Allowable Load K | Ratio Load / Allowable | Allowable Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Diagonal | A325N | 0.5000 | 1 | 3.74 | 4.12 | 0.907 ✔ | 1.333 | Bolt Shear |
| T5 | 40 | Leg | A325N | 0.6250 | 4 | 17.86 | 13.50 | 1.323 ✔ | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 4.05 | 4.12 | 0.981 ✔ | 1.333 | Bolt Shear |
| T6 | 20 | Leg | A325N | 0.7500 | 4 | 22.54 | 19.44 | 1.159 ✔ | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 4.40 | 4.08 | 1.079 ✔ | 1.333 | Member Bearing |

## Compression Checks

## Leg Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio P / $P_a$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | P2x.154 | 12.00 | 4.00 | 61.0<br>K=1.00 | 22.549 | 1.0745 | -7.01 | 24.23 | 0.289 ✔ |
| T2 | 92 - 80 | P2x.154 | 12.00 | 6.00 | 91.5<br>K=1.00 | 16.619 | 1.0745 | -19.59 | 17.86 | 1.097 ✔ |
| T3 | 80 - 60 | P2.5x.203 | 20.03 | 5.01 | 63.4<br>K=1.00 | 22.122 | 1.7040 | -47.70 | 37.70 | 1.265 ✔ |
| T4 | 60 - 40 | Pipe 2.875 x .203 w/ 3/8 Plate | 20.03 | 6.68 | 88.5<br>K=1.00 | 17.258 | 3.5180 | -71.71 | 60.71 | 1.181 ✔ |
| T5 | 40 - 20 | Pipe 2.875 x 0.276 w/ 3/8 Plate | 20.03 | 6.68 | 87.0<br>K=1.00 | 17.572 | 4.0080 | -93.26 | 70.43 | 1.324 ✔ |
| T6 | 20 - 0 | Pipe 3 x 0.3 w/ 3/8 Plate | 20.03 | 6.68 | 71.4<br>K=1.00 | 20.671 | 5.0840 | -114.75 | 105.09 | 1.092 ✔ |

## Diagonal Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio P / $P_a$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | L1 1/2x1 1/2x3/16 | 7.65 | 3.60 | 147.4<br>K=1.00 | 6.869 | 0.5273 | -1.71 | 3.62 | 0.471 ✔ |
| T2 | 92 - 80 | L1 1/2x1 1/2x1/4 | 8.88 | 4.21 | 173.0<br>K=1.00 | 4.990 | 0.6875 | -4.11 | 3.43 | 1.198 ✔ |
| T3 | 80 - 60 | L1 1/2x1 1/2x1/4 | 9.70 | 4.75 | 195.3<br>K=1.00 | 3.917 | 0.6875 | -3.45 | 2.69 | 1.282 ✔ |
| T4 | 60 - 40 | L2x2x3/16 | 12.21 | 6.04 | 183.9<br>K=1.00 | 4.416 | 0.7150 | -3.56 | 3.16 | 1.128 ✔ |
| T5 | 40 - 20 | L2 1/2x2 1/2x3/16 | 13.96 | 6.91 | 167.6<br>K=1.00 | 5.316 | 0.9020 | -4.05 | 4.80 | 0.844 ✔ |
| T6 | 20 - 0 | L2 1/2x2 1/2x3/16 | 15.17 | 7.49 | 181.6 | 4.526 | 0.9020 | -4.31 | 4.08 | 1.057 |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | K=1.00 | | | | | ✔ |

## 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 K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | L2x2x3/16 | 6.52 | 6.11 | 186.2<br>K=1.00 | 4.307 | 0.7150 | -0.16 | 3.08 | 0.053<br>✔ |
| T2 | 92 - 80 | L2x2x3/16 | 6.52 | 6.11 | 186.2<br>K=1.00 | 4.307 | 0.7150 | -0.29 | 3.08 | 0.093<br>✔ |

## 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 K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | P2x.154 | 12.00 | 4.00 | 61.0 | 30.000 | 1.0745 | 4.72 | 32.24 | 0.146<br>✔ |
| T2 | 92 - 80 | P2x.154 | 12.00 | 6.00 | 91.5 | 30.000 | 1.0745 | 16.51 | 32.24 | 0.512<br>✔ |
| T3 | 80 - 60 | P2.5x.203 | 20.03 | 5.01 | 63.4 | 30.000 | 1.7040 | 42.22 | 51.12 | 0.826<br>✔ |
| T4 | 60 - 40 | Pipe 2.875 x .203 w/ 3/8 Plate | 20.03 | 6.68 | 88.5 | 30.000 | 3.5180 | 64.59 | 105.54 | 0.612<br>✔ |
| T5 | 40 - 20 | Pipe 2.875 x 0.276 w/ 3/8 Plate | 20.03 | 6.68 | 87.0 | 30.000 | 4.0080 | 84.19 | 120.24 | 0.700<br>✔ |
| T6 | 20 - 0 | Pipe 3 x 0.3 w/ 3/8 Plate | 20.03 | 6.68 | 71.4 | 30.000 | 5.0840 | 101.43 | 152.52 | 0.665<br>✔ |

## Diagonal Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | L1 1/2x1 1/2x3/16 | 7.65 | 3.60 | 97.4 | 29.000 | 0.3076 | 1.73 | 8.92 | 0.194<br>✔ |
| T2 | 92 - 80 | L1 1/2x1 1/2x1/4 | 8.88 | 4.21 | 115.3 | 29.000 | 0.3984 | 3.97 | 11.55 | 0.343<br>✔ |
| T3 | 80 - 60 | L1 1/2x1 1/2x1/4 | 9.70 | 4.75 | 129.8 | 29.000 | 0.3984 | 3.39 | 11.55 | 0.293 |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T4 | 60 - 40 | L2x2x3/16 | 12.21 | 6.04 | 119.4 | 29.000 | 0.4484 | 3.61 | 13.00 | 0.277 ✔ |
| T5 | 40 - 20 | L2 1/2x2 1/2x3/16 | 13.36 | 6.62 | 103.7 | 29.000 | 0.5886 | 3.74 | 17.07 | 0.219 ✔ |
| T6 | 20 - 0 | L2 1/2x2 1/2x3/16 | 15.79 | 7.80 | 121.9 | 29.000 | 0.5886 | 4.40 | 17.07 | 0.258 ✔ |

## Top Girt Design Data (Tension)

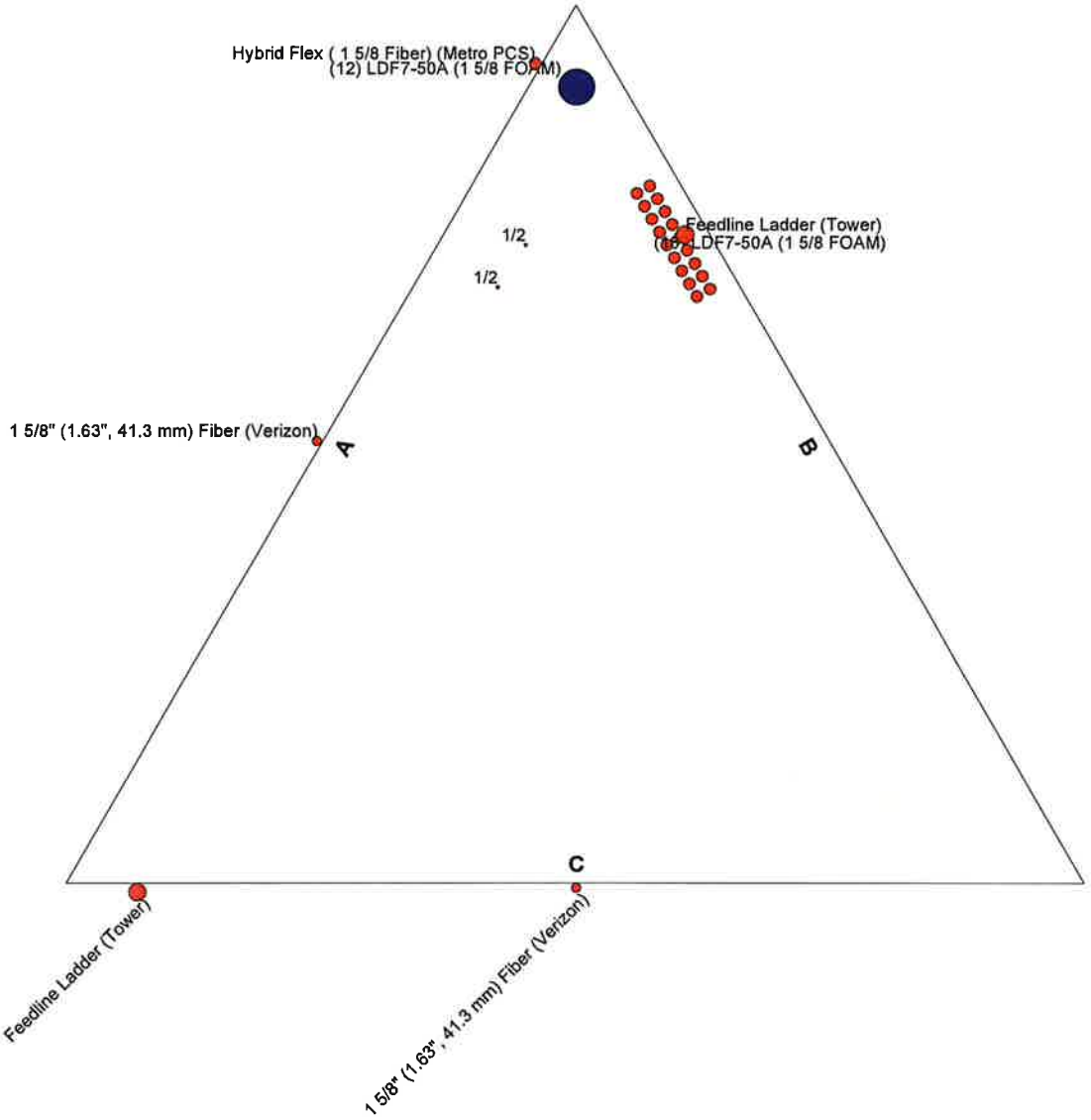
| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | $F_a$ ksi | A $in^2$ | Actual P K | Allow. $P_a$ K | Ratio $\frac{P}{P_a}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | L2x2x3/16 | 6.52 | 6.11 | 123.0 | 29.000 | 0.4484 | 0.17 | 13.00 | 0.013 ✔ |
| T2 | 92 - 80 | L2x2x3/16 | 6.52 | 6.11 | 123.0 | 29.000 | 0.4484 | 0.24 | 13.00 | 0.019 ✔ |

## Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | $SF*P_{allow}$ K | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| T1 | 104 - 92 | Leg | P2x.154 | 3 | -7.01 | 32.30 | 21.7 | Pass |
| T2 | 92 - 80 | Leg | P2x.154 | 27 | -19.59 | 23.80 | 82.3 | Pass |
| T3 | 80 - 60 | Leg | P2.5x.203 | 45 | -47.70 | 50.25 | 94.9 | Pass |
| T4 | 60 - 40 | Leg | Pipe 2.875 x .203 w/ 3/8 Plate | 72 | -71.71 | 80.93 | 88.6 | Pass |
| T5 | 40 - 20 | Leg | Pipe 2.875 x 0.276 w/ 3/8 Plate | 93 | -93.26 | 93.88 | 99.3 | Pass |
| T6 | 20 - 0 | Leg | Pipe 3 x 0.3 w/ 3/8 Plate | 114 | -114.75 | 140.09 | 81.9<br>87.0 (b) | Pass |
| T1 | 104 - 92 | Diagonal | L1 1/2x1 1/2x3/16 | 17 | -1.71 | 4.83 | 35.3 | Pass |
| T2 | 92 - 80 | Diagonal | L1 1/2x1 1/2x1/4 | 35 | -4.11 | 4.57 | 89.9 | Pass |
| T3 | 80 - 60 | Diagonal | L1 1/2x1 1/2x1/4 | 49 | -3.45 | 3.59 | 96.2 | Pass |
| T4 | 60 - 40 | Diagonal | L2x2x3/16 | 76 | -3.56 | 4.21 | 84.6 | Pass |
| T5 | 40 - 20 | Diagonal | L2 1/2x2 1/2x3/16 | 97 | -4.05 | 6.39 | 63.3<br>73.6 (b) | Pass |
| T6 | 20 - 0 | Diagonal | L2 1/2x2 1/2x3/16 | 124 | -4.31 | 5.44 | 79.3<br>80.9 (b) | Pass |
| T1 | 104 - 92 | Top Girt | L2x2x3/16 | 4 | -0.16 | 4.10 | 4.0 | Pass |
| T2 | 92 - 80 | Top Girt | L2x2x3/16 | 28 | -0.29 | 4.10 | 6.9 | Pass |

| Summary | ELC: | Existing + Proposed |
|---|---|---|
| Leg (T5) | 99.3 | Pass |
| Diagonal (T3) | 96.2 | Pass |
| Top Girt (T2) | 6.9 | Pass |
| Bolt Checks | 99.2 | Pass |
| Rating = | 99.3 | Pass |

# Feed Line Plan





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| | | | |
|---|---|---|---|
| Job: **CT901 Glastonbury** | | | |
| Project: **SST Analysis** | | | |
| Client: Insite Towers, LLC | Drawn by: J. Turner | App'd: | |
| Code: TIA/EIA-222-F | Date: 08/28/14 | Scale: NTS | |
| Path: | | Dwg No. E-7 | |