Robinson+Cole

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Also admitted in Massachusetts

October 8, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
**12 Burr Road, Bloomfield, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at the 117-foot level of the existing 140-foot tower at 12 Burr Road in Bloomfield, Connecticut (the "Property"). The tower is owned by SBA. The Council approved Cellco's use of this tower in 2009. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model SBNHH-1D65B, 1900 MHz antennas; three (3) model SBNHH-1D65B, 1900 MHz antennas; and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same 117-foot level on the tower. Cellco also intends to replace three (3) existing remote radio heads ("RRHs"), and install six (6) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Philip K. Schenk, Jr., Bloomfield's Town Manager. A copy of this letter is also being sent to Maple Hill Farms, the owner of the Property and SBA, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be located on Cellco's antenna platform at the 117-foot level on the 140-foot 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 modified facility 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 behind is included behind 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 Report 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:
Philip K. Schenk, Jr., Bloomfield Town Manager
Maple Hill Farms
Victoria Barrios, SBA
Tim Parks

# ATTACHMENT 1

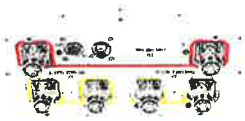
# Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

## SBNHH-1D65B

**Andrew® Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.**



- Interleaved dipole technology providing for attractive, low wind load mechanical package

## Electrical Specifications

| Frequency Band, MHz | 698–806 | 806–896 | 1695–1880 | 1850–1990 | 1920–2200 | 2300–2360 |
|---|---|---|---|---|---|---|
| Gain, dBi | 14.9 | 14.7 | 17.7 | 18.2 | 18.6 | 18.6 |
| Beamwidth, Horizontal, degrees | 68 | 66 | 69 | 66 | 63 | 58 |
| Beamwidth, Vertical, degrees | 12.1 | 10.7 | 5.6 | 5.2 | 5.0 | 4.5 |
| Beam Tilt, degrees | 0–14 | 0–14 | 0–7 | 0–7 | 0–7 | 0–7 |
| USLS, dB | 14 | 13 | 15 | 15 | 15 | 13 |
| Front-to-Back Ratio at 180°, dB | 27 | 29 | 28 | 28 | 28 | 27 |
| CPR at Boresight, dB | 20 | 23 | 20 | 20 | 17 | 21 |
| CPR at Sector, dB | 14 | 10 | 12 | 10 | 9 | 1 |
| Isolation, dB | 25 | 25 | 25 | 25 | 25 | 25 |
| Isolation, Intersystem, dB | 30 | 30 | 30 | 30 | 30 | 30 |
| VSWR \| Return Loss, dB | 1.5 \| 14.0 | 1.5 \| 14.0 | 1.5 \| 14.0 | 1.5 \| 14.0 | 1.5 \| 14.0 | 1.5 \| 14.0 |
| PIM, 3rd Order, 2 x 20 W, dBc | -153 | -153 | -153 | -153 | -153 | -153 |
| Input Power per Port, maximum, watts | 350 | 350 | 350 | 350 | 350 | 300 |
| Polarization | ±45° | ±45° | ±45° | ±45° | ±45° | ±45° |
| Impedance | 50 ohm | 50 ohm | 50 ohm | 50 ohm | 50 ohm | 50 ohm |

## Electrical Specifications, BASTA*

| Frequency Band, MHz | 698–806 | 806–896 | 1695–1880 | 1850–1990 | 1920–2200 | 2300–2360 |
|---|---|---|---|---|---|---|
| Gain by all Beam Tilts, average, dBi | 14.5 | 14.3 | 17.4 | 17.9 | 18.2 | 18.3 |
| Gain by all Beam Tilts Tolerance, dB | ±0.5 | ±0.8 | ±0.4 | ±0.3 | ±0.5 | ±0.3 |
| Gain by Beam Tilt, average, dBi | 0 ° \| 14.6 | 0 ° \| 14.5 | 0 ° \| 17.4 | 0 ° \| 17.8 | 0 ° \| 18.1 | 0 ° \| 18.2 |
| | 7 ° \| 14.6 | 7 ° \| 14.4 | 3 ° \| 17.5 | 3 ° \| 17.9 | 3 ° \| 18.3 | 3 ° \| 18.4 |
| | 14 ° \| 14.2 | 14 ° \| 13.6 | 7 ° \| 17.4 | 7 ° \| 17.9 | 7 ° \| 18.2 | 7 ° \| 18.4 |
| Beamwidth, Horizontal Tolerance, degrees | ±2.2 | ±3.4 | ±2 | ±4.6 | ±5.7 | ±4.3 |
| Beamwidth, Vertical Tolerance, degrees | ±0.8 | ±1 | ±0.3 | ±0.2 | ±0.3 | ±0.2 |
| USLS, dB | 16 | 14 | 16 | 16 | 16 | 15 |
| Front-to-Back Total Power at 180° ± 30°, dB | 25 | 26 | 27 | 26 | 26 | 26 |
| CPR at Boresight, dB | 22 | 23 | 21 | 20 | 20 | 22 |
| CPR at Sector, dB | 13 | 11 | 16 | 12 | 11 | 4 |

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

## General Specifications

| | |
|---|---|
| Antenna Brand | Andrew® |
| Antenna Type | DualPol® multiband with internal RET |
| Band | Multiband |
| Brand | DualPol® \| Teletilt® |
| Operating Frequency Band | 1695 – 2360 MHz \| 698 – 896 MHz |
| Performance Note | Outdoor usage |

# Product Specifications

SBNHH-1D65B

## Mechanical Specifications

| | |
|---|---|
| Color | Light gray |
| Lightning Protection | dc Ground |
| Radiator Material | Aluminum \| Low loss circuit board |
| Radome Material | Fiberglass, UV resistant |
| Reflector Material | Aluminum |
| RF Connector Interface | 7-16 DIN Female |
| RF Connector Location | Bottom |
| RF Connector Quantity, total | 6 |
| Wind Loading, maximum | 617.7 N @ 150 km/h<br>138.9 lbf @ 150 km/h |
| Wind Speed, maximum | 241.4 km/h \| 150.0 mph |

## Dimensions

| | |
|---|---|
| Depth | 181.0 mm \| 7.1 in |
| Length | 1851.0 mm \| 72.9 in |
| Width | 301.0 mm \| 11.9 in |
| Net Weight | 18.4 kg \| 40.6 lb |

## Remote Electrical Tilt (RET) Information

| | |
|---|---|
| Input Voltage | 10–30 Vdc |
| Power Consumption, idle state, maximum | 2.0 W |
| Power Consumption, normal conditions, maximum | 13.0 W |
| Protocol | 3GPP/AISG 2.0 (Multi-RET) |
| RET Interface | 8-pin DIN Female \| 8-pin DIN Male |
| RET Interface, quantity | 1 female \| 1 male |
| RET System | Teletilt® |

## Packed Dimensions

| | |
|---|---|
| Depth | 299.0 mm \| 11.8 in |
| Length | 1970.0 mm \| 77.6 in |
| Width | 409.0 mm \| 16.1 in |
| Shipping Weight | 31.0 kg \| 68.3 lb |

## Regulatory Compliance/Certifications

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

## Included Products

# Product Specifications

SBNHH-1D65B

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

## * Footnotes

| | |
|---|---|
| Performance Note | Severe environmental conditions may degrade optimum performance |

# ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

**Supporting 2Tx/4Tx MIMO and 4-way Rx diversity**, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

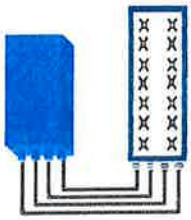
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

## FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

## BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

Alcatel·Lucent

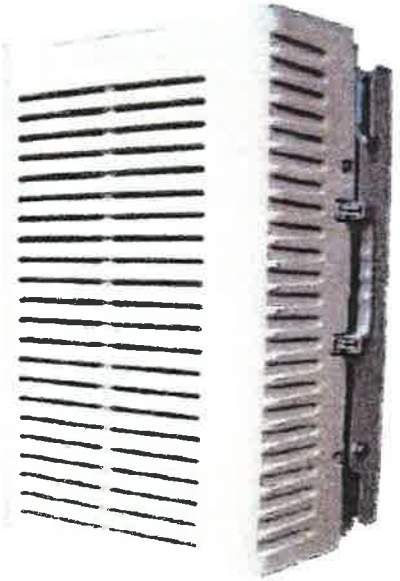
| Features & performance | |
|---|---|
| Number of TX/RX paths | 4 duplexed (either 4T4R or 2T4R by SW) |
| Frequency band | U700 (C) (3GPP bands 13):<br>DL: 746 - 756 MHz / UL: 777 - 787 MHz |
| Instantaneous bandwidth - #carriers | 10MHz – 1 LTE carrier (in 10MHz occupied bandwidth) |
| LTE carrier bandwidth | 10 MHz |
| RF output power | 2x60W or 4x30W (by SW) |
| Noise figure – RX Diversity scheme | 2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity |
| Sizes (HxWxD) in mm (in.)<br>Volume in L<br>Weight in kg (lb) (w/o mounting HW) | 550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)<br>38 (with solar shield)<br>26 (57.2) (with solar shield) |
| DC voltage range<br>DC power consumption | -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption<br>550W typical @100% RF load ( in 2Tx or 4TX mode) |
| Environmental conditions<br><br>Wind load (@150km/h or 93mph) | -40°C (-40°F) /+55°C (+131°F)<br>IP65<br>Frontal:<200N / Lateral :<150N |
| Antenna ports | 4 ports 7/16 DIN female (50 ohms)<br>VSWR < 1.5 |
| CPRI ports | 2 CPRI ports (HW ready for Rate7, 9.8 Gbps)<br>SFP single mode dual fiber |
| AISG interfaces | 1 AISG2.0 output (RS485)<br>Integrated Smart Bias Tees (x2) |
| Misc. Interfaces | 4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins) |
| Installation conditions | Pole and wall mounting |
| Regulatory compliance | 3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 |

# PCS RF MODULES

## RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

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

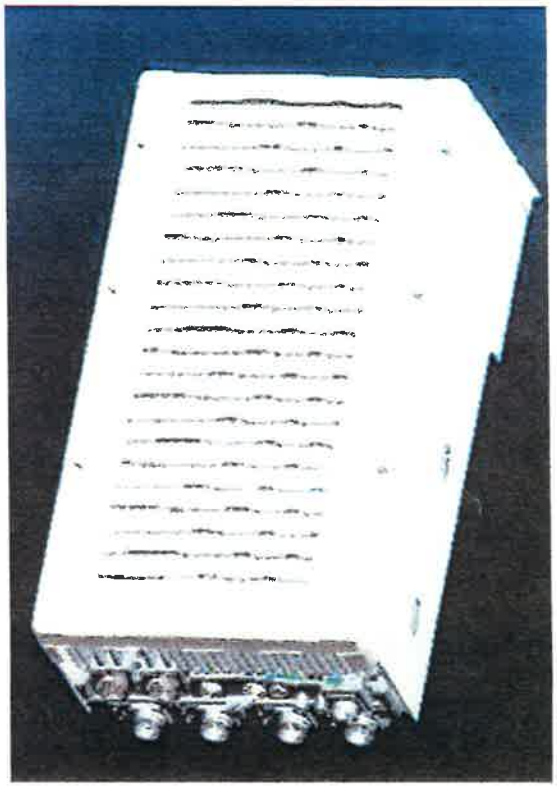


** Not a Verizon Wireless deployed product

# NEW PCS RF MODULES FOR VZW
## RRH2X60 - HW CHARACTERISTICS

LR14.3

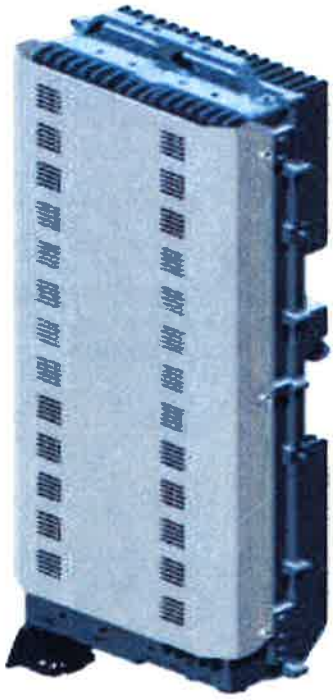
| | RRH2x60 |
|---|---|
| RF Output Power | 2x60W (4x30W HW Ready) |
| Instantaneous Bandwidth | 60MHz |
| Target Reliability (Annual Return Rate) | <2% |
| Receiver | 4 Branch Rx |
| Features | AISG 2.0 for RET/TMA |
| Power | -48VDC |
| | Internal Smart Bias-T |
| CPRI Ports | 2 CPRI Rate 5 Ports |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



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

# 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.

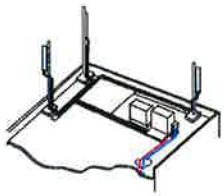
### EASY INSTALLATION

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.

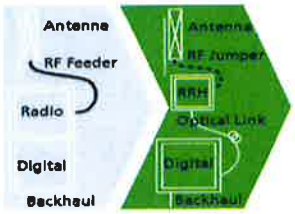
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

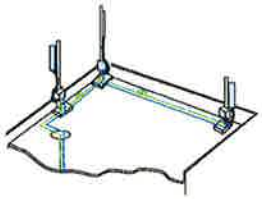
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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 |
| 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) |
| 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) |
| 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 |
| 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 |
| Installation Temperature | | [°C (°F)] | -40 to +65 (-40 to149) |
| Operation Temperature | | [°C (°F)] | -40 to +65 (-40 to149) |

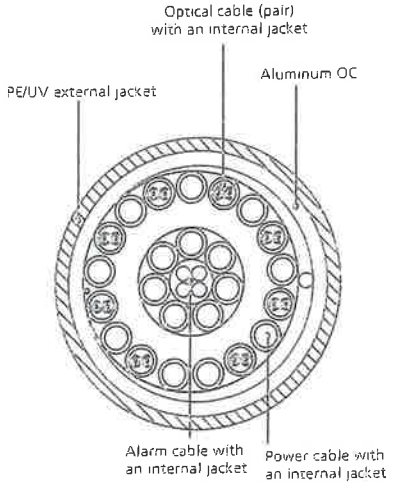



Figure 2: Construction Detail

* This data is provisional and subject to change

# ATTACHMENT 2

| | General | Power | Density | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Site Name: Bloomfield 2** | | | | | | | | |
| **Tower Height: 140'** | | | | | | | | |
| **CARRIER** | **# OF CHAN.** | **WATTS ERP** | **HEIGHT** | **CALC. POWER DENS** | **FREQ.** | **MAX. PERMISS. EXP.** | **FRACTION MPE** | **Total** |
| *Clearwire | 2 | 153 | 97 | 0.0133 | 2496 | 1.0000 | 0.13% | |
| *Clearwire | 1 | 211 | 97 | 0.0092 | 11 GHz | 1.0000 | 0.09% | |
| *T-Mobile | 2 | 953 | 130 | 0.0446 | 1900 | 1.0000 | 0.45% | |
| *T-Mobile | 4 | 477 | 130 | 0.0446 | 2100 | 1.0000 | 0.45% | |
| *AT&T UMTS | 2 | 565 | 107 | 0.0398 | 880 | 0.5867 | 0.68% | |
| *AT&T UMTS | 2 | 875 | 107 | 0.0617 | 1900 | 1.0000 | 0.62% | |
| *AT&T GSM | 1 | 283 | 107 | 0.0100 | 880 | 0.5867 | 0.17% | |
| *AT&T GSM | 4 | 525 | 107 | 0.0740 | 1900 | 1.0000 | 0.74% | |
| *AT&T LTE | 1 | 1615 | 107 | 0.0569 | 734 | 0.4893 | 1.16% | |
| *MetroPCS | 3 | 727 | 137 | 0.0457 | 2140 | 1.0000 | 0.46% | |
| **Verizon** | **11** | **441** | **117** | **0.1274** | **1970** | **1.0000** | **12.74%** | |
| **Verizon** | **9** | **405** | **117** | **0.0957** | **869** | **0.5793** | **16.53%** | |
| **Verizon** | **1** | **3500** | **117** | **0.0919** | **2145** | **1.0000** | **9.19%** | |
| **Verizon** | **1** | **2100** | **117** | **0.0552** | **746** | **0.4973** | **11.09%** | |
| | | | | | | | | |
| | | | | | | | | **54.5%** |
| * Source: Siting Council | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# ATTACHMENT 3

Tower Engineering Solutions
Phone (972) 483-0607, Fax (972) 975-9615
8445 Freeport Parkway, Suite 375, Irving, Texas 75063

# Structural Analysis Report

**Existing 140 ft. ROHN Monopole**

**Customer Name: SBA Communications Corp**

**Customer Site Number: CT13548-S**

**Customer Site Name: Bloomfield 4**

**Carrier Name: Verizon**

**Carrier Site Number: Bloomfield 2**

**Carrier Site Name: Unknown**

**Site Location: 12 Burr Road**

**Bloomfield, Connecticut**

**Hartford County**

**Latitude: 41.817858**

**Longitude: -72.764511**


**Analysis Result:**

**Max Structural Usage: 69.8 % [Pass]**

**Max Foundation Usage: 72.0 % [Pass]**

**Report Prepared By : Walter Velez**

## Introduction

The purpose of this report is to summarize the analysis results on the 140 ft. ROHN Monopole to support the proposed antennas and transmission lines in addition to those currently installed. Any modification listed under Sources of Information was assumed completed and was included in this analysis.

## Sources of Information

| | |
|---|---|
| **Tower Drawings** | Monopole original structural design report & shaft section data prepared by ROHN. Dated 12-02-2009. Drawing No 606820-01-D1. File No 0606820.<br>Monopole previous structural report prepared by FDH Engineering, Inc. Dated 08-22-2014. Project No 146ASY1400. |
| **Foundation Drawing** | Monopole original foundation calculations & Drawings prepared by ROHN. Dated 12-02-2009. Drawing No 606820-01-F1 & 606820-01-F2. File No 0606820. |
| **Geotechnical Report** | Monopole geotechnical report prepared by Tower Engineering Professionals, Inc. Dated 03-01-2010. Project No 093184.01 Rev 1. |
| **Modification Drawings** | Monopole previous modifications by FDH Engineering, Inc. Dated 06-26-2012. Project No 12-02719E S1. Modification inspection report prepared by FDH Engineering, Inc. Dated 08-30-2012. Project No 1206095TC1. |

## Analysis Criteria

The analysis was performed in accordance with the requirements and stipulations of the ANSI/TIA 222-F. In accordance with this standard, the structure was analyzed using **TESPoles,** a proprietary analysis software. The program considers the structure as an elastic 3-D model with second-order effects and temperature effects incorporated in the analysis. The analysis was performed using multiple wind directions.

| | |
|---|---|
| **Basic Wind Speed Used in the Analysis:** | 95 mph (3-Sec. Gust) / 78.0 mph (Fastest Mile) |
| **Basic Wind Speed with Ice:** | 68 mph (fastest mile) with 1/2" radial ice concurrent |
| **Operational Wind Speed:** | 50 mph + 0" Radial ice |
| **Standard/Codes:** | ANSI/TIA- 222-F & 2005 Connecticut State Building Code |

## Existing Antennas, Mounts and Transmission Lines

The table below summarizes the antennas, mounts and transmission lines that were considered in the analysis as existing on the tower.

| Items | Elevation (ft.) | Qty. | Antenna Descriptions | Mount Type & Qty. | Transmission Lines | Owner |
|---|---|---|---|---|---|---|
| 1 | 130.0 | 3 | Ericsson AIR21 B2A/B4P | (3) T-Arms | (18) 1 5/8"; (1) 1 5/8" Fiber | T-Mobile |
| 2 | | 3 | Ericsson AIR21 B4A/B2P | | | |
| 3 | | 6 | Ericsson KRY 112 144/1 | | | |
| 4 | | 3 | RFS APXV18-209014-C | | | |
| 5 | 117.0 | 3 | ALU RRH2X40-AWS | (3) T-Arms | (18) 1 5/8"; (1) 1 5/8" Hybriflex | Verizon |
| 6 | | 3 | Antel BXA-70063/6CF | | | |
| 7 | | 6 | Antel LPA-80063/6CF | | | |
| 8 | | 6 | Kathrein 742 213 | | | |
| 9 | | 1 | RFS DB-T1-6Z-8AB-0Z | | | |
| 10 | 107.0 | 1 | Andrew SBNH-1D6565C | Platform w/ Hand Rails | (12) 1 5/8"; (1) 1/2"; [ (1) Fiber + (2) DC Cables inside (1) 3" Conduit ]* | AT&T |
| 11 | | 1 | KMW AM-X-CD-16-65-00T-RET | | | |
| 12 | | 12 | Powerwave 7020.00 | | | |
| 13 | | 9 | Powerwave P65-16-XLH-RR | | | |
| 14 | | 1 | Powerwave P65-17-XLH-RR | | | |
| 15 | | 12 | Powerwave TT08-19DB111-001 | | | |
| 16 | 106.0 | 6 | Andrew RRUS11 RRUs | (1) Valmont LWRM Ring Mount | | |
| 17 | | 1 | Raycap DC6-48-60-18-8F | | | |

* Existing (1) Fiber + (2) DC Power lines installed inside (1) 3" Conduit running outside of the pole shaft and exposed to wind.

## Proposed Carrier's Final Configuration of Antennas, Mounts and Transmission Lines

Information pertaining to the proposed carrier's final configuration of antennas and transmission lines was provided by SBA Communications Corp. The proposed antennas and lines are listed below.

| Items | Elevation (ft.) | Qty. | Antenna Descriptions | Mount Type & Qty. | Transmission Lines | Owner |
|---|---|---|---|---|---|---|
| 18 | 117.0 | 3 | ALU RRH2x60-700 | (3) T-Arms | (12) 1 5/8"; (2) 1 5/8" Fiber | Verizon |
| 19 | | 3 | ALU RRH2x60-AWS | | | |
| 20 | | 3 | ALU RRH2X60-PCS | | | |
| 21 | | 6 | Antel LPA-80063/6CFx5 | | | |
| 22 | | 9 | Commscope SBNHH-1D65B | | | |
| 23 | | 2 | RFS DB-T1-6Z-8AB-0Z | | | |

All transmission lines are considered running inside of the pole shafts.

## Analysis Results

The results of the structural analysis, performed for the wind and ice loading and antenna equipment as defined above, are summarized as the following:

| | Pole shafts | Anchor Bolts | Base Plate |
|---|---|---|---|
| Max. Usage: | **69.8%** | **67.5%** | **61.7%** |
| Pass/Fail | **Pass** | **Pass** | **Pass** |

## Foundations

| | Moment (Kip-Ft) | Shear (Kips) | Axial (Kips) |
|---|---|---|---|
| Original Design Reactions | 4028.2 | 38.7 | 95.1 |
| Analysis Reactions | 2273.9 | 23.2 | 32.3 |
| % of Design Reactions | 56.4% | 60.0% | 34.0% |

The foundation has been investigated using the supplied documents and soils report and was found adequate. Therefore, no modification to the foundation will be required.

## Operational Condition (Rigidity):

Operational characteristics of the tower are found to be within the limits prescribed by ANSI/TIA-222-F for the installed antennas. Maximum twist/sway at the elevation of the proposed equipment is 1.5592 degrees under the operational wind speed as specified in the Analysis Criteria.

## Conclusions

Based on the analysis results, the existing structure and its foundation were found to be adequate to safely support the existing and proposed equipment and meet the minimum requirements per the ANSI/TIA-222-G standards, the 2003 IBC and the 2005 Connecticut State Building Code under the design basic wind speed specified in the Analysis Criteria.

# Standard Conditions

1. This analysis was performed based on the information supplied to **(TES) Tower Engineering Solutions, LLC.** Verification of the information provided was not included in the Scope of Work for **TES**. The accuracy of the analysis is dependent on the accuracy of the information provided.

2. The analysis is based on the presumption that the tower members and components along with any existing reinforcement items have been correctly and properly designed, manufactured, installed and maintained.

3. All the existing structural members were assumed to be in good condition with no physical damage or deterioration associated with corrosion.

4. An initial tension of 10% of the break strength on all the existing guy wires was assumed in all the structural analyses of guyed towers unless different values were provided by the client. **TES** cannot take responsibility for the deviations in the analysis results because of differences in the initial tension forces of the existing guy wires.

5. Secondary component or connection secondary components, welds and bolts are assumed to be able to carry their intended original design loads. **TES** cannot take responsibility for verification of the adequacy on the connections, bolts and welds present in the structure.

6. The analyses will be performed based on the codes as specified by the client or based on the best knowledge of the engineering staff of **TES**. In the absence of information to the contrary, all work will be performed in accordance with the latest relevant revision of ANSI/TIA-222. If wind speed or/and ice loads are different from the minimum values recommended by the EIA/TIA-222 standard or other codes, **TES** should be notified in writing and the applicable minimum values provided by the client.

7. The configuration of the existing mounts, antennas, coax and other appurtenances were supplied by the customer for the current structural analysis. **TES** has not visited the tower site to verify the adequacy of the information provided. If there is any discrepancy found in the report regarding the existing conditions, **TES** should be notified immediately to evaluate the effect of the discrepancy on the analysis results.

8. The client will assume responsibility for rework associated with the differences in initially provided information, including tower and foundation information, existing and/or proposed equipment and transmission lines.

9. If a feasibility analysis was performed, final acceptance of changed conditions shall be based upon a rigorous structural analysis.

# Usage Diagram - Max Stress 69.8% at 48.0ft

| | | | | |
|---|---|---|---|---|
| **Structure:** | CT13548-S-SBA | **Code:** | EIA/TIA-222-F | 7/10/2015 |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | |
| **Base Elev:** | 0.000 (ft) | | | Page: 1 |

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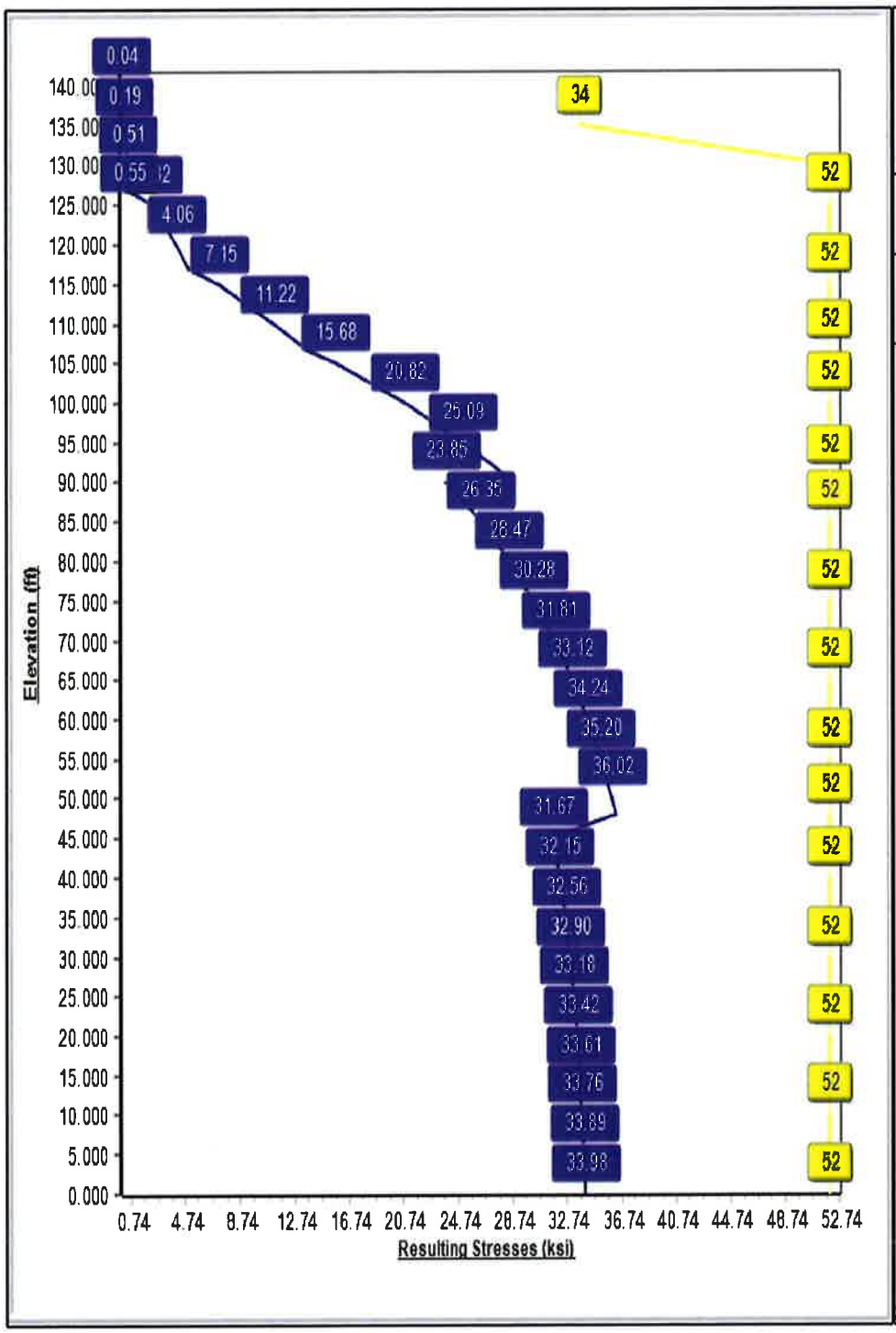
Dead Load Factor: 1.00
Wind Load Factor: 1.00

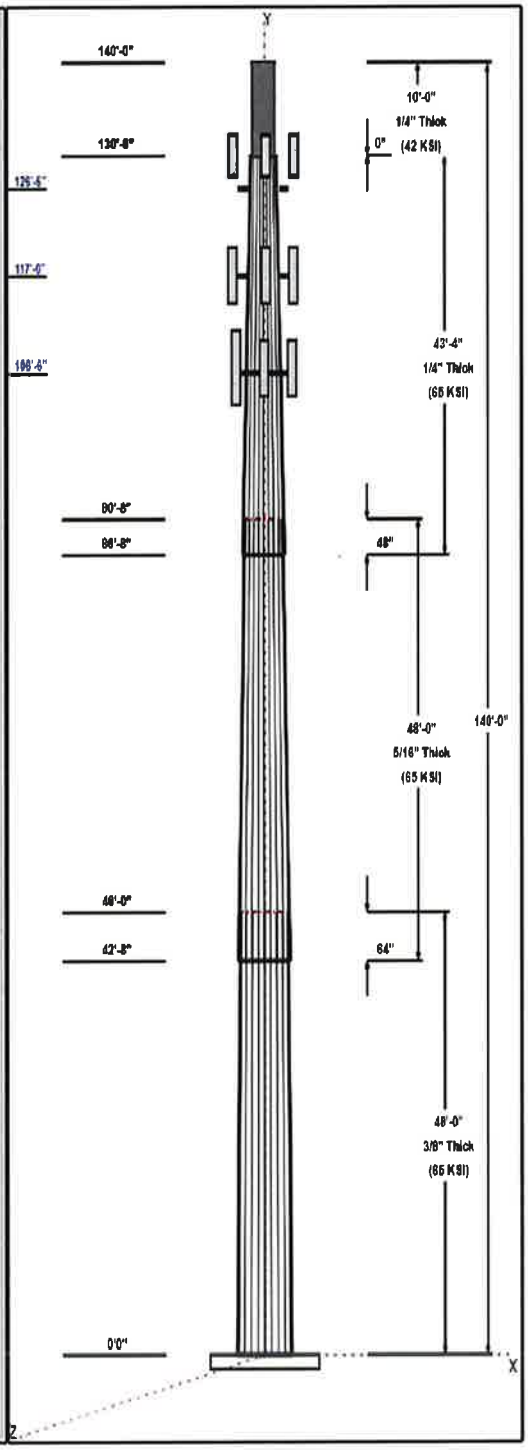
52 Allowable Stress
36 Resulting Stress

**Load Case : 78 mphWind with 0 in Ice**

**Iterations:** 23





# Structure: CT13548-S-SBA

**Type:** Custom
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.00 (ft)

**Base Shape:** 18 Sided
**Taper:** 0.00000

7/10/2015



TES Tower Engineering Solutions

## Shaft Properties

| Seq | Length (ft) | Top (in) | Bottom (in) | Thick (in) | Joint Type | Taper | Grade (ksi) |
|---|---|---|---|---|---|---|---|
| 1 | 48.00 | 40.62 | 53.00 | 0.375 | | 0.25788 | 65 |
| 2 | 48.00 | 30.24 | 42.62 | 0.313 | Slip | 0.25788 | 65 |
| 3 | 43.33 | 20.60 | 31.77 | 0.250 | Slip | 0.25788 | 65 |
| 4 | 10.00 | 20.00 | 20.00 | 0.250 | Butt | 0.00000 | 42 |

## Discrete Appurtenances

| Attach Elev (ft) | Force Elev (ft) | Qty | Description | Carrier |
|---|---|---|---|---|
| 126.50 | 130.00 | 3 | Ericsson AIR21 B2A/B4P | T-Mobile |
| 126.50 | 130.00 | 3 | Ericsson AIR21 B4A/B2P | T-Mobile |
| 126.50 | 130.00 | 6 | Ericsson KRY 112 144/1 | T-Mobile |
| 126.50 | 130.00 | 3 | RFS APXV18-209014-C | T-Mobile |
| 126.50 | 126.50 | 3 | T-Arms | T-Mobile |
| 117.00 | 117.00 | 3 | ALU RRH2x60-700 | Verizon |
| 117.00 | 117.00 | 3 | ALU RRH2x60-AWS | Verizon |
| 117.00 | 117.00 | 3 | ALU RRH2X60-PCS | Verizon |
| 117.00 | 117.00 | 6 | Antel LPA-80063/6CFx5 | Verizon |
| 117.00 | 117.00 | 9 | Commscope | Verizon |
| 117.00 | 117.00 | 2 | RFS DB-T1-6Z-8AB-0Z | Verizon |
| 117.00 | 117.00 | 3 | T-Arms | Verizon |
| 106.50 | 107.00 | 1 | Andrew SBNH-1D6565C | AT&T |
| 106.50 | 107.00 | 1 | KMW | AT&T |
| 106.50 | 106.50 | 1 | Platform w/ Hand Rails | AT&T |
| 106.50 | 107.00 | 12 | Powerwave 7020.00 | AT&T |
| 106.50 | 107.00 | 9 | Powerwave | AT&T |
| 106.50 | 107.00 | 1 | Powerwave | AT&T |
| 106.50 | 107.00 | 12 | Powerwave | AT&T |
| 105.00 | 106.00 | 6 | Andrew RRUS11 RRUs | AT&T |
| 105.00 | 106.00 | 1 | Raycap DC6-48-60-18-8F | AT&T |
| 105.00 | 105.00 | 1 | Valmont LWRM Ring | AT&T |

## Linear Appurtenances

| Elev From (ft) | Elev To (ft) | Placement | Description | Carrier |
|---|---|---|---|---|
| 3.00 | 126.50 | Inside | 1 5/8" Coax | T-Mobile |
| 3.00 | 126.50 | Inside | 1 5/8" Fiber | T-Mobile |
| 3.00 | 117.00 | Inside | 1 5/8" Coax | Verizon |
| 3.00 | 117.00 | Inside | 1 5/8" Fiber | Verizon |
| 3.00 | 106.50 | Inside | 1 5/8" Coax | AT&T |
| 3.00 | 106.50 | Inside | 1/2" Coax | AT&T |
| 3.00 | 106.50 | Outside | 3" Conduit | AT&T |

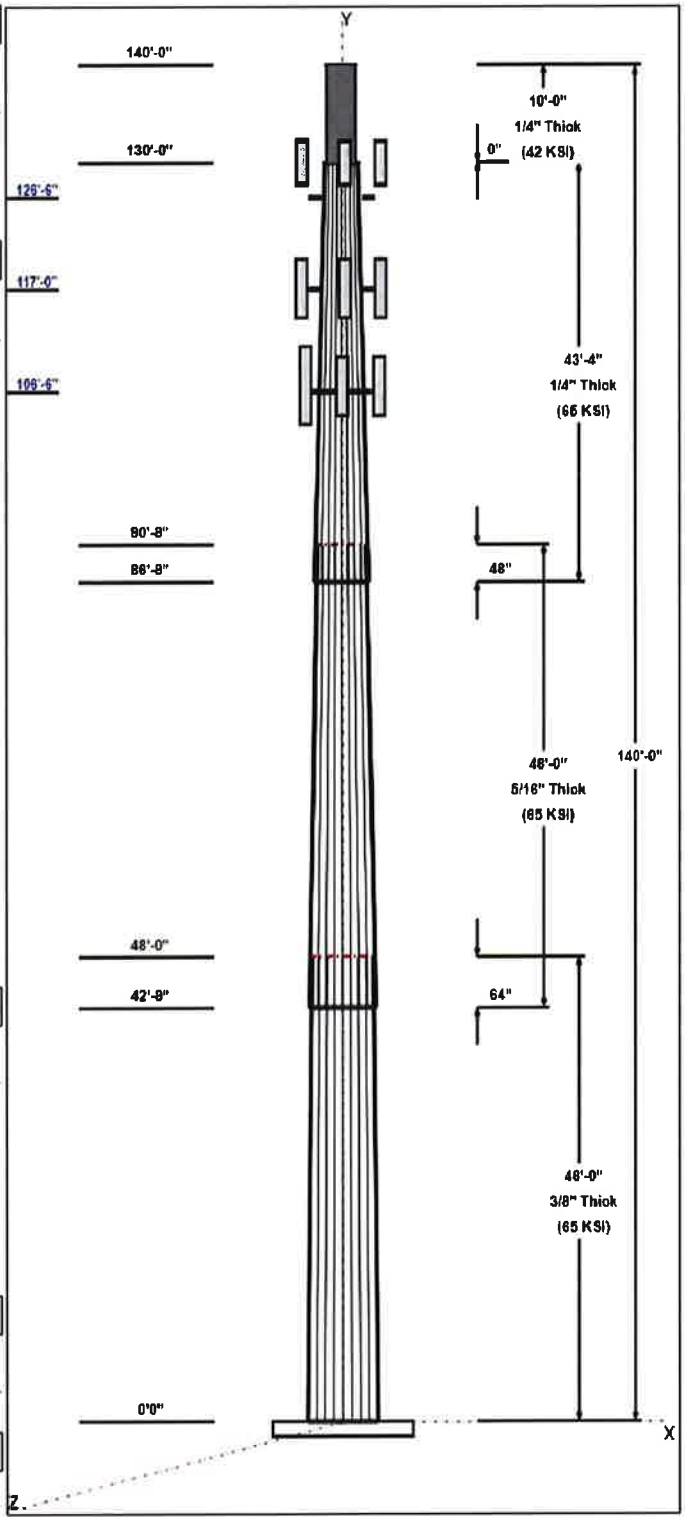
## Anchor Bolts

| Qty | Specifications | Grade (ksi) | Arrangement |
|---|---|---|---|
| 24 | 1.5" F1554 105 | 105.0 | Radial |

## Base Plate

| Thickness (in) | Specifications (in) | Grade (ksi) | Geometry |
|---|---|---|---|
| 2.0000 | 61.5 | 50.0 | Round |

## Reactions



| Load Case | Moment | Shear | Axial |
|---|---|---|---|
| 78 mphWind with 0" Ice | 2273.9 | 23.2 | 28.3 |
| 69 67.55 mph Wind with 0.5" Ice | 1845.9 | 18.4 | 32.3 |
| 50 mph Wind with 0" Ice | 934.8 | 9.5 | 28.3 |

# Shaft Properties

| | | | | |
|---|---|---|---|---|
| **Structure:** | CT13548-S-SBA | **Code:** | EIA/TIA-222-F | 7/10/2015 |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 4 |

Tower Engineering Solutions

| Sec. No. | Shape | Length (ft) | Thick (in) | Fy (ksi) | Joint Type | Overlap (in) | Weight (lb) |
|---|---|---|---|---|---|---|---|
| 1 | 18 | 48.000 | 0.3750 | 65 | | 0.00 | 9,027 |
| 2 | 18 | 48.000 | 0.3125 | 65 | Slip | 64.00 | 5,851 |
| 3 | 18 | 43.333 | 0.2500 | 65 | Slip | 48.00 | 3,035 |
| 4 | R | 10.000 | 0.2500 | 42 | Flange | 0.00 | 528 |
| | | | | | **Total Shaft Weight:** | | **18,441** |

| | Bottom | | | | | | Top | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sec. No. | Dia (in) | Elev (ft) | Area (sqin) | Ix (in^4) | W/t Ratio | D/t Ratio | Dia (in) | Elev (ft) | Area (sqin) | Ix (in^4) | W/t Ratio | D/t Ratio | Taper |
| 1 | 53.00 | 0.00 | 62.63 | 21915.53 | 23.51 | 141.3 | 40.62 | 48.00 | 47.90 | 9803.05 | 17.68 | 108.3 | 0.257885 |
| 2 | 42.62 | 42.67 | 41.96 | 9490.86 | 22.63 | 136.3 | 30.24 | 90.67 | 29.69 | 3360.13 | 15.65 | 96.77 | 0.257885 |
| 3 | 31.77 | 86.67 | 25.01 | 3140.87 | 21.00 | 127.1 | 20.60 | 130.0 | 16.15 | 844.85 | 13.11 | 82.4 | 0.257885 |
| 4 | 20.00 | 130.0 | 15.51 | 756.89 | 0 | 80 | 20.00 | 140.0 | 15.51 | 756.89 | 0 | 80 | 0.000000 |

# Loading Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SBA | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 5 | |

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## Discrete Appurtenances

| | | | | No Ice | | | Ice | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Elev (ft) | Description | Qty | Weight (lb) | CaAa (sf) | CaAa Factor | Weight (lb) | CaAa (sf) | CaAa Factor | Hor. Ecc. (ft) | Vert Ecc (ft) |
| 1 | 126.5 | Ericsson AIR21 B2A/B4P | 3 | 91.50 | 6.58 | 0.86 | 129.20 | 6.970 | 0.86 | 0.00 | 3.50 |
| 2 | 126.5 | Ericsson AIR21 B4A/B2P | 3 | 90.40 | 6.58 | 0.86 | 128.10 | 6.970 | 0.86 | 0.00 | 3.50 |
| 3 | 126.5 | Ericsson KRY 112 144/1 | 6 | 11.00 | 0.41 | 0.67 | 14.10 | 0.550 | 0.67 | 0.00 | 3.50 |
| 4 | 126.5 | RFS APXV18-209014-C | 3 | 18.70 | 3.57 | 0.74 | 0.00 | 4.090 | 0.74 | 0.00 | 3.50 |
| 5 | 126.5 | T-Arms | 3 | 350.00 | 8.00 | 0.75 | 420.00 | 10.50 | 0.75 | 0.00 | 0.00 |
| 6 | 117.0 | ALU RRH2x60-700 | 3 | 60.00 | 3.96 | 0.67 | 80.10 | 4.230 | 0.67 | 0.00 | 0.00 |
| 7 | 117.0 | ALU RRH2x60-AWS | 3 | 60.00 | 3.96 | 0.67 | 80.10 | 4.230 | 0.67 | 0.00 | 0.00 |
| 8 | 117.0 | ALU RRH2X60-PCS | 3 | 55.00 | 2.57 | 0.67 | 69.70 | 2.300 | 0.67 | 0.00 | 0.00 |
| 9 | 117.0 | Antel LPA-80063/6CFx5 | 6 | 27.00 | 10.34 | 0.85 | 0.00 | 11.18 | 0.85 | 0.00 | 0.00 |
| 10 | 117.0 | Commscope SBNHH-1D65B | 9 | 50.71 | 8.30 | 0.83 | 86.60 | 8.870 | 0.83 | 0.00 | 0.00 |
| 11 | 117.0 | RFS DB-T1-6Z-8AB-0Z | 2 | 44.00 | 5.60 | 0.75 | 51.10 | 5.040 | 0.75 | 0.00 | 0.00 |
| 12 | 117.0 | T-Arms | 3 | 350.00 | 8.00 | 0.75 | 420.00 | 10.50 | 0.75 | 0.00 | 0.00 |
| 13 | 106.5 | Andrew SBNH-1D6565C | 1 | 66.10 | 11.44 | 0.80 | 132.00 | 12.37 | 0.80 | 0.00 | 0.50 |
| 14 | 106.5 | KMW AM-X-CD-16-65-00T-RET | 1 | 48.50 | 8.26 | 0.78 | 95.00 | 9.080 | 0.78 | 0.00 | 0.50 |
| 15 | 106.5 | Platform w/ Hand Rails | 1 | 2000.00 | 40.00 | 1.00 | 2600.00 | 48.00 | 1.00 | 0.00 | 0.00 |
| 16 | 106.5 | Powerwave 7020.00 | 12 | 2.20 | 0.40 | 0.50 | 5.10 | 0.540 | 0.50 | 0.00 | 0.50 |
| 17 | 106.5 | Powerwave P65-16-XLH-RR | 9 | 53.00 | 8.40 | 0.80 | 100.20 | 9.220 | 0.80 | 0.00 | 0.50 |
| 18 | 106.5 | Powerwave P65-17-XLH-RR | 1 | 59.00 | 11.46 | 0.80 | 121.00 | 12.39 | 0.80 | 0.00 | 0.50 |
| 19 | 106.5 | Powerwave TT08-19DB111-001 | 12 | 22.00 | 0.92 | 0.67 | 29.60 | 1.140 | 0.67 | 0.00 | 0.50 |
| 20 | 105.0 | Andrew RRUS11 RRUs | 6 | 50.70 | 2.94 | 0.67 | 66.00 | 3.140 | 0.67 | 0.00 | 1.00 |
| 21 | 105.0 | Raycap DC6-48-60-18-8F | 1 | 32.80 | 1.47 | 0.67 | 50.50 | 1.670 | 0.67 | 0.00 | 1.00 |
| 22 | 105.0 | Valmont LWRM Ring Mount | 1 | 350.00 | 5.00 | 1.00 | 450.00 | 6.000 | 1.00 | 0.00 | 0.00 |
| | | **Totals:** | **92** | **7,627.19** | | | **10,110.50** | | | | |

## Linear Appurtenances

| | | | No Ice | | Ice | | |
|---|---|---|---|---|---|---|---|
| Bottom Elev. (ft) | Top Elev. (ft) | Description | Weight (lb/ft) | CaAa (sf/ft) | Weight (lb/ft) | CaAa (sf/ft) | Exposed |
| 3.00 | 126.5 | (18) 1 5/8" Coax | 1.04 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 126.5 | (1) 1 5/8" Fiber | 1.04 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 117.0 | (12) 1 5/8" Coax | 1.04 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 117.0 | (2) 1 5/8" Fiber | 1.04 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 106.5 | (12) 1 5/8" Coax | 1.04 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 106.5 | (1) 1/2" Coax | 1.44 | 0.00 | 0.00 | 0.00 | Inside |
| 3.00 | 106.5 | (1) 3" Conduit | 14.49 | 0.20 | 0.00 | 0.00 | Outside |
| | | **Totals:** | **2,250.39** | | **0.00** | | |

# Shaft Section Properties

**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

7/10/2015



Tower Engineering Solutions

**Increment Length:** 5 (ft)

| Elev (ft) | Description | Thick (in) | Dia (in) | Area (in^2) | Ix (in^4) | W/t Ratio | D/t Ratio | Fy (ksi) | Fb (ksi) | Weight (lb) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.3750 | 53.000 | 62.635 | 21915.5 | 23.51 | 141.33 | 65 | 52 | 0.0 |
| 5.00 | | 0.3750 | 51.711 | 61.100 | 20343.7 | 22.90 | 137.89 | 65 | 52 | 1052.6 |
| 10.00 | | 0.3750 | 50.421 | 59.565 | 18849.0 | 22.30 | 134.46 | 65 | 52 | 1026.5 |
| 15.00 | | 0.3750 | 49.132 | 58.031 | 17429.3 | 21.69 | 131.02 | 65 | 52 | 1000.4 |
| 20.00 | | 0.3750 | 47.842 | 56.496 | 16082.7 | 21.09 | 127.58 | 65 | 52 | 974.3 |
| 25.00 | | 0.3750 | 46.553 | 54.961 | 14807.4 | 20.48 | 124.14 | 65 | 52 | 948.2 |
| 30.00 | | 0.3750 | 45.263 | 53.427 | 13601.3 | 19.87 | 120.70 | 65 | 52 | 922.0 |
| 35.00 | | 0.3750 | 43.974 | 51.892 | 12462.5 | 19.27 | 117.26 | 65 | 52 | 895.9 |
| 40.00 | | 0.3750 | 42.685 | 50.357 | 11389.2 | 18.66 | 113.83 | 65 | 52 | 869.8 |
| 42.67 | Bot - Section 2 | 0.3750 | 41.997 | 49.539 | 10842.8 | 18.34 | 111.99 | 65 | 52 | 453.2 |
| 45.00 | | 0.3750 | 41.395 | 48.823 | 10379.3 | 18.05 | 110.39 | 65 | 52 | 721.3 |
| 48.00 | Top - Section 1 | 0.3125 | 41.247 | 40.600 | 8595.0 | 21.86 | 131.99 | 65 | 52 | 912.1 |
| 50.00 | | 0.3125 | 40.731 | 40.088 | 8274.2 | 21.57 | 130.34 | 65 | 52 | 274.6 |
| 55.00 | | 0.3125 | 39.441 | 38.810 | 7507.3 | 20.84 | 126.21 | 65 | 52 | 671.2 |
| 60.00 | | 0.3125 | 38.152 | 37.531 | 6789.3 | 20.12 | 122.09 | 65 | 52 | 649.4 |
| 65.00 | | 0.3125 | 36.862 | 36.252 | 6118.7 | 19.39 | 117.96 | 65 | 52 | 627.7 |
| 70.00 | | 0.3125 | 35.573 | 34.973 | 5493.7 | 18.66 | 113.83 | 65 | 52 | 605.9 |
| 75.00 | | 0.3125 | 34.284 | 33.694 | 4912.8 | 17.93 | 109.71 | 65 | 52 | 584.1 |
| 80.00 | | 0.3125 | 32.994 | 32.415 | 4374.3 | 17.21 | 105.58 | 65 | 52 | 562.4 |
| 85.00 | | 0.3125 | 31.705 | 31.136 | 3876.7 | 16.48 | 101.46 | 65 | 52 | 540.6 |
| 86.67 | Bot - Section 3 | 0.3125 | 31.275 | 30.710 | 3719.7 | 16.24 | 100.08 | 65 | 52 | 175.4 |
| 90.00 | | 0.3125 | 30.415 | 29.857 | 3418.4 | 15.75 | 97.33 | 65 | 52 | 623.4 |
| 90.67 | Top - Section 2 | 0.2500 | 30.743 | 24.196 | 2842.5 | 20.27 | 122.97 | 65 | 52 | 122.6 |
| 95.00 | | 0.2500 | 29.626 | 23.309 | 2541.3 | 19.48 | 118.50 | 65 | 52 | 350.2 |
| 100.00 | | 0.2500 | 28.337 | 22.286 | 2221.2 | 18.58 | 113.35 | 65 | 52 | 387.9 |
| 105.00 | | 0.2500 | 27.047 | 21.263 | 1929.1 | 17.67 | 108.19 | 65 | 52 | 370.5 |
| 106.50 | | 0.2500 | 26.660 | 20.956 | 1846.7 | 17.39 | 106.64 | 65 | 52 | 107.7 |
| 110.00 | | 0.2500 | 25.758 | 20.240 | 1663.8 | 16.76 | 103.03 | 65 | 52 | 245.3 |
| 115.00 | | 0.2500 | 24.468 | 19.217 | 1424.0 | 15.85 | 97.87 | 65 | 52 | 335.7 |
| 117.00 | | 0.2500 | 23.952 | 18.807 | 1335.0 | 15.48 | 95.81 | 65 | 52 | 129.4 |
| 120.00 | | 0.2500 | 23.179 | 18.193 | 1208.5 | 14.94 | 92.72 | 65 | 52 | 188.9 |
| 125.00 | | 0.2500 | 21.889 | 17.170 | 1015.8 | 14.03 | 87.56 | 65 | 52 | 300.8 |
| 126.50 | | 0.2500 | 21.503 | 16.863 | 962.3 | 13.76 | 86.01 | 65 | 52 | 86.9 |
| 130.00 | Top - Section 3 | 0.0000 | 0.000 | 0.000 | 0.0 | NAN | NAN | 0 | 0 | 196.6 |
| 130.00 | Bot - Section 4 | 0.2500 | 20.600 | 16.147 | 844.8 | 13.12 | 82.40 | 65 | 52 | |
| 135.00 | | 0.2500 | 20.000 | 15.512 | 756.9 | 0.00 | 80.00 | 42 | 34 | 263.9 |
| 140.00 | | 0.2500 | 20.000 | 15.512 | 756.9 | 0.00 | 80.00 | 42 | 34 | 263.9 |
| | | | | | | | | | | 18441.1 |

# Wind Loading - Shaft

**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

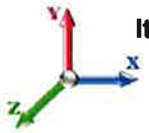
7/10/2015



Tower Engineering Solutions

**Load Case:** 78 mphWind with 0" Ice

**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Description | Kzt | Kz | qz (psf) | qzGh (psf) | C (mph-ft) | Cf | Ice Thick (in) | Tributary (ft) | Aa (sf) | CfAa (sf) | Wind Force X (lb) | Dead Load Ice (lb) | Tot Dead Load (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 344.50 | 0.650 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 336.12 | 0.650 | 0.000 | 5.00 | 21.815 | 14.18 | 373.2 | 0.0 | 1052.6 |
| 10.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 327.74 | 0.650 | 0.000 | 5.00 | 21.277 | 13.83 | 364.0 | 0.0 | 1026.5 |
| 15.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 319.36 | 0.650 | 0.000 | 5.00 | 20.740 | 13.48 | 354.8 | 0.0 | 1000.4 |
| 20.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 310.97 | 0.650 | 0.000 | 5.00 | 20.203 | 13.13 | 345.7 | 0.0 | 974.3 |
| 25.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 302.59 | 0.650 | 0.000 | 5.00 | 19.666 | 12.78 | 336.5 | 0.0 | 948.2 |
| 30.00 | | 0.00 | 1.00 | 15.575 | 26.32 | 294.21 | 0.650 | 0.000 | 5.00 | 19.128 | 12.43 | 327.3 | 0.0 | 922.0 |
| 35.00 | | 0.00 | 1.02 | 15.839 | 26.77 | 288.24 | 0.650 | 0.000 | 5.00 | 18.591 | 12.08 | 323.5 | 0.0 | 895.9 |
| 40.00 | | 0.00 | 1.06 | 16.455 | 27.81 | 285.18 | 0.650 | 0.000 | 5.00 | 18.054 | 11.74 | 326.3 | 0.0 | 869.8 |
| 42.67 | Bot - Section 2 | 0.00 | 1.08 | 16.761 | 28.33 | 283.18 | 0.650 | 0.000 | 2.67 | 9.409 | 6.12 | 173.2 | 0.0 | 453.2 |
| 45.00 | | 0.00 | 1.09 | 17.018 | 28.76 | 281.26 | 0.650 | 0.000 | 2.33 | 8.229 | 5.35 | 153.8 | 0.0 | 721.3 |
| 48.00 | Top - Section 1 | 0.00 | 1.11 | 17.335 | 29.30 | 278.56 | 0.650 | 0.000 | 3.00 | 10.408 | 6.77 | 198.2 | 0.0 | 912.1 |
| 50.00 | | 0.00 | 1.13 | 17.538 | 29.64 | 280.94 | 0.650 | 0.000 | 2.00 | 6.831 | 4.44 | 131.6 | 0.0 | 274.6 |
| 55.00 | | 0.00 | 1.16 | 18.022 | 30.46 | 275.78 | 0.650 | 0.000 | 5.00 | 16.703 | 10.86 | 330.7 | 0.0 | 671.2 |
| 60.00 | | 0.00 | 1.19 | 18.476 | 31.22 | 270.10 | 0.650 | 0.000 | 5.00 | 16.165 | 10.51 | 328.1 | 0.0 | 649.4 |
| 65.00 | | 0.00 | 1.21 | 18.904 | 31.95 | 263.97 | 0.650 | 0.000 | 5.00 | 15.628 | 10.16 | 324.5 | 0.0 | 627.7 |
| 70.00 | | 0.00 | 1.24 | 19.308 | 32.63 | 257.45 | 0.650 | 0.000 | 5.00 | 15.091 | 9.81 | 320.1 | 0.0 | 605.9 |
| 75.00 | | 0.00 | 1.26 | 19.692 | 33.28 | 250.57 | 0.650 | 0.000 | 5.00 | 14.553 | 9.46 | 314.8 | 0.0 | 584.1 |
| 80.00 | | 0.00 | 1.29 | 20.059 | 33.90 | 243.38 | 0.650 | 0.000 | 5.00 | 14.016 | 9.11 | 308.8 | 0.0 | 562.4 |
| 85.00 | | 0.00 | 1.31 | 20.409 | 34.49 | 235.91 | 0.650 | 0.000 | 5.00 | 13.479 | 8.76 | 302.2 | 0.0 | 540.6 |
| 86.67 | Bot - Section 3 | 0.00 | 1.32 | 20.523 | 34.68 | 233.35 | 0.650 | 0.000 | 1.67 | 4.374 | 2.84 | 98.6 | 0.0 | 175.4 |
| 90.00 | | 0.00 | 1.33 | 20.745 | 35.06 | 228.17 | 0.650 | 0.000 | 3.33 | 8.707 | 5.66 | 198.4 | 0.0 | 623.4 |
| 90.67 | Top - Section 2 | 0.00 | 1.33 | 20.789 | 35.13 | 227.12 | 0.650 | 0.000 | 0.67 | 1.713 | 1.11 | 39.1 | 0.0 | 122.6 |
| 95.00 | | 0.00 | 1.35 | 21.068 | 35.61 | 223.97 | 0.650 | 0.000 | 4.33 | 10.900 | 7.09 | 252.3 | 0.0 | 350.2 |
| 100.00 | | 0.00 | 1.37 | 21.379 | 36.13 | 215.80 | 0.650 | 0.000 | 5.00 | 12.076 | 7.85 | 283.6 | 0.0 | 387.9 |
| 105.00 | Appurtenance(s) | 0.00 | 1.39 | 21.680 | 36.64 | 207.42 | 0.650 | 0.000 | 5.00 | 11.538 | 7.50 | 274.8 | 0.0 | 370.5 |
| 106.50 | Appurtenance(s) | 0.00 | 1.40 | 21.768 | 36.79 | 204.87 | 0.650 | 0.000 | 1.50 | 3.357 | 2.18 | 80.3 | 0.0 | 107.7 |
| 110.00 | | 0.00 | 1.41 | 21.970 | 37.13 | 198.85 | 0.650 | 0.000 | 3.50 | 7.644 | 4.97 | 184.5 | 0.0 | 245.3 |
| 115.00 | | 0.00 | 1.43 | 22.250 | 37.60 | 190.10 | 0.650 | 0.000 | 5.00 | 10.464 | 6.80 | 255.8 | 0.0 | 335.7 |
| 117.00 | Appurtenance(s) | 0.00 | 1.44 | 22.360 | 37.79 | 186.55 | 0.650 | 0.000 | 2.00 | 4.035 | 2.62 | 99.1 | 0.0 | 129.4 |
| 120.00 | | 0.00 | 1.45 | 22.523 | 38.06 | 181.18 | 0.650 | 0.000 | 3.00 | 5.891 | 3.83 | 145.8 | 0.0 | 188.9 |
| 125.00 | | 0.00 | 1.46 | 22.787 | 38.51 | 172.10 | 0.650 | 0.000 | 5.00 | 9.389 | 6.10 | 235.0 | 0.0 | 300.8 |
| 126.50 | Appurtenance(s) | 0.00 | 1.47 | 22.865 | 38.64 | 169.34 | 0.650 | 0.000 | 1.50 | 2.712 | 1.76 | 68.1 | 0.0 | 86.9 |
| 130.00 | Top - Section 3 | 0.00 | 1.48 | 23.044 | 38.94 | 162.87 | 0.650 | 0.000 | 3.50 | 6.140 | 3.99 | 155.4 | 0.0 | 196.6 |
| 135.00 | | 0.00 | 1.50 | 23.294 | 39.37 | 158.98 | 0.590 | 0.000 | 5.00 | 8.333 | 4.92 | 193.5 | 0.0 | 263.9 |
| 140.00 | | 0.00 | 1.51 | 23.537 | 39.78 | 159.81 | 0.590 | 0.000 | 5.00 | 8.333 | 4.92 | 195.6 | 0.0 | 263.9 |
| | | | | | | | | **Totals:** | **140.00** | | | **8,397.3** | | **18,441.1** |

# Discrete Appurtenance Forces

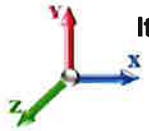
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 8 | |

Tower Engineering Solutions

**Load Case:** 78 mphWind with 0" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa Factor | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 105.00 | Andrew RRUS11 RRUs | 6 | 21.738 | 36.738 | 0.67 | 11.82 | 304.20 | 0.000 | 1.000 | 434.20 | 0.00 | 434.20 |
| 2 | 105.00 | Raycap DC6-48-60-18-8F | 1 | 21.738 | 36.738 | 0.67 | 0.98 | 32.80 | 0.000 | 1.000 | 36.18 | 0.00 | 36.18 |
| 3 | 105.00 | Valmont LWRM Ring Mount | 1 | 21.680 | 36.638 | 1.00 | 5.00 | 350.00 | 0.000 | 0.000 | 183.19 | 0.00 | 0.00 |
| 4 | 106.50 | Andrew SBNH-1D6565C | 1 | 21.797 | 36.837 | 0.80 | 9.15 | 66.10 | 0.000 | 0.500 | 337.13 | 0.00 | 168.56 |
| 5 | 106.50 | KMW | 1 | 21.797 | 36.837 | 0.78 | 6.44 | 48.50 | 0.000 | 0.500 | 237.33 | 0.00 | 118.67 |
| 6 | 106.50 | Platform w/ Hand Rails | 1 | 21.768 | 36.787 | 1.00 | 40.00 | 2000.00 | 0.000 | 0.000 | 1471.49 | 0.00 | 0.00 |
| 7 | 106.50 | Powerwave 7020.00 | 12 | 21.797 | 36.837 | 0.50 | 2.40 | 26.40 | 0.000 | 0.500 | 88.41 | 0.00 | 44.20 |
| 8 | 106.50 | Powerwave P65-16-XLH-RR | 9 | 21.797 | 36.837 | 0.80 | 60.48 | 477.00 | 0.000 | 0.500 | 2227.87 | 0.00 | 1113.94 |
| 9 | 106.50 | Powerwave P65-17-XLH-RR | 1 | 21.797 | 36.837 | 0.80 | 9.17 | 59.00 | 0.000 | 0.500 | 337.72 | 0.00 | 168.86 |
| 10 | 106.50 | Powerwave | 12 | 21.797 | 36.837 | 0.67 | 7.40 | 264.00 | 0.000 | 0.500 | 272.47 | 0.00 | 136.24 |
| 11 | 117.00 | ALU RRH2x60-700 | 3 | 22.360 | 37.789 | 0.67 | 7.96 | 180.00 | 0.000 | 0.000 | 300.79 | 0.00 | 0.00 |
| 12 | 117.00 | ALU RRH2x60-AWS | 3 | 22.360 | 37.789 | 0.67 | 7.96 | 180.00 | 0.000 | 0.000 | 300.79 | 0.00 | 0.00 |
| 13 | 117.00 | ALU RRH2X60-PCS | 3 | 22.360 | 37.789 | 0.67 | 5.17 | 165.00 | 0.000 | 0.000 | 195.21 | 0.00 | 0.00 |
| 14 | 117.00 | Antel LPA-80063/6CFx5 | 6 | 22.360 | 37.789 | 0.85 | 52.73 | 162.00 | 0.000 | 0.000 | 1992.76 | 0.00 | 0.00 |
| 15 | 117.00 | Commscope SBNHH-1D65B | 9 | 22.360 | 37.789 | 0.83 | 62.00 | 456.39 | 0.000 | 0.000 | 2342.95 | 0.00 | 0.00 |
| 16 | 117.00 | RFS DB-T1-6Z-8AB-0Z | 2 | 22.360 | 37.789 | 0.75 | 8.40 | 88.00 | 0.000 | 0.000 | 317.43 | 0.00 | 0.00 |
| 17 | 117.00 | T-Arms | 3 | 22.360 | 37.789 | 0.75 | 18.00 | 1050.00 | 0.000 | 0.000 | 680.20 | 0.00 | 0.00 |
| 18 | 126.50 | Ericsson AIR21 B2A/B4P | 3 | 23.044 | 38.944 | 0.86 | 16.98 | 274.50 | 0.000 | 3.500 | 661.13 | 0.00 | 2313.94 |
| 19 | 126.50 | Ericsson AIR21 B4A/B2P | 3 | 23.044 | 38.944 | 0.86 | 16.98 | 271.20 | 0.000 | 3.500 | 661.13 | 0.00 | 2313.94 |
| 20 | 126.50 | Ericsson KRY 112 144/1 | 6 | 23.044 | 38.944 | 0.67 | 1.65 | 66.00 | 0.000 | 3.500 | 64.19 | 0.00 | 224.66 |
| 21 | 126.50 | RFS APXV18-209014-C | 3 | 23.044 | 38.944 | 0.74 | 7.93 | 56.10 | 0.000 | 3.500 | 308.65 | 0.00 | 1080.26 |
| 22 | 126.50 | T-Arms | 3 | 22.865 | 38.641 | 0.75 | 18.00 | 1050.00 | 0.000 | 0.000 | 695.54 | 0.00 | 0.00 |
| | | | | | | **Totals:** | | **7,627.19** | | | **14,146.74** | | |

# Total Applied Force Summary

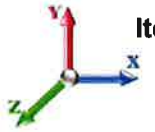
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 9 | |

TES Tower Engineering Solutions

**Load Case:** 78 mphWind with 0" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Description | Lateral FX (-) (lb) | Axial FY (-) (lb) | Torsion MY (lb-ft) | Moment MZ (lb-ft) |
|---|---|---|---|---|---|
| 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| 5.00 | | 383.76 | 1094.86 | 0.00 | 0.00 |
| 10.00 | | 390.36 | 1132.14 | 0.00 | 0.00 |
| 15.00 | | 381.17 | 1106.03 | 0.00 | 0.00 |
| 20.00 | | 371.98 | 1079.92 | 0.00 | 0.00 |
| 25.00 | | 362.79 | 1053.81 | 0.00 | 0.00 |
| 30.00 | | 353.59 | 1027.70 | 0.00 | 0.00 |
| 35.00 | | 350.24 | 1001.59 | 0.00 | 0.00 |
| 40.00 | | 354.15 | 975.48 | 0.00 | 0.00 |
| 42.67 | | 188.35 | 509.58 | 0.00 | 0.00 |
| 45.00 | | 167.26 | 770.61 | 0.00 | 0.00 |
| 48.00 | | 215.78 | 975.46 | 0.00 | 0.00 |
| 50.00 | | 143.47 | 316.82 | 0.00 | 0.00 |
| 55.00 | | 361.13 | 776.83 | 0.00 | 0.00 |
| 60.00 | | 359.32 | 755.07 | 0.00 | 0.00 |
| 65.00 | | 356.47 | 733.31 | 0.00 | 0.00 |
| 70.00 | | 352.70 | 711.55 | 0.00 | 0.00 |
| 75.00 | | 348.10 | 689.79 | 0.00 | 0.00 |
| 80.00 | | 342.74 | 668.04 | 0.00 | 0.00 |
| 85.00 | | 336.69 | 646.28 | 0.00 | 0.00 |
| 86.67 | | 110.16 | 210.59 | 0.00 | 0.00 |
| 90.00 | | 221.80 | 693.78 | 0.00 | 0.00 |
| 90.67 | | 43.80 | 136.67 | 0.00 | 0.00 |
| 95.00 | | 283.12 | 441.80 | 0.00 | 0.00 |
| 100.00 | | 319.73 | 493.52 | 0.00 | 0.00 |
| 105.00 | (8) appurtenances | 964.99 | 1163.12 | 0.00 | 470.38 |
| 106.50 | (37) appurtenances | 5063.72 | 3080.44 | 0.00 | 1750.46 |
| 110.00 | | 184.48 | 259.87 | 0.00 | 0.00 |
| 115.00 | | 255.76 | 356.45 | 0.00 | 0.00 |
| 117.00 | (29) appurtenances | 6229.23 | 2419.10 | 0.00 | 0.00 |
| 120.00 | | 145.76 | 195.10 | 0.00 | 0.00 |
| 125.00 | | 235.03 | 311.24 | 0.00 | 0.00 |
| 126.50 | (18) appurtenances | 2458.75 | 1807.78 | 0.00 | 5932.80 |
| 130.00 | | 155.42 | 196.57 | 0.00 | 0.00 |
| 135.00 | | 193.55 | 263.91 | 0.00 | 0.00 |
| 140.00 | | 195.57 | 263.91 | 0.00 | 0.00 |
| | **Totals:** | **23,180.92** | **28,318.73** | **0.00** | **8,153.64** |

# Resulting Forces and Deflections

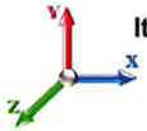
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 10 | |

TES Tower Engineering Solutions

**Load Case:** 78 mphWind with 0" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Lateral FX (-) (kips) | Axial FY (-) (kips) | Lateral FZ (kips) | Moment MX (ft-kips) | Torsion MY (ft-kips) | Moment MZ (ft-kips) | Deflect X (in) | Deflect Z (in) | Deflect Resultant (in) | Rotation Sway (deg) | Rotation Twist (deg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -23.217 | -28.289 | 0.000 | 0.000 | 0.000 | -2273.8 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5.00 | -22.901 | -27.136 | 0.000 | 0.000 | 0.000 | -2157.7 | -0.077 | 0.000 | 0.077 | -0.144 | 0.000 |
| 10.00 | -22.573 | -25.947 | 0.000 | 0.000 | 0.000 | -2043.2 | -0.307 | 0.000 | 0.307 | -0.291 | 0.000 |
| 15.00 | -22.251 | -24.785 | 0.000 | 0.000 | 0.000 | -1930.4 | -0.693 | 0.000 | 0.693 | -0.441 | 0.000 |
| 20.00 | -21.933 | -23.649 | 0.000 | 0.000 | 0.000 | -1819.1 | -1.236 | 0.000 | 1.236 | -0.594 | 0.000 |
| 25.00 | -21.620 | -22.541 | 0.000 | 0.000 | 0.000 | -1709.5 | -1.942 | 0.000 | 1.942 | -0.750 | 0.000 |
| 30.00 | -21.311 | -21.458 | 0.000 | 0.000 | 0.000 | -1601.4 | -2.813 | 0.000 | 2.813 | -0.909 | 0.000 |
| 35.00 | -21.002 | -20.403 | 0.000 | 0.000 | 0.000 | -1494.8 | -3.852 | 0.000 | 3.852 | -1.071 | 0.000 |
| 40.00 | -20.672 | -19.389 | 0.000 | 0.000 | 0.000 | -1389.8 | -5.062 | 0.000 | 5.062 | -1.235 | 0.000 |
| 42.67 | -20.500 | -18.854 | 0.000 | 0.000 | 0.000 | -1334.7 | -5.778 | 0.000 | 5.778 | -1.326 | 0.000 |
| 45.00 | -20.343 | -18.055 | 0.000 | 0.000 | 0.000 | -1286.8 | -6.447 | 0.000 | 6.447 | -1.406 | 0.000 |
| 48.00 | -20.129 | -17.055 | 0.000 | 0.000 | 0.000 | -1225.8 | -7.364 | 0.000 | 7.364 | -1.510 | 0.000 |
| 50.00 | -20.016 | -16.695 | 0.000 | 0.000 | 0.000 | -1185.6 | -8.012 | 0.000 | 8.012 | -1.580 | 0.000 |
| 55.00 | -19.686 | -15.862 | 0.000 | 0.000 | 0.000 | -1085.5 | -9.772 | 0.000 | 9.772 | -1.775 | 0.000 |
| 60.00 | -19.354 | -15.053 | 0.000 | 0.000 | 0.000 | -987.09 | -11.736 | 0.000 | 11.736 | -1.971 | 0.000 |
| 65.00 | -19.021 | -14.267 | 0.000 | 0.000 | 0.000 | -890.32 | -13.907 | 0.000 | 13.907 | -2.168 | 0.000 |
| 70.00 | -18.686 | -13.507 | 0.000 | 0.000 | 0.000 | -795.22 | -16.283 | 0.000 | 16.283 | -2.364 | 0.000 |
| 75.00 | -18.352 | -12.771 | 0.000 | 0.000 | 0.000 | -701.79 | -18.863 | 0.000 | 18.863 | -2.558 | 0.000 |
| 80.00 | -18.018 | -12.061 | 0.000 | 0.000 | 0.000 | -610.03 | -21.645 | 0.000 | 21.645 | -2.748 | 0.000 |
| 85.00 | -17.673 | -11.395 | 0.000 | 0.000 | 0.000 | -519.95 | -24.622 | 0.000 | 24.622 | -2.931 | 0.000 |
| 86.67 | -17.570 | -11.163 | 0.000 | 0.000 | 0.000 | -490.49 | -25.656 | 0.000 | 25.656 | -2.993 | 0.000 |
| 90.00 | -17.324 | -10.461 | 0.000 | 0.000 | 0.000 | -431.92 | -27.788 | 0.000 | 27.788 | -3.111 | 0.000 |
| 90.67 | -17.288 | -10.301 | 0.000 | 0.000 | 0.000 | -420.37 | -28.224 | 0.000 | 28.224 | -3.134 | 0.000 |
| 95.00 | -17.008 | -9.829 | 0.000 | 0.000 | 0.000 | -345.46 | -31.135 | 0.000 | 31.135 | -3.275 | 0.000 |
| 100.00 | -16.685 | -9.310 | 0.000 | 0.000 | 0.000 | -260.42 | -34.659 | 0.000 | 34.659 | -3.444 | 0.000 |
| 105.00 | -15.663 | -8.186 | 0.000 | 0.000 | 0.000 | -176.52 | -38.344 | 0.000 | 38.344 | -3.584 | 0.000 |
| 106.50 | -10.421 | -5.420 | 0.000 | 0.000 | 0.000 | -151.28 | -39.476 | 0.000 | 39.476 | -3.621 | 0.000 |
| 110.00 | -10.227 | -5.159 | 0.000 | 0.000 | 0.000 | -114.81 | -42.158 | 0.000 | 42.158 | -3.693 | 0.000 |
| 115.00 | -9.952 | -4.812 | 0.000 | 0.000 | 0.000 | -63.678 | -46.068 | 0.000 | 46.068 | -3.769 | 0.000 |
| 117.00 | -3.578 | -2.807 | 0.000 | 0.000 | 0.000 | -43.774 | -47.651 | 0.000 | 47.651 | -3.790 | 0.000 |
| 120.00 | -3.421 | -2.621 | 0.000 | 0.000 | 0.000 | -33.041 | -50.039 | 0.000 | 50.039 | -3.815 | 0.000 |
| 125.00 | -3.166 | -2.325 | 0.000 | 0.000 | 0.000 | -15.936 | -54.049 | 0.000 | 54.049 | -3.844 | 0.000 |
| 126.50 | -0.592 | -0.686 | 0.000 | 0.000 | 0.000 | -5.254 | -55.257 | 0.000 | 55.257 | -3.849 | 0.000 |
| 130.00 | -0.424 | -0.500 | 0.000 | 0.000 | 0.000 | -3.182 | -58.078 | 0.000 | 58.078 | -3.854 | 0.000 |
| 135.00 | -0.213 | -0.250 | 0.000 | 0.000 | 0.000 | -1.064 | -62.113 | 0.000 | 62.113 | -3.857 | 0.000 |
| 140.00 | -0.196 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 66.150 | -3.858 | 0.000 |

# Resulting Stresses

**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

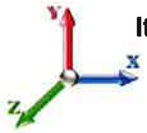
7/10/2015



TES Tower Engineering Solutions

**Load Case:** 78 mphWind with 0" Ice

**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 23

Applied Stresses

| Elev (ft) | fa Axial (Y) (ksi) | fvx Shear (X) (ksi) | fvz Shear (Z) (ksi) | fvt Torsion (ksi) | fbx Bending (X) (ksi) | fbz Bending (Z) (ksi) | fb Combined (ksi) | Fb Allow Stress (ksi) | | f/Fb Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.45 | 0.75 | 0.00 | 0.00 | 0.00 | 33.50 | 33.98 | 52.0 | | 0.654 |
| 5.00 | 0.44 | 0.76 | 0.00 | 0.00 | 0.00 | 33.42 | 33.89 | 52.0 | | 0.652 |
| 10.00 | 0.44 | 0.76 | 0.00 | 0.00 | 0.00 | 33.30 | 33.76 | 52.0 | | 0.650 |
| 15.00 | 0.43 | 0.77 | 0.00 | 0.00 | 0.00 | 33.15 | 33.61 | 52.0 | | 0.647 |
| 20.00 | 0.42 | 0.78 | 0.00 | 0.00 | 0.00 | 32.97 | 33.42 | 52.0 | | 0.643 |
| 25.00 | 0.41 | 0.79 | 0.00 | 0.00 | 0.00 | 32.74 | 33.18 | 52.0 | | 0.638 |
| 30.00 | 0.40 | 0.80 | 0.00 | 0.00 | 0.00 | 32.47 | 32.90 | 52.0 | | 0.633 |
| 35.00 | 0.39 | 0.82 | 0.00 | 0.00 | 0.00 | 32.14 | 32.56 | 52.0 | | 0.626 |
| 40.00 | 0.39 | 0.83 | 0.00 | 0.00 | 0.00 | 31.74 | 32.15 | 52.0 | | 0.619 |
| 42.67 | 0.38 | 0.83 | 0.00 | 0.00 | 0.00 | 31.50 | 31.91 | 52.0 | | 0.614 |
| 45.00 | 0.37 | 0.84 | 0.00 | 0.00 | 0.00 | 31.27 | 31.67 | 52.0 | | 0.609 |
| 48.00 | 0.42 | 1.00 | 0.00 | 0.00 | 0.00 | 35.84 | 36.30 | 52.0 | | 0.698 |
| 50.00 | 0.42 | 1.01 | 0.00 | 0.00 | 0.00 | 35.56 | 36.02 | 52.0 | | 0.693 |
| 55.00 | 0.41 | 1.02 | 0.00 | 0.00 | 0.00 | 34.75 | 35.20 | 52.0 | | 0.677 |
| 60.00 | 0.40 | 1.04 | 0.00 | 0.00 | 0.00 | 33.79 | 34.24 | 52.0 | | 0.659 |
| 65.00 | 0.39 | 1.06 | 0.00 | 0.00 | 0.00 | 32.68 | 33.12 | 52.0 | | 0.637 |
| 70.00 | 0.39 | 1.08 | 0.00 | 0.00 | 0.00 | 31.37 | 31.81 | 52.0 | | 0.612 |
| 75.00 | 0.38 | 1.10 | 0.00 | 0.00 | 0.00 | 29.84 | 30.28 | 52.0 | | 0.582 |
| 80.00 | 0.37 | 1.12 | 0.00 | 0.00 | 0.00 | 28.03 | 28.47 | 52.0 | | 0.548 |
| 85.00 | 0.37 | 1.14 | 0.00 | 0.00 | 0.00 | 25.91 | 26.35 | 52.0 | | 0.507 |
| 86.67 | 0.36 | 1.15 | 0.00 | 0.00 | 0.00 | 25.13 | 25.57 | 52.0 | | 0.492 |
| 90.00 | 0.35 | 1.17 | 0.00 | 0.00 | 0.00 | 23.41 | 23.85 | 52.0 | | 0.459 |
| 90.67 | 0.43 | 1.44 | 0.00 | 0.00 | 0.00 | 27.70 | 28.24 | 52.0 | | 0.543 |
| 95.00 | 0.42 | 1.47 | 0.00 | 0.00 | 0.00 | 24.54 | 25.09 | 52.0 | | 0.483 |
| 100.00 | 0.42 | 1.51 | 0.00 | 0.00 | 0.00 | 20.24 | 20.82 | 52.0 | | 0.401 |
| 105.00 | 0.38 | 1.48 | 0.00 | 0.00 | 0.00 | 15.08 | 15.68 | 52.0 | | 0.302 |
| 106.50 | 0.26 | 1.00 | 0.00 | 0.00 | 0.00 | 13.31 | 13.68 | 52.0 | | 0.263 |
| 110.00 | 0.25 | 1.02 | 0.00 | 0.00 | 0.00 | 10.83 | 11.22 | 52.0 | | 0.216 |
| 115.00 | 0.25 | 1.04 | 0.00 | 0.00 | 0.00 | 6.67 | 7.15 | 52.0 | | 0.138 |
| 117.00 | 0.15 | 0.38 | 0.00 | 0.00 | 0.00 | 4.79 | 4.98 | 52.0 | | 0.096 |
| 120.00 | 0.14 | 0.38 | 0.00 | 0.00 | 0.00 | 3.86 | 4.06 | 52.0 | | 0.078 |
| 125.00 | 0.14 | 0.37 | 0.00 | 0.00 | 0.00 | 2.09 | 2.32 | 52.0 | | 0.045 |
| 126.50 | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.72 | 0.77 | 52.0 | | 0.015 |
| 130.00 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.47 | 0.51 | 52.0 | | 0.010 |
| 130.00 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.47 | 0.51 | 52.0 | | 0.010 |
| 135.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.17 | 0.19 | 33.6 | 33.6 | 0.006 |
| 140.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 33.6 | 33.6 | 0.001 |

# Wind Loading - Shaft

**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

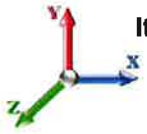
7/10/2015



Tower Engineering Solutions

**Load Case:** 69 67.55 mph Wind with 0.5" Ice

**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Description | Kzt | Kz | qz (psf) | qzGh (psf) | C (mph-ft) | Cf | Ice Thick (in) | Tributary (ft) | Aa (sf) | CfAa (sf) | Wind Force X (lb) | Dead Load Ice (lb) | Tot Dead Load (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 298.35 | 0.650 | 0.500 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 291.09 | 0.650 | 0.500 | 5.00 | 22.231 | 14.45 | 285.3 | 159.5 | 1212.1 |
| 10.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 283.83 | 0.650 | 0.500 | 5.00 | 21.694 | 14.10 | 278.4 | 155.5 | 1182.0 |
| 15.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 276.57 | 0.650 | 0.500 | 5.00 | 21.157 | 13.75 | 271.5 | 151.6 | 1152.0 |
| 20.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 269.31 | 0.650 | 0.500 | 5.00 | 20.620 | 13.40 | 264.6 | 147.7 | 1121.9 |
| 25.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 262.05 | 0.650 | 0.500 | 5.00 | 20.082 | 13.05 | 257.7 | 143.7 | 1091.9 |
| 30.00 | | 0.00 | 1.00 | 11.681 | 19.74 | 254.80 | 0.650 | 0.500 | 5.00 | 19.545 | 12.70 | 250.8 | 139.8 | 1061.8 |
| 35.00 | | 0.00 | 1.02 | 11.879 | 20.08 | 249.63 | 0.650 | 0.500 | 5.00 | 19.008 | 12.36 | 248.0 | 135.8 | 1031.8 |
| 40.00 | | 0.00 | 1.06 | 12.341 | 20.86 | 246.97 | 0.650 | 0.500 | 5.00 | 18.471 | 12.01 | 250.4 | 131.9 | 1001.7 |
| 42.67 | Bot - Section 2 | 0.00 | 1.08 | 12.571 | 21.24 | 245.25 | 0.650 | 0.500 | 2.67 | 9.631 | 6.26 | 133.0 | 69.2 | 522.5 |
| 45.00 | | 0.00 | 1.09 | 12.764 | 21.57 | 243.58 | 0.650 | 0.500 | 2.33 | 8.424 | 5.48 | 118.1 | 60.6 | 781.9 |
| 48.00 | Top - Section 1 | 0.00 | 1.11 | 13.001 | 21.97 | 241.24 | 0.650 | 0.500 | 3.00 | 10.658 | 6.93 | 152.2 | 76.5 | 988.6 |
| 50.00 | | 0.00 | 1.13 | 13.154 | 22.23 | 243.30 | 0.650 | 0.500 | 2.00 | 6.998 | 4.55 | 101.1 | 50.4 | 324.9 |
| 55.00 | | 0.00 | 1.16 | 13.517 | 22.84 | 238.83 | 0.650 | 0.500 | 5.00 | 17.119 | 11.13 | 254.2 | 122.0 | 793.2 |
| 60.00 | | 0.00 | 1.19 | 13.857 | 23.42 | 233.91 | 0.650 | 0.500 | 5.00 | 16.582 | 10.78 | 252.4 | 118.1 | 767.5 |
| 65.00 | | 0.00 | 1.21 | 14.178 | 23.96 | 228.61 | 0.650 | 0.500 | 5.00 | 16.045 | 10.43 | 249.9 | 114.1 | 741.8 |
| 70.00 | | 0.00 | 1.24 | 14.481 | 24.47 | 222.96 | 0.650 | 0.500 | 5.00 | 15.507 | 10.08 | 246.7 | 110.2 | 716.1 |
| 75.00 | | 0.00 | 1.26 | 14.769 | 24.96 | 217.00 | 0.650 | 0.500 | 5.00 | 14.970 | 9.73 | 242.9 | 106.2 | 690.4 |
| 80.00 | | 0.00 | 1.29 | 15.044 | 25.42 | 210.78 | 0.650 | 0.500 | 5.00 | 14.433 | 9.38 | 238.5 | 102.3 | 664.7 |
| 85.00 | | 0.00 | 1.31 | 15.307 | 25.87 | 204.30 | 0.650 | 0.500 | 5.00 | 13.896 | 9.03 | 233.7 | 98.4 | 639.0 |
| 86.67 | Bot - Section 3 | 0.00 | 1.32 | 15.392 | 26.01 | 202.09 | 0.650 | 0.500 | 1.67 | 4.512 | 2.93 | 76.3 | 32.4 | 207.7 |
| 90.00 | | 0.00 | 1.33 | 15.559 | 26.29 | 197.60 | 0.650 | 0.500 | 3.33 | 8.985 | 5.84 | 153.6 | 64.0 | 687.3 |
| 90.67 | Top - Section 2 | 0.00 | 1.33 | 15.592 | 26.35 | 196.69 | 0.650 | 0.500 | 0.67 | 1.768 | 1.15 | 30.3 | 12.7 | 135.3 |
| 95.00 | | 0.00 | 1.35 | 15.801 | 26.70 | 193.96 | 0.650 | 0.500 | 4.33 | 11.261 | 7.32 | 195.5 | 79.7 | 430.0 |
| 100.00 | | 0.00 | 1.37 | 16.035 | 27.10 | 186.89 | 0.650 | 0.500 | 5.00 | 12.492 | 8.12 | 220.0 | 88.1 | 475.9 |
| 105.00 | Appurtenance(s) | 0.00 | 1.39 | 16.260 | 27.48 | 179.63 | 0.650 | 0.500 | 5.00 | 11.955 | 7.77 | 213.5 | 84.1 | 454.6 |
| 106.50 | Appurtenance(s) | 0.00 | 1.40 | 16.326 | 27.59 | 177.42 | 0.650 | 0.500 | 1.50 | 3.482 | 2.26 | 62.4 | 24.9 | 132.6 |
| 110.00 | | 0.00 | 1.41 | 16.477 | 27.85 | 172.21 | 0.650 | 0.500 | 3.50 | 7.936 | 5.16 | 143.6 | 56.1 | 301.5 |
| 115.00 | | 0.00 | 1.43 | 16.688 | 28.20 | 164.63 | 0.650 | 0.500 | 5.00 | 10.880 | 7.07 | 199.5 | 76.3 | 411.9 |
| 117.00 | Appurtenance(s) | 0.00 | 1.44 | 16.770 | 28.34 | 161.55 | 0.650 | 0.500 | 2.00 | 4.202 | 2.73 | 77.4 | 29.9 | 159.3 |
| 120.00 | | 0.00 | 1.45 | 16.892 | 28.55 | 156.90 | 0.650 | 0.500 | 3.00 | 6.141 | 3.99 | 114.0 | 43.4 | 232.3 |
| 125.00 | | 0.00 | 1.46 | 17.090 | 28.88 | 149.04 | 0.650 | 0.500 | 5.00 | 9.806 | 6.37 | 184.1 | 68.4 | 369.2 |
| 126.50 | Appurtenance(s) | 0.00 | 1.47 | 17.149 | 28.98 | 146.66 | 0.650 | 0.500 | 1.50 | 2.837 | 1.84 | 53.4 | 20.2 | 107.0 |
| 130.00 | Top - Section 3 | 0.00 | 1.48 | 17.283 | 29.21 | 141.05 | 0.650 | 0.500 | 3.50 | 6.432 | 4.18 | 122.1 | 45.1 | 241.7 |
| 135.00 | | 0.00 | 1.50 | 17.470 | 29.52 | 137.68 | 0.590 | 0.500 | 5.00 | 8.750 | 5.16 | 152.4 | 62.6 | 326.5 |
| 140.00 | | 0.00 | 1.51 | 17.653 | 29.83 | 138.40 | 0.590 | 0.500 | 5.00 | 8.750 | 5.16 | 154.0 | 62.6 | 326.5 |
| | | | | | | | | **Totals:** | **140.00** | | | **6,481.5** | | **21,485.0** |

# Discrete Appurtenance Forces

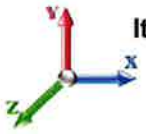
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 13 | |

Tower Engineering Solutions

**Load Case:** 69 67.55 mph Wind with 0.5" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa Factor | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 105.00 | Andrew RRUS11 RRUs | 6 | 16.304 | 27.553 | 0.67 | 12.62 | 396.00 | 0.000 | 1.000 | 347.80 | 0.00 | 347.80 |
| 2 | 105.00 | Raycap DC6-48-60-18-8F | 1 | 16.304 | 27.553 | 0.67 | 1.12 | 50.50 | 0.000 | 1.000 | 30.83 | 0.00 | 30.83 |
| 3 | 105.00 | Valmont LWRM Ring Mount | 1 | 16.260 | 27.479 | 1.00 | 6.00 | 450.00 | 0.000 | 0.000 | 164.87 | 0.00 | 0.00 |
| 4 | 106.50 | Andrew SBNH-1D6565C | 1 | 16.348 | 27.627 | 0.80 | 9.90 | 132.00 | 0.000 | 0.500 | 273.40 | 0.00 | 136.70 |
| 5 | 106.50 | KMW | 1 | 16.348 | 27.627 | 0.78 | 7.08 | 95.00 | 0.000 | 0.500 | 195.67 | 0.00 | 97.83 |
| 6 | 106.50 | Platform w/ Hand Rails | 1 | 16.326 | 27.590 | 1.00 | 48.00 | 2600.00 | 0.000 | 0.000 | 1324.34 | 0.00 | 0.00 |
| 7 | 106.50 | Powerwave 7020.00 | 12 | 16.348 | 27.627 | 0.50 | 3.24 | 61.20 | 0.000 | 0.500 | 89.51 | 0.00 | 44.76 |
| 8 | 106.50 | Powerwave P65-16-XLH-RR | 9 | 16.348 | 27.627 | 0.80 | 66.38 | 901.80 | 0.000 | 0.500 | 1834.02 | 0.00 | 917.01 |
| 9 | 106.50 | Powerwave P65-17-XLH-RR | 1 | 16.348 | 27.627 | 0.80 | 9.91 | 121.00 | 0.000 | 0.500 | 273.84 | 0.00 | 136.92 |
| 10 | 106.50 | Powerwave | 12 | 16.348 | 27.627 | 0.67 | 9.17 | 355.20 | 0.000 | 0.500 | 253.22 | 0.00 | 126.61 |
| 11 | 117.00 | ALU RRH2x60-700 | 3 | 16.770 | 28.342 | 0.67 | 8.50 | 240.30 | 0.000 | 0.000 | 240.97 | 0.00 | 0.00 |
| 12 | 117.00 | ALU RRH2x60-AWS | 3 | 16.770 | 28.342 | 0.67 | 8.50 | 240.30 | 0.000 | 0.000 | 240.97 | 0.00 | 0.00 |
| 13 | 117.00 | ALU RRH2X60-PCS | 3 | 16.770 | 28.342 | 0.67 | 4.62 | 209.10 | 0.000 | 0.000 | 131.02 | 0.00 | 0.00 |
| 14 | 117.00 | Antel LPA-80063/6CFx5 | 6 | 16.770 | 28.342 | 0.85 | 57.02 | 0.00 | 0.000 | 0.000 | 1615.99 | 0.00 | 0.00 |
| 15 | 117.00 | Commscope SBNHH-1D65B | 9 | 16.770 | 28.342 | 0.83 | 66.26 | 779.40 | 0.000 | 0.000 | 1877.89 | 0.00 | 0.00 |
| 16 | 117.00 | RFS DB-T1-6Z-8AB-0Z | 2 | 16.770 | 28.342 | 0.75 | 7.56 | 102.20 | 0.000 | 0.000 | 214.26 | 0.00 | 0.00 |
| 17 | 117.00 | T-Arms | 3 | 16.770 | 28.342 | 0.75 | 23.63 | 1260.00 | 0.000 | 0.000 | 669.57 | 0.00 | 0.00 |
| 18 | 126.50 | Ericsson AIR21 B2A/B4P | 3 | 17.283 | 29.208 | 0.86 | 17.98 | 387.60 | 0.000 | 3.500 | 525.23 | 0.00 | 1838.32 |
| 19 | 126.50 | Ericsson AIR21 B4A/B2P | 3 | 17.283 | 29.208 | 0.86 | 17.98 | 384.30 | 0.000 | 3.500 | 525.23 | 0.00 | 1838.32 |
| 20 | 126.50 | Ericsson KRY 112 144/1 | 6 | 17.283 | 29.208 | 0.67 | 2.21 | 84.60 | 0.000 | 3.500 | 64.58 | 0.00 | 226.03 |
| 21 | 126.50 | RFS APXV18-209014-C | 3 | 17.283 | 29.208 | 0.74 | 9.08 | 0.00 | 0.000 | 3.500 | 265.20 | 0.00 | 928.21 |
| 22 | 126.50 | T-Arms | 3 | 17.149 | 28.981 | 0.75 | 23.63 | 1260.00 | 0.000 | 0.000 | 684.68 | 0.00 | 0.00 |
| | | | | | | **Totals:** | | **10,110.50** | | | **11,843.12** | | |

# Total Applied Force Summary

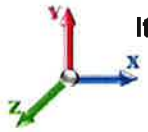
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 14 | |

TES Tower Engineering Solutions

**Load Case:** 69 67.55 mph Wind with 0.5" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Description | Lateral FX (-) (lb) | Axial FY (-) (lb) | Torsion MY (lb-ft) | Moment MZ (lb-ft) |
|---|---|---|---|---|---|
| 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| 5.00 | | 285.27 | 1225.35 | 0.00 | 0.00 |
| 10.00 | | 278.38 | 1215.22 | 0.00 | 0.00 |
| 15.00 | | 271.48 | 1185.17 | 0.00 | 0.00 |
| 20.00 | | 264.59 | 1155.12 | 0.00 | 0.00 |
| 25.00 | | 257.69 | 1125.07 | 0.00 | 0.00 |
| 30.00 | | 250.80 | 1095.03 | 0.00 | 0.00 |
| 35.00 | | 248.04 | 1064.98 | 0.00 | 0.00 |
| 40.00 | | 250.40 | 1034.93 | 0.00 | 0.00 |
| 42.67 | | 133.00 | 540.16 | 0.00 | 0.00 |
| 45.00 | | 118.11 | 797.40 | 0.00 | 0.00 |
| 48.00 | | 152.22 | 1008.50 | 0.00 | 0.00 |
| 50.00 | | 101.12 | 338.22 | 0.00 | 0.00 |
| 55.00 | | 254.19 | 826.37 | 0.00 | 0.00 |
| 60.00 | | 252.41 | 800.68 | 0.00 | 0.00 |
| 65.00 | | 249.88 | 774.98 | 0.00 | 0.00 |
| 70.00 | | 246.68 | 749.28 | 0.00 | 0.00 |
| 75.00 | | 242.88 | 723.58 | 0.00 | 0.00 |
| 80.00 | | 238.52 | 697.89 | 0.00 | 0.00 |
| 85.00 | | 233.65 | 672.19 | 0.00 | 0.00 |
| 86.67 | | 76.30 | 218.79 | 0.00 | 0.00 |
| 90.00 | | 153.56 | 709.45 | 0.00 | 0.00 |
| 90.67 | | 30.29 | 139.73 | 0.00 | 0.00 |
| 95.00 | | 195.47 | 458.76 | 0.00 | 0.00 |
| 100.00 | | 220.04 | 509.15 | 0.00 | 0.00 |
| 105.00 | (8) appurtenances | 757.03 | 1384.30 | 0.00 | 378.63 |
| 106.50 | (37) appurtenances | 4306.45 | 4408.79 | 0.00 | 1459.83 |
| 110.00 | | 143.64 | 316.01 | 0.00 | 0.00 |
| 115.00 | | 199.46 | 432.71 | 0.00 | 0.00 |
| 117.00 | (29) appurtenances | 5068.09 | 2998.88 | 0.00 | 0.00 |
| 120.00 | | 113.96 | 238.49 | 0.00 | 0.00 |
| 125.00 | | 184.09 | 379.62 | 0.00 | 0.00 |
| 126.50 | (18) appurtenances | 2118.37 | 2226.64 | 0.00 | 4830.87 |
| 130.00 | | 122.11 | 241.69 | 0.00 | 0.00 |
| 135.00 | | 152.42 | 326.53 | 0.00 | 0.00 |
| 140.00 | | 154.01 | 326.53 | 0.00 | 0.00 |
| | **Totals:** | **18,324.60** | **32,346.20** | **0.00** | **6,669.33** |

# Resulting Forces and Deflections

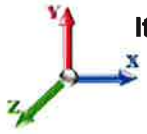
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 15 | |

Tower Engineering Solutions

**Load Case:** 69 67.55 mph Wind with 0.5" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| Elev (ft) | Lateral FX (-) (kips) | Axial FY (-) (kips) | Lateral FZ (kips) | Moment MX (ft-kips) | Torsion MY (ft-kips) | Moment MZ (ft-kips) | Deflect X (in) | Deflect Z (in) | Deflect Resultant (in) | Rotation Sway (deg) | Rotation Twist (deg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -18.358 | -32.327 | 0.000 | 0.000 | 0.000 | -1845.9 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5.00 | -18.136 | -31.065 | 0.000 | 0.000 | 0.000 | -1754.1 | -0.063 | 0.000 | 0.063 | -0.117 | 0.000 |
| 10.00 | -17.916 | -29.812 | 0.000 | 0.000 | 0.000 | -1663.4 | -0.250 | 0.000 | 0.250 | -0.236 | 0.000 |
| 15.00 | -17.700 | -28.591 | 0.000 | 0.000 | 0.000 | -1573.8 | -0.563 | 0.000 | 0.563 | -0.358 | 0.000 |
| 20.00 | -17.488 | -27.399 | 0.000 | 0.000 | 0.000 | -1485.3 | -1.006 | 0.000 | 1.006 | -0.483 | 0.000 |
| 25.00 | -17.278 | -26.238 | 0.000 | 0.000 | 0.000 | -1397.9 | -1.580 | 0.000 | 1.580 | -0.611 | 0.000 |
| 30.00 | -17.072 | -25.107 | 0.000 | 0.000 | 0.000 | -1311.5 | -2.290 | 0.000 | 2.290 | -0.741 | 0.000 |
| 35.00 | -16.865 | -24.006 | 0.000 | 0.000 | 0.000 | -1226.2 | -3.138 | 0.000 | 3.138 | -0.874 | 0.000 |
| 40.00 | -16.640 | -22.945 | 0.000 | 0.000 | 0.000 | -1141.8 | -4.126 | 0.000 | 4.126 | -1.009 | 0.000 |
| 42.67 | -16.524 | -22.387 | 0.000 | 0.000 | 0.000 | -1097.5 | -4.711 | 0.000 | 4.711 | -1.083 | 0.000 |
| 45.00 | -16.419 | -21.570 | 0.000 | 0.000 | 0.000 | -1058.9 | -5.257 | 0.000 | 5.257 | -1.149 | 0.000 |
| 48.00 | -16.272 | -20.545 | 0.000 | 0.000 | 0.000 | -1009.6 | -6.007 | 0.000 | 6.007 | -1.235 | 0.000 |
| 50.00 | -16.202 | -20.178 | 0.000 | 0.000 | 0.000 | -977.15 | -6.537 | 0.000 | 6.537 | -1.292 | 0.000 |
| 55.00 | -15.983 | -19.313 | 0.000 | 0.000 | 0.000 | -896.14 | -7.977 | 0.000 | 7.977 | -1.453 | 0.000 |
| 60.00 | -15.761 | -18.475 | 0.000 | 0.000 | 0.000 | -816.22 | -9.586 | 0.000 | 9.586 | -1.615 | 0.000 |
| 65.00 | -15.539 | -17.663 | 0.000 | 0.000 | 0.000 | -737.42 | -11.366 | 0.000 | 11.366 | -1.778 | 0.000 |
| 70.00 | -15.316 | -16.879 | 0.000 | 0.000 | 0.000 | -659.73 | -13.316 | 0.000 | 13.316 | -1.941 | 0.000 |
| 75.00 | -15.092 | -16.123 | 0.000 | 0.000 | 0.000 | -583.15 | -15.436 | 0.000 | 15.436 | -2.102 | 0.000 |
| 80.00 | -14.869 | -15.394 | 0.000 | 0.000 | 0.000 | -507.69 | -17.722 | 0.000 | 17.722 | -2.259 | 0.000 |
| 85.00 | -14.634 | -14.706 | 0.000 | 0.000 | 0.000 | -433.34 | -20.172 | 0.000 | 20.172 | -2.412 | 0.000 |
| 86.67 | -14.568 | -14.472 | 0.000 | 0.000 | 0.000 | -408.95 | -21.023 | 0.000 | 21.023 | -2.464 | 0.000 |
| 90.00 | -14.397 | -13.755 | 0.000 | 0.000 | 0.000 | -360.39 | -22.779 | 0.000 | 22.779 | -2.562 | 0.000 |
| 90.67 | -14.378 | -13.599 | 0.000 | 0.000 | 0.000 | -350.79 | -23.139 | 0.000 | 23.139 | -2.582 | 0.000 |
| 95.00 | -14.191 | -13.118 | 0.000 | 0.000 | 0.000 | -288.49 | -25.537 | 0.000 | 25.537 | -2.699 | 0.000 |
| 100.00 | -13.975 | -12.588 | 0.000 | 0.000 | 0.000 | -217.54 | -28.443 | 0.000 | 28.443 | -2.841 | 0.000 |
| 105.00 | -13.163 | -11.228 | 0.000 | 0.000 | 0.000 | -147.28 | -31.484 | 0.000 | 31.484 | -2.958 | 0.000 |
| 106.50 | -8.639 | -7.042 | 0.000 | 0.000 | 0.000 | -126.08 | -32.418 | 0.000 | 32.418 | -2.988 | 0.000 |
| 110.00 | -8.486 | -6.724 | 0.000 | 0.000 | 0.000 | -95.849 | -34.632 | 0.000 | 34.632 | -3.048 | 0.000 |
| 115.00 | -8.268 | -6.297 | 0.000 | 0.000 | 0.000 | -53.418 | -37.860 | 0.000 | 37.860 | -3.112 | 0.000 |
| 117.00 | -3.045 | -3.578 | 0.000 | 0.000 | 0.000 | -36.882 | -39.168 | 0.000 | 39.168 | -3.130 | 0.000 |
| 120.00 | -2.920 | -3.345 | 0.000 | 0.000 | 0.000 | -27.745 | -41.140 | 0.000 | 41.140 | -3.150 | 0.000 |
| 125.00 | -2.716 | -2.975 | 0.000 | 0.000 | 0.000 | -13.146 | -44.453 | 0.000 | 44.453 | -3.174 | 0.000 |
| 126.50 | -0.477 | -0.870 | 0.000 | 0.000 | 0.000 | -4.241 | -45.450 | 0.000 | 45.450 | -3.179 | 0.000 |
| 130.00 | -0.342 | -0.635 | 0.000 | 0.000 | 0.000 | -2.570 | -47.781 | 0.000 | 47.781 | -3.183 | 0.000 |
| 135.00 | -0.172 | -0.317 | 0.000 | 0.000 | 0.000 | -0.859 | -51.114 | 0.000 | 51.114 | -3.186 | 0.000 |
| 140.00 | -0.154 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 54.449 | -3.186 | 0.000 |

# Resulting Stresses

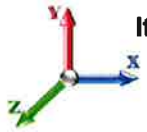
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SBA | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 16 | |

Tower Engineering Solutions

**Load Case:** 69 67.55 mph Wind with 0.5" Ice

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations:** 23

| | Applied Stresses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Elev (ft) | fa Axial (Y) (ksi) | fvx Shear (X) (ksi) | fvz Shear (Z) (ksi) | fvt Torsion (ksi) | fbx Bending (X) (ksi) | fbz Bending (Z) (ksi) | fb Combined (ksi) | Allow Stress (ksi) | | f/Fb Stress Ratio |
| 0.00 | 0.52 | 0.59 | 0.00 | 0.00 | 0.00 | 27.20 | 27.73 | 52.0 | | 0.534 |
| 5.00 | 0.51 | 0.60 | 0.00 | 0.00 | 0.00 | 27.17 | 27.69 | 52.0 | | 0.533 |
| 10.00 | 0.50 | 0.61 | 0.00 | 0.00 | 0.00 | 27.11 | 27.63 | 52.0 | | 0.532 |
| 15.00 | 0.49 | 0.61 | 0.00 | 0.00 | 0.00 | 27.03 | 27.54 | 52.0 | | 0.530 |
| 20.00 | 0.48 | 0.62 | 0.00 | 0.00 | 0.00 | 26.92 | 27.43 | 52.0 | | 0.528 |
| 25.00 | 0.48 | 0.63 | 0.00 | 0.00 | 0.00 | 26.78 | 27.28 | 52.0 | | 0.525 |
| 30.00 | 0.47 | 0.64 | 0.00 | 0.00 | 0.00 | 26.59 | 27.09 | 52.0 | | 0.521 |
| 35.00 | 0.46 | 0.66 | 0.00 | 0.00 | 0.00 | 26.36 | 26.85 | 52.0 | | 0.516 |
| 40.00 | 0.46 | 0.67 | 0.00 | 0.00 | 0.00 | 26.07 | 26.55 | 52.0 | | 0.511 |
| 42.67 | 0.45 | 0.67 | 0.00 | 0.00 | 0.00 | 25.90 | 26.38 | 52.0 | | 0.507 |
| 45.00 | 0.44 | 0.68 | 0.00 | 0.00 | 0.00 | 25.73 | 26.20 | 52.0 | | 0.504 |
| 48.00 | 0.51 | 0.81 | 0.00 | 0.00 | 0.00 | 29.52 | 30.06 | 52.0 | | 0.578 |
| 50.00 | 0.50 | 0.81 | 0.00 | 0.00 | 0.00 | 29.31 | 29.84 | 52.0 | | 0.574 |
| 55.00 | 0.50 | 0.83 | 0.00 | 0.00 | 0.00 | 28.68 | 29.22 | 52.0 | | 0.562 |
| 60.00 | 0.49 | 0.85 | 0.00 | 0.00 | 0.00 | 27.94 | 28.47 | 52.0 | | 0.548 |
| 65.00 | 0.49 | 0.86 | 0.00 | 0.00 | 0.00 | 27.07 | 27.60 | 52.0 | | 0.531 |
| 70.00 | 0.48 | 0.88 | 0.00 | 0.00 | 0.00 | 26.03 | 26.55 | 52.0 | | 0.511 |
| 75.00 | 0.48 | 0.90 | 0.00 | 0.00 | 0.00 | 24.79 | 25.32 | 52.0 | | 0.487 |
| 80.00 | 0.47 | 0.92 | 0.00 | 0.00 | 0.00 | 23.33 | 23.86 | 52.0 | | 0.459 |
| 85.00 | 0.47 | 0.95 | 0.00 | 0.00 | 0.00 | 21.59 | 22.13 | 52.0 | | 0.426 |
| 86.67 | 0.47 | 0.96 | 0.00 | 0.00 | 0.00 | 20.95 | 21.48 | 52.0 | | 0.413 |
| 90.00 | 0.46 | 0.97 | 0.00 | 0.00 | 0.00 | 19.54 | 20.07 | 52.0 | | 0.386 |
| 90.67 | 0.56 | 1.20 | 0.00 | 0.00 | 0.00 | 23.12 | 23.77 | 52.0 | | 0.457 |
| 95.00 | 0.56 | 1.23 | 0.00 | 0.00 | 0.00 | 20.49 | 21.16 | 52.0 | | 0.407 |
| 100.00 | 0.56 | 1.26 | 0.00 | 0.00 | 0.00 | 16.91 | 17.61 | 52.0 | | 0.339 |
| 105.00 | 0.53 | 1.25 | 0.00 | 0.00 | 0.00 | 12.58 | 13.29 | 52.0 | | 0.256 |
| 106.50 | 0.34 | 0.83 | 0.00 | 0.00 | 0.00 | 11.09 | 11.52 | 52.0 | | 0.222 |
| 110.00 | 0.33 | 0.85 | 0.00 | 0.00 | 0.00 | 9.04 | 9.49 | 52.0 | | 0.182 |
| 115.00 | 0.33 | 0.87 | 0.00 | 0.00 | 0.00 | 5.59 | 6.11 | 52.0 | | 0.117 |
| 117.00 | 0.19 | 0.33 | 0.00 | 0.00 | 0.00 | 4.03 | 4.26 | 52.0 | | 0.082 |
| 120.00 | 0.18 | 0.32 | 0.00 | 0.00 | 0.00 | 3.24 | 3.47 | 52.0 | | 0.067 |
| 125.00 | 0.17 | 0.32 | 0.00 | 0.00 | 0.00 | 1.73 | 1.98 | 52.0 | | 0.038 |
| 126.50 | 0.05 | 0.06 | 0.00 | 0.00 | 0.00 | 0.58 | 0.64 | 52.0 | | 0.012 |
| 130.00 | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.38 | 0.43 | 52.0 | | 0.008 |
| 130.00 | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.38 | 0.43 | 52.0 | | 0.009 |
| 135.00 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.14 | 0.16 | 33.6 | 33.6 | 0.005 |
| 140.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 33.6 | 33.6 | 0.001 |

# Wind Loading - Shaft

**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

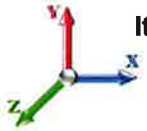
7/10/2015



Tower Engineering Solutions

**Load Case:** 50 mph Wind with 0" Ice

**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 22

| Elev (ft) | Description | Kzt | Kz | qz (psf) | qzGh (psf) | C (mph-ft) | Cf | Ice Thick (in) | Tributary (ft) | Aa (sf) | CfAa (sf) | Wind Force X (lb) | Dead Load Ice (lb) | Tot Dead Load (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 220.83 | 0.650 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 215.46 | 0.650 | 0.000 | 5.00 | 21.815 | 14.18 | 153.4 | 0.0 | 1052.6 |
| 10.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 210.09 | 0.650 | 0.000 | 5.00 | 21.277 | 13.83 | 149.6 | 0.0 | 1026.5 |
| 15.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 204.72 | 0.650 | 0.000 | 5.00 | 20.740 | 13.48 | 145.8 | 0.0 | 1000.4 |
| 20.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 199.34 | 0.650 | 0.000 | 5.00 | 20.203 | 13.13 | 142.0 | 0.0 | 974.3 |
| 25.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 193.97 | 0.650 | 0.000 | 5.00 | 19.666 | 12.78 | 138.3 | 0.0 | 948.2 |
| 30.00 | | 0.00 | 1.00 | 6.400 | 10.82 | 188.60 | 0.650 | 0.000 | 5.00 | 19.128 | 12.43 | 134.5 | 0.0 | 922.0 |
| 35.00 | | 0.00 | 1.02 | 6.509 | 11.00 | 184.77 | 0.650 | 0.000 | 5.00 | 18.591 | 12.08 | 132.9 | 0.0 | 895.9 |
| 40.00 | | 0.00 | 1.06 | 6.762 | 11.43 | 182.81 | 0.650 | 0.000 | 5.00 | 18.054 | 11.74 | 134.1 | 0.0 | 869.8 |
| 42.67 | Bot - Section 2 | 0.00 | 1.08 | 6.887 | 11.64 | 181.53 | 0.650 | 0.000 | 2.67 | 9.409 | 6.12 | 71.2 | 0.0 | 453.2 |
| 45.00 | | 0.00 | 1.09 | 6.993 | 11.82 | 180.29 | 0.650 | 0.000 | 2.33 | 8.229 | 5.35 | 63.2 | 0.0 | 721.3 |
| 48.00 | Top - Section 1 | 0.00 | 1.11 | 7.123 | 12.04 | 178.56 | 0.650 | 0.000 | 3.00 | 10.408 | 6.77 | 81.4 | 0.0 | 912.1 |
| 50.00 | | 0.00 | 1.13 | 7.207 | 12.18 | 180.09 | 0.650 | 0.000 | 2.00 | 6.831 | 4.44 | 54.1 | 0.0 | 274.6 |
| 55.00 | | 0.00 | 1.16 | 7.406 | 12.52 | 176.78 | 0.650 | 0.000 | 5.00 | 16.703 | 10.86 | 135.9 | 0.0 | 671.2 |
| 60.00 | | 0.00 | 1.19 | 7.592 | 12.83 | 173.14 | 0.650 | 0.000 | 5.00 | 16.165 | 10.51 | 134.8 | 0.0 | 649.4 |
| 65.00 | | 0.00 | 1.21 | 7.768 | 13.13 | 169.21 | 0.650 | 0.000 | 5.00 | 15.628 | 10.16 | 133.4 | 0.0 | 627.7 |
| 70.00 | | 0.00 | 1.24 | 7.934 | 13.41 | 165.03 | 0.650 | 0.000 | 5.00 | 15.091 | 9.81 | 131.5 | 0.0 | 605.9 |
| 75.00 | | 0.00 | 1.26 | 8.092 | 13.68 | 160.62 | 0.650 | 0.000 | 5.00 | 14.553 | 9.46 | 129.4 | 0.0 | 584.1 |
| 80.00 | | 0.00 | 1.29 | 8.242 | 13.93 | 156.01 | 0.650 | 0.000 | 5.00 | 14.016 | 9.11 | 126.9 | 0.0 | 562.4 |
| 85.00 | | 0.00 | 1.31 | 8.387 | 14.17 | 151.22 | 0.650 | 0.000 | 5.00 | 13.479 | 8.76 | 124.2 | 0.0 | 540.6 |
| 86.67 | Bot - Section 3 | 0.00 | 1.32 | 8.433 | 14.25 | 149.59 | 0.650 | 0.000 | 1.67 | 4.374 | 2.84 | 40.5 | 0.0 | 175.4 |
| 90.00 | | 0.00 | 1.33 | 8.525 | 14.41 | 146.26 | 0.650 | 0.000 | 3.33 | 8.707 | 5.66 | 81.5 | 0.0 | 623.4 |
| 90.67 | Top - Section 2 | 0.00 | 1.33 | 8.543 | 14.44 | 145.59 | 0.650 | 0.000 | 0.67 | 1.713 | 1.11 | 16.1 | 0.0 | 122.6 |
| 95.00 | | 0.00 | 1.35 | 8.657 | 14.63 | 143.57 | 0.650 | 0.000 | 4.33 | 10.900 | 7.09 | 103.7 | 0.0 | 350.2 |
| 100.00 | | 0.00 | 1.37 | 8.785 | 14.85 | 138.33 | 0.650 | 0.000 | 5.00 | 12.076 | 7.85 | 116.5 | 0.0 | 387.9 |
| 105.00 | Appurtenance(s) | 0.00 | 1.39 | 8.908 | 15.06 | 132.96 | 0.650 | 0.000 | 5.00 | 11.538 | 7.50 | 112.9 | 0.0 | 370.5 |
| 106.50 | Appurtenance(s) | 0.00 | 1.40 | 8.945 | 15.12 | 131.32 | 0.650 | 0.000 | 1.50 | 3.357 | 2.18 | 33.0 | 0.0 | 107.7 |
| 110.00 | | 0.00 | 1.41 | 9.028 | 15.26 | 127.47 | 0.650 | 0.000 | 3.50 | 7.644 | 4.97 | 75.8 | 0.0 | 245.3 |
| 115.00 | | 0.00 | 1.43 | 9.143 | 15.45 | 121.86 | 0.650 | 0.000 | 5.00 | 10.464 | 6.80 | 105.1 | 0.0 | 335.7 |
| 117.00 | Appurtenance(s) | 0.00 | 1.44 | 9.188 | 15.53 | 119.58 | 0.650 | 0.000 | 2.00 | 4.035 | 2.62 | 40.7 | 0.0 | 129.4 |
| 120.00 | | 0.00 | 1.45 | 9.255 | 15.64 | 116.14 | 0.650 | 0.000 | 3.00 | 5.891 | 3.83 | 59.9 | 0.0 | 188.9 |
| 125.00 | | 0.00 | 1.46 | 9.363 | 15.82 | 110.32 | 0.650 | 0.000 | 5.00 | 9.389 | 6.10 | 96.6 | 0.0 | 300.8 |
| 126.50 | Appurtenance(s) | 0.00 | 1.47 | 9.395 | 15.88 | 108.55 | 0.650 | 0.000 | 1.50 | 2.712 | 1.76 | 28.0 | 0.0 | 86.9 |
| 130.00 | Top - Section 3 | 0.00 | 1.48 | 9.469 | 16.00 | 104.40 | 0.650 | 0.000 | 3.50 | 6.140 | 3.99 | 63.9 | 0.0 | 196.6 |
| 135.00 | | 0.00 | 1.50 | 9.572 | 16.18 | 101.91 | 0.590 | 0.000 | 5.00 | 8.333 | 4.92 | 79.5 | 0.0 | 263.9 |
| 140.00 | | 0.00 | 1.51 | 9.672 | 16.35 | 102.44 | 0.590 | 0.000 | 5.00 | 8.333 | 4.92 | 80.4 | 0.0 | 263.9 |
| | | | | | | | | **Totals:** | **140.00** | | | **3,450.6** | | **18,441.1** |

# Discrete Appurtenance Forces

**Structure:** CT13548-S-SB
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

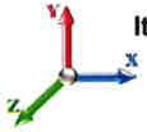
7/10/2015



Tower Engineering Solutions

**Load Case:** 50 mph Wind with 0" Ice

**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 22

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa Factor | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 105.00 | Andrew RRUS11 RRUs | 6 | 8.933 | 15.096 | 0.67 | 11.82 | 304.20 | 0.000 | 1.000 | 178.42 | 0.00 | 178.42 |
| 2 | 105.00 | Raycap DC6-48-60-18-8F | 1 | 8.933 | 15.096 | 0.67 | 0.98 | 32.80 | 0.000 | 1.000 | 14.87 | 0.00 | 14.87 |
| 3 | 105.00 | Valmont LWRM Ring Mount | 1 | 8.908 | 15.055 | 1.00 | 5.00 | 350.00 | 0.000 | 0.000 | 75.28 | 0.00 | 0.00 |
| 4 | 106.50 | Andrew SBNH-1D6565C | 1 | 8.957 | 15.137 | 0.80 | 9.15 | 66.10 | 0.000 | 0.500 | 138.53 | 0.00 | 69.27 |
| 5 | 106.50 | KMW | 1 | 8.957 | 15.137 | 0.78 | 6.44 | 48.50 | 0.000 | 0.500 | 97.52 | 0.00 | 48.76 |
| 6 | 106.50 | Platform w/ Hand Rails | 1 | 8.945 | 15.116 | 1.00 | 40.00 | 2000.00 | 0.000 | 0.000 | 604.66 | 0.00 | 0.00 |
| 7 | 106.50 | Powerwave 7020.00 | 12 | 8.957 | 15.137 | 0.50 | 2.40 | 26.40 | 0.000 | 0.500 | 36.33 | 0.00 | 18.16 |
| 8 | 106.50 | Powerwave P65-16-XLH-RR | 9 | 8.957 | 15.137 | 0.80 | 60.48 | 477.00 | 0.000 | 0.500 | 915.46 | 0.00 | 457.73 |
| 9 | 106.50 | Powerwave P65-17-XLH-RR | 1 | 8.957 | 15.137 | 0.80 | 9.17 | 59.00 | 0.000 | 0.500 | 138.77 | 0.00 | 69.39 |
| 10 | 106.50 | Powerwave | 12 | 8.957 | 15.137 | 0.67 | 7.40 | 264.00 | 0.000 | 0.500 | 111.96 | 0.00 | 55.98 |
| 11 | 117.00 | ALU RRH2x60-700 | 3 | 9.188 | 15.528 | 0.67 | 7.96 | 180.00 | 0.000 | 0.000 | 123.60 | 0.00 | 0.00 |
| 12 | 117.00 | ALU RRH2x60-AWS | 3 | 9.188 | 15.528 | 0.67 | 7.96 | 180.00 | 0.000 | 0.000 | 123.60 | 0.00 | 0.00 |
| 13 | 117.00 | ALU RRH2X60-PCS | 3 | 9.188 | 15.528 | 0.67 | 5.17 | 165.00 | 0.000 | 0.000 | 80.21 | 0.00 | 0.00 |
| 14 | 117.00 | Antel LPA-80063/6CFx5 | 6 | 9.188 | 15.528 | 0.85 | 52.73 | 162.00 | 0.000 | 0.000 | 818.85 | 0.00 | 0.00 |
| 15 | 117.00 | Commscope SBNHH-1D65B | 9 | 9.188 | 15.528 | 0.83 | 62.00 | 456.39 | 0.000 | 0.000 | 962.75 | 0.00 | 0.00 |
| 16 | 117.00 | RFS DB-T1-6Z-8AB-0Z | 2 | 9.188 | 15.528 | 0.75 | 8.40 | 88.00 | 0.000 | 0.000 | 130.44 | 0.00 | 0.00 |
| 17 | 117.00 | T-Arms | 3 | 9.188 | 15.528 | 0.75 | 18.00 | 1050.00 | 0.000 | 0.000 | 279.50 | 0.00 | 0.00 |
| 18 | 126.50 | Ericsson AIR21 B2A/B4P | 3 | 9.469 | 16.003 | 0.86 | 16.98 | 274.50 | 0.000 | 3.500 | 271.67 | 0.00 | 950.83 |
| 19 | 126.50 | Ericsson AIR21 B4A/B2P | 3 | 9.469 | 16.003 | 0.86 | 16.98 | 271.20 | 0.000 | 3.500 | 271.67 | 0.00 | 950.83 |
| 20 | 126.50 | Ericsson KRY 112 144/1 | 6 | 9.469 | 16.003 | 0.67 | 1.65 | 66.00 | 0.000 | 3.500 | 26.38 | 0.00 | 92.31 |
| 21 | 126.50 | RFS APXV18-209014-C | 3 | 9.469 | 16.003 | 0.74 | 7.93 | 56.10 | 0.000 | 3.500 | 126.83 | 0.00 | 443.89 |
| 22 | 126.50 | T-Arms | 3 | 9.395 | 15.878 | 0.75 | 18.00 | 1050.00 | 0.000 | 0.000 | 285.81 | 0.00 | 0.00 |
| | | | | | | **Totals:** | | **7,627.19** | | | **5,813.09** | | |

# Total Applied Force Summary

**Structure:** CT13548-S-SB
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

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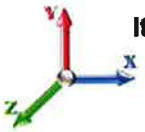
Tower Engineering Solutions

**Load Case:** 50 mph Wind with 0" Ice
**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 22

| Elev (ft) | Description | Lateral FX (-) (lb) | Axial FY (-) (lb) | Torsion MY (lb-ft) | Moment MZ (lb-ft) |
|---|---|---|---|---|---|
| 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| 5.00 | | 157.69 | 1094.86 | 0.00 | 0.00 |
| 10.00 | | 160.40 | 1132.14 | 0.00 | 0.00 |
| 15.00 | | 156.63 | 1106.03 | 0.00 | 0.00 |
| 20.00 | | 152.85 | 1079.92 | 0.00 | 0.00 |
| 25.00 | | 149.07 | 1053.81 | 0.00 | 0.00 |
| 30.00 | | 145.30 | 1027.70 | 0.00 | 0.00 |
| 35.00 | | 143.92 | 1001.59 | 0.00 | 0.00 |
| 40.00 | | 145.52 | 975.48 | 0.00 | 0.00 |
| 42.67 | | 77.40 | 509.58 | 0.00 | 0.00 |
| 45.00 | | 68.73 | 770.61 | 0.00 | 0.00 |
| 48.00 | | 88.67 | 975.46 | 0.00 | 0.00 |
| 50.00 | | 58.95 | 316.82 | 0.00 | 0.00 |
| 55.00 | | 148.39 | 776.83 | 0.00 | 0.00 |
| 60.00 | | 147.65 | 755.07 | 0.00 | 0.00 |
| 65.00 | | 146.48 | 733.31 | 0.00 | 0.00 |
| 70.00 | | 144.93 | 711.55 | 0.00 | 0.00 |
| 75.00 | | 143.04 | 689.79 | 0.00 | 0.00 |
| 80.00 | | 140.84 | 668.04 | 0.00 | 0.00 |
| 85.00 | | 138.35 | 646.28 | 0.00 | 0.00 |
| 86.67 | | 45.27 | 210.59 | 0.00 | 0.00 |
| 90.00 | | 91.14 | 693.78 | 0.00 | 0.00 |
| 90.67 | | 18.00 | 136.67 | 0.00 | 0.00 |
| 95.00 | | 116.34 | 441.80 | 0.00 | 0.00 |
| 100.00 | | 131.38 | 493.52 | 0.00 | 0.00 |
| 105.00 | (8) appurtenances | 396.53 | 1163.12 | 0.00 | 193.29 |
| 106.50 | (37) appurtenances | 2080.75 | 3080.44 | 0.00 | 719.29 |
| 110.00 | | 75.81 | 259.87 | 0.00 | 0.00 |
| 115.00 | | 105.09 | 356.45 | 0.00 | 0.00 |
| 117.00 | (29) appurtenances | 2559.68 | 2419.10 | 0.00 | 0.00 |
| 120.00 | | 59.89 | 195.10 | 0.00 | 0.00 |
| 125.00 | | 96.58 | 311.24 | 0.00 | 0.00 |
| 126.50 | (18) appurtenances | 1010.33 | 1807.78 | 0.00 | 2437.87 |
| 130.00 | | 63.87 | 196.57 | 0.00 | 0.00 |
| 135.00 | | 79.53 | 263.91 | 0.00 | 0.00 |
| 140.00 | | 80.36 | 263.91 | 0.00 | 0.00 |
| | **Totals:** | **9,525.36** | **28,318.73** | **0.00** | **3,350.44** |

# Resulting Forces and Deflections

**Structure:** CT13548-S-SB
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

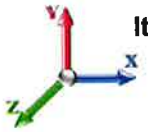
**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

7/10/2015



Tower Engineering Solutions

**Load Case:** 50 mph Wind with 0" Ice
**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 22

| Elev (ft) | Lateral FX (-) (kips) | Axial FY (-) (kips) | Lateral FZ (kips) | Moment MX (ft-kips) | Torsion MY (ft-kips) | Moment MZ (ft-kips) | Deflect X (in) | Deflect Z (in) | Deflect Resultant (in) | Rotation Sway (deg) | Rotation Twist (deg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -9.540 | -28.314 | 0.000 | 0.000 | 0.000 | -934.84 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5.00 | -9.410 | -27.209 | 0.000 | 0.000 | 0.000 | -887.14 | -0.032 | 0.000 | 0.032 | -0.059 | 0.000 |
| 10.00 | -9.275 | -26.067 | 0.000 | 0.000 | 0.000 | -840.09 | -0.126 | 0.000 | 0.126 | -0.120 | 0.000 |
| 15.00 | -9.143 | -24.952 | 0.000 | 0.000 | 0.000 | -793.72 | -0.285 | 0.000 | 0.285 | -0.181 | 0.000 |
| 20.00 | -9.012 | -23.862 | 0.000 | 0.000 | 0.000 | -748.00 | -0.508 | 0.000 | 0.508 | -0.244 | 0.000 |
| 25.00 | -8.884 | -22.799 | 0.000 | 0.000 | 0.000 | -702.94 | -0.799 | 0.000 | 0.799 | -0.308 | 0.000 |
| 30.00 | -8.758 | -21.762 | 0.000 | 0.000 | 0.000 | -658.52 | -1.157 | 0.000 | 1.157 | -0.374 | 0.000 |
| 35.00 | -8.631 | -20.752 | 0.000 | 0.000 | 0.000 | -614.73 | -1.584 | 0.000 | 1.584 | -0.440 | 0.000 |
| 40.00 | -8.495 | -19.770 | 0.000 | 0.000 | 0.000 | -571.58 | -2.081 | 0.000 | 2.081 | -0.508 | 0.000 |
| 42.67 | -8.425 | -19.256 | 0.000 | 0.000 | 0.000 | -548.92 | -2.376 | 0.000 | 2.376 | -0.545 | 0.000 |
| 45.00 | -8.361 | -18.480 | 0.000 | 0.000 | 0.000 | -529.27 | -2.651 | 0.000 | 2.651 | -0.578 | 0.000 |
| 48.00 | -8.273 | -17.501 | 0.000 | 0.000 | 0.000 | -504.18 | -3.028 | 0.000 | 3.028 | -0.621 | 0.000 |
| 50.00 | -8.227 | -17.177 | 0.000 | 0.000 | 0.000 | -487.64 | -3.294 | 0.000 | 3.294 | -0.650 | 0.000 |
| 55.00 | -8.093 | -16.390 | 0.000 | 0.000 | 0.000 | -446.50 | -4.018 | 0.000 | 4.018 | -0.730 | 0.000 |
| 60.00 | -7.957 | -15.626 | 0.000 | 0.000 | 0.000 | -406.04 | -4.826 | 0.000 | 4.826 | -0.811 | 0.000 |
| 65.00 | -7.820 | -14.884 | 0.000 | 0.000 | 0.000 | -366.26 | -5.719 | 0.000 | 5.719 | -0.892 | 0.000 |
| 70.00 | -7.684 | -14.164 | 0.000 | 0.000 | 0.000 | -327.15 | -6.696 | 0.000 | 6.696 | -0.972 | 0.000 |
| 75.00 | -7.547 | -13.467 | 0.000 | 0.000 | 0.000 | -288.74 | -7.758 | 0.000 | 7.758 | -1.052 | 0.000 |
| 80.00 | -7.411 | -12.792 | 0.000 | 0.000 | 0.000 | -251.00 | -8.902 | 0.000 | 8.902 | -1.130 | 0.000 |
| 85.00 | -7.270 | -12.142 | 0.000 | 0.000 | 0.000 | -213.95 | -10.127 | 0.000 | 10.127 | -1.206 | 0.000 |
| 86.67 | -7.228 | -11.928 | 0.000 | 0.000 | 0.000 | -201.83 | -10.553 | 0.000 | 10.553 | -1.231 | 0.000 |
| 90.00 | -7.127 | -11.232 | 0.000 | 0.000 | 0.000 | -177.74 | -11.430 | 0.000 | 11.430 | -1.279 | 0.000 |
| 90.67 | -7.113 | -11.092 | 0.000 | 0.000 | 0.000 | -172.99 | -11.609 | 0.000 | 11.609 | -1.289 | 0.000 |
| 95.00 | -6.998 | -10.645 | 0.000 | 0.000 | 0.000 | -142.16 | -12.807 | 0.000 | 12.807 | -1.347 | 0.000 |
| 100.00 | -6.867 | -10.147 | 0.000 | 0.000 | 0.000 | -107.17 | -14.257 | 0.000 | 14.257 | -1.417 | 0.000 |
| 105.00 | -6.446 | -8.991 | 0.000 | 0.000 | 0.000 | -72.652 | -15.774 | 0.000 | 15.774 | -1.474 | 0.000 |
| 106.50 | -4.289 | -5.963 | 0.000 | 0.000 | 0.000 | -62.263 | -16.240 | 0.000 | 16.240 | -1.489 | 0.000 |
| 110.00 | -4.209 | -5.703 | 0.000 | 0.000 | 0.000 | -47.253 | -17.343 | 0.000 | 17.343 | -1.519 | 0.000 |
| 115.00 | -4.097 | -5.348 | 0.000 | 0.000 | 0.000 | -26.206 | -18.953 | 0.000 | 18.953 | -1.550 | 0.000 |
| 117.00 | -1.473 | -2.999 | 0.000 | 0.000 | 0.000 | -18.013 | -19.604 | 0.000 | 19.604 | -1.559 | 0.000 |
| 120.00 | -1.408 | -2.806 | 0.000 | 0.000 | 0.000 | -13.595 | -20.587 | 0.000 | 20.587 | -1.569 | 0.000 |
| 125.00 | -1.303 | -2.497 | 0.000 | 0.000 | 0.000 | -6.555 | -22.238 | 0.000 | 22.238 | -1.581 | 0.000 |
| 126.50 | -0.244 | -0.718 | 0.000 | 0.000 | 0.000 | -2.162 | -22.735 | 0.000 | 22.735 | -1.583 | 0.000 |
| 130.00 | -0.174 | -0.523 | 0.000 | 0.000 | 0.000 | -1.309 | -23.896 | 0.000 | 23.896 | -1.585 | 0.000 |
| 135.00 | -0.088 | -0.262 | 0.000 | 0.000 | 0.000 | -0.438 | -25.557 | 0.000 | 25.557 | -1.587 | 0.000 |
| 140.00 | -0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 27.219 | -1.587 | 0.000 |

# Resulting Stresses

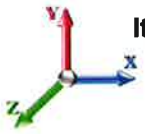
**Structure:** CT13548-S-SBA
**Site Name:** Bloomfield 4
**Height:** 140.00 (ft)
**Base Elev:** 0.000 (ft)

**Code:** EIA/TIA-222-F
**Exposure:** C
**Gh:** 1.69
**Struct Class:** II

7/10/2015


Tower Engineering Solutions

**Load Case:** 50 mph Wind with 0" Ice
**Dead Load Factor** 1.00
**Wind Load Factor** 1.00




**Iterations:** 22

| | Applied Stresses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Elev (ft) | fa Axial (Y) (ksi) | fvx Shear (X) (ksi) | fvz Shear (Z) (ksi) | fvt Torsion (ksi) | fbx Bending (X) (ksi) | fbz Bending (Z) (ksi) | fb Combined (ksi) | Allow Stress (ksi) | | f/Fb Stress Ratio |
| 0.00 | 0.45 | 0.31 | 0.00 | 0.00 | 0.00 | 13.77 | 14.24 | 52.0 | | 0.274 |
| 5.00 | 0.45 | 0.31 | 0.00 | 0.00 | 0.00 | 13.74 | 14.19 | 52.0 | | 0.273 |
| 10.00 | 0.44 | 0.31 | 0.00 | 0.00 | 0.00 | 13.69 | 14.14 | 52.0 | | 0.272 |
| 15.00 | 0.43 | 0.32 | 0.00 | 0.00 | 0.00 | 13.63 | 14.07 | 52.0 | | 0.271 |
| 20.00 | 0.42 | 0.32 | 0.00 | 0.00 | 0.00 | 13.56 | 13.99 | 52.0 | | 0.269 |
| 25.00 | 0.41 | 0.33 | 0.00 | 0.00 | 0.00 | 13.46 | 13.89 | 52.0 | | 0.267 |
| 30.00 | 0.41 | 0.33 | 0.00 | 0.00 | 0.00 | 13.35 | 13.77 | 52.0 | | 0.265 |
| 35.00 | 0.40 | 0.34 | 0.00 | 0.00 | 0.00 | 13.22 | 13.63 | 52.0 | | 0.262 |
| 40.00 | 0.39 | 0.34 | 0.00 | 0.00 | 0.00 | 13.05 | 13.46 | 52.0 | | 0.259 |
| 42.67 | 0.39 | 0.34 | 0.00 | 0.00 | 0.00 | 12.95 | 13.36 | 52.0 | | 0.257 |
| 45.00 | 0.38 | 0.35 | 0.00 | 0.00 | 0.00 | 12.86 | 13.25 | 52.0 | | 0.255 |
| 48.00 | 0.43 | 0.41 | 0.00 | 0.00 | 0.00 | 14.74 | 15.19 | 52.0 | | 0.292 |
| 50.00 | 0.43 | 0.41 | 0.00 | 0.00 | 0.00 | 14.62 | 15.07 | 52.0 | | 0.290 |
| 55.00 | 0.42 | 0.42 | 0.00 | 0.00 | 0.00 | 14.29 | 14.73 | 52.0 | | 0.283 |
| 60.00 | 0.42 | 0.43 | 0.00 | 0.00 | 0.00 | 13.90 | 14.34 | 52.0 | | 0.276 |
| 65.00 | 0.41 | 0.43 | 0.00 | 0.00 | 0.00 | 13.44 | 13.87 | 52.0 | | 0.267 |
| 70.00 | 0.41 | 0.44 | 0.00 | 0.00 | 0.00 | 12.91 | 13.33 | 52.0 | | 0.257 |
| 75.00 | 0.40 | 0.45 | 0.00 | 0.00 | 0.00 | 12.28 | 12.70 | 52.0 | | 0.244 |
| 80.00 | 0.39 | 0.46 | 0.00 | 0.00 | 0.00 | 11.53 | 11.96 | 52.0 | | 0.230 |
| 85.00 | 0.39 | 0.47 | 0.00 | 0.00 | 0.00 | 10.66 | 11.08 | 52.0 | | 0.213 |
| 86.67 | 0.39 | 0.47 | 0.00 | 0.00 | 0.00 | 10.34 | 10.76 | 52.0 | | 0.207 |
| 90.00 | 0.38 | 0.48 | 0.00 | 0.00 | 0.00 | 9.64 | 10.05 | 52.0 | | 0.193 |
| 90.67 | 0.46 | 0.59 | 0.00 | 0.00 | 0.00 | 11.40 | 11.90 | 52.0 | | 0.229 |
| 95.00 | 0.46 | 0.61 | 0.00 | 0.00 | 0.00 | 10.10 | 10.61 | 52.0 | | 0.204 |
| 100.00 | 0.46 | 0.62 | 0.00 | 0.00 | 0.00 | 8.33 | 8.85 | 52.0 | | 0.170 |
| 105.00 | 0.42 | 0.61 | 0.00 | 0.00 | 0.00 | 6.21 | 6.71 | 52.0 | | 0.129 |
| 106.50 | 0.28 | 0.41 | 0.00 | 0.00 | 0.00 | 5.48 | 5.81 | 52.0 | | 0.112 |
| 110.00 | 0.28 | 0.42 | 0.00 | 0.00 | 0.00 | 4.46 | 4.79 | 52.0 | | 0.092 |
| 115.00 | 0.28 | 0.43 | 0.00 | 0.00 | 0.00 | 2.74 | 3.11 | 52.0 | | 0.060 |
| 117.00 | 0.16 | 0.16 | 0.00 | 0.00 | 0.00 | 1.97 | 2.15 | 52.0 | | 0.041 |
| 120.00 | 0.15 | 0.16 | 0.00 | 0.00 | 0.00 | 1.59 | 1.76 | 52.0 | | 0.034 |
| 125.00 | 0.15 | 0.15 | 0.00 | 0.00 | 0.00 | 0.86 | 1.04 | 52.0 | | 0.020 |
| 126.50 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.29 | 0.34 | 52.0 | | 0.007 |
| 130.00 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.19 | 0.23 | 52.0 | | 0.004 |
| 130.00 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.19 | 0.23 | 52.0 | | 0.005 |
| 135.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.07 | 0.09 | 33.6 | 33.6 | 0.003 |
| 140.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 33.6 | 33.6 | 0.001 |

## Reactions

| Load Case | Shear FX (kips) | Shear FZ (kips) | Axial FY (kips) | Moment MX (ft-kips) | Moment MY (ft-kips) | t MZ (ft-kips) |
|---|---|---|---|---|---|---|
| 78 mphWind with 0" Ice | 23.2 | 0.00 | 28.29 | 0.00 | 0.00 | 2273.87 |
| 69 67.55 mph Wind with 0.5" | 18.4 | 0.00 | 32.33 | 0.00 | 0.00 | 1845.94 |
| 50 mph Wind with 0" Ice | 9.5 | 0.00 | 28.31 | 0.00 | 0.00 | 934.84 |

## Max Stresses

| Load Case | fa Axial (Y) (ksi) | fvx Shear (X) (ksi) | fvz Shear (Z) (ksi) | fvt Torsion (ksi) | fbx Bending (X) (ksi) | fbz Bending (Z) (ksi) | Combined Stress (ksi) | Allowable Stress (ksi) | Elev (ft) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 mphWind with 0" Ice | 0.42 | 1.00 | 0.00 | 0.00 | 0.00 | 35.84 | 36.30 | 52.0 | 48.00 | 0.698 |
| 69 67.55 mph Wind with 0.5" Ice | 0.51 | 0.81 | 0.00 | 0.00 | 0.00 | 29.52 | 30.06 | 52.0 | 48.00 | 0.578 |
| 50 mph Wind with 0" Ice | 0.43 | 0.41 | 0.00 | 0.00 | 0.00 | 14.74 | 15.19 | 52.0 | 48.00 | 0.292 |

# Base Plate Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT13548-S-SB | **Code:** | EIA/TIA-222-F | 7/10/2015 | |
| **Site Name:** | Bloomfield 4 | **Exposure:** | C | | |
| **Height:** | 140.00 (ft) | **Gh:** | 1.69 | | |
| **Base Elev:** | 0.000 (ft) | **Struct Class:** | II | Page: 23 | |

Tower Engineering Solutions

| Reactions | | Base Plate | | Anchor Bolts | |
|---|---|---|---|---|---|
| Original Design | | **Yield (ksi):** | 50.00 | **Bolt Circle:** | 57.88 |
| **Moment (kip-ft):** | 4028.20 | **Width (in):** | 61.50 | **Number Bolts:** | 24.00 |
| **Axial (kip):** | 95.10 | **Style:** | Round | **Bolt Type:** | 1.5" F1554 105 |
| **Shear (kip):** | 38.70 | **Polygon Sides:** | 0.00 | **Bolt Diameter (in):** | 1.50 |
| | | **Clip Length (in):** | 0.00 | **Yield (ksi):** | 105.00 |
| Analysis | | | | **Ultimate (ksi):** | 125.00 |
| **Moment (kip-ft):** | 2273.87 | **Effective Len (in):** | 9.48 | **Arrangement:** | Radial |
| **Axial (kip):** | 32.33 | **Moment (kip-in):** | 195.00 | **Cluster Dist (in):** | 0.00 |
| **Shear (kip):** | 23.22 | **Allow Stress (ksi):** | 50.00 | **Start Angle (deg):** | 0.00 |
| | | **Applied Stress (ksi):** | 30.84 | | |
| **Moment Design %:** | 56.45 | **Stress Ratio:** | 0.62 | Compression | |
| | | | | **Force (kip):** | 79.92 |
| | | | | **Allowable (kip):** | 118.44 |
| | | | | **Ratio:** | 0.67 |
| | | | | Tension | |
| | | | | **Force (kip):** | 77.22 |
| | | | | **Allowable (kip):** | 97.19 |
| | | | | **Ratio:** | 0.79 |

# Monopole Mat Foundation Design

| | | | |
|---|---|---|---|
| | | | Date: 7/10/2015 |
| Customer Name: | Verizon | EIA/TIA Standard: | EIA-222-F |
| Site Name: | Bloomfield 4 | Structure Height (Ft.): | 140 |
| Site Nmber: | CT13548-S-SBA | Engineer Name: | W. Velez |
| Engr. Number: | 16421 | Engineer Login ID: | TES |

**Foundation Info Obtained from:** Drawings/Calculations

**Structure Type:** Monopole

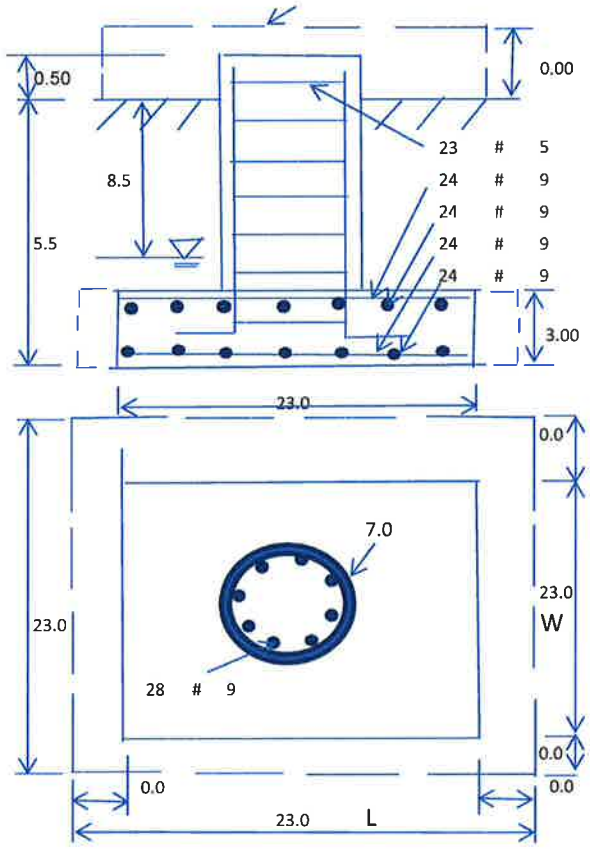
**Analysis or Design?** Analysis

**Base Reactions (Unfactored)**

| | | | |
|---|---|---|---|
| Axial Load (Kips): | 32.3 | Shear Force (Kips): | 23.2 |
| Uplift Force (Kips): | 0.0 | Moment (Kips-ft): | 2273.9 |

**Foundation Geometries:**

| | | | |
|---|---|---|---|
| | | Mods required -Yes/No ?: | No |
| Diameter of Pier (ft.): | 7.0 | Depth of Base BG (ft.): | 5.5 |
| Pier Height A. G. (ft.): | 0.50 | Thickness of Pad (ft): | 3.00 |
| Length of Pad (ft.): | 23 | Width of Pad (ft.): | 23 |
| Final Length of pad (ft) | 23.0 | Final width of pad (ft): | 23.0 |
| Control Value for Cell D18: | 0 | Control Value for Cell F18: | 0 |




**Material Properties and Reabr Info:**

| | | | | |
|---|---|---|---|---|
| Concrete Strength (psi): | 4000 | Steel Elastic Modulus: | 29000 | ksi |
| Vertical bar yield (ksi) | 60 | Tie steel yield (ksi): | 60 | |
| Vertical Rebar Size #: | 9 | Tie / Stirrup Size #: | 5 | |
| Qty. of Vertical Rebars: | 28 | Tie Spacing (in): | 3.0 | |
| Pad Rebar Yield (Ksi): | 60 | Pad Steel Rebar Size (#): | 9 | |
| Concrete Cover (in.): | 3 | Unit Weight of Concrete: | 150.0 | pcf |
| Rebar at the bottom of the concrete pad: | | | | |
| Qty. of Rebar in Pad (L): | 24 | Qty. of Rebar in Pad (W): | 24 | |
| Rebar at the top of the concrete pad: | | | | |
| Qty. of Rebar in Pad (L): | 24 | Qty. of Rebar in Pad (W): | 24 | |

**Soil Design Parameters:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Soil Unit Weight (pcf): | 115.0 | Soil Buoyant Weight: | 64.1 | Pcf | | |
| Water Table B.G.S. (ft): | 8.5 | Unit Weight of Water: | 62.4 | pcf | Angle from Top of Pad: | 30 |
| Allowable Net Soil Bearing (psf): | 3000 | Allowable Skin Friction: | 0 | Psf | Angle from Bottm of Pad: | 25 |
| Consider Friction for O.T.M. (Y/N): | No | Consider Friction for bearing (Y/N): | No | | Angle from Bottm of Pad: | 25 |
| Consider soil hori. force for O.T.M.: | Yes | Reduction factor on the maximum soil bearing pressure: | | | 1.00 | |

**Foundation Analysis and Design:**

| | | | |
|---|---|---|---|
| Total Dry Soil Volume (cu. Ft.): | 1226.29 | Total Dry Soil Weight (Kips): | 141.02 |
| Total Buoyant Soil Volume (cu. Ft.): | 0.00 | Total Buoyant Soil Weight (Kips): | 0.00 |
| Total Effective Soil Weight (Kips): | 141.02 | Weight from the Concrete Block at Top (K): | 0.00 |
| Total Dry Concrete Volume (cu. Ft.): | 1702.45 | Total Dry Concrete Weight (Kips): | 255.37 |
| Total Buoyant Concrete Volume (cu. Ft.): | 0.00 | Total Buoyant Concrete Weight (Kips): | 0.00 |
| Total Effective Concrete Weight (Kips): | 255.37 | Total Vertical Load on Base (Kips): | 428.72 |

**Check Soil Capacities:**

| | | | | | Load/ Capacity Ratio | |
|---|---|---|---|---|---|---|
| Calculated Maxium Net Soil Pressure under the base (psf): | 2099 | < | Allowable Soil Bearing (psf): | 3000 | 0.70 | OK! |
| Allowable Foundation Overturning Resistance (SF=1.5, kips-ft.): | 3286.9 | > | Applied Momont (kips-ft): | 2379 | 0.72 | OK! |
| Factor of Safety Against Overturning (O. R. Moment/Design Moment): | 2.07 | OK! | | | | |

**Check the capacities of Reinforceing Concrete:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Strength reduction factor (Flexure and axial tension): | 0.90 | | Strength reduction factor (Shear): | 0.75 | | |
| Strength reduction factor (Axial compresion): | 0.65 | | Wind Load Factor on Concrete Design: | 1.30 | | |
| | | | | | Capacity Ratio | |
| (1) Concrete Pier: | | | | | | |
| Vertical Steel Rebar Area (sq. in./each): | 1.00 | | Tie / Stirrup Area (sq. in./each): | 0.31 | | |
| Calculated Moment Capacity (Mn,Kips-Ft): | 4737.7 | > | Design Factored Moment (Mu, Kips-Ft | 3046.5 | 0.64 | OK! |
| Calculated Shear Capacity (Kips): | 1359.0 | > | Design Factored Shear (Kips): | 30.2 | 0.02 | OK! |
| Calculated Tension Capacity (Tn, Kips): | 1512.0 | > | Design Factored Tension (Tu Kips): | 0.0 | 0.00 | OK! |
| Calculated Compression Capacity (Pn, Kips): | 9748.3 | > | Design Factored Axial Load (Pu Kips): | 42.0 | 0.00 | OK! |
| Moment & Axial Strength Combination(Pu/Pn+Mu/Mn): | 0.65 | OK! | Check Tie Spacing (Design/Required): | | 0.25 | OK! |
| Pier Reinforcement Ratio: | 0.005 | | Reinforcement Ratio is too small | | | |
| (2).Concrete Pad: | | | | | | |
| One-Way Design Shear Capacity (L-Direction, Kips): | 849.3 | > | One-Way Factored Shear (L-D. Kips): | 180.9 | 0.21 | OK! |
| One-Way Design Shear Capacity (W-Direction, Kips): | 849.3 | > | One-Way Factored Shear (W-D., Kips) | 180.9 | 0.21 | OK! |
| One-Way Design Shear Capacity (Corner-Corner. Kips): | 942.6 | > | One-Way Factored Shear (C-C, Kips): | 313.9 | 0.33 | OK! |
| Lower Steel Pad Reinforcement Ratio (L-Direct. ): | 0.0027 | OK! | Lower Steel Pad Reinf. Ratio (W-Direc | 0.0027 | | |
| Lower Steel Pad Moment Capacity (L-Direction. Kips-ft): | 3420.4 | > | Moment at Bottom ( L-Direct. K-Ft): | 368.5 | 0.11 | OK! |
| Lower Steel Pad Moment Capacity (W-Direction. Kips-ft): | 3420.4 | > | Moment at Bottom ( W-Direct. K-Ft): | 368.5 | 0.11 | OK! |
| Lower Steel Pad Moment Capacity (Corner-Corner,K-ft): | 4805.0 | > | Moment at Bottom ( C-C Dir. K-Ft): | 521.1 | 0.11 | OK! |
| Upper Steel Pad Reinforcement Ratio (L-Direct. ): | 0.0027 | OK! | Upper Steel Reinf. Ratio (W-Direct. ): | 0.0027 | | |
| Upper Steel Pad Moment Capacity (L-Direction. Kips-ft): | 3420.4 | > | Moment at the top (L-Dir Kips-Ft): | 493.6 | 0.14 | OK! |
| Upper Steel Pad Moment Capacity (W-Direction. Kips-ft): | 3420.4 | > | Moment at the top (W-Dir Kips-Ft): | 493.6 | 0.14 | OK! |
| Upper Steel Pad Moment Capacity (Corner-Corner. K-ft): | 4805.0 | > | Moment at the top (C-C Direc. K-Ft): | 480.9 | 0.10 | OK! |

# Pier Foundation Design For Monopole

| | | | |
|---|---|---|---|
| Date | 7/10/2015 | | |
| Customer Name: | Verizon | EIA/TIA Standard: | EIA-222-F |
| Site Name: | Bloomfield 4 | Structure Height (Ft.): | 140 |
| Site Number: | CT13548-S-SBA | Engineer Name: | W. Velez |
| Engr. Number: | 16421 | Engineer Login ID: | |

**Foundation Info Obtained from:** Drawings/Calculations

**Structure Type:** Monopole

**Analysis or Design?** Analysis

**Base Reactions (Unfactored)**

| | | | |
|---|---|---|---|
| Axial Load (Kips): | 32.3 | Shear Force (Kips): | 23.2 |
| Uplift Force (Kips): | 0.0 | Moment (Kips-ft): | 2273.9 |

**Foundation Geometries:**

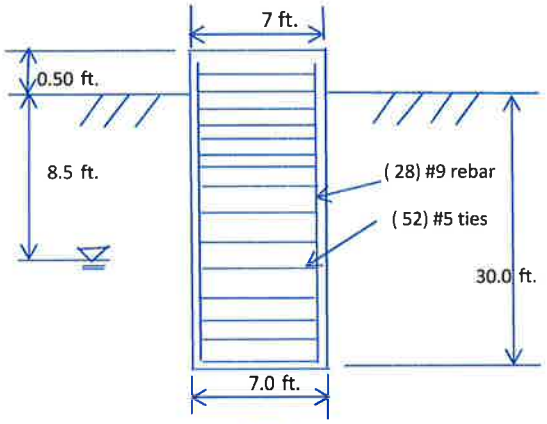
| | | | | |
|---|---|---|---|---|
| Mods required -Yes/No ?: | No | | | ft. |
| Diameter of Pier (ft.): | 7.0 | Depth of Base B. G. S. : | 30.0 | ft. |
| Pier Height A. G. (ft.): | 0.50 | | | |

**Material Properties and Reabr Info:**

| | | | | |
|---|---|---|---|---|
| Concrete Strength (psi): | 4000 | Steel Elastic Modulus: | 29000 | ksi |
| Vertical bar yield (ksi) | 60 | Tie steel yield strength: | 60 | ksi |
| Vertical Rebar Size #: | 9 | Tie / Stirrup Size #: | 5 | |
| Qty. of Vertical Rebars: | 28 | Tie Spacing: | 8.0 | in. |
| Concrete Cover (in.): | 3 | Concrete unit weight: | 150.0 | pcf |

**Soil Design Parameters:**

| | | | | |
|---|---|---|---|---|
| Water Table B.G.S. (ft): | 8.5 | Unit weight of water: | 62.4 | psf |
| Ratio of Uplift/Axial Skin Friction: | 1.0 | Pullout failure Angle: | 30 | (°) |
| Skin Frictions are to be obtained from: | | Soil Report | | |




Monopole Pier Foundation

| Depth of Layers (ft) Top | Depth of Layers (ft) Bottom | $\gamma_{soil}$ (pcf) | ϕ (°) | Cohesion (psf) | Allowable Skin Friction (psf) | Allowable Bearing (psf) | Soil Types |
|---|---|---|---|---|---|---|---|
| 0.0 | 4.0 | 110 | 10 | 0 | 0 | 0 | Sand |
| 4.0 | 8.0 | 115 | 33 | 0 | 200 | 0 | Sand |
| 8.0 | 15.0 | 115 | 33 | 0 | 275 | 0 | Sand |
| 15.0 | 26.0 | 115 | 33 | 0 | 400 | 0 | Sand |
| 26.0 | 31.0 | 115 | 33 | 0 | 550 | 3000 | Sand |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Soil weight Increase Factor for bouyant soils (1.0 to 1.15): 1.1

**Foundation Analysis and Design:**

| | | | | |
|---|---|---|---|---|
| Total Dry Soil Volume from Conical Failure (cu. Ft.): | 8715 | Dry Soil Weight from Conical Failure: | 982 | Kips |
| Total Buoyant Soil Volume from Conical Failure (cu. Ft.): | 6404 | Buoyant Soil Weight from Conical Failure (K | 447 | Kips |
| Total Dry Concrete Volume (cu. Ft.): | 346 | Total Dry Concrete Weight: | 52.0 | Kips |
| Total Buoyant Concrete Volume (cu. Ft.): | 827.4 | Total Buoyant Concrete Weight: | 72.48 | Kips |
| Total Effective Concrete Weight (Kips): | 124.4 | Total Effective Soil Weight: | 1429.1 | Kips |
| Total Effective Vertical Load on Base (Kips): | 62.1 | | | |

**Check Soil Capacities:**

| | | | | | Usage | |
|---|---|---|---|---|---|---|
| Allowable Foundation Overturning Resistance (kips-ft.): | 6771.9 | > | Applied Momont (kips-ft): | 2739 | 0.40 | OK! |
| Factor of Safety of Passive Soil Resistance against Moment: | 4.95 | OK! | | | | |

**Check the capacities of Reinforceing Concrete:**

| | | | | | Usage | |
|---|---|---|---|---|---|---|
| Strength reduction factor (Flexure and axial tension): | 0.90 | | Strength reduction factor (Shear): | 0.75 | | |
| Strength reduction factor (Axial compresion): | 0.65 | | Wind Load Factor on Concrete Design: | 1.30 | | |
| Reinforcing Concrete Pier: | | | | | | |
| Vertical Steel Rebar Area (sq. in./each): | 1.00 | | Tie / Stirrup Area (sq. in./each): | 0.31 | | |
| Calculated Moment Capacity (Mn,Kips-Ft): | 4738 | > | Design Factored Moment (Mu, K-Ft): | 3093.6 | 0.65 | OK! |
| Calculated Shear Capacity (Kips): | 1022.2 | > | Design Factored Shear (Kips): | 269.6 | 0.26 | OK! |
| Calculated Tension Capacity (Tn, Kips): | 1512.0 | > | Design Factored Tension (Tu Kips): | 0.0 | 0.00 | OK! |
| Calculated Compression Capacity (Pn, Kips): | 9748 | > | Design Factored Axial Load (Pu Kips): | 42.0 | 0.00 | OK! |
| Moment & Axial Strength Combination(Tu/Tn+Mu/Mn): | 0.66 | OK! | Max. Allowable Tie/Stirrup Spacing: | 12.00 | in. | |
| Pier Reinforcement Ratio: | 0.005 | | Reinforcement Ratio is too small | | | |