*Filed by:*
*Kri Pelletier, Property Specialist - SBA Communications*
*134 Flanders Rd., Suite 125, Westborough, MA 01581*
*508.251.0720 x 3804 - kpelletier@sbasite.com*

October 12, 2018

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

**Application for Tower Share**
**1214 Farmington Ave., Bristol, CT 06010**
**41 41 43.7 N / -72 54 5.97 W**
**T-Mobile #: CTHA272A _NSD**

Dear Ms. Bachman:

Please accept this letter as notification pursuant to Connecticut General Statutes § 16-50aa and R.C.S.A § 16-50j-88 of T-Mobile's Application for Tower Sharing at the existing 150-foot Monopole Tower at 1214 Farmington Ave in Bristol, CT.

Per the requirements under R.C.S.A §16-50j-89 please find the following statements in support of T-Mobile's Application:

1. **Facility and Proposed Modifications**

   A. **Existing Facility and Appurtenances**
   - Application #1707 was made for Special Permit for a public utility facility (telecommunications tower) by Nextel Communications of the Mid-Atlantic to the Bristol Planning and Zoning Commission on June 5, 2000
   - Special Permit Approval was issued August 9, 2000, by the Bristol Zoning Commission, with the stipulation that the facility be located in the Southeast corner of the subject property
   - Zoning Permit #14412 was issued for a 150' monopole tower on October 20, 2000
   - Building Permit #69666 was issued for a 150' tower on October 23, 2000
   - A Certificate of Use was issued July 2, 2001
   - Latitude / Longitude: 41 41 43.7 N / -72 54 5.97 W
   - Assessors Map 46-Lot 72A-3-Zoned BG
   - Height of Tower: 150'
   - Owned/operated by: SBA Steel II, LLC
   - Property Owner: Route 6 Developers, LLC, c/o Developers Realty Corp.
   - Size/Components of existing equipment compound:
     - 100' x 25' fenced compound (6' tall chain link fence with barbed wire and plastic slats) with double gate access:
       - Monopole [center of compound]
       - 30'x30' concrete pad w/in compound with:
         - (Abandoned) Nextel shelter [North of monopole w/in compound]
         - Clearwire equipment [North of monopole w/in compound]

- Sprint ice bridge/ice bridge base plate/post
- Underground Telco Box [Northeast of monopole w/in compound]
- Meter Bank [Northeast of monopole w/in compound - T-Mobile to connect at leased area w/in compound]
- Transformer [Northeast of monopole outside of compound]
- Utility Pole [Northeast of monopole outside of compound]

➢ Components of existing tower:

- Sprint / Clearwire:
  - 140'
    - (3) NNVV-65B-R4 – Panel Antennas
    - (3) AAHC - Panel Antennas
    - (3) ALU 1900 Mhz RRUs
    - (6) ALU 800 Mhz RRUs
    - (3) Dragonwave Dishes
    - (1) Platform with Hand Rail (RMQR-4096-HK)
    - (3) 1-1/4" fiber
    - (1) 1.689" fiber
    - (3) 1/2" lines
- Sprint / Nextel:
  - 150'
    - (12) Andrew - DB844H90E-XY – Panel Antennas
    - (1) Low Profile Platform
    - (12) 1-1/4" lines

**B. Nature and Extent of Proposed Modifications**

T-Mobile proposes to install (9) panel antennas at the 130-foot level of the existing 150-foot Monopole Tower and occupy a ground lease area of 10' x 20' within the existing fenced compound. T-Mobile's full proposed scope of work is as follows:

Remove: None

Remove and Replace: None

Install:

**Tower:**

*At 130'*

- (3) RFS APXVAARR24_43-U-A20 – Panel Antennas
- (3) RFS APX16DWV-16DWV-S-EA20 (Quad) – Panel Antennas
- (3) Ericsson AIR3246 B66 (Octa) – Panel Antennas
- (3) Ericsson AIR 5122 28GHz – Panel Antennas (entitlements only / **future installation**)
- (1) Commscope SHP2-13 Dish (entitlements only / **future installation**)
- (3) Ericsson Radio 4415 B25
- (3) Ericsson Radio 4449 B71 + B12
- (3) Ericsson Radio 2217 B66A
- (1) SitePro Platform F3P-10W with SitePro F3P-HRK10 Handrail Kit
- (3) 1-5/8" fiber
- (1) ½" line

Ground: ***(no change to existing compound size or area-all work within T-Mobile's leased space within compound)***

- (1) AAV Purcell cabinet on proposed H-Frame
- (1) RBS 6102 cabinet on existing concrete pad
- (1) PPC (on proposed H-Frame)
- (1) GPS Antenna (ground mount to Ice Bridge post)
- (1) Ice Bridge
- (1) DC/Alarm Interconnect kit
- Underground Telco / Electric

Existing Equipment to Remain: None

**C. This Proposal is technically, legally, environmentally, and economically feasible and meets public safety concerns per Connecticut General Statute Section 16-50aa.**

T-Mobile proposes to collocate at the above-referenced existing telecommunication facility rather than to require additional tower construction. The 1214 Farmington Avenue site sits in a heavily trafficked area of Bristol serving portions of Routes 6, 69, 72 and 177 along with local roads within their proximity. Since the site was built, wireless technology has flourished, resulting in greatly increased consumer usage and data transfer. One carrier is currently on the tower.

The proposed collocation meets with all legal and technical requirements. This Application contains all required information and statements per R.C.S.A §16-50j-89 and the proposed installation has been drafted per current code, and studied with regard to structural feasibility and RF emissions output. Drawings and Reports are attached. T-Mobile's proposed collocation presents no known material changes to environmental conditions from those as documented in initial Application #1707 for Special Permit and presents no known public safety concerns.

2. Engineering Drawings per the requirements under R.C.S.A. §16-50j-89 are enclosed herewith.

3. An Engineering / Structural Analysis per the requirements under R.C.S.A. §16-50j-89 is enclosed herewith.

4. A Letter from SBA, as Owner of the Facility, agreeing to the proposed shared use of the facility, is enclosed herewith.

5. Description of any potential environmental impact associated with the proposed shared use, including, but not limited to, visibility, wetlands and water resources, air quality and noise. Sources of noise shall be identified and in compliance with state and local noise control regulations.

    A. T-Mobile's collocation will not have any significant adverse visual impact on the surrounding areas. The antennas should result in only marginal additional equipment visibility from areas that already have views of the existing tower. The proposed work would not require any Federal Aviation Administration obstruction marking or lighting.

    B. The proposed collocation does not affect or alter the existing site with regard to wetlands, water resources or air quality.

The proposed work is not thought to have any substantial adverse environmental impact. Public Need for the additional coverage outweighs any minor environmental effects that would result from the construction, operation, and maintenance of the proposed collocation.

6. A Power Density / RF Report per the requirements under R.C.S.A. §16-50j-89 is enclosed herewith.

    A. The operation of T-Mobile's new antennas will not increase the total radio frequency electromagnetic power density at the site to a level at or above the applicable standards. The anticipated Maximum Composite contributions from the T-Mobile facility are only 5.39% of the allowable FCC established general public limit. The anticipated composite MPE value for this site assuming all carriers present is 5.77% of the allowable FCC established general public limit sampled at the ground level.

7. An original and fifteen copies of this Tower Share Application are being submitted along with a $625 filing fee per Conn. Gen. Stat. §4-189j; Regs., Conn. State Agencies §16-50v-1a.
    A. A copy of this Application and all attachments is being sent to:
        i. The City of Bristol's Mayor, Ellen Zoppo-Sassu
        ii. The City of Bristol's Zoning Enforcement Officer, Monica Holloway
        iii. The Landowner, Route 6 Developers, LLC
        iv. (Separate notice is not being sent to tower owner, as it belongs to SBA)

Please note, additionally: 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 structure.
2. The proposed modification will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.
5. The proposed modification will not cause a significant change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

T-Mobile respectfully submits for the Council's review and approval this Application for Tower Share.

Sincerely,

Kri Pelletier
Property Specialist
SBA COMMUNICATIONS CORPORATION
134 Flanders Rd., Suite 125
Westborough, MA 01581
508.251.0720 x3804 + T / 508.366.2610 + F / 203.446.7700 + C
kpelletier@sbasite.com
Attachments

cc: The Honorable Ellen Zoppo-Sassu / with attachments
*City of Bristol, Office of the Mayor, 111 North Main Street, Bristol, CT 06010*
Monica Holloway, Zoning Enforcement Officer / with attachments
*City of Bristol, Zoning Office, 111 North Main Street, Bristol, CT 06010*
Route 6 Developers, LLC / with attachments
*c/o Developers Realty Corp., 1224 Mill Street, Building D, Suite 103, East Berlin, CT 06023*

## POWER DENSITY

### T-Mobile Site Inventory and Power Data

| Sector: | A | Sector: | B | Sector: | C |
|---|---|---|---|---|---|
| Antenna #: | 1 | Antenna #: | 1 | Antenna #: | 1 |
| Make / Model: | Ericsson AIR3246 B66 | Make / Model: | Ericsson AIR3246 B66 | Make / Model: | Ericsson AIR3246 B66 |
| Gain: | 15.9 dBd | Gain: | 15.9 dBd | Gain: | 15.9 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 2100 MHz (AWS) | Frequency Bands | 2100 MHz (AWS) | Frequency Bands | 2100 MHz (AWS) |
| Channel Count | 4 | Channel Count | 4 | Channel Count | 4 |
| Total TX Power(W): | 240 | Total TX Power(W): | 240 | Total TX Power(W): | 240 |
| ERP (W): | 9,337.08 | ERP (W): | 9,337.08 | ERP (W): | 9,337.08 |
| Antenna A1 MPE% | **2.18** | Antenna B1 MPE% | **2.18** | Antenna C1 MPE% | **2.18** |
| Antenna #: | 2 | Antenna #: | 2 | Antenna #: | 2 |
| Make / Model: | RFS APX16DWV-16DWVS-E-A20 | Make / Model: | RFS APX16DWV-16DWVS-E-A20 | Make / Model: | RFS APX16DWV-16DWVS-E-A20 |
| Gain: | 16.3 dBd | Gain: | 16.3 dBd | Gain: | 16.3 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 1900 MHz (PCS) | Frequency Bands | 1900 MHz (PCS) | Frequency Bands | 1900 MHz (PCS) |
| Channel Count | 2 | Channel Count | 2 | Channel Count | 2 |
| Total TX Power(W): | 120 | Total TX Power(W): | 120 | Total TX Power(W): | 120 |
| ERP (W): | 5,118.95 | ERP (W): | 5,118.95 | ERP (W): | 5,118.95 |
| Antenna A2 MPE% | **1.20** | Antenna B2 MPE% | **1.20** | Antenna C2 MPE% | **1.20** |
| Antenna #: | 3 | Antenna #: | 3 | Antenna #: | 3 |
| Make / Model: | RFS APXVAARR24_43-U-NA20 | Make / Model: | RFS APXVAARR24_43-U-NA20 | Make / Model: | RFS APXVAARR24_43-U-NA20 |
| Gain: | 16.35 / 12.95/ 13.35 dBd | Gain: | 16.35 / 12.95/ 13.35 dBd | Gain: | 16.35 / 12.95/ 13.35 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz | Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz | Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz |
| Channel Count | 6 | Channel Count | 6 | Channel Count | 6 |
| Total TX Power(W): | 180 | Total TX Power(W): | 180 | Total TX Power(W): | 180 |
| ERP (W): | 5,070.19 | ERP (W): | 5,070.19 | ERP (W): | 5,070.19 |
| Antenna A3 MPE% | **1.95** | Antenna B3 MPE% | **1.95** | Antenna C3 MPE% | **1.95** |

### Microwave Backhaul Data

| Make / Model: | Gain | Height (AGL): | Frequency Bands | Channel Count | Total TX Power(W) | ERP (W) | MPE % | Sector |
|---|---|---|---|---|---|---|---|---|
| Commscope SP2-13 | 33.85 dBd | 130 | 13 GHz | 1 | 1 | 2,426.61 | **0.06** | A |

### Site Summary Tables

| | |
|---|---|
| T-Mobile Sector A Total: | 5.39% |
| T-Mobile Sector B Total: | 5.33 % |
| T-Mobile Sector C Total: | 5.33 % |
| | |
| Site Total: | 5.77 % |

| Site Composite MPE% | |
|---|---|
| **Carrier** | **MPE%** |
| T-Mobile (Sector A) | **5.39 %** |
| Nextel | **0.28 %** |
| Clearwire / Sprint | **0.10 %** |
| **Site Total MPE %:** | **5.77 %** |

# T-Mobile Max Power Values (Sector A)

| T-Mobile _Max Power Values (Sector A) | # Channels | Watts ERP (Per Channel) | Height (feet) | Total Power Density ($\mu W/cm^2$) | Frequency (MHz) | Allowable MPE ($\mu W/cm^2$) | Calculated % MPE |
|---|---|---|---|---|---|---|---|
| T-Mobile AWS - 2100 MHz LTE | 4 | 2,334.27 | 130 | 21.83 | AWS - 2100 MHz | 1000 | 2.18% |
| T-Mobile AWS - 2100 MHz LTE | 2 | 2,559.48 | 130 | 11.97 | AWS - 2100 MHz | 1000 | 1.20% |
| T-Mobile AWS - 2100 MHz UMTS | 2 | 1,294.56 | 130 | 6.05 | AWS - 2100 MHz | 1000 | 0.61% |
| T-Mobile 600 MHz LTE | 2 | 591.73 | 130 | 2.77 | 600 MHz | 1000 | 0.69% |
| T-Mobile 700 MHz LTE | 2 | 648.82 | 130 | 3.03 | 700 MHz | 467 | 0.65% |
| T-Mobile 13 GHz Microwave | 1 | 2,426.61 | 130 | 0.57 | 13 GHz | 1000 | 0.06% |
| | | | | | | **Total:** | **5.39%** |


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# 1214 FARMINGTON AVE

| | | | |
|---|---|---|---|
| **Location** | 1214 FARMINGTON AVE | **Mblu** | 46/ / 72A-3/ / |
| **Acct#** | 0054445 | **Owner** | ROUTE 6 DEVELOPERS LLC |
| **Assessment** | $9,513,000 | **Appraisal** | $13,590,000 |
| **PID** | 1763 | **Building Count** | 3 |

## Current Value

| Appraisal | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2017 | $11,125,500 | $2,464,500 | $13,590,000 |
| **Assessment** | | | |
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2017 | $7,787,850 | $1,725,150 | $9,513,000 |

## Owner of Record

| | |
|---|---|
| **Owner** | ROUTE 6 DEVELOPERS LLC |
| **Co-Owner** | |
| **Address** | 1224 MILL ST, BLDG D, STE 103<br>EAST BERLIN, CT 06023-1159 |

| | |
|---|---|
| **Sale Price** | $0 |
| **Certificate** | 1 |
| **Book & Page** | 1514/1092 |
| **Sale Date** | 09/08/2003 |
| **Instrument** | 00 |

## Ownership History

| Ownership History | | | | | |
|---|---|---|---|---|---|
| **Owner** | **Sale Price** | **Certificate** | **Book & Page** | **Instrument** | **Sale Date** |
| ROUTE 6 DEVELOPERS LLC | $0 | 1 | 1514/1092 | 00 | 09/08/2003 |
| EISENBAUM WAYNE+ ALLAN+ MARLA | $0 | | 1448/1117 | | 10/31/2002 |
| EISENBAUM WAYNE+ ALLAN+ MARLA | $0 | | 1044/ 346 | | 03/02/1992 |
| EISENBAUM WAYNE + MARLA | $0 | | 1023/ 480 | | 06/10/1991 |
| EISENBAUM ALAN+WAYNE+MARLA | $0 | | 1023/ 478 | | 06/07/1991 |

## Building Information

### Building 1 : Section 1

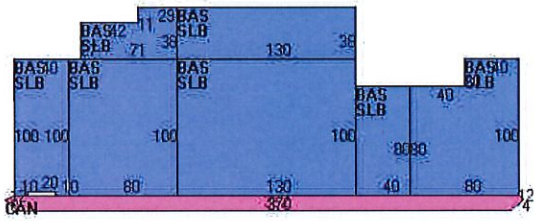
| | |
|---|---|
| **Year Built:** | 1964 |
| **Living Area:** | 42,516 |
| **Replacement Cost:** | $4,602,769 |
| **Building Percent Good:** | 67 |
| **Replacement Cost Less Depreciation:** | $3,083,900 |

**Building Photo**

| Building Attributes | |
|---|---|
| **Field** | **Description** |
| STYLE | Shop Center |
| MODEL | Comm/Ind |
| Stories: | 1 |
| Occupancy | 6 |
| Exterior Wall 1 | Stucco/Masonry |
| Exterior Wall 2 | Concr/Cinder |
| Roof Structure | Flat |
| Roof Cover | T+G/Rubber |
| Interior Wall 1 | Drywall/Sheetr |
| Interior Wall 2 | |
| Interior Floor 1 | Carpet |
| Interior Floor 2 | Vinyl/Asphalt |
| Heating Fuel | Propane Gas |
| Heating Type | Forced Air-Duc |
| AC Type | Central |
| Bldg Use | Shopping Ctr |
| Bedrooms | |
| Full Baths | |
| Half Baths | |
| 1st Floor Use: | |
| Heat/AC | Heat/AC Pkgs |
| Frame Type | Masonry |
| Baths/Plumbing | Average |
| Ceiling/Wall | Sus-Ceil & WL |
| Rooms/Prtns | Average |
| Wall Height | 18 |
| % Comn Wall | |

(http://images.vgsi.com/photos2/BristolCTPhotos//\00\02\23/74.jpg)

**Building Layout**




| Building Sub-Areas (sq ft) | | | Legend |
|---|---|---|---|
| **Code** | **Description** | **Gross Area** | **Living Area** |
| BAS | First Floor | 42,516 | 42,516 |
| CAN | Canopy | 4,093 | 0 |
| SLB | Slab | 42,516 | 0 |
| | | 89,125 | 42,516 |

## Building 2 : Section 1

**Year Built:** 1964
**Living Area:** 70,720
**Replacement Cost:** $8,826,079
**Building Percent Good:** 57
**Replacement Cost Less Depreciation:** $5,030,900

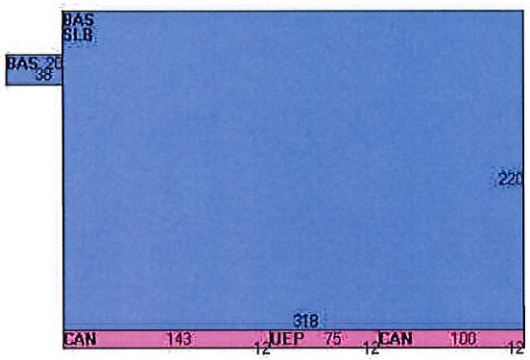
**Building Photo**

| Building Attributes : Bldg 2 of 3 | |
|---|---|
| **Field** | **Description** |
| STYLE | Supermarket |
| MODEL | Comm/Ind |
| Stories: | 1 |
| Occupancy | 2 |
| Exterior Wall 1 | Concr/Cinder |

| | |
|---|---|
| Exterior Wall 2 | |
| Roof Structure | Flat |
| Roof Cover | T+G/Rubber |
| Interior Wall 1 | Drywall/Sheetr |
| Interior Wall 2 | |
| Interior Floor 1 | Vinyl/Asphalt |
| Interior Floor 2 | |
| Heating Fuel | Oil |
| Heating Type | Forced Air-Duc |
| AC Type | Central |
| Bldg Use | Shopping Ctr |
| Bedrooms | |
| Full Baths | |
| Half Baths | |
| 1st Floor Use: | |
| Heat/AC | Heat/AC Pkgs |
| Frame Type | Masonry |
| Baths/Plumbing | Average |
| Ceiling/Wall | Sus-Ceil & WL |
| Rooms/Prtns | Average |
| Wall Height | 20 |
| % Comn Wall | |


0054445 04/29/2016
(http://images.vgsi.com/photos2/BristolCTPhotos//\00\05\42/23.jpg)

**Building Layout**




| Building Sub-Areas (sq ft) | | | Legend |
|---|---|---|---|
| **Code** | **Description** | **Gross Area** | **Living Area** |
| BAS | First Floor | 70,720 | 70,720 |
| CAN | Canopy | 2,916 | 0 |
| SLB | Slab | 69,960 | 0 |
| UEP | Porch, Enclosed, Unfinished | 900 | 0 |
| | | 144,496 | 70,720 |

**Building 3 : Section 1**

**Year Built:** 2003
**Living Area:** 20,772
**Replacement Cost:** $2,573,520
**Building Percent Good:** 92
**Replacement Cost Less Depreciation:** $2,367,600

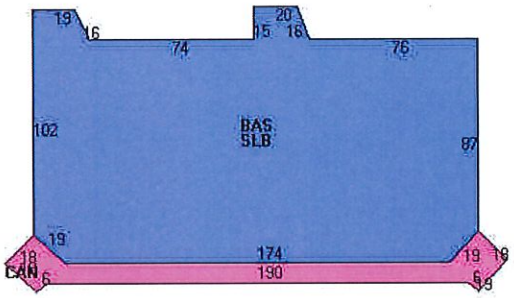
**Building Photo**

| Building Attributes : Bldg 3 of 3 | |
|---|---|
| **Field** | **Description** |
| STYLE | Shop Center |
| MODEL | Comm/Ind |
| Stories: | 1 |
| Occupancy | 9 |

| | |
|---|---|
| Exterior Wall 1 | Stucco/Masonry |
| Exterior Wall 2 | Concr/Cinder |
| Roof Structure | Flat |
| Roof Cover | T+G/Rubber |
| Interior Wall 1 | Drywall/Sheetr |
| Interior Wall 2 | |
| Interior Floor 1 | Carpet |
| Interior Floor 2 | Ceram Clay Til |
| Heating Fuel | Propane Gas |
| Heating Type | Forced Air-Duc |
| AC Type | Central |
| Bldg Use | Shopping Ctr |
| Bedrooms | |
| Full Baths | |
| Half Baths | |
| 1st Floor Use: | |
| Heat/AC | Heat/AC Pkgs |
| Frame Type | Masonry |
| Baths/Plumbing | Average |
| Ceiling/Wall | Sus-Ceil & WL |
| Rooms/Prtns | Average |
| Wall Height | 18 |
| % Comn Wall | |

(http://images.vgsi.com/photos2/BristolCTPhotos//\00\02\23/76.jpg)

**Building Layout**




| Building Sub-Areas (sq ft) | | | Legend |
|---|---|---|---|
| **Code** | **Description** | **Gross Area** | **Living Area** |
| BAS | First Floor | 20,772 | 20,772 |
| CAN | Canopy | 2,353 | 0 |
| SLB | Slab | 20,772 | 0 |
| | | 43,897 | 20,772 |

**Extra Features**

| Extra Features | | | | Legend |
|---|---|---|---|---|
| **Code** | **Description** | **Size** | **Value** | **Bldg #** |
| CNP3 | Bank Canopy | 96 S.F | $2,200 | 1 |
| SPR | Sprinklers | 20772 S.F. | $49,700 | 3 |
| OHD | Overhead Door | 6 Units | $0 | 1 |
| LDL1 | Load Leveler | 3 Units | $5,300 | 2 |
| SPR | Sprinklers | 42516 S.F. | $74,100 | 1 |
| NDP | Night Dep Box | 1 Units | $10,700 | 1 |
| OHD | Overhead Door | 4 Units | $0 | 2 |
| SPR | Sprinklers | 70720 S.F. | $112,900 | 2 |

## Land

### Land Use

| | |
|---|---|
| **Use Code** | 328 |
| **Description** | Shopping Ctr |
| **Zone** | BG |
| **Neighborhood** | |
| **Alt Land Appr** | No |
| **Category** | |

### Land Line Valuation

| | |
|---|---|
| **Size (Acres)** | 10.4 |
| **Frontage** | 483 |
| **Depth** | |
| **Assessed Value** | $1,725,150 |
| **Appraised Value** | $2,464,500 |

## Outbuildings

| Outbuildings | | | | | | Legend |
|---|---|---|---|---|---|---|
| **Code** | **Description** | **Sub Code** | **Sub Description** | **Size** | **Value** | **Bldg #** |
| PAV1 | Paving Asph. | | | 325000 S.F. | $341,300 | 1 |
| CELL | Cell Tower/Site | | | 1 UNITS | $0 | 1 |
| CB3 | PreCastConcCel | | | 240 S.F. | $43,200 | 2 |
| FN3 | Fence 6' | | | 250 L.F. | $1,900 | 2 |
| PAV2 | Paving Concrt | | | 900 S.F. | $1,800 | 2 |

## Valuation History

| Appraisal | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2017 | $11,125,500 | $2,464,500 | $13,590,000 |
| 2016 | $10,762,900 | $2,604,900 | $13,367,800 |
| 2015 | $10,762,900 | $2,604,900 | $13,367,800 |

| Assessment | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2017 | $7,787,850 | $1,725,150 | $9,513,000 |
| 2016 | $7,534,030 | $1,823,430 | $9,357,460 |
| 2015 | $7,534,030 | $1,823,430 | $9,357,460 |

July 26, 2018

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

RE: **Notice of Intent to Allow Shared Use of the Existing SBA Telecommunications Site**

| | |
|---|---|
| **Location:** | **1214 Farmington Ave., Bristol, CT** |
| TMO Site No: | CTHA272A_NSD |
| SBA Site No: | CT46136-A |

Dear Ms. Bachman:

Please let the following serve as Evidence of Intent to allow T-Mobile's shared use of the existing SBA telecommunications site at 1214 Farmington Avenue, Bristol, CT.

SBA Steel II, LLC ("Owner"), and T-Mobile Northeast LLC ("Tenant") are entering into a Site Lease Agreement. Tenant will be provided ground space within the existing site compound for its base station equipment and space at the height of 130' for antennas and associated equipment.

Thank you,

Rick Woods
*Site Development Manager*
SBA COMMUNICATIONS CORPORATION
134 Flanders Road, Suite 125
Westboro, MA 01581

508.251.0720 x3800 + T
508.366.2610 + F
508.614.0389 + C
rwoods@sbasite.com

EBI Consulting
environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CTHA272A

SBA Bristol East
1214 Farmington Avenue
Bristol, CT 06010

**September 11, 2018**

**EBI Project Number: 6218004523**

| Site Compliance Summary | |
|---|---|
| Compliance Status: | COMPLIANT |
| Site total MPE% of FCC general population allowable limit: | 5.77 % |

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

EBI Consulting
environmental | engineering | due diligence

September 11, 2018

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

Emissions Analysis for Site: **CTHA272A – SBA Bristol East**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **1214 Farmington Avenue, Bristol, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 600 MHz and 700 MHz Band are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$ respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 13 GHz Microwave bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

## CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **1214 Farmington Avenue, Bristol, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

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

1) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

2) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

3) 4 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

4) 2 LTE channels (600 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

5) 2 LTE channels (600 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

6) 1 microwave backhaul channel (13 GHz) was considered for the proposed facility. This channel has a transmit power of 1 Watt.

7) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

8) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

9) The antennas used in this modeling are the **Ericsson AIR3246 B66** & **RFS APX16DWV-16DWVS-E-A20** for 1900 MHz (PCS) and 2100 MHz (AWS) channels, the **RFS APXVAARR24_43-U-NA20** for 2100 MHz (AWS), 600 MHz and 700 MHz channels and the **Commscope SP2-13** for the proposed 13 GHz microwave backhaul. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

10) The antenna mounting height centerline of the proposed antennas (both panel antennas and microwave dish) is **130 feet** above ground level (AGL).

11) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

12) All calculations were done with respect to uncontrolled / general population threshold limits.

**T-Mobile Site Inventory and Power Data**

| Sector: | A | Sector: | B | Sector: | C |
|---|---|---|---|---|---|
| Antenna #: | **1** | Antenna #: | **1** | Antenna #: | **1** |
| Make / Model: | Ericsson AIR3246 B66 | Make / Model: | Ericsson AIR3246 B66 | Make / Model: | Ericsson AIR3246 B66 |
| Gain: | 15.9 dBd | Gain: | 15.9 dBd | Gain: | 15.9 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 2100 MHz (AWS) | Frequency Bands | 2100 MHz (AWS) | Frequency Bands | 2100 MHz (AWS) |
| Channel Count | 4 | Channel Count | 4 | Channel Count | 4 |
| Total TX Power(W): | 240 | Total TX Power(W): | 240 | Total TX Power(W): | 240 |
| ERP (W): | 9,337.08 | ERP (W): | 9,337.08 | ERP (W): | 9,337.08 |
| Antenna A1 MPE% | **2.18** | Antenna B1 MPE% | **2.18** | Antenna C1 MPE% | **2.18** |
| Antenna #: | **2** | Antenna #: | **2** | Antenna #: | **2** |
| Make / Model: | RFS APX16DWV-16DWVS-E-A20 | Make / Model: | RFS APX16DWV-16DWVS-E-A20 | Make / Model: | RFS APX16DWV-16DWVS-E-A20 |
| Gain: | 16.3 dBd | Gain: | 16.3 dBd | Gain: | 16.3 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 1900 MHz (PCS) | Frequency Bands | 1900 MHz (PCS) | Frequency Bands | 1900 MHz (PCS) |
| Channel Count | 2 | Channel Count | 2 | Channel Count | 2 |
| Total TX Power(W): | 120 | Total TX Power(W): | 120 | Total TX Power(W): | 120 |
| ERP (W): | 5,118.95 | ERP (W): | 5,118.95 | ERP (W): | 5,118.95 |
| Antenna A2 MPE% | **1.20** | Antenna B2 MPE% | **1.20** | Antenna C2 MPE% | **1.20** |
| Antenna #: | **3** | Antenna #: | **3** | Antenna #: | **3** |
| Make / Model: | RFS APXVAARR24_43-U-NA20 | Make / Model: | RFS APXVAARR24_43-U-NA20 | Make / Model: | RFS APXVAARR24_43-U-NA20 |
| Gain: | 16.35 / 12.95/ 13.35 dBd | Gain: | 16.35 / 12.95/ 13.35 dBd | Gain: | 16.35 / 12.95/ 13.35 dBd |
| Height (AGL): | 130 | Height (AGL): | 130 | Height (AGL): | 130 |
| Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz | Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz | Frequency Bands | 2100 MHz (AWS) / 600 MHz / 700 MHz |
| Channel Count | 6 | Channel Count | 6 | Channel Count | 6 |
| Total TX Power(W): | 180 | Total TX Power(W): | 180 | Total TX Power(W): | 180 |
| ERP (W): | 5,070.19 | ERP (W): | 5,070.19 | ERP (W): | 5,070.19 |
| Antenna A3 MPE% | **1.95** | Antenna B3 MPE% | **1.95** | Antenna C3 MPE% | **1.95** |

**Microwave Backhaul Data**

| Make / Model: | Gain | Height (AGL): | Frequency Bands | Channel Count | Total TX Power(W) | ERP (W) | MPE % | Sector |
|---|---|---|---|---|---|---|---|---|
| Commscope SP2-13 | 33.85 dBd | 130 | 13 GHz | 1 | 1 | 2,426.61 | **0.06** | A |

## Site Summary Tables

| Site Composite MPE% | |
|---|---|
| **Carrier** | **MPE%** |
| T-Mobile (Sector A) | **5.39 %** |
| Nextel | **0.28 %** |
| Clearwire / Sprint | **0.10 %** |
| **Site Total MPE %:** | **5.77 %** |

| | |
|---|---|
| T-Mobile Sector A Total: | 5.39% |
| T-Mobile Sector B Total: | 5.33 % |
| T-Mobile Sector C Total: | 5.33 % |
| | |
| Site Total: | 5.77 % |

## T-Mobile Max Power Values (Sector A)

| T-Mobile _Max Power Values (Sector A) | # Channels | Watts ERP (Per Channel) | Height (feet) | Total Power Density ($\mu W/cm^2$) | Frequency (MHz) | Allowable MPE ($\mu W/cm^2$) | Calculated % MPE |
|---|---|---|---|---|---|---|---|
| T-Mobile AWS - 2100 MHz LTE | 4 | 2,334.27 | 130 | 21.83 | AWS - 2100 MHz | 1000 | 2.18% |
| T-Mobile AWS - 2100 MHz LTE | 2 | 2,559.48 | 130 | 11.97 | AWS - 2100 MHz | 1000 | 1.20% |
| T-Mobile AWS - 2100 MHz UMTS | 2 | 1,294.56 | 130 | 6.05 | AWS - 2100 MHz | 1000 | 0.61% |
| T-Mobile 600 MHz LTE | 2 | 591.73 | 130 | 2.77 | 600 MHz | 1000 | 0.69% |
| T-Mobile 700 MHz LTE | 2 | 648.82 | 130 | 3.03 | 700 MHz | 467 | 0.65% |
| T-Mobile 13 GHz Microwave | 1 | 2,426.61 | 130 | 0.57 | 13 GHz | 1000 | 0.06% |
| | | | | | | **Total:** | **5.39%** |

## Summary

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

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

| T-Mobile Sector | Power Density Value (%) |
|---|---|
| Sector A: | 5.39 % |
| Sector B: | 5.33 % |
| Sector C: | 5.33 % |
| T-Mobile Per Sector Maximum (Sector A): | 5.39 % |
| | |
| Site Total: | 5.77 % |
| | |
| Site Compliance Status: | **COMPLIANT** |

The anticipated composite MPE value for this site assuming all carriers present is **5.77%** of the allowable FCC established general population limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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

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

# Structural Analysis Report

**Existing 150 ft SUMMIT Monopole**

**Customer Name: SBA Communications Corp**

**Customer Site Number: CT46136-A**

**Customer Site Name: Bristol-east**

**Carrier Name: T-Mobile**

**Carrier Site ID / Name: CTHA272A / CTHA272A**

**Site Location: 1214 Farmington Ave.**

**Bristol, Connecticut**

**Hartford County**

**Latitude: 41.695472**

**Longitude: -72.901658**


8/1/18

## Analysis Result:

**Max Structural Usage: 33.7% [Pass]**

**Max Foundation Usage: 32% [Pass]**

**Additional Usage Caused by New Mount: 5.20%**

**Report Prepared By: Mariana Franco**

## Introduction

The purpose of this report is to summarize the analysis results on the 150 ft SUMMIT 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** | PJF, Job#: 29200-1543. Summit job#: 11622. dated 10/16/2000. |
| **Foundation Drawing** | PJF, Job#: 29200-1543. Summit job#: 11622. dated 10/16/2000. |
| **Geotechnical Report** | Diversified Technology Consultants. Dated 09/14/2000. |
| **Modification Drawings** | N/A |

## Analysis Criteria

The rigorous analysis was performed in accordance with the requirements and stipulations of the ANSI/TIA/EIA 222-G**.** 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.

| | |
|---|---|
| **Wind Speed Used in the Analysis:** | Ultimate Design Wind Speed $V_{ult}$ = 120.0 mph (3-Sec. Gust)/ Nominal Design Wind Speed $V_{asd}$ = 93.0 mph (3-Sec. Gust) |
| **Wind Speed with Ice:** | 50 mph (3-Sec. Gust) with 1" radial ice concurrent |
| **Operational Wind Speed:** | 60 mph + 0" Radial ice |
| **Standard/Codes:** | ANSI/TIA/EIA 222-G / 2012 IBC / 2016 Connecticut State Building Code |
| **Exposure Category:** | C |
| **Structure Class:** | II |
| **Topographic Category:** | 1 |
| **Crest Height:** | 0 ft |
| **Seismic Parameters:** | $S_S$ = 0.185g, $S_1$ = 0.064g |

This structural analysis is based upon the tower being classified as a Structure Class II; however, if a different classification is required subsequent to the date hereof, the tower classification will be changed to meet such requirement and a new structural analysis will be run.

## 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 |
|---|---|---|---|---|---|---|
| - | 150.0 | 12 | Andrew - DB844H90E-XY - Panel | Low Profile Platform | (12) 1-1/4" | *Sprint Nextel |
| 1 | 140.0 | 3 | NNVV-65B-R4 - Panel | Platform w/ Hand Rail (RMQR-4096-HK) | (3) 1-1/4 Fiber (1) 1.689" Fiber (3) 1/2" | Sprint- Clear |
| 2 | | 3 | AAHC - Panel | | | |
| 3 | | 3 | ALU 1900 Mhz RRUs | | | |
| 4 | | 6 | ALU 800 Mhz RRUs | | | |
| 5 | | 3 | Dragonwave - Dish | | | |

*Sprint Nextel is terminated at 150.0'. T-Mobile will remove the equipment at 150.0' as part of their install.

## 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 |
|---|---|---|---|---|---|---|
| 6 | 130.0 | 3 | RFS APXVAARR24_43-U-NA20 - Panel | (1) SitePro Platform FSP-10W w/ SitePro f#P-HRK10 Handrail Kit | (3) 1 5/8" Fiber (1) 1/2" | T-Mobile |
| 7 | | 3 | RFS APX16DWV-16DWV-S-EA20 (Quad) - Panel | | | |
| 8 | | 3 | Ericsson AIR3246 B66 (Octa) - Panel | | | |
| 9 | | 3 | Ericsson AIR 5122 28GHz - Panel | | | |
| 10 | | 1 | Commscope SHP2-13 - Dish | | | |
| 11 | | 3 | Ericsson Radio 4415 B25 | | | |
| 12 | | 3 | Ericsson Radio 4449 B71 + B12 | | | |
| 13 | | 3 | Ericsson Radio 2217 B66A | | | |

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: | **32.7%** | **33.4%** | **33.7%** |
| Pass/Fail | **Pass** | **Pass** | **Pass** |

## Foundations

| | Moment (Kip-Ft) | Shear (Kips) |
|---|---|---|
| Original Design Reactions | 6300.0 | 48.0 |
| Analysis Reactions | 2874.5 | 28.2 |
| Factored Reactions* | 8505.0 | 64.8 |
| % of Design Reactions | 33.8% | 43.6% |

* Per section 15.5.1 of the TIA-222-G standard, factored reactions were obtained by multiplying a 1.35 factor to the original design reactions.

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):

The maximum twist and sway of the microwave dishes under the operational wind speed as specified in the Analysis Criteria are listed in the table below:

| Elevation (ft) | Antenna / Dish | Carrier | Twist (deg) | Sway (deg) |
|---|---|---|---|---|
| 130.0 | Commscope SHP2-13 - Dish | T-Mobile | 0.001 | 0.492 |

It is recommended that the carriers review the twist and sway values of the microwave dishes.

## 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/EIA 222-G Standard under the design basic wind speed as 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 and/or 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 Ratio 32.68% at 0.0ft

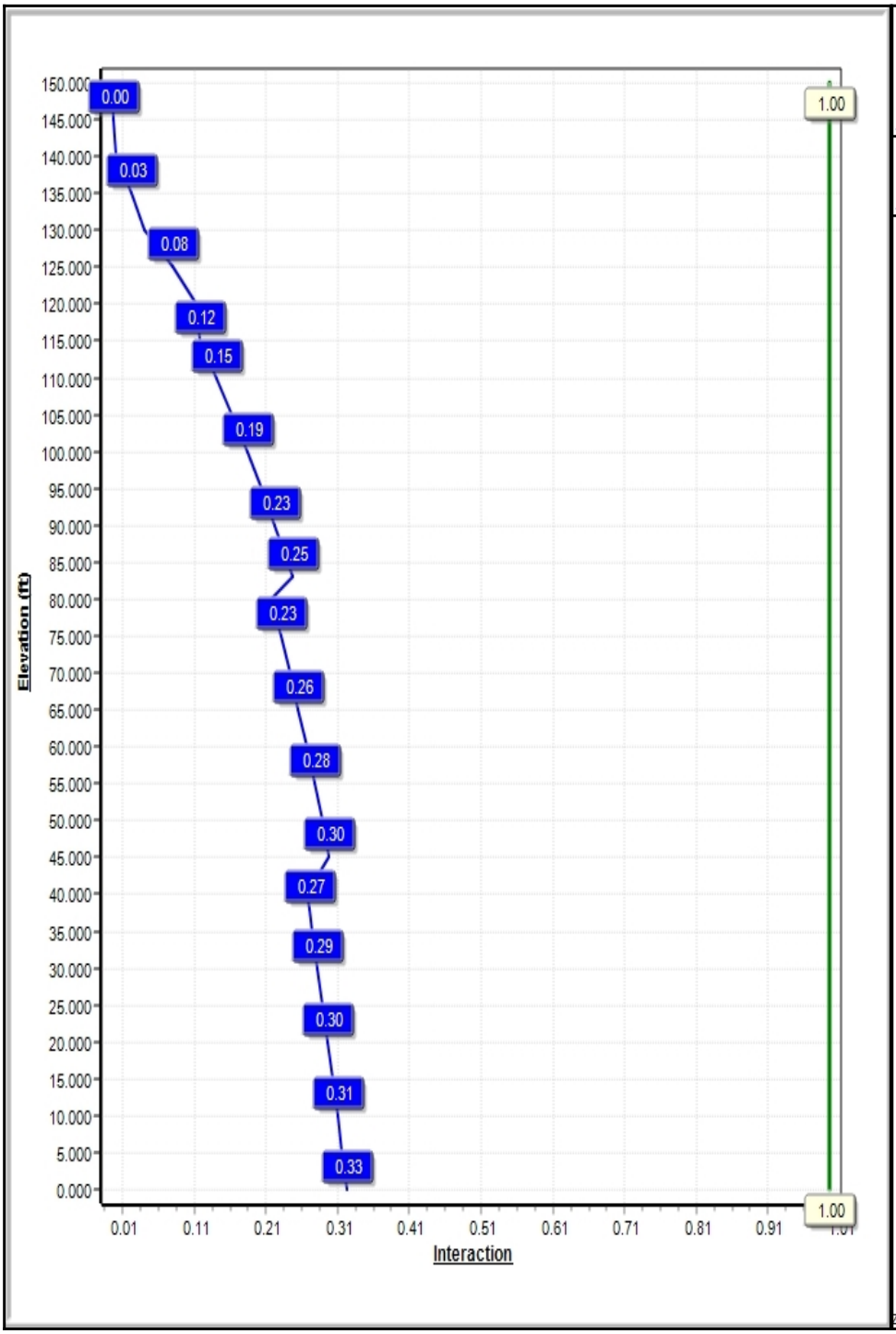
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Gh:** | 1.1 | | |
| **Base Elev:** | 0.000 (ft) | | | Page: 1 | |

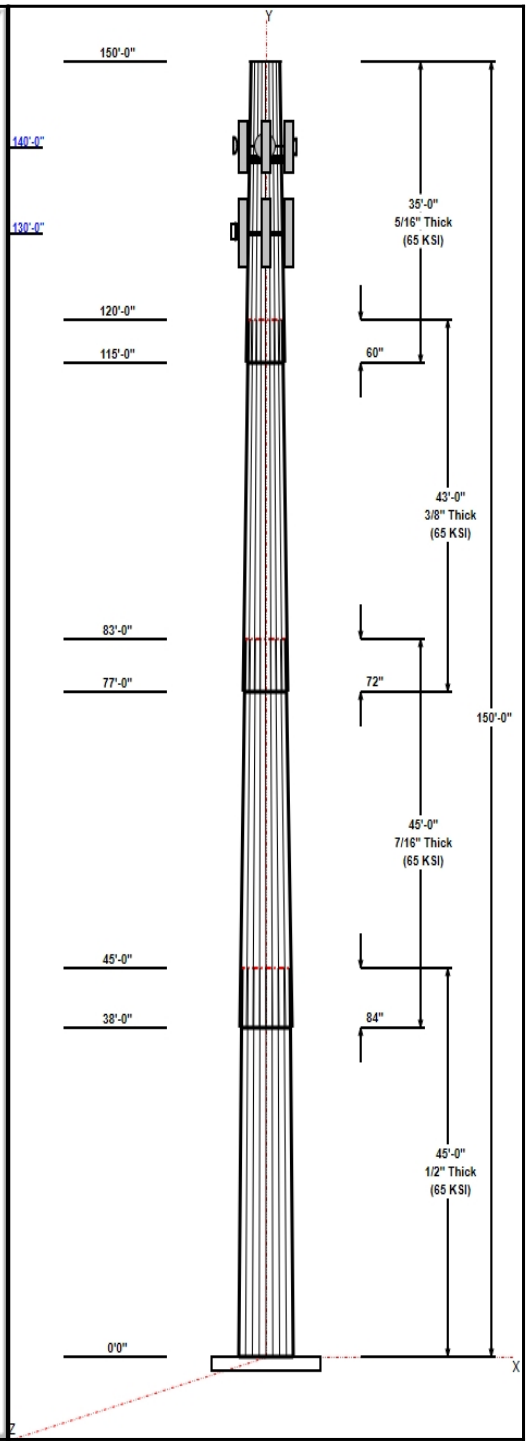
Tower Engineering Solutions

| | | | |
|---|---|---|---|
| Dead Load Factor: | 1.20 | **Iterations:** | 19 |
| Wind Load Factor: | 1.60 | | |

**Load Case : 1.2D + 1.6W 93 mph Wind**





# Structure: CT46136-A-SBA

**Type:** Tapered
**Site Name:** Bristol-east
**Height:** 150.00 (ft)
**Base Elev:** 0.00 (ft)

**Base Shape:** 18 Sided
**Taper:** 0.23607

8/1/2018



Tower Engineering Solutions

## Shaft Properties

| Seq | Length (ft) | Top (in) | Bottom (in) | Thick (in) | Joint Type | Taper | Grade (ksi) |
|---|---|---|---|---|---|---|---|
| 1 | 45.00 | 53.15 | 63.77 | 0.500 | | 0.23607 | 65 |
| 2 | 45.00 | 45.05 | 55.67 | 0.438 | Slip | 0.23607 | 65 |
| 3 | 43.00 | 37.07 | 47.22 | 0.375 | Slip | 0.23607 | 65 |
| 4 | 35.00 | 30.61 | 38.87 | 0.313 | Slip | 0.23607 | 65 |

## Discrete Appurtenances

| Attach Elev (ft) | Force Elev (ft) | Qty | Description | Carrier |
|---|---|---|---|---|
| 140.00 | 140.00 | 3 | NNVV-65B-R4 | Sprint Nextel |
| 140.00 | 140.00 | 3 | AAHC | Sprint Nextel |
| 140.00 | 140.00 | 1 | RMQP-496-HK | Sprint Nextel |
| 140.00 | 140.00 | 3 | Dragonwave | Sprint Nextel |
| 140.00 | 140.00 | 3 | ALU 1900 Mhz RRUs | Sprint Nextel |
| 140.00 | 140.00 | 6 | ALU 800 Mhz RRUs | Sprint Nextel |
| 130.00 | 130.00 | 3 | APXVAA24_43-U-A20 | T-Mobile |
| 130.00 | 130.00 | 3 | APX16DWV-16DWV-S-EA | T-Mobile |
| 130.00 | 130.00 | 3 | AIR3246 B66 | T-Mobile |
| 130.00 | 130.00 | 3 | AIR 5122 28GHz | T-Mobile |
| 130.00 | 130.00 | 1 | SHP2-13 | T-Mobile |
| 130.00 | 130.00 | 3 | Radio 4415 B25 | T-Mobile |
| 130.00 | 130.00 | 3 | Radio 4449 B71 + B12 | T-Mobile |
| 130.00 | 130.00 | 3 | Radio 2217 B66A | T-Mobile |
| 130.00 | 130.00 | 1 | FSP-10W | T-Mobile |
| 130.00 | 130.00 | 1 | f#P-HRK10 | T-Mobile |

## Linear Appurtenances

| Elev From (ft) | Elev To (ft) | Placement | Description | Carrier |
|---|---|---|---|---|
| 0.00 | 140.00 | Inside | 1-1/4 fiber | Sprint Nextel |
| 0.00 | 140.00 | Inside | 1.689" Fiber | Sprint Nextel |
| 0.00 | 140.00 | Inside | 1/2" Coax | Sprint Nextel |
| 0.00 | 130.00 | Inside | 1 5/8" Fiber | T-Mobile |
| 0.00 | 130.00 | Inside | 1/2" Coax | T-Mobile |

## Anchor Bolts

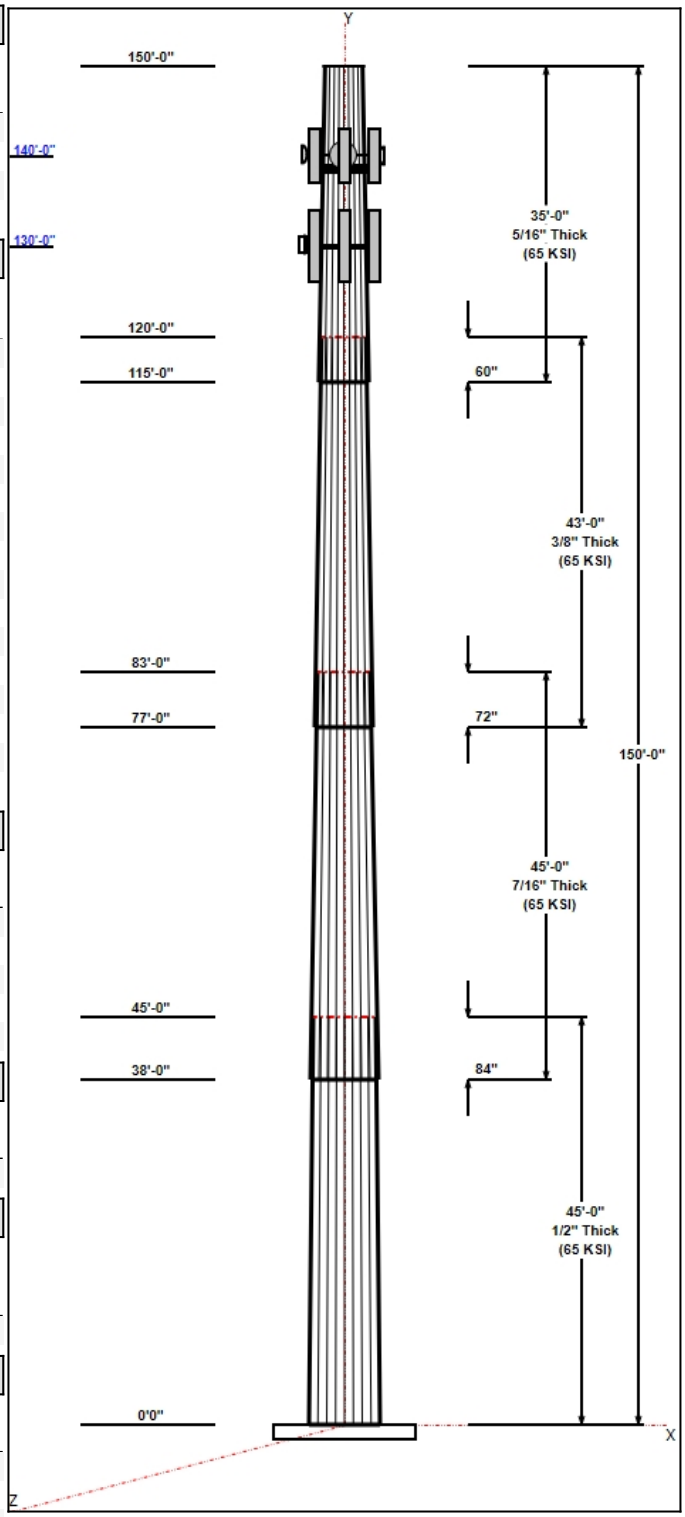
| Qty | Specifications | Grade (ksi) | Arrangement |
|---|---|---|---|
| 24 | 2.25" 18J | 75.0 | Cluster |

## Base Plate

| Thickness (in) | Specifications (in) | Grade (ksi) | Geometry |
|---|---|---|---|
| 3.0000 | 71.0 | 55.0 | Clipped |

## Reactions

| Load Case | Moment (FT-Kips) | Shear (Kips) | Axial (Kips) |
|---|---|---|---|
| 1.2D + 1.6W 93 mph Wind | 2874.5 | 28.2 | 53.8 |
| 0.9D + 1.6W 93 mph Wind | 2859.7 | 28.2 | 40.4 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind | 994.9 | 9.7 | 85.7 |
| 1.2D + 1.0E | 217.4 | 2.0 | 53.9 |
| 0.9D + 1.0E | 216.2 | 2.0 | 40.4 |
| 1.0D + 1.0W 60 mph Wind | 745.3 | 7.3 | 44.9 |



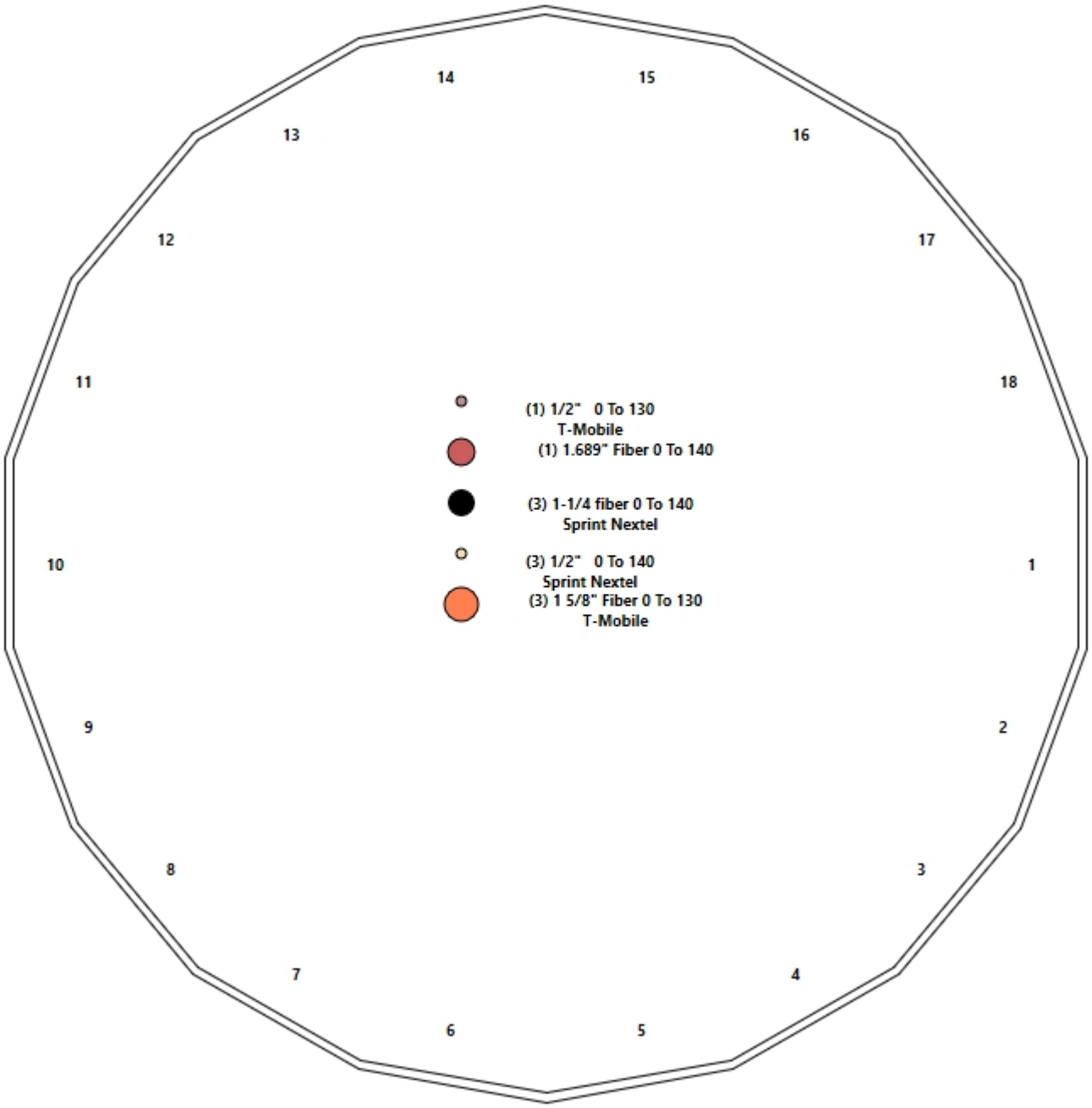
# Structure: CT46136-A-SBA - Coax Line Placement

**Type:** Monopole
**Site Name:** Bristol-east
**Height:** 150.00 (ft)

8/1/2018



Tower Engineering Solutions



# Shaft Properties

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **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 | 45.000 | 0.5000 | 65 | | 0.00 | 14,084 |
| 2 | 18 | 45.000 | 0.4375 | 65 | Slip | 84.00 | 10,615 |
| 3 | 18 | 43.000 | 0.3750 | 65 | Slip | 72.00 | 7,274 |
| 4 | 18 | 35.000 | 0.3125 | 65 | Slip | 60.00 | 4,067 |
| | | | | | **Total Shaft Weight:** | | **36,040** |

| | 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 | 63.77 | 0.00 | 100.4 | 50781.78 | 21.08 | 127.54 | 53.15 | 45.00 | 83.55 | 29257.3 | 17.33 | 106.2 | 0.236067 |
| 2 | 55.67 | 38.00 | 76.70 | 29567.32 | 21.03 | 127.26 | 45.05 | 83.00 | 61.95 | 15578.8 | 16.75 | 102.9 | 0.236067 |
| 3 | 47.22 | 77.00 | 55.75 | 15456.32 | 20.79 | 125.91 | 37.07 | 120.00 | 43.67 | 7428.31 | 16.02 | 98.85 | 0.236067 |
| 4 | 38.87 | 115.0 | 38.25 | 7184.55 | 20.52 | 124.39 | 30.61 | 150.00 | 30.05 | 3485.10 | 15.86 | 97.95 | 0.236067 |

# Load Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 5 | |

Tower Engineering Solutions

## 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 | 140.00 | NNVV-65B-R4 | 3 | 77.40 | 12.27 | 0.74 | 455.53 | 14.198 | 0.74 | 0.00 | 0.00 |
| 2 | 140.00 | AAHC | 3 | 104.00 | 4.20 | 0.75 | 285.88 | 5.324 | 0.75 | 0.00 | 0.00 |
| 3 | 140.00 | RMQP-496-HK | 1 | 2449.00 | 48.00 | 1.00 | 5844.72 | 92.370 | 1.00 | 0.00 | 0.00 |
| 4 | 140.00 | Dragonwave | 3 | 27.10 | 4.68 | 1.00 | 156.69 | 6.367 | 1.00 | 0.10 | 0.00 |
| 5 | 140.00 | ALU 1900 Mhz RRUs | 3 | 60.00 | 2.77 | 0.67 | 170.48 | 4.450 | 0.67 | 0.00 | 0.00 |
| 6 | 140.00 | ALU 800 Mhz RRUs | 6 | 53.00 | 2.49 | 0.67 | 150.94 | 4.005 | 0.67 | 0.00 | 0.00 |
| 7 | 130.00 | APXVAA24_43-U-A20 | 3 | 99.00 | 20.24 | 0.73 | 683.43 | 22.767 | 0.73 | 0.00 | 0.00 |
| 8 | 130.00 | APX16DWV-16DWV-S-EA20 | 3 | 40.70 | 6.46 | 0.62 | 233.83 | 7.954 | 0.62 | 0.00 | 0.00 |
| 9 | 130.00 | AIR3246 B66 | 3 | 132.20 | 6.51 | 0.87 | 387.12 | 8.014 | 0.87 | 0.00 | 0.00 |
| 10 | 130.00 | AIR 5122 28GHz | 3 | 24.30 | 1.89 | 0.76 | 89.58 | 3.147 | 0.76 | 0.00 | 0.00 |
| 11 | 130.00 | SHP2-13 | 1 | 152.00 | 3.96 | 1.00 | 165.95 | 4.323 | 1.00 | 1.00 | 0.00 |
| 12 | 130.00 | Radio 4415 B25 | 3 | 46.00 | 1.64 | 0.70 | 100.03 | 2.317 | 0.70 | 0.00 | 0.00 |
| 13 | 130.00 | Radio 4449 B71 + B12 | 3 | 70.00 | 1.65 | 0.67 | 167.14 | 2.381 | 0.67 | 0.00 | 0.00 |
| 14 | 130.00 | Radio 2217 B66A | 3 | 27.00 | 1.35 | 0.67 | 72.11 | 1.974 | 0.67 | 0.00 | 0.00 |
| 15 | 130.00 | FSP-10W | 1 | 2396.00 | 58.98 | 1.00 | 5473.85 | 50.980 | 1.00 | 0.00 | 0.00 |
| 16 | 130.00 | f#P-HRK10 | 1 | 478.27 | 9.00 | 1.00 | 1092.65 | 23.039 | 1.00 | 0.00 | 0.00 |
| | | **Totals:** | **43** | **7,916.37** | | | **21,888.28** | | | | |

## Linear Appurtenances

| Bottom Elev. (ft) | Top Elev. (ft) | Description | Exposed Width | Exposed |
|---|---|---|---|---|
| 0.00 | 140.00 | (3) 1-1/4 fiber | 0.00 | Inside |
| 0.00 | 140.00 | (1) 1.689" Fiber | 0.00 | Inside |
| 0.00 | 140.00 | (3) 1/2" Coax | 0.00 | Inside |
| 0.00 | 130.00 | (3) 1 5/8" Fiber | 0.00 | Inside |
| 0.00 | 130.00 | (1) 1/2" Coax | 0.00 | Inside |

# Shaft Section Properties

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 6 | |

**Increment Length:** **5 (ft)**

| Elev (ft) | Description | Thick (in) | Dia (in) | Area (in^2) | Ix (in^4) | W/t Ratio | D/t Ratio | Fpy (ksi) | S (in^3) | Weight (lb) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.5000 | 63.770 | 100.406 | 50781.8 | 21.08 | 127.54 | 76.6 | 1568. | 0.0 |
| 5.00 | | 0.5000 | 62.590 | 98.533 | 47992.4 | 20.66 | 125.18 | 77.1 | 1510. | 1692.4 |
| 10.00 | | 0.5000 | 61.409 | 96.660 | 45307.1 | 20.25 | 122.82 | 77.6 | 1453. | 1660.5 |
| 15.00 | | 0.5000 | 60.229 | 94.787 | 42723.8 | 19.83 | 120.46 | 78.1 | 1397. | 1628.6 |
| 20.00 | | 0.5000 | 59.049 | 92.913 | 40240.7 | 19.41 | 118.10 | 78.6 | 1342. | 1596.8 |
| 25.00 | | 0.5000 | 57.868 | 91.040 | 37855.7 | 19.00 | 115.74 | 79.1 | 1288. | 1564.9 |
| 30.00 | | 0.5000 | 56.688 | 89.167 | 35566.8 | 18.58 | 113.38 | 79.5 | 1235. | 1533.0 |
| 35.00 | | 0.5000 | 55.508 | 87.294 | 33372.1 | 18.16 | 111.02 | 80.0 | 1184. | 1501.1 |
| 38.00 | Bot - Section 2 | 0.5000 | 54.799 | 86.170 | 32099.7 | 17.91 | 109.60 | 80.3 | 1153. | 885.4 |
| 40.00 | | 0.5000 | 54.327 | 85.421 | 31269.6 | 17.75 | 108.65 | 80.5 | 1133. | 1103.6 |
| 45.00 | Top - Section 1 | 0.4375 | 54.022 | 74.406 | 26992.3 | 20.36 | 123.48 | 0.0 | 0.0 | 2717.3 |
| 50.00 | | 0.4375 | 52.842 | 72.767 | 25247.6 | 19.89 | 120.78 | 78.0 | 941.1 | 1252.0 |
| 55.00 | | 0.4375 | 51.661 | 71.128 | 23579.7 | 19.41 | 118.08 | 78.6 | 899.0 | 1224.1 |
| 60.00 | | 0.4375 | 50.481 | 69.489 | 21987.0 | 18.93 | 115.39 | 79.1 | 857.9 | 1196.2 |
| 65.00 | | 0.4375 | 49.301 | 67.850 | 20467.6 | 18.46 | 112.69 | 79.7 | 817.7 | 1168.3 |
| 70.00 | | 0.4375 | 48.120 | 66.211 | 19019.9 | 17.98 | 109.99 | 80.2 | 778.5 | 1140.5 |
| 75.00 | | 0.4375 | 46.940 | 64.572 | 17642.1 | 17.51 | 107.29 | 80.8 | 740.3 | 1112.6 |
| 77.00 | Bot - Section 3 | 0.4375 | 46.468 | 63.917 | 17110.2 | 17.32 | 106.21 | 81.0 | 725.2 | 437.2 |
| 80.00 | | 0.4375 | 45.760 | 62.933 | 16332.6 | 17.03 | 104.59 | 81.4 | 703.0 | 1212.3 |
| 83.00 | Top - Section 2 | 0.3750 | 45.801 | 54.067 | 14096.2 | 20.13 | 122.14 | 0.0 | 0.0 | 1193.7 |
| 85.00 | | 0.3750 | 45.329 | 53.505 | 13661.2 | 19.90 | 120.88 | 78.0 | 593.6 | 366.0 |
| 90.00 | | 0.3750 | 44.149 | 52.100 | 12613.2 | 19.35 | 117.73 | 78.6 | 562.7 | 898.4 |
| 95.00 | | 0.3750 | 42.969 | 50.695 | 11620.1 | 18.79 | 114.58 | 79.3 | 532.6 | 874.5 |
| 100.00 | | 0.3750 | 41.788 | 49.290 | 10680.6 | 18.24 | 111.44 | 79.9 | 503.4 | 850.6 |
| 105.00 | | 0.3750 | 40.608 | 47.886 | 9793.2 | 17.68 | 108.29 | 80.6 | 475.0 | 826.7 |
| 110.00 | | 0.3750 | 39.428 | 46.481 | 8956.3 | 17.13 | 105.14 | 81.3 | 447.4 | 802.8 |
| 115.00 | Bot - Section 4 | 0.3750 | 38.247 | 45.076 | 8168.5 | 16.57 | 101.99 | 81.9 | 420.7 | 778.9 |
| 120.00 | Top - Section 3 | 0.3125 | 37.692 | 37.074 | 6544.8 | 19.86 | 120.61 | 0.0 | 0.0 | 1395.7 |
| 125.00 | | 0.3125 | 36.512 | 35.904 | 5944.2 | 19.19 | 116.84 | 78.8 | 320.7 | 620.8 |
| 130.00 | | 0.3125 | 35.331 | 34.733 | 5381.5 | 18.52 | 113.06 | 79.6 | 300.0 | 600.9 |
| 135.00 | | 0.3125 | 34.151 | 33.562 | 4855.4 | 17.86 | 109.28 | 80.4 | 280.0 | 581.0 |
| 140.00 | | 0.3125 | 32.971 | 32.392 | 4364.9 | 17.19 | 105.51 | 81.2 | 260.7 | 561.1 |
| 145.00 | | 0.3125 | 31.790 | 31.221 | 3908.5 | 16.53 | 101.73 | 82.0 | 242.2 | 541.1 |
| 150.00 | | 0.3125 | 30.610 | 30.050 | 3485.1 | 15.86 | 97.95 | 82.5 | 224.3 | 521.2 |
| | | | | | | | | | | **36040.1** |

# Wind Loading - Shaft

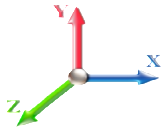
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 7 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.6W 93 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.60




**Iterations** 19

| 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 | | 1.00 | 0.85 | 17.879 | 19.67 | 462.68 | 0.650 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 454.11 | 0.650 | 0.000 | 5.00 | 26.731 | 17.38 | 546.8 | 0.0 | 2030.8 |
| 10.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 445.55 | 0.650 | 0.000 | 5.00 | 26.232 | 17.05 | 536.5 | 0.0 | 1992.6 |
| 15.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 436.98 | 0.650 | 0.000 | 5.00 | 25.732 | 16.73 | 526.3 | 0.0 | 1954.3 |
| 20.00 | | 1.00 | 0.90 | 18.971 | 20.87 | 441.30 | 0.650 | 0.000 | 5.00 | 25.233 | 16.40 | 547.6 | 0.0 | 1916.1 |
| 25.00 | | 1.00 | 0.95 | 19.883 | 21.87 | 442.76 | 0.650 | 0.000 | 5.00 | 24.733 | 16.08 | 562.6 | 0.0 | 1877.9 |
| 30.00 | | 1.00 | 0.98 | 20.661 | 22.73 | 442.13 | 0.650 | 0.000 | 5.00 | 24.234 | 15.75 | 572.8 | 0.0 | 1839.6 |
| 35.00 | | 1.00 | 1.01 | 21.343 | 23.48 | 440.01 | 0.650 | 0.000 | 5.00 | 23.735 | 15.43 | 579.5 | 0.0 | 1801.4 |
| 38.00 | Bot - Section 2 | 1.00 | 1.03 | 21.715 | 23.89 | 438.17 | 0.650 | 0.000 | 3.00 | 14.001 | 9.10 | 347.8 | 0.0 | 1062.5 |
| 40.00 | | 1.00 | 1.04 | 21.951 | 24.15 | 436.75 | 0.650 | 0.000 | 2.00 | 9.382 | 6.10 | 235.6 | 0.0 | 1324.4 |
| 45.00 | Top - Section 1 | 1.00 | 1.07 | 22.502 | 24.75 | 432.59 | 0.650 | 0.000 | 5.00 | 23.106 | 15.02 | 594.8 | 0.0 | 3260.7 |
| 50.00 | | 1.00 | 1.09 | 23.007 | 25.31 | 434.90 | 0.650 | 0.000 | 5.00 | 22.607 | 14.69 | 595.0 | 0.0 | 1502.4 |
| 55.00 | | 1.00 | 1.12 | 23.473 | 25.82 | 429.47 | 0.650 | 0.000 | 5.00 | 22.107 | 14.37 | 593.7 | 0.0 | 1468.9 |
| 60.00 | | 1.00 | 1.14 | 23.907 | 26.30 | 423.52 | 0.650 | 0.000 | 5.00 | 21.608 | 14.05 | 591.0 | 0.0 | 1435.5 |
| 65.00 | | 1.00 | 1.16 | 24.313 | 26.74 | 417.12 | 0.650 | 0.000 | 5.00 | 21.109 | 13.72 | 587.1 | 0.0 | 1402.0 |
| 70.00 | | 1.00 | 1.17 | 24.696 | 27.17 | 410.32 | 0.650 | 0.000 | 5.00 | 20.609 | 13.40 | 582.2 | 0.0 | 1368.5 |
| 75.00 | | 1.00 | 1.19 | 25.057 | 27.56 | 403.17 | 0.650 | 0.000 | 5.00 | 20.110 | 13.07 | 576.5 | 0.0 | 1335.1 |
| 77.00 | Bot - Section 3 | 1.00 | 1.20 | 25.196 | 27.72 | 400.23 | 0.650 | 0.000 | 2.00 | 7.904 | 5.14 | 227.8 | 0.0 | 524.7 |
| 80.00 | | 1.00 | 1.21 | 25.400 | 27.94 | 395.72 | 0.650 | 0.000 | 3.00 | 11.897 | 7.73 | 345.7 | 0.0 | 1454.8 |
| 83.00 | Top - Section 2 | 1.00 | 1.22 | 25.597 | 28.16 | 391.10 | 0.650 | 0.000 | 3.00 | 11.717 | 7.62 | 343.1 | 0.0 | 1432.4 |
| 85.00 | | 1.00 | 1.22 | 25.726 | 28.30 | 394.50 | 0.650 | 0.000 | 2.00 | 7.711 | 5.01 | 227.0 | 0.0 | 439.3 |
| 90.00 | | 1.00 | 1.24 | 26.037 | 28.64 | 386.55 | 0.650 | 0.000 | 5.00 | 18.929 | 12.30 | 563.8 | 0.0 | 1078.1 |
| 95.00 | | 1.00 | 1.25 | 26.336 | 28.97 | 378.36 | 0.650 | 0.000 | 5.00 | 18.429 | 11.98 | 555.2 | 0.0 | 1049.4 |
| 100.00 | | 1.00 | 1.27 | 26.621 | 29.28 | 369.96 | 0.650 | 0.000 | 5.00 | 17.930 | 11.65 | 546.1 | 0.0 | 1020.7 |
| 105.00 | | 1.00 | 1.28 | 26.896 | 29.59 | 361.36 | 0.650 | 0.000 | 5.00 | 17.431 | 11.33 | 536.3 | 0.0 | 992.0 |
| 110.00 | | 1.00 | 1.29 | 27.161 | 29.88 | 352.58 | 0.650 | 0.000 | 5.00 | 16.931 | 11.01 | 526.1 | 0.0 | 963.3 |
| 115.00 | Bot - Section 4 | 1.00 | 1.30 | 27.416 | 30.16 | 343.63 | 0.650 | 0.000 | 5.00 | 16.432 | 10.68 | 515.4 | 0.0 | 934.6 |
| 120.00 | Top - Section 3 | 1.00 | 1.32 | 27.663 | 30.43 | 334.52 | 0.650 | 0.000 | 5.00 | 16.197 | 10.53 | 512.6 | 0.0 | 1674.8 |
| 125.00 | | 1.00 | 1.33 | 27.902 | 30.69 | 330.93 | 0.650 | 0.000 | 5.00 | 15.698 | 10.20 | 501.1 | 0.0 | 745.0 |
| 130.00 | Appurtenance(s) | 1.00 | 1.34 | 28.133 | 30.95 | 321.56 | 0.650 | 0.000 | 5.00 | 15.198 | 9.88 | 489.1 | 0.0 | 721.1 |
| 135.00 | | 1.00 | 1.35 | 28.358 | 31.19 | 312.05 | 0.650 | 0.000 | 5.00 | 14.699 | 9.55 | 476.8 | 0.0 | 697.2 |
| 140.00 | Appurtenance(s) | 1.00 | 1.36 | 28.576 | 31.43 | 302.42 | 0.650 | 0.000 | 5.00 | 14.199 | 9.23 | 464.2 | 0.0 | 673.3 |
| 145.00 | | 1.00 | 1.37 | 28.788 | 31.67 | 292.67 | 0.650 | 0.000 | 5.00 | 13.700 | 8.91 | 451.2 | 0.0 | 649.4 |
| 150.00 | | 1.00 | 1.38 | 28.994 | 31.89 | 282.81 | 0.650 | 0.000 | 5.00 | 13.201 | 8.58 | 437.8 | 0.0 | 625.5 |
| | | | | | | | | **Totals:** | **150.00** | | | **16,295.2** | | **43,248.1** |

# Discrete Appurtenance Forces

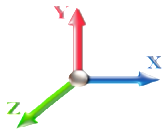
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 8 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.6W 93 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.60




**Iterations** 19

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa x Ka | Ka | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140.00 | ALU 1900 Mhz RRUs | 3 | 28.576 | 31.433 | 0.50 | 0.75 | 4.18 | 216.00 | 0.000 | 0.000 | 210.01 | 0.00 | 0.00 |
| 2 | 140.00 | Dragonwave | 3 | 28.576 | 31.433 | 1.00 | 1.00 | 14.04 | 97.56 | 1.495 | 0.000 | 706.12 | 659.76 | 0.00 |
| 3 | 140.00 | RMQP-496-HK | 1 | 28.576 | 31.433 | 1.00 | 1.00 | 48.00 | 2938.80 | 0.000 | 0.000 | 2414.07 | 0.00 | 0.00 |
| 4 | 140.00 | AAHC | 3 | 28.576 | 31.433 | 0.56 | 0.75 | 7.09 | 374.40 | 0.000 | 0.000 | 356.45 | 0.00 | 0.00 |
| 5 | 140.00 | NNVV-65B-R4 | 3 | 28.576 | 31.433 | 0.55 | 0.75 | 20.43 | 278.64 | 0.000 | 0.000 | 1027.47 | 0.00 | 0.00 |
| 6 | 140.00 | ALU 800 Mhz RRUs | 6 | 28.576 | 31.433 | 0.50 | 0.75 | 7.51 | 381.60 | 0.000 | 0.000 | 377.57 | 0.00 | 0.00 |
| 7 | 130.00 | f#P-HRK10 | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 9.00 | 573.92 | 0.000 | 0.000 | 445.63 | 0.00 | 0.00 |
| 8 | 130.00 | APXVAA24_43-U-A20 | 3 | 28.133 | 30.947 | 0.55 | 0.75 | 33.24 | 356.40 | 0.000 | 0.000 | 1646.07 | 0.00 | 0.00 |
| 9 | 130.00 | Radio 2217 B66A | 3 | 28.133 | 30.947 | 0.50 | 0.75 | 2.04 | 97.20 | 0.000 | 0.000 | 100.77 | 0.00 | 0.00 |
| 10 | 130.00 | FSP-10W | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 58.98 | 2875.20 | 0.000 | 0.000 | 2920.37 | 0.00 | 0.00 |
| 11 | 130.00 | Radio 4449 B71 + B12 | 3 | 28.133 | 30.947 | 0.50 | 0.75 | 2.49 | 252.00 | 0.000 | 0.000 | 123.16 | 0.00 | 0.00 |
| 12 | 130.00 | Radio 4415 B25 | 3 | 28.133 | 30.947 | 0.52 | 0.75 | 2.58 | 165.60 | 0.000 | 0.000 | 127.90 | 0.00 | 0.00 |
| 13 | 130.00 | SHP2-13 | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 3.96 | 182.40 | 2.495 | 0.000 | 196.08 | 305.74 | 0.00 |
| 14 | 130.00 | AIR 5122 28GHz | 3 | 28.133 | 30.947 | 0.57 | 0.75 | 3.23 | 87.48 | 0.000 | 0.000 | 160.03 | 0.00 | 0.00 |
| 15 | 130.00 | AIR3246 B66 | 3 | 28.133 | 30.947 | 0.65 | 0.75 | 12.74 | 475.92 | 0.000 | 0.000 | 630.98 | 0.00 | 0.00 |
| 16 | 130.00 | APX16DWV-16DWV-S-EA | 3 | 28.133 | 30.947 | 0.46 | 0.75 | 9.01 | 146.52 | 0.000 | 0.000 | 446.21 | 0.00 | 0.00 |
| | | | | | | | **Totals:** | | **9,499.64** | | | **11,888.88** | | |

# Total Applied Force Summary

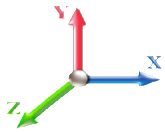
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 9 |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.6W 93 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.60




**Iterations** 19

| 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 | | 546.75 | 2072.35 | 0.00 | 0.00 |
| 10.00 | | 536.54 | 2034.11 | 0.00 | 0.00 |
| 15.00 | | 526.32 | 1995.87 | 0.00 | 0.00 |
| 20.00 | | 547.61 | 1957.62 | 0.00 | 0.00 |
| 25.00 | | 562.59 | 1919.38 | 0.00 | 0.00 |
| 30.00 | | 572.80 | 1881.14 | 0.00 | 0.00 |
| 35.00 | | 579.50 | 1842.89 | 0.00 | 0.00 |
| 38.00 | | 347.82 | 1087.38 | 0.00 | 0.00 |
| 40.00 | | 235.61 | 1340.98 | 0.00 | 0.00 |
| 45.00 | | 594.81 | 3302.26 | 0.00 | 0.00 |
| 50.00 | | 595.01 | 1543.91 | 0.00 | 0.00 |
| 55.00 | | 593.65 | 1510.45 | 0.00 | 0.00 |
| 60.00 | | 590.97 | 1476.99 | 0.00 | 0.00 |
| 65.00 | | 587.12 | 1443.53 | 0.00 | 0.00 |
| 70.00 | | 582.25 | 1410.06 | 0.00 | 0.00 |
| 75.00 | | 576.45 | 1376.60 | 0.00 | 0.00 |
| 77.00 | | 227.83 | 541.27 | 0.00 | 0.00 |
| 80.00 | | 345.69 | 1479.68 | 0.00 | 0.00 |
| 83.00 | | 343.11 | 1457.30 | 0.00 | 0.00 |
| 85.00 | | 226.95 | 455.86 | 0.00 | 0.00 |
| 90.00 | | 563.83 | 1119.57 | 0.00 | 0.00 |
| 95.00 | | 555.24 | 1090.89 | 0.00 | 0.00 |
| 100.00 | | 546.06 | 1062.21 | 0.00 | 0.00 |
| 105.00 | | 536.33 | 1033.53 | 0.00 | 0.00 |
| 110.00 | | 526.09 | 1004.84 | 0.00 | 0.00 |
| 115.00 | | 515.38 | 976.16 | 0.00 | 0.00 |
| 120.00 | | 512.58 | 1716.37 | 0.00 | 0.00 |
| 125.00 | | 501.06 | 786.51 | 0.00 | 0.00 |
| 130.00 | (24) attachments | 7286.34 | 5975.25 | 305.74 | 0.00 |
| 135.00 | | 476.85 | 717.94 | 0.00 | 0.00 |
| 140.00 | (19) attachments | 5555.87 | 4981.04 | 659.76 | 0.00 |
| 145.00 | | 451.18 | 649.38 | 0.00 | 0.00 |
| 150.00 | | 437.85 | 625.48 | 0.00 | 0.00 |
| | **Totals:** | **28,184.07** | **53,868.80** | **965.50** | **0.00** |

# Calculated Forces

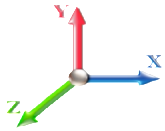
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 10 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.6W 93 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.60




**Iterations** 19

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -53.85 | -28.22 | -0.96 | -2874.5 | 0.00 | 2874.51 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | 0.00 | 0.000 | 0.000 | 0.327 |
| 5.00 | -51.74 | -27.74 | -0.96 | -2733.4 | 0.00 | 2733.40 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | 0.04 | -0.079 | 0.000 | 0.321 |
| 10.00 | -49.67 | -27.27 | -0.96 | -2594.6 | 0.00 | 2594.68 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | 0.17 | -0.158 | 0.000 | 0.314 |
| 15.00 | -47.64 | -26.81 | -0.96 | -2458.3 | 0.00 | 2458.32 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | 0.38 | -0.237 | 0.000 | 0.308 |
| 20.00 | -45.65 | -26.31 | -0.96 | -2324.2 | 0.00 | 2324.29 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | 0.67 | -0.316 | 0.000 | 0.301 |
| 25.00 | -43.69 | -25.80 | -0.96 | -2192.7 | 0.00 | 2192.74 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | 1.04 | -0.396 | 0.000 | 0.294 |
| 30.00 | -41.78 | -25.27 | -0.96 | -2063.7 | 0.00 | 2063.75 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | 1.50 | -0.476 | 0.000 | 0.287 |
| 35.00 | -39.92 | -24.72 | -0.96 | -1937.4 | 0.00 | 1937.40 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | 2.04 | -0.556 | 0.000 | 0.279 |
| 38.00 | -38.82 | -24.39 | -0.96 | -1863.2 | 0.00 | 1863.25 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | 2.41 | -0.605 | 0.000 | 0.274 |
| 40.00 | -37.45 | -24.17 | -0.96 | -1814.4 | -0.01 | 1814.47 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | 2.67 | -0.637 | 0.000 | 0.271 |
| 45.00 | -34.13 | -23.59 | -0.96 | -1693.6 | -0.01 | 1693.61 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | 3.38 | -0.717 | 0.000 | 0.303 |
| 50.00 | -32.56 | -23.02 | -0.96 | -1575.6 | -0.01 | 1575.67 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | 4.17 | -0.797 | 0.000 | 0.293 |
| 55.00 | -31.02 | -22.45 | -0.96 | -1460.5 | -0.01 | 1460.58 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | 5.06 | -0.882 | 0.000 | 0.282 |
| 60.00 | -29.52 | -21.88 | -0.96 | -1348.3 | -0.01 | 1348.34 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | 6.03 | -0.967 | 0.000 | 0.271 |
| 65.00 | -28.06 | -21.31 | -0.96 | -1238.9 | -0.01 | 1238.95 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | 7.08 | -1.051 | -0.001 | 0.259 |
| 70.00 | -26.63 | -20.73 | -0.96 | -1132.4 | -0.01 | 1132.42 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | 8.23 | -1.133 | -0.001 | 0.247 |
| 75.00 | -25.25 | -20.16 | -0.96 | -1028.7 | -0.01 | 1028.75 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | 9.46 | -1.214 | -0.001 | 0.235 |
| 77.00 | -24.70 | -19.93 | -0.96 | -988.44 | -0.01 | 988.44 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | 9.98 | -1.246 | -0.001 | 0.230 |
| 80.00 | -23.21 | -19.57 | -0.96 | -928.64 | -0.01 | 928.64 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | 10.77 | -1.294 | -0.001 | 0.222 |
| 83.00 | -21.75 | -19.21 | -0.96 | -869.92 | -0.01 | 869.92 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | 11.60 | -1.341 | -0.001 | 0.252 |
| 85.00 | -21.28 | -19.00 | -0.96 | -831.50 | -0.01 | 831.50 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | 12.17 | -1.372 | -0.001 | 0.245 |
| 90.00 | -20.15 | -18.43 | -0.96 | -736.52 | -0.01 | 736.52 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | 13.65 | -1.454 | -0.001 | 0.227 |
| 95.00 | -19.05 | -17.87 | -0.96 | -644.36 | -0.02 | 644.36 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | 15.22 | -1.532 | -0.001 | 0.209 |
| 100.00 | -17.98 | -17.32 | -0.96 | -554.99 | -0.02 | 554.99 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | 16.86 | -1.605 | -0.001 | 0.189 |
| 105.00 | -16.94 | -16.77 | -0.96 | -468.38 | -0.02 | 468.38 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | 18.58 | -1.673 | -0.001 | 0.168 |
| 110.00 | -15.94 | -16.24 | -0.96 | -384.51 | -0.02 | 384.51 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | 20.37 | -1.735 | -0.001 | 0.146 |
| 115.00 | -14.96 | -15.70 | -0.96 | -303.33 | -0.02 | 303.33 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | 22.22 | -1.790 | -0.002 | 0.122 |
| 120.00 | -13.25 | -15.15 | -0.96 | -224.82 | -0.03 | 224.82 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | 24.12 | -1.836 | -0.002 | 0.118 |
| 125.00 | -12.47 | -14.63 | -0.96 | -149.09 | -0.03 | 149.09 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | 26.06 | -1.872 | -0.002 | 0.084 |
| 130.00 | -6.74 | -7.15 | -0.66 | -75.95 | -0.02 | 75.95 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | 28.04 | -1.899 | -0.002 | 0.045 |
| 135.00 | -6.04 | -6.65 | -0.66 | -40.20 | -0.02 | 40.20 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | 30.04 | -1.914 | -0.002 | 0.026 |
| 140.00 | -1.24 | -0.93 | 0.00 | -6.95 | 0.00 | 6.95 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | 32.05 | -1.921 | -0.003 | 0.005 |
| 145.00 | -0.61 | -0.46 | 0.00 | -2.29 | 0.00 | 2.29 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | 34.06 | -1.922 | -0.003 | 0.002 |
| 150.00 | 0.00 | -0.44 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | 36.07 | -1.923 | -0.003 | 0.000 |

# Wind Loading - Shaft

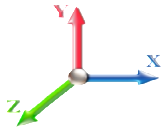
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 11 | |

Tower Engineering Solutions

**Load Case:** 0.9D + 1.6W 93 mph Wind

**Dead Load Factor** 0.90

**Wind Load Factor** 1.60




**Iterations** 19

| 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 | | 1.00 | 0.85 | 17.879 | 19.67 | 462.68 | 0.650 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 454.11 | 0.650 | 0.000 | 5.00 | 26.731 | 17.38 | 546.8 | 0.0 | 1523.1 |
| 10.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 445.55 | 0.650 | 0.000 | 5.00 | 26.232 | 17.05 | 536.5 | 0.0 | 1494.4 |
| 15.00 | | 1.00 | 0.85 | 17.879 | 19.67 | 436.98 | 0.650 | 0.000 | 5.00 | 25.732 | 16.73 | 526.3 | 0.0 | 1465.8 |
| 20.00 | | 1.00 | 0.90 | 18.971 | 20.87 | 441.30 | 0.650 | 0.000 | 5.00 | 25.233 | 16.40 | 547.6 | 0.0 | 1437.1 |
| 25.00 | | 1.00 | 0.95 | 19.883 | 21.87 | 442.76 | 0.650 | 0.000 | 5.00 | 24.733 | 16.08 | 562.6 | 0.0 | 1408.4 |
| 30.00 | | 1.00 | 0.98 | 20.661 | 22.73 | 442.13 | 0.650 | 0.000 | 5.00 | 24.234 | 15.75 | 572.8 | 0.0 | 1379.7 |
| 35.00 | | 1.00 | 1.01 | 21.343 | 23.48 | 440.01 | 0.650 | 0.000 | 5.00 | 23.735 | 15.43 | 579.5 | 0.0 | 1351.0 |
| 38.00 | Bot - Section 2 | 1.00 | 1.03 | 21.715 | 23.89 | 438.17 | 0.650 | 0.000 | 3.00 | 14.001 | 9.10 | 347.8 | 0.0 | 796.9 |
| 40.00 | | 1.00 | 1.04 | 21.951 | 24.15 | 436.75 | 0.650 | 0.000 | 2.00 | 9.382 | 6.10 | 235.6 | 0.0 | 993.3 |
| 45.00 | Top - Section 1 | 1.00 | 1.07 | 22.502 | 24.75 | 432.59 | 0.650 | 0.000 | 5.00 | 23.106 | 15.02 | 594.8 | 0.0 | 2445.6 |
| 50.00 | | 1.00 | 1.09 | 23.007 | 25.31 | 434.90 | 0.650 | 0.000 | 5.00 | 22.607 | 14.69 | 595.0 | 0.0 | 1126.8 |
| 55.00 | | 1.00 | 1.12 | 23.473 | 25.82 | 429.47 | 0.650 | 0.000 | 5.00 | 22.107 | 14.37 | 593.7 | 0.0 | 1101.7 |
| 60.00 | | 1.00 | 1.14 | 23.907 | 26.30 | 423.52 | 0.650 | 0.000 | 5.00 | 21.608 | 14.05 | 591.0 | 0.0 | 1076.6 |
| 65.00 | | 1.00 | 1.16 | 24.313 | 26.74 | 417.12 | 0.650 | 0.000 | 5.00 | 21.109 | 13.72 | 587.1 | 0.0 | 1051.5 |
| 70.00 | | 1.00 | 1.17 | 24.696 | 27.17 | 410.32 | 0.650 | 0.000 | 5.00 | 20.609 | 13.40 | 582.2 | 0.0 | 1026.4 |
| 75.00 | | 1.00 | 1.19 | 25.057 | 27.56 | 403.17 | 0.650 | 0.000 | 5.00 | 20.110 | 13.07 | 576.5 | 0.0 | 1001.3 |
| 77.00 | Bot - Section 3 | 1.00 | 1.20 | 25.196 | 27.72 | 400.23 | 0.650 | 0.000 | 2.00 | 7.904 | 5.14 | 227.8 | 0.0 | 393.5 |
| 80.00 | | 1.00 | 1.21 | 25.400 | 27.94 | 395.72 | 0.650 | 0.000 | 3.00 | 11.897 | 7.73 | 345.7 | 0.0 | 1091.1 |
| 83.00 | Top - Section 2 | 1.00 | 1.22 | 25.597 | 28.16 | 391.10 | 0.650 | 0.000 | 3.00 | 11.717 | 7.62 | 343.1 | 0.0 | 1074.3 |
| 85.00 | | 1.00 | 1.22 | 25.726 | 28.30 | 394.50 | 0.650 | 0.000 | 2.00 | 7.711 | 5.01 | 227.0 | 0.0 | 329.4 |
| 90.00 | | 1.00 | 1.24 | 26.037 | 28.64 | 386.55 | 0.650 | 0.000 | 5.00 | 18.929 | 12.30 | 563.8 | 0.0 | 808.5 |
| 95.00 | | 1.00 | 1.25 | 26.336 | 28.97 | 378.36 | 0.650 | 0.000 | 5.00 | 18.429 | 11.98 | 555.2 | 0.0 | 787.0 |
| 100.00 | | 1.00 | 1.27 | 26.621 | 29.28 | 369.96 | 0.650 | 0.000 | 5.00 | 17.930 | 11.65 | 546.1 | 0.0 | 765.5 |
| 105.00 | | 1.00 | 1.28 | 26.896 | 29.59 | 361.36 | 0.650 | 0.000 | 5.00 | 17.431 | 11.33 | 536.3 | 0.0 | 744.0 |
| 110.00 | | 1.00 | 1.29 | 27.161 | 29.88 | 352.58 | 0.650 | 0.000 | 5.00 | 16.931 | 11.01 | 526.1 | 0.0 | 722.5 |
| 115.00 | Bot - Section 4 | 1.00 | 1.30 | 27.416 | 30.16 | 343.63 | 0.650 | 0.000 | 5.00 | 16.432 | 10.68 | 515.4 | 0.0 | 701.0 |
| 120.00 | Top - Section 3 | 1.00 | 1.32 | 27.663 | 30.43 | 334.52 | 0.650 | 0.000 | 5.00 | 16.197 | 10.53 | 512.6 | 0.0 | 1256.1 |
| 125.00 | | 1.00 | 1.33 | 27.902 | 30.69 | 330.93 | 0.650 | 0.000 | 5.00 | 15.698 | 10.20 | 501.1 | 0.0 | 558.7 |
| 130.00 | Appurtenance(s) | 1.00 | 1.34 | 28.133 | 30.95 | 321.56 | 0.650 | 0.000 | 5.00 | 15.198 | 9.88 | 489.1 | 0.0 | 540.8 |
| 135.00 | | 1.00 | 1.35 | 28.358 | 31.19 | 312.05 | 0.650 | 0.000 | 5.00 | 14.699 | 9.55 | 476.8 | 0.0 | 522.9 |
| 140.00 | Appurtenance(s) | 1.00 | 1.36 | 28.576 | 31.43 | 302.42 | 0.650 | 0.000 | 5.00 | 14.199 | 9.23 | 464.2 | 0.0 | 505.0 |
| 145.00 | | 1.00 | 1.37 | 28.788 | 31.67 | 292.67 | 0.650 | 0.000 | 5.00 | 13.700 | 8.91 | 451.2 | 0.0 | 487.0 |
| 150.00 | | 1.00 | 1.38 | 28.994 | 31.89 | 282.81 | 0.650 | 0.000 | 5.00 | 13.201 | 8.58 | 437.8 | 0.0 | 469.1 |
| | | | | | | | | **Totals:** | **150.00** | | | **16,295.2** | | **32,436.1** |

# Discrete Appurtenance Forces

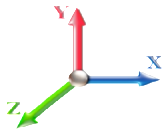
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 12 | |

Tower Engineering Solutions

**Load Case:** 0.9D + 1.6W 93 mph Wind

**Dead Load Factor** 0.90

**Wind Load Factor** 1.60




**Iterations** 19

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa x Ka | Ka | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140.00 | ALU 1900 Mhz RRUs | 3 | 28.576 | 31.433 | 0.50 | 0.75 | 4.18 | 162.00 | 0.000 | 0.000 | 210.01 | 0.00 | 0.00 |
| 2 | 140.00 | Dragonwave | 3 | 28.576 | 31.433 | 1.00 | 1.00 | 14.04 | 73.17 | 1.495 | 0.000 | 706.12 | 659.76 | 0.00 |
| 3 | 140.00 | RMQP-496-HK | 1 | 28.576 | 31.433 | 1.00 | 1.00 | 48.00 | 2204.10 | 0.000 | 0.000 | 2414.07 | 0.00 | 0.00 |
| 4 | 140.00 | AAHC | 3 | 28.576 | 31.433 | 0.56 | 0.75 | 7.09 | 280.80 | 0.000 | 0.000 | 356.45 | 0.00 | 0.00 |
| 5 | 140.00 | NNVV-65B-R4 | 3 | 28.576 | 31.433 | 0.55 | 0.75 | 20.43 | 208.98 | 0.000 | 0.000 | 1027.47 | 0.00 | 0.00 |
| 6 | 140.00 | ALU 800 Mhz RRUs | 6 | 28.576 | 31.433 | 0.50 | 0.75 | 7.51 | 286.20 | 0.000 | 0.000 | 377.57 | 0.00 | 0.00 |
| 7 | 130.00 | f#P-HRK10 | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 9.00 | 430.44 | 0.000 | 0.000 | 445.63 | 0.00 | 0.00 |
| 8 | 130.00 | APXVAA24_43-U-A20 | 3 | 28.133 | 30.947 | 0.55 | 0.75 | 33.24 | 267.30 | 0.000 | 0.000 | 1646.07 | 0.00 | 0.00 |
| 9 | 130.00 | Radio 2217 B66A | 3 | 28.133 | 30.947 | 0.50 | 0.75 | 2.04 | 72.90 | 0.000 | 0.000 | 100.77 | 0.00 | 0.00 |
| 10 | 130.00 | FSP-10W | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 58.98 | 2156.40 | 0.000 | 0.000 | 2920.37 | 0.00 | 0.00 |
| 11 | 130.00 | Radio 4449 B71 + B12 | 3 | 28.133 | 30.947 | 0.50 | 0.75 | 2.49 | 189.00 | 0.000 | 0.000 | 123.16 | 0.00 | 0.00 |
| 12 | 130.00 | Radio 4415 B25 | 3 | 28.133 | 30.947 | 0.52 | 0.75 | 2.58 | 124.20 | 0.000 | 0.000 | 127.90 | 0.00 | 0.00 |
| 13 | 130.00 | SHP2-13 | 1 | 28.133 | 30.947 | 1.00 | 1.00 | 3.96 | 136.80 | 2.495 | 0.000 | 196.08 | 305.74 | 0.00 |
| 14 | 130.00 | AIR 5122 28GHz | 3 | 28.133 | 30.947 | 0.57 | 0.75 | 3.23 | 65.61 | 0.000 | 0.000 | 160.03 | 0.00 | 0.00 |
| 15 | 130.00 | AIR3246 B66 | 3 | 28.133 | 30.947 | 0.65 | 0.75 | 12.74 | 356.94 | 0.000 | 0.000 | 630.98 | 0.00 | 0.00 |
| 16 | 130.00 | APX16DWV-16DWV-S-EA | 3 | 28.133 | 30.947 | 0.46 | 0.75 | 9.01 | 109.89 | 0.000 | 0.000 | 446.21 | 0.00 | 0.00 |
| | | | | | | | **Totals:** | | **7,124.73** | | | **11,888.88** | | |

# Total Applied Force Summary

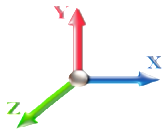
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 13 |

IES Tower Engineering Solutions

**Load Case:** 0.9D + 1.6W 93 mph Wind

**Dead Load Factor** 0.90

**Wind Load Factor** 1.60




**Iterations** 19

| 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 | | 546.75 | 1554.26 | 0.00 | 0.00 |
| 10.00 | | 536.54 | 1525.58 | 0.00 | 0.00 |
| 15.00 | | 526.32 | 1496.90 | 0.00 | 0.00 |
| 20.00 | | 547.61 | 1468.22 | 0.00 | 0.00 |
| 25.00 | | 562.59 | 1439.54 | 0.00 | 0.00 |
| 30.00 | | 572.80 | 1410.85 | 0.00 | 0.00 |
| 35.00 | | 579.50 | 1382.17 | 0.00 | 0.00 |
| 38.00 | | 347.82 | 815.54 | 0.00 | 0.00 |
| 40.00 | | 235.61 | 1005.74 | 0.00 | 0.00 |
| 45.00 | | 594.81 | 2476.70 | 0.00 | 0.00 |
| 50.00 | | 595.01 | 1157.93 | 0.00 | 0.00 |
| 55.00 | | 593.65 | 1132.84 | 0.00 | 0.00 |
| 60.00 | | 590.97 | 1107.74 | 0.00 | 0.00 |
| 65.00 | | 587.12 | 1082.64 | 0.00 | 0.00 |
| 70.00 | | 582.25 | 1057.55 | 0.00 | 0.00 |
| 75.00 | | 576.45 | 1032.45 | 0.00 | 0.00 |
| 77.00 | | 227.83 | 405.95 | 0.00 | 0.00 |
| 80.00 | | 345.69 | 1109.76 | 0.00 | 0.00 |
| 83.00 | | 343.11 | 1092.98 | 0.00 | 0.00 |
| 85.00 | | 226.95 | 341.89 | 0.00 | 0.00 |
| 90.00 | | 563.83 | 839.68 | 0.00 | 0.00 |
| 95.00 | | 555.24 | 818.17 | 0.00 | 0.00 |
| 100.00 | | 546.06 | 796.66 | 0.00 | 0.00 |
| 105.00 | | 536.33 | 775.14 | 0.00 | 0.00 |
| 110.00 | | 526.09 | 753.63 | 0.00 | 0.00 |
| 115.00 | | 515.38 | 732.12 | 0.00 | 0.00 |
| 120.00 | | 512.58 | 1287.28 | 0.00 | 0.00 |
| 125.00 | | 501.06 | 589.88 | 0.00 | 0.00 |
| 130.00 | (24) attachments | 7286.34 | 4481.44 | 305.74 | 0.00 |
| 135.00 | | 476.85 | 538.46 | 0.00 | 0.00 |
| 140.00 | (19) attachments | 5555.87 | 3735.78 | 659.76 | 0.00 |
| 145.00 | | 451.18 | 487.03 | 0.00 | 0.00 |
| 150.00 | | 437.85 | 469.11 | 0.00 | 0.00 |
| | **Totals:** | **28,184.07** | **40,401.60** | **965.50** | **0.00** |

# Calculated Forces

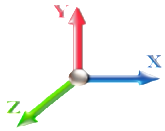
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 14 | |

Tower Engineering Solutions

**Load Case:** 0.9D + 1.6W 93 mph Wind

**Dead Load Factor** 0.90

**Wind Load Factor** 1.60




**Iterations** 19

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -40.38 | -28.21 | -0.96 | -2859.7 | 0.00 | 2859.73 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | 0.00 | 0.000 | 0.000 | 0.323 |
| 5.00 | -38.79 | -27.72 | -0.96 | -2718.6 | 0.00 | 2718.68 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | 0.04 | -0.078 | 0.000 | 0.317 |
| 10.00 | -37.23 | -27.23 | -0.96 | -2580.0 | 0.00 | 2580.09 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | 0.17 | -0.157 | 0.000 | 0.311 |
| 15.00 | -35.70 | -26.75 | -0.96 | -2443.9 | 0.00 | 2443.95 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | 0.37 | -0.236 | 0.000 | 0.304 |
| 20.00 | -34.19 | -26.24 | -0.96 | -2310.2 | 0.00 | 2310.22 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | 0.66 | -0.315 | 0.000 | 0.297 |
| 25.00 | -32.72 | -25.71 | -0.96 | -2179.0 | 0.00 | 2179.02 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | 1.04 | -0.394 | 0.000 | 0.290 |
| 30.00 | -31.28 | -25.17 | -0.96 | -2050.4 | 0.00 | 2050.46 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | 1.49 | -0.473 | 0.000 | 0.283 |
| 35.00 | -29.88 | -24.61 | -0.96 | -1924.5 | 0.00 | 1924.59 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | 2.03 | -0.553 | 0.000 | 0.276 |
| 38.00 | -29.05 | -24.28 | -0.96 | -1850.7 | 0.00 | 1850.75 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | 2.39 | -0.601 | 0.000 | 0.271 |
| 40.00 | -28.02 | -24.06 | -0.96 | -1802.1 | 0.00 | 1802.19 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | 2.65 | -0.634 | 0.000 | 0.268 |
| 45.00 | -25.52 | -23.47 | -0.96 | -1681.9 | -0.01 | 1681.90 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | 3.36 | -0.713 | 0.000 | 0.299 |
| 50.00 | -24.34 | -22.90 | -0.96 | -1564.5 | -0.01 | 1564.54 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | 4.15 | -0.792 | 0.000 | 0.289 |
| 55.00 | -23.18 | -22.32 | -0.96 | -1450.0 | -0.01 | 1450.06 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | 5.03 | -0.877 | 0.000 | 0.278 |
| 60.00 | -22.05 | -21.74 | -0.96 | -1338.4 | -0.01 | 1338.47 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | 5.99 | -0.961 | 0.000 | 0.267 |
| 65.00 | -20.95 | -21.17 | -0.96 | -1229.7 | -0.01 | 1229.75 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | 7.04 | -1.044 | -0.001 | 0.256 |
| 70.00 | -19.87 | -20.59 | -0.96 | -1123.9 | -0.01 | 1123.91 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | 8.18 | -1.126 | -0.001 | 0.244 |
| 75.00 | -18.83 | -20.01 | -0.96 | -1020.9 | -0.01 | 1020.95 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | 9.40 | -1.206 | -0.001 | 0.232 |
| 77.00 | -18.42 | -19.79 | -0.96 | -980.92 | -0.01 | 980.92 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | 9.91 | -1.238 | -0.001 | 0.227 |
| 80.00 | -17.30 | -19.44 | -0.96 | -921.54 | -0.01 | 921.54 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | 10.71 | -1.286 | -0.001 | 0.219 |
| 83.00 | -16.20 | -19.08 | -0.96 | -863.24 | -0.01 | 863.24 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | 11.53 | -1.332 | -0.001 | 0.249 |
| 85.00 | -15.85 | -18.86 | -0.96 | -825.08 | -0.01 | 825.08 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | 12.10 | -1.363 | -0.001 | 0.242 |
| 90.00 | -15.00 | -18.30 | -0.96 | -730.79 | -0.01 | 730.79 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | 13.57 | -1.444 | -0.001 | 0.224 |
| 95.00 | -14.17 | -17.74 | -0.96 | -639.32 | -0.02 | 639.32 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | 15.12 | -1.521 | -0.001 | 0.206 |
| 100.00 | -13.37 | -17.19 | -0.96 | -550.63 | -0.02 | 550.63 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | 16.76 | -1.594 | -0.001 | 0.186 |
| 105.00 | -12.59 | -16.64 | -0.96 | -464.70 | -0.02 | 464.70 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | 18.46 | -1.662 | -0.001 | 0.166 |
| 110.00 | -11.83 | -16.11 | -0.96 | -381.48 | -0.02 | 381.48 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | 20.24 | -1.723 | -0.001 | 0.143 |
| 115.00 | -11.10 | -15.58 | -0.96 | -300.95 | -0.02 | 300.95 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | 22.07 | -1.777 | -0.002 | 0.120 |
| 120.00 | -9.82 | -15.03 | -0.96 | -223.06 | -0.02 | 223.06 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | 23.96 | -1.823 | -0.002 | 0.115 |
| 125.00 | -9.24 | -14.52 | -0.96 | -147.90 | -0.03 | 147.90 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | 25.89 | -1.859 | -0.002 | 0.082 |
| 130.00 | -5.00 | -7.09 | -0.66 | -75.31 | -0.02 | 75.31 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | 27.85 | -1.885 | -0.002 | 0.044 |
| 135.00 | -4.48 | -6.60 | -0.66 | -39.85 | -0.02 | 39.85 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | 29.84 | -1.901 | -0.002 | 0.025 |
| 140.00 | -0.93 | -0.92 | 0.00 | -6.87 | 0.00 | 6.87 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | 31.83 | -1.907 | -0.003 | 0.005 |
| 145.00 | -0.45 | -0.45 | 0.00 | -2.27 | 0.00 | 2.27 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | 33.83 | -1.909 | -0.003 | 0.002 |
| 150.00 | 0.00 | -0.44 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | 35.83 | -1.909 | -0.003 | 0.000 |

# Wind Loading - Shaft

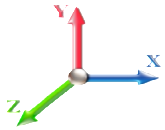
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 15 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.00




**Iterations** 18

| 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 | | 1.00 | 0.85 | 5.168 | 5.68 | 0.00 | 1.200 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 1.00 | 0.85 | 5.168 | 5.68 | 0.00 | 1.200 | 1.656 | 5.00 | 28.111 | 33.73 | 191.8 | 666.5 | 2697.3 |
| 10.00 | | 1.00 | 0.85 | 5.168 | 5.68 | 0.00 | 1.200 | 1.775 | 5.00 | 27.711 | 33.25 | 189.0 | 702.5 | 2695.1 |
| 15.00 | | 1.00 | 0.85 | 5.168 | 5.68 | 0.00 | 1.200 | 1.848 | 5.00 | 27.273 | 32.73 | 186.0 | 718.7 | 2673.1 |
| 20.00 | | 1.00 | 0.90 | 5.483 | 6.03 | 0.00 | 1.200 | 1.902 | 5.00 | 26.818 | 32.18 | 194.1 | 726.3 | 2642.4 |
| 25.00 | | 1.00 | 0.95 | 5.747 | 6.32 | 0.00 | 1.200 | 1.945 | 5.00 | 26.354 | 31.63 | 199.9 | 728.8 | 2606.6 |
| 30.00 | | 1.00 | 0.98 | 5.972 | 6.57 | 0.00 | 1.200 | 1.981 | 5.00 | 25.885 | 31.06 | 204.1 | 728.0 | 2567.6 |
| 35.00 | | 1.00 | 1.01 | 6.169 | 6.79 | 0.00 | 1.200 | 2.012 | 5.00 | 25.411 | 30.49 | 206.9 | 724.8 | 2526.2 |
| 38.00 | Bot - Section 2 | 1.00 | 1.03 | 6.277 | 6.90 | 0.00 | 1.200 | 2.028 | 3.00 | 15.015 | 18.02 | 124.4 | 433.2 | 1495.6 |
| 40.00 | | 1.00 | 1.04 | 6.345 | 6.98 | 0.00 | 1.200 | 2.039 | 2.00 | 10.062 | 12.07 | 84.3 | 292.4 | 1616.8 |
| 45.00 | Top - Section 1 | 1.00 | 1.07 | 6.504 | 7.15 | 0.00 | 1.200 | 2.063 | 5.00 | 24.825 | 29.79 | 213.1 | 724.7 | 3985.4 |
| 50.00 | | 1.00 | 1.09 | 6.650 | 7.32 | 0.00 | 1.200 | 2.085 | 5.00 | 24.344 | 29.21 | 213.7 | 717.2 | 2219.6 |
| 55.00 | | 1.00 | 1.12 | 6.785 | 7.46 | 0.00 | 1.200 | 2.105 | 5.00 | 23.861 | 28.63 | 213.7 | 708.8 | 2177.7 |
| 60.00 | | 1.00 | 1.14 | 6.910 | 7.60 | 0.00 | 1.200 | 2.123 | 5.00 | 23.377 | 28.05 | 213.2 | 699.5 | 2135.0 |
| 65.00 | | 1.00 | 1.16 | 7.028 | 7.73 | 0.00 | 1.200 | 2.140 | 5.00 | 22.892 | 27.47 | 212.4 | 689.5 | 2091.5 |
| 70.00 | | 1.00 | 1.17 | 7.138 | 7.85 | 0.00 | 1.200 | 2.156 | 5.00 | 22.406 | 26.89 | 211.1 | 678.9 | 2047.4 |
| 75.00 | | 1.00 | 1.19 | 7.243 | 7.97 | 0.00 | 1.200 | 2.171 | 5.00 | 21.919 | 26.30 | 209.6 | 667.7 | 2002.8 |
| 77.00 | Bot - Section 3 | 1.00 | 1.20 | 7.283 | 8.01 | 0.00 | 1.200 | 2.177 | 2.00 | 8.630 | 10.36 | 83.0 | 265.3 | 789.9 |
| 80.00 | | 1.00 | 1.21 | 7.342 | 8.08 | 0.00 | 1.200 | 2.185 | 3.00 | 12.989 | 15.59 | 125.9 | 399.8 | 1854.6 |
| 83.00 | Top - Section 2 | 1.00 | 1.22 | 7.399 | 8.14 | 0.00 | 1.200 | 2.193 | 3.00 | 12.814 | 15.38 | 125.1 | 395.5 | 1827.9 |
| 85.00 | | 1.00 | 1.22 | 7.436 | 8.18 | 0.00 | 1.200 | 2.198 | 2.00 | 8.444 | 10.13 | 82.9 | 261.7 | 701.0 |
| 90.00 | | 1.00 | 1.24 | 7.526 | 8.28 | 0.00 | 1.200 | 2.211 | 5.00 | 20.771 | 24.93 | 206.4 | 641.9 | 1720.0 |
| 95.00 | | 1.00 | 1.25 | 7.612 | 8.37 | 0.00 | 1.200 | 2.223 | 5.00 | 20.282 | 24.34 | 203.8 | 629.1 | 1678.5 |
| 100.00 | | 1.00 | 1.27 | 7.695 | 8.46 | 0.00 | 1.200 | 2.234 | 5.00 | 19.792 | 23.75 | 201.0 | 616.0 | 1636.7 |
| 105.00 | | 1.00 | 1.28 | 7.774 | 8.55 | 0.00 | 1.200 | 2.245 | 5.00 | 19.302 | 23.16 | 198.1 | 602.5 | 1594.5 |
| 110.00 | | 1.00 | 1.29 | 7.851 | 8.64 | 0.00 | 1.200 | 2.256 | 5.00 | 18.811 | 22.57 | 194.9 | 588.8 | 1552.1 |
| 115.00 | Bot - Section 4 | 1.00 | 1.30 | 7.925 | 8.72 | 0.00 | 1.200 | 2.266 | 5.00 | 18.320 | 21.98 | 191.6 | 574.8 | 1509.4 |
| 120.00 | Top - Section 3 | 1.00 | 1.32 | 7.996 | 8.80 | 0.00 | 1.200 | 2.276 | 5.00 | 18.093 | 21.71 | 191.0 | 569.5 | 2244.3 |
| 125.00 | | 1.00 | 1.33 | 8.065 | 8.87 | 0.00 | 1.200 | 2.285 | 5.00 | 17.602 | 21.12 | 187.4 | 555.0 | 1300.0 |
| 130.00 | Appurtenance(s) | 1.00 | 1.34 | 8.132 | 8.95 | 0.00 | 1.200 | 2.294 | 5.00 | 17.110 | 20.53 | 183.7 | 540.4 | 1261.4 |
| 135.00 | | 1.00 | 1.35 | 8.197 | 9.02 | 0.00 | 1.200 | 2.303 | 5.00 | 16.618 | 19.94 | 179.8 | 525.5 | 1222.7 |
| 140.00 | Appurtenance(s) | 1.00 | 1.36 | 8.260 | 9.09 | 0.00 | 1.200 | 2.311 | 5.00 | 16.125 | 19.35 | 175.8 | 510.4 | 1183.7 |
| 145.00 | | 1.00 | 1.37 | 8.321 | 9.15 | 0.00 | 1.200 | 2.319 | 5.00 | 15.633 | 18.76 | 171.7 | 495.2 | 1144.6 |
| 150.00 | | 1.00 | 1.38 | 8.381 | 9.22 | 0.00 | 1.200 | 2.327 | 5.00 | 15.140 | 18.17 | 167.5 | 479.8 | 1105.3 |
| | | | | | | | | **Totals:** | **150.00** | | | **5,936.9** | | **62,506.6** |

# Discrete Appurtenance Forces

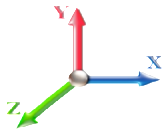
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 16 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.00




**Iterations** 18

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa x Ka | Ka | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140.00 | ALU 1900 Mhz RRUs | 3 | 8.260 | 9.086 | 0.50 | 0.75 | 6.71 | 475.75 | 0.000 | 0.000 | 60.95 | 0.00 | 0.00 |
| 2 | 140.00 | Dragonwave | 3 | 8.260 | 9.086 | 1.00 | 1.00 | 19.10 | 402.32 | 1.495 | 0.000 | 173.55 | 259.46 | 0.00 |
| 3 | 140.00 | RMQP-496-HK | 1 | 8.260 | 9.086 | 1.00 | 1.00 | 92.37 | 5544.52 | 0.000 | 0.000 | 839.26 | 0.00 | 0.00 |
| 4 | 140.00 | AAHC | 3 | 8.260 | 9.086 | 0.56 | 0.75 | 8.98 | 920.05 | 0.000 | 0.000 | 81.63 | 0.00 | 0.00 |
| 5 | 140.00 | NNVV-65B-R4 | 3 | 8.260 | 9.086 | 0.55 | 0.75 | 23.64 | 1215.62 | 0.000 | 0.000 | 214.79 | 0.00 | 0.00 |
| 6 | 140.00 | ALU 800 Mhz RRUs | 6 | 8.260 | 9.086 | 0.50 | 0.75 | 12.07 | 842.61 | 0.000 | 0.000 | 109.70 | 0.00 | 0.00 |
| 7 | 130.00 | f#P-HRK10 | 1 | 8.132 | 8.945 | 1.00 | 1.00 | 23.04 | 1666.57 | 0.000 | 0.000 | 206.08 | 0.00 | 0.00 |
| 8 | 130.00 | APXVAA24_43-U-A20 | 3 | 8.132 | 8.945 | 0.55 | 0.75 | 37.39 | 2109.70 | 0.000 | 0.000 | 334.50 | 0.00 | 0.00 |
| 9 | 130.00 | Radio 2217 B66A | 3 | 8.132 | 8.945 | 0.50 | 0.75 | 2.98 | 208.84 | 0.000 | 0.000 | 26.62 | 0.00 | 0.00 |
| 10 | 130.00 | FSP-10W | 1 | 8.132 | 8.945 | 1.00 | 1.00 | 150.98 | 5262.05 | 0.000 | 0.000 | 1350.54 | 0.00 | 0.00 |
| 11 | 130.00 | Radio 4449 B71 + B12 | 3 | 8.132 | 8.945 | 0.50 | 0.75 | 3.59 | 543.42 | 0.000 | 0.000 | 32.11 | 0.00 | 0.00 |
| 12 | 130.00 | Radio 4415 B25 | 3 | 8.132 | 8.945 | 0.52 | 0.75 | 3.65 | 299.48 | 0.000 | 0.000 | 32.65 | 0.00 | 0.00 |
| 13 | 130.00 | SHP2-13 | 1 | 8.132 | 8.945 | 1.00 | 1.00 | 4.32 | 348.35 | 2.495 | 0.000 | 38.67 | 96.48 | 0.00 |
| 14 | 130.00 | AIR 5122 28GHz | 3 | 8.132 | 8.945 | 0.57 | 0.75 | 5.38 | 240.73 | 0.000 | 0.000 | 48.14 | 0.00 | 0.00 |
| 15 | 130.00 | AIR3246 B66 | 3 | 8.132 | 8.945 | 0.65 | 0.75 | 15.69 | 1240.69 | 0.000 | 0.000 | 140.33 | 0.00 | 0.00 |
| 16 | 130.00 | APX16DWV-16DWV-S-EA | 3 | 8.132 | 8.945 | 0.46 | 0.75 | 11.10 | 725.92 | 0.000 | 0.000 | 99.26 | 0.00 | 0.00 |
| | | | | | | | **Totals:** | | **22,046.62** | | | **3,788.78** | | |

# Total Applied Force Summary

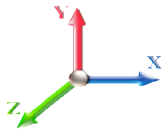
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 17 |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.00




**Iterations** 18

| 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 | | 191.77 | 2738.83 | 0.00 | 0.00 |
| 10.00 | | 189.04 | 2736.59 | 0.00 | 0.00 |
| 15.00 | | 186.05 | 2714.59 | 0.00 | 0.00 |
| 20.00 | | 194.11 | 2683.88 | 0.00 | 0.00 |
| 25.00 | | 199.93 | 2648.15 | 0.00 | 0.00 |
| 30.00 | | 204.06 | 2609.11 | 0.00 | 0.00 |
| 35.00 | | 206.93 | 2567.67 | 0.00 | 0.00 |
| 38.00 | | 124.41 | 1520.56 | 0.00 | 0.00 |
| 40.00 | | 84.27 | 1633.37 | 0.00 | 0.00 |
| 45.00 | | 213.14 | 4026.93 | 0.00 | 0.00 |
| 50.00 | | 213.70 | 2261.12 | 0.00 | 0.00 |
| 55.00 | | 213.70 | 2219.21 | 0.00 | 0.00 |
| 60.00 | | 213.24 | 2176.48 | 0.00 | 0.00 |
| 65.00 | | 212.36 | 2133.03 | 0.00 | 0.00 |
| 70.00 | | 211.12 | 2088.96 | 0.00 | 0.00 |
| 75.00 | | 209.56 | 2044.34 | 0.00 | 0.00 |
| 77.00 | | 82.96 | 806.53 | 0.00 | 0.00 |
| 80.00 | | 125.88 | 1879.49 | 0.00 | 0.00 |
| 83.00 | | 125.14 | 1852.82 | 0.00 | 0.00 |
| 85.00 | | 82.89 | 717.59 | 0.00 | 0.00 |
| 90.00 | | 206.35 | 1761.47 | 0.00 | 0.00 |
| 95.00 | | 203.80 | 1719.99 | 0.00 | 0.00 |
| 100.00 | | 201.04 | 1678.17 | 0.00 | 0.00 |
| 105.00 | | 198.08 | 1636.05 | 0.00 | 0.00 |
| 110.00 | | 194.94 | 1593.63 | 0.00 | 0.00 |
| 115.00 | | 191.64 | 1550.95 | 0.00 | 0.00 |
| 120.00 | | 190.97 | 2285.83 | 0.00 | 0.00 |
| 125.00 | | 187.39 | 1341.53 | 0.00 | 0.00 |
| 130.00 | (24) attachments | 2492.56 | 13948.72 | 96.48 | 0.00 |
| 135.00 | | 179.80 | 1243.44 | 0.00 | 0.00 |
| 140.00 | (19) attachments | 1655.69 | 10605.35 | 259.46 | 0.00 |
| 145.00 | | 171.71 | 1144.57 | 0.00 | 0.00 |
| 150.00 | | 167.48 | 1105.25 | 0.00 | 0.00 |
| | **Totals:** | **9,725.71** | **85,674.23** | **355.94** | **0.00** |

# Calculated Forces

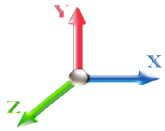
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 18 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi 50 mph Wind

**Dead Load Factor** 1.20

**Wind Load Factor** 1.00




**Iterations** 18

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -85.67 | -9.75 | -0.36 | -994.89 | 0.00 | 994.89 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | 0.00 | 0.000 | 0.000 | 0.123 |
| 5.00 | -82.93 | -9.59 | -0.36 | -946.16 | 0.00 | 946.16 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | 0.01 | -0.027 | 0.000 | 0.120 |
| 10.00 | -80.19 | -9.44 | -0.36 | -898.20 | 0.00 | 898.20 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | 0.06 | -0.055 | 0.000 | 0.118 |
| 15.00 | -77.47 | -9.29 | -0.36 | -851.00 | 0.00 | 851.00 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | 0.13 | -0.082 | 0.000 | 0.116 |
| 20.00 | -74.78 | -9.13 | -0.36 | -804.56 | 0.00 | 804.56 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | 0.23 | -0.110 | 0.000 | 0.113 |
| 25.00 | -72.13 | -8.95 | -0.36 | -758.93 | 0.00 | 758.93 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | 0.36 | -0.137 | 0.000 | 0.110 |
| 30.00 | -69.52 | -8.78 | -0.36 | -714.16 | 0.00 | 714.16 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | 0.52 | -0.165 | 0.000 | 0.108 |
| 35.00 | -66.95 | -8.59 | -0.36 | -670.27 | 0.00 | 670.27 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | 0.71 | -0.193 | 0.000 | 0.105 |
| 38.00 | -65.42 | -8.47 | -0.36 | -644.50 | 0.00 | 644.50 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | 0.83 | -0.209 | 0.000 | 0.103 |
| 40.00 | -63.79 | -8.41 | -0.36 | -627.56 | 0.00 | 627.56 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | 0.92 | -0.221 | 0.000 | 0.102 |
| 45.00 | -59.76 | -8.21 | -0.36 | -585.53 | 0.00 | 585.53 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | 1.17 | -0.248 | 0.000 | 0.114 |
| 50.00 | -57.49 | -8.01 | -0.36 | -544.50 | 0.00 | 544.50 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | 1.44 | -0.276 | 0.000 | 0.110 |
| 55.00 | -55.27 | -7.81 | -0.36 | -504.46 | 0.00 | 504.46 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | 1.75 | -0.305 | 0.000 | 0.106 |
| 60.00 | -53.09 | -7.61 | -0.36 | -465.39 | 0.00 | 465.39 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | 2.09 | -0.334 | 0.000 | 0.102 |
| 65.00 | -50.96 | -7.41 | -0.36 | -427.32 | 0.00 | 427.32 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | 2.45 | -0.363 | 0.000 | 0.098 |
| 70.00 | -48.87 | -7.21 | -0.36 | -390.25 | 0.00 | 390.25 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | 2.85 | -0.392 | 0.000 | 0.094 |
| 75.00 | -46.82 | -7.01 | -0.36 | -354.18 | 0.00 | 354.18 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | 3.27 | -0.420 | 0.000 | 0.089 |
| 77.00 | -46.01 | -6.93 | -0.36 | -340.17 | 0.00 | 340.17 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | 3.45 | -0.431 | 0.000 | 0.087 |
| 80.00 | -44.13 | -6.80 | -0.36 | -319.38 | 0.00 | 319.38 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | 3.73 | -0.447 | 0.000 | 0.084 |
| 83.00 | -42.28 | -6.67 | -0.36 | -298.98 | 0.00 | 298.98 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | 4.01 | -0.463 | 0.000 | 0.096 |
| 85.00 | -41.56 | -6.60 | -0.36 | -285.64 | 0.00 | 285.64 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | 4.21 | -0.474 | 0.000 | 0.093 |
| 90.00 | -39.80 | -6.39 | -0.36 | -252.66 | 0.00 | 252.66 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | 4.72 | -0.502 | 0.000 | 0.087 |
| 95.00 | -38.08 | -6.19 | -0.36 | -220.70 | 0.00 | 220.70 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | 5.26 | -0.529 | 0.000 | 0.080 |
| 100.00 | -36.40 | -5.99 | -0.36 | -189.74 | 0.00 | 189.74 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | 5.83 | -0.554 | 0.000 | 0.073 |
| 105.00 | -34.76 | -5.79 | -0.36 | -159.79 | 0.00 | 159.79 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | 6.42 | -0.577 | 0.000 | 0.066 |
| 110.00 | -33.17 | -5.59 | -0.36 | -130.85 | 0.00 | 130.85 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | 7.04 | -0.598 | -0.001 | 0.058 |
| 115.00 | -31.62 | -5.39 | -0.36 | -102.90 | 0.00 | 102.90 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | 7.68 | -0.617 | -0.001 | 0.049 |
| 120.00 | -29.33 | -5.18 | -0.36 | -75.95 | 0.00 | 75.95 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | 8.33 | -0.632 | -0.001 | 0.049 |
| 125.00 | -27.99 | -4.98 | -0.36 | -50.04 | 0.00 | 50.04 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | 9.00 | -0.645 | -0.001 | 0.037 |
| 130.00 | -14.07 | -2.34 | -0.26 | -25.12 | 0.00 | 25.12 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | 9.68 | -0.654 | -0.001 | 0.020 |
| 135.00 | -12.83 | -2.14 | -0.26 | -13.44 | 0.00 | 13.44 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | 10.37 | -0.659 | -0.001 | 0.013 |
| 140.00 | -2.25 | -0.37 | 0.00 | -2.73 | 0.00 | 2.73 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | 11.06 | -0.661 | -0.001 | 0.003 |
| 145.00 | -1.10 | -0.18 | 0.00 | -0.90 | 0.00 | 0.90 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | 11.75 | -0.662 | -0.001 | 0.001 |
| 150.00 | 0.00 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | 12.45 | -0.662 | -0.001 | 0.000 |

# Seismic Segment Forces (Factored)

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 19 |

Tower Engineering Solutions

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Load Case:** | 1.2D + 1.0E | | | | | | | **Iterations** | 17 |
| **Gust Response Factor** | 1.10 | | | | **Sds** | 0.20 | | **Ss** | 0.18 |
| **Dead Load Factor** | 1.20 | **Seismic Load Factor** | 1.00 | | **Sd1** | 0.10 | | **S1** | 0.06 |
| **Wind Load Factor** | 0.00 | **Structure Frequency** | 0.49 | | **SA** | 0.05 | **Seismic Importance Factor** | | 1.00 |

| Top Elev (ft) | Description | Wz (lb) | a | b | c | Lateral Fs (lb) | R: 1.50 |
|---|---|---|---|---|---|---|---|
| 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5.00 | | 1692.3 | 0.00 | 0.03 | 0.02 | 25.34 | |
| 10.00 | | 1660.4 | 0.01 | 0.05 | 0.03 | 37.53 | |
| 15.00 | | 1628.6 | 0.02 | 0.06 | 0.04 | 43.36 | |
| 20.00 | | 1596.7 | 0.03 | 0.07 | 0.04 | 46.01 | |
| 25.00 | | 1564.8 | 0.05 | 0.07 | 0.04 | 47.16 | |
| 30.00 | | 1533.0 | 0.08 | 0.07 | 0.04 | 47.72 | |
| 35.00 | | 1501.1 | 0.10 | 0.07 | 0.04 | 48.07 | |
| 38.00 | Bot - Section 2 | 885.39 | 0.12 | 0.07 | 0.03 | 28.80 | |
| 40.00 | | 1103.6 | 0.13 | 0.07 | 0.03 | 36.25 | |
| 45.00 | Top - Section 1 | 2717.2 | 0.17 | 0.07 | 0.03 | 90.94 | |
| 50.00 | | 1251.9 | 0.21 | 0.06 | 0.02 | 42.03 | |
| 55.00 | | 1224.1 | 0.25 | 0.05 | 0.02 | 40.10 | |
| 60.00 | | 1196.2 | 0.30 | 0.04 | 0.01 | 36.54 | |
| 65.00 | | 1168.3 | 0.35 | 0.03 | 0.01 | 30.93 | |
| 70.00 | | 1140.4 | 0.41 | 0.01 | 0.01 | 23.11 | |
| 75.00 | | 1112.5 | 0.47 | -0.01 | 0.01 | 13.34 | |
| 77.00 | Bot - Section 3 | 437.22 | 0.50 | -0.02 | 0.01 | 3.60 | |
| 80.00 | | 1212.3 | 0.54 | -0.03 | 0.01 | 2.80 | |
| 83.00 | Top - Section 2 | 1193.6 | 0.58 | -0.05 | 0.01 | -4.41 | |
| 85.00 | | 366.04 | 0.61 | -0.06 | 0.02 | -2.77 | |
| 90.00 | | 898.38 | 0.68 | -0.08 | 0.03 | -14.44 | |
| 95.00 | | 874.47 | 0.76 | -0.10 | 0.04 | -18.96 | |
| 100.00 | | 850.57 | 0.84 | -0.12 | 0.07 | -19.76 | |
| 105.00 | | 826.67 | 0.93 | -0.12 | 0.10 | -16.52 | |
| 110.00 | | 802.77 | 1.02 | -0.11 | 0.14 | -9.31 | |
| 115.00 | Bot - Section 4 | 778.87 | 1.11 | -0.06 | 0.19 | 1.64 | |
| 120.00 | Top - Section 3 | 1395.7 | 1.21 | 0.01 | 0.26 | 29.57 | |
| 125.00 | | 620.82 | 1.31 | 0.14 | 0.35 | 28.37 | |
| 130.00 | Appurtenance(s) | 4944.7 | 1.42 | 0.32 | 0.45 | 374.27 | |
| 135.00 | | 580.99 | 1.53 | 0.58 | 0.58 | 64.62 | |
| 140.00 | Appurtenance(s) | 4133.5 | 1.65 | 0.93 | 0.73 | 629.87 | |
| 145.00 | | 541.15 | 1.77 | 1.39 | 0.92 | 107.83 | |
| 150.00 | | 521.23 | 1.89 | 1.98 | 1.14 | 131.33 | |
| | **Totals:** | **43,956.5** | | | | **1,925.0** | **Total Wind:** **28,184.1** |

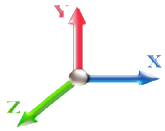
Seismic Base Shear is Less Than 50% of Wind Force - An Analysis is NOT Required

# Calculated Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 20 | |

Tower Engineering Solutions

**Load Case:** 1.2D + 1.0E




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Gust Response Factor** | 1.10 | | | **Sds** | 0.20 | **Iterations** | 17 | | |
| **Dead Load Factor** | 1.20 | **Seismic Load Factor** | 1.00 | **Sd1** | 0.10 | **Ss** | 0.18 | | |
| **Wind Load Factor** | 0.00 | **Structure Frequency** | 0.49 | **SA** | 0.05 | **S1** | 0.06 | **Seismic Importance Factor** | 1.00 |

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -53.87 | -2.01 | 0.00 | -217.35 | 0.00 | 217.35 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | | 0.00 | 0.00 | 0.032 |
| 5.00 | -51.80 | -1.99 | 0.00 | -207.29 | 0.00 | 207.29 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | | 0.00 | -0.01 | 0.031 |
| 10.00 | -49.76 | -1.96 | 0.00 | -197.32 | 0.00 | 197.32 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | | 0.01 | -0.01 | 0.031 |
| 15.00 | -47.77 | -1.92 | 0.00 | -187.52 | 0.00 | 187.52 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | | 0.03 | -0.02 | 0.030 |
| 20.00 | -45.81 | -1.88 | 0.00 | -177.91 | 0.00 | 177.91 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | | 0.05 | -0.02 | 0.029 |
| 25.00 | -43.89 | -1.84 | 0.00 | -168.51 | 0.00 | 168.51 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | | 0.08 | -0.03 | 0.029 |
| 30.00 | -42.01 | -1.79 | 0.00 | -159.33 | 0.00 | 159.33 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | | 0.11 | -0.04 | 0.028 |
| 35.00 | -40.16 | -1.75 | 0.00 | -150.37 | 0.00 | 150.37 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | | 0.16 | -0.04 | 0.028 |
| 38.00 | -39.08 | -1.72 | 0.00 | -145.13 | 0.00 | 145.13 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | | 0.18 | -0.05 | 0.027 |
| 40.00 | -37.74 | -1.68 | 0.00 | -141.69 | 0.00 | 141.69 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | | 0.20 | -0.05 | 0.027 |
| 45.00 | -34.43 | -1.59 | 0.00 | -133.27 | 0.00 | 133.27 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | | 0.26 | -0.06 | 0.030 |
| 50.00 | -32.89 | -1.55 | 0.00 | -125.30 | 0.00 | 125.30 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | | 0.32 | -0.06 | 0.029 |
| 55.00 | -31.38 | -1.52 | 0.00 | -117.52 | 0.00 | 117.52 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | | 0.39 | -0.07 | 0.028 |
| 60.00 | -29.90 | -1.48 | 0.00 | -109.94 | 0.00 | 109.94 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | | 0.46 | -0.08 | 0.028 |
| 65.00 | -28.46 | -1.45 | 0.00 | -102.53 | 0.00 | 102.53 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | | 0.54 | -0.08 | 0.027 |
| 70.00 | -27.05 | -1.43 | 0.00 | -95.27 | 0.00 | 95.27 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | | 0.63 | -0.09 | 0.026 |
| 75.00 | -25.67 | -1.42 | 0.00 | -88.12 | 0.00 | 88.12 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | | 0.73 | -0.10 | 0.025 |
| 77.00 | -25.13 | -1.41 | 0.00 | -85.29 | 0.00 | 85.29 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | | 0.77 | -0.10 | 0.025 |
| 80.00 | -23.65 | -1.41 | 0.00 | -81.05 | 0.00 | 81.05 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | | 0.84 | -0.10 | 0.024 |
| 83.00 | -22.19 | -1.41 | 0.00 | -76.82 | 0.00 | 76.82 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | | 0.90 | -0.11 | 0.028 |
| 85.00 | -21.74 | -1.41 | 0.00 | -74.00 | 0.00 | 74.00 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | | 0.95 | -0.11 | 0.027 |
| 90.00 | -20.62 | -1.41 | 0.00 | -66.95 | 0.00 | 66.95 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | | 1.06 | -0.12 | 0.026 |
| 95.00 | -19.53 | -1.41 | 0.00 | -59.90 | 0.00 | 59.90 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | | 1.19 | -0.12 | 0.024 |
| 100.00 | -18.46 | -1.41 | 0.00 | -52.84 | 0.00 | 52.84 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | | 1.32 | -0.13 | 0.023 |
| 105.00 | -17.43 | -1.41 | 0.00 | -45.79 | 0.00 | 45.79 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | | 1.47 | -0.14 | 0.021 |
| 110.00 | -16.42 | -1.41 | 0.00 | -38.74 | 0.00 | 38.74 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | | 1.61 | -0.14 | 0.019 |
| 115.00 | -15.45 | -1.41 | 0.00 | -31.70 | 0.00 | 31.70 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | | 1.77 | -0.15 | 0.017 |
| 120.00 | -13.73 | -1.37 | 0.00 | -24.67 | 0.00 | 24.67 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | | 1.93 | -0.15 | 0.018 |
| 125.00 | -12.95 | -1.34 | 0.00 | -17.80 | 0.00 | 17.80 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | | 2.09 | -0.16 | 0.014 |
| 130.00 | -6.97 | -0.95 | 0.00 | -11.08 | 0.00 | 11.08 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | | 2.26 | -0.16 | 0.009 |
| 135.00 | -6.25 | -0.89 | 0.00 | -6.31 | 0.00 | 6.31 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | | 2.43 | -0.16 | 0.006 |
| 140.00 | -1.27 | -0.24 | 0.00 | -1.88 | 0.00 | 1.88 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | | 2.60 | -0.17 | 0.002 |
| 145.00 | -0.63 | -0.13 | 0.00 | -0.67 | 0.00 | 0.67 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | | 2.77 | -0.17 | 0.001 |
| 150.00 | 0.00 | -0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | | 2.95 | -0.17 | 0.000 |

# Seismic Segment Forces (Factored)

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 21 |

Tower Engineering Solutions

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Load Case:** | 0.9D + 1.0E | | | | | | | **Iterations** | 17 |
| **Gust Response Factor** | 1.10 | | | | **Sds** | 0.20 | | **Ss** | 0.18 |
| **Dead Load Factor** | 0.90 | **Seismic Load Factor** | 1.00 | | **Sd1** | 0.10 | | **S1** | 0.06 |
| **Wind Load Factor** | 0.00 | **Structure Frequency** | 0.49 | | **SA** | 0.05 | **Seismic Importance Factor** | | 1.00 |

| Top Elev (ft) | Description | Wz (lb) | a | b | c | Lateral Fs (lb) | R: 1.50 |
|---|---|---|---|---|---|---|---|
| 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 5.00 | | 1692.3 | 0.00 | 0.03 | 0.02 | 25.34 | |
| 10.00 | | 1660.4 | 0.01 | 0.05 | 0.03 | 37.53 | |
| 15.00 | | 1628.6 | 0.02 | 0.06 | 0.04 | 43.36 | |
| 20.00 | | 1596.7 | 0.03 | 0.07 | 0.04 | 46.01 | |
| 25.00 | | 1564.8 | 0.05 | 0.07 | 0.04 | 47.16 | |
| 30.00 | | 1533.0 | 0.08 | 0.07 | 0.04 | 47.72 | |
| 35.00 | | 1501.1 | 0.10 | 0.07 | 0.04 | 48.07 | |
| 38.00 | Bot - Section 2 | 885.39 | 0.12 | 0.07 | 0.03 | 28.80 | |
| 40.00 | | 1103.6 | 0.13 | 0.07 | 0.03 | 36.25 | |
| 45.00 | Top - Section 1 | 2717.2 | 0.17 | 0.07 | 0.03 | 90.94 | |
| 50.00 | | 1251.9 | 0.21 | 0.06 | 0.02 | 42.03 | |
| 55.00 | | 1224.1 | 0.25 | 0.05 | 0.02 | 40.10 | |
| 60.00 | | 1196.2 | 0.30 | 0.04 | 0.01 | 36.54 | |
| 65.00 | | 1168.3 | 0.35 | 0.03 | 0.01 | 30.93 | |
| 70.00 | | 1140.4 | 0.41 | 0.01 | 0.01 | 23.11 | |
| 75.00 | | 1112.5 | 0.47 | -0.01 | 0.01 | 13.34 | |
| 77.00 | Bot - Section 3 | 437.22 | 0.50 | -0.02 | 0.01 | 3.60 | |
| 80.00 | | 1212.3 | 0.54 | -0.03 | 0.01 | 2.80 | |
| 83.00 | Top - Section 2 | 1193.6 | 0.58 | -0.05 | 0.01 | -4.41 | |
| 85.00 | | 366.04 | 0.61 | -0.06 | 0.02 | -2.77 | |
| 90.00 | | 898.38 | 0.68 | -0.08 | 0.03 | -14.44 | |
| 95.00 | | 874.47 | 0.76 | -0.10 | 0.04 | -18.96 | |
| 100.00 | | 850.57 | 0.84 | -0.12 | 0.07 | -19.76 | |
| 105.00 | | 826.67 | 0.93 | -0.12 | 0.10 | -16.52 | |
| 110.00 | | 802.77 | 1.02 | -0.11 | 0.14 | -9.31 | |
| 115.00 | Bot - Section 4 | 778.87 | 1.11 | -0.06 | 0.19 | 1.64 | |
| 120.00 | Top - Section 3 | 1395.7 | 1.21 | 0.01 | 0.26 | 29.57 | |
| 125.00 | | 620.82 | 1.31 | 0.14 | 0.35 | 28.37 | |
| 130.00 | Appurtenance(s) | 4944.7 | 1.42 | 0.32 | 0.45 | 374.27 | |
| 135.00 | | 580.99 | 1.53 | 0.58 | 0.58 | 64.62 | |
| 140.00 | Appurtenance(s) | 4133.5 | 1.65 | 0.93 | 0.73 | 629.87 | |
| 145.00 | | 541.15 | 1.77 | 1.39 | 0.92 | 107.83 | |
| 150.00 | | 521.23 | 1.89 | 1.98 | 1.14 | 131.33 | |
| | **Totals:** | **43,956.5** | | | | **1,925.0** | **Total Wind:** **28,184.1** |

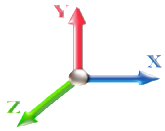
Seismic Base Shear is Less Than 50% of Wind Force - An Analysis is NOT Required

# Calculated Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 22 | |

Tower Engineering Solutions

**Load Case:** 0.9D + 1.0E




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Gust Response Factor** | 1.10 | | | **Sds** | 0.20 | **Iterations** | 17 | | |
| **Dead Load Factor** | 0.90 | **Seismic Load Factor** | 1.00 | **Sd1** | 0.10 | **Ss** | 0.18 | | |
| **Wind Load Factor** | 0.00 | **Structure Frequency** | 0.49 | **SA** | 0.05 | **S1** | 0.06 | **Seismic Importance Factor** | 1.00 |

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -40.40 | -2.01 | 0.00 | -216.18 | 0.00 | 216.18 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | | 0.00 | 0.00 | 0.030 |
| 5.00 | -38.85 | -1.99 | 0.00 | -206.11 | 0.00 | 206.11 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | | 0.00 | -0.01 | 0.029 |
| 10.00 | -37.32 | -1.96 | 0.00 | -196.16 | 0.00 | 196.16 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | | 0.01 | -0.01 | 0.029 |
| 15.00 | -35.82 | -1.92 | 0.00 | -186.37 | 0.00 | 186.37 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | | 0.03 | -0.02 | 0.028 |
| 20.00 | -34.36 | -1.87 | 0.00 | -176.79 | 0.00 | 176.79 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | | 0.05 | -0.02 | 0.028 |
| 25.00 | -32.92 | -1.83 | 0.00 | -167.41 | 0.00 | 167.41 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | | 0.08 | -0.03 | 0.027 |
| 30.00 | -31.51 | -1.78 | 0.00 | -158.26 | 0.00 | 158.26 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | | 0.11 | -0.04 | 0.026 |
| 35.00 | -30.12 | -1.74 | 0.00 | -149.34 | 0.00 | 149.34 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | | 0.15 | -0.04 | 0.026 |
| 38.00 | -29.31 | -1.71 | 0.00 | -144.12 | 0.00 | 144.12 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | | 0.18 | -0.05 | 0.025 |
| 40.00 | -28.30 | -1.68 | 0.00 | -140.70 | 0.00 | 140.70 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | | 0.20 | -0.05 | 0.025 |
| 45.00 | -25.82 | -1.59 | 0.00 | -132.32 | 0.00 | 132.32 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | | 0.26 | -0.05 | 0.028 |
| 50.00 | -24.67 | -1.55 | 0.00 | -124.40 | 0.00 | 124.40 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | | 0.32 | -0.06 | 0.027 |
| 55.00 | -23.53 | -1.51 | 0.00 | -116.67 | 0.00 | 116.67 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | | 0.38 | -0.07 | 0.027 |
| 60.00 | -22.43 | -1.47 | 0.00 | -109.14 | 0.00 | 109.14 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | | 0.46 | -0.07 | 0.026 |
| 65.00 | -21.34 | -1.44 | 0.00 | -101.78 | 0.00 | 101.78 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | | 0.54 | -0.08 | 0.025 |
| 70.00 | -20.29 | -1.42 | 0.00 | -94.58 | 0.00 | 94.58 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | | 0.63 | -0.09 | 0.024 |
| 75.00 | -19.25 | -1.41 | 0.00 | -87.48 | 0.00 | 87.48 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | | 0.73 | -0.10 | 0.024 |
| 77.00 | -18.85 | -1.40 | 0.00 | -84.67 | 0.00 | 84.67 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | | 0.77 | -0.10 | 0.023 |
| 80.00 | -17.74 | -1.40 | 0.00 | -80.46 | 0.00 | 80.46 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | | 0.83 | -0.10 | 0.023 |
| 83.00 | -16.64 | -1.40 | 0.00 | -76.26 | 0.00 | 76.26 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | | 0.90 | -0.11 | 0.026 |
| 85.00 | -16.30 | -1.40 | 0.00 | -73.47 | 0.00 | 73.47 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | | 0.94 | -0.11 | 0.026 |
| 90.00 | -15.46 | -1.40 | 0.00 | -66.47 | 0.00 | 66.47 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | | 1.06 | -0.12 | 0.024 |
| 95.00 | -14.64 | -1.40 | 0.00 | -59.48 | 0.00 | 59.48 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | | 1.18 | -0.12 | 0.023 |
| 100.00 | -13.85 | -1.40 | 0.00 | -52.48 | 0.00 | 52.48 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | | 1.32 | -0.13 | 0.021 |
| 105.00 | -13.07 | -1.40 | 0.00 | -45.48 | 0.00 | 45.48 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | | 1.46 | -0.14 | 0.020 |
| 110.00 | -12.32 | -1.40 | 0.00 | -38.49 | 0.00 | 38.49 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | | 1.60 | -0.14 | 0.018 |
| 115.00 | -11.59 | -1.40 | 0.00 | -31.50 | 0.00 | 31.50 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | | 1.75 | -0.15 | 0.016 |
| 120.00 | -10.30 | -1.36 | 0.00 | -24.52 | 0.00 | 24.52 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | | 1.91 | -0.15 | 0.016 |
| 125.00 | -9.71 | -1.33 | 0.00 | -17.70 | 0.00 | 17.70 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | | 2.08 | -0.16 | 0.013 |
| 130.00 | -5.23 | -0.95 | 0.00 | -11.02 | 0.00 | 11.02 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | | 2.24 | -0.16 | 0.008 |
| 135.00 | -4.69 | -0.88 | 0.00 | -6.28 | 0.00 | 6.28 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | | 2.41 | -0.16 | 0.006 |
| 140.00 | -0.96 | -0.24 | 0.00 | -1.87 | 0.00 | 1.87 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | | 2.58 | -0.16 | 0.002 |
| 145.00 | -0.47 | -0.13 | 0.00 | -0.66 | 0.00 | 0.66 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | | 2.76 | -0.16 | 0.001 |
| 150.00 | 0.00 | -0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | | 2.93 | -0.16 | 0.000 |

# Wind Loading - Shaft

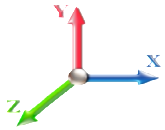
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 23 | |

Tower Engineering Solutions

**Load Case:** 1.0D + 1.0W 60 mph Wind

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations** 18

| 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 | | 1.00 | 0.85 | 7.442 | 8.19 | 298.50 | 0.650 | 0.000 | 0.00 | 0.000 | 0.00 | 0.0 | 0.0 | 0.0 |
| 5.00 | | 1.00 | 0.85 | 7.442 | 8.19 | 292.98 | 0.650 | 0.000 | 5.00 | 26.731 | 17.38 | 142.2 | 0.0 | 1692.4 |
| 10.00 | | 1.00 | 0.85 | 7.442 | 8.19 | 287.45 | 0.650 | 0.000 | 5.00 | 26.232 | 17.05 | 139.6 | 0.0 | 1660.5 |
| 15.00 | | 1.00 | 0.85 | 7.442 | 8.19 | 281.93 | 0.650 | 0.000 | 5.00 | 25.732 | 16.73 | 136.9 | 0.0 | 1628.6 |
| 20.00 | | 1.00 | 0.90 | 7.896 | 8.69 | 284.71 | 0.650 | 0.000 | 5.00 | 25.233 | 16.40 | 142.5 | 0.0 | 1596.8 |
| 25.00 | | 1.00 | 0.95 | 8.276 | 9.10 | 285.65 | 0.650 | 0.000 | 5.00 | 24.733 | 16.08 | 146.4 | 0.0 | 1564.9 |
| 30.00 | | 1.00 | 0.98 | 8.600 | 9.46 | 285.25 | 0.650 | 0.000 | 5.00 | 24.234 | 15.75 | 149.0 | 0.0 | 1533.0 |
| 35.00 | | 1.00 | 1.01 | 8.883 | 9.77 | 283.88 | 0.650 | 0.000 | 5.00 | 23.735 | 15.43 | 150.8 | 0.0 | 1501.1 |
| 38.00 | Bot - Section 2 | 1.00 | 1.03 | 9.039 | 9.94 | 282.69 | 0.650 | 0.000 | 3.00 | 14.001 | 9.10 | 90.5 | 0.0 | 885.4 |
| 40.00 | | 1.00 | 1.04 | 9.137 | 10.05 | 281.77 | 0.650 | 0.000 | 2.00 | 9.382 | 6.10 | 61.3 | 0.0 | 1103.6 |
| 45.00 | Top - Section 1 | 1.00 | 1.07 | 9.366 | 10.30 | 279.09 | 0.650 | 0.000 | 5.00 | 23.106 | 15.02 | 154.7 | 0.0 | 2717.3 |
| 50.00 | | 1.00 | 1.09 | 9.576 | 10.53 | 280.58 | 0.650 | 0.000 | 5.00 | 22.607 | 14.69 | 154.8 | 0.0 | 1252.0 |
| 55.00 | | 1.00 | 1.12 | 9.770 | 10.75 | 277.08 | 0.650 | 0.000 | 5.00 | 22.107 | 14.37 | 154.4 | 0.0 | 1224.1 |
| 60.00 | | 1.00 | 1.14 | 9.951 | 10.95 | 273.24 | 0.650 | 0.000 | 5.00 | 21.608 | 14.05 | 153.7 | 0.0 | 1196.2 |
| 65.00 | | 1.00 | 1.16 | 10.120 | 11.13 | 269.11 | 0.650 | 0.000 | 5.00 | 21.109 | 13.72 | 152.7 | 0.0 | 1168.3 |
| 70.00 | | 1.00 | 1.17 | 10.279 | 11.31 | 264.72 | 0.650 | 0.000 | 5.00 | 20.609 | 13.40 | 151.5 | 0.0 | 1140.5 |
| 75.00 | | 1.00 | 1.19 | 10.430 | 11.47 | 260.11 | 0.650 | 0.000 | 5.00 | 20.110 | 13.07 | 150.0 | 0.0 | 1112.6 |
| 77.00 | Bot - Section 3 | 1.00 | 1.20 | 10.488 | 11.54 | 258.21 | 0.650 | 0.000 | 2.00 | 7.904 | 5.14 | 59.3 | 0.0 | 437.2 |
| 80.00 | | 1.00 | 1.21 | 10.572 | 11.63 | 255.30 | 0.650 | 0.000 | 3.00 | 11.897 | 7.73 | 89.9 | 0.0 | 1212.3 |
| 83.00 | Top - Section 2 | 1.00 | 1.22 | 10.654 | 11.72 | 252.33 | 0.650 | 0.000 | 3.00 | 11.717 | 7.62 | 89.3 | 0.0 | 1193.7 |
| 85.00 | | 1.00 | 1.22 | 10.708 | 11.78 | 254.52 | 0.650 | 0.000 | 2.00 | 7.711 | 5.01 | 59.0 | 0.0 | 366.0 |
| 90.00 | | 1.00 | 1.24 | 10.838 | 11.92 | 249.39 | 0.650 | 0.000 | 5.00 | 18.929 | 12.30 | 146.7 | 0.0 | 898.4 |
| 95.00 | | 1.00 | 1.25 | 10.962 | 12.06 | 244.11 | 0.650 | 0.000 | 5.00 | 18.429 | 11.98 | 144.4 | 0.0 | 874.5 |
| 100.00 | | 1.00 | 1.27 | 11.081 | 12.19 | 238.68 | 0.650 | 0.000 | 5.00 | 17.930 | 11.65 | 142.1 | 0.0 | 850.6 |
| 105.00 | | 1.00 | 1.28 | 11.195 | 12.31 | 233.14 | 0.650 | 0.000 | 5.00 | 17.431 | 11.33 | 139.5 | 0.0 | 826.7 |
| 110.00 | | 1.00 | 1.29 | 11.305 | 12.44 | 227.47 | 0.650 | 0.000 | 5.00 | 16.931 | 11.01 | 136.9 | 0.0 | 802.8 |
| 115.00 | Bot - Section 4 | 1.00 | 1.30 | 11.412 | 12.55 | 221.70 | 0.650 | 0.000 | 5.00 | 16.432 | 10.68 | 134.1 | 0.0 | 778.9 |
| 120.00 | Top - Section 3 | 1.00 | 1.32 | 11.514 | 12.67 | 215.82 | 0.650 | 0.000 | 5.00 | 16.197 | 10.53 | 133.3 | 0.0 | 1395.7 |
| 125.00 | | 1.00 | 1.33 | 11.614 | 12.78 | 213.50 | 0.650 | 0.000 | 5.00 | 15.698 | 10.20 | 130.3 | 0.0 | 620.8 |
| 130.00 | Appurtenance(s) | 1.00 | 1.34 | 11.710 | 12.88 | 207.46 | 0.650 | 0.000 | 5.00 | 15.198 | 9.88 | 127.2 | 0.0 | 600.9 |
| 135.00 | | 1.00 | 1.35 | 11.803 | 12.98 | 201.32 | 0.650 | 0.000 | 5.00 | 14.699 | 9.55 | 124.0 | 0.0 | 581.0 |
| 140.00 | Appurtenance(s) | 1.00 | 1.36 | 11.894 | 13.08 | 195.11 | 0.650 | 0.000 | 5.00 | 14.199 | 9.23 | 120.8 | 0.0 | 561.1 |
| 145.00 | | 1.00 | 1.37 | 11.982 | 13.18 | 188.82 | 0.650 | 0.000 | 5.00 | 13.700 | 8.91 | 117.4 | 0.0 | 541.1 |
| 150.00 | | 1.00 | 1.38 | 12.068 | 13.27 | 182.46 | 0.650 | 0.000 | 5.00 | 13.201 | 8.58 | 113.9 | 0.0 | 521.2 |
| | | | | | | | | **Totals:** | **150.00** | | | **4,239.1** | | **36,040.1** |

# Discrete Appurtenance Forces

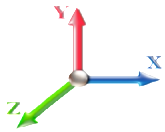
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 24 | |

Tower Engineering Solutions

**Load Case:** 1.0D + 1.0W 60 mph Wind

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations** 18

| No. | Elev (ft) | Description | Qty | qz (psf) | qzGh (psf) | CaAa x Ka | Ka | Total CaAa (sf) | Dead Load (lb) | Horiz Ecc (ft) | Vert Ecc (ft) | Wind FX (lb) | Mom Y (lb-ft) | Mom Z (lb-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 140.00 | ALU 1900 Mhz RRUs | 3 | 11.894 | 13.084 | 0.50 | 0.75 | 4.18 | 180.00 | 0.000 | 0.000 | 54.63 | 0.00 | 0.00 |
| 2 | 140.00 | Dragonwave | 3 | 11.894 | 13.084 | 1.00 | 1.00 | 14.04 | 81.30 | 1.495 | 0.000 | 183.69 | 274.62 | 0.00 |
| 3 | 140.00 | RMQP-496-HK | 1 | 11.894 | 13.084 | 1.00 | 1.00 | 48.00 | 2449.00 | 0.000 | 0.000 | 628.01 | 0.00 | 0.00 |
| 4 | 140.00 | AAHC | 3 | 11.894 | 13.084 | 0.56 | 0.75 | 7.09 | 312.00 | 0.000 | 0.000 | 92.73 | 0.00 | 0.00 |
| 5 | 140.00 | NNVV-65B-R4 | 3 | 11.894 | 13.084 | 0.55 | 0.75 | 20.43 | 232.20 | 0.000 | 0.000 | 267.29 | 0.00 | 0.00 |
| 6 | 140.00 | ALU 800 Mhz RRUs | 6 | 11.894 | 13.084 | 0.50 | 0.75 | 7.51 | 318.00 | 0.000 | 0.000 | 98.22 | 0.00 | 0.00 |
| 7 | 130.00 | f#P-HRK10 | 1 | 11.710 | 12.881 | 1.00 | 1.00 | 9.00 | 478.27 | 0.000 | 0.000 | 115.93 | 0.00 | 0.00 |
| 8 | 130.00 | APXVAA24_43-U-A20 | 3 | 11.710 | 12.881 | 0.55 | 0.75 | 33.24 | 297.00 | 0.000 | 0.000 | 428.22 | 0.00 | 0.00 |
| 9 | 130.00 | Radio 2217 B66A | 3 | 11.710 | 12.881 | 0.50 | 0.75 | 2.04 | 81.00 | 0.000 | 0.000 | 26.21 | 0.00 | 0.00 |
| 10 | 130.00 | FSP-10W | 1 | 11.710 | 12.881 | 1.00 | 1.00 | 58.98 | 2396.00 | 0.000 | 0.000 | 759.72 | 0.00 | 0.00 |
| 11 | 130.00 | Radio 4449 B71 + B12 | 3 | 11.710 | 12.881 | 0.50 | 0.75 | 2.49 | 210.00 | 0.000 | 0.000 | 32.04 | 0.00 | 0.00 |
| 12 | 130.00 | Radio 4415 B25 | 3 | 11.710 | 12.881 | 0.52 | 0.75 | 2.58 | 138.00 | 0.000 | 0.000 | 33.27 | 0.00 | 0.00 |
| 13 | 130.00 | SHP2-13 | 1 | 11.710 | 12.881 | 1.00 | 1.00 | 3.96 | 152.00 | 2.495 | 0.000 | 51.01 | 127.26 | 0.00 |
| 14 | 130.00 | AIR 5122 28GHz | 3 | 11.710 | 12.881 | 0.57 | 0.75 | 3.23 | 72.90 | 0.000 | 0.000 | 41.63 | 0.00 | 0.00 |
| 15 | 130.00 | AIR3246 B66 | 3 | 11.710 | 12.881 | 0.65 | 0.75 | 12.74 | 396.60 | 0.000 | 0.000 | 164.15 | 0.00 | 0.00 |
| 16 | 130.00 | APX16DWV-16DWV-S-EA | 3 | 11.710 | 12.881 | 0.46 | 0.75 | 9.01 | 122.10 | 0.000 | 0.000 | 116.08 | 0.00 | 0.00 |
| | | | | | | | **Totals:** | | **7,916.37** | | | **3,092.84** | | |

# Total Applied Force Summary

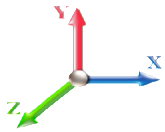
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 25 |

Tower Engineering Solutions

**Load Case:** 1.0D + 1.0W 60 mph Wind

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations** 18

| 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 | | 142.24 | 1726.96 | 0.00 | 0.00 |
| 10.00 | | 139.58 | 1695.09 | 0.00 | 0.00 |
| 15.00 | | 136.92 | 1663.22 | 0.00 | 0.00 |
| 20.00 | | 142.46 | 1631.35 | 0.00 | 0.00 |
| 25.00 | | 146.36 | 1599.48 | 0.00 | 0.00 |
| 30.00 | | 149.01 | 1567.61 | 0.00 | 0.00 |
| 35.00 | | 150.76 | 1535.75 | 0.00 | 0.00 |
| 38.00 | | 90.48 | 906.15 | 0.00 | 0.00 |
| 40.00 | | 61.29 | 1117.49 | 0.00 | 0.00 |
| 45.00 | | 154.74 | 2751.89 | 0.00 | 0.00 |
| 50.00 | | 154.79 | 1286.59 | 0.00 | 0.00 |
| 55.00 | | 154.44 | 1258.71 | 0.00 | 0.00 |
| 60.00 | | 153.74 | 1230.82 | 0.00 | 0.00 |
| 65.00 | | 152.74 | 1202.94 | 0.00 | 0.00 |
| 70.00 | | 151.47 | 1175.05 | 0.00 | 0.00 |
| 75.00 | | 149.96 | 1147.17 | 0.00 | 0.00 |
| 77.00 | | 59.27 | 451.06 | 0.00 | 0.00 |
| 80.00 | | 89.93 | 1233.06 | 0.00 | 0.00 |
| 83.00 | | 89.26 | 1214.42 | 0.00 | 0.00 |
| 85.00 | | 59.04 | 379.88 | 0.00 | 0.00 |
| 90.00 | | 146.68 | 932.98 | 0.00 | 0.00 |
| 95.00 | | 144.44 | 909.07 | 0.00 | 0.00 |
| 100.00 | | 142.06 | 885.17 | 0.00 | 0.00 |
| 105.00 | | 139.52 | 861.27 | 0.00 | 0.00 |
| 110.00 | | 136.86 | 837.37 | 0.00 | 0.00 |
| 115.00 | | 134.07 | 813.47 | 0.00 | 0.00 |
| 120.00 | | 133.35 | 1430.31 | 0.00 | 0.00 |
| 125.00 | | 130.35 | 655.42 | 0.00 | 0.00 |
| 130.00 | (24) attachments | 1895.51 | 4979.37 | 127.26 | 0.00 |
| 135.00 | | 124.05 | 598.29 | 0.00 | 0.00 |
| 140.00 | (19) attachments | 1445.34 | 4150.87 | 274.62 | 0.00 |
| 145.00 | | 117.37 | 541.15 | 0.00 | 0.00 |
| 150.00 | | 113.90 | 521.23 | 0.00 | 0.00 |
| | **Totals:** | **7,331.96** | **44,890.66** | **401.87** | **0.00** |

# Calculated Forces

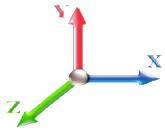
| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | **Code:** | EIA/TIA-222-G | 8/1/2018 | |
| **Site Name:** | Bristol-east | **Exposure:** | C | | |
| **Height:** | 150.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 1.1 **Topography:** 1 | **Struct Class:** | II | Page: 26 | |

Tower Engineering Solutions

**Load Case:** 1.0D + 1.0W 60 mph Wind

**Dead Load Factor** 1.00

**Wind Load Factor** 1.00




**Iterations** 18

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Total Deflect (in) | Rotation Sway (deg) | Rotation Twist (deg) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -44.89 | -7.34 | -0.40 | -745.31 | 0.00 | 745.31 | 6922.80 | 3461.40 | 17996.9 | 9011.85 | 0.00 | 0.000 | 0.000 | 0.089 |
| 5.00 | -43.16 | -7.21 | -0.40 | -708.61 | 0.00 | 708.61 | 6837.06 | 3418.53 | 17439.8 | 8732.91 | 0.01 | -0.020 | 0.000 | 0.087 |
| 10.00 | -41.46 | -7.09 | -0.40 | -672.55 | 0.00 | 672.55 | 6749.68 | 3374.84 | 16887.0 | 8456.09 | 0.04 | -0.041 | 0.000 | 0.086 |
| 15.00 | -39.80 | -6.96 | -0.40 | -637.11 | 0.00 | 637.11 | 6660.64 | 3330.32 | 16338.7 | 8181.53 | 0.10 | -0.061 | 0.000 | 0.084 |
| 20.00 | -38.16 | -6.83 | -0.40 | -602.30 | 0.00 | 602.30 | 6569.96 | 3284.98 | 15795.1 | 7909.33 | 0.17 | -0.082 | 0.000 | 0.082 |
| 25.00 | -36.56 | -6.70 | -0.40 | -568.14 | 0.00 | 568.14 | 6477.62 | 3238.81 | 15256.5 | 7639.63 | 0.27 | -0.103 | 0.000 | 0.080 |
| 30.00 | -34.99 | -6.56 | -0.40 | -534.66 | 0.00 | 534.66 | 6383.64 | 3191.82 | 14723.2 | 7372.54 | 0.39 | -0.123 | 0.000 | 0.078 |
| 35.00 | -33.45 | -6.41 | -0.40 | -501.87 | 0.00 | 501.87 | 6288.00 | 3144.00 | 14195.2 | 7108.19 | 0.53 | -0.144 | 0.000 | 0.076 |
| 38.00 | -32.55 | -6.33 | -0.40 | -482.64 | 0.00 | 482.64 | 6229.82 | 3114.91 | 13881.2 | 6950.95 | 0.62 | -0.157 | 0.000 | 0.075 |
| 40.00 | -31.43 | -6.27 | -0.40 | -469.99 | 0.00 | 469.99 | 6190.71 | 3095.36 | 13673.0 | 6846.70 | 0.69 | -0.165 | 0.000 | 0.074 |
| 45.00 | -28.67 | -6.12 | -0.40 | -438.64 | 0.00 | 438.64 | 5186.56 | 2593.28 | 11416.3 | 5716.63 | 0.88 | -0.186 | 0.000 | 0.082 |
| 50.00 | -27.39 | -5.97 | -0.40 | -408.06 | 0.00 | 408.06 | 5108.96 | 2554.48 | 10995.7 | 5506.06 | 1.08 | -0.206 | 0.000 | 0.079 |
| 55.00 | -26.13 | -5.82 | -0.40 | -378.23 | 0.00 | 378.23 | 5029.70 | 2514.85 | 10579.3 | 5297.54 | 1.31 | -0.229 | 0.000 | 0.077 |
| 60.00 | -24.89 | -5.67 | -0.40 | -349.14 | 0.00 | 349.14 | 4948.79 | 2474.40 | 10167.2 | 5091.20 | 1.56 | -0.251 | 0.000 | 0.074 |
| 65.00 | -23.69 | -5.52 | -0.40 | -320.80 | 0.00 | 320.80 | 4866.24 | 2433.12 | 9759.82 | 4887.17 | 1.84 | -0.272 | 0.000 | 0.071 |
| 70.00 | -22.51 | -5.37 | -0.40 | -293.20 | 0.00 | 293.20 | 4782.03 | 2391.02 | 9357.20 | 4685.56 | 2.13 | -0.294 | 0.000 | 0.067 |
| 75.00 | -21.37 | -5.22 | -0.40 | -266.35 | 0.00 | 266.35 | 4696.17 | 2348.09 | 8959.67 | 4486.49 | 2.45 | -0.314 | 0.000 | 0.064 |
| 77.00 | -20.91 | -5.16 | -0.40 | -255.91 | 0.00 | 255.91 | 4661.37 | 2330.68 | 8802.13 | 4407.61 | 2.58 | -0.323 | 0.000 | 0.063 |
| 80.00 | -19.68 | -5.07 | -0.40 | -240.43 | 0.00 | 240.43 | 4608.66 | 2304.33 | 8567.45 | 4290.09 | 2.79 | -0.335 | 0.000 | 0.060 |
| 83.00 | -18.47 | -4.98 | -0.40 | -225.22 | 0.00 | 225.22 | 3782.33 | 1891.17 | 7057.27 | 3533.88 | 3.01 | -0.347 | 0.000 | 0.069 |
| 85.00 | -18.08 | -4.92 | -0.40 | -215.27 | 0.00 | 215.27 | 3755.60 | 1877.80 | 6933.95 | 3472.13 | 3.15 | -0.355 | 0.000 | 0.067 |
| 90.00 | -17.15 | -4.77 | -0.40 | -190.68 | 0.00 | 190.68 | 3687.60 | 1843.80 | 6628.16 | 3319.01 | 3.54 | -0.377 | 0.000 | 0.062 |
| 95.00 | -16.24 | -4.63 | -0.40 | -166.81 | 0.00 | 166.81 | 3617.94 | 1808.97 | 6326.13 | 3167.77 | 3.94 | -0.397 | 0.000 | 0.057 |
| 100.00 | -15.36 | -4.48 | -0.40 | -143.68 | 0.00 | 143.68 | 3546.64 | 1773.32 | 6028.11 | 3018.53 | 4.37 | -0.416 | 0.000 | 0.052 |
| 105.00 | -14.49 | -4.34 | -0.40 | -121.26 | 0.00 | 121.26 | 3473.69 | 1736.85 | 5734.33 | 2871.43 | 4.81 | -0.433 | -0.001 | 0.046 |
| 110.00 | -13.66 | -4.20 | -0.40 | -99.54 | 0.00 | 99.54 | 3399.09 | 1699.54 | 5445.04 | 2726.57 | 5.28 | -0.449 | -0.001 | 0.041 |
| 115.00 | -12.84 | -4.07 | -0.40 | -78.53 | 0.00 | 78.53 | 3322.84 | 1661.42 | 5160.48 | 2584.08 | 5.76 | -0.464 | -0.001 | 0.034 |
| 120.00 | -11.41 | -3.92 | -0.40 | -58.21 | 0.00 | 58.21 | 2604.14 | 1302.07 | 3997.79 | 2001.87 | 6.25 | -0.476 | -0.001 | 0.033 |
| 125.00 | -10.76 | -3.79 | -0.40 | -38.59 | 0.00 | 38.59 | 2547.22 | 1273.61 | 3785.91 | 1895.77 | 6.75 | -0.485 | -0.001 | 0.025 |
| 130.00 | -5.80 | -1.85 | -0.27 | -19.65 | 0.00 | 19.65 | 2488.65 | 1244.32 | 3577.22 | 1791.27 | 7.26 | -0.492 | -0.001 | 0.013 |
| 135.00 | -5.20 | -1.72 | -0.27 | -10.40 | 0.00 | 10.40 | 2428.43 | 1214.21 | 3371.96 | 1688.49 | 7.78 | -0.496 | -0.001 | 0.008 |
| 140.00 | -1.06 | -0.24 | 0.00 | -1.79 | 0.00 | 1.79 | 2366.56 | 1183.28 | 3170.38 | 1587.54 | 8.30 | -0.498 | -0.001 | 0.002 |
| 145.00 | -0.52 | -0.12 | 0.00 | -0.59 | 0.00 | 0.59 | 2303.03 | 1151.52 | 2972.71 | 1488.57 | 8.82 | -0.498 | -0.001 | 0.001 |
| 150.00 | 0.00 | -0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 2232.58 | 1116.29 | 2772.66 | 1388.39 | 9.35 | -0.498 | -0.001 | 0.000 |

# Final Analysis Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SBA | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 27 |

Tower Engineering Solutions

## Reactions

| Load Case | Shear FX (kips) | Shear FZ (kips) | Axial FY (kips) | Moment MX (ft-kips) | Moment MY (ft-kips) | Moment MZ (ft-kips) |
|---|---|---|---|---|---|---|
| 1.2D + 1.6W 93 mph Wind | 28.2 | 0.00 | 53.85 | 0.00 | 0.96 | 2874.51 |
| 0.9D + 1.6W 93 mph Wind | 28.2 | 0.00 | 40.38 | 0.00 | 0.96 | 2859.73 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind | 9.7 | 0.00 | 85.67 | 0.00 | 0.36 | 994.89 |
| 1.2D + 1.0E | 2.0 | 0.00 | 53.87 | 0.00 | 0.00 | 217.35 |
| 0.9D + 1.0E | 2.0 | 0.00 | 40.40 | 0.00 | 0.00 | 216.18 |
| 1.0D + 1.0W 60 mph Wind | 7.3 | 0.00 | 44.89 | 0.00 | 0.40 | 745.31 |

## Max Stresses

| Load Case | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (-) (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | phi Pn (kips) | phi Vn (kips) | phi Tn (ft-kips) | phi Mn (ft-kips) | Elev (ft) | Stress Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.2D + 1.6W 93 mph Wind | -53.85 | -28.22 | -0.96 | -2874.5 | 0.00 | -2874.5 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.327 |
| 0.9D + 1.6W 93 mph Wind | -40.38 | -28.21 | -0.96 | -2859.7 | 0.00 | -2859.7 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.323 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind | -85.67 | -9.75 | -0.36 | -994.89 | 0.00 | -994.89 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.123 |
| 1.2D + 1.0E | -53.87 | -2.01 | 0.00 | -217.35 | 0.00 | -217.35 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.032 |
| 0.9D + 1.0E | -40.40 | -2.01 | 0.00 | -216.18 | 0.00 | -216.18 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.030 |
| 1.0D + 1.0W 60 mph Wind | -44.89 | -7.34 | -0.40 | -745.31 | 0.00 | -745.31 | 6922.80 | 3461.4 | 17996.9 | 9011.85 | 0.00 | 0.089 |

# Base Plate Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT46136-A-SB | | **Code:** | EIA/TIA-222-G | 8/1/2018 |
| **Site Name:** | Bristol-east | | **Exposure:** | C | |
| **Height:** | 150.00 (ft) | | **Crest Height:** | 0.00 | |
| **Base Elev:** | 0.000 (ft) | | **Site Class:** | D - Stiff Soil | |
| **Gh:** | 1.1 | **Topography:** 1 | **Struct Class:** | II | Page: 28 |

Tower Engineering Solutions

| Reactions | | Base Plate | | Anchor Bolts | |
|---|---|---|---|---|---|
| Original Design | | **Yield (ksi):** | 55.00 | **Bolt Circle:** | 71.00 |
| **Moment (kip-ft):** | 6300.00 | **Width (in):** | 71.00 | **Number Bolts:** | 24.00 |
| **Axial (kip):** | 52.00 | **Style:** | Clipped | **Bolt Type:** | 2.25" 18J |
| **Shear (kip):** | 48.00 | **Polygon Sides:** | 4.00 | **Bolt Diameter (in):** | 2.25 |
| Analysis | | **Clip Length (in):** | 6.00 | **Yield (ksi):** | 75.00 |
| **Moment (kip-ft):** | 2874.51 | **Effective Len (in):** | 8.14 | **Ultimate (ksi):** | 100.00 |
| **Axial (kip):** | 85.67 | **Moment (kip-in):** | 305.62 | **Arrangement:** | Clustered |
| **Shear (kip):** | 28.22 | **Allow Stress (ksi):** | 74.25 | **Cluster Dist (in):** | 6.00 |
| | | **Applied Stress (ksi):** | 0.00 | **Start Angle (deg):** | 45.00 |
| **Moment Design %:** | 45.63 | **Stress Ratio:** | 0.34 | Compression | |
| | | | | **Force (kip):** | 84.54 |
| | | | | **Allowable (kip):** | 260.00 |
| | | | | **Ratio:** | 0.33 |
| | | | | Tension | |
| | | | | **Force (kip):** | 77.40 |
| | | | | **Allowable (kip):** | 260.00 |
| | | | | **Ratio:** | 0.31 |

# Monopole Mat Foundation Design

| | | | |
|---|---|---|---|
| | | | Date: 10/11/2017 |
| **Customer Name:** | SBA Communcations Corp | **EIA/TIA Standard:** | EIA-222-G |
| **Site Name:** | | **Structure Height (Ft.):** | 53 |
| **Site Number:** | CT46136 | **Engineer Name:** | K. Wyant |
| **Engr. Number:** | | **Engineer Login ID:** | |

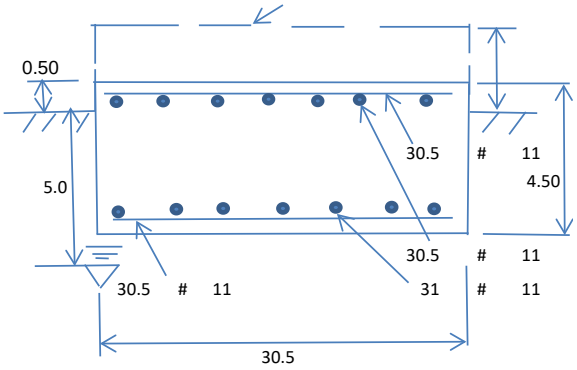
**Foundation Info Obtained from:** Drawings/Calculations

**Structure Type:** Monopole

**Analysis or Design?** Analysis

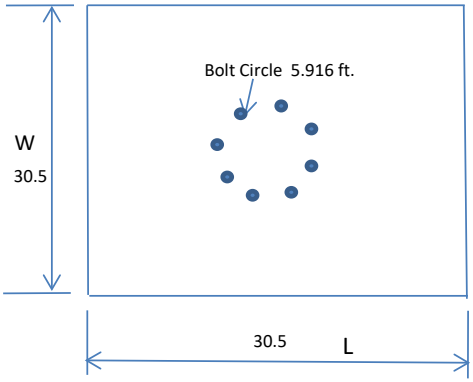
**Base Reactions (Factored):**

| | | | |
|---|---|---|---|
| Axial Load (Kips): | 53.9 | Shear Force (Kips): | 28.2 |
| Uplift Force (Kips): | 0.0 | Moment (Kips-ft): | 2874.5 |
| Allowable overstress %: | 5.0% | | |




**Foundation Geometries:**

| | | | |
|---|---|---|---|
| | | Mods required -Yes/No ?: | No |
| Anchor Bolt Circle (ft.): | 5.92 | Depth of Base BG (ft.): | 4.00 |
| Thickness of Pad (ft): | 4.50 | | |
| Length of Pad (ft.): | 30.5 | Width of Pad (ft.): | 30.5 |
| Final Length of pad (ft) | 30.5 | Final width of pad (ft): | 30.5 |




**Material Properties and Reabr Info:**

| | | | | |
|---|---|---|---|---|
| Concrete Strength (psi): | 3000 | Steel Elastic Modulus: | 29000 | ksi |
| Pad Rebar Yield (Ksi): | 60 | Tie Spacing (in): | 12.0 | |
| Pad Steel Rebar Size (#): | 11 | | | |
| 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): | 31 | Qty. of Rebar in Pad (W): | 30.5 | |
| Rebar at the top of the concrete pad: | | | | |
| Qty. of Rebar in Pad (L): | 31 | Qty. of Rebar in Pad (W): | 31 | |
| Apply 1.35 factor for e/w Per G: | 1.35 | | | |

**Soil Design Parameters:**

| | | | | | | |
|---|---|---|---|---|---|---|
| Water Table B.G.S. (ft): | 5.0 | Unit Weight of Water: | 62.4 | pcf | Angle from Top of Pad: | 30 |
| Ultimate Bearing Pressure (psf): | 12000 | Ultimate 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 hor. resist. for OTM.: | No | Reduction factor on the maximum soil bearing pressure: | 1.00 | | | |

**Foundation Analysis and Design:** Uplift Strength Reduction Factor: 0.75 — Compression Strength Reduction Factor: 0.75

| | | | |
|---|---|---|---|
| Total Dry Soil Volume (cu. Ft.): | 0.00 | Total Dry Soil Weight (Kips): | 0.00 |
| Total Buoyant Soil Volume (cu. Ft.): | 0.00 | Total Buoyant Soil Weight (Kips): | 0.00 |
| Total Effective Soil Weight (Kips): | 0.00 | Weight from the Concrete Block at Top (K): | 0.00 |
| Total Dry Concrete Volume (cu. Ft.): | 4186.13 | Total Dry Concrete Weight (Kips): | 627.92 |
| Total Buoyant Concrete Volume (cu. Ft.): | 0.00 | Total Buoyant Concrete Weight (Kips): | 0.00 |
| Total Effective Concrete Weight (Kips): | 627.92 | Total Vertical Load on Base (Kips): | 681.77 |

**Check Soil Capacities:**

| | | | | Load/ Capacity Ratio | |
|---|---|---|---|---|---|
| Calculated Maxium Net Soil Pressure under the base (psf): | 1655 | < | Allowable Factored Soil Bearing (psf): 9000 | 0.18 | OK! |
| Allowable Foundation Overturning Resistance (kips-ft.): | 9439.4 | > | Design Factored Momont (kips-ft): 3003 | 0.32 | OK! |
| Factor of Safety Against Overturning (O. R. Moment/Design Moment): | 3.14 | OK! | | | |

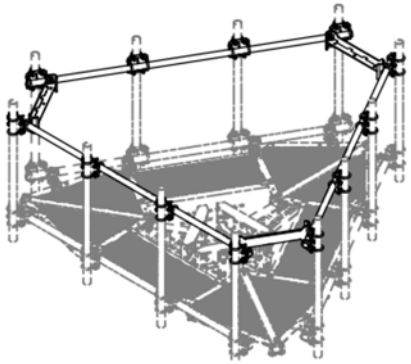
**Check the capacities of Reinforceing Concrete:**

| | | | |
|---|---|---|---|
| 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: | 1.00 |

Concrete Pad:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| One-Way Design Shear Capacity (L-Direction, Kips): | 1512.9 | > | One-Way Factored Shear (L-D. Kips): | 277.5 | 0.18 | OK! |
| One-Way Design Shear Capacity (W-Direction, Kips): | 1512.9 | > | One-Way Factored Shear (W-D., Kips) | 277.5 | 0.18 | OK! |
| One-Way Design Shear Capacity (Corner-Corner. Kips): | 1821.3 | > | One-Way Factored Shear (C-C, Kips): | 449.0 | 0.25 | OK! |
| Lower Steel Pad Reinforcement Ratio (L-Direct. ): | 0.0026 | OK! | Lower Steel Pad Reinf. Ratio (W-Direc | 0.0026 | | |
| Lower Steel Pad Moment Capacity (L-Direction. Kips-ft): | 10444.9 | > | Moment at Bottom ( L-Direct. K-Ft): | 1089.2 | 0.10 | OK! |
| Lower Steel Pad Moment Capacity (W-Direction. Kips-ft): | 10444.9 | > | Moment at Bottom ( W-Direct. K-Ft): | 1089.2 | 0.10 | OK! |
| Lower Steel Pad Moment Capacity (Corner-Corner,K-ft): | 14690.5 | > | Moment at Bottom ( C-C Dir. K-Ft): | 1540.4 | 0.10 | OK! |
| Upper Steel Pad Reinforcement Ratio (L-Direct. ): | 0.0026 | OK! | Upper Steel Reinf. Ratio (W-Direct. ): | 0.0026 | | |
| Upper Steel Pad Moment Capacity (L-Direction. Kips-ft): | 10444.9 | > | Moment at the top (L-Dir Kips-Ft): | 274.5 | 0.03 | OK! |
| Upper Steel Pad Moment Capacity (W-Direction. Kips-ft): | 10444.9 | > | Moment at the top (W-Dir Kips-Ft): | 274.5 | 0.03 | OK! |
| Upper Steel Pad Moment Capacity (Corner-Corner. K-ft): | 14690.5 | > | Moment at the top (C-C Direc. K-Ft): | 443.0 | 0.03 | OK! |

# Antenna Mount Structural Analysis



Source: Sitepro1

| | |
|---|---|
| **SBA Site:** | **CT46136-A Bristol-East** |
| **T-Mobile Site Number:** | **CTHA272A** |
| **Project:** | **T-Mobile NSD** |
| **Prepared For:** | **T-Mobile** |
| **Mount Description:** | **(1) Platform**<br>***Sitepro1 F3P-10W + F3P-HRK10*** |
| **Site Location:** | **1214 Farmington Ave, Bristol, CT**<br>**Hartford County**<br>**41.696538°, -72.901645°** |
| **Design Codes:** | **ANSI/TIA-222-G**<br>**IBC 2015 w/ 2016 CT Code** |
| **Analysis Load Case:** | **T-Mobile Final Configuration** |
| **Analysis Result:** | **Adequate @ 57% - See Conclusion** |


**Revision 0**
**September 5, 2018**



GeoStructural ▪ P.O. Box 2621, Boise, ID 83701 ▪ Office: (530) 539-4787
Professional Engineers | Tower Technicians | Climbers | sUAS Mapping

## *1.0 Introduction*

An antenna mount structural analysis has been performed on T-Mobile's new mount assembly located at the CT46136-A Bristol-East communications site in Hartford County, CT considering the final equipment loading configuration listed in Section 3.0.

## *2.0 Analysis Criteria*

An elastic three-dimensional model of the mount structure has been analyzed pursuant to the following criteria:

- IBC 2015 – International Building Code.
- ANSI/TIA-222-G – Structural Standard for Antenna Supporting Structures and Antennas.
- AISC – Steel Construction Manual.
- ANSI/AWS D1.1 – Structural Welding Code.

| | |
|---|---|
| Wind w/o ice = 121 mph (3-sec gust Ultimate Wind Speed)<br>Wind w/o ice = 94 mph (3-sec gust Equivalent per TIA-222-G Tower Code) | |
| Wind with ice = 50 mph (3-sec gust, 1" Ice)<br>Exposure Category C | Topographic Category 1<br>Structure Class II |

The following documents were provided:

- Construction Drawings
  ProTerra Design Group, 5/09/18.
- Tower Structural Analysis
  Tower Engineering Solutions, 10/16/17.
- RF Design
  T-Mobile NSD Project, 3/23/18.

The results of the analysis are illustrated in Section 4.0. If any of the existing or proposed conditions reported in this analysis are not properly represented, please contact our office immediately to request an amended report.

## 3.0 Appurtenance Information

### Table 3.1 – T-Mobile Final Configuration[1]

| COR | (Quantity) Appurtenance Make/Model | Mount Description |
|---|---|---|
| 130.0'± | (3) ERICSSON AIR3246 B66 (Octa) | *(1) Platform*<br>*Sitepro1 F4P-10W + F4P-HRK10* |
| | (3) RFS APX16DWV-16DWV-S-E-A20 (Quad) | |
| | (3) RFS APXVAARR24_43-U-NA20 (Octa) | |
| | (3) ERICSSON AIR5122 28GHz | |
| | (1) ANDREW SP2-13 | |
| | (3) ERICSSON 4415 B25 | |
| | (3) ERICSSON 2217 B66A | |
| | (3) ERICSSON 4449 B71+B12 | |

1. *Refer to antenna installation Construction Drawings (by others, when applicable) for additional information regarding final antenna and equipment orientations.*
2. *Panel antennas to be installed in Positions 1, 2, 3 and 4 with AIR32, APX16, APXV and AIR51 panels in Positions 1, 2, 3 and 4 respectively.*
3. *RRH units to be installed as follows: (1) 2217 and (1) 4449 on mount pipe behind antenna in Position 3 and (1) 4415 on mount pipe behind antenna in Position 2.*
4. *Microwave to be installed in Position 4 only on Gamma sector.*

## 4.0 Analysis Results

### Table 4.1 – New Mount Capacity

| Load Case | Governing Mount Component[1] | % Capacity[2] | Result |
|---|---|---|---|
| Final T-Mobile Configuration | Mount Pipe | 57% | **Adequate**[3] |

1. *Refer to the Calculations & Software Output portion of this report for mount component and structural information.*
2. *Listed results are expressed as a percentage of available mount member capacity based upon the assumed material strengths listed in Table 4.2. 105% is an acceptable allowable stress percentage for mount components.*
3. *Refer to Conclusion & Recommendations Section for more information regarding new mount.*

***Table 4.2 – Structural Component Material Strengths***

| Structural Component | Nominal Strength/Material[1] |
|---|---|
| Pipe | $F_y$ = 35 ksi (A53, Gr. B) |
| Tube | $F_y$ = 46 ksi (A500, Gr. B) |
| Structural Shapes (L, C, W, etc.), Plate / Bar | $F_y$ = 36 ksi (A36) |
| Uni-Strut | $F_y$ = 33 ksi (A570, Gr. 33) |
| Connection Bolts | A325 |
| Stainless Steel Bolts | 18-8 Stainless, Grade 316/304<br>$F_y$ = 74 ksi (Yield) & $F_u$ = 29 ksi (Tension) |
| U-Bolts / Threaded Rod | SAE J429 Grade 2 (Substitution: ASTM A449)<br>$F_y$ = 57 ksi (Yield) & $F_u$ = 74 ksi (Tension) |
| Welds | E70XX Electrodes |

1. *Strengths listed were assumed for this analysis and are based upon ASTM, AISC, RCSC, AWS and ACI preferred specification values. Values and materials are consistent with industry standards. Material strengths were taken from original design documents when available.*

## *5.0 Conclusion & Recommendations*

Based on T-Mobile's final equipment loading configuration, the proposed mount assembly does have sufficient capacity to support the loading considered in this analysis pursuant to the listed standards.

- Install (1) New Platform with Handrail; attach tri-collar bracket directly to monopole shaft per manufacturer's specifications. Install and attach mount pipes and handrail kit per Construction Drawings.
    - Sitepro1 F3P-HRK10, (1) total.
        - Sitepro1 F3P-10W + F3P-HRK10.
        - 10' Fortress platform mount with handrail.

**Installation Requirements:**

- Panel antennas and equipment shall be installed centered vertically on the mount front face rails (limit vertical installation eccentricity) unless specifically depicted otherwise in approved Construction Drawings.
- Panel antennas to be installed in Positions 1, 2, 3 and 4 with AIR32, APX16, APXV and AIR51 panels in Positions 1, 2, 3 and 4 respectively.
- RRH units to be installed as follows: (1) 2217 and (1) 4449 on mount pipe behind antenna in Position 3 and (1) 4415 on mount pipe behind antenna in Position 2.
- Microwave to be installed in Position 4 only on Gamma sector.

This analysis only encompasses the antenna mount assembly. The tower, overall mount support structure, foundation, etc. are beyond the scope of this analysis. If any of the existing or proposed conditions (appurtenance loading, member sizes, etc.) reported in this analysis are not properly represented, please contact our office immediately to request an amended report.

Prepared by:

**Jesse Drennen, PE, MLE**
208.761.7986
jesse.drennen@geostructural.com

Reviewed and Approved by:

**Gregory Durgin, PE, MLE**
509.999.5278
gregory.durgin@geostructural.com

## *6.0 Standard Conditions*

- All data required to complete our structural analysis was furnished by our client and provided record data. GeoStructural has not conducted a site visit or independent study to verify existing conditions and the results of this analysis are based solely on the information provided. It has been assumed that the tower, antenna support structure and foundation have been constructed according to the provided existing drawings, previous structural analysis reports, mapping documents, etc.

- The default Structure Classification is Class II in accordance with ANSI/TIA-222-G §A.2.2 & §A.15.3 and has been assumed for this analysis. The owner shall verify this classification conforms with original or desired reliability criteria.

- This analysis assumes that the structure has been properly installed and maintained in accordance with ANSI/TIA-222-G §15.5 and that no physical deterioration has occurred in any of the components of the structure. Damaged, missing, or rusted members were not considered.

- This analysis verifies the adequacy of the main components of the structure. Not all connections, welds, bolts, plates, etc. were individually detailed and analyzed. Where not specifically analyzed, the existing connection plates, welds, bolts, etc. were assumed adequate to develop the full capacity of the main structural members.

- No consideration has been made for unusual or extreme wind events, rime/in-cloud ice loadings, harmonic or nodal vibration, vortex shedding or other similar conditions.

- It is the owner's responsibility to determine the appropriate design wind speed and amount of ice accumulation beyond code minimum values that should be considered in the analysis.

- This analysis report does not constitute a maintenance and condition assessment. No certifications regarding maintenance and condition are expressed or implied. If desired, GeoStructural can provide these services under a subsequent contract.

- This analysis only encompasses the antenna mount assembly. The tower, overall mount support structure, foundation, etc. are beyond the scope of this analysis. If desired, GeoStructural can provide these services under a subsequent contract.

## *7.0 Calculations & Software Output*

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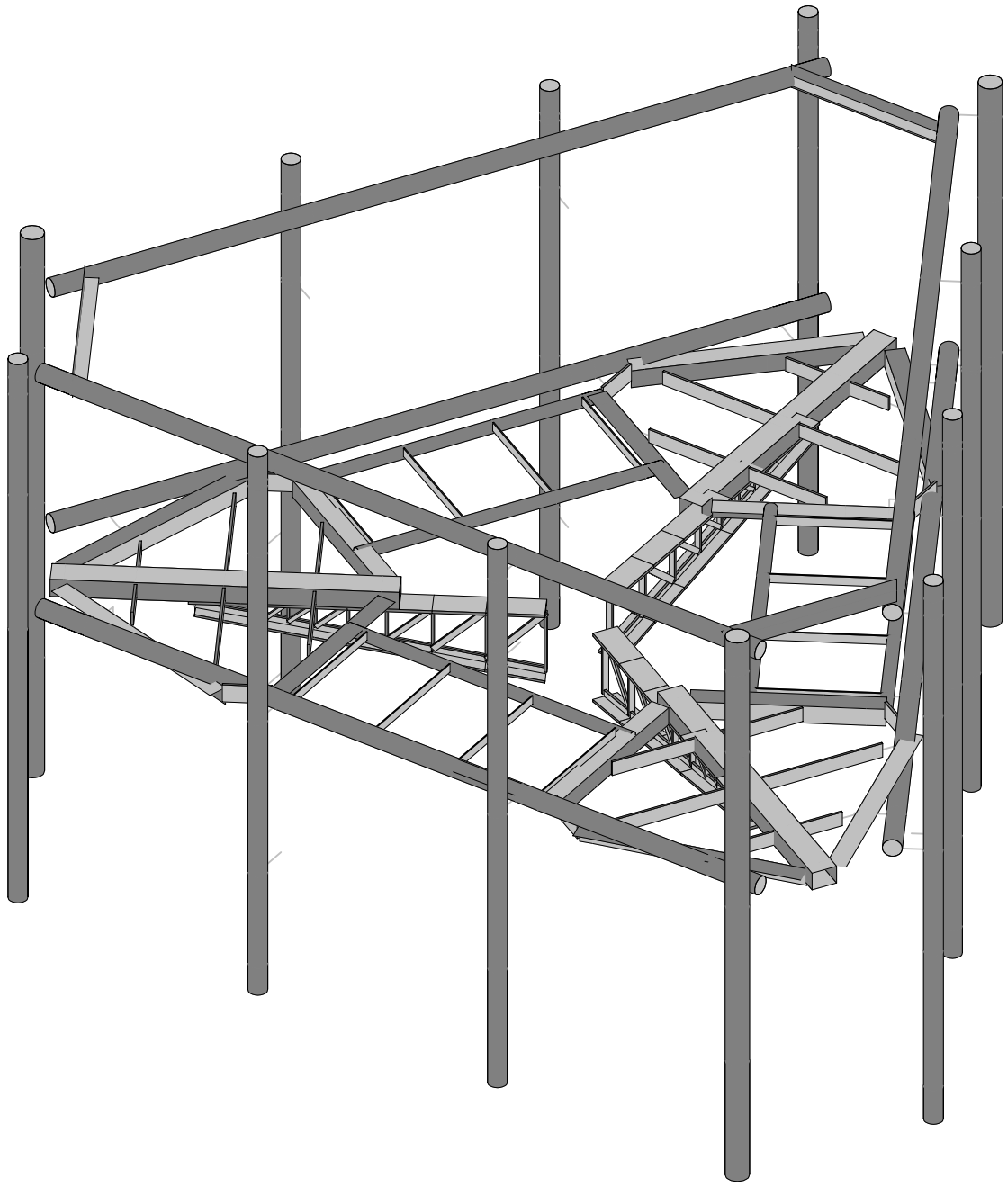


Envelope Only Solution

| | | |
|---|---|---|
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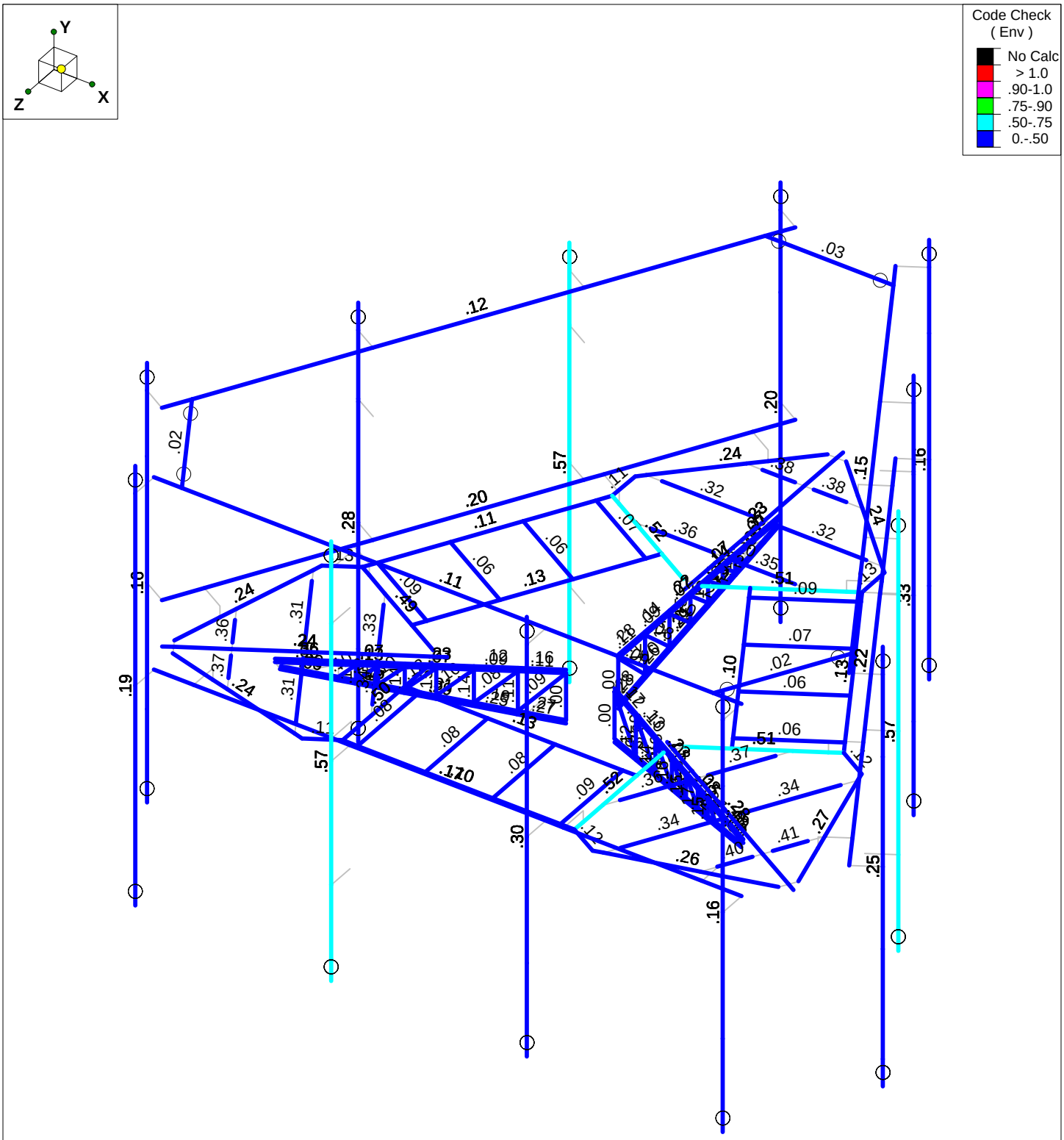
| Jesse Drennen, PE | | July 13, 2018 at 10:39 AM |
| | | CTHA272A_F3P-10 Mount Analysi... |




Member Code Checks Displayed (Enveloped)
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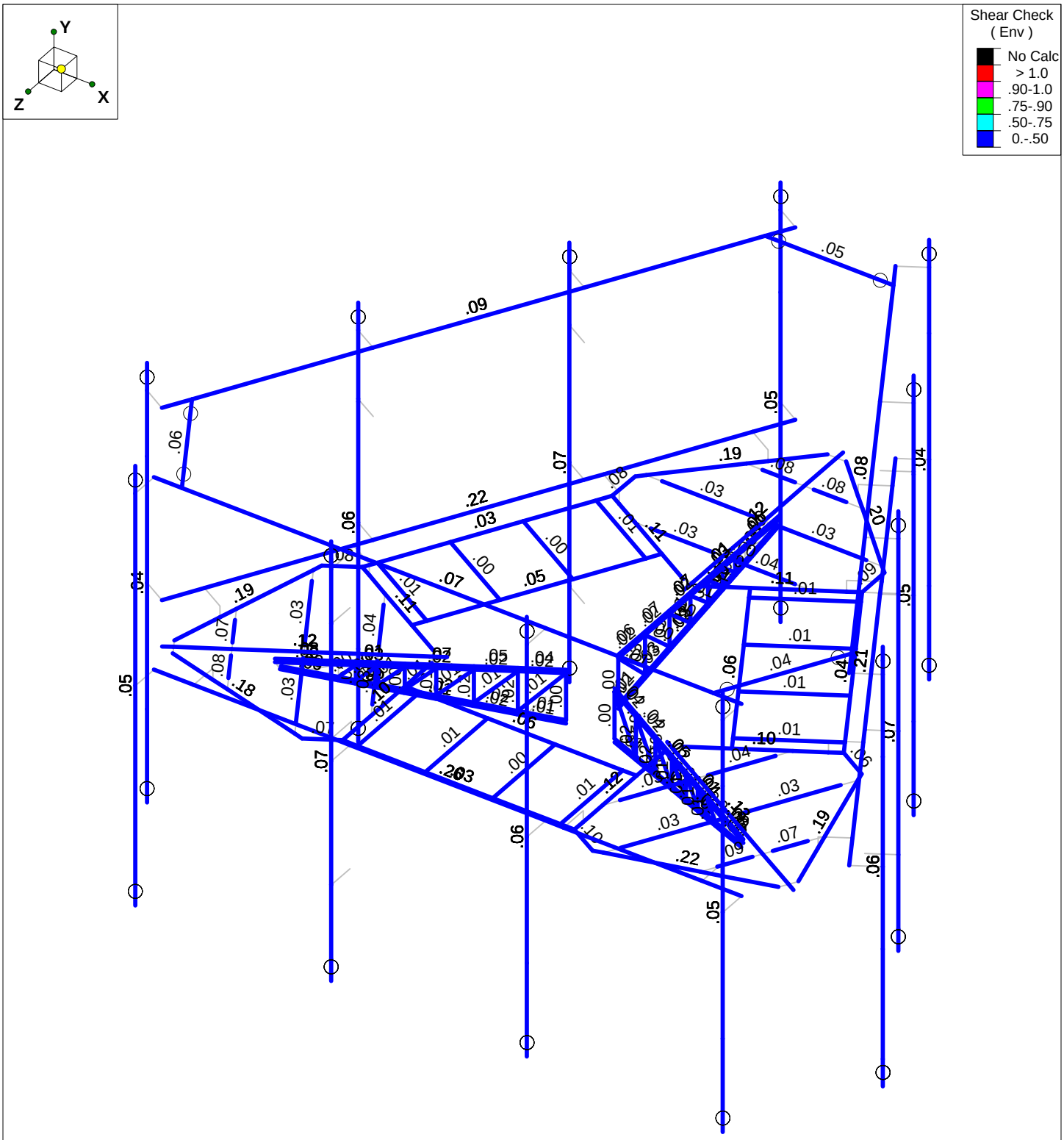


Member Shear Checks Displayed (Enveloped)
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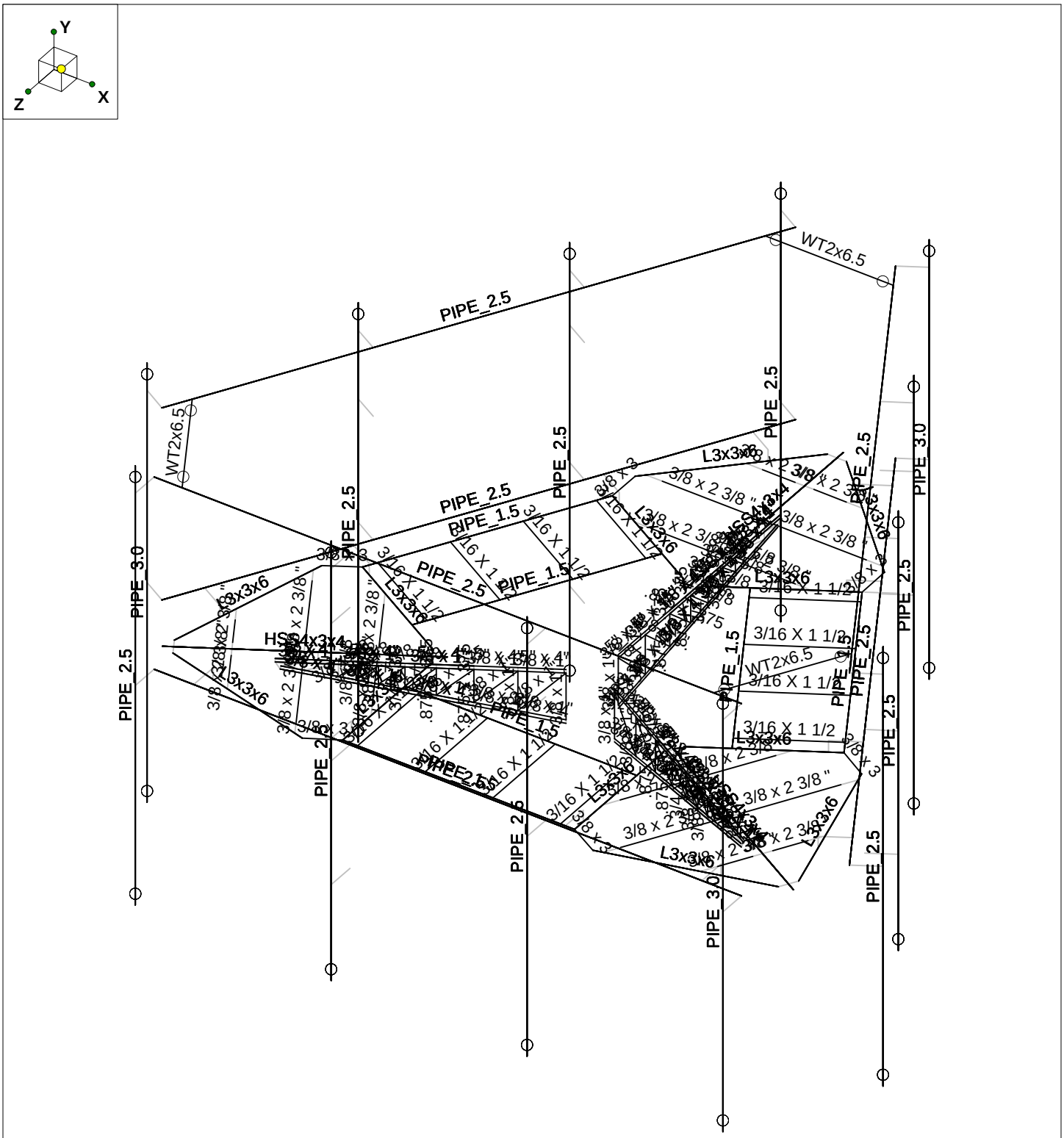


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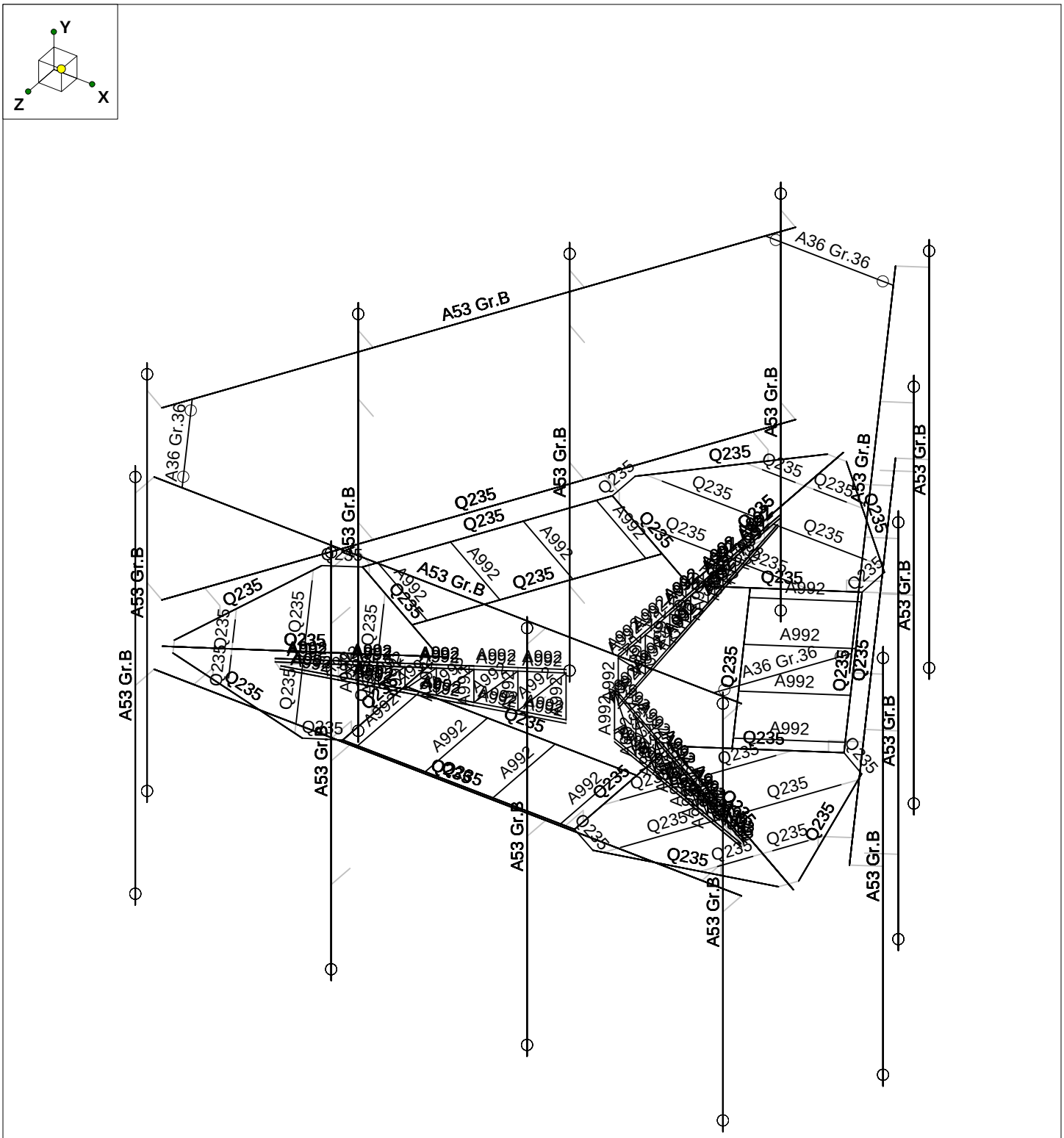


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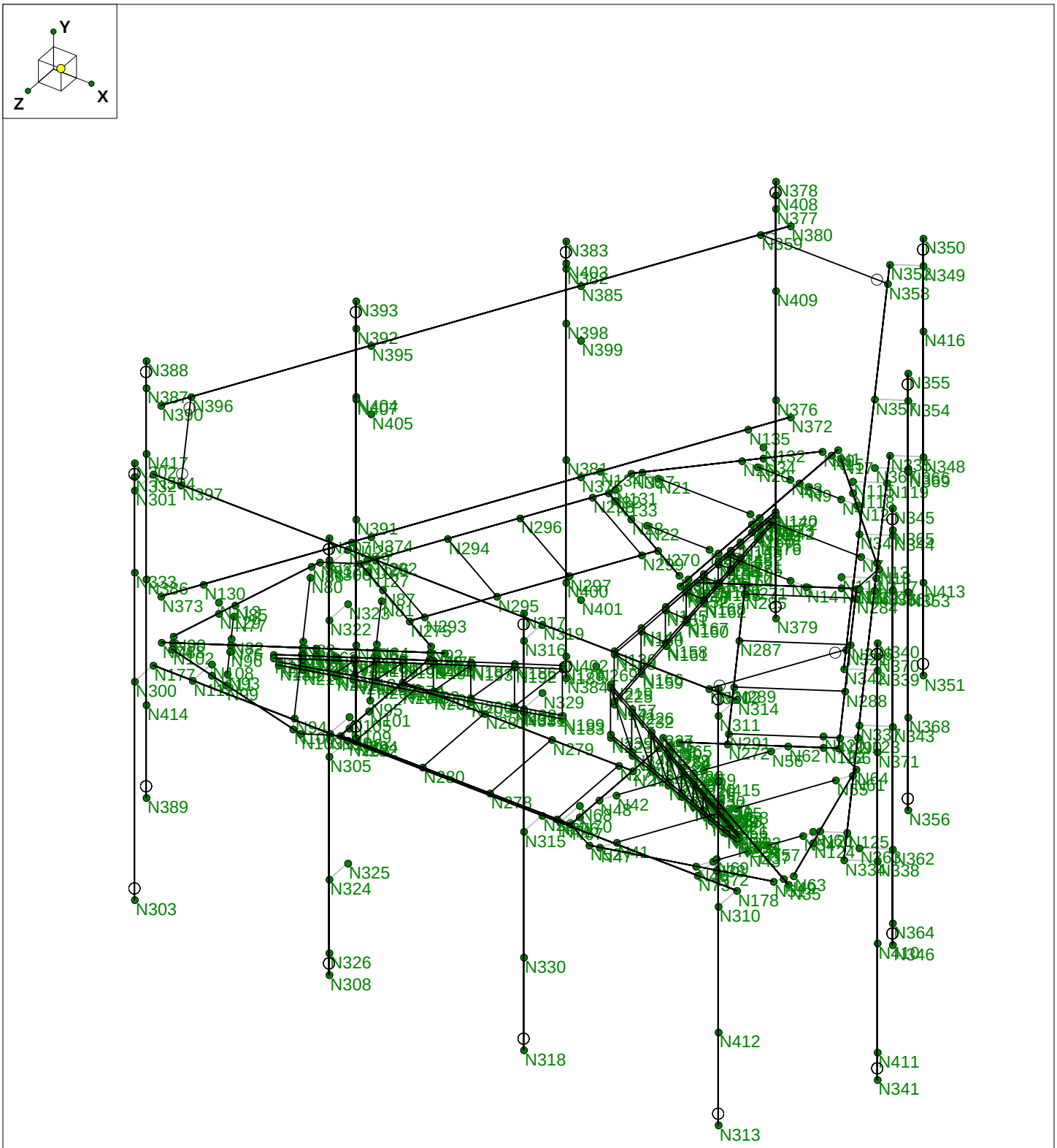


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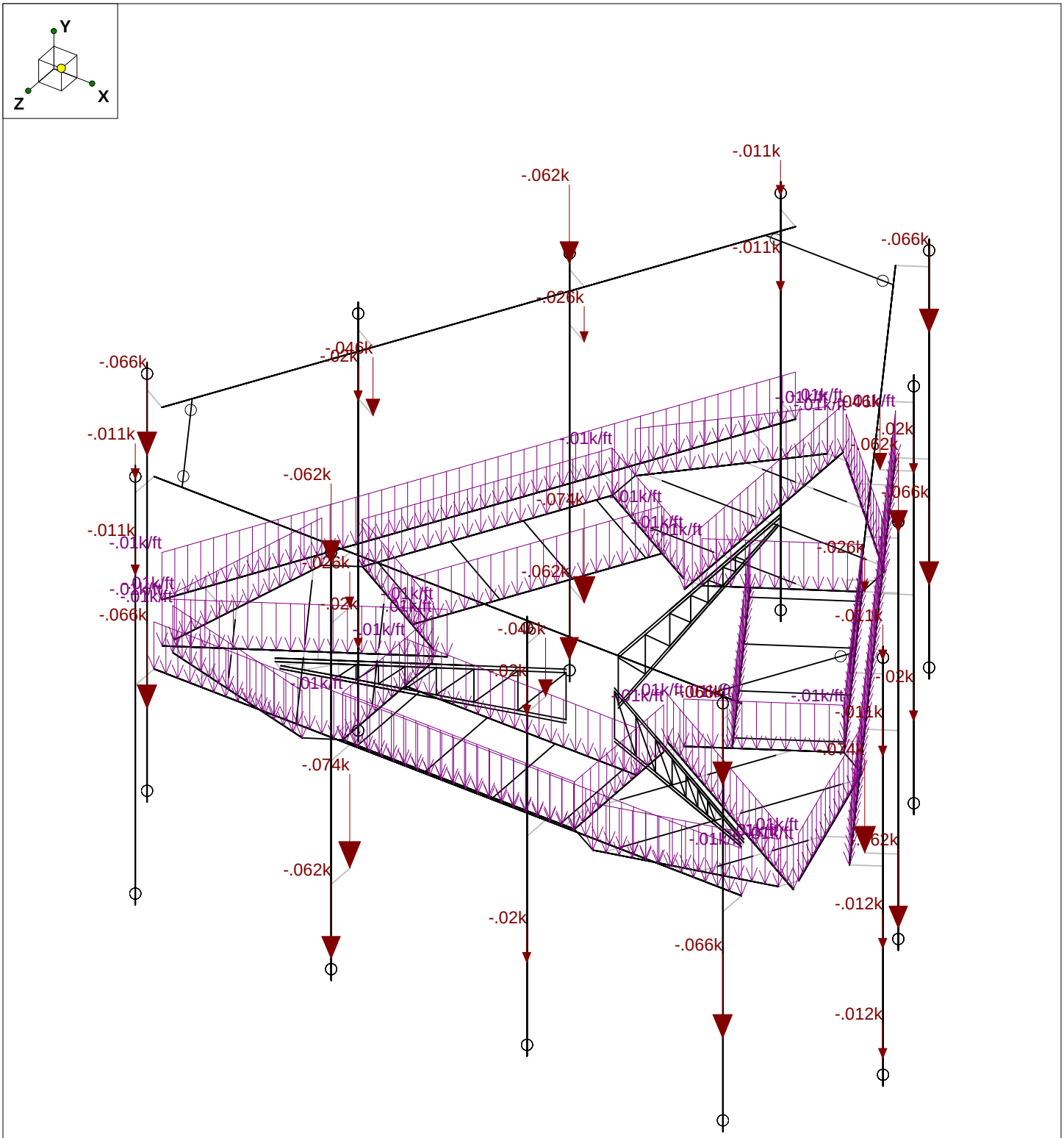


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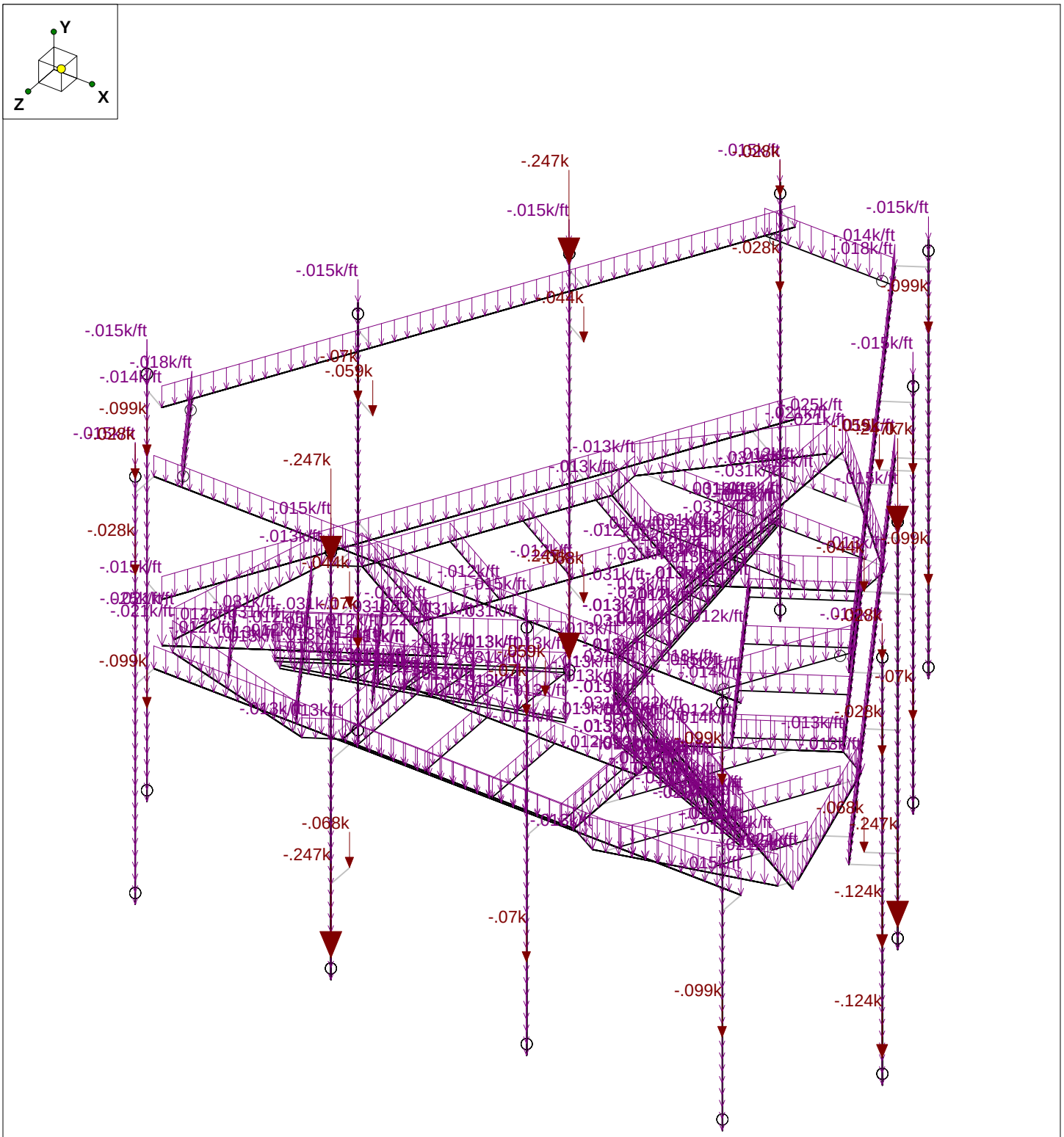


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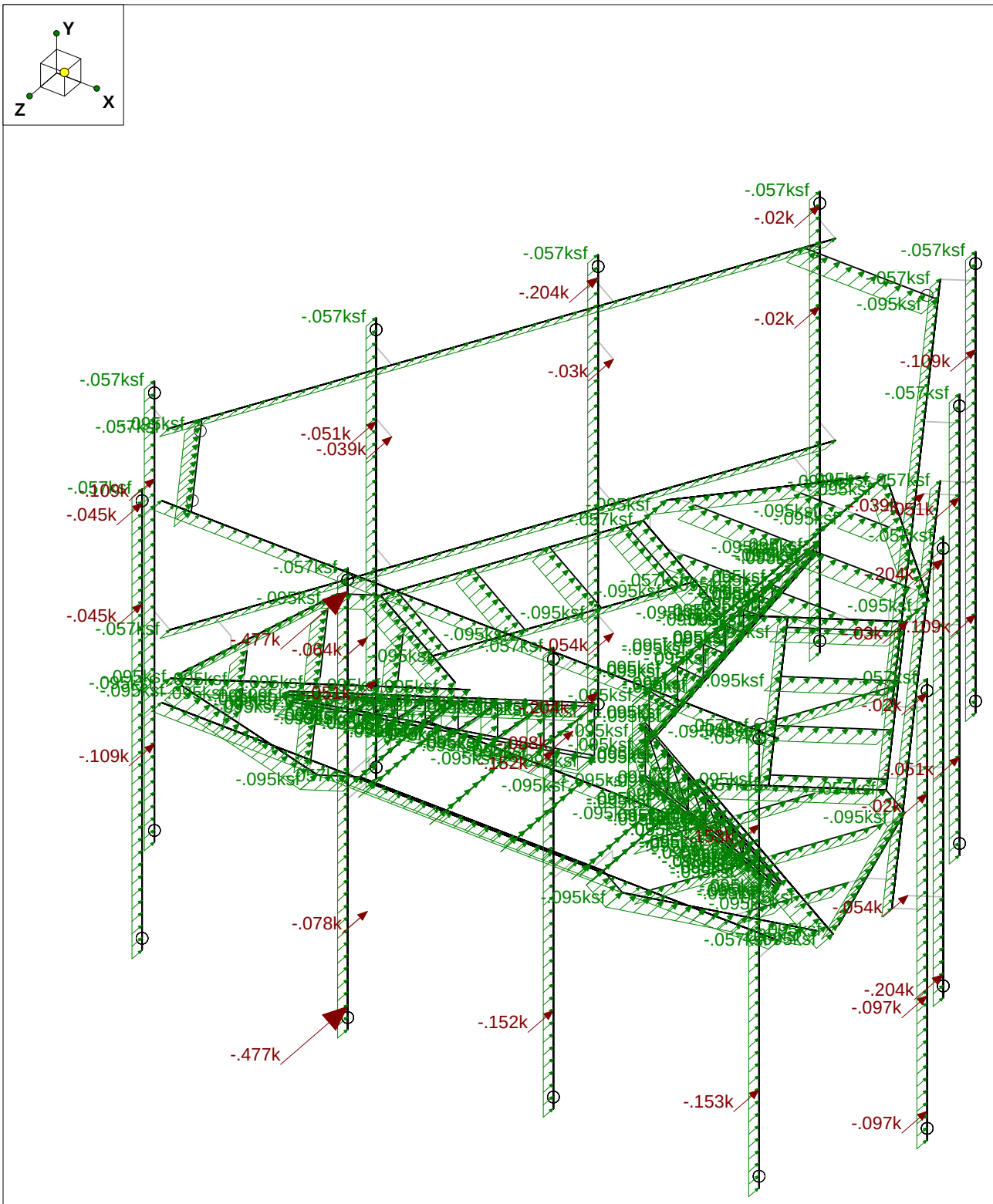


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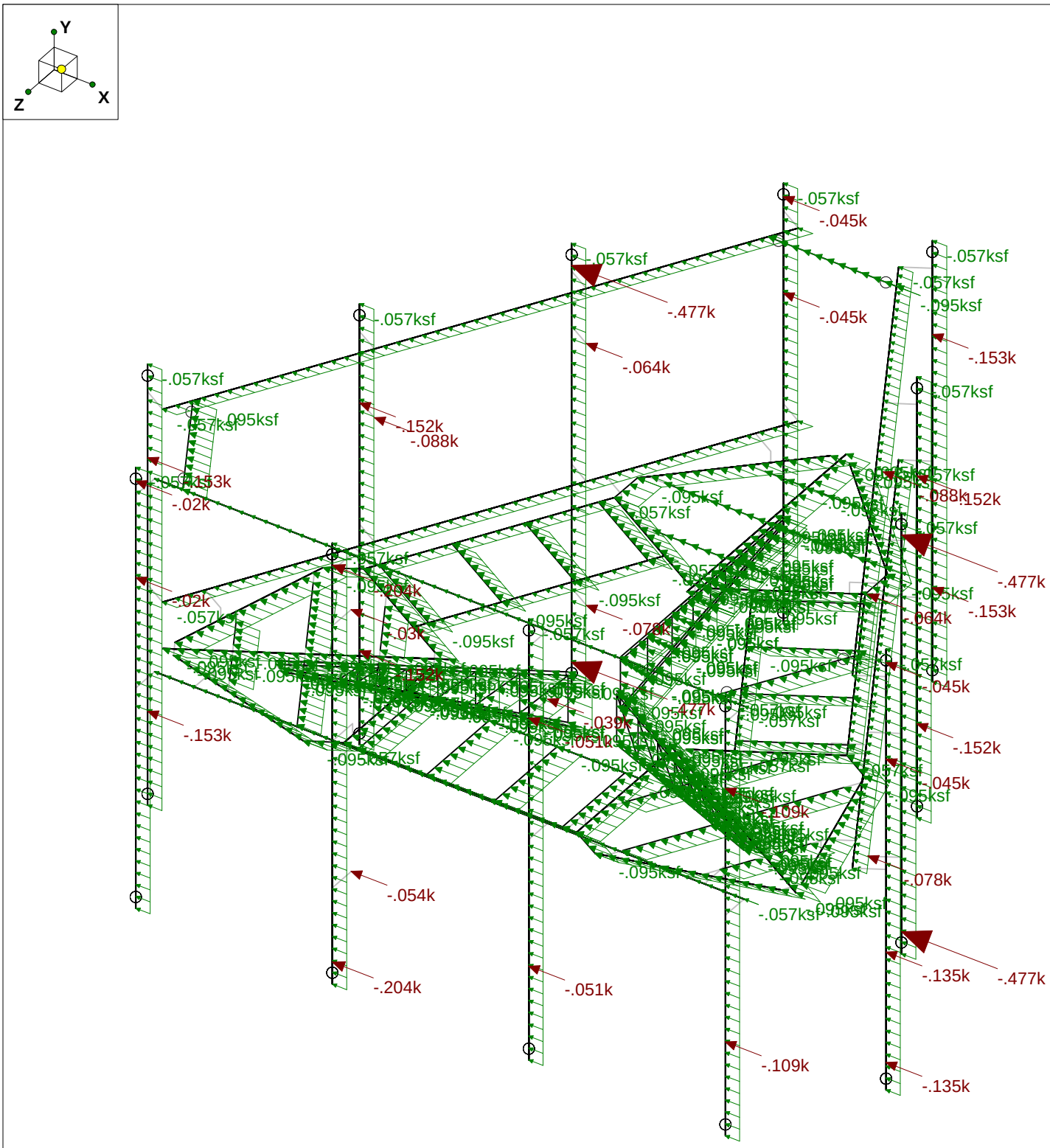


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| Jesse Drennen, PE | | July 13, 2018 at 10:39 AM |
| | | CTHA272A_F3P-10 Mount Analysi... |

## Basic Load Cases

| | BLC Description | Category | X Gravity | Y Gravity | Z Gravity | Joint | Point | Distributed | Area(Me... | Surface(... |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | D | DL | | -1 | | 36 | | 24 | | |
| 2 | Di | SL | | | | 36 | | 168 | | |
| 3 | Lm [500] | LL | | | | 1 | | | | |
| 4 | Lv [250] | LL | | | | 2 | | | | |
| 5 | Woz | WL | | | | 36 | | 180 | | |
| 6 | Wox | WL | | | | 36 | | 180 | | |
| 7 | Wiz | WL | | | | 36 | | 180 | | |
| 8 | Wix | WL | | | | 36 | | 180 | | |
| 9 | Ez | EL | | | | 36 | | | | |
| 10 | Ex | EL | | | | 36 | | | | |

## Load Combination Design

| | Description | ASIF | CD | ABIF | Service | Hot Rolled | Cold For... | Wood | Concrete | Masonry | Footings | Aluminum | Connecti... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1) 1.4D | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 2 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 3 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 4 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 5 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 6 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 7 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 8 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 9 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 10 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 11 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 12 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 13 | 2) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 14 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 15 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 16 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 17 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 18 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 19 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 20 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 21 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 22 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 23 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 24 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 25 | 3) 0.9D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 26 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 27 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 28 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 29 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 30 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 31 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 32 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 33 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 34 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 35 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 36 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 37 | 4) 1.2D+1.0... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 38 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 39 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 40 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 41 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

## Load Combination Design (Continued)

| | Description | ASIF | CD | ABIF | Service | Hot Rolled | Cold For... | Wood | Concrete | Masonry | Footings | Aluminum | Connecti... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 43 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 44 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 45 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 46 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 47 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 48 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 49 | 5) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 50 | 6) 1.2D+1.5... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 51 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 52 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 53 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 54 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 55 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 56 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 57 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 58 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 59 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 61 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 62 | 7) (1.2+0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 63 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 64 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 65 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 66 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 67 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 68 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 69 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 70 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 71 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 72 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 73 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 74 | 8) (0.9-0.2S... | | | | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

## Hot Rolled Steel Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (\1E... | Density[k/ft... | Yield[ksi] | Ry | Fu[ksi] | Rt |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A36 Gr.36 | 29000 | 11154 | .3 | .65 | .49 | 36 | 1.5 | 58 | 1.2 |
| 2 | A572 Gr.50 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 65 | 1.1 |
| 3 | A992 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 65 | 1.1 |
| 4 | A500 Gr.B RND | 29000 | 11154 | .3 | .65 | .49 | 42 | 1.4 | 58 | 1.3 |
| 5 | A500 Gr.B Rect | 29000 | 11154 | .3 | .65 | .49 | 46 | 1.4 | 58 | 1.3 |
| 6 | A53 Gr.B | 29000 | 11154 | .3 | .65 | .49 | 35 | 1.6 | 60 | 1.2 |
| 7 | A500 Gr.B RND_1 | 29000 | 11154 | .3 | .65 | .527 | 42 | 1.4 | 58 | 1.3 |
| 8 | A500 Gr.B Rect_1 | 29000 | 11154 | .3 | .65 | .527 | 46 | 1.4 | 58 | 1.3 |
| 9 | A1085 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.4 | 65 | 1.3 |
| 10 | Q235 | 29000 | 11154 | .3 | .65 | .49 | 35 | 1.5 | 58 | 1.2 |

## Hot Rolled Steel Section Sets

| | Label | Shape | Type | Design List | Material | Design Rul... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PIPE_1.5 | PIPE_1.5 | Beam | Pipe | A53 Gr.B | Typical | .749 | .293 | .293 | .586 |
| 2 | PIPE_2.0 | PIPE_2.0 | Beam | Pipe | A53 Gr.B | Typical | 1.02 | .627 | .627 | 1.25 |
| 3 | PIPE_2.5 | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical | 1.61 | 1.45 | 1.45 | 2.89 |
| 4 | PIPE_3.0 | PIPE_3.0 | Beam | Pipe | A53 Gr.B | Typical | 2.07 | 2.85 | 2.85 | 5.69 |
| 5 | PIPE_3.5 | PIPE_3.5 | Beam | Pipe | A53 Gr.B | Typical | 2.5 | 4.52 | 4.52 | 9.04 |

## Hot Rolled Steel Section Sets (Continued)

| | Label | Shape | Type | Design List | Material | Design Rul... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | PIPE_4.0 | PIPE_4.0 | Beam | Pipe | A53 Gr.B | Typical | 2.96 | 6.82 | 6.82 | 13.6 |
| 7 | PIPE_5.0 | PIPE_5.0 | Beam | Pipe | A53 Gr.B | Typical | 4.01 | 14.3 | 14.3 | 28.6 |
| 8 | HSS2x2x3 | HSS2x2x3 | Beam | Tube | A500 Gr.B ... | Typical | 1.19 | .641 | .641 | 1.09 |
| 9 | HSS3x3x3 | HSS3x3x3 | Beam | Tube | A500 Gr.B ... | Typical | 1.89 | 2.46 | 2.46 | 4.03 |
| 10 | HSS4x4x3 | HSS4x4x3 | Beam | Tube | A500 Gr.B ... | Typical | 2.58 | 6.21 | 6.21 | 10 |
| 11 | HSS4x4x4 | HSS4x4x4 | Beam | Tube | A500 Gr.B ... | Typical | 3.37 | 7.8 | 7.8 | 12.8 |
| 12 | HSS5x5x4 | HSS5x5x4 | Beam | Tube | A500 Gr.B ... | Typical | 4.3 | 16 | 16 | 25.8 |
| 13 | C3x3.5 | C3x3.5 | Beam | Channel | A36 Gr.36 | Typical | 1.09 | .169 | 1.57 | .023 |
| 14 | C4x4.5 | C4x4.5 | Beam | Channel | A36 Gr.36 | Typical | 1.38 | .289 | 3.65 | .032 |
| 15 | C5x6.7 | C5x6.7 | Beam | Channel | A36 Gr.36 | Typical | 1.97 | .47 | 7.48 | .055 |
| 16 | L2.5x2.5x3 | L2.5x2.5x3 | Beam | Single Angle | A36 Gr.36 | Typical | .901 | .535 | .535 | .011 |
| 17 | L2.5x2.5x4 | L2.5x2.5x4 | Beam | Single Angle | A36 Gr.36 | Typical | 1.19 | .692 | .692 | .026 |
| 18 | L3x3x3 | L3x3x3 | Beam | Single Angle | A36 Gr.36 | Typical | 1.09 | .948 | .948 | .014 |
| 19 | L3x3x4 | L3x3x4 | Beam | Single Angle | A36 Gr.36 | Typical | 1.44 | 1.23 | 1.23 | .031 |
| 20 | L3x3x6 | L3x3x6 | Beam | Single Angle | A36 Gr.36 | Typical | 2.11 | 1.75 | 1.75 | .101 |
| 21 | L3.5x3.5x4 | L3.5x3.5x4 | Beam | Single Angle | A36 Gr.36 | Typical | 1.7 | 2 | 2 | .039 |
| 22 | L4x4x4 | L4x4x4 | Beam | Single Angle | A36 Gr.36 | Typical | 1.93 | 3 | 3 | .044 |
| 23 | WT2x6.5 | WT2x6.5 | Beam | W_Tee | A36 Gr.36 | Typical | 1.91 | 1.93 | .526 | .075 |

## Member Primary Data

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | N3 | N9 | | | RIGID | None | None | RIGID | Typical |
| 2 | M2 | N5 | N10 | | | RIGID | None | None | RIGID | Typical |
| 3 | M3 | N6 | N11 | | | RIGID | None | None | RIGID | Typical |
| 4 | M4 | N4 | N12 | | | RIGID | None | None | RIGID | Typical |
| 5 | M5 | N7 | N13 | | | RIGID | None | None | RIGID | Typical |
| 6 | M6 | N8 | N14 | | | RIGID | None | None | RIGID | Typical |
| 7 | M7 | N15 | N17 | | | RIGID | None | None | RIGID | Typical |
| 8 | M8 | N16 | N19 | | | RIGID | None | None | RIGID | Typical |
| 9 | M9 | N3 | N23 | | | RIGID | None | None | RIGID | Typical |
| 10 | M10 | N5 | N24 | | | RIGID | None | None | RIGID | Typical |
| 11 | M11 | N6 | N25 | | | RIGID | None | None | RIGID | Typical |
| 12 | M12 | N20 | N26 | | | RIGID | None | None | RIGID | Typical |
| 13 | M13 | N21 | N27 | | | RIGID | None | None | RIGID | Typical |
| 14 | M14 | N22 | N28 | | | RIGID | None | None | RIGID | Typical |
| 15 | M15 | N15 | N29 | | | RIGID | None | None | RIGID | Typical |
| 16 | M16 | N16 | N31 | | | RIGID | None | None | RIGID | Typical |
| 17 | M17 | N17 | N18 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 18 | M18 | N29 | N30 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 19 | M19 | N31 | N32 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 20 | M20 | N19 | N33 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 21 | M21 | N1 | N2 | | 90 | HSS4x3x4 | Beam | Tube | Q235 | Typical |
| 22 | M22 | N30 | N32 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 23 | M23 | N18 | N33 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 24 | M24 | N10 | N7 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 25 | M25 | N11 | N8 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 26 | M26 | N9 | N4 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 27 | M27 | N24 | N21 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 28 | M28 | N25 | N22 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 29 | M29 | N23 | N20 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 30 | M30 | N37 | N43 | | | RIGID | None | None | RIGID | Typical |
| 31 | M31 | N39 | N44 | | | RIGID | None | None | RIGID | Typical |
| 32 | M32 | N40 | N45 | | | RIGID | None | None | RIGID | Typical |
| 33 | M33 | N38 | N46 | | | RIGID | None | None | RIGID | Typical |
| 34 | M34 | N41 | N47 | | | RIGID | None | None | RIGID | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 35 | M35 | N42 | N48 | | | RIGID | None | None | RIGID | Typical |
| 36 | M36 | N49 | N51 | | | RIGID | None | None | RIGID | Typical |
| 37 | M37 | N50 | N53 | | | RIGID | None | None | RIGID | Typical |
| 38 | M38 | N37 | N57 | | | RIGID | None | None | RIGID | Typical |
| 39 | M39 | N39 | N58 | | | RIGID | None | None | RIGID | Typical |
| 40 | M40 | N40 | N59 | | | RIGID | None | None | RIGID | Typical |
| 41 | M41 | N54 | N60 | | | RIGID | None | None | RIGID | Typical |
| 42 | M42 | N55 | N61 | | | RIGID | None | None | RIGID | Typical |
| 43 | M43 | N56 | N62 | | | RIGID | None | None | RIGID | Typical |
| 44 | M44 | N49 | N63 | | | RIGID | None | None | RIGID | Typical |
| 45 | M45 | N50 | N65 | | | RIGID | None | None | RIGID | Typical |
| 46 | M46 | N51 | N52 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 47 | M47 | N63 | N64 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 48 | M48 | N65 | N66 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 49 | M49 | N53 | N67 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 50 | M50 | N35 | N36 | | 90 | HSS4x3x4 | Beam | Tube | Q235 | Typical |
| 51 | M51 | N64 | N66 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 52 | M52 | N52 | N67 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 53 | M53 | N44 | N41 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 54 | M54 | N45 | N42 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 55 | M55 | N43 | N38 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 56 | M56 | N58 | N55 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 57 | M57 | N59 | N56 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 58 | M58 | N57 | N54 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 59 | M59 | N70 | N68 | | | RIGID | None | None | RIGID | Typical |
| 60 | M60 | N68 | N71 | | | RIGID | None | None | RIGID | Typical |
| 61 | M61 | N72 | N69 | | | RIGID | None | None | RIGID | Typical |
| 62 | M62 | N69 | N73 | | | RIGID | None | None | RIGID | Typical |
| 63 | M63 | N76 | N82 | | | RIGID | None | None | RIGID | Typical |
| 64 | M64 | N78 | N83 | | | RIGID | None | None | RIGID | Typical |
| 65 | M65 | N79 | N84 | | | RIGID | None | None | RIGID | Typical |
| 66 | M66 | N77 | N85 | | | RIGID | None | None | RIGID | Typical |
| 67 | M67 | N80 | N86 | | | RIGID | None | None | RIGID | Typical |
| 68 | M68 | N81 | N87 | | | RIGID | None | None | RIGID | Typical |
| 69 | M69 | N88 | N90 | | | RIGID | None | None | RIGID | Typical |
| 70 | M70 | N89 | N92 | | | RIGID | None | None | RIGID | Typical |
| 71 | M71 | N76 | N96 | | | RIGID | None | None | RIGID | Typical |
| 72 | M72 | N78 | N97 | | | RIGID | None | None | RIGID | Typical |
| 73 | M73 | N79 | N98 | | | RIGID | None | None | RIGID | Typical |
| 74 | M74 | N93 | N99 | | | RIGID | None | None | RIGID | Typical |
| 75 | M75 | N94 | N100 | | | RIGID | None | None | RIGID | Typical |
| 76 | M76 | N95 | N101 | | | RIGID | None | None | RIGID | Typical |
| 77 | M77 | N88 | N102 | | | RIGID | None | None | RIGID | Typical |
| 78 | M78 | N89 | N104 | | | RIGID | None | None | RIGID | Typical |
| 79 | M79 | N109 | N105 | | | RIGID | None | None | RIGID | Typical |
| 80 | M80 | N105 | N110 | | | RIGID | None | None | RIGID | Typical |
| 81 | M81 | N111 | N108 | | | RIGID | None | None | RIGID | Typical |
| 82 | M82 | N108 | N112 | | | RIGID | None | None | RIGID | Typical |
| 83 | M83 | N90 | N91 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 84 | M84 | N102 | N103 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 85 | M85 | N104 | N106 | | 180 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 86 | M86 | N92 | N107 | | 90 | L3x3x6 | Beam | Single Angle | Q235 | Typical |
| 87 | M87 | N74 | N75 | | 90 | HSS4x3x4 | Beam | Tube | Q235 | Typical |
| 88 | M88 | N103 | N106 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 89 | M89 | N91 | N107 | | | 3/8 x 3 | Beam | RECT | Q235 | Typical |
| 90 | M90 | N83 | N80 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 91 | M91 | N84 | N81 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 92 | M92 | N82 | N77 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 93 | M93 | N97 | N94 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 94 | M94 | N98 | N95 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 95 | M95 | N96 | N93 | | | 3/8 x 2 3/8 " | Beam | RECT | Q235 | Typical |
| 96 | M96 | N116 | N114 | | | RIGID | None | None | RIGID | Typical |
| 97 | M97 | N114 | N117 | | | RIGID | None | None | RIGID | Typical |
| 98 | M98 | N118 | N115 | | | RIGID | None | None | RIGID | Typical |
| 99 | M99 | N115 | N119 | | | RIGID | None | None | RIGID | Typical |
| 100 | M100 | N122 | N120 | | | RIGID | None | None | RIGID | Typical |
| 101 | M101 | N120 | N123 | | | RIGID | None | None | RIGID | Typical |
| 102 | M102 | N124 | N121 | | | RIGID | None | None | RIGID | Typical |
| 103 | M103 | N121 | N125 | | | RIGID | None | None | RIGID | Typical |
| 104 | M104 | N127 | N126 | | | RIGID | None | None | RIGID | Typical |
| 105 | M105 | N126 | N128 | | | RIGID | None | None | RIGID | Typical |
| 106 | M106 | N129 | N113 | | | RIGID | None | None | RIGID | Typical |
| 107 | M107 | N113 | N130 | | | RIGID | None | None | RIGID | Typical |
| 108 | M108 | N133 | N131 | | | RIGID | None | None | RIGID | Typical |
| 109 | M109 | N131 | N134 | | | RIGID | None | None | RIGID | Typical |
| 110 | M110 | N34 | N132 | | | RIGID | None | None | RIGID | Typical |
| 111 | M111 | N132 | N135 | | | RIGID | None | None | RIGID | Typical |
| 112 | M112 | N143 | N136 | | | RIGID | None | None | RIGID | Typical |
| 113 | M113 | N150 | N144 | | | RIGID | None | None | RIGID | Typical |
| 114 | M114 | N151 | N145 | | | RIGID | None | None | RIGID | Typical |
| 115 | M115 | N152 | N146 | | | RIGID | None | None | RIGID | Typical |
| 116 | M116 | N153 | N147 | | | RIGID | None | None | RIGID | Typical |
| 117 | M117 | N154 | N138 | | | RIGID | None | None | RIGID | Typical |
| 118 | M118 | N155 | N148 | | | RIGID | None | None | RIGID | Typical |
| 119 | M119 | N156 | N149 | | | RIGID | None | None | RIGID | Typical |
| 120 | M120 | N174 | N139 | | | RIGID | None | None | RIGID | Typical |
| 121 | M121 | N172 | N140 | | | RIGID | None | None | RIGID | Typical |
| 122 | M122 | N142 | N172 | | | RIGID | None | None | RIGID | Typical |
| 123 | M123 | N142 | N173 | | | RIGID | None | None | RIGID | Typical |
| 124 | M124 | N176 | N175 | | | RIGID | None | None | RIGID | Typical |
| 125 | M125 | N165 | N171 | | | RIGID | None | None | RIGID | Typical |
| 126 | M126 | N164 | N170 | | | RIGID | None | None | RIGID | Typical |
| 127 | M127 | N163 | N169 | | | RIGID | None | None | RIGID | Typical |
| 128 | M128 | N162 | N168 | | | RIGID | None | None | RIGID | Typical |
| 129 | M129 | N160 | N167 | | | RIGID | None | None | RIGID | Typical |
| 130 | M130 | N161 | N158 | | | RIGID | None | None | RIGID | Typical |
| 131 | M131 | N159 | N166 | | | RIGID | None | None | RIGID | Typical |
| 132 | M132 | N141 | N157 | | | RIGID | None | None | RIGID | Typical |
| 133 | M133 | N140 | N149 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 134 | M134 | N142 | N165 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 135 | M135 | N149 | N147 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 136 | M136 | N147 | N145 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 137 | M137 | N145 | N144 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 138 | M138 | N144 | N136 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 139 | M139 | N165 | N162 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 140 | M140 | N162 | N161 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 141 | M141 | N161 | N159 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 142 | M142 | N159 | N141 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 143 | M143 | N172 | N156 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 144 | M144 | N173 | N171 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 145 | M145 | N156 | N153 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 146 | M146 | N153 | N151 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 147 | M147 | N151 | N150 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 148 | M148 | N150 | N143 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 149 | M149 | N171 | N168 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 150 | M150 | N168 | N158 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 151 | M151 | N158 | N166 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 152 | M152 | N166 | N157 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 153 | M153 | N157 | N143 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 154 | M154 | N175 | N174 | | | RIGID | None | None | RIGID | Typical |
| 155 | M155 | N143 | N166 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 156 | M156 | N166 | N150 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 157 | M157 | N150 | N158 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 158 | M158 | N158 | N151 | | | .875 x .375 | Beam | RECT | A992 | Typical |
| 159 | M159 | N167 | N151 | | | .875 x .375 | Beam | RECT | A992 | Typical |
| 160 | M160 | N167 | N152 | | | .875 x .375 | Beam | RECT | A992 | Typical |
| 161 | M161 | N168 | N152 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 162 | M162 | N168 | N153 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 163 | M163 | N169 | N153 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 164 | M164 | N169 | N154 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 165 | M165 | N170 | N154 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 166 | M166 | N170 | N155 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 167 | M167 | N171 | N155 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 168 | M168 | N171 | N156 | | | RIGID | None | None | RIGID | Typical |
| 169 | M169 | N259 | N260 | | | RIGID | None | None | RIGID | Typical |
| 170 | M170 | N137 | N16 | | | RIGID | None | None | RIGID | Typical |
| 171 | M171 | N185 | N179 | | | RIGID | None | None | RIGID | Typical |
| 172 | M172 | N192 | N186 | | | RIGID | None | None | RIGID | Typical |
| 173 | M173 | N193 | N187 | | | RIGID | None | None | RIGID | Typical |
| 174 | M174 | N194 | N188 | | | RIGID | None | None | RIGID | Typical |
| 175 | M175 | N195 | N189 | | | RIGID | None | None | RIGID | Typical |
| 176 | M176 | N196 | N180 | | | RIGID | None | None | RIGID | Typical |
| 177 | M177 | N197 | N190 | | | RIGID | None | None | RIGID | Typical |
| 178 | M178 | N198 | N191 | | | RIGID | None | None | RIGID | Typical |
| 179 | M179 | N216 | N181 | | | RIGID | None | None | RIGID | Typical |
| 180 | M180 | N214 | N182 | | | RIGID | None | None | RIGID | Typical |
| 181 | M181 | N184 | N214 | | | RIGID | None | None | RIGID | Typical |
| 182 | M182 | N184 | N215 | | | RIGID | None | None | RIGID | Typical |
| 183 | M183 | N218 | N217 | | | RIGID | None | None | RIGID | Typical |
| 184 | M184 | N207 | N213 | | | RIGID | None | None | RIGID | Typical |
| 185 | M185 | N206 | N212 | | | RIGID | None | None | RIGID | Typical |
| 186 | M186 | N205 | N211 | | | RIGID | None | None | RIGID | Typical |
| 187 | M187 | N204 | N210 | | | RIGID | None | None | RIGID | Typical |
| 188 | M188 | N202 | N209 | | | RIGID | None | None | RIGID | Typical |
| 189 | M189 | N203 | N200 | | | RIGID | None | None | RIGID | Typical |
| 190 | M190 | N201 | N208 | | | RIGID | None | None | RIGID | Typical |
| 191 | M191 | N183 | N199 | | | RIGID | None | None | RIGID | Typical |
| 192 | M192 | N182 | N191 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 193 | M193 | N184 | N207 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 194 | M194 | N191 | N189 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 195 | M195 | N189 | N187 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 196 | M196 | N187 | N186 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 197 | M197 | N186 | N179 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 198 | M198 | N207 | N204 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 199 | M199 | N204 | N203 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 200 | M200 | N203 | N201 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 201 | M201 | N201 | N183 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 202 | M202 | N214 | N198 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 203 | M203 | N215 | N213 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 204 | M204 | N198 | N195 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 205 | M205 | N195 | N193 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 206 | M206 | N193 | N192 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 207 | M207 | N192 | N185 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 208 | M208 | N213 | N210 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 209 | M209 | N210 | N200 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 210 | M210 | N200 | N208 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 211 | M211 | N208 | N199 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 212 | M212 | N199 | N185 | | 120 | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 213 | M213 | N217 | N216 | | | RIGID | None | None | RIGID | Typical |
| 214 | M214 | N185 | N208 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 215 | M215 | N208 | N192 | | 120 | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 216 | M216 | N192 | N200 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 217 | M217 | N200 | N193 | | 120 | .875 x .375 | Beam | RECT | A992 | Typical |
| 218 | M218 | N209 | N193 | | | .875 x .375 | Beam | RECT | A992 | Typical |
| 219 | M219 | N209 | N194 | | 120 | .875 x .375 | Beam | RECT | A992 | Typical |
| 220 | M220 | N210 | N194 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 221 | M221 | N210 | N195 | | 120 | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 222 | M222 | N211 | N195 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 223 | M223 | N211 | N196 | | 120 | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 224 | M224 | N212 | N196 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 225 | M225 | N212 | N197 | | 120 | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 226 | M226 | N213 | N197 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 227 | M227 | N213 | N198 | | | RIGID | None | None | RIGID | Typical |
| 228 | M228 | N225 | N219 | | | RIGID | None | None | RIGID | Typical |
| 229 | M229 | N232 | N226 | | | RIGID | None | None | RIGID | Typical |
| 230 | M230 | N233 | N227 | | | RIGID | None | None | RIGID | Typical |
| 231 | M231 | N234 | N228 | | | RIGID | None | None | RIGID | Typical |
| 232 | M232 | N235 | N229 | | | RIGID | None | None | RIGID | Typical |
| 233 | M233 | N236 | N220 | | | RIGID | None | None | RIGID | Typical |
| 234 | M234 | N237 | N230 | | | RIGID | None | None | RIGID | Typical |
| 235 | M235 | N238 | N231 | | | RIGID | None | None | RIGID | Typical |
| 236 | M236 | N256 | N221 | | | RIGID | None | None | RIGID | Typical |
| 237 | M237 | N254 | N222 | | | RIGID | None | None | RIGID | Typical |
| 238 | M238 | N224 | N254 | | | RIGID | None | None | RIGID | Typical |
| 239 | M239 | N224 | N255 | | | RIGID | None | None | RIGID | Typical |
| 240 | M240 | N258 | N257 | | | RIGID | None | None | RIGID | Typical |
| 241 | M241 | N247 | N253 | | | RIGID | None | None | RIGID | Typical |
| 242 | M242 | N246 | N252 | | | RIGID | None | None | RIGID | Typical |
| 243 | M243 | N245 | N251 | | | RIGID | None | None | RIGID | Typical |
| 244 | M244 | N244 | N250 | | | RIGID | None | None | RIGID | Typical |
| 245 | M245 | N242 | N249 | | | RIGID | None | None | RIGID | Typical |
| 246 | M246 | N243 | N240 | | | RIGID | None | None | RIGID | Typical |
| 247 | M247 | N241 | N248 | | | RIGID | None | None | RIGID | Typical |
| 248 | M248 | N223 | N239 | | | RIGID | None | None | RIGID | Typical |
| 249 | M249 | N222 | N231 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 250 | M250 | N224 | N247 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 251 | M251 | N231 | N229 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 252 | M252 | N229 | N227 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 253 | M253 | N227 | N226 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 254 | M254 | N226 | N219 | | 90 | .5" x 4" | Beam | RECT | A992 | Typical |
| 255 | M255 | N247 | N244 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 256 | M256 | N244 | N243 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 257 | M257 | N243 | N241 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 258 | M258 | N241 | N223 | | 90 | 3/8 x 4 | Beam | RECT | A992 | Typical |
| 259 | M259 | N254 | N238 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 260 | M260 | N255 | N253 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 261 | M261 | N238 | N235 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 262 | M262 | N235 | N233 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 263 | M263 | N233 | N232 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 264 | M264 | N232 | N225 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 265 | M265 | N253 | N250 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 266 | M266 | N250 | N240 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 267 | M267 | N240 | N248 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 268 | M268 | N248 | N239 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 269 | M269 | N239 | N225 | | 60 | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 270 | M270 | N257 | N256 | | | RIGID | None | None | RIGID | Typical |
| 271 | M271 | N225 | N248 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 272 | M272 | N248 | N232 | | 60 | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 273 | M273 | N232 | N240 | | | 3/8 x 1" | Beam | RECT | A992 | Typical |
| 274 | M274 | N240 | N233 | | 60 | .875 x .375 | Beam | RECT | A992 | Typical |
| 275 | M275 | N249 | N233 | | | .875 x .375 | Beam | RECT | A992 | Typical |
| 276 | M276 | N249 | N234 | | 60 | .875 x .375 | Beam | RECT | A992 | Typical |
| 277 | M277 | N250 | N234 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 278 | M278 | N250 | N235 | | 60 | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 279 | M279 | N251 | N235 | | | 3/4 x 3/8 | Beam | RECT | A992 | Typical |
| 280 | M280 | N251 | N236 | | 60 | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 281 | M281 | N252 | N236 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 282 | M282 | N252 | N237 | | 60 | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 283 | M283 | N253 | N237 | | | 3/8 x 5/8 | Beam | RECT | A992 | Typical |
| 284 | M284 | N253 | N238 | | 60 | RIGID | None | None | RIGID | Typical |
| 285 | M285 | N262 | N263 | | | RIGID | None | None | RIGID | Typical |
| 286 | M286 | N261 | N89 | | | RIGID | None | None | RIGID | Typical |
| 287 | M287 | N265 | N266 | | | RIGID | None | None | RIGID | Typical |
| 288 | M288 | N264 | N50 | | | RIGID | None | None | RIGID | Typical |
| 289 | M289 | N178 | N177 | | | PIPE_2.5 | Beam | Pipe | Q235 | Typical |
| 290 | M292 | N238 | N257 | | | RIGID | None | None | RIGID | Typical |
| 291 | M293 | N256 | N255 | | | RIGID | None | None | RIGID | Typical |
| 292 | M294 | N198 | N217 | | | RIGID | None | None | RIGID | Typical |
| 293 | M295 | N216 | N215 | | | RIGID | None | None | RIGID | Typical |
| 294 | M296 | N156 | N175 | | | RIGID | None | None | RIGID | Typical |
| 295 | M297 | N174 | N173 | | | RIGID | None | None | RIGID | Typical |
| 296 | M298 | N274 | N273 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 297 | M299 | N106 | N67 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 298 | M300 | N283 | N282 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 299 | M301 | N281 | N280 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 300 | M302 | N279 | N278 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 301 | M303 | N277 | N276 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 302 | M304 | N272 | N271 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 303 | M305 | N66 | N33 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 304 | M306 | N291 | N290 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 305 | M307 | N289 | N288 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 306 | M308 | N287 | N286 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 307 | M309 | N285 | N284 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 308 | M310 | N270 | N275 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 309 | M311 | N32 | N107 | | | PIPE_1.5 | Beam | Pipe | Q235 | Typical |
| 310 | M312 | N299 | N298 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 311 | M313 | N297 | N296 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 312 | M314 | N295 | N294 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 313 | M315 | N293 | N292 | | | 3/16 X 1 1/2 | Beam | RECT | A992 | Typical |
| 314 | M316 | N300 | N177 | | | RIGID | None | None | RIGID | Typical |
| 315 | M317 | N301 | N304 | | | RIGID | None | None | RIGID | Typical |
| 316 | M318 | N302 | N303 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 317 | M321 | N305 | N268 | | | RIGID | None | None | RIGID | Typical |
| 318 | M322 | N306 | N309 | | | RIGID | None | None | RIGID | Typical |
| 319 | M323 | N307 | N308 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |

## Member Primary Data (Continued)

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 320 | M326 | N310 | N178 | | | RIGID | None | None | RIGID | Typical |
| 321 | M327 | N311 | N314 | | | RIGID | None | None | RIGID | Typical |
| 322 | M328 | N312 | N313 | | | PIPE_3.0 | Beam | Pipe | A53 Gr.B | Typical |
| 323 | M331 | N315 | N267 | | | RIGID | None | None | RIGID | Typical |
| 324 | M332 | N316 | N319 | | | RIGID | None | None | RIGID | Typical |
| 325 | M333 | N317 | N318 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 326 | M376 | N314 | N304 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 327 | M380 | N320 | N321 | | 90 | WT2x6.5 | Beam | W Tee | A36 Gr.36 | Typical |
| 328 | M328A | N322 | N323 | | | RIGID | None | None | RIGID | Typical |
| 329 | M329 | N324 | N325 | | | RIGID | None | None | RIGID | Typical |
| 330 | M330 | N328 | N329 | | | RIGID | None | None | RIGID | Typical |
| 331 | M331A | N335 | N334 | | | PIPE_2.5 | Beam | Pipe | Q235 | Typical |
| 332 | M332A | N338 | N334 | | | RIGID | None | None | RIGID | Typical |
| 333 | M333A | N339 | N342 | | | RIGID | None | None | RIGID | Typical |
| 334 | M334 | N340 | N341 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 335 | M335 | N343 | N337 | | | RIGID | None | None | RIGID | Typical |
| 336 | M336 | N344 | N347 | | | RIGID | None | None | RIGID | Typical |
| 337 | M337 | N345 | N346 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 338 | M338 | N348 | N335 | | | RIGID | None | None | RIGID | Typical |
| 339 | M339 | N349 | N352 | | | RIGID | None | None | RIGID | Typical |
| 340 | M340 | N350 | N351 | | | PIPE_3.0 | Beam | Pipe | A53 Gr.B | Typical |
| 341 | M341 | N353 | N336 | | | RIGID | None | None | RIGID | Typical |
| 342 | M342 | N354 | N357 | | | RIGID | None | None | RIGID | Typical |
| 343 | M343 | N355 | N356 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 344 | M344 | N352 | N342 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 345 | M345 | N358 | N359 | | 90 | WT2x6.5 | Beam | W Tee | A36 Gr.36 | Typical |
| 346 | M346 | N360 | N361 | | | RIGID | None | None | RIGID | Typical |
| 347 | M347 | N362 | N363 | | | RIGID | None | None | RIGID | Typical |
| 348 | M348 | N366 | N367 | | | RIGID | None | None | RIGID | Typical |
| 349 | M349 | N373 | N372 | | | PIPE_2.5 | Beam | Pipe | Q235 | Typical |
| 350 | M350 | N376 | N372 | | | RIGID | None | None | RIGID | Typical |
| 351 | M351 | N377 | N380 | | | RIGID | None | None | RIGID | Typical |
| 352 | M352 | N378 | N379 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 353 | M353 | N381 | N375 | | | RIGID | None | None | RIGID | Typical |
| 354 | M354 | N382 | N385 | | | RIGID | None | None | RIGID | Typical |
| 355 | M355 | N383 | N384 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 356 | M356 | N386 | N373 | | | RIGID | None | None | RIGID | Typical |
| 357 | M357 | N387 | N390 | | | RIGID | None | None | RIGID | Typical |
| 358 | M358 | N388 | N389 | | | PIPE_3.0 | Beam | Pipe | A53 Gr.B | Typical |
| 359 | M359 | N391 | N374 | | | RIGID | None | None | RIGID | Typical |
| 360 | M360 | N392 | N395 | | | RIGID | None | None | RIGID | Typical |
| 361 | M361 | N393 | N394 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 362 | M362 | N390 | N380 | | | PIPE_2.5 | Beam | Pipe | A53 Gr.B | Typical |
| 363 | M363 | N396 | N397 | | 90 | WT2x6.5 | Beam | W Tee | A36 Gr.36 | Typical |
| 364 | M364 | N398 | N399 | | | RIGID | None | None | RIGID | Typical |
| 365 | M365 | N400 | N401 | | | RIGID | None | None | RIGID | Typical |
| 366 | M366 | N404 | N405 | | | RIGID | None | None | RIGID | Typical |

## Envelope Joint Reactions

| | Joint | | X [k] | LC | Y [k] | LC | Z [k] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N136 | max | 1.526 | 17 | 1.626 | 30 | 10.619 | 26 | .042 | 20 | 1.886 | 11 | .013 | 11 |
| 2 | | min | -1.542 | 11 | .3 | 24 | -4.005 | 20 | -.082 | 2 | -1.884 | 17 | -.013 | 17 |
| 3 | N219 | max | 3.802 | 16 | 1.634 | 37 | 2.363 | 16 | .047 | 35 | .921 | 20 | .041 | 16 |
| 4 | | min | -10.659 | 34 | .344 | 69 | -6.144 | 34 | -.025 | 16 | -.931 | 2 | -.078 | 10 |
| 5 | N179 | max | 8.93 | 30 | 1.587 | 34 | 2.542 | 24 | .042 | 5 | .804 | 25 | .076 | 6 |

## Envelope Joint Reactions (Continued)

| | Joint | | X [k] | LC | Y [k] | LC | Z [k] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | min | -3.72 | 24 | .307 | 16 | -5.442 | 6 | -.022 | 23 | -.802 | 7 | -.042 | 24 |
| 7 | N141 | max | .156 | 17 | 3.142 | 26 | -1.699 | 20 | -.013 | 20 | .467 | 23 | .092 | 23 |
| 8 | | min | -.153 | 23 | .342 | 20 | -16.403 | 26 | -.156 | 26 | -.477 | 5 | -.094 | 5 |
| 9 | N183 | max | -1.381 | 24 | 3.077 | 30 | 8.024 | 30 | .082 | 10 | .435 | 23 | .139 | 29 |
| 10 | | min | -13.916 | 30 | .335 | 24 | .932 | 24 | -.035 | 16 | -.44 | 5 | -.026 | 23 |
| 11 | N223 | max | 15.615 | 34 | 3.436 | 34 | 8.928 | 34 | .084 | 4 | .433 | 10 | .026 | 16 |
| 12 | | min | 1.555 | 16 | .374 | 16 | 1.068 | 16 | -.034 | 22 | -.435 | 16 | -.162 | 34 |
| 13 | Totals: | max | 8.585 | 5 | 14.11 | 37 | 7.561 | 14 | | | | | | |
| 14 | | min | -8.585 | 23 | 3.206 | 67 | -7.561 | 8 | | | | | | |

## Envelope AISC 14th(360-10): LRFD Steel Code Checks

| | Member | Shape | Code Check | Loc[ft] | LC | Shear Check | Loc..... | | LC | phi*P... | phi*P... | phi*M... | phi*M... | ... | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M337 | PIPE_2.5 | .573 | 4 | 11 | .071 | 1.5 | | 10 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 2 | M323 | PIPE_2.5 | .572 | 4 | 8 | .067 | 4 | | 3 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 3 | M355 | PIPE_2.5 | .569 | 4 | 5 | .070 | 1.5 | | 12 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 4 | M19 | L3x3x6 | .518 | 0 | 35 | .108 | .696 | z | 35 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 5 | M49 | L3x3x6 | .517 | 0 | 37 | .120 | .696 | y | 37 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 6 | M20 | L3x3x6 | .514 | 0 | 29 | .113 | .696 | y | 29 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 7 | M48 | L3x3x6 | .513 | 0 | 31 | .100 | .696 | z | 31 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 8 | M85 | L3x3x6 | .496 | 0 | 27 | .104 | .696 | z | 27 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 9 | M86 | L3x3x6 | .486 | 0 | 33 | .109 | .696 | y | 33 | 66.149 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 10 | M249 | .5" x 4" | .427 | .629 | 34 | .083 | .432 | z | 35 | 74.534 | 90 | .938 | 7.5 | ... | H1-1b |
| 11 | M58 | 3/8 x 2 3... | .408 | 0 | 32 | .074 | 0 | y | 32 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 12 | M55 | 3/8 x 2 3... | .405 | 0 | 35 | .086 | 0 | y | 36 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 13 | M29 | 3/8 x 2 3... | .377 | 0 | 37 | .082 | 0 | y | 35 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 14 | M26 | 3/8 x 2 3... | .376 | 0 | 27 | .075 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 15 | M133 | .5" x 4" | .367 | .629 | 37 | .060 | .432 | z | 26 | 74.534 | 90 | .938 | 7.5 | ... | H1-1b |
| 16 | M95 | 3/8 x 2 3... | .366 | 0 | 28 | .082 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 17 | M57 | 3/8 x 2 3... | .366 | 0 | 32 | .040 | 0 | y | 37 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 18 | M192 | .5" x 4" | .364 | .629 | 29 | .077 | .432 | z | 4 | 74.534 | 90 | .938 | 7.5 | ... | H1-1b |
| 19 | M54 | 3/8 x 2 3... | .363 | 0 | 36 | .034 | 0 | y | 32 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 20 | M28 | 3/8 x 2 3... | .358 | 0 | 36 | .035 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 21 | M92 | 3/8 x 2 3... | .356 | 0 | 31 | .068 | 0 | y | 32 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 22 | M25 | 3/8 x 2 3... | .352 | 0 | 29 | .036 | 0 | y | 36 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 23 | M94 | 3/8 x 2 3... | .345 | 0 | 28 | .032 | 0 | y | 33 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 24 | M56 | 3/8 x 2 3... | .340 | 0 | 32 | .029 | 0 | y | 27 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 25 | M266 | 3/8 x 1" | .338 | 1.045 | 34 | .027 | .468 | y | 35 | 11.147 | 16.875 | .132 | .352 | ... | H1-1a |
| 26 | M53 | 3/8 x 2 3... | .337 | 0 | 33 | .031 | 0 | y | 35 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 27 | M91 | 3/8 x 2 3... | .334 | 0 | 33 | .035 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 28 | M343 | PIPE_2.5 | .328 | 4 | 5 | .051 | 4 | | 4 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 29 | M27 | 3/8 x 2 3... | .322 | 0 | 37 | .030 | 0 | y | 36 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 30 | M24 | 3/8 x 2 3... | .320 | 0 | 37 | .028 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 31 | M256 | 3/8 x 4 | .320 | 1.045 | 34 | .012 | 0 | y | 41 | 44.585 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 32 | M258 | 3/8 x 4 | .315 | .742 | 34 | .012 | 0 | y | 24 | 54.764 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 33 | M150 | 3/8 x 1" | .314 | 1.045 | 27 | .026 | 1.0... | y | 5 | 11.147 | 16.875 | .132 | .352 | ... | H1-1a |
| 34 | M93 | 3/8 x 2 3... | .308 | 0 | 28 | .028 | 0 | y | 29 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 35 | M209 | 3/8 x 1" | .307 | 1.045 | 30 | .021 | .468 | y | 31 | 11.147 | 16.875 | .132 | .352 | ... | H1-1a |
| 36 | M90 | 3/8 x 2 3... | .307 | 0 | 28 | .026 | 0 | y | 28 | 26.252 | 28.055 | .219 | 1.388 | ... | H1-1b |
| 37 | M268 | 3/8 x 1" | .302 | .731 | 34 | .011 | .731 | y | 13 | 13.777 | 16.875 | .132 | .352 | ... | H1-1a |
| 38 | M333 | PIPE_2.5 | .296 | 4 | 2 | .056 | 4 | | 9 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 39 | M140 | 3/8 x 4 | .290 | 1.045 | 27 | .025 | 1.0... | y | 11 | 44.585 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 40 | M267 | 3/8 x 1" | .289 | .667 | 34 | .018 | .667 | y | 13 | 14.256 | 16.875 | .132 | .352 | ... | H1-1a |
| 41 | M265 | 3/8 x 1" | .288 | 0 | 34 | .069 | .262 | y | 34 | 11.496 | 16.875 | .132 | .352 | ... | H1-1b |
| 42 | M199 | 3/8 x 4 | .286 | 1.045 | 29 | .014 | .479 | y | 3 | 44.585 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 43 | M257 | 3/8 x 4 | .285 | .667 | 34 | .016 | 0 | y | 12 | 57.024 | 67.5 | .527 | 5.625 | ... | H1-1a |

## Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

| | Member | Shape | Code Check | Loc[ft] | LC | Shear Check | Loc..... | | LC | phi*P... | phi*P... | phi*M... | phi*M... | ... | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | M138 | .5" x 4" | .280 | .718 | 5 | .063 | .718 | y | 11 | 80.683 | 90 | .938 | 7.5 | ... | H1-1b |
| 45 | M50 | HSS4x3x4 | .278 | 2.299 | 35 | .132 | 2.2... | z | 35 | 83.04 | 91.665 | 8.19 | 10.001 | ... | H1-1b |
| 46 | M152 | 3/8 x 1" | .278 | .731 | 27 | .013 | .731 | y | 5 | 13.777 | 16.875 | .132 | .352 | ... | H1-1a |
| 47 | M142 | 3/8 x 4 | .278 | .742 | 27 | .016 | .742 | y | 23 | 54.764 | 67.5 | .527 | 5.576 | ... | H1-1a |
| 48 | M361 | PIPE_2.5 | .277 | 4 | 10 | .057 | 1.75 | | 7 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 49 | M201 | 3/8 x 4 | .275 | .742 | 29 | .015 | 0 | y | 16 | 54.764 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 50 | M211 | 3/8 x 1" | .272 | .731 | 30 | .013 | .731 | y | 9 | 13.777 | 16.875 | .132 | .352 | ... | H1-1a |
| 51 | M47 | L3x3x6 | .266 | 0 | 27 | .187 | 2.9... | y | 34 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 52 | M46 | L3x3x6 | .257 | 0 | 31 | .220 | 2.7... | z | 36 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 53 | M141 | 3/8 x 4 | .256 | .667 | 27 | .028 | .667 | y | 11 | 57.024 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 54 | M149 | 3/8 x 1" | .255 | 0 | 26 | .059 | .262 | y | 26 | 11.496 | 16.875 | .132 | .352 | ... | H1-1b |
| 55 | M334 | PIPE_2.5 | .254 | 4 | 30 | .063 | 4 | | 11 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 56 | M200 | 3/8 x 4 | .253 | .667 | 29 | .020 | 0 | y | 3 | 57.024 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 57 | M281 | 3/8 x 5/8 | .252 | .43 | 34 | .006 | 0 | y | 34 | 9.833 | 10.547 | .082 | .137 | ... | H1-1a |
| 58 | M208 | 3/8 x 1" | .250 | 0 | 30 | .058 | .262 | y | 30 | 11.496 | 16.875 | .132 | .352 | ... | H1-1b |
| 59 | M17 | L3x3x6 | .243 | 0 | 35 | .195 | 2.7... | z | 28 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 60 | M255 | 3/8 x 4 | .243 | 1.006 | 34 | .011 | .608 | y | 40 | 45.984 | 67.5 | .527 | 5.625 | ... | H1-1a |
| 61 | M83 | L3x3x6 | .241 | 0 | 28 | .188 | 2.7... | z | 32 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 62 | M84 | L3x3x6 | .240 | .88 | 26 | .182 | 2.7... | y | 28 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 63 | M18 | L3x3x6 | .239 | .88 | 34 | .186 | 2.7... | y | 36 | 65.969 | 66.465 | 2.243 | 5.174 | ... | H2-1 |
| 64 | M87 | HSS4x3x4 | .235 | 2.299 | 29 | .118 | 2.2... | z | 28 | 83.04 | 91.665 | 8.19 | 10.001 | ... | H1-1b |
| 65 | M21 | HSS4x3x4 | .234 | 2.299 | 36 | .118 | 2.2... | z | 36 | 83.04 | 91.665 | 8.19 | 10.001 | ... | H1-1b |
| 66 | M195 | .5" x 4" | .232 | .417 | 4 | .067 | .46 | y | 9 | 71.96 | 90 | .938 | 7.5 | ... | H1-1b |
| 67 | M252 | .5" x 4" | .228 | .417 | 11 | .052 | .46 | y | 12 | 71.96 | 90 | .938 | 7.5 | ... | H1-1b |
| 68 | M165 | 3/8 x 5/8 | .223 | .43 | 26 | .004 | 0 | y | 12 | 9.833 | 10.547 | .082 | .137 | ... | H1-1a |
| 69 | M224 | 3/8 x 5/8 | .219 | .43 | 30 | .004 | .43 | y | 4 | 9.833 | 10.547 | .082 | .137 | ... | H1-1a |
| 70 | M331A | PIPE_2.5 | .217 | 7 | 4 | .213 | 7.2... | | 11 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 71 | M136 | .5" x 4" | .217 | .417 | 12 | .065 | 1.0... | y | 23 | 71.96 | 90 | .938 | 7.5 | ... | H1-1b |
| 72 | M352 | PIPE_2.5 | .198 | 4 | 35 | .054 | .5 | | 26 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 73 | M151 | 3/8 x 1" | .196 | .667 | 26 | .026 | .667 | y | 5 | 14.256 | 16.875 | .132 | .352 | ... | H1-1... |
| 74 | M349 | PIPE_2.5 | .195 | 7 | 6 | .220 | 7.2... | | 5 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 75 | M210 | 3/8 x 1" | .192 | .667 | 30 | .019 | .667 | y | 9 | 14.256 | 16.875 | .132 | .352 | ... | H1-1... |
| 76 | M318 | PIPE_2.5 | .191 | 4 | 27 | .052 | .5 | | 29 | 30.038 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 77 | M139 | 3/8 x 4 | .177 | 1.006 | 26 | .007 | .262 | z | 37 | 45.984 | 67.5 | .527 | 5.625 | ... | H1-1... |
| 78 | M198 | 3/8 x 4 | .174 | 1.006 | 30 | .009 | .608 | y | 10 | 45.984 | 67.5 | .527 | 5.625 | ... | H1-1... |
| 79 | M289 | PIPE_2.5 | .173 | .766 | 4 | .258 | 7.2... | | 8 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 80 | M254 | .5" x 4" | .173 | .718 | 9 | .039 | .718 | y | 13 | 80.683 | 90 | .938 | 7.5 | ... | H1-1b |
| 81 | M280 | 3/8 x 5/8 | .170 | 0 | 34 | .007 | .334 | z | 33 | 10.111 | 10.547 | .082 | .137 | ... | H1-1... |
| 82 | M328 | PIPE_3.0 | .164 | 4 | 26 | .049 | .5 | | 33 | 46.291 | 65.205 | 5.749 | 5.749 | ... | H1-1b |
| 83 | M278 | 3/4 x 3/8 | .163 | 0 | 34 | .009 | 0 | y | 49 | 11.885 | 12.656 | .099 | .198 | ... | H1-1... |
| 84 | M197 | .5" x 4" | .163 | .718 | 7 | .040 | .718 | y | 2 | 80.683 | 90 | .938 | 7.5 | ... | H1-1b |
| 85 | M276 | .875 x .3... | .163 | .494 | 34 | .012 | 0 | y | 47 | 13.459 | 14.766 | .115 | .269 | ... | H1-1b |
| 86 | M340 | PIPE_3.0 | .161 | 4 | 30 | .043 | .5 | | 37 | 46.291 | 65.205 | 5.749 | 5.749 | ... | H1-1b |
| 87 | M358 | PIPE_3.0 | .158 | 4 | 34 | .035 | .5 | | 30 | 46.291 | 65.205 | 5.749 | 5.749 | ... | H1-1b |
| 88 | M282 | 3/8 x 5/8 | .154 | 0 | 34 | .009 | .272 | z | 34 | 10.256 | 10.547 | .082 | .137 | ... | H1-1b |
| 89 | M261 | 3/8 x 1" | .153 | 0 | 34 | .039 | .257 | y | 34 | 11.645 | 16.875 | .132 | .352 | ... | H1-1b |
| 90 | M160 | .875 x .3... | .153 | 0 | 30 | .015 | 0 | y | 11 | 13.459 | 14.766 | .115 | .269 | ... | H1-1... |
| 91 | M164 | 3/8 x 5/8 | .151 | 0 | 26 | .005 | .334 | z | 27 | 10.111 | 10.547 | .082 | .137 | ... | H1-1... |
| 92 | M344 | PIPE_2.5 | .149 | 7 | 10 | .082 | 9.9... | | 10 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 93 | M219 | .875 x .3... | .148 | 0 | 34 | .008 | .494 | y | 11 | 13.459 | 14.766 | .115 | .269 | ... | H1-1... |
| 94 | M223 | 3/8 x 5/8 | .148 | 0 | 30 | .005 | .334 | z | 31 | 10.111 | 10.547 | .082 | .137 | ... | H1-1... |
| 95 | M162 | 3/4 x 3/8 | .146 | 0 | 26 | .006 | 0 | y | 10 | 11.885 | 12.656 | .099 | .198 | ... | H1-1... |
| 96 | M221 | 3/4 x 3/8 | .143 | 0 | 30 | .005 | .407 | y | 11 | 11.885 | 12.656 | .099 | .198 | ... | H1-1... |
| 97 | M274 | .875 x .3... | .140 | 0 | 37 | .018 | 0 | y | 13 | 12.892 | 14.766 | .115 | .269 | ... | H1-1... |
| 98 | M137 | .5" x 4" | .140 | .655 | 4 | .071 | .655 | y | 11 | 82.174 | 90 | .938 | 7.5 | ... | H1-1b |
| 99 | M158 | .875 x .3... | .139 | 0 | 30 | .031 | 0 | y | 11 | 12.892 | 14.766 | .115 | .269 | ... | H1-1... |
| 100 | M277 | 3/4 x 3/8 | .138 | .621 | 34 | .013 | 0 | y | 34 | 10.934 | 12.656 | .099 | .198 | ... | H1-1b |

## Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

| | Member | Shape | Code Check | Loc[ft] | LC | Shear Check | Loc..... | | LC | phi*P... | phi*P... | phi*M... | phi*M... | ... | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | M145 | 3/8 x 1" | .136 | 0 | 26 | .035 | .257 | y | 37 | 11.645 | 16.875 | .132 | .352 | ... | H1-1b |
| 102 | M217 | .875 x .3... | .136 | 0 | 34 | .020 | 0 | y | 2 | 12.892 | 14.766 | .115 | .269 | ... | H1-1... |
| 103 | M166 | 3/8 x 5/8 | .135 | .272 | 26 | .007 | .272 | z | 26 | 10.256 | 10.547 | .082 | .137 | ... | H1-1b |
| 104 | M225 | 3/8 x 5/8 | .133 | .272 | 30 | .007 | .272 | z | 31 | 10.256 | 10.547 | .082 | .137 | ... | H1-1b |
| 105 | M204 | 3/8 x 1" | .133 | 0 | 30 | .034 | .257 | y | 30 | 11.645 | 16.875 | .132 | .352 | ... | H1-1b |
| 106 | M298 | PIPE_1.5 | .130 | 0 | 4 | .060 | 4.1... | | 33 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 107 | M23 | 3/8 x 3 | .128 | 0 | 33 | .089 | 0 | y | 26 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 108 | M305 | PIPE_1.5 | .128 | 4.142 | 5 | .044 | 4.1... | | 5 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 109 | M89 | 3/8 x 3 | .127 | 0 | 36 | .078 | 0 | y | 30 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 110 | M310 | PIPE_1.5 | .126 | 4.142 | 10 | .055 | 4.1... | | 28 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 111 | M253 | .5" x 4" | .125 | 0 | 11 | .044 | .655 | y | 13 | 82.174 | 90 | .938 | 7.5 | ... | H1-1b |
| 112 | M196 | .5" x 4" | .125 | 0 | 4 | .047 | .655 | y | 14 | 82.174 | 90 | .938 | 7.5 | ... | H1-1b |
| 113 | M51 | 3/8 x 3 | .121 | 0 | 29 | .065 | 0 | y | 34 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 114 | M161 | 3/4 x 3/8 | .121 | .621 | 26 | .006 | .621 | y | 13 | 10.934 | 12.656 | .099 | .198 | ... | H1-1b |
| 115 | M362 | PIPE_2.5 | .120 | 3.5 | 7 | .085 | 7 | | 12 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 116 | M279 | 3/4 x 3/8 | .120 | 0 | 34 | .009 | 0 | y | 34 | 11.436 | 12.656 | .099 | .198 | ... | H1-1b |
| 117 | M264 | 3/8 x 1" | .120 | .718 | 34 | .016 | .718 | y | 37 | 13.874 | 16.875 | .132 | .352 | ... | H1-1b |
| 118 | M272 | 3/8 x 1" | .118 | 0 | 37 | .017 | .72 | y | 13 | 13.864 | 16.875 | .132 | .352 | ... | H1-1... |
| 119 | M220 | 3/4 x 3/8 | .117 | .621 | 31 | .012 | 0 | y | 10 | 10.934 | 12.656 | .099 | .198 | ... | H1-1b |
| 120 | M156 | 3/8 x 1" | .117 | 0 | 30 | .026 | .72 | y | 11 | 13.864 | 16.875 | .132 | .352 | ... | H1-1... |
| 121 | M52 | 3/8 x 3 | .116 | 0 | 28 | .096 | 0 | y | 33 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 122 | M283 | 3/8 x 5/8 | .116 | 0 | 34 | .002 | 0 | y | 9 | 10.086 | 10.547 | .082 | .137 | ... | H1-1b |
| 123 | M215 | 3/8 x 1" | .114 | 0 | 34 | .019 | .72 | y | 3 | 13.864 | 16.875 | .132 | .352 | ... | H1-1... |
| 124 | M148 | 3/8 x 1" | .112 | .718 | 27 | .018 | .718 | y | 5 | 13.874 | 16.875 | .132 | .352 | ... | H1-1b |
| 125 | M376 | PIPE_2.5 | .110 | 3.5 | 35 | .070 | 9.9... | | 6 | 34.641 | 50.715 | 3.596 | 3.596 | ... | H1-1b |
| 126 | M22 | 3/8 x 3 | .110 | 0 | 32 | .078 | 0 | y | 37 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 127 | M207 | 3/8 x 1" | .108 | .718 | 30 | .015 | .718 | y | 9 | 13.874 | 16.875 | .132 | .352 | ... | H1-1b |
| 128 | M88 | 3/8 x 3 | .108 | 0 | 26 | .070 | 0 | y | 29 | 32.153 | 35.438 | .277 | 2.215 | ... | H1-1b |
| 129 | M311 | PIPE_1.5 | .107 | 0 | 10 | .031 | 4.1... | | 9 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 130 | M163 | 3/4 x 3/8 | .105 | 0 | 26 | .006 | 0 | y | 12 | 11.436 | 12.656 | .099 | .198 | ... | H1-1b |
| 131 | M299 | PIPE_1.5 | .104 | 4.142 | 3 | .034 | 4.1... | | 44 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 132 | M222 | 3/4 x 3/8 | .103 | 0 | 30 | .007 | .517 | y | 4 | 11.436 | 12.656 | .099 | .198 | ... | H1-1b |
| 133 | M167 | 3/8 x 5/8 | .103 | 0 | 26 | .002 | .343 | y | 11 | 10.086 | 10.547 | .082 | .137 | ... | H1-1b |
| 134 | M275 | .875 x .3... | .101 | .746 | 36 | .011 | 0 | y | 11 | 11.954 | 14.766 | .115 | .269 | ... | H1-1b |
| 135 | M263 | 3/8 x 1" | .101 | .655 | 34 | .018 | .655 | y | 37 | 14.337 | 16.875 | .132 | .352 | ... | H1-1b |
| 136 | M226 | 3/8 x 5/8 | .101 | 0 | 30 | .002 | .343 | y | 27 | 10.086 | 10.547 | .082 | .137 | ... | H1-1b |
| 137 | M304 | PIPE_1.5 | .100 | 0 | 5 | .063 | 4.1... | | 36 | 17.076 | 23.593 | 1.105 | 1.105 | ... | H1-1b |
| 138 | M159 | .875 x .3... | .099 | .746 | 29 | .002 | .746 | y | 9 | 11.954 | 14.766 | .115 | .269 | ... | H1-1b |
| 139 | M218 | .875 x .3... | .096 | .746 | 33 | .013 | .746 | y | 10 | 11.954 | 14.766 | .115 | .269 | ... | H1-1b |
| 140 | M309 | 3/16 X 1 ... | .094 | 0 | 10 | .007 | 0 | y | 36 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 141 | M271 | 3/8 x 1" | .092 | 0 | 26 | .010 | 0 | y | 4 | 11.398 | 16.875 | .132 | .352 | ... | H1-1b |
| 142 | M155 | 3/8 x 1" | .092 | 0 | 29 | .015 | 0 | y | 5 | 11.398 | 16.875 | .132 | .352 | ... | H1-1b |
| 143 | M147 | 3/8 x 1" | .091 | .655 | 27 | .025 | .655 | y | 5 | 14.337 | 16.875 | .132 | .352 | ... | H1-1b |
| 144 | M315 | 3/16 X 1 ... | .091 | 0 | 2 | .006 | 0 | y | 27 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 145 | M206 | 3/8 x 1" | .089 | .655 | 30 | .021 | .655 | y | 9 | 14.337 | 16.875 | .132 | .352 | ... | H1-1b |
| 146 | M214 | 3/8 x 1" | .088 | 0 | 33 | .008 | 0 | y | 12 | 11.398 | 16.875 | .132 | .352 | ... | H1-1b |
| 147 | M303 | 3/16 X 1 ... | .085 | 0 | 6 | .006 | 0 | y | 32 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 148 | M273 | 3/8 x 1" | .084 | 0 | 36 | .009 | .887 | y | 11 | 12.518 | 16.875 | .132 | .352 | ... | H1-1b |
| 149 | M262 | 3/8 x 1" | .083 | 1.028 | 35 | .021 | 1.0... | y | 37 | 11.302 | 16.875 | .132 | .352 | ... | H1-1b |
| 150 | M157 | 3/8 x 1" | .081 | 0 | 29 | .003 | 0 | y | 5 | 12.518 | 16.875 | .132 | .352 | ... | H1-1b |
| 151 | M301 | 3/16 X 1 ... | .081 | 1.667 | 5 | .005 | 0 | y | 33 | 1.877 | 12.69 | .05 | .349 | 1 | H1-1b |
| 152 | M216 | 3/8 x 1" | .080 | 0 | 34 | .010 | 0 | y | 10 | 12.518 | 16.875 | .132 | .352 | ... | H1-1b |
| 153 | M251 | .5" x 4" | .079 | 0 | 32 | .008 | .989 | y | 11 | 73.168 | 90 | .938 | 7.5 | ... | H1-1b |
| 154 | M302 | 3/16 X 1 ... | .078 | 1.667 | 23 | .005 | 0 | y | 32 | 1.877 | 12.69 | .05 | .344 | ... | H1-1b |
| 155 | M300 | 3/16 X 1 ... | .075 | 1.667 | 5 | .006 | 0 | y | 30 | 1.877 | 12.69 | .05 | .349 | 1 | H1-1b |
| 156 | M146 | 3/8 x 1" | .074 | 1.028 | 27 | .022 | 1.0... | y | 5 | 11.302 | 16.875 | .132 | .352 | ... | H1-1b |
| 157 | M205 | 3/8 x 1" | .073 | 1.028 | 31 | .023 | 1.0... | y | 9 | 11.302 | 16.875 | .132 | .352 | ... | H1-1b |

## Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

| | Member | Shape | Code Check | Loc[ft] | LC | Shear Check | Loc..... | | LC | phi*P... | phi*P... | phi*M... | phi*M... | ... | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 158 | M308 | 3/16 X 1 ... | .073 | 0 | 10 | .006 | 0 | y | 27 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 159 | M135 | .5" x 4" | .069 | 0 | 36 | .007 | .257 | z | 37 | 73.168 | 90 | .938 | 7.5 | ... | H1-1b |
| 160 | M194 | .5" x 4" | .069 | 0 | 28 | .007 | .257 | z | 29 | 73.168 | 90 | .938 | 7.5 | ... | H1-1b |
| 161 | M312 | 3/16 X 1 ... | .068 | 0 | 2 | .007 | 0 | y | 27 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 162 | M306 | 3/16 X 1 ... | .064 | 0 | 2 | .006 | 0 | y | 35 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 163 | M307 | 3/16 X 1 ... | .062 | 0 | 10 | .006 | 0 | y | 28 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 164 | M314 | 3/16 X 1 ... | .062 | 0 | 2 | .005 | 0 | y | 28 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 165 | M313 | 3/16 X 1 ... | .060 | 0 | 13 | .005 | 0 | y | 29 | 1.877 | 12.69 | .05 | .397 | ... | H1-1b |
| 166 | M345 | WT2x6.5 | .028 | 1.144 | 2 | .055 | 2.2... | z | 11 | 53.576 | 61.884 | 3.942 | .866 | ... | H1-1b |
| 167 | M363 | WT2x6.5 | .023 | 1.144 | 6 | .056 | 0 | y | 3 | 53.576 | 61.884 | 3.942 | .866 | ... | H1-1b |
| 168 | M380 | WT2x6.5 | .023 | 1.144 | 10 | .042 | 2.2... | y | 7 | 53.576 | 61.884 | 3.942 | .866 | ... | H1-1b |
| 169 | M212 | 3/8 x 1" | .004 | 0 | 11 | .000 | .855 | y | 3 | 12.784 | 16.875 | .132 | .352 | ... | H1-1b |
| 170 | M269 | 3/8 x 1" | .004 | 0 | 5 | .000 | .855 | y | 13 | 12.784 | 16.875 | .132 | .352 | ... | H1-1b |
| 171 | M153 | 3/8 x 1" | .004 | 0 | 2 | .000 | 0 | z | 2 | 12.784 | 16.875 | .132 | .348 | 1 | H1-1b |
| 172 | M250 | 3/8 x 4 | .002 | .874 | 35 | .000 | .874 | z | 34 | 50.515 | 67.5 | .527 | 5.172 | 1 | H1-1b |
| 173 | M193 | 3/8 x 4 | .002 | .874 | 29 | .000 | .874 | z | 30 | 50.515 | 67.5 | .527 | 5.172 | 1 | H1-1b |
| 174 | M134 | 3/8 x 4 | .002 | .874 | 37 | .000 | .874 | z | 26 | 50.515 | 67.5 | .527 | 5.172 | 1 | H1-1b |
| 175 | M144 | 3/8 x 1" | .001 | .872 | 11 | .001 | .872 | y | 26 | 12.641 | 16.875 | .132 | .352 | ... | H1-1b |
| 176 | M143 | 3/8 x 1" | .001 | .943 | 11 | .001 | .943 | y | 37 | 12.037 | 16.875 | .132 | .352 | ... | H1-1b |
| 177 | M203 | 3/8 x 1" | .001 | .872 | 9 | .001 | .872 | y | 30 | 12.641 | 16.875 | .132 | .352 | ... | H1-1b |
| 178 | M260 | 3/8 x 1" | .001 | .872 | 7 | .001 | .872 | y | 34 | 12.641 | 16.875 | .132 | .352 | ... | H1-1b |
| 179 | M202 | 3/8 x 1" | .001 | .943 | 3 | .001 | .943 | y | 30 | 12.037 | 16.875 | .132 | .352 | ... | H1-1b |
| 180 | M259 | 3/8 x 1" | .001 | .943 | 13 | .001 | .943 | y | 34 | 12.037 | 16.875 | .132 | .352 | ... | H1-1b |

# SITE NAME: CTHA272A

1214 FARMINGTON AVENUE
BRISTOL, CT 06010

# SITE NUMBER: CTHA272A

# PROJECT: T-MOBILE L700

## CONFIGURATION: 67D98M2

### T-MOBILE TECHNICIAN SITE SAFETY NOTES

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

### GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF T-MOBILE NORTHEAST, LLC. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE T-MOBILE NORTHEAST. LLC REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

### SPECIAL CONSTRUCTION NOTES

1. TOWER OWNER SHALL PROVIDE GLOBAL STRUCTURAL STABILITY ANALYSIS OF EXISTING ANTENNA SUPPORT STRUCTURE. GENERAL CONTRACTOR SCOPE OF WORK SHALL INCLUDE TO FURNISH, INSTALL AND COMPLETE ALL REQUIRED STRUCTURAL MODIFICATIONS, RE-BUNDLING OF COAXIAL CABLES OR OTHER SPECIAL MODIFICATIONS AS OUTLINED THEREIN.
2. GENERAL CONTRACTOR SHALL FURNISH AND INSTALL ALL SPECIAL OR SUPPLEMENTAL ADDITIONAL TOWER-MOUNTED EQUIPMENT PER RECOMMENDATIONS FROM SBA-PROVIDED TOWER STRUCTURAL ANALYSIS FOR ANY SPECIAL SHIELDING OF TOWER TOP EQUIPMENT AND FOR ANY SPECIAL FEEDLINE BUNDLING OR RELOCATION.
3. PROTERRA DESIGN GROUP ASSUMES THAT THE MONOPOLE IS PROPERLY CONSTRUCTED AND MAINTAINED. ALL STRUCTURAL MEMBERS AND THEIR CONNECTION ARE ASSUMED TO BE IN GOOD CONDITION AND ARE FREE FROM DEFECTS WITH NO DETERIORATION TO ITS MEMBER CAPACITIES.
4. ANTENNA MOUNT INSTALLATION SHALL BE COMPLETED IN ACCORDANCE WITH THE ANTENNA MOUNT STRUCTURAL ANALYSIS, (MSA) PREPARED BY OTHERS PRIOR TO INSTALLING ANY RF EQUIPMENT SHOWN IN THESE PLANS.


### PROJECT INFORMATION

| | |
|---|---|
| SCOPE OF WORK: | UNMANNED TELECOMMUNICATIONS FACILITY T-MOBILE CO-LOCATION |
| SITE ADDRESS: | 1214 FARMINGTON AVENUE BRISTOL, CT 06010 |
| LATITUDE: | 41° 41' 43.36" N (FROM T-MOBILE PROVIDED FCC 2-C) |
| LONGITUDE: | 72° 54' 06.00" W (FROM T-MOBILE PROVIDED FCC 2-C) |
| JURISDICTION: | CITY OF BRISTOL / CT SITING COUNCIL |
| BUILDING CODE: | 2016 CONNECTICUT STATE BUILDING CODE WITH AMENDMENTS. (IBC 2012 BASED) |
| ELECTRICAL CODE: | 2014 NATIONAL ELECTRICAL CODE WITH AMENDMENTS |
| CURRENT USE: | TELECOMMUNICATIONS FACILITY |
| PROPOSED USE: | TELECOMMUNICATIONS FACILITY |
| PROPERTY OWNER: | N/F ROUTE 6 DEVELOPERS LLC. 1224 MILL STREET, BLDG D, STE 103 EAST BERLIN, CT 06023-1159 |
| TOWER OWNER: | SBA STEEL II, LLC |
| SBA SITE ID: | CT46136-A |
| SBA SITE NAME: | BRISTOL-EAST |
| SBA REGIONAL SITE MANAGER: | STEPHEN ROTH (860) 539-4920 |

### APPROVALS

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

DIG SAFE SYSTEM
(MA, ME, NH, RI, VT):
1-888-344-7233

CALL BEFORE YOU DIG
(CT): 1-800-922-4455

UNDERGROUND SERVICE ALERT

### DRAWING INDEX

| SHEET NO. | DESCRIPTION | REV. |
|---|---|---|
| T-1 | TITLE SHEET | 2 |
| GN-1 | GENERAL NOTES | 2 |
| A-1 | COMPOUND PLAN | 2 |
| A-2 | ELEVATIONS & PROPOSED ANTENNA PLAN | 2 |
| A-3 | ANTENNA MOUNTING DETAILS | 2 |
| A-4 TO A-5 | DETAILS | 2 |
| S-1 | STRUCTURAL DETAILS | 2 |
| RF-1 | RF DATA SHEET | 2 |
| E-1 TO E-2 | ELECTRICAL & GROUNDING DETAILS | 2 |


T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648-1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
WESTBOROUGH, MA 01581 TEL: (508) 251-0720

ProTerra DESIGN GROUP, LLC
4 Bay Road, Building A
Suite 200
Hadley, MA 01035 PH: (413) 320-4918


STATE OF CONNECTICUT
THOMAS E. JOHNSON
No. 28192
LICENSED PROFESSIONAL ENGINEER
9/27/18

CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| 2 | 09/27/18 | CONSTRUCTION REVISED | PN |
| 1 | 07/16/18 | CONSTRUCTION REVISED | PN |
| 0 | 05/09/18 | ISSUED FOR CONSTRUCTION | JEB |

SITE NUMBER:
CTHA272A
SITE NAME:
CTHA272A

SITE ADDRESS:
1214 FARMINGTON AVENUE
BRISTOL, CT 06010

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

## GROUNDING NOTES

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

## GENERAL NOTES

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:

   CONTRACTOR – SBA COMMUNICATIONS CORP.
   SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
   OWNER – T-MOBILE

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CONTRACTOR.
3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
4. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.
5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.
7. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.
9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.
10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CUR\BS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
11. SUBCONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.
12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.
13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.
14. ANY NEW CONCRETE NEEDED FOR CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.
15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (FY = 36 KSI) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (FY = 35 KSI). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.
16. CONSTRUCTION SHALL COMPLY WITH UMTS SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF T-MOBILE SITES."
17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.
19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.
20. APPLICABLE BUILDING CODES:
    SUBCONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.

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

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

    AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), STEEL CONSTRUCTION MANUAL, 14TH EDITION;

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

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

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

## ABBREVIATIONS

| | | | | | |
|---|---|---|---|---|---|
| AGL | ABOVE GRADE LEVEL | EQ | EQUAL | REF | REFERENCE |
| AWG | AMERICAN WIRE GAUGE | G.C. | GENERAL CONTRACTOR | REQ | REQUIRED |
| BTCW | BARE TINNED SOLID COPPER WIRE | GRC | GALVANIZED RIGID CONDUIT | RF | RADIO FREQUENCY |
| | | MGB | MASTER GROUND BAR | TBD | TO BE DETERMINED |
| BGR | BURIED GROUND RING | MIN | MINIMUM | TBR | TO BE REMOVED |
| BTS | BASE TRANSCEIVER STATION | PROPOSED | NEW OR (P) | TBRR | TO BE REMOVED AND REPLACED |
| EXISTING | EXISTING OR (E) | N.T.S. | NOT TO SCALE | TYP | TYPICAL |
| EGB | EQUIPMENT GROUND BAR | RAD | RADIATION CENTERLINE (ANTENNA) | VIF | VERIFY IN FIELD |
| EGR | EQUIPMENT GROUND RING | RAN | RADIO ACCESS NETWORK | | |


T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648-1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
WESTBOROUGH, MA 01581 TEL: (508) 251-0720

ProTerra DESIGN GROUP, LLC
4 Bay Road, Building A
Suite 200
Hadley, MA 01035 PH: (413)320-4918


STATE OF CONNECTICUT
THOMAS E. JOHNSON
No. 28192
LICENSED PROFESSIONAL ENGINEER
9/27/18

CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
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| 2 | 09/27/18 | CONSTRUCTION REVISED | PN |
| 1 | 07/16/18 | CONSTRUCTION REVISED | PN |
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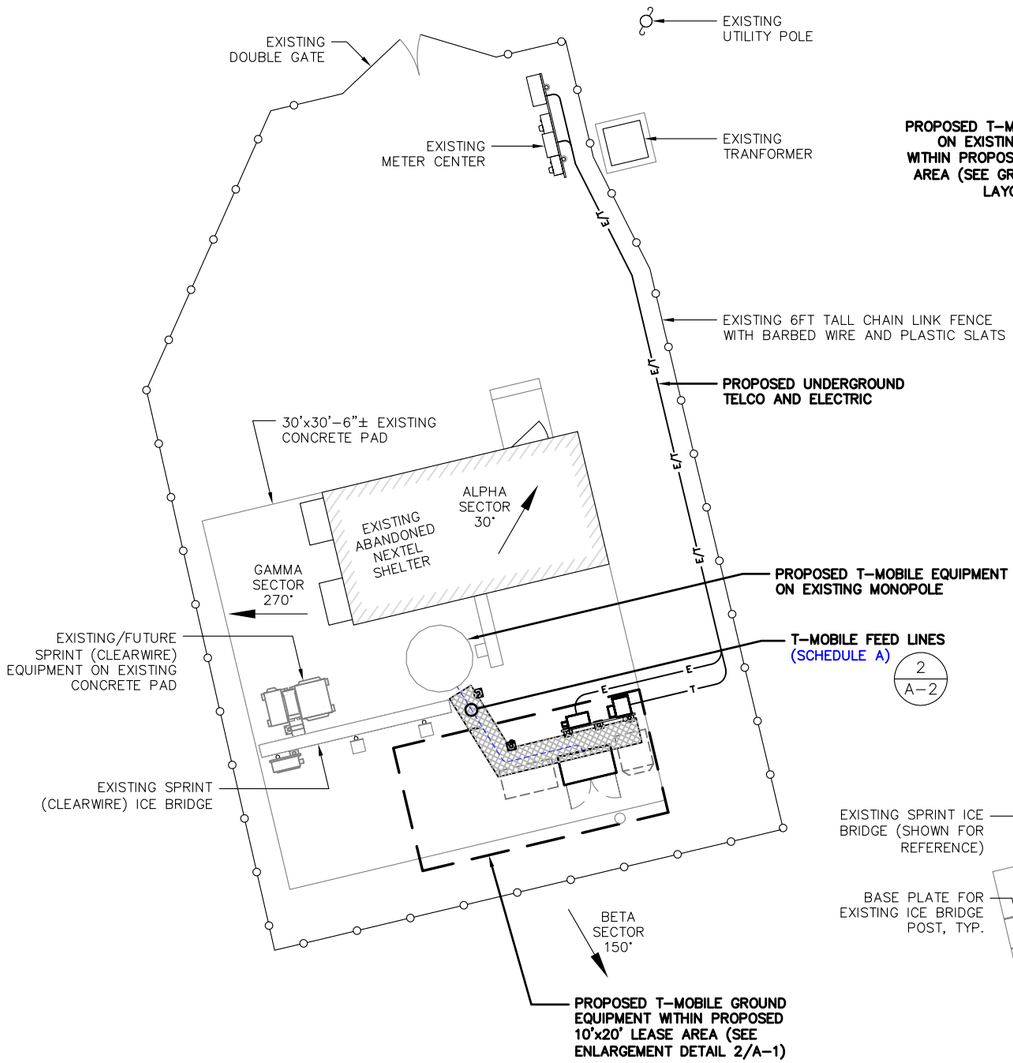
SITE NUMBER:
CTHA272A
SITE NAME:
CTHA272A
SITE ADDRESS:
1214 FARMINGTON AVENUE
BRISTOL, CT 06010

SHEET TITLE
GENERAL NOTES

SHEET NUMBER
GN-1




## COMPOUND PLAN

SCALE: 1"=12' (11"x17")
1"=6' (22"x34")

1 / A-1

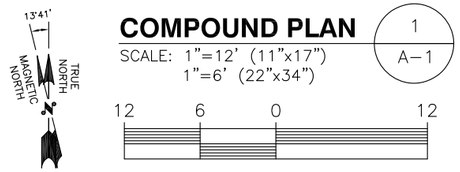


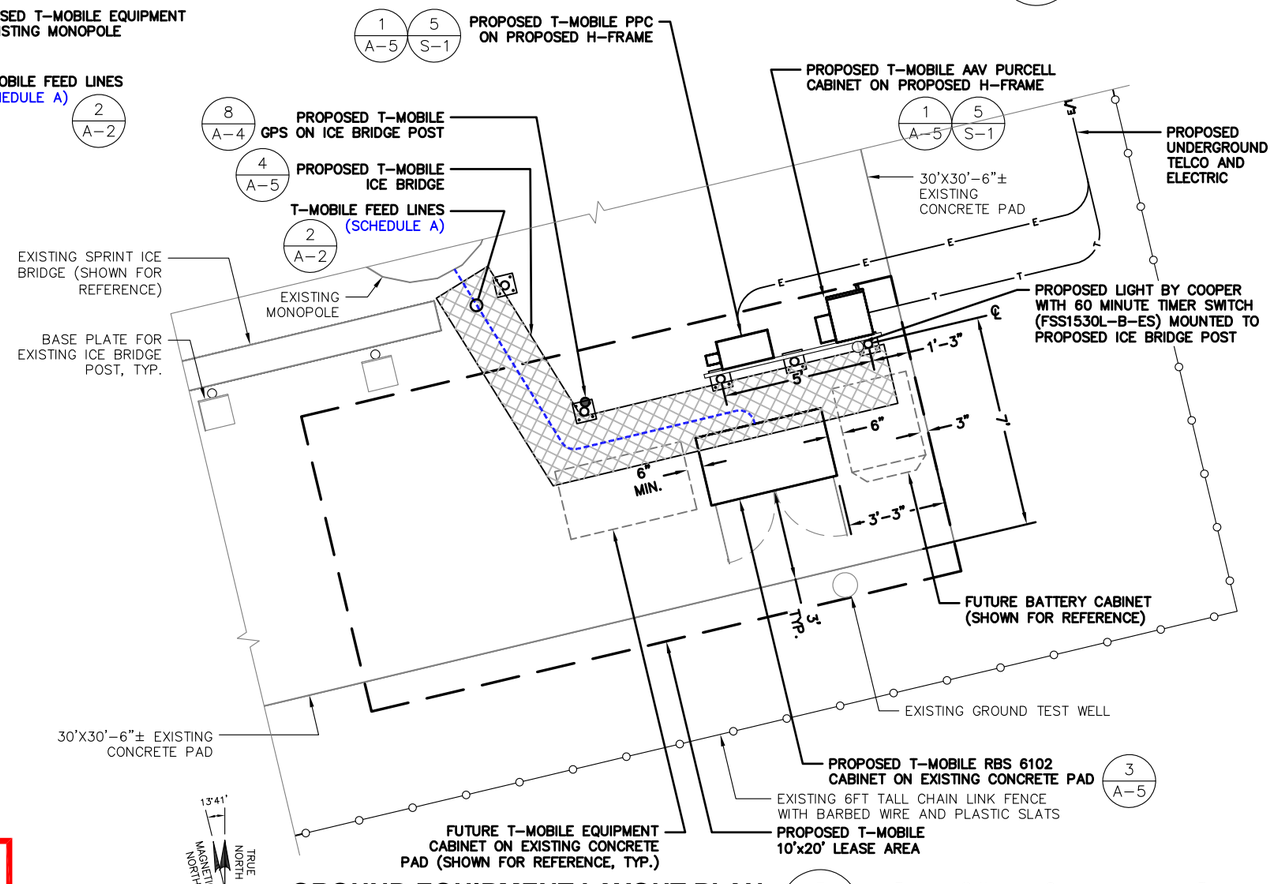


IMAGE SOURCE: PROTERRA 04/21/2018

## PROPOSED EQUIPMENT AREA PHOTO DETAIL

SCALE: N.T.S.

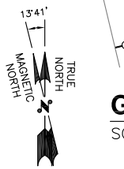
2 / A-1

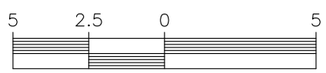



## GROUND EQUIPMENT LAYOUT PLAN

SCALE: 1"=5' (11"x17")
1"=2.5' (22"x34")

3 / A-1




NOTE:
MAINTAIN 3' CLEAR IN FRONT OF ALL EQUIPMENT CABINET ACCESS DOORS OR PANELS PER NEC.

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35 GRIFFIN ROAD SOUTH
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OFFICE: (860) 648-1116

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134 FLANDERS ROAD, SUITE 125
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9/27/18

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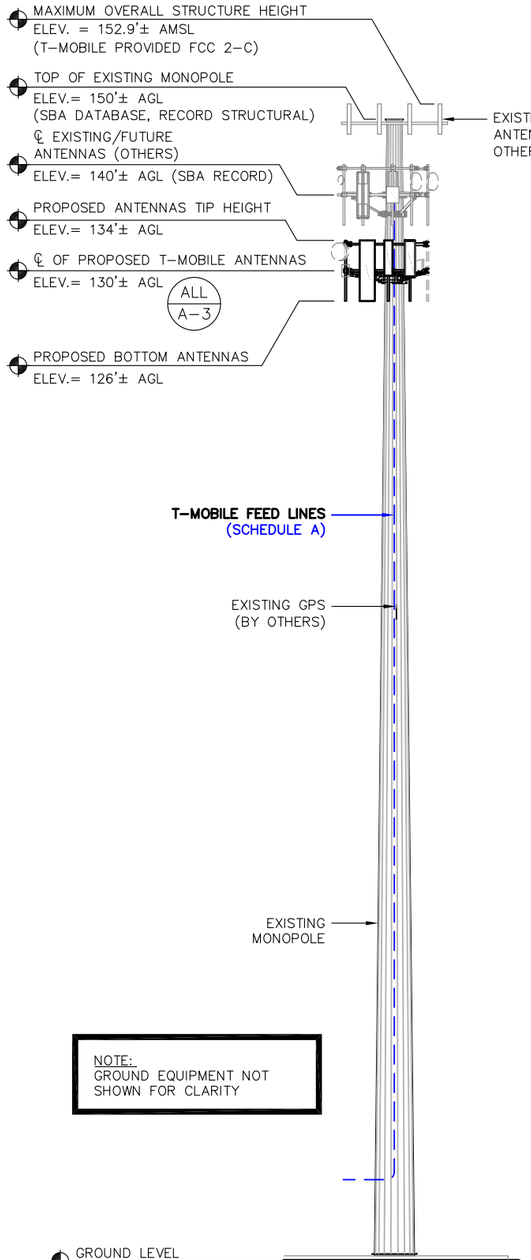
SITE NUMBER:
CTHA272A
SITE NAME:
CTHA272A

SITE ADDRESS:
1214 FARMINGTON AVENUE
BRISTOL, CT 06010

SHEET TITLE
COMPOUND & ELEVATION PLAN

SHEET NUMBER
A-1




## ELEVATION

1 / A-2

SCALE: 1"=20' (11"x17")
1"=10' (22"x34")

20 10 0 20

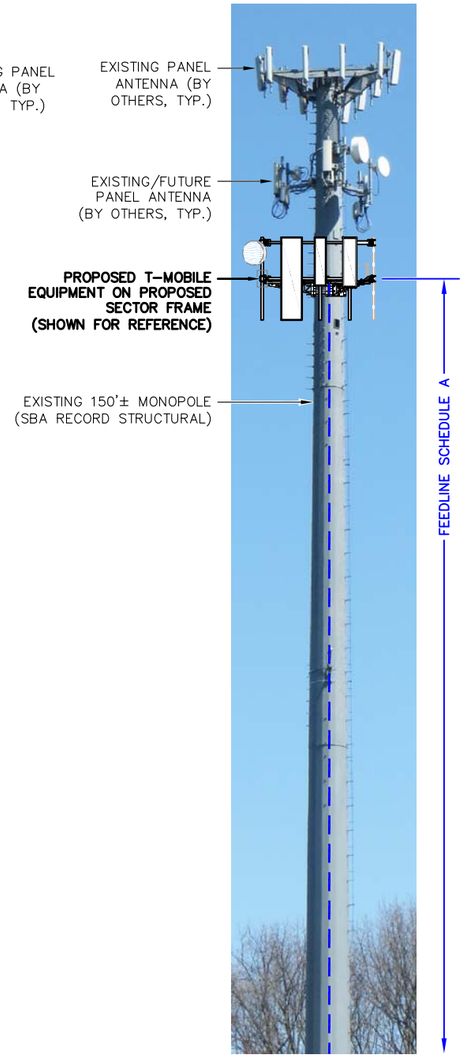



IMAGE SOURCE:
PROTERRA 04/21/2018

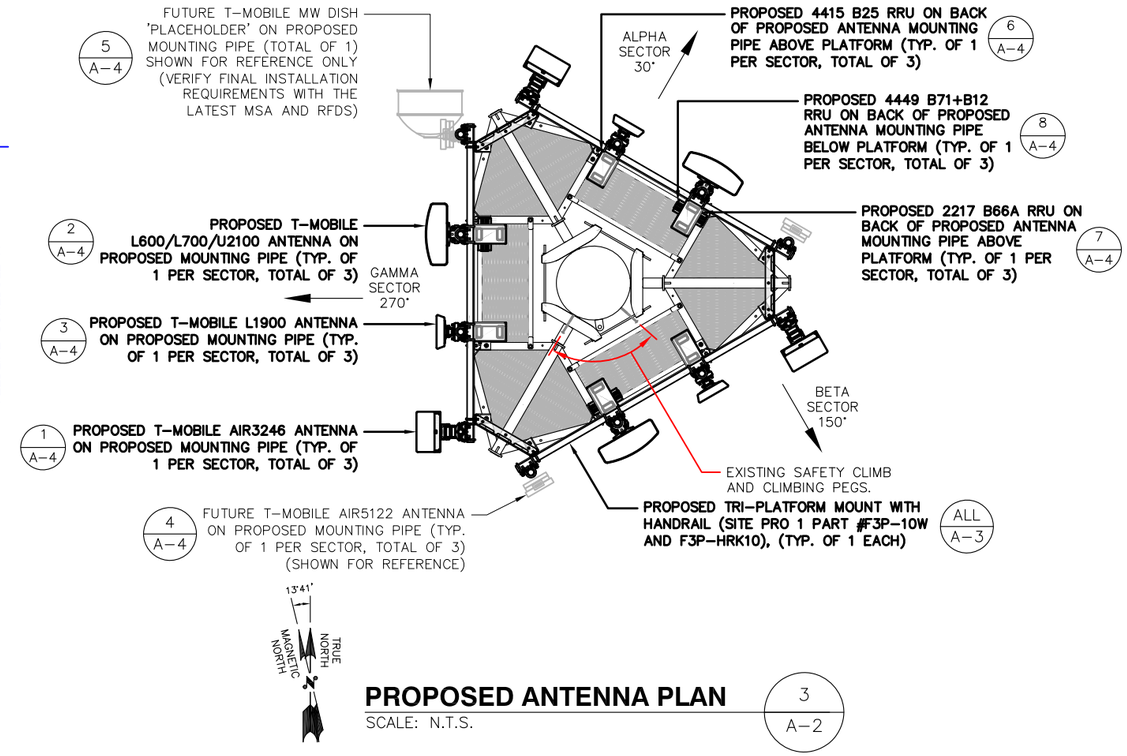
| FEEDLINE SCHEDULE | FEEDLINE DESCRIPTION | LOCATION |
|---|---|---|
| A | PROPOSED: (3) HYBRID TO 130' RAD;<br>FUTURE: (1) 7/8" COAX TO 130' RAD (FOR FUTURE DISH) | UP MONOPOLE TOWER TO RAD |

NOTE:
PROPOSED T-MOBILE EQUIPMENT FEEDLINE INVENTORY BASED ON COLOCATION APPLICATION. RFDS AND FEEDLINE LEASING ENTITLEMENTS MAY DIFFER.

## TOWER ELEVATION PHOTO DETAIL

2 / A-2

SCALE: N.T.S.




## PROPOSED ANTENNA PLAN

3 / A-2

SCALE: N.T.S.

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35 GRIFFIN ROAD SOUTH
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OFFICE: (860) 648-1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
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CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

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SITE NUMBER:
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SITE NAME:
CTHA272A

SITE ADDRESS:
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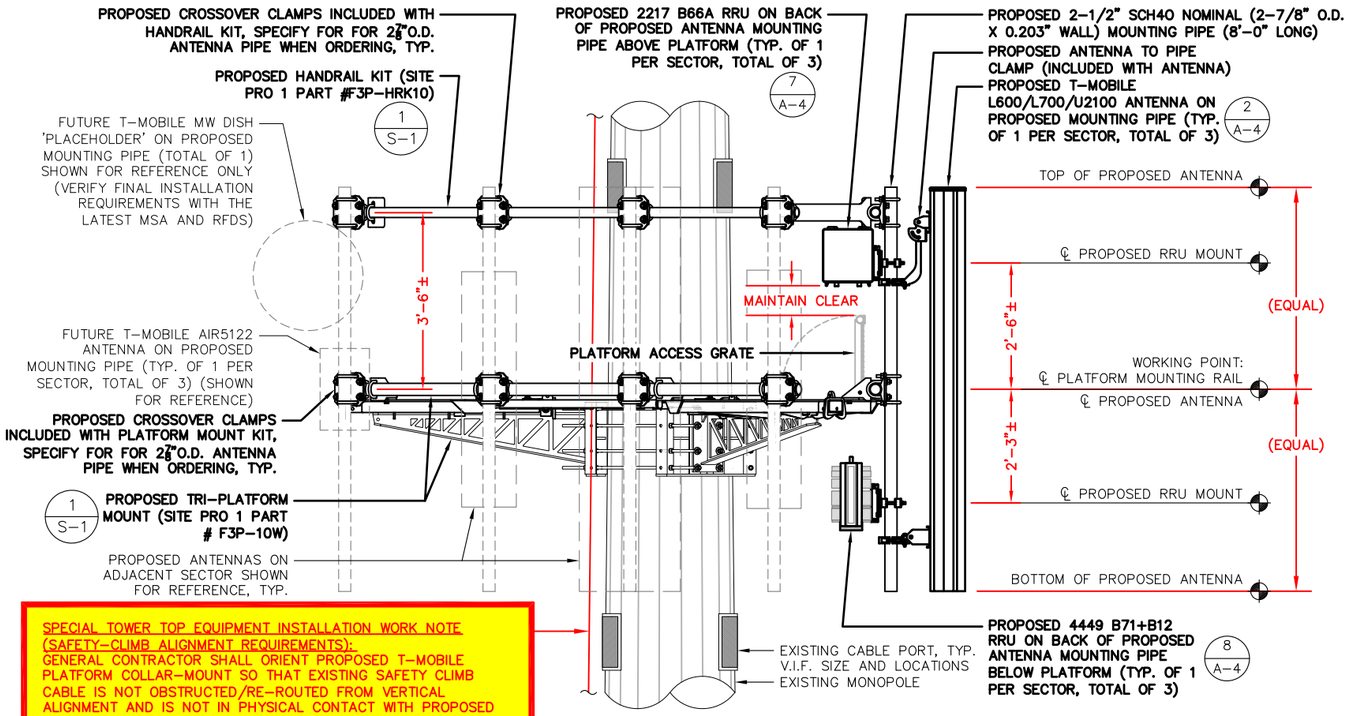
BRISTOL, CT 06010

SHEET TITLE
ELEVATIONS AND PROPOSED ANTENNA PLAN

SHEET NUMBER
A-2

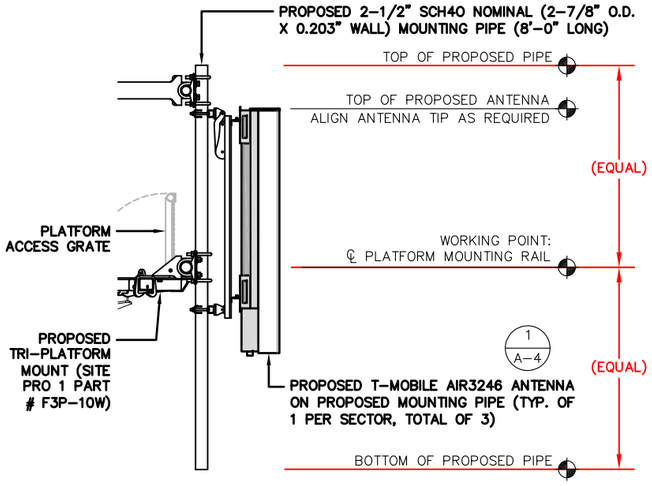



SPECIAL TOWER TOP EQUIPMENT INSTALLATION WORK NOTE (SAFETY-CLIMB ALIGNMENT REQUIREMENTS):
GENERAL CONTRACTOR SHALL ORIENT PROPOSED T-MOBILE PLATFORM COLLAR-MOUNT SO THAT EXISTING SAFETY CLIMB CABLE IS NOT OBSTRUCTED/RE-ROUTED FROM VERTICAL ALIGNMENT AND IS NOT IN PHYSICAL CONTACT WITH PROPOSED COLLAR-MOUNT HARDWARE. GENERAL CONTRACTOR SHALL INSTALL NEW OR ADDITIONAL SAFETY-CLIMB CABLE GUIDES IF ADDITIONAL CLEARANCE IS REQUIRED. ADDITIONAL CABLE GUIDES SHALL BE ATTACHED SECURELY TO THE POLE USING MECHANICAL FASTENERS OR FIELD WELDED BY A CERTIFIED WELDING TECHNICIAN.

## PROPOSED L600/L700/U2100 ANTENNA AND PLATFORM MOUNTING DETAIL

1 A-3

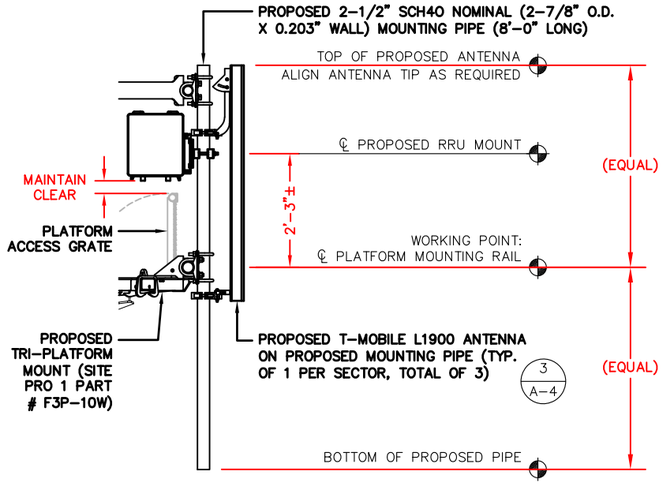
SCALE: N.T.S.




## PROPOSED L2100 ANTENNA MOUNTING DETAIL

2 A-3

SCALE: N.T.S.




## PROPOSED L1900 ANTENNA MOUNTING DETAIL

3 A-3

SCALE: N.T.S.

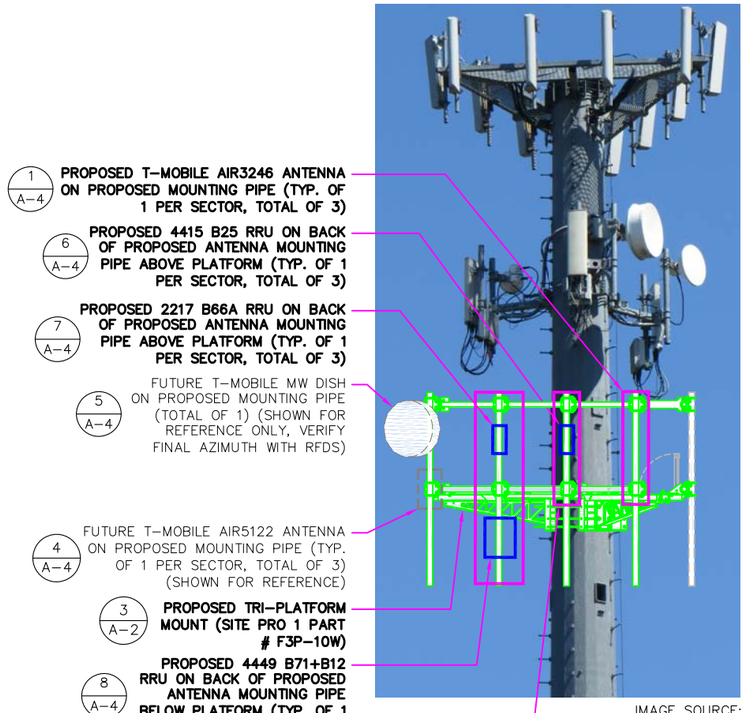



IMAGE SOURCE: PROTERRA 04/21/2018

NOTE: ONE SECTOR SHOWN FOR CLARITY

## ANTENNA PHOTO DETAIL

4 A-3

SCALE: N.T.S.

T-Mobile
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BLOOMFIELD, CT 06002
OFFICE: (860) 648-1116

SBA
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APPROVED BY: JMM/TEJ

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SITE NUMBER:
CTHA272A
SITE NAME:
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SITE ADDRESS:
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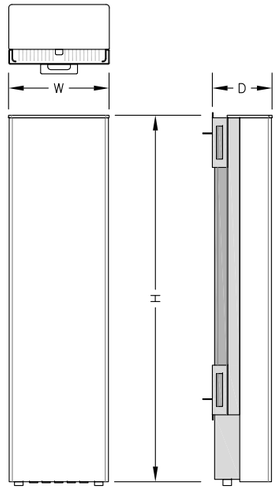
BRISTOL, CT 06010

SHEET TITLE
ANTENNA MOUNTING DETAILS

SHEET NUMBER
A-3

## L2100 ANTENNA SPECIFICATIONS

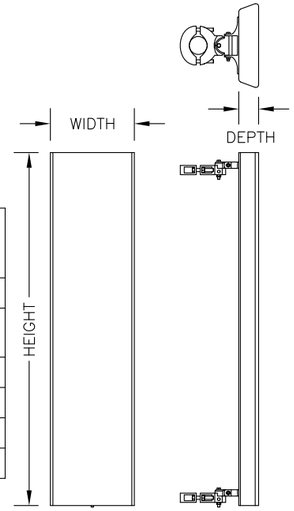
| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | AIR 3246_B66A (Octa) |
| HEIGHT | 58.1" |
| WIDTH | 15.8" |
| DEPTH | 9.4" |
| WEIGHT | 180± LBS. |




**L2100 ANTENNA DETAIL** — SCALE: N.T.S. — 1 / A-4

## L1900 ANTENNA SPECIFICATIONS

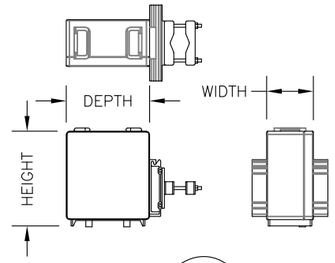
| | |
|---|---|
| MANUF. | RFS |
| MODEL # | APX16DWV-16DWV-S-E-A20 (Quad) |
| HEIGHT | 55.9" |
| WIDTH | 13" |
| DEPTH | 3.15" |
| WEIGHT | 40.7± LBS. |




**L1900 ANTENNA DETAIL** — SCALE: N.T.S. — 3 / A-4

## 4415 B25 SPECIFICATIONS

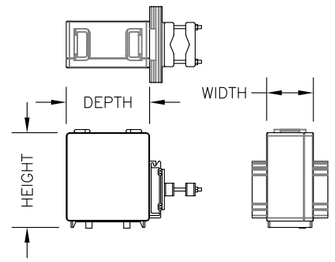
| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | 4415 B25 |
| HEIGHT | 16.5" |
| WIDTH | 13.4" |
| DEPTH | 5.9" |
| WEIGHT | 46± LBS. |




**RRU DETAIL** — SCALE: N.T.S. — 6 / A-4

## 2217 B66A SPECIFICATIONS

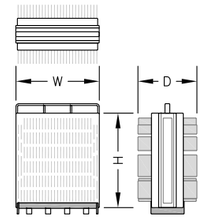
| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | 2217 B66A |
| HEIGHT | 13.8" |
| WIDTH | 11.7" |
| DEPTH | 5.4" |
| WEIGHT | 26.5± LBS. |




**RRU DETAIL** — SCALE: N.T.S. — 7 / A-4

## RRU SPECIFICATIONS

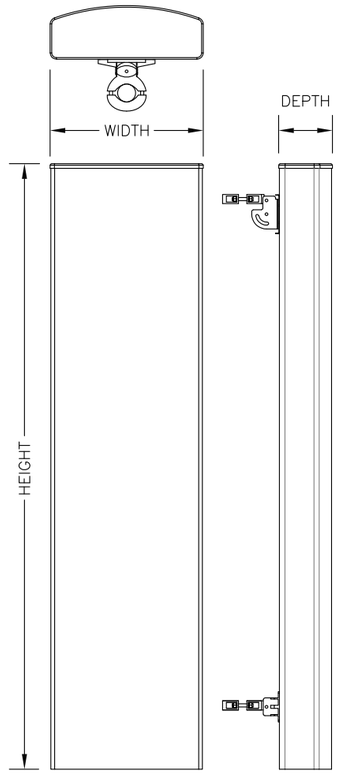
| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | 4449 B71+B12 |
| HEIGHT | 14.9" |
| WIDTH | 13.2" |
| DEPTH | 9.2" |
| WEIGHT | 74± LBS. |




**RRU DETAIL** — SCALE: N.T.S. — 8 / A-4

## L600/L700/U2100 ANTENNA SPECIFICATIONS

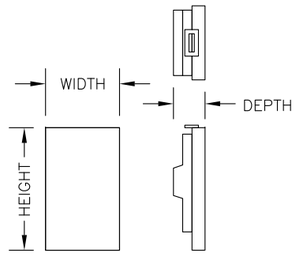
| | |
|---|---|
| MANUF. | ANDREW |
| MODEL # | APXVAARR24_43-U-NA20 |
| HEIGHT | 95.9" |
| WIDTH | 24.0" |
| DEPTH | 8.7" |
| WEIGHT | 128± LBS. |




**L600/L700/U2100 ANTENNA DETAIL** — SCALE: N.T.S. — 2 / A-4

## AIR 5122 ANTENNA SPECIFICATIONS

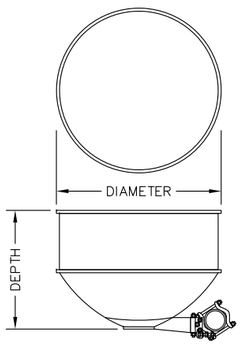
| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | AIR 5122 28GHz |
| HEIGHT | 19.4" |
| WIDTH | 11.7" |
| DEPTH | 5" |
| WEIGHT | 22± LBS. |




**AIR 5122 ANTENNA DETAIL** — SCALE: N.T.S. — 4 / A-4

## DISH ANTENNA SPECIFICATIONS

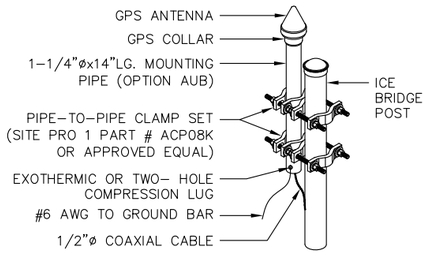
| | |
|---|---|
| MANUF. | COMMSCOPE |
| MODEL # | SP2-13 |
| DIA. | 26.1" |
| DEPTH | 18.8" |
| WEIGHT | 24± LBS. |




**SP2-13 DISH ANTENNA DETAIL** — SCALE: N.T.S. — 5 / A-4

## GPS ANTENNA

| | |
|---|---|
| MANUF. | NAIS |
| MODEL # | CCAH32ST03 |
| HEIGHT | 3.9" |
| WIDTH | 3.5" |




**GPS DETAIL** — SCALE: N.T.S. — 9 / A-4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35 GRIFFIN ROAD SOUTH
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SBA COMMUNICATIONS CORP.
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STATE OF CONNECTICUT — THOMAS E. JOHNSON — No. 28192 — LICENSED PROFESSIONAL ENGINEER — 9/27/18

CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

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SITE ADDRESS:
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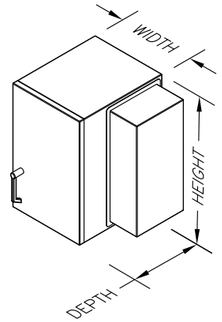
BRISTOL, CT 06010

SHEET TITLE
DETAILS

SHEET NUMBER
A-4

## SSC SPECIFICATIONS

| | |
|---|---|
| MANUF. | PURCELL |
| MODEL # | RAC24 |
| HEIGHT | 24.0" (37.1" WITH PLINTH) |
| WIDTH | 25.4" |
| DEPTH | 20.0" |
| WEIGHT | 85± LBS. (EMPTY)<br>388± LBS. (MAX.) |



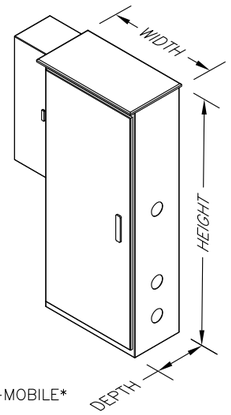

## SITE SUPPORT CABINET (SSC)

SCALE: N.T.S.

1 / A-5

## PPC SPECIFICATIONS

| | |
|---|---|
| MANUF. | DELTA |
| MODEL # | 3799340400 |
| HEIGHT | 40" |
| WIDTH | 20" |
| DEPTH | 10" |
| WEIGHT | 75± LBS. |




*TO BE PROVIDED BY T-MOBILE*

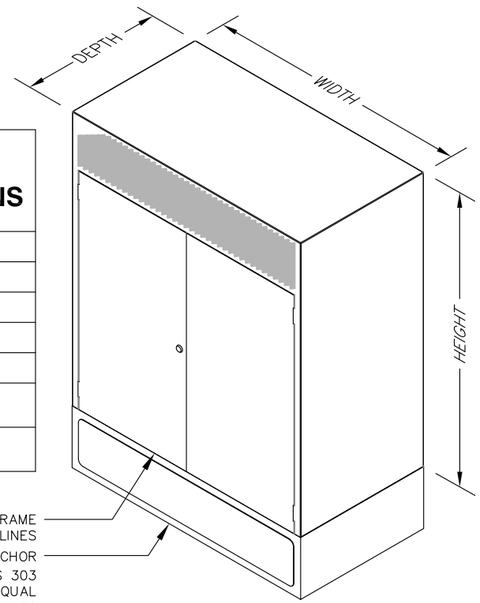
## POWER PROTECTION CABINET (PPC)

SCALE: N.T.S.

2 / A-5

## RBS SPECIFICATIONS

| | |
|---|---|
| MANUF. | ERICSSON |
| MODEL # | RBS 6102 |
| HEIGHT | 57.1" |
| WIDTH | 51.2" |
| DEPTH | 27.6" |
| WEIGHT | 728± LBS. W/O BATTERIES |
| MAX WEIGHT | ~1600 LBS. |

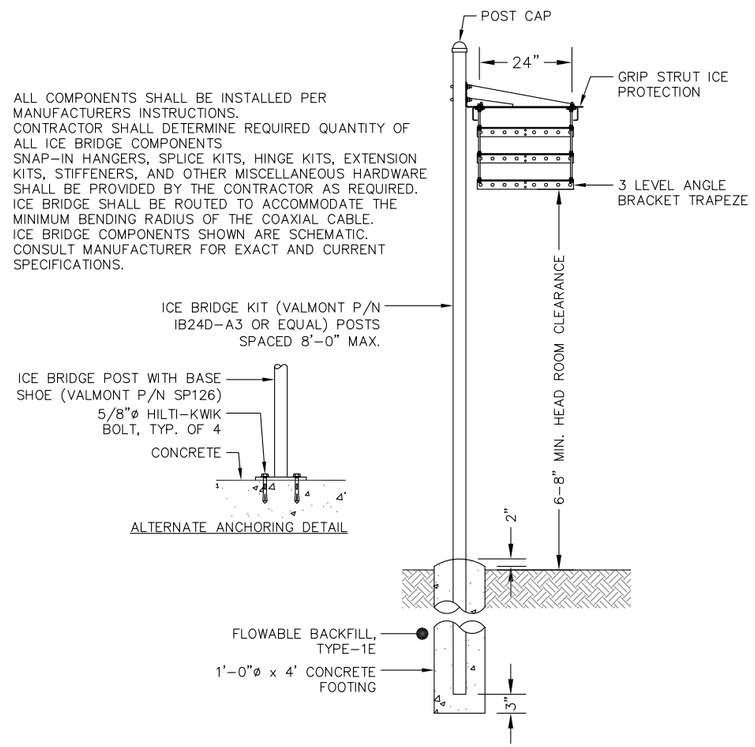



## RBS 6102

SCALE: N.T.S.

3 / A-5

1. ALL COMPONENTS SHALL BE INSTALLED PER MANUFACTURERS INSTRUCTIONS.
2. CONTRACTOR SHALL DETERMINE REQUIRED QUANTITY OF ALL ICE BRIDGE COMPONENTS
3. SNAP-IN HANGERS, SPLICE KITS, HINGE KITS, EXTENSION KITS, STIFFENERS, AND OTHER MISCELLANEOUS HARDWARE SHALL BE PROVIDED BY THE CONTRACTOR AS REQUIRED.
4. ICE BRIDGE SHALL BE ROUTED TO ACCOMMODATE THE MINIMUM BENDING RADIUS OF THE COAXIAL CABLE.
5. ICE BRIDGE COMPONENTS SHOWN ARE SCHEMATIC. CONSULT MANUFACTURER FOR EXACT AND CURRENT SPECIFICATIONS.




## ICE BRIDGE

SCALE: N.T.S.

4 / A-5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35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648-1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
WESTBOROUGH, MA 01581 TEL: (508) 251-0720

ProTerra DESIGN GROUP, LLC
4 Bay Road, Building A
Suite 200
Hadley, MA 01035 PH: (413)320-4918


STATE OF CONNECTICUT
THOMAS E. JOHNSON
No. 28192
LICENSED PROFESSIONAL ENGINEER
9/27/18

CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
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| 2 | 09/27/18 | CONSTRUCTION REVISED | PN |
| 1 | 07/16/18 | CONSTRUCTION REVISED | PN |
| 0 | 05/09/18 | ISSUED FOR CONSTRUCTION | JEB |

SITE NUMBER:
CTHA272A
SITE NAME:
CTHA272A

SITE ADDRESS:
1214 FARMINGTON AVENUE
BRISTOL, CT 06010

SHEET TITLE
DETAILS

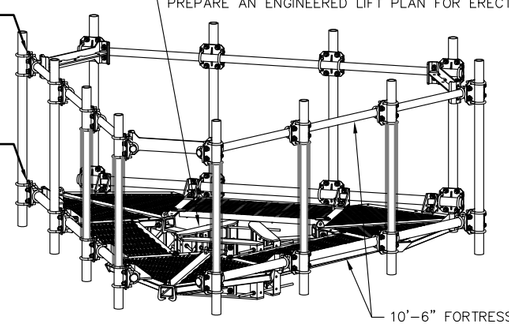
SHEET NUMBER
A-5

NOTE:
MOUNTING PIPES SHOWN FOR REFERENCE. SEE NOTE FOR REQUIRED PIPE SIZES

**PROPOSED CROSSOVER CLAMPS INCLUDED WITH HANDRAIL KIT, SPECIFY FOR FOR 2⅜"O.D. ANTENNA PIPE WHEN ORDERING, TYP.**

**PROPOSED CROSSOVER CLAMPS INCLUDED WITH PLATFORM MOUNT KIT, SPECIFY FOR FOR 2⅜"O.D. ANTENNA PIPE WHEN ORDERING, TYP.**

FOLLOW MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION. DO NOT OVER TORQUE (60–100 FT–LBS MAX ON COLLAR BOLTS), CONTRACTOR TO TAKE SPECIAL CARE AND ERECT IN PIECES OR PREPARE AN ENGINEERED LIFT PLAN FOR ERECTION.



10'–6" FORTRESS TRI–PLATFORM MOUNT (SITEPRO1 P/N F3P–10W) WITH HANDRAIL KIT (SITEPRO1 P/N F3P–HRK10)

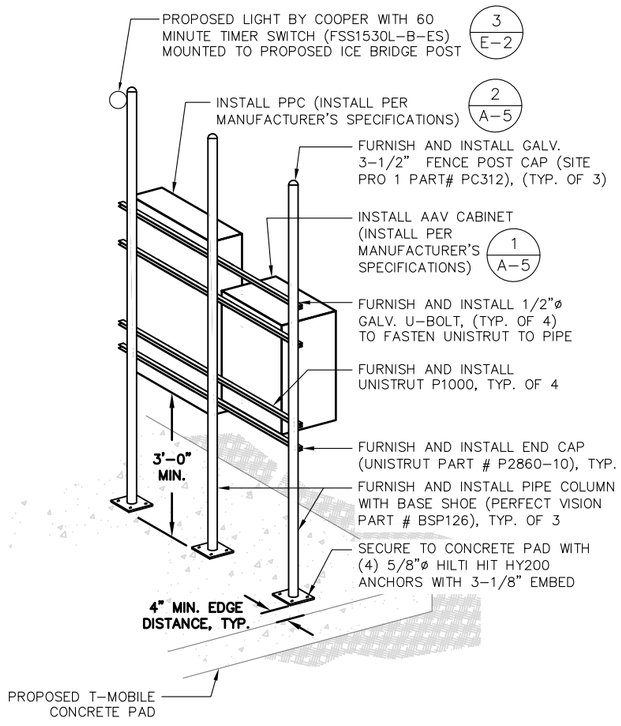
## SECTOR FRAME DETAIL

SCALE: N.T.S.

1 / S–1

NOTE:
ANTENNA MOUNTING PIPES NOT INCLUDED WITH PLATFORM OR HANDRAIL KIT. CONTRACTOR SHALL ORDER SEPARATELY: 2–1/2" SCH40 NOMINAL (2–7/8" O.D. X 0.203" WALL) MOUNTING PIPES (8'–0" LONG), (TYP. OF 4 PER SECTOR, TOTAL OF 12). SPECIFY CROSSOVER CLAMPS FOR 2–7/8" O.D. PIPE WHEN ORDERING PLATFORM AND HANDRAIL KIT.

NOTE:
CONTRACTOR SHALL SPECIFY 2½" SCH40 (2.875 O.D. X 0.203 WALL, 10'–6" LONG MOUNTING TOP RAILS WHEN ORDERING HANDRAIL KIT, TYP. OF 1 PER SECTOR, TOTAL OF 4)




## PPC AND TELCO CABINET H-FRAME MOUNTING DETAIL

SCALE: N.T.S.

2 / S–1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35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648–1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
WESTBOROUGH, MA 01581 TEL: (508) 251-0720

ProTerra DESIGN GROUP, LLC
4 Bay Road, Building A
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STATE OF CONNECTICUT · THOMAS E. JOHNSON · No. 28192 · LICENSED PROFESSIONAL ENGINEER · 9/27/18

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SHEET TITLE
STRUCTURAL DETAILS

SHEET NUMBER
S–1

## ANTENNA CONFIGURATION

| SECTOR | BAND | ANTENNA MODEL | ANTENNA RAD | AZIMUTH | DOWNTILT MECH. / ELEC. | | RADIOS | CABLE FEED LINES |
|---|---|---|---|---|---|---|---|---|
| ALPHA | L2100 | ERICSSON – AIR 3246_B66A (OCTO) | 130'± | 30° | 0° | 2° | – | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| ALPHA | L1900 | RFS – APXV16DWV–16DWV–S–E–A20 (QUAD) | 130'± | 30° | 0° | 2° | PROPOSED (1) 4415 B25 | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| ALPHA | L600, L700, U2100 | RFS – APXVAARR24_43–U–NA20 (OCTO) | 130'± | 30° | 0° | 2° | PROPOSED (1) 4449 B71+B12 (1) 2217 B66A | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| BETA | L2100 | ERICSSON – AIR 3246_B66A (OCTO) | 130'± | 150° | 0° | 2° | – | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| BETA | L1900 | RFS – APXV16DWV–16DWV–S–E–A20 (QUAD) | 130'± | 150° | 0° | 2° | PROPOSED (1) 4415 B25 | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| BETA | L600, L700, U2100 | RFS – APXVAARR24_43–U–NA20 (OCTO) | 130'± | 150° | 0° | 2° | PROPOSED (1) 4449 B71+B12 (1) 2217 B66A | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| GAMMA | L2100 | ERICSSON – AIR 3246_B66A (OCTO) | 130'± | 270° | 0° | 2° | – | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| GAMMA | L1900 | RFS – APXV16DWV–16DWV–S–E–A20 (QUAD) | 130'± | 270° | 0° | 2° | PROPOSED (1) 4415 B25 | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| GAMMA | L600, L700, U2100 | RFS – APXVAARR24_43–U–NA20 (OCTO) | 130'± | 270° | 0° | 2° | PROPOSED (1) 4449 B71+B12 (1) 2217 B66A | PROPOSED SHARED HYBRID CABLE TRUNK (TOTAL OF 3) |
| REFER TO FINAL RFDS AND FINAL COLLO–APPLICATION FOR FINAL CONFIGURATION AND QUANTITIES. | | | | | | | | |

**RF DATA SHEET**
SCALE: N.T.S.

1
RF–1


T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648–1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
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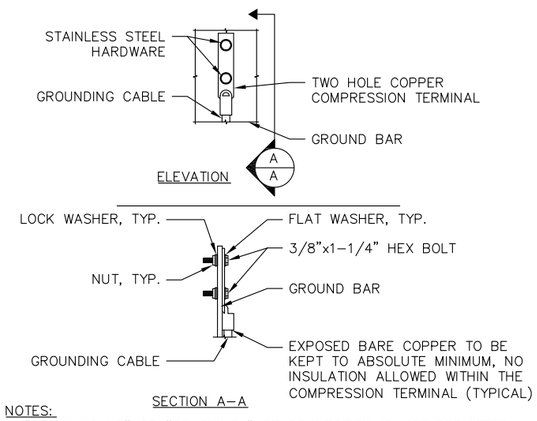
RF DATA SHEET

SHEET NUMBER
RF–1

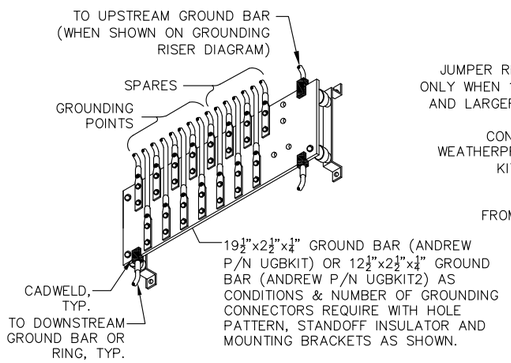



NOTES:
1. "DOUBLING UP" OR "STACKING " OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.
3. CADWELD DOWNLEADS FROM UPPER EGB, LOWER EGB, AND MGB.

## TYPICAL GROUND BAR CONNECTION DETAIL

1 / E-1

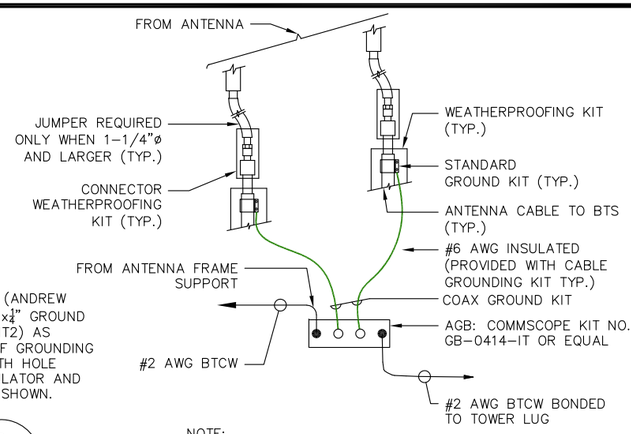
SCALE: N.T.S.



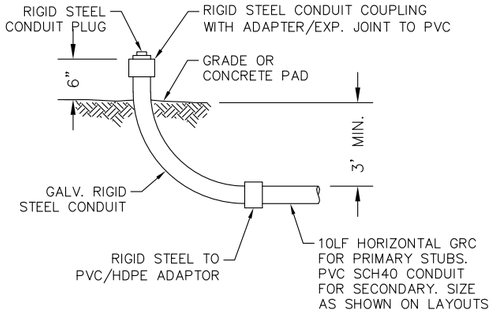

## COAX GROUND BAR (MGB)

2 / E-1

SCALE: NONE




NOTE:
INSTALL CABLE GROUND KIT ABOVE HORIZONTAL BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO AGB/EGB.




## CONDUIT STUB UP

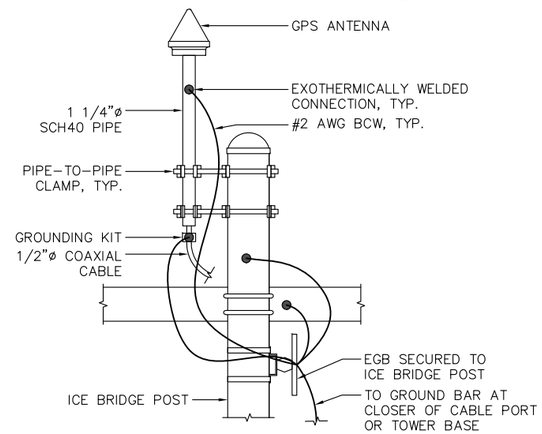
4 / E-1

SCALE: NONE

## TOWER TOP CABLE GROUNDING DETAIL

3 / E-1

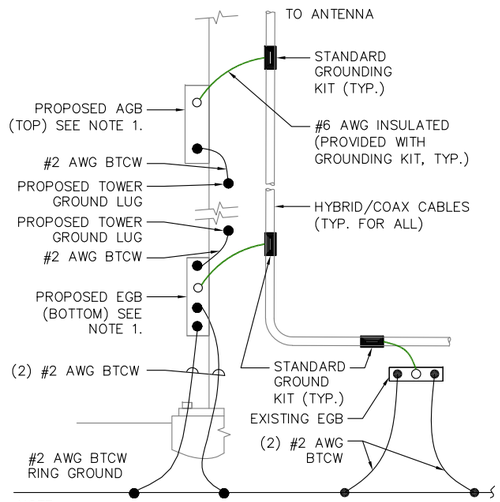
SCALE: N.T.S.




## GPS ANTENNA GROUNDING DETAIL

5 / E-1

SCALE: N.T.S.

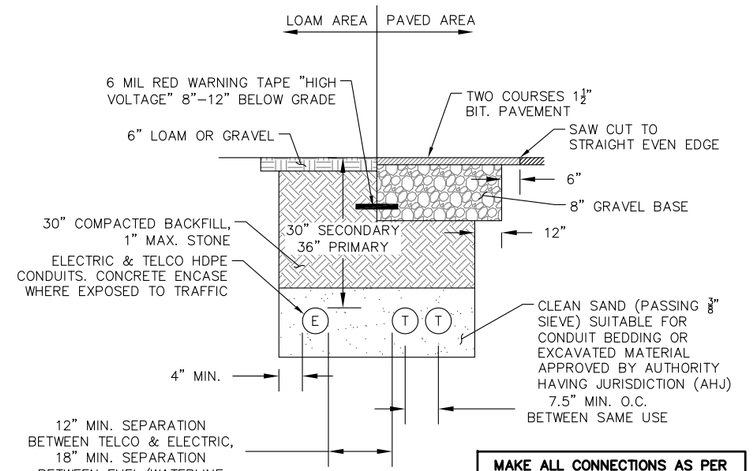



NOTE:
1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, ANTENNA LOCATION, AND CONNECTION ORIENTATION. PROVIDE ADDITIONAL AGB/EGB AS REQUIRED.
2. A SEPARATE GROUND BAR TO BE USED FOR GPS ANTENNA IF REQUIRED

## TOWER BOTTOM CABLE GROUNDING DETAIL

6 / E-1

SCALE: N.T.S.




**MAKE ALL CONNECTIONS AS PER UTILITY COMPANY REQUIREMENTS**

NOTES
1. MAKE ALL CONNECTIONS AS PER UTILITY COMPANY REQUIREMENTS.
2. VERIFY CONDUIT SIZE WITH UTILITY COMPANY.
3. CONTRACTOR SHALL FURNISH AND INSTALL AN APPROVED 2,500 POUND TEST TAPE IN EACH PRIMARY CONDUIT RUN OR PER UTILITY COMPANY REQUIREMENTS.

## BURIED CONDUIT SECTION

7 / E-1

SCALE: NONE

## ELECTRICAL LEGEND

| | |
|---|---|
| A | AMPERE |
| V | VOLT |
| KWH | KILOWATT - HOUR |
| C | CONDUIT |
| GRC | GALVANIZED RIGID CONDUIT |
| BTCW | BARE TINNED (SOLID) COPPER WIRE (#2 AWG, UNLESS NOTES OTHERWISE) |
| G | GROUND |
| | GROUND |
| MGB | MASTER GROUND BAR — ○ MECHANICAL CONNECTION ● CADWELD CONNECTION |
| AGB/EGB | EQUIPMENT GROUND BAR/ANTENNA GROUND BAR |
| G | GROUND COPPER WIRE, SIZE AS NOTED |
| | EXPOSED WIRING |
| | INSULATED GROUNDING CONDUCTOR (#6 AWG STRANDED, UNLESS NOTED OTHERWISE) |
| | 5/8"x10' COPPER CLAD STAINLESS STEEL GROUND ROD |
| | ● EXOTHERMIC (CAD WELD) OR ○ MECHANICAL (COMPRESSION TYPE) CONNECTION |
| PPC | POWER PROTECTION CABINET |
| | OMNI-DIRECTIONAL ELECTRONIC MARKER SYSTEM (EMS) BALL |

## ELECTRICAL & GROUNDING NOTES:

1. ALL ELECTRICAL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC) 2014 WITH CONNECTICUT AMENDMENTS AS WELL AS APPLICABLE STATE AND LOCAL CODES.
2. ALL ELECTRICAL ITEMS SHALL BE U.L. APPROVED OR LISTED AND PROCURED PER SPECIFICATION REQUIREMENTS.
3. THE ELECTRICAL WORK INCLUDES ALL LABOR AND MATERIAL DESCRIBED BY DRAWINGS AND SPECIFICATIONS INCLUDING INCIDENTAL WORK TO PROVIDE COMPLETE OPERATING AND APPROVED ELECTRICAL SYSTEM.
4. GENERAL CONTRACTOR SHALL PAY FEES FOR PERMITS, AND IS RESPONSIBLE FOR OBTAINING SAID PERMITS AND COORDINATION OF INSPECTIONS.
5. ELECTRICAL AND TELCO WIRING OUTSIDE A BUILDING AND EXPOSED TO WEATHER SHALL BE IN WATER TIGHT GALVANIZED RIGID STEEL CONDUITS OR SCHEDULE 80 PVC (AS PERMITTED BY CODE) AND WHERE REQUIRED IN LIQUID TIGHT FLEXIBLE METAL OR NONMETALLIC CONDUITS.
6. RIGID STEEL CONDUITS SHALL BE GROUNDED AT BOTH ENDS.
7. ELECTRICAL WIRING SHALL BE COPPER WITH TYPE XHHW, THWN, OR THHN INSULATION AS REQUIRED BY NEC.
8. RUN ELECTRICAL CONDUIT OR CABLE BETWEEN ELECTRICAL ROOM AND PROPOSED CELL SITE POWER PEDESTAL AS INDICATED ON THIS DRAWING. PROVIDE FULL LENGTH PULL ROPE. COORDINATE INSTALLATION WITH UTILITY COMPANY.
9. RUN TELCO CONDUIT OR CABLE BETWEEN TELEPHONE UTILITY DEMARCATION POINT AND PROPOSED CELL SITE TELCO CABINET AND BTS CABINET AS INDICATED ON DRAWING A-1. PROVIDE FULL LENGTH PULL ROPE IN INSTALLED TELCO CONDUIT. PROVIDE GREENLEE CONDUIT MEASURING TAPE AT EACH END.
10. ALL EQUIPMENT LOCATED OUTSIDE SHALL HAVE NEMA 3R ENCLOSURE.
11. GROUNDING SHALL COMPLY WITH NEC ART. 250.
12. GROUND COAXIAL CABLE SHIELDS MINIMUM AT BOTH ENDS USING MANUFACTURERS COAX CABLE GROUNDING KITS SUPPLIED BY PROJECT OWNER.
13. USE #6 COPPER STRANDED WIRE WITH GREEN COLOR INSULATION FOR ABOVE GRADE GROUNDING (UNLESS OTHERWISE SPECIFIED) AND #2 SOLID TINNED BARE COPPER WIRE FOR BELOW GRADE GROUNDING AS INDICATED ON THE DRAWING.
14. ALL GROUND CONNECTIONS TO BE BURNDY HYGROUND COMPRESSION TYPE CONNECTORS OR CADWELD EXOTHERMIC WELD. DO NOT ALLOW BARE COPPER WIRE TO BE IN CONTACT WITH GALVANIZED STEEL.
15. ROUTE GROUNDING CONDUCTORS ALONG THE SHORTEST AND STRAIGHTEST PATH POSSIBLE, EXCEPT AS OTHERWISE INDICATED. GROUNDING LEADS SHOULD NEVER BE BENT AT RIGHT ANGLE. ALWAYS MAKE AT LEAST 12" RADIUS BENDS. #6 WIRE CAN BE BENT AT 6" RADIUS WHEN NECESSARY. BOND ANY METAL OBJECTS WITHIN 7 FEET OF PROPOSED EQUIPMENT OR CABINET TO MASTER GROUND BAR.
16. CONNECTIONS TO MGB SHALL BE ARRANGED IN THREE MAIN GROUPS: SURGE PRODUCERS (COAXIAL CABLE GROUND KITS, TELCO AND POWER PANEL GROUND); (GROUNDING ELECTRODE RING OR BUILDING STEEL); NON-SURGING OBJECTS (EGB GROUND IN BTS UNIT).
17. CONNECTIONS TO GROUND BARS SHALL BE MADE WITH TWO HOLE COMPRESSION TYPE COPPER LYGS. APPLY OXIDE INHIBITING COMPOUND TO ALL LOCATIONS.
18. APPLY OXIDE INHIBITING COMPOUND TO ALL COMPRESSION TYPE GROUND CONNECTIONS.
19. BOMD ANTENNA MOUNTING BRACKETS, COAXIAL CABLE GROUND KITS, AND ALNA TO EGB PLACED NEAR THE ANTENNA LOCATION.
20. BOND ANTENNA EGB'S AND MGB TO WATER MAIN/GROUND RING.
21. TEST COMPLETED GROUND SYSTEM AND RECORD RESULTS FOR PROJECT CLOSE-OUT DOCUMENTATION.
22. VERIFY PROPOSED SERVICE UPGRADE WITH LOCAL UTILITY COMPANY PRIOR TO CONSTRUCTION.

T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 648-1116

SBA COMMUNICATIONS CORP.
134 FLANDERS ROAD, SUITE 125
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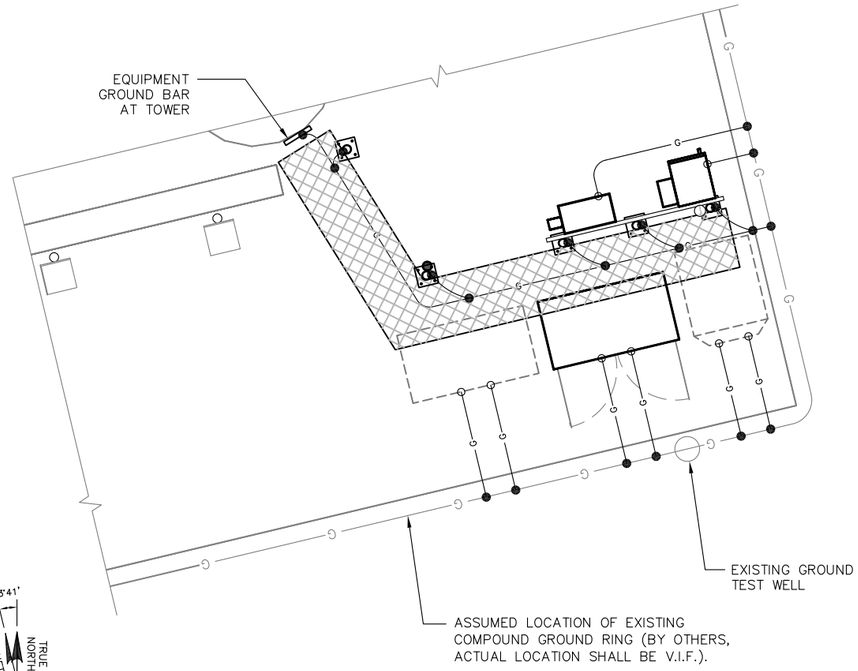
SHEET TITLE
ELECTRICAL & GROUNDING DETAILS

SHEET NUMBER
E-1





## LEGEND

| | |
|---|---|
| ⊠ | 5/8"x10' COPPER CLAD STEEL GROUND ROD |
| ● | EXOTHERMIC WELD |
| ○ | MECHANICAL LUG |
| ——— G ——— | #2 BCW CONDUCTOR WITH 2"x4" BED OF SOIL ENHANCEMENT OR #2/0 STRANDED TINNED |

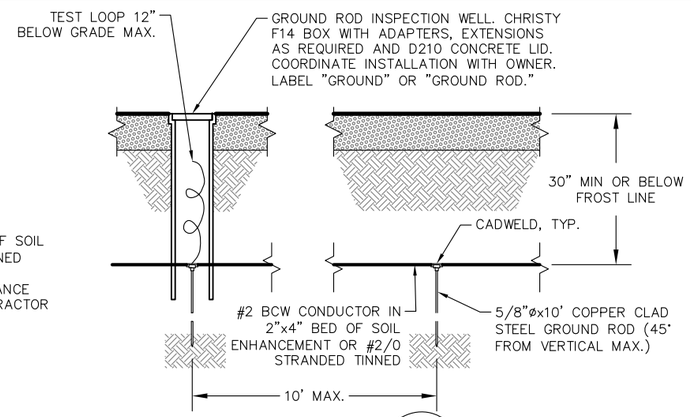
NOTE:
SITE GROUNDING SYSTEM IS A BASIC DESIGN. THE ACTUAL RESISTANCE TO GROUND CANNOT BE CONFIRMED WITHOUT A FIELD TEST. CONTRACTOR TO INSTALL AND PROVIDE DOCUMENTATION AT CLOSEOUT.

## GROUND EQUIPMENT GROUNDING SCHEMATIC

1 / E-2

SCALE: 1"=5' (11"x17")
1"=2.5' (22"x34")

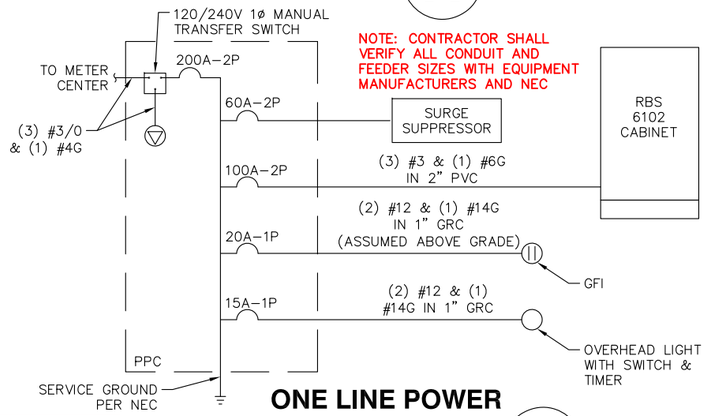
5 2.5 0 5




## GROUND ROD

2 / E-2

SCALE: NONE



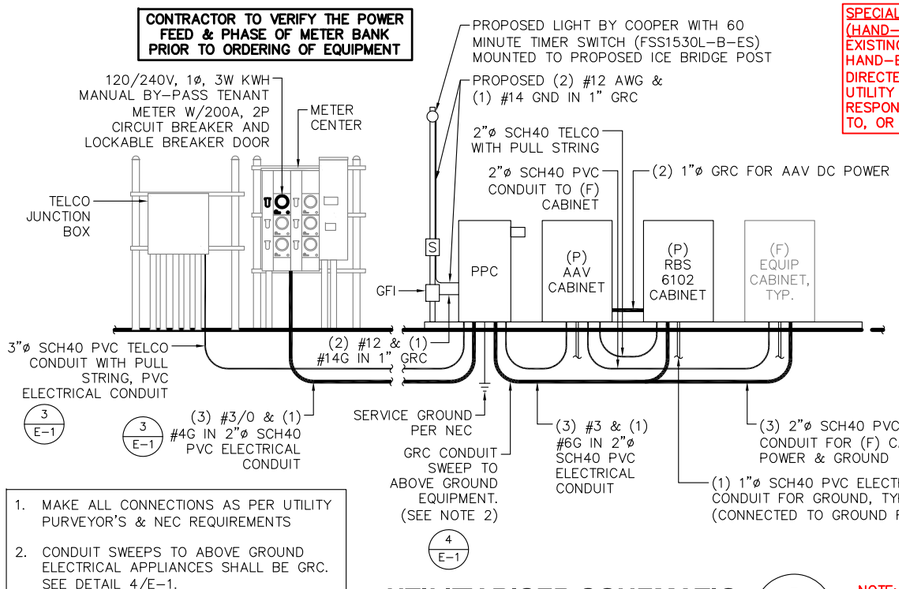

NOTE: CONTRACTOR SHALL VERIFY ALL CONDUIT AND FEEDER SIZES WITH EQUIPMENT MANUFACTURERS AND NEC

## ONE LINE POWER SCHEMATIC

4 / E-2

SCALE: N.T.S.

**CONTRACTOR TO VERIFY THE POWER FEED & PHASE OF METER BANK PRIOR TO ORDERING OF EQUIPMENT**




1. MAKE ALL CONNECTIONS AS PER UTILITY PURVEYOR'S & NEC REQUIREMENTS
2. CONDUIT SWEEPS TO ABOVE GROUND ELECTRICAL APPLIANCES SHALL BE GRC. SEE DETAIL 4/E–1.
3. UTILITY PURVEYOR TO CONFIRM CAPACITY IN METER BANK AND TRANSFORMER.

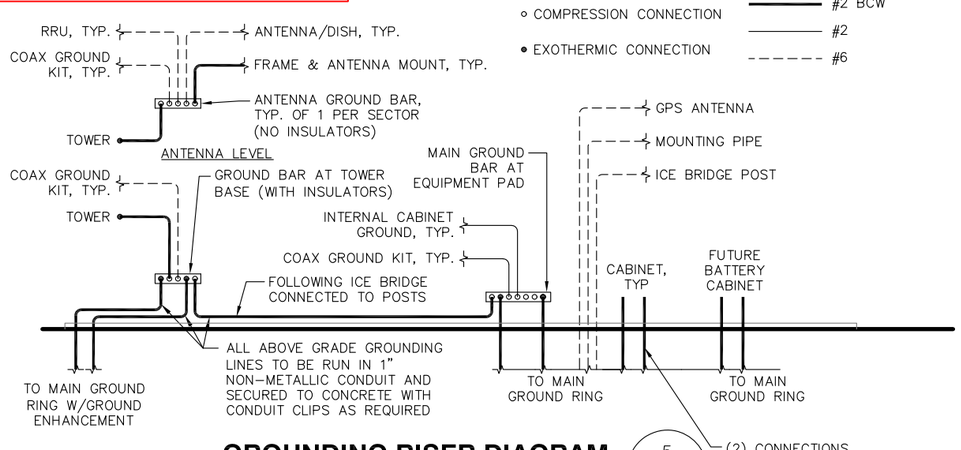
## UTILITY RISER SCHEMATIC

3 / E-2

SCALE: NONE

SPECIAL CONSTRUCTION WORK NOTE
(HAND–DUG UTILITY TRENCH EXCAVATION REQUIRED):
EXISTING UNDERGROUND UTILITY LOCATIONS ARE UNKNOWN. GENERAL CONTRACTOR SHALL HAND–EXCAVATE TO REQUIRED SUB–GRADE DEPTH, SUFFICIENT TEST HOLES OR AS DIRECTED/REQUIRED BY SBA REGIONAL SITE MANAGER. ALL PROPOSED UNDERGROUND UTILITY TRENCHES SHALL BE HAND–EXCAVATE AS REQUIRED. GENERAL CONTRACTOR IS RESPONSIBLE FOR ANY REQUIRED SPECIAL TEMPORARY PROTECTION OF, PHYSICAL DAMAGE TO, OR REPAIR OF EXISTING UNDERGROUND CONDUIT INCLUDING RESTORATION OF SERVICE.

NOTE: ALL CONDUITS ROUTING AND SIZES SHALL BE CONFIRMED WITH CONSTRUCTION MANAGER PRIOR TO COMMENCEMENT OF WORK




## GROUNDING RISER DIAGRAM

5 / E-2

SCALE: NONE

T-MOBILE NORTHEAST LLC
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THOMAS E. JOHNSON
No. 28192
LICENSED PROFESSIONAL ENGINEER
FOR SCHEMATIC 09/27/18

CHECKED BY: JMM/TEJ

APPROVED BY: JMM/TEJ

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
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| 2 | 09/27/18 | CONSTRUCTION REVISED | PN |
| 1 | 07/16/18 | CONSTRUCTION REVISED | PN |
| 0 | 05/09/18 | ISSUED FOR CONSTRUCTION | JEB |

SITE NUMBER:
CTHA272A
SITE NAME:
CTHA272A
SITE ADDRESS:
1214 FARMINGTON AVENUE
BRISTOL, CT 06010

SHEET TITLE
ELECTRICAL & GROUNDING DETAILS

SHEET NUMBER
E–2