EM-SPRINT-142-130109

497 Old Post Road

Tolland

Alcatel·Lucent

1 Robbins Road
Westford, MA 01886



July 9, 2014

State of Connecticut
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: Notification of Construction Completion on telecommunication facilities

To whom it may concern:

Alcatel Lucent hereby acknowledges that the list of attached sites have completed construction per the approval granted on the specified date. Please advise if further information is needed..

Very truly yours,

*Martha Powers*

Martha Powers
Lead Development Manager
Alcatel-Lucent
Sprint Vision Project
1 Robbins Road
Westford, MA 01886

Cc: FST, Siterra

| EM/TS # | Address | Town | Sprint ID | Decision Date |
|---|---|---|---|---|
| EM-SPRINT-062-130912 | 1065 Wintergreen Avenue | Hamden | CT03XC003 | 10/15/2013 |
| EM-SPRINT-NEXTEL-060-130118 | 10 Tanner Marsh Road | Guilford | CT03XC022 | 2/14/2013 |
| EM-SPRINT-004-130822 | 181 Montevideo Road | Avon | CT03XC053 | 9/6/2013 |
| EM-SPRINT-NEXTEL-155-130214A | 1358 New Britain Ave. | West Hartford | CT03XC057 | 3/1/2013 |
| EM-SPRINT-NEXTEL-164-130201 | 440 Hayden Station Road | Windsor | CT03XC065 | 3/8/2013 |
| EM-SPRINT-NEXTEL-132-130201 | 59 McGuire Road | South Windsor | CT03XC066 | 3/1/2013 |
| EM-SPRINT-NEXTEL-054-130201 | 299 Paxton Way | Glastonbury | CT03XC081 | 3/1/2013 |
| EM-SPRINT-NEXTEL-094-130214B | 36 Prospect Street | Newington | CT03XC084 | 3/1/2013 |
| EM-SPRINT-110-130725 | 10 Sparks Street | Plainville | CT03XC086 | 8/8/2013 |
| EM-SPRINT-007-130314 | 260 Beckley Road | Kensington | CT03XC088 | 4/5/2013 |
| EM-SPRINT-NEXTEL-155-130201 | 570 New Park Avenue | West Hartford | CT03XC091 | 3/1/2013 |
| EM-SPRINT-NEXTEL-106-130201 | 430 Middlesex Turnpike | Old Saybrook | CT03XC102 | 3/1/2013 |
| EM-SPRINT-NEXTEL-105-130201 | 30 Short Hills Road | Old Lyme | CT03XC104 | 3/1/2013 |
| EM-SPRINT-NEXTEL-152-130201 | 41 Manitock Hill Road | Waterford | CT03XC105 | 3/1/2013 |
| EM-SPRINT-NEXTEL-045-130201 | 93 Roxbury Road | East Lyme | CT03XC110 | 3/1/2013 |
| EM-SPRINT-152-130114 | 45R Fargo Road | Waterford | CT03XC112 | 2/14/2013 |
| EM-SPRINT-NEXTEL-027-130201 | 48 Cow Hill Road | Clinton | CT03XC156 | 3/1/2013 |
| EM-SPRINT-NEXTEL-082-130201 | 238 Meridan Road | Middlefield | CT03XC160 | 3/8/2013 |
| EM-SPRINT-047-130109 | 160 Plantation Road | East Windsor | CT03XC202 | 2/7/2013 |
| EM-SPRINT-NEXTEL-077-130214 | 53 Slater Street | Manchester | CT03XC211 | 3/1/2013 |
| EM-SPRINT-142-130109 | 497 Old Post Road | Tolland | CT03XC212 | 2/7/2013 |
| EM-SPRINT-NEXTEL-042-130222 | 94 East High Street | East Hampton | CT03XC335 | 3/8/2013 |
| EM-SPRINT-057-121226 | Butternut Hollow Road | Greenwich | CT03XC343 | 1/11/2013 |
| EM-SPRINT-158-130213 | 515 Boston Post Road | Westport | CT03XC355 | 3/1/2013 |
| EM-SPRINT-046-130402 | 206 Everett Road | Easton | CT03XC362 | 4/19/2013 |
| EM-SPRINT-085-130322 | 474 MAIN STREET | MONROE | CT03XC365 | 4/5/2013 |
| EM-SPRINT-086-131011 | 57 Cook Drive | Montville | CT03XC365 | 10/25/2013 |
| EM-SPRINT-118-130322 | 76 EAST RIDGE | RIDGEFIELD | CT03XC370 | 4/5/2013 |
| EM-SPRINT-097-131230 | 20 Barnabas Road | Newtown | CT03XC383 | 1/21/2014 |
| EM-SPRINT-051-130207 | 3965 Congress Street | Fairfield | CT03XC385 | 3/1/2013 |
| EM-SPRINT-NEXTEL-094-130214A | 123 Costello Road | Newington | CT23XC555 | 3/1/2013 |
| EM-SPRINT-119-131008 | 699 Old Main Street | Rocky Hill | CT23XC556 | 10/25/2013 |
| EM-SPRINT-077-131008 | 60 Adams Street | Manchester | CT23XC557 | 10/25/2013 |
| EM-SPRINT-NEXTEL-080-130123 | 462 West Main Street | Meriden | CT25XC840 | 2/14/2013 |
| EM-SPRINT-096-130920 | 18 Hilltop View Lane | New Milford | CT33XC095 | 10/4/2013 |
| EM-SPRINT-157-130213 | 237 Godfrey Road | Weston | CT33XC522 | 3/1/2013 |
| EM-SPRINT-018-131008 | 20 Vale Road | Brookfield | CT33XC525 | 10/25/2013 |
| EM-SPRINT-077-130528 | 595 Keeney Street | Manchester | CT33XC538 | 6/14/2013 |
| EM-SPRINT-NEXTEL-129-130214 | 400 Main Street | Somers | CT33XC554 | 3/1/2013 |
| EM-SPRINT-047-130322 | 15 CHAMBERLAIN | BROADBROOK | CT33XC565 | 4/5/2013 |
| EM-SPRINT-004-130502 | 277 Huckleberry Road | Avon | CT33XC589 | 5/17/2013 |

| | | | | |
|---|---|---|---|---|
| EM-SPRINT-143-130604 | 218 Wheeler Road | Torrington | CT33XC592 | 6/28/2013 |
| EM-SPRINT-140-130724 | 583 Chapel Street | Thomaston | CT33XC603 | 8/8/2013 |
| EM-SPRINT-103-130920 | Charles Marshall Drive | Norwalk | CT33XC802 | 10/4/2013 |
| EM-SPRINT-NEXTEL-064-130214 | 439-455 Homestead Ave. | Hartford | CT43XC805 | 3/1/2013 |
| EM-SPRINT-064-130311 | 99 Meadow Street | Hartford | CT43XC806 | 4/5/2013 |
| EM-SPRINT-083-131127 | 290 Preston Ave. | Middletown | CT43XC816 | 12/16/2013 |
| EM-SPRINT-128-130920 | 530 Bushy Hill Road | Simsbury | CT43XC825 | 10/4/2013 |
| EM-SPRINT-164-130405A | 340 Bloomfield Avenue | Windsor | CT43XC826 | 4/19/2013 |
| EM-SPRINT-077-130109 | 239 Middle Turnpike | Manchester | CT43XC827 | 2/13/2013 |
| EM-SPRINT-165-130118 | 2-4 Volunteer Drive | Windsor Locks | CT43XC828 | 2/14/2013 |
| EM-SPRINT-NEXTEL-139-130214 | 44 Fyler Place | Suffield | CT43XC829 | 3/8/2013 |
| EM-SPRINT-111-130712 | 171 Town Hill Road | Plymouth | CT54XC712 | 7/26/2013 |
| EM-SPRINT-009-130322 | 38 Spring Hill Road | Bethel | CT54XC749 | 4/5/2013 |
| EM-SPRINT-154-131011 | 315 Spencer Plains Road | Westbrook | CT54XC758 | 10/25/2013 |
| EM-SPRINT-023-130405 | 14 Canton Springs Road | Canton | CT54XC760 | 4/19/2013 |
| EM-SPRINT-104-130606 | 153 Old Salem Road | Norwich | CT54XC775 | 6/28/2013 |
| EM-SPRINT-164-130405B | 99 Day Hill Road | Windsor | CT54XC787 | 4/19/2013 |
| EM-SPRINT-132-130920 | 300 Governor's Highway | South Windsor | CT60XC014 | 10/4/2013 |
| EM-SPRINT-094-130108 | 605 Willard Avenue | Newington | CT60XC018 | 1/25/2013 |
| EM-SPRINT-146-130506 | 197 South Street | Vernon | CT60XC935 | 5/24/2013 |
| EM-SPRINT-146-130311 | 777 Talcottville Road | Vernon | CT70XC147 | 4/5/2013 |
| EM-SPRINT-126-130531 | 62 Birdseye Road | Shelton | CT73XC004 | 6/21/2013 |

STATE OF CONNECTICUT
*CONNECTICUT SITING COUNCIL*
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

February 7, 2013

Patricia Masterson
Site Acquisition Manager
Goodman Networks
Two Willow Street, Suite 101
Southborough, MA 01745

RE: **EM-SPRINT-142-130109** – Sprint Spectrum L.P. notice of intent to modify an existing telecommunications facility located at 497 Old Post Road, Tolland, Connecticut.

Dear Ms. Masterson:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated January 9, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Linda Roberts per LAB

Linda Roberts
Executive Director

LR/CDM/jb

c: The Honorable Jack Scavone, Chairman Town Council, Town of Tolland
Steven R. Werbner, Town Manager, Town of Tolland
Linda Farmer, Town Planner, Town of Tolland
Old Post Road Holdings

CSC
CONNECTICUT SITING COUNCIL

**EM-SPRINT-142-130109**

Goodman Networks
Network Knowledge... Delivered.

January 9, 2013

Linda Roberts
Executive Director
Connecticut Siting Counsel
Ten Franklin Square
New Britain, CT 06051
Linda Roberts, Executive Director

RECEIVED
JAN - 9 2013
CONNECTICUT
SITING COUNCIL

Re: Notice of Exempt Modification – Antenna Swap
497 Old Post Road, Tolland, Connecticut

Dear Ms. Roberts:

Sprint is planning to consolidate multiple network technologies into one seamless network with the goal of increasing efficiency and enhancing network coverage, call quality and data speeds for customers across Connecticut. Pursuant §16-50j-73 to of the Regulations of Connecticut State Agencies (RCSA), please accept this letter and attachments as notification of Sprint's intent to make exempt modifications, under RCSA §16-50j-72(b)(2), to its existing telecommunications facility at 497 Old Post Road, Tolland, Connecticut. In accordance with RCSA §16-50j-73, a copy of this letter was sent to Jack Scavone, Chair, Tolland Town Council.

Sprint currently maintains six (6) antennas at 147 feet on the existing 150 foot tower at the address referenced above. Sprint intends to replace its existing six (6) CDMA antennas with three (3) Multimodal antennas at their same current height of 147 feet. Sprint will a be replacing its existing six (6) lines of coaxial cable with three (3) smaller lines of Hybriflex cable and installing six (6) RRH's. Sprint will also be swapping three (3) existing ground cabinets with three (3) new cabinets and adding one (1) fiber junction box. This work will result in a net reduction of antennas, from six (6) to three (3), and will not increase the height of the tower or the size compound. Please find included with this letter compound, elevation and overhead drawings which depict Sprint's proposed modifications.

Sprint's planned modifications fall squarely within the activities permitted in RCSA §16-50j-72(b)(2) in that:

1. The proposed modifications will not increase the existing tower height;

2. The proposed modifications will not extend the boundaries of the site by any dimension;

3. The proposed modifications will not increase the noise levels at the existing facility by six (6) decibels or more;

4. The proposed modifications will not increase the total radio frequency electromagnetic radiation power density to or above the standards adopted by the Federal Communications Commission. Please find included with this letter a Radio Frequency Emissions Analysis Report.

Also included with this letter is a Structural Assessment confirming that the foundation and tower are sufficient to support Sprint's proposed modifications.

For the foregoing reasons, Sprint respectfully submits that its proposed modifications to the existing tower located at the address referenced above constitute an exempt modification under RSCA §16-50j-72(b)(2).

Please do not hesitate to contact me at (214) 478-3516 or dtorres@goodmannetworks.com if you have any questions. Thank you for your consideration.

Respectfully,

David Torres
Goodman Networks

Attachments

Copy to:
Jack Scavone, Chair, Tolland Town Council

EBI Consulting
environmental | engineering | due diligence

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

Sprint Existing Facility

Site ID: CT03XC212

BANM Tower
497 Old Post Road
Tolland, CT 06084

**October 19, 2012**

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

EBI Consulting
environmental | engineering | due diligence

October 19, 2012

Sprint
Attn: RF Engineering Manager
1 International Boulevard, Suite 800
Mahwah, NJ 07495

Re: Emissions Values for Site: **CT03XC212 – BANM Tower**

EBI Consulting was directed to analyze the proposed upgrades to the existing Sprint facility located at 497 Old Post Road, Tolland, CT, for the purpose of determining whether the emissions from the proposed Sprint equipment upgrades 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 μW/cm2 calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the cellular band is approximately 567 $\mu W/cm^2$, and the general population exposure limit for the PCS band 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 upgrades to the existing Sprint Wireless antenna facility located at 497 Old Post Road, Tolland, CT, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario. Actual values seen from this site will be dramatically less than those shown in this report. 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 emissions were calculated using the following assumptions:

1) 3 CDMA Carriers (1900 MHz) were considered for each sector of the proposed installation.
2) 1 CDMA Carrier (850 MHz ) was considered for each sector of the proposed installation
3) 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.
4) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
5) The antenna used in this modeling is the APXVSPP18-C-A20. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.9 dBd gain value at its main lobe at 1900 MHz and 13.4 dBd at its main lobe for 850 MHz. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario.

6) The antenna mounting height centerline of the proposed antennas is **147 feet** above ground level (AGL)
7) 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.

All calculation were done with respect to uncontrolled / general public threshold limits

| Site ID | CT03XC212 - BANM Tower |
|---|---|
| Site Addresss | 497 Old Post Road, Tolland, CT, 06084 |
| Site Type | Guyed Tower |

**Sector 1**

| Antenna Number | Antenna Make | Antenna Model | Radio Type | Frequency Band | Technology | Power Out Per Channel (Watts) | Number of Channels | Composite Power | Antenna Gain in direction of sample point (dBd) | Antenna Height (ft) | analysis height | Antenna Height Meters | Cable Size | Cable Loss (dB) | Additional Loss | ERP | Power Density Value | Power Density Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1a | RFS | APXVSPP18-C-A20 | RRH | 1900 MHz | CDMA / LTE | 20 | 3 | 60 | 15.9 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 2080.4211 | 37.62002 | 3.76200% |
| 1a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 389.96892 | 7.051764 | 1.24370% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 5.006% | |

**Sector 2**

| Antenna Number | Antenna Make | Antenna Model | Radio Type | Frequency Band | Technology | Power Out Per Channel (Watts) | Number of Channels | Composite Power | Antenna Gain in direction of sample point (dBd) | Antenna Height (ft) | analysis height | Antenna Height Meters | Cable Size | Cable Loss (dB) | Additional Loss | ERP | Power Density Value | Power Density Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2a | RFS | APXVSPP18-C-A20 | RRH | 1900 MHz | CDMA / LTE | 20 | 3 | 60 | 15.9 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 2080.4211 | 37.62002 | 3.76200% |
| 2a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 389.96892 | 7.051764 | 1.24370% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 5.006% | |

**Sector 3**

| Antenna Number | Antenna Make | Antenna Model | Radio Type | Frequency Band | Technology | Power Out Per Channel (Watts) | Number of Channels | Composite Power | Antenna Gain in direction of sample point (dBd) | Antenna Height (ft) | analysis height | Antenna Height Meters | Cable Size | Cable Loss (dB) | Additional Loss | ERP | Power Density Value | Power Density Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3a | RFS | APXVSPP18-C-A20 | RRH | 1900 MHz | CDMA / LTE | 20 | 3 | 60 | 15.9 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 2080.4211 | 37.62002 | 3.76200% |
| 3a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 147 | 141 | 43 | 1/2 " | 0.5 | 0 | 389.96892 | 7.051764 | 1.24370% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 5.006% | |

| Site Composite MPE % | |
|---|---|
| Carrier | MPE % |
| Sprint | 15.017% |
| NE Paging | 0.540% |
| Hamden Commons | 3.310% |
| Conn Radio Rocky Hill | 4.810% |
| Air Touch | 0.630% |
| Verizon Wireless | 37.940% |
| Pocket | 5.150% |
| AT&T | 32.270% |
| **Total Site MPE %** | **99.667%** |

EBI Consulting
environmental | engineering | due diligence

## Summary

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

The anticipated Maximum Composite contributions from the Sprint facility are **15.017% (5.006%from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

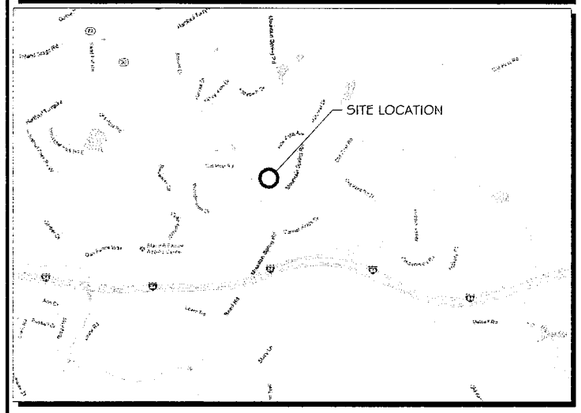
The anticipated composite MPE value for this site assuming all carriers present is **99.667%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions

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

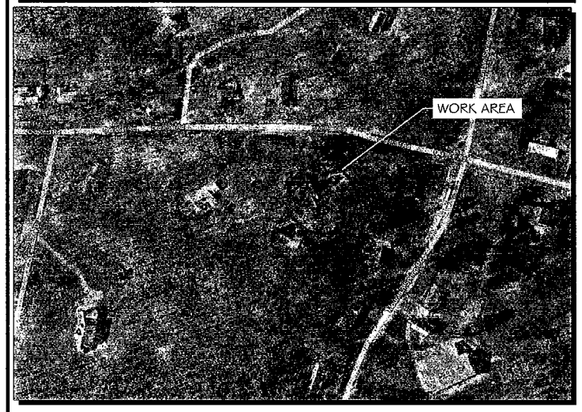
Scott Heffernan
RF Engineering Director

**EBI Consulting**
21 B Street
Burlington, MA 01803

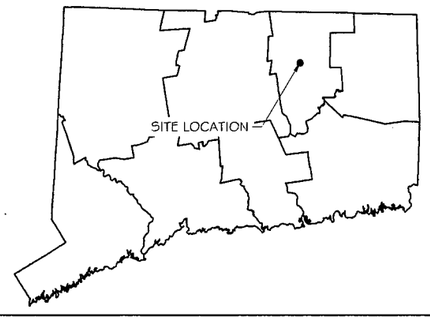
## VICINITY MAP




## AERIAL VIEW OF SITE




## GENERAL LOCATION




DRIVING DIRECTIONS:

I-91 NORTH TO I-84 EAST. TAKE EXIT 67 (ROUTE 31). TAKE A RIGHT OF THE EXIT AND GO 1/2 MILE AND TAKE A LEFT ONTO REED ROAD. GO APPROX 1 MILE AND GO OVER THE I-84 OVERPASS. TAKE A LEFT ONTO OLD POST ROAD. TAKE THE FIRST DRIVEWAY ON THE LEFT, NUMBER 497.

## CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL COVERING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

1. INTERNATIONAL BUILDING CODE 2009
2. ACCESSIBILITY CODE IBC 2009, CHAPTER 11 & ICC/ ANSI A117.1-2003
3. 2008 NATIONAL ELECTRIC CODE
4. FIRE/ LIFE SAFETY CODE- IFC 2009
5. ENERGY CODE IECC 2009

## PROJECT NOTES

1. THIS IS AN UNMANNED TELECOMMUNICATIONS FACILITY CONSISTING OF BTS EQUIPMENT AND ANTENNAS.
2. SIGNALS FROM THE ANTENNA SHALL NOT INTERFERE WITH ANY EXISTING COMMUNICATION SITES. ALL ITEMS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED.
3. THE PROPOSED ANTENNAS ARE ATTACHED TO EITHER BUILDING OR ANTENNA FRAME OR TO BOTH.
4. THE PROPOSED WORK WILL HAVE NO EFFECT ON STRUCTURAL STABILITY. ALL WORK SHALL BE PERFORMED IN STRICT ADHERENCE WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.
5. REFERENCE SPRINT STANDARD CONSTRUCTION SPECIFICATIONS FOR WIRELESS SITES FOR GENERAL REQUIREMENTS.
6. THIS IS AN UNMANNED FACILITY- NO SOLID WASTE. THE SITE WILL CREATE NO TRASH, THUS REQUIRES NO DUMPSTER.
7. EQUIPMENT IS UNMANNED AND NOT FOR HUMAN HABITATION. HANDICAP ACCESS IS THEREFORE NOT REQUIRED.
8. OWNER & TENANT MAY, FROM TIME TO TIME AT TENANT'S OPTION, REPLACE THIS EXHIBIT WITH AN EXHIBIT SETTING FORTH THE LEGAL DESCRIPTION OF THE SITE, OR WITH ENGINEERED OR AS-BUILT DRAWING DEPICTING THE SITE OR ILLUSTRATING STRUCTURAL MODIFICATIONS OR CONSTRUCTION PLANS OF THE SITE. ANY VISUAL OR TEXTUAL REPRESENTATION OF THE EQUIPMENT LOCATED WITHIN THE SITE CONTAINED IN THESE OTHER DOCUMENTS IS ILLUSTRATIVE ONLY, AND DOES NOT LIMIT THE RIGHTS OF SPRINT AS PROVIDED FOR IN THE AGREEMENT. THE LOCATIONS OF ANY ACCESS AND UTILITY EASEMENTS ARE ILLUSTRATIVE ONLY. ACTUAL LOCATIONS MAY BE DETERMINED BY TENANT AND/OR THE SERVICING UTILITY COMPANY IN COMPLIANCE WITH LOCAL LAWS AND REGULATIONS.

## PROJECT DESCRIPTION

APPLICANT PROPOSED TO INSTALL ANTENNAS AND WEATHERPROOF EQUIPMENT CABINETS FOR AN UNMANNED PERSONAL COMMUNICATIONS SYSTEM WIRELESS CALL SITE AT AN EXISTING TELECOMMUNICATIONS FACILITY. PROPOSED FACILITY IS NOT STAFFED AND IS VISITED ONCE A MONTH FOR MAINTENANCE PURPOSES ONLY; THEREFORE, SANITARY, SEWER, GAS, POTABLE WATER AND PLUMBING ARE NOT REQUIRED.

TO OBTAIN LOCATION OF PARTICIPANTS' UNDERGROUND FACILITIES BEFORE YOU DIG IN CONNECTICUT

**CALL BEFORE YOU DIG 811 OR 1-800-922-4455**

CONNECTICUT PUBLIC ACT 87-71 REQUIRES MIN. 2 WORKING DAYS NOTICE BEFORE YOU EXCAVATE.

DO NOT SCALE DRAWINGS:

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

## APPROVALS

CONSTRUCTION PROJECT MANAGER: _____

SITE ACQUISITION: _____

SPRINT REPRESENTATIVE: _____

RF ENGINEER: _____

LANDLORD/ OWNER: _____

# CONSTRUCTION DRAWINGS

Sprint®

BANM TOWER
CT03XC212

497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY
GUYED TOWER

## SHEET INDEX



## PROJECT INFORMATION

APPLICANT ID:

SITE NAME: BANM TOWER
SITE #: CT03XC212

PROPERTY LANDLORD:

OLD POST ROAD HOLDINGS, LLC
4564 BERSAGLIO STREET
LAS VEGAS, NV 89135

SITE ADDRESS:

497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY
ZONING CLASSIFICATION: R-2A RESIDENCE

SITE DATA:

LATITUDE: 41°-51'-38.52" N (41.8607°)
LONGITUDE: 72°-24'-12.29" W (-72.4034°)
GROUND ELEVATION: 915 FT AMSL

POWER COMPANY:

CONNECTICUT LIGHT & POWER
PH.: (800) 286-2000

TELEPHONE COMPANY:

AT&T
PH.: (800) 288-2020

HOSPITAL

ROCKVILLE GENERAL HOSPITAL
31 UNION STREET
VERNON ROCKVILLE, CT 06066
PH.:(860) 872-0501

FIRE HOUSE

VERNON FIRE DEPARTMENT STATION 4
30 NYE STREET
VERNON ROCKVILLE, CT 06066
PH.: (860) 875-2543

APPLICANT:

SPRINT
6391 SPRINT PARKWAY
OVERLAND PARK, KS 66251

PLANS PREPARED BY:

RAMAKER & ASSOCIATES, INC.
1120 DALLAS STREET
SAUK CITY, WI 53583
CONTACT: KEITH BOHNSACK, P.E., PROJECT MANAGER
PH.: (608) 643-4100
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6391 Sprint Parkway
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RAMAKER & ASSOCIATES, INC.
1120 Dallas Street, Sauk City, WI 53583
Phone: 608-643-4100 Fax: 608-643-7999
www.Ramaker.com


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MMBTS LAUNCH
NORTHERN CT MARKET

Certification & Seal:

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 26265 LICENSED PROFESSIONAL ENGINEER

Signature: _____ Date: 1/08/2013

| MARK | DATE | DESCRIPTION |
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| | | |
| | | |
| C | 1/08/13 | FINAL CD'S ISSUED |
| B | 10/26/12 | FINAL PRELIM CD'S |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL — DATE ISSUED: 01/08/2013

PROJECT TITLE:

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TOLLAND, CT 06084
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SHEET TITLE:

TITLE SHEET

SCALE: NONE

PROJECT NUMBER: 23002

SHEET NUMBER: T-1

CHECKED BY: KAB
DRAWN BY: KJG

**DIVISION 1 - GENERAL REQUIREMENTS**

**SECTION 01100 - SCOPE OF WORK**

**PART 1 - GENERAL**

1.1 THE WORK: These Standard Construction Specifications in conjunction with the other Contract Documents and the Construction Drawings describe the Work to be performed by the Contractor.

1.3 PRECEDENCE: Should conflicts occur between the Standard Construction Specifications for Wireless Sites including the Standard Construction Details for Wireless Sites and the Construction Drawings, information on the Construction Drawings shall take precedence. Notify Company designated representative of conflicts prior to construction.

1.4 NATIONALLY RECOGNIZED CODES AND STANDARDS:

A. The Work shall comply with applicable national codes and standards, latest edition, and portions thereof, included but not limited to the following:

1. GR-63-CORE NEBS Requirements: Physical Protection
2. GR-78-CORE Generic Requirements for the Physical Design and Manufacture of Telecommunications Equipment.
3. National Fire Protection Association Codes and Standards (NFPA) including NFPA 70 (National Electrical Code - "NEC") and NFPA 101 (Life Safety Code).
4. American Society for Testing of Materials (ASTM)
5. Institute of Electronic and Electrical Engineers (IEEE)
6. American Concrete Institute (ACI)
7. American Wire Producers Association (AWPA)
8. Concrete Reinforcing Steel Institute (CRSI)
9. American Association of State Highway and Transportation Officials (AASHTO)
10. Portland Cement Association (PCA)
11. National Concrete Masonry Association (NCMA)
12. Brick Industry Association (BIA)
13. American Welding Society (AWS)
14. National Roofing Contractors Association (NRCA)
15. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
16. Door and Hardware Institute (DHI)
17. Occupational Safety and Health Act (OSHA)
18. Applicable building codes including Uniform Building Code, Southern Building Code, BOCA, and the International Building Code.

**SECTION 01300 - CELL SITE CONSTRUCTION**

3.1 GENERAL REQUIREMENTS FOR CIVIL CONSTRUCTION:

A. Contractor shall keep the site free from accumulating waste material, debris, and trash. At the completion of the work, Contractor shall remove from the site all remaining rubbish, implements, temporary facilities, and surplus materials.

B. Equipment rooms shall at all times be maintained "broom clean" and clear of debris.

C. Contractor shall take all reasonable precautions to discover and locate any Hazardous Condition.

1. In the event Contractor encounters any hazardous condition which has not been abated or otherwise mitigated, Contractor and all other persons shall immediately stop Work in the affected area and notify Company in writing. The Work in the affected area shall not be resumed except by written notification by Company.
2. Contractor agrees to use care while on the Site and shall not take any action that will or may result in or cause the hazardous condition to be further released in the environment, or to further expose individuals to the hazard.

D. Contractor's activities shall be restricted to the project limits. Should areas outside the project limits be affected by Contractor's activities, Contractor shall immediately return them to original condition

E. Conduct testing as required herein.

**DIVISION 2 - SITE CONSTRUCTION**

**SECTION 02300 - EARTHWORK**

**PART 3 - EXECUTION**

3.4 TRENCHING AND BACKFILLING: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the Construction Drawings or as otherwise specified.

A. Protection of Existing Utilities: The Contractor shall check with the local utilities and the respective utility locator companies prior to starting excavation operations in each respective area to ascertain the locations of known utility lines. The locations, number and types of existing utility lines detailed on the Construction Drawings are approximate and do not represent exact information. The Contractor shall be responsible for repairing all lines damaged during excavation and all associated operations. All utility lines uncovered during the excavation operations, shall be protected from damage during excavation and associated operations. All repairs shall be approved by the utility company.

B. Hand Digging: Unless approved in writing otherwise, all digging within an existing cell site compound is to be done by hand.

C. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and disposed of at the Contractor's expense.

D. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved method.

E. Sheeting and shoring shall be done as necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut, except that short sections of a trench may be tunneled if, the conduit can be safely and properly installed and backfill can be properly tamped in such tunnel sections. Earth excavation shall comprise all materials and shall include clay, silt, sand, muck, gravel, hardpan, loose shale, and loose stone.

F. Trenches shall be of necessary width for the proper laying of the conduit or cable, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the conduit or cable on undisturbed soil at every point along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are necessary, the rock shall be excavated to a minimum over depth of 6 inches below the trench depths indicated on the Construction Drawings or specified. Over depths in the rock excavation and unauthorized over depths shall be thoroughly back filled and tamped to the appropriate grade. Whenever wet or otherwise unstable soil that is incapable of properly supporting the conduit or cable is encountered in the bottom of the trench, such solid shall be removed to a minimum over depth of 6 inches and the trench backfilled to the proper grade with earth of other suitable material, as hereinafter specified.

G. Backfilling of Trenches. Trenches shall not be backfilled until all specified tests have been performed and accepted. Where compacted backfill is not indicated the trenches shall be carefully backfilled with select material such as excavated soils that are free of roots, sod, rubbish or stones, deposited in 6 inch layers and thoroughly and carefully rammed until the conduit or cable has a cover of not less than 1 foot. The remainder of the backfill material shall be granular in nature and shall not contain roots, sod, rubbing, or stones of 2-1/2 inch maximum dimension. Backfill shall be carefully placed in the trench and in 1 foot layers and each layer tamped. Settling the backfill with water will be permitted. The surface shall be graded to a reasonable uniformity and the mounding over the trenches left in a uniform and neat condition.

H. Except as otherwise required, compacted backfill shall be used under concrete pads, walkways, concrete paving, and asphalt concrete paving. The first 1 foot cover shall be of select materials such as excavated soils that are free of roots, sod, rubbish, or stones. The Company may reject any onsite or borrow materials which are considered unsuitable for the intended use of the fill.

I. All fills shall be compacted to a dry density equal to at least 90 percent of the maximum dry density determined in accordance with ASTM D1557. The maximum density and optimum moisture content shall be determined by the Contractor on basis of laboratory tests conducted on the materials used in the fill.

J. Adequacy of compaction shall be determined on the basis of in-place density determinations that shall be conducted by the Contractor while the fills are being placed. The results of these tests shall be the basis on which satisfactory completion of the work is judged. If the fills fail to meet the specified densities, the Contractor shall remove and recompact the soils until the specified densities are achieved.

3.6 REMOVAL OF WATER: The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations and other parts of the work. Each excavation shall be kept dry during sub-grade preparation and continually thereafter until the construction to be provided therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result. Ground water level shall be maintained at least 12 inches below the bottom of each excavation. Removal of water shall be in accordance with all state, federal, and local regulations. Contractor shall submit water removal plan to the Company.

3.10 UNAUTHORIZED EXCAVATION: Except where otherwise authorized, indicated, or specified, all material excavated below the bottom of concrete structures which will be supported by the sub-grade shall be replaced with concrete placed monolithic with the concrete above. Material excavated below structures supported on piers shall be replaced with approved material. The material shall be compacted to a density equal to or greater than the density of the adjacent undisturbed soil.

3.11 STRUCTURE EXCAVATION: Excavation for structures shall be done to lines and elevations indicated on the Construction Drawings and to the limits required to perform the construction work.

A. Excavated materials free of trash, rocks, roots, and other foreign materials, and which meet the specified requirements, may be used as required for the fills, embankments, and backfills constructed under these specifications.

3.12 STABILIZATION: Sub-grades for structures and the bottom of trenches shall be firm, dense, and thoroughly compacted.

A. Trench sub-grades which run beneath roads, or pass through structural backfill, shall be compacted to 95 percent of maximum density as determined by ASTM D1557.

B. Sub-grades for structures and trench bottoms which are otherwise solid, but which become soft on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel.

3.13 STRUCTURE BACKFILL: Backfill around and outside of structures shall be deposited in layers not to exceed 6 inches in uncompacted thickness and mechanically compacted, using acceptable compaction techniques, to at least 95 percent of maximum density as determined by ASTM D1557, with a moisture content of plus or minus 3 percent of optimum, as determined by ASTM D698 when that test is appropriate, or to 70 percent relative density as determined by ASTM D4253 and D4254 when those tests are appropriate. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

A. Material for structure backfill shall be composed of earth only and shall contain no wood, grass, roots, broken concrete, stones, trash, or debris of any kind.

B. No backfill shall be deposited or compacted in water.

C. All backfill material shall consist of loose earth having a moisture content such that the required density of the compacted soil will be obtained with the compaction method used. Moisture content shall be distributed uniformly, and water for correction of moisture content shall be added sufficiently in advance so proper moisture distribution and compaction will be obtained. Granular material shall be wet, not just damp, when compacted.

D. Particular care shall be taken to compact structure backfill which will be beneath pipes, drives, roads, or other surface construction or structures. In addition, wherever a trench will pass through structure backfill, the structure backfill shall be placed and compacted to an elevation at least 12 inches above the top of the pipe before the trench is excavated.

3.18 DISPOSITION OF MATERIALS: Excess excavated earth and construction material shall be removed from the job site and legally disposed of by the Contractor.

**DIVISION 3 - CONCRETE**

**SECTION 03300 - CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

Contact engineer or construction manager for complete concrete specifications if such work is required.

**SECTION 03600 - GROUT**

**PART 1- GENERAL**

Contact engineer or construction manager for complete grout specifications if such work is required.

**DIVISION 5 - METALS**

**SECTION 05120 - ICE BRIDGE AND OTHER STRUCTURAL STEEL**

**PART 2 - PRODUCTS**

2.1 ICE BRIDGE MATERIALS:

A. Ice Bridge posts shall be fabricated of 3-inch schedule 40 galvanized steel, ASTM A-53, Grade B (seamless). Posts shall be installed a minimum of 3 feet 6 inches below finish grade and backfilled with 3000 p.s.i concrete. Post tops shall be capped with steel pipe caps. Maximum horizontal separation between posts shall be 8 feet on center.

B. Ice Bridge material shall be McNichols "Grip Strut" 10 diamond plank, 24 inches wide and 3 inches deep; part number 103014 or approved equal.

C. Ice Bridge components shall be hot dip galvanized and connected in an electrically continuous fashion per the manufacturer's recommendations. Any site penetrations or saw cuts to galvanized metal shall be treated with two coats of a zinc rich cold galvanizing paint as per ASTM A 780 standards.

2.2 STRUCTURAL STEEL MATERIALS: Conform to the latest edition of applicable standards and to all applicable codes and requirements of local authorities having jurisdiction, whichever is more stringent. All structural steel shall be in accordance with the latest applicable requirements of AISC, ASTM, ACI, CRSI, AWS and all other applicable standards.

2.3 All steel shall be galvanized in accordance with ASTM A36 unless noted on the construction drawings.

2.4 Rolled steel shapes, plates and bars shall be no less than 3/16 inches in thickness and shall comply with ASTM A-36 as a minimum.

2.5 Steel pipe shall comply with ASTM A-501 or ASTM A-53, Type E or S, Grade B. A-500 Grade B steel may be substituted.

2.6 Steel tube shall comply with ASTM A-500, Grade B.

2.7 Galvanized steel grating shall be a minimum 3/4 inch x 1/8 inch at 3 /16 inches on center.

2.8 Galvanized checkered plate shall be a minimum 3/16 inch.

**PART 3 - EXECUTION**

3.1 ICE BRIDGE:

A. The Contractor is responsible for installing an Ice Bridge and support posts between the BTS radio equipment and the tower. At no point shall the Ice Bridge structure be mechanically connected to the tower. Cabling supports shall be designed to accept snap-in type hangers and accommodate a minimum coax or waveguide bending radius of 20 inches.

B. Each tier shall be vertically and horizontally aligned with the cable entry ports on the shelter consisting of three tiers capable of holding 5 runs of 1-5/8 inch coaxial cable each for a total of 15 coaxial cables. The cover shall be aligned to allow for easy access to the cabling and be of sufficient width and durability to prevent damage to the cable that might otherwise be caused by falling ice, bolts, nuts or hand tools. The entire structure, including cover, shall be sufficiently rigid to prevent cable damage caused by movement of the structure. Cover shall continue to within 2 inches of shelter wall and waveguide ladder.

C. Provision shall be made to ground the Ice Bridge structure as specified in Division 16.

3.2 STRUCTURAL STEEL FABRICATION: All shop fabrication and assembly of structural steel shall be in accordance with AISC specifications and as indicated on the approved shop drawings. All materials shall be properly marked for field assembly and for identification as to the location for which it is intended. Materials shall be fabricated and delivered in an order to expedite erection and minimize field handling of materials.

3.3 WELDING:

A. Welding shall be performed by a certified welder and shall conform to requirements for shielded metal arc welding of the Standard Code for Arc and Gas Welding of the American Welding Society (AWS D1.1)

B. Electrodes shall comply with AWS Code and shall be classified E-70 electrodes as a minimum. Where finishing is required, complete the assembly, including welding of units, before the start of finishing operations. Provide finish surfaces of exposed members that are free from markings, burrs and other defects.

C. Welded construction shall comply with AWS Code for procedures, appearance and quality of welds and methods used in correcting welded work. Assemble and weld built-up sections by methods that will produce correct dimensions without warp.

3.4 CONNECTIONS:

A. Contractor shall provide all hardware required to complete field erection of structure as indicated by Contract Documents or these specifications.

B. High strength threaded fasteners shall be installed in accordance with AISC Specifications for Structural Joints Using ASTM A-325 or A-490 Bolts. Use A-325N bearing-type connection bolts unless noted otherwise.

C. Grating and plates shall be fastened with saddle clips. The necessary holes to complete all phases of construction shall be provided and called out on the approved shop drawings. All holes shall be drilled or punched perpendicular to metal surfaces, flame cut or burned holes will not be permitted.

D. All unfinished threaded fasteners shall comply with ASTM A-307, Grade A, regular low-carbon steel bolts and nuts with hexagonal heads.

E. All high strength threaded fasteners shall be heavy hexagonal bolts and nuts with hardened washers, all from quenched and tempered medium carbon steel complying with ASTM A-325.

3.5 REPAIR: Repair all damaged galvanized steel with "Galvanox," "Dry Galv," or "Zinc-It.", or approved equal, per the manufacturer's instructions.

**SECTION 07500 - ROOF CUTTING, PATCHING AND REPAIR**

**PART 1 - GENERAL**

1.4 SUBMITTALS:

A. Pre-Construction Roof Condition Analysis Reports: Complete a roof inspection and report prior to the installation of Sprint equipment on any rooftop build requiring roof penetration. At a minimum inspect all areas impacted by the addition of the Sprint equipment.

Roof inspection reports should be uploaded into SMS using task # 234.

B. New Roofing Material Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

C. Shop Drawings: Provide large scale shop drawings for installation of all parts of the work. Provide plans. and details of seams, connections and accessory items. Show layouts of tapered insulation and locations of drains. Show interfaces and relationships to work of other trades.

D. Certification and Warranty:

1. Upon completion of work of this Section, submit certification by existing roof manufacturer acknowledging that all work performed is acceptable and that the entire roof remains under warranty.
2. Maintain existing warranty if applicable. Take no action which would void existing warranty.

**PART 2 - PRODUCTS**

2.1 MATERIALS:

A. Existing Roof Materials and Compatibility: Furnish specific product acceptable to manufacturer of roofing membrane which will not compromise the roofing manufacturer's warranty.

B. Substrate Board: Glass-mat, water-resistant gypsum ASTM C 1177 or match existing.

C. Vapor Retarder: Match existing.

D. Insulation: Extruded polystyrene board insulation, or match existing.

E. Tapered Insulation: Fabricated to provide proper drainage.

F. Recovery Board over Insulation: Match existing, mechanically fastened.

G. Membrane and Flashing: Match existing.

H. Sheet Metal Accessories: Follow SMACNA and NRCA recommendations. Materials and finishes to match existing.

I. Ballast: Match existing.

J. Walkway Protection Board: Compatible with membrane.

**PART 3 - EXECUTION**

3.1 INSTALLATION:

A. Inspect substrate and report unsatisfactory conditions in writing. Beginning work on site means Contractor's acceptance of existing roof conditions.

B. Comply with roof system manufacturer's instructions and recommendations on any penetrations, repairs, etc.

C. Install insulation with tightly butted joints and neatly fitted around penetrations.

D. Where applicable, distribute ballast uniformly to 10 pounds per square foot or more as required by Factory Mutual. Obtain approval of ballast weight from the building owner before loading roof.

E. Install walkway protection over an additional layer of membrane at locations indicated and where required to provide access to roof mounted equipment.

F. Restore or replace damaged components. Protect work from damage.

**SECTION 07840 - FIRESTOPPING**

**PART 1 - GENERAL**

1.5 QUALITY ASSURANCE:

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Fire Performance: ASTM E 119, ASTM E 814, and local regulations.

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Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 20286 LICENSED PROFESSIONAL ENGINEER

James R. Skowronski 1/08/2013
Signature: Date:

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TOLLAND COUNTY

SHEET TITLE:
SPECIFICATIONS

SCALE: NONE

PROJECT NUMBER: 23002
SHEET NUMBER: SP-1



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**SECTION 09910 - PAINTING**

**PART 2 - PRODUCTS**

**2.1** MATERIALS:

**A.** Manufacturers: Benjamin Moore, ICI Devoe Coatings, PPG, Sherwin Williams or approved equal. Provide premium grade, professional-quality products for coating systems.

**B.** PAINT SCHEDULE:

1. Interior Gypsum Drywall Walls and Ceilings: One coat latex primer plus two coats latex eggshell finish.
2. Exterior and Interior Steel Doors, Frames and Ferrous Metals: One coat rust-inhibiting primer, plus two coats alkyd enamel semi-gloss finish.
3. Exterior Antennae: One coat of primer and two finish coats. Paint for antennae shall be non-metallic based and contain no metallic particles. Submit MSDS sheet to the Owner for approval. Provide colors and patterns as required to mask appearance of antennae on adjacent building surfaces and as acceptable to the Owner. Refer to antenna manufacturer's instructions whenever possible.

**SECTION 11007 - ANTENNA ASSEMBLY AND INSTALLATION**

**PART 2 - PRODUCTS**

**2.1** MATERIALS: Panel and Microwave Antennas: Refer to the Drawings for types and quantities. The following paragraphs outline the materials used for an Omni site and a sectored site.

**B.** Sectored Site:

1. ESMR (Enhanced Specialized Mobile Radio) Panels: Located per project requirements.
2. Microwave: High performance type, located per project requirements.
3. GPS: Located on the south side of obstructions.

**C.** Antenna Mounts:

1. Ballast mounts for rooftop applications shall be Valmont/Microflect No. 31-99540 (12 foot separation) or approved equal.
2. Facade-mounted antennas shall comply with site-specific mounting requirements indicated on the Drawings.

**D.** Surge Arrestors:

1. Refer to the drawings for types and quantities. All surge arrestors shall be models that are approved by the Company before installation.
2. All surge arrestors for ESMR antennas shall terminate in 7/16 DIN connectors with MALE connectors toward the antenna and FEMALE toward equipment.
3. All surge arrestors for GPS and microwave antennas shall be Type N with MALE connectors toward the antenna and FEMALE toward equipment.
4. Surge arrestors shall be mounted on a trapeze or other grounding arrangement to ensure that surge currents are properly grounded.

**E.** Cross-Band Couplers: Refer to drawings for types and quantities. All couplers shall be models that are approved by the Company before installation.

**F.** Tower-Mounted Amplifiers (TMA or TTA): Refer to drawings for types, quantities, and mounting methods. All tower-mounted amplifiers shall be models that are approved by the Company before installation.

**G.** Low Noise Amplifiers (LNA): Refer to drawings for types, quantities, and mounting methods. All LNAs amplifiers shall be models that are approved by the Company before installation.

**H.** Connect antenna, coax, GPS, etc. to grounding system as indicated on the site plans and as indicated in Division 16.

**PART 3 - EXECUTION**

**3.4** ANTENNA INSTALLATION:

**A.** The Contractor shall assemble all antennas onsite in accordance with the instructions supplied by the manufacturer. Antenna height, azimuth, and feed orientation information shall be a designated on the Construction Drawings. Azimuth delineation will be determined by appropriate RF Engineer.

**B.** Remote tilt antenna assemblies are to be completely assembled on the ground, run through their full range of motion using the controller and full cable assembly before being placed on the tower. Once installed, they are to be run through this process again prior to the tower crew leaving the site.

**C.** The serial numbers, azimuths, and downtilts are to be recorded and the information left on site for the RF and start up crew to use at the time of hand over to Field Operations.

**D.** The Contractor shall install all antennas and side struts in accordance with the Construction Drawings and the manufacturer's recommendations.

**E.** The Contractor shall position the antenna on tower pipe mounts so that the bottom strut is level. The pipe mounts shall be plumb.

**F.** Antenna Mounting Requirements: Refer to the Job Specifications for site specific antenna mounting details such as radiation centerlines, azimuths and antenna mount designs. Provide U-bolts and brackets to fasten antennas to side arms on pipe mounts. All mounts and mounting hardware shall be hot dipped galvanized or stainless steel material. All antenna installations shall conform to the following specifications.

1. Panel Antennas: Panel antennas shall be fastened to the vertical pipe mounts on the sector head frame supplied with the tower. Adjust pipe mounts, as necessary, on the sector headframe to provide 12 feet of horizontal separation between the outer most panel antennas unless otherwise specified. If necessary, raise or lower the headframe to achieve the correct radiation centerline as per the Drawings.

**G.** Ballast Mounts: Install ballast mounts in accordance with manufacturer's specifications and per the Construction Drawings and Details.

**H.** All unused antenna ports shall be terminated with a terminating load.

**I.** GPS antennas shall be installed at a location identified on the construction drawings. Effort should be made to locate GPS antennas on either the shelter or the ice bridge.

**3.5** Coaxial Cables and Waveguide Installation:

**A.** The Contractor shall route, test, and install all coaxial cables as indicated on the Construction Drawings and in accordance with the manufacturer's recommendations.

**B.** The routing of the coax shall be checked for interference with other tower appurtenances before installation and vertical waveguide/coax hangers shall be installed on the tower waveguide ladder.

**C.** The coax shall be hoisted, connected to the antenna feed, secured to the hangers, and oriented to provide the correct entrance plane to the equipment cabinet. The waveguide/coax shall then be cut to the appropriate length to reach the equipment.

**D.** The waveguide/coax shall be grounded in accordance with the Construction Drawings and the Company grounding specifications Division 16.

**E.** The waveguide/coax shall be routed in accordance with the structural requirements. If possible, coax shall be routed on the inside of monopoles or down the waveguide ladder in a manner that will prevent obstruction of the climbing ladder. Additionally, the waveguide/coax shall be positioned in the best possible location to protect it from damage. The bending radius of the coax shall not be less than the manufacturer's specifications.

**F.** Extreme care shall be taken to avoid damage to the waveguide/coax during handling and installation. The Company will furnish to the Contractor port assignments, if applicable, prior to waveguide installation.

1. Waveguide Ladder (Lattice towers only: Waveguide ladders shall be used to support all coaxial cable, microwave waveguide cable and any baseband cable on the tower). One ladder, 18 cables wide, shall be mounted on the tower per the tower structural requirements. The rungs on the waveguide ladders shall be spaced a maximum of 4 feet apart.
2. Ice Bridge: An Ice Bridge will be installed between the tower and the shelter to support all cabling. Use stainless steel snap-in type hangers to support cables on the Ice Bridge. Provide a drip loop in all cabling between the base of the tower and the Ice Bridge. Install in accordance with manufacturer's specifications.
3. Fastening Cables: Waveguide and coaxial cable lines shall be raised on the tower using properly sized split type, lace-up hoisting socks attached to each cable every 200ft. All cables shall be permanently fastened to the tower using a hoisting sock at the top of the tower. Use stainless steel snap in type cable hangers at each wave guide ladder rung (on lattice towers only). Do not drill holes in tower members, use angle member adapters and stainless steel butterfly clips, to attach cabling to tower. Make sure that there is no strain on any cable connector due to the cable weight.
4. Jumpers: Jumpers between the feed lines and antennas or tower top amplifiers shall consist of 1/2 inch foam dielectric, outdoor rated coaxial cable. Do not use Superflex outdoors. Secure jumpers to the side arms or head frames using stainless steel tie wraps or stainless steel butterfly clips. Be certain that there is no strain on any connector due to the weight of the jumper cable, or its method of installation.
5. Bending Radius: Cables shall not exceed the minimum bending radius as determined by the cable manufacturer.
6. Cable Installation:
   a. Inspect cable prior to use for shipping damage, notify the Company Representative of any damage. Any cable ends cut shall be covered to protect them from weather and entry of foreign matter. If using bulk cable, field attach antenna connector before hoisting cable.
   b. Cable Routing: Cable installation shall be planned to ensure that the lines will be properly routed in a neat and orderly manner. Avoid twisting and crossovers in the building, along the tower face, and waveguide raceways. Secure cable at maximum spacing of 4 feet on center making sure that the cable weight is equally distributed and no strain is placed on connectors or antennas.
   c. Hoist cable using proper hoisting grips. Hoist slowly and carefully. Prevent kinking and snags when around tower members. Bend cable slowly at the maximum practical bend radius consistent with good installation practice. Avoid using minimum cable bends.
7. Termination at Shelter and Entry Plate:
   a. All cabling shall enter the building through the waveguide entry plate and be properly weather sealed with a cable boot fabricated for the size of the cable. Cable boots are not to be cut to fit in the field. Coaxial cables shall be terminated within 18 inches inside the shelter and fitted with a surge suppressor.
   b. Coax Port Assignments for Shelter Sites: The coax will be installed and marked per the Antenna Transmission Line Acceptance Standards and the Detail - Coax Port Assignments.
8. Grounding of transmission lines: All transmission lines shall be grounded in accordance with the Company grounding standards.
9. Labeling Coaxial Cables: All cables shall be marked with 2 inch UV resistant colored tape and stencil tagged per the latest version of the RF Antenna Transmission Line Acceptance Standards. All coaxial cables shall be at the top, bottom, both sides of the entry port and all locations where the cable penetrates a wall, ceiling or floor. Antenna locations should be determined from the reference point of standing in the center of the tower looking out. Labeling should be adherent with industry standard for T1 transmit and receive.
10. Cable Connections:
    a. Use only cable connectors recommended by the cable manufacturer.
    b. Connectors for all main station antenna cables shall be 7/16 DIN.
    c. Connectors for GPS antennas shall be Type N.
    d. Connectors for microwave antennas, unless otherwise noted, shall be Type N.
    e. Install and tighten connectors per manufacturer's instructions.
    f. All exterior connectors. connector splices, jumpers, ground kits, etc., shall be weatherproofed using connector/splice weather proofing kits. Weatherproofing shall be installed in strict accordance with manufacturer's instructions.

**3.6** WEATHERPROOFING CONNECTORS AND GROUND KITS:

**A.** All connectors and ground kits shall be weatherproofed using butyl rubber weatherproofing and tape. This installation must be done in accordance with the manufacturer's recommendation or as shown on the construction drawings (whichever is greater). If no direction is provided, weatherproofing must be done per Sprint Standard Construction Specification for Wireless Sites Section 11007-3.6 A-D.

**SECTION 11008 - BASE TRANSCEIVER STATIONS (BTS) AND RELATED EQUIPMENT INSTALLATION**

**PART 3 - EXECUTION**

3.1 GENERAL: The Contractor shall install the BTS and associated equipment at the locations shown on the Construction Drawings and in accordance with the manufacturer's recommendations. Minimum requirements for performance of the work are:

A. Contractor shall be responsible for all services associated with the delivery, bolt-down and installation of Sprint Nextel's radio equipment.

B. Equipment installation procedures shall fully comply and strictly adhere to original equipment manufacturer's installation instructions. Contractor shall immediately cease any work if inconsistencies are found between Sprint Nextel Standards and the manufacturer's documentation. Contractor shall seek guidance from Sprint Nextel or its designated project representative for resolution.

C. Contractor shall provide a fully functioning and operable radio system at the wireless facility. Contractor shall complete and provide all documentation of the Work.

**3.1** CONTRACTOR PROVIDED MATERIAL: Contractor shall obtain by any means necessary the original equipment manufacturer specifications and strictly adhere to them. Contractor shall provide all required tools. test equipment, materials, labor, and equipment including anchor kits and external mounting hardware for positioning and securing final bolt-down of the radio equipment. Contractor shall furnish all necessary grounding products to successfully bond the radio equipment to the site ground ring or shelter grounding system in accordance with the construction drawings.

**3.2** WORK SCHEDULING: Contractor shall provide and coordinate scheduling of licensed electrician qualified to perform the work of connecting the power and grounding to the radio equipment along with any other connections or installations of radio equipment requiring a licensed electrician per the manufacturer specifications.

**3.3** MISC WORKS:

A. Contractor shall remove radio equipment from crates, wrapping, or pallets and properly dispose of all packaging materials. Contractor shall verify the proper radio equipment is being installed at the correct site. The equipment is assigned a site specific asset number and must be installed at the designated location.

B. Contractor shall measure equipment platform, pad, interior space or shelter space and verify exact equipment layout in accordance with the construction drawings and set the radio equipment accordingly. Contractor shall set equipment cabinets and racks in the locations indicated on the construction drawings or as otherwise directed by Sprint Nextel or its designated project representative in writing.

C. Contractor shall install batteries, rectifiers, additional RF carriers, EV-DO cards, amplifiers, circuit packs, and all other radio equipment for the site as required by the manufacturer specifications.

D. Contractor shall ensure GPS is installed and ready for connection to the BTS. Contractor shall install or coordinate for the installation of the Global Positioning System (GPS) antenna via the construction contractor and as specified by the manufacturer as applicable.

E. Contractor shall procure and install:

1. DC wiring with conduit or cable tray as indicated between power supply cabinets and radio cabinets as shown on the Construction Drawings.
2. AC wiring from Load center to power supply or radio cabinet in conduit or cable tray as indicated in the manufacturer specifications.
3. Circuit breakers in spare sockets in the Load Center as indicated in the manufacturer specifications.
4. Alarm cabling from radio equipment to telco alarm terminal strip in conduit or cable tray. Contractor shall be responsible to extend conduit or cable tray as necessary to successfully complete the work.
5. T1 and alarm cables extending conduit or cable tray as necessary to successfully complete the work.
6. Jumpers from the coax main line feeds to the radio equipment. Contractor is to perform Sweep testing of lines or coordinate with construction contractor to perform this activity.

F. Contractor shall energize the equipment according to manufacturer specifications and conduct functionality tests of the AC and DC power systems correcting any deficiencies in the work as applicable.

**DIVISION 16 - ELECTRICAL**

**SECTION 16000 - BASIC ELECTRICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.4** CODES AND STANDARDS:

**A.** The codes and standards referenced in Division 16 shall be the most current revision, regardless of the actual year indicated hereinafter, except as otherwise required by Division 1.

**B.** The entire electrical installation shall comply fully with the requirements of all authorities having jurisdiction.

**C.** The Work shall comply with applicable requirements of the following:

1. U.S. National Electrical Code (NEC),
2. U.S. National Fire Protection Association (NFPA) codes and standards,
3. U.S. Occupational Safety and Health Act (OSHA),
4. Other Codes and Standards as referenced in the individual technical sections of Division 16.

**PART 2 - PRODUCTS**

**2.1** MATERIALS AND EQUIPMENT: All materials and equipment specified in Division 16 of the same type shall be of the same manufacturer and shall be new, of the best quality and design, and free from defects.

**2.2** FIRESTOPPING MATERIAL:

**A.** Firestopping Material: Subject to compliance with requirements, Provide one or more of the following:

1. Spec Seal PEN 300 Sealant by STI
2. Spec Seal "Type SSP100" Firestop Mastic/Putty by STI
3. Spec Seal "Type SSB" Firestop Pillows by STI
4. Similar products by Nelson or 3M

**PART 3 - EXECUTION**

**3.3** INSTALLATION:

**A.** Verify all dimensions by field measurements.

**B.** Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to the closing of a structure.

**C.** All cutting and channeling shall be accomplished in a neat and workmanlike manner, without the removal of excess materials. Contractor shall patch, replace and repair all cut and channeled areas with material similar to adjacent construction.

**D.** Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.

**E.** Coordinate location of all equipment, boards. lights, outlets, switches, boxes, conduits, electrical trays with other services and utilities. Locate all equipment, fixtures and conduits to clear windows, door openings and other services and utilities. Route conduits so as to clear valves and other similar obstructions requiring access. Follow manufacturer's recommendations for installation methods not otherwise specified.

**F.** Equipment shall be installed at locations shown on the drawings. Any changes to locations of installed equipment, facilities, or other appurtenances shall be noted as "Red-Lines" and submitted with "As-Built" package upon project completion. All changes require appropriate Project Manager pre-approval

**G.** Working spaces and accessibility shall not be less than specified in the National Electrical Code for all voltages and equipment specified.

**3.4** FIRESTOPPING: Apply firestopping material as recommended by the manufacturer to maintain the fire resistance rating of the barrier being penetrated. Utilize suitable templates or dams to properly retain material in large openings.

**3.5** SUPPORTING DEVICES:

**A.** Install supporting devices to fasten electrical components securely and permanently in accordance with NEC.

**B.** Coordinate with the building structural system and with other trades.

**C.** Raceway supports shall conform to the manufacturer's recommendations for selection and installation of supports.

**D.** The strength of each support shall be adequate to carry the present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 pounds, provide additional strength until there is a minimum of 200 pounds safety allowance in the strength of each support.

**E.** Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support the raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

**F.** Support parallel runs of horizontal raceways together on trapeze-type hangers.

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www.Ramaker.com

NETWORK VISION
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NORTHERN CT MARKET

Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 23265 LICENSED PROFESSIONAL ENGINEER

Signature: James R. Skowronski Date: 1/08/2013

| MARK | DATE | DESCRIPTION |
|---|---|---|
| C | 1/08/13 | FINAL CD'S ISSUED |
| B | 10/26/12 | FINAL PRELIM CD'S |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL DATE ISSUED: 01/08/2013

PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

SHEET TITLE:
SPECIFICATIONS

SCALE: NONE

PROJECT NUMBER: 23002
SHEET NUMBER: SP-2

DRAWN BY: KJG CHECKED BY: KAB

G. Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers and other devices.

H. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with a listed type of fastener not more than 24" (600 mm) from the box.

I. Install conduit sealing fittings for conduit penetrations of concrete wall exterior or below grade as specified or required by code.

J. Unless otherwise indicated on the drawings, fasten electrical items and their supporting hardware securely to the structure in accordance with the following:

1. Fasten by means of wood screws on wood,
2. Toggle bolts on hollow masonry units,
3. Concrete inserts or expansion bolts on concrete or solid masonry,
4. Machine screws, welded threaded studs, or spring-tension clamps on steel,
5. Explosive devices for attaching hangers to structure shall not be permitted.
6. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures.
7. In partitions of light steel construction, use sheet metal screws.

K. Ensure that the load applied by any fastener does not exceed 25 percent of the proof test load.

L. Use vibration and shock-resistant fasteners for attachments to concrete slabs.

**SECTION 16001 - ELECTRICAL MATERIALS AND EQUIPMENT**

**PART 2 - PRODUCTS**

2.1 DISCONNECT SWITCHES:

A. Furnish and install externally operated, quick-make, quick-break, safety, fused and non-fused heavy duty disconnect switches where shown on the drawings and where required by NEC. Switches shall be safety type as manufactured by Square "D", I-T-E, Cutler-Hammer/Westinghouse, GE, or approved equal.

B. Switches shall be rated for horsepower of motors controlled. Indoor switches shall be mounted in NEMA 1 enclosures, except as indicated. Switches located exterior to building shall be mounted in NEMA 3R enclosures except as indicated. Switches utilized as service entrance equipment shall be so labeled.

C. Disconnect switches shall be provided at all equipment.

D. Furnish Class R fuse kits for all fused switches utilizing RK-1 or RK-5 fuses.

2.2 CIRCUIT BREAKERS FOR INSTALLATION INTO PANELBOARDS:

A. For application in panelboards, provide circuit breakers of the same manufacturer as the Original Equipment Manufacturer (OEM) panel. integral to the cabinet.

B. Circuit breaker configuration (bolt-on or clip-on) shall match that of breakers installed and shipped with the cabinet.

C. Amps Interrupting Capacity (AIC) of field supplied and installed circuit breakers shall not be less than the printed withstand and interrupting rating of the load center.

2.3 SEPARATELY ENCLOSED CIRCUIT BREAKERS:

A. Furnish and install where indicated molded case circuit breakers, trip indicating, trip free, thermal magnetic type with electrical characteristics and ratings as indicated. Short circuit withstand and interrupting rating shall be as required by the fault current indicated.

B. Provide NEMA 1 enclosures indoor, NEMA 3R outdoor enclosure except as otherwise indicated. Circuit breaker handles shall be lockable in the OFF position.

C. Provide service entrance label where indicated.

D. Provide equipment by Square "D", General Electric, Siemens, or Cutler-Hammer/Westinghouse.

2.7 CABLE TRAY:

A. Furnish and install a complete cable tray system as indicated on the drawings and as manufactured by B-Line Systems, Inc., Square "D" Company or approved equal.

B. Cable tray, fittings and accessories shall be steel, hot-dipped galvanized after fabrication or aluminum as indicated.

C. Cable tray shall be ladder-type, trough-type, channel-type, or as indicated.

D. Cable tray system shall be furnished with all dimensions, covers, necessary tees, crosses, risers, elbows, connectors, hangers, etc. of same material as cable tray and as shown on drawings and as required by cable tray manufacturer.

E. Barriers shall be installed in cable tray to separate cables of different systems such as low and high voltage, telephone, data, etc. Barriers shall be of same material as cable tray.

F. Cable tray shall be installed level and, plumb in accordance with manufacturer's instructions.

2.9 COMMUNICATION CABLING FOR CELL SITE T1 CIRCUITS:

A. This specification applies to the T1 circuit to be installed by this Contractor between the Network Interface Unit (NIU) and the Company radio equipment.

B. In indoor locations and in underground conduits in dry climates cabling shall be PVC-insulated tinned solid copper 24 - 24 AWG twisted pairs, UL Type CMR, with overall braided shield and PVC jacket, except as otherwise recommended by the manufacturer.

C. In underground conduits in wet climates, provide Outdoor plant cable. gel filled, 24 - 24AWG twisted pairs.

D. Exception: In all cases for installations in Lucent BTS markets, utilize the T1 cable shipped with the BTS, whenever the cable length is sufficient for the installation.

E. Adhere to Bellcore standards for cable color coding.

2.12 GROUNDING ELECTRODES AND CONDUCTORS:

A. Comply with Exhibit C - Cell Site Grounding Design.

B. Equipment Grounding Conductor:

1. Bare copper conductor or insulated green wire ground as specified herein.

2.13 BOXES AND COVERS:

A. Pull and junction boxes shall be sized in accordance with NEC requirements and shall be installed so that the conductors in them are accessible without removing any part of the structure.

B. Interior switch and outlet boxes flush mounted in finished areas shall be code gauge pressed plated steel, Midland Ross or approved equal, suitable for the device to be installed. Covers shall be as hereinafter specified in paragraph "Device Plates in Finished Areas."

C. Device and pull boxes surface-mounted above accessible ceilings and within unfinished enclosed Mechanical rooms shall be as specified above sized for the conductors within and shall have pressed plated steel screw attached covers.

D. Interior switch, pull, junction and outlet boxes surface mounted in unfinished industrial areas shall be (cast aluminum or) plated cast alloy, threaded, suitable for the device to be installed, Crouse-Hinds FS/FD series or approved equal. Covers shall be screw attached plated iron alloy suitable for the box and device. Switch plate covers shall be "guarded" style.

E. Pull boxes exterior to the building and in interior industrial areas shall be plated cast alloy, heavy duty, weatherproof, dust proof, with gasket, plated iron alloy cover and stainless steel cover screws, Crouse-Hinds WAB series or equal.

F. Conduit outlet bodies shall be plated cast alloy with similar gasketed covers. Outlet bodies shall be of the configuration and size suitable for the application. Provide Crouse-Hinds Form 8 or equal.

G. Exterior switch and outlet boxes shall be recessed mounted except as noted, cast aluminum or plated cast alloy with wet location, Crouse-Hinds series WLRD covers, or equal. Masonry boxes mounted recessed in exterior wall shall be furnished with weatherproof covers.

H. Manufacturer for boxes and covers shall be Hoffman, Square "D", Crouse-Hinds, Cooper, Adalet, Appleton, O-Z Gedney, Raco, or approved equal.

2.21 LIGHTNING PROTECTION:

A. Comply with the latest revisions of Exhibit D - Cell Site Lightning - Surge Protection and Exhibit C - Cell Site Grounding Design.

2.26 SURGE SUPPRESSION

A. Except as otherwise required, surge suppression devices are Company furnished materials

**PART 3 - EXECUTION**

3.1 GROUNDING:

A. Electrical services, circuits and systems, enclosures and equipment shall be grounded in accordance with Article 250 of the National Electrical Code.

B. Grounding shall be provided as indicated for feeder, branch circuit, control, and instrument circuits.

C. Equipment Grounding Conductor: Furnish and install a separate insulated green wire grounding conductor with circuit conductors for all feeders and branch circuits.

D. Furnish and install an insulated green wire grounding conductor in non-metallic raceways unless designated otherwise for telephone or data cables.

E. Telephone and communication system services, circuits, enclosures and equipment shall be grounded in accordance with paragraph 800-33 and paragraph 800-40 of the National Electrical Code.

F. Separately derived AC systems that are required to be grounded by the NEC shall be grounded in accordance with paragraph 250-26 of the NEC.

G. Furnish and install insulated copper ground conductors in conduit from main electrical service equipment or electrical room ground bus and connect to main metallic water service entrance (if available) with ground clamps. Connect ground conductor to the street side of water main where a dielectric main water fitting is installed.

H. Furnish and install ground fault protection where required by code and as required by the specifications and drawings. Installation of ground fault protection shall be in accordance with NEC.

3.3 CONDUIT AND CONDUCTOR INSTALLATION:

A. Conduit and conductors shall be sized as required by NEC and shall be installed continuous and complete from outlet to outlet, panels and junction boxes.

1. In order to closely follow the lines of the structure, maintain close proximity to the structure and keep conduits in tight envelopes. Changes in direction to route around obstacles shall be made with conduit outlet bodies in exposed locations except as otherwise indicated, and in accordance with good construction practice.
2. Other changes in direction shall be made with trade elbows, keeping conduits grouped in tight envelopes following the lines of the structure and maintaining close proximity to the structure except as otherwise indicated, and in accordance with good construction practice.
3. Route conduits according to the envelopes, areas, details and sections, if any, identified on the drawings.

B. Conduits shall be fastened securely in place with approved non-perforated straps and hangers. Explosive devices for attaching hangers to structure will not be permitted. Conduits shall be concealed in finished areas. Conduit shall be exposed in unfinished areas.

C. Conduit shall be installed in a neat and workmanlike manner, parallel and perpendicular to structure wall and ceiling lines. Conduit shall be installed as required by the design of the structure and placed in concrete forms so as not to interfere with reinforcing or strength of slabs, joists or beams. Conduit shall clear all pipes and ducts and depressions in floors. Permission of Engineer shall be obtained as to location of conduit in reinforced concrete slabs, joists and beams.

D. All conduit shall be fished to clear obstructions. Ends of conduits shall be temporarily capped to prevent concrete, plaster or dirt from entering.

E. Conduits shall be rigidly clamped to boxes by galvanized malleable iron bushing on inside and galvanized malleable iron locknut on outside and inside.

F. EMT conduits (if allowed) shall have approved EMT threaded type box connectors and couplings. Set screw connectors and couplings shall not be acceptable.

G. Conductors shall be pulled in accordance with accepted good practice. Where more than one conductor is installed in the same conduit all conductors within the conduit shall be pulled simultaneously. Pull shall not deform conductors. Approved type lubricant may be used in pulling conductors where required.

H. Splices and taps shall be kept to a minimum and made in accordance with the NEC.

I. Where conduit crosses an expansion joint, an expansion and deflection fitting shall be installed in the conduit.

J. Conduit Entrance Seals:

1. All conduits penetrating new concrete walls exterior or below grade shall be sealed at penetrations with conduit entrance seal, Type FSK by O-Z/Gedney or approved equal.
2. All conduit penetrating existing concrete walls exterior or below grade shall be sealed on both sides with O-Z/Gedney Type CSML seals.

K. Conduits and cables passing through all floors, fire rated walls, and smoke partitions shall be sealed in accordance with NEC-300-21. Furnish and install O-Z/Gedney fire seal fittings or approved equal at those locations. At the Contractor's option, Specified Technologies Inc. Model PEN200, UL-Listed fire resistant silicone foam sealant installed in accordance with the manufacturer's recommendations may be utilized. All unused openings and sleeves shall be sealed as herein specified.

L. A #16 gauge (1.3 mm2) steel pull wire shall be left in all empty conduits.

M. PVC conduits shall be installed using fittings, solvents, glues, and methodology as recommended by the manufacturer.

N. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Do not bend conductors sharper than eight times the cable outside diameter. Make terminations so there is no bare conductor at the terminal. Bundle multiple conductors, with conductors larger than No. 10 AWG in individual circuit bundles.

O. Tighten electrical connectors and terminals, including screws and bolts, in accordance with the manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and 486B.

P. Utilize flexible liquid tight conduit for final connection in exterior, damp wet, or corrosive locations, and elsewhere as indicated on the drawings.

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Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 26266 LICENSED PROFESSIONAL ENGINEER

Signature: James R. Skowronski Date: 1/08/2013

| MARK | DATE | DESCRIPTION |
|---|---|---|
| C | 1/08/13 | FINAL CD'S ISSUED |
| B | 10/26/12 | FINAL PRELIM CD'S |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL DATE ISSUED: 01/08/2013

PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

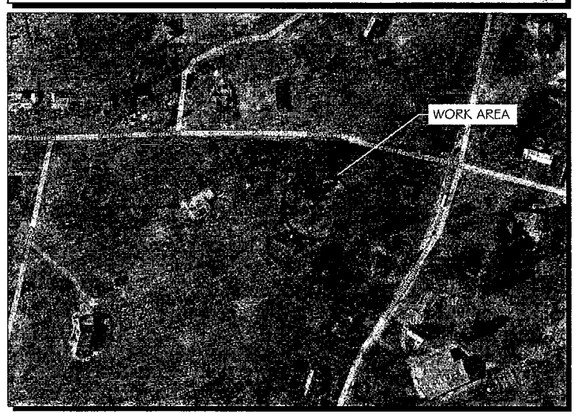
PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

SHEET TITLE:
SPECIFICATIONS

SCALE: NONE

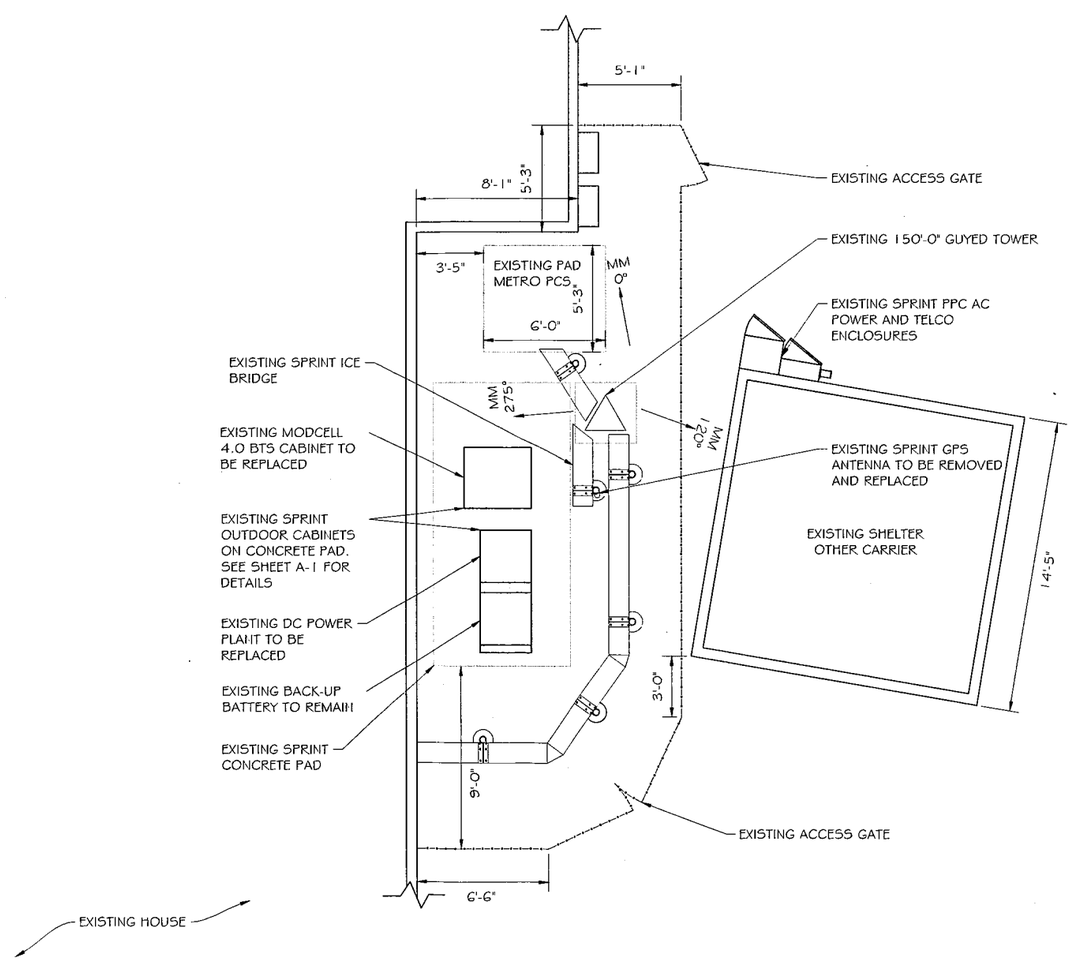
PROJECT NUMBER: 23002
SHEET NUMBER: SP-3

## VICINITY MAP




GENERAL NOTES:

1. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE CODES ORDINANCES, LAWS, AND REGULATIONS OF ALL MUNICIPALITIES, UTILITIES COMPANY, OR OTHER PUBLIC AUTHORITIES.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS THAT MAY BE REQUIRED BY ANY FEDERAL, STATE, COUNTY, OR MUNICIPAL AUTHORITIES.
3. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER, IN WRITING, OF ANY CONFLICTS, ERRORS OR OMISSIONS PRIOR TO THE SUBMISSION OF BIDS OR PERFORMANCE OF WORK. MINOR OMISSIONS OR ERRORS IN THE BID DOCUMENTS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR THE OVERALL INTENT OF THESE DRAWINGS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING SITE IMPROVEMENTS PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED AS A RESULT OF CONSTRUCTION OF THE FACILITY.
5. THE SCOPE OF WORK FOR THIS PROJECT SHALL INCLUDE PROVIDING ALL MATERIALS, EQUIPMENT, AND LABOR REQUIRED TO COMPLETE THIS PROJECT. ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. THE CONTRACTOR SHALL VISIT THE PROJECT SITE PRIOR TO SUBMITTING A BID TO VERIFY THAT THE PROJECT CAN BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
7. CONTRACTOR SHALL VERIFY ANTENNA ELEVATION AND AZIMUTH WITH RF ENGINEERING PRIOR TO INSTALLATION.
8. TRANSMITTER EQUIPMENT AND ANTENNAS ARE DESIGNED TO MEET ANSI/EIA/TIA 222-G REQUIREMENTS.
9. ALL STRUCTURAL ELEMENTS SHALL BE HOT DIPPED GALVANIZED STEEL.
10. CONTRACTOR SHALL MAKE A UTILITY "ONE-CALL" TO LOCATE ALL UTILITIES PRIOR TO EXCAVATING.
11. IF ANY UNDERGROUND UTILITIES OR STRUCTURES EXIST BENEATH THE PROJECT AREA, CONTRACTOR MUST LOCATE IT AND CONTACT THE APPLICANT & THE OWNER'S REPRESENTATIVE.
12. OCCUPANCY IS LIMITED TO PERIODIC MAINTENANCE AND INSPECTION BY TECHNICIANS APPROXIMATELY 2 TIMES PER MONTH.
13. RAMAKER & ASSOCIATES HAS NOT PERFORMED A STRUCTURAL ANALYSIS FOR THIS PROJECT. PRIOR TO THE INSTALLATION OF THE PROPOSED EQUIPMENT OR MODIFICATION OF THE EXISTING STRUCTURE, A STRUCTURAL ANALYSIS SHALL BE PERFORMED BY SPRINT'S AGENT TO CERTIFY THAT THE EXISTING/PROPOSED COMMUNICATION STRUCTURE AND COMPONENTS ARE STRUCTURALLY ADEQUATE TO SUPPORT ALL EXISTING AND PROPOSED ANTENNAS, COAXIAL CABLES, AND OTHER APPURTENANCES.
14. PROPERTY LINE INFORMATION WAS PREPARED USING DEEDS, TAX MAPS, AND PLANS OF RECORD AND SHOULD NOT BE CONSTRUED AS AN ACCURATE BOUNDARY SURVEY.
15. THIS PLAN IS SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.
16. THE PROPOSED FACILITY WILL CAUSE ONLY A "DE MINIMIS" INCREASE IN STORMWATER RUNOFF; THEREFORE, NO DRAINAGE STRUCTURES ARE PROPOSED.
17. NO SIGNIFICANT NOISE, SMOKE, DUST, OR ODOR WILL RESULT FROM THIS FACILITY.
18. THE FACILITY IS UNMANNED AND NOT INTENDED FOR HUMAN HABITATION (NO HANDICAP ACCESS REQUIRED).
19. POWER TO THE FACILITY WILL BE MONITORED BY A SEPARATE METER.




SITE PLAN (1)
SCALE: 1" = 7.5'

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Certification & Seal:
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STATE OF CONNECTICUT * JAMES R. SKOWRONSKI * No. 28266 LICENSED PROFESSIONAL ENGINEER

Signature: 1/08/2013 Date:

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ISSUE PHASE: FINAL DATE ISSUED: 01/08/2013

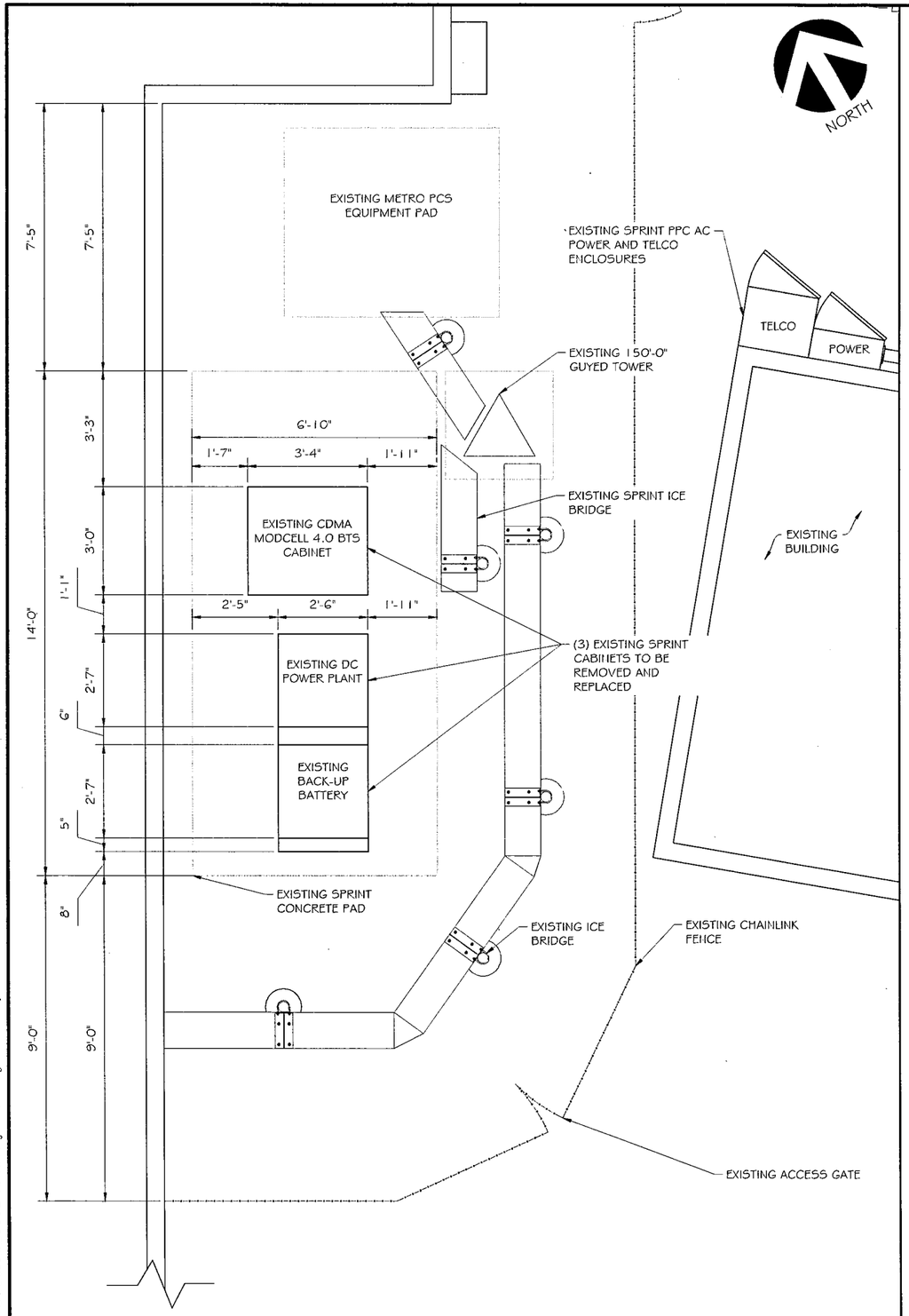
PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

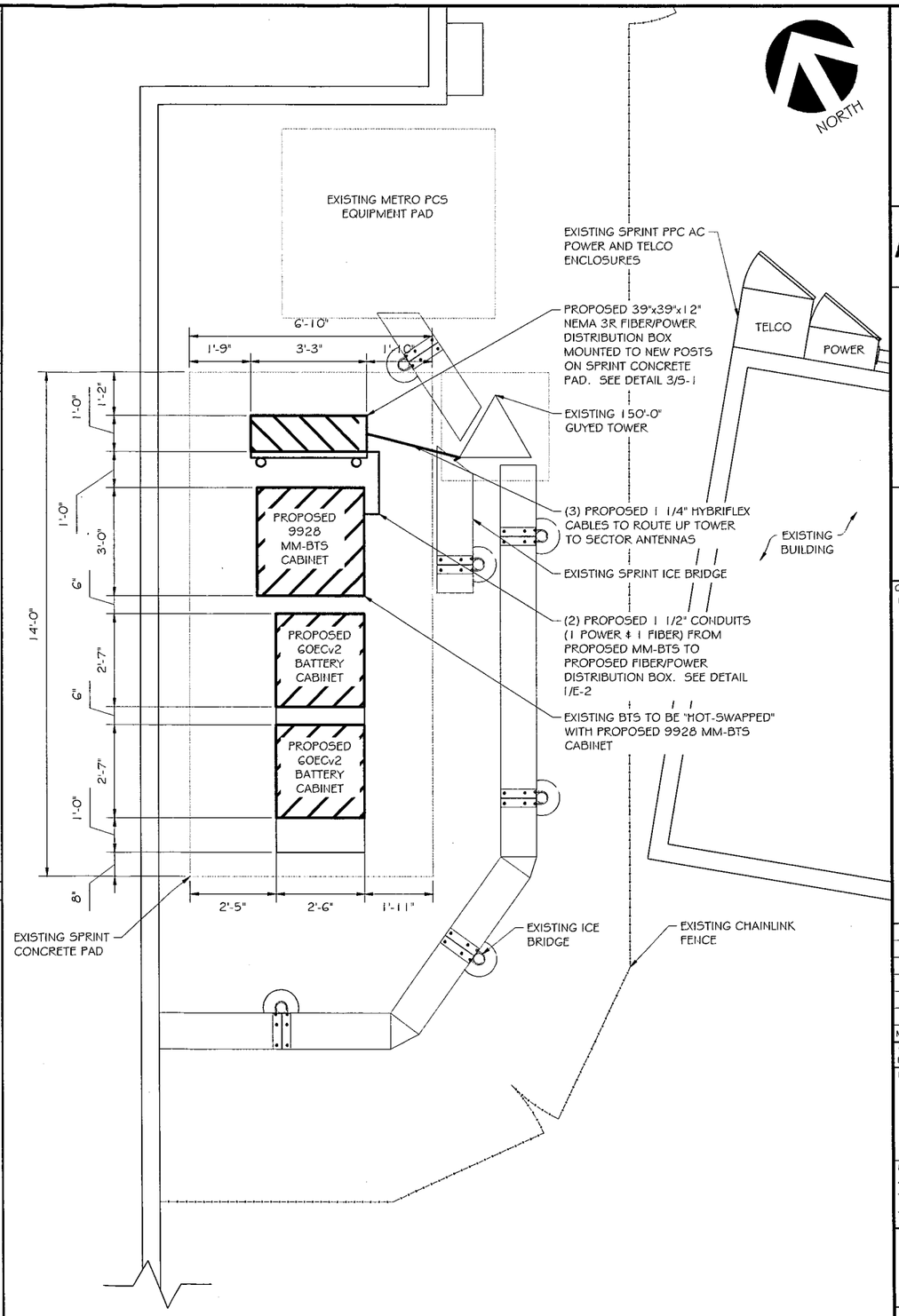
SHEET TITLE:
OVERALL SITE PLAN

0 3.75' 7.5' 15'
11" x 17" - 1" = 7.5'
22" x 34" - 1" = 3.75'

PROJECT NUMBER: 23002
SHEET NUMBER: C-1




EXISTING EQUIPMENT PLAN (1)
SCALE: 1" = 3.75'




PROPOSED EQUIPMENT PLAN (2)
SCALE: 1" = 3.75'

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6391 Sprint Parkway
Overland Park, KS 66251

Alcatel·Lucent

RAMAKER & ASSOCIATES, INC.
1120 Dallas Street, Sauk City, WI 53583
Phone: 608-643-4100 Fax: 608-643-7999
www.Ramaker.com

# NETWORK VISION MMBTS LAUNCH NORTHERN CT MARKET

Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 26268 LICENSED PROFESSIONAL ENGINEER

Signature: 1/08/2013 Date:

| MARK | DATE | DESCRIPTION |
|---|---|---|
| C | 1/08/13 | FINAL CD'S ISSUED |
| B | 10/26/12 | FINAL PRELIM CD'S |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL
DATE ISSUED: 01/08/2013

PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

SHEET TITLE:
EQUIPMENT PLAN

0 1.875' 3.75' 7.5'
11" x 17" - 1" = 3.75'
22" x 34" - 1" = 1.875'

PROJECT NUMBER: 23002
SHEET NUMBER: A-1



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DRAWN BY: KJG CHECKED BY: KAB

## NOTES:

I. SCOPE

A. THIS SECTION COVERS THE SPECIFICATIONS FOR ANTENNA AND COAXIAL CABLE INSTALLATION OF: ANTENNAS, COAXIAL, CONNECTIONS, AND ICE BRIDGE.

B. REFERENCE SPRINT STANDARD CONSTRUCTION SPECIFICATIONS FOR WIRELESS SITES FOR GENERAL REQUIREMENTS.

II. ANTENNAS:

A. ANTENNAS SHALL BE PLUMB AND INSTALLED SO THAT THE ENTIRE WHIP EXTENDS ABOVE VERTICAL PIPE MOUNT. DIRECTIONAL ANTENNAS SHALL BE ORIENTED TO PROPER AZIMUTH, PROVIDED ON THE RF SPECIFICATION SHEET. NOTE: THE ANTENNA MAY BE ORIENTED USING THE REFLECTOR AS THE REFERENCE, ADJUSTING ITS AZIMUTH 180 DEGREES FROM MAXIMUM ANTENNA RADIATION.

B. MICROWAVE ANTENNAS (DISHES) SHALL BE ASSEMBLED PER MANUFACTURER'S DRAWINGS. STIFF ARMS AND RADOMES SHALL BE INSTALLED WITH POLARIZATION PROVIDED BY RF SPECIFICATION SHEET. IF PATH IS NOT READY TO ALIGN, DISH SHOULD BE POINTED TOWARD CALCULATED AZIMUTH, OR DIRECTION OF FIELD STAKE DENOTING OPPOSITE END. 2 STIFF ARMS SHALL BE PROVIDED FOR MICROWAVE DISHES 6'-0" IN DIAMETER OR GREATER.

C. A TRANSIT SHALL BE USED TO PROPERLY ALIGN CELLULAR AND MICROWAVE ANTENNAS.

III. COAXIAL CABLE:

A. COAXIAL CABLE SHALL BE SUPPORTED WITH SNAP-IN HANGERS. SNAP-IN HANGERS SHOULD BE USED EVERY 3 FEET THE ENTIRE HEIGHT OF THE TOWER. ANGLE ADAPTERS OR ROUND MEMBER ADAPTERS WITH BUTTERFLY CLAMPS SHALL BE USED ELSEWHERE, I.E. SIDEARMS, PLATFORMS, AND MICROWAVE MOUNTS.

B. COAXIAL CABLE SHALL ALSO BE SUPPORTED WITH HOISTING GRIPS, INSTALLED AT MAXIMUM INTERVALS OF 200 FEET. HOISTING GRIPS SHALL BE ATTACHED WITH SHACKLES, BOLTED IN THE 7/16" HOLE OF WAVEGUIDE LADDER.

C. ALL JUMPERS USED BETWEEN COAXIAL CABLE AND ANTENNA SHALL BE SUPPORTED WITHIN 18 INCHES OF ANTENNA, USING BUTTERFLY CLAMPS WITH ANGLE ADAPTERS OR ROUND MEMBER ADAPTERS AROUND PIPES. CELLULAR ANTENNAS TYPICALLY USE 6' JUMPERS; MICROWAVE DISHES USE 3' JUMPERS.

D. COAXIAL CABLE SHALL BE NEATLY BENT WHEN REQUIRED, USING A MINIMUM BENDING RADIUS OF 10 TIMES THE DIAMETER OF THE COAXIAL CABLE. DRIP LOOPS SHOULD BEGIN AT THE ICE BRIDGE. THE END IN THE COAXIAL CABLE SHOULD BE AT A LOWER HEIGHT THAN THE ENTRY PORT.

E. COAXIAL CABLE SHALL BE SUPPORTED WITH SNAP-IN HANGERS ON THE WAVEGUIDE LADDER UNDER ICE BRIDGE. COAXIAL CABLE SHOULD BE NEATLY CUT 16" INSIDE BUILDING AND TERMINATED AT THE QUARTER WAVE SHORTS.

F. CONNECTORS WILL NORMALLY BE PROVIDED FIRST OFF REEL FROM FACTORY. CONNECTORS TERMINATED IN BUILDING SHALL BE NEATLY INSTALLED PER MANUFACTURER'S SPECIFICATIONS.

G. COAXIAL CABLES SHOULD BE LABELED WITH TAGS INSIDE THE BUILDING.

H. USE 2" WIDE COLORED TAPE TO INDICATE SECTORS. CONTRACTOR TO USE SECTOR COLOR CODING AS INDICATED IN THESE DRAWINGS OR AS PROVIDED BY SPRINT.

I. ALL EXCEPTIONS NEED TO BE VERIFIED WITH THE PROJECT MANAGER.

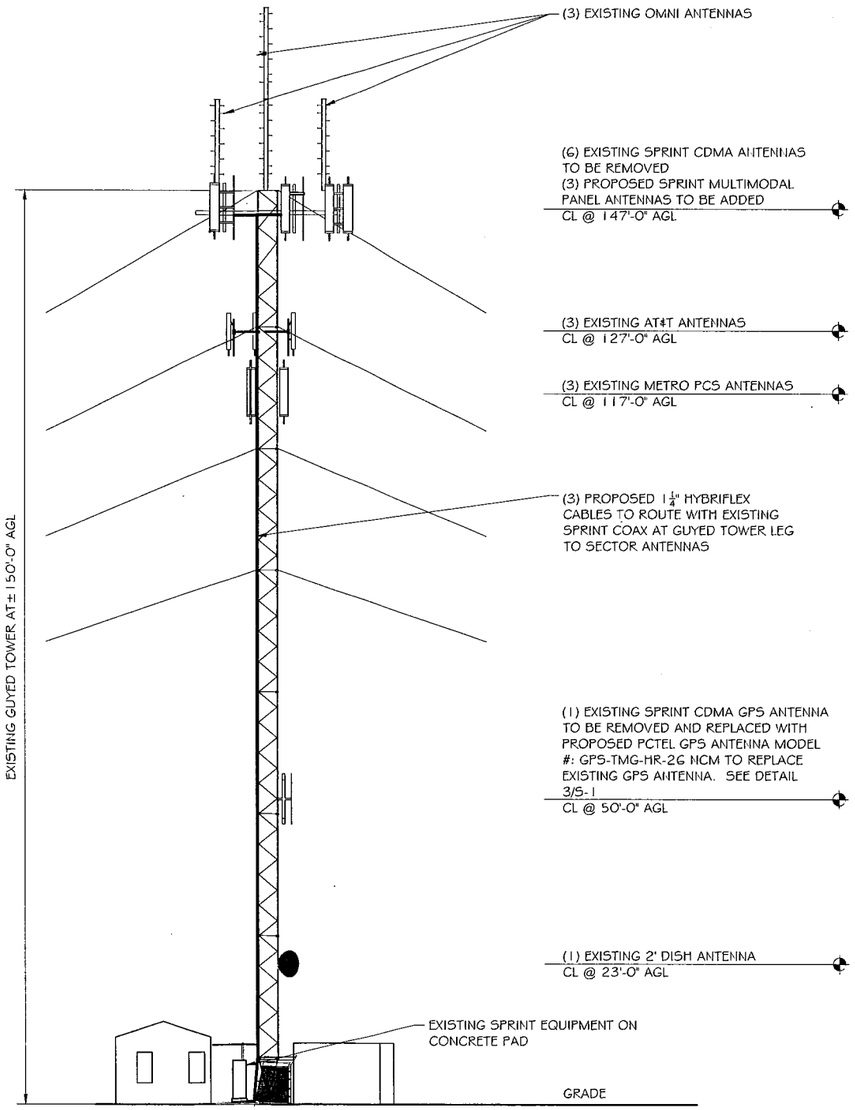
IV. CONNECTORS:

A. ALL CONNECTIONS AND GROUNDING KITS SHALL BE WEATHERPROOFED USING COLD SHRINK OR ANDREW APPROVED WEATHER STRIPPING. NOTE: NO PORTION OF CONNECTOR SHALL BE EXPOSED TO THE ELEMENTS.

B. COAXIAL CABLE SHALL BE GROUNDED USING GROUNDING KITS AT THE TOP (BELOW THE BEND), BOTTOM (ABOVE THE BEND ON TOWER GROUND BAR), AND ON BUILDING GROUND BAR BEFORE ENTRY INTO WAVEGUIDE PORTS. 4" CABLE BOOTS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

C. GROUNDING KITS SHALL BE NEATLY INSTALLED SO THAT THE JUMPER RUNS IN THE SAME DIRECTION AS THE COAXIAL AND GROUND BAR. JUMPER WIRE SHOULD RUN IN A DIRECT PATH TO THE GROUND BAR/ TOWER LADDER, BUT HAVE ADEQUATE SLACK FOR EXPANSION, CONTRACTION, AND REPAIR. NON-OXIDE GREASE SHOULD BE APPLIED BETWEEN LUG AND BAR/TOWER.

D. TOWER GROUND BAR SHALL BE INSTALLED ON THE ANGLE BEHIND THE FIRST DIAGONAL WAVEGUIDE LADDER RUNG, ABOVE 8'-6". GROUND BAR SHALL BE ISOLATED FROM ANGLE USING NEWTON BUSHINGS PROVIDED.




ELEVATION 1
SCALE: 1"=

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NETWORK VISION
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NORTHERN CT MARKET

Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 26286 LICENSED PROFESSIONAL ENGINEER

James R. Skowronski 1/08/2013
Signature: Date:

| MARK | DATE | DESCRIPTION |
|---|---|---|
| C | 1/08/13 | FINAL CD'S ISSUED |
| B | 10/26/12 | FINAL PRELIM CD'S |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL
DATE ISSUED: 01/08/2013

PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

SHEET TITLE:
SITE ELEVATION & NOTES

0 12.5' 25' 50'
11" x 17" - 1" = 25'
22" x 34" - 1" = 12.5'

PROJECT NUMBER: 23002
SHEET NUMBER: A-2



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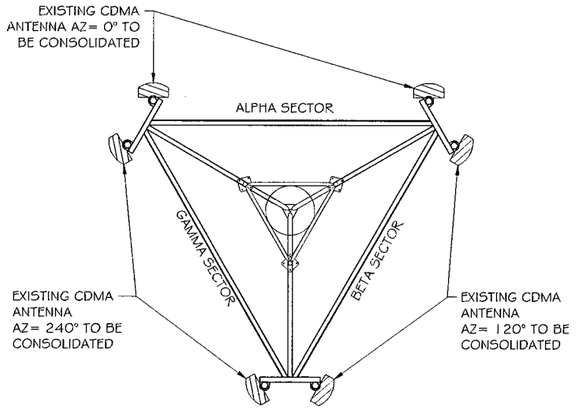
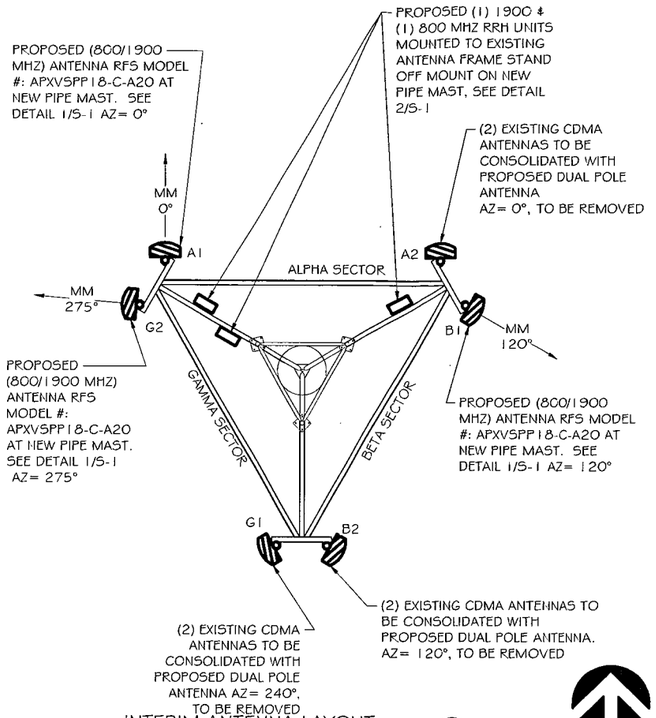


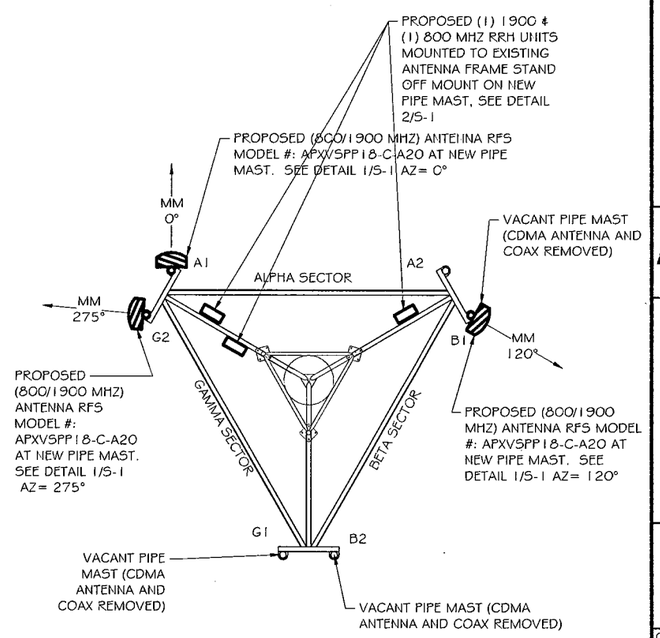

EXISTING ANTENNA LAYOUT (1)
SCALE: NTS

NORTH




INTERIM ANTENNA LAYOUT (2)
SCALE: NTS

NORTH




FINAL ANTENNA LAYOUT (3)
SCALE: NTS

NORTH

## ANTENNA AND COAXIAL CABLE SCHEDULE

| SECTOR | POS. | AZIMUTH | ANTENNA CENTERLINE | ANTENNA STATUS | TECH. | ANTENNA MAKE/ MODEL | MECH. DOWNTILT (°) | ELEC. DOWNTILT (°) | RRHs | CABLE SIZE | CABLE LENGTH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALPHA | A-1 | 0° | 147'-0" | PROPOSED | MULTIMODAL | RFS/APXVSPP18-C-A20 | 1900(0), 800(0) | 1900(-1), 800(0) | (1) 1900, (1) 800 | (1) 1 5/8" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J | ±180'-0" |
| | A-2 | 0° | 147'-0" | PROPOSED CONSOLIDATED CDMA TO BE REMOVED | CDMA | T.B.D. (DUAL POLE CDMA) | - | - | - | EX. TO BE REMOVED | - |
| BETA | B-1 | 120° | 147'-0" | PROPOSED | MULTIMODAL | RFS/APXVSPP18-C-A20 | 1900(0), 800(0) | 1900(-2), 800(-2) | (1) 1900, (1) 800 | (1) 1 5/8" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J | ±180'-0" |
| | B-2 | 120° | 147'-0" | PROPOSED CONSOLIDATED CDMA TO BE REMOVED | CDMA | T.B.D. (DUAL POLE CDMA) | - | - | - | EX. TO BE REMOVED | - |
| GAMMA | G-1 | 240° | 147'-0" | PROPOSED CONSOLIDATED CDMA TO BE REMOVED | CDMA | T.B.D. (DUAL POLE CDMA) | - | - | - | EX. TO BE REMOVED | - |
| | G-2 | 275° | 147'-0" | PROPOSED | MULTIMODAL | RFS/APXVSPP18-C-A20 | 1900(0), 800(0) | 1900(-3), 800(-8) | (1900, (1) 800 | (1) 1 5/8" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J | ±180'-0" |

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Certification & Seal:
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STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 28268 LICENSED PROFESSIONAL ENGINEER

Signature: James R. Skowronski Date: 1/08/2013

| MARK | DATE | DESCRIPTION |
|---|---|---|
| C | 1/08/13 | FINAL CDS ISSUED |
| B | 10/26/12 | FINAL PRELIM CDS |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: FINAL
DATE ISSUED: 01/08/2013

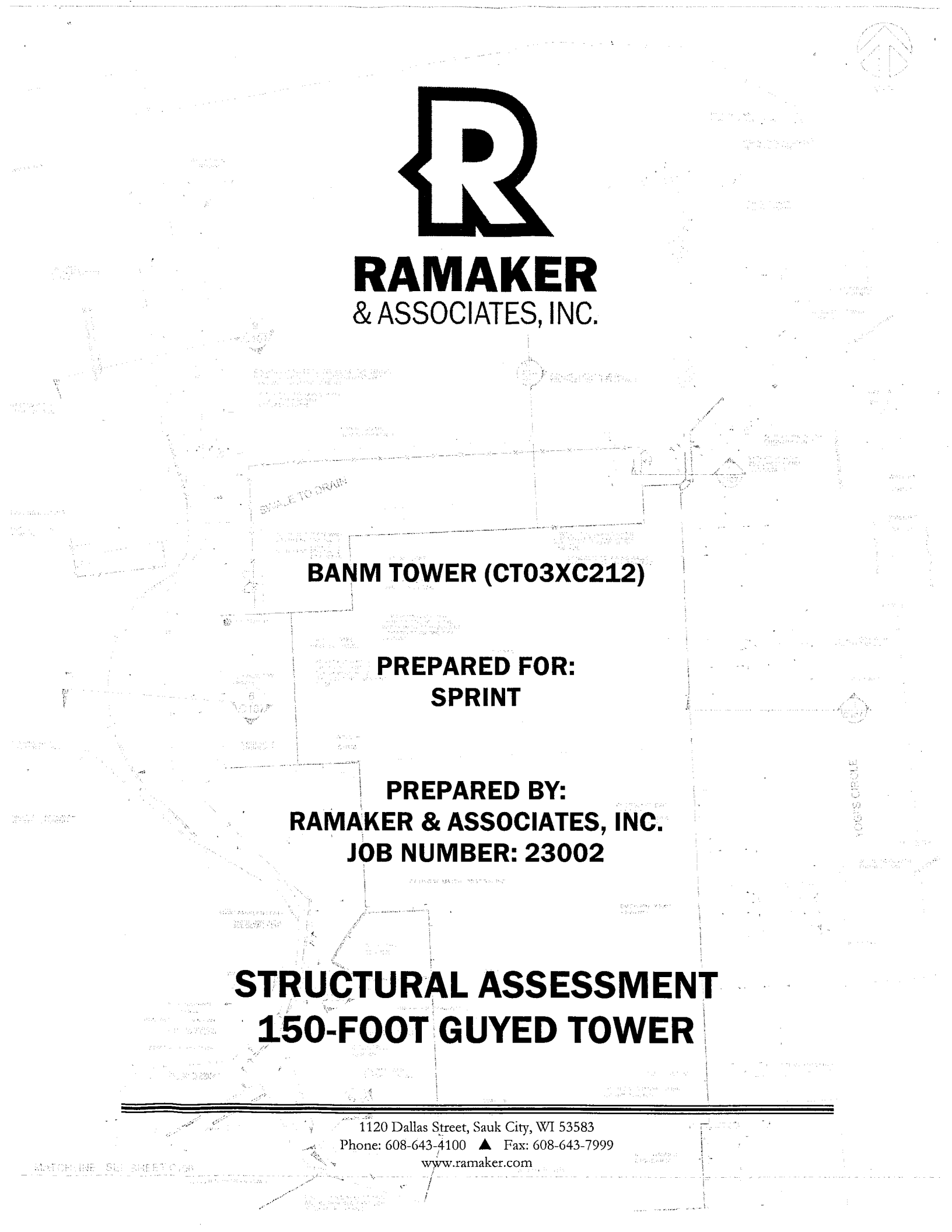
PROJECT TITLE:
BANM TOWER
SITE#: CT03XC212

PROJECT INFORMATION:
497 OLD POST ROAD
TOLLAND, CT 06084
TOLLAND COUNTY

SHEET TITLE:
ANTENNA DETAILS & COAX SCHEDULE

SCALE: NONE

PROJECT NUMBER: 23002
SHEET NUMBER: A-3



RAMAKER
& ASSOCIATES, INC.

**BANM TOWER (CT03XC212)**

**PREPARED FOR:**
**SPRINT**

**PREPARED BY:**
**RAMAKER & ASSOCIATES, INC.**
**JOB NUMBER: 23002**

# STRUCTURAL ASSESSMENT
# 150-FOOT GUYED TOWER

1120 Dallas Street, Sauk City, WI 53583
Phone: 608-643-4100 ▲ Fax: 608-643-7999
www.ramaker.com

# STRUCTURAL ASSESSMENT

**SITE:**
BANM Tower (CT03XC212)
497 Old Post Road
Tolland, Tolland County, Connecticut 06084

**PREPARED FOR:**
Alcatel-Lucent
600 Mountain Avenue
Murray Hill, New Jersey 07974

**CONTACT PERSON:**
Alcatel-Lucent
John Szilezy
Site Acquisition Manager
john.szilezy@alcatel-lucent.com

**PREPARED BY:**
Ramaker & Associates, Inc.
1120 Dallas Street
Sauk City, Wisconsin 53583
Telephone: (608) 643-4100
Facsimile: (608) 643-7999

**RAMAKER JOB NUMBER:** 23002

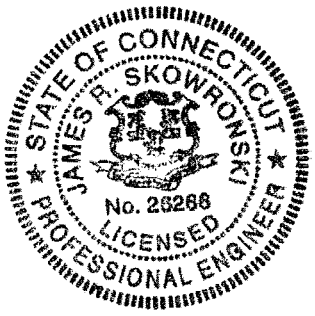
**DATE OF REPORT ISSUANCE:** November 9, 2012

Thomas E. Moore
Structural Engineer

11/9/12
Date

James R. Skowronski, P.E.
Supervising Engineer

11/9/12
Date



# TABLE OF CONTENTS



**LIST OF APPENDICES**

# SECTION 1

# EXECUTIVE SUMMARY

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Alcatel-Lucent (ALU) on behalf of Sprint, who intends to install additional equipment on an existing 150-foot guyed tower. The tower site is located in Tolland, Tolland County, Connecticut.

ALU is proposing to install three (3) RFS APXVSPP18-C-A20 panel antennas on the existing mounts at a centerline elevation of 147 feet AGL. ALU is also proposing to install three (3) ALU 1900 MHz RRH units and three (3) ALU 800 MHz RRH units on the existing Frame. The proposed equipment shall be fed with three (3) 1-1/4 inch fiber/power hybrid cables. Three of the six existing CDMA panel antennas shall be removed during the interim phase, and then the other three CDMA panel antennas shall be removed for the final antenna layout.

Results of our analysis show that the tower will be stressed to a maximum of 92.8 percent of capacity under proposed loading conditions. All foundation reactions are less than the modified original design reactions. Therefore, it is anticipated that the existing foundations will provide adequate strength under proposed loading conditions.

In summary, the tower will pass the TIA-222-G code requirements under proposed loading conditions.

# SECTION 2
# INTRODUCTION

## 2.1 PROJECT INFORMATION

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for ALU, who intends to install additional equipment on an existing tower.

## 2.2 PURPOSE OF REPORT

The analysis activities of this report were conducted for the purposes of creating and analyzing a model of the subject structure under the required loading conditions. Base reactions from the resulting model were also determined for tower foundation and support development. Recommendations regarding the analysis results, loading configuration, and structural modifications are also provided.

## 2.3 SCOPE OF SERVICES

Ramaker & Associates developed a finite element model (FEM) of the tower, using tnxTower, for member force, joint deflection, and structure reaction determinations. Subsequently, this report was drafted to provide our engineering recommendations. All information contained herein is valid only for the described structure configuration and loading conditions. Ramaker & Associates reserves the right to modify our recommendations should alterations to the tower loading occur.

# SECTION 3
# MODEL DEVELOPMENT

## 3.1 INTRODUCTION

Ramaker & Associates, Inc. developed a FEM of the tower superstructure using the tower drawings and site photos. Required static loads consisting of the antenna configuration, wind forces, ice loads, and linear appurtenances (including cable loads) were then applied to the FEM. As a result, all member forces, allowable capacities, and base reactions were computed. Additionally, potentially overstressed members were identified.

## 3.2 EXISTING STRUCTURE INFORMATION

Tower information was gathered from the tower drawings by Pirod, file number A-115329, drawing number 204110-B, dated 1/13/99. The structural analysis by Tectonic, work order 2650.CT330, dated 5/15/02, was also used. The foundation plan by Tectonic, work order 2204.02, dated 1/7/99, was also used.

## 3.3 EXISTING TOWER LOADS

Ramaker & Associates understands that the existing antenna, cable, and appurtenance configurations are as shown in the following chart:

| Elevation | Appurtenance | Mount | Coax |
|---|---|---|---|
| 170 | Decibel DB420 | Top Mount | 7/8 |
| 150 | 20' Dipole | Face Mount | 7/8 |
| | 4' Lightning Rod | Leg Mount | -- |
| 147 | (2) Decibel DB420 | Delta Mount | (2) 7/8 |
| | Decibel DB222 | | 7/8 |
| | ** (6) Decibel DB980H90E-M ** | | (6) 1-5/8 |
| 125 | (2) EMS MB96RR900200DPBL | Delta Mount | (9) 7/8 |
| | EMS FS90-11-00NAL2 | | |
| | (6) ClearGain DD1900W800 | | |
| 120 | Decibel DB225 | Leg Mount | 7/8 |
| 115 | (3) 6' Panel Antennas | Leg Mounted | (6) 1-1/4 |
| 96 | 10' Omni | Torque Arm | 7/8 |
| 80 | 15' Omni | 4' Standoff | 7/8 |
| 55 | Decibel DB225 | Leg Mount | 7/8 |
| 50 | GPS Antenna | 3' Standoff | 1/2 |
| 35 | 4' Dish | Leg Mount | 7/8 |

Three (3) of the six (6) CDMA antennas at 147 feet AGL were assumed to be removed under the interim loading conditions and the remaining three (3) antennas shall be removed for the final antenna layout.

## 3.4 PROPOSED TOWER LOADS

Ramaker & Associates understands that the total antenna loading for the tower will consist of the aforementioned existing antennas and the following proposed antennas:

| Elevation | Appurtenance | Mount | Coax |
|---|---|---|---|
| 147 | (3) RFS APXVSPP18-C-A20 | Existing Delta Mount | (3) 1-1/4 Fiber/Power |
| | (3) ALU 1900MHz RRH | | |
| | (3) ALU 800MHz RRH | | |

The proposed fiber/power cables were assumed to be installed next to the existing Sprint coax.

## 3.5 WIND AND ICE LOAD

Wind forces used in model development are in compliance with the TIA-222-G Standard. These guidelines call for an analysis to be performed, which assumes a basic wind speed (3-second gust) of 105 miles-per-hour (mph) without ice in Tolland County. The tower is also designed for a 50 mph basic wind speed with 1.00-inch of radial ice. The tower was analyzed using the following parameters: Structure Class II, Topographic Category 1, and Exposure Category C.

# SECTION 4
# ANALYSIS RESULTS

## 4.1 ANALYSIS RESULTS

The tower superstructure was analyzed with the combined existing and proposed antenna loading with and without radial ice. The computed maximum tower member stress capacities are as follows:

| Component Type | Percent Capacity |
|---|---|
| Leg | 77.3 |
| Diagonal | 70.8 |
| Horizontal | 30.8 |
| Guy Line | 92.8 |
| Bolts | 30.8 |
| RATING | 92.8 |

## 4.2 BASE REACTIONS

The computed maximum reactions under the corresponding maximum moment are as follows:

| Load Type | Original Design | Original Design * 1.35 | Proposed Model |
|---|---|---|---|
| Axial (k) | 118.0 | 159.30 | 135.80 |
| Shear (k) | 2.6 | 3.51 | 1.59 |
| Anchor A Uplift (k) | 46.5 | 62.78 | 37.80 |
| Anchor A Lateral (k) | 35.5 | 47.93 | 30.93 |
| Anchor B Uplift (k) | 71.8 | 96.93 | 41.75 |
| Anchor B Lateral (k) | 35.5 | 47.93 | 30.92 |
| Anchor C Uplift (k) | 70.4 | 95.04 | 66.23 |
| Anchor C Lateral (k) | 37.6 | 50.76 | 31.22 |

All foundation reactions are less than the modified original design reactions. Therefore, it is anticipated that the existing foundations will provide adequate strength under proposed loading conditions.

# SECTION 5
# LIMITATIONS

The recommendations contained within this report were developed using general project information provided by the owner, tower manufacturer, general field observations, reference information and laboratory testing data, as applicable. All recommendations pertain only to the proposed tower construction, location, and loading as described in this report. Ramaker & Associates assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to the following:

1. Missing, corroding, and/or deteriorating members
2. Improper manufacturing and/or construction
3. Improper maintenance

Ramaker & Associates assumes no responsibility for modifications completed prior to or hereafter in which Ramaker & Associates was not directly involved. These modifications include but are not limited to the following:

1. Replacing or strengthening bracing members
2. Reinforcing or extending vertical members
3. Installing or removing antenna mounting gates or side arms
4. Changing loading configurations

Furthermore, Ramaker & Associates hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations and conclusions are based on the information contained and set forth herein. If you are aware of any information contrary to that contained herein, or if you are aware of any defects arising from the original design, material, fabrication and erection deficiencies, you should disregard this report and immediately contact Ramaker & Associates. Ramaker & Associates isn't liable for any representation, recommendation, or conclusion not expressly stated herein.

The tower owner is responsible for verifying that the existing loading on the tower is consistent with the loading applied to the tower within this report.

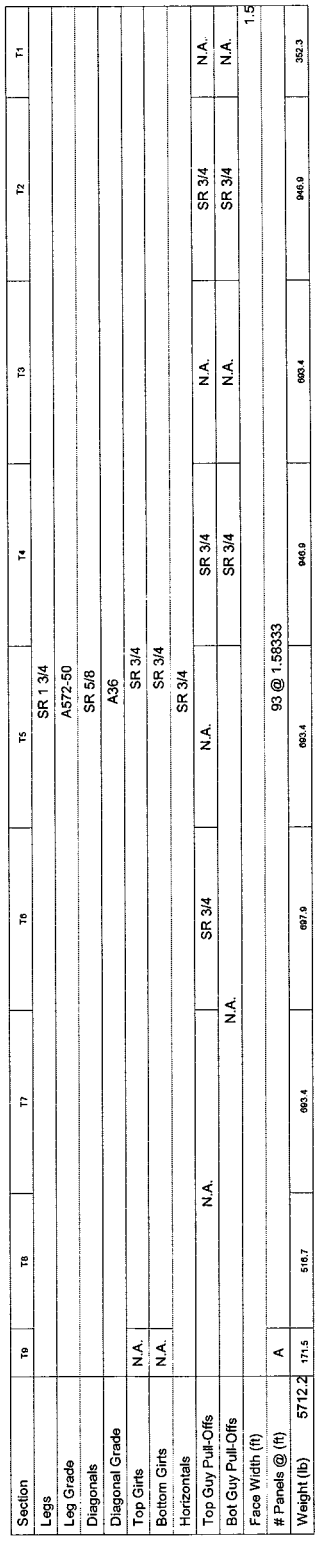
# SECTION 6
# REFERENCES

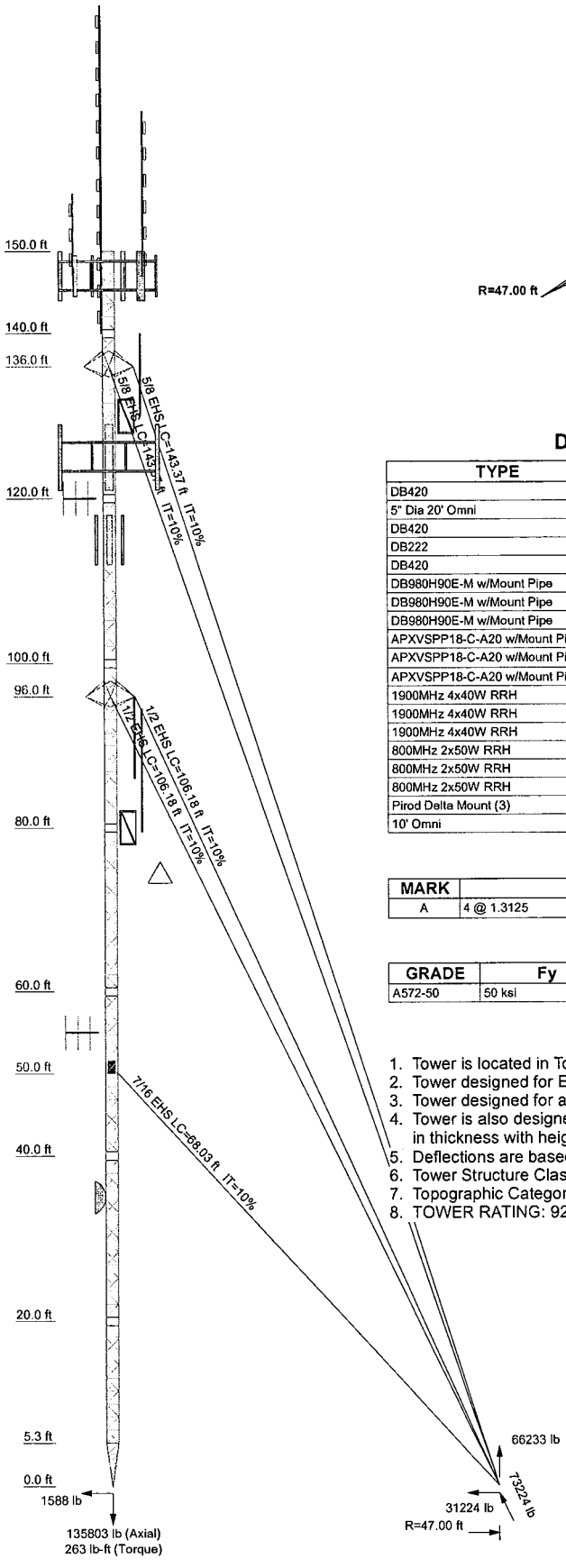
1. 2009 International Building Code.

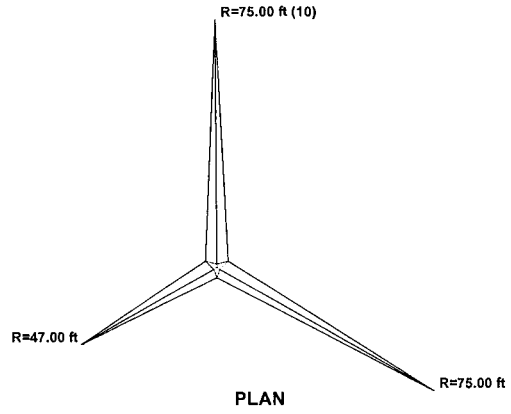
2. Telecommunications Industries Association, Structural Standard for Antenna Supporting Structures and Antennas, TIA Standard ANSI/TIA-222-G 2005, Washington, D.C.

# APPENDIX A

# TOWER FIGURES




PLAN

## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| DB420 | 170 | 4' Standoff | 130 |
| 5" Dia 20' Omni | 150 | MB96RR900200DPBL w/Mount Pipe | 125 |
| DB420 | 147 | MB96RR900200DPBL w/Mount Pipe | 125 |
| DB222 | 147 | FS90-11-00NAL2 w/Mount Pipe | 125 |
| DB420 | 147 | CG DD1900W800 | 125 |
| DB980H90E-M w/Mount Pipe | 147 | CG DD1900W800 | 125 |
| DB980H90E-M w/Mount Pipe | 147 | CG DD1900W800 | 125 |
| DB980H90E-M w/Mount Pipe | 147 | Pirod Delta Mount (3) | 125 |
| APXVSPP18-C-A20 w/Mount Pipe | 147 | DB225-A | 120 |
| APXVSPP18-C-A20 w/Mount Pipe | 147 | 6' x 8" Panel Antenna w/Mount Pipe | 115 |
| APXVSPP18-C-A20 w/Mount Pipe | 147 | 6' x 8" Panel Antenna w/Mount Pipe | 115 |
| 1900MHz 4x40W RRH | 147 | 6' x 8" Panel Antenna w/Mount Pipe | 115 |
| 1900MHz 4x40W RRH | 147 | 10' Omni | 96 |
| 1900MHz 4x40W RRH | 147 | 15' Omni | 80 |
| 800MHz 2x50W RRH | 147 | 4' Standoff | 80 |
| 800MHz 2x50W RRH | 147 | DB225-A | 55 |
| 800MHz 2x50W RRH | 147 | GPS | 50 |
| Pirod Delta Mount (3) | 147 | 3' Standoff | 50 |
| 10' Omni | 130 | 4 FT DISH | 35 |

## SYMBOL LIST

| MARK | SIZE | MARK | SIZE |
|---|---|---|---|
| A | 4 @ 1.3125 | | |

## MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A572-50 | 50 ksi | 65 ksi | A36 | 36 ksi | 58 ksi |

## TOWER DESIGN NOTES

1. Tower is located in Tolland County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 105 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 92.8%

ALL REACTIONS ARE FACTORED

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Phone: (608) 643-4100
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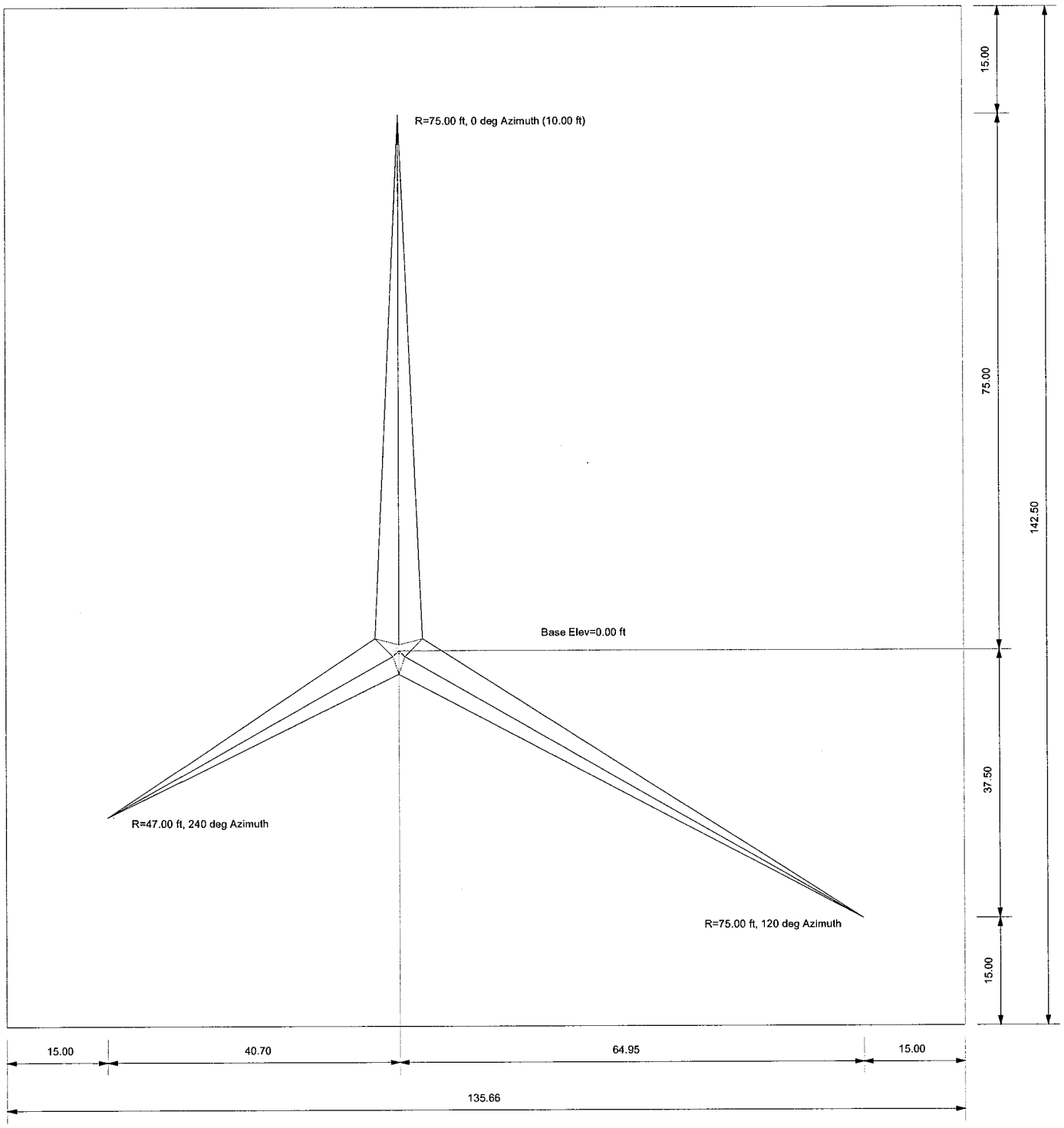
| | | | |
|---|---|---|---|
| Job: **BANM Tower (CT03XC212)** | | | |
| Project: **23002** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-1 | |

# Plot Plan
## Total Area - 0.44 Acres





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| | | | |
|---|---|---|---|
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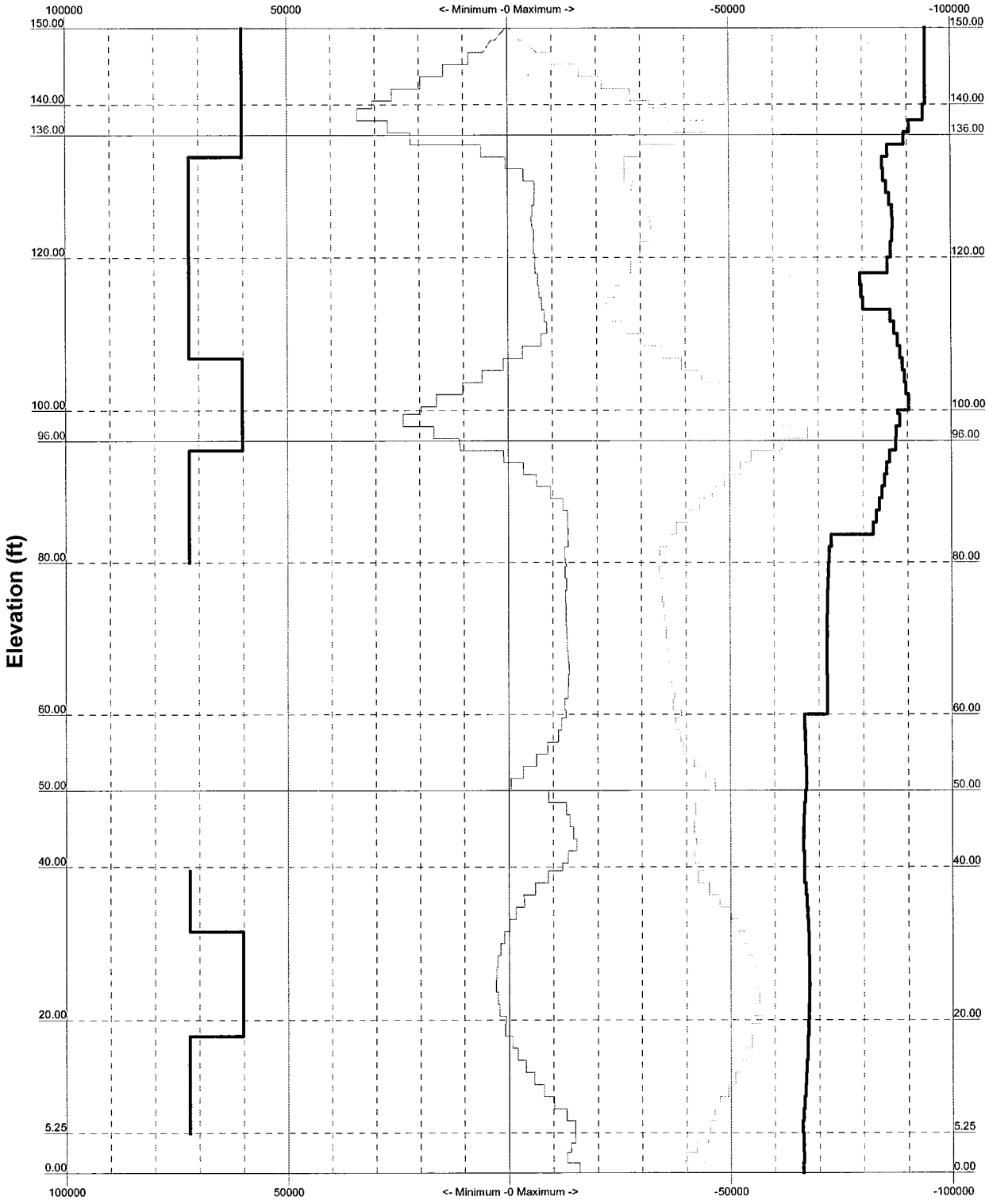
| Project: ***23002*** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | | App'd: |
| Code: TIA-222-G | Date: 11/09/12 | | Scale: NTS |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | | Dwg No. E-2 |

## TIA-222-G - 105 mph/50 mph 1.0000 in Ice Exposure C

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





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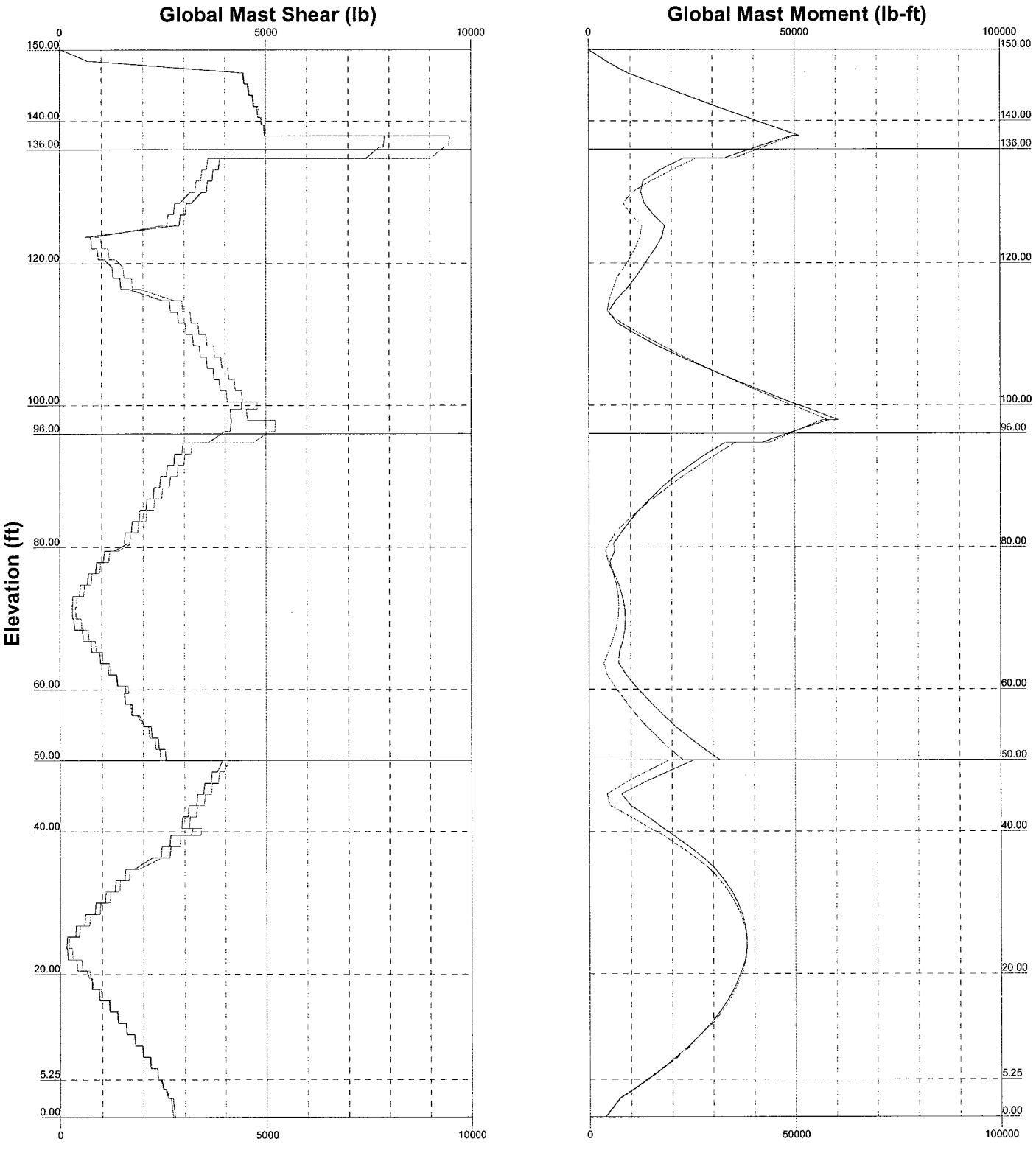
| | | | |
|---|---|---|---|
| Job: ***BANM Tower (CT03XC212)*** | | | |
| Project: ***23002*** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-3 | |

TIA-222-G - 105 mph/50 mph 1.0000 in Ice Exposure C

Vx Vz

Maximum Values

Mx Mz





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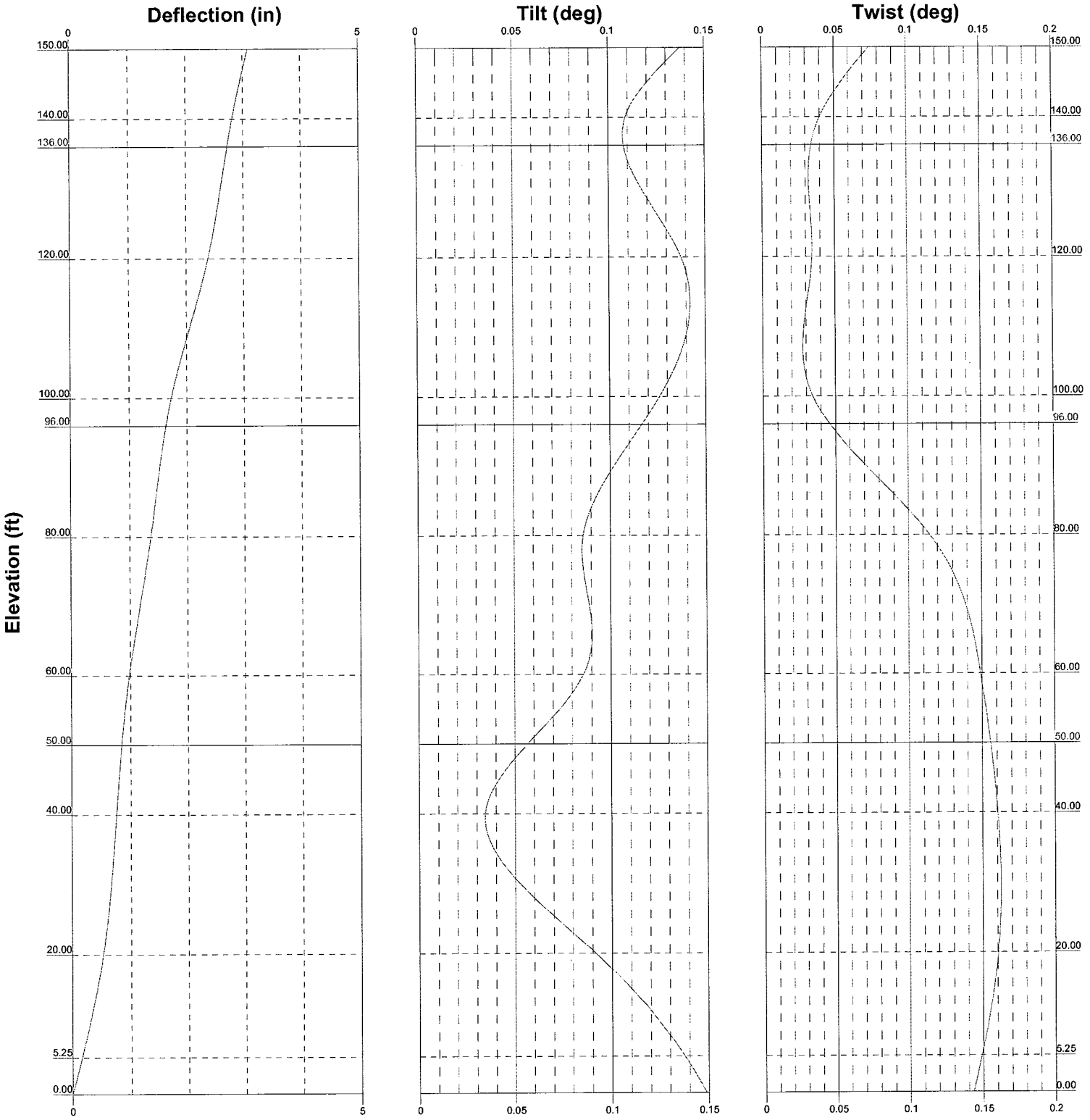
| | | | |
|---|---|---|---|
| Job: *BANM Tower (CT03XC212)* | | | |
| Project: *23002* | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-4 | |

## TIA-222-G - Service - 60 mph

**Maximum Values**





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| | | | |
|---|---|---|---|
| Job: ***BANM Tower (CT03XC212)*** | | | |
| Project: ***23002*** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-5 | |

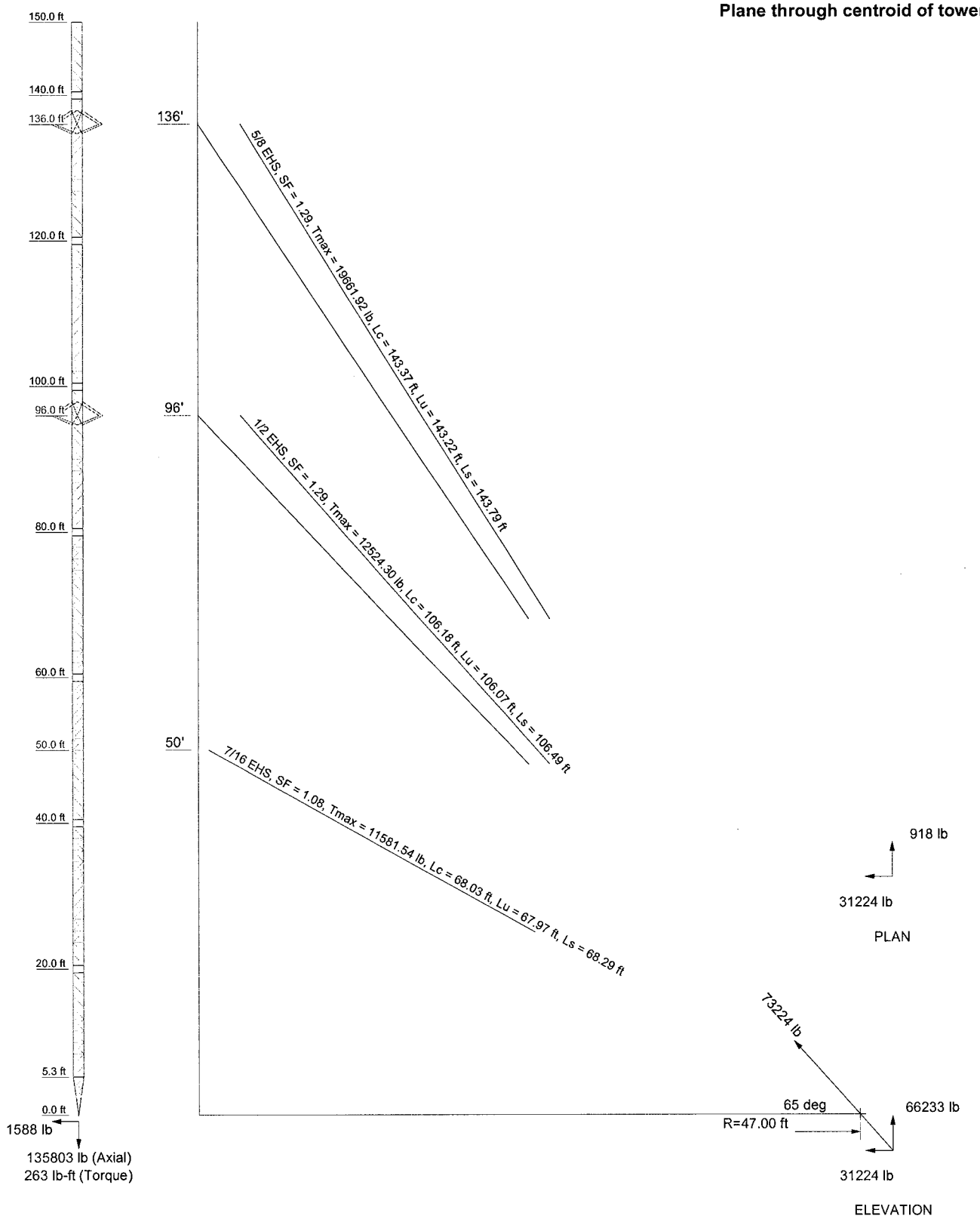
# Guy Tensions and Tower Reactions

**TIA-222-G - 105 mph/50 mph 1.0000 in Ice Exposure C**

**Maximum Values**

**Anchor 'C'@47 ft Azimuth 240 deg Elev 0 ft**

**Plane through centroid of tower**





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| | | | |
|---|---|---|---|
| Job: ***BANM Tower (CT03XC212)*** | | | |
| Project: ***23002*** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-6 | |

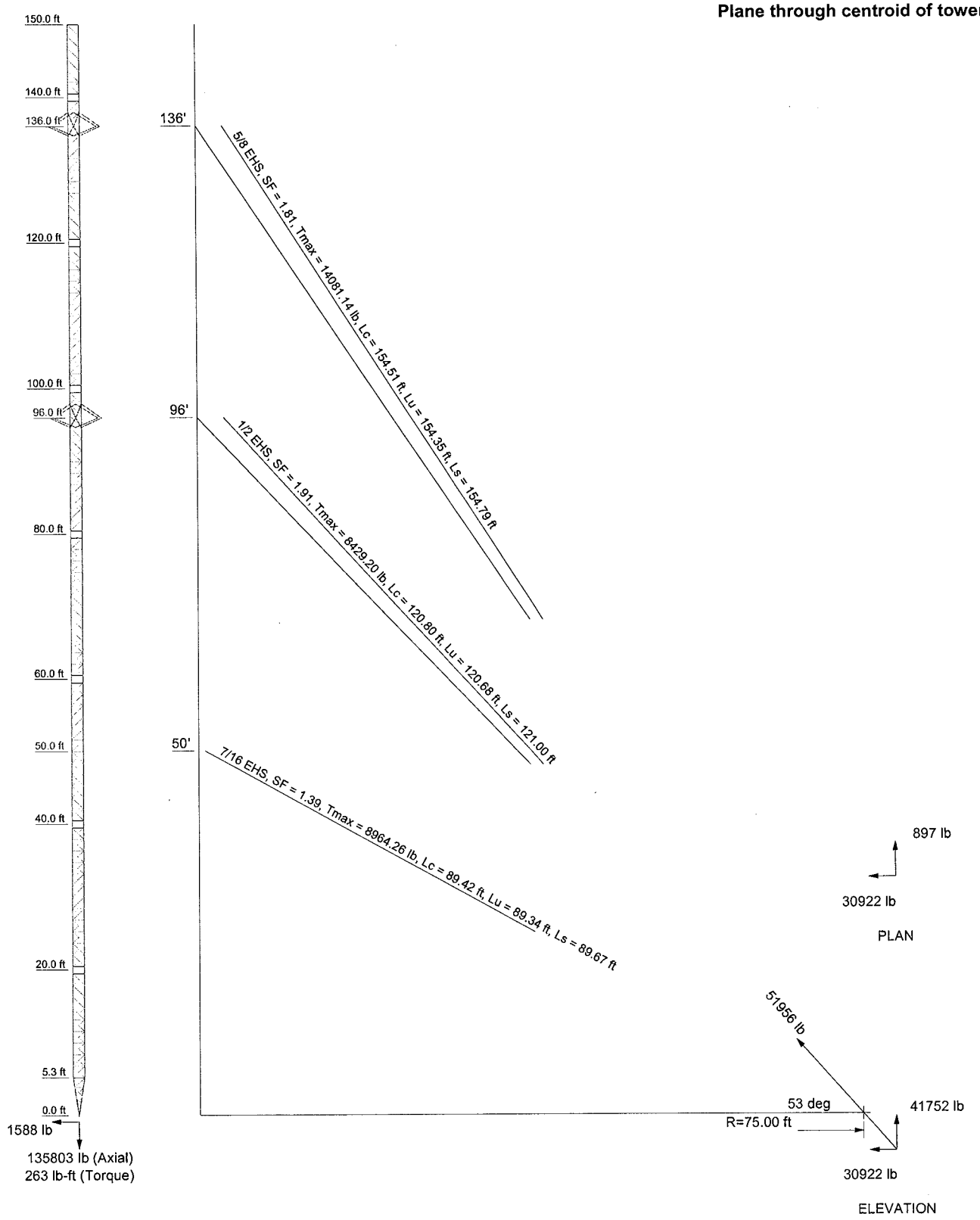
# Guy Tensions and Tower Reactions

**TIA-222-G - 105 mph/50 mph 1.0000 in Ice Exposure C**

**Maximum Values**

**Anchor 'B'@75 ft Azimuth 120 deg Elev 0 ft**

**Plane through centroid of tower**





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| | | | |
|---|---|---|---|
| Job: *BANM Tower (CT03XC212)* | | | |
| Project: *23002* | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-6 | |

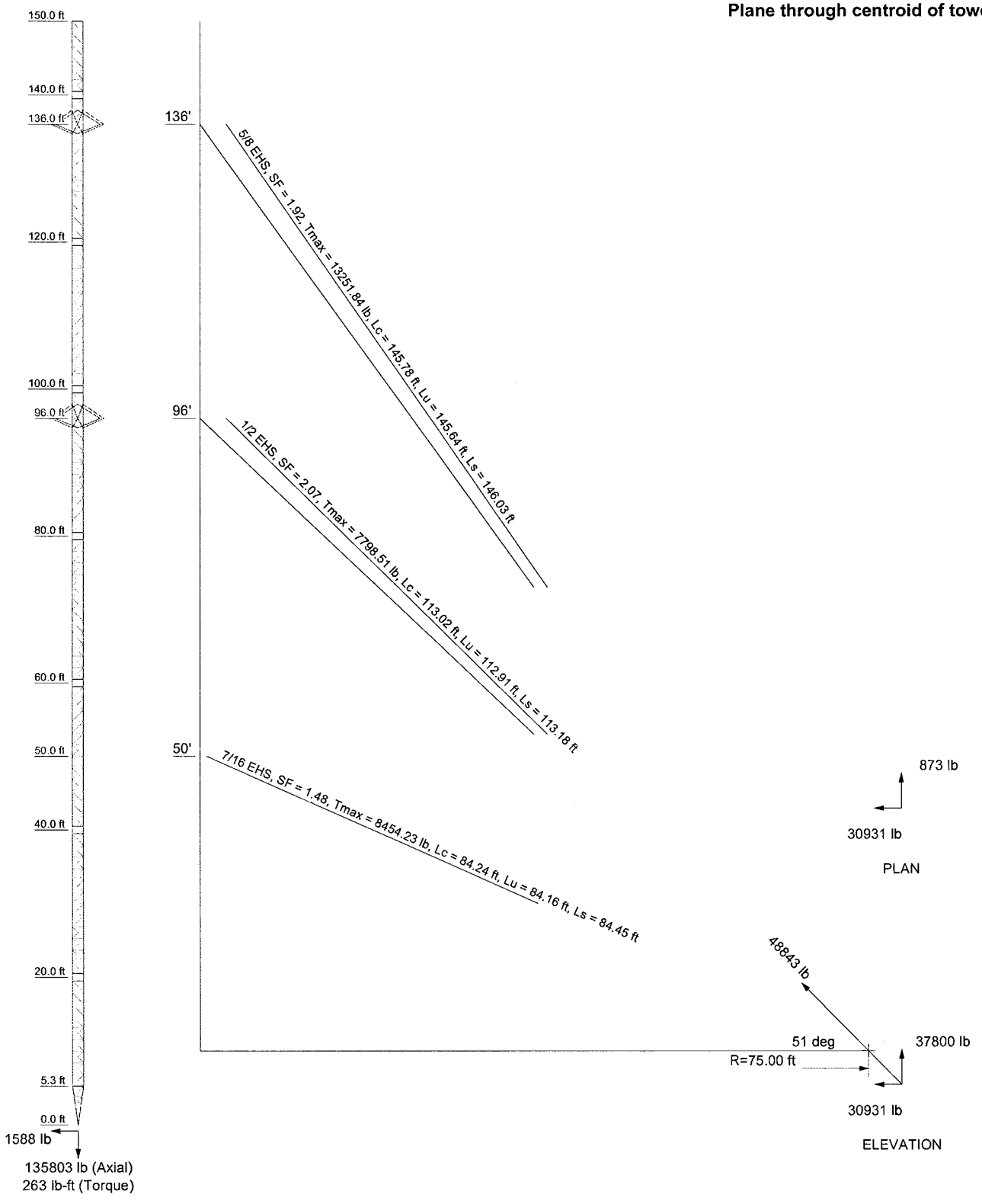
# Guy Tensions and Tower Reactions

**TIA-222-G - 105 mph/50 mph 1.0000 in Ice Exposure C**

**Maximum Values**

**Anchor 'A'@75 ft Azimuth 0 deg Elev 10 ft**

**Plane through centroid of tower**




| | | | |
|---|---|---|---|
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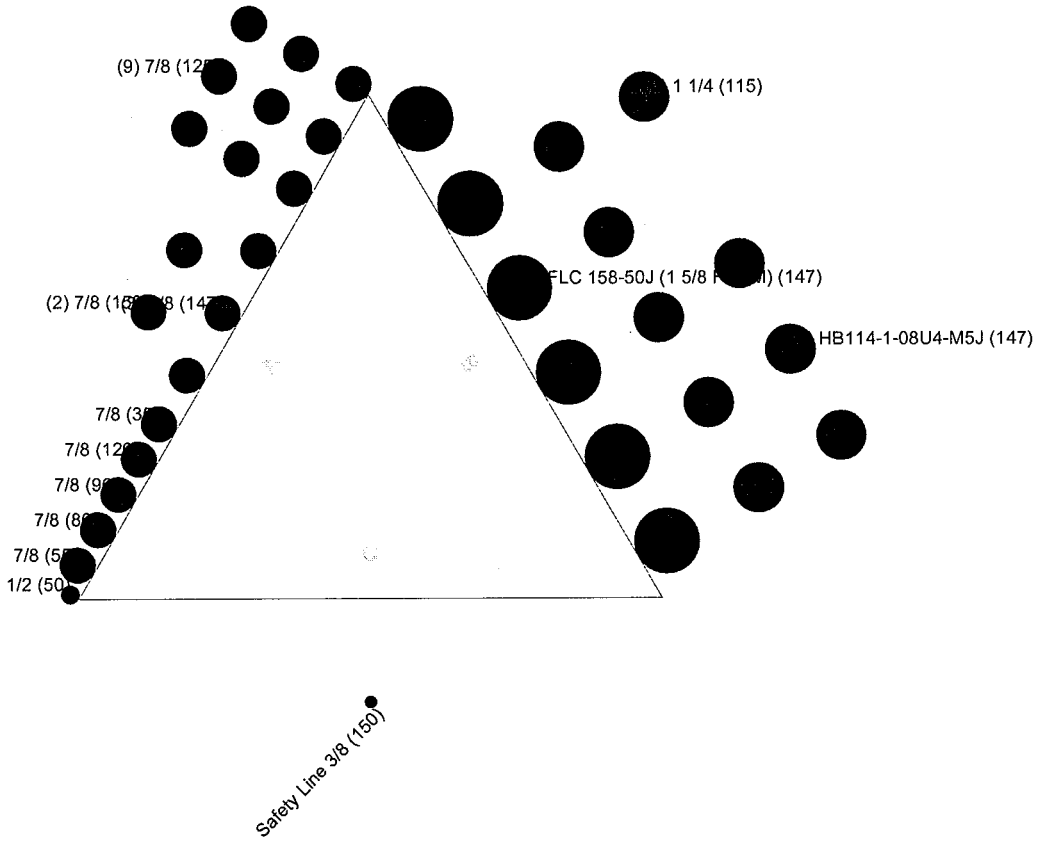
| | | Project: ***23002*** | |
| | | Client: Alcatel-Lucent / Sprint | Drawn by: tmoore / App'd: |
| | | Code: TIA-222-G | Date: 11/09/12 / Scale: NTS |
| | | Path: I:\23000\23002\Structural\Risa\23002.eri | Dwg No. E-6 |

# Feedline Plan

_____ Round _____ Flat _____ App In Face _____ App Out Face




| | | |
|---|---|---|
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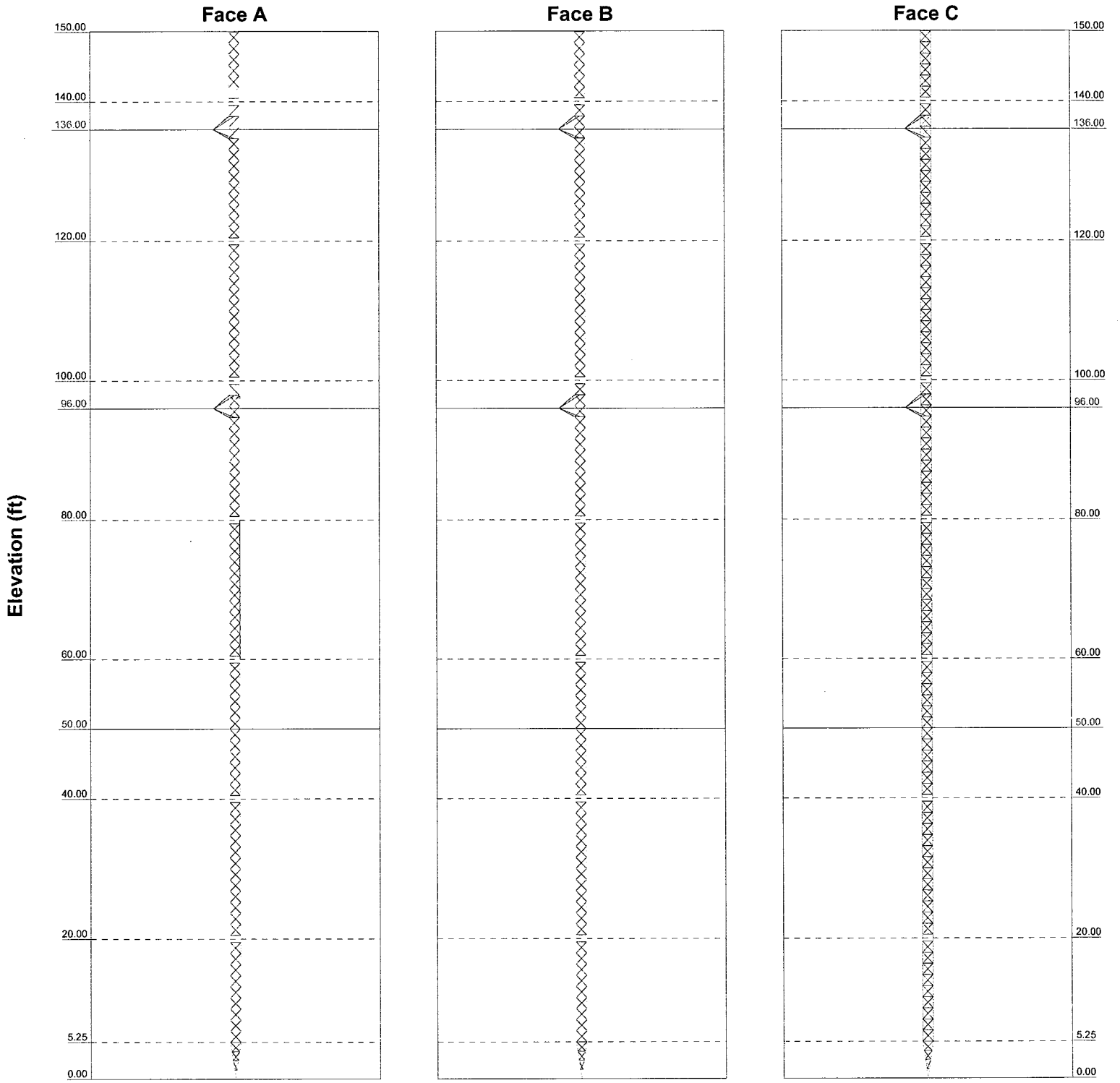
## Stress Distribution Chart
### 0' - 150'

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





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|---|---|---|---|
| Job: ***BANM Tower (CT03XC212)*** | | | |
| Project: ***23002*** | | | |
| Client: Alcatel-Lucent / Sprint | Drawn by: tmoore | App'd: | |
| Code: TIA-222-G | Date: 11/09/12 | Scale: NTS | |
| Path: I:\23000\23002\Structural\Risa\23002.eri | | Dwg No. E-8 | |

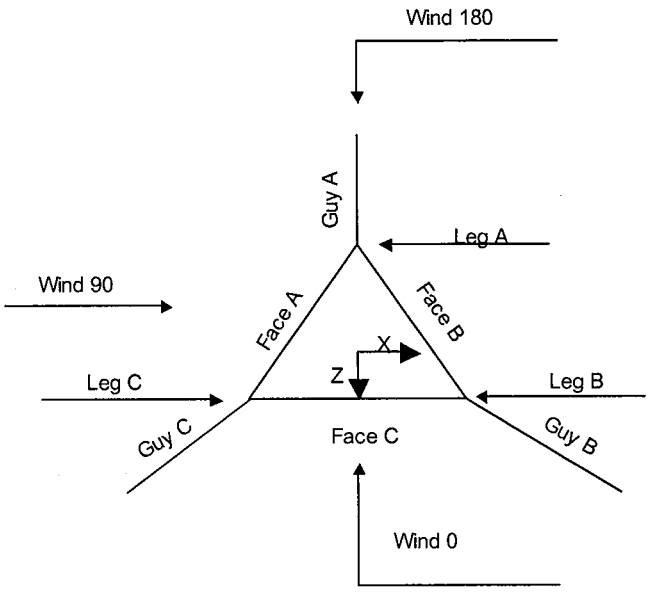
# APPENDIX B

# TOWER CALCULATIONS

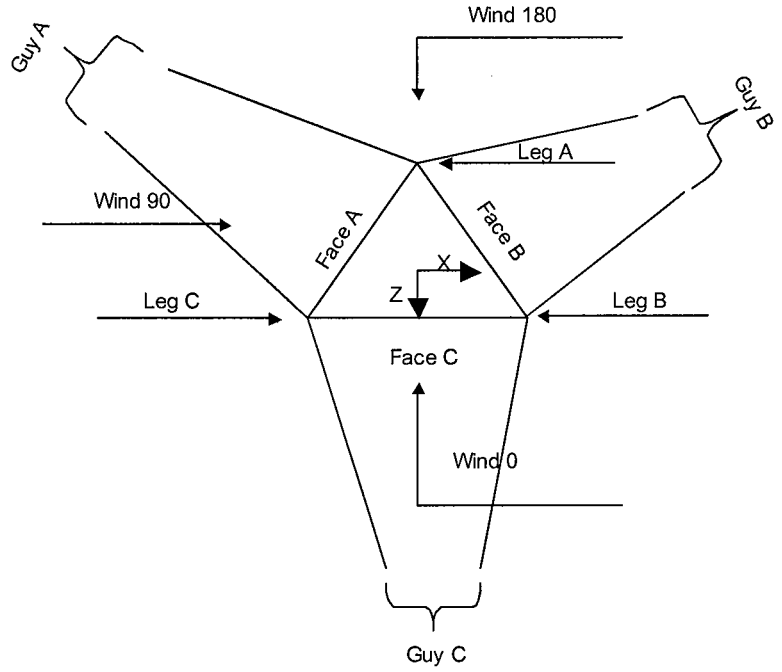
# Tower Input Data

The main tower is a 3x guyed tower with an overall height of 150.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 1.50 ft at the top and tapered at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Tower is located in Tolland County, Connecticut.
Basic wind speed of 105 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Safety factor used in guy design is 1.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.




***Corner & Starmount Guyed Tower***




***Face Guyed***

## Tower Section Geometry

| Tower Section | Tower Elevation | Assembly Database | Description | Section Width | Number of Sections | Section Length |
|---|---|---|---|---|---|---|
| | ft | | | ft | | ft |
| T1 | 150.00-140.00 | | | 1.50 | 1 | 10.00 |
| T2 | 140.00-120.00 | | | 1.50 | 1 | 20.00 |
| T3 | 120.00-100.00 | | | 1.50 | 1 | 20.00 |
| T4 | 100.00-80.00 | | | 1.50 | 1 | 20.00 |
| T5 | 80.00-60.00 | | | 1.50 | 1 | 20.00 |
| T6 | 60.00-40.00 | | | 1.50 | 1 | 20.00 |
| T7 | 40.00-20.00 | | | 1.50 | 1 | 20.00 |
| T8 | 20.00-5.25 | | | 1.50 | 1 | 14.75 |
| T9 | 5.25-0.00 | | | 1.50 | 1 | 5.25 |

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

| Tower Section | Tower Elevation ft | Diagonal Spacing ft | Bracing Type | Has K Brace End Panels | Has Horizontals | Top Girt Offset in | Bottom Girt Offset in |
|---|---|---|---|---|---|---|---|
| T1 | 150.00-140.00 | 1.58 | X Brace | No | Steps | 0.0000 | 6.0000 |
| T2 | 140.00-120.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T3 | 120.00-100.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T4 | 100.00-80.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T5 | 80.00-60.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T6 | 60.00-40.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T7 | 40.00-20.00 | 1.58 | X Brace | No | Steps | 6.0000 | 6.0000 |
| T8 | 20.00-5.25 | 1.58 | X Brace | No | Steps | 6.0000 | 0.0000 |
| T9 | 5.25-0.00 | 1.31 | X Brace | No | Yes | 0.0000 | 0.0000 |

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

| Tower Elevation ft | Leg Type | Leg Size | Leg Grade | Diagonal Type | Diagonal Size | Diagonal Grade |
|---|---|---|---|---|---|---|
| T1 150.00-140.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T2 140.00-120.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T3 120.00-100.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T4 100.00-80.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T5 80.00-60.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T6 60.00-40.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T7 40.00-20.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T8 20.00-5.25 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |
| T9 5.25-0.00 | Solid Round | 1 3/4 | A572-50 (50 ksi) | Solid Round | 5/8 | A36 (36 ksi) |

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

| Tower Elevation ft | Top Girt Type | Top Girt Size | Top Girt Grade | Bottom Girt Type | Bottom Girt Size | Bottom Girt Grade |
|---|---|---|---|---|---|---|
| T1 150.00-140.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T2 140.00-120.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T3 120.00-100.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T4 100.00-80.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T5 80.00-60.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T6 60.00-40.00 | Solid Round | 3/4 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T7 40.00-20.00 | Solid Round | 3/4 | A572-50 | Solid Round | 3/4 | A572-50 |

| Tower Elevation ft | Top Girt Type | Top Girt Size | Top Girt Grade | Bottom Girt Type | Bottom Girt Size | Bottom Girt Grade |
|---|---|---|---|---|---|---|
| T8 20.00-5.25 | Solid Round | 3/4 | (50 ksi) A572-50 (50 ksi) | Solid Round | 3/4 | (50 ksi) A572-50 (50 ksi) |
| T9 5.25-0.00 | Solid Round | | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |

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

| Tower Elevation ft | No. of Mid Girts | Mid Girt Type | Mid Girt Size | Mid Girt Grade | Horizontal Type | Horizontal Size | Horizontal Grade |
|---|---|---|---|---|---|---|---|
| T1 150.00-140.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T2 140.00-120.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T3 120.00-100.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T4 100.00-80.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T5 80.00-60.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T6 60.00-40.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T7 40.00-20.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T8 20.00-5.25 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T9 5.25-0.00 | None | Flat Bar | | A36 (36 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |

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

| Tower Elevation ft | Gusset Area (per face) ft² | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in |
|---|---|---|---|---|---|---|---|---|
| T1 150.00-140.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T2 140.00-120.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T3 120.00-100.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T4 100.00-80.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T5 80.00-60.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T6 60.00-40.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T7 40.00-20.00 | 0.00 | 0.0000 | A36 | 1 | 1 | 1 | 36.0000 | 36.0000 |

| Tower Elevation ft | Gusset Area (per face) ft² | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in |
|---|---|---|---|---|---|---|---|---|
| T8 20.00-5.25 | 0.00 | 0.0000 | (36 ksi) A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |
| T9 5.25-0.00 | 0.00 | 0.0000 | (36 ksi) A36 (36 ksi) | 1 | 1 | 1 | 36.0000 | 36.0000 |

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

| Tower Elevation ft | Calc K Single Angles | Calc K Solid Rounds | K Factors[1] Legs | X Brace Diags X | X Brace Diags Y | K Single Diags X | K Single Diags Y | Girts X | Girts Y | Horiz. X | Horiz. Y | Sec. Horiz. X | Sec. Horiz. Y | Inner Brace X | Inner Brace Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 150.00-140.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T2 140.00-120.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T3 120.00-100.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T4 100.00-80.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T5 80.00-60.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T6 60.00-40.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T7 40.00-20.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T8 20.00-5.25 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| T9 5.25-0.00 | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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

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

| Tower Elevation ft | Leg Net Width Deduct in | Leg U | Diagonal Net Width Deduct in | Diagonal U | Top Girt Net Width Deduct in | Top Girt U | Bottom Girt Net Width Deduct in | Bottom Girt U | Mid Girt Net Width Deduct in | Mid Girt U | Long Horizontal Net Width Deduct in | Long Horizontal U | Short Horizontal Net Width Deduct in | Short Horizontal U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 150.00-140.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T2 140.00-120.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T3 120.00-100.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T4 100.00-80.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T5 80.00-60.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T6 60.00-40.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T7 40.00-20.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |
| T8 20.00-5.25 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |

| Tower Elevation ft | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U |
| T9 5.25-0.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |

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

| Tower Elevation ft | Leg Connection Type | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. |
| T1 150.00-140.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T2 140.00-120.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T3 120.00-100.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T4 100.00-80.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T5 80.00-60.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T6 60.00-40.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T7 40.00-20.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T8 20.00-5.25 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T9 5.25-0.00 | Sleeve DS | 0.6250 A325N | 4 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |

## Guy Data

| Guy Elevation ft | Guy Grade | | Guy Size | Initial Tension lb | % | Guy Modulus ksi | Guy Weight plf | $L_u$ ft | Anchor Radius ft | Anchor Azimuth Adj. ° | Anchor Elevation ft | End Fitting Efficiency % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 136 | EHS | A | 5/8 | 4240.00 | 10% | 21000 | 0.813 | 145.66 | 75.00 | 0.0000 | 10.00 | 100% |
| | | B | 5/8 | 4240.00 | 10% | 21000 | 0.813 | 154.38 | 75.00 | 0.0000 | 0.00 | 100% |
| | | C | 5/8 | 4240.00 | 10% | 21000 | 0.813 | 143.24 | 47.00 | 0.0000 | 0.00 | 100% |
| 96 | EHS | A | 1/2 | 2690.00 | 10% | 21000 | 0.517 | 112.92 | 75.00 | 0.0000 | 10.00 | 100% |
| | | B | 1/2 | 2690.00 | 10% | 21000 | 0.517 | 120.70 | 75.00 | 0.0000 | 0.00 | 100% |
| | | C | 1/2 | 2690.00 | 10% | 21000 | 0.517 | 106.09 | 47.00 | 0.0000 | 0.00 | 100% |
| 50 | EHS | A | 7/16 | 2080.00 | 10% | 21000 | 0.399 | 84.17 | 75.00 | 0.0000 | 10.00 | 100% |
| | | B | 7/16 | 2080.00 | 10% | 21000 | 0.399 | 89.34 | 75.00 | 0.0000 | 0.00 | 100% |
| | | C | 7/16 | 2080.00 | 10% | 21000 | 0.399 | 67.97 | 47.00 | 0.0000 | 0.00 | 100% |

## Guy Data *(cont'd)*

| Guy Elevation ft | Mount Type | Torque-Arm Spread ft | Torque-Arm Leg Angle ° | Torque-Arm Style | Torque-Arm Grade | Torque-Arm Type | Torque-Arm Size |
|---|---|---|---|---|---|---|---|
| 136 | Torque Arm | 6.00 | 20.0000 | Wing | A36 (36 ksi) | Pipe | P2.5x.203 |
| 96 | Torque Arm | 6.00 | 20.0000 | Wing | A36 (36 ksi) | Pipe | P2.5x.203 |
| 50 | Corner | | | | | | |

## Guy Data (cont'd)

| Guy Elevation ft | Diagonal Grade | Diagonal Type | Upper Diagonal Size | Lower Diagonal Size | Is Strap. | Pull-Off Grade | Pull-Off Type | Pull-Off Size |
|---|---|---|---|---|---|---|---|---|
| 136.00 | A572-50 (50 ksi) | Solid Round | | | No | A572-50 (50 ksi) | Solid Round | 3/4 |
| 96.00 | A572-50 (50 ksi) | Solid Round | | | No | A572-50 (50 ksi) | Solid Round | 3/4 |
| 50.00 | A572-50 (50 ksi) | Solid Round | | | No | A572-50 (50 ksi) | Solid Round | 3/4 |

## Guy Data (cont'd)

| Guy Elevation ft | Cable Weight A lb | Cable Weight B lb | Cable Weight C lb | Cable Weight D lb | Tower Intercept A ft | Tower Intercept B ft | Tower Intercept C ft | Tower Intercept D ft |
|---|---|---|---|---|---|---|---|---|
| 136 | 118.42 | 125.51 | 116.46 | | 2.01<br>2.4 sec/pulse | 2.26<br>2.6 sec/pulse | 1.94<br>2.4 sec/pulse | |
| 96 | 58.38 | 62.40 | 54.85 | | 1.22<br>1.9 sec/pulse | 1.39<br>2.0 sec/pulse | 1.07<br>1.8 sec/pulse | |
| 50 | 33.58 | 35.65 | 27.12 | | 0.68<br>1.4 sec/pulse | 0.76<br>1.5 sec/pulse | 0.44<br>1.1 sec/pulse | |

## Guy Data (cont'd)

| Guy Elevation ft | Calc K Single Angles | Calc K Solid Rounds | Torque Arm $K_x$ | Torque Arm $K_y$ | Pull Off $K_x$ | Pull Off $K_y$ | Diagonal $K_x$ | Diagonal $K_y$ |
|---|---|---|---|---|---|---|---|---|
| 136 | No | Yes | 1 | 1 | 1 | 1 | 1 | 1 |
| 96 | No | Yes | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | No | No | | | 1 | 1 | 1 | 1 |

## Guy Data (cont'd)

| Guy Elevation ft | Torque-Arm | | | | Pull Off | | | | Diagonal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bolt Size in | Number | Net Width Deduct in | U | Bolt Size in | Number | Net Width Deduct in | U | Bolt Size in | Number | Net Width Deduct in | U |
| 136 | 0.0000 A325N | 0 | 0.0000 | 1 | 0.6250 A325N | 0 | 0.0000 | 0.75 | 0.6250 A325N | 0 | 0.0000 | 0.75 |
| 96 | 0.0000 A325N | 0 | 0.0000 | 1 | 0.6250 A325N | 0 | 0.0000 | 0.75 | 0.6250 A325N | 0 | 0.0000 | 0.75 |
| 50 | 0.6250 A325N | 0 | 0.0000 | 0.75 | 0.6250 A325N | 0 | 0.0000 | 0.75 | 0.6250 A325N | 0 | 0.0000 | 0.75 |

## Guy Pressures

| Guy Elevation ft | Guy Location | z ft | $q_z$ psf | $q_z$ Ice psf | Ice Thickness in |
|---|---|---|---|---|---|
| 136 | A | 73.00 | 28 | 6 | 2.1653 |
| | B | 68.00 | 28 | 6 | 2.1500 |
| | C | 68.00 | 28 | 6 | 2.1500 |
| 96 | A | 53.00 | 27 | 6 | 2.0970 |
| | B | 48.00 | 26 | 6 | 2.0764 |
| | C | 48.00 | 26 | 6 | 2.0764 |
| 50 | A | 30.00 | 24 | 5 | 1.9810 |
| | B | 25.00 | 23 | 5 | 1.9452 |
| | C | 25.00 | 23 | 5 | 1.9452 |

## Guy-Tensioning Information

| Guy Elevation ft | | H ft | V ft | Temperature At Time Of Tensioning: 0 F Initial Tension lb | 0 F Intercept ft | 20 F Initial Tension lb | 20 F Intercept ft | 40 F Initial Tension lb | 40 F Intercept ft | 60 F Initial Tension lb | 60 F Intercept ft | 80 F Initial Tension lb | 80 F Intercept ft | 100 F Initial Tension lb | 100 F Intercept ft | 120 F Initial Tension lb | 120 F Intercept ft |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 136 | A | 73.33 | 126.00 | 4721 | 1.81 | 4561 | 1.87 | 4400 | 1.94 | 4240 | 2.01 | 4080 | 2.09 | 3921 | 2.17 | 3762 | 2.26 |
| | B | 73.33 | 136.00 | 4668 | 2.05 | 4525 | 2.12 | 4383 | 2.18 | 4240 | 2.26 | 4098 | 2.34 | 3956 | 2.42 | 3814 | 2.51 |
| | C | 45.37 | 136.00 | 4432 | 1.86 | 4368 | 1.89 | 4304 | 1.91 | 4240 | 1.94 | 4176 | 1.97 | 4112 | 2.00 | 4048 | 2.04 |
| 96 | A | 73.33 | 86.00 | 3199 | 1.02 | 3029 | 1.08 | 2859 | 1.14 | 2690 | 1.22 | 2521 | 1.30 | 2353 | 1.39 | 2187 | 1.49 |
| | B | 73.33 | 96.00 | 3136 | 1.19 | 2987 | 1.25 | 2838 | 1.32 | 2690 | 1.39 | 2542 | 1.47 | 2395 | 1.56 | 2249 | 1.66 |
| | C | 45.37 | 96.00 | 2913 | 0.99 | 2838 | 1.02 | 2764 | 1.04 | 2690 | 1.07 | 2616 | 1.10 | 2542 | 1.13 | 2468 | 1.17 |
| 50 | A | 74.13 | 40.00 | 2805 | 0.50 | 2563 | 0.55 | 2321 | 0.61 | 2080 | 0.68 | 1841 | 0.77 | 1604 | 0.88 | 1373 | 1.02 |
| | B | 74.13 | 50.00 | 2723 | 0.58 | 2508 | 0.63 | 2294 | 0.69 | 2080 | 0.76 | 1868 | 0.85 | 1657 | 0.96 | 1450 | 1.09 |
| | C | 46.13 | 50.00 | 2514 | 0.37 | 2369 | 0.39 | 2224 | 0.41 | 2080 | 0.44 | 1936 | 0.47 | 1792 | 0.51 | 1649 | 0.56 |

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

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Perimeter in | Weight plf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLC 158-50J (1 5/8 FOAM) (147) | B | No | Ar (CaAa) | 147.00 - 0.00 | 0.0000 | 0 | 6 | 6 | 1.0000 | 2.0200 | | 0.92 |
| HB114-1-08U4-M5J (147) | B | No | Ar (CaAa) | 147.00 - 0.00 | 6.5000 | 0.24 | 3 | 3 | 1.5400 | 1.5400 | | 1.08 |
| 7/8 (125) | A | No | Ar (CaAa) | 125.00 - 0.00 | 0.0000 | 0.4 | 9 | 3 | 0.7500 | 1.1100 | | 0.54 |

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Perimeter in | Weight plf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/4 (115) | B | No | Ar (CaAa) | 115.00 - 0.00 | 3.5000 | 0.08 | 6 | 5 | 1.5000 | 1.5500 | | 0.66 |
| ********** | | | | | | | | | | | | |
| 7/8 (150) | A | No | Ar (CaAa) | 150.00 - 0.00 | 2.0000 | 0.05 | 2 | 2 | 1.1100 | 1.1100 | | 0.54 |
| 7/8 (147) | A | No | Ar (CaAa) | 147.00 - 0.00 | 0.0000 | 0.05 | 3 | 3 | 1.1100 | 1.1100 | | 0.54 |
| 7/8 (120) | A | No | Ar (CaAa) | 120.00 - 0.00 | 0.0000 | -0.24 | 1 | 1 | 1.1100 | 1.1100 | | 0.54 |
| 7/8 (96) | A | No | Ar (CaAa) | 96.00 - 0.00 | 0.0000 | -0.31 | 1 | 1 | 1.1100 | 1.1100 | | 0.54 |
| 7/8 (80) | A | No | Ar (CaAa) | 80.00 - 0.00 | 0.0000 | -0.38 | 1 | 1 | 1.1100 | 1.1100 | | 0.54 |
| 7/8 (55) | A | No | Ar (CaAa) | 55.00 - 0.00 | 0.0000 | -0.45 | 1 | 1 | 1.1100 | 1.1100 | | 0.54 |
| 1/2 (50) | A | No | Ar (CaAa) | 50.00 - 0.00 | 0.0000 | -0.5 | 1 | 1 | 0.5800 | 0.5800 | | 0.25 |
| 7/8 (35) | A | No | Ar (CaAa) | 35.00 - 0.00 | 0.0000 | -0.17 | 1 | 1 | 1.1100 | 1.1100 | | 0.54 |
| ********** | | | | | | | | | | | | |
| Safety Line 3/8 (150) | C | No | Ar (CaAa) | 150.00 - 0.00 | 3.0000 | 0 | 1 | 1 | 0.3750 | 0.3750 | | 0.22 |

## Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|
| T1 | 150.00-140.00 | A | 0.000 | 0.000 | 4.551 | 0.000 | 22.14 |
| | | B | 0.000 | 0.000 | 11.718 | 0.000 | 61.32 |
| | | C | 0.000 | 0.000 | 0.375 | 0.000 | 2.20 |
| T2 | 140.00-120.00 | A | 0.000 | 0.000 | 16.095 | 0.000 | 78.30 |
| | | B | 0.000 | 0.000 | 33.480 | 0.000 | 175.20 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T3 | 120.00-100.00 | A | 0.000 | 0.000 | 33.300 | 0.000 | 162.00 |
| | | B | 0.000 | 0.000 | 47.430 | 0.000 | 234.60 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T4 | 100.00-80.00 | A | 0.000 | 0.000 | 35.076 | 0.000 | 170.64 |
| | | B | 0.000 | 0.000 | 52.080 | 0.000 | 254.40 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T5 | 80.00-60.00 | A | 0.000 | 0.000 | 37.740 | 0.000 | 183.60 |
| | | B | 0.000 | 0.000 | 52.080 | 0.000 | 254.40 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T6 | 60.00-40.00 | A | 0.000 | 0.000 | 39.985 | 0.000 | 194.20 |
| | | B | 0.000 | 0.000 | 52.080 | 0.000 | 254.40 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T7 | 40.00-20.00 | A | 0.000 | 0.000 | 42.785 | 0.000 | 207.50 |
| | | B | 0.000 | 0.000 | 52.080 | 0.000 | 254.40 |
| | | C | 0.000 | 0.000 | 0.750 | 0.000 | 4.40 |
| T8 | 20.00-5.25 | A | 0.000 | 0.000 | 31.963 | 0.000 | 155.02 |
| | | B | 0.000 | 0.000 | 38.409 | 0.000 | 187.62 |
| | | C | 0.000 | 0.000 | 0.553 | 0.000 | 3.25 |
| T9 | 5.25-0.00 | A | 0.000 | 0.000 | 11.377 | 0.000 | 55.18 |
| | | B | 0.000 | 0.000 | 13.671 | 0.000 | 66.78 |
| | | C | 0.000 | 0.000 | 0.197 | 0.000 | 1.16 |

## Feed Line/Linear Appurtenances Section Areas - With Ice

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|
| T1 | 150.00-140.00 | A | 2.319 | 0.000 | 0.000 | 22.517 | 0.000 | 297.37 |
| | | B | | 0.000 | 0.000 | 31.984 | 0.000 | 547.44 |
| | | C | | 0.000 | 0.000 | 5.013 | 0.000 | 78.53 |
| T2 | 140.00-120.00 | A | 2.294 | 0.000 | 0.000 | 61.784 | 0.000 | 874.42 |
| | | B | | 0.000 | 0.000 | 91.055 | 0.000 | 1547.92 |
| | | C | | 0.000 | 0.000 | 9.926 | 0.000 | 153.99 |
| T3 | 120.00-100.00 | A | 2.256 | 0.000 | 0.000 | 97.208 | 0.000 | 1545.50 |
| | | B | | 0.000 | 0.000 | 128.830 | 0.000 | 2213.05 |
| | | C | | 0.000 | 0.000 | 9.774 | 0.000 | 149.42 |
| T4 | 100.00-80.00 | A | 2.211 | 0.000 | 0.000 | 104.946 | 0.000 | 1663.42 |
| | | B | | 0.000 | 0.000 | 140.706 | 0.000 | 2397.59 |
| | | C | | 0.000 | 0.000 | 9.594 | 0.000 | 144.12 |
| T5 | 80.00-60.00 | A | 2.156 | 0.000 | 0.000 | 116.421 | 0.000 | 1835.59 |
| | | B | | 0.000 | 0.000 | 139.630 | 0.000 | 2342.55 |
| | | C | | 0.000 | 0.000 | 9.375 | 0.000 | 137.76 |
| T6 | 60.00-40.00 | A | 2.085 | 0.000 | 0.000 | 126.748 | 0.000 | 1964.52 |
| | | B | | 0.000 | 0.000 | 138.233 | 0.000 | 2271.63 |
| | | C | | 0.000 | 0.000 | 9.089 | 0.000 | 129.71 |
| T7 | 40.00-20.00 | A | 1.981 | 0.000 | 0.000 | 137.509 | 0.000 | 2072.13 |
| | | B | | 0.000 | 0.000 | 136.205 | 0.000 | 2169.73 |
| | | C | | 0.000 | 0.000 | 8.674 | 0.000 | 118.45 |
| T8 | 20.00-5.25 | A | 1.817 | 0.000 | 0.000 | 97.859 | 0.000 | 1402.03 |
| | | B | | 0.000 | 0.000 | 98.093 | 0.000 | 1483.61 |
| | | C | | 0.000 | 0.000 | 5.913 | 0.000 | 75.00 |
| T9 | 5.25-0.00 | A | 1.553 | 0.000 | 0.000 | 31.732 | 0.000 | 416.44 |
| | | B | | 0.000 | 0.000 | 33.574 | 0.000 | 463.49 |
| | | C | | 0.000 | 0.000 | 1.827 | 0.000 | 20.35 |

## Feed Line Center of Pressure

| Section | Elevation ft | $CP_X$ in | $CP_Z$ in | $CP_X$ Ice in | $CP_Z$ Ice in |
|---|---|---|---|---|---|
| T1 | 150.00-140.00 | 0.7093 | -0.5637 | 0.0000 | 0.0000 |
| T2 | 140.00-120.00 | 0.7452 | -0.7321 | 0.0000 | 0.0000 |
| T3 | 120.00-100.00 | 0.7676 | -1.0020 | 0.0000 | 0.0000 |
| T4 | 100.00-80.00 | 0.8036 | -0.9756 | 0.0000 | 0.0000 |
| T5 | 80.00-60.00 | 0.7261 | -0.9307 | 0.0000 | 0.0000 |
| T6 | 60.00-40.00 | 0.6582 | -0.8845 | 0.0000 | 0.0000 |
| T7 | 40.00-20.00 | 0.5889 | -0.8492 | 0.0304 | -0.0590 |
| T8 | 20.00-5.25 | 0.5763 | -0.8439 | 0.0566 | -0.1052 |
| T9 | 5.25-0.00 | 0.5059 | -0.8619 | 0.0000 | 0.0000 |

## Shielding Factor Ka

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|

| tnxTower | Job: BANM Tower (CT03XC212) | Page: 12 of 38 |
|---|---|---|
| Ramaker & Associates, Inc.<br>1120 Dallas Street<br>Sauk City, WI 53583<br>Phone: (608) 643-4100<br>FAX: (608) 643-7999 | Project: 23002 | Date: 13:55:14 11/09/12 |
| | Client: Alcatel-Lucent / Sprint | Designed by: tmoore |

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|
| T1 | 1 | FLC 158-50J (1 5/8 FOAM) | 140.00 - 147.00 | 0.6000 | 0.0000 |
| T1 | 2 | HB114-1-08U4-M5J | 140.00 - 147.00 | 0.6000 | 0.0000 |
| T1 | 6 | 7/8 | 140.00 - 150.00 | 0.6000 | 0.0000 |
| T1 | 7 | 7/8 | 140.00 - 147.00 | 0.6000 | 0.0000 |
| T1 | 15 | Safety Line 3/8 | 140.00 - 150.00 | 0.6000 | 0.0000 |
| T2 | 1 | FLC 158-50J (1 5/8 FOAM) | 120.00 - 140.00 | 0.6000 | 0.0000 |
| T2 | 2 | HB114-1-08U4-M5J | 120.00 - 140.00 | 0.6000 | 0.0000 |
| T2 | 3 | 7/8 | 120.00 - 125.00 | 0.6000 | 0.0000 |
| T2 | 6 | 7/8 | 120.00 - 140.00 | 0.6000 | 0.0000 |
| T2 | 7 | 7/8 | 120.00 - 140.00 | 0.6000 | 0.0000 |
| T2 | 15 | Safety Line 3/8 | 120.00 - 140.00 | 0.6000 | 0.0000 |
| T3 | 1 | FLC 158-50J (1 5/8 FOAM) | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 2 | HB114-1-08U4-M5J | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 3 | 7/8 | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 4 | 1 1/4 | 100.00 - 115.00 | 0.6000 | 0.0000 |
| T3 | 6 | 7/8 | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 7 | 7/8 | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 8 | 7/8 | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T3 | 15 | Safety Line 3/8 | 100.00 - 120.00 | 0.6000 | 0.0000 |
| T4 | 1 | FLC 158-50J (1 5/8 FOAM) | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 2 | HB114-1-08U4-M5J | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 3 | 7/8 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 4 | 1 1/4 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 6 | 7/8 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 7 | 7/8 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 8 | 7/8 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T4 | 9 | 7/8 | 80.00 - 96.00 | 0.6000 | 0.0000 |
| T4 | 15 | Safety Line 3/8 | 80.00 - 100.00 | 0.6000 | 0.0000 |
| T5 | 1 | FLC 158-50J (1 5/8 FOAM) | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 2 | HB114-1-08U4-M5J | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 3 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 4 | 1 1/4 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 6 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 7 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 8 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 9 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 10 | 7/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T5 | 15 | Safety Line 3/8 | 60.00 - 80.00 | 0.6000 | 0.0000 |
| T6 | 1 | FLC 158-50J (1 5/8 FOAM) | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 2 | HB114-1-08U4-M5J | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 3 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 4 | 1 1/4 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 6 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 7 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 8 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 9 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 10 | 7/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T6 | 11 | 7/8 | 40.00 - 55.00 | 0.6000 | 0.0000 |
| T6 | 12 | 1/2 | 40.00 - 50.00 | 0.6000 | 0.0000 |
| T6 | 15 | Safety Line 3/8 | 40.00 - 60.00 | 0.6000 | 0.0000 |
| T7 | 1 | FLC 158-50J (1 5/8 FOAM) | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 2 | HB114-1-08U4-M5J | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 3 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 4 | 1 1/4 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 6 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 7 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 8 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 9 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 10 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 11 | 7/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 12 | 1/2 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T7 | 13 | 7/8 | 20.00 - 35.00 | 0.6000 | 0.0342 |

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|
| T7 | 15 | Safety Line 3/8 | 20.00 - 40.00 | 0.6000 | 0.0342 |
| T8 | 1 | FLC 158-50J (1 5/8 FOAM) | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 2 | HB114-1-08U4-M5J | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 3 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 4 | 1 1/4 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 6 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 7 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 8 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 9 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 10 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 11 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 12 | 1/2 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 13 | 7/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T8 | 15 | Safety Line 3/8 | 5.25 - 20.00 | 0.6000 | 0.0675 |
| T9 | 1 | FLC 158-50J (1 5/8 FOAM) | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 2 | HB114-1-08U4-M5J | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 3 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 4 | 1 1/4 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 6 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 7 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 8 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 9 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 10 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 11 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 12 | 1/2 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 13 | 7/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |
| T9 | 15 | Safety Line 3/8 | 0.00 - 5.25 | 0.5561 | 0.0000 |

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| DB420 | A | From Face | 0.50<br>0.00<br>0.00 | 0.0000 | 170.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.33<br>5.99<br>8.66 | 3.33<br>5.99<br>8.66 | 34.00<br>44.20<br>54.40 |
| 5" Dia 20' Omni | A | From Face | 0.50<br>0.00<br>0.00 | 0.0000 | 150.00 | No Ice<br>1/2" Ice<br>1" Ice | 10.00<br>12.05<br>14.12 | 10.00<br>12.05<br>14.12 | 60.00<br>128.11<br>209.10 |
| ********** | | | | | | | | | |
| DB420 | A | From Leg | 4.00<br>0.00<br>10.00 | 0.0000 | 147.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.33<br>5.99<br>8.66 | 3.33<br>5.99<br>8.66 | 34.00<br>44.20<br>54.40 |
| DB222 | B | From Leg | 4.00<br>0.00<br>10.00 | 0.0000 | 147.00 | No Ice<br>1/2" Ice<br>1" Ice | 1.60<br>2.88<br>4.16 | 1.60<br>2.88<br>4.16 | 16.00<br>20.80<br>25.60 |
| DB420 | C | From Leg | 4.00<br>0.00<br>5.00 | 0.0000 | 147.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.33<br>5.99<br>8.66 | 3.33<br>5.99<br>8.66 | 34.00<br>44.20<br>54.40 |
| DB980H90E-M w/Mount Pipe | A | From Face | 4.00<br>4.00 | 0.0000 | 147.00 | No Ice<br>1/2" Ice | 4.27<br>4.86 | 3.86<br>4.95 | 34.05<br>69.84 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0.00 | | | 1" Ice | 5.37 | 5.75 | 116.19 |
| DB980H90E-M w/Mount Pipe | B | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 4.27 | 3.86 | 34.05 |
| | | | 4.00 | | | 1/2" Ice | 4.86 | 4.95 | 69.84 |
| | | | 0.00 | | | 1" Ice | 5.37 | 5.75 | 116.19 |
| DB980H90E-M w/Mount Pipe | C | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 4.27 | 3.86 | 34.05 |
| | | | 4.00 | | | 1/2" Ice | 4.86 | 4.95 | 69.84 |
| | | | 0.00 | | | 1" Ice | 5.37 | 5.75 | 116.19 |
| APXVSPP18-C-A20 w/Mount Pipe | A | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 8.56 | 6.95 | 82.55 |
| | | | -4.00 | | | 1/2" Ice | 9.21 | 8.13 | 147.99 |
| | | | 0.00 | | | 1" Ice | 9.83 | 9.03 | 225.42 |
| APXVSPP18-C-A20 w/Mount Pipe | B | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 8.56 | 6.95 | 82.55 |
| | | | -4.00 | | | 1/2" Ice | 9.21 | 8.13 | 147.99 |
| | | | 0.00 | | | 1" Ice | 9.83 | 9.03 | 225.42 |
| APXVSPP18-C-A20 w/Mount Pipe | C | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 8.56 | 6.95 | 82.55 |
| | | | -4.00 | | | 1/2" Ice | 9.21 | 8.13 | 147.99 |
| | | | 0.00 | | | 1" Ice | 9.83 | 9.03 | 225.42 |
| 1900MHz 4x40W RRH | A | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.71 | 2.61 | 59.50 |
| | | | 0.00 | | | 1/2" Ice | 2.95 | 2.84 | 82.62 |
| | | | 0.00 | | | 1" Ice | 3.20 | 3.09 | 108.98 |
| 1900MHz 4x40W RRH | B | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.71 | 2.61 | 59.50 |
| | | | 0.00 | | | 1/2" Ice | 2.95 | 2.84 | 82.62 |
| | | | 0.00 | | | 1" Ice | 3.20 | 3.09 | 108.98 |
| 1900MHz 4x40W RRH | C | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.71 | 2.61 | 59.50 |
| | | | 0.00 | | | 1/2" Ice | 2.95 | 2.84 | 82.62 |
| | | | 0.00 | | | 1" Ice | 3.20 | 3.09 | 108.98 |
| 800MHz 2x50W RRH | A | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.40 | 2.25 | 64.00 |
| | | | 0.00 | | | 1/2" Ice | 2.61 | 2.46 | 86.12 |
| | | | 0.00 | | | 1" Ice | 2.83 | 2.68 | 111.30 |
| 800MHz 2x50W RRH | B | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.40 | 2.25 | 64.00 |
| | | | 0.00 | | | 1/2" Ice | 2.61 | 2.46 | 86.12 |
| | | | 0.00 | | | 1" Ice | 2.83 | 2.68 | 111.30 |
| 800MHz 2x50W RRH | C | From Face | 4.00 | 0.0000 | 147.00 | No Ice | 2.40 | 2.25 | 64.00 |
| | | | 0.00 | | | 1/2" Ice | 2.61 | 2.46 | 86.12 |
| | | | 0.00 | | | 1" Ice | 2.83 | 2.68 | 111.30 |
| Pirod Delta Mount (3) | C | None | | 0.0000 | 147.00 | No Ice | 32.94 | 32.94 | 740.00 |
| | | | | | | 1/2" Ice | 47.60 | 47.60 | 1000.00 |
| | | | | | | 1" Ice | 62.26 | 62.26 | 1260.00 |
| ********** | | | | | | | | | |
| 10' Omni | B | From Face | 4.00 | 0.0000 | 130.00 | No Ice | 2.50 | 2.50 | 30.00 |
| | | | 0.00 | | | 1/2" Ice | 3.53 | 3.53 | 48.64 |
| | | | 5.00 | | | 1" Ice | 4.58 | 4.58 | 73.79 |
| 4' Standoff | B | From Face | 2.00 | 0.0000 | 130.00 | No Ice | 2.72 | 2.72 | 50.00 |
| | | | 0.00 | | | 1/2" Ice | 4.91 | 4.91 | 89.00 |
| | | | 0.00 | | | 1" Ice | 7.10 | 7.10 | 128.00 |
| ********** | | | | | | | | | |
| MB96RR900200DPBL w/Mount Pipe | A | From Leg | 6.00 | 0.0000 | 125.00 | No Ice | 11.47 | 9.48 | 65.20 |
| | | | 0.00 | | | 1/2" Ice | 12.08 | 10.90 | 148.67 |
| | | | 0.00 | | | 1" Ice | 12.71 | 12.17 | 246.45 |
| MB96RR900200DPBL w/Mount Pipe | B | From Leg | 6.00 | 0.0000 | 125.00 | No Ice | 11.47 | 9.48 | 65.20 |
| | | | 0.00 | | | 1/2" Ice | 12.08 | 10.90 | 148.67 |
| | | | 0.00 | | | 1" Ice | 12.71 | 12.17 | 246.45 |
| FS90-11-00NAL2 w/Mount Pipe | C | From Leg | 6.00 | 0.0000 | 125.00 | No Ice | 11.47 | 9.48 | 65.20 |
| | | | 0.00 | | | 1/2" Ice | 12.08 | 10.90 | 148.67 |
| | | | 0.00 | | | 1" Ice | 12.71 | 12.17 | 246.45 |
| CG DD1900W800 | A | From Leg | 4.00 | 0.0000 | 125.00 | No Ice | 1.28 | 0.31 | 12.10 |
| | | | 0.00 | | | 1/2" Ice | 1.44 | 0.41 | 19.30 |
| | | | 0.00 | | | 1" Ice | 1.60 | 0.52 | 28.37 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| CG DD1900W800 | B | From Leg | 4.00 | 0.0000 | 125.00 | No Ice | 1.28 | 0.31 | 12.10 |
| | | | 0.00 | | | 1/2" Ice | 1.44 | 0.41 | 19.30 |
| | | | 0.00 | | | 1" Ice | 1.60 | 0.52 | 28.37 |
| CG DD1900W800 | C | From Leg | 4.00 | 0.0000 | 125.00 | No Ice | 1.28 | 0.31 | 12.10 |
| | | | 0.00 | | | 1/2" Ice | 1.44 | 0.41 | 19.30 |
| | | | 0.00 | | | 1" Ice | 1.60 | 0.52 | 28.37 |
| Pirod Delta Mount (3) | C | None | | 0.0000 | 125.00 | No Ice | 32.94 | 32.94 | 740.00 |
| | | | | | | 1/2" Ice | 47.60 | 47.60 | 1000.00 |
| | | | | | | 1" Ice | 62.26 | 62.26 | 1260.00 |
| ********** | | | | | | | | | |
| DB225-A | C | From Leg | 1.00 | 0.0000 | 120.00 | No Ice | 3.21 | 3.21 | 37.00 |
| | | | 0.00 | | | 1/2" Ice | 5.78 | 5.78 | 48.10 |
| | | | 0.00 | | | 1" Ice | 8.35 | 8.35 | 59.20 |
| ********** | | | | | | | | | |
| 6' x 8" Panel Antenna w/Mount Pipe | A | From Leg | 1.00 | 0.0000 | 115.00 | No Ice | 6.10 | 6.36 | 65.55 |
| | | | 0.00 | | | 1/2" Ice | 6.67 | 7.54 | 118.26 |
| | | | 0.00 | | | 1" Ice | 7.19 | 8.43 | 182.63 |
| 6' x 8" Panel Antenna w/Mount Pipe | B | From Leg | 1.00 | 0.0000 | 115.00 | No Ice | 6.10 | 6.36 | 65.55 |
| | | | 0.00 | | | 1/2" Ice | 6.67 | 7.54 | 118.26 |
| | | | 0.00 | | | 1" Ice | 7.19 | 8.43 | 182.63 |
| 6' x 8" Panel Antenna w/Mount Pipe | C | From Leg | 1.00 | 0.0000 | 115.00 | No Ice | 6.10 | 6.36 | 65.55 |
| | | | 0.00 | | | 1/2" Ice | 6.67 | 7.54 | 118.26 |
| | | | 0.00 | | | 1" Ice | 7.19 | 8.43 | 182.63 |
| ********** | | | | | | | | | |
| 10' Omni | B | From Leg | 2.50 | 0.0000 | 96.00 | No Ice | 2.50 | 2.50 | 30.00 |
| | | | 0.00 | | | 1/2" Ice | 3.53 | 3.53 | 48.64 |
| | | | -5.00 | | | 1" Ice | 4.58 | 4.58 | 73.79 |
| ********** | | | | | | | | | |
| 15' Omni | B | From Face | 4.00 | 0.0000 | 80.00 | No Ice | 4.50 | 4.50 | 40.00 |
| | | | 0.00 | | | 1/2" Ice | 6.03 | 6.03 | 72.48 |
| | | | 7.00 | | | 1" Ice | 7.58 | 7.58 | 114.58 |
| 4' Standoff | B | From Face | 2.00 | 0.0000 | 80.00 | No Ice | 2.72 | 2.72 | 50.00 |
| | | | 0.00 | | | 1/2" Ice | 4.91 | 4.91 | 89.00 |
| | | | 0.00 | | | 1" Ice | 7.10 | 7.10 | 128.00 |
| ********** | | | | | | | | | |
| DB225-A | C | From Leg | 1.00 | 0.0000 | 55.00 | No Ice | 3.21 | 3.21 | 37.00 |
| | | | 0.00 | | | 1/2" Ice | 5.78 | 5.78 | 48.10 |
| | | | 0.00 | | | 1" Ice | 8.35 | 8.35 | 59.20 |
| ********** | | | | | | | | | |
| GPS | A | From Leg | 3.00 | 0.0000 | 50.00 | No Ice | 1.00 | 1.00 | 10.00 |
| | | | 0.00 | | | 1/2" Ice | 1.50 | 1.50 | 15.00 |
| | | | 0.00 | | | 1" Ice | 2.00 | 2.00 | 20.00 |
| 3' Standoff | A | From Leg | 0.00 | 0.0000 | 50.00 | No Ice | 2.00 | 2.00 | 38.00 |
| | | | 0.00 | | | 1/2" Ice | 3.70 | 3.70 | 67.00 |
| | | | 0.00 | | | 1" Ice | 5.40 | 5.40 | 96.00 |

## Dishes

| Description | Face or Leg | Dish Type | Offset Type | Offsets: Horz Lateral / Vert | Azimuth Adjustment | 3 dB Beam Width | Elevation | Outside Diameter | | Aperture Area | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ft | ° | ° | ft | ft | | $ft^2$ | lb |
| 4 FT DISH | C | Paraboloid w/o Radome | From Leg | 0.00<br>0.00<br>0.00 | 0.0000 | | 35.00 | 4.00 | No Ice<br>1/2" Ice<br>1" Ice | 12.56<br>13.09<br>13.62 | 170.00<br>237.19<br>304.38 |

## Force Totals (Does not include forces on guys)

| Load Case | Vertical Forces lb | Sum of Forces X lb | Sum of Forces Z lb | Sum of Torques lb-ft |
|---|---|---|---|---|
| Leg Weight | 3684.84 | | | |
| Bracing Weight | 2027.34 | | | |
| Total Member Self-Weight | 5712.19 | | | |
| Guy Weight | 1168.38 | | | |
| Total Weight | 13184.12 | | | |
| Wind 0 deg - No Ice | | 339.52 | -14338.97 | 946.57 |
| Wind 30 deg - No Ice | | 7714.51 | -12943.83 | 164.11 |
| Wind 60 deg - No Ice | | 13607.13 | -7856.08 | -772.38 |
| Wind 90 deg - No Ice | | 15795.27 | -209.04 | -1520.87 |
| Wind 120 deg - No Ice | | 12565.58 | 6862.69 | -1674.86 |
| Wind 150 deg - No Ice | | 6183.20 | 10715.70 | -1102.38 |
| Wind 180 deg - No Ice | | -43.47 | 14066.72 | -649.29 |
| Wind 210 deg - No Ice | | -7483.86 | 12937.26 | 87.58 |
| Wind 240 deg - No Ice | | -13351.89 | 7708.72 | 766.88 |
| Wind 270 deg - No Ice | | -15674.26 | 12.59 | 1269.19 |
| Wind 300 deg - No Ice | | -12325.36 | -7065.85 | 1387.35 |
| Wind 330 deg - No Ice | | -6188.47 | -10712.66 | 1102.38 |
| Member Ice | 15684.41 | | | |
| Guy Ice | 12339.52 | | | |
| Total Weight Ice | 76535.90 | | | |
| Wind 0 deg - Ice | | 90.06 | -6396.45 | 157.17 |
| Wind 30 deg - Ice | | 3256.48 | -5529.48 | -125.55 |
| Wind 60 deg - Ice | | 5570.34 | -3216.04 | -388.44 |
| Wind 90 deg - Ice | | 6416.91 | -55.45 | -547.25 |
| Wind 120 deg - Ice | | 5584.52 | 3120.23 | -545.61 |
| Wind 150 deg - Ice | | 3173.74 | 5498.69 | -338.00 |
| Wind 180 deg - Ice | | -11.53 | 6368.21 | -80.90 |
| Wind 210 deg - Ice | | -3195.30 | 5527.74 | 192.31 |
| Wind 240 deg - Ice | | -5540.73 | 3198.94 | 388.44 |
| Wind 270 deg - Ice | | -6384.81 | 3.34 | 480.49 |
| Wind 300 deg - Ice | | -5520.80 | -3174.12 | 469.34 |
| Wind 330 deg - Ice | | -3175.14 | -5497.88 | 338.00 |
| Total Weight | 13184.12 | | | |
| Wind 0 deg - Service | | 110.87 | -4682.11 | 309.08 |
| Wind 30 deg - Service | | 2519.02 | -4226.56 | 53.59 |
| Wind 60 deg - Service | | 4443.14 | -2565.25 | -252.21 |
| Wind 90 deg - Service | | 5157.64 | -68.26 | -496.61 |
| Wind 120 deg - Service | | 4103.05 | 2240.88 | -546.89 |
| Wind 150 deg - Service | | 2019.00 | 3499.00 | -359.96 |
| Wind 180 deg - Service | | -14.20 | 4593.21 | -212.01 |
| Wind 210 deg - Service | | -2443.71 | 4224.41 | 28.60 |
| Wind 240 deg - Service | | -4359.80 | 2517.13 | 250.41 |
| Wind 270 deg - Service | | -5118.13 | 4.11 | 414.43 |
| Wind 300 deg - Service | | -4024.61 | -2307.22 | 453.01 |
| Wind 330 deg - Service | | -2020.73 | -3498.01 | 359.96 |

## Load Combinations

| Comb. No. | Description |
|---|---|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy |
| 3 | 1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy |
| 4 | 1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy |
| 5 | 1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy |
| 6 | 1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy |
| 7 | 1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy |
| 8 | 1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy |
| 9 | 1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy |
| 10 | 1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy |
| 11 | 1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy |
| 12 | 1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy |
| 13 | 1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy |
| 14 | 1.2 Dead+1.0 Ice+1.0 Temp+Guy |
| 15 | 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 16 | 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 17 | 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 18 | 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 19 | 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 20 | 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 21 | 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 22 | 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 23 | 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 24 | 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 25 | 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 26 | 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy |
| 27 | Dead+Wind 0 deg - Service+Guy |
| 28 | Dead+Wind 30 deg - Service+Guy |
| 29 | Dead+Wind 60 deg - Service+Guy |
| 30 | Dead+Wind 90 deg - Service+Guy |
| 31 | Dead+Wind 120 deg - Service+Guy |
| 32 | Dead+Wind 150 deg - Service+Guy |
| 33 | Dead+Wind 180 deg - Service+Guy |
| 34 | Dead+Wind 210 deg - Service+Guy |
| 35 | Dead+Wind 240 deg - Service+Guy |
| 36 | Dead+Wind 270 deg - Service+Guy |
| 37 | Dead+Wind 300 deg - Service+Guy |
| 38 | Dead+Wind 330 deg - Service+Guy |

## Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | Leg | Max Tension | 12 | 30579.04 | -703.00 | -417.89 |
| | | | Max. Compression | 2 | -32150.82 | 6.87 | 50.71 |
| | | | Max. Mx | 5 | -957.17 | 861.24 | 6.05 |
| | | | Max. My | 2 | 12529.19 | -28.39 | -901.96 |
| | | | Max. Vy | 5 | 1723.83 | 0.28 | 4.22 |
| | | | Max. Vx | 8 | 1835.44 | 24.35 | -16.70 |
| | | Diagonal | Max Tension | 3 | 4005.69 | 0.00 | 0.00 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. Compression | 3 | -3985.38 | 0.00 | 0.00 |
| | | | Max. Mx | 15 | 1196.41 | -1.95 | -0.24 |
| | | | Max. My | 9 | -3975.56 | 1.26 | 1.91 |
| | | | Max. Vy | 15 | 5.41 | -1.95 | -0.24 |
| | | | Max. Vx | 9 | -1.75 | 1.26 | 1.91 |
| | | Horizontal | Max Tension | 8 | 678.77 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -591.72 | 0.00 | 0.00 |
| | | | Max. Mx | 21 | 56.55 | 2.95 | 0.00 |
| | | | Max. My | 4 | -19.53 | 0.00 | -0.00 |
| | | | Max. Vy | 21 | -7.87 | 0.00 | 0.00 |
| | | | Max. Vx | 4 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 10 | 134.44 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -154.33 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 0.26 | 2.95 | 0.00 |
| | | | Max. My | 16 | 11.55 | 0.00 | 0.00 |
| | | | Max. Vy | 14 | 7.87 | 0.00 | 0.00 |
| | | | Max. Vx | 16 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 8 | 1489.11 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -1552.71 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 40.32 | 2.95 | 0.00 |
| | | | Max. My | 4 | -621.96 | 0.00 | 0.00 |
| | | | Max. Vy | 14 | 7.87 | 0.00 | 0.00 |
| | | | Max. Vx | 4 | -0.00 | 0.00 | 0.00 |
| T2 | 140 - 120 | Leg | Max Tension | 12 | 34027.23 | 774.95 | 461.03 |
| | | | Max. Compression | 10 | -44901.01 | 102.87 | -17.56 |
| | | | Max. Mx | 11 | -1339.29 | 868.27 | 0.05 |
| | | | Max. My | 8 | -16502.61 | -1.82 | -934.23 |
| | | | Max. Vy | 5 | 1728.01 | -862.67 | 2.37 |
| | | | Max. Vx | 8 | 1836.19 | -1.82 | -934.23 |
| | | Diagonal | Max Tension | 3 | 4897.34 | 0.00 | 0.00 |
| | | | Max. Compression | 5 | -5208.03 | -1.72 | 0.96 |
| | | | Max. Mx | 10 | -2639.61 | -3.46 | 0.65 |
| | | | Max. My | 9 | -3695.35 | 2.28 | 3.05 |
| | | | Max. Vy | 17 | 6.45 | -3.20 | 0.10 |
| | | | Max. Vx | 9 | -2.80 | 1.95 | 3.05 |
| | | Horizontal | Max Tension | 2 | 1772.47 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 21 | 894.02 | 2.91 | 0.00 |
| | | | Max. My | 5 | 1248.02 | 0.00 | -0.00 |
| | | | Max. Vy | 21 | -7.75 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 10 | 631.25 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -885.03 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | -65.12 | 2.91 | 0.00 |
| | | | Max. My | 4 | 124.45 | 0.00 | 0.00 |
| | | | Max. Vy | 14 | 7.75 | 0.00 | 0.00 |
| | | | Max. Vx | 4 | -0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 21 | 641.70 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 224.51 | 2.91 | 0.00 |
| | | | Max. My | 5 | 596.32 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | 7.75 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Guy A | Bottom Tension | 9 | 13151.02 | | |
| | | | Top Tension | 9 | 13251.84 | | |
| | | | Top Cable Vert | 9 | 11506.77 | | |
| | | | Top Cable Norm | 9 | 6573.00 | | |
| | | | Top Cable Tan | 9 | 36.09 | | |
| | | | Bot Cable Vert | 9 | -11271.41 | | |
| | | | Bot Cable Norm | 9 | 6773.95 | | |
| | | | Bot Cable Tan | 9 | 134.27 | | |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | Guy B | Bottom Tension | 11 | 13972.42 | | |
| | | | Top Tension | 11 | 14081.14 | | |
| | | | Top Cable Vert | 11 | 12444.10 | | |
| | | | Top Cable Norm | 11 | 6589.49 | | |
| | | | Top Cable Tan | 11 | 40.23 | | |
| | | | Bot Cable Vert | 11 | -12199.86 | | |
| | | | Bot Cable Norm | 11 | 6809.73 | | |
| | | | Bot Cable Tan | 11 | 139.79 | | |
| | | Guy C | Bottom Tension | 5 | 19555.39 | | |
| | | | Top Tension | 5 | 19661.92 | | |
| | | | Top Cable Vert | 5 | 18644.19 | | |
| | | | Top Cable Norm | 5 | 6243.61 | | |
| | | | Top Cable Tan | 5 | 50.84 | | |
| | | | Bot Cable Vert | 5 | -18445.73 | | |
| | | | Bot Cable Norm | 5 | 6489.50 | | |
| | | | Bot Cable Tan | 5 | 233.71 | | |
| | | Top Guy Pull-Off | Max Tension | 4 | 8047.59 | 0.00 | 0.00 |
| | | | Max. Compression | 10 | -3436.56 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 1969.56 | 2.91 | 0.00 |
| | | | Max. My | 5 | 2486.84 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | 7.75 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Bottom Guy Pull-Off | Max Tension | 8 | 4574.87 | 0.00 | 0.00 |
| | | | Max. Compression | 10 | -6004.70 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | -41.65 | 2.91 | 0.00 |
| | | | Max. My | 5 | -698.06 | 0.00 | -0.00 |
| | | | Max. Vy | 17 | 7.75 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Torque Arm Top | Max Tension | 2 | 18478.35 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 16 | 8555.37 | 30.76 | 0.00 |
| | | | Max. My | 17 | 10790.19 | 0.00 | -0.09 |
| | | | Max. Vy | 16 | -33.58 | 0.00 | 0.00 |
| | | | Max. Vx | 17 | 0.10 | 0.00 | 0.00 |
| | | Torque Arm Bottom | Max Tension | 13 | 4962.70 | 0.00 | 0.00 |
| | | | Max. Compression | 3 | -20848.17 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | -3067.31 | 28.22 | 0.00 |
| | | | Max. My | 17 | -12014.43 | 0.00 | 0.04 |
| | | | Max. Vy | 17 | -33.56 | 0.00 | 0.00 |
| | | | Max. Vx | 17 | -0.04 | 0.00 | 0.00 |
| T3 | 120 - 100 | Leg | Max Tension | 4 | 19634.23 | 630.68 | -449.70 |
| | | | Max. Compression | 2 | -57378.44 | -2.66 | 75.21 |
| | | | Max. Mx | 5 | -52746.98 | 762.81 | -32.40 |
| | | | Max. My | 2 | 2379.28 | 122.46 | -749.61 |
| | | | Max. Vy | 5 | 1643.17 | -58.28 | -29.29 |
| | | | Max. Vx | 2 | -1548.09 | -12.48 | 23.98 |
| | | Diagonal | Max Tension | 3 | 3036.48 | 0.00 | 0.00 |
| | | | Max. Compression | 5 | -3857.75 | 0.00 | 0.00 |
| | | | Max. Mx | 2 | 2356.42 | -4.08 | 0.01 |
| | | | Max. My | 2 | -1462.98 | 1.37 | -0.84 |
| | | | Max. Vy | 15 | 6.81 | -3.65 | 0.11 |
| | | | Max. Vx | 2 | -0.77 | 1.37 | -0.84 |
| | | Horizontal | Max Tension | 21 | 1577.05 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 22 | 1447.82 | 2.84 | 0.00 |
| | | | Max. My | 5 | 1231.22 | 0.00 | -0.00 |
| | | | Max. Vy | 22 | -7.57 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 2 | 987.26 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -233.06 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 146.85 | 2.84 | 0.00 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. My | 5 | 731.46 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | 7.57 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 5 | 1584.59 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -1103.97 | 0.00 | 0.00 |
| | | | Max. Mx | 23 | -4.34 | 2.84 | 0.00 |
| | | | Max. My | 5 | 645.79 | 0.00 | -0.00 |
| | | | Max. Vy | 23 | 7.57 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| T4 | 100 - 80 | Leg | Max Tension | 4 | 23737.81 | -709.48 | 486.31 |
| | | | Max. Compression | 2 | -67576.11 | -7.68 | 3.24 |
| | | | Max. Mx | 5 | -52758.35 | -872.23 | -22.93 |
| | | | Max. My | 2 | -59213.30 | -160.39 | 811.76 |
| | | | Max. Vy | 5 | 1628.86 | -872.23 | -22.93 |
| | | | Max. Vx | 2 | -1550.21 | -147.88 | 798.69 |
| | | Diagonal | Max Tension | 3 | 2633.34 | 0.00 | 0.00 |
| | | | Max. Compression | 3 | -4015.39 | 0.00 | 0.00 |
| | | | Max. Mx | 2 | -2245.78 | -5.18 | 0.42 |
| | | | Max. My | 6 | -2383.67 | 1.69 | 2.65 |
| | | | Max. Vy | 23 | 7.47 | -4.50 | 0.52 |
| | | | Max. Vx | 6 | 2.43 | 1.69 | 2.65 |
| | | Horizontal | Max Tension | 6 | 2260.81 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 25 | 1731.66 | 2.76 | 0.00 |
| | | | Max. My | 6 | 2068.85 | 0.00 | -0.00 |
| | | | Max. Vy | 25 | -7.35 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 2 | 1045.79 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -176.78 | 0.00 | 0.00 |
| | | | Max. Mx | 23 | 582.52 | 2.76 | 0.00 |
| | | | Max. My | 2 | 137.19 | 0.00 | -0.00 |
| | | | Max. Vy | 23 | 7.35 | 0.00 | 0.00 |
| | | | Max. Vx | 2 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 2 | 1247.85 | 0.00 | 0.00 |
| | | | Max. Compression | 12 | -130.97 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | 325.13 | 2.76 | 0.00 |
| | | | Max. My | 6 | 755.59 | 0.00 | -0.00 |
| | | | Max. Vy | 17 | 7.35 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| | | Guy A | Bottom Tension | 9 | 7754.65 | | |
| | | | Top Tension | 9 | 7798.51 | | |
| | | | Top Cable Vert | 9 | 5971.72 | | |
| | | | Top Cable Norm | 9 | 5015.46 | | |
| | | | Top Cable Tan | 9 | 24.00 | | |
| | | | Bot Cable Vert | 9 | -5842.20 | | |
| | | | Bot Cable Norm | 9 | 5098.90 | | |
| | | | Bot Cable Tan | 9 | 67.26 | | |
| | | Guy B | Bottom Tension | 11 | 8380.28 | | |
| | | | Top Tension | 11 | 8429.20 | | |
| | | | Top Cable Vert | 11 | 6734.64 | | |
| | | | Top Cable Norm | 11 | 5069.06 | | |
| | | | Top Cable Tan | 11 | 26.58 | | |
| | | | Bot Cable Vert | 11 | -6597.56 | | |
| | | | Bot Cable Norm | 11 | 5166.84 | | |
| | | | Bot Cable Tan | 11 | 71.48 | | |
| | | Guy C | Bottom Tension | 5 | 12476.24 | | |
| | | | Top Tension | 5 | 12524.30 | | |
| | | | Top Cable Vert | 5 | 11323.05 | | |
| | | | Top Cable Norm | 5 | 5352.22 | | |
| | | | Top Cable Tan | 5 | 19.95 | | |
| | | | Bot Cable Vert | 5 | -11211.89 | | |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Bot Cable Norm | 5 | 5471.39 | | |
| | | | Bot Cable Tan | 5 | 117.51 | | |
| | | Top Guy Pull-Off | Max Tension | 4 | 7046.42 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -2611.96 | 0.00 | 0.00 |
| | | | Max. Mx | 23 | 2605.95 | 2.76 | 0.00 |
| | | | Max. My | 2 | 4217.34 | 0.00 | -0.00 |
| | | | Max. Vy | 23 | 7.35 | 0.00 | 0.00 |
| | | | Max. Vx | 2 | 0.00 | 0.00 | 0.00 |
| | | Bottom Guy Pull-Off | Max Tension | 8 | 4792.37 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -4865.47 | 0.00 | 0.00 |
| | | | Max. Mx | 23 | -1433.53 | 2.76 | 0.00 |
| | | | Max. My | 2 | 1674.15 | 0.00 | -0.00 |
| | | | Max. Vy | 23 | 7.35 | 0.00 | 0.00 |
| | | | Max. Vx | 2 | 0.00 | 0.00 | 0.00 |
| | | Torque Arm Top | Max Tension | 2 | 10698.71 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | 5524.81 | 29.67 | 0.00 |
| | | | Max. My | 2 | 6086.29 | 0.00 | 0.07 |
| | | | Max. Vy | 17 | -32.40 | 0.00 | 0.00 |
| | | | Max. Vx | 2 | -0.08 | 0.00 | 0.00 |
| | | Torque Arm Bottom | Max Tension | 13 | 4888.82 | 0.00 | 0.00 |
| | | | Max. Compression | 3 | -14420.86 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | -2053.14 | 27.24 | 0.00 |
| | | | Max. My | 16 | -6947.49 | 0.00 | -0.03 |
| | | | Max. Vy | 17 | -32.39 | 0.00 | 0.00 |
| | | | Max. Vx | 16 | -0.03 | 0.00 | 0.00 |
| T5 | 80 - 60 | Leg | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 17 | -38979.35 | -13.49 | -60.87 |
| | | | Max. Mx | 11 | -21315.34 | -323.74 | 73.60 |
| | | | Max. My | 2 | -30738.81 | -22.12 | -357.71 |
| | | | Max. Vy | 6 | -881.55 | 93.73 | 62.86 |
| | | | Max. Vx | 2 | 845.36 | 29.97 | -136.06 |
| | | Diagonal | Max Tension | 8 | 866.76 | 0.00 | 0.00 |
| | | | Max. Compression | 5 | -2534.05 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | -626.41 | -4.52 | -0.55 |
| | | | Max. My | 6 | -1531.61 | 2.88 | 1.28 |
| | | | Max. Vy | 17 | 7.37 | -4.52 | -0.55 |
| | | | Max. Vx | 6 | 1.17 | 0.00 | 0.00 |
| | | Horizontal | Max Tension | 16 | 2314.37 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 24 | 2148.93 | 2.66 | 0.00 |
| | | | Max. My | 5 | 1688.93 | 0.00 | -0.00 |
| | | | Max. Vy | 24 | -7.09 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 21 | 1137.88 | 0.00 | 0.00 |
| | | | Max. Compression | 10 | -69.55 | 0.00 | 0.00 |
| | | | Max. Mx | 17 | 425.15 | 2.66 | 0.00 |
| | | | Max. My | 6 | 1126.44 | 0.00 | -0.00 |
| | | | Max. Vy | 17 | 7.09 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 21 | 1137.62 | 0.00 | 0.00 |
| | | | Max. Compression | 7 | -10.28 | 0.00 | 0.00 |
| | | | Max. Mx | 22 | 382.89 | 2.66 | 0.00 |
| | | | Max. My | 5 | 847.17 | 0.00 | -0.00 |
| | | | Max. Vy | 22 | 7.09 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| T6 | 60 - 40 | Leg | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -46579.48 | -69.75 | -130.02 |
| | | | Max. Mx | 5 | -27143.69 | -570.47 | -48.25 |
| | | | Max. My | 2 | -22574.71 | -82.07 | 605.78 |
| | | | Max. Vy | 5 | -1171.90 | -566.46 | 59.15 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. Vx | 2 | 1138.65 | -82.07 | 605.78 |
| | | Diagonal | Max Tension | 3 | 1920.34 | 0.00 | 0.00 |
| | | | Max. Compression | 5 | -3640.35 | 0.00 | 0.00 |
| | | | Max. Mx | 16 | -391.78 | -5.07 | -0.64 |
| | | | Max. My | 3 | -2149.79 | 1.62 | -1.21 |
| | | | Max. Vy | 16 | 7.71 | -5.07 | -0.64 |
| | | | Max. Vx | 3 | -1.12 | 0.00 | 0.00 |
| | | Horizontal | Max Tension | 16 | 2651.80 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 25 | 2576.02 | 2.54 | 0.00 |
| | | | Max. My | 5 | 1817.58 | 0.00 | -0.00 |
| | | | Max. Vy | 25 | -6.77 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 2 | 1182.60 | 0.00 | 0.00 |
| | | | Max. Compression | 12 | -132.72 | 0.00 | 0.00 |
| | | | Max. Mx | 21 | 399.35 | 2.54 | 0.00 |
| | | | Max. My | 5 | 938.67 | 0.00 | -0.00 |
| | | | Max. Vy | 21 | -6.77 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 2 | 1951.17 | 0.00 | 0.00 |
| | | | Max. Compression | 4 | -485.07 | 0.00 | 0.00 |
| | | | Max. Mx | 21 | 537.88 | 2.54 | 0.00 |
| | | | Max. My | 5 | 1156.32 | 0.00 | -0.00 |
| | | | Max. Vy | 21 | -6.77 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Guy A | Bottom Tension | 9 | 8438.51 | | |
| | | | Top Tension | 9 | 8454.23 | | |
| | | | Top Cable Vert | 9 | 4029.10 | | |
| | | | Top Cable Norm | 9 | 7432.38 | | |
| | | | Top Cable Tan | 9 | 7.80 | | |
| | | | Bot Cable Vert | 9 | -3967.87 | | |
| | | | Bot Cable Norm | 9 | 7447.30 | | |
| | | | Bot Cable Tan | 9 | 46.00 | | |
| | | Guy B | Bottom Tension | 11 | 8944.61 | | |
| | | | Top Tension | 11 | 8964.26 | | |
| | | | Top Cable Vert | 11 | 5025.81 | | |
| | | | Top Cable Norm | 11 | 7422.89 | | |
| | | | Top Cable Tan | 11 | 5.72 | | |
| | | | Bot Cable Vert | 11 | -4956.47 | | |
| | | | Bot Cable Norm | 11 | 7445.61 | | |
| | | | Bot Cable Tan | 11 | 47.67 | | |
| | | Guy C | Bottom Tension | 5 | 11562.07 | | |
| | | | Top Tension | 5 | 11581.54 | | |
| | | | Top Cable Vert | 5 | 8498.26 | | |
| | | | Top Cable Norm | 5 | 7868.32 | | |
| | | | Top Cable Tan | 5 | 34.12 | | |
| | | | Bot Cable Vert | 5 | -8439.10 | | |
| | | | Bot Cable Norm | 5 | 7903.04 | | |
| | | | Bot Cable Tan | 5 | 71.23 | | |
| | | Top Guy Pull-Off | Max Tension | 2 | 4512.26 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 16 | 2318.41 | 2.54 | 0.00 |
| | | | Max. My | 5 | 3557.85 | 0.00 | -0.00 |
| | | | Max. Vy | 16 | -6.77 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| T7 | 40 - 20 | Leg | Max Tension | 10 | 2938.90 | -40.76 | 37.70 |
| | | | Max. Compression | 3 | -57097.87 | 28.95 | -93.91 |
| | | | Max. Mx | 5 | -40733.76 | 601.85 | -173.63 |
| | | | Max. My | 2 | -41493.02 | 89.43 | -580.44 |
| | | | Max. Vy | 5 | -1166.23 | 19.09 | -60.77 |
| | | | Max. Vx | 2 | 1140.67 | -0.45 | 37.07 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | Diagonal | Max Tension | 3 | 1530.96 | 0.00 | 0.00 |
| | | | Max. Compression | 5 | -3564.14 | 0.00 | 0.00 |
| | | | Max. Mx | 5 | -865.25 | -5.41 | 0.13 |
| | | | Max. My | 9 | -2185.01 | 3.11 | -1.51 |
| | | | Max. Vy | 21 | 7.75 | -5.36 | -0.69 |
| | | | Max. Vx | 9 | -1.38 | 0.00 | 0.00 |
| | | Horizontal | Max Tension | 2 | 3325.23 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 24 | 2533.33 | 2.37 | 0.00 |
| | | | Max. My | 6 | 1853.77 | 0.00 | -0.00 |
| | | | Max. Vy | 24 | -6.31 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 21 | 1307.80 | 0.00 | 0.00 |
| | | | Max. Compression | 6 | -252.93 | 0.00 | 0.00 |
| | | | Max. Mx | 21 | 399.64 | 2.37 | 0.00 |
| | | | Max. My | 5 | 959.39 | 0.00 | -0.00 |
| | | | Max. Vy | 21 | -6.31 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 2 | 1530.91 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 23 | 469.76 | 2.37 | 0.00 |
| | | | Max. My | 6 | 911.74 | 0.00 | -0.00 |
| | | | Max. Vy | 23 | -6.31 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| T8 | 20 - 5.25 | Leg | Max Tension | 10 | 895.52 | 82.93 | -86.45 |
| | | | Max. Compression | 3 | -57098.87 | -24.79 | -20.93 |
| | | | Max. Mx | 6 | -40024.77 | 154.66 | -0.58 |
| | | | Max. My | 6 | -40516.19 | -126.37 | -162.31 |
| | | | Max. Vy | 11 | -251.79 | 74.25 | -66.75 |
| | | | Max. Vx | 2 | -266.65 | -26.14 | 42.86 |
| | | Diagonal | Max Tension | 9 | 1157.88 | 0.00 | 0.00 |
| | | | Max. Compression | 2 | -2501.07 | 0.00 | 0.00 |
| | | | Max. Mx | 5 | -355.38 | 4.95 | -0.46 |
| | | | Max. My | 6 | -1408.27 | -3.18 | -1.16 |
| | | | Max. Vy | 20 | 6.91 | -4.81 | 0.38 |
| | | | Max. Vx | 6 | 1.08 | -3.18 | -1.16 |
| | | Horizontal | Max Tension | 2 | 3162.04 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 26 | 2925.54 | 2.11 | 0.00 |
| | | | Max. My | 5 | 1964.37 | 0.00 | -0.00 |
| | | | Max. Vy | 26 | 5.63 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 2 | 1773.54 | 0.00 | 0.00 |
| | | | Max. Compression | 12 | -23.80 | 0.00 | 0.00 |
| | | | Max. Mx | 26 | 1447.52 | 2.11 | 0.00 |
| | | | Max. My | 6 | 850.33 | 0.00 | -0.00 |
| | | | Max. Vy | 26 | 5.63 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | Max Tension | 16 | 6127.33 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 5167.08 | 2.11 | 0.00 |
| | | | Max. My | 5 | 4611.50 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | 5.63 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |
| T9 | 5.25 - 0 | Leg | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 17 | -47223.71 | -11.29 | 0.78 |
| | | | Max. Mx | 2 | -19797.77 | 136.66 | -16.91 |
| | | | Max. My | 6 | -41232.04 | -20.10 | -378.45 |
| | | | Max. Vy | 2 | 130.15 | -21.50 | 254.62 |
| | | | Max. Vx | 6 | 400.04 | -15.80 | -376.88 |
| | | Diagonal | Max Tension | 1 | 0.00 | 0.00 | 0.00 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. Compression | 6 | -4255.07 | 0.00 | 0.00 |
| | | | Max. Mx | 5 | -3430.21 | 4.00 | -2.90 |
| | | | Max. My | 6 | -3269.24 | 3.65 | -2.94 |
| | | | Max. Vy | 5 | 8.51 | 0.00 | 0.00 |
| | | | Max. Vx | 6 | -6.16 | 3.65 | -2.94 |
| | | Horizontal | Max Tension | 18 | 3116.34 | 0.00 | 0.00 |
| | | | Max. Compression | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 2452.26 | 0.98 | 0.00 |
| | | | Max. My | 5 | 1957.65 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | 3.47 | 0.00 | 0.00 |
| | | | Max. Vx | 5 | 0.00 | 0.00 | 0.00 |

## Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical lb | Horizontal, X lb | Horizontal, Z lb |
|---|---|---|---|---|---|
| Mast | Max. Vert | 17 | 135802.58 | 107.67 | -96.97 |
| | Max. $H_x$ | 11 | 82172.02 | 1423.00 | 57.91 |
| | Max. $H_z$ | 13 | 93283.69 | 826.81 | 866.67 |
| | Max. $M_x$ | 1 | 0.00 | 38.63 | -18.14 |
| | Max. $M_z$ | 1 | 0.00 | 38.63 | -18.14 |
| | Max. Torsion | 6 | 263.45 | -659.62 | -492.22 |
| | Min. Vert | 28 | 51670.09 | -142.24 | 283.36 |
| | Min. $H_x$ | 4 | 86036.61 | -1056.08 | 656.65 |
| | Min. $H_z$ | 8 | 70213.90 | 65.80 | -1586.52 |
| | Min. $M_x$ | 1 | 0.00 | 38.63 | -18.14 |
| | Min. $M_z$ | 1 | 0.00 | 38.63 | -18.14 |
| | Min. Torsion | 2 | -177.74 | 73.87 | 749.65 |
| Guy C @ 47 ft Elev 0 ft Azimuth 240 deg | Max. Vert | 10 | -3826.78 | -882.24 | 510.75 |
| | Max. $H_x$ | 10 | -3826.78 | -882.24 | 510.75 |
| | Max. $H_z$ | 3 | -65897.55 | -26562.65 | 16134.42 |
| | Min. Vert | 5 | -66232.50 | -27370.81 | 15040.80 |
| | Min. $H_x$ | 5 | -66232.50 | -27370.81 | 15040.80 |
| | Min. $H_z$ | 9 | -4749.09 | -1402.42 | 494.12 |
| Guy B @ 75 ft Elev 0 ft Azimuth 120 deg | Max. Vert | 6 | -1786.06 | 604.66 | 354.58 |
| | Max. $H_x$ | 11 | -41751.90 | 26989.90 | 15096.13 |
| | Max. $H_z$ | 13 | -40907.76 | 25958.64 | 15639.97 |
| | Min. Vert | 11 | -41751.90 | 26989.90 | 15096.13 |
| | Min. $H_x$ | 6 | -1786.06 | 604.66 | 354.58 |
| | Min. $H_z$ | 6 | -1786.06 | 604.66 | 354.58 |
| Guy A @ 75 ft Elev 10 ft Azimuth 0 deg | Max. Vert | 2 | -1396.66 | -3.58 | -571.26 |
| | Max. $H_x$ | 11 | -20221.78 | 750.16 | -16169.64 |
| | Max. $H_z$ | 2 | -1396.66 | -3.58 | -571.26 |
| | Min. Vert | 9 | -37800.47 | 412.46 | -30931.14 |
| | Min. $H_x$ | 6 | -31371.27 | -873.16 | -25485.13 |
| | Min. $H_z$ | 9 | -37800.47 | 412.46 | -30931.14 |

## Tower Mast Reaction Summary

| Load Combination | Vertical | $Shear_x$ | $Shear_z$ | Overturning Moment, $M_x$ | Overturning Moment, $M_z$ | Torque |
|---|---|---|---|---|---|---|
| | lb | lb | lb | lb-ft | lb-ft | lb-ft |
| Dead Only | 52071.19 | -38.63 | 18.14 | 0.00 | 0.00 | 0.61 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy | 107521.36 | -73.87 | -749.65 | 0.00 | 0.00 | 177.74 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy | 104480.14 | 569.87 | -624.74 | 0.00 | 0.00 | 71.43 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy | 86036.61 | 1056.08 | -656.65 | 0.00 | 0.00 | -130.80 |
| 1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy | 103333.09 | 839.95 | -173.66 | 0.00 | 0.00 | -253.52 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy | 105106.08 | 659.62 | 492.22 | 0.00 | 0.00 | -263.45 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy | 90637.40 | 376.46 | 1214.12 | 0.00 | 0.00 | -93.33 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy | 70213.90 | -65.80 | 1586.52 | 0.00 | 0.00 | -27.55 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy | 80735.86 | -684.52 | 1312.49 | 0.00 | 0.00 | 54.47 |
| 1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy | 87468.90 | -1125.75 | 673.10 | 0.00 | 0.00 | 99.92 |
| 1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy | 82172.02 | -1423.00 | -57.91 | 0.00 | 0.00 | 126.84 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy | 70930.11 | -1375.41 | -735.31 | 0.00 | 0.00 | 138.40 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy | 93283.69 | -826.81 | -866.67 | 0.00 | 0.00 | 101.99 |
| 1.2 Dead+1.0 Ice+1.0 Temp+Guy | 129319.80 | -227.76 | 168.70 | 0.00 | 0.00 | 0.40 |
| 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy | 133897.15 | -239.00 | -1.25 | 0.00 | 0.00 | 17.93 |
| 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy | 135356.46 | -172.28 | 21.43 | 0.00 | 0.00 | 9.25 |
| 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy | 135802.58 | -107.67 | 96.97 | 0.00 | 0.00 | -17.89 |
| 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy | 134589.94 | -70.08 | 193.43 | 0.00 | 0.00 | -40.39 |
| 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy | 132542.34 | -79.17 | 268.02 | 0.00 | 0.00 | -35.59 |
| 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy | 131341.89 | -138.44 | 326.38 | 0.00 | 0.00 | -1.45 |
| 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy | 130772.01 | -230.54 | 338.88 | 0.00 | 0.00 | 8.13 |
| 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy | 129911.89 | -326.98 | 317.36 | 0.00 | 0.00 | 12.73 |
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy | 129212.83 | -387.98 | 264.38 | 0.00 | 0.00 | 17.59 |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy | 130087.85 | -401.26 | 183.30 | 0.00 | 0.00 | 17.73 |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy | 131262.19 | -371.60 | 88.51 | 0.00 | 0.00 | 9.54 |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy | 132341.91 | -316.37 | 18.58 | 0.00 | 0.00 | 1.93 |
| Dead+Wind 0 deg - Service+Guy | 51751.26 | -19.41 | -329.98 | 0.00 | 0.00 | 33.79 |
| Dead+Wind 30 deg - Service+Guy | 51670.09 | 142.24 | -283.36 | 0.00 | 0.00 | 11.96 |
| Dead+Wind 60 deg - Service+Guy | 51767.07 | 258.92 | -155.70 | 0.00 | 0.00 | -22.16 |
| Dead+Wind 90 deg - Service+Guy | 51830.48 | 309.38 | 10.50 | 0.00 | 0.00 | -50.75 |
| Dead+Wind 120 deg - Service+Guy | 52036.13 | 268.19 | 175.40 | 0.00 | 0.00 | -53.40 |
| Dead+Wind 150 deg - Service+Guy | 52430.77 | 130.80 | 315.94 | 0.00 | 0.00 | -18.31 |
| Dead+Wind 180 deg - Service+Guy | 52838.09 | -36.32 | 359.00 | 0.00 | 0.00 | -4.85 |
| Dead+Wind 210 deg - Service+Guy | 53056.48 | -203.58 | 316.61 | 0.00 | 0.00 | 13.33 |
| Dead+Wind 240 deg - Service+Guy | 53045.11 | -325.11 | 185.57 | 0.00 | 0.00 | 22.75 |
| Dead+Wind 270 deg - Service+Guy | 52869.78 | -376.57 | 13.52 | 0.00 | 0.00 | 27.23 |
| Dead+Wind 300 deg - Service+Guy | 52523.32 | -329.21 | -154.72 | 0.00 | 0.00 | 26.71 |
| Dead+Wind 330 deg - Service+Guy | 52075.36 | -208.71 | -280.14 | 0.00 | 0.00 | 19.19 |

## Solution Summary

| | Sum of Applied Forces | | | Sum of Reactions | | | |
|---|---|---|---|---|---|---|---|
| Load Comb. | PX | PY | PZ | PX | PY | PZ | % Error |
| | lb | lb | lb | lb | lb | lb | |
| 1 | -0.00 | -13183.94 | 0.00 | 1.02 | 13184.04 | -0.49 | 0.009% |
| 2 | 635.09 | -15611.38 | -27521.85 | -633.96 | 15611.14 | 27515.26 | 0.021% |
| 3 | 14507.22 | -15495.53 | -24286.62 | -14506.06 | 15495.31 | 24280.63 | 0.019% |
| 4 | 24460.87 | -15407.92 | -14107.18 | -24459.27 | 15407.91 | 14109.72 | 0.009% |
| 5 | 28317.69 | -15478.18 | -412.05 | -28313.91 | 15478.03 | 413.11 | 0.012% |
| 6 | 24180.08 | -15580.15 | 13211.73 | -24176.16 | 15580.00 | -13210.55 | 0.013% |
| 7 | 13826.23 | -15569.73 | 23940.98 | -13822.92 | 15569.63 | -23939.95 | 0.011% |
| 8 | -161.41 | -15562.79 | 27616.79 | 163.94 | 15562.78 | -27616.70 | 0.008% |
| 9 | -14138.19 | -15678.64 | 24276.12 | 14134.59 | 15678.55 | -24274.44 | 0.012% |
| 10 | -24052.50 | -15766.25 | 13871.41 | 24049.31 | 15766.16 | -13869.88 | 0.011% |
| 11 | -28124.07 | -15695.99 | 97.72 | 28121.63 | 15695.93 | -96.52 | 0.008% |

| Load Comb. | Sum of Applied Forces PX lb | PY lb | PZ lb | Sum of Reactions PX lb | PY lb | PZ lb | % Error |
|---|---|---|---|---|---|---|---|
| 12 | -24025.46 | -15594.01 | -13669.42 | 24026.70 | 15594.01 | 13667.20 | 0.008% |
| 13 | -13834.67 | -15604.44 | -23936.11 | 13835.29 | 15604.32 | 23932.18 | 0.013% |
| 14 | -0.00 | -78936.98 | 0.00 | 0.22 | 78936.97 | -0.45 | 0.001% |
| 15 | 204.31 | -78969.75 | -9831.72 | -204.31 | 78969.72 | 9830.92 | 0.001% |
| 16 | 5161.70 | -78826.40 | -8614.19 | -5161.79 | 78826.38 | 8613.61 | 0.001% |
| 17 | 8811.04 | -78717.69 | -5065.25 | -8810.84 | 78717.64 | 5064.22 | 0.001% |
| 18 | 10085.56 | -78807.77 | -151.15 | -10085.14 | 78807.75 | 151.41 | 0.001% |
| 19 | 8656.70 | -78935.85 | 4740.23 | -8656.01 | 78935.82 | -4739.89 | 0.001% |
| 20 | 4853.64 | -78918.35 | 8384.55 | -4852.80 | 78918.33 | -8384.23 | 0.001% |
| 21 | -125.78 | -78904.21 | 9803.48 | 126.51 | 78904.20 | -9803.18 | 0.001% |
| 22 | -5100.52 | -79047.56 | 8612.45 | 5101.27 | 79047.55 | -8611.92 | 0.001% |
| 23 | -8781.42 | -79156.27 | 5048.16 | 8781.08 | 79156.26 | -5048.24 | 0.000% |
| 24 | -10053.46 | -79066.19 | 99.04 | 10053.17 | 79066.17 | -100.64 | 0.002% |
| 25 | -8592.98 | -78938.11 | -4794.12 | 8593.02 | 78938.10 | 4792.85 | 0.002% |
| 26 | -4855.04 | -78955.61 | -8383.74 | 4855.10 | 78955.59 | 8382.93 | 0.001% |
| 27 | 129.61 | -13188.90 | -5616.70 | -129.33 | 13188.89 | 5615.69 | 0.007% |
| 28 | 2960.66 | -13165.25 | -4956.45 | -2959.54 | 13165.25 | 4955.44 | 0.011% |
| 29 | 4992.01 | -13147.37 | -2879.02 | -4990.13 | 13147.37 | 2878.10 | 0.015% |
| 30 | 5779.12 | -13161.71 | -84.09 | -5777.56 | 13161.71 | 83.73 | 0.011% |
| 31 | 4934.71 | -13182.52 | 2696.27 | -4933.67 | 13182.52 | -2696.11 | 0.007% |
| 32 | 2821.68 | -13180.40 | 4885.91 | -2820.93 | 13180.40 | -4885.58 | 0.006% |
| 33 | -32.94 | -13178.98 | 5636.08 | 33.30 | 13178.98 | -5635.68 | 0.004% |
| 34 | -2885.34 | -13202.62 | 4954.31 | 2885.11 | 13202.62 | -4953.93 | 0.003% |
| 35 | -4908.67 | -13220.50 | 2830.90 | 4908.11 | 13220.50 | -2830.67 | 0.004% |
| 36 | -5739.61 | -13206.16 | 19.94 | 5739.02 | 13206.16 | -20.02 | 0.004% |
| 37 | -4903.16 | -13185.35 | -2789.68 | 4902.83 | 13185.35 | 2789.17 | 0.004% |
| 38 | -2823.40 | -13187.48 | -4884.92 | 2823.34 | 13187.48 | 4884.12 | 0.006% |

## Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|---|---|---|---|---|
| 1 | Yes | 13 | 0.00000001 | 0.00011155 |
| 2 | Yes | 26 | 0.00014357 | 0.00013209 |
| 3 | Yes | 26 | 0.00014076 | 0.00013794 |
| 4 | Yes | 26 | 0.00014178 | 0.00014561 |
| 5 | Yes | 26 | 0.00009601 | 0.00009991 |
| 6 | Yes | 26 | 0.00009707 | 0.00009290 |
| 7 | Yes | 25 | 0.00010760 | 0.00008018 |
| 8 | Yes | 21 | 0.00013521 | 0.00007045 |
| 9 | Yes | 21 | 0.00013024 | 0.00014049 |
| 10 | Yes | 22 | 0.00009612 | 0.00012400 |
| 11 | Yes | 22 | 0.00008137 | 0.00009953 |
| 12 | Yes | 24 | 0.00014185 | 0.00009700 |
| 13 | Yes | 26 | 0.00010954 | 0.00008293 |
| 14 | Yes | 18 | 0.00000001 | 0.00007740 |
| 15 | Yes | 22 | 0.00011743 | 0.00004640 |
| 16 | Yes | 22 | 0.00009955 | 0.00004947 |
| 17 | Yes | 19 | 0.00013036 | 0.00011623 |
| 18 | Yes | 21 | 0.00010767 | 0.00005930 |
| 19 | Yes | 21 | 0.00000001 | 0.00004619 |
| 20 | Yes | 20 | 0.00000001 | 0.00005190 |
| 21 | Yes | 19 | 0.00000001 | 0.00005183 |
| 22 | Yes | 17 | 0.00000001 | 0.00010260 |
| 23 | Yes | 17 | 0.00000001 | 0.00009982 |
| 24 | Yes | 17 | 0.00000001 | 0.00010869 |

| | | | | |
|---|---|---|---|---|
| 25 | Yes | 19 | 0.00000001 | 0.00005768 |
| 26 | Yes | 21 | 0.00000001 | 0.00004254 |
| 27 | Yes | 12 | 0.00000001 | 0.00010647 |
| 28 | Yes | 12 | 0.00000001 | 0.00008553 |
| 29 | Yes | 12 | 0.00000001 | 0.00008424 |
| 30 | Yes | 12 | 0.00000001 | 0.00008781 |
| 31 | Yes | 12 | 0.00000001 | 0.00009937 |
| 32 | Yes | 12 | 0.00000001 | 0.00008871 |
| 33 | Yes | 12 | 0.00000001 | 0.00010112 |
| 34 | Yes | 12 | 0.00000001 | 0.00011838 |
| 35 | Yes | 12 | 0.00000001 | 0.00013057 |
| 36 | Yes | 12 | 0.00000001 | 0.00013057 |
| 37 | Yes | 12 | 0.00000001 | 0.00011849 |
| 38 | Yes | 12 | 0.00000001 | 0.00010364 |

## Maximum Tower Deflections - Service Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| T1 | 150 - 140 | 3.089 | 29 | 0.1384 | 0.0758 |
| T2 | 140 - 120 | 2.812 | 29 | 0.1111 | 0.0417 |
| T3 | 120 - 100 | 2.379 | 29 | 0.1375 | 0.0343 |
| T4 | 100 - 80 | 1.728 | 29 | 0.1236 | 0.0354 |
| T5 | 80 - 60 | 1.359 | 29 | 0.0844 | 0.1148 |
| T6 | 60 - 40 | 0.981 | 29 | 0.0851 | 0.1473 |
| T7 | 40 - 20 | 0.757 | 29 | 0.0337 | 0.1628 |
| T8 | 20 - 5.25 | 0.524 | 30 | 0.0928 | 0.1589 |
| T9 | 5.25 - 0 | 0.159 | 30 | 0.1363 | 0.1462 |

## Critical Deflections and Radius of Curvature - Service Wind

| Elevation<br>ft | Appurtenance | Gov. Load Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|---|---|---|---|---|---|---|
| 170.00 | DB420 | 29 | 3.089 | 0.1384 | 0.0758 | 13836 |
| 150.00 | 5" Dia 20' Omni | 29 | 3.089 | 0.1384 | 0.0758 | 13836 |
| 147.00 | DB420 | 29 | 3.001 | 0.1308 | 0.0644 | 13836 |
| 136.00 | Guy | 29 | 2.723 | 0.1058 | 0.0373 | 9163 |
| 130.00 | 10' Omni | 29 | 2.605 | 0.1157 | 0.0355 | 17729 |
| 125.00 | MB96RR900200DPBL w/Mount Pipe | 29 | 2.503 | 0.1276 | 0.0354 | 14280 |
| 120.00 | DB225-A | 29 | 2.379 | 0.1375 | 0.0343 | 9574 |
| 115.00 | 6' x 8" Panel Antenna w/Mount Pipe | 29 | 2.224 | 0.1415 | 0.0310 | 16617 |
| 96.00 | Guy | 29 | 1.632 | 0.1140 | 0.0473 | 10518 |
| 80.00 | 15' Omni | 29 | 1.359 | 0.0844 | 0.1148 | 26081 |
| 55.00 | DB225-A | 29 | 0.909 | 0.0723 | 0.1517 | 21881 |
| 50.00 | Guy | 29 | 0.850 | 0.0554 | 0.1561 | 31281 |
| 35.00 | 4 FT DISH | 29 | 0.714 | 0.0390 | 0.1640 | 23617 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| T1 | 150 - 140 | 23.881 | 3 | 1.2827 | 0.6012 |
| T2 | 140 - 120 | 21.239 | 3 | 1.1509 | 0.4340 |
| T3 | 120 - 100 | 16.882 | 3 | 1.1102 | 0.2958 |
| T4 | 100 - 80 | 12.185 | 3 | 0.9155 | 0.2586 |
| T5 | 80 - 60 | 9.447 | 3 | 0.5468 | 0.6287 |
| T6 | 60 - 40 | 7.574 | 2 | 0.4881 | 0.7519 |
| T7 | 40 - 20 | 6.203 | 2 | 0.3118 | 0.8080 |
| T8 | 20 - 5.25 | 4.108 | 2 | 0.7628 | 0.7871 |
| T9 | 5.25 - 0 | 1.215 | 2 | 1.0487 | 0.7231 |

## Critical Deflections and Radius of Curvature - Design Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|
| 170.00 | DB420 | 3 | 23.881 | 1.2827 | 0.6012 | 3156 |
| 150.00 | 5" Dia 20' Omni | 3 | 23.881 | 1.2827 | 0.6012 | 3156 |
| 147.00 | DB420 | 3 | 23.060 | 1.2379 | 0.5460 | 3156 |
| 136.00 | Guy | 3 | 20.311 | 1.1218 | 0.3901 | 2230 |
| 130.00 | 10' Omni | 3 | 19.029 | 1.1048 | 0.3471 | 5578 |
| 125.00 | MB96RR900200DPBL w/Mount Pipe | 3 | 17.983 | 1.1102 | 0.3218 | 4864 |
| 120.00 | DB225-A | 3 | 16.882 | 1.1102 | 0.2958 | 2753 |
| 115.00 | 6' x 8" Panel Antenna w/Mount Pipe | 3 | 15.681 | 1.0929 | 0.2627 | 5832 |
| 96.00 | Guy | 3 | 11.479 | 0.8362 | 0.3136 | 1734 |
| 80.00 | 15' Omni | 3 | 9.447 | 0.5468 | 0.6287 | 9155 |
| 55.00 | DB225-A | 2 | 7.205 | 0.4352 | 0.7664 | 5082 |
| 50.00 | Guy | 2 | 6.870 | 0.3700 | 0.7825 | 8196 |
| 35.00 | 4 FT DISH | 2 | 5.821 | 0.3808 | 0.8123 | 3210 |

## Bolt Design Data

| Section No. | Elevation ft | Component Type | Bolt Grade | Bolt Size in | Number Of Bolts | Maximum Load per Bolt lb | Allowable Load lb | Ratio Load / Allowable | Allowable Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 | Leg | A325N | 0.6250 | 4 | 680.28 | 24850.50 | 0.027 ✓ | 1 | Bolt DS |
| T2 | 140 | Leg | A325N | 0.6250 | 4 | 7643.25 | 24850.50 | 0.308 ✓ | 1 | Bolt DS |
| T3 | 120 | Leg | A325N | 0.6250 | 4 | 0.00 | 24850.50 | 0.000 ✓ | 1 | Bolt DS |
| T4 | 100 | Leg | A325N | 0.6250 | 4 | 4908.29 | 24850.50 | 0.198 ✓ | 1 | Bolt DS |
| T5 | 80 | Leg | A325N | 0.6250 | 4 | 0.00 | 24850.50 | 0.000 ✓ | 1 | Bolt DS |
| T6 | 60 | Leg | A325N | 0.6250 | 4 | 0.00 | 24850.50 | 0.000 ✓ | 1 | Bolt DS |
| T7 | 40 | Leg | A325N | 0.6250 | 4 | 0.00 | 24850.50 | 0.000 ✓ | 1 | Bolt DS |
| T8 | 20 | Leg | A325N | 0.6250 | 4 | 174.16 | 24850.50 | 0.007 ✓ | 1 | Bolt DS |
| T9 | 5.25 | Leg | A325N | 0.6250 | 4 | 0.00 | 24850.50 | 0.000 ✓ | 1 | Bolt DS |

## Guy Design Data

| Section No. | Elevation ft | Size | Initial Tension lb | Breaking Load lb | Actual $T_u$ lb | Allowable $\phi T_n$ lb | Required S.F. | Actual S.F. |
|---|---|---|---|---|---|---|---|---|
| T2 | 136.00 (A) (720) | 5/8 EHS | 4240.00 | 42399.99 | 13251.80 | 25440.00 | 1.000 | 1.920 ✓ |
| | 136.00 (A) (721) | 5/8 EHS | 4240.00 | 42399.99 | 13060.00 | 25440.00 | 1.000 | 1.948 ✓ |
| | 136.00 (B) (714) | 5/8 EHS | 4240.00 | 42399.99 | 13624.30 | 25440.00 | 1.000 | 1.867 ✓ |
| | 136.00 (B) (715) | 5/8 EHS | 4240.00 | 42399.99 | 14081.10 | 25440.00 | 1.000 | 1.807 ✓ |
| | 136.00 (C) (704) | 5/8 EHS | 4240.00 | 42399.99 | 19661.90 | 25440.00 | 1.000 | 1.294 ✓ |
| | 136.00 (C) (705) | 5/8 EHS | 4240.00 | 42399.99 | 19387.80 | 25440.00 | 1.000 | 1.312 ✓ |
| T4 | 96.00 (A) (742) | 1/2 EHS | 2690.00 | 26900.04 | 7798.51 | 16140.00 | 1.000 | 2.070 ✓ |
| | 96.00 (A) (743) | 1/2 EHS | 2690.00 | 26900.04 | 7672.17 | 16140.00 | 1.000 | 2.104 ✓ |
| | 96.00 (B) (736) | 1/2 EHS | 2690.00 | 26900.04 | 8226.18 | 16140.00 | 1.000 | 1.962 ✓ |
| | 96.00 (B) (737) | 1/2 EHS | 2690.00 | 26900.04 | 8429.20 | 16140.00 | 1.000 | 1.915 ✓ |
| | 96.00 (C) (726) | 1/2 EHS | 2690.00 | 26900.04 | 12524.30 | 16140.00 | 1.000 | 1.289 ✓ |
| | 96.00 (C) (727) | 1/2 EHS | 2690.00 | 26900.04 | 12433.00 | 16140.00 | 1.000 | 1.298 ✓ |
| T6 | 50.00 (A) (752) | 7/16 EHS | 2080.00 | 20800.02 | 8454.23 | 12480.00 | 1.000 | 1.476 ✓ |
| | 50.00 (B) (751) | 7/16 EHS | 2080.00 | 20800.02 | 8964.26 | 12480.00 | 1.000 | 1.392 ✓ |
| | 50.00 (C) (748) | 7/16 EHS | 2080.00 | 20800.02 | 11581.50 | 12480.00 | 1.000 | 1.078 ✓ |

## Compression Checks

## Leg Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | Mast Stability Index | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | 1 3/4 | 10.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 1.00 | -32150.80 | 94294.90 | 0.341 [1] ✓ |
| T2 | 140 - 120 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.96 | -44901.00 | 90507.10 | 0.496 [1] ✓ |
| T3 | 120 - 100 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.96 | -57378.40 | 90266.90 | 0.636 [1] ✓ |
| T4 | 100 - 80 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.93 | -67576.10 | 87434.40 | 0.773 [1] ✓ |
| T5 | 80 - 60 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.76 | -38979.40 | 71902.10 | 0.542 [1] ✓ |
| T6 | 60 - 40 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.71 | -44060.30 | 66673.50 | 0.661 [1] ✓ |
| T7 | 40 - 20 | 1 3/4 | 20.00 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.72 | -48288.40 | 67658.00 | 0.714 [1] ✓ |
| T8 | 20 - 5.25 | 1 3/4 | 14.75 | 1.58 | 43.4 K=1.00 | 2.4053 | 0.71 | -48232.90 | 67418.70 | 0.715 [1] ✓ |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | Mast Stability Index | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| T9 | 5.25 - 0 | 1 3/4 | 5.32 | 1.33 | 36.5<br>K=1.00 | 2.4053 | 0.68 | -46976.60 | 66371.00 | 0.708 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Diagonal Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -3985.38 | 7356.83 | 0.542 [1] ✓ |
| T2 | 140 - 120 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -5208.03 | 7356.83 | 0.708 [1] ✓ |
| T3 | 120 - 100 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -3857.75 | 7356.83 | 0.524 [1] ✓ |
| T4 | 100 - 80 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -4015.39 | 7356.83 | 0.546 [1] ✓ |
| T5 | 80 - 60 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -2534.05 | 7356.83 | 0.344 [1] ✓ |
| T6 | 60 - 40 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -3640.35 | 7356.83 | 0.495 [1] ✓ |
| T7 | 40 - 20 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -3564.14 | 7356.83 | 0.484 [1] ✓ |
| T8 | 20 - 5.25 | 5/8 | 2.18 | 0.98 | 75.6<br>K=1.00 | 0.3068 | -2501.07 | 7356.83 | 0.340 [1] ✓ |
| T9 | 5.25 - 0 | 5/8 | 1.43 | 0.77 | 59.3<br>K=1.00 | 0.3068 | -4255.07 | 8259.22 | 0.515 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Horizontal Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -591.72 | 12110.70 | 0.049 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Top Girt Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -154.33 | 12110.70 | 0.013 [1] ✓ |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -885.03 | 12110.70 | 0.073 [1] ✓ |
| T3 | 120 - 100 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -233.06 | 12110.70 | 0.019 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -176.78 | 12110.70 | 0.015 [1] ✓ |
| T5 | 80 - 60 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -69.55 | 12110.70 | 0.006 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -132.72 | 12110.70 | 0.011 [1] ✓ |
| T7 | 40 - 20 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -252.93 | 12110.70 | 0.021 [1] ✓ |
| T8 | 20 - 5.25 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -23.80 | 12110.70 | 0.002 [1] ✓ |

[1] $P_u / \phi P_n$ controls

## Bottom Girt Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -1552.71 | 12110.70 | 0.128 [1] ✓ |
| T3 | 120 - 100 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -1103.97 | 12110.70 | 0.091 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -130.98 | 12110.70 | 0.011 [1] ✓ |
| T5 | 80 - 60 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -10.28 | 12110.70 | 0.001 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -485.07 | 12110.70 | 0.040 [1] ✓ |

[1] $P_u / \phi P_n$ controls

## Top Guy Pull-Off Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -3436.56 | 12110.70 | 0.284 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -2611.96 | 12110.70 | 0.216 [1] ✓ |

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |

[1] $P_u / \phi P_n$ controls

## Bottom Guy Pull-Off Design Data (Compression)

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -6004.70 | 12110.70 | 0.496 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 82.3<br>K=0.95 | 0.4418 | -4865.47 | 12110.70 | 0.402 [1] ✓ |

[1] $P_u / \phi P_n$ controls

## Torque-Arm Bottom Design Data

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 (710) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -20848.20 | 50402.20 | 0.414 [1] ✓ |
| T2 | 140 - 120 (711) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -15500.00 | 50402.20 | 0.308 [1] ✓ |
| T2 | 140 - 120 (718) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -16038.80 | 50402.20 | 0.318 [1] ✓ |
| T2 | 140 - 120 (719) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -20810.30 | 50402.20 | 0.413 [1] ✓ |
| T2 | 140 - 120 (724) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -16201.50 | 50402.20 | 0.321 [1] ✓ |
| T2 | 140 - 120 (725) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -15584.20 | 50402.20 | 0.309 [1] ✓ |
| T4 | 100 - 80 (732) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -14420.90 | 50402.20 | 0.286 [1] ✓ |
| T4 | 100 - 80 (733) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -9618.70 | 50402.20 | 0.191 [1] ✓ |
| T4 | 100 - 80 (740) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -10274.30 | 50402.20 | 0.204 [1] ✓ |
| T4 | 100 - 80 (741) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -14294.70 | 50402.20 | 0.284 [1] ✓ |
| T4 | 100 - 80 (746) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -10646.80 | 50402.20 | 0.211 [1] ✓ |
| T4 | 100 - 80 (747) | P2.5x.203 | 3.36 | 3.28 | 41.6<br>K=1.00 | 1.7040 | -9871.78 | 50402.20 | 0.196 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Tension Checks

## Leg Design Data (Tension)

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T1 | 150 - 140 | 1 3/4 | 10.00 | 1.58 | 43.4 | 1.2339 | 30579.00 | 60150.90 | 0.508 [1] ✓ |
| T2 | 140 - 120 | 1 3/4 | 20.00 | 1.58 | 43.4 | 1.2339 | 34027.20 | 60150.90 | 0.566 [1] ✓ |
| T3 | 120 - 100 | 1 3/4 | 20.00 | 1.58 | 43.4 | 1.2339 | 19634.20 | 60150.90 | 0.326 [1] ✓ |
| T4 | 100 - 80 | 1 3/4 | 20.00 | 1.58 | 43.4 | 1.2339 | 23737.80 | 60150.90 | 0.395 [1] ✓ |
| T7 | 40 - 20 | 1 3/4 | 20.00 | 1.58 | 43.4 | 1.2339 | 2938.90 | 60150.90 | 0.049 [1] ✓ |
| T8 | 20 - 5.25 | 1 3/4 | 14.75 | 1.58 | 43.4 | 1.2339 | 895.52 | 60150.90 | 0.015 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Diagonal Design Data (Tension)

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T1 | 150 - 140 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 4005.69 | 9940.20 | 0.403 [1] ✓ |
| T2 | 140 - 120 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 4897.34 | 9940.20 | 0.493 [1] ✓ |
| T3 | 120 - 100 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 3036.48 | 9940.20 | 0.305 [1] ✓ |
| T4 | 100 - 80 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 2633.34 | 9940.20 | 0.265 [1] ✓ |
| T5 | 80 - 60 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 866.76 | 9940.20 | 0.087 [1] ✓ |
| T6 | 60 - 40 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 1920.34 | 9940.20 | 0.193 [1] ✓ |
| T7 | 40 - 20 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 1530.96 | 9940.20 | 0.154 [1] ✓ |
| T8 | 20 - 5.25 | 5/8 | 2.18 | 0.98 | 75.6 | 0.3068 | 1157.88 | 9940.20 | 0.116 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Horizontal Design Data (Tension)

| Section No. | Elevation | Size | $L$ | $L_u$ | $Kl/r$ | $A$ | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 678.77 | 19880.40 | 0.034 [1] ✓ |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1772.47 | 19880.40 | 0.089 [1] ✓ |
| T3 | 120 - 100 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1577.05 | 19880.40 | 0.079 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 2260.81 | 19880.40 | 0.114 [1] ✓ |
| T5 | 80 - 60 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 2314.37 | 19880.40 | 0.116 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 2651.80 | 19880.40 | 0.133 [1] ✓ |
| T7 | 40 - 20 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 3325.23 | 19880.40 | 0.167 [1] ✓ |
| T8 | 20 - 5.25 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 3162.04 | 19880.40 | 0.159 [1] ✓ |
| T9 | 5.25 - 0 | 3/4 | 0.75 | 0.60 | 38.7 | 0.4418 | 3116.34 | 19880.40 | 0.157 [1] ✓ |

[1] $P_u / \phi P_n$ controls

## Top Girt Design Data (Tension)

| Section No. | Elevation | Size | $L$ | $L_u$ | $Kl/r$ | $A$ | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 134.44 | 19880.40 | 0.007 [1] ✓ |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 631.25 | 19880.40 | 0.032 [1] ✓ |
| T3 | 120 - 100 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 987.26 | 19880.40 | 0.050 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1045.79 | 19880.40 | 0.053 [1] ✓ |
| T5 | 80 - 60 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1137.88 | 19880.40 | 0.057 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1182.60 | 19880.40 | 0.059 [1] ✓ |
| T7 | 40 - 20 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1307.80 | 19880.40 | 0.066 [1] ✓ |
| T8 | 20 - 5.25 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1773.54 | 19880.40 | 0.089 [1] ✓ |

[1] $P_u / \phi P_n$ controls

## Bottom Girt Design Data (Tension)

| Section No. | Elevation | Size | $L$ | $L_u$ | $Kl/r$ | $A$ | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T1 | 150 - 140 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1489.11 | 19880.40 | 0.075 [1] ✓ |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 641.70 | 19880.40 | 0.032 [1] ✓ |
| T3 | 120 - 100 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1584.59 | 19880.40 | 0.080 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1247.85 | 19880.40 | 0.063 [1] ✓ |
| T5 | 80 - 60 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1137.62 | 19880.40 | 0.057 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1951.17 | 19880.40 | 0.098 [1] ✓ |
| T7 | 40 - 20 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 1530.91 | 19880.40 | 0.077 [1] ✓ |
| T8 | 20 - 5.25 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 6127.33 | 19880.40 | 0.308 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Top Guy Pull-Off Design Data (Tension)

| Section No. | Elevation | Size | $L$ | $L_u$ | $Kl/r$ | $A$ | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 8047.59 | 19880.40 | 0.405 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 7046.42 | 19880.40 | 0.354 [1] ✓ |
| T6 | 60 - 40 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 4512.26 | 19880.40 | 0.227 [1] ✓ |

[1] $P_u$ / $\phi P_n$ controls

## Bottom Guy Pull-Off Design Data (Tension)

| Section No. | Elevation | Size | $L$ | $L_u$ | $Kl/r$ | $A$ | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 4574.87 | 19880.40 | 0.230 [1] ✓ |
| T4 | 100 - 80 | 3/4 | 1.50 | 1.35 | 86.7 | 0.4418 | 4792.37 | 19880.40 | 0.241 [1] ✓ |

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |

[1] $P_u / \phi P_n$ controls

## Torque-Arm Top Design Data

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 (706) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 18211.00 | 55211.20 | 0.330 [1] ✔ |
| T2 | 140 - 120 (707) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 13719.20 | 55211.20 | 0.248 [1] ✔ |
| T2 | 140 - 120 (716) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 14084.20 | 55211.20 | 0.255 [1] ✔ |
| T2 | 140 - 120 (717) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 18478.40 | 55211.20 | 0.335 [1] ✔ |
| T2 | 140 - 120 (722) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 13118.80 | 55211.20 | 0.238 [1] ✔ |
| T2 | 140 - 120 (723) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 13058.90 | 55211.20 | 0.237 [1] ✔ |
| T4 | 100 - 80 (728) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 10599.80 | 55211.20 | 0.192 [1] ✔ |
| T4 | 100 - 80 (729) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 8676.57 | 55211.20 | 0.157 [1] ✔ |
| T4 | 100 - 80 (738) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 8963.43 | 55211.20 | 0.162 [1] ✔ |
| T4 | 100 - 80 (739) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 10698.70 | 55211.20 | 0.194 [1] ✔ |
| T4 | 100 - 80 (744) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 7662.31 | 55211.20 | 0.139 [1] ✔ |
| T4 | 100 - 80 (745) | P2.5x.203 | 3.66 | 3.58 | 45.3 | 1.7040 | 7434.56 | 55211.20 | 0.135 [1] ✔ |

[1] $P_u / \phi P_n$ controls

## Torque-Arm Bottom Design Data

| Section No. | Elevation | Size | L | $L_u$ | Kl/r | A | $P_u$ | $\phi P_n$ | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | ft | | ft | ft | | $in^2$ | lb | lb | |
| T2 | 140 - 120 (710) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4010.60 | 55211.20 | 0.073 [1] ✔ |
| T2 | 140 - 120 (711) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 3189.55 | 55211.20 | 0.058 [1] ✔ |
| T2 | 140 - 120 (718) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 3097.03 | 55211.20 | 0.056 [1] ✔ |
| T2 | 140 - 120 (719) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 3937.35 | 55211.20 | 0.071 [1] ✔ |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T2 | 140 - 120 (724) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4953.95 | 55211.20 | 0.090 [1] |
| T2 | 140 - 120 (725) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4962.70 | 55211.20 | 0.090 [1] |
| T4 | 100 - 80 (732) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4181.14 | 55211.20 | 0.076 [1] |
| T4 | 100 - 80 (733) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4148.40 | 55211.20 | 0.075 [1] |
| T4 | 100 - 80 (740) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 3959.67 | 55211.20 | 0.072 [1] |
| T4 | 100 - 80 (741) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4145.98 | 55211.20 | 0.075 [1] |
| T4 | 100 - 80 (746) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4762.66 | 55211.20 | 0.086 [1] |
| T4 | 100 - 80 (747) | P2.5x.203 | 3.36 | 3.28 | 41.6 | 1.7040 | 4888.82 | 55211.20 | 0.089 [1] |

[1] $P_u / \phi P_n$ controls

## Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P lb | $\phi P_{allow}$ lb | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| T1 | 150 - 140 | Leg | 1 3/4 | 2 | 30579.00 | 60150.90 | 50.8 | Pass |
| | | Diagonal | 5/8 | 14 | -3985.38 | 7356.83 | 54.2 | Pass |
| | | Horizontal | 3/4 | 23 | -591.72 | 12110.70 | 4.9 | Pass |
| | | Top Girt | 3/4 | 5 | -154.33 | 12110.70 | 1.3 | Pass |
| | | Bottom Girt | 3/4 | 7 | -1552.71 | 12110.70 | 12.8 | Pass |
| T2 | 140 - 120 | Leg | 1 3/4 | 52 | 34027.20 | 60150.90 | 56.6 | Pass |
| | | Diagonal | 5/8 | 123 | -5208.03 | 7356.83 | 70.8 | Pass |
| | | Horizontal | 3/4 | 80 | 1772.47 | 19880.40 | 8.9 | Pass |
| | | Top Girt | 3/4 | 55 | -885.03 | 12110.70 | 7.3 | Pass |
| | | Bottom Girt | 3/4 | 57 | 641.70 | 19880.40 | 3.2 | Pass |
| | | Guy A@136 | 5/8 | 720 | 13251.80 | 25440.00 | 52.1 | Pass |
| | | Guy B@136 | 5/8 | 715 | 14081.10 | 25440.00 | 55.4 | Pass |
| | | Guy C@136 | 5/8 | 704 | 19661.90 | 25440.00 | 77.3 | Pass |
| | | Top Guy Pull-Off@136 | 3/4 | 708 | 8047.59 | 19880.40 | 40.5 | Pass |
| | | Bottom Guy Pull-Off@136 | 3/4 | 712 | -6004.70 | 12110.70 | 49.6 | Pass |
| | | Torque Arm Top@136 | P2.5x.203 | 717 | 18478.40 | 55211.20 | 33.5 | Pass |
| | | Torque Arm Bottom@136 | P2.5x.203 | 710 | -20848.20 | 50402.20 | 41.4 | Pass |
| T3 | 120 - 100 | Leg | 1 3/4 | 145 | -57378.40 | 90266.90 | 63.6 | Pass |
| | | Diagonal | 5/8 | 153 | -3857.75 | 7356.83 | 52.4 | Pass |
| | | Horizontal | 3/4 | 158 | 1577.05 | 19880.40 | 7.9 | Pass |
| | | Top Girt | 3/4 | 146 | 987.26 | 19880.40 | 5.0 | Pass |
| | | Bottom Girt | 3/4 | 151 | -1103.97 | 12110.70 | 9.1 | Pass |
| T4 | 100 - 80 | Leg | 1 3/4 | 237 | -67576.10 | 87434.40 | 77.3 | Pass |
| | | Diagonal | 5/8 | 325 | -4015.39 | 7356.83 | 54.6 | Pass |
| | | Horizontal | 3/4 | 299 | 2260.81 | 19880.40 | 11.4 | Pass |
| | | Top Girt | 3/4 | 238 | 1045.79 | 19880.40 | 5.3 | Pass |
| | | Bottom Girt | 3/4 | 241 | 1247.85 | 19880.40 | 6.3 | Pass |
| | | Guy A@96 | 1/2 | 742 | 7798.51 | 16140.00 | 48.3 | Pass |
| | | Guy B@96 | 1/2 | 737 | 8429.20 | 16140.00 | 52.2 | Pass |

| Section No. | Elevation ft | Component Type | Size | Critical Element | P lb | $\phi P_{allow}$ lb | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| | | Guy C@96 | 1/2 | 726 | 12524.30 | 16140.00 | 77.6 | Pass |
| | | Top Guy Pull-Off@96 | 3/4 | 730 | 7046.42 | 19880.40 | 35.4 | Pass |
| | | Bottom Guy Pull-Off@96 | 3/4 | 735 | -4865.47 | 12110.70 | 40.2 | Pass |
| | | Torque Arm Top@96 | P2.5x.203 | 739 | 10698.70 | 55211.20 | 19.4 | Pass |
| | | Torque Arm Bottom@96 | P2.5x.203 | 732 | -14420.90 | 50402.20 | 28.6 | Pass |
| T5 | 80 - 60 | Leg | 1 3/4 | 328 | -38979.40 | 71902.10 | 54.2 | Pass |
| | | Diagonal | 5/8 | 337 | -2534.05 | 7356.83 | 34.4 | Pass |
| | | Horizontal | 3/4 | 342 | 2314.37 | 19880.40 | 11.6 | Pass |
| | | Top Girt | 3/4 | 330 | 1137.88 | 19880.40 | 5.7 | Pass |
| | | Bottom Girt | 3/4 | 333 | 1137.62 | 19880.40 | 5.7 | Pass |
| T6 | 60 - 40 | Leg | 1 3/4 | 420 | -44060.30 | 66673.50 | 66.1 | Pass |
| | | Diagonal | 5/8 | 428 | -3640.35 | 7356.83 | 49.5 | Pass |
| | | Horizontal | 3/4 | 434 | 2651.80 | 19880.40 | 13.3 | Pass |
| | | Top Girt | 3/4 | 422 | 1182.60 | 19880.40 | 5.9 | Pass |
| | | Bottom Girt | 3/4 | 425 | 1951.17 | 19880.40 | 9.8 | Pass |
| | | Guy A@50 | 7/16 | 752 | 8454.23 | 12480.00 | 67.7 | Pass |
| | | Guy B@50 | 7/16 | 751 | 8964.26 | 12480.00 | 71.8 | Pass |
| | | Guy C@50 | 7/16 | 748 | 11581.50 | 12480.00 | 92.8 | Pass |
| | | Top Guy Pull-Off@50 | 3/4 | 469 | 4512.26 | 19880.40 | 22.7 | Pass |
| T7 | 40 - 20 | Leg | 1 3/4 | 512 | -48288.40 | 67658.00 | 71.4 | Pass |
| | | Diagonal | 5/8 | 597 | -3564.14 | 7356.83 | 48.4 | Pass |
| | | Horizontal | 3/4 | 526 | 3325.23 | 19880.40 | 16.7 | Pass |
| | | Top Girt | 3/4 | 514 | 1307.80 | 19880.40 | 6.6 | Pass |
| | | Bottom Girt | 3/4 | 517 | 1530.91 | 19880.40 | 7.7 | Pass |
| T8 | 20 - 5.25 | Leg | 1 3/4 | 605 | -48232.90 | 67418.70 | 71.5 | Pass |
| | | Diagonal | 5/8 | 669 | -2501.07 | 7356.83 | 34.0 | Pass |
| | | Horizontal | 3/4 | 667 | 3162.04 | 19880.40 | 15.9 | Pass |
| | | Top Girt | 3/4 | 606 | 1773.54 | 19880.40 | 8.9 | Pass |
| | | Bottom Girt | 3/4 | 609 | 6127.33 | 19880.40 | 30.8 | Pass |
| T9 | 5.25 - 0 | Leg | 1 3/4 | 675 | -46976.60 | 66371.00 | 70.8 | Pass |
| | | Diagonal | 5/8 | 684 | -4255.07 | 8259.22 | 51.5 | Pass |
| | | Horizontal | 3/4 | 688 | 3116.34 | 19880.40 | 15.7 | Pass |
| | | | | | | | Summary | |
| | | | | | | Leg (T4) | 77.3 | Pass |
| | | | | | | Diagonal (T2) | 70.8 | Pass |
| | | | | | | Horizontal (T7) | 16.7 | Pass |
| | | | | | | Top Girt (T8) | 8.9 | Pass |
| | | | | | | Bottom Girt (T8) | 30.8 | Pass |
| | | | | | | Guy A (T6) | 67.7 | Pass |
| | | | | | | Guy B (T6) | 71.8 | Pass |
| | | | | | | Guy C (T6) | 92.8 | Pass |
| | | | | | | Top Guy Pull-Off (T2) | 40.5 | Pass |
| | | | | | | Bottom Guy Pull-Off (T2) | 49.6 | Pass |
| | | | | | | Torque Arm Top (T2) | 33.5 | Pass |
| | | | | | | Torque Arm Bottom (T2) | 41.4 | Pass |
| | | | | | | Bolt Checks | 30.8 | Pass |
| | | | | | | **RATING =** | **92.8** | **Pass** |