HPC Wireless Services
22 Shelter Rock Lane.
Building C
Danbury, CT, 06810
P.: 203.797.1112

HPC
WIRELESS SERVICES

October 4, 2013

**VIA OVERNIGHT COURIER**

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Melanie Bachman, Acting Executive Director

Re: Sprint Spectrum, L.P. – Exempt Modification
232 South Main Street (aka 236 South Main Street), East Windsor, Connecticut

Dear Ms. Bachman:

This letter and attachments are submitted on behalf of Sprint Spectrum, L.P. ("Sprint"). Sprint is undertaking modifications to certain existing sites in its Connecticut system in order to implement updated technology. Please accept this letter and attachments as notification, pursuant to R.C.S.A. Section 16-50j-73, of construction that constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the First Selectman of the Town of East Windsor.

Sprint plans to modify the existing wireless communications facility owned by the Balch Bridge Street Corporation and located at 232 South Main Street (aka 236 South Main Street), East Windsor, (coordinates 41°-52'-37.8" N, 72°-36'-38.8" W). Attached are plan and elevation drawings depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration, subject to modifications detailed in the attached structural documentation. Also included is a power density report reflecting the modification to Sprint's operations at the site.

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. Sprint will remove the existing six (6) CMDA antennas and add three (3) dual-band panel LTE antennas on new pipe masts, on the existing T-frames at a centerline height of approximately 123'. Sprint will also install six (6) RRHs (remote radio heads) on new RRH pipes next to the antennas, also at a centerline height of approximately 123'.

During an interim period of up to one year, the six (6) existing CDMA antennas will remain. Sprint will also install three (3) hybriflex cables along the existing coaxial cable run, and will remove the coaxial cable at the end of the interim period. The proposed modifications will not extend the height of the approximately 188' structure.

2. Sprint will replace the two (2) existing cabinets with three (3) similar cabinets, all on the existing Concrete Pad. Sprint will also add a new surge suppressor, and place a new fiber/power junction box on new posts on a proposed H-frame on the existing platform, all on the existing Concrete Pad. The existing GPS antenna, on the existing Ice Bridge, will be replaced by another GPS antenna. These changes will have no effect on the site boundaries.

3. The proposed changes will not increase the noise level at the existing facility by six decibels or more. The incremental effect of the proposed changes will be negligible.

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by EBI Consulting, Sprint's operations at the site will result in a power density of approximately 18.507%; the combined site operations will result in a total power density of approximately 56.537%.

Please contact me by phone at (203) 610-1071 or by e-mail at mjhowlett@optonline.net with questions concerning this matter. Thank you for your consideration.

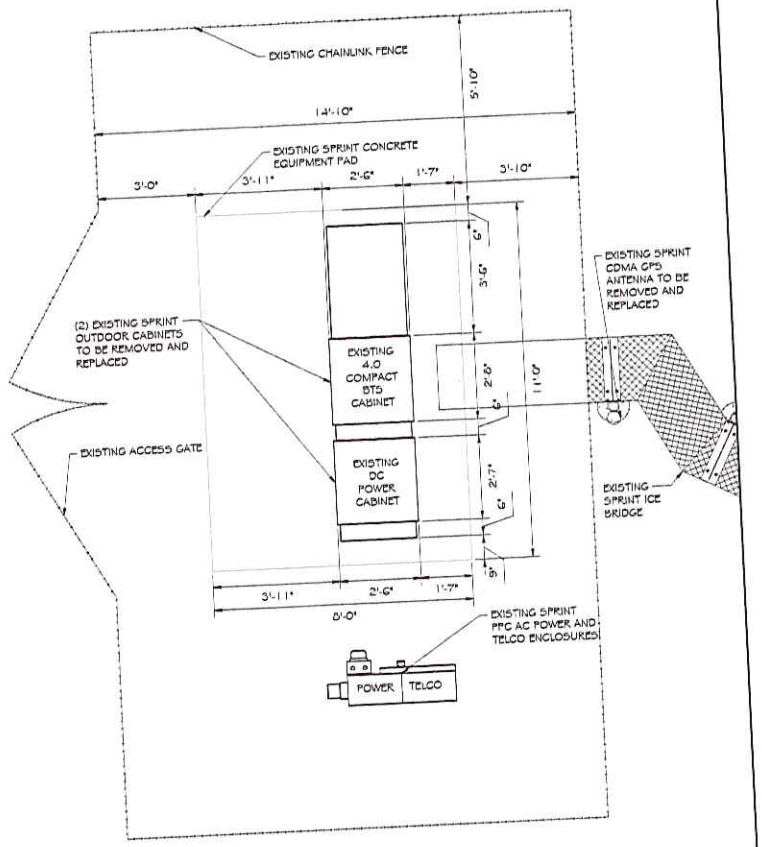
Respectfully yours,

Melanie J. Howlett

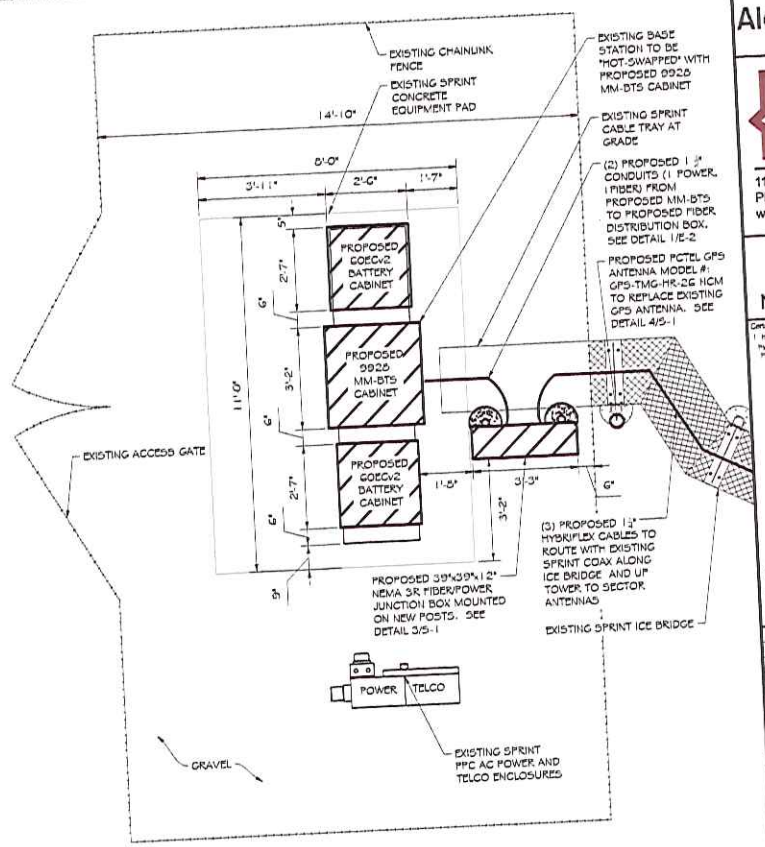
Melanie J. Howlett

Attachments

cc: Honorable Denise Menard, First Selectman, Town of East Windsor
Balch Bridge Street Corporation (underlying property owner)




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




PROPOSED EQUIPMENT PLAN (2)
SCALE: 1" = 3.75'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Overland Park, KS 66251

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1120 Dallas Street, Sauk City, WI 53583
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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. 29286
LICENSED
PROFESSIONAL ENGINEER

Signature: James R. Skowronski Date: 7/02/2013

| MARK | DATE | DESCRIPTION |
|---|---|---|
| F | 7/02/13 | RF REVISIONS, PRELIMINARY PERMIT CD'S |
| E | 5/30/13 | TOWER MODS, PRELIMINARY PERMIT CD'S |
| D | 5/20/13 | HOT SWAP SCENARIO, PRELIMINARY PERMIT CD'S |
| C | 4/23/13 | PRELIMINARY PERMIT CD'S |
| B | 10/29/12 | FINAL PRELIMINARY CD'S |
| A | 10/03/12 | 100% CD REVIEW |

ISSUE PHASE: PRELIM PERMIT — DATE ISSUED: 07/02/2013

PROJECT TITLE:
BALCH TOWER
SITE #: CT03XC090

PROJECT INFORMATION
236 SOUTH MAIN STREET
EAST WINDSOR, CT 06088
HARTFORD 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: 22997
SHEET NUMBER: A-1


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## 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 MANUFACTURERS 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 7/8" 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 18" 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.

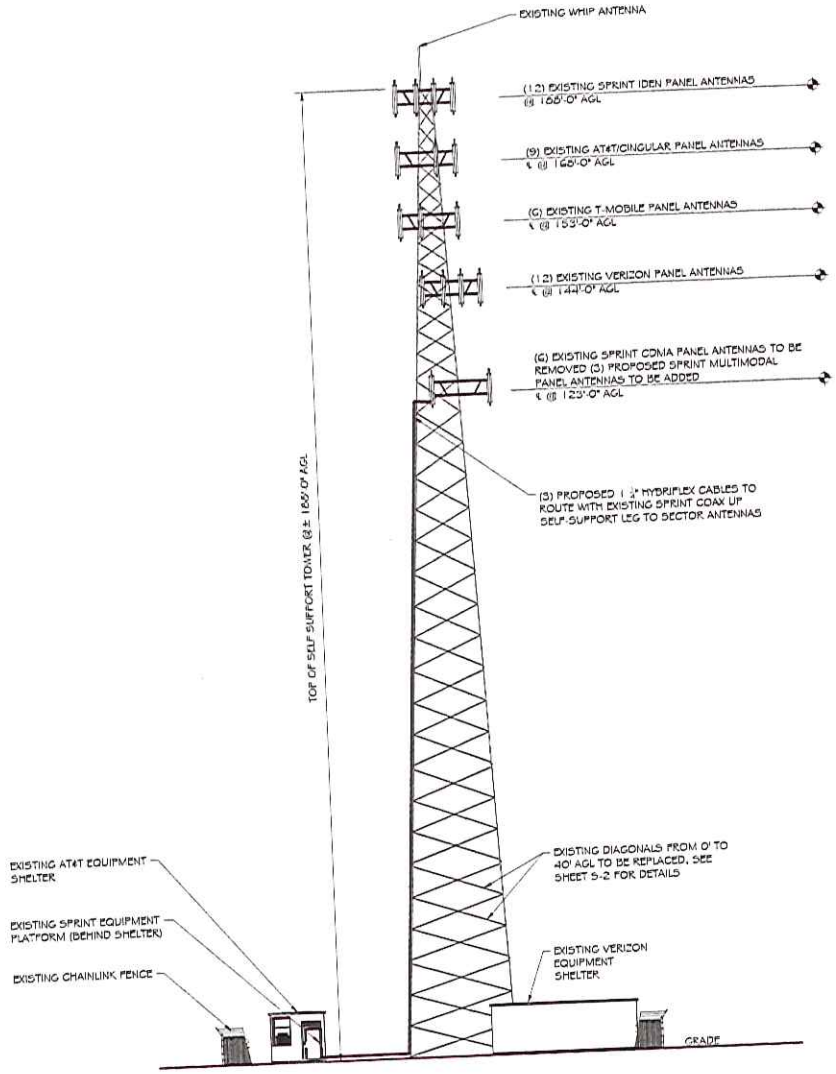
IV. CONNECTORS:

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 5'-6". GROUND BAR SHALL BE ISOLATED FROM ANGLE USING NEWTON BUSHINGS PROVIDED.




ELEVATION 1
SCALE: 1" = 25'-0"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Overland Park, KS 66251

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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. 28286 · LICENSED · PROFESSIONAL ENGINEER

7/02/2013
Signature Date

| MARK | DATE | DESCRIPTION |
|---|---|---|
| F | 7/02/13 | RF REVISIONS, PRELIMINARY PERMIT CDS |
| E | 6/05/13 | TOWER MODS, PRELIMINARY PERMIT CDS |
| D | 5/20/13 | HOT SWAP SCENARIO, PRELIMINARY PERMIT CDS |
| C | 4/03/13 | PRELIMINARY PERMIT CDS |
| B | 04/19/12 | FINAL PRELIMINARY CDS |
| A | 10/03/12 | 90% CD REVIEW |

ISSUE PHASE: PRELIM PERMIT — DATE ISSUED: 07/02/2013

PROJECT TITLE:
BALCH TOWER
SITE #: CT03XC090

PROJECT INFORMATION:
236 SOUTH MAIN STREET
EAST WINDSOR, CT 06088
HARTFORD COUNTY

SHEET TITLE:
SITE ELEVATION & NOTES

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

PROJECT NUMBER: 22997
SHEET NUMBER: A-2


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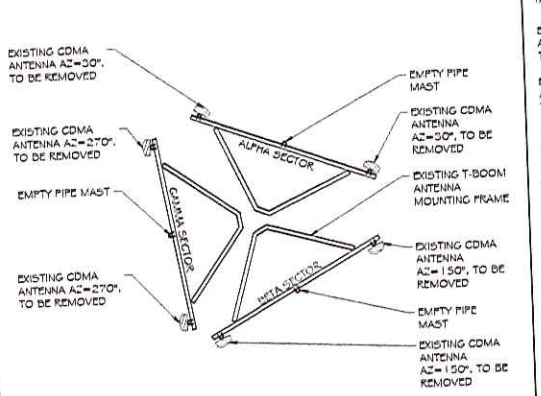
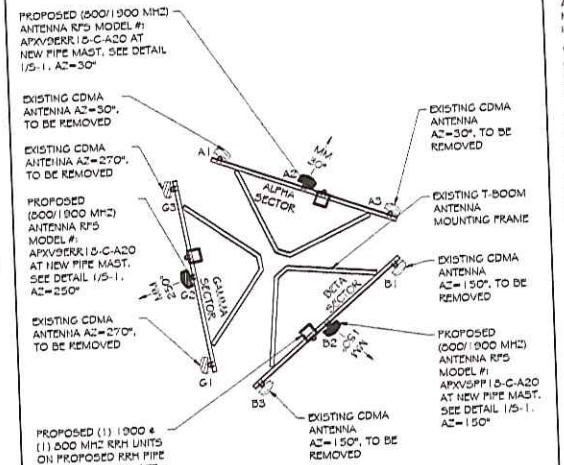
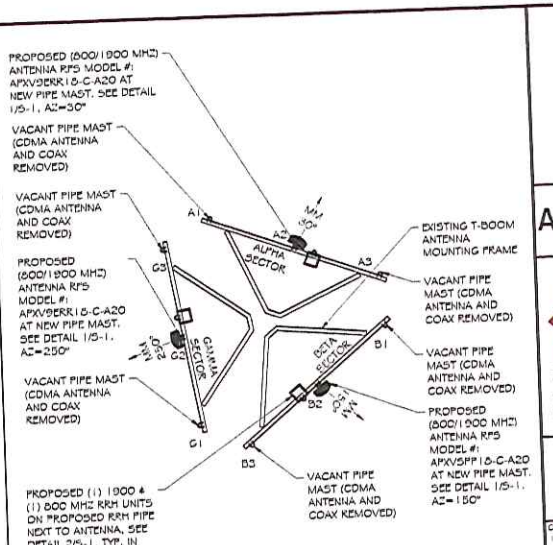



EXISTING ANTENNA LAYOUT (1)
SCALE: NTS




INTERIM ANTENNA LAYOUT (2)
SCALE: NTS




FINAL ANTENNA LAYOUT (3)
SCALE: NTS




## 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 | 30° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |
| | A-2 | 30° | 123'-0" | PROPOSED | MULTIMODAL | RFS/APXV9ERR18-C-A20 | 1900(-3), 800(-3) | 1900(0), 800(-3) | 1900(1), 800(1) | (1) 1 5/8" HYBRIFLEX RFS MODEL #: HB114-1-08U4-M5J | ±155'-0" |
| | A-3 | 30° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |
| BETA | B-1 | 150° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |
| | B-2 | 150° | 123'-0" | PROPOSED | MULTIMODAL | RFS/APXV9PP18-C-A20 | 1900(0), 800(0) | 1900(-1), 800(-8) | 1900(1), 800(1) | (1) 1 5/8" HYBRIFLEX RFS MODEL #: HB114-1-08U4-M5J | ±155'-0" |
| | B-3 | 150° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |
| GAMMA | G-1 | 270° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |
| | G-2 | 250° | 123'-0" | PROPOSED | MULTIMODAL | RFS/APXV9ERR18-C-A20 | 1900(0), 800(0) | 1900(0), 800(0) | 1900(1), 800(1) | (1) 1 5/8" HYBRIFLEX RFS MODEL #: HB114-1-08U4-M5J | ±155'-0" |
| | G-3 | 270° | 123'-0" | EX. TO BE REMOVED | CDMA | - | - | - | - | EX. TO BE REMOVED | - |

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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. 28266
LICENSED
PROFESSIONAL ENGINEER

Signature: Date: 7/02/2013

| MARK | DATE | DESCRIPTION |
|---|---|---|
| F | 7/02/13 | RF REVISIONS, PRELIMINARY PERMIT CDS |
| E | 5/30/13 | TOWER MODS, PRELIMINARY PERMIT CDS |
| D | 5/20/13 | HOT SWAP SCENARIO, PRELIMINARY PERMIT CDS |
| C | 4/03/13 | PRELIMINARY PERMIT CDS |
| B | 10/29/12 | FINAL PRELIMINARY CDS |
| A | 10/03/12 | DOR CD REVIEW |

ISSUE PHASE: PRELIM PERMIT DATE ISSUED: 07/02/2013

PROJECT TITLE:
BALCH TOWER
SITE #: CT03XC090

PROJECT INFORMATION:
236 SOUTH MAIN STREET
EAST WINDSOR, CT 06088
HARTFORD COUNTY

SHEET TITLE:
ANTENNA DETAILS
& COAX SCHEDULE

SCALE: NONE

PROJECT NUMBER: 22997
SHEET NUMBER: A-3

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RAMAKER
& ASSOCIATES, INC.

# BALCH TOWER (CT03XC090)

## PREPARED FOR:
## ALCATEL-LUCENT ON BEHALF OF SPRINT

## PREPARED BY:
## RAMAKER & ASSOCIATES, INC.
## JOB NUMBER: 22997

# STRUCTURAL ASSESSMENT
# 188-FOOT SELF-SUPPORT TOWER

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

# BALCH TOWER (CT03XC090)

| | |
|---|---|
| **SITE:** | Balch Tower (CT03XC090)<br>236 South Main Street<br>East Windsor, Hartford County, CT 06088 |
| **CONTACT PERSON:** | John Szilezy<br>Alcatel-Lucent<br>Site Acquisition Manager<br>600 Mountain Avenue, Murray Hill, NJ 07974<br>Email: john.szilezy@alcatel-lucent.com |
| **PREPARED BY:** | Ramaker & Associates, Inc.<br>1120 Dallas Street<br>Sauk City, Wisconsin 53583<br>Telephone: (608) 643-4100<br>Facsimile: (608) 643-7999 |
| **RAMAKER JOB NUMBER:** | 22997 |
| **DATE OF REPORT ISSUANCE:** | June 3, 2013 |

Adam Kraus
Engineering Technician

06/03/13
Date

James R. Skowronski, P.E.
Supervising Engineer

06/03/13
Date

STATE OF CONNECTICUT
JAMES R. SKOWRONSKI
No. 28266
LICENSED
PROFESSIONAL ENGINEER

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3.3 EXISTING TOWER LOADS
3.4 PROPOSED TOWER LOADS
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**LIST OF APPENDICES**

A. TOWER FIGURES
B. TOWER CALCULATIONS
C. TOWER MODIFICATION DETAILS

# SECTION 1

# EXECUTIVE SUMMARY

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Alcatel-Lucent on behalf of Sprint, who intends to install additional equipment on an existing 188-foot self-support tower.

Alcatel-Lucent is proposing to install two (2) RFS APXV9ERR18-C-A20 panel antennas, one (1) RFS APXVSPP18-C-A20 panel antenna, and six (6) Alcatel-Lucent RRHs on the three (3) existing T-frames at a centerline elevation of 123 feet AGL. The proposed equipment shall be fed with three (3) 1-1/4-inch fiber/power hybrid cables that were assumed to routed up the existing Sprint feedline ladder. The six (6) existing Sprint CDMA panel antennas and their associated coax at 123 feet AGL shall remain for the proposed interim phase, and then be removed for the final antenna configuration.

***The existing tower diagonals from 0'-40' could become overstressed under proposed loading conditions. These tower members shall be replaced per the associated construction drawings prior to any equipment installation.***

Results of our analysis show that the tower will be stressed to a maximum of 92.9 percent of capacity under proposed loading conditions ***after all required structural modifications have been completed.***

All proposed model foundation reactions were found to be less than the modified original design reactions. The foundation was also analyzed using the geotechnical report by Ramaker & Associates, job number 22997, dated February 19, 2013 and it was determined to provide adequate strength under proposed loading conditions.

Results of our mount assessment show that by engineering calculation and inspection, the antenna and RRH mounting structure is capable of supporting the existing and proposed Sprint Network Vision equipment deployment without causing an overstress condition in the antenna and RRH mounting structure.

In summary, the tower will pass and the mounting structure will pass the TIA-222-G code requirements under proposed loading conditions ***after all required structural modifications have been completed.***

# SECTION 2
# INTRODUCTION

## 2.1 PROJECT INFORMATION

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Alcatel-Lucent on behalf of Sprint, 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 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.

## 3.2 EXISTING STRUCTURE INFORMATION

Tower information was gathered from the original tower drawings by Rohn, file number 34769PH, dated September 27, 1996.

## 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 |
|---|---|---|---|
| 188 | 10' Omni | Platform | 1-5/8 |
| | (12) Decibel DB844H90E-XY | | (12) 1-5/8 |
| 176 | (3) 6' x 1' Panel Antennas | Leg Mounted | (6) 1-5/8 |
| 168 | (6) CSS DU01417-8686 | (3) T-Frames | (12) 1-5/8 |
| | (3) Powerwave 7770.00 | | |
| | (3) Powerwave LGP186nn | | |
| 155 | (6) Allgon 7250.03 | (3) T-Frames | (9) 1-5/8 |
| | (3) 5' x 1.5' Panel Antennas | | |
| 141 | (6) Decibel DB844H90E-XY | (3) T-Frames | (15) 1-5/8 |
| | (3) 4' x 1' Panel Antennas | | |
| | (3) 5' x 8" Panel Antennas | | |
| 123 | ** (6) Decibel DB980H90E-M ** | (3) T-Frames | ** (6) 1-5/8 ** |

** The six (6) existing Sprint CDMA panel antennas and their associated coax at 123 feet AGL shall remain for the proposed interim phase, and then be removed for the final antenna configuration.

## 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 |
|---|---|---|---|
| 123 | (2) RFS APXV9ERR18-C | Existing (3) T-Frames | (3) 1-1/4 Hybrid Cables |
| | (1) RFS APXVSPP18-C | | |
| | (3) ALU 1900MHz 4x40W RRH | | |
| | (3) ALU 800MHz 2x50W RRH | | |

Proposed hybrid cables were assumed to be routed up the existing Sprint feedline ladder.

Details regarding the antenna and RRH mounting structure and proposed equipment modifications can be found in the construction drawings by Ramaker & Associates, Inc., project number 22997, dated May 30, 2013.

## 3.5 PROPOSED TOWER MODIFICATIONS

The existing tower diagonals from 0'-40' could become overstressed under proposed loading conditions. These tower members shall be replaced per the associated construction drawings prior to any equipment installation.

| Elevation | Member | Existing Member Size | Proposed Member Size |
|---|---|---|---|
| 40'-20' | Diagonal | L4x4x5/16 | L5x5x5/16 |
| 20'-0' | Diagonal | L4x4x3/8 | L5x5x5/16 |

## 3.6 WIND AND ICE LOAD

Wind forces used in model development are in compliance with the TIA-222-G Standard. These guidelines, in accordance with the ATC website, call for an analysis to be performed, which assumes a basic wind speed (3-second gust) of 98 miles-per-hour (mph) without ice in Hartford County. The tower is also designed for a 50 mph basic wind speed with 1.0-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 *modified* 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 |
|---|---|
| Legs | 84.2 |
| Diagonals | 92.9 |
| Bolts | 87.8 |
| RATING = | 92.9 |

## 4.2 BASE REACTIONS

The computed maximum factored reactions correlated to maximum moment are as follows:

| Load Type | Original Design | Original Design * 1.35 | Proposed Model |
|---|---|---|---|
| Total Axial (k) | -- | -- | 72.8 |
| Total Shear (k) | 63.8 | 86.1 | 85.7 |
| Total Moment (k-ft) | 6790.7 | 9167.5 | 8616.7 |
| Leg Uplift (k) | 292.0 | 394.2 | 362.6 |
| Leg Compression (k) | 379.0 | 511.7 | 421.6 |
| Leg Shear (k) | 42.7 | 57.6 | 51.8 |

The TIA-222-G code in Section 15.5.1 specifies to multiply original ASD reactions by 1.35 when comparing them with reactions determined using the TIA-222-G code. All proposed model foundation reactions were found to be less than the modified original design reactions. The foundation was also analyzed using the geotechnical report by Ramaker & Associates, job number 22997, dated February 19, 2013 and it was determined to provide adequate strength under proposed loading conditions.

## 4.3 MOUNTING STRUCTURE ASSESSMENT

The antenna and RRH mounting structure is capable of supporting the existing and proposed Sprint Network Vision equipment deployment without causing an overstress condition in the antenna and RRH mounting structure.

This assessment is inclusive of the entire antenna and RRH mounting structure, including tower platforms, arms, and all other aspects of the mounting structure that will support the Sprint Network Vision equipment deployment.

# 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

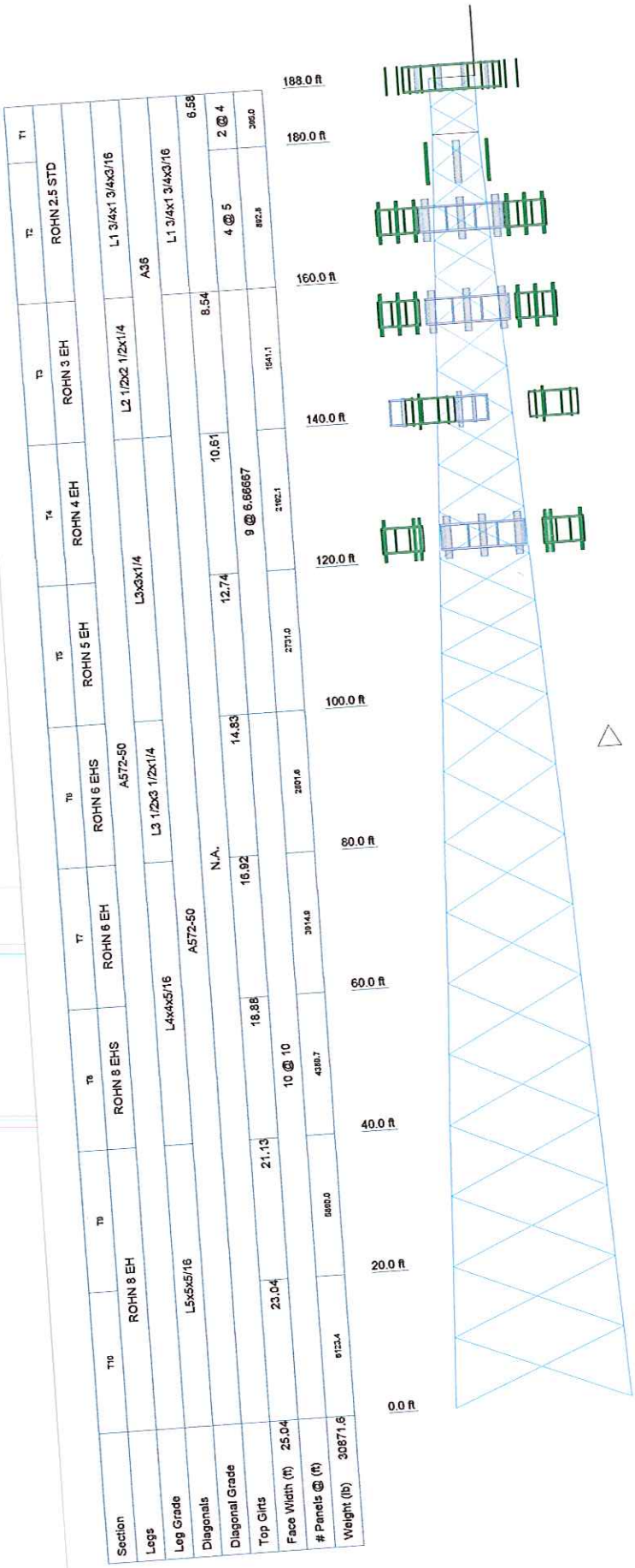
# REFERENCES

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




## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| 10' Omni | 188 | (2) DB844H90E-XY w/Mount Pipe | 141 |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | 188 | (2) DB844H90E-XY w/Mount Pipe | 141 |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | 188 | (2) DB844H90E-XY w/Mount Pipe | 141 |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | 188 | 4' x 1' Panel Antenna w/Mount Pipe | 141 |
| Rohn 14' Rotable Platform (Sprint) | 188 | 4' x 1' Panel Antenna w/Mount Pipe | 141 |
| 6' x 1' Panel Antenna w/Mount Pipe | 176 | 4' x 1' Panel Antenna w/Mount Pipe | 141 |
| 6' x 1' Panel Antenna w/Mount Pipe | 176 | 5' x 8" Panel Antenna w/Mount Pipe | 141 |
| 6' x 1' Panel Antenna w/Mount Pipe | 176 | 5' x 8" Panel Antenna w/Mount Pipe | 141 |
| (2) DUO1417-8686 w/Mount Pipe (ATT) | 168 | 5' x 8" Panel Antenna w/Mount Pipe | 141 |
| (2) DUO1417-8686 w/Mount Pipe (ATT) | 168 | Rohn 14' Boom Gate | 141 |
| (2) DUO1417-8686 w/Mount Pipe (ATT) | 168 | Rohn 14' Boom Gate | 141 |
| 7770.00 w/Mount Pipe (ATT) | 168 | Rohn 14' Boom Gate | 141 |
| 7770.00 w/Mount Pipe (ATT) | 168 | (2) DB980H90E-M w/Mount Pipe (Sprint) | 123 |
| 7770.00 w/Mount Pipe (ATT) | 168 | (2) DB980H90E-M w/Mount Pipe (Sprint) | 123 |
| LGP186nn (ATT) | 168 | (2) DB980H90E-M w/Mount Pipe (Sprint) | 123 |
| LGP186nn (ATT) | 168 | Rohn 12' Boom Gate (3) (Sprint) | 123 |
| LGP186nn (ATT) | 168 | APXV9ERR18-C w/Mount Pipe (Sprint) | 123 |
| Rohn 12' Boom Gate (3) (ATT) | 168 | APXVSPP18-C w/Mount Pipe (Sprint) | 123 |
| (2) 7250.03 w/Mount Pipe | 155 | APXV9ERR18-C w/Mount Pipe (Sprint) | 123 |
| (2) 7250.03 w/Mount Pipe | 155 | 1900MHz 4x40W RRH (Sprint) | 123 |
| (2) 7250.03 w/Mount Pipe | 155 | 1900MHz 4x40W RRH (Sprint) | 123 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | 155 | 1900MHz 4x40W RRH (Sprint) | 123 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | 155 | 800MHz 2x50W RRH (Sprint) | 123 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | 155 | 800MHz 2x50W RRH (Sprint) | 123 |
| Pirod 12' Knockdown T-Frames (3) | 155 | 800MHz 2x50W RRH (Sprint) | 123 |

## MATERIAL STRENGTH

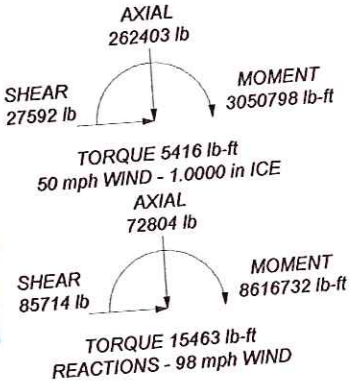
| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A572-50 | 50 ksi | 65 ksi | A36 | 36 ksi | 58 ksi |

## TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 98 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: 92.9%

*ALL REACTIONS ARE FACTORED*

*MAX. CORNER REACTIONS AT BASE:*
*DOWN: 421622 lb*
*UPLIFT: -362630 lb*
*SHEAR: 51777 lb*





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*Ramaker & Associates*
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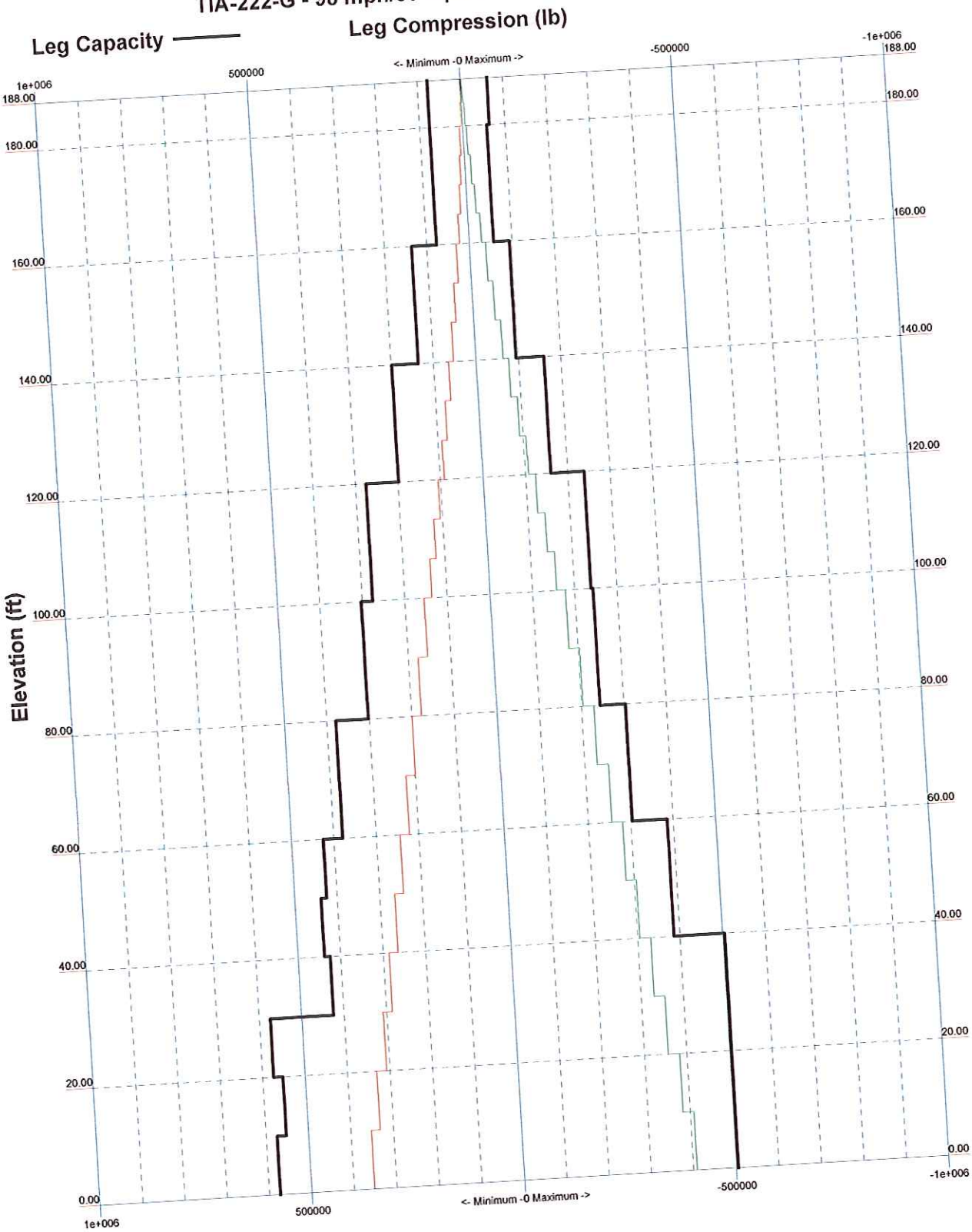
Phone: (608) 643-4100
FAX: (608) 643-7999


| | |
|---|---|
| Job: | Balch Tower (CT03XC |
| Project: | 22997 |
| Client: | Sprint |
| Drawn by: | A. Krau |
| Code: | TIA-222-G |
| Date: | 05/29/13 |
| Path: | I:\22900\22997\Structural\Risa\22997 rev4.e |

## TIA-222-G - 98 mph/50 mph 1.0000 in Ice Exposure C



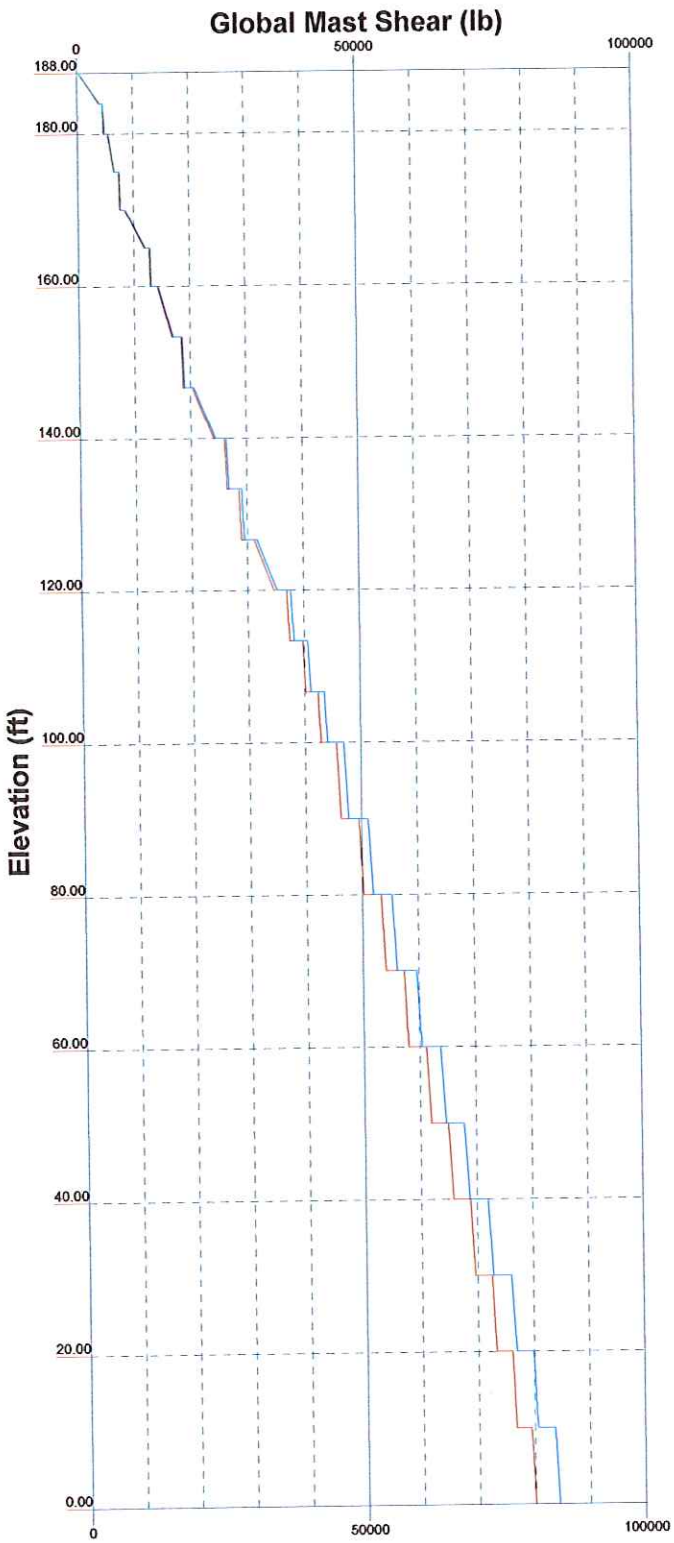

| | | | |
|---|---|---|---|
| Ramaker & Associates<br>1120 Dallas St.<br>Sauk City, WI 53583<br>Phone: (608) 643-4100<br>FAX: (608) 643-7999 | Job: Balch Tower (CT03XC09 | | |
| | Project: 22997 | | |
| | Client: Sprint | Drawn by: A. Kraus | A |
| | Code: TIA-222-G | Date: 05/29/13 | S |
| | Path: I:\22900\22997\Structural\Risa\22997 rev4 eri | | D |

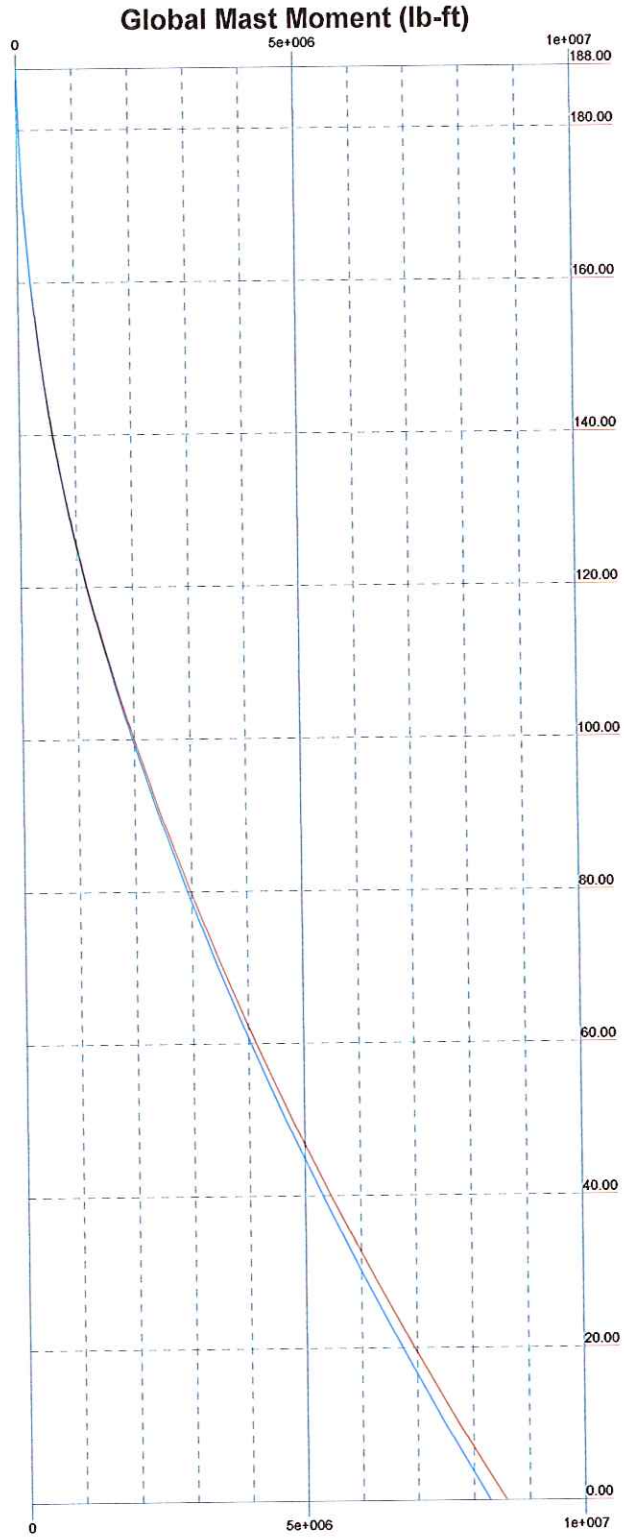
## TIA-222-G - 98 mph/50 mph 1.0000 in Ice Exposure C

Vx Vz

Maximum Values

Mx Mz




| | | | |
|---|---|---|---|
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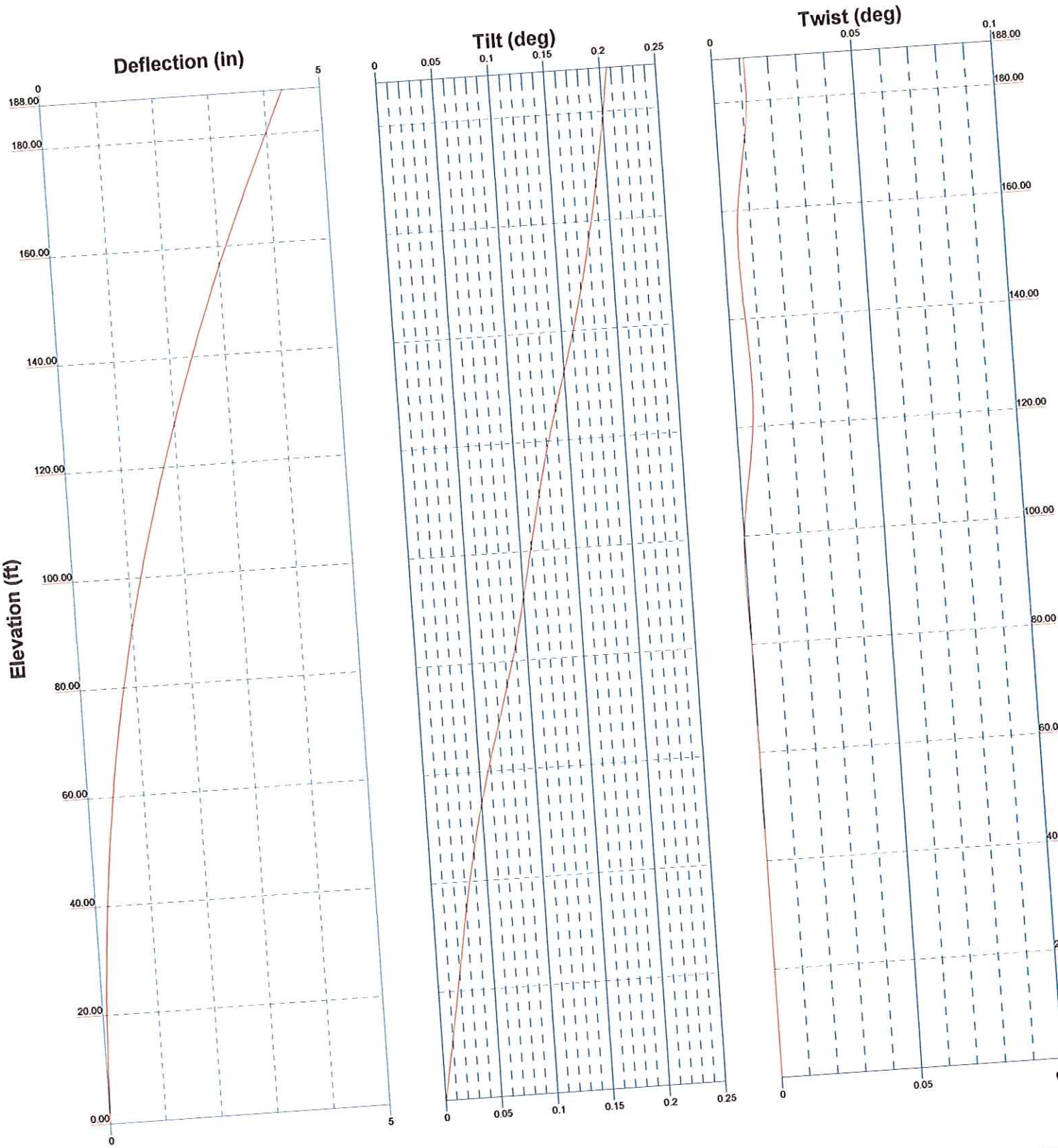
| | | Project: ***22997*** | |
| | | Client: Sprint | Drawn by: A. Kraus | App'd: |
| | | Code: TIA-222-G | Date: 05/29/13 | Scale: NTS |
| | | Path: I:\22900\22997\Structural\Risa\22997 rev4.eri | | Dwg No. E-4 |

Maximum Values

# TIA-222-G - Service - 60 mph





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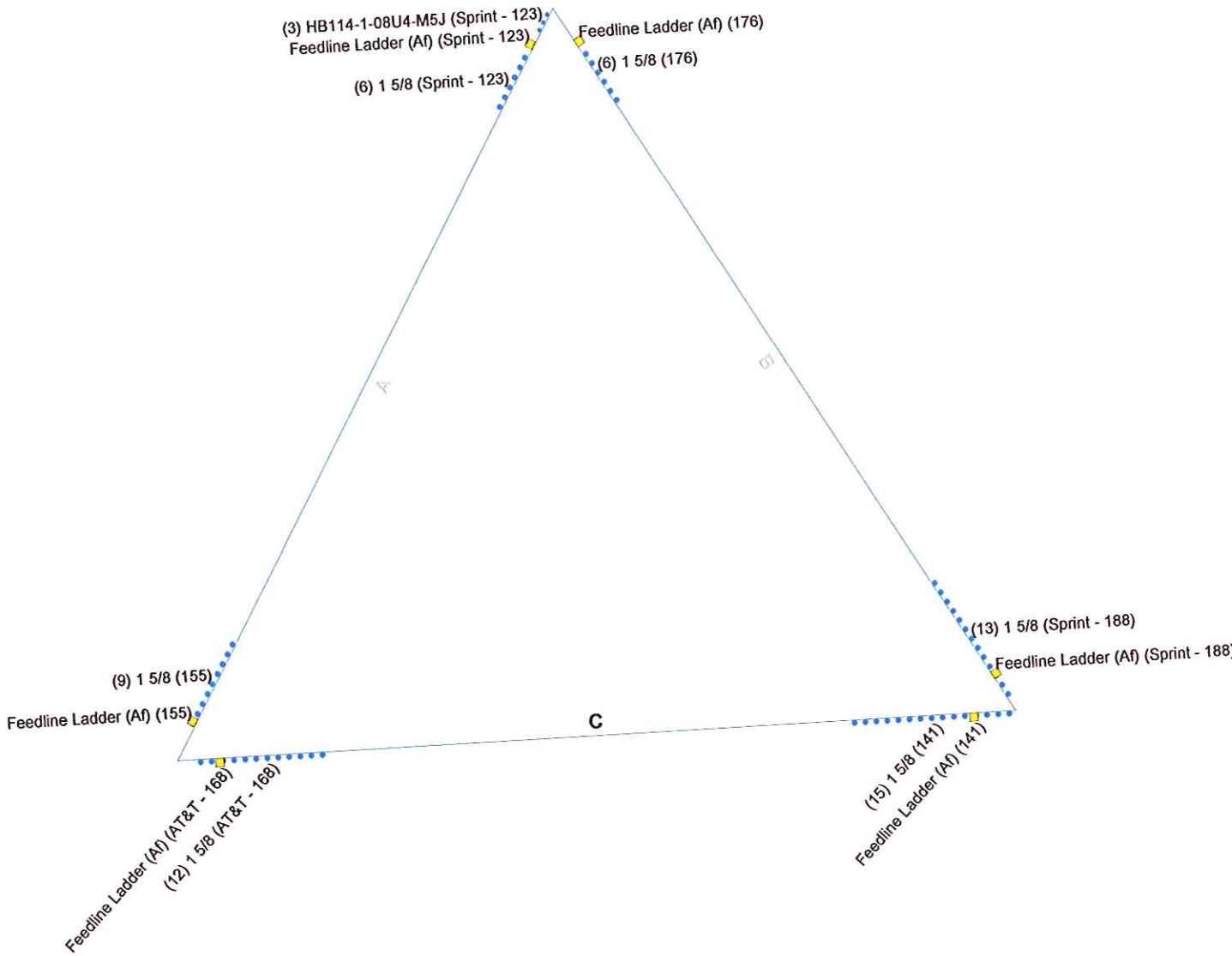
| | |
|---|---|
| Job: Balch Tower (CT03XC | |
| Project: 22997 | |
| Client: Sprint | Drawn by: A. Kraus |
| Code: TIA-222-G | Date: 05/29/13 |
| Path: \\22900\22997\Structural\Risa\22997 rev4 en | |

# Feedline Plan

Round — Flat — App In Face — App Out Face





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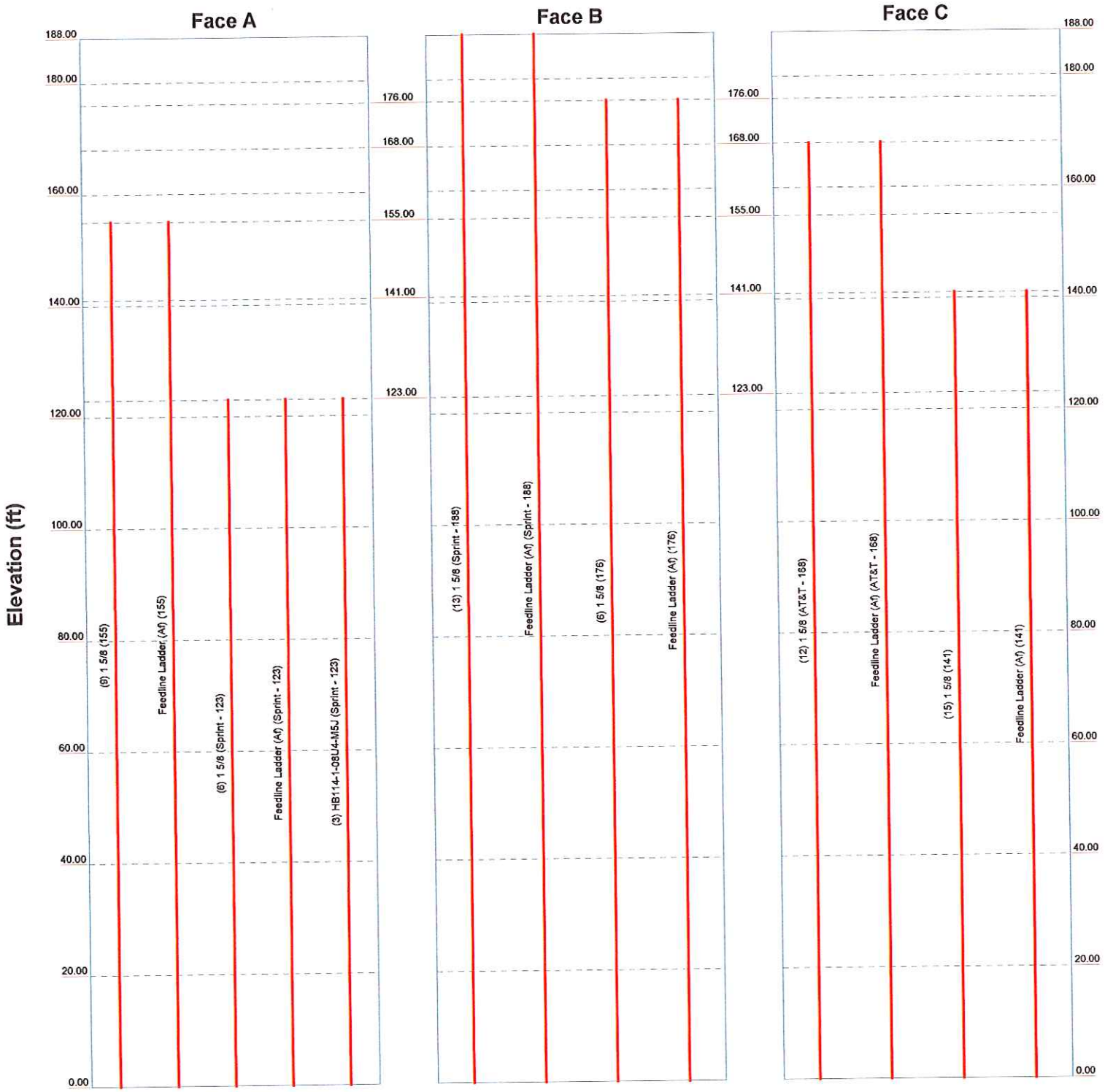
| | | | |
|---|---|---|---|
| Job: | Balch Tower (CT03XC09 | | |
| Project: | 22997 | | |
| Client: | Sprint | Drawn by: | A. Kraus |
| Code: | TIA-222-G | Date: | 05/29/13 |
| Path: | I:\22900\22997\Structural\Risa\22997 rev4.en | | |

# Feedline Distribution Chart
## 0' - 188'

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




| | | | |
|---|---|---|---|
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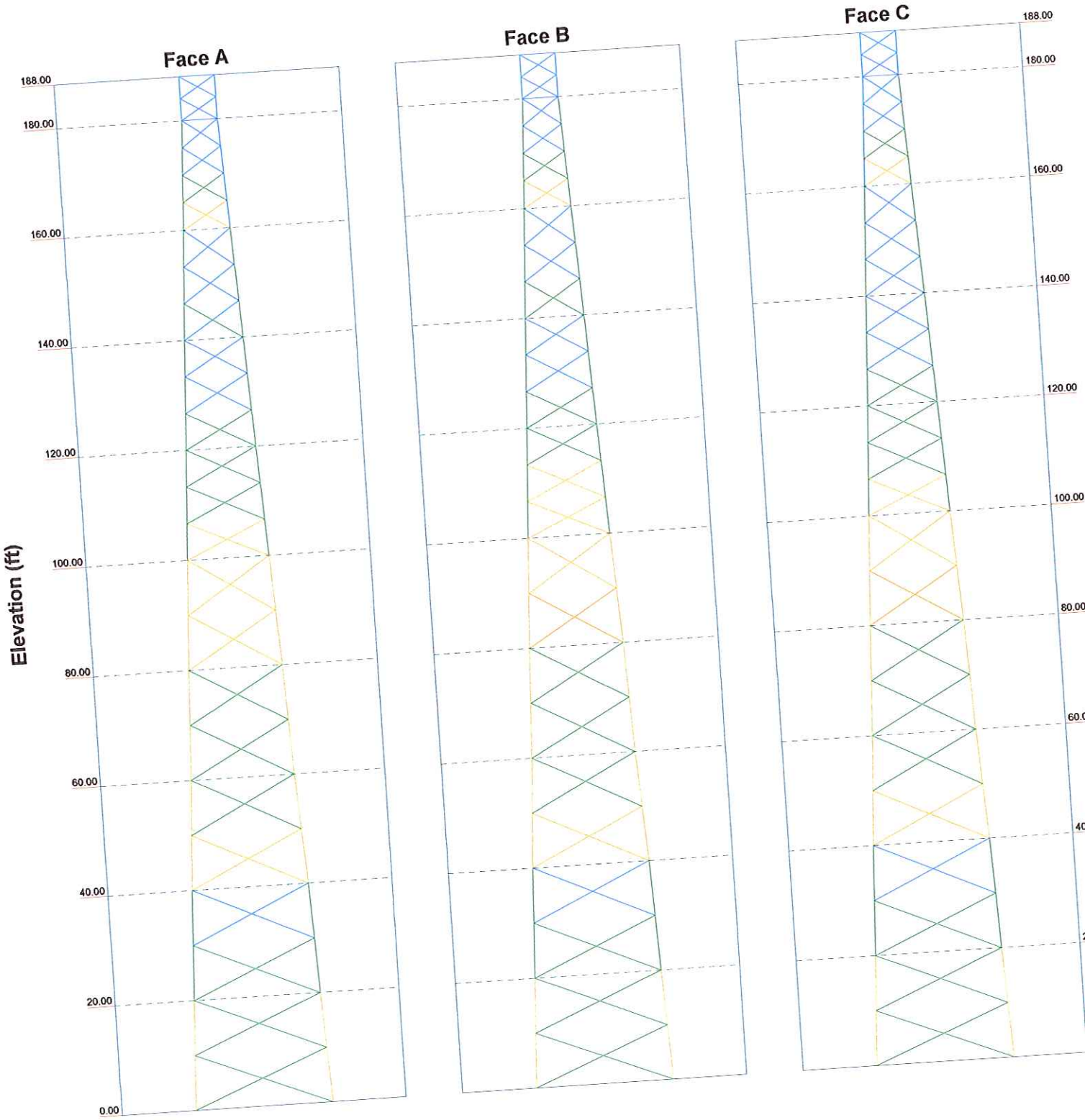
| | | Project: **22997** | |
| | | Client: Sprint | Drawn by: A. Kraus | App'd: |
| | | Code: TIA-222-G | Date: 05/29/13 | Scale: NTS |
| | | Path: I:\22900\22997\Structural\Risa\22997 rev4.eri | | Dwg No. E-7 |

## Stress Distribution Chart
## 0' - 188'

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





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| | |
|---|---|
| Job: | Balch Tower (CT03XC0 |
| Project: | 22997 |
| Client: | Sprint |
| Drawn by: | A. Kraus |
| Code: | TIA-222-G |
| Date: | 05/29/13 |
| Path: | I:\22900\22997\Structural\Risa\22997 rev4.eri |

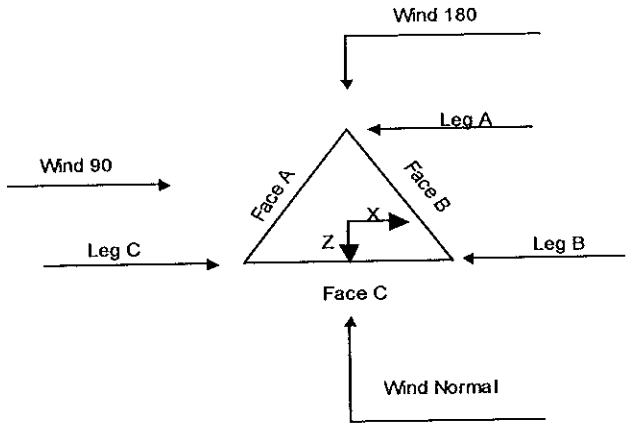
# APPENDIX B

# TOWER CALCULATIONS

# Tower Input Data

The main tower is a 3x free standing tower with an overall height of 188.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.58 ft at the top and 25.04 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

- Tower is located in Hartford County, Connecticut.
- Basic wind speed of 98 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.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.




*Triangular Tower*

## Tower Section Geometry

| Tower Section | Tower Elevation ft | Assembly Database | Description | Section Width ft | Number of Sections | Section Length ft |
|---|---|---|---|---|---|---|
| T1 | 188.00-180.00 | | | 6.58 | 1 | 8.00 |
| T2 | 180.00-160.00 | | | 6.58 | 1 | 20.00 |
| T3 | 160.00-140.00 | | | 8.54 | 1 | 20.00 |
| T4 | 140.00-120.00 | | | 10.61 | 1 | 20.00 |
| T5 | 120.00-100.00 | | | 12.74 | 1 | 20.00 |
| T6 | 100.00-80.00 | | | 14.83 | 1 | 20.00 |
| T7 | 80.00-60.00 | | | 16.92 | 1 | 20.00 |
| T8 | 60.00-40.00 | | | 18.88 | 1 | 20.00 |
| T9 | 40.00-20.00 | | | 21.13 | 1 | 20.00 |
| T10 | 20.00-0.00 | | | 23.04 | 1 | 20.00 |

## 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 | 188.00-180.00 | 4.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T2 | 180.00-160.00 | 5.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T3 | 160.00-140.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |
| T4 | 140.00-120.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |
| T5 | 120.00-100.00 | 6.67 | X Brace | No | No | 0.0000 | 0.0000 |
| T6 | 100.00-80.00 | 10.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T7 | 80.00-60.00 | 10.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T8 | 60.00-40.00 | 10.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T9 | 40.00-20.00 | 10.00 | X Brace | No | No | 0.0000 | 0.0000 |
| T10 | 20.00-0.00 | 10.00 | X Brace | No | No | 0.0000 | 0.0000 |

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

| Tower Elevation ft | Leg Type | Leg Size | Leg Grade | Diagonal Type | Diagonal Size | Diagonal Grade |
|---|---|---|---|---|---|---|
| T1 188.00-180.00 | Pipe | ROHN 2.5 STD | A572-50 (50 ksi) | Equal Angle | L1 3/4x1 3/4x3/16 | A36 (36 ksi) |
| T2 180.00-160.00 | Pipe | ROHN 2.5 STD | A572-50 (50 ksi) | Equal Angle | L1 3/4x1 3/4x3/16 | A36 (36 ksi) |
| T3 160.00-140.00 | Pipe | ROHN 3 EH | A572-50 (50 ksi) | Equal Angle | L2 1/2x2 1/2x1/4 | A36 (36 ksi) |
| T4 140.00-120.00 | Pipe | ROHN 4 EH | A572-50 (50 ksi) | Equal Angle | L3x3x1/4 | A572-50 (50 ksi) |
| T5 120.00-100.00 | Pipe | ROHN 5 EH | A572-50 (50 ksi) | Equal Angle | L3x3x1/4 | A572-50 (50 ksi) |
| T6 100.00-80.00 | Pipe | ROHN 6 EHS | A572-50 (50 ksi) | Equal Angle | L3 1/2x3 1/2x1/4 | A572-50 (50 ksi) |
| T7 80.00-60.00 | Pipe | ROHN 6 EH | A572-50 (50 ksi) | Equal Angle | L4x4x5/16 | A572-50 (50 ksi) |

| Tower Elevation ft | Leg Type | Leg Size | Leg Grade | Diagonal Type | Diagonal Size | Diagonal Grade |
|---|---|---|---|---|---|---|
| T8 60.00-40.00 | Pipe | ROHN 8 EHS | A572-50 (50 ksi) | Equal Angle | L4x4x5/16 | A572-50 (50 ksi) |
| T9 40.00-20.00 | Pipe | ROHN 8 EH | A572-50 (50 ksi) | Equal Angle | L5x5x5/16 | A572-50 (50 ksi) |
| T10 20.00-0.00 | Pipe | ROHN 8 EH | A572-50 (50 ksi) | Equal Angle | L5x5x5/16 | A572-50 (50 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 188.00-180.00 | Equal Angle | L1 3/4x1 3/4x3/16 | A36 (36 ksi) | Solid Round | | A36 (36 ksi) |
| T2 180.00-160.00 | Equal Angle | L1 3/4x1 3/4x3/16 | A36 (36 ksi) | Solid Round | | A36 (36 ksi) |

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

| Tower Elevation ft | Gusset Area (per face) $ft^2$ | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in |
|---|---|---|---|---|---|---|---|---|
| T1 188.00-180.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T2 180.00-160.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T3 160.00-140.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T4 140.00-120.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T5 120.00-100.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T6 100.00-80.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T7 80.00-60.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T8 60.00-40.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T9 40.00-20.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |
| T10 20.00-0.00 | 0.00 | 0.0000 | A36 (36 ksi) | 1 | 1 | 1.05 | 36.0000 | 36.0000 |

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

| K Factors[1] |
|---|

| Tower Elevation ft | Calc K Single Angles | Calc K Solid Rounds | Legs | X Brace Diags X Y | K Brace Diags X Y | Single Diags X Y | Girts X Y | Horiz. X Y | Sec. Horiz. X Y | Inner Brace X Y |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 188.00-180.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T2 180.00-160.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T3 160.00-140.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T4 140.00-120.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T5 120.00-100.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T6 100.00-80.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T7 80.00-60.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T8 60.00-40.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T9 40.00-20.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 |
| T10 20.00-0.00 | Yes | Yes | 1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>1 | 1<br>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 | | 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 |
| T1 188.00-180.00 | 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 180.00-160.00 | 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 160.00-140.00 | 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 |
| T4 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 |
| T5 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 |
| T6 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 |
| T7 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 |
| T8 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 |
| T9 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 |
| T10 20.00-0.00 | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 0.75 |

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

| Tower Elevation ft | Leg Connection Type | Leg Bolt Size in | Leg No. | Diagonal Bolt Size in | Diagonal No. | Top Girt Bolt Size in | Top Girt No. | Bottom Girt Bolt Size in | Bottom Girt No. | Mid Girt Bolt Size in | Mid Girt No. | Long Horizontal Bolt Size in | Long Horizontal No. | Short Horizontal Bolt Size in | Short Horizontal No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 188.00-180.00 | Flange | 0.6250 A325N | 4 | 0.6250 A325N | 1 | 0.6250 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T2 180.00-160.00 | Flange | 0.7500 A325N | 4 | 0.6250 A325N | 1 | 0.6250 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T3 160.00-140.00 | Flange | 0.8750 A325N | 4 | 0.6250 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T4 140.00-120.00 | Flange | 1.0000 A325N | 4 | 0.6250 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T5 120.00-100.00 | Flange | 1.0000 A325N | 6 | 0.7500 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T6 100.00-80.00 | Flange | 1.0000 A325N | 6 | 0.7500 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T7 80.00-60.00 | Flange | 1.0000 A325N | 8 | 0.7500 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T8 60.00-40.00 | Flange | 1.0000 A325N | 8 | 0.7500 A325N | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T9 40.00-20.00 | Flange | 1.0000 A325N | 8 | 0.7500 A325X | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |
| T10 20.00-0.00 | Flange | 1.0000 A354-BC | 10 | 0.7500 A325X | 1 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 | 0.6250 A325N | 0 |

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

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Perimeter in | Weight plf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 5/8 (Sprint - 188) | B | No | Ar (CaAa) | 188.00 - 0.00 | 0.0000 | 0.4 | 13 | 13 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) (Sprint - 188) | B | No | Af (CaAa) | 188.00 - 0.00 | 0.0000 | 0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |
| ********** | | | | | | | | | | | | |
| 1 5/8 (176) | B | No | Ar (CaAa) | 176.00 - 0.00 | 0.0000 | -0.4 | 6 | 6 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) (176) | B | No | Af (CaAa) | 176.00 - 0.00 | 0.0000 | -0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |
| ********** | | | | | | | | | | | | |
| 1 5/8 (AT&T - 168) | C | No | Ar (CaAa) | 168.00 - 0.00 | 0.0000 | 0.4 | 12 | 12 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) (AT&T - 168) | C | No | Af (CaAa) | 168.00 - 0.00 | 0.0000 | 0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |
| ********** | | | | | | | | | | | | |
| 1 5/8 (155) | A | No | Ar (CaAa) | 155.00 - 0.00 | 0.0000 | -0.4 | 9 | 9 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) (155) | A | No | Af (CaAa) | 155.00 - 0.00 | 0.0000 | -0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |
| ********** | | | | | | | | | | | | |
| 1 5/8 (141) | C | No | Ar (CaAa) | 141.00 - 0.00 | 0.0000 | -0.4 | 15 | 15 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) | C | No | Af (CaAa) | 141.00 - 0.00 | 0.0000 | -0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (141) ********** 1 5/8 (Sprint - 123) | A | No | Ar (CaAa) | 123.00 - 0.00 | 0.0000 | 0.4 | 6 | 6 | 1.9800 | 1.9800 | | 1.04 |
| Feedline Ladder (Af) (Sprint - 123) | A | No | Af (CaAa) | 123.00 - 0.00 | 0.0000 | 0.45 | 1 | 1 | 3.0000 | 3.0000 | | 8.40 |
| HB114-1-08U4-M5J (Sprint - 123) | A | No | Ar (CaAa) | 123.00 - 0.00 | 0.0000 | 0.48 | 3 | 3 | 1.5400 | 1.5400 | | 1.08 |

## 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 | 188.00-180.00 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 24.592 | 0.000 | 175.36 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T2 | 180.00-160.00 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 88.488 | 0.000 | 672.64 |
| | | C | 0.000 | 0.000 | 23.008 | 0.000 | 167.04 |
| T3 | 160.00-140.00 | A | 0.000 | 0.000 | 34.230 | 0.000 | 266.40 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 60.990 | 0.000 | 441.60 |
| T4 | 140.00-120.00 | A | 0.000 | 0.000 | 52.090 | 0.000 | 408.84 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T5 | 120.00-100.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T6 | 100.00-80.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T7 | 80.00-60.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T8 | 60.00-40.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T9 | 40.00-20.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |
| T10 | 20.00-0.00 | A | 0.000 | 0.000 | 88.640 | 0.000 | 712.80 |
| | | B | 0.000 | 0.000 | 95.240 | 0.000 | 731.20 |
| | | C | 0.000 | 0.000 | 126.920 | 0.000 | 897.60 |

## 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 | 188.00-180.00 | A | 2.375 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 62.466 | 0.000 | 1311.55 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

| 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 |
|---|---|---|---|---|---|---|---|---|
| T2 | 180.00-160.00 | A | 2.356 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 226.175 | 0.000 | 4727.01 |
| | | C | | 0.000 | 0.000 | 58.466 | 0.000 | 1221.85 |
| T3 | 160.00-140.00 | A | 2.327 | 0.000 | 0.000 | 87.388 | 0.000 | 1814.77 |
| | | B | | 0.000 | 0.000 | 243.147 | 0.000 | 5040.57 |
| | | C | | 0.000 | 0.000 | 154.653 | 0.000 | 3204.56 |
| T4 | 140.00-120.00 | A | 2.294 | 0.000 | 0.000 | 134.410 | 0.000 | 2741.09 |
| | | B | | 0.000 | 0.000 | 242.497 | 0.000 | 4980.11 |
| | | C | | 0.000 | 0.000 | 320.628 | 0.000 | 6573.23 |
| T5 | 120.00-100.00 | A | 2.256 | 0.000 | 0.000 | 236.623 | 0.000 | 4658.73 |
| | | B | | 0.000 | 0.000 | 241.752 | 0.000 | 4910.92 |
| | | C | | 0.000 | 0.000 | 319.902 | 0.000 | 6485.30 |
| T6 | 100.00-80.00 | A | 2.211 | 0.000 | 0.000 | 235.435 | 0.000 | 4577.69 |
| | | B | | 0.000 | 0.000 | 240.873 | 0.000 | 4829.71 |
| | | C | | 0.000 | 0.000 | 319.047 | 0.000 | 6382.01 |
| T7 | 80.00-60.00 | A | 2.156 | 0.000 | 0.000 | 233.982 | 0.000 | 4479.19 |
| | | B | | 0.000 | 0.000 | 239.798 | 0.000 | 4730.87 |
| | | C | | 0.000 | 0.000 | 318.000 | 0.000 | 6256.12 |
| T8 | 60.00-40.00 | A | 2.085 | 0.000 | 0.000 | 232.095 | 0.000 | 4352.32 |
| | | B | | 0.000 | 0.000 | 238.402 | 0.000 | 4603.33 |
| | | C | | 0.000 | 0.000 | 316.640 | 0.000 | 6093.43 |
| T9 | 40.00-20.00 | A | 1.981 | 0.000 | 0.000 | 229.354 | 0.000 | 4170.10 |
| | | B | | 0.000 | 0.000 | 236.374 | 0.000 | 4419.69 |
| | | C | | 0.000 | 0.000 | 314.664 | 0.000 | 5858.63 |
| T10 | 20.00-0.00 | A | 1.775 | 0.000 | 0.000 | 223.931 | 0.000 | 3816.79 |
| | | B | | 0.000 | 0.000 | 232.359 | 0.000 | 4062.02 |
| | | C | | 0.000 | 0.000 | 310.750 | 0.000 | 5399.39 |

## Feed Line Center of Pressure

| Section | Elevation ft | $CP_X$ in | $CP_Z$ in | $CP_X$ Ice in | $CP_Z$ Ice in |
|---|---|---|---|---|---|
| T1 | 188.00-180.00 | 6.2903 | 2.7320 | 5.4519 | 2.3959 |
| T2 | 180.00-160.00 | 3.2810 | 0.9573 | 3.0345 | 0.9132 |
| T3 | 160.00-140.00 | -1.0451 | 2.7021 | -1.0236 | 2.6536 |
| T4 | 140.00-120.00 | 1.4743 | 4.2981 | 1.4700 | 4.3063 |
| T5 | 120.00-100.00 | 1.3525 | 2.3078 | 1.3670 | 2.5235 |
| T6 | 100.00-80.00 | 1.5435 | 2.6314 | 1.5879 | 2.9291 |
| T7 | 80.00-60.00 | 1.7085 | 2.9107 | 1.7791 | 3.2801 |
| T8 | 60.00-40.00 | 1.8527 | 3.1546 | 1.9693 | 3.6292 |
| T9 | 40.00-20.00 | 1.9786 | 3.3674 | 2.1566 | 3.9731 |
| T10 | 20.00-0.00 | 2.1330 | 3.6289 | 2.3769 | 4.3777 |

## Shielding Factor Ka

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|
| T1 | 1 | 1 5/8 | 180.00 - 188.00 | 0.6000 | 0.4859 |
| T1 | 2 | Feedline Ladder (Af) | 180.00 - 188.00 | 0.6000 | 0.4859 |
| T2 | 1 | 1 5/8 | 160.00 - 180.00 | 0.6000 | 0.5937 |

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|
| T2 | 2 | Feedline Ladder (Af) | 160.00 - 180.00 | 0.6000 | 0.5937 |
| T2 | 4 | 1 5/8 | 160.00 - 176.00 | 0.6000 | 0.5937 |
| T2 | 5 | Feedline Ladder (Af) | 160.00 - 176.00 | 0.6000 | 0.5937 |
| T2 | 7 | 1 5/8 | 160.00 - 168.00 | 0.6000 | 0.5937 |
| T2 | 8 | Feedline Ladder (Af) | 160.00 - 168.00 | 0.6000 | 0.5937 |
| T3 | 1 | 1 5/8 | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 2 | Feedline Ladder (Af) | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 4 | 1 5/8 | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 5 | Feedline Ladder (Af) | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 7 | 1 5/8 | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 8 | Feedline Ladder (Af) | 140.00 - 160.00 | 0.6000 | 0.6000 |
| T3 | 10 | 1 5/8 | 140.00 - 155.00 | 0.6000 | 0.6000 |
| T3 | 11 | Feedline Ladder (Af) | 140.00 - 155.00 | 0.6000 | 0.6000 |
| T3 | 13 | 1 5/8 | 140.00 - 141.00 | 0.6000 | 0.6000 |
| T3 | 14 | Feedline Ladder (Af) | 140.00 - 141.00 | 0.6000 | 0.6000 |
| T4 | 1 | 1 5/8 | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 2 | Feedline Ladder (Af) | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 4 | 1 5/8 | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 5 | Feedline Ladder (Af) | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 7 | 1 5/8 | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 8 | Feedline Ladder (Af) | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 10 | 1 5/8 | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 11 | Feedline Ladder (Af) | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 13 | 1 5/8 | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 14 | Feedline Ladder (Af) | 120.00 - 140.00 | 0.6000 | 0.6000 |
| T4 | 16 | 1 5/8 | 120.00 - 123.00 | 0.6000 | 0.6000 |
| T4 | 17 | Feedline Ladder (Af) | 120.00 - 123.00 | 0.6000 | 0.6000 |
| T4 | 18 | HB114-1-08U4-M5J | 120.00 - 123.00 | 0.6000 | 0.6000 |
| T5 | 1 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 2 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 4 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 5 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 7 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 8 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 10 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 11 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 13 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 14 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 16 | 1 5/8 | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 17 | Feedline Ladder (Af) | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T5 | 18 | HB114-1-08U4-M5J | 100.00 - 120.00 | 0.6000 | 0.6000 |
| T6 | 1 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 2 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 4 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 5 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 7 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 8 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 10 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 11 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 13 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 14 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 16 | 1 5/8 | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 17 | Feedline Ladder (Af) | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T6 | 18 | HB114-1-08U4-M5J | 80.00 - 100.00 | 0.6000 | 0.6000 |
| T7 | 1 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 2 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 4 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 5 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 7 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 8 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 10 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 11 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|
| T7 | 13 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 14 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 16 | 1 5/8 | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 17 | Feedline Ladder (Af) | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T7 | 18 | HB114-1-08U4-M5J | 60.00 - 80.00 | 0.6000 | 0.6000 |
| T8 | 1 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 2 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 4 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 5 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 7 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 8 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 10 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 11 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 13 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 14 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 16 | 1 5/8 | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 17 | Feedline Ladder (Af) | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T8 | 18 | HB114-1-08U4-M5J | 40.00 - 60.00 | 0.6000 | 0.6000 |
| T9 | 1 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 2 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 4 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 5 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 7 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 8 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 10 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 11 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 13 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 14 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 16 | 1 5/8 | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 17 | Feedline Ladder (Af) | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T9 | 18 | HB114-1-08U4-M5J | 20.00 - 40.00 | 0.6000 | 0.6000 |
| T10 | 1 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 2 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 4 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 5 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 7 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 8 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 10 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 11 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 13 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 14 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 16 | 1 5/8 | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 17 | Feedline Ladder (Af) | 0.00 - 20.00 | 0.6000 | 0.6000 |
| T10 | 18 | HB114-1-08U4-M5J | 0.00 - 20.00 | 0.6000 | 0.6000 |

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral Vert<br>ft ft ft | Azimuth Adjustment<br>° | Placement<br>ft | | $C_AA_A$ Front<br>$ft^2$ | $C_AA_A$ Side<br>$ft^2$ | Weight<br>lb |
|---|---|---|---|---|---|---|---|---|---|
| 10' Omni | B | From Leg | 0.00 | 0.0000 | 188.00 | No Ice | 2.50 | 2.50 | 30.00 |

| 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 | | | 1/2" Ice | 3.53 | 3.53 | 48.64 |
| | | | 5.00 | | | 1" Ice | 4.58 | 4.58 | 73.79 |
| ********** | | | | | | | | | |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | A | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 188.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.58<br>4.20<br>4.73 | 5.40<br>6.49<br>7.30 | 35.55<br>76.59<br>127.74 |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | B | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 188.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.58<br>4.20<br>4.73 | 5.40<br>6.49<br>7.30 | 35.55<br>76.59<br>127.74 |
| (4) DB844H90E-XY w/Mount Pipe (Sprint) | C | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 188.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.58<br>4.20<br>4.73 | 5.40<br>6.49<br>7.30 | 35.55<br>76.59<br>127.74 |
| Rohn 14' Rotable Platform (Sprint) | C | None | | 0.0000 | 188.00 | No Ice<br>1/2" Ice<br>1" Ice | 41.00<br>56.00<br>71.00 | 41.00<br>56.00<br>71.00 | 2500.00<br>3000.00<br>3500.00 |
| ********** | | | | | | | | | |
| 6' x 1' Panel Antenna w/Mount Pipe | A | From Leg | 1.00<br>0.00<br>0.00 | 0.0000 | 176.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.40<br>8.95<br>9.51 | 6.13<br>7.07<br>7.90 | 61.90<br>122.64<br>194.54 |
| 6' x 1' Panel Antenna w/Mount Pipe | B | From Leg | 1.00<br>0.00<br>0.00 | 0.0000 | 176.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.40<br>8.95<br>9.51 | 6.13<br>7.07<br>7.90 | 61.90<br>122.64<br>194.54 |
| 6' x 1' Panel Antenna w/Mount Pipe | C | From Leg | 1.00<br>0.00<br>0.00 | 0.0000 | 176.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.40<br>8.95<br>9.51 | 6.13<br>7.07<br>7.90 | 61.90<br>122.64<br>194.54 |
| ********** | | | | | | | | | |
| (2) DUO1417-8686 w/Mount Pipe (AT&T) | A | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 7.25<br>7.96<br>8.57 | 5.86<br>6.96<br>7.78 | 45.85<br>103.71<br>172.26 |
| (2) DUO1417-8686 w/Mount Pipe (AT&T) | B | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 7.25<br>7.96<br>8.57 | 5.86<br>6.96<br>7.78 | 45.85<br>103.71<br>172.26 |
| (2) DUO1417-8686 w/Mount Pipe (AT&T) | C | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 7.25<br>7.96<br>8.57 | 5.86<br>6.96<br>7.78 | 45.85<br>103.71<br>172.26 |
| 7770.00 w/Mount Pipe (AT&T) | A | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 6.98<br>7.87<br>8.77 | 5.06<br>6.33<br>7.63 | 59.85<br>112.68<br>177.76 |
| 7770.00 w/Mount Pipe (AT&T) | B | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 6.98<br>7.87<br>8.77 | 5.06<br>6.33<br>7.63 | 59.85<br>112.68<br>177.76 |
| 7770.00 w/Mount Pipe (AT&T) | C | From Leg | 4.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 6.98<br>7.87<br>8.77 | 5.06<br>6.33<br>7.63 | 59.85<br>112.68<br>177.76 |
| LGP186nn (AT&T) | A | From Leg | 2.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 0.70<br>0.81<br>0.94 | 0.28<br>0.37<br>0.47 | 9.90<br>14.43<br>20.46 |
| LGP186nn (AT&T) | B | From Leg | 2.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 0.70<br>0.81<br>0.94 | 0.28<br>0.37<br>0.47 | 9.90<br>14.43<br>20.46 |
| LGP186nn (AT&T) | C | From Leg | 2.00<br>-4.00<br>0.00 | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 0.70<br>0.81<br>0.94 | 0.28<br>0.37<br>0.47 | 9.90<br>14.43<br>20.46 |
| Rohn 12' Boom Gate (3) (AT&T) | C | None | | 0.0000 | 168.00 | No Ice<br>1/2" Ice<br>1" Ice | 33.02<br>47.36<br>61.70 | 33.02<br>47.36<br>61.70 | 1670.00<br>2220.00<br>2770.00 |
| ********** | | | | | | | | | |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft | Vert ft | Vert ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (2) 7250.03 w/Mount Pipe | A | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 4.45 | 3.54 | 40.95 |
| | | | | | | | | 1/2" Ice | 5.03 | 4.72 | 76.25 |
| | | | | | | | | 1" Ice | 5.55 | 5.53 | 122.16 |
| (2) 7250.03 w/Mount Pipe | B | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 4.45 | 3.54 | 40.95 |
| | | | | | | | | 1/2" Ice | 5.03 | 4.72 | 76.25 |
| | | | | | | | | 1" Ice | 5.55 | 5.53 | 122.16 |
| (2) 7250.03 w/Mount Pipe | C | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 4.45 | 3.54 | 40.95 |
| | | | | | | | | 1/2" Ice | 5.03 | 4.72 | 76.25 |
| | | | | | | | | 1" Ice | 5.55 | 5.53 | 122.16 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | A | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 10.74 | 4.69 | 56.90 |
| | | | | | | | | 1/2" Ice | 11.33 | 5.56 | 120.72 |
| | | | | | | | | 1" Ice | 11.91 | 6.31 | 195.24 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | B | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 10.74 | 4.69 | 56.90 |
| | | | | | | | | 1/2" Ice | 11.33 | 5.56 | 120.72 |
| | | | | | | | | 1" Ice | 11.91 | 6.31 | 195.24 |
| 5' x 1.5' Panel Antenna w/Mount Pipe | C | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 10.74 | 4.69 | 56.90 |
| | | | | | | | | 1/2" Ice | 11.33 | 5.56 | 120.72 |
| | | | | | | | | 1" Ice | 11.91 | 6.31 | 195.24 |
| Pirod 12' Knockdown T-Frames (3) | A | From Leg | 4.00 | 4.00 | 0.00 | 0.0000 | 155.00 | No Ice | 18.91 | 18.91 | 850.00 |
| | | | | | | | | 1/2" Ice | 26.78 | 26.78 | 1260.00 |
| | | | | | | | | 1" Ice | 34.65 | 34.65 | 1620.00 |
| ********** | | | | | | | | | | | |
| (2) DB844H90E-XY w/Mount Pipe | A | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 3.58 | 5.40 | 35.55 |
| | | | | | | | | 1/2" Ice | 4.20 | 6.49 | 76.59 |
| | | | | | | | | 1" Ice | 4.73 | 7.30 | 127.74 |
| (2) DB844H90E-XY w/Mount Pipe | B | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 3.58 | 5.40 | 35.55 |
| | | | | | | | | 1/2" Ice | 4.20 | 6.49 | 76.59 |
| | | | | | | | | 1" Ice | 4.73 | 7.30 | 127.74 |
| (2) DB844H90E-XY w/Mount Pipe | C | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 3.58 | 5.40 | 35.55 |
| | | | | | | | | 1/2" Ice | 4.20 | 6.49 | 76.59 |
| | | | | | | | | 1" Ice | 4.73 | 7.30 | 127.74 |
| 4' x 1' Panel Antenna w/Mount Pipe | A | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 5.84 | 4.05 | 53.25 |
| | | | | | | | | 1/2" Ice | 6.29 | 4.67 | 97.01 |
| | | | | | | | | 1" Ice | 6.76 | 5.32 | 149.59 |
| 4' x 1' Panel Antenna w/Mount Pipe | B | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 5.84 | 4.05 | 53.25 |
| | | | | | | | | 1/2" Ice | 6.29 | 4.67 | 97.01 |
| | | | | | | | | 1" Ice | 6.76 | 5.32 | 149.59 |
| 4' x 1' Panel Antenna w/Mount Pipe | C | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 5.84 | 4.05 | 53.25 |
| | | | | | | | | 1/2" Ice | 6.29 | 4.67 | 97.01 |
| | | | | | | | | 1" Ice | 6.76 | 5.32 | 149.59 |
| 5' x 8" Panel Antenna w/Mount Pipe | A | From Leg | 4.00 | -2.00 | 0.00 | 0.0000 | 141.00 | No Ice | 4.72 | 3.97 | 48.25 |
| | | | | | | | | 1/2" Ice | 5.11 | 4.64 | 86.24 |
| | | | | | | | | 1" Ice | 5.57 | 5.33 | 133.44 |
| 5' x 8" Panel Antenna w/Mount Pipe | B | From Leg | 4.00 | -2.00 | 0.00 | 0.0000 | 141.00 | No Ice | 4.72 | 3.97 | 48.25 |
| | | | | | | | | 1/2" Ice | 5.11 | 4.64 | 86.24 |
| | | | | | | | | 1" Ice | 5.57 | 5.33 | 133.44 |
| 5' x 8" Panel Antenna w/Mount Pipe | C | From Leg | 4.00 | -2.00 | 0.00 | 0.0000 | 141.00 | No Ice | 4.72 | 3.97 | 48.25 |
| | | | | | | | | 1/2" Ice | 5.11 | 4.64 | 86.24 |
| | | | | | | | | 1" Ice | 5.57 | 5.33 | 133.44 |
| Rohn 14' Boom Gate | A | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 16.44 | 14.00 | 569.00 |
| | | | | | | | | 1/2" Ice | 22.73 | 20.81 | 762.00 |
| | | | | | | | | 1" Ice | 29.02 | 27.62 | 954.00 |
| Rohn 14' Boom Gate | B | From Leg | 4.00 | -5.00 | 0.00 | 0.0000 | 141.00 | No Ice | 16.44 | 14.00 | 569.00 |
| | | | | | | | | 1/2" Ice | 22.73 | 20.81 | 762.00 |
| | | | | | | | | 1" Ice | 29.02 | 27.62 | 954.00 |
| Rohn 14' Boom Gate | C | From Leg | 4.00 | -5.00 | | 0.0000 | 141.00 | No Ice | 16.44 | 14.00 | 569.00 |
| | | | | | | | | 1/2" Ice | 22.73 | 20.81 | 762.00 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral Vert ft ft ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0.00 | | | 1" Ice | 29.02 | 27.62 | 954.00 |
| ********** | | | | | | | | | |
| (2) DB980H90E-M w/Mount Pipe (Sprint) | A | From Face | 4.00<br>-6.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 4.27<br>4.86<br>5.37 | 3.86<br>4.95<br>5.75 | 34.05<br>69.84<br>116.19 |
| (2) DB980H90E-M w/Mount Pipe (Sprint) | B | From Face | 4.00<br>-6.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 4.27<br>4.86<br>5.37 | 3.86<br>4.95<br>5.75 | 34.05<br>69.84<br>116.19 |
| (2) DB980H90E-M w/Mount Pipe (Sprint) | C | From Face | 4.00<br>-6.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 4.27<br>4.86<br>5.37 | 3.86<br>4.95<br>5.75 | 34.05<br>69.84<br>116.19 |
| Rohn 12' Boom Gate (3) (Sprint) | C | None | | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 33.02<br>47.36<br>61.70 | 33.02<br>47.36<br>61.70 | 1670.00<br>2220.00<br>2770.00 |
| ********** | | | | | | | | | |
| APXV9ERR18-C w/Mount Pipe (Sprint) | A | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.26<br>8.81<br>9.36 | 6.71<br>7.66<br>8.49 | 71.90<br>134.88<br>209.06 |
| APXVSPP18-C w/Mount Pipe (Sprint) | B | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.26<br>8.81<br>9.36 | 6.71<br>7.66<br>8.49 | 78.90<br>141.88<br>216.06 |
| APXV9ERR18-C w/Mount Pipe (Sprint) | C | From Leg | 4.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 8.26<br>8.81<br>9.36 | 6.71<br>7.66<br>8.49 | 71.90<br>134.88<br>209.06 |
| 1900MHz 4x40W RRH (Sprint) | A | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.71<br>2.95<br>3.20 | 2.61<br>2.84<br>3.09 | 60.00<br>83.12<br>109.48 |
| 1900MHz 4x40W RRH (Sprint) | B | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.71<br>2.95<br>3.20 | 2.61<br>2.84<br>3.09 | 60.00<br>83.12<br>109.48 |
| 1900MHz 4x40W RRH (Sprint) | C | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.71<br>2.95<br>3.20 | 2.61<br>2.84<br>3.09 | 60.00<br>83.12<br>109.48 |
| 800MHz 2x50W RRH (Sprint) | A | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.40<br>2.61<br>2.83 | 2.25<br>2.46<br>2.68 | 64.00<br>86.12<br>111.30 |
| 800MHz 2x50W RRH (Sprint) | B | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.40<br>2.61<br>2.83 | 2.25<br>2.46<br>2.68 | 64.00<br>86.12<br>111.30 |
| 800MHz 2x50W RRH (Sprint) | C | From Leg | 2.00<br>0.00<br>0.00 | 0.0000 | 123.00 | No Ice<br>1/2" Ice<br>1" Ice | 2.40<br>2.61<br>2.83 | 2.25<br>2.46<br>2.68 | 64.00<br>86.12<br>111.30 |

## Force Totals

| Load Case | Vertical Forces lb | Sum of Forces X lb | Sum of Forces Z lb | Sum of Overturning Moments, $M_x$ lb-ft | Sum of Overturning Moments, $M_z$ lb-ft | Sum of Torques lb-ft |
|---|---|---|---|---|---|---|
| Leg Weight | 14234.18 | | | | | |
| Bracing Weight | 16637.44 | | | | | |

| Load Case | Vertical Forces lb | Sum of Forces X lb | Sum of Forces Z lb | Sum of Overturning Moments, $M_x$ lb-ft | Sum of Overturning Moments, $M_z$ lb-ft | Sum of Torques lb-ft |
|---|---|---|---|---|---|---|
| Total Member Self-Weight | 30871.62 | | | 7898.40 | -12365.83 | |
| Total Weight | 60669.95 | | | 7898.40 | -12365.83 | |
| Wind 0 deg - No Ice | | 0.00 | -53127.68 | -5270923.41 | -12365.83 | 7966.72 |
| Wind 30 deg - No Ice | | 25424.08 | -44035.80 | -4458798.69 | -2591214.60 | 9592.73 |
| Wind 60 deg - No Ice | | 43267.97 | -24980.77 | -2525042.08 | -4399547.43 | 8666.46 |
| Wind 90 deg - No Ice | | 46393.58 | 0.00 | 7898.40 | -4768807.07 | 4727.90 |
| Wind 120 deg - No Ice | | 44545.00 | 25718.07 | 2571917.64 | -4453377.43 | 1379.27 |
| Wind 150 deg - No Ice | | 23915.80 | 41423.38 | 4120502.27 | -2386778.78 | -3588.50 |
| Wind 180 deg - No Ice | | 0.00 | 50526.30 | 5075138.61 | -12365.83 | -7585.20 |
| Wind 210 deg - No Ice | | -25424.08 | 44035.80 | 4474595.49 | 2566482.93 | -9592.73 |
| Wind 240 deg - No Ice | | -45520.83 | 26281.46 | 2646629.68 | 4558050.81 | -9422.05 |
| Wind 270 deg - No Ice | | -46393.58 | 0.00 | 7898.40 | 4744075.41 | -4727.90 |
| Wind 300 deg - No Ice | | -42292.14 | -24417.38 | -2450330.04 | 4245410.73 | -1005.21 |
| Wind 330 deg - No Ice | | -23915.80 | -41423.38 | -4104705.47 | 2362047.12 | 3588.50 |
| Member Ice | 56906.02 | | | | | |
| Total Weight Ice | 250269.20 | | | 115192.73 | -89823.73 | |
| Wind 0 deg - Ice | | 0.00 | -26992.46 | -2649639.28 | -89823.73 | 4531.41 |
| Wind 30 deg - Ice | | 13404.33 | -23216.98 | -2307516.41 | -1488575.50 | 5133.91 |
| Wind 60 deg - Ice | | 22265.36 | -12854.91 | -1245667.66 | -2446903.06 | 4007.40 |
| Wind 90 deg - Ice | | 24652.29 | 0.00 | 115192.73 | -2691957.22 | 1839.46 |
| Wind 120 deg - Ice | | 21508.69 | 12418.05 | 1399923.71 | -2315043.06 | -422.45 |
| Wind 150 deg - Ice | | 12682.44 | 21966.63 | 2367476.11 | -1390180.14 | -2649.60 |
| Wind 180 deg - Ice | | 0.00 | 26422.42 | 2835492.84 | -89823.73 | -4445.46 |
| Wind 210 deg - Ice | | -13404.33 | 23216.98 | 2537901.87 | 1308928.05 | -5133.91 |
| Wind 240 deg - Ice | | -22759.03 | 13139.93 | 1498319.07 | 2305821.37 | -4189.53 |
| Wind 270 deg - Ice | | -24652.29 | 0.00 | 115192.73 | 2512309.77 | -1839.46 |
| Wind 300 deg - Ice | | -21015.01 | -12133.02 | -1147272.30 | 2096829.85 | 518.64 |
| Wind 330 deg - Ice | | -12682.44 | -21966.63 | -2137090.65 | 1210532.69 | 2649.60 |
| Total Weight | 60669.95 | | | 7898.40 | -12365.83 | |
| Wind 0 deg - Service | | 0.00 | -19914.58 | -1986482.57 | -3566.42 | 2986.28 |
| Wind 30 deg - Service | | 9530.06 | -16506.55 | -1682062.64 | -970231.93 | 3595.78 |
| Wind 60 deg - Service | | 16218.73 | -9363.89 | -957205.94 | -1648074.31 | 3248.57 |
| Wind 90 deg - Service | | 17390.35 | 0.00 | -7748.86 | -1786489.00 | 1772.22 |
| Wind 120 deg - Service | | 16697.42 | 9640.26 | 953357.89 | -1668252.15 | 517.01 |
| Wind 150 deg - Service | | 8964.69 | 15527.30 | 1533835.26 | -893600.43 | -1345.13 |
| Wind 180 deg - Service | | 0.00 | 18939.47 | 1891674.79 | -3566.42 | -2843.26 |
| Wind 210 deg - Service | | -9530.06 | 16506.55 | 1666564.91 | 963099.09 | -3595.78 |
| Wind 240 deg - Service | | -17063.20 | 9851.44 | 981363.24 | 1709625.99 | -3531.80 |
| Wind 270 deg - Service | | -17390.35 | 0.00 | -7748.86 | 1779356.16 | -1772.22 |
| Wind 300 deg - Service | | -15852.95 | -9152.70 | -929200.59 | 1592434.79 | -376.80 |
| Wind 330 deg - Service | | -8964.69 | -15527.30 | -1549332.99 | 886467.59 | 1345.13 |

## Load Combinations

| Comb. No. | Description |
|---|---|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.6 Wind 0 deg - No Ice |
| 3 | 0.9 Dead+1.6 Wind 0 deg - No Ice |
| 4 | 1.2 Dead+1.6 Wind 30 deg - No Ice |
| 5 | 0.9 Dead+1.6 Wind 30 deg - No Ice |
| 6 | 1.2 Dead+1.6 Wind 60 deg - No Ice |
| 7 | 0.9 Dead+1.6 Wind 60 deg - No Ice |
| 8 | 1.2 Dead+1.6 Wind 90 deg - No Ice |
| 9 | 0.9 Dead+1.6 Wind 90 deg - No Ice |
| 10 | 1.2 Dead+1.6 Wind 120 deg - No Ice |

| Comb. No. | Description |
|---|---|
| 11 | 0.9 Dead+1.6 Wind 120 deg - No Ice |
| 12 | 1.2 Dead+1.6 Wind 150 deg - No Ice |
| 13 | 0.9 Dead+1.6 Wind 150 deg - No Ice |
| 14 | 1.2 Dead+1.6 Wind 180 deg - No Ice |
| 15 | 0.9 Dead+1.6 Wind 180 deg - No Ice |
| 16 | 1.2 Dead+1.6 Wind 210 deg - No Ice |
| 17 | 0.9 Dead+1.6 Wind 210 deg - No Ice |
| 18 | 1.2 Dead+1.6 Wind 240 deg - No Ice |
| 19 | 0.9 Dead+1.6 Wind 240 deg - No Ice |
| 20 | 1.2 Dead+1.6 Wind 270 deg - No Ice |
| 21 | 0.9 Dead+1.6 Wind 270 deg - No Ice |
| 22 | 1.2 Dead+1.6 Wind 300 deg - No Ice |
| 23 | 0.9 Dead+1.6 Wind 300 deg - No Ice |
| 24 | 1.2 Dead+1.6 Wind 330 deg - No Ice |
| 25 | 0.9 Dead+1.6 Wind 330 deg - No Ice |
| 26 | 1.2 Dead+1.0 Ice+1.0 Temp |
| 27 | 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp |
| 28 | 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp |
| 29 | 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp |
| 30 | 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp |
| 31 | 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp |
| 32 | 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp |
| 33 | 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp |
| 34 | 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp |
| 35 | 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp |
| 36 | 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp |
| 37 | 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp |
| 38 | 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp |
| 39 | Dead+Wind 0 deg - Service |
| 40 | Dead+Wind 30 deg - Service |
| 41 | Dead+Wind 60 deg - Service |
| 42 | Dead+Wind 90 deg - Service |
| 43 | Dead+Wind 120 deg - Service |
| 44 | Dead+Wind 150 deg - Service |
| 45 | Dead+Wind 180 deg - Service |
| 46 | Dead+Wind 210 deg - Service |
| 47 | Dead+Wind 240 deg - Service |
| 48 | Dead+Wind 270 deg - Service |
| 49 | Dead+Wind 300 deg - Service |
| 50 | Dead+Wind 330 deg - Service |

## 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 | 188 - 180 | Leg | Max Tension | 7 | 3452.20 | -112.90 | 55.45 |
| | | | Max. Compression | 31 | -6735.39 | -43.79 | -27.38 |
| | | | Max. Mx | 20 | -5081.36 | 127.62 | -14.88 |
| | | | Max. My | 2 | -5730.46 | 12.22 | 137.86 |
| | | | Max. Vy | 8 | -1244.22 | 0.00 | 0.00 |
| | | | Max. Vx | 2 | 1264.22 | 0.00 | -0.00 |
| | | Diagonal | Max Tension | 8 | 1816.49 | 0.00 | 0.00 |
| | | | Max. Compression | 20 | -1832.58 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 599.54 | 30.11 | 0.28 |
| | | | Max. My | 6 | -1310.74 | 4.14 | -1.21 |
| | | | Max. Vy | 31 | -35.44 | 30.11 | -0.24 |
| | | | Max. Vx | 6 | -0.32 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 11 | 653.47 | 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 | -677.46 | 0.00 | 0.00 |
| | | | Max. Mx | 26 | -69.23 | -90.57 | 0.00 |
| | | | Max. My | 32 | -78.63 | 0.00 | -0.00 |
| | | | Max. Vy | 26 | 55.06 | 0.00 | 0.00 |
| | | | Max. Vx | 32 | 0.00 | 0.00 | 0.00 |
| T2 | 180 - 160 | Leg | Max Tension | 7 | 23122.22 | -89.91 | 45.10 |
| | | | Max. Compression | 10 | -29047.45 | 106.82 | 86.29 |
| | | | Max. Mx | 22 | 15813.33 | 942.00 | -7.89 |
| | | | Max. My | 4 | -2032.45 | -17.43 | 927.18 |
| | | | Max. Vy | 22 | -728.35 | -489.49 | -7.89 |
| | | | Max. Vx | 4 | -727.22 | -17.43 | -493.87 |
| | | Diagonal | Max Tension | 20 | 4307.07 | 0.00 | 0.00 |
| | | | Max. Compression | 20 | -4306.13 | 0.00 | 0.00 |
| | | | Max. Mx | 30 | 1591.85 | 44.77 | 4.94 |
| | | | Max. My | 28 | -680.35 | 40.56 | -7.02 |
| | | | Max. Vy | 29 | 44.35 | 44.32 | 5.51 |
| | | | Max. Vx | 28 | 2.63 | 0.00 | 0.00 |
| | | Top Girt | Max Tension | 19 | 100.01 | 0.00 | 0.00 |
| | | | Max. Compression | 22 | -119.47 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 5.33 | -89.64 | 0.00 |
| | | | Max. My | 33 | -18.21 | 0.00 | 2.54 |
| | | | Max. Vy | 31 | 54.49 | 0.00 | 0.00 |
| | | | Max. Vx | 33 | -1.54 | 0.00 | 0.00 |
| T3 | 160 - 140 | Leg | Max Tension | 7 | 53271.90 | -81.88 | -45.43 |
| | | | Max. Compression | 2 | -63678.27 | 904.77 | -10.95 |
| | | | Max. Mx | 6 | 51596.36 | -947.84 | -0.01 |
| | | | Max. My | 20 | -4714.89 | -44.18 | 1076.29 |
| | | | Max. Vy | 6 | 1216.28 | -947.84 | -0.01 |
| | | | Max. Vx | 16 | -1079.53 | -20.94 | 602.81 |
| | | Diagonal | Max Tension | 12 | 6639.07 | 0.00 | 0.00 |
| | | | Max. Compression | 12 | -6738.15 | 0.00 | 0.00 |
| | | | Max. Mx | 28 | 1043.27 | 107.28 | 11.67 |
| | | | Max. My | 24 | -6417.37 | -3.10 | -18.96 |
| | | | Max. Vy | 28 | 72.89 | 95.00 | -14.90 |
| | | | Max. Vx | 37 | 4.87 | 0.00 | 0.00 |
| T4 | 140 - 120 | Leg | Max Tension | 7 | 91355.02 | -792.71 | -23.48 |
| | | | Max. Compression | 2 | -107243.70 | 972.54 | -4.98 |
| | | | Max. Mx | 22 | 87919.03 | -1055.67 | 10.43 |
| | | | Max. My | 4 | -8288.00 | -57.06 | -1078.34 |
| | | | Max. Vy | 22 | 711.42 | -1055.67 | 10.43 |
| | | | Max. Vx | 4 | 722.08 | -57.06 | -1078.34 |
| | | Diagonal | Max Tension | 12 | 9241.79 | 0.00 | 0.00 |
| | | | Max. Compression | 12 | -9412.07 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 2280.64 | 156.63 | 18.06 |
| | | | Max. My | 31 | 170.48 | 131.19 | 22.10 |
| | | | Max. Vy | 29 | 98.24 | 145.68 | 19.67 |
| | | | Max. Vx | 31 | -5.87 | 0.00 | 0.00 |
| T5 | 120 - 100 | Leg | Max Tension | 7 | 135991.26 | -419.51 | -9.45 |
| | | | Max. Compression | 10 | -157930.13 | 888.06 | -4.50 |
| | | | Max. Mx | 22 | 102995.50 | -1055.68 | 10.44 |
| | | | Max. My | 4 | -8837.03 | -57.08 | -1078.35 |
| | | | Max. Vy | 22 | -200.35 | -1055.68 | 10.44 |
| | | | Max. Vx | 4 | -196.95 | -57.08 | -1078.35 |
| | | Diagonal | Max Tension | 24 | 11067.36 | 0.00 | 0.00 |
| | | | Max. Compression | 24 | -11149.75 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 3630.00 | 182.36 | -20.38 |
| | | | Max. My | 31 | 221.38 | 164.80 | 26.35 |
| | | | Max. Vy | 33 | 111.53 | 181.01 | 24.15 |
| | | | Max. Vx | 31 | 6.26 | 0.00 | 0.00 |
| T6 | 100 - 80 | Leg | Max Tension | 7 | 177085.40 | -669.42 | -28.38 |
| | | | Max. Compression | 10 | -204007.82 | 1261.84 | -9.56 |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment lb-ft | Minor Axis Moment lb-ft |
|---|---|---|---|---|---|---|---|
| | | | Max. Mx | 2 | -203509.39 | 1266.72 | -25.33 |
| | | | Max. My | 4 | -11406.67 | -79.06 | -1144.46 |
| | | | Max. Vy | 2 | -192.45 | 1266.72 | -25.33 |
| | | | Max. Vx | 4 | 177.61 | -79.06 | -1144.46 |
| | | Diagonal | Max Tension | 24 | 13051.08 | 0.00 | 0.00 |
| | | | Max. Compression | 24 | -13311.96 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 3854.65 | 296.62 | 36.32 |
| | | | Max. My | 32 | 2379.20 | 262.69 | 40.80 |
| | | | Max. Vy | 33 | 141.59 | 287.63 | -38.77 |
| | | | Max. Vx | 31 | 8.20 | 0.00 | 0.00 |
| T7 | 80 - 60 | Leg | Max Tension | 7 | 222334.31 | -697.27 | -26.96 |
| | | | Max. Compression | 10 | -255612.93 | 1405.48 | -13.16 |
| | | | Max. Mx | 2 | -254900.21 | 1409.05 | -15.55 |
| | | | Max. My | 4 | -13713.27 | -91.68 | -1081.83 |
| | | | Max. Vy | 2 | -203.78 | 1409.05 | -15.55 |
| | | | Max. Vx | 4 | 166.40 | -91.68 | -1081.83 |
| | | Diagonal | Max Tension | 24 | 14531.38 | 0.00 | 0.00 |
| | | | Max. Compression | 24 | -14849.34 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 4256.47 | 418.95 | 47.35 |
| | | | Max. My | 32 | 2784.78 | 370.69 | 51.49 |
| | | | Max. Vy | 33 | 182.98 | 399.75 | -49.44 |
| | | | Max. Vx | 32 | 9.56 | 0.00 | 0.00 |
| T8 | 60 - 40 | Leg | Max Tension | 7 | 265053.34 | -1552.92 | -21.89 |
| | | | Max. Compression | 10 | -305313.49 | 1715.47 | -11.73 |
| | | | Max. Mx | 37 | 25991.46 | -2357.14 | 10.72 |
| | | | Max. My | 4 | -17798.20 | 52.60 | -1740.67 |
| | | | Max. Vy | 37 | 342.16 | -2357.14 | 10.72 |
| | | | Max. Vx | 4 | 229.28 | -110.38 | -1714.86 |
| | | Diagonal | Max Tension | 24 | 14418.47 | 0.00 | 0.00 |
| | | | Max. Compression | 24 | -14677.98 | 0.00 | 0.00 |
| | | | Max. Mx | 33 | 4211.78 | 456.93 | -61.66 |
| | | | Max. My | 34 | -2091.32 | 421.30 | 64.62 |
| | | | Max. Vy | 33 | 197.41 | 456.93 | -61.66 |
| | | | Max. Vx | 34 | 11.28 | 0.00 | 0.00 |
| T9 | 40 - 20 | Leg | Max Tension | 7 | 308689.74 | -1514.26 | -21.39 |
| | | | Max. Compression | 10 | -356826.86 | 2019.78 | -10.47 |
| | | | Max. Mx | 29 | 37516.13 | -4958.11 | -22.26 |
| | | | Max. My | 4 | -18823.39 | 52.60 | -1740.70 |
| | | | Max. Vy | 37 | 811.77 | -4947.09 | 8.59 |
| | | | Max. Vx | 16 | 232.45 | -123.48 | 1609.16 |
| | | Diagonal | Max Tension | 24 | 17070.39 | 0.00 | 0.00 |
| | | | Max. Compression | 24 | -17471.23 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 4401.58 | 683.77 | 69.45 |
| | | | Max. My | 27 | -475.43 | 596.65 | -74.42 |
| | | | Max. Vy | 33 | 247.02 | 661.40 | -71.92 |
| | | | Max. Vx | 27 | -12.02 | 0.00 | 0.00 |
| T10 | 20 - 0 | Leg | Max Tension | 7 | 352075.62 | -1575.97 | -26.58 |
| | | | Max. Compression | 10 | -408727.65 | 0.00 | 0.19 |
| | | | Max. Mx | 27 | -196670.04 | 5224.40 | 34.64 |
| | | | Max. My | 16 | -23863.94 | -201.34 | 3380.32 |
| | | | Max. Vy | 37 | -972.34 | -4947.09 | 8.60 |
| | | | Max. Vx | 16 | 459.15 | -201.34 | 3380.32 |
| | | Diagonal | Max Tension | 20 | 17665.13 | 0.00 | 0.00 |
| | | | Max. Compression | 20 | -18205.89 | 0.00 | 0.00 |
| | | | Max. Mx | 31 | 2732.47 | 788.94 | -80.79 |
| | | | Max. My | 33 | -7991.23 | 710.89 | 92.11 |
| | | | Max. Vy | 33 | 253.54 | 787.07 | 84.38 |
| | | | Max. Vx | 33 | -13.15 | 0.00 | 0.00 |

## Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical lb | Horizontal, X lb | Horizontal, Z lb |
|---|---|---|---|---|---|
| Leg C | Max. Vert | 18 | 420430.19 | 44999.04 | -25570.32 |
| | Max. $H_x$ | 18 | 420430.19 | 44999.04 | -25570.32 |
| | Max. $H_z$ | 7 | -362584.86 | -40161.27 | 22821.19 |
| | Min. Vert | 7 | -362584.86 | -40161.27 | 22821.19 |
| | Min. $H_x$ | 7 | -362584.86 | -40161.27 | 22821.19 |
| | Min. $H_z$ | 18 | 420430.19 | 44999.04 | -25570.32 |
| Leg B | Max. Vert | 10 | 421621.99 | -44864.56 | -25845.82 |
| | Max. $H_x$ | 23 | -361692.47 | 40006.91 | 23055.99 |
| | Max. $H_z$ | 23 | -361692.47 | 40006.91 | 23055.99 |
| | Min. Vert | 23 | -361692.47 | 40006.91 | 23055.99 |
| | Min. $H_x$ | 10 | 421621.99 | -44864.56 | -25845.82 |
| | Min. $H_z$ | 10 | 421621.99 | -44864.56 | -25845.82 |
| Leg A | Max. Vert | 2 | 420370.33 | 303.08 | 51754.38 |
| | Max. $H_x$ | 21 | 17873.19 | 6606.51 | 1474.87 |
| | Max. $H_z$ | 2 | 420370.33 | 303.08 | 51754.38 |
| | Min. Vert | 15 | -362630.45 | -277.67 | -46192.13 |
| | Min. $H_x$ | 9 | 17873.07 | -6587.90 | 1474.43 |
| | Min. $H_z$ | 15 | -362630.45 | -277.67 | -46192.13 |

## Tower Mast Reaction Summary

| Load Combination | Vertical lb | $Shear_x$ lb | $Shear_z$ lb | Overturning Moment, $M_x$ lb-ft | Overturning Moment, $M_z$ lb-ft | Torque lb-ft |
|---|---|---|---|---|---|---|
| Dead Only | 60669.95 | 0.00 | 0.00 | 7900.78 | -12365.01 | -0.08 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice | 72803.94 | -0.00 | -85713.74 | -8589588.97 | -14973.80 | 12865.92 |
| 0.9 Dead+1.6 Wind 0 deg - No Ice | 54602.95 | -0.00 | -85713.99 | -8583587.18 | -11228.30 | 12835.77 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice | 72803.94 | 40678.01 | -70456.50 | -7165109.17 | -4157227.82 | 15462.87 |
| 0.9 Dead+1.6 Wind 30 deg - No Ice | 54602.95 | 40678.14 | -70456.71 | -7160427.73 | -4149404.22 | 15428.19 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice | 72803.94 | 70625.64 | -40775.73 | -4120196.85 | -7167784.13 | 13923.03 |
| 0.9 Dead+1.6 Wind 60 deg - No Ice | 54602.95 | 70625.85 | -40775.85 | -4118528.36 | -7157044.02 | 13909.14 |
| 1.2 Dead+1.6 Wind 90 deg - No Ice | 72803.94 | 81356.12 | 0.06 | 9473.86 | -8299452.02 | 7548.71 |
| 0.9 Dead+1.6 Wind 90 deg - No Ice | 54602.95 | 81356.37 | 0.05 | 7110.92 | -8287559.47 | 7560.85 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 72803.94 | 74230.28 | 42856.87 | 4308993.47 | -7461945.97 | 2147.67 |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 54602.95 | 74230.49 | 42857.00 | 4302438.10 | -7450949.90 | 2163.15 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice | 72803.94 | 40678.11 | 70456.44 | 7184074.77 | -4157222.45 | -5826.30 |
| 0.9 Dead+1.6 Wind 150 deg - No Ice | 54602.95 | 40678.23 | 70456.66 | 7174646.63 | -4149408.58 | -5811.94 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice | 72803.94 | -0.00 | 81551.47 | 8268880.87 | -14973.67 | -12250.11 |
| 0.9 Dead+1.6 Wind 180 deg - No Ice | 54602.95 | -0.00 | 81551.71 | 8258434.73 | -11227.09 | -12221.18 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice | 72803.94 | -40678.11 | 70456.44 | 7184119.52 | 4127300.06 | -15462.82 |
| 0.9 Dead+1.6 Wind 210 deg - No Ice | 54602.95 | -40678.23 | 70456.66 | 7174692.50 | 4126978.94 | -15428.15 |
| 1.2 Dead+1.6 Wind 240 deg - No Ice | 72803.94 | -74230.28 | 42856.87 | 4309041.34 | 7432075.70 | -15135.30 |
| 0.9 Dead+1.6 Wind 240 deg - No Ice | 54602.95 | -74230.50 | 42857.00 | 4302486.16 | 7428571.68 | -15120.63 |

| Load Combination | Vertical lb | $Shear_x$ lb | $Shear_z$ lb | Overturning Moment, $M_x$ lb-ft | Overturning Moment, $M_z$ lb-ft | Torque lb-ft |
|---|---|---|---|---|---|---|
| 1.2 Dead+1.6 Wind 270 deg - No Ice | 72803.94 | -81356.13 | 0.05 | 9470.32 | 8269612.78 | -7548.82 |
| 0.9 Dead+1.6 Wind 270 deg - No Ice | 54602.95 | -81356.37 | 0.05 | 7108.27 | 8265211.47 | -7560.97 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice | 72803.94 | -70625.64 | -40775.73 | -4120245.30 | 7137920.33 | -1551.26 |
| 0.9 Dead+1.6 Wind 300 deg - No Ice | 54602.95 | -70625.85 | -40775.85 | -4118575.89 | 7134671.21 | -1566.29 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice | 72803.94 | -40678.02 | -70456.50 | -7165156.02 | 4127313.04 | 5826.34 |
| 0.9 Dead+1.6 Wind 330 deg - No Ice | 54602.95 | -40678.14 | -70456.71 | -7160473.43 | 4126979.26 | 5811.99 |
| 1.2 Dead+1.0 Ice+1.0 Temp | 262403.19 | -0.30 | -0.21 | 118137.59 | -93968.44 | 1.91 |
| 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp | 262403.19 | -0.02 | -27592.47 | -2791420.88 | -94074.75 | 4755.69 |
| 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp | 262403.19 | 13404.16 | -23216.72 | -2341871.67 | -1514446.95 | 5416.37 |
| 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp | 262403.19 | 23402.09 | -13511.22 | -1314019.37 | -2574900.46 | 4278.90 |
| 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp | 262403.19 | 26808.34 | -0.01 | 118270.90 | -2934804.92 | 2023.58 |
| 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp | 262403.19 | 23895.76 | 13796.22 | 1573118.53 | -2613936.80 | -370.77 |
| 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp | 262403.19 | 13404.16 | 23216.70 | 2578423.72 | -1514435.15 | -2745.86 |
| 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp | 262403.19 | -0.01 | 27022.41 | 2982888.52 | -94078.24 | -4666.00 |
| 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp | 262403.19 | -13404.19 | 23216.70 | 2578426.33 | 1326297.52 | -5416.24 |
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp | 262403.19 | -23895.79 | 13796.22 | 1573117.16 | 2425805.06 | -4465.22 |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp | 262403.19 | -26808.37 | -0.01 | 118260.89 | 2746675.26 | -2023.57 |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp | 262403.19 | -23402.12 | -13511.22 | -1314036.77 | 2386753.00 | 467.90 |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp | 262403.19 | -13404.19 | -23216.72 | -2341882.77 | 1326301.55 | 2746.21 |
| Dead+Wind 0 deg - Service | 60669.95 | -0.00 | -20080.82 | -2005403.38 | -12425.10 | 3009.46 |
| Dead+Wind 30 deg - Service | 60669.95 | 9529.96 | -16506.39 | -1671884.22 | -982249.84 | 3605.64 |
| Dead+Wind 60 deg - Service | 60669.95 | 16546.03 | -9552.86 | -958982.39 | -1687115.04 | 3259.69 |
| Dead+Wind 90 deg - Service | 60669.95 | 19059.94 | 0.00 | 7899.47 | -1952072.13 | 1782.14 |
| Dead+Wind 120 deg - Service | 60669.95 | 17390.50 | 10040.41 | 1014550.35 | -1755995.13 | 505.56 |
| Dead+Wind 150 deg - Service | 60669.95 | 9529.97 | 16506.39 | 1687684.41 | -982249.19 | -1374.54 |
| Dead+Wind 180 deg - Service | 60669.95 | -0.00 | 19105.71 | 1941666.85 | -12425.83 | -2865.58 |
| Dead+Wind 210 deg - Service | 60669.95 | -9529.97 | 16506.39 | 1687686.63 | 957398.86 | -3605.64 |
| Dead+Wind 240 deg - Service | 60669.95 | -17390.50 | 10040.41 | 1014552.45 | 1731147.86 | -3543.61 |
| Dead+Wind 270 deg - Service | 60669.95 | -19059.94 | 0.00 | 7898.80 | 1927226.68 | -1782.21 |
| Dead+Wind 300 deg - Service | 60669.95 | -16546.03 | -9552.86 | -958985.24 | 1662268.61 | -365.69 |
| Dead+Wind 330 deg - Service | 60669.95 | -9529.97 | -16506.39 | -1671886.81 | 957400.91 | 1374.61 |

## Solution Summary

| Load Comb. | Sum of Applied Forces PX lb | PY lb | PZ lb | Sum of Reactions PX lb | PY lb | PZ lb | % Error |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | -60669.95 | -0.00 | -0.00 | 60669.95 | -0.00 | 0.000% |
| 2 | 0.00 | -72803.94 | -85714.65 | 0.00 | 72803.94 | 85713.74 | 0.001% |
| 3 | 0.00 | -54602.96 | -85714.65 | 0.00 | 54602.95 | 85713.99 | 0.001% |

| Load Comb. | Sum of Applied Forces PX lb | PY lb | PZ lb | Sum of Reactions PX lb | PY lb | PZ lb | % Error |
|---|---|---|---|---|---|---|---|
| 4 | 40678.53 | -72803.94 | -70457.29 | -40678.01 | 72803.94 | 70456.50 | 0.001% |
| 5 | 40678.53 | -54602.96 | -70457.29 | -40678.14 | 54602.95 | 70456.71 | 0.001% |
| 6 | 70626.50 | -72803.94 | -40776.23 | -70625.64 | 72803.94 | 40775.73 | 0.001% |
| 7 | 70626.50 | -54602.96 | -40776.23 | -70625.85 | 54602.95 | 40775.85 | 0.001% |
| 8 | 81357.07 | -72803.94 | -0.00 | -81356.12 | 72803.94 | -0.06 | 0.001% |
| 9 | 81357.07 | -54602.96 | 0.00 | -81356.37 | 54602.95 | -0.05 | 0.001% |
| 10 | 74231.06 | -72803.94 | 42857.32 | -74230.28 | 72803.94 | -42856.87 | 0.001% |
| 11 | 74231.06 | -54602.96 | 42857.32 | -74230.49 | 54602.95 | -42857.00 | 0.001% |
| 12 | 40678.53 | -72803.94 | 70457.29 | -40678.11 | 72803.94 | -70456.44 | 0.001% |
| 13 | 40678.53 | -54602.96 | 70457.29 | -40678.23 | 54602.95 | -70456.66 | 0.001% |
| 14 | -0.00 | -72803.94 | 81552.45 | 0.00 | 72803.94 | -81551.47 | 0.001% |
| 15 | -0.00 | -54602.96 | 81552.45 | 0.00 | 54602.95 | -81551.71 | 0.001% |
| 16 | -40678.53 | -72803.94 | 70457.29 | 40678.11 | 72803.94 | -70456.44 | 0.001% |
| 17 | -40678.53 | -54602.96 | 70457.29 | 40678.23 | 54602.95 | -70456.66 | 0.001% |
| 18 | -74231.06 | -72803.94 | 42857.32 | 74230.28 | 72803.94 | -42856.87 | 0.001% |
| 19 | -74231.06 | -54602.96 | 42857.32 | 74230.50 | 54602.95 | -42857.00 | 0.001% |
| 20 | -81357.07 | -72803.94 | -0.00 | 81356.13 | 72803.94 | -0.05 | 0.001% |
| 21 | -81357.07 | -54602.96 | 0.00 | 81356.37 | 54602.95 | -0.05 | 0.001% |
| 22 | -70626.50 | -72803.94 | -40776.23 | 70625.64 | 72803.94 | 40775.73 | 0.001% |
| 23 | -70626.50 | -54602.96 | -40776.23 | 70625.85 | 54602.95 | 40775.85 | 0.001% |
| 24 | -40678.53 | -72803.94 | -70457.29 | 40678.02 | 72803.94 | 70456.50 | 0.001% |
| 25 | -40678.53 | -54602.96 | -70457.29 | 40678.14 | 54602.95 | 70456.71 | 0.001% |
| 26 | -0.00 | -262403.19 | -0.00 | 0.30 | 262403.19 | 0.21 | 0.000% |
| 27 | -0.00 | -262403.19 | -27592.78 | 0.02 | 262403.19 | 27592.47 | 0.000% |
| 28 | 13404.33 | -262403.19 | -23216.98 | -13404.16 | 262403.19 | 23216.72 | 0.000% |
| 29 | 23402.37 | -262403.19 | -13511.37 | -23402.09 | 262403.19 | 13511.22 | 0.000% |
| 30 | 26808.66 | -262403.19 | -0.00 | -26808.34 | 262403.19 | 0.01 | 0.000% |
| 31 | 23896.04 | -262403.19 | 13796.39 | -23895.76 | 262403.19 | -13796.22 | 0.000% |
| 32 | 13404.33 | -262403.19 | 23216.98 | -13404.16 | 262403.19 | -23216.70 | 0.000% |
| 33 | 0.00 | -262403.19 | 27022.73 | 0.01 | 262403.19 | -27022.41 | 0.000% |
| 34 | -13404.33 | -262403.19 | 23216.98 | 13404.19 | 262403.19 | -23216.70 | 0.000% |
| 35 | -23896.04 | -262403.19 | 13796.39 | 23895.79 | 262403.19 | -13796.22 | 0.000% |
| 36 | -26808.66 | -262403.19 | -0.00 | 26808.37 | 262403.19 | 0.01 | 0.000% |
| 37 | -23402.37 | -262403.19 | -13511.37 | 23402.12 | 262403.19 | 13511.22 | 0.000% |
| 38 | -13404.33 | -262403.19 | -23216.98 | 13404.19 | 262403.19 | 23216.72 | 0.000% |
| 39 | 0.00 | -60669.95 | -20081.00 | 0.00 | 60669.95 | 20080.82 | 0.000% |
| 40 | 9530.06 | -60669.95 | -16506.55 | -9529.96 | 60669.95 | 16506.39 | 0.000% |
| 41 | 16546.19 | -60669.95 | -9552.95 | -16546.03 | 60669.95 | 9552.86 | 0.000% |
| 42 | 19060.12 | -60669.95 | 0.00 | -19059.94 | 60669.95 | -0.00 | 0.000% |
| 43 | 17390.66 | -60669.95 | 10040.50 | -17390.50 | 60669.95 | -10040.41 | 0.000% |
| 44 | 9530.06 | -60669.95 | 16506.55 | -9529.97 | 60669.95 | -16506.39 | 0.000% |
| 45 | -0.00 | -60669.95 | 19105.90 | 0.00 | 60669.95 | -19105.71 | 0.000% |
| 46 | -9530.06 | -60669.95 | 16506.55 | 9529.97 | 60669.95 | -16506.39 | 0.000% |
| 47 | -17390.66 | -60669.95 | 10040.50 | 17390.50 | 60669.95 | -10040.41 | 0.000% |
| 48 | -19060.12 | -60669.95 | 0.00 | 19059.94 | 60669.95 | -0.00 | 0.000% |
| 49 | -16546.19 | -60669.95 | -9552.95 | 16546.03 | 60669.95 | 9552.86 | 0.000% |
| 50 | -9530.06 | -60669.95 | -16506.55 | 9529.97 | 60669.95 | 16506.39 | 0.000% |

## Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|---|---|---|---|---|
| 1 | Yes | 6 | 0.00000001 | 0.00000001 |
| 2 | Yes | 9 | 0.00000001 | 0.00006685 |
| 3 | Yes | 9 | 0.00000001 | 0.00004864 |
| 4 | Yes | 9 | 0.00000001 | 0.00007186 |

| | | | | |
|---|---|---|---|---|
| 5 | Yes | 9 | 0.00000001 | 0.00005351 |
| 6 | Yes | 9 | 0.00000001 | 0.00007596 |
| 7 | Yes | 9 | 0.00000001 | 0.00005752 |
| 8 | Yes | 9 | 0.00000001 | 0.00007182 |
| 9 | Yes | 9 | 0.00000001 | 0.00005348 |
| 10 | Yes | 9 | 0.00000001 | 0.00006680 |
| 11 | Yes | 9 | 0.00000001 | 0.00004862 |
| 12 | Yes | 9 | 0.00000001 | 0.00007171 |
| 13 | Yes | 9 | 0.00000001 | 0.00005342 |
| 14 | Yes | 9 | 0.00000001 | 0.00007581 |
| 15 | Yes | 9 | 0.00000001 | 0.00005743 |
| 16 | Yes | 9 | 0.00000001 | 0.00007170 |
| 17 | Yes | 9 | 0.00000001 | 0.00005342 |
| 18 | Yes | 9 | 0.00000001 | 0.00006672 |
| 19 | Yes | 9 | 0.00000001 | 0.00004857 |
| 20 | Yes | 9 | 0.00000001 | 0.00007171 |
| 21 | Yes | 9 | 0.00000001 | 0.00005342 |
| 22 | Yes | 9 | 0.00000001 | 0.00007586 |
| 23 | Yes | 9 | 0.00000001 | 0.00005746 |
| 24 | Yes | 9 | 0.00000001 | 0.00007177 |
| 25 | Yes | 9 | 0.00000001 | 0.00005345 |
| 26 | Yes | 8 | 0.00000001 | 0.00006402 |
| 27 | Yes | 10 | 0.00000001 | 0.00005623 |
| 28 | Yes | 10 | 0.00000001 | 0.00005700 |
| 29 | Yes | 10 | 0.00000001 | 0.00005849 |
| 30 | Yes | 10 | 0.00000001 | 0.00005831 |
| 31 | Yes | 10 | 0.00000001 | 0.00005861 |
| 32 | Yes | 10 | 0.00000001 | 0.00005822 |
| 33 | Yes | 10 | 0.00000001 | 0.00005833 |
| 34 | Yes | 10 | 0.00000001 | 0.00005682 |
| 35 | Yes | 10 | 0.00000001 | 0.00005607 |
| 36 | Yes | 10 | 0.00000001 | 0.00005514 |
| 37 | Yes | 10 | 0.00000001 | 0.00005564 |
| 38 | Yes | 10 | 0.00000001 | 0.00005522 |
| 39 | Yes | 9 | 0.00000001 | 0.00005596 |
| 40 | Yes | 9 | 0.00000001 | 0.00005715 |
| 41 | Yes | 9 | 0.00000001 | 0.00005796 |
| 42 | Yes | 9 | 0.00000001 | 0.00005708 |
| 43 | Yes | 9 | 0.00000001 | 0.00005586 |
| 44 | Yes | 9 | 0.00000001 | 0.00005681 |
| 45 | Yes | 9 | 0.00000001 | 0.00005751 |
| 46 | Yes | 9 | 0.00000001 | 0.00005665 |
| 47 | Yes | 9 | 0.00000001 | 0.00005553 |
| 48 | Yes | 9 | 0.00000001 | 0.00005669 |
| 49 | Yes | 9 | 0.00000001 | 0.00005761 |
| 50 | Yes | 9 | 0.00000001 | 0.00005692 |

## Maximum Tower Deflections - Service Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| T1 | 188 - 180 | 4.324 | 43 | 0.2048 | 0.0094 |
| T2 | 180 - 160 | 3.978 | 43 | 0.2030 | 0.0089 |
| T3 | 160 - 140 | 3.139 | 43 | 0.1836 | 0.0069 |
| T4 | 140 - 120 | 2.400 | 43 | 0.1589 | 0.0051 |
| T5 | 120 - 100 | 1.758 | 43 | 0.1333 | 0.0038 |
| T6 | 100 - 80 | 1.211 | 43 | 0.1094 | 0.0027 |
| T7 | 80 - 60 | 0.774 | 43 | 0.0831 | 0.0020 |
| T8 | 60 - 40 | 0.448 | 43 | 0.0592 | 0.0015 |

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| T9 | 40 - 20 | 0.217 | 43 | 0.0370 | 0.0009 |
| T10 | 20 - 0 | 0.071 | 43 | 0.0190 | 0.0005 |

## Critical Deflections and Radius of Curvature - Service Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|
| 188.00 | 10' Omni | 43 | 4.324 | 0.2048 | 0.0094 | 450272 |
| 176.00 | 6' x 1' Panel Antenna w/Mount Pipe | 43 | 3.805 | 0.2006 | 0.0086 | 126826 |
| 168.00 | (2) DUO1417-8686 w/Mount Pipe | 43 | 3.465 | 0.1930 | 0.0078 | 60072 |
| 155.00 | (2) 7250.03 w/Mount Pipe | 43 | 2.944 | 0.1775 | 0.0064 | 41244 |
| 141.00 | (2) DB844H90E-XY w/Mount Pipe | 43 | 2.434 | 0.1601 | 0.0052 | 47337 |
| 123.00 | (2) DB980H90E-M w/Mount Pipe | 43 | 1.849 | 0.1371 | 0.0040 | 53137 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| T1 | 188 - 180 | 18.353 | 10 | 0.8660 | 0.0403 |
| T2 | 180 - 160 | 16.886 | 10 | 0.8587 | 0.0382 |
| T3 | 160 - 140 | 13.331 | 10 | 0.7783 | 0.0296 |
| T4 | 140 - 120 | 10.194 | 10 | 0.6742 | 0.0219 |
| T5 | 120 - 100 | 7.471 | 10 | 0.5659 | 0.0164 |
| T6 | 100 - 80 | 5.148 | 10 | 0.4644 | 0.0117 |
| T7 | 80 - 60 | 3.292 | 10 | 0.3529 | 0.0086 |
| T8 | 60 - 40 | 1.907 | 10 | 0.2516 | 0.0063 |
| T9 | 40 - 20 | 0.925 | 10 | 0.1571 | 0.0039 |
| T10 | 20 - 0 | 0.302 | 10 | 0.0807 | 0.0020 |

## Critical Deflections and Radius of Curvature - Design Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|
| 188.00 | 10' Omni | 10 | 18.353 | 0.8660 | 0.0403 | 126933 |
| 176.00 | 6' x 1' Panel Antenna w/Mount Pipe | 10 | 16.156 | 0.8489 | 0.0368 | 32082 |
| 168.00 | (2) DUO1417-8686 w/Mount Pipe | 10 | 14.717 | 0.8177 | 0.0334 | 14540 |
| 155.00 | (2) 7250.03 w/Mount Pipe | 10 | 12.503 | 0.7527 | 0.0274 | 9911 |
| 141.00 | (2) DB844H90E-XY w/Mount Pipe | 10 | 10.340 | 0.6796 | 0.0222 | 11562 |
| 123.00 | (2) DB980H90E-M w/Mount Pipe | 10 | 7.855 | 0.5817 | 0.0172 | 12602 |

## 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 | 188 | Leg | A325N | 0.6250 | 4 | 863.05 | 20708.70 | 0.042 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.6250 | 1 | 1816.49 | 6475.78 | 0.281 ✓ | 1 | Member Block Shear |
| | | Top Girt | A325N | 0.6250 | 1 | 653.47 | 6475.78 | 0.101 ✓ | 1 | Member Block Shear |
| T2 | 180 | Leg | A325N | 0.7500 | 4 | 5780.55 | 29820.60 | 0.194 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.6250 | 1 | 4307.07 | 6475.78 | 0.665 ✓ | 1 | Member Block Shear |
| | | Top Girt | A325N | 0.6250 | 1 | 100.01 | 6475.78 | 0.015 ✓ | 1 | Member Block Shear |
| T3 | 160 | Leg | A325N | 0.8750 | 4 | 13318.00 | 40589.10 | 0.328 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.6250 | 1 | 6738.15 | 12425.20 | 0.542 ✓ | 1 | Bolt Shear |
| T4 | 140 | Leg | A325N | 1.0000 | 4 | 22838.80 | 53014.40 | 0.431 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.6250 | 1 | 9412.07 | 12425.20 | 0.757 ✓ | 1 | Bolt Shear |
| T5 | 120 | Leg | A325N | 1.0000 | 6 | 22665.20 | 53014.40 | 0.428 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.7500 | 1 | 11067.40 | 15843.80 | 0.699 ✓ | 1 | Member Block Shear |
| T6 | 100 | Leg | A325N | 1.0000 | 6 | 29514.20 | 53014.40 | 0.557 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.7500 | 1 | 13051.10 | 16087.50 | 0.811 ✓ | 1 | Member Bearing |
| T7 | 80 | Leg | A325N | 1.0000 | 8 | 27791.80 | 53014.40 | 0.524 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.7500 | 1 | 14849.30 | 17892.40 | 0.830 ✓ | 1 | Bolt Shear |
| T8 | 60 | Leg | A325N | 1.0000 | 8 | 33131.70 | 53014.40 | 0.625 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.7500 | 1 | 14678.00 | 17892.40 | 0.820 ✓ | 1 | Bolt Shear |
| T9 | 40 | Leg | A325N | 1.0000 | 8 | 38586.20 | 53014.40 | 0.728 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325X | 0.7500 | 1 | 17070.40 | 20109.40 | 0.849 ✓ | 1 | Member Bearing |
| T10 | 20 | Leg | A354-BC | 1.0000 | 10 | 35207.60 | 55223.30 | 0.638 ✓ | 1 | Bolt Tension |
| | | Diagonal | A325X | 0.7500 | 1 | 17665.10 | 20109.40 | 0.878 ✓ | 1 | Member Bearing |

## Compression Checks

## Leg 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 $P_u / \phi P_n$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 188 - 180 | ROHN 2.5 STD | 8.00 | 4.00 | 50.7<br>K=1.00 | 1.7040 | -6735.39 | 63560.30 | 0.106 [1] ✓ |
| T2 | 180 - 160 | ROHN 2.5 STD | 20.03 | 5.01 | 63.4<br>K=1.00 | 1.7040 | -29047.40 | 57138.60 | 0.508 [1] ✓ |
| T3 | 160 - 140 | ROHN 3 EH | 20.04 | 6.68 | 70.5<br>K=1.00 | 3.0159 | -63678.30 | 94337.20 | 0.675 [1] ✓ |
| T4 | 140 - 120 | ROHN 4 EH | 20.04 | 6.68 | 54.3 | 4.4074 | -107244.00 | 159899.00 | 0.671 [1] ✓ |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | K=1.00 | | | | ✓ |
| T5 | 120 - 100 | ROHN 5 EH | 20.04 | 6.68 | 43.6<br>K=1.00 | 6.1120 | -157930.00 | 239378.00 | 0.660 [1] ✓ |
| T6 | 100 - 80 | ROHN 6 EHS | 20.04 | 10.02 | 54.0<br>K=1.00 | 6.7133 | -204008.00 | 244047.00 | 0.836 [1] ✓ |
| T7 | 80 - 60 | ROHN 6 EH | 20.03 | 10.02 | 54.8<br>K=1.00 | 8.4049 | -255613.00 | 303757.00 | 0.842 [1] ✓ |
| T8 | 60 - 40 | ROHN 8 EHS | 20.04 | 10.02 | 41.2<br>K=1.00 | 9.7193 | -305314.00 | 386354.00 | 0.790 [1] ✓ |
| T9 | 40 - 20 | ROHN 8 EH | 20.03 | 10.02 | 41.8<br>K=1.00 | 12.7627 | -356827.00 | 505573.00 | 0.706 [1] ✓ |
| T10 | 20 - 0 | ROHN 8 EH | 20.03 | 10.02 | 41.8<br>K=1.00 | 12.7627 | -408728.00 | 505555.00 | 0.808 [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 | 188 - 180 | L1 3/4x1 3/4x3/16 | 7.70 | 3.57 | 124.9<br>K=1.00 | 0.6211 | -1832.58 | 8852.42 | 0.207 [1] ✓ |
| T2 | 180 - 160 | L1 3/4x1 3/4x3/16 | 9.69 | 4.71 | 164.6<br>K=1.00 | 0.6211 | -4306.13 | 5178.87 | 0.831 [1] ✓ |
| T3 | 160 - 140 | L2 1/2x2 1/2x1/4 | 12.24 | 6.02 | 147.1<br>K=1.00 | 1.1900 | -6738.15 | 12430.90 | 0.542 [1] ✓ |
| T4 | 140 - 120 | L3x3x1/4 | 14.07 | 6.89 | 139.6<br>K=1.00 | 1.4400 | -9412.07 | 16694.30 | 0.564 [1] ✓ |
| T5 | 120 - 100 | L3x3x1/4 | 15.94 | 7.76 | 157.4<br>K=1.00 | 1.4400 | -11149.80 | 13139.10 | 0.849 [1] ✓ |
| T6 | 100 - 80 | L3 1/2x3 1/2x1/4 | 19.21 | 9.44 | 163.2<br>K=1.00 | 1.6900 | -13312.00 | 14326.20 | 0.929 [1] ✓ |
| T7 | 80 - 60 | L4x4x5/16 | 20.93 | 10.29 | 156.1<br>K=1.00 | 2.4000 | -14849.30 | 22264.80 | 0.667 [1] ✓ |
| T8 | 60 - 40 | L4x4x5/16 | 22.87 | 11.20 | 170.0<br>K=1.00 | 2.4000 | -14678.00 | 18769.30 | 0.782 [1] ✓ |
| T9 | 40 - 20 | L5x5x5/16 | 24.68 | 12.06 | 145.6<br>K=1.00 | 3.0300 | -17471.20 | 32278.00 | 0.541 [1] ✓ |
| T10 | 20 - 0 | L5x5x5/16 | 26.50 | 12.99 | 156.8<br>K=1.00 | 3.0300 | -18205.90 | 27848.90 | 0.654 [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 | 188 - 180 | L1 3/4x1 3/4x3/16 | 6.58 | 6.07 | 212.1<br>K=1.00 | 0.6211 | -677.46 | 3119.90 | 0.217 [1] ✓ |
| T2 | 180 - 160 | KL/R > 200 (C) - 5<br>L1 3/4x1 3/4x3/16<br>KL/R > 200 (C) - 24 | 6.58 | 6.07 | 212.1<br>K=1.00 | 0.6211 | -119.47 | 3119.90 | 0.038 [1] ✓ |

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

## Tension Checks

## Leg Design Data (Tension)

| 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 | 188 - 180 | ROHN 2.5 STD | 8.00 | 4.00 | 50.7 | 1.7040 | 3452.20 | 76682.30 | 0.045 [1] ✓ |
| T2 | 180 - 160 | ROHN 2.5 STD | 20.03 | 5.01 | 63.4 | 1.7040 | 23122.20 | 76682.30 | 0.302 [1] ✓ |
| T3 | 160 - 140 | ROHN 3 EH | 20.04 | 6.68 | 70.5 | 3.0159 | 53271.90 | 135717.00 | 0.393 [1] ✓ |
| T4 | 140 - 120 | ROHN 4 EH | 20.04 | 6.68 | 54.3 | 4.4074 | 91355.00 | 198335.00 | 0.461 [1] ✓ |
| T5 | 120 - 100 | ROHN 5 EH | 20.04 | 6.68 | 43.6 | 6.1120 | 135991.00 | 275039.00 | 0.494 [1] ✓ |
| T6 | 100 - 80 | ROHN 6 EHS | 20.04 | 10.02 | 54.0 | 6.7133 | 177085.00 | 302097.00 | 0.586 [1] ✓ |
| T7 | 80 - 60 | ROHN 6 EH | 20.03 | 10.02 | 54.8 | 8.4049 | 222334.00 | 378222.00 | 0.588 [1] ✓ |
| T8 | 60 - 40 | ROHN 8 EHS | 20.04 | 10.02 | 41.2 | 9.7193 | 265053.00 | 437369.00 | 0.606 [1] ✓ |
| T9 | 40 - 20 | ROHN 8 EH | 20.03 | 10.02 | 41.8 | 12.7627 | 308690.00 | 574322.00 | 0.537 [1] ✓ |
| T10 | 20 - 0 | ROHN 8 EH | 20.03 | 10.02 | 41.8 | 12.7627 | 352076.00 | 574322.00 | 0.613 [1] ✓ |

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

## Diagonal Design Data (Tension)

| 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 | 188 - 180 | L1 3/4x1 3/4x3/16 | 7.70 | 3.57 | 82.9 | 0.3604 | 1816.49 | 15675.30 | 0.116 [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 | 180 - 160 | L1 3/4x1 3/4x3/16 | 9.69 | 4.71 | 108.3 | 0.3604 | 4307.07 | 15675.30 | 0.275 [1] |
| T3 | 160 - 140 | L2 1/2x2 1/2x1/4 | 12.24 | 6.02 | 96.0 | 0.7519 | 6639.07 | 32706.60 | 0.203 [1] |
| T4 | 140 - 120 | L3x3x1/4 | 14.07 | 6.89 | 90.6 | 0.9394 | 9241.79 | 45794.50 | 0.202 [1] |
| T5 | 120 - 100 | L3x3x1/4 | 15.94 | 7.76 | 102.0 | 0.9159 | 11067.40 | 44652.00 | 0.248 [1] |
| T6 | 100 - 80 | L3 1/2x3 1/2x1/4 | 19.21 | 9.44 | 105.5 | 1.1034 | 13051.10 | 53792.60 | 0.243 [1] |
| T7 | 80 - 60 | L4x4x5/16 | 20.93 | 10.29 | 101.0 | 1.5949 | 14531.40 | 77752.40 | 0.187 [1] |
| T8 | 60 - 40 | L4x4x5/16 | 22.87 | 11.20 | 109.8 | 1.5949 | 14418.50 | 77752.40 | 0.185 [1] |
| T9 | 40 - 20 | L5x5x5/16 | 24.68 | 12.06 | 93.3 | 2.0674 | 17070.40 | 100787.00 | 0.169 [1] |
| T10 | 20 - 0 | L5x5x5/16 | 26.50 | 12.99 | 100.4 | 2.0674 | 17665.10 | 100787.00 | 0.175 [1] |

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

## Top Girt Design Data (Tension)

| 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 | 188 - 180 | L1 3/4x1 3/4x3/16 | 6.58 | 6.07 | 141.7 | 0.3604 | 653.47 | 15675.30 | 0.042 [1] |
| T2 | 180 - 160 | L1 3/4x1 3/4x3/16 | 6.58 | 6.07 | 141.7 | 0.3604 | 100.01 | 15675.30 | 0.006 [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 | 188 - 180 | Leg | ROHN 2.5 STD | 2 | -6735.39 | 63560.30 | 10.6 | Pass |
| T2 | 180 - 160 | Leg | ROHN 2.5 STD | 20 | -29047.40 | 57138.60 | 50.8 | Pass |
| T3 | 160 - 140 | Leg | ROHN 3 EH | 51 | -63678.30 | 94337.20 | 67.5 | Pass |
| T4 | 140 - 120 | Leg | ROHN 4 EH | 72 | -107244.00 | 159899.00 | 67.1 | Pass |
| T5 | 120 - 100 | Leg | ROHN 5 EH | 92 | -157930.00 | 239378.00 | 66.0 | Pass |
| T6 | 100 - 80 | Leg | ROHN 6 EHS | 113 | -204008.00 | 244047.00 | 83.6 | Pass |
| T7 | 80 - 60 | Leg | ROHN 6 EH | 128 | -255613.00 | 303757.00 | 84.2 | Pass |
| T8 | 60 - 40 | Leg | ROHN 8 EHS | 143 | -305314.00 | 386354.00 | 79.0 | Pass |
| T9 | 40 - 20 | Leg | ROHN 8 EH | 158 | -356827.00 | 505573.00 | 70.6 | Pass |
| T10 | 20 - 0 | Leg | ROHN 8 EH | 173 | -408728.00 | 505555.00 | 80.8 | Pass |

| Section No. | Elevation ft | Component Type | Size | Critical Element | P lb | $øP_{allow}$ lb | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| T1 | 188 - 180 | Diagonal | L1 3/4x1 3/4x3/16 | 7 | -1832.58 | 8852.42 | 20.7 | Pass |
| T2 | 180 - 160 | Diagonal | L1 3/4x1 3/4x3/16 | 25 | -4306.13 | 5178.87 | 83.1 | Pass |
| T3 | 160 - 140 | Diagonal | L2 1/2x2 1/2x1/4 | 54 | -6738.15 | 12430.90 | 54.2 | Pass |
| T4 | 140 - 120 | Diagonal | L3x3x1/4 | 75 | -9412.07 | 16694.30 | 56.4 | Pass |
| T5 | 120 - 100 | Diagonal | L3x3x1/4 | 97 | -11149.80 | 13139.10 | 84.9 | Pass |
| T6 | 100 - 80 | Diagonal | L3 1/2x3 1/2x1/4 | 118 | -13312.00 | 14326.20 | 92.9 | Pass |
| T7 | 80 - 60 | Diagonal | L4x4x5/16 | 133 | -14849.30 | 22264.80 | 66.7 | Pass |
| T8 | 60 - 40 | Diagonal | L4x4x5/16 | 148 | -14678.00 | 18769.30 | 78.2 | Pass |
| T9 | 40 - 20 | Diagonal | L5x5x5/16 | 163 | -17471.20 | 32278.00 | 54.1 | Pass |
| T10 | 20 - 0 | Diagonal | L5x5x5/16 | 175 | -18205.90 | 27848.90 | 65.4 | Pass |
| T1 | 188 - 180 | Top Girt | L1 3/4x1 3/4x3/16 | 5 | -677.46 | 3119.90 | 21.7 | Pass |
| T2 | 180 - 160 | Top Girt | L1 3/4x1 3/4x3/16 | 24 | -119.47 | 3119.90 | 3.8 | Pass |
| | | | | | | | Summary | |
| | | | | | | Leg (T7) | 84.2 | Pass |
| | | | | | | Diagonal (T6) | 92.9 | Pass |
| | | | | | | Top Girt (T1) | 21.7 | Pass |
| | | | | | | Bolt Checks | 87.8 | Pass |
| | | | | | | RATING = | 92.9 | Pass |

# APPENDIX C

# TOWER MODIFICATION DETAILS

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: CT03XC090

Balch Tower
236 South Main Street
East Windsor, CT 06088

**September 27, 2013**

**EBI Project Number: 69130121**

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

EBI Consulting
environmental | engineering | due diligence

September 27, 2013

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

Re: Emissions Values for Site: **CT03XC090 – Balch Tower**

EBI Consulting was directed to analyze the proposed upgrades to the existing Sprint facility located at 236 South Main Street, East Windsor, 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.

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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 236 South Main Street, East Windsor, 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 antennas used in this modeling are the RFS APXVSPP18-C-A20 and the RFS APXV9ERR18-C-A20. This is based on feedback from the carrier with regards to anticipated antenna selection. The RFS APXVSPP18-C-A20 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. The RFS APXV9ERR18-C-A20 has a 14.9 dBd gain value at its main lobe at 1900 MHz and 11.9 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 **123 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 | CT03XC090 - Baich Tower |
| Site Addresss | 236 South Main Street, East Windsor, CT, 06088 |
| Site Type | Self Support 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 | Cable Size | Cable Loss (dB) | Additional Loss | ERP | Power Density Value | Power Density Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1a | RFS | APXV9ERR18-C | RRH | 1900 MHz | CDMA / LTE | 20 | 3 | 60 | 14.9 | 123 | 117 | 1/2 " | 0.5 | 0 | 1652.5372 | 43.39958 | 4.33996% |
| 1a | RFS | APXV9ERR18-C | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 11.9 | 123 | 117 | 1/2 " | 0.5 | 0 | 276.07685 | 7.250438 | 1.27874% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 5.619% |

**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 | 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 | 123 | 117 | 1/2 " | 0.5 | 0 | 2080.4211 | 54.63683 | 5.46368% |
| 2a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 123 | 117 | 1/2 " | 0.5 | 0 | 389.96892 | 10.24152 | 1.80626% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 7.270% |

**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 | Cable Size | Cable Loss (dB) | Additional Loss | ERP | Power Density Value | Power Density Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3a | RFS | APXV9ERR18-C | RRH | 1900 MHz | CDMA / LTE | 20 | 3 | 60 | 14.9 | 123 | 117 | 1/2 " | 0.5 | 0 | 1652.5372 | 43.39958 | 4.33996% |
| 3a | RFS | APXV9ERR18-C | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 11.9 | 123 | 117 | 1/2 " | 0.5 | 0 | 276.07685 | 7.250438 | 1.27874% |
| | | | | | | | | | | | | | | | Sector total Power Density Value: | | 5.619% |

**Site Composite MPE %**

| Carrier | MPE % |
|---|---|
| Sprint | 18.507% |
| Nextel | 2.270% |
| Town | 1.680% |
| T-Mobile | 3.640% |
| MetroPCS | 3.880% |
| Verizon Wireless | 11.360% |
| AT&T | 15.200% |
| **Total Site MPE %** | **56.537%** |

## 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 **18.507% (5.619% each from sectors 1 and 3 and 7.270% from sector 3)** 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 **56.537%** 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

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