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


**VIA ELECTRONIC MAIL**

May 29, 2018

Paul F. Sagristano
Cherundolo Consulting
4 Davis Road West, Suite 5
Old Lyme, CT 06371

RE: **EM-SPRINT-028-180517** - Sprint Spectrum Realty Company, L.P. notice of intent to modify an existing telecommunications facility located at 600 Old Hartford Rd, Colchester, Connecticut.

Dear Mr. Sagristano:

The Connecticut Siting Council (Council) is in receipt of your email correspondence of May 24, 2018 submitted in response to the Council's May 22, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MB/FOC/jmb

**From:** Paul Sagristano [mailto:psagristano@lrivassoc.com]
**Sent:** Thursday, May 24, 2018 4:18 PM
**To:** Cunliffe, Fred <Fred.Cunliffe@ct.gov>
**Cc:** CSC-DL Siting Council <Siting.Council@ct.gov>
**Subject:** RE: Council Incomplete Letter for EM-SPRINT-028-180517-OldHartfordRd-Colchester

Fred: Attached please find the Mount analysis as requested by CSC in the incomplete letter. Please advise if this is sufficient to continue the CSC review/approval of this site. Thank you!

Best,

Paul F. Sagristano
917-841-0247

MASER CONSULTING
— CONNECTICUT —



# Antenna Mount Analysis

FOR

## CT33XC576 – North Colchester

DO Macro Project
600 Old Hartford Road
Colchester, CT 06415
New London County

**Mount Utilization: 84.6%**

May 24, 2018

*Prepared For*

Sprint
201 State Route 17 North
Rutherford, NJ 07070

*Prepared By*

Maser Consulting Connecticut
331 Newman Springs Road, Suite 203
Redbank, NJ 07701
T: 732.383.1950

Petros E. Tsoukalas. P.E.
Geographic Discipline Leader
Connecticut License No. PEN.32577

MC Project No. 17924006A

## Objective:

The objective of this report is to determine the capacity of the existing antenna support mount at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards.

## Introduction:

Maser Consulting Connecticut has performed limited field observations on August 30, 2017 to verify the existing condition of the structure and to locate and quantify the existing wireless appurtenances where possible, from ground level. Maser Consulting Connecticut has reviewed the following documents in completing this report:

- Mount Mapping prepared by TEP, dated May 4, 2018.
- RFDS 45854 provided by Sprint, dated April 11, 2017.
- Previous Structural Analysis prepared by Fred A. Nudd Corporation, dated March 20, 214.

The proposed **Sprint** equipment is to be supported on an existing antenna support mount constructed of structural steel antenna support pipes supported by pipes and HSS tubes at a centerline of approximately 180’-0” above ground level. This report is based upon this information, as well as information obtained in the field.

## Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2016 Connecticut State Building Code, Incorporating the 2012 IBC
- Structural Standards for Antenna Supporting Structures and Antennas ANSI/TIA-222-G
    - Ultimate Wind Speed – 130 mph
    - Nominal Wind Speed – 101 mph
    - Exposure Category – C
    - Structural Class – II
    - Topographic Category – 1
    - Ice Wind – 50 mph
    - Ice Thickness – ¾”
- Specification for Structural Steel Buildings ANSI/AISC 360-10, American Institute of Steel Construction (AISC)

Loading used in this analysis is found in Appendix A of this report.

## Analysis Approach & Assumptions:

The analysis approach used in this structural analysis is based on the premise that if the existing antenna support mount is structurally adequate to support the existing and proposed equipment per the aforementioned codes and standards, or if the increase in the forces in the structure is deemed to be negligible or acceptable, then the proposed equipment can be installed as intended.

The existing antenna mount for all sectors has been modeled in RISA-3D, a comprehensive structural analysis program. The program performs design checks of structures under user specified loads. The user specified loads have been calculated separately based on the requirements of the above referenced codes. The program performs an analysis based on the steel code to determine the adequacy of the members and produces the reactions at the connection points of the mounts to the existing structure.

## General Site Design Assumption:

- All engineering services are performed on the basis that the information used is current and correct.
- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes, prior to the proposed modifications listed within this report, if any.
- It is assumed that information provided by the client regarding the structure itself, the antenna models, feed lines, and other relevant information is current and correct.
- It is the responsibility of the client to ensure that the information provided to Maser Consulting Connecticut and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that the original design, material production, fabrication, and erection of the existing structure was performed in accordance with accepted industry design standards and in accordance with all applicable codes. Further, it is assumed that the existing structure and appurtenances have been properly maintained in accordance with all applicable codes and manufacturer's specifications and no structural defects and/or deterioration to the structural members has occurred.
- It is assumed all other existing appurtenances, antennas, cables, etc. belonging to others have been installed and supported per code and per specifications so as not to damage any existing structural support members, and that any contributing loads from adjacent equipment has been taken into consideration for their design.
- All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. Maser Consulting Connecticut is not responsible for the conclusion, opinions, and recommendations made by others based on the information we supply.

## Site Specific Design Parameters:

The following design parameters have been utilized in this report:

- *Structural Steel Angles are constructed of A36 Steel*
- *Structural Steel Pipes are constructed of A53 Grade B Steel*
- *Structural Steel HSS tubes are constructed of A500 Grade B Steel*
- *The proposed antenna shall be mounted on a proposed 8' long 3.0 STD pipe mast in all sectors. The pipe masts will attach to the existing horizontal pipe member via pipe support cross plates (SitePro 1 P/N SP216 or approved equivalent). The pipe mast will be attached 8'-4" from the existing antenna pipe mast.*
- *The proposed RRHs will be mounted behind the proposed antenna on the proposed pipe mast in all sectors.*

## Calculations:

The calculations are found in Appendix A of this report.

## Conclusion:

Maser Consulting Connecticut has determined the existing antenna support mount has **ADEQUATE** structural capacity to support the proposed loading. The existing antenna support mount has been determined to be stressed to a maximum of **84.6%** of its structural capacity with the maximum usage occurring at the HSS support members. Therefore, the proposed **Sprint** installation **CAN** be installed as intended.

The conclusions reached by Maser Consulting Connecticut in this evaluation are only applicable for the existing structural members supporting the proposed **Sprint** telecommunications installation described herein. Further, no structural qualifications are made or implied by this document for the existing structure.

Maser Consulting Connecticut reserves the right to amend this report if additional information about the existing members is provided. The conclusions reached by Maser Consulting Connecticut in this report are only valid for the appurtenances listed in this report. Any change to the installation will require a revision to this structural analysis.

We appreciate the opportunity to be of service on this project. If you should have any questions or require any additional information, please do not hesitate to call our office.

Sincerely,

Maser Consulting Connecticut

Petros E. Tsoukalas, P.E.
Geographic Discipline Leader

Carol Luengas, E.I.T.
Engineer

*R:\Projects\2017\17924000A\17924006A (Temp)\Structural\Mount Analysis\Word\CT33XC576.North Colchester.Mount Analysis.Rev 0.docx*

# APPENDIX A

## 1. LOADING SUMMARY

| Quantity | Manufacturer | Antenna/ Appurtenance | Status | Sector |
|---|---|---|---|---|
| *3* | *RFS* | *APXV9ERR18-C-A20* | *Existing* | *Alpha, Beta, & Gamma* |
| **3** | **COMMSCOPE** | **DT465B-2XR-V2** | **Proposed** | **Alpha, Beta, & Gamma** |
| *3* | *ALCATEL-LUCENT* | *1900 MHz RRH* | *Existing* | *Alpha, Beta, & Gamma* |
| *3* | *ALCATEL-LUCENT* | *800 2x50W* | *Existing* | *Alpha, Beta, & Gamma* |
| **3** | **ALCATEL-LUCENT** | **TD-RRH 8x20** | **Proposed** | **Alpha, Beta, & Gamma** |
| **3** | **ALCATEL-LUCENT** | **800 2x50W** | **Proposed** | **Alpha, Beta, & Gamma** |

**The worst case loading occurs in the Alpha Sector**

| Quantity | Manufacturer | Antenna/ Appurtenance | Status |
|---|---|---|---|
| 1 | RFS | APXV9ERR18-C-A20 | Existing |
| **1** | **COMMSCOPE** | **DT465B-2XR-V2** | **Proposed** |
| 1 | ALCATEL-LUCENT | 1900 MHz RRH | Existing |
| 1 | ALCATEL-LUCENT | 800 2x50W | Existing |
| **1** | **ALCATEL-LUCENT** | **TD-RRH 8x20** | **Proposed** |
| **1** | **ALCATEL-LUCENT** | **800 2x50W** | **Proposed** |

## ANALYSIS AND DESIGN

# I. DESIGN INPUTS

***Calculations for gravity and lateral loading on equipment and support mounts are determined as per the ANSI/TIA-222-G Code, Addendum 2***

## *Wind Load Inputs Parameters*

| | | | | Reference | Equation |
|---|---|---|---|---|---|
| Antenna Centerline | $z$ | 180 | ft | | |
| Ultimate Wind Speed | $V_U$ | 130 | mph | | |
| Normal Wind Speed (3 sec. Gust): | $V$ | 101 | mph | Ref. 1, Eqn. 16-33 | |
| Normal Wind Speed with Ice (3 sec. gust): | $V_i$ | 50.0 | mph | (Figure a5-2a, p. 233) | |
| Service Wind Speed: | $V_s$ | 60.0 | mph | (Figure a5-2a, p. 233) | |
| Design Ice Thickness: | $t_i$ | 0.75 | in | (Figure A1-2a, p. 233) | |
| Exposure Category: | | C | | Ref. 3, Section 2.6.5.1 | |
| Structure Class: | | II | | Ref. 3, Table 2-1 | |
| Gust Effect Factor: | $G_h$ | 0.85 | | Ref. 3, Section 2.6.7 | |
| Wind Directionality Factor: | $K_d$ | 0.85 | | Ref. 3, Table 2-2 | |
| Topographic Category: | | 1 | | Ref. 3, Section 2.6.6.2 | |

## *Wind Load Coefficients*

### *Importance Factors:*

| | | | | | |
|---|---|---|---|---|---|
| Non-Iced: | $I$ | 1 | | Ref. 3, Table 2-3 | |
| Iced: | $I_{ice}$ | 1 | | (Table 2-3, P. 39) | |

### *Exposure Category Coefficients:*

| | | | | | |
|---|---|---|---|---|---|
| 3-s Gust-Speed Power Law Exponent: | $\alpha$ | 9.5 | | Ref. 3, Table 2-4 | |
| Nominal Height of the Atmospheric Boundary Layer: | $Z_g$ | 900 | ft | Ref. 3, Table 2-4 | |
| Min. Value for $k_z$: | $Kz_{min}$ | 0.85 | | Ref. 3, Table 2-4 | |
| Terrain Constant: | $K_e$ | 1.00 | | Ref. 3, Table 2-4 | |
| Velocity Pressure Exposure Coefficient: | $K_z$ | 1.432 | | Ref. 3, Section 2.6.5.2 | $=2.01 \cdot (z/z_g)^{2/\alpha}$ |

### *Topographic Category Coefficients:*

| | | | | | |
|---|---|---|---|---|---|
| Topographic Constant: | $K_t$ | N/A | | Ref. 3, Table 2-5 | |
| Height Attenuation Factor: | $f$ | N/A | | Ref. 3, Table 2-5 | |
| Height Reduction Factor: | $K_h$ | N/A | | Ref. 3, Section 2.6.6.4 | $=e^{(f \cdot z/H)}$ |
| Topographic Factor: | $K_{zt}$ | 1.00 | | Ref.3, Section 2.6.6.4 | $=[1+(K_e \cdot K_t/K_h)]^2$ |

### *Ice Accumulation:*

| | | | | | |
|---|---|---|---|---|---|
| Ice Velocity Pressure Exposure Coefficient: | $K_{iz}$ | 1.18 | | | $=(z/33)^{0.10}$ |
| Factored Ice Thickness: | $t_{iz}$ | 1.78 | in | (Section 2.6.8, p. 16) | $=2.0 \cdot t_i \cdot I \cdot K_{iz} \cdot K_{zt}$ |
| Ice Density: | $\rho_i$ | 56.00 | pcf | | |

### *Design Wind Pressures:*

| | | | | | |
|---|---|---|---|---|---|
| Velocity Pressure: | $q_z$ | 31.60 | psf | Ref. 3, Section 2.6.9.6 | $=0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$ |
| Velocity Pressure (With Ice): | $q_{zi}$ | 7.79 | psf | (Section 2.6.9.6, P. 25) | $=.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_i^2 \cdot I$ |
| Velocity Pressure (Service): | $q_{zs}$ | 11.22 | psf | (Section 2.6.9.6, P. 25) | $=.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_i^2 \cdot I$ |

## II. CALCULATIONS

### ▪ *Wind Load on Appurtenances*

*Dimensions and Force Coefficients*

| Antenna/ Appurtenance | Non-Iced Condition | | | | | | | | Iced Condition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mounting Pipe | | | Equipment | | | | | Mounting Pipe | | | Equipment | | | | |
| | Length (in) | Diameter (in) | Force Coefficient $C_a$ | Height (in) | Width (in) | Depth (in) | Force Coefficient $C_{a\ Front}$ | $C_{a\ Side}$ | Length (in) | Diameter (in) | Force Coefficient $C_a$ | Height (in) | Width (in) | Depth (in) | Force Coefficient $C_{a\ Front}$ | $C_{a\ Side}$ |
| APXV9ERR18-C-A20 | 72.0 | 2.400 | 1.200 | 72.00 | 11.80 | 7.90 | 1.36 | 1.47 | 75.6 | 6.0 | 0.926 | 75.55 | 15.35 | 11.45 | 1.31 | 1.38 |
| DT465B-2XR-V2 | 96.0 | 3.500 | 1.200 | 71.90 | 13.80 | 8.20 | 1.32 | 1.46 | 99.6 | 7.1 | 0.958 | 75.45 | 17.35 | 11.75 | 1.28 | 1.37 |
| 1900 MHz RRH | 0.0 | 0.000 | 0.000 | 25.00 | 12.40 | 12.20 | 1.20 | 1.20 | 0.0 | 0.0 | 0.000 | 28.55 | 15.95 | 15.75 | 1.20 | 1.20 |
| 800 2x50W | 0.0 | 0.000 | 0.000 | 19.00 | 13.00 | 8.61 | 1.20 | 1.20 | 0.0 | 0.0 | 0.000 | 22.55 | 16.55 | 12.16 | 1.20 | 1.20 |
| TD-RRH 8x20 | 0.0 | 0.000 | 0.000 | 26.10 | 18.60 | 6.70 | 1.20 | 1.26 | 0.0 | 0.0 | 0.000 | 29.65 | 22.15 | 10.25 | 1.20 | 1.22 |
| 800 2x50W | 0.0 | 0.000 | 0.000 | 19.00 | 13.00 | 8.61 | 1.20 | 1.20 | 0.0 | 0.0 | 0.000 | 22.55 | 16.55 | 12.16 | 1.20 | 1.20 |

| Antenna/ Appurtenance | # of Brackets | Non-Iced Condition | | | | Iced Condition | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Wind Force (lbs.) $F_N$ | $F_T$ | Controlling Wind Force (lbs.) | Gravity (lbs.) | Wind Force (lbs.) $F_N$ | $F_T$ | Controlling Wind Force (lbs.) | Gravity (lbs.) |
| APXV9ERR18-C-A20 | 2 | 107.8 | 97.4 | **107.8** | **34.8** | 34.9 | 37.1 | **37.1** | **109.2** |
| DT465B-2XR-V2 | 2 | 131.6 | 117.8 | **131.6** | **36.1** | 43.3 | 43.5 | **43.5** | **121.7** |
| 1900 MHz RRH | 1 | 69.4 | 68.3 | **69.4** | **60.0** | 25.1 | 24.8 | **25.1** | **99.1** |
| 800 2x50W | 1 | 55.3 | 36.6 | **55.3** | **53.0** | 20.6 | 15.1 | **20.6** | **70.9** |
| TD-RRH 8x20 | 1 | 108.7 | 41.2 | **108.7** | **70.0** | 36.3 | 17.0 | **36.3** | **115.6** |
| 800 2x50W | 1 | 55.3 | 36.6 | **55.3** | **53.0** | 20.6 | 15.1 | **20.6** | **70.9** |

** ALL CALCULATED LOADS ARE PER MOUNTING BRACKET. TO GET THE TOTAL EQUIPMENT LOAD, MULTIPLY THE INDIVIDUAL LOADS BY THE NUMBER OF BRACKETS*

### ▪ *Wind Load on Framing Members*

| Member Category | Member Shape | Length (in) | Member Surface | Non-Iced Condition | | | Iced Condition | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Exposed Wind Height (in) | Force Coefficient $C_a$ | Wind Load (plf) | Exposed Wind Height (in) | Depth (in) | Length (in) | Force Coefficient $C_a$ | Wind Load (plf) | Ice Weight (plf) |
| Pipe | Pipe 3.5 | 172 | Round | 4.00 | 1.20 | 10.75 | 7.55 | 7.55 | 175.55 | 1.16 | 4.84 | 12.54 |
| Pipe | Pipe 2.0 | 60 | Round | 2.38 | 1.20 | 6.38 | 5.93 | 5.93 | 63.55 | 0.88 | 2.89 | 9.02 |
| Square HSS | HSS 4X4 | 44 | Square | 4.00 | 1.53 | 13.73 | 7.55 | 7.55 | 47.55 | 1.37 | 5.71 | 16.14 |
| Square HSS | HSS 4X4 | 28 | Square | 4.00 | 1.40 | 12.53 | 7.55 | 7.55 | 31.55 | 1.27 | 5.31 | 16.14 |
| Equal Angle | L4x4 | 43 | Square | 4.00 | 1.52 | 13.65 | 7.55 | 7.55 | 46.55 | 1.36 | 5.68 | 16.14 |
| Equal Angle | L2x2 | 17 | Square | 2.00 | 1.45 | 6.49 | 5.55 | 5.55 | 20.55 | 1.25 | 3.84 | 10.00 |
| Grating | | | | | | | | | | | | 18.92171015 |

## BASIC EQUATIONS

**ANSI/TIA-222-G Reference**

Importance Factor: (Table 2-3, Pg. 39)

$$I := \begin{cases} 1.0 & \text{if } Class = \text{"II"} \\ 1.15 & \text{if } Class = \text{"III"} \end{cases}$$

Force Coefficient: (Square) (Table 2-8, P. 42)

$$C_{f\_square}(h,w) := \begin{cases} 1.2 & \text{if } \frac{h}{w} \le 2.5 \\ \left[1.2 + \frac{0.2}{4.5}\cdot\left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[1.4 + \frac{0.6}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 2.0 & \text{otherwise} \end{cases}$$

Force Coefficient: (Round) (Table 2-8, P. 42)

$$C_{f\_round}(h,w) := \begin{cases} 0.7 & \text{if } \frac{h}{w} \le 2.5 \\ \left[0.7 + \frac{0.1}{4.5}\cdot\left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[0.8 + \frac{0.4}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 1.2 & \text{otherwise} \end{cases}$$

Terrain Exposure Constants: (Table 2-4, P. 40)

$$\alpha := \begin{cases} 7.0 & \text{if } Exp = \text{"B"} \\ 9.5 & \text{if } Exp = \text{"C"} \\ 11.5 & \text{if } Exp = \text{"D"} \end{cases} \quad Z_g := \begin{cases} 1200ft & \text{if } Exp = \text{"B"} \\ 900ft & \text{if } Exp = \text{"C"} \\ 700ft & \text{if } Exp = \text{"D"} \end{cases} \quad K_{zmin} := \begin{cases} 0.70 & \text{if } Exp = \text{"B"} \\ 0.85 & \text{if } Exp = \text{"C"} \\ 1.03 & \text{if } Exp = \text{"D"} \end{cases}$$

## BASIC EQUATIONS

**ANSI/TIA-222-G Reference**

Velocity Pressure Coefficient:

$$Kz(z) := \left| \begin{array}{l} K_z \leftarrow \max\left[ 2.01\cdot\left(\frac{z}{Z_g}\right)^{\frac{2}{\alpha}}, K_{zmin} \right] \\ K_z \leftarrow \min(K_z, 2.01) \end{array} \right.$$

$$K_z := Kz(z)$$ Section 2.6.5, P. 13

$$Kzt(z) := K_{zt} \leftarrow \left| \begin{array}{l} 1.0 \ \text{ if } Topo = "1" \\ \text{otherwise} \\ \left| \begin{array}{l} K_e \leftarrow \left| \begin{array}{l} 0.90 \ \text{ if } Exp = "B" \\ 1.00 \ \text{ if } Exp = "C" \\ 1.10 \ \text{ if } Exp = "D" \end{array} \right. \\ K_t \leftarrow \left| \begin{array}{l} 0.43 \ \text{ if } Topo = "2" \\ 0.53 \ \text{ if } Topo = "3" \\ 0.72 \ \text{ if } Topo = "4" \end{array} \right. \\ f \leftarrow \left| \begin{array}{l} 1.25 \ \text{ if } Topo = "2" \\ 2.00 \ \text{ if } Topo = "3" \\ 1.50 \ \text{ if } Topo = "4" \end{array} \right. \\ K_h \leftarrow e^{\left(\frac{f\cdot z}{CH}\right)} \\ \left(1 + \frac{K_e\cdot K_t}{K_h}\right)^2 \end{array} \right. \end{array} \right.$$

Section 2.6.6.4, p. 14

Table 2-4 p. 40

Table 2-5 p. 40

Table 2-5 p. 40

Section 2.6.6.4, P. 14

Section 2.6.6.4, P. 14

$$K_{zt} := Kzt(z)$$

Velocity Pressure: Section 2.6.9.6, P. 25

$$q_z := 0.00256\cdot K_z\cdot K_{zt}\cdot K_d\cdot V^2\cdot I\cdot psf$$

# LOAD EQUATIONS

## WIND LOAD

| | |
|---|---|
| Area (Normal): | $AN_{area} = H_{ant} \cdot Want$ |
| Area (Side): | $AT_{area} = H_{ant} \cdot Dant$ |
| Force Coefficient (Normal): | $C_{fn} = C_{fsquare}(H_{ant}, Want)$ |
| Force Coefficient (Side): | $C_{fs} = C_{fsquare}(H_{ant}, Dant)$ |
| Pipe Area (Normal): | $AN_p = \max[(L_p - H_{ant}) * Dp , 0]$ |
| Pipe Area (Side): | $AT_p = L_p \cdot Dp$ |
| Force Coefficient (Normal): | $C_{fp} = C_{fround}(Lp, Dp)$ |
| Normal Effective Projected Area: | $E_{pan} = (C_{fn} \cdot ANarea) + (Cfp \cdot ANp)$ |
| Side Effective Projected Area: | $E_{pat} = (C_{fs} \cdot ATarea) + (Cfp \cdot ATp)$ |
| Effective Projected Area: | $EPA = max(E_{pan}, Epat)$ |
| Wind Force: | $F_{ant} = q_z \cdot Gh \cdot EPA$ |

## ICE DEAD LOAD

| | |
|---|---|
| Largest Out-to-Out Dimension: | $D_{ant} = \sqrt{D_{ant}{}^2 + W_{ant}{}^2}$ |
| Cross Sectional Area of Ice: | $A_{ice\_ant} = \pi \cdot tiz \cdot (Dant + tiz)$ |
| Total Ice Dead Load: | $DL_{ice\_ant} = \boldsymbol{\rho_i} \cdot (Aice_{\_ant} \cdot Hant)$ |

## ICE WIND LOAD

| | |
|---|---|
| Dimensions: | $H_{i_{ant}} = H_{ant} + 2tiz$ |
| | $W_{i_{ant}} = W_{ant} + 2tiz$ |
| | $D_{i_{ant}} = D_{ant} + 2tiz$ |
| Area (Normal): | $AIN_{area} = H_{i\_ant} \cdot W_{i\_ant}$ |
| Area (Side): | $AIT_{area} = H_{i\_ant} \cdot D_{i\_ant}$ |
| Force Coefficient (Normal): | $Ci_{fn} = C_{fsquare}(H_{i\_ant}, W_{i\_ant})$ |
| Force Coefficient (Side): | $Ci_{fs} = C_{fsquare}(H_{i\_ant}, D_{i\_ant})$ |
| Pipe Area (Normal): | $AN_p = \max[(L_{ip} - H_{i\_ant}) * D_{ip} , 0]$ |
| Pipe Area (Side): | $AT_p = L_{ip} \cdot Dip$ |
| Force Coefficient (Normal): | $C_{fp} = C_{fround}(L_{ip}, D_{ip})$ |
| Normal Effective Projected Area: | $E_{pain} = (Ci_{fn} \cdot ANarea) + (Cfp \cdot ANp)$ |
| Side Effective Projected Area: | $E_{pait} = (Ci_{fs} \cdot ATarea) + (Cfp \cdot ATp)$ |
| Effective Projected Area: | $EPA_i = max(E_{pain}, Epait)$ |
| Wind Force: | $F_{i\_ant} = q_z \cdot Gh \cdot EPAi$ |

## III. ATTACHMENTS

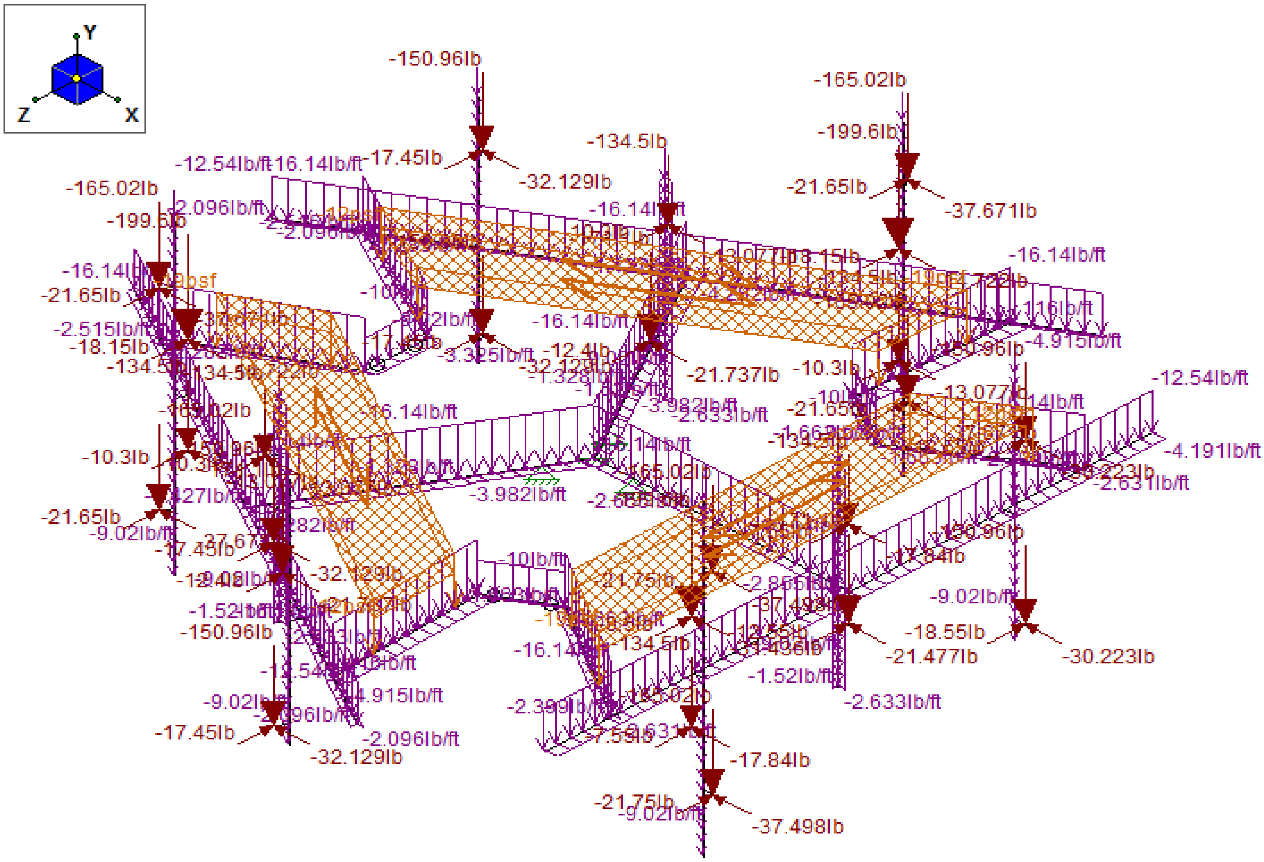
## RISA MODEL

Y
Z
X
Pipe_3.5x0.23 thickness
Pipe_2.0x0.154 thickness
PIPE_3.0
L4x4x4
L2x2x3
HSS4x4x4

MASER CONSULTING
— CONNECTICUT —

| | | | |
|---|---|---|---|
| Client: | Sprint | Computed By: | CL |
| Site Name: | CT33XC576 | Date: | 5/24/2018 |
| Project No. | 17924006A | Verified By: | PET |
| Title: | Antenna Mount Analysis | Page: | 10 |

## RISA WORST CASE LOADING




Loads: LC 22, 1.2D+1.0ICE+1.0W8ICE
Envelope Only Solution

## RISA CODE CHECK