EM-SPRINT-018-131029

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

HPC WIRELESS SERVICES

October 25, 2013

RECEIVED
OCT 29 2013
CONNECTICUT SITING COUNCIL

**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
761 Federal Road, Brookfield, 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 Brookfield.

Sprint plans to modify the existing wireless communications facility owned by the Connecticut Light and Power Company and located at 761 Federal Road, Brookfield (coordinates 41°-28'-43.55" N, 73°-24'-29.86" 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. 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 three (3) CMDA antennas and add three (3) dual-band panel LTE antennas flushed mounted to the existing pipe masts at a centerline height of approximately 110.8' AGL. Sprint will also install six (6) RRHs (remote radio heads) and Notch Filters on proposed steel mounts on the existing Concrete Pad. Sprint will also place DC power and fiber runs along the existing coaxial cable run. The

existing coaxial cables will remain. The proposed modifications will not extend the height of the approximately 90' structure, or 180' AGL.

2. Sprint will replace the two (2) existing cabinets with two (2) similar cabinets, add a third cabinet, and add a Fiber/Power Distribution Box on an H-frame, all on the existing Concrete Equipment Pad. The existing GPS antenna 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 power density of approximately 20.424%; the combined site operations will result in a total power density of approximately 52.584%.

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.

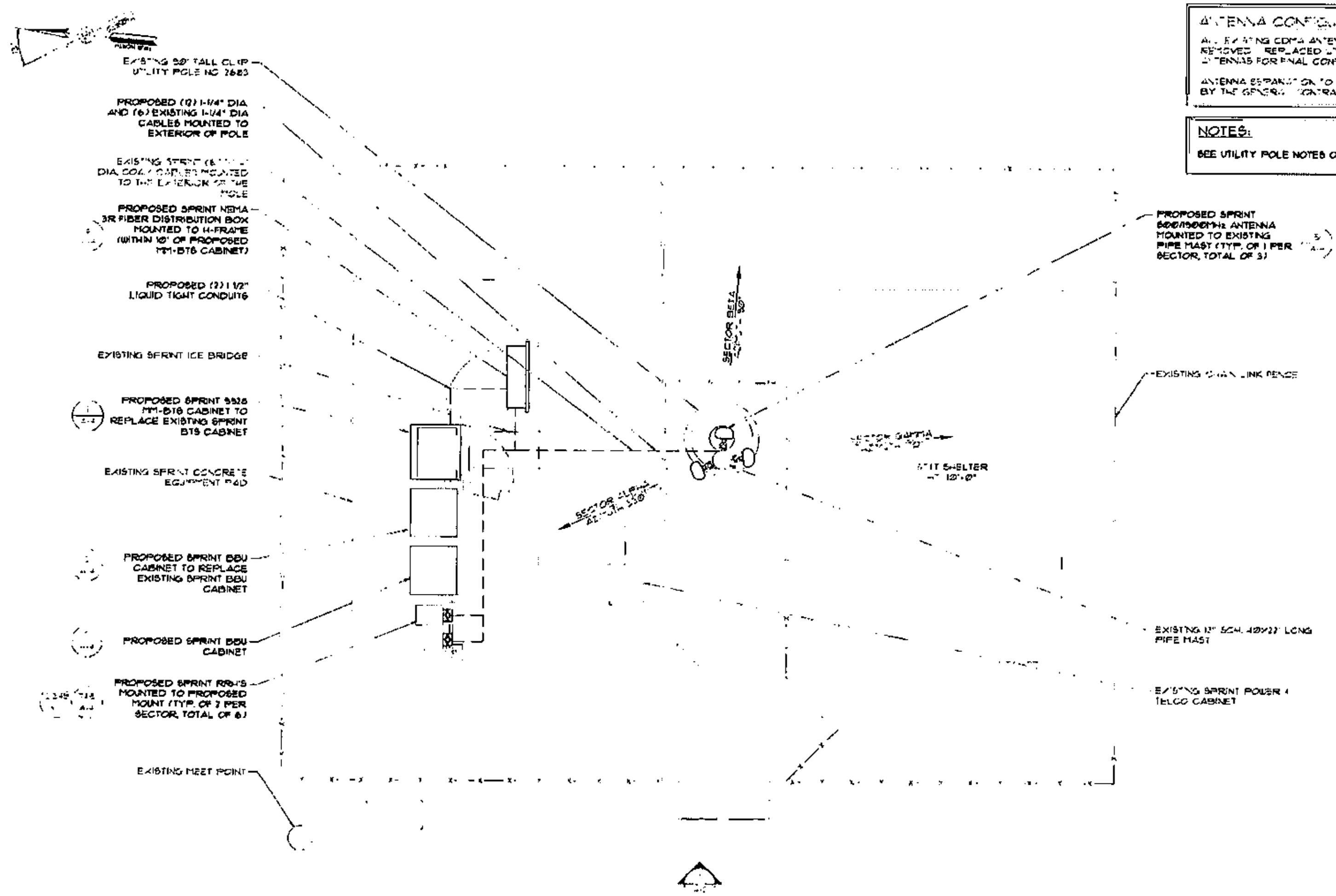
Respectfully yours,

Melanie J. Howlett

Melanie J. Howlett

Attachments

cc: Honorable William R. Davidson, First Selectman, Town of Brookfield
State of Connecticut (underlying property owner)




ANTENNA CONFIGURATION NOTE

ALL EXISTING CDMA ANTENNAS TO BE REMOVED / REPLACED WITH NETWORK VISION ANTENNAS FOR FINAL CONFIGURATION

ANTENNA ESPANSION TO BE FIELD VERIFIED BY THE GENERAL CONTRACTOR

NOTES:

SEE UTILITY POLE NOTES ON GN-2

COMPOUND PLAN

SCALE: 3/8" = 1'-0"

**Sprint**

1 INTERNATIONAL BLVD, SUITE 800
MAHWAH, NJ 07495
P: 800-357-7641

**Alcatel·Lucent**

600-700 MOUNTAIN AVE
MURRAY HILL, NJ 07974

**Sa Salient ARCHITECTS, LLC**

New Jersey Office:
8 East Palisade Avenue
Englewood, NJ 07631
P: 201-567-0032 · F: 201-567-8556

STATE OF CONNECTICUT PAUL M. GIONFRIDDO LICENSED



SUBMITTALS

| NO | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 3/2/12 | PRELIMINARY | |
| 2 | [illegible] | REVISED PER COMMENTS | JUP |
| 3 | [illegible] | STRUCTURAL REVIEW | FB |
| 4 | 06/06/13 | ISSUED AS FINAL | ADM/AS |

SITE NUMBER:
CT54XC713

SITE NAME:
CL&P POLE # 2683 - BROOKFIELD

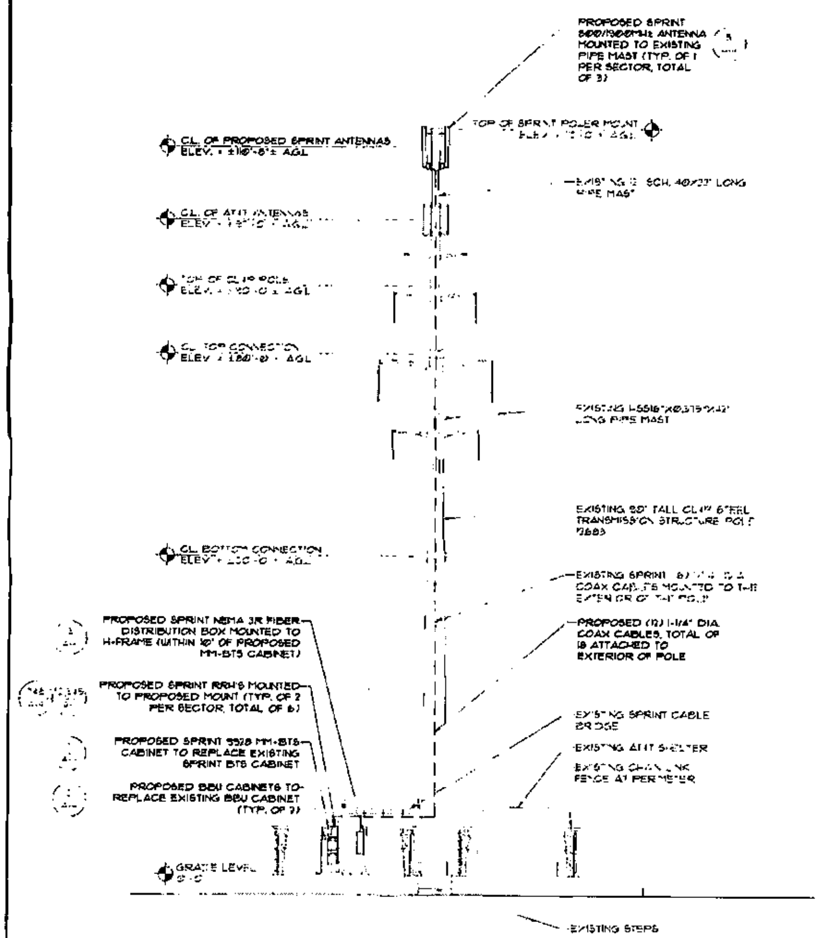
SITE ADDRESS:
761 FEDERAL ROAD
BROOKFIELD, CT 06804

SHEET TITLE:
COMPOUND PLAN

SALIENT PROJ. NO.: CT54XC713
SHEET NO.: A-1
DATE:
CHECKED BY: ADC

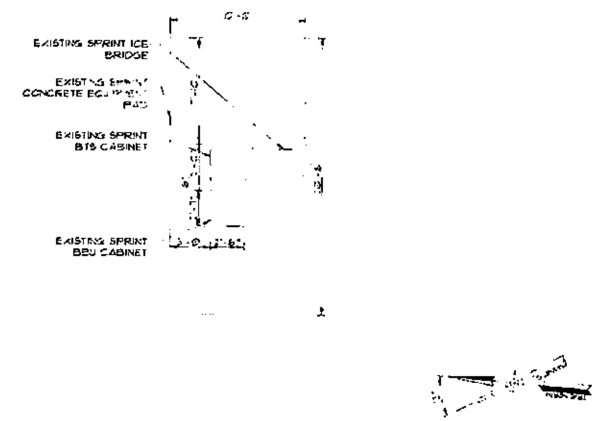
ANTENNA CONFIGURATION NOTE:
ALL EXISTING CDMA ANTENNAS TO BE REMOVED / REPLACED WITH NETWORK VISION ANTENNAS FOR FINAL CONFIGURATION
ANTENNA SEPARATION TO BE FIELD VERIFIED BY THE GENERAL CONTRACTOR

**NOTE:**
SEE UTILITY POLE NOTES ON GN-2

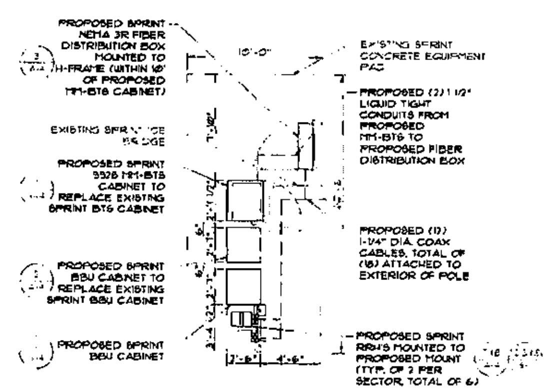



1 ELEVATION
SCALE = 1/8" = 1'-0"

EXISTING EQUIPMENT LAYOUT




FINAL EQUIPMENT LAYOUT




2 ENLARGED EQUIPMENT CABINET LAYOUT
SCALE = 1/4" = 1'-0"

**Sprint**

1 INTERNATIONAL BLVD, SUITE 800
MAHWAH, NJ 07495
P: 800-357-7641

**Alcatel·Lucent**

600-700 MOUNTAIN AVE
MURRAY HILL, NJ 07974

**Sa Salient ARCHITECTS, LLC**

New Jersey Office:
8 East Palisade Avenue
Englewood, NJ 07631
P: 201-567-0032 — F: 201-567-9550

PAUL ... P.E.



DRAWING SCALES ARE INTENDED FOR 24"x36" SIZE PRINTED MEDIA ONLY. ALL OTHER PRINTED SIZES ARE DEEMED "NOT TO SCALE"

SUBMITTALS

| NO | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 5/2/12 | PRELIMINARY | |
| 2 | 6/4/12 | REVISED PER COMMENTS | JMP |
| 3 | 10/9/12 | STRUCTURAL REVIEW | PS |
| 4 | 04/09/13 | ISSUED AS FINAL | ADNAS |
| | | | |
| | | | |
| | | | |

SITE NUMBER
CT54XC713

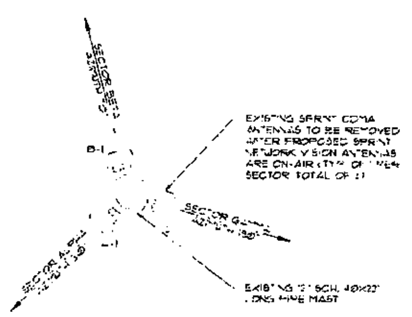
SITE NAME
CL&P POLE # 2683 - BROOKFIELD

SITE ADDRESS
161 FEDERAL ROAD
BROOKFIELD, CT 06804

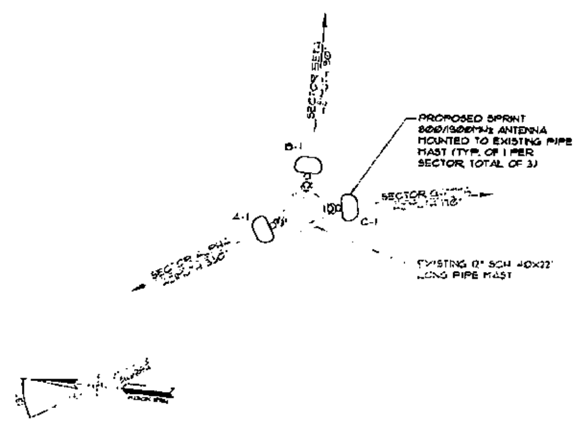
SHEET TITLE
ELEVATION & ENLARGED EQUIPMENT CABINET LAYOUT

SALIENT PROJ. NO: CT54XC713
DATE:
CHECKED BY: ADC
SHEET NO: A-2

EXISTING ANTENNA PLAN




FINAL ANTENNA PLAN




ANTENNA SCENARIO

SCALE : N.T.S.

**ALPHA**

| POSITION | ANTENNA STATUS | FREQUENCY (MHZ) | ANTENNA MAKE | ANTENNA MODEL | AZIMUTHS EXISTING (FOR REFERENCE) | AZIMUTHS PROPOSED | MECHANICAL DOWN TILT | ELECTRICAL DOWN TILT | RAD CENTER (AGL) | *COAX CABLE LENGTH (FT) | RRH MODEL | TOP/BOTTOM COAX JUMPER SIZE (IN) | *TOP/BOTTOM COAX JUMPER LENGTH (FT) | COAX CABLE MODEL | TOP/BOTTOM COAX JUMPER MAKE | TOP/BOTTOM COAX JUMPER MODEL | COMBINER | *COMBINER JUMPER LENGTH (FT) | ANTENNA COLOR CODING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | PROPOSED | 800/1900 | RFS | APXV9PP18-C-A20 | 310° | 330° | 0° | -2° | 110'-8" | 105 | (1) 800 MHz 2x50W | 1/2 | 10 | LCF158-50JA-A | RFS | (2) LCF12-50J | -- | -- | TBD |
| | | | | | | | 0° | 0° | | | (1) 1900 4X45 65MHz | 1/2 | 10 | LCF158-50JA-A | RFS | (4) LCF12-50J | -- | -- | |

**BETA**

| POSITION | ANTENNA STATUS | FREQUENCY (MHZ) | ANTENNA MAKE | ANTENNA MODEL | AZIMUTHS EXISTING (FOR REFERENCE) | AZIMUTHS PROPOSED | MECHANICAL DOWN TILT | ELECTRICAL DOWN TILT | RAD CENTER (AGL) | *COAX CABLE LENGTH (FT) | RRH MODEL | TOP/BOTTOM COAX JUMPER SIZE (IN) | *TOP/BOTTOM COAX JUMPER LENGTH (FT) | COAX CABLE MODEL | TOP/BOTTOM COAX JUMPER MAKE | TOP/BOTTOM COAX JUMPER MODEL | COMBINER | *COMBINER JUMPER LENGTH (FT) | ANTENNA COLOR CODING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | PROPOSED | 800/1900 | RFS | APXV9ERR18-C-A20 | 70° | 90° | 0° | -8° | 110'-8" | 105 | (1) 800 MHz 2x50W | 1/2 | 10 | LCF158-50JA-A | RFS | (2) LCF12-50J | -- | -- | TBD |
| | | | | | | | 0° | 0° | | | (1) 1900 4X45 65MHz | 1/2 | 10 | LCF158-50JA-A | RFS | (4) LCF12-50J | -- | -- | |

**GAMMA**

| POSITION | ANTENNA STATUS | FREQUENCY (MHZ) | ANTENNA MAKE | ANTENNA MODEL | AZIMUTHS EXISTING (FOR REFERENCE) | AZIMUTHS PROPOSED | MECHANICAL DOWN TILT | ELECTRICAL DOWN TILT | RAD CENTER (AGL) | *COAX CABLE LENGTH (FT) | RRH MODEL | TOP/BOTTOM COAX JUMPER SIZE (IN) | *TOP/BOTTOM COAX JUMPER LENGTH (FT) | COAX CABLE MODEL | TOP/BOTTOM COAX JUMPER MAKE | TOP/BOTTOM COAX JUMPER MODEL | COMBINER | *COMBINER JUMPER LENGTH (FT) | ANTENNA COLOR CODING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C-1 | PROPOSED | 800/1900 | RFS | APXV9PP18-C-A20 | 190° | 110° | 0° | 0° | 110'-8" | 105 | (1) 800 MHz 2x50W | 1/2 | 10 | LCF158-50JA-A | RFS | (2) LCF12-50J | -- | -- | TBD |
| | | | | | | | 0° | 0° | | | (1) 1900 4X45 65MHz | 1/2 | 10 | LCF158-50JA-A | RFS | (4) LCF12-50J | -- | -- | |

* CONTRACTOR TO FIELD VERIFY ALL CABLE/JUMPER LENGTHS AGAINST CURRENT BOM.

RF SYSTEM SCHEDULE

SCALE : N.T.S.

**Sprint**

1 INTERNATIONAL BLVD, SUITE 800
MAHWAH, NJ 07495
P: 800-357-7641

**Alcatel·Lucent**

600-700 MOUNTAIN AVE
MURRAY HILL, NJ 07974

**Sa Salient ARCHITECTS, LLC**

New Jersey Office,
8 East Palisade Avenue
Englewood, NJ 07631
P 201-567-0032 – F 201-567-9556



DRAWING SCALES ARE INTENDED FOR 24"x36" SIZE PRINTED MEDIA ONLY. ALL OTHER PRINTED SIZES ARE DEEMED "NOT TO SCALE".

SUBMITTALS

| NO | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 5/2/12 | PRELIMINARY | |
| 2 | 8/4/12 | REVISED PER COMMENTS | JAP |
| 3 | 10/5/12 | STRUCTURAL REVIEW | JG |
| 4 | 05/06/13 | ISSUED AS FINAL | ADM/AG |

SITE NUMBER: CT54XC713

SITE NAME: CL&P POLE * 2683 - BROOKFIELD

SITE ADDRESS: 761 FEDERAL ROAD BROOKFIELD, CT 06804

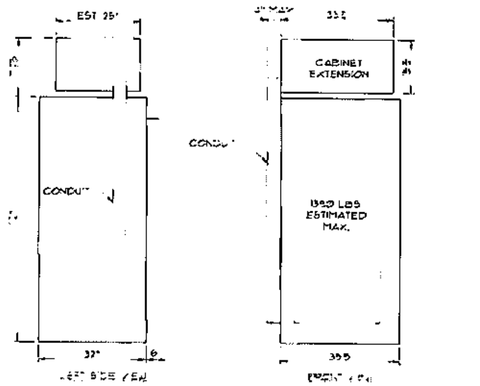
SHEET TITLE: ANTENNA SCENARIO AND RF SYSTEM SCHEDULE

SALIENT PROJ NO: CT54XC713

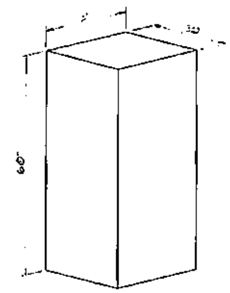
DATE:

CHECKED BY: ADC

SHEET NO. A-3

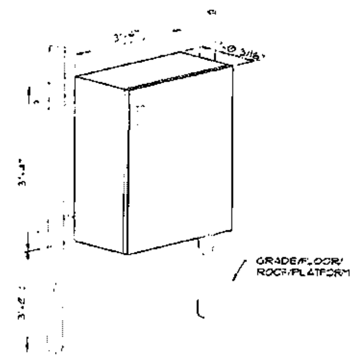



1 [illegible] OUTDOOR CABINET
SCALE = NTS.

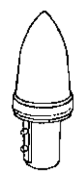



WEIGHT WITH BATTERIES = 1675 LBS

2 [illegible] CABINET
SCALE = NTS



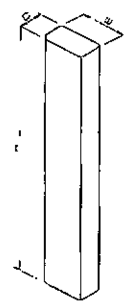

3 FIBER DISTRIBUTION BOX
SCALE = NTS



| ANTENNA SPECIFICATIONS | | |
|---|---|---|
| MODEL NO. | DIMENSIONS | WEIGHT |
| GPS [illegible] 26N | [illegible] | [illegible] LBS |

*ALL MOUNTING OPTIONS FIT PIPES OF 1"-1.45" MAX. DIA

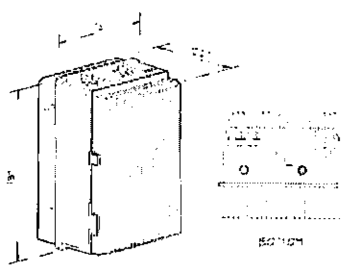
4 GPS ANTENNA
SCALE = NTS



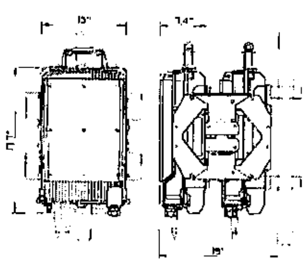
| ANTENNA SPECIFICATIONS | | |
|---|---|---|
| MODEL NO. | DIMENSIONS (HxWxD) | WEIGHT W/O MOUNTING HARDWARE |
| [illegible] | [illegible] | [illegible] LBS |
| APX [illegible] | [illegible] | [illegible] LBS |

5 [illegible] ANTENNA
SCALE = NTS

6 NOT USED
SCALE = NTS.




7 [illegible]
SCALE = NTS.




8 [illegible]
SCALE = NTS

9 NOT USED
SCALE = NTS

Sprint
1 INTERNATIONAL BLVD, SUITE 800
MAHWAH, NJ 07495
P: 800-357-7641

Alcatel·Lucent
600-700 MOUNTAIN AVE
MURRAY HILL, NJ 07974

Sa Salient ARCHITECTS, LLC
New Jersey Office
8 East Palisade Avenue
Englewood, NJ 07631
P: 201-567-0032 · F: 201-567-0566

STATE OF CONNECTICUT [illegible]



SUBMITTALS

| NO | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 3/2/12 | PRELIMINARY | |
| 2 | 8/4/12 | REVISED PER COMMENTS | AJP |
| 3 | 10/5/12 | STRUCTURAL REVIEW | FA |
| 4 | 06/06/13 | ISSUED AS FINAL | ADC/AAS |

SITE NUMBER:
CT54XC713
SITE NAME:
CL&P POLE #2683 - BROOKFIELD
SITE ADDRESS:
761 FEDERAL ROAD
BROOKFIELD, CT 06804

SHEET TITLE
TYPICAL DETAILS

| SALIENT PROJ. NO | SHEET NO |
|---|---|
| CT54XC713 | A-4 |
| DATE: | |
| CHECKED BY ADC | |

Northeast
Utilities System

107 Selden Street, Berlin, CT 06037

Northeast Utilities Service Company
P.O. Box 270
Hartford, CT 06141-0270
(203) 665-5000

October 4, 2013

Ms. Jennifer Gaudet
HPC Development

Sprint,
1 International Blvd.
Suite 300
Mahwah NJ
07495

RE: Sprint Antenna Site, CT-03XC329, 63-69 Myrtle Ave., Stamford CT, structure 1217

Dear Ms. Gaudet:

Based on the structural review letter dated August 27, 2013 provided by Centek Engineering stating that the proposed structural loading has not increased when compared to the original structural modification report dated July 10, 2013; we have reviewed for acceptance this modification.

Since there are no outstanding structural or site related issues to resolve at this time, construction at these locations may begin as soon as scheduling allows. You may contact Mr. O'Brien (860-665-6987); once the lease issues are secured you may then contact Mr. John Landry directly (860-665-5425) to begin the construction arrangements

Sincerely,

Robert Gray
Transmission Line Engineering

REF: 12047.CO2 - CT03XC329-Stamford.pdf
12047.002 CT03XC329 - Antenna Upgrade Compliance Letter.pdf
NV_CT03XC329_Issued as Final CDs.pdf

CENTEK engineering

Centered on Solutions℠

# Structural Analysis of PCS Mast and CL&P Pole

Sprint Site Ref: CT54XC713

CL&P Structure No. 2683
90' Electric Transmission Pole

761 Federal Road
Brookfield, CT

CENTEK Project No. 12047.CO13

Date: April 18, 2013

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 18694
LICENSED
PROFESSIONAL ENGINEER

**Prepared for:**
*Sprint Nextel*
*8 Airline Drive, Suite 105*
*Albany, NY 12205*

# Table of Contents

## Introduction

The purpose of this report is to analyze the existing mast and 90' CL&P pole located at 761 Federal Road in Brookfield, CT for the proposed antenna and equipment upgrade by Sprint.

The existing/proposed loads consist of the following:

- AT&T (Existing to Remain):

  Antennas: Three (3) Powerwave 7770 panel antennas, three (3) Powerwave P65-16-XLH-RR panel antennas, three (3) Powerwave TTAW-07BP111-001 TMAs and six (6) Powerwave LGP-21401 TMAs mounted on dual standoff mounts to the existing mast with a RAD center elevation of 97-ft above grade level.
  Coax Cables: Fifteen (15) 1-1/4" ∅ coax cables running on the exterior of the CL&P pole.

- SPRINT (Existing to Remain):

  Coax Cables: Six (6) 1-1/4" ∅ coax cables running on the exterior of the CL&P pole and pcs mast.
  Mast: 12" Sch. 40 x 22' long pipe flange connected to a HSS16"x0.375" x 42' long pipe.

- SPRINT (Existing to Remove):

  Antennas: Three (3) EMS RR90-17-00DP panel antennas flush mounted on the existing mast with a RAD center elevation of 110-ft-8-in above grade level.

- **SPRINT (Proposed):**

  **Antennas: Three (3) RFS APXVSPP18-C panel antennas panel antennas flush mounted on the existing mast with a RAD center elevation of 110-ft-8-in above grade level.**
  **Coax Cables: Twelve (12) 1-1/4" ∅ coax cables running on the exterior of the CL&P pole and pcs mast.**

## Primary assumptions used in the analysis

- Allowable steel stresses are defined by AISC-ASD 9th edition for design of the PCS Mast and antenna supporting elements.
- ASCE Manual No. 72, "Design of Steel Transmission Pole Structures Second Edition", defines allowable steel stresses for evaluation of the CL&P utility pole.
- All utility pole members are adequately protected to prevent corrosion of steel members.
- All proposed antenna mounts are modeled as listed above.
- Pipe mast will be properly installed and maintained.
- No residual stresses exist due to incorrect pole erection.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds conform to the requirements of AWS D1.1.
- Pipe mast and utility pole will be in plumb condition.
- Utility pole was properly installed and maintained and all members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
- Any deviation from the analyzed loading will require a new analysis for verification of structural adequacy.

## Analysis

Structural analysis of the existing *Mast* was independently completed using the current version of RISA-3D computer program licensed to CENTEK Engineering, Inc.

The existing mast consisting of a 12" Sch. 40 x 22' long pipe conforming to ASTM A53 Grade B (Fy = 35ksi) flange connected to a HSS16"x0.375" x 42' long pipe conforming to ASTM A500 Grade B (Fy = 42ksi) connected at two points to the existing pole was analyzed for its ability to resist loads prescribed by the TIA/EIA standard. Section 5 of this report details these gravity and lateral wind loads. NESC prescribed loads were also applied to the mast in order to obtain reactions needed for analyzing the CL&P pole structure. These loads are developed in Section 7 of this report. Load cases and combinations used in RISA-3D for TIA/EIA loading and for NESC/NU loading are listed in report Sections 6 and 8, respectively.

An envelope solution was first made to determine maximum and minimum forces, stresses, and deflections to confirm the selected section as adequate. Additional analyses were then made to determine the NESC forces to be applied to the CL&P pole structure.

The RISA-3D program contains a library of all AISC shapes and corresponding section properties are computed and applied directly within the program. The program's Steel Code Check option was also utilized. The forces calculated in RISA-3D using NESC guidelines were then applied to the CL&P pole using PLS-Pole. Maximum usage for the pole was calculated considering the additional forces from the mast and associated appurtenances.

## Design Basis

Our analysis was performed in accordance with TIA/EIA-222-F-1996, ASCE Manual No. 72 – "Design of Steel Transmission Pole Structures Second Edition", NESC C2-2007 and Northeast Utilities Design Criteria.

The CL&P pole structure, considering existing and future conductor and shield wire loading, with the pcs antenna mast was analyzed under two conditions:

- UTILITY POLE ANALYSIS

  The purpose of this analysis is to determine the adequacy of the existing utility pole to support the proposed antenna loads. The loading and design requirements were analyzed in accordance with the NU Design Criteria Table, NESC C2-2007 ~ Construction Grade B, and ASCE Manual No. 72.

  Load cases considered:

  Load Case 1: NESC Heavy
  Wind Pressure.................................... 4.0 psf
  Radial Ice Thickness............................ 0.5"
  Vertical Overload Capacity Factor............ 1.50
  Wind Overload Capacity Factor................ 2.50
  Wire Tension Overload Capacity Factor...... 1.65

  Load Case 2: NESC Extreme
  Wind Speed....................................... 100 mph (1)
  Radial Ice Thickness............................ 0"

  *Note 1: NESC C2-2007, Section25, Rule 250C: Extreme Wind Loading, 1.25 x Gust Response Factor (wind speed: 3-second gust)*

- MAST ASSEMBLY ANALYSIS

Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the NU Design Criteria Table, TIA/EIA-222-F, and AISC-ASD standards.

Load cases considered:

Load Case 1:
Wind Speed.......................................... 85 mph [2]
Radial Ice Thickness............................. 0"

Load Case 2:
Wind Pressure....................................... 75% of 85 mph wind pressure
Radial Ice Thickness............................. 0.5"

*Note 2: Per NU Mast Design Criteria Exception 1.*

## Results

- MAST ASSEMBLY

The existing mast was determined to be structurally **adequate**.

| Member | Stress Ratio (% of capacity) | Result |
|---|---|---|
| 12" Sch. 40 pipe x 22-ft long | 67.7% | **PASS** |
| HSS 16"x0.375" pipe x 42-ft long | 79.4% | **PASS** |
| 5/8" ∅ ASTM A325 Bolt | 42.6% [1] | **PASS** |

Note 1 – 1/3 increase in allowable stress not used per OTRM 059.

- UTILITY POLE

This analysis finds that the subject utility pole is adequate to support the proposed antenna mast and related appurtenances. The pole stresses meet the requirements set forth by the ASCE Manual No. 72, "Design of Steel Transmission Pole Structures Second Edition", for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

A maximum usage of **70.57%** occurs in the utility pole under the **NESC Heavy** loading condition.

POLE SECTION:

The utility pole was found to be within allowable limits.

| Tower Section | Elevation | Stress Ratio (% of capacity) | Result |
|---|---|---|---|
| Tube Number 3 | 0'-20.67' (AGL) | 70.57% | **PASS** |

BASE PLATE:
The base plate was found to be within allowable limits from the PLS output based on 10 bend lines.

| Tower Component | Design Limit | Stress Ratio (percentage of capacity) | Result |
|---|---|---|---|
| Base Plate | Bending | 58.15% | **PASS** |

- FOUNDATION AND ANCHORS

The existing foundation consists of a 10-ft square x 9-ft long reinforced concrete pier with (16) rock anchors. The base of the tower is connected to the foundation by means of (12) 2.25"Ø, ASTM A615-75 anchor bolts embedded approximately 8-ft into the concrete foundation structure. Foundation information was obtained from NUSCO drawing # 01039-60001.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

BASE REACTIONS:

From PLS-Pole analysis of CL&P pole based on NESC/NU prescribed loads.

| Load Case | Shear | Axial | Moment |
|---|---|---|---|
| NESC Heavy Wind | 24.81 kips | 50.88 kips | 1892.67 ft-kips |
| NESC Extreme Wind | 26.69 kips | 24.93 kips | 1911.26 ft-kips |

Note 1 – 10% increase applied to tower base reactions per OTRM 051

ANCHOR BOLTS:

The anchor bolts were found to be within allowable limits.

| Tower Component | Design Limit | Stress Ratio (% of capacity) | Result |
|---|---|---|---|
| Anchor Bolts | Tension | 35.27% | **PASS** |

FOUNDATION:

The foundation was found to be within allowable limits.

| Foundation | Design Limit | Allowable Load (1) | Proposed Loading (2) | Result |
|---|---|---|---|---|
| Reinf. Conc. Pier w/ Rock Anchors | OTM(3) | 2973.5 ft-kips | 2102.4 ft-kips | **PASS** |

*Note 1: Allowable Load taken from NUSCO drawing no. 01039-50002.*
*Note 2: 10% increase to PLS base reactions used in foundation analysis per OTRM 051.*
*Note 3: OTM denotes Overturning Moment*

## Conclusions and Recommendations

This analysis shows that the subject utility pole **is adequate** to support the proposed Sprint equipment upgrade.

The analysis is based, in part on the information provided to this office by Northeast Utilities and Sprint. If the existing conditions are different than the information in this report, CENTEK engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT CARLO F. CENTORE No. 16694 LICENSED PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, EIT
Structural Engineer

## STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.

- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or generated by field inspections or measurements of the structure.

- It is the responsibility of the client to ensure that the information provided to CENTEK engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.

- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222.

- All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. CENTEK engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ RISA-3D

RISA-3D Structural Analysis Program is an integrated structural analysis and design software package for buildings, bridges, tower structures, etc.

Modeling Features:

- Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, etc.
- Versatile drawing grids (orthogonal, radial, skewed)
- Universal snaps and object snaps allow drawing without grids
- Versatile general truss generator
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet selection, with locking
- Saved selections to quickly recall desired selections
- Modification tools that modify single items or entire selections
- Real spreadsheets with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and views so you can edit or view any data in the plotted views or in the spreadsheets
- Simultaneous view of multiple spreadsheets
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection libraries
- Import DXF, RISA-2D, STAAD and ProSteel 3D files
- Export DXF, SDNF and ProSteel 3D files

Analysis Features:

- Static analysis and P-Delta effects
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS mode combinations
- Automatic inclusion of mass offset (5% or user defined) for dynamic analysis
- Physical member modeling that does not require members to be broken up at intermediate joints
- State of the art 3 or 4 node plate/shell elements
- High-end automatic mesh generation — draw a polygon with any number of sides to create a mesh of well-formed quadrilateral (NOT triangular) elements.
- Accurate analysis of tapered wide flanges - web, top and bottom flanges may all taper independently
- Automatic rigid diaphragm modeling
- Area loads with one-way or two-way distributions
- Multiple simultaneous moving loads with standard AASHTO loads and custom moving loads for bridges, cranes, etc.
- Torsional warping calculations for stiffness, stress and design
- Automatic Top of Member offset modeling
- Member end releases & rigid end offsets
- Joint master-slave assignments
- Joints detachable from diaphragms
- Enforced joint displacements
- 1-Way members, for tension only bracing, slipping, etc.

- 1-Way springs, for modeling soils and other effects
- Euler members that take compression up to their buckling load, then turn off.
- Stress calculations on any arbitrary shape
- Inactive members, plates, and diaphragms allows you to quickly remove parts of structures from consideration
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members and plates
- Automatic subgrade soil spring generator

Graphics Features:

- Unlimited simultaneous model view windows
- Extraordinary "true to scale" rendering, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamic scrolling stops right where you want
- Plot & print virtually everything with color coding & labeling
- Rotate, zoom, pan, scroll and snap views
- Saved views to quickly restore frequent or desired views
- Full render or wire-frame animations of deflected model and dynamic mode shapes with frame and speed control
- Animation of moving loads with speed control
- High quality customizable graphics printing

Design Features:

- Designs concrete, hot rolled steel, cold formed steel and wood
- ACI 1999/2002, BS 8110-97, CSA A23.3-94, IS456:2000,EC 2-1992 with consistent bar sizes through adjacent spans
- Exact integration of concrete stress distributions using parabolic or rectangular stress blocks
- Concrete beam detailing (Rectangular, T and L)
- Concrete column interaction diagrams
- Steel Design Codes: AISC ASD 9th, LRFD 2nd & 3rd, HSS Specification, CAN/CSA-S16.1-1994 & 2004, BS 5950-1-2000, IS 800-1984, Euro 3-1993 including local shape databases
- AISI 1999 cold formed steel design
- NDS 1991/1997/2001 wood design, including Structural Composite Lumber, multi-ply, full sawn
- Automatic spectra generation for UBC 1997, IBC 2000/2003
- Generation of load combinations: ASCE, UBC, IBC, BOCA, SBC, ACI
- Unbraced lengths for physical members that recognize connecting elements and full lengths of members
- Automatic approximation of K factors
- Tapered wide flange design with either ASD or LRFD codes
- Optimization of member sizes for all materials and all design codes, controlled by standard or user-defined lists of available sizes and criteria such as maximum depths
- Automatic calculation of custom shape properties
- Steel Shapes: AISC, HSS, CAN, ARBED, British, Euro, Indian, Chilean
- Light Gage Shapes: AISI, SSMA, Dale / Incor, Dietrich, MarinoWARE
- Wood Shapes: Complete NDS species/grade database
- Full seamless integration with RISAFoot (Ver 2 or better) for advanced footing design and detailing
- Plate force summation tool

Results Features:

- Graphic presentation of color-coded results and plotted designs
- Color contours of plate stresses and forces with quadratic smoothing, the contours may also be animated
- Spreadsheet results with sorting and filtering of: reactions, member & joint deflections, beam & plate forces/stresses, optimized sizes, code designs, concrete reinforcing, material takeoffs, frequencies and mode shapes
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams that display magnitudes at any dialed location
- Saved solutions quickly restore analysis and design results.

## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ PLS-TOWER

PLS-TOWER is a Microsoft Windows program for the analysis and design of steel latticed towers used in electric power lines or communication facilities. Both self-supporting and guyed towers can be modeled. The program performs design checks of structures under user specified loads. For electric power structures it can also calculate maximum allowable wind and weight spans and interaction diagrams between different ratios of allowable wind and weight spans.

### Modeling Features:

- Powerful graphics module (stress usages shown in different colors)
- Graphical selection of joints and members allows graphical editing and checking
- Towers can be shown as lines, wire frames or can be rendered as 3-d polygon surfaces
- Can extract geometry and connectivity information from a DXF CAD drawing
- CAD design drawings, title blocks, drawing borders or photos can be tied to structure model
- XML based post processor interface
- Steel Detailing Neutral File (SDNF) export to link with detailing packages
- Can link directly to line design program PLS-CADD
- Automatic generation of structure files for PLS-CADD
- Databases of steel angles, rounds, bolts, guys, etc.
- Automatic generation of joints and members by symmetries and interpolations
- Automated mast generation (quickly builds model for towers that have regular repeating sections) via graphical copy/paste
- Steel angles and rounds modeled either as truss, beam or tension-only elements
- Guys are easily handled (can be modeled as exact cable elements)

### Analysis Features:

- Automatic handling of tension-only members
- Automatic distribution of loads in 2-part suspension insulators (v-strings, horizontal vees, etc.)
- Automatic calculation of tower dead, ice, and wind loads as well as drag coefficients according to:
    - ASCE 74-1991
    - NESC 2002
    - NESC 2007
    - IEC 60826:2003
    - EN50341-1:2001 (CENELEC)
    - EN50341-3-9:2001 (UK NNA)
    - EN50341-3-17:2001 (Portugal NNA)
    - ESAA C(b)1-2003 (Australia)
    - TPNZ (New Zealand)
    - REE (Spain)
    - EIA/TIA 222-F
    - ANSI/TIA 222-G
    - CSA S37-01
- Automated microwave antenna loading as per EIA/TIA 222-F and ANSI/TIA 222-G
- Minimization of problems caused by unstable joints and mechanisms
- Automatic bandwidth minimization and ability to solve large problems
- Design checks according to (other standards can be added easily):
    - ASCE Standard 10-90

- AS 3995 (Australian Standard 3995)
- BS 8100 (British Standard 8100)
- EN50341-1 (CENELEC, both empirical and analytical methods are available)
- ECCS 1985
- NGT-ECCS
- PN-90/B-03200
- EIA/TIA 222-F
- ANSI/TIA 222-G
- CSA S37-01
- EDF/RTE Resal
- IS 802 (India Standard 802)

<u>Results Features:</u>

- Design summaries printed for each group of members
- Easy to interpret text, spreadsheet and graphics design summaries
- Automatic determination of allowable wind and weight spans
- Automatic determination of interaction diagrams between allowable wind and weight spans
- Capability to batch run multiple tower configurations and consolidate the results
- Automated optimum angle member size selection and bolt quantity determination

Tool for interactive angle member sizing and bolt quantity determination.

# Criteria for Design of PCS Facilities On or Extending Above Metal Electric Transmission Towers & Analysis of Transmission Towers Supporting PCS Masts [(1)]

## Introduction

This criteria is the result from an evaluation of the methods and loadings specified by the separate standards, which are used in designing telecommunications towers and electric transmission towers. That evaluation is detailed elsewhere, but in summary; the methods and loadings are significantly different. This criteria specifies the manner in which the appropriate standard is used to design PCS facilities including masts and brackets (hereafter referred to as "masts"), and to evaluate the electric transmission towers to support PCS masts. The intent is to achieve an equivalent level of safety and security under the extreme design conditions expected in Connecticut and Massachusetts.

ANSI Standard TIA/EIA-222 covering the design of telecommunications structures specifies a working strength/allowable stress design approach. This approach applies the loads from extreme weather loading conditions, and designs the structure so that it does not exceed some defined percentage of failure strength (allowable stress).

ANSI Standard C2-2007 (National Electrical Safety Code) covering the design of electric transmission metal structures is based upon an ultimate strength/yield stress design approach. This approach applies a multiplier (overload capacity factor) to the loads possible from extreme weather loading conditions, and designs the structure so that it does not exceed its ultimate strength (yield stress).

Each standard defines the details of how loads are to be calculated differently. Most of the NU effort in "unifying" both codes was to establish what level of strength each approach would provide, and then increasing the appropriate elements of each to achieve a similar level of security under extreme weather loadings.

Two extreme weather conditions are considered. The first is an extreme wind condition (hurricane) based upon a 50-year recurrence (2% annual probability). The second is a winter condition combining wind and ice loadings.

The following sections describe the design criteria for any PCS mast extending above the top of an electric transmission tower, and the analysis criteria for evaluating the loads on the transmission tower from such a mast from the lower portions of such a mast, and loads on the pre-existing electric lower portions of such a mast, and loads on the pre-existing electric transmission tower and the conductors it supports.

*Note 1: Prepared from documentation provide from Northeast Utilities.*

## *P C S M a s t*

The PCS facility (mast, external cable/trays, including the initial and any planned future support platforms, antennas, etc. extending the full height above the top level of the electric transmission structure) shall be designed in accordance with the provisions of TIA/EIA Standard 222 with two exceptions:

1. An 85 mph extreme wind speed shall be used for locations in all counties throughout the NU system.
2. The stress increase of TIA Section 3.1.1.1 is disallowed. The combined wind and ice condition shall consider ½" radial ice in combination with the wind load (0.75 Wi) as specified in TIA section 2.3.16.

## *E L E C T R I C T R A N S M I S S I O N T O W E R*

The electric transmission tower shall be analyzed using yield stress theory in accordance with the attached table titled "NU Design Criteria". This specifies uniform loadings (different from the TIA loadings) on the each of the following components of the installed facility:

- PCS mast for its total height above ground level, including the initial and planned future support platforms, antennas, etc. above the top of an electric transmission structure.
- Conductors are related devices and hardware.
- Electric transmission structure. The loads from the PCS facility and from the electric conductors shall be applied to the structure at conductor and PCS mast attachment points, where those load transfer to the tower.

The uniform loadings and factors specified for the above components in the table are based upon the National Electrical Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to TIA and its loads and factors with the exceptions noted above. (Note that the NESC does not require the projected wind surfaces of structures and equipment to be increased by the ice covering.)

In the event that the electric transmission tower is not sufficient to support the additional loadings of the PCS mast, reinforcement will be necessary to upgrade the strength of the overstressed members.

## Attachment A

## NU Design Criteria

| | | | Basic Wind Speed | Pressure | Height Factor | Gust Factor | Load or Stress Factor | Force Coef - Shape Factor |
|---|---|---|---|---|---|---|---|---|
| | | | V (MPH) | Q (PSF) | Kz | Gh | | |
| Ice Condition | TIA/EIA | Antenna Mount | TIA | TIA (.75Wi) | TIA | TIA | TIA, Section 3.1.1.1 disallowed for connection design | TIA |
| Ice Condition | NESC Heavy | Tower/Pole Analysis with antennas extending above top of Tower/Pole (Yield Stress) | ---- | 4 | 1.00 | 1.00 | 2.50 | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| Ice Condition | NESC Heavy | Tower/Pole Analysis with Antennas below top of Tower/Pole (on two faces) | ---- | 4 | 1.00 | 1.00 | 2.50 | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| Ice Condition | NESC Heavy | Conductors: | Conductor loads provided by NU | | | | | |
| High Wind Condtion | TIA/EIA | Antenna Mount | 85 | TIA | TIA | TIA | TIA, Section 3.1.1.1 disallowed for connection design | TIA |
| High Wind Condtion | NESC Extreme Wind | Tower/Pole Analysis with antennas extending above top of Tower/Pole | Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading<br>1.25 x Gust Response Factor<br>Height above ground level based on top of Mast/Antenna | | | | | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| High Wind Condtion | NESC Extreme Wind | Tower/Pole Analysis with Antennas below top of Tower/Pole | Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading<br>Height above ground level based on top of Tower/Pole | | | | | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| High Wind Condtion | NESC Extreme Wind | Conductors: | Conductor loads provided by NU | | | | | |
| NESC Extreme Ice with Wind Conditon* | | Tower/Pole Analysis with antennas extending above top of Tower/Pole | Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading<br>4PSF Wind Load 1.25 x Gust Response Factor<br>Height above ground level based on top of Mast/Antenna | | | | | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| NESC Extreme Ice with Wind Conditon* | | Tower/Pole Analysis with Antennas below top of Tower/Pole | Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading<br>4PSF Wind Load<br>Height above ground level based on top of Tower/Pole | | | | | 1.6 Flat Surfaces<br>1.3 Round Surfaces |
| NESC Extreme Ice with Wind Conditon* | | Conductors: | Conductor loads provided by NU | | | | | |

* Only for Structures Installed after 2007

Shape Factor Criteria shall be per TIA Shape Factors.

2) STEP 2 - The electric transmission structure analysis and evaluation shall be performed in accordance with NESC requirements and shall include the mast and antenna loads determined from NESC applied loading conditions (not TIA/EIA Loads) on the structure and mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The structure shall be analyzed using yield stress theory in accordance with Attachment A, "NU Design Criteria." This specifies uniform loadings (different from the TIA loadings) on each of the following components of the installed facility:

a) Wireless communication mast for its total height above ground level, including the initial and any planned future equipment (Support Platforms, Antennas, TMA's etc.) above the top of an electric transmission structure.
b) Conductors and related devices and hardware (wire loads will be provided by NU).
c) Electric Transmission Structure
   i) The loads from the wireless communication equipment components based on NESC and NU Criteria in Attachment A, and from the electric conductors shall be applied to the structure at conductor and wireless communication mast attachment points, where those loads transfer to the tower.
   ii) Shape Factor Multiplier:

| NESC Structure Shape | Cd |
|---|---|
| Polyround (for polygonal steel poles) | 1.3 |
| Flat | 1.6 |
| Open Lattice | 3.2 |

   iii) When Coaxial Cables are mounted along side the pole structure, the shape multiplier shall be:

| Mount Type | Cable Cd | Pole Cd |
|---|---|---|
| Coaxial Cables on outside periphery (One layer) | 1.45 | 1.45 |
| Coaxial Cables mounted on stand offs | 1.6 | 1.3 |

d) The uniform loadings and factors specified for the above components in Attachment A, "NU Design Criteria" are based upon the National Electric Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to the TIA and its loads and factors with the exceptions noted above.

   **Note:** The NESC does not require ice load be included in the supporting structure. (Ice on conductors and shield wire only, and NU will provide these loads).

e) Mast reaction loads shall be evaluated for local effects on the transmission structure members at the attachment points.

TITLE ______________________ 06/05/2000

STRUCT CL&P #2683

| | CONDUCTOR | |
|---|---|---|
| | AHEAD | BACK |
| | LINNET | LINNET |
| | 336 | 336 |
| | 26/7 ACSR | 26/7 ACSR |
| DIAM = | 0.720 | 0.720 |
| WEIGHT = | 0.462 | 0.462 |
| TENSION (LBS) | AHEAD 4,000 | BACK 4,000 |

| LOADCASE | NESC HEAVY |
|---|---|
| WIND (PSF) | 4 |
| ICE (IN) | 0.50 |
| OLF ANG | 1.65 |
| OLF WIND | 2.50 |
| OLF WT | 1.50 |

| STR | ANGLE | WIND SPAN | WGT SPAN | NESC HEAVY H | L | V |
|---|---|---|---|---|---|---|
| BACK | 7 | 243 | 345 | 1152 | -6551 | 632 |
| AHEAD | 7 | 243 | 345 | 1153 | 6551 | 632 |
| TOTALS | **14.0** | **486** | **690** | **2305** | **0** | **1263** |

TITLE ______________________ 06/05/2000

STRUCT CL&P #2683

| | CONDUCTOR | |
|---|---|---|
| | AHEAD | BACK |
| | LINNET | LINNET |
| | 336 | 336 |
| | 26/7 ACSR | 26/7 ACSR |
| DIAM = | 0.720 | 0.720 |
| WEIGHT = | 0.462 | 0.462 |

| TENSION (LBS) | AHEAD | 2,904 | BACK | 2,904 |
|---|---|---|---|---|

| LOADCASE | HI WIND |
|---|---|
| WIND (PSF) | 20 |
| ICE (IN) | 0.00 |
| OLF ANG | 1.15 |
| OLF WIND | 1.15 |
| OLF WT | 1.15 |

| STR | ANGLE | WIND SPAN | WGT SPAN | HI WIND H | HI WIND L | HI WIND V |
|---|---|---|---|---|---|---|
| BACK | 7 | 243 | 345 | 742 | -3315 | 183 |
| AHEAD | 7 | 243 | 345 | 742 | 3315 | 183 |
| **TOTALS** | **14.0** | **486** | **690** | **1484** | **0** | **367** |

TITLE ______ 06/05/2000

STRUCT CL&P #2683

CONDUCTOR SHIELD WIRE

| | AHEAD | | BACK | |
|---|---|---|---|---|
| | 3/8 AW | | 3/8 AW | |
| | 0.000 | | 0.000 | |
| | 7 #8 Al Weld | | 7 #8 Al Weld | |
| DIAM = | 0.385 | | 0.385 | |
| WEIGHT = | 0.262 | | 0.262 | |
| TENSION (LBS) | AHEAD | 2,749 | BACK | 2,749 |

| LOADCASE | HI WIND |
|---|---|
| WIND (PSF) | 20 |
| ICE (IN) | 0.00 |
| OLF ANG | 1.15 |
| OLF WIND | 1.15 |
| OLF WT | 1.15 |

| STR | ANGLE | WIND SPAN | WGT SPAN | HI WIND H | HI WIND L | HI WIND V |
|---|---|---|---|---|---|---|
| BACK | 7 | 243 | 345 | 564 | -3138 | 104 |
| AHEAD | 7 | 243 | 345 | 565 | 3138 | 104 |
| **TOTALS** | **14.0** | **486** | **690** | **1129** | **0** | **208** |

TITLE ________________ 06/05/2000

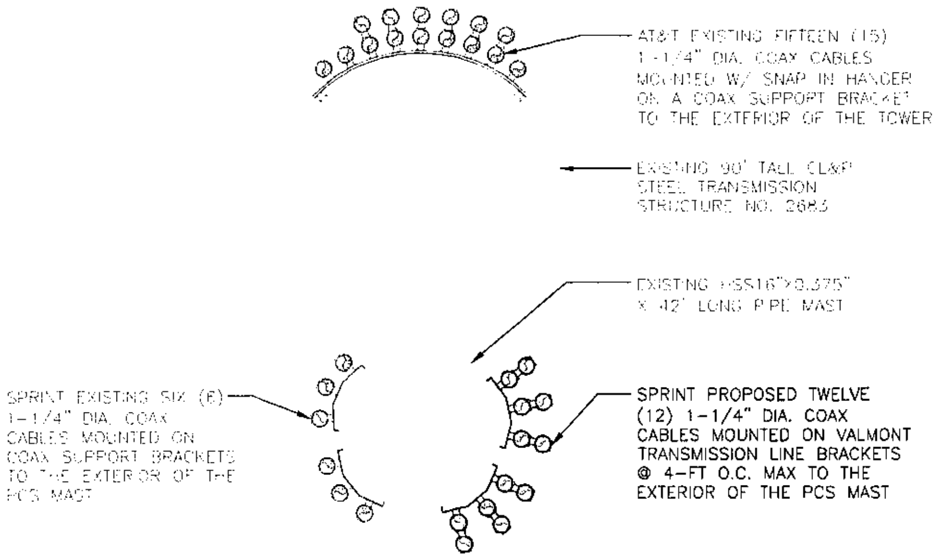
STRUCT CL&P #2683

CONDUCTOR SHIELD WIRE

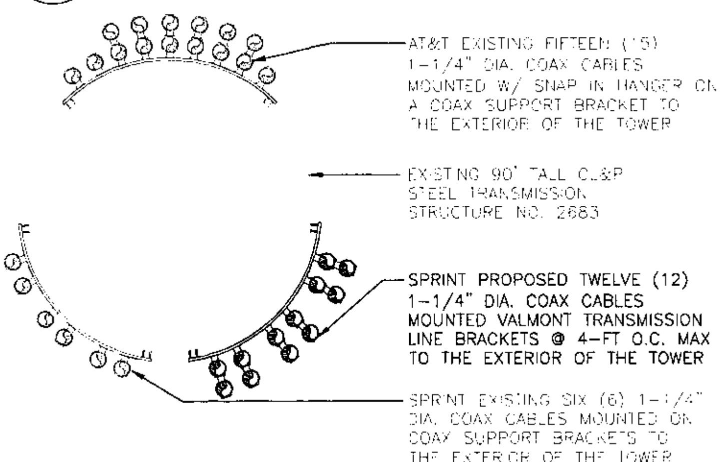
| | AHEAD | | BACK | |
|---|---|---|---|---|
| | 3/8 AW | | 3/8 AW | |
| | 0.000 | | 0.000 | |
| | 7 #8 Al Weld | | 7 #8 Al Weld | |
| DIAM = | 0.385 | | 0.385 | |
| WEIGHT = | 0.262 | | 0.262 | |
| TENSION (LBS) | AHEAD | 4,200 | BACK | 4,200 |

| LOADCASE | NESC HEAVY |
|---|---|
| WIND (PSF) | 4 |
| ICE (IN) | 0.50 |
| OLF ANG | 1.65 |
| OLF WIND | 2.50 |
| OLF WT | 1.50 |

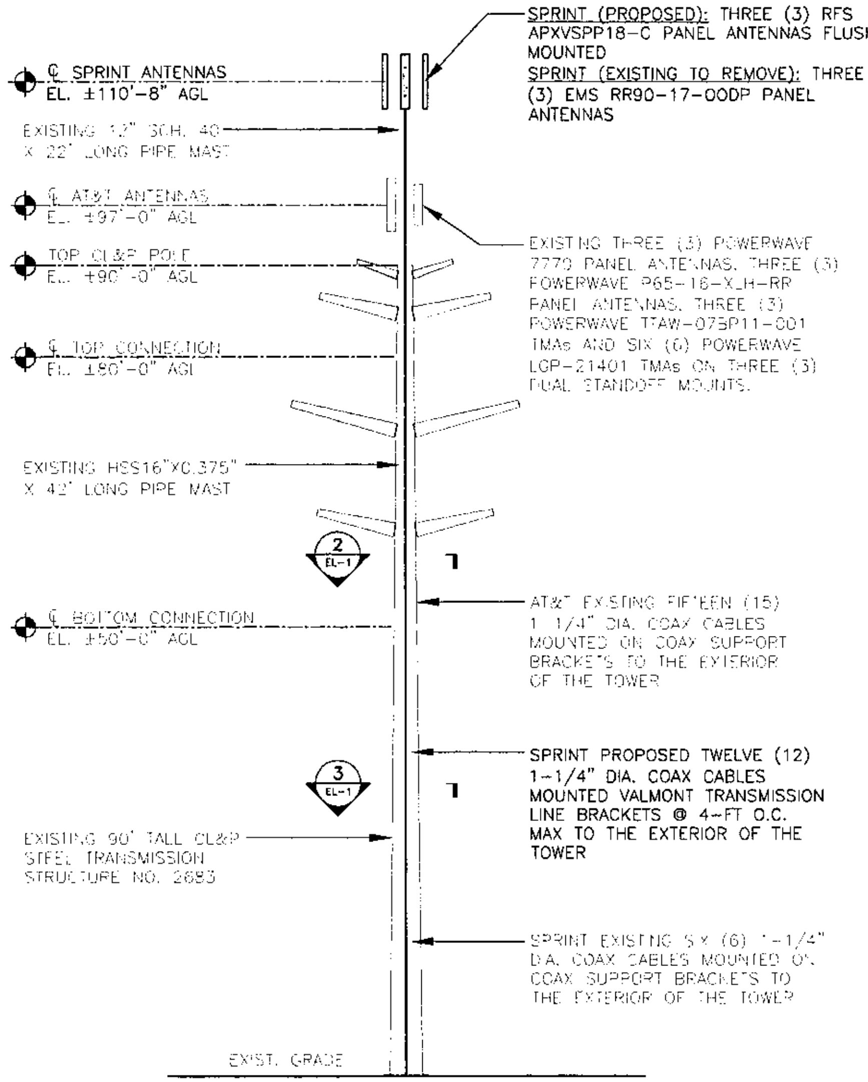
| STR | ANGLE | WIND SPAN | WGT SPAN | NESC HEAVY H | L | V |
|---|---|---|---|---|---|---|
| BACK | 7 | 243 | 345 | 1125 | -6878 | 420 |
| AHEAD | 7 | 243 | 345 | 1125 | 6878 | 420 |
| **TOTALS** | **14.0** | **486** | **690** | **2250** | **0** | **840** |




2 EL-1 COAX CABLE PLAN
SCALE: 1" = 1'-0"




3 EL-1 COAX CABLE PLAN
SCALE: 1" = 1'-0"




1 EL-1 TOWER & MAST ELEVATION
SCALE: NOT TO SCALE

| DESIGNED BY: | TJL |
|---|---|
| DRAWN BY: | TJL |
| CHK'D BY: | CFC |

| REV. | DATE | DRAWN BY | CHK'D BY | DESCRIPTION |
|---|---|---|---|---|
| 0 | 4/18/13 | TJL | CFC | ISSUED FOR NU REVIEW |

PROFESSIONAL ENGINEER SEAL

CENTEK engineering

SPRINT
CT54XC713
CL&P STRUCTURE 2683
78 FEDERAL ROAD
BROOKFIELD CT 06804

| DATE: | 4/18/13 |
|---|---|
| SCALE: | AS SHOWN |
| JOB NO. | 12047.C013 |

POLE AND MAST ELEVATION

SHEET NO. EL-1
Sheet No. 1 of 1

## Development of Design Heights, Exposure Coefficients, and Velocity Pressures Per TIA/EIA

### Wind Speeds

Basic Wind Speed $V := 85$ mph (User Input per NU Mast Design Criteria Exception 1)

Basic Wind Speed with Ice $V_i := 74$ mph (User Input per TIA/EIA-222-F Section 2.3.16)

### Heights above ground level, z

Mast 1 $z_{mast1} := 103$ ft (User Input)

Mast 2 $z_{mast2} := 71$ ft (User Input)

Sprint $z_{Sprint} := 110.67$ ft (User Input)

AT&T $z_{AT\&T} := 97$ ft (User Input)

Coax Cable $z_{coax} := 82$ ft (User Input)

### Exposure Coefficients, kz

(per TIA/EIA-222-F Section 2.3.3)

Mast 1 $$Kz_{mast1} := \left(\frac{z_{mast1}}{33}\right)^{\frac{2}{7}} = 1.384$$

Mast 2 $$Kz_{mast2} := \left(\frac{z_{mast2}}{33}\right)^{\frac{2}{7}} = 1.245$$

Sprint $$Kz_{Sprint} := \left(\frac{z_{Sprint}}{33}\right)^{\frac{2}{7}} = 1.413$$

AT&T $$Kz_{AT\&T} := \left(\frac{z_{AT\&T}}{33}\right)^{\frac{2}{7}} = 1.361$$

Coax Cable $$Kz_{coax} := \left(\frac{z_{coax}}{33}\right)^{\frac{2}{7}} = 1.297$$

**Velocity Pressure without ice, qz** (per TIA/EIA-222-F Section 2.3.3)

Mast 1 $qz_{mast1} := 0.00256 \cdot Kz_{mast1} \cdot V^2 = 25.604$

Mast 2 $qz_{mast2} := 0.00256 \cdot Kz_{mast2} \cdot V^2 = 23.022$

Sprint $qz_{Sprint} := 0.00256 \cdot Kz_{Sprint} \cdot V^2 = 26.135$

AT&T $qz_{AT\&T} := 0.00256 \cdot Kz_{AT\&T} \cdot V^2 = 25.169$

Coax Cable $qz_{coax} := 0.00256 \cdot Kz_{coax} \cdot V^2 = 23.989$

**Velocity Pressure with ice, qzICE** (per TIA/EIA-222-F Section 2.3.3)

Mast 1 $qzICE_{mast1} := 0.00256 \cdot Kz_{mast1} \cdot V_i^2 = 19.406$

Mast 2 $qzICE_{mast2} := 0.00256 \cdot Kz_{mast2} \cdot V_i^2 = 17.449$

Sprint $qzICE_{Sprint} := 0.00256 \cdot Kz_{Sprint} \cdot V_i^2 = 19.808$

AT&T $qzICE_{AT\&T} := 0.00256 \cdot Kz_{AT\&T} \cdot V_i^2 = 19.076$

Coax Cable $qzICE_{coax} := 0.00256 \cdot Kz_{coax} \cdot V_i^2 = 18.182$

**TIA/EIA Common Factors:**

| | | | |
|---|---|---|---|
| Gust Response Factor = | $G_H := 1.69$ | | (User Input per TIA/EIA-222-F Section 2.3.4) |
| Gust Response Factor Multiplier = | $m := 1.25$ | | (User Input per TIA/EIA-222-F Section 2.3.4.4) |
| Radial Ice Thickness = | $Ir := 0.50$ | in | (User Input per TIA/EIA-222-F Section 2.3.1) |
| Radial Ice Density = | $Id := 56.00$ | pcf | (User Input) |

**Development of Wind & Ice Load on PCS Mast** (per TIA/EIA-222-F-1996 Criteria)

**Existing Upper Mast Data** (Pipe 12 STD) (User Input)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 12.8$ in (User Input)

Mast Length = $L_{mast} := 22.417$ ft (User Input)

Mast Thickness = $t_{mast} := 0.375$ in (User Input)

Mast Aspect Ratio = $Ar_{mast} := \frac{12 L_{mast}}{D_{mast}} = 21.0$

Mast Force Coefficient = $Ca_{mast} = 1.11$ (per TIA/EIA-222-F Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.067$ sf/ft

Total Mast Wind Force = $qz_{mast1} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 51$ plf **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.15$ sf/ft

Total Mast Wind Force w/ Ice = $qzICE_{mast1} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 42$ plf **BLC 4**

**Gravity Loads (without ice)**

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\,2}\right] = 20.9$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 8$ plf **BLC 3**

**Development of Wind & Ice Load on PCS Mast** (per TIA/EIA-222-F-1996 Criteria)

**Existing Lower Mast Data**

| | | | |
|---|---|---|---|
| Existing Lower Mast Data | HSS16.0x0.375 | | (User Input) |
| Mast Shape = | Round | | (User Input) |
| Mast Diameter = | $D_{mast} := 16.0$ | in | (User Input) |
| Mast Length = | $L_{mast} := 41.583$ | ft | (User Input) |
| Mast Thickness = | $t_{mast} := 0.375$ | in | (User Input) |

Mast Aspect Ratio = $Ar_{mast} := \frac{12L_{mast}}{D_{mast}} = 31.2$

Mast Force Coefficient = $Ca_{mast} = 1.2$ (per TIA/EIA-222-F Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.333$ sf/ft

Total Mast Wind Force = $qz_{mast2} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 62$ plf **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.417$ sf/ft

Total Mast Wind Force w/ Ice = $qzICE_{mast2} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 50$ plf **BLC 4**

**Gravity Loads (without ice)**

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^2\right] = 25.9$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 10$ plf **BLC 3**

**Development of Wind & Ice Load on Antennas** (per TIA/EIA-222-F-1996 Criteria)

**Existing Antenna Data:** (Sprint)

Antenna Model = RFS APXVSPP18-C

Antenna Shape = Flat (User Input)

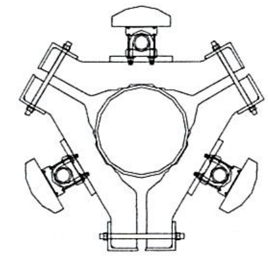
Antenna Height = $L_{ant} := 72$ in (User Input)

Antenna Width = $W_{ant} := 11.8$ in (User Input)

Antenna Thickness = $T_{ant} := 7$ in (User Input)

Antenna Weight = $WT_{ant} := 57$ lbs (User Input)

Number of Antennas = $N_{ant} := 3$ (User Input)



Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.1$

Antenna Force Coefficient = $Ca_{ant} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.9$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 17.7$ sf

Total Antenna Wind Force = $F_{ant} := qz_{Sprint} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1094$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.5$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qzICE_{Sprint} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 912$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 171$ lbs **BLC 2**

**Gravity Loads (ice only)**

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5947$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1528$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 50$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 149$ lbs **BLC 3**

**Development of Wind & Ice Load on Antenna Mounts** (per TIA/EIA-222-F-1996 Criteria)

**Mount Data:** (Sprint)

Mount Type: Microflect Universal Tri-Bracket

Mount Shape = Flat (User Input)

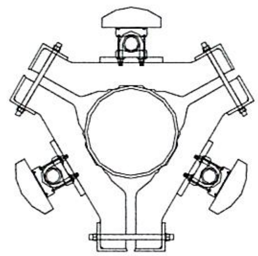
Pipe Mount Length = $L_{mnt} := 72$ in (User Input)

2 inch Pipe Mount Linear Weight = $W_{mnt} := 3.66$ plf (User Input)

Pipe Mount Outside Diameter = $D_{mnt} := 2.375$ in (User Input)

Number of Mounting Pipes = $N_{mnt} := 3$ (User Input)

Tri Bracket Weight = $W_{tb.mnt} := 197$ lbs (User Input)



Mount Aspect Ratio = $Ar_{mnt} := \frac{L_{mnt}}{D_{mnt}} = 30$

Mount Force Coefficient = $Ca_{mnt} = 2$ (per TIA/EIA-222-F Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Mount is Shielded by Antenna***

Mount Projected Surface Area = $A_{mnt} := 0.0$ sf

Total Mount Wind Force = $F_{mnt} := qz_{Sprint} \cdot G_H \cdot Ca_{mnt} \cdot A_{mnt} = 0$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Mount is Shielded by Antenna***

Mount Projected Surface Area w/ Ice = $A_{ICEmnt} := 0.0$ sf

Total Mount Wind Force = $Fi_{mnt} := qzICE_{Sprint} \cdot G_H \cdot Ca_{mnt} \cdot A_{ICEmnt} = 0$ lbs **BLC 4**

**Gravity Loads (without ice)** (per TIA/EIA-222-F-1996)

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 22$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{tb.mnt} = 263$ lbs **BLC 2**

**Gravity Loads (ice only)** (per TIA/EIA-222-F-1996)

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^{2} \cdot L_{mnt} = 319$ cu in

Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 1\right)^2\right] \cdot \left(L_{mnt} + 1\right)\right] - V_{mnt} = 334$ cu in

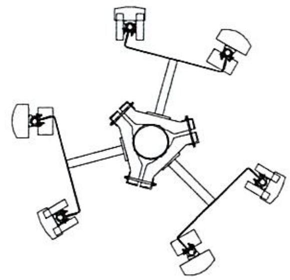
Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 11$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 5 = 37$ lbs **BLC 3**

| CENTEK engineering — Centered on Solutions — www.centekeng.com — 63-2 North Branford Road, Branford, CT 06405 — P: (203) 488-0580 — F: (203) 488-8587 | Subject: | Load Analysis of Pipe Mast on CL&P Structure #2683 |
|---|---|---|
| | Location: | Brookfield, CT |
| | Rev. 0: 4/17/13 | Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13 |

**Development of Wind & Ice Load on Antennas** (per TIA/EIA-222-F-1996 Criteria)

**Existing Antenna Data:** (AT&T)



Antenna Model = Powerwave 7770.00

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 55$ in (User Input)

Antenna Width = $W_{ant} := 11$ in (User Input)

Antenna Thickness = $T_{ant} := 5$ in (User Input)

Antenna Weight = $WT_{ant} := 39$ lbs (User Input)

Number of Antennas = $N_{ant} := 3$ (User Input)

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 5.0$

Antenna Force Coefficient = $Ca_{ant} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.2$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 12.6$ sf

Total Antenna Wind Force = $F_{ant} := qz_{AT\&T} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 751$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant}+1) \cdot (W_{ant}+1)}{144} = 4.7$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 14$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qzICE_{AT\&T} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 632$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 117$ lbs **BLC 2**

**Gravity Loads (ice only)**

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 3025$ cu in

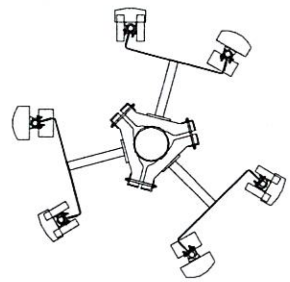
Volume of Ice on Each Antenna = $V_{ice} := (L_{ant}+1)(W_{ant}+1) \cdot (T_{ant}+1) - V_{ant} = 1007$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 33$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 98$ lbs **BLC 3**

**Development of Wind & Ice Load on Antennas** (per TIA/EIA-222-F-1996 Criteria)

**Proposed Antenna Data:** (AT&T)



Antenna Model = Powerwave P65-16-XLH-RR

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 72$ in (User Input)

Antenna Width = $W_{ant} := 12$ in (User Input)

Antenna Thickness = $T_{ant} := 6$ in (User Input)

Antenna Weight = $WT_{ant} := 64$ lbs (User Input)

Number of Antennas = $N_{ant} := 3$ (User Input)

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.0$

Antenna Force Coefficient = $Ca_{ant} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 18$ sf

Total Antenna Wind Force = $F_{ant} := qz_{AT\&T} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1072$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.6$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.8$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qzICE_{AT\&T} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 892$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 192$ lbs **BLC 2**

**Gravity Loads (ice only)**

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5184$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1459$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 47$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 142$ lbs **BLC 3**

**Development of Wind & Ice Load on TMA's** (per TIA/EIA-222-F-1996 Criteria)

**Existing TMA Data:** (AT&T)

TMA Model = Powerwave LGP 21401

TMA Shape = Flat (User Input)

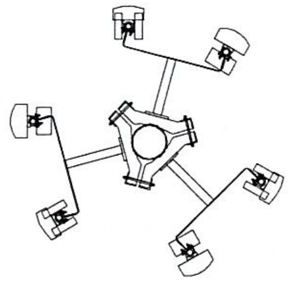
TMA Height = $L_{TMA} := 14.4$ in (User Input)

TMA Width = $W_{TMA} := 9.2$ in (User Input)

TMA Thickness = $T_{TMA} := 2.6$ in (User Input)

TMA Weight = $WT_{TMA} := 14.1$ lbs (User Input)

Number of TMA's = $N_{TMA} := 6$ (User Input)



TMA Aspect Ratio = $Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1.6$

TMA Force Coefficient = $Ca_{TMA} = 1.4$ (per TIA/EIA-222-F Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA = $SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.9$ sf

TMA Projected Surface Area = $A_{TMA} := SA_{TMA} \cdot N_{TMA} = 5.5$ sf

Total TMA Wind Force = $F_{TMA} := qz_{AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot A_{TMA} = 329$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA w/ Ice = $SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 1.1$ sf

TMA Projected Surface Area w/ Ice = $A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 6.5$ sf

Total TMA Wind Force w/ Ice = $Fi_{TMA} := qzICE_{AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot A_{ICETMA} = 295$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All TMA's = $WT_{TMA} \cdot N_{TMA} = 85$ lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each TMA = $V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 344$ cu in

Volume of Ice on Each TMA = $V_{ice} := (L_{TMA} + 1)(W_{TMA} + 1)(T_{TMA} + 1) - V_{TMA} = 221$ cu in

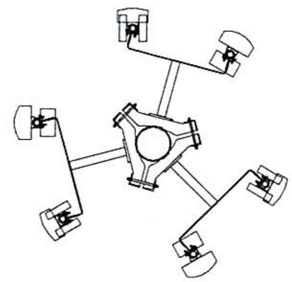
Weight of Ice on Each TMA = $W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 7$ lbs

Weight of Ice on All TMA's = $W_{ICETMA} \cdot N_{TMA} = 43$ lbs **BLC 3**

**Development of Wind & Ice Load on TMA's** (per TIA/EIA-222-F-1996 Criteria)

**Proposed TMA Data:** (AT&T)

TMA Model = Powerwave TTAW-07B P111-001



TMA Shape = Flat (User Input)

TMA Height = $L_{TMA} := 9.9$ in (User Input)

TMA Width = $W_{TMA} := 6.7$ in (User Input)

TMA Thickness = $T_{TMA} := 5.4$ in (User Input)

TMA Weight = $WT_{TMA} := 18$ lbs (User Input)

Number of TMA's = $N_{TMA} := 3$ (User Input)

TMA Aspect Ratio = $Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1.5$

TMA Force Coefficient = $Ca_{TMA} = 1.4$ (per TIA/EIA-222-F Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA = $SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.5$ sf

TMA Projected Surface Area = $A_{TMA} := SA_{TMA} \cdot N_{TMA} = 1.4$ sf

Total TMA Wind Force = $F_{TMA} := qz_{AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot A_{TMA} = 82$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA w/ Ice = $SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 0.6$ sf

TMA Projected Surface Area w/ Ice = $A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 1.7$ sf

Total TMA Wind Force w/ Ice = $Fi_{TMA} := qzICE_{AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot A_{ICETMA} = 79$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All TMA's = $WT_{TMA} \cdot N_{TMA} = 54$ lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each TMA = $V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 358$ cu in

Volume of Ice on Each TMA = $V_{ice} := (L_{TMA} + 1)(W_{TMA} + 1)(T_{TMA} + 1) - V_{TMA} = 179$ cu in

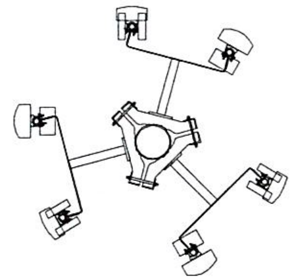
Weight of Ice on Each TMA = $W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 6$ lbs

Weight of Ice on All TMA's = $W_{ICETMA} \cdot N_{TMA} = 17$ lbs **BLC 3**

**Development of Wind & Ice Load on Antenna Mounts** (per TIA/EIA-222-F-1996 Criteria)

**Mount Data:** (AT&T)

Mount Type: (3) Valmont Dual Standoff Mounts w/ Universal Tr-Bracket



Mount Shape = Flat (User Input)

Mount Area = $A_{mnt} := 4.0$ sq ft (User Input)

Mount Area w/ Ice = $A_{ICE.mnt} := 4.6$ sq ft (User Input)

Mount Weight = $WT_{mnt} := 610$ lbs (User Input)

Mount Weight w/ Ice = $WT_{ICE.mnt} := 700$ lbs (User Input)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Total Mount Wind Force = $F_{mnt} := qz_{AT\&T} \cdot G_H \cdot Ca_{mnt} \cdot A_{mnt} = 238$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Total Mount Wind Force w/ Ice = $Fi_{mnt} := qzICE_{AT\&T} \cdot G_H \cdot Ca_{mnt} \cdot A_{ICE.mnt} = 208$ lbs **BLC 4**

**Gravity Load (without ice)**

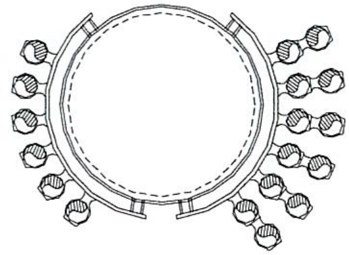
Weight of Mount = $WT_{mnt} = 610$ lbs **BLC 2**

**Gravity Loads (ice only)**

Weight of Ice on Mount = $WT_{ICE.mnt} - WT_{mnt} = 90$ lbs **BLC 3**

| CENTEK engineering<br>Centered on Solutions™ www.centekeng.com<br>63-2 North Branford Road P: (203) 488-0580<br>Branford, CT 06405 F: (203) 488-8587 | Subject:<br><br>Location:<br><br>Rev. 0: 4/17/13 | Load Analysis of Pipe Mast on CL&P Structure #2683<br><br>Brookfield, CT<br><br>Prepared by: T.J.L. Checked by: C.F.C.<br>Job No. 12047.CO13 |
|---|---|---|

**Development of Wind & Ice Load on Coax Cables** per TIA/EIA-222-F-96 Criteria



Note: AT&T Existing/Proposed cables attached to CL&P Pole

**Existing Coax Cable Data:** (Sprint)

Coax Type = HELIAX 1-1/4"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.55$ in (User Input)

Coax Cable Length = $L_{coax} := 64$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 0.66$ plf (User Input)

Total Number of Coax = $N_{coax} := 18$ (User Input)

No. of Coax Projecting Outside Face of PCS Mast = $NP_{coax} := 3$ (User Input)

Coax aspect ratio, $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 495.5$

Coax Cable Force Factor Coefficient = $Ca_{coax} = 1.2$ TIA/EIA-222-F-96 Table 3

**Wind Load (without ice)** per TIA/EIA-222-F-96 Section 2.3.2

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.4$ ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{coax} \cdot G_H \cdot A_{coax} = 19$ plf **BLC 5**

**Wind Load (with ice)** per TIA/EIA-222-F-96 Section 2.3.2

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.5$ ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qzICE_{coax} \cdot G_H \cdot AICE_{coax} = 17$ plf **BLC 4**

**Gravity Loads (without ice)**

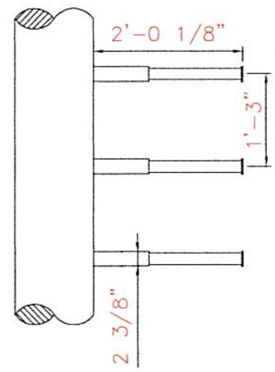
Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 2**

**Gravity Loads (ice only)**

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\,2}\right] = 3.2$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 23$ plf **BLC 3**

**Development of Wind & Ice Load on Brace Member** (per TIA/EIA-222-F-1996 Criteria)




**Member Data:** Step Bolts

Shape = Round (User Input)

Diameter = $D_{mem} := 2.38$ in (User Input)

Length = $L_{mem} := 2$ ft (User Input)

Spacing = $Sp_{mem} := 1.25$ ft (User Input)

Weight = $Wt_{mem} := 3.66$ plf

Member Aspect Ratio = $Ar_{mem} := \dfrac{D_{mem}}{L_{mem} \cdot 12} = 0.1$

Member Force Coefficient = $Ca_{mem} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)

**Wind Load (without ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area = $A_{mem} := \dfrac{D_{mem} \cdot L_{mem}}{12 \cdot Sp_{mem}} = 0.3$ sf/ft

Total Member Wind Force = $F_{mem} := qz_{mast1} \cdot G_H \cdot Ca_{mem} \cdot A_{mem} = 19$ lbs **BLC 5**

**Wind Load (with ice)** (per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area w/ Ice = $A_{ICEmem} := \dfrac{(D_{mem} + 2 \cdot Ir) \cdot (L_{mem} + 2 \cdot Ir)}{12 \cdot Sp_{mem}} = 0.7$ plf

Total Member Wind Force w/ Ice = $Fi_{mem} := qzICE_{mast1} \cdot G_H \cdot Ca_{mem} \cdot A_{ICEmem} = 31$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of Member = $\dfrac{Wt_{mem} \cdot L_{mem}}{Sp_{mem}} = 6$ lbs **BLC 2**

**Gravity Loads (ice only)**

Ice Area per Linear foot = $Ai_{mem} := \dfrac{1}{4} \cdot \pi \cdot \left[ (D_{mem} + 2 \cdot Ir)^2 - D_{mem}{}^2 \right] = 4.5$ sq in

Weight of Ice on Member = $W_{ICEmem} := Id \cdot \dfrac{Ai_{mem}}{144} \cdot \dfrac{L_{mem}}{Sp_{mem}} = 3$ lbs **BLC 3**

**CENTEK engineering, INC.**
**Consulting Engineers**
63-2 North Branford Road
Branford, CT 06405
Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of TIA/EIA Wind and Ice Loads for Analysis of Mast Only**
**Tabulated Load Cases**

Location: **Brookfield, CT**

Date: 4/17/13 Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13

| Load Case | Description |
|---|---|
| 1 | Self Weight (Mast) |
| 2 | Weight of Appurtenances |
| 3 | Weight of Ice Only on PCS Structure (1) |
| 4 | TIA/EIA Wind with Ice on PCS Structure (1) |
| 5 | TIA/EIA Wind on PCS Structure (1) |

Footnotes:
(1) PCS Structure includes: Mast and Appurtenances

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Subject: **Analysis of TIA/EIA Wind and Ice Loads for Analysis of Mast Only**
**Load Combinations Table**

Location: **Brookfield, CT**
Date: 4/17/13 Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13

| Load Combination | Description | Envelope Soultion | Wind Factor | P-Delta | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TIA/EIA Wind + Ice on PCS Structure | | 1 | | 1 | 1 | 2 | 1 | 3 | 1 | 4 | 1 | | |
| 2 | TIA/EIA Wind on PCS Structure | | 1 | | 1 | 1 | 2 | 1 | 5 | 1 | | | | |

Footnotes:
(1) BLC = Basic Load Case
(2) PCS Structure includes: Mast and Appurtenances

## Global

| | |
|---|---|
| Display Sections for Member Calcs | 5 |
| Max Internal Sections for Member Calcs | 97 |
| Include Shear Deformation | Yes |
| Include Warping | Yes |
| Area Load Mesh (in^2) | 144 |
| Merge Tolerance (in) | .12 |
| P-Delta Analysis Tolerance | 0.50% |
| Vertical Axis | Y |
| Global Member Orientation Plane | XZ |

| | |
|---|---|
| Hot Rolled Steel Code | AISC 9th: ASD |
| Cold Formed Steel Code | AISI 1999: ASD |
| Wood Code | AF&PA NDS-97: ASD |
| Wood Temperature | < 100F |
| Concrete Code | ACI 318-02 |
| Masonry Code | ACI 530-05/08: ASD |
| Aluminum Code | AA ADM1-05: ASD |

| | |
|---|---|
| Number of Shear Regions | 4 |
| Region Spacing Increment (in) | 4 |
| Biaxial Column Method | PCA Load Contour |
| Parme Beta Factor (PCA) | .65 |
| Concrete Stress Block | Rectangular |
| Use Cracked Sections | Yes |
| Bad Framing Warnings | No |
| Unused Force Warnings | Yes |

| | |
|---|---|
| Seismic Code | UBC 1997 |
| Seismic Base Elevation (ft) | Not Entered |
| Ct X | .035 |
| Ct Z | .035 |
| T X (sec) | Not Entered |
| T Z (sec) | Not Entered |
| R X | 8.5 |
| R Z | 8.5 |
| Ct Exp. X | .75 |
| Ct Exp. Z | .75 |
| Ca | .36 |
| Cv | .54 |
| Nv | 1 |
| SD1 | 1 |
| SDS | 1 |
| S1 | 1 |
| Occupancy Code | 4 |
| Seismic Zone | 3 |
| Use Group | I |
| Use Gravity Self Wt in Diaphragm Mass | Yes |
| Use Deck Self Wt in Diaphragm Mass | Yes |
| Use Lateral Self Wt in Diaphragm Mass | Yes |
| Seismic Detailing Code | None |
| Om X | 1 |
| Om Z | 1 |
| Rho X | 1 |
| Rho Z | 1 |

## Hot Rolled Steel Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (\1E.. | Density[k/ft... | Yield[ksi] | Ry | Fu[ksi] | Rt |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A36 Gr.36 | 29000 | 11154 | .3 | .65 | .49 | 36 | 1.5 | 58 | 1.2 |
| 2 | A572 Gr.50 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 58 | 1.2 |
| 3 | A992 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 58 | 1.2 |
| 4 | A500 Gr.42 | 29000 | 11154 | .3 | .65 | .49 | 42 | 1.3 | 58 | 1.1 |
| 5 | A500 Gr.46 | 29000 | 11154 | .3 | .65 | .49 | 46 | 1.2 | 58 | 1.1 |
| 6 | A53 Gr. B | 29000 | 11154 | .3 | .65 | .49 | 35 | 1.5 | 58 | 1.2 |

## Hot Rolled Steel Design Parameters

| | Label | Shape | Lengt... | Lbyy[ft] | Lbzz[ft] | Lcomp top[ft] | Lcomp bot[ft] | Kyy | Kzz | Cm-... | Cm-... | Cb | y sw.. | z sw.. | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | Existing .. | 41.583 | 30 | | 30 | | | | | | | | | Lateral |
| 2 | M2 | Existing .. | 22.417 | 30 | | 30 | | | | | | | | | Lateral |

## Hot Rolled Steel Section Sets

| | Label | Shape | Type | Design List | Material | Design Rul... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Existing Upper Mast | PIPE_12.0 | Beam | Pipe | A53 Gr. B | Typical | 13.6 | 262 | 262 | 523 |
| 2 | Existing Lower Mast | HSS16X0.375 | Beam | Pipe | A500 Gr.42 | Typical | 17.2 | 526 | 526 | 1050 |

## Member Primary Data

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | BOT_CO... | SPLICE | | | Existing Lower... | Beam | Pipe | A500 Gr.42 | Typical |
| 2 | M2 | SPLICE | TOP_MA... | | | Existing Upper... | Beam | Pipe | A53 Gr. B | Typical |

## Joint Coordinates and Temperatures

| | Label | X [ft] | Y [ft] | Z [ft] | Temp [F] | Detach From Diap... |
|---|---|---|---|---|---|---|
| 1 | BOT_CONN | 0 | 0 | 0 | 0 | |
| 2 | TOP_CONN | 0 | 30 | 0 | 0 | |
| 3 | SPLICE | 0 | 41.583 | 0 | 0 | |
| 4 | TOP_MAST | 0 | 64 | 0 | 0 | |
| 5 | CL_SPRINT | 0 | 60.667 | 0 | 0 | |
| 6 | CL_ATT | 0 | 47 | 0 | 0 | |

## Joint Boundary Conditions

| | Joint Label | X [k/in] | Y [k/in] | Z [k/in] | X Rot.[k-ft/rad] | Y Rot.[k-ft/rad] | Z Rot.[k-ft/rad] | Footing |
|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | Reaction | Reaction | Reaction | | Reaction | | |
| 2 | TOP_CONN | Reaction | Reaction | Reaction | | Reaction | | |

## Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | Y | -.171 |
| 2 | CL_SPRINT | L | Y | -.263 |
| 3 | CL_ATT | L | Y | -.117 |
| 4 | CL_ATT | L | Y | -.192 |
| 5 | CL_ATT | L | Y | -.085 |

## Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances) (Continued)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 6 | CL_ATT | L | Y | -.054 |
| 7 | CL_ATT | L | Y | -.61 |

## Joint Loads and Enforced Displacements (BLC 3 : Weight of Ice Only on PCS Struct)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | Y | -.149 |
| 2 | CL_SPRINT | L | Y | -.037 |
| 3 | CL_ATT | L | Y | -.098 |
| 4 | CL_ATT | L | Y | -.142 |
| 5 | CL_ATT | L | Y | -.043 |
| 6 | CL_ATT | L | Y | -.017 |
| 7 | CL_ATT | L | Y | -.09 |

## Joint Loads and Enforced Displacements (BLC 4 : TIA/EIA Wind with Ice on PCS Str)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | X | .912 |
| 2 | CL_ATT | L | X | .632 |
| 3 | CL_ATT | L | X | .892 |
| 4 | CL_ATT | L | X | .295 |
| 5 | CL_ATT | L | X | .079 |
| 6 | CL_ATT | L | X | .208 |

## Joint Loads and Enforced Displacements (BLC 5 : TIA/EIA Wind on PCS Structure)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | X | 1.094 |
| 2 | CL_ATT | L | X | .751 |
| 3 | CL_ATT | L | X | 1.072 |
| 4 | CL_ATT | L | X | .329 |
| 5 | CL_ATT | L | X | .082 |
| 6 | CL_ATT | L | X | .238 |

## Member Point Loads

| Member Label | Direction | Magnitude[k,k-ft] | Location[ft,%] |
|---|---|---|---|
| No Data to Print ... | | | |

## Member Distributed Loads (BLC 2 : Weight of Appurtenances)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | Y | -.012 | -.012 | 0 | 0 |
| 2 | M2 | Y | -.012 | -.012 | 0 | 0 |
| 3 | M1 | Y | -.006 | -.006 | 36 | 0 |
| 4 | M2 | Y | -.006 | -.006 | 0 | 10 |

## Member Distributed Loads (BLC 3 : Weight of Ice Only on PCS Struct)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | Y | -.01 | -.01 | 0 | 0 |
| 2 | M2 | Y | -.008 | -.008 | 0 | 0 |
| 3 | M1 | Y | -.023 | -.023 | 0 | 0 |
| 4 | M2 | Y | -.023 | -.023 | 0 | 0 |

## Member Distributed Loads (BLC 3 : Weight of Ice Only on PCS Struct) (Continued)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 5 | M1 | Y | -.003 | -.003 | 36 | 0 |
| 6 | M2 | Y | -.003 | -.003 | 0 | 10 |

## Member Distributed Loads (BLC 4 : TIA/EIA Wind with Ice on PCS Str)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | X | .05 | .05 | 0 | 0 |
| 2 | M2 | X | .042 | .042 | 0 | 0 |
| 3 | M1 | X | .017 | .017 | 0 | 0 |
| 4 | M2 | X | .017 | .017 | 0 | 0 |
| 5 | M1 | X | .031 | .031 | 36 | 0 |
| 6 | M2 | X | .031 | .031 | 0 | 10 |

## Member Distributed Loads (BLC 5 : TIA/EIA Wind on PCS Structure)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | X | .062 | .062 | 0 | 0 |
| 2 | M2 | X | .051 | .051 | 0 | 0 |
| 3 | M1 | X | .019 | .019 | 0 | 0 |
| 4 | M2 | X | .019 | .019 | 0 | 0 |
| 5 | M1 | X | .019 | .019 | 36 | 0 |
| 6 | M2 | X | .019 | .019 | 0 | 10 |

## Basic Load Cases

| | BLC Description | Category | X Gr... | Y Gr... | Z Grav... | Joint | Point | Distri... | Area(... | Surfa... |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Self Weight (PCS Mast) | None | | -1 | | | | | | |
| 2 | Weight of Appurtenances | None | | | | 7 | | 4 | | |
| 3 | Weight of Ice Only on PCS Struct | None | | | | 7 | | 6 | | |
| 4 | TIA/EIA Wind with Ice on PCS Str | None | | | | 6 | | 6 | | |
| 5 | TIA/EIA Wind on PCS Structure | None | | | | 6 | | 6 | | |

## Load Combinations

| | Description | So... | PDelta | SRSS | BLC | Fac.. | BLC | Fac.. | BLC | Fac.. | BLC | Fac.. | BLC | Fac.. | BLC | Fac.. | BLC | Fac.. | BLC | Fac... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TIA/EIA Wind + Ice on PCS ... | Yes | | | 1 | 1 | 2 | 1 | 3 | 1 | 4 | 1 | | | | | | | | |
| 2 | TIA/EIA Wind on PCS Struct... | Yes | | | 1 | 1 | 2 | 1 | 5 | 1 | | | | | | | | | | |
| 3 | Self Weight | | | | 1 | 1 | | | | | | | | | | | | | | |

## Envelope Member Section Forces

| | Member | Sec | | Axial[k] | LC | y Shear[k] | LC | z Shear[k] | LC | Torque[k-ft] | LC | y-y Momen... | LC | z-z Momen... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | 1 | max | 1.553 | 1 | -2.497 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | | min | 1.058 | 2 | -2.813 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | | 2 | max | .477 | 1 | -3.194 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 33.626 | 2 |
| 4 | | | min | .325 | 2 | -3.656 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 29.583 | 1 |
| 5 | | 3 | max | -.408 | 2 | -3.89 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 76.005 | 2 |
| 6 | | | min | -.6 | 1 | -4.498 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 66.407 | 1 |
| 7 | | 4 | max | 5.286 | 1 | 6.273 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 113.35 | 2 |
| 8 | | | min | 3.625 | 2 | 5.52 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 98.47 | 1 |
| 9 | | 5 | max | 4.159 | 1 | 5.325 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 52.807 | 2 |
| 10 | | | min | 2.858 | 2 | 4.651 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 45.187 | 1 |

## Envelope Member Section Forces (Continued)

| | Member | Sec | | Axial[k] | LC | y Shear[k] | LC | z Shear[k] | LC | Torque[k-ft] | LC | y-y Momen... | LC | z-z Momen... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | M2 | 1 | max | 4.159 | 1 | 5.325 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 52.807 | 2 |
| 12 | | | min | 2.858 | 2 | 4.651 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 45.187 | 1 |
| 13 | | 2 | max | 2.161 | 1 | 2.354 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 24.824 | 2 |
| 14 | | | min | 1.44 | 2 | 2.04 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 20.932 | 1 |
| 15 | | 3 | max | 1.621 | 1 | 1.879 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 13.013 | 2 |
| 16 | | | min | 1.087 | 2 | 1.573 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 10.889 | 1 |
| 17 | | 4 | max | 1.12 | 1 | 1.486 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 3.584 | 2 |
| 18 | | | min | .761 | 2 | 1.243 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 2.998 | 1 |
| 19 | | 5 | max | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

## Envelope Member Section Stresses

| | Member | Sec | | Axial[ksi] | LC | y Shear[... | LC | z Shear[... | LC | y-Top[ksi] | LC | y-Bot[ksi] | LC | z-Top[ksi] | LC | z-Bot[ksi] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | 1 | max | .09 | 1 | -.29 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | | min | .062 | 2 | -.327 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | | 2 | max | .028 | 1 | -.371 | 1 | 0 | 1 | -5.399 | 1 | 6.137 | 2 | 0 | 1 | 0 | 1 |
| 4 | | | min | .019 | 2 | -.425 | 2 | 0 | 1 | -6.137 | 2 | 5.399 | 1 | 0 | 1 | 0 | 1 |
| 5 | | 3 | max | -.024 | 2 | -.452 | 1 | 0 | 1 | -12.12 | 1 | 13.872 | 2 | 0 | 1 | 0 | 1 |
| 6 | | | min | -.035 | 1 | -.523 | 2 | 0 | 1 | -13.872 | 2 | 12.12 | 1 | 0 | 1 | 0 | 1 |
| 7 | | 4 | max | .307 | 1 | .729 | 2 | 0 | 1 | -17.972 | 1 | 20.687 | 2 | 0 | 1 | 0 | 1 |
| 8 | | | min | .211 | 2 | .642 | 1 | 0 | 1 | -20.687 | 2 | 17.972 | 1 | 0 | 1 | 0 | 1 |
| 9 | | 5 | max | .242 | 1 | .619 | 2 | 0 | 1 | -8.247 | 1 | 9.638 | 2 | 0 | 1 | 0 | 1 |
| 10 | | | min | .166 | 2 | .541 | 1 | 0 | 1 | -9.638 | 2 | 8.247 | 1 | 0 | 1 | 0 | 1 |
| 11 | M2 | 1 | max | .306 | 1 | .783 | 2 | 0 | 1 | -13.194 | 1 | 15.419 | 2 | 0 | 1 | 0 | 1 |
| 12 | | | min | .21 | 2 | .684 | 1 | 0 | 1 | -15.419 | 2 | 13.194 | 1 | 0 | 1 | 0 | 1 |
| 13 | | 2 | max | .159 | 1 | .346 | 2 | 0 | 1 | -6.112 | 1 | 7.248 | 2 | 0 | 1 | 0 | 1 |
| 14 | | | min | .106 | 2 | .3 | 1 | 0 | 1 | -7.248 | 2 | 6.112 | 1 | 0 | 1 | 0 | 1 |
| 15 | | 3 | max | .119 | 1 | .276 | 2 | 0 | 1 | -3.179 | 1 | 3.8 | 2 | 0 | 1 | 0 | 1 |
| 16 | | | min | .08 | 2 | .231 | 1 | 0 | 1 | -3.8 | 2 | 3.179 | 1 | 0 | 1 | 0 | 1 |
| 17 | | 4 | max | .082 | 1 | .219 | 2 | 0 | 1 | -.875 | 1 | 1.046 | 2 | 0 | 1 | 0 | 1 |
| 18 | | | min | .056 | 2 | .183 | 1 | 0 | 1 | -1.046 | 2 | .875 | 1 | 0 | 1 | 0 | 1 |
| 19 | | 5 | max | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

## Envelope Joint Reactions

| | Joint | | X [k] | LC | Y [k] | LC | Z [k] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | max | 2.813 | 2 | 1.553 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | min | 2.497 | 1 | 1.058 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | TOP_CONN | max | -10.107 | 1 | 6.962 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4 | | min | -11.613 | 2 | 4.767 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 5 | Totals: | max | -7.61 | 1 | 8.515 | 1 | 0 | 1 | | | | | | |
| 6 | | min | -8.799 | 2 | 5.825 | 2 | 0 | 1 | | | | | | |

## Envelope Joint Displacements

| | Joint | | X [in] | LC | Y [in] | LC | Z [in] | LC | X Rotation... | LC | Y Rotation... | LC | Z Rotation... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | max | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 4.805e-3 | 2 |
| 2 | | min | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 4.214e-3 | 1 |
| 3 | TOP_CONN | max | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -9.242e-3 | 1 |

## Envelope Joint Displacements (Continued)

| | Joint | | X [in] | LC | Y [in] | LC | Z [in] | LC | X Rotation... | LC | Y Rotation... | LC | Z Rotation... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -1.059e-2 | 2 |
| 5 | SPLICE | max | 2.218 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -1.736e-2 | 1 |
| 6 | | min | 1.932 | 1 | -.001 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -1.997e-2 | 2 |
| 7 | TOP_MAST | max | 9.013 | 2 | -.002 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -2.329e-2 | 1 |
| 8 | | min | 7.806 | 1 | -.003 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.699e-2 | 2 |
| 9 | CL_SPRINT | max | 7.934 | 2 | -.002 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -2.328e-2 | 1 |
| 10 | | min | 6.874 | 1 | -.003 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.698e-2 | 2 |
| 11 | CL_ATT | max | 3.665 | 2 | -.001 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -2.075e-2 | 1 |
| 12 | | min | 3.187 | 1 | -.002 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.396e-2 | 2 |

## Envelope AISC ASD Steel Code Checks

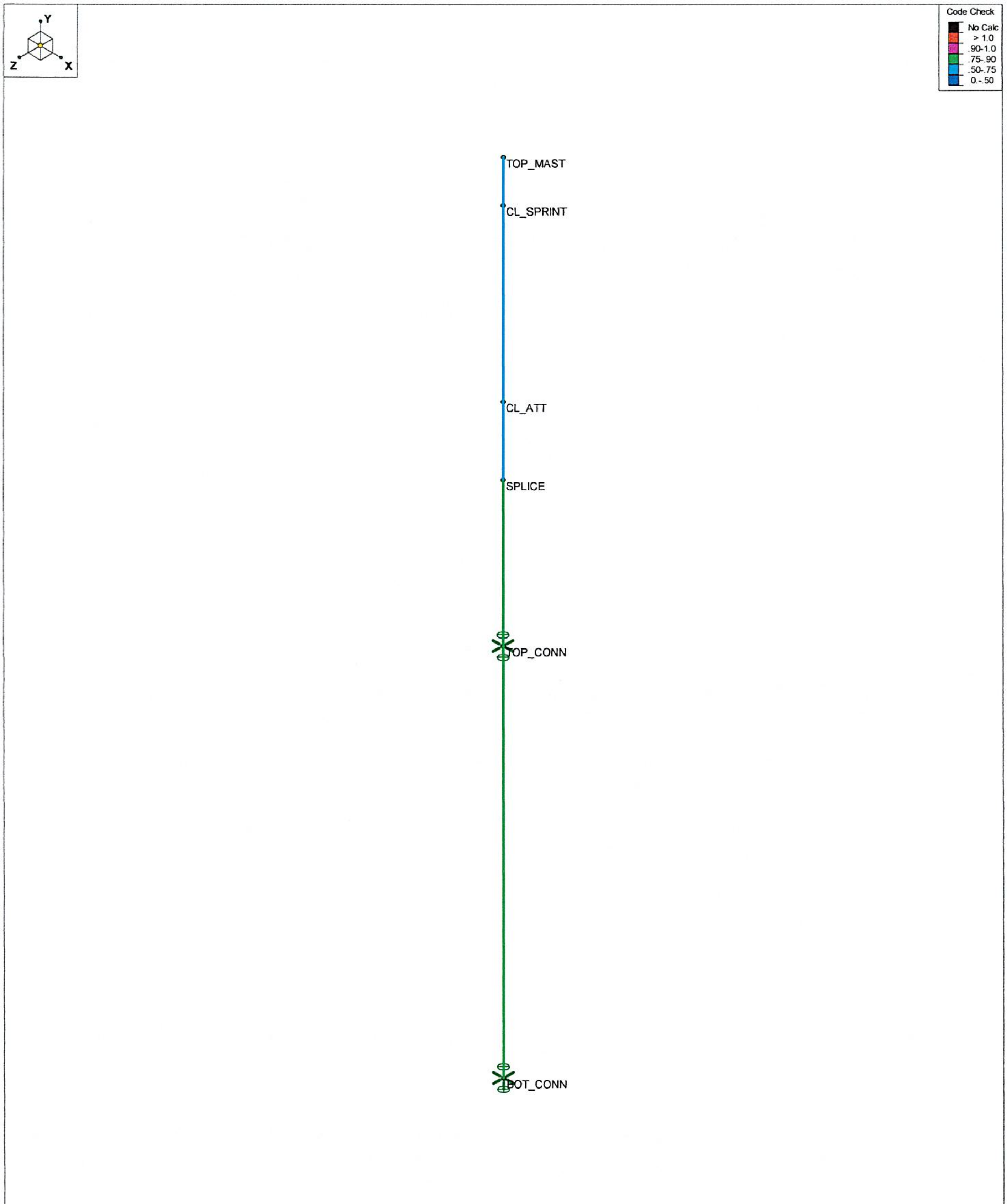
| | Member | Shape | Code Check | Loc[ft] | LC | Sh... | Loc[ft] | ... | ... | ...Fa... | Ft [ksi] | Fb y-y [ksi] | Fb... | ... | ... | ... | AS... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | HSS16... | .794 | 29.8... | 2 | .044 | 30.321 | | 2 | 15... | 25.2 | 27.72 | 27... | 1 | .6 | ... | H2... |
| 2 | M2 | PIPE_1... | .677 | 0 | 2 | .056 | 0 | | 2 | 14... | 21 | 23.1 | 23.1 | ... | .6 | ... | H1... |

## *Joint Reactions*

| | LC | Joint Label | X [k] | Y [k] | Z [k] | MX [k-ft] | MY [k-ft] | MZ [k-ft] |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | BOT_CONN | 2.497 | 1.553 | 0 | 0 | 0 | 0 |
| 2 | 1 | TOP_CONN | -10.107 | 6.962 | 0 | 0 | 0 | 0 |
| 3 | 1 | Totals: | -7.61 | 8.515 | 0 | | | |
| 4 | 1 | COG (ft): | X: 0 | Y: 36.053 | Z: 0 | | | |

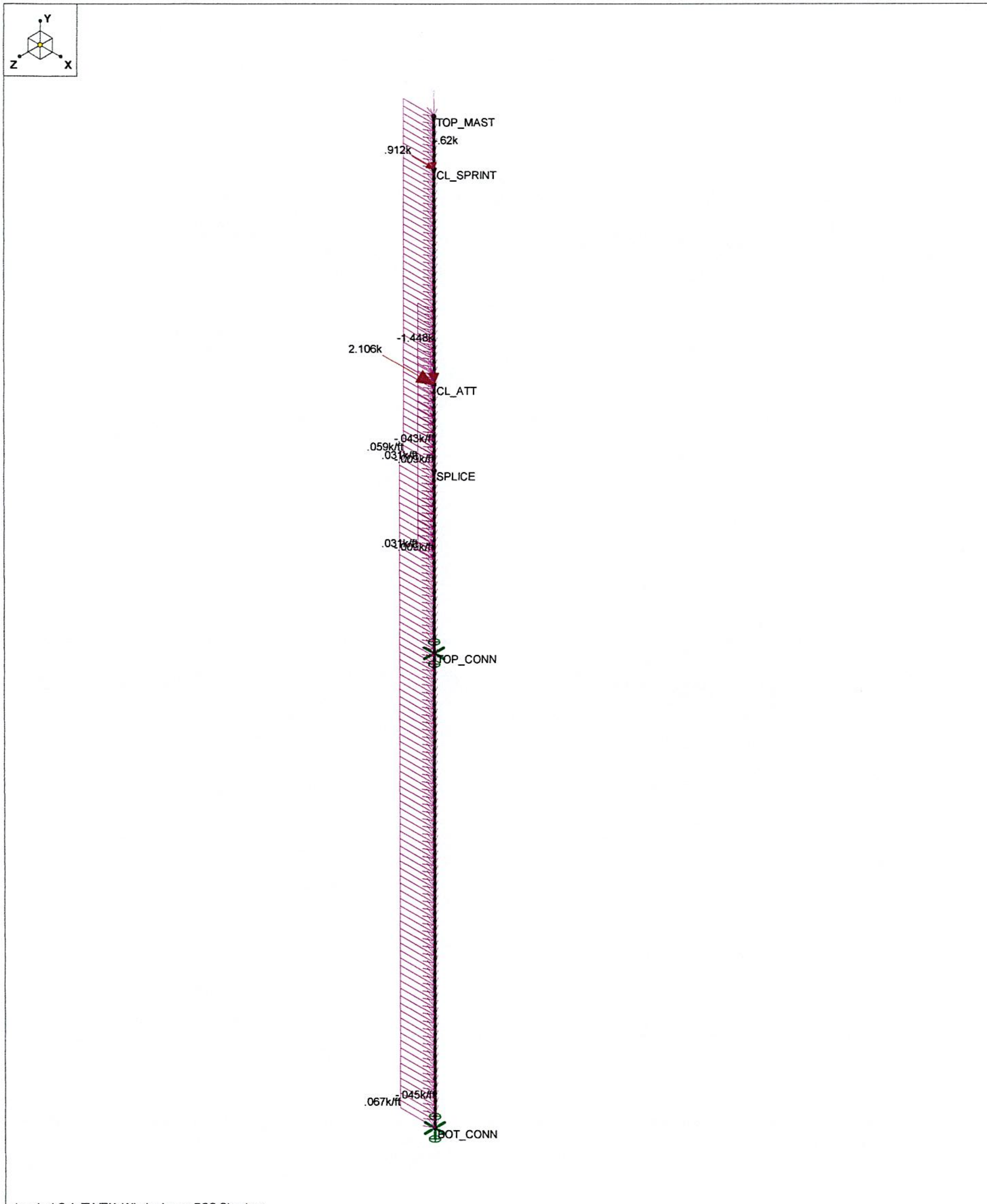
## *Joint Reactions*

| | LC | Joint Label | X [k] | Y [k] | Z [k] | MX [k-ft] | MY [k-ft] | MZ [k-ft] |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | BOT_CONN | 2.813 | 1.058 | 0 | 0 | 0 | 0 |
| 2 | 2 | TOP_CONN | -11.613 | 4.767 | 0 | 0 | 0 | 0 |
| 3 | 2 | Totals: | -8.799 | 5.825 | 0 | | | |
| 4 | 2 | COG (ft): | X: 0 | Y: 36.07 | Z: 0 | | | |



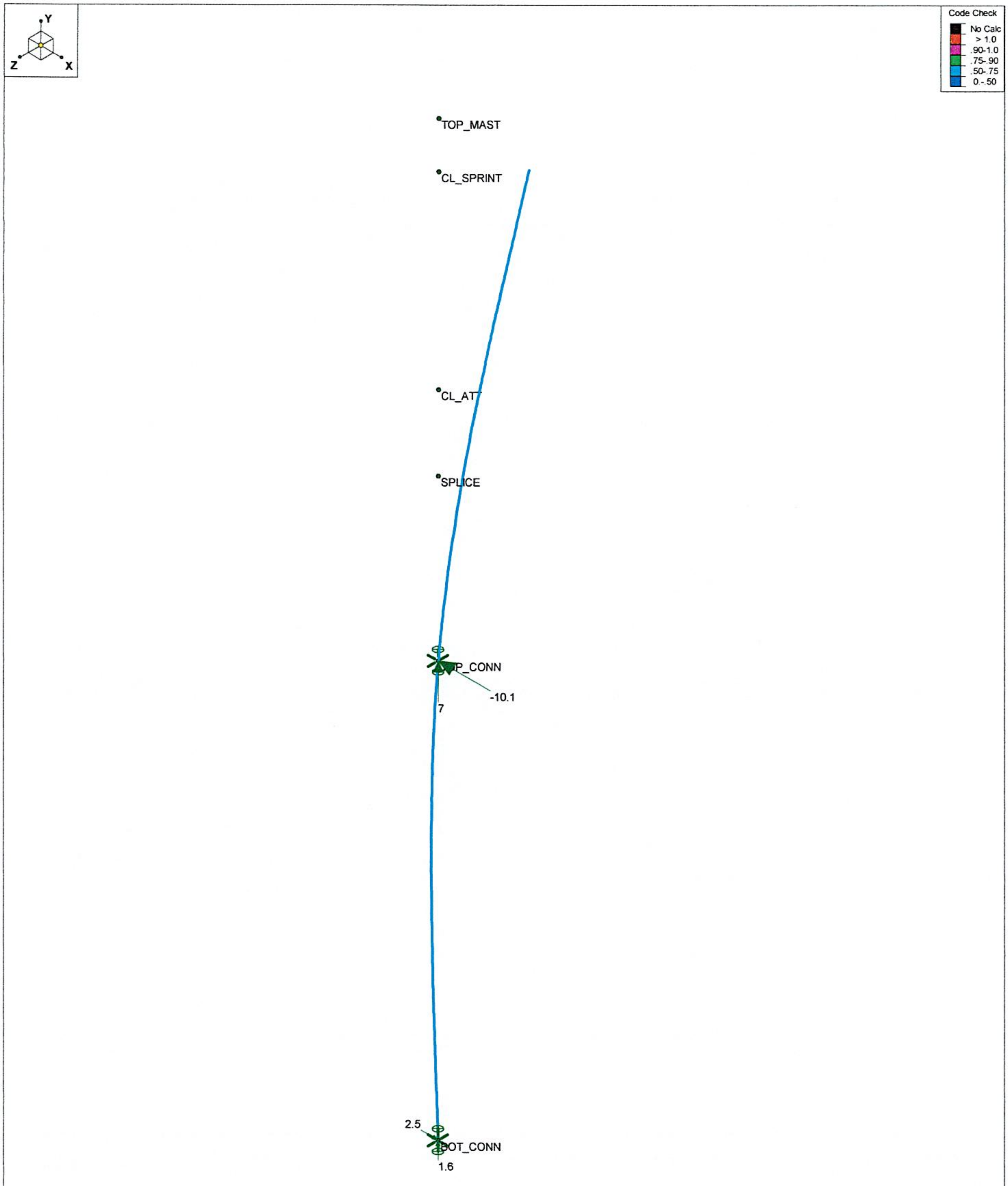

Solution: Envelope

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:31 AM |
| 12047.CO13 /Sprint CT54... | Unity Check | EIA-TIA Loads.r3d |



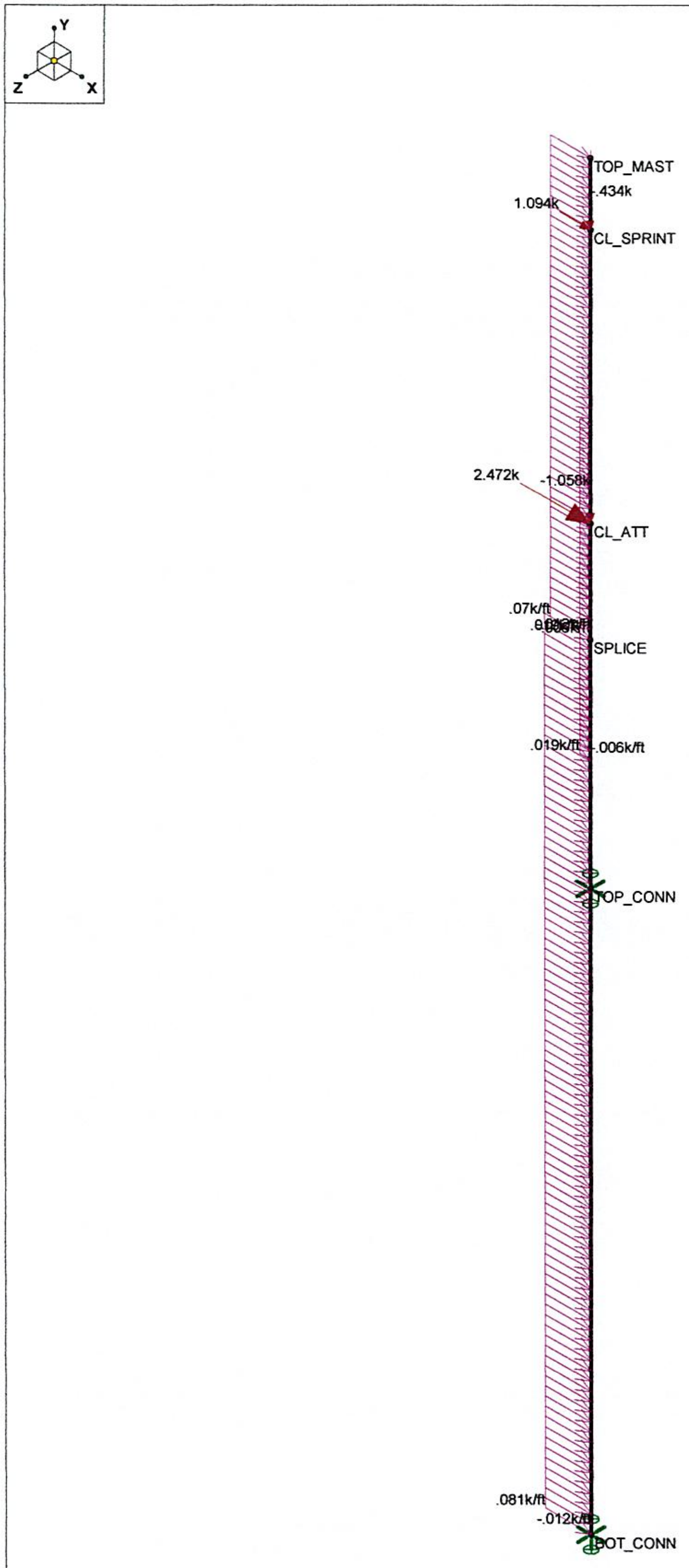

Loads: LC 1, TIA/EIA Wind + Ice on PCS Structure

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:31 AM |
| 12047.CO13 /Sprint CT54... | LC #1 Loads | EIA-TIA Loads.r3d |



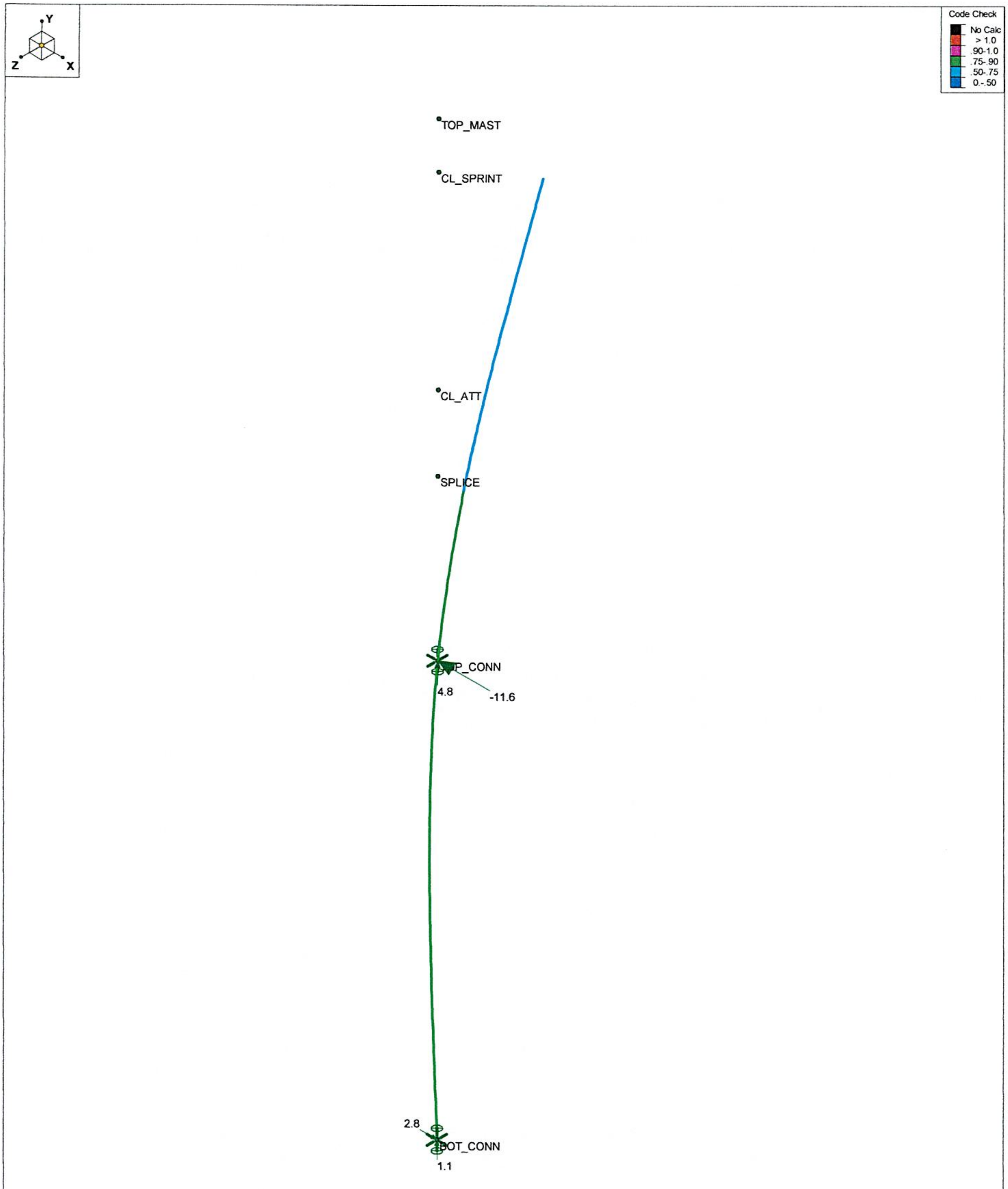

Results for LC 1, TIA/EIA Wind + Ice on PCS Structure
Z-moment Reaction units are k and k-ft

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:32 AM |
| 12047.CO13 /Sprint CT54... | LC #1 Reactions and Deflected Shape | EIA-TIA Loads.r3d |




Loads: LC 2, TIA/EIA Wind on PCS Structure

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:32 AM |
| 12047.CO13 /Sprint CT54... | LC #2 Loads | EIA-TIA Loads.r3d |




Results for LC 2, TIA/EIA Wind on PCS Structure
Z-moment Reaction units are k and k-ft

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:33 AM |
| 12047.CO13 /Sprint CT54... | LC #2 Reactions and Deflected Shape | EIA-TIA Loads.r3d |

## Mast Connection to CL&P Tower:

Reactions:

| | | |
|---|---|---|
| Moment = | $Moment := 0 \cdot kips$ | (Input From Risa-3D) |
| Vertical = | $Vertical := 4.8 \cdot kips$ | (Input From Risa-3D) |
| Horizontal x-dir = | $Horizontal_x := 11.6 \cdot kips$ | (Input From Risa-3D) |
| Horizontal z-dir = | $Horizontal_z := 11.6 \cdot kips$ | (Input From Risa-3D) |

Bolt Data:

| | | |
|---|---|---|
| Bolt Type = | ASTM A325 | (User Input) |
| Bolt Diameter = | $D := 0.625 \cdot in$ | (User Input) |
| Number of Bolts = | $N_b := 4$ | (User Input) |
| Allowable Tensile Strength = | $F_t := 13.8 \cdot kips$ | (User Input) |
| Allowable Shear Strength = | $F_v := 7.36 \cdot kips$ | (User Input) |

Shear Force = $$f_v := \frac{\sqrt{Horizontal_z^2 + Vertical^2}}{N_b} = 3.1 \cdot kips$$

Bolt Shear % of Capacity = $$\frac{f_v}{F_v} = 42.64 \cdot \%$$

Check Bolt Shear = $$Bolt\_Shear := if\left(\frac{f_v}{F_v} \le 1.00, "OK", "Overstressed"\right)$$

Bolt_Shear = "OK"

Tension Force = $$f_t := \frac{Horizontal_x}{N_b} = 2.9 \cdot kips$$

Bolt Tenison % of Capacity = $$\frac{f_t}{F_t} = 21.01 \cdot \%$$

Check Bolt Tension = $$Bolt\_Tension := if\left(\frac{f_t}{F_t} \le 1.00, "OK", "Overstressed"\right)$$

Bolt_Tension = "OK"

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F: (203) 488-8587

| | |
|---|---|
| Subject: | Load Analysis of Pipe Mast on CL&P Structure #2683 |
| Location: | Brookfield, CT |
| Rev. 0: 4/17/13 | Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13 |

## Basic Components

Heavy Wind Pressure = $p := 4.00$ psf (User Input NESC 2007 Figure 250-1 & Table 250-1)

Basic Windspeed = $V := 100$ mph (User Input NESC 2007 Figure 250-2(e) )

Radial Ice Thickness = $Ir := 0.50$ in (User Input)

Radial Ice Density = $Id := 56.0$ pcf (User Input)

## Factors for Extreme Wind Calculation

Elevation of Top of PCS Mast Above Grade = $TME := 114$ ft (User Input)

Multiplier Gust Response Factor = $m := 1.25$ (User Input - Only for NESC Extreme wind case)

NESC Factor = $kv := 1.43$ (User Input from NESC 2007 Table 250-3 equation)

Importance Factor = $I := 1.0$ (User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.301$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.307$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.837$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.86$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 28.6$ psf (NESC 2007 Section 250.C.2)

## Shape Factors

NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members = $Cd_R := 1.3$ (User Input)

Shape Factor for Flat Members = $Cd_F := 1.6$ (User Input)

Shape Factor for Coax Cables Attached to Outside of Pole = $Cd_{coax} := 1.45$ (User Input)

## Overload Factors

NU Design Criteria Table

### Overload Factors for Wind Loads:

**NESC Heavy Loading =** **2.5** (User Input) Apply in Risa-3D Analysis

**NESC Extreme Loading =** **1.0** (User Input) Apply in Risa-3D Analysis

### Overload Factors for Vertical Loads:

**NESC Heavy Loading =** **1.5** (User Input) Apply in Risa-3D Analysis

**NESC Extreme Loading =** **1.0** (User Input) Apply in Risa-3D Analysis

**Development of Wind & Ice Load on PCS Mast**

**Existing Upper PCS Mast Data:** (Pipe 12 STD)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 12.8$ in (User Input)

Mast Length = $L_{mast} := 22.417$ ft (User Input)

Mast Thickness = $t_{mast} := 0.375$ in (User Input)

**Wind Load (NESC Extreme)**

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.067$ sf/ft

Total Mast Wind Force (Above NU Structure) = $qz \cdot Cd_R \cdot A_{mast} \cdot m = 50$ plf **BLC 5**

**Wind Load (NESE Heavy)**

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.15$ sf/ft

Total Mast Wind Force w/ Ice = $p \cdot Cd_R \cdot AICE_{mast} = 6$ plf **BLC 4**

**Gravity Loads (without ice)**

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^2\right] = 20.9$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 8$ plf **BLC 3**

| | | |
|---|---|---|
| CENTEK engineering<br>Centered on Solutions www.centekeng.com<br>63-2 North Branford Road P: (203) 488-0580<br>Branford, CT 06405 F: (203) 488-8587 | Subject: | Load Analysis of Pipe Mast on CL&P Structure #2683 |
| | Location: | Brookfield, CT |
| | Rev. 0: 4/17/13 | Prepared by: T.J.L. Checked by: C.F.C.<br>Job No. 12047.CO13 |

**Development of Wind & Ice Load on PCS Mast**

**Existing Lower PCS Mast Data:** HSS16.0x0.375

| | | | |
|---|---|---|---|
| Mast Shape = | Round | | (User Input) |
| Mast Diameter = | $D_{mast} := 16.0$ | in | (User Input) |
| Mast Length = | $L_{mast} := 41.583$ | ft | (User Input) |
| Mast Thickness = | $t_{mast} := 0.375$ | in | (User Input) |

**Wind Load (NESC Extreme)**

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.333$ sf/ft

Total Mast Wind Force (Below NU Structure) = $qz \cdot Cd_R \cdot A_{mast} = 50$ plf **BLC 5**

**Wind Load (NESE Heavy)**

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.417$ sf/ft

Total Mast Wind Force w/ Ice = $p \cdot Cd_R \cdot AICE_{mast} = 7$ plf **BLC 4**

**Gravity Loads (without ice)**

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\ 2}\right] = 25.9$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 10$ plf **BLC 3**

**Development of Wind & Ice Load on Antennas**

**Existing Antenna Data:** (Sprint)

Antenna Model = RFS APX VSPP18-C

Antenna Shape = Flat (User Input)

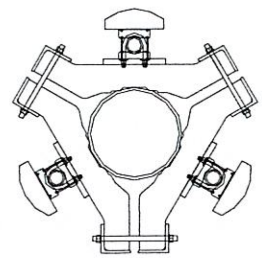
Antenna Height = $L_{ant} := 72$ in (User Input)

Antenna Width = $W_{ant} := 11.8$ in (User Input)

Antenna Thickness = $T_{ant} := 7$ in (User Input)

Antenna Weight = $WT_{ant} := 57$ lbs (User Input)

Number of Antennas = $N_{ant} := 3$ (User Input)



**Wind Load (NESC Extreme)**

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.9$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 17.7$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 1014$ lbs **BLC 5**

**Wind Load (NESC Heavy)**

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.5$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 125$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 171$ lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5947$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1528$ cu in

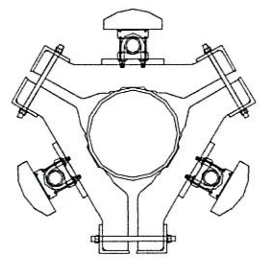
Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 50$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 149$ lbs **BLC 3**

## Development of Wind & Ice Load on Antenna Mounts

**Mount Data:** (Sprint)

Mount Type: Microflect Universal Tri-Bracket



| | | | |
|---|---|---|---|
| Mount Shape = | Flat | | (User Input) |
| Pipe Mount Length = | $L_{mnt} := 72$ | in | (User Input) |
| 2 inch Pipe Mount Linear Weight = | $W_{mnt} := 3.66$ | plf | (User Input) |
| Pipe Mount Outside Diameter = | $D_{mnt} := 2.375$ | in | (User Input) |
| Number of Mounting Pipes = | $N_{mnt} := 3$ | | (User Input) |
| Tri-Bracket Weight = | $W_{tb.mnt} := 197$ | lbs | (User Input) |

### Wind Load (NESC Extreme)

***Assumes Mount is Shielded by Antenna***

Mount Projected Surface Area = $A_{mnt} := 0.0$ sf

Total Mount Wind Force = $F_{mnt} := qz \cdot Cd_F \cdot A_{mnt} \cdot m = 0$ lbs **BLC 5**

### Wind Load (NESC Heavy)

***Assumes Mount is Shielded by Antenna***

Mount Projected Surface Area w/ Ice = $A_{ICEmnt} := 0.0$ sf

Total Mount Wind Force = $Fi_{mnt} := p \cdot Cd_F \cdot A_{ICEmnt} = 0$ lbs **BLC 4**

### Gravity Loads (without ice)

(per TIA/EIA-222-F-1996)

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 22$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{tb.mnt} = 263$ lbs **BLC 2**

### Gravity Load (ice only)

(per TIA/EIA-222-F-1996)

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^{2} \cdot L_{mnt} = 319$ cu in

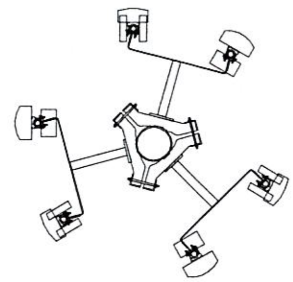
Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 1\right)^2\right] \cdot \left(L_{mnt} + 1\right)\right] - V_{mnt} = 334$ cu in

Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 11$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 5 = 37$ lbs **BLC 3**

## Development of Wind & Ice Load on Antennas

**Existing Antenna Data:** (AT&T)



| | | | |
|---|---|---|---|
| Antenna Model = | Powerwave 7770.00 | | |
| Antenna Shape = | Flat | | (User Input) |
| Antenna Height = | $L_{ant} := 55$ | in | (User Input) |
| Antenna Width = | $W_{ant} := 11.0$ | in | (User Input) |
| Antenna Thickness = | $T_{ant} := 5$ | in | (User Input) |
| Antenna Weight = | $WT_{ant} := 39$ | lbs | (User Input) |
| Number of Antennas = | $N_{ant} := 3$ | | (User Input) |

### Wind Load (NESC Extreme)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.2$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 12.6$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 722$ lbs **BLC 5**

### Wind Load (NESC Heavy)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant}+1) \cdot (W_{ant}+1)}{144} = 4.7$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 14$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 90$ lbs **BLC 4**

### Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 117$ lbs **BLC 2**

### Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 3025$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant}+1)(W_{ant}+1) \cdot (T_{ant}+1) - V_{ant} = 1007$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 33$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 98$ lbs **BLC 3**

## Development of Wind & Ice Load on Antennas

**Proposed Antenna Data:** (AT&T)

Antenna Model = Powerwave P65-16-XLH-RR

Antenna Shape = Flat (User Input)

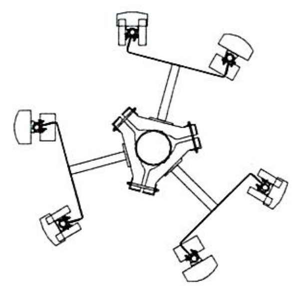
Antenna Height = $L_{ant} := 72$ in (User Input)

Antenna Width = $W_{ant} := 12$ in (User Input)

Antenna Thickness = $T_{ant} := 6$ in (User Input)

Antenna Weight = $WT_{ant} := 64$ lbs (User Input)

Number of Antennas = $N_{ant} := 3$ (User Input)



### Wind Load (NESC Extreme)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 18$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 1031$ lbs **BLC 5**

### Wind Load (NESC Heavy)

***Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously***

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.6$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.8$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 127$ lbs **BLC 4**

### Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 192$ lbs **BLC 2**

### Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5184$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1459$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 47$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 142$ lbs **BLC 3**

**Development of Wind & Ice Load on TMA's**

**Existing TMA Data:** (AT&T)

TMA Model = Powerwave LGP 21401

TMA Shape = Flat (User Input)

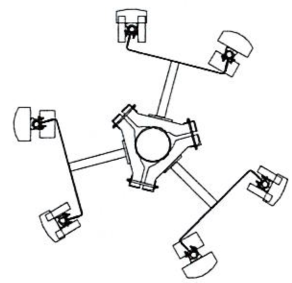
TMA Height = $L_{TMA} := 14.4$ in (User Input)

TMA Width = $W_{TMA} := 9.2$ in (User Input)

TMA Thickness = $T_{TMA} := 2.6$ in (User Input)

TMA Weight = $WT_{TMA} := 14.1$ lbs (User Input)

Number of TMA's = $N_{TMA} := 6$ (User Input)



**Wind Load (NESC Extreme)**

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA = $SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.9$ sf

TMA Projected Surface Area = $A_{TMA} := SA_{TMA} \cdot N_{TMA} = 5.5$ sf

Total TMA Wind Force = $F_{TMA} := qz \cdot Cd_F \cdot A_{TMA} \cdot m = 316$ lbs **BLC 5**

**Wind Load (NESC Heavy)**

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA w/ Ice = $SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 1.1$ sf

TMA Projected Surface Area w/ Ice = $A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 6.5$ sf

Total TMA Wind Force w/ Ice = $Fi_{TMA} := p \cdot Cd_F \cdot A_{ICETMA} = 42$ lbs **BLC 4**

**Gravity Load (without ice)**

Weight of All TMA's = $WT_{TMA} \cdot N_{TMA} = 85$ lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each TMA = $V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 344$ cu in

Volume of Ice on Each TMA = $V_{ice} := (L_{TMA} + 1)(W_{TMA} + 1)(T_{TMA} + 1) - V_{TMA} = 221$ cu in

Weight of Ice on Each TMA = $W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 7$ lbs

Weight of Ice on All TMA's $W_{ICETMA} \cdot N_{TMA} = 43$ lbs **BLC 3**

## Development of Wind & Ice Load on TMA's

**Proposed TMA Data:** (AT&T)

TMA Model = Powerwave TTAW-07B P111-001

TMA Shape = Flat (User Input)

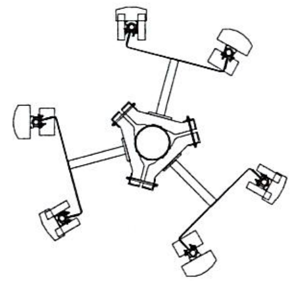
TMA Height = $L_{TMA} := 9.9$ in (User Input)

TMA Width = $W_{TMA} := 6.7$ in (User Input)

TMA Thickness = $T_{TMA} := 5.4$ in (User Input)

TMA Weight = $WT_{TMA} := 18$ lbs (User Input)

Number of TMA's = $N_{TMA} := 3$ (User Input)



### Wind Load (NESC Extreme)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA = $SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.5$ sf

TMA Projected Surface Area = $A_{TMA} := SA_{TMA} \cdot N_{TMA} = 1.4$ sf

Total TMA Wind Force = $F_{TMA} := qz \cdot Cd_F \cdot A_{TMA} \cdot m = 79$ lbs **BLC 5**

### Wind Load (NESC Heavy)

***Assumes Maximum Possible Wind Pressure Applied to All TMA's Simultaneously***

Surface Area for One TMA w/ Ice = $SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 0.6$ sf

TMA Projected Surface Area w/ Ice = $A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 1.7$ sf

Total TMA Wind Force w/ Ice = $Fi_{TMA} := p \cdot Cd_F \cdot A_{ICETMA} = 11$ lbs **BLC 4**

### Gravity Load (without ice)

Weight of All TMA's = $WT_{TMA} \cdot N_{TMA} = 54$ lbs **BLC 2**

### Gravity Load (ice only)

Volume of Each TMA = $V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 358$ cu in

Volume of Ice on Each TMA = $V_{ice} := (L_{TMA} + 1)(W_{TMA} + 1)(T_{TMA} + 1) - V_{TMA} = 179$ cu in

Weight of Ice on Each TMA = $W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 6$ lbs

Weight of Ice on All TMA's = $W_{ICETMA} \cdot N_{TMA} = 17$ lbs **BLC 3**

## Development of Wind & Ice Load on Mounts

**Mount Data:** (AT&T)

Mount Type = (3) Valmont Dual Standoff Mounts w/ Universal Tri-Bracket

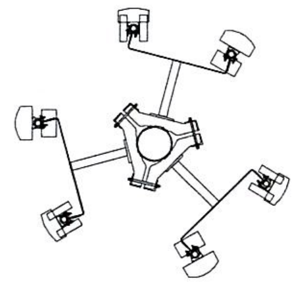
Mount Shape = Flat (User Input)

Mount Area = $A_{mnt} := 4.0$ sq ft (User Input)

Mount Area w/ Ice = $A_{ICEmnt} := 4.6$ sq ft (User Input)

Mount Weight = $WT_{mnt} := 610$ lbs (User Input)

Mount Weight w/ Ice = $WT_{ICEmnt} := 700$ lbs (User Input)



### Wind Load (NESC Extreme)

Total Mount Wind Force = $F_{mnt} := qz \cdot Cd_F \cdot A_{mnt} \cdot m = 229$ lbs **BLC 5**

### Wind Load (NESC Heavy)

Total Mount Wind Force w/ Ice = $Fi_{mnt} := p \cdot Cd_F \cdot A_{ICEmnt} = 29$ lbs **BLC 4**

### Gravity Load (without ice)

Weight of Mount = $WT_{mnt} = 610$ lbs **BLC 2**

### Gravity Load (ice only)

Weight of Ice on Mount = $WT_{ICEmnt} - WT_{mnt} = 90$ lbs **BLC 3**

CENTEK engineering
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Subject: Load Analysis of Pipe Mast on CL&P Structure #2683

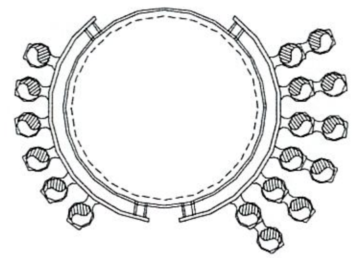
Location: Brookfield, CT

Rev. 0: 4/17/13

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 12047.CO13

**Development of Wind & Ice Load on Coax Cables**

**Existing Coax Cable Data:** (Sprint)



Coax Type = HELIAX 1-1/4"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.55$ in (User Input)

Coax Cable Length = $L_{coax} := 64$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 0.66$ plf (User Input)

Total Number of Coax = $N_{coax} := 18$ (User Input)

No. of Coax Projecting Outside Face of PCS Mast = $NP_{coax} := 3$ (User Input)

Note: AT&T Existing/Proposed cables attached to CL&P Pole

**Wind Load (NESC Extreme)**

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.4$ sf/ft

Total Coax Wind Force (Above NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 20$ plf **BLC 5**

Total Coax Wind Force (Below NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 16$ plf **BLC 5**

**Wind Load (NESC Heavy)**

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.5$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 3$ plf **BLC 4**

**Gravity Loads (without ice)**

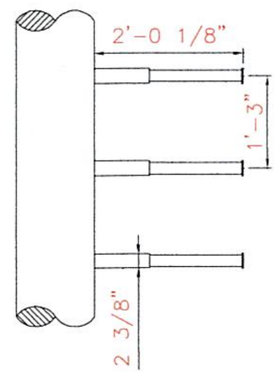
Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 2**

**Gravity Load (ice only)**

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\,2}\right] = 3.2$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 23$ plf **BLC 3**

## Development of Wind & Ice Load on Brace Member




**Member Data:** Step Bolts

| | | | |
|---|---|---|---|
| Shape = | Round | | (User Input) |
| Diameter = | $D_{mem} := 2.38$ | in | (User Input) |
| Length = | $L_{mem} := 2$ | ft | (User Input) |
| Spacing = | $Sp_{mem} := 1.25$ | ft | (User Input) |
| Weight = | $Wt_{mem} := 3.66$ | plf | (User Input) |

### Wind Load (NESC Extreme)

Member Projected Surface Area = $A_{mem} := \frac{D_{mem} \cdot L_{mem}}{12 \cdot Sp_{mem}} = 0.317$ sf/ft

Total Member Wind Force = $qz \cdot Cd_R \cdot A_{mem} \cdot m = 15$ plf **BLC 5**

### Wind Load (NESE Heavy)

Member Projected Surface Area w/ Ice = $AICE_{mem} := \frac{(D_{mem} + 2 \cdot Ir) \cdot (L_{mem} + 2 \cdot Ir)}{12 \cdot Sp_{mem}} = 0.676$ sf/ft

Total Member Wind Force w/ Ice = $p \cdot Cd_R \cdot AICE_{mem} = 4$ plf **BLC 4**

### Gravity Loads (without ice)

Weight of the Member = $\frac{Wt_{mem} \cdot L_{mem}}{Sp_{mem}} = 6$ plf **BLC 2**

### Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{mem} := \frac{1}{4} \cdot \pi \cdot \left[(D_{mem} + 2 \cdot Ir)^2 - D_{mem}^2\right] = 4.5$ sq in

Weight of Ice on Member = $W_{ICEmem} := Id \cdot \frac{Ai_{mem}}{144} \cdot \frac{L_{mem}}{Sp_{mem}} = 3$ plf **BLC 3**

CENTEK engineering, INC.
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Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining PCS Structure Reactions Applied to CL&P Pole Tabulated Load Cases**

Location: **Brookfield, CT**

Date:4/17/13 Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13

| Load Case | Description |
|---|---|
| 1 | Self Weight (Mast) |
| 2 | Weight of Appurtenances |
| 3 | Weight of Ice Only on PCS Structure [1] |
| 4 | NESC Heavy Wind on PCS Structure[1] |
| 5 | NESC Extreme Wind on PCS Structure[1] |

Footnotes:
(1) PCS Structure includes: Mast and Appurtenances

**CENTEK engineering, INC.**
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Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining PCS Structure Reactions Applied to CL&P Pole Load Combinations Table**
Location: **Brookfield, CT**
Date: 4/17/13 Prepared by: T.J.L. Checked by: C.F.C. Job No. 12047.CO13

| Load Combination | Description | Envelope Soultion | Wind Factor | P-Delta | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NESC Heavy Wind on PCS Structure | | 1 | | 1 | 1.5 | 2 | 1.5 | 3 | 1.5 | 4 | 2.5 | | |
| 2 | NESC Extreme Wind on PCS Structure | | 1 | | 1 | 1 | 2 | 1 | 5 | 1 | | | | |

Footnotes:
(1) BLC = Basic Load Case
(2) PCS Structure includes: Mast and Appurtenances

## Global

| | |
|---|---|
| Display Sections for Member Calcs | 5 |
| Max Internal Sections for Member Calcs | 97 |
| Include Shear Deformation | Yes |
| Include Warping | Yes |
| Area Load Mesh (in^2) | 144 |
| Merge Tolerance (in) | .12 |
| P-Delta Analysis Tolerance | 0.50% |
| Vertical Axis | Y |
| Global Member Orientation Plane | XZ |

| | |
|---|---|
| Hot Rolled Steel Code | AISC 9th: ASD |
| Cold Formed Steel Code | AISI 1999: ASD |
| Wood Code | AF&PA NDS-97: ASD |
| Wood Temperature | < 100F |
| Concrete Code | ACI 318-02 |
| Masonry Code | ACI 530-05/08: ASD |
| Aluminum Code | AA ADM1-05: ASD |

| | |
|---|---|
| Number of Shear Regions | 4 |
| Region Spacing Increment (in) | 4 |
| Biaxial Column Method | PCA Load Contour |
| Parme Beta Factor (PCA) | .65 |
| Concrete Stress Block | Rectangular |
| Use Cracked Sections | Yes |
| Bad Framing Warnings | No |
| Unused Force Warnings | Yes |

| | |
|---|---|
| Seismic Code | UBC 1997 |
| Seismic Base Elevation (ft) | Not Entered |
| Ct X | .035 |
| Ct Z | .035 |
| T X (sec) | Not Entered |
| T Z (sec) | Not Entered |
| R X | 8.5 |
| R Z | 8.5 |
| Ct Exp. X | .75 |
| Ct Exp. Z | .75 |
| Ca | .36 |
| Cv | .54 |
| Nv | 1 |
| SD1 | 1 |
| SDS | 1 |
| S1 | 1 |
| Occupancy Code | 4 |
| Seismic Zone | 3 |
| Use Group | I |
| Use Gravity Self Wt in Diaphragm Mass | Yes |
| Use Deck Self Wt in Diaphragm Mass | Yes |
| Use Lateral Self Wt in Diaphragm Mass | Yes |
| Seismic Detailing Code | None |
| Om X | 1 |
| Om Z | 1 |
| Rho X | 1 |
| Rho Z | 1 |

## Hot Rolled Steel Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (\1E... | Density[k/ft... | Yield[ksi] | Ry | Fu[ksi] | Rt |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A36 Gr.36 | 29000 | 11154 | .3 | .65 | .49 | 36 | 1.5 | 58 | 1.2 |
| 2 | A572 Gr.50 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 58 | 1.2 |
| 3 | A992 | 29000 | 11154 | .3 | .65 | .49 | 50 | 1.1 | 58 | 1.2 |
| 4 | A500 Gr.42 | 29000 | 11154 | .3 | .65 | .49 | 42 | 1.3 | 58 | 1.1 |
| 5 | A500 Gr.46 | 29000 | 11154 | .3 | .65 | .49 | 46 | 1.2 | 58 | 1.1 |
| 6 | A53 Gr. B | 29000 | 11154 | .3 | .65 | .49 | 35 | 1.5 | 58 | 1.2 |

## Hot Rolled Steel Design Parameters

| | Label | Shape | Lengt... | Lbyy[ft] | Lbzz[ft] | Lcomp top[ft] | Lcomp bot[ft] | Kyy | Kzz | Cm-... | Cm-... | Cb | y sw... | z sw... | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | Existing ... | 41.583 | 30 | | 30 | | | | | | | | | Lateral |
| 2 | M2 | Existing ... | 22.417 | 30 | | 30 | | | | | | | | | Lateral |

## Hot Rolled Steel Section Sets

| | Label | Shape | Type | Design List | Material | Design Rul... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Existing Upper Mast | PIPE_12.0 | Beam | Pipe | A53 Gr. B | Typical | 13.6 | 262 | 262 | 523 |
| 2 | Existing Lower Mast | HSS16X0.375 | Beam | Pipe | A500 Gr.42 | Typical | 17.2 | 526 | 526 | 1050 |

## Member Primary Data

| | Label | I Joint | J Joint | K Joint | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rules |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | BOT_CO... | SPLICE | | | Existing Lower... | Beam | Pipe | A500 Gr.42 | Typical |
| 2 | M2 | SPLICE | TOP_MA... | | | Existing Upper... | Beam | Pipe | A53 Gr. B | Typical |

## Joint Coordinates and Temperatures

| | Label | X [ft] | Y [ft] | Z [ft] | Temp [F] | Detach From Diap... |
|---|---|---|---|---|---|---|
| 1 | BOT_CONN | 0 | 0 | 0 | 0 | |
| 2 | TOP_CONN | 0 | 30 | 0 | 0 | |
| 3 | SPLICE | 0 | 41.583 | 0 | 0 | |
| 4 | TOP_MAST | 0 | 64 | 0 | 0 | |
| 5 | CL_SPRINT | 0 | 60.667 | 0 | 0 | |
| 6 | CL_ATT | 0 | 47 | 0 | 0 | |

## Joint Boundary Conditions

| | Joint Label | X [k/in] | Y [k/in] | Z [k/in] | X Rot.[k-ft/rad] | Y Rot.[k-ft/rad] | Z Rot.[k-ft/rad] | Footing |
|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | Reaction | Reaction | Reaction | | Reaction | | |
| 2 | TOP_CONN | Reaction | Reaction | Reaction | | Reaction | | |

## Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances)

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | Y | -.171 |
| 2 | CL_SPRINT | L | Y | -.263 |
| 3 | CL_ATT | L | Y | -.117 |
| 4 | CL_ATT | L | Y | -.192 |
| 5 | CL_ATT | L | Y | -.085 |

### *Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances) (Continued)*

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 6 | CL_ATT | L | Y | -.054 |
| 7 | CL_ATT | L | Y | -.61 |

### *Joint Loads and Enforced Displacements (BLC 3 : Weight of Ice Only on PCS Struct)*

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | Y | -.149 |
| 2 | CL_SPRINT | L | Y | -.037 |
| 3 | CL_ATT | L | Y | -.098 |
| 4 | CL_ATT | L | Y | -.142 |
| 5 | CL_ATT | L | Y | -.043 |
| 6 | CL_ATT | L | Y | -.017 |
| 7 | CL_ATT | L | Y | -.09 |

### *Joint Loads and Enforced Displacements (BLC 4 : NESC Heavy Wind on PCS Structure)*

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | X | .125 |
| 2 | CL_ATT | L | X | .09 |
| 3 | CL_ATT | L | X | .127 |
| 4 | CL_ATT | L | X | .042 |
| 5 | CL_ATT | L | X | .011 |
| 6 | CL_ATT | L | X | .029 |

### *Joint Loads and Enforced Displacements (BLC 5 : NESC Extreme Wind on PCS Structu)*

| | Joint Label | L,D,M | Direction | Magnitude[(k,k-ft), (in,rad), (k*s^2/f... |
|---|---|---|---|---|
| 1 | CL_SPRINT | L | X | 1.014 |
| 2 | CL_ATT | L | X | .722 |
| 3 | CL_ATT | L | X | 1.031 |
| 4 | CL_ATT | L | X | .316 |
| 5 | CL_ATT | L | X | .079 |
| 6 | CL_ATT | L | X | .229 |

### *Member Point Loads*

| Member Label | Direction | Magnitude[k,k-ft] | Location[ft,%] |
|---|---|---|---|
| No Data to Print ... | | | |

### *Member Distributed Loads (BLC 2 : Weight of Appurtenances)*

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | Y | -.012 | -.012 | 0 | 0 |
| 2 | M2 | Y | -.012 | -.012 | 0 | 0 |
| 3 | M1 | Y | -.006 | -.006 | 36 | 0 |
| 4 | M2 | Y | -.006 | -.006 | 0 | 10 |

### *Member Distributed Loads (BLC 3 : Weight of Ice Only on PCS Struct)*

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | Y | -.01 | -.01 | 0 | 0 |
| 2 | M2 | Y | -.008 | -.008 | 0 | 0 |
| 3 | M1 | Y | -.023 | -.023 | 0 | 0 |
| 4 | M2 | Y | -.023 | -.023 | 0 | 0 |

## Member Distributed Loads (BLC 3 : Weight of Ice Only on PCS Struct) (Continued)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 5 | M1 | Y | -.003 | -.003 | 36 | 0 |
| 6 | M2 | Y | -.003 | -.003 | 0 | 10 |

## Member Distributed Loads (BLC 4 : NESC Heavy Wind on PCS Structure)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | X | .007 | .007 | 0 | 0 |
| 2 | M2 | X | .006 | .006 | 0 | 0 |
| 3 | M1 | X | .003 | .003 | 0 | 0 |
| 4 | M2 | X | .003 | .003 | 0 | 0 |
| 5 | M1 | X | .004 | .004 | 36 | 0 |
| 6 | M2 | X | .004 | .004 | 0 | 10 |

## Member Distributed Loads (BLC 5 : NESC Extreme Wind on PCS Structu)

| | Member Label | Direction | Start Magnitude[k/ft,deg] | End Magnitude[k/f... | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M1 | X | .05 | .05 | 0 | 0 |
| 2 | M2 | X | .05 | .05 | 0 | 0 |
| 3 | M1 | X | .016 | .016 | 0 | 0 |
| 4 | M2 | X | .02 | .02 | 0 | 0 |
| 5 | M1 | X | .015 | .015 | 36 | 0 |
| 6 | M2 | X | .015 | .015 | 0 | 10 |

## Basic Load Cases

| | BLC Description | Category | X Gr... | Y Gr... | Z Grav... | Joint | Point | Distri... | Area(... | Surfa... |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Self Weight (PCS Mast) | None | | -1 | | | | | | |
| 2 | Weight of Appurtenances | None | | | | 7 | | 4 | | |
| 3 | Weight of Ice Only on PCS Struct | None | | | | 7 | | 6 | | |
| 4 | NESC Heavy Wind on PCS Structure | None | | | | 6 | | 6 | | |
| 5 | NESC Extreme Wind on PCS Structu | None | | | | 6 | | 6 | | |

## Load Combinations

| | Description | So... | PDelta | SRSS | BLC | Fac... | BLC | Fac... | BLC | Fac... | BLC | Fac... | BLC | Fac... | BLC | Fac... | BLC | Fac... | BLC | Fac... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NESC Heavy Wind on PCS ... | Yes | | | 1 | 1.5 | 2 | 1.5 | 3 | 1.5 | 4 | 2.5 | | | | | | | | |
| 2 | NESC Extreme Wind on PCS... | Yes | | | 1 | 1 | 2 | 1 | 5 | 1 | | | | | | | | | | |
| 3 | Self Weight | | | | 1 | 1 | | | | | | | | | | | | | | |

## Envelope Member Section Forces

| | Member | Sec | | Axial[k] | LC | y Shear[k] | LC | z Shear[k] | LC | Torque[k-ft] | LC | y-y Momen... | LC | z-z Momen... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | 1 | max | 2.329 | 1 | -.879 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | | min | 1.058 | 2 | -2.841 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | | 2 | max | .715 | 1 | -1.139 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 33.098 | 2 |
| 4 | | | min | .325 | 2 | -3.527 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 10.486 | 1 |
| 5 | | 3 | max | -.408 | 2 | -1.399 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 73.328 | 2 |
| 6 | | | min | -.899 | 1 | -4.213 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 23.675 | 1 |
| 7 | | 4 | max | 7.929 | 1 | 5.88 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 107.893 | 2 |
| 8 | | | min | 3.625 | 2 | 1.98 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 35.244 | 1 |
| 9 | | 5 | max | 6.239 | 1 | 5.11 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 50.566 | 2 |
| 10 | | | min | 2.858 | 2 | 1.664 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 16.166 | 1 |

## Envelope Member Section Forces (Continued)

| | Member | Sec | | Axial[k] | LC | y Shear[k] | LC | z Shear[k] | LC | Torque[k-ft] | LC | y-y Momen... | LC | z-z Momen... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | M2 | 1 | max | 6.239 | 1 | 5.11 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 50.566 | 2 |
| 12 | | | min | 2.858 | 2 | 1.664 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 16.166 | 1 |
| 13 | | 2 | max | 3.241 | 1 | 2.257 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 23.707 | 2 |
| 14 | | | min | 1.44 | 2 | .735 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 7.489 | 1 |
| 15 | | 3 | max | 2.431 | 1 | 1.799 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 12.383 | 2 |
| 16 | | | min | 1.087 | 2 | .565 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 3.874 | 1 |
| 17 | | 4 | max | 1.681 | 1 | 1.406 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 3.402 | 2 |
| 18 | | | min | .761 | 2 | .439 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1.063 | 1 |
| 19 | | 5 | max | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

## Envelope Member Section Stresses

| | Member | Sec | | Axial[ksi] | LC | y Shear[... | LC | z Shear[... | LC | y-Top[ksi] | LC | y-Bot[ksi] | LC | z-Top[ksi] | LC | z-Bot[ksi] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | 1 | max | .135 | 1 | -.102 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | | min | .062 | 2 | -.33 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | | 2 | max | .042 | 1 | -.132 | 1 | 0 | 1 | -1.914 | 1 | 6.041 | 2 | 0 | 1 | 0 | 1 |
| 4 | | | min | .019 | 2 | -.41 | 2 | 0 | 1 | -6.041 | 2 | 1.914 | 1 | 0 | 1 | 0 | 1 |
| 5 | | 3 | max | -.024 | 2 | -.163 | 1 | 0 | 1 | -4.321 | 1 | 13.383 | 2 | 0 | 1 | 0 | 1 |
| 6 | | | min | -.052 | 1 | -.49 | 2 | 0 | 1 | -13.383 | 2 | 4.321 | 1 | 0 | 1 | 0 | 1 |
| 7 | | 4 | max | .461 | 1 | .684 | 2 | 0 | 1 | -6.432 | 1 | 19.692 | 2 | 0 | 1 | 0 | 1 |
| 8 | | | min | .211 | 2 | .23 | 1 | 0 | 1 | -19.692 | 2 | 6.432 | 1 | 0 | 1 | 0 | 1 |
| 9 | | 5 | max | .363 | 1 | .594 | 2 | 0 | 1 | -2.951 | 1 | 9.229 | 2 | 0 | 1 | 0 | 1 |
| 10 | | | min | .166 | 2 | .194 | 1 | 0 | 1 | -9.229 | 2 | 2.951 | 1 | 0 | 1 | 0 | 1 |
| 11 | M2 | 1 | max | .459 | 1 | .751 | 2 | 0 | 1 | -4.72 | 1 | 14.764 | 2 | 0 | 1 | 0 | 1 |
| 12 | | | min | .21 | 2 | .245 | 1 | 0 | 1 | -14.764 | 2 | 4.72 | 1 | 0 | 1 | 0 | 1 |
| 13 | | 2 | max | .238 | 1 | .332 | 2 | 0 | 1 | -2.187 | 1 | 6.922 | 2 | 0 | 1 | 0 | 1 |
| 14 | | | min | .106 | 2 | .108 | 1 | 0 | 1 | -6.922 | 2 | 2.187 | 1 | 0 | 1 | 0 | 1 |
| 15 | | 3 | max | .179 | 1 | .264 | 2 | 0 | 1 | -1.131 | 1 | 3.616 | 2 | 0 | 1 | 0 | 1 |
| 16 | | | min | .08 | 2 | .083 | 1 | 0 | 1 | -3.616 | 2 | 1.131 | 1 | 0 | 1 | 0 | 1 |
| 17 | | 4 | max | .124 | 1 | .207 | 2 | 0 | 1 | -.31 | 1 | .993 | 2 | 0 | 1 | 0 | 1 |
| 18 | | | min | .056 | 2 | .064 | 1 | 0 | 1 | -.993 | 2 | .31 | 1 | 0 | 1 | 0 | 1 |
| 19 | | 5 | max | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

## Envelope Joint Reactions

| | Joint | | X [k] | LC | Y [k] | LC | Z [k] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | max | 2.841 | 2 | 2.329 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2 | | min | .879 | 1 | 1.058 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | TOP_CONN | max | -3.639 | 1 | 10.442 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4 | | min | -10.779 | 2 | 4.767 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 5 | Totals: | max | -2.76 | 1 | 12.772 | 1 | 0 | 1 | | | | | | |
| 6 | | min | -7.938 | 2 | 5.825 | 2 | 0 | 1 | | | | | | |

## Envelope Joint Displacements

| | Joint | | X [in] | LC | Y [in] | LC | Z [in] | LC | X Rotation... | LC | Y Rotation... | LC | Z Rotation... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BOT_CONN | max | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 4.686e-3 | 2 |
| 2 | | min | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1.498e-3 | 1 |
| 3 | TOP_CONN | max | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -3.298e-3 | 1 |

## Envelope Joint Displacements (Continued)

| | Joint | | X [in] | LC | Y [in] | LC | Z [in] | LC | X Rotation... | LC | Y Rotation... | LC | Z Rotation... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | min | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -1.019e-2 | 2 |
| 5 | SPLICE | max | 2.127 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -6.201e-3 | 1 |
| 6 | | min | .69 | 1 | -.002 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -1.914e-2 | 2 |
| 7 | TOP_MAST | max | 8.636 | 2 | -.002 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -8.32e-3 | 1 |
| 8 | | min | 2.789 | 1 | -.004 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.584e-2 | 2 |
| 9 | CL_SPRINT | max | 7.603 | 2 | -.002 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -8.317e-3 | 1 |
| 10 | | min | 2.456 | 1 | -.004 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.583e-2 | 2 |
| 11 | CL_ATT | max | 3.514 | 2 | -.001 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | -7.415e-3 | 1 |
| 12 | | min | 1.138 | 1 | -.003 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -2.296e-2 | 2 |

## Envelope AISC ASD Steel Code Checks

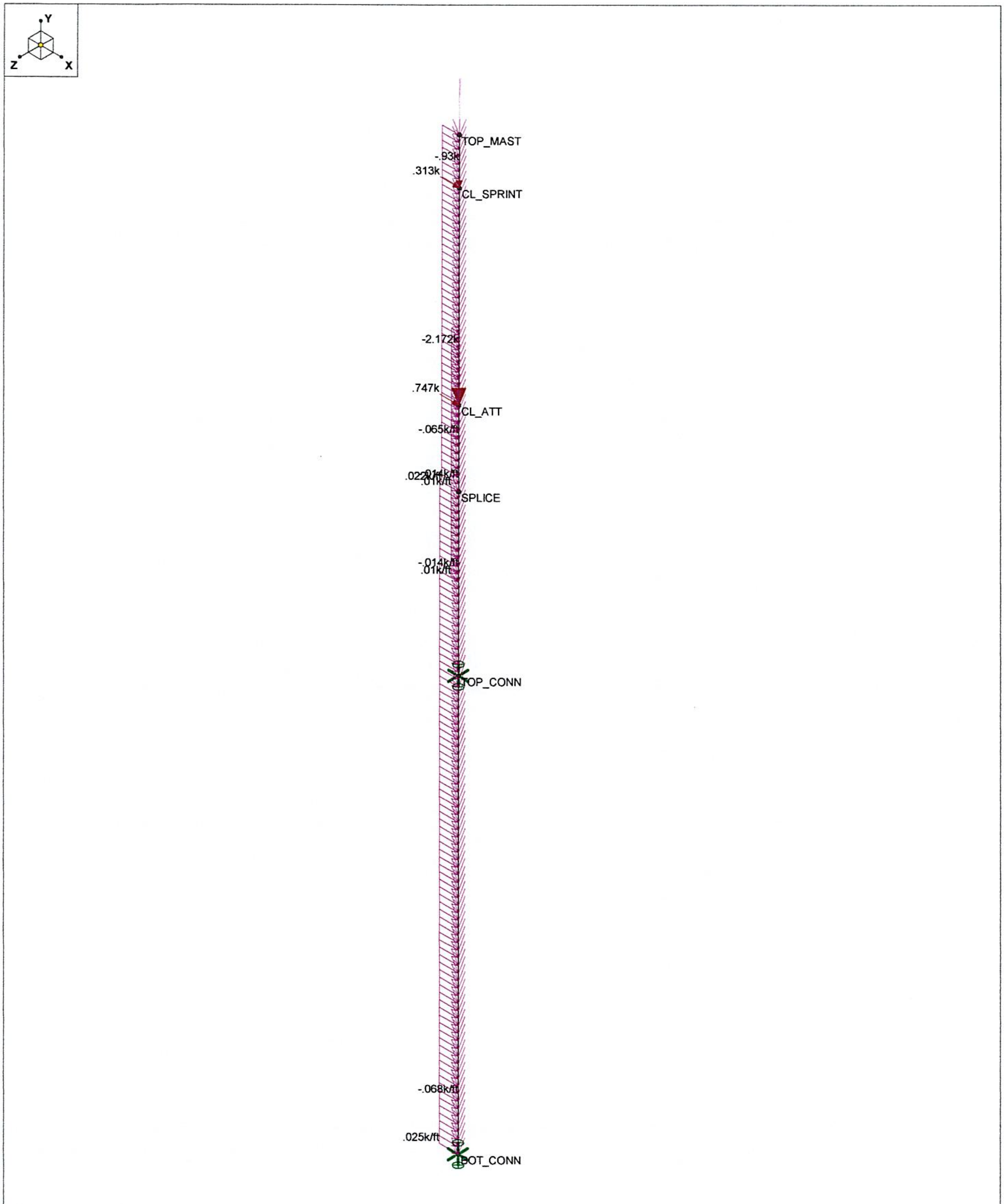
| | Member | Shape | Code Check | Loc[ft] | LC | Sh... | Loc[ft] | ...... | | Fa... | Ft [ksi] | Fb y-y [ksi] | Fb... | | | ... | AS... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1 | HSS16... | .756 | 29.8... | 2 | .041 | 30.321 | | 2 | 15... | 25.2 | 27.72 | 27... | 1 | .6 | ... | H2... |
| 2 | M2 | PIPE_1... | .649 | 0 | 2 | .054 | 0 | | 2 | 14... | 21 | 23.1 | 23.1 | .. | .6 | ... | H1... |

## *Joint Reactions*

| | LC | Joint Label | X [k] | Y [k] | Z [k] | MX [k-ft] | MY [k-ft] | MZ [k-ft] |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | BOT_CONN | .879 | 2.329 | 0 | 0 | 0 | 0 |
| 2 | 1 | TOP_CONN | -3.639 | 10.442 | 0 | 0 | 0 | 0 |
| 3 | 1 | Totals: | -2.76 | 12.772 | 0 | | | |
| 4 | 1 | COG (ft): | X: 0 | Y: 36.053 | Z: 0 | | | |

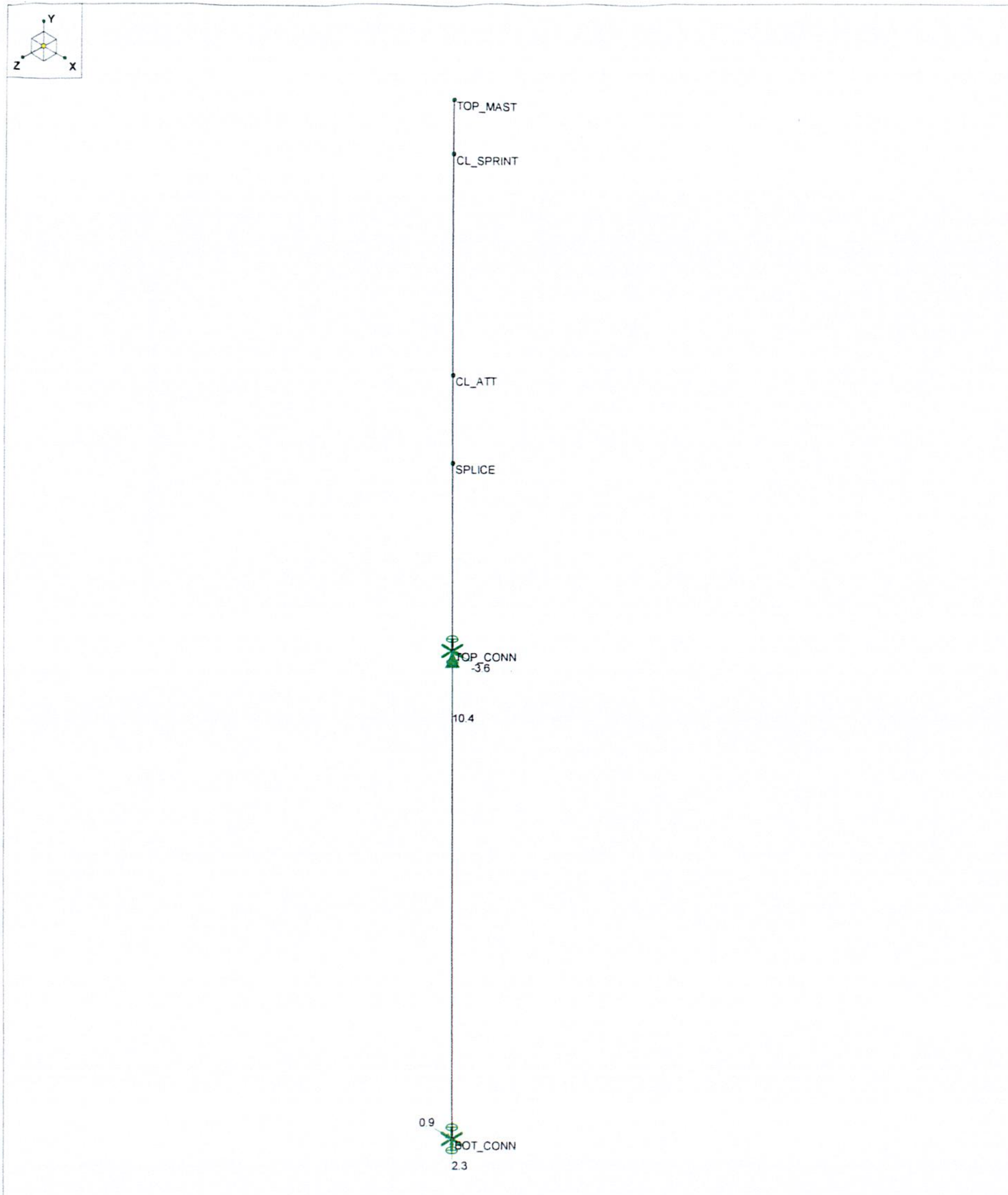
## *Joint Reactions*

| | LC | Joint Label | X [k] | Y [k] | Z [k] | MX [k-ft] | MY [k-ft] | MZ [k-ft] |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | BOT_CONN | 2.841 | 1.058 | 0 | 0 | 0 | 0 |
| 2 | 2 | TOP_CONN | -10.779 | 4.767 | 0 | 0 | 0 | 0 |
| 3 | 2 | Totals: | -7.938 | 5.825 | 0 | | | |
| 4 | 2 | COG (ft): | X: 0 | Y: 36.07 | Z: 0 | | | |




Loads: LC 1, NESC Heavy Wind on PCS Structure

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:38 AM |
| 12047.CO13 /Sprint CT54... | LC #1 Loads | NESC Loads.r3d |




Results for LC 1, NESC Heavy Wind on PCS Structure
Z-moment Reaction units are k and k-ft

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:39 AM |
| 12047.CO13 /Sprint CT54... | LC #1 Reactions | NESC Loads.r3d |

**Coax Cable on CL&P Pole** (Below 50-ft AGL)

Distance Between Coax Cable Attach Points =

Coaxial Cable Span = $Coax_{Span} := \begin{pmatrix} 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} \cdot ft$ *(User Input)*

Diameter of Coax Cable = $D_{coax1} := 1.55 \cdot in$ *(User Input)*

Weight of Coax Cable = $W_{coax1} := 0.66 \cdot plf$ *(User Input)*

Number of Coax Cables = $N_{coax1} := 33$ *(User Input)* 15 AT&T Cables and 18 Sprint Cables

Number of Projected Coax Cables = $NP_{coax1} := 4$ *(User Input)*

Extreme Wind Pressure = $qz := 28.6 \cdot psf$ *(User Input)*

Heavy Wind Pressure = $p := 4 \cdot psf$ *(User Input)*

Radial Ice Thickness = $Ir := 0.5 \cdot in$ *(User Input)*

Radial Ice Density = $Id := 56 \cdot pcf$ *(User Input)*

Shape Factor = $Cd_{coax} := 1.45$ *(User Input)*

Overload Factor for NESC Heavy Wind Load = $OF_{HW} := 2.5$ *(User Input)*

Overload Factor for NESC Extreme Wind Load = $OF_{EW} := 1.0$ *(User Input)*

Overload Factor for NESC Heavy Vertical Load = $OF_{HV} := 1.5$ *(User Input)*

Overload Factor for NESC Extreme Vertical Load = $OF_{EV} := 1.0$ *(User Input)*

Wind Area with Ice = $A_{ice} := \left(NP_{coax1} \cdot D_{coax1} + 2 \cdot Ir\right) = 7.2 \cdot in$

Wind Area without Ice = $A := \left(NP_{coax1} \cdot D_{coax1}\right) = 6.2 \cdot in$

Ice Area per Liner Ft = $Ai_{coax1} := \frac{\pi}{4} \cdot \left[\left(D_{coax1} + 2 \cdot Ir\right)^2 - D_{coax1}^{\ 2}\right] = 0.022 \, ft^2$

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax1} \cdot Id \cdot N_{coax1} = 41 \cdot plf$

Heavy Vertical Load =

$$Heavy_{Vert} := \overrightarrow{\left[\left(N_{coax1} \cdot W_{coax1} + W_{ice}\right) \cdot Coax_{Span} \cdot OF_{HV}\right]}$$

Heavy Transverse Load =

$$Heavy_{Trans} := \overrightarrow{\left(p \cdot A_{ice} \cdot Cd_{coax} \cdot Coax_{Span} \cdot OF_{HW}\right)}$$

$$Heavy_{Vert} = \begin{pmatrix} 947 \\ 947 \\ 947 \\ 947 \\ 947 \end{pmatrix} lb \qquad Heavy_{Trans} = \begin{pmatrix} 87 \\ 87 \\ 87 \\ 87 \\ 87 \end{pmatrix} lb$$

Extreme Vertical Load =

$$Extreme_{Vert} := \overrightarrow{\left[\left(N_{coax1} \cdot W_{coax1}\right) \cdot Coax_{Span} \cdot OF_{EV}\right]}$$

Extreme Transverse Load =

$$Extreme_{Trans} := \overrightarrow{\left[\left(qz \cdot A \cdot Cd_{coax}\right) \cdot Coax_{Span} \cdot OF_{EW}\right]}$$

$$Extreme_{Vert} = \begin{pmatrix} 218 \\ 218 \\ 218 \\ 218 \\ 218 \end{pmatrix} lb \qquad Extreme_{Trans} = \begin{pmatrix} 214 \\ 214 \\ 214 \\ 214 \\ 214 \end{pmatrix} lb$$

| CENTEK engineering<br>Centered on Solutions www.centekeng.com<br>63-2 North Branford Road P: (203) 488-0580<br>Branford, CT 06405 F: (203) 488-8587 | Subject: | Coax Cable on CL&P Pole # 2683 |
|---|---|---|
| | Location: | Brookfield, CT |
| | Rev. 0: 4/17/13 | Prepared by: T.J.L Checked by: C.F.C.<br>Job No. 12047.CO13 |

**Coax Cable on CL&P Pole** (Above 50-ft AGL)

Distance Between Coax Cable Attach Points =

Coaxial Cable Span = $Coax_{Span} := \begin{pmatrix} 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} \cdot ft$ *(User Input)*

Diameter of Coax Cable = $D_{coax1} := 1.55 \cdot in$ *(User Input)*

Weight of Coax Cable = $W_{coax1} := 0.66 \cdot plf$ *(User Input)*

Number of Coax Cables = $N_{coax1} := 15$ *(User Input)* 15 AT&T Cables

Number of Projected Coax Cables = $NP_{coax1} := 2$ *(User Input)* Sprint Cables on PCS Mast

Extreme Wind Pressure = $qz := 28.6 \cdot psf$ *(User Input)*

Heavy Wind Pressure = $p := 4 \cdot psf$ *(User Input)*

Radial Ice Thickness = $Ir := 0.5 \cdot in$ *(User Input)*

Radial Ice Density = $Id := 56 \cdot pcf$ *(User Input)*

Shape Factor = $Cd_{coax} := 1.45$ *(User Input)*

Overload Factor for NESC Heavy Wind Load = $OF_{HW} := 2.5$ *(User Input)*

Overload Factor for NESC Extreme Wind Load = $OF_{EW} := 1.0$ *(User Input)*

Overload Factor for NESC Heavy Vertical Load = $OF_{HV} := 1.5$ *(User Input)*

Overload Factor for NESC Extreme Vertical Load = $OF_{EV} := 1.0$ *(User Input)*

Wind Area with Ice = $A_{ice} := \left(NP_{coax1} \cdot D_{coax1} + 2 \cdot Ir\right) = 4.1 \cdot in$

Wind Area without Ice = $A := \left(NP_{coax1} \cdot D_{coax1}\right) = 3.1 \cdot in$

Ice Area per Liner Ft = $Ai_{coax1} := \frac{\pi}{4} \cdot \left[\left(D_{coax1} + 2 \cdot Ir\right)^2 - D_{coax1}^{\;2}\right] = 0.022 ft^2$

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax1} \cdot Id \cdot N_{coax1} = 19 \cdot plf$

Heavy Vertical Load =

$$Heavy_{Vert} := \overrightarrow{\left[\left(N_{coax1} \cdot W_{coax1} + W_{ice}\right) \cdot Coax_{Span} \cdot OF_{HV}\right]}$$

Heavy Transverse Load =

$$Heavy_{Trans} := \overrightarrow{\left(p \cdot A_{ice} \cdot Cd_{coax} \cdot Coax_{Span} \cdot OF_{HW}\right)}$$

$$Heavy_{Vert} = \begin{pmatrix} 430 \\ 430 \\ 430 \\ 430 \end{pmatrix} lb \qquad Heavy_{Trans} = \begin{pmatrix} 50 \\ 50 \\ 50 \\ 50 \end{pmatrix} lb$$

Extreme Vertical Load =

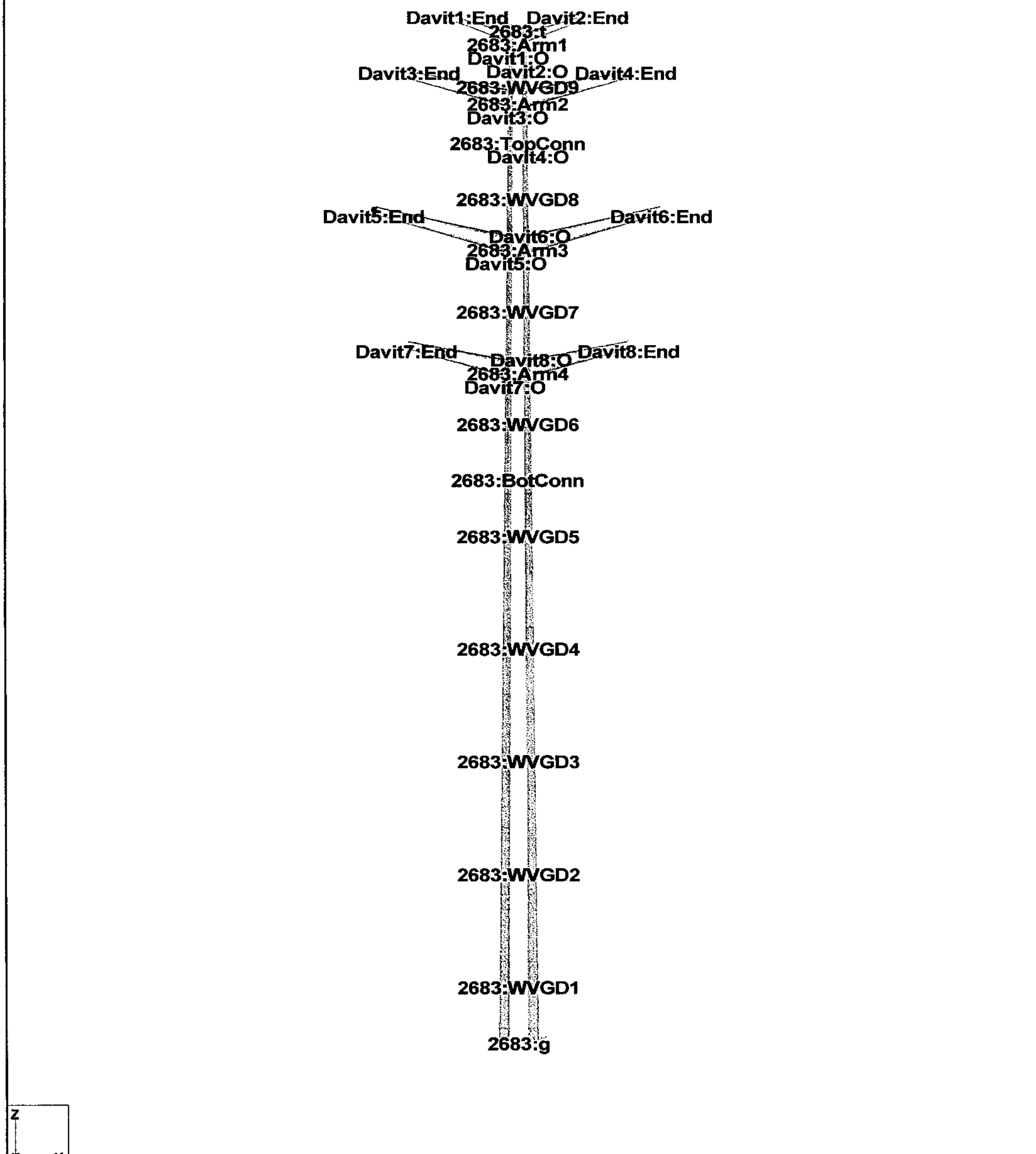
$$Extreme_{Vert} := \overrightarrow{\left[\left(N_{coax1} \cdot W_{coax1}\right) \cdot Coax_{Span} \cdot OF_{EV}\right]}$$

Extreme Transverse Load =

$$Extreme_{Trans} := \overrightarrow{\left[\left(qz \cdot A \cdot Cd_{coax}\right) \cdot Coax_{Span} \cdot OF_{EW}\right]}$$

$$Extreme_{Vert} = \begin{pmatrix} 99 \\ 99 \\ 99 \\ 99 \end{pmatrix} lb \qquad Extreme_{Trans} = \begin{pmatrix} 107 \\ 107 \\ 107 \\ 107 \end{pmatrix} lb$$

Centek Engineering Inc, Project: "cl&p structure # 2683"
PLS-POLE Version 11.11, 8:51:58 AM Thursday, April 18, 2013
Undeformed geometry displayed



Project Name : 12047.CO13 - Brookfield, CT
Project Notes: CL&P # 2683/ Sprint - CT54XC713
Project File : J:\Jobs\1204700.WI\CO13 - CT54XC713\Calcs\PLS Pole\cl&p structure # 2683.pol
Date run : 8:50:46 AM Thursday, April 18, 2013
by : PLS-POLE Version 11.11
Licensed to : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.

Loads from file: j:\jobs\1204700.wi\co13 - ct54xc713\calcs\pls pole\cl&p #2683.lca

*** Analysis Results:

Maximum element usage is 70.57% for Steel Pole "2683" in load case "NESC Heavy"
Maximum insulator usage is 14.73% for Clamp "Clamp21" in load case "NESC Extreme"

**Summary of Joint Support Reactions For All Load Cases:**

| Load Case | Joint Label | Long. Force (kips) | Tran. Force (kips) | Vert. Force (kips) | Shear Force (kips) | Tran. Moment (ft-k) | Long. Moment (ft-k) | Vert. Moment (ft-k) | Bending Moment (ft-k) | Found. Usage % |
|---|---|---|---|---|---|---|---|---|---|---|
| NESC Heavy | 2683:g | -0.09 | -24.81 | 50.88 | 24.81 | 1892.67 | -3.74 | -0.01 | 1892.67 | 0.00 |
| NESC Extreme | 2683:g | -0.03 | -26.69 | 24.93 | 26.69 | 1911.26 | -1.17 | -0.00 | 1911.26 | 0.00 |

**Summary of Tip Deflections For All Load Cases:**

**Note: postive tip load results in positive rotation**

| Load Case | Joint Label | Long. Defl. (in) | Tran. Defl. (in) | Vert. Defl. (in) | Resultant Defl. (in) | Long. Rot. (deg) | Tran. Rot. (deg) | Twist (deg) |
|---|---|---|---|---|---|---|---|---|
| NESC Heavy | 2683:t | 0.05 | 36.67 | -0.84 | 36.68 | 0.00 | -3.37 | 0.00 |
| NESC Extreme | 2683:t | 0.02 | 36.64 | -0.82 | 36.65 | 0.00 | -3.32 | 0.00 |

**Tubes Summary:**

| Pole Label | Tube Num. | Weight (lbs) | Load Case | Maximum Usage % | Resultant Moment (ft-k) |
|---|---|---|---|---|---|
| 2683 | 1 | 3397 | NESC Heavy | 47.89 | 552.18 |
| 2683 | 2 | 5750 | NESC Heavy | 61.15 | 1394.02 |
| 2683 | 3 | 3427 | NESC Heavy | 70.57 | 1892.67 |

*** Overall summary for all load cases - Usage = Maximum Stress / Allowable Stress

**Summary of Steel Pole Usages:**

| Steel Pole Label | Maximum Usage % | Load Case | Segment Number | Weight (lbs) |
|---|---|---|---|---|
| 2683 | 70.57 | NESC Heavy | 25 | 13920.9 |

**Summary of Tubular Davit Usages:**

| Tubular Davit Label | Maximum Usage % | Load Case | Segment Number | Weight (lbs) |
|---|---|---|---|---|
| Davit1 | 1.36 | NESC Extreme | 1 | 77.9 |
| Davit2 | 8.43 | NESC Heavy | 1 | 77.9 |
| Davit3 | 2.27 | NESC Heavy | 1 | 321.0 |
| Davit4 | 4.97 | NESC Heavy | 1 | 321.0 |
| Davit5 | 3.02 | NESC Heavy | 1 | 434.7 |
| Davit6 | 7.07 | NESC Heavy | 1 | 434.7 |
| Davit7 | 2.35 | NESC Heavy | 1 | 321.0 |
| Davit8 | 5.03 | NESC Heavy | 1 | 321.0 |

*** Maximum Stress Summary for Each Load Case

**Summary of Maximum Usages by Load Case:**

| Load Case | Maximum Usage % | Element Label | Element Type |
|---|---|---|---|
| NESC Heavy | 70.57 | 2683 | Steel Pole |
| NESC Extreme | 70.33 | 2683 | Steel Pole |

**Summary of Steel Pole Usages by Load Case:**

| Load Case | Maximum Usage % | Steel Pole Label | Segment Number |
|---|---|---|---|
| NESC Heavy | 70.57 | 2683 | 25 |
| NESC Extreme | 70.33 | 2683 | 25 |

**Summary of Base Plate Usages by Load Case:**

| Load Case | Pole Label | Bend Line # | Length (in) | Vertical Load (kips) | X Moment (ft-k) | Y Moment (ft-k) | Bending Stress (ksi) | Bolt Moment Sum (ft-k) | # Bolts Acting On Bend Line | Max Bolt Load For Bend Line (kips) | Minimum Plate Thickness (in) | Usage % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NESC Heavy | 2683 | 6 | 30.544 | 50.878 | 1892.667 | -3.740 | 31.983 | 122.110 | 6 | 85.898 | 2.288 | 58.15 |
| NESC Extreme | 2683 | 6 | 30.544 | 24.935 | 1911.258 | -1.173 | 31.473 | 120.164 | 6 | 84.304 | 2.269 | 57.22 |

**Summary of Tubular Davit Usages by Load Case:**

| Load Case | Maximum Usage % | Tubular Davit Label | Segment Number |
|---|---|---|---|
| NESC Heavy | 8.43 | Davit2 | 1 |
| NESC Extreme | 3.19 | Davit2 | 1 |

**Summary of Insulator Usages:**

| Insulator Label | Insulator Type | Maximum Usage % | Load Case | Weight (lbs) |
|---|---|---|---|---|
| Clamp1 | Clamp | 3.00 | NESC Heavy | 0.0 |
| Clamp2 | Clamp | 3.00 | NESC Heavy | 0.0 |
| Clamp3 | Clamp | 3.29 | NESC Heavy | 0.0 |

| | | | | |
|---|---|---|---|---|
| Clamp4 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp5 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp6 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp7 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp8 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp9 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp10 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp11 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp12 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp13 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp14 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp15 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp16 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp17 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp21 | Clamp | 14.73 | NESC Extreme | 0.0 |
| Clamp23 | Clamp | 3.79 | NESC Extreme | 0.0 |

*** Weight of structure (lbs):

| | |
|---|---|
| Weight of Tubular Davit Arms: | 2309.3 |
| Weight of Steel Poles: | 13920.9 |
| Total: | 16230.2 |

*** End of Report

```
*************************************************************************
*                                                                       *
*                               PLS-POLE                                *
*                  POLE AND FRAME ANALYSIS AND DESIGN                   *
*             Copyright Power Line Systems, Inc. 1999-2011              *
*                                                                       *
*************************************************************************

Project Name : 12047.CO13 - Brookfield, CT
Project Notes: CL&P # 2683/ Sprint - CT54XC713
Project File : J:\Jobs\1204700.WI\CO13 - CT54XC713\Calcs\PLS Pole\cl&p structure # 2683.pol
Date run     : 8:50:45 AM Thursday, April 18, 2013
by           : PLS-POLE Version 11.11
Licensed to  : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.
```

```
Modeling options:
  Offset Arms from Pole/Mast:   Yes
  Offset Braces from Pole/Mast: Yes
  Offset Guys from Pole/Mast:   Yes
  Offset Posts from Pole/Mast:  Yes
  Offset Strains from Pole/Mast:  Yes
  Use Alternate Convergence Process: No
  Steel poles checked with ASCE/SEI 48-05


Default Modulus of Elasticity for Steel = 29000.00 (ksi)
Default Weight Density for Steel = 490.00 (lbs/ft^3)
```

**Steel Pole Properties:**

| Steel Pole Property | Stock Number | Length | Default Embedded | Base Plate | Shape | Tip Diameter | Base Diameter | Taper | Default Drag | Tubes | Modulus of Elasticity | Weight Density | Shape At | Strength Check | Distance From | Ultimate | Ultimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| Label | | (ft) | Length (ft) | | | (in) | (in) | (in/ft) | Coef. | | Override (ksi) | Override (lbs/ft^3) | Base | Type | Tip (ft) | Trans. Load (kips) | Long. Load (kips) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CL&P2683 | 2683 | 90.00 | 0 | Yes | 8F | 19.63 | 43.21 | 0 | 1.3 | 3 tubes | 0 | 0 | | Calculated | 0.000 | 0.0000 | 0.0000 |

**Steel Tubes Properties:**

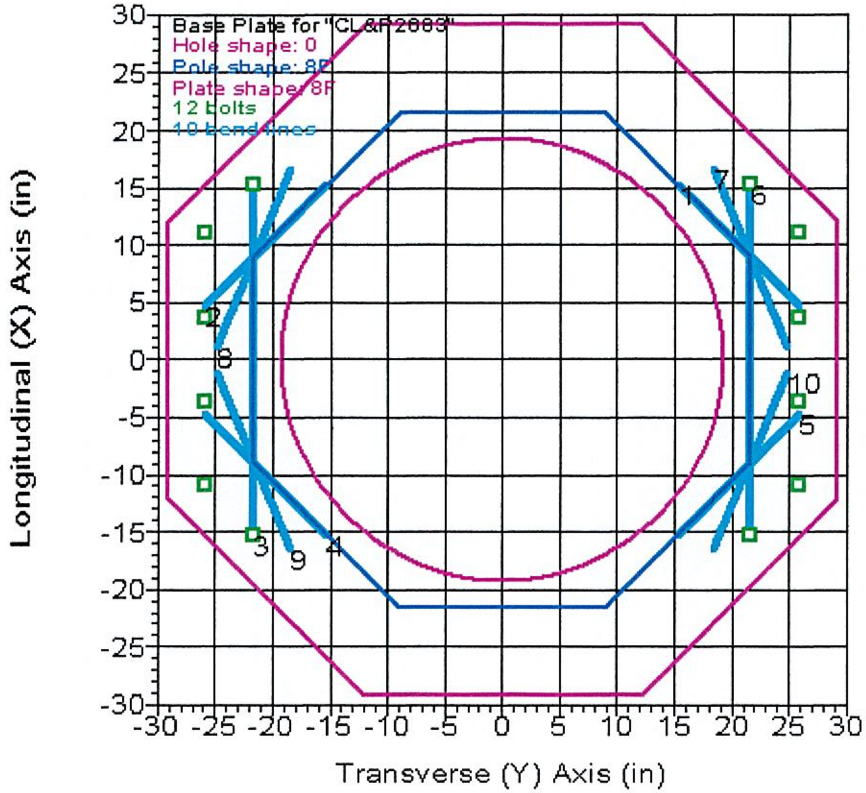
| Pole Property | Tube No. | Length (ft) | Thickness (in) | Lap Length (ft) | Lap Gap (in) | Yield Stress (ksi) | Moment Cap. Override (ft-k) | Tube Weight (lbs) | Center of Gravity (ft) | Calculated Taper (in/ft) | Tube Top Diameter (in) | Tube Bot. Diameter (in) | 1.5x Diam. Lap Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CL&P2683 | 1 | 39 | 0.3125 | 4.167 | 0.000 | 65.000 | 0.000 | 3397 | 20.92 | 0.27728 | 19.63 | 30.44 | 3.73 |
| CL&P2683 | 2 | 40.1667 | 0.375 | 5.250 | 0.000 | 65.000 | 0.000 | 5750 | 21.18 | 0.27728 | 28.66 | 39.80 | 4.88 |
| CL&P2683 | 3 | 20.25 | 0.375 | 0.000 | 0.000 | 65.000 | 0.000 | 3427 | 10.36 | 0.27728 | 37.59 | 43.20 | 0.00 |

**Base Plate Properties:**

| Pole Property | Plate Diam. (in) | Plate Shape | Plate Thick. (in) | Plate Weight (lbs) | Bend Line Length Override (in) | Hole Diam. (in) | Hole Shape | Steel Density (lbs/ft^3) | Steel Yield Stress (ksi) | Bolt Diam. (in) | Bolt Pattern Diam. (in) | Num. Of Bolts | Bolt Cage X Inertia (in^4) | Bolt Cage Y Inertia (in^4) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CL&P2683 | 58.250 | 8F | 3.000 | 1347 | 0.000 | 38.750 | 0 | 490.00 | 55.000 | 2.250 | 51.750 | 12 | 28733.01 | 5839.56 |

**Base Plate Bolt Coordinates for Property "CL&P2683":**

| Bolt X Coord. | Bolt Y Coord. | Bolt Angle (deg) |
|---|---|---|
| 0.5894 | 0.8357 | 0 |
| 0.4251 | 1 | 0 |
| 0.1425 | 1 | 0 |



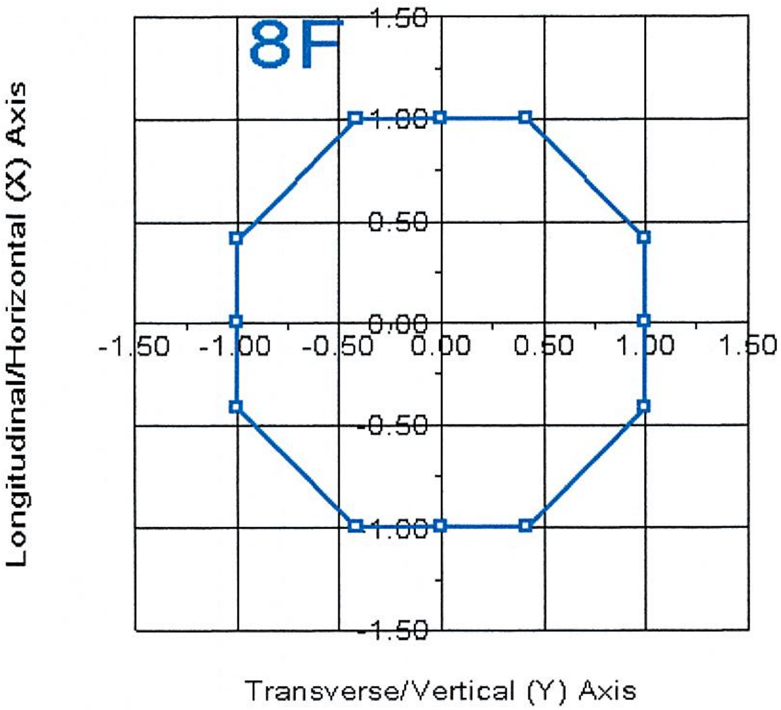

**Steel Pole Connectivity:**

| Pole Label | Tip Joint | Base Joint | X of Base (ft) | Y of Base (ft) | Z of Base (ft) | Inclin. About X (deg) | Inclin. About Y (deg) | Property Set | Attach. Labels | Base Connect | Embed % Override | Embed C. Override (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | | | 0 | 0 | 0 | 0 | 0 | CL&P2683 | 15 labels | Fixed | 0.00 | 0 |

**Relative Attachment Labels for Steel Pole "2683":**

| Joint Label | Distance From Origin/Top Joint (ft) | Global Z of Attach (ft) |
|---|---|---|
| 2683:WVGD1 | 0.00 | 5.00 |
| 2683:WVGD2 | 0.00 | 15.00 |
| 2683:WVGD3 | 0.00 | 25.00 |
| 2683:WVGD4 | 0.00 | 35.00 |
| 2683:WVGD5 | 0.00 | 45.00 |

| | | |
|---|---|---|
| 2683:WVGD6 | 0.00 | 55.00 |
| 2683:WVGD7 | 0.00 | 65.00 |
| 2683:WVGD8 | 0.00 | 75.00 |
| 2683:TopConn | 0.00 | 80.00 |
| 2683:BotConn | 0.00 | 50.00 |
| 2683:WVGD9 | 0.00 | 85.00 |
| 2683:Arm1 | 0.00 | 88.92 |
| 2683:Arm2 | 0.00 | 83.50 |
| 2683:Arm3 | 0.00 | 70.50 |
| 2683:Arm4 | 0.00 | 59.50 |




**Pole Steel Properties:**

Warning: Capacities and usages printed in splices are listed for the inner tube except at the splice top which uses the outer tube. ??

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Outer Diam. (in) | Area (in^2) | T-Moment Inertia (in^4) | L-Moment Inertia (in^4) | D/t | W/t Max. | Fy (ksi) | Fa Min. (ksi) | ASCE Cap Trans. (ft-k) | ASCE Cap Long. (ft-k) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:t | 2683:t Ori | 0.00 | 19.63 | 20.00 | 985.95 | 985.95 | 0.00 | 21.9 | 65.00 | 65.00 | 544.26 | 544.26 |
| 2683 | 2683:Arm1 | 2683:Arm1 End | 1.08 | 19.92 | 20.31 | 1032.52 | 1032.52 | 0.00 | 22.3 | 65.00 | 65.00 | 561.40 | 561.40 |
| 2683 | 2683:Arm1 | 2683:Arm1 Ori | 1.08 | 19.92 | 20.31 | 1032.52 | 1032.52 | 0.00 | 22.3 | 65.00 | 65.00 | 561.40 | 561.40 |
| 2683 | 2683:WVGD9 | 2683:WVGD9 End | 5.00 | 21.01 | 21.43 | 1213.85 | 1213.85 | 0.00 | 23.7 | 65.00 | 65.00 | 625.85 | 625.85 |
| 2683 | 2683:WVGD9 | 2683:WVGD9 Ori | 5.00 | 21.01 | 21.43 | 1213.85 | 1213.85 | 0.00 | 23.7 | 65.00 | 65.00 | 625.85 | 625.85 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:Arm2 | 2683:Arm2 | End | 6.50 | 21.43 | 21.87 | 1288.49 | 1288.49 | 0.00 | 24.3 | 65.00 | 65.00 | 651.44 | 651.44 |
| 2683 | 2683:Arm2 | 2683:Arm2 | Ori | 6.50 | 21.43 | 21.87 | 1288.49 | 1288.49 | 0.00 | 24.3 | 65.00 | 65.00 | 651.44 | 651.44 |
| 2683 | 2683:TopConn | 2683:TopConn | End | 10.00 | 22.40 | 22.87 | 1474.42 | 1474.42 | 0.00 | 25.5 | 65.00 | 65.00 | 713.14 | 713.14 |
| 2683 | 2683:TopConn | 2683:TopConn | Ori | 10.00 | 22.40 | 22.87 | 1474.42 | 1474.42 | 0.00 | 25.5 | 65.00 | 65.00 | 713.15 | 713.15 |
| 2683 | 2683:WVGD8 | 2683:WVGD8 | End | 15.00 | 23.78 | 24.31 | 1769.84 | 1769.84 | 0.00 | 27.4 | 65.00 | 65.00 | 806.14 | 806.14 |
| 2683 | 2683:WVGD8 | 2683:WVGD8 | Ori | 15.00 | 23.78 | 24.31 | 1769.84 | 1769.84 | 0.00 | 27.4 | 65.00 | 65.00 | 806.14 | 806.14 |
| 2683 | 2683:Arm3 | 2683:Arm3 | End | 19.50 | 25.03 | 25.60 | 2067.33 | 2067.33 | 0.00 | 29.0 | 65.00 | 65.00 | 894.70 | 894.70 |
| 2683 | 2683:Arm3 | 2683:Arm3 | Ori | 19.50 | 25.03 | 25.60 | 2067.33 | 2067.33 | 0.00 | 29.0 | 65.00 | 65.00 | 894.70 | 894.70 |
| 2683 | #2683:0 | Tube 1 | End | 22.25 | 25.79 | 26.39 | 2264.58 | 2264.58 | 0.00 | 30.0 | 65.00 | 65.00 | 951.09 | 951.09 |
| 2683 | #2683:0 | Tube 1 | Ori | 22.25 | 25.79 | 26.39 | 2264.58 | 2264.58 | 0.00 | 30.0 | 65.00 | 65.00 | 951.09 | 951.09 |
| 2683 | 2683:WVGD7 | 2683:WVGD7 | End | 25.00 | 26.56 | 27.18 | 2474.00 | 2474.00 | 0.00 | 31.1 | 65.00 | 65.00 | 1009.21 | 1009.21 |
| 2683 | 2683:WVGD7 | 2683:WVGD7 | Ori | 25.00 | 26.56 | 27.18 | 2474.00 | 2474.00 | 0.00 | 31.1 | 65.00 | 65.00 | 1009.21 | 1009.21 |
| 2683 | #2683:1 | Tube 1 | End | 27.75 | 27.32 | 27.97 | 2695.95 | 2695.95 | 0.00 | 32.1 | 65.00 | 65.00 | 1069.06 | 1069.06 |
| 2683 | #2683:1 | Tube 1 | Ori | 27.75 | 27.32 | 27.97 | 2695.95 | 2695.95 | 0.00 | 32.1 | 65.00 | 65.00 | 1069.06 | 1069.06 |
| 2683 | 2683:Arm4 | 2683:Arm4 | End | 30.50 | 28.08 | 28.76 | 2930.78 | 2930.78 | 0.00 | 33.1 | 65.00 | 64.24 | 1117.35 | 1117.35 |
| 2683 | 2683:Arm4 | 2683:Arm4 | Ori | 30.50 | 28.08 | 28.76 | 2930.78 | 2930.78 | 0.00 | 33.1 | 65.00 | 64.24 | 1117.35 | 1117.35 |
| 2683 | #2683:2 | SpliceT | End | 34.83 | 29.28 | 30.00 | 3327.87 | 3327.87 | 0.00 | 34.7 | 65.00 | 62.89 | 1191.09 | 1191.09 |
| 2683 | #2683:2 | SpliceT | Ori | 34.83 | 29.28 | 30.00 | 3327.87 | 3327.87 | 0.00 | 34.7 | 65.00 | 62.89 | 1191.10 | 1191.10 |
| 2683 | 2683:WVGD6 | 2683:WVGD6 | End | 35.00 | 28.70 | 35.20 | 3734.31 | 3734.31 | 0.00 | 27.6 | 65.00 | 65.00 | 1409.35 | 1409.35 |
| 2683 | 2683:WVGD6 | 2683:WVGD6 | Ori | 35.00 | 28.70 | 35.20 | 3734.31 | 3734.31 | 0.00 | 27.6 | 65.00 | 65.00 | 1409.35 | 1409.35 |
| 2683 | #2683:3 | SpliceB | End | 39.00 | 29.81 | 36.58 | 4190.24 | 4190.24 | 0.00 | 28.8 | 65.00 | 65.00 | 1522.59 | 1522.59 |
| 2683 | #2683:3 | SpliceB | Ori | 39.00 | 29.81 | 36.58 | 4190.24 | 4190.24 | 0.00 | 28.8 | 65.00 | 65.00 | 1522.59 | 1522.59 |
| 2683 | 2683:BotConn | 2683:BotConn | End | 40.00 | 30.09 | 36.93 | 4309.75 | 4309.75 | 0.00 | 29.1 | 65.00 | 65.00 | 1551.58 | 1551.58 |
| 2683 | 2683:BotConn | 2683:BotConn | Ori | 40.00 | 30.09 | 36.93 | 4309.75 | 4309.75 | 0.00 | 29.1 | 65.00 | 65.00 | 1551.58 | 1551.58 |
| 2683 | 2683:WVGD5 | 2683:WVGD5 | End | 45.00 | 31.48 | 38.65 | 4941.47 | 4941.47 | 0.00 | 30.6 | 65.00 | 65.00 | 1700.66 | 1700.66 |
| 2683 | 2683:WVGD5 | 2683:WVGD5 | Ori | 45.00 | 31.48 | 38.65 | 4941.47 | 4941.47 | 0.00 | 30.6 | 65.00 | 65.00 | 1700.66 | 1700.66 |
| 2683 | #2683:4 | Tube 2 | End | 50.00 | 32.86 | 40.37 | 5632.09 | 5632.09 | 0.00 | 32.2 | 65.00 | 65.00 | 1856.57 | 1856.57 |
| 2683 | #2683:4 | Tube 2 | Ori | 50.00 | 32.86 | 40.37 | 5632.09 | 5632.09 | 0.00 | 32.2 | 65.00 | 65.00 | 1856.57 | 1856.57 |
| 2683 | 2683:WVGD4 | 2683:WVGD4 | End | 55.00 | 34.25 | 42.09 | 6384.24 | 6384.24 | 0.00 | 33.7 | 65.00 | 63.72 | 1979.56 | 1979.56 |
| 2683 | 2683:WVGD4 | 2683:WVGD4 | Ori | 55.00 | 34.25 | 42.09 | 6384.24 | 6384.24 | 0.00 | 33.7 | 65.00 | 63.72 | 1979.56 | 1979.56 |
| 2683 | #2683:5 | Tube 2 | End | 60.00 | 35.64 | 43.82 | 7200.54 | 7200.54 | 0.00 | 35.2 | 65.00 | 62.42 | 2102.06 | 2102.06 |
| 2683 | #2683:5 | Tube 2 | Ori | 60.00 | 35.64 | 43.82 | 7200.54 | 7200.54 | 0.00 | 35.2 | 65.00 | 62.42 | 2102.06 | 2102.06 |
| 2683 | 2683:WVGD3 | 2683:WVGD3 | End | 65.00 | 37.02 | 45.54 | 8083.61 | 8083.61 | 0.00 | 36.8 | 65.00 | 61.12 | 2224.22 | 2224.22 |
| 2683 | 2683:WVGD3 | 2683:WVGD3 | Ori | 65.00 | 37.02 | 45.54 | 8083.61 | 8083.61 | 0.00 | 36.8 | 65.00 | 61.12 | 2224.22 | 2224.22 |
| 2683 | #2683:6 | SpliceT | End | 69.75 | 38.34 | 47.18 | 8986.78 | 8986.78 | 0.00 | 38.2 | 65.00 | 59.89 | 2339.57 | 2339.57 |
| 2683 | #2683:6 | SpliceT | Ori | 69.75 | 38.34 | 47.18 | 8986.78 | 8986.78 | 0.00 | 38.2 | 65.00 | 59.89 | 2339.57 | 2339.57 |
| 2683 | #2683:7 | Tube 2 | End | 72.38 | 38.32 | 47.15 | 8971.06 | 8971.06 | 0.00 | 38.2 | 65.00 | 59.91 | 2337.64 | 2337.64 |
| 2683 | #2683:7 | Tube 2 | Ori | 72.38 | 38.32 | 47.15 | 8971.06 | 8971.06 | 0.00 | 38.2 | 65.00 | 59.91 | 2337.64 | 2337.64 |
| 2683 | 2683:WVGD2 | 2683:WVGD2 | End | 75.00 | 39.05 | 48.05 | 9497.27 | 9497.27 | 0.00 | 39.0 | 65.00 | 59.23 | 2400.97 | 2400.97 |
| 2683 | 2683:WVGD2 | 2683:WVGD2 | Ori | 75.00 | 39.05 | 48.05 | 9497.27 | 9497.27 | 0.00 | 39.0 | 65.00 | 59.23 | 2400.97 | 2400.97 |
| 2683 | #2683:8 | Tube 3 | End | 80.00 | 40.43 | 49.78 | 10555.72 | 10555.72 | 0.00 | 40.5 | 65.00 | 57.93 | 2520.52 | 2520.52 |
| 2683 | #2683:8 | Tube 3 | Ori | 80.00 | 40.43 | 49.78 | 10555.72 | 10555.72 | 0.00 | 40.5 | 65.00 | 57.93 | 2520.52 | 2520.52 |
| 2683 | 2683:WVGD1 | 2683:WVGD1 | End | 85.00 | 41.82 | 51.50 | 11690.03 | 11690.03 | 0.00 | 42.0 | 65.00 | 56.63 | 2638.31 | 2638.31 |
| 2683 | 2683:WVGD1 | 2683:WVGD1 | Ori | 85.00 | 41.82 | 51.50 | 11690.03 | 11690.03 | 0.00 | 42.0 | 65.00 | 56.63 | 2638.31 | 2638.31 |
| 2683 | 2683:g | 2683:g | End | 90.00 | 43.20 | 53.22 | 12902.82 | 12902.82 | 0.00 | 43.6 | 65.00 | 55.27 | 2751.00 | 2751.00 |

**Tubular Davit Properties:**

| Davit Property Label | Stock Number | Steel Shape | Thickness (in) | Base Diameter or Depth (in) | Tip Diameter or Depth (in) | Taper (in/ft) | Drag Coef. | Modulus of Elasticity (ksi) | Geometry | Strength Check Type | Vertical Capacity (lbs) | Tension Capacity (lbs) | Compres. Capacity (lbs) | Long. Capacity (lbs) | Yield Stress (ksi) | Weight Density Override (lbs/ft^3) | Steel Shape At End |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARM A | 0 | | 0.1875 | 10.76 | 6 | 0 | 1.3 | 29000 | 1 point | Calculated | 0 | 0 | 0 | 0 | 65 | 0 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARM B | 0 | 0.25 | 18.5 | 9 | 0 | 1.3 | 29000 | 1 point | Calculated | 0 | 0 | 0 | 0 | 65 | 0 |
| ARM C | 0 | 0.25 | 18.5 | 9 | 0 | 1.3 | 29000 | 1 point | Calculated | 0 | 0 | 0 | 0 | 65 | 0 |

**Intermediate Joints for Davit Property "ARM A":**

| Joint Label | Horz. Offset (ft) | Vert. Offset (ft) |
|---|---|---|
| End | 4.5 | -1.5 |

**Intermediate Joints for Davit Property "ARM B":**

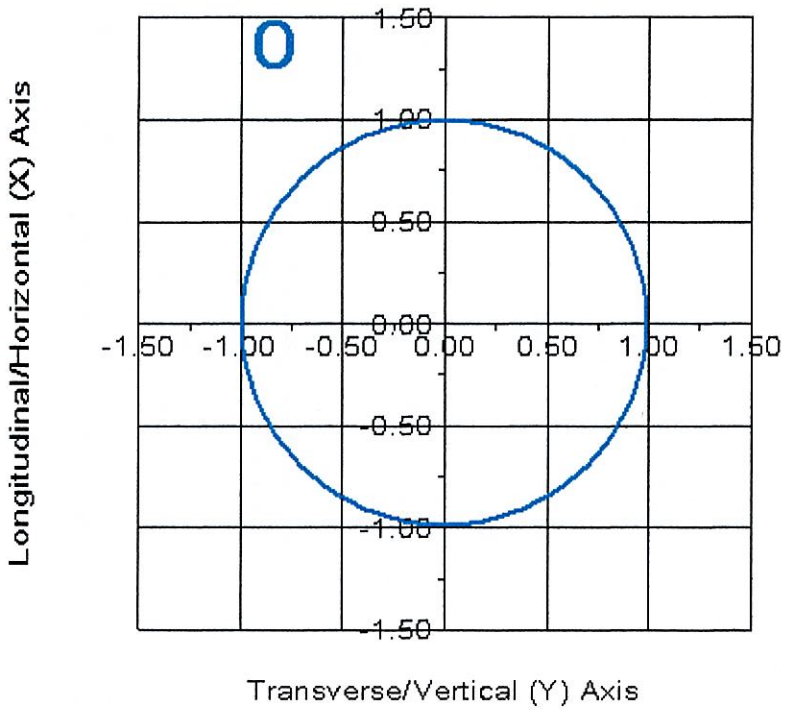
| Joint Label | Horz. Offset (ft) | Vert. Offset (ft) |
|---|---|---|
| End | 8.67 | -2 |

**Intermediate Joints for Davit Property "ARM C":**

| Joint Label | Horz. Offset (ft) | Vert. Offset (ft) |
|---|---|---|
| End | 11.67 | -3 |

**Tubular Davit Arm Connectivity:**

| Davit Label | Attach Label | Davit Property Set | Azimuth (deg) |
|---|---|---|---|
| Davit1 | 2683:Arm1 | ARM A | 180 |
| Davit2 | 2683:Arm1 | ARM A | 0 |
| Davit3 | 2683:Arm2 | ARM B | 180 |
| Davit4 | 2683:Arm2 | ARM B | 0 |
| Davit5 | 2683:Arm3 | ARM C | 180 |
| Davit6 | 2683:Arm3 | ARM C | 0 |
| Davit7 | 2683:Arm4 | ARM B | 180 |
| Davit8 | 2683:Arm4 | ARM B | 0 |




**Tubular Davit Arm Steel Properties:**

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Outer Diam. (in) | Area (in^2) | V-Moment Inertia (in^4) | H-Moment Inertia (in^4) | D/t | W/t Max. | Fy (ksi) | Fa Min. (ksi) | ASCE Cap V-Mom. (ft-k) | ASCE Cap H-Mom. (ft-k) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit1 | Davit1:O | Origin | 0.00 | 10.76 | 6.23 | 87.04 | 87.04 | 57.39 | 0.0 | 65.00 | 65.00 | 87.64 | 87.64 |
| Davit1 | Davit1:End | End | 4.74 | 6.00 | 3.42 | 14.47 | 14.47 | 32.00 | 0.0 | 65.00 | 65.00 | 26.13 | 26.13 |
| Davit2 | Davit2:O | Origin | 0.00 | 10.76 | 6.23 | 87.04 | 87.04 | 57.39 | 0.0 | 65.00 | 65.00 | 87.64 | 87.64 |
| Davit2 | Davit2:End | End | 4.74 | 6.00 | 3.42 | 14.47 | 14.47 | 32.00 | 0.0 | 65.00 | 65.00 | 26.13 | 26.13 |
| Davit3 | Davit3:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |
| Davit3 | #Davit3:0 | End | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit3 | #Davit3:0 | Origin | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit3 | Davit3:End | End | 8.90 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |
| Davit4 | Davit4:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |
| Davit4 | #Davit4:0 | End | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit4 | #Davit4:0 | Origin | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit4 | Davit4:End | End | 8.90 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |
| Davit5 | Davit5:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit5 | #Davit5:0 | End | 5.00 | 14.56 | 11.24 | 287.65 | 287.65 | 58.23 | 0.0 | 65.00 | 65.00 | 214.05 | 214.05 |
| Davit5 | #Davit5:0 | Origin | 5.00 | 14.56 | 11.24 | 287.65 | 287.65 | 58.23 | 0.0 | 65.00 | 65.00 | 214.05 | 214.05 |
| Davit5 | #Davit5:1 | End | 8.52 | 11.78 | 9.05 | 150.51 | 150.51 | 47.12 | 0.0 | 65.00 | 65.00 | 138.43 | 138.43 |
| Davit5 | #Davit5:1 | Origin | 8.52 | 11.78 | 9.05 | 150.51 | 150.51 | 47.12 | 0.0 | 65.00 | 65.00 | 138.43 | 138.43 |
| Davit5 | Davit5:End | End | 12.05 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |
| Davit6 | Davit6:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |
| Davit6 | #Davit6:0 | End | 5.00 | 14.56 | 11.24 | 287.65 | 287.65 | 58.23 | 0.0 | 65.00 | 65.00 | 214.05 | 214.05 |
| Davit6 | #Davit6:0 | Origin | 5.00 | 14.56 | 11.24 | 287.65 | 287.65 | 58.23 | 0.0 | 65.00 | 65.00 | 214.05 | 214.05 |
| Davit6 | #Davit6:1 | End | 8.52 | 11.78 | 9.05 | 150.51 | 150.51 | 47.12 | 0.0 | 65.00 | 65.00 | 138.43 | 138.43 |
| Davit6 | #Davit6:1 | Origin | 8.52 | 11.78 | 9.05 | 150.51 | 150.51 | 47.12 | 0.0 | 65.00 | 65.00 | 138.43 | 138.43 |
| Davit6 | Davit6:End | End | 12.05 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |
| Davit7 | Davit7:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |
| Davit7 | #Davit7:0 | End | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit7 | #Davit7:0 | Origin | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit7 | Davit7:End | End | 8.90 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |
| Davit8 | Davit8:O | Origin | 0.00 | 18.50 | 14.33 | 596.86 | 596.86 | 74.00 | 0.0 | 65.00 | 65.00 | 349.51 | 349.51 |
| Davit8 | #Davit8:0 | End | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit8 | #Davit8:0 | Origin | 4.45 | 13.75 | 10.60 | 241.63 | 241.63 | 55.00 | 0.0 | 65.00 | 65.00 | 190.37 | 190.37 |
| Davit8 | Davit8:End | End | 8.90 | 9.00 | 6.87 | 65.82 | 65.82 | 36.00 | 0.0 | 65.00 | 65.00 | 79.23 | 79.23 |

*** Insulator Data

**Clamp Properties:**

| Label | Stock Number | Holding Capacity (lbs) |
|---|---|---|
| clamp | clamp1 | 8e+004 |

**Clamp Insulator Connectivity:**

| Clamp Label | Structure And Tip Attach | Property Set | Min. Required Vertical Load (uplift) (lbs) |
|---|---|---|---|
| Clamp1 | Davit1:End | clamp | No Limit |
| Clamp2 | Davit2:End | clamp | No Limit |
| Clamp3 | Davit3:End | clamp | No Limit |
| Clamp4 | Davit4:End | clamp | No Limit |
| Clamp5 | Davit5:End | clamp | No Limit |
| Clamp6 | Davit6:End | clamp | No Limit |
| Clamp7 | Davit7:End | clamp | No Limit |
| Clamp8 | Davit8:End | clamp | No Limit |
| Clamp9 | 2683:WVGD1 | clamp | No Limit |
| Clamp10 | 2683:WVGD2 | clamp | No Limit |
| Clamp11 | 2683:WVGD3 | clamp | No Limit |
| Clamp12 | 2683:WVGD4 | clamp | No Limit |
| Clamp13 | 2683:WVGD5 | clamp | No Limit |
| Clamp14 | 2683:WVGD6 | clamp | No Limit |
| Clamp15 | 2683:WVGD7 | clamp | No Limit |
| Clamp16 | 2683:WVGD8 | clamp | No Limit |
| Clamp17 | 2683:WVGD9 | clamp | No Limit |
| Clamp21 | 2683:TopConn | clamp | No Limit |
| Clamp23 | 2683:BotConn | clamp | No Limit |

*** Loads Data

Loads from file: j:\jobs\1204700.wi\co13 - ct54xc713\calcs\pls pole\cl&p #2683.lca

Insulator dead and wind loads are already included in the point loads printed below.

Loading Method Parameters:

Structure Height Summary (used for calculating wind/ice adjust with height):

| | | |
|---|---|---|
| Z of ground for wind height adjust | 0.00 (ft) | and structure Z coordinate that will be put on the centerline ground profile in PLS-CADD. |
| Ground elevation shift | 0.00 (ft) | |
| Z of ground with shift | 0.00 (ft) | |
| Z of structure top (highest joint) | 90.42 (ft) | |
| Structure height | 90.42 (ft) | |
| Structure height above ground | 90.42 (ft) | |

**Vector Load Cases:**

| Load Case Description | Dead Load Factor | Wind Area Factor | SF for Steel Poles Tubular Arms and Towers | SF for Wood Poles | SF for Conc. Poles Ult. | SF for Conc. First Crack | SF for Conc. Zero Tens. | SF for Guys and Cables | SF for Non Tubular Arms | SF for Braces | SF for Insuls. | SF For Found. | Point Loads | Wind/Ice Model | Trans. Wind Pressure (psf) | Longit. Wind Pressure (psf) | Ice Thick. (in) | Ice Density (lbs/ft^3) | Ice Temperature (deg F) | Pole Deflection Check | Pole Deflection Limit % or (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NESC Heavy | 1.5000 | 2.5000 | 1.00000 | 0.6500 | 0.0000 | 1.0000 | 0.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 19 loads | Wind on All | 4 | 0 | 0.000 | 0.000 | 0.0 | No Limit | 0 |
| NESC Extreme | 1.0000 | 1.0000 | 1.00000 | 0.6500 | 0.0000 | 1.0000 | 0.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 19 loads | NESC 2007 | 25.6 | 0 | 0.000 | 0.000 | 0.0 | No Limit | 0 |

**Point Loads for Load Case "NESC Heavy":**

| Joint Label | Vertical Load (lbs) | Transverse Load (lbs) | Longitudinal Load (lbs) | Load Comment |
|---|---|---|---|---|
| Davit1:End | 840 | 2250 | 0 | |
| Davit2:End | 840 | 2250 | 0 | |
| Davit3:End | 1263 | 2305 | 0 | |
| Davit4:End | 1263 | 2305 | 0 | |
| Davit5:End | 1263 | 2305 | 0 | |
| Davit6:End | 1263 | 2305 | 0 | |
| Davit7:End | 1263 | 2305 | 0 | |
| Davit8:End | 1263 | 2305 | 0 | |
| 2683:TopConn | 10442 | 3639 | 0 | |
| 2683:BotConn | 2329 | -879 | 0 | |
| 2683:WVGD1 | 947 | 87 | 0 | |
| 2683:WVGD2 | 947 | 87 | 0 | |
| 2683:WVGD3 | 947 | 87 | 0 | |
| 2683:WVGD4 | 947 | 87 | 0 | |
| 2683:WVGD5 | 947 | 87 | 0 | |
| 2683:WVGD6 | 430 | 50 | 0 | |

| | | | |
|---|---|---|---|
| 2683:WVGD7 | 430 | 50 | 0 |
| 2683:WVGD8 | 430 | 50 | 0 |
| 2683:WVGD9 | 430 | 50 | 0 |

**Point Loads for Load Case "NESC Extreme":**

| Joint Label | Vertical Load (lbs) | Transverse Load (lbs) | Longitudinal Load (lbs) | Load Comment |
|---|---|---|---|---|
| Davit1:End | 208 | 1129 | 0 | |
| Davit2:End | 208 | 1129 | 0 | |
| Davit3:End | 367 | 1484 | 0 | |
| Davit4:End | 367 | 1484 | 0 | |
| Davit5:End | 367 | 1484 | 0 | |
| Davit6:End | 367 | 1484 | 0 | |
| Davit7:End | 367 | 1484 | 0 | |
| Davit8:End | 367 | 1484 | 0 | |
| 2683:TopConn | 4767 | 10779 | 0 | |
| 2683:BotConn | 1058 | -2841 | 0 | |
| 2683:WVGD1 | 218 | 214 | 0 | |
| 2683:WVGD2 | 218 | 214 | 0 | |
| 2683:WVGD3 | 218 | 214 | 0 | |
| 2683:WVGD4 | 218 | 214 | 0 | |
| 2683:WVGD5 | 218 | 214 | 0 | |
| 2683:WVGD6 | 99 | 107 | 0 | |
| 2683:WVGD7 | 99 | 107 | 0 | |
| 2683:WVGD8 | 99 | 107 | 0 | |
| 2683:WVGD9 | 99 | 107 | 0 | |

**Detailed Pole Loading Data for Load Case "NESC Extreme":**

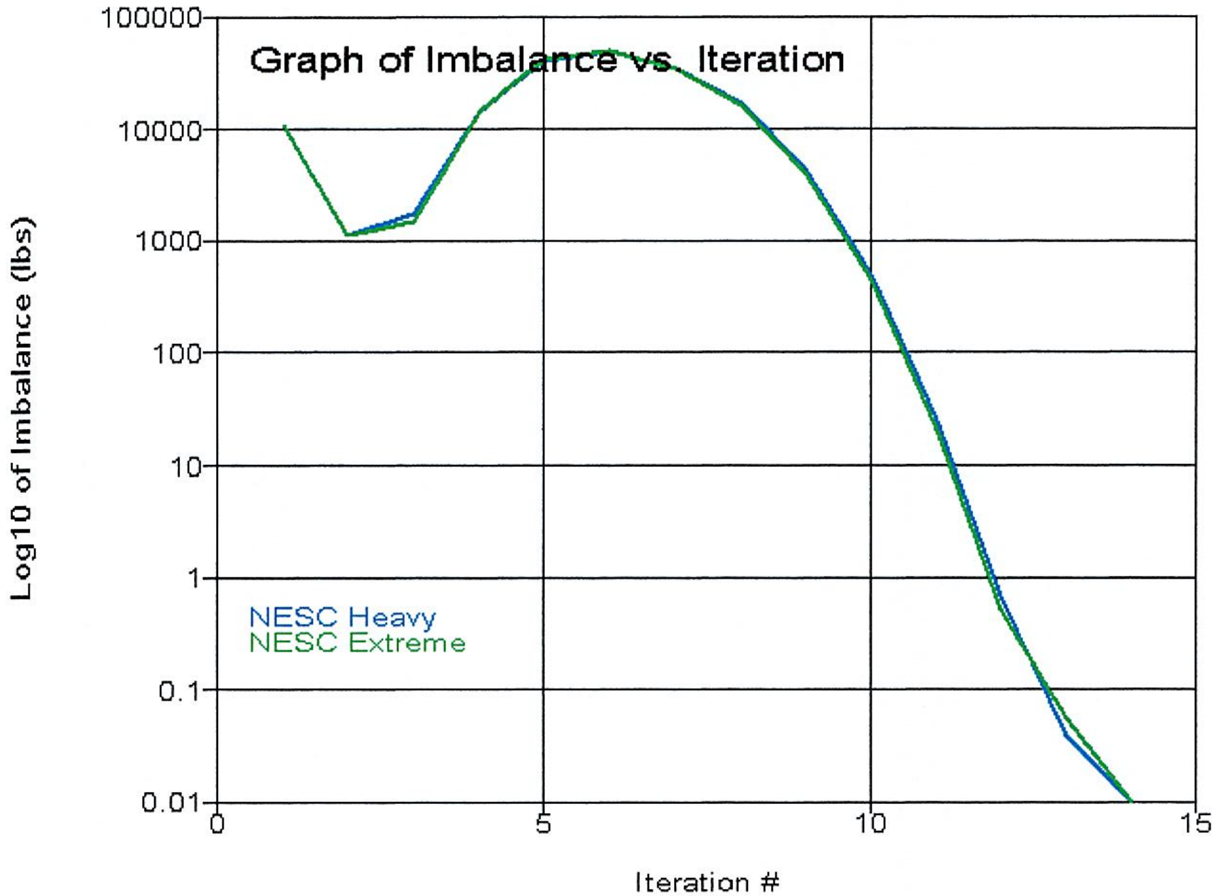
**Notes: Does not include loads from equipment, arms, guys, braces, etc. or user input loads.**
**Wind load is calculated for the undeformed shape of a pole.**

| Pole Label | Top Joint | Bottom Joint | Section Top Z (ft) | Section Bottom Z (ft) | Section Average Elevation (ft) | Outer Diameter (in) | Reynolds Number | Drag Coef. | Adjusted Wind Pressure (psf) | Adjusted Ice Thickness (in) | Pole Vert. Load (lbs) | Pole Wind Load (lbs) | Pole Ice Vertical Load (lbs) | Pole Ice Wind Load (lbs) | Tran. Wind Load (lbs) | Long. Wind Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:t | 2683:Arm1 | 90.00 | 88.92 | 89.46 | 19.775 | 1.5e+006 | 1.000 | 25.60 | 0.00 | 74.07 | 45.56 | 0.00 | 0.00 | 45.56 | 0.00 |
| 2683 | 2683:Arm1 | 2683:WVGD9 | 88.92 | 85.00 | 86.96 | 20.468 | 1.55e+006 | 1.000 | 25.60 | 0.00 | 278.40 | 171.18 | 0.00 | 0.00 | 171.18 | 0.00 |
| 2683 | 2683:WVGD9 | 2683:Arm2 | 85.00 | 83.50 | 84.25 | 21.219 | 1.61e+006 | 1.000 | 25.60 | 0.00 | 110.50 | 67.91 | 0.00 | 0.00 | 67.91 | 0.00 |
| 2683 | 2683:Arm2 | 2683:TopConn | 83.50 | 80.00 | 81.75 | 21.913 | 1.66e+006 | 1.000 | 25.60 | 0.00 | 266.39 | 163.63 | 0.00 | 0.00 | 163.63 | 0.00 |
| 2683 | 2683:TopConn | 2683:WVGD8 | 80.00 | 75.00 | 77.50 | 23.091 | 1.75e+006 | 1.000 | 25.60 | 0.00 | 401.32 | 246.32 | 0.00 | 0.00 | 246.32 | 0.00 |
| 2683 | 2683:WVGD8 | 2683:Arm3 | 75.00 | 70.50 | 72.75 | 24.408 | 1.85e+006 | 1.000 | 25.60 | 0.00 | 382.07 | 234.34 | 0.00 | 0.00 | 234.34 | 0.00 |
| 2683 | 2683:Arm3 | | 70.50 | 67.75 | 69.13 | 25.413 | 1.93e+006 | 1.000 | 25.60 | 0.00 | 243.23 | 149.10 | 0.00 | 0.00 | 149.10 | 0.00 |
| 2683 | | 2683:WVGD7 | 67.75 | 65.00 | 66.38 | 26.176 | 1.98e+006 | 1.000 | 25.60 | 0.00 | 250.62 | 153.58 | 0.00 | 0.00 | 153.58 | 0.00 |
| 2683 | 2683:WVGD7 | | 65.00 | 62.25 | 63.63 | 26.938 | 2.04e+006 | 1.000 | 25.60 | 0.00 | 258.01 | 158.05 | 0.00 | 0.00 | 158.05 | 0.00 |
| 2683 | | 2683:Arm4 | 62.25 | 59.50 | 60.88 | 27.701 | 2.1e+006 | 1.000 | 25.60 | 0.00 | 265.40 | 162.52 | 0.00 | 0.00 | 162.52 | 0.00 |
| 2683 | 2683:Arm4 | | 59.50 | 55.17 | 57.33 | 28.683 | 2.17e+006 | 1.000 | 25.60 | 0.00 | 433.19 | 265.18 | 0.00 | 0.00 | 265.18 | 0.00 |
| 2683 | | 2683:WVGD6 | 55.17 | 55.00 | 55.08 | 28.994 | 2.2e+006 | 1.000 | 25.60 | 0.00 | 36.98 | 10.31 | 0.00 | 0.00 | 10.31 | 0.00 |
| 2683 | 2683:WVGD6 | | 55.00 | 51.00 | 53.00 | 29.259 | 2.22e+006 | 1.000 | 25.60 | 0.00 | 905.35 | 249.70 | 0.00 | 0.00 | 249.70 | 0.00 |
| 2683 | | 2683:BotConn | 51.00 | 50.00 | 50.50 | 29.952 | 2.27e+006 | 1.000 | 25.60 | 0.00 | 125.15 | 63.90 | 0.00 | 0.00 | 63.90 | 0.00 |
| 2683 | 2683:BotConn | 2683:WVGD5 | 50.00 | 45.00 | 47.50 | 30.784 | 2.33e+006 | 1.000 | 25.60 | 0.00 | 642.92 | 328.39 | 0.00 | 0.00 | 328.39 | 0.00 |
| 2683 | 2683:WVGD5 | | 45.00 | 40.00 | 42.50 | 32.171 | 2.44e+006 | 1.000 | 25.60 | 0.00 | 672.23 | 343.18 | 0.00 | 0.00 | 343.18 | 0.00 |
| 2683 | | 2683:WVGD4 | 40.00 | 35.00 | 37.50 | 33.557 | 2.54e+006 | 1.000 | 25.60 | 0.00 | 701.54 | 357.97 | 0.00 | 0.00 | 357.97 | 0.00 |
| 2683 | 2683:WVGD4 | | 35.00 | 30.00 | 32.50 | 34.943 | 2.65e+006 | 1.000 | 25.60 | 0.00 | 730.85 | 372.76 | 0.00 | 0.00 | 372.76 | 0.00 |
| 2683 | | 2683:WVGD3 | 30.00 | 25.00 | 27.50 | 36.330 | 2.75e+006 | 1.000 | 25.60 | 0.00 | 760.16 | 387.55 | 0.00 | 0.00 | 387.55 | 0.00 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:WVGD3 | | 25.00 | 20.25 | 22.63 | 37.682 | 2.85e+006 | 1.000 | 25.60 | 0.00 | 749.30 | 381.87 | 0.00 | 0.00 | 381.87 | 0.00 |
| 2683 | | | 20.25 | 17.63 | 18.94 | 38.329 | 2.9e+006 | 1.000 | 25.60 | 0.00 | 842.55 | 214.66 | 0.00 | 0.00 | 214.66 | 0.00 |
| 2683 | | 2683:WVGD2 | 17.63 | 15.00 | 16.31 | 38.682 | 2.93e+006 | 1.000 | 25.60 | 0.00 | 858.71 | 216.64 | 0.00 | 0.00 | 216.64 | 0.00 |
| 2683 | 2683:WVGD2 | | 15.00 | 10.00 | 12.50 | 39.739 | 3.01e+006 | 1.000 | 25.60 | 0.00 | 832.34 | 423.92 | 0.00 | 0.00 | 423.92 | 0.00 |
| 2683 | | 2683:WVGD1 | 10.00 | 5.00 | 7.50 | 41.125 | 3.12e+006 | 1.000 | 25.60 | 0.00 | 861.55 | 438.71 | 0.00 | 0.00 | 438.71 | 0.00 |
| 2683 | 2683:WVGD1 | 2683:g | 5.00 | 0.00 | 2.50 | 42.512 | 3.22e+006 | 1.000 | 25.60 | 0.00 | 890.86 | 453.50 | 0.00 | 0.00 | 453.50 | 0.00 |

*** Analysis Results:

Maximum element usage is 70.57% for Steel Pole "2683" in load case "NESC Heavy"
Maximum insulator usage is 14.73% for Clamp "Clamp21" in load case "NESC Extreme"




*** Analysis Results for Load Case No. 1 "NESC Heavy" - Number of iterations in SAPS 14

**Equilibrium Joint Positions and Rotations for Load Case "NESC Heavy":**

| Joint Label | X-Displ (ft) | Y-Displ (ft) | Z-Displ (ft) | X-Rot (deg) | Y-Rot (deg) | Z-Rot (deg) | X-Pos (ft) | Y-Pos (ft) | Z-Pos (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 2683:g | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | 0 | 0 | 0 |
| 2683:t | 0.004452 | 3.056 | -0.07008 | -3.3725 | 0.0044 | 0.0001 | 0.004452 | 3.056 | 89.93 |
| 2683:Arm1 | 0.00437 | 2.992 | -0.06821 | -3.3725 | 0.0044 | 0.0001 | 0.00437 | 2.992 | 88.85 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2683:WVGD9 | 0.004072 | 2.762 | -0.06143 | -3.3565 | 0.0044 | 0.0001 | 0.004072 | 2.762 | 84.94 |
| 2683:Arm2 | 0.003958 | 2.674 | -0.05886 | -3.3466 | 0.0044 | 0.0001 | 0.003958 | 2.674 | 83.44 |
| 2683:TopConn | 0.003693 | 2.471 | -0.05292 | -3.3039 | 0.0043 | 0.0001 | 0.003693 | 2.471 | 79.95 |
| 2683:WVGD8 | 0.003317 | 2.186 | -0.04469 | -3.2062 | 0.0043 | 0.0001 | 0.003317 | 2.186 | 74.96 |
| 2683:Arm3 | 0.002986 | 1.939 | -0.03776 | -3.0869 | 0.0042 | 0.0001 | 0.002986 | 1.939 | 70.46 |
| 2683:WVGD7 | 0.002592 | 1.651 | -0.03007 | -2.8955 | 0.0040 | 0.0001 | 0.002592 | 1.651 | 64.97 |
| 2683:Arm4 | 0.002215 | 1.383 | -0.02339 | -2.6730 | 0.0038 | 0.0000 | 0.002215 | 1.383 | 59.48 |
| 2683:WVGD6 | 0.001923 | 1.181 | -0.01869 | -2.4687 | 0.0036 | 0.0000 | 0.001923 | 1.181 | 54.98 |
| 2683:BotConn | 0.001616 | 0.9743 | -0.01429 | -2.2504 | 0.0034 | 0.0000 | 0.001616 | 0.9743 | 49.99 |
| 2683:WVGD5 | 0.001331 | 0.7874 | -0.01064 | -2.0235 | 0.0031 | 0.0000 | 0.001331 | 0.7874 | 44.99 |
| 2683:WVGD4 | 0.0008304 | 0.4735 | -0.005388 | -1.5618 | 0.0026 | 0.0000 | 0.0008304 | 0.4735 | 34.99 |
| 2683:WVGD3 | 0.0004367 | 0.2401 | -0.002338 | -1.1055 | 0.0019 | 0.0000 | 0.0004367 | 0.2401 | 25 |
| 2683:WVGD2 | 0.0001616 | 0.08559 | -0.0008085 | -0.6548 | 0.0012 | 0.0000 | 0.0001616 | 0.08559 | 15 |
| 2683:WVGD1 | 1.889e-005 | 0.009557 | -0.0001743 | -0.2118 | 0.0004 | 0.0000 | 1.889e-005 | 0.009557 | 5 |
| Davit1:O | 0.004375 | 2.993 | -0.01938 | -3.3725 | 0.0044 | 0.0001 | 0.004375 | 2.163 | 88.9 |
| Davit1:End | 0.004517 | 3.09 | 0.2427 | -3.3728 | 0.0044 | 0.0001 | 0.004517 | -2.241 | 90.66 |
| Davit2:O | 0.004365 | 2.991 | -0.1171 | -3.3725 | 0.0044 | 0.0001 | 0.004365 | 3.821 | 88.8 |
| Davit2:End | 0.004452 | 3.072 | -0.3894 | -3.4640 | 0.0044 | 0.0001 | 0.004452 | 8.403 | 90.03 |
| Davit3:O | 0.003963 | 2.676 | -0.006742 | -3.3466 | 0.0044 | 0.0001 | 0.003963 | 1.783 | 83.49 |
| Davit3:End | 0.004167 | 2.806 | 0.4936 | -3.3198 | 0.0044 | 0.0001 | 0.004167 | -6.756 | 85.99 |
| Davit4:O | 0.003952 | 2.672 | -0.111 | -3.3466 | 0.0044 | 0.0001 | 0.003952 | 3.565 | 83.39 |
| Davit4:End | 0.004053 | 2.776 | -0.6266 | -3.4147 | 0.0044 | 0.0001 | 0.004053 | 12.34 | 84.87 |
| Davit5:O | 0.002991 | 1.94 | 0.0184 | -3.0869 | 0.0042 | 0.0001 | 0.002991 | 0.8971 | 70.52 |
| Davit5:End | 0.003273 | 2.117 | 0.6369 | -3.0396 | 0.0042 | 0.0001 | 0.003273 | -10.6 | 74.14 |
| Davit6:O | 0.002981 | 1.937 | -0.09393 | -3.0869 | 0.0042 | 0.0001 | 0.002981 | 2.98 | 70.41 |
| Davit6:End | 0.003141 | 2.085 | -0.7421 | -3.2187 | 0.0042 | 0.0001 | 0.003141 | 14.8 | 72.76 |
| Davit7:O | 0.00222 | 1.384 | 0.03118 | -2.6730 | 0.0038 | 0.0000 | 0.00222 | 0.2143 | 59.53 |
| Davit7:End | 0.002388 | 1.486 | 0.4308 | -2.6450 | 0.0038 | 0.0001 | 0.002388 | -8.354 | 61.93 |
| Davit8:O | 0.002211 | 1.382 | -0.07795 | -2.6730 | 0.0038 | 0.0000 | 0.002211 | 2.552 | 59.42 |
| Davit8:End | 0.00231 | 1.467 | -0.4906 | -2.7420 | 0.0038 | 0.0000 | 0.00231 | 11.31 | 61.01 |

**Joint Support Reactions for Load Case "NESC Heavy":**

| Joint Label | X Force (kips) | X Usage % | Y Force (kips) | Y Usage % | Z Force (kips) | Comp. Usage % | Uplift Usage % | Result. Force (kips) | Result. Usage % | X Moment (ft-k) | X-M. Usage % | Y Moment (ft-k) | Y-M. Usage % | Z Moment (ft-k) | Z-M. Usage % | Max. Usage % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683:g | -0.09 | 0.0 | -24.81 | 0.0 | 50.88 | 0.0 | 0.0 | 56.61 | 0.0 | 1892.67 | 0.0 | -3.7 | 0.0 | -0.01 | 0.0 | 0.0 |

**Detailed Steel Pole Usages for Load Case "NESC Heavy":**

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Trans. Defl. (in) | Long. Defl. (in) | Vert. Defl. (in) | Trans. Mom. (Local Mx) (ft-k) | Long. Mom. (Local My) (ft-k) | Tors. Mom. (ft-k) | Axial Force (kips) | Tran. Shear (kips) | Long. Shear (kips) | P/A (ksi) | M/S. (ksi) | V/Q. (ksi) | T/R. (ksi) | Res. (ksi) | Max. Usage % | At Pt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:t | Origin | 0.00 | 36.67 | 0.05 | -0.84 | -0.00 | -0.00 | 0.0 | -0.06 | 0.01 | -0.00 | -0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 4 |
| 2683 | 2683:Arm1 | End | 1.08 | 35.90 | 0.05 | -0.82 | 0.02 | -0.00 | 0.0 | -0.06 | 0.01 | -0.00 | -0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 2 |
| 2683 | 2683:Arm1 | Origin | 1.08 | 35.90 | 0.05 | -0.82 | 6.93 | -0.00 | 0.0 | -1.96 | 4.69 | -0.00 | -0.10 | 0.80 | 0.18 | 0.00 | 0.95 | 1.5 | 2 |
| 2683 | 2683:WVGD9 | End | 5.00 | 33.14 | 0.05 | -0.74 | 25.33 | -0.01 | 0.0 | -1.96 | 4.69 | -0.00 | -0.09 | 2.63 | 0.17 | 0.00 | 2.74 | 4.2 | 2 |
| 2683 | 2683:WVGD9 | Origin | 5.00 | 33.14 | 0.05 | -0.74 | 25.33 | -0.01 | 0.0 | -2.68 | 4.84 | -0.00 | -0.13 | 2.63 | 0.18 | 0.00 | 2.77 | 4.3 | 2 |
| 2683 | 2683:Arm2 | End | 6.50 | 32.09 | 0.05 | -0.71 | 32.59 | -0.02 | 0.0 | -2.68 | 4.84 | -0.00 | -0.12 | 3.25 | 0.18 | 0.00 | 3.39 | 5.2 | 2 |
| 2683 | 2683:Arm2 | Origin | 6.50 | 32.09 | 0.05 | -0.71 | 42.19 | -0.02 | 0.0 | -6.17 | 9.73 | -0.01 | -0.28 | 4.21 | 0.35 | 0.00 | 4.53 | 7.0 | 2 |
| 2683 | 2683:TopConn | End | 10.00 | 29.65 | 0.04 | -0.64 | 76.24 | -0.05 | 0.0 | -6.17 | 9.73 | -0.01 | -0.27 | 6.95 | 0.34 | 0.00 | 7.24 | 11.1 | 2 |
| 2683 | 2683:TopConn | Origin | 10.00 | 29.65 | 0.04 | -0.64 | 76.24 | -0.05 | 0.0 | -16.90 | 14.08 | -0.01 | -0.74 | 6.95 | 0.49 | 0.00 | 7.74 | 11.9 | 2 |
| 2683 | 2683:WVGD8 | End | 15.00 | 26.23 | 0.04 | -0.54 | 146.63 | -0.10 | 0.0 | -16.90 | 14.08 | -0.01 | -0.70 | 11.83 | 0.46 | 0.00 | 12.55 | 19.3 | 2 |
| 2683 | 2683:WVGD8 | Origin | 15.00 | 26.23 | 0.04 | -0.54 | 146.63 | -0.10 | 0.0 | -17.94 | 14.27 | -0.01 | -0.74 | 11.83 | 0.47 | 0.00 | 12.59 | 19.4 | 2 |
| 2683 | 2683:Arm3 | End | 19.50 | 23.26 | 0.04 | -0.45 | 210.86 | -0.17 | 0.0 | -17.94 | 14.27 | -0.01 | -0.70 | 15.32 | 0.44 | 0.00 | 16.04 | 24.7 | 2 |
| 2683 | 2683:Arm3 | Origin | 19.50 | 23.26 | 0.04 | -0.45 | 225.28 | -0.17 | 0.0 | -22.01 | 19.18 | -0.02 | -0.86 | 16.37 | 0.59 | 0.00 | 17.26 | 26.6 | 2 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | Tube 1 | End | 22.25 | 21.51 | 0.03 | -0.41 | 278.01 | -0.22 | 0.0 | -22.01 | 19.18 | -0.02 | -0.83 | 19.01 | 0.58 | 0.00 | 19.87 | 30.6 | 2 |
| 2683 | Tube 1 | Origin | 22.25 | 21.51 | 0.03 | -0.41 | 278.01 | -0.22 | 0.0 | -22.41 | 19.23 | -0.02 | -0.85 | 19.01 | 0.58 | 0.00 | 19.88 | 30.6 | 2 |
| 2683 | 2683:WVGD7 | End | 25.00 | 19.81 | 0.03 | -0.36 | 330.91 | -0.28 | 0.0 | -22.41 | 19.23 | -0.02 | -0.82 | 21.32 | 0.56 | 0.00 | 22.17 | 34.1 | 2 |
| 2683 | 2683:WVGD7 | Origin | 25.00 | 19.81 | 0.03 | -0.36 | 330.91 | -0.28 | 0.0 | -23.25 | 19.36 | -0.02 | -0.86 | 21.32 | 0.56 | 0.00 | 22.20 | 34.1 | 2 |
| 2683 | Tube 1 | End | 27.75 | 18.17 | 0.03 | -0.32 | 384.15 | -0.35 | 0.0 | -23.25 | 19.36 | -0.02 | -0.83 | 23.37 | 0.55 | 0.00 | 24.22 | 37.3 | 2 |
| 2683 | Tube 1 | Origin | 27.75 | 18.17 | 0.03 | -0.32 | 384.15 | -0.35 | 0.0 | -23.68 | 19.42 | -0.03 | -0.85 | 23.37 | 0.55 | 0.00 | 24.23 | 37.3 | 2 |
| 2683 | 2683:Arm4 | End | 30.50 | 16.60 | 0.03 | -0.28 | 437.55 | -0.42 | 0.0 | -23.68 | 19.42 | -0.03 | -0.82 | 25.16 | 0.54 | 0.00 | 26.00 | 40.5 | 2 |
| 2683 | 2683:Arm4 | Origin | 30.50 | 16.60 | 0.03 | -0.28 | 447.09 | -0.42 | 0.0 | -27.53 | 24.25 | -0.03 | -0.96 | 25.71 | 0.67 | 0.00 | 26.70 | 41.6 | 2 |
| 2683 | SpliceT | End | 34.83 | 14.25 | 0.02 | -0.23 | 552.18 | -0.55 | 0.0 | -27.53 | 24.25 | -0.03 | -0.92 | 29.17 | 0.64 | 0.00 | 30.10 | 47.9 | 2 |
| 2683 | SpliceT | Origin | 34.83 | 14.25 | 0.02 | -0.23 | 552.18 | -0.55 | 0.0 | -27.93 | 24.29 | -0.03 | -0.93 | 29.17 | 0.64 | 0.00 | 30.12 | 47.9 | 2 |
| 2683 | 2683:WVGD6 | End | 35.00 | 14.17 | 0.02 | -0.22 | 556.22 | -0.56 | 0.0 | -27.93 | 24.29 | -0.03 | -0.79 | 25.66 | 0.55 | 0.00 | 26.47 | 40.7 | 2 |
| 2683 | 2683:WVGD6 | Origin | 35.00 | 14.17 | 0.02 | -0.22 | 556.22 | -0.56 | 0.0 | -29.10 | 24.41 | -0.03 | -0.83 | 25.66 | 0.55 | 0.00 | 26.51 | 40.8 | 2 |
| 2683 | SpliceB | End | 39.00 | 12.17 | 0.02 | -0.18 | 653.84 | -0.69 | 0.0 | -29.10 | 24.41 | -0.03 | -0.80 | 27.93 | 0.53 | 0.00 | 28.74 | 44.2 | 2 |
| 2683 | SpliceB | Origin | 39.00 | 12.17 | 0.02 | -0.18 | 653.84 | -0.69 | 0.0 | -29.92 | 24.46 | -0.04 | -0.82 | 27.93 | 0.53 | 0.00 | 28.76 | 44.2 | 2 |
| 2683 | 2683:BotConn | End | 40.00 | 11.69 | 0.02 | -0.17 | 678.30 | -0.73 | 0.0 | -29.92 | 24.46 | -0.04 | -0.81 | 28.43 | 0.53 | 0.00 | 29.25 | 45.0 | 2 |
| 2683 | 2683:BotConn | Origin | 40.00 | 11.69 | 0.02 | -0.17 | 678.30 | -0.73 | 0.0 | -32.91 | 23.72 | -0.04 | -0.89 | 28.43 | 0.51 | 0.00 | 29.33 | 45.1 | 2 |
| 2683 | 2683:WVGD5 | End | 45.00 | 9.45 | 0.02 | -0.13 | 796.90 | -0.92 | 0.0 | -32.91 | 23.72 | -0.04 | -0.85 | 30.47 | 0.49 | 0.00 | 31.34 | 48.2 | 2 |
| 2683 | 2683:WVGD5 | Origin | 45.00 | 9.45 | 0.02 | -0.13 | 796.90 | -0.92 | 0.0 | -34.94 | 23.91 | -0.04 | -0.90 | 30.47 | 0.49 | 0.00 | 31.39 | 48.3 | 2 |
| 2683 | Tube 2 | End | 50.00 | 7.44 | 0.01 | -0.09 | 916.44 | -1.14 | 0.0 | -34.94 | 23.91 | -0.04 | -0.87 | 32.10 | 0.47 | 0.00 | 32.98 | 50.7 | 2 |
| 2683 | Tube 2 | Origin | 50.00 | 7.44 | 0.01 | -0.09 | 916.44 | -1.14 | 0.0 | -36.06 | 23.98 | -0.05 | -0.89 | 32.10 | 0.47 | 0.00 | 33.01 | 50.8 | 2 |
| 2683 | 2683:WVGD4 | End | 55.00 | 5.68 | 0.01 | -0.06 | 1036.32 | -1.38 | 0.0 | -36.06 | 23.98 | -0.05 | -0.86 | 33.38 | 0.45 | 0.00 | 34.24 | 53.7 | 2 |
| 2683 | 2683:WVGD4 | Origin | 55.00 | 5.68 | 0.01 | -0.06 | 1036.32 | -1.37 | 0.0 | -38.18 | 24.15 | -0.05 | -0.91 | 33.38 | 0.45 | 0.00 | 34.29 | 53.8 | 2 |
| 2683 | Tube 2 | End | 60.00 | 4.16 | 0.01 | -0.04 | 1157.09 | -1.64 | 0.0 | -38.18 | 24.15 | -0.05 | -0.87 | 34.38 | 0.44 | 0.00 | 35.26 | 56.5 | 2 |
| 2683 | Tube 2 | Origin | 60.00 | 4.16 | 0.01 | -0.04 | 1157.09 | -1.64 | 0.0 | -39.39 | 24.22 | -0.06 | -0.90 | 34.38 | 0.44 | 0.00 | 35.29 | 56.5 | 2 |
| 2683 | 2683:WVGD3 | End | 65.00 | 2.88 | 0.01 | -0.03 | 1278.18 | -1.92 | 0.0 | -39.39 | 24.22 | -0.06 | -0.87 | 35.15 | 0.42 | 0.00 | 36.02 | 58.9 | 2 |
| 2683 | 2683:WVGD3 | Origin | 65.00 | 2.88 | 0.01 | -0.03 | 1278.18 | -1.92 | 0.0 | -41.56 | 24.39 | -0.06 | -0.91 | 35.15 | 0.42 | 0.00 | 36.07 | 59.0 | 2 |
| 2683 | SpliceT | End | 69.75 | 1.88 | 0.00 | -0.02 | 1394.02 | -2.22 | 0.0 | -41.56 | 24.39 | -0.06 | -0.88 | 35.71 | 0.41 | 0.00 | 36.60 | 61.1 | 2 |
| 2683 | SpliceT | Origin | 69.75 | 1.88 | 0.00 | -0.02 | 1394.02 | -2.22 | 0.0 | -42.83 | 24.43 | -0.07 | -0.91 | 35.71 | 0.41 | 0.00 | 36.62 | 61.2 | 2 |
| 2683 | Tube 2 | End | 72.38 | 1.42 | 0.00 | -0.01 | 1458.16 | -2.39 | 0.0 | -42.83 | 24.43 | -0.07 | -0.91 | 37.39 | 0.41 | 0.00 | 38.31 | 63.9 | 2 |
| 2683 | Tube 2 | Origin | 72.38 | 1.42 | 0.00 | -0.01 | 1458.16 | -2.39 | 0.0 | -44.15 | 24.47 | -0.07 | -0.94 | 37.39 | 0.41 | 0.00 | 38.34 | 64.0 | 2 |
| 2683 | 2683:WVGD2 | End | 75.00 | 1.03 | 0.00 | -0.01 | 1522.39 | -2.57 | 0.0 | -44.15 | 24.47 | -0.07 | -0.92 | 37.58 | 0.40 | 0.00 | 38.51 | 65.0 | 2 |
| 2683 | 2683:WVGD2 | Origin | 75.00 | 1.03 | 0.00 | -0.01 | 1522.39 | -2.57 | 0.0 | -46.44 | 24.61 | -0.07 | -0.97 | 37.58 | 0.41 | 0.00 | 38.55 | 65.1 | 2 |
| 2683 | Tube 3 | End | 80.00 | 0.45 | 0.00 | -0.01 | 1645.43 | -2.93 | 0.0 | -46.44 | 24.61 | -0.07 | -0.93 | 37.84 | 0.39 | 0.00 | 38.78 | 67.0 | 2 |
| 2683 | Tube 3 | Origin | 80.00 | 0.45 | 0.00 | -0.01 | 1645.43 | -2.93 | 0.0 | -47.81 | 24.66 | -0.08 | -0.96 | 37.84 | 0.39 | 0.00 | 38.81 | 67.0 | 2 |
| 2683 | 2683:WVGD1 | End | 85.00 | 0.11 | 0.00 | -0.00 | 1768.70 | -3.32 | 0.0 | -47.81 | 24.66 | -0.08 | -0.93 | 37.99 | 0.38 | 0.00 | 38.93 | 68.7 | 2 |
| 2683 | 2683:WVGD1 | Origin | 85.00 | 0.11 | 0.00 | -0.00 | 1768.70 | -3.32 | 0.0 | -50.16 | 24.79 | -0.08 | -0.97 | 37.99 | 0.38 | 0.00 | 38.97 | 68.8 | 2 |
| 2683 | 2683:g | End | 90.00 | 0.00 | 0.00 | 0.00 | 1892.67 | -3.74 | 0.0 | -50.16 | 24.79 | -0.08 | -0.94 | 38.06 | 0.37 | 0.00 | 39.00 | 70.6 | 2 |

**Detailed Tubular Davit Arm Usages for Load Case "NESC Heavy":**

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Trans. Defl. (in) | Long. Defl. (in) | Vert. Defl. (in) | Vert. Mom. (ft-k) | Horz. Mom. (ft-k) | Tors. Mom. (ft-k) | Axial Force (kips) | Vert. Shear (kips) | Horz. Shear (kips) | P/A (ksi) | M/S. (ksi) | V/Q. (ksi) | T/R. (ksi) | Res. (ksi) | Max. Usage % | At Pt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit1 | Davit1:O | Origin | 0.00 | 35.92 | 0.05 | -0.23 | 0.02 | 0.00 | 0.0 | -2.42 | -0.00 | -0.00 | -0.39 | 0.02 | 0.00 | 0.00 | 0.41 | 0.6 | 1 |
| Davit1 | Davit1:End | End | 4.74 | 37.07 | 0.05 | 2.91 | -0.00 | 0.00 | 0.0 | -2.42 | -0.00 | -0.00 | -0.71 | 0.00 | 0.00 | 0.00 | 0.71 | 1.1 | 1 |
| Davit2 | Davit2:O | Origin | 0.00 | 35.89 | 0.05 | -1.40 | -6.89 | -0.00 | 0.0 | 1.94 | 1.45 | 0.00 | 0.31 | 5.11 | 0.47 | 0.00 | 5.48 | 8.4 | 1 |
| Davit2 | Davit2:End | End | 4.74 | 36.87 | 0.05 | -4.67 | 0.00 | 0.00 | 0.0 | 1.94 | 1.45 | 0.00 | 0.57 | 0.00 | 0.85 | 0.00 | 1.57 | 2.4 | 1 |
| Davit3 | Davit3:O | Origin | 0.00 | 32.11 | 0.05 | -0.08 | -6.85 | 0.00 | 0.0 | -2.66 | 0.88 | -0.00 | -0.19 | 1.27 | 0.12 | 0.00 | 1.48 | 2.3 | 1 |
| Davit3 | #Davit3:0 | End | 4.45 | 32.89 | 0.05 | 2.93 | -2.93 | 0.00 | 0.0 | -2.66 | 0.88 | -0.00 | -0.25 | 1.00 | 0.17 | 0.00 | 1.28 | 2.0 | 1 |
| Davit3 | #Davit3:0 | Origin | 4.45 | 32.89 | 0.05 | 2.93 | -2.93 | 0.00 | 0.0 | -2.59 | 0.66 | -0.00 | -0.24 | 1.00 | 0.12 | 0.00 | 1.26 | 1.9 | 1 |
| Davit3 | Davit3:End | End | 8.90 | 33.68 | 0.05 | 5.92 | -0.00 | 0.00 | 0.0 | -2.59 | 0.66 | -0.00 | -0.38 | 0.00 | 0.19 | 0.00 | 0.50 | 0.8 | 1 |
| Davit4 | Davit4:O | Origin | 0.00 | 32.07 | 0.05 | -1.33 | -16.44 | -0.00 | -0.0 | 2.00 | 1.97 | 0.00 | 0.14 | 3.06 | 0.27 | 0.00 | 3.23 | 5.0 | 1 |
| Davit4 | #Davit4:0 | End | 4.45 | 32.69 | 0.05 | -4.41 | -7.69 | -0.00 | -0.0 | 2.00 | 1.97 | 0.00 | 0.19 | 2.62 | 0.37 | 0.00 | 2.89 | 4.4 | 1 |
| Davit4 | #Davit4:0 | Origin | 4.45 | 32.69 | 0.05 | -4.41 | -7.69 | -0.00 | 0.0 | 2.05 | 1.73 | 0.00 | 0.19 | 2.62 | 0.33 | 0.00 | 2.87 | 4.4 | 1 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit4 | Davit4:End | End | 8.90 | 33.31 | 0.05 | -7.52 | 0.00 | 0.00 | 0.0 | 2.05 | 1.73 | 0.00 | 0.30 | 0.00 | 0.50 | 0.00 | 0.92 | 1.4 | 1 |
| Davit5 | Davit5:O | Origin | 0.00 | 23.28 | 0.04 | 0.22 | -9.45 | 0.01 | 0.0 | -2.72 | 0.97 | -0.00 | -0.19 | 1.76 | 0.13 | 0.00 | 1.96 | 3.0 | 1 |
| Davit5 | #Davit5:0 | End | 5.00 | 24.17 | 0.04 | 3.32 | -4.62 | 0.00 | 0.0 | -2.72 | 0.97 | -0.00 | -0.24 | 1.40 | 0.17 | 0.00 | 1.67 | 2.6 | 1 |
| Davit5 | #Davit5:0 | Origin | 5.00 | 24.17 | 0.04 | 3.32 | -4.62 | 0.00 | 0.0 | -2.65 | 0.73 | -0.00 | -0.24 | 1.40 | 0.13 | 0.00 | 1.65 | 2.5 | 1 |
| Davit5 | #Davit5:1 | End | 8.52 | 24.79 | 0.04 | 5.48 | -2.04 | 0.00 | 0.0 | -2.65 | 0.73 | -0.00 | -0.29 | 0.96 | 0.16 | 0.00 | 1.28 | 2.0 | 1 |
| Davit5 | #Davit5:1 | Origin | 8.52 | 24.79 | 0.04 | 5.48 | -2.04 | 0.00 | 0.0 | -2.60 | 0.58 | -0.00 | -0.29 | 0.96 | 0.13 | 0.00 | 1.27 | 1.9 | 1 |
| Davit5 | Davit5:End | End | 12.05 | 25.40 | 0.04 | 7.64 | -0.00 | 0.00 | 0.0 | -2.60 | 0.58 | -0.00 | -0.38 | 0.00 | 0.17 | 0.00 | 0.48 | 0.7 | 1 |
| Davit6 | Davit6:O | Origin | 0.00 | 23.25 | 0.04 | -1.13 | -23.84 | -0.01 | -0.0 | 1.92 | 2.17 | 0.00 | 0.13 | 4.43 | 0.30 | 0.00 | 4.60 | 7.1 | 1 |
| Davit6 | #Davit6:0 | End | 5.00 | 23.97 | 0.04 | -4.31 | -12.97 | -0.00 | -0.0 | 1.92 | 2.17 | 0.00 | 0.17 | 3.94 | 0.39 | 0.00 | 4.16 | 6.4 | 1 |
| Davit6 | #Davit6:0 | Origin | 5.00 | 23.97 | 0.04 | -4.31 | -12.97 | -0.00 | -0.0 | 1.97 | 1.92 | 0.00 | 0.18 | 3.94 | 0.34 | 0.00 | 4.15 | 6.4 | 1 |
| Davit6 | #Davit6:1 | End | 8.52 | 24.49 | 0.04 | -6.59 | -6.20 | -0.00 | -0.0 | 1.97 | 1.92 | 0.00 | 0.22 | 2.91 | 0.42 | 0.00 | 3.21 | 4.9 | 1 |
| Davit6 | #Davit6:1 | Origin | 8.52 | 24.49 | 0.04 | -6.59 | -6.20 | -0.00 | 0.0 | 2.00 | 1.76 | 0.00 | 0.22 | 2.91 | 0.39 | 0.00 | 3.20 | 4.9 | 1 |
| Davit6 | Davit6:End | End | 12.05 | 25.02 | 0.04 | -8.91 | 0.00 | 0.00 | 0.0 | 2.00 | 1.76 | 0.00 | 0.29 | 0.00 | 0.51 | 0.00 | 0.93 | 1.4 | 1 |
| Davit7 | Davit7:O | Origin | 0.00 | 16.61 | 0.03 | 0.37 | -7.13 | 0.00 | 0.0 | -2.65 | 0.91 | -0.00 | -0.19 | 1.33 | 0.13 | 0.00 | 1.53 | 2.4 | 1 |
| Davit7 | #Davit7:0 | End | 4.45 | 17.23 | 0.03 | 2.78 | -3.06 | 0.00 | 0.0 | -2.65 | 0.91 | -0.00 | -0.25 | 1.05 | 0.17 | 0.00 | 1.33 | 2.0 | 1 |
| Davit7 | #Davit7:0 | Origin | 4.45 | 17.23 | 0.03 | 2.78 | -3.06 | 0.00 | 0.0 | -2.59 | 0.69 | -0.00 | -0.24 | 1.05 | 0.13 | 0.00 | 1.31 | 2.0 | 1 |
| Davit7 | Davit7:End | End | 8.90 | 17.84 | 0.03 | 5.17 | -0.00 | 0.00 | 0.0 | -2.59 | 0.69 | -0.00 | -0.38 | 0.00 | 0.20 | 0.00 | 0.51 | 0.8 | 1 |
| Davit8 | Davit8:O | Origin | 0.00 | 16.58 | 0.03 | -0.94 | -16.66 | -0.00 | -0.0 | 1.98 | 1.99 | 0.00 | 0.14 | 3.10 | 0.28 | 0.00 | 3.27 | 5.0 | 1 |
| Davit8 | #Davit8:0 | End | 4.45 | 17.09 | 0.03 | -3.39 | -7.79 | -0.00 | -0.0 | 1.98 | 1.99 | 0.00 | 0.19 | 2.66 | 0.38 | 0.00 | 2.92 | 4.5 | 1 |
| Davit8 | #Davit8:0 | Origin | 4.45 | 17.09 | 0.03 | -3.39 | -7.79 | -0.00 | 0.0 | 2.03 | 1.75 | 0.00 | 0.19 | 2.66 | 0.33 | 0.00 | 2.91 | 4.5 | 1 |
| Davit8 | Davit8:End | End | 8.90 | 17.60 | 0.03 | -5.89 | 0.00 | 0.00 | 0.0 | 2.03 | 1.75 | 0.00 | 0.29 | 0.00 | 0.51 | 0.00 | 0.93 | 1.4 | 1 |

**Summary of Clamp Capacities and Usages for Load Case "NESC Heavy":**

| Clamp Label | Force (kips) | Input Holding Capacity (kips) | Factored Holding Capacity (kips) | Usage % |
|---|---|---|---|---|
| Clamp1 | 2.402 | 80.00 | 80.00 | 3.00 |
| Clamp2 | 2.402 | 80.00 | 80.00 | 3.00 |
| Clamp3 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp4 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp5 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp6 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp7 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp8 | 2.628 | 80.00 | 80.00 | 3.29 |
| Clamp9 | 0.951 | 80.00 | 80.00 | 1.19 |
| Clamp10 | 0.951 | 80.00 | 80.00 | 1.19 |
| Clamp11 | 0.951 | 80.00 | 80.00 | 1.19 |
| Clamp12 | 0.951 | 80.00 | 80.00 | 1.19 |
| Clamp13 | 0.951 | 80.00 | 80.00 | 1.19 |
| Clamp14 | 0.433 | 80.00 | 80.00 | 0.54 |
| Clamp15 | 0.433 | 80.00 | 80.00 | 0.54 |
| Clamp16 | 0.433 | 80.00 | 80.00 | 0.54 |
| Clamp17 | 0.433 | 80.00 | 80.00 | 0.54 |
| Clamp21 | 11.058 | 80.00 | 80.00 | 13.82 |
| Clamp23 | 2.489 | 80.00 | 80.00 | 3.11 |

*** Analysis Results for Load Case No. 2 "NESC Extreme" - Number of iterations in SAPS 14

**Equilibrium Joint Positions and Rotations for Load Case "NESC Extreme":**

| Joint Label | X-Displ (ft) | Y-Displ (ft) | Z-Displ (ft) | X-Rot (deg) | Y-Rot (deg) | Z-Rot (deg) | X-Pos (ft) | Y-Pos (ft) | Z-Pos (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 2683:g | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | 0 | 0 | 0 |
| 2683:t | 0.001396 | 3.053 | -0.06851 | -3.3235 | 0.0014 | 0.0000 | 0.001396 | 3.053 | 89.93 |
| 2683:Arm1 | 0.00137 | 2.991 | -0.0667 | -3.3235 | 0.0014 | 0.0000 | 0.00137 | 2.991 | 88.85 |
| 2683:WVGD9 | 0.001277 | 2.764 | -0.06011 | -3.3152 | 0.0014 | 0.0000 | 0.001277 | 2.764 | 84.94 |
| 2683:Arm2 | 0.001241 | 2.677 | -0.0576 | -3.3101 | 0.0014 | 0.0000 | 0.001241 | 2.677 | 83.44 |
| 2683:TopConn | 0.001158 | 2.475 | -0.05178 | -3.2859 | 0.0014 | 0.0000 | 0.001158 | 2.475 | 79.95 |
| 2683:WVGD8 | 0.00104 | 2.191 | -0.04365 | -3.2099 | 0.0013 | 0.0000 | 0.00104 | 2.191 | 74.96 |
| 2683:Arm3 | 0.0009365 | 1.943 | -0.03676 | -3.0974 | 0.0013 | 0.0000 | 0.0009365 | 1.943 | 70.46 |
| 2683:WVGD7 | 0.000813 | 1.654 | -0.0291 | -2.9084 | 0.0013 | 0.0000 | 0.000813 | 1.654 | 64.97 |
| 2683:Arm4 | 0.0006949 | 1.385 | -0.02245 | -2.6826 | 0.0012 | 0.0000 | 0.0006949 | 1.385 | 59.48 |
| 2683:WVGD6 | 0.0006031 | 1.182 | -0.0178 | -2.4749 | 0.0011 | 0.0000 | 0.0006031 | 1.182 | 54.98 |
| 2683:BotConn | 0.000507 | 0.9753 | -0.01346 | -2.2529 | 0.0011 | 0.0000 | 0.000507 | 0.9753 | 49.99 |
| 2683:WVGD5 | 0.0004173 | 0.7883 | -0.009896 | -2.0235 | 0.0010 | 0.0000 | 0.0004173 | 0.7883 | 44.99 |
| 2683:WVGD4 | 0.0002604 | 0.4746 | -0.004816 | -1.5614 | 0.0008 | 0.0000 | 0.0002604 | 0.4746 | 35 |
| 2683:WVGD3 | 0.000137 | 0.241 | -0.001928 | -1.1070 | 0.0006 | 0.0000 | 0.000137 | 0.241 | 25 |
| 2683:WVGD2 | 5.07e-005 | 0.08612 | -0.0005587 | -0.6575 | 0.0004 | 0.0000 | 5.07e-005 | 0.08612 | 15 |
| 2683:WVGD1 | 5.926e-006 | 0.009651 | -8.978e-005 | -0.2134 | 0.0001 | 0.0000 | 5.926e-006 | 0.009651 | 5 |
| Davit1:O | 0.001372 | 2.992 | -0.01857 | -3.3235 | 0.0014 | 0.0000 | 0.001372 | 2.162 | 88.9 |
| Davit1:End | 0.001416 | 3.087 | 0.2404 | -3.3359 | 0.0014 | 0.0000 | 0.001416 | -2.243 | 90.66 |
| Davit2:O | 0.001369 | 2.989 | -0.1148 | -3.3235 | 0.0014 | 0.0000 | 0.001369 | 3.819 | 88.81 |
| Davit2:End | 0.001396 | 3.069 | -0.3801 | -3.3573 | 0.0014 | 0.0000 | 0.001396 | 8.399 | 90.04 |
| Davit3:O | 0.001243 | 2.678 | -0.006052 | -3.3101 | 0.0014 | 0.0000 | 0.001243 | 1.786 | 83.49 |
| Davit3:End | 0.001307 | 2.808 | 0.4911 | -3.3094 | 0.0014 | 0.0000 | 0.001307 | -6.755 | 85.99 |
| Davit4:O | 0.001239 | 2.675 | -0.1092 | -3.3101 | 0.0014 | 0.0000 | 0.001239 | 3.568 | 83.39 |
| Davit4:End | 0.001271 | 2.777 | -0.6155 | -3.3372 | 0.0014 | 0.0000 | 0.001271 | 12.34 | 84.88 |
| Davit5:O | 0.0009382 | 1.945 | 0.0196 | -3.0974 | 0.0013 | 0.0000 | 0.0009382 | 0.9015 | 70.52 |
| Davit5:End | 0.001027 | 2.124 | 0.6456 | -3.0976 | 0.0013 | 0.0000 | 0.001027 | -10.59 | 74.15 |
| Davit6:O | 0.0009348 | 1.941 | -0.09312 | -3.0974 | 0.0013 | 0.0000 | 0.0009348 | 2.984 | 70.41 |
| Davit6:End | 0.0009847 | 2.088 | -0.7345 | -3.1516 | 0.0013 | 0.0000 | 0.0009847 | 14.8 | 72.77 |
| Davit7:O | 0.0006964 | 1.386 | 0.03232 | -2.6826 | 0.0012 | 0.0000 | 0.0006964 | 0.2163 | 59.53 |
| Davit7:End | 0.0007496 | 1.49 | 0.4357 | -2.6812 | 0.0012 | 0.0000 | 0.0007496 | -8.351 | 61.94 |
| Davit8:O | 0.0006934 | 1.384 | -0.07721 | -2.6826 | 0.0012 | 0.0000 | 0.0006934 | 2.554 | 59.42 |
| Davit8:End | 0.0007244 | 1.468 | -0.4877 | -2.7103 | 0.0012 | 0.0000 | 0.0007244 | 11.31 | 61.01 |

**Joint Support Reactions for Load Case "NESC Extreme":**

| Joint Label | X Force (kips) | X Usage % | Y Force (kips) | Y Usage % | Z Force (kips) | Comp. Usage % | Uplift Usage % | Result. Force (kips) | Result. Usage % | X Moment (ft-k) | X-M. Usage % | Y Moment (ft-k) | Y-M. Usage % | Z Moment (ft-k) | Z-M. Usage % | Max. Usage % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683:g | -0.03 | 0.0 | -26.69 | 0.0 | 24.93 | 0.0 | 0.0 | 36.52 | 0.0 | 1911.26 | 0.0 | -1.2 | 0.0 | -0.00 | 0.0 | 0.0 |

**Detailed Steel Pole Usages for Load Case "NESC Extreme":**

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Trans. Defl. (in) | Long. Defl. (in) | Vert. Defl. (in) | Trans. Mom. (Local Mx) (ft-k) | Long. Mom. (Local My) (ft-k) | Tors. Mom. (ft-k) | Axial Force (kips) | Tran. Shear (kips) | Long. Shear (kips) | P/A (ksi) | M/S. (ksi) | V/Q. (ksi) | T/R. (ksi) | Res. (ksi) | Max. Usage % | At Pt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:t | Origin | 0.00 | 36.64 | 0.02 | -0.82 | -0.00 | 0.00 | 0.0 | -0.04 | 0.02 | -0.00 | -0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 4 |

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Trans. Defl. (in) | Long. Defl. (in) | Vert. Defl. (in) | Vert. Mom. (ft-k) | Horz. Mom. (ft-k) | Tors. Mom. (ft-k) | Axial Force (kips) | Vert. Shear (kips) | Horz. Shear (kips) | P/A (ksi) | M/S. (ksi) | V/Q. (ksi) | T/R. (ksi) | Res. (ksi) | Max. Usage % | At Pt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | 2683:Arm1 | End | 1.08 | 35.89 | 0.02 | -0.80 | 0.03 | -0.00 | 0.0 | -0.04 | 0.02 | -0.00 | -0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0 | 2 |
| 2683 | 2683:Arm1 | Origin | 1.08 | 35.89 | 0.02 | -0.80 | 3.52 | -0.00 | 0.0 | -0.65 | 2.44 | -0.00 | -0.03 | 0.41 | 0.10 | 0.00 | 0.47 | 0.7 | 2 |
| 2683 | 2683:WVGD9 | End | 5.00 | 33.16 | 0.02 | -0.72 | 13.08 | -0.00 | 0.0 | -0.65 | 2.44 | -0.00 | -0.03 | 1.36 | 0.09 | 0.00 | 1.40 | 2.1 | 2 |
| 2683 | 2683:WVGD9 | Origin | 5.00 | 33.16 | 0.02 | -0.72 | 13.08 | -0.00 | 0.0 | -0.93 | 2.68 | -0.00 | -0.04 | 1.36 | 0.10 | 0.00 | 1.41 | 2.2 | 2 |
| 2683 | 2683:Arm2 | End | 6.50 | 32.12 | 0.01 | -0.69 | 17.10 | -0.01 | 0.0 | -0.93 | 2.68 | -0.00 | -0.04 | 1.71 | 0.10 | 0.00 | 1.76 | 2.7 | 2 |
| 2683 | 2683:Arm2 | Origin | 6.50 | 32.12 | 0.01 | -0.69 | 23.32 | -0.01 | 0.0 | -2.31 | 5.86 | -0.00 | -0.11 | 2.33 | 0.21 | 0.00 | 2.46 | 3.8 | 2 |
| 2683 | 2683:TopConn | End | 10.00 | 29.70 | 0.01 | -0.62 | 43.82 | -0.01 | 0.0 | -2.31 | 5.86 | -0.00 | -0.10 | 3.99 | 0.20 | 0.00 | 4.11 | 6.3 | 2 |
| 2683 | 2683:TopConn | Origin | 10.00 | 29.70 | 0.01 | -0.62 | 43.82 | -0.01 | 0.0 | -6.79 | 17.11 | -0.00 | -0.30 | 3.99 | 0.59 | 0.00 | 4.41 | 6.8 | 2 |
| 2683 | 2683:WVGD8 | End | 15.00 | 26.29 | 0.01 | -0.52 | 129.37 | -0.03 | 0.0 | -6.79 | 17.11 | -0.00 | -0.28 | 10.43 | 0.56 | 0.00 | 10.76 | 16.5 | 2 |
| 2683 | 2683:WVGD8 | Origin | 15.00 | 26.29 | 0.01 | -0.52 | 129.37 | -0.03 | 0.0 | -7.31 | 17.47 | -0.00 | -0.30 | 10.43 | 0.57 | 0.00 | 10.78 | 16.6 | 2 |
| 2683 | 2683:Arm3 | End | 19.50 | 23.32 | 0.01 | -0.44 | 208.00 | -0.05 | 0.0 | -7.31 | 17.47 | -0.00 | -0.29 | 15.11 | 0.54 | 0.00 | 15.43 | 23.7 | 2 |
| 2683 | 2683:Arm3 | Origin | 19.50 | 23.32 | 0.01 | -0.44 | 217.44 | -0.05 | 0.0 | -9.07 | 20.73 | -0.01 | -0.35 | 15.80 | 0.64 | 0.00 | 16.19 | 24.9 | 2 |
| 2683 | Tube 1 | End | 22.25 | 21.56 | 0.01 | -0.39 | 274.45 | -0.07 | 0.0 | -9.07 | 20.73 | -0.01 | -0.34 | 18.76 | 0.62 | 0.00 | 19.13 | 29.4 | 2 |
| 2683 | Tube 1 | Origin | 22.25 | 21.56 | 0.01 | -0.39 | 274.45 | -0.07 | 0.0 | -9.35 | 20.88 | -0.01 | -0.35 | 18.76 | 0.63 | 0.00 | 19.14 | 29.5 | 2 |
| 2683 | 2683:WVGD7 | End | 25.00 | 19.85 | 0.01 | -0.35 | 331.87 | -0.09 | 0.0 | -9.35 | 20.88 | -0.01 | -0.34 | 21.38 | 0.61 | 0.00 | 21.75 | 33.5 | 2 |
| 2683 | 2683:WVGD7 | Origin | 25.00 | 19.85 | 0.01 | -0.35 | 331.87 | -0.09 | 0.0 | -9.74 | 21.14 | -0.01 | -0.36 | 21.38 | 0.62 | 0.00 | 21.76 | 33.5 | 2 |
| 2683 | Tube 1 | End | 27.75 | 18.20 | 0.01 | -0.31 | 390.02 | -0.11 | 0.0 | -9.74 | 21.14 | -0.01 | -0.35 | 23.72 | 0.60 | 0.00 | 24.09 | 37.1 | 2 |
| 2683 | Tube 1 | Origin | 27.75 | 18.20 | 0.01 | -0.31 | 390.02 | -0.11 | 0.0 | -10.04 | 21.30 | -0.01 | -0.36 | 23.72 | 0.60 | 0.00 | 24.10 | 37.1 | 2 |
| 2683 | 2683:Arm4 | End | 30.50 | 16.62 | 0.01 | -0.27 | 448.58 | -0.13 | 0.0 | -10.04 | 21.30 | -0.01 | -0.35 | 25.79 | 0.59 | 0.00 | 26.16 | 40.7 | 2 |
| 2683 | 2683:Arm4 | Origin | 30.50 | 16.62 | 0.01 | -0.27 | 454.79 | -0.13 | 0.0 | -11.67 | 24.53 | -0.01 | -0.41 | 26.15 | 0.68 | 0.00 | 26.58 | 41.4 | 2 |
| 2683 | SpliceT | End | 34.83 | 14.27 | 0.01 | -0.22 | 561.10 | -0.17 | 0.0 | -11.67 | 24.53 | -0.01 | -0.39 | 29.63 | 0.65 | 0.00 | 30.04 | 47.8 | 2 |
| 2683 | SpliceT | Origin | 34.83 | 14.27 | 0.01 | -0.22 | 561.10 | -0.17 | 0.0 | -11.95 | 24.66 | -0.01 | -0.40 | 29.63 | 0.65 | 0.00 | 30.05 | 47.8 | 2 |
| 2683 | 2683:WVGD6 | End | 35.00 | 14.18 | 0.01 | -0.21 | 565.21 | -0.18 | 0.0 | -11.95 | 24.66 | -0.01 | -0.34 | 26.07 | 0.56 | 0.00 | 26.43 | 40.7 | 2 |
| 2683 | 2683:WVGD6 | Origin | 35.00 | 14.18 | 0.01 | -0.21 | 565.21 | -0.18 | 0.0 | -12.56 | 24.90 | -0.01 | -0.36 | 26.07 | 0.56 | 0.00 | 26.45 | 40.7 | 2 |
| 2683 | SpliceB | End | 39.00 | 12.18 | 0.01 | -0.17 | 664.81 | -0.22 | 0.0 | -12.56 | 24.90 | -0.01 | -0.34 | 28.38 | 0.54 | 0.00 | 28.74 | 44.2 | 2 |
| 2683 | SpliceB | Origin | 39.00 | 12.18 | 0.01 | -0.17 | 664.81 | -0.22 | 0.0 | -13.12 | 25.05 | -0.01 | -0.36 | 28.38 | 0.54 | 0.00 | 28.76 | 44.2 | 2 |
| 2683 | 2683:BotConn | End | 40.00 | 11.70 | 0.01 | -0.16 | 689.86 | -0.23 | 0.0 | -13.12 | 25.05 | -0.01 | -0.36 | 28.90 | 0.54 | 0.00 | 29.27 | 45.0 | 2 |
| 2683 | 2683:BotConn | Origin | 40.00 | 11.70 | 0.01 | -0.16 | 689.86 | -0.23 | 0.0 | -14.73 | 22.43 | -0.01 | -0.40 | 28.90 | 0.48 | 0.00 | 29.31 | 45.1 | 2 |
| 2683 | 2683:WVGD5 | End | 45.00 | 9.46 | 0.01 | -0.12 | 802.02 | -0.29 | 0.0 | -14.73 | 22.43 | -0.01 | -0.38 | 30.66 | 0.46 | 0.00 | 31.05 | 47.8 | 2 |
| 2683 | 2683:WVGD5 | Origin | 45.00 | 9.46 | 0.01 | -0.12 | 802.02 | -0.29 | 0.0 | -15.69 | 22.95 | -0.01 | -0.41 | 30.66 | 0.47 | 0.00 | 31.07 | 47.8 | 2 |
| 2683 | Tube 2 | End | 50.00 | 7.46 | 0.00 | -0.08 | 916.78 | -0.36 | 0.0 | -15.69 | 22.95 | -0.01 | -0.39 | 32.10 | 0.45 | 0.00 | 32.50 | 50.0 | 2 |
| 2683 | Tube 2 | Origin | 50.00 | 7.46 | 0.00 | -0.08 | 916.78 | -0.36 | 0.0 | -16.47 | 23.26 | -0.01 | -0.41 | 32.10 | 0.46 | 0.00 | 32.52 | 50.0 | 2 |
| 2683 | 2683:WVGD4 | End | 55.00 | 5.69 | 0.00 | -0.06 | 1033.07 | -0.43 | 0.0 | -16.47 | 23.26 | -0.01 | -0.39 | 33.26 | 0.44 | 0.00 | 33.66 | 52.8 | 2 |
| 2683 | 2683:WVGD4 | Origin | 55.00 | 5.69 | 0.00 | -0.06 | 1033.07 | -0.43 | 0.0 | -17.49 | 23.79 | -0.02 | -0.42 | 33.26 | 0.45 | 0.00 | 33.68 | 52.9 | 2 |
| 2683 | Tube 2 | End | 60.00 | 4.17 | 0.00 | -0.04 | 1152.04 | -0.51 | 0.0 | -17.49 | 23.79 | -0.02 | -0.40 | 34.22 | 0.43 | 0.00 | 34.62 | 55.5 | 2 |
| 2683 | Tube 2 | Origin | 60.00 | 4.17 | 0.00 | -0.04 | 1152.04 | -0.51 | 0.0 | -18.33 | 24.12 | -0.02 | -0.42 | 34.22 | 0.44 | 0.00 | 34.64 | 55.5 | 2 |
| 2683 | 2683:WVGD3 | End | 65.00 | 2.89 | 0.00 | -0.02 | 1272.65 | -0.60 | 0.0 | -18.33 | 24.12 | -0.02 | -0.40 | 34.98 | 0.42 | 0.00 | 35.39 | 57.9 | 2 |
| 2683 | 2683:WVGD3 | Origin | 65.00 | 2.89 | 0.00 | -0.02 | 1272.64 | -0.60 | 0.0 | -19.39 | 24.67 | -0.02 | -0.43 | 34.98 | 0.43 | 0.00 | 35.41 | 57.9 | 2 |
| 2683 | SpliceT | End | 69.75 | 1.89 | 0.00 | -0.01 | 1389.81 | -0.70 | 0.0 | -19.39 | 24.67 | -0.02 | -0.41 | 35.58 | 0.41 | 0.00 | 36.00 | 60.1 | 2 |
| 2683 | SpliceT | Origin | 69.75 | 1.89 | 0.00 | -0.01 | 1389.81 | -0.70 | 0.0 | -20.26 | 24.92 | -0.02 | -0.43 | 35.58 | 0.42 | 0.00 | 36.02 | 60.1 | 2 |
| 2683 | Tube 2 | End | 72.38 | 1.43 | 0.00 | -0.01 | 1455.22 | -0.75 | 0.0 | -20.26 | 24.92 | -0.02 | -0.43 | 37.30 | 0.42 | 0.00 | 37.74 | 63.0 | 2 |
| 2683 | Tube 2 | Origin | 72.38 | 1.43 | 0.00 | -0.01 | 1455.22 | -0.75 | 0.0 | -21.16 | 25.10 | -0.02 | -0.45 | 37.30 | 0.42 | 0.00 | 37.76 | 63.0 | 2 |
| 2683 | 2683:WVGD2 | End | 75.00 | 1.03 | 0.00 | -0.01 | 1521.12 | -0.81 | 0.0 | -21.16 | 25.10 | -0.02 | -0.44 | 37.53 | 0.41 | 0.00 | 37.98 | 64.1 | 2 |
| 2683 | 2683:WVGD2 | Origin | 75.00 | 1.03 | 0.00 | -0.01 | 1521.12 | -0.81 | 0.0 | -22.30 | 25.59 | -0.02 | -0.46 | 37.53 | 0.42 | 0.00 | 38.00 | 64.2 | 2 |
| 2683 | Tube 3 | End | 80.00 | 0.46 | 0.00 | -0.00 | 1649.05 | -0.92 | 0.0 | -22.30 | 25.59 | -0.02 | -0.45 | 37.91 | 0.41 | 0.00 | 38.36 | 66.2 | 2 |
| 2683 | Tube 3 | Origin | 80.00 | 0.46 | 0.00 | -0.00 | 1649.05 | -0.92 | 0.0 | -23.25 | 25.93 | -0.02 | -0.47 | 37.91 | 0.41 | 0.00 | 38.38 | 66.3 | 2 |
| 2683 | 2683:WVGD1 | End | 85.00 | 0.12 | 0.00 | -0.00 | 1778.72 | -1.04 | 0.0 | -23.25 | 25.93 | -0.02 | -0.45 | 38.19 | 0.40 | 0.00 | 38.64 | 68.2 | 2 |
| 2683 | 2683:WVGD1 | Origin | 85.00 | 0.12 | 0.00 | -0.00 | 1778.72 | -1.04 | 0.0 | -24.44 | 26.51 | -0.03 | -0.47 | 38.19 | 0.41 | 0.00 | 38.67 | 68.3 | 2 |
| 2683 | 2683:g | End | 90.00 | 0.00 | 0.00 | 0.00 | 1911.26 | -1.17 | 0.0 | -24.44 | 26.51 | -0.03 | -0.46 | 38.41 | 0.39 | 0.00 | 38.87 | 70.3 | 2 |

**Detailed Tubular Davit Arm Usages for Load Case "NESC Extreme":**

| Element Label | Joint Label | Joint Position | Rel. Dist. (ft) | Trans. Defl. (in) | Long. Defl. (in) | Vert. Defl. (in) | Vert. Mom. (ft-k) | Horz. Mom. (ft-k) | Tors. Mom. (ft-k) | Axial Force (kips) | Vert. Shear (kips) | Horz. Shear (kips) | P/A (ksi) | M/S. (ksi) | V/Q. (ksi) | T/R. (ksi) | Res. (ksi) | Max. Usage % | At Pt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit1 | Davit1:O | Origin | 0.00 | 35.90 | 0.02 | -0.22 | 0.93 | 0.00 | 0.0 | -1.14 | -0.20 | -0.00 | -0.18 | 0.69 | 0.06 | 0.00 | 0.88 | 1.4 | 1 |
| Davit1 | Davit1:End | End | 4.74 | 37.04 | 0.02 | 2.89 | -0.00 | 0.00 | 0.0 | -1.14 | -0.20 | -0.00 | -0.33 | 0.00 | 0.12 | 0.00 | 0.39 | 0.6 | 1 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Davit2 | Davit2:O | Origin | 0.00 | 35.87 | 0.02 | -1.38 | -2.54 | -0.00 | 0.0 | 1.03 | 0.54 | 0.00 | 0.16 | 1.89 | 0.17 | 0.00 | 2.07 | 3.2 | 1 |
| Davit2 | Davit2:End | End | 4.74 | 36.83 | 0.02 | -4.56 | 0.00 | 0.00 | 0.0 | 1.03 | 0.54 | 0.00 | 0.30 | 0.00 | 0.31 | 0.00 | 0.62 | 1.0 | 1 |
| Davit3 | Davit3:O | Origin | 0.00 | 32.14 | 0.01 | -0.07 | -0.57 | 0.00 | 0.0 | -1.59 | 0.13 | -0.00 | -0.11 | 0.11 | 0.02 | 0.00 | 0.22 | 0.3 | 1 |
| Davit3 | #Davit3:0 | End | 4.45 | 32.92 | 0.02 | 2.91 | 0.03 | 0.00 | 0.0 | -1.59 | 0.13 | -0.00 | -0.15 | 0.01 | 0.03 | 0.00 | 0.17 | 0.3 | 1 |
| Davit3 | #Davit3:0 | Origin | 4.45 | 32.92 | 0.02 | 2.91 | 0.03 | 0.00 | 0.0 | -1.55 | -0.01 | -0.00 | -0.15 | 0.01 | 0.00 | 0.00 | 0.16 | 0.2 | 1 |
| Davit3 | Davit3:End | End | 8.90 | 33.70 | 0.02 | 5.89 | -0.00 | 0.00 | 0.0 | -1.55 | -0.01 | -0.00 | -0.22 | 0.00 | 0.00 | 0.00 | 0.22 | 0.3 | 1 |
| Davit4 | Davit4:O | Origin | 0.00 | 32.10 | 0.01 | -1.31 | -6.76 | -0.00 | -0.0 | 1.36 | 0.84 | 0.00 | 0.10 | 1.26 | 0.12 | 0.00 | 1.37 | 2.1 | 1 |
| Davit4 | #Davit4:0 | End | 4.45 | 32.71 | 0.02 | -4.34 | -3.02 | -0.00 | -0.0 | 1.36 | 0.84 | 0.00 | 0.13 | 1.03 | 0.16 | 0.00 | 1.19 | 1.8 | 1 |
| Davit4 | #Davit4:0 | Origin | 4.45 | 32.71 | 0.02 | -4.34 | -3.02 | -0.00 | 0.0 | 1.39 | 0.68 | 0.00 | 0.13 | 1.03 | 0.13 | 0.00 | 1.18 | 1.8 | 1 |
| Davit4 | Davit4:End | End | 8.90 | 33.32 | 0.02 | -7.39 | 0.00 | 0.00 | 0.0 | 1.39 | 0.68 | 0.00 | 0.20 | 0.00 | 0.20 | 0.00 | 0.40 | 0.6 | 1 |
| Davit5 | Davit5:O | Origin | 0.00 | 23.33 | 0.01 | 0.24 | -0.85 | 0.00 | 0.0 | -1.62 | 0.18 | -0.00 | -0.11 | 0.16 | 0.03 | 0.00 | 0.28 | 0.4 | 1 |
| Davit5 | #Davit5:0 | End | 5.00 | 24.23 | 0.01 | 3.35 | 0.06 | 0.00 | 0.0 | -1.62 | 0.18 | -0.00 | -0.14 | 0.02 | 0.03 | 0.00 | 0.17 | 0.3 | 1 |
| Davit5 | #Davit5:0 | Origin | 5.00 | 24.23 | 0.01 | 3.35 | 0.06 | 0.00 | 0.0 | -1.57 | 0.04 | -0.00 | -0.14 | 0.02 | 0.01 | 0.00 | 0.16 | 0.2 | 1 |
| Davit5 | #Davit5:1 | End | 8.52 | 24.86 | 0.01 | 5.55 | 0.20 | 0.00 | 0.0 | -1.57 | 0.04 | -0.00 | -0.17 | 0.09 | 0.01 | 0.00 | 0.27 | 0.4 | 1 |
| Davit5 | #Davit5:1 | Origin | 8.52 | 24.86 | 0.01 | 5.55 | 0.20 | 0.00 | 0.0 | -1.54 | -0.06 | -0.00 | -0.17 | 0.09 | 0.01 | 0.00 | 0.26 | 0.4 | 1 |
| Davit5 | Davit5:End | End | 12.05 | 25.48 | 0.01 | 7.75 | -0.00 | 0.00 | 0.0 | -1.54 | -0.06 | -0.00 | -0.22 | 0.00 | 0.02 | 0.00 | 0.23 | 0.3 | 1 |
| Davit6 | Davit6:O | Origin | 0.00 | 23.30 | 0.01 | -1.12 | -10.24 | -0.00 | -0.0 | 1.32 | 0.98 | 0.00 | 0.09 | 1.90 | 0.14 | 0.00 | 2.01 | 3.1 | 1 |
| Davit6 | #Davit6:0 | End | 5.00 | 24.02 | 0.01 | -4.29 | -5.32 | -0.00 | -0.0 | 1.32 | 0.98 | 0.00 | 0.12 | 1.61 | 0.18 | 0.00 | 1.76 | 2.7 | 1 |
| Davit6 | #Davit6:0 | Origin | 5.00 | 24.02 | 0.01 | -4.29 | -5.32 | -0.00 | -0.0 | 1.35 | 0.81 | 0.00 | 0.12 | 1.61 | 0.14 | 0.00 | 1.75 | 2.7 | 1 |
| Davit6 | #Davit6:1 | End | 8.52 | 24.54 | 0.01 | -6.55 | -2.46 | -0.00 | -0.0 | 1.35 | 0.81 | 0.00 | 0.15 | 1.16 | 0.18 | 0.00 | 1.34 | 2.1 | 1 |
| Davit6 | #Davit6:1 | Origin | 8.52 | 24.54 | 0.01 | -6.55 | -2.46 | -0.00 | 0.0 | 1.37 | 0.70 | 0.00 | 0.15 | 1.16 | 0.15 | 0.00 | 1.34 | 2.1 | 1 |
| Davit6 | Davit6:End | End | 12.05 | 25.05 | 0.01 | -8.81 | 0.00 | 0.00 | 0.0 | 1.37 | 0.70 | 0.00 | 0.20 | 0.00 | 0.20 | 0.00 | 0.41 | 0.6 | 1 |
| Davit7 | Davit7:O | Origin | 0.00 | 16.64 | 0.01 | 0.39 | -0.73 | 0.00 | 0.0 | -1.59 | 0.15 | -0.00 | -0.11 | 0.14 | 0.02 | 0.00 | 0.25 | 0.4 | 1 |
| Davit7 | #Davit7:0 | End | 4.45 | 17.26 | 0.01 | 2.81 | -0.05 | 0.00 | 0.0 | -1.59 | 0.15 | -0.00 | -0.15 | 0.02 | 0.03 | 0.00 | 0.17 | 0.3 | 1 |
| Davit7 | #Davit7:0 | Origin | 4.45 | 17.26 | 0.01 | 2.81 | -0.05 | 0.00 | 0.0 | -1.55 | 0.01 | -0.00 | -0.15 | 0.02 | 0.00 | 0.00 | 0.16 | 0.3 | 1 |
| Davit7 | Davit7:End | End | 8.90 | 17.87 | 0.01 | 5.23 | -0.00 | 0.00 | 0.0 | -1.55 | 0.01 | -0.00 | -0.22 | 0.00 | 0.00 | 0.00 | 0.23 | 0.3 | 1 |
| Davit8 | Davit8:O | Origin | 0.00 | 16.61 | 0.01 | -0.93 | -6.90 | -0.00 | -0.0 | 1.35 | 0.86 | 0.00 | 0.09 | 1.28 | 0.12 | 0.00 | 1.39 | 2.1 | 1 |
| Davit8 | #Davit8:0 | End | 4.45 | 17.11 | 0.01 | -3.38 | -3.08 | -0.00 | -0.0 | 1.35 | 0.86 | 0.00 | 0.13 | 1.05 | 0.16 | 0.00 | 1.21 | 1.9 | 1 |
| Davit8 | #Davit8:0 | Origin | 4.45 | 17.11 | 0.01 | -3.38 | -3.08 | -0.00 | 0.0 | 1.38 | 0.69 | 0.00 | 0.13 | 1.05 | 0.13 | 0.00 | 1.21 | 1.9 | 1 |
| Davit8 | Davit8:End | End | 8.90 | 17.62 | 0.01 | -5.85 | 0.00 | 0.00 | 0.0 | 1.38 | 0.69 | 0.00 | 0.20 | 0.00 | 0.20 | 0.00 | 0.40 | 0.6 | 1 |

**Summary of Clamp Capacities and Usages for Load Case "NESC Extreme":**

| Clamp Label | Force (kips) | Input Holding Capacity (kips) | Factored Holding Capacity (kips) | Usage % |
|---|---|---|---|---|
| Clamp1 | 1.148 | 80.00 | 80.00 | 1.44 |
| Clamp2 | 1.148 | 80.00 | 80.00 | 1.44 |
| Clamp3 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp4 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp5 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp6 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp7 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp8 | 1.529 | 80.00 | 80.00 | 1.91 |
| Clamp9 | 0.305 | 80.00 | 80.00 | 0.38 |
| Clamp10 | 0.305 | 80.00 | 80.00 | 0.38 |
| Clamp11 | 0.305 | 80.00 | 80.00 | 0.38 |
| Clamp12 | 0.305 | 80.00 | 80.00 | 0.38 |
| Clamp13 | 0.305 | 80.00 | 80.00 | 0.38 |

| | | | | |
|---|---|---|---|---|
| Clamp14 | 0.146 | 80.00 | 80.00 | 0.18 |
| Clamp15 | 0.146 | 80.00 | 80.00 | 0.18 |
| Clamp16 | 0.146 | 80.00 | 80.00 | 0.18 |
| Clamp17 | 0.146 | 80.00 | 80.00 | 0.18 |
| Clamp21 | 11.786 | 80.00 | 80.00 | 14.73 |
| Clamp23 | 3.032 | 80.00 | 80.00 | 3.79 |

*** Overall summary for all load cases - Usage = Maximum Stress / Allowable Stress

**Summary of Steel Pole Usages:**

| Steel Pole Label | Maximum Usage % | Load Case | Segment Number | Weight (lbs) |
|---|---|---|---|---|
| 2683 | 70.57 | NESC Heavy | 25 | 13920.9 |

**Base Plate Results by Bend Line:**

| Pole Label | Load Case | Bend Line # | Start X (ft) | Start Y (ft) | End X (ft) | End Y (ft) | Length (in) | Bending Stress (ksi) | Bolt Mom. Sum (ft-k) | # Bolts Acting | Bolt Max Load (kips) | Min Plate Thickness (in) | Actual Thickness (in) | Usage % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2683 | NESC Heavy | 1 | 1.271 | 1.275 | 0.390 | 2.156 | 14.956 | 31.288 | 58.491 | 2 | 85.226 | 2.263 | 3.000 | 56.89 |
| 2683 | NESC Heavy | 2 | 0.390 | -2.156 | 1.271 | -1.275 | 14.956 | 28.227 | 52.769 | 2 | -77.419 | 2.149 | 3.000 | 51.32 |
| 2683 | NESC Heavy | 3 | -1.273 | -1.800 | 1.273 | -1.800 | 30.544 | 28.812 | 110.004 | 6 | -77.419 | 2.171 | 3.000 | 52.39 |
| 2683 | NESC Heavy | 4 | -1.271 | -1.275 | -0.390 | -2.156 | 14.956 | 27.907 | 52.171 | 2 | -76.746 | 2.137 | 3.000 | 50.74 |
| 2683 | NESC Heavy | 5 | -0.390 | 2.156 | -1.271 | 1.275 | 14.956 | 31.607 | 59.088 | 2 | 85.898 | 2.274 | 3.000 | 57.47 |
| 2683 | NESC Heavy | 6 | 1.273 | 1.800 | -1.273 | 1.800 | 30.544 | 31.983 | 122.110 | 6 | 85.898 | 2.288 | 3.000 | 58.15 |
| 2683 | NESC Heavy | 7 | 1.381 | 1.537 | 0.097 | 2.069 | 16.676 | 29.704 | 61.918 | 3 | 85.449 | 2.205 | 3.000 | 54.01 |
| 2683 | NESC Heavy | 8 | 0.097 | -2.069 | 1.381 | -1.537 | 16.676 | 26.855 | 55.979 | 3 | -77.419 | 2.096 | 3.000 | 48.83 |
| 2683 | NESC Heavy | 9 | -1.381 | -1.537 | -0.097 | -2.069 | 16.676 | 26.620 | 55.489 | 3 | -76.970 | 2.087 | 3.000 | 48.40 |
| 2683 | NESC Heavy | 10 | -0.097 | 2.069 | -1.381 | 1.537 | 16.676 | 29.939 | 62.408 | 3 | 85.898 | 2.213 | 3.000 | 54.44 |
| 2683 | NESC Extreme | 1 | 1.271 | 1.275 | 0.390 | 2.156 | 14.956 | 30.828 | 57.631 | 2 | 84.094 | 2.246 | 3.000 | 56.05 |
| 2683 | NESC Extreme | 2 | 0.390 | -2.156 | 1.271 | -1.275 | 14.956 | 29.271 | 54.721 | 2 | -80.149 | 2.189 | 3.000 | 53.22 |
| 2683 | NESC Extreme | 3 | -1.273 | -1.800 | 1.273 | -1.800 | 30.544 | 29.919 | 114.230 | 6 | -80.149 | 2.213 | 3.000 | 54.40 |
| 2683 | NESC Extreme | 4 | -1.271 | -1.275 | -0.390 | -2.156 | 14.956 | 29.171 | 54.534 | 2 | -79.938 | 2.185 | 3.000 | 53.04 |
| 2683 | NESC Extreme | 5 | -0.390 | 2.156 | -1.271 | 1.275 | 14.956 | 30.928 | 57.819 | 2 | 84.304 | 2.250 | 3.000 | 56.23 |
| 2683 | NESC Extreme | 6 | 1.273 | 1.800 | -1.273 | 1.800 | 30.544 | 31.473 | 120.164 | 6 | 84.304 | 2.269 | 3.000 | 57.22 |
| 2683 | NESC Extreme | 7 | 1.381 | 1.537 | 0.097 | 2.069 | 16.676 | 29.276 | 61.026 | 3 | 84.164 | 2.189 | 3.000 | 53.23 |
| 2683 | NESC Extreme | 8 | 0.097 | -2.069 | 1.381 | -1.537 | 16.676 | 27.839 | 58.029 | 3 | -80.149 | 2.134 | 3.000 | 50.62 |
| 2683 | NESC Extreme | 9 | -1.381 | -1.537 | -0.097 | -2.069 | 16.676 | 27.765 | 57.875 | 3 | -80.008 | 2.132 | 3.000 | 50.48 |
| 2683 | NESC Extreme | 10 | -0.097 | 2.069 | -1.381 | 1.537 | 16.676 | 29.350 | 61.180 | 3 | 84.304 | 2.192 | 3.000 | 53.36 |

**Summary of Tubular Davit Usages:**

| Tubular Davit Label | Maximum Usage % | Load Case | Segment Number | Weight (lbs) |
|---|---|---|---|---|
| Davit1 | 1.36 | NESC Extreme | 1 | 77.9 |
| Davit2 | 8.43 | NESC Heavy | 1 | 77.9 |
| Davit3 | 2.27 | NESC Heavy | 1 | 321.0 |
| Davit4 | 4.97 | NESC Heavy | 1 | 321.0 |
| Davit5 | 3.02 | NESC Heavy | 1 | 434.7 |
| Davit6 | 7.07 | NESC Heavy | 1 | 434.7 |
| Davit7 | 2.35 | NESC Heavy | 1 | 321.0 |
| Davit8 | 5.03 | NESC Heavy | 1 | 321.0 |

*** Maximum Stress Summary for Each Load Case

**Summary of Maximum Usages by Load Case:**

**Load Case Maximum Element Element**

| | Usage % | Label | Type |
|---|---|---|---|
| NESC Heavy | 70.57 | 2683 | Steel Pole |
| NESC Extreme | 70.33 | 2683 | Steel Pole |

**Summary of Steel Pole Usages by Load Case:**

| Load Case | Maximum Usage % | Steel Pole Label | Segment Number |
|---|---|---|---|
| NESC Heavy | 70.57 | 2683 | 25 |
| NESC Extreme | 70.33 | 2683 | 25 |

**Summary of Base Plate Usages by Load Case:**

| Load Case | Pole Label | Bend Line # | Length (in) | Vertical Load (kips) | X Moment (ft-k) | Y Moment (ft-k) | Bending Stress (ksi) | Bolt Moment Sum (ft-k) | # Bolts Acting On Bend Line | Max Bolt Load For Bend Line (kips) | Minimum Plate Thickness (in) | Usage % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NESC Heavy | 2683 | 6 | 30.544 | 50.878 | 1892.667 | -3.740 | 31.983 | 122.110 | 6 | 85.898 | 2.288 | 58.15 |
| NESC Extreme | 2683 | 6 | 30.544 | 24.935 | 1911.258 | -1.173 | 31.473 | 120.164 | 6 | 84.304 | 2.269 | 57.22 |

**Summary of Tubular Davit Usages by Load Case:**

| Load Case | Maximum Usage % | Tubular Davit Label | Segment Number |
|---|---|---|---|
| NESC Heavy | 8.43 | Davit2 | 1 |
| NESC Extreme | 3.19 | Davit2 | 1 |

**Summary of Insulator Usages:**

| Insulator Label | Insulator Type | Maximum Usage % | Load Case | Weight (lbs) |
|---|---|---|---|---|
| Clamp1 | Clamp | 3.00 | NESC Heavy | 0.0 |
| Clamp2 | Clamp | 3.00 | NESC Heavy | 0.0 |
| Clamp3 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp4 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp5 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp6 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp7 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp8 | Clamp | 3.29 | NESC Heavy | 0.0 |
| Clamp9 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp10 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp11 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp12 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp13 | Clamp | 1.19 | NESC Heavy | 0.0 |
| Clamp14 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp15 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp16 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp17 | Clamp | 0.54 | NESC Heavy | 0.0 |
| Clamp21 | Clamp | 14.73 | NESC Extreme | 0.0 |
| Clamp23 | Clamp | 3.79 | NESC Extreme | 0.0 |

**Loads At Insulator Attachments For All Load Cases:**

| Load Case | Insulator Label | Insulator Type | Structure Attach Label | Structure Attach Load X (kips) | Structure Attach Load Y (kips) | Structure Attach Load Z (kips) | Structure Attach Load Res. (kips) |
|---|---|---|---|---|---|---|---|
| NESC Heavy | Clamp1 | Clamp | Davit1:End | 0.000 | 2.250 | 0.840 | 2.402 |
| NESC Heavy | Clamp2 | Clamp | Davit2:End | 0.000 | 2.250 | 0.840 | 2.402 |
| NESC Heavy | Clamp3 | Clamp | Davit3:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp4 | Clamp | Davit4:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp5 | Clamp | Davit5:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp6 | Clamp | Davit6:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp7 | Clamp | Davit7:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp8 | Clamp | Davit8:End | 0.000 | 2.305 | 1.263 | 2.628 |
| NESC Heavy | Clamp9 | Clamp | 2683:WVGD1 | 0.000 | 0.087 | 0.947 | 0.951 |
| NESC Heavy | Clamp10 | Clamp | 2683:WVGD2 | 0.000 | 0.087 | 0.947 | 0.951 |
| NESC Heavy | Clamp11 | Clamp | 2683:WVGD3 | 0.000 | 0.087 | 0.947 | 0.951 |
| NESC Heavy | Clamp12 | Clamp | 2683:WVGD4 | 0.000 | 0.087 | 0.947 | 0.951 |
| NESC Heavy | Clamp13 | Clamp | 2683:WVGD5 | 0.000 | 0.087 | 0.947 | 0.951 |
| NESC Heavy | Clamp14 | Clamp | 2683:WVGD6 | 0.000 | 0.050 | 0.430 | 0.433 |
| NESC Heavy | Clamp15 | Clamp | 2683:WVGD7 | 0.000 | 0.050 | 0.430 | 0.433 |
| NESC Heavy | Clamp16 | Clamp | 2683:WVGD8 | 0.000 | 0.050 | 0.430 | 0.433 |
| NESC Heavy | Clamp17 | Clamp | 2683:WVGD9 | 0.000 | 0.050 | 0.430 | 0.433 |
| NESC Heavy | Clamp21 | Clamp | 2683:TopConn | 0.000 | 3.639 | 10.442 | 11.058 |
| NESC Heavy | Clamp23 | Clamp | 2683:BotConn | 0.000 | -0.879 | 2.329 | 2.489 |
| NESC Extreme | Clamp1 | Clamp | Davit1:End | 0.000 | 1.129 | 0.208 | 1.148 |
| NESC Extreme | Clamp2 | Clamp | Davit2:End | 0.000 | 1.129 | 0.208 | 1.148 |
| NESC Extreme | Clamp3 | Clamp | Davit3:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp4 | Clamp | Davit4:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp5 | Clamp | Davit5:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp6 | Clamp | Davit6:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp7 | Clamp | Davit7:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp8 | Clamp | Davit8:End | 0.000 | 1.484 | 0.367 | 1.529 |
| NESC Extreme | Clamp9 | Clamp | 2683:WVGD1 | 0.000 | 0.214 | 0.218 | 0.305 |
| NESC Extreme | Clamp10 | Clamp | 2683:WVGD2 | 0.000 | 0.214 | 0.218 | 0.305 |
| NESC Extreme | Clamp11 | Clamp | 2683:WVGD3 | 0.000 | 0.214 | 0.218 | 0.305 |
| NESC Extreme | Clamp12 | Clamp | 2683:WVGD4 | 0.000 | 0.214 | 0.218 | 0.305 |
| NESC Extreme | Clamp13 | Clamp | 2683:WVGD5 | 0.000 | 0.214 | 0.218 | 0.305 |
| NESC Extreme | Clamp14 | Clamp | 2683:WVGD6 | 0.000 | 0.107 | 0.099 | 0.146 |
| NESC Extreme | Clamp15 | Clamp | 2683:WVGD7 | 0.000 | 0.107 | 0.099 | 0.146 |
| NESC Extreme | Clamp16 | Clamp | 2683:WVGD8 | 0.000 | 0.107 | 0.099 | 0.146 |
| NESC Extreme | Clamp17 | Clamp | 2683:WVGD9 | 0.000 | 0.107 | 0.099 | 0.146 |
| NESC Extreme | Clamp21 | Clamp | 2683:TopConn | 0.000 | 10.779 | 4.767 | 11.786 |
| NESC Extreme | Clamp23 | Clamp | 2683:BotConn | 0.000 | -2.841 | 1.058 | 3.032 |

**Overturning Moments For User Input Concentrated Loads:**

**Moments are static equivalents based on central axis of 0,0 (i.e. a single pole).**

| Load Case | Total Tran. Load (kips) | Total Long. Load (kips) | Total Vert. Load (kips) | Transverse Overturning Moment (ft-k) | Longitudinal Overturning Moment (ft-k) |
|---|---|---|---|---|---|
| NESC Heavy | 21.725 | 0.000 | 28.484 | 1695.440 | -0.000 |
| NESC Extreme | 20.598 | 0.000 | 9.929 | 1635.592 | -0.000 |

*** Weight of structure (lbs):
Weight of Tubular Davit Arms: 2309.3

| | |
|---|---|
| Weight of Steel Poles: | 13920.9 |
| Total: | 16230.2 |

*** End of Report

## Anchor Bolt Analysis:

### Input Data:

Bolt Force:

| | | |
|---|---|---|
| Maximum Tensile Force = | $T_{Max} := 85.9 \cdot kips$ | (User Input from PLS-Pole) |

Anchor Bolt Data:

Use ASTM A615 Grade 75

| | | |
|---|---|---|
| Number of Anchor Bolts = | $N := 12$ | (User Input) |
| Bolt "Column" Distance = | $l := 3.0 \cdot in$ | (User Input) |
| Bolt Ultimate Strength = | $F_u := 100 \cdot ksi$ | (User Input) |
| Bolt Yeild Strength= | $F_y := 75 \cdot ksi$ | (User Input) |
| Bolt Modulus = | $E := 29000 \cdot ksi$ | (User Input) |
| Diameter of Anchor Bolts = | $D := 2.25 \cdot in$ | (User Input) |
| Threads per Inch = | $n := 4.5$ | (User Input) |

## Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Bolt Tension Check:

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.0 \cdot \left(A_n \cdot F_y\right) = 243.576 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 35.27 \cdot \%$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK"

**Product Data Sheet** **APXVSPP18-C**

Triple Band Dual Polarized Antenna, 806-1995, 65deg, 16-18dBi, 1.8m, VET, 0-10deg, 0.5m AISG Cable

RFS

## Product Description

This antenna is an ideal choice for dual band site upgrade for high traffic areas. It features 4 ports in 1900 MHz and 2 ports in 800 MHz.

## Features/Benefits

- **Variable electrical downtilt – provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.**
- **High suppression of all upper sidelobes (Typically < 18 dB)**
- **Independent control of electrical downtilt for 800 and PCS bands**
- **Remote tilt – AISG compatible**
- **Low profile for low visual impact**
- **Quick and easy to adjust**
- **High front-to-back ratio**

## Technical Specifications

### Electrical Specifications

| | | | |
|---|---|---|---|
| Frequency Range, MHz | 806-869 | 1850-1995 | 1850-1995 |
| Horizontal Beamwidth, deg | 65 | 65 | 65 |
| Vertical Beamwidth, deg | 11.5 | 5.5 | 5.5 |
| Electrical Downtilt, deg | | 0-10 | |
| Gain, dBi (dBd) | 15.5 (13.4) | 18.0 (15.9) | 18.0 (15.9) |
| 1st Upper Sidelobe Suppression, dB, typ. @ T0° & T8° | | >18 | |
| Front-To-Back Ratio, dB, @ 180° ± 15° | >30 | >27 | >27 |
| Polarization | | Dual pol +/-45° | |
| Return Loss, dB | | > 14 | |
| Isolation between Ports, dB | | >28 | |
| 3rd Order IMP @ 2 x 43 dBm, @ 2 min. duration | | >110 | |
| Cross Polar Discrimination (XPD) 0°, dB | >15 | >20 | >20 |
| Cross Polar Discrimination (XPD) ± 60°, dB | >9.5 | >11 | >11 |
| HBW Squint accross same band ports, ° | | ±5 | |
| Impedance, Ohms | | 50 | |
| Maximum Power Input, W | | 250 | |
| Lightning Protection | | Direct Ground | |
| Connector Type | | (6) 7-16 DIN Female | |

### Mechanical Specifications

| | |
|---|---|
| Dimensions - HxWxD, mm (in) | 1829 x 302 x 178 (72.0 x 11.8 x 7) |
| Weight w/o Mtg Hardware, kg (lb) | 25.8 (57) |
| Radome Material | ASA |
| Radome Color | Light Grey RAL7035 |
| Mounting Hardware Material | Diecasted Aluminum and Galvanized Steel |

### Ordering Information

| | |
|---|---|
| Mounting Hardware | APM40-2 Downtilt Kit |
| AISG System Cable | 0.5 m, included |
| Mounting Pipe Diameter, mm (in) | 60-120 (2.4-4.7) |
| Mounting Hardware Weight, kg (lb) | 3.4 (7.5) |

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: CT54XC713

NU Pole # 2683 Brookfield
761 Federal Street
Brookfield, CT 06804

**May 29, 2013**

**EBI Project Number: 62136525**

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

May 29, 2013

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

Re: Emissions Values for Site: **CT54XC713 – NU Pole # 2683 Brookfield**

EBI Consulting was directed to analyze the proposed upgrades to the existing Sprint facility located at 761 Federal Street, Brookfield, CT, for the purpose of determining whether the emissions from the proposed Sprint equipment upgrades on this property are within specified federal limits.

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

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the cellular band is approximately 567 $\mu W/cm^2$, and the general population exposure limit for the PCS band is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

## CALCULATIONS

Calculations were done for the proposed upgrades to the existing Sprint Wireless antenna facility located at 761 Federal Street, Brookfield, 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) 2 CDMA Carriers (1900 MHz) were considered for each sector of the proposed installation.
2) 1 CDMA Carrier (850 MHz ) was considered for each sector of the proposed installation
3) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
4) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
5) The antenna used in this modeling is the APXVSPP18-C-A20. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.9 dBd gain value at its main lobe at 1900 MHz and 13.4 dBd at its main lobe for 850 MHz. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario.

6) The antenna mounting height centerline of the proposed  antennas is **110.67 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 | CT54XC713 - NU Pole # 2683 Brookfield |
| Site Addresss | 761 Federal Street, Brookfield, CT, 06804 |
| Site Type | Utility Transmission Pole |

**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 | APXVSPP18-C-A20 | RRH | 1900 MHz | CDMA / LTE | 20 | 2 | 40 | 15.9 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 1386.9474 | 45.51154 | 4.55115% |
| 1a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 389.96892 | 12.79651 | 2.25688% |
| | | | | | | | | | | | | Sector total Power Density Value: | | | 6.808% | | |

**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 | 2 | 40 | 15.9 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 1386.9474 | 45.51154 | 4.55115% |
| 2a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 389.96892 | 12.79651 | 2.25688% |
| | | | | | | | | | | | | Sector total Power Density Value: | | | 6.808% | | |

**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 | APXVSPP18-C-A20 | RRH | 1900 MHz | CDMA / LTE | 20 | 2 | 40 | 15.9 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 1386.9474 | 45.51154 | 4.55115% |
| 3a | RFS | APXVSPP18-C-A20 | RRH | 850 MHz | CDMA / LTE | 20 | 1 | 20 | 13.4 | 110.67 | 104.67 | 1/2 " | 0.5 | 0 | 389.96892 | 12.79651 | 2.25688% |
| | | | | | | | | | | | | Sector total Power Density Value: | | | 6.808% | | |

**Site Composite MPE %**

| Carrier | MPE % |
|---|---|
| Sprint | 20.424% |
| AT&T | 32.160% |
| Total Site MPE % | 52.584% |

## 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 **20.424% (6.808% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **52.584%** 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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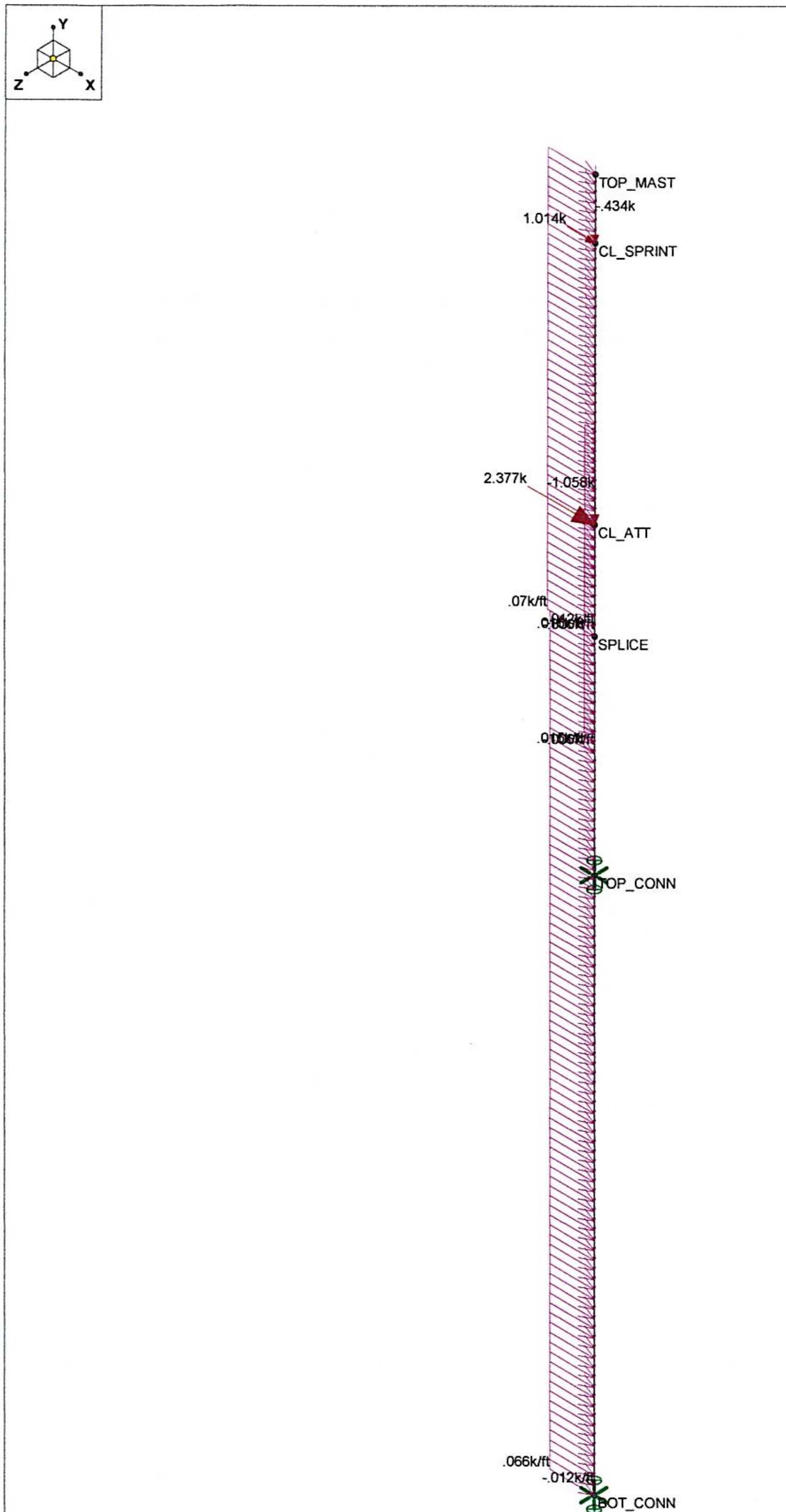
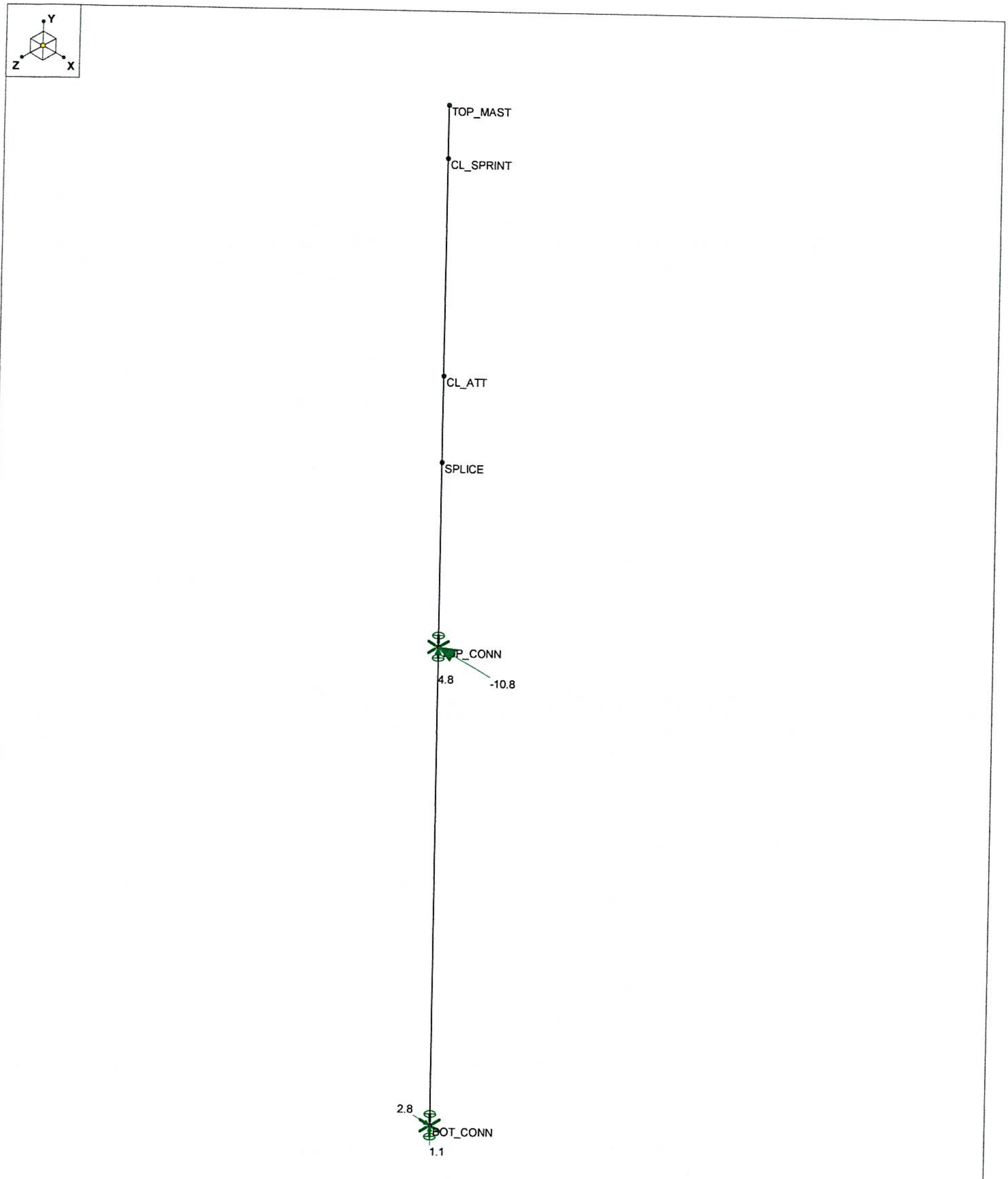



Loads: LC 2, NESC Extreme Wind on PCS Structure

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:38 AM |
| 12047.CO13 /Sprint CT54... | LC #2 Loads | NESC Loads.r3d |




Results for LC 2, NESC Extreme Wind on PCS Structure
Z-moment Reaction units are k and k-ft

| | | |
|---|---|---|
| CENTEK Engineering, INC. | | |
| tjl, cfc | CL&P # 2683 - Mast | Apr 18, 2013 at 8:40 AM |
| 12047.CO13 /Sprint CT54... | LC #2 Reactions | NESC Loads.r3d |