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

VIA ELECTRONIC MAIL

September 28, 2021

Victoria Masse
Northeast Site Solutions
420 Main Street Unit #2
Sturbridge, MA 01566
victoria@northeastsitesolutions.com

RE: **EM-T-MOBILE-035-210812 -** T-Mobile notice of intent to modify an existing telecommunications facility located at 0 Mechanic Street, Darien, Connecticut.

Dear Ms. Masse:

The Connecticut Siting Council (Council) is in receipt of your correspondence of September 14, 2021 submitted in response to the Council's September 14, 2021 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

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

Thank you for your attention and cooperation.

Sincerely,

Melanie Bachman
Executive Director

MAB/FOC/laf

From: Deborah Chase <deborah@northeastsitesolutions.com>
Sent: Tuesday, September 14, 2021 5:29 PM
To: CSC-DL Siting Council <Siting.Council@ct.gov>; Bachman, Melanie <Melanie.Bachman@ct.gov>; Mathews, Lisa A <Lisa.A.Mathews@ct.gov>; Fontaine, Lisa <Lisa.Fontaine@ct.gov>
Cc: victoria@northeastsitesolutions.com
Subject: Re: Council Incomplete Ltr - EM-T-MOBILE-035-210812 3 Mechanic Street (aka 0 Mechanic Street), Darien CT 06820- EM Application CD not S&S

Siting Council
Please see attached the signed and stamped Mount Design within the Structural Analysis as per the attached Incomplete letter.
Please let us know if this fulfills the completion requirements.
Thank you very much

Deborah Chase
Senior Project Coordinator & Analyst
Mobile: 860-490-8839

NORTHEAST
SITE SOLUTIONS
Turnkey Wireless Development
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CENTEK engineering

Centered on Solutions℠

Structural Analysis of Antenna Mast and Pole

T-Mobile Site Ref: CT11290C

Eversource Structure No. 1068
115' Electric Transmission Pole

3 Mechanic Street
Darien, CT

CENTEK Project No. 18058.58

~~Date: September 27, 2018~~
Rev 6: December 14, 2018

Prepared for:
T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

Introduction

The purpose of this report is to analyze the existing mast and 115' utility pole located at 3 Mechanic Street in Darien, CT for the proposed antenna and equipment upgrade by T-Mobile.

The existing/proposed loads consist of the following:

- T-MOBILE (Existing to Remain):
  Coax Cables: Eighteen (18) 1-1/4" ∅ coax cables running on the outside of the tower as indicated in section 4 of this report.
- T-MOBILE (Existing to Relocate):
  Antennas: Three (3) Andrew ATSBT-TOP-FM-4G Smart Bias Tees mounted relocated from existing pipe mast to new pipe mast.
- T-MOBILE (Existing to be Removed):
  Antennas: Three (3) Andrew SBNHH-1D65A panel antennas mounted on a mast with a RAD center elevation of 120-ft above tower base plate.
- **T-MOBILE (Proposed):**
  Antennas: Three (3) RFS APXVAARR18_43 panel antennas mounted on a proposed mast with a RAD center elevation of 124-ft above tower base plate.
  Coax Cables: Six (6) 1-1/4" ∅ coax cables running on the outside of the tower as indicated in section 4 of this report.

Primary assumptions used in the analysis

- Design steel stresses are defined by AISC-LRFD 14th edition for design of the antenna Mast and antenna supporting elements.
- ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures", defines allowable steel stresses for evaluation of the 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 antenna mast was independently completed using the current version of RISA-3D computer program licensed to CENTEK Engineering, Inc.

The existing mast was found to be structural inadequate to support the new equipment configuration and will need to be replaced with a 8-in x 21-ft long SCH. 80 pipe (O.D. = 8.625") connected at two points to the existing tower. The proposed mast was designed to resist loads prescribed by the TIA-222G 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 utility pole structure. These loads are developed in Section 7 of this report. Load cases and combinations used in RISA-3D for TIA-222-G 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 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 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-222-G, ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures", NESC C2-2007 and Northeast Utilities Design Criteria.

- 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. 48-11.

  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.………………………………… 110 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-222-G and AISC standards.

Load cases considered:

Load Case 1:
Wind Speed………………………………... 93 mph (2016 CSBC Appendix-N)
Radial Ice Thickness………………………. 0"

Load Case 2:
Wind Pressure.……………………………. 50 mph wind pressure
Radial Ice Thickness……………………….. 0.75"

Results

- MAST ASSEMBLY

The existing mast was found to be structural inadequate to support the new equipment configuration and will need to be replaced with a 8-in x 21-ft long SCH. 80 pipe.

Member	Stress Ratio (% of capacity)	Result
8" Sch. 80 Pipe	45.0%	**PASS**

- 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. 48-11, "Design of Steel Transmission Pole Structures", for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 6 of this report. The analysis results are summarized as follows:

A maximum usage of **97.81%** occurs in the utility pole under the **NESC Extreme** loading condition.

POLE SECTION:

The utility pole was found to be **structurally adequate** to support the proposed equipment.

Tower Section	Elevation	Stress Ratio (% of capacity)	Result
Tube Number 4	0.00'-15.08' (AGL)	97.81%	**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	93.44%	**PASS**

- FOUNDATION AND ANCHORS

  The existing foundation consists of a 6-ft diameter x 18-ft long reinforced concrete caisson. The base of the tower is connected to the foundation by means of (12) 2.25”∅, ASTM A432 Grade 60 anchor bolts embedded into the concrete foundation structure.

<u>BASE REACTIONS:</u>

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

Load Case	Shear	Axial	Moment
NESC Heavy Wind	17.64 kips	47.37 kips	1617.52 ft-kips
NESC Extreme Wind	26.07 kips	24.75 kips	2188.86 ft-kips

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

<u>ANCHOR BOLTS:</u>

The anchor bolts were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (% of capacity)	Result
Anchor Bolts	Tension	53.89%	**PASS**

<u>FOUNDATION:</u>

The foundation was found to be within allowable limits.

Design Limit	Original Design Reaction	Proposed Reaction (1)	Result
Shear	29.5 kips	28.7 kips	**PASS**
Moment	2414.4 ft-kips	2407.8 ft-kips	**PASS**

Note 1: 10% increase to PLS base reactions used in foundation analysis per OTRM 051.

<u>C o n c l u s i o n</u>

This analysis shows that the subject utility pole **<u>is adequate</u>** to support the proposed T-Mobile equipment upgrade.

The analysis is based, in part on the information provided to this office by Eversource and T-Mobile. 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:

Timothy J. Lynn, PE
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, Marino\WARE
- 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)

Results Features:

- 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-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 222-G:

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
Eversource Design Criteria

		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 (0.75Wi)	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	1	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Tower/Pole Analysis with antennas below top of Tower/Pole (on two faces)	____	4	1	1	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Conductors:	Conductor Loads Provided by NU					
High Wind Condition	TIA/EIA	Antenna Mount	85	TIA	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
High Wind Condition	NESC Extreme Wind	Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Apply a 1.25 X Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condition	NESC Extreme Wind	Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condition	NESC Extreme Wind	Conductors:	Conductor Loads Provided by NU					
NESC Extreme Ice with Wind Condition*		Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load 1.25 X Gust Response Factor Apply a 1.25 X Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Condition*		Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Condition*		Conductors:	Conductor Loads Provided by NU					
		* Only for structures installed after 2007						

mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The strength reduction factor obtained from the field investigation shall be applied to the members or connections that are showing signs of deterioration from their original condition

With the written approval of Eversource Transmission Line Engineering on a case by case the existing structures may be analyzed initially using the current NESC code, then it is permitted to use the original design code with the original conductor load should the existing tower fail the current NESC code.

The structure shall be analyzed using yield stress theory in accordance with Attachment A, “Eversource 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 Eversource).

c) Electric Transmission Structure

   i) The loads from the wireless communication equipment components based on NESC and Eversource 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
Pole with Coaxial Cable	1.6

   iii) When Coaxial Cables are mounted alongside 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	1.6

d) The uniform loadings and factors specified for the above components in Attachment A, “Eversource 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 Eversource will provide these loads).

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

Northeast Utilities System

Job :		Page	of
Description:	Spec. Number	Sheet	of
	Computed by	Date	5/26/09
	Checked by	Date	

INPUT DATA

TOWER ID: 1068

Structure Height (ft) : 115

Wind Zone : Central CT (green)

Wind Speed : 110 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*OPGW-012*	*OPGW-012*
DESCRIPTION =	2-Groove	2-Groove
STRANDING =	12 #8 FOCAS	12 #8 FOCAS
DIAMETER =	0.635 in	0.635 in
WEIGHT =	0.563 lb/ft	0.563 lb/ft

Conductor Properties:

		BACK	AHEAD		
	NAME =	*BITTERN*	*BITTERN*		
Number of Conductors per phase	1	1272.000	1272.000	1	Number of Conductors per phase
		45/7 ACSR	45/7 ACSR		
	DIAMETER =	1.345 in	1.345 in		
	WEIGHT =	1.432 lb/ft	1.432 lb/ft		

Insulator Weight = 200 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	3,800	10,000	3,800	10,000
EXTREME WIND =	2,500	6,751	2,500	6,751
LONG. WIND =	na	na	na	na
250D COMBINED =	na	na	na	na
NESC W/O OLF =	na	na	na	na
60 DEG F NO WIND =	1,319	4,289	1,319	4,289

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	2	AHEAD:	2	**3**
WIND SPAN (ft) =	BACK:	210	AHEAD:	210	**420**
WEIGHT SPAN (ft) =	BACK:	217	AHEAD:	217	**434**

WIRE LOADING AT ATTACHMENTS

TOWER ID: 1068

Wind Span =	420	ft
Weight Span =	434	ft
Total Angle =	3	degrees

Broken Wire Span =	AHEAD SPAN
Type of Insulator Attachment =	SUSPENSION

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	901 lb	0 lb	826 lb	450 lb	4,369 lb	413 lb
Conductor =	1,685 lb	0 lb	2,279 lb	842 lb	11,496 lb	1,140 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	828 lb	0 lb	244 lb
Conductor =	1,830 lb	0 lb	1,021 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	244 lb
Conductor =	#VALUE!	#VALUE!	1,021 lb

4. NESC RULE 250D Extreme Ice & Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,127 lb
Conductor =	#VALUE!	#VALUE!	2,287 lb

5. NESC RULE 250B w/o OLF's

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	551 lb
Conductor =	#VALUE!	#VALUE!	1,519 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	69 lb	0 lb	244 lb
Conductor =	225 lb	0 lb	1,021 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	104 lb	0 lb	367 lb
Conductor =	337 lb	0 lb	1,532 lb

NOTE: All loads include required overload factors (OLF's).

INPUT DATA

TOWER ID: 1068

Structure Height (ft) : 115

Wind Zone : Central CT (green)

Wind Speed : 110 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*OPGW-012*	*OPGW-012*
DESCRIPTION =	2-Groove	2-Groove
STRANDING =	12 #8 FOCAS	12 #8 FOCAS
DIAMETER =	0.635 in	0.635 in
WEIGHT =	0.563 lb/ft	0.563 lb/ft

Conductor Properties:

	BACK	AHEAD
NAME =	*LINNET*	*LINNET*
	336	336
	26/7 ACSR	26/7 ACSR
DIAMETER =	0.720 in	0.720 in
WEIGHT =	0.462 lb/ft	0.462 lb/ft

Number of Conductors per phase (BACK): 1

Number of Conductors per phase (AHEAD): 1

Insulator Weight = 200 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	3,800	5,000	3,800	5,000
EXTREME WIND =	2,500	3,464	2,500	3,464
LONG. WIND =	na	na	na	na
250D COMBINED =	na	na	na	na
NESC W/O OLF =	na	na	na	na
60 DEG F NO WIND =	1,319	1,943	1,319	1,943

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	2	AHEAD:	2	**3**
WIND SPAN (ft) =	BACK:	210	AHEAD:	210	**420**
WEIGHT SPAN (ft) =	BACK:	217	AHEAD:	217	**434**

WIRE LOADING AT ATTACHMENTS

TOWER ID: 1068

Wind Span =	420 ft
Weight Span =	434 ft
Total Angle =	3 degrees

Broken Wire Span =	AHEAD SPAN
Type of Insulator Attachment =	SUSPENSION

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	901 lb	0 lb	826 lb	450 lb	4,369 lb	413 lb
Conductor =	1,034 lb	0 lb	1,395 lb	517 lb	5,748 lb	697 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	828 lb	0 lb	244 lb
Conductor =	972 lb	0 lb	601 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	244 lb
Conductor =	#VALUE!	#VALUE!	601 lb

4. NESC RULE 250D Extreme Ice & Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,127 lb
Conductor =	#VALUE!	#VALUE!	1,529 lb

5. NESC RULE 250B w/o OLF's

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	551 lb
Conductor =	#VALUE!	#VALUE!	930 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	69 lb	0 lb	244 lb
Conductor =	102 lb	0 lb	601 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	104 lb	0 lb	367 lb
Conductor =	153 lb	0 lb	901 lb

NOTE: All loads include required overload factors (OLF's).

ANTENNA MAST DESIGN

STRUCT. NO. 1068
3 MECHANIC STREET
DARIEN, CT 06820

VICINITY MAP

NORTH

PROJECT SUMMARY

SITE ADDRESS:	3 MECHANIC STREET DARIEN, CT 06820
PROJECT COORDINATES:	LAT: 41°–04'–39.25N LON: 73°–28'–03.29W ELEV:±55' AMSL
EVERSOURCE STRUCT NO:	1068
EVERSOURCE CONTACT:	JOEL SZARKOWICZ 860.728.4503
T–MOBILE SITE REF.:	CT11290C
T–MOBILE CONTACT:	DAN REID 203.592.8291
ANTENNA CL HEIGHT:	124'–0"
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63–2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	TIMOTHY J LYNN, PE 203.433.7507

SHEET INDEX

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
3	11/29/18	TJL	CAG	ISSUED FOR CONSTRUCTION – ADDED WELD TO S–3
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DATE: 10/1/18
SCALE: AS SHOWN
JOB NO. 18058.58

TITLE SHEET

SHEET NO. T–1

Sheet No. 1 of 7

DESIGN BASIS

1. GOVERNING CODE: 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CT STATE SUPPLEMENT.

2. TIA-222-G, ASCE MANUAL NO. 48-11 – "DESIGN OF STEEL TRANSMISSION POLE STRUCTURES SECOND EDITION", NESC C2-2007 AND NORTHEAST UTILITIES DESIGN CRITERIA.

3. DESIGN CRITERIA

   WIND LOAD: (ANTENNA MAST)
   NOMINAL DESIGN WIND SPEED (V) = 93 MPH (2018 CSBC: APPENDIX 'N')

   WIND LOAD: (UTILITY POLE & FOUNDATION)
   BASIC WIND SPEED (V) =110 MPH (3-SECOND GUST) BASED ON NESC C2-2007, SECTION 25 RULE 250C.

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, INC., FOR T-MOBILE, DATED 11/1/18.

2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM THE TOWER DESIGN DRAWINGS PREPARED BY UNIVERSAL POLE BRACKET CORP.; SHOP ORDER T-6291 DATED MAY 17, 1967.

3. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE GOVERNING BUILDING CODE.

4. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

5. BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK. THIS INCLUDES VERIFYING ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.

6. PCS MAST INSTALLATION SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF TRANSMISSION STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

7. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

8. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

9. NO DRILLING WELDING OR TAPING IS PERMITTED ON CL&P OWNED EQUIPMENT.

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DESIGN BASIS AND GENERAL NOTES

SHEET NO. N-1

Sheet No. 2 of 7

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).

2. MATERIAL SPECIFICATIONS

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
   C. STRUCTURAL STEEL (TOWER REINF. SOLID ROUND BAR)--- ASTM A572_GR50 (50 KSI)
   D. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   E. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   F. PIPE---ASTM A53 GRADE B (FY = 35 KSI)

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.
   E. BLIND BOLTS---AS1252 PROPERTY CLASS 8.8 (FU=120 KSI).

4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.

5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.

8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.

10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.

15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.

16. ALL BOLTS SHALL BE INSTALLED PER THE REQUIREMENTS OF AISC 14TH EDITION & RCSC "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS".

17. ALL BOLTS SHALL BE INSTALLED AS SNUG-TIGHT CONNECTIONS UNLESS OTHERWISE INDICATED. CONNECTIONS SPECIFIED AS PRETENSIONED OR SLIP-CRITICAL SHALL BE TIGHTENED TO A BOLT TENSION NOT LESS THAN THAT GIVEN IN TABLE J3.1 OF AISC 14TH EDITION.

18. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.

19. LOAD INDICATOR WASHERS SHALL BE UTILIZED ON ALL PRETENSIONED OR SLIP-CRITICAL CONNECTIONS.

20. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.

21. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

22. FABRICATE BEAMS WITH MILL CAMBER UP.

23. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.

24. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

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DATE: 10/1/18
SCALE: AS SHOWN
JOB NO. 18058.58

STRUCTURAL STEEL NOTES

SHEET NO.
N-2

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTUCTION		DURING CONSTRUCTION		POST-CONSTRUCTION	
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM
X	EOR MODIFICATION INSPECTION DRAWING	–	FOUNDATIONS	X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING
X	EOR APPROVED SHOP DRAWINGS	–	EARTHWORK: BACKFILL MATERIAL & COMPACTION	–	POST–INSTALLED ANCHOR ROD PULL–OUT TEST
–	EOR APPROVED POST–INSTALLED ANCHOR MPII	–	REBAR & FORMWORK GEOMETRY VERIFICATION	X	PHOTOGRAPHS
–	FABRICATION INSPECTION	–	CONCRETE TESTING		
–	FABRICATOR CERTIFIED WELDER INSPECTION	X	STEEL INSPECTION		
X	MATERIAL CERTIFICATIONS	–	POST INSTALLED ANCHOR ROD VERIFICATION		
		–	BASE PLATE GROUT VERIFICATION		
		–	CONTRACTOR'S CERTIFIED WELD INSPECTION		
		X	ON–SITE COLD GALVANIZING VERIFICATION		
		X	CONTRACTOR AS–BUILT REDLINE DRAWINGS		

NOTES:

1. REFER TO MODIFICATION INSPECTION NOTES FOR ADDITIONAL REQUIREMENTS
2. "X" DENOTES DOCUMENT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
3. "–" DENOTES DOCUMENT NOT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
4. EOR – ENGINEER OF RECORD
4. MPII – "MANUFACTURER'S PRINTED INSTALLATION GUIDELINES"

GENERAL

1. THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPILATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).

2. THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.

3. TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.

4. THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.

5. WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

1. THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON–SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

1. THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

1. SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:

   – CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
   – WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS–BUILT CONDITION.

REQUIRED PHOTOGRAPHS

1. THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:

   – PRE–CONSTRUCTION: GENERAL CONDITION OF THE SITE.
   – DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
   – POST–CONSTRUCTION: FINAL CONDITION OF THE SITE

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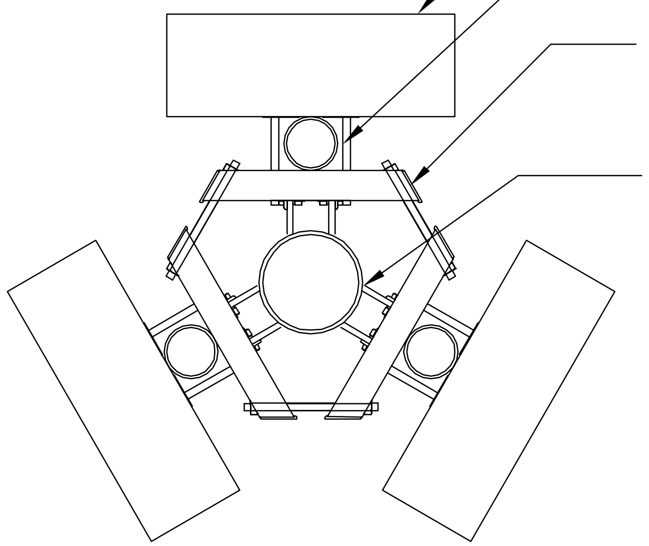
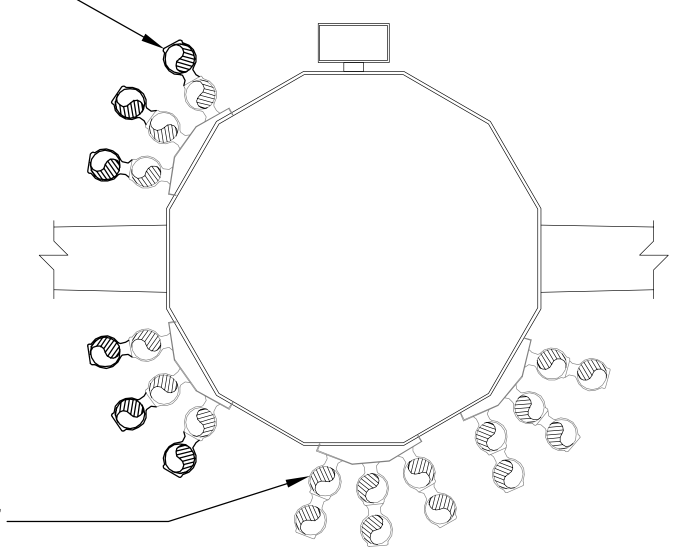
MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1
Sheet No. 4 of 7



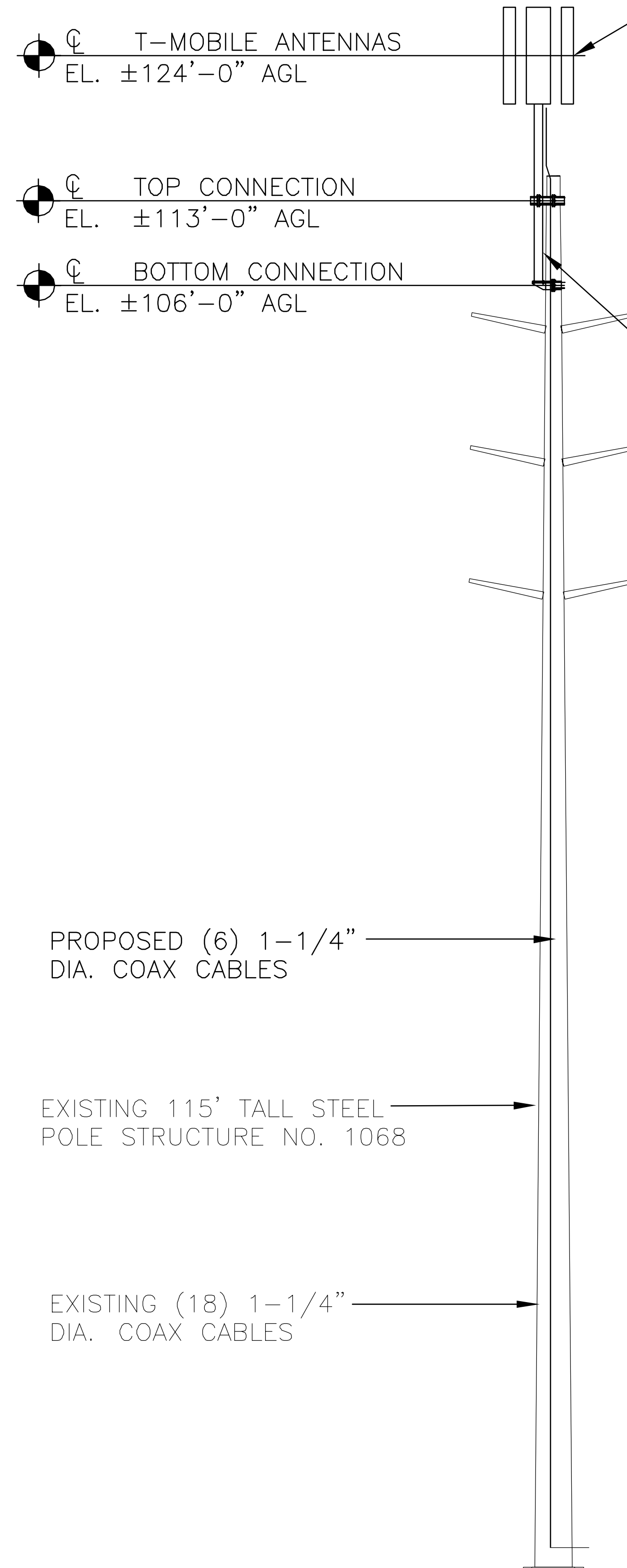
2 S-1 ANTENNA MOUNTING DETAIL

SCALE: 3/4" = 1'-0"



3 S-1 COAX CABLE PLAN

SCALE: NTS



1 EL-1 TOWER + MAST ELEVATION

SCALE: NOT TO SCALE

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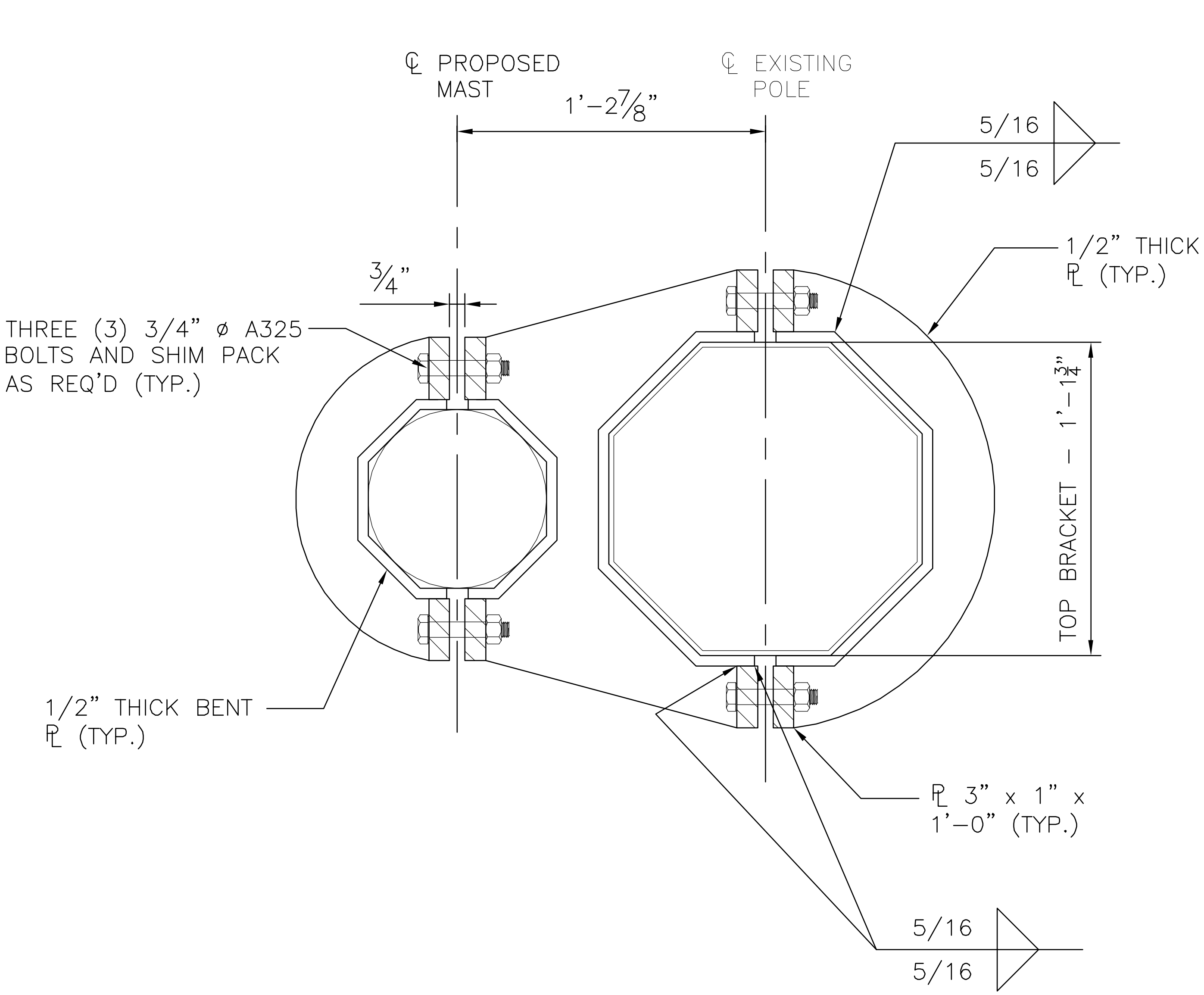
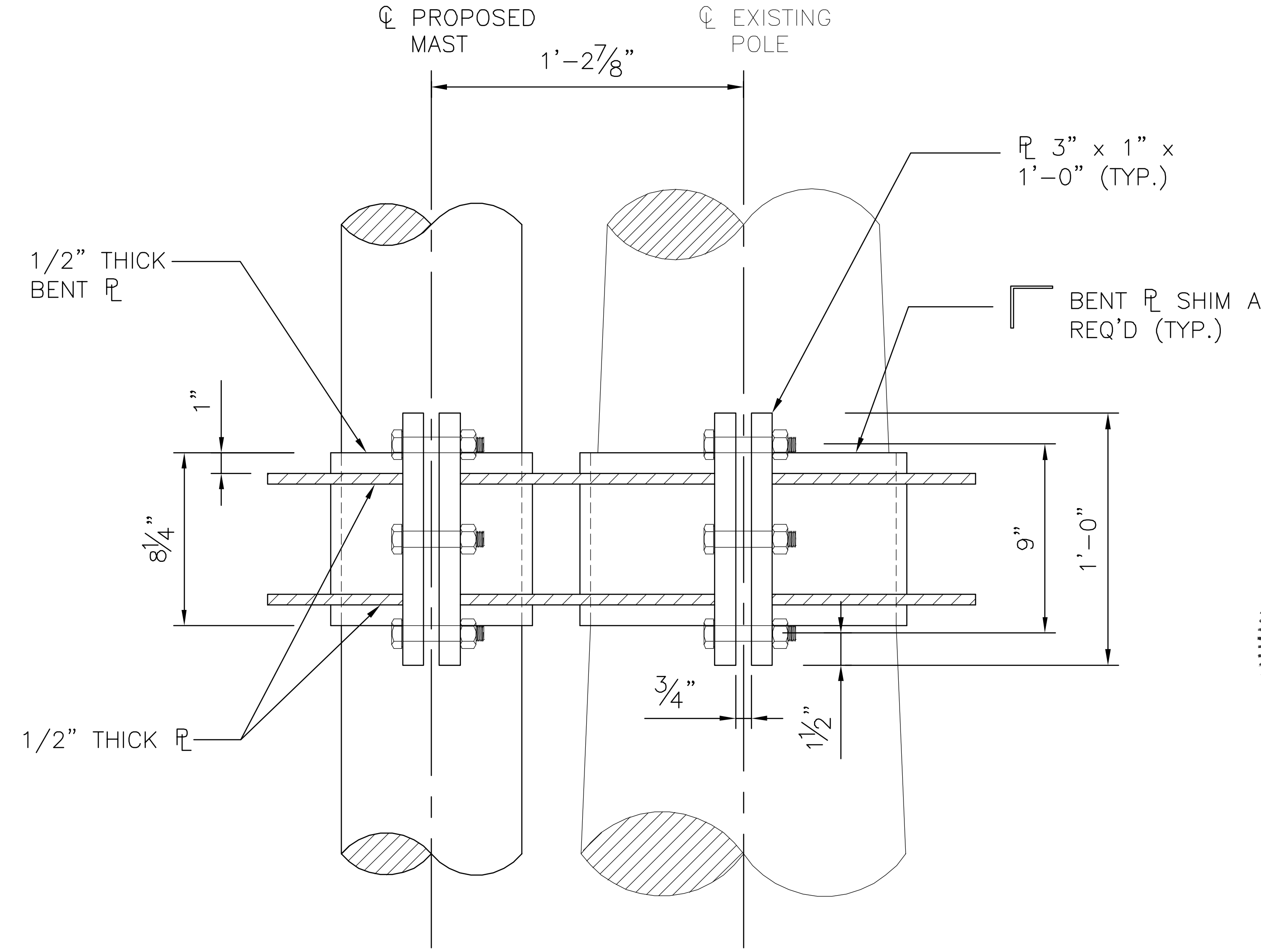
TOWER ELEVATION AND FEEDLINE PLAN

SHEET NO. S-1
Sheet No. 5 of 7



2 S-2 TOP BRACKET PLAN VIEW

SCALE: 1-1/2" = 1'-0"



1 S-2 TOP BRACKET DETAIL

SCALE: 1-1/2" = 1'-0"

NOTE:

1. POLE TAPER = 0.2099"/FT (V.I.F.)

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
3	11/29/18	TJL	CAG	ISSUED FOR CONSTRUCTION – ADDED WELD TO S-3
2	11/19/18	TJL	CAG	ISSUED FOR CONSTRUCTION
1	10/31/18	TJL	CAG	ISSUED FOR CONSTRUCTION
0	10/01/18	TJL	CAG	ISSUED FOR CONSTRUCTION

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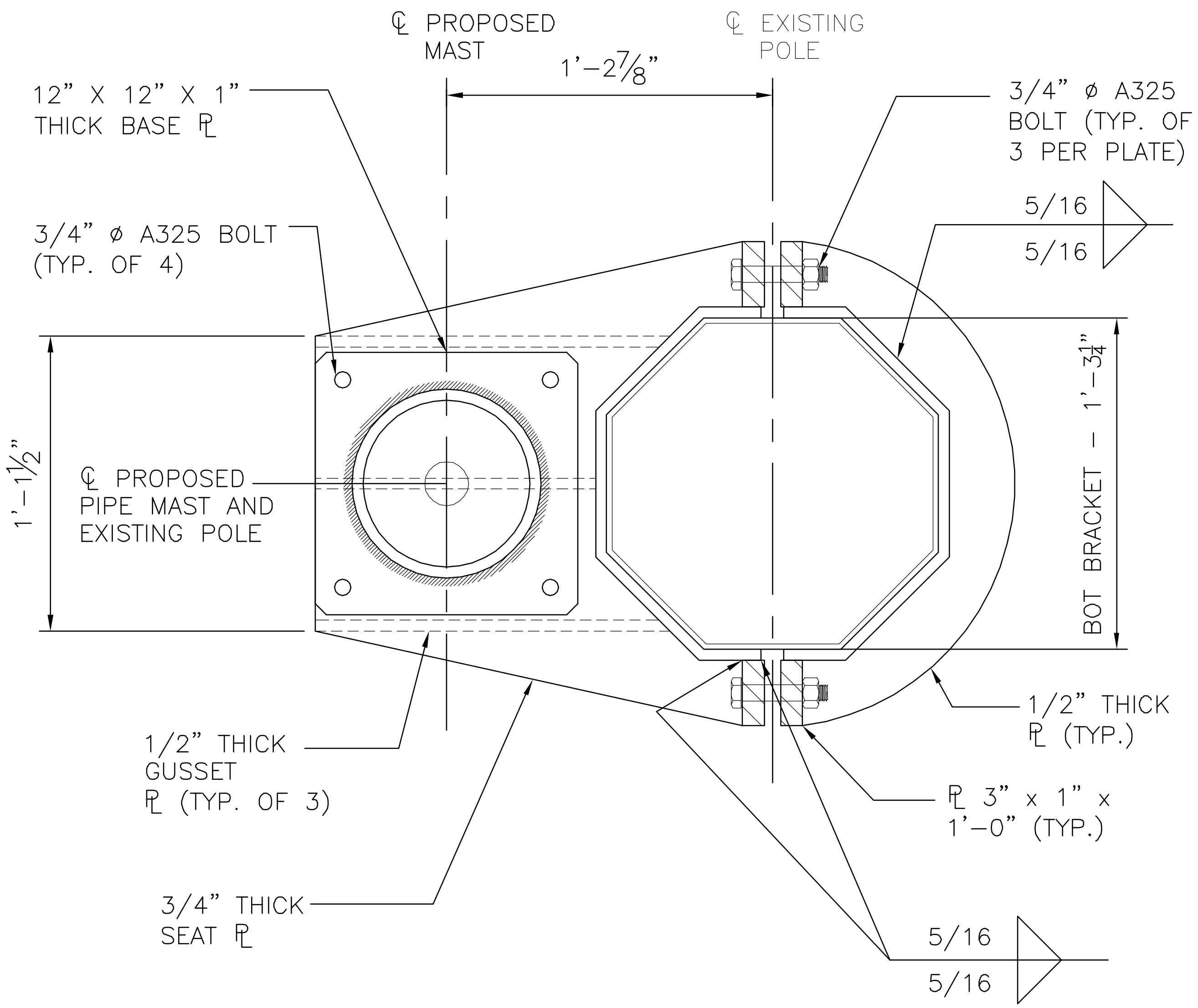
DATE: 10/1/18
SCALE: AS SHOWN
JOB NO. 18058.58

TOP CONNECTION DETAILS

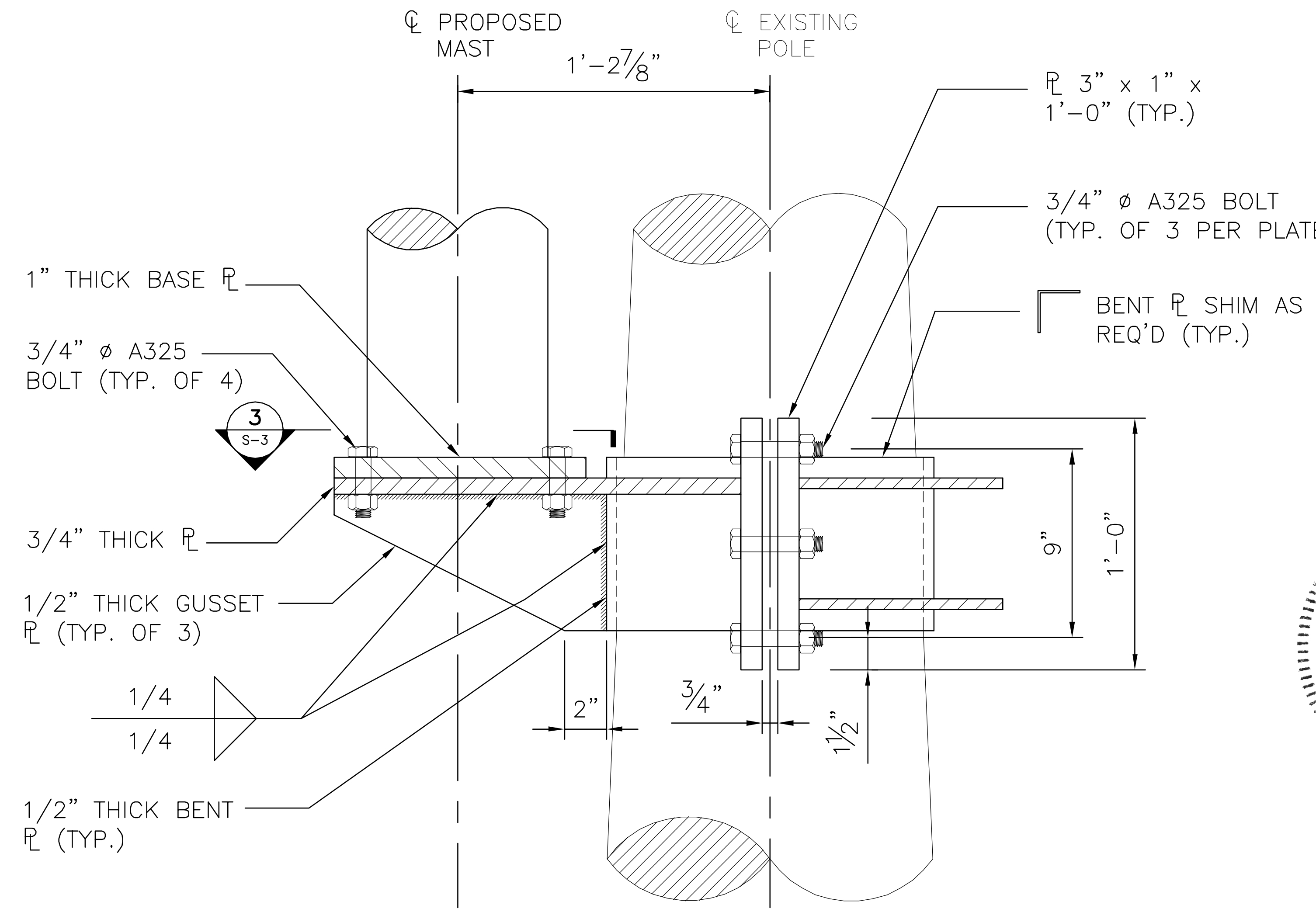
SHEET NO.
S-2
Sheet No. 6 of 7



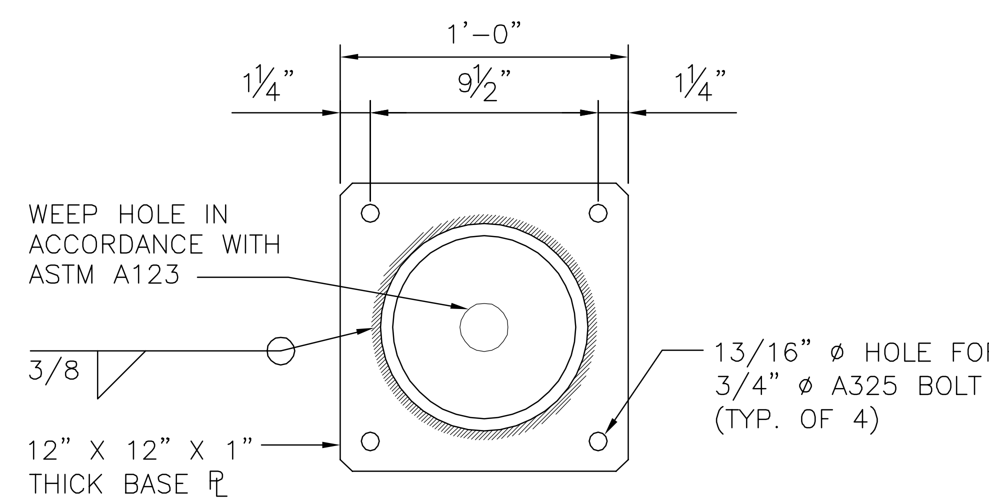
2
S-3
BOTTOM BRACKET PLAN VIEW
SCALE: 1-1/2" = 1'-0"

NOTE:

1. POLE TAPER = 0.2099"/FT (V.I.F.)



1
S-3
BOTTOM BRACKET DETAIL
SCALE: 1-1/2" = 1'-0"



3
S-3
BOTTOM PLATE DETAIL
SCALE: 1" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
3	11/29/18	TJL	CAG	ISSUED FOR CONSTRUCTION – ADDED WELD TO S-3
2	11/19/18	TJL	CAG	ISSUED FOR CONSTRUCTION
1	10/31/18	TJL	CAG	ISSUED FOR CONSTRUCTION
0	10/01/18	TJL	CAG	ISSUED FOR CONSTRUCTION

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DATE: 10/1/18
SCALE: AS SHOWN
JOB NO. 18058.58

BOTTOM CONNECTION DETAILS

SHEET NO.
S-3
Sheet No. 7 of 7

Development of Design Heights, Exposure Coefficients, and Velocity Pressures Per TIA-222-G

Wind Speeds

Basic Wind Speed $V := 93$ mph (User Input - 2016 CSBC Appendix N)

Basic Wind Speed with Ice $V_i := 50$ mph (User Input per Annex B of TIA-222-G)

Input

Structure Type = $Structure\_Type := Pole$ (User Input)

Structure Category = $SC := III$ (User Input)

Exposure Category = $Exp := C$ (User Input)

Structure Height = $h := 115$ ft (User Input)

Height to Center of Antennas = $z_{ant} := 124$ ft (User Input)

Radial Ice Thickness = $t_i := 0.75$ in (User Input per Annex B of TIA-222-G)

Radial Ice Density = $Id := 56.00$ pcf (User Input)

Topograpic Factor = $K_{zt} := 1.0$ (User Input)

$K_a := 1.0$ (User Input)

Gust Response Factor = $G_H := 1.35$ (User Input)

Output

Wind Direction Probability Factor = $K_d := \begin{cases} 0.95 & \text{if } Structure\_Type = Pole \\ 0.85 & \text{if } Structure\_Type = Lattice \end{cases} = 0.95$ (Per Table 2-2 of TIA-222-G)

Importance Factors = $I_{Wind} := \begin{cases} 0.87 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.15 & \text{if } SC = 3 \end{cases} = 1.15$ (Per Table 2-3 of TIA-222-G)

$I_{Wind\_w\_Ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.00 & \text{if } SC = 3 \end{cases} = 1$

$I_{ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.25 & \text{if } SC = 3 \end{cases} = 1.25$

$K_{iz} := \left(\frac{z_{ant}}{33}\right)^{0.1} = 1.142$ $t_{iz.ant} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.14$

Velocity Pressure Coefficient Antennas = $Kz_{ant} := 2.01 \left(\left(\frac{z_{ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.324$

Velocity Pressure w/o Ice Antennas = $qz_{ant} := 0.00256 \cdot K_d \cdot Kz_{ant} \cdot V^2 \cdot I_{Wind} = 32.033$

Velocity Pressure with Ice Antennas = $qz_{ice.ant} := 0.00256 \cdot K_d \cdot Kz_{ant} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 8.051$

Development of Wind & Ice Load on Mast

Mast Data:	(8" Sch. 80 Pipe)		(User Input)
Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 8.625$	in	(User Input)
Mast Length =	$L_{mast} := 22$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.5$	in	(User Input)
Velocity Coefficient =	$C := \sqrt{I \cdot Kz_{ant}} \cdot V \cdot \frac{D_{mast}}{12} = 77$		
Mast Force Coefficient =	$CF_{mast} = 0.6$		

Wind Load (without ice)

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 0.719$	sf/ft	
Total Mast Wind Force =	$qz_{ant} \cdot G_H \cdot CF_{mast} \cdot A_{mast} = 19$	plf	**BLC 5**

Wind Load (with ice)

Mast Projected Surface Area w/ Ice =	$AICE_{mast} := \frac{\left(D_{mast} + 2 \cdot t_{iz.ant}\right)}{12} = 1.075$	sf/ft	
Total Mast Wind Force w/ Ice =	$qz_{ice.ant} \cdot G_H \cdot CF_{mast} \cdot AICE_{mast} = 7$	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 =	$Ai_{mast} := \frac{\pi}{4}\left[\left(D_{mast} + t_{iz.ant} \cdot 2\right)^2 - D_{mast}^{\ 2}\right] = 72.4$	sq in	
Weight of Ice on Mast =	$W_{ICEmast2} := Id \cdot \frac{Ai_{mast}}{144} = 28$	plf	**BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = RFSAPXVAARR18_43

Antenna Shape = Flat (User Input)

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

Antenna Width = $W_{ant} := 24$ in (User Input)

Antenna Thickness = $T_{ant} := 8.5$ in (User Input)

Antenna Weight = $WT_{ant} := 132$ lbs (User Input)

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

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.0$

Antenna Force Coefficient = $Ca_{ant} = 1.22$

Wind Load (without ice)

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 12$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 36$ sf

Total Antenna Wind Force = $F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 1903$ lbs **BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz.ant}) \cdot (W_{ant} + 2 \cdot t_{iz.ant})}{144} = 15$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 44.9$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 597$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 396$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \times 10^4$ cu in

Volume of Ice on Each Antenna =

$$V_{ice} := (L_{ant} + 2 \cdot t_{iz.ant})(W_{ant} + 2 \cdot t_{iz.ant}) \cdot (T_{ant} + 2 \cdot t_{iz.ant}) - V_{ant} = 1 \times 10^4$$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 418$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 1253$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = Commscope ATSBT-TOP-FM-4G Bias Tee

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 5.63$ in (User Input)

Antenna Width = $W_{ant} := 3.7$ in (User Input)

Antenna Thickness = $T_{ant} := 2.0$ in (User Input)

Antenna Weight = $WT_{ant} := 2$ lbs (User Input)

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

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

Antenna Force Coefficient = $Ca_{ant} = 1.2$

Wind Load (without ice)

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 0.1$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 0.4$ sf

Total Antenna Wind Force = $F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 23$ lbs **BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz.ant}) \cdot (W_{ant} + 2 \cdot t_{iz.ant})}{144} = 0.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 1.6$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 21$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 6$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 42$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{iz.ant})(W_{ant} + 2 \cdot t_{iz.ant}) \cdot (T_{ant} + 2 \cdot t_{iz.ant}) - V_{ant} = 455$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 15$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 44$ lbs **BLC 3**

Development of Wind & Ice Load on Antenna Mounts

Mount Data:

Mount Type: Lightweight Ring Mount with Flush Adapters

Mount Shape =	Flat		(User Input)
Mount Projected Surface Area =	$CaAa := 0$	sf	(User Input)
Mount Projected Surface Area w/ Ice =	$CaAa_{ice} := 0$	sf	(User Input)
Mount Weight =	$WT_{mnt} := 305$	lbs	(User Input)
Mount Weight w/ Ice =	$WT_{mnt.ice} := 425$	lbs	

Wind Load (without ice)

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

Wind Load (with ice)

Total Mount Wind Force =	$Fi_{mnt} := qz_{ice.ant} \cdot G_H \cdot CaAa_{ice} = 0$	lbs	**BLC 4**

Gravity Loads (without ice)

Weight of All Mounts =	$WT_{mnt} = 305$	lbs	**BLC 2**

Gravity Loads (ice only)

Weight of Ice on All Mounts =	$WT_{mnt.ice} - WT_{mnt} = 120$	lbs	**BLC 3**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type =	HELIAX 1-1/4"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.55$	in	(User Input)
Coax Cable Length =	$L_{coax} := 15$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 0.66$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 24$		(User Input)
Total Number of Exterior Coax =	$Ne_{coax} := 24$		(User Input)
No. of Coax Projecting Outside Face of Mast =	$NP_{coax} := 4$		(User Input)

Coax aspect ratio, $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 116.1$

Coax Cable Force Factor Coefficient = $Ca_{coax} = 1.2$

Wind Load (without ice)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.5$ sf/ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{ant} \cdot G_H \cdot A_{coax} = 27$ plf **BLC 5**

Wind Load (with ice)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot t_{iz.ant})}{12} = 0.9$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qz_{ice.ant} \cdot G_H \cdot AICE_{coax} = 11$ plf **BLC 4**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 16$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[\left(D_{coax} + 2 \cdot t_{iz.ant}\right)^2 - D_{coax}{}^2\right] = 24.8$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 232$ plf **BLC 3**

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

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
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	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 Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	PIPE_8.0X	Column	Wide Flange	A53 Gr. B	Typical	11.9	100	100	199

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Existing Mast	21			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	BOTMA...	TOPMA...			Existing Mast	Column	Wide Flange	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	BOTMAST	0	0	0	0	
2	TOPCONNECTION	0	7	0	0	
3	TOPMAST	0	21	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]
1	TOPCONNECTION	Reaction		Reaction			
2	BOTMAST	Reaction	Reaction	Reaction		Reaction	

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.396	18
2	M1	Y	-.006	18
3	M1	Y	-.305	18

Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-1.253	18
2	M1	Y	-.044	18
3	M1	Y	-.12	18

Member Point Loads (BLC 4 : TIA Wind with Ice)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.597	18
2	M1	X	.021	18

Member Point Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	1.903	18
2	M1	X	.023	18

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.016	-.016	9	15

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.028	-.028	0	0
2	M1	Y	-.232	-.232	9	15

Member Distributed Loads (BLC 4 : TIA Wind with Ice)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.007	.007	0	15
2	M1	X	.011	.011	9	15

Member Distributed Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.019	.019	0	15
2	M1	X	.027	.027	9	15

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	Self Weight	None		-1						
2	Weight of Appurtenances	None					3	1		
3	Weight of Ice Only	None					3	2		
4	TIA Wind with Ice	None					2	2		
5	TIA Wind	None					2	2		

Load Combinations

	Description	So...	P...	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	1.2D + 1.6W	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9D + 1.6W	Yes	Y		1	.9	2	.9	5	1.6														
3	1.2D +1.0Di + 1.0..	Yes	Y		1	1.2	2	1.2	3	1	4	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	TOPCONNEC...	max	-1.829	3	0	3	0	3	0	3	0	3	0	3
2		min	-8.88	1	0	1	0	1	0	1	0	1	0	1
3	BOTMAST	max	5.084	1	5.381	3	0	3	0	3	0	3	0	3
4		min	1.04	3	1.488	2	0	1	0	1	0	1	0	1
5	Totals:	max	-.789	3	5.381	3	0	3						
6		min	-3.797	1	1.488	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	BOTMAST	max	0	3	0	3	0	3	0	3	0	3	2.531e-03	1
2		min	0	1	0	1	0	1	0	1	0	1	5.183e-04	3
3	TOPCONNECT...	max	0	3	0	2	0	3	0	3	0	3	-1.088e-03	3
4		min	0	1	-.002	3	0	1	0	1	0	1	-5.308e-03	1
5	TOPMAST	max	2.397	1	0	2	0	3	0	3	0	3	-3.546e-03	3
6		min	.49	3	-.003	3	0	1	0	1	0	1	-1.734e-02	1

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

	Member	Shape	Code Check	Loc...	LC	Shea...	Loc...	...	L...	phi*Pn...	phi*Pn...	phi*M...	phi*M...	...	Eqn
1	M1	PIPE_8.0X	.450	7	1	.047	7		1	254.613	374.85	81.375	81.375	1..	H1-1b

Joint Reactions

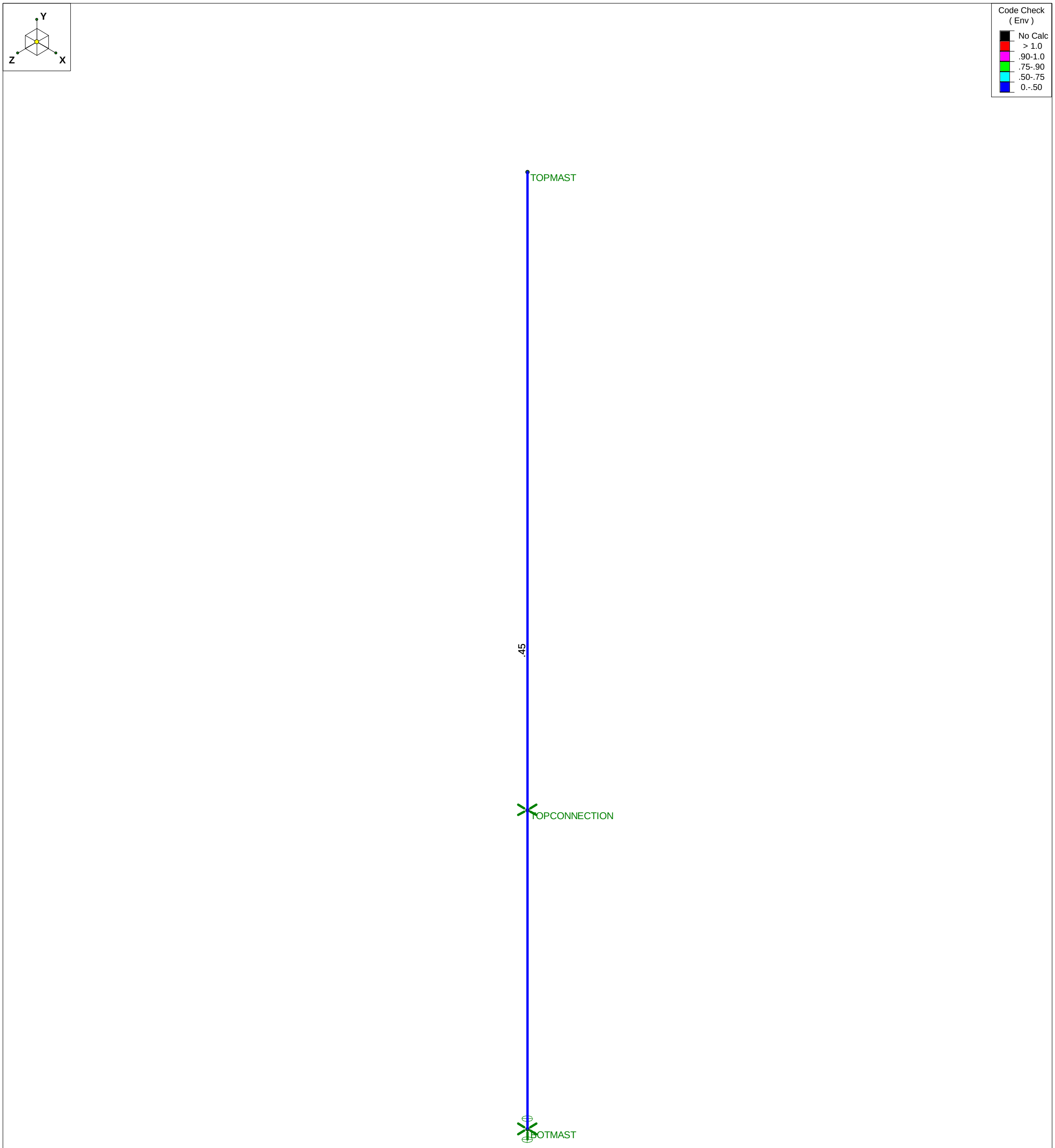
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	TOPCONNECTION	-8.88	0	0	0	0	0
2	1	BOTMAST	5.084	1.984	0	0	0	0
3	1	Totals:	-3.797	1.984	0			
4	1	COG (ft):	X: 0	Y: 13.794	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	TOPCONNECTION	-8.875	0	0	0	0	0
2	2	BOTMAST	5.078	1.488	0	0	0	0
3	2	Totals:	-3.797	1.488	0			
4	2	COG (ft):	X: 0	Y: 13.794	Z: 0			

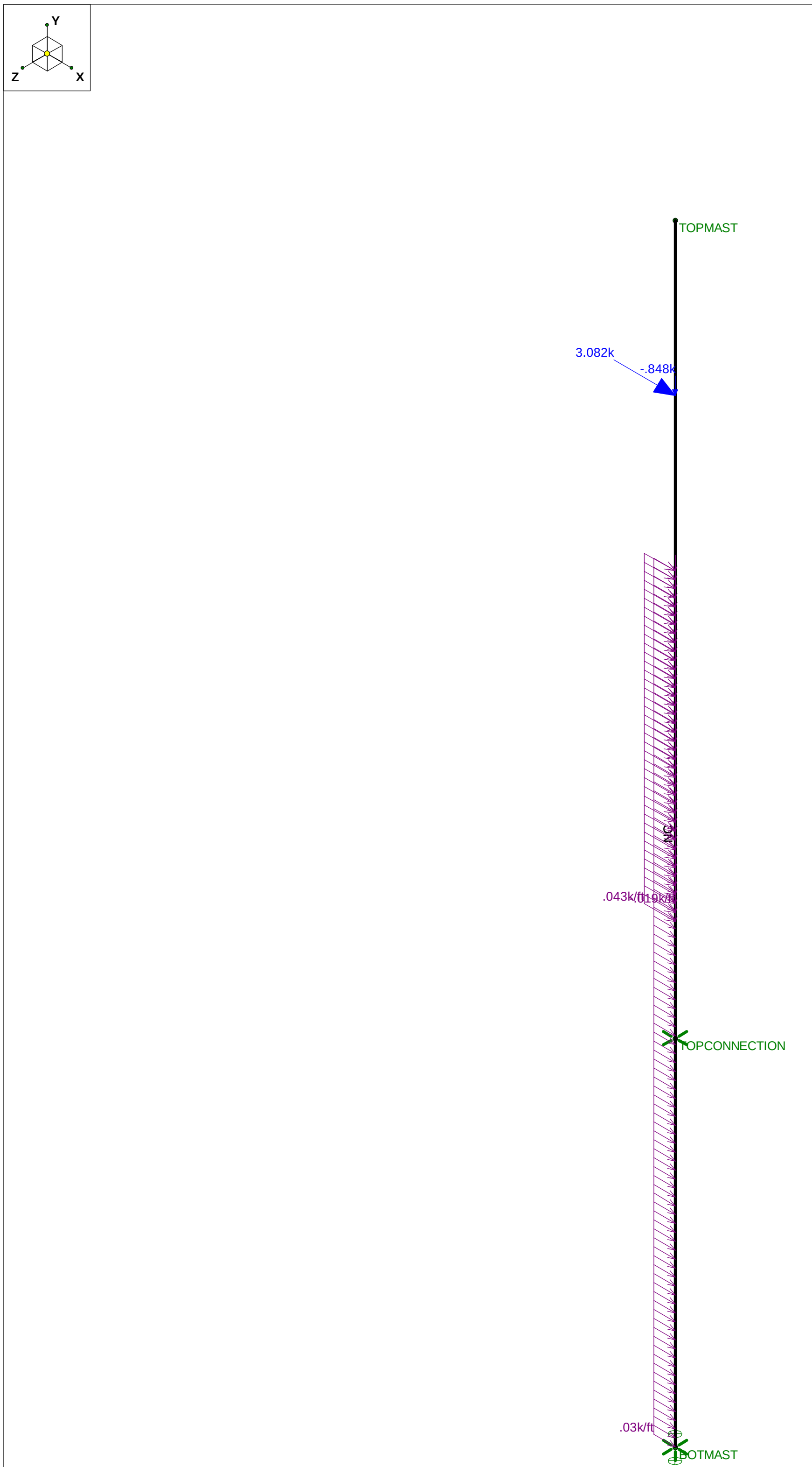
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	TOPCONNECTION	-1.829	0	0	0	0	0
2	3	BOTMAST	1.04	5.381	0	0	0	0
3	3	Totals:	-.789	5.381	0			
4	3	COG (ft):	X: 0	Y: 14.078	Z: 0			



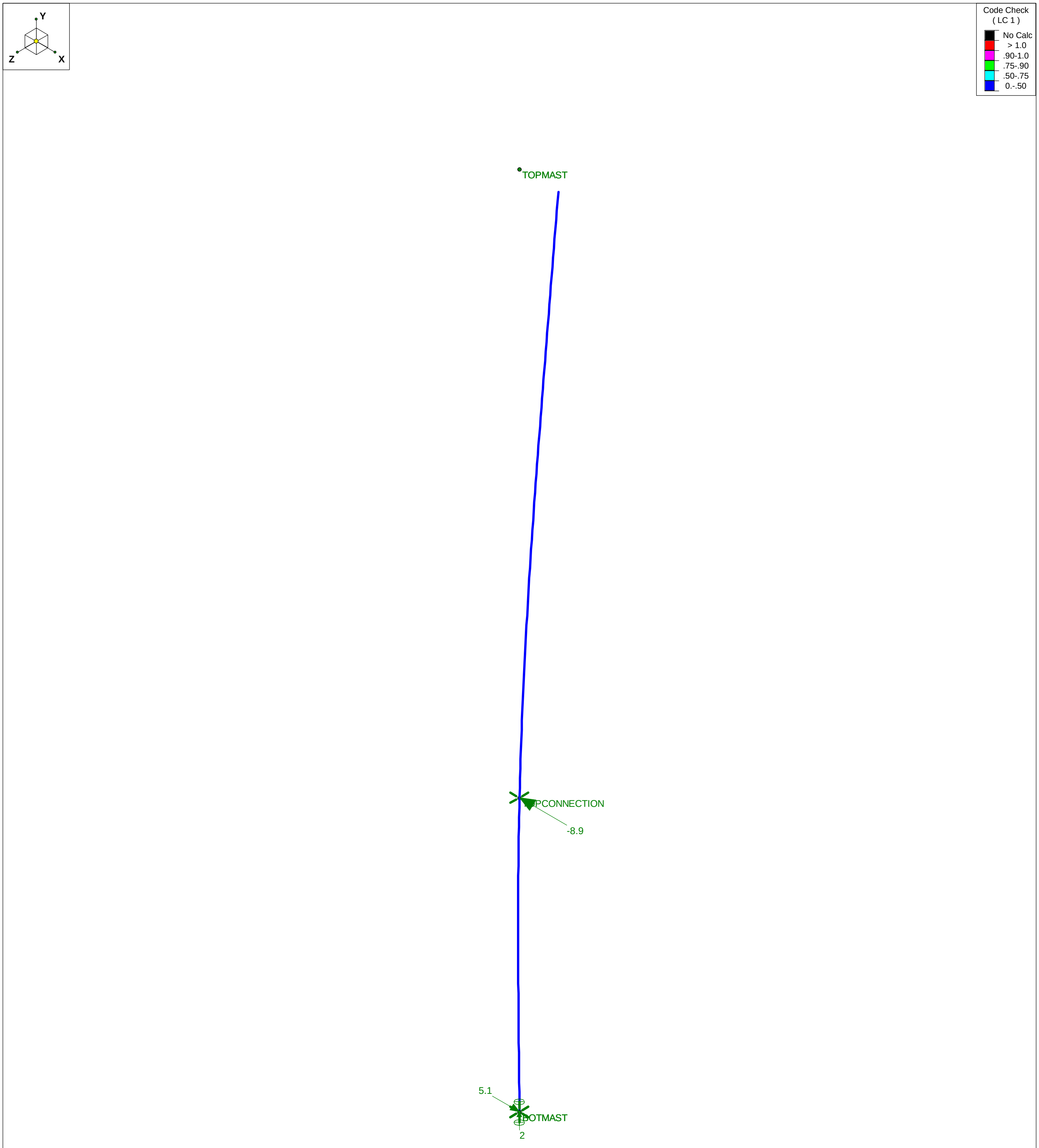
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:40 PM
18058.58 /T-Mobile CT112...	Unity Check	TIA.r3d



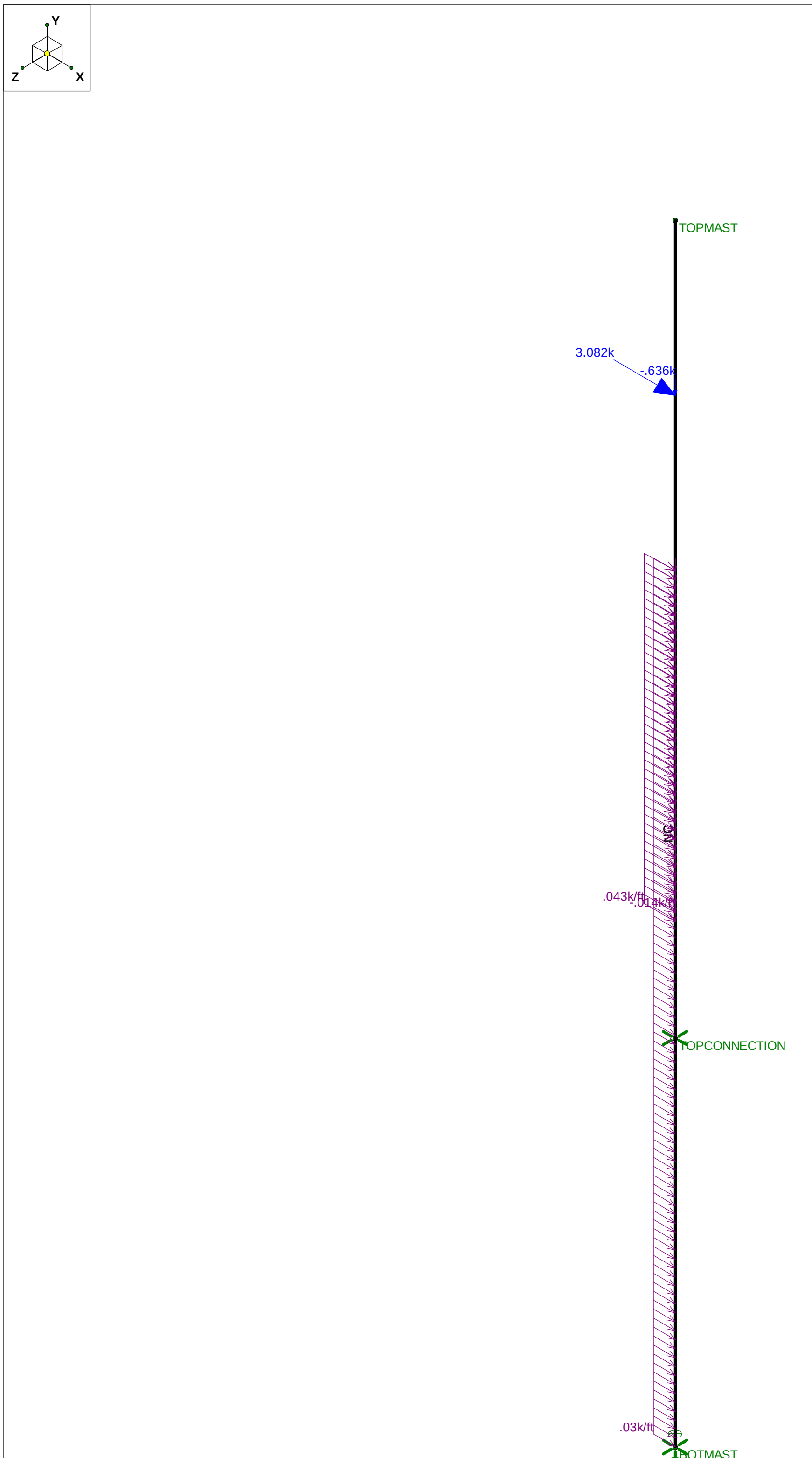
Member Code Checks Displayed
Loads: LC 1, 1.2D + 1.6W

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:40 PM
18058.58 /T-Mobile CT112...	LC #1 Loads	TIA.r3d



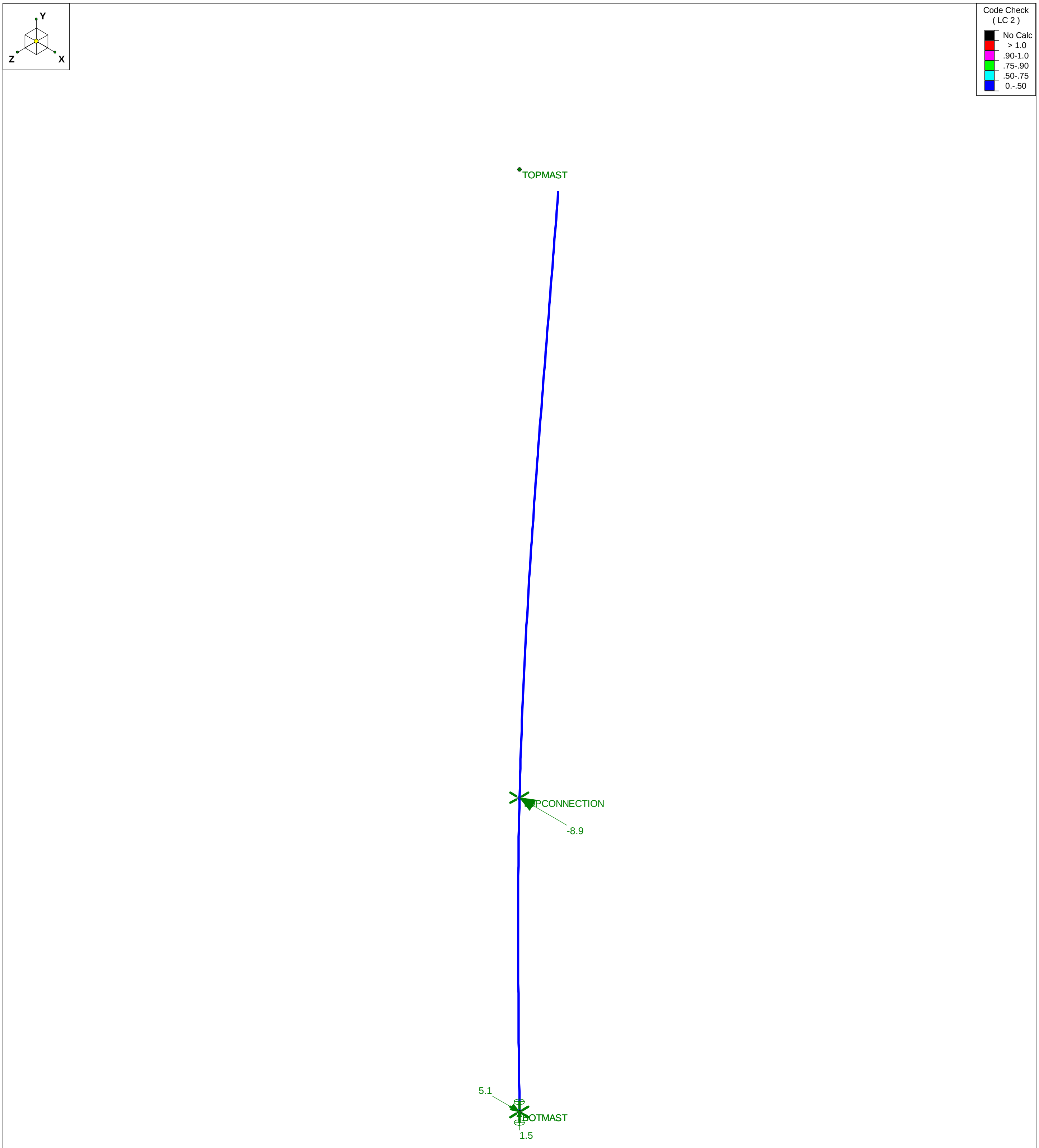
Member Code Checks Displayed
Results for LC 1, 1.2D + 1.6W
Reaction and Moment Units are k and k-ft

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:41 PM
18058.58 /T-Mobile CT112...	LC #1 Reactions and Deflected Shape	TIA.r3d



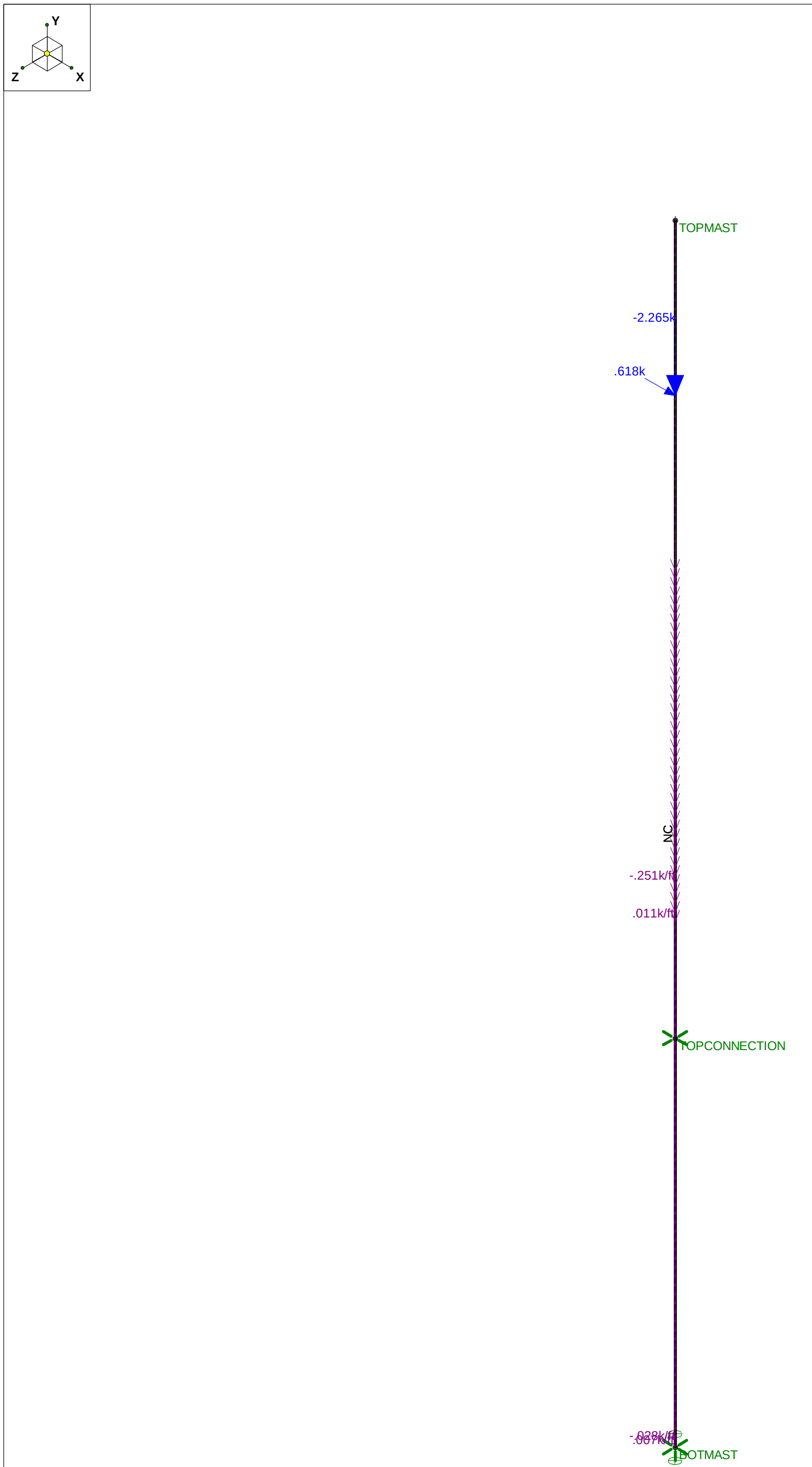
Member Code Checks Displayed
Loads: LC 2, 0.9D + 1.6W

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:41 PM
18058.58 /T-Mobile CT112...	LC #2 Loads	TIA.r3d



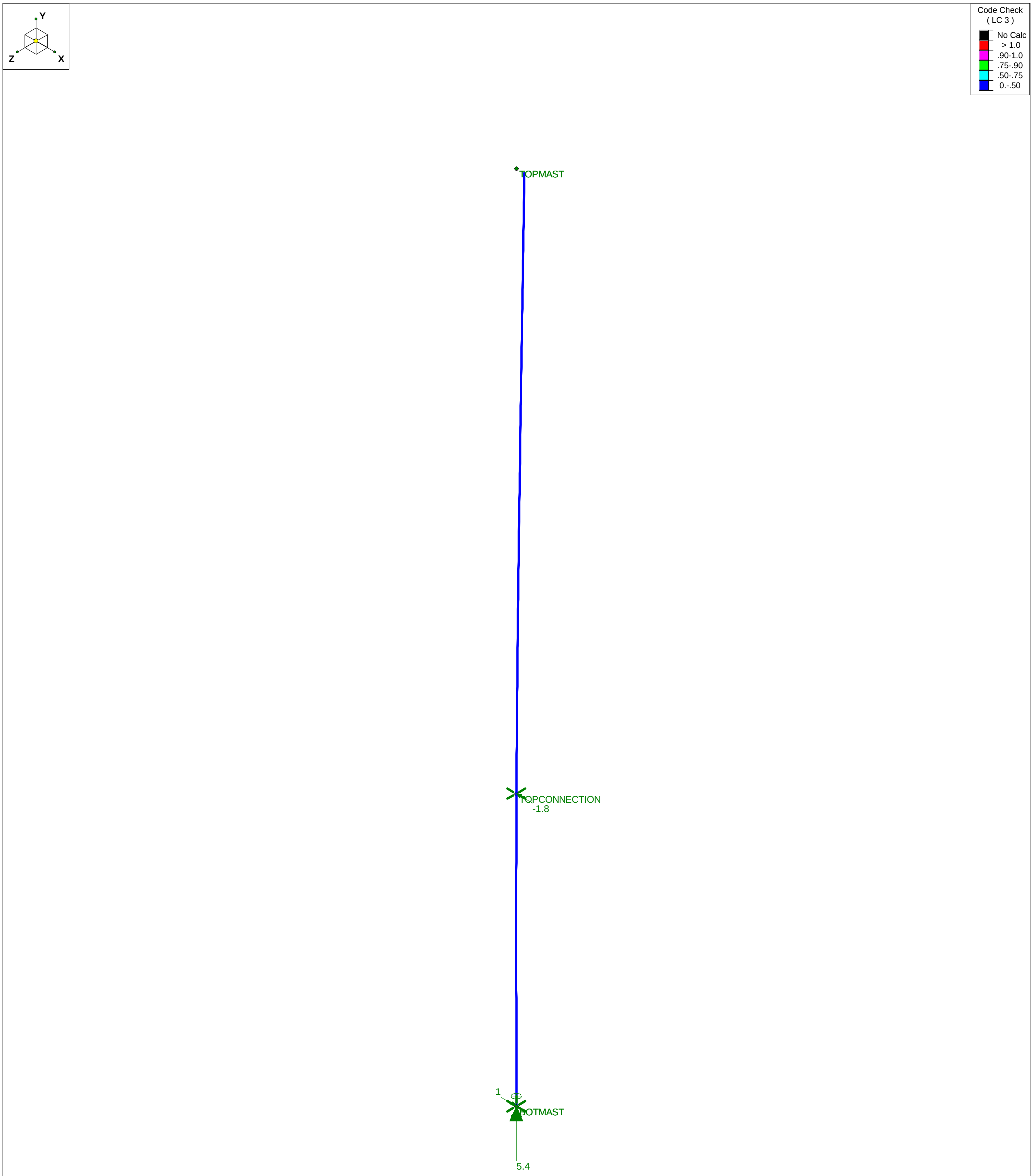
Member Code Checks Displayed
Results for LC 2, 0.9D + 1.6W
Reaction and Moment Units are k and k-ft

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:42 PM
18058.58 /T-Mobile CT112...	LC #2 Reactions and Deflected Shape	TIA.r3d



Member Code Checks Displayed
Loads: LC 3, 1.2D +1.0Di + 1.0Wi

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:41 PM
18058.58 /T-Mobile CT112...	LC #3 Loads	TIA.r3d



Member Code Checks Displayed
Results for LC 3, 1.2D +1.0Di + 1.0Wi
Reaction and Moment Units are k and k-ft

CENTEK		
TJL	Strcuture #1068 - Mast	Oct 31, 2018 at 3:42 PM
18058.58 /T-Mobile CT112...	LC #3 Reactions and Deflected Shape	TIA.r3d

Mast Top Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 0 \cdot kips$	(User Input)
Horizontal =	$Horz := 8.9 \cdot kips$	(User Input)
Moment =	$Moment := 0$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 6$	(User Input)
Bolt Diameter =	$d_b := 0.75in$	(User Input)
Nomianl Tensile Strength =	$F_{nt} := 90 \cdot ksi$	(User Input)
Nomianl Shear Strength =	$F_{nv} := 54 \cdot ksi$	(User Input)
Resistance Factor =	$\phi := 0.75$	(User Input)
Bolt Eccentricity from C.L. Mast =	$e := 14.875 \cdot in$	(User Input)
Vetical Spacing Between Top and Bottom Bolts =	$S_{vert} := 9 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 17.75 \cdot in$	(User Input)

Bolt Area = $a_b := \frac{1}{4} \cdot \pi \cdot d_b^{\,2} = 0.442 \cdot in^2$

Check Bolt Stresses:

Wind Acting Parallel to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{Vert}{n_b \cdot a_b} = 0 \cdot ksi$

$Condition1 := if\left(f_v < \phi \cdot F_{nv}, "OK", "Overstressed"\right)$

$Condition1 = "OK"$

$\frac{f_v}{\left(\phi \cdot F_{nv}\right)} = 0 \cdot \%$

Tensile Stress Adjusted for Shear = $F'_{nt} := \begin{cases} \left(1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) & \text{if } 1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \le F_{nt} \\ F_{nt} & \text{otherwise} \end{cases} = 90 \cdot ksi$

Tension Force Each Bolt = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 1.483 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 3.4 \cdot ksi$

$Condition2 := if\left(f_t < \phi \cdot F'_{nt}, "OK", "Overstressed"\right)$

$Condition2 = "OK"$

$\frac{f_t}{\left(\phi \cdot F'_{nt}\right)} = 5 \cdot \%$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{\sqrt{Vert^2 + Horz^2}}{n_b \cdot a_b} = 3.358 \cdot ksi$

$Condition3 := if\left(f_v < \phi \cdot F_{nv}, "OK", "Overstressed"\right)$

$Condition3 = "OK"$

$\frac{f_v}{\left(\phi \cdot F_{nv}\right)} = 8.3 \cdot \%$

Tensile Stress Adjusted for Shear = $F'_{nt} := \begin{cases} \left(1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) & \text{if } 1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \le F_{nt} \\ F_{nt} & \text{otherwise} \end{cases} = 90 \cdot ksi$

Tension Force per Bolt = $F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 2.486 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 5.627 \cdot ksi$

$Condition4 := if\left(f_t < \phi \cdot F'_{nt}, "OK", "Overstressed"\right)$

$Condition4 = "OK"$

$\frac{f_t}{\left(\phi \cdot F'_{nt}\right)} = 8.3 \cdot \%$

Mast Connection to Bottom Bracket:

Design Reactions at Brace:

Axial =	$Axial := 2.0 \cdot kips$	(User Input)
Shear =	$Shear := 5.1 \cdot kips$	(User Input)
Moment =	$Moment := 0 \cdot kips \cdot ft$	(User Input)

Anchor Bolt Data:

Bolt Grade =	A325	(User Input)
Design Shear Stress =	$F_V := 40.5 \cdot ksi$	(User Input)
Design Tension Stress =	$F_T := 67.5 \cdot ksi$	(User Input)
Total Number of Bolts =	$n_b := 4$	(User Input)
Number of Bolts Tension Side Parallel =	$n_{b.par} := 2$	(User Input)
Number of Bolts Tension Side Diagonal =	$n_{b.diag} := 1$	(User Input)
Bolt Diameter =	$d_b := 0.75in$	(User Input)
Bolt Spacing X Direction =	$S_x := 9.5 \cdot in$	(User Input)
Bolt Spacing Z Direction =	$S_z := 9.5 \cdot in$	(User Input)

Base Plate Data:

Base Plate Steel =	A36	(User Input)
Allowable Yield Stress =	$F_y := 36 \cdot ksi$	(User Input)
Base Plate Width =	$Pl_w := 12 \cdot in$	(User Input)
Base Plate Thickness =	$Pl_t := 1.00 \cdot in$	(User Input)
Bolt Edge Distance =	$B_E := 1.25 \cdot in$	(User Input)
Pole Diameter =	$D_p := 8.625 \cdot in$	(User Input)

Base Plate Data:

Weld Grade	E70XX	(User Input)
Weld Yield Stress =	$F_{yw} := 70 \cdot ksi$	(User Input)
Weld Size =	$sw := 0.375 \cdot in$	(User Input)

Anchor Bolt Check:

Bolt Area = $a_b := \frac{1}{4} \cdot \pi \cdot d_b^{\,2} = 0.442 \cdot in^2$

Bolt Spacing Diag. Direction = $S_{diag} := \sqrt{S_x^{\,2} + S_z^{\,2}} = 13.44 \cdot in$

Tension Load per Bolt Parallel = $T_{par} := \frac{Moment}{S_x \cdot n_{b.par}} - \frac{Axial}{n_b} = -0.5 \cdot kips$

Tension Load per Bolt Diagonal = $T_{diag} := \frac{Moment}{S_{diag} \cdot n_{b.diag}} - \frac{Axial}{n_b} = -0.5 \cdot kips$

Tension per bolt = $T := if(T_{par} > T_{diag}, T_{par}, T_{diag}) = -0.5 \cdot kips$

Actual Tensile Stress = $f_t := \frac{T}{a_b} = -1.13 \cdot ksi$

Condition2 := if($f_t < F_T$, "OK" , "Overstressed")

Condition2 = "OK"

Base Plate Check:

Design Bending Stress = $F_b := 0.9 \cdot F_y = 32.4 \cdot ksi$

Plate Bending Width = $Z := \left(Pl_w \cdot \sqrt{2} - D_p\right) = 8.35 \cdot in$

Moment Arm = $K := \frac{\left(S_{diag} - D_p\right)}{2} = 2.41 \cdot in$

Load per Bolt Diagonal = $P_{diag} := \frac{Moment}{S_{diag} \cdot n_{b.diag}} + \frac{Axial}{n_b} = 0.5 \cdot kips$

Moment in Base Plate = $M := K \cdot P_{diag} = 1.2 \cdot kips \cdot in$

Section Modulus = $S_Z := \frac{1}{6} \cdot Z \cdot Pl_t^{\,2} = 1.39 \cdot in^3$

Bending Stress = $f_b := \frac{M}{S_Z} = 0.86 \cdot ksi$

Condition3 := if($f_b < F_b$, "OK" , "Overstressed")

Condition3 = "OK"

Base Plate to PCS Mast Weld Check:

Design Weld Stress = $F_w := 0.45 \cdot F_{yw} = 31.5 \cdot ksi$

Weld Area = $A_w := \frac{\pi}{4} \cdot \left[\left(D_p + 2sw \cdot 0.707 \right)^2 - D_p^{\,2} \right] = 7.4 \cdot in^2$

Weld Moment of Inertia = $I_w := \frac{\pi}{64} \cdot \left[\left(D_p + 2sw \cdot 0.707 \right)^4 - D_p^{\,4} \right] = 73.22 \cdot in^4$

$c := \frac{D_p}{2} + sw \cdot 0.707 = 4.58 \cdot in$

Section Modulus of Weld = $S_w := \frac{I_w}{c} = 15.99 \cdot in^3$

Weld Stress = $f_w := \frac{Moment}{S_w} + \frac{Shear}{A_w} = 0.69 \cdot ksi$

Condition4 := if($f_w < F_w$,"OK" ,"Overstressed")

Condition4 = "OK"

Mast Bottom Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 2.0 \cdot kips$	(User Input)
Horizontal =	$Horz := 5.1 \cdot kips$	(User Input)
Moment =	$Moment := 0 \cdot ft \cdot kips$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 6$	(User Input)
Bolt Diameter =	$d_b := 0.75in$	(User Input)
Nomianl Tensile Strength =	$F_{nt} := 90 \cdot ksi$	(User Input)
Nomianl Shear Strength =	$F_{nv} := 54 \cdot ksi$	(User Input)
Resistance Factor =	$\phi := 0.75$	(User Input)
Bolt Eccentricity from C.L. Mast =	$e := 14.875 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 19.25 \cdot in$	(User Input)
Vetical Spacing Between Top and Bottom Bolts =	$S_{vert} := 9 \cdot in$	(User Input)

Bolt Area = $a_b := \frac{1}{4} \cdot \pi \cdot d_b^{2} = 0.442 \cdot in^{2}$

Check Bolt Stresses:

Wind Acting Parallel to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{Vert}{n_b \cdot a_b} = 0.755 \cdot ksi$

Condition1 := if($f_v < \phi \cdot F_{nv}$, "OK", "Overstressed")

Condition1 = "OK"

$\frac{f_v}{(\phi \cdot F_{nv})} = 1.9 \cdot \%$

Tensile Stress Adjusted for Shear = $F'_{nt} := \begin{cases} \left(1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) & \text{if } 1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \le F_{nt} \\ F_{nt} & \text{otherwise} \end{cases} = 90 \cdot ksi$

Tension Force Each Bolt = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{(Vert \cdot e + Moment)}{2 \cdot S_{vert}} = 2.503 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 5.7 \cdot ksi$

Condition2 := if($f_t < \phi \cdot F'_{nt}$, "OK", "Overstressed")

Condition2 = "OK"

$\frac{f_t}{(\phi \cdot F'_{nt})} = 8.4 \cdot \%$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \sqrt{\left(\frac{Vert}{n_b \cdot a_b} + \frac{Moment \cdot 2}{S_{horz} \cdot n_b \cdot a_b}\right)^2 + \left(\frac{Horz}{n_b \cdot a_b}\right)^2} = 2.067 \cdot ksi$

Condition3 := if($f_v < \phi \cdot F_{nv}$, "OK", "Overstressed")

Condition3 = "OK"

$\frac{f_v}{(\phi \cdot F_{nv})} = 5.1 \cdot \%$

Tensile Stress Adjusted for Shear = $F'_{nt} := \begin{cases} \left(1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) & \text{if } 1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \le F_{nt} \\ F_{nt} & \text{otherwise} \end{cases} = 90 \cdot ksi$

Tension Force per Bolt = $F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{2 \cdot S_{vert}} = 2.966 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 6.715 \cdot ksi$

Condition4 := if($f_t < \phi \cdot F'_{nt}$, "OK", "Overstressed")

Condition4 = "OK"

$\frac{f_t}{(\phi \cdot F'_{nt})} = 9.9 \cdot \%$

Basic Components

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

Basic Windspeed = $V := 110$ 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 Mast Above Grade = $TME := 127$ 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 = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.331$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.302$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.822$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.851$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 35.1$ psf (NESC 2007 Section 250.C.2)

Shape Factors

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 = $Cd_{coax} := 1.6$ (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

Mast Data: (Pipe 8" Sch. 80)

Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 8.625$	in	(User Input)
Mast Length =	$L_{mast} := 22$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.5$	in	(User Input)

Wind Load (NESC Extreme)

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 0.719$		sf/ft	
Total Mast Wind Force (Above NU Structure) =	$qz \cdot Cd_{coax} \cdot A_{mast} \cdot m = 50$	Coax on Mast Above Tower	plf	**BLC 5**
Total Mast Wind Force (Below NU Structure) =	$qz \cdot Cd_R \cdot A_{mast} = 33$		plf	**BLC 5**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice =	$AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.802$	sf/ft	
Total Mast Wind Force w/ Ice =	$p \cdot Cd_{coax} \cdot AICE_{mast} = 5$	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 =	$Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\,2}\right] = 14.3$	sq in	
Weight of Ice on Mast =	$W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 6$	plf	**BLC 3**

Development of Wind & Ice Load on Antennas

Proposed Antenna Data:

Antenna Model = RFSAPXVAARR18_43

Antenna Shape = Flat (User Input)

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

Antenna Width = $W_{ant} := 24$ in (User Input)

Antenna Thickness = $T_{ant} := 8.5$ in (User Input)

Antenna Weight = $WT_{ant} := 132$ 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 = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 12$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 36$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 2525$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 12.7$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 38$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 243$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 396$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \times 10^4$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 2650$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 86$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 258$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Proposed Antenna Data:

Antenna Model = Commscope ATSBT-TOP-FM-4G Bias Tee

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 5.63$ in (User Input)

Antenna Width = $W_{ant} := 3.7$ in (User Input)

Antenna Thickness = $T_{ant} := 2.0$ in (User Input)

Antenna Weight = $WT_{ant} := 2$ 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 = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 0.1$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 0.4$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 30$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 0.2$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 0.6$ sf

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

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 6$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 42$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 52$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 2$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 5$ lbs **BLC 3**

Development of Wind & Ice Load on Mount

Mount Data:

Model = Lightweight Ring Mount with Flush Adapters

Mount Shape = Flat

Mount Projected Surface Area = $CdAa := 0$ sf (User Input)

Mount Projected Surface Area w/ Ice = $CdAa_{ice} := 0$ sf (User Input)

Mount Weight = $WT_{mnt} := 305$ lbs (User Input)

Mount Weight w/ Ice = $WT_{mnt.ice} := 425$ lbs (User Input)

Gravity Loads (without ice)

Weight of All Mounts = $Wt_{mnt1} := WT_{mnt} = 305$ lbs

Gravity Load (ice only)

Weight of Ice on All Mounts = $Wt_{ice.mnt1} := \left(WT_{mnt.ice} - WT_{mnt}\right) = 120$ lbs

Wind Load (NESC Heavy)

Total Mount Wind Force w/ Ice = $Fi_{mnt1} := p \cdot CdAa_{ice} = 0$ lbs

Wind Load (NESC Extreme)

Total Mount Wind Force = $F_{mnt1} := qz \cdot CdAa \cdot m = 0$ lbs

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type =	HELIAX 1-1/4"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.55$	in	(User Input)
Coax Cable Length =	$L_{coax} := 15$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 0.66$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 24$		(User Input)
No. of Coax Projecting Outside Face of PCS Mast =	$NP_{coax} := 4$		(User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.5$ sf/ft

Total Coax Wind Force (Above NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 36$ plf **BLC 5**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.6$ sf/ft

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

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 16$ 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 = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 30$ plf **BLC 3**

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

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
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	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 Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	PIPE_8.0X	Column	Wide Flange	A53 Gr. B	Typical	11.9	100	100	199

Hot Rolled Steel Design Parameters

	Label	Shape	Length...	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	y sway	z sway	Function
1	M1	Existing ...	21			Lbyy									Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	BOTMA...	TOPMA...			Existing Mast	Column	Wide Flange	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	BOTMAST	0	0	0	0	
2	TOPCONNECTION	0	7	0	0	
3	TOPMAST	0	21	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]
1	TOPCONNECTION	Reaction		Reaction			
2	BOTMAST	Reaction	Reaction	Reaction		Reaction	

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.396	18
2	M1	Y	-.006	18
3	M1	Y	-.305	18

Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.258	18
2	M1	Y	-.005	18
3	M1	Y	-.12	18

Member Point Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.243	18
2	M1	X	.004	18

Member Point Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	2.525	18
2	M1	X	.03	18

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.016	-.016	9	15

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.006	-.006	0	0
2	M1	Y	-.03	-.03	9	15

Member Distributed Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.005	.005	0	15
2	M1	X	.004	.004	9	15

Member Distributed Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.05	.05	9	15
2	M1	X	.033	.033	0	9
3	M1	X	.036	.036	9	15

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	Self Weight	None		-1						
2	Weight of Appurtenances	None					3	1		
3	Weight of Ice Only	None					3	2		
4	NESC Heavy Wind	None					2	2		
5	NESC Extreme Wind	None					2	3		

Load Combinations

	Description	So..	P...	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	NESC Heavy Wind	Yes			1	1.5	2	1.5	3	1.5	4	2.5												
2	NESC Extreme Wind	Yes			1	1	2	1	5	1														
3	Self Weight				1	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	TOPCONNEC...	max	-1.892	1	0	2	0	2	0	2	0	2	0	2
2		min	-7.645	2	0	1	0	1	0	1	0	1	0	1
3	BOTMAST	max	4.277	2	3.514	1	0	2	0	2	0	2	0	2
4		min	1.027	1	1.653	2	0	1	0	1	0	1	0	1
5	Totals:	max	-.865	1	3.514	1	0	2						
6		min	-3.368	2	1.653	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	BOTMAST	max	0	2	0	2	0	2	0	2	0	2	1.696e-03	2
2		min	0	1	0	1	0	1	0	1	0	1	4.101e-04	1
3	TOPCONNECT...	max	0	2	0	2	0	2	0	2	0	2	-8.743e-04	1
4		min	0	1	0	1	0	1	0	1	0	1	-3.602e-03	2
5	TOPMAST	max	1.614	2	0	2	0	2	0	2	0	2	-2.824e-03	1
6		min	.392	1	-.002	1	0	1	0	1	0	1	-1.164e-02	2

Envelope AISC ASD Steel Code Checks

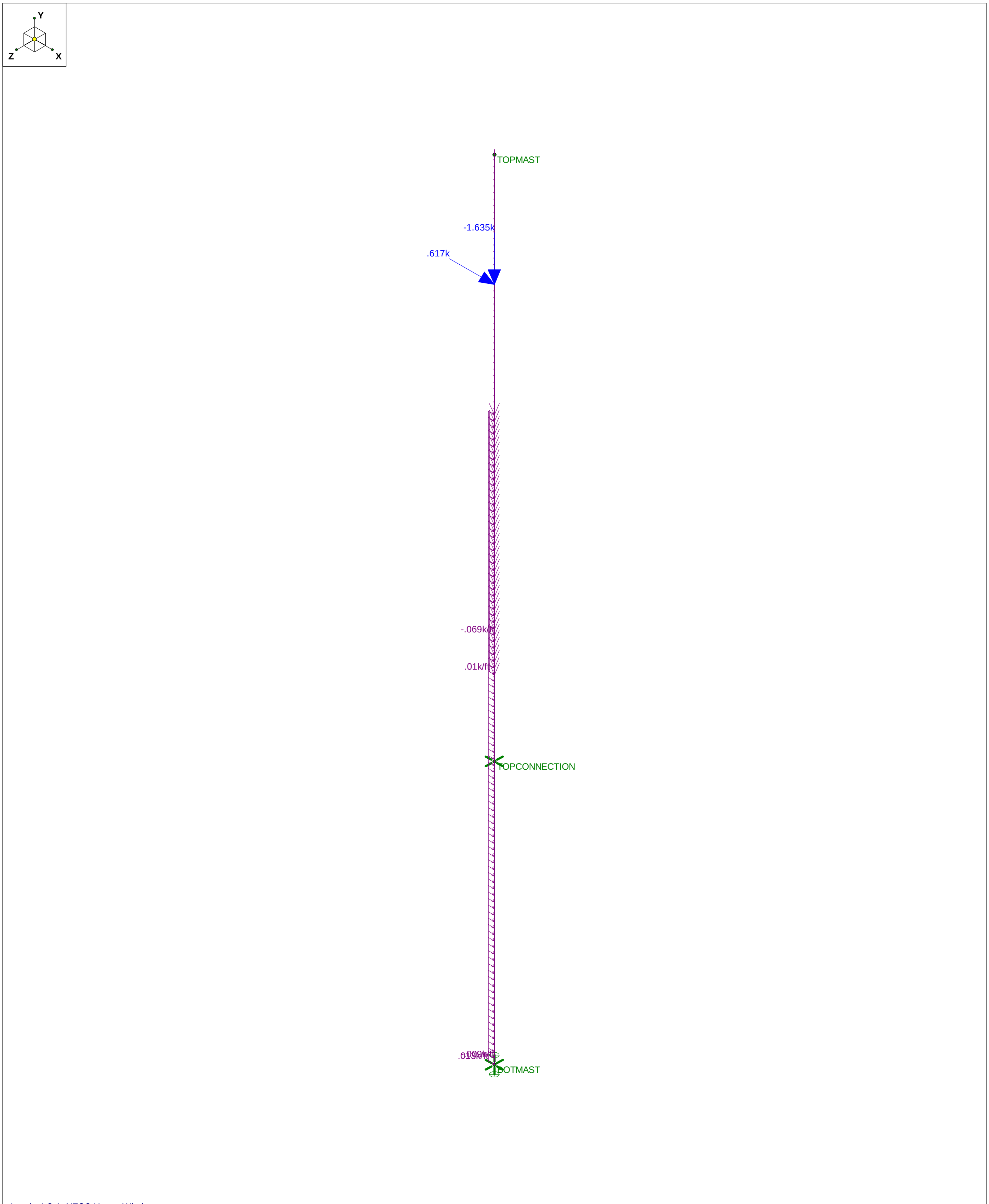
	Mem...	Shape	Code Check	Loc[ft]	LC	She...	Lo...	...	...	Fa [...	Ft [...	Fb y...	Fb z...	...	C...	C...	AS...
1	M1	PIPE_8.0X	.694	7	2	.054	7		2	14.2..	21	23.1	23.1	1	.6	.85	H1-2

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	TOPCONNECTION	-1.892	0	0	0	0	0
2	1	BOTMAST	1.027	3.514	0	0	0	0
3	1	Totals:	-.865	3.514	0			
4	1	COG (ft):	X: 0	Y: 14.167	Z: 0			

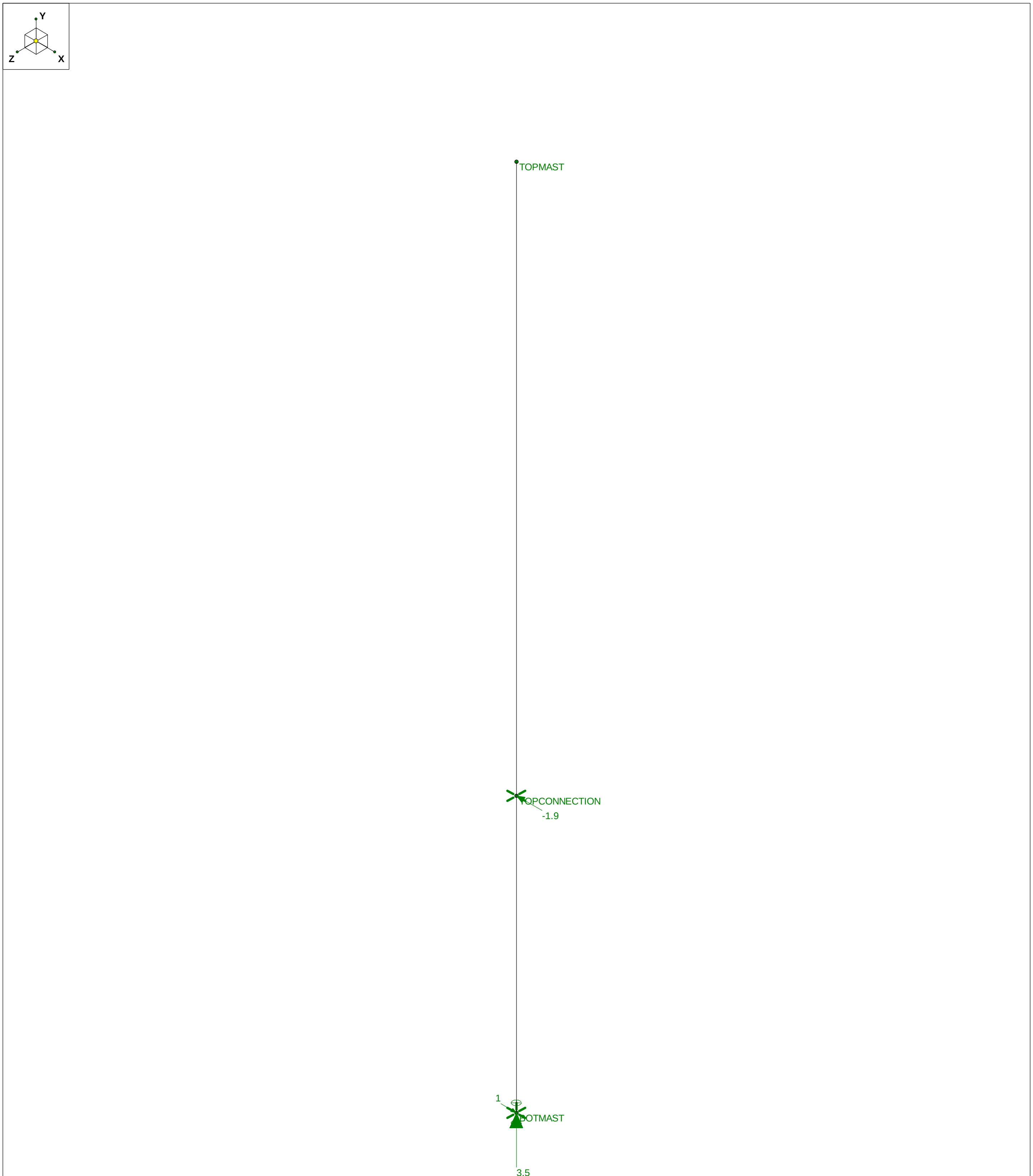
Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	TOPCONNECTION	-7.645	0	0	0	0	0
2	2	BOTMAST	4.277	1.653	0	0	0	0
3	2	Totals:	-3.368	1.653	0			
4	2	COG (ft):	X: 0	Y: 13.794	Z: 0			



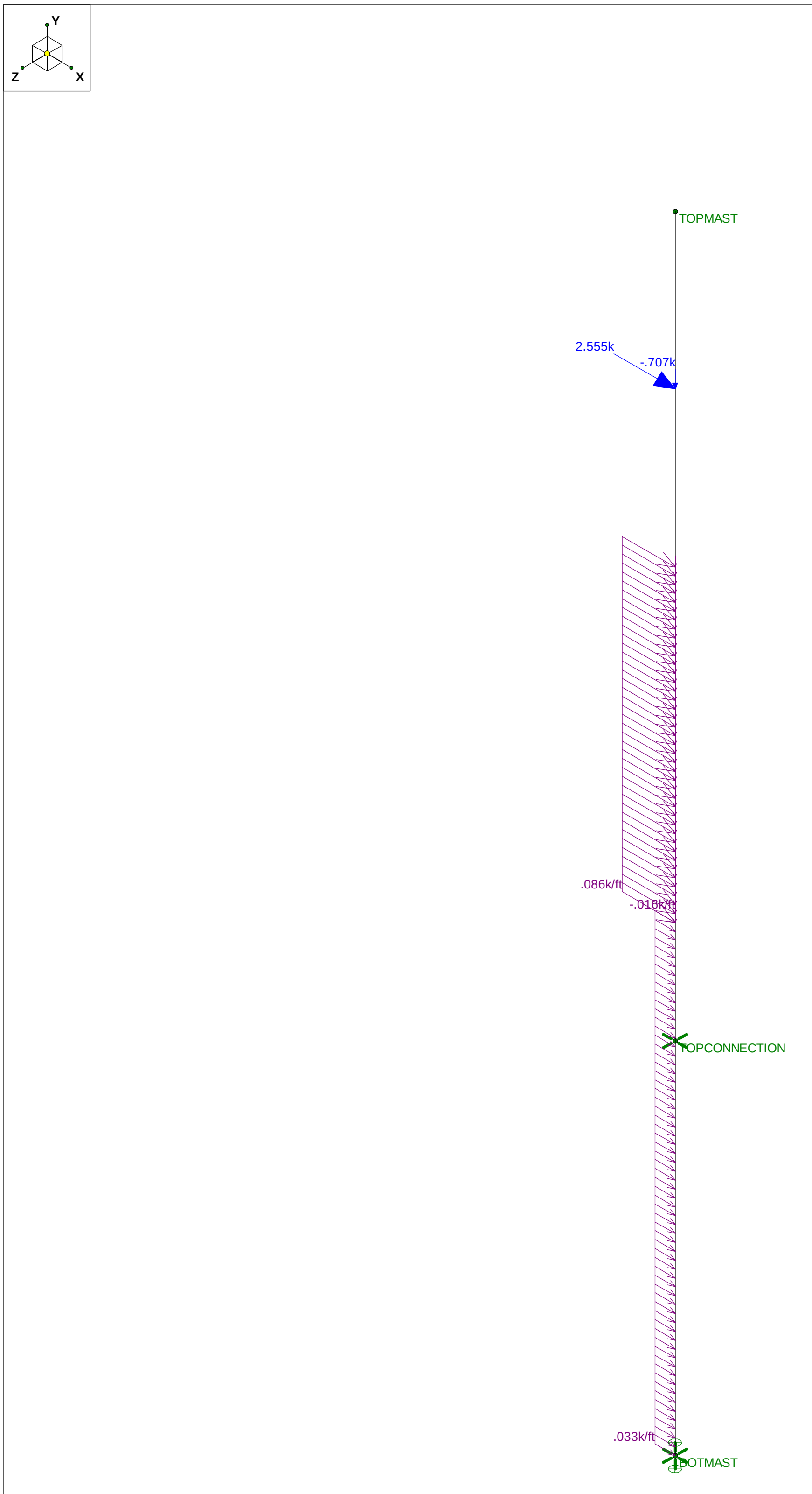
Loads: LC 1, NESC Heavy Wind

Centek	Structure # 1068 - Mast	
TJL		Dec 14, 2018 at 10:06 AM
18058.58 /T-Mobile CT112...	LC #1 Loads	NESC.r3d



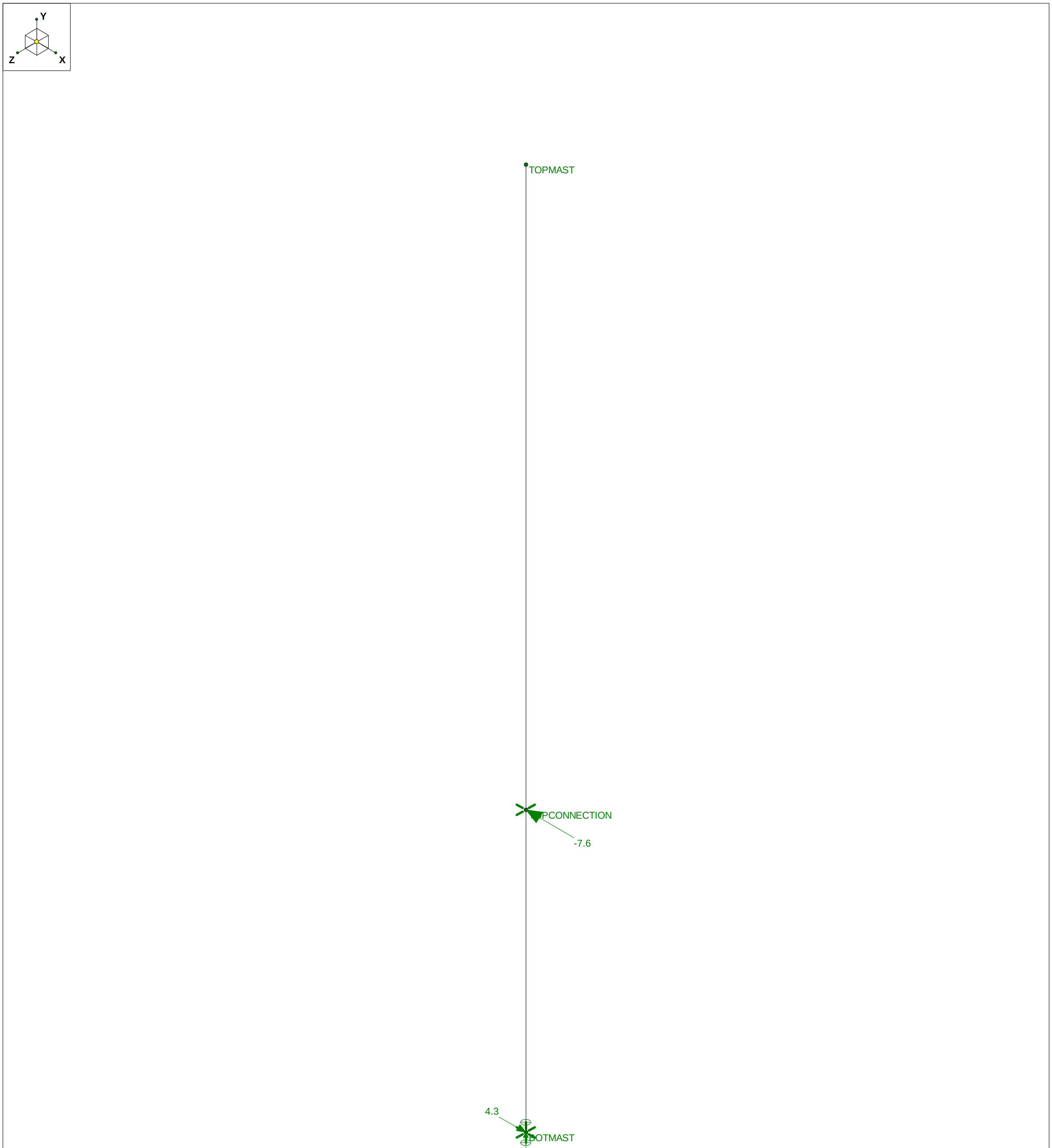
Results for LC 1, NESC Heavy Wind
Reaction and Moment Units are k and k-ft

Centek	Structure # 1068 - Mast	
TJL		Dec 14, 2018 at 10:07 AM
18058.58 /T-Mobile CT112...	LC #1 Reactions	NESC.r3d



Loads: LC 2, NESC Extreme Wind

Centek	Structure # 1068 - Mast	
TJL		Dec 14, 2018 at 10:06 AM
18058.58 /T-Mobile CT112...	LC #2 Loads	NESC.r3d



Results for LC 2, NESC Extreme Wind
Reaction and Moment Units are k and k-ft

Centek	Structure # 1068 - Mast	
TJL		Dec 14, 2018 at 10:07 AM
18058.58 /T-Mobile CT112...	LC #2 Reactions	NESC.r3d

Coax Cable on CL&P Pole

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

Basic Windspeed = $V := 110$ mph (User Input NESC 2007 Figure 250-2(e))

Height to Top of Coax Above Grade = $TC := 115$ ft (User Input)

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 = $Kz := 2.01 \cdot \left(\frac{0.67TC}{900}\right)^{\frac{2}{9.5}} = 1.198$ (NESC 2007 Table 250-2)

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

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TC}{220}\right)} = 0.836$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.859$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 31.9$ psf (NESC 2007 Section 250.C.2)

Diameter of Coax Cable =	$D_{coax} := 1.55 \cdot in$	*(User Input)*
Weight of Coax Cable =	$W_{coax} := 0.66 \cdot plf$	*(User Input)*
Number of Coax Cables =	$N_{coax} := 24$	*(User Input)*
Number of Projected Coax Cables =	$NP_{coax} := 3$	*(User Input)*
Shape Factor =	$Cd_{coax} := 1.6$	*(User Input)*
Overload Factor for NESC Heavy Wind Transverse Load =	$OF_{HWT} := 2.5$	*(User Input)*
Overload Factor for NESC Heavy Wind Vertical Load =	$OF_{HWV} := 1.5$	*(User Input)*
Overload Factor for NESC Extreme Wind Transverse Load =	$OF_{EWT} := 1.0$	*(User Input)*
Overload Factor for NESC Extreme Wind Vertical Load =	$OF_{EWV} := 1.0$	*(User Input)*

Wind Area without Ice = $A := \left(NP_{coax} \cdot D_{coax}\right) = 4.65 \cdot in$

Wind Area with Ice = $A_{ice} := \left(NP_{coax} \cdot D_{coax} + 2 \cdot Ir\right) = 5.65 \cdot in$

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

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax} \cdot Id \cdot N_{coax} = 30.055 \cdot plf$

Heavy Wind Vertical Load =

$$Heavy\_WInd_{Vert} := \overrightarrow{\left[\left(N_{coax} \cdot W_{coax} + W_{ice}\right) \cdot Coax_{Span} \cdot OF_{HWV}\right]}$$

Heavy Wind Transverse Load =

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

$$Heavy\_WInd_{Vert} = \begin{pmatrix} 688 \\ 688 \\ 688 \\ 688 \\ 688 \\ 688 \\ 688 \\ 688 \\ 688 \\ 688 \end{pmatrix} lb \qquad Heavy\_Wind_{Trans} = \begin{pmatrix} 75 \\ 75 \\ 75 \\ 75 \\ 75 \\ 75 \\ 75 \\ 75 \\ 75 \\ 75 \end{pmatrix} lb$$

Extreme Wind Vertical Load =

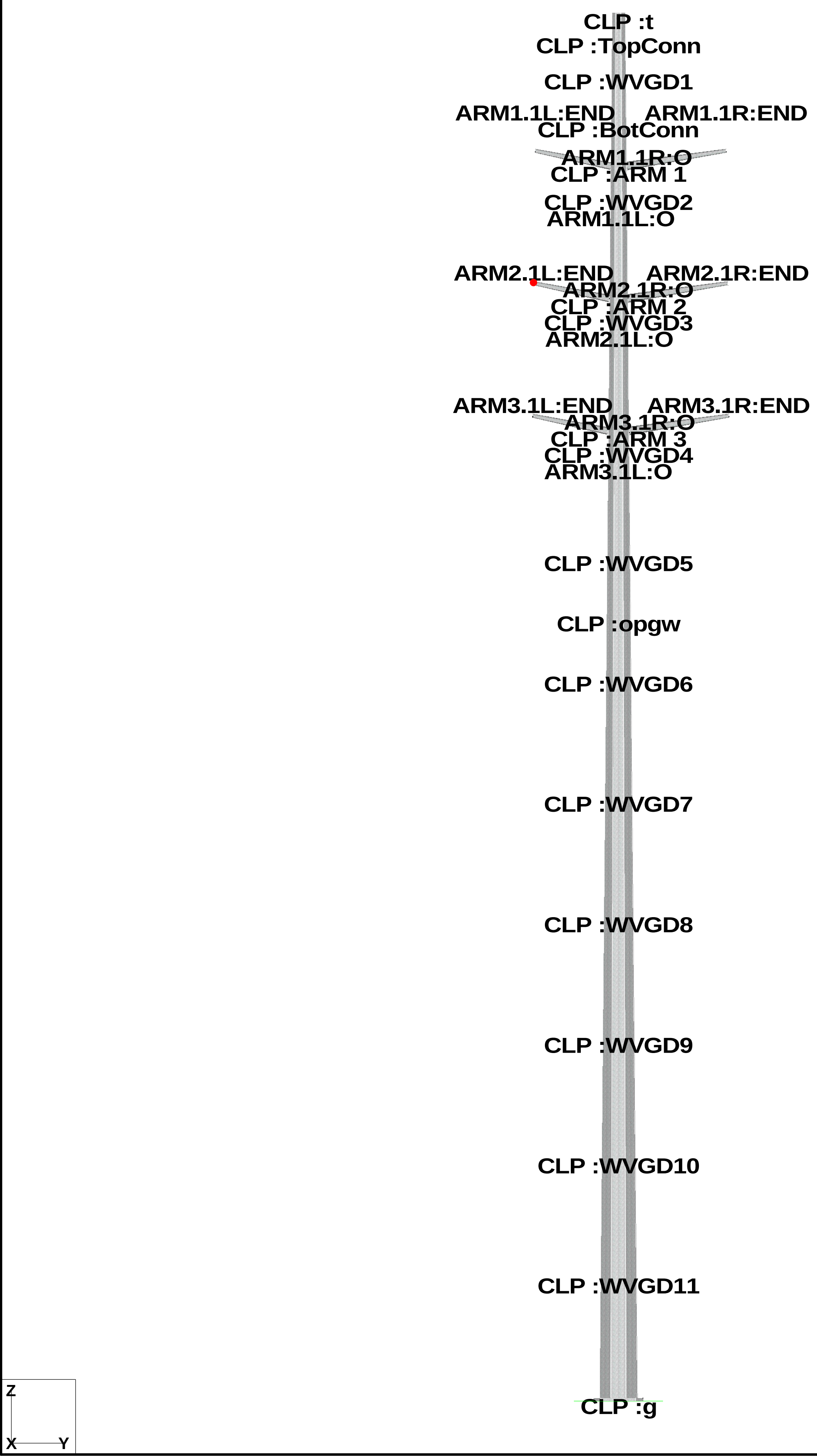
$$Extreme\_Wind_{Vert} := \overrightarrow{\left(N_{coax} \cdot W_{coax} \cdot Coax_{Span} \cdot OF_{EWV}\right)}$$

Extreme Wind Transverse Load =

$$Extreme\_Wind_{Trans} := \overrightarrow{\left[\left(qz \cdot psf \cdot A \cdot Cd_{coax}\right) \cdot Coax_{Span} \cdot OF_{EWT}\right]}$$

$$Extreme\_Wind_{Vert} = \begin{pmatrix} 158 \\ 158 \\ 158 \\ 158 \\ 158 \\ 158 \\ 158 \\ 158 \\ 158 \\ 158 \end{pmatrix} lb \qquad Extreme\_Wind_{Trans} = \begin{pmatrix} 198 \\ 198 \\ 198 \\ 198 \\ 198 \\ 198 \\ 198 \\ 198 \\ 198 \\ 198 \end{pmatrix} lb$$

Centek Engineering Inc, Project: "CLP Pole 1068"
PLS-POLE Version 12.50, 3:27:56 PM Wednesday, October 31, 2018
Undeformed geometry displayed



Project Name : 18058.58 - Darien, CT
Project Notes: Structure # 1068/ T-Mobile CT11290C
Project File : J:\Jobs\1805800.WI\58_CT11290C\05_Structural\Backup Documentation\Rev (6)\Calcs\PLS Pole\CLP Pole 1068.pol
Date run : 10:04:34 AM Friday, December 14, 2018
by : PLS-POLE Version 12.50
Licensed to : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.

Loads from file: j:\jobs\1805800.wi\58_ct11290c\05_structural\backup documentation\rev (6)\calcs\pls pole\cl&p pole # 1068.lca

*** Analysis Results:

Maximum element usage is 97.81% for Steel Pole "CLP " in load case "EXTREME"
Maximum insulator usage is 28.79% for Clamp "C17" in load case "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)	Bending Moment (ft-k)	Vert. Moment (ft-k)	Found. Usage %
NESC HEAVY	CLP :g	-0.10	-17.64	-47.37	17.64	1617.51	-5.43	1617.52	0.00	0.00
EXTREME	CLP :g	-0.03	-26.07	-24.75	26.07	2188.86	-1.35	2188.86	-0.00	0.00

Summary of Tip Deflections For All Load Cases:

Note: postive tip load results in positive deflection

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	CLP :t	0.22	89.85	-4.00	89.94	0.01	-6.81	0.00
EXTREME	CLP :t	0.05	121.03	-7.28	121.25	0.00	-9.55	0.00

Tubes Summary:

Pole Label	Tube Num.	Weight (lbs)	Load Case	Maximum Usage %	Resultant Moment (ft-k)
CLP	1	1854	EXTREME	96.86	379.48
CLP	2	3496	EXTREME	97.25	1121.28
CLP	3	4553	EXTREME	89.99	1804.18
CLP	4	2253	EXTREME	97.81	2188.86

*** 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)
CLP	97.81	EXTREME	22	13365.5

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
ARM1.1R	55.24	NESC HEAVY	1	97.0
ARM1.1L	40.79	NESC HEAVY	1	67.4
ARM2.1R	55.52	NESC HEAVY	1	97.0
ARM2.1L	41.22	NESC HEAVY	1	67.4
ARM3.1R	55.96	NESC HEAVY	1	97.0
ARM3.1L	41.88	NESC HEAVY	1	67.4

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC HEAVY	78.43	CLP	Steel Pole
EXTREME	97.81	CLP	Steel Pole

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number
NESC HEAVY	78.43	CLP	17
EXTREME	97.81	CLP	22

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	CLP	1	15.491	46.156	1617.507	-5.435	39.164	63.726	3	79.793	2.321	71.21
EXTREME	CLP	1	15.491	23.542	2188.864	-1.349	51.393	83.623	3	104.563	2.658	93.44

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC HEAVY	55.96	ARM3.1R	1
EXTREME	25.90	ARM3.1R	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
C1	Clamp	9.45	NESC HEAVY	0.0
C2	Clamp	9.45	NESC HEAVY	0.0
C3	Clamp	9.45	NESC HEAVY	0.0
C4	Clamp	9.45	NESC HEAVY	0.0

C5	Clamp	9.45	NESC HEAVY	0.0
C6	Clamp	9.45	NESC HEAVY	0.0
C7	Clamp	2.31	NESC HEAVY	0.0
C8	Clamp	2.31	NESC HEAVY	0.0
C9	Clamp	2.31	NESC HEAVY	0.0
C10	Clamp	2.31	NESC HEAVY	0.0
C11	Clamp	2.31	NESC HEAVY	0.0
C12	Clamp	2.31	NESC HEAVY	0.0
C13	Clamp	2.31	NESC HEAVY	0.0
C14	Clamp	2.31	NESC HEAVY	0.0
C15	Clamp	2.31	NESC HEAVY	0.0
C16	Clamp	2.31	NESC HEAVY	0.0
C17	Clamp	28.79	EXTREME	0.0
C18	Clamp	15.28	EXTREME	0.0
C19	Clamp	2.31	NESC HEAVY	0.0
C20	Clamp	4.07	NESC HEAVY	0.0

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	493.2
Weight of Steel Poles:	13365.5
Total:	13858.7

*** End of Report

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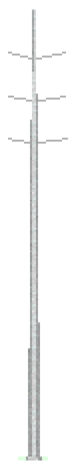

Project Name : 18058.58 - Darien, CT
Project Notes: Structure # 1068/ T-Mobile CT11290C
Project File : J:\Jobs\1805800.WI\58_CT11290C\05_Structural\Backup Documentation\Rev (6)\Calcs\PLS Pole\CLP Pole 1068.pol
Date run : 10:04:34 AM Friday, December 14, 2018
by : PLS-POLE Version 12.50
Licensed to : 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: No
- Use Alternate Convergence Process: No
- Steel poles checked with ASCE/SEI 48-11

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)
CLP 1068	1068	115.00	0	Yes	8F	13.26	37.4	0	1.6	4 tubes	0	0		Calculated	0.000	0.0000	0.0000

Steel Tubes Properties:

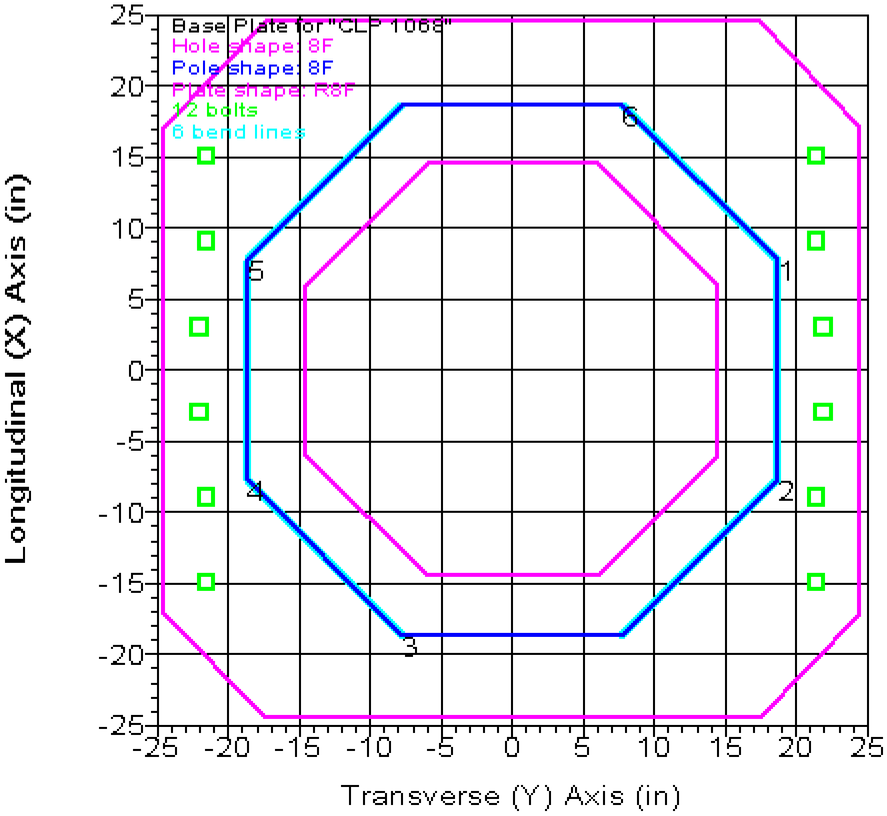
Pole Property	Tube No.	Length (ft)	Thickness (in)	Lap Length (ft)	Lap Factor	Lap Gap (in)	Yield Stress (ksi)	Moment Cap. Override (ft-k)	Tube Weight (lbs)	Center of Gravity (ft)	Calculated Taper (in/ft)	Tube Top Diameter (in)	Tube Bot. Diameter (in)	1.5x Diam. Lap Length (ft)	Actual Overlap (ft)
CLP 1068	1	38	0.25	2.833	0.000	0.000	50.000	0.000	1854	20.57	0.22619	13.26	21.86	2.670	2.833
CLP 1068	2	39.833	0.3125	4.000	0.000	0.000	65.000	0.000	3496	21.12	0.22619	20.72	29.73	3.638	4.000
CLP 1068	3	34	0.375	5.083	0.000	0.000	65.000	0.000	4553	17.69	0.22619	28.20	35.89	4.392	5.083
CLP 1068	4	15.083	0.375	0.000	0.000	0.000	65.000	0.000	2253	7.66	0.22619	33.99	37.40	0.000	0.000

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)
CLP 1068	49.000	R8F	2.750	1210	0.000	29.000	8F	490.00	55.000	2.250	44.000	12	22402.05	5009.80

Base Plate Bolt Coordinates for Property "CLP 1068":

Bolt X Coord.	Bolt Y Coord.	Bolt Angle (deg)
0.1364	1	0
0.4091	0.9773	0
0.6818	0.9773	0



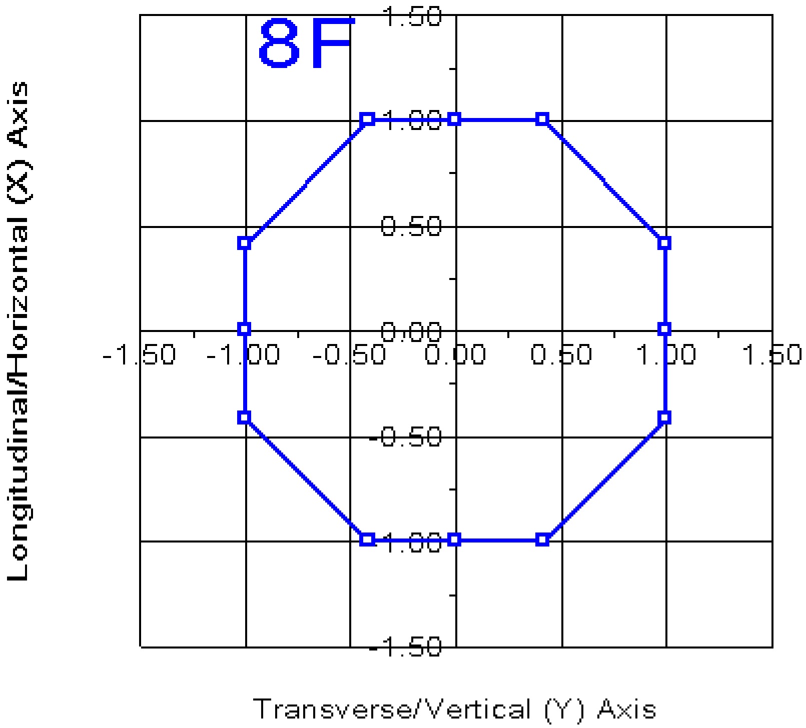
Steel Pole Connectivity:

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)
CLP			0	0	0	0	0	CLP 1068	17 labels		0.00	0

Relative Attachment Labels for Steel Pole "CLP ":

Joint Label	Distance From Origin/Top Joint (ft)	Global Z of Attach (ft)
CLP :ARM 1	12.67	0.00
CLP :ARM 2	23.67	0.00
CLP :ARM 3	34.67	0.00
CLP :WVGD1	0.00	110.00
CLP :WVGD2	0.00	100.00

CLP :WVGD3	0.00	90.00
CLP :WVGD4	0.00	80.00
CLP :WVGD5	0.00	70.00
CLP :WVGD6	0.00	60.00
CLP :WVGD7	0.00	50.00
CLP :WVGD8	0.00	40.00
CLP :WVGD9	0.00	30.00
CLP :WVGD10	0.00	20.00
CLP :WVGD11	0.00	10.00
CLP :TopConn	0.00	113.00
CLP :BotConn	0.00	106.00
CLP :opgw	0.00	65.00



Pole Steel Properties:

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)	T-Moment Capacity (ft-k)	L-Moment Capacity (ft-k)
CLP	CLP :t	CLP :t Ori	0.00	13.26	10.78	241.33	241.33	0.00	17.8	50.00	50.00	151.63	151.63
CLP	CLP :TopConn	CLP :TopConn End	2.00	13.72	11.16	267.38	267.38	0.00	18.6	50.00	50.00	162.45	162.45
CLP	CLP :TopConn	CLP :TopConn Ori	2.00	13.72	11.16	267.38	267.38	0.00	18.6	50.00	50.00	162.45	162.45
CLP	CLP :WVGD1	CLP :WVGD1 End	5.00	14.39	11.72	309.86	309.86	0.00	19.7	50.00	50.00	179.39	179.39
CLP	CLP :WVGD1	CLP :WVGD1 Ori	5.00	14.39	11.72	309.86	309.86	0.00	19.7	50.00	50.00	179.39	179.39

CLP	CLP :BotConn	CLP :BotConn	End	9.00	15.30	12.47	373.19	373.19	0.00	21.2	50.00	50.00	203.28	203.28
CLP	CLP :BotConn	CLP :BotConn	Ori	9.00	15.30	12.47	373.19	373.19	0.00	21.2	50.00	50.00	203.28	203.28
CLP	CLP :ARM 1	CLP :ARM 1	End	12.67	16.13	13.15	438.41	438.41	0.00	22.6	50.00	50.00	226.51	226.51
CLP	CLP :ARM 1	CLP :ARM 1	Ori	12.67	16.13	13.15	438.41	438.41	0.00	22.6	50.00	50.00	226.51	226.51
CLP	CLP :WVGD2	CLP :WVGD2	End	15.00	16.66	13.59	483.52	483.52	0.00	23.5	50.00	50.00	241.92	241.92
CLP	CLP :WVGD2	CLP :WVGD2	Ori	15.00	16.66	13.59	483.52	483.52	0.00	23.5	50.00	50.00	241.92	241.92
CLP	CLP :ARM 2	CLP :ARM 2	End	23.67	18.62	15.22	678.43	678.43	0.00	26.7	50.00	50.00	303.68	303.68
CLP	CLP :ARM 2	CLP :ARM 2	Ori	23.67	18.62	15.22	678.43	678.43	0.00	26.7	50.00	50.00	303.68	303.68
CLP	CLP :WVGD3	CLP :WVGD3	End	25.00	18.92	15.46	712.31	712.31	0.00	27.2	50.00	50.00	313.78	313.78
CLP	CLP :WVGD3	CLP :WVGD3	Ori	25.00	18.92	15.46	712.31	712.31	0.00	27.2	50.00	50.00	313.78	313.78
CLP	CLP :ARM 3	CLP :ARM 3	End	34.67	21.11	17.28	993.14	993.14	0.00	30.8	50.00	50.00	392.14	392.14
CLP	CLP :ARM 3	CLP :ARM 3	Ori	34.67	21.11	17.28	993.14	993.14	0.00	30.8	50.00	50.00	392.14	392.14
CLP	CLP :WVGD4	CLP :WVGD4	End	35.00	21.18	17.34	1003.84	1003.84	0.00	30.9	50.00	50.00	394.97	394.97
CLP	CLP :WVGD4	CLP :WVGD4	Ori	35.00	21.18	17.34	1003.84	1003.84	0.00	30.9	50.00	50.00	394.97	394.97
CLP	#CLP :0	SpliceT	End	35.17	21.22	17.37	1009.29	1009.29	0.00	31.0	50.00	50.00	396.41	396.41
CLP	#CLP :0	SpliceT	Ori	35.17	21.22	17.37	1009.29	1009.29	0.00	31.0	50.00	50.00	396.41	396.41
CLP	#CLP :1	SpliceB	End	38.00	21.36	21.79	1275.90	1275.90	0.00	24.2	65.00	65.00	647.16	647.16
CLP	#CLP :1	SpliceB	Ori	38.00	21.36	21.79	1275.90	1275.90	0.00	24.2	65.00	65.00	647.16	647.16
CLP	CLP :WVGD5	CLP :WVGD5	End	45.00	22.94	23.43	1586.03	1586.03	0.00	26.3	65.00	65.00	748.94	748.94
CLP	CLP :WVGD5	CLP :WVGD5	Ori	45.00	22.94	23.43	1586.03	1586.03	0.00	26.3	65.00	65.00	748.94	748.94
CLP	CLP :opgw	CLP :opgw	End	50.00	24.07	24.60	1835.88	1835.88	0.00	27.8	65.00	65.00	826.20	826.20
CLP	CLP :opgw	CLP :opgw	Ori	50.00	24.07	24.60	1835.88	1835.88	0.00	27.8	65.00	65.00	826.20	826.20
CLP	CLP :WVGD6	CLP :WVGD6	End	55.00	25.20	25.78	2110.68	2110.68	0.00	29.3	65.00	65.00	907.24	907.24
CLP	CLP :WVGD6	CLP :WVGD6	Ori	55.00	25.20	25.78	2110.68	2110.68	0.00	29.3	65.00	65.00	907.24	907.24
CLP	CLP :WVGD7	CLP :WVGD7	End	65.00	27.47	28.12	2739.89	2739.89	0.00	32.3	65.00	64.93	1079.55	1079.55
CLP	CLP :WVGD7	CLP :WVGD7	Ori	65.00	27.47	28.12	2739.89	2739.89	0.00	32.3	65.00	64.93	1079.55	1079.55
CLP	#CLP :2	SpliceT	End	71.00	28.82	29.52	3171.56	3171.56	0.00	34.1	65.00	63.40	1162.81	1162.81
CLP	#CLP :2	SpliceT	Ori	71.00	28.82	29.52	3171.56	3171.56	0.00	34.1	65.00	63.40	1162.81	1162.81
CLP	CLP :WVGD8	CLP :WVGD8	End	75.00	29.10	35.70	3893.75	3893.75	0.00	28.0	65.00	65.00	1449.44	1449.44
CLP	CLP :WVGD8	CLP :WVGD8	Ori	75.00	29.10	35.70	3893.75	3893.75	0.00	28.0	65.00	65.00	1449.44	1449.44
CLP	CLP :WVGD9	CLP :WVGD9	End	85.00	31.36	38.51	4887.70	4887.70	0.00	30.5	65.00	65.00	1688.23	1688.23
CLP	CLP :WVGD9	CLP :WVGD9	Ori	85.00	31.36	38.51	4887.70	4887.70	0.00	30.5	65.00	65.00	1688.23	1688.23
CLP	CLP :WVGD10	CLP :WVGD10	End	95.00	33.63	41.32	6037.86	6037.86	0.00	33.0	65.00	64.30	1924.41	1924.41
CLP	CLP :WVGD10	CLP :WVGD10	Ori	95.00	33.63	41.32	6037.87	6037.87	0.00	33.0	65.00	64.30	1924.41	1924.41
CLP	#CLP :3	SpliceT	End	99.92	34.74	42.70	6664.16	6664.16	0.00	34.2	65.00	63.26	2022.70	2022.70
CLP	#CLP :3	SpliceT	Ori	99.92	34.74	42.70	6664.16	6664.16	0.00	34.2	65.00	63.26	2022.70	2022.70
CLP	CLP :WVGD11	CLP :WVGD11	End	105.00	35.14	43.20	6899.42	6899.42	0.00	34.7	65.00	62.89	2058.03	2058.03
CLP	CLP :WVGD11	CLP :WVGD11	Ori	105.00	35.14	43.20	6899.42	6899.42	0.00	34.7	65.00	62.89	2058.03	2058.03
CLP	CLP :g	CLP :g	End	115.00	37.40	46.01	8335.60	8335.60	0.00	37.2	65.00	60.77	2257.31	2257.31

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
D281-6S		8T	0.1875	6.875	3.5	0	1.3	29000	1 point	Calculated	0	0	0	0	50	0	
D281-8D		8T	0.1875	7.875	3.5	0	1.3	29000	1 point	Calculated	0	0	0	0	50	0	

Intermediate Joints for Davit Property "D281-6S":

Joint Label	Horz. Offset	Vert. Offset

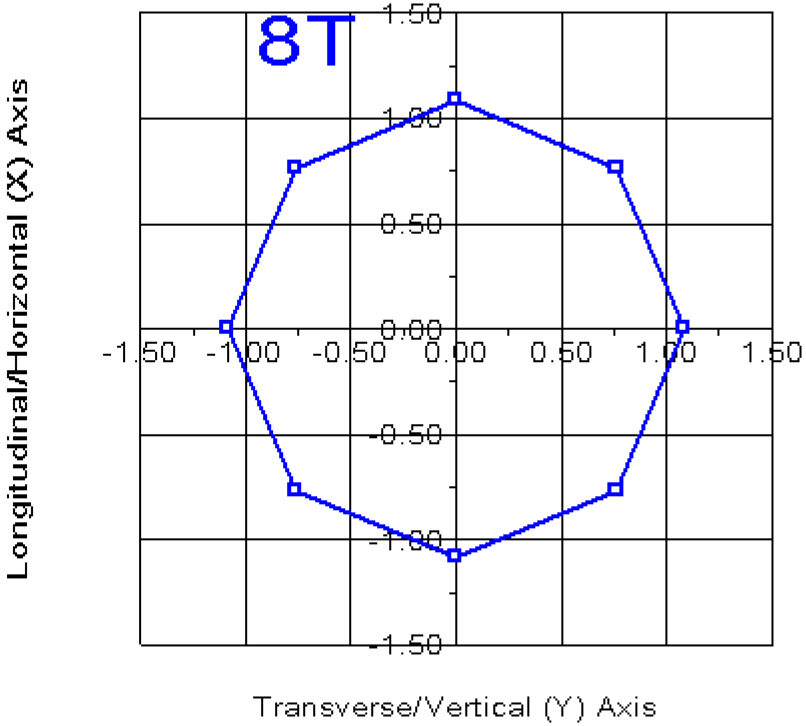
	(ft)	(ft)
END	6.25	-1.25

Intermediate Joints for Davit Property "D281-8D":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
END	8.25	-1.25

Tubular Davit Arm Connectivity:

Davit Label	Attach Label	Davit Property Set	Azimuth (deg)
ARM1.1R	CLP :ARM 1	D281-8D	0
ARM1.1L	CLP :ARM 1	D281-6S	180
ARM2.1R	CLP :ARM 2	D281-8D	0
ARM2.1L	CLP :ARM 2	D281-6S	180
ARM3.1R	CLP :ARM 3	D281-8D	0
ARM3.1L	CLP :ARM 3	D281-6S	180



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)	V-Moment Capacity (ft-k)	H-Moment Capacity (ft-k)
ARM1.1R	ARM1.1R:O	Origin	0.00	7.88	4.78	37.32	37.32	0.00	13.3	50.00	50.00	36.49	36.49
ARM1.1R	ARM1.1R:END	End	8.34	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58
ARM1.1L	ARM1.1L:O	Origin	0.00	6.88	4.16	24.58	24.58	0.00	11.0	50.00	50.00	27.52	27.52
ARM1.1L	ARM1.1L:END	End	6.37	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58
ARM2.1R	ARM2.1R:O	Origin	0.00	7.88	4.78	37.32	37.32	0.00	13.3	50.00	50.00	36.49	36.49
ARM2.1R	ARM2.1R:END	End	8.34	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58
ARM2.1L	ARM2.1L:O	Origin	0.00	6.88	4.16	24.58	24.58	0.00	11.0	50.00	50.00	27.52	27.52
ARM2.1L	ARM2.1L:END	End	6.37	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58
ARM3.1R	ARM3.1R:O	Origin	0.00	7.88	4.78	37.32	37.32	0.00	13.3	50.00	50.00	36.49	36.49
ARM3.1R	ARM3.1R:END	End	8.34	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58
ARM3.1L	ARM3.1L:O	Origin	0.00	6.88	4.16	24.58	24.58	0.00	11.0	50.00	50.00	27.52	27.52
ARM3.1L	ARM3.1L:END	End	6.37	3.50	2.06	2.99	2.99	0.00	3.6	50.00	50.00	6.58	6.58

*** Insulator Data

Clamp Properties:

Label	Stock Number	Holding Capacity (lbs)
CLAMP		3e+004

Clamp Insulator Connectivity:

Clamp Label	Structure And Tip Attach	Property Set	Min. Required Vertical Load (uplift) (lbs)
C1	ARM1.1R:END	CLAMP	No Limit
C2	ARM1.1L:END	CLAMP	No Limit
C3	ARM2.1R:END	CLAMP	No Limit
C4	ARM2.1L:END	CLAMP	No Limit
C5	ARM3.1R:END	CLAMP	No Limit
C6	ARM3.1L:END	CLAMP	No Limit
C7	CLP :WVGD1	CLAMP	No Limit
C8	CLP :WVGD2	CLAMP	No Limit
C9	CLP :WVGD3	CLAMP	No Limit
C10	CLP :WVGD4	CLAMP	No Limit
C11	CLP :WVGD5	CLAMP	No Limit
C12	CLP :WVGD6	CLAMP	No Limit
C13	CLP :WVGD7	CLAMP	No Limit
C14	CLP :WVGD8	CLAMP	No Limit
C15	CLP :WVGD9	CLAMP	No Limit
C16	CLP :WVGD10	CLAMP	No Limit
C17	CLP :TopConn	CLAMP	No Limit

C18	CLP :BotConn	CLAMP	No Limit
C19	CLP :WVGD11	CLAMP	No Limit
C20	CLP :opgw	CLAMP	No Limit

*** Loads Data

Loads from file: j:\jobs\1805800.wi\58_ct11290c\05_structural\backup documentation\rev (6)\calcs\pls pole\cl&p pole # 1068.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)	115.00 (ft)
Structure height	115.00 (ft)
Structure height above ground	115.00 (ft)

Vector Load Cases:

Load Case Description	Dead Load Factor	Wind Area Factor	SF for Steel Poles Tubular and Towers	SF for Wood Poles	SF for Conc. 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)	Temperature (deg F)	Pole Deflection Check	Pole Deflection Limit % or (ft)
NESC HEAVY	1.5000	2.5000	1.00000	0.6500	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	21 loads	Wind on All	4	0	0.000	0.000	0.0	No Limit	0
EXTREME	1.0000	1.0000	1.00000	0.6500	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	21 loads	NESC 2012	31	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
CLP :TopConn	1395	1034	0	Linnet
ARM1.1L:END	2279	1685	0	BITTERN
ARM1.1R:END	2279	1685	0	BITTERN
ARM2.1L:END	2279	1685	0	BITTERN
ARM2.1R:END	2279	1685	0	BITTERN
ARM3.1L:END	2279	1685	0	BITTERN
ARM3.1R:END	2279	1685	0	BITTERN
CLP :opgw	826	901	0	OPGW-012
CLP :WVGD1	688	75	0	Coax Cable
CLP :WVGD2	688	75	0	Coax Cable
CLP :WVGD3	688	75	0	Coax Cable
CLP :WVGD4	688	75	0	Coax Cable
CLP :WVGD5	688	75	0	Coax Cable
CLP :WVGD6	688	75	0	Coax Cable
CLP :WVGD7	688	75	0	Coax Cable
CLP :WVGD8	688	75	0	Coax Cable

CLP :WVGD9	688	75	0	Coax Cable
CLP :WVGD10	688	75	0	Coax Cable
CLP :WVGD11	688	75	0	Coax Cable
CLP :TopConn	0	1892	0	Mast Top Connection
CLP :BotConn	3514	-1027	0	Mast Bottom Connection

Point Loads for Load Case "EXTREME":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
CLP :TopConn	601	972	0	Linnet
ARM1.1L:END	1021	1830	0	BITTERN
ARM1.1R:END	1021	1830	0	BITTERN
ARM2.1L:END	1021	1830	0	BITTERN
ARM2.1R:END	1021	1830	0	BITTERN
ARM3.1L:END	1021	1830	0	BITTERN
ARM3.1R:END	1021	1830	0	BITTERN
CLP :opgw	244	828	0	OPGW-012
CLP :WVGD1	158	198	0	Coax Cable
CLP :WVGD2	158	198	0	Coax Cable
CLP :WVGD3	158	198	0	Coax Cable
CLP :WVGD4	158	198	0	Coax Cable
CLP :WVGD5	158	198	0	Coax Cable
CLP :WVGD6	158	198	0	Coax Cable
CLP :WVGD7	158	198	0	Coax Cable
CLP :WVGD8	158	198	0	Coax Cable
CLP :WVGD9	158	198	0	Coax Cable
CLP :WVGD10	158	198	0	Coax Cable
CLP :WVGD11	158	198	0	Coax Cable
CLP :TopConn	0	7645	0	Mast Top Connection
CLP :BotConn	1653	-4277	0	Mast Bottom Connection

Detailed Pole Loading Data for Load Case "EXTREME":

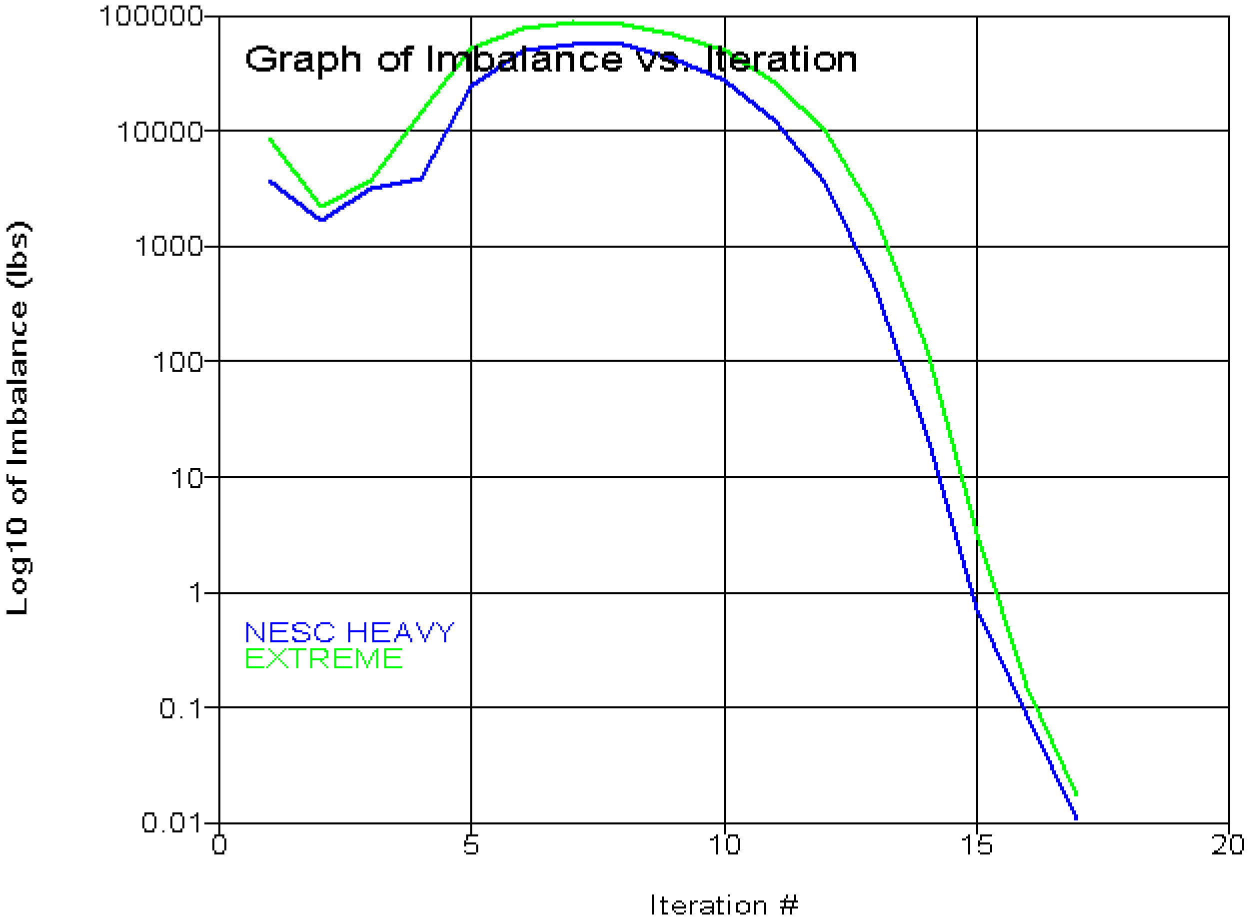
Notes: Does not include loads from equipment, arms, guys, braces, etc. or user input loads.
Wind load is calculated for the undeformed shape of a pole.

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)
CLP	CLP :t	CLP :TopConn	115.00	113.00	114.00	13.489	1.14e+006	1.000	31.88	0.00	74.64	71.67	0.00	0.00	71.67	0.00
CLP	CLP :TopConn	CLP :WVGD1	113.00	110.00	111.50	14.055	1.19e+006	1.000	31.88	0.00	116.74	112.01	0.00	0.00	112.01	0.00
CLP	CLP :WVGD1	CLP :BotConn	110.00	106.00	108.00	14.846	1.25e+006	1.000	31.88	0.00	164.59	157.75	0.00	0.00	157.75	0.00
CLP	CLP :BotConn	CLP :ARM 1	106.00	102.33	104.16	15.714	1.33e+006	1.000	31.88	0.00	159.98	153.19	0.00	0.00	153.19	0.00
CLP	CLP :ARM 1	CLP :WVGD2	102.33	100.00	101.17	16.392	1.39e+006	1.000	31.88	0.00	106.03	101.46	0.00	0.00	101.46	0.00
CLP	CLP :WVGD2	CLP :ARM 2	100.00	91.33	95.67	17.636	1.49e+006	1.000	31.88	0.00	424.93	406.19	0.00	0.00	406.19	0.00
CLP	CLP :ARM 2	CLP :WVGD3	91.33	90.00	90.67	18.767	1.59e+006	1.000	31.88	0.00	69.43	66.31	0.00	0.00	66.31	0.00
CLP	CLP :WVGD3	CLP :ARM 3	90.00	80.33	85.17	20.011	1.69e+006	1.000	31.88	0.00	538.68	514.04	0.00	0.00	514.04	0.00
CLP	CLP :ARM 3	CLP :WVGD4	80.33	80.00	80.17	21.142	1.79e+006	1.000	31.88	0.00	19.44	18.53	0.00	0.00	18.53	0.00
CLP	CLP :WVGD4		80.00	79.83	79.92	21.199	1.79e+006	1.000	31.88	0.00	9.86	9.40	0.00	0.00	9.40	0.00
CLP			79.83	77.00	78.42	21.288	1.8e+006	1.000	31.88	0.00	376.80	160.20	0.00	0.00	160.20	0.00
CLP		CLP :WVGD5	77.00	70.00	73.50	22.150	1.87e+006	1.000	31.88	0.00	538.70	411.88	0.00	0.00	411.88	0.00
CLP	CLP :WVGD5	CLP :opgw	70.00	65.00	67.50	23.507	1.99e+006	1.000	31.88	0.00	408.65	312.22	0.00	0.00	312.22	0.00
CLP	CLP :opgw	CLP :WVGD6	65.00	60.00	62.50	24.638	2.08e+006	1.000	31.88	0.00	428.58	327.24	0.00	0.00	327.24	0.00
CLP	CLP :WVGD6	CLP :WVGD7	60.00	50.00	55.00	26.334	2.23e+006	1.000	31.88	0.00	916.93	699.55	0.00	0.00	699.55	0.00

CLP	CLP :WVGD7		50.00	44.00	47.00	28.144	2.38e+006	1.000	31.88	0.00	588.42	448.57	0.00	0.00	448.57	0.00
CLP		CLP :WVGD8	44.00	40.00	42.00	28.962	2.45e+006	1.000	31.88	0.00	886.29	307.75	0.00	0.00	307.75	0.00
CLP	CLP :WVGD8	CLP :WVGD9	40.00	30.00	35.00	30.233	2.56e+006	1.000	31.88	0.00	1262.62	803.12	0.00	0.00	803.12	0.00
CLP	CLP :WVGD9	CLP :WVGD10	30.00	20.00	25.00	32.495	2.75e+006	1.000	31.88	0.00	1358.18	863.21	0.00	0.00	863.21	0.00
CLP	CLP :WVGD10		20.00	15.08	17.54	34.182	2.89e+006	1.000	31.88	0.00	702.89	446.47	0.00	0.00	446.47	0.00
CLP		CLP :WVGD11	15.08	10.00	12.54	34.938	2.95e+006	1.000	31.88	0.00	1485.74	471.76	0.00	0.00	471.76	0.00
CLP	CLP :WVGD11	CLP :g	10.00	0.00	5.00	36.269	3.07e+006	1.000	31.88	0.00	1517.86	963.46	0.00	0.00	963.46	0.00

*** Analysis Results:

Maximum element usage is 97.81% for Steel Pole "CLP " in load case "EXTREME"
Maximum insulator usage is 28.79% for Clamp "C17" in load case "EXTREME"



*** Analysis Results for Load Case No. 1 "NESC HEAVY" - Number of iterations in SAPS 17

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)
CLP :g	0	0	0	0.0000	0.0000	0.0000	0	0	0
CLP :t	0.01829	7.487	-0.3335	-6.8099	0.0149	0.0002	0.01829	7.487	114.7
CLP :TopConn	0.01777	7.25	-0.3194	-6.8099	0.0149	0.0002	0.01777	7.25	112.7

CLP :WVGD1	0.01699	6.894	-0.2982	-6.7957	0.0149	0.0002	0.01699	6.894	109.7
CLP :BotConn	0.01596	6.423	-0.2703	-6.7413	0.0149	0.0002	0.01596	6.423	105.7
CLP :ARM 1	0.01501	5.994	-0.2451	-6.6681	0.0148	0.0002	0.01501	5.994	102.1
CLP :WVGD2	0.01441	5.725	-0.2294	-6.5950	0.0147	0.0002	0.01441	5.725	99.77
CLP :ARM 2	0.01223	4.754	-0.1747	-6.2135	0.0141	0.0002	0.01223	4.754	91.16
CLP :WVGD3	0.0119	4.611	-0.1669	-6.1388	0.0140	0.0002	0.0119	4.611	89.83
CLP :ARM 3	0.00962	3.625	-0.1162	-5.4943	0.0129	0.0001	0.00962	3.625	80.21
CLP :WVGD4	0.009546	3.594	-0.1147	-5.4693	0.0129	0.0001	0.009546	3.594	79.89
CLP :WVGD5	0.0074	2.702	-0.07439	-4.7359	0.0116	0.0001	0.0074	2.702	69.93
CLP :opgw	0.006414	2.305	-0.05843	-4.3513	0.0109	0.0001	0.006414	2.305	64.94
CLP :WVGD6	0.005491	1.942	-0.04505	-3.9597	0.0102	0.0001	0.005491	1.942	59.95
CLP :WVGD7	0.003845	1.317	-0.02508	-3.1752	0.0086	0.0000	0.003845	1.317	49.97
CLP :WVGD8	0.002494	0.8281	-0.01273	-2.4250	0.0069	0.0000	0.002494	0.8281	39.99
CLP :WVGD9	0.001427	0.4599	-0.005628	-1.7720	0.0053	0.0000	0.001427	0.4599	29.99
CLP :WVGD10	0.0006474	0.2026	-0.001991	-1.1575	0.0036	0.0000	0.0006474	0.2026	20
CLP :WVGD11	0.0001685	0.05116	-0.0004782	-0.5712	0.0018	-0.0000	0.0001685	0.05116	10
ARM1.1R:O	0.01499	5.989	-0.3231	-6.6681	0.0148	0.0002	0.01499	6.661	102
ARM1.1R:END	0.015	6.082	-1.404	-7.8401	0.0148	0.0002	0.015	15	102.2
ARM1.1L:O	0.01503	5.999	-0.1671	-6.6681	0.0148	0.0002	0.01503	5.326	102.2
ARM1.1L:END	0.01556	6.17	0.4991	-5.9497	0.0149	0.0003	0.01556	-0.7522	104.1
ARM2.1R:O	0.0122	4.749	-0.2586	-6.2135	0.0141	0.0002	0.0122	5.525	91.07
ARM2.1R:END	0.01224	4.84	-1.274	-7.3918	0.0141	0.0002	0.01224	13.87	91.31
ARM2.1L:O	0.01225	4.759	-0.09072	-6.2135	0.0141	0.0002	0.01225	3.983	91.24
ARM2.1L:END	0.01274	4.915	0.5266	-5.4874	0.0142	0.0003	0.01274	-2.111	93.11
ARM3.1R:O	0.009599	3.621	-0.2004	-5.4943	0.0129	0.0001	0.009599	4.501	80.13
ARM3.1R:END	0.009657	3.709	-1.112	-6.6825	0.0130	0.0001	0.009657	12.84	80.47
ARM3.1L:O	0.009641	3.629	-0.03199	-5.4943	0.0129	0.0001	0.009641	2.75	80.3
ARM3.1L:END	0.01007	3.762	0.5078	-4.7560	0.0130	0.0002	0.01007	-3.367	82.09

Joint Support Reactions for Load Case "NESC HEAVY":

Joint Label	X Force (kips)	X Usage %	Y Force (kips)	Y Usage %	H-Shear 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 %	H-Bend-M Usage %	Z Moment (ft-k)	Z-M. Usage %	Max. Usage %
CLP :g	-0.10	0.0	-17.64	0.0	0.0	-47.37	0.0	0.0	50.54	0.0	1617.51	0.0	-5.4	0.0	0.0	0.00	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.
CLP	CLP :t	Origin	0.00	89.85	0.22	-4.00	-0.00	-0.00	0.0	-0.06	0.02	-0.00	-0.01	0.00	0.00	0.00	0.01	0.0	4
CLP	CLP :TopConn	End	2.00	87.00	0.21	-3.83	0.05	-0.00	0.0	-0.06	0.02	-0.00	-0.00	0.02	0.00	0.00	0.02	0.0	2
CLP	CLP :TopConn	Origin	2.00	87.00	0.21	-3.83	0.05	-0.00	-0.0	-1.24	3.16	-0.00	-0.11	0.00	0.59	0.00	1.02	2.0	4
CLP	CLP :WVGD1	End	5.00	82.73	0.20	-3.58	9.52	-0.01	-0.0	-1.24	3.16	-0.00	-0.11	2.65	0.21	0.00	2.79	5.6	2
CLP	CLP :WVGD1	Origin	5.00	82.73	0.20	-3.58	9.52	-0.01	0.0	-2.12	3.40	-0.00	-0.18	2.65	0.23	0.00	2.86	5.7	2
CLP	CLP :BotConn	End	9.00	77.07	0.19	-3.24	23.14	-0.02	0.0	-2.12	3.40	-0.00	-0.17	5.69	0.22	0.00	5.88	11.8	2
CLP	CLP :BotConn	Origin	9.00	77.07	0.19	-3.24	23.14	-0.02	0.0	-5.98	2.90	-0.01	-0.48	5.69	0.19	0.00	6.18	12.4	2
CLP	CLP :ARM 1	End	12.67	71.93	0.18	-2.94	33.77	-0.05	0.0	-5.98	2.90	-0.01	-0.45	7.46	0.18	0.00	7.92	15.8	2
CLP	CLP :ARM 1	Origin	12.67	71.93	0.18	-2.94	42.79	-0.05	-0.0	-10.56	6.88	-0.01	-0.80	9.45	0.42	0.00	10.28	20.6	2
CLP	CLP :WVGD2	End	15.00	68.70	0.17	-2.75	58.82	-0.08	-0.0	-10.56	6.88	-0.01	-0.78	12.16	0.40	0.00	12.96	25.9	2
CLP	CLP :WVGD2	Origin	15.00	68.70	0.17	-2.75	58.82	-0.08	-0.0	-11.66	7.16	-0.01	-0.86	12.16	0.42	0.00	13.04	26.1	2
CLP	CLP :ARM 2	End	23.67	57.05	0.15	-2.10	120.92	-0.20	-0.0	-11.66	7.16	-0.01	-0.77	19.92	0.37	0.00	20.70	41.4	2
CLP	CLP :ARM 2	Origin	23.67	57.05	0.15	-2.10	129.93	-0.20	-0.0	-16.47	11.14	-0.02	-1.08	21.41	0.58	0.00	22.51	45.0	2
CLP	CLP :WVGD3	End	25.00	55.33	0.14	-2.00	144.74	-0.22	-0.0	-16.47	11.14	-0.02	-1.06	23.08	0.57	0.00	24.16	48.3	2
CLP	CLP :WVGD3	Origin	25.00	55.33	0.14	-2.00	144.74	-0.22	-0.0	-17.66	11.38	-0.02	-1.14	23.08	0.58	0.00	24.24	48.5	2

CLP	CLP :ARM 3	End	34.67	43.50	0.12	-1.39	254.76	-0.44	-0.0	-17.66	11.38	-0.02	-1.02	32.51	0.52	0.00	33.54	67.1	2
CLP	CLP :ARM 3	Origin	34.67	43.50	0.12	-1.39	263.75	-0.44	-0.0	-22.61	15.25	-0.03	-1.31	33.65	0.70	0.00	34.98	70.0	2
CLP	CLP :WVGD4	End	35.00	43.12	0.11	-1.38	268.79	-0.45	-0.0	-22.61	15.25	-0.03	-1.30	34.05	0.70	0.00	35.37	70.7	2
CLP	CLP :WVGD4	Origin	35.00	43.12	0.11	-1.38	268.79	-0.45	-0.0	-23.31	15.39	-0.03	-1.34	34.05	0.70	0.00	35.42	70.8	2
CLP	SpliceT	End	35.17	42.93	0.11	-1.37	271.36	-0.45	-0.0	-23.31	15.39	-0.03	-1.34	34.25	0.70	0.00	35.61	71.2	2
CLP	SpliceT	Origin	35.17	42.93	0.11	-1.37	271.36	-0.45	-0.0	-23.63	15.42	-0.03	-1.36	34.25	0.70	0.00	35.63	71.3	2
CLP	SpliceB	End	38.00	39.76	0.11	-1.22	315.04	-0.53	-0.0	-23.63	15.42	-0.03	-1.08	31.66	0.56	0.00	32.76	50.4	2
CLP	SpliceB	Origin	38.00	39.76	0.11	-1.22	315.04	-0.53	-0.0	-24.41	15.48	-0.03	-1.12	31.66	0.56	0.00	32.80	50.5	2
CLP	CLP :WVGD5	End	45.00	32.42	0.09	-0.89	423.38	-0.76	-0.0	-24.41	15.48	-0.03	-1.04	36.77	0.52	0.00	37.82	58.2	2
CLP	CLP :WVGD5	Origin	45.00	32.42	0.09	-0.89	423.38	-0.76	-0.0	-25.92	15.65	-0.04	-1.11	36.77	0.53	0.00	37.89	58.3	2
CLP	CLP :opgw	End	50.00	27.66	0.08	-0.70	501.61	-0.94	-0.0	-25.92	15.65	-0.04	-1.05	39.49	0.50	0.00	40.56	62.4	2
CLP	CLP :opgw	Origin	50.00	27.66	0.08	-0.70	501.61	-0.94	-0.0	-27.41	16.64	-0.04	-1.11	39.49	0.54	0.00	40.62	62.5	2
CLP	CLP :WVGD6	End	55.00	23.31	0.07	-0.54	584.79	-1.15	-0.0	-27.41	16.64	-0.04	-1.06	41.93	0.51	0.00	43.00	66.2	2
CLP	CLP :WVGD6	Origin	55.00	23.31	0.07	-0.54	584.79	-1.14	-0.0	-29.27	16.80	-0.05	-1.14	41.93	0.52	0.00	43.08	66.3	2
CLP	CLP :WVGD7	End	65.00	15.80	0.05	-0.30	752.75	-1.62	-0.0	-29.27	16.80	-0.05	-1.04	45.32	0.47	0.00	46.36	74.0	2
CLP	CLP :WVGD7	Origin	65.00	15.80	0.05	-0.30	752.75	-1.62	-0.0	-31.26	16.93	-0.05	-1.11	45.32	0.48	0.00	46.43	74.1	2
CLP	SpliceT	End	71.00	12.09	0.04	-0.20	854.31	-1.94	-0.0	-31.26	16.93	-0.05	-1.06	46.63	0.45	0.00	47.69	78.4	2
CLP	SpliceT	Origin	71.00	12.09	0.04	-0.20	854.31	-1.94	-0.0	-32.48	16.96	-0.06	-1.10	46.63	0.46	0.00	47.73	78.4	2
CLP	CLP :WVGD8	End	75.00	9.94	0.03	-0.15	922.14	-2.18	-0.0	-32.48	16.96	-0.06	-0.91	41.39	0.38	0.00	42.31	65.1	2
CLP	CLP :WVGD8	Origin	75.00	9.94	0.03	-0.15	922.14	-2.18	-0.0	-34.91	17.13	-0.07	-0.98	41.39	0.38	0.00	42.38	65.2	2
CLP	CLP :WVGD9	End	85.00	5.52	0.02	-0.07	1093.47	-2.84	-0.0	-34.91	17.13	-0.07	-0.91	42.15	0.35	0.00	43.06	66.2	2
CLP	CLP :WVGD9	Origin	85.00	5.52	0.02	-0.07	1093.47	-2.83	-0.0	-37.75	17.31	-0.08	-0.98	42.15	0.36	0.00	43.13	66.4	2
CLP	CLP :WVGD10	End	95.00	2.43	0.01	-0.02	1266.53	-3.59	-0.0	-37.75	17.31	-0.08	-0.91	42.37	0.33	0.00	43.29	67.3	2
CLP	CLP :WVGD10	Origin	95.00	2.43	0.01	-0.02	1266.53	-3.59	-0.0	-40.12	17.45	-0.08	-0.97	42.37	0.33	0.00	43.35	67.4	2
CLP	SpliceT	End	99.92	1.38	0.00	-0.01	1352.32	-4.00	-0.0	-40.12	17.45	-0.08	-0.94	42.35	0.32	0.00	43.29	68.4	2
CLP	SpliceT	Origin	99.92	1.38	0.00	-0.01	1352.32	-4.00	-0.0	-41.85	17.49	-0.09	-0.98	42.35	0.32	0.00	43.33	68.5	2
CLP	CLP :WVGD11	End	105.00	0.61	0.00	-0.01	1441.23	-4.46	-0.0	-41.85	17.49	-0.09	-0.97	44.10	0.32	0.00	45.07	71.7	2
CLP	CLP :WVGD11	Origin	105.00	0.61	0.00	-0.01	1441.23	-4.46	-0.0	-44.93	17.63	-0.10	-1.04	44.10	0.32	0.00	45.14	74.9	2
CLP	CLP :g	End	115.00	0.00	0.00	0.00	1617.51	-5.43	-0.0	-44.93	17.63	-0.10	-0.98	43.61	0.30	0.00	44.58	73.4	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.
ARM1.1R	ARM1.1R:O	Origin	0.00	71.87	0.18	-3.88	-19.91	-0.01	0.0	1.64	2.39	0.00	0.34	27.28	0.00	0.00	27.62	55.2	1
ARM1.1R	ARM1.1R:END	End	8.34	72.98	0.18	-16.85	0.00	0.00	0.0	1.64	2.39	0.00	0.80	0.00	2.43	0.00	4.27	8.5	3
ARM1.1L	ARM1.1L:O	Origin	0.00	71.98	0.18	-2.00	-10.92	0.00	0.0	-2.31	1.71	-0.00	-0.56	19.84	0.00	0.00	20.40	40.8	1
ARM1.1L	ARM1.1L:END	End	6.37	74.04	0.19	5.99	-0.00	0.00	0.0	-2.31	1.71	-0.00	-1.12	0.00	1.74	0.00	3.22	6.4	3
ARM2.1R	ARM2.1R:O	Origin	0.00	56.99	0.15	-3.10	-20.01	-0.01	0.0	1.62	2.40	0.00	0.34	27.42	0.00	0.00	27.76	55.5	1
ARM2.1R	ARM2.1R:END	End	8.34	58.09	0.15	-15.29	0.00	0.00	0.0	1.62	2.40	0.00	0.79	0.00	2.44	0.00	4.30	8.6	3
ARM2.1L	ARM2.1L:O	Origin	0.00	57.10	0.15	-1.09	-11.04	0.00	0.0	-2.29	1.73	-0.00	-0.55	20.06	0.00	0.00	20.61	41.2	1
ARM2.1L	ARM2.1L:END	End	6.37	58.98	0.15	6.32	-0.00	0.00	0.0	-2.29	1.73	-0.00	-1.11	0.00	1.76	0.00	3.25	6.5	3
ARM3.1R	ARM3.1R:O	Origin	0.00	43.45	0.12	-2.40	-20.18	-0.00	0.0	1.59	2.42	0.00	0.33	27.65	0.00	0.00	27.98	56.0	1
ARM3.1R	ARM3.1R:END	End	8.34	44.50	0.12	-13.34	0.00	0.00	0.0	1.59	2.42	0.00	0.77	0.00	2.46	0.00	4.33	8.7	3
ARM3.1L	ARM3.1L:O	Origin	0.00	43.55	0.12	-0.38	-11.23	0.00	0.0	-2.27	1.76	-0.00	-0.55	20.39	0.00	0.00	20.94	41.9	1
ARM3.1L	ARM3.1L:END	End	6.37	45.15	0.12	6.09	-0.00	0.00	0.0	-2.27	1.76	-0.00	-1.10	0.00	1.79	0.00	3.29	6.6	3

Summary of Clamp Capacities and Usages for Load Case "NESC HEAVY":

Clamp Force	Input	Factored	Usage

Label	(kips)	Holding Capacity (kips)	Holding Capacity (kips)	%
C1	2.834	30.00	30.00	9.45
C2	2.834	30.00	30.00	9.45
C3	2.834	30.00	30.00	9.45
C4	2.834	30.00	30.00	9.45
C5	2.834	30.00	30.00	9.45
C6	2.834	30.00	30.00	9.45
C7	0.692	30.00	30.00	2.31
C8	0.692	30.00	30.00	2.31
C9	0.692	30.00	30.00	2.31
C10	0.692	30.00	30.00	2.31
C11	0.692	30.00	30.00	2.31
C12	0.692	30.00	30.00	2.31
C13	0.692	30.00	30.00	2.31
C14	0.692	30.00	30.00	2.31
C15	0.692	30.00	30.00	2.31
C16	0.692	30.00	30.00	2.31
C17	3.242	30.00	30.00	10.81
C18	3.661	30.00	30.00	12.20
C19	0.692	30.00	30.00	2.31
C20	1.222	30.00	30.00	4.07

*** Analysis Results for Load Case No. 2 "EXTREME" - Number of iterations in SAPS 17

Equilibrium Joint Positions and Rotations for Load Case "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)
CLP :g	0	0	0	0.0000	0.0000	0.0000	0	0	0
CLP :t	0.004388	10.09	-0.6065	-9.5462	0.0035	0.0001	0.004388	10.09	114.4
CLP :TopConn	0.004265	9.754	-0.5788	-9.5461	0.0035	0.0001	0.004265	9.754	112.4
CLP :WVGD1	0.004081	9.257	-0.5374	-9.5071	0.0035	0.0001	0.004081	9.257	109.5
CLP :BotConn	0.003835	8.6	-0.4831	-9.3586	0.0035	0.0001	0.003835	8.6	105.5
CLP :ARM 1	0.003611	8.009	-0.4351	-9.1718	0.0035	0.0001	0.003611	8.009	101.9
CLP :WVGD2	0.00347	7.64	-0.4058	-9.0281	0.0035	0.0001	0.00347	7.64	99.59
CLP :ARM 2	0.002952	6.324	-0.3051	-8.3743	0.0034	0.0001	0.002952	6.324	91.02
CLP :WVGD3	0.002875	6.131	-0.2911	-8.2584	0.0033	0.0001	0.002875	6.131	89.71
CLP :ARM 3	0.002332	4.814	-0.2008	-7.3132	0.0031	0.0001	0.002332	4.814	80.13
CLP :WVGD4	0.002314	4.772	-0.1981	-7.2781	0.0031	0.0001	0.002314	4.772	79.8
CLP :WVGD5	0.0018	3.59	-0.1277	-6.2762	0.0028	0.0000	0.0018	3.59	69.87
CLP :opgw	0.001563	3.064	-0.1	-5.7622	0.0026	0.0000	0.001563	3.064	64.9
CLP :WVGD6	0.00134	2.584	-0.07679	-5.2430	0.0025	0.0000	0.00134	2.584	59.92
CLP :WVGD7	0.0009417	1.756	-0.04226	-4.2104	0.0021	0.0000	0.0009417	1.756	49.96
CLP :WVGD8	0.0006127	1.107	-0.02097	-3.2256	0.0017	0.0000	0.0006127	1.107	39.98
CLP :WVGD9	0.0003515	0.6167	-0.008784	-2.3657	0.0013	0.0000	0.0003515	0.6167	29.99
CLP :WVGD10	0.00016	0.2726	-0.002705	-1.5517	0.0009	0.0000	0.00016	0.2726	20
CLP :WVGD11	4.175e-005	0.06906	-0.0004132	-0.7694	0.0005	0.0000	4.175e-005	0.06906	10
ARM1.1R:O	0.003603	8	-0.5423	-9.1718	0.0035	0.0001	0.003603	8.672	101.8
ARM1.1R:END	0.003578	8.094	-1.923	-9.6831	0.0035	0.0001	0.003578	17.02	101.7
ARM1.1L:O	0.003619	8.018	-0.328	-9.1718	0.0035	0.0001	0.003619	7.346	102
ARM1.1L:END	0.003773	8.293	0.6421	-9.0275	0.0035	0.0002	0.003773	1.371	104.2
ARM2.1R:O	0.002945	6.315	-0.4181	-8.3743	0.0034	0.0001	0.002945	7.091	90.91
ARM2.1R:END	0.00293	6.41	-1.684	-8.8980	0.0034	0.0001	0.00293	15.44	90.9
ARM2.1L:O	0.00296	6.332	-0.1921	-8.3743	0.0034	0.0001	0.00296	5.556	91.14
ARM2.1L:END	0.0031	6.577	0.6937	-8.2175	0.0034	0.0001	0.0031	-0.4489	93.27
ARM3.1R:O	0.002325	4.807	-0.3128	-7.3132	0.0031	0.0001	0.002325	5.686	80.02
ARM3.1R:END	0.002323	4.9	-1.426	-7.8534	0.0031	0.0001	0.002323	14.03	80.15
ARM3.1L:O	0.002339	4.821	-0.08889	-7.3132	0.0031	0.0001	0.002339	3.942	80.24
ARM3.1L:END	0.002459	5.027	0.6842	-7.1399	0.0031	0.0001	0.002459	-2.102	82.26

Joint Support Reactions for Load Case "EXTREME":

Joint Label	X Force (kips)	X Usage %	Y Force (kips)	Y Usage %	H-Shear 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 %	H-Bend-M Usage %	Z Moment (ft-k)	Z-M. Usage %	Max. Usage %
CLP :g	-0.03	0.0	-26.07	0.0	0.0	-24.75	0.0	0.0	35.95	0.0	2188.86	0.0	-1.3	0.0	0.0	-0.00	0.0	0.0

Detailed Steel Pole Usages for Load Case "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.
CLP	CLP :t	Origin	0.00	121.03	0.05	-7.28	-0.00	-0.00	0.0	-0.04	0.04	-0.00	-0.00	0.00	0.01	0.00	0.01	0.0	4
CLP	CLP :TopConn	End	2.00	117.05	0.05	-6.95	0.08	-0.00	0.0	-0.04	0.04	-0.00	-0.00	0.03	0.00	0.00	0.03	0.1	2
CLP	CLP :TopConn	Origin	2.00	117.05	0.05	-6.95	0.08	-0.00	-0.0	0.70	8.74	-0.00	0.06	0.00	1.62	0.00	2.81	5.6	4

CLP	CLP :WVGD1	End	5.00	111.08	0.05	-6.45	26.31	-0.00	-0.0	0.70	8.74	-0.00	0.06	7.33	0.59	0.00	7.47	14.9	2
CLP	CLP :WVGD1	Origin	5.00	111.08	0.05	-6.45	26.31	-0.00	0.0	0.43	9.12	-0.00	0.04	7.33	0.62	0.00	7.45	14.9	2
CLP	CLP :BotConn	End	9.00	103.20	0.05	-5.80	62.79	-0.01	0.0	0.43	9.12	-0.00	0.03	15.45	0.58	0.00	15.51	31.0	2
CLP	CLP :BotConn	Origin	9.00	103.20	0.05	-5.80	62.79	-0.01	0.0	-2.08	5.34	-0.00	-0.17	15.45	0.34	0.00	15.62	31.2	2
CLP	CLP :ARM 1	End	12.67	96.11	0.04	-5.22	82.41	-0.01	0.0	-2.08	5.34	-0.00	-0.16	18.19	0.32	0.00	18.36	36.7	2
CLP	CLP :ARM 1	Origin	12.67	96.11	0.04	-5.22	88.93	-0.01	0.0	-3.81	9.45	-0.00	-0.29	19.63	0.57	0.00	19.94	39.9	2
CLP	CLP :WVGD2	End	15.00	91.68	0.04	-4.87	110.94	-0.02	0.0	-3.81	9.45	-0.00	-0.28	22.93	0.55	0.00	23.23	46.5	2
CLP	CLP :WVGD2	Origin	15.00	91.68	0.04	-4.87	110.94	-0.02	0.0	-4.26	9.93	-0.00	-0.31	22.93	0.58	0.00	23.27	46.5	2
CLP	CLP :ARM 2	End	23.67	75.88	0.04	-3.66	197.05	-0.04	0.0	-4.26	9.93	-0.00	-0.28	32.45	0.52	0.00	32.74	65.5	2
CLP	CLP :ARM 2	Origin	23.67	75.88	0.04	-3.66	203.60	-0.04	0.0	-6.22	14.11	-0.00	-0.41	33.52	0.74	0.00	33.96	67.9	2
CLP	CLP :WVGD3	End	25.00	73.57	0.03	-3.49	222.36	-0.05	0.0	-6.22	14.11	-0.00	-0.40	35.44	0.72	0.00	35.86	71.7	2
CLP	CLP :WVGD3	Origin	25.00	73.57	0.03	-3.49	222.36	-0.05	0.0	-6.77	14.60	-0.01	-0.44	35.44	0.75	0.00	35.90	71.8	2
CLP	CLP :ARM 3	End	34.67	57.77	0.03	-2.41	363.55	-0.10	0.0	-6.77	14.60	-0.01	-0.39	46.36	0.67	0.00	46.77	93.5	2
CLP	CLP :ARM 3	Origin	34.67	57.77	0.03	-2.41	370.13	-0.10	0.0	-8.90	18.75	-0.01	-0.52	47.20	0.86	0.00	47.74	95.5	2
CLP	CLP :WVGD4	End	35.00	57.27	0.03	-2.38	376.31	-0.10	0.0	-8.90	18.75	-0.01	-0.51	47.64	0.86	0.00	48.18	96.4	2
CLP	CLP :WVGD4	Origin	35.00	57.27	0.03	-2.38	376.31	-0.10	0.0	-9.05	18.98	-0.01	-0.52	47.64	0.87	0.00	48.19	96.4	2
CLP	SpliceT	End	35.17	57.01	0.03	-2.36	379.48	-0.10	0.0	-9.05	18.98	-0.01	-0.52	47.87	0.87	0.00	48.42	96.8	2
CLP	SpliceT	Origin	35.17	57.01	0.03	-2.36	379.48	-0.10	0.0	-9.30	19.06	-0.01	-0.54	47.87	0.87	0.00	48.43	96.9	2
CLP	SpliceB	End	38.00	52.79	0.03	-2.10	433.47	-0.12	0.0	-9.30	19.06	-0.01	-0.43	43.54	0.70	0.00	43.99	67.7	2
CLP	SpliceB	Origin	38.00	52.79	0.03	-2.10	433.47	-0.12	0.0	-9.91	19.32	-0.01	-0.45	43.54	0.70	0.00	44.01	67.7	2
CLP	CLP :WVGD5	End	45.00	43.07	0.02	-1.53	568.68	-0.18	0.0	-9.91	19.32	-0.01	-0.42	49.36	0.65	0.00	49.80	76.6	2
CLP	CLP :WVGD5	Origin	45.00	43.07	0.02	-1.53	568.68	-0.17	0.0	-10.73	19.83	-0.01	-0.46	49.36	0.67	0.00	49.83	76.7	2
CLP	CLP :opgw	End	50.00	36.77	0.02	-1.20	667.83	-0.22	0.0	-10.73	19.83	-0.01	-0.44	52.55	0.64	0.00	53.00	81.5	2
CLP	CLP :opgw	Origin	50.00	36.77	0.02	-1.20	667.83	-0.22	0.0	-11.49	20.94	-0.01	-0.47	52.55	0.68	0.00	53.03	81.6	2
CLP	CLP :WVGD6	End	55.00	31.01	0.02	-0.92	772.50	-0.27	0.0	-11.49	20.94	-0.01	-0.45	55.35	0.64	0.00	55.81	85.9	2
CLP	CLP :WVGD6	Origin	55.00	31.01	0.02	-0.92	772.50	-0.27	0.0	-12.58	21.56	-0.01	-0.49	55.35	0.66	0.00	55.85	85.9	2
CLP	CLP :WVGD7	End	65.00	21.07	0.01	-0.51	988.07	-0.38	0.0	-12.58	21.56	-0.01	-0.45	59.44	0.61	0.00	59.89	92.2	2
CLP	CLP :WVGD7	Origin	65.00	21.07	0.01	-0.51	988.07	-0.38	0.0	-13.79	22.20	-0.01	-0.49	59.44	0.63	0.00	59.94	92.3	2
CLP	SpliceT	End	71.00	16.15	0.01	-0.34	1121.28	-0.46	0.0	-13.79	22.20	-0.01	-0.47	61.15	0.60	0.00	61.63	97.2	2
CLP	SpliceT	Origin	71.00	16.15	0.01	-0.34	1121.28	-0.46	0.0	-14.72	22.50	-0.01	-0.50	61.15	0.60	0.00	61.66	97.2	2
CLP	CLP :WVGD8	End	75.00	13.29	0.01	-0.25	1211.28	-0.52	0.0	-14.72	22.50	-0.01	-0.41	54.33	0.50	0.00	54.75	84.2	2
CLP	CLP :WVGD8	Origin	75.00	13.29	0.01	-0.25	1211.28	-0.52	0.0	-16.18	23.16	-0.02	-0.45	54.33	0.51	0.00	54.79	84.3	2
CLP	CLP :WVGD9	End	85.00	7.40	0.00	-0.11	1442.84	-0.69	0.0	-16.18	23.16	-0.02	-0.42	55.56	0.48	0.00	55.99	86.1	2
CLP	CLP :WVGD9	Origin	85.00	7.40	0.00	-0.11	1442.84	-0.69	0.0	-17.99	24.00	-0.02	-0.47	55.56	0.49	0.00	56.04	86.2	2
CLP	CLP :WVGD10	End	95.00	3.27	0.00	-0.03	1682.80	-0.88	0.0	-17.99	24.00	-0.02	-0.44	56.24	0.46	0.00	56.68	88.1	2
CLP	CLP :WVGD10	Origin	95.00	3.27	0.00	-0.03	1682.80	-0.88	0.0	-19.43	24.69	-0.02	-0.47	56.24	0.47	0.00	56.72	88.2	2
CLP	SpliceT	End	99.92	1.87	0.00	-0.01	1804.18	-0.98	0.0	-19.43	24.69	-0.02	-0.45	56.44	0.46	0.00	56.90	89.9	2
CLP	SpliceT	Origin	99.92	1.87	0.00	-0.01	1804.18	-0.98	0.0	-20.69	25.03	-0.02	-0.48	56.44	0.46	0.00	56.93	90.0	2
CLP	CLP :WVGD11	End	105.00	0.83	0.00	-0.00	1931.40	-1.10	0.0	-20.69	25.03	-0.02	-0.48	59.03	0.46	0.00	59.52	94.6	2
CLP	CLP :WVGD11	Origin	105.00	0.83	0.00	-0.00	1931.40	-1.10	0.0	-22.60	25.75	-0.03	-0.52	59.03	0.47	0.00	59.56	94.7	2
CLP	CLP :g	End	115.00	0.00	0.00	0.00	2188.86	-1.35	0.0	-22.60	25.75	-0.03	-0.49	58.94	0.44	0.00	59.44	97.8	2

Detailed Tubular Davit Arm Usages for Load Case "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.
ARM1.1R	ARM1.1R:O	Origin	0.00	96.01	0.04	-6.51	-8.68	-0.00	0.0	1.85	1.04	0.00	0.39	11.90	0.00	0.00	12.29	24.6	1
ARM1.1R	ARM1.1R:END	End	8.34	97.12	0.04	-23.08	0.00	0.00	0.0	1.85	1.04	0.00	0.90	0.00	1.06	0.00	2.04	4.1	3
ARM1.1L	ARM1.1L:O	Origin	0.00	96.21	0.04	-3.94	-2.19	0.00	0.0	-2.08	0.34	-0.00	-0.50	3.99	0.00	0.00	4.49	9.0	1
ARM1.1L	ARM1.1L:END	End	6.37	99.52	0.05	7.70	-0.00	0.00	0.0	-2.08	0.34	-0.00	-1.01	0.00	0.35	0.00	1.18	2.4	3
ARM2.1R	ARM2.1R:O	Origin	0.00	75.78	0.04	-5.02	-8.90	-0.00	0.0	1.83	1.07	0.00	0.38	12.19	0.00	0.00	12.57	25.1	1
ARM2.1R	ARM2.1R:END	End	8.34	76.92	0.04	-20.21	0.00	0.00	0.0	1.83	1.07	0.00	0.89	0.00	1.08	0.00	2.08	4.2	3
ARM2.1L	ARM2.1L:O	Origin	0.00	75.98	0.04	-2.31	-2.38	0.00	0.0	-2.08	0.37	-0.00	-0.50	4.33	0.00	0.00	4.83	9.7	1

ARM2.1L	ARM2.1L:END	End	6.37	78.92	0.04	8.32	-0.00	0.00	0.0	-2.08	0.37	-0.00	-1.01	0.00	0.38	0.00	1.21	2.4	3
ARM3.1R	ARM3.1R:O	Origin	0.00	57.68	0.03	-3.75	-9.17	-0.00	0.0	1.81	1.10	0.00	0.38	12.57	0.00	0.00	12.95	25.9	1
ARM3.1R	ARM3.1R:END	End	8.34	58.80	0.03	-17.11	0.00	0.00	0.0	1.81	1.10	0.00	0.88	0.00	1.12	0.00	2.13	4.3	3
ARM3.1L	ARM3.1L:O	Origin	0.00	57.85	0.03	-1.07	-2.64	0.00	0.0	-2.07	0.41	-0.00	-0.50	4.79	0.00	0.00	5.29	10.6	1
ARM3.1L	ARM3.1L:END	End	6.37	60.33	0.03	8.21	-0.00	0.00	0.0	-2.07	0.41	-0.00	-1.01	0.00	0.42	0.00	1.24	2.5	3

Summary of Clamp Capacities and Usages for Load Case "EXTREME":

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Usage %
C1	2.096	30.00	30.00	6.99
C2	2.096	30.00	30.00	6.99
C3	2.096	30.00	30.00	6.99
C4	2.096	30.00	30.00	6.99
C5	2.096	30.00	30.00	6.99
C6	2.096	30.00	30.00	6.99
C7	0.253	30.00	30.00	0.84
C8	0.253	30.00	30.00	0.84
C9	0.253	30.00	30.00	0.84
C10	0.253	30.00	30.00	0.84
C11	0.253	30.00	30.00	0.84
C12	0.253	30.00	30.00	0.84
C13	0.253	30.00	30.00	0.84
C14	0.253	30.00	30.00	0.84
C15	0.253	30.00	30.00	0.84
C16	0.253	30.00	30.00	0.84
C17	8.638	30.00	30.00	28.79
C18	4.585	30.00	30.00	15.28
C19	0.253	30.00	30.00	0.84
C20	0.863	30.00	30.00	2.88

*** 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)
CLP	97.81	EXTREME	22	13365.5

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 %
CLP	NESC HEAVY	1	0.645	1.558	-0.645	1.558	15.491	39.164	63.726	3	79.793	2.321	2.750	71.21
CLP	NESC HEAVY	2	-0.645	1.558	-1.558	0.645	15.492	34.812	56.645	1.5	78.693	2.188	2.750	63.30
CLP	NESC HEAVY	3	-1.558	-0.645	-0.645	-1.558	15.492	30.768	50.065	1.5	-69.758	2.057	2.750	55.94
CLP	NESC HEAVY	4	-0.645	-1.558	0.645	-1.558	15.491	35.355	57.528	3	-72.100	2.205	2.750	64.28
CLP	NESC HEAVY	5	0.645	-1.558	1.558	-0.645	15.492	31.407	51.104	1.5	-71.001	2.078	2.750	57.10
CLP	NESC HEAVY	6	1.558	0.645	0.645	1.558	15.492	34.174	55.606	1.5	77.451	2.168	2.750	62.13
CLP	EXTREME	1	0.645	1.558	-0.645	1.558	15.491	51.393	83.623	3	104.563	2.658	2.750	93.44
CLP	EXTREME	2	-0.645	1.558	-1.558	0.645	15.492	45.321	73.744	1.5	102.389	2.496	2.750	82.40
CLP	EXTREME	3	-1.558	-0.645	-0.645	-1.558	15.492	43.425	70.660	1.5	-98.157	2.444	2.750	78.95
CLP	EXTREME	4	-0.645	-1.558	0.645	-1.558	15.491	49.450	80.462	3	-100.640	2.608	2.750	89.91
CLP	EXTREME	5	0.645	-1.558	1.558	-0.645	15.492	43.584	70.918	1.5	-98.466	2.448	2.750	79.24
CLP	EXTREME	6	1.558	0.645	0.645	1.558	15.492	45.162	73.486	1.5	102.081	2.492	2.750	82.11

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
ARM1.1R	55.24	NESC HEAVY	1	97.0
ARM1.1L	40.79	NESC HEAVY	1	67.4
ARM2.1R	55.52	NESC HEAVY	1	97.0
ARM2.1L	41.22	NESC HEAVY	1	67.4
ARM3.1R	55.96	NESC HEAVY	1	97.0
ARM3.1L	41.88	NESC HEAVY	1	67.4

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC HEAVY	78.43	CLP	Steel Pole
EXTREME	97.81	CLP	Steel Pole

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number

NESC HEAVY	78.43	CLP	17
EXTREME	97.81	CLP	22

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	CLP	1	15.491	46.156	1617.507	-5.435	39.164	63.726	3	79.793	2.321	71.21
EXTREME	CLP	1	15.491	23.542	2188.864	-1.349	51.393	83.623	3	104.563	2.658	93.44

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC HEAVY	55.96	ARM3.1R	1
EXTREME	25.90	ARM3.1R	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
C1	Clamp	9.45	NESC HEAVY	0.0
C2	Clamp	9.45	NESC HEAVY	0.0
C3	Clamp	9.45	NESC HEAVY	0.0
C4	Clamp	9.45	NESC HEAVY	0.0
C5	Clamp	9.45	NESC HEAVY	0.0
C6	Clamp	9.45	NESC HEAVY	0.0
C7	Clamp	2.31	NESC HEAVY	0.0
C8	Clamp	2.31	NESC HEAVY	0.0
C9	Clamp	2.31	NESC HEAVY	0.0
C10	Clamp	2.31	NESC HEAVY	0.0
C11	Clamp	2.31	NESC HEAVY	0.0
C12	Clamp	2.31	NESC HEAVY	0.0
C13	Clamp	2.31	NESC HEAVY	0.0
C14	Clamp	2.31	NESC HEAVY	0.0
C15	Clamp	2.31	NESC HEAVY	0.0
C16	Clamp	2.31	NESC HEAVY	0.0
C17	Clamp	28.79	EXTREME	0.0
C18	Clamp	15.28	EXTREME	0.0
C19	Clamp	2.31	NESC HEAVY	0.0
C20	Clamp	4.07	NESC HEAVY	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	C1	Clamp	ARM1.1R:END	0.000	1.685	2.279	2.834
NESC HEAVY	C2	Clamp	ARM1.1L:END	0.000	1.685	2.279	2.834
NESC HEAVY	C3	Clamp	ARM2.1R:END	0.000	1.685	2.279	2.834

NESC HEAVY	C4	Clamp	ARM2.1L:END	0.000	1.685	2.279	2.834
NESC HEAVY	C5	Clamp	ARM3.1R:END	0.000	1.685	2.279	2.834
NESC HEAVY	C6	Clamp	ARM3.1L:END	0.000	1.685	2.279	2.834
NESC HEAVY	C7	Clamp	CLP :WVGD1	0.000	0.075	0.688	0.692
NESC HEAVY	C8	Clamp	CLP :WVGD2	0.000	0.075	0.688	0.692
NESC HEAVY	C9	Clamp	CLP :WVGD3	0.000	0.075	0.688	0.692
NESC HEAVY	C10	Clamp	CLP :WVGD4	0.000	0.075	0.688	0.692
NESC HEAVY	C11	Clamp	CLP :WVGD5	0.000	0.075	0.688	0.692
NESC HEAVY	C12	Clamp	CLP :WVGD6	0.000	0.075	0.688	0.692
NESC HEAVY	C13	Clamp	CLP :WVGD7	0.000	0.075	0.688	0.692
NESC HEAVY	C14	Clamp	CLP :WVGD8	0.000	0.075	0.688	0.692
NESC HEAVY	C15	Clamp	CLP :WVGD9	0.000	0.075	0.688	0.692
NESC HEAVY	C16	Clamp	CLP :WVGD10	0.000	0.075	0.688	0.692
NESC HEAVY	C17	Clamp	CLP :TopConn	0.000	2.926	1.395	3.242
NESC HEAVY	C18	Clamp	CLP :BotConn	0.000	-1.027	3.514	3.661
NESC HEAVY	C19	Clamp	CLP :WVGD11	0.000	0.075	0.688	0.692
NESC HEAVY	C20	Clamp	CLP :opgw	0.000	0.901	0.826	1.222
EXTREME	C1	Clamp	ARM1.1R:END	0.000	1.830	1.021	2.096
EXTREME	C2	Clamp	ARM1.1L:END	0.000	1.830	1.021	2.096
EXTREME	C3	Clamp	ARM2.1R:END	0.000	1.830	1.021	2.096
EXTREME	C4	Clamp	ARM2.1L:END	0.000	1.830	1.021	2.096
EXTREME	C5	Clamp	ARM3.1R:END	0.000	1.830	1.021	2.096
EXTREME	C6	Clamp	ARM3.1L:END	0.000	1.830	1.021	2.096
EXTREME	C7	Clamp	CLP :WVGD1	0.000	0.198	0.158	0.253
EXTREME	C8	Clamp	CLP :WVGD2	0.000	0.198	0.158	0.253
EXTREME	C9	Clamp	CLP :WVGD3	0.000	0.198	0.158	0.253
EXTREME	C10	Clamp	CLP :WVGD4	0.000	0.198	0.158	0.253
EXTREME	C11	Clamp	CLP :WVGD5	0.000	0.198	0.158	0.253
EXTREME	C12	Clamp	CLP :WVGD6	0.000	0.198	0.158	0.253
EXTREME	C13	Clamp	CLP :WVGD7	0.000	0.198	0.158	0.253
EXTREME	C14	Clamp	CLP :WVGD8	0.000	0.198	0.158	0.253
EXTREME	C15	Clamp	CLP :WVGD9	0.000	0.198	0.158	0.253
EXTREME	C16	Clamp	CLP :WVGD10	0.000	0.198	0.158	0.253
EXTREME	C17	Clamp	CLP :TopConn	0.000	8.617	0.601	8.638
EXTREME	C18	Clamp	CLP :BotConn	0.000	-4.277	1.653	4.585
EXTREME	C19	Clamp	CLP :WVGD11	0.000	0.198	0.158	0.253
EXTREME	C20	Clamp	CLP :opgw	0.000	0.828	0.244	0.863

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)**	**Torsional Moment (ft-k)**
NESC HEAVY	13.735	0.000	26.977	1279.499	-0.000	-0.000
EXTREME	18.326	0.000	10.362	1727.513	-0.000	-0.000

*** Weight of structure (lbs):
Weight of Tubular Davit Arms: 493.2
Weight of Steel Poles: 13365.5
Total: 13858.7

*** End of Report

Anchor Bolt Analysis:

Input Data:

Bolt Force:

Maximum Tension Force per Bolt = $T_{Max} := 105 \cdot kips$ (User Input from PLS-Pole)

Maximum Shear Force at Base = $V_{base} := 26.1 \cdot kips$ (User Input from PLS-Pole)

Anchor Bolt Data:

Use ASTM A432 Grade 60

Number of Anchor Bolts = $N := 12$ (User Input)

Bolt "Column" Distance = $l := 3.0 \cdot in$ (User Input)

Bolt Ultimate Strength = $F_u := 90 \cdot ksi$ (User Input)

Bolt Yeild Strength= $F_y := 60 \cdot ksi$ (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:

Stress Area of Bolt = $A_s := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Maximum Shear Force per Bolt = $V_{Max} := \frac{V_{base}}{N} = 2.2 \times 10^3 \, lbf$

Shear Stress per Bolt = $f_v := \frac{V_{Max}}{A_s} = 669.7 \, psi$

Tensile Stress Permitted = $F_t := \min\left(F_y, 0.83 \cdot F_u\right) = 60 \cdot ksi$

Shear Stress Permitted = $F_v := 0.65 F_y = 39 \cdot ksi$

Permitted Axial Tensile Stress in Conjuction with Shear = $F_{tv} := F_t \cdot \sqrt{1 - \left(\frac{f_v}{F_v}\right)^2} = 59.99 \cdot ksi$

Bolt Tension % of Capacity = $\frac{T_{Max}}{F_{tv} \cdot A_s} = 53.89 \cdot \%$

Condition1 = Condition1 := if$\left(\frac{T_{Max}}{F_{tv} \cdot A_s} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1QP+1OP	Power System Template: Custom

CT11290C_L600_4.1_draft

Section 1 - Site Information

Site ID: CT11290C
Status: Draft
Version: 4.1
Project Type: L600
Approved: Not Approved
Approved By: Not Approved
Last Modified: 5/11/2018 10:51:07 AM
Last Modified By: GSM1900\AMurill9

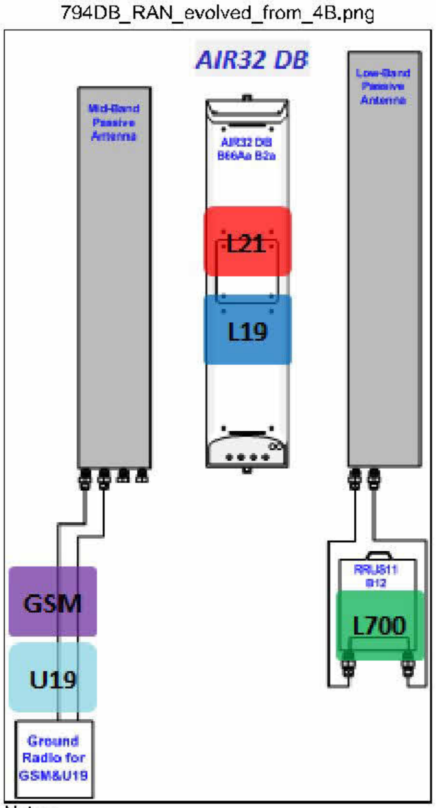
Site Name: Darien/ Dtwn & Rt-1
Site Class: Utility Lattice Tower
Site Type: Structure Non Building
Solution Type:
Plan Year:
Market: CONNECTICUT
Vendor: Ericsson
Landlord: <undefined>

Latitude: 41.0775700000
Longitude: -73.4675810000
Address: 3 Mechanic Street
City, State: Darien, CT
Region: NORTHEAST

RAN Template: 67D94B Outdoor		AL Template: 67D94B_1DP+1QP+1OP		
Sector Count: 3	Antenna Count: 3	Coax Line Count: 12	TMA Count: 0	RRU Count: 0

Section 2 - Existing Template Images

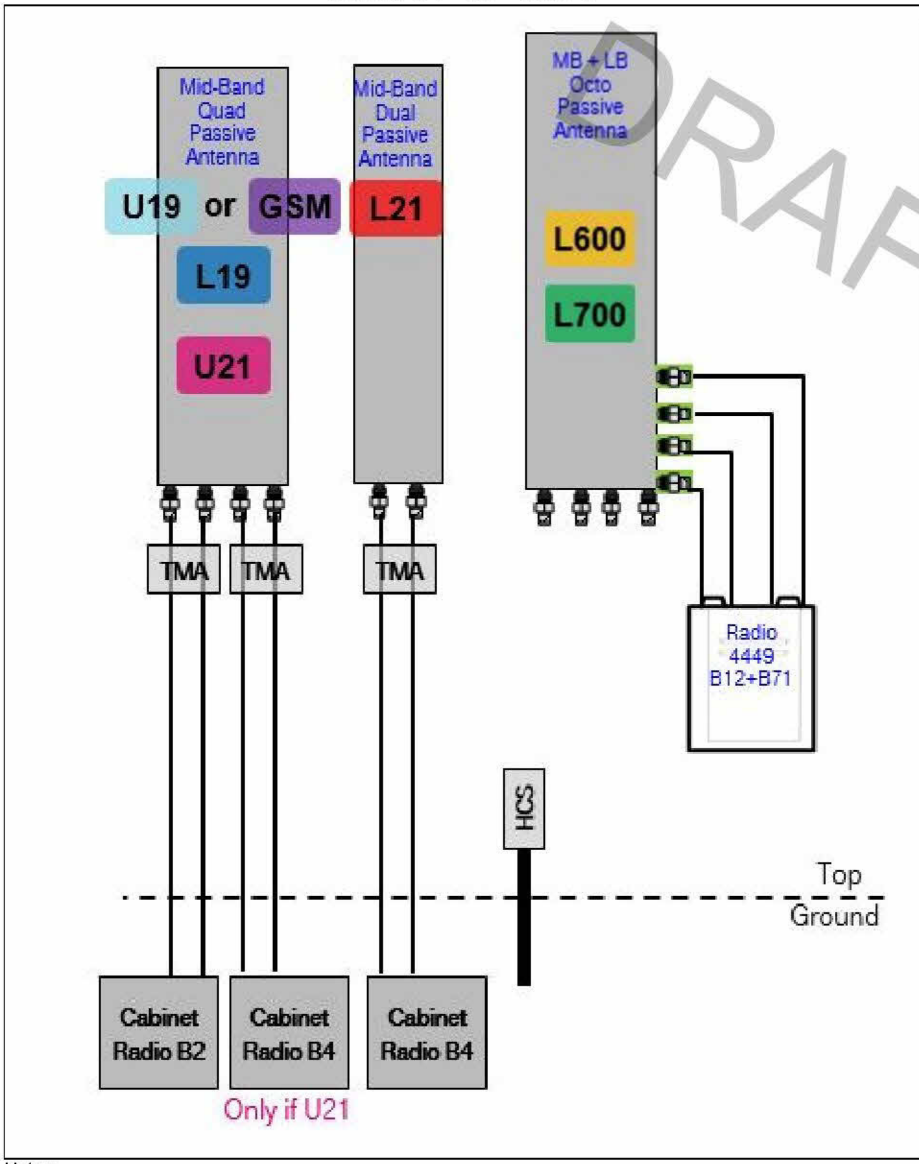
794DB_RAN_evolved_from_4B.png



Notes:

Section 3 - Proposed Template Images

67D94B_1DP+1QP+1OP.JPG



Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 794DB Outdoor (evolved from 4B)

Enclosure	1	2
Enclosure Type	RBS 6102	Ground Mount
Baseband	DUG20 (G1900); DUW30 (U1900 (DECOMMISSIONED)); DUW30 (U2100); DUS41 (L2100, L700)	
Multiplexer	XMU (L2100, L1900, L700)	
Radio	RUS01 B2 (x3) (L1900, G1900); RUS01 B2 (x3) (L1900); RUS01 B4 (x3) (U2100); RUS01 B4 (x3) (L2100)	RRUS11 B12 (x3) (L700)

Proposed RAN Equipment

Template: 67D94B Outdoor

Enclosure	1	2
Enclosure Type	RBS 6102	Ancillary Equipment
Baseband	BB 5216 (L2100, L1900, L700, L600); DUW30 (U2100); DUG20 (G1900); DUW30 (U1900 (DECOMMISSIONED))	
Multiplexer	XMU	
Radio	RUS01 B2 (x3) (L1900, G1900); RUS01 B2 (x3) (L1900); RUS01 B4 (x3) (U2100); RUS01 B4 (x3) (L2100)	

RAN Scope of Work:

Adding 6 - 1 1/4" coax lines

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Section 6 - A&L Equipment

Existing Template: Custom
Proposed Template: 67D94B_1DP+1QP+1OP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	110		
M. Tilt	0		
Height	120		
Ports	P1	P2	P3
Active Tech.	L1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.	U1900		
E. Tilt	2	2	2
Cables	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment			Andrew Smart Bias T (At Antenna)

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Sector 1 (Proposed) view from behind				
Coverage Type	A - Outdoor Macro			
Antenna	1			
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	110			
M. Tilt	0			
Height	120			
Ports	P1	P2	P3	P4
Active Tech.	L1900 G1900	U2100 L2100	L700 L600	L700 L600
Dark Tech.				
Restricted Tech.				
Decomm. Tech.				
E. Tilt				
Cables	Generic Feeder Coax **(x2)**	Generic Feeder Coax **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs				
Diplexers / Combiners				
Radio			Radio 4449 B71+B12 (At Cabinet)	
Sector Equipment				

Unconnected Equipment:

Scope of Work:

Adding 6 - 1 1/4" coax lines

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Sector 2 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	230		
M. Tilt	0		
Height	120		
Ports	P1	P2	P3
Active Tech.	L1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.	U1900		
E. Tilt	2	2	2
Cables	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment			Andrew Smart Bias T (At Antenna)

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Sector 2 (Proposed) view from behind				
Coverage Type	A - Outdoor Macro			
Antenna	1			
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	230			
M. Tilt	0			
Height	120			
Ports	P1	P2	P3	P4
Active Tech.	L1900 G1900	U2100 L2100	L700 L600	L700 L600
Dark Tech.				
Restricted Tech.				
Decomm. Tech.				
E. Tilt				
Cables	Generic Feeder Coax **(x2)**	Generic Feeder Coax **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs				
Diplexers / Combiners				
Radio			Radio 4449 B71+B12 (At Cabinet)	
Sector Equipment				

Unconnected Equipment:

Scope of Work:

Adding 6 - 1 1/4" coax lines

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Sector 3 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	350		
M. Tilt	0		
Height	120		
Ports	P1	P2	P3
Active Tech.	L1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.	U1900		
E. Tilt	2	2	2
Cables	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**	1-1/4" Coax - 143 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment			Andrew Smart Bias T (At Antenna)

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Sector 3 (Proposed) view from behind				
Coverage Type	A - Outdoor Macro			
Antenna	1			
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	350			
M. Tilt	0			
Height	120			
Ports	P1	P2	P3	P4
Active Tech.	L1900 G1900	U2100 L2100	L700 L600	L700 L600
Dark Tech.				
Restricted Tech.				
Decomm. Tech.				
E. Tilt				
Cables	Generic Feeder Coax **(x2)**	Generic Feeder Coax **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs				
Diplexers / Combiners				
Radio			Radio 4449 B71+B12 (At Cabinet)	
Sector Equipment				

Unconnected Equipment:

Scope of Work:

Adding 6 - 1 1/4" coax lines

RAN Template:	A&L Template:	Power System Template:
67D94B Outdoor	67D94B_1DP+1QP+1OP	Custom

CT11290C_L600_4.1_draft

Section 7 - Power Systems Equipment

Existing Power Systems Equipment
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Proposed Power Systems Equipment

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

FEATURES / BENEFITS

This antenna provides a 8 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- 24 Inch Width For Easier Zoning
- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality
- Superior elevation pattern performance across the entire electrical down tilt range
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional daisy chain of two high band RET motors for one single AISG point of high band tilt control.
- Low band arrays driven by a single RET motor

Technical Features

LOW BAND LEFT ARRAY (617-746 MHZ) [R1]

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	14.1 +/- .3	14.5 +/- .4
Horizontal Beamwidth @3dB	Deg	66.1+/-4.3	63.1+/-2.3
Vertical Beamwidth @3dB	Deg	14.2+/-0.8	13.0+/-0.5
Electrical Downtilt Range	Deg	0-14	
Upper Side Lobe Suppression 0 to +20	dB	20.5	21.4
Front-to-Back, at +/-30°, Copolar	dB	22.4	21.8
Cross Polar Discrimination (XPD) @ Boresight	dB	21.4	20.1
Cross Polar Discrimination (XPD) @ +/-60	dB	5.2	3.5
3rd Order PIM 2 x 43dBm	dBc	-153	
VSWR	-	1.5:1	
Cross Polar Isolation	dB	25	
Maximum Effective Power per Port	Watt	250	

LOW BAND RIGHT ARRAY (617-746 MHZ) [R2]

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	13.8 +/- .3	14.1 +/- .4
Horizontal Beamwidth @3dB	Deg	66.5+/-4.9	63.3+/-2.2
Vertical Beamwidth @3dB	Deg	14.2+/-0.8	12.9+/-0.6
Electrical Downtilt Range	Deg	0-14	
Upper Side Lobe Suppression 0 to +20	dB	20.3	21.3
Front-to-Back, at +/-30°, Copolar	dB	22.4	21.4
Cross Polar Discrimination (XPD) @ Boresight	dB	20.2	19.7
Cross Polar Discrimination (XPD) @ +/-60	dB	4.5	1.7
3rd Order PIM 2 x 43dBm	dBc	-153	
VSWR	-	1.5:1	
Cross Polar Isolation	dB	25	
Maximum Effective Power per Port	Watt	250	

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

HIGH BAND LEFT ARRAY (1695-2200 MHZ) [B1]

Frequency Band	MHz	1695-1880	1850-1990	1920-2200
Gain Over All Tilts	dBi	16.3 +/- 1	17.0 +/- .4	17.7 +/- .9
Horizontal Beamwidth @3dB	Deg	64.3+/-6.7	58.6+/-6.6	56.4+/-6.8
Vertical Beamwidth @3dB	Deg	6.0+/-0.6	5.5+/-0.5	5.2+/-0.5
Electrical Downtilt Range	Deg	2-12		
Upper Side Lobe Suppression 0 to +20	dB	14.9	15	15.1
Front-to-Back, at +/-30°, Copolar	dB	25.6	23.7	24.1
Cross Polar Discrimination (XPD) @ Boresight	dB	18.2	15	15.1
Cross Polar Discrimination (XPD) @ +/-60	dB	1.9	2.7	4.6
3rd Order PIM 2 x 43dBm	dBc	-153		
VSWR	-	1.5:1		
Cross Polar Isolation	dB	25		
Maximum Effective Power per Port	Watt	250		

HIGH BAND RIGHT ARRAY (1695-2200 MHZ) [B2]

Frequency Band	MHz	1695-1880	1850-1990	1920-2200
Gain Over All Tilts	dBi	16.2 +/- 1	17.0 +/- .6	17.7 +/- .9
Horizontal Beamwidth @3dB	Deg	64.8+/-7.6	58.7+/-5.7	56.7+/-6.4
Vertical Beamwidth @3dB	Deg	6.0+/-0.6	5.6+/-0.5	5.2+/-0.5
Electrical Downtilt Range	Deg	2-12		
Upper Side Lobe Suppression 0 to +20	dB	14.3	15.4	15.8
Front-to-Back, at +/-30°, Copolar	dB	26	25.1	24.9
Cross Polar Discrimination (XPD) @ Boresight	dB	16.8	15	15.7
Cross Polar Discrimination (XPD) @ +/-60	dB	1.4	3.5	5.5
3rd Order PIM 2 x 43dBm	dBc	-153		
VSWR	-	1.5:1		
Cross Polar Isolation	dB	25		
Maximum Effective Power per Port	Watt	250		

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

ELECTRICAL SPECIFICATIONS

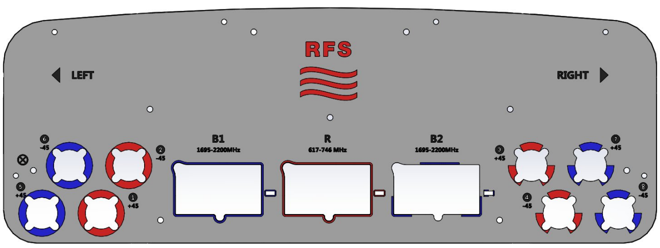
Impedance	Ohm	50.0
Polarization	Deg	±45°

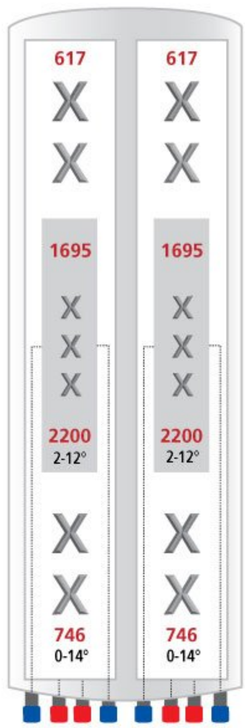
MECHANICAL SPECIFICATIONS

Dimensions - H x W x D	mm (in)	1829 x 609 x 215 (72 x 24 x 8.5)
Weight (Antenna Only)	kg (lb)	48 (106)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.3)
Packing size- HxWxD	mm (in)	1980 x 735 x 375 (77.9 x 28.9 x 14.8)
Shipping Weight	kg (lb)	70 (154)
Connector type		8 x 4.3-10 female at bottom + 6 AISG connectors (3 male, 3 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable) + Manual Override + External Tilt Indicator
Mounting Hardware Material		Galvanized steel
Radome Material / Color		Fiber Glass / Light Grey RAL7035

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		IEC 61000-4-5
Survival/Rated Wind Velocity	km/h	240 (150)
Wind Load @Rated Wind Front	N	1072.0
Wind Load @Rated Wind Side	N	326.0
Wind Load @Rated Wind Rear	N	1160.0
Environmental		ETSI 300-019-2-4 Class 4.1E





RADIO FREQUENCY SYSTEMS
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Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

ORDERING INFORMATION

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Shipping Weight
APXVAARR18_43-U-NA20	Field Replace RET included (3)	APM40-5E Beam tilt kit (included)	60-120mm	70 Kg

External Document Links

APM40_Series_Installation_Instructions
Manual_Overdrive_Instructions
Global RFS Website

Notes

All electrical parameters are compliant with BASTA NGMN 9.6 requirements.

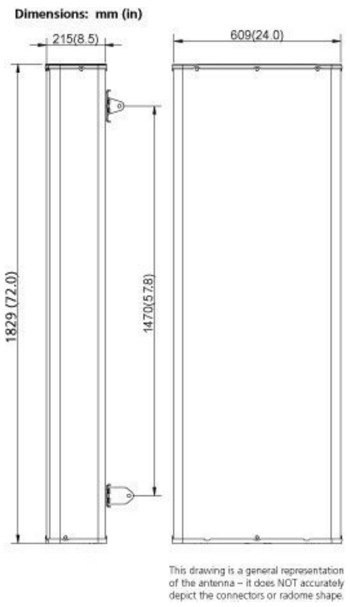
Available Configurations
APXVAARR18_43-U-NA20 -- External ACU is included -- shipping weight 69kg.

For additional mounting information please click "External Document Links".

This data is provisional and subject to changes.

External Link Reference

Global RFS Website	http://www.rfsworld.com



Product Specifications

COMMSCOPE®

POWERED BY ANDREW

ATSBT-TOP-FM-4G

Teletilt® Top Smart Bias Tee

- Injects AISG power and control signals onto a coaxial cable line
- Reduces cable and site lease costs by eliminating the need for AISG home run cables
- AISG 1.1 and 2.0 compliant
- Operates at 10-30 Vdc
- Weatherproof AISG connectors
- Intuitive schematics simplify and ensure proper installation
- Enhanced lightning protection plus grounding stud for additional surge protection
- 7-16 DIN female connector (BTS)
- 7-16 DIN male connector (ANT)

General Specifications

Smart Bias Tee Type	10–30 V Top
Brand	Teletilt®
Operating Frequency Band	694 – 2690 MHz

Electrical Specifications

EU Certification	CE
Protocol	AISG 1.1 | AISG 2.0
Antenna Interface Signal	dc Blocked | RF
BTS Interface Signal	AISG data | dc | RF
Interface Protocol Signal	Data | dc
Voltage Range	10–30 Vdc
VSWR | Return Loss	1.17:1 | 22 dB, typical
Power Consumption, maximum	0.6 W
RF Power, maximum	250 W @ 1850 MHz 500 W @ 850 MHz
Impedance	50 ohm
Insertion Loss, typical	0.1 dB
3rd Order IMD	-158.0 dBc (relative to carrier)
3rd Order IMD Test Method	Two +43 dBm carriers
Electromagnetic Compatibility (EMC)	CFR 47 Part 15, Subpart B, Class B | EN 55022, Class B | ICES-003 Issue 4 CAN/CSA-CEI/IEC CISPR 22:02

Mechanical Specifications

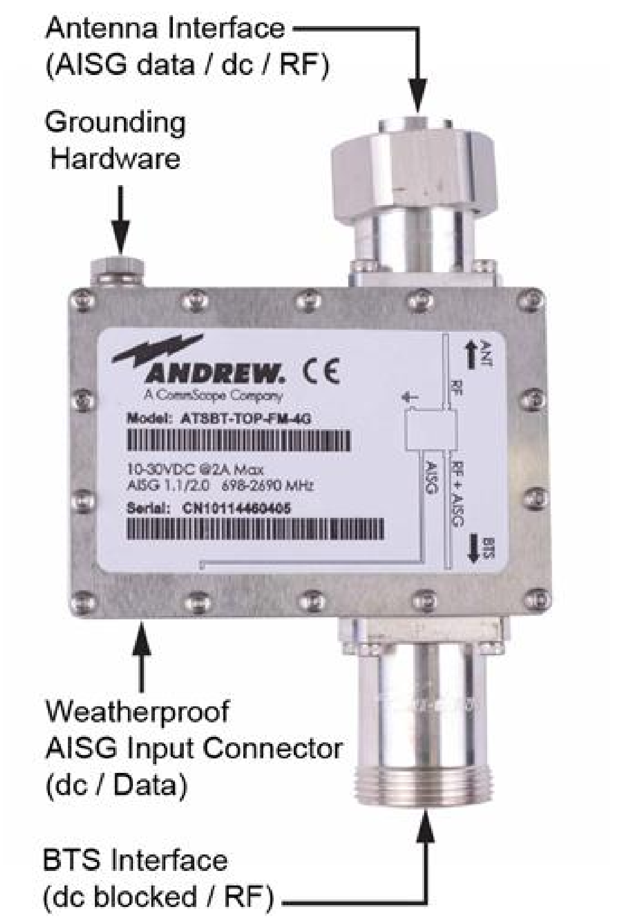
Antenna Interface	7-16 DIN Male
BTS Interface	7-16 DIN Female
AISG Input Connector	8-pin DIN Female
Color	Silver
Grounding Lug Thread Size	M8
Material Type	Aluminum
Lightning Surge Capability	5 times @ -3 kA 5 times @ 3 kA

Lightning Surge Capability Test Method	IEC 61000-4-5, Level X
Lightning Surge Capability Waveform	1.2/50 voltage and 8/20 current combination waveform

Environmental Specifications

Ingress Protection Test Method	IEC 60529:2001, IP66
Operating Temperature	-40 °C to +70 °C (-40 °F to +158 °F)

Interface Port Drawing



Dimensions

Width	94.0 mm | 3.7 in
Depth	50.0 mm | 2.0 in
Height	143.00 mm | 5.63 in
Net Weight	0.8 kg | 1.8 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption