NORTHEAST
SITE SOLUTIONS
Turnkey Wireless Development

Northeast Site Solutions
Denise Sabo
199 Brickyard Rd Farmington, CT 06032
860-209-4690
denise@northeastsitesolutions.com

February 27, 2017

Members of the Siting Council
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

RE: Notice of Exempt Modification
20 Vale Road, Brookfield CT 06804
Latitude: 41.43086800
Longitude: -73.40259800
T-Mobile Site#: CT11201A_L700

Dear Ms. Bachman:

T-Mobile currently maintains six (6) antennas at the 130-foot and 122-foot level of the existing 115-foot transmission pole located at 20 Vale Road, Brookfield CT (aka- 101 Park Ridge Road) Pole #10247. The electric transmission pole is owned by CL&P d/b/a Eversource. The property which holds the utility easment is owned by Berkshire North LLC. T-Mobile now intends to install three (3) new 700MHz antenna. The new antennas would be installed at the 122-foot level of the tower. T-Mobile also intends to make the following modifications.

Planned Modifications:

Remove:
(3) TMA

Remove and Replace:
(3) RFS APX18-206516S Antenna (Remove) - (3) Commscope LNX-6515DS Antenna (Replace)

Install New:
(3) Smart Bias-T

Existing to Remain:
(3) RFS APX16DWV-16DWVS
(18) 1-1/4” Coax

This facility was approved by the CT Siting Council. Petition No. 588 – Dated December 14, 2000. The petition was approved for Voicestream (T-Mobile) to install antenna on the existing 115-foot CL&P transmission structure (#10247). T-Mobile received approval for two (2) RAD centers – Total height approved is 132’4”. Please see attached.

NORTHEAST SITE SOLUTIONS

Turnkey Wireless Development

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to First Selectman Stephen C. Dunn, Elected Official and Alice Dew, Land Use Manager for the Town of Brookfield, as well as the property owner and the tower owner.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S;A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing structure.

2. The proposed modifications will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site. ·

6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, T-Mobile respectfully submits that the proposed modifications to the above referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Denise Sabo
Mobile: 860-209-4690
Fax: 413-521-0558
Office: 199 Brickyard Rd, Farmington, CT 06032
Email: denise@northeastsitesolutions.com

Attachments
cc: Stephen C. Dunn-First Selectman - as elected official
Alice Dew- Land Use Manager
CL&P d/b/a Eversource - as tower owner
Berkshire North LLC - property owner- **Utility Easement**

Exhibit A

Petition No. 493
VoiceStream Wireless
Brookfield, Connecticut
Staff Report
December 14, 2000

On November 20, 2000, Connecticut Siting Council (Council) member Edward Wilensky and Christina Lepage of the Council staff met with VoiceStream Wireless (VoiceStream) representative Brendan Sharkey off of Vale Road, Brookfield, Connecticut for inspection of an electric transmission structure. The property and structure is owned by Connecticut Light and Power Co. (CL&P). VoiceStream Wireless, with the agreement of CL&P, proposes to modify the structure by installing antennas and associated equipment for telecommunications use and is petitioning the Council for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need (Certificate) is required for the modification.

VoiceStream proposes the installation of six EMS dual-pol antennas on top of a 3-inch wide pipe mast extension. The antennas will extend approximately 17-feet 4-inches above the existing 115-foot transmission line monopole structure (#10247). The height at the top of the upper set of antennas will be about 132-feet 4-inches above ground level (AGL); the top of the lower set of antennas will be at 125-feet 8-inches AGL. This design requires a minimum of six feet above the CL&P shield wire and at least two feet in between the antennas.

Two Nortel S8000 equipment cabinets will be mounted on a 13’x12’ concrete slab in a 17’x16’ fenced compound at the base of the tower. The equipment cabinets do not require any protective structures or air conditioning; therefore no audible noise will be created. An underground conduit from an adjacent utility pole will provide power to the site, and a microwave will provide telephone service.

The proposed site is located east of Route 7, bordering a railroad and an industrial park in Brookfield. The zoning designation of this site is IG-80 Industrial. VoiceStream states that the land use in the surrounding area consists of an office industrial park, a railroad right-of-way and what appears to be a former quarry area.

The worst-case power density for the telecommunications operations at the site has been calculated to be 2.24% of the applicable standard for uncontrolled environments.

VoiceStream contends that the increase in height of this monopole structure will not result in a substantial environmental effect and the proposed project will prevent the construction of a new tower in the area. VoiceStream also states that the PCS antennas will blend in with the existing transmission line structure, and the placement of the equipment cabinets, which will be directly underneath the existing tower, will limit the disturbance created by construction activities.

VoiceStream submits that the proposed modification of the structure would not require a Certificate because it will reduce the need for a new telecommunications tower by utilizing an existing structure and contends that the proposed installation will not cause a substantial adverse environmental effect.

Exhibit B

Town of Brookfield, CT

Property Listing Report

Map Block Lot	D16001	Account	00460000

Property Information

Property Location	20 VALE RD
Owner	BERKSHIRE NORTH LLC
Co-Owner	
Mailing Address	2 PARKLAWN DR BETHEL CT 06801
Land Use	302 Ind Vac
Land Class	I
Zoning Code	IL80
Census Tract	205300023000

Neighborhood	35
Acreage	73.21
Utilities	
Lot Setting/Desc	Level,Rolling
Town Clerk Map # 1	4-31, 99-33
Town Clerk Map # 2	817,819,821,824

Photo

Sketch

Primary Construction Details

Year Built	
Stories	
Building Style	
Building Use	
Building Condition	
Floors	
Total Rooms	

Bedrooms	
Full Bathrooms	
Half Bathrooms	
Bath Style	
Kitchen Style	
Roof Style	
Roof Cover	

Exterior Walls	
Interior Walls	
Heating Type	
Heating Fuel	
AC Type	
Gross Bldg Area	
Total Living Area	

Report Created On 1/26/2017

Town of Brookfield, CT

Property Listing Report | Map Block Lot **D16001** | Account **00460000**

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings		
Extras		
Improvements		
Outbuildings		
Land		
Total		

Outbuilding and Extra Items

Type	Description

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
Total Area		0

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
BERKSHIRE NORTH LLC	291/ 850	12/12/1994	2281893

Report Created On 1/26/2017

Town of Brookfield, CT

Property Listing Report

Map Block Lot	D16001	Account	00460000

Property Information

Property Location	101 PARK RIDGE RD
Owner	BERKSHIRE NORTH LLC
Co-Owner	
Mailing Address	2 PARKLAWN DRIVE BETHEL CT 06801
Land Use	390 Com Ld Dv
Land Class	C
Zoning Code	IL80
Census Tract	205300023000

Neighborhood	
Acreage	62.3
Utilities	
Lot Setting/Desc	Level,Rolling
Town Clerk Map # 1	4-31, 99-33
Town Clerk Map # 2	817,819,821,824

Photo

Sketch

Primary Construction Details

Year Built		Bedrooms		Exterior Walls	
Stories		Full Bathrooms		Interior Walls	
Building Style		Half Bathrooms		Heating Type	
Building Use		Bath Style		Heating Fuel	
Building Condition		Kitchen Style		AC Type	
Floors		Roof Style		Gross Bldg Area	
Total Rooms		Roof Cover		Total Living Area	

Report Created On 2/27/2017

Town of Brookfield, CT

Property Listing Report | Map Block Lot: D16001 | Account: 00460000

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	0	0
Extras	0	0
Improvements	0	0
Outbuildings	0	0
Land	1399500	979650
Total	1399500	979650

Outbuilding and Extra Items

Type	Description

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
Total Area		0

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
BERKSHIRE NORTH LLC	291/ 850	12/12/1994	2281893

Report Created On 2/27/2017

Town of Brookfield, Connecticut - Assessment Parcel Map

Parcel: **D16001** **Address:** 101 PARK RIDGE RD

Map Produced July 2015

Approximate Scale: 1 inch = 600 feet

Disclaimer: This map is for informational purposes only. All information is subject to verification by any user.
The Town of Brookfield and its mapping contractors assume no legal responsibility for the information contained herein.

Exhibit C

ANTENNA UPGRADES
BY
T - Mobile

T-MOBILE NORTHEAST LLC

SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road, Brookfield, CT 06804
CL&P STRUCTURE #10247
(704BU CONFIGURATION)

PROJECT SCOPE:

T-MOBILE, A WIRELESS TELECOMMUNICATIONS PROVIDER PROPOSES TO UPGRADE THEIR EXISTING FACILITY AS FOLLOWS:
REMOVE: (3) ANTENNAS
ADD: (3) ANTENNAS, (3) SMART BIAS TEE AND (3) PERIPHERAL REMOTE RADIO UNIT.

PROJECT NOTES:

1. THIS IS AN UNMANNED TELECOMMUNICATION FACILITY AND NOT FOR HUMAN HABITATION: HANDICAPPED ACCESS IS NOT REQUIRED. POTABLE WATER OR SANITARY SERVICE IS NOT REQUIRED.NO OUTDOOR STORAGE OR ANY SOLID WASTE RECEPTACLES REQUIRED.
2. CONTRACTOR SHALL VERIFY ALL PLANS, EXISTING DIMENSIONS, AND CONDITIONS ON THE JOB SITE. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK. FAILURE TO NOTIFY THE ARCHITECT/ENGINEER PLACES THE RESPONSIBILITY ON THE CONTRACTOR TO CORRECT THE DISCREPANCIES AT THE CONTRACTOR'S EXPENSE.
3. DEVELOPMENT AND USE OF THE SITE WILL CONFORM TO ALL APPLICABLE CODES, ORDINANCES AND SPECIFICATIONS.
4. REFER TO STRUCTURAL ANALYSIS REPORT BY CENTEK ENGINEERING DATED JANUARY 19, 2017 FOR STRUCTURAL EVALUATION OF THE TOWER AND CONDITION.

APPLICABLE STATE ADOPTION CODES:

2016 CONNECTICUT STATE BUILDING CODE (CSBC).

ANSI/TIA-222-G-2005 STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS.

2014 NATIONAL ELECTRICAL CODE (NFPA 70) FOR POWER AND GROUNDING REQUIREMENTS.

SATELLITE IMAGE:

ZONING / VICINITY MAP:

PROJECT INFORMATION:

ADDRESS:	20 VALE ROAD BROOKFIELD, CT 06804
STRUCTURE TYPE:	ELECTRIC TRANSMISSION TOWER
ZONING DISTRICT:	R40
COORDINATES:	N 41.43086800 , W -73.40259800
STRUCTURE HEIGHT:	134' AGL

PROJECT TEAM:

APPLICANT:	T-MOBILE NORTHEAST, LLC. 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002 860-692-7100
LANDLOARD:	EVERSOURCE CL&P 56 PROSPECT RD HARTFORD, CT06103
DEVELOPER:	NORTHEAST SITE SOLUTIONS 199 BRICKYARD RD FARMINGTON, CT 06032 SHELDON FREINCLE SHELDON@NORTHEASTSITE SOLUTIONS.COM 203-376-9186
CONSULTANTS:	FORESITE LLC 462 WALNUT ST NEWTON, MA 02460 SAEED MOSSAVAT SMOSSAVAT@FORESITELLC.COM 617-212-3123

SHEET INDEX:

APPLICANT:
T - Mobile
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

TURNKEY DEVELOPER:
NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
199 Brickyard road
Farmington, CT 06032
203-275-6669

CONSULTANT:
FORESITE LLC
Architects . Engineers . Surveyors
462 Walnut street
Newton, MA 02460
617-212-3123

PROFESSIONAL SEAL

REV	DESCRIPTION	DATE
A	PRELIMINARY	01/13/17
0	FINAL ISSUED	01/25/17

SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road
Brookfield, CT 06804

SHEET TITLE:
T-1: TITLE SHEET

NOTES AND DISCLAIMERS:

1. THE CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY, MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES BEARING ON THE PERFORMANCE OF THE WORK. THE WORK PERFORMED ON THE PROJECT AND THE MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES.

2. THE ARCHITECT/ENGINEER HAS MADE EVERY EFFORT TO SET FORTH IN THE CONSTRUCTION AND CONTRACT DOCUMENTS THE COMPLETE SCOPE OF WORK. THE CONTRACTOR BIDDING THE JOB IS NEVERTHELESS CAUTIONED THAT MINOR OMISSIONS OR ERRORS IN THE DRAWINGS AND OR SPECIFICATIONS SHALL NOT EXCUSE SAID CONTRACTOR FROM COMPLETING THE PROJECT AND IMPROVEMENTS IN ACCORDANCE WITH THE INTENT OF THESE DOCUMENTS.

3. THE CONTRACTOR OR BIDDER SHALL BEAR THE RESPONSIBILITY OF NOTIFYING (IN WRITING) THE CLIENT'S REPRESENTATIVE OF ANY CONFLICTS, ERRORS, OR OMISSIONS PRIOR TO THE SUBMISSION OF CONTRACTOR'S PROPOSAL OR PERFORMANCE OF WORK.

5. THE CONTRACTOR SHALL VISIT THE JOB SITE PRIOR TO THE SUBMISSION OF BIDS OR PERFORMING WORK TO FAMILIARIZE HIMSELF WITH THE FIELD CONDITIONS AND TO VERIFY THAT THE PROJECT CAN BE CONSTRUCTED IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS.

6. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS ACCORDING TO THE MANUFACTURER'S / VENDOR'S SPECIFICATIONS UNLESS NOTED OTHERWISE OR WHERE LOCAL CODES OR ORDINANCES TAKE PRECEDENCE.

7. THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS TO PROTECT EXISTING IMPROVEMENTS DURING CONSTRUCTION.

8. THE CONTRACTOR SHALL COMPLY WITH ALL PERTINENT SECTIONS OF THE BASIC STATE BUILDING CODE, LATEST EDITION, AND ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJEC

9. THE CONTRACTOR SHALL NOTIFY THE CLIENT'S REPRESENTATIVE IN WRITING WHERE A CONFLICT OCCURS ON ANY OF THE CONTRACT DOCUMENTS. THE CONTRACTOR IS NOT TO ORDER MATERIAL OR CONSTRUCT ANY PORTION OF THE WORK THAT IS IN CONFLICT UNTIL CONFLICT IS RESOLVED BY THE CLIENT'S REPRESENTATIVE.

10. THE WORK SHALL CONFORM TO THE CODES AND STANDARDS OF THE FOLLOWING AGENCIES AS FURTHER CITED HEREIN:

A. ASTM: AMERICAN SOCIETY FOR TESTING AND MATERIALS, AS PUBLISHED IN "COMPILATION OF ASTM STANDARDS BUILDING CODES" OR LATEST EDITION.

B. AWS: AMERICAN WELDING SOCIETY INC. AS PUBLISHED IN "STANDARD D1.1-08, STRUCTURAL WELDING CODE" OR LATEST EDITION.

C. AISC: AMERICAN INSTITUTE FOR STEEL CONSTRUCTION AS PUBLISHED IN "CODE FOR STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"; "SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS" (LATEST EDITION).

11. BOLTING:

A. BOLTS SHALL BE CONFORMING TO ASTM A325 HIGH STRENGTH, HOT DIP GALVANIZED WITH ASTM A153 HEAVY HEX TYPE NUTS.

B. BOLTS SHALL BE 3/4"ø MINIMUM (UNLESS OTHERWISE NOTED)

C. ALL CONNECTIONS SHALL BE 2 BOLTS MINIMUM.

12. FABRICATION:

A. FABRICATION OF STEEL SHALL CONFORM TO THE AISC AND AWS STANDARDS AND CODES (LATEST EDITION).

B. ALL STRUCTURAL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 (LATEST EDITION), UNLESS OTHERWISE NOTED.

13. ERECTION OF STEEL:

A. PROVIDE ALL ERECTION EQUIPMENT, BRACING, PLANKING, FIELD BOLTS, NUTS, WASHERS, DRIFT PINS, AND SIMILAR MATERIALS WHICH DO NOT FORM A PART OF THE COMPLETED CONSTRUCTION BUT ARE NECESSARY FOR ITS PROPER ERECTION.

B. ERECT AND ANCHOR ALL STRUCTURAL STEEL IN ACCORDANCE WITH AISC REFERENCE STANDARDS. ALL WORK SHALL BE ACCURATELY SET TO ESTABLISHED LINES AND ELEVATIONS AND RIGIDLY FASTENED IN PLACE WITH SUITABLE ATTACHMENTS TO THE CONSTRUCTION OF THE BUILDING.

C. TEMPORARY BRACING, GUYING AND SUPPORT SHALL BE PROVIDED TO KEEP THE STRUCTURE SAFE AND ALIGNED AT ALL TIMES DURING CONSTRUCTION, AND TO PREVENT DANGER TO PERSONS AND PROPERTY. CHECK ALL TEMPORARY LOADS AND STAY WITHIN SAFE CAPACITY OF ALL BUILDING COMPONENTS.

14. ANTENNA INSTALLATION:

A. INSTALL ANTENNAS AS INDICATED ON DRAWINGS AND CLIENT'S REPRESENTATIVE SPECIFICATIONS.

B. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.

C. INSTALL COAXIAL / FIBER CABLES AND TERMINATIONS BETWEEN ANTENNAS AND EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. WEATHERPROOF ALL CONNECTORS BETWEEN THE ANTENNA AND EQUIPMENT PER MANUFACTURER'S REQUIREMENTS.

15. ANTENNA AND COAXIAL / FIBER CABLE GROUNDING:

A. ALL EXTERIOR #6 GREEN GROUND WIRE "DAISY CHAIN" CONNECTIONS ARE TO BE WEATHER SEALED WITH ANDREWS CONNECTOR/SPLICE WEATHERPROOFING KIT TYPE #221213 OR EQUAL.

B. ALL COAXIAL / FIBER CABLE GROUNDING KITS ARE TO BE INSTALLED ON STRAIGHT RUNS OF COAXIAL / FIBER CABLE (NOT WITHIN BENDS).

16. RELATED WORK, FURNISH THE FOLLOWING WORK AS SPECIFIED UNDER CONSTRUCTION DOCUMENTS, BUT COORDINATE WITH OTHER TRADES PRIOR TO BID:

A. FLASHING OF OPENING INTO OUTSIDE WALLS

B. SEALING AND CAULKING ALL OPENINGS

C. PAINTING

D. CUTTING AND PATCHING

17. REQUIREMENTS OF REGULATORY AGENCIES:

A. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE. INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.

B. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, AND SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS WORK INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

C. TIA-EIA - 222 (LATEST EDITION). STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.

D. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-IH, OBSTRUCTION MARKING AND LIGHTING.

E. FCC - FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATION FOR ANTENNA STRUCTURES AND FORM 715A, HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.

F. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS (LATEST EDITION).

G. NEC - NATIONAL ELECTRICAL CODE - ON TOWER LIGHTING KITS.

H. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.

I. IN ALL CASES, PART 77 OF THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.

J. 2009 LIFE SAFETY CODE NFPA - 101.

APPLICANT:

T-Mobile

T-MOBILE NORTHEAST LLC

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

TURNKEY DEVELOPER:

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
199 Brickyard road
Farmington, CT 06032
203-275-6669

CONSULTANT:

FORESITE LLC
Architects . Engineers . Surveyors
462 Walnut street
Newton, MA 02460
617-212-3123

PROFESSIONAL SEAL

STATE OF CONNECTICUT
HOSSEIN VAHEDI
No. ARI. 11182
LICENSED ARCHITECT

REV	DESCRIPTION	DATE
A	PRELIMINARY	01/13/17
0	FINAL ISSUED	01/25/17

SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road
Brookfield, CT 06804

SHEET TITLE:
N-1: NOTES AND DISCLAIMERS

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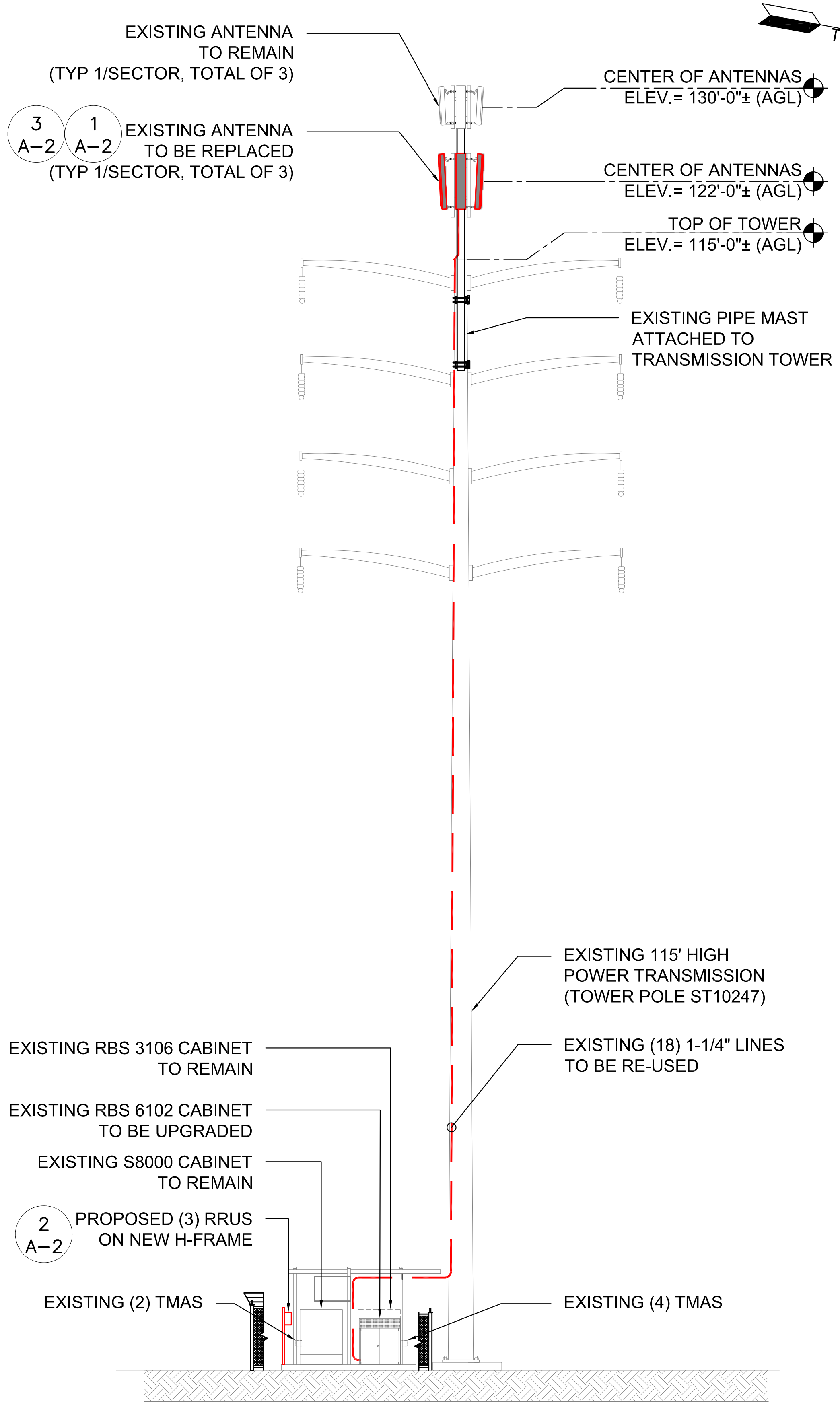
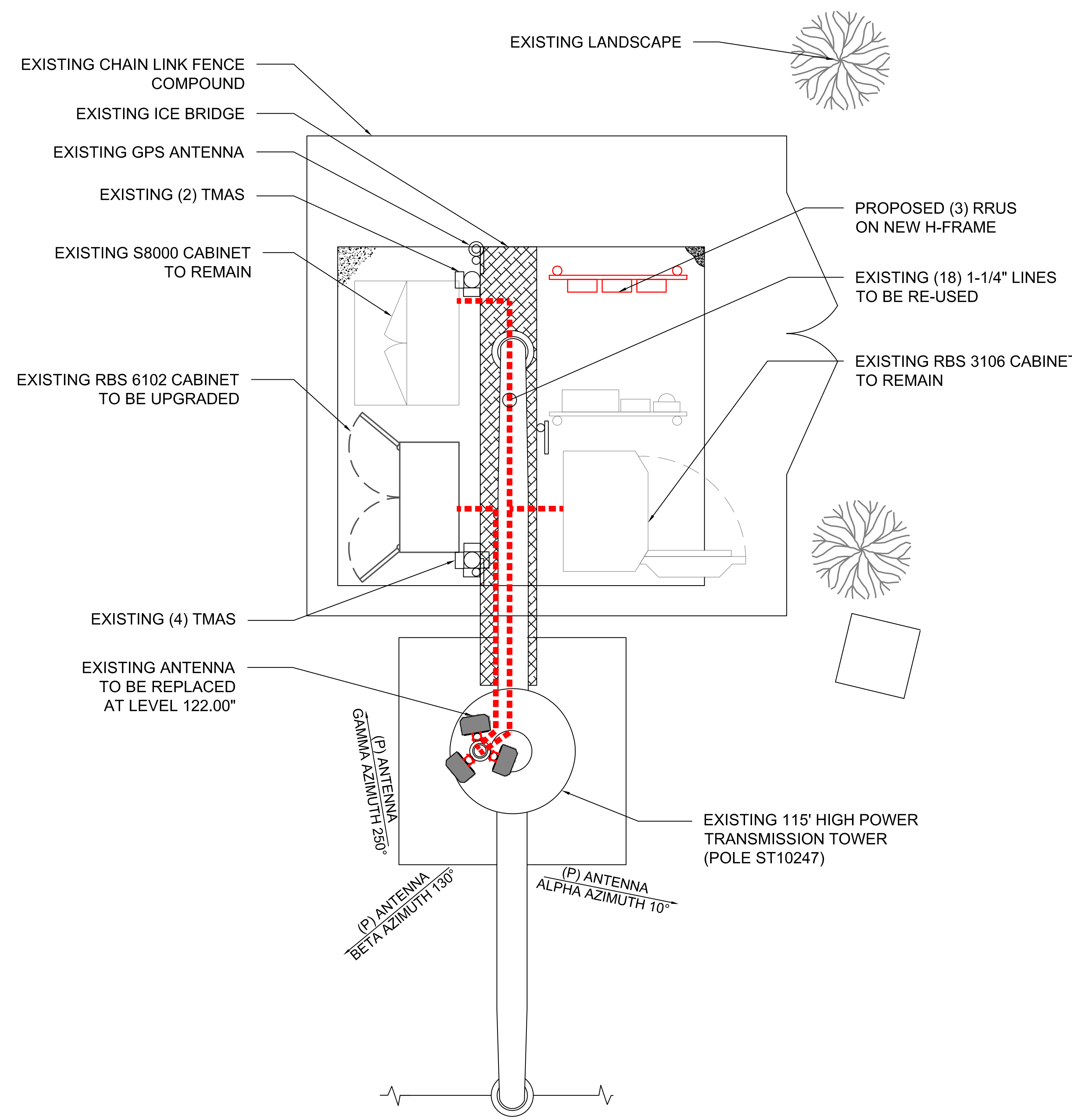


ELEVATION
SCALE 1"=16'
1 A-1



SITE PLAN
SCALE 1"=5'
1 A-1

APPLICANT:
T-Mobile
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

TURNKEY DEVELOPER:
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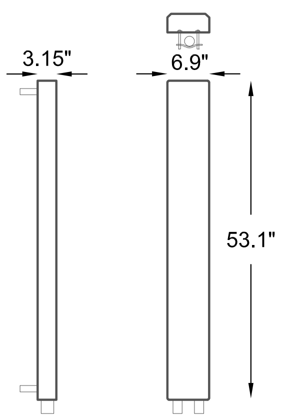
SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road
Brookfield, CT 06804

SHEET TITLE:
A-1: PLANS AND ELEVATIONS

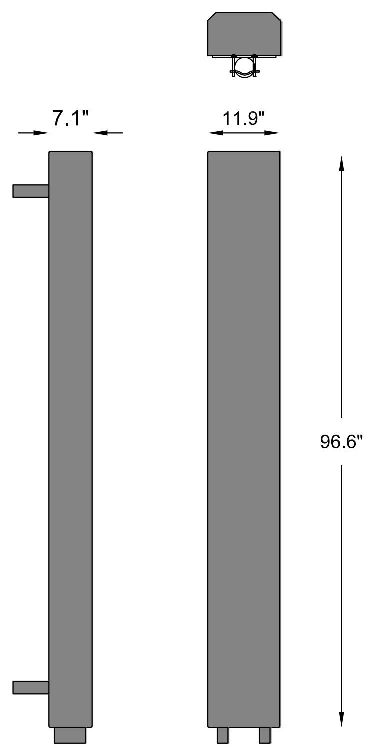
REMOVE:
(3) ANTENNAS

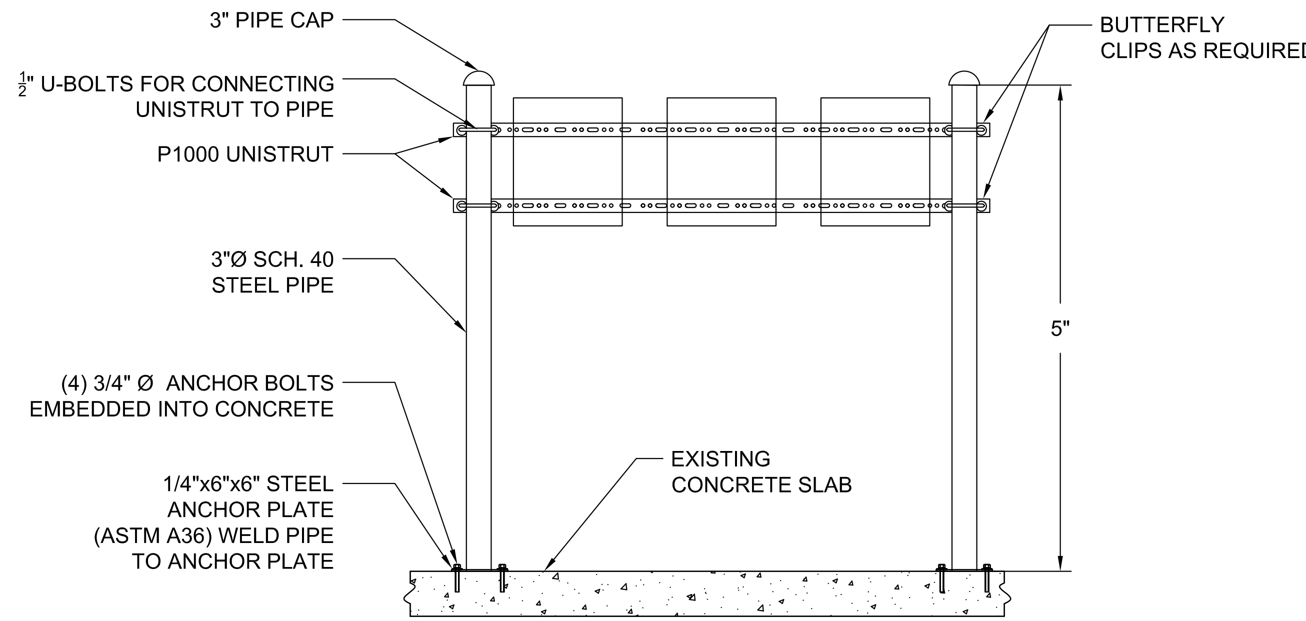
Manufacturer:	RFS
Model:	APX18D-206516-S-A20
Footprint:	53.1"Hx6.9"Wx3.15"D
weight:	31.9 lbs



ADD:
(3) ANTENNAS

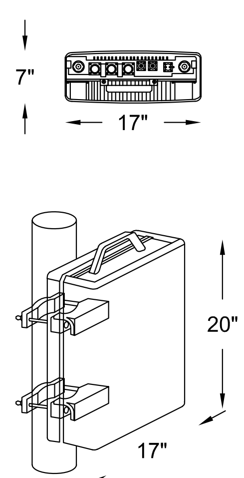
Manufacturer:	COMMSCOPE
Model	LNX-6515DS-A1M
Footprint:	96.6"Hx11.9"Wx7.1"D
weight:	43.7 lbs
Frequency band	698-896 MHZ
Antenna type	Single Sector
Wind loading lateral	150 km/h
Wind loading rear	150 km/h
Wind loading maximum	241 km/h



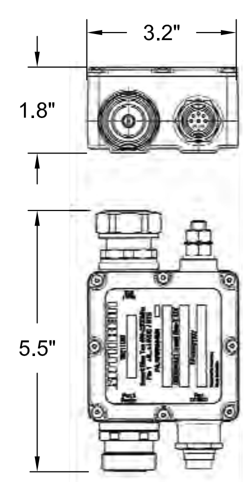


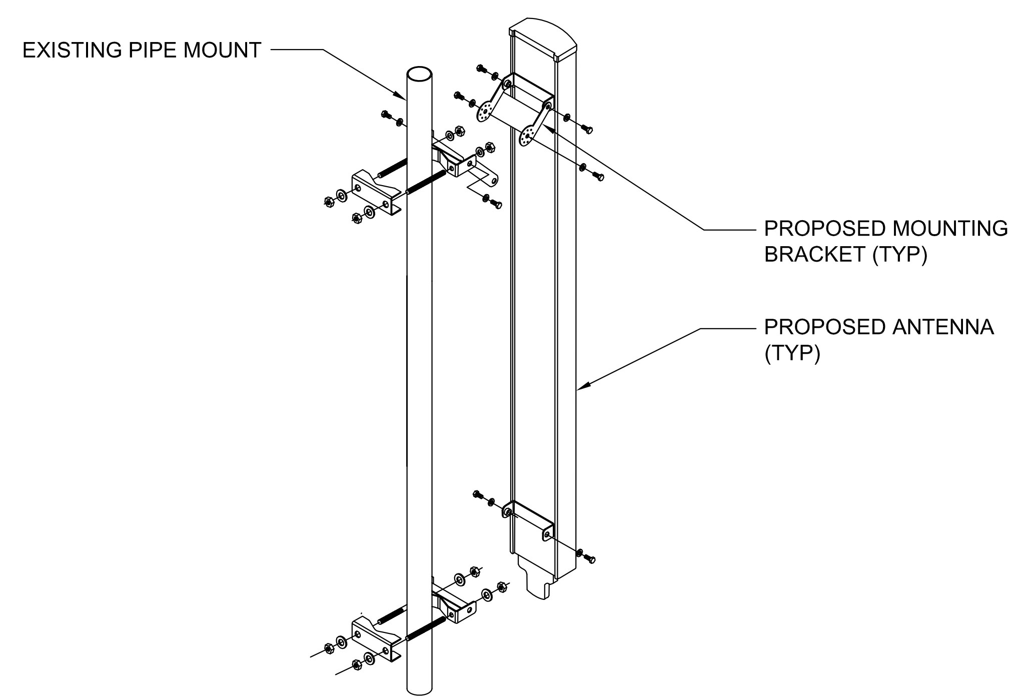
H-FRAME DETAILS 2 A–2
N.T.S

ADD:
(3) RRUS 11B12 DETAILS



ADD:
(3) SMART BIAS TEES AT ANTENNA LEVEL





ANTENNA AND EQUIPMENT DETAILS 1 A–2
N.T.S

ANTENNA MOUNTING DETAIL 3 A–2
N.T.S

APPLICANT:
T-Mobile
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
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860-692-7100

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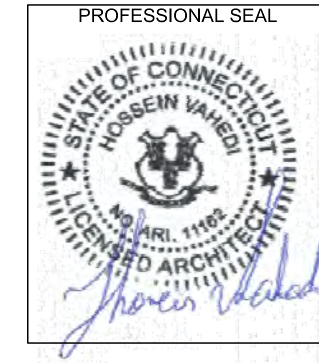
PROFESSIONAL SEAL



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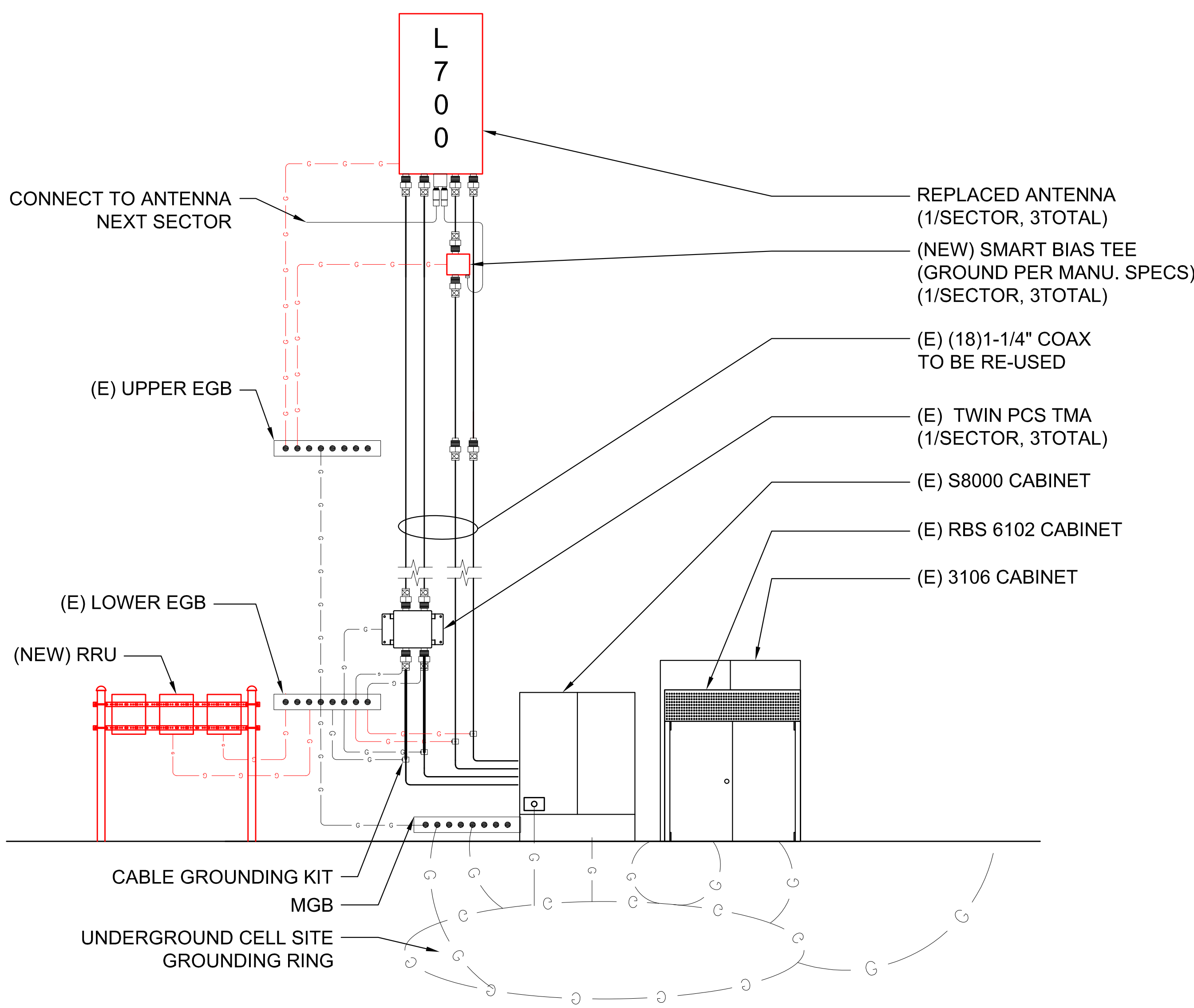
A	PRELIMINARY	01/13/17
0	FINAL ISSUED	01/25/17

SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road
Brookfield, CT 06804

SHEET TITLE:
A-2: ANTENNAS, EQUIPMENT AND DETAILS

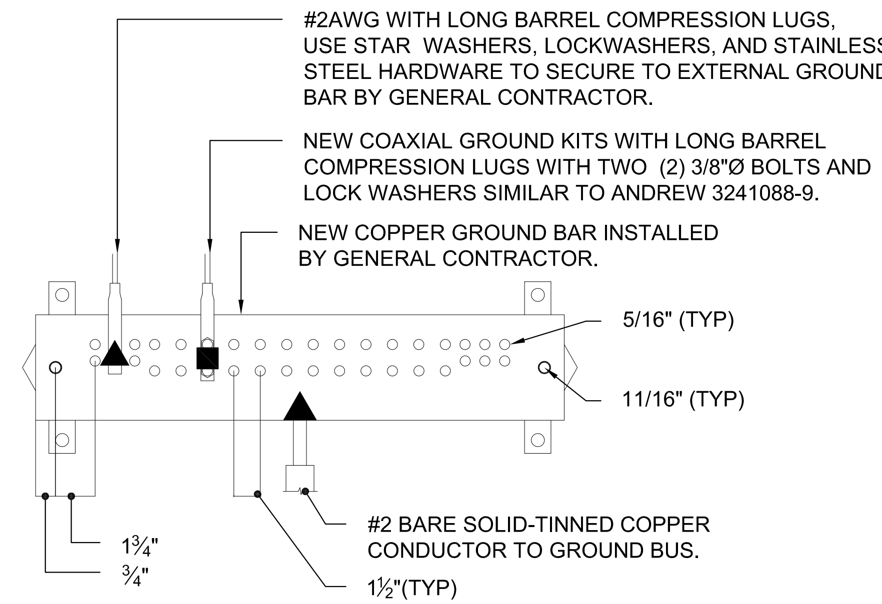
NOTES TO CONTRACTOR

1. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
2. ALL GROUNDING WORK SHALL BE IN ACCORDANCE WITH T-MOBILE STANDARD PRACTICE.
3. ALL BUS CONNECTORS SHALL BE TWO-HOLE, LONG-BARREL TYPE COMPRESSION LUGS, T&B OR EQUAL, UNLESS OTHERWISE NOTED ON DRAWINGS. ALL LUGS SHALL BE ATTACHED TO BUSSES USING BOLTS, NUTS, AND LOCK WASHERS. NO WASHERS ARE ALLOWED BETWEEN THE ITEMS BEING GROUNDED.
4. ALL CONNECTORS SHALL BE CRIMPED USING HYDRAULIC CRIMPING TOOLS, T&B #TBM 8 OR EQUIVALENT.
5. ALL CONNECTIONS SHALL BE MADE TO BARE METAL. ALL PAINTED SURFACES SHALL BE FILED TO ENSURE PROPER CONTACT . NO WASHERS ARE ALLOWED BETWEEN THE ITEMS BEING GROUNDED. ALL CONNECTIONS ARE TO HAVE A NON-OXIDIZING AGENT APPLIED PRIOR TO INSTALLAT ION.
6. ALL COPPER BUSSES SHALL BE CLEANED, POLISHED, AND A NON-OXIDIZING AGENT APPLIED. NO FINGERPRINTS OR DISCOLORED COPPER WILL BE PERMITTED.
7. ALL BENDS SHALL BE AS SHALLOW AS POSSIBLE, WITH NO TURN SHORTER THAN AN 8-INCH NOMINAL
8. GROUNDING CONDUCTORS SHALL BE SOLID TINNED COPPER AND ANNEALED #2. ALL GROUNDING CONDUCTORS SHALL RUN THROUGH PVC SLEEVES WHEREVER CONDUCTORS RUN THROUGH WALLS, FLOORS, OR CEILINGS. IF CONDUCTORS MUST RUN THROUGH EMT, BOTH ENDS OF CONDUIT SHALL BE GROUNDED. SEAL BOTH ENDS OF CONDUIT WITH SILICONE CAULK.
9. GROUNDING SYSTEM RESISTANCE SHALL NOT EXCEED 10 OHMS. IF THE RESISTANCE VALUE IS EXCEEDED, NOTIFY THE PROJECT MANAGER FOR FURTHER INSTRUCTION ON METHODS FOR REDUCING THE RESISTANCE
10. ALL ROOF TOP ANTENNA MOUNTS SHALL BE GROUNDED WITH A #2 GROUND WIRE CONNECTED TO THE NEAREST GROUND BUS. ALL CONNECTIONS ARE TO BE CAD-WELDED IF POSSIBLE.
11. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUNDING TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO THE PROJECT MANAGER.
12. GROUNDING CONNECTION TO TRAVEL IN A DOWNWARD DIRECTION.
13. ALL EXPOSED #2 WIRE MUST BE TINN NOT BTW.



GROUNDING DIAGRAM
SCALE: N.T.S

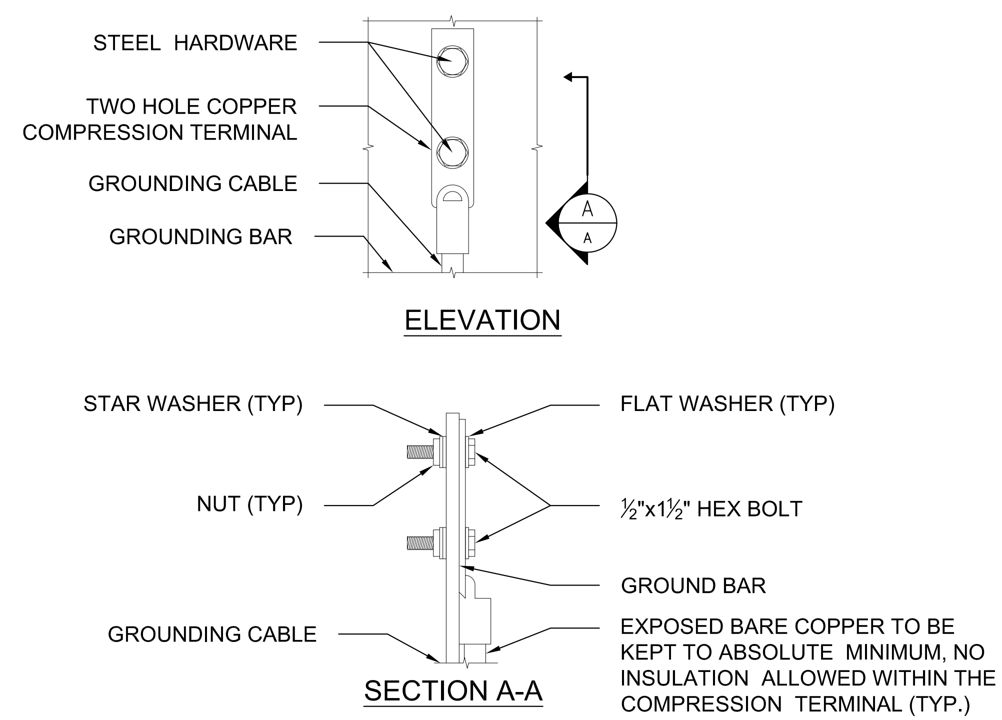
1 / E−1



NOTES:
1. ALL HARDWARE STAINLESS STEEL COAT ALL SURFACES WITH KOPR-SHIELD BEFORE MATING.
2. FOR GROUND BOND TO STEEL ONLY: INSERT A TOOTH WASHER BETWEEN LUG AND STEEL, COAT ALL SURFACES WITH KOPR-SHIELD.
3. ALL HOLES ARE COUNTERSUNK 1/16".

GROUND BAR DETAILS
SCALE: N.T.S

2 / E−1



NOTES:
1. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.

TYPICAL GROUND BAR CONNECTIOS DETAIL
SCALE: N.T.S

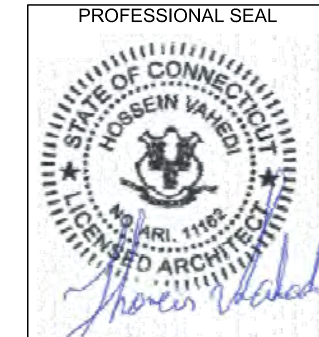
3 / E−1

APPLICANT:
T-Mobile
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

TURNKEY DEVELOPER:
NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
199 Brickyard road
Farmington, CT 06032
203-275-6669

CONSULTANT:
FORESITE LLC
Architects . Engineers . Surveyors
462 Walnut street
Newton, MA 02460
617-212-3123

PROFESSIONAL SEAL



REV	DESCRIPTION	DATE
A	PRELIMINARY	01/13/17
0	FINAL ISSUED	01/25/17

SITE NUMBER: CT11201A
SITE NAME: Brookfield/ Business Area
SITE ADDRESS: 20 Vale Road
Brookfield, CT 06804

SHEET TITLE:
E-1: GROUNDING DETAILS

Exhibit D

CENTEK engineering

Centered on Solutions℠

Structural Analysis of Antenna Mast and Pole

T-Mobile Site Ref: CT11201A

Eversource Structure No. 10247
115' Electric Transmission Pole

20 Vale Road
Brookfield, CT

CENTEK Project No. 16162.08

Date: January 19, 2017

STATE OF CONNECTICUT TIMOTHY J. LYNN No. 29336 LICENSED PROFESSIONAL ENGINEER

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 20 Vale Road in Brookfield, CT for the proposed antenna and equipment upgrade by T-Mobile.

The existing/proposed loads consist of the following:

- T-MOBILE (Existing to Remain):

  Antennas: Three (3) RFS APX16DWV-16DWVS panel antennas mounted on the pipe mast with a RAD center elevation of 130-ft above grade.
  Coax Cables: Eighteen (18) 1-1/4" ∅ coax cables mounted to the exterior of the pole.

- T-MOBILE (Existing to be Removed):

  Antennas: Three (3) RFS APXV18-206516S panel antennas and three (3) TMAs mounted on the pipe mast with a RAD center elevation of 123-ft above grade.

- **T-MOBILE (Proposed):**

  Antennas: Three (3) Andrew LNX-6515DS panel antennas and three (3) Andrew ATSBT-TOP-FM-4G Smart Bias Tees mounted on the pipe mast with a RAD center elevation of 122-ft above grade.

Primary assumptions used in the analysis

- ASCE 48-05, "Design of Steel Transmission Pole Structures", defines 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 consisting of a 8-in x 29.5-ft long SCH. 80 pipe (O.D. = 8.63") connected at two points to the existing tower was analyzed for its ability 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 48-05, "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 48-05.

  Load cases considered:

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

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

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

- MAST ASSEMBLY ANALYSIS

Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the NU Design Criteria Table, TIA-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 pipe mast was determined to be structurally **adequate**.

Component	Stress Ratio (percentage of capacity)	Result
8” Sch. 80 Pipe	85.7%	**PASS**
Connection to Tower	92.1%	**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 48-05, “Design of Steel Transmission Pole Structures” for the applied NESC Heavy and Extreme load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

A maximum usage of **85.46%** occurs in the utility pole base plate under the **NESC Extreme** loading condition.

POLE SECTION:

The utility pole was found to be structurally **adequate**.

Tower Section	Elevation	Stress Ratio (% of capacity)	Result
Tube Number 2	20.00’ -64.50’ (AGL)	70.16%	**PASS**

BASE PLATE:
The base plate was found to be structurally **adequate**.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Base Plate	Bending	85.46%	**PASS**

- FOUNDATION AND ANCHORS

The existing foundation consists of a 8-ft square x 15.0-ft long reinforced concrete pier with twelve (12) rock anchors embedded 22-ft into rock. The base of the tower is connected to the foundation by means of sixteen (16) 2.25"∅, ASTM A615-75 anchor bolts embedded into the concrete foundation structure. Foundation information was obtained from Northeast Utilities drawing 01143-60001.

BASE REACTIONS:

From PLS-Pole analysis based on NESC/EVERSOURCE prescribed loads.

Load Case	Shear	Axial	Moment
NESC Heavy Wind	20.86 kips	72.73 kips	1775.89 ft-kips
NESC Extreme Wind	34.66 kips	38.55 kips	2777.54 ft-kips

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

ANCHOR BOLTS:

The anchor bolts were found to be structurally **adequate**.

Tower Component	Design Limit	Stress Ratio (% of capacity)	Result
Anchor Bolts	Tension	55.42%	**PASS**

FOUNDATION:

The existing foundation was found to be structurally **adequate**.

Foundation	Design Limit	Allowable Limit	Proposed Loading (4)	Result
Reinf. Conc. Pier w/ Rock Anchors	OTM (1)	1.0 FS (2)	1.94 FS (2)	**PASS**
	Bearing Pressure	50 ksf (3)	22.5 ksf	**PASS**

Note 1: OTM denotes overturning moment.
Note 2: FS denotes Factor of Safety
Note 3: Bearing Capacity based on Weak Rock.
Note 4: 10% increase to PLS base reactions used in foundation analysis per OTRM 051.

Conclusion

This analysis shows that the subject tower i**s adequate** to support the proposed modified antenna configuration.

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

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL 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

NU Design Criteria

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

* Only for Structures Installed after 2007

Shape Factor Criteria shall be per TIA Shape Factors.

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

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

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

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

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

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

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

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

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

Northeast Utilities System

Job :	T-MOBILE	Spec. Number		Page	of
Description:	BETHEL	Computed by		Sheet	of
		Checked by		Date	8/20/09
				Date	

INPUT DATA

TOWER ID: 10247

EAST SIDE

Structure Height (ft) : 115

Wind Zone : Central CT (green)

Wind Speed : 90.5711047 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*3/8 AW*	*3/8 AW*
DESCRIPTION =	3/8	3/8
STRANDING =	7 #8 Al Weld	7 #8 Al Weld
DIAMETER =	0.385 in	0.385 in
WEIGHT =	0.262 lb/ft	0.262 lb/ft

Conductor Properties:

		BACK	AHEAD		
	NAME =	*BITTERN*	*BITTERN*		
Number of Conductors per phase	2	1272.000	1272.000	2	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 = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	4,200	10,000	4,200	10,000
EXTREME WIND =	3,440	10,733	3,400	10,733
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 =	1,239	4,616	1,239	4,616

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	0	AHEAD:	0	**0**
WIND SPAN (ft) =	BACK:	257	AHEAD:	305	**562**
WEIGHT SPAN (ft) =	BACK:	525	AHEAD:	131	**657**

Northeast Utilities System

Job :				Page	of
Description:		Spec. Number		Sheet	of
		Computed by		Date	8/20/09
		Checked by		Date	

WIRE LOADING AT ATTACHMENTS

TOWER ID: 10247

Wind Span =	562 ft
Weight Span =	657 ft
Total Angle =	0 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 =	648 lb	0 lb	800 lb	296 lb	4,830 lb	640 lb
Conductor =	2,195 lb	0 lb	5,082 lb	1,003 lb	23,000 lb	4,065 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	433 lb	46 lb	198 lb
Conductor =	3,028 lb	0 lb	2,163 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	198 lb
Conductor =	#VALUE!	#VALUE!	2,163 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,303 lb
Conductor =	#VALUE!	#VALUE!	5,712 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	533 lb
Conductor =	#VALUE!	#VALUE!	3,388 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	172 lb
Conductor =	0 lb	0 lb	1,881 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	258 lb
Conductor =	0 lb	0 lb	2,822 lb

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

Northeast Utilities System

Job :	T- MOBILE	Spec. Number		Page	of
Description:	BETHEL	Computed by		Sheet	of
		Checked by		Date	8/20/09
				Date	

INPUT DATA

TOWER ID: 10247

[redacted]

WEST SIDE

Structure Height (ft) : 115

Wind Zone : Central CT (green)

Wind Speed : 90.5711047 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*3/8 AW*	*3/8 AW*
DESCRIPTION =	3/8	3/8
STRANDING =	7 #8 Al Weld	7 #8 Al Weld
DIAMETER =	0.385 in	0.385 in
WEIGHT =	0.262 lb/ft	0.262 lb/ft

Conductor Properties:

	BACK	AHEAD
NAME =	*BITTERN*	*BITTERN*
	1272.000	1272.000
	45/7 ACSR	45/7 ACSR
DIAMETER =	1.345 in	1.345 in
WEIGHT =	1.432 lb/ft	1.432 lb/ft
Number of Conductors per phase	2	2

Insulator Weight = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	4,200	10,000	4,200	10,000
EXTREME WIND =	3,446	10,924	3,446	10,924
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 =	1,174	4,638	1,174	4,638

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	0	AHEAD:	0	**0**
WIND SPAN (ft) =	BACK:	231	AHEAD:	305	**536**
WEIGHT SPAN (ft) =	BACK:	447	AHEAD:	131	**578**

Northeast Utilities System

Job :			Page of
Description:	Spec. Number		Sheet of
	Computed by		Date 8/20/09
	Checked by		Date

WIRE LOADING AT ATTACHMENTS

TOWER ID: 10247

Wind Span = 536 ft
Weight Span = 578 ft
Total Angle = 0 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 =	619 lb	0 lb	704 lb	267 lb	4,830 lb	544 lb
Conductor =	2,095 lb	0 lb	4,473 lb	903 lb	23,000 lb	3,456 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	417 lb	0 lb	174 lb
Conductor =	2,915 lb	0 lb	1,904 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	174 lb
Conductor =	#VALUE!	#VALUE!	1,904 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,147 lb
Conductor =	#VALUE!	#VALUE!	5,027 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	469 lb
Conductor =	#VALUE!	#VALUE!	2,982 lb

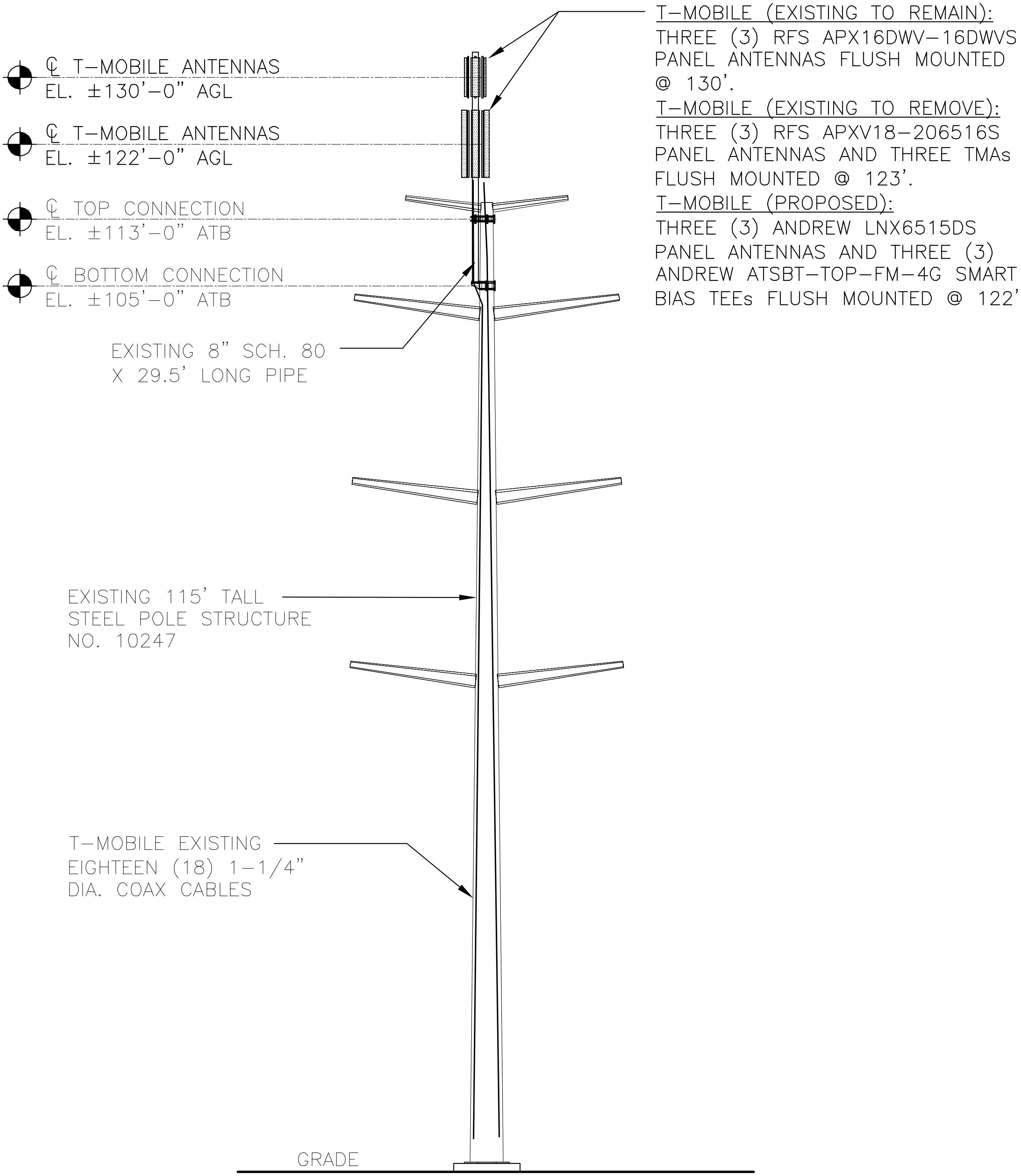
6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	151 lb
Conductor =	0 lb	0 lb	1,656 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	227 lb
Conductor =	0 lb	0 lb	2,484 lb

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



1
EL-1

TOWER & MAST ELEVATION

SCALE: NOT TO SCALE

REVISIONS		
01	01/19/17	ISSUED FOR REVIEW

CENTEK engineering
Centered on Solutions℠
www.CentekEng.com
(203) 488-0580
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63-2 North Branford Road, Branford, CT 06405

CT11201A
EVERSOURCE 10247
20 VALE ROAD
BROOKFIELD, CT 06804

PROJECT NO:	16162.08
DRAWN BY:	TJL
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	1/19/17

TOWER ELEVATION

EL-1

DWG. 1 OF 1

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 = $z_{ant} := 130$ 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)

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

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

$K_{iz} := \left(\frac{z_{ant}}{33}\right)^{0.1} = 1.147$

$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.151$

Velocity Pressure Coefficient = $Kz_{ant} := 2.01\left(\left(\frac{z_{ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.337$

Velocity Pressure w/o Ice = $qz_{ant} := 0.00256 \cdot K_d \cdot Kz_{ant} \cdot K_{zt} \cdot V^2 \cdot I_{Wind} = 32.353$

Velocity Pressure with Ice = $qz_{ice.ant} := 0.00256 \cdot K_d \cdot Kz_{ant} \cdot K_{zt} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 8.132$

Development of Wind & Ice Load on Mast

Mast Data: (Pipe 8" SCH. 80) (User Input)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 8.63$ in (User Input)

Mast Length = $L_{mast} := 29.5$ ft (User Input)

Mast Thickness = $t_{mast} := 0.5$ in (User Input)

Mast Aspect Ratio = $Ar_{mast} := \frac{12 L_{mast}}{D_{mast}} = 41.0$

Mast Force Coefficient = $Ca_{mast} = 1.2$

Wind Load (without ice)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 0.719$ sf/ft

Total Mast Wind Force = $qz_{ant} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 38$ plf **BLC 5**

Wind Load (with ice)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{\left(D_{mast} + 2 \cdot t_{iz}\right)}{12} = 1.078$ sf/ft

Total Mast Wind Force w/ Ice = $qz_{ice.ant} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 14$ 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 = $Ai_{mast} := \frac{\pi}{4}\left[\left(D_{mast} + t_{iz} \cdot 2\right)^2 - D_{mast}{}^2\right] = 72.8$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 28$ plf **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Andrew LNX-6515DS		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 96.6$	in	(User Input)
Antenna Width =	$W_{ant} := 11.9$	in	(User Input)
Antenna Thickness =	$T_{ant} := 7.1$	in	(User Input)
Antenna Weight =	$WT_{ant} := 44$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 8.1$

Antenna Force Coefficient = $Ca_{ant} = 1.44$

Wind Load (without ice)

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 8$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 23.9$ sf

Total Antenna Wind Force = $F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 1503$ lbs **BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 11.4$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 34.1$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 537$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 132$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 8162$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 1 \times 10^4$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 339$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 1018$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = RFS APX16DWV-16DWVS

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 55.9$ in (User Input)

Antenna Width = $W_{ant} := 13$ in (User Input)

Antenna Thickness = $T_{ant} := 3.15$ in (User Input)

Antenna Weight = $WT_{ant} := 41$ lbs (User Input)

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

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.3$

Antenna Force Coefficient = $Ca_{ant} = 1.28$

Wind Load (without ice)

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 15.1$ sf

Total Antenna Wind Force = $F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 846$ lbs **BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 7.2$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 21.7$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 305$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 123$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2289$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 5471$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 177$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 532$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = Andrew ATSBT-TOP-FM-4G

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 = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 0.6$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 1.7$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 22$ 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 = $V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 459$ cu in

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

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 45$ lbs **BLC 3**

Development of Wind & Ice Load on Antenna Mounts

Mount Data:

Mount Type: Site Pro Universal Ring Mount & Adapter Kit w/ 3 Pipes

Mount Shape = Round (User Input)

Pipe Mount Length = $L_{mnt} := 60$ in (User Input)

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

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

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

Tri Sector Adapter and Bracket Mount Weight = $W_{tsa.mnt} := 300$ lbs (User Input)

Mount Aspect Ratio = $Ar_{mnt} := \frac{L_{mnt}}{D_{mnt}} = 25$

Mount Force Coefficient = $Ca_{mnt} = 1.2$

Wind Load (without ice)

Assumes Mount is Shielded by Antenna

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

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

Wind Load (with ice)

Assumes Mount is Shielded by Antenna

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

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

Gravity Loads (without ice)

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 18$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{tsa.mnt} = 355$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^{2} \cdot L_{mnt} = 266$ cu in

Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 2 \cdot t_{iz}\right)^2\right] \cdot \left(L_{mnt} + 2 \cdot t_{iz}\right)\right] - V_{mnt} = 2 \times 10^3$ cu in

Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 64$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 5 = 198$ 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 = $L_{coax} := 29$ ft (User Input)

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

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

No. of Coax Projecting Outside Face of Mast = $NP_{coax} := 6$ (User Input)

Coax aspect ratio, $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 224.5$

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

Wind Load (without ice)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.8$ sf/ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{ant} \cdot G_H \cdot A_{coax} = 41$ plf **BLC 5**

Wind Load (with ice)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot t_{iz})}{12} = 1.1$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qz_{ice.ant} \cdot G_H \cdot AICE_{coax} = 15$ plf **BLC 4**

Gravity Loads (without ice)

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

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[\left(D_{coax} + 2 \cdot t_{iz}\right)^2 - D_{coax}{}^2\right] = 25$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 175$ plf **BLC 3**

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

Subject: **Analysis of TIA-222G Wind and Ice Loads for Analysis of Mast Only**
Tabulated Load Cases
Location: **Brookfield, CT**
Date: 1/18/17 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16162.08

Load Case	Description
1	Self Weight (Mast)
2	Weight of Appurtenances
3	Weight of Ice Only
4	TIA Wind with Ice
5	TIA Wind

Footnotes:

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Subject: **Analysis of TIA-222G Wind and Ice Loads for Analysis of Mast Only**
Load Combinations Table

Location: **Brookfield, CT**

Date: 1/18/17 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16162.08

Load Combination	Description	Envelope Soultion	Wind Factor	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	1.2D + 1.6W		1	Y	1	1.2	2	1.2	5	1.6				
2	0.9D + 1.6W		1	Y	1	0.9	2	0.9	5	1.6				
3	1.2D + 1.0Di + 1.0Wi		1	Y	1	1.2	2	1.2	3	1.0	4	1.0		

Footnotes:
BLC = Basic Load Case
D = Dead Load
Di = Dead Load of Ice
W = Wind Load
W = Wind Load w/ Ice

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number 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-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

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, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	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 Design Parameters

	Label	Shape	Lengt...	Lbyy[ft]	Lbzz[ft]	Lcomp t...	Lcomp b...	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Existing Mast	29.5									Lateral

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	Beam	Pipe	A53 Gr. B	Typical	11.9	100	100	199

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTCO...	TOPMA...			Existing Mast	Beam	Pipe	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From ...
1	BOTCONNECTION	0	0	0	0	
2	TOPCONNECTION	0	8	0	0	
3	TOPMAST	0	29.5	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTCONNECTION	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	TOPCONNECTION	Reaction		Reaction		Reaction		

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.123	25
2	M1	Y	-.355	25
3	M1	Y	-.132	17
4	M1	Y	-.006	17
5	M1	Y	-.355	17

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.532	25
2	M1	Y	-.198	25
3	M1	Y	-1.018	17
4	M1	Y	-.045	17
5	M1	Y	-.198	17

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.305	25
2	M1	X	.537	17
3	M1	X	.022	17

Member Point Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.846	25
2	M1	X	1.503	17
3	M1	X	.023	17

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
No Data to Print ...			

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.012	-.012	0	25

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

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.028	-.028	0	0
2	M1	Y	-.175	-.175	0	25

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

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.014	.014	0	0
2	M1	X	.015	.015	0	25

Member Distributed Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.038	.038	0	0
2	M1	X	.041	.041	0	25

Basic Load Cases

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

Load Combinations

	Description	Sol...	PDelta	SR..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact...
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 + 1.0Wi	Yes	Y		1	1.2	2	1.2	3	1	4	1								

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torqu...	LC	y-y Mo...	LC	z-z Mo...	LC
1	M1	1	max	10.151	3	-2.869	3	0	1	0	1	0	1	-7.635	3
2			min	2.219	2	-12.231	1	0	1	0	1	0	1	-32.567	1
3		2	max	8.189	3	-3.083	3	0	1	0	1	0	1	61.078	1
4			min	1.871	2	-13.164	1	0	1	0	1	0	1	14.312	3
5		3	max	6.227	3	5.402	1	0	1	0	1	0	1	29.986	1
6			min	1.522	2	1.253	3	0	1	0	1	0	1	7.124	3
7		4	max	2.413	3	2.028	1	0	1	0	1	0	1	6.095	1
8			min	.73	2	.48	3	0	1	0	1	0	1	1.534	3
9		5	max	0	1	.038	1	0	1	0	1	0	1	0	1
10			min	0	1	.028	2	0	1	0	1	0	1	0	1

Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC	y Shear[...	LC	z Shear[...	LC	y-Top[ksi]	LC	y-Bot[ksi]	LC	z-Top[ksi]	LC	z-Bot[ksi]	LC
1	M1	1	max	.853	3	-.482	3	0	1	16.863	1	-3.954	3	0	1	0	1
2			min	.186	2	-2.056	1	0	1	3.954	3	-16.863	1	0	1	0	1
3		2	max	.688	3	-.518	3	0	1	-7.411	3	31.626	1	0	1	0	1
4			min	.157	2	-2.212	1	0	1	-31.626	1	7.411	3	0	1	0	1
5		3	max	.523	3	.908	1	0	1	-3.689	3	15.527	1	0	1	0	1
6			min	.128	2	.211	3	0	1	-15.527	1	3.689	3	0	1	0	1
7		4	max	.203	3	.341	1	0	1	-.794	3	3.156	1	0	1	0	1
8			min	.061	2	.081	3	0	1	-3.156	1	.794	3	0	1	0	1
9		5	max	0	1	.006	1	0	1	0	1	0	1	0	1	0	1
10			min	0	1	.005	2	0	1	0	1	0	1	0	1	0	1

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTCONNE...	max	12.231	1	10.151	3	0	1	0	1	0	1	-7.635	3
2		min	2.869	3	2.219	2	0	1	0	1	0	1	-32.567	1
3	TOPCONNE...	max	-4.521	3	0	1	0	1	0	1	0	1	0	1
4		min	-19.46	1	0	1	0	1	0	1	0	1	0	1
5	Totals:	max	-1.652	3	10.151	3	0	1						
6		min	-7.229	1	2.219	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotatio...	LC	Y Rotatio...	LC	Z Rotation...	LC
1	BOTCONNE...	max	0	3	0	2	0	1	0	1	0	1	0	1
2		min	0	1	0	3	0	1	0	1	0	1	0	3
3	TOPCONNE...	max	0	1	0	2	0	1	0	1	0	1	-2.061e-3	3
4		min	0	3	-.003	3	0	1	0	1	0	1	-8.793e-3	1
5	TOPMAST	max	7.942	1	-.001	2	0	1	0	1	0	1	-8.82e-3	3
6		min	1.874	3	-.005	3	0	1	0	1	0	1	-3.72e-2	1

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

	Member	Shape	Code Check	Loc...	LC	Sh...	Loc[ft]	Dir	LC	phi*Pn...	phi*...	phi*...	phi*...	...	Eqn
1	M1	PIPE_8.0X	.857	7.99	1	.118	7.99		1	174.735	374...	81.3...	81.3...	...	H1...

Joint Reactions

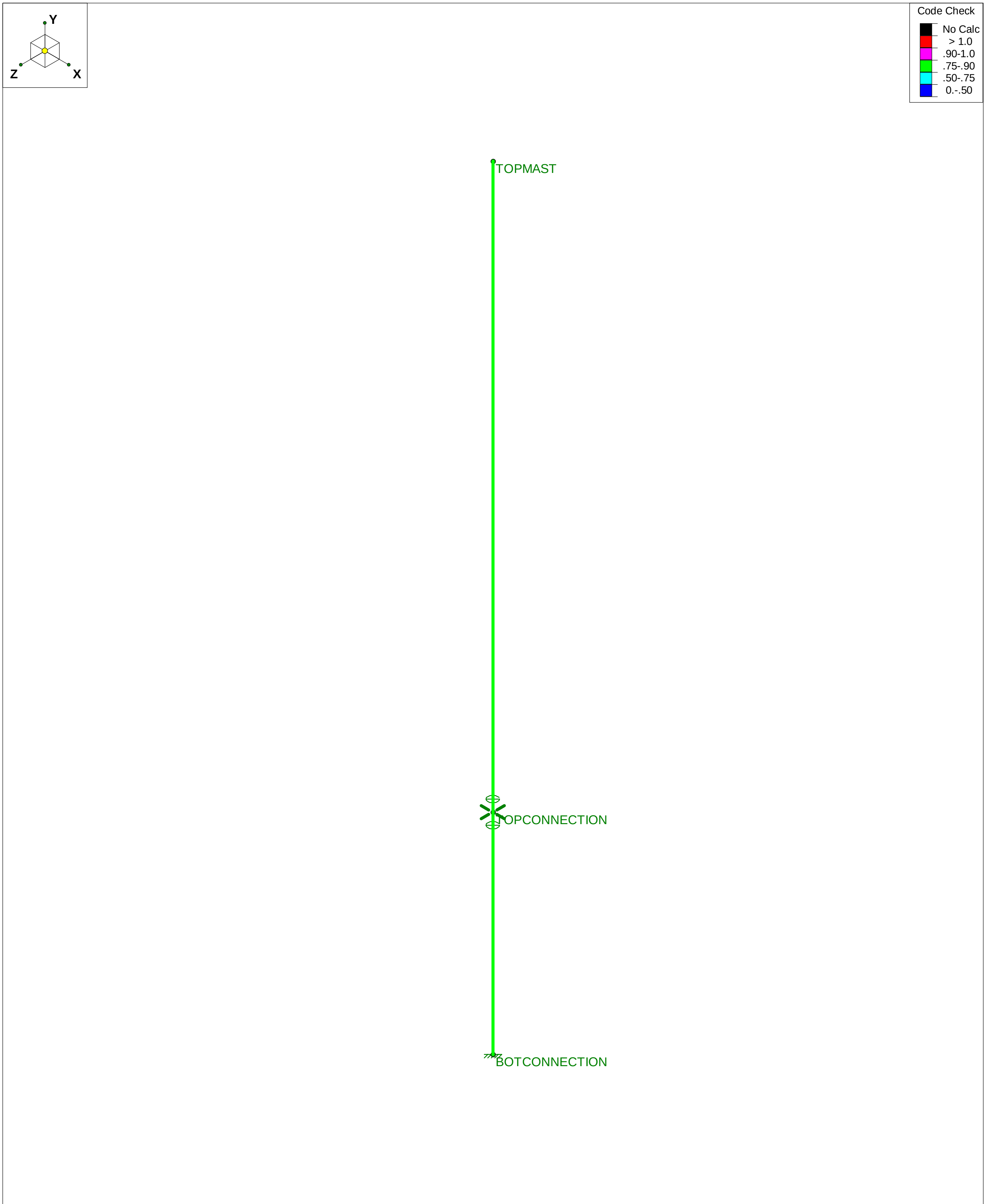
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	12.231	2.959	0	0	0	-32.567
2	1	TOPCONNECTION	-19.46	0	0	0	0	0
3	1	Totals:	-7.229	2.959	0			
4	1	COG (ft):	X: 0	Y: 16.913	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	12.193	2.219	0	0	0	-32.467
2	2	TOPCONNECTION	-19.422	0	0	0	0	0
3	2	Totals:	-7.229	2.219	0			
4	2	COG (ft):	X: 0	Y: 16.913	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTCONNECTION	2.869	10.151	0	0	0	-7.635
2	3	TOPCONNECTION	-4.521	0	0	0	0	0
3	3	Totals:	-1.652	10.151	0			
4	3	COG (ft):	X: 0	Y: 15.427	Z: 0			



CENTEK Engineering, INC.		
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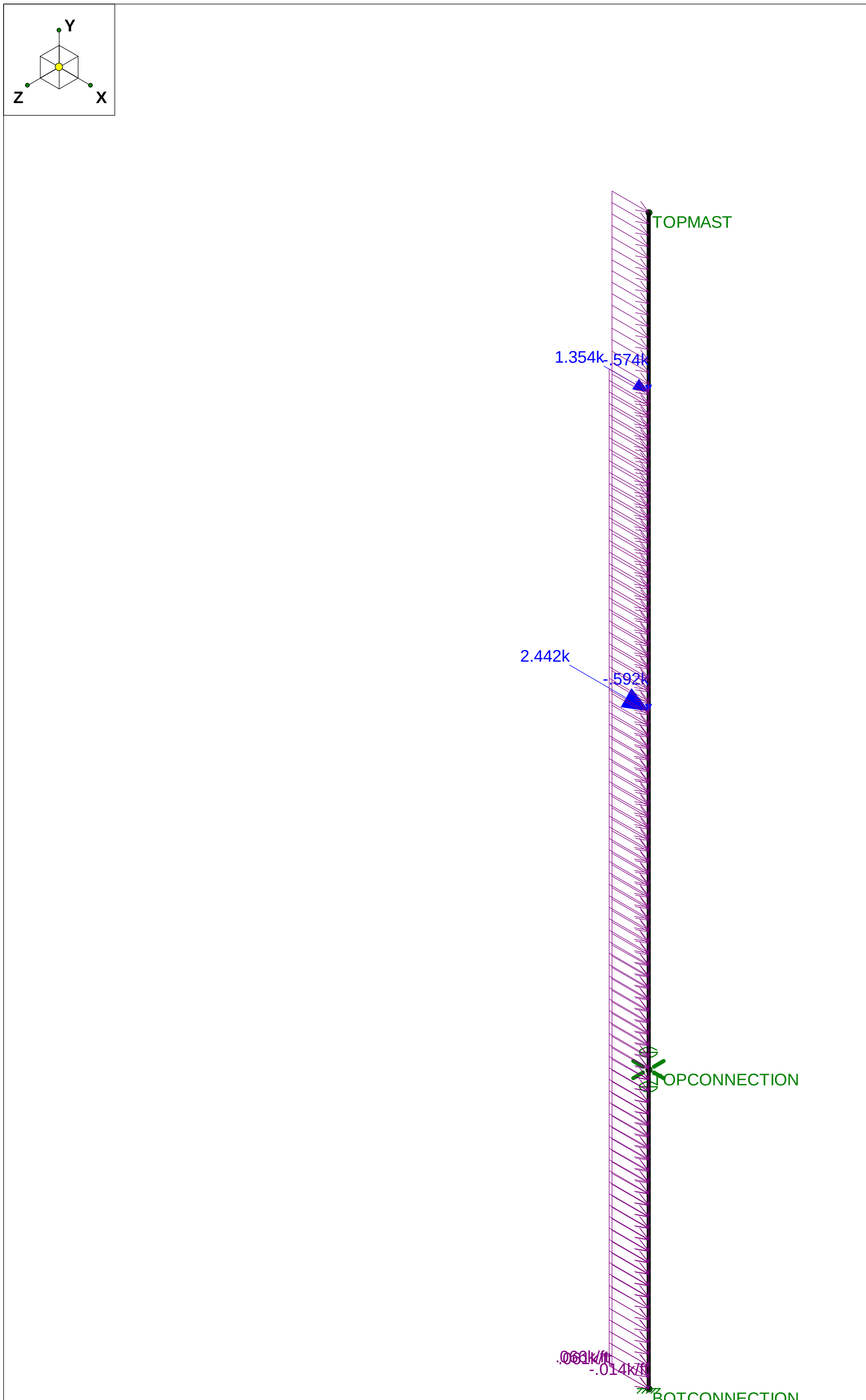
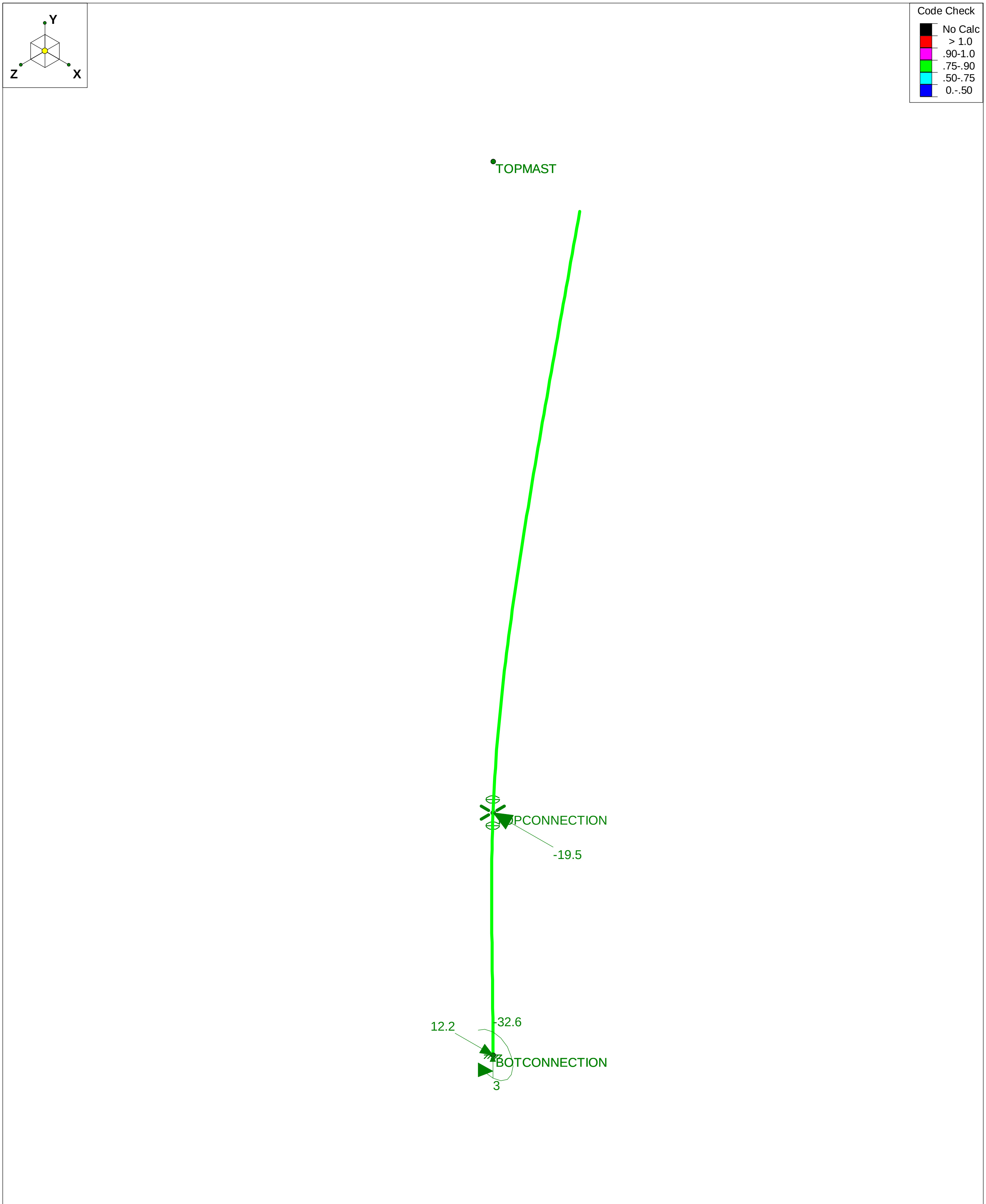
16162.08 /T-Mobile CT112...	Unity Check	TIA.r3d



Loads: LC 1, 1.2D + 1.6W

CENTEK Engineering, INC.		
tjl, cfc	Strcuture #10247 - Mast	Jan 18, 2017 at 4:43 PM
16162.08 /T-Mobile CT112...	LC #1 Loads	TIA.r3d



CENTEK Engineering, INC.		
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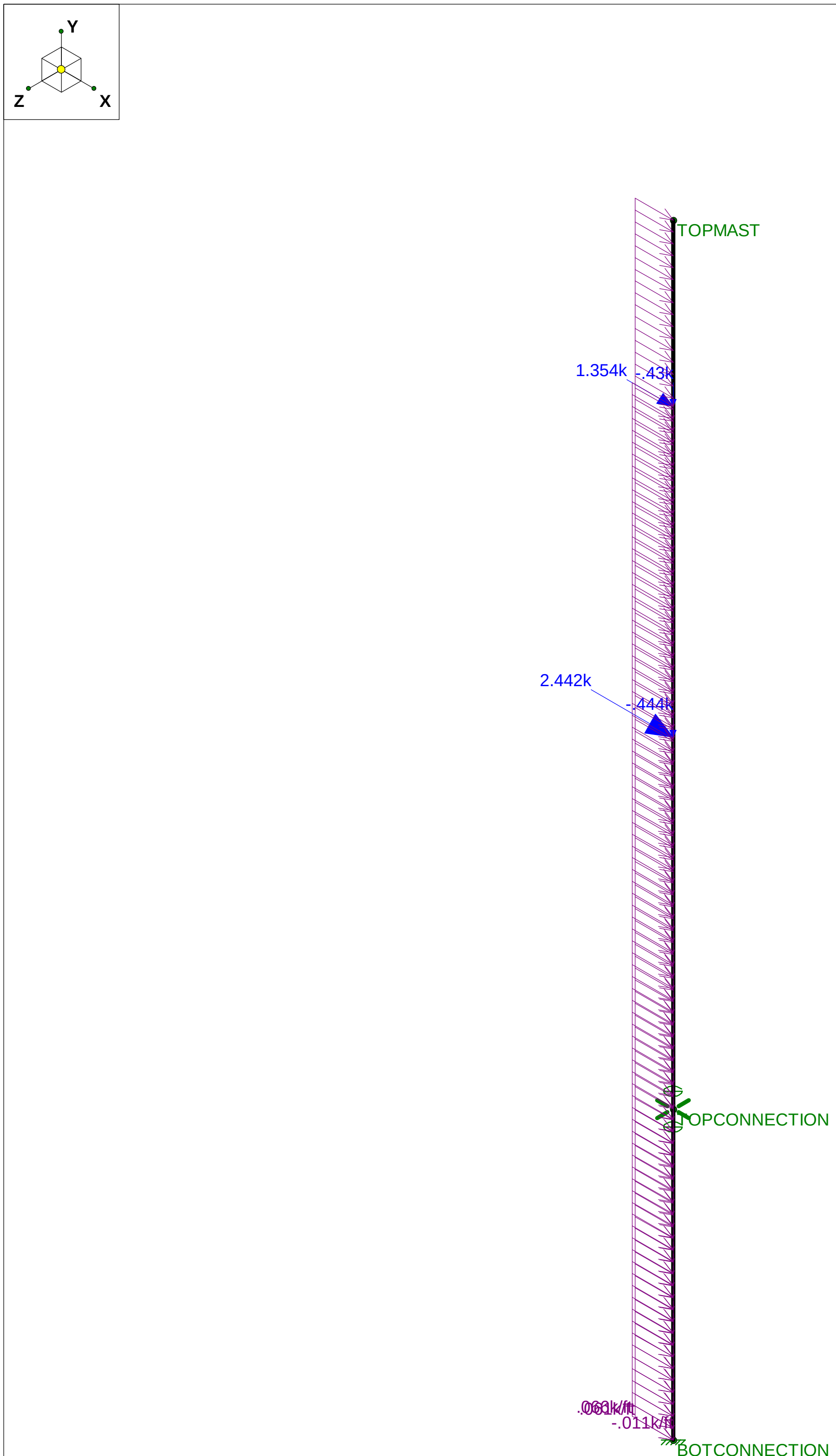
16162.08 /T-Mobile CT112...	LC #1 Reactions and Deflected Shape	TIA.r3d



Loads: LC 2, 0.9D + 1.6W

CENTEK Engineering, INC.		
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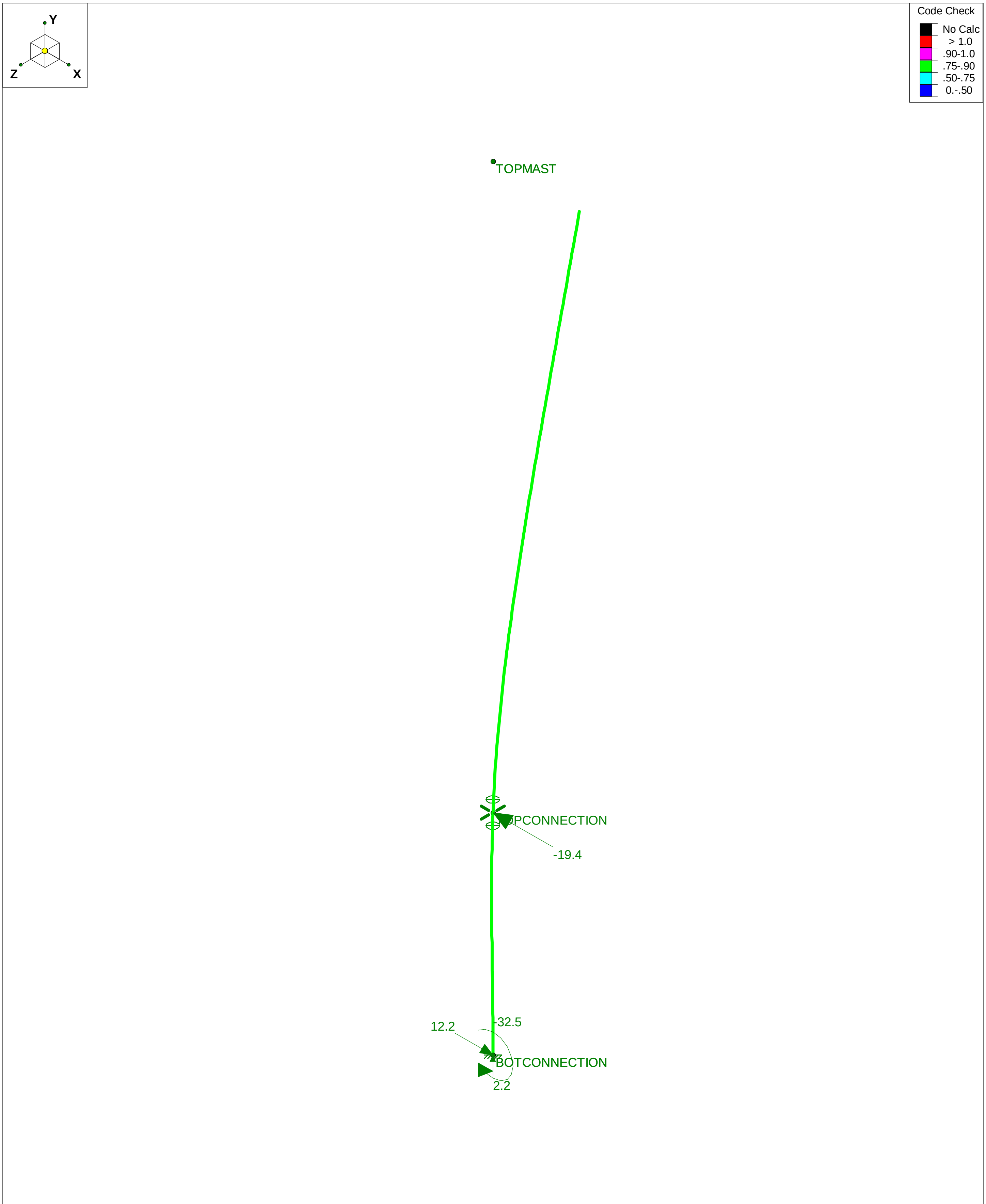

CENTEK Engineering, INC.		
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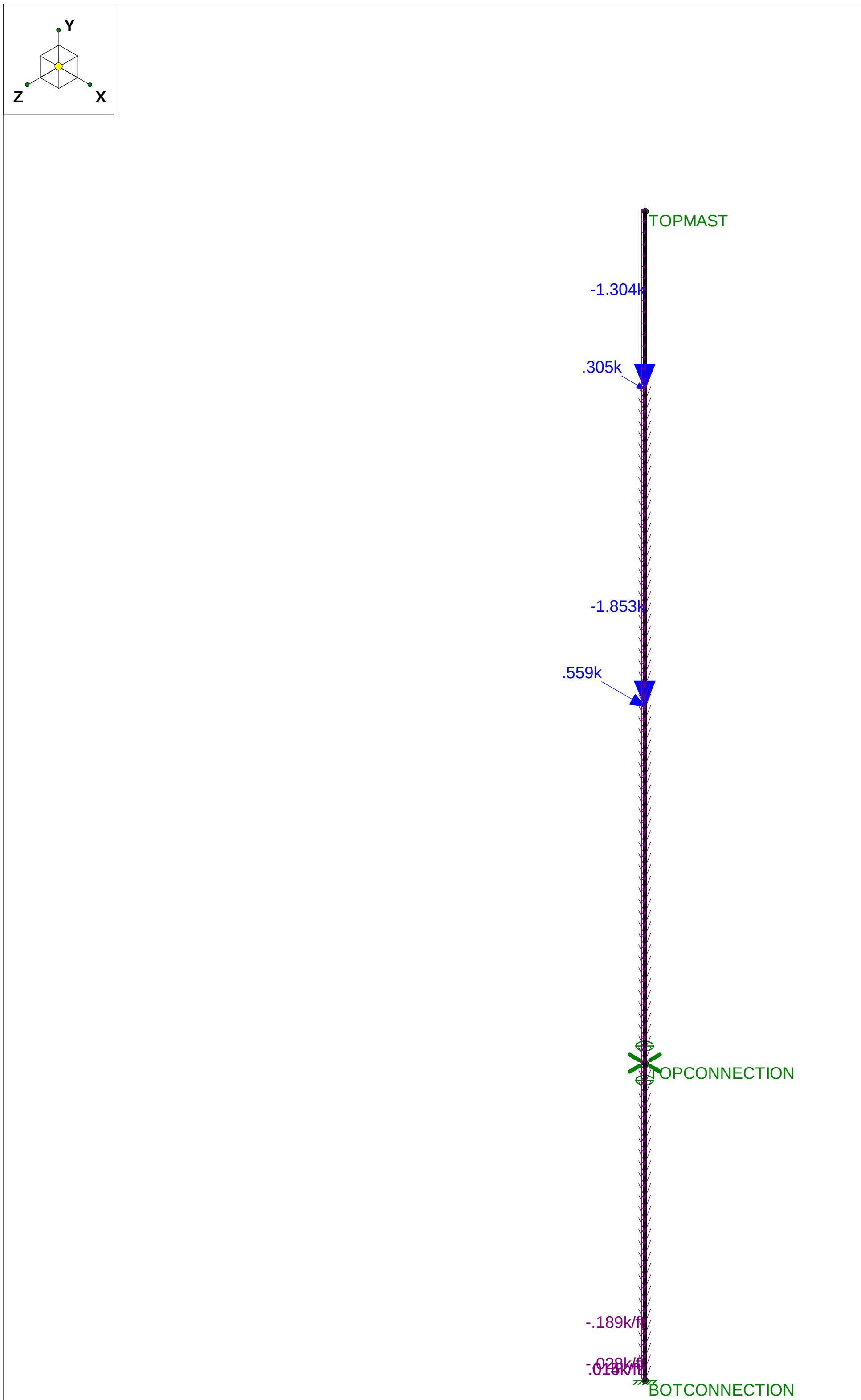
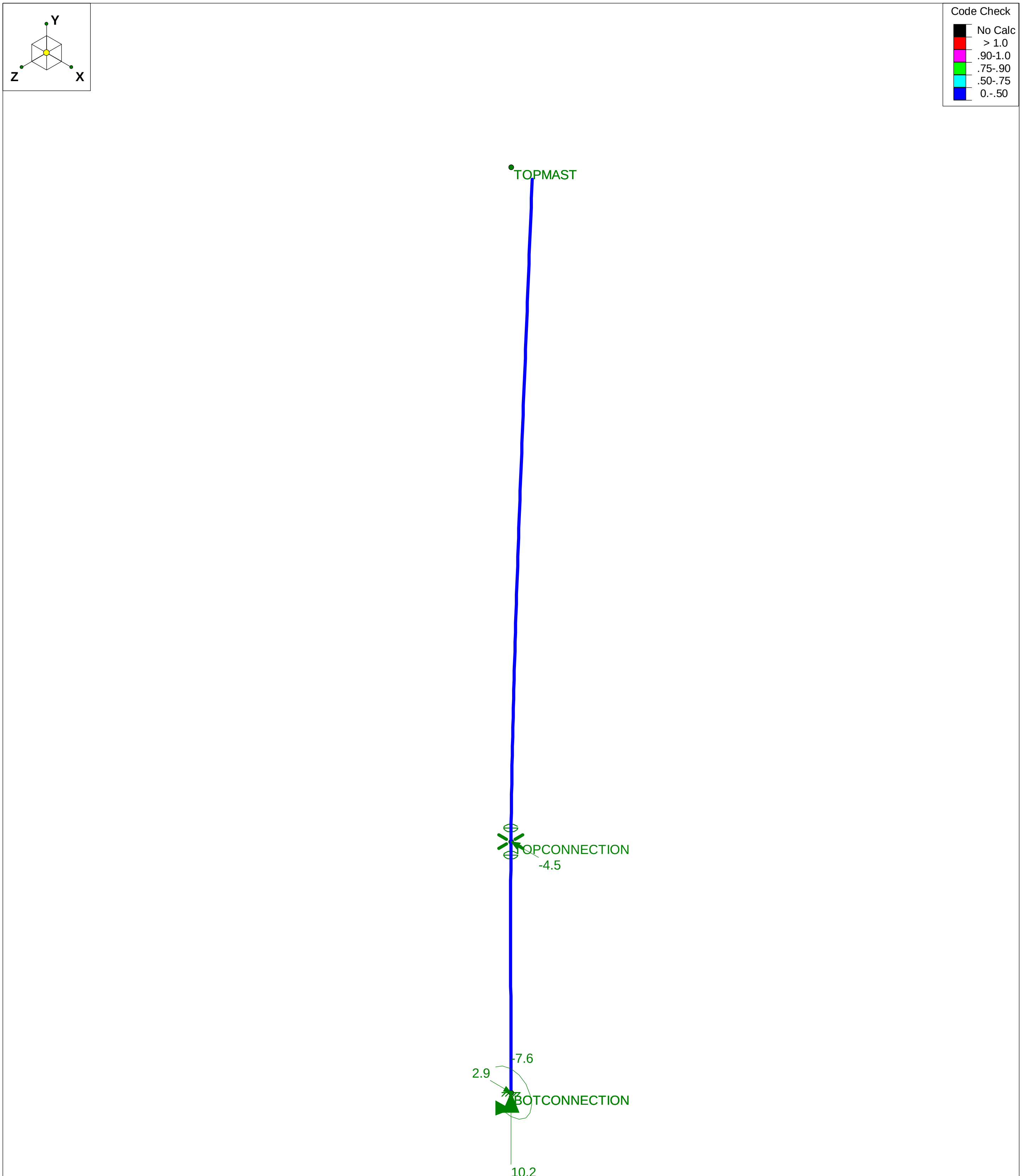
16162.08 /T-Mobile CT112...	LC #2 Reactions and Deflected Shape	TIA.r3d



Loads: LC 3, 1.2D +1.0Di + 1.0Wi

CENTEK Engineering, INC.		
tjl, cfc	Strcuture #10247 - Mast	Jan 18, 2017 at 4:43 PM
16162.08 /T-Mobile CT112...	LC #3 Loads	TIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Strcuture #10247 - Mast	Jan 18, 2017 at 4:45 PM
16162.08 /T-Mobile CT112...	LC #3 Reactions and Deflected Shape	TIA.r3d

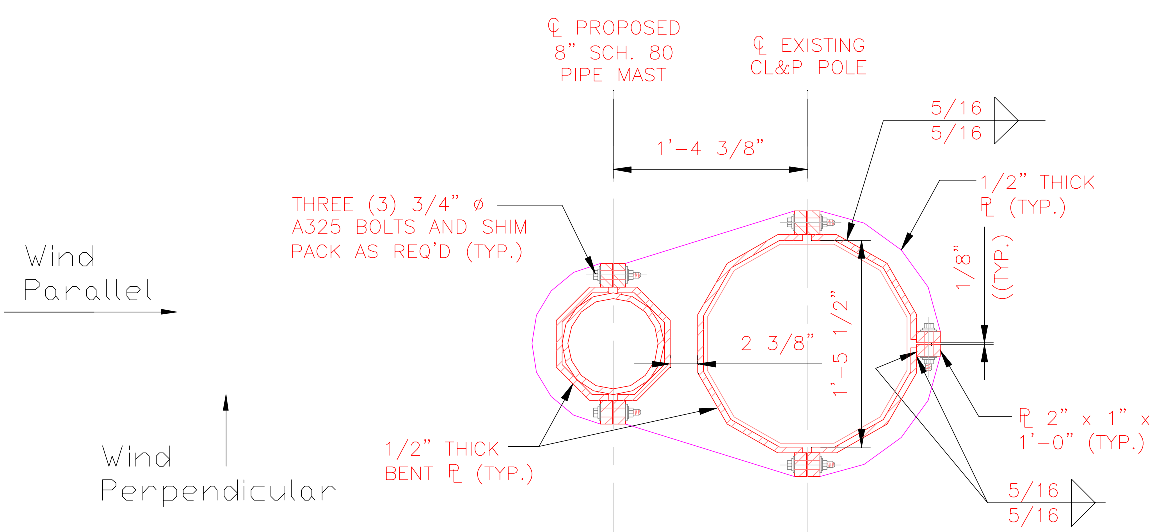
Mast Top Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 0 \cdot kips$	(User Input)
Horizontal =	$Horz := 19.5 \cdot kips$	(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 =	$e := 16.375 \cdot in$	(User Input)
Vetical Spacing Between Top and Bottom Bolts =	$S_{vert} := 9 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 20.5 \cdot in$	(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($f_v < \phi \cdot F_{nv}$, "OK", "Overstressed")

Condition1 = "OK"

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

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 = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 3.25 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 7.4 \cdot ksi$

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

Condition2 = "OK"

$\frac{f_t}{(\phi \cdot F'_{nt})} = 10.9$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{\sqrt{Vert^2 + Horz^2}}{n_b \cdot a_b} = 7.356 \cdot ksi$

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

Condition3 = "OK"

$\frac{f_v}{(\phi \cdot F_{nv})} = 18.2 \cdot \%$

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 = $F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 5.192 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 11.752 \cdot ksi$

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

Condition4 = "OK"

$\frac{f_t}{(\phi \cdot F'_{nt})} = 17.4 \cdot \%$

Mast Connection to Bottom Bracket:

Design Reactions:

Axial =	$Axial := 3.0 \cdot kips$	(User Input)
Shear =	$Shear := 12.3 \cdot kips$	(User Input)
Moment =	$Moment := 33 \cdot kips \cdot ft$	(User Input)

Bolt Data:

Use ASTM A325

Number of Bolts =	$N := 4$	(User Input)
Distance Between Bolts x-dir=	$S_x := 9 \cdot in$	(User Input)
Distance Between Bolts x-dir=	$S_y := 9 \cdot in$	(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 Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Flange Bolts =	$D := 1.0 \cdot in$	(User Input)
Threads per Inch =	$n := 8$	(User Input)

Base Plate Data:

Base Plate Steel =	A36	(User Input)
Yield Stress =	$F_y := 36 \cdot ksi$	(User Input)
Resistance Factor =	$\phi_b := 0.9$	(User Input)
Base Plate Width =	$Pl_w := 12 \cdot in$	(User Input)
Base Plate Length =	$Pl_L := 12 \cdot in$	(User Input)
Base Plate Thickness =	$Pl_t := 1.0 \cdot in$	(User Input)
Pole Diameter =	$D_p := 8.63 \cdot in$	(User Input)

Base Plate Data:

Weld Grade	E70XX	(User Input)
Weld Yield Stress =	$F_{EXX} := 70 \cdot ksi$	(User Input)
Resistance Factor =	$\phi_w := 0.75$	(User Input)
Weld Size =	$sw := 0.375 \cdot in$	(User Input)

Bolt Analysis:

Area of Bolt = $A_b := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Shear Stress per Bolt = $f_v := \frac{Shear}{N \cdot A_b} = 3.915 \cdot ksi$

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

Condition1 = "OK"

$\frac{f_v}{(\phi \cdot F_{nv})} = 9.7 \cdot \%$

Tensile Force Horizontal = $T_x := \frac{Moment}{S_x \cdot \frac{N}{2}} - \frac{Axial}{N} = 21.3 \cdot kips$

Tensile Force Horizontal = $T_y := \frac{Moment}{S_y \cdot \frac{N}{2}} - \frac{Axial}{N} = 21.3 \cdot kips$

Spacing Diagonal = $S_d := \sqrt{S_x^2 + S_y^2} = 12.7 \cdot in$

Tensile Force Diagonal = $T_D := \frac{Moment}{S_d} - \frac{Axial}{N} = 30.4 \cdot kips$

Maximum Tension per Bolt = $T_{max} := \max(T_x, T_y, T_D) = 0.2 ft^2 \cdot ksi$

Tensile Stress per Bolt = $f_t := \frac{T_{max}}{A_b} = 38.7 \cdot ksi$

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

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

Condition2 = "OK"

$\frac{f_t}{(\phi \cdot F'_{nt})} = 57.3 \cdot \%$

Base Plate Check:

Moment Arm = $K := \frac{(S_d - D_p)}{2} = 2.05 \cdot in$

Moment in Base Plate = $M := K \cdot T_{max} = 62.21 \cdot kips \cdot in$

Plate Bending Width = $W := \left(Pl_w \cdot \sqrt{2} - D_p\right) = 8.34 \cdot in$

Plastic Modulus = $Z := \frac{1}{4} \cdot W \cdot Pl_t^{\,2} = 2.09 \cdot in^3$

Bending Stress = $f_b := \frac{M}{Z} = 29.84 \cdot ksi$

Condition3 := if$\left(f_b < \phi_b \cdot F_y, \text{"OK"}, \text{"Overstressed"}\right)$ $\frac{f_b}{(\phi_b \cdot F_y)} = 92.1 \cdot \%$

Condition3 = "OK"

Base Plate to Mast Weld Check:

Nominal Weld Stress = $F_w := 0.6 \cdot F_{EXX} = 42 \cdot ksi$

Weld Area = $A_w := \frac{\pi}{4} \cdot \left[\left(D_p + 2sw \cdot 0.707\right)^2 - D_p^{\,2}\right] = 7.41 \cdot in^2$

Weld Moment of Inertia = $I_w := \frac{\pi}{64} \cdot \left[\left(D_p + 2sw \cdot 0.707\right)^4 - D_p^{\,4}\right] = 73.34 \cdot in^4$

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

Section Modulus of Weld = $S_w := \frac{I_w}{c} = 16.01 \cdot in^3$

Weld Stress = $f_w := \frac{Moment}{S_w} + \frac{Shear}{A_w} = 26.39 \cdot ksi$

Condition3 := if$\left(f_w < \phi_w \cdot F_w, \text{"OK"}, \text{"Overstressed"}\right)$ $\frac{f_w}{(\phi_w \cdot F_w)} = 83.8 \cdot \%$

Condition3 = "OK"

Mast Bottom Connection:

Maximum Design Reactions at Brace:

Vertical = $Vert := 3.0 \cdot kips$ (User Input)

Horizontal = $Horz := 12.3 \cdot kips$ (User Input)

Moment = $Moment := 33 \cdot ft \cdot kips$ (User Input)

Bolt Data:

Bolt Grade = A325 (User Input)

Number of Bolts = $n_b := 8$ (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 = $e := 16.375 \cdot in$ (User Input)

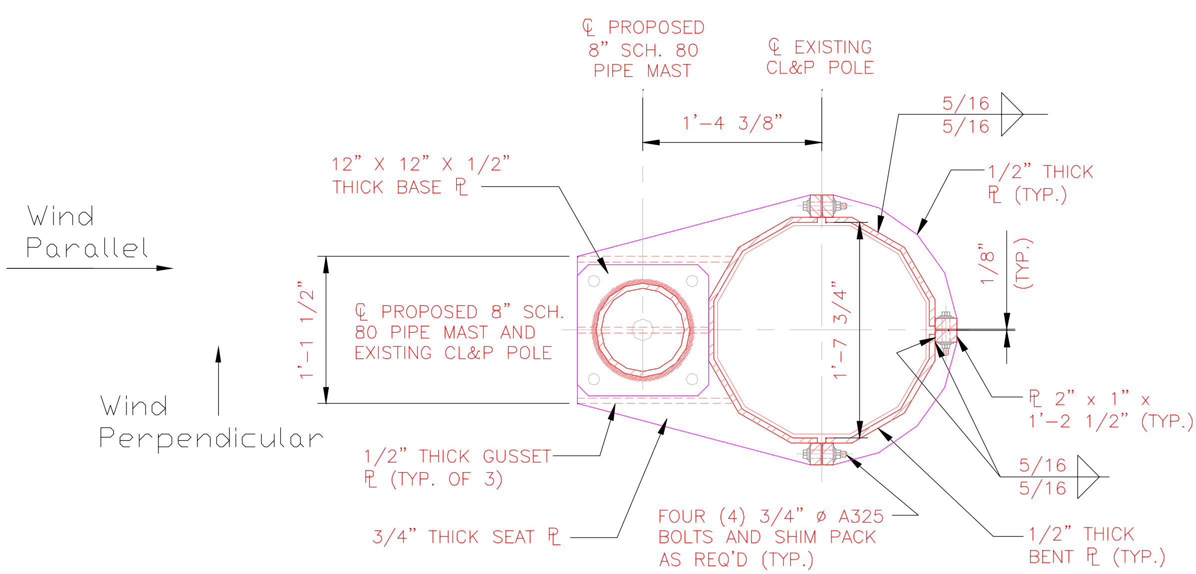
Horizontal Spacing Between Bolts = $S_{horz} := 22.75 \cdot in$ (User Input)

Vetical Spacing From Plate CL to Bolt 1 = $S_{vert1} := 2 \cdot in$ (User Input)

Vetical Spacing From Plate CL to Bolt 2 = $S_{vert2} := 6 \cdot in$ (User Input)

Bolt Polar Moment of Inertia = $I_p := 4 \cdot S_{vert1}^2 + 4 \cdot S_{vert2}^2 = 160 \cdot in^2$

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 = $f_v := \frac{Vert}{n_b \cdot a_b} = 0.849 \cdot ksi$

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

$\frac{f_v}{(\phi \cdot F_{nv})} = 2.1 \cdot \%$

Condition1 = "OK"

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

Tension Force Each Bolt = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{(Vert \cdot e + Moment) \cdot S_{vert2}}{I_p} = 18.23 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 41.3 \cdot ksi$

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

$\frac{f_t}{(\phi \cdot F'_{nt})} = 61.1 \cdot \%$

Condition2 = "OK"

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{\sqrt{\left(\frac{Vert}{n_b} + \frac{Moment \cdot 2}{S_{horz} \cdot n_b}\right)^2 + \left(\frac{Horz}{n_b}\right)^2}}{a_b} = 11.251 \cdot ksi$

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

$\frac{f_v}{(\phi \cdot F_{nv})} = 27.8 \cdot \%$

Condition3 = "OK"

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

Tension Force per Bolt = $F_{tension.conn} := \frac{\frac{Horz \cdot e}{n_b}}{S_{horz} \cdot \frac{n_b}{2}} + \frac{(Vert \cdot e) \cdot S_{vert2}}{I_p} = 4.056 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 9.18 \cdot ksi$

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

$\frac{f_t}{(\phi \cdot F'_{nt})} = 13.6 \cdot \%$

Condition4 = "OK"

Basic Components

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

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

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

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

Factors for Extreme Wind Calculation

Elevation of Top of Mast Above Grade = $TME := 133$ 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 = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.344$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.3$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.815$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.847$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 29.1$ psf (NESC 2007 Section 250.C.2)

Shape Factors

NUS Design Criteria Issued April 12, 2007

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

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

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

Overload Factors

NU Design Criteria Table

Overload Factors for Wind Loads:

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

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

Overload Factors for Vertical Loads:

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

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

Development of Wind & Ice Load on PCS Mast

Mast Data: (Pipe 8" Sch. 80)

Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 8.63$	in	(User Input)
Mast Length =	$L_{mast} := 29.5$	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) = $qz \cdot Cd_R \cdot A_{mast} \cdot m = 34$ plf **BLC 5**

Total Mast Wind Force (Below NU Structure) = $qz \cdot Cd_R \cdot A_{mast} = 27$ plf **BLC 5**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.803$ sf/ft

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

Antenna Data:

Antenna Model = Andrew LNX-6515DS

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 96.6$ in (User Input)

Antenna Width = $W_{ant} := 11.9$ in (User Input)

Antenna Thickness = $T_{ant} := 7.1$ in (User Input)

Antenna Weight = $WT_{ant} := 44$ 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 = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 8$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 23.9$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 1396$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 8.7$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 26.2$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 168$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 132$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 8162$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 2036$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 66$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 198$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = RFS APX16DWV-16DWVS

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 55.9$ in (User Input)

Antenna Width = $W_{ant} := 13$ in (User Input)

Antenna Thickness = $T_{ant} := 3.15$ in (User Input)

Antenna Weight = $WT_{ant} := 41$ lbs (User Input)

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

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 15.1$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 882$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 5.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 16.6$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 106$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 123$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2289$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1017$ cu in

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

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 99$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = Andrew ATSBT-TOP-FM-4G

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 = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 25$ 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 Antenna Mounts

Mount Data:

Mount Type: Site Pro Universal Ring Mount & Adapter Kit w/ 3 Pipes

Mount Shape = Round (User Input)

Pipe Mount Length = $L_{mnt} := 60$ in (User Input)

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

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

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

Site Pro Universal Ring Mount & Adapter Weight = $W_{tsa.mnt} := 300$ lbs (User Input)

Wind Load (NESC Extreme)

Assumes Mount is Shielded by Antenna

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

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

Wind Load (NESC Heavy)

Assumes Mount is Shielded by Antenna

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

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

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

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 18$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{tsa.mnt} = 355$ lbs **BLC 2**

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

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^{2} \cdot L_{mnt} = 266$ cu in

Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 1\right)^2\right] \cdot \left(L_{mnt} + 1\right)\right] - V_{mnt} = 280$ cu in

Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 9$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 5 = 32$ 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 = $L_{coax} := 29$ ft (User Input)

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

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

No. of Coax Projecting Outside Face of Mast = $NP_{coax} := 6$ (User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.8$ sf/ft

Total Coax Wind Force (Above NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 41$ plf **BLC 5**

Total Coax Wind Force (Below NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 33$ plf **BLC 5**

Wind Load (NESC Heavy)

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

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 5$ plf **BLC 4**

Gravity Loads (without ice)

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

Gravity Load (ice only)

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

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

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

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining Reactions Applied to Utility Pole Tabulated Load Cases**

Location: **Brookfield, CT**

Date:1/18/17 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16162.08

Load Case	Description
1	Self Weight (Mast)
2	Weight of Appurtenances
3	Weight of Ice Only
4	NESC Heavy Wind
5	NESC Extreme Wind

Footnotes:

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Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining Reactions Applied to Utility Pole**
Load Combinations Table

Location: **Brookfield, CT**

Date: 1/18/17 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16162.08

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

Footnotes:
(1) BLC = Basic Load Case

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number 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-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

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, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	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 Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	Existing Mast	29.5												Lateral

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	Beam	Pipe	A53 Gr. B	Typical	11.9	100	100	199

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTCO...	TOPMA...			Existing Mast	Beam	Pipe	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From ...
1	BOTCONNECTION	0	0	0	0	
2	TOPCONNECTION	0	8	0	0	
3	TOPMAST	0	29.5	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTCONNECTION	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	TOPCONNECTION	Reaction		Reaction		Reaction		

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.123	25
2	M1	Y	-.355	25
3	M1	Y	-.132	17
4	M1	Y	-.006	17
5	M1	Y	-.355	17

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.099	25
2	M1	Y	-.032	25
3	M1	Y	-.198	17
4	M1	Y	-.005	17
5	M1	Y	-.032	17

Member Point Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.106	25
2	M1	X	.168	17
3	M1	X	.004	17

Member Point Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.882	25
2	M1	X	1.396	17
3	M1	X	.025	17

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
No Data to Print ...			

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.012	-.012	0	25

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

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.006	-.006	0	0
2	M1	Y	-.023	-.023	0	25

Member Distributed Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.004	.004	0	0
2	M1	X	.005	.005	0	25

Member Distributed Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.034	.034	10	29.5
2	M1	X	.027	.027	0	10
3	M1	X	.041	.041	10	25
4	M1	X	.033	.033	0	10

Basic Load Cases

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

Load Combinations

	Description	Sol...	PDelta	SR..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact...
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

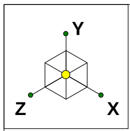
	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTCONNE...	max	7.386	2	5.375	1	0	1	0	1	0	1	-5.822	1
2		min	2.199	1	2.466	2	0	1	0	1	0	1	-19.474	2
3	TOPCONNE...	max	-3.502	1	0	1	0	1	0	1	0	1	0	1
4		min	-11.567	2	0	1	0	1	0	1	0	1	0	1
5	Totals:	max	-1.302	1	5.375	1	0	1						
6		min	-4.181	2	2.466	2	0	1						

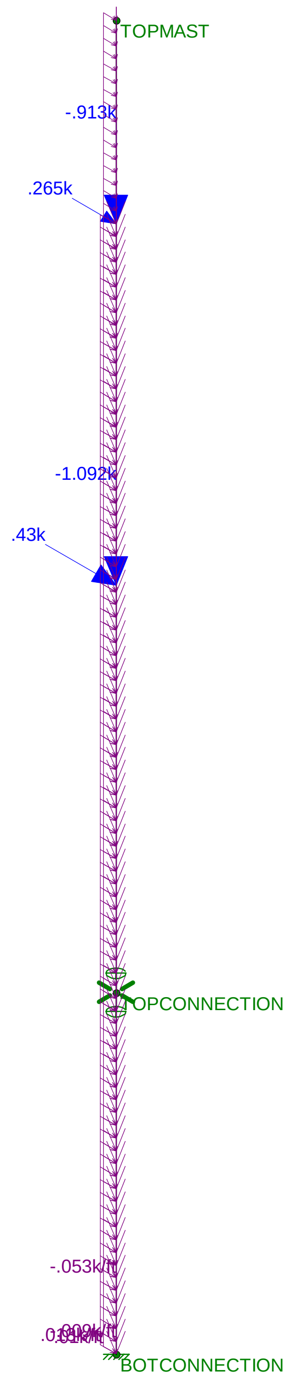
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	2.199	5.375	0	0	0	-5.822
2	1	TOPCONNECTION	-3.502	0	0	0	0	0
3	1	Totals:	-1.302	5.375	0			
4	1	COG (ft):	X: 0	Y: 16.4	Z: 0			

Joint Reactions

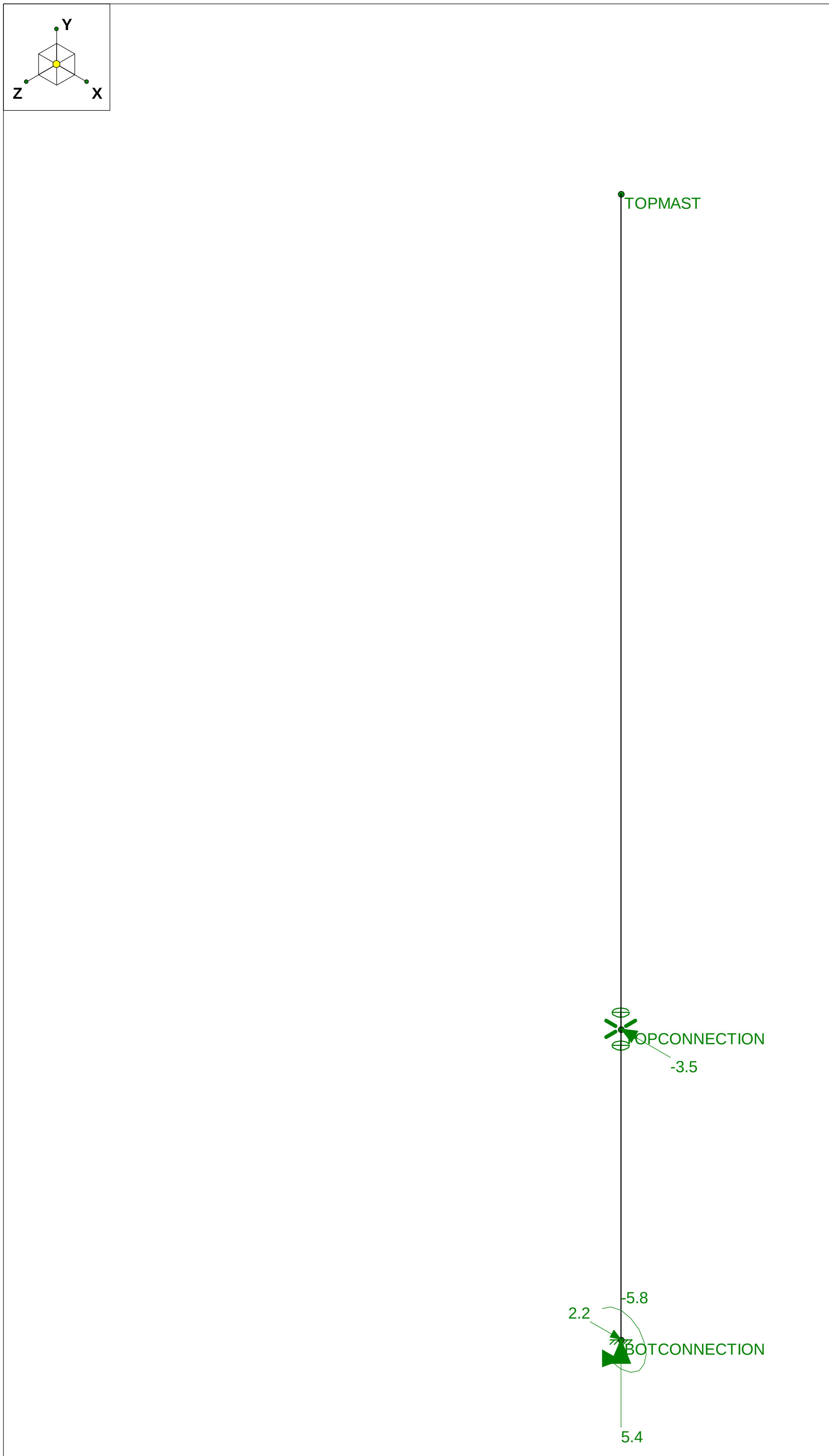
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	7.386	2.466	0	0	0	-19.474
2	2	TOPCONNECTION	-11.567	0	0	0	0	0
3	2	Totals:	-4.181	2.466	0			
4	2	COG (ft):	X: 0	Y: 16.913	Z: 0			





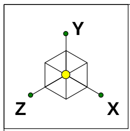
Loads: LC 1, NESC Heavy Wind

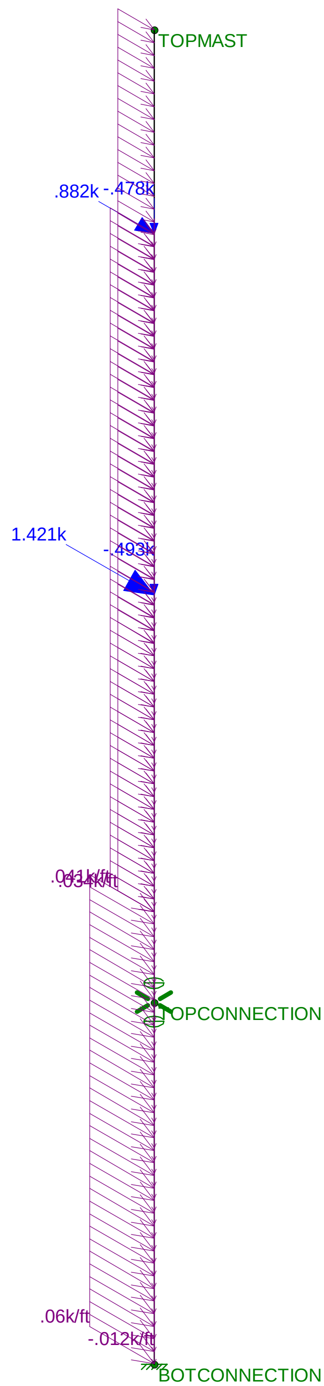
CENTEK Engineering, Inc.		
tjl, cfc	Structure # 10247 - Mast	Jan 18, 2017 at 4:59 PM
16162.08 /T-Mobile CT112...	LC #1 Loads	NESC.r3d



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

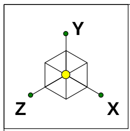
CENTEK Engineering, Inc.		
tjl, cfc	Structure # 10247 - Mast	Jan 18, 2017 at 5:00 PM
16162.08 /T-Mobile CT112...	LC #1 Reactions	NESC.r3d

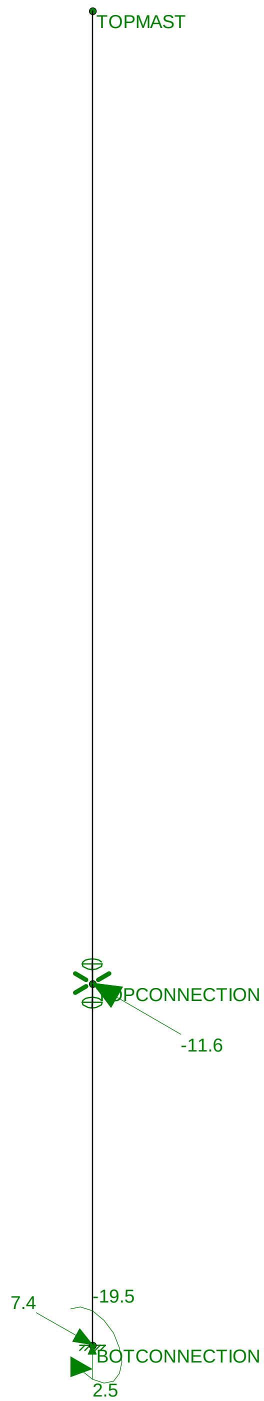




Loads: LC 2, NESC Extreme Wind

CENTEK Engineering, Inc.		
tjl, cfc	Structure # 10247 - Mast	Jan 18, 2017 at 5:00 PM
16162.08 /T-Mobile CT112...	LC #2 Loads	NESC.r3d





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

CENTEK Engineering, Inc.		
tjl, cfc	Structure # 10247 - Mast	Jan 18, 2017 at 5:01 PM
16162.08 /T-Mobile CT112...	LC #2 Reactions	NESC.r3d

Coax Cable on CL&P Pole

Distance Between Coax Cable Attach Points =

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

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 = $N_{coax} := 18$ *(User Input)*

Number of Projected Coax Cables = $NP_{coax} := 6$ *(User Input)*

Extreme Wind Pressure = $qz := 29.1 \cdot psf$ *(User Input)*

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

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

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

Shape Factor = $Cd_{coax} := 1.6$ *(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 = $A := (NP_{coax} \cdot D_{coax}) = 9.3 \cdot in$

Wind Area with Ice = $A_{ice} := (NP_{coax} \cdot D_{coax} + 2 \cdot Ir) = 10.3 \cdot in$

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

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax} \cdot Id \cdot N_{coax} = 22.541 \cdot plf$

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 =

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

$$Heavy\_WInd_{Vert} = \begin{pmatrix} 516 \\ 516 \\ 516 \\ 516 \\ 516 \\ 516 \\ 516 \\ 516 \\ 516 \\ 516 \end{pmatrix} lb \qquad Heavy\_Wind_{Trans} = \begin{pmatrix} 137 \\ 137 \\ 137 \\ 137 \\ 137 \\ 137 \\ 137 \\ 137 \\ 137 \\ 137 \end{pmatrix} lb$$

Extreme Wind Vertical Load =

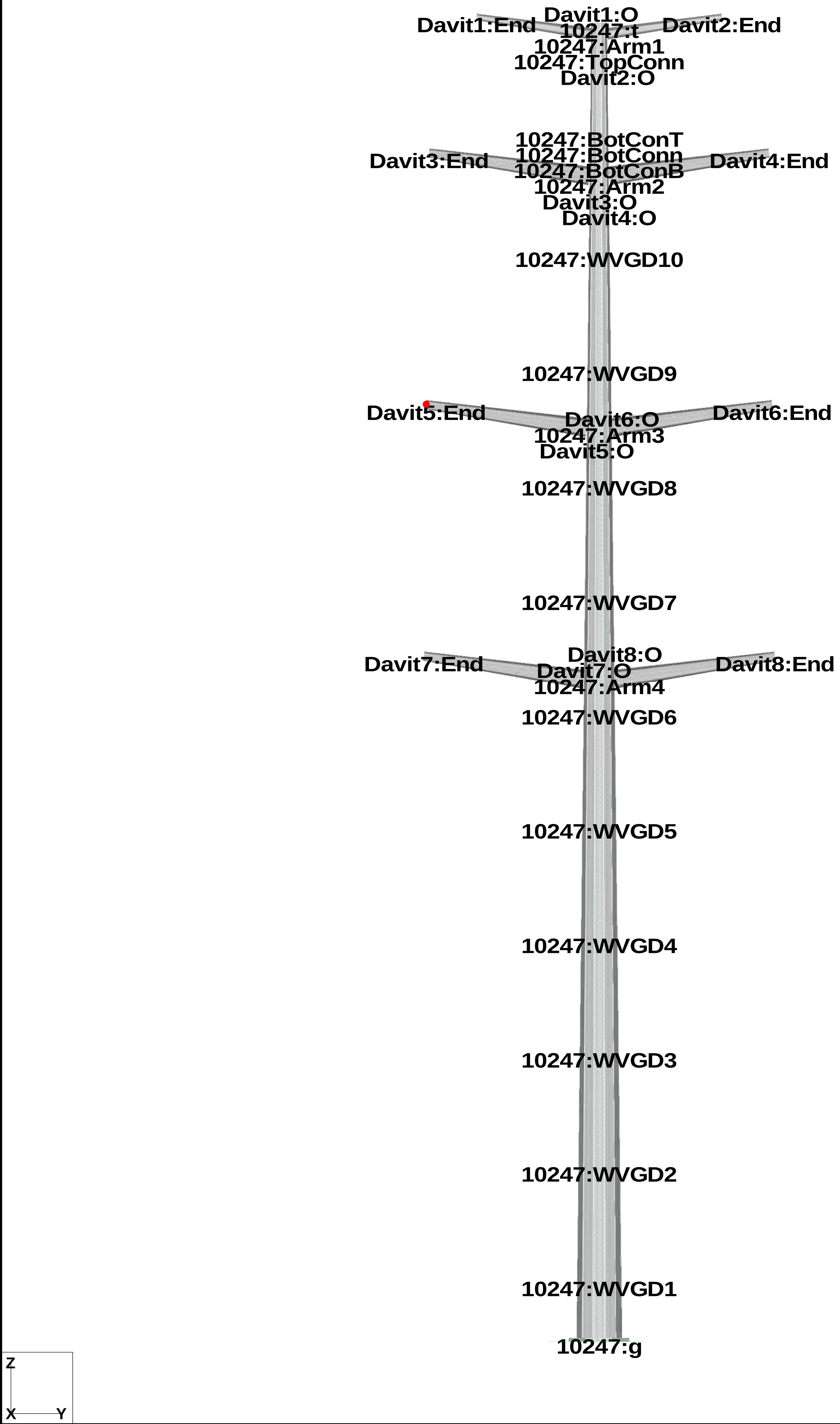
$$Extreme\_Wind_{Vert} := \overrightarrow{\left(N_{coax} \cdot W_{coax} \cdot Coax_{Span} \cdot OF_{EWV}\right)}$$

Extreme Wind Transverse Load =

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

$$Extreme\_Wind_{Vert} = \begin{pmatrix} 119 \\ 119 \\ 119 \\ 119 \\ 119 \\ 119 \\ 119 \\ 119 \\ 119 \\ 119 \end{pmatrix} lb \qquad Extreme\_Wind_{Trans} = \begin{pmatrix} 361 \\ 361 \\ 361 \\ 361 \\ 361 \\ 361 \\ 361 \\ 361 \\ 361 \\ 361 \end{pmatrix} lb$$

Centek Engineering Inc, Project: "cl&p structure # 10247"
PLS-POLE Version 12.50, 8:50:40 AM Thursday, January 19, 2017
Undeformed geometry displayed



Project Name : 16162.08 - Brookfield, CT
Project Notes: Str # 10247/ T-Mobile - CT11201A
Project File : J:\Jobs\1616200.WI\08_CT11201A\04_Structural\Backup Documentation\Calcs\PLS-Pole\cl&p structure # 10247.pol
Date run : 8:50:01 AM Thursday, January 19, 2017
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\1616200.wi\08_ct11201a\04_structural\backup documentation\calcs\pls-pole\cl&p #10247.lca

*** Analysis Results:

Maximum element usage is 85.46% for Base Plate "10247" in load case "NESC Extreme"
Maximum insulator usage is 24.34% for Clamp "Clamp11" in load case "NESC Extreme"

Summary of Joint Support Reactions For All Load Cases:

Load Case	Joint Label	Long. Force (kips)	Tran. Force (kips)	Vert. Force (kips)	Shear Force (kips)	Tran. Moment (ft-k)	Long. Moment (ft-k)	Bending Moment (ft-k)	Vert. Moment (ft-k)	Found. Usage %
NESC Heavy	10247:g	-0.11	-20.86	-72.73	20.86	1775.89	-5.78	1775.89	-0.01	0.00
NESC Extreme	10247:g	-0.04	-34.66	-38.55	34.66	2777.54	-1.81	2777.54	-0.01	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	10247:t	0.11	45.32	-1.05	45.33	0.01	-3.46	0.00
NESC Extreme	10247:t	0.03	70.91	-2.49	70.95	0.00	-5.58	0.00

Tubes Summary:

Pole Label	Tube Num.	Weight (lbs)	Load Case	Maximum Usage %	Resultant Moment (ft-k)
10247	1	4574	NESC Extreme	61.17	786.69
10247	2	6628	NESC Extreme	70.16	1918.32
10247	3	5021	NESC Extreme	69.90	2777.54

*** 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)
10247	70.16	NESC Extreme	27	18435.7

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
Davit1	7.66	NESC Heavy	1	182.8
Davit2	10.74	NESC Heavy	1	182.8
Davit3	17.39	NESC Heavy	1	537.4
Davit4	22.27	NESC Heavy	1	537.4
Davit5	17.52	NESC Heavy	1	537.4
Davit6	22.33	NESC Heavy	1	537.4
Davit7	17.67	NESC Heavy	1	537.4
Davit8	22.42	NESC Heavy	1	537.4

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	56.52	10247	Base Plate
NESC Extreme	85.46	10247	Base Plate

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number
NESC Heavy	46.89	10247	27
NESC Extreme	70.16	10247	27

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	10247	12	38.475	70.520	1775.885	-5.775	33.914	137.053	4	89.013	2.068	56.52
NESC Extreme	10247	12	38.475	36.334	2777.538	-1.807	51.279	207.228	4	134.454	2.542	85.46

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC Heavy	22.42	Davit8	1
NESC Extreme	10.79	Davit8	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
Clamp1	Clamp	1.17	NESC Heavy	0.0
Clamp2	Clamp	1.29	NESC Heavy	0.0
Clamp3	Clamp	6.17	NESC Heavy	0.0

Clamp4	Clamp	6.92	NESC Heavy	0.0
Clamp5	Clamp	6.17	NESC Heavy	0.0
Clamp6	Clamp	6.92	NESC Heavy	0.0
Clamp7	Clamp	6.17	NESC Heavy	0.0
Clamp8	Clamp	6.92	NESC Heavy	0.0
Clamp9	Clamp	14.46	NESC Extreme	0.0
Clamp10	Clamp	9.73	NESC Extreme	0.0
Clamp11	Clamp	24.34	NESC Extreme	0.0
Clamp12	Clamp	24.34	NESC Extreme	0.0
Clamp13	Clamp	0.67	NESC Heavy	0.0
Clamp14	Clamp	0.67	NESC Heavy	0.0
Clamp15	Clamp	0.67	NESC Heavy	0.0
Clamp16	Clamp	0.67	NESC Heavy	0.0
Clamp17	Clamp	0.67	NESC Heavy	0.0
Clamp18	Clamp	0.67	NESC Heavy	0.0
Clamp19	Clamp	0.67	NESC Heavy	0.0
Clamp20	Clamp	0.67	NESC Heavy	0.0
Clamp21	Clamp	0.67	NESC Heavy	0.0
Clamp22	Clamp	0.67	NESC Heavy	0.0

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	3590.0
Weight of Steel Poles:	18435.7
Total:	22025.7

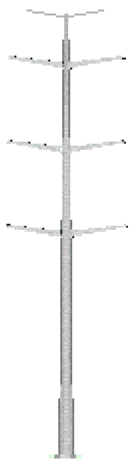
*** End of Report

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

Project Name : 16162.08 - Brookfield, CT
Project Notes: Str # 10247/ T-Mobile - CT11201A
Project File : J:\Jobs\1616200.WI\08_CT11201A\04_Structural\Backup Documentation\Calcs\PLS-Pole\cl&p structure # 10247.pol
Date run : 8:50:00 AM Thursday, January 19, 2017
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: Yes
  Use Alternate Convergence Process: No
  Steel poles checked with ASCE/SEI 48-05

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

Steel Pole Properties:

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

Label		(ft)	Length (ft)			(in)	(in)	(in/ft)	Coef.		Override (ksi)	Override (lbs/ft^3)	Base	Type	Tip (ft)	Trans. Load (kips)	Long. Load (kips)
CL&P10247	10247	115.00	0	Yes	12F	16.94	47.75	0	1.3	3 tubes	0	0		Calculated	0.000	0.0000	0.0000

Steel Tubes Properties:

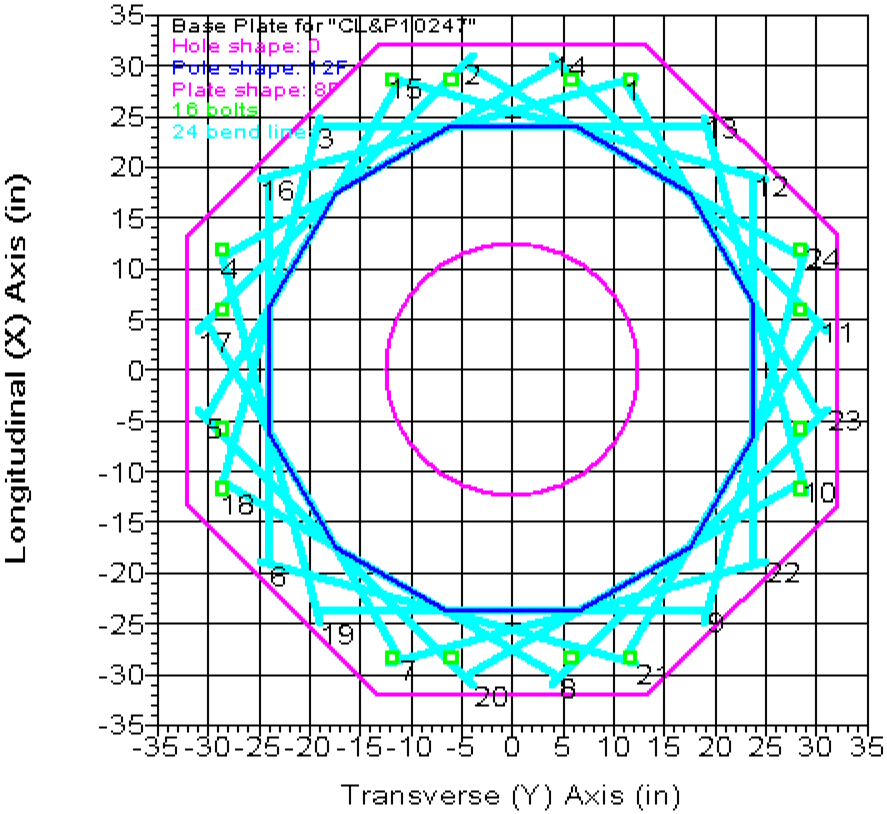
Pole Property	Tube No.	Length (ft)	Thickness (in)	Lap Length (ft)	Lap Factor	Lap Gap (in)	Yield Stress (ksi)	Moment Cap. Override (ft-k)	Tube Weight (lbs)	Center of Gravity (ft)	Calculated Taper (in/ft)	Tube Top Diameter (in)	Tube Bot. Diameter (in)	1.5x Diam. Lap Length (ft)	Actual Overlap (ft)
CL&P10247	1	55	0.3125	4.500	0.000	0.000	65.000	0.000	4574	30.40	0.27989	16.94	32.33	3.963	4.500
CL&P10247	2	44.5	0.375	5.830	0.000	0.000	65.000	0.000	6628	23.52	0.27989	30.45	42.90	5.269	5.830
CL&P10247	3	25.83	0.40625	0.000	0.000	0.000	65.000	0.000	5021	13.27	0.27989	40.52	47.75	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)
CL&P10247	64.000	8F	2.750	2214	38.475	25.000	0	490.00	60.000	2.250	57.000	16	28581.28	28581.28

Base Plate Bolt Coordinates for Property "CL&P10247":

Bolt X Coord.	Bolt Y Coord.	Bolt Angle (deg)
0.2061	1	0
0.4123	1	0
1	0.4123	0
1	0.2061	0



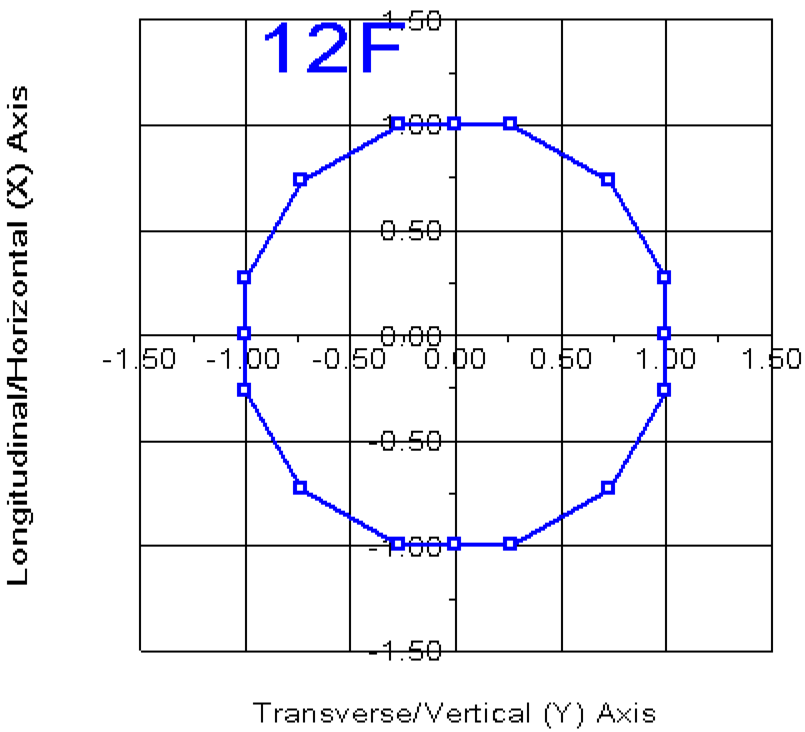
Steel Pole Connectivity:

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)
10247			0	0	0	0	0	CL&P10247	18 labels		0.00	0

Relative Attachment Labels for Steel Pole "10247":

Joint Label	Distance From Origin/Top Joint (ft)	Global Z of Attach (ft)
10247:Arm1	0.00	114.06
10247:Arm2	0.00	101.63
10247:Arm3	0.00	79.63
10247:Arm4	0.00	57.63
10247:TopConn	0.00	113.00

10247:BotConn	0.00	105.00
10247:BotConT	0.00	105.50
10247:BotConB	0.00	104.50
10247:WVGD1	0.00	5.00
10247:WVGD2	0.00	15.00
10247:WVGD3	0.00	25.00
10247:WVGD4	0.00	35.00
10247:WVGD5	0.00	45.00
10247:WVGD6	0.00	55.00
10247:WVGD7	0.00	65.00
10247:WVGD8	0.00	75.00
10247:WVGD9	0.00	85.00
10247:WVGD10	0.00	95.00



Pole Steel Properties:

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

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Outer Diam. (in)	Area (in^2)	T-Moment Inertia (in^4)	L-Moment Inertia (in^4)	D/t	W/t Max.	Fy (ksi)	Fa Min. (ksi)	T-Moment Capacity (ft-k)	L-Moment Capacity (ft-k)
10247	10247:t	10247:t Ori	0.00	16.94	16.70	591.15	591.15	0.00	11.8	65.00	65.00	378.10	378.10
10247	10247:Arm1	10247:Arm1 End	0.94	17.20	16.97	619.58	619.58	0.00	12.1	65.00	65.00	390.24	390.24

10247	10247:Arm1	10247:Arm1	Ori	0.94	17.20	16.97	619.58	619.58	0.00	12.1	65.00	65.00	390.24	390.24
10247	10247:TopConn	10247:TopConn	End	2.00	17.50	17.27	652.88	652.88	0.00	12.3	65.00	65.00	404.23	404.23
10247	10247:TopConn	10247:TopConn	Ori	2.00	17.50	17.27	652.88	652.88	0.00	12.3	65.00	65.00	404.23	404.23
10247	#10247:0	Tube 1	End	5.75	18.55	18.32	779.94	779.94	0.00	13.2	65.00	65.00	455.57	455.57
10247	#10247:0	Tube 1	Ori	5.75	18.55	18.32	779.94	779.94	0.00	13.2	65.00	65.00	455.57	455.57
10247	10247:BotConT	10247:BotConT	End	9.50	19.60	19.38	922.50	922.50	0.00	14.1	65.00	65.00	509.97	509.97
10247	10247:BotConT	10247:BotConT	Ori	9.50	19.60	19.38	922.50	922.50	0.00	14.1	65.00	65.00	509.97	509.97
10247	10247:BotConn	10247:BotConn	End	10.00	19.74	19.52	942.72	942.72	0.00	14.2	65.00	65.00	517.46	517.46
10247	10247:BotConn	10247:BotConn	Ori	10.00	19.74	19.52	942.72	942.72	0.00	14.2	65.00	65.00	517.46	517.46
10247	10247:BotConB	10247:BotConB	End	10.50	19.88	19.66	963.24	963.24	0.00	14.4	65.00	65.00	525.00	525.00
10247	10247:BotConB	10247:BotConB	Ori	10.50	19.88	19.66	963.24	963.24	0.00	14.4	65.00	65.00	525.00	525.00
10247	10247:Arm2	10247:Arm2	End	13.37	20.68	20.47	1087.04	1087.04	0.00	15.1	65.00	65.00	569.42	569.42
10247	10247:Arm2	10247:Arm2	Ori	13.37	20.68	20.47	1087.04	1087.04	0.00	15.1	65.00	65.00	569.42	569.42
10247	#10247:1	Tube 1	End	16.69	21.61	21.40	1242.31	1242.31	0.00	15.8	65.00	65.00	622.84	622.84
10247	#10247:1	Tube 1	Ori	16.69	21.61	21.40	1242.31	1242.31	0.00	15.8	65.00	65.00	622.84	622.84
10247	10247:WVGD10	10247:WVGD10	End	20.00	22.54	22.33	1411.71	1411.71	0.00	16.6	65.00	65.00	678.65	678.65
10247	10247:WVGD10	10247:WVGD10	Ori	20.00	22.54	22.33	1411.71	1411.71	0.00	16.6	65.00	65.00	678.65	678.65
10247	#10247:2	Tube 1	End	25.00	23.93	23.74	1695.53	1695.53	0.00	17.8	65.00	65.00	767.43	767.43
10247	#10247:2	Tube 1	Ori	25.00	23.93	23.74	1695.53	1695.53	0.00	17.8	65.00	65.00	767.43	767.43
10247	10247:WVGD9	10247:WVGD9	End	30.00	25.33	25.14	2015.04	2015.04	0.00	19.0	65.00	65.00	861.66	861.66
10247	10247:WVGD9	10247:WVGD9	Ori	30.00	25.33	25.14	2015.04	2015.04	0.00	19.0	65.00	65.00	861.66	861.66
10247	#10247:3	Tube 1	End	32.69	26.09	25.90	2202.27	2202.27	0.00	19.7	65.00	65.00	914.57	914.57
10247	#10247:3	Tube 1	Ori	32.69	26.09	25.90	2202.27	2202.27	0.00	19.7	65.00	65.00	914.57	914.57
10247	10247:Arm3	10247:Arm3	End	35.38	26.84	26.65	2400.75	2400.75	0.00	20.3	65.00	65.00	969.05	969.05
10247	10247:Arm3	10247:Arm3	Ori	35.38	26.84	26.65	2400.75	2400.75	0.00	20.3	65.00	65.00	969.05	969.05
10247	10247:WVGD8	10247:WVGD8	End	40.00	28.13	27.95	2769.62	2769.62	0.00	21.4	65.00	65.00	1066.51	1066.51
10247	10247:WVGD8	10247:WVGD8	Ori	40.00	28.13	27.95	2769.62	2769.62	0.00	21.4	65.00	65.00	1066.51	1066.51
10247	#10247:4	Tube 1	End	45.00	29.53	29.36	3208.92	3208.92	0.00	22.6	65.00	65.00	1177.11	1177.11
10247	#10247:4	Tube 1	Ori	45.00	29.53	29.36	3208.92	3208.92	0.00	22.6	65.00	65.00	1177.11	1177.11
10247	10247:WVGD7	10247:WVGD7	End	50.00	30.93	30.77	3692.38	3692.38	0.00	23.8	65.00	65.00	1293.18	1293.18
10247	10247:WVGD7	10247:WVGD7	Ori	50.00	30.93	30.77	3692.38	3692.38	0.00	23.8	65.00	65.00	1293.18	1293.18
10247	#10247:5	SpliceT	End	50.50	31.07	30.91	3743.23	3743.23	0.00	24.0	65.00	65.00	1305.09	1305.09
10247	#10247:5	SpliceT	Ori	50.50	31.07	30.91	3743.23	3743.23	0.00	24.0	65.00	65.00	1305.09	1305.09
10247	#10247:6	SpliceB	End	55.00	31.71	37.78	4747.35	4747.35	0.00	20.0	65.00	65.00	1622.05	1622.05
10247	#10247:6	SpliceB	Ori	55.00	31.71	37.78	4747.35	4747.35	0.00	20.0	65.00	65.00	1622.05	1622.05
10247	10247:Arm4	10247:Arm4	End	57.38	32.37	38.58	5055.94	5055.94	0.00	20.5	65.00	65.00	1692.01	1692.01
10247	10247:Arm4	10247:Arm4	Ori	57.38	32.37	38.58	5055.94	5055.94	0.00	20.5	65.00	65.00	1692.01	1692.01
10247	10247:WVGD6	10247:WVGD6	End	60.00	33.11	39.47	5412.26	5412.26	0.00	21.0	65.00	65.00	1771.06	1771.06
10247	10247:WVGD6	10247:WVGD6	Ori	60.00	33.11	39.47	5412.26	5412.26	0.00	21.0	65.00	65.00	1771.06	1771.06
10247	#10247:7	Tube 2	End	65.00	34.51	41.15	6136.53	6136.53	0.00	22.0	65.00	65.00	1926.62	1926.62
10247	#10247:7	Tube 2	Ori	65.00	34.51	41.15	6136.53	6136.53	0.00	22.0	65.00	65.00	1926.62	1926.62
10247	10247:WVGD5	10247:WVGD5	End	70.00	35.90	42.84	6922.69	6922.69	0.00	23.0	65.00	65.00	2088.73	2088.73
10247	10247:WVGD5	10247:WVGD5	Ori	70.00	35.90	42.84	6922.69	6922.69	0.00	23.0	65.00	65.00	2088.73	2088.73
10247	#10247:8	Tube 2	End	75.00	37.30	44.53	7773.29	7773.29	0.00	24.0	65.00	65.00	2257.39	2257.39
10247	#10247:8	Tube 2	Ori	75.00	37.30	44.53	7773.29	7773.29	0.00	24.0	65.00	65.00	2257.39	2257.39
10247	10247:WVGD4	10247:WVGD4	End	80.00	38.70	46.22	8690.86	8690.86	0.00	25.0	65.00	65.00	2432.60	2432.60
10247	10247:WVGD4	10247:WVGD4	Ori	80.00	38.70	46.22	8690.86	8690.86	0.00	25.0	65.00	65.00	2432.60	2432.60
10247	#10247:9	Tube 2	End	84.58	39.99	47.76	9593.30	9593.30	0.00	25.9	65.00	65.00	2599.02	2599.02
10247	#10247:9	Tube 2	Ori	84.58	39.99	47.76	9593.30	9593.30	0.00	25.9	65.00	65.00	2599.02	2599.02
10247	#10247:10	SpliceT	End	89.17	41.27	49.31	10556.15	10556.15	0.00	26.8	65.00	65.00	2770.95	2770.95
10247	#10247:10	SpliceT	Ori	89.17	41.27	49.31	10556.15	10556.15	0.00	26.8	65.00	65.00	2770.95	2770.95
10247	10247:WVGD3	10247:WVGD3	End	90.00	40.75	52.70	10981.66	10981.66	0.00	24.2	65.00	65.00	2919.26	2919.26
10247	10247:WVGD3	10247:WVGD3	Ori	90.00	40.75	52.70	10981.66	10981.66	0.00	24.2	65.00	65.00	2919.26	2919.26
10247	#10247:11	SpliceB	End	95.00	42.15	54.53	12164.40	12164.40	0.00	25.1	65.00	65.00	3126.31	3126.31
10247	#10247:11	SpliceB	Ori	95.00	42.15	54.53	12164.40	12164.40	0.00	25.1	65.00	65.00	3126.31	3126.31
10247	10247:WVGD2	10247:WVGD2	End	100.00	43.55	56.36	13429.16	13429.16	0.00	26.0	65.00	65.00	3340.46	3340.46
10247	10247:WVGD2	10247:WVGD2	Ori	100.00	43.55	56.36	13429.16	13429.16	0.00	26.0	65.00	65.00	3340.46	3340.46
10247	#10247:12	Tube 3	End	105.00	44.95	58.19	14778.68	14778.68	0.00	27.0	65.00	65.00	3561.70	3561.70
10247	#10247:12	Tube 3	Ori	105.00	44.95	58.19	14778.68	14778.68	0.00	27.0	65.00	65.00	3561.70	3561.70

10247	10247:WVGD1	10247:WVGD1	End	110.00	46.35	60.01	16215.72	16215.72	0.00	27.9	65.00	65.00	3790.03	3790.03
10247	10247:WVGD1	10247:WVGD1	Ori	110.00	46.35	60.01	16215.72	16215.72	0.00	27.9	65.00	65.00	3790.03	3790.03
10247	10247:g	10247:g	End	115.00	47.75	61.84	17743.02	17743.02	0.00	28.8	65.00	65.00	4025.46	4025.46

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
ARM1	601420	6T	0.1875	10.75	6	0	1	29000	1 point	Calculated	0	0	0	0	65	0	
ARM2	601515	8T	0.25	18.46	9	0	1	29000	1 point	Calculated	0	0	0	0	65	0	

Intermediate Joints for Davit Property "ARM1":

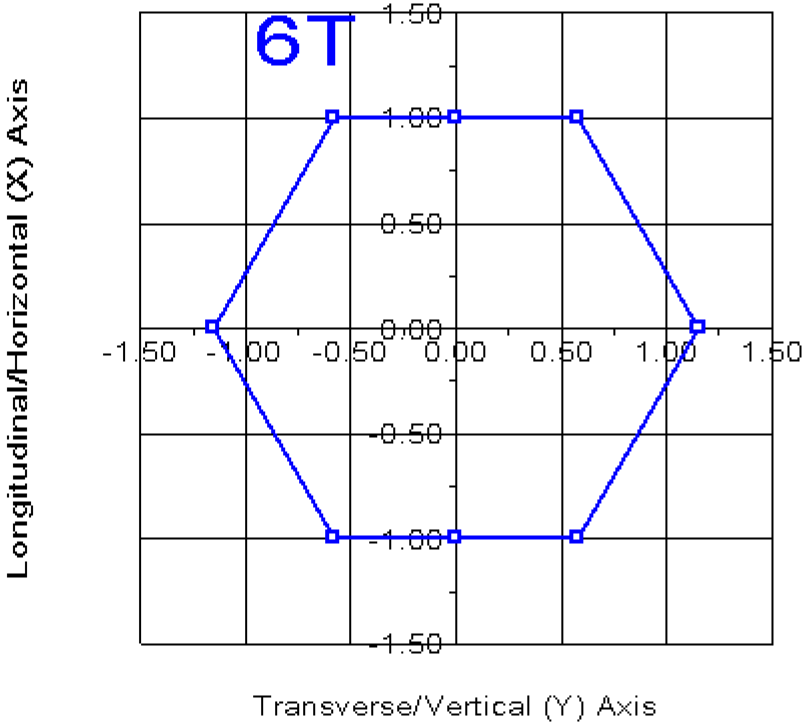
Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	10	-1.4375

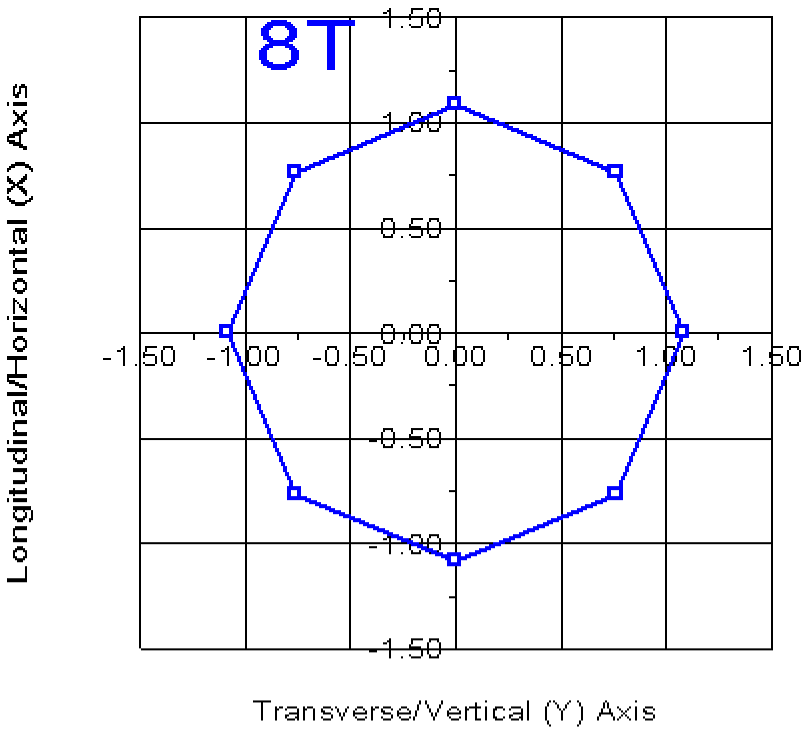
Intermediate Joints for Davit Property "ARM2":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	14	-2

Tubular Davit Arm Connectivity:

Davit Label	Attach Label	Davit Property Set	Azimuth (deg)
Davit1	10247:Arm1	ARM1	180
Davit2	10247:Arm1	ARM1	0
Davit3	10247:Arm2	ARM2	180
Davit4	10247:Arm2	ARM2	0
Davit5	10247:Arm3	ARM2	180
Davit6	10247:Arm3	ARM2	0
Davit7	10247:Arm4	ARM2	180
Davit8	10247:Arm4	ARM2	0


6T
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-1.50
-1.00
-0.50
0.00
0.50
1.00
1.50
Longitudinal/Horizontal (X) Axis
Transverse/Vertical (Y) Axis



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)
Davit1	Davit1:O	Origin	0.00	10.75	6.86	106.34	106.34	0.00	27.3	65.00	65.00	92.80	107.16
Davit1	#Davit1:0	End	5.00	8.40	5.33	49.98	49.98	0.00	20.1	65.00	65.00	55.82	64.46
Davit1	#Davit1:0	Origin	5.00	8.40	5.33	49.98	49.98	0.00	20.1	65.00	65.00	55.82	64.46
Davit1	#Davit1:1	End	7.55	7.20	4.55	31.12	31.12	0.00	16.4	65.00	65.00	40.56	46.83
Davit1	#Davit1:1	Origin	7.55	7.20	4.55	31.12	31.12	0.00	16.4	65.00	65.00	40.56	46.83
Davit1	Davit1:End	End	10.10	6.00	3.78	17.73	17.73	0.00	12.7	65.00	65.00	27.73	32.02
Davit2	Davit2:O	Origin	0.00	10.75	6.86	106.34	106.34	0.00	27.3	65.00	65.00	92.80	107.16
Davit2	#Davit2:0	End	5.00	8.40	5.33	49.98	49.98	0.00	20.1	65.00	65.00	55.82	64.46
Davit2	#Davit2:0	Origin	5.00	8.40	5.33	49.98	49.98	0.00	20.1	65.00	65.00	55.82	64.46
Davit2	#Davit2:1	End	7.55	7.20	4.55	31.12	31.12	0.00	16.4	65.00	65.00	40.56	46.83
Davit2	#Davit2:1	Origin	7.55	7.20	4.55	31.12	31.12	0.00	16.4	65.00	65.00	40.56	46.83
Davit2	Davit2:End	End	10.10	6.00	3.78	17.73	17.73	0.00	12.7	65.00	65.00	27.73	32.02
Davit3	Davit3:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit3	#Davit3:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit3	#Davit3:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19

Davit3	#Davit3:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit3	#Davit3:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit3	Davit3:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63
Davit4	Davit4:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit4	#Davit4:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit4	#Davit4:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit4	#Davit4:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit4	#Davit4:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit4	Davit4:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63
Davit5	Davit5:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit5	#Davit5:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit5	#Davit5:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit5	#Davit5:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit5	#Davit5:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit5	Davit5:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63
Davit6	Davit6:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit6	#Davit6:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit6	#Davit6:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit6	#Davit6:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit6	#Davit6:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit6	Davit6:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63
Davit7	Davit7:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit7	#Davit7:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit7	#Davit7:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit7	#Davit7:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit7	#Davit7:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit7	Davit7:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63
Davit8	Davit8:O	Origin	0.00	18.46	15.09	661.20	661.20	0.00	26.4	65.00	65.00	358.49	358.49
Davit8	#Davit8:0	End	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit8	#Davit8:0	Origin	5.00	15.12	12.31	359.72	359.72	0.00	20.9	65.00	65.00	238.19	238.19
Davit8	#Davit8:1	End	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit8	#Davit8:1	Origin	9.57	12.06	9.78	180.30	180.30	0.00	15.8	65.00	65.00	149.66	149.66
Davit8	Davit8:End	End	14.14	9.00	7.25	73.40	73.40	0.00	10.8	65.00	65.00	81.63	81.63

*** Insulator Data

Clamp Properties:

Label	Stock Number	Holding Capacity (lbs)
clamp	clamp1	8e+004

Clamp Insulator Connectivity:

Clamp Label	Structure And Tip Attach	Property Set	Min. Required Vertical Load (uplift) (lbs)
Clamp1	Davit1:End	clamp	No Limit
Clamp2	Davit2:End	clamp	No Limit
Clamp3	Davit3:End	clamp	No Limit

Clamp4	Davit4:End	clamp	No Limit
Clamp5	Davit5:End	clamp	No Limit
Clamp6	Davit6:End	clamp	No Limit
Clamp7	Davit7:End	clamp	No Limit
Clamp8	Davit8:End	clamp	No Limit
Clamp9	10247:TopConn	clamp	No Limit
Clamp10	10247:BotConn	clamp	No Limit
Clamp11	10247:BotConT	clamp	No Limit
Clamp12	10247:BotConB	clamp	No Limit
Clamp13	10247:WVGD1	clamp	No Limit
Clamp14	10247:WVGD2	clamp	No Limit
Clamp15	10247:WVGD3	clamp	No Limit
Clamp16	10247:WVGD4	clamp	No Limit
Clamp17	10247:WVGD5	clamp	No Limit
Clamp18	10247:WVGD6	clamp	No Limit
Clamp19	10247:WVGD7	clamp	No Limit
Clamp20	10247:WVGD8	clamp	No Limit
Clamp21	10247:WVGD9	clamp	No Limit
Clamp22	10247:WVGD10	clamp	No Limit

*** Loads Data

Loads from file: j:\jobs\1616200.wi\08_ct11201a\04_structural\backup documentation\calcs\pls-pole\cl&p #10247.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)	115.50 (ft)	
Structure height	115.50 (ft)	
Structure height above ground	115.50 (ft)	

Vector Load Cases:

Load Case Description	Dead Load Factor	Wind Area Factor	SF for Steel Poles Tubular Arms and Towers	SF for Wood Poles	SF for Conc. 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	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	22 loads	Wind on All	4	0	0.000	56.000	0.0	No Limit	0
NESC Extreme	1.0000	1.0000	1.00000	0.6500	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	22 loads	NESC 2012	25.6	0	0.000	0.000	0.0	No Limit	0

Point Loads for Load Case "NESC Heavy":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
Davit1:End	704	619	0	Shield Wire
Davit2:End	800	648	0	Shield Wire
Davit3:End	4473	2095	0	Conductor
Davit4:End	5082	2195	0	Conductor
Davit5:End	4473	2095	0	Conductor
Davit6:End	5082	2195	0	Conductor
Davit7:End	4473	2095	0	Conductor
Davit8:End	5082	2195	0	Conductor
10247:TopConn	0	3502	0	Top Connection
10247:BotConn	5375	-2199	0	Bottom Connection
10247:BotConT	0	5822	0	Bottom Connection
10247:BotConB	0	-5822	0	Bottom Connection
10247:WVGD1	516	137	0	Coax Cables
10247:WVGD2	516	137	0	Coax Cables
10247:WVGD3	516	137	0	Coax Cables
10247:WVGD4	516	137	0	Coax Cables

10247:WVGD5	516	137	0	Coax Cables
10247:WVGD6	516	137	0	Coax Cables
10247:WVGD7	516	137	0	Coax Cables
10247:WVGD8	516	137	0	Coax Cables
10247:WVGD9	516	137	0	Coax Cables
10247:WVGD10	516	137	0	Coax Cables

Point Loads for Load Case "NESC Extreme":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
Davit1:End	174	417	0	Shield Wire
Davit2:End	198	433	0	Shield Wire
Davit3:End	1904	2915	0	Conductor
Davit4:End	2163	3028	0	Conductor
Davit5:End	1904	2915	0	Conductor
Davit6:End	2163	3028	0	Conductor
Davit7:End	1904	2915	0	Conductor
Davit8:End	2163	3028	0	Conductor
10247:TopConn	0	11567	0	Top Connection
10247:BotConn	2466	-7386	0	Bottom Connection
10247:BotConT	0	19474	0	Bottom Connection
10247:BotConB	0	-19474	0	Bottom Connection
10247:WVGD1	119	361	0	Coax Cables
10247:WVGD2	119	361	0	Coax Cables
10247:WVGD3	119	361	0	Coax Cables
10247:WVGD4	119	361	0	Coax Cables
10247:WVGD5	119	361	0	Coax Cables
10247:WVGD6	119	361	0	Coax Cables
10247:WVGD7	119	361	0	Coax Cables
10247:WVGD8	119	361	0	Coax Cables
10247:WVGD9	119	361	0	Coax Cables
10247:WVGD10	119	361	0	Coax Cables

Detailed Pole Loading Data for Load Case "NESC Extreme":

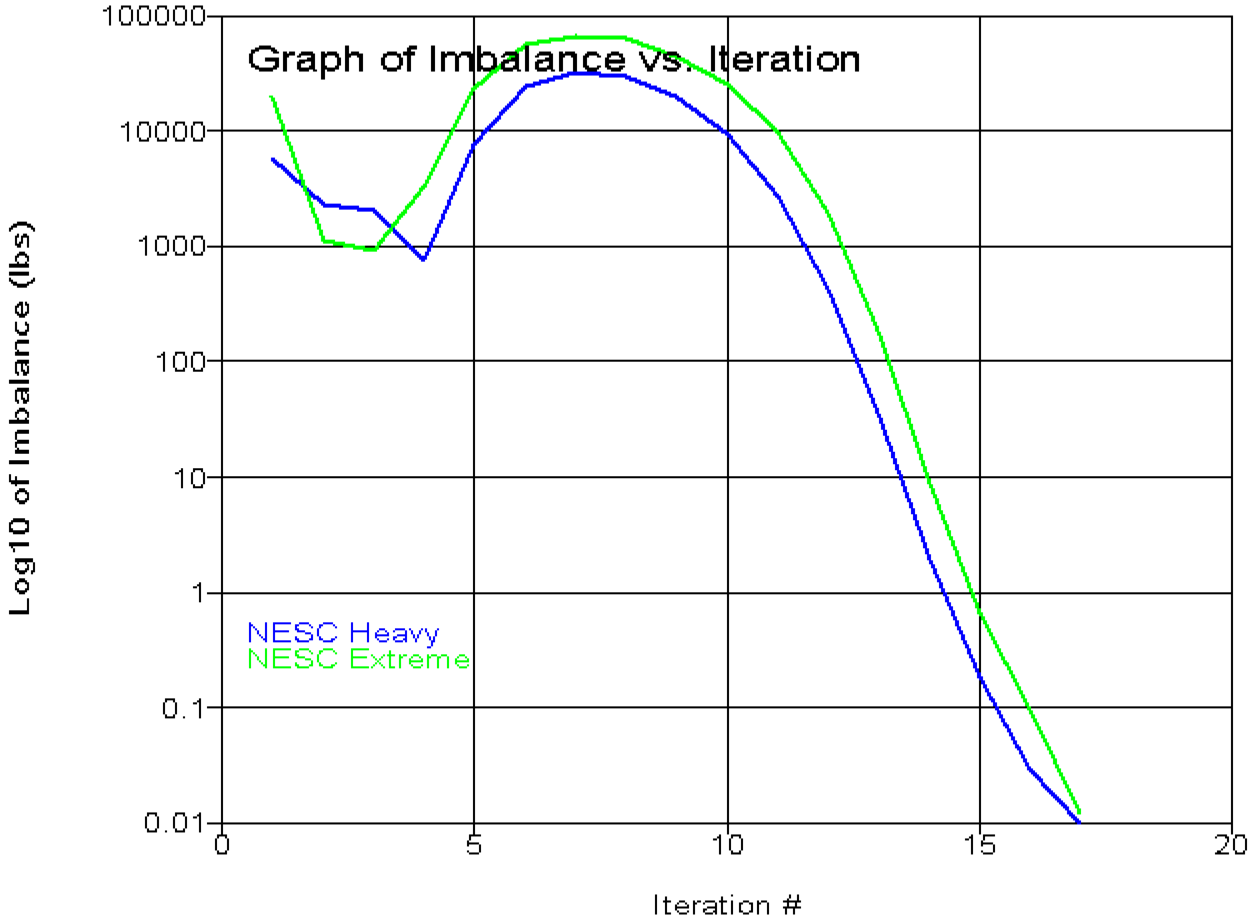
Notes: Does not include loads from equipment, arms, guys, braces, etc. or user input loads.
Wind load is calculated for the undeformed shape of a pole.

Pole Label	Top Joint	Bottom Joint	Section Top Z (ft)	Section Bottom Z (ft)	Section Average Elevation (ft)	Outer Diameter (in)	Reynolds Number	Drag Coef.	Adjusted Wind Pressure (psf)	Adjusted Ice Thickness (in)	Pole Vert. Load (lbs)	Pole Wind Load (lbs)	Pole Ice Vertical Load (lbs)	Pole Ice Wind Load (lbs)	Tran. Wind Load (lbs)	Long. Wind Load (lbs)
10247	10247:t	10247:Arm1	115.00	114.06	114.53	17.069	1.31e+006	1.000	26.34	0.00	53.71	35.12	0.00	0.00	35.12	0.00
10247	10247:Arm1	10247:TopConn	114.06	113.00	113.53	17.349	1.33e+006	1.000	26.34	0.00	61.89	40.46	0.00	0.00	40.46	0.00
10247	10247:TopConn		113.00	109.25	111.13	18.022	1.38e+006	1.000	26.34	0.00	227.07	148.33	0.00	0.00	148.33	0.00
10247		10247:BotConT	109.25	105.50	107.38	19.072	1.47e+006	1.000	26.34	0.00	240.53	156.97	0.00	0.00	156.97	0.00
10247	10247:BotConT	10247:BotConn	105.50	105.00	105.25	19.666	1.51e+006	1.000	26.34	0.00	33.09	21.58	0.00	0.00	21.58	0.00
10247	10247:BotConn	10247:BotConB	105.00	104.50	104.75	19.806	1.52e+006	1.000	26.34	0.00	33.33	21.74	0.00	0.00	21.74	0.00
10247	10247:BotConB	10247:Arm2	104.50	101.63	103.06	20.279	1.56e+006	1.000	26.34	0.00	196.27	127.96	0.00	0.00	127.96	0.00
10247	10247:Arm2		101.63	98.31	99.97	21.145	1.62e+006	1.000	26.34	0.00	235.94	153.73	0.00	0.00	153.73	0.00
10247		10247:WVGD10	98.31	95.00	96.66	22.072	1.7e+006	1.000	26.34	0.00	246.44	160.47	0.00	0.00	160.47	0.00
10247	10247:WVGD10		95.00	90.00	92.50	23.235	1.79e+006	1.000	26.34	0.00	391.88	254.98	0.00	0.00	254.98	0.00
10247		10247:WVGD9	90.00	85.00	87.50	24.635	1.89e+006	1.000	26.34	0.00	415.80	270.34	0.00	0.00	270.34	0.00
10247	10247:WVGD9		85.00	82.31	83.66	25.710	1.98e+006	1.000	26.34	0.00	233.38	151.65	0.00	0.00	151.65	0.00
10247		10247:Arm3	82.31	79.63	80.97	26.463	2.03e+006	1.000	26.34	0.00	240.29	156.09	0.00	0.00	156.09	0.00

10247	10247:Arm3	10247:WVGD8	79.63	75.00	77.31	27.486	2.11e+006	1.000	26.34	0.00	429.71	279.00	0.00	0.00	279.00	0.00
10247	10247:WVGD8		75.00	70.00	72.50	28.833	2.22e+006	1.000	26.34	0.00	487.58	316.41	0.00	0.00	316.41	0.00
10247		10247:WVGD7	70.00	65.00	67.50	30.232	2.32e+006	1.000	26.34	0.00	511.50	331.77	0.00	0.00	331.77	0.00
10247	10247:WVGD7		65.00	64.50	64.75	31.002	2.38e+006	1.000	26.34	0.00	52.47	34.02	0.00	0.00	34.02	0.00
10247			64.50	60.00	62.25	31.389	2.41e+006	1.000	26.34	0.00	1049.82	310.02	0.00	0.00	310.02	0.00
10247		10247:Arm4	60.00	57.63	58.81	32.039	2.46e+006	1.000	26.34	0.00	308.63	167.01	0.00	0.00	167.01	0.00
10247	10247:Arm4	10247:WVGD6	57.63	55.00	56.31	32.739	2.52e+006	1.000	26.34	0.00	348.57	188.62	0.00	0.00	188.62	0.00
10247	10247:WVGD6		55.00	50.00	52.50	33.806	2.6e+006	1.000	26.34	0.00	685.83	370.98	0.00	0.00	370.98	0.00
10247		10247:WVGD5	50.00	45.00	47.50	35.205	2.7e+006	1.000	26.34	0.00	714.54	386.34	0.00	0.00	386.34	0.00
10247	10247:WVGD5		45.00	40.00	42.50	36.605	2.81e+006	1.000	26.34	0.00	743.25	401.69	0.00	0.00	401.69	0.00
10247		10247:WVGD4	40.00	35.00	37.50	38.004	2.92e+006	1.000	26.34	0.00	771.96	417.05	0.00	0.00	417.05	0.00
10247	10247:WVGD4		35.00	30.42	32.71	39.345	3.02e+006	1.000	26.34	0.00	733.12	395.93	0.00	0.00	395.93	0.00
10247			30.42	25.83	28.12	40.629	3.12e+006	1.000	26.34	0.00	757.26	408.85	0.00	0.00	408.85	0.00
10247		10247:WVGD3	25.83	25.00	25.42	41.012	3.15e+006	1.000	26.34	0.00	288.08	74.71	0.00	0.00	74.71	0.00
10247	10247:WVGD3		25.00	20.00	22.50	41.452	3.18e+006	1.000	26.34	0.00	1770.31	454.89	0.00	0.00	454.89	0.00
10247		10247:WVGD2	20.00	15.00	17.50	42.852	3.29e+006	1.000	26.34	0.00	943.44	470.25	0.00	0.00	470.25	0.00
10247	10247:WVGD2		15.00	10.00	12.50	44.251	3.4e+006	1.000	26.34	0.00	974.43	485.61	0.00	0.00	485.61	0.00
10247		10247:WVGD1	10.00	5.00	7.50	45.651	3.51e+006	1.000	26.34	0.00	1005.53	500.97	0.00	0.00	500.97	0.00
10247	10247:WVGD1	10247:g	5.00	0.00	2.50	47.050	3.62e+006	1.000	26.34	0.00	1036.64	516.32	0.00	0.00	516.32	0.00

*** Analysis Results:

Maximum element usage is 85.46% for Base Plate "10247" in load case "NESC Extreme"
Maximum insulator usage is 24.34% for Clamp "Clamp11" in load case "NESC 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)
10247:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
10247:t	0.009212	3.777	-0.0872	-3.4602	0.0074	0.0001	0.009212	3.777	114.9
10247:Arm1	0.009091	3.72	-0.08549	-3.4602	0.0074	0.0001	0.009091	3.72	114

10247:TopConn	0.008953	3.656	-0.08355	-3.4584	0.0074	0.0001	0.008953	3.656	112.9
10247:BotConT	0.007986	3.206	-0.07003	-3.3969	0.0074	0.0001	0.007986	3.206	105.4
10247:BotConn	0.007922	3.177	-0.06915	-3.3900	0.0074	0.0001	0.007922	3.177	104.9
10247:BotConB	0.007858	3.147	-0.06827	-3.3826	0.0074	0.0001	0.007858	3.147	104.4
10247:Arm2	0.007489	2.979	-0.06328	-3.3371	0.0073	0.0001	0.007489	2.979	101.6
10247:WVGD10	0.006651	2.602	-0.05234	-3.1747	0.0072	0.0001	0.006651	2.602	94.95
10247:WVGD9	0.005433	2.073	-0.03801	-2.8771	0.0068	0.0001	0.005433	2.073	84.96
10247:Arm3	0.004811	1.811	-0.03145	-2.7061	0.0065	0.0001	0.004811	1.811	79.59
10247:WVGD8	0.004298	1.598	-0.02638	-2.5425	0.0062	0.0001	0.004298	1.598	74.97
10247:WVGD7	0.003272	1.186	-0.01745	-2.1676	0.0055	0.0000	0.003272	1.186	64.98
10247:Arm4	0.002596	0.9241	-0.0125	-1.9064	0.0050	0.0000	0.002596	0.9241	57.61
10247:WVGD6	0.002373	0.8387	-0.011	-1.8142	0.0048	0.0000	0.002373	0.8387	54.99
10247:WVGD5	0.001604	0.5524	-0.006443	-1.4587	0.0040	0.0000	0.001604	0.5524	44.99
10247:WVGD4	0.0009786	0.328	-0.003483	-1.1063	0.0031	0.0000	0.0009786	0.328	35
10247:WVGD3	0.0005037	0.1643	-0.001711	-0.7650	0.0023	0.0000	0.0005037	0.1643	25
10247:WVGD2	0.0001837	0.05833	-0.0007406	-0.4462	0.0014	0.0000	0.0001837	0.05833	15
10247:WVGD1	2.125e-005	0.006518	-0.0002015	-0.1444	0.0005	0.0000	2.125e-005	0.006518	5
Davit1:O	0.009098	3.721	-0.04224	-3.4602	0.0074	0.0001	0.009098	3.005	114
Davit1:End	0.009385	3.823	0.5426	-3.3037	0.0074	0.0002	0.009385	-6.894	116
Davit2:O	0.009084	3.719	-0.1287	-3.4602	0.0074	0.0001	0.009084	4.435	113.9
Davit2:End	0.009167	3.789	-0.7584	-3.6864	0.0074	0.0001	0.009167	14.51	114.7
Davit3:O	0.007497	2.98	-0.01312	-3.3371	0.0073	0.0001	0.007497	2.118	101.6
Davit3:End	0.007882	3.11	0.7481	-2.9657	0.0073	0.0001	0.007882	-11.75	104.4
Davit4:O	0.007481	2.977	-0.1134	-3.3371	0.0073	0.0001	0.007481	3.839	101.5
Davit4:End	0.007598	3.075	-0.9982	-3.8205	0.0073	0.0001	0.007598	17.94	102.6
Davit5:O	0.004818	1.812	0.02134	-2.7061	0.0065	0.0001	0.004818	0.6935	79.65
Davit5:End	0.005132	1.912	0.6293	-2.3318	0.0065	0.0001	0.005132	-13.21	82.25
Davit6:O	0.004804	1.809	-0.08425	-2.7061	0.0065	0.0001	0.004804	2.928	79.54
Davit6:End	0.004934	1.894	-0.814	-3.1912	0.0065	0.0001	0.004934	17.01	80.81
Davit7:O	0.002601	0.9248	0.03237	-1.9064	0.0050	0.0000	0.002601	-0.424	57.66
Davit7:End	0.00282	0.9903	0.4456	-1.5284	0.0050	0.0000	0.00282	-14.36	60.07
Davit8:O	0.002592	0.9233	-0.05737	-1.9064	0.0050	0.0000	0.002592	2.272	57.57
Davit8:End	0.002714	0.9893	-0.591	-2.3936	0.0050	0.0000	0.002714	16.34	59.03

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 %
10247:g	-0.11	0.0	-20.86	0.0	0.0	-72.73	0.0	0.0	75.67	0.0	1775.89	0.0	-5.8	0.0	0.0	-0.01	0.0	0.0

Detailed Steel Pole Usages for Load Case "NESC Heavy":

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Trans. Mom. (Local Mx) (ft-k)	Long. Mom. (Local My) (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Tran. Shear (kips)	Long. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
10247	10247:t	Origin	0.00	45.32	0.11	-1.05	-0.00	-0.00	0.0	-0.04	0.01	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	5
10247	10247:Arm1	End	0.94	44.64	0.11	-1.03	0.01	-0.00	0.0	-0.04	0.01	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	2
10247	10247:Arm1	Origin	0.94	44.64	0.11	-1.03	2.98	-0.00	0.0	-2.10	1.42	-0.00	-0.12	0.50	0.04	0.00	0.62	1.0	2
10247	10247:TopConn	End	2.00	43.87	0.11	-1.00	4.49	-0.00	0.0	-2.10	1.42	-0.00	-0.12	0.72	0.04	0.00	0.85	1.3	2
10247	10247:TopConn	Origin	2.00	43.87	0.11	-1.00	4.49	-0.00	0.0	-2.10	4.98	-0.00	-0.12	0.19	0.57	0.00	1.04	1.6	4
10247	Tube 1	End	5.75	41.16	0.10	-0.92	23.16	-0.01	0.0	-2.10	4.98	-0.00	-0.11	3.31	0.14	0.00	3.43	5.3	2
10247	Tube 1	Origin	5.75	41.16	0.10	-0.92	23.16	-0.01	0.0	-2.46	5.07	-0.00	-0.13	3.31	0.15	0.00	3.45	5.3	2
10247	10247:BotConT	End	9.50	38.48	0.10	-0.84	42.19	-0.03	0.0	-2.46	5.07	-0.00	-0.13	5.38	0.14	0.00	5.51	8.5	2
10247	10247:BotConT	Origin	9.50	38.48	0.10	-0.84	42.19	-0.03	0.0	-2.32	10.94	-0.01	-0.12	5.38	0.30	0.00	5.52	8.5	2
10247	10247:BotConn	End	10.00	38.12	0.10	-0.83	47.66	-0.03	0.0	-2.32	10.94	-0.01	-0.12	5.99	0.30	0.00	6.13	9.4	2

10247	10247:BotConn	Origin	10.00	38.12	0.10	-0.83	47.66	-0.03	0.0	-7.86	9.08	-0.01	-0.40	5.99	0.25	0.00	6.41	9.9	2
10247	10247:BotConB	End	10.50	37.77	0.09	-0.82	52.20	-0.04	0.0	-7.86	9.08	-0.01	-0.40	6.46	0.25	0.00	6.88	10.6	2
10247	10247:BotConB	Origin	10.50	37.77	0.09	-0.82	52.20	-0.04	0.0	-8.38	3.31	-0.01	-0.43	6.46	0.09	0.00	6.89	10.6	2
10247	10247:Arm2	End	13.37	35.74	0.09	-0.76	61.71	-0.06	0.0	-8.38	3.31	-0.01	-0.41	7.05	0.09	0.00	7.46	11.5	2
10247	10247:Arm2	Origin	13.37	35.74	0.09	-0.76	80.20	-0.06	0.0	-19.60	8.31	-0.01	-0.96	9.16	0.22	0.00	10.12	15.6	2
10247	Tube 1	End	16.69	33.45	0.08	-0.69	107.74	-0.10	0.0	-19.60	8.31	-0.01	-0.92	11.25	0.21	0.00	12.17	18.7	2
10247	Tube 1	Origin	16.69	33.45	0.08	-0.69	107.74	-0.10	0.0	-19.98	8.38	-0.01	-0.93	11.25	0.21	0.00	12.19	18.7	2
10247	10247:WVGD10	End	20.00	31.22	0.08	-0.63	135.51	-0.15	0.0	-19.98	8.38	-0.01	-0.89	12.98	0.20	0.00	13.88	21.4	2
10247	10247:WVGD10	Origin	20.00	31.22	0.08	-0.63	135.51	-0.15	0.0	-20.98	8.64	-0.02	-0.94	12.98	0.21	0.00	13.93	21.4	2
10247	Tube 1	End	25.00	27.97	0.07	-0.54	178.70	-0.24	0.0	-20.98	8.64	-0.02	-0.88	15.14	0.19	0.00	16.03	24.7	2
10247	Tube 1	Origin	25.00	27.97	0.07	-0.54	178.70	-0.24	0.0	-21.61	8.74	-0.02	-0.91	15.14	0.20	0.00	16.05	24.7	2
10247	10247:WVGD9	End	30.00	24.87	0.07	-0.46	222.41	-0.34	0.0	-21.61	8.74	-0.02	-0.86	16.78	0.18	0.00	17.65	27.1	2
10247	10247:WVGD9	Origin	30.00	24.87	0.07	-0.46	222.41	-0.34	0.0	-22.62	8.99	-0.02	-0.90	16.78	0.19	0.00	17.69	27.2	2
10247	Tube 1	End	32.69	23.27	0.06	-0.42	246.56	-0.40	0.0	-22.62	8.99	-0.02	-0.87	17.53	0.18	0.00	18.41	28.3	2
10247	Tube 1	Origin	32.69	23.27	0.06	-0.42	246.56	-0.40	0.0	-22.99	9.05	-0.03	-0.89	17.53	0.19	0.00	18.42	28.3	2
10247	10247:Arm3	End	35.38	21.73	0.06	-0.38	270.87	-0.47	0.0	-22.99	9.05	-0.03	-0.86	18.18	0.18	0.00	19.04	29.3	2
10247	10247:Arm3	Origin	35.38	21.73	0.06	-0.38	289.33	-0.47	0.0	-34.47	13.93	-0.03	-1.29	19.42	0.28	0.00	20.71	31.9	2
10247	10247:WVGD8	End	40.00	19.18	0.05	-0.32	353.74	-0.62	0.0	-34.47	13.93	-0.03	-1.23	21.57	0.26	0.00	22.81	35.1	2
10247	10247:WVGD8	Origin	40.00	19.18	0.05	-0.32	353.74	-0.62	0.0	-35.71	14.16	-0.03	-1.28	21.57	0.27	0.00	22.85	35.2	2
10247	Tube 1	End	45.00	16.61	0.05	-0.26	424.52	-0.79	0.0	-35.71	14.16	-0.03	-1.22	23.45	0.26	0.00	24.67	38.0	2
10247	Tube 1	Origin	45.00	16.61	0.05	-0.26	424.52	-0.79	0.0	-36.50	14.23	-0.04	-1.24	23.45	0.26	0.00	24.70	38.0	2
10247	10247:WVGD7	End	50.00	14.24	0.04	-0.21	495.66	-0.98	0.0	-36.50	14.23	-0.04	-1.19	24.93	0.24	0.00	26.12	40.2	2
10247	10247:WVGD7	Origin	50.00	14.24	0.04	-0.21	495.66	-0.98	0.0	-37.46	14.42	-0.04	-1.22	24.93	0.25	0.00	26.15	40.2	2
10247	SpliceT	End	50.50	14.01	0.04	-0.20	502.87	-1.00	0.0	-37.46	14.42	-0.04	-1.21	25.06	0.25	0.00	26.27	40.4	2
10247	SpliceT	Origin	50.50	14.01	0.04	-0.20	502.87	-1.00	0.0	-38.31	14.48	-0.04	-1.24	25.06	0.25	0.00	26.30	40.5	2
10247	SpliceB	End	55.00	12.06	0.03	-0.17	568.03	-1.19	0.0	-38.31	14.48	-0.04	-1.01	22.78	0.20	0.00	23.79	36.6	2
10247	SpliceB	Origin	55.00	12.06	0.03	-0.17	568.03	-1.19	0.0	-39.36	14.55	-0.05	-1.04	22.78	0.20	0.00	23.82	36.6	2
10247	10247:Arm4	End	57.38	11.09	0.03	-0.15	602.58	-1.30	0.0	-39.36	14.55	-0.05	-1.02	23.16	0.20	0.00	24.18	37.2	2
10247	10247:Arm4	Origin	57.38	11.09	0.03	-0.15	620.92	-1.30	0.0	-50.89	19.25	-0.05	-1.32	23.87	0.26	0.00	25.19	38.8	2
10247	10247:WVGD6	End	60.00	10.06	0.03	-0.13	671.44	-1.43	0.0	-50.89	19.25	-0.05	-1.29	24.66	0.26	0.00	25.95	39.9	2
10247	10247:WVGD6	Origin	60.00	10.06	0.03	-0.13	671.44	-1.43	0.0	-52.22	19.44	-0.05	-1.32	24.66	0.26	0.00	25.98	40.0	2
10247	Tube 2	End	65.00	8.25	0.02	-0.10	768.65	-1.70	0.0	-52.22	19.44	-0.05	-1.27	25.95	0.25	0.00	27.22	41.9	2
10247	Tube 2	Origin	65.00	8.25	0.02	-0.10	768.65	-1.70	0.0	-53.33	19.49	-0.06	-1.30	25.95	0.25	0.00	27.25	41.9	2
10247	10247:WVGD5	End	70.00	6.63	0.02	-0.08	866.12	-1.99	0.0	-53.33	19.49	-0.06	-1.24	26.97	0.24	0.00	28.22	43.4	2
10247	10247:WVGD5	Origin	70.00	6.63	0.02	-0.08	866.12	-1.99	0.0	-55.00	19.70	-0.06	-1.28	26.97	0.24	0.00	28.26	43.5	2
10247	Tube 2	End	75.00	5.19	0.02	-0.06	964.61	-2.30	0.0	-55.00	19.70	-0.06	-1.24	27.79	0.23	0.00	29.03	44.7	2
10247	Tube 2	Origin	75.00	5.19	0.02	-0.06	964.61	-2.30	0.0	-56.20	19.76	-0.07	-1.26	27.79	0.23	0.00	29.06	44.7	2
10247	10247:WVGD4	End	80.00	3.94	0.01	-0.04	1063.38	-2.64	0.0	-56.20	19.76	-0.07	-1.22	28.43	0.23	0.00	29.65	45.6	2
10247	10247:WVGD4	Origin	80.00	3.94	0.01	-0.04	1063.38	-2.64	0.0	-57.90	19.96	-0.07	-1.25	28.43	0.23	0.00	29.69	45.7	2
10247	Tube 2	End	84.58	2.95	0.01	-0.03	1154.89	-2.98	0.0	-57.90	19.96	-0.07	-1.21	28.90	0.22	0.00	30.12	46.3	2
10247	Tube 2	Origin	84.58	2.95	0.01	-0.03	1154.89	-2.98	0.0	-59.07	20.02	-0.08	-1.24	28.90	0.22	0.00	30.14	46.4	2
10247	SpliceT	End	89.17	2.11	0.01	-0.02	1246.65	-3.33	0.0	-59.07	20.02	-0.08	-1.20	29.26	0.21	0.00	30.46	46.9	2
10247	SpliceT	Origin	89.17	2.11	0.01	-0.02	1246.65	-3.33	0.0	-59.88	20.05	-0.08	-1.21	29.26	0.21	0.00	30.48	46.9	2
10247	10247:WVGD3	End	90.00	1.97	0.01	-0.02	1263.29	-3.40	0.0	-59.88	20.05	-0.08	-1.14	28.15	0.20	0.00	29.29	45.1	2
10247	10247:WVGD3	Origin	90.00	1.97	0.01	-0.02	1263.29	-3.40	0.0	-61.98	20.24	-0.08	-1.18	28.15	0.20	0.00	29.33	45.1	2
10247	SpliceB	End	95.00	1.25	0.00	-0.01	1364.51	-3.82	0.0	-61.98	20.24	-0.08	-1.14	28.39	0.20	0.00	29.53	45.4	2
10247	SpliceB	Origin	95.00	1.25	0.00	-0.01	1364.51	-3.82	0.0	-64.07	20.32	-0.09	-1.17	28.39	0.20	0.00	29.57	45.5	2
10247	10247:WVGD2	End	100.00	0.70	0.00	-0.01	1466.10	-4.26	0.0	-64.07	20.32	-0.09	-1.14	28.55	0.19	0.00	29.69	45.7	2
10247	10247:WVGD2	Origin	100.00	0.70	0.00	-0.01	1466.10	-4.26	0.0	-66.08	20.53	-0.09	-1.17	28.55	0.19	0.00	29.72	45.7	2
10247	Tube 3	End	105.00	0.31	0.00	-0.01	1568.75	-4.74	0.0	-66.08	20.53	-0.09	-1.14	28.65	0.19	0.00	29.79	45.8	2
10247	Tube 3	Origin	105.00	0.31	0.00	-0.01	1568.75	-4.74	0.0	-67.61	20.61	-0.10	-1.16	28.65	0.19	0.00	29.82	45.9	2
10247	10247:WVGD1	End	110.00	0.08	0.00	-0.00	1671.77	-5.24	0.0	-67.61	20.61	-0.10	-1.13	28.70	0.18	0.00	29.82	45.9	2
10247	10247:WVGD1	Origin	110.00	0.08	0.00	-0.00	1671.77	-5.24	0.0	-69.72	20.82	-0.11	-1.16	28.70	0.18	0.00	29.86	45.9	2
10247	10247:g	End	115.00	0.00	0.00	0.00	1775.89	-5.78	0.0	-69.72	20.82	-0.11	-1.13	28.70	0.18	0.00	29.83	45.9	2

Detailed Tubular Davit Arm Usages for Load Case "NESC Heavy":

Element	**Joint**	**Joint**	**Rel.**	**Trans.**	**Long.**	**Vert.**	**Vert.**	**Horz.**	**Tors.**	**Axial**	**Vert.**	**Horz.**	**P/A**	**M/S.**	**V/Q.**	**T/R.**	**Res.**	**Max.**	**At**

Label	Label	Position	Dist. (ft)	Defl. (in)	Defl. (in)	Defl. (in)	Mom. (ft-k)	Mom. (ft-k)	Mom. (ft-k)	Force (kips)	Shear (kips)	Shear (kips)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	Usage %	Pt.
Davit1	Davit1:O	Origin	0.00	44.66	0.11	-0.51	-6.95	0.00	0.0	-0.79	0.76	-0.00	-0.11	4.87	0.00	0.00	4.98	7.7	1
Davit1	#Davit1:0	End	5.00	45.27	0.11	3.01	-3.17	0.00	0.0	-0.79	0.76	-0.00	-0.15	3.69	0.00	0.00	3.84	5.9	1
Davit1	#Davit1:0	Origin	5.00	45.27	0.11	3.01	-3.17	0.00	0.0	-0.76	0.65	-0.00	-0.14	3.69	0.00	0.00	3.84	5.9	1
Davit1	#Davit1:1	End	7.55	45.58	0.11	4.77	-1.51	0.00	0.0	-0.76	0.65	-0.00	-0.17	2.42	0.00	0.00	2.59	4.0	1
Davit1	#Davit1:1	Origin	7.55	45.58	0.11	4.77	-1.51	0.00	0.0	-0.75	0.59	-0.00	-0.17	2.42	0.00	0.00	2.59	4.0	1
Davit1	Davit1:End	End	10.10	45.88	0.11	6.51	-0.00	0.00	0.0	-0.75	0.59	-0.00	-0.20	0.00	0.33	0.00	0.61	0.9	3
Davit2	Davit2:O	Origin	0.00	44.63	0.11	-1.54	-9.85	-0.00	-0.0	0.57	1.05	0.00	0.08	6.90	0.00	0.00	6.98	10.7	1
Davit2	#Davit2:0	End	5.00	45.04	0.11	-5.22	-4.62	-0.00	-0.0	0.57	1.05	0.00	0.11	5.38	0.00	0.00	5.49	8.4	1
Davit2	#Davit2:0	Origin	5.00	45.04	0.11	-5.22	-4.62	-0.00	-0.0	0.58	0.94	0.00	0.11	5.38	0.00	0.00	5.49	8.4	1
Davit2	#Davit2:1	End	7.55	45.25	0.11	-7.15	-2.23	-0.00	-0.0	0.58	0.94	0.00	0.13	3.58	0.00	0.00	3.71	5.7	1
Davit2	#Davit2:1	Origin	7.55	45.25	0.11	-7.15	-2.23	-0.00	0.0	0.58	0.88	0.00	0.13	3.58	0.00	0.00	3.71	5.7	1
Davit2	Davit2:End	End	10.10	45.47	0.11	-9.10	0.00	0.00	0.0	0.58	0.88	0.00	0.15	0.00	0.49	0.00	0.87	1.3	3
Davit3	Davit3:O	Origin	0.00	35.76	0.09	-0.16	-61.22	0.01	0.0	-3.06	4.59	-0.00	-0.20	11.10	0.00	0.00	11.30	17.4	1
Davit3	#Davit3:0	End	5.00	36.34	0.09	3.21	-38.30	0.01	0.0	-3.06	4.59	-0.00	-0.25	10.45	0.00	0.00	10.70	16.5	1
Davit3	#Davit3:0	Origin	5.00	36.34	0.09	3.21	-38.30	0.01	0.0	-2.99	4.30	-0.00	-0.24	10.45	0.00	0.00	10.69	16.5	1
Davit3	#Davit3:1	End	9.57	36.84	0.09	6.15	-18.66	0.00	0.0	-2.99	4.30	-0.00	-0.31	8.10	0.00	0.00	8.41	12.9	1
Davit3	#Davit3:1	Origin	9.57	36.84	0.09	6.15	-18.66	0.00	0.0	-2.94	4.08	-0.00	-0.30	8.10	0.00	0.00	8.40	12.9	1
Davit3	Davit3:End	End	14.14	37.32	0.09	8.98	-0.00	0.00	0.0	-2.94	4.08	-0.00	-0.41	0.00	1.17	0.00	2.06	3.2	3
Davit4	Davit4:O	Origin	0.00	35.73	0.09	-1.36	-79.19	-0.01	-0.0	1.72	5.87	0.00	0.11	14.36	0.00	0.00	14.47	22.3	1
Davit4	#Davit4:0	End	5.00	36.13	0.09	-4.94	-49.82	-0.01	-0.0	1.72	5.87	0.00	0.14	13.60	0.00	0.00	13.73	21.1	1
Davit4	#Davit4:0	Origin	5.00	36.13	0.09	-4.94	-49.82	-0.01	-0.0	1.76	5.57	0.00	0.14	13.60	0.00	0.00	13.74	21.1	1
Davit4	#Davit4:1	End	9.57	36.51	0.09	-8.38	-24.38	-0.00	-0.0	1.76	5.57	0.00	0.18	10.59	0.00	0.00	10.77	16.6	1
Davit4	#Davit4:1	Origin	9.57	36.51	0.09	-8.38	-24.38	-0.00	0.0	1.80	5.33	0.00	0.18	10.59	0.00	0.00	10.77	16.6	1
Davit4	Davit4:End	End	14.14	36.90	0.09	-11.98	-0.00	0.00	0.0	1.80	5.33	0.00	0.25	0.00	1.52	0.00	2.65	4.1	3
Davit5	Davit5:O	Origin	0.00	21.74	0.06	0.26	-61.69	0.01	0.0	-3.01	4.62	-0.00	-0.20	11.19	0.00	0.00	11.39	17.5	1
Davit5	#Davit5:0	End	5.00	22.19	0.06	2.97	-38.60	0.01	0.0	-3.01	4.62	-0.00	-0.24	10.53	0.00	0.00	10.78	16.6	1
Davit5	#Davit5:0	Origin	5.00	22.19	0.06	2.97	-38.60	0.01	0.0	-2.94	4.33	-0.00	-0.24	10.53	0.00	0.00	10.77	16.6	1
Davit5	#Davit5:1	End	9.57	22.58	0.06	5.32	-18.80	0.00	0.0	-2.94	4.33	-0.00	-0.30	8.17	0.00	0.00	8.47	13.0	1
Davit5	#Davit5:1	Origin	9.57	22.58	0.06	5.32	-18.80	0.00	0.0	-2.89	4.11	-0.00	-0.30	8.17	0.00	0.00	8.46	13.0	1
Davit5	Davit5:End	End	14.14	22.95	0.06	7.55	-0.00	0.00	0.0	-2.89	4.11	-0.00	-0.40	0.00	1.18	0.00	2.08	3.2	3
Davit6	Davit6:O	Origin	0.00	21.71	0.06	-1.01	-79.46	-0.01	-0.0	1.66	5.89	0.00	0.11	14.41	0.00	0.00	14.52	22.3	1
Davit6	#Davit6:0	End	5.00	22.06	0.06	-3.93	-50.00	-0.01	-0.0	1.66	5.89	0.00	0.13	13.64	0.00	0.00	13.78	21.2	1
Davit6	#Davit6:0	Origin	5.00	22.06	0.06	-3.93	-50.00	-0.01	-0.0	1.70	5.59	0.00	0.14	13.64	0.00	0.00	13.78	21.2	1
Davit6	#Davit6:1	End	9.57	22.39	0.06	-6.77	-24.47	-0.00	-0.0	1.70	5.59	0.00	0.17	10.63	0.00	0.00	10.80	16.6	1
Davit6	#Davit6:1	Origin	9.57	22.39	0.06	-6.77	-24.47	-0.00	0.0	1.74	5.35	0.00	0.18	10.63	0.00	0.00	10.80	16.6	1
Davit6	Davit6:End	End	14.14	22.73	0.06	-9.77	-0.00	0.00	0.0	1.74	5.35	0.00	0.24	0.00	1.53	0.00	2.66	4.1	3
Davit7	Davit7:O	Origin	0.00	11.10	0.03	0.39	-62.28	0.01	0.0	-2.95	4.66	-0.00	-0.20	11.29	0.00	0.00	11.49	17.7	1
Davit7	#Davit7:0	End	5.00	11.40	0.03	2.28	-38.97	0.01	0.0	-2.95	4.66	-0.00	-0.24	10.63	0.00	0.00	10.87	16.7	1
Davit7	#Davit7:0	Origin	5.00	11.40	0.03	2.28	-38.97	0.01	0.0	-2.88	4.37	-0.00	-0.23	10.63	0.00	0.00	10.87	16.7	1
Davit7	#Davit7:1	End	9.57	11.65	0.03	3.87	-18.99	0.00	0.0	-2.88	4.37	-0.00	-0.29	8.25	0.00	0.00	8.54	13.1	1
Davit7	#Davit7:1	Origin	9.57	11.65	0.03	3.87	-18.99	0.00	0.0	-2.83	4.15	-0.00	-0.29	8.25	0.00	0.00	8.54	13.1	1
Davit7	Davit7:End	End	14.14	11.88	0.03	5.35	-0.00	0.00	0.0	-2.83	4.15	-0.00	-0.39	0.00	1.19	0.00	2.09	3.2	3
Davit8	Davit8:O	Origin	0.00	11.08	0.03	-0.69	-79.79	-0.01	-0.0	1.57	5.92	0.00	0.10	14.47	0.00	0.00	14.57	22.4	1
Davit8	#Davit8:0	End	5.00	11.34	0.03	-2.77	-50.21	-0.01	-0.0	1.57	5.92	0.00	0.13	13.70	0.00	0.00	13.83	21.3	1
Davit8	#Davit8:0	Origin	5.00	11.34	0.03	-2.77	-50.21	-0.01	-0.0	1.62	5.61	0.00	0.13	13.70	0.00	0.00	13.83	21.3	1
Davit8	#Davit8:1	End	9.57	11.60	0.03	-4.85	-24.57	-0.00	-0.0	1.62	5.61	0.00	0.17	10.67	0.00	0.00	10.84	16.7	1
Davit8	#Davit8:1	Origin	9.57	11.60	0.03	-4.85	-24.57	-0.00	0.0	1.66	5.38	0.00	0.17	10.67	0.00	0.00	10.84	16.7	1
Davit8	Davit8:End	End	14.14	11.87	0.03	-7.09	-0.00	0.00	0.0	1.66	5.38	0.00	0.23	0.00	1.54	0.00	2.67	4.1	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Usage %
Clamp1	0.937	80.00	80.00	1.17
Clamp2	1.030	80.00	80.00	1.29
Clamp3	4.939	80.00	80.00	6.17
Clamp4	5.536	80.00	80.00	6.92
Clamp5	4.939	80.00	80.00	6.17
Clamp6	5.536	80.00	80.00	6.92
Clamp7	4.939	80.00	80.00	6.17
Clamp8	5.536	80.00	80.00	6.92
Clamp9	3.502	80.00	80.00	4.38
Clamp10	5.807	80.00	80.00	7.26
Clamp11	5.822	80.00	80.00	7.28
Clamp12	5.822	80.00	80.00	7.28
Clamp13	0.534	80.00	80.00	0.67
Clamp14	0.534	80.00	80.00	0.67
Clamp15	0.534	80.00	80.00	0.67
Clamp16	0.534	80.00	80.00	0.67
Clamp17	0.534	80.00	80.00	0.67
Clamp18	0.534	80.00	80.00	0.67
Clamp19	0.534	80.00	80.00	0.67
Clamp20	0.534	80.00	80.00	0.67
Clamp21	0.534	80.00	80.00	0.67
Clamp22	0.534	80.00	80.00	0.67

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

Equilibrium Joint Positions and Rotations for Load Case "NESC Extreme":

Joint Label	X-Displ (ft)	Y-Displ (ft)	Z-Displ (ft)	X-Rot (deg)	Y-Rot (deg)	Z-Rot (deg)	X-Pos (ft)	Y-Pos (ft)	Z-Pos (ft)
10247:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
10247:t	0.002828	5.909	-0.2071	-5.5753	0.0023	0.0001	0.002828	5.909	114.8
10247:Arm1	0.002791	5.818	-0.2027	-5.5753	0.0023	0.0001	0.002791	5.818	113.9
10247:TopConn	0.00275	5.714	-0.1977	-5.5743	0.0023	0.0001	0.00275	5.714	112.8
10247:BotConT	0.002455	4.992	-0.1628	-5.4426	0.0023	0.0001	0.002455	4.992	105.3
10247:BotConn	0.002435	4.944	-0.1605	-5.4264	0.0023	0.0001	0.002435	4.944	104.8
10247:BotConB	0.002416	4.897	-0.1583	-5.4085	0.0023	0.0001	0.002416	4.897	104.3
10247:Arm2	0.002303	4.628	-0.1457	-5.3008	0.0022	0.0001	0.002303	4.628	101.5
10247:WVGD10	0.002048	4.033	-0.1188	-4.9975	0.0022	0.0001	0.002048	4.033	94.88
10247:WVGD9	0.001676	3.205	-0.08427	-4.4835	0.0021	0.0000	0.001676	3.205	84.92
10247:Arm3	0.001485	2.798	-0.06875	-4.1973	0.0020	0.0000	0.001485	2.798	79.56
10247:WVGD8	0.001328	2.469	-0.05697	-3.9354	0.0019	0.0000	0.001328	2.469	74.94
10247:WVGD7	0.001013	1.833	-0.03648	-3.3451	0.0017	0.0000	0.001013	1.833	64.96
10247:Arm4	0.0008048	1.428	-0.02524	-2.9370	0.0015	0.0000	0.0008048	1.428	57.6
10247:WVGD6	0.0007358	1.297	-0.0219	-2.7953	0.0015	0.0000	0.0007358	1.297	54.98
10247:WVGD5	0.0004984	0.8554	-0.01192	-2.2504	0.0012	0.0000	0.0004984	0.8554	44.99
10247:WVGD4	0.0003045	0.509	-0.00568	-1.7106	0.0010	0.0000	0.0003045	0.509	34.99
10247:WVGD3	0.000157	0.2556	-0.002237	-1.1864	0.0007	0.0000	0.000157	0.2556	25
10247:WVGD2	5.737e-005	0.09094	-0.0006594	-0.6942	0.0004	0.0000	5.737e-005	0.09094	15
10247:WVGD1	6.648e-006	0.0102	-0.0001115	-0.2255	0.0001	0.0000	6.648e-006	0.0102	5
Davit1:O	0.002795	5.821	-0.1331	-5.5753	0.0023	0.0001	0.002795	5.104	113.9
Davit1:End	0.002908	6.007	0.8286	-5.5469	0.0023	0.0001	0.002908	-4.709	116.3
Davit2:O	0.002788	5.814	-0.2723	-5.5753	0.0023	0.0001	0.002788	6.531	113.8
Davit2:End	0.00279	5.907	-1.258	-5.6407	0.0023	0.0001	0.00279	16.62	114.2
Davit3:O	0.002308	4.632	-0.06609	-5.3008	0.0022	0.0001	0.002308	3.77	101.6
Davit3:End	0.002456	4.873	1.203	-5.1847	0.0022	0.0001	0.002456	-9.989	104.8
Davit4:O	0.002299	4.625	-0.2253	-5.3008	0.0022	0.0001	0.002299	5.487	101.4
Davit4:End	0.002307	4.751	-1.557	-5.5174	0.0022	0.0001	0.002307	19.61	102.1
Davit5:O	0.001489	2.801	0.0131	-4.1973	0.0020	0.0000	0.001489	1.682	79.64
Davit5:End	0.001605	2.981	1.016	-4.0755	0.0020	0.0001	0.001605	-12.14	82.64
Davit6:O	0.001482	2.795	-0.1506	-4.1973	0.0020	0.0000	0.001482	3.913	79.47
Davit6:End	0.001504	2.906	-1.211	-4.4188	0.0020	0.0000	0.001504	18.02	80.41
Davit7:O	0.0008071	1.43	0.04387	-2.9370	0.0015	0.0000	0.0008071	0.08122	57.67
Davit7:End	0.0008856	1.548	0.741	-2.8088	0.0015	0.0000	0.0008856	-13.8	60.37
Davit8:O	0.0008025	1.426	-0.09436	-2.9370	0.0015	0.0000	0.0008025	2.775	57.53
Davit8:End	0.0008317	1.513	-0.8456	-3.1641	0.0015	0.0000	0.0008317	16.86	58.78

Joint Support Reactions for Load Case "NESC 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 %
10247:g	-0.04	0.0	-34.66	0.0	0.0	-38.55	0.0	0.0	51.84	0.0	2777.54	0.0	-1.8	0.0	0.0	-0.01	0.0	0.0

Detailed Steel Pole Usages for Load Case "NESC Extreme":

Element Label	Joint Label	Joint Position	Rel. Dist.	Trans. Defl.	Long. Defl.	Vert. Defl.	Trans. Mom. (Local Mx)	Long. Mom. (Local My)	Tors. Mom.	Axial Force	Tran. Shear	Long. Shear	P/A	M/S.	V/Q.	T/R.	Res.	Max. Usage	At Pt.

			(ft)	(in)	(in)	(in)	(ft-k)	(ft-k)	(ft-k)	(kips)	(kips)	(kips)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	%	
10247	10247:t	Origin	0.00	70.91	0.03	-2.49	-0.00	0.00	0.0	-0.03	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	5
10247	10247:Arm1	End	0.94	69.81	0.03	-2.43	0.02	-0.00	0.0	-0.03	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	3
10247	10247:Arm1	Origin	0.94	69.81	0.03	-2.43	1.60	-0.00	0.0	-0.73	0.98	-0.00	-0.04	0.27	0.03	0.00	0.31	0.5	2
10247	10247:TopConn	End	2.00	68.57	0.03	-2.37	2.65	-0.00	0.0	-0.73	0.98	-0.00	-0.04	0.43	0.03	0.00	0.47	0.7	2
10247	10247:TopConn	Origin	2.00	68.57	0.03	-2.37	2.65	-0.00	0.0	0.25	12.60	-0.00	0.01	0.00	1.49	0.00	2.58	4.0	5
10247	Tube 1	End	5.75	64.21	0.03	-2.16	49.90	-0.00	0.0	0.25	12.60	-0.00	0.01	7.12	0.37	0.00	7.16	11.0	2
10247	Tube 1	Origin	5.75	64.21	0.03	-2.16	49.90	-0.00	0.0	0.00	12.78	-0.00	0.00	7.12	0.37	0.00	7.15	11.0	2
10247	10247:BotConT	End	9.50	59.90	0.03	-1.95	97.81	-0.01	0.0	0.00	12.78	-0.00	0.00	12.47	0.35	0.00	12.48	19.2	2
10247	10247:BotConT	Origin	9.50	59.90	0.03	-1.95	97.81	-0.01	0.0	1.70	32.26	-0.00	0.09	12.47	0.89	0.00	12.65	19.5	2
10247	10247:BotConn	End	10.00	59.33	0.03	-1.93	113.95	-0.01	0.0	1.70	32.26	-0.00	0.09	14.31	0.88	0.00	14.48	22.3	2
10247	10247:BotConn	Origin	10.00	59.33	0.03	-1.93	113.95	-0.01	0.0	-1.49	25.17	-0.00	-0.08	14.31	0.69	0.00	14.44	22.2	2
10247	10247:BotConB	End	10.50	58.76	0.03	-1.90	126.53	-0.01	0.0	-1.49	25.17	-0.00	-0.08	15.67	0.68	0.00	15.79	24.3	2
10247	10247:BotConB	Origin	10.50	58.76	0.03	-1.90	126.53	-0.01	0.0	-3.46	5.86	-0.00	-0.18	15.67	0.16	0.00	15.84	24.4	2
10247	10247:Arm2	End	13.37	55.54	0.03	-1.75	143.39	-0.02	0.0	-3.46	5.86	-0.00	-0.17	16.37	0.15	0.00	16.54	25.4	2
10247	10247:Arm2	Origin	13.37	55.54	0.03	-1.75	159.77	-0.02	0.0	-8.24	12.41	-0.00	-0.40	18.24	0.32	0.00	18.65	28.7	2
10247	Tube 1	End	16.69	51.92	0.03	-1.58	200.86	-0.03	0.0	-8.24	12.41	-0.00	-0.39	20.96	0.31	0.00	21.36	32.9	2
10247	Tube 1	Origin	16.69	51.92	0.03	-1.58	200.86	-0.03	0.0	-8.51	12.56	-0.00	-0.40	20.96	0.31	0.00	21.37	32.9	2
10247	10247:WVGD10	End	20.00	48.40	0.02	-1.43	242.47	-0.05	0.0	-8.51	12.56	-0.00	-0.38	23.22	0.30	0.00	23.61	36.3	2
10247	10247:WVGD10	Origin	20.00	48.40	0.02	-1.43	242.47	-0.05	0.0	-8.96	13.13	-0.01	-0.40	23.22	0.31	0.00	23.63	36.4	2
10247	Tube 1	End	25.00	43.29	0.02	-1.21	308.14	-0.07	0.0	-8.96	13.13	-0.01	-0.38	26.10	0.29	0.00	26.48	40.7	2
10247	Tube 1	Origin	25.00	43.29	0.02	-1.21	308.14	-0.07	0.0	-9.43	13.39	-0.01	-0.40	26.10	0.30	0.00	26.50	40.8	2
10247	10247:WVGD9	End	30.00	38.46	0.02	-1.01	375.07	-0.10	0.0	-9.43	13.39	-0.01	-0.37	28.30	0.28	0.00	28.68	44.1	2
10247	10247:WVGD9	Origin	30.00	38.46	0.02	-1.01	375.07	-0.10	0.0	-9.89	13.96	-0.01	-0.39	28.30	0.29	0.00	28.69	44.1	2
10247	Tube 1	End	32.69	35.97	0.02	-0.92	412.58	-0.12	0.0	-9.89	13.96	-0.01	-0.38	29.33	0.29	0.00	29.71	45.7	2
10247	Tube 1	Origin	32.69	35.97	0.02	-0.92	412.58	-0.12	0.0	-10.16	14.10	-0.01	-0.39	29.33	0.29	0.00	29.72	45.7	2
10247	10247:Arm3	End	35.38	33.57	0.02	-0.83	450.48	-0.14	0.0	-10.16	14.10	-0.01	-0.38	30.22	0.28	0.00	30.60	47.1	2
10247	10247:Arm3	Origin	35.38	33.57	0.02	-0.83	466.80	-0.14	0.0	-15.23	20.60	-0.01	-0.57	31.31	0.41	0.00	31.89	49.1	2
10247	10247:WVGD8	End	40.00	29.63	0.02	-0.68	562.09	-0.18	0.0	-15.23	20.60	-0.01	-0.54	34.26	0.39	0.00	34.81	53.6	2
10247	10247:WVGD8	Origin	40.00	29.63	0.02	-0.68	562.09	-0.18	0.0	-15.89	21.22	-0.01	-0.57	34.26	0.40	0.00	34.84	53.6	2
10247	Tube 1	End	45.00	25.65	0.01	-0.55	668.21	-0.24	0.0	-15.89	21.22	-0.01	-0.54	36.90	0.38	0.00	37.45	57.6	2
10247	Tube 1	Origin	45.00	25.65	0.01	-0.55	668.21	-0.24	0.0	-16.49	21.50	-0.01	-0.56	36.90	0.39	0.00	37.47	57.6	2
10247	10247:WVGD7	End	50.00	21.99	0.01	-0.44	775.68	-0.30	0.0	-16.49	21.50	-0.01	-0.54	38.99	0.37	0.00	39.53	60.8	2
10247	10247:WVGD7	Origin	50.00	21.99	0.01	-0.44	775.68	-0.30	0.0	-16.94	22.01	-0.01	-0.55	38.99	0.38	0.00	39.55	60.8	2
10247	SpliceT	End	50.50	21.64	0.01	-0.43	786.69	-0.30	0.0	-16.94	22.01	-0.01	-0.55	39.19	0.38	0.00	39.74	61.1	2
10247	SpliceT	Origin	50.50	21.64	0.01	-0.43	786.69	-0.30	0.0	-17.54	22.17	-0.01	-0.57	39.19	0.38	0.00	39.76	61.2	2
10247	SpliceB	End	55.00	18.63	0.01	-0.34	886.47	-0.36	0.0	-17.54	22.17	-0.01	-0.46	35.53	0.31	0.00	36.00	55.4	2
10247	SpliceB	Origin	55.00	18.63	0.01	-0.34	886.47	-0.36	0.0	-18.29	22.39	-0.01	-0.48	35.53	0.31	0.00	36.02	55.4	2
10247	10247:Arm4	End	57.38	17.14	0.01	-0.30	939.65	-0.39	0.0	-18.29	22.39	-0.01	-0.47	36.10	0.31	0.00	36.58	56.3	2
10247	10247:Arm4	Origin	57.38	17.14	0.01	-0.30	955.86	-0.40	0.0	-23.50	28.74	-0.02	-0.61	36.72	0.39	0.00	37.34	57.4	2
10247	10247:WVGD6	End	60.00	15.56	0.01	-0.26	1031.29	-0.44	0.0	-23.50	28.74	-0.02	-0.60	37.85	0.39	0.00	38.46	59.2	2
10247	10247:WVGD6	Origin	60.00	15.56	0.01	-0.26	1031.29	-0.44	0.0	-24.22	29.32	-0.02	-0.61	37.85	0.39	0.00	38.47	59.2	2
10247	Tube 2	End	65.00	12.77	0.01	-0.20	1177.90	-0.52	0.0	-24.22	29.32	-0.02	-0.59	39.74	0.38	0.00	40.34	62.1	2
10247	Tube 2	Origin	65.00	12.77	0.01	-0.20	1177.90	-0.52	0.0	-25.06	29.61	-0.02	-0.61	39.74	0.38	0.00	40.36	62.1	2
10247	10247:WVGD5	End	70.00	10.27	0.01	-0.14	1325.96	-0.61	0.0	-25.06	29.61	-0.02	-0.58	41.27	0.37	0.00	41.86	64.4	2
10247	10247:WVGD5	Origin	70.00	10.27	0.01	-0.14	1325.96	-0.61	0.0	-26.04	30.28	-0.02	-0.61	41.27	0.37	0.00	41.88	64.4	2
10247	Tube 2	End	75.00	8.05	0.00	-0.10	1477.35	-0.71	0.0	-26.04	30.28	-0.02	-0.58	42.54	0.36	0.00	43.13	66.4	2
10247	Tube 2	Origin	75.00	8.05	0.00	-0.10	1477.35	-0.71	0.0	-26.94	30.59	-0.02	-0.60	42.54	0.36	0.00	43.15	66.4	2
10247	10247:WVGD4	End	80.00	6.11	0.00	-0.07	1630.29	-0.81	0.0	-26.94	30.59	-0.02	-0.58	43.57	0.35	0.00	44.15	67.9	2
10247	10247:WVGD4	Origin	80.00	6.11	0.00	-0.07	1630.29	-0.81	0.0	-27.94	31.26	-0.02	-0.60	43.57	0.36	0.00	44.18	68.0	2
10247	Tube 2	End	84.58	4.58	0.00	-0.05	1773.61	-0.92	0.0	-27.94	31.26	-0.02	-0.58	44.36	0.35	0.00	44.95	69.2	2
10247	Tube 2	Origin	84.58	4.58	0.00	-0.05	1773.61	-0.92	0.0	-28.81	31.56	-0.02	-0.60	44.36	0.35	0.00	44.97	69.2	2
10247	SpliceT	End	89.17	3.28	0.00	-0.03	1918.32	-1.03	0.0	-28.81	31.56	-0.02	-0.58	45.01	0.34	0.00	45.59	70.1	2
10247	SpliceT	Origin	89.17	3.28	0.00	-0.03	1918.32	-1.03	0.0	-29.41	31.74	-0.03	-0.60	45.01	0.34	0.00	45.61	70.2	2
10247	10247:WVGD3	End	90.00	3.07	0.00	-0.03	1944.66	-1.05	0.0	-29.41	31.74	-0.03	-0.56	43.31	0.32	0.00	43.87	67.5	2
10247	10247:WVGD3	Origin	90.00	3.07	0.00	-0.03	1944.66	-1.05	0.0	-30.63	32.32	-0.03	-0.58	43.31	0.32	0.00	43.89	67.5	2
10247	SpliceB	End	95.00	1.95	0.00	-0.02	2106.23	-1.18	0.0	-30.63	32.32	-0.03	-0.56	43.80	0.31	0.00	44.36	68.3	2
10247	SpliceB	Origin	95.00	1.95	0.00	-0.02	2106.23	-1.18	0.0	-32.13	32.67	-0.03	-0.59	43.80	0.32	0.00	44.39	68.3	2

10247	10247:WVGD2	End	100.00	1.09	0.00	-0.01	2269.56	-1.32	0.0	-32.13	32.67	-0.03	-0.57	44.17	0.31	0.00	44.74	68.8	2
10247	10247:WVGD2	Origin	100.00	1.09	0.00	-0.01	2269.56	-1.32	0.0	-33.34	33.38	-0.03	-0.59	44.17	0.31	0.00	44.76	68.9	2
10247	Tube 3	End	105.00	0.48	0.00	-0.00	2436.45	-1.48	0.0	-33.34	33.38	-0.03	-0.57	44.47	0.30	0.00	45.05	69.3	2
10247	Tube 3	Origin	105.00	0.48	0.00	-0.00	2436.45	-1.48	0.0	-34.47	33.74	-0.03	-0.59	44.47	0.31	0.00	45.07	69.3	2
10247	10247:WVGD1	End	110.00	0.12	0.00	-0.00	2605.16	-1.64	0.0	-34.47	33.74	-0.03	-0.57	44.69	0.30	0.00	45.26	69.6	2
10247	10247:WVGD1	Origin	110.00	0.12	0.00	-0.00	2605.16	-1.64	0.0	-35.75	34.48	-0.03	-0.60	44.69	0.30	0.00	45.29	69.7	2
10247	10247:g	End	115.00	0.00	0.00	0.00	2777.54	-1.81	0.0	-35.75	34.48	-0.03	-0.58	44.86	0.29	0.00	45.44	69.9	2

Detailed Tubular Davit Arm Usages for Load Case "NESC Extreme":

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Vert. Mom. (ft-k)	Horz. Mom. (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Vert. Shear (kips)	Horz. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
Davit1	Davit1:O	Origin	0.00	69.85	0.03	-1.60	-1.48	0.00	-0.0	-0.48	0.19	-0.00	-0.07	1.04	0.00	0.00	1.11	1.7	1
Davit1	#Davit1:0	End	5.00	70.96	0.03	4.12	-0.53	0.00	-0.0	-0.48	0.19	-0.00	-0.09	0.62	0.00	0.00	0.71	1.1	1
Davit1	#Davit1:0	Origin	5.00	70.96	0.03	4.12	-0.53	0.00	0.0	-0.46	0.12	-0.00	-0.09	0.62	0.00	0.00	0.71	1.1	1
Davit1	#Davit1:1	End	7.55	71.52	0.03	7.03	-0.22	0.00	0.0	-0.46	0.12	-0.00	-0.10	0.35	0.00	0.00	0.46	0.7	1
Davit1	#Davit1:1	Origin	7.55	71.52	0.03	7.03	-0.22	0.00	0.0	-0.45	0.09	-0.00	-0.10	0.35	0.00	0.00	0.45	0.7	1
Davit1	Davit1:End	End	10.10	72.09	0.03	9.94	-0.00	0.00	0.0	-0.45	0.09	-0.00	-0.12	0.00	0.05	0.00	0.15	0.2	3
Davit2	Davit2:O	Origin	0.00	69.77	0.03	-3.27	-3.04	-0.00	-0.0	0.42	0.35	0.00	0.06	2.13	0.00	0.00	2.19	3.4	1
Davit2	#Davit2:0	End	5.00	70.32	0.03	-9.10	-1.30	-0.00	-0.0	0.42	0.35	0.00	0.08	1.51	0.00	0.00	1.59	2.5	1
Davit2	#Davit2:0	Origin	5.00	70.32	0.03	-9.10	-1.30	-0.00	-0.0	0.42	0.27	0.00	0.08	1.51	0.00	0.00	1.59	2.5	1
Davit2	#Davit2:1	End	7.55	70.60	0.03	-12.09	-0.60	-0.00	-0.0	0.42	0.27	0.00	0.09	0.96	0.00	0.00	1.05	1.6	1
Davit2	#Davit2:1	Origin	7.55	70.60	0.03	-12.09	-0.60	-0.00	0.0	0.42	0.24	0.00	0.09	0.96	0.00	0.00	1.05	1.6	1
Davit2	Davit2:End	End	10.10	70.88	0.03	-15.09	0.00	0.00	0.0	0.42	0.24	0.00	0.11	0.00	0.13	0.00	0.26	0.4	3
Davit3	Davit3:O	Origin	0.00	55.59	0.03	-0.79	-19.84	0.00	0.0	-3.37	1.57	-0.00	-0.22	3.60	0.00	0.00	3.82	5.9	1
Davit3	#Davit3:0	End	5.00	56.62	0.03	4.63	-12.00	0.00	0.0	-3.37	1.57	-0.00	-0.27	3.27	0.00	0.00	3.55	5.5	1
Davit3	#Davit3:0	Origin	5.00	56.62	0.03	4.63	-12.00	0.00	0.0	-3.33	1.38	-0.00	-0.27	3.27	0.00	0.00	3.54	5.5	1
Davit3	#Davit3:1	End	9.57	57.55	0.03	9.55	-5.68	0.00	0.0	-3.33	1.38	-0.00	-0.34	2.47	0.00	0.00	2.81	4.3	1
Davit3	#Davit3:1	Origin	9.57	57.55	0.03	9.55	-5.68	0.00	0.0	-3.29	1.24	-0.00	-0.34	2.47	0.00	0.00	2.80	4.3	1
Davit3	Davit3:End	End	14.14	58.48	0.03	14.44	-0.00	0.00	0.0	-3.29	1.24	-0.00	-0.45	0.00	0.36	0.00	0.76	1.2	3
Davit4	Davit4:O	Origin	0.00	55.50	0.03	-2.70	-35.99	-0.00	-0.0	2.90	2.73	0.00	0.19	6.52	0.00	0.00	6.72	10.3	1
Davit4	#Davit4:0	End	5.00	56.03	0.03	-8.27	-22.34	-0.00	-0.0	2.90	2.73	0.00	0.24	6.10	0.00	0.00	6.33	9.7	1
Davit4	#Davit4:0	Origin	5.00	56.03	0.03	-8.27	-22.34	-0.00	-0.0	2.91	2.52	0.00	0.24	6.10	0.00	0.00	6.33	9.7	1
Davit4	#Davit4:1	End	9.57	56.52	0.03	-13.45	-10.81	-0.00	-0.0	2.91	2.52	0.00	0.30	4.70	0.00	0.00	4.99	7.7	1
Davit4	#Davit4:1	Origin	9.57	56.52	0.03	-13.45	-10.81	-0.00	0.0	2.92	2.37	0.00	0.30	4.70	0.00	0.00	5.00	7.7	1
Davit4	Davit4:End	End	14.14	57.02	0.03	-18.69	-0.00	0.00	0.0	2.92	2.37	0.00	0.40	0.00	0.68	0.00	1.24	1.9	3
Davit5	Davit5:O	Origin	0.00	33.61	0.02	0.16	-20.76	0.00	0.0	-3.34	1.64	-0.00	-0.22	3.77	0.00	0.00	3.99	6.1	1
Davit5	#Davit5:0	End	5.00	34.38	0.02	4.46	-12.59	0.00	0.0	-3.34	1.64	-0.00	-0.27	3.44	0.00	0.00	3.71	5.7	1
Davit5	#Davit5:0	Origin	5.00	34.38	0.02	4.46	-12.59	0.00	0.0	-3.30	1.45	-0.00	-0.27	3.44	0.00	0.00	3.70	5.7	1
Davit5	#Davit5:1	End	9.57	35.08	0.02	8.34	-5.97	0.00	0.0	-3.30	1.45	-0.00	-0.34	2.59	0.00	0.00	2.93	4.5	1
Davit5	#Davit5:1	Origin	9.57	35.08	0.02	8.34	-5.97	0.00	0.0	-3.27	1.31	-0.00	-0.33	2.59	0.00	0.00	2.93	4.5	1
Davit5	Davit5:End	End	14.14	35.77	0.02	12.19	-0.00	0.00	0.0	-3.27	1.31	-0.00	-0.45	0.00	0.37	0.00	0.79	1.2	3
Davit6	Davit6:O	Origin	0.00	33.54	0.02	-1.81	-36.78	-0.00	-0.0	2.85	2.78	0.00	0.19	6.67	0.00	0.00	6.86	10.5	1
Davit6	#Davit6:0	End	5.00	34.00	0.02	-6.23	-22.85	-0.00	-0.0	2.85	2.78	0.00	0.23	6.24	0.00	0.00	6.47	9.9	1
Davit6	#Davit6:0	Origin	5.00	34.00	0.02	-6.23	-22.85	-0.00	-0.0	2.86	2.58	0.00	0.23	6.24	0.00	0.00	6.47	10.0	1
Davit6	#Davit6:1	End	9.57	34.43	0.02	-10.34	-11.07	-0.00	-0.0	2.86	2.58	0.00	0.29	4.81	0.00	0.00	5.10	7.8	1
Davit6	#Davit6:1	Origin	9.57	34.43	0.02	-10.34	-11.07	-0.00	0.0	2.88	2.42	0.00	0.29	4.81	0.00	0.00	5.10	7.8	1
Davit6	Davit6:End	End	14.14	34.87	0.02	-14.53	-0.00	0.00	0.0	2.88	2.42	0.00	0.40	0.00	0.69	0.00	1.26	1.9	3
Davit7	Davit7:O	Origin	0.00	17.16	0.01	0.53	-21.81	0.00	0.0	-3.31	1.71	-0.00	-0.22	3.96	0.00	0.00	4.17	6.4	1
Davit7	#Davit7:0	End	5.00	17.67	0.01	3.53	-13.26	0.00	0.0	-3.31	1.71	-0.00	-0.27	3.62	0.00	0.00	3.89	6.0	1

Davit7	#Davit7:0	Origin	5.00	17.67	0.01	3.53	-13.26	0.00	0.0	-3.27	1.52	-0.00	-0.27	3.62	0.00	0.00	3.88	6.0	1
Davit7	#Davit7:1	End	9.57	18.12	0.01	6.23	-6.30	0.00	0.0	-3.27	1.52	-0.00	-0.33	2.74	0.00	0.00	3.07	4.7	1
Davit7	#Davit7:1	Origin	9.57	18.12	0.01	6.23	-6.30	0.00	0.0	-3.24	1.38	-0.00	-0.33	2.74	0.00	0.00	3.07	4.7	1
Davit7	Davit7:End	End	14.14	18.57	0.01	8.89	-0.00	0.00	0.0	-3.24	1.38	-0.00	-0.45	0.00	0.39	0.00	0.82	1.3	3
Davit8	Davit8:O	Origin	0.00	17.12	0.01	-1.13	-37.66	-0.00	-0.0	2.78	2.85	0.00	0.18	6.83	0.00	0.00	7.01	10.8	1
Davit8	#Davit8:0	End	5.00	17.48	0.01	-4.24	-23.43	-0.00	-0.0	2.78	2.85	0.00	0.23	6.39	0.00	0.00	6.62	10.2	1
Davit8	#Davit8:0	Origin	5.00	17.48	0.01	-4.24	-23.43	-0.00	-0.0	2.81	2.64	0.00	0.23	6.39	0.00	0.00	6.62	10.2	1
Davit8	#Davit8:1	End	9.57	17.82	0.01	-7.16	-11.36	-0.00	-0.0	2.81	2.64	0.00	0.29	4.93	0.00	0.00	5.22	8.0	1
Davit8	#Davit8:1	Origin	9.57	17.82	0.01	-7.16	-11.36	-0.00	0.0	2.82	2.48	0.00	0.29	4.93	0.00	0.00	5.22	8.0	1
Davit8	Davit8:End	End	14.14	18.16	0.01	-10.15	-0.00	0.00	0.0	2.82	2.48	0.00	0.39	0.00	0.71	0.00	1.29	2.0	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Usage %
Clamp1	0.452	80.00	80.00	0.56
Clamp2	0.476	80.00	80.00	0.60
Clamp3	3.482	80.00	80.00	4.35
Clamp4	3.721	80.00	80.00	4.65
Clamp5	3.482	80.00	80.00	4.35
Clamp6	3.721	80.00	80.00	4.65
Clamp7	3.482	80.00	80.00	4.35
Clamp8	3.721	80.00	80.00	4.65
Clamp9	11.567	80.00	80.00	14.46
Clamp10	7.787	80.00	80.00	9.73
Clamp11	19.474	80.00	80.00	24.34
Clamp12	19.474	80.00	80.00	24.34
Clamp13	0.380	80.00	80.00	0.48
Clamp14	0.380	80.00	80.00	0.48
Clamp15	0.380	80.00	80.00	0.48
Clamp16	0.380	80.00	80.00	0.48
Clamp17	0.380	80.00	80.00	0.48
Clamp18	0.380	80.00	80.00	0.48
Clamp19	0.380	80.00	80.00	0.48
Clamp20	0.380	80.00	80.00	0.48
Clamp21	0.380	80.00	80.00	0.48
Clamp22	0.380	80.00	80.00	0.48

*** 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)
10247	70.16	NESC Extreme	27	18435.7

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 %
10247	NESC Heavy	1	2.383	0.921	-0.394	2.525	38.475	19.535	78.946	3	88.843	1.569	2.750	32.56
10247	NESC Heavy	2	2.525	-0.394	0.921	2.383	38.475	8.042	32.500	3	88.786	1.007	2.750	13.40
10247	NESC Heavy	3	1.990	-1.603	1.990	1.603	38.475	9.966	40.276	4	38.969	1.121	2.750	16.61
10247	NESC Heavy	4	0.921	-2.383	2.525	0.394	38.475	6.168	24.924	3	-80.198	0.882	2.750	10.28
10247	NESC Heavy	5	-0.394	-2.525	2.383	-0.921	38.475	17.586	71.069	3	-80.198	1.489	2.750	29.31
10247	NESC Heavy	6	-1.603	-1.990	1.603	-1.990	38.475	30.551	123.463	4	-80.198	1.962	2.750	50.92
10247	NESC Heavy	7	-2.383	-0.921	0.394	-2.525	38.475	17.540	70.882	3	-80.028	1.487	2.750	29.23
10247	NESC Heavy	8	-2.525	0.394	-0.921	-2.383	38.475	6.047	24.437	3	-79.971	0.873	2.750	10.08
10247	NESC Heavy	9	-1.990	1.603	-1.990	-1.603	38.475	9.966	40.276	4	39.518	1.121	2.750	16.61
10247	NESC Heavy	10	-0.921	2.383	-2.525	-0.394	38.475	8.163	32.988	3	89.013	1.014	2.750	13.60
10247	NESC Heavy	11	0.394	2.525	-2.383	0.921	38.475	19.581	79.132	3	89.013	1.571	2.750	32.64
10247	NESC Heavy	12	1.603	1.990	-1.603	1.990	38.475	33.914	137.053	4	89.013	2.068	2.750	56.52
10247	NESC Heavy	13	2.082	1.575	-1.015	2.405	38.475	21.021	84.949	3	88.956	1.628	2.750	35.03
10247	NESC Heavy	14	2.590	0.323	0.323	2.590	38.475	9.864	39.862	2	88.786	1.115	2.750	16.44
10247	NESC Heavy	15	2.405	-1.015	1.575	2.082	38.475	6.982	28.214	3	38.969	0.938	2.750	11.64
10247	NESC Heavy	16	1.575	-2.082	2.405	1.015	38.475	5.466	22.088	3	-30.703	0.830	2.750	9.11
10247	NESC Heavy	17	0.323	-2.590	2.590	-0.323	38.475	8.563	34.603	2	-80.198	1.039	2.750	14.27
10247	NESC Heavy	18	-1.015	-2.405	2.082	-1.575	38.475	18.969	76.658	3	-80.198	1.546	2.750	31.62
10247	NESC Heavy	19	-2.082	-1.575	1.015	-2.405	38.475	18.935	76.519	3	-80.141	1.545	2.750	31.56
10247	NESC Heavy	20	-2.590	-0.323	-0.323	-2.590	38.475	8.503	34.361	2	-79.971	1.035	2.750	14.17
10247	NESC Heavy	21	-2.405	1.015	-1.575	-2.082	38.475	5.365	21.681	3	-30.154	0.822	2.750	8.94
10247	NESC Heavy	22	-1.575	2.082	-2.405	-1.015	38.475	7.082	28.621	3	39.518	0.945	2.750	11.80
10247	NESC Heavy	23	-0.323	2.590	-2.590	0.323	38.475	9.924	40.104	2	89.013	1.118	2.750	16.54
10247	NESC Heavy	24	1.015	2.405	-2.082	1.575	38.475	21.055	85.089	3	89.013	1.629	2.750	35.09
10247	NESC Extreme	1	2.383	0.921	-0.394	2.525	38.475	29.536	119.361	3	134.401	1.929	2.750	49.23
10247	NESC Extreme	2	2.525	-0.394	0.921	2.383	38.475	11.607	46.908	3	134.383	1.210	2.750	19.35
10247	NESC Extreme	3	1.990	-1.603	1.990	1.603	38.475	15.588	62.993	4	56.669	1.402	2.750	25.98
10247	NESC Extreme	4	0.921	-2.383	2.525	0.394	38.475	10.617	42.906	3	-129.912	1.157	2.750	17.70
10247	NESC Extreme	5	-0.394	-2.525	2.383	-0.921	38.475	28.523	115.265	3	-129.912	1.896	2.750	47.54
10247	NESC Extreme	6	-1.603	-1.990	1.603	-1.990	38.475	49.546	200.227	4	-129.912	2.499	2.750	82.58
10247	NESC Extreme	7	-2.383	-0.921	0.394	-2.525	38.475	28.508	115.207	3	-129.859	1.896	2.750	47.51
10247	NESC Extreme	8	-2.525	0.394	-0.921	-2.383	38.475	10.579	42.753	3	-129.841	1.155	2.750	17.63
10247	NESC Extreme	9	-1.990	1.603	-1.990	-1.603	38.475	15.588	62.993	4	56.841	1.402	2.750	25.98
10247	NESC Extreme	10	-0.921	2.383	-2.525	-0.394	38.475	11.645	47.060	3	134.454	1.212	2.750	19.41
10247	NESC Extreme	11	0.394	2.525	-2.383	0.921	38.475	29.551	119.420	3	134.454	1.930	2.750	49.25
10247	NESC Extreme	12	1.603	1.990	-1.603	1.990	38.475	51.279	207.228	4	134.454	2.542	2.750	85.46
10247	NESC Extreme	13	2.082	1.575	-1.015	2.405	38.475	31.805	128.530	3	134.436	2.002	2.750	53.01
10247	NESC Extreme	14	2.590	0.323	0.323	2.590	38.475	14.751	59.612	2	134.383	1.364	2.750	24.59
10247	NESC Extreme	15	2.405	-1.015	1.575	2.082	38.475	10.135	40.957	3	56.669	1.130	2.750	16.89
10247	NESC Extreme	16	1.575	-2.082	2.405	1.015	38.475	9.333	37.718	3	-52.300	1.085	2.750	15.56
10247	NESC Extreme	17	0.323	-2.590	2.590	-0.323	38.475	14.069	56.854	2	-129.912	1.332	2.750	23.45

10247	NESC Extreme	18	-1.015	-2.405	2.082	-1.575	38.475	30.741	124.230	3	-129.912	1.968	2.750	51.23
10247	NESC Extreme	19	-2.082	-1.575	1.015	-2.405	38.475	30.730	124.186	3	-129.894	1.968	2.750	51.22
10247	NESC Extreme	20	-2.590	-0.323	-0.323	-2.590	38.475	14.050	56.778	2	-129.841	1.331	2.750	23.42
10247	NESC Extreme	21	-2.405	1.015	-1.575	-2.082	38.475	9.302	37.591	3	-52.128	1.083	2.750	15.50
10247	NESC Extreme	22	-1.575	2.082	-2.405	-1.015	38.475	10.166	41.084	3	56.841	1.132	2.750	16.94
10247	NESC Extreme	23	-0.323	2.590	-2.590	0.323	38.475	14.770	59.688	2	134.454	1.364	2.750	24.62
10247	NESC Extreme	24	1.015	2.405	-2.082	1.575	38.475	31.816	128.573	3	134.454	2.003	2.750	53.03

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
Davit1	7.66	NESC Heavy	1	182.8
Davit2	10.74	NESC Heavy	1	182.8
Davit3	17.39	NESC Heavy	1	537.4
Davit4	22.27	NESC Heavy	1	537.4
Davit5	17.52	NESC Heavy	1	537.4
Davit6	22.33	NESC Heavy	1	537.4
Davit7	17.67	NESC Heavy	1	537.4
Davit8	22.42	NESC Heavy	1	537.4

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	56.52	10247	Base Plate
NESC Extreme	85.46	10247	Base Plate

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number
NESC Heavy	46.89	10247	27
NESC Extreme	70.16	10247	27

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	10247	12	38.475	70.520	1775.885	-5.775	33.914	137.053	4	89.013	2.068	56.52
NESC Extreme	10247	12	38.475	36.334	2777.538	-1.807	51.279	207.228	4	134.454	2.542	85.46

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC Heavy	22.42	Davit8	1
NESC Extreme	10.79	Davit8	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
Clamp1	Clamp	1.17	NESC Heavy	0.0
Clamp2	Clamp	1.29	NESC Heavy	0.0
Clamp3	Clamp	6.17	NESC Heavy	0.0
Clamp4	Clamp	6.92	NESC Heavy	0.0
Clamp5	Clamp	6.17	NESC Heavy	0.0
Clamp6	Clamp	6.92	NESC Heavy	0.0
Clamp7	Clamp	6.17	NESC Heavy	0.0
Clamp8	Clamp	6.92	NESC Heavy	0.0
Clamp9	Clamp	14.46	NESC Extreme	0.0
Clamp10	Clamp	9.73	NESC Extreme	0.0
Clamp11	Clamp	24.34	NESC Extreme	0.0
Clamp12	Clamp	24.34	NESC Extreme	0.0
Clamp13	Clamp	0.67	NESC Heavy	0.0
Clamp14	Clamp	0.67	NESC Heavy	0.0
Clamp15	Clamp	0.67	NESC Heavy	0.0
Clamp16	Clamp	0.67	NESC Heavy	0.0
Clamp17	Clamp	0.67	NESC Heavy	0.0
Clamp18	Clamp	0.67	NESC Heavy	0.0
Clamp19	Clamp	0.67	NESC Heavy	0.0
Clamp20	Clamp	0.67	NESC Heavy	0.0
Clamp21	Clamp	0.67	NESC Heavy	0.0
Clamp22	Clamp	0.67	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	Clamp1	Clamp	Davit1:End	0.000	0.619	0.704	0.937
NESC Heavy	Clamp2	Clamp	Davit2:End	0.000	0.648	0.800	1.030
NESC Heavy	Clamp3	Clamp	Davit3:End	0.000	2.095	4.473	4.939
NESC Heavy	Clamp4	Clamp	Davit4:End	0.000	2.195	5.082	5.536
NESC Heavy	Clamp5	Clamp	Davit5:End	0.000	2.095	4.473	4.939
NESC Heavy	Clamp6	Clamp	Davit6:End	0.000	2.195	5.082	5.536
NESC Heavy	Clamp7	Clamp	Davit7:End	0.000	2.095	4.473	4.939
NESC Heavy	Clamp8	Clamp	Davit8:End	0.000	2.195	5.082	5.536
NESC Heavy	Clamp9	Clamp	10247:TopConn	0.000	3.502	0.000	3.502
NESC Heavy	Clamp10	Clamp	10247:BotConn	0.000	-2.199	5.375	5.807
NESC Heavy	Clamp11	Clamp	10247:BotConT	0.000	5.822	0.000	5.822
NESC Heavy	Clamp12	Clamp	10247:BotConB	0.000	-5.822	0.000	5.822
NESC Heavy	Clamp13	Clamp	10247:WVGD1	0.000	0.137	0.516	0.534
NESC Heavy	Clamp14	Clamp	10247:WVGD2	0.000	0.137	0.516	0.534
NESC Heavy	Clamp15	Clamp	10247:WVGD3	0.000	0.137	0.516	0.534
NESC Heavy	Clamp16	Clamp	10247:WVGD4	0.000	0.137	0.516	0.534
NESC Heavy	Clamp17	Clamp	10247:WVGD5	0.000	0.137	0.516	0.534
NESC Heavy	Clamp18	Clamp	10247:WVGD6	0.000	0.137	0.516	0.534
NESC Heavy	Clamp19	Clamp	10247:WVGD7	0.000	0.137	0.516	0.534
NESC Heavy	Clamp20	Clamp	10247:WVGD8	0.000	0.137	0.516	0.534
NESC Heavy	Clamp21	Clamp	10247:WVGD9	0.000	0.137	0.516	0.534
NESC Heavy	Clamp22	Clamp	10247:WVGD10	0.000	0.137	0.516	0.534

NESC Extreme	Clamp1	Clamp	Davit1:End	0.000	0.417	0.174	0.452
NESC Extreme	Clamp2	Clamp	Davit2:End	0.000	0.433	0.198	0.476
NESC Extreme	Clamp3	Clamp	Davit3:End	0.000	2.915	1.904	3.482
NESC Extreme	Clamp4	Clamp	Davit4:End	0.000	3.028	2.163	3.721
NESC Extreme	Clamp5	Clamp	Davit5:End	0.000	2.915	1.904	3.482
NESC Extreme	Clamp6	Clamp	Davit6:End	0.000	3.028	2.163	3.721
NESC Extreme	Clamp7	Clamp	Davit7:End	0.000	2.915	1.904	3.482
NESC Extreme	Clamp8	Clamp	Davit8:End	0.000	3.028	2.163	3.721
NESC Extreme	Clamp9	Clamp	10247:TopConn	0.000	11.567	0.000	11.567
NESC Extreme	Clamp10	Clamp	10247:BotConn	0.000	-7.386	2.466	7.787
NESC Extreme	Clamp11	Clamp	10247:BotConT	0.000	19.474	0.000	19.474
NESC Extreme	Clamp12	Clamp	10247:BotConB	0.000	-19.474	0.000	19.474
NESC Extreme	Clamp13	Clamp	10247:WVGD1	0.000	0.361	0.119	0.380
NESC Extreme	Clamp14	Clamp	10247:WVGD2	0.000	0.361	0.119	0.380
NESC Extreme	Clamp15	Clamp	10247:WVGD3	0.000	0.361	0.119	0.380
NESC Extreme	Clamp16	Clamp	10247:WVGD4	0.000	0.361	0.119	0.380
NESC Extreme	Clamp17	Clamp	10247:WVGD5	0.000	0.361	0.119	0.380
NESC Extreme	Clamp18	Clamp	10247:WVGD6	0.000	0.361	0.119	0.380
NESC Extreme	Clamp19	Clamp	10247:WVGD7	0.000	0.361	0.119	0.380
NESC Extreme	Clamp20	Clamp	10247:WVGD8	0.000	0.361	0.119	0.380
NESC Extreme	Clamp21	Clamp	10247:WVGD9	0.000	0.361	0.119	0.380
NESC Extreme	Clamp22	Clamp	10247:WVGD10	0.000	0.361	0.119	0.380

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	16.810	0.000	40.704	1464.639	-0.000	-0.000
NESC Extreme	26.470	0.000	16.229	2296.979	-0.000	-0.000

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	3590.0
Weight of Steel Poles:	18435.7
Total:	22025.7

*** End of Report

Anchor Bolt Analysis:

Input Data:

Bolt Force:

Maximum Tensile Force =	$T_{Max} := 135 \cdot kips$	(User Input from PLS-Pole)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 16$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yeild Strength=	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

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

Bolt Tension Check:

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.0 \cdot \left(A_n \cdot F_y\right) = 243.576 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 55.42 \cdot \%$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 2777.54 \cdot 1.1 \cdot ft \cdot kips = 3055 \cdot ft \cdot kips$	(User Input from PLS-Pole)
Shear Force =	$Shear := 34.66 \cdot kip \cdot 1.1 = 38.126 \cdot kips$	(User Input from PLS-Pole)
Axial Force =	$Axial := 38.55 \cdot kip \cdot 1.1 = 42.405 \cdot kips$	(User Input from PLS-Pole)
Tower Height =	$H_t := 115 \cdot ft$	(User Input)

Footing Data:

Depth to Bottom of Footing =	$D_f := 34 \cdot ft$	(User Input)
Length of Pier =	$L_p := 15 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 3 \cdot ft$	(User Input)
Width of Pier =	$W_p := 8 \cdot ft$	(User Input)
Depth of Soil =	$D_{soil} := 12 \cdot ft$	(User Input)
Depth of Rock =	$D_{rock} := 22 \cdot ft$	(User Input)

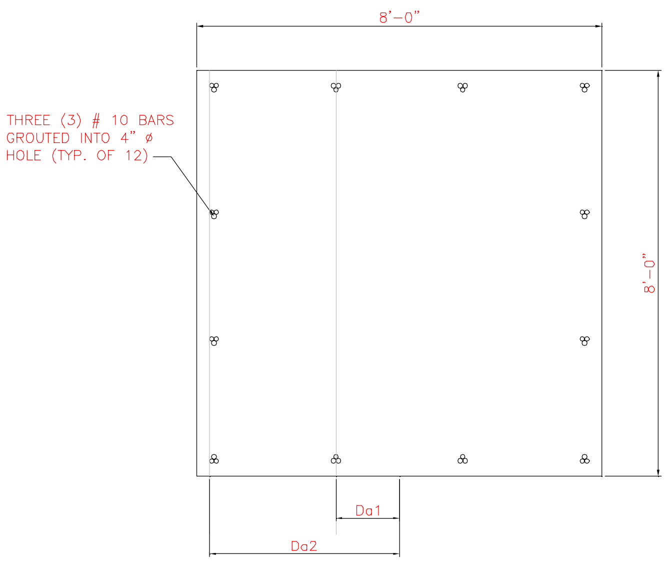
Material Properties:

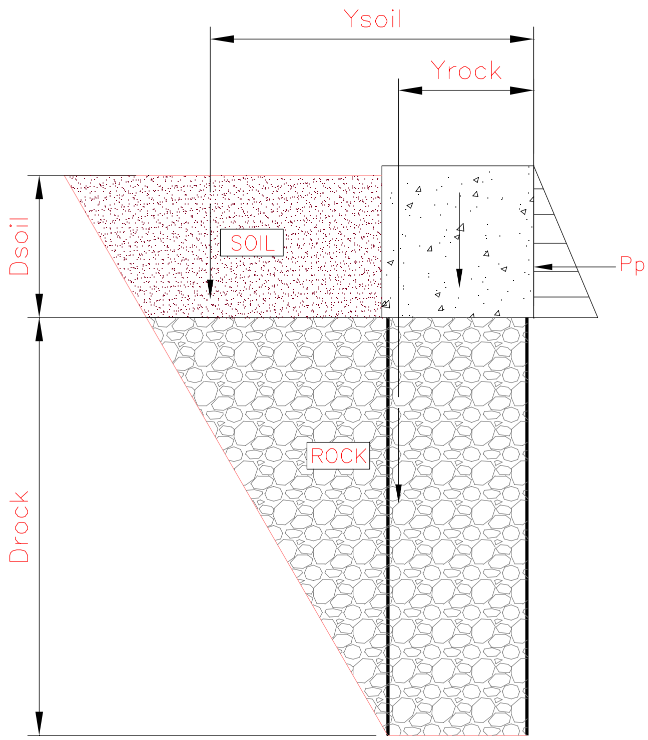
Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Soil Bearing Capacity =	$q_s := 8000 \cdot psf$	(User Input)	
Rock Bearing Capacity =	$q_{rock} := 50000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Unit Weight of Rock =	$\gamma_{rock} := 160 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1.0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Rock Anchor Properties:

ASTM A615 Grade 60

Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)	
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(User Input)	
Anchor Diameter =	$d_{ra} := 3.81 \cdot in$	(User Input)	(3 # 10 Bars)
Hole Diameter =	$d_{Hole} := 4 \cdot in$	(User Input)	
Grout Strength =	$\tau := 120 \cdot psi$	(User Input)	(Assumed Conservative Value)
Distance to Rock Anchor Group 1 =	$D_{a1} := 15 \cdot in$	(User Input)	
Distance to Rock Anchor Group 2 =	$D_{a2} := 45 \cdot in$	(User Input)	
Number of Rock Anchors in Group 1 =	$N_{a1} := 4$	(User Input)	
Number of Rock Anchors in Group 2 =	$N_{a2} := 8$	(User Input)	
Total Number of Rock Anchors =	$N_{atot} := 12$	(User Input)	





Area 1 = $A1_s := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{soil}^2 = 41.569\,ft^2$

Area 2 = $A2_s := \tan(\Phi_s)\cdot D_{rock}\cdot D_{soil} = 152.42\,ft^2$ sf

Distance to Centroid 1 = $Y1 := \tan(\Phi_s)\cdot D_{rock} + \frac{1}{3}\cdot\tan(\Phi_s)\cdot D_{soil} = 15.011\,ft$ ft

Distance to Centroid 2 = $Y2 := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{rock} = 6.351\,ft$ ft

Distance from Toe to Centroid of Soil = $Y_{soil} := \frac{(A1_s\cdot Y1 + A2_s\cdot Y2)}{(A1_s + A2_s)} + W_p = 16.21\,ft$ ft

Area 1 = $A1_r := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{rock}^2 = 139.719\,ft^2$ sf

Area 2 = $A2_r := W_p\cdot D_{rock} = 176\,ft^2$ sf

Distance to Centroid 1 = $Y1 := W_p + \frac{1}{3}\cdot\tan(\Phi_s)\cdot D_{rock} = 12.234\,ft$ ft

Distance to Centroid 2 = $Y2 := \frac{W_p}{2} = 4\,ft$ ft

Distance from Toe to Centroid of Rock = $Y_{rock} := \frac{(A1_r\cdot Y1 + A2_r\cdot Y2)}{(A1_r + A2_r)} = 7.64\,ft$ ft

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}\left(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}\right) = 150 \cdot \text{pcf}$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 100 \cdot \text{pcf}$

Coefficient of Lateral Soil Pressure = $K_p := \dfrac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Passive Pressure = $P_{top} := 0 = 0 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_{soil} + c \cdot 2 \cdot \sqrt{K_p} = 3.6 \cdot \text{ksf}$

$P_{ave} := \dfrac{P_{top} + P_{bot}}{2} = 1.8 \cdot \text{ksf}$

$A_p := W_p \cdot \left(L_p - L_{pag}\right) = 96 \text{ft}^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 172.8 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := \left(W_p^{\ 2} \cdot L_p\right) \cdot \gamma_c = 144 \cdot \text{kip}$

Total Weight of Soil = $WT_{Stot} := \left(A1_s + A2_s\right) \cdot W_p \cdot \gamma_s = 155.2 \cdot \text{kips}$

Total Weight of Rock = $WT_{Rtot} := \left(A1_r + A2_r\right) \cdot W_p \cdot \gamma_{rock} = 404.1 \cdot \text{kips}$

Resisting Moment = $M_r := \left(WT_c + \text{Axial}\right) \cdot \dfrac{W_p}{2} + S_u \cdot \dfrac{\left(L_p - L_{pag}\right)}{3} + WT_{Stot} \cdot Y_{soil} + WT_{Rtot} \cdot Y_{rock} = 7041 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot L_p = 3627 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \dfrac{M_r}{M_{ot}} = 1.94$

Factor of Safety Required = $FS_{req} := 1.0$

$\text{OverTurning\_Moment\_Check} := \text{if}\left(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$

$\text{OverTurning\_Moment\_Check} = \text{"Okay"}$

Rock Anchor Check:

Polar Moment of Inertia = $I_p := \left(D_{a1}^2 \cdot N_{a1} + D_{a2}^2 \cdot N_{a2}\right) = 17100 \cdot in^2$

Maximum Tension Force = $T_{Max} := \frac{OM \cdot D_{a2}}{I_p} - \frac{Axial + WT_c}{N_{atot}} = 80.9 \cdot kips$

Gross Area of Bolt Group = $A_g := \frac{\pi}{4} \cdot d_{ra}^2 = 11.401 \cdot in^2$

Allowable Tension = $T_{all} := A_g \cdot F_y = 684.1 \cdot kips$

$\frac{T_{Max}}{T_{all}} = 11.8 \cdot \%$

Condition1 := if$\left(T_{Max} < T_{all}, \text{"OK"}, \text{"NG"}\right)$

Condition1 = "OK"

Check Bond Strength:

Bond Strength = Bond_Strength := $d_{Hole} \cdot \pi \cdot D_{rock} \cdot \tau = 398 \cdot kips$

$\frac{T_{Max}}{Bond\_Strength} = 20.3 \cdot \%$

Condition2 := if$\left(T_{Max} < Bond_Strength, \text{"OK"}, \text{"NG"}\right)$

Condition2 = "OK"

Bearing Pressure Caused by Footing:

$P_2 := \frac{M_{ot} \cdot D_{a2}}{I_p} = 114.5 \cdot kips$

$P_1 := \frac{M_{ot} \cdot D_{a1}}{I_p} = 38.2 \cdot kips$

Area of the Mat = $A_{mat} := \left(W_p \cdot \frac{W_p}{2}\right) = 32 \, ft^2$

Maximum Pressure in Mat = $P_{max} := \frac{WT_c + Axial + P_1 \cdot \frac{N_{a1}}{2} + P_2 \cdot \frac{N_{a2}}{2}}{A_{mat}} = 22.529 \cdot ksf$

Max_Pressure_Check := if$\left(P_{max} < q_{rock}, \text{"Okay"}, \text{"No Good"}\right)$

Max_Pressure_Check = "Okay"

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Section 1 - Site Information

Site ID: CT11201A
Status: Draft
Version: 1.1
Project Type: L700
Approved: Not Approved
Approved By: Not Approved
Last Modified: 12/1/2016 7:59:27 AM
Last Modified By: GSM1900\VJaini

Site Name: Brookfield/ Business Area
Site Class: Monopole
Site Type: Structure Non Building
Solution Type:
Plan Year:
Market: CONNECTICUT
Vendor: Ericsson
Landlord: CL&P

Latitude: 41.43086800
Longitude: -73.40259800
Address: 20 Vale Road Tower #10247
City, State: Brookfield, CT
Region: NORTHEAST

RAN Template: 704Bu Outdoor			AL Template: Custom	
Sector Count: 3	Antenna Count: 6	Coax Line Count: 18	TMA Count: 6	RRU Count: 3

Section 2 - Existing Template Images

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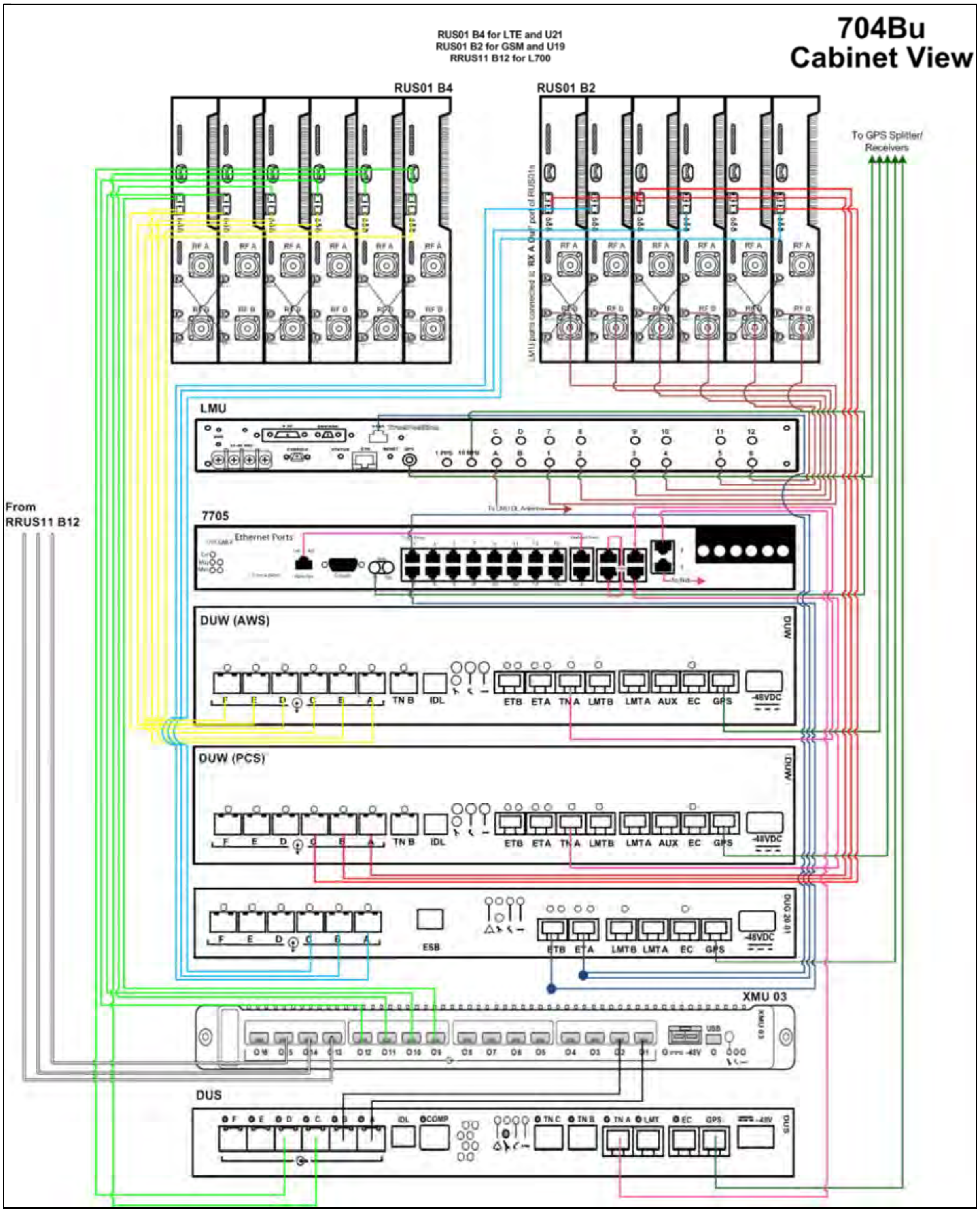
Section 3 - Proposed Template Images

704Bu.png



Notes:

Section 4 - Siteplan Images

— This section is intentionally blank. —

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Section 5 - RAN Equipment

Existing RAN Equipment			
Template: 4B			
Enclosure	1	2	3
Enclosure Type	RBS 3106	RBS 6102	S8000 Outdoor
Baseband		DUL20, DUW30 (x2), DUG20	
Radio		RUS01 B2 (x6), RUS01 B4 (x6)	

Proposed RAN Equipment	
Template: 704Bu Outdoor	
Enclosure	1
Enclosure Type	RBS 6102
Baseband	DUG20 (G1900), DUW30 (U1900), DUW30 (U2100), DUS41 (L2100, L700)
Multiplexer	XMU (L2100, L700)
Radio	RUS01 B2 (x3) (G1900), RUS01 B2 (x3) (U1900), RUS01 B4 (x6) (U2100, L2100)

RAN Scope of Work:

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Section 6 - A&L Equipment

Existing Template: 4B
Proposed Template: Custom

Sector 1 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		APXV18-206516S-A20 (Dual)
Azimuth	10		
M. Tilt	0		
Height	130		
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			
Sector Equipment			

Unconnected Equipment:

Scope of Work:

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Sector 1 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		LNX-6515DS-A1M (Dual)
Azimuth	10		10
M. Tilt	0		0
Height	130		122
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			RRUS11 B12
Sector Equipment			Andrew Smart Bias T

Unconnected Equipment:

Scope of Work:

TMA's are on the ground.RRU's on the ground for L700.

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Sector 2 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		APXV18-206516S-A20 (Dual)
Azimuth	130		
M. Tilt	0		
Height	130		
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			
Sector Equipment			

Unconnected Equipment:

Scope of Work:

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Sector 2 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		LNX-6515DS-A1M (Dual)
Azimuth	130		130
M. Tilt	0		0
Height	130		122
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			RRUS11 B12
Sector Equipment			Andrew Smart Bias T

Unconnected Equipment:

Scope of Work:

TMA's are on the ground.RRU's on the ground for L700.

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Sector 3 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		APXV18-206516S-A20 (Dual)
Azimuth	250		
M. Tilt	0		
Height	130		
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	5	3	
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			
Sector Equipment			

Unconnected Equipment:

Scope of Work:

RAN Template: 704Bu Outdoor	A&L Template: Custom

CT11201A_1.1_L700

Sector 3 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	APX16DWV-16DWV-S-E-A20 (Quad)		LNX-6515DS-A1M (Dual)
Azimuth	250		250
M. Tilt	0		0
Height	130		122
Ports	P1	P2	P3
Active Tech.	U1900 G1900	U2100 L2100	L700
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.	1-1/4" Coax - 145 ft. 1-1/4" Coax - 145 ft.
TMAs	Generic Style 1A - Twin PCS	Generic Style 1B - Twin AWS	
Diplexers / Combiners			
Radio			RRUS11 B12
Sector Equipment			Andrew Smart Bias T

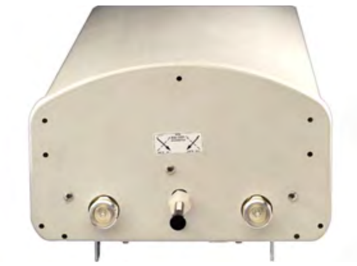
Unconnected Equipment:

Scope of Work:

TMA's are on the ground.RRU's on the ground for L700.

Product Specifications

COMMSCOPE®



LNX-6515DS-VTM | LNX-6515DS-A1M

Single Band Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- Exceptional horizontal pattern roll-off and strong front-to-back ratio
- Extended bandwidth allows one antenna to serve multiple frequency allocations
- Great solution to maximize network coverage and capacity
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	16.7	17.6
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	9.7	8.6
Beam Tilt, degrees	0–8	0–8
USLS (First Lobe), dB	17	17
Front-to-Back Ratio at 180°, dB	32	27
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	16.6	16.9
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 16.6 4 ° | 16.6 8 ° | 16.4	0 ° | 17.0 4 ° | 17.0 8 ° | 16.8
Beamwidth, Horizontal Tolerance, degrees	±1	±0.9
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.4
USLS, beampeak to 20° above beampeak, dB	18	18
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

Antenna Type	Sector
Band	Single band
Brand	DualPol®
Operating Frequency Band	698 – 896 MHz

Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, frontal	878.0 N @ 150 km/h 197.4 lbf @ 150 km/h
Wind Loading, lateral	273.0 N @ 150 km/h 61.4 lbf @ 150 km/h
Wind Loading, rear	1033.0 N @ 150 km/h 232.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	180.5 mm | 7.1 in
Length	2453.0 mm | 96.6 in
Width	301.0 mm | 11.9 in
Net Weight, without mounting kit	19.8 kg | 43.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	LNX-6515DS-A1M

Packed Dimensions

Depth	295.0 mm | 11.6 in
Length	2718.0 mm | 107.0 in
Width	392.0 mm | 15.4 in
Shipping Weight	36.9 kg | 81.4 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

DB380-3 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Used for wide panel antennas. Includes

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

Product Specifications

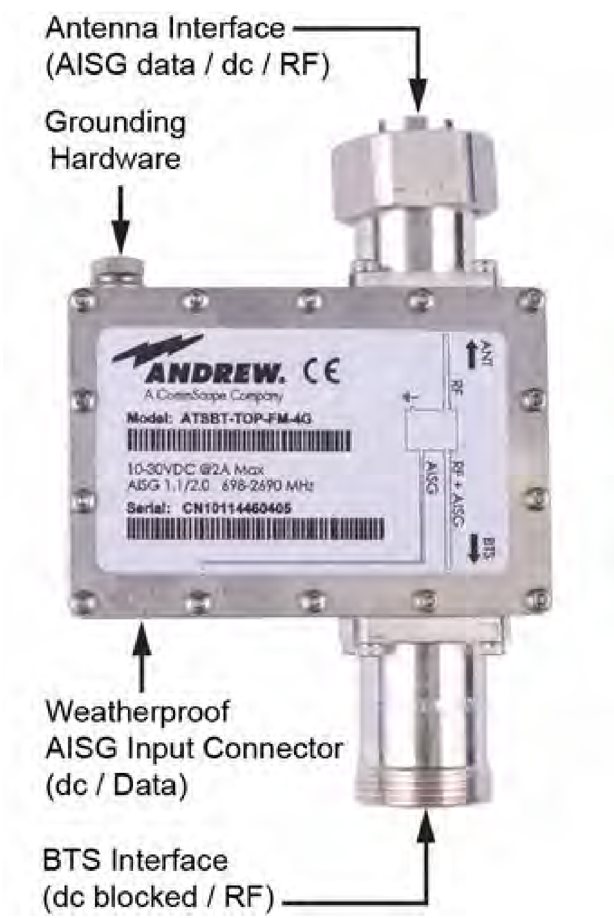
ATSBT-TOP-FM-4G

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

Exhibit E

EBI Consulting

environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CT11201A

Brookfield/ Business Area
20 Vale Road
Brookfield, CT 06804

February 2, 2017

EBI Project Number: 6217000354

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general public allowable limit:	**2.36 %**

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

February 2, 2017

T-Mobile USA
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, CT 06002

Emissions Analysis for Site: **CT11201A – Brookfield/ Business Area**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **20 Vale Road, Brookfield, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the 700 MHz Band is approximately 467 $\mu W/cm^2$, and the general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **20 Vale Road, Brookfield, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

2) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

3) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

4) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel

5) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.

6) Since all radios are ground mounted there are additional cabling losses accounted for. For each ground mounted RF path the following losses were calculated. 1.01 dB of additional cable loss for all ground mounted 700 MHz Channels, 1.77 dB of additional cable loss for all ground mounted 1900 MHz channels and 1.87 dB of additional cable loss for all ground mounted 2100 MHz channels were factored into the calculations used for this analysis. This is based on manufacturers Specifications for 145 feet of 1-1/4" coax cable on each path.

7) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

8) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

9) The antennas used in this modeling are the **RFS APX16DWV-16DWVS-E-A20** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-A1M** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **RFS APX16DWV-16DWVS-E-A20** has a maximum gain of **16.3 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Commscope LNX-6515DS-A1M** has a maximum gain of **14.6 dBd** at its main lobe at 700 MHz. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

10) The antenna mounting height centerlines of the proposed antennas are **130 & 122 feet** above ground level (AGL).

11) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

12) All calculations were done with respect to uncontrolled / general public threshold limits.

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20
Gain:	16.3 dBd	Gain:	16.3 dBd	Gain:	16.3 dBd
Height (AGL):	130	Height (AGL):	130	Height (AGL):	130
Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)
Channel Count	8	Channel Count	8	Channel Count	8
Total TX Power(W):	300	Total TX Power(W):	300	Total TX Power(W):	300
ERP (W):	8,397.48	ERP (W):	8,397.48	ERP (W):	8,397.48
Antenna A1 MPE%	1.96	Antenna B1 MPE%	1.96	Antenna C1 MPE%	1.96
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	Commscope LNX-6515DS-A1M	Make / Model:	Commscope LNX-6515DS-A1M	Make / Model:	Commscope LNX-6515DS-A1M
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	122	Height (AGL):	122	Height (AGL):	122
Frequency Bands	700 MHz	Frequency Bands	700 MHz	Frequency Bands	700 MHz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power(W):	30	Total TX Power(W):	30	Total TX Power(W):	30
ERP (W):	685.68	ERP (W):	685.68	ERP (W):	685.68
Antenna A2 MPE%	0.39	Antenna B2 MPE%	0.39	Antenna C2 MPE%	0.39

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**2.36 %**
Ne Additional Carriers Located On This Facility	NA
Site Total MPE %:	**2.36 %**

T-Mobile Sector A Total:	2.36 %
T-Mobile Sector B Total:	2.36 %
T-Mobile Sector C Total:	2.36 %
Site Total:	2.36 %

T-Mobile _Max Values per sector	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
T-Mobile AWS - 2100 MHz LTE	2	1,663.99	130	7.78	AWS - 2100 MHz	1000	0.78%
T-Mobile AWS - 2100 MHz UMTS	2	832.00	130	3.89	AWS - 2100 MHz	1000	0.39%
T-Mobile PCS - 1950 MHz UMTS	2	851.38	130	3.98	PCS - 1950 MHz	1000	0.40%
T-Mobile PCS - 1950 MHz GSM	2	851.38	130	3.98	PCS - 1950 MHz	1000	0.40%
T-Mobile 700 MHz LTE	1	685.68	130	1.60	700 MHz	467	0.39%
						Total:	**2.36%**

Summary

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

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general public exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	2.36 %
Sector B:	2.36 %
Sector C:	2.36 %
T-Mobile Per Sector Maximum:	2.36 %
Site Total:	2.36 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **2.36%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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

Exhibit F

EVERSOURCE ENERGY

56 Prospect Street,
Hartford, CT 06103

P.O. Box 270
Hartford, CT 06141-0270
(860) 665-5000

February 24, 2017

Mr. Mark Richard
T-Mobile
35 Griffin Rd.
Bloomfield, CT 06002

RE: T-Mobile Antenna Site, CT11201A, 20 Vale Rd., Brookfield CT, structure 10247.

Dear Mr. Richard:

Based on our reviews of the site drawings, the structural analysis provided by Centek Engineering and, and the foundation analyses performed by Centek Engineering, we have reviewed for acceptance this modification

Since there are no outstanding structural or site related issues to resolve at this time, please contact Hank O'Brien (860-665-6987) to complete the lease amendment issues

Sincerely,

Robert Gray
Transmission Line Engineering

ref: CT11201A-L700-CD-V2 (S&S softcopy).pdf
16162.08 - CT11201A Structural Analysis Rev0 17.01.19.pdf