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

VIA ELECTRONIC MAIL

May 3, 2022

Victoria Masse
Northeast Site Solutions
54 Main Street, Unit 3
Sturbridge, MA 01566
victoria@northeastsitesolutions.com

RE: **EM-T-MOBILE-144-220325** – T-Mobile notice of intent to modify an existing telecommunications facility located at 48 Quail Trail, Trumbull, Connecticut.

Dear Ms. Masse:

The Connecticut Siting Council (Council) is in receipt of your correspondence of April 22, 2022 submitted in response to the Council's April 21, 2022 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

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

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/FOC/emr

Northeast Site Solutions
Victoria Masse
420 Main Street #2, Sturbridge, MA 01566
860-306-2326
victoria@northeastsitesolutions.com

March 22, 2022

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

RE: Notice of Exempt Modification
48 Quail Trail, Trumbull CT 06611
Latitude: 41.23250000
Longitude: -73.17220000
T-Mobile Site#: CT11860A_L600

Dear Ms. Bachman:
T-Mobile currently maintains three (3) antennas at the 105-foot level of the existing 95-foot transmission pole (#838) 48 Quail Trail, Trumbull CT. The electric transmission pole (#838) is owned by CL&P d/b/a Eversource. The property is owned by Irma and Letzi Perez. T-Mobile now intends to replace three (3) existing antennas with three (3) new 600/700/1900/2100 MHz antenna. The new antennas would be installed at the 105-foot level of the tower. This modification includes B2, B5 hardware that is both 4G (LTE), and 5G capable.

T-Mobile Planned Modifications:
Remove:
(3) Andrew Smart Bias Tees

Remove and Replace:
(3) Andrew SBNHH Antenna (Remove) – (3) RFS APXVARR18 600/700/1900/2100 MHz Antenna (Replace)

Install New: NONE

Existing to Remain:
(18) Coax
(3) Standoff arms

Ground Work:
(3) Existing Radios (Remove) – (3) Radio 4449 B71 + B85 (Replace)
Install (3) 4415 B25 Radio
Install (3) 4415 B66A Radio
Install (3) Diplexer

NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

This facility was approved by the CT Siting Council. Per the attached Petition No. 872 – Dated December 4, 2008.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Vicki A Tesoro, First Selectwomen and Douglas Wenz, Zoning Enforcement Officer for the Town of Trumbull, as well as the property owner and the tower owner.

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,

Victoria Masse
Mobile: 860-306-2326
Fax: 413-521-0558
Office: 420 Main Street, Unit 2, Sturbridge MA 01566
Email: victoria@northeastsitesolutions.com

NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

Attachments:

cc:
The Honorable Vicki A Tesoro- First Selectwomen
Town of Trumbull
5866 Main Street
Second Floor
Trumbull, CT 06611

Douglas Wenz - Zoning Enforcement Officer
Town of Trumbull
5866 Main Street
Second Floor
Trumbull, CT 06611

CL&P d/b/a Eversource - as tower owner
56 Prospect St., First Floor
Hartford, CT 06103

Irma and Letzi Perez-as property owners
48 Quail Trail
Trumbull, CT 06611

NORTHEAST SITE SOLUTIONS, LLC
1053 FARMINGTON AVE. STE G
FARMINGTON, CT 06032

WEBSTER BANK
51-7010/2111

0413

03/23/2022

PAY TO THE ORDER OF Connecticut Siting Council $ *625.00

EXACTLY SIX HUNDRED TWENTY-FIVE DOLLARS DOLLARS

Connecticut Siting Council
10 Franklin Square
New Britain CT 06051

MEMO

AUTHORIZED SIGNATURE

⑈000413⑈ ⑆211170101⑆10 0011489092⑈

NORTHEAST SITE SOLUTIONS, LLC 0413

Check#: 413 **Date: 03/23/2022** **Vendor#: 10023 Connecticut Siting Council Check Total: *625.00**

Invoice#	*Invoice Date*	*Job/Description*	*Balance*	*Retain*	*Discount*	*This Check*
CT11860A	03/23/2022	4 TMO L600	625.00			625.00

NORTHEAST SITE SOLUTIONS, LLC 0413

Check#: 413 **Date: 03/23/2022** **Vendor#: 10023 Connecticut Siting Council Check Total: *625.00**

Invoice#	*Invoice Date*	*Job/Description*	*Balance*	*Retain*	*Discount*	*This Check*
CT11860A	03/23/2022	4 TMO L600	625.00			625.00

Exhibit A

Original Facility Approval

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

Daniel F. Caruso
Chairman

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

December 4, 2008

Raymond J. Lemley
T-Mobile
35 Griffin Road South
Bloomfield, CT 06002

RE: **PETITION NO. 872** - Omnipoint Communications, Inc. a.k.a. T-Mobile petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need for the proposed antennas to be installed on an existing Connecticut Light and Power Company-owned transmission line structure located at 48 Quail Trail, Trumbull, Connecticut.

Dear Mr. Lemley:

At a public meeting held on December 4, 2008, the Connecticut Siting Council (Council) considered and ruled that this proposal would not have a substantial adverse environmental effect, and pursuant to General Statutes § 16-50k would not require a Certificate of Environmental Compatibility and Public Need.

This decision is under the exclusive jurisdiction of the Council and is not applicable to any other modification or construction. All work is to be implemented as specified in the petition, dated October 17, 2008.

Enclosed for your information is a copy of the staff report on this project.

Very truly yours,

Daniel F. Caruso
Chairman

DFC/RDM/laf

Enclosure: Staff Report dated December 4, 2008

c: The Honorable Raymond G. Baldwin, Jr., First Selectman, Town of Trumbull
Harry Eberhart, Zoning Enforcement Officer, Town of Trumbull
Karina Fournier, T-Mobile

Petition No. 872
Omnipoint Communications, Inc.
48 Quail Trail, Trumbull
December 4, 2008
Staff Report

On October 22, 2008, the Connecticut Siting Council (Council) received a petition from Omnipoint Communications, Inc. (T-Mobile) for declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed installation of wireless communications antennas on an existing Connecticut Light and Power Company (CL&P) electric transmission tower located at 48 Quail Trail in Trumbull, Connecticut. Connecticut Siting Council member Dr. Barbara Bell and Council staff member Robert Mercier conducted a field review of the proposed installation on November 5, 2008. T-Mobile representatives Ray Lemley and Neil Coon and property owner Joyce Sztuka attended the field review. Town officials, the property owners and abutting landowners were notified of the proposal.

T-Mobile seeks to place a 10-foot extension on an existing 95-foot electric transmission tower that supports a 115-kV circuit. A 10-foot United Illuminating (UI) meter reader antenna is currently located at the top of the tower. Meter reading equipment is located on a wood pole adjacent to the south side of the tower. UI's equipment installation was approved by the Council on December 14, 2000 under Petition 496.

T-Mobile would install six panel antennas on t-arm mounts at a centerline height of 105 feet. UI's whip antenna would be relocated to the top of the extension, extending to approximately 115 feet above ground level. CL&P determined the tower and foundation is structurally adequate to support the proposed installation.

T-Mobile would install three radio cabinets within a 15-foot by 15-foot equipment compound located adjacent to the southwest side of the tower, in the right-of-way (ROW). The equipment compound would be enclosed by an eight-foot high wood stockade fence. Shrub and suitable tree plantings would be placed around the fenced area. Both the fence and vegetation would provide a buffer consistent with the surrounding residential area. Furthermore, no permanent driveway is proposed. UI's equipment would remain adjacent to and outside of the enclosure.

The site is located 25 feet east of Quail Trail, a short cross street within a residential area. The site is in the backyard of Ms. Sztuka and is visible from Quail Trail. Ms. Sztuka maintains lawn and garden areas in the ROW portion of her property, so the view along the ROW is open. The nearest residence is approximately 200 feet northwest of the site at 15 Bob White Lane. Views of the compound and pole would occur during winter months from this property. The abutting residence to the south at 41 Hillston Road is 240 feet from the site. A band of deciduous trees and shrubs in the rear portion of this property provides screening. Land west of the site consists of ROW. Although the site is within a residential and improved ROW, the visibility impact of increasing the tower by 10 feet would not be significant when compared to the existing views.

Coverage from the site would fill existing gaps on Route 8 and the Merritt Parkway. The worst-case radio frequency power density level at the base of the tower would be 5.0% of the applicable ANSI standard.

Exhibit B

Property Card

48 QUAIL TRAIL

Location 48 QUAIL TRAIL

Mblu I/10 / 00148/ 000/

Acct#

Owner PEREZ IRMA A & LETXI

Assessment $213,150

Appraisal $304,500

PID 11047

Building Count 1

Fire District T

Current Value

Appraisal	
Valuation Year	**Total**
2015	$304,500

Assessment	
Valuation Year	**Total**
2015	$213,150

Owner of Record

Owner PEREZ IRMA A & LETXI
Co-Owner
Address 48 QUAIL TRAIL
TRUMBULL, CT 06611

Sale Price $330,000
Book & Page 1809/ 573
Sale Date 04/21/2020
Instrument

Ownership History

Ownership History				
Owner	**Sale Price**	**Book & Page**	**Instrument**	**Sale Date**
PEREZ IRMA A & LETXI	$330,000	1809/ 573		04/21/2020
SZTUKA JOYCE	$0	1719/ 51	10	07/08/2016
SZTUKA MAXYM & JOYCE	$0	235/ 57		09/30/1971

Building Information

Building 1 : Section 1

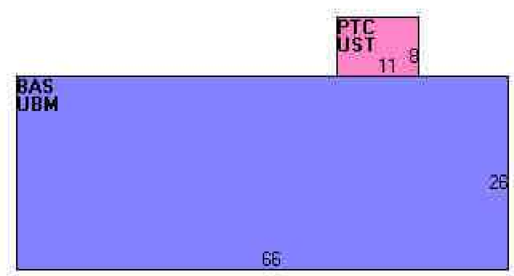
Year Built: 1971
Living Area: 1,716

Building Attributes	
Field	**Description**
Style	Ranch
Stories:	1 Story
Occupancy	1
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure:	Gable
Roof Cover	Asph/F Gls
Interior Wall 1	Drywall
Interior Wall 2	
Floor Covering	Hardwood
Alt. Floor Cover	Carpet
Heat Fuel	Gas
Heat Type:	Hot Water
AC Type:	Central
Total Bedrooms:	3 Bedrooms
Total Bthrms:	2 Full Baths
Total Half Baths:	
Total Xtra Fixtrs:	
Total Rooms:	7 Rooms
Bath Style:	Average
Kitchen Style:	Average
Total Kitchens	1
Total Elec Meters	1

Building Photo

(http://images.vgsi.com/photos2/TrumbullCTPhotos//\00\02\63/33.JPG)

Building Layout



(http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/11047_1104

Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	1,716	1,716
PTC	Concrete Patio	88	0
UBM	Unfinished Basement	1,716	0
UST	Utility Storage	88	0
		3,608	1,716

Extra Features

Extra Features			Legend
Code	**Description**	**Size**	**Bldg #**
FPL	Fireplace	1 Units	1
FBM	Finished Bsmt	1100 S.F.	1
BGR	Bsmt Garage	2 Units	1

Land

Land

Land Use

Use Code	101
Description	Single Family Res
Zone	AA
Neighborhood	625
Alt Land Appr	No
Category	

Land Line Valuation

Size (Acres)	1.01
Frontage	
Depth	

Outbuildings

Outbuildings	Legend
No Data for Outbuildings	

Valuation History

Appraisal	
Valuation Year	**Total**
2019	$304,500
2018	$304,500
2017	$304,500

Assessment	
Valuation Year	**Total**
2019	$213,150
2018	$213,150
2017	$213,150

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Town of Trumbull

Map Title

Legend

Streetname

Roadways

- Local
- Collector
- Minor Collector
- Minor Arterial
- Major Collector
- PA Other
- PA Other Expwy
- PA Interstate

Citations

200.0 0 100.00 200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Created by Greater Bridgeport Regional Council

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

METROCOG
Connecticut Metropolitan Council of Governments

Exhibit C

Construction Drawings

T-Mobile

SITE NAME: CT860/CL&P TRUMBULL
SITE ID: CT11860A
48 QUAIL TRAIL
TRUMBULL, CT 06611

T-MOBILE A&L TEMPLATE (PROVIDED BY RFDS)
67D93D4_1QP+2HP

T-MOBILE RAN TEMPLATE (PROVIDED BY RFDS)
67D93D4 HYBRID

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL, AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION OF NEW DRAWINGS TO SUBCONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. THE CONTRACTOR SHALL FURNISH AN 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
7. LOCATION OF EQUIPMENT AND WORK SUPPLIED BY OTHERS THAT IS DIAGRAMMATICALLY INDICATED ON THE DRAWINGS, SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL DETERMINE LOCATIONS AND DIMENSIONS SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF THE SUBCONTRACTORS.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.
9. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
10. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
11. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTOR FOR ANY CONDITION PER MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
12. ANY AND ALL ERRORS, DISCREPANCIES, AND 'MISSED' ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE T-MOBILE CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO 'EXTRA' WILL BE ALLOWED FOR MISSED ITEMS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
15. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
16. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUITS AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
17. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
18. THE CONTRACTOR SHALL CONTACT 'CALL BEFORE YOU DIG' AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1-800-922-4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
19. CONTRACTOR SHALL COMPLY WITH THE OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

SITE DIRECTIONS

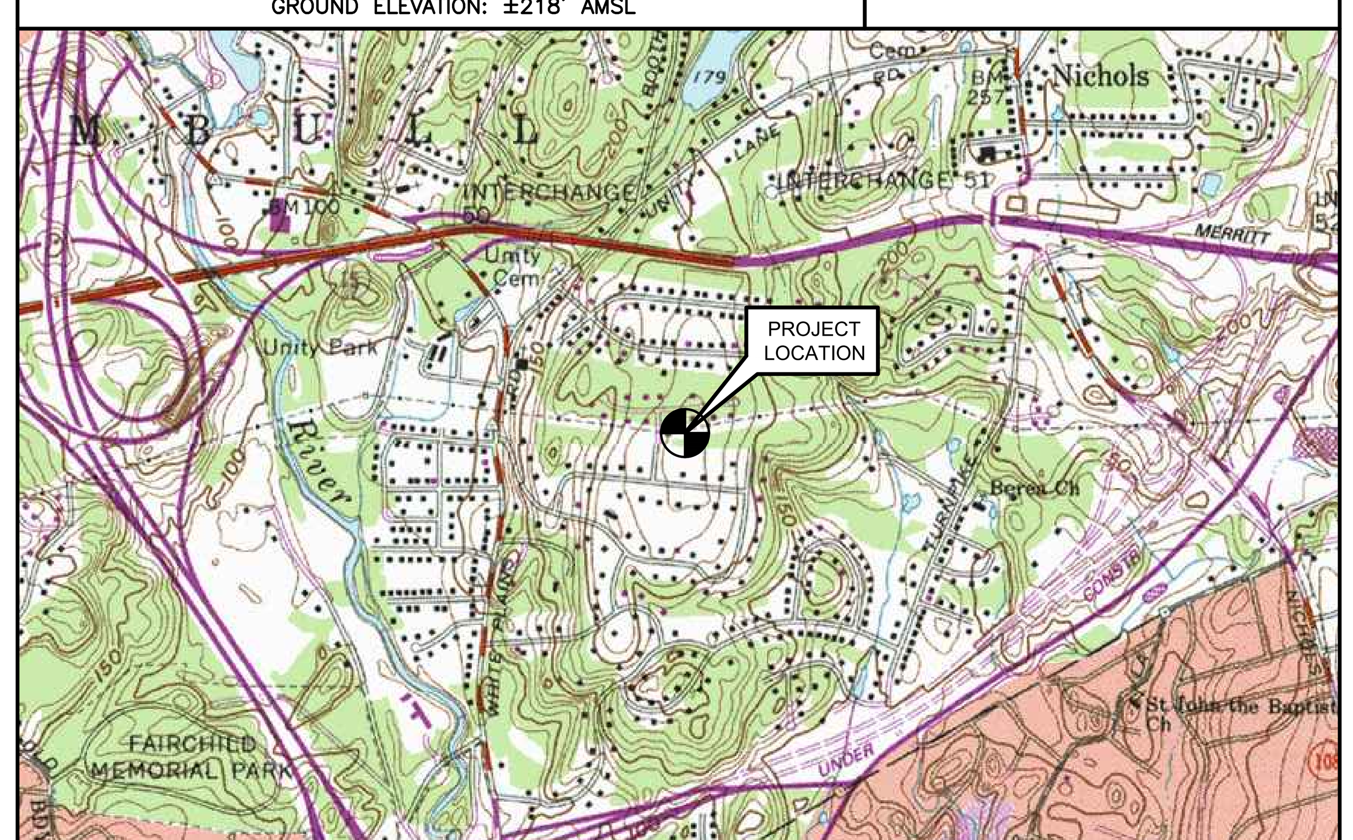
FROM: 35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

TO: 48 QUAIL TRAIL
TRUMBULL, CT 06611

1.	HEAD SOUTH ON GRIFFIN RD, AND TURN RIGHT TOWARD CURTIS RD.	0.10 MI.
2.	TURN LEFT ONTO N HARWINTON AVE.	0.10 MI.
3.	TURN RIGHT ONTO MINOR RD.	2.30 MI.
4.	TURN LEFT ONTO CT-222 S.	0.30 MI.
5.	TURN LEFT ONTO E MAIN ST.	0.30 MI.
6.	TURN RIGHT TO MERGE ONTO CT-8/US-6 W TOWARD WATERBURY.	33.20 MI.
7.	MERGE AND CONTINUE ONTO CT-8S.	1.50 MI.
8.	TAKE EXIT 10 TO MERGE ONTO CT-15 S/ MERRIT PKWY.	0.20 MI.
9.	TAKE EXIT 50 FOR CT127 S TOWARD TRUMBULL.	0.20 MI.
10.	TURN LEFT ONTO CT-127 S/WHITE PLAINS RD.	0.10 MI.
11.	TURN LEFT ONTO UNITY RD.	0.10 MI.
12.	TURN RIGHT ONTO LEFFERT RD.	0.30 MI.
13.	TURN RIGHT ON TO FOSTER AVE.	0.10 MI.
14.	CONTINUE ONTO QUAIL TRAIL, DESTINATION WILL BE ON THE RIGHT.	0.20 MI.

SITE COORDINATES: LATITUDE: 41° 13' 57.66" N
LONGITUDE: 73° 10' 20.13" W
GROUND ELEVATION: ±218' AMSL

COORDINATES AND GROUND ELEVATION ARE REFERENCED FROM GOOGLE EARTH



VICINITY MAP

PROJECT SUMMARY

THE PROPOSED SCOPE OF WORK CONSISTS OF A MODIFICATION TO THE EXISTING UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:

1. REMOVE (3) EXISTING ANDREW - SBNHH-1D65A-SR ANTENNAS
2. REMOVE ALL EXISTING TMA'S
3. REMOVE (3) EXISTING RADIOS AT CABINETS
4. REMOVE EXISTING BIAS-TEES
5. REMOVE ALL EXISTING UNISTRUTS FROM EXISTING EQUIPMENT FRAME
6. INSTALL (6) PROPOSED UNISTRUTS ON THE EXISTING EQUIPMENT FRAME
7. INSTALL (3) RFS - APXVARR18_43-C-NA20 ANTENNAS
8. INSTALL & MOUNT (3) 4415 B25, (3) 4415 B66A, & (3) 4449 B71+B85 RADIOS TO PROPOSED UNISTRUTS ON AN EXISTING EQUIPMENT FRAME LOCATED AT CABINETS
9. INSTALL & MOUNT (3) MICRODATA - AWS/PCS (8:4) DIPLEXER MI-54131 TO PROPOSED UNISTRUTS

PROJECT INFORMATION

SITE NAME:	CT860/CL&P TRUMBULL
SITE ID:	CT11860
SITE ADDRESS:	48 QUAIL TRAIL TRUMBULL, CT 06611
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	DEREK WAITE (PROJECT MANAGER) NORTHEAST SITE SOLUTIONS (231) 409-5439
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405 CARLO F. CENTORE, PE (203) 488-0580 EXT. 122
PROJECT COORDINATES:	LATITUDE: 41° 13' 57.66" N LONGITUDE: 73° 10' 20.13" W GROUND ELEVATION: ±218' AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	1
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C-1	SITE LOCATION PLAN	1
C-2	PARTIAL COMPOUND PLANS	1
C-3	EVERSOURCE STRUCTURE ELEVATION	1
C-4	TYPICAL EQUIPMENT DETAILS	1
E-1	TYPICAL ELECTRICAL DETAILS	1
E-2	ELECTRICAL SPECIFICATIONS	1

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	02/07/22	RTS	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
1	02/24/22	RTS	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

T-Mobile

NSS NORTHEAST SITE SOLUTIONS

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

T-MOBILE NORTHEAST LLC

SITE NAME: CT860/CL&P TRUMBULL
SITE ID: CT11860A
48 QUAIL TRAIL
TRUMBULL, CT 06611

DATE:	06/18/21
SCALE:	AS NOTED
JOB NO.	21051.02

TITLE SHEET

T-1

Sheet No. 1 of 8

NOTES AND SPECIFICATIONS

DESIGN BASIS:

GOVERNING CODE: 2015 INTERNATIONAL BUILDING (IBC) AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE.

1. DESIGN CRITERIA:

- RISK CATEGORY II (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED (OTHER STRUCTURE): 119 MPH (Vasd) (EXPOSURE B/ IMPORTANCE FACTOR 1.0 BASED ON ASCE 7–10).

SITE NOTES

1. THE CONTRACTOR SHALL CALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
4. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
5. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA–222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD–OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION OF NEW DRAWINGS TO SUBCONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. THE CONTRACTOR SHALL FURNISH AN 'AS–BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
7. LOCATION OF EQUIPMENT AND WORK SUPPLIED BY OTHERS THAT IS DIAGRAMMATICALLY INDICATED ON THE DRAWINGS, SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL DETERMINE LOCATIONS AND DIMENSIONS SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF THE SUBCONTRACTORS.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND IT'S COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.
9. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
10. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
11. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MFR.'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
12. ANY AND ALL ERRORS, DISCREPANCIES, AND "MISSED" ITEMS, ARE TO BE BROUGHT TO THE ATTENTION OF THE SITE OWNER'S CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO 'EXTRA' WILL BE ALLOWED FOR MISSED ITEMS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON–SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
15. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
16. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUIT AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
17. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
18. THE CONTRACTOR SHALL CONTACT 'CALL BEFORE YOU DIG' AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1–800–922–4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
18. CONTRACTOR SHALL COMPLY WITH OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.
19. THE COUNTY/CITY/TOWN WILL MAKE PERIODIC FIELD OBSERVATION AND INSPECTIONS TO MONITOR THE INSTALLATION, MATERIALS, WORKMANSHIP AND EQUIPMENT INCORPORATED INTO THE PROJECT TO ENSURE COMPLIANCE WITH THE DESIGN PLANS, SPECIFICATIONS, CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS.
20. THE COUNTY/CITY/TOWN MUST BE NOTIFIED (2) WORKING DAYS PRIOR TO CONCEALMENT/BURIAL OF ANY SYSTEM OR MATERIAL THAT WILL PREVENT THE DIRECT INSPECTION OF MATERIALS, METHODS OR WORKMANSHIP. EXAMPLES OF THESE PROCESSES ARE BACKFILLING A GROUND RING OR TOWER FOUNDATION, POURING TOWER FOUNDATIONS, BURYING GROUND RODS, PLATES OR GRIDS, ETC. THE CONTRACTOR MAY PROCEED WITH THE SCHEDULED PROCESS (2) WORKING DAYS AFTER PROVIDING NOTICE UNLESS NOTIFIED OTHERWISE BY THE COUNTY/CITY/TOWN.

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GENERAL NOTES AND SPECIFICATIONS

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NOTE:
ALL COAX LENGTHS TO BE MEASURED AND VERIFIED IN FIELD BEFORE ORDERING

ANTENNA SCHEDULE

SECTOR	EXISTING/PROPOSED	ANTENNA	SIZE (INCHES) (L x W x D)	ANTENNA ℄ HEIGHT	AZIMUTH	(E/P) RRU (QTY)	(E/P) TMA/DIPLEXER (QTY)	(QTY) PROPOSED COAX
A1	PROPOSED	RFS (APXVARR18_43-C-NA20)	72 x 19.7 x 8.5	105'	50°	(P) RADIO 4449 B71+B85 (AT CABINET) (1), (P) RADIO 4415 B25 (AT CABINET) (1)	(P) MICRODATA – DIPLEXER MI-S4131 (AT CABINET) (1)	
						(P) RADIO 4415 B66A (AT CABINET) (1)		
B1	PROPOSED	RFS (APXVARR18_43-C-NA20)	72 x 19.7 x 8.5	105'	170°	(P) RADIO 4449 B71+B85 (AT CABINET) (1), (P) RADIO 4415 B25 (AT CABINET) (1)	(P) MICRODATA – DIPLEXER MI-S4131 (AT CABINET) (1)	
						(P) RADIO 4415 B66A (AT CABINET) (1)		
C1	PROPOSED	RFS (APXVARR18_43-C-NA20)	72 x 19.7 x 8.5	105'	300°	(P) RADIO 4449 B71+B85 (AT CABINET) (1), (P) RADIO 4415 B25 (AT CABINET) (1)	(P) MICRODATA – DIPLEXER MI-S4131 (AT CABINET) (1)	
						(P) RADIO 4415 B66A (AT CABINET) (1)		

1 / C-1 **SITE LOCATION PLAN**
SCALE: NOT TO SCALE
TRUE NORTH

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SITE LOCATION PLAN

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STRUCTURAL COMPLIANCE

ANTENNA MOUNTS

A STRUCTURAL ANALYSIS OF THE ANTENNA MOUNTS WAS PERFORMED FOR THE PROPOSED EQUIPMENT INSTALLATION AND THEY WERE FOUND TO BE STRUCTURALLY SUFFICIENT TO ACCOMMODATE THE PROPOSED LOADING..

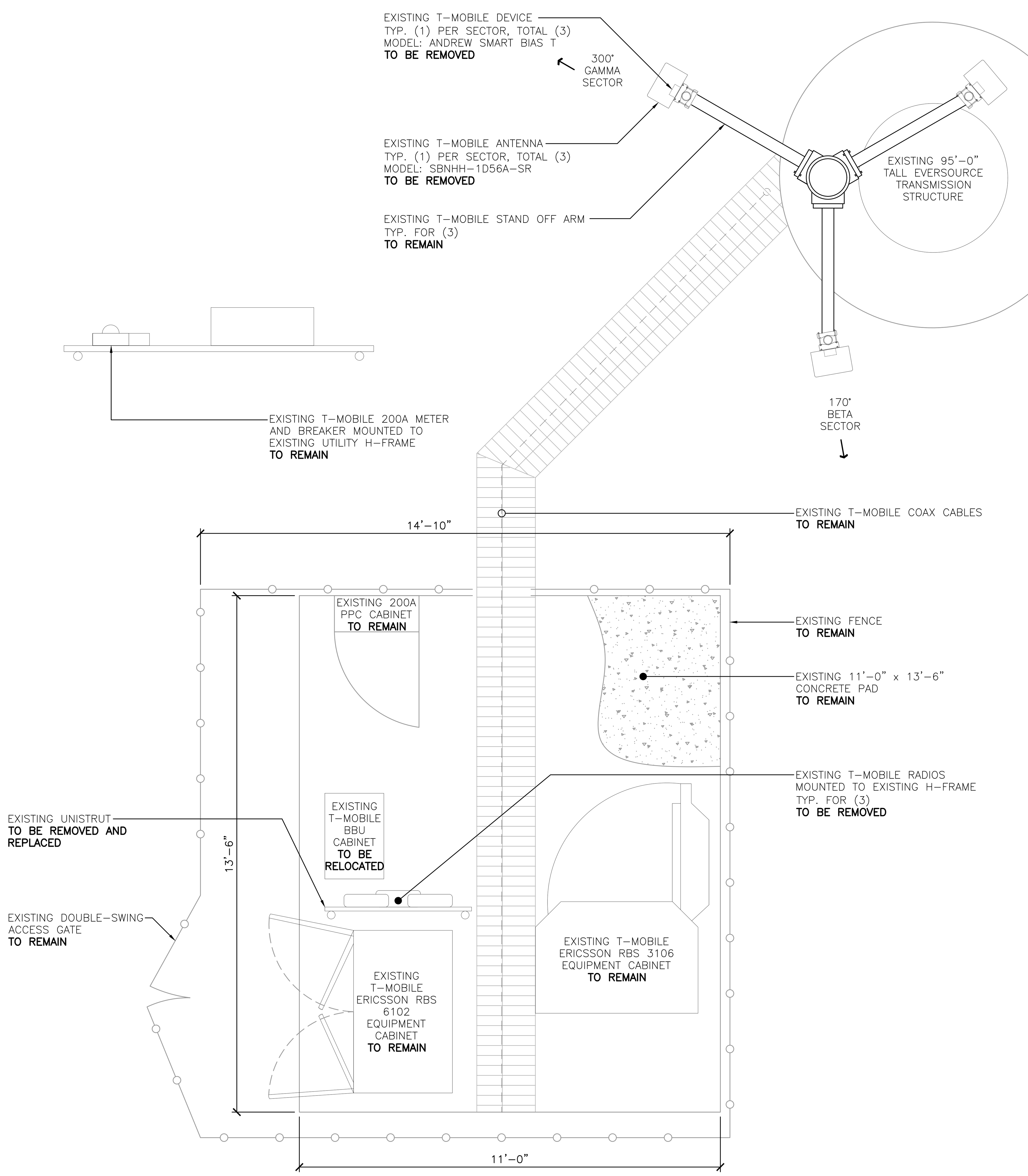
REFER TO THE ANTENNA MOUNT ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 21051.02) DATED 01/10/22 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TOWER AND TOWER FOUNDATION

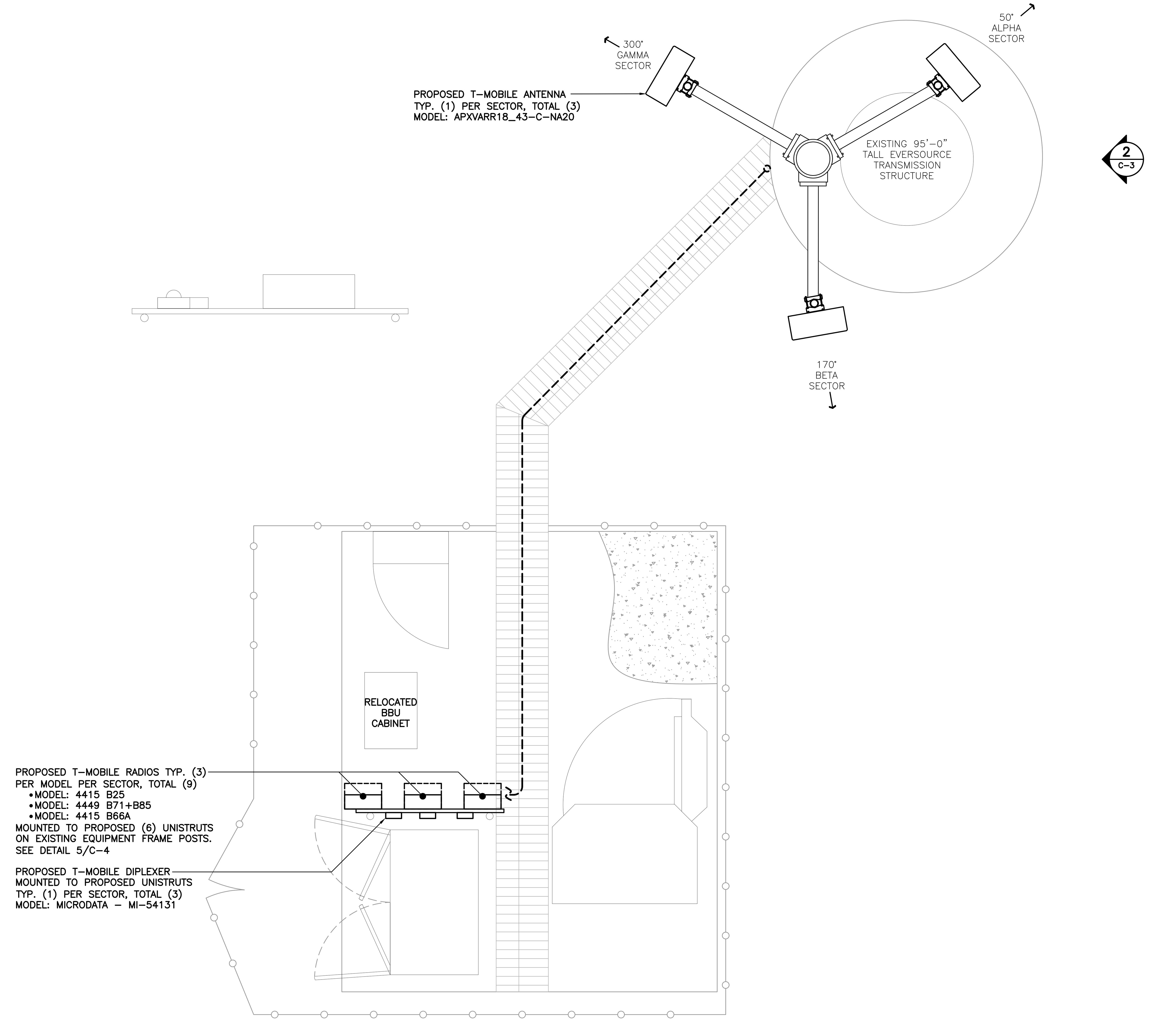
A STRUCTURAL ANALYSIS OF THE TOWER AND TOWER FOUNDATION WAS PERFORMED FOR THE PROPOSED EQUIPMENT INSTALLATION AND THEY WERE FOUND TO BE STRUCTURALLY SUFFICIENT TO ACCOMMODATE THE PROPOSED LOADING.

REFER TO THE STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 21051.02) DATED 01/11/22 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

NOTE: NO EQUIPMENT SHALL BE INSTALLED ON THE HOSTING STRUCTURE WITHOUT A PASSING STRUCTURAL ANALYSIS REPORT AND CONTRACTOR PRIOR CONFIRMATION THAT ANY AND ALL REQUISITE MODIFICATIONS HAVE BEEN COMPLETED.



1 C-2 EXISTING COMPOUND PLAN
SCALE: 1/2" = 1'
TRUE NORTH



2 C-2 PROPOSED COMPOUND PLAN
SCALE: 1/2" = 1'
TRUE NORTH

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PARTIAL COMPOUND PLANS

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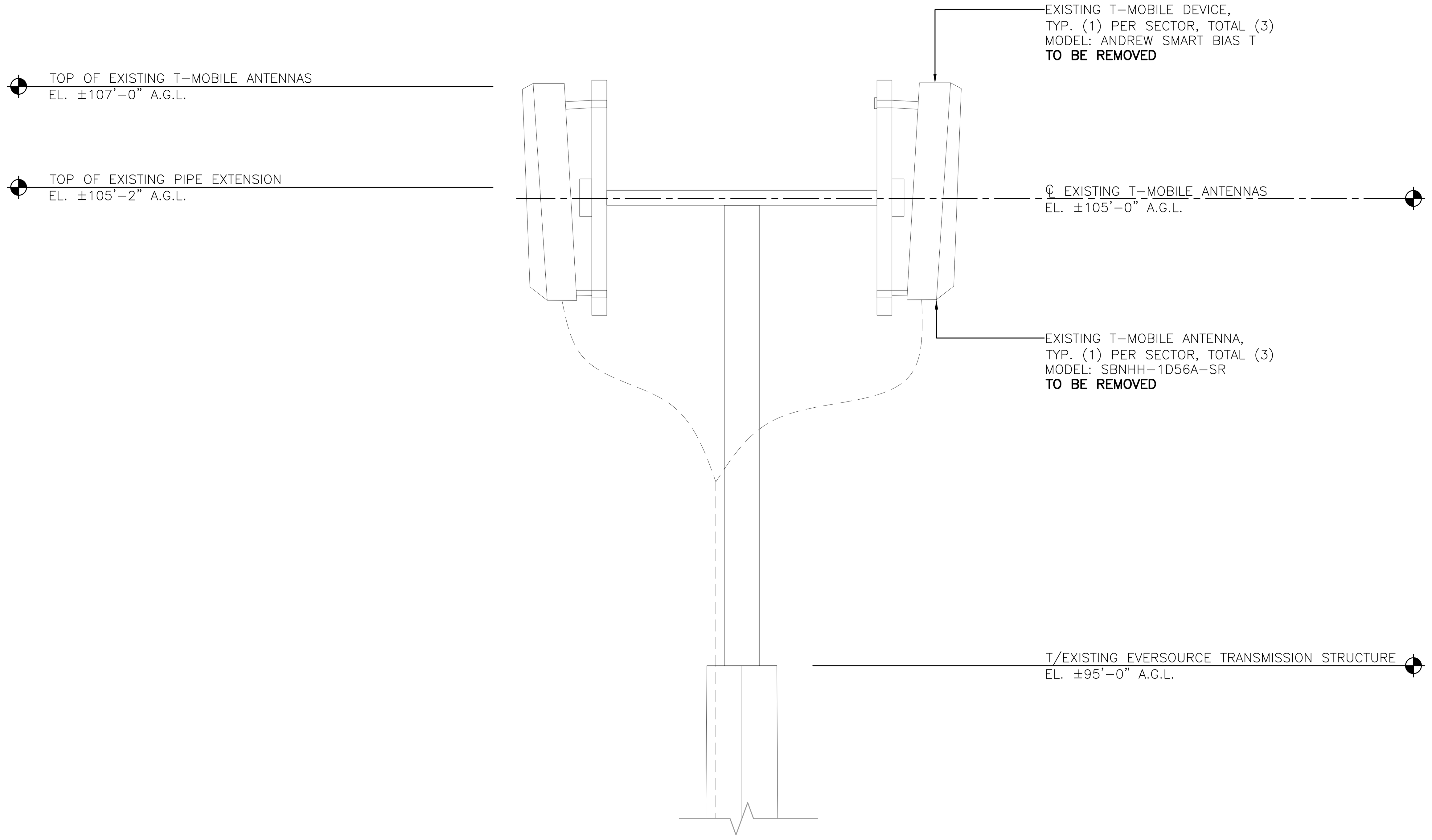
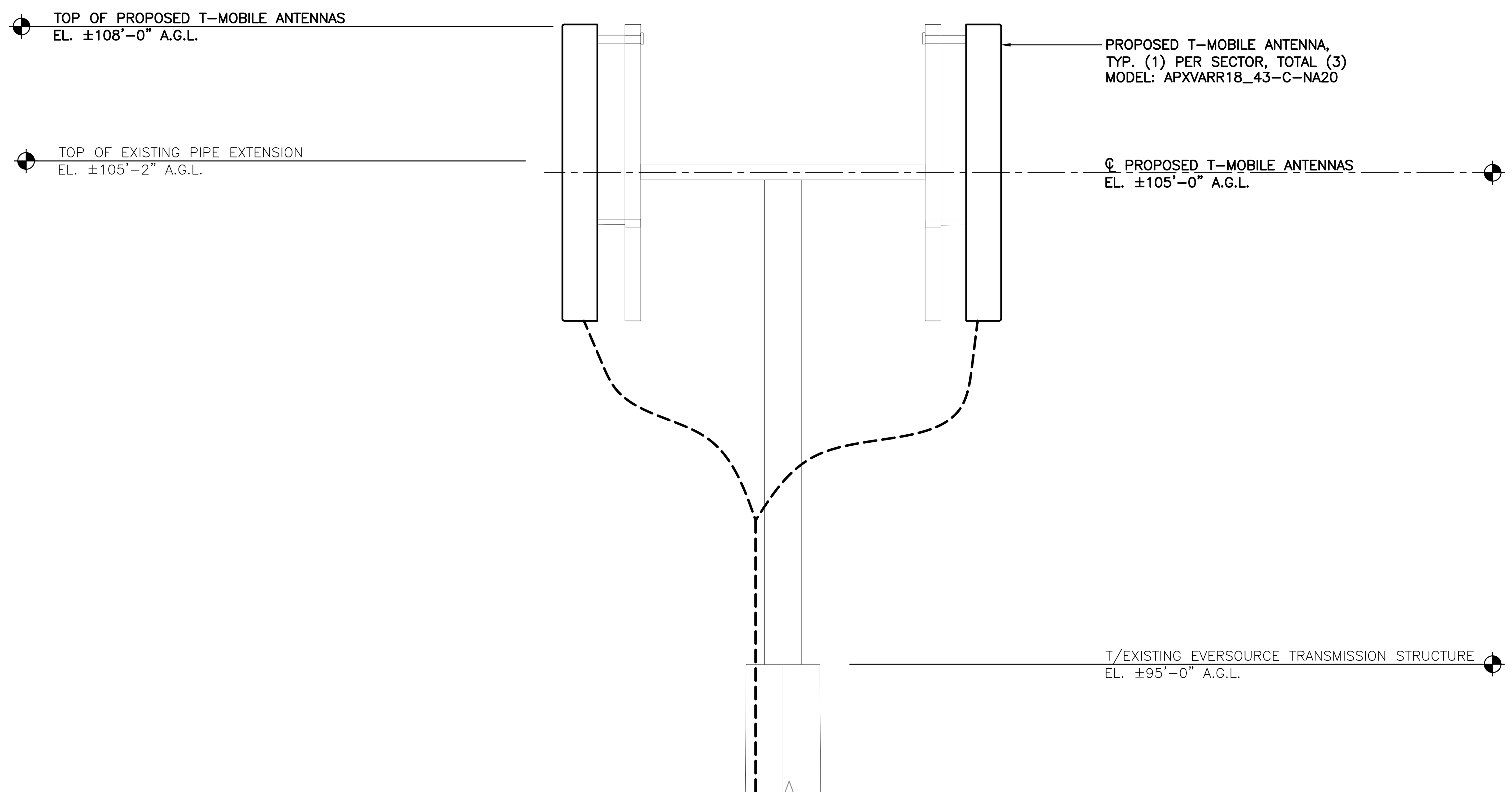
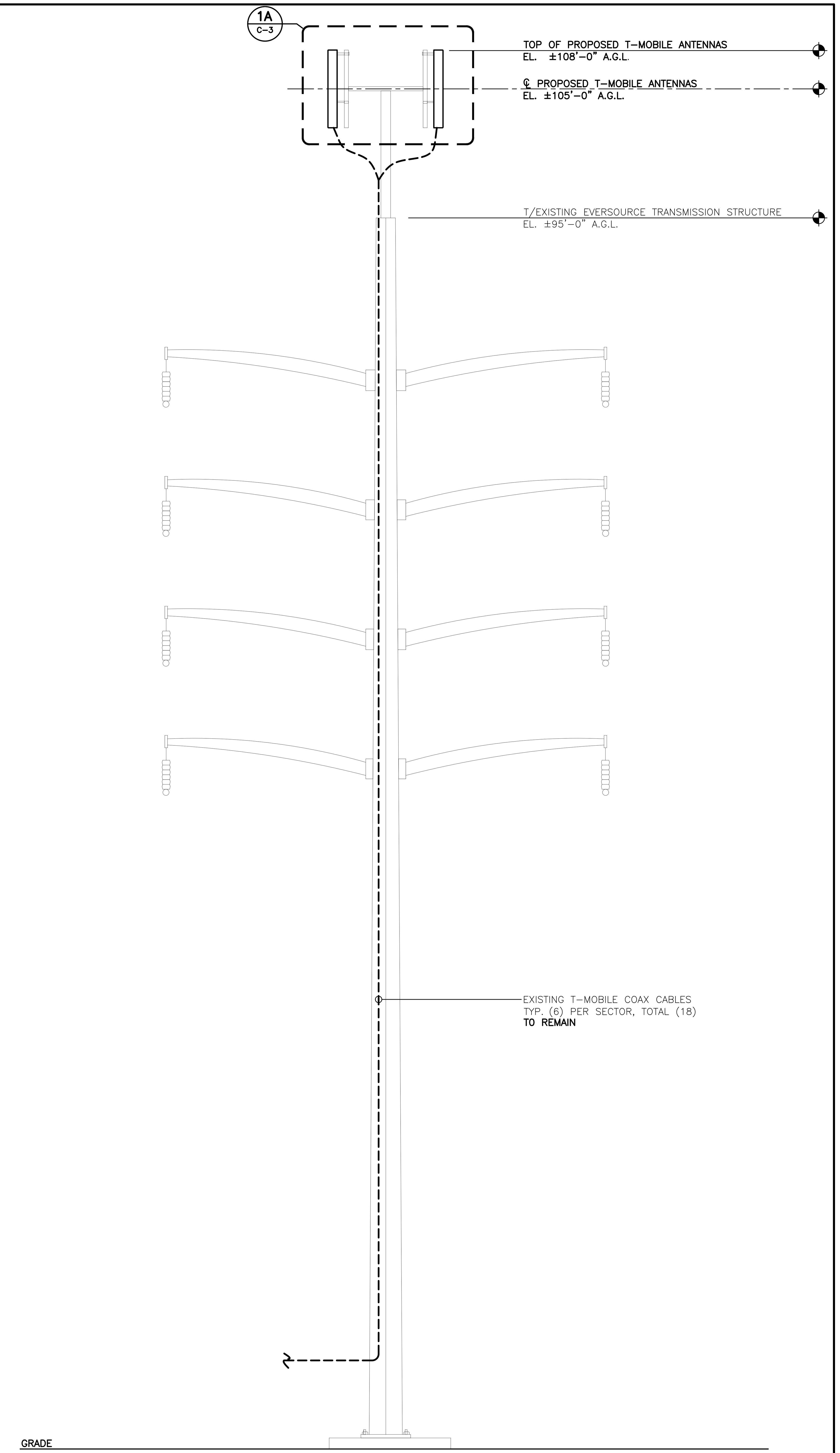


1 C-3 **ANTENNA ELEVATION - EXISTING**
SCALE: 3/16" = 1'



1A C-3 **ANTENNA ELEVATION - PROPOSED**
SCALE: 3/16" = 1'



2 C-3 **EVERSOURCE STRUCTURE ELEVATION - PROPOSED**
SCALE: 3/16" = 1'

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EVERSOURCE STRUCTURE ELEVATION

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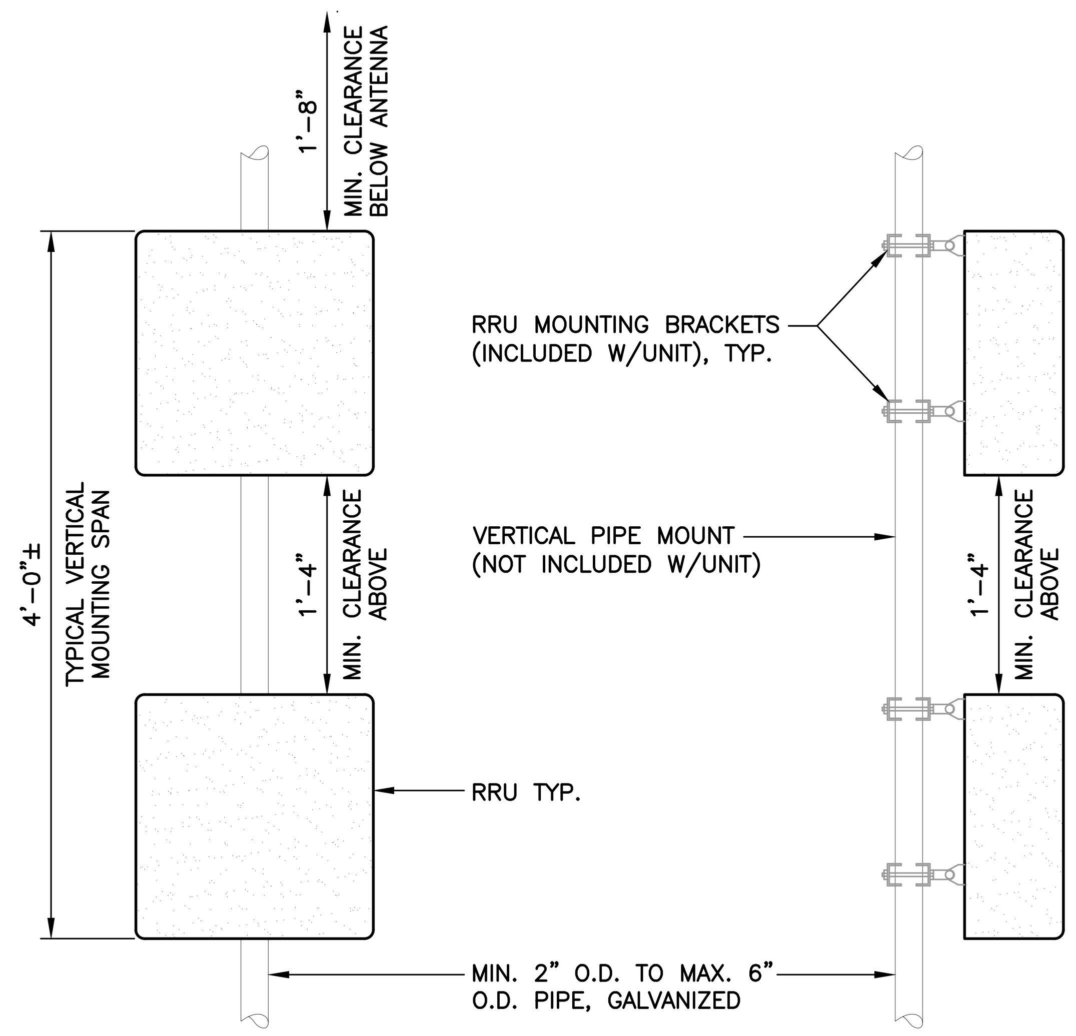
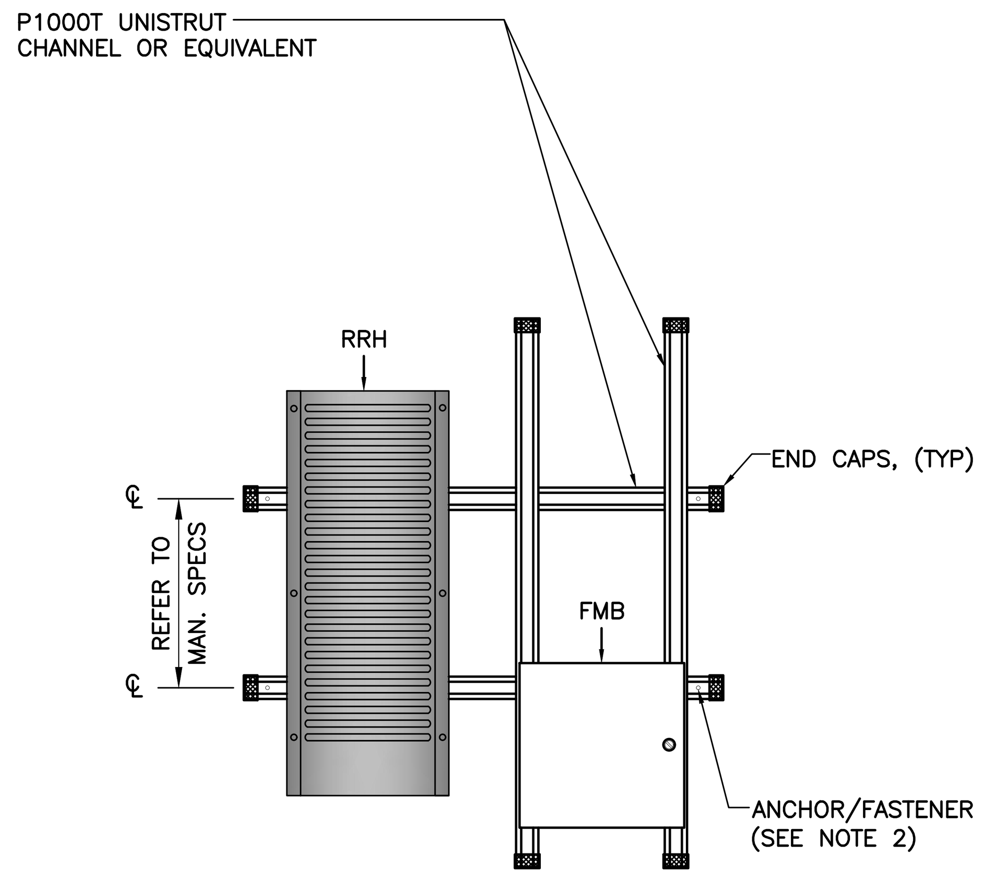


FRONT ELEVATION

SIDE ELEVATION



FRONT ELEVATION

NOTES: (POLE MOUNTING)

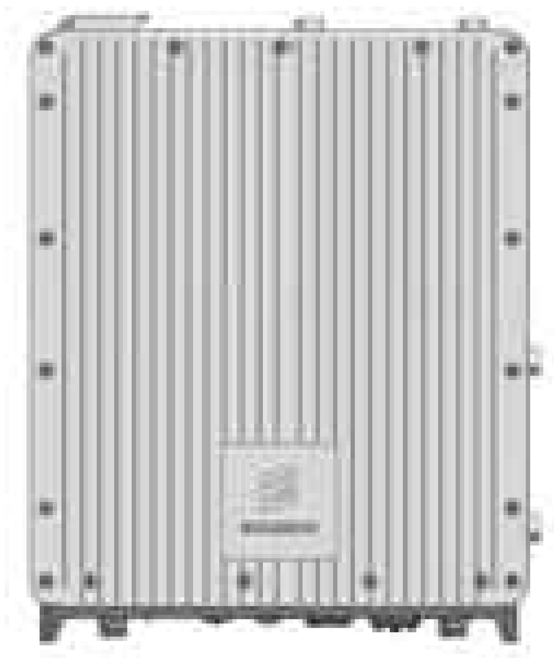
1. T–MOBILE SHALL SUPPLY RRU, AND RRU POLE–MOUNTING BRACKET. CONTRACTOR SHALL SUPPLY POLE/PIPE AND INSTALL ALL MOUNTING HARDWARE INCLUDING ERICSSON RRU POLE–MOUNTING BRACKET.
2. NO PAINTING OF THE RRU OR SOLAR SHIELD IS ALLOWED.

NOTES: (UNISTRUT MOUNTING)

1. INSTALL A MINIMUM OF (2) ANCHORS PER UNISTRUT (± 16"o/c MIN).
2. MOUNT RRU TO UNISTRUT WITH 3/8"ø UNISTRUT BOLTING HARDWARE AND SPRING NUTS. TYPICAL FOUR PER BRACKET.
3. NO PAINTING OF THE RRU OR SOLAR SHIELD IS ALLOWED.

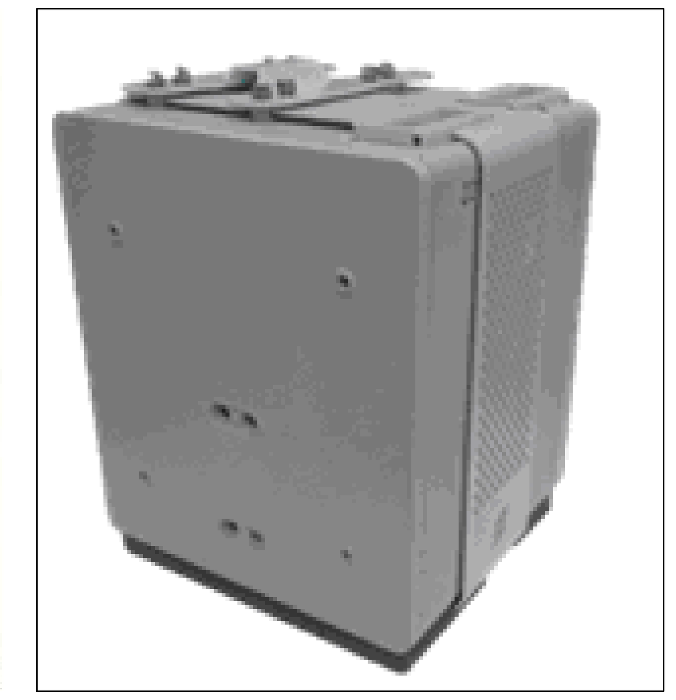
1 (C-4) TYPICAL RRU MOUNTING DETAILS

SCALE: NOT TO SCALE



RADIO 4415 B25

RADIO 4449 B71+B85



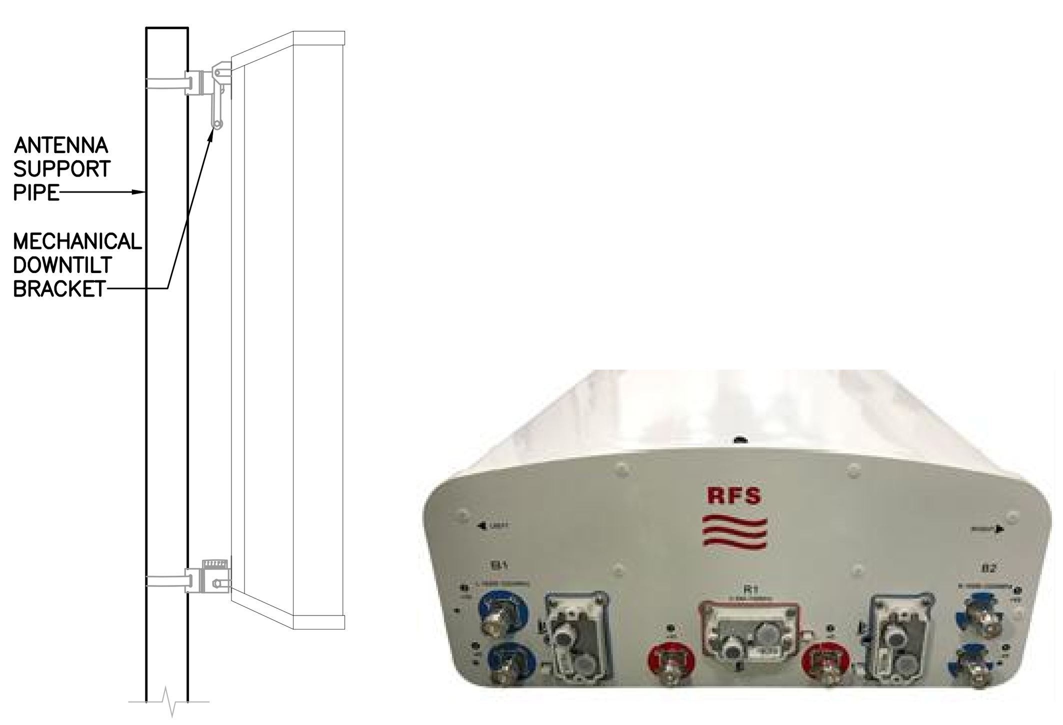
RADIO 4415 B66A

RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RADIO 4415 B25	16.5"L x 13.4"W x 5.9"D	±46 LBS.	BEHIND ANT.: 8" MIN. BELOW ANT.: 20" MIN. BELOW RRU: 16" MIN.
MAKE: ERICSSON MODEL: RADIO 4449 B71+B85	14.9"L x 13.2"W x 5.4"D	±74 LBS.	BEHIND ANT.: 8" MIN. BELOW ANT.: 20" MIN. BELOW RRU: 16" MIN.
MAKE: ERICSSON MODEL: RADIO 4415 B66A	16.5"L x 13.5"W x 9.6"D	±86 LBS.	BEHIND ANT.: 8" MIN. BELOW ANT.: 20" MIN. BELOW RRU: 16" MIN.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.

2 (C-4) PROPOSED RRU DETAIL

SCALE: NOT TO SCALE



APXVARR18_43-C-NA20

ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: RFS MODEL: APXVARR18_43–C–NA20	72"L x 19.7"W x 8.5"D	±74 LBS.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.

3 (C-4) PROPOSED ANTENNA DETAIL

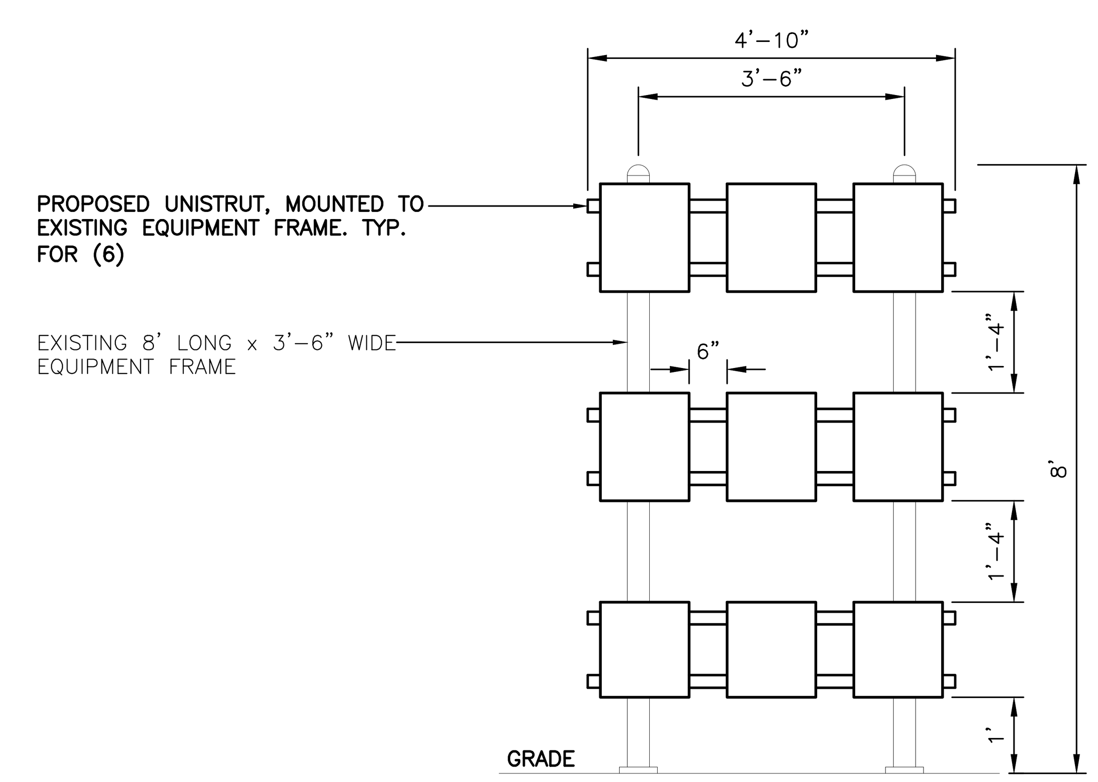
SCALE: NOT TO SCALE

DIPLEXER		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: MICRODATA MODEL: AWS/PCS (8:4) DIPLEXER MI–54131	4.2"L x 7.0"W x 3.0"D	–

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.

4 (C-4) PROPOSED DIPLEXER DETAIL

SCALE: NOT TO SCALE



5 (C-4) PROPOSED UNISTRUT AND RADIO MOUNTING DETAIL

SCALE: NOT TO SCALE

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TYPICAL EQUIPMENT DETAILS

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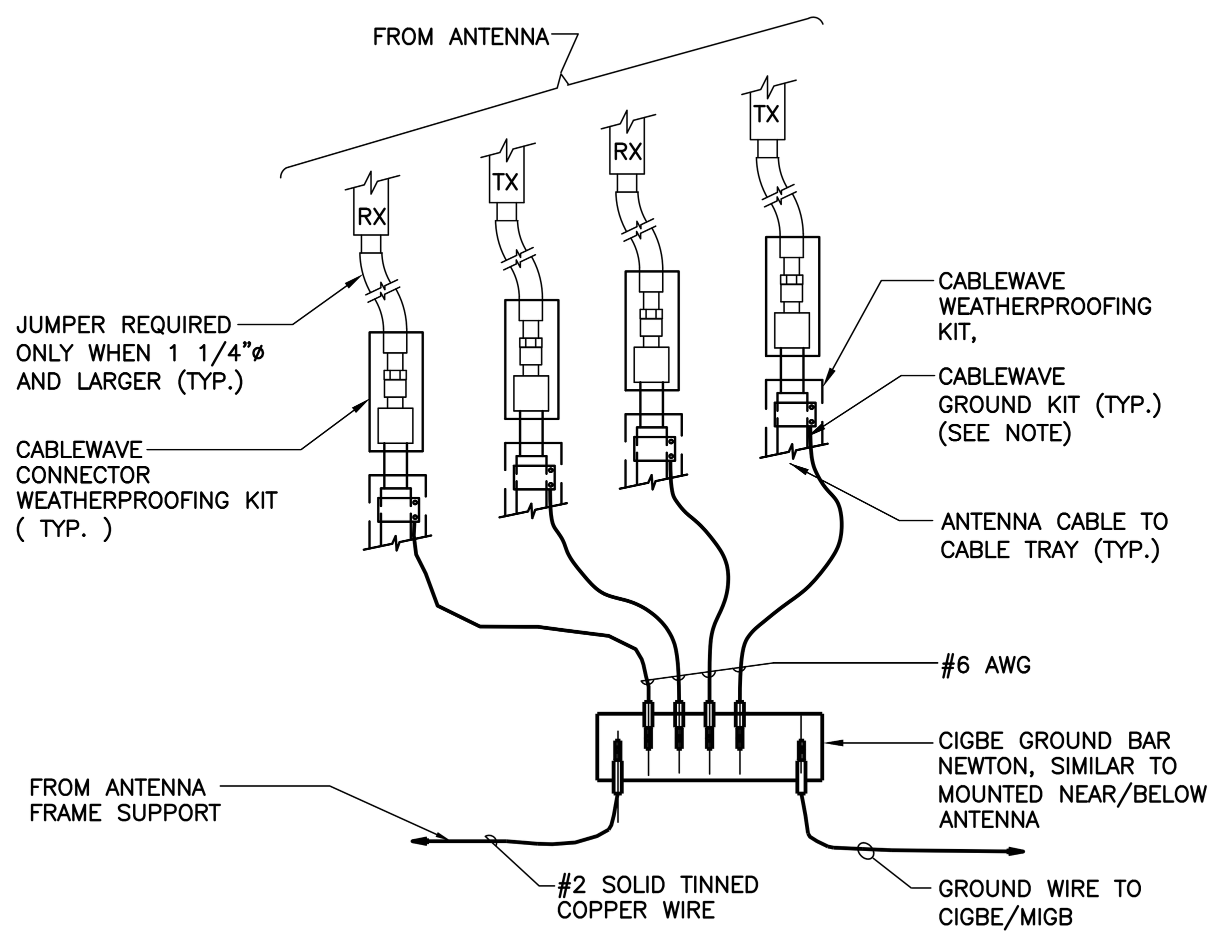
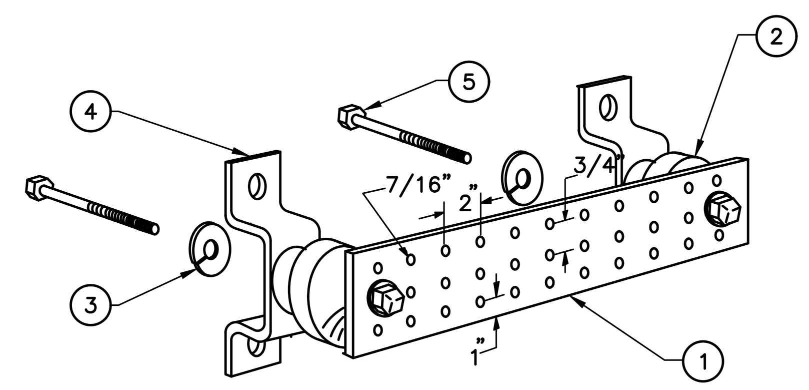


NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO CIGBE

1 (E-1) CONNECTION OF GROUND WIRES TO GROUND BAR

SCALE: NOT TO SCALE

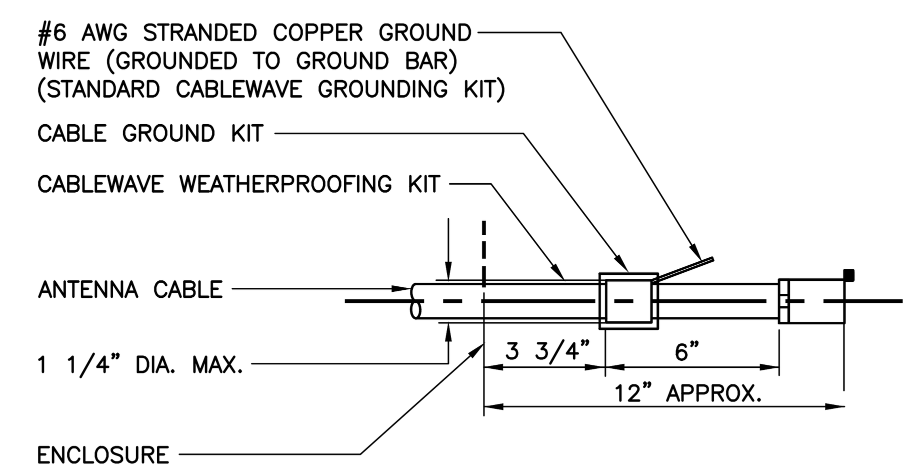


NOTES

1. TINNED COPPER GROUND BAR, 1/4" x 4" x 20", NEWTON INSTRUMENT CO. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
2. INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4.
3. 5/8" LOCK WASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8.
4. WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT NO. A-6056.
5. 5/8-11 x 1" STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS.

2 (E-1) GROUND BAR DETAIL

SCALE: NOT TO SCALE

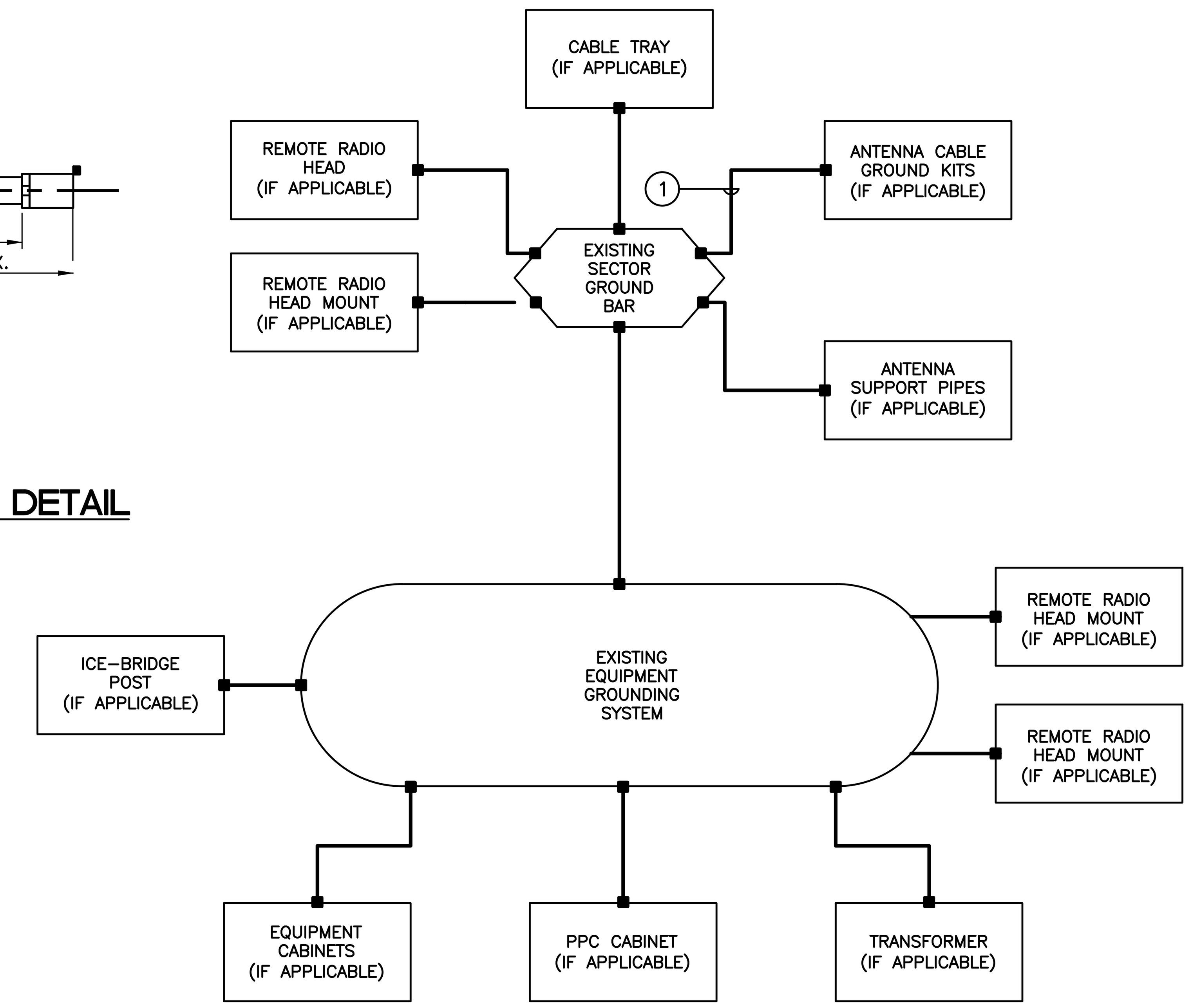


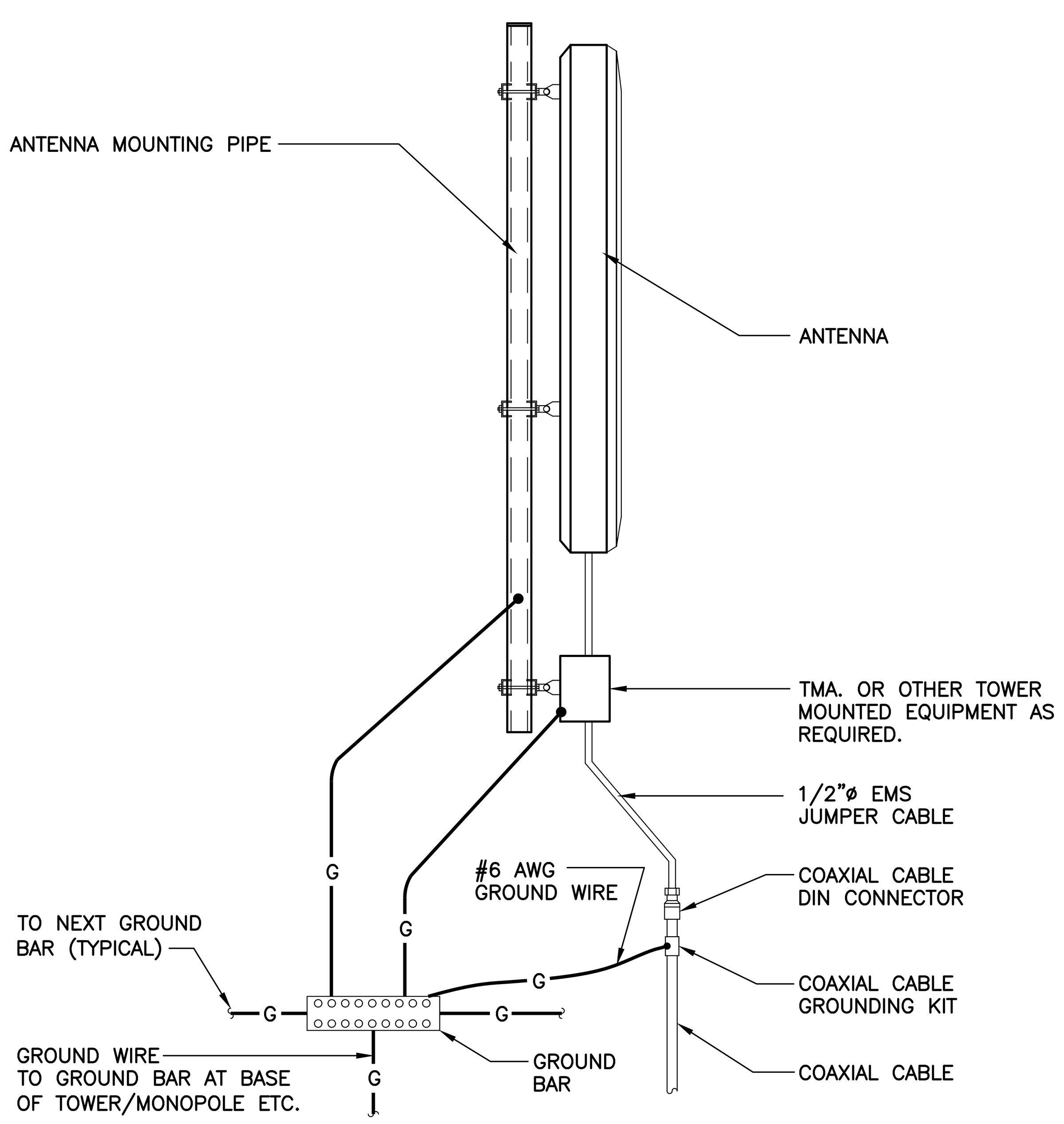
NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.

3 (E-1) ANTENNA CABLE GROUNDING DETAIL

SCALE: NOT TO SCALE

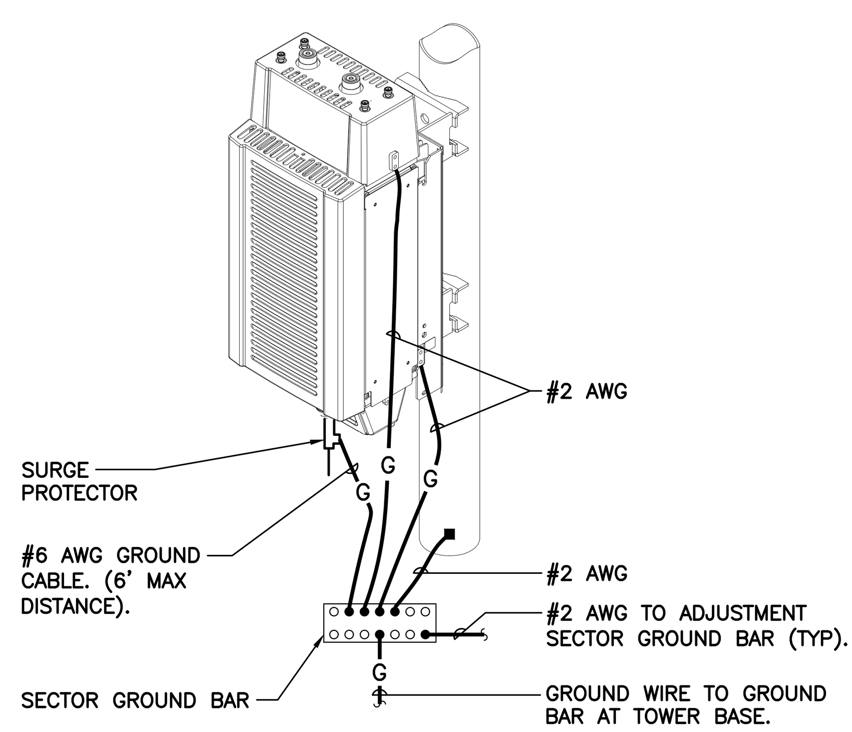




4 (E-1) TYPICAL ANTENNA GROUNDING DETAIL

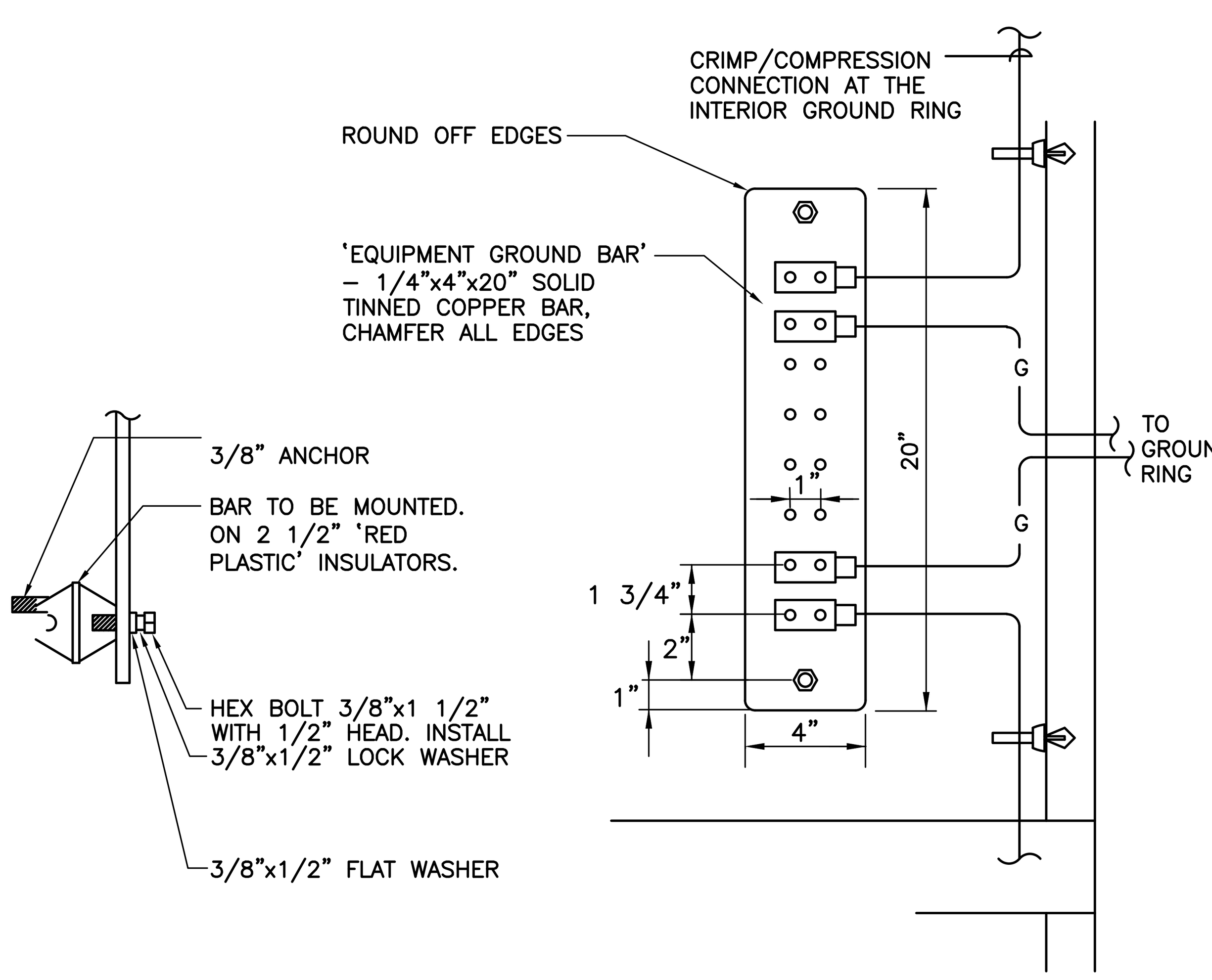
SCALE: NOT TO SCALE

EACH RRH CABINET SHALL BE GROUNDED IN THE FOLLOWING MANNER:
1. AT TOP OF THE CABINET
2. AT RIGHT SIDE OF THE CABINET.



5 (E-1) RRH POLE MOUNT GROUNDING

SCALE: NOT TO SCALE



6 (E-1) EQUIPMENT GROUND BAR DETAIL

SCALE: NOT TO SCALE

GROUNDING SCHEMATIC NOTES

(1) #6 AWG

GENERAL NOTES:

1. ALL SURGE SUPPRESSION EQUIPMENT SHALL BE BONDED TO GROUND PER MANUFACTURER'S SPECIFICATIONS
2. UNLESS OTHERWISE NOTED OR REQUIRED BY CODE, GROUND CONDUCTORS SHOWN SHALL BE #2 AWG (SOLID TINNED BCW - EXTERIOR; STRANDED GREEN INSULATED - INTERIOR).
3. BOND CABLE TRAY SECTIONS TOGETHER WITH #6 AWG STRANDED GREEN INSULATED JUMPERS.
4. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW.
5. BOND ALL EQUIPMENT CABINETS AND BATTERY CABINETS TO GROUND PER MANUFACTURER'S SPECIFICATIONS.
6. REFER TO ALL ELECTRICAL AND GROUNDING DETAILS.
7. COORDINATE ALL ROOF MOUNTED EQUIPMENT WITH OWNER.
8. ALL ROOF MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
9. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.

7 (E-1) ELECTRICAL SCHEMATIC DIAGRAM

SCALE: NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

E-1

Sheet No. 7 of 8

ELECTRICAL SPECIFICATIONS

1.00. GENERAL REQUIREMENTS

A. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE MADE IN STRICT ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND REGULATIONS WHICH MAY APPLY AND NOTHING IN THE DRAWINGS OR SPECIFICATIONS SHALL BE INTERPRETED AS AN INFRINGEMENT OF SUCH CODES OR REGULATIONS.

B. THE ELECTRICAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE COMPLETE INSTALLATION AND COORDINATION OF THE ENTIRE ELECTRICAL SERVICE. ALL ACTIVITIES TO BE COORDINATED THROUGH OWNERS REPRESENTATIVE, DESIGN ENGINEER AND OTHER AUTHORITIES HAVING JURISDICTION OF TRADES.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND PAY ALL FEES THAT MAY BE REQUIRED FOR THE ELECTRICAL WORK AND FOR THE SCHEDULING OF ALL INSPECTIONS THAT MAY BE REQUIRED BY THE LOCAL AUTHORITY.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE BUILDING OWNER FOR NEW AND/OR DEMOLITION WORK INVOLVED.

E. NO MATERIAL OTHER THAN THAT CONTAINED IN THE "LATEST LIST OF ELECTRICAL FITTINGS" APPROVED BY THE UNDERWRITERS' LABORATORIES, SHALL BE USED IN ANY PART OF THE WORK. ALL MATERIAL FOR WHICH LABEL SERVICE HAS BEEN ESTABLISHED SHALL BEAR THE U.L. LABEL.

F. THE CONTRACTOR SHALL GUARANTEE ALL NEW WORK FOR A PERIOD OF ONE YEAR FROM THE ACCEPTANCE DATE BY THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING WARRANTIES FROM ALL EQUIPMENT MANUFACTURERS FOR SUBMISSION TO THE OWNER.

G. DRAWINGS INDICATE GENERAL ARRANGEMENT OF WORK INCLUDED IN CONTRACT. CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE MODIFICATIONS TO THE LAYOUT OF THE WORK TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND FOR THE PROPER INSTALLATION OF WORK. CHECK ALL DRAWINGS AND VISIT JOB SITE TO VERIFY SPACE AND TYPE OF EXISTING CONDITIONS IN WHICH WORK WILL BE DONE, PRIOR TO SUBMITTAL OF BID.

H. THE ELECTRICAL CONTRACTOR SHALL SUPPLY THREE (3) COMPLETE SETS OF APPROVED DRAWINGS, ENGINEERING DATA SHEETS, MAINTENANCE AND OPERATING INSTRUCTION MANUALS FOR ALL SYSTEMS AND THEIR RESPECTIVE EQUIPMENT. THESE MANUALS SHALL BE INSERTED IN VINYL COVERED 3-RING BINDERS AND TURNED OVER TO OWNER'S REPRESENTATIVE ONE (1) WEEK PRIOR TO FINAL PUNCH LIST.

I. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMAN LIKE MANNER AND WILL BE SUBJECT TO THE APPROVAL OF THE OWNER'S REPRESENTATIVE.

J. ALL EQUIPMENT AND MATERIALS TO BE INSTALLED SHALL BE NEW, UNLESS OTHERWISE NOTED.

K. BEFORE FINAL PAYMENT, THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF PRINTS (AS-BUILTS), LEGIBLY MARKED IN RED PENCIL TO SHOW ALL CHANGES FROM THE ORIGINAL PLANS.

L. PROVIDE TEMPORARY POWER AND LIGHTING IN WORK AREAS AS REQUIRED.

M. SHOP DRAWINGS:

1. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF SHOP DRAWINGS ON ALL EQUIPMENT AND MATERIALS PROPOSED FOR USE ON THIS PROJECT, GIVING ALL DETAILS, WHICH INCLUDE DIMENSIONS, CAPACITIES, ETC.

2. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF ALL TEST REPORTS CALLED FOR IN THE SPECIFICATIONS AND DRAWINGS.

N. ENTIRE ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH OWNER'S SPECIFICATIONS, AND REQUIREMENTS OF ALL LOCAL AUTHORITIES HAVING JURISDICTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH APPROPRIATE INDIVIDUALS TO OBTAIN ALL SUCH SPECIFICATIONS AND REQUIREMENTS. NOTHING CONTAINED IN, OR OMITTED FROM, THESE DOCUMENTS SHALL RELIEVE CONTRACTOR FROM THIS OBLIGATION.

SECTION 16111

1.01. CONDUIT

A. MINIMUM CONDUIT SIZE FOR BRANCH CIRCUITS, LOW VOLTAGE CONTROL AND ALARM CIRCUITS SHALL BE 3/4". CONDUITS SHALL BE PROPERLY FASTENED AS REQUIRED BY THE N.E.C.

B. THE INTERIOR OF RACEWAYS/ENCLOSURES INSTALLED UNDERGROUND SHALL BE CONSIDERED TO BE WET LOCATION, INSULATED CONDUCTORS SHALL BE LISTED FOR USE IN WET LOCATIONS. PROVIDE WEATHERPROOF CONSTRUCTION IN WET LOCATIONS.

C. CONDUIT INSTALLED UNDERGROUND SHALL BE INSTALLED TO MEET MINIMUM COVER REQUIREMENTS OF TABLE 300.5.

D. PROVIDE RIGID GALVANIZED STEEL CONDUIT (RMC) FOR THE FIRST 10 FOOT SECTION WHEN LEAVING A BUILDING OR SECTIONS PASSING THROUGH FLOOR SLABS

E. ONLY LISTED PVC CONDUIT AND FITTINGS ARE PERMITTED FOR THE INSTALLATION OF ELECTRICAL CONDUCTORS, SUITABLE FOR UNDERGROUND APPLICATIONS.

CONDUIT SCHEDULE SECTION 16111

CONDUIT TYPE	NEC REFERENCE	APPLICATION	MIN. BURIAL DEPTH (PER NEC TABLE 300.5) [2,3]
EMT	ARTICLE 358	INTERIOR CIRCUITING, EQUIPMENT ROOMS, SHELTERS	N/A
RMC, RIGID GALV. STEEL	ARTICLE 344, 300.5, 300.50	ALL INTERIOR/ EXTERIOR CIRCUITING, ALL UNDERGROUND INSTALLATIONS.	6 INCHES
PVC, SCHEDULE 40	ARTICLE 352, 300.5, 300.50	INTERIOR/ EXTERIOR CIRCUITING AND GROUNDING SYSTEMS, UNDERGROUND INSTALLATIONS, WHERE NOT SUBJECT TO PHYSICAL DAMAGE. [1]	18 INCHES
PVC, SCHEDULE 80	ARTICLE 352, 300.5, 300.50	INTERIOR/ EXTERIOR CIRCUITING AND GROUNDING SYSTEMS, UNDERGROUND INSTALLATIONS, WHERE SUBJECT TO PHYSICAL DAMAGE. [1]	18 INCHES
LIQUID TIGHT FLEX. METAL	ARTICLE 350	SHORT LENGTHS (MAX. 3FT.) WIRING TO VIBRATING EQUIPMENT IN WET LOCATIONS.	N/A SECTION 16450
FLEX. METAL	ARTICLE 348	SHORT LENGTHS (MAX. 3FT.) WIRING TO VIBRATING EQUIPMENT IN WET LOCATIONS.	N/A

[1] PHYSICAL DAMAGE IS SUBJECT TO THE AUTHORITY HAVING JURISDICTION.

[2] UNDERGROUND CONDUIT INSTALLED UNDER ROADS, HIGHWAYS, DRIVEWAYS, PARKING LOTS SHALL HAVE MINIMUM DEPTH OF 24".

[3] WHERE SOLID ROCK PREVENTS COMPLIANCE WITH MINIMUM COVER DEPTHS, WIRING SHALL BE INSTALLED IN PERMITTED RACEWAY FOR DIRECT BURIAL. THE RACEWAY SHALL BE COVERED BY A MINIMUM OF 2" OF CONCRETE EXTENDING DOWN TO ROCK.

SECTION 16123

1.01. CONDUCTORS

A. ALL CONDUCTORS SHALL BE TYPE THWN (INT. APPLICATION) AND XHHW (EXT. APPLICATION), 75 DEGREE C, 600 VOLT INSULATION, SOFT ANNEALED STRANDED COPPER. #10 AWG AND SMALLER SHALL BE SPLICED USING ACCEPTABLE SOLDERLESS PRESSURE CONNECTORS. #8 AWG AND LARGER SHALL BE SPLICED USING COMPRESSION SPLIT-BOLT TYPE CONNECTORS. #12 AWG SHALL BE THE MINIMUM SIZE CONDUCTOR FOR LINE VOLTAGE BRANCH CIRCUITS. REFER TO PANEL SCHEDULE FOR BRANCH CIRCUIT CONDUCTOR SIZE(S). CONDUCTORS SHALL BE COLOR CODED FOR CONSISTENT PHASE IDENTIFICATION:

LINE	120/208/240V COLOR	277/480V COLOR
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
N	CONTINUOUS WHITE	GREY
G	CONTINUOUS GREEN	GREEN WITH YELLOW STRIPE

B. MINIMUM BENDING RADIUS FOR CONDUCTORS SHALL BE 12 TIMES THE LARGEST DIAMETER OF BRANCH CIRCUIT CONDUCTOR.

SECTION 16130

1.01. BOXES

A. FURNISH AND INSTALL OUTLET BOXES FOR ALL DEVICES, SWITCHES, RECEPTACLES, ETC.. BOXES TO BE ZINC COATED STEEL.

B. FURNISH AND INSTALL PULL BOXES IN MAIN FEEDERS RUNS WHERE REQUIRED. PULL BOXES SHALL BE GALVANIZED STEEL WITH SCREW REMOVABLE COVERS, SIZE AND QUANTITY AS REQUIRED. PROVIDE WEATHERPROOF CONSTRUCTION IN WET LOCATIONS.

SECTION 16140

1.01. WIRING DEVICES

A. THE FOLLOWING LIST IS PROVIDED TO CONVEY THE QUALITY AND RATING OF WIRING DEVICES WHICH ARE TO BE INSTALLED. A COMPLETE LIST OF ALL DEVICES MUST BE SUBMITTED BEFORE INSTALLATION FOR APPROVAL.

1. 15 MINUTE TIMER SWITCH – INTERMATIC #FF15M (INTERIOR LIGHTS)

2. DUPLEX RECEPTACLE – P&S #2095 (GFCI) SPECIFICATION GRADE

3. SINGLE POLE SWITCH – P&S #CSB20AC2 (20A-120V HARD USE) SPECIFICATION GRADE

4. DUPLEX RECEPTACLE – P&S #5362 (20A-120V HARD USE) SPECIFICATION GRADE

B. PLATES – ALL PLATES USED SHALL BE CORROSION RESISTANT TYPE 304 STAINLESS STEEL. PLATES SHALL BE FROM SAME MANUFACTURER AS SWITCHES AND RECEPTACLES. PROVIDE WEATHERPROOF HOUSING FOR DEVICES LOCATED IN WET LOCATIONS.

C. OTHER MANUFACTURERS OF THE SWITCHES, RECEPTACLES AND PLATES MAY BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

SECTION 16170

1.01. DISCONNECT SWITCHES

A. FUSIBLE AND NON-FUSIBLE, 600V, HEAVY DUTY DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY SQUARE "D". PROVIDE FUSES AS CALLED FOR ON THE CONTRACT DRAWINGS. AMPERE RATING SHALL BE CONSISTENT WITH LOAD BEING SERVED. DISCONNECT SWITCH COVER SHALL BE MECHANICALLY INTERLOCKED TO PREVENT COVER FROM OPENING WHEN THE SWITCH IS IN THE "ON" POSITION. EXTERIOR APPLICATIONS SHALL BE NEMA 3R CONSTRUCTION WITH PADLOCK FEATURE.

SECTION 16190

1.01. SEISMIC RESTRAINT

A. ALL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH ZONE 2 SEISMIC REQUIREMENTS.

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

A. CONTRACTOR SHALL FURNISH AND INSTALL NON-METALLIC ENGRAVED BACK-LIT NAMEPLATES ON ALL PANELS AND MAJOR ITEMS OF ELECTRICAL EQUIPMENT.

B. LETTERS TO BE WHITE ON BLACK BACKGROUND WITH LETTERS 1-1/2 INCH HIGH WITH 1/4 INCH MARGIN.

C. IDENTIFICATION NOMENCLATURE SHALL BE IN ACCORDANCE WITH OWNER'S STANDARDS.

SECTION 16450

1.01. GROUNDING

A. ALL NON-CURRENT CARRYING PARTS OF THE ELECTRICAL AND TELEPHONE CONDUIT SYSTEMS SHALL BE MECHANICALLY AND ELECTRICALLY CONNECTED TO PROVIDE AN INDEPENDENT RETURN PATH TO THE EQUIPMENT GROUNDING SOURCES.

B. GROUNDING SYSTEM WILL BE IN ACCORDANCE WITH THE LATEST ACCEPTABLE EDITION OF THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS PER LOCAL INSPECTOR HAVING JURISDICTION.

C. GROUNDING OF PANELBOARDS:

1. PANELBOARD SHALL BE GROUNDED BY TERMINATING THE PANELBOARD FEEDER'S EQUIPMENT GROUND CONDUCTOR TO THE EQUIPMENT GROUND BAR KIT(S) LUGGED TO THE CABINET. ENSURE THAT THE SURFACE BETWEEN THE KIT AND CABINET ARE BARE METAL TO BARE METAL. PRIME AND PAINT OVER TO PREVENT CORROSION.

2. CONDUIT(S) TERMINATING INTO THE PANELBOARD SHALL HAVE GROUNDING TYPE BUSHINGS. THE BUSHINGS SHALL BE BONDED TOGETHER WITH BARE #10 AWG COPPER CONDUCTOR WHICH IN TURN IS TERMINATED INTO THE PANELBOARD'S EQUIPMENT GROUND BAR KIT(S).

D. EQUIPMENT GROUNDING CONDUCTOR:

1. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122.

2. THE MINIMUM SIZE OF EQUIPMENT GROUND CONDUCTOR SHALL BE #12 AWG COPPER.

3. EACH FEEDER OR BRANCH CIRCUIT SHALL HAVE EQUIPMENT GROUND CONDUCTOR(S) INSTALLED IN THE SAME RACEWAY(S).

E. CELLULAR GROUNDING SYSTEM:

CONTRACTOR SHALL PROVIDE A CELLULAR GROUNDING SYSTEM WITH THE MAXIMUM AC RESISTANCE TO GROUND OF 10 OHM BETWEEN ANY POINT ON THE GROUNDING SYSTEM AS MEASURED BY 3-POINT GROUNDING TEST. (REFER TO SECTION 16960).

PROVIDE THE CELLULAR GROUNDING SYSTEM AS SPECIFIED ON DRAWINGS, INCLUDING, BUT NOT LIMITED TO:

1. GROUND BARS

2. EXTERIOR GROUNDING (WHERE REQUIRED DUE TO MEASURED AC RESISTANCE GREATER THAN SPECIFIED).

3. ANTENNA GROUND CONNECTIONS AND PLATES.

F. CONTRACTOR, AFTER COMPLETION OF THE COMPLETE GROUNDING SYSTEM BUT PRIOR TO CONCEALMENT/BURIAL OF SAME, SHALL NOTIFY OWNER'S PROJECT ENGINEER WHO WILL HAVE A DESIGN ENGINEER VISIT SITE AND MAKE A VISUAL INSPECTION OF THE GROUNDING GRID AND CONNECTIONS OF THE SYSTEM.

G. ALL EQUIPMENT SHALL BE BONDED TO GROUND AS REQUIRED BY N.E.C., MFG. SPECIFICATIONS, AND OWNER'S SPECIFICATIONS.

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

A. FUSES SHALL BE NONRENEWABLE TYPE AS MANUFACTURED BY "BUSSMAN" OR APPROVED EQUAL. FUSES RATED TO 1/10 AMPERE UP TO 600 AMPERES SHALL BE EQUIVALENT TO BUSSMAN TYPE LPN-RK (250V) UL CLASS RK1, LOW PEAK, DUAL ELEMENT, TIME-DELAY FUSES. FUSES SHALL HAVE SEPARATE SHORT CIRCUIT AND OVERLOAD ELEMENTS AND HAVE AN INTERRUPTING RATING OF 200 KAIC. UPON COMPLETION OF WORK, PROVIDE ONE SPARE SET OF FUSES FOR EACH TYPE INSTALLED.

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

A. CONTRACTOR SHALL RETAIN THE SERVICES OF A LOCAL INDEPENDENT ELECTRICAL TESTING FIRM (WITH MINIMUM 5 YEARS COMMERCIAL EXPERIENCE IN THE ELECTRICAL TESTING INDUSTRY) AS SPECIFIED BY OWNER TO PERFORM:

TEST 1: THERMAL OVERLOAD AND MAGNETIC TRIP TEST, AND CABLE INSULATION TEST FOR ALL CIRCUIT BREAKERS RATED 100 AMPS OR GREATER.

TEST 2: RESISTANCE TO GROUND TEST ON THE CELLULAR GROUNDING SYSTEM.

THE TESTING FIRM SHALL INCLUDE THE FOLLOWING INFORMATION WITH THE REPORT:

1. TESTING PROCEDURE INCLUDING THE MAKE AND MODEL OF TEST EQUIPMENT.

2. CERTIFICATION OF TESTING EQUIPMENT CALIBRATION WITHIN SIX (6) MONTHS OF DATE OF TESTING. INCLUDE CERTIFICATION LAB ADDRESS AND TELEPHONE NUMBER.

3. GRAPHICAL DESCRIPTION OF TESTING METHOD ACTUALLY IMPLEMENTED.

B. THESE TESTS SHALL BE PERFORMED IN THE PRESENCE AND TO THE SATISFACTION OF OWNER'S CONSTRUCTION REPRESENTATIVE. TESTING DATA SHALL BE INITIALED AND DATED BY THE CONSTRUCTION REPRESENTATIVE AND INCLUDED WITH THE WRITTEN REPORT/ANALYSIS.

C. THE CONTRACTOR SHALL FORWARD SIX (6) COPIES OF THE INDEPENDENT ELECTRICAL TESTING FIRM'S REPORT/ANALYSIS TO ENGINEER A MINIMUM OF TEN (10) WORKING DAYS PRIOR TO THE JOB TURNOVER.

D. CONTRACTOR TO PROVIDE A MINIMUM OF ONE (1) WEEK NOTICE TO OWNER AND ENGINEER FOR ALL TESTS REQUIRING WITNESSING.

SECTION 16961

1.01. TESTS BY CONTRACTOR

A. ALL TESTS AS REQUIRED UPON COMPLETION OF WORK, SHALL BE MADE BY THIS CONTRACTOR. THESE SHALL BE CONTINUITY AND INSULATION TESTS; TEST TO DETERMINE THE QUALITY OF MATERIALS, ETC. AND SHALL BE MADE IN ACCORDANCE WITH N.E.C. RECOMMENDATIONS. ALL FEEDERS AND BRANCH CIRCUIT WIRING (EXCEPT CLASS 2 SIGNAL CIRCUITS) MUST BE TESTED FREE FROM SHORT CIRCUIT AND GROUND FAULT CONDITIONS AT 500V IN A REASONABLY DRY AMBIENT OF APPROXIMATELY 70 DEGREES F.

B. CONTRACTOR SHALL PERFORM LOAD PHASE BALANCING TESTS. CIRCUITS SHALL BE SO CONNECTED TO THE PANELBOARDS SUCH THAT THE NEW LOAD IS DISTRIBUTED AS EQUALLY AS POSSIBLE BETWEEN EACH LOAD AND NEUTRAL. 10% SHALL BE CONSIDERED AS A REASONABLE AND ACCEPTABLE ALLOWANCE. BRANCH CIRCUITS SHALL BE BALANCED ON THEIR OWN PANELBOARDS; FEEDER LOADS SHALL, IN TURN, BE BALANCED ON THE SERVICE EQUIPMENT. REASONABLE LOAD TEST SHALL BE ARRANGED TO VERIFY LOAD BALANCE IF REQUESTED BY THE ENGINEER.

C. ALL TESTS, UPON REQUEST, SHALL BE REPEATED IN THE PRESENCE OF OWNER'S REPRESENTATIVE. ALL TESTS SHALL BE DOCUMENTED AND TURNED OVER TO OWNER. OWNER SHALL HAVE THE AUTHORITY TO STOP ANY OF THE WORK NOT BEING PROPERLY INSTALLED. ALL SUCH DETECTED WORK SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL EXPENSE TO THE OWNER AND THE TESTS SHALL BE REPEATED.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	02/24/22	RTS	TJR	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION
0	02/07/22	RTS	TJR	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

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

T-Mobile

NSS NORTHEAST SITE SOLUTIONS Turnkey Wireless Development

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T-MOBILE NORTHEAST LLC

SITE NAME: CT860/CL&P TRUMBULL
SITE ID: CT11860A
48 QUAIL TRAIL
TRUMBULL, CT 06611

DATE: 06/18/21
SCALE: AS NOTED
JOB NO. 21051.02

ELECTRICAL SPECIFICATIONS

E-2

Exhibit D

Structural Analysis Report

CENTEK engineering

Centered on Solutions℠

Structural Analysis of Antenna Mast and Pole

T-Mobile Site Ref: CT11860A

Eversource Structure No. 838

95' Electric Transmission Pole

48 Quail Trail

Trumbull, CT

CENTEK Project No. 21051.02

~~Date: July 16, 2021~~

Rev 3: January 11, 2022

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
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Prepared for:
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35 Griffin Road
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Introduction

The purpose of this report is to analyze the existing mast and 95' utility pole located at 48 Quail Trail in Trumbull, CT for the proposed antenna and equipment upgrade by T-Mobile.

The existing/proposed loads consist of the following:

- T-MOBILE (EXISTING TO REMOVE):
  Antennas: Three (3) Andrew SBNHH-1D65A panel antennas and three (3) Andrew ATSBT-TOP-FM-4G Smart Bias Tees mounted on three (3) existing standoff arms to the existing pipe mast with a RAD center elevation of 105-ft above tower base plate.
- T-MOBILE (EXISTING TO REMAIN):
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on the outside of the tower as indicated in section 4 of this report.
- **T-MOBILE (Proposed):**
  Antennas: Three (3) RFS APXVARR18_43 panel antennas mounted on three (3) existing standoff arms to the existing pipe mast with a RAD center elevation of 105-ft above tower base plate.

Primary assumptions used in the analysis

- ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures", defines steel stresses for evaluation of the utility pole.
- All utility tower members are adequately protected to prevent corrosion of steel members.
- All proposed antenna mounts are modeled as listed above.
- All coaxial cable will be installed within the antenna mast unless specified otherwise.
- Antenna 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.
- Antenna 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 HSS12.75"x0.375" x 28.25-ft long pipe 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/EVERSOURCE 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 ASCE 48-11, "Design of Steel Transmission Pole Structures", NESC C2-2017 and Eversource Design Criteria.

- UTILITY POLE ANALYSIS

  The purpose of this analysis is to determine the adequacy of the existing utility structure to support the proposed antenna loads. The loading and design requirements were analyzed in accordance with the EVERSOURCE Design Criteria Table, NESC C2-2017 ~ Construction Grade B, and ASCE Manual No. 48-11, "Design Of Steel Transmission Pole Structures".

  Load cases considered:

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

  Load Case 2: NESC Extreme
  Wind Speed.………………………………. 110 mph (1)
  Radial Ice Thickness……………………….. 0"

  Note 1: NESC C2-2017, 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 TIA-222-G and AISC standards.

  Load cases considered:

  Load Case 1:
  Wind Speed……………………………….... 97 mph (2018 CSBC Appendix-N)
  Radial Ice Thickness……………………….. 0"

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

Results

- MAST ASSEMBLY

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

Member	Stress Ratio (% of capacity)	Result
HSS12.75"x0.375" Pipe	31.9%	**PASS**
3/4" ∅ ASTM A325 Bolt (Top Bracket)[1]	12.0%	**PASS**

Note 1 – Critical connection component.

- UTILITY POLE

  This analysis finds that the subject utility pole is adequate to support the proposed antenna mast and related appurtenances. The pole stresses meet the requirements set forth by the ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures Second Edition", for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

  A maximum usage of **88.19%** occurs in the utility pole base plate under the **NESC Heavy** loading condition.

  POLE SECTION:

  The utility pole was found to be within allowable limits.

Tower Section	Elevation	Stress Ratio (% of capacity)	Result
Tube Number 2	9.25-54.25' (AGL)	77.25%	**PASS**

  BASE PLATE:

  The base plate was found to be within allowable limits from the PLS output based on 16 bend lines.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Base Plate	Bending	88.19%	**PASS**

- FOUNDATION AND ANCHORS

  The existing foundation consists of a 10-ft square x 14-ft long reinforced concrete pier with (16) rock anchors. The base of the tower is connected to the foundation by means of (20) 2.25"∅, ASTM A615-75 anchor bolts embedded into the concrete foundation structure. Foundation information was obtained from NUSCO drawing # 01103-60000.

  <u>BASE REACTIONS:</u>

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

Load Case	Shear	Axial	Moment
NESC Heavy Wind	48.33 kips	63.96 kips	3591.92 ft-kips
NESC Extreme Wind	50.94 kips	34.82 kips	3598.18 ft-kips

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

<u>ANCHOR BOLTS:</u>

The anchor bolts were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (% of capacity)	Result
Anchor Bolts	Tension	53.4%	**PASS**

<u>FOUNDATION:</u>

The foundation was found to be within allowable limits.

Foundation	Design Limit	Allowable Limit	Proposed Loading (4)	Result
Reinf. Conc. Pier w/ Rock Anchors	OTM (1)	1.0 FS (2)	1.89 FS (2)	**PASS**
	Bearing Pressure	50 ksf (3)	17.9 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.

<u>*Conclusion*</u>

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES

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

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

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

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

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

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ RISA-3D

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

Modeling Features:

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

Analysis Features:

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

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

Graphics Features:

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

Design Features:

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

Results Features:

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ PLS-POLE

PLS-POLE provides all of the capabilities a structural engineer requires to design transmission, substation or communications structures. It does so using a simple easy to use graphical interface that rests upon our time tested finite element engine. Regardless of whether you want to model a simple wood pole or a guyed steel X-Frame; PLS-POLE can handle the job simply, reliably and efficiently.

Modeling Features:

- Structures are made of standard reusable components that are available in libraries. You can easily create your own libraries or get them from a manufacturer
- Structure models are built interactively using interactive menus and graphical commands
- Automatic generation of underlying finite element model of structure
- Steel poles can have circular, 4, 6, 8, 12, 16, or 18-sided, regular, elliptical or user input cross sections (flat-to-flat or tip-to-tip orientations)
- Steel and concrete poles can be selected from standard sizes available from manufacturers
- Automatic pole class selection
- Cross brace position optimizer
- Capability to specify pole ground line rotations
- Capability to model foundation displacements
- Can optionally model foundation stiffness
- Guys are easily handled (modeled as exact cable elements in nonlinear analysis)
- Powerful graphics module (members color-coded by stress usage)
- Graphical selection of joints and components allows graphical editing and checking
- Poles can be shown as lines, wire frames or can be rendered as 3-d polygon surfaces

Analysis Features:

- Automatic distribution of loads in 2-part suspension insulators (v-strings, horizontal vees, etc.)
- Design checks for ASCE, ANSI/TIA/EIA 222 (Revisions F and G) or other requirements
- Automatic calculation of dead and wind loads
- Automated loading on structure (wind, ice and 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
- Detects buckling by nonlinear analysis

Results Features:

- Detects buckling by nonlinear analysis
- 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
- Automatic tracking of part numbers and costs

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 C2-2017 (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.*

PCS Mast

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:

ELECTRIC TRANSMISSION TOWER

The electric transmission tower shall be analyzed using yield stress theory in accordance with the attached table titled “Eversource 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 2017 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to TIA and its loads and factors with the exceptions noted above. (Note that the NESC does not require the projected wind surfaces of structures and equipment to be increased by the ice covering.)

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

Attachment A
Eversource Design Criteria

		Attachment A ES Design Criteria	Basic Wind Speed	Pressure	Height Factor	Gust Factor	Load or Stress Factor	Force Coef. - Shape Factor
			V (MPH)	Q (PSF)	Kz	Gh		
Ice Condition	TIA/EIA	Antenna Mount	TIA	TIA (0.75Wi)	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
Ice Condition	NESC Heavy	Tower/Pole Analysis with antennas extending above top of Tower/Pole (Yield Stress)	-----	4	1	1	2.5	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Tower/Pole Analysis with antennas below top of Tower/Pole (on two faces)	-----	4	1	1	2.5	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Conductors:	Conductor Loads Provided by ES					
High Wind Condition	TIA/EIA	Antenna Mount	85	TIA	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
High Wind Condition	NESC Extreme Wind	Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Apply a 1.25 x Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condition	NESC Extreme Wind	Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condition	NESC Extreme Wind	Conductors:	Conductor Loads Provided by ES					
NESC Extreme Ice with Wind Condition*		Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load 1.25 x Gust Response Factor Apply a 1.25 x Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Condition*		Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Condition*		Conductors:	Conductor Loads Provided by ES					
NESC Extreme Ice with Wind Condition*		*Only for structures installed after 2007						

determined from NESC applied loading conditions (not TIA Loads) on the structure and mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The strength reduction factor obtained from the field investigation shall be applied to the members or connections that are showing signs of deterioration from their original condition With the written approval of Eversource Transmission Line Engineering on a case by case the existing structures may be analyzed initially using the current NESC code, then it is permitted to use the original design code with the original conductor load should the existing tower fail the current NESC code.

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

a) Wireless communication mast for its total height above ground level, including the initial and any planned future equipment (Support Platforms, Antennas, TMA's etc.) above the top of an electric transmission structure.

b) Conductors and related devices and hardware (wire loads will be provided by Eversource).

c) Electric Transmission Structure

i) The loads from the wireless communication equipment components based on NESC and Eversource Criteria in Attachment A, and from the electric conductors shall be applied to the structure at conductor and wireless communication mast attachment points, where those loads transfer to the tower. ii)

ii) Shape Factor Multiplier:

NESC Structure Shape	Cd
Polyround (for polygonal steel poles)	1.3
Flat	1.6
Open Lattice	3.2
Pole with Coaxial Cable	See Below Table

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

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

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

INPUT DATA

TOWER ID: 838

Structure Height (ft) : 95

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 =	*OPGW-120*	*OPGW-120*
DESCRIPTION =	6-Groove	6-Groove
STRANDING =	10/9 FOCAS	10/9 FOCAS
DIAMETER =	0.738 in	0.738 in
WEIGHT =	0.518 lb/ft	0.518 lb/ft

Conductor Properties:

	BACK	AHEAD
NAME =	*LAPWING*	*LAPWING*
	1590.000	1590.000
	45/7 ACSR	45/7 ACSR
DIAMETER =	1.504 in	1.504 in
WEIGHT =	1.790 lb/ft	1.790 lb/ft

Number of Conductors per phase (BACK): 1

Number of Conductors per phase (AHEAD): 1

Insulator Weight = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK Shield	BACK Conductor	AHEAD Shield	AHEAD Conductor
NESC HEAVY =	6,000	11,400	6,000	11,400
EXTREME WIND =	6,016	12,178	6,016	12,178
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 =	2,045	5,625	2,045	5,625

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	8	AHEAD:	8	**15**
WIND SPAN (ft) =	BACK:	262	AHEAD:	262	**524**
WEIGHT SPAN (ft) =	BACK:	396	AHEAD:	396	**792**

Job :	Spec. Number	Page	of
Description:	Computed by	Sheet	of
	Checked by	Date	9/29/09
		Date	

WIRE LOADING AT ATTACHMENTS

TOWER ID: 838

Wind Span =	524 ft
Weight Span =	792 ft
Total Angle =	15 degrees
Broken Wire Span =	AHEAD SPAN
Type of Insulator Attachment =	STRAIN

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	3,426 lb	0 lb	1,530 lb	1,713 lb	9,810 lb	765 lb
Conductor =	6,160 lb	0 lb	3,607 lb	3,080 lb	18,639 lb	1,803 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	2,614 lb	0 lb	472 lb
Conductor =	5,302 lb	0 lb	1,630 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	472 lb
Conductor =	#VALUE!	#VALUE!	1,630 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	2,122 lb
Conductor =	#VALUE!	#VALUE!	3,884 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,020 lb
Conductor =	#VALUE!	#VALUE!	2,405 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	551 lb	0 lb	410 lb
Conductor =	1,515 lb	0 lb	1,418 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	826 lb	0 lb	615 lb
Conductor =	2,273 lb	0 lb	2,127 lb

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

Northeast Utilities System

		Page	of
Job :	Spec. Number	Sheet	of
Description:	Computed by	Date	9/29/09
	Checked by	Date	

INPUT DATA

TOWER ID: 838

Structure Height (ft) : 95

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 =	*LAPWING*	*LAPWING*
	1590.000	1590.000
	45/7 ACSR	45/7 ACSR
DIAMETER =	1.504 in	1.504 in
WEIGHT =	1.790 lb/ft	1.790 lb/ft
Number of Conductors per phase	1	1

Insulator Weight = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	4,200	11,400	4,200	11,400
EXTREME WIND =	3,440	12,178	3,440	12,178
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 =	1,234	5,625	1,234	5,625

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	8	AHEAD:	8	**15**
WIND SPAN (ft) =	BACK:	262	AHEAD:	262	**524**
WEIGHT SPAN (ft) =	BACK:	396	AHEAD:	396	**792**

WIRE LOADING AT ATTACHMENTS

TOWER ID: 838

Wind Span =	524	ft
Weight Span =	792	ft
Total Angle =	15	degrees

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

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	2,471 lb	0 lb	965 lb	1,236 lb	6,867 lb	482 lb
Conductor =	6,160 lb	0 lb	3,607 lb	3,080 lb	18,639 lb	1,803 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	1,457 lb	0 lb	238 lb
Conductor =	5,302 lb	0 lb	1,630 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	238 lb
Conductor =	#VALUE!	#VALUE!	1,630 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,571 lb
Conductor =	#VALUE!	#VALUE!	3,884 lb

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

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	643 lb
Conductor =	#VALUE!	#VALUE!	2,405 lb

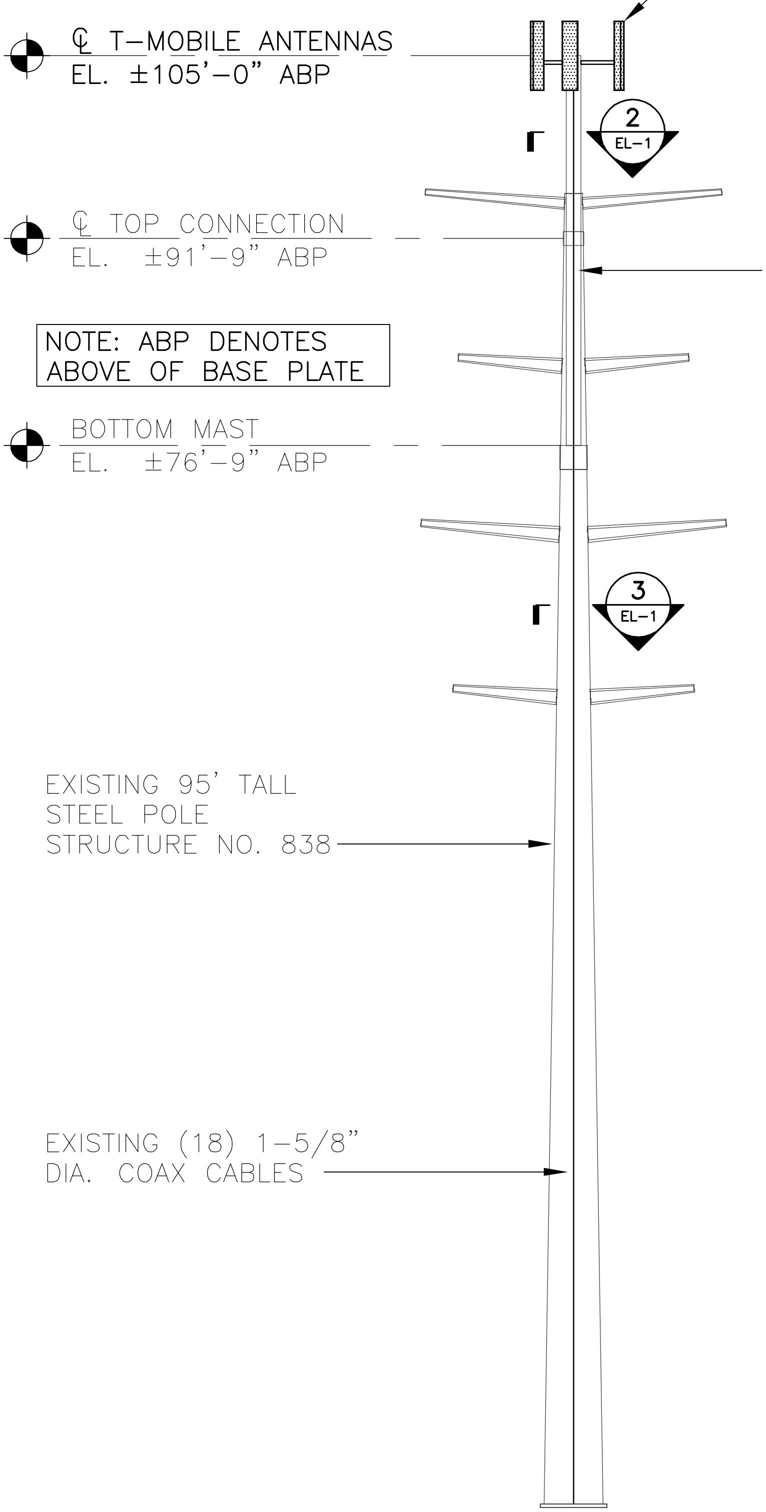
6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	332 lb	0 lb	207 lb
Conductor =	1,515 lb	0 lb	1,418 lb

7. Construction

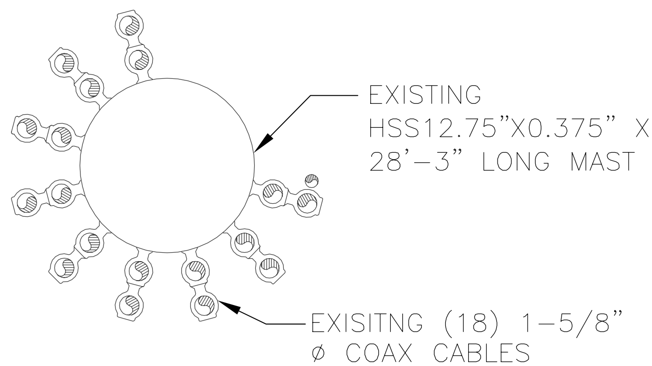
	Horizontal	Longitudinal	Vertical
Shield Wire =	499 lb	0 lb	311 lb
Conductor =	2,273 lb	0 lb	2,127 lb

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



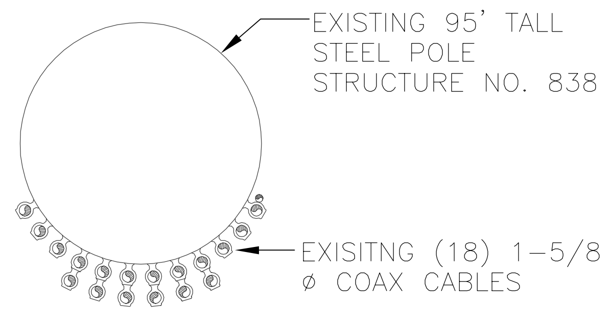
1 EL-1 TOWER & MAST ELEVATION

SCALE: NOT TO SCALE



2 EL-1 COAX PLAN

SCALE: NOT TO SCALE



3 EL-1 COAX PLAN

SCALE: NOT TO SCALE

REVISIONS		
00	7/16/21	ISSUED FOR REVIEW
01	1/11/22	CONSTRUCTION

CENTEK engineering
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CT11860A
EVERSOURCE 838

48 QUAIL TRAIL
TRUMBULL, CT 06611

PROJECT NO:	21051.02
DRAWN BY:	TJL
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	7/16/21

T-Mobile

TOWER AND MAST 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 $V := 97$ mph (User Input - 2018 CSBC Appendix N)

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

Basic Wind Speed Service Loads $V_{Ser} := 60$ mph (User Input - TIA-222-G Section 2.8.3)

Input

Structure Type = Structure_Type := Pole (User Input)

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

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

Structure Height = $h := 95$ ft (User Input)

Height to Center of Antennas = $z_{T\text{-}Mo} := 105$ ft (User Input)

Height to Center of Mast = $z_{Mast1} := 91$ 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)

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

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

Wind Direction Probability Factor (Service) = $K_{dSer} := 0.85$ (Per Section 2.8.3 of TIA-222-G)

Importance Factor (Service) = $I_{Ser} := 1$ (Per Section 2.8.3 of TIA-222-G)

$K_{iz} := \left(\frac{z_{T\text{-}Mo}}{33}\right)^{0.1} = 1.123$ $\quad t_{izT\text{-}Mo} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.105$

Velocity Pressure Coefficient Antennas = $Kz_{T\text{-}Mo} := 2.01\left(\left(\frac{z_{T\text{-}Mo}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.279$

Velocity Pressure w/o Ice Antennas = $qz_{T\text{-}Mo} := 0.00256 \cdot K_d \cdot Kz_{T\text{-}Mo} \cdot V^2 \cdot I_{Wind} = 33.649$

Velocity Pressure with Ice Antennas = $qz_{ice.T\text{-}Mo} := 0.00256 \cdot K_d \cdot Kz_{T\text{-}Mo} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 7.774$

Velocity Pressure Service = $qz_{T\text{-}Mo.Ser} := 0.00256 \cdot K_{dSer} \cdot Kz_{T\text{-}Mo} \cdot V_{Ser}^2 \cdot I_{Ser} = 10.017$

$K_{izMast1} := \left(\frac{z_{Mast1}}{33}\right)^{0.1} = 1.107$ $\quad t_{izMast1} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{izMast1} \cdot K_{zt}^{0.35} = 2.075$

Velocity Pressure Coefficient Mast = $Kz_{Mast1} := 2.01\left(\left(\frac{z_{Mast1}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.241$

Velocity Pressure w/o Ice Mast= $qz_{Mast1} := 0.00256 \cdot K_d \cdot Kz_{Mast1} \cdot V^2 \cdot I_{Wind} = 32.65$

Velocity Pressure with Ice Mast = $qz_{ice.Mast1} := 0.00256 \cdot K_d \cdot Kz_{Mast1} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 7.544$

Velocity Pressure Service = $qz_{Mast1.Ser} := 0.00256 \cdot K_{dSer} \cdot Kz_{Mast1} \cdot V_{Ser}^2 \cdot I_{Ser} = 9.719$

Development of Wind & Ice Load on Mast

Mast Data: (HSS12.75"x0.375") (User Input)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 12.75$ in (User Input)

Mast Length = $L_{mast} := 28.25$ ft (User Input)

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

Mast Aspect Ratio = $Ar_{mast} := \frac{12L_{mast}}{D_{mast}} = 26.6$

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

Wind Load (without ice)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.063$ sf/ft

Total Mast Wind Force = $qz_{Mast1} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 56$ plf **BLC 5**

Wind Load (with ice)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{\left(D_{mast} + 2 \cdot t_{izMast1}\right)}{12} = 1.408$ sf/ft

Total Mast Wind Force w/ Ice = $qz_{ice.Mast1} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 17$ plf **BLC 4**

Wind Load (Service)

Total Mast Wind Force Service Loads = $qz_{Mast1.Ser} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 17$ plf **BLC 6**

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 = $Ai_{mast} := \frac{\pi}{4}\left[\left(D_{mast} + t_{izMast1} \cdot 2\right)^2 - D_{mast}{}^2\right] = 96.7$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 38$ plf **BLC 3**

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Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFSAPXVARR18_43		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 19.7$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.5$	in	(User Input)
Antenna Weight =	$WT_{ant} := 100$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.7$		
Antenna Force Coefficient =	$Ca_{ant} = 1.25$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 9.9$	sf	
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 29.5$	sf	
Total Antenna Wind Force =	$F_{ant} := qz_{T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 1680$	lbs	**BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{izT\text{-}Mo}) \cdot (W_{ant} + 2 \cdot t_{izT\text{-}Mo})}{144} = 12.7$	sf	
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 38$	sf	
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 499$	lbs	**BLC 4**

Wind Load (Service)

Total Antenna Wind Force Service Loads =	$F_{ant.Ser} := qz_{T\text{-}Mo.Ser} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 500$	lbs	**BLC 6**

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 300$	lbs	**BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 12056$	cu in	
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{izT\text{-}Mo})(W_{ant} + 2 \cdot t_{izT\text{-}Mo}) \cdot (T_{ant} + 2 \cdot t_{izT\text{-}Mo}) - V_{ant} = 11104$		
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 360$	lbs	
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 1080$	lbs	**BLC 3**

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Subject:	Loads on T-Mobile Mast - Structure 838
Location:	Trumbull, CT
Rev. 3: 1/11/22	Prepared by: T.J.L. Checked by: C.F.C. Job No. 21051.02

Development of Wind & Ice Load on Antenna Mounts

Mount Data:

Mount Shape =	Flat		
Mount Projected Surface Area =	$CaAa := 10.3$	sf	(User Input)
Mount Projected Surface Area w/ Ice =	$CaAa_{ice} := 13.6$	sf	(User Input)
Mount Weight =	$WT_{mnt} := 500$	lbs	(User Input)
Mount Weight w/ Ice =	$WT_{mnt.ice} := 575$	lbs	(User Input)

Wind Load (NESC Extreme)

Total Mount Wind Force =	$F_{mnt} := qz_{T\text{-}Mo} \cdot G_H \cdot CaAa = 468$	lbs	**BLC 5**

Wind Load (NESC Heavy)

Total Mount Wind Force =	$Fi_{mnt} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot CaAa_{ice} = 143$	lbs	**BLC 4**

Wind Load (Service)

Assumes Mount is Shielded by Antenna

Total Antenna Wind Force Service Loads =	$F_{ant.Ser} := qz_{T\text{-}Mo.Ser} \cdot G_H \cdot CaAa = 139$	lbs	**BLC 6**

Gravity Loads (without ice)

Weight of All Mounts =	$WT_{mnt} = 500$	lbs	**BLC 2**

Gravity Load (ice only)

Weight of Ice on All Mounts =	$W_{ICEmnt} := WT_{mnt.ice} - WT_{mnt} = 75$	lbs	**BLC 3**

Weight:

Tri-Bracket (80168) = 250 lbs
3 x Standoff Arms (B2759) = 50lbs * 3 = 150 lbs
3 x 2 Std. x 6'-0" Pipes = 3.66plf*6'*3 = 66 lbs
Miscl = 25 lbs
Tot = 490 lbs

Weight Ice:

3 x Standoff Arms (B2759) = (5"^2-4"^2)/144*3'*3*56pcf = 32 lbs
3 x 2 Std. x 6'-0" Pipes = $\frac{\pi}{4}$(3.375"^2-2.375"^2)/144*6'*3*56pcf = 32 lbs
Tot = 64 lbs

CaAa:

3 x Standoff Arms (B2759) = 2.0*4"/12*3'*3 = 6 ft^2
3 x 2 Std. x 6'-0" Pipes = 1.2*2.375"/12*6'*3 = 4.3 ft^2
Tot = 10.3 ft^2

CaAa w/ Ice:

3 x Standoff Arms (B2759) = 2.0*5"/12*3'*3 = 7.5 ft^2
3 x 2 Std. x 6'-0" Pipes = 1.2*3.375"/12*6'*3 = 6.1 ft^2
Tot = 13.6 ft^2

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type = HELIAX 1-5/8"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.98$ in (User Input)

Coax Cable Length = $L_{coax} := 28.25$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 1.04$ plf (User Input)

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

No. of Coax Projecting Outside Face of PCS Mast = $NP_{coax} := 4$ (User Input)

Coax aspect ratio, $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 171.2$

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

Wind Load (without ice)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.7$ sf/ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{Mast1} \cdot G_H \cdot A_{coax} = 35$ plf **BLC 5**

Wind Load (with ice)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot t_{izMast1})}{12} = 1$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qz_{ice.Mast1} \cdot G_H \cdot AICE_{coax} = 12$ plf **BLC 4**

Wind Load (Service)

Total Coax Wind Force Service Loads = $F_{coax} := Ca_{coax} \cdot qz_{Mast1.Ser} \cdot G_H \cdot A_{coax} = 10$ plf **BLC 6**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 19$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot t_{izMast1})^2 - D_{coax}^{\ 2}\right] = 26.4$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 185$ plf **BLC 3**

(Global) Model Settings

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

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

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

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

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\...	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	65	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	65	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	62	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	60	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Mast	HSS12.750X0.375	Column	Pipe	A500 Gr.46	Typical	13.6	262	262	523

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Mast	28.25			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	BOTC...	TOPM...			Mast	Column	Pipe	A500 Gr.46	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	BOTCONNECTION	0	0	0	0	
2	TOPCONNECTION	0	15	0	0	
3	TOPMAST	0	28.25	0	0	

Joint Boundary Conditions

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

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.3	28.25
2	M1	Y	-.5	28.25

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-1.08	28.25
2	M1	Y	-.075	28.25

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.499	28.25
2	M1	X	.143	28.25

Member Point Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	1.68	28.25
2	M1	X	.468	28.25

Member Point Loads (BLC 6 : Service Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]

Member Point Loads (BLC 6 : Service Wind) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.5	28.25
2	M1	X	.139	28.25

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.019	-.019	0	0

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.038	-.038	0	0
2	M1	Y	-.185	-.185	0	0

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.017	.017	0	0
2	M1	X	.012	.012	0	0

Member Distributed Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.056	.056	0	0
2	M1	X	.035	.035	0	0

Member Distributed Loads (BLC 6 : Service Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.017	.017	0	0
2	M1	X	.01	.01	0	0

Basic Load Cases

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

Load Combinations

	Description	Sol..	PD..	SR..	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	1.2D + 1.6...	Yes	Y		1	1.2	2	1.2	5	1.6												
2	0.9D + 1.6...	Yes	Y		1	.9	2	.9	5	1.6												
3	1.2D +1.0...	Yes	Y		1	1.2	2	1.2	3	1	4	1										
4	1.0D + 1.0...	Yes	Y		1	1	2	1	6	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	BOTCONNEC...	max	2.812	1	10.628	3	0	4	0	4	0	4	0	4
2		min	.522	4	2.38	2	0	1	0	1	0	1	0	1
3	TOPCONNEC...	max	-1.924	4	0	4	0	4	0	4	0	4	0	4
4		min	-10.362	1	0	1	0	1	0	1	0	1	0	1
5	Totals:	max	-1.402	4	10.628	3	0	4						
6		min	-7.55	1	2.38	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotation [rad]	LC
1	BOTCONNE...	max	0	4	0	4	0	4	0	4	0	4	2.935e-03	1
2		min	0	1	0	1	0	1	0	1	0	1	5.451e-04	4
3	TOPCONNE...	max	0	4	-.001	2	0	4	0	4	0	4	-1.207e-03	4
4		min	0	1	-.005	3	0	1	0	1	0	1	-6.5e-03	1
5	TOPMAST	max	1.963	1	-.002	2	0	4	0	4	0	4	-2.79e-03	4
6		min	.365	4	-.007	3	0	1	0	1	0	1	-1.502e-02	1

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

	Memb...	Shape	Code Check	L...	LC	Sh...	L...	Dir	...phi*P...	phi*Pn...	phi*Mn y-y [k-ft]	phi*...	Cb	Eqn
1	M1	HSS12.750...	.319	1...	1	.032	1...		1 376.9...	563.04	185.265	185...	1....	H1...

Joint Reactions

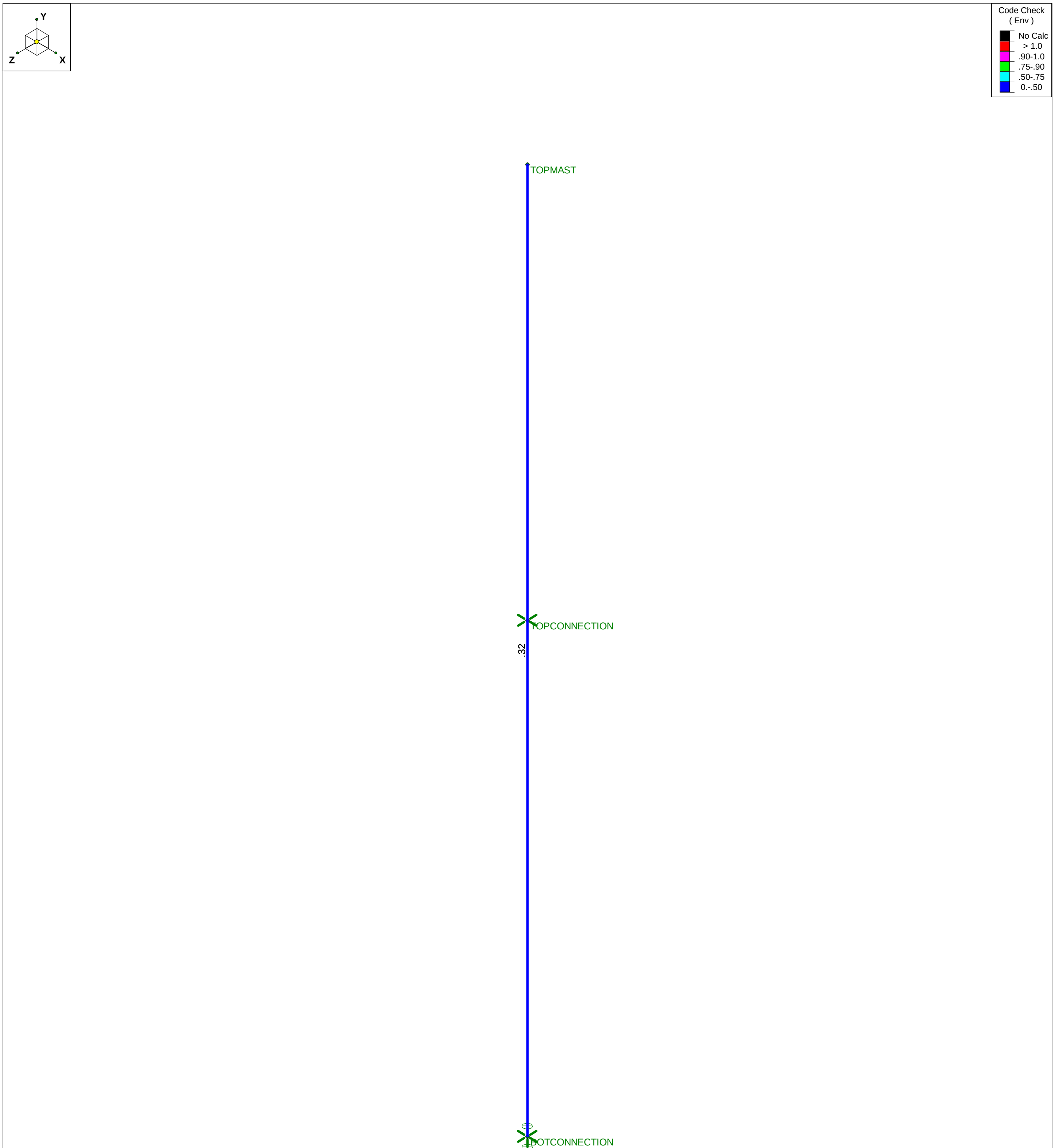
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	2.812	3.184	0	0	0	0
2	1	TOPCONNECTION	-10.362	0	0	0	0	0
3	1	Totals:	-7.55	3.184	0			
4	1	COG (ft):	X: 0	Y: 18.383	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	2.808	2.388	0	0	0	0
2	2	TOPCONNECTION	-10.358	0	0	0	0	0
3	2	Totals:	-7.55	2.388	0			
4	2	COG (ft):	X: 0	Y: 18.383	Z: 0			

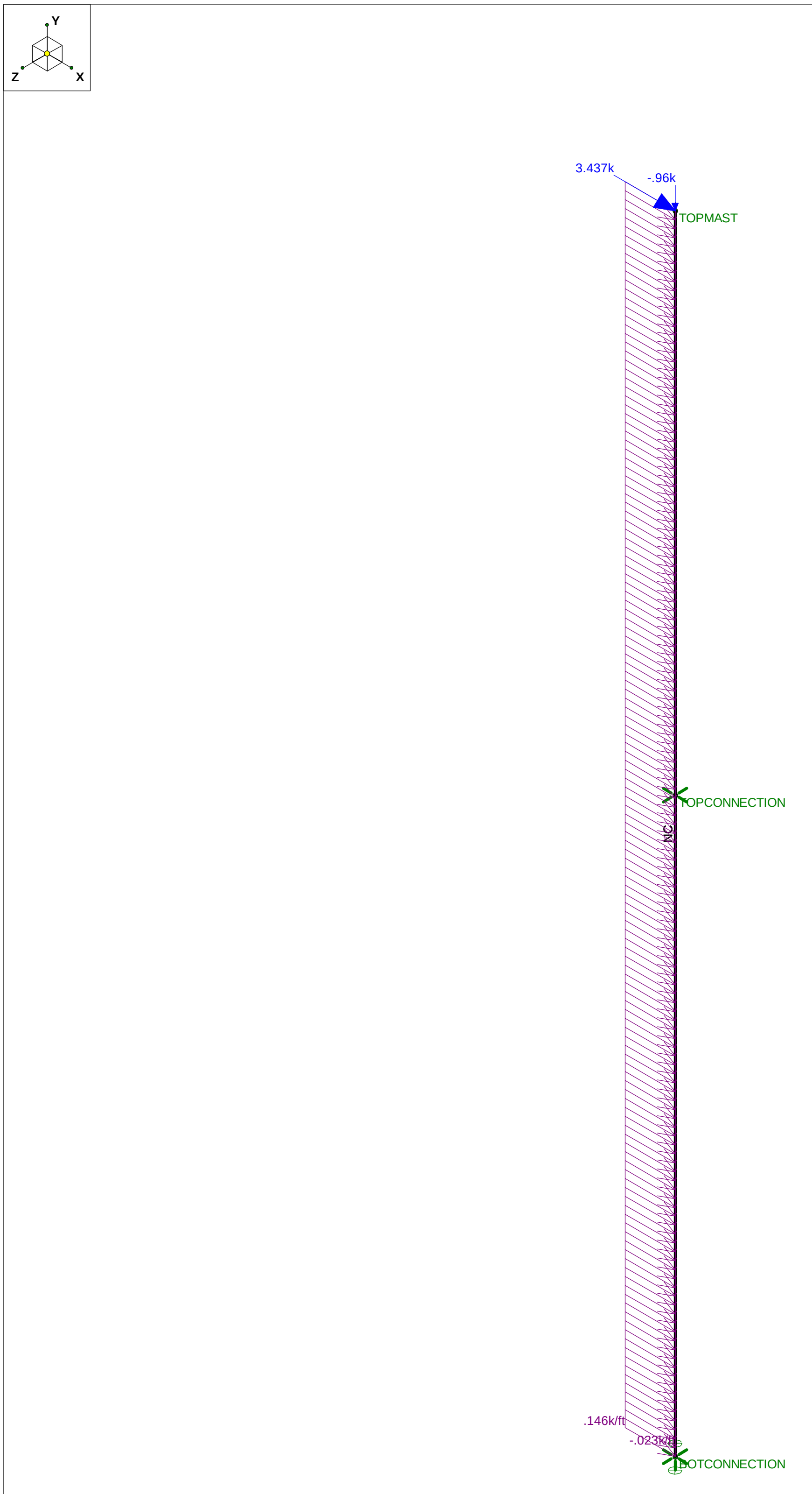
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTCONNECTION	.528	10.639	0	0	0	0
2	3	TOPCONNECTION	-1.989	0	0	0	0	0
3	3	Totals:	-1.461	10.639	0			
4	3	COG (ft):	X: 0	Y: 16.933	Z: 0			



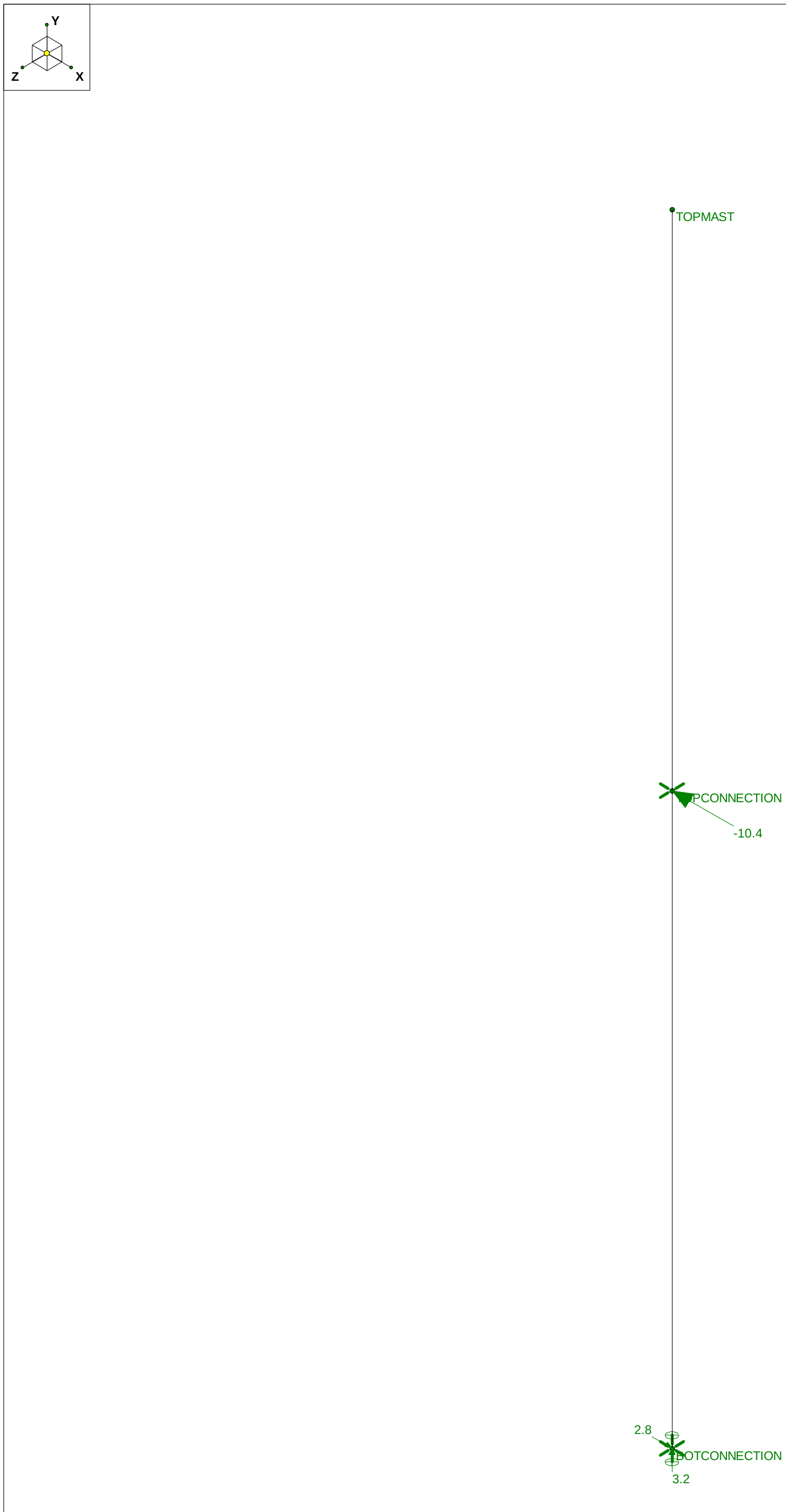
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:13 PM
21051.02 /T-Mobile CT118...	Unity Check	TIA.r3d



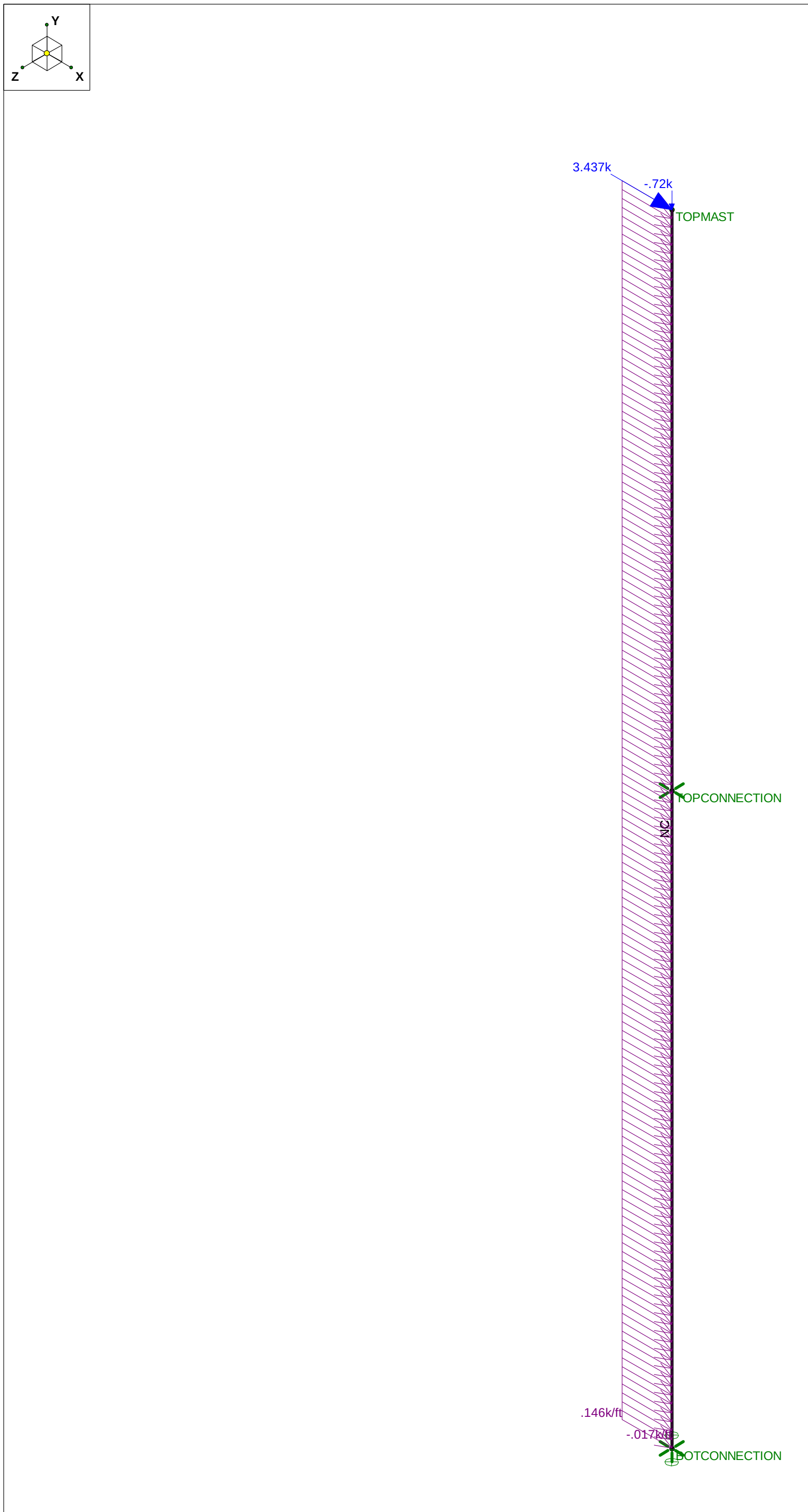
Member Code Checks Displayed
Loads: LC 1, 1.2D + 1.6W

CENTEK Engineering, INC.	Strcuture #838 - Mast	
TJL		Dec 14, 2021 at 1:13 PM
21051.02 /T-Mobile CT118...	LC #1 Loads	TIA.r3d



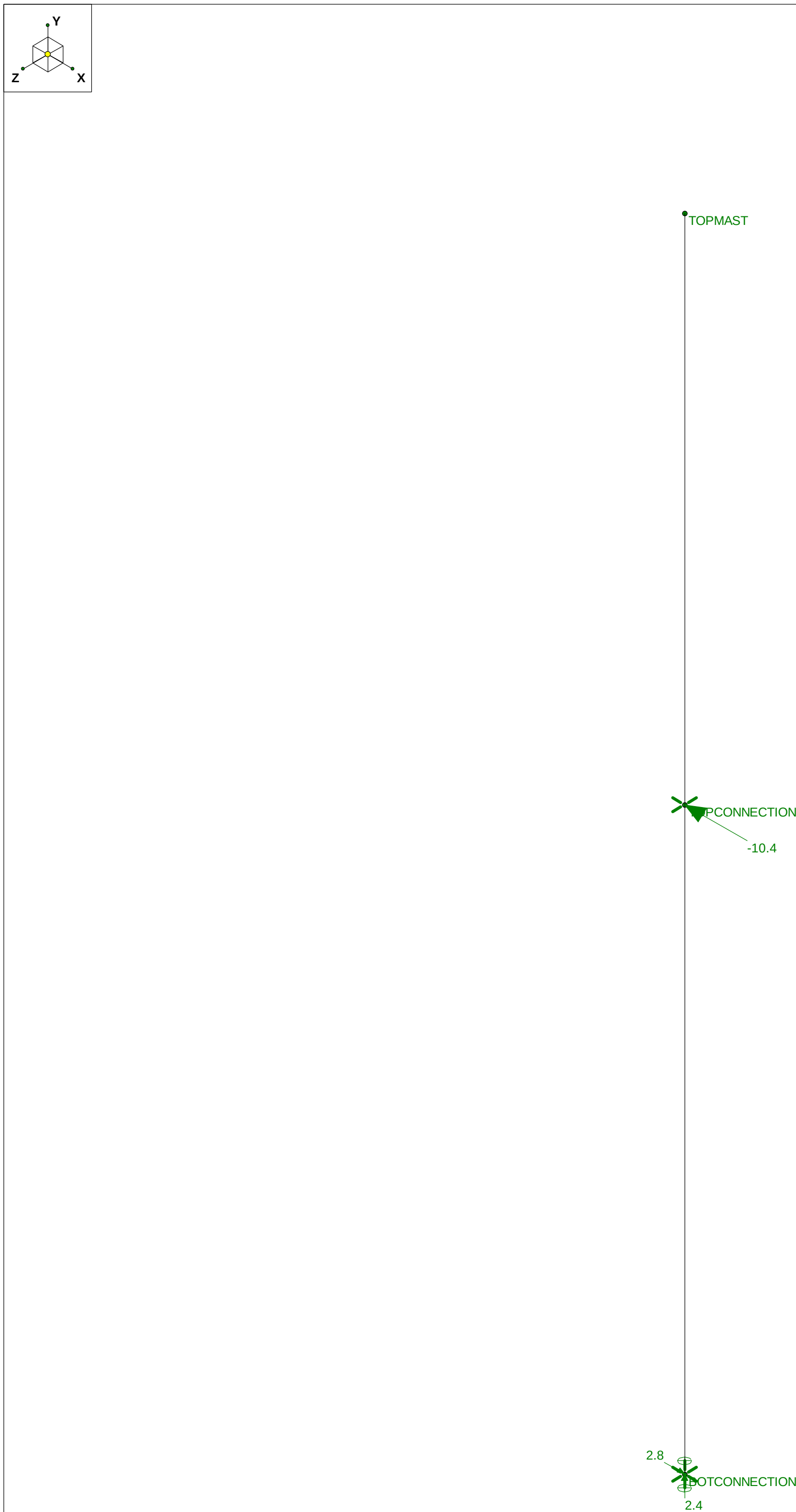
Reaction and Moment Units are k and k-ft

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:14 PM
21051.02 /T-Mobile CT118...	LC #1 Reactions	TIA.r3d



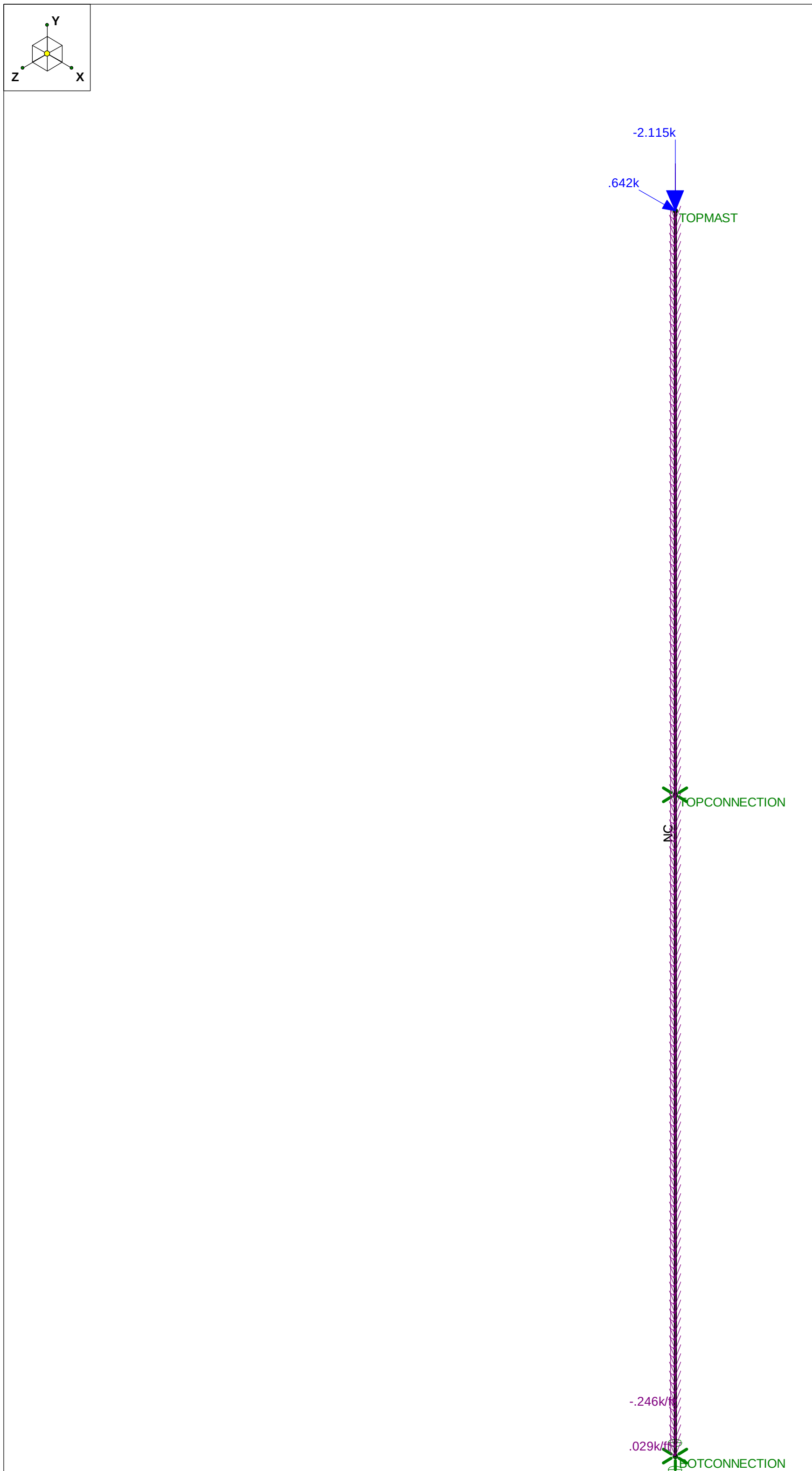
Member Code Checks Displayed
Loads: LC 2, 0.9D + 1.6W

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:14 PM
21051.02 /T-Mobile CT118...	LC #2 Loads	TIA.r3d



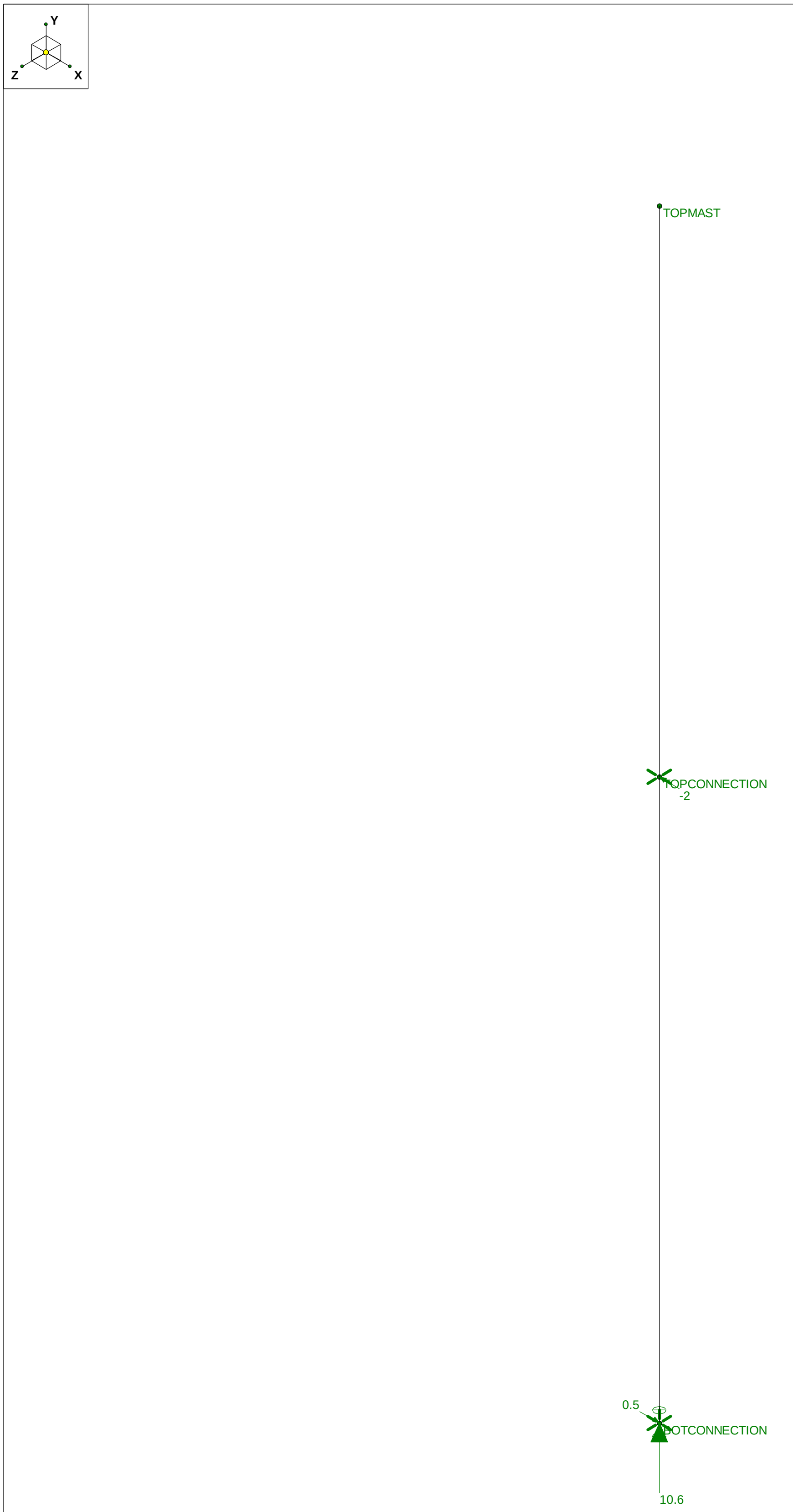
Reaction and Moment Units are k and k-ft

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:15 PM
21051.02 /T-Mobile CT118...	LC #2 Reactions	TIA.r3d



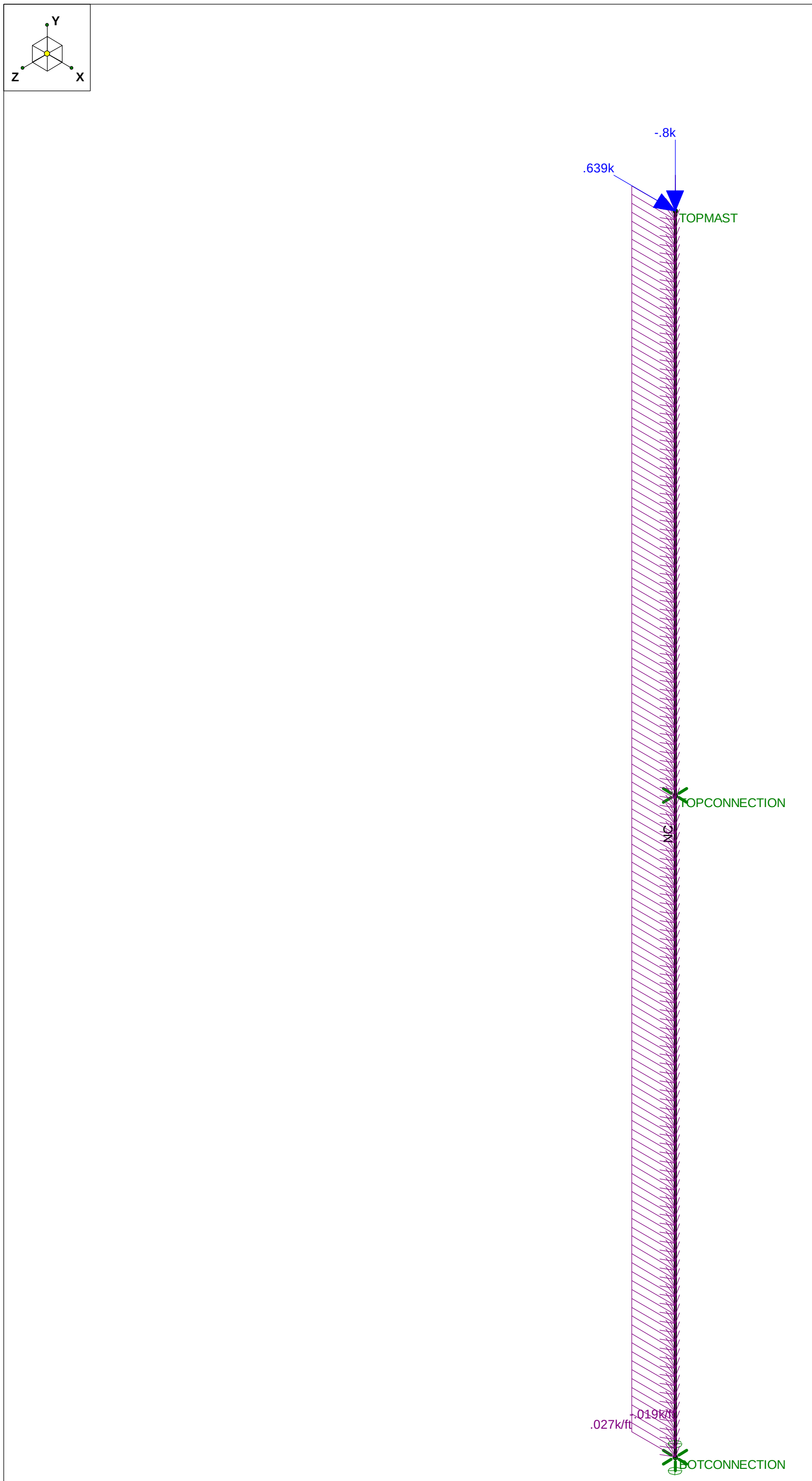
Member Code Checks Displayed
Loads: LC 3, 1.2D +1.0Di + 1.0Wi

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:14 PM
21051.02 /T-Mobile CT118...	LC #3 Loads	TIA.r3d



Reaction and Moment Units are k and k-ft

CENTEK Engineering, INC.	Strcuture #838 - Mast	
TJL		Dec 14, 2021 at 1:16 PM
21051.02 /T-Mobile CT118...	LC #3 Reactions	TIA.r3d

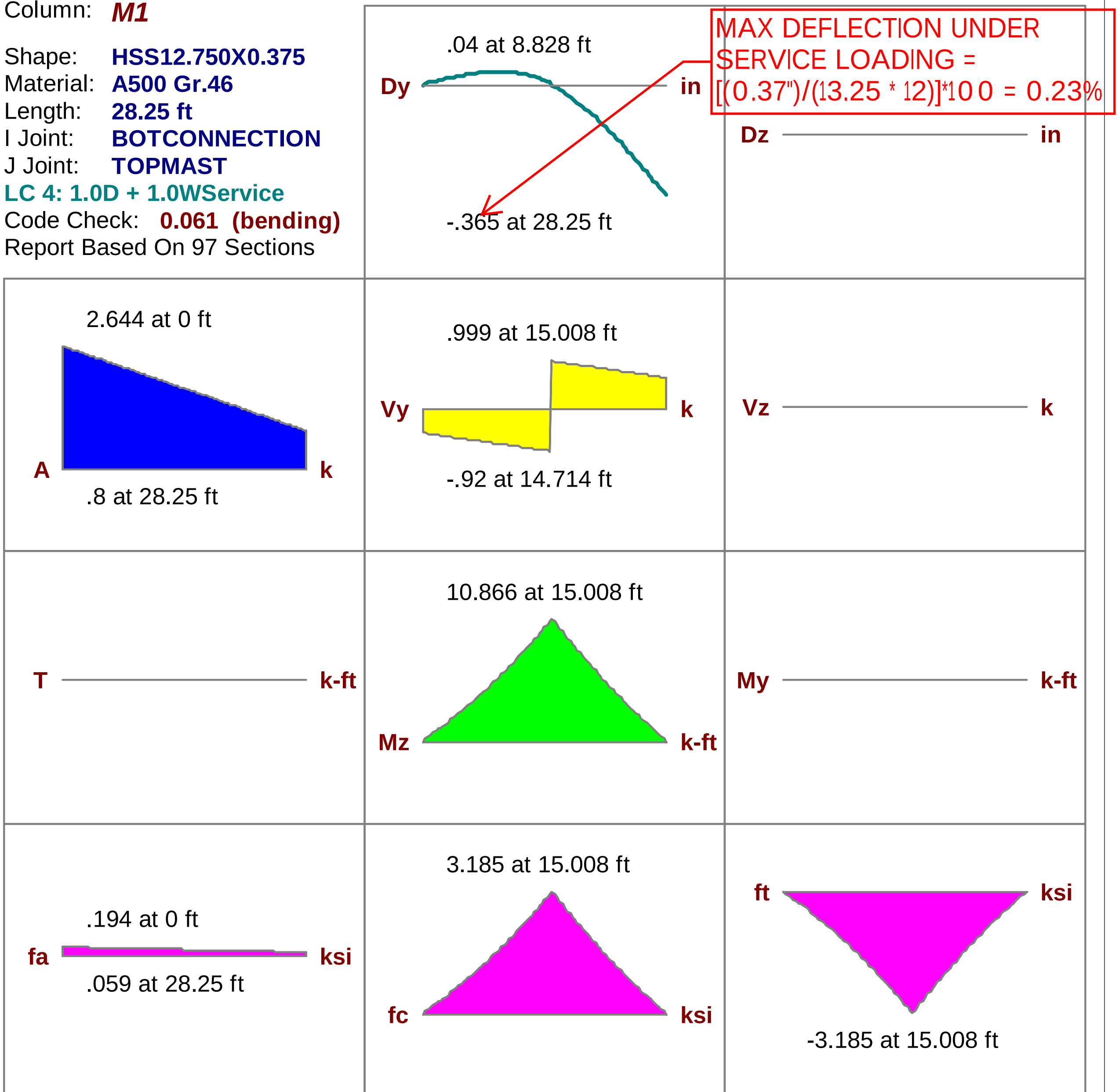


Member Code Checks Displayed
Loads: LC 4, 1.0D + 1.0WService

CENTEK Engineering, INC.		
TJL	Strcuture #838 - Mast	Dec 14, 2021 at 1:14 PM
21051.02 /T-Mobile CT118...	LC #4 Loads	TIA.r3d

Column: ***M1***

Shape: **HSS12.750X0.375**
Material: **A500 Gr.46**
Length: **28.25 ft**
I Joint: **BOTCONNECTION**
J Joint: **TOPMAST**
LC 4: 1.0D + 1.0WService
Code Check: **0.061 (bending)**
Report Based On 97 Sections



AISC 14th(360-10): LRFD Code Check
Direct Analysis Method

Max Bending Check	**0.061**	Max Shear Check	**0.006 (s)**
Location	**15.008 ft**	Location	**15.008 ft**
Equation	**H1-1b**	Max Defl Ratio	**L/929**
Bending	**Compact**	Compression	**Non-Slender**

			y-y	z-z
Fy	**46 ksi**	Lb	**28.25 ft**	**28.25 ft**
phi*Pnc	**376.935 k**	KL/r	**77.236**	**77.236**
phi*Pnt	**563.04 k**			
phi*Mny	**185.265 k-ft**	L Comp Flange	**28.25 ft**	
phi*Mnz	**185.265 k-ft**	L-torque	**28.25 ft**	
phi*Vny	**168.912 k**	Tau_b	**1**	
phi*Vnz	**168.912 k**			
phi*Tn	**175.924 k-ft**			
Cb	**1.412**			

Mast Top Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 0 \cdot kips$	(User Input)
Horizontal =	$Horz := 10.4 \cdot kips$	(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 =	$e := 21.125 \cdot in$	(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 = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 1.733 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 3.9 \cdot ksi$

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

$Condition2 = "OK"$

$\frac{f_t}{(\phi \cdot F'_{nt})} = 5.8 \cdot \%$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{\sqrt{Vert^2 + Horz^2}}{n_b \cdot a_b} = 3.923 \cdot ksi$

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

$Condition3 = "OK"$

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

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 = $F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 3.572 \cdot kips$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 8.086 \cdot ksi$

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

$Condition4 = "OK"$

$\frac{f_t}{(\phi \cdot F'_{nt})} = 12 \cdot \%$

Mast Connection to Bottom Bracket:

Design Reactions at Brace:

Axial (Max) =	$Axial_{max} := 10.6 \cdot kips$	(User Input)
Axial (Min) =	$Axial_{min} := 2.4 \cdot kips$	(User Input)
Shear =	$Shear := 2.8 \cdot kips$	(User Input)
Moment =	$Moment := 0 \cdot kips \cdot ft$	(User Input)

Anchor Bolt Data:

Bolt Grade =	A325	(User Input)
Design Shear Stress =	$F_V := 40.5 \cdot ksi$	(User Input)
Design Tension Stress =	$F_T := 67.5 \cdot ksi$	(User Input)
Total Number of Bolts =	$n_b := 4$	(User Input)
Number of Bolts Tension Side Parallel =	$n_{b.par} := 2$	(User Input)
Number of Bolts Tension Side Diagonal =	$n_{b.diag} := 1$	(User Input)
Bolt Diameter =	$d_b := 1in$	(User Input)
Bolt Spacing X Direction =	$S_x := 11 \cdot in$	(User Input)
Bolt Spacing Z Direction =	$S_z := 11 \cdot in$	(User Input)

Base Plate Data:

Base Plate Steel =	A36	(User Input)
Allowable Yield Stress =	$F_y := 36 \cdot ksi$	(User Input)
Base Plate Width =	$Pl_w := 14.5 \cdot in$	(User Input)
Base Plate Thickness =	$Pl_t := 1 \cdot in$	(User Input)
Bolt Edge Distance =	$B_E := 1.75 \cdot in$	(User Input)
Pole Diameter =	$D_p := 12.75 \cdot in$	(User Input)

Base Plate Data:

Weld Grade	E70XX	(User Input)
Weld Yield Stress =	$F_{yw} := 70 \cdot ksi$	(User Input)
Weld Size =	$sw := 0.3125 \cdot in$	(User Input)

Anchor Bolt Check:

Bolt Area = $a_b := \frac{1}{4} \cdot \pi \cdot d_b^{\,2} = 0.785 \cdot in^2$

Shear per bolt = $V_{bolt} := \frac{Shear}{n_b} = 0.7 \cdot kips$

Actual Shear Stress = $f_v := \frac{V_{bolt}}{a_b} = 0.89 \cdot ksi$

Condition1 := if($f_v < F_v$, "OK" , "Overstressed")

Condition1 = "OK"

Bolt Spacing Diag. Direction = $S_{diag} := \sqrt{S_x^{\,2} + S_z^{\,2}} = 15.56 \cdot in$

Tension Load per Bolt Parallel = $T_{par} := \frac{Moment}{S_x \cdot n_{b.par}} - \frac{Axial_{min}}{n_b} = -0.6 \cdot kips$

Tension Load per Bolt Diagonal = $T_{diag} := \frac{Moment}{S_{diag} \cdot n_{b.diag}} - \frac{Axial_{min}}{n_b} = -0.6 \cdot kips$

Tension per bolt = $T := \text{if}\left(T_{par} > T_{diag}, T_{par}, T_{diag}\right) = -0.6 \cdot kips$

Actual Tensile Stress = $f_t := \frac{T}{a_b} = -0.76 \cdot ksi$

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

Condition2 = "OK"

Base Plate Check:

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

Plate Bending Width = $Z := \left(Pl_w \cdot \sqrt{2} - D_p\right) = 7.76 \cdot in$

Moment Arm = $K := \frac{\left(S_{diag} - D_p\right)}{2} = 1.4 \cdot in$

Load per Bolt Diagonal = $P_{diag} := \frac{Moment}{S_{diag} \cdot n_{b.diag}} + \frac{Axial_{max}}{n_b} = 2.65 \cdot kips$

Moment in Base Plate = $M := K \cdot P_{diag} = 3.72 \cdot kips \cdot in$

Plastic Section Modulus = $Z := \frac{1}{4} \cdot Z \cdot Pl_t^{\,2} = 1.94 \cdot in^3$

Bending Stress = $f_b := \frac{M}{Z} = 1.92 \cdot ksi$

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

Condition3 = "OK"

Base Plate to PCS Mast Weld Check:

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

Weld Area = $A_w := \frac{\pi}{4} \cdot \left[\left(D_p + 2sw \cdot 0.707 \right)^2 - D_p^2 \right] = 9 \cdot in^2$

Weld Moment of Inertia = $I_w := \frac{\pi}{64} \cdot \left[\left(D_p + 2sw \cdot 0.707 \right)^4 - D_p^4 \right] = 189.4 \cdot in^4$

$c := \frac{D_p}{2} + sw \cdot 0.707 = 6.6 \cdot in$

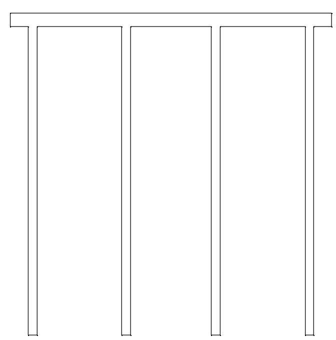
Section Modulus of Weld = $S_w := \frac{I_w}{c} = 28.71 \cdot in^3$

Weld Stress = $f_w := \frac{Moment}{S_w} + \frac{Shear}{A_w} = 0.31 \cdot ksi$

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

Condition4 = "OK"

Check Gusset Plates Below Base Plates:



Gusset Plate Data:

Allowable Yield Stress = $F_y := 36 \cdot ksi$ (User Input)

Plate Height = $Pl_h := 17.375 \cdot in$ (User Input)

Plate Thickness = $Pl_t := 0.5 \cdot in$ (User Input)

Distance from CL Pole to Face of Collar = $d := 9.25 \cdot in$ (User Input)

Section Modulus Gusset Assembly = $S_x := 134.8 \cdot in^3$ (User Input)

Max Moment = $Moment_{max} := Moment + Axial_{max} \cdot d = 98.05 \cdot in \cdot kips$

Bending Stress = $f_b := \frac{Moment_{max}}{S_x} = 0.73 \cdot ksi$

Condition5 := if($f_b < F_b$, "OK", "Overstressed")

Condition5 = "OK"

Weld Data:

Weld Yield Stress =	$F_{yw} := 70 \cdot ksi$	(User Input)
Weld Size =	$sw := .1875 \cdot in$	(User Input)
Weld Area =	$A_w := 18.8 \cdot in^2$	(User Input)
Section Modulus of Weld =	$S_w := 55.6 \cdot in^3$	(User Input)

Weld Stress =

$$f_w := \frac{Moment_{max}}{S_w} + \frac{Axial_{max}}{A_w} = 2.33 \cdot ksi$$

Condition6 := if($f_w < F_w$, "OK", "Overstressed")

Condition6 = "OK"

Mast Bottom Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 10.6 \cdot kips$	(User Input)
Horizontal =	$Horz := 2.8 \cdot kips$	(User Input)
Moment =	$Moment := 0 \cdot ft \cdot kips$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 16$	(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 =	$e := 21.125 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 27.25 \cdot in$	(User Input)
Vetical Spacing From Plate CL to Bolt 1 =	$S_{vert1} := 1.5 \cdot in$	(User Input)
Vetical Spacing From Plate CL to Bolt 2 =	$S_{vert2} := 4.5 \cdot in$	(User Input)
Vetical Spacing From Plate CL to Bolt 3 =	$S_{vert3} := 7.5 \cdot in$	(User Input)
Vetical Spacing From Plate CL to Bolt 4 =	$S_{vert4} := 10.5 \cdot in$	(User Input)

Bolt Polar Moment of Inertia = $I_p := 4 \cdot S_{vert1}^2 + 4 \cdot S_{vert2}^2 + 4 \cdot S_{vert3}^2 + 4 \cdot S_{vert4}^2 = 756 \cdot in^2$

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 =

$$f_v := \frac{Vert}{n_b \cdot a_b} = 1.5 \cdot ksi$$

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

$$\frac{f_v}{(\phi \cdot F_{nv})} = 3.7 \cdot \%$$

Condition1 = "OK"

Tensile Stress Adjusted for Shear =

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

Tension Force Each Bolt =

$$F_{tension.bolt} := \frac{Horz}{n_b} + \frac{(Vert \cdot e + Moment) \cdot S_{vert4}}{I_p} = 3.285 \cdot kips$$

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")

$$\frac{f_t}{(\phi \cdot F'_{nt})} = 11 \cdot \%$$

Condition2 = "OK"

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt =

$$f_v := \frac{\sqrt{\left(\frac{Vert}{n_b} + \frac{Moment \cdot 2}{S_{horz} \cdot n_b}\right)^2 + \left(\frac{Horz}{n_b}\right)^2}}{a_b} = 1.551 \cdot ksi$$

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

$$\frac{f_v}{(\phi \cdot F_{nv})} = 3.8 \cdot \%$$

Condition3 = "OK"

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 =

$$F_{tension.conn} := \frac{Horz \cdot e}{\frac{n_b}{S_{horz} \cdot 2}} + \frac{(Vert \cdot e) \cdot S_{vert4}}{I_p} = 3.381 \cdot kips$$

Tension Stress Each Bolt =

$$f_t := \frac{F_{tension.conn}}{a_b} = 7.654 \cdot ksi$$

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

$$\frac{f_t}{(\phi \cdot F'_{nt})} = 11.3 \cdot \%$$

Condition4 = "OK"

Basic Components

Heavy Wind Pressure = $p := 4.00$ psf (User Input NESC 2017 Figure 250-1 & Table 250-1)

Basic Windspeed = $V := 110$ mph (User Input NESC 2017 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 = $TME := 105$ 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 2017 Table 250-3 equation)

Importance Factor = $I := 1.0$ (User Input from NESC 2017 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.279$ (NESC 2017 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.311$ (NESC 2017 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.848$ (NESC 2017 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.867$ (NESC 2017 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 34.3$ psf (NESC 2017 Section 250.C.2)

Shape Factors

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

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

Shape Factor for Open Lattice = $Cd_{OL} := 3.2$ (User Input)

Shape Factor for Coax Cables Attached to Outside of Pole = $Cd_{coax} := 1.6$ (User Input)

Overload Factors

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 Mast

Mast Data: (HSS12.75"x0.375")

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 12.75$ in (User Input)

Mast Length = $L_{mast} := 28.25$ ft (User Input)

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

Wind Load (NESC Extreme)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 1.063$ sf/ft

Total Mast Wind Force (Above Structure) = $qz \cdot Cd_{coax} \cdot A_{mast} \cdot m = 73$ plf **BLC 5**

Total Mast Wind Force (Below Structure) = $qz \cdot Cd_{coax} \cdot A_{mast} = 58$ plf **BLC 5**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.146$ sf/ft

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

Gravity Loads (without ice)

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

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\ 2}\right] = 20.8$ sq in

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

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFSAPXVARR18_43		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 19.7$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.5$	in	(User Input)
Antenna Weight =	$WT_{ant} := 100$	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 = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 9.9$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 29.5$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 2029$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 10.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 31.5$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 201$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 300$ lbs **BLC 2**

Gravity Load (ice only)

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

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 2299$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 75$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 224$ lbs **BLC 3**

Development of Wind & Ice Load on Antenna Mounts

Mount Data:

Mount Type:	Valmont Standoff Arms		
Mount Shape =	Flat		(User Input)
Mount Projected Surface Area =	$CdAa := 9.4$	sf	(User Input)
Mount Projected Surface Area w/ Ice =	$CdAa_{ice} := 12.6$	sf	(User Input)
Mount Weight =	$WT_{mnt} := 500$	lbs	(User Input)
Mount Weight w/ Ice =	$WT_{mnt.ice} := 575$	lbs	

Wind Load (NESC Extreme)

Total Mount Wind Force =	$F_{mnt} := qz \cdot CdAa \cdot m = 403$	lbs	**BLC 5**

Wind Load (NESC Heavy)

Total Mount Wind Force w/ Ice =	$Fi_{mnt} := p \cdot CdAa_{ice} = 50$	lbs	**BLC 4**

Gravity Loads (without ice)

Weight of All Mounts =	$WT_{mnt} = 500$	lbs	**BLC 2**

Gravity Load (ice only)

Weight of Ice on All Mounts =	$WT_{mnt.ice} - WT_{mnt} = 75$	lbs	**BLC 3**

Weight:

Tri-Bracket (80168) = 250 lbs
3 x Standoff Arms (B2759) = 50lbs * 3 = 150 lbs
3 x 2 Std. x 6'-0" Pipes = 3.66plf*6'*3 = 66 lbs
Miscl = 25 lbs
Tot = 490 lbs

Weight Ice:

3 x Standoff Arms (B2759) = (5"^2-4"^2)/144*3'*3*56pcf = 32 lbs
3 x 2 Std. x 6'-0" Pipes = $\frac{\pi}{4}$(3.375"^2-2.375"^2)/144*6'*3*56pcf = 32 lbs
Tot = 64 lbs

CaAa:

3 x Standoff Arms (B2759) = 1.6*4"/12*3'*3 = 4.8 ft^2
3 x 2 Std. x 6'-0" Pipes = 1.3*2.375"/12*6'*3 = 4.6 ft^2
Tot = 9.4 ft^2

CaAa w/ Ice:

3 x Standoff Arms (B2759) = 1.6*5"/12*3'*3 = 6.0 ft^2
3 x 2 Std. x 6'-0" Pipes = 1.3*3.375"/12*6'*3 = 6.6 ft^2
Tot = 12.6 ft^2

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type =	HELIAX 1-5/8"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.98$	in	(User Input)
Coax Cable Length =	$L_{coax} := 28.25$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 1.04$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 18$		(User Input)
No. of Coax Projecting Outside Face of Member =	$NP_{coax} := 4$		(User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.7$ ft

Total Coax Wind Force (Above Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 45$ plf **BLC 5**

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

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.7$ 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 $WT_{coax} := Wt_{coax} \cdot N_{coax} = 19$ plf **BLC 2**

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\;2}\right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 27$ plf **BLC 3**

(Global) Model Settings

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

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

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

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	HSS12.750X0.375	Column	Pipe	A500 Gr.46	Typical	13.6	262	262	523

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Existing Mast	28.25			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	BOTC...	TOPM...			Existing Mast	Column	Pipe	A500 Gr.46	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	BOTCONNECTION	0	0	0	0	
2	TOPCONNECTION	0	15	0	0	
3	TOPMAST	0	28.25	0	0	

Joint Boundary Conditions

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

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.3	28.25
2	M1	Y	-.5	28.25

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.224	28.25
2	M1	Y	-.075	28.25

Member Point Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.201	28.25
2	M1	X	.05	28.25

Member Point Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	2.029	28.25
2	M1	X	.403	28.25

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.019	-.019	0	0

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	0
2	M1	Y	-.027	-.027	0	0

Member Distributed Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.007	.007	0	0
2	M1	X	.005	.005	0	0

Member Distributed Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.073	.073	18.25	0
2	M1	X	.058	.058	0	18.25
3	M1	X	.045	.045	18.25	0
4	M1	X	.036	.036	0	18.25

Basic Load Cases

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

Load Combinations

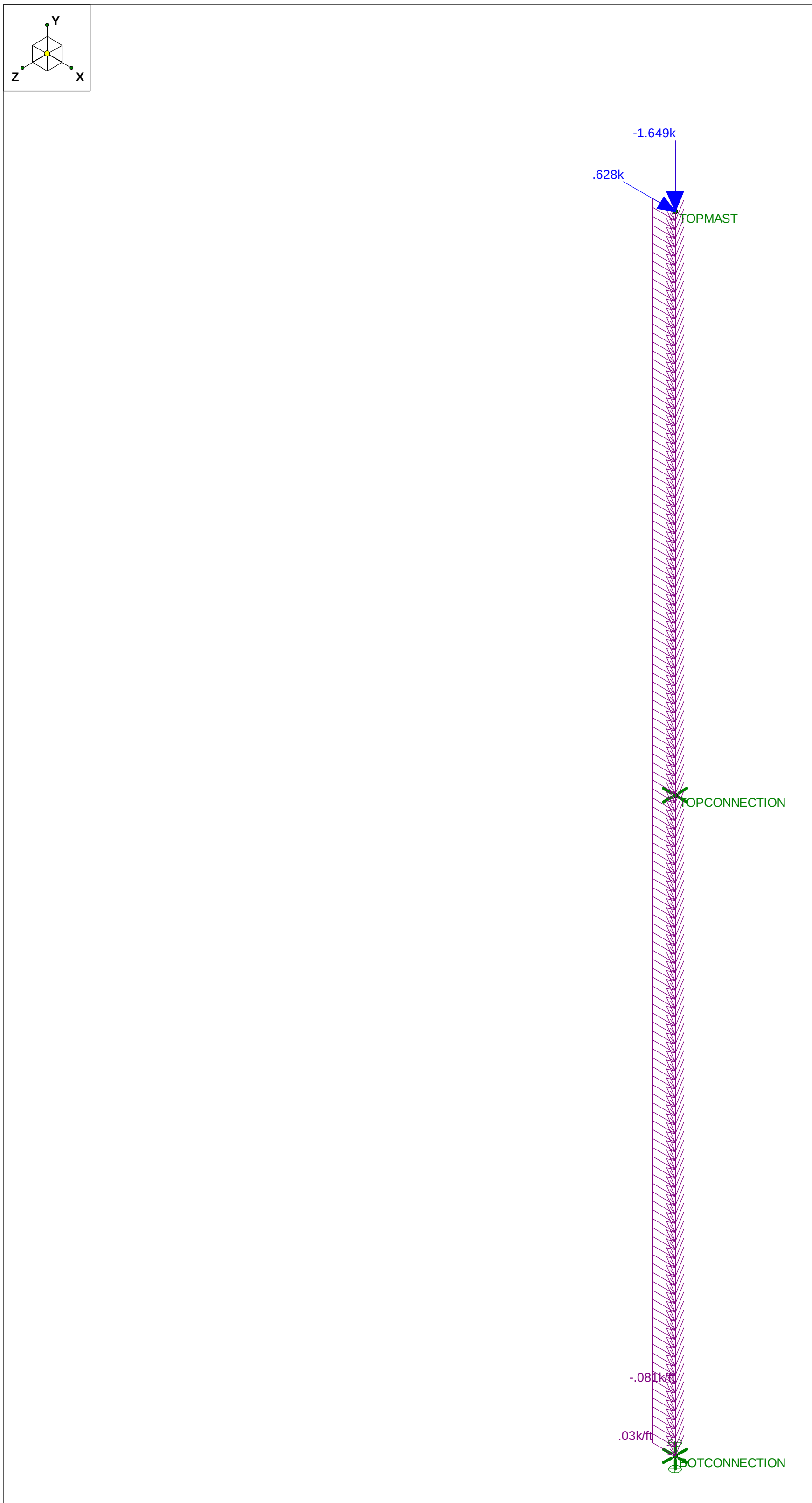
	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	NESC He...	Yes	Y		1	1.5	2	1.5	3	1.5	4	2.5												
2	NESC Ext...	Yes	Y		1	1	2	1	5	1														

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	.51	5.912	0	0	0	0
2	1	TOPCONNECTION	-1.985	0	0	0	0	0
3	1	Totals:	-1.475	5.912	0			
4	1	COG (ft):	X: 0	Y: 18.063	Z: 0			

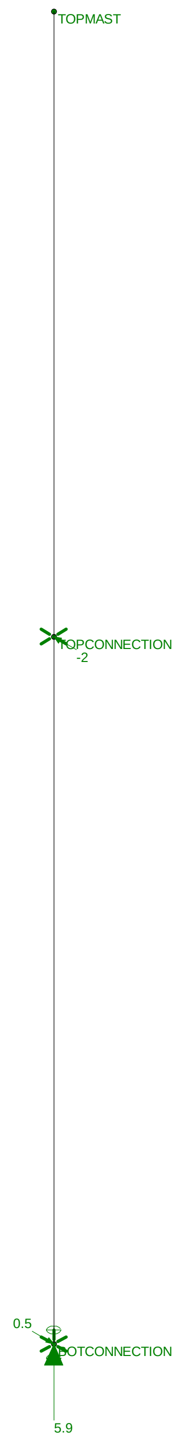
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	2.135	2.654	0	0	0	0
2	2	TOPCONNECTION	-7.463	0	0	0	0	0
3	2	Totals:	-5.327	2.654	0			
4	2	COG (ft):	X: 0	Y: 18.383	Z: 0			



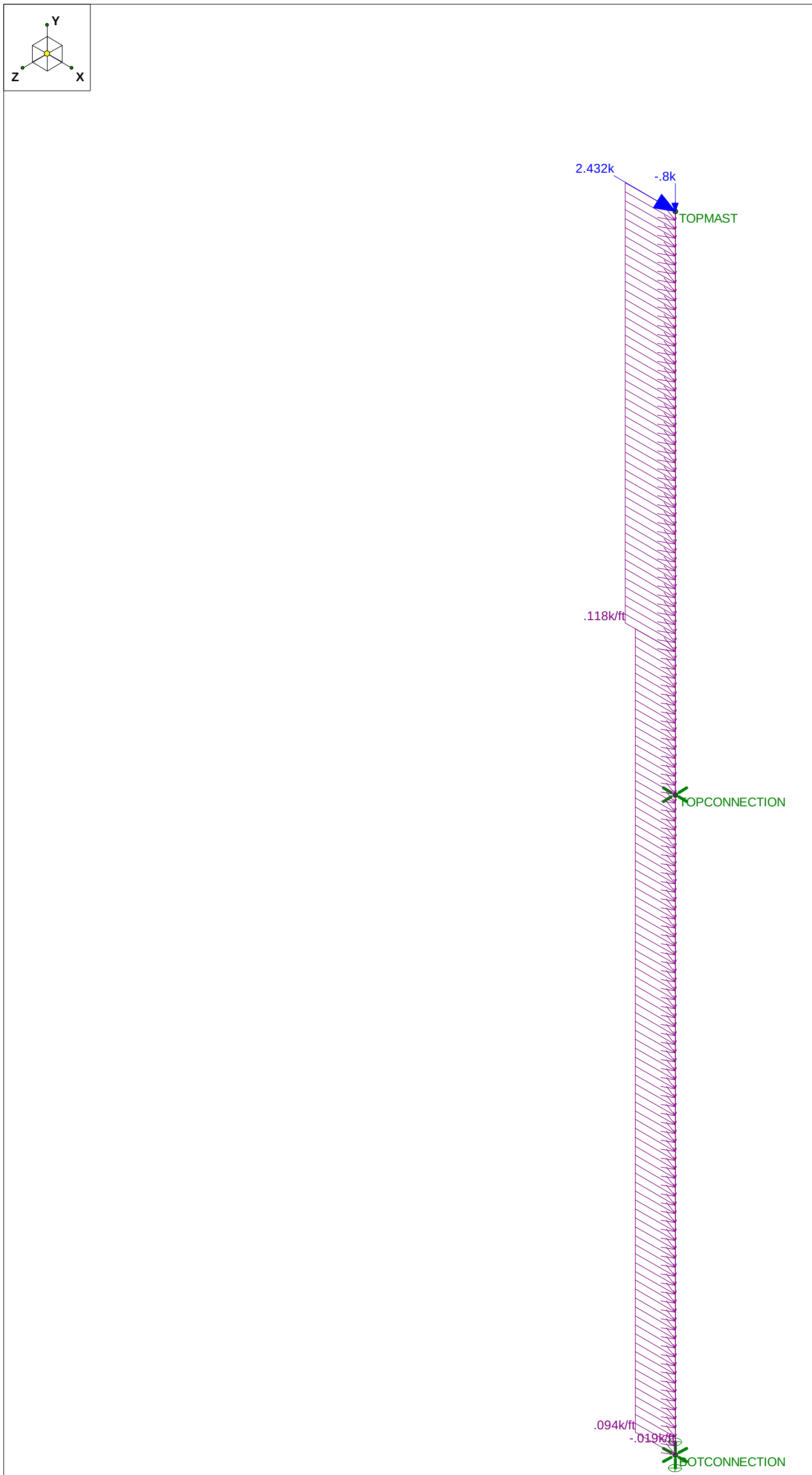
Loads: LC 1, NESC Heavy Wind

CENTEK Engineering, Inc.	Structure # 838 - Mast	
TJL		Dec 14, 2021 at 1:08 PM
21051.02 /T-Mobile CT118...	LC #1 Loads	NESC.r3d



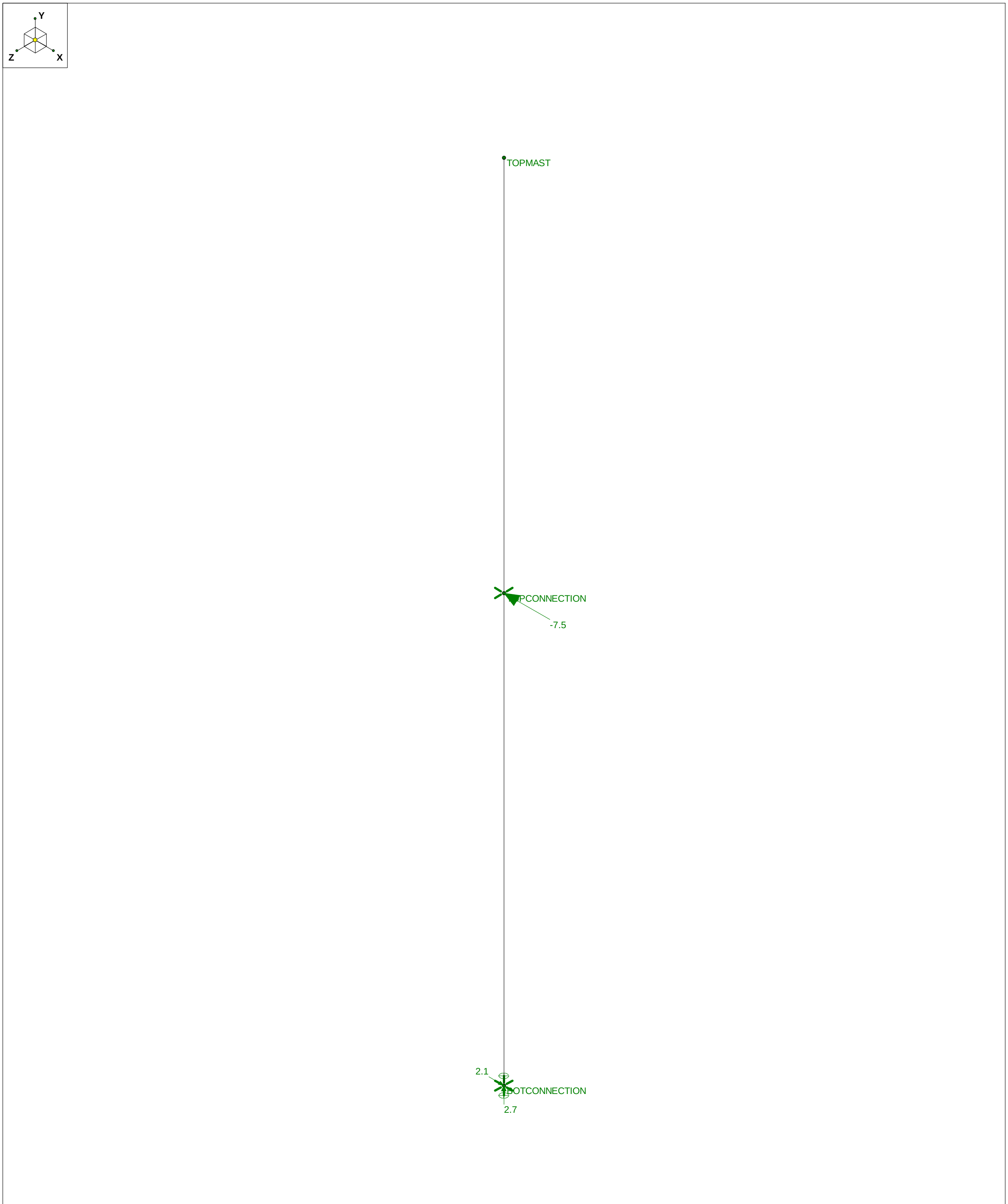
Results for LC 1, NESC Heavy Wind
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.		
TJL	Structure # 838 - Mast	Dec 14, 2021 at 1:10 PM
21051.02 /T-Mobile CT118...	LC #1 Reactions	NESC.r3d



Loads: LC 2, NESC Extreme Wind

CENTEK Engineering, Inc.		
TJL	Structure # 838 - Mast	Dec 14, 2021 at 1:09 PM
21051.02 /T-Mobile CT118...	LC #2 Loads	NESC.r3d



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

CENTEK Engineering, Inc.		
TJL	Structure # 838 - Mast	Dec 14, 2021 at 1:10 PM
21051.02 /T-Mobile CT118...	LC #2 Reactions	NESC.r3d

Coax Cable on CL&P Pole

Coaxial Cable Span $Coax_{Span} := \begin{pmatrix} 5 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} ft$ *(User Input)*

Heavy Wind Pressure =	$p := 4 \cdot psf$	*(User Input)*
Radial Ice Thickness =	$Ir := 0.5 \cdot in$	*(User Input)*
Radial Ice Density =	$Id := 56 \cdot pcf$	*(User Input)*
Basic Windspeed =	$V := 110$ mph	(User Input NESC 2017 Figure 250-2(e))
Height to Top of Coax (on utility pole) Above Grade =	$TC := 75$ ft	(User Input)
NESC Factor =	$kv := 1.43$	(User Input from NESC 2017 Table 250-3 equation)
Importance Factor =	$I := 1.0$	(User Input from NESC 2017 Section 250.C.2)
Velocity Pressure Coefficient =	$Kz := 2.01 \cdot \left(\frac{0.67TC}{900}\right)^{\frac{2}{9.5}} = 1.095$	(NESC 2017 Table 250-2)
Exposure Factor =	$Es := 0.346 \left[\frac{33}{(0.67 \cdot TC)}\right]^{\frac{1}{7}} = 0.326$	(NESC 2017 Table 250-3)
Response Term =	$Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TC}{220}\right)} = 0.887$	(NESC 2017 Table 250-3)
Gust Response Factor =	$Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.894$	(NESC 2017 Table 250-3)
Wind Pressure =	$qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 30.3$ psf	(NESC 2017 Section 250.C.2)

Diameter of Coax Cable =	$D_{coax} := 1.98 \cdot in$	*(User Input)*
Weight of Coax Cable =	$W_{coax} := 1.04 \cdot plf$	*(User Input)*
Number of Coax Cables =	$N_{coax} := 18$	*(User Input)*
Number of Projected Coax Cables =	$NP_{coax} := 3$	*(User Input)*
Shape Factor =	$Cd_{coax} := 1.6$	*(User Input)*
Overload Factor for NESC Heavy Wind Transverse Load =	$OF_{HWT} := 2.5$	*(User Input)*
Overload Factor for NESC Heavy Wind Vertical Load =	$OF_{HWV} := 1.5$	*(User Input)*
Overload Factor for NESC Extreme Wind Transverse Load =	$OF_{EWT} := 1.0$	*(User Input)*
Overload Factor for NESC Extreme Wind Vertical Load =	$OF_{EWV} := 1.0$	*(User Input)*

Wind Area without Ice = $A := \left(NP_{coax} \cdot D_{coax}\right) = 5.94 \cdot in$

Wind Area with Ice = $A_{ice} := \left(NP_{coax} \cdot D_{coax} + 2 \cdot Ir\right) = 6.94 \cdot in$

Ice Area per Liner Ft = $Ai_{coax} := \frac{\pi}{4} \cdot \left[\left(D_{coax} + 2 \cdot Ir\right)^2 - D_{coax}^{\,2}\right] = 0.027\,ft^2$

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax} \cdot Id \cdot N_{coax} = 27.269 \cdot plf$

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 =

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

$$Heavy\_WInd_{Vert} = \begin{pmatrix} 345 \\ 690 \\ 690 \\ 690 \\ 690 \\ 690 \\ 690 \\ 690 \end{pmatrix} lb \qquad Heavy\_Wind_{Trans} = \begin{pmatrix} 46 \\ 93 \\ 93 \\ 93 \\ 93 \\ 93 \\ 93 \\ 93 \end{pmatrix} lb$$

Extreme Wind Vertical Load =

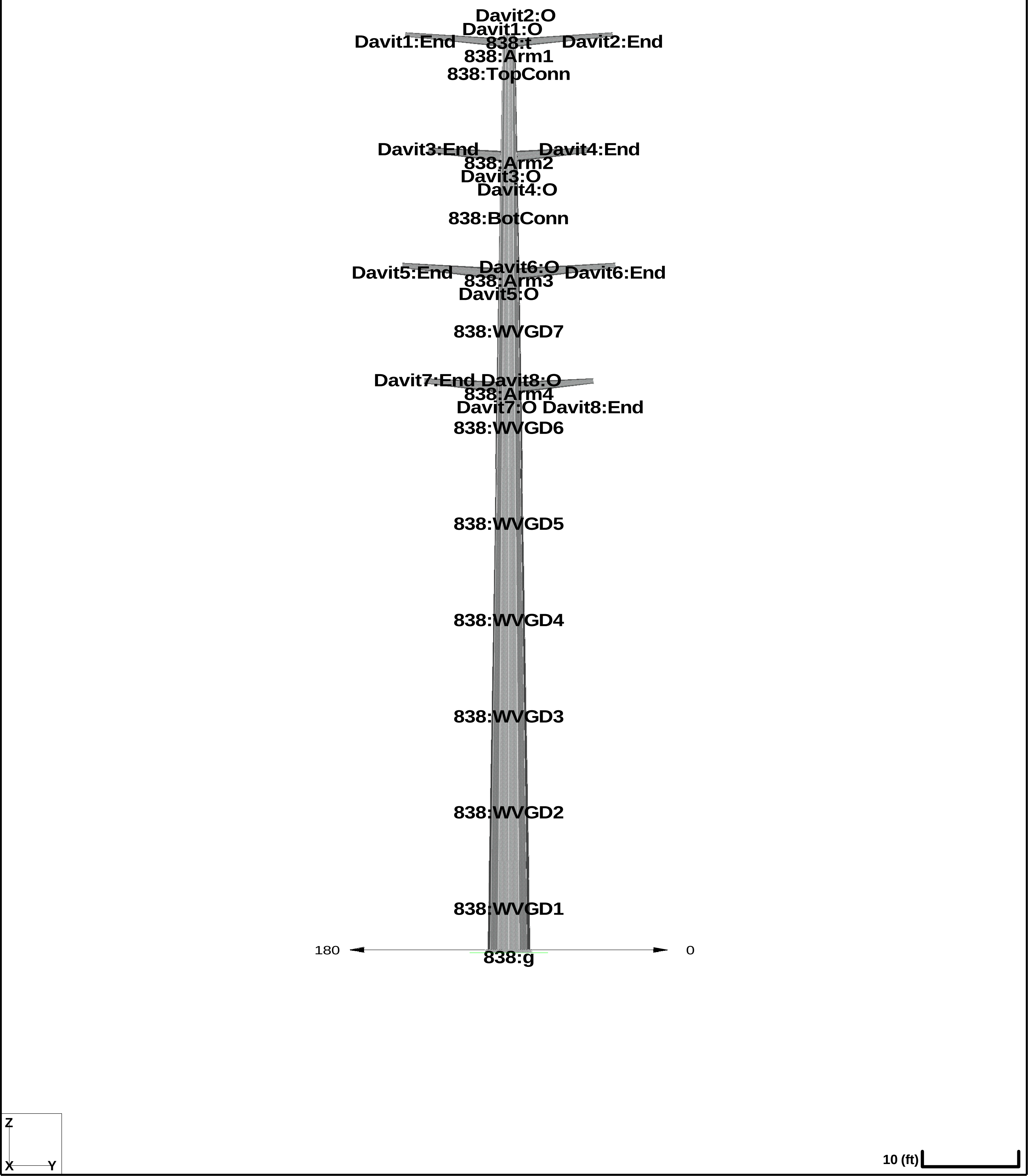
$$Extreme\_Wind_{Vert} := \overrightarrow{\left(N_{coax} \cdot W_{coax} \cdot Coax_{Span} \cdot OF_{EWV}\right)}$$

Extreme Wind Transverse Load =

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

$$Extreme\_Wind_{Vert} = \begin{pmatrix} 94 \\ 187 \\ 187 \\ 187 \\ 187 \\ 187 \\ 187 \\ 187 \end{pmatrix} lb \qquad Extreme\_Wind_{Trans} = \begin{pmatrix} 120 \\ 240 \\ 240 \\ 240 \\ 240 \\ 240 \\ 240 \\ 240 \end{pmatrix} lb$$

Centek Engineering Inc, Project: "cl&p structure # 838"
PLS-POLE Version 16.81, 1:39:57 PM Tuesday, December 14, 2021
Undeformed geometry displayed



Project Name : 21051.02 - Trumbull, CT
Project Notes: Str # 838/ T-Mobile - CT11860A
Project File : J:\Jobs\2105100.WI\02_CT11860A\05_Structural\Tower\Backup Documentation\Rev (3)\Calcs\PLS Pole\cl&p structure # 838.pol
Date run : 7:42:59 AM Tuesday, January 11, 2022
by : PLS-POLE Version 16.81
Licensed to : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.

Loads from file: J:\Jobs\2105100.WI\02_CT11860A\05_Structural\Tower\Backup Documentation\Rev (3)\Calcs\PLS Pole\cl&p #838.lca

*** Analysis Results:

Maximum element usage is 88.19% for Base Plate "838" in load case "NESC Heavy"
Maximum insulator usage is 9.33% for Clamp "Clamp9" in load case "NESC Extreme"

Foundation Design Forces For All Load Cases:

Note: loads are factored.

Load Case	Foundation Description	Axial Force (kips)	Shear Force (kips)	Bending Moment (ft-k)	Foundation Usage %
NESC Heavy	838:g	63.96	48.33	3591.92	0.00
NESC Extreme	838:g	34.82	50.94	3598.18	0.00

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	838:g	-0.09	-48.33	-63.96	48.33	3591.92	-3.58	3591.92	-0.01	0.00
NESC Extreme	838:g	-0.03	-50.94	-34.82	50.94	3598.18	-1.10	3598.18	-0.00	0.00

Summary of Tip Deflections For All Load Cases:

Note: positive 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	838:t	0.04	50.98	-1.57	51.00	0.00	-4.69	0.00
NESC Extreme	838:t	0.01	51.46	-1.60	51.48	0.00	-4.85	0.00

Tubes Summary:

Pole Label	Tube Num.	Weight (lbs)	Load Case	Maximum Usage %	Resultant Moment (ft-k)
838	1	4227	NESC Extreme	72.11	1003.81
838	2	8597	NESC Heavy	77.25	2628.51
838	3	2399	NESC Heavy	71.99	3145.57

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

Summary of Steel Pole Usages:

Steel Pole Label	Maximum Usage %	Load Case	Height AGL (ft)	Segment Number	Weight (lbs)
838	77.25	NESC Heavy	17.5	22	18016.5

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Height AGL (ft)	Segment Number	Weight (lbs)
Davit1	11.69	NESC Heavy	94.5	1	223.6
Davit2	11.49	NESC Heavy	94.5	1	223.6
Davit3	12.79	NESC Heavy	82.7	1	211.1
Davit4	17.24	NESC Heavy	82.7	1	211.1
Davit5	13.51	NESC Heavy	70.5	1	351.3
Davit6	18.00	NESC Heavy	70.5	1	351.3
Davit7	13.40	NESC Heavy	58.7	1	211.1
Davit8	17.79	NESC Heavy	58.7	1	211.1

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	88.19	838	Base Plate
NESC Extreme	87.10	838	Base Plate

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Height AGL (ft)	Segment Number
NESC Heavy	77.25	838	17.5	22
NESC Extreme	76.01	838	13.6	23

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	838	2	13.297	61.162	3591.920	-3.577	52.913	87.947	3	130.081	2.817	88.19
NESC Extreme	838	2	13.297	32.030	3598.179	-1.100	52.258	86.858	3	128.789	2.800	87.10

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Height AGL (ft)	Segment Number
NESC Heavy	18.00	Davit6	70.5	1

NESC Extreme	8.81	Davit8	58.7	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
Clamp1	Clamp	4.69	NESC Heavy	0.0
Clamp2	Clamp	3.32	NESC Heavy	0.0
Clamp3	Clamp	8.92	NESC Heavy	0.0
Clamp4	Clamp	8.92	NESC Heavy	0.0
Clamp5	Clamp	8.92	NESC Heavy	0.0
Clamp6	Clamp	8.92	NESC Heavy	0.0
Clamp7	Clamp	8.92	NESC Heavy	0.0
Clamp8	Clamp	8.92	NESC Heavy	0.0
Clamp9	Clamp	9.33	NESC Extreme	0.0
Clamp10	Clamp	7.84	NESC Heavy	0.0
Clamp13	Clamp	0.87	NESC Heavy	0.0
Clamp14	Clamp	0.87	NESC Heavy	0.0
Clamp15	Clamp	0.87	NESC Heavy	0.0
Clamp16	Clamp	0.87	NESC Heavy	0.0
Clamp17	Clamp	0.87	NESC Heavy	0.0
Clamp18	Clamp	0.87	NESC Heavy	0.0
Clamp19	Clamp	0.87	NESC Heavy	0.0

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	1994.0
Weight of Steel Poles:	18016.5
Total:	20010.6

*** End of Report

```
************************************************************************
*                                                                      *
*                               PLS-POLE                               *
*                   POLE AND FRAME ANALYSIS AND DESIGN                 *
*              Copyright Power Line Systems 1999-2021                  *
*                                                                      *
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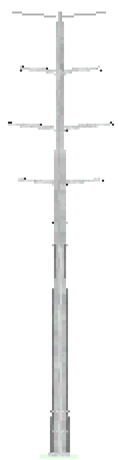
Project Name : 21051.02 - Trumbull, CT
Project Notes: Str # 838/ T-Mobile - CT11860A
Project File : J:\Jobs\2105100.WI\02_CT11860A\05_Structural\Tower\Backup Documentation\Rev (3)\Calcs\PLS Pole\cl&p structure # 838.pol
Date run   : 7:42:58 AM Tuesday, January 11, 2022
by   : PLS-POLE Version 16.81
Licensed 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 and tubular arms checked with ASCE/SEI 48-11

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

Steel Pole Properties:

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

Label		(ft)	Length (ft)			(in)	(in)	(in/ft)	Coef.		Override (ksi)	Override (lbs/ft^3)	Base	Type	Tip (ft)	Load (kips)	Long. Load (kips)	
CL&P838	838	95.00	0	Yes	12T	14.87	49.63	0	1.3	3 tubes	0	0		Calculated	0.000	0.0000	0.0000	Galvanized Steel

Steel Tubes Properties:

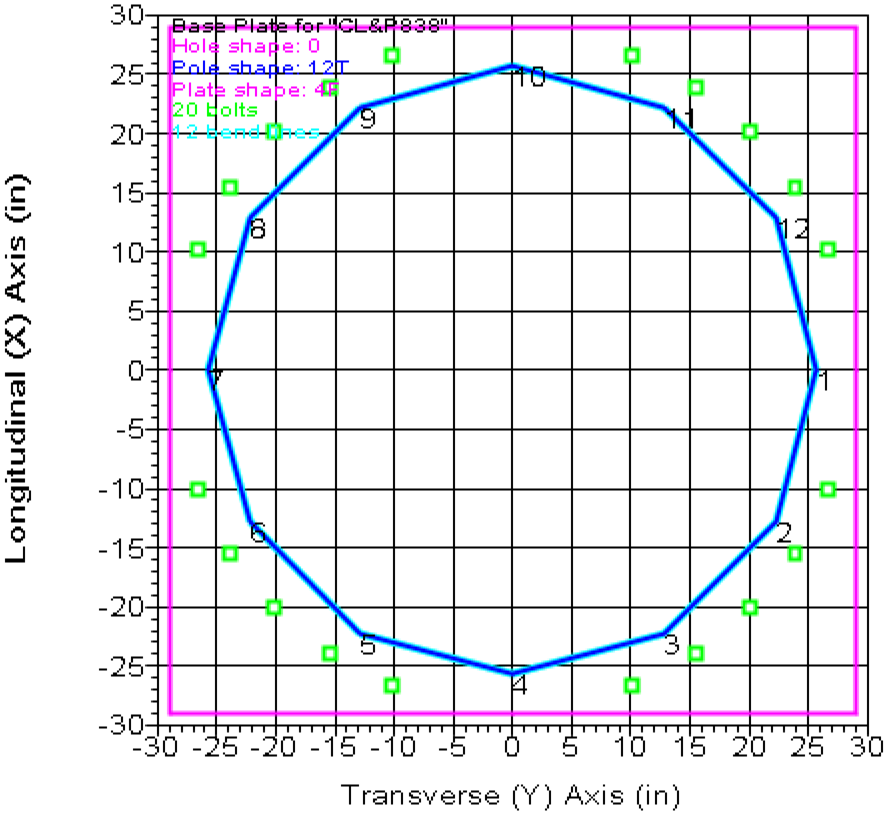
Pole Property	Tube No.	Length (ft)	Thickness (in)	Lap Length (ft)	Lap Factor	Lap Gap or Butt Offset (in)	Yield Stress (ksi)	Moment Cap. Override (ft-k)	Tube Weight (lbs)	Center of Gravity (ft)	Calculated Taper (in/ft)	Tube Top Diameter (in)	Tube Bot. Diameter (in)	1.5x Diam. Lap Length (ft)	Actual Overlap (ft)
CL&P838	1	45	0.375	4.250	0.000	0.000	65.000	0.000	4227	25.25	0.37303	14.87	31.66	3.864	4.250
CL&P838	2	45	0.46875	0.000	0.000	0.000	65.000	0.000	8597	24.19	0.37303	29.33	46.11	5.647	0.000
CL&P838	3	9.25	0.5	0.000	0.000	0.000	65.000	0.000	2399	4.68	0.37303	46.17	49.62	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&P838	58.000	4F	3.000	2794	0.000	0.000	0	490.00	60.000	2.250	57.000	20	32232.57	32232.57

Base Plate Bolt Coordinates for Property "CL&P838":

Bolt X Coord.	Bolt Y Coord.	Bolt Angle (deg)
0.3553	0.9342	0
0.5439	0.8377	0
0.7061	0.7061	0
0.8377	0.5439	0
0.9342	0.3553	0



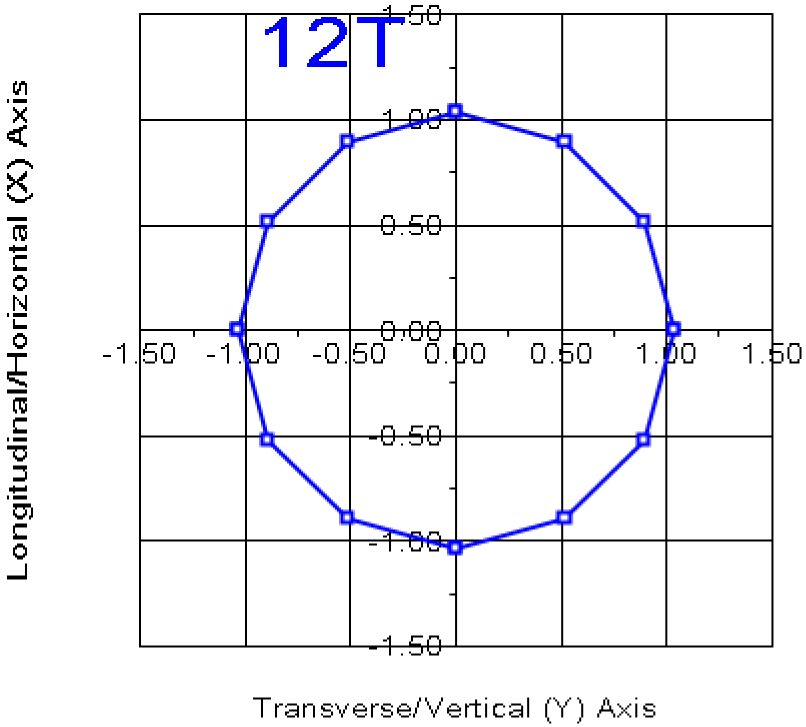
Steel Pole Connectivity:

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)
838			0	0	0	0	0	CL&P838	13 labels		0.00	0

Relative Attachment Labels for Steel Pole "838":

Joint Label	Distance From Origin/Top Joint (ft)	Global Z of Attach (ft)
838:Arm1	0.00	94.29
838:Arm2	0.00	82.50
838:Arm3	0.00	70.29
838:Arm4	0.00	58.50
838:TopConn	0.00	91.75

838:BotConn	0.00	76.75
838:WVGD1	0.00	5.00
838:WVGD2	0.00	15.00
838:WVGD3	0.00	25.00
838:WVGD4	0.00	35.00
838:WVGD5	0.00	45.00
838:WVGD6	0.00	55.00
838:WVGD7	0.00	65.00



Pole Steel Properties:

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Outer Diam. (in)	Area (in^2)	T-Moment Inertia (in^4)	L-Moment Inertia (in^4)	D/t	W/t Max.	Fy (ksi)	Fa Min. (ksi)	T-Moment Capacity (ft-k)	L-Moment Capacity (ft-k)
838	838:t	838:t Ori	0.00	14.88	17.48	470.76	470.76	0.00	7.9	65.00	65.00	331.17	331.17
838	838:Arm1	838:Arm1 End	0.71	15.14	17.80	497.02	497.02	0.00	8.1	65.00	65.00	343.52	343.52
838	838:Arm1	838:Arm1 Ori	0.71	15.14	17.80	497.02	497.02	0.00	8.1	65.00	65.00	343.52	343.52
838	838:TopConn	838:TopConn End	3.25	16.09	18.95	598.94	598.94	0.00	8.8	65.00	65.00	389.58	389.58
838	838:TopConn	838:TopConn Ori	3.25	16.09	18.95	598.94	598.94	0.00	8.8	65.00	65.00	389.58	389.58
838	#838:0	Tube 1 End	7.87	17.81	21.03	818.62	818.62	0.00	10.0	65.00	65.00	480.90	480.90
838	#838:0	Tube 1 Ori	7.87	17.81	21.03	818.62	818.62	0.00	10.0	65.00	65.00	480.90	480.90
838	838:Arm2	838:Arm2 End	12.50	19.54	23.11	1086.36	1086.36	0.00	11.3	65.00	65.00	581.83	581.83
838	838:Arm2	838:Arm2 Ori	12.50	19.54	23.11	1086.36	1086.36	0.00	11.3	65.00	65.00	581.83	581.83

838	#838:1	Tube 1	End	15.37	20.61	24.40	1279.11	1279.11	0.00	12.0	65.00	65.00	649.42	649.42
838	#838:1	Tube 1	Ori	15.37	20.61	24.40	1279.11	1279.11	0.00	12.0	65.00	65.00	649.42	649.42
838	838:BotConn	838:BotConn	End	18.25	21.68	25.69	1493.41	1493.41	0.00	12.8	65.00	65.00	720.72	720.72
838	838:BotConn	838:BotConn	Ori	18.25	21.68	25.69	1493.41	1493.41	0.00	12.8	65.00	65.00	720.72	720.72
838	#838:2	Tube 1	End	21.48	22.89	27.15	1761.29	1761.29	0.00	13.7	65.00	65.00	805.26	805.26
838	#838:2	Tube 1	Ori	21.48	22.89	27.15	1761.29	1761.29	0.00	13.7	65.00	65.00	805.26	805.26
838	838:Arm3	838:Arm3	End	24.71	24.09	28.60	2059.44	2059.44	0.00	14.5	65.00	65.00	894.48	894.48
838	838:Arm3	838:Arm3	Ori	24.71	24.09	28.60	2059.44	2059.44	0.00	14.5	65.00	65.00	894.48	894.48
838	#838:3	Tube 1	End	27.35	25.08	29.79	2327.26	2327.26	0.00	15.2	65.00	65.00	971.04	971.04
838	#838:3	Tube 1	Ori	27.35	25.08	29.79	2327.26	2327.26	0.00	15.2	65.00	65.00	971.04	971.04
838	838:WVGD7	838:WVGD7	End	30.00	26.07	30.98	2617.35	2617.35	0.00	15.9	65.00	65.00	1050.74	1050.74
838	838:WVGD7	838:WVGD7	Ori	30.00	26.07	30.98	2617.35	2617.35	0.00	15.9	65.00	65.00	1050.74	1050.74
838	#838:4	Tube 1	End	33.25	27.28	32.44	3005.60	3005.60	0.00	16.8	65.00	65.00	1152.98	1152.98
838	#838:4	Tube 1	Ori	33.25	27.28	32.44	3005.60	3005.60	0.00	16.8	65.00	65.00	1152.98	1152.98
838	838:Arm4	838:Arm4	End	36.50	28.49	33.90	3430.46	3430.46	0.00	17.7	65.00	65.00	1259.96	1259.96
838	838:Arm4	838:Arm4	Ori	36.50	28.49	33.90	3430.46	3430.46	0.00	17.7	65.00	65.00	1259.96	1259.96
838	838:WVGD6	838:WVGD6	End	40.00	29.80	35.48	3930.84	3930.84	0.00	18.6	65.00	65.00	1380.48	1380.48
838	838:WVGD6	838:WVGD6	Ori	40.00	29.80	35.48	3930.84	3930.84	0.00	18.6	65.00	65.00	1380.48	1380.48
838	#838:5	SpliceT	End	40.75	30.08	35.81	4044.03	4044.03	0.00	18.8	65.00	65.00	1407.02	1407.02
838	#838:5	SpliceT	Ori	40.75	30.08	35.81	4044.03	4044.03	0.00	18.8	65.00	65.00	1407.02	1407.02
838	#838:6	SpliceB	End	45.00	30.91	45.88	5443.61	5443.61	0.00	15.0	65.00	65.00	1842.79	1842.79
838	#838:6	SpliceB	Ori	45.00	30.91	45.88	5443.61	5443.61	0.00	15.0	65.00	65.00	1842.79	1842.79
838	838:WVGD5	838:WVGD5	End	50.00	32.78	48.69	6506.56	6506.56	0.00	16.1	65.00	65.00	2077.28	2077.28
838	838:WVGD5	838:WVGD5	Ori	50.00	32.78	48.69	6506.56	6506.56	0.00	16.1	65.00	65.00	2077.28	2077.28
838	#838:7	Tube 2	End	55.00	34.64	51.51	7699.60	7699.60	0.00	17.1	65.00	65.00	2325.82	2325.82
838	#838:7	Tube 2	Ori	55.00	34.64	51.51	7699.60	7699.60	0.00	17.1	65.00	65.00	2325.82	2325.82
838	838:WVGD4	838:WVGD4	End	60.00	36.51	54.32	9030.23	9030.23	0.00	18.2	65.00	65.00	2588.40	2588.40
838	838:WVGD4	838:WVGD4	Ori	60.00	36.51	54.32	9030.23	9030.23	0.00	18.2	65.00	65.00	2588.40	2588.40
838	#838:8	Tube 2	End	65.00	38.37	57.13	10505.97	10505.97	0.00	19.3	65.00	65.00	2865.03	2865.03
838	#838:8	Tube 2	Ori	65.00	38.37	57.13	10505.97	10505.97	0.00	19.3	65.00	65.00	2865.03	2865.03
838	838:WVGD3	838:WVGD3	End	70.00	40.24	59.94	12134.32	12134.32	0.00	20.3	65.00	65.00	3155.70	3155.70
838	838:WVGD3	838:WVGD3	Ori	70.00	40.24	59.94	12134.32	12134.32	0.00	20.3	65.00	65.00	3155.70	3155.70
838	#838:9	Tube 2	End	75.00	42.10	62.75	13922.80	13922.80	0.00	21.4	65.00	65.00	3460.41	3460.41
838	#838:9	Tube 2	Ori	75.00	42.10	62.75	13922.80	13922.80	0.00	21.4	65.00	65.00	3460.41	3460.41
838	838:WVGD2	838:WVGD2	End	80.00	43.97	65.56	15878.91	15878.91	0.00	22.5	65.00	65.00	3779.17	3779.17
838	838:WVGD2	838:WVGD2	Ori	80.00	43.97	65.56	15878.91	15878.91	0.00	22.5	65.00	65.00	3779.17	3779.17
838	#838:10	Tube 2	End	82.88	45.04	67.18	17082.50	17082.50	0.00	23.1	65.00	65.00	3968.82	3968.82
838	#838:10	Tube 2	Ori	82.88	45.04	67.18	17082.50	17082.50	0.00	23.1	65.00	65.00	3968.82	3968.82
838	#838:11	SpliceT	End	85.75	46.11	68.79	18345.42	18345.42	0.00	23.7	65.00	65.00	4163.10	4163.10
838	#838:11	SpliceT	Ori	85.75	46.17	73.43	19608.93	19608.93	0.00	22.1	65.00	65.00	4443.81	4443.81
838	838:WVGD1	838:WVGD1	End	90.00	47.76	75.98	21722.34	21722.34	0.00	22.9	65.00	65.00	4759.35	4759.35
838	838:WVGD1	838:WVGD1	Ori	90.00	47.76	75.98	21722.35	21722.35	0.00	22.9	65.00	65.00	4759.35	4759.35
838	838:g	838:g	End	95.00	49.62	78.98	24396.84	24396.84	0.00	23.9	65.00	65.00	5144.42	5144.42

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 Texture Shape At End
7003	7003	8T	0.2813	9.5	5	0	1.3	29000	1 point	Calculated	0	0	0	0	65	0	
7004	7004	8T	0.2813	12.25	6	0	1.3	29000	1 point	Calculated	0	0	0	0	65	0	
7005	7005	8T	0.3438	12.75	6	0	1.3	29000	1 point	Calculated	0	0	0	0	65	0	

Intermediate Joints for Davit Property "7003":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	10.083	-0.8333

Intermediate Joints for Davit Property "7004":

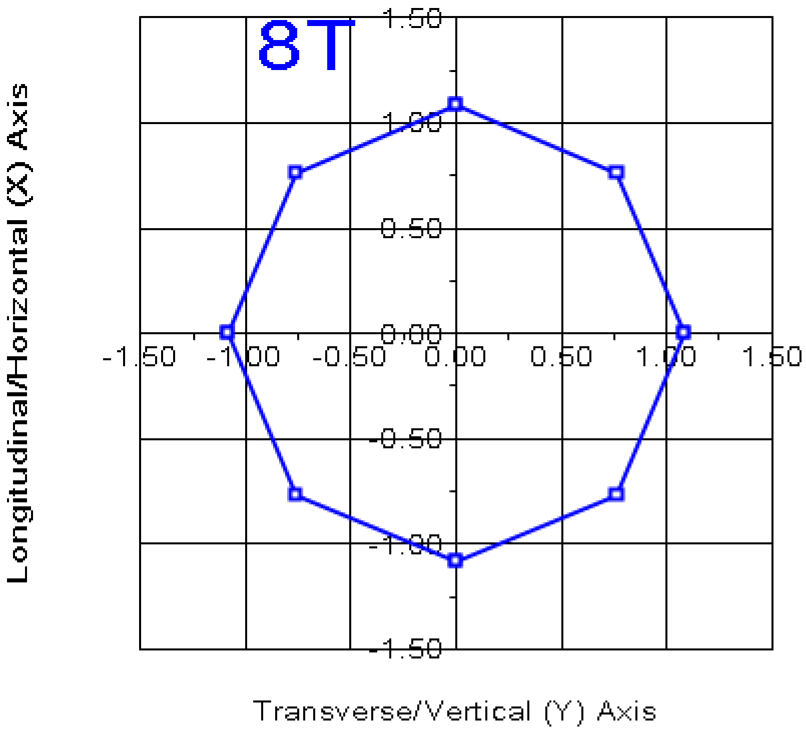
Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	7.5	-0.625

Intermediate Joints for Davit Property "7005":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	10	-0.8333

Tubular Davit Arm Connectivity:

Davit Label	Attach Label	Davit Property Set	Azimuth (deg)
Davit1	838:Arm1	7003	180
Davit2	838:Arm1	7003	0
Davit3	838:Arm2	7004	180
Davit4	838:Arm2	7004	0
Davit5	838:Arm3	7005	180
Davit6	838:Arm3	7005	0
Davit7	838:Arm4	7004	180
Davit8	838:Arm4	7004	0



Tubular Davit Arm Steel Properties:

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Outer Diam. (in)	Area (in^2)	V-Moment Inertia (in^4)	H-Moment Inertia (in^4)	D/t	W/t Max.	Fy (ksi)	Fa Min. (ksi)	V-Moment Capacity (ft-k)	H-Moment Capacity (ft-k)
Davit1	Davit1:O	Origin	0.00	9.50	8.59	96.58	96.58	0.00	9.8	65.00	65.00	101.75	101.75
Davit1	#Davit1:0	End	5.00	7.28	6.52	42.22	42.22	0.00	6.6	65.00	65.00	58.07	58.07
Davit1	#Davit1:0	Origin	5.00	7.28	6.52	42.22	42.22	0.00	6.6	65.00	65.00	58.07	58.07
Davit1	#Davit1:1	End	7.56	6.14	5.46	24.80	24.80	0.00	4.9	65.00	65.00	40.44	40.44
Davit1	#Davit1:1	Origin	7.56	6.14	5.46	24.80	24.80	0.00	4.9	65.00	65.00	40.44	40.44
Davit1	Davit1:End	End	10.12	5.00	4.40	12.98	12.98	0.00	3.2	65.00	65.00	25.99	25.99
Davit2	Davit2:O	Origin	0.00	9.50	8.59	96.58	96.58	0.00	9.8	65.00	65.00	101.75	101.75
Davit2	#Davit2:0	End	5.00	7.28	6.52	42.22	42.22	0.00	6.6	65.00	65.00	58.07	58.07
Davit2	#Davit2:0	Origin	5.00	7.28	6.52	42.22	42.22	0.00	6.6	65.00	65.00	58.07	58.07
Davit2	#Davit2:1	End	7.56	6.14	5.46	24.80	24.80	0.00	4.9	65.00	65.00	40.44	40.44
Davit2	#Davit2:1	Origin	7.56	6.14	5.46	24.80	24.80	0.00	4.9	65.00	65.00	40.44	40.44
Davit2	Davit2:End	End	10.12	5.00	4.40	12.98	12.98	0.00	3.2	65.00	65.00	25.99	25.99
Davit3	Davit3:O	Origin	0.00	12.25	11.15	211.28	211.28	0.00	13.9	65.00	65.00	172.62	172.62
Davit3	#Davit3:0	End	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit3	#Davit3:0	Origin	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53

Davit3	Davit3:End	End	7.53	6.00	5.33	23.09	23.09	0.00	4.7	65.00	65.00	38.51	38.51
Davit4	Davit4:O	Origin	0.00	12.25	11.15	211.28	211.28	0.00	13.9	65.00	65.00	172.62	172.62
Davit4	#Davit4:0	End	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit4	#Davit4:0	Origin	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit4	Davit4:End	End	7.53	6.00	5.33	23.09	23.09	0.00	4.7	65.00	65.00	38.51	38.51
Davit5	Davit5:O	Origin	0.00	12.75	14.13	287.65	287.65	0.00	11.2	65.00	65.00	225.81	225.81
Davit5	#Davit5:0	End	5.00	9.39	10.30	111.47	111.47	0.00	7.2	65.00	65.00	118.86	118.86
Davit5	#Davit5:0	Origin	5.00	9.39	10.30	111.47	111.47	0.00	7.2	65.00	65.00	118.86	118.86
Davit5	#Davit5:1	End	7.52	7.69	8.37	59.89	59.89	0.00	5.1	65.00	65.00	77.91	77.91
Davit5	#Davit5:1	Origin	7.52	7.69	8.37	59.89	59.89	0.00	5.1	65.00	65.00	77.91	77.91
Davit5	Davit5:End	End	10.03	6.00	6.44	27.34	27.34	0.00	3.1	65.00	65.00	45.60	45.60
Davit6	Davit6:O	Origin	0.00	12.75	14.13	287.65	287.65	0.00	11.2	65.00	65.00	225.81	225.81
Davit6	#Davit6:0	End	5.00	9.39	10.30	111.47	111.47	0.00	7.2	65.00	65.00	118.86	118.86
Davit6	#Davit6:0	Origin	5.00	9.39	10.30	111.47	111.47	0.00	7.2	65.00	65.00	118.86	118.86
Davit6	#Davit6:1	End	7.52	7.69	8.37	59.89	59.89	0.00	5.1	65.00	65.00	77.91	77.91
Davit6	#Davit6:1	Origin	7.52	7.69	8.37	59.89	59.89	0.00	5.1	65.00	65.00	77.91	77.91
Davit6	Davit6:End	End	10.03	6.00	6.44	27.34	27.34	0.00	3.1	65.00	65.00	45.60	45.60
Davit7	Davit7:O	Origin	0.00	12.25	11.15	211.28	211.28	0.00	13.9	65.00	65.00	172.62	172.62
Davit7	#Davit7:0	End	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit7	#Davit7:0	Origin	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit7	Davit7:End	End	7.53	6.00	5.33	23.09	23.09	0.00	4.7	65.00	65.00	38.51	38.51
Davit8	Davit8:O	Origin	0.00	12.25	11.15	211.28	211.28	0.00	13.9	65.00	65.00	172.62	172.62
Davit8	#Davit8:0	End	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit8	#Davit8:0	Origin	3.76	9.13	8.24	85.27	85.27	0.00	9.3	65.00	65.00	93.53	93.53
Davit8	Davit8:End	End	7.53	6.00	5.33	23.09	23.09	0.00	4.7	65.00	65.00	38.51	38.51

*** Insulator Data

Clamp Properties:

Label	Stock Number	Holding Capacity (lbs)	Hardware Capacity (lbs)	Notes
clamp	clamp1	8e+04	0	

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	838:TopConn	clamp	No Limit
Clamp10	838:BotConn	clamp	No Limit
Clamp13	838:WVGD1	clamp	No Limit

Clamp14	838:WVGD2	clamp	No Limit
Clamp15	838:WVGD3	clamp	No Limit
Clamp16	838:WVGD4	clamp	No Limit
Clamp17	838:WVGD5	clamp	No Limit
Clamp18	838:WVGD6	clamp	No Limit
Clamp19	838:WVGD7	clamp	No Limit

Material List Options:
Show Parts: YES
Decompose Assemblies: NO
Show Assemblies: YES

Material List

Stock Number	**Item Description**	**Quantity**	**Unit of Measure**
7003	Tubular Davit property: 7003	2.00	Each
7004	Tubular Davit property: 7004	4.00	Each
7005	Tubular Davit property: 7005	2.00	Each
clamp1	Clamp property: clamp	17.00	Each
838	Steel Pole property: CL&P838	1.00	Each

*** Loads Data

Loads from file: J:\Jobs\2105100.WI\02_CT11860A\05_Structural\Tower\Backup Documentation\Rev (3)\Calcs\PLS Pole\cl&p #838.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)	95.12 (ft)	
Structure height	95.12 (ft)	
Structure height above ground	95.12 (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 Hardware	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	0.0000	1.0000	18 loads	Wind on All	4	0	0.000	0.000	0.0	No Limit	0
NESC Extreme	1.0000	1.0000	1.00000	0.6500	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	18 loads	NESC 2012	31	0	0.000	0.000	0.0	No Limit	0

Point Loads for Load Case "NESC Heavy":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
Davit1:End	1530	3426	0	
Davit2:End	965	2471	0	
Davit3:End	3607	6160	0	
Davit4:End	3607	6160	0	
Davit5:End	3607	6160	0	
Davit6:End	3607	6160	0	
Davit7:End	3607	6160	0	
Davit8:End	3607	6160	0	
838:TopConn	0	1985	0	Top Connection
838:BotConn	5912	-510	0	Bot Connection
838:BotConn	345	46	0	Coax
838:WVGD1	690	93	0	Coax
838:WVGD2	690	93	0	Coax
838:WVGD3	690	93	0	Coax
838:WVGD4	690	93	0	Coax
838:WVGD5	690	93	0	Coax

838:WVGD6	690	93	0	Coax
838:WVGD7	690	93	0	Coax

Point Loads for Load Case "NESC Extreme":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
Davit1:End	472	2614	0	
Davit2:End	238	1457	0	
Davit3:End	1630	5302	0	
Davit4:End	1630	5302	0	
Davit5:End	1630	5302	0	
Davit6:End	1630	5302	0	
Davit7:End	1630	5302	0	
Davit8:End	1630	5302	0	
838:TopConn	0	7463	0	Top Connection
838:BotConn	2654	-2135	0	Bot Connection
838:BotConn	94	120	0	Coax
838:WVGD1	187	240	0	Coax
838:WVGD2	187	240	0	Coax
838:WVGD3	187	240	0	Coax
838:WVGD4	187	240	0	Coax
838:WVGD5	187	240	0	Coax
838:WVGD6	187	240	0	Coax
838:WVGD7	187	240	0	Coax

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

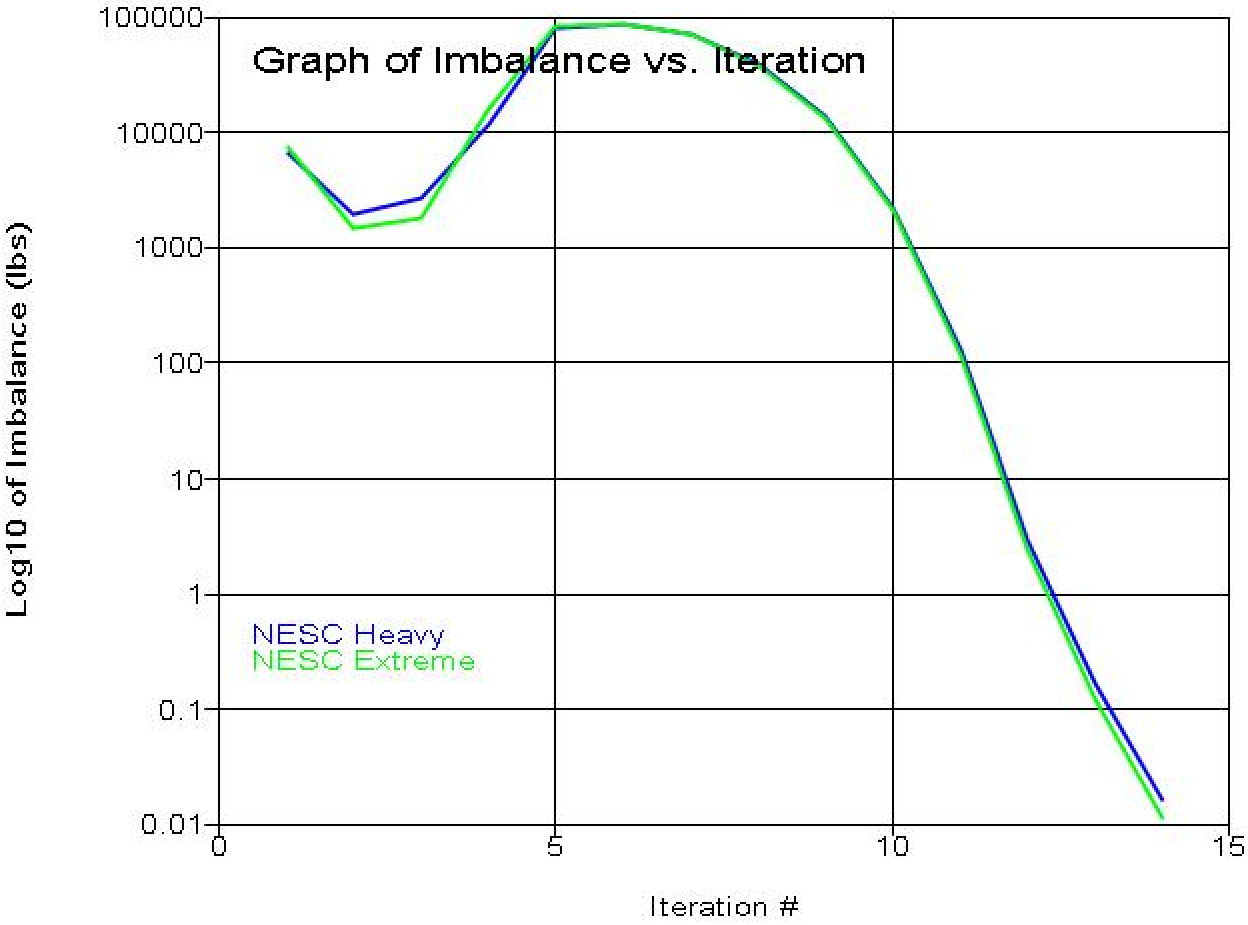
Notes: Does not include loads from equipment, arms, guys, braces, etc. or user input loads.
Wind load is calculated for the undeformed shape of a pole.

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)
838	838:t	838:Arm1	95.00	94.29	94.64	15.007	1.25e+06	1.000	31.19	0.00	42.63	27.69	0.00	0.00	27.69	0.00
838	838:Arm1	838:TopConn	94.29	91.75	93.02	15.614	1.31e+06	1.000	31.19	0.00	158.81	103.07	0.00	0.00	103.07	0.00
838	838:TopConn		91.75	87.13	89.44	16.950	1.42e+06	1.000	31.19	0.00	314.53	203.74	0.00	0.00	203.74	0.00
838		838:Arm2	87.13	82.50	84.81	18.675	1.56e+06	1.000	31.19	0.00	347.27	224.48	0.00	0.00	224.48	0.00
838	838:Arm2		82.50	79.63	81.06	20.074	1.68e+06	1.000	31.19	0.00	232.37	149.99	0.00	0.00	149.99	0.00
838		838:BotConn	79.63	76.75	78.19	21.147	1.77e+06	1.000	31.19	0.00	245.02	158.01	0.00	0.00	158.01	0.00
838	838:BotConn		76.75	73.52	75.14	22.285	1.86e+06	1.000	31.19	0.00	290.37	187.07	0.00	0.00	187.07	0.00
838		838:Arm3	73.52	70.29	71.91	23.490	1.96e+06	1.000	31.19	0.00	306.33	197.19	0.00	0.00	197.19	0.00
838	838:Arm3		70.29	67.65	68.97	24.586	2.06e+06	1.000	31.19	0.00	262.74	169.01	0.00	0.00	169.01	0.00
838		838:WVGD7	67.65	65.00	66.32	25.572	2.14e+06	1.000	31.19	0.00	273.45	175.79	0.00	0.00	175.79	0.00
838	838:WVGD7		65.00	61.75	63.38	26.672	2.23e+06	1.000	31.19	0.00	350.66	225.29	0.00	0.00	225.29	0.00
838		838:Arm4	61.75	58.50	60.13	27.884	2.33e+06	1.000	31.19	0.00	366.83	235.53	0.00	0.00	235.53	0.00
838	838:Arm4	838:WVGD6	58.50	55.00	56.75	29.143	2.44e+06	1.000	31.19	0.00	413.12	265.09	0.00	0.00	265.09	0.00
838	838:WVGD6		55.00	54.25	54.62	29.936	2.5e+06	1.000	31.19	0.00	90.97	58.35	0.00	0.00	58.35	0.00
838			54.25	50.00	52.12	30.494	2.55e+06	1.000	31.19	0.00	1178.01	336.82	0.00	0.00	336.82	0.00
838		838:WVGD5	50.00	45.00	47.50	31.844	2.66e+06	1.000	31.19	0.00	804.69	413.80	0.00	0.00	413.80	0.00
838	838:WVGD5		45.00	40.00	42.50	33.709	2.82e+06	1.000	31.19	0.00	852.39	438.04	0.00	0.00	438.04	0.00
838		838:WVGD4	40.00	35.00	37.50	35.574	2.97e+06	1.000	31.19	0.00	900.22	462.27	0.00	0.00	462.27	0.00
838	838:WVGD4		35.00	30.00	32.50	37.439	3.13e+06	1.000	31.19	0.00	948.05	486.51	0.00	0.00	486.51	0.00
838		838:WVGD3	30.00	25.00	27.50	39.304	3.29e+06	1.000	31.19	0.00	995.88	510.75	0.00	0.00	510.75	0.00
838	838:WVGD3		25.00	20.00	22.50	41.169	3.44e+06	1.000	31.19	0.00	1043.71	534.98	0.00	0.00	534.98	0.00

838		838:WVGD2	20.00	15.00	17.50	43.035	3.6e+06	1.000	31.19	0.00	1091.54	559.22	0.00	0.00	559.22	0.00
838	838:WVGD2		15.00	12.12	13.56	44.503	3.72e+06	1.000	31.19	0.00	649.29	332.53	0.00	0.00	332.53	0.00
838			12.12	9.25	10.69	45.576	3.81e+06	1.000	31.19	0.00	665.10	340.54	0.00	0.00	340.54	0.00
838		838:WVGD1	9.25	5.00	7.12	46.967	3.93e+06	1.000	31.19	0.00	1080.36	518.77	0.00	0.00	518.77	0.00
838	838:WVGD1	838:g	5.00	0.00	2.50	48.692	4.07e+06	1.000	31.19	0.00	1318.21	632.74	0.00	0.00	632.74	0.00

*** Analysis Results:

Maximum element usage is 88.19% for Base Plate "838" in load case "NESC Heavy"
Maximum insulator usage is 9.33% for Clamp "Clamp9" in load case "NESC Extreme"



*** Analysis Results for Load Case No. 1 "NESC Heavy" - Number of iterations in SAPS 14

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

Joint Label	X-Displ (ft)	Y-Displ (ft)	Z-Displ (ft)	X-Rot (deg)	Y-Rot (deg)	Z-Rot (deg)	X-Pos (ft)	Y-Pos (ft)	Z-Pos (ft)
838:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
838:t	0.003004	4.248	-0.1312	-4.6929	0.0030	0.0001	0.003004	4.248	94.87
838:Arm1	0.002967	4.19	-0.1288	-4.6929	0.0030	0.0001	0.002967	4.19	94.16

838:TopConn	0.002835	3.982	-0.1203	-4.6830	0.0030	0.0001	0.002835	3.982	91.63
838:Arm2	0.002358	3.238	-0.09021	-4.5181	0.0029	0.0001	0.002358	3.238	82.41
838:BotConn	0.002069	2.794	-0.07294	-4.3141	0.0028	0.0001	0.002069	2.794	76.68
838:Arm3	0.001757	2.324	-0.05566	-4.0107	0.0027	0.0000	0.001757	2.324	70.23
838:WVGD7	0.001515	1.966	-0.04342	-3.7120	0.0025	0.0000	0.001515	1.966	64.96
838:Arm4	0.001238	1.568	-0.03097	-3.3026	0.0023	0.0000	0.001238	1.568	58.47
838:WVGD6	0.001099	1.372	-0.0254	-3.0667	0.0022	0.0000	0.001099	1.372	54.97
838:WVGD5	0.0007443	0.8927	-0.01352	-2.4239	0.0018	0.0000	0.0007443	0.8927	44.99
838:WVGD4	0.0004539	0.5222	-0.006331	-1.8089	0.0015	0.0000	0.0004539	0.5222	34.99
838:WVGD3	0.0002326	0.2564	-0.002479	-1.2283	0.0011	0.0000	0.0002326	0.2564	25
838:WVGD2	8.371e-05	0.08831	-0.0007538	-0.6920	0.0006	0.0000	8.371e-05	0.08831	15
838:WVGD1	9.739e-06	0.009731	-0.0001432	-0.2141	0.0002	0.0000	9.739e-06	0.009731	5
Davit1:O	0.002971	4.192	-0.07537	-4.6929	0.0030	0.0001	0.002971	3.539	94.21
Davit1:End	0.003073	4.289	0.7162	-4.3895	0.0030	0.0001	0.003073	-6.447	95.84
Davit2:O	0.002963	4.188	-0.1822	-4.6929	0.0030	0.0001	0.002963	4.841	94.11
Davit2:End	0.002949	4.222	-1.041	-4.9948	0.0030	0.0001	0.002949	14.96	94.08
Davit3:O	0.002362	3.24	-0.02382	-4.5181	0.0029	0.0001	0.002362	2.398	82.48
Davit3:End	0.002433	3.311	0.5494	-4.3096	0.0029	0.0001	0.002433	-5.032	83.67
Davit4:O	0.002354	3.235	-0.1566	-4.5181	0.0029	0.0001	0.002354	4.078	82.34
Davit4:End	0.002346	3.261	-0.7712	-4.8067	0.0029	0.0001	0.002346	11.6	82.35
Davit5:O	0.001762	2.326	0.01703	-4.0107	0.0027	0.0000	0.001762	1.287	70.31
Davit5:End	0.001842	2.405	0.6861	-3.7162	0.0027	0.0001	0.001842	-8.634	71.81
Davit6:O	0.001753	2.321	-0.1284	-4.0107	0.0027	0.0000	0.001753	3.36	70.16
Davit6:End	0.00175	2.355	-0.8687	-4.4118	0.0027	0.0000	0.00175	13.39	70.25
Davit7:O	0.001241	1.57	0.03983	-3.3026	0.0023	0.0000	0.001241	0.3406	58.54
Davit7:End	0.001288	1.616	0.4544	-3.0830	0.0023	0.0000	0.001288	-7.113	59.58
Davit8:O	0.001234	1.565	-0.1018	-3.3026	0.0023	0.0000	0.001234	2.794	58.4
Davit8:End	0.001238	1.59	-0.5575	-3.6012	0.0023	0.0000	0.001238	10.32	58.57

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 %
838:g	-0.09	0.0	-48.33	0.0	0.0	-63.96	0.0	0.0	80.17	0.0	3591.92	0.0	-3.6	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.
838	838:t	Origin	0.00	50.98	0.04	-1.57	-0.00	-0.00	0.0	-0.03	0.01	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	4
838	838:Arm1	End	0.71	50.28	0.04	-1.55	0.01	-0.00	0.0	-0.03	0.01	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	1
838	838:Arm1	Origin	0.71	50.28	0.04	-1.55	-0.29	-0.00	0.0	-2.85	6.18	-0.00	-0.16	0.00	0.71	0.00	1.24	1.9	4
838	838:TopConn	End	3.25	47.79	0.03	-1.44	15.42	-0.00	0.0	-2.85	6.18	-0.00	-0.15	2.57	0.00	0.00	2.72	4.2	1
838	838:TopConn	Origin	3.25	47.79	0.03	-1.44	15.42	-0.00	0.0	-3.05	8.25	-0.00	-0.16	2.57	0.00	0.00	2.73	4.2	1
838	Tube 1	End	7.87	43.28	0.03	-1.26	53.59	-0.02	0.0	-3.05	8.25	-0.00	-0.15	7.24	0.00	0.00	7.39	11.4	1
838	Tube 1	Origin	7.87	43.28	0.03	-1.26	53.59	-0.02	0.0	-3.56	8.38	-0.01	-0.17	7.24	0.00	0.00	7.41	11.4	1
838	838:Arm2	End	12.50	38.85	0.03	-1.08	92.33	-0.04	0.0	-3.56	8.38	-0.01	-0.15	10.31	0.00	0.00	10.47	16.1	1
838	838:Arm2	Origin	12.50	38.85	0.03	-1.08	100.15	-0.04	0.0	-10.86	21.38	-0.01	-0.47	11.19	0.00	0.00	11.66	17.9	1
838	Tube 1	End	15.37	36.16	0.03	-0.98	161.61	-0.07	0.0	-10.86	21.38	-0.01	-0.45	16.18	0.00	0.00	16.62	25.6	1
838	Tube 1	Origin	15.37	36.16	0.03	-0.98	161.61	-0.07	0.0	-11.26	21.45	-0.01	-0.46	16.18	0.00	0.00	16.64	25.6	1
838	838:BotConn	End	18.25	33.52	0.02	-0.88	223.28	-0.10	0.0	-11.26	21.45	-0.01	-0.44	20.14	0.00	0.00	20.57	31.7	1
838	838:BotConn	Origin	18.25	33.52	0.02	-0.88	223.28	-0.10	0.0	-17.98	21.53	-0.01	-0.70	20.14	0.00	0.00	20.84	32.1	1
838	Tube 1	End	21.48	30.65	0.02	-0.77	292.81	-0.14	0.0	-17.98	21.53	-0.01	-0.66	23.64	0.00	0.00	24.30	37.4	1
838	Tube 1	Origin	21.48	30.65	0.02	-0.77	292.81	-0.14	0.0	-18.48	21.59	-0.01	-0.68	23.64	0.00	0.00	24.32	37.4	1

838	838:Arm3	End	24.71	27.88	0.02	-0.67	362.54	-0.18	0.0	-18.48	21.59	-0.01	-0.65	26.35	0.00	0.00	26.99	41.5	1
838	838:Arm3	Origin	24.71	27.88	0.02	-0.67	372.82	-0.18	0.0	-26.36	34.51	-0.02	-0.92	27.09	0.00	0.00	28.01	43.1	1
838	Tube 1	End	27.35	25.70	0.02	-0.59	464.09	-0.23	0.0	-26.36	34.51	-0.02	-0.89	31.07	0.00	0.00	31.95	49.2	1
838	Tube 1	Origin	27.35	25.70	0.02	-0.59	464.09	-0.23	0.0	-26.86	34.54	-0.02	-0.90	31.07	0.00	0.00	31.97	49.2	1
838	838:WVGD7	End	30.00	23.60	0.02	-0.52	555.43	-0.28	0.0	-26.86	34.54	-0.02	-0.87	34.36	0.00	0.00	35.23	54.2	1
838	838:WVGD7	Origin	30.00	23.60	0.02	-0.52	555.43	-0.28	0.0	-28.11	34.70	-0.02	-0.91	34.36	0.00	0.00	35.27	54.3	1
838	Tube 1	End	33.25	21.13	0.02	-0.44	668.21	-0.35	0.0	-28.11	34.70	-0.02	-0.87	37.67	0.00	0.00	38.54	59.3	1
838	Tube 1	Origin	33.25	21.13	0.02	-0.44	668.21	-0.35	0.0	-28.77	34.73	-0.02	-0.89	37.67	0.00	0.00	38.56	59.3	1
838	838:Arm4	End	36.50	18.81	0.01	-0.37	781.08	-0.42	0.0	-28.77	34.73	-0.02	-0.85	40.30	0.00	0.00	41.14	63.3	1
838	838:Arm4	Origin	36.50	18.81	0.01	-0.37	788.80	-0.42	0.0	-36.64	47.49	-0.03	-1.08	40.69	0.00	0.00	41.77	64.3	1
838	838:WVGD6	End	40.00	16.47	0.01	-0.30	955.02	-0.52	0.0	-36.64	47.49	-0.03	-1.03	44.97	0.00	0.00	46.00	70.8	1
838	838:WVGD6	Origin	40.00	16.47	0.01	-0.30	955.02	-0.52	0.0	-37.82	47.62	-0.03	-1.07	44.97	0.00	0.00	46.03	70.8	1
838	SpliceT	End	40.75	15.99	0.01	-0.29	990.73	-0.54	0.0	-37.82	47.62	-0.03	-1.06	45.77	0.00	0.00	46.82	72.0	1
838	SpliceT	Origin	40.75	15.99	0.01	-0.29	990.73	-0.54	0.0	-38.91	47.64	-0.03	-1.09	45.77	0.00	0.00	46.86	72.1	1
838	SpliceB	End	45.00	13.42	0.01	-0.23	1193.19	-0.67	0.0	-38.91	47.64	-0.03	-0.85	42.09	0.00	0.00	42.93	66.1	1
838	SpliceB	Origin	45.00	13.42	0.01	-0.23	1193.19	-0.67	0.0	-40.64	47.66	-0.03	-0.89	42.09	0.00	0.00	42.97	66.1	1
838	838:WVGD5	End	50.00	10.71	0.01	-0.16	1431.49	-0.84	0.0	-40.64	47.66	-0.03	-0.83	44.79	0.00	0.00	45.63	70.2	1
838	838:WVGD5	Origin	50.00	10.71	0.01	-0.16	1431.49	-0.84	0.0	-42.83	47.79	-0.04	-0.88	44.79	0.00	0.00	45.67	70.3	1
838	Tube 2	End	55.00	8.33	0.01	-0.11	1670.41	-1.04	0.0	-42.83	47.79	-0.04	-0.83	46.68	0.00	0.00	47.51	73.1	1
838	Tube 2	Origin	55.00	8.33	0.01	-0.11	1670.41	-1.04	0.0	-44.40	47.79	-0.04	-0.86	46.68	0.00	0.00	47.55	73.1	1
838	838:WVGD4	End	60.00	6.27	0.01	-0.08	1909.34	-1.26	0.0	-44.40	47.79	-0.04	-0.82	47.95	0.00	0.00	48.76	75.0	1
838	838:WVGD4	Origin	60.00	6.27	0.01	-0.08	1909.34	-1.26	0.0	-46.72	47.90	-0.05	-0.86	47.95	0.00	0.00	48.81	75.1	1
838	Tube 2	End	65.00	4.52	0.00	-0.05	2148.85	-1.50	0.0	-46.72	47.90	-0.05	-0.82	48.75	0.00	0.00	49.57	76.3	1
838	Tube 2	Origin	65.00	4.52	0.00	-0.05	2148.85	-1.50	0.0	-48.42	47.91	-0.05	-0.85	48.75	0.00	0.00	49.60	76.3	1
838	838:WVGD3	End	70.00	3.08	0.00	-0.03	2388.39	-1.78	0.0	-48.42	47.91	-0.05	-0.81	49.20	0.00	0.00	50.00	76.9	1
838	838:WVGD3	Origin	70.00	3.08	0.00	-0.03	2388.39	-1.78	0.0	-50.87	48.03	-0.06	-0.85	49.20	0.00	0.00	50.04	77.0	1
838	Tube 2	End	75.00	1.93	0.00	-0.02	2628.51	-2.08	0.0	-50.87	48.03	-0.06	-0.81	49.37	0.00	0.00	50.18	77.2	1
838	Tube 2	Origin	75.00	1.93	0.00	-0.02	2628.51	-2.08	0.0	-52.70	48.04	-0.07	-0.84	49.37	0.00	0.00	50.21	77.3	1
838	838:WVGD2	End	80.00	1.06	0.00	-0.01	2868.69	-2.41	0.0	-52.70	48.04	-0.07	-0.80	49.34	0.00	0.00	50.14	77.1	1
838	838:WVGD2	Origin	80.00	1.06	0.00	-0.01	2868.69	-2.41	0.0	-54.87	48.15	-0.07	-0.84	49.34	0.00	0.00	50.18	77.2	1
838	Tube 2	End	82.88	0.68	0.00	-0.01	3007.11	-2.61	0.0	-54.87	48.15	-0.07	-0.82	49.25	0.00	0.00	50.07	77.0	1
838	Tube 2	Origin	82.88	0.68	0.00	-0.01	3007.11	-2.61	0.0	-55.97	48.16	-0.07	-0.83	49.25	0.00	0.00	50.08	77.1	1
838	SpliceT	End	85.75	0.40	0.00	-0.00	3145.56	-2.82	0.0	-55.97	48.16	-0.07	-0.81	49.11	0.00	0.00	49.93	76.8	1
838	SpliceT	Origin	85.75	0.40	0.00	-0.00	3145.56	-2.82	0.0	-57.42	48.18	-0.08	-0.78	46.01	0.00	0.00	46.79	72.0	1
838	838:WVGD1	End	90.00	0.12	0.00	-0.00	3350.34	-3.15	0.0	-57.42	48.18	-0.08	-0.76	45.76	0.00	0.00	46.51	71.6	1
838	838:WVGD1	Origin	90.00	0.12	0.00	-0.00	3350.34	-3.15	0.0	-60.08	48.32	-0.08	-0.79	45.76	0.00	0.00	46.55	71.6	1
838	838:g	End	95.00	0.00	0.00	0.00	3591.92	-3.58	0.0	-60.08	48.32	-0.08	-0.76	45.38	0.00	0.00	46.14	71.0	1

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

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Vert. Mom. (ft-k)	Horz. Mom. (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Vert. Shear (kips)	Horz. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
Davit1	Davit1:O	Origin	0.00	50.31	0.04	-0.90	-11.22	0.00	0.0	-3.67	1.19	-0.00	-0.43	7.17	0.00	0.00	7.60	11.7	1
Davit1	#Davit1:0	End	5.00	50.90	0.04	3.87	-5.28	0.00	0.0	-3.67	1.19	-0.00	-0.56	5.91	0.00	0.00	6.47	10.0	1
Davit1	#Davit1:0	Origin	5.00	50.90	0.04	3.87	-5.28	0.00	0.0	-3.64	1.06	-0.00	-0.56	5.91	0.00	0.00	6.47	9.9	1
Davit1	#Davit1:1	End	7.56	51.19	0.04	6.25	-2.56	0.00	0.0	-3.64	1.06	-0.00	-0.67	4.11	0.00	0.00	4.77	7.3	1
Davit1	#Davit1:1	Origin	7.56	51.19	0.04	6.25	-2.56	0.00	0.0	-3.63	1.00	-0.00	-0.67	4.11	0.00	0.00	4.77	7.3	1
Davit1	Davit1:End	End	10.12	51.47	0.04	8.59	-0.00	0.00	0.0	-3.63	1.00	-0.00	-0.83	0.00	0.48	0.00	1.17	1.8	3
Davit2	Davit2:O	Origin	0.00	50.25	0.04	-2.19	-11.24	-0.00	-0.0	2.47	1.20	0.00	0.29	7.18	0.00	0.00	7.47	11.5	1
Davit2	#Davit2:0	End	5.00	50.46	0.04	-7.20	-5.24	-0.00	-0.0	2.47	1.20	0.00	0.38	5.86	0.00	0.00	6.24	9.6	1
Davit2	#Davit2:0	Origin	5.00	50.46	0.04	-7.20	-5.24	-0.00	-0.0	2.47	1.06	0.00	0.38	5.86	0.00	0.00	6.24	9.6	1
Davit2	#Davit2:1	End	7.56	50.56	0.04	-9.82	-2.52	-0.00	-0.0	2.47	1.06	0.00	0.45	4.06	0.00	0.00	4.51	6.9	1
Davit2	#Davit2:1	Origin	7.56	50.56	0.04	-9.82	-2.52	-0.00	0.0	2.48	0.99	0.00	0.45	4.06	0.00	0.00	4.51	6.9	1
Davit2	Davit2:End	End	10.12	50.67	0.04	-12.49	0.00	0.00	0.0	2.48	0.99	0.00	0.56	0.00	0.47	0.00	0.99	1.5	3

Davit3	Davit3:O	Origin	0.00	38.88	0.03	-0.29	-20.48	0.00	0.0	-6.69	2.79	-0.00	-0.60	7.71	0.00	0.00	8.31	12.8	1
Davit3	#Davit3:0	End	3.76	39.31	0.03	3.20	-9.97	0.00	0.0	-6.69	2.79	-0.00	-0.81	6.93	0.00	0.00	7.74	11.9	1
Davit3	#Davit3:0	Origin	3.76	39.31	0.03	3.20	-9.97	0.00	0.0	-6.66	2.65	-0.00	-0.81	6.93	0.00	0.00	7.74	11.9	1
Davit3	Davit3:End	End	7.53	39.73	0.03	6.59	-0.00	0.00	0.0	-6.66	2.65	-0.00	-1.25	0.00	1.04	0.00	2.19	3.4	3
Davit4	Davit4:O	Origin	0.00	38.82	0.03	-1.88	-28.30	-0.00	-0.0	6.15	3.85	0.00	0.55	10.66	0.00	0.00	11.21	17.2	1
Davit4	#Davit4:0	End	3.76	38.98	0.03	-5.50	-13.82	-0.00	-0.0	6.15	3.85	0.00	0.75	9.60	0.00	0.00	10.35	15.9	1
Davit4	#Davit4:0	Origin	3.76	38.98	0.03	-5.50	-13.82	-0.00	0.0	6.16	3.67	0.00	0.75	9.60	0.00	0.00	10.35	15.9	1
Davit4	Davit4:End	End	7.53	39.14	0.03	-9.25	-0.00	0.00	0.0	6.16	3.67	0.00	1.16	0.00	1.44	0.00	2.75	4.2	3
Davit5	Davit5:O	Origin	0.00	27.91	0.02	0.20	-28.86	0.00	0.0	-6.69	3.00	-0.00	-0.47	8.31	0.00	0.00	8.78	13.5	1
Davit5	#Davit5:0	End	5.00	28.40	0.02	4.28	-13.86	0.00	0.0	-6.69	3.00	-0.00	-0.65	7.58	0.00	0.00	8.23	12.7	1
Davit5	#Davit5:0	Origin	5.00	28.40	0.02	4.28	-13.86	0.00	0.0	-6.65	2.80	-0.00	-0.65	7.58	0.00	0.00	8.22	12.7	1
Davit5	#Davit5:1	End	7.52	28.63	0.02	6.28	-6.81	0.00	0.0	-6.65	2.80	-0.00	-0.79	5.68	0.00	0.00	6.47	10.0	1
Davit5	#Davit5:1	Origin	7.52	28.63	0.02	6.28	-6.81	0.00	0.0	-6.63	2.70	-0.00	-0.79	5.68	0.00	0.00	6.47	10.0	1
Davit5	Davit5:End	End	10.03	28.86	0.02	8.23	-0.00	0.00	0.0	-6.63	2.70	-0.00	-1.03	0.00	0.88	0.00	1.84	2.8	3
Davit6	Davit6:O	Origin	0.00	27.85	0.02	-1.54	-39.13	-0.00	-0.0	6.12	4.05	0.00	0.43	11.26	0.00	0.00	11.70	18.0	1
Davit6	#Davit6:0	End	5.00	28.06	0.02	-5.86	-18.90	-0.00	-0.0	6.12	4.05	0.00	0.59	10.34	0.00	0.00	10.93	16.8	1
Davit6	#Davit6:0	Origin	5.00	28.06	0.02	-5.86	-18.90	-0.00	-0.0	6.13	3.81	0.00	0.59	10.34	0.00	0.00	10.93	16.8	1
Davit6	#Davit6:1	End	7.52	28.16	0.02	-8.11	-9.30	-0.00	-0.0	6.13	3.81	0.00	0.73	7.76	0.00	0.00	8.49	13.1	1
Davit6	#Davit6:1	Origin	7.52	28.16	0.02	-8.11	-9.30	-0.00	0.0	6.14	3.69	0.00	0.73	7.76	0.00	0.00	8.49	13.1	1
Davit6	Davit6:End	End	10.03	28.27	0.02	-10.42	-0.00	0.00	0.0	6.14	3.69	0.00	0.95	0.00	1.20	0.00	2.29	3.5	3
Davit7	Davit7:O	Origin	0.00	18.83	0.01	0.48	-21.55	0.00	0.0	-6.63	2.93	-0.00	-0.59	8.12	0.00	0.00	8.71	13.4	1
Davit7	#Davit7:0	End	3.76	19.12	0.02	3.01	-10.51	0.00	0.0	-6.63	2.93	-0.00	-0.80	7.30	0.00	0.00	8.11	12.5	1
Davit7	#Davit7:0	Origin	3.76	19.12	0.02	3.01	-10.51	0.00	0.0	-6.61	2.79	-0.00	-0.80	7.30	0.00	0.00	8.10	12.5	1
Davit7	Davit7:End	End	7.53	19.39	0.02	5.45	-0.00	0.00	0.0	-6.61	2.79	-0.00	-1.24	0.00	1.09	0.00	2.26	3.5	3
Davit8	Davit8:O	Origin	0.00	18.79	0.01	-1.22	-29.27	-0.00	-0.0	6.07	3.98	0.00	0.54	11.02	0.00	0.00	11.57	17.8	1
Davit8	#Davit8:0	End	3.76	18.93	0.01	-3.89	-14.30	-0.00	-0.0	6.07	3.98	0.00	0.74	9.94	0.00	0.00	10.68	16.4	1
Davit8	#Davit8:0	Origin	3.76	18.93	0.01	-3.89	-14.30	-0.00	0.0	6.08	3.80	0.00	0.74	9.94	0.00	0.00	10.68	16.4	1
Davit8	Davit8:End	End	7.53	19.08	0.01	-6.69	-0.00	0.00	0.0	6.08	3.80	0.00	1.14	0.00	1.49	0.00	2.82	4.3	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Holding Usage %	Input Hardware Capacity (kips)	Factored Hardware Capacity (kips)	Hardware Usage %	Max. Usage %
Clamp1	3.752	80.00	80.00	4.69	0.00	0.00	0.00	4.69
Clamp2	2.653	80.00	80.00	3.32	0.00	0.00	0.00	3.32
Clamp3	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp4	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp5	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp6	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp7	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp8	7.138	80.00	80.00	8.92	0.00	0.00	0.00	8.92
Clamp9	1.985	80.00	80.00	2.48	0.00	0.00	0.00	2.48
Clamp10	6.274	80.00	80.00	7.84	0.00	0.00	0.00	7.84
Clamp13	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp14	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp15	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp16	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp17	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp18	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87
Clamp19	0.696	80.00	80.00	0.87	0.00	0.00	0.00	0.87

*** Analysis Results for Load Case No. 2 "NESC Extreme" - Number of iterations in SAPS 14

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

Joint Label	X-Displ (ft)	Y-Displ (ft)	Z-Displ (ft)	X-Rot (deg)	Y-Rot (deg)	Z-Rot (deg)	X-Pos (ft)	Y-Pos (ft)	Z-Pos (ft)
838:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
838:t	0.0009159	4.288	-0.1335	-4.8535	0.0009	0.0000	0.0009159	4.288	94.87
838:Arm1	0.0009047	4.228	-0.131	-4.8535	0.0009	0.0000	0.0009047	4.228	94.16
838:TopConn	0.0008646	4.013	-0.1219	-4.8438	0.0009	0.0000	0.0008646	4.013	91.63
838:Arm2	0.0007196	3.245	-0.08989	-4.6371	0.0009	0.0000	0.0007196	3.245	82.41
838:BotConn	0.0006318	2.791	-0.07192	-4.3880	0.0009	0.0000	0.0006318	2.791	76.68
838:Arm3	0.0005369	2.315	-0.0543	-4.0415	0.0008	0.0000	0.0005369	2.315	70.24
838:WVGD7	0.0004632	1.956	-0.04203	-3.7189	0.0008	0.0000	0.0004632	1.956	64.96
838:Arm4	0.0003787	1.558	-0.02971	-3.2915	0.0007	0.0000	0.0003787	1.558	58.47
838:WVGD6	0.0003363	1.364	-0.02426	-3.0503	0.0007	0.0000	0.0003363	1.364	54.98
838:WVGD5	0.000228	0.8871	-0.01272	-2.4051	0.0006	0.0000	0.000228	0.8871	44.99
838:WVGD4	0.0001392	0.5195	-0.005782	-1.7954	0.0004	0.0000	0.0001392	0.5195	34.99
838:WVGD3	7.138e-05	0.2556	-0.002124	-1.2212	0.0003	0.0000	7.138e-05	0.2556	25
838:WVGD2	2.572e-05	0.08821	-0.0005541	-0.6898	0.0002	0.0000	2.572e-05	0.08821	15
838:WVGD1	2.996e-06	0.009751	-7.91e-05	-0.2142	0.0001	0.0000	2.996e-06	0.009751	5
Davit1:O	0.0009059	4.23	-0.07573	-4.8535	0.0009	0.0000	0.0009059	3.577	94.21
Davit1:End	0.0009397	4.337	0.7715	-4.8281	0.0009	0.0000	0.0009397	-6.399	95.89
Davit2:O	0.0009034	4.226	-0.1862	-4.8535	0.0009	0.0000	0.0009034	4.879	94.1
Davit2:End	0.0008975	4.26	-1.051	-4.9379	0.0009	0.0000	0.0008975	15	94.07
Davit3:O	0.000721	3.248	-0.02176	-4.6371	0.0009	0.0000	0.000721	2.405	82.48
Davit3:End	0.0007437	3.322	0.5778	-4.5743	0.0009	0.0000	0.0007437	-5.021	83.7
Davit4:O	0.0007182	3.242	-0.158	-4.6371	0.0009	0.0000	0.0007182	4.085	82.34
Davit4:End	0.000715	3.268	-0.7764	-4.7691	0.0009	0.0000	0.000715	11.61	82.35
Davit5:O	0.0005383	2.318	0.01895	-4.0415	0.0008	0.0000	0.0005383	1.279	70.31
Davit5:End	0.0005639	2.4	0.7125	-3.9472	0.0008	0.0000	0.0005639	-8.639	71.84
Davit6:O	0.0005355	2.313	-0.1275	-4.0415	0.0008	0.0000	0.0005355	3.352	70.16
Davit6:End	0.0005341	2.347	-0.8527	-4.2291	0.0008	0.0000	0.0005341	13.39	70.27
Davit7:O	0.0003798	1.56	0.04085	-3.2915	0.0007	0.0000	0.0003798	0.3309	58.54
Davit7:End	0.0003945	1.608	0.4649	-3.2186	0.0007	0.0000	0.0003945	-7.121	59.59
Davit8:O	0.0003776	1.556	-0.1003	-3.2915	0.0007	0.0000	0.0003776	2.785	58.4
Davit8:End	0.0003784	1.58	-0.5427	-3.4332	0.0007	0.0000	0.0003784	10.31	58.58

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 %
838:g	-0.03	0.0	-50.94	0.0	0.0	-34.82	0.0	0.0	61.70	0.0	3598.18	0.0	-1.1	0.0	0.0	-0.00	0.0	0.0

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

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Trans. Mom. (Local Mx) (ft-k)	Long. Mom. (Local My) (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Tran. Shear (kips)	Long. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
838	838:t	Origin	0.00	51.46	0.01	-1.60	-0.00	-0.00	-0.0	-0.02	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	4
838	838:Arm1	End	0.71	50.74	0.01	-1.57	0.01	-0.00	-0.0	-0.02	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	0.0	3
838	838:Arm1	Origin	0.71	50.74	0.01	-1.57	2.02	-0.00	0.0	-0.92	4.24	-0.00	-0.05	0.00	0.49	0.00	0.85	1.3	4

838	838:TopConn	End	3.25	48.16	0.01	-1.46	12.80	-0.00	0.0	-0.92	4.24	-0.00	-0.05	2.14	0.00	0.00	2.18	3.4	1
838	838:TopConn	Origin	3.25	48.16	0.01	-1.46	12.80	-0.00	0.0	-0.54	11.85	-0.00	-0.03	1.07	1.12	0.00	2.22	3.4	3
838	Tube 1	End	7.87	43.50	0.01	-1.27	67.61	-0.01	0.0	-0.54	11.85	-0.00	-0.03	9.14	0.00	0.00	9.16	14.1	1
838	Tube 1	Origin	7.87	43.50	0.01	-1.27	67.61	-0.01	0.0	-0.89	12.09	-0.00	-0.04	9.14	0.00	0.00	9.18	14.1	1
838	838:Arm2	End	12.50	38.94	0.01	-1.08	123.53	-0.01	0.0	-0.89	12.09	-0.00	-0.04	13.80	0.00	0.00	13.84	21.3	1
838	838:Arm2	Origin	12.50	38.94	0.01	-1.08	130.26	-0.01	0.0	-4.02	23.16	-0.00	-0.17	14.55	0.00	0.00	14.73	22.7	1
838	Tube 1	End	15.37	36.18	0.01	-0.97	196.86	-0.02	0.0	-4.02	23.16	-0.00	-0.16	19.70	0.00	0.00	19.87	30.6	1
838	Tube 1	Origin	15.37	36.18	0.01	-0.97	196.86	-0.02	0.0	-4.31	23.33	-0.00	-0.18	19.70	0.00	0.00	19.88	30.6	1
838	838:BotConn	End	18.25	33.49	0.01	-0.86	263.92	-0.03	0.0	-4.31	23.33	-0.00	-0.17	23.80	0.00	0.00	23.97	36.9	1
838	838:BotConn	Origin	18.25	33.49	0.01	-0.86	263.92	-0.03	0.0	-7.53	21.70	-0.00	-0.29	23.80	0.00	0.00	24.10	37.1	1
838	Tube 1	End	21.48	30.58	0.01	-0.75	334.02	-0.04	0.0	-7.53	21.70	-0.00	-0.28	26.96	0.00	0.00	27.24	41.9	1
838	Tube 1	Origin	21.48	30.58	0.01	-0.75	334.02	-0.04	0.0	-7.89	21.89	-0.00	-0.29	26.96	0.00	0.00	27.25	41.9	1
838	838:Arm3	End	24.71	27.78	0.01	-0.65	404.73	-0.05	0.0	-7.89	21.89	-0.00	-0.28	29.41	0.00	0.00	29.69	45.7	1
838	838:Arm3	Origin	24.71	27.78	0.01	-0.65	413.65	-0.05	0.0	-11.45	32.93	-0.01	-0.40	30.06	0.00	0.00	30.46	46.9	1
838	Tube 1	End	27.35	25.58	0.01	-0.57	500.74	-0.07	0.0	-11.45	32.93	-0.01	-0.38	33.52	0.00	0.00	33.90	52.2	1
838	Tube 1	Origin	27.35	25.58	0.01	-0.57	500.74	-0.07	0.0	-11.81	33.08	-0.01	-0.40	33.52	0.00	0.00	33.92	52.2	1
838	838:WVGD7	End	30.00	23.48	0.01	-0.50	588.24	-0.08	0.0	-11.81	33.08	-0.01	-0.38	36.39	0.00	0.00	36.77	56.6	1
838	838:WVGD7	Origin	30.00	23.48	0.01	-0.50	588.24	-0.08	0.0	-12.40	33.51	-0.01	-0.40	36.39	0.00	0.00	36.79	56.6	1
838	Tube 1	End	33.25	21.01	0.01	-0.43	697.16	-0.10	0.0	-12.40	33.51	-0.01	-0.38	39.30	0.00	0.00	39.69	61.1	1
838	Tube 1	Origin	33.25	21.01	0.01	-0.43	697.16	-0.10	0.0	-12.89	33.72	-0.01	-0.40	39.30	0.00	0.00	39.70	61.1	1
838	838:Arm4	End	36.50	18.69	0.00	-0.36	806.74	-0.13	0.0	-12.89	33.72	-0.01	-0.38	41.62	0.00	0.00	42.00	64.6	1
838	838:Arm4	Origin	36.50	18.69	0.00	-0.36	813.42	-0.13	0.0	-16.49	44.73	-0.01	-0.49	41.96	0.00	0.00	42.45	65.3	1
838	838:WVGD6	End	40.00	16.36	0.00	-0.29	969.98	-0.16	0.0	-16.49	44.73	-0.01	-0.46	45.67	0.00	0.00	46.14	71.0	1
838	838:WVGD6	Origin	40.00	16.36	0.00	-0.29	969.98	-0.16	0.0	-17.04	45.11	-0.01	-0.48	45.67	0.00	0.00	46.15	71.0	1
838	SpliceT	End	40.75	15.89	0.00	-0.28	1003.81	-0.16	0.0	-17.04	45.11	-0.01	-0.48	46.37	0.00	0.00	46.85	72.1	1
838	SpliceT	Origin	40.75	15.89	0.00	-0.28	1003.81	-0.16	0.0	-17.80	45.29	-0.01	-0.50	46.37	0.00	0.00	46.87	72.1	1
838	SpliceB	End	45.00	13.34	0.00	-0.21	1196.30	-0.20	0.0	-17.80	45.29	-0.01	-0.39	42.20	0.00	0.00	42.58	65.5	1
838	SpliceB	Origin	45.00	13.34	0.00	-0.21	1196.30	-0.20	0.0	-19.02	45.62	-0.01	-0.41	42.20	0.00	0.00	42.61	65.6	1
838	838:WVGD5	End	50.00	10.65	0.00	-0.15	1424.38	-0.26	0.0	-19.02	45.62	-0.01	-0.39	44.57	0.00	0.00	44.96	69.2	1
838	838:WVGD5	Origin	50.00	10.65	0.00	-0.15	1424.38	-0.26	0.0	-20.28	46.22	-0.01	-0.42	44.57	0.00	0.00	44.99	69.2	1
838	Tube 2	End	55.00	8.28	0.00	-0.11	1655.47	-0.32	0.0	-20.28	46.22	-0.01	-0.39	46.27	0.00	0.00	46.66	71.8	1
838	Tube 2	Origin	55.00	8.28	0.00	-0.11	1655.47	-0.32	0.0	-21.40	46.59	-0.01	-0.42	46.27	0.00	0.00	46.68	71.8	1
838	838:WVGD4	End	60.00	6.23	0.00	-0.07	1888.42	-0.38	0.0	-21.40	46.59	-0.01	-0.39	47.42	0.00	0.00	47.82	73.6	1
838	838:WVGD4	Origin	60.00	6.23	0.00	-0.07	1888.42	-0.38	0.0	-22.75	47.22	-0.02	-0.42	47.42	0.00	0.00	47.84	73.6	1
838	Tube 2	End	65.00	4.50	0.00	-0.04	2124.53	-0.46	0.0	-22.75	47.22	-0.02	-0.40	48.20	0.00	0.00	48.60	74.8	1
838	Tube 2	Origin	65.00	4.50	0.00	-0.04	2124.53	-0.46	0.0	-23.96	47.63	-0.02	-0.42	48.20	0.00	0.00	48.62	74.8	1
838	838:WVGD3	End	70.00	3.07	0.00	-0.03	2362.68	-0.54	0.0	-23.96	47.63	-0.02	-0.40	48.67	0.00	0.00	49.07	75.5	1
838	838:WVGD3	Origin	70.00	3.07	0.00	-0.03	2362.68	-0.54	0.0	-25.39	48.30	-0.02	-0.42	48.67	0.00	0.00	49.09	75.5	1
838	Tube 2	End	75.00	1.92	0.00	-0.01	2604.18	-0.64	0.0	-25.39	48.30	-0.02	-0.40	48.92	0.00	0.00	49.32	75.9	1
838	Tube 2	Origin	75.00	1.92	0.00	-0.01	2604.18	-0.64	0.0	-26.68	48.74	-0.02	-0.43	48.92	0.00	0.00	49.34	75.9	1
838	838:WVGD2	End	80.00	1.06	0.00	-0.01	2847.89	-0.74	0.0	-26.68	48.74	-0.02	-0.41	48.98	0.00	0.00	49.39	76.0	1
838	838:WVGD2	Origin	80.00	1.06	0.00	-0.01	2847.89	-0.74	0.0	-27.91	49.35	-0.02	-0.43	48.98	0.00	0.00	49.41	76.0	1
838	Tube 2	End	82.88	0.68	0.00	-0.00	2989.76	-0.80	0.0	-27.91	49.35	-0.02	-0.42	48.97	0.00	0.00	49.38	76.0	1
838	Tube 2	Origin	82.88	0.68	0.00	-0.00	2989.76	-0.80	0.0	-28.69	49.62	-0.02	-0.43	48.97	0.00	0.00	49.39	76.0	1
838	SpliceT	End	85.75	0.40	0.00	-0.00	3132.40	-0.87	0.0	-28.69	49.62	-0.02	-0.42	48.91	0.00	0.00	49.32	75.9	1
838	SpliceT	Origin	85.75	0.40	0.00	-0.00	3132.40	-0.87	0.0	-29.71	49.97	-0.02	-0.40	45.82	0.00	0.00	46.22	71.1	1
838	838:WVGD1	End	90.00	0.12	0.00	-0.00	3344.77	-0.97	0.0	-29.71	49.97	-0.02	-0.39	45.68	0.00	0.00	46.07	70.9	1
838	838:WVGD1	Origin	90.00	0.12	0.00	-0.00	3344.77	-0.97	0.0	-31.27	50.68	-0.03	-0.41	45.68	0.00	0.00	46.09	70.9	1
838	838:g	End	95.00	0.00	0.00	0.00	3598.18	-1.10	0.0	-31.27	50.68	-0.03	-0.40	45.46	0.00	0.00	45.86	70.6	1

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	50.76	0.01	-0.91	-1.30	0.00	0.0	-2.68	0.18	-0.00	-0.31	0.83	0.00	0.00	1.14	1.8	1
Davit1	#Davit1:0	End	5.00	51.40	0.01	4.12	-0.38	0.00	0.0	-2.68	0.18	-0.00	-0.41	0.43	0.00	0.00	0.84	1.3	1

Davit1	#Davit1:0	Origin	5.00	51.40	0.01	4.12	-0.38	0.00	0.0	-2.67	0.10	-0.00	-0.41	0.43	0.00	0.00	0.84	1.3	1
Davit1	#Davit1:1	End	7.56	51.72	0.01	6.69	-0.13	0.00	0.0	-2.67	0.10	-0.00	-0.49	0.21	0.00	0.00	0.70	1.1	1
Davit1	#Davit1:1	Origin	7.56	51.72	0.01	6.69	-0.13	0.00	0.0	-2.66	0.05	-0.00	-0.49	0.21	0.00	0.00	0.70	1.1	1
Davit1	Davit1:End	End	10.12	52.04	0.01	9.26	-0.00	0.00	0.0	-2.66	0.05	-0.00	-0.60	0.00	0.02	0.00	0.61	0.9	3
Davit2	Davit2:O	Origin	0.00	50.71	0.01	-2.23	-3.39	-0.00	-0.0	1.46	0.39	0.00	0.17	2.17	0.00	0.00	2.34	3.6	1
Davit2	#Davit2:0	End	5.00	50.91	0.01	-7.34	-1.42	-0.00	-0.0	1.46	0.39	0.00	0.22	1.59	0.00	0.00	1.82	2.8	1
Davit2	#Davit2:0	Origin	5.00	50.91	0.01	-7.34	-1.42	-0.00	-0.0	1.46	0.30	0.00	0.22	1.59	0.00	0.00	1.82	2.8	1
Davit2	#Davit2:1	End	7.56	51.02	0.01	-9.97	-0.65	-0.00	-0.0	1.46	0.30	0.00	0.27	1.05	0.00	0.00	1.31	2.0	1
Davit2	#Davit2:1	Origin	7.56	51.02	0.01	-9.97	-0.65	-0.00	-0.0	1.46	0.25	0.00	0.27	1.05	0.00	0.00	1.31	2.0	1
Davit2	Davit2:End	End	10.12	51.12	0.01	-12.61	0.00	0.00	-0.0	1.46	0.25	0.00	0.33	0.00	0.12	0.00	0.39	0.6	3
Davit3	Davit3:O	Origin	0.00	38.97	0.01	-0.26	-6.30	0.00	0.0	-5.52	0.89	-0.00	-0.49	2.37	0.00	0.00	2.87	4.4	1
Davit3	#Davit3:0	End	3.76	39.42	0.01	3.35	-2.97	0.00	0.0	-5.52	0.89	-0.00	-0.67	2.06	0.00	0.00	2.73	4.2	1
Davit3	#Davit3:0	Origin	3.76	39.42	0.01	3.35	-2.97	0.00	0.0	-5.50	0.79	-0.00	-0.67	2.06	0.00	0.00	2.73	4.2	1
Davit3	Davit3:End	End	7.53	39.86	0.01	6.93	-0.00	0.00	0.0	-5.50	0.79	-0.00	-1.03	0.00	0.31	0.00	1.16	1.8	3
Davit4	Davit4:O	Origin	0.00	38.90	0.01	-1.90	-13.03	-0.00	-0.0	5.30	1.79	0.00	0.48	4.91	0.00	0.00	5.38	8.3	1
Davit4	#Davit4:0	End	3.76	39.06	0.01	-5.58	-6.30	-0.00	-0.0	5.30	1.79	0.00	0.64	4.38	0.00	0.00	5.02	7.7	1
Davit4	#Davit4:0	Origin	3.76	39.06	0.01	-5.58	-6.30	-0.00	0.0	5.30	1.67	0.00	0.64	4.38	0.00	0.00	5.02	7.7	1
Davit4	Davit4:End	End	7.53	39.22	0.01	-9.32	-0.00	0.00	0.0	5.30	1.67	0.00	0.99	0.00	0.66	0.00	1.51	2.3	3
Davit5	Davit5:O	Origin	0.00	27.81	0.01	0.23	-9.60	0.00	0.0	-5.53	1.04	-0.00	-0.39	2.76	0.00	0.00	3.15	4.9	1
Davit5	#Davit5:0	End	5.00	28.31	0.01	4.40	-4.39	0.00	0.0	-5.53	1.04	-0.00	-0.54	2.40	0.00	0.00	2.94	4.5	1
Davit5	#Davit5:0	Origin	5.00	28.31	0.01	4.40	-4.39	0.00	0.0	-5.50	0.91	-0.00	-0.53	2.40	0.00	0.00	2.94	4.5	1
Davit5	#Davit5:1	End	7.52	28.56	0.01	6.48	-2.11	0.00	0.0	-5.50	0.91	-0.00	-0.66	1.76	0.00	0.00	2.42	3.7	1
Davit5	#Davit5:1	Origin	7.52	28.56	0.01	6.48	-2.11	0.00	0.0	-5.49	0.84	-0.00	-0.66	1.76	0.00	0.00	2.42	3.7	1
Davit5	Davit5:End	End	10.03	28.80	0.01	8.55	-0.00	0.00	0.0	-5.49	0.84	-0.00	-0.85	0.00	0.27	0.00	0.97	1.5	3
Davit6	Davit6:O	Origin	0.00	27.75	0.01	-1.53	-18.51	-0.00	-0.0	5.28	1.94	0.00	0.37	5.33	0.00	0.00	5.70	8.8	1
Davit6	#Davit6:0	End	5.00	27.96	0.01	-5.81	-8.81	-0.00	-0.0	5.28	1.94	0.00	0.51	4.82	0.00	0.00	5.33	8.2	1
Davit6	#Davit6:0	Origin	5.00	27.96	0.01	-5.81	-8.81	-0.00	-0.0	5.28	1.79	0.00	0.51	4.82	0.00	0.00	5.33	8.2	1
Davit6	#Davit6:1	End	7.52	28.06	0.01	-8.01	-4.31	-0.00	-0.0	5.28	1.79	0.00	0.63	3.60	0.00	0.00	4.23	6.5	1
Davit6	#Davit6:1	Origin	7.52	28.06	0.01	-8.01	-4.31	-0.00	0.0	5.29	1.71	0.00	0.63	3.60	0.00	0.00	4.23	6.5	1
Davit6	Davit6:End	End	10.03	28.16	0.01	-10.23	-0.00	0.00	0.0	5.29	1.71	0.00	0.82	0.00	0.56	0.00	1.27	1.9	3
Davit7	Davit7:O	Origin	0.00	18.72	0.00	0.49	-7.29	0.00	0.0	-5.50	1.02	-0.00	-0.49	2.74	0.00	0.00	3.24	5.0	1
Davit7	#Davit7:0	End	3.76	19.01	0.00	3.05	-3.46	0.00	0.0	-5.50	1.02	-0.00	-0.67	2.40	0.00	0.00	3.07	4.7	1
Davit7	#Davit7:0	Origin	3.76	19.01	0.00	3.05	-3.46	0.00	0.0	-5.48	0.92	-0.00	-0.67	2.40	0.00	0.00	3.07	4.7	1
Davit7	Davit7:End	End	7.53	19.29	0.00	5.58	-0.00	0.00	0.0	-5.48	0.92	-0.00	-1.03	0.00	0.36	0.00	1.20	1.9	3
Davit8	Davit8:O	Origin	0.00	18.67	0.00	-1.20	-13.96	-0.00	-0.0	5.26	1.91	0.00	0.47	5.26	0.00	0.00	5.73	8.8	1
Davit8	#Davit8:0	End	3.76	18.81	0.00	-3.83	-6.77	-0.00	-0.0	5.26	1.91	0.00	0.64	4.70	0.00	0.00	5.34	8.2	1
Davit8	#Davit8:0	Origin	3.76	18.81	0.00	-3.83	-6.77	-0.00	0.0	5.26	1.80	0.00	0.64	4.70	0.00	0.00	5.34	8.2	1
Davit8	Davit8:End	End	7.53	18.96	0.00	-6.51	-0.00	0.00	0.0	5.26	1.80	0.00	0.99	0.00	0.70	0.00	1.57	2.4	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Holding Usage %	Input Hardware Capacity (kips)	Factored Hardware Capacity (kips)	Hardware Usage %	Max. Usage %
Clamp1	2.656	80.00	80.00	3.32	0.00	0.00	0.00	3.32
Clamp2	1.476	80.00	80.00	1.85	0.00	0.00	0.00	1.85
Clamp3	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93
Clamp4	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93
Clamp5	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93

Clamp6	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93
Clamp7	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93
Clamp8	5.547	80.00	80.00	6.93	0.00	0.00	0.00	6.93
Clamp9	7.463	80.00	80.00	9.33	0.00	0.00	0.00	9.33
Clamp10	3.408	80.00	80.00	4.26	0.00	0.00	0.00	4.26
Clamp13	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp14	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp15	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp16	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp17	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp18	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38
Clamp19	0.304	80.00	80.00	0.38	0.00	0.00	0.00	0.38

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

Summary of Steel Pole Usages:

Steel Pole Label	Maximum Usage %	Load Case	Height AGL (ft)	Segment Number	Weight (lbs)
838	77.25	NESC Heavy	17.5	22	18016.5

Base Plate Results by Bend Line:

Pole Label	Load Case	Bend Line #	Start X (ft)	Start Y (ft)	End X (ft)	End Y (ft)	Length (in)	Bending Stress (ksi)	Bolt Mom. Sum (ft-k)	# Bolts Acting	Bolt Max Load (kips)	Min Plate Thickness (in)	Actual Thickness (in)	Usage %
838	NESC Heavy	1	-0.000	2.141	-1.070	1.854	13.297	25.575	42.509	1	144.676	1.959	3.000	42.62
838	NESC Heavy	2	-1.070	1.854	-1.854	1.070	13.297	52.913	87.947	3	130.081	2.817	3.000	88.19
838	NESC Heavy	3	-1.854	1.070	-2.141	-0.000	13.297	10.083	16.759	1	57.039	1.230	3.000	16.81
838	NESC Heavy	4	-2.141	-0.000	-1.854	-1.070	13.297	8.952	14.879	1	-50.641	1.159	3.000	14.92
838	NESC Heavy	5	-1.854	-1.070	-1.070	-1.854	13.297	49.834	82.829	3	-123.801	2.734	3.000	83.06
838	NESC Heavy	6	-1.070	-1.854	0.000	-2.141	13.297	24.475	40.680	1	-138.452	1.916	3.000	40.79
838	NESC Heavy	7	0.000	-2.141	1.070	-1.854	13.297	24.494	40.712	1	-138.559	1.917	3.000	40.82
838	NESC Heavy	8	1.070	-1.854	1.854	-1.070	13.297	49.936	82.999	3	-123.965	2.737	3.000	83.23
838	NESC Heavy	9	1.854	-1.070	2.141	0.000	13.297	9.002	14.962	1	-50.923	1.162	3.000	15.00
838	NESC Heavy	10	2.141	0.000	1.854	1.070	13.297	10.033	16.677	1	56.757	1.227	3.000	16.72
838	NESC Heavy	11	1.854	1.070	1.070	1.854	13.297	52.811	87.777	3	129.917	2.815	3.000	88.02
838	NESC Heavy	12	1.070	1.854	0.000	2.141	13.297	25.556	42.477	1	144.568	1.958	3.000	42.59
838	NESC Extreme	1	-0.000	2.141	-1.070	1.854	13.297	25.354	42.142	1	143.429	1.950	3.000	42.26
838	NESC Extreme	2	-1.070	1.854	-1.854	1.070	13.297	52.258	86.858	3	128.789	2.800	3.000	87.10
838	NESC Extreme	3	-1.854	1.070	-2.141	-0.000	13.297	9.825	16.330	1	55.579	1.214	3.000	16.37
838	NESC Extreme	4	-2.141	-0.000	-1.854	-1.070	13.297	9.243	15.364	1	-52.289	1.178	3.000	15.41
838	NESC Extreme	5	-1.854	-1.070	-1.070	-1.854	13.297	50.668	84.215	3	-125.535	2.757	3.000	84.45
838	NESC Extreme	6	-1.070	-1.854	0.000	-2.141	13.297	24.782	41.192	1	-140.193	1.928	3.000	41.30
838	NESC Extreme	7	0.000	-2.141	1.070	-1.854	13.297	24.788	41.201	1	-140.226	1.928	3.000	41.31
838	NESC Extreme	8	1.070	-1.854	1.854	-1.070	13.297	50.700	84.267	3	-125.586	2.758	3.000	84.50
838	NESC Extreme	9	1.854	-1.070	2.141	0.000	13.297	9.259	15.389	1	-52.376	1.178	3.000	15.43
838	NESC Extreme	10	2.141	0.000	1.854	1.070	13.297	9.810	16.305	1	55.492	1.213	3.000	16.35
838	NESC Extreme	11	1.854	1.070	1.070	1.854	13.297	52.227	86.806	3	128.738	2.799	3.000	87.05
838	NESC Extreme	12	1.070	1.854	0.000	2.141	13.297	25.349	42.133	1	143.396	1.950	3.000	42.25

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Height AGL (ft)	Segment Number	Weight (lbs)
Davit1	11.69	NESC Heavy	94.5	1	223.6
Davit2	11.49	NESC Heavy	94.5	1	223.6
Davit3	12.79	NESC Heavy	82.7	1	211.1
Davit4	17.24	NESC Heavy	82.7	1	211.1
Davit5	13.51	NESC Heavy	70.5	1	351.3
Davit6	18.00	NESC Heavy	70.5	1	351.3
Davit7	13.40	NESC Heavy	58.7	1	211.1
Davit8	17.79	NESC Heavy	58.7	1	211.1

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	88.19	838	Base Plate
NESC Extreme	87.10	838	Base Plate

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Height AGL (ft)	Segment Number
NESC Heavy	77.25	838	17.5	22
NESC Extreme	76.01	838	13.6	23

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	838	2	13.297	61.162	3591.920	-3.577	52.913	87.947	3	130.081	2.817	88.19
NESC Extreme	838	2	13.297	32.030	3598.179	-1.100	52.258	86.858	3	128.789	2.800	87.10

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Height AGL (ft)	Segment Number
NESC Heavy	18.00	Davit6	70.5	1
NESC Extreme	8.81	Davit8	58.7	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
Clamp1	Clamp	4.69	NESC Heavy	0.0
Clamp2	Clamp	3.32	NESC Heavy	0.0
Clamp3	Clamp	8.92	NESC Heavy	0.0
Clamp4	Clamp	8.92	NESC Heavy	0.0
Clamp5	Clamp	8.92	NESC Heavy	0.0
Clamp6	Clamp	8.92	NESC Heavy	0.0
Clamp7	Clamp	8.92	NESC Heavy	0.0
Clamp8	Clamp	8.92	NESC Heavy	0.0
Clamp9	Clamp	9.33	NESC Extreme	0.0
Clamp10	Clamp	7.84	NESC Heavy	0.0
Clamp13	Clamp	0.87	NESC Heavy	0.0
Clamp14	Clamp	0.87	NESC Heavy	0.0
Clamp15	Clamp	0.87	NESC Heavy	0.0
Clamp16	Clamp	0.87	NESC Heavy	0.0
Clamp17	Clamp	0.87	NESC Heavy	0.0
Clamp18	Clamp	0.87	NESC Heavy	0.0
Clamp19	Clamp	0.87	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	3.426	1.530	3.752
NESC Heavy	Clamp2	Clamp	Davit2:End	0.000	2.471	0.965	2.653
NESC Heavy	Clamp3	Clamp	Davit3:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp4	Clamp	Davit4:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp5	Clamp	Davit5:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp6	Clamp	Davit6:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp7	Clamp	Davit7:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp8	Clamp	Davit8:End	0.000	6.160	3.607	7.138
NESC Heavy	Clamp9	Clamp	838:TopConn	0.000	1.985	0.000	1.985
NESC Heavy	Clamp10	Clamp	838:BotConn	0.000	-0.464	6.257	6.274
NESC Heavy	Clamp13	Clamp	838:WVGD1	0.000	0.093	0.690	0.696
NESC Heavy	Clamp14	Clamp	838:WVGD2	0.000	0.093	0.690	0.696
NESC Heavy	Clamp15	Clamp	838:WVGD3	0.000	0.093	0.690	0.696
NESC Heavy	Clamp16	Clamp	838:WVGD4	0.000	0.093	0.690	0.696
NESC Heavy	Clamp17	Clamp	838:WVGD5	0.000	0.093	0.690	0.696
NESC Heavy	Clamp18	Clamp	838:WVGD6	0.000	0.093	0.690	0.696
NESC Heavy	Clamp19	Clamp	838:WVGD7	0.000	0.093	0.690	0.696
NESC Extreme	Clamp1	Clamp	Davit1:End	0.000	2.614	0.472	2.656
NESC Extreme	Clamp2	Clamp	Davit2:End	0.000	1.457	0.238	1.476
NESC Extreme	Clamp3	Clamp	Davit3:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp4	Clamp	Davit4:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp5	Clamp	Davit5:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp6	Clamp	Davit6:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp7	Clamp	Davit7:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp8	Clamp	Davit8:End	0.000	5.302	1.630	5.547
NESC Extreme	Clamp9	Clamp	838:TopConn	0.000	7.463	0.000	7.463
NESC Extreme	Clamp10	Clamp	838:BotConn	0.000	-2.015	2.748	3.408
NESC Extreme	Clamp13	Clamp	838:WVGD1	0.000	0.240	0.187	0.304
NESC Extreme	Clamp14	Clamp	838:WVGD2	0.000	0.240	0.187	0.304
NESC Extreme	Clamp15	Clamp	838:WVGD3	0.000	0.240	0.187	0.304
NESC Extreme	Clamp16	Clamp	838:WVGD4	0.000	0.240	0.187	0.304
NESC Extreme	Clamp17	Clamp	838:WVGD5	0.000	0.240	0.187	0.304
NESC Extreme	Clamp18	Clamp	838:WVGD6	0.000	0.240	0.187	0.304
NESC Extreme	Clamp19	Clamp	838:WVGD7	0.000	0.240	0.187	0.304

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	45.029	0.000	35.224	3352.932	0.000	0.000
NESC Extreme	43.011	0.000	14.547	3236.224	0.000	0.000

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	1994.0
Weight of Steel Poles:	18016.5
Total:	20010.6

*** End of Report

Anchor Bolt Analysis:

Input Data:

Bolt Force:

Maximum Tensile Force =	$T_{Max} := 130 \cdot kips$	(User Input from PLS-Pole)
Maximum Shear Force at Base =	$V_{base} := 51 \cdot kips$	(User Input from PLS-Pole)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 20$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield 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:

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

Maximum Shear Force per Bolt = $V_{Max} := \frac{V_{base}}{N} = 2.6 \cdot kips$

Shear Stress per Bolt = $f_v := \frac{V_{Max}}{A_s} = 785.2\,psi$

Tensile Stress Permitted = $F_t := 0.75 \cdot F_u = 75 \cdot ksi$

Shear Stress Permitted = $F_v := 0.35 F_y = 26.25 \cdot ksi$

Permitted Axial Tensile Stress in Conjuction with Shear = $F_{tv} := F_t \cdot \sqrt{1 - \left(\frac{f_v}{F_v}\right)^2} = 74.97 \cdot ksi$

Bolt Tension % of Capacity = $\frac{T_{Max}}{F_{tv} \cdot A_s} = 53.4 \cdot \%$

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

Condition1 = "OK"

Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 3599 \cdot 1.1 \cdot ft \cdot kips = 3959 \cdot ft \cdot kips$	(User Input from PLS-Pole)	
Shear Force =	$Shear := 51 \cdot kip \cdot 1.1 = 56.1 \cdot kips$	(User Input from PLS-Pole)	
Axial Force =	$Axial := 35 \cdot kip \cdot 1.1 = 38.5 \cdot kips$	(User Input from PLS-Pole)	
Tower Height =	$H_t := 95 \cdot ft$	(User Input)	

Footing Data:

Depth to Bottom of Footing =	$D_f := 13.5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 14 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Width of Pier =	$W_p := 10 \cdot ft$	(User Input)	
Depth of Soil =	$D_{soil} := 13.5 \cdot ft$	(User Input)	
Depth of Rock =	$D_{rock} := 18 \cdot ft$	(User Input)	

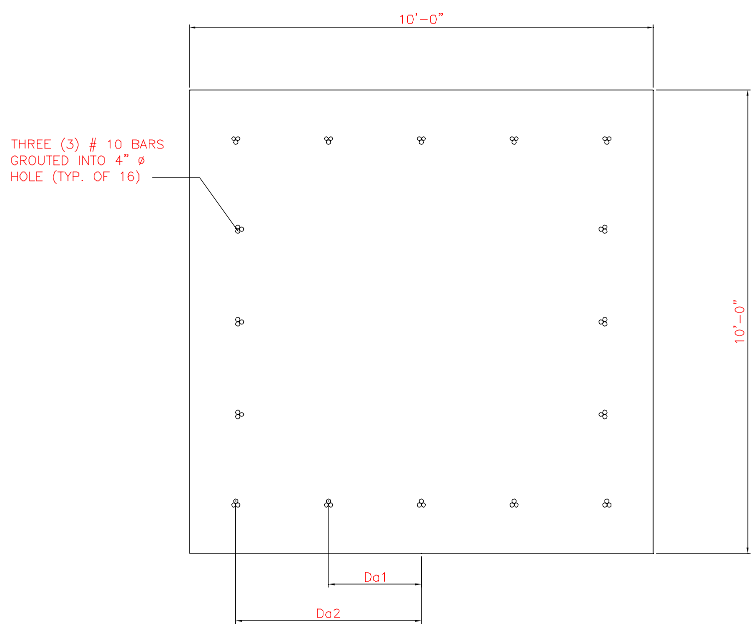
Material Properties:

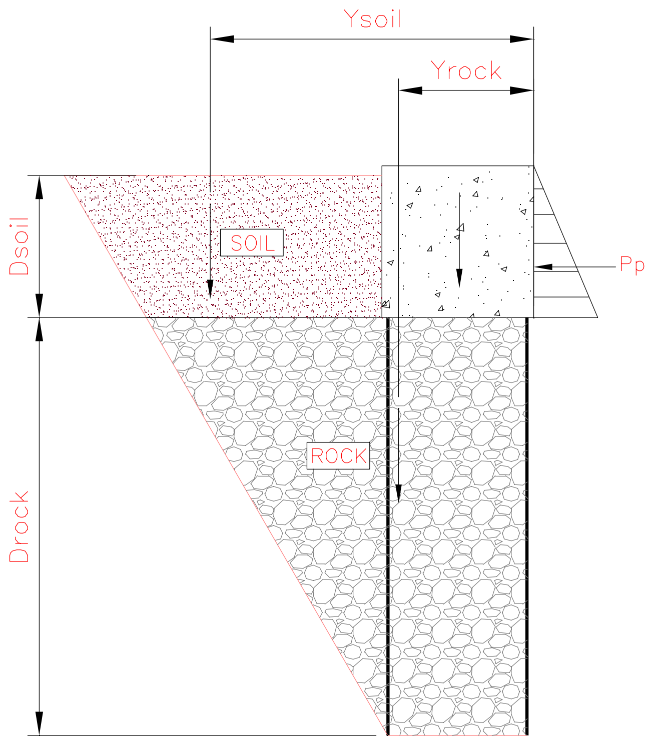
Concrete Compressive Strength =	$f_c := 3500 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Soil Bearing Capacity =	$q_s := 8000 \cdot psf$	(User Input)	
Rock Bearing Capacity =	$q_{rock} := 50000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(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)	
Bar Diameter =	$d_{ra} := 1.27 \cdot in$	(User Input)	
Number of Bars per Hole =	$n_{ra} := 3$	(User Input)	
Gross Area of Bolt Group =	$A_g := \frac{\pi}{4} \cdot d_{ra}^2 \cdot n_{ra} = 3.8 \cdot in^2$		(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 =	$D_{a1} := 24 \cdot in$	(User Input)	
Distance to Rock Anchor Group 2 =	$D_{a2} := 48 \cdot in$	(User Input)	
Number of Rock Anchors in Group 1 =	$N_{a1} := 4$	(User Input)	
Number of Rock Anchors in Group 2 =	$N_{a2} := 10$	(User Input)	
Total Number of Rock Anchors =	$N_{atot} := 16$	(User Input)	





Area 1 =	$A1_s := \frac{1}{2} \cdot \tan(\Phi_s) \cdot D_{soil}^2 = 52.611\,ft^2$	
Area 2 =	$A2_s := \tan(\Phi_s) \cdot D_{rock} \cdot D_{soil} = 140.296\,ft^2$	sf
Distance to Centroid 1 =	$Y1 := \tan(\Phi_s) \cdot D_{rock} + \frac{1}{3} \cdot \tan(\Phi_s) \cdot D_{soil} = 12.99\,ft$	ft
Distance to Centroid 2 =	$Y2 := \frac{1}{2} \cdot \tan(\Phi_s) \cdot D_{rock} = 5.196\,ft$	ft
Distance from Toe to Centroid of Soil =	$Y_{soil} := \frac{(A1_s \cdot Y1 + A2_s \cdot Y2)}{(A1_s + A2_s)} + W_p = 17.32\,ft$	ft
Area 1 =	$A1_r := \frac{1}{2} \cdot \tan(\Phi_s) \cdot D_{rock}^2 = 93.531\,ft^2$	sf
Area 2 =	$A2_r := W_p \cdot D_{rock} = 180\,ft^2$	sf
Distance to Centroid 1 =	$Y1 := W_p + \frac{1}{3} \cdot \tan(\Phi_s) \cdot D_{rock} = 13.464\,ft$	ft
Distance to Centroid 2 =	$Y2 := \frac{W_p}{2} = 5\,ft$	ft
Distance from Toe to Centroid of Rock =	$Y_{rock} := \frac{(A1_r \cdot Y1 + A2_r \cdot Y2)}{(A1_r + A2_r)} = 7.89\,ft$	ft

Stability of Footing:

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

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 120 \cdot \text{pcf}$

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

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

$P_{bot} := K_p \cdot \gamma_s \cdot D_{soil} + c \cdot 2 \cdot \sqrt{K_p} = 4.86 \cdot \text{ksf}$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 2.43 \cdot \text{ksf}$

$A_p := W_p \cdot (L_p - L_{pag}) = 135 \text{ft}^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 328.05 \cdot \text{kip}$

Passive Pressure Resistance to Overturning = $PP_R := \min[\text{Shear}, (S_u)] = 56.1 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := (W_p^2 \cdot L_p) \cdot \gamma_c = 210 \cdot \text{kip}$

Total Weight of Soil = $WT_{Stot} := (A1_s + A2_s) \cdot W_p \cdot \gamma_s = 231.5 \cdot \text{kips}$

Total Weight of Rock = $WT_{Rtot} := (A1_r + A2_r) \cdot W_p \cdot \gamma_{rock} = 437.6 \cdot \text{kips}$

Resisting Moment = $M_r := (WT_c + \text{Axial}) \cdot \frac{W_p}{2} + PP_R \cdot \frac{(L_p - L_{pag})}{3} + WT_{Stot} \cdot Y_{soil} + WT_{Rtot} \cdot Y_{rock} = 8960 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot L_p = 4744 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 1.89$

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

OverTurning_Moment_Check := if(FS ≥ FS_{req}, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

RockAnchor Check

Polar Moment of Inertia = $I_p := \left(D_{a1}{}^2 \cdot N_{a1} + D_{a2}{}^2 \cdot N_{a2}\right) = 25344 \cdot in^2$

Maximum Tension Force = $T_{Max} := \frac{OM \cdot D_{a2}}{I_p} - \frac{Axial + WT_c}{N_{atot}} = 74.4 \cdot kips$

Reduction Factor = $\phi := 0.9$

Design Tension = $T_{des} := \phi \cdot A_g \cdot F_y = 205.2 \cdot kips$

$\frac{T_{Max}}{T_{des}} = 36.3 \cdot \%$

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

Condition1 = "OK"

Check Bond Strength:

Reduction Factor = $\phi := 0.75$

Bond Strength = Bond_Strength := $\phi \cdot d_{Hole} \cdot \pi \cdot D_{rock} \cdot \tau = 244 \cdot kips$

$\frac{T_{Max}}{Bond\_Strength} = 30.5 \cdot \%$

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

Condition2 = "OK"

Bearing Pressure Caused by Footing:

$P_2 := \frac{M_{ot} \cdot D_{a2}}{I_p} = 107.8 \cdot kips$

$P_1 := \frac{M_{ot} \cdot D_{a1}}{I_p} = 53.9 \cdot kips$

Area of the Mat = $A_{mat} := \left(W_p \cdot \frac{W_p}{2}\right) = 50\,ft^2$

Maximum Pressure in Mat = $P_{max} := \frac{WT_c + Axial + P_1 \cdot \frac{N_{a1}}{2} + P_2 \cdot \frac{N_{a2}}{2}}{A_{mat}} = 17.909 \cdot ksf$

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

Max_Pressure_Check = "Okay"

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 1 - Site Information

Site ID: CT11860A
Status: Draft
Version: 7
Project Type: L600
Approved: Not Approved
Approved By: Not Approved
Last Modified: 9/28/2021 1:44:20 PM
Last Modified By: Mohamed.Seddik@T-Mobile.com

Site Name: CT860/CL&P Trumbull
Site Class: Utility Lattice Tower
Site Type: Structure Non Building
Plan Year: 2021
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: CL&P

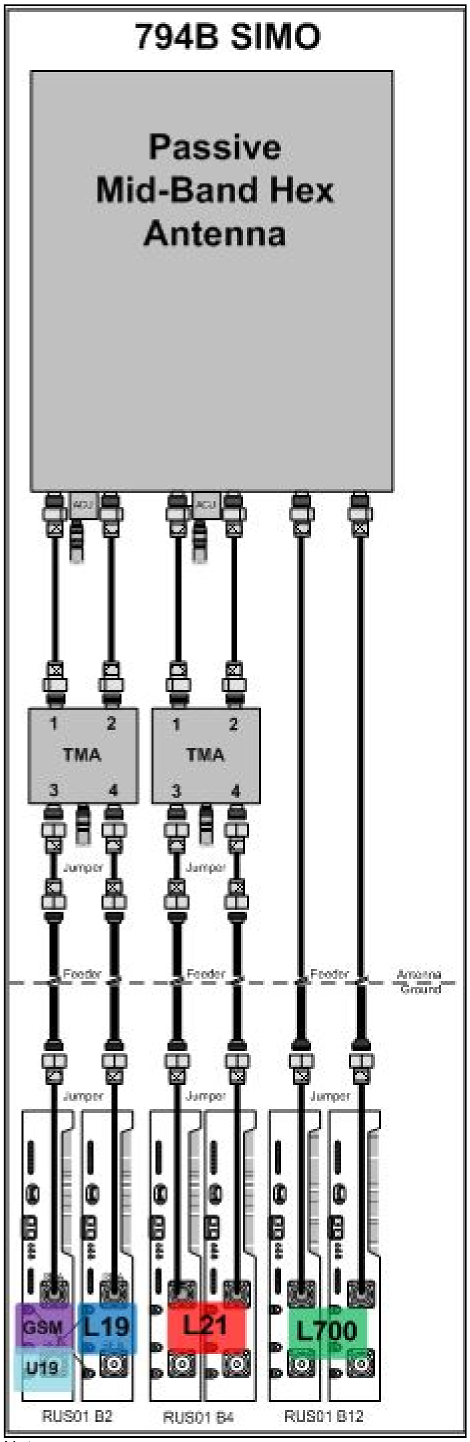
Latitude: 41.23250000
Longitude: -73.17220000
Address: 48 Quail Trail
City, State: Trumbull, CT
Region: NORTHEAST

RAN Template: 67D93D4 Hybrid		**AL Template:** 67D93D4_1QP+2HP (U21 Market)		
Sector Count: 3	**Antenna Count:** 3	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 9

Section 2 - Existing Template Images

794B_SIMO_1HP_Antenna.JPG

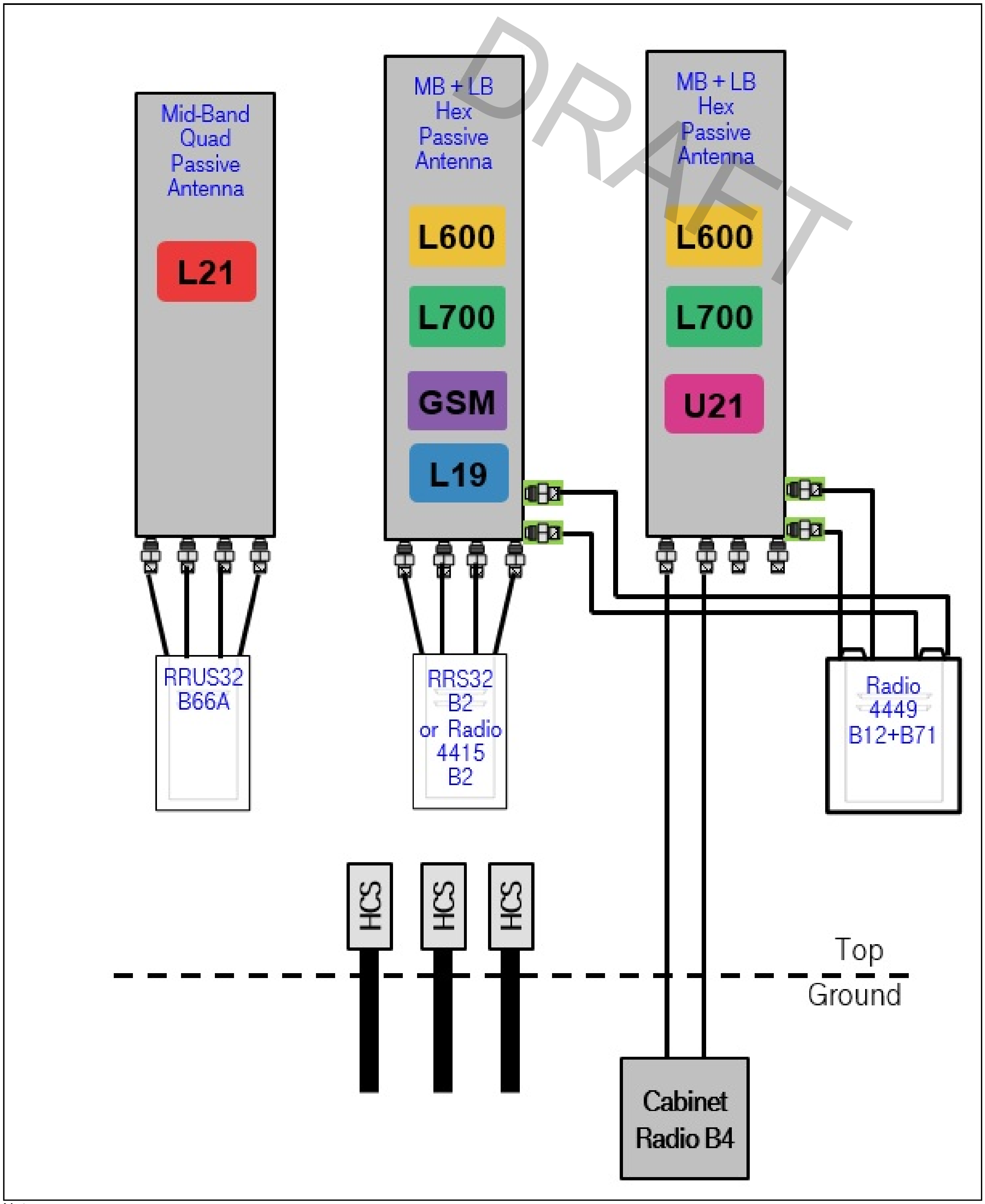
DRAFT


794B SIMO
Passive
Mid-Band Hex
Antenna
ACU
ACU
1
2
TMA
3
4
1
2
TMA
3
4
Jumper
Jumper
Feeder
Feeder
Feeder
Antenna
Ground
Jumper
Jumper
Jumper
GSM
U19
L19
L21
L700
RUS01 B2
RUS01 B4
RUS01 B12

Notes:

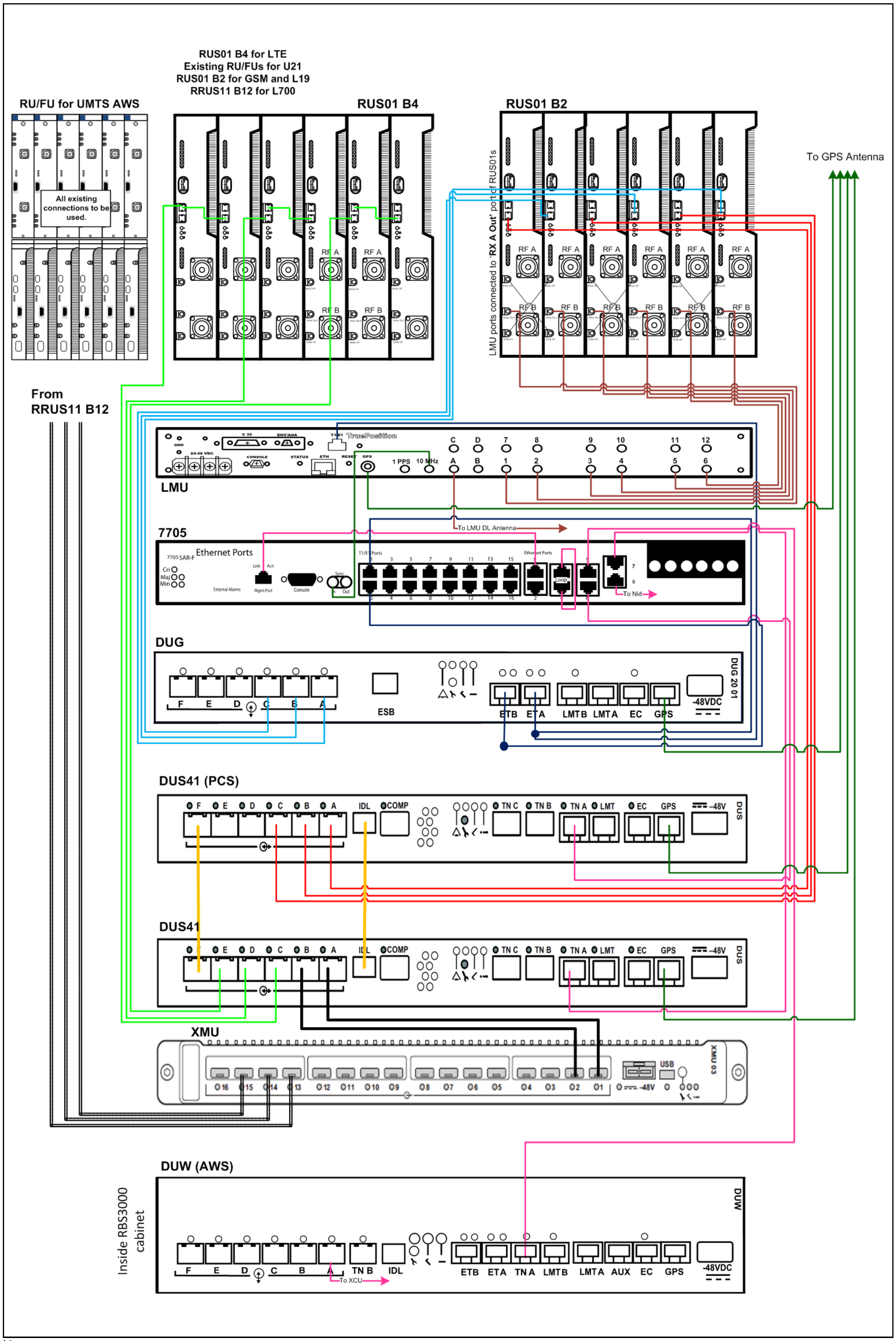
Section 3 - Proposed Template Images

67D93D4_1QP+2HP (U21 Market).jpg



Notes:

794A Indoor.png



RUS01 B4 for LTE
Existing RU/FUs for U21
RUS01 B2 for GSM and L19
RRUS11 B12 for L700
RU/FU for UMTS AWS
RUS01 B4
RUS01 B2
All existing connections to be used.
LMU ports connected to 'RX A Out' port of RUS01s
To GPS Antenna
From RRUS11 B12
LMU
7705
To LMU DL Antenna
Ethernet Ports
To Nid
DUG
ESB
ETB ETA LMTB LMTA EC GPS
-48VDC
DUG 20 01
DUS41 (PCS)
DUS41
XMU
XMU 03
DUW (AWS)
TN B IDL ETB ETA TN A LMTB LMTA AUX EC GPS
To XCU
DUW
Inside RBS3000 cabinet

Notes:

Section 4 - Siteplan Images

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

DRAFT

RAN Template: 67D93D4 Hybrid	A&L Template: 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 5 - RAN Equipment

DRAFT

Existing RAN Equipment

Template: 794B SIMO Outdoor

Enclosure	1	2	3
Enclosure Type	RBS 6102	Ground Mount (Ericsson)	Ancillary Equipment (Ericsson)
Baseband	DUW30 **(x 2)**; DUG20 (G1900); BB 5216 (L1900, L2100, L700)		
Hybrid Cable System			Ericsson 6x12 HCS *Select Length & AWG*
Multiplexer	XMU (L1900, L2100, L700)		
Radio	RUS01 B2 **(x 3)** (L1900, G1900); RUS01 B2 **(x 3)** (L1900); RUS01 B4 **(x 3)** (L2100); RUS01 B4 **(x 3)** (U2100)	RRUS11 B12 **(x 3)** (L700)	

Proposed RAN Equipment

Template: 67D93D4 Hybrid

Enclosure	1	2
Enclosure Type	RBS 6102	Ancillary Equipment (Ericsson)
Baseband	DUW30 (U2100); DUG20 (G1900); BB 6648 (L700, L600, N600); BB 6648 (L2100, L1900)	
Transport System	CSR IXRe V2 (Gen2)	

RAN Scope of Work:

RAN Template:	A&L Template:
67D93D4 Hybrid	67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 6 - A&L Equipment

DRAFT

Existing Template: 794B SIMO_1HP
Proposed Template: 67D93D4_1QP+2HP (U21 Market)

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	50		
M. Tilt	0		
Height	105		
Ports	P1	P2	P3
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	A&L Template: 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 1 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	50		
M. Tilt			
Height	105		
Ports	P1	P2	P3
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 2 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	170		
M. Tilt	0		
Height	105		
Ports	**P1**	**P2**	**P3**
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 2 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	170		
M. Tilt			
Height	105		
Ports	**P1**	**P2**	**P3**
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:	A&L Template:
67D93D4 Hybrid	67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 3 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	300		
M. Tilt	0		
Height	105		
Ports	P1	P2	P3
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 3 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	300		
M. Tilt			
Height	105		
Ports	P1	P2	P3
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 7 - Power Systems Equipment

DRAFT

Existing Power Systems Equipment

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

Proposed Power Systems Equipment

APXVARR18_43-C-NA20

Dual Slant Polarized Triple Band (6 Port) Antenna, 584-746/1695-2200/1695-2200MHz,65 deg, 15.7/19.3/19.2dBi, 1.8m (6ft), VET, RET, 0-12°/2-12°/2-12° Tilt Range

FEATURES / BENEFITS

This antenna provides a 6 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality.
- Superior elevation pattern performance across the entire electrical down tilt range.
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional daisy chain of two high band RET motors for one single AISG point of high band tilt control.

My e-catalog

Technical features

ELECTRICAL SPECIFICATIONS

Electrical Specification Header		LOW BAND ARRAY (584-746 MHZ) [R1]		
Frequency Range	MHz	584-617	617-698	698-746
Typical Gain	dBi	14.7	15.0	15.7
Gain Over All Tilts	dBi	14.4+/-0.3	14.7+/-0.3	15.3+/-0.4
Horizontal Beamwidth	deg	63.9+/-1.2	62.1+/-1.8	60+/-1.2
Vertical Beamwidth	deg	15.9+/-0.9	14.4+/-0.8	13.0+/-0.4
Electrical Down Tilt Range	deg	0-12		
Upper Side Lobe Suppression Peak to +20	deg	22.7	21.2	18.5
Upper Side Lobe Suppression 0 to +20	deg	20.3	17.8	15.6

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Cross Polarization (XPD) @ Boresight	dB	21.5	18.7	17
Cross Polarization (XPD) @ +/-60	dB	8	9.2	8.3
VSWR		1.5:1		
3rd Order IMP 2 x 43dBm	dB	-153		
Maximum Power Input	Watts	250		

ELECTRICAL SPECIFICATIONS

Impedance	Ohm	50
Polarization	Deg	+/-45°

MECHANICAL SPECIFICATIONS

Dimensions - H x W x D	mm (in)	1829 x 500 x 216 (72 x 19.7 x 8.5)
Weight (Antenna Only)	kg (lb)	33.5 (73.9)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.4)
Packing size- HxWxD	mm (in)	1975 x 560 x 411 (77.8 x 22 x 16.2)
Shipping Weight	kg (lb)	51.8 (114.2)
Connector type		6 x 4.3-10 Long Neck Female/Bottom + 6 AISG RET connectors (3 male, 3 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable)
Mounting Hardware Material		Diecast Aluminium and Galvanized steel
Radome Material / Color		Fiberglass / Light Grey RAL7035

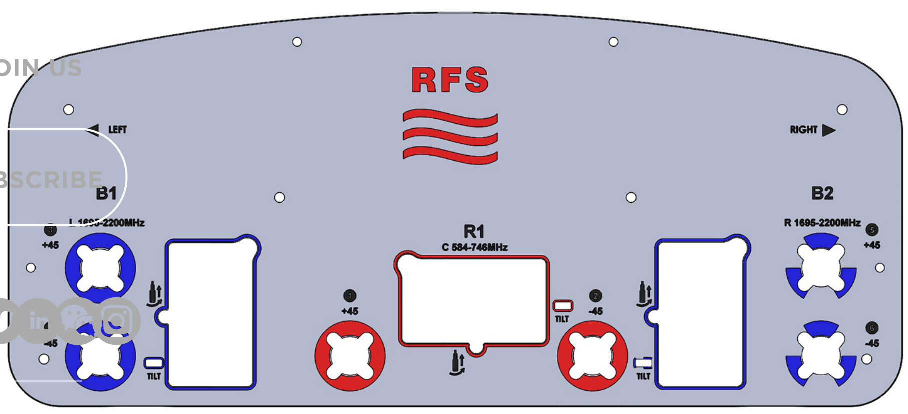
My e-catalog

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		Direct Ground
Survival/Rated Wind Velocity	km/h	241 (150)
Wind Load @Rated Wind Front	N	912
Wind Load @Rated Wind Side	N	333
Wind Load @Rated Wind Rear	N	1014
Survival wind Velocity	km/h	241

ORDERING INFORMATION

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Weight
APXVARR18_43-C-NA20	Field Replaceable RET (3)	APM40-5E Heavy Duty Beam Tilt Kit	60-120mm	33.5 kg (73.9 lbs)



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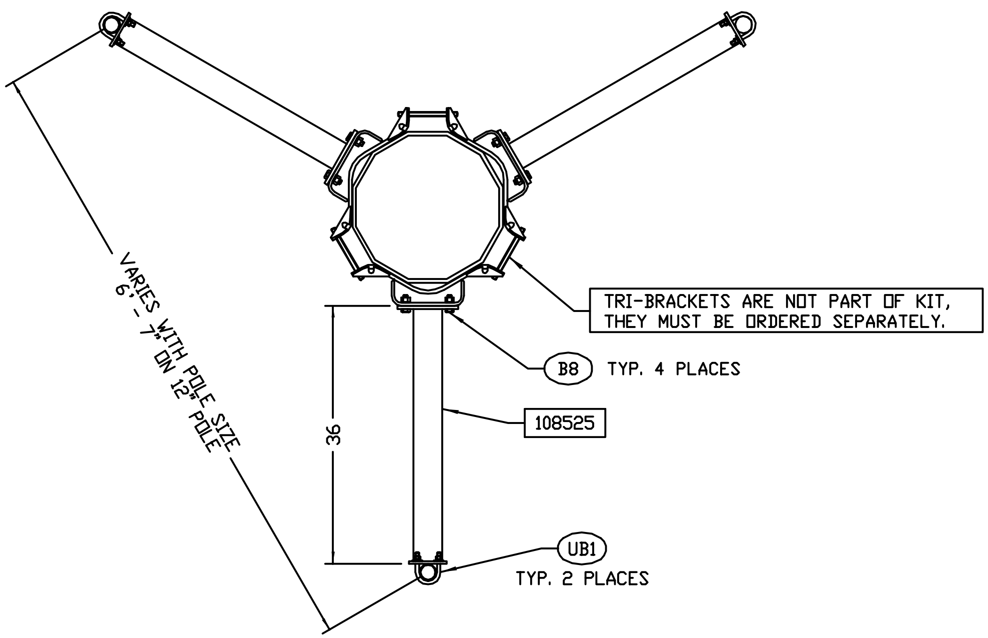
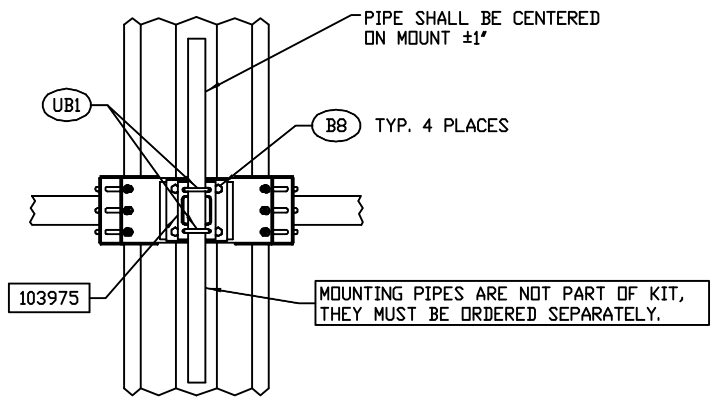


PLAN VIEW
3/4" = 1'-0"



PARTS LIST

MARK	DESCRIPTION	QTY
108525	ARM	1

HARDWARE LIST

SYM	QTY	DESCRIPTION
B8	4	5/8ø X 2 A325 BOLT, NUT & L.W.
UB1	2	1/2 X 2 1/2 X 4 U-BOLT, F.W., L.W. & NUT

TOTAL GALV. WT.: 50#

NOTE:

1. KIT INCLUDES ONE ARM AND ATTACHING HARDWARE

REVISIONS			
REV	DESCRIPTION	DATE	BY/CK

B2759 36" STANDOFF ARM
FOR TAPERED POLES

BY	CK	DATE	S.O.
CC	SJ	4APR00	

VALMONT MICROFLECT
3575 25TH STREET SE, SALEM, OR 97302
MAIN (503)363-9267 FAX (503)316-2040

SHEET 1 OF 1

DWG. NO. B-108259

VALLEY - CBM2759

Exhibit E

Mount Analysis

CENTEK engineering
Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

Site Ref: CT11860A

Eversource Structure No. 838
95' Electric Transmission Pole

48 Quail Trail
Trumbull, CT

Centek Project No. 21051.02

~~Date: July 16, 2021~~
Rev 2: January 10, 2022

Max Stress Ratio = 80%

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

SECTION 1 – REPORT

- ANTENNA AND APPURTENANCE SUMMARY
- STRUCTURE LOADING
- CONCLUSION

SECTION 2 – CALCULATIONS

- WIND LOAD ON APPURTENANCES
- RISA3D OUTPUT REPORT
- CONNECTION TO STRUCTURE

SECTION 3 – REFERENCE MATERIALS

- RF DATA SHEET
- EQUIPMENT CUT SHEET

CENTEK engineering

Centered on Solutions℠

January 10, 2022

Mr. Sheldon Freincle
Northeast Site Solutions
420 Main Street, Building 4
Sturbridge, MA 01566

Re: Structural Letter ~ Antenna Mount
T-Mobile – Site Ref: CT11860A
48 Quail Trail
Trumbull, CT 06611

Centek Project No. 21051.02

Dear Mr. Freincle,

Centek Engineering, Inc. has reviewed the T-Mobile antenna installation at the above referenced site. The purpose of the review is to determine the structural adequacy of the existing mount, consisting of three (3) 3-ft standoff cantilever arms with antenna masts and one (1) collar mount to support the equipment configuration. The review considered the effects of wind load, dead load and ice load in accordance with the 2015 International Building Code as modified by the 2018 Connecticut State Building Code (CTBC) including ASCE 7-10 and ANSI/TIA-222-G *Structural Standards for Steel Antenna Towers and Supporting Structures*.

The loads considered in this analysis consist of the following:

- T-Mobile:
  Three (3) RFS APXVARR18_43 panel antennas mounted on existing antenna mounts with a RAD center elevation of 105-ft +/- AGL.

The antenna mount was analyzed per the requirements of the 2015 International Building Code as modified by the 2018 Connecticut State Building Code considering a nominal design wind speed of 97 mph for Trumbull as required in Appendix N of the 2018 Connecticut State Building Code.

A structural analysis of tower and foundation needs to be completed prior to any work.

Based on our review of the installation, it is our opinion that the existing antenna mounts have sufficient capacity to support the aforementioned antenna configuration. If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

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

Prepared by:

Fernando J. Palacios
Engineer

Section 2 - Calculations

Figure 1 Antenna Mount

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

Wind Speeds

Basic Wind Speed $V := 97$ mph (User Input - 2018 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 = $h := 95$ ft (User Input)

Height to Center of Antennas = $z_{T\text{-}Mo} := 105$ 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)

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

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

$K_{iz} := \left(\frac{z_{T\text{-}Mo}}{33}\right)^{0.1} = 1.123$

$t_{izT\text{-}Mo} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.105$

Velocity Pressure Coefficient Antennas = $Kz_{T\text{-}Mo} := 2.01\left(\left(\frac{z_{T\text{-}Mo}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.279$

Velocity Pressure w/o Ice Antennas = $qz_{T\text{-}Mo} := 0.00256 \cdot K_d \cdot Kz_{T\text{-}Mo} \cdot V^2 \cdot I_{Wind} = 33.649$

Velocity Pressure with Ice Antennas = $qz_{ice.T\text{-}Mo} := 0.00256 \cdot K_d \cdot Kz_{T\text{-}Mo} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 7.774$

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model = RFSAPXVARR18_43

Antenna Shape = Flat (User Input)

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

Antenna Width = $W_{ant} := 19.7$ in (User Input)

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

Antenna Weight = $WT_{ant} := 100$ lbs (User Input)

Number of Antennas = $N_{ant} := 1$ (User Input - per mount)

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.7$

Antenna Force Coefficient = $Ca_{ant} = 1.25$

Wind Load (without ice)

Surface Area for One Antenna = $SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 9.9$ sf

Total Antenna Wind Force = $F_{ant} := qz_{T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 560$ lbs

Surface Area for One Antenna = $SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 4.3$ sf

Total Antenna Wind Force = $F_{ant} := qz_{T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 242$ lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{izT\text{-}Mo}) \cdot (W_{ant} + 2 \cdot t_{izT\text{-}Mo})}{144} = 12.7$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 166$ lbs

Surface Area for One Antenna w/ Ice = $SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{izT\text{-}Mo}) \cdot (T_{ant} + 2 \cdot t_{izT\text{-}Mo})}{144} = 6.7$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 88$ lbs

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 100$ lbs

Gravity Loads (ice only)

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

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{izT\text{-}Mo})(W_{ant} + 2 \cdot t_{izT\text{-}Mo}) \cdot (T_{ant} + 2 \cdot t_{izT\text{-}Mo}) - V_{ant} = 11104$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 360$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 360$ lbs

Development of Wind & Ice Load on Brace Member

Member Data: 2 Std. Pipe

Antenna Shape = Flat (User Input)

Width = $W_{mem} := 2.375$ in (User Input)

Thickness = $t_{mem} := 0.154$ in (User Input)

Length = $L_{mem} := 72$ in (User Input)

Member Aspect Ratio = $Ar_{mem} := \frac{L_{mem}}{W_{mem}} = 30.3$

Member Force Coefficient = $Ca_{mem} = 1.2$

Wind Load (without ice)

Member Projected Surface Area = $A_{mem} := \frac{W_{mem}}{12} = 0.2$ sf/ft

Total Member Wind Force = $F_{mem} := qz_{T\text{-}Mo} \cdot G_H \cdot Ca_{mem} \cdot A_{mem} = 11$ plf **BLC 5**

Wind Load (with ice)

Member Projected Surface Area w/ Ice = $A_{ICEmem} := \frac{\left(W_{mem} + 2 \cdot t_{izT\text{-}Mo}\right)}{12} = 0.5$ sf/ft

Total Member Wind Force w/ Ice = $Fi_{mem} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot Ca_{mem} \cdot A_{ICEmem} = 7$ plf **BLC 4**

Gravity Load (without ice)

Weight of Member = Self Weight plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear foot = $Ai_{mem} := \frac{\pi}{4}\left(W_{mem} + 2 \cdot t_{izT\text{-}Mo}\right)^2 - \left(W_{mem}\right)^2 = 28$ sq in

Weight of Ice on Member = $W_{ICE.mem} := Id \cdot \frac{Ai_{mem}}{144} = 11$ plf **BLC 3**

Development of Wind & Ice Load on Brace Member

Member Data: HSS4x4x3/16

Antenna Shape = Flat (User Input)

Height = $H_{mem} := 4$ in (User Input)

Width = $W_{mem} := 4$ in (User Input)

Thickness = $t_{mem} := 0.1875$ in (User Input)

Length = $L_{mem} := 36$ in (User Input)

Member Aspect Ratio = $Ar_{mem} := \frac{L_{mem}}{W_{mem}} = 9.0$

Member Force Coefficient = $Ca_{mem} = 1.47$

Wind Load (without ice)

Member Projected Surface Area = $A_{mem} := \frac{H_{mem}}{12} = 0.3$ sf/ft

Total Member Wind Force = $F_{mem} := qz_{T\text{-}Mo} \cdot G_H \cdot Ca_{mem} \cdot A_{mem} = 22$ plf **BLC 5**

Wind Load (with ice)

Member Projected Surface Area w/ Ice = $A_{ICEmem} := \frac{\left(H_{mem} + 2 \cdot t_{izT\text{-}Mo}\right)}{12} = 0.7$ sf/ft

Total Member Wind Force w/ Ice = $Fi_{mem} := qz_{ice.T\text{-}Mo} \cdot G_H \cdot Ca_{mem} \cdot A_{ICEmem} = 11$ plf **BLC 4**

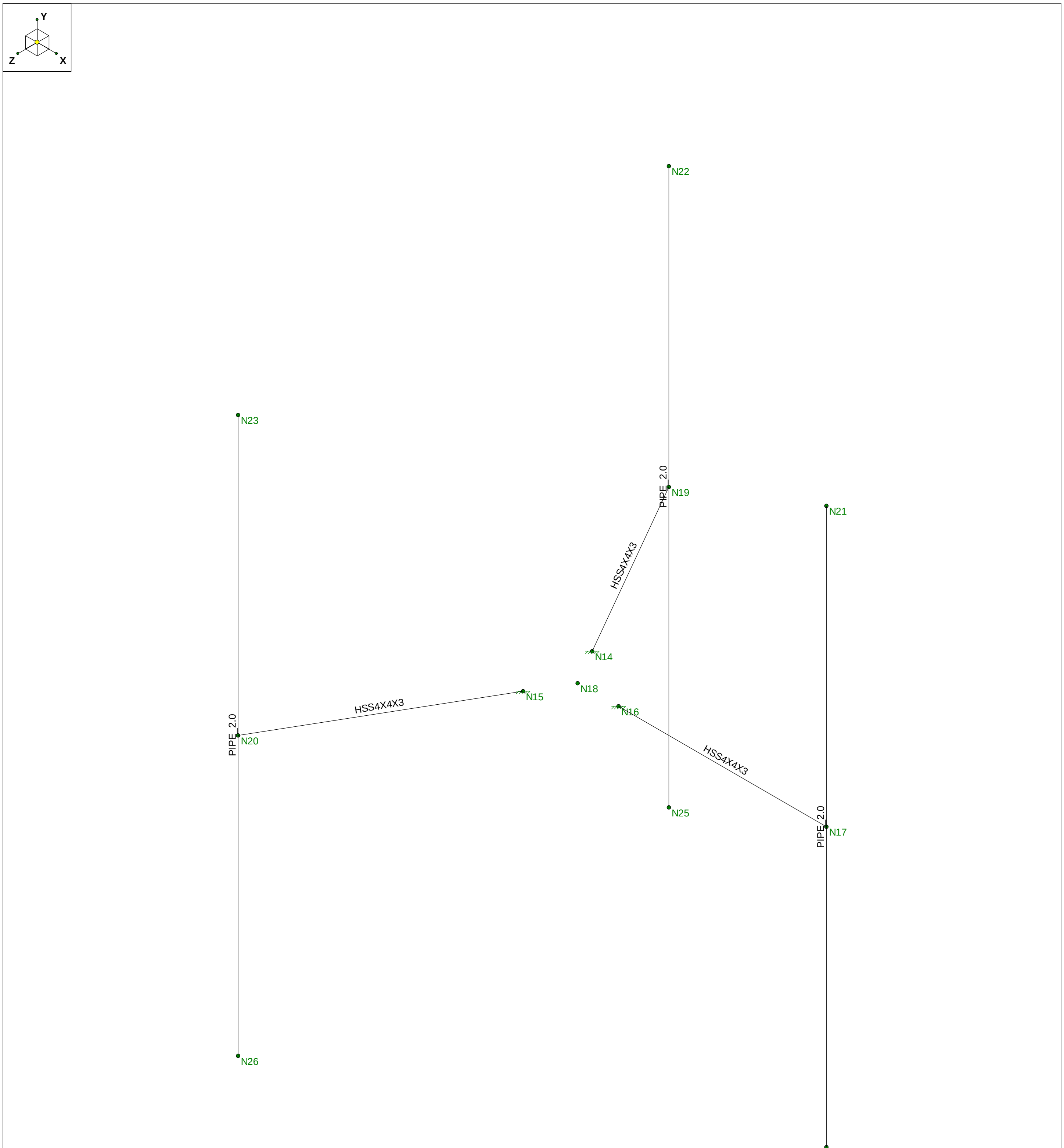
Gravity Load (without ice)

Weight of Member = Self Weight plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear foot = $Ai_{mem} := \left(H_{mem} + 2 \cdot t_{izT\text{-}Mo}\right)^2 - \left(H_{mem}\right)^2 = 51$ sq in

Weight of Ice on Member = $W_{ICE.mem} := Id \cdot \frac{Ai_{mem}}{144} = 20$ plf **BLC 3**



Envelope Only Solution

Centek	CT11860A - Mount	
FJP		Jan 10, 2022 at 4:12 PM
21051.02	Member Framing	CT11860A_AMA.r3d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI S100-10: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	150.001
Footing Concrete f'c (ksi)	4
Footing Concrete Ec (ksi)	3644
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	2
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 (\...	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 Grade B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	(E)Outrigger_HSS4X4...	HSS4X4X3	Beam	Tube	A500 Gr.46	Typical	2.58	6.21	6.21	10
2	(P) Antenna Mast_Pipe	PIPE_2.0	Column	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M7	(E)Outrigger_HSS4...	3	Segment	Segment	Lbyy						Lateral
2	M8	(E)Outrigger_HSS4...	3.004	Segment	Segment	Lbyy						Lateral
3	M9	(E)Outrigger_HSS4...	3.004	Segment	Segment	Lbyy						Lateral
4	M10	(P) Antenna Mast_...	8	Segment	Segment	Lbyy						Lateral
5	M11	(P) Antenna Mast_...	8	Segment	Segment	Lbyy						Lateral
6	M12	(P) Antenna Mast_...	8	Segment	Segment	Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M7	N16	N17			(E)Outrigger_HSS4X4X3/...	Beam	Tube	A500 Gr.46	Typical
2	M8	N14	N19			(E)Outrigger_HSS4X4X3/...	Beam	Tube	A500 Gr.46	Typical
3	M9	N15	N20			(E)Outrigger_HSS4X4X3/...	Beam	Tube	A500 Gr.46	Typical
4	M10	N23	N26			(P) Antenna Mast_Pipe	Column	Pipe	A53 Grade B	Typical
5	M11	N22	N25			(P) Antenna Mast_Pipe	Column	Pipe	A53 Grade B	Typical
6	M12	N21	N24			(P) Antenna Mast_Pipe	Column	Pipe	A53 Grade B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N17	3.583333	0	0	0	
2	N21	3.583333	4	0	0	
3	N24	3.583333	-4	0	0	
4	N16	0.583333	0	0	0	
5	N18	0	0	0	0	
6	N14	-0.291667	0	-.5	0	
7	N15	-0.291667	0	.5	0	
8	N19	-1.791666	0	-3.103257	0	
9	N20	-1.791666	0	3.103257	0	
10	N22	-1.791666	4	-3.103257	0	
11	N23	-1.791666	4	3.103257	0	
12	N25	-1.791666	-4	-3.103257	0	
13	N26	-1.791666	-4	3.103257	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N14	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N15	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N16	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	N17						
5	N19						
6	N20						

Joint Boundary Conditions (Continued)

	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]
7	N21						
8	N22						
9	N23						
10	N24						
11	N25						
12	N26						

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	Y	-.05	1
2	M10	Y	-.05	7
3	M11	Y	-.05	1
4	M11	Y	-.05	7
5	M12	Y	-.05	1
6	M12	Y	-.05	7

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	Y	-.18	1
2	M10	Y	-.18	7
3	M11	Y	-.18	1
4	M11	Y	-.18	7
5	M12	Y	-.18	1
6	M12	Y	-.18	7

Member Point Loads (BLC 4 : (x) TIA Wind with Ice (9 psf))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	X	.044	1
2	M10	X	.044	7
3	M11	X	.044	1
4	M11	X	.044	7
5	M12	X	.083	1
6	M12	X	.083	7

Member Point Loads (BLC 5 : (x) TIA Wind (33 psf))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	X	.121	1
2	M10	X	.121	7
3	M11	X	.121	1
4	M11	X	.121	7
5	M12	X	.28	1
6	M12	X	.28	7

Member Point Loads (BLC 6 : (z) TIA Wind with Ice (9 psf))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	Z	.083	1
2	M10	Z	.083	7
3	M11	Z	.083	1

Member Point Loads (BLC 6 : (z) TIA Wind with Ice (9 psf)) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
4	M11	Z	.083	7
5	M12	Z	.044	1
6	M12	Z	.044	7

Member Point Loads (BLC 7 : (z) TIA Wind (33 psf))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M10	Z	.28	1
2	M10	Z	.28	7
3	M11	Z	.28	1
4	M11	Z	.28	7
5	M12	Z	.121	1
6	M12	Z	.121	7

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M7	Y	-.02	-.02	0	0
2	M8	Y	-.02	-.02	0	0
3	M9	Y	-.02	-.02	0	0
4	M10	Y	-.011	-.011	0	0
5	M11	Y	-.011	-.011	0	0
6	M12	Y	-.011	-.011	0	0

Member Distributed Loads (BLC 4 : (x) TIA Wind with Ice (9 psf))

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M10	X	.007	.007	0	0
2	M11	X	.007	.007	0	0
3	M12	X	.007	.007	0	0
4	M7	X	.011	.011	0	0
5	M8	X	.011	.011	0	0
6	M9	X	.011	.011	0	0

Member Distributed Loads (BLC 5 : (x) TIA Wind (33 psf))

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M10	X	.011	.011	0	0
2	M11	X	.011	.011	0	0
3	M12	X	.011	.011	0	0
4	M7	X	.022	.022	0	0
5	M8	X	.022	.022	0	0
6	M9	X	.022	.022	0	0

Member Distributed Loads (BLC 6 : (z) TIA Wind with Ice (9 psf))

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M10	Z	.007	.007	0	0
2	M11	Z	.007	.007	0	0
3	M12	Z	.007	.007	0	0
4	M7	Z	.011	.011	0	0
5	M8	Z	.011	.011	0	0
6	M9	Z	.011	.011	0	0

Member Distributed Loads (BLC 7 : (z) TIA Wind (33 psf))

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/f..	Start Location[ft,%]	End Location[ft,%]
1	M10	Z	.011	.011	0	0
2	M11	Z	.011	.011	0	0
3	M12	Z	.011	.011	0	0
4	M7	Z	.022	.022	0	0
5	M8	Z	.022	.022	0	0
6	M9	Z	.022	.022	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	DL		-1						
2	Weight of Appurtenances	None					6			
3	Weight of Ice Only	None					6	6		
4	(x) TIA Wind with Ice (9 psf)	None					6	6		
5	(x) TIA Wind (33 psf)	None					6	6		
6	(z) TIA Wind with Ice (9 psf)	None					6	6		
7	(z) TIA Wind (33 psf)	None					6	6		

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	1.2D + 1.6...	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9D + 1.6...	Yes	Y		1	.9	2	.9	5	1.6														
3	1.2D + 1.0...	Yes	Y		1	1.2	2	1.2	3	1	4	1												
4	1.2D + 1.6...	Yes	Y		1	1.2	2	1.2	7	1.6														
5	0.9D + 1.6...	Yes	Y		1	.9	2	.9	7	1.6														
6	1.2D + 1.0...	Yes	Y		1	1.2	2	1.2	3	1	6	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	N14	max	0	6	.693	6	0	3	1.685	3	1.514	2	-.189	2
2		min	-.634	1	.139	2	-1.143	4	.327	5	-1.639	4	-.971	6
3	N15	max	0	6	.693	6	0	3	-.331	2	-.358	6	-.189	2
4		min	-.634	1	.139	2	-1.143	4	-1.688	6	-1.63	4	-.97	6
5	N16	max	0	6	.693	6	0	3	0	3	1.742	5	1.944	3
6		min	-1.142	1	.139	2	-.634	4	-.002	6	0	1	.381	5
7	Totals:	max	0	6	2.079	6	0	3						
8		min	-2.41	1	.416	2	-2.919	4						

Envelope Joint Displacements

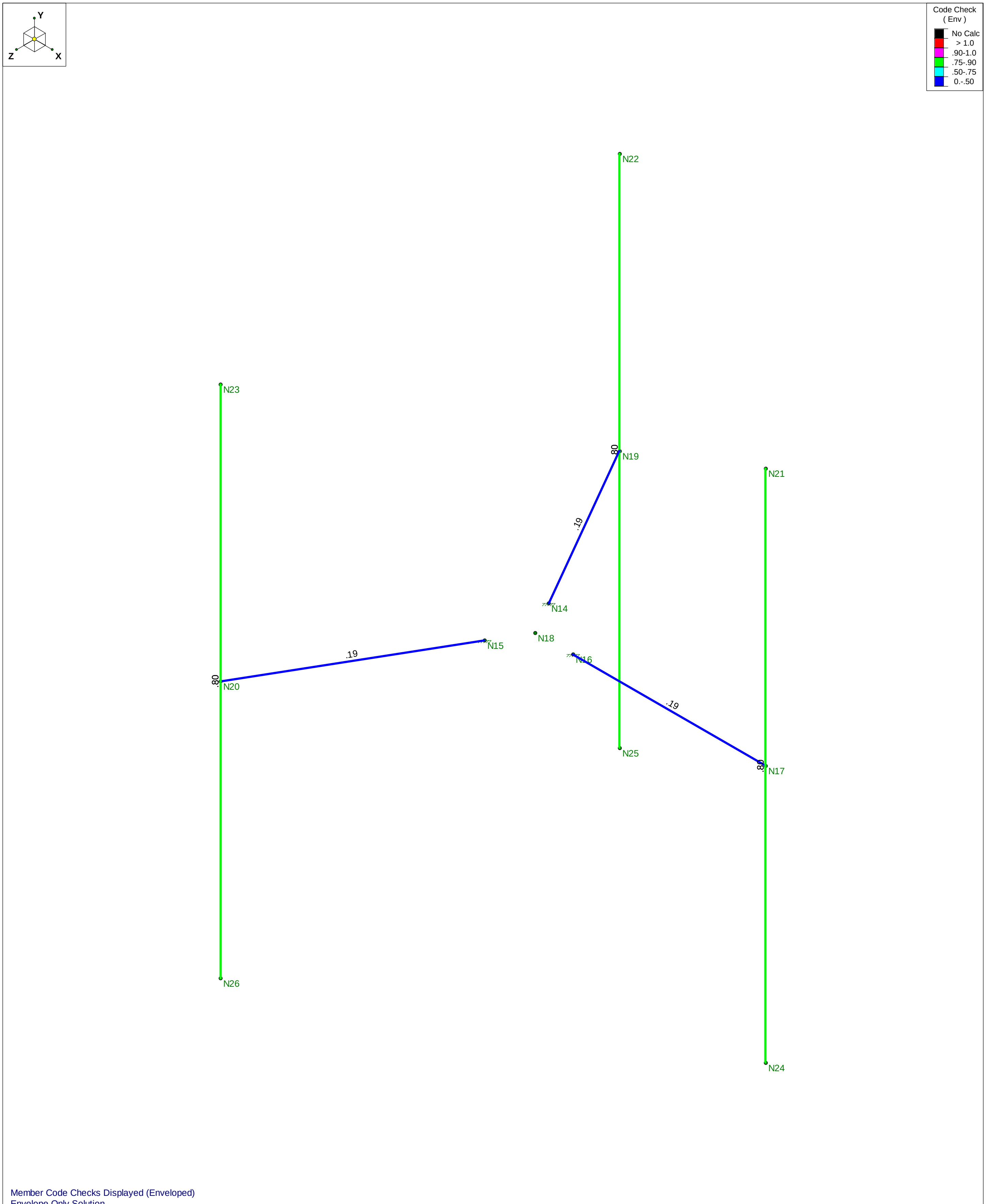
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotation [rad]	LC
1	N17	max	0	2	-.014	5	.063	5	9.469e-06	6	0	3	-5.527e-04	5
2		min	0	4	-.071	3	0	1	0	1	-2.533e-03	4	-2.852e-03	3
3	N21	max	.827	1	-.014	5	.443	4	1.052e-02	4	0	3	-5.54e-04	5
4		min	.027	5	-.071	3	0	1	0	1	-2.533e-03	4	-2.262e-02	1
5	N24	max	.761	2	-.014	5	.441	5	0	3	0	3	2.122e-02	2
6		min	-.135	6	-.071	3	0	1	-1.046e-02	5	-2.533e-03	4	-2.808e-03	6
7	N16	max	0	6	0	6	0	6	0	6	0	6	0	6

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotation [rad]	LC
8		min	0	1	0	1	0	1	0	1	0	1	0	1
9	N18	max	0	6	0	6	0	6	0	6	0	6	0	6
10		min	0	1	0	1	0	1	0	1	0	1	0	1
11	N14	max	0	6	0	6	0	6	0	6	0	6	0	6
12		min	0	1	0	1	0	1	0	1	0	1	0	1
13	N15	max	0	6	0	6	0	6	0	6	0	6	0	6
14		min	0	1	0	1	0	1	0	1	0	1	0	1
15	N19	max	.048	2	-.014	5	.03	5	-4.696e-04	5	2.422e-03	5	1.426e-03	6
16		min	-.052	4	-.071	3	-.027	1	-2.472e-03	3	-2.204e-03	1	2.704e-04	2
17	N20	max	.051	5	-.014	2	.03	5	2.481e-03	6	2.407e-03	5	1.421e-03	6
18		min	.011	6	-.071	6	.007	6	4.815e-04	2	5.245e-04	6	2.704e-04	2
19	N22	max	.414	2	-.014	5	.798	5	2.138e-02	5	2.422e-03	5	1.443e-03	6
20		min	-.08	6	-.071	3	-.127	3	-2.501e-03	3	-2.204e-03	1	-1.023e-02	2
21	N23	max	.414	2	-.014	2	.852	4	2.252e-02	4	2.407e-03	5	1.438e-03	6
22		min	-.058	6	-.071	6	.05	2	4.826e-04	2	5.245e-04	6	-1.023e-02	2
23	N25	max	.443	1	-.014	5	.847	4	-4.804e-04	2	2.422e-03	5	1.082e-02	1
24		min	-.038	5	-.071	3	-.004	2	-2.239e-02	4	-2.204e-03	1	2.784e-04	5
25	N26	max	.443	1	-.014	2	.794	5	2.442e-03	3	2.407e-03	5	1.082e-02	1
26		min	.064	5	-.071	6	-.11	3	-2.129e-02	5	5.245e-04	6	2.739e-04	5

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

	Memb...	Shape	Code Check	L...	LC	Sh...	L...	Dir	...	phi*P...	phi*Pn...	phi*Mn y-y [k-ft]	phi*...	Cb	Eqn
1	M7	HSS4X4X3	.191	0	6	.023	0	y	6	103.0...	106.812	12.662	12....	1....	H1...
2	M8	HSS4X4X3	.187	0	3	.023	0	y	3	103.0...	106.812	12.662	12....	1....	H1...
3	M9	HSS4X4X3	.187	0	3	.023	0	y	3	103.0...	106.812	12.662	12....	1....	H1...
4	M10	PIPE_2.0	.796	4	4	.054	4		4	26.521	32.13	1.872	1.872	1....	H1...
5	M11	PIPE_2.0	.796	4	4	.054	4		4	26.521	32.13	1.872	1.872	1....	H1...
6	M12	PIPE_2.0	.796	4	1	.054	4		1	26.521	32.13	1.872	1.872	1....	H1...



Centek	CT11860A - Mount Unity Check	
FJP		Jan 10, 2022 at 4:12 PM
21051.02		CT11860A_AMA.r3d

Connection:

Maximum Design Reactions:

Px =	$P_x := 1.2 \cdot kips$	(User Input)
Py =	$P_y := 0.7 \cdot kips$	(User Input)
Pz =	$P_z := 1.2 \cdot kips$	(User Input)
Mx =	$M_x := 1.7 \cdot ft \cdot kips$	(User Input)
My =	$M_y := 1.8 \cdot ft \cdot kips$	(User Input)
Mz =	$M_z := 2 \cdot ft \cdot kips$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 4$	(User Input)
Bolt Diameter =	$d_b := 0.625 in$	(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)
Spacing Between Bolts =	$S_{bolt} := 6 \cdot in$	(User Input)

Bolt Area = $a_b := \frac{1}{4} \cdot \pi \cdot d_b^2 = 0.307 \cdot in^2$

Check Bolt Stresses:

Shear Stress per Bolt = $$f_v := \frac{P_y + P_z}{n_b \cdot a_b} + \frac{M_x + M_y}{S_{bolt} \cdot \frac{n_b}{2} \cdot a_b} = 12.956 \cdot ksi$$

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

Condition1 = "OK"

$$\frac{f_v}{(\phi \cdot F_{nv})} = 32 \cdot \%$$

Tensile Stress Adjusted for Shear = $$F'_{nt} := \begin{cases} \left(1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) & \text{if } 1.3 \cdot F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \le F_{nt} \\ F_{nt} & \text{otherwise} \end{cases} = 88.21 \cdot ksi$$

Tension Stress Each Bolt = $$f_t := \frac{P_x}{n_b \cdot a_b} + \frac{M_z}{S_{bolt} \cdot \frac{n_b}{2} \cdot a_b} = 7.497 \cdot ksi$$

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

Condition2 = "OK"

$$\frac{f_t}{(\phi \cdot F'_{nt})} = 11.3 \cdot \%$$

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 1 - Site Information

Site ID: CT11860A
Status: Draft
Version: 7
Project Type: L600
Approved: Not Approved
Approved By: Not Approved
Last Modified: 9/28/2021 1:44:20 PM
Last Modified By: Mohamed.Seddik@T-Mobile.com

Site Name: CT860/CL&P Trumbull
Site Class: Utility Lattice Tower
Site Type: Structure Non Building
Plan Year: 2021
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: CL&P

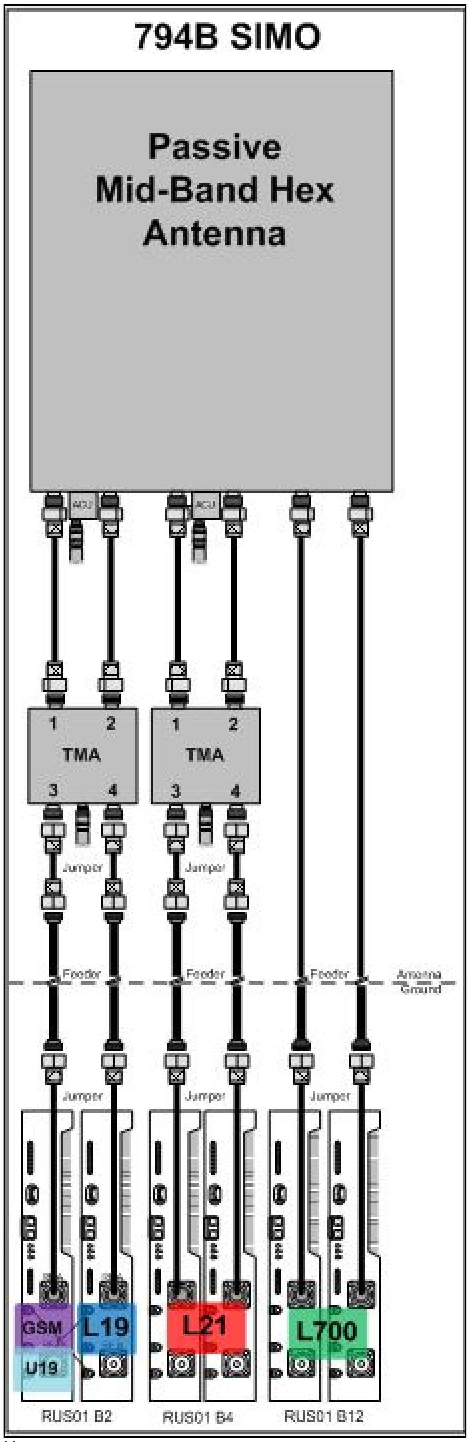
Latitude: 41.23250000
Longitude: -73.17220000
Address: 48 Quail Trail
City, State: Trumbull, CT
Region: NORTHEAST

RAN Template: 67D93D4 Hybrid		**AL Template:** 67D93D4_1QP+2HP (U21 Market)		
Sector Count: 3	**Antenna Count:** 3	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 9

DRAFT

Section 2 - Existing Template Images

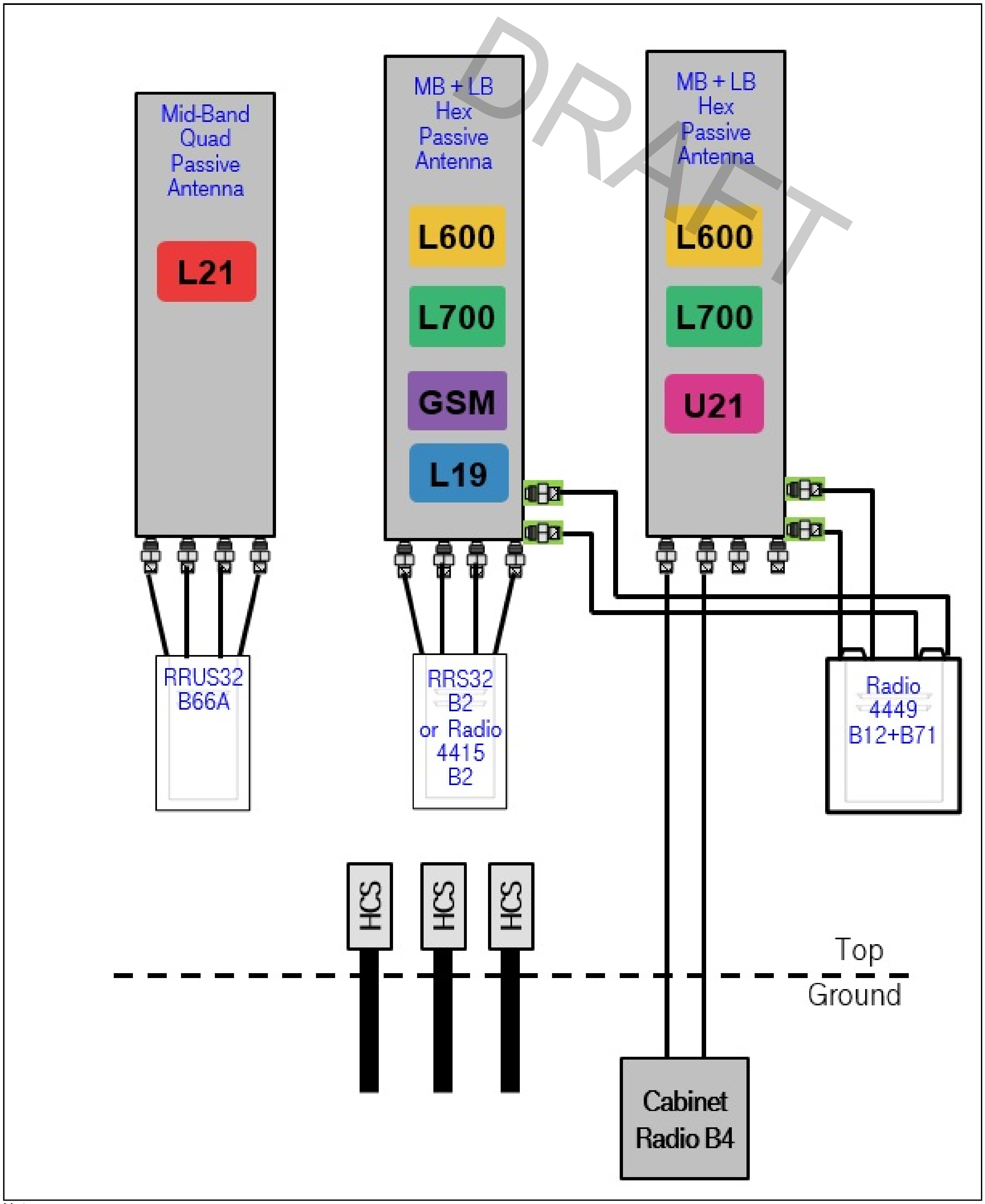
794B_SIMO_1HP_Antenna.JPG


794B SIMO
Passive
Mid-Band Hex
Antenna
TMA
1
2
3
4
TMA
1
2
3
4
Jumper
Feeder
Antenna
Ground
GSM
U19
L19
L21
L700
RUS01 B2
RUS01 B4
RUS01 B12

Notes:

Section 3 - Proposed Template Images

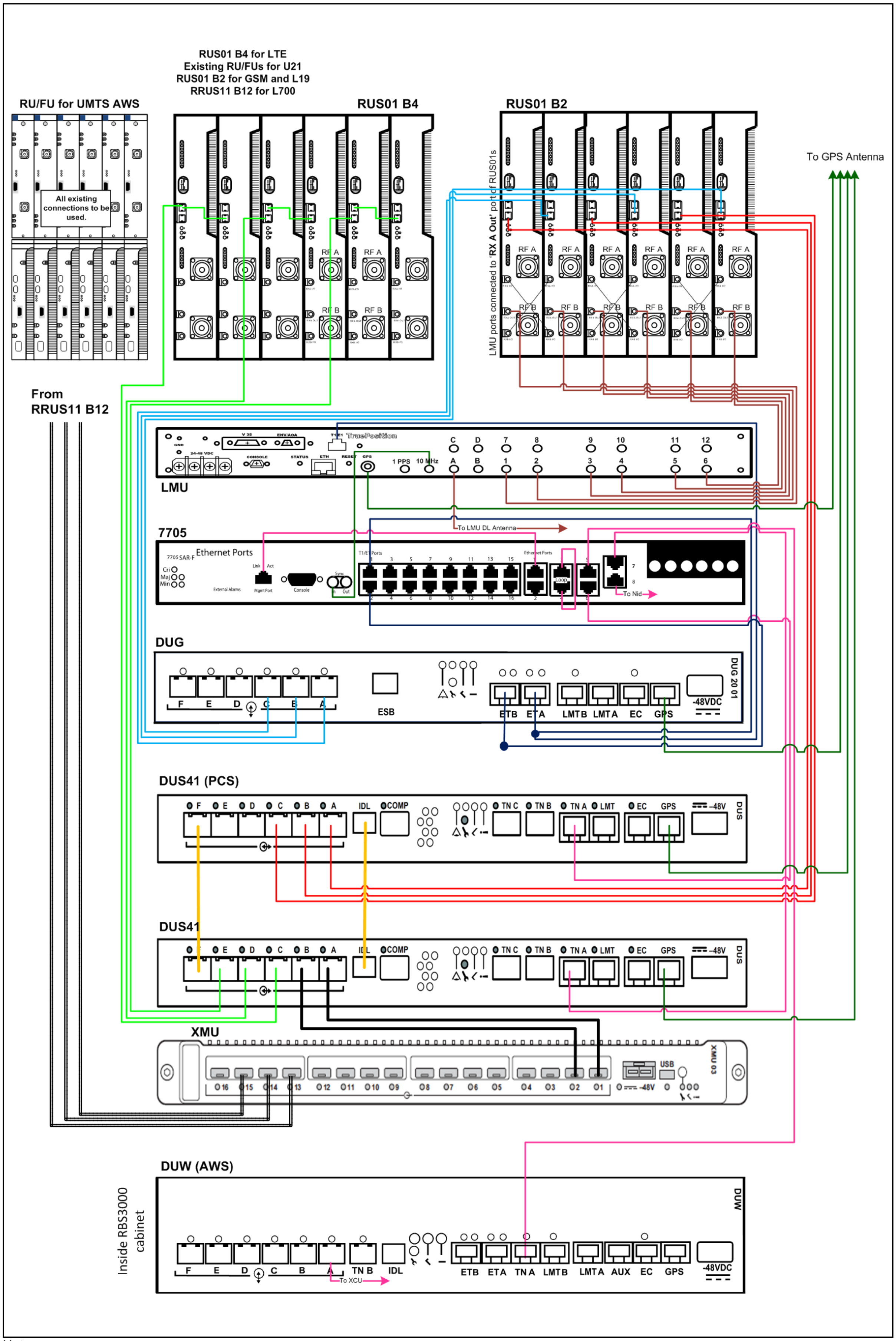
67D93D4_1QP+2HP (U21 Market).jpg



DRAFT

Notes:

794A Indoor.png


RUS01 B4 for LTE
Existing RU/FUs for U21
RUS01 B2 for GSM and L19
RRUS11 B12 for L700
RU/FU for UMTS AWS
All existing connections to be used.
RUS01 B4
RUS01 B2
LMU ports connected to 'RX A Out' port of RUS01s
To GPS Antenna
From RRUS11 B12
LMU
7705
To LMU DL Antenna
To Nid
DUG
DUS41 (PCS)
DUS41
XMU
DUW (AWS)
To XCU
Inside RBS3000 cabinet

Notes:

Section 4 - Siteplan Images

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

DRAFT

RAN Template:	A&L Template:
67D93D4 Hybrid	67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 5 - RAN Equipment

DRAFT

Existing RAN Equipment

Template: 794B SIMO Outdoor

Enclosure	1	2	3
Enclosure Type	RBS 6102	Ground Mount (Ericsson)	Ancillary Equipment (Ericsson)
Baseband	DUW30 **(x 2)**; DUG20 (G1900); BB 5216 (L1900, L2100, L700)		
Hybrid Cable System			Ericsson 6x12 HCS *Select Length & AWG*
Multiplexer	XMU (L1900, L2100, L700)		
Radio	RUS01 B2 **(x 3)** (L1900, G1900); RUS01 B2 **(x 3)** (L1900); RUS01 B4 **(x 3)** (L2100); RUS01 B4 **(x 3)** (U2100)	RRUS11 B12 **(x 3)** (L700)	

Proposed RAN Equipment

Template: 67D93D4 Hybrid

Enclosure	1	2
Enclosure Type	RBS 6102	Ancillary Equipment (Ericsson)
Baseband	DUW30 (U2100); DUG20 (G1900); BB 6648 (L700, L600, N600); BB 6648 (L2100, L1900)	
Transport System	CSR IXRe V2 (Gen2)	

RAN Scope of Work:

RAN Template:	A&L Template:
67D93D4 Hybrid	67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 6 - A&L Equipment

DRAFT

Existing Template: 794B SIMO_1HP
Proposed Template: 67D93D4_1QP+2HP (U21 Market)

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	50		
M. Tilt	0		
Height	105		
Ports	P1	P2	P3
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	A&L Template: 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 1 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	50		
M. Tilt			
Height	105		
Ports	P1	P2	P3
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:	A&L Template:
67D93D4 Hybrid	67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 2 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	170		
M. Tilt	0		
Height	105		
Ports	P1	P2	P3
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 2 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	170		
M. Tilt			
Height	105		
Ports	**P1**	**P2**	**P3**
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 3 (Existing) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	Andrew - SBNHH-1D65A-SR (Hex)		
Azimuth	300		
M. Tilt	0		
Height	105		
Ports	P1	P2	P3
Active Tech.	L700	L1900 G1900	U2100 L2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	2
Cables	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**
TMAs			
Diplexers / Combiners			
Radio			
Sector Equipment	Andrew Smart Bias T (Ericsson) (At Antenna)		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Sector 3 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		
Antenna Model	RFS - APXVARR18_43-C-NA20 (Hex)		
Azimuth	300		
M. Tilt			
Height	105		
Ports	P1	P2	P3
Active Tech.	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 U2100
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt			
Cables	Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**
TMAs			
Diplexers / Combiners		Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)	SHARED Microdata - AWS/PCS (8:4) Diplexer MI-54131 (AtCabinet)
Radio	Radio 4449 B71+B85 (At Cabinet)	Radio 4415 B25 (At Cabinet) Radio 4415 B66A (At Cabinet)	SHARED Radio 4415 B25 (At Cabinet) SHARED Radio 4415 B66A (At Cabinet)
Sector Equipment			

Unconnected Equipment:

Scope of Work:

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D93D4 Hybrid	**A&L Template:** 67D93D4_1QP+2HP (U21 Market)

CT11860A_L600_7_draft

Print Name: Standard
PORs: L600_L600 Coverage

Section 7 - Power Systems Equipment

DRAFT

Existing Power Systems Equipment

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

Proposed Power Systems Equipment

APXVARR18_43-C-NA20

Dual Slant Polarized Triple Band (6 Port) Antenna, 584-746/1695-2200/1695-2200MHz,65 deg, 15.7/19.3/19.2dBi, 1.8m (6ft), VET, RET, 0-12°/2-12°/2-12° Tilt Range

FEATURES / BENEFITS

This antenna provides a 6 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality.
- Superior elevation pattern performance across the entire electrical down tilt range.
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional daisy chain of two high band RET motors for one single AISG point of high band tilt control.

Technical features

ELECTRICAL SPECIFICATIONS

Electrical Specification Header		LOW BAND ARRAY (584-746 MHZ) [R1]		
Frequency Range	MHz	584-617	617-698	698-746
Typical Gain	dBi	14.7	15.0	15.7
Gain Over All Tilts	dBi	14.4+/-0.3	14.7+/-0.3	15.3+/-0.4
Horizontal Beamwidth	deg	63.9+/-1.2	62.1+/-1.8	60+/-1.2
Vertical Beamwidth	deg	15.9+/-0.9	14.4+/-0.8	13.0+/-0.4
Electrical Down Tilt Range	deg	0-12		
Upper Side Lobe Suppression Peak to +20	deg	22.7	21.2	18.5
Upper Side Lobe Suppression 0 to +20	deg	20.3	17.8	15.6

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Cross Polarization (XPD) @ Boresight	dB	21.5	18.7	17
Cross Polarization (XPD) @ +/-60	dB	8	9.2	8.3
VSWR		1.5:1		
3rd Order IMP 2 x 43dBm	dB	-153		
Maximum Power Input	Watts	250		

ELECTRICAL SPECIFICATIONS

Impedance	Ohm	50
Polarization	Deg	+/-45°

MECHANICAL SPECIFICATIONS

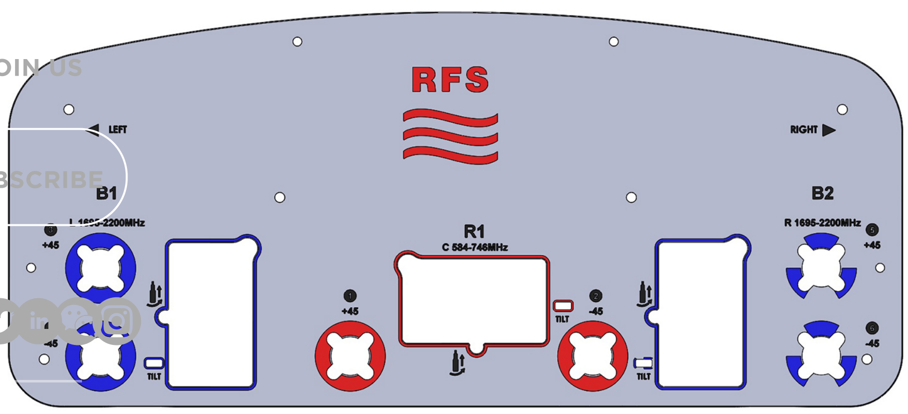
Dimensions - H x W x D	mm (in)	1829 x 500 x 216 (72 x 19.7 x 8.5)
Weight (Antenna Only)	kg (lb)	33.5 (73.9)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.4)
Packing size- HxWxD	mm (in)	1975 x 560 x 411 (77.8 x 22 x 16.2)
Shipping Weight	kg (lb)	51.8 (114.2)
Connector type		6 x 4.3-10 Long Neck Female/Bottom + 6 AISG RET connectors (3 male, 3 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable)
Mounting Hardware Material		Diecast Aluminium and Galvanized steel
Radome Material / Color		Fiberglass / Light Grey RAL7035

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		Direct Ground
Survival/Rated Wind Velocity	km/h	241 (150)
Wind Load @Rated Wind Front	N	912
Wind Load @Rated Wind Side	N	333
Wind Load @Rated Wind Rear	N	1014
Survival wind Velocity	km/h	241

ORDERING INFORMATION

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Weight
APXVARR18_43-C-NA20	Field Replaceable RET (3)	APM40-5E Heavy Duty Beam Tilt Kit	60-120mm	33.5 kg (73.9 lbs)



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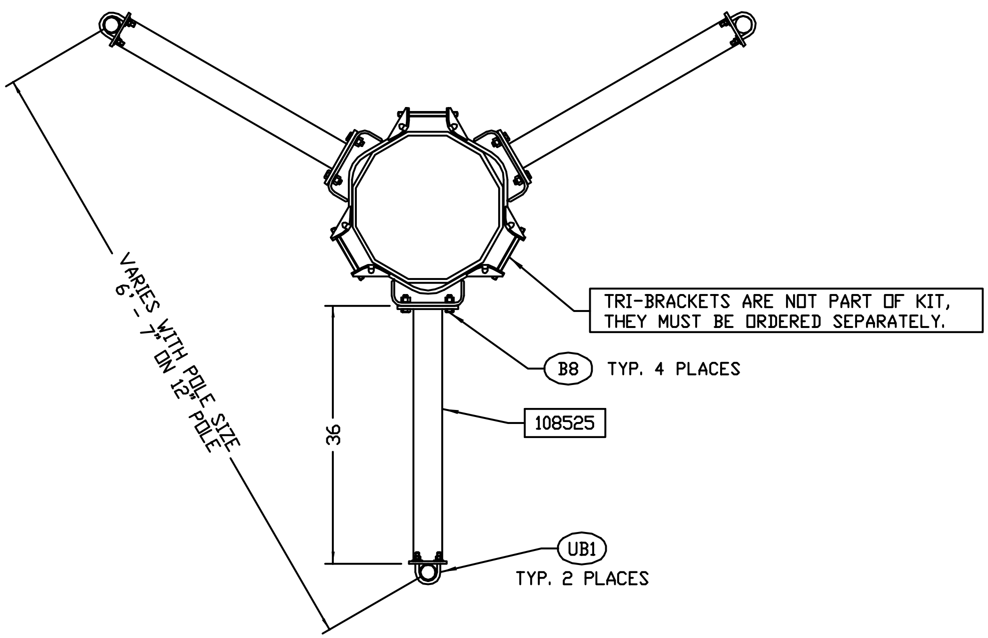
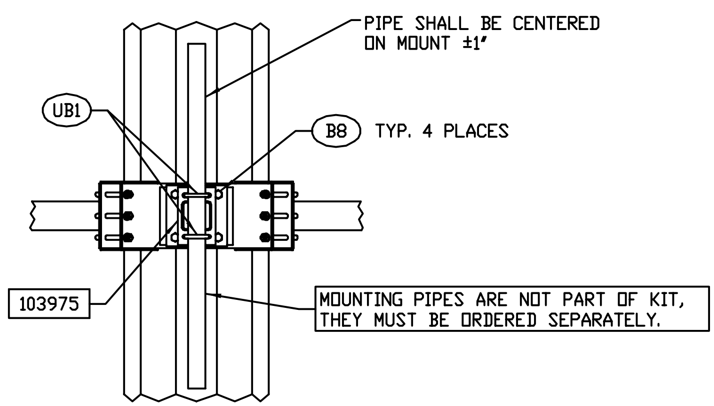


PLAN VIEW

3/4" = 1'-0"



PARTS LIST

MARK	DESCRIPTION	QTY
108525	ARM	1

HARDWARE LIST

SYM	QTY	DESCRIPTION
B8	4	5/8ø X 2 A325 BOLT, NUT & L.W.
UB1	2	1/2 X 2 1/2 X 4 U-BOLT, F.W., L.W. & NUT

TOTAL GALV. WT.: 50#

HSS4X4X3/16" = 9.4 plf * 35"/12 = 27.4 #
PLATE 1 = (8.5")^2*(0.5")/1728*490pcf = 10.2 #
PLATE 1 = (8.5")*(5.5")*(0.5")/1728*490pcf = 6.2 #
HARDWARE = 5 #
TOT. = 48.8 #

NOTE:

1. KIT INCLUDES ONE ARM AND ATTACHING HARDWARE

REVISIONS			
REV	DESCRIPTION	DATE	BY/CK

B2759 36" STANDOFF ARM
FOR TAPERED POLES

BY	CC
CK	SJ
DATE	4APR00
S.O.	

VALMONT MICROFLECT
3575 25TH STREET SE, SALEM, OR 97302
MAIN (503)363-9267 FAX (503)316-2040

SHEET 1 OF 1

DWG. NO. B-108259

VALLEY - CBM2759

Exhibit F

Power Density/RF Emissions Report

Fox Hill Telecom

Radio Frequency Emissions Analysis Report

T-MOBILE Existing Facility

Site ID: CT11860A

CL&P Trumbull
48 Quail Trail
Trumbull, CT 06611

March 23, 2022

Fox Hill Telecom Project Number: 220665

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**8.39 %**

Fox Hill Telecom

March 23, 2022

T-MOBILE
Attn: RF Manager
35 Griffin Road South
Bloomfield, CT 6009

Emissions Analysis for Site: **CT11860A – CL&P Trumbull**

Fox Hill Telecom, Inc ("Fox Hill") was directed to analyze the proposed upgrades to the T-MOBILE facility located at **48 Quail Trail, Trumbull, 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.

General population/uncontrolled exposure limits apply to situations in which the general population 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 population 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.

Population exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 600 MHz & 700 MHz bands are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$ respectively. 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.

<u>Occupational/controlled exposure</u> 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 performed for the proposed upgrades to the T-MOBILE antenna facility located at **48 Quail Trail, Trumbull, 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 for directional panel antennas, 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.

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. All power values expressed and analyzed are maximum power levels expected to be used on all radios.

All emissions values for additional carriers were taken from the Connecticut Siting Council (CSC) active MPE database. Values in this database are provided by the individual carriers themselves

For each sector the following channel counts, frequency bands and power levels were utilized as shown in *Table 1*:

Technology	Frequency Band	Channel Count	Transmit Power per Channel (W)
LTE / 5G NR	600 MHz	2	40
LTE	700 MHz	2	20
LTE	1900 MHz (PCS)	4	40
GSM	1900 MHz (PCS)	1	15
LTE	2100 MHz (AWS)	4	40
UMTS	2100 MHz (AWS)	1	40

Table 1: Channel Data Table

The following antennas listed in *Table 2* were used in the modeling for transmission in the 600 MHz, 700 MHz, 1900 MHz (PCS) and 2100 MHz (AWS) frequency bands. This is based on feedback from the carrier with regards to anticipated antenna selection. Maximum gain values for all antennas are listed in the Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, 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.

Sector	Antenna Number	Antenna Make / Model	Antenna Centerline (ft)
A	1	RFS APXVARR18_43-C-NA20	105
B	1	RFS APXVARR18_43-C-NA20	105
C	1	RFS APXVARR18_43-C-NA20	105

Table 2: Antenna Data

All calculations were done with respect to uncontrolled / general population threshold limits.

RESULTS

Per the calculations completed for the proposed T-MOBILE configurations *Table 3* shows resulting emissions power levels and percentages of the FCC's allowable general population limit.

Antenna ID	Antenna Make / Model	Frequency Bands	Antenna Gain (dBd)	Channel Count	Total TX Power (W)	ERP (W)	MPE %
Antenna A1	RFS APXVARR18_43-C-NA20	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)	12.95 / 13.35 / 15.65 / 16.35	14	495	19,554.23	8.39
						Sector A Composite MPE%	**8.39**
Antenna B1	RFS APXVARR18_43-C-NA20	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)	12.95 / 13.35 / 15.65 / 16.35	14	495	19,554.23	8.39
						Sector B Composite MPE%	**8.39**
Antenna C1	RFS APXVARR18_43-C-NA20	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)	12.95 / 13.35 / 15.65 / 16.35	14	495	19,554.23	8.39
						Sector C Composite MPE%	**8.39**

Table 3: T-MOBILE Emissions Levels

The Following table (*table 4*) shows all additional carriers on site and their MPE% as recorded in the CSC active MPE database for this facility along with the newly calculated maximum T-MOBILE MPE contributions per this report. FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. For this site, all three sectors have the same configuration yielding the same results on all three sectors. *Table 5* below shows a summary for each T-MOBILE Sector as well as the composite MPE value for the site.

Site Composite MPE%	
Carrier	**MPE%**
T-MOBILE – Max Per Sector Value	**8.39 %**
No Additional Carriers on Site	NA
Site Total MPE %:	**8.39 %**

Table 4: All Carrier MPE Contributions

T-MOBILE Sector A Total:	8.39 %
T-MOBILE Sector B Total:	8.39 %
T-MOBILE Sector C Total:	8.39 %
Site Total:	8.39 %

Table 5: Site MPE Summary

FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. *Table 6* below details a breakdown by frequency band and technology for the MPE power values for the maximum calculated T-MOBILE sector(s). For this site, all three sectors have the same configuration yielding the same results on all three sectors.

T-MOBILE _ Frequency Band / Technology Max Power Values (Per Sector)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density (μW/cm²)	Frequency (MHz)	Allowable MPE (μW/cm²)	Calculated % MPE
T-Mobile 600 MHz LTE / 5G NR	2	771.01	105	5.66	600 MHz	400	1.41%
T-Mobile 700 MHz LTE	2	452.93	105	3.32	700 MHz	467	0.71%
T-Mobile 1900 MHz (PCS) LTE	4	1,538.37	105	22.57	1900 MHz (PCS)	1000	2.26%
T-Mobile 1900 MHz (PCS) GSM	1	576.89	105	2.12	1900 MHz (PCS)	1000	0.21%
T-Mobile 2100 MHz (AWS) LTE	4	2,075.20	105	30.45	2100 MHz (AWS)	1000	3.04%
T-Mobile 2100 MHz (AWS) UMTS	1	2,075.20	105	7.61	2100 MHz (AWS)	1000	0.76%
						Total:	**8.39%**

Table 6: T-MOBILE Maximum Sector MPE Power Values

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population 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 population exposure to RF Emissions are shown here:

T-MOBILE Sector	Power Density Value (%)
Sector A:	8.39 %
Sector B:	8.39 %
Sector C:	8.39 %
T-MOBILE Maximum Total (per sector):	8.39 %
Site Total:	8.39 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **8.39 %** of the allowable FCC established general population limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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

Scott Heffernan
Principal RF Engineer
Fox Hill Telecom, Inc
Holden, MA 01520
(978)660-3998

Exhibit G

Letter of Authorization

Exhibit H

Recipient Mailings

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