NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

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

January 12, 2021

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

RE: Notice of Exempt Modification
142 Duncaster Road, Bloomfield CT 06002
Latitude: 41.8653670000
Longitude: -72.7618240000
T-Mobile Site#: CT11385A_L600

Dear Ms. Bachman:

T-Mobile currently maintains six (6) antennas at the 95-foot and 100-foot level of the existing 104-foot utility pole located at 142 Duncaster Road, Bloomfield CT (Pole #3147). The 104-foot tower and property are both owned by the CT Light and Power d/b/a Eversource. T-Mobile now intends to replace three (3) of their existing antennas with three (3) new 600/700/1900/2100 MHz 5G antenna. The new antennas would be installed at the 96-foot level of the tower. Please note that due to the antenna being flush mounted, there is not a mount analysis included for this site.
Planned Modifications:
Remove:
(3) APXV18 – Antenna
(3) Twin TMA (move to ground)
(3) Diplexers (move to ground)

Remove and Replace:
(3) APXV18 Antenna (Remove) – APXVAR18-206516S- 600/700/1900/2100 MHz **5G** Antenna (Replace)

Install New: NONE

Existing to Remain:
(12) Coax
(3) Smart Bias T

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This facility was approved by the CT Siting Council Petition No.472 on July 25, 2000. Please see attached.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to Mayor Suzette DeBeatham-Brown, Elected Official and Jose Giner, Zoning Director for the Town of Bloomfield, as well as the property owner and the tower owner.

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

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

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

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

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

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

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

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

Sincerely,

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: Mayor Suzette DeBeatham-Brown- elected official
Jose Giner – Director of Planning and Zoning
Eversource - as property and tower owner

Exhibit A

Petition No. 472
Voicestream Wireless
Bloomfield, Connecticut
Staff Report
July 25, 2000

On July 21, 2000, Connecticut Siting Council (Council) member Daniel P. Lynch, Jr., and Fred Cunliffe of Council staff met Voicestream Wireless (Voicestream) representatives J. Brendan Sharkey, Esq., Chetan Dharduk, Kemp Morhardt, and Bill Crumb for inspection of a Connecticut Light & Power Company (CL&P) electric transmission line structure (no. 3147) located off Duncaster Road in Bloomfield. Voicestream, with the agreement of CL&P, proposes to modify the transmission structure for telecommunications use and is petitioning the Council for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need (Certificate) is required for the modification.

Voicestream proposes to attach a 4.5-inch diameter pipe extending the existing lattice structure height of 87 feet by 17 feet four inches for a total height of approximately 104 feet four inches. A structural analysis concludes the proposed telecommunications equipment does not overstress the existing CL&P structure; however, to transfer wind shear, the engineering report does recommend that a special connection on the wave guide ladder be made at various levels on the structure. Voicestream proposes to install two low profile antenna cluster mounts (three antennas per elevation) with centers of radiation at 161 feet and 95 feet 4 inches on the pipe. Voicestream also proposes to place associated equipment cabinets on a concrete foundation within an 11-foot by 13-foot compound secured by a six-foot chain link fence.

CL&P's structure is approximately 70 feet from Duncaster Road. Access after construction would be on foot. Utilities would be placed underground within CL&P's property from an existing distribution pole located approximately 80 feet north of the proposed site.

Surrounding land uses include the transmission lines, single-family residences and farmland. The zoning of the proposed site is R-40 Residential District. The nearest home is approximately 150 feet to the north. Voicestream has contacted the three homeowners within 300 feet of the structure with details of the proposed petition.

The worst case power density for the telecommunications operations at the site has been calculated to be less than six percent of the applicable standard for uncontrolled environments.

Council staff recommends that the fence be architecturally treated and landscaping be placed around the perimeter of the fence.

Voicestream contends that the proposed installation will not cause a substantial adverse environmental effect, and for this reason would not require a Certificate.

Exhibit B

Town of Bloomfield, CT

Property Listing Report

Map Block Lot	232-3-16	Building #	1	PID	5847	Account	R05973

Property Information

Property Location	DUNCASTER RD
Owner	CONN LIGHT & POWER CO
Co-Owner	
Mailing Address	PO BOX 270 HARTFORD CT 06141
Land Use	100 Residential Land
Land Class	R
Zoning Code	R-40
Census Tract	4714

Site Index	0
Acreage	8.6
Utilities	
Lot Setting/Desc	
Fire District	C
Book / Page	68/467

Photo

Sketch

Primary Construction Details

Year Built	0
Building Desc.	Tillable D
Building Style	UNKNOWN
Building Grade	
Stories	
Occupancy	
Exterior Walls	
Exterior Walls 2	NA
Roof Style	
Roof Cover	
Interior Walls	
Interior Walls 2	NA
Interior Floors 1	
Interior Floors 2	

Heating Fuel	
Heating Type	
AC Type	
Bedrooms	0
Full Bathrooms	0
Half Bathrooms	0
Extra Fixtures	0
Total Rooms	0
Bath Style	NA
Kitchen Style	NA
Bsmt Fin Area	0
Rec Rm Area	0
Bsmt Gar	0
Fireplaces	0

(*Industrial / Commercial Details)

Building Use	Vacant
Building Condition	
Sprinkler %	NA
Heat / AC	NA
Frame Type	NA
Baths / Plumbing	NA
Ceiling / Wall	NA
Rooms / Prtns	NA
Wall Height	NA
First Floor Use	NA
Foundation	NA

Report Created On 12/30/2020

Town of Bloomfield, CT

Property Listing Report | Map Block Lot 232-3-16 | Building # 1 | PID 5847 | Account R05973

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	0	0
Extras	0	0
Improvements		
Outbuildings	0	0
Land	38700	27090
Total	38700	27090

Sub Areas

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

Outbuilding and Extra Features

Type	Description

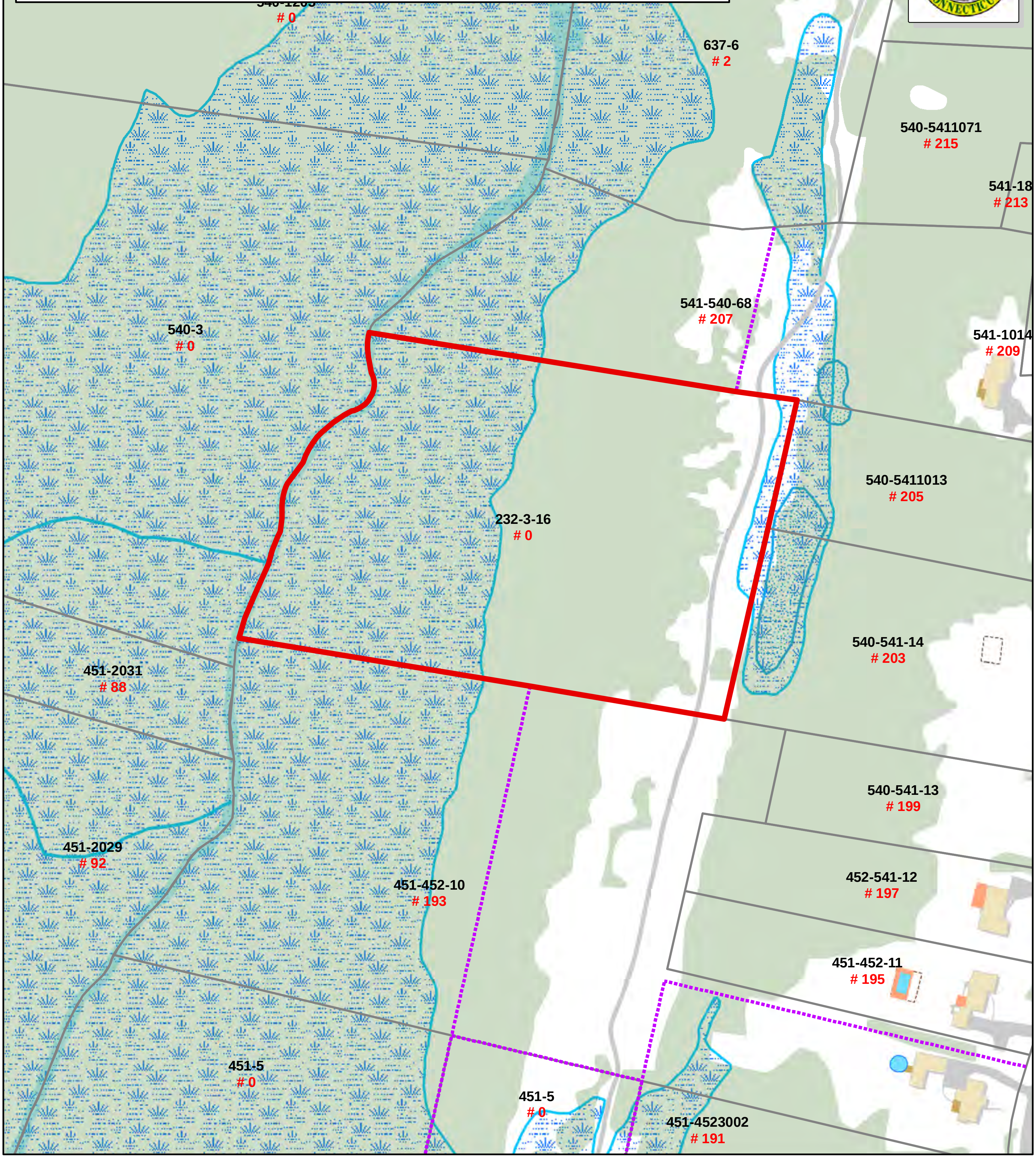
Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
CONN LIGHT & POWER CO	68/467	1953-10-23	0

Report Created On 12/30/2020

Town of Bloomfield, Connecticut - Assessment Parcel Map

MBL: 232-3-16 **Address:** DUNCASTER RD



N W E S

Approximate Scale:

1 inch = 200 feet

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

Map Produced October 2019

Parcels labeled by Unique ID

Exhibit C

T-Mobile

WIRELESS COMMUNICATIONS FACILITY

BLOOMFIELD/RT 187/RT 189
SITE ID: CT11385A
142 DUNCASTER ROAD
BLOOMFIELD, CT 06002

T-MOBILE RF CONFIGURATION

67D94B_1DP+1OP

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE, INCLUDING THE TIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES, 2016 CONNECTICUT FIRE SAFETY CODE AND, 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 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 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 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.
19. CONTRACTOR SHALL COMPLY WITH OWNERS 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: 142 DUNCASTER RD, BLOOMFIELD, CT 06002

1.	START OUT GOING NORTH ON GRIFFIN RD TOWARD HARTMAN RD.	0.30 MI.
2.	TAKE FIRST LEFT ONTO DAY HILL RD.	0.61 MI.
3.	TAKE LEFT ONTO TUNXIS AVE/CT-189.	0.34 MI.
4.	TAKE FIRST RIGHT ONTO ADAMS RD.	0.73 MI.
5.	TAKE THIRD LEFT ONTO DUNCASTER RD.	0.54 MI.
6.	142 DUNCASTER RD, BLOOMFIELD, CT 06002-1223, 142 DUNCASTER RD IS ON THE LEFT.	

SITE COORDINATES: LATITUDE: 41°-51'-55.32" N
LONGITUDE: 72°-45'-42.56" W
GROUND ELEVATION: 211'± AMSL

COORDINATES AND GROUND ELEVATION ARE REFERENCED FROM GOOGLE EARTH

VICINITY MAP

NORTH

PROJECT SUMMARY

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

1. REPLACE (1) DU WITH (1) BB6630 FOR LTE.
2. INSTALL ADDITIONAL (1) BB6630 FOR FUTURE 5G N600.
3. REMOVE (1) RFS ANTENNA AT P1 AT 100' PER EACH SECTOR, TOTAL OF (3).
4. INSTALL (1) LB/MB QUAD IN P1 PER EACH SECTOR, TOTAL OF (3).
5. CONNECT (2) LINES TO LOW-BAND PORTS PER EACH SECTOR, TOTAL OF (6).
6. CONNECT (2) LINES TO MID-BAND PORTS PER EACH SECTOR, TOTAL OF (6).
7. INSTALL NEW EQUIPMENT BACKBOARD FOR PROPOSED APPURTENANCES.
8. INSTALL (1) PCS/AWS DIPLEXER PER EACH SECTOR, TOTAL OF (3) ONTO A NEW EQUIPMENT BACKBOARD.
9. INSTALL (2) AWS TMA PER EACH SECTOR, TOTAL OF (6) MOUNTED ONTO NEW EQUIPMENT BACKBOARD
10. INSTALL (1) RADIO 4449 B71+B12 PER EACH SECTOR, TOTAL OF (3) MOUNTED ONTO A NEW EQUIPMENT BACKBOARD.
11. REMOVE (1) ANTENNA IN P2 AT 90' PER EACH SECTOR, TOTAL OF (3). P2 WILL BE LEFT EMPTY.

PROJECT INFORMATION

SITE NAME:	BLOOMFIELD/RT 187/RT 189
SITE ID:	CT11385A
SITE ADDRESS:	142 DUNCASTER ROAD BLOOMFIELD, CT 06002
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	SHELDON FREINCLE (PROJECT MANAGER) NORTHEAST SITE SOLUTIONS (203) 776-8521
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405 CARLO F. CENTORE, PE (203) 488-0580 EXT. 122
PROJECT COORDINATES:	LATITUDE: 41°-51'-55.32" N LONGITUDE: 72°-45'-42.56" W GROUND ELEVATION: 211'± AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
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C-2	COMPOUND PLAN, EQUIPMENT PLAN AND ELEVATION	1
C-3	ANTENNA PLANS AND ELEVATIONS	1
C-4	TYPICAL EQUIPMENT DETAILS	1
E-1	TYPICAL ELECTRICAL DETAILS	1

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	12/21/20	RTS	TJR	CONSTRUCTION DOCUMENTS - ISSUED FOR CONSTRUCTION
1	01/04/21	RTS	TJR	CONSTRUCTION DOCUMENTS - REVISED PER CLIENT COMMENTS

PROFESSIONAL ENGINEER SEAL

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
WIRELESS COMMUNICATIONS FACILITY
BLOOMFIELD/RT187/RT189
SITE ID: CT11385A
142 DUNCASTER ROAD
BLOOMFIELD, CT 06002

DATE:	06/03/19
SCALE:	AS NOTED
JOB NO.	19066.04

TITLE SHEET

T-1

Sheet No. 1 of 7

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 III (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED (OTHER STRUCTURE): 129 MPH (Vasd) (EXPOSURE C/ 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.
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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.

STRUCTURAL STEEL

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

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI)
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   E. PIPE---ASTM A53 (FY = 35 KSI)
   F. CONNECTION BOLTS---ASTM A325–N
   G. U–BOLTS---ASTM A36
   H. ANCHOR RODS---ASTM F 1554
   I. WELDING ELECTRODE---ASTM E 70XX

2. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
3. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
4. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
5. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
6. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
7. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON–GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
8. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
9. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT–DIP) ON IRON AND STEEL HARDWARE".
10. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
11. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
12. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
13. LOCK WASHER ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES.
14. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
15. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
16. FABRICATE BEAMS WITH MILL CAMBER UP.
17. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
18. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.
19. INSPECTION AND TESTING OF ALL WELDING AND HIGH STRENGTH BOLTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY.
20. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

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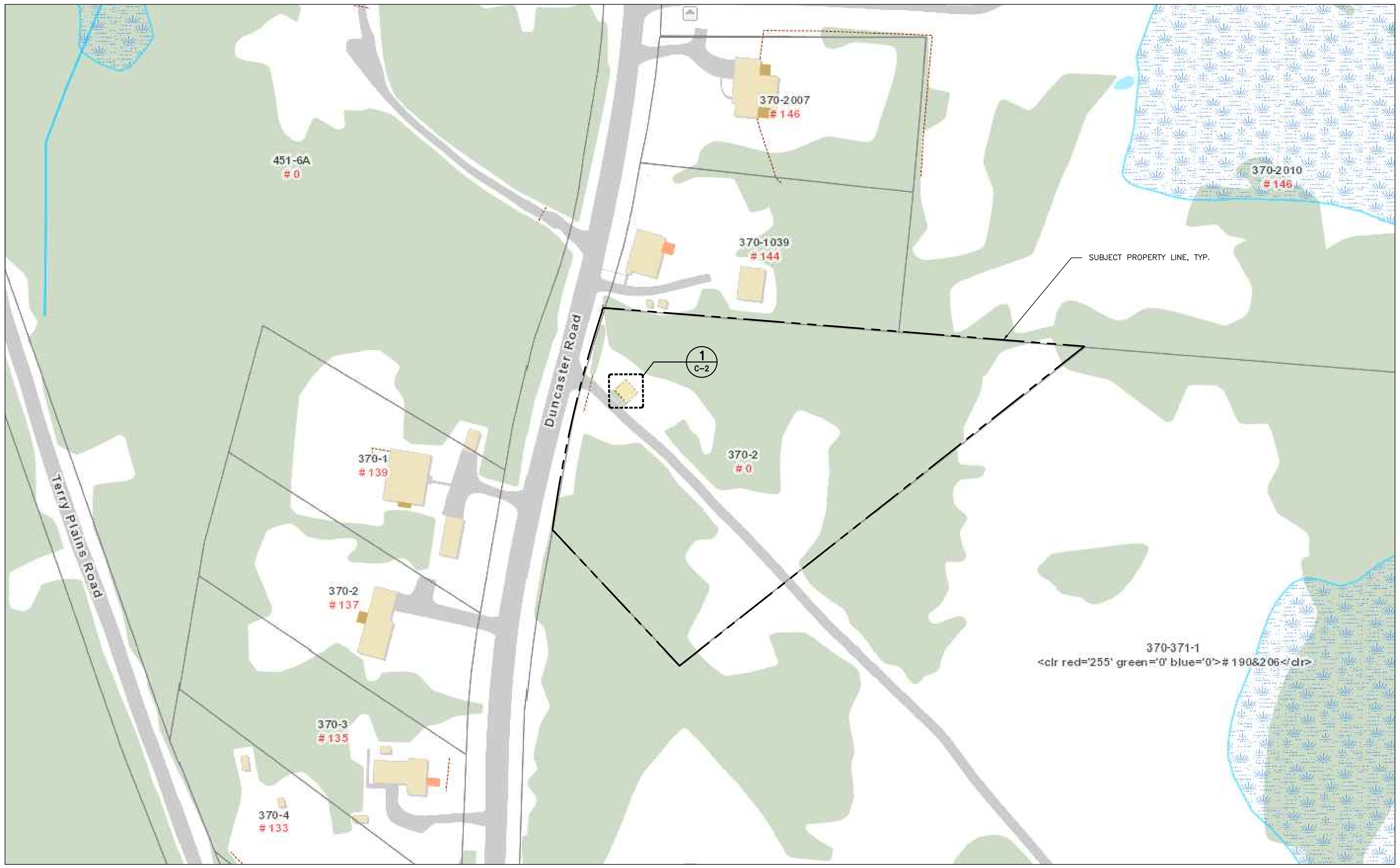
DESIGN BASIS AND SITE NOTES

N-1

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)	(E/P) SECTOR EQUIPMENT (QTY)	(QTY) PROPOSED COAX (LENGTH)
A1	PROPOSED	APXVAR18_43-C-NA20	68"L x 16"W x 9"D	96'	20°	(P) RADIO 4449 B71+B85 (1)	(P) GENERIC TWIN STYLE 1A-PCS (1), (P) GENERIC TWIN STYLE 1B-AWS (1), (P) GENERIC AWS/PCS DIPLEXER (1)	(P) ERICSSON (ANDREW SMART BIAS T) (1)	(4) 1-1/4" COAX CABLE (±120')
A2	EMPTY								
B1	PROPOSED	APXVAR18_43-C-NA20	68"L x 16"W x 9"D	96'	110°	(P) RADIO 4449 B71+B85 (1)	(P) GENERIC TWIN STYLE 1A-PCS (1), (P) GENERIC TWIN STYLE 1B-AWS (1), (P) GENERIC AWS/PCS DIPLEXER (1)	(P) ERICSSON (ANDREW SMART BIAS T) (1)	(4) 1-1/4" COAX CABLE (±120')
B2	EMPTY								
C1	PROPOSED	APXVAR18_43-C-NA20	68"L x 16"W x 9"D	96'	210°	(P) RADIO 4449 B71+B85 (1)	(P) GENERIC TWIN STYLE 1A-PCS (1), (P) GENERIC TWIN STYLE 1B-AWS (1), (P) GENERIC AWS/PCS DIPLEXER (1)	(P) ERICSSON (ANDREW SMART BIAS T) (1)	(4) 1-1/4" COAX CABLE (±120')
C2	EMPTY								



1 / C-1 **SITE LOCATION PLAN**
SCALE: NTS
APPROX. NORTH

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SITE LOCATION PLAN

C-1

Sheet No. 3 of 7

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..

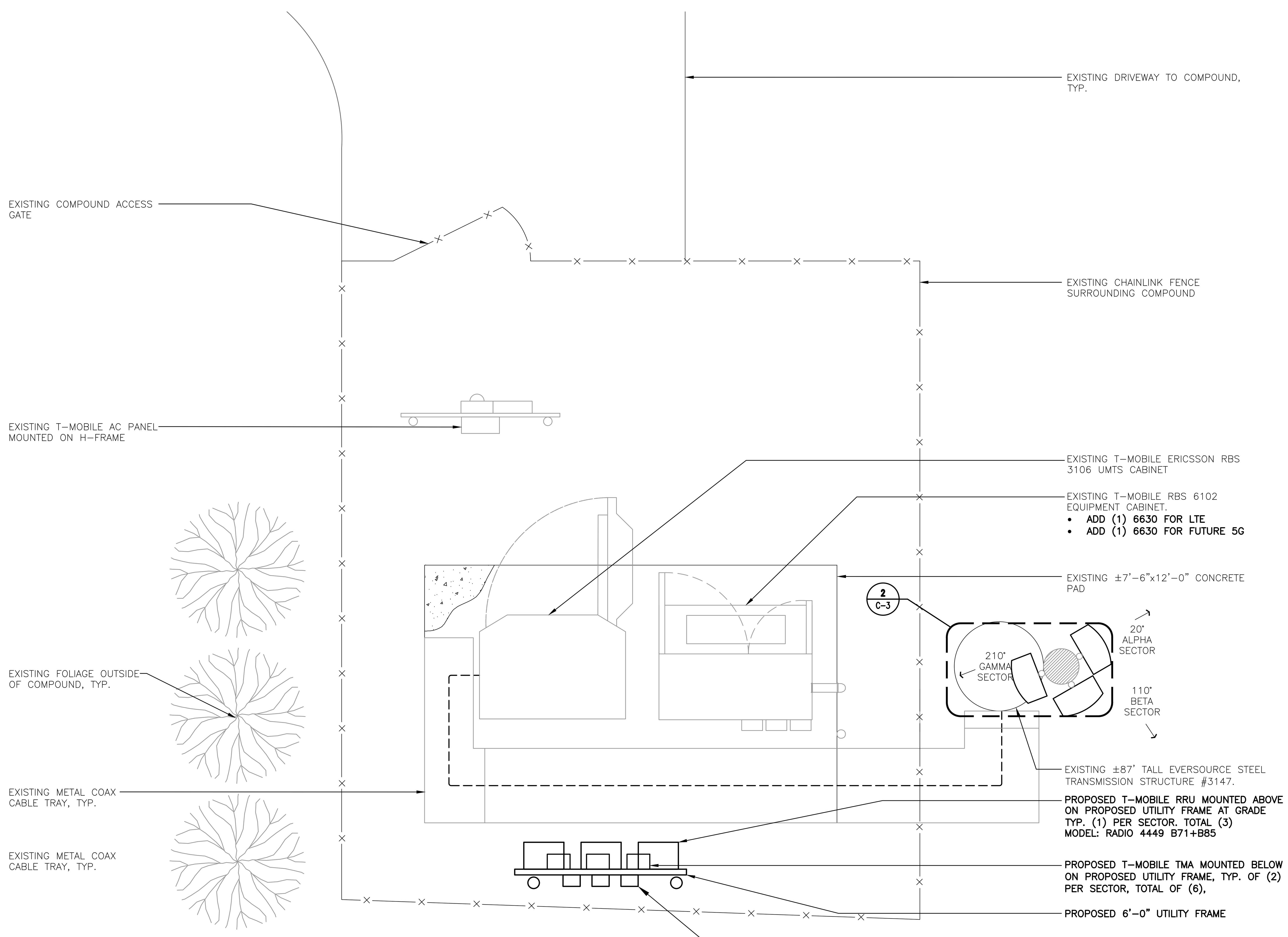
REFER TO THE ANTENNA MOUNT ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 19066.04) DATED 10/30/19 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TOWER AND TOWER FOUNDATION

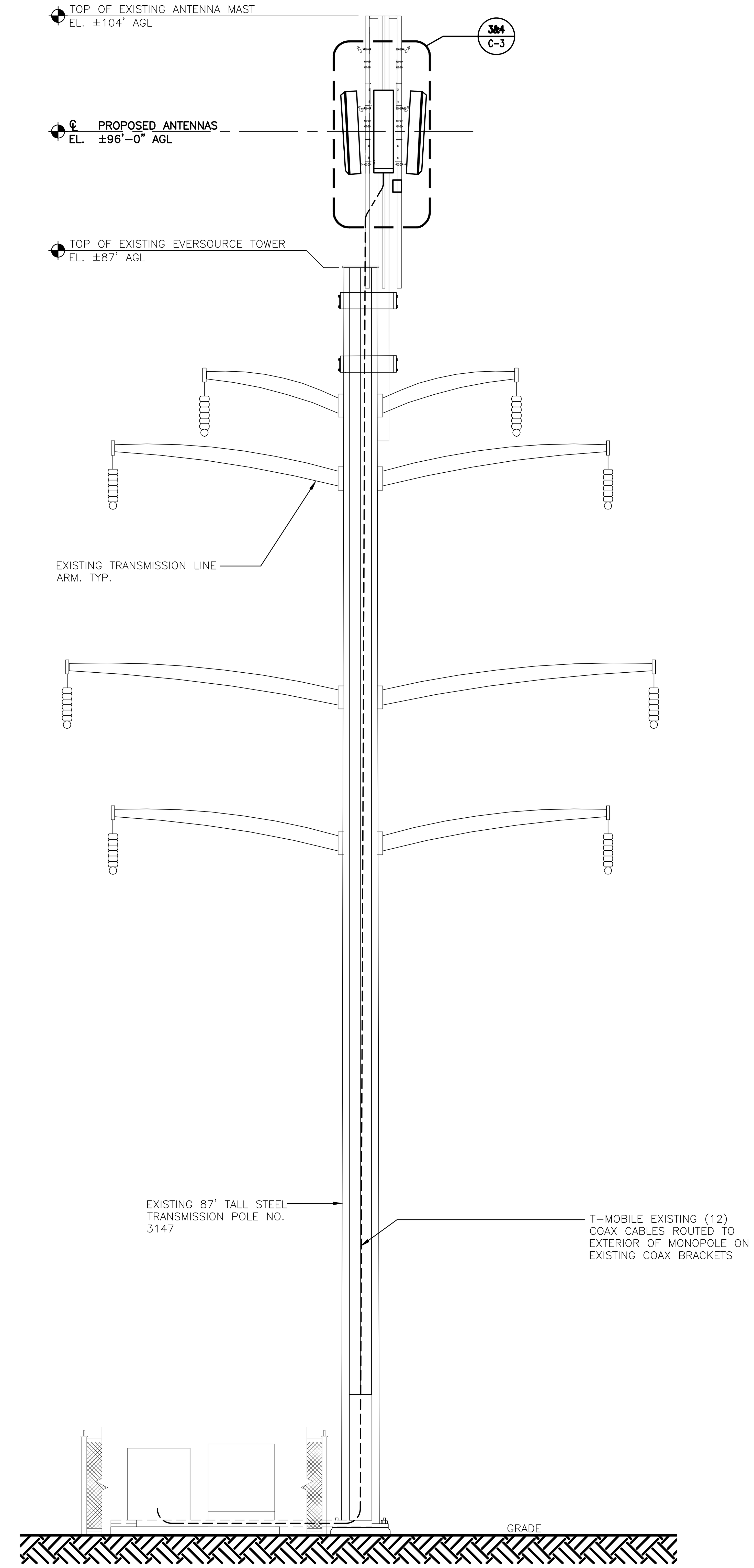
A STRUCTURAL ANALYSIS OF THE TOWER AND TOWER FOUNDATION WAS PERFORMED FOR THE PROPOSED EQUIPMENT INSTALLATION AND THEY WERE FOUND TO BE STRUCTURALLY SUFFICIENT TO ACCOMMODATE THE PROPOSED LOADING.

REFER TO THE STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 19066.04) DATED 10/30/19 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 **COMPOUND PLAN - PROPOSED**
SCALE: 1/2" = 1'



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

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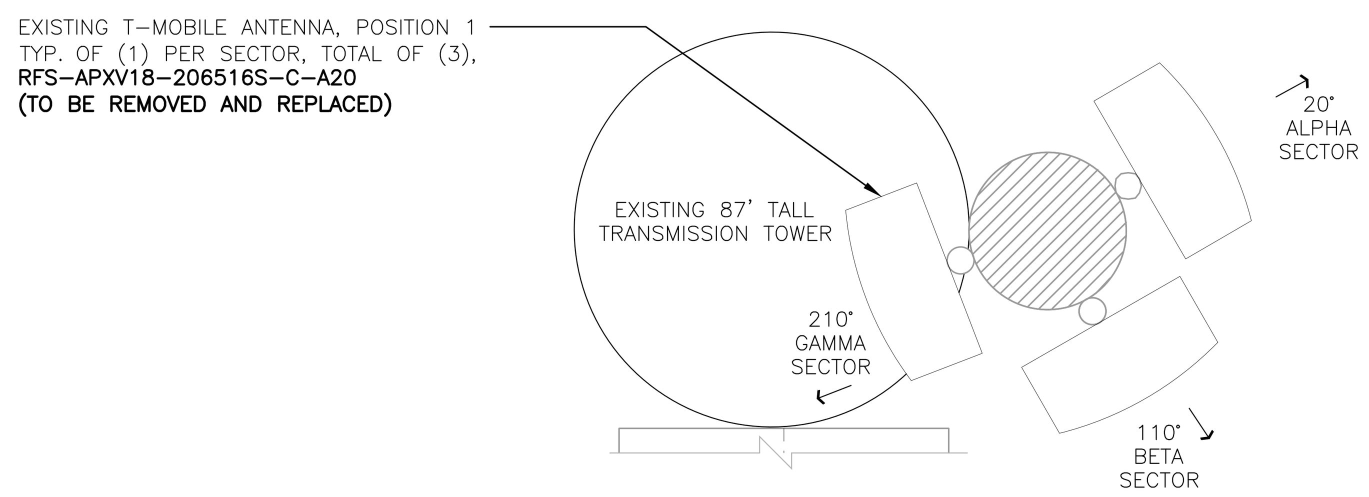
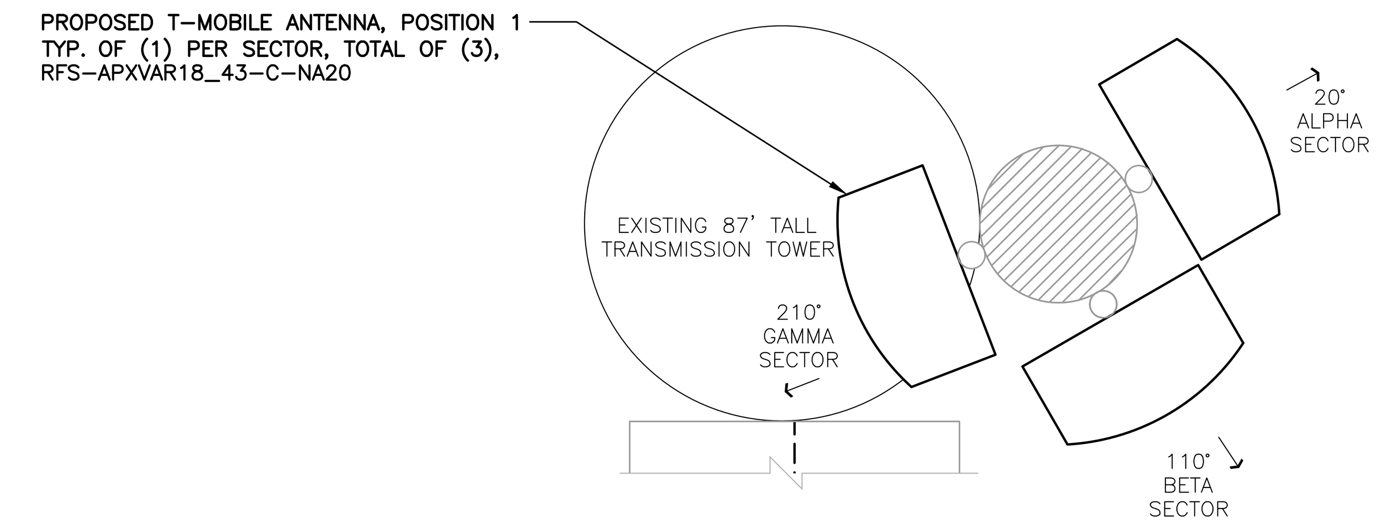
COMPOUND PLAN, EQUIPMENT PLAN, AND ELEVATION

C-2

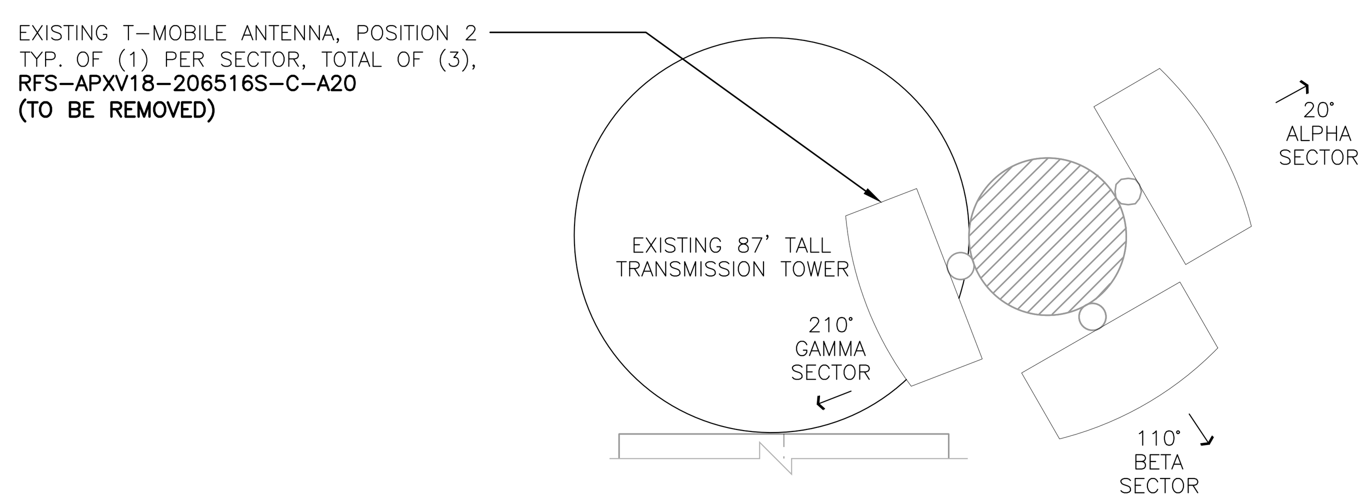
Sheet No. 4 of 7



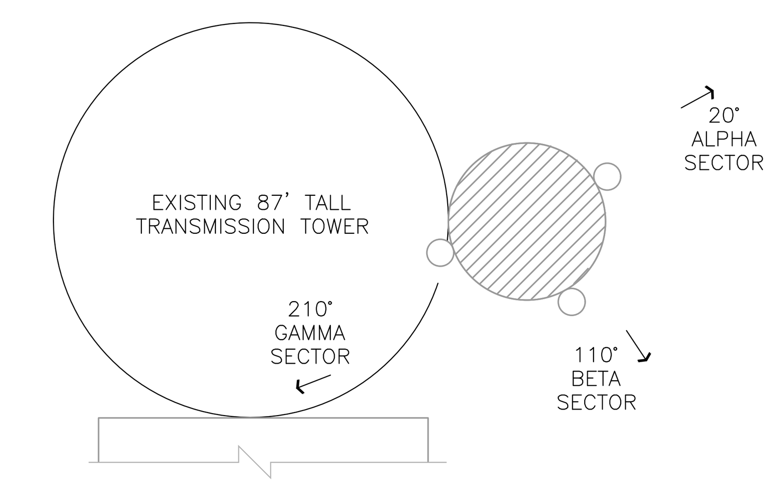
1 / C-3 **ANTENNA PLAN - EXISTING POSITION 1**
SCALE: 1" = 1'
TRUE NORTH



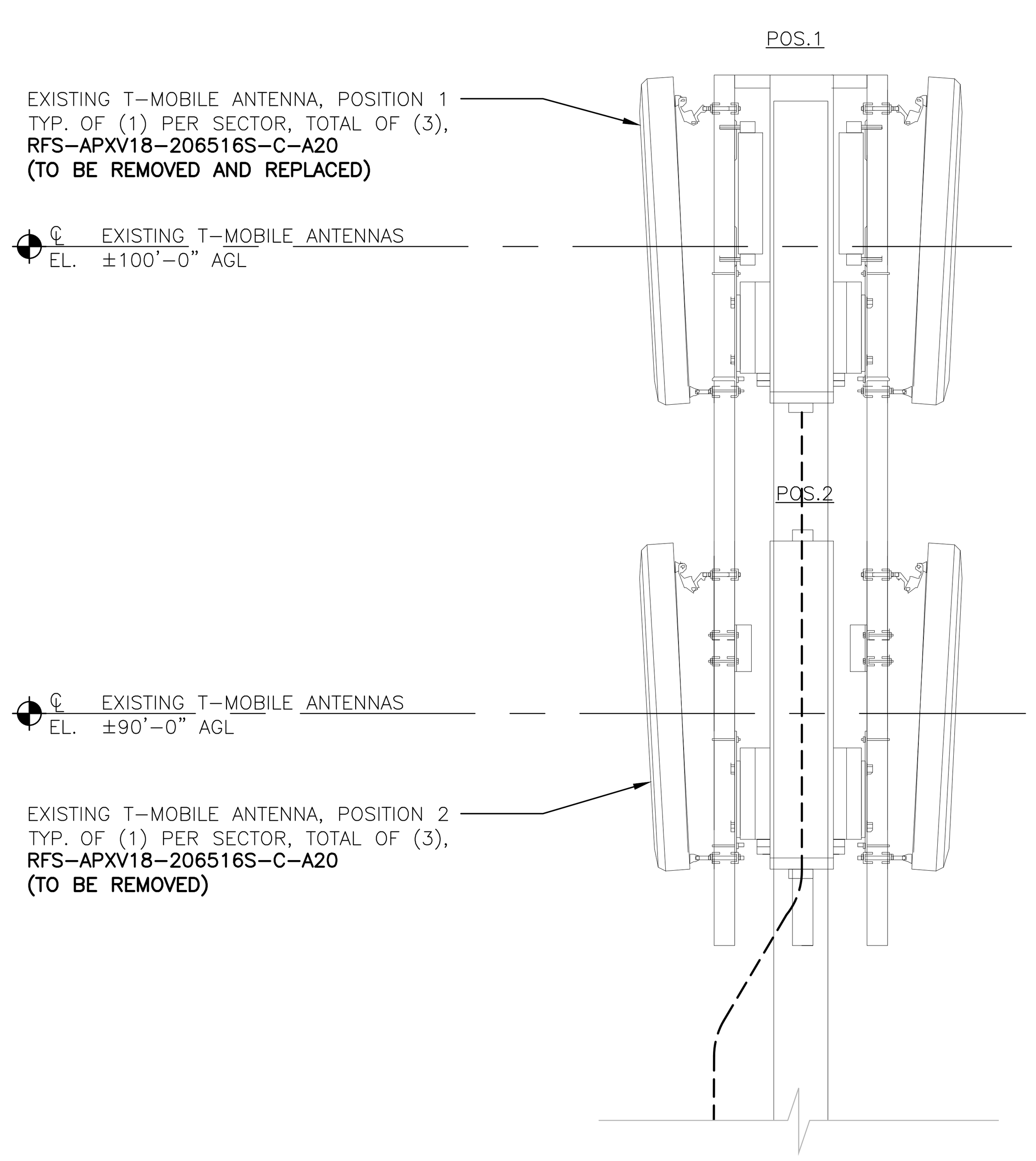
2 / C-3 **ANTENNA PLAN - PROPOSED POSITION 1**
SCALE: 1" = 1'
TRUE NORTH



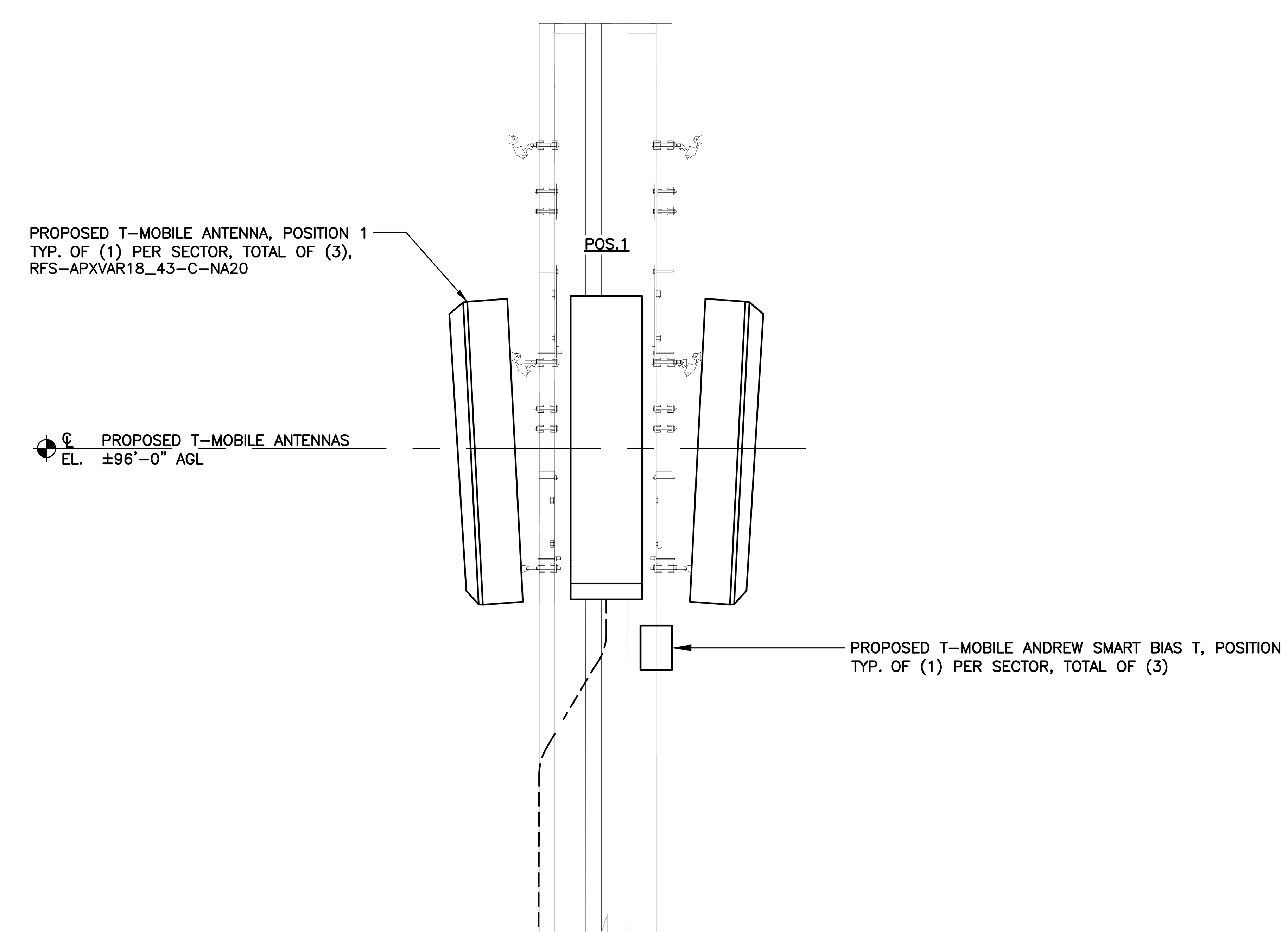
1A / C-3 **ANTENNA PLAN - EXISTING POSITION 2**
SCALE: 1" = 1'
TRUE NORTH



2A / C-3 **ANTENNA PLAN - PROPOSED POSITION 2**
SCALE: 1" = 1'
TRUE NORTH



3 / C-3 **ANTENNA ELEVATION - EXISTING**
SCALE: 1/2" = 1'



4 / C-3 **ANTENNA ELEVATION - PROPOSED**
SCALE: 1/2" = 1'

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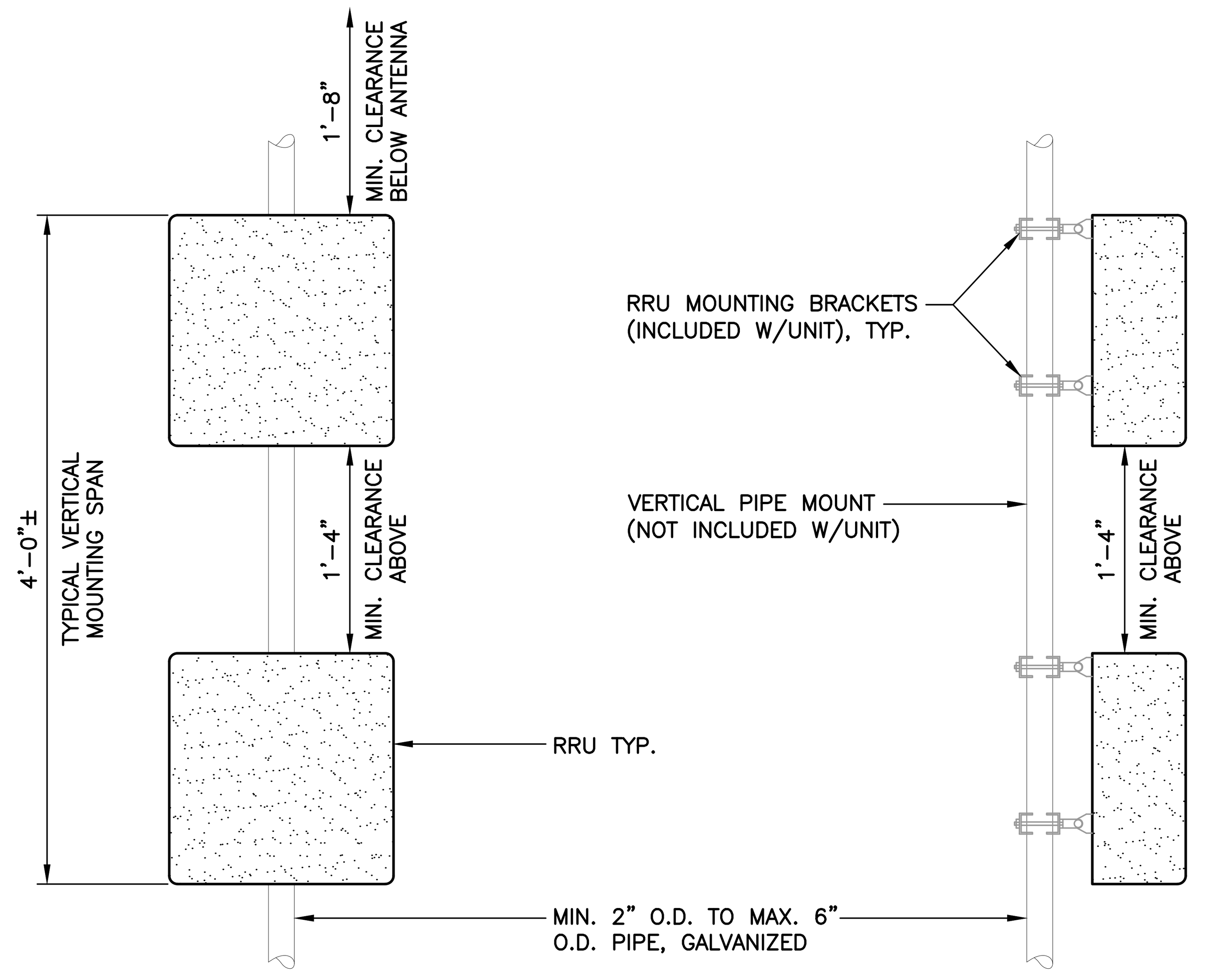
ANTENNA PLANS AND ELEVATIONS

C-3

Sheet No. 5 of 7



NOTES:

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. CONTRACTOR SHALL INSTALLS RRU AND MAKES CABLE TERMINATIONS.
2. NO PAINTING OF THE RRU OR SOLAR SHIELD IS ALLOWED.

1 (C-4) TYPICAL RRU MOUNTING DETAIL
SCALE: NOT TO SCALE

BOTTOM

ALPHA/BETA/GAMMA ANTENNA			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE: MODEL:	RFS APXVAR18_43-C-NA20	68"L x 16"W x 9"D	±48.4 LBS.

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

2 (C-4) PROPOSED ANTENNA DETAIL
SCALE: NOT TO SCALE

ISOMETRIC VIEW

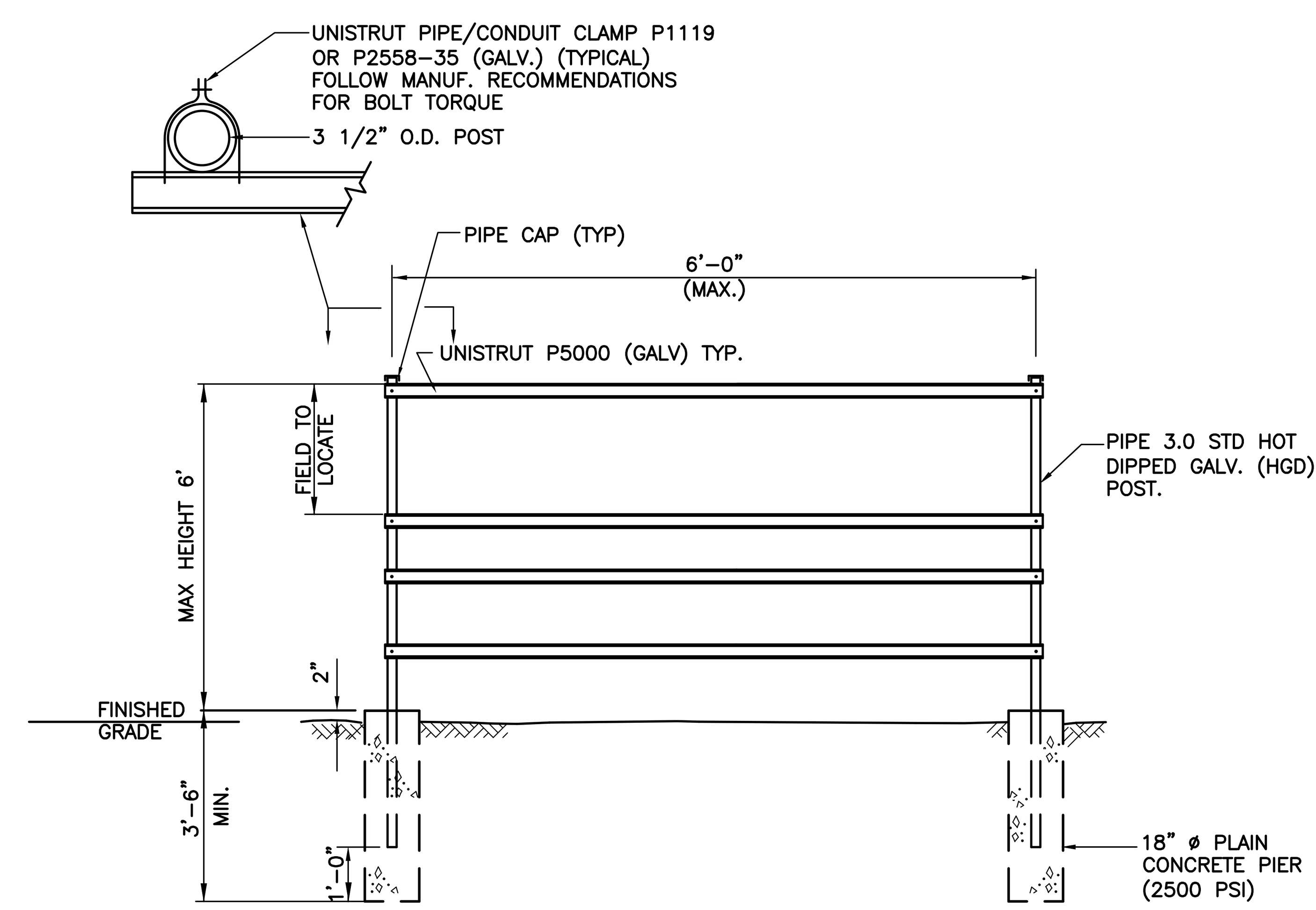
RRU (REMOTE RADIO UNIT)				
EQUIPMENT		DIMENSIONS	WEIGHT	CLEARANCES
MAKE: MODEL:	ERICSSON RADIO 4449 B71+B85	14.9"L x 13.2"W x 5.4"D	±74 LBS.	BEHIND ANT.: 8" MIN. BELOW ANT.: 20" MIN. BELOW RRU: 16" MIN.

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

3 (C-4) PROPOSED RRU DETAIL
SCALE: NOT TO SCALE

4 (C-4) PROPOSED BIAS-T DETAIL
SCALE: NOT TO SCALE

5 (C-4) PROPOSED DIPLEXER DETAIL
SCALE: NOT TO SCALE



6 (C-4) UTILITY SUPPORT FRAME (TYP)
NOT TO SCALE

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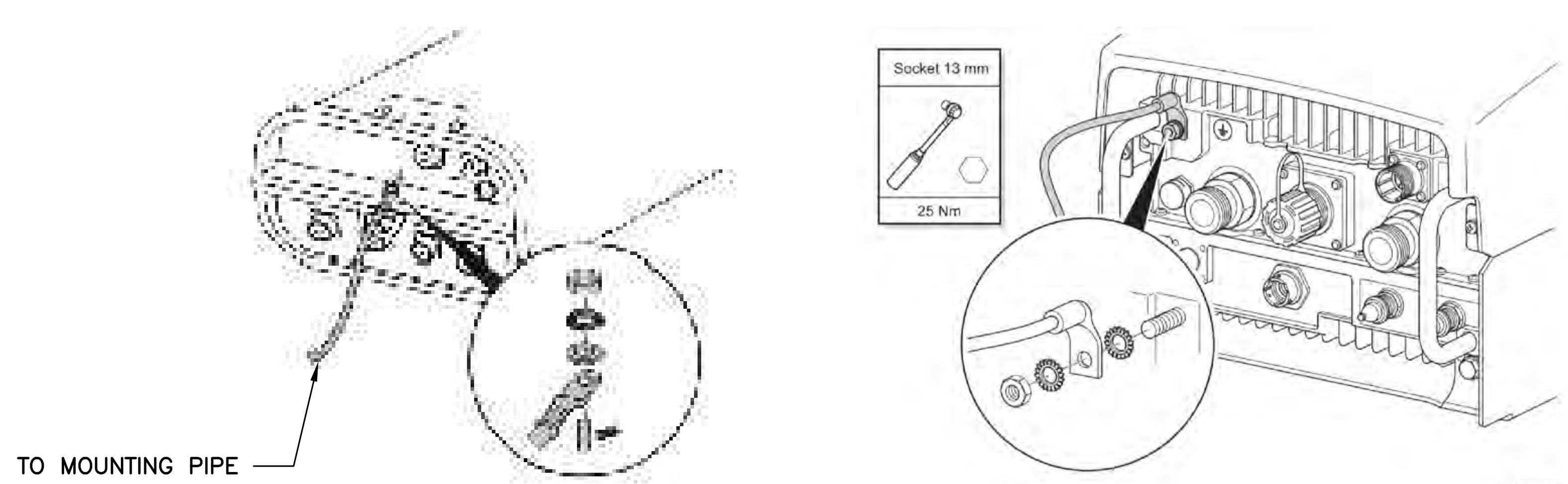
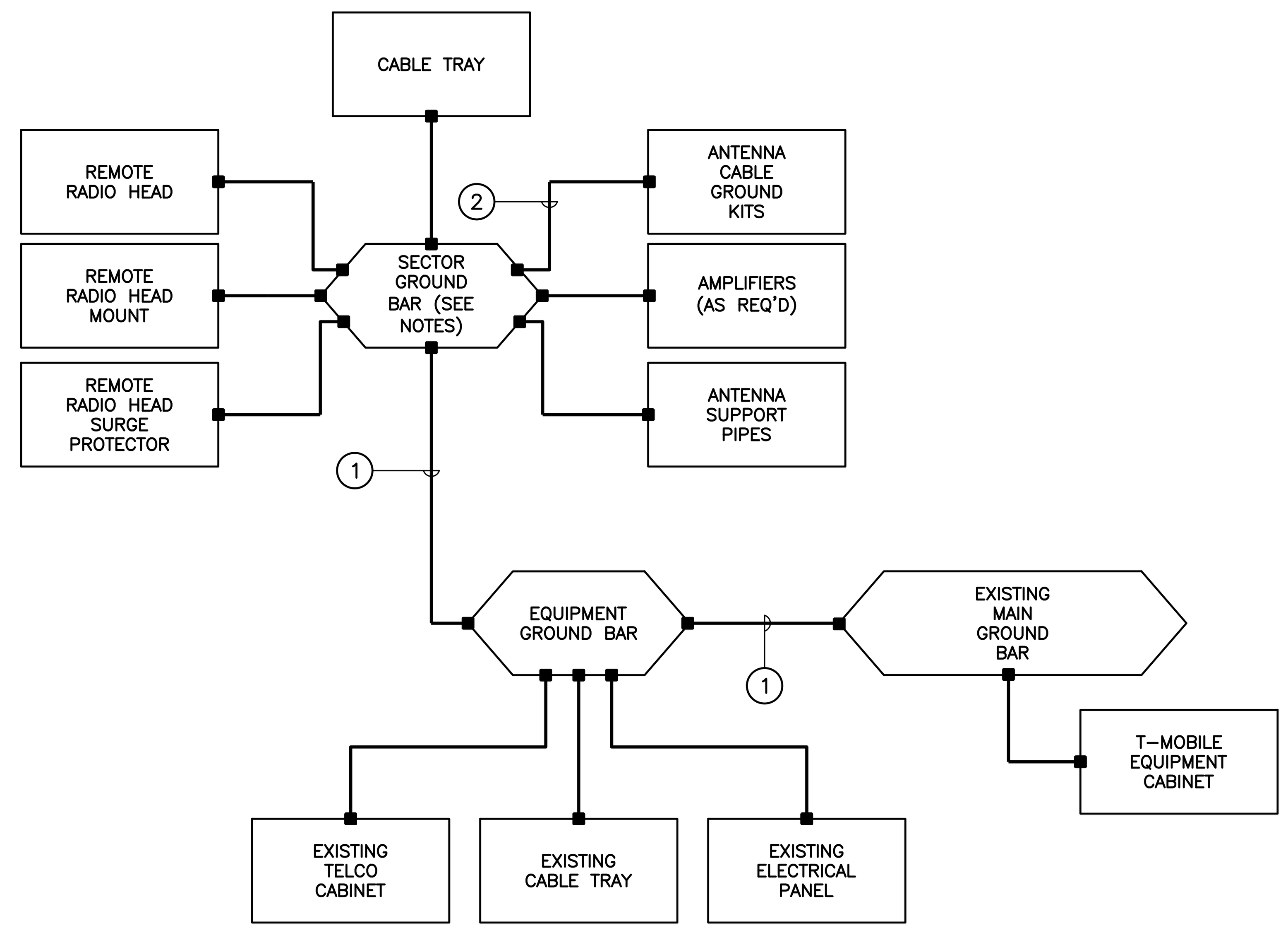
TYPICAL EQUIPMENT DETAILS

C-4



1 / E-1 TYPICAL ANTENNA/RRU GROUNDING DETAILS
SCALE: NOT TO SCALE



GROUNDING SCHEMATIC NOTES

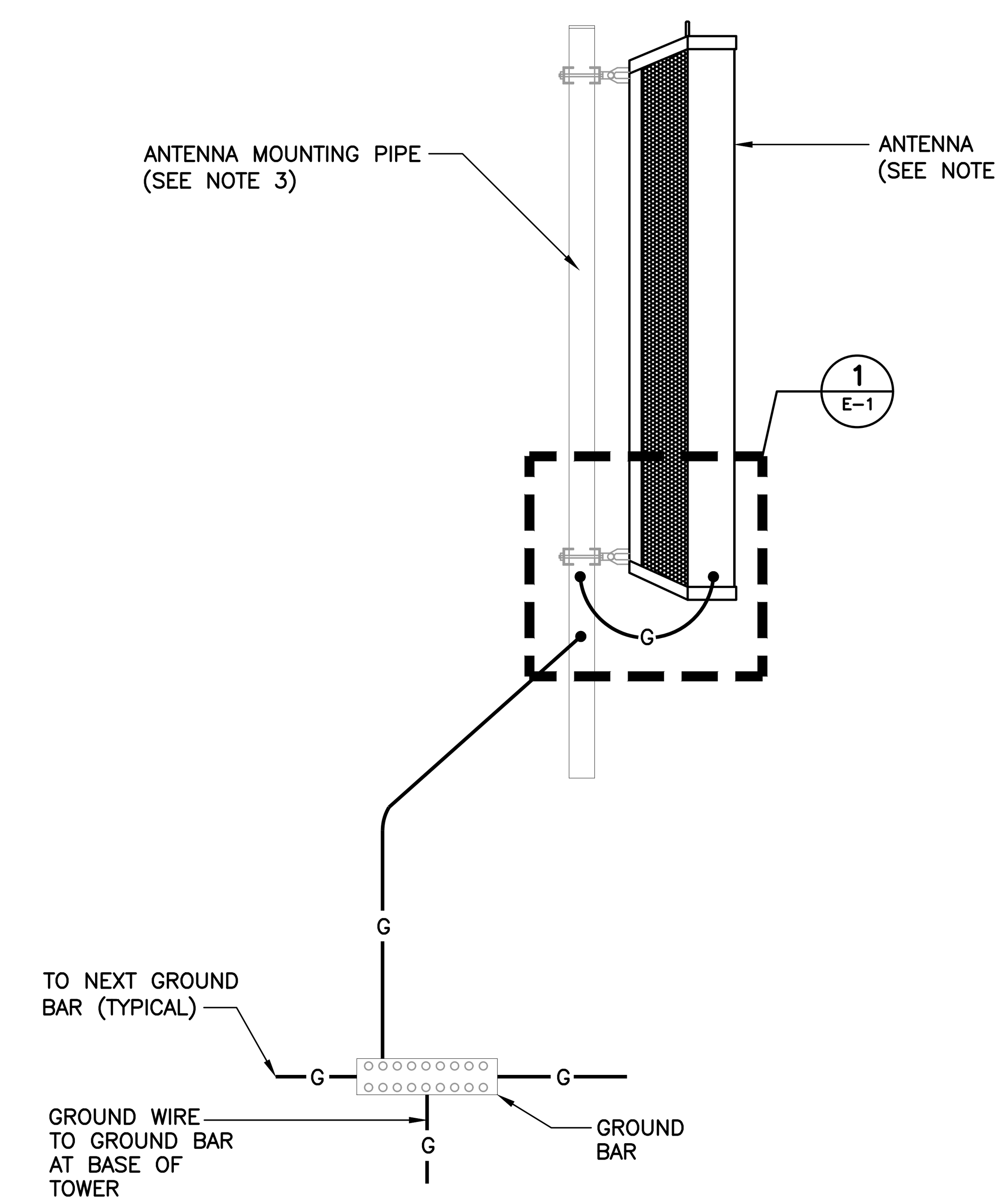
(1) #2 AWG

(2) #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. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW.
4. BOND ALL EQUIPMENT CABINETS AND BATTERY CABINETS TO GROUND PER MANUFACTURER'S SPECIFICATIONS.
5. COORDINATE ALL ROOF MOUNTED EQUIPMENT WITH OWNER.
6. ALL ROOF MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
7. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.

2 / E-1 TYPICAL GROUNDING SCHEMATIC DETAIL
SCALE: NOT TO SCALE



NOTES:

1. BOND COAXIAL CABLE GROUND KITS TO EACH OWNER'S GROUND BAR ALONG ENTIRE COAX RUN FROM ANTENNA TO SHELTER.
2. BOND ALL EQUIPMENT TO GROUND PER NEC AND MANUFACTURERS SPECIFICATIONS.
3. DETAIL IS TYPICAL FOR ALL ANTENNA SECTORS, INCLUDING GPS ANTENNA.

3 / E-1 TYPICAL ANTENNA GROUNDING DETAIL
SCALE: NOT TO SCALE

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TYPICAL DETAILS

E-1

Sheet No. 7 of 7

Exhibit D

CENTEK engineering

Centered on Solutions℠

Structural Analysis of Antenna Mast and Tower

T-Mobile Site Ref: CT11385A

Eversource Structure No. 3147
100' (87' AGL) Electric Transmission Pole

142 Duncaster Road
Bloomfield, CT

CENTEK Project No. 19066.04

~~Date: October 3, 2019~~
Rev 1: October 30, 2019

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

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

Table of Contents

Introduction

The purpose of this report is to analyze the existing antenna mast and 100' (87' AGL) utility pole located at 142 Duncaster Road in Bloomfield, CT for the proposed antenna and equipment upgrade by T-Mobile.

The existing and proposed loads consist of the following:

- T-MOBILE (Existing to Remain):
  Appurtenances: Three (3) Andrew ATSBT-TOP-FM-4G Smart Bias Tees mounted with a RAD center elevation of 95-ft above grade.
  Coax Cables: Twelve (12) 1-1/4" ∅ coax cables mounted to the existing exterior of the pole.
- T-MOBILE (Existing to Remove):
  Antennas: Six (6) RFS APXV18-206516S-C-A20 panel antennas and six (6) AWS/PCS Dual Diplexed TMA's mounted with a RAD center elevations of 95-ft & 101-ft above tower base.
- **T-MOBILE (Proposed):**
  Antennas: Three (3) RFS APXVAR18_43-C-NA20 panel antennas flush mounted with a RAD center elevation of 96-ft above grade.

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 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 existing antenna mast consisting of a of a 6-in x 30-ft long SCH. 80 pipe (O.D. = 6.63") connected at two points to the existing tower was analyzed for its ability to resist loads prescribed by the TIA-222-G standard. Section 5 of this report details these gravity and lateral wind loads. NESC prescribed loads were also applied to the mast in order to obtain reactions needed for analyzing the utility pole structure. These loads are developed in Section 7 of this report. Load cases and combinations used in RISA-3D for TIA-222-G loading and for NESC/NU loading are listed in report Sections 6 and 8, respectively.

Structural analysis of the existing utility pole structure was completed using the current version of PLS-Pole computer program licensed to CENTEK Engineering, Inc. The NESC program contains a library of all AISC angle shapes and corresponding section properties are computed and applied directly within the program. The program's Steel Code Check option was also utilized.

The existing 100-ft tall utility pole was analyzed for its ability to resist loads prescribed by the NESC standard. Maximum usage for the tower was calculated considering the additional forces from the antenna mast and associated appurtenances. Section 7 of this report details these gravity and lateral wind loads.

Design Basis

Our analysis was performed in accordance with TIA-222-G, ASCE 48-11, "Design of Steel Transmission Pole Structures", NESC C2-2012 and Northeast Utilities 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 NU Design Criteria Table, NESC C2-2012 ~ 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 C2-2012, Section25, Rule 250C: Extreme Wind Loading, 1.25 x Gust Response Factor (wind speed: 3-second gust)

- MAST ASSEMBLY ANALYSIS

  Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the Design Criteria Table, TIA/EIA-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……………………….. 1.00”

Results

- ANTENNA MAST

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

Component	Stress Ratio (percentage of capacity)	Result
6” Sch. 80 Pipe	95.1%	**PASS**
Connection to Tower	12.3%	**PASS**

- UTILITY POLE

  This analysis finds that the subject utility pole is adequate to support the proposed antenna mast and related appurtenances. The pole stresses meet the requirements set forth by the ASCE 48-11, “Design of Steel Transmission Pole Structures” for the applied NESC Heavy and Extreme load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

  A maximum usage of **85.23%** 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 1	37.00’ -100’ (AGL)	85.23%	**PASS**

The CL&P utility pole is embedded approximately 13-ft into the ground. Review of the utility pole embedment consisted of verification of applied loads obtained from the tower analysis calculations and a comparison against original tower design calculations.

BASE REACTIONS:

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

Load Case	Shear	Compression	Moment
NESC Heavy Wind	7.62 kips	31.05 kips	661.02 kips
NESC Extreme Wind	14.07 kips	16.97 kips	968.69 kips

Note 1 – 10% increase to be applied to the above tower base reactions for foundation verification per OTRM 051

The direct embedment length was found to be within allowable limits based on original tower design reactions.

Reaction Type	Original Design Reaction (1)	Proposed Reaction	Result
Shear	17.3 kips	15.48 kips	**PASS**
Compression	11.3 kips	7.01 kips (2)	**PASS**
Moment	1224.0 ft-kips	1065.56 ft-kips	**PASS**

Note 1: Original design reactions taken from NUSCO drawing no. 01123-50000 sh. 12 of 20.
Note 2: Original compression reaction does not include weight of utility structure. Proposed reaction reduced by weight of structure (10.6 kips) for comparison.

Conclusion

This analysis shows that the subject utility tower **is adequate** 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

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

Prepared by:

Fernando J.Palacios
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 drawing/editing environment: draw, generate, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, trim, extend, etc.
- Versatile drawing grids (orthogonal, radial, skewed, DXF underlay)
- Universal snaps and object snaps allow drawing without grids
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet based, save/recall selections with locking
- True spreadsheet editing with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and graphics
- Open multiple spreadsheets simultaneously
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability, automatic timed backup
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, geodesic domes, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection custom shape libraries
- Steel Shapes: AISC, Historic, Australian, British, Canadian, Chilean, Chinese, European, Indian, Mexican
- Light Gage Shapes: AISI, SSMA, Dale/Incor, Dietrich, Marino\WARE
- Import DXF, RISA-2D, STAAD and CIS/2 files
- Export DXF, SDNF and CIS/2 files
- Robust two-way link with Revit Structure 2019
- Link with Tekla Structures 2018

Analysis Features

- Analysis of 1D members (beams, columns, braces, etc.) using Finite Element Method
- Analysis of 2D elements (plates, walls) using Finite Element Method
- Analysis of 3D elements (solids) using Finite Element Method
- Partial fixity member end releases using rotational spring constants
- Time History Analysis
- Accelerated true sparse solver for static analysis
- Flexible modeling of P-Delta effects
- Accelerated Sparse Lanczos dynamics solver, very fast and robust
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS with automatic calc of scaling factors
- Automatic inclusion of mass offset (5% or user defined) for dynamics when integrated with RISAFloor
- Ritz vector dynamic solver
- True physical member modeling (members are aware of interior joints)
- Plate/shell elements with plane stress only option
- 8 node solid elements
- High end mesh generation — draw a polygon with any number of sides to create a mesh of well formed quadrilateral (NO triangular) elements
- Automatic rigid diaphragm modeling with detachable joints

- Area loads with one-way or two-way distributions with optional “blow through” distribution for loading open structures
- Plate thermal loads
- Simultaneous moving loads, AASHTO/custom for bridges, cranes…
- Torsional warping calculations for stiffness, stress and design of hot rolled steel
- Member end releases, rigid end offsets, analysis offsets
- Enforced joint displacements
- One Way members, for tension only bracing, slipping, etc.
- One Way springs, for modeling soils and other effects
- Euler members: Compression up to buckling load, then disable
- Stress calculations on any arbitrary shape
- Inactivate members, plates, solids and diaphragms without deleting them
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members, plates and solids

Graphics Features

- Unlimited simultaneous model view windows
- “True to scale” rendering with translucency, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamically zoom, pan, rotate, scroll, snap views
- Font and color control
- Saved views to quickly restore frequent or desired views
- Rendered or wire-frame animations of deflected model and mode shapes
- Animation of moving loads with speed control
- Distance tool for measuring between points
- Force/moment summation about any arbitrary cut line
- High quality customizable graphics printing

Design Codes

- Steel Design Codes: AISC 360-16/10/05: ASD & LRFD, AISC 2nd & 3rd: LRFD, AISC 9th: ASD, CSA S16-14/09/05/01/CSA-S16.1-94, BS 5950-1: 2000, EN 1993-1-1:2014/2005, ENV 1993-1-1:1992, IS 800: 2007/1998, AS 4100-1998, NZS 3404: 1997
- Seismic design per AISC 341-10/05, including 358 prequalified connections
- Concrete Design Codes: ACI 318-14/11/08/05/02/99, CSA A23.3-14/04/94, NTC-DF 2004, BS 8110-1: 1997, BS EN 1992-1-1: 2004+A1: 2014/2004, EN 1992-1-1:1992, IS 456: 2000, AS 3600-2001, NZS 3101: 1995, SBC 304-2007
- Cold Formed Steel Design Codes: AISI S100-16/12/10/07: ASD & LRFD, AISI NAS-04/01: ASD & LRFD, AISI 1999: ASD & LRFD, CSA S136-16/12/10/07/04/01: LSD, CANACERO 16: ASD, CANACERO 12/10/07/04/01: ASD & LRFD
- Aluminum Design Codes: AA ADM1-15/10: ASD & LRFD, AA ADM1-05: ASD
- Wood Design Codes: AWC NDS-18/15/12: ASD, AF&PA NDS-08/05/01/97/91: ASD, CSA 086-14/09 Ultimate, Structural Composite Lumber, multi-ply, full sawn, Glulam, shear walls
- Masonry Design Codes: TMS 402-16: ASD & Strength, ACI 530-13/11/08/05/02: ASD & Strength, ACI 530-99: ASD, UBC 1997: ASD & Strength
- Stainless Steel Design Code: AISC 360-10: ASD & LRFD
- Wind loads are generated automatically (ASCE 7-16/10/05/02/98/95, NBC 15/10/05, NTC 2004, & IS 875: 1987) for building-type structures, including partial wind cases
- Seismic loads are generated automatically (ASCE 7-16/10/05/02, CBC 2001, IBC 2000, UBC 1997, NBC 15/10/05, NTC 2004, & IS 1893: 2002) for building-type structures, including accidental torsion

Design Features

- Designs/optimizes concrete, hot rolled & cold formed steel, masonry, wood and aluminum

- Program selected or user-defined rebar layouts for flexure and shear
- Concrete beam detailing (Rectangular, T and L).
- Concrete column interaction diagrams
- Concrete wall design including in-plane, out-of-plane & bearing loads
- Automatic spectra generation for ASCE 7, NBC, IS 1893, NTC
- Extensive user controlled generation of load combinations
- Intelligent unbraced length calculations for physical members
- Tapered wide flange design per AISC Design Guide 25
- Masonry wall design for in-plane and out-of-plane
- Wood Shapes: Complete NDS species/grade and Glulam database
- Complete wood wall design for bearing & shear walls: Segmented, Perforated & Force Transfer Around Openings design methods
- Strap and Hold Down design for Wood Shear Walls
- Seismic design of concrete walls using ACI 318-14 Chapter 18
- Concrete seismic coupling beams for multi-story walls with diaphragms

Results Features

- Graphic presentation of color-coded results and plotted designs
- Color contours on plates, solid stresses/forces with smoothing and animation
- Spreadsheet results with sorting and filtering of: deflections, forces, stresses, optimized sizes for strength or deflection, code designs, concrete reinforcing, material takeoffs, etc.
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams

Integrated Building Design

RISA-3D, RISAFloor, RISAFoundation and RISAConnection are so tightly integrated that they operate as one program on the same building model. Optimize the gravity system in RISAFloor, the lateral system in RISA-3D, the connection design in RISAConnection and the foundation system in RISAFoundation, with a complete flow of information both ways.

General Features

- Compatible with Windows 7/8.1/10 (64-bit Windows)
- Program technical support provided by Professional Engineers

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-G covering the design of telecommunications structures specifies a limit state design approach. This approach applies the loads from extreme weather loading conditions, and designs the structure so that the design strength exceeds the required strength.

ANSI Standard C2-2012 (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 Eversource.

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 "NU Design Criteria". This specifies uniform loadings (different from the TIA loadings) on the each of the following components of the installed facility:

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

The uniform loadings and factors specified for the above components in the table are based upon the National Electrical Safety Code 2012 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.

Project: 1751 Line, Structure 3147
Date: 5/24/19
Engineer: JS
Purpose: Recalculate wire loads for T-Mobile site.

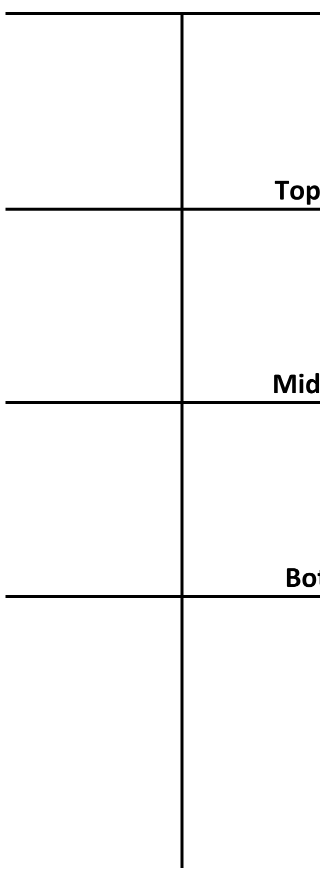
Shield Wires:
7#8 Alumoweld, sagged in PLS-CADD

Conductors:
1272 ACSR, sagged to PLS-CADD

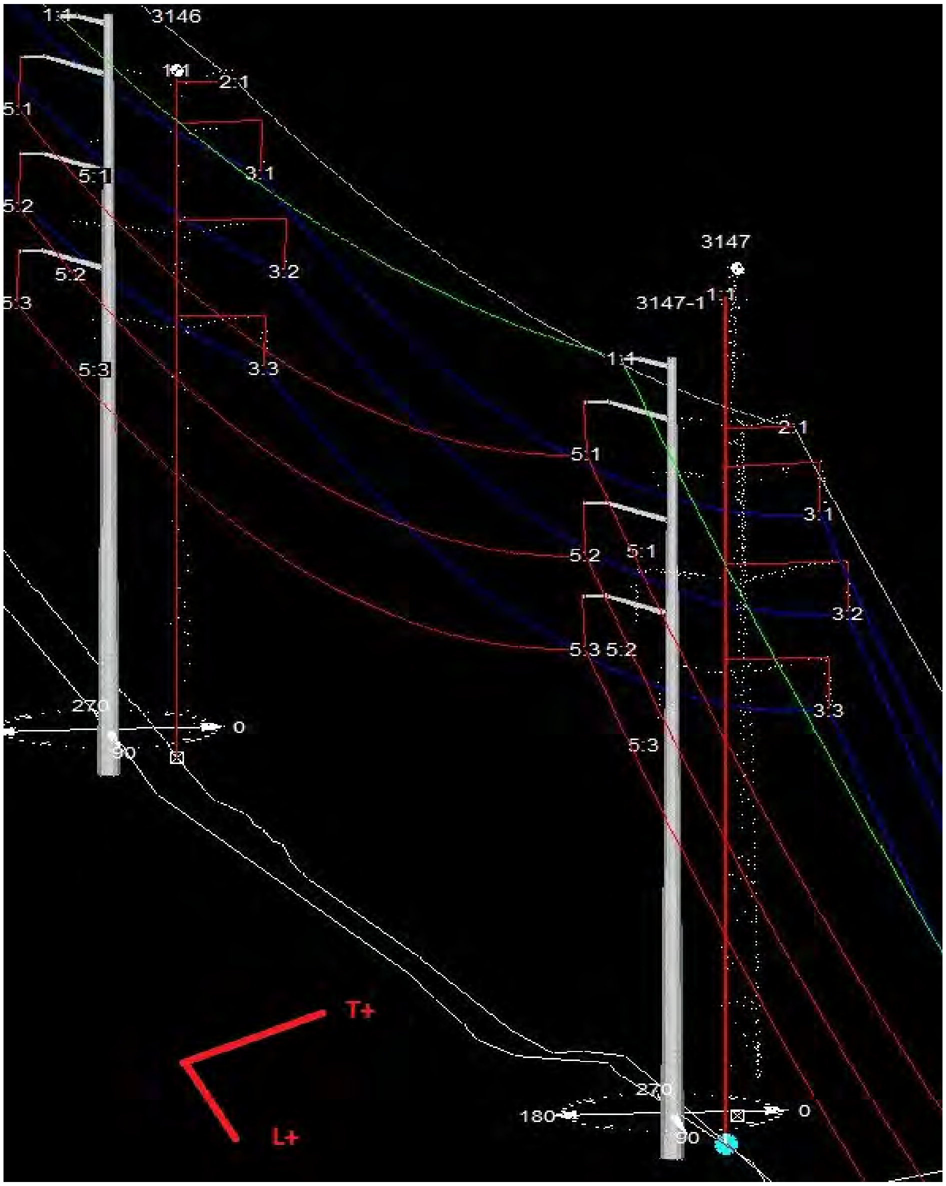
NESC 250B

1751 Line

OPEN



Alwld	**V**	1355
	T	690
	L	0
Top Phase:	**V**	4302
	T	1161
	L	0
Mid Phase:	**V**	4300
	T	1055
	L	0
Bot Phase:	**V**	4295
	T	1135
	L	0



3146
1:1
2:1
5:1
3:1
5:2
3:2
5:3
3:3
3147
3147-1
2:1
3:1
3:2
3:3
270
0
90
180
T+
L+

Project: 1751 Line, Structure 3147
Date: 5/24/19
Engineer: JS
Purpose: Recalculate wire loads for T-Mobile site.

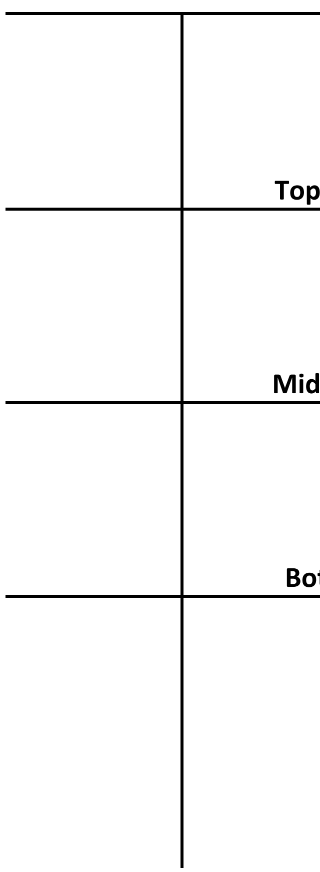
Shield Wires:
7#8 Alumoweld, sagged in PLS-CADD

Conductors:
1272 ACSR, sagged to PLS-CADD

NESC 250C

1751 Line

OPEN



Alwld	**V**	610
	T	500
	L	0
Top Phase:	**V**	2238
	T	1752
	L	50
Mid Phase:	**V**	2235
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	L	50
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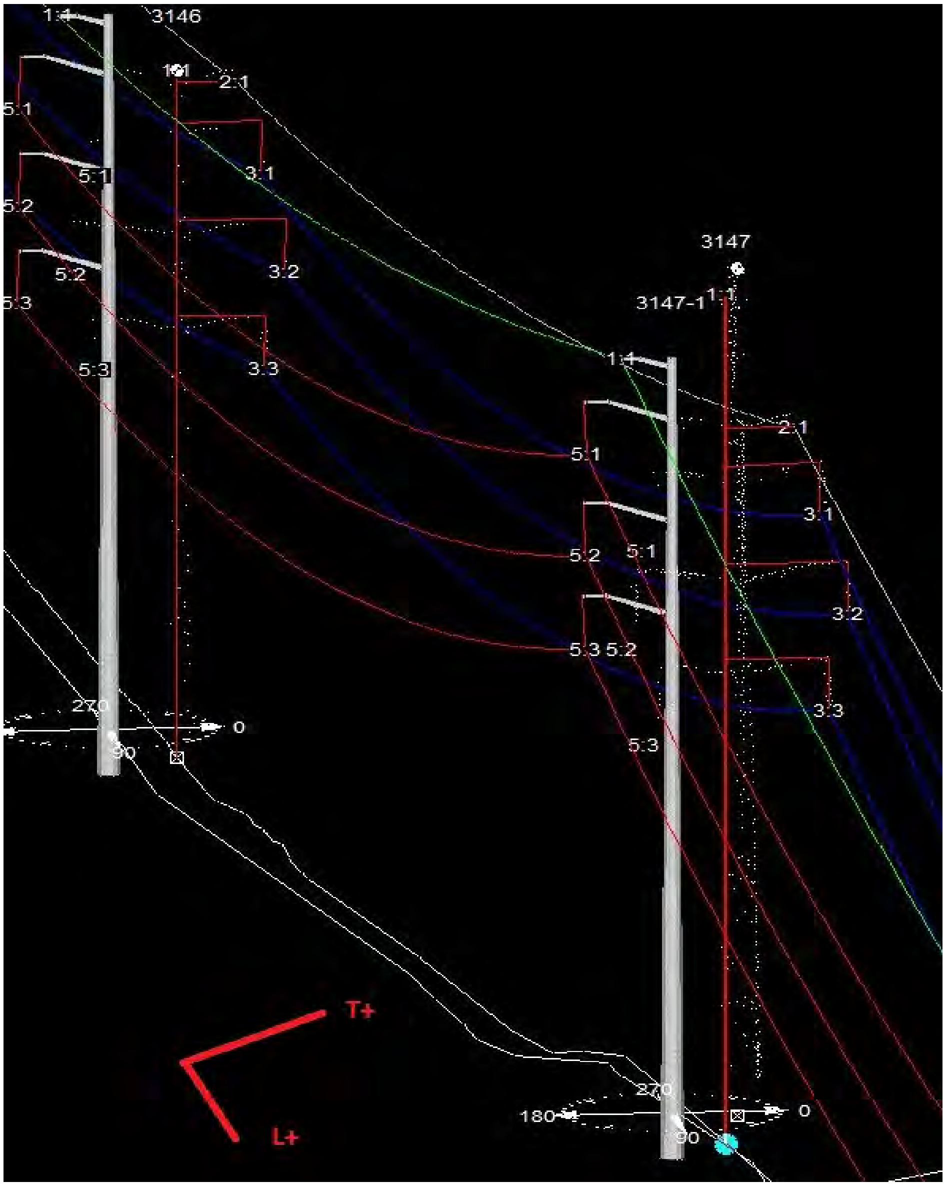
	T	1640
	L	50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2:1
5:1
3:1
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3147
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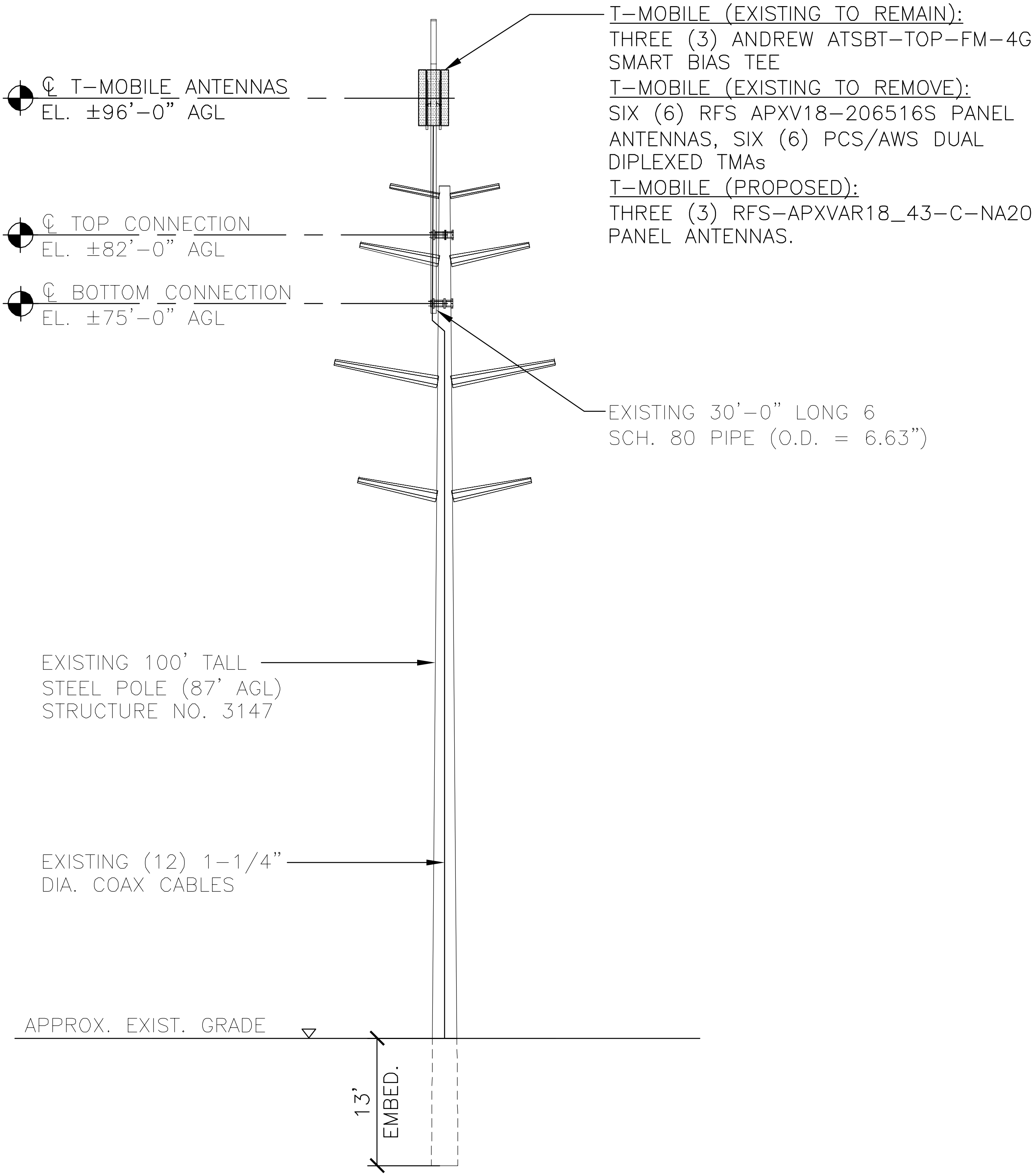
3:3
180
T+
L+



1 / EL-1

TOWER & MAST ELEVATION

SCALE: NOT TO SCALE

REVISIONS		
00	10/03/19	ISSUED FOR REVIEW

CENTEK engineering
Centered on Solutions℠
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CT11385A
EVERSOURCE 3147
142 DUNCASTER ROAD
BLOOMFIELD, CT 06002

PROJECT NO:	19066.04
DRAWN BY:	FJP
CHECKED BY:	TJL
SCALE:	AS NOTED
DATE:	10/3/19

TOWER ELEVATION

EL-1

DWG. 1 OF 1

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

Wind Speeds

Basic Wind Speed =	$V := 97$	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 =	$h := 87$	ft	(User Input)
Height to Center of Antennas =	$z_{T-Mo} := 96$	ft	(User Input)
Height to Center of Mast =	$z_{Mast1} := 89$	ft	(User Input)
Radial Ice Thickness =	$t_i := 1.0$	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 =

$K_d :=$ if Structure_Type = Pole: 0.95; if Structure_Type = Lattice: 0.85 $= 0.95$

(Per Table 2-2 of TIA-222-G)

Importance Factors =

$I_{Wind} :=$ if SC = 1: 0.87; if SC = 2: 1.00; if SC = 3: 1.15 $= 1.15$

(Per Table 2-3 of TIA-222-G)

$I_{Wind\_w\_Ice} :=$ if SC = 1: 0; if SC = 2: 1.00; if SC = 3: 1.00 $= 1$

$I_{ice} :=$ if $SC = 1$: 0; if $SC = 2$: 1.00; if $SC = 3$: 1.25 $= 1.25$ (Per Section 2.8.3 of TIA-222-G)

Wind Direction Probability Factor (Service) = $K_{dSer} :=$ if Structure_Type = Pole: 0.95; if Structure_Type = Lattice: 0.85 $= 0.95$ (Per Section 2.8.3 of TIA-222-G)

Importance Factor (Service) = $I_{Ser} := 1$

$K_{iz} := \left(\frac{z_{T-Mo}}{33}\right)^{0.1} = 1.113$ $t_{izT-Mo} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.782$

Velocity Pressure Coefficient Antennas = $Kz_{T-Mo} := 2.01 \cdot \left(\left(\frac{z_{T-Mo}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.255$

Velocity Pressure w/o Ice Antennas = $qz_{T-Mo} := 0.00256 \cdot K_d \cdot Kz_{T-Mo} \cdot V^2 \cdot I_{Wind} = 33.02$

Velocity Pressure with Ice Antennas = $qz_{ice.T-Mo} := 0.00256 \cdot K_d \cdot Kz_{T-Mo} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 7.629$

Velocity Pressure Service = $qz_{T-Mo.Ser} := 0.00256 \cdot K_{dSer} \cdot Kz_{T-Mo} \cdot V_{Ser}^2 \cdot I_{Ser} = 10.986$

$K_{izMast1} := \left(\frac{z_{Mast1}}{33}\right)^{0.1} = 1.104$ $t_{izMast1} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{izMast1} \cdot K_{zt}^{0.35} = 2.761$

Velocity Pressure Coefficient Mast = $Kz_{Mast1} := 2.01 \cdot \left(\left(\frac{z_{Mast1}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.235$

Velocity Pressure w/o Ice Mast = $qz_{Mast1} := 0.00256 \cdot K_d \cdot Kz_{Mast1} \cdot V^2 \cdot I_{Wind} = 32.498$

Velocity Pressure with Ice Mast = $qz_{ice.Mast1} := 0.00256 \cdot K_d \cdot Kz_{Mast1} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 7.508$

Velocity Pressure Service = $qz_{Mast1.Ser} := 0.00256 \cdot K_{dSer} \cdot Kz_{Mast1} \cdot V_{Ser}^2 \cdot I_{Ser} = 10.812$

Development of Wind & Ice Load on Mast

Mast Data:	(Pipe 6" SCH. 80)		(User Input)
Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 6.63$	in	(User Input)
Mast Length =	$L_{mast} := 30$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.432$	in	(User Input)
Mast Aspect Ratio =	$Ar_{mast} := \frac{12 \cdot L_{mast}}{D_{mast}} = 54.3$		
Mast Force Coefficient =	$Ca_{mast} = 1.2$		

Wind Load (without ice)

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 0.553$	sf/ft	
Total Mast Wind Force =	$qz_{Mast1} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 29$	plf	**BLC 5**

Wind Load (with ice)

Mast Projected Surface Area w/ Ice =	$AICE_{mast} := \frac{(D_{mast} + 2 \cdot t_{izMast1})}{12} = 1.013$	sf/ft	
Total Mast Wind Force w/ Ice =	$qz_{ice.Mast1} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 12$	plf	**BLC 4**

Wind Load (Service)

Total Mast Wind Force Service Loads =	$qz_{Mast1.Ser} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 10$	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 =	$Ai_{mast} := \frac{\pi}{4} \cdot \left((D_{mast} + t_{izMast1} \cdot 2)^2 - D_{mast}^2 \right) = 81.4$	sq in	
Weight of Ice on Mast =	$W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 32$	plf	**BLC 3**

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Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVAR18_43-C-NA20		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 68$	in	(User Input)
Antenna Width =	$W_{ant} := 16$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9$	in	(User Input)
Antenna Weight =	$WT_{ant} := 56$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.3$		
Antenna Force Coefficient =	$Ca_{ant} = 1.28$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 7.6$	sf	
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 22.7$	sf	
Total Antenna Wind Force =	$F_{ant} := qz_{T-Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 1291$	lbs	**BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{izT-Mo}) \cdot (W_{ant} + 2 \cdot t_{izT-Mo})}{144} = 11$	sf	
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 33$	sf	
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.T-Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 435$	lbs	**BLC 4**

Wind Load (Service)

Total Antenna Wind Force Service Loads =	$F_{ant.Ser} := qz_{T-Mo.Ser} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 430$	lbs	**BLC 6**

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 168$	lbs	**BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 9792$	cu in	
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{izT-Mo}) \cdot (W_{ant} + 2 \cdot t_{izT-Mo}) \cdot (T_{ant} + 2 \cdot t_{izT-Mo}) - V_{ant} = 1 \cdot 10^4$	cu in	
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 431$	lbs	
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 1294$	lbs	**BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

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

Antenna Shape = Flat (User Input)

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

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

Antenna Thickness = $T_{ant} := 2$ in (User Input)

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

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

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

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

Wind Load (without ice)

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

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

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

Wind Load (with ice)

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{izT-Mo}) \cdot (W_{ant} + 2 \cdot t_{izT-Mo})}{144} = 0.7$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 2.2$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qz_{ice.T-Mo} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 27$ lbs **BLC 4**

Wind Load (Service)

Total Antenna Wind Force Service Loads = $F_{ant.Ser} := qz_{T-Mo.Ser} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 8$ lbs **BLC 6**

Gravity Load (without ice)

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

Gravity Loads (ice only)

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

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{izT-Mo}) \cdot (W_{ant} + 2 \cdot t_{izT-Mo}) \cdot (T_{ant} + 2 \cdot t_{izT-Mo}) - V_{ant} = 743$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 24$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 72$ lbs **BLC 3**

Development of Wind & Ice Load on Mounts

Mount Data:

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

MountShape = Round (User Input)

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

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

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

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

Tri Sector and Bracket Mount Weight = $WT_{sa.mnt} := 300$ lbs (User Input)

Wind Load (without ice)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area = $A_{mnt} := 0$ sf

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

Wind Load (with ice)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area w/ Ice = $AICE_{mnt} := 0$ sf

Total Mount Wind Force w/ Ice = $Fi_{mnt} := qz_{ice.T-Mo} \cdot G_H \cdot K_a \cdot Ca_{mnt} \cdot AICE_{mnt} = 0$ lbs **BLC 4**

Wind Load (Service)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area = $A_{mnt} := 0$

Total Mount Wind Force Service Loads = $F_{mnt.Ser} := qz_{T-Mo.Ser} \cdot G_H \cdot K_a \cdot Ca_{mnt} \cdot A_{mnt} = 0$ lbs **BLC 6**

Gravity Load (without ice)

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

Weight of all Mounts= $WT_{mnt} \cdot N_{mnt} + WT_{sa.mnt} = 355$ lbs **BLC 2**

Gravity Loads (ice only)

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

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

Weight of Ice on Each Antenna = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 97$ lbs

Weight of Ice on All Antennas = $W_{ICEmnt} \cdot N_{mnt} + 5 = 295$ lbs **BLC 3**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type =	HELIAX 1-1/4"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.55$	in	(User Input)
Coax Cable Length =	$L_{coax} := 20$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 0.66$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 12$		(User Input)
No. of Coax Projecting Outside Face of PCS Mast =	$NP_{coax} := 2$		(User Input)

Coax aspect ratio = $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 154.8$

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

Wind Load (without ice)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} \cdot D_{coax})}{12} = 0.3$ sf/ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{Mast1} \cdot G_H \cdot A_{coax} = 14$ plf **BLC 5**

Wind Load (with ice)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot t_{izMast1})}{12} = 0.7$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qz_{ice.Mast1} \cdot G_H \cdot AICE_{coax} = 9$ plf **BLC 4**

Wind Load (Service)

Total Coax Wind Force Service Loads = $F_{coax} := Ca_{coax} \cdot qz_{Mast1.Ser} \cdot G_H \cdot A_{coax} = 5$ plf **BLC 6**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 8$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4} \cdot \left((D_{coax} + 2 \cdot t_{izT-Mo})^2 - D_{coax}^{\ 2} \right) = 37.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 177$ 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

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Existing Mast	30			Lbyy						Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	PIPE_6.0X	Column	Pipe	A53 Gr. B	Typical	7.83	38.3	38.3	76.6

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	BOTMAST	TOPMAST			Existing Mast	Column	Pipe	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	BOTMAST	0	0	0	0	
2	BOTCONNEC...	0	1	0	0	
3	TOPCONNEC...	0	8	0	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
4	TOPMAST	0	30	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	Reaction		Reaction	

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.168	22
2	M1	Y	-.355	22
3	M1	Y	-.006	22

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-1.294	22
2	M1	Y	-.295	22
3	M1	Y	-.072	22

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.435	22
2	M1	X	.027	22

Member Point Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	1.291	22
2	M1	X	.023	22

Member Point Loads (BLC 6 : Service Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.43	22
2	M1	X	.008	22

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	19

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.032	-.032	0	0
2	M1	Y	-.177	-.177	0	19

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.012	.012	0	19
2	M1	X	.012	.012	25	0
3	M1	X	.009	.009	0	19

Member Distributed Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.029	.029	0	19
2	M1	X	.029	.029	25	0
3	M1	X	.014	.014	0	19

Member Distributed Loads (BLC 6 : Service Wind)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.01	.01	0	19
2	M1	X	.01	.01	25	0
3	M1	X	.005	.005	0	19

Basic Load Cases

	BLC Description	Category	X Grav...	Y Grav...	Z Gra...	Joint	Point	Distrib...	Area(M...	Surface(Plate/Wall)
1	Self Weight	None		-1						
2	Weight of Appurtenances	None					3	1		
3	Weight of Ice Only	None					3	2		
4	TIA Wind with Ice	None					2	3		
5	TIA Wind	None					2	3		
6	Service Wind	None					2	3		

Load Combinations

	Description	Solve	PD...	SR...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.2D + 1.6W	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9D + 1.6W	Yes	Y		1	.9	2	.9	5	1.6														
3	1.2D +1.0Di + 1.0Wi	Yes	Y		1	1.2	2	1.2	3	1	4	1												
4	1.0D+1.0 W Service	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	BOTCON...	max	5.243	1	1.128	3	0	4	0	4	0	4	0	4
2		min	1.096	4	.14	2	0	1	0	1	0	1	0	1
3	TOPCON...	max	-1.869	4	6.633	3	0	4	0	4	0	4	0	4
4		min	-8.884	1	1.192	2	0	1	0	1	0	1	0	1
5	Totals:	max	-.773	4	7.76	3	0	4						
6		min	-3.642	1	1.332	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
1	BOTMAST	max	.085	1	0	2	0	4	0	4	0	4	7.091e-03	1
2		min	.018	4	0	3	0	1	0	1	0	1	1.485e-03	4
3	BOTCONNECT...	max	0	4	0	4	0	4	0	4	0	4	7.089e-03	1
4		min	0	1	0	1	0	1	0	1	0	1	1.484e-03	4
5	TOPCONNECT...	max	0	4	0	4	0	4	0	4	0	4	-3.074e-03	4
6		min	0	1	0	1	0	1	0	1	0	1	-1.468e-02	1
7	TOPMAST	max	12.977	1	0	2	0	4	0	4	0	4	-1.236e-02	4
8		min	2.715	4	-.004	3	0	1	0	1	0	1	-5.912e-02	1

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

	Me...	Shape	Code ...	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt ...	phi*Mn y-...	phi*M...	Cb	Eqn
1	M1	PIPE_6.0X	.951	8.125	1	.078	7.813		1	66.763	246.645	40.95	40.95	1.6...	H1-1b

Joint Reactions (By Combination)

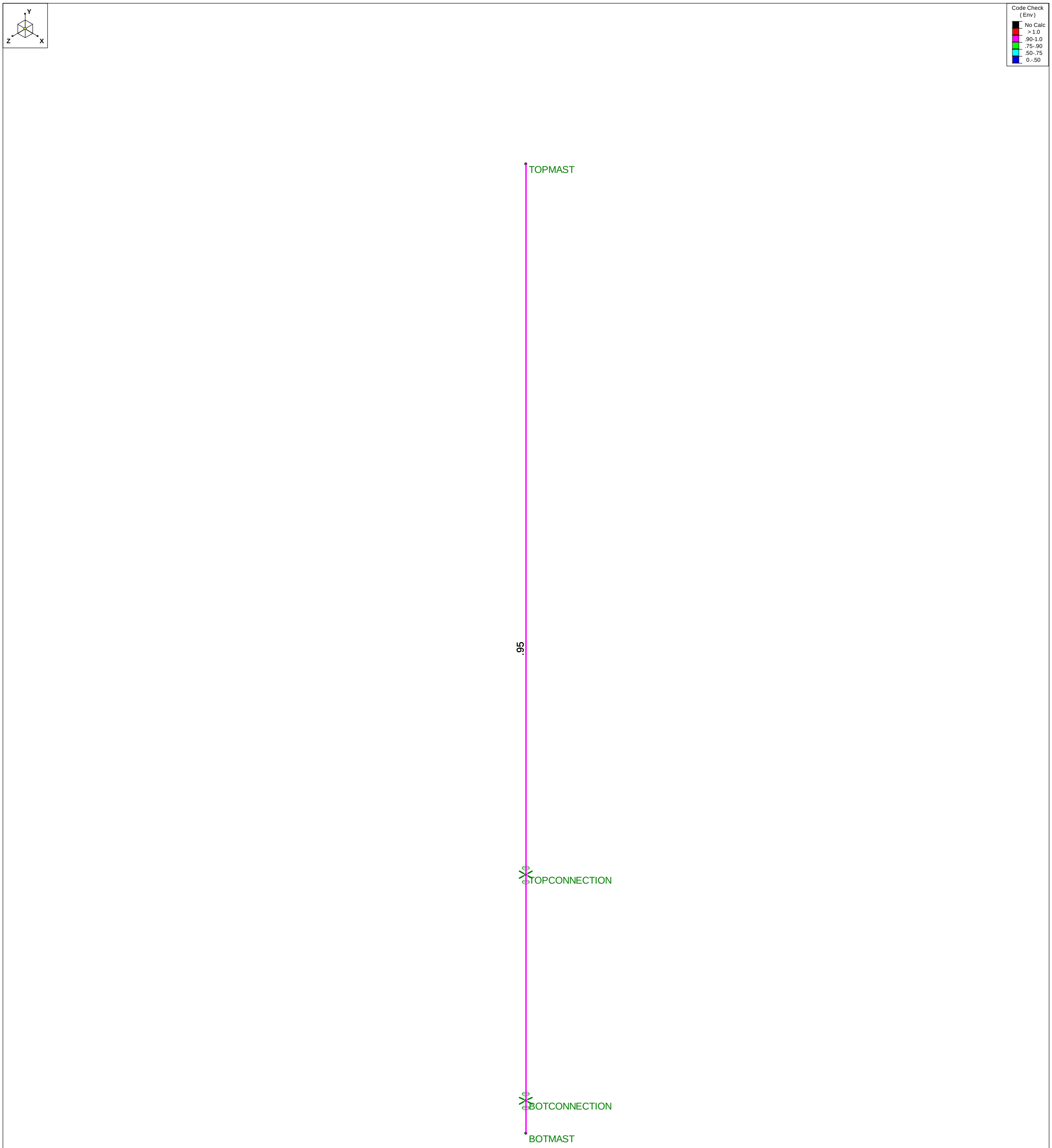
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	5.243	.187	0	0	0	0
2	1	TOPCONNECTION	-8.884	1.589	0	0	0	0
3	1	Totals:	-3.642	1.776	0			
4	1	COG (ft):	X: 0	Y: 16.937	Z: 0			

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	5.214	.14	0	0	0	0
2	2	TOPCONNECTION	-8.856	1.192	0	0	0	0
3	2	Totals:	-3.642	1.332	0			
4	2	COG (ft):	X: 0	Y: 16.937	Z: 0			

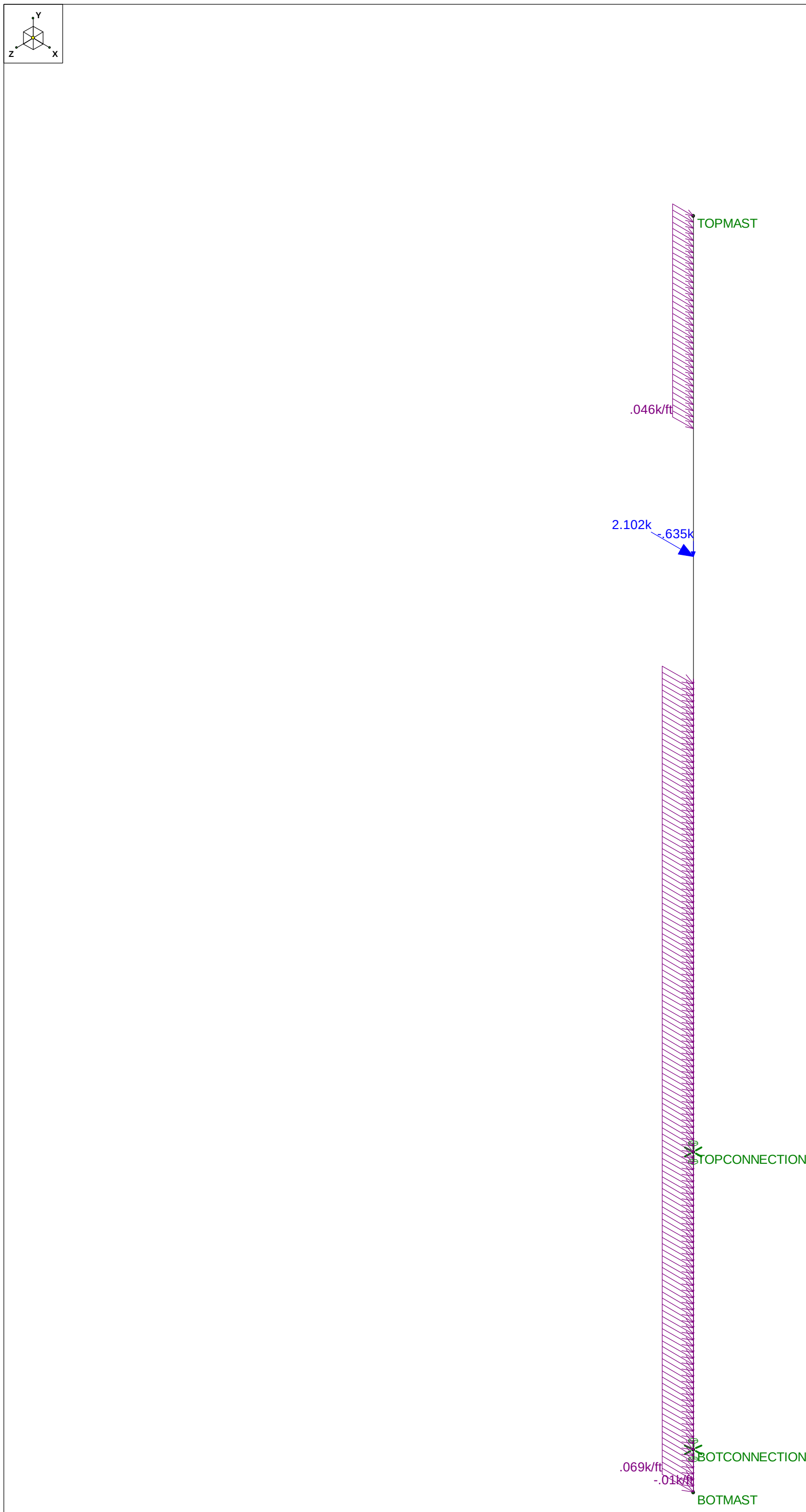
Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTCONNECTION	1.288	1.128	0	0	0	0
2	3	TOPCONNECTION	-2.209	6.633	0	0	0	0
3	3	Totals:	-.921	7.76	0			
4	3	COG (ft):	X: 0	Y: 14.558	Z: 0			



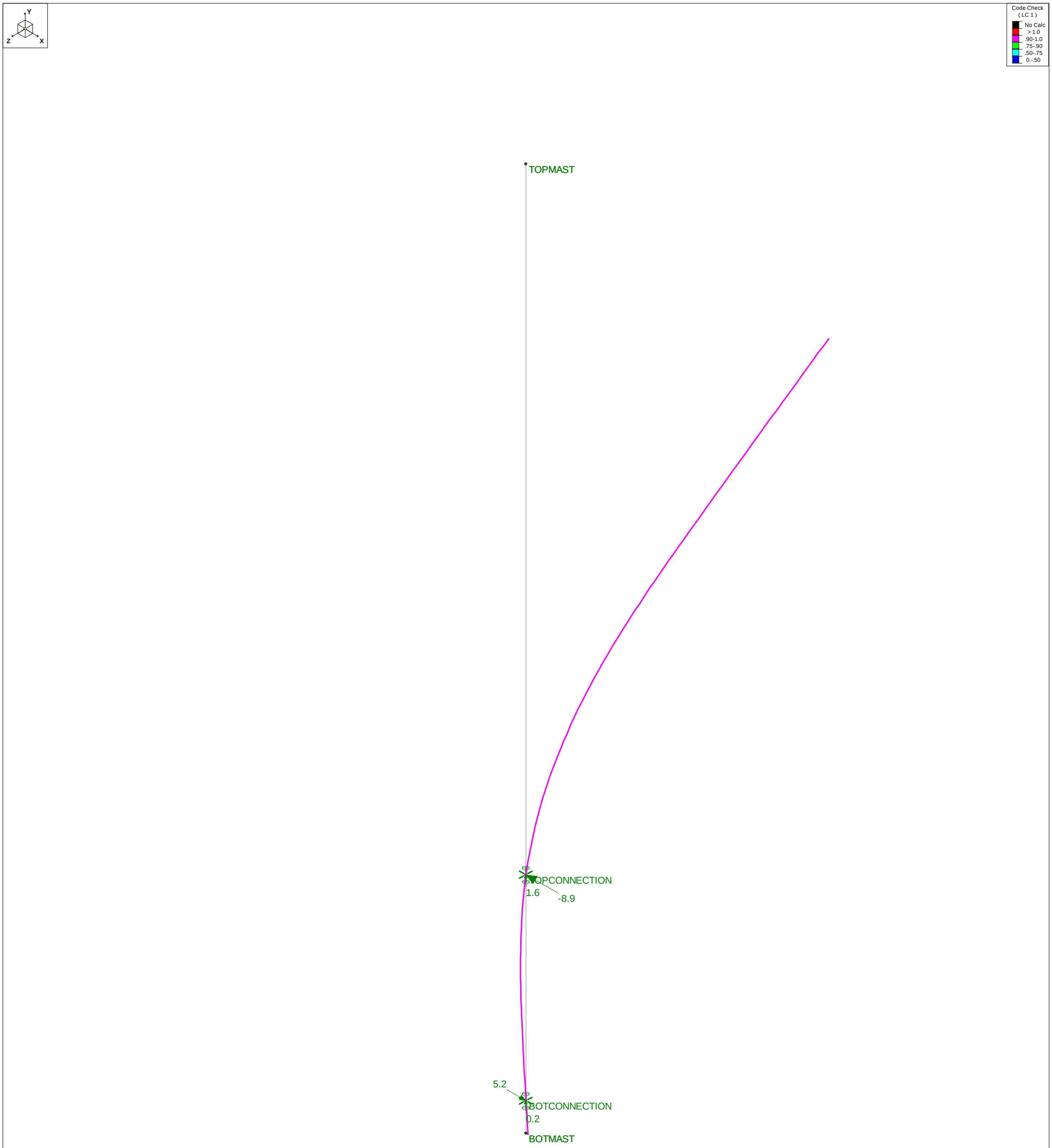
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

CENTEK Engineering, INC.	Strcuture #3147 - Mast	
FJP		Oct 1, 2019 at 12:34 PM
19066.04 /T-Mobile CT113...	Member Unity Check	TIA.r3d



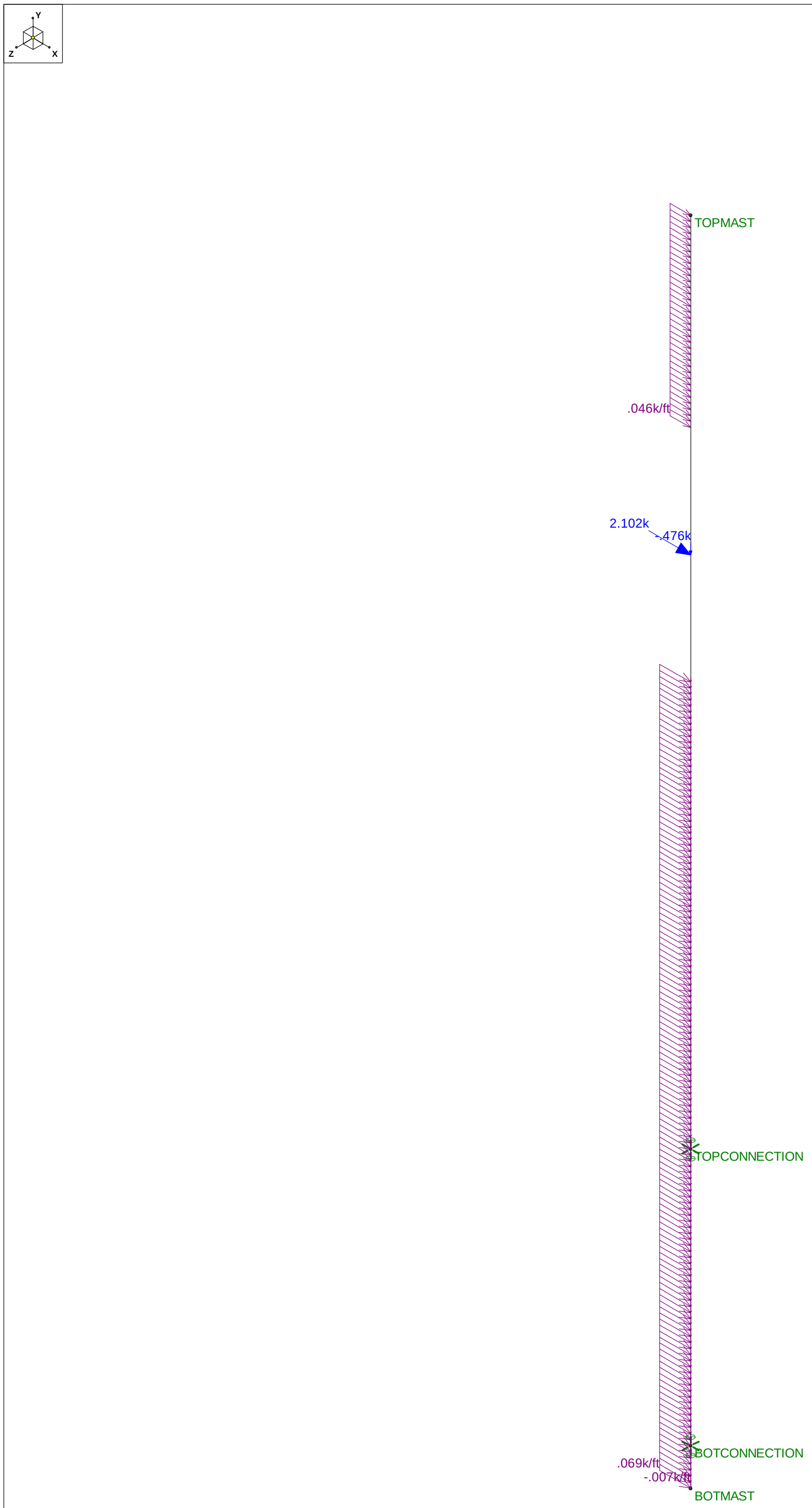
Loads: LC 1, 1.2D + 1.6W
Envelope Only Solution

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:36 PM
19066.04 /T-Mobile CT113...	LC #1 Loads	TIA.r3d



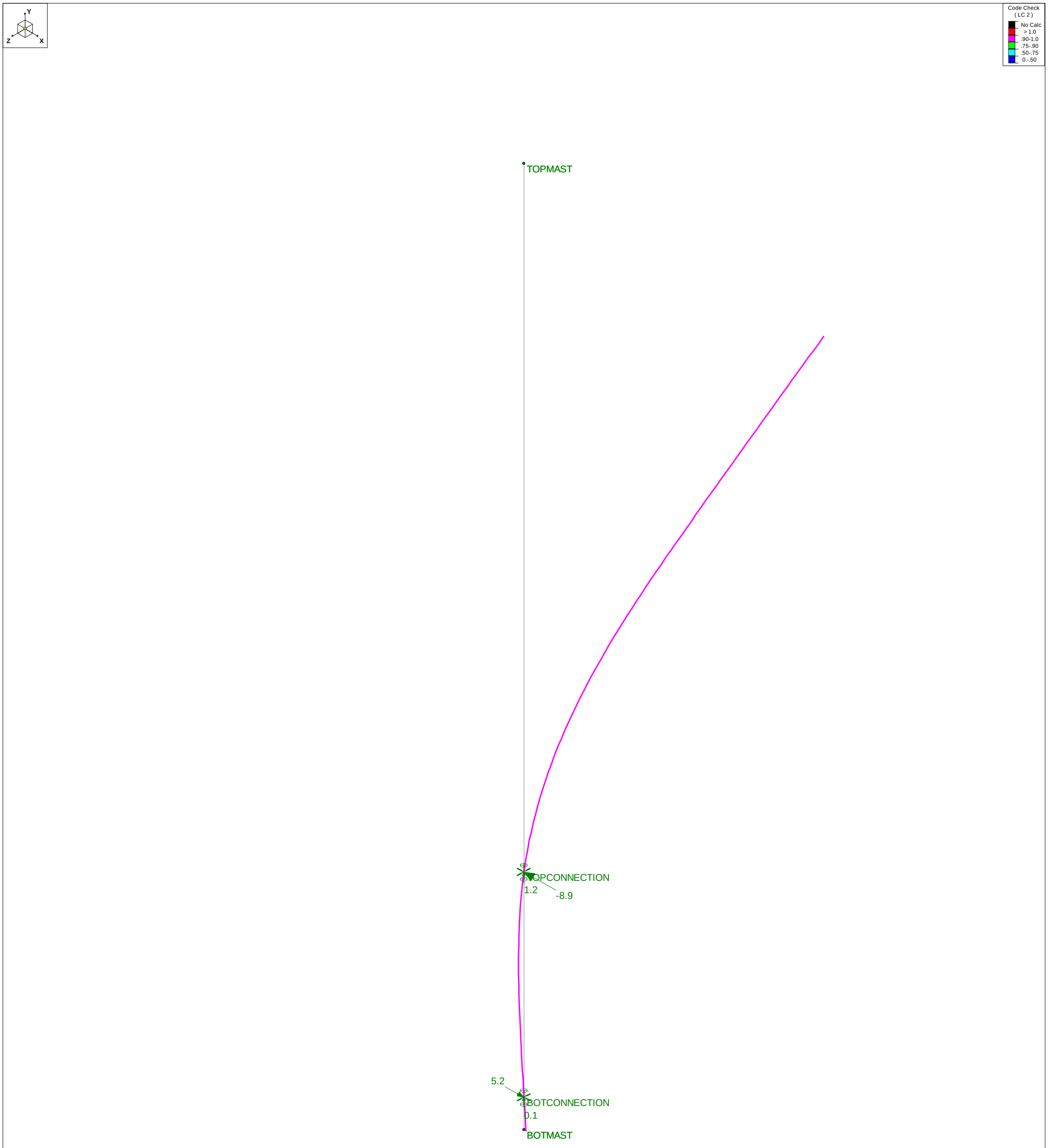
Member Code Checks Displayed
Results for LC 1, 1.2D + 1.6W
Reaction and Moment Units are k and k-ft

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:41 PM
19066.04 /T-Mobile CT113...	LC #1 Reactions	TIA.r3d



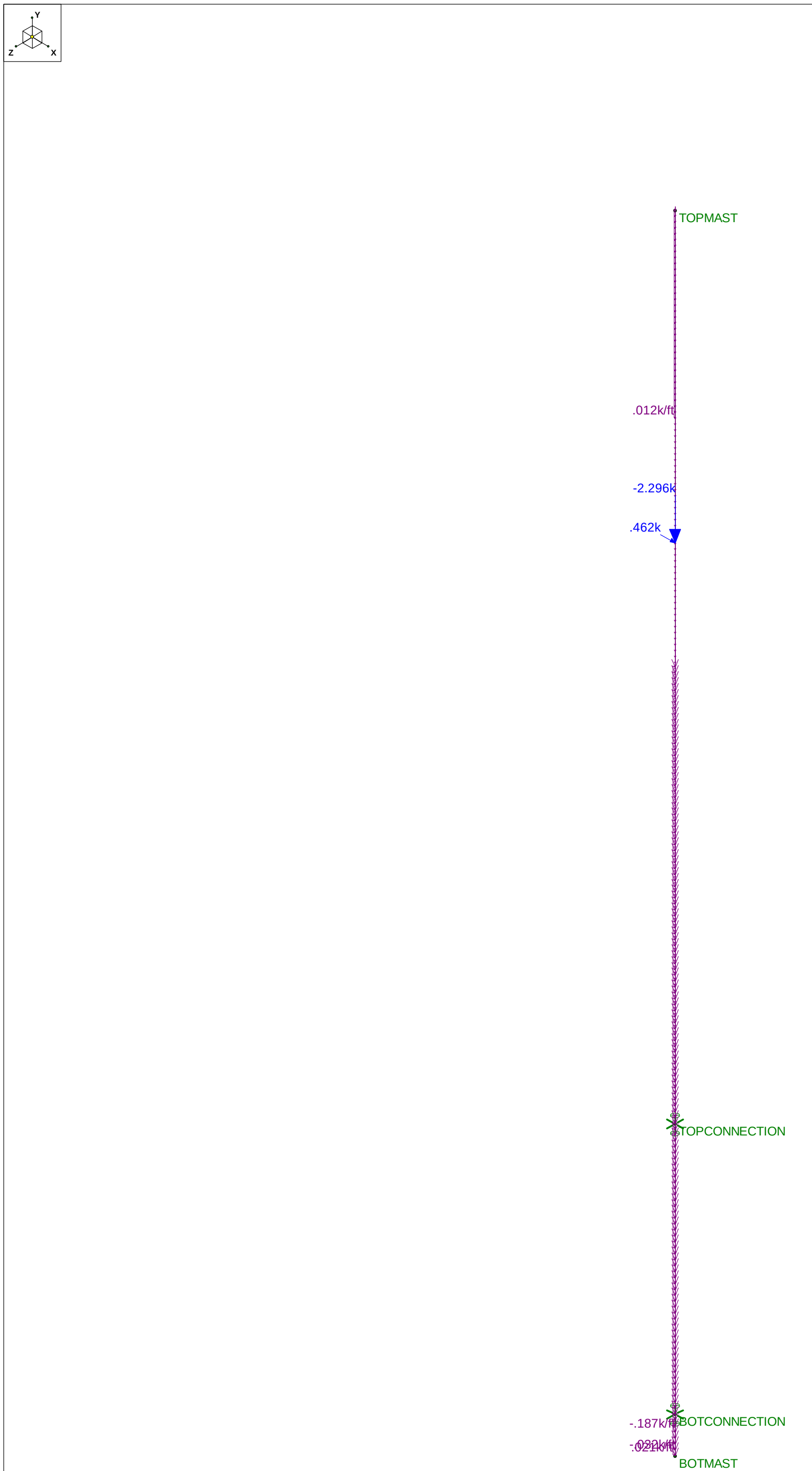
Loads: LC 2, 0.9D + 1.6W

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:37 PM
19066.04 /T-Mobile CT113...	LC #2 Loads	TIA.r3d



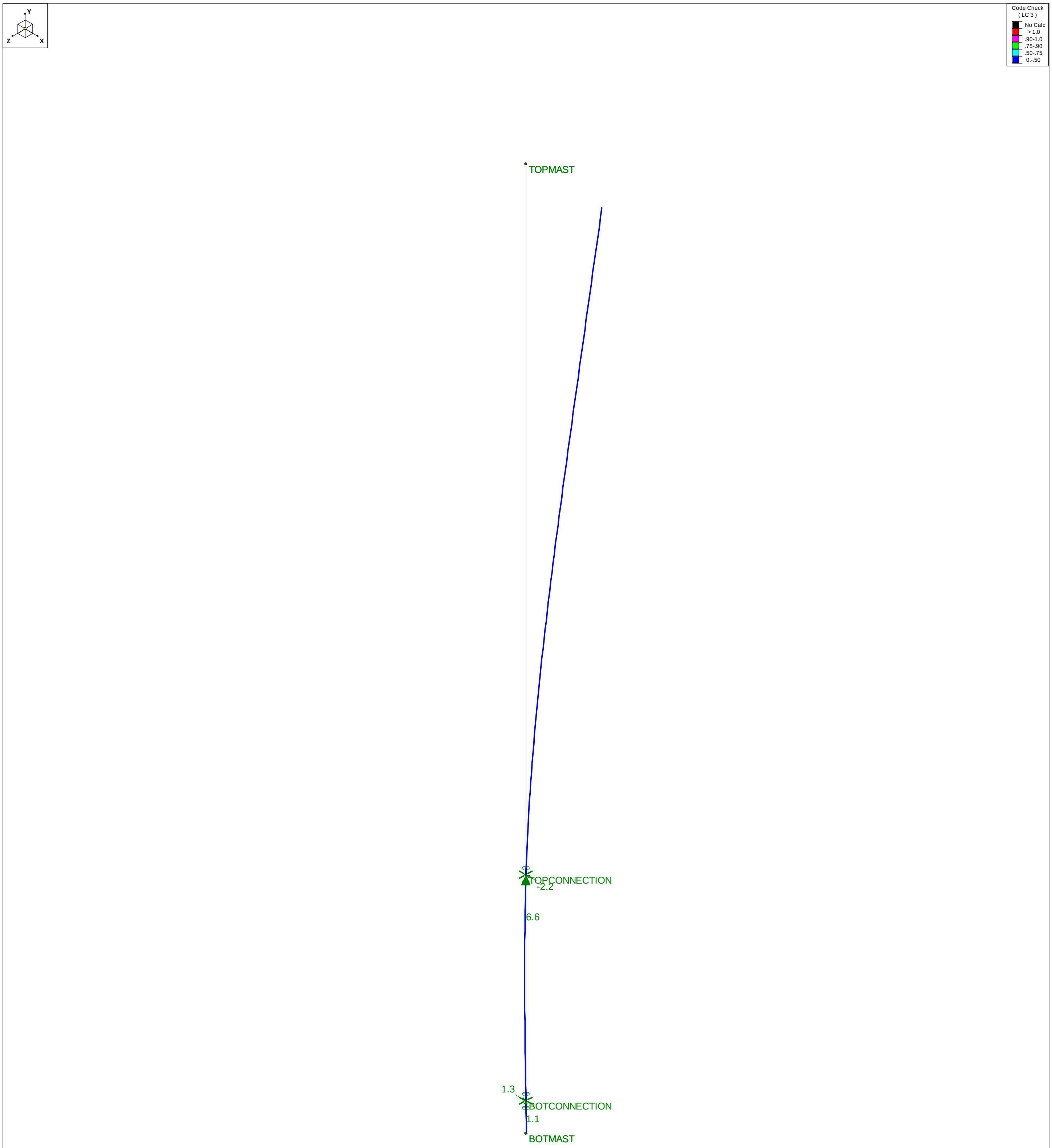
Member Code Checks Displayed
Results for LC 2, 0.9D + 1.6W
Reaction and Moment Units are k and k-ft

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:40 PM
19066.04 /T-Mobile CT113...	LC #2 Reactions	TIA.r3d



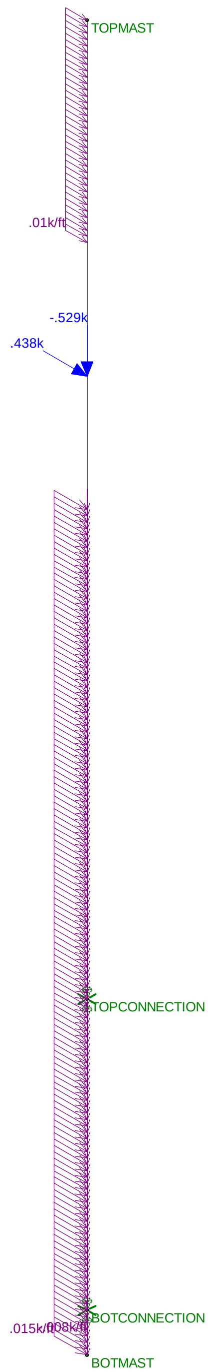
Loads: LC 3, 1.2D +1.0Di + 1.0Wi

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:37 PM
19066.04 /T-Mobile CT113...	LC #3 Loads	TIA.r3d



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

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:39 PM
19066.04 /T-Mobile CT113...	LC #3 Reactions	TIA.r3d



Loads: LC 4, 1.0D+1.0 W Service

CENTEK Engineering, INC.		
FJP	Strcuture #3147 - Mast	Oct 1, 2019 at 12:38 PM
19066.04 /T-Mobile CT113...	LC #4 Loads	TIA.r3d

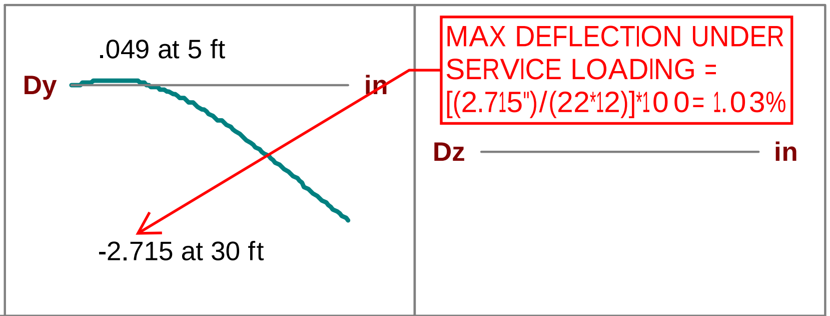
Column: ***M1***

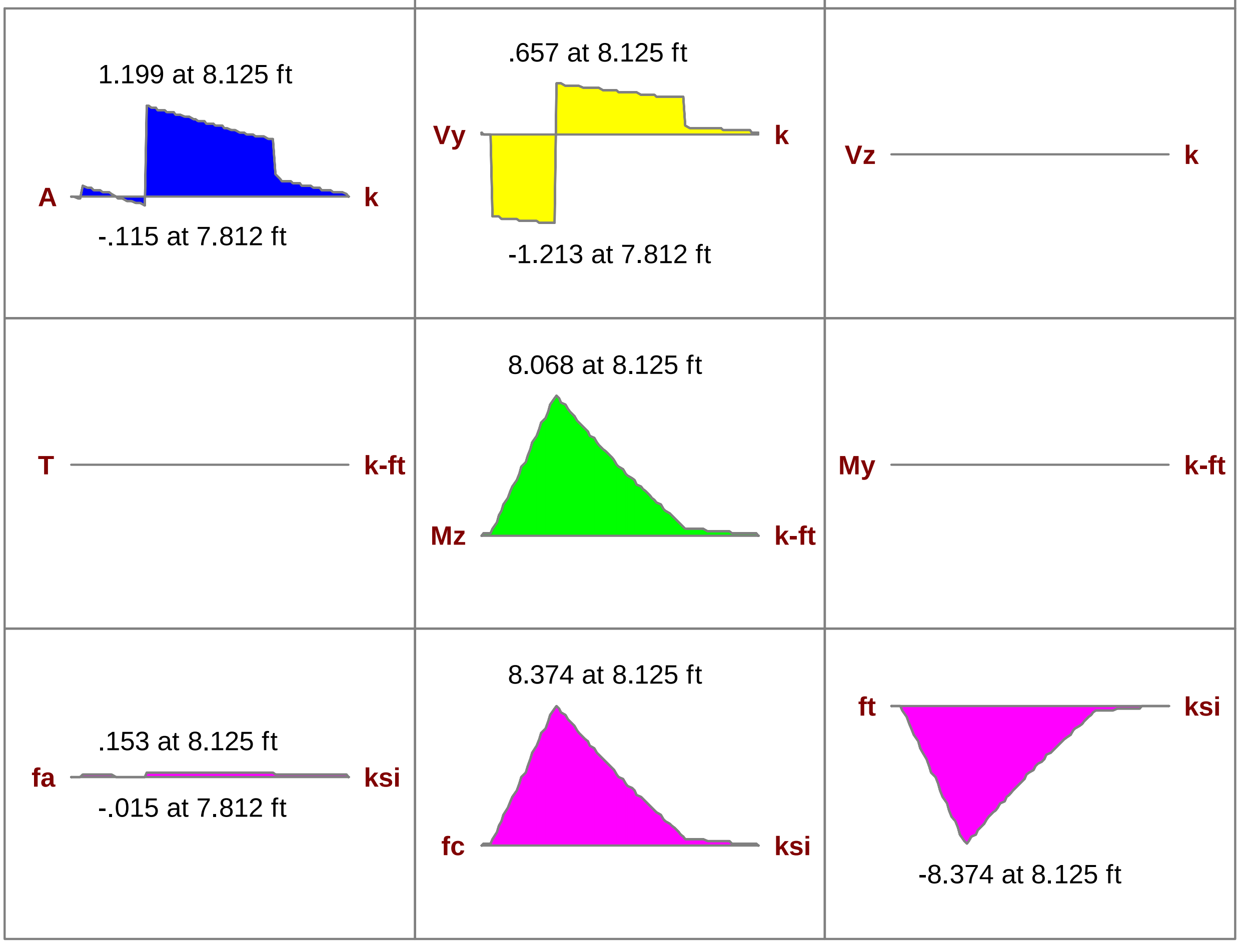
Shape:	**PIPE_6.0X**
Material:	**A53 Gr. B**
Length:	**30 ft**
I Joint:	**BOTMAST**
J Joint:	**TOPMAST**

LC 4: 1.0D+1.0 W Service

Code Check: **0.206 (bending)**

Report Based On 97 Sections





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

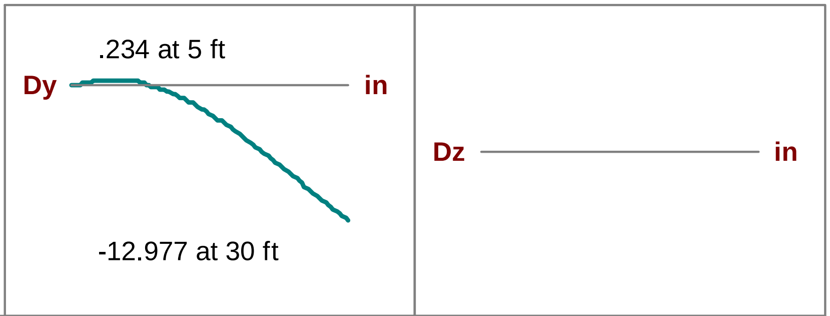
Direct Analysis Method

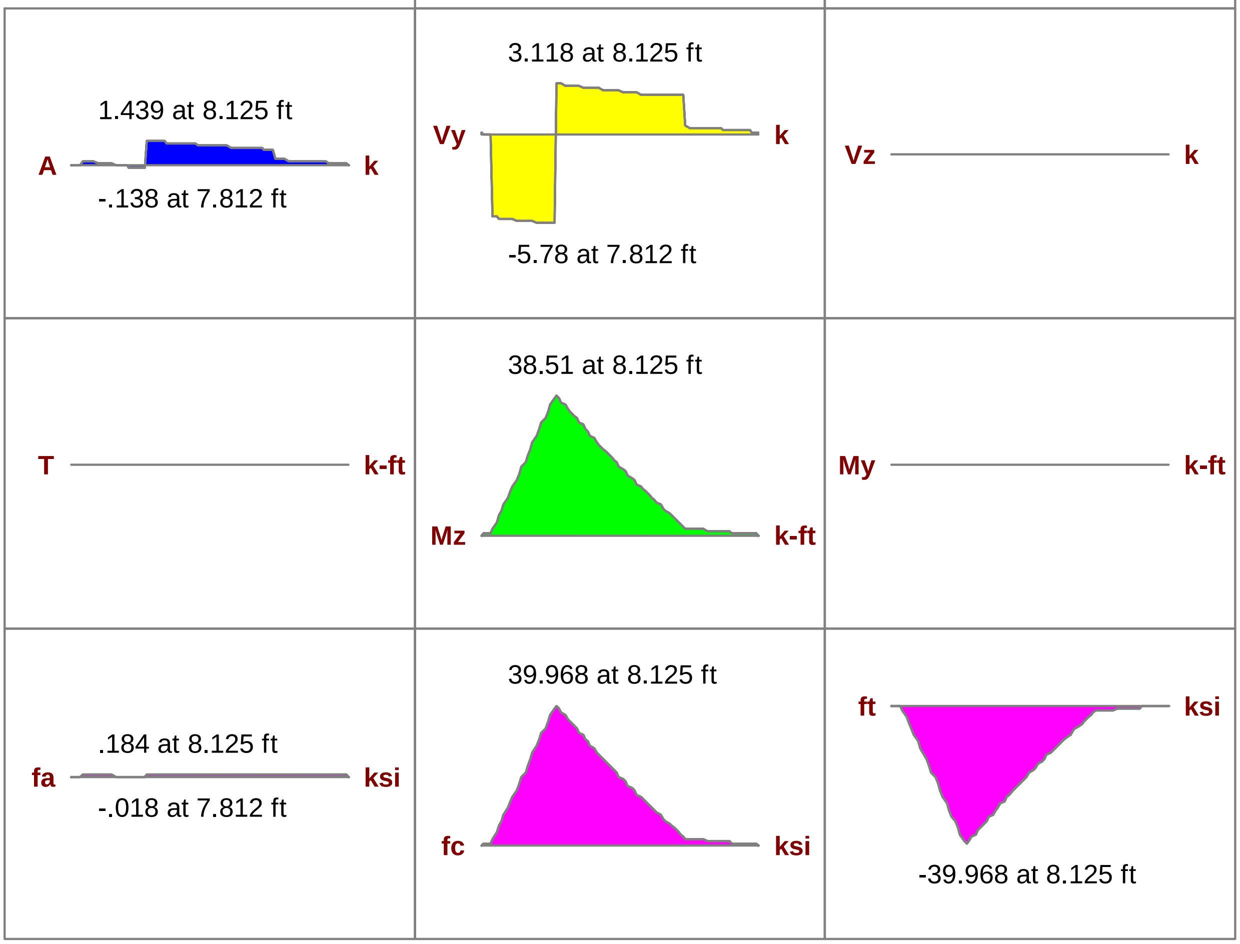
Max Bending Check	**0.206**	Max Shear Check	**0.016 (s)**
Location	**8.125 ft**	Location	**7.813 ft**
Equation	**H1-1b**	Max Defl Ratio	**L/133**
Bending	**Compact**	Compression	**Non-Slender**

			y-y	z-z
Fy	**35 ksi**	Lb	**30 ft**	**30 ft**
phi*Pnc	**66.763 k**	KL/r	**162.774**	**162.774**
phi*Pnt	**246.645 k**			
phi*Mny	**40.95 k-ft**	L Comp Flange	**30 ft**	
phi*Mnz	**40.95 k-ft**	L-torque	**30 ft**	
phi*Vny	**73.994 k**	Tau_b	**1**	
phi*Vnz	**73.994 k**			
phi*Tn	**38.598 k-ft**			
Cb	**1.7**			

Column: ***M1***

Shape: **PIPE_6.0X**
Material: **A53 Gr. B**
Length: **30 ft**
I Joint: **BOTMAST**
J Joint: **TOPMAST**
LC 1: 1.2D + 1.6W
Code Check: **0.951 (bending)**
Report Based On 97 Sections





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

Max Bending Check	**0.951**	Max Shear Check	**0.078 (s)**
Location	**8.125 ft**	Location	**7.813 ft**
Equation	**H1-1b**	Max Defl Ratio	**L/28**

Bending	**Compact**	Compression	**Non-Slender**

			y-y	z-z
Fy	**35 ksi**	Lb	**30 ft**	**30 ft**
phi*Pnc	**66.763 k**	KL/r	**162.774**	**162.774**
phi*Pnt	**246.645 k**			
phi*Mny	**40.95 k-ft**	L Comp Flange	**30 ft**	
phi*Mnz	**40.95 k-ft**	L-torque	**30 ft**	
phi*Vny	**73.994 k**	Tau_b	**1**	
phi*Vnz	**73.994 k**			
phi*Tn	**38.598 k-ft**			
Cb	**1.699**			

Mast Top Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 1.589 \cdot kips$	(User Input)
Horizontal =	$Horz := 8.884 \cdot kips$	(User Input)
Moment =	$Moment := 0$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 6$	(User Input)
Bolt Diameter =	$d_b := 0.75 \cdot in$	(User Input)
Nomianl Tensile Strength =	$F_{nt} := 90 \cdot ksi$	(User Input)
Nomianl Shear Strength =	$F_{nv} := 54 \cdot ksi$	(User Input)
Resistance Factor =	$\phi := 0.75$	(User Input)
Bolt Eccentricity from C.L. Mast =	$e := 14.25 \cdot in$	(User Input)
Vetical Spacing Between Top and Bottom Bolts =	$S_{vert} := 9 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 17.5 \cdot in$	(User Input)

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

Check Bolt Stresses:

Wind Acting Parallel to Stiffiner Plate:

$$f_v := \frac{Vert}{n_b \cdot a_b} = 0.599\ ksi$$

Shear Stress per Bolt =

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

$$Condition1 = \text{"OK"}$$

$$\frac{f_v}{(\phi \cdot F_{nv})} = 1.5\%$$

Tensile Stress Adjusted for Shear =

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

Tension Force Each Bolt =

$$F_{tension.bolt} := \frac{Horz}{n_b} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 2.739\ kips$$

Tension Stress Each Bolt =

$$f_t := \frac{F_{tension.bolt}}{a_b} = 6.2\ ksi$$

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

$$Condition2 = \text{"OK"}$$

$$\frac{f_t}{(\phi \cdot F'_{nt})} = 9.2\%$$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt =

$$f_v := \frac{\sqrt{Vert^2 + Horz^2}}{n_b \cdot a_b} = 3.405\ ksi$$

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

$$Condition3 = \text{"OK"}$$

$$\frac{f_v}{(\phi \cdot F_{nv})} = 8.4\%$$

Tensile Stress Adjusted for Shear =

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

Tension Force per Bolt =

$$F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 3.669\ kips$$

Tension Stress Each Bolt =

$$f_t := \frac{F_{tension.conn}}{a_b} = 8.306\ ksi$$

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

$$Condition4 = \text{"OK"}$$

$$\frac{f_t}{(\phi \cdot F'_{nt})} = 12.3\%$$

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Mast Bottom Connection:

Maximum Design Reactions at Brace:

Vertical =	$Vert := 0.187 \cdot kips$	(User Input)
Horizontal =	$Horz := 5.243 \cdot kips$	(User Input)
Moment =	$Moment := 0$	(User Input)

Bolt Data:

Bolt Grade =	A325	(User Input)
Number of Bolts =	$n_b := 6$	(User Input)
Bolt Diameter =	$d_b := 0.75 \cdot in$	(User Input)
Nomianl Tensile Strength =	$F_{nt} := 90 \cdot ksi$	(User Input)
Nomianl Shear Strength =	$F_{nv} := 54 \cdot ksi$	(User Input)
Resistance Factor =	$\phi := 0.75$	(User Input)
Bolt Eccentricity from C.L. Mast =	$e := 14.25 \cdot in$	(User Input)
Vetical Spacing Between Top and Bottom Bolts =	$S_{vert} := 9 \cdot in$	(User Input)
Horizontal Spacing Between Bolts =	$S_{horz} := 19 \cdot in$	(User Input)

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

Check Bolt Stresses:

Wind Acting Parallel to Stiffiner Plate:

$f_v := \frac{Vert}{n_b \cdot a_b} = 0.071 \text{ ksi}$

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

$Condition1 = \text{"OK"}$ $\frac{f_v}{(\phi \cdot F_{nv})} = 0.2\%$

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

Tension Force Each Bolt = $F_{tension.bolt} := \frac{Horz}{n_b} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 1.022 \text{ kips}$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.bolt}}{a_b} = 2.3 \text{ ksi}$

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

$Condition2 = \text{"OK"}$ $\frac{f_t}{(\phi \cdot F'_{nt})} = 3.4\%$

Wind Acting Perpendicular to Stiffiner Plate:

Shear Stress per Bolt = $f_v := \frac{\sqrt{Vert^2 + Horz^2}}{n_b \cdot a_b} = 1.979 \text{ ksi}$

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

$Condition3 = \text{"OK"}$ $\frac{f_v}{(\phi \cdot F_{nv})} = 4.9\%$

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

Tension Force per Bolt = $F_{tension.conn} := \frac{Horz \cdot e}{S_{horz} \cdot \frac{n_b}{2}} + \frac{Vert \cdot e}{S_{vert} \cdot 2} = 1.459 \text{ kips}$

Tension Stress Each Bolt = $f_t := \frac{F_{tension.conn}}{a_b} = 3.302 \text{ ksi}$

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

$Condition4 = \text{"OK"}$ $\frac{f_t}{(\phi \cdot F'_{nt})} = 4.9\%$

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Basic Components

Heavy Wind Pressure =	$p := 4.00$	psf	(User Input NESC 2012 Figure 250-1 & Table 250-1)
Basic Windspeed =	$V := 110$	mph	(User Input NESC 2012 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 =	$TME := 104$	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 2012 Table 250-3 equation)
Importance Factor =	$I := 1.0$		(User Input from NESC 2012 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.276$ (NESC 2012 Table 250-2)

Exposure Factor = $Es := 0.346 \cdot \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.311$ (NESC 2012 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.849$ (NESC 2012 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 2012 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 34.3$ psf (NESC 2012 Section 250.C.2)

Shape Factors

Shape Factor for Round Members =	$Cd_R := 1.3$	(User Input)
Shape Factor for Flat Members =	$Cd_F := 1.6$	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	$Cd_{coax} := 1.6$	(User Input)

Overload Factors

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: (Pipe 6.0" SCH. 80)

Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 6.63$	in	(User Input)
Mast Length =	$L_{mast} := 30$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.432$	in	(User Input)

Wind Load (NESC Extreme)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 0.553$

Total Mast Wind Force (Above NU Structure) = $qz \cdot Cd_R \cdot A_{mast} \cdot m = 31$ plf **BLC 5**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.636$

Total Mast Wind Force w/ Ice = $p \cdot Cd_R \cdot AICE_{mast} = 3$ 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 = $Ai_{mast} := \frac{\pi}{4} \cdot \left((D_{mast} + Ir \cdot 2)^2 - D_{mast}^2\right) = 11.2$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 4$ plf **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVAR18_43-C-NA20		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 68$	in	(User Input)
Antenna Width =	$W_{ant} := 16$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9$	in	(User Input)
Antenna Weight =	$WT_{ant} := 56$	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 = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 7.6$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 22.7$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 1554$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 8.1$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 24.4$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 156$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 168$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 9792$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1938$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 63$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 188$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Andrew ATSBT-TOP-FM-4G		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 5.63$	in	(User Input)
Antenna Width =	$W_{ant} := 3.7$	in	(User Input)
Antenna Thickness =	$T_{ant} := 2.0$	in	(User Input)
Antenna Weight =	$WT_{ant} := 2$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

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

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

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

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

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

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

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

Gravity Load (without ice)

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

Gravity Load (ice only)

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

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

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

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

Development of Wind & Ice Load on Mounts

Mount Data:

Mounting Type =	Site Pro Universal Ring Mount & Adapter Kit w/ 3 Pipes		
MountShape =	Round		(User Input)
Pipe Mount Lenght=	$L_{mnt} := 60$	in	(User Input)
2 inch Pipe Mount Linear Weight =	$W_{mnt} := 3.66$	plf	(User Input)
Pipe Mount Outside Diameter=	$D_{mnt} := 2.375$	in	(User Input)
Number of Antennas =	$N_{mnt} := 3$		(User Input)
Tri Sector and Bracket Mount Weight =	$WT_{sa.mnt} := 300$	lbs	(User Input)

Wind Load (NESC Extreme)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area = $A_{mnt} := 0 = 0$ sf

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

Wind Load (NESC Heavy)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area w/ Ice = $AICE_{mnt} := 0 = 0$ sf

Total Antenna Wind Force w/ Ice = $Fi_{mnt} := p \cdot Cd_R \cdot AICE_{mnt} = 0$ lbs **BLC 4**

Gravity Load (without ice)

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

Weight of all Mounts= $WT_{mnt} \cdot N_{mnt} + WT_{sa.mnt} = 355$ lbs **BLC 2**

Gravity Load (ice only)

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

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

Weight of Ice on Each Antenna = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 9$ lbs

Weight of Ice on All Antennas = $W_{ICEmnt} \cdot N_{mnt} + 5 = 32$ lbs **BLC 3**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type =	HELIAX 1-1/4"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.55$	in	(User Input)
Coax Cable Length =	$L_{coax} := 20$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 0.66$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 12$		(User Input)
No. of Coax Projecting Outside Face of PCS Mast =	$NP_{coax} := 2$		(User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} \cdot D_{coax})}{12} = 0.3$ ft

Total Coax Wind Force (Above NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 18$ plf **BLC 5**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.3$ ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 2$ plf **BLC 4**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 8$ plf **BLC 2**

Gravity Load (ice only)

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

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 15$ 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

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Existing Mast	30			Lbyy						Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	PIPE_6.0X	Column	Wide Flange	A53 Gr. B	Typical	7.83	38.3	38.3	76.6

Member Primary Data

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

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[lb,k-ft]	Location[ft,%]
1	M1	Y	-168	22
2	M1	Y	-6	22
3	M1	Y	-355	22

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

	Member Label	Direction	Magnitude[lb,k-ft]	Location[ft,%]
1	M1	Y	-188	22
2	M1	Y	-5	22
3	M1	Y	-32	22

Member Point Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Magnitude[lb,k-ft]	Location[ft,%]
1	M1	X	156	22
2	M1	X	4	22

Member Point Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Magnitude[lb,k-ft]	Location[ft,%]
1	M1	X	1554	22
2	M1	X	30	22

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-8	-8	0	19

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

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-4	-4	0	0
2	M1	Y	-15	-15	0	19

Member Distributed Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	3	3	0	19
2	M1	X	3	3	25	0
3	M1	X	2	2	0	19

Member Distributed Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	31	31	0	19
2	M1	X	31	31	25	0
3	M1	X	18	18	0	19

Basic Load Cases

	BLC Description	Category	X Grav...	Y Grav...	Z Gra...	Joint	Point	Distrib...	Area(M...	Surface(Plate/Wall)
1	Self Weight	None		-1						
2	Weight of Appurtenances	None					3	1		
3	Weight of Ice Only	None					3	2		
4	NESC Heavy Wind	None					2	3		
5	NESC Extreme Wind	None					2	3		

Load Combinations

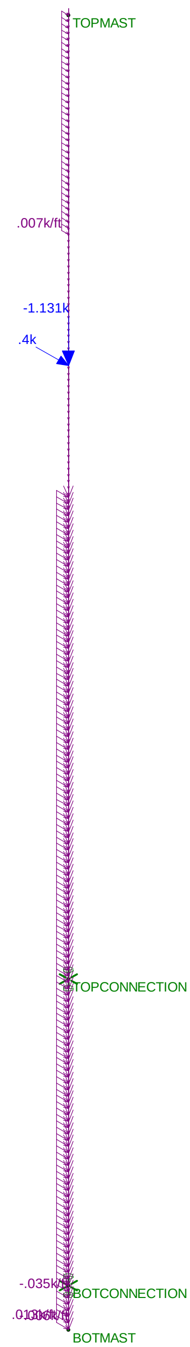
	Description	Solve	PD..	SR...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	NESC Heavy Wind	Yes	Y		1	1.5	2	1.5	3	1.5	4	2.5												
2	NESC Extreme Wind	Yes	Y		1	1	2	1	5	1														

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTCONNECTION	.992	.362	0	0	0	0
2	1	TOPCONNECTION	-1.667	2.803	0	0	0	0
3	1	Totals:	-.675	3.165	0			
4	1	COG (ft):	X: 0	Y: 16.362	Z: 0			

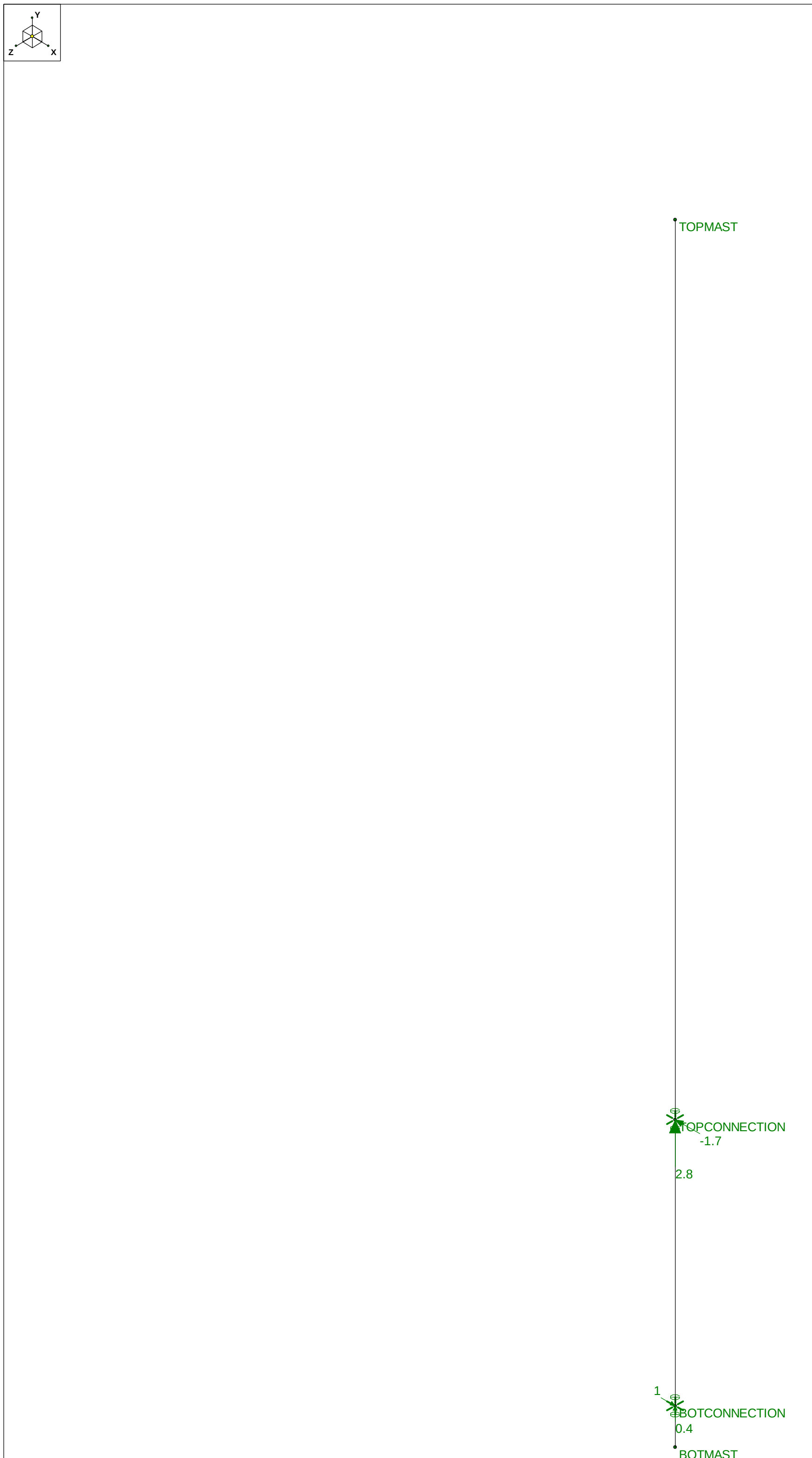
Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTCONNECTION	3.868	.156	0	0	0	0
2	2	TOPCONNECTION	-6.538	1.324	0	0	0	0
3	2	Totals:	-2.67	1.48	0			
4	2	COG (ft):	X: 0	Y: 16.937	Z: 0			



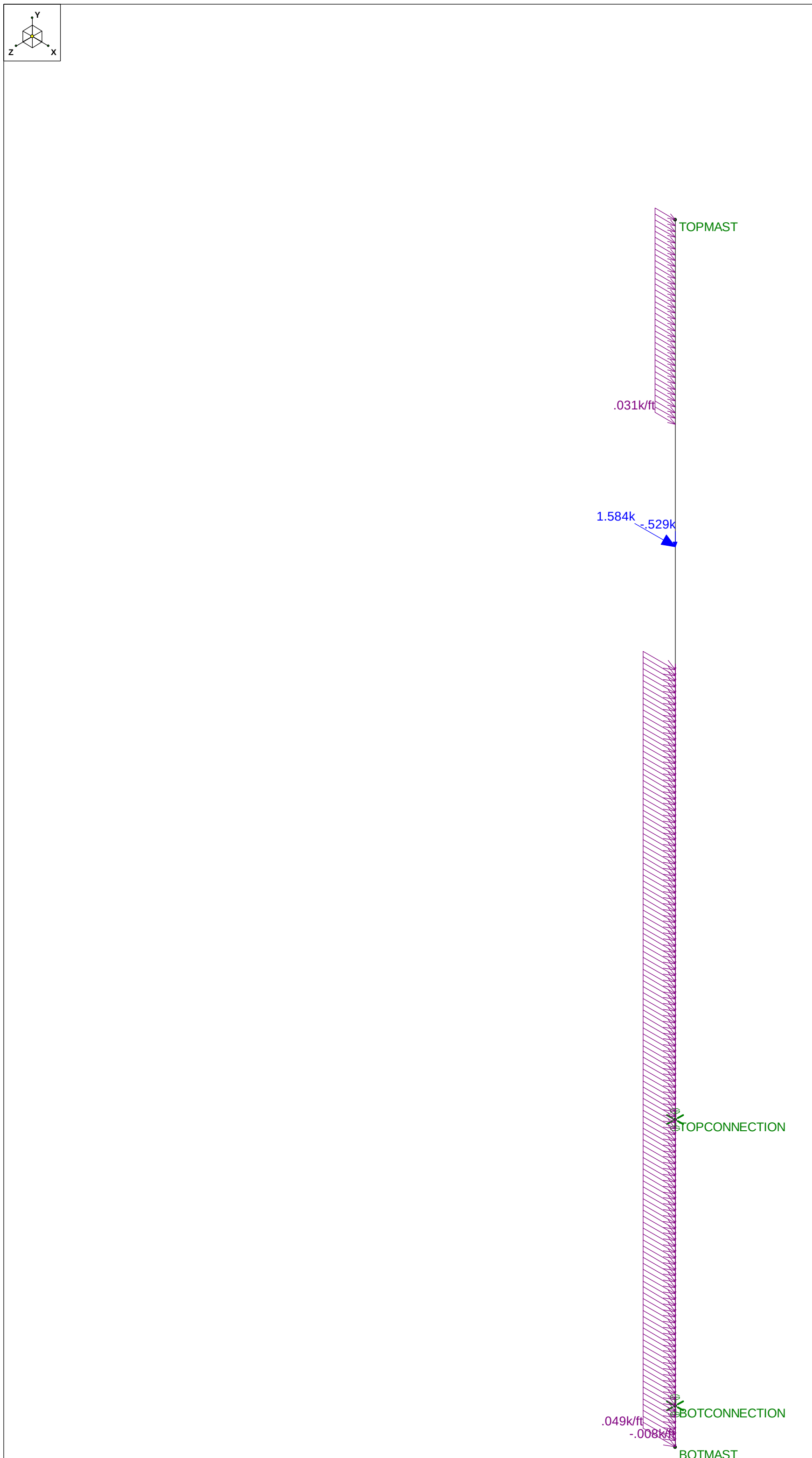
Loads: LC 1, NESC Heavy Wind

CENTEK Engineering, Inc.		
FJP	Structure # 3147 - Mast	Oct 1, 2019 at 2:18 PM
19066.04 /T-Mobile CT113...	LC #1 Loads	NESC.r3d



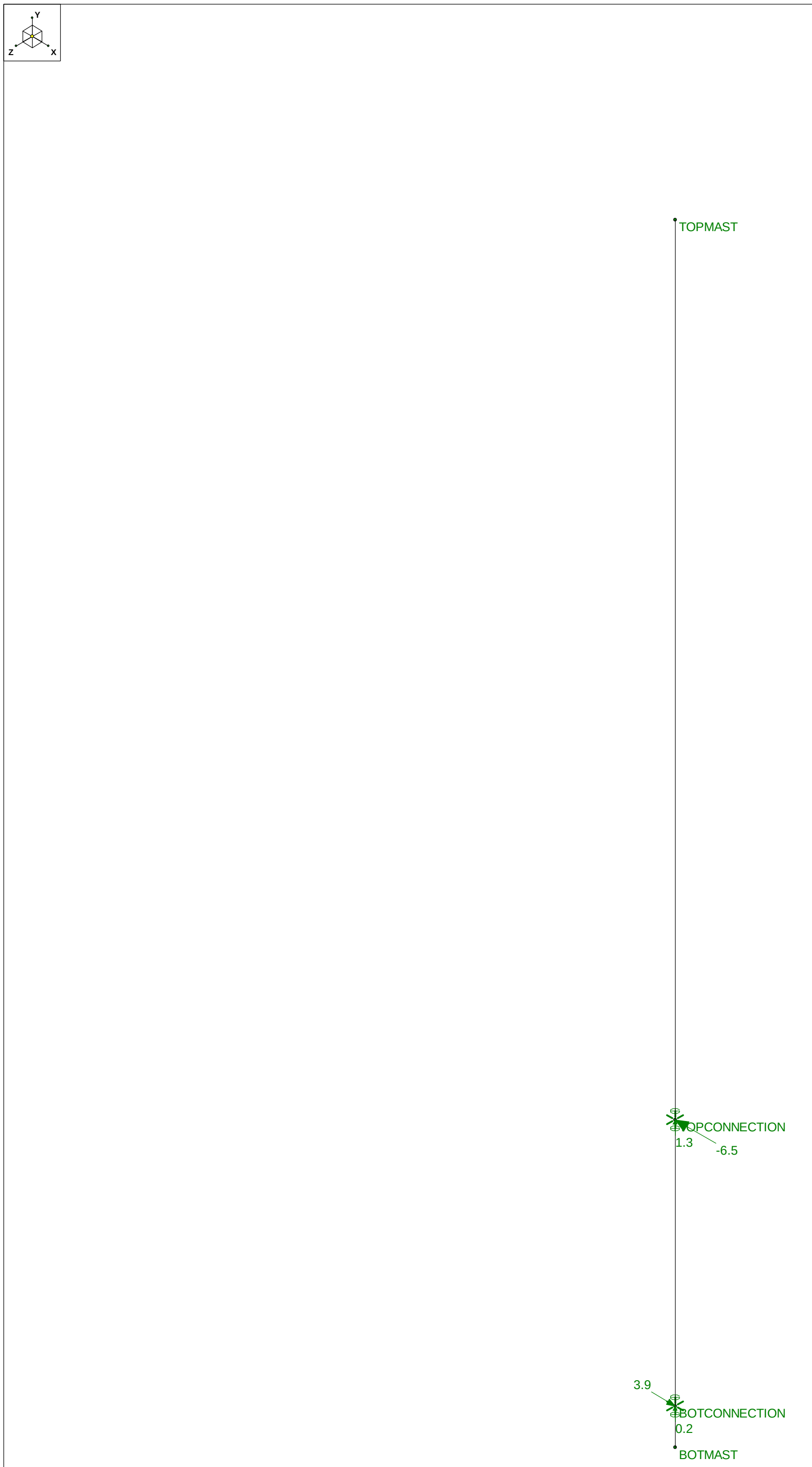
Results for LC 1, NESC Heavy Wind
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.		
FJP	Structure # 3147 - Mast	Oct 1, 2019 at 2:22 PM
19066.04 /T-Mobile CT113...	LC #1 Reactions	NESC.r3d



Loads: LC 2, NESC Extreme Wind

CENTEK Engineering, Inc.		
FJP	Structure # 3147 - Mast	Oct 1, 2019 at 2:18 PM
19066.04 /T-Mobile CT113...	LC #2 Loads	NESC.r3d



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

CENTEK Engineering, Inc.		
FJP	Structure # 3147 - Mast	Oct 1, 2019 at 2:21 PM
19066.04 /T-Mobile CT113...	LC #2 Reactions	NESC.r3d

CENTEK engineering
Centered on Solutions
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Branford, CT 06405
P: (203) 488-0580
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Subject: Coax Cable on Pole#3147

Location: Bloomfield, CT

Rev. 0: 10/01/19

Prepared by: F.J.P Checked by: T.J.L.
Job No. 19066.04

Coax Cable on CL&P Tower

Distance Between Coax Cable Attach Points =

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

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

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

Number of Coax Cables = $N_{coax} := 12$ *(User Input)*

Number of Projected Coax Cables = $NP_{coax} := 2$ *(User Input)*

Extreme Wind Pressure = $qz := 34.3 \cdot psf$ *(User Input)*

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

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

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

Shape Factor = $Cd_{coax} := 1.6$ *(User Input)*

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

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

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

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

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

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

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

Weight of Ice on All Coax Cables = $W_{ice} := Ai_{coax} \cdot Id \cdot N_{coax} = 15.027\ plf$

Heavy Vertical Load =

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

Heavy Transverse Load =

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

$$Heavy_{Vert} = \begin{bmatrix} 344 \\ 344 \\ 344 \\ 344 \\ 344 \\ 344 \\ 344 \end{bmatrix} lb \qquad Heavy_{Trans} = \begin{bmatrix} 55 \\ 55 \\ 55 \\ 55 \\ 55 \\ 55 \\ 55 \end{bmatrix} lb$$

Extreme Vertical Load =

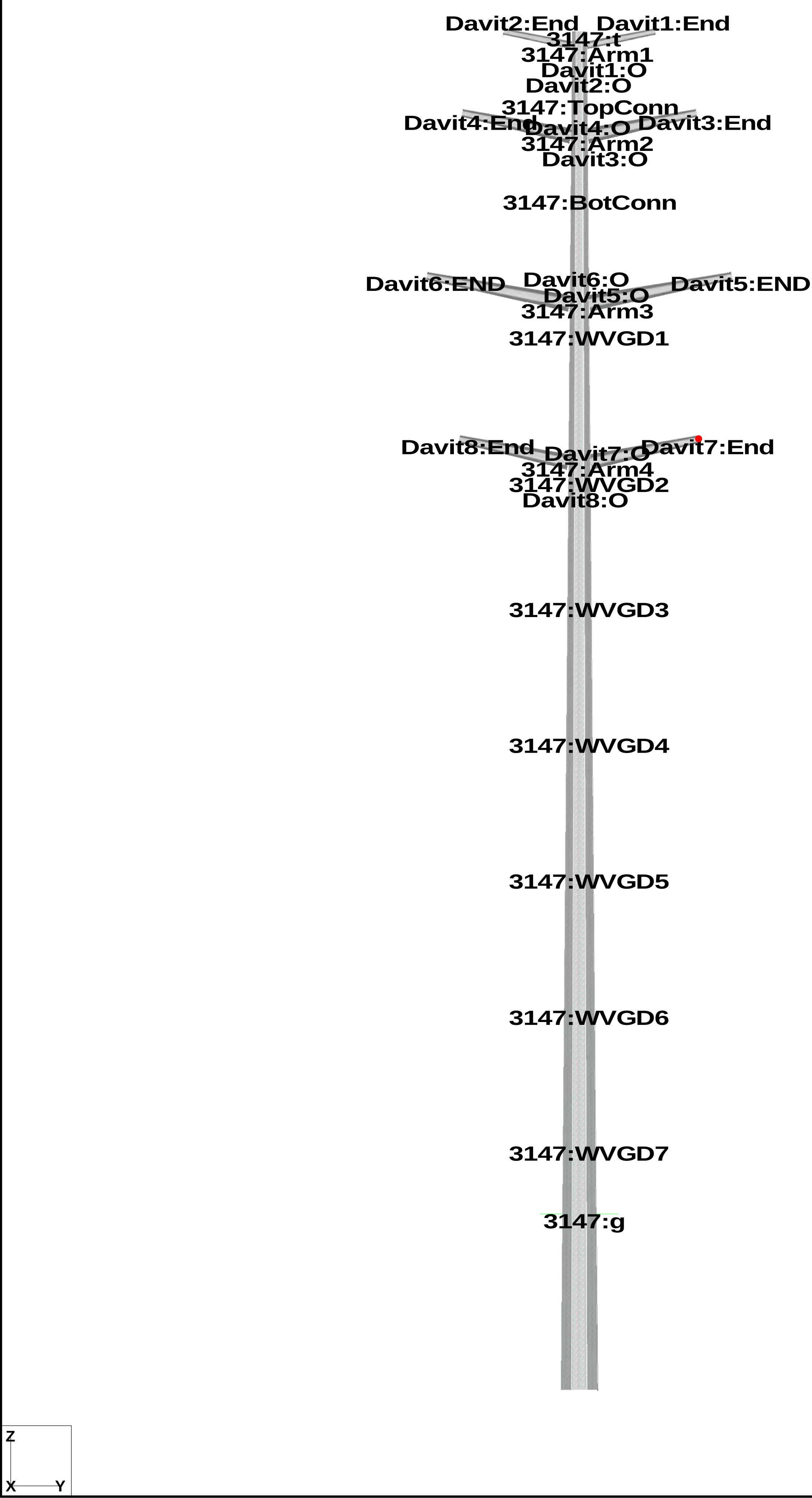
$$Extreme_{Vert} := \overrightarrow{\left(\left(N_{coax} \cdot W_{coax}\right) \cdot Coax_{Span} \cdot OF_{EV}\right)}$$

Extreme Transverse Load =

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

$$Extreme_{Vert} = \begin{bmatrix} 79 \\ 79 \\ 79 \\ 79 \\ 79 \\ 79 \\ 79 \end{bmatrix} lb \qquad Extreme_{Trans} = \begin{bmatrix} 142 \\ 142 \\ 142 \\ 142 \\ 142 \\ 142 \\ 142 \end{bmatrix} lb$$

Centek Engineering Inc, Project: "cl&p structure # 3147"
PLS-POLE Version 12.50, 3:33:51 PM Tuesday, October 01, 2019
Undeformed geometry displayed



Project Name : 19066.04 - Bloomfield, CT
Project Notes: Str # 3147/ T-Mobile - CT11385A
Project File : J:\Jobs\1906600.WI\04_CT11385A\05_Structural\Backup Documentation\Rev (1)\Calcs\PLS-Pole\cl&p structure # 3147.pol
Date run : 11:02:46 AM Wednesday, October 30, 2019
by : PLS-POLE Version 12.50
Licensed to : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.

Loads from file: j:\jobs\1906600.wi\04_ct11385a\05_structural\backup documentation\rev (1)\calcs\pls-pole\cl&p #3147.lca

*** Analysis Results:

Maximum element usage is 85.23% for Steel Pole "3147" in load case "NESC Extreme"
Maximum insulator usage is 8.34% for Clamp "Clamp9" in load case "NESC Extreme"

Summary of Joint Support Reactions For All Load Cases:

Load Case	Joint Label	Long. Force (kips)	Tran. Force (kips)	Vert. Force (kips)	Shear Force (kips)	Tran. Moment (ft-k)	Long. Moment (ft-k)	Bending Moment (ft-k)	Vert. Moment (ft-k)	Found. Usage %
NESC Heavy	3147:g	-0.07	-7.62	-31.05	7.62	661.02	-2.93	661.02	0.02	0.00
NESC Extreme	3147:g	-0.15	-14.07	-16.97	14.07	968.63	-10.72	968.69	1.45	0.00

Summary of Tip Deflections For All Load Cases:

Note: postive tip load results in positive deflection

Load Case	Joint Label	Long. Defl. (in)	Tran. Defl. (in)	Vert. Defl. (in)	Resultant Defl. (in)	Long. Rot. (deg)	Tran. Rot. (deg)	Twist (deg)
NESC Heavy	3147:t	0.15	52.85	-1.89	52.89	0.01	-5.54	-0.00
NESC Extreme	3147:t	0.73	68.62	-3.06	68.69	0.06	-6.88	-0.03

Tubes Summary:

Pole Label	Tube Num.	Weight (lbs)	Load Case	Maximum Usage %	Resultant Moment (ft-k)
3147	1	2553	NESC Extreme	85.23	451.78
3147	2	5088	NESC Extreme	84.72	968.69

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

Summary of Steel Pole Usages:

Steel Pole Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
3147	85.23	NESC Extreme	14	7641.0

Summary of Tubular Davit Usages:

Tubular Davit Maximum Load Case Segment Weight

Label	Usage %		Number	(lbs)
Davit1	29.31	NESC Heavy	1	59.9
Davit2	0.82	NESC Heavy	1	59.9
Davit3	34.48	NESC Heavy	1	159.2
Davit4	0.78	NESC Heavy	1	159.2
Davit5	38.78	NESC Heavy	1	220.0
Davit6	1.19	NESC Heavy	1	220.0
Davit7	34.50	NESC Heavy	1	159.2
Davit8	0.79	NESC Heavy	1	159.2

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	72.12	3147	Steel Pole
NESC Extreme	85.23	3147	Steel Pole

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number
NESC Heavy	72.12	3147	14
NESC Extreme	85.23	3147	14

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC Heavy	38.78	Davit5	1
NESC Extreme	21.26	Davit5	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)
Clamp1	Clamp	1.90	NESC Heavy	0.0
Clamp2	Clamp	0.00	NESC Heavy	0.0
Clamp3	Clamp	5.57	NESC Heavy	0.0
Clamp4	Clamp	0.00	NESC Heavy	0.0
Clamp5	Clamp	5.53	NESC Heavy	0.0
Clamp6	Clamp	0.00	NESC Heavy	0.0
Clamp7	Clamp	5.55	NESC Heavy	0.0
Clamp8	Clamp	0.00	NESC Heavy	0.0
Clamp9	Clamp	8.34	NESC Extreme	0.0
Clamp10	Clamp	4.84	NESC Extreme	0.0
Clamp11	Clamp	0.44	NESC Heavy	0.0
Clamp12	Clamp	0.44	NESC Heavy	0.0
Clamp13	Clamp	0.44	NESC Heavy	0.0
Clamp14	Clamp	0.44	NESC Heavy	0.0

Clamp15	Clamp	0.44	NESC Heavy	0.0
Clamp16	Clamp	0.44	NESC Heavy	0.0
Clamp17	Clamp	0.44	NESC Heavy	0.0

*** Weight of structure (lbs):

Weight of Tubular Davit Arms:	1196.4
Weight of Steel Poles:	7641.0
Total:	8837.4

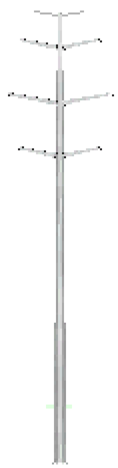
*** End of Report

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

Project Name : 19066.04 - Bloomfield, CT
Project Notes: Str # 3147/ T-Mobile - CT11385A
Project File : J:\Jobs\1906600.WI\04_CT11385A\05_Structural\Backup Documentation\Rev (1)\Calcs\PLS-Pole\cl&p structure # 3147.pol
Date run   : 11:02:46 AM Wednesday, October 30, 2019
by   : PLS-POLE Version 12.50
Licensed to : Centek Engineering Inc

Successfully performed nonlinear analysis

The model has 0 warnings.



Modeling options:
  Offset Arms from Pole/Mast: Yes
  Offset Braces from Pole/Mast: Yes
  Offset Guys from Pole/Mast: Yes
  Offset Posts from Pole/Mast: Yes
  Offset Strains from Pole/Mast: Yes
  Use Alternate Convergence Process: No
  Steel poles checked with ASCE/SEI 48-11

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

Steel Pole Properties:

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

Label		(ft)	Length (ft)			(in)	(in)	(in/ft)	Coef.		Override (ksi)	Override (lbs/ft^3)	Base	Type	Tip (ft)	Trans. Load (kips)	Long. Load (kips)
CL&P3147	3147	100.00	13	No	8F	13.47	32.54	0	1.6	2 tubes	0	0		Calculated	0.000	0.0000	0.0000

Steel Tubes Properties:

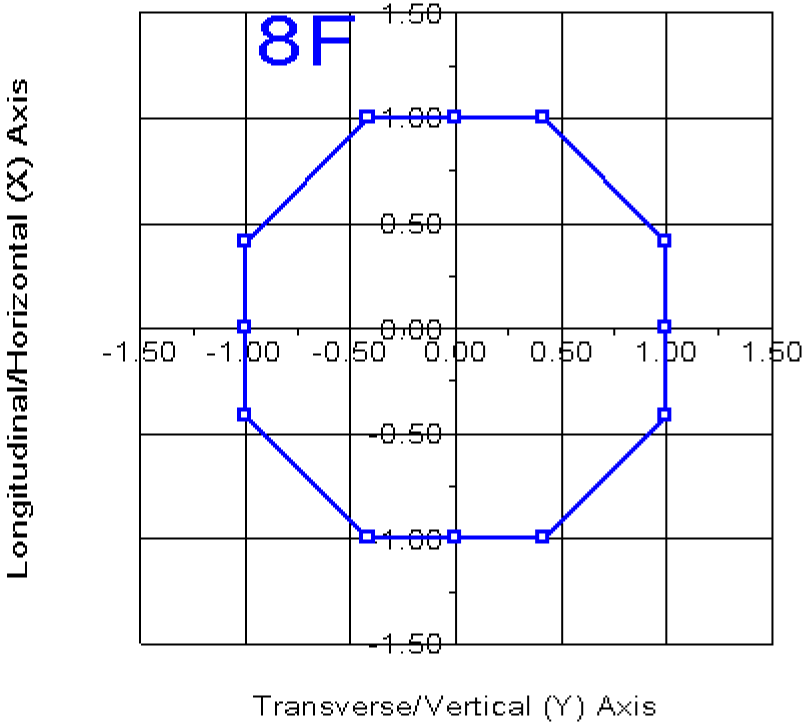
Pole Property	Tube No.	Length (ft)	Thickness (in)	Lap Length (ft)	Lap Factor	Lap Gap (in)	Yield Stress (ksi)	Moment Cap. Override (ft-k)	Tube Weight (lbs)	Center of Gravity (ft)	Calculated Taper (in/ft)	Tube Top Diameter (in)	Tube Bot. Diameter (in)	1.5x Diam. Lap Length (ft)	Actual Overlap (ft)
CL&P3147	1	50	0.25	3.500	0.000	0.000	60.000	0.000	2553	27.25	0.19569	13.47	23.25	2.844	3.500
CL&P3147	2	53.5	0.3125	0.000	0.000	0.000	60.000	0.000	5088	28.48	0.19569	22.07	32.54	0.000	0.000

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)
3147			0	0	0	0	0	CL&P3147	13 labels		0.00	0

Relative Attachment Labels for Steel Pole "3147":

Joint Label	Distance From Origin/Top Joint (ft)	Global Z of Attach (ft)
3147:Arm1	0.00	86.00
3147:Arm2	0.00	79.33
3147:Arm3	0.00	67.00
3147:Arm4	0.00	55.33
3147:TopConn	0.00	82.00
3147:BotConn	0.00	75.00
3147:WVGD1	0.00	65.00
3147:WVGD2	0.00	55.00
3147:WVGD3	0.00	45.00
3147:WVGD4	0.00	35.00
3147:WVGD5	0.00	25.00
3147:WVGD6	0.00	15.00
3147:WVGD7	0.00	5.00



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)
3147	3147:t	3147:t Ori	0.00	13.47	10.95	252.96	252.96	0.00	18.2	60.00	60.00	187.81	187.81
3147	3147:Arm1	3147:Arm1 End	1.00	13.66	11.11	264.36	264.36	0.00	18.5	60.00	60.00	193.46	193.46
3147	3147:Arm1	3147:Arm1 Ori	1.00	13.66	11.11	264.36	264.36	0.00	18.5	60.00	60.00	193.46	193.46
3147	3147:TopConn	3147:TopConn End	5.00	14.45	11.76	313.37	313.37	0.00	19.8	60.00	60.00	216.91	216.91
3147	3147:TopConn	3147:TopConn Ori	5.00	14.45	11.76	313.37	313.37	0.00	19.8	60.00	60.00	216.91	216.91
3147	3147:Arm2	3147:Arm2 End	7.67	14.97	12.19	349.26	349.26	0.00	20.7	60.00	60.00	233.31	233.31
3147	3147:Arm2	3147:Arm2 Ori	7.67	14.97	12.19	349.26	349.26	0.00	20.7	60.00	60.00	233.31	233.31
3147	3147:BotConn	3147:BotConn End	12.00	15.82	12.90	413.10	413.10	0.00	22.1	60.00	60.00	261.17	261.17
3147	3147:BotConn	3147:BotConn Ori	12.00	15.82	12.90	413.10	413.10	0.00	22.1	60.00	60.00	261.17	261.17
3147	#3147:0	Tube 1 End	16.00	16.60	13.54	478.59	478.59	0.00	23.4	60.00	60.00	288.31	288.31
3147	#3147:0	Tube 1 Ori	16.00	16.60	13.54	478.59	478.59	0.00	23.4	60.00	60.00	288.31	288.31
3147	3147:Arm3	3147:Arm3 End	20.00	17.38	14.19	550.66	550.66	0.00	24.7	60.00	60.00	316.79	316.79
3147	3147:Arm3	3147:Arm3 Ori	20.00	17.38	14.19	550.66	550.66	0.00	24.7	60.00	60.00	316.79	316.79
3147	3147:WVGD1	3147:WVGD1 End	22.00	17.77	14.52	589.26	589.26	0.00	25.3	60.00	60.00	331.53	331.53
3147	3147:WVGD1	3147:WVGD1 Ori	22.00	17.77	14.52	589.26	589.26	0.00	25.3	60.00	60.00	331.53	331.53
3147	#3147:1	Tube 1 End	26.83	18.72	15.30	689.94	689.94	0.00	26.9	60.00	60.00	368.55	368.55
3147	#3147:1	Tube 1 Ori	26.83	18.72	15.30	689.94	689.94	0.00	26.9	60.00	60.00	368.55	368.55

3147	3147:Arm4	3147:Arm4 End	31.67	19.67	16.09	801.48	801.48	0.00	28.4	60.00	60.00	407.54	407.54
3147	3147:Arm4	3147:Arm4 Ori	31.67	19.67	16.09	801.48	801.48	0.00	28.4	60.00	60.00	407.54	407.54
3147	3147:WVGD2	3147:WVGD2 End	32.00	19.73	16.14	809.50	809.50	0.00	28.5	60.00	60.00	410.27	410.27
3147	3147:WVGD2	3147:WVGD2 Ori	32.00	19.73	16.14	809.51	809.51	0.00	28.5	60.00	60.00	410.27	410.27
3147	#3147:2	Tube 1 End	37.00	20.71	16.95	937.70	937.70	0.00	30.2	60.00	60.00	452.79	452.79
3147	#3147:2	Tube 1 Ori	37.00	20.71	16.95	937.70	937.70	0.00	30.2	60.00	60.00	452.79	452.79
3147	3147:WVGD3	3147:WVGD3 End	42.00	21.69	17.76	1078.75	1078.75	0.00	31.8	60.00	60.00	497.40	497.40
3147	3147:WVGD3	3147:WVGD3 Ori	42.00	21.69	17.76	1078.75	1078.75	0.00	31.8	60.00	60.00	497.40	497.40
3147	#3147:3	SpliceT End	46.50	22.57	18.49	1217.21	1217.21	0.00	33.3	60.00	60.00	539.34	539.34
3147	#3147:3	SpliceT Ori	46.50	22.57	18.49	1217.21	1217.21	0.00	33.3	60.00	60.00	539.34	539.34
3147	#3147:4	SpliceB End	50.00	22.75	23.24	1546.80	1546.80	0.00	26.0	60.00	60.00	679.81	679.81
3147	#3147:4	SpliceB Ori	50.00	22.75	23.24	1546.80	1546.80	0.00	26.0	60.00	60.00	679.81	679.81
3147	3147:WVGD4	3147:WVGD4 End	52.00	23.14	23.64	1629.14	1629.14	0.00	26.5	60.00	60.00	703.89	703.89
3147	3147:WVGD4	3147:WVGD4 Ori	52.00	23.14	23.64	1629.14	1629.14	0.00	26.5	60.00	60.00	703.89	703.89
3147	#3147:5	Tube 2 End	57.00	24.12	24.66	1847.66	1847.66	0.00	27.8	60.00	60.00	765.92	765.92
3147	#3147:5	Tube 2 Ori	57.00	24.12	24.66	1847.66	1847.66	0.00	27.8	60.00	60.00	765.92	765.92
3147	3147:WVGD5	3147:WVGD5 End	62.00	25.10	25.67	2084.90	2084.90	0.00	29.1	60.00	60.00	830.58	830.58
3147	3147:WVGD5	3147:WVGD5 Ori	62.00	25.10	25.67	2084.90	2084.90	0.00	29.1	60.00	60.00	830.58	830.58
3147	#3147:6	Tube 2 End	67.00	26.08	26.68	2341.63	2341.63	0.00	30.4	60.00	60.00	897.85	897.85
3147	#3147:6	Tube 2 Ori	67.00	26.08	26.68	2341.63	2341.63	0.00	30.4	60.00	60.00	897.86	897.86
3147	3147:WVGD6	3147:WVGD6 End	72.00	27.06	27.70	2618.61	2618.61	0.00	31.7	60.00	60.00	967.75	967.75
3147	3147:WVGD6	3147:WVGD6 Ori	72.00	27.06	27.70	2618.61	2618.61	0.00	31.7	60.00	60.00	967.75	967.75
3147	#3147:7	Tube 2 End	77.00	28.04	28.71	2916.62	2916.62	0.00	33.0	60.00	60.00	1040.27	1040.27
3147	#3147:7	Tube 2 Ori	77.00	28.04	28.71	2916.62	2916.62	0.00	33.0	60.00	60.00	1040.27	1040.27
3147	3147:WVGD7	3147:WVGD7 End	82.00	29.02	29.72	3236.42	3236.42	0.00	34.3	60.00	59.38	1103.90	1103.90
3147	3147:WVGD7	3147:WVGD7 Ori	82.00	29.02	29.72	3236.42	3236.42	0.00	34.3	60.00	59.38	1103.90	1103.90
3147	3147:g	3147:g End	87.00	29.99	30.74	3578.79	3578.79	0.00	35.6	60.00	58.41	1161.45	1161.45

Tubular Davit Properties:

Davit Property Label	Stock Number	Steel Shape	Thickness (in)	Base Diameter or Depth (in)	Tip Diameter or Depth (in)	Taper (in/ft)	Drag Coef.	Modulus of Elasticity (ksi)	Geometry	Strength Check Type	Vertical Capacity (lbs)	Tension Capacity (lbs)	Compres. Capacity (lbs)	Long. Capacity (lbs)	Yield Stress (ksi)	Weight Density Override (lbs/ft^3)	Steel Shape At End
ARM1		6T	0.1875	6	5	0	1.3	29000	1 point	Calculated	0	0	0	0	60	0	
ARM2		6T	0.1875	12	6	0	1.3	29000	1 point	Calculated	0	0	0	0	60	0	
ARM3		6T	0.1875	13	6	0	1.3	29000	1 point	Calculated	0	0	0	0	60	0	

Intermediate Joints for Davit Property "ARM1":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	5	-1

Intermediate Joints for Davit Property "ARM2":

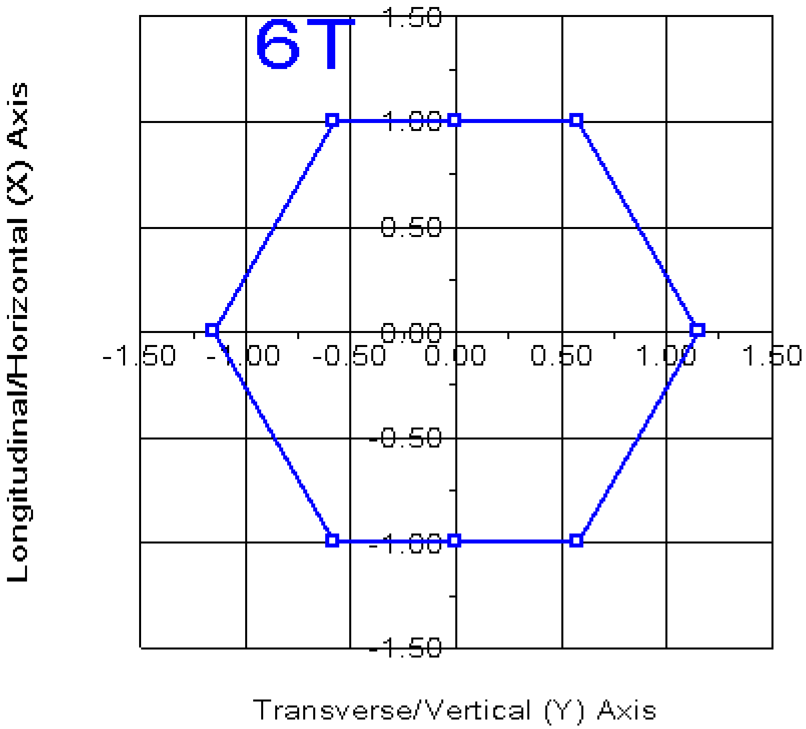
Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
End	8	-1.67

Intermediate Joints for Davit Property "ARM3":

Joint Label	Horz. Offset (ft)	Vert. Offset (ft)
END	10.5	-2

Tubular Davit Arm Connectivity:

Davit Label	Attach Label	Davit Property Set	Azimuth (deg)
Davit1	3147:Arm1	ARM1	0
Davit2	3147:Arm1	ARM1	180
Davit3	3147:Arm2	ARM2	0
Davit4	3147:Arm2	ARM2	180
Davit5	3147:Arm3	ARM3	0
Davit6	3147:Arm3	ARM3	180
Davit7	3147:Arm4	ARM2	0
Davit8	3147:Arm4	ARM2	180



Tubular Davit Arm Steel Properties:

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Outer Diam. (in)	Area (in^2)	V-Moment Inertia (in^4)	H-Moment Inertia (in^4)	D/t	W/t Max.	Fy (ksi)	Fa Min. (ksi)	V-Moment Capacity (ft-k)	H-Moment Capacity (ft-k)
Davit1	Davit1:O	Origin	0.00	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit1	#Davit1:0	End	2.55	5.50	3.45	13.54	13.54	0.00	11.2	60.00	60.00	21.32	24.62
Davit1	#Davit1:0	Origin	2.55	5.50	3.45	13.54	13.54	0.00	11.2	60.00	60.00	21.32	24.62
Davit1	Davit1:End	End	5.10	5.00	3.13	10.07	10.07	0.00	9.6	60.00	60.00	17.44	20.14
Davit2	Davit2:O	Origin	0.00	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit2	#Davit2:0	End	2.55	5.50	3.45	13.54	13.54	0.00	11.2	60.00	60.00	21.32	24.62
Davit2	#Davit2:0	Origin	2.55	5.50	3.45	13.54	13.54	0.00	11.2	60.00	60.00	21.32	24.62
Davit2	Davit2:End	End	5.10	5.00	3.13	10.07	10.07	0.00	9.6	60.00	60.00	17.44	20.14
Davit3	Davit3:O	Origin	0.00	12.00	7.67	148.72	148.72	0.00	31.2	60.00	60.00	107.33	123.93
Davit3	#Davit3:0	End	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit3	#Davit3:0	Origin	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit3	Davit3:End	End	8.17	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit4	Davit4:O	Origin	0.00	12.00	7.67	148.72	148.72	0.00	31.2	60.00	60.00	107.33	123.93
Davit4	#Davit4:0	End	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit4	#Davit4:0	Origin	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit4	Davit4:End	End	8.17	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit5	Davit5:O	Origin	0.00	13.00	8.32	189.77	189.77	0.00	34.3	60.00	59.43	125.21	144.58
Davit5	#Davit5:0	End	5.00	9.73	6.20	78.30	78.30	0.00	24.2	60.00	60.00	69.73	80.51
Davit5	#Davit5:0	Origin	5.00	9.73	6.20	78.30	78.30	0.00	24.2	60.00	60.00	69.73	80.51
Davit5	#Davit5:1	End	7.84	7.86	4.99	40.81	40.81	0.00	18.4	60.00	60.00	44.95	51.90
Davit5	#Davit5:1	Origin	7.84	7.86	4.99	40.81	40.81	0.00	18.4	60.00	60.00	44.95	51.90
Davit5	Davit5:END	End	10.69	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit6	Davit6:O	Origin	0.00	13.00	8.32	189.77	189.77	0.00	34.3	60.00	59.43	125.21	144.58
Davit6	#Davit6:0	End	5.00	9.73	6.20	78.30	78.30	0.00	24.2	60.00	60.00	69.73	80.51
Davit6	#Davit6:0	Origin	5.00	9.73	6.20	78.30	78.30	0.00	24.2	60.00	60.00	69.73	80.51
Davit6	#Davit6:1	End	7.84	7.86	4.99	40.81	40.81	0.00	18.4	60.00	60.00	44.95	51.90
Davit6	#Davit6:1	Origin	7.84	7.86	4.99	40.81	40.81	0.00	18.4	60.00	60.00	44.95	51.90
Davit6	Davit6:END	End	10.69	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit7	Davit7:O	Origin	0.00	12.00	7.67	148.72	148.72	0.00	31.2	60.00	60.00	107.33	123.93
Davit7	#Davit7:0	End	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit7	#Davit7:0	Origin	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit7	Davit7:End	End	8.17	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55
Davit8	Davit8:O	Origin	0.00	12.00	7.67	148.72	148.72	0.00	31.2	60.00	60.00	107.33	123.93
Davit8	#Davit8:0	End	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit8	#Davit8:0	Origin	4.09	9.00	5.72	61.76	61.76	0.00	21.9	60.00	60.00	59.43	68.63
Davit8	Davit8:End	End	8.17	6.00	3.78	17.73	17.73	0.00	12.7	60.00	60.00	25.60	29.55

*** Insulator Data

Clamp Properties:

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

Clamp Insulator Connectivity:

Clamp Label	Structure And Tip Attach	Property Set	Min. Required Vertical Load (uplift) (lbs)
Clamp1	Davit1:End	clamp	No Limit
Clamp2	Davit2:End	clamp	No Limit
Clamp3	Davit3:End	clamp	No Limit
Clamp4	Davit4:End	clamp	No Limit
Clamp5	Davit5:END	clamp	No Limit
Clamp6	Davit6:END	clamp	No Limit
Clamp7	Davit7:End	clamp	No Limit
Clamp8	Davit8:End	clamp	No Limit
Clamp9	3147:TopConn	clamp	No Limit
Clamp10	3147:BotConn	clamp	No Limit
Clamp11	3147:WVGD1	clamp	No Limit
Clamp12	3147:WVGD2	clamp	No Limit
Clamp13	3147:WVGD3	clamp	No Limit
Clamp14	3147:WVGD4	clamp	No Limit
Clamp15	3147:WVGD5	clamp	No Limit
Clamp16	3147:WVGD6	clamp	No Limit
Clamp17	3147:WVGD7	clamp	No Limit

*** Loads Data

Loads from file: j:\jobs\1906600.wi\04_ct11385a\05_structural\backup documentation\rev (1)\calcs\pls-pole\cl&p #3147.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)	87.00 (ft)	
Structure height	87.00 (ft)	
Structure height above ground	87.00 (ft)	

Vector Load Cases:

Load Case Description	Dead Load Factor	Wind Area Factor	SF for Steel Poles Tubular Arms and Towers	SF for Wood Poles	SF for Conc. Ult.	SF for Conc. First Crack	SF for Conc. Zero Tens.	SF for Guys and Cables	SF for Non Tubular Arms	SF for Braces	SF for Insuls.	SF For Found.	Point Loads	Wind/Ice Model	Trans. Wind Pressure (psf)	Longit. Wind Pressure (psf)	Ice Thick. (in)	Ice Density (lbs/ft^3)	Temperature (deg F)	Pole Deflection Check	Pole Deflection Limit % or (ft)
NESC Heavy	1.5000	2.5000	1.00000	0.6500	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13 loads	Wind on All	4	0	0.000	0.000	0.0	No Limit	0
NESC Extreme	1.0000	1.0000	1.00000	0.6500	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13 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	1355	690	0	ALWLD
Davit3:End	4302	1161	0	TOP PHASE
Davit5:END	4300	1055	0	MID PHASE
Davit7:End	4295	1135	0	BOT PHASE
3147:TopConn	2803	1667	0	TOP CONN.
3147:BotConn	362	-992	0	BOT CONN.
3147:WVGD1	344	55	0	COAX CABLE LOADS
3147:WVGD2	344	55	0	COAX CABLE LOADS
3147:WVGD3	344	55	0	COAX CABLE LOADS
3147:WVGD4	344	55	0	COAX CABLE LOADS
3147:WVGD5	344	55	0	COAX CABLE LOADS
3147:WVGD6	344	55	0	COAX CABLE LOADS
3147:WVGD7	344	55	0	COAX CABLE LOADS

Point Loads for Load Case "NESC Extreme":

Joint Label	Vertical Load (lbs)	Transverse Load (lbs)	Longitudinal Load (lbs)	Load Comment
Davit1:End	610	500	0	ALWLD
Davit3:End	2238	1752	50	TOP PHASE
Davit5:END	2235	1650	50	MID PHASE
Davit7:End	2232	1640	50	BOT PHASE
3147:TopConn	1324	6538	0	TOP CONN.
3147:BotConn	156	-3868	0	BOT CONN.
3147:WVGD1	79	142	0	COAX CABLE LOADS
3147:WVGD2	79	142	0	COAX CABLE LOADS
3147:WVGD3	79	142	0	COAX CABLE LOADS
3147:WVGD4	79	142	0	COAX CABLE LOADS
3147:WVGD5	79	142	0	COAX CABLE LOADS
3147:WVGD6	79	142	0	COAX CABLE LOADS
3147:WVGD7	79	142	0	COAX CABLE LOADS

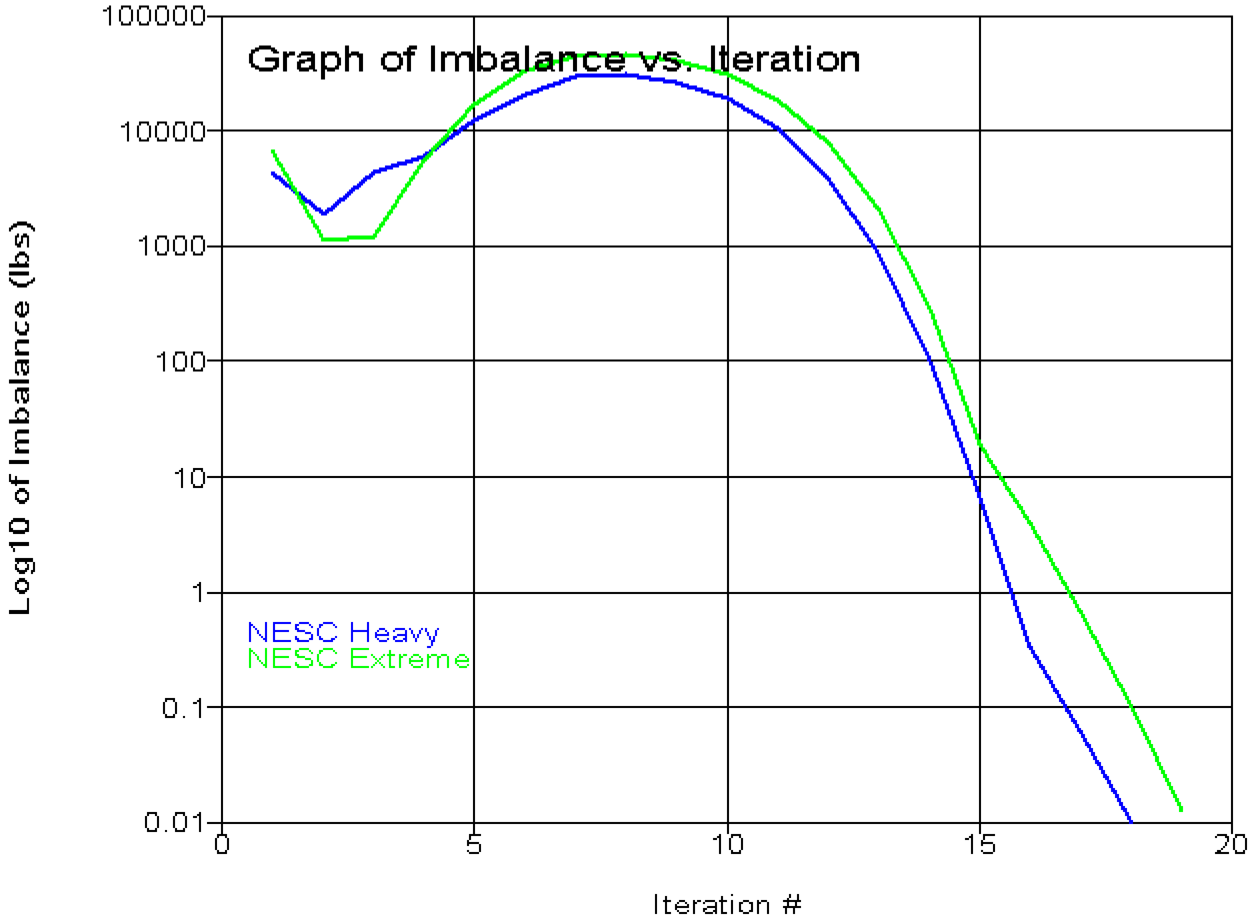
Detailed Pole Loading Data for Load Case "NESC Extreme":

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)
3147	3147:t	3147:Arm1	87.00	86.00	86.50	13.567	1.13e+006	1.000	30.86	0.00	37.54	34.89	0.00	0.00	34.89	0.00
3147	3147:Arm1	3147:TopConn	86.00	82.00	84.00	14.056	1.17e+006	1.000	30.86	0.00	155.67	144.60	0.00	0.00	144.60	0.00
3147	3147:TopConn	3147:Arm2	82.00	79.33	80.67	14.709	1.22e+006	1.000	30.86	0.00	108.82	101.00	0.00	0.00	101.00	0.00
3147	3147:Arm2	3147:BotConn	79.33	75.00	77.16	15.393	1.28e+006	1.000	30.86	0.00	184.84	171.42	0.00	0.00	171.42	0.00
3147	3147:BotConn		75.00	71.00	73.00	16.209	1.35e+006	1.000	30.86	0.00	179.94	166.74	0.00	0.00	166.74	0.00
3147		3147:Arm3	71.00	67.00	69.00	16.991	1.41e+006	1.000	30.86	0.00	188.77	174.79	0.00	0.00	174.79	0.00
3147	3147:Arm3	3147:WVGD1	67.00	65.00	66.00	17.578	1.46e+006	1.000	30.86	0.00	97.70	90.42	0.00	0.00	90.42	0.00
3147	3147:WVGD1		65.00	60.16	62.58	18.247	1.52e+006	1.000	30.86	0.00	245.29	226.90	0.00	0.00	226.90	0.00
3147		3147:Arm4	60.16	55.33	57.75	19.193	1.6e+006	1.000	30.86	0.00	258.19	238.66	0.00	0.00	238.66	0.00
3147	3147:Arm4	3147:WVGD2	55.33	55.00	55.17	19.699	1.64e+006	1.000	30.86	0.00	18.09	16.72	0.00	0.00	16.72	0.00
3147	3147:WVGD2		55.00	50.00	52.50	20.220	1.68e+006	1.000	30.86	0.00	281.48	260.01	0.00	0.00	260.01	0.00
3147		3147:WVGD3	50.00	45.00	47.50	21.199	1.76e+006	1.000	30.86	0.00	295.27	272.59	0.00	0.00	272.59	0.00
3147	3147:WVGD3		45.00	40.50	42.75	22.128	1.84e+006	1.000	30.86	0.00	277.53	256.09	0.00	0.00	256.09	0.00
3147			40.50	37.00	38.75	22.661	1.88e+006	1.000	30.86	0.00	496.12	203.98	0.00	0.00	203.98	0.00
3147		3147:WVGD4	37.00	35.00	36.00	22.949	1.91e+006	1.000	30.86	0.00	159.59	118.04	0.00	0.00	118.04	0.00
3147	3147:WVGD4		35.00	30.00	32.50	23.634	1.97e+006	1.000	30.86	0.00	410.89	303.91	0.00	0.00	303.91	0.00
3147		3147:WVGD5	30.00	25.00	27.50	24.613	2.05e+006	1.000	30.86	0.00	428.13	316.49	0.00	0.00	316.49	0.00
3147	3147:WVGD5		25.00	20.00	22.50	25.591	2.13e+006	1.000	30.86	0.00	445.37	329.08	0.00	0.00	329.08	0.00
3147		3147:WVGD6	20.00	15.00	17.50	26.569	2.21e+006	1.000	30.86	0.00	462.61	341.66	0.00	0.00	341.66	0.00
3147	3147:WVGD6		15.00	10.00	12.50	27.548	2.29e+006	1.000	30.86	0.00	479.85	354.24	0.00	0.00	354.24	0.00
3147		3147:WVGD7	10.00	5.00	7.50	28.526	2.37e+006	1.000	30.86	0.00	497.08	366.82	0.00	0.00	366.82	0.00
3147	3147:WVGD7	3147:g	5.00	0.00	2.50	29.505	2.45e+006	1.000	30.86	0.00	514.32	379.40	0.00	0.00	379.40	0.00

*** Analysis Results:

Maximum element usage is 85.23% for Steel Pole "3147" in load case "NESC Extreme"
Maximum insulator usage is 8.34% for Clamp "Clamp9" in load case "NESC Extreme"



*** Analysis Results for Load Case No. 1 "NESC Heavy" - Number of iterations in SAPS 18

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)
3147:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
3147:t	0.01251	4.405	-0.1575	-5.5416	0.0129	-0.0001	0.01251	4.405	86.84
3147:Arm1	0.01228	4.308	-0.1528	-5.5416	0.0129	-0.0001	0.01228	4.308	85.85

3147:TopConn	0.01138	3.923	-0.1342	-5.5030	0.0129	-0.0001	0.01138	3.923	81.87
3147:Arm2	0.01078	3.668	-0.122	-5.4675	0.0129	-0.0001	0.01078	3.668	79.21
3147:BotConn	0.009805	3.263	-0.1029	-5.2478	0.0127	-0.0001	0.009805	3.263	74.9
3147:Arm3	0.008051	2.561	-0.07181	-4.8079	0.0123	-0.0001	0.008051	2.561	66.93
3147:WVGD1	0.007624	2.396	-0.06492	-4.6449	0.0121	-0.0001	0.007624	2.396	64.94
3147:Arm4	0.005667	1.677	-0.03777	-3.8706	0.0110	-0.0001	0.005667	1.677	55.29
3147:WVGD2	0.005604	1.655	-0.03701	-3.8401	0.0109	-0.0001	0.005604	1.655	54.96
3147:WVGD3	0.003828	1.063	-0.01895	-2.9384	0.0093	-0.0001	0.003828	1.063	44.98
3147:WVGD4	0.002367	0.6229	-0.008764	-2.1358	0.0074	-0.0001	0.002367	0.6229	34.99
3147:WVGD5	0.001234	0.3091	-0.003438	-1.4601	0.0055	-0.0001	0.001234	0.3091	25
3147:WVGD6	0.0004536	0.1085	-0.001036	-0.8389	0.0034	-0.0000	0.0004536	0.1085	15
3147:WVGD7	5.234e-005	0.01192	-0.000189	-0.2680	0.0012	-0.0000	5.234e-005	0.01192	5
Davit1:O	0.01227	4.305	-0.2078	-5.5416	0.0129	-0.0001	0.01227	4.875	85.79
Davit1:End	0.0124	4.381	-0.7166	-5.9115	0.0129	-0.0001	0.0124	9.95	86.28
Davit2:O	0.01229	4.311	-0.09784	-5.5416	0.0129	-0.0001	0.01229	3.741	85.9
Davit2:End	0.01262	4.43	0.3799	-5.5341	0.0129	-0.0001	0.01262	-1.139	87.38
Davit3:O	0.01076	3.665	-0.1814	-5.4675	0.0129	-0.0001	0.01076	4.288	79.15
Davit3:End	0.01098	3.793	-0.9979	-6.0372	0.0129	-0.0001	0.01098	12.42	80
Davit4:O	0.01079	3.67	-0.06252	-5.4675	0.0129	-0.0001	0.01079	3.047	79.27
Davit4:End	0.01132	3.866	0.6914	-5.4592	0.0129	-0.0001	0.01132	-4.758	81.69
Davit5:O	0.008039	2.558	-0.1325	-4.8079	0.0123	-0.0001	0.008039	3.283	66.87
Davit5:END	0.008289	2.697	-1.103	-5.6295	0.0123	-0.0002	0.008289	13.92	67.9
Davit6:O	0.008062	2.563	-0.0111	-4.8079	0.0123	-0.0001	0.008062	1.839	66.99
Davit6:END	0.008657	2.768	0.8602	-4.7939	0.0123	-0.0001	0.008657	-8.457	69.86
Davit7:O	0.005658	1.675	-0.09309	-3.8706	0.0110	-0.0001	0.005658	2.495	55.24
Davit7:End	0.005885	1.776	-0.6835	-4.4412	0.0110	-0.0001	0.005885	10.6	56.32
Davit8:O	0.005675	1.679	0.01754	-3.8706	0.0110	-0.0001	0.005675	0.8598	55.35
Davit8:End	0.006081	1.81	0.553	-3.8622	0.0110	-0.0001	0.006081	-7.009	57.55

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 %
3147:g	-0.07	0.0	-7.62	0.0	0.0	-31.05	0.0	0.0	31.97	0.0	661.02	0.0	-2.9	0.0	0.0	0.02	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.
3147	3147:t	Origin	0.00	52.85	0.15	-1.89	-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
3147	3147:Arm1	End	1.00	51.70	0.15	-1.83	0.01	-0.00	0.0	-0.03	0.01	-0.00	-0.00	0.00	0.00	0.00	0.01	0.0	2
3147	3147:Arm1	Origin	1.00	51.70	0.15	-1.83	7.97	-0.00	-0.0	-1.63	0.91	-0.00	-0.15	2.47	0.07	0.00	2.62	4.4	2
3147	3147:TopConn	End	5.00	47.08	0.14	-1.61	11.60	-0.01	-0.0	-1.63	0.91	-0.00	-0.14	3.21	0.06	0.00	3.35	5.6	2
3147	3147:TopConn	Origin	5.00	47.08	0.14	-1.61	11.60	-0.01	-0.0	-4.46	2.92	-0.00	-0.38	3.21	0.20	0.00	3.61	6.0	2
3147	3147:Arm2	End	7.67	44.01	0.13	-1.46	19.39	-0.02	-0.0	-4.46	2.92	-0.00	-0.37	4.99	0.19	0.00	5.36	8.9	2
3147	3147:Arm2	Origin	7.67	44.01	0.13	-1.46	58.01	-0.02	-0.0	-9.33	4.60	-0.01	-0.77	14.92	0.30	0.00	15.70	26.2	2
3147	3147:BotConn	End	12.00	39.15	0.12	-1.23	77.93	-0.06	-0.0	-9.33	4.60	-0.01	-0.72	17.91	0.28	0.00	18.64	31.1	2
3147	3147:BotConn	Origin	12.00	39.15	0.12	-1.23	77.93	-0.06	-0.0	-10.07	3.72	-0.01	-0.78	17.91	0.23	0.00	18.69	31.2	2
3147	Tube 1	End	16.00	34.85	0.11	-1.04	92.82	-0.10	-0.0	-10.07	3.72	-0.01	-0.74	19.32	0.22	0.00	20.07	33.5	2
3147	Tube 1	Origin	16.00	34.85	0.11	-1.04	92.82	-0.10	-0.0	-10.36	3.79	-0.01	-0.76	19.32	0.22	0.00	20.09	33.5	2
3147	3147:Arm3	End	20.00	30.73	0.10	-0.86	107.99	-0.15	-0.0	-10.36	3.79	-0.01	-0.73	20.47	0.21	0.00	21.20	35.3	2
3147	3147:Arm3	Origin	20.00	30.73	0.10	-0.86	157.96	-0.16	-0.0	-15.44	5.31	-0.02	-1.09	29.93	0.30	0.00	31.02	51.7	2
3147	3147:WVGD1	End	22.00	28.75	0.09	-0.78	168.57	-0.19	-0.0	-15.44	5.31	-0.02	-1.06	30.52	0.29	0.00	31.59	52.6	2
3147	3147:WVGD1	Origin	22.00	28.75	0.09	-0.78	168.57	-0.19	-0.0	-16.06	5.42	-0.02	-1.11	30.52	0.30	0.00	31.63	52.7	2

3147	Tube 1	End	26.83	24.24	0.08	-0.60	194.76	-0.28	-0.0	-16.06	5.42	-0.02	-1.05	31.73	0.28	0.00	32.78	54.6	2
3147	Tube 1	Origin	26.83	24.24	0.08	-0.60	194.76	-0.28	-0.0	-16.47	5.45	-0.02	-1.08	31.73	0.28	0.00	32.81	54.7	2
3147	3147:Arm4	End	31.67	20.13	0.07	-0.45	221.13	-0.39	-0.0	-16.47	5.45	-0.02	-1.02	32.58	0.27	0.00	33.61	56.0	2
3147	3147:Arm4	Origin	31.67	20.13	0.07	-0.45	260.65	-0.39	-0.0	-21.38	6.93	-0.03	-1.33	38.40	0.34	0.00	39.73	66.2	2
3147	3147:WVGD2	End	32.00	19.86	0.07	-0.44	262.94	-0.40	-0.0	-21.38	6.93	-0.03	-1.32	38.48	0.34	0.00	39.81	66.3	2
3147	3147:WVGD2	Origin	32.00	19.86	0.07	-0.44	262.94	-0.40	-0.0	-21.97	7.00	-0.03	-1.36	38.48	0.34	0.00	39.84	66.4	2
3147	Tube 1	End	37.00	16.08	0.06	-0.32	297.94	-0.54	-0.0	-21.97	7.00	-0.03	-1.30	39.51	0.33	0.00	40.81	68.0	2
3147	Tube 1	Origin	37.00	16.08	0.06	-0.32	297.94	-0.54	-0.0	-22.46	6.99	-0.03	-1.32	39.51	0.33	0.00	40.84	68.1	2
3147	3147:WVGD3	End	42.00	12.76	0.05	-0.23	332.89	-0.69	-0.0	-22.46	6.99	-0.03	-1.26	40.19	0.31	0.00	41.46	69.8	2
3147	3147:WVGD3	Origin	42.00	12.76	0.05	-0.23	332.89	-0.69	-0.0	-23.28	7.05	-0.03	-1.31	40.19	0.31	0.00	41.50	69.9	2
3147	SpliceT	End	46.50	10.17	0.04	-0.16	364.63	-0.84	-0.0	-23.28	7.05	-0.03	-1.26	40.60	0.30	0.00	41.86	72.1	2
3147	SpliceT	Origin	46.50	10.17	0.04	-0.16	364.63	-0.84	-0.0	-23.90	7.06	-0.04	-1.29	40.60	0.30	0.00	41.90	72.1	2
3147	SpliceB	End	50.00	8.40	0.03	-0.12	389.34	-0.97	-0.0	-23.90	7.06	-0.04	-1.03	34.40	0.24	0.00	35.43	59.0	2
3147	SpliceB	Origin	50.00	8.40	0.03	-0.12	389.34	-0.97	-0.0	-24.42	7.08	-0.04	-1.05	34.40	0.24	0.00	35.45	59.1	2
3147	3147:WVGD4	End	52.00	7.47	0.03	-0.11	403.50	-1.05	-0.0	-24.42	7.08	-0.04	-1.03	34.43	0.24	0.00	35.47	59.1	2
3147	3147:WVGD4	Origin	52.00	7.47	0.03	-0.11	403.50	-1.05	-0.0	-25.21	7.17	-0.04	-1.07	34.43	0.24	0.00	35.50	59.2	2
3147	Tube 2	End	57.00	5.41	0.02	-0.07	439.32	-1.26	-0.0	-25.21	7.17	-0.04	-1.02	34.46	0.23	0.00	35.48	59.1	2
3147	Tube 2	Origin	57.00	5.41	0.02	-0.07	439.32	-1.26	-0.0	-25.89	7.20	-0.05	-1.05	34.46	0.23	0.00	35.51	59.2	2
3147	3147:WVGD5	End	62.00	3.71	0.01	-0.04	475.30	-1.48	-0.0	-25.89	7.20	-0.05	-1.01	34.38	0.22	0.00	35.39	59.0	2
3147	3147:WVGD5	Origin	62.00	3.71	0.01	-0.04	475.30	-1.48	-0.0	-26.92	7.29	-0.05	-1.05	34.38	0.23	0.00	35.43	59.1	2
3147	Tube 2	End	67.00	2.34	0.01	-0.02	511.76	-1.73	-0.0	-26.92	7.29	-0.05	-1.01	34.25	0.22	0.00	35.26	58.8	2
3147	Tube 2	Origin	67.00	2.34	0.01	-0.02	511.76	-1.73	-0.0	-27.65	7.33	-0.05	-1.04	34.25	0.22	0.00	35.29	58.8	2
3147	3147:WVGD6	End	72.00	1.30	0.01	-0.01	548.43	-2.00	-0.0	-27.65	7.33	-0.05	-1.00	34.05	0.21	0.00	35.05	58.4	2
3147	3147:WVGD6	Origin	72.00	1.30	0.01	-0.01	548.43	-2.00	-0.0	-28.73	7.44	-0.06	-1.04	34.05	0.21	0.00	35.09	59.1	2
3147	Tube 2	End	77.00	0.57	0.00	-0.01	585.61	-2.29	-0.0	-28.73	7.44	-0.06	-1.00	33.83	0.21	0.00	34.83	59.8	2
3147	Tube 2	Origin	77.00	0.57	0.00	-0.01	585.61	-2.29	-0.0	-29.50	7.49	-0.06	-1.03	33.83	0.21	0.00	34.86	59.8	2
3147	3147:WVGD7	End	82.00	0.14	0.00	-0.00	623.04	-2.60	-0.0	-29.50	7.49	-0.06	-0.99	33.57	0.20	0.00	34.57	58.2	2
3147	3147:WVGD7	Origin	82.00	0.14	0.00	-0.00	623.04	-2.60	-0.0	-30.64	7.60	-0.07	-1.03	33.57	0.20	0.00	34.61	60.5	2
3147	3147:g	End	87.00	0.00	0.00	0.00	661.02	-2.93	-0.0	-30.64	7.60	-0.07	-1.00	33.30	0.20	0.00	34.30	58.7	2

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

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Vert. Mom. (ft-k)	Horz. Mom. (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Vert. Shear (kips)	Horz. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
Davit1	Davit1:O	Origin	0.00	51.66	0.15	-2.49	-7.44	-0.00	-0.0	0.55	1.48	0.00	0.15	17.44	0.00	0.00	17.58	29.3	1
Davit1	#Davit1:0	End	2.55	52.11	0.15	-5.50	-3.66	-0.00	-0.0	0.55	1.48	0.00	0.16	10.30	0.00	0.00	10.46	17.4	1
Davit1	#Davit1:0	Origin	2.55	52.11	0.15	-5.50	-3.66	-0.00	0.0	0.56	1.44	0.00	0.16	10.30	0.00	0.00	10.46	17.4	1
Davit1	Davit1:End	End	5.10	52.57	0.15	-8.60	0.00	0.00	0.0	0.56	1.44	0.00	0.18	0.00	0.98	0.00	1.71	2.8	3
Davit2	Davit2:O	Origin	0.00	51.73	0.15	-1.17	-0.21	0.00	0.0	-0.02	0.06	-0.00	-0.01	0.49	0.00	0.00	0.49	0.8	1
Davit2	#Davit2:0	End	2.55	52.45	0.15	1.69	-0.05	0.00	0.0	-0.02	0.06	-0.00	-0.01	0.14	0.00	0.00	0.15	0.2	1
Davit2	#Davit2:0	Origin	2.55	52.45	0.15	1.69	-0.05	0.00	0.0	-0.01	0.02	-0.00	-0.00	0.14	0.00	0.00	0.14	0.2	1
Davit2	Davit2:End	End	5.10	53.17	0.15	4.56	-0.00	0.00	0.0	-0.01	0.02	-0.00	-0.00	0.00	0.01	0.00	0.02	0.0	3
Davit3	Davit3:O	Origin	0.00	43.98	0.13	-2.18	-36.85	-0.01	-0.0	0.68	4.57	0.00	0.09	20.60	0.00	0.00	20.69	34.5	1
Davit3	#Davit3:0	End	4.09	44.73	0.13	-6.94	-18.17	-0.00	-0.0	0.68	4.57	0.00	0.12	18.35	0.00	0.00	18.46	30.8	1
Davit3	#Davit3:0	Origin	4.09	44.73	0.13	-6.94	-18.17	-0.00	0.0	0.71	4.45	0.00	0.12	18.35	0.00	0.00	18.47	30.8	1
Davit3	Davit3:End	End	8.17	45.51	0.13	-11.98	0.00	0.00	0.0	0.71	4.45	0.00	0.19	0.00	2.51	0.00	4.35	7.3	3
Davit4	Davit4:O	Origin	0.00	44.05	0.13	-0.75	-0.83	0.00	0.0	-0.05	0.16	-0.00	-0.01	0.46	0.00	0.00	0.47	0.8	1
Davit4	#Davit4:0	End	4.09	45.22	0.13	3.77	-0.19	0.00	0.0	-0.05	0.16	-0.00	-0.01	0.19	0.00	0.00	0.20	0.3	1
Davit4	#Davit4:0	Origin	4.09	45.22	0.13	3.77	-0.19	0.00	0.0	-0.01	0.05	-0.00	-0.00	0.19	0.00	0.00	0.19	0.3	1
Davit4	Davit4:End	End	8.17	46.39	0.14	8.30	-0.00	0.00	0.0	-0.01	0.05	-0.00	-0.00	0.00	0.03	0.00	0.04	0.1	3
Davit5	Davit5:O	Origin	0.00	30.70	0.10	-1.59	-48.40	-0.01	-0.0	0.59	4.62	0.00	0.07	22.97	0.00	0.00	23.04	38.8	1
Davit5	#Davit5:0	End	5.00	31.46	0.10	-6.80	-25.30	-0.01	-0.0	0.59	4.62	0.00	0.10	21.77	0.00	0.00	21.87	36.4	1

Davit5	#Davit5:0	Origin	5.00	31.46	0.10	-6.80	-25.30	-0.01	-0.0	0.63	4.48	0.00	0.10	21.77	0.00	0.00	21.87	36.5	1
Davit5	#Davit5:1	End	7.84	31.91	0.10	-9.95	-12.54	-0.00	-0.0	0.63	4.48	0.00	0.13	16.74	0.00	0.00	16.87	28.1	1
Davit5	#Davit5:1	Origin	7.84	31.91	0.10	-9.95	-12.54	-0.00	0.0	0.66	4.41	0.00	0.13	16.74	0.00	0.00	16.87	28.1	1
Davit5	Davit5:END	End	10.69	32.37	0.10	-13.24	0.00	0.00	0.0	0.66	4.41	0.00	0.17	0.00	2.49	0.00	4.32	7.2	3
Davit6	Davit6:O	Origin	0.00	30.76	0.10	-0.13	-1.48	0.00	0.0	-0.06	0.22	-0.00	-0.01	0.70	0.00	0.00	0.71	1.2	1
Davit6	#Davit6:0	End	5.00	31.91	0.10	4.76	-0.36	0.00	0.0	-0.06	0.22	-0.00	-0.01	0.31	0.00	0.00	0.32	0.5	1
Davit6	#Davit6:0	Origin	5.00	31.91	0.10	4.76	-0.36	0.00	0.0	-0.03	0.10	-0.00	-0.00	0.31	0.00	0.00	0.32	0.5	1
Davit6	#Davit6:1	End	7.84	32.56	0.10	7.54	-0.08	0.00	0.0	-0.03	0.10	-0.00	-0.01	0.11	0.00	0.00	0.12	0.2	1
Davit6	#Davit6:1	Origin	7.84	32.56	0.10	7.54	-0.08	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.11	0.00	0.00	0.12	0.2	1
Davit6	Davit6:END	End	10.69	33.21	0.10	10.32	-0.00	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.00	0.02	0.00	0.03	0.0	3
Davit7	Davit7:O	Origin	0.00	20.11	0.07	-1.12	-36.91	-0.01	-0.0	0.52	4.58	0.00	0.07	20.63	0.00	0.00	20.70	34.5	1
Davit7	#Davit7:0	End	4.09	20.69	0.07	-4.53	-18.20	-0.00	-0.0	0.52	4.58	0.00	0.09	18.38	0.00	0.00	18.47	30.8	1
Davit7	#Davit7:0	Origin	4.09	20.69	0.07	-4.53	-18.20	-0.00	0.0	0.56	4.46	0.00	0.10	18.38	0.00	0.00	18.48	30.8	1
Davit7	Davit7:End	End	8.17	21.32	0.07	-8.20	0.00	0.00	0.0	0.56	4.46	0.00	0.15	0.00	2.52	0.00	4.36	7.3	3
Davit8	Davit8:O	Origin	0.00	20.15	0.07	0.21	-0.84	0.00	0.0	-0.05	0.16	-0.00	-0.01	0.47	0.00	0.00	0.47	0.8	1
Davit8	#Davit8:0	End	4.09	20.94	0.07	3.42	-0.19	0.00	0.0	-0.05	0.16	-0.00	-0.01	0.19	0.00	0.00	0.20	0.3	1
Davit8	#Davit8:0	Origin	4.09	20.94	0.07	3.42	-0.19	0.00	0.0	-0.01	0.05	-0.00	-0.00	0.19	0.00	0.00	0.19	0.3	1
Davit8	Davit8:End	End	8.17	21.72	0.07	6.64	-0.00	0.00	0.0	-0.01	0.05	-0.00	-0.00	0.00	0.03	0.00	0.05	0.1	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Usage %
Clamp1	1.521	80.00	80.00	1.90
Clamp2	0.000	80.00	80.00	0.00
Clamp3	4.456	80.00	80.00	5.57
Clamp4	0.000	80.00	80.00	0.00
Clamp5	4.428	80.00	80.00	5.53
Clamp6	0.000	80.00	80.00	0.00
Clamp7	4.442	80.00	80.00	5.55
Clamp8	0.000	80.00	80.00	0.00
Clamp9	3.261	80.00	80.00	4.08
Clamp10	1.056	80.00	80.00	1.32
Clamp11	0.348	80.00	80.00	0.44
Clamp12	0.348	80.00	80.00	0.44
Clamp13	0.348	80.00	80.00	0.44
Clamp14	0.348	80.00	80.00	0.44
Clamp15	0.348	80.00	80.00	0.44
Clamp16	0.348	80.00	80.00	0.44
Clamp17	0.348	80.00	80.00	0.44

*** Analysis Results for Load Case No. 2 "NESC Extreme" - Number of iterations in SAPS 19

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)
3147:g	0	0	0	0.0000	0.0000	0.0000	0	0	0
3147:t	0.06057	5.718	-0.2546	-6.8801	0.0627	-0.0282	0.06057	5.718	86.75
3147:Arm1	0.05942	5.599	-0.2474	-6.8801	0.0627	-0.0282	0.05942	5.599	85.75
3147:TopConn	0.0548	5.12	-0.2187	-6.8602	0.0627	-0.0283	0.0548	5.12	81.78
3147:Arm2	0.05172	4.802	-0.1996	-6.8224	0.0627	-0.0283	0.05172	4.802	79.13
3147:BotConn	0.04661	4.294	-0.1698	-6.6017	0.0619	-0.0266	0.04661	4.294	74.83
3147:Arm3	0.03756	3.41	-0.1206	-6.0651	0.0593	-0.0241	0.03756	3.41	66.88
3147:WVGD1	0.03534	3.202	-0.1097	-5.8922	0.0582	-0.0228	0.03534	3.202	64.89
3147:Arm4	0.02543	2.281	-0.06553	-5.0076	0.0518	-0.0178	0.02543	2.281	55.26
3147:WVGD2	0.02511	2.252	-0.06427	-4.9740	0.0515	-0.0176	0.02511	2.252	54.94
3147:WVGD3	0.01649	1.474	-0.03358	-3.9319	0.0423	-0.0119	0.01649	1.474	44.97
3147:WVGD4	0.009809	0.8766	-0.0154	-2.9360	0.0322	-0.0078	0.009809	0.8766	34.98
3147:WVGD5	0.004925	0.4408	-0.005641	-2.0503	0.0227	-0.0049	0.004925	0.4408	24.99
3147:WVGD6	0.001744	0.1566	-0.001345	-1.2001	0.0133	-0.0026	0.001744	0.1566	15
3147:WVGD7	0.0001933	0.01743	-0.0001254	-0.3898	0.0043	-0.0008	0.0001933	0.01743	5
Davit1:O	0.05962	5.594	-0.3156	-6.8801	0.0627	-0.0282	0.05962	6.164	85.68
Davit1:End	0.06257	5.679	-0.9316	-7.0507	0.0628	-0.0282	0.06257	11.25	86.07
Davit2:O	0.05921	5.603	-0.1792	-6.8801	0.0627	-0.0282	0.05921	5.033	85.82
Davit2:End	0.05856	5.758	0.4123	-6.8758	0.0627	-0.0282	0.05856	0.189	87.41
Davit3:O	0.05195	4.797	-0.2737	-6.8224	0.0627	-0.0283	0.05195	5.421	79.06
Davit3:End	0.05727	4.941	-1.261	-7.1312	0.0634	-0.0345	0.05727	13.56	79.74
Davit4:O	0.0515	4.806	-0.1255	-6.8224	0.0627	-0.0283	0.0515	4.182	79.2
Davit4:End	0.05052	5.061	0.8125	-6.8176	0.0627	-0.0283	0.05052	-3.563	81.81
Davit5:O	0.03778	3.406	-0.1972	-6.0651	0.0593	-0.0241	0.03778	4.13	66.8
Davit5:END	0.04408	3.562	-1.363	-6.5088	0.0602	-0.0331	0.04408	14.79	67.64
Davit6:O	0.03733	3.414	-0.04411	-6.0651	0.0593	-0.0241	0.03733	2.69	66.96
Davit6:END	0.03622	3.684	1.053	-6.0569	0.0593	-0.0241	0.03622	-7.54	70.05
Davit7:O	0.02562	2.278	-0.1371	-5.0076	0.0518	-0.0178	0.02562	3.097	55.19
Davit7:End	0.02952	2.396	-0.8673	-5.3202	0.0527	-0.0240	0.02952	11.22	56.13
Davit8:O	0.02524	2.284	0.006	-5.0076	0.0518	-0.0178	0.02524	1.465	55.34
Davit8:End	0.02494	2.46	0.6975	-5.0026	0.0518	-0.0178	0.02494	-6.359	57.7

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 %
3147:g	-0.15	0.0	-14.07	0.0	0.0	-16.97	0.0	0.0	22.04	0.0	968.63	0.0	-10.7	0.0	0.0	1.45	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.
3147	3147:t	Origin	0.00	68.62	0.73	-3.06	-0.00	-0.00	-0.0	-0.02	0.02	0.00	-0.00	0.00	0.00	0.00	0.01	0.0	4
3147	3147:Arm1	End	1.00	67.18	0.71	-2.97	0.02	-0.00	-0.0	-0.02	0.02	0.00	-0.00	0.01	0.00	0.00	0.01	0.0	2
3147	3147:Arm1	Origin	1.00	67.18	0.71	-2.97	3.66	-0.00	-0.0	-0.77	0.71	-0.00	-0.07	1.14	0.05	0.00	1.21	2.0	2

3147	3147:TopConn	End	5.00	61.44	0.66	-2.62	6.48	-0.00	-0.0	-0.77	0.71	-0.00	-0.07	1.79	0.05	0.00	1.86	3.1	2
3147	3147:TopConn	Origin	5.00	61.44	0.66	-2.62	6.48	-0.00	-0.0	-1.44	7.49	0.00	-0.12	0.00	1.32	0.00	2.29	3.8	4
3147	3147:Arm2	End	7.67	57.62	0.62	-2.40	26.48	-0.00	-0.0	-1.44	7.49	0.00	-0.12	6.81	0.49	0.00	6.98	11.6	2
3147	3147:Arm2	Origin	7.67	57.62	0.62	-2.40	47.30	-0.09	-0.4	-3.91	9.68	-0.05	-0.32	12.17	0.63	0.06	12.55	20.9	2
3147	3147:BotConn	End	12.00	51.53	0.56	-2.04	89.24	-0.31	-0.4	-3.91	9.68	-0.05	-0.30	20.53	0.60	0.06	20.86	34.8	2
3147	3147:BotConn	Origin	12.00	51.53	0.56	-2.04	89.24	-0.31	-0.4	-4.72	6.03	-0.05	-0.37	20.53	0.37	0.06	20.91	34.8	2
3147	Tube 1	End	16.00	46.12	0.50	-1.73	113.35	-0.52	-0.4	-4.72	6.03	-0.05	-0.35	23.63	0.35	0.05	23.99	40.0	2
3147	Tube 1	Origin	16.00	46.12	0.50	-1.73	113.35	-0.52	-0.4	-4.94	6.20	-0.05	-0.36	23.63	0.36	0.05	24.01	40.0	2
3147	3147:Arm3	End	20.00	40.92	0.45	-1.45	138.13	-0.74	-0.4	-4.94	6.20	-0.05	-0.35	26.22	0.35	0.05	26.58	44.3	2
3147	3147:Arm3	Origin	20.00	40.92	0.45	-1.45	165.02	-0.84	-1.0	-7.57	8.25	-0.11	-0.53	31.32	0.46	0.11	31.87	53.1	2
3147	3147:WVGD1	End	22.00	38.42	0.42	-1.32	181.51	-1.05	-1.0	-7.57	8.25	-0.11	-0.52	32.93	0.45	0.10	33.46	55.8	2
3147	3147:WVGD1	Origin	22.00	38.42	0.42	-1.32	181.51	-1.05	-1.0	-7.84	8.53	-0.11	-0.54	32.93	0.47	0.10	33.48	55.8	2
3147	Tube 1	End	26.83	32.67	0.36	-1.03	222.76	-1.57	-1.0	-7.84	8.53	-0.11	-0.51	36.37	0.44	0.09	36.89	61.5	2
3147	Tube 1	Origin	26.83	32.67	0.36	-1.03	222.76	-1.56	-1.0	-8.16	8.72	-0.11	-0.53	36.37	0.45	0.09	36.92	61.5	2
3147	3147:Arm4	End	31.67	27.37	0.31	-0.79	264.94	-2.08	-1.0	-8.16	8.72	-0.11	-0.51	39.13	0.43	0.08	39.65	66.1	2
3147	3147:Arm4	Origin	31.67	27.37	0.31	-0.79	286.43	-2.16	-1.5	-10.72	10.69	-0.16	-0.67	42.30	0.53	0.12	42.98	71.6	2
3147	3147:WVGD2	End	32.00	27.03	0.30	-0.77	289.96	-2.21	-1.5	-10.72	10.69	-0.16	-0.66	42.54	0.53	0.12	43.22	72.0	2
3147	3147:WVGD2	Origin	32.00	27.03	0.30	-0.77	289.96	-2.21	-1.5	-10.98	10.94	-0.16	-0.68	42.54	0.54	0.12	43.23	72.1	2
3147	Tube 1	End	37.00	22.08	0.25	-0.57	344.63	-3.01	-1.5	-10.98	10.94	-0.16	-0.65	45.83	0.51	0.11	46.49	77.5	2
3147	Tube 1	Origin	37.00	22.08	0.25	-0.57	344.63	-2.99	-1.5	-11.37	11.12	-0.16	-0.67	45.83	0.52	0.11	46.52	77.5	2
3147	3147:WVGD3	End	42.00	17.69	0.20	-0.40	400.23	-3.80	-1.5	-11.37	11.12	-0.16	-0.64	48.47	0.50	0.10	49.12	81.9	2
3147	3147:WVGD3	Origin	42.00	17.69	0.20	-0.40	400.23	-3.78	-1.5	-11.83	11.45	-0.16	-0.67	48.47	0.51	0.10	49.15	81.9	2
3147	SpliceT	End	46.50	14.20	0.16	-0.29	451.75	-4.50	-1.5	-11.83	11.45	-0.16	-0.64	50.46	0.49	0.09	51.11	85.2	2
3147	SpliceT	Origin	46.50	14.20	0.16	-0.29	451.75	-4.49	-1.5	-12.30	11.62	-0.16	-0.66	50.46	0.50	0.09	51.14	85.2	2
3147	SpliceB	End	50.00	11.79	0.13	-0.22	492.41	-5.05	-1.5	-12.30	11.62	-0.16	-0.53	43.64	0.40	0.07	44.18	73.6	2
3147	SpliceB	Origin	50.00	11.79	0.13	-0.22	492.41	-5.04	-1.5	-12.68	11.74	-0.16	-0.55	43.64	0.40	0.07	44.20	73.7	2
3147	3147:WVGD4	End	52.00	10.52	0.12	-0.18	515.88	-5.36	-1.5	-12.68	11.74	-0.16	-0.54	44.16	0.39	0.07	44.71	74.5	2
3147	3147:WVGD4	Origin	52.00	10.52	0.12	-0.18	515.88	-5.35	-1.5	-13.10	12.04	-0.16	-0.55	44.16	0.40	0.07	44.72	74.5	2
3147	Tube 2	End	57.00	7.67	0.09	-0.12	576.06	-6.14	-1.5	-13.10	12.04	-0.16	-0.53	45.33	0.39	0.06	45.86	76.4	2
3147	Tube 2	Origin	57.00	7.67	0.09	-0.12	576.06	-6.13	-1.5	-13.61	12.26	-0.15	-0.55	45.33	0.39	0.06	45.88	76.5	2
3147	3147:WVGD5	End	62.00	5.29	0.06	-0.07	637.37	-6.91	-1.5	-13.61	12.26	-0.15	-0.53	46.25	0.38	0.06	46.79	78.0	2
3147	3147:WVGD5	Origin	62.00	5.29	0.06	-0.07	637.37	-6.90	-1.5	-14.21	12.64	-0.15	-0.55	46.25	0.39	0.06	46.81	78.0	2
3147	Tube 2	End	67.00	3.36	0.04	-0.04	700.57	-7.69	-1.5	-14.21	12.64	-0.15	-0.53	47.03	0.38	0.05	47.57	79.3	2
3147	Tube 2	Origin	67.00	3.36	0.04	-0.04	700.57	-7.67	-1.5	-14.76	12.88	-0.15	-0.55	47.03	0.38	0.05	47.59	79.3	2
3147	3147:WVGD6	End	72.00	1.88	0.02	-0.02	764.96	-8.45	-1.5	-14.76	12.88	-0.15	-0.53	47.64	0.37	0.05	48.18	80.3	2
3147	3147:WVGD6	Origin	72.00	1.88	0.02	-0.02	764.96	-8.44	-1.5	-15.41	13.27	-0.15	-0.56	47.64	0.38	0.05	48.21	80.3	2
3147	Tube 2	End	77.00	0.83	0.01	-0.01	831.32	-9.22	-1.5	-15.41	13.27	-0.15	-0.54	48.17	0.37	0.05	48.71	81.2	2
3147	Tube 2	Origin	77.00	0.83	0.01	-0.01	831.32	-9.20	-1.5	-15.99	13.53	-0.15	-0.56	48.17	0.37	0.05	48.73	81.2	2
3147	3147:WVGD7	End	82.00	0.21	0.00	-0.00	898.96	-9.97	-1.5	-15.99	13.53	-0.15	-0.54	48.58	0.36	0.04	49.12	82.7	2
3147	3147:WVGD7	Origin	82.00	0.21	0.00	-0.00	898.96	-9.96	-1.5	-16.67	13.93	-0.15	-0.56	48.58	0.37	0.04	49.14	82.8	2
3147	3147:g	End	87.00	0.00	0.00	0.00	968.63	-10.73	-1.5	-16.67	13.93	-0.15	-0.54	48.93	0.36	0.04	49.48	84.7	2

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

Element Label	Joint Label	Joint Position	Rel. Dist. (ft)	Trans. Defl. (in)	Long. Defl. (in)	Vert. Defl. (in)	Vert. Mom. (ft-k)	Horz. Mom. (ft-k)	Tors. Mom. (ft-k)	Axial Force (kips)	Vert. Shear (kips)	Horz. Shear (kips)	P/A (ksi)	M/S. (ksi)	V/Q. (ksi)	T/R. (ksi)	Res. (ksi)	Max. Usage %	At Pt.
Davit1	Davit1:O	Origin	0.00	67.13	0.72	-3.79	-3.44	-0.00	-0.0	0.45	0.69	0.00	0.12	8.07	0.00	0.00	8.19	13.7	1
Davit1	#Davit1:0	End	2.55	67.64	0.73	-7.46	-1.68	-0.00	-0.0	0.45	0.69	0.00	0.13	4.73	0.00	0.00	4.86	8.1	1
Davit1	#Davit1:0	Origin	2.55	67.64	0.73	-7.46	-1.68	-0.00	0.0	0.45	0.66	0.00	0.13	4.73	0.00	0.00	4.87	8.1	1
Davit1	Davit1:End	End	5.10	68.15	0.75	-11.18	0.00	0.00	0.0	0.45	0.66	0.00	0.14	0.00	0.45	0.00	0.79	1.3	3
Davit2	Davit2:O	Origin	0.00	67.23	0.71	-2.15	-0.12	0.00	0.0	-0.01	0.04	-0.00	-0.00	0.28	0.00	0.00	0.28	0.5	1
Davit2	#Davit2:0	End	2.55	68.17	0.71	1.40	-0.03	0.00	0.0	-0.01	0.04	-0.00	-0.00	0.08	0.00	0.00	0.09	0.1	1
Davit2	#Davit2:0	Origin	2.55	68.17	0.71	1.40	-0.03	0.00	0.0	-0.00	0.01	-0.00	-0.00	0.08	0.00	0.00	0.08	0.1	1
Davit2	Davit2:End	End	5.10	69.10	0.70	4.95	-0.00	0.00	0.0	-0.00	0.01	-0.00	-0.00	0.00	0.01	0.00	0.01	0.0	3

Davit3	Davit3:O	Origin	0.00	57.57	0.62	-3.28	-20.02	-0.42	-0.0	1.55	2.49	0.05	0.20	11.19	0.01	0.00	11.39	19.0	1
Davit3	#Davit3:0	End	4.09	58.42	0.65	-9.14	-9.84	-0.21	-0.0	1.55	2.49	0.05	0.27	9.93	0.02	0.00	10.20	17.0	1
Davit3	#Davit3:0	Origin	4.09	58.42	0.65	-9.14	-9.84	-0.21	0.0	1.56	2.41	0.05	0.27	9.93	0.02	0.00	10.20	17.0	1
Davit3	Davit3:End	End	8.17	59.29	0.69	-15.14	0.00	0.00	0.0	1.56	2.41	0.05	0.41	0.00	1.36	0.00	2.39	4.0	3
Davit4	Davit4:O	Origin	0.00	57.67	0.62	-1.51	-0.47	0.00	0.0	-0.04	0.09	-0.00	-0.00	0.26	0.00	0.00	0.27	0.4	1
Davit4	#Davit4:0	End	4.09	59.20	0.61	4.12	-0.11	0.00	0.0	-0.04	0.09	-0.00	-0.01	0.11	0.00	0.00	0.11	0.2	1
Davit4	#Davit4:0	Origin	4.09	59.20	0.61	4.12	-0.11	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.11	0.00	0.00	0.11	0.2	1
Davit4	Davit4:End	End	8.17	60.73	0.61	9.75	-0.00	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.00	0.01	0.00	0.03	0.0	3
Davit5	Davit5:O	Origin	0.00	40.87	0.45	-2.37	-26.25	-0.55	-0.0	1.45	2.52	0.05	0.17	12.46	0.01	0.00	12.63	21.3	1
Davit5	#Davit5:0	End	5.00	41.74	0.49	-8.78	-13.65	-0.29	-0.0	1.45	2.52	0.05	0.23	11.75	0.02	0.00	11.98	20.0	1
Davit5	#Davit5:0	Origin	5.00	41.74	0.49	-8.78	-13.65	-0.29	-0.0	1.47	2.43	0.05	0.24	11.75	0.02	0.00	11.98	20.0	1
Davit5	#Davit5:1	End	7.84	42.24	0.51	-12.53	-6.75	-0.14	-0.0	1.47	2.43	0.05	0.29	9.01	0.02	0.00	9.31	15.5	1
Davit5	#Davit5:1	Origin	7.84	42.24	0.51	-12.53	-6.75	-0.14	0.0	1.48	2.37	0.05	0.30	9.01	0.02	0.00	9.31	15.5	1
Davit5	Davit5:END	End	10.69	42.75	0.53	-16.36	0.00	0.00	0.0	1.48	2.37	0.05	0.39	0.00	1.34	0.00	2.35	3.9	3
Davit6	Davit6:O	Origin	0.00	40.97	0.45	-0.53	-0.87	0.00	0.0	-0.05	0.13	-0.00	-0.01	0.41	0.00	0.00	0.42	0.7	1
Davit6	#Davit6:0	End	5.00	42.49	0.44	5.63	-0.21	0.00	0.0	-0.05	0.13	-0.00	-0.01	0.18	0.00	0.00	0.19	0.3	1
Davit6	#Davit6:0	Origin	5.00	42.49	0.44	5.63	-0.21	0.00	0.0	-0.02	0.06	-0.00	-0.00	0.18	0.00	0.00	0.19	0.3	1
Davit6	#Davit6:1	End	7.84	43.35	0.44	9.13	-0.05	0.00	0.0	-0.02	0.06	-0.00	-0.00	0.07	0.00	0.00	0.07	0.1	1
Davit6	#Davit6:1	Origin	7.84	43.35	0.44	9.13	-0.05	0.00	0.0	-0.01	0.02	-0.00	-0.00	0.07	0.00	0.00	0.07	0.1	1
Davit6	Davit6:END	End	10.69	44.21	0.43	12.64	-0.00	0.00	0.0	-0.01	0.02	-0.00	-0.00	0.00	0.01	0.00	0.02	0.0	3
Davit7	Davit7:O	Origin	0.00	27.34	0.31	-1.64	-20.26	-0.42	-0.0	1.36	2.52	0.05	0.18	11.33	0.01	0.00	11.50	19.2	1
Davit7	#Davit7:0	End	4.09	28.04	0.33	-5.95	-9.96	-0.21	-0.0	1.36	2.52	0.05	0.24	10.05	0.02	0.00	10.29	17.2	1
Davit7	#Davit7:0	Origin	4.09	28.04	0.33	-5.95	-9.96	-0.21	0.0	1.37	2.44	0.05	0.24	10.05	0.02	0.00	10.29	17.2	1
Davit7	Davit7:End	End	8.17	28.76	0.35	-10.41	0.00	0.00	0.0	1.37	2.44	0.05	0.36	0.00	1.38	0.00	2.41	4.0	3
Davit8	Davit8:O	Origin	0.00	27.41	0.30	0.07	-0.49	0.00	0.0	-0.03	0.09	-0.00	-0.00	0.28	0.00	0.00	0.28	0.5	1
Davit8	#Davit8:0	End	4.09	28.47	0.30	4.22	-0.11	0.00	0.0	-0.03	0.09	-0.00	-0.01	0.11	0.00	0.00	0.12	0.2	1
Davit8	#Davit8:0	Origin	4.09	28.47	0.30	4.22	-0.11	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.11	0.00	0.00	0.11	0.2	1
Davit8	Davit8:End	End	8.17	29.52	0.30	8.37	-0.00	0.00	0.0	-0.01	0.03	-0.00	-0.00	0.00	0.02	0.00	0.03	0.0	3

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

Clamp Label	Force (kips)	Input Holding Capacity (kips)	Factored Holding Capacity (kips)	Usage %
Clamp1	0.789	80.00	80.00	0.99
Clamp2	0.000	80.00	80.00	0.00
Clamp3	2.843	80.00	80.00	3.55
Clamp4	0.000	80.00	80.00	0.00
Clamp5	2.779	80.00	80.00	3.47
Clamp6	0.000	80.00	80.00	0.00
Clamp7	2.770	80.00	80.00	3.46
Clamp8	0.000	80.00	80.00	0.00
Clamp9	6.671	80.00	80.00	8.34
Clamp10	3.871	80.00	80.00	4.84
Clamp11	0.162	80.00	80.00	0.20
Clamp12	0.162	80.00	80.00	0.20
Clamp13	0.162	80.00	80.00	0.20
Clamp14	0.162	80.00	80.00	0.20
Clamp15	0.162	80.00	80.00	0.20
Clamp16	0.162	80.00	80.00	0.20
Clamp17	0.162	80.00	80.00	0.20

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

Summary of Steel Pole Usages:

Steel Pole Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
3147	85.23	NESC Extreme	14	7641.0

Summary of Tubular Davit Usages:

Tubular Davit Label	Maximum Usage %	Load Case	Segment Number	Weight (lbs)
Davit1	29.31	NESC Heavy	1	59.9
Davit2	0.82	NESC Heavy	1	59.9
Davit3	34.48	NESC Heavy	1	159.2
Davit4	0.78	NESC Heavy	1	159.2
Davit5	38.78	NESC Heavy	1	220.0
Davit6	1.19	NESC Heavy	1	220.0
Davit7	34.50	NESC Heavy	1	159.2
Davit8	0.79	NESC Heavy	1	159.2

*** Maximum Stress Summary for Each Load Case

Summary of Maximum Usages by Load Case:

Load Case	Maximum Usage %	Element Label	Element Type
NESC Heavy	72.12	3147	Steel Pole
NESC Extreme	85.23	3147	Steel Pole

Summary of Steel Pole Usages by Load Case:

Load Case	Maximum Usage %	Steel Pole Label	Segment Number
NESC Heavy	72.12	3147	14
NESC Extreme	85.23	3147	14

Summary of Tubular Davit Usages by Load Case:

Load Case	Maximum Usage %	Tubular Davit Label	Segment Number
NESC Heavy	38.78	Davit5	1
NESC Extreme	21.26	Davit5	1

Summary of Insulator Usages:

Insulator Label	Insulator Type	Maximum Usage %	Load Case	Weight (lbs)

Clamp1	Clamp	1.90	NESC Heavy	0.0
Clamp2	Clamp	0.00	NESC Heavy	0.0
Clamp3	Clamp	5.57	NESC Heavy	0.0
Clamp4	Clamp	0.00	NESC Heavy	0.0
Clamp5	Clamp	5.53	NESC Heavy	0.0
Clamp6	Clamp	0.00	NESC Heavy	0.0
Clamp7	Clamp	5.55	NESC Heavy	0.0
Clamp8	Clamp	0.00	NESC Heavy	0.0
Clamp9	Clamp	8.34	NESC Extreme	0.0
Clamp10	Clamp	4.84	NESC Extreme	0.0
Clamp11	Clamp	0.44	NESC Heavy	0.0
Clamp12	Clamp	0.44	NESC Heavy	0.0
Clamp13	Clamp	0.44	NESC Heavy	0.0
Clamp14	Clamp	0.44	NESC Heavy	0.0
Clamp15	Clamp	0.44	NESC Heavy	0.0
Clamp16	Clamp	0.44	NESC Heavy	0.0
Clamp17	Clamp	0.44	NESC Heavy	0.0

Loads At Insulator Attachments For All Load Cases:

Load Case	Insulator Label	Insulator Type	Structure Attach Label	Structure Attach Load X (kips)	Structure Attach Load Y (kips)	Structure Attach Load Z (kips)	Structure Attach Load Res. (kips)
NESC Heavy	Clamp1	Clamp	Davit1:End	0.000	0.690	1.355	1.521
NESC Heavy	Clamp2	Clamp	Davit2:End	0.000	0.000	-0.000	0.000
NESC Heavy	Clamp3	Clamp	Davit3:End	0.000	1.161	4.302	4.456
NESC Heavy	Clamp4	Clamp	Davit4:End	0.000	0.000	-0.000	0.000
NESC Heavy	Clamp5	Clamp	Davit5:END	0.000	1.055	4.300	4.428
NESC Heavy	Clamp6	Clamp	Davit6:END	0.000	0.000	-0.000	0.000
NESC Heavy	Clamp7	Clamp	Davit7:End	0.000	1.135	4.295	4.442
NESC Heavy	Clamp8	Clamp	Davit8:End	0.000	0.000	-0.000	0.000
NESC Heavy	Clamp9	Clamp	3147:TopConn	0.000	1.667	2.803	3.261
NESC Heavy	Clamp10	Clamp	3147:BotConn	0.000	-0.992	0.362	1.056
NESC Heavy	Clamp11	Clamp	3147:WVGD1	0.000	0.055	0.344	0.348
NESC Heavy	Clamp12	Clamp	3147:WVGD2	0.000	0.055	0.344	0.348
NESC Heavy	Clamp13	Clamp	3147:WVGD3	0.000	0.055	0.344	0.348
NESC Heavy	Clamp14	Clamp	3147:WVGD4	0.000	0.055	0.344	0.348
NESC Heavy	Clamp15	Clamp	3147:WVGD5	0.000	0.055	0.344	0.348
NESC Heavy	Clamp16	Clamp	3147:WVGD6	0.000	0.055	0.344	0.348
NESC Heavy	Clamp17	Clamp	3147:WVGD7	0.000	0.055	0.344	0.348
NESC Extreme	Clamp1	Clamp	Davit1:End	0.000	0.500	0.610	0.789
NESC Extreme	Clamp2	Clamp	Davit2:End	0.000	0.000	-0.000	0.000
NESC Extreme	Clamp3	Clamp	Davit3:End	0.050	1.752	2.238	2.843
NESC Extreme	Clamp4	Clamp	Davit4:End	0.000	0.000	-0.000	0.000
NESC Extreme	Clamp5	Clamp	Davit5:END	0.050	1.650	2.235	2.779
NESC Extreme	Clamp6	Clamp	Davit6:END	0.000	0.000	-0.000	0.000
NESC Extreme	Clamp7	Clamp	Davit7:End	0.050	1.640	2.232	2.770
NESC Extreme	Clamp8	Clamp	Davit8:End	0.000	0.000	-0.000	0.000
NESC Extreme	Clamp9	Clamp	3147:TopConn	0.000	6.538	1.324	6.671
NESC Extreme	Clamp10	Clamp	3147:BotConn	0.000	-3.868	0.156	3.871
NESC Extreme	Clamp11	Clamp	3147:WVGD1	0.000	0.142	0.079	0.162
NESC Extreme	Clamp12	Clamp	3147:WVGD2	0.000	0.142	0.079	0.162
NESC Extreme	Clamp13	Clamp	3147:WVGD3	0.000	0.142	0.079	0.162
NESC Extreme	Clamp14	Clamp	3147:WVGD4	0.000	0.142	0.079	0.162
NESC Extreme	Clamp15	Clamp	3147:WVGD5	0.000	0.142	0.079	0.162
NESC Extreme	Clamp16	Clamp	3147:WVGD6	0.000	0.142	0.079	0.162
NESC Extreme	Clamp17	Clamp	3147:WVGD7	0.000	0.142	0.079	0.162

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	5.101	0.000	19.825	498.120	0.000	0.000
NESC Extreme	9.206	0.150	9.348	741.016	10.350	-1.433

*** Weight of structure (lbs):
Weight of Tubular Davit Arms: 1196.4
Weight of Steel Poles: 7641.0
Total: 8837.4

*** End of Report

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft

Standard (1)

Section 1 - Site Information

Site ID: CT11385A
Status: Draft
Version: 4
Project Type: L600
Approved: Not Approved
Approved By: Not Approved
Last Modified: 4/22/2019 4:48:52 PM
Last Modified By: GSM1900\DYerra1

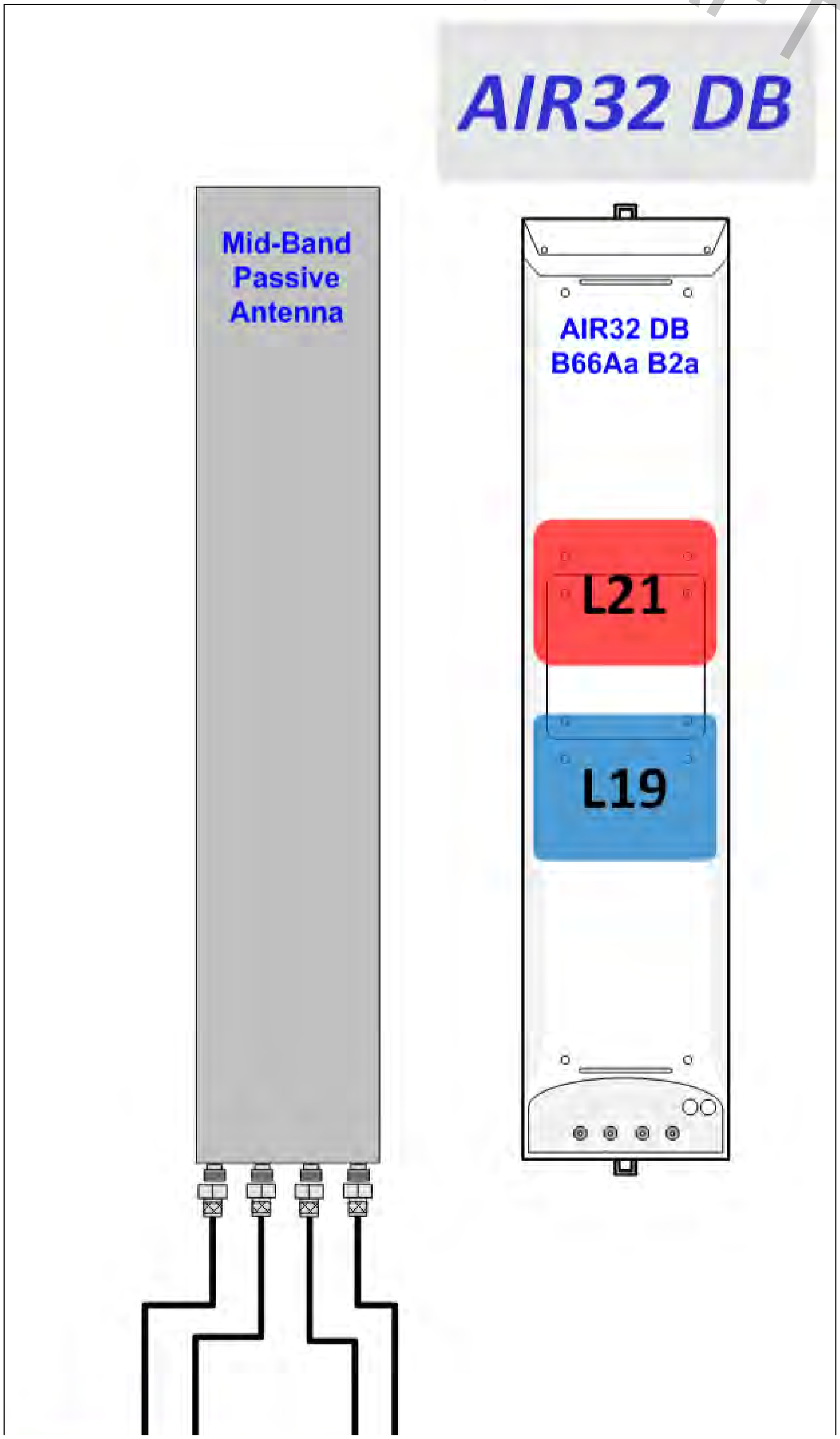
Site Name: BLOOMFIELD/RT187/RT189
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2019
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: CL&P

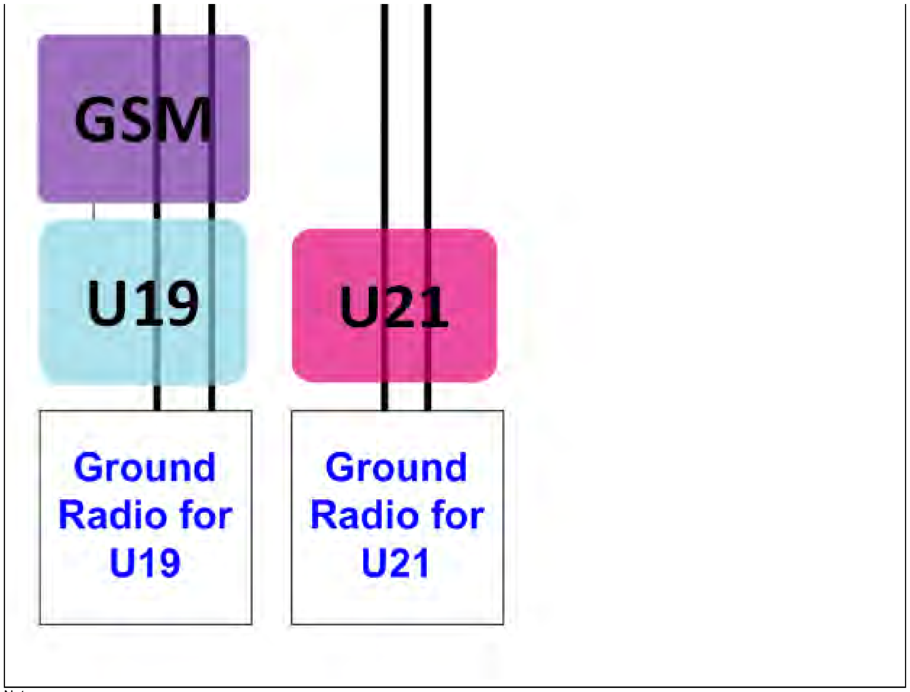
Latitude: 41.8653670000
Longitude: -72.7618240000
Address: 142 Duncaster Road
City, State: Bloomfield, CT
Region: NORTHEAST

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

Section 2 - Existing Template Images

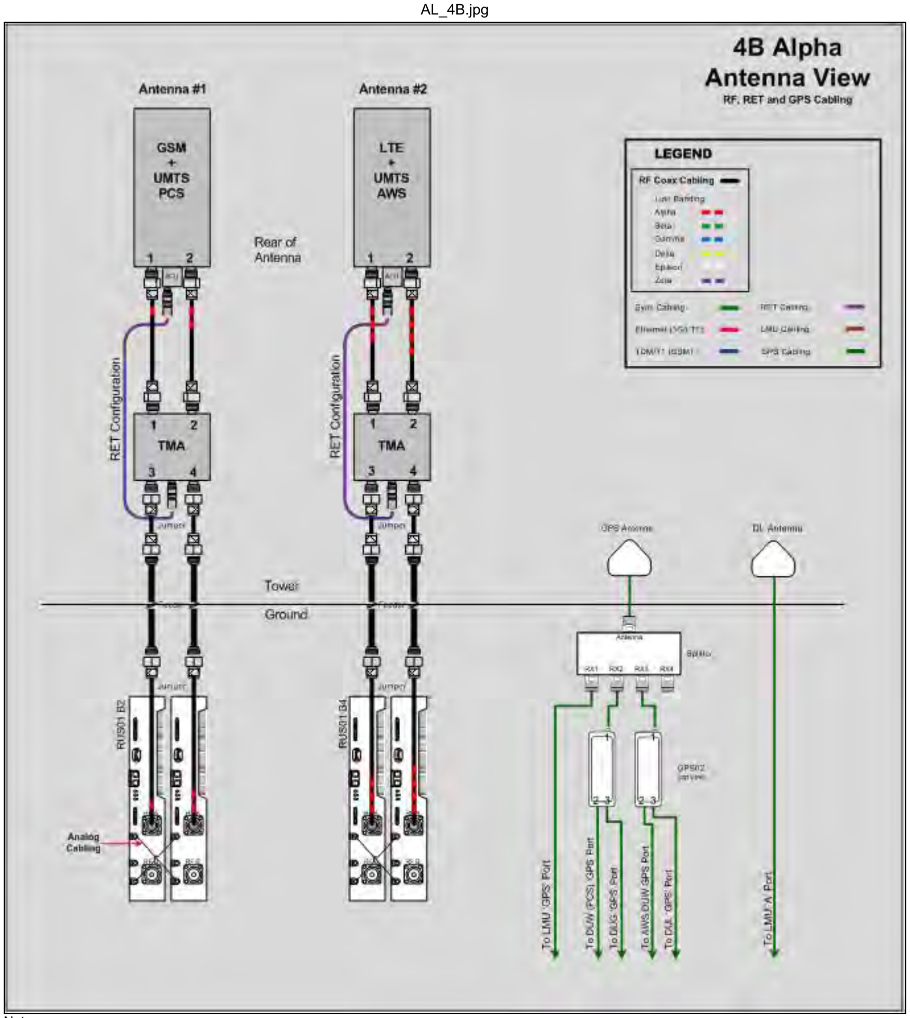
94DB_1xAIR+1QP.png





Notes:

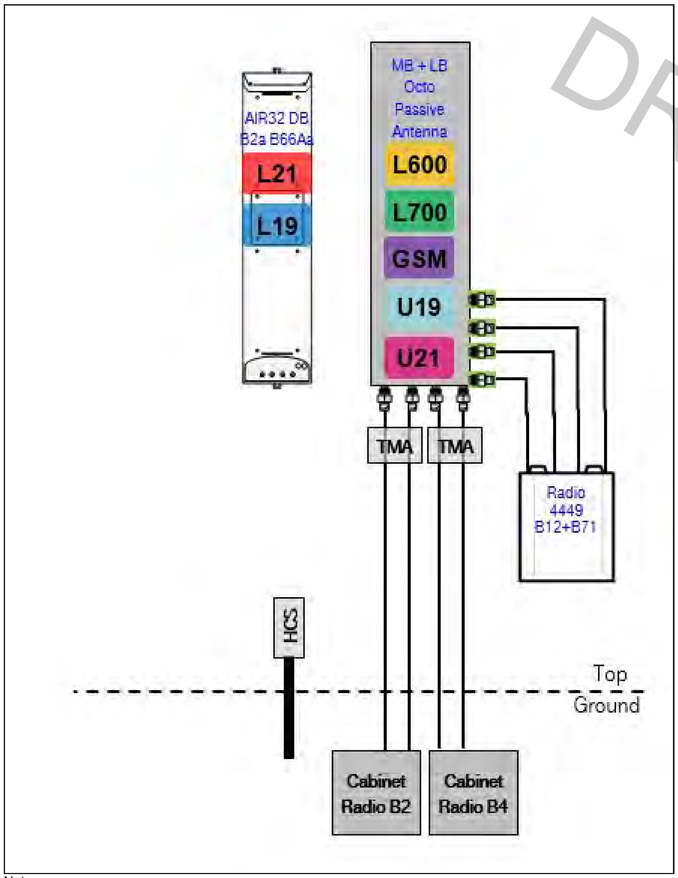
AL_4B.jpg



Notes:

Section 3 - Proposed Template Images

67D94DB_1xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

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RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft
Standard (1)

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 94DB Outdoor (evolved from 4B)

Enclosure	1	2
Enclosure Type	RBS 6102	RBS 3106
Baseband	DUW30 (x 2); DUL20 (L1900, L2100); DUG20	
Radio	RUS01 B2 (x 3) G1900; RUS01 B2 (x 3) L1900; RUS01 B4 (x 6); RUS01 B4 (x 3) U2100	

Proposed RAN Equipment

Template: 67D94B Outdoor

Enclosure	1	2
Enclosure Type	RBS 6102	RBS 3106
Baseband	DUW30 (U2100); DUW30; DUG20 (G1900); BB 6630 (L700, L600, L2100, L1900); BB 6630 (N600)	
Radio	RUS01 B2 (x 3) L1900; RUS01 B2 (x 3); RUS01 B4 (x 3) U2100; RUS01 B4 (x 6)	

RAN Scope of Work:

Replace (1) DU with (1) BB6630 for LTE.
Install (1) BB6630 for future 5G N600.
Existing: (12) Coaxial Lines

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft
Standard (1)

Section 6 - A&L Equipment

Existing Template: 4B_2DP
Proposed Template: 67D94B_1DP+1OP

Sector 1 (Existing) view from behind		
Coverage Type	A - Outdoor Macro	
Antenna	1	2
Antenna Model	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
Azimuth	20	20
M. Tilt		
Height	100	90
Ports	P1	P2
Active Tech.	L1900 G1900	U2100 L2100
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	2	2
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**
TMAs	Generic Twin Style 1A - PCS (AtAntenna)	Generic Twin Style 1B - AWS (AtAntenna)
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft

Standard (1)

Sector 1 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	RFS - APXVAR18_43-C-NA20 (Quad)		Empty Antenna Mount (Empty mount)
Azimuth	20		
M. Tilt			
Height	96		90
Ports	P1	P2	
Active Tech.	L700 L600 N600	U2100 L2100 L1900 G1900	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**	
TMAs		Generic Twin Style 1A - PCS (AtCabinet) Generic Twin Style 1B - AWS (AtCabinet)	
Diplexers / Combiners		Generic AWS/PCS Diplexer (AtCabinet)	
Radio	Radio 4449 B71+B85 (At Cabinet)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)	

Unconnected Equipment:

Scope of Work:

*** Existing TMAs are ground mounted ***
*** No Style 1B AWS TMA existing on site ***
Smart Bias-T at site.
Daisy Chain RETs.
Remove Antenna at Position 1 at 100 Feet.
Install (1) LB/MB Quad in Position 1.
Connect (2) lines to Low-Band ports.
Connect (2) lines to Mid-Band ports.
Add (1) PCS/AWS diplexer at Ground Level, and connect it to two lines for Mid-Band Ports of LB/MB Quad.
Add (1) AWS TMA at Ground Level.
Add (1) Radio 4449 B71+B12 for L600+L700 at Ground Level, and connect to two lines for Low-Band Ports of LB/MB Quad.
Remove Antenna in Position 2 at 90 Feet. Position 2 will be left empty.

RAN Template:	A&L Template:
67D94B Outdoor	67D94B_1DP+1OP

CT11385A_L600_4_draft

Standard (1)

Sector 2 (Existing) view from behind		
Coverage Type	A - Outdoor Macro	
Antenna	1	2
Antenna Model	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
Azimuth	110	110
M. Tilt		
Height	100	90
Ports	P1	P2
Active Tech.	L1900 G1900	U2100 L2100
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	5	3
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**
TMAs	Generic Twin Style 1A - PCS (AtAntenna)	Generic Twin Style 1B - AWS (AtAntenna)
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft
Standard (1)

Sector 2 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	RFS - APXVAR18_43-C-NA20 (Quad)		Empty Antenna Mount (Empty mount)
Azimuth	110		
M. Tilt			
Height	96		90
Ports	P1	P2	
Active Tech.	L700 L600 N600	U2100 L2100 L1900 G1900	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**	
TMAs		Generic Twin Style 1A - PCS (AtCabinet) Generic Twin Style 1B - AWS (AtCabinet)	
Diplexers / Combiners		Generic AWS/PCS Diplexer (AtCabinet)	
Radio	Radio 4449 B71+B85 (At Cabinet)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)	

Unconnected Equipment:

Scope of Work:

*** Existing TMAs are ground mounted ***
*** No Style 1B AWS TMA existing on site ***
Smart Bias-T at site.
Daisy Chain RETs.
Remove Antenna at Position 1 at 100 Feet.
Install (1) LB/MB Quad in Position 1.
Connect (2) lines to Low-Band ports.
Connect (2) lines to Mid-Band ports.
Add (1) PCS/AWS diplexer at Ground Level, and connect it to two lines for Mid-Band Ports of LB/MB Quad.
Add (1) AWS TMA at Ground Level.
Add (1) Radio 4449 B71+B12 for L600+L700 at Ground Level, and connect to two lines for Low-Band Ports of LB/MB Quad.
Remove Antenna in Position 2 at 90 Feet. Position 2 will be left empty.

RAN Template:	A&L Template:
67D94B Outdoor	67D94B_1DP+1OP

CT11385A_L600_4_draft
Standard (1)

Sector 3 (Existing) view from behind		
Coverage Type	A - Outdoor Macro	
Antenna	1	2
Antenna Model	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
Azimuth	210	210
M. Tilt		
Height	100	90
Ports	P1	P2
Active Tech.	L1900 G1900	U2100 L2100
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	2	2
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**
TMAs	Generic Twin Style 1A - PCS (AtAntenna)	Generic Twin Style 1B - AWS (AtAntenna)
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
67D94B Outdoor	67D94B_1DP+1OP

CT11385A_L600_4_draft

Standard (1)

Sector 3 (Proposed) view from behind			
Coverage Type	A - Outdoor Macro		
Antenna	1		2
Antenna Model	RFS - APXVAR18_43-C-NA20 (Quad)		Empty Antenna Mount (Empty mount)
Azimuth	210		
M. Tilt			
Height	96		90
Ports	P1	P2	
Active Tech.	L700 L600 N600	U2100 L2100 L1900 G1900	
Dark Tech.			
Restricted Tech.			
Decomm. Tech.			
E. Tilt	2	2	
Cables	1-1/4" Coax - 120 ft. **(x2)**	1-1/4" Coax - 120 ft. **(x2)**	
TMAs		Generic Twin Style 1A - PCS (AtCabinet) Generic Twin Style 1B - AWS (AtCabinet)	
Diplexers / Combiners		Generic AWS/PCS Diplexer (AtCabinet)	
Radio	Radio 4449 B71+B85 (At Cabinet)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)	

Unconnected Equipment:

Scope of Work:

*** Existing TMAs are ground mounted ***
*** No Style 1B AWS TMA existing on site ***

Smart Bias-T at site.
Daisy Chain RETs.

Remove Antenna at Position 1 at 100 Feet.
Install (1) LB/MB Quad in Position 1.
Connect (2) lines to Low-Band ports.
Connect (2) lines to Mid-Band ports.
Add (1) PCS/AWS diplexer at Ground Level, and connect it to two lines for Mid-Band Ports of LB/MB Quad.
Add (1) AWS TMA at Ground Level.
Add (1) Radio 4449 B71+B12 for L600+L700 at Ground Level, and connect to two lines for Low-Band Ports of LB/MB Quad.

Remove Antenna in Position 2 at 90 Feet. Position 2 will be left empty.

RAN Template: 67D94B Outdoor	A&L Template: 67D94B_1DP+1OP

CT11385A_L600_4_draft

Standard (1)

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

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

Proposed Power Systems Equipment

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746/1695-2200MHz, 65deg, 15.0/18.9dBi, 1.8m(6.0ft), VET, RET, 5-19°/2-12° Tilt Range

FEATURES / BENEFITS

This antenna provides a 4 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- 16 Inch Width & 68" Length For Easier Zoning
- Rear Fed Connectors For Roof Top Installations
- 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 two AISG RET motors - Includes 0.5m AISG jumper for optional daisy chaining

Technical Features

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

Frequency Band	MHz	617-698	698-746
Gain Typical	dBi	14.7	15.0
Gain Over All Tilts	dBi	14.1 +/- 0.6	14.4 +/- 0.6
Horizontal Beamwidth @3dB	Deg	66.1+/-1.3	63.8+/-1.7
Vertical Beamwidth @3dB	Deg	15.5 +/- 1.2	14.1 +/- 1.0
Electrical Downtilt Range	Deg	5 to 19	
Upper Side Lobe Suppression 0 to +20	dB	14.7	16.2
Front-to-Back, at +/-30°, Copolar	dB	23.9	24.4
Cross Polar Discrimination (XPD) @ Boresight	dB	19.8	23.3
Cross Polar Discrimination (XPD) @ +/-60	dB	8.8	8.4
3rd Order PIM 2 x 43dBm	dBc	-153	
VSWR	-	1.5:1	
Cross Polar Isolation	dB	25	
Maximum Effective Power per Port	Watt	250	

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746/1695-2200MHz, 65deg, 15.0/18.9dBi, 1.8m(6.0ft), VET, RET, 5-19°/2-12° Tilt Range

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

Frequency Band	MHz	1695-1880	1850-1990	1920-2200
Gain Typical	dBi	17.8	18.1	18.9
Gain Over All Tilts	dBi	17.5 +/- 0.3	17.6 +/- 0.5	18.2 +/- 0.7
Horizontal Beamwidth @3dB	Deg	66.7+/-3.2	69.1+/-2.2	64.3+/-6.2
Vertical Beamwidth @3dB	Deg	5.8 +/- 0.2	5.5 +/- 0.2	5.1 +/- 0.3
Electrical Downtilt Range	Deg	2 to 12		
Upper Side Lobe Suppression 0 to +20	dB	17.3	17.5	16.6
Front-to-Back, at +/-30°, Copolar	dB	25.6	24.9	26.5
Cross Polar Discrimination (XPD) @ Boresight	dB	24.5	27.4	20.5
Cross Polar Discrimination (XPD) @ +/-60	dB	8.8	10	2.8
3rd Order PIM 2 x 43dBm	dBc	-153		
VSWR	-	1.5:1		
Cross Polar Isolation	dB	25		
Maximum Effective Power per Port	Watt	250		

ELECTRICAL SPECIFICATIONS

Impedance	Ohm	50.0
Polarization	Deg	±45°

MECHANICAL SPECIFICATIONS

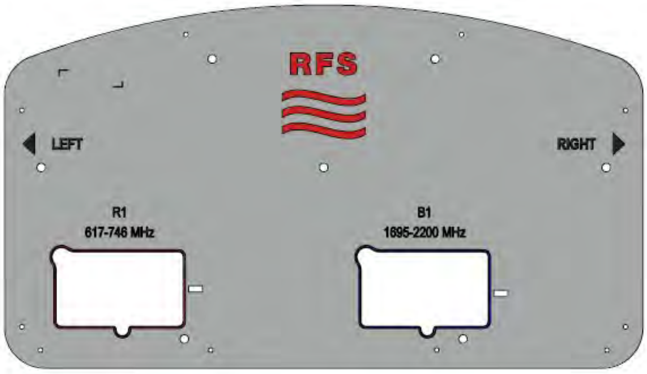
Dimensions - H x W x D	mm (in)	1726 x 405 x 228 (68 x 16 x 9)
Weight (Antenna Only)	kg (lb)	22 (48.4)
Weight (Mounting Hardware only)	kg (lb)	3.4 (7.5)
Packing size- HxWxD	mm (in)	1835 x 485 x 395 (72.2 x 19.1 x 15.6)
Shipping Weight	kg (lb)	31.5 (69.4)
Connector type		4 x 4.3-10 female on back + 4 AISG connectors (2 male, 2 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable)
Radome Material / Color		ASA / Light Grey RAL7035
Mechanical Distance between Mointing Points	mm (in)	(46.5) (46.5)

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		IEC 61000-4-5, DC Ground
Survival/Rated Wind Velocity	km/h	240 (150)
Wind Load @Rated Wind Front	N	890.0
Wind Load @Rated Wind Side	N	448.0
Wind Load @Rated Wind Rear	N	862.0
Environmental		ETSI 300-019-2-4 Class 4.1E

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746/1695-2200MHz, 65deg, 15.0/18.9dBi, 1.8m(6.0ft), VET, RET, 5-19°/2-12° Tilt Range



ORDERING INFORMATION

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Weight
APXVAR18_43-C-NA20	Field Replace RET included (2)	APM40-2 Beam tilt kit (included)	60-120mm	25.4 Kg

External Document Links

APM40_Series_Installation_Instructions

Global RFS Website

Notes

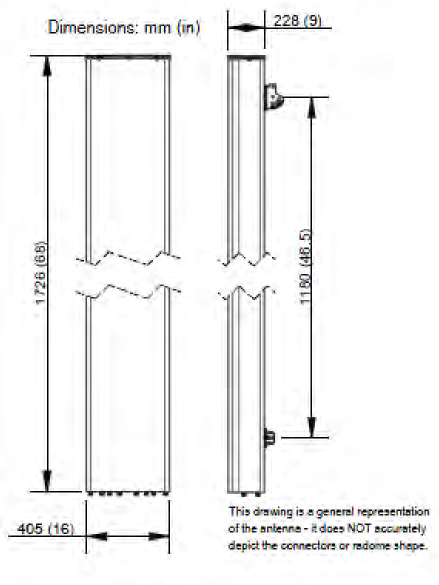
All electrical parameters are compliant with BASTA NGMN 10.0 requirements.
For additional mounting information please click "External Document Links".

External Link Reference

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

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746/1695-2200MHz, 65deg, 15.0/18.9dBi, 1.8m(6.0ft), VET, RET, 5-19°/2-12° Tilt Range



APXVAR18 Rear Fed Connectors

Product Specifications

COMMSCOPE

POWERED BY ANDREW

ATSBT-TOP-FM-4G

Teletilt® Top Smart Bias Tee

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

General Specifications

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

Electrical Specifications

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

Mechanical Specifications

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

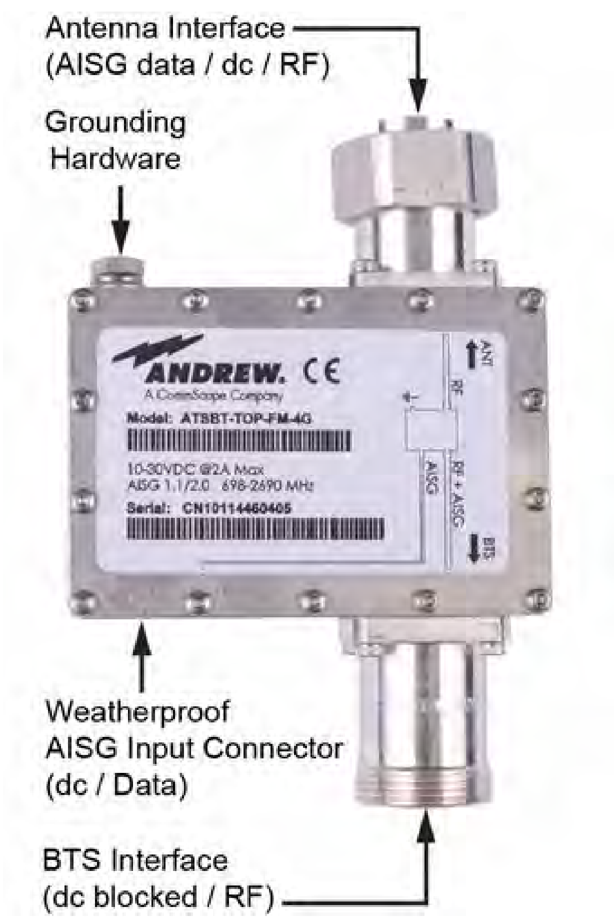
Product Specifications

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

Environmental Specifications

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

Interface Port Drawing



Dimensions

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

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption

Exhibit E

EBI Consulting

environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CT11385A

Bloomfield/RT187/RT189
142 Duncaster Road
Bloomfield, Connecticut 06002

May 30, 2019

EBI Project Number: 6219001891

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**8.32%**

May 30, 2019

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

Emissions Analysis for Site: CT11385A - Bloomfield/RT187/RT189

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **142 Duncaster Road** in **Bloomfield, Connecticut** 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 ($\mu W/cm^2$). 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.

Public 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 and 700 MHz frequency 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), 2100 MHz (AWS) and 11 GHz frequency bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at 142 Duncaster Road in Bloomfield, Connecticut 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 manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report, the sample point is the top of a 6-foot person standing at the base of the tower.

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

1) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

2) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

3) 4 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

4) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

5) 2 UMTS/LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 90 Watts per Channel.

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

7) For the following calculations, the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

8) The antennas used in this modeling are the RFS APXVAR18_43-C-NA20 for the 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector A, the RFS APXVAR18_43-C-NA20 for the 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector B, the RFS APXVAR18_43-C-NA20 for the 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector C. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, 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.

9) The antenna mounting height centerline of the proposed antennas is 100 feet above ground level (AGL).

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

11) All calculations were done with respect to uncontrolled / general population threshold limits.

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T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	RFS APXVAR18_43-C-NA20	Make / Model:	RFS APXVAR18_43-C-NA20	Make / Model:	RFS APXVAR18_43-C-NA20
Frequency Bands:	600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz
Gain:	12.55 dBd / 12.85 dBd / 15.95 dBd / 15.95 dBd / 16.75 dBd	Gain:	12.55 dBd / 12.85 dBd / 15.95 dBd / 15.95 dBd / 16.75 dBd	Gain:	12.55 dBd / 12.85 dBd / 15.95 dBd / 15.95 dBd / 16.75 dBd
Height (AGL):	100 feet	Height (AGL):	100 feet	Height (AGL):	100 feet
Channel Count:	12	Channel Count:	12	Channel Count:	12
Total TX Power (W):	540 Watts	Total TX Power (W):	540 Watts	Total TX Power (W):	540 Watts
ERP (W):	20,197.76	ERP (W):	20,197.76	ERP (W):	20,197.76
Antenna A1 MPE %:	**8.32%**	Antenna B1 MPE %:	**8.32%**	Antenna C1 MPE %:	**8.32%**
Antenna A4 MPE %:	**0.00%**	Antenna B4 MPE %:	**0.00%**	Antenna C4 MPE %:	**0.00%**

Site Composite MPE %	
Carrier	**MPE %**
T-Mobile (Max at Sector A):	8.32%
no additional carriers	N/A
Site Total MPE % :	8.32%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	8.32%
T-Mobile Sector B Total:	8.32%
T-Mobile Sector C Total:	8.32%
Site Total MPE % :	8.32%

T-Mobile Maximum MPE Power Values (Sector A)

T-Mobile Frequency Band / Technology (Sector A)	# 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	2	539.66	100.0	3.88	600 MHz LTE	400	0.97%
T-Mobile 700 MHz LTE	2	578.26	100.0	4.16	700 MHz LTE	467	0.89%
T-Mobile 1900 MHz GSM	4	1180.65	100.0	16.98	1900 MHz GSM	1000	1.70%
T-Mobile 1900 MHz LTE PCS	2	2361.30	100.0	16.98	1900 MHz LTE PCS	1000	1.70%
T-Mobile 2100 MHz UMTS/LTE	2	4258.36	100.0	30.62	2100 MHz UMTS/LTE	1000	3.06%
						Total:	**8.32%**

• NOTE: Totals may vary by approximately 0.01% due to summation of remainders in calculations.

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:	8.32%
Sector B:	8.32%
Sector C:	8.32%
T-Mobile Maximum MPE % (Sector A):	8.32%
Site Total:	8.32%
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **8.32%** 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.

Exhibit F

56 Prospect Street,
Hartford, CT 06103

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

January 12, 2021

Mr. Sheldon Freincle
Northeast Site Solutions
420 Main St,
Sturbridge, MA 01566

RE: T-Mobile Antenna Site CT11385A, 142 Duncaster Rd, Bloomfield, CT, Eversource Structure 3147

Dear Mr. Freincle:

Based on our reviews of the site drawings, the structural analysis and foundation review provided by Centek Engineering, along with a third party review performed by Paul J. Ford and Company, we accept the proposed modification.

Please work with Christopher Gelinas of Eversource Real Estate to process the site lease amendment. Please do not hesitate to contact us with questions or concerns. Christopher can be contacted at 860-665-2008, and I can be contacted at (203) 623-0409.

Sincerely,

Richard Badon

Richard Badon
Transmission Line Engineering

Ref: 19066.04 CT11385A Structural Analysis Rev 1 19.10.30
2021-0105_19066.04 CT11385A - Rev1 CDs (S&S)

Exhibit G

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Flat Rate Env

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Ref#: 385-L600
0006

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

C017

SHIP TO:
SUZETTE DEBEATHAM-BROWN
MAYOR OF BLOOMFIELD
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

USPS TRACKING #

9405 5036 9930 0234 3082 54

Electronic Rate Approved #038555749

Cut on dotted line.

Instructions

1. **Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.**
2. **Place your label so it does not wrap around the edge of the package.**
3. **Adhere your label to the package. A self-adhesive label is recommended. If tape or glue is used, DO NOT TAPE OVER BARCODE. Be sure all edges are secure.**
4. **To mail your package with PC Postage®, you may schedule a Package Pickup online, hand to your letter carrier, take to a Post Office™, or drop in a USPS collection box.**
5. **Mail your package on the "Ship Date" you selected when creating this label.**

Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0234 3082 54

Trans. #:	521522327
Print Date:	01/13/2021
Ship Date:	01/15/2021
Expected Delivery Date:	01/19/2021

Priority Mail® Postage:	**$7.75**
Total:	**$7.75**

From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Ref#: 385-L600

To: SUZETTE DEBEATHAM-BROWN
MAYOR OF BLOOMFIELD
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.

Thank you for shipping with the United States Postal Service!
Check the status of your shipment on the USPS Tracking® page at usps.com

Click-N-Ship®

UNITED STATES POSTAL SERVICE®

P

usps.com
$7.75
US POSTAGE
Flat Rate Env

9405 5036 9930 0234 3082 92 0000 0000 0010 6002

01/15/2021 Mailed from 01566 062S0000001308

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Expected Delivery Date: 01/19/21
Ref#: 385A-L600
0006

C017

SHIP TO:
JOSE GINER
DIRECTOR PLANNING & ZONING
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

USPS TRACKING #

9405 5036 9930 0234 3082 92

Electronic Rate Approved #038555749

Cut on dotted line.

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Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0234 3082 92

Trans. #:	521522327	Priority Mail® Postage:	**$7.75**
Print Date:	01/13/2021	Total:	**$7.75**
Ship Date:	01/15/2021		
Expected Delivery Date:	01/19/2021		

From: DEBORAH CHASE Ref#: 385A-L600
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

To: JOSE GINER
DIRECTOR PLANNING & ZONING
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

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UNITED STATES POSTAL SERVICE®

Click-N-Ship®

P

usps.com
$7.75
US POSTAGE
Flat Rate Env

9405 5036 9930 0234 3083 15 0000 0000 0010 6037

01/15/2021

Mailed from 01566 062S0000001310

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Expected Delivery Date: 01/19/21
Ref#: 385A-L600
0006

C015

SHIP TO:
CHRIS GELINAS
EVERSOURCE
107 SELDEN ST
BERLIN CT 06037-1616

USPS TRACKING #

9405 5036 9930 0234 3083 15

Electronic Rate Approved #038555749

Cut on dotted line.

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Click-N-Ship® Label Record

USPS TRACKING # :

9405 5036 9930 0234 3083 15

Trans. #:	521522327	Priority Mail® Postage:	**$7.75**
Print Date:	01/13/2021	Total:	**$7.75**
Ship Date:	01/15/2021		
Expected Delivery Date:	01/19/2021		

From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Ref#: 385A-L600

To: CHRIS GELINAS
EVERSOURCE
107 SELDEN ST
BERLIN CT 06037-1616

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UNITED STATES POSTAL SERVICE®

Click-N-Ship®

P

usps.com
$7.75
US POSTAGE
Flat Rate Env

9405 5036 9930 0234 3083 39 0000 0000 0010 6051

01/15/2021 Mailed from 01566 062S00000000314

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Expected Delivery Date: 01/19/21
Ref#: 385A-L600
0006

C006

SHIP TO: LISA A MATTHEWS
CT SITING COUNCIL
10 FRANKLIN SQ
NEW BRITAIN CT 06051-2655

USPS TRACKING #

9405 5036 9930 0234 3083 39

Electronic Rate Approved #038555749

Cut on dotted line.

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From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Ref#: 385A-L600

To: LISA A MATTHEWS
CT SITING COUNCIL
10 FRANKLIN SQ
NEW BRITAIN CT 06051-2655

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Exhibit H

Deborah Chase

From: Deborah Chase
Sent: Friday, January 15, 2021 8:43 AM
To: 'sbrown@bloomfield.org'
Subject: FW: 142 DUNCASTER ROAD, BLOOMFIELD CT 06002 T-MOBILE EM APPLICATION (CT11385A-L600)
Attachments: 142 DUNCASTER ROAD, BLOOMFIELD, CT 06002 T-MOBILE EM APPLICATION (CT11385A L600).pdf

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From: Deborah Chase <deborah@northeastsitesolutions.com>
Sent: Friday, January 15, 2021 8:41 AM
To: 'mayor-sbrown@bloomfieldct.org' <mayor-sbrown@bloomfieldct.org>; 'jginer@bloomfieldct.org' <jginer@bloomfieldct.org>
Cc: 'Gelinas, Christopher' <christopher.gelinas@eversource.com>
Subject: 142 DUNCASTER ROAD, BLOOMFIELD CT 06002 T-MOBILE EM APPLICATION (CT11385A-L600)

Good morning
This is to inform you that you will be receiving a copy of T-Mobile's Exempt Modification (Zoning) Application to the CT Siting Council for the site listed above.
It will be delivered via Priority Mail.
Please let me know if you have any questions.
Thank you very much

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

NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
www.northeastsitesolutions.com

Save a tree. Refuse.Reduce. Reuse. Recycle.

Deborah Chase

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To: 'mayor-sbrown@bloomfieldct.org'; 'jginer@bloomfieldct.org'
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