Transcend Wireless

10 Industrial Avenue,
Suite 3
Mahwah, NJ 07430

Phone: 201.684.0055
Fax: 201.684.0066

August 5, 2019

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Notice of Exempt Modification
26 South Orange Center Road, Orange CT
Latitude: 41.25553056
Longitude: -73.01088056
T-Mobile site: CT11720A//L600

Dear Ms. Bachman,

T-Mobile currently maintains (9) existing antennas at the 150' level of the existing 180'Monople at 26 So. Orange Center Road in Orange, Connecticut. The tower and the property is owned by the Town of Orange. T-Mobile now intends to replace (3) of its existing antennas with (3) new 600/700 MHz antennas, and add (3) RRUs. These antennas and RRUs would be installed at the same 150' level of the tower, with proposed mount modifications as per the attached mount analysis.

Planned Modifications:

Remove:
(6) 1-5/8" coax cables

Remove and Replace:
Antennas/TMAs/RRUs:
(3) Ericsson AIR21 panel antennas (REMOVE) - (3) Ericsson AIR3246 B66 panel antennas (REPLACE) 600/700 MHz

Existing to Remain:
Antennas/TMAs/RRUs/coax:
(3) Ericsson AIR32
(3) RFSAPXVAARR24_43
(3) Ericsson KRY112 TMAs
(3) Ericsson 4449 B71 B12 RRUs
(6) 1-5/8" coax cables
(1) 6x12 fiber

Install New:
Antennas/TMAs/RRUs/coax:
(3) Ericsson 4415 B25 RRUs
(2) 6x12 fiber

This facility was approved by the Town of Orange, with no record approval, however in a letter from the Town of Orange to the Council dated August 27, 2001, there is acknowledgement that the Facility was approved by the Orange Planning and Zoning Commission. A copy of that correspondence is attached. Subsequent Exempt Modifications have been approved on this tower an there are no known conditions that would restrict exempt modifications

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. 16-50j-72(b)(2). In accordance with R.C.S.A. 16-50j-73, a copy of this letter is being sent to First Selectman Zeoli, Paul Dinice, Zoning Administrator & Enforcement Officer, as well as the tower and property 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 modification 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 modification 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,

Elizabeth Jamieson

Elizabeth Jamieson
Transcend Wireless
10 Industrial Ave., Suite 3
Mahwah, New Jersey 07430
860-605-7808
EJamieson@TranscendWireless.com

cc:
James Zeoli, Orange First Selectman and Property Owner
Paul Dinice, Zoning Administrator & Enforcement Officer

Exhibit A

Original Facility Approval

ORANGE CONNECTICUT 1822 TOWN SEAL

Town of Orange, Connecticut

Office of the First Selectman

TOWN HALL
617 ORANGE CENTER ROAD
ORANGE, CONNECTICUT 06477-2499

TELEPHONE: (203) 891-2122
FAX: (203) 891-2185

August 27, 2001

Joel M. Rinebold, Executive Director
State of Connecticut
Connecticut Siting Council
Ten Franklin Square
New Britain, Connecticut 06051

Dear Mr. Rinebold,

It is my understanding that Sprint Spectrum LP will be making an application to the Connecticut Siting Council to co-locate a telecommunications wireless antenna on a soon-to-be constructed monopole at the Orange Transfer Station on South Orange Center Road, Orange.

Please be advised that the Town of Orange is a co-applicant in this application and hereby requests approval of this particular application. The monopole to be constructed by AT&T Wireless is on Town-owned property and has been approved by the Orange Town Plan and Zoning Commission.

If there are any questions or concerns, please contact me.

Thank you for your consideration.

Sincerely,

Mitchell R. Goldblatt
First Selectman

Copy: Town Attorney Brian Stone
Douglas L. Culp, Network Building and Consulting, LLC.

Exhibit B

Property card

RED CEDAR RD

Location	RED CEDAR RD	**Mblu**	13/ 7/ 1A/ /
Acct#	34500	**Owner**	ORANGE TOWN OF
Assessment	$2,174,000	**Appraisal**	$3,105,800
PID	555	**Building Count**	1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$12,900	$3,092,900	$3,105,800
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$9,000	$2,165,000	$2,174,000

Owner of Record

Owner	ORANGE TOWN OF
Co-Owner	TOWN DUMP AND OTHER TOWN OWNED LAND
Address	617 ORANGE CENTER RD ORANGE, CT 06477

Sale Price	$0
Certificate	
Book & Page	232/ 655
Sale Date	02/11/1971
Instrument	00

Ownership History

Ownership History					
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Instrument**	**Sale Date**
ORANGE TOWN OF	$0		232/ 655	00	02/11/1971

Building Information

Building 1 : Section 1

Year Built:
Living Area: 0
Replacement Cost
Less Depreciation: $0

Building Attributes	
Field	**Description**
Style	Outbuildings
Model	

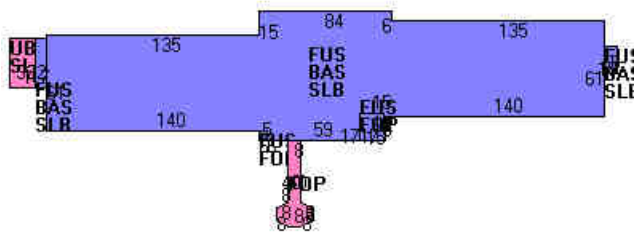
Stories	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure	
Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Floor 1	
Interior Floor 2	
Heat Fuel	
Heat Type	
AC Type	
Bedrooms	
Full Baths	
Half Baths	
Extra Fixtures	
Total Rooms	
Stacks	
Fireplace(s)	
Gas Fireplace(s)	
Attic	
Frame	
Traffic	
Bsmt Gar(s)	
SF FBM	
Basement	
Bsmt Floor	

Building Photo

13-7-1A 03/08/2017

(http://images.vgsi.com/photos/OrangeCTPhotos//\00\01\22/64.

Building Layout



(http://images.vgsi.com/photos/OrangeCTPhotos//Sketches/555_

Building Sub-Areas (sq ft)	Legend
No Data for Building Sub-Areas	

Extra Features

Extra Features	Legend
No Data for Extra Features	

Land

Land Use

Use Code	512E
Description	Exempt Vac w/ OB
Zone	RES
Neighborhood	C20
Alt Land Appr	No

Land Line Valuation

Size (Acres)	40.61
Frontage	
Depth	
Assessed Value	$2,165,000
Appraised Value	$3,092,900

Category

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
FGR3	Garage w/Basement			510 UNITS	$12,900	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$12,900	$3,092,900	$3,105,800
2015	$12,900	$3,092,900	$3,105,800
2014	$12,900	$3,092,900	$3,105,800

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$9,000	$2,165,000	$2,174,000
2015	$9,000	$2,165,000	$2,174,000
2014	$9,000	$2,165,000	$2,174,000

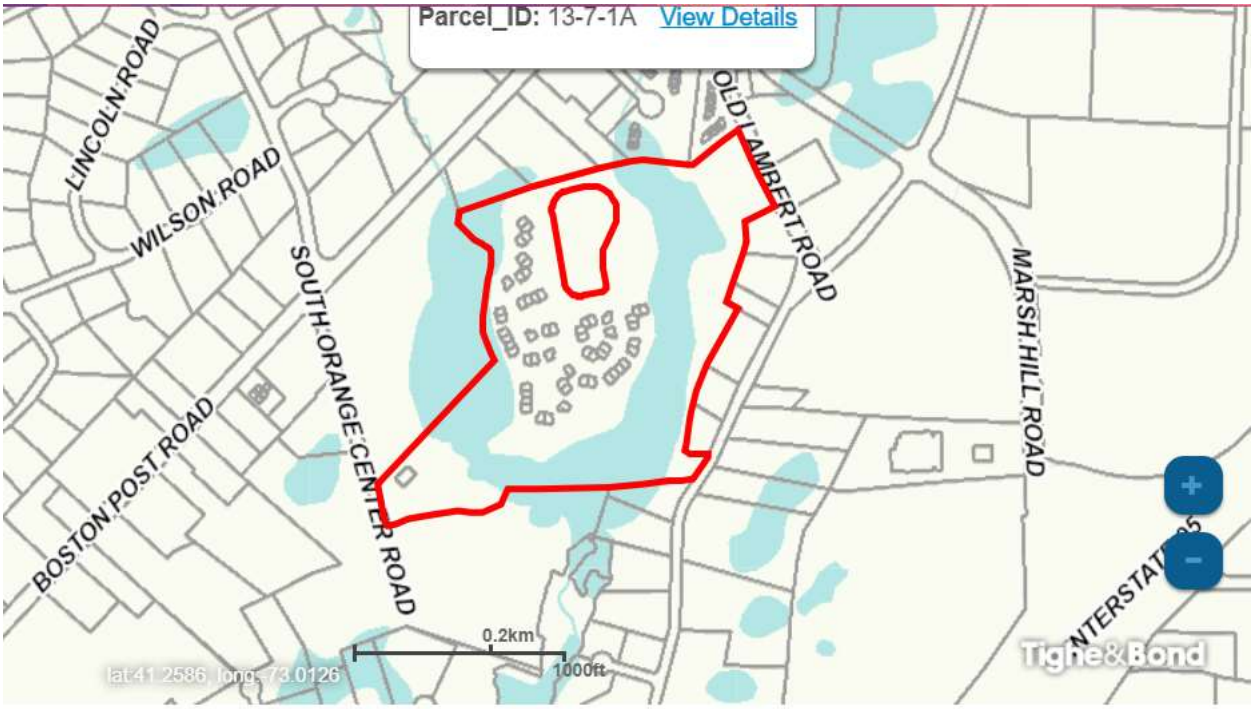

Parcel_ID: 13-7-1A View Details
LINCOLN ROAD
WILSON ROAD
SOUTH ORANGE CENTER ROAD
BOSTON POST ROAD
OLD LAMBERT ROAD
MARSH HILL ROAD
0.2km
1000ft
lat 41.2586, long -73.0126
Tighe&Bond

Exhibit C

Construction Drawings

T-Mobile

WIRELESS COMMUNICATIONS FACILITY

CT720/TOWN OF ORANGE_MP

SITE ID: CT11720A

26 S ORANGE CENTER RD

ORANGE, CT 06477

T-MOBILE RF CONFIGURATION

67D92M_2xAIR+1OP

PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK CONSISTS OF A MODIFICATION TO THE EXISTING UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:
   - A. REMOVE THREE (3) EXISTING ANTENNAS, ONE (1) PER SECTOR
   - B. RELOCATE THREE (3) EXISTING TMA'S, ONE (1) PER SECTOR
   - C. INSTALL THREE (3) NEW AIR 32 ANTENNAS, ONE (1) PER SECTOR
   - D. INSTALL THREE (3) NEW RADIO REMOTE UNITS, ONE (1) PER SECTOR.
   - E. INSTALL TWO (2) NEW HYBRID CABLES
   - F. REMOVE SIX (6) EXISTING COAX CABLES
   - G. INSTALL DUAL SWIVEL MOUNTS, TYP OF (1) PER SECTOR TO ACCOMMODATE EXISTING/PROPOSED RADIO REMOTE UNITS

PROJECT INFORMATION

SITE NAME:	CT720/TOWN OF ORANGE_MP
SITE ID:	CT11720A
SITE ADDRESS:	26 S ORANGE CENTER RD ORANGE, CT 06477
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	DAN REID (PROJECT MANAGER) TRANSCEND WIRELESS, LLC (203) 592-8291
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405
PROJECT COORDINATES:	LATITUDE: 41°-15'-20.07" N LONGITUDE: 73°-00'-39.34" W GROUND ELEVATION: 47'± AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

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." 2018 CONNECTICUT FIRE SAFETY CODE, 2017 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.

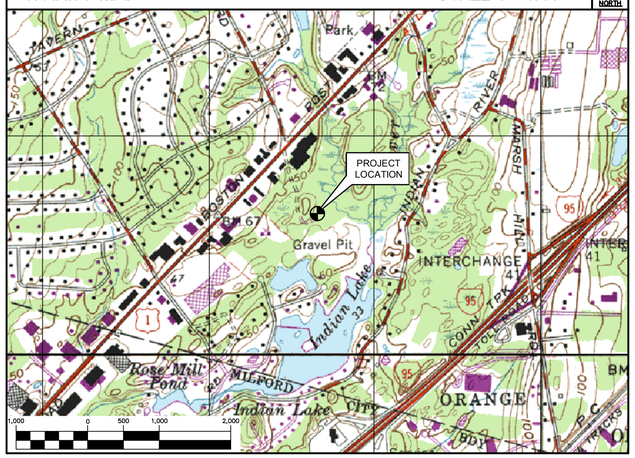
SITE DIRECTIONS

FROM: 35 GRIFFIN ROAD SOUTH, BLOOMFIELD, CT 06002 **TO:** 26 S ORANGE CENTER RD, ORANGE, CT 06477

1.	HEAD NORTH ON GRIFFIN ROAD S. TOWARD HARTMAN RD.	0.30 MI.
2.	TAKE THE 2ND RIGHT ONTO DAY HILL RD.	3.64 MI.
3.	MERGE ONTO I-91 S TOWARD HARTFORD.	45.80 MI.
4.	KEEP RIGHT TOWARD NY CITY.	0.08 MI.
5.	MERGE ONTO I-95 S/GOVERNOR JOHN DAVIS LODGE TPKE S TOWARD NY CITY/N Y CITY.	5.69 MI.
6.	TAKE THE MARSH HILL RD EXIT, EXIT 41.	0.29 MI.
7.	TURN RIGHT ONTO MARSH HILL RD.	0.33 MI.
8.	MARSH HILL RD BECOMES S LAMBERT RD.	0.32 MI.
9.	TURN LEFT ONTO BOSTON POST RD/US-1 S.	0.47 MI.
10.	TURN LEFT ONTO S ORANGE CENTER RD.	0.18 MI.
11.	[201 - 233] S ORANGE CENTER RD, 232 SD.	

VICINITY MAP

SCALE: 1" = 1000'



SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS AND SITE NOTES	0
C-1	SITE LOCATION PLAN	0
C-2	COMPOUND PLAN AND TOWER ELEVATION	0
C-3	ANTENNA CONFIG. & ELEVATION	0
E-1	TYPICAL ELECTRICAL DETAILS	0

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	05/13/19	KAWJR	CAG	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

STATE OF CONNECTICUT · CHRISTOPHER A. GAUDIOSO · 27017 · REGISTERED PROFESSIONAL ENGINEER

T-Mobile

Transcend Wireless

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
CT720/TOWN OF ORANGE_MP
SITE ID: CT11720A
26 S ORANGE CENTER RD
ORANGE, CT 06477

DATE: 04/10/19
SCALE: AS NOTED
JOB NO. 19027.09

TITLE SHEET

T-1

Sheet No. 1 of 6

DESIGN BASIS:

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

1. DESIGN CRITERIA:

- WIND LOAD: PER TIA 222 G (ANTENNA MOUNTS): 95-115 MPH (3 SECOND GUST)
- RISK CATEGORY: II (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED (OTHER STRUCTURE): 97 MPH (Vasd) (EXPOSURE C/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-10) PER 2015 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE.
- SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN COMPLIANCE WITH THE GOVERNING BUILDING CODE.
2. 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.
3. BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK.
4. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST EXISTING FIELD CONDITIONS.
5. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.
6. ALL DIMENSIONS, ELEVATIONS, AND OTHER REFERENCES TO EXISTING STRUCTURES, SURFACE, AND SUBSURFACE CONDITIONS ARE APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL DIMENSIONS, ELEVATIONS, ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
7. AS THE WORK PROGRESSES, THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY CONDITIONS WHICH ARE IN CONFLICT OR OTHERWISE NOT CONSISTENT WITH THE CONSTRUCTION DOCUMENTS AND SHALL NOT PROCEED WITH SUCH WORK UNTIL THE CONFLICT IS SATISFACTORILY RESOLVED.
8. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING AND MAINTAINING ADEQUATE SHORING, BRACING, AND BARRICADES AS MAY BE REQUIRED FOR THE PROTECTION OF EXISTING PROPERTY, CONSTRUCTION WORKERS, AND FOR PUBLIC SAFETY.
9. 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. MAINTAIN EXISTING SITE OPERATIONS, COORDINATE WORK WITH NORTHEAST UTILITIES
10. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER FOUNDATION REMEDIATION WORK IS COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIEDOWNS, WHICH MIGHT BE NECESSARY.
11. 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.
12. SHOP DRAWINGS, CONCRETE MIX DESIGNS, TEST REPORTS, AND OTHER SUBMITTALS PERTAINING TO STRUCTURAL WORK SHALL BE FORWARDED TO THE OWNER FOR REVIEW BEFORE FABRICATION AND/OR INSTALLATION IS MADE. SHOP DRAWINGS SHALL INCLUDE ERECTION DRAWINGS AND COMPLETE DETAILS OF CONNECTIONS AS WELL AS MANUFACTURER'S SPECIFICATION DATA WHERE APPROPRIATE. SHOP DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR AND BEAR THE CHECKER'S INITIALS BEFORE BEING SUBMITTED FOR REVIEW.
13. NO DRILLING WELDING OR TAPING ON EVERSOURCE OWNED EQUIPMENT.
14. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

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.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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WIRELESS COMMUNICATIONS FACILITY

CT720/TOWN OF ORANGE_MP
SITE ID: CT11720A
26 S ORANGE CENTER RD
ORANGE, CT 06477

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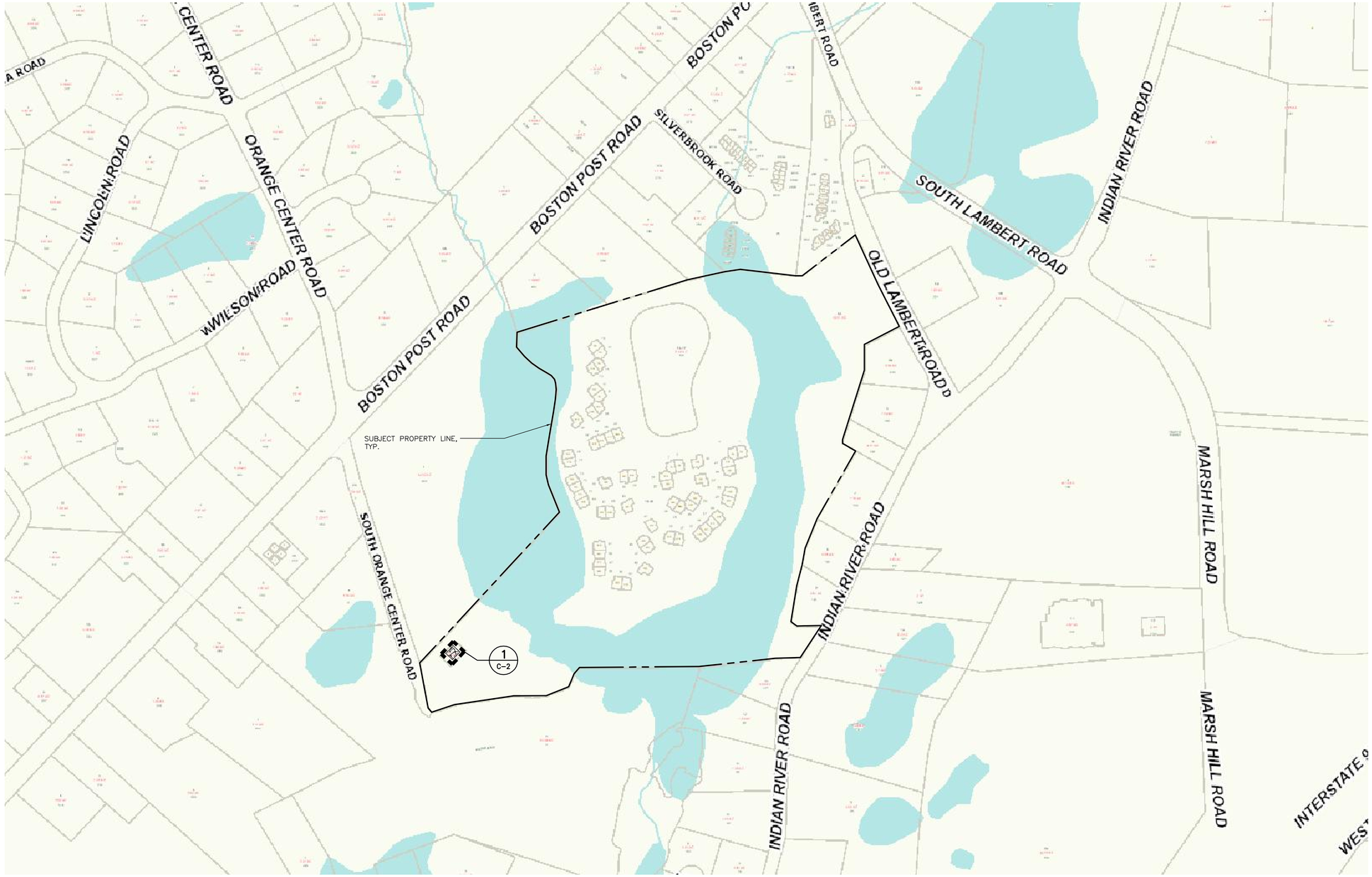
DESIGN BASIS AND SITE NOTES

N-1

Sheet No. 2 of 6



1 / C-1 SITE LOCATION PLAN
SCALE: 1" = 200'

APPROX. NORTH

GRAPHIC SCALE
200 0 100 200 400 800
(IN FEET)
1 inch = 200 ft.

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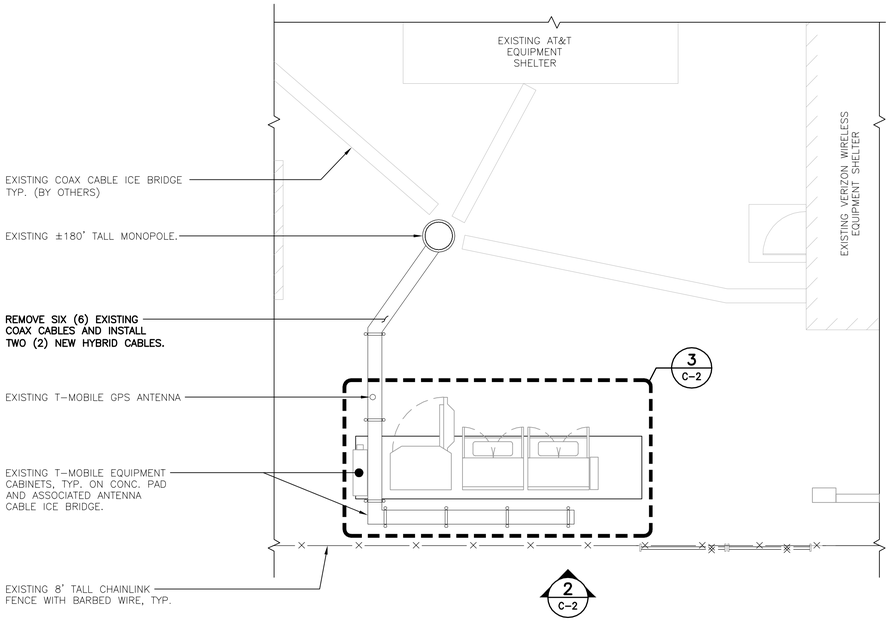
SITE LOCATION PLAN

C-1

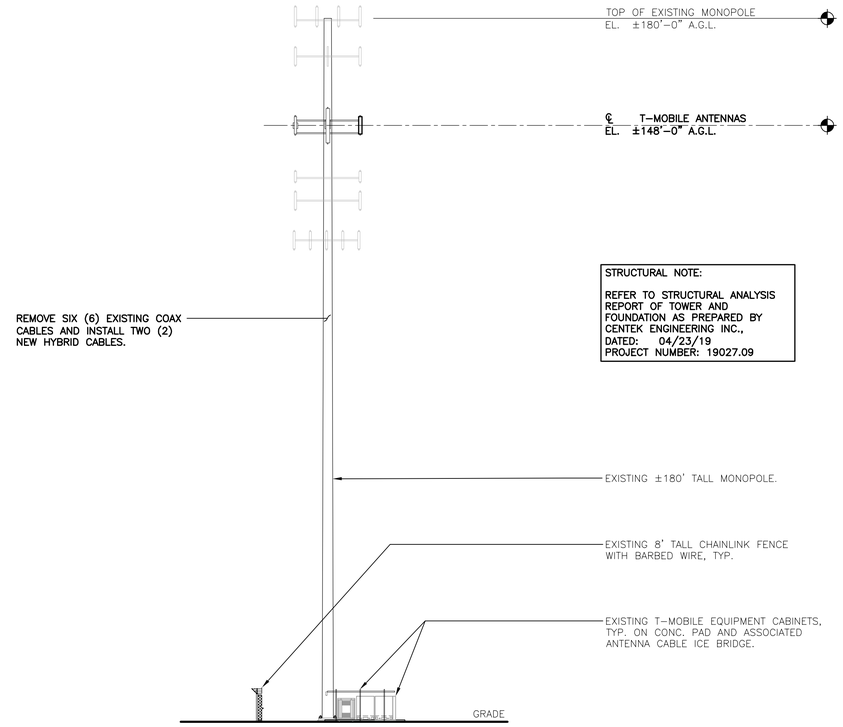
Sheet No. 3 of 6



1 / C-2 **COMPOUND PLAN**
SCALE: 1" = 5'

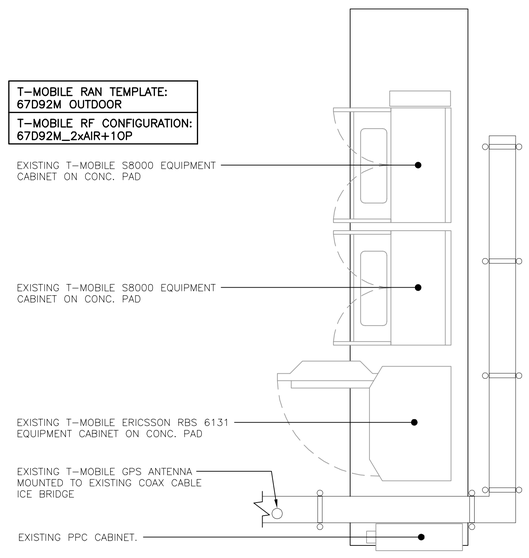
TRUE NORTH

GRAPHIC SCALE
5 0 2.5 5 10 20
(IN FEET)
1 inch = 5 ft.



2 / C-2 **TOWER ELEVATION - PROPOSED**
SCALE: 1" = 18'

GRAPHIC SCALE
18 0 9 18 36 72
(IN FEET)
1 inch = 18 ft.



3 / C-2 **EQUIPMENT PLAN**
SCALE: 3/8" = 1'

TRUE NORTH

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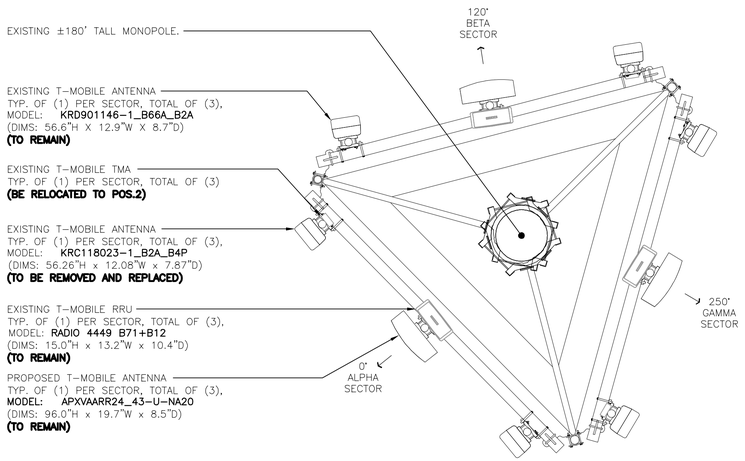
JOB NO.	19027.09

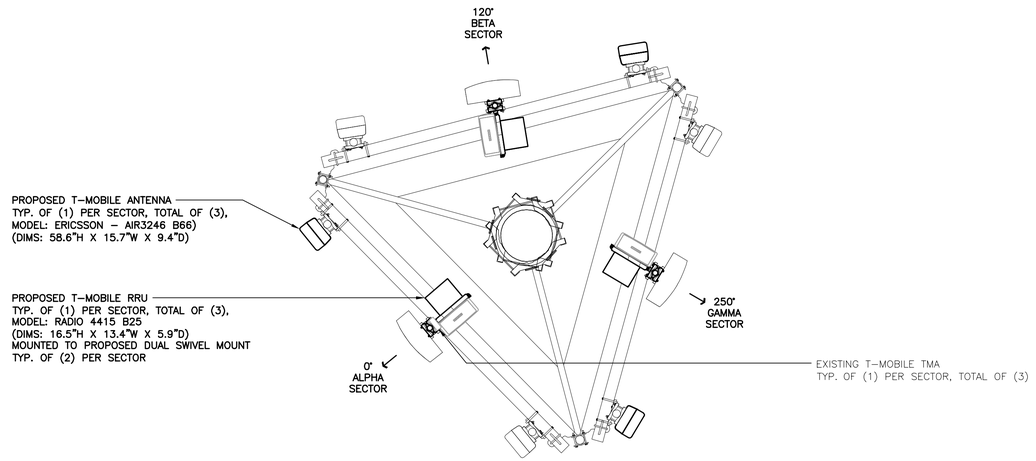
COMPOUND PLAN
&
TOWER ELEVATION

C-2

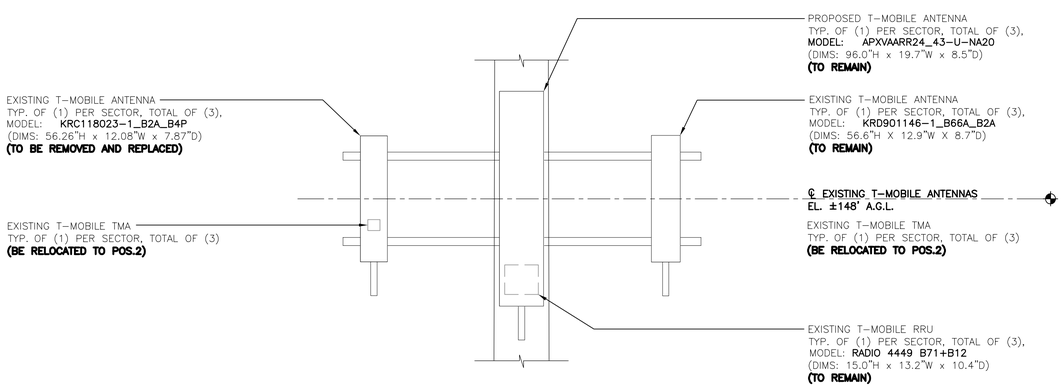
Sheet No. 4 of 6



1 C-3 **EXISTING ANTENNA MOUNTING CONFIGURATION**
SCALE: 3/8" = 1' **148' ELEVATION** TRUE NORTH

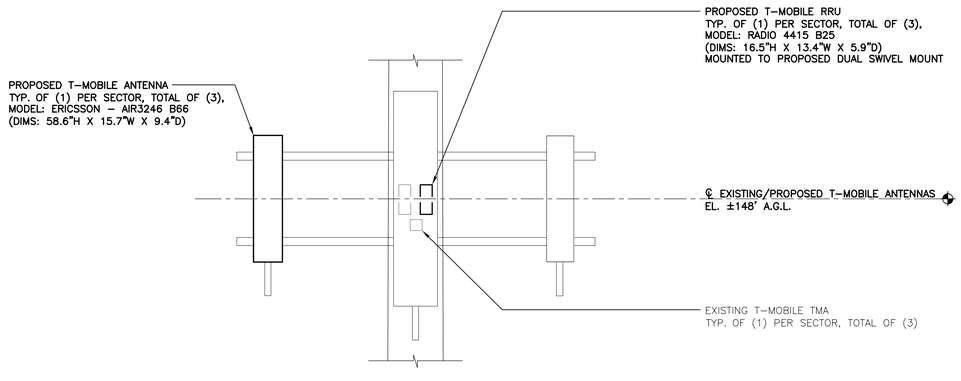


2 C-3 **PROPOSED ANTENNA MOUNTING CONFIGURATION**
SCALE: 3/8" = 1' **148' ELEVATION** TRUE NORTH



TYPICAL SECTOR

3 C-3 **ANTENNA ELEVATION - EXISTING**
SCALE: NONE



TYPICAL SECTOR

4 C-3 **ANTENNA ELEVATION - PROPOSED**
SCALE: NONE

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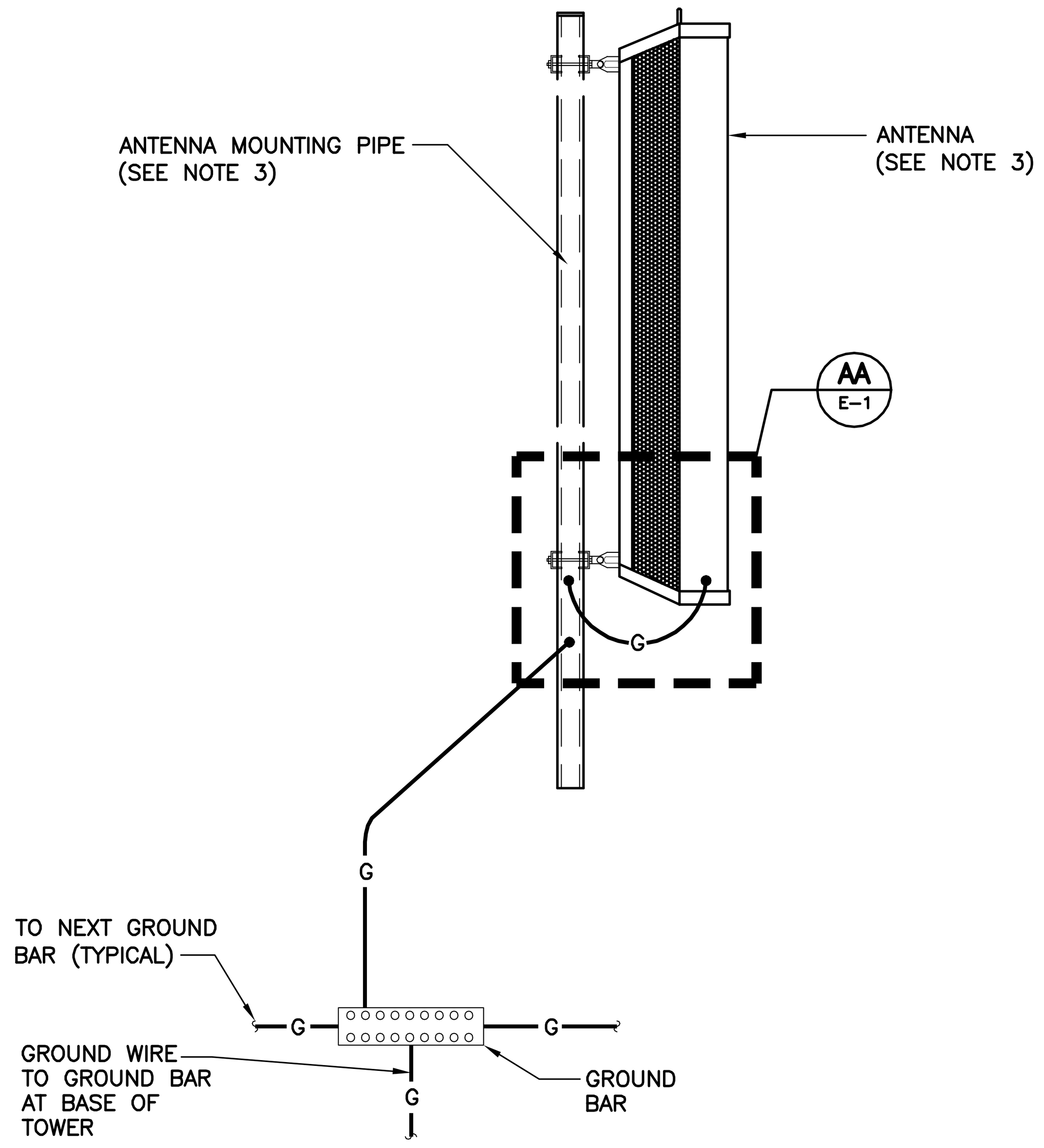
ANTENNA CONFIG. & ELEVATION

C-3

Sheet No. 5 of 6

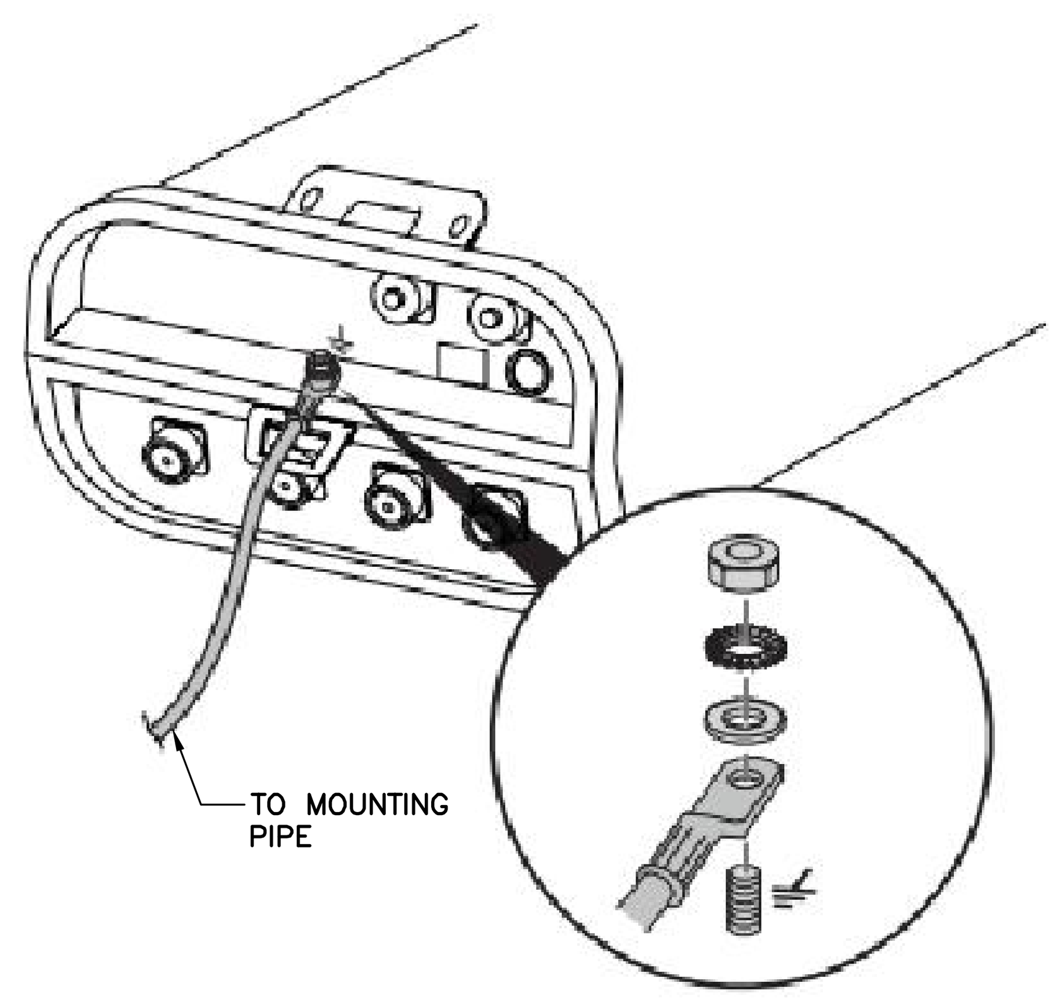


NOTES:

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.

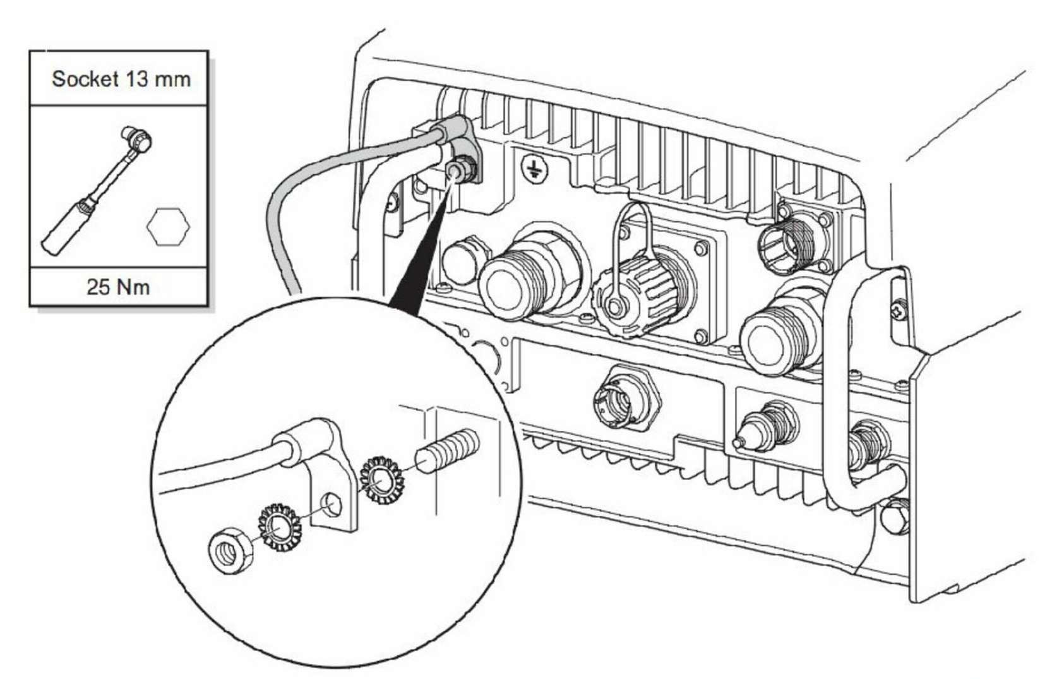
1 / E-1 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NONE



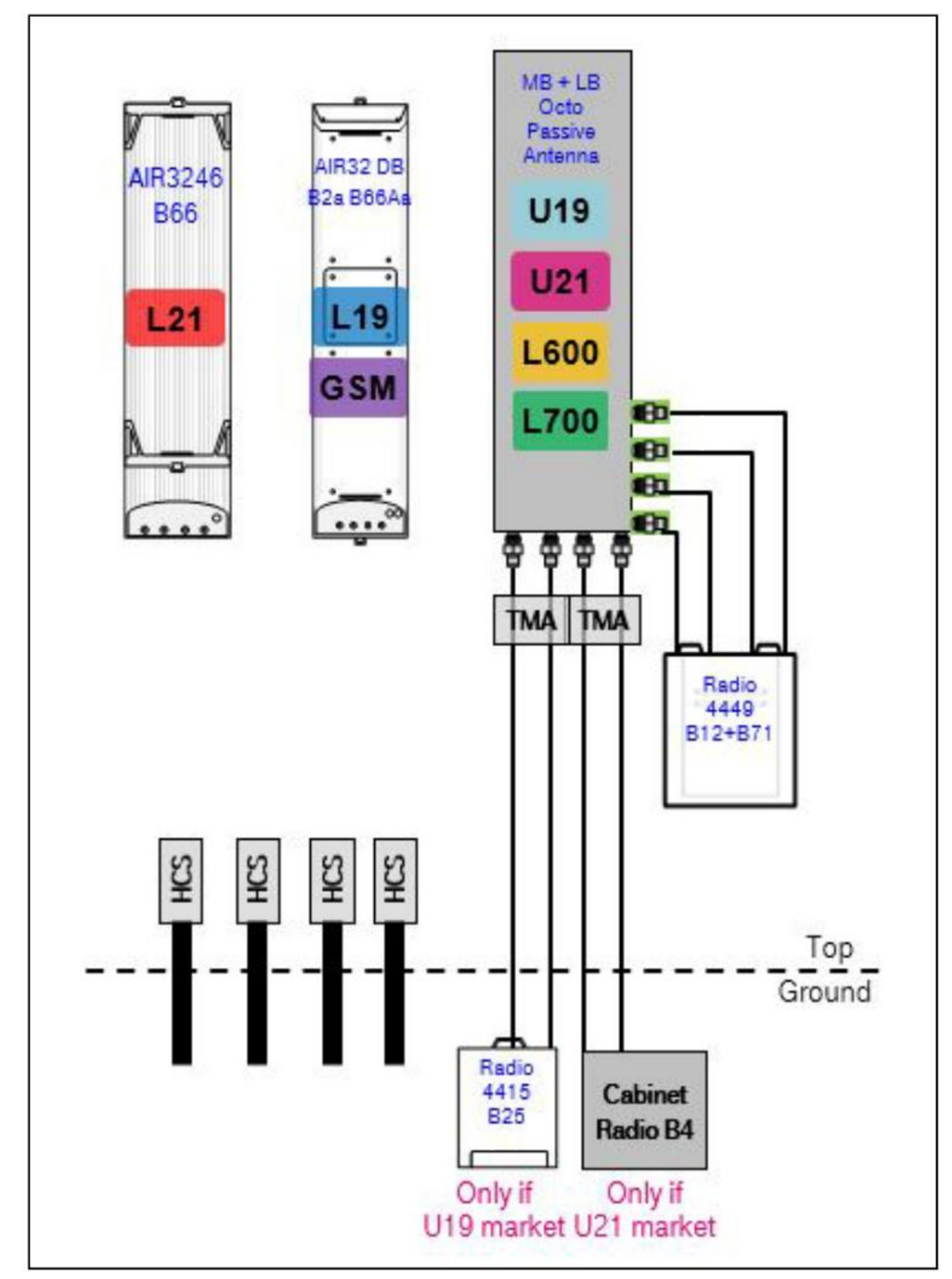
AA / E-1 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NONE



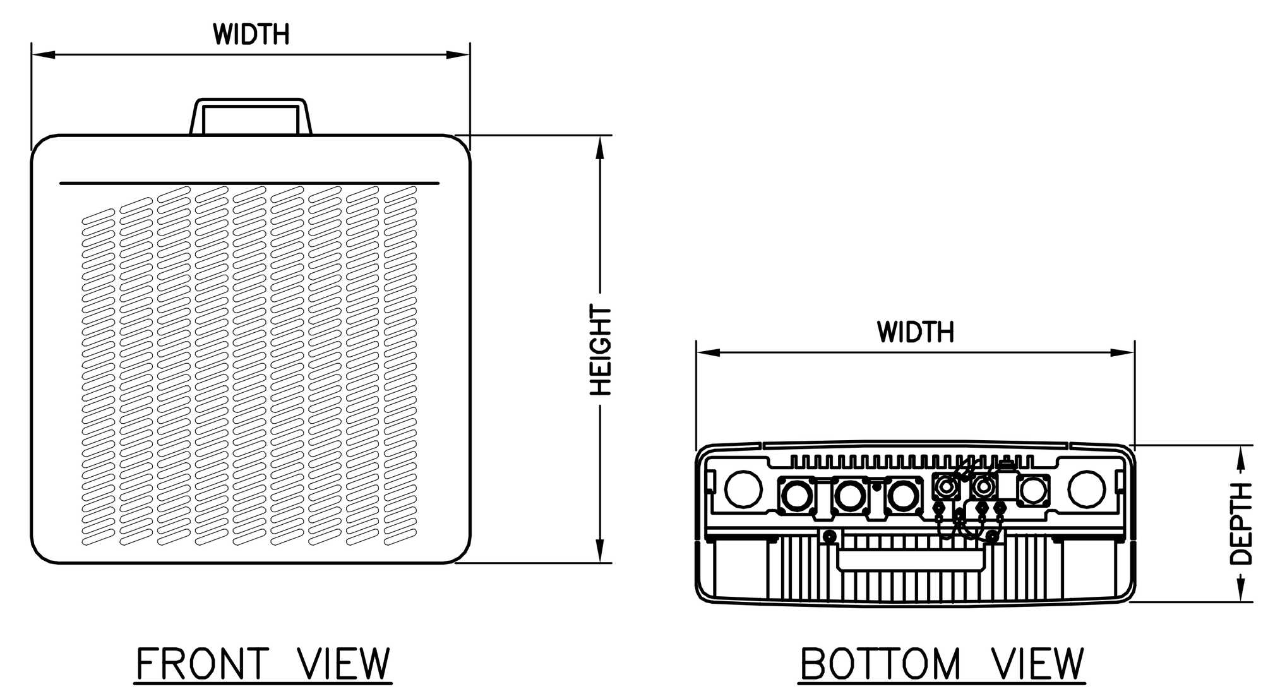
2 / E-1 TYPICAL RRU GROUNDING DETAIL

NOT TO SCALE



3 / E-1 PROPOSED PLUMBING DIAGRAM

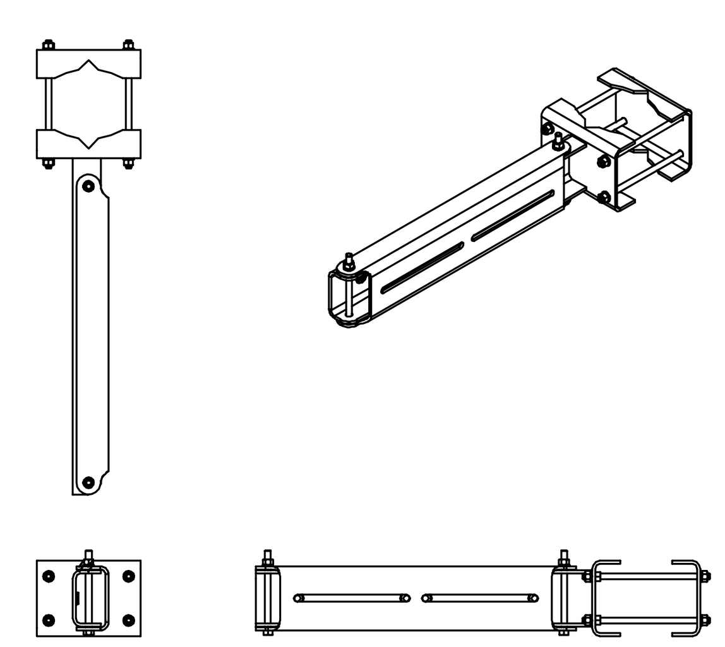
SCALE: NONE



RRH (REMOTE RADIO HEAD)			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE: MODEL:	ERICSSON RRU 4415 B25	16.5"H x 13.4"W x 5.9"D	±46 LBS

4 / E-1 REMOTE RADIO HEAD (RRH) DETAIL

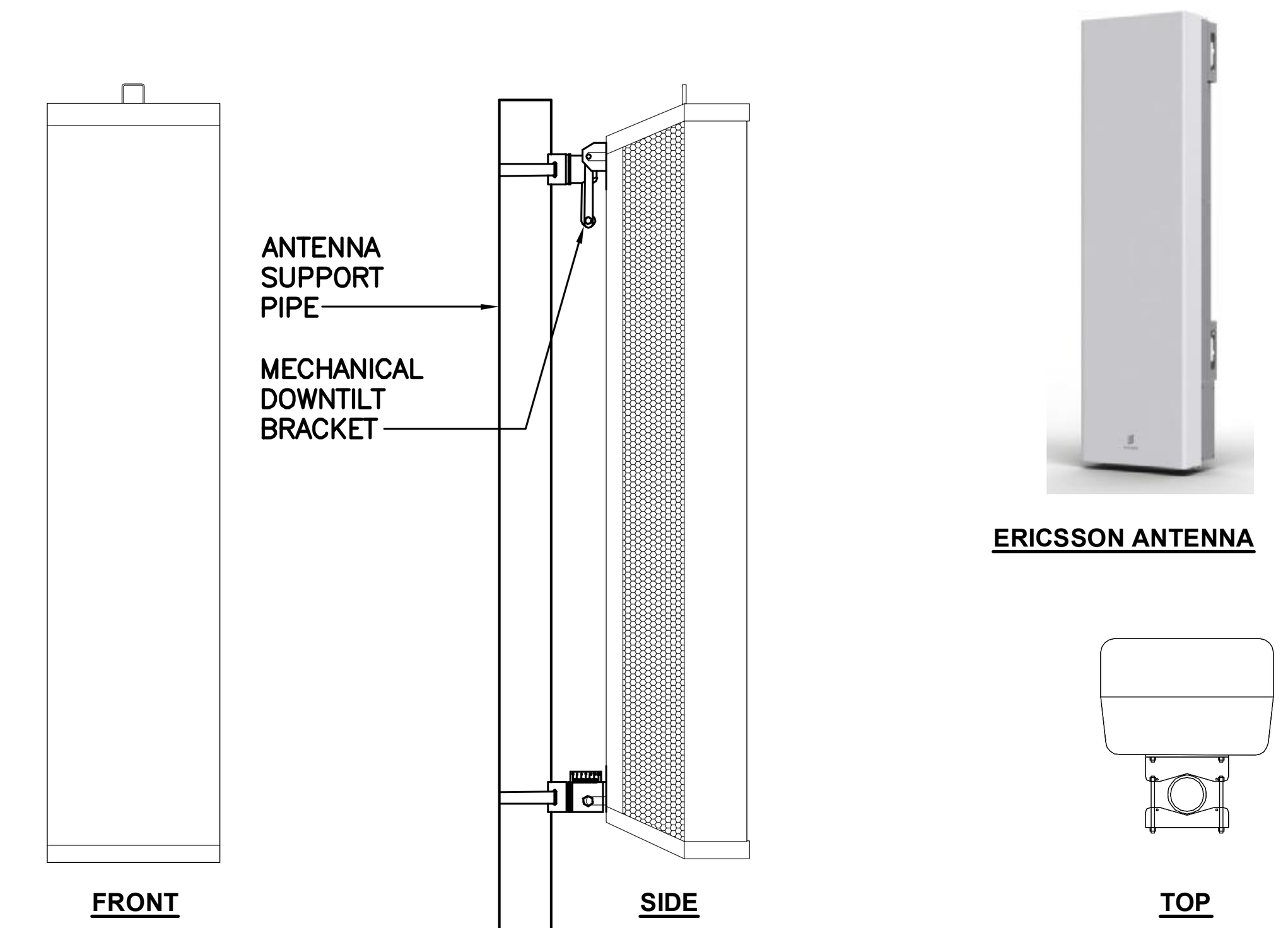
SCALE: NTS



RRU DUAL SWIVEL MOUNT			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE: PART NO.:	SITE PRO 1 RRUDSM	27.75"L x 6.5"W x 4.7"D	39.4 LBS.

5 / E-1 RRH DUAL SWIVEL MOUNT DETAIL

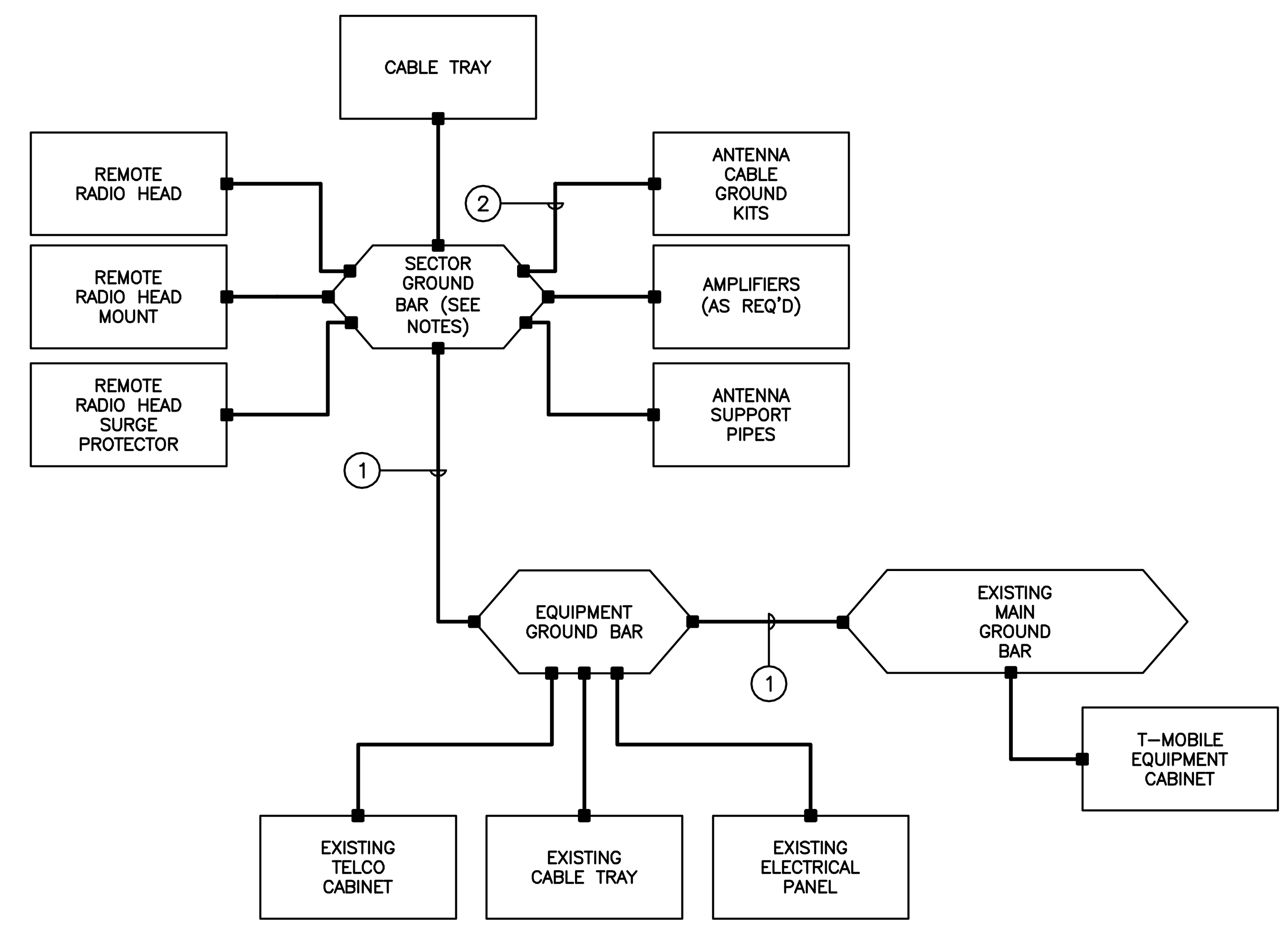
NOT TO SCALE



ALPHA/BETA/GAMMA ANTENNA			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE: MODEL:	ERICSSON AIR3246 B66	58.6"L x 15.7"W x 9.4"D	180 LBS.

6 / E-1 PROPOSED ANTENNA DETAIL

SCALE: NONE



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.

7 / E-1 TYPICAL GROUNDING SCHEMATIC DETAIL

SCALE: NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

E-1

Exhibit D

Structural Analysis Report

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing Rohn Monopole

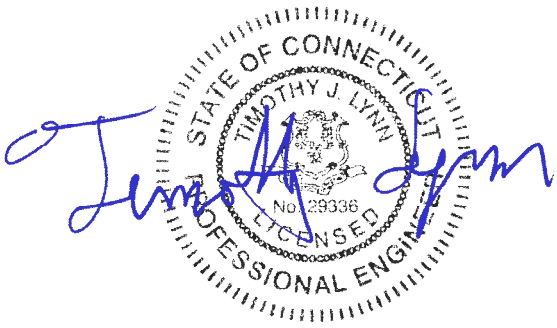
Proposed T-Mobile
Antenna Upgrade

Site Ref: CT11720A

26 South Orange Center Road
Orange, CT

CENTEK Project No. 19027.09

Date: April 23, 2019



Prepared for:

T-Mobile USA
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SECTION 3 – CALCULATIONS

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- RF DATA SHEET
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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by T-Mobile on the existing monopole (tower) located in Orange, CT.

The host tower is a 180-ft tall, five-section, eighteen sided, tapered monopole originally designed and manufactured by ROHN in August off 2001. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural report prepared by Centek job no. 18058.87 dated October 2, 2018. Antenna and appurtenance information were obtained from the aforementioned structural report and a RF data sheet.

The tower is made up of five (5) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 24.00-in at the top and 64.75-in at the base.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- AT&T (EXISTING):
  Antennas: Three (3) Powerwave 7770 panel antennas, three (3) CCI OPA-65R-LCUU-H4 panel antenna, three (3) Andrew SBNHH-1D65A panel antennas, three (3) Kathrein 80010964 panel antennas, six (6) Powerwave LGP21401 TMAs, six (6) CCI TPX-070821 triplexers, three (3) Ericsson B14 4478 remote radio heads, six (6) Ericsson RRUS-11 remote radio units, nine (9) Ericsson RRUS-32 remote radio units and three (3) Raycap DC6-48-60-18-8F surge arrestors mounted on a low profile platform with a RAD center elevation of 177-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables, three (3) fiber cable and six (6) dc control cables running on the inside of the existing monopole.

- SPRINT (EXISTING):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas, three (3) ALU 1900 MHz RRHs, three (3) ALU 800 MHz RRHs, three (3) ALU TD-RRH-8x20-25 RRHs and three (3) Notch Filters mounted to a platform with handrails with a RAD center elevation of 131-ft above grade.
  Coax Cables: Four (4) 1-5/8" ∅ Hybriflex cables running on the inside of the existing tower.
- VERIZON (EXISTING):
  Antennas: Three (3) Swedcom SLCP 2x6015 panel antenna, six (6) Antel BXA-171063-12BF panel antennas, three (3) Antel BXA-70063-4CF panel antenna, three (3) Alcatel-Lucent RRH2x40-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a low profile platform with a RAD center elevation of 115-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running inside the monopole. Six (6) 1-5/8" ∅ coax cables running on the exterior of the monopole.
- T-MOBILE (EXISTING TO REMAIN):
  Antennas: Three (3) Ericsson AIR32 panel antennas, three (3) RFS APXVAARR24_43 panel antennas, three (3) Ericsson 4449 B71 B12 remote radio heads and three (3) Ericsson KRY112 TMAs mounted on a low profile platform with a RAD center elevation of 148-ft above grade level
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and one (1) 6x12 fiber line running inside the monopole.
- **T-MOBILE (EXISTING TO REMOVE):**
  Antennas: Three (3) Ericsson AIR21 panel antennas mounted on a platform with a RAD center elevation of 148-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running inside the monopole.
- **T-MOBILE (PROPOSED):**
  Misc. Equipment: Three (3) Ericsson AIR3246 B66 panel antennas and three (3) Ericsson 4415 B25 remote radio heads mounted on a platform with a RAD center elevation of 148-ft above grade level.
  Coax Cables: Two (2) 6x12 fiber lines running on the interior of the monopole.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower, and the model assumes that the tower members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-G-2005 entitled "Structural Standard for Antenna Support Structures and Antennas", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix N of the CSBC[1] and the wind speed data available in the TIA-222-G-2005 Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 0.75" radial ice on the tower structure and its components.

Basic Wind Speed:	New Haven; v = 95-115 mph	*[Annex B of TIA-222-G-2005]*
	Orange; v = 97 mph	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

[1] The 2015 International Building Code as amended by the 2018 Connecticut State Building Code (CSBC).

Tower Capacity

- Calculated stresses were found to be within allowable limits. This tower was found to be at **64.6%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	40.75'-82.75'	64.6%	**PASS**

Foundation and Anchors

The existing foundation consists of a 8-ft diameter x 2-ft long reinforced concrete pier on a 48.0-ft square x 6-ft thick reinforce concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned Crown Castle structural report. The base of the tower is connected to the foundation by means of (20) 2.25"∅, ASTM A615-75 anchor bolts embedded into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	40 kips
	Compression	64 kips
	Moment	4780 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	TIA-222-G Section 9.4 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Pier	OTM[2]	1.0	10.94	**PASS**

Note 1: FS denotes Factor of Safety.

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Shear	50.9%	**PASS**
Base Plate	Bending	57.8%	**PASS**

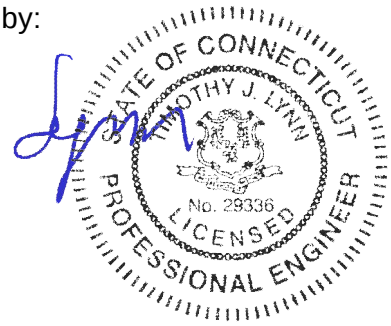
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are 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.

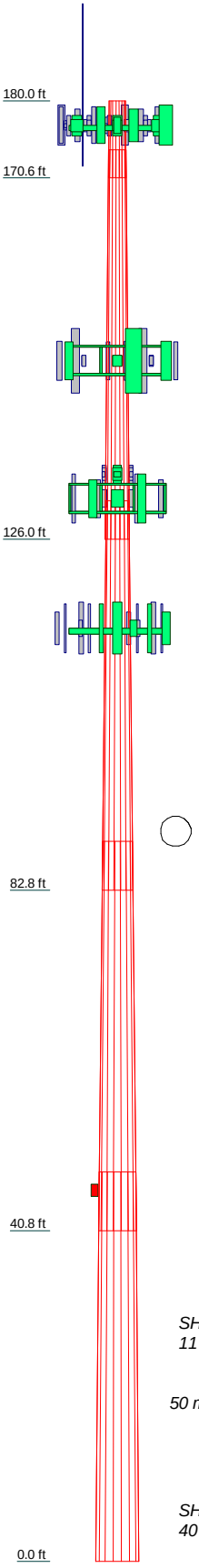
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

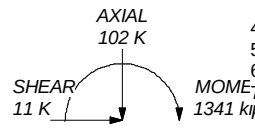
tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

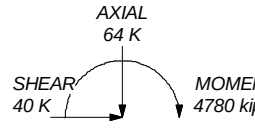
Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	9.42	18	0.1875	3.42	24.0000	26.2500		0.5
2	48.00	18	0.2500	4.75	25.0581	36.5250		4.0
3	48.00	18	0.3125	6.00	34.8903	46.3570	A572-65	6.5
4	48.00	18	0.3750	7.25	44.2987	55.7650		9.7
5	48.00	18	0.4375		53.2831	64.7500		13.3
								33.9



ALL REACTIONS ARE FACTORED



TORQUE 0 kip-ft
50 mph WIND - 0.7500 in ICE



TORQUE 0 kip-ft
REACTIONS - 97 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
4-ft Lightning Rod (Town - Existing)	182	Radio 4449 B71 B12 (T-Mobile - Existing)	148
7770.00 (ATI)	177	Radio 4449 B71 B12 (T-Mobile - Existing)	148
OPA-65R-LCUU-H4 (ATI)	177	4415 B25 (T-Mobile - Proposed)	148
SBNHH-1D65A (ATI)	177	4415 B25 (T-Mobile - Proposed)	148
80010964 (ATI)	177	4415 B25 (T-Mobile - Proposed)	148
7770.00 (ATI)	177	13' Platform w/rails (T-Mobile - Existing)	148
OPA-65R-LCUU-H4 (ATI)	177	FD-RRH 4x45 1900 (Sprint)	134
SBNHH-1D65A (ATI)	177	FD-RRH 4x45 1900 (Sprint)	134
80010964 (ATI)	177	FD-RRH 4x45 1900 (Sprint)	134
7770.00 (ATI)	177	FD-RRH 2x50 800 (Sprint)	134
OPA-65R-LCUU-H4 (ATI)	177	FD-RRH 2x50 800 (Sprint)	134
SBNHH-1D65A (ATI)	177	FD-RRH 2x50 800 (Sprint)	134
80010964 (ATI)	177	Notch Filter (Sprint)	134
(2) TPX-070821 (ATI)	177	Notch Filter (Sprint)	134
(2) TPX-070821 (ATI)	177	Notch Filter (Sprint)	134
(2) TPX-070821 (ATI)	177	APXVSPP18-C-A20 (Sprint)	131
(2) LGP21401 TMA (ATI)	177	APXVTM14 (Sprint)	131
(2) LGP21401 TMA (ATI)	177	APXVSPP18-C-A20 (Sprint)	131
(2) LGP21401 TMA (ATI)	177	APXVTM14 (Sprint)	131
(3) RRUS-32 (ATI)	177	APXVSPP18-C-A20 (Sprint)	131
(3) RRUS-32 (ATI)	177	APXVTM14 (Sprint)	131
(3) RRUS-32 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
B14 4478 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
B14 4478 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
B14 4478 (ATI)	177	13' Platform w/rails (Sprint)	131
(2) RRUS-11 (ATI)	177	BXA-70063/4CF (Verizon)	115
(2) RRUS-11 (ATI)	177	BXA-171063-12BF (Verizon)	115
(2) RRUS-11 (ATI)	177	SLCP 2x6015 (Verizon)	115
DC6-48-60-18-8F Surge Arrestor (ATI)	177	BXA-171063-12BF (Verizon)	115
DC6-48-60-18-8F Surge Arrestor (ATI)	177	BXA-70063/4CF (Verizon)	115
DC6-48-60-18-8F Surge Arrestor (ATI)	177	BXA-171063-12BF (Verizon)	115
EEI 14-ft Low Profile Platform (ATI)	177	SLCP 2x6015 (Verizon)	115
AIR 3246 (T-Mobile - Proposed)	148	BXA-171063-12BF (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	148	BXA-70063/4CF (Verizon)	115
AIR32 (T-Mobile - Existing)	148	BXA-171063-12BF (Verizon)	115
AIR 3246 (T-Mobile - Proposed)	148	SLCP 2x6015 (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	148	BXA-171063-12BF (Verizon)	115
AIR32 (T-Mobile - Existing)	148	RRH2x40-AWS (Verizon)	115
AIR 3246 (T-Mobile - Proposed)	148	RRH2x40-AWS (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	148	RRH2x40-AWS (Verizon)	115
AIR32 (T-Mobile - Existing)	148	DB-T1-6Z-8AB-0Z (Verizon)	115
KRY 112 TMA (T-Mobile - Existing)	148	EEI 14-ft Low Profile Platform (Verizon)	115
KRY 112 TMA (T-Mobile - Existing)	148	GPS	45
KRY 112 TMA (T-Mobile - Existing)	148		
Radio 4449 B71 B12 (T-Mobile - Existing)	148		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 64.6%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **19027.09 - CT11720A**
Project: ***180' Monopole - 26 South Orange Center Road, Orange, CT***
Client: T-Mobile | Drawn by: TJL | App'd:
Code: TIA-222-G | Date: 04/23/19 | Scale: NTS
Path: J:\Jobs\1902700\Wk09_CT11720A\05_Structural\Tower Analysis\Backup Documentation\ER Files\180' Monopole_Orange_CT.eri | Dwg No. E-1

Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 97 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Horizontals		Assume Legs Pinned		Calculate Redundant Bracing Forces
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification		Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
√	Use Code Stress Ratios		Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks		Consider Feed Line Torque
	Always Use Max Kz		Use Azimuth Dish Coefficients		Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-G Bracing Resist. Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-G Tension Splice Exemption
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component	√	Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known

Tapered Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Splice Length* *ft*	*Number of Sides*	*Top Diameter* *in*	*Bottom Diameter* *in*	*Wall Thickness* *in*	*Bend Radius* *in*	*Pole Grade*
L1	180.00-170.58	9.42	3.42	18	24.0000	26.2500	0.1875	0.7500	A572-65 (65 ksi)

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L2	170.58-126.00	48.00	4.75	18	25.0581	36.5250	0.2500	1.0000	A572-65 (65 ksi)
L3	126.00-82.75	48.00	6.00	18	34.8903	46.3570	0.3125	1.2500	A572-65 (65 ksi)
L4	82.75-40.75	48.00	7.25	18	44.2987	55.7650	0.3750	1.5000	A572-65 (65 ksi)
L5	40.75-0.00	48.00		18	53.2831	64.7500	0.4375	1.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	24.3413	14.1714	1015.2211	8.4534	12.1920	83.2694	2031.7780	7.0871	3.8940	20.768
	26.6260	15.5104	1331.0484	9.2522	13.3350	99.8162	2663.8483	7.7567	4.2900	22.88
L2	26.2357	19.6852	1530.6151	8.8069	12.7295	120.2413	3063.2442	9.8445	3.9702	15.881
	37.0499	28.7842	4785.2722	12.8776	18.5547	257.9008	9576.8409	14.3948	5.9884	23.954
L3	36.5325	34.2968	5180.6571	12.2751	17.7243	292.2920	10368.1310	17.1517	5.5907	17.89
	47.0239	45.6704	12232.8508	16.3458	23.5494	519.4559	24481.7979	22.8395	7.6088	24.348
L4	46.3796	52.2801	12742.9833	15.5929	22.5037	566.2612	25502.7342	26.1450	7.1366	19.031
	56.5674	65.9279	25554.6382	19.6635	28.3286	902.0785	51142.9018	32.9702	9.1546	24.412
L5	55.7963	73.3827	25891.0121	18.7602	27.0678	956.5238	51816.0923	36.6983	8.6078	19.675
	65.6814	89.3059	46666.8628	22.8309	32.8930	1418.7475	93395.1311	44.6615	10.6260	24.288

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 180.00-170.58				1	1	1			
L2 170.58-126.00				1	1	1			
L3 126.00-82.75				1	1	1			
L4 82.75-40.75				1	1	1			
L5 40.75-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (Verizon)	C	Yes	Surface Ar (CaAa)	115.00 - 0.00	6	6	0.000 0.000	1.9800		1.04

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (AT&T)	C	No	Yes	Inside Pole	177.00 - 3.00	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
RG6-Fiber (AT&T)	C	No	Yes	Inside Pole	177.00 - 3.00	3	No Ice	0.00	1.00
							1/2" Ice	0.00	1.00
							1" Ice	0.00	1.00
#8 AWG Copper WIre (AT&T)	C	No	Yes	Inside Pole	177.00 - 3.00	6	No Ice	0.00	0.05
							1/2" Ice	0.00	0.05
							1" Ice	0.00	0.05
1 5/8 (T-Mobile)	C	No	Yes	Inside Pole	102.00 - 3.00	6	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (T-Mobile)	C	No	Yes	Inside Pole	102.00 - 3.00	1	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
HYBRIFLEX 1-5/8" (T-Mobile - Proposed)	C	No	Yes	Inside Pole	102.00 - 3.00	2	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
HYBRIFLEX 1-1/4" (Sprint)	C	No	Yes	Inside Pole	131.00 - 0.00	4	No Ice	0.00	1.30
							1/2" Ice	0.00	1.30
							1" Ice	0.00	1.30
1 5/8 (Verizon)	C	No	Yes	Inside Pole	115.00 - 0.00	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (Verizon)	C	No	Yes	Inside Pole	115.00 - 0.00	1	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
1/2	C	No	Yes	Inside Pole	44.00 - 0.00	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-170.58	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.10
L2	170.58-126.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.73
L3	126.00-82.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	38.313	0.000	1.80
L4	82.75-40.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	49.896	0.000	2.25
L5	40.75-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	48.411	0.000	2.11

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-170.58	A	1.773	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.10
L2	170.58-126.00	A	1.742	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.73
L3	126.00-82.75	A	1.682	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	61.936	0.000	2.54
L4	82.75-40.75	A	1.596	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	80.031	0.000	3.18
L5	40.75-0.00	A	1.431	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	76.775	0.000	2.96

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L2	10	1 5/8	126.00 - 115.00	1.0000	1.0000
L3	10	1 5/8	82.75 - 115.00	1.0000	1.0000
L4	10	1 5/8	40.75 - 82.75	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
4-ft Lightning Rod (Town - Existing)	A	From Face	4.00 0.00 0.00	0.0000	182.00	No Ice 1/2" Ice 1" Ice	0.40 0.81 1.06	0.40 0.81 1.06	0.01 0.01 0.02
7770.00 (AT&T)	A	From Face	3.50 -6.00 0.00	0.0000	177.00	No Ice 1/2" Ice 1" Ice	5.51 5.87 6.23	2.93 3.27 3.63	0.04 0.07 0.11
OPA-65R-LCUU-H4 (AT&T)	A	From Face	3.50 -2.00 0.00	0.0000	177.00	No Ice 1/2" Ice 1" Ice	5.94 6.28 6.62	3.36 3.66 3.97	0.06 0.10 0.14
SBNHH-1D65A (AT&T)	A	From Face	3.50 2.00 0.00	0.0000	177.00	No Ice 1/2" Ice 1" Ice	5.88 6.25 6.62	3.86 4.22 4.57	0.04 0.08 0.12

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
80010964	A	From Face	3.50	0.0000	177.00	No Ice	10.00	4.10	0.10
(AT&T)			-6.00			1/2" Ice	10.42	4.48	0.15
			0.00			1" Ice	10.86	4.87	0.22
7770.00	B	From Face	3.50	0.0000	177.00	No Ice	5.51	2.93	0.04
(AT&T)			-6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
OPA-65R-LCUU-H4	B	From Face	3.50	0.0000	177.00	No Ice	5.94	3.36	0.06
(AT&T)			-2.00			1/2" Ice	6.28	3.66	0.10
			0.00			1" Ice	6.62	3.97	0.14
SBNHH-1D65A	B	From Face	3.50	0.0000	177.00	No Ice	5.88	3.86	0.04
(AT&T)			2.00			1/2" Ice	6.25	4.22	0.08
			0.00			1" Ice	6.62	4.57	0.12
80010964	B	From Face	3.50	0.0000	177.00	No Ice	10.00	4.10	0.10
(AT&T)			-6.00			1/2" Ice	10.42	4.48	0.15
			0.00			1" Ice	10.86	4.87	0.22
7770.00	C	From Face	3.50	0.0000	177.00	No Ice	5.51	2.93	0.04
(AT&T)			-6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
OPA-65R-LCUU-H4	C	From Face	3.50	0.0000	177.00	No Ice	5.94	3.36	0.06
(AT&T)			-2.00			1/2" Ice	6.28	3.66	0.10
			0.00			1" Ice	6.62	3.97	0.14
SBNHH-1D65A	C	From Face	3.50	0.0000	177.00	No Ice	5.88	3.86	0.04
(AT&T)			2.00			1/2" Ice	6.25	4.22	0.08
			0.00			1" Ice	6.62	4.57	0.12
80010964	C	From Face	3.50	0.0000	177.00	No Ice	10.00	4.10	0.10
(AT&T)			-6.00			1/2" Ice	10.42	4.48	0.15
			0.00			1" Ice	10.86	4.87	0.22
(2) TPX-070821	A	From Face	3.50	0.0000	177.00	No Ice	0.47	0.10	0.01
(AT&T)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	B	From Face	3.50	0.0000	177.00	No Ice	0.47	0.10	0.01
(AT&T)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	C	From Face	3.50	0.0000	177.00	No Ice	0.47	0.10	0.01
(AT&T)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) LGP21401 TMA	A	From Face	3.50	0.0000	177.00	No Ice	0.82	0.35	0.02
(AT&T)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	B	From Face	3.50	0.0000	177.00	No Ice	0.82	0.35	0.02
(AT&T)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	C	From Face	3.50	0.0000	177.00	No Ice	0.82	0.35	0.02
(AT&T)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(3) RRUS-32	A	From Face	3.00	0.0000	177.00	No Ice	3.31	2.42	0.08
(AT&T)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
(3) RRUS-32	B	From Face	3.00	0.0000	177.00	No Ice	3.31	2.42	0.08
(AT&T)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
(3) RRUS-32	C	From Face	3.00	0.0000	177.00	No Ice	3.31	2.42	0.08
(AT&T)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
B14 4478	A	From Face	3.00	0.0000	177.00	No Ice	1.84	1.06	0.06
(AT&T)			0.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
B14 4478	B	From Face	3.00	0.0000	177.00	No Ice	1.84	1.06	0.06
(AT&T)			0.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09
B14 4478	C	From Face	3.00	0.0000	177.00	No Ice	1.84	1.06	0.06
(AT&T)			0.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09
(2) RRUS-11	A	From Face	0.50	0.0000	177.00	No Ice	2.57	1.07	0.05
(AT&T)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
(2) RRUS-11	B	From Face	0.50	0.0000	177.00	No Ice	2.57	1.07	0.05
(AT&T)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
(2) RRUS-11	C	From Face	0.50	0.0000	177.00	No Ice	2.57	1.07	0.05
(AT&T)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
DC6-48-60-18-8F Surge	A	From Face	0.50	0.0000	177.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge	B	From Face	0.50	0.0000	177.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	177.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T)			0.00			1" Ice	2.29	2.29	0.06
EEI 14-ft Low Profile	C	None		0.0000	177.00	No Ice	16.50	16.50	1.55
Platform						1/2" Ice	20.00	20.00	1.80
(AT&T)						1" Ice	23.50	23.50	2.05
AIR 3246	A	From Face	3.50	0.0000	148.00	No Ice	7.94	5.17	0.18
(T-Mobile - Proposed)			-6.00			1/2" Ice	8.34	5.54	0.23
			0.00			1" Ice	8.75	5.91	0.30
APXVAARR24-43	A	From Face	3.50	0.0000	148.00	No Ice	20.24	8.89	0.16
(T-Mobile - Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	A	From Face	3.50	0.0000	148.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			6.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR 3246	B	From Face	3.50	0.0000	148.00	No Ice	7.94	5.17	0.18
(T-Mobile - Proposed)			-6.00			1/2" Ice	8.34	5.54	0.23
			0.00			1" Ice	8.75	5.91	0.30
APXVAARR24-43	B	From Face	3.50	0.0000	148.00	No Ice	20.24	8.89	0.16
(T-Mobile - Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	B	From Face	3.50	0.0000	148.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			6.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR 3246	C	From Face	3.50	0.0000	148.00	No Ice	7.94	5.17	0.18
(T-Mobile - Proposed)			-6.00			1/2" Ice	8.34	5.54	0.23
			0.00			1" Ice	8.75	5.91	0.30
APXVAARR24-43	C	From Face	3.50	0.0000	148.00	No Ice	20.24	8.89	0.16
(T-Mobile - Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	C	From Face	3.50	0.0000	148.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			6.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
KRY 112 TMA	A	From Face	3.50	0.0000	148.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
KRY 112 TMA	B	From Face	3.50	0.0000	148.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04
KRY 112 TMA	C	From Face	3.50	0.0000	148.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04
Radio 4449 B71 B12	A	From Face	3.50	0.0000	148.00	No Ice	1.64	1.29	0.07
(T-Mobile - Existing)			0.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	B	From Face	3.50	0.0000	148.00	No Ice	1.64	1.29	0.07
(T-Mobile - Existing)			0.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	C	From Face	3.50	0.0000	148.00	No Ice	1.64	1.29	0.07
(T-Mobile - Existing)			0.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
4415 B25	A	From Face	3.50	0.0000	148.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	B	From Face	3.50	0.0000	148.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	C	From Face	3.50	0.0000	148.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
13' Platform w/rails	C	None		0.0000	148.00	No Ice	31.30	31.30	1.82
(T-Mobile - Existing)						1/2" Ice	40.20	40.20	2.45
						1" Ice	49.10	49.10	3.08
APXVSPP18-C-A20	A	From Face	3.00	0.0000	131.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	A	From Face	3.00	0.0000	131.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVSPP18-C-A20	B	From Face	3.00	0.0000	131.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	B	From Face	3.00	0.0000	131.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVSPP18-C-A20	C	From Face	3.00	0.0000	131.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	C	From Face	3.00	0.0000	131.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
TD-RRH8x20-25	A	From Face	0.50	0.0000	131.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	0.50	0.0000	131.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	0.50	0.0000	131.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
FD-RRH 4x45 1900	A	From Face	0.50	0.0000	134.00	No Ice	2.32	2.38	0.06
(Sprint)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
FD-RRH 4x45 1900 (Sprint)	B	From Face	0.50	0.00	0.0000	134.00	No Ice	2.32	2.38	0.06
			0.00				1/2" Ice	2.52	2.59	0.08
			0.00				1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900 (Sprint)	C	From Face	0.50	0.00	0.0000	134.00	No Ice	2.32	2.38	0.06
			0.00				1/2" Ice	2.52	2.59	0.08
			0.00				1" Ice	2.74	2.80	0.11
FD-RRH 2x50 800 (Sprint)	A	From Face	0.50	0.00	0.0000	134.00	No Ice	2.06	1.93	0.06
			0.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800 (Sprint)	B	From Face	0.50	0.00	0.0000	134.00	No Ice	2.06	1.93	0.06
			0.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800 (Sprint)	C	From Face	0.50	0.00	0.0000	134.00	No Ice	2.06	1.93	0.06
			0.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
Notch Filter (Sprint)	A	From Face	0.50	0.00	0.0000	134.00	No Ice	0.74	0.32	0.01
			0.00				1/2" Ice	0.85	0.40	0.02
			0.00				1" Ice	0.97	0.48	0.02
Notch Filter (Sprint)	B	From Face	0.50	0.00	0.0000	134.00	No Ice	0.74	0.32	0.01
			0.00				1/2" Ice	0.85	0.40	0.02
			0.00				1" Ice	0.97	0.48	0.02
Notch Filter (Sprint)	C	From Face	0.50	0.00	0.0000	134.00	No Ice	0.74	0.32	0.01
			0.00				1/2" Ice	0.85	0.40	0.02
			0.00				1" Ice	0.97	0.48	0.02
13' Platform w/rails (Sprint)	C	None			0.0000	131.00	No Ice	31.30	31.30	1.82
							1/2" Ice	40.20	40.20	2.45
							1" Ice	49.10	49.10	3.08
BXA-70063/4CF (Verizon)	A	From Face	3.50	-6.00	0.0000	115.00	No Ice	4.71	2.44	0.01
							1/2" Ice	5.03	2.74	0.04
			0.00				1" Ice	5.35	3.05	0.07
BXA-171063-12BF (Verizon)	A	From Face	3.50	2.00	0.0000	115.00	No Ice	4.73	3.57	0.02
							1/2" Ice	5.18	4.01	0.04
			0.00				1" Ice	5.63	4.45	0.07
SLCP 2x6015 (Verizon)	A	From Face	3.50	0.00	0.0000	115.00	No Ice	9.98	8.23	0.03
			0.00				1/2" Ice	10.48	8.71	0.10
			0.00				1" Ice	10.98	9.20	0.18
BXA-171063-12BF (Verizon)	A	From Face	3.50	-4.00	0.0000	115.00	No Ice	4.73	3.57	0.02
							1/2" Ice	5.18	4.01	0.04
			0.00				1" Ice	5.63	4.45	0.07
BXA-70063/4CF (Verizon)	B	From Face	3.50	-6.00	0.0000	115.00	No Ice	4.71	2.44	0.01
							1/2" Ice	5.03	2.74	0.04
			0.00				1" Ice	5.35	3.05	0.07
BXA-171063-12BF (Verizon)	B	From Face	3.50	2.00	0.0000	115.00	No Ice	4.73	3.57	0.02
							1/2" Ice	5.18	4.01	0.04
			0.00				1" Ice	5.63	4.45	0.07
SLCP 2x6015 (Verizon)	B	From Face	3.50	0.00	0.0000	115.00	No Ice	9.98	8.23	0.03
			0.00				1/2" Ice	10.48	8.71	0.10
			0.00				1" Ice	10.98	9.20	0.18
BXA-171063-12BF (Verizon)	B	From Face	3.50	-4.00	0.0000	115.00	No Ice	4.73	3.57	0.02
							1/2" Ice	5.18	4.01	0.04
			0.00				1" Ice	5.63	4.45	0.07
BXA-70063/4CF (Verizon)	C	From Face	3.50	-6.00	0.0000	115.00	No Ice	4.71	2.44	0.01
							1/2" Ice	5.03	2.74	0.04
			0.00				1" Ice	5.35	3.05	0.07
BXA-171063-12BF (Verizon)	C	From Face	3.50	2.00	0.0000	115.00	No Ice	4.73	3.57	0.02
							1/2" Ice	5.18	4.01	0.04
			0.00				1" Ice	5.63	4.45	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
SLCP 2x6015	C	From Face	3.50	0.0000	115.00	No Ice	9.98	8.23	0.03
(Verizon)			0.00			1/2" Ice	10.48	8.71	0.10
			0.00			1" Ice	10.98	9.20	0.18
BXA-171063-12BF	C	From Face	3.50	0.0000	115.00	No Ice	4.73	3.57	0.02
(Verizon)			-4.00			1/2" Ice	5.18	4.01	0.04
			0.00			1" Ice	5.63	4.45	0.07
RRH2x40-AWS	A	From Face	2.50	0.0000	115.00	No Ice	2.16	1.42	0.04
(Verizon)			-2.00			1/2" Ice	2.36	1.59	0.06
			0.00			1" Ice	2.57	1.77	0.08
RRH2x40-AWS	B	From Face	2.50	0.0000	115.00	No Ice	2.16	1.42	0.04
(Verizon)			-2.00			1/2" Ice	2.36	1.59	0.06
			0.00			1" Ice	2.57	1.77	0.08
RRH2x40-AWS	C	From Face	2.50	0.0000	115.00	No Ice	2.16	1.42	0.04
(Verizon)			-2.00			1/2" Ice	2.36	1.59	0.06
			0.00			1" Ice	2.57	1.77	0.08
DB-T1-6Z-8AB-0Z	A	From Face	0.50	0.0000	115.00	No Ice	4.80	2.00	0.04
(Verizon)			0.00			1/2" Ice	5.07	2.19	0.08
			0.00			1" Ice	5.35	2.39	0.12
EEI 14-ft Low Profile Platform	C	None		0.0000	115.00	No Ice	16.50	16.50	1.55
(Verizon)						1/2" Ice	20.00	20.00	1.80
						1" Ice	23.50	23.50	2.05
GPS	A	From Face	1.00	0.0000	45.00	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	175.22	1.424	33	20.005	A	0.000	20.005	20.005	100.00	0.000	0.000
180.00-170.58					B	0.000	20.005		100.00	0.000	0.000
					C	0.000	20.005		100.00	0.000	0.000
L2	147.20	1.373	31	117.553	A	0.000	117.553	117.553	100.00	0.000	0.000
170.58-126.00					B	0.000	117.553		100.00	0.000	0.000
					C	0.000	117.553		100.00	0.000	0.000
L3	103.71	1.275	29	150.576	A	0.000	150.576	150.576	100.00	0.000	0.000
126.00-82.75					B	0.000	150.576		100.00	0.000	0.000
					C	0.000	150.576		100.00	38.313	0.000
L4 82.75-40.75	61.44	1.142	26	180.157	A	0.000	180.157	180.157	100.00	0.000	0.000
					B	0.000	180.157		100.00	0.000	0.000
					C	0.000	180.157		100.00	49.896	0.000
L5 40.75-0.00	20.57	0.907	21	206.259	A	0.000	206.259	206.259	100.00	0.000	0.000
					B	0.000	206.259		100.00	0.000	0.000
					C	0.000	206.259		100.00	48.411	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	175.22	1.424	9	1.7725	22.788	A	0.000	22.788	22.788	100.00	0.000	0.000
180.00-170.58						B	0.000	22.788		100.00	0.000	0.000
						C	0.000	22.788		100.00	0.000	0.000
L2	147.20	1.373	8	1.7419	130.723	A	0.000	130.723	130.723	100.00	0.000	0.000
170.58-126.00						B	0.000	130.723		100.00	0.000	0.000
						C	0.000	130.723		100.00	0.000	0.000
L3 126.00-82.75	103.71	1.275	8	1.6820	163.132	A	0.000	163.132	163.132	100.00	0.000	0.000
						B	0.000	163.132		100.00	0.000	0.000
						C	0.000	163.132		100.00	61.936	0.000
L4 82.75-40.75	61.44	1.142	7	1.5962	191.931	A	0.000	191.931	191.931	100.00	0.000	0.000
						B	0.000	191.931		100.00	0.000	0.000
						C	0.000	191.931		100.00	80.031	0.000
L5 40.75-0.00	20.57	0.907	6	1.4308	217.100	A	0.000	217.100	217.100	100.00	0.000	0.000
						B	0.000	217.100		100.00	0.000	0.000
						C	0.000	217.100		100.00	76.775	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	175.22	1.424	11	20.005	A	0.000	20.005	20.005	100.00	0.000	0.000
180.00-170.58					B	0.000	20.005		100.00	0.000	0.000
					C	0.000	20.005		100.00	0.000	0.000
L2	147.20	1.373	11	117.553	A	0.000	117.553	117.553	100.00	0.000	0.000
170.58-126.00					B	0.000	117.553		100.00	0.000	0.000
					C	0.000	117.553		100.00	0.000	0.000
L3	103.71	1.275	10	150.576	A	0.000	150.576	150.576	100.00	0.000	0.000
126.00-82.75					B	0.000	150.576		100.00	0.000	0.000
					C	0.000	150.576		100.00	38.313	0.000
L4 82.75-40.75	61.44	1.142	9	180.157	A	0.000	180.157	180.157	100.00	0.000	0.000
					B	0.000	180.157		100.00	0.000	0.000
					C	0.000	180.157		100.00	49.896	0.000
L5 40.75-0.00	20.57	0.907	7	206.259	A	0.000	206.259	206.259	100.00	0.000	0.000
					B	0.000	206.259		100.00	0.000	0.000
					C	0.000	206.259		100.00	48.411	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	21	1	1	206.259	3.09	75.76	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	1065.05 kip-ft	12.68		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	21	1	1	206.259	3.09	75.76	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	1065.05 kip-ft	12.68		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C
180.00-170.58			B	1	0.65		1	1	20.005			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	21	1	1	206.259	3.09	75.76	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	1065.05 kip-ft	12.68		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	21	1	1	206.259	3.09	75.76	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	1065.05 kip-ft	12.68		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
180.00-170.58			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L2	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
170.58-126.00			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3	2.54	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
126.00-82.75			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4	3.18	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
82.75-40.75			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	2.96	17.70	A	1	1.2	6	1	1	217.100	1.59	39.11	C
			B	1	1.2		1	1	217.100			
			C	1	1.2		1	1	217.100			
Sum Weight:	9.51	50.21						OTM	570.91 kip-ft	6.71		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
180.00-170.58			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
170.58-126.00			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3	2.54	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
126.00-82.75			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4	3.18	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
82.75-40.75			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	2.96	17.70	A	1	1.2	6	1	1	217.100	1.59	39.11	C
			B	1	1.2		1	1	217.100			
			C	1	1.2		1	1	217.100			
Sum Weight:	9.51	50.21						OTM	570.91 kip-ft	6.71		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
180.00-170.58			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
170.58-126.00			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3	2.54	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
126.00-82.75			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4	3.18	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
82.75-40.75			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	2.96	17.70	A	1	1.2	6	1	1	217.100	1.59	39.11	C
			B	1	1.2		1	1	217.100			
			C	1	1.2		1	1	217.100			
Sum Weight:	9.51	50.21						OTM	570.91 kip-ft	6.71		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
180.00-170.58			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
170.58-126.00			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3	2.54	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
126.00-82.75			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4	3.18	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
82.75-40.75			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	2.96	17.70	A	1	1.2	6	1	1	217.100	1.59	39.11	C
			B	1	1.2		1	1	217.100			
			C	1	1.2		1	1	217.100			
Sum Weight:	9.51	50.21						OTM	570.91 kip-ft	6.71		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	11	1	1	20.005	0.16	16.94	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	11	1	1	117.553	0.90	20.26	C
170.58-126.00			B	1	0.65		1	1	117.553			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	10	1	1	150.576	1.07	24.84	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	9	1	1	180.157	1.15	27.34	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	7	1	1	206.259	1.06	25.93	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	364.61 kip-ft	4.34		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	11	1	1	20.005	0.16	16.94	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	11	1	1	117.553	0.90	20.26	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	10	1	1	150.576	1.07	24.84	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	9	1	1	180.157	1.15	27.34	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	7	1	1	206.259	1.06	25.93	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	364.61 kip-ft	4.34		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	11	1	1	20.005	0.16	16.94	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	11	1	1	117.553	0.90	20.26	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3	1.80	6.53	A	1	0.65	10	1	1	150.576	1.07	24.84	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	9	1	1	180.157	1.15	27.34	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	7	1	1	206.259	1.06	25.93	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	364.61 kip-ft	4.34		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.10	0.48	A	1	0.65	11	1	1	20.005	0.16	16.94	C
180.00-170.58			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2	0.73	3.96	A	1	0.65	11	1	1	117.553	0.90	20.26	C
170.58-126.00			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3	1.80	6.53	A	1	0.65	10	1	1	150.576	1.07	24.84	C
126.00-82.75			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.25	9.65	A	1	0.65	9	1	1	180.157	1.15	27.34	C
82.75-40.75			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.11	13.29	A	1	0.65	7	1	1	206.259	1.06	25.93	C
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	6.99	33.90						OTM	364.61 kip-ft	4.34		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	33.90					
Bracing Weight	0.00					
Total Member Self-Weight	33.90			-0.08	0.14	
Total Weight	53.03			-0.08	0.14	
Wind 0 deg - No Ice		-0.03	-24.89	-2871.36	3.80	-0.24
Wind 30 deg - No Ice		12.44	-21.54	-2484.85	-1434.44	-0.27
Wind 45 deg - No Ice		17.60	-17.58	-2027.79	-2030.55	-0.26

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 60 deg - No Ice		21.57	-12.42	-1432.55	-2488.28	-0.24
Wind 90 deg - No Ice		24.93	0.03	3.58	-2875.35	-0.14
Wind 120 deg - No Ice		21.60	12.47	1438.72	-2491.94	0.00
Wind 135 deg - No Ice		17.65	17.62	2032.80	-2035.73	0.07
Wind 150 deg - No Ice		12.49	21.57	2488.34	-1440.77	0.14
Wind 180 deg - No Ice		0.03	24.89	2871.19	-3.51	0.24
Wind 210 deg - No Ice		-12.44	21.54	2484.68	1434.72	0.27
Wind 225 deg - No Ice		-17.60	17.58	2027.62	2030.84	0.26
Wind 240 deg - No Ice		-21.57	12.42	1432.38	2488.57	0.24
Wind 270 deg - No Ice		-24.93	-0.03	-3.74	2875.64	0.14
Wind 300 deg - No Ice		-21.60	-12.47	-1438.89	2492.23	0.00
Wind 315 deg - No Ice		-17.65	-17.62	-2032.97	2036.02	-0.07
Wind 330 deg - No Ice		-12.49	-21.57	-2488.51	1441.06	-0.14
Member Ice	16.31					
Total Weight Ice	89.62			-0.33	0.57	
Wind 0 deg - Ice		-0.01	-11.28	-1243.86	1.64	-0.15
Wind 30 deg - Ice		5.64	-9.76	-1076.73	-620.89	-0.17
Wind 45 deg - Ice		7.97	-7.97	-878.89	-878.85	-0.16
Wind 60 deg - Ice		9.77	-5.63	-621.17	-1076.89	-0.15
Wind 90 deg - Ice		11.29	0.01	0.73	-1244.19	-0.08
Wind 120 deg - Ice		9.78	5.65	622.36	-1077.95	0.00
Wind 135 deg - Ice		7.99	7.98	879.73	-880.36	0.04
Wind 150 deg - Ice		5.65	9.77	1077.13	-622.73	0.08
Wind 180 deg - Ice		0.01	11.28	1243.20	-0.49	0.15
Wind 210 deg - Ice		-5.64	9.76	1076.07	622.03	0.17
Wind 225 deg - Ice		-7.97	7.97	878.23	880.00	0.16
Wind 240 deg - Ice		-9.77	5.63	620.51	1078.03	0.15
Wind 270 deg - Ice		-11.29	-0.01	-1.39	1245.33	0.08
Wind 300 deg - Ice		-9.78	-5.65	-623.02	1079.10	0.00
Wind 315 deg - Ice		-7.99	-7.98	-880.39	881.50	-0.04
Wind 330 deg - Ice		-5.65	-9.77	-1077.79	623.87	-0.08
Total Weight	53.03			-0.08	0.14	
Wind 0 deg - Service		-0.01	-8.52	-983.03	1.40	-0.08
Wind 30 deg - Service		4.26	-7.37	-850.71	-490.97	-0.09
Wind 45 deg - Service		6.03	-6.02	-694.24	-695.04	-0.09
Wind 60 deg - Service		7.38	-4.25	-490.47	-851.74	-0.08
Wind 90 deg - Service		8.53	0.01	1.17	-984.25	-0.05
Wind 120 deg - Service		7.40	4.27	492.47	-852.99	0.00
Wind 135 deg - Service		6.04	6.03	695.85	-696.81	0.02
Wind 150 deg - Service		4.28	7.38	851.80	-493.14	0.05
Wind 180 deg - Service		0.01	8.52	982.86	-1.11	0.08
Wind 210 deg - Service		-4.26	7.37	850.54	491.26	0.09
Wind 225 deg - Service		-6.03	6.02	694.08	695.33	0.09
Wind 240 deg - Service		-7.38	4.25	490.30	852.03	0.08
Wind 270 deg - Service		-8.53	-0.01	-1.34	984.54	0.05
Wind 300 deg - Service		-7.40	-4.27	-492.64	853.28	0.00
Wind 315 deg - Service		-6.04	-6.03	-696.02	697.10	-0.02
Wind 330 deg - Service		-4.28	-7.38	-851.96	493.43	-0.05

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice

Comb. No.	Description
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 45 deg - No Ice
7	0.9 Dead+1.6 Wind 45 deg - No Ice
8	1.2 Dead+1.6 Wind 60 deg - No Ice
9	0.9 Dead+1.6 Wind 60 deg - No Ice
10	1.2 Dead+1.6 Wind 90 deg - No Ice
11	0.9 Dead+1.6 Wind 90 deg - No Ice
12	1.2 Dead+1.6 Wind 120 deg - No Ice
13	0.9 Dead+1.6 Wind 120 deg - No Ice
14	1.2 Dead+1.6 Wind 135 deg - No Ice
15	0.9 Dead+1.6 Wind 135 deg - No Ice
16	1.2 Dead+1.6 Wind 150 deg - No Ice
17	0.9 Dead+1.6 Wind 150 deg - No Ice
18	1.2 Dead+1.6 Wind 180 deg - No Ice
19	0.9 Dead+1.6 Wind 180 deg - No Ice
20	1.2 Dead+1.6 Wind 210 deg - No Ice
21	0.9 Dead+1.6 Wind 210 deg - No Ice
22	1.2 Dead+1.6 Wind 225 deg - No Ice
23	0.9 Dead+1.6 Wind 225 deg - No Ice
24	1.2 Dead+1.6 Wind 240 deg - No Ice
25	0.9 Dead+1.6 Wind 240 deg - No Ice
26	1.2 Dead+1.6 Wind 270 deg - No Ice
27	0.9 Dead+1.6 Wind 270 deg - No Ice
28	1.2 Dead+1.6 Wind 300 deg - No Ice
29	0.9 Dead+1.6 Wind 300 deg - No Ice
30	1.2 Dead+1.6 Wind 315 deg - No Ice
31	0.9 Dead+1.6 Wind 315 deg - No Ice
32	1.2 Dead+1.6 Wind 330 deg - No Ice
33	0.9 Dead+1.6 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service

Comb. No.	Description
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	180 - 170.58	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-10.51	0.17	0.10
			Max. Mx	26	-4.23	22.39	0.03
			Max. My	2	-4.23	0.04	22.37
			Max. Vy	26	-7.41	22.39	0.03
			Max. Vx	2	-7.41	0.04	22.37
			Max. Torque	20			-0.12
L2	170.58 - 126	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-36.18	0.17	0.10
			Max. Mx	26	-16.30	533.74	0.06
			Max. My	2	-16.31	0.08	533.69
			Max. Vy	26	-21.60	533.74	0.06
			Max. Vx	2	-21.60	0.08	533.69
			Max. Torque	20			-0.12
L3	126 - 82.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-55.54	0.52	0.30
			Max. Mx	26	-28.01	1641.51	1.51
			Max. My	2	-28.01	1.57	1639.81
			Max. Vy	26	-30.20	1641.51	1.51
			Max. Vx	2	-30.14	1.57	1639.81
			Max. Torque	20			-0.30
L4	82.75 - 40.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-74.44	0.52	0.30
			Max. Mx	26	-41.91	2971.25	3.65
			Max. My	2	-41.91	3.72	2967.08
			Max. Vy	26	-34.98	2971.25	3.65
			Max. Vx	2	-34.92	3.72	2967.08
			Max. Torque	20			-0.29
L5	40.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-102.29	0.60	0.35
			Max. Mx	26	-63.61	4776.94	6.15
			Max. My	2	-63.61	6.23	4769.90
			Max. Vy	26	-39.92	4776.94	6.15
			Max. Vx	2	-39.86	6.23	4769.90
			Max. Torque	20			-0.43

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	47	102.29	11.29	0.01
	Max. H_x	26	63.63	39.88	0.05
	Max. H_z	2	63.63	0.05	39.83
	Max. M_x	2	4769.90	0.05	39.83
	Max. M_z	10	4776.58	-39.88	-0.05
	Max. Torsion	4	0.43	-19.90	34.46
	Min. Vert	7	47.73	-28.17	28.12

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. H_x	10	63.63	-39.88	-0.05
	Min. H_z	18	63.63	-0.05	-39.83
	Min. M_x	18	-4769.68	-0.05	-39.83
	Min. M_z	26	-4776.94	39.88	0.05
	Min. Torsion	20	-0.43	19.90	-34.46

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	53.03	0.00	0.00	-0.08	0.14	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	63.63	-0.05	-39.83	-4769.90	6.23	-0.38
0.9 Dead+1.6 Wind 0 deg - No Ice	47.73	-0.05	-39.83	-4723.12	6.13	-0.38
1.2 Dead+1.6 Wind 30 deg - No Ice	63.63	19.90	-34.46	-4127.86	-2382.98	-0.43
0.9 Dead+1.6 Wind 30 deg - No Ice	47.73	19.90	-34.46	-4087.36	-2359.66	-0.43
1.2 Dead+1.6 Wind 45 deg - No Ice	63.63	28.17	-28.12	-3368.60	-3373.24	-0.42
0.9 Dead+1.6 Wind 45 deg - No Ice	47.73	28.17	-28.12	-3335.54	-3340.22	-0.42
1.2 Dead+1.6 Wind 60 deg - No Ice	63.63	34.52	-19.87	-2379.77	-4133.61	-0.38
0.9 Dead+1.6 Wind 60 deg - No Ice	47.73	34.52	-19.87	-2356.41	-4093.14	-0.38
1.2 Dead+1.6 Wind 90 deg - No Ice	63.63	39.88	0.05	5.94	-4776.58	-0.22
0.9 Dead+1.6 Wind 90 deg - No Ice	47.73	39.88	0.05	5.92	-4729.82	-0.22
1.2 Dead+1.6 Wind 120 deg - No Ice	63.63	34.57	19.96	2390.03	-4139.65	0.00
0.9 Dead+1.6 Wind 120 deg - No Ice	47.73	34.57	19.96	2366.63	-4099.12	0.00
1.2 Dead+1.6 Wind 135 deg - No Ice	63.63	28.24	28.20	3376.92	-3381.78	0.11
0.9 Dead+1.6 Wind 135 deg - No Ice	47.73	28.24	28.20	3343.85	-3348.69	0.11
1.2 Dead+1.6 Wind 150 deg - No Ice	63.63	19.99	34.52	4133.68	-2393.44	0.22
0.9 Dead+1.6 Wind 150 deg - No Ice	47.73	19.99	34.52	4093.19	-2370.04	0.22
1.2 Dead+1.6 Wind 180 deg - No Ice	63.63	0.05	39.83	4769.68	-5.86	0.38
0.9 Dead+1.6 Wind 180 deg - No Ice	47.73	0.05	39.83	4722.96	-5.86	0.38
1.2 Dead+1.6 Wind 210 deg - No Ice	63.63	-19.90	34.46	4127.65	2383.34	0.43
0.9 Dead+1.6 Wind 210 deg - No Ice	47.73	-19.90	34.46	4087.21	2359.93	0.43
1.2 Dead+1.6 Wind 225 deg - No Ice	63.63	-28.17	28.12	3368.39	3373.61	0.42
0.9 Dead+1.6 Wind 225 deg - No Ice	47.73	-28.17	28.12	3335.38	3340.49	0.42
1.2 Dead+1.6 Wind 240 deg -	63.63	-34.52	19.87	2379.56	4133.98	0.38

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
No Ice						
0.9 Dead+1.6 Wind 240 deg - No Ice	47.73	-34.52	19.87	2356.25	4093.41	0.38
1.2 Dead+1.6 Wind 270 deg - No Ice	63.63	-39.88	-0.05	-6.15	4776.94	0.22
0.9 Dead+1.6 Wind 270 deg - No Ice	47.73	-39.88	-0.05	-6.07	4730.09	0.22
1.2 Dead+1.6 Wind 300 deg - No Ice	63.63	-34.57	-19.96	-2390.24	4140.01	0.00
0.9 Dead+1.6 Wind 300 deg - No Ice	47.73	-34.57	-19.96	-2366.79	4099.39	0.00
1.2 Dead+1.6 Wind 315 deg - No Ice	63.63	-28.24	-28.20	-3377.13	3382.15	-0.11
0.9 Dead+1.6 Wind 315 deg - No Ice	47.73	-28.24	-28.20	-3344.01	3348.96	-0.11
1.2 Dead+1.6 Wind 330 deg - No Ice	63.63	-19.99	-34.52	-4133.89	2393.81	-0.22
0.9 Dead+1.6 Wind 330 deg - No Ice	47.73	-19.99	-34.52	-4093.35	2370.31	-0.22
1.2 Dead+1.0 Ice+1.0 Temp	102.29	0.00	0.00	-0.35	0.60	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	102.29	-0.01	-11.28	-1338.31	1.81	-0.15
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	102.29	5.64	-9.76	-1158.50	-667.95	-0.17
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	102.29	7.97	-7.97	-945.64	-945.49	-0.17
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	102.29	9.77	-5.63	-668.37	-1158.55	-0.15
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	102.29	11.29	0.01	0.74	-1338.54	-0.09
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	102.29	9.78	5.65	669.55	-1159.69	0.00
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	102.29	7.99	7.98	946.46	-947.09	0.04
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	102.29	5.65	9.77	1158.84	-669.91	0.09
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	102.29	0.01	11.28	1337.52	-0.45	0.15
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	102.29	-5.64	9.76	1157.71	669.31	0.17
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	102.29	-7.97	7.97	944.85	946.85	0.17
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	102.29	-9.77	5.63	667.58	1159.92	0.15
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	102.29	-11.29	-0.01	-1.53	1339.91	0.09
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	102.29	-9.78	-5.65	-670.33	1161.05	0.00
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	102.29	-7.99	-7.98	-947.24	948.46	-0.04
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	102.29	-5.65	-9.77	-1159.63	671.28	-0.09
Dead+Wind 0 deg - Service	53.03	-0.01	-8.52	-1014.98	1.44	-0.08
Dead+Wind 30 deg - Service	53.03	4.26	-7.37	-878.36	-506.92	-0.09
Dead+Wind 45 deg - Service	53.03	6.03	-6.02	-716.81	-717.62	-0.09
Dead+Wind 60 deg - Service	53.03	7.38	-4.25	-506.42	-879.41	-0.08
Dead+Wind 90 deg - Service	53.03	8.53	0.01	1.20	-1016.22	-0.05
Dead+Wind 120 deg - Service	53.03	7.40	4.27	508.47	-880.70	0.00
Dead+Wind 135 deg - Service	53.03	6.04	6.03	718.46	-719.44	0.02
Dead+Wind 150 deg - Service	53.03	4.28	7.38	879.48	-509.15	0.05
Dead+Wind 180 deg - Service	53.03	0.01	8.52	1014.80	-1.13	0.08

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 210 deg - Service	53.03	-4.26	7.37	878.19	507.23	0.09
Dead+Wind 225 deg - Service	53.03	-6.03	6.02	716.64	717.93	0.09
Dead+Wind 240 deg - Service	53.03	-7.38	4.25	506.24	879.72	0.08
Dead+Wind 270 deg - Service	53.03	-8.53	-0.01	-1.38	1016.53	0.05
Dead+Wind 300 deg - Service	53.03	-7.40	-4.27	-508.65	881.00	0.00
Dead+Wind 315 deg - Service	53.03	-6.04	-6.03	-718.63	719.75	-0.02
Dead+Wind 330 deg - Service	53.03	-4.28	-7.38	-879.65	509.46	-0.05

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-53.03	0.00	0.00	53.03	0.00	0.000%
2	-0.05	-63.63	-39.83	0.05	63.63	39.83	0.000%
3	-0.05	-47.73	-39.83	0.05	47.73	39.83	0.000%
4	19.90	-63.63	-34.46	-19.90	63.63	34.46	0.000%
5	19.90	-47.73	-34.46	-19.90	47.73	34.46	0.000%
6	28.17	-63.63	-28.12	-28.17	63.63	28.12	0.000%
7	28.17	-47.73	-28.12	-28.17	47.73	28.12	0.000%
8	34.52	-63.63	-19.87	-34.52	63.63	19.87	0.000%
9	34.52	-47.73	-19.87	-34.52	47.73	19.87	0.000%
10	39.88	-63.63	0.05	-39.88	63.63	-0.05	0.000%
11	39.88	-47.73	0.05	-39.88	47.73	-0.05	0.000%
12	34.57	-63.63	19.96	-34.57	63.63	-19.96	0.000%
13	34.57	-47.73	19.96	-34.57	47.73	-19.96	0.000%
14	28.24	-63.63	28.20	-28.24	63.63	-28.20	0.000%
15	28.24	-47.73	28.20	-28.24	47.73	-28.20	0.000%
16	19.99	-63.63	34.52	-19.99	63.63	-34.52	0.000%
17	19.99	-47.73	34.52	-19.99	47.73	-34.52	0.000%
18	0.05	-63.63	39.83	-0.05	63.63	-39.83	0.000%
19	0.05	-47.73	39.83	-0.05	47.73	-39.83	0.000%
20	-19.90	-63.63	34.46	19.90	63.63	-34.46	0.000%
21	-19.90	-47.73	34.46	19.90	47.73	-34.46	0.000%
22	-28.17	-63.63	28.12	28.17	63.63	-28.12	0.000%
23	-28.17	-47.73	28.12	28.17	47.73	-28.12	0.000%
24	-34.52	-63.63	19.87	34.52	63.63	-19.87	0.000%
25	-34.52	-47.73	19.87	34.52	47.73	-19.87	0.000%
26	-39.88	-63.63	-0.05	39.88	63.63	0.05	0.000%
27	-39.88	-47.73	-0.05	39.88	47.73	0.05	0.000%
28	-34.57	-63.63	-19.96	34.57	63.63	19.96	0.000%
29	-34.57	-47.73	-19.96	34.57	47.73	19.96	0.000%
30	-28.24	-63.63	-28.20	28.24	63.63	28.20	0.000%
31	-28.24	-47.73	-28.20	28.24	47.73	28.20	0.000%
32	-19.99	-63.63	-34.52	19.99	63.63	34.52	0.000%
33	-19.99	-47.73	-34.52	19.99	47.73	34.52	0.000%
34	0.00	-102.29	0.00	0.00	102.29	0.00	0.000%
35	-0.01	-102.29	-11.28	0.01	102.29	11.28	0.000%
36	5.64	-102.29	-9.76	-5.64	102.29	9.76	0.000%
37	7.97	-102.29	-7.97	-7.97	102.29	7.97	0.000%
38	9.77	-102.29	-5.63	-9.77	102.29	5.63	0.000%
39	11.29	-102.29	0.01	-11.29	102.29	-0.01	0.000%
40	9.78	-102.29	5.65	-9.78	102.29	-5.65	0.000%
41	7.99	-102.29	7.98	-7.99	102.29	-7.98	0.000%
42	5.65	-102.29	9.77	-5.65	102.29	-9.77	0.000%
43	0.01	-102.29	11.28	-0.01	102.29	-11.28	0.000%
44	-5.64	-102.29	9.76	5.64	102.29	-9.76	0.000%
45	-7.97	-102.29	7.97	7.97	102.29	-7.97	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
46	-9.77	-102.29	5.63	9.77	102.29	-5.63	0.000%
47	-11.29	-102.29	-0.01	11.29	102.29	0.01	0.000%
48	-9.78	-102.29	-5.65	9.78	102.29	5.65	0.000%
49	-7.99	-102.29	-7.98	7.99	102.29	7.98	0.000%
50	-5.65	-102.29	-9.77	5.65	102.29	9.77	0.000%
51	-0.01	-53.03	-8.52	0.01	53.03	8.52	0.000%
52	4.26	-53.03	-7.37	-4.26	53.03	7.37	0.000%
53	6.03	-53.03	-6.02	-6.03	53.03	6.02	0.000%
54	7.38	-53.03	-4.25	-7.38	53.03	4.25	0.000%
55	8.53	-53.03	0.01	-8.53	53.03	-0.01	0.000%
56	7.40	-53.03	4.27	-7.40	53.03	-4.27	0.000%
57	6.04	-53.03	6.03	-6.04	53.03	-6.03	0.000%
58	4.28	-53.03	7.38	-4.28	53.03	-7.38	0.000%
59	0.01	-53.03	8.52	-0.01	53.03	-8.52	0.000%
60	-4.26	-53.03	7.37	4.26	53.03	-7.37	0.000%
61	-6.03	-53.03	6.02	6.03	53.03	-6.02	0.000%
62	-7.38	-53.03	4.25	7.38	53.03	-4.25	0.000%
63	-8.53	-53.03	-0.01	8.53	53.03	0.01	0.000%
64	-7.40	-53.03	-4.27	7.40	53.03	4.27	0.000%
65	-6.04	-53.03	-6.03	6.04	53.03	6.03	0.000%
66	-4.28	-53.03	-7.38	4.28	53.03	7.38	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00033380
3	Yes	4	0.00000001	0.00016194
4	Yes	5	0.00000001	0.00087852
5	Yes	5	0.00000001	0.00039306
6	Yes	5	0.00000001	0.00098711
7	Yes	5	0.00000001	0.00043607
8	Yes	5	0.00000001	0.00088574
9	Yes	5	0.00000001	0.00039654
10	Yes	4	0.00000001	0.00028137
11	Yes	4	0.00000001	0.00011411
12	Yes	5	0.00000001	0.00088599
13	Yes	5	0.00000001	0.00039629
14	Yes	5	0.00000001	0.00099044
15	Yes	5	0.00000001	0.00043725
16	Yes	5	0.00000001	0.00088409
17	Yes	5	0.00000001	0.00039541
18	Yes	4	0.00000001	0.00029198
19	Yes	4	0.00000001	0.00012492
20	Yes	5	0.00000001	0.00088642
21	Yes	5	0.00000001	0.00039690
22	Yes	5	0.00000001	0.00098722
23	Yes	5	0.00000001	0.00043610
24	Yes	5	0.00000001	0.00087910
25	Yes	5	0.00000001	0.00039327
26	Yes	4	0.00000001	0.00030712
27	Yes	4	0.00000001	0.00013842
28	Yes	5	0.00000001	0.00088642
29	Yes	5	0.00000001	0.00039642
30	Yes	5	0.00000001	0.00099089

31	Yes	5	0.00000001	0.00043738
32	Yes	5	0.00000001	0.00088840
33	Yes	5	0.00000001	0.00039745
34	Yes	4	0.00000001	0.00000001
35	Yes	5	0.00000001	0.00032591
36	Yes	5	0.00000001	0.00040909
37	Yes	5	0.00000001	0.00043434
38	Yes	5	0.00000001	0.00041056
39	Yes	5	0.00000001	0.00032564
40	Yes	5	0.00000001	0.00041019
41	Yes	5	0.00000001	0.00043465
42	Yes	5	0.00000001	0.00040973
43	Yes	5	0.00000001	0.00032554
44	Yes	5	0.00000001	0.00041093
45	Yes	5	0.00000001	0.00043474
46	Yes	5	0.00000001	0.00040965
47	Yes	5	0.00000001	0.00032627
48	Yes	5	0.00000001	0.00041157
49	Yes	5	0.00000001	0.00043614
50	Yes	5	0.00000001	0.00041184
51	Yes	4	0.00000001	0.00004323
52	Yes	4	0.00000001	0.00023659
53	Yes	4	0.00000001	0.00027605
54	Yes	4	0.00000001	0.00024318
55	Yes	4	0.00000001	0.00004276
56	Yes	4	0.00000001	0.00024122
57	Yes	4	0.00000001	0.00027716
58	Yes	4	0.00000001	0.00023943
59	Yes	4	0.00000001	0.00004305
60	Yes	4	0.00000001	0.00024374
61	Yes	4	0.00000001	0.00027619
62	Yes	4	0.00000001	0.00023722
63	Yes	4	0.00000001	0.00004288
64	Yes	4	0.00000001	0.00024172
65	Yes	4	0.00000001	0.00027770
66	Yes	4	0.00000001	0.00024343

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 170.58	22.813	64	1.1033	0.0004
L2	174 - 126	21.427	64	1.1014	0.0003
L3	130.75 - 82.75	12.120	64	0.9077	0.0002
L4	88.75 - 40.75	5.391	64	0.5909	0.0001
L5	48 - 0	1.543	64	0.2927	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
182.00	4-ft Lightning Rod	64	22.813	1.1033	0.0004	47552
177.00	7770.00	64	22.120	1.1028	0.0004	47552
148.00	AIR 3246	64	15.623	1.0153	0.0002	11921

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
134.00	FD-RRH 4x45 1900	64	12.751	0.9298	0.0002	8710
131.00	APXVSPP18-C-A20	64	12.168	0.9094	0.0002	8326
115.00	BXA-70063/4CF	64	9.282	0.7936	0.0001	7951
45.00	GPS	64	1.370	0.2727	0.0000	7356

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 170.58	107.227	26	5.1929	0.0018
L2	174 - 126	100.715	26	5.1843	0.0016
L3	130.75 - 82.75	56.986	28	4.2728	0.0009
L4	88.75 - 40.75	25.352	28	2.7806	0.0004
L5	48 - 0	7.254	28	1.3767	0.0002

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
182.00	4-ft Lightning Rod	26	107.227	5.1929	0.0018	10323
177.00	7770.00	26	103.968	5.1911	0.0017	10323
148.00	AIR 3246	28	73.451	4.7798	0.0010	2566
134.00	FD-RRH 4x45 1900	28	59.951	4.3770	0.0009	1870
131.00	APXVSPP18-C-A20	28	57.211	4.2810	0.0009	1787
115.00	BXA-70063/4CF	28	43.649	3.7355	0.0007	1703
45.00	GPS	28	6.443	1.2827	0.0002	1565

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	9.42	0.00	0.0	15.0243	-4.23	1019.44	0.004
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	48.00	0.00	0.0	27.8838	-16.30	1861.24	0.009
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	48.00	0.00	0.0	44.2487	-28.01	2935.51	0.010
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	48.00	0.00	0.0	63.8666	-41.91	4233.02	0.010
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	48.00	0.00	0.0	89.3059	-63.61	5854.04	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	22.40	529.45	0.042	0.00	529.45	0.000
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	533.77	1345.93	0.397	0.00	1345.93	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	1642.37	2695.18	0.609	0.00	2695.18	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	2973.33	4674.70	0.636	0.00	4674.70	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	4780.48	7749.95	0.617	0.00	7749.95	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	7.42	509.72	0.015	0.00	1061.38	0.000
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	21.60	930.62	0.023	0.00	2698.04	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	30.23	1467.75	0.021	0.00	5402.66	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	35.01	2116.51	0.017	0.00	9370.75	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	39.95	2927.02	0.014	0.00	15534.83	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	180 - 170.58 (1)	0.004	0.042	0.000	0.015	0.000	0.047 ✔	1.000	4.8.2 ✔
L2	170.58 - 126 (2)	0.009	0.397	0.000	0.023	0.000	0.406 ✔	1.000	4.8.2 ✔
L3	126 - 82.75 (3)	0.010	0.609	0.000	0.021	0.000	0.619 ✔	1.000	4.8.2 ✔
L4	82.75 - 40.75 (4)	0.010	0.636	0.000	0.017	0.000	0.646 ✔	1.000	4.8.2 ✔
L5	40.75 - 0 (5)	0.011	0.617	0.000	0.014	0.000	0.628 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	180 - 170.58	Pole	TP26.25x24x0.1875	1	-4.23	1019.44	4.7	Pass
L2	170.58 - 126	Pole	TP36.525x25.0581x0.25	2	-16.30	1861.24	40.6	Pass
L3	126 - 82.75	Pole	TP46.357x34.8903x0.3125	3	-28.01	2935.51	61.9	Pass
L4	82.75 - 40.75	Pole	TP55.765x44.2987x0.375	4	-41.91	4233.02	64.6	Pass
L5	40.75 - 0	Pole	TP64.75x53.2831x0.4375	5	-63.61	5854.04	62.8	Pass
							Summary	
						Pole (L4)	64.6	Pass
						RATING =	**64.6**	**Pass**

Program Version 8.0.5.0 - 11/28/2018 File:J:/Jobs/1902700.WI/09_CT11720A/05_Structural/Tower Analysis/Backup Documentation/ERI Files/180' Monopole_Orange_CT.eri

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	180-FT Monopole Orange, CT
Rev. 0: 4/23/19	Prepared by: T.J.L. Checked by: C.A.G. Job No. 19027.09

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M_u := 4780 \cdot ft \cdot kips$	(Input From tnxTower)
Shear Force =	$Shear := 40 \cdot kips$	(Input From tnxTower)
Axial Force =	$R_u := 64 \cdot kips$	(Input From tnxTower)

Anchor Bolt Data:

ASTMA615 Grade 75

Number of Anchor Bolts =	$N := 20$	(User Input)
Diameter of Bolt Circle =	$D_{BC} := 72 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)
Top of Concrete to Bot Leveling Nut =	$l_{ar} := 2 \cdot in$	(User Input)
Anchor Rod Force Correction Factor =	$n_c = 1$	Table 2-1 Addendum 3

Base Plate Data:

ASTMA572 Grade 60

Plate Yield Strength =	$F_{yf} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{TP} := 2.75 \cdot in$	(User Input)
Base Plate Diameter =	$D_{OD} := 77.25 \cdot in$	(User Input)
Outer Pole Diameter =	$D_T := 64.75 \cdot in$	(User Input)
Pole Wall Thickness =	$t_T := 0.4375 \cdot in$	(User Input)
Pole Design Yield Strength =	$F_{yp} := 65 \cdot ksi$	(User Input)
	$\eta := 0.5$	For Ungrouted Base Plate per TIA-222-G Section 4.9.9

Anchor Bolt Analysis:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

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

Tensile Root Diameter = $d_{rt} := D - \frac{0.9743 \cdot in}{n} = 2.033 \cdot in$

Plastic Section Modulus = $Z := \frac{d_{rt}^3}{6} = 1.401 \cdot in^3$

Maximum Anchor Rod Force = $P_u := \frac{n_c \cdot \pi \cdot M_u}{N \cdot D_{BC}} + \frac{R_u}{N} = 128.3 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 2 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot k$

Bolt % of Capacity = $\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 50.9$

Condition1 = $Condition1 := if\left[\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \le 1.00, "OK", "Overstressed" \right]$

Condition1 = "OK"

Design Shear Strength = $\Phi R_{nv} := 0.75 \cdot 0.45 \cdot F_u \cdot A_g = 134.193 \cdot k$

Design Flexural Strength = $\Phi R_{nm} := 0.9 \cdot F_y \cdot Z = 94.597 \cdot in \cdot k$

$$M_u := \begin{cases} 0 & \text{if } l_{ar} < D \\ 0.65 \cdot l_{ar} \cdot V_u & \text{otherwise} \end{cases} = 0 \cdot in \cdot k$$

Bolt % of Capacity = $\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \right] \cdot 100 = 24.4$

Condition2 = $Condition2 := if\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \le 1.00, "OK", "Overstressed" \right]$

Condition2 = "OK"

Base Plate Analysis:

Strength Resistance Factor for Yielding due to Bending = $\phi_b := 0.9$

Strength Resistance Factor for Yielding due to Shear = $\phi_v := 1.0$

Outside Fillet Horizontal Leg Dimension = $w_1 := 0.25 \cdot in$

Effective Pole Outside Diameter = $D_e := D_T + w_1 = 65 \cdot in$

Effective Base Plate Outside Diameter = $D_{oe} := \begin{cases} D_{OD} & \text{if } D_{OD} \le \left(D_{BC} + 6 \cdot t_{TP}\right) \\ \left(D_{BC} + 6 \cdot t_{TP}\right) & \text{otherwise} \end{cases} = 77.25 \cdot in$

Half-Angle Between Radial Lines Extending from Pole Centerline Through Midpoints Between Adjacent Anchor Rods = $\theta_1 := \frac{\pi}{N} = 0.157$

Angle Defining Limiting Effective Base Plate Width Based on Plate Thickness = $\theta_2 := \operatorname{asin}\left(\frac{12 \cdot t_{TP}}{D_{BC}}\right) = 0.476$

Angle Defining Limiting Effective Base Plate Width Based on Distance Between Anchor Rod Bolt Circle and Effective Pole Outside Diameter = $\theta_3 := \operatorname{acos}\left(\frac{D_{BC} + D_e}{2 \cdot D_{BC}}\right) = 0.313$

Governing Angle Defining Effective Base Plate Width Resisting Bending = $\theta := \min\left(\theta_1, \theta_2, \theta_3\right) = 0.157$

Effective Moment Arm of Anchor Rod Force = $x := 0.5 \cdot \left(D_{BC} - D_e\right) = 3.5 \cdot in$

Effective Base Plate Width Resisting Bending from Transverse Bend Line = $B_{et} := D_{BC} \cdot \sin(\theta) = 11.263 \cdot in$

Effective Base Plate Width Resisting Bending from Radial Bend Lines = $B_{er} := \left(D_{oe} - D_e\right) \cdot \sin(\theta) = 1.916 \cdot in$

Total Effective Base Plate Width Resisting Bending = $B_{eff} := B_{et} + B_{er} = 13.18 \cdot in$

Required Base Plate Thickness = $t_{TP.Req} := \sqrt{\frac{4 \cdot P_u \cdot x}{\phi_b \cdot F_{yf} \cdot B_{eff}}} = 1.589 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 57.8 \cdot \%$

Condition2 = $Condition3 := if\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

Required Base Plate Thickness = $t_{TP.Req} := \frac{\phi_b \cdot t_T \cdot F_{yp}}{\phi_v \cdot 0.6 \cdot F_{yf}} = 0.711 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 25.9 \cdot \%$

Condition2 = $Condition4 := if\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, "Ok", "Overstressed"\right)$

Condition4 = "Ok"

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Subject:	FOUNDATION ANALYSIS
Location:	180-ft Monopole Orange, CT
Rev. 0: 4/23/19	Prepared by: T.J.L Checked by: C.A.G. Job no. 19027.09

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 4780 \cdot ft \cdot kips$	(User Input)	
Shear Force =	$Shear := 40 \cdot kip$	(User Input)	
Axial Force =	$Axial := 64 \cdot kip$	(User Input)	
Tower Height =	$H_t := 180 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 7.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 2.0 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 1 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 8.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 6.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 48.0 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 32 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_u := 12000 \cdot psf$	(User Input)	
Allowable Soil Bearing Capacity =	$q_a := \frac{q_u}{2} = 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	
Coefficient of Lateral Soil Pressure =	$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.255$		

Stability of Footing:

Adjusted Concrete Unit Weight =

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

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 120\cdot\text{pcf}$$

Passive Pressure =

$$P_{pn} := K_p\cdot\gamma_s\cdot n + c\cdot 2\cdot\sqrt{K_p} = 0\cdot\text{ksf}$$

$$P_{pt} := K_p\cdot\gamma_s\cdot\left(D_f - T_f\right) + c\cdot 2\cdot\sqrt{K_p} = 0.391\cdot\text{ksf}$$

$$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0.391\cdot\text{ksf}$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 2.734\cdot\text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.562\cdot\text{ksf}$$

$$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 6$$

$$A_p := W_f\cdot T_p = 288$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 449.914\cdot\text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[\left(W_f^{\,2}\cdot T_f\right) + d_p^{\,2} L_p\right]\cdot\gamma_c = 2093\cdot\text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^{\,2} - d_p^{\,2}\right)\cdot\left(\left|L_p - L_{pag} - n\right|\right)\right]\cdot\gamma_s = 268.8\cdot\text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^{\,2}\cdot\tan\left(\Phi_s\right)}{2}\cdot W_f\right)\cdot\gamma_s = 88.182\cdot\text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2\cdot\left[\left(D_f\right)^3\cdot\frac{\tan\left(\Phi_s\right)}{3}\right]\cdot\gamma_s = 17.146\cdot\text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 2.426\times 10^3\cdot\text{kip}$$

Resisting Weight =

$$WT_R := 0.9\cdot WT_c + 0.75\cdot WT_{s1} + 0.75\cdot\text{Axial} = 2.133\times 10^3\cdot\text{kip}$$

Resisting Moment =

$$M_r := \left(WT_R\right)\cdot\frac{W_f}{2} + 0.75\cdot S_u\cdot\frac{T_f}{3} + 0.75\cdot\left[\left(WT_{s2} + WT_{s3}\right)\cdot\left(W_f + \frac{D_f\cdot\tan\left(\Phi_s\right)}{3}\right)\right] = 55777\cdot\text{kip}\cdot\text{ft}$$

Overturning Moment =

$$M_{ot} := \text{OM} + \text{Shear}\cdot\left(L_p + T_f\right) = 5100\cdot\text{kip}\cdot\text{ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 10.94$$

Factor of Safety Required =

$$FS_{req} := 1$$

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

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 1.541 \times 10^3 \cdot kips$$

$$Shear\_Check := if\left(S_p > Shear, "Okay", "No Good"\right)$$

$Shear\_Check = "Okay"$

Bearing Pressure Caused by Footing:

Area of the Mat =

$$A_{mat} := W_f^2 = 2.304 \times 10^3$$

Section Modulus of Mat =

$$S := \frac{W_f^3}{6} = 1.84 \times 10^4 \cdot ft^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.329 \cdot ksf$$

$$Max\_Pressure\_Check := if\left(P_{max} < .75 \cdot q_u, "Okay", "No Good"\right)$$

$Max\_Pressure\_Check = "Okay"$

Minimum Pressure in Mat =

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.776 \cdot ksf$$

$$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < .75 \cdot q_u\right), "Okay", "No Good"\right]$$

$Min\_Pressure\_Check = "Okay"$

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Section 1 - Site Information

Site ID: CT11720A
Status: Final
Version: R2.1
Project Type: M-MIMO
Approved: 4/17/2019 12:31:28 PM
Approved By: GSM1900\MSEDDIK
Last Modified: 4/17/2019 12:31:28 PM
Last Modified By: GSM1900\MSEDDIK

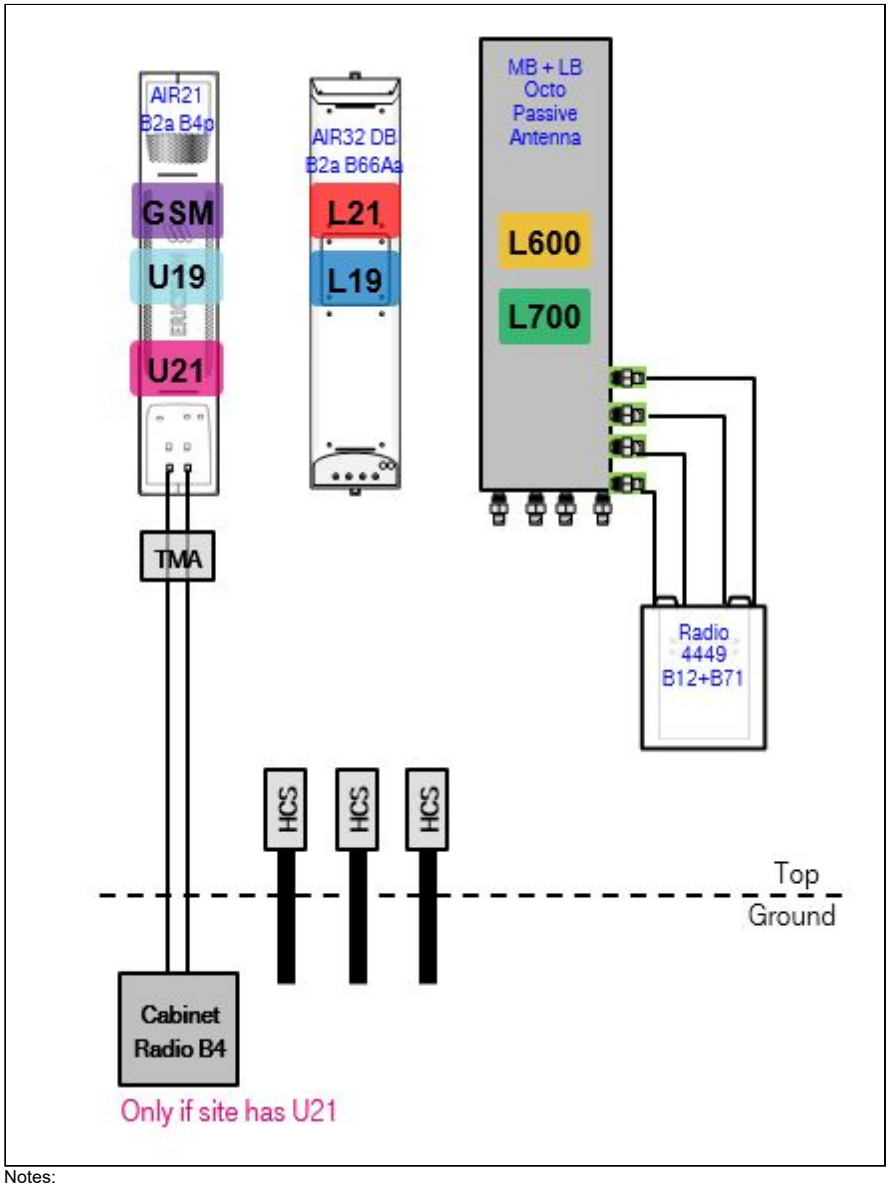
Site Name: CT720/Town of Orange_MP
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2019
Market: CONNECTICUT
Vendor: Ericsson
Landlord: Crown Castle

Latitude: 41.2557210000
Longitude: -73.0108180000
Address: 26 So. Orange Center Rd
City, State: Orange, CT
Region: NORTHEAST

RAN Template: 67D92M Outdoor		**AL Template:** 67D92M_2xAIR+1OP		
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 6	**TMA Count:** 3	**RRU Count:** 6

Section 2 - Existing Template Images

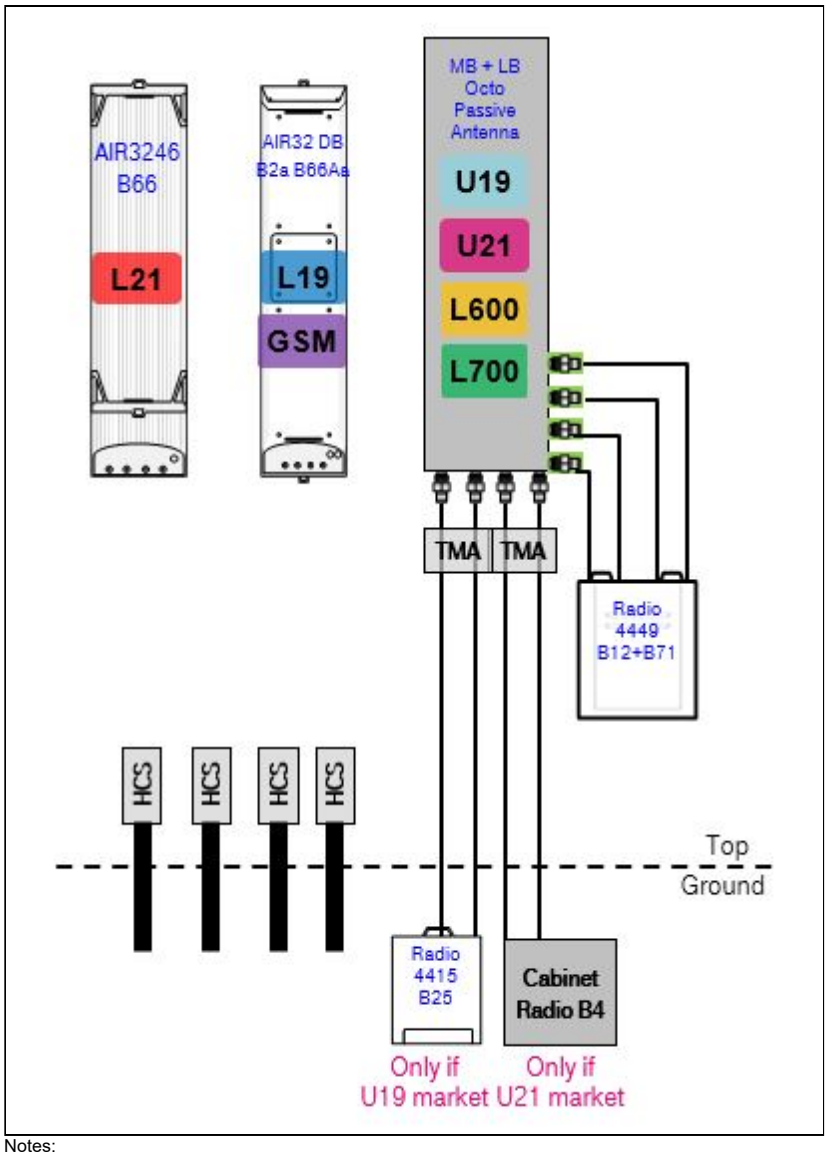
67D92DB_2xAIR+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D92M_2xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

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

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Section 5 - RAN Equipment

Existing RAN Equipment		
Template: 67D92DB Outdoor		
Enclosure	1	2
Enclosure Type	RBS 6131	Ancillary Equipment
Baseband	DUW30 (U1900); DUW30 (U2100); DUG20 (G1900); BB 6630 (L2100, L1900, L700, L600); BB 6630 (N600 (DARK))	
Hybrid Cable System		Ericsson 6x12 HCS 4AWG 60m
Radio	RU22 (x6) (U2100)	

Proposed RAN Equipment		
Template: 67D92M Outdoor		
Enclosure	1	
Enclosure Type	RBS 6131	
Baseband	DUW30 (U1900); DUW30 (U2100); DUG20 (G1900); BB 6630 (L1900, L700, L600); BB 6630 (N600 (DARK)); BB 6630 (L2100)	
Hybrid Cable System	Ericsson 6x12 HCS *Select Length & AWG* (x2); Ericsson 6x12 HCS 4AWG 60m	
Radio	RU22 (x6) (U2100)	

RAN Scope of Work:

Add (2) new 6x12 HCS. Add (1) BB 6630 for L2100 alone.
Currently 2 HCS add 2 HCS.
Remove 6 coax of existing 12.

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Section 6 - A&L Equipment

Existing Template: 67D92DB_2xAIR+1OP
Proposed Template: 67D92M_2xAIR+1OP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	0		0				0			
M. Tilt										
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	U1900 G1900	U2100	L700 L600	L700 L600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B12 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Sector 1 (Proposed) view from behind												
Coverage Type	A - Outdoor Macro											
Antenna	1				2				3			
Antenna Model	Ericsson - AIR3246 B66 (Active Antenna - Massive MIMO)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	0				0				0			
M. Tilt												
Height	150				150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	L2100	L2100	L2100	L2100	L700 L600	L700 L600	U1900	U2100			L1900 G1900	L1900 G1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt												
Cables					JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	Coax Jumper **(x2)**	1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**				
TMAs								Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners												
Radio					Radio 4449 B71+B12 (At Antenna)	SHARED Radio 4449 B71+B12 (At Antenna)	Radio 4415 B25 (At Antenna)					
Sector Equipment												

Unconnected Equipment:

Scope of Work:

Swap (1) AIR21 B2A/B4P antenna with (1) AIR3246 B66 antenna. Move GSM to AIR32 DB antenna Mixed Mode with L1900.
Add (1) Radio 4415 B25 for U1900 and connect coax jumpers to Octa antenna's MB port. Move U2100 coax and TMA to MB ports

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

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Sector 2 (Existing) view from behind										
Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	120		120				120			
M. Tilt										
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	U1900 G1900	U2100	L700 L600	L700 L600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B12 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Sector 2 (Proposed) view from behind												
Coverage Type	A - Outdoor Macro											
Antenna	1				2				3			
Antenna Model	Ericsson - AIR3246 B66 (Active Antenna - Massive MIMO)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	120				120				120			
M. Tilt												
Height	150				150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	L2100	L2100	L2100	L2100	L700 L600	L700 L600	U1900	U2100			L1900 G1900	L1900 G1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt												
Cables					JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	Coax Jumper **(x2)**	1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**				
TMAs								Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners												
Radio					Radio 4449 B71+B12 (At Antenna)	SHARED Radio 4449 B71+B12 (At Antenna)	Radio 4415 B25 (At Antenna)					
Sector Equipment												

Unconnected Equipment:

Scope of Work:

Swap (1) AIR21 B2A/B4P antenna with (1) AIR3246 B66 antenna. Move GSM to AIR32 DB antenna Mixed Mode with L1900.
Add (1) Radio 4415 B25 for U1900 and connect coax jumpers to Octa antenna's MB port. Move U2100 coax and TMA to MB ports

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

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Sector 3 (Existing) view from behind										
Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	250		250				250			
M. Tilt										
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	U1900 G1900	U2100	L700 L600	L700 L600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B12 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Sector 3 (Proposed) view from behind												
Coverage Type	A - Outdoor Macro											
Antenna	1				2				3			
Antenna Model	Ericsson - AIR3246 B66 (Active Antenna - Massive MIMO)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	250				250				250			
M. Tilt												
Height	150				150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	L2100	L2100	L2100	L2100	L700 L600	L700 L600	U1900	U2100			L1900 G1900	L1900 G1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt												
Cables					JUMPER 6' DIN MALE-DIN MALE **(x2)**	JUMPER 6' DIN MALE-DIN MALE **(x2)**	Coax Jumper **(x2)**	1-5/8" Coax - 198 ft. **(x2)** Coax Jumper **(x2)**				
TMAs								Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners												
Radio					Radio 4449 B71+B12 (At Antenna)	SHARED Radio 4449 B71+B12 (At Antenna)	Radio 4415 B25 (At Antenna)					
Sector Equipment												

Unconnected Equipment:

Scope of Work:

Swap (1) AIR21 B2A/B4P antenna with (1) AIR3246 B66 antenna. Move GSM to AIR32 DB antenna Mixed Mode with L1900.
Add (1) Radio 4415 B25 for U1900 and connect coax jumpers to Octa antenna's MB port. Move U2100 coax and TMA to MB ports

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

RAN Template:	A&L Template:	Power System Template:
67D92M Outdoor	67D92M_2xAIR+1OP	Custom

CT11720A_M-MIMO_R2.1

Section 7 - Power Systems Equipment

Existing Power Systems Equipment
----- This section is intentionally blank. -----

Proposed Power Systems Equipment

AIR 3246 update 12/18 - 17

Kenth Höglund – AIR3246 product manager
Evangelos Paravalos – PjM RAN SW development Ottawa R&D

AIR 3246 BAND 66 (1/2)

- Radio
  - 32 TX/RX
  - 90 MHz IBW
  - 60 MHz LTE CBW
  - Up to 3 carriers LTE
  - 160 W total RF conducted power
- Baseband interface 4 x 10.1 Gbps CPRI
- Mechanical properties
  - Size (H x W x D):1475x400x238 mm 58.1"x15.7"x9.4"
  - Weight : 81 Kg (estimated) 180 lbs
- Power
  - -48v DC, 3 wire or 2 wire
  - Max Power consumption: < 1350 w (estimated)
  - 120/230 VAC via supervised external PSU

RRUS 4415 B25 DATA SHEET

For Turf Vendors

2017-11-02 Rev B

RRUS 4415 B25

- B25
  - TX = 1930 – 1995 MHz
  - RX = 1850 – 1915 MHz
- CPRI 2 ports x 2.5/4.9/9.8/10.1 Gbps. Install 2 SFPs and connect 2 fiber pair to the RRUS 4415 during initial install.
- Only use Ericsson supplied and approved SFPs RDH10265/25

  Exception: SFP7 RDH 10265/3 for CPRI 1.4km to 10km

  Exception: SFP7 (pair): RDH 102 70/1 and RDH 102 70/2 for CPRI > 10km
- 2 external alarm inputs
- Max wind load @ 50m/sec = 260N
- Breaker size = 25A, DC Power Consumption = 670 W (for dimensioning)
- 200mm horizontal separation required for side by side mounting
- 200mm separation required from antenna backplane to radio
- 400mm vertical outdoor/indoor separation required between 2 radios
- 500mm vertical separation below antenna
- Min, Max DC cable size from squid to radio = 10,8 AWG
  - Adapter is required for 2-wire connection
  - Shielded DC cable is required
- Ground cable size = 2AWG
- Dimensions (incl. handles, feet and sunshield, w/o fan unit)
  - Height:16.5” (420 mm)
  - Width: 13.4” (342 mm)
  - Depth: 5.9” (149 mm)
- Weight, excl. mounting hardware = 46 lbs (21 kg)

Exhibit E

Mount Analysis

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

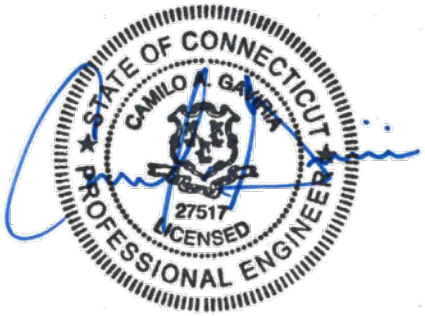
T-Mobile Site #: CT11720A

26 S Orange Center Rd
Orange, CT

Centek Project No. 19027.09

Date: April 24, 2019

Max Stress Ratio = 93.3%



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

SECTION 1 – REPORT

- ANTENNA AND APPURTENANCE SUMMARY
- STRUCTURE LOADING
- CONCLUSION

SECTION 2 – CALCULATIONS

- WIND LOAD ON APPURTENANCES
- RISA3D OUTPUT REPORT

SECTION 3 – REFERENCE MATERIALS (NOT INCLUDED WITHIN REPORT)

- RF DATA SHEET, DATED 04/17/2019

CENTEK engineering

Centered on Solutions℠

April 24, 2019

Mr. Dan Reid
Transcend Wireless
10 Industrial Ave
Mahwah, NJ 07430

Re: Structural Letter ~ Antenna Mount
T-Mobile – Site Ref: CT11720A
26 S Orange Center Road
Orange, CT 06477

Centek Project No. 19027.09

Dear Mr. Reid,

Centek Engineering, Inc. has reviewed the T-Mobile antenna installation at the above referenced site. The purpose of the review is to determine the structural adequacy of the existing mount, consisting of one (1) 12-ft low profile platform to support the equipment configuration. The review considered the effects of wind load, dead load and ice load in accordance with the 2015 International Building Code as modified by the 2018 Connecticut State Building Code (CTBC) including ASCE 7-10 and ANSI/TIA-222-G *Structural Standards for Steel Antenna Towers and Supporting Structures*.

The loads considered in this analysis consist of the following:

- **T-Mobile:**
  Low Profile Platform: Three (3) Ericsson-AIR3246 B66, three (3) Ericsson KRD901146-1_B66A_B2A panel antennas, three (3) RFS APXVAARR2443-NA20 panel antennas, three (3) KRY112 TMAs, three (3) Ericsson 4449 B71_B12 , three (3) Ericsson 4415 B25 remote radio units mounted on one (1) low profile platform with a RAD center elevation of 150-ft +/- AGL.

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

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

Based on our review of the installation, it is our opinion that the **existing antenna platform is structurally adequate to support the proposed antenna configuration.** If there are any questions regarding this matter, please feel free to call.

Respectfully submitted by:

Camilo A. Gaviria, PE
Structural Engineer

STATE OF CONNECTICUT
CAMILO A. GAVIRIA
27517
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Fernando J. Palacios
Engineer

Section 2 - Calculations

CENTEK engineering
Centered on Solutions℠ www.centekeng.com
63-2 North Branford Road P: (203) 488-0580
Branford, CT 06405 F: (203) 488-8587

Subject: Loads on Equipment

Location: Orange, CT

Rev. 0: 04/25/19

Prepared by: F.J.P Checked by: T.J.L.
Job No. 19027.09

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

Wind Speeds

Basic Wind Speed	$V := 97$	mph	(User Input - 2018 CSBC Appendix N)
Basic Wind Speed with Ice	$V_i := 50$	mph	(User Input per Annex B of TIA-222-G)

Input

Structure Type =	$Structure\_Type := Pole$		(User Input)
Structure Category =	$SC := II$		(User Input)
Exposure Category =	$Exp := C$		(User Input)
Structure Height =	$h := 177$	ft	(User Input)
Height to Center of Antennas =	$z := 145.5$	ft	(User Input)
Radial Ice Thickness =	$t_i := 0.75$	in	(User Input per Annex B of TIA-222-G)
Radial Ice Density =	$Id := 56.00$	pcf	(User Input)
Topograpic Factor =	$K_{zt} := 1.0$		(User Input)
	$K_a := 1.0$		(User Input)
Gust Response Factor =	$G_H = 1.1$		(User Input)

Output

Wind Direction Probability Factor =

$$K_d := \begin{cases} 0.95 & \text{if } Structure\_Type = Pole \\ 0.85 & \text{if } Structure\_Type = Lattice \end{cases} = 0.95$$

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

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

Importance Factors =

$$I_{Wind} := \begin{cases} 0.87 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.15 & \text{if } SC = 3 \end{cases} = 1$$

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

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

$$K_{iz} := \left(\frac{z}{33}\right)^{0.1} = 1.16$$

Velocity Pressure Coefficient Antennas =

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 1.74$$

$$Kz := 2.01 \cdot \left(\left(\frac{z}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.37$$

Velocity Pressure w/o Ice Antennas = $qz := 0.00256 \cdot K_d \cdot Kz \cdot V^2 \cdot I_{Wind} = 31.34$ psf

Velocity Pressure with Ice Antennas = $qz_{ice} := 0.00256 \cdot K_d \cdot Kz \cdot V_i^2 \cdot I_{Wind} = 8.327$ psf

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson KRD901146-1_B66A_B2A		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 56.65$	in	(User Input)
Antenna Width =	$W_{ant} := 12.87$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.66$	in	(User Input)
Antenna Weight =	$WT_{ant} := 132.2$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.4$		
Antenna Force Coefficient =	$Ca_{ant} = 1.28$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.1$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 224$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 3.4$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 151$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 6.8$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 80$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 5.1$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 60$	lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6314$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 5621$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 182$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 182$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVAARR24_43-U-NA20		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 95.9$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in	(User Input)
Antenna Weight =	$WT_{ant} := 153$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.27$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 698$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 5.8$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 253$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 19$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 220$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 8.4$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 98$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 153$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \cdot 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 1 \cdot 10^4$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 429$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 429$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AIR 3246 B66		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 58.1$	in	(User Input)
Antenna Width =	$W_{ant} := 15.8$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9.4$	in	(User Input)
Antenna Weight =	$WT_{ant} := 178.6$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.7$		
Antenna Force Coefficient =	$Ca_{ant} = 1.25$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 6.4$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 275$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 3.8$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 164$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 8.2$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 95$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 5.5$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 63$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 179$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 8629$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 6663$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 216$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 216$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model =	Ericsson 4415 B25		
RRUS Shape =	Flat		(User Input)
RRUS Height =	$L_{RRUS} := 16.5$	in	(User Input)
RRUS Width =	$W_{RRUS} := 13.4$	in	(User Input)
RRUS Thickness =	$T_{RRUS} := 5.9$	in	(User Input)
RRUS Weight =	$WT_{RRUS} := 46$	lbs	(User Input)
Number of RRUS's =	$N_{RRUS} := 1$		
RRUS Aspect Ratio =	$Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.2$		
RRUS Force Coefficient =	$Ca_{RRUS} = 1.2$		

Wind Load (without ice)

Surface Area for One RRUS =	$SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.5$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 64$	lbs
Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 0.7$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 28$	lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.3$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 26$	lbs
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.3$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 14$	lbs

Gravity Load (without ice)

Weight of All RRUSs =	$WT_{RRUS} \cdot N_{RRUS} = 46$	lbs

Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 1304$	cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 1859$	cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 60$	lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 60$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model =	Ericsson 4449 B71B12		
RRUS Shape =	Flat		(User Input)
RRUS Height =	$L_{RRUS} := 14.9$	in	(User Input)
RRUS Width =	$W_{RRUS} := 13.2$	in	(User Input)
RRUS Thickness =	$T_{RRUS} := 10.4$	in	(User Input)
RRUS Weight =	$WT_{RRUS} := 74$	lbs	(User Input)
Number of RRUS's =	$N_{RRUS} := 1$		
RRUS Aspect Ratio =	$Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$		
RRUS Force Coefficient =	$Ca_{RRUS} = 1.2$		

Wind Load (without ice)

Surface Area for One RRUS =	$SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.4$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 57$	lbs
Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.1$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 45$	lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.1$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 23$	lbs
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.8$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 19$	lbs

Gravity Load (without ice)

Weight of All RRUSs =	$WT_{RRUS} \cdot N_{RRUS} = 74$	lbs

Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 2045$	cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2210$	cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 72$	lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 72$	lbs

Development of Wind & Ice Load on TMA's

TMA Data:

TMA Model =	Ericsson KRY112 TMA		
TMA Shape =	Flat	in	(User Input)
TMA Height =	$L_{TMA} := 7.7$	in	(User Input)
TMA Width =	$W_{TMA} := 7.5$	in	(User Input)
TMA Thickness =	$T_{TMA} := 3.4$	lbs	(User Input)
TMA Weight =	$WT_{TMA} := 11$		(User Input)
Number of TMA's =	$N_{TMA} := 1$		(User Input)
TMA Aspect Ratio =	$Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1$		
TMA Force Coefficient =	$Ca_{TMA} = 1.2$		

Wind Load (without ice)

Surface Area for One TMA =	$SA_{TMAF} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.4$	sf
Total TMA Wind Force =	$F_{TMA} := qz \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAF} = 17$	lbs
Surface Area for One TMA =	$SA_{TMAS} := \frac{L_{TMA} \cdot T_{TMA}}{144} = 0.2$	sf
Total TMA Wind Force =	$F_{TMA} := qz \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAS} = 8$	lbs

Wind Load (with ice)

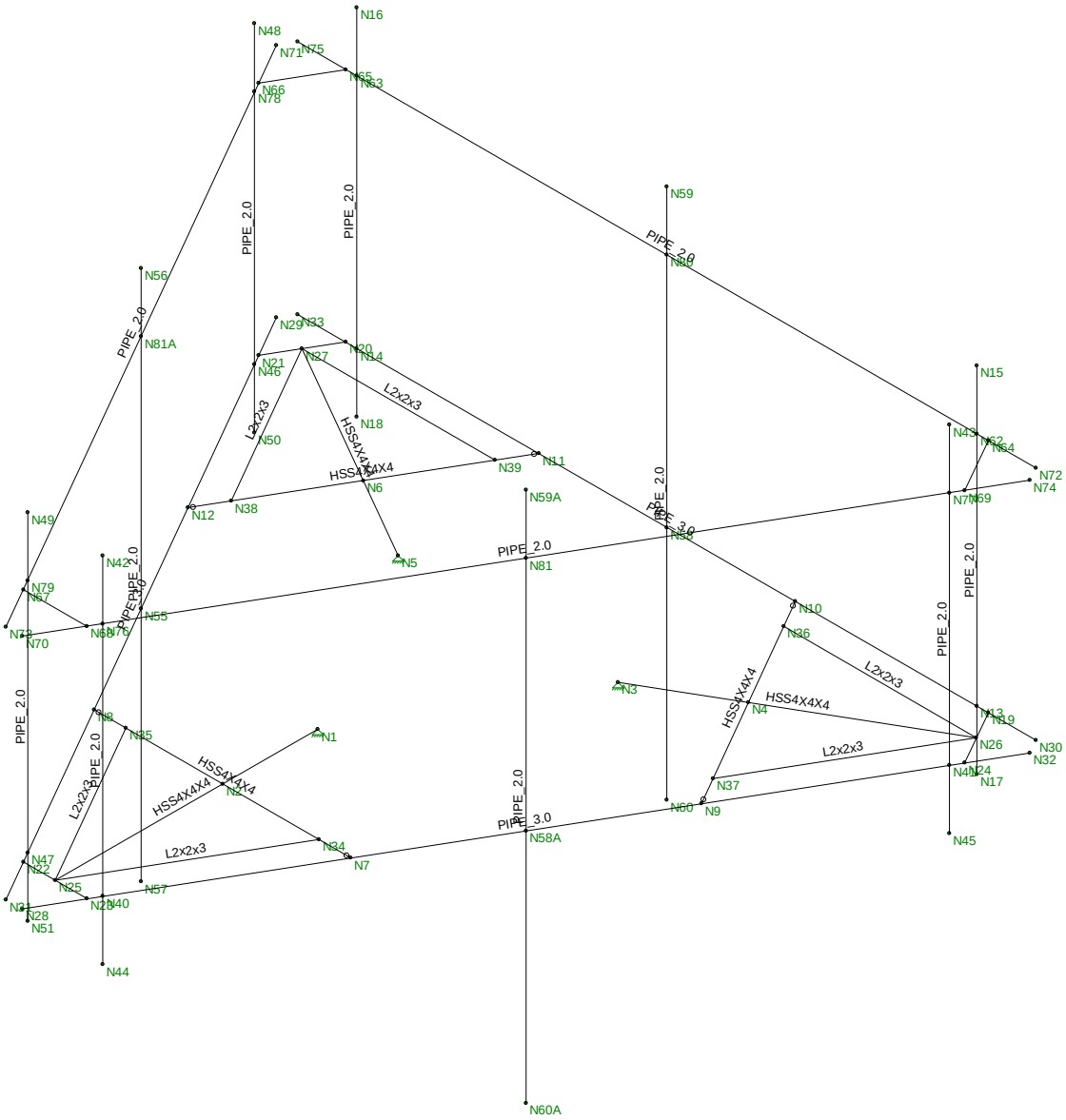
Surface Area for One TMA w/ Ice =	$SA_{ICETMAF} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz})}{144} = 0.9$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAF} = 9$	lbs
Surface Area for One TMA w/ Ice =	$SA_{ICETMAS} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz})}{144} = 0.5$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAS} = 6$	lbs

Gravity Load (without ice)

Weight of All TMAs =	$WT_{TMA} \cdot N_{TMA} = 11$	lbs

Gravity Loads (ice only)

Volume of Each TMA =	$V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 196$	cu in
Volume of Ice on Each TMA =	$V_{ice} := (L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz}) - V_{TMA} = 648$	cu in
Weight of Ice on Each TMA =	$W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 21$	lbs
Weight of Ice on All TMAs =	$W_{ICETMA} \cdot N_{TMA} = 21$	lbs



Envelope Only Solution

Centek		
THC	CT11720A - Mount	Apr 24, 2019 at 11:59 AM
19027.09	Member Framing	CT11720A_AMA.r3d

(Global) Model Settings

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

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

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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd 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 Grade 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[..	Lcomp bot[..	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Outrigger	4.446			Lbyy						Lateral
2	M2	Support	4.346			Lbyy						Lateral
3	M3	Outrigger	4.445			Lbyy						Lateral
4	M4	Support	4.346			Lbyy						Lateral
5	M5	Outrigger	4.445			Lbyy						Lateral
6	M6	Support	4.346			Lbyy						Lateral
7	M7	Horz	12.5			Lbyy						Lateral
8	M8	Horz	12.5			Lbyy						Lateral
9	M9	Horz	12.5			Lbyy						Lateral
10	M10	Antenna M...	6			Lbyy						Lateral
11	M11	Antenna M...	6			Lbyy						Lateral
12	M15	L2x2	3.271			Lbyy						Lateral
13	M16	L2x2	3.271			Lbyy						Lateral
14	M17	L2x2	3.27			Lbyy						Lateral
15	M18	L2x2	3.271			Lbyy						Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[..	Lcomp bot[..	L-torq...	Kyy	Kzz	Cb	Functi...
16	M19	L2x2	3.271			Lbyy						Lateral
17	M20	L2x2	3.27			Lbyy						Lateral
18	M21	Antenna M...	6			Lbyy						Lateral
19	M22	Antenna M...	6			Lbyy						Lateral
20	M23	Antenna M...	6			Lbyy						Lateral
21	M24	Antenna M...	6			Lbyy						Lateral
22	M27	Antenna M...	9	Segment	Segment	Segment	Segment	Segm...				Lateral
23	M26	Antenna M...	9	Segment	Segment	Segment	Segment	Segm...				Lateral
24	M25	Antenna M...	9	Segment	Segment	Segment	Segment	Segm...				Lateral
25	M28	Handrail	12.5			Lbyy						Lateral
26	M29	Handrail	12.5			Lbyy						Lateral
27	M30	Handrail	12.5			Lbyy						Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Desig..	A [in2]	Iyy [i...	Izz [i...	J [in4]
1	Outrigger	HSS4X4X4	Beam	Tube	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
2	Horz	PIPE_3.0	Beam	Pipe	A53 Grade B	Typical	2.07	2.85	2.85	5.69
3	Antenna Mast	PIPE_2.0	VBrace	Wide Fla...	A53 Grade B	Typical	1.02	.627	.627	1.25
4	Support	HSS4X4X4	Beam	Tube	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
5	L2x2	L2x2x3	Beam	Tube	A36 Gr.36	Typical	.722	.271	.271	.009
6	Handrail	PIPE_2.0	Beam	Tube	A53 Grade B	Typical	1.02	.627	.627	1.25

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N25			Outrigger	Beam	Tube	A500 Gr.46	Typical
2	M2	N7	N8			Support	Beam	Tube	A500 Gr.46	Typical
3	M3	N3	N26			Outrigger	Beam	Tube	A500 Gr.46	Typical
4	M4	N9	N10			Support	Beam	Tube	A500 Gr.46	Typical
5	M5	N5	N27			Outrigger	Beam	Tube	A500 Gr.46	Typical
6	M6	N11	N12			Support	Beam	Tube	A500 Gr.46	Typical
7	M7	N28	N32			Horz	Beam	Pipe	A53 Grad...	Typical
8	M8	N30	N33			Horz	Beam	Pipe	A53 Grad...	Typical
9	M9	N29	N31			Horz	Beam	Pipe	A53 Grad...	Typical
10	M10	N17	N15			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
11	M11	N18	N16			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
12	M12	N21	N20			RIGID	None	None	RIGID	Typical
13	M13	N19	N24			RIGID	None	None	RIGID	Typical
14	M14	N23	N22			RIGID	None	None	RIGID	Typical
15	M15	N25	N34		180	L2x2	Beam	Tube	A36 Gr.36	Typical
16	M16	N25	N35		180	L2x2	Beam	Tube	A36 Gr.36	Typical
17	M17	N26	N36		180	L2x2	Beam	Tube	A36 Gr.36	Typical
18	M18	N26	N37		180	L2x2	Beam	Tube	A36 Gr.36	Typical
19	M19	N27	N38		180	L2x2	Beam	Tube	A36 Gr.36	Typical
20	M20	N27	N39		180	L2x2	Beam	Tube	A36 Gr.36	Typical
21	M21	N44	N42			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
22	M22	N45	N43			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
23	M23	N50	N48			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
24	M24	N51	N49			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
25	M27	N59	N60			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
26	M26	N56	N57			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
27	M25	N59A	N60A			Antenna Mast	VBrace	Wide Flange	A53 Grad...	Typical
28	M28	N74	N70			Handrail	Beam	Tube	A53 Grad...	Typical
29	M29	N73	N71			Handrail	Beam	Tube	A53 Grad...	Typical
30	M30	N75	N72			Handrail	Beam	Tube	A53 Grad...	Typical
31	M31	N67	N68			RIGID	None	None	RIGID	Typical
32	M32	N66	N65			RIGID	None	None	RIGID	Typical
33	M33	N64	N69			RIGID	None	None	RIGID	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	0	0	2.150723	0	
2	N2	0	0	3.763765	0	
3	N3	1.86258	0	-1.075361	0	
4	N4	3.259516	0	-1.881882	0	
5	N5	-1.86258	0	-1.075361	0	
6	N6	-3.259516	0	-1.881882	0	
7	N7	2.173011	0	3.763765	0	
8	N8	-2.173011	0	3.763765	0	
9	N9	4.346021	0	-0.	0	
10	N10	2.173011	0	-3.763765	0	
11	N11	-2.173011	0	-3.763765	0	
12	N12	-4.346021	0	0.	0	
13	N13	5.250196	0	-3.763765	0	
14	N14	-5.249805	0	-3.763765	0	
15	N15	5.250196	5	-3.763765	0	
16	N16	-5.249805	5	-3.763765	0	
17	N17	5.250196	-1	-3.763765	0	
18	N18	-5.249805	-1	-3.763765	0	
19	N19	5.44367	0	-3.763765	0	
20	N20	-5.443288	0	-3.763765	0	
21	N21	-5.981351	0	-2.832474	0	
22	N22	-0.537681	0	6.596239	0	
23	N23	0.537681	0	6.596239	0	
24	N24	5.98116	0	-2.832143	0	
25	N25	0	0	6.596239	0	
26	N26	5.712367	0	-3.298037	0	
27	N27	-5.712367	0	-3.298037	0	
28	N28	0.13442	0	7.294707	0	
29	N29	-6.384611	0	-3.530942	0	
30	N30	6.250191	0	-3.763765	0	
31	N31	-0.134611	0	7.294375	0	
32	N32	6.38442	0	-3.530611	0	
33	N33	-6.249809	0	-3.763765	0	
34	N34	1.63533	0	3.763765	0	
35	N35	-1.63533	0	3.763765	0	
36	N36	2.441899	0	-3.298037	0	
37	N37	4.077181	0	-0.465645	0	
38	N38	-4.077181	0	-0.465645	0	
39	N39	-2.441899	0	-3.298037	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
40	N40	0.634418	0	6.428685	0	
41	N41	5.884418	0	-2.664582	0	
42	N42	0.634418	5	6.428685	0	
43	N43	5.884418	5	-2.664582	0	
44	N44	0.634418	-1	6.428685	0	
45	N45	5.884418	-1	-2.664582	0	
46	N46	-5.884614	0	-2.664921	0	
47	N47	-0.634613	0	6.428347	0	
48	N48	-5.884614	5	-2.664921	0	
49	N49	-0.634613	5	6.428347	0	
50	N50	-5.884614	-1	-2.664921	0	
51	N51	-0.634613	-1	6.428347	0	
52	N58	0.000195	0	-3.763765	0	
53	N59	0.000195	5	-3.763765	0	
54	N60	.000195	-4	-3.763765	0	
55	N55	-3.259613	0	1.881714	0	
56	N56	-3.259613	5	1.881714	0	
57	N57	-3.259613	-4	1.881714	0	
58	N58A	3.259418	0	1.882051	0	
59	N59A	3.259418	5	1.882051	0	
60	N60A	3.259418	-4	1.882051	0	
61	N81	3.259418	4	1.882051	0	
62	N62	5.250196	4	-3.763765	0	
63	N63	-5.249805	4	-3.763765	0	
64	N64	5.44367	4	-3.763765	0	
65	N65	-5.443288	4	-3.763765	0	
66	N66	-5.981351	4	-2.832474	0	
67	N67	-0.537681	4	6.596239	0	
68	N68	0.537681	4	6.596239	0	
69	N69	5.98116	4	-2.832143	0	
70	N70	0.13442	4	7.294707	0	
71	N71	-6.384611	4	-3.530942	0	
72	N72	6.250191	4	-3.763765	0	
73	N73	-0.134611	4	7.294375	0	
74	N74	6.38442	4	-3.530611	0	
75	N75	-6.249809	4	-3.763765	0	
76	N76	0.634418	4	6.428685	0	
77	N77	5.884418	4	-2.664582	0	
78	N78	-5.884614	4	-2.664921	0	
79	N79	-0.634613	4	6.428347	0	
80	N80	0.000195	4	-3.763765	0	
81	N81A	-3.259613	4	1.881714	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	N1	Reaction	Reaction	Reaction			
2	N3	Reaction	Reaction	Reaction			
3	N5	Reaction	Reaction	Reaction			

Member Point Loads (BLC 2 : Equipment Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Y	-.09	.5
2	M24	Y	-.09	4.5
3	M26	Y	-.076	.5
4	M26	Y	-.076	4.5
5	M23	Y	-.066	.5
6	M23	Y	-.066	4.5
7	M11	Y	-.089	.5
8	M11	Y	-.089	4.5
9	M27	Y	-.076	.5
10	M27	Y	-.076	4.5
11	M10	Y	-.066	4.5
12	M10	Y	-.066	.5
13	M22	Y	-.089	.5
14	M22	Y	-.089	4.5
15	M25	Y	-.076	.5
16	M25	Y	-.076	4.5
17	M21	Y	-.066	.5
18	M21	Y	-.066	4.5
19	M26	Y	-.011	1
20	M26	Y	-.074	2
21	M26	Y	-.046	3
22	M27	Y	-.011	1
23	M27	Y	-.074	2
24	M25	Y	-.011	1
25	M25	Y	-.074	2
26	M27	Y	-.046	3
27	M25	Y	-.046	3

Member Point Loads (BLC 3 : Ice Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Y	-.108	.5
2	M24	Y	-.108	4.5
3	M26	Y	-.214	.5
4	M26	Y	-.214	4.5
5	M23	Y	-.091	.5
6	M23	Y	-.091	4.5
7	M11	Y	-.108	.5
8	M11	Y	-.108	4.5
9	M27	Y	-.214	.5
10	M27	Y	-.214	4.5
11	M10	Y	-.091	.5
12	M10	Y	-.091	4.5
13	M22	Y	-.108	4.5
14	M22	Y	-.108	.5
15	M25	Y	-.214	4.5
16	M25	Y	-.214	.5
17	M21	Y	-.091	4.5
18	M21	Y	-.091	.5
19	M26	Y	-.021	1
20	M26	Y	-.072	2

Member Point Loads (BLC 3 : Ice Weight) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
21	M26	Y	-.06	3
22	M27	Y	-.021	1
23	M27	Y	-.072	2
24	M25	Y	-.021	1
25	M25	Y	-.072	2
26	M27	Y	-.06	3
27	M25	Y	-.06	3

Member Point Loads (BLC 4 : Wind w/ Ice X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	X	.048	.5
2	M24	X	.048	4.5
3	M26	X	.11	.5
4	M26	X	.11	4.5
5	M23	X	.04	.5
6	M23	X	.04	4.5
7	M11	X	.032	.5
8	M11	X	.032	4.5
9	M27	X	.049	.5
10	M27	X	.049	4.5
11	M10	X	.03	.5
12	M10	X	.03	4.5
13	M22	X	.048	.5
14	M22	X	.048	4.5
15	M25	X	.11	.5
16	M25	X	.11	4.5
17	M21	X	.04	.5
18	M21	X	.04	4.5
19	M26	X	.009	1
20	M26	X	.023	2
21	M26	X	.026	3
22	M27	X	.006	1
23	M27	X	.019	2
24	M25	X	.009	1
25	M25	X	.023	2
26	M27	X	.014	3
27	M25	X	.026	3

Member Point Loads (BLC 5 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	X	.138	.5
2	M24	X	.138	4.5
3	M26	X	.349	.5
4	M26	X	.349	4.5
5	M23	X	.112	.5
6	M23	X	.112	4.5
7	M11	X	.082	.5
8	M11	X	.082	4.5
9	M27	X	.127	.5
10	M27	X	.127	4.5
11	M10	X	.075	.5

Member Point Loads (BLC 5 : Wind X) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
12	M10	X	.075	4.5
13	M22	X	.138	.5
14	M22	X	.138	4.5
15	M25	X	.349	.5
16	M25	X	.349	4.5
17	M21	X	.112	.5
18	M21	X	.112	4.5
19	M26	X	.017	1
20	M26	X	.057	2
21	M26	X	.064	3
22	M22	X	.008	1
23	M27	X	.045	2
24	M25	X	.017	1
25	M25	X	.057	2
26	M27	X	.028	3
27	M25	X	.064	3

Member Point Loads (BLC 6 : Wind w/ Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Z	.032	.5
2	M24	Z	.032	4.5
3	M26	Z	.049	.5
4	M26	Z	.049	4.5
5	M23	Z	.03	.5
6	M23	Z	.03	4.5
7	M11	Z	.048	.5
8	M11	Z	.048	4.5
9	M27	Z	.11	.5
10	M27	Z	.11	4.5
11	M10	Z	.04	4.5
12	M10	Z	.04	.5
13	M22	Z	.032	4.5
14	M22	Z	.032	.5
15	M25	Z	.049	4.5
16	M25	Z	.049	.5
17	M21	Z	.03	.5
18	M21	Z	.03	4.5
19	M26	Z	.006	1
20	M26	Z	.019	2
21	M26	Z	.014	3
22	M27	Z	.009	1
23	M27	Z	.023	2
24	M25	Z	.006	1
25	M25	Z	.019	2
26	M27	Z	.026	3
27	M25	Z	.014	3

Member Point Loads (BLC 7 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Z	.082	.5
2	M24	Z	.082	4.5

Member Point Loads (BLC 7 : Wind Z) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
3	M26	Z	.127	.5
4	M26	Z	.127	4.5
5	M23	Z	.075	.5
6	M23	Z	.075	4.5
7	M11	Z	.138	.5
8	M11	Z	.138	4.5
9	M27	Z	.349	.5
10	M27	Z	.349	4.5
11	M10	Z	.112	.5
12	M10	Z	.112	4.5
13	M22	Z	.082	4.5
14	M22	Z	.082	.5
15	M25	Z	.127	4.5
16	M25	Z	.127	.5
17	M21	Z	.075	4.5
18	M21	Z	.075	.5
19	M26	Z	.008	1
20	M26	Z	.045	2
21	M26	Z	.028	3
22	M27	Z	.017	1
23	M27	Z	.057	2
24	M25	Z	.008	1
25	M25	Z	.045	2
26	M27	Z	.064	3
27	M25	Z	.028	3

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (i...
No Data to Print ...			

Member Distributed Loads (BLC 4 : Wind w/ Ice X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M9	X	.002	.002	0	0
2	M7	X	.002	.002	0	0
3	M29	X	.002	.002	0	0
4	M28	X	.002	.002	0	0
5	M11	X	.002	.002	0	0
6	M27	X	.002	.002	0	0
7	M10	X	.002	.002	0	0

Member Distributed Loads (BLC 5 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M9	X	.009	.009	0	0
2	M7	X	.009	.009	0	0
3	M29	X	.009	.009	0	0
4	M28	X	.009	.009	0	0
5	M11	X	.009	.009	0	0
6	M27	X	.009	.009	0	0

Member Distributed Loads (BLC 5 : Wind X) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
7	M10	X	.009	.009	0	0

Member Distributed Loads (BLC 6 : Wind w/ Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M8	Z	.002	.002	0	0
2	M30	Z	.002	.002	0	0
3	M23	Z	.002	.002	0	0
4	M22	Z	.002	.002	0	0
5	M29	Z	.002	.002	0	0
6	M28	Z	.002	.002	0	0
7	M25	Z	.002	.002	0	0
8	M26	Z	.002	.002	0	0
9	M24	Z	.002	.002	0	0
10	M21	Z	.002	.002	0	0

Member Distributed Loads (BLC 7 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M8	Z	.009	.009	0	0
2	M30	Z	.009	.009	0	0
3	M23	Z	.009	.009	0	0
4	M29	Z	.009	.009	0	0
5	M28	Z	.009	.009	0	0
6	M22	Z	.009	.009	0	0
7	M26	Z	.009	.009	0	0
8	M24	Z	.009	.009	0	0
9	M21	Z	.009	.009	0	0
10	M25	Z	.009	.009	0	0

Member Distributed Loads (BLC 8 : BLC 1 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.004	-.004	1.334	4.001
2	M15	Y	-.0004619	-.002	0	1.635
3	M15	Y	-.002	-.003	1.635	3.271
4	M16	Y	-.0004619	-.002	0	1.635
5	M16	Y	-.002	-.003	1.635	3.271
6	M5	Y	-.006	-.002	1.334	4.001
7	M19	Y	-.0004199	-.002	0	1.635
8	M19	Y	-.002	-.003	1.635	3.271
9	M20	Y	-.0004619	-.002	0	1.635
10	M20	Y	-.002	-.003	1.635	3.27
11	M3	Y	-.006	-.002	1.334	4.001
12	M17	Y	-.0004266	-.002	0	1.635
13	M17	Y	-.002	-.003	1.635	3.27
14	M18	Y	-.0004199	-.002	0	1.635
15	M18	Y	-.002	-.003	1.635	3.271

Basic Load Cases

	BLC Description	Category	X Gr...	Y Gr...	Z Gr...	Joint	Point	Distri...	Area(...	Surface(Plate/Wall)
1	Self Weight	DL		-1					3	
2	Equipment Weight	DL					27			
3	Ice Weight	DL					27			
4	Wind w/ Ice X	WLX					27	7		
5	Wind X	WLX					27	7		
6	Wind w/ Ice Z	WLZ					27	10		
7	Wind Z	WLZ					27	10		
8	BLC 1 Transient Area Loads	None						15		

Load Combinations

	Description	Solve	P...	SR...	BLC	F...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.2D + 1.6W (X-direction)	Yes	Y		1	1...	2	1.2	5	1.6																
2	0.9D + 1.6W (X-direction)	Yes	Y		1	.9	2	.9	5	1.6																
3	1.2D + 1.0Di + 1.0Wi (X...	Yes	Y		1	1...	2	1.2	3	1	4	1														
4	1.2D + 1.6W (X-direction)	Yes	Y		1	1...	2	1.2	7	1.6																
5	0.9D + 1.6W (X-direction)	Yes	Y		1	.9	2	.9	7	1.6																
6	1.2D + 1.0Di + 1.0Wi (X...	Yes	Y		1	1...	2	1.2	3	1	6	1														

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	-.009	6	4.825	4	.333	3	0	6	0	6	0	6
2		min	-1.893	2	.873	2	-2.516	5	0	1	0	1	0	1
3	N3	max	.898	4	4.656	1	1.299	2	0	6	0	6	0	6
4		min	-2.119	2	-.999	5	-1.497	4	0	1	0	1	0	1
5	N5	max	-.445	6	1.704	6	-.441	3	0	6	0	6	0	6
6		min	-2.38	1	-2.704	2	-1.593	4	0	1	0	1	0	1
7	Totals:	max	0	6	6.323	6	0	3						
8		min	-6.35	1	2.537	2	-5.56	4						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
1	N1	max	0	6	0	6	0	6	3.885e-02	4	5.259e-03	2	3.053e-05	6
2		min	0	1	0	1	0	1	5.345e-03	2	4.541e-05	6	-1.927e-02	1
3	N2	max	.091	2	-.099	2	0	5	3.396e-02	4	3.298e-03	1	3.053e-05	6
4		min	0	6	-.726	4	0	3	4.446e-03	2	3.652e-05	6	-1.927e-02	1
5	N3	max	0	6	0	6	0	6	1.874e-02	5	3.078e-03	1	2.658e-03	5
6		min	0	1	0	1	0	1	-1.033e-02	1	-8.015e-04	5	-3.731e-02	1
7	N4	max	.005	5	.22	5	.01	4	1.821e-02	5	3.017e-03	2	1.743e-03	5
8		min	-.029	1	-.7	1	-.052	2	-7.966e-03	1	1.006e-05	6	-3.322e-02	1
9	N5	max	0	6	0	6	0	6	1.874e-02	5	3.124e-03	1	8.954e-03	6
10		min	0	1	0	1	0	1	-4.424e-03	3	2.746e-04	6	-2.798e-02	2
11	N6	max	-.002	6	.506	2	.052	1	1.821e-02	5	3.041e-03	2	7.428e-03	6
12		min	-.029	2	-.155	6	.004	6	-3.731e-03	3	7.054e-05	6	-2.548e-02	2
13	N7	max	.092	2	-.366	3	0	6	2.822e-02	4	1.321e-03	1	-4.324e-03	6
14		min	0	6	-.819	4	-.068	1	7.707e-03	2	-2.222e-04	5	-2.455e-02	1
15	N8	max	.092	2	.377	2	.068	1	2.823e-02	4	1.268e-03	2	6.75e-03	4

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
16		min	0	6	-.819	4	.002	6	-6.874e-04	2	3.485e-05	6	-2.164e-02	2
17	N9	max	.044	2	-.135	5	.004	4	1.659e-02	5	2.451e-03	2	-2.411e-03	5
18		min	.003	6	-1.039	1	-.094	1	-6.217e-04	3	-3.003e-05	6	-3.477e-02	1
19	N10	max	-.001	6	.624	5	.016	4	2.326e-02	5	1.598e-03	1	9.827e-04	5
20		min	-.098	1	-.543	1	-.012	2	-8.622e-03	1	2.137e-04	6	-2.429e-02	1
21	N11	max	-.002	6	.625	5	.02	5	2.324e-02	5	1.556e-03	2	4.332e-03	6
22		min	-.098	1	-.17	3	.002	3	-5.334e-03	3	-5.734e-04	4	-1.961e-02	2
23	N12	max	.043	1	.802	2	.094	1	1.662e-02	5	2.526e-03	1	8.001e-03	6
24		min	-.01	5	-.267	6	.004	6	-2.337e-03	1	7.082e-05	6	-2.725e-02	2
25	N13	max	-.001	6	.69	5	.003	4	2.148e-02	5	3.519e-03	1	4.981e-04	5
26		min	-.099	1	-1.602	1	-.122	2	-5.005e-03	1	1.422e-04	6	-3.168e-02	1
27	N14	max	-.002	6	1.166	2	.123	1	2.147e-02	5	3.482e-03	1	5.946e-03	6
28		min	-.099	2	-.308	6	.004	6	-3.254e-03	3	-2.421e-04	5	-2.559e-02	2
29	N15	max	1.588	1	.692	5	1.646	4	2.398e-02	4	6.981e-03	2	1.177e-03	5
30		min	-.021	5	-1.601	1	-.1	2	-4.919e-04	2	1.07e-03	3	-2.55e-02	1
31	N16	max	1.58	1	1.165	2	1.669	4	2.396e-02	4	6.803e-03	1	1.482e-04	6
32		min	-.003	6	-.307	6	.021	3	3.533e-04	3	-6.043e-03	4	-2.5e-02	2
33	N17	max	0	5	.69	5	.034	3	2.126e-02	5	3.519e-03	1	4.98e-04	5
34		min	-.477	1	-1.602	1	-.252	5	-5.004e-03	1	1.422e-04	6	-3.15e-02	1
35	N18	max	.07	6	1.166	2	.105	1	2.12e-02	5	3.482e-03	1	5.943e-03	6
36		min	-.404	2	-.308	6	-.233	5	-3.252e-03	3	-2.421e-04	5	-2.54e-02	2
37	N19	max	-.001	6	.691	5	.002	4	2.102e-02	5	3.43e-03	1	1.415e-04	5
38		min	-.099	1	-1.676	1	-.13	2	-5.048e-03	1	1.582e-04	6	-3.195e-02	1
39	N20	max	-.002	6	1.226	2	.131	1	2.101e-02	5	3.383e-03	1	6.144e-03	6
40		min	-.099	2	-.322	6	.004	6	-3.252e-03	3	-3.018e-04	5	-2.573e-02	2
41	N21	max	-.002	6	1.369	2	.153	1	2.101e-02	5	3.383e-03	1	6.144e-03	6
42		min	-.061	2	-.372	6	.004	6	-3.252e-03	3	-3.018e-04	5	-2.573e-02	2
43	N22	max	.184	1	-.08	2	.015	2	3.144e-02	4	2.408e-03	1	6.946e-05	6
44		min	.002	6	-1.818	4	0	6	3.595e-03	2	5.981e-05	6	-2.366e-02	1
45	N23	max	.184	1	-.385	2	0	5	3.144e-02	4	2.408e-03	1	6.946e-05	6
46		min	.002	6	-1.818	4	-.016	1	3.595e-03	2	5.981e-05	6	-2.366e-02	1
47	N24	max	.002	5	.457	5	0	6	2.102e-02	5	3.43e-03	1	1.415e-04	5
48		min	-.061	1	-1.825	1	-.153	1	-5.048e-03	1	1.582e-04	6	-3.195e-02	1
49	N25	max	.184	1	-.233	2	.002	5	3.144e-02	4	2.408e-03	1	6.946e-05	6
50		min	.002	6	-1.818	4	0	3	3.595e-03	2	5.981e-05	6	-2.366e-02	1
51	N26	max	0	6	.574	5	0	6	2.102e-02	5	3.43e-03	1	1.415e-04	5
52		min	-.08	1	-1.751	1	-.142	2	-5.048e-03	1	1.582e-04	6	-3.195e-02	1
53	N27	max	-.002	6	1.297	2	.142	1	2.101e-02	5	3.383e-03	1	6.144e-03	6
54		min	-.08	2	-.347	6	.004	6	-3.252e-03	3	-3.018e-04	5	-2.573e-02	2
55	N28	max	.204	1	-.301	2	.001	5	3.144e-02	4	2.41e-03	1	7.027e-05	6
56		min	.003	6	-2.082	4	-.004	1	3.597e-03	2	5.981e-05	6	-2.366e-02	1
57	N29	max	-.002	6	1.511	2	.17	1	2.101e-02	5	3.381e-03	1	6.145e-03	6
58		min	-.089	2	-.394	6	.004	6	-3.253e-03	3	-3.018e-04	5	-2.573e-02	2
59	N30	max	-.001	6	.692	5	0	6	2.102e-02	5	3.43e-03	1	1.403e-04	5
60		min	-.099	1	-1.985	1	-.164	1	-5.048e-03	1	1.577e-04	6	-3.195e-02	1
61	N31	max	.204	1	-.225	2	.004	2	3.144e-02	4	2.41e-03	1	6.866e-05	6
62		min	.003	6	-2.081	4	0	6	3.597e-03	2	5.981e-05	6	-2.366e-02	1
63	N32	max	0	6	.634	5	-.001	6	2.102e-02	5	3.427e-03	1	1.409e-04	5
64		min	-.089	1	-2.022	1	-.169	1	-5.049e-03	1	1.582e-04	6	-3.195e-02	1
65	N33	max	-.002	6	1.475	2	.164	1	2.101e-02	5	3.383e-03	1	6.146e-03	6
66		min	-.099	2	-.381	6	.004	6	-3.252e-03	3	-2.99e-04	5	-2.573e-02	2
67	N34	max	.091	2	-.327	3	0	6	2.969e-02	4	2.348e-03	1	-2.8e-03	6

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
68		min	0	6	-.786	4	-.053	1	6.883e-03	2	3.21e-05	6	-1.968e-02	1
69	N35	max	.091	2	.262	2	.053	1	2.97e-02	4	2.376e-03	1	4.818e-03	4
70		min	0	6	-.786	4	.001	6	6.26e-04	2	8.382e-05	6	-1.789e-02	2
71	N36	max	0	6	.522	5	.014	4	1.961e-02	5	3.104e-03	1	2.549e-03	5
72		min	-.081	1	-.571	1	-.022	2	-9.489e-03	1	1.515e-04	6	-2.597e-02	1
73	N37	max	.025	2	-.051	5	.006	4	1.51e-02	5	3.331e-03	1	-2.518e-04	5
74		min	.002	6	-.946	1	-.083	1	-2.848e-03	1	1.19e-04	6	-3.323e-02	1
75	N38	max	.024	1	.723	2	.083	1	1.509e-02	5	3.293e-03	1	7.414e-03	6
76		min	-.009	5	-.236	6	.004	6	-1.988e-03	3	-1.708e-04	5	-2.59e-02	2
77	N39	max	-.002	6	.523	5	.023	1	1.961e-02	5	3.037e-03	1	5.e-03	6
78		min	-.081	2	-.149	3	.004	3	-4.343e-03	3	-2.779e-04	5	-2.037e-02	2
79	N40	max	.179	1	-.405	2	0	5	3.147e-02	4	2.529e-03	1	-3.318e-05	6
80		min	.002	6	-1.755	4	-.018	1	4.146e-03	2	5.87e-05	6	-2.39e-02	1
81	N41	max	.004	5	.415	5	0	6	2.092e-02	5	3.466e-03	1	-1.884e-04	5
82		min	-.054	1	-1.778	1	-.149	2	-4.965e-03	1	1.575e-04	6	-3.235e-02	1
83	N42	max	2.039	1	-.408	2	1.576	4	2.419e-02	4	-2.826e-04	5	3.923e-04	6
84		min	-.004	6	-1.755	4	.019	3	6.611e-04	3	-4.93e-03	1	-2.567e-02	2
85	N43	max	1.708	1	.413	5	1.581	4	2.22e-02	5	8.764e-03	1	-1.436e-04	6
86		min	.018	6	-1.779	1	-.161	2	-8.393e-04	1	1.318e-03	6	-2.676e-02	1
87	N44	max	.009	4	-.405	2	-.068	2	3.129e-02	4	2.529e-03	1	-3.317e-05	6
88		min	-.106	1	-1.755	4	-.376	4	4.145e-03	2	5.87e-05	6	-2.368e-02	1
89	N45	max	.002	5	.415	5	.027	3	2.073e-02	5	3.466e-03	1	-1.884e-04	5
90		min	-.439	1	-1.778	1	-.251	5	-4.964e-03	1	1.575e-04	6	-3.207e-02	1
91	N46	max	-.002	6	1.334	2	.149	1	2.092e-02	5	3.42e-03	1	6.159e-03	6
92		min	-.054	2	-.367	6	.004	6	-3.14e-03	3	-2.812e-04	5	-2.619e-02	2
93	N47	max	.179	1	-.046	2	.018	2	3.147e-02	4	2.53e-03	1	1.895e-04	4
94		min	.002	6	-1.755	4	0	6	2.946e-03	2	5.667e-05	6	-2.384e-02	1
95	N48	max	1.699	1	1.336	2	1.605	4	2.222e-02	5	8.126e-03	2	2.159e-04	4
96		min	-.079	4	-.367	6	.024	3	-3.51e-04	3	-5.055e-03	4	-2.664e-02	1
97	N49	max	2.044	1	-.043	2	1.58	4	2.419e-02	4	8.827e-04	4	1.765e-04	5
98		min	.003	6	-1.755	4	-.03	2	-9.522e-04	2	-4.659e-03	1	-2.607e-02	1
99	N50	max	.072	6	1.334	2	.131	1	2.075e-02	5	3.42e-03	1	6.156e-03	6
100		min	-.366	2	-.367	6	-.23	5	-3.138e-03	3	-2.812e-04	5	-2.596e-02	2
101	N51	max	.013	4	-.046	2	-.017	2	3.127e-02	4	2.53e-03	1	1.894e-04	4
102		min	-.104	1	-1.755	4	-.372	4	2.945e-03	2	5.667e-05	6	-2.356e-02	1
103	N58	max	-.001	6	.608	5	.04	4	2.665e-02	5	3.869e-05	5	2.663e-05	6
104		min	-.098	1	-.211	3	.001	2	-5.716e-03	3	-4.13e-05	1	-1.445e-02	1
105	N59	max	1.596	1	.608	5	2.363	5	4.062e-02	4	1.927e-04	5	-4.905e-06	6
106		min	-.006	5	-.213	3	-.061	3	5.494e-04	3	-6.748e-04	1	-2.63e-02	1
107	N60	max	0	6	.608	5	.276	3	2.664e-02	5	3.869e-05	5	2.661e-05	6
108		min	-.735	1	-.211	3	-1.239	5	-5.712e-03	3	-4.13e-05	1	-1.289e-02	1
109	N55	max	.084	1	.576	2	.072	2	1.785e-02	4	7.102e-04	2	8.376e-03	4
110		min	-.008	5	-.448	4	.002	6	-6.016e-03	2	7.639e-05	6	-2.54e-02	2
111	N56	max	2.427	2	.576	2	1.724	4	2.656e-02	4	3.525e-03	2	4.279e-03	5
112		min	-.243	4	-.449	4	-.223	2	-6.605e-03	1	3.812e-04	6	-4.009e-02	1
113	N57	max	.395	4	.576	2	.36	2	1.629e-02	4	7.102e-04	2	8.37e-03	4
114		min	-1.135	2	-.448	4	-.785	4	-6.013e-03	2	7.639e-05	6	-2.539e-02	2
115	N58A	max	.083	2	-.287	6	.004	5	1.78e-02	4	6.937e-04	2	-6.278e-03	6
116		min	.001	6	-.776	1	-.072	1	4.468e-03	3	-3.355e-04	4	-3.012e-02	1
117	N59A	max	2.495	1	-.289	6	1.707	4	2.648e-02	4	3.372e-03	2	-5.649e-04	6
118		min	.104	6	-.777	1	.093	3	1.237e-03	3	-1.742e-03	4	-3.978e-02	1
119	N60A	max	-.3	6	-.287	6	-.227	3	1.625e-02	4	6.937e-04	2	-6.274e-03	6

Envelope Joint Displacements (Continued)

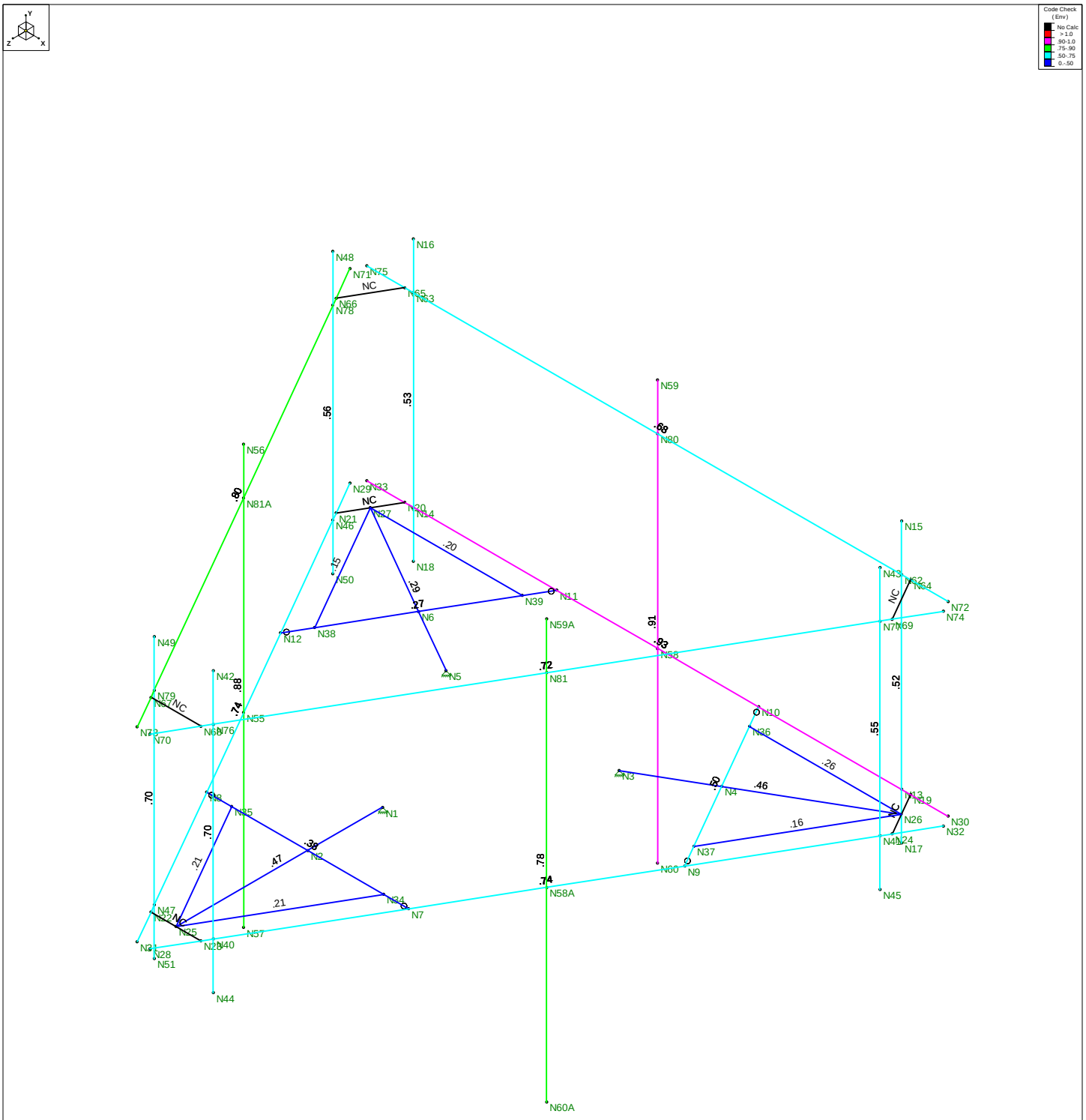
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
120		min	-1.362	1	-.776	1	-.795	4	4.465e-03	3	-3.355e-04	4	-3.01e-02	1
121	N81	max	2.018	1	-.289	6	1.39	4	2.62e-02	4	3.372e-03	2	-5.645e-04	6
122		min	.098	6	-.777	1	.078	3	1.236e-03	3	-1.742e-03	4	-3.908e-02	1
123	N62	max	1.282	1	.692	5	1.358	4	2.398e-02	4	6.981e-03	2	1.177e-03	5
124		min	-.007	5	-1.601	1	-.094	2	-4.919e-04	2	1.07e-03	3	-2.548e-02	1
125	N63	max	1.281	1	1.165	2	1.381	4	2.396e-02	4	6.803e-03	1	1.482e-04	6
126		min	-.006	5	-.307	6	.017	3	3.533e-04	3	-6.043e-03	4	-2.497e-02	2
127	N64	max	1.282	1	.696	5	1.344	4	2.197e-02	4	7.879e-03	1	1.105e-03	5
128		min	-.007	5	-1.66	1	-.111	2	-1.266e-03	1	1.177e-03	6	-2.576e-02	1
129	N65	max	1.281	1	1.224	2	1.368	4	2.194e-02	4	7.43e-03	1	-2.049e-05	6
130		min	-.006	5	-.307	6	.02	3	1.224e-04	3	-5.403e-03	4	-2.544e-02	1
131	N66	max	1.364	1	1.369	2	1.333	4	2.194e-02	4	7.43e-03	1	-2.049e-05	6
132		min	-.066	4	-.359	6	.029	3	1.224e-04	3	-5.403e-03	4	-2.544e-02	1
133	N67	max	1.722	1	-.071	2	1.289	4	2.417e-02	4	2.927e-04	5	7.089e-05	6
134		min	0	6	-1.804	4	-.013	2	3.74e-04	3	-4.546e-03	1	-2.41e-02	1
135	N68	max	1.722	1	-.382	2	1.285	4	2.417e-02	4	2.927e-04	5	7.089e-05	6
136		min	0	6	-1.803	4	.009	3	3.74e-04	3	-4.546e-03	1	-2.41e-02	1
137	N69	max	1.37	1	.457	5	1.308	4	2.197e-02	4	7.879e-03	1	1.105e-03	5
138		min	.014	6	-1.812	1	-.161	2	-1.266e-03	1	1.177e-03	6	-2.576e-02	1
139	N70	max	1.684	1	-.269	2	1.287	4	2.417e-02	4	2.99e-04	5	7.268e-05	6
140		min	0	6	-2.006	4	.004	3	3.771e-04	3	-4.535e-03	1	-2.409e-02	1
141	N71	max	1.302	1	1.506	2	1.307	4	2.194e-02	4	7.419e-03	1	-1.869e-05	6
142		min	-.021	4	-.32	6	.036	3	1.193e-04	3	-5.396e-03	4	-2.544e-02	1
143	N72	max	1.282	1	.706	5	1.29	4	2.197e-02	4	7.879e-03	1	1.102e-03	5
144		min	-.007	5	-1.909	1	-.187	2	-1.266e-03	1	1.175e-03	6	-2.577e-02	1
145	N73	max	1.684	1	-.192	2	1.288	4	2.417e-02	4	2.864e-04	5	6.909e-05	6
146		min	0	6	-2.006	4	.001	3	3.771e-04	3	-4.535e-03	1	-2.41e-02	1
147	N74	max	1.304	1	.647	5	1.281	4	2.197e-02	4	7.868e-03	1	1.103e-03	5
148		min	.004	6	-1.947	1	-.199	2	-1.269e-03	1	1.176e-03	6	-2.576e-02	1
149	N75	max	1.281	1	1.47	2	1.316	4	2.194e-02	4	7.43e-03	1	-1.689e-05	6
150		min	-.006	5	-.307	6	.034	3	1.224e-04	3	-5.39e-03	4	-2.543e-02	1
151	N76	max	1.732	1	-.408	2	1.285	4	2.417e-02	4	-2.826e-04	5	3.923e-04	6
152		min	0	6	-1.755	4	.011	3	6.61e-04	3	-4.93e-03	1	-2.567e-02	2
153	N77	max	1.387	1	.413	5	1.314	4	2.218e-02	5	8.764e-03	1	-1.436e-04	6
154		min	.016	6	-1.779	1	-.152	2	-8.392e-04	1	1.318e-03	6	-2.676e-02	1
155	N78	max	1.379	1	1.336	2	1.339	4	2.22e-02	5	8.126e-03	2	2.159e-04	4
156		min	-.077	4	-.367	6	.028	3	-3.51e-04	3	-5.055e-03	4	-2.664e-02	1
157	N79	max	1.731	1	-.043	2	1.29	4	2.417e-02	4	8.827e-04	4	1.765e-04	5
158		min	0	6	-1.755	4	-.018	2	-9.522e-04	2	-4.659e-03	1	-2.607e-02	1
159	N80	max	1.281	1	.608	5	1.878	5	3.991e-02	4	1.927e-04	5	-4.902e-06	6
160		min	-.007	5	-.213	3	-.067	3	5.49e-04	3	-6.748e-04	1	-2.602e-02	1
161	N81A	max	1.949	2	.576	2	1.406	4	2.628e-02	4	3.525e-03	2	4.278e-03	5
162		min	-.192	4	-.449	4	-.145	2	-6.604e-03	1	3.812e-04	6	-3.939e-02	1

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

	Me...	Shape	Code C...	Loc...	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pn...	phi*P...	phi*Mn...	phi*...	Cb	Eqn
1	M1	HSS4X4X4	.472	1.5...	4	.124	0	y	4	128.443	139.5...	16.181	16.181	2.095	H1-1b
2	M2	HSS4X4X4	.381	2.1...	4	.270	.498	y	4	128.914	139.5...	16.181	16.181	1.324	H1-1b
3	M3	HSS4X4X4	.458	1.5...	1	.120	0	y	1	128.444	139.5...	16.181	16.181	2.071	H1-1b
4	M4	HSS4X4X4	.505	2.1...	1	.328	3.848	y	1	128.914	139.5...	16.181	16.181	1.345	H3-6

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

	Me...	Shape	Code C...	Loc...	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pn...	phi*P...	phi*Mn...	phi*...	Cb	Eqn
5	M5	HSS4X4X4	.289	1.5...	2	.092	1.621	y	5	128.444	139.5...	16.181	16.181	2.261	H1-1b
6	M6	HSS4X4X4	.269	2.1...	2	.235	0	y	2	128.914	139.5...	16.181	16.181	1.353	H1-1b
7	M7	PIPE_3.0	.740	4.1...	4	.297	6.25		4	28.251	65.205	5.749	5.749	2.541	H1-1b
8	M8	PIPE_3.0	.933	4.1...	1	.364	4.167		1	28.251	65.205	5.749	5.749	2.566	H3-6
9	M9	PIPE_3.0	.738	8.3...	4	.319	8.333		1	28.251	65.205	5.749	5.749	2.541	H1-1b
10	M10	PIPE_2.0	.520	1	4	.127	1		4	20.867	32.13	1.872	1.872	1.738	H1-1b
11	M11	PIPE_2.0	.531	1	4	.131	1		4	20.867	32.13	1.872	1.872	1.779	H1-1b
12	M15	L2x2x3	.207	3.2...	4	.016	3.271	y	4	13.688	23.393	.558	1.239	1.981	H2-1
13	M16	L2x2x3	.206	3.2...	4	.015	3.271	y	4	13.688	23.393	.558	1.239	1.957	H2-1
14	M17	L2x2x3	.257	3.27	1	.018	3.27	y	1	13.689	23.393	.558	1.219	1.592	H2-1
15	M18	L2x2x3	.158	3.2...	5	.010	3.271	y	1	13.689	23.393	.558	1.199	1.425	H2-1
16	M19	L2x2x3	.146	3.2...	5	.008	0	y	5	13.689	23.393	.558	1.129	1.024	H2-1
17	M20	L2x2x3	.203	3.27	2	.012	0	y	2	13.689	23.393	.558	1.224	1.631	H2-1
18	M21	PIPE_2.0	.701	1	1	.170	1		1	20.867	32.13	1.872	1.872	1.79	H1-1b
19	M22	PIPE_2.0	.551	1	4	.118	1		4	20.867	32.13	1.872	1.872	1.811	H1-1b
20	M23	PIPE_2.0	.557	1	4	.122	1		4	20.867	32.13	1.872	1.872	1.809	H1-1b
21	M24	PIPE_2.0	.696	1	1	.166	1		1	20.867	32.13	1.872	1.872	1.791	H1-1b
22	M27	PIPE_2.0	.907	4.9...	1	.106	4.5		4	26.521	32.13	1.872	1.872	2.343	H1-1b
23	M26	PIPE_2.0	.880	4.9...	1	.156	4.5		1	26.521	32.13	1.872	1.872	2.504	H1-1b
24	M25	PIPE_2.0	.777	4.9...	4	.148	4.5		2	26.521	32.13	1.872	1.872	2.184	H1-1b
25	M28	PIPE_2.0	.719	11....	2	.786	11.589		2	6.295	32.13	1.872	1.872	1.788	H3-6
26	M29	PIPE_2.0	.802	.911	1	.886	.911		1	6.295	32.13	1.872	1.872	1.718	H3-6
27	M30	PIPE_2.0	.675	11....	4	.722	.911		4	6.295	32.13	1.872	1.872	1.174	H3-6



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek		
THC	CT11720A - Mount	Apr 24, 2019 at 12:00 PM
19027.09	Member Unity Check	CT11720A_AMA.r3d

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

T-Mobile Existing Facility

Site ID: CT11720A

CT720/Town of Orange_MP
26 So. Orange Center Road
Orange, CT 06477

May 8, 2019

EBI Project Number: 6219001507

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general population allowable limit:	10.12 %

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

EBI Consulting
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May 8, 2019

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

Emissions Analysis for Site: **CT11720A – CT720/Town of Orange_MP**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **26 So. Orange Center Road, Orange, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

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

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

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

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) and 2100 MHz (AWS) 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 **26 So. Orange Center Road, Orange, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

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

1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 15 Watts per Channel.

2) 1 UMTS channel (PCS Band - 1900 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

3) 1 UMTS channel (AWS Band – 2100 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 40 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 40 Watts per Channel.

5) 4 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

6) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

7) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 20 Watts per Channel.

8) Cable losses were factored in the calculations for this site. Since the 2100 MHz UMTS radios are ground mounted the following cable loss values were used. For each ground mounted 2100 MHz (AWS) UMTS radio there was 2.10 dB of cable loss calculated into the system gains / losses for this site. These values were calculated based upon the manufacturers specifications for 198 feet of 1-5/8" coax.

9) 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.

10) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, 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.

11) The antennas used in this modeling are the **Ericsson AIR 3246 B66**, the **Ericsson AIR32 B66A/B2A** & the **RFS APXVAARR24_43-U-NA20** for 600 MHz, 700 MHz channels, 1900 MHz (PCS) and 2100 MHz (AWS). 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 manufactures supplied specifications, minus 10 dB for directional panel antennas, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

12) The antenna mounting height centerline of the proposed antennas is **148 feet** above ground level (AGL).

13) 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.

14) 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:	Ericsson AIR 3246 B66	Make / Model:	Ericsson AIR 3246 B66	Make / Model:	Ericsson AIR 3246 B66
Gain:	15.85 dBd	Gain:	15.85 dBd	Gain:	15.85 dBd
Height (AGL):	148 feet	Height (AGL):	148 feet	Height (AGL):	148 feet
Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	160	Total TX Power(W):	160	Total TX Power(W):	160
ERP (W):	6,153.47	ERP (W):	6,153.47	ERP (W):	6,153.47
Antenna A1 MPE%	**1.10**	Antenna B1 MPE%	**1.10**	Antenna C1 MPE%	**1.10**
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	Ericsson AIR32 B66A/B2A	Make / Model:	Ericsson AIR32 B66A/B2A	Make / Model:	Ericsson AIR32 B66A/B2A
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	148 feet	Height (AGL):	148 feet	Height (AGL):	148 feet
Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	110	Total TX Power(W):	110	Total TX Power(W):	110
ERP (W):	4,279.50	ERP (W):	4,279.50	ERP (W):	4,279.50
Antenna A2 MPE%	**0.76**	Antenna B2 MPE%	**0.76**	Antenna C2 MPE%	**0.76**
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Gain:	12.95 / 13.35 / 15.65 / 16.35 dBd	Gain:	12.95 / 13.35 / 15.65 / 16.35 dBd	Gain:	12.95 / 13.35 / 15.65 / 16.35 dBd
Height (AGL):	148 feet	Height (AGL):	148 feet	Height (AGL):	148 feet
Frequency Bands	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	600 MHz / 700 MHz / 1900 MHz (PCS) / 2100 MHz (AWS)
Channel Count	6	Channel Count	6	Channel Count	6
Total TX Power(W):	200	Total TX Power(W):	200	Total TX Power(W):	200
ERP (W):	4,976.44	ERP (W):	4,976.44	ERP (W):	4,976.44
Antenna A3 MPE%	**1.49**	Antenna B3 MPE%	**1.49**	Antenna C3 MPE%	**1.49**

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**3.35 %**
Sprint	**1.04** %
Clearwire	**0.13** %
AT&T	**2.98** %
Verizon Wireless	**2.18** %
Nextel	**0.44** %
Site Total MPE %:	**10.12 %**

T-Mobile Sector A Total:	3.35 %
T-Mobile Sector B Total:	3.35 %
T-Mobile Sector C Total:	3.35 %
Site Total:	10.12 %

T-Mobile Maximum MPE Power Values (Per Sector)

T-Mobile _Frequency Band / Technology (Per Sector)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
T-Mobile AWS - 2100 MHz LTE	4	1,538.37	148	10.97	AWS - 2100 MHz	1000.00	1.10%
T-Mobile PCS - 1900 MHz LTE	2	1,556.18	148	5.55	PCS - 1900 MHz	1000.00	0.55%
T-Mobile PCS - 1900 MHz GSM	2	583.57	148	2.08	PCS - 1900 MHz	1000.00	0.21%
T-Mobile 600 MHz LTE	2	788.97	148	2.81	600 MHz	400.00	0.71%
T-Mobile 700 MHz LTE	2	432.54	148	1.54	700 MHz	467.00	0.33%
T-Mobile PCS - 1900 MHz UMTS	1	1,469.13	148	2.62	PCS - 1900 MHz	1000.00	0.26%
T-Mobile AWS - 2100 MHz UMTS	1	1,064.29	148	1.90	AWS - 2100 MHz	1000.00	0.19%
						Total:	**3.35%**

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:	3.35 %
Sector B:	3.35 %
Sector C:	3.35 %
T-Mobile Maximum MPE % (Per Sector):	3.35 %
Site Total:	10.12 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **10.12%** 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

Power Density/RF Emissions Report

Exhibit G

Mailing Receipts/Proof of Notice

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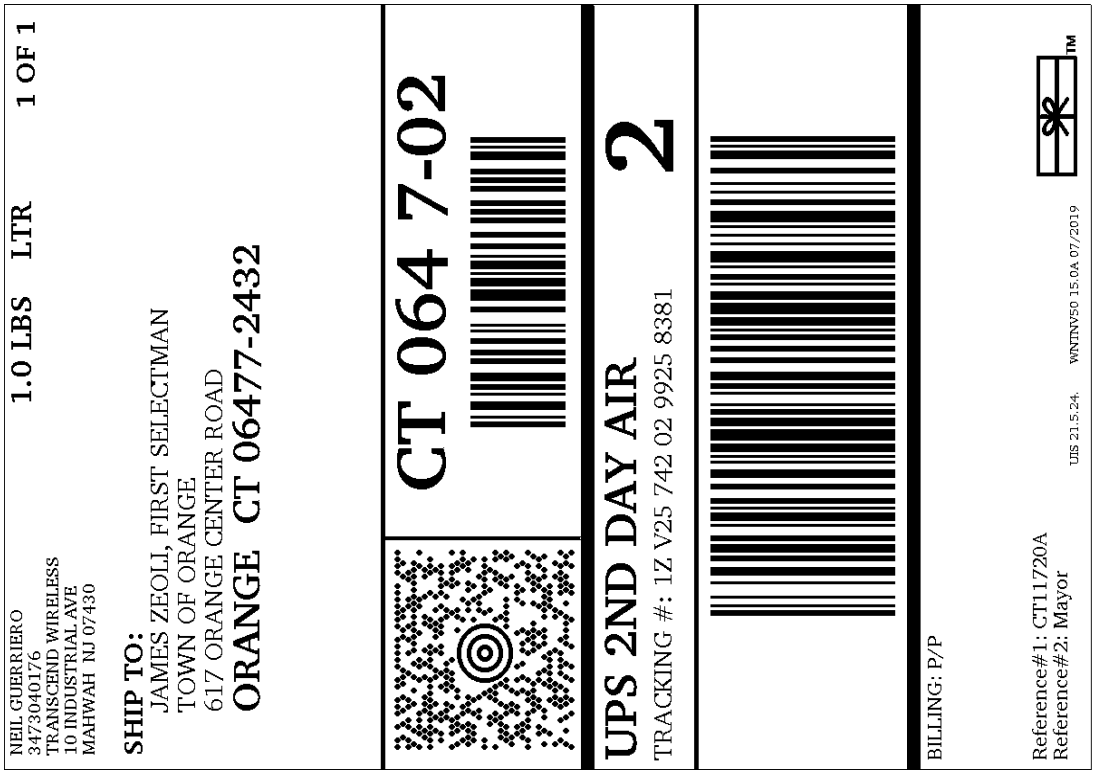

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