



10 INDUSTRIAL AVENUE,
SUITE 3
MAHWAH, NJ 07430

PHONE: 201.684.0055
FAX: 201.684.0066

July 31, 2020

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/Anchor

Dear Ms. Bachman,

T-Mobile currently maintains (9) existing antennas at the 150' level of the existing 180' Monopole 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 2500 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:

Existing to Remain

- (3) RFS APXVAARR24_43-U-NA20 Antennas
- (3) Ericsson AIR 32 Antennas
- (3) Ericsson 4449 B71+B12 RRU's
- (3) KRY 112 TMA's

Remove/Replace:

Antennas:

- (3) KRC118023-1_B2A_B4P (Remove) – (3) Air6449 B41- 2500 MHz / 2500 MHz Antennas (Replace)

Install New:

- (3) Ericsson 4415 B25 RRU's
- (1) 6x12 hybrid cable
- (6) Dual swivel Mounts
- (3) Diplexers

Ground:

- Install (1) B160 Battery cabinet and install (1) 6160 Equipment cabinet

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 and 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, Jack Demirjian, 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 modifications will not result in an increase in the height of the existing structure.
2. The proposed modifications will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

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

Sincerely,

A handwritten signature in black ink, appearing to read 'EJ Jamieson', with a stylized flourish at the end.

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
Jack Demirjian, Zoning Administrator & Enforcement Officer

Exhibit A

Original Facility Approval



Town of Orange, Connecticut

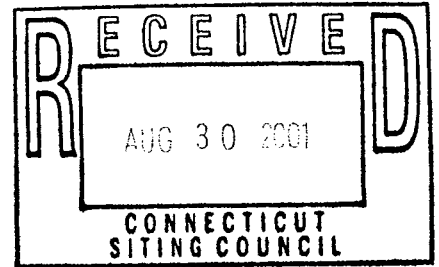
Office of the First Selectman

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

Sale Price

\$0

Co-Owner

TOWN DUMP AND OTHER TOWN OWNED LAND

Certificate

Address

617 ORANGE CENTER RD
ORANGE, CT 06477

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	

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

[illegible]

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

Extra Features		Legend
No Data for Extra Features		

Land Use		Land Line Valuation	
Use Code	512E	Size (Acres)	40.61
Description	Exempt Vac w/ OB	Frontage	
Zone	RES	Depth	
Neighborhood	C20	Assessed Value	\$2,165,000
Alt Land Appr	No	Appraised Value	\$3,092,900

Category**Outbuildings**

Outbuildings						<u>Legend</u>
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

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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

67D5997DB_2xAIR+10P

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA--222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL, AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION 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 MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
12. ANY AND ALL ERRORS, DISCREPANCIES, AND "MISSED" ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE T-MOBILE CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO "EXTRA" WILL BE ALLOWED FOR MISSED ITEMS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
15. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES AND EXISTING CONDITIONS AT THE SITE PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
16. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUITS AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
17. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
18. THE CONTRACTOR SHALL CONTACT 'CALL BEFORE YOU DIG' AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1-800-922-4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
19. CONTRACTOR SHALL COMPLY WITH THE OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

SITE DIRECTIONS

FROM: 35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

TO: 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 5D. | |

SITE COORDINATES: LATITUDE: 41°-15'-20.07" N LONGITUDE: 73°-00'-39.34" W GROUND ELEVATION: 47'± A.G.L.	COORDINATES AND GROUND ELEVATION ARE REFERENCED FROM GOOGLE EARTH
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VICINITY MAP



PROJECT SUMMARY

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

1. REMOVE EXISTING BOTH NORTEL CABINETS.
2. ADD (1) ENCLOSURE B160.
3. ADD (1) BATTERY CABINET B160.
4. ADD (1) IXRE ROUTER TO NEW ENCLOSURE B160.
5. ADD (1) BB6630 FOR L2500 TO NEW ENCLOSURE B160.
6. ADD (1) BB6648 FOR N2500 TO NEW ENCLOSURE B160.
7. CHECK AC SERVICE, AND UPGRADE AC SERVICE, BREAKERS, AND PPC WHERE NECESSARY.
8. REMOVE XMU FROM EXISTING RBS6131 CABINET, IF PRESENT.
9. REPLACE BB5216 WITH (1) BB6630 FOR L2100, L1900 (BOTH CARRIERS), L700, AND L600 IN EXISTING RBS6131 CABINET, IF STILL PRESENT.
10. ADD (1) 6X12 HCS
11. REMOVE (3) EXISTING ANTENNAS
12. INSTALL (3) NEW ANTENNAS
13. INSTALL (3) NEW RADIO REMOTE HEADS
14. INSTALL (3) NEW DIPLEXERS
15. RELOCATE (3) EXISTING ANTENNAS
16. RELOCATE (3) EXISTING TMAS
17. INSTALL (6) NEW DUAL SWIVEL MOUNTS, (2) PER SECTOR

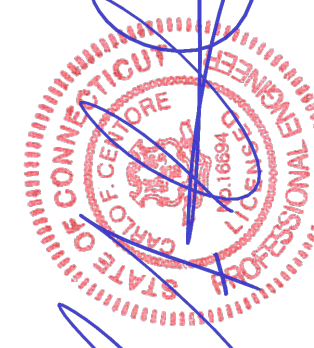
PROJECT INFORMATION

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 OF RECORD: CENTEK ENGINEERING, INC.
63-2 NORTH BRANFORD RD.
BRANFORD, CT 06405
CARLO F. CENTORE, PE
(203) 488-0580 EXT. 122
PROJECT COORDINATES: LATITUDE: 41°-15'-20.07" N
LONGITUDE: 73°-00'-39.34" W
GROUND ELEVATION: 47± A.G.L.
SITE COORDINATES AND GROUND ELEVATION
REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	GENERAL NOTES AND SPECIFICATIONS	0
C-1	SITE LOCATION PLAN	0
C-2	COMPOUND PLAN, EQUIPMENT PLAN, AND ELEVATION	0
C-3	ANTENNA PLANS	0
C-4	TYPICAL EQUIPMENT DETAILS	0
E-1	TYPICAL ELECTRICAL DETAILS	0

PROFESSIONAL ENGINEER SEAL



...T-Mobile-



CENTEK engineering
Centered on SolutionsSM

203| 488-0580
203| 488-8587 Fax
33-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

T-MOBILE NORTHEAST LLC

WIRELESS COMMUNICATIONS FACILITY

CT720/TOWN OF ORANGE_MP
SITE ID: CT1720A

S ORANGE CENTER RD
ORANGE, CT 06477

DATE: 07/02/20

SCALE: AS NOTED

JOB NO. 20074.55

TITLE
SHEET

T-1

Sheet No. 1 of 7

DESIGN BASIS:

1. DESIGN CRITERIA:

- ## SITE NOTES

- ## GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
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18. THE CONTRACTOR SHALL CONTACT "DIG SAFE" (DIAL 811) AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
19. CONTRACTOR SHALL COMPLY WITH OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.
20. THE COUNTY/CITY/TOWN WILL MAKE PERIODIC FIELD OBSERVATION AND INSPECTIONS TO MONITOR THE INSTALLATION, MATERIALS, WORKMANSHIP AND EQUIPMENT INCORPORATED INTO THE PROJECT TO ENSURE COMPLIANCE WITH THE DESIGN PLANS, SPECIFICATIONS, CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS.
21. THE COUNTY/CITY/TOWN MUST BE NOTIFIED (2) WORKING DAYS PRIOR TO CONCEALMENT/BURIAL OF ANY SYSTEM OR MATERIAL THAT WILL PREVENT THE DIRECT INSPECTION OF MATERIALS, METHODS OR WORKMANSHIP. EXCESS OF THESE PROCESSES ARE BACKFILLING A GROUND RING OR TOWER FOUNDATION, POILING TOWER FOUNDATIONS, BURYING GROUND RINGS, FOUNDATION OR GRIDS, ETC. THE CONTRACTOR MAY PROCEED WITH THE SCHEDULED PROCESS (2) WORKING DAYS AFTER PROVIDING NOTICE UNLESS NOTIFIED OTHERWISE BY THE COUNTY/CITY/TOWN.

DATE: 07/02/20

SCALE: AS NOTED

JOB NO. 20074.55

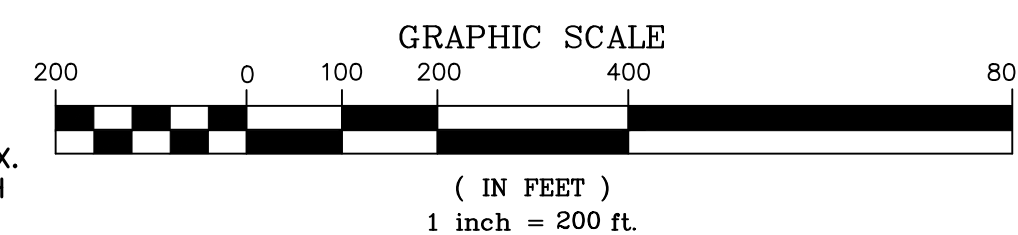
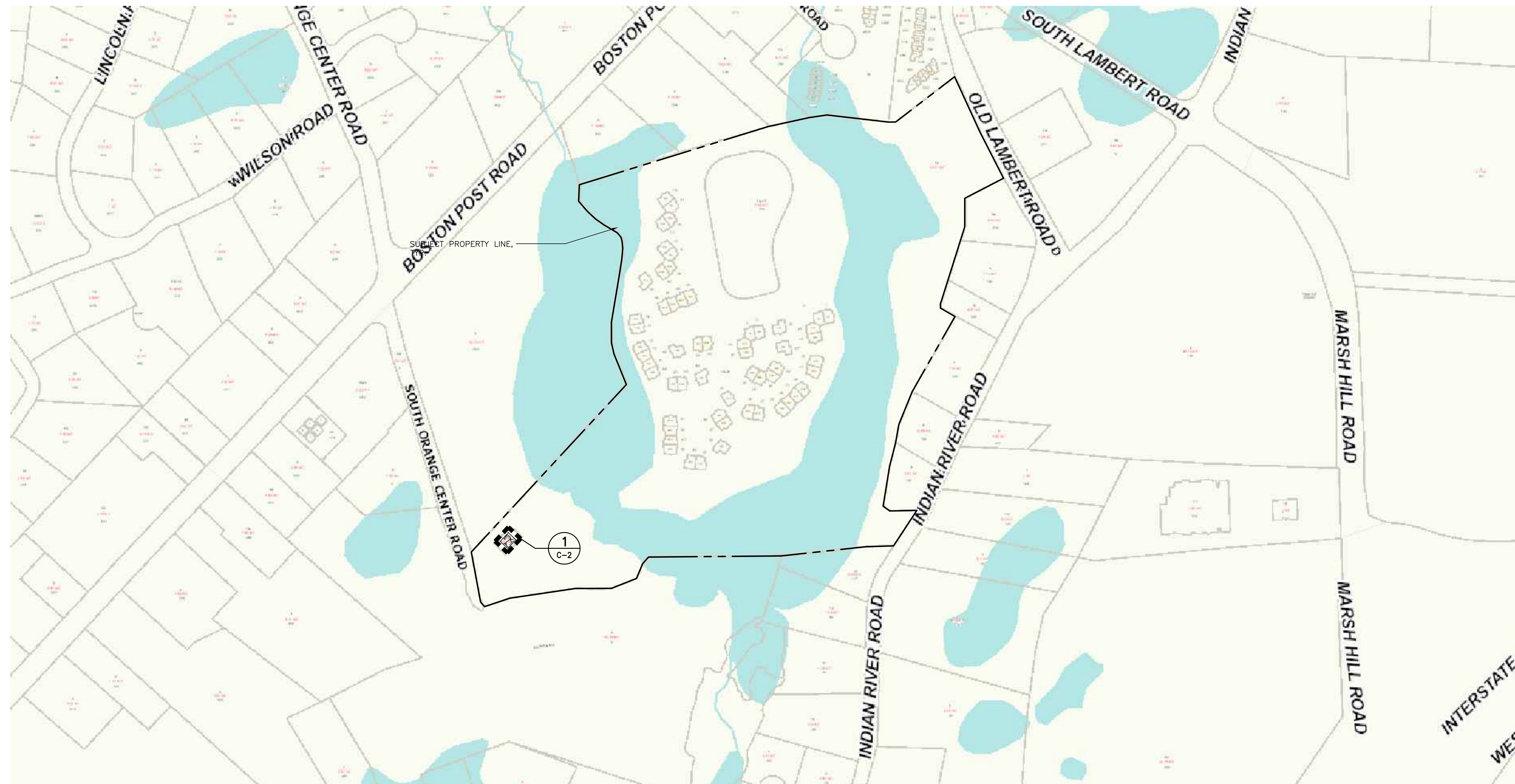
GENERAL NOTES AND SPECIFICATIONS

N-1

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

ANTENNA SCHEDULE

ANTENNA SCHEDULE									
SECTOR	EXISTING/PROPOSED	ANTENNA	SIZE (INCHES) (L x W x D)	ANTENNA & HEIGHT	AZIMUTH	(E/P) RRU (QTY)	(E/P) TMA (QTY)	(E/P) DIPLEXER (QTY)	(QTY) PROPOSED COAX (LENGTH)
A1	EXISTING	ERICSSON (AIR32 KRD901146-1_B66A_B2A)	56.6 x 12.9 x 8.7	150'	0°				(1) 6x12 HYBRID CABLE (±180°)
A2	EXISTING	RFS (APXVAARR24_43-U-NA20)	95.9 x 24 x 8.7	150'	0°	(E) RADIO 4449 B71 (1), (P) RADIO 4415 B66A (1)	(E) GENERIC TWIN STYLE 1B (1)	(P) COMMSCOPE - SDX192 6Q-43 (E14F05P86) (1)	
A3	PROPOSED	ERICSSON (AIR6449 B41)	33.1 x 20.6 x 8.6	150'	0°				
B1	EXISTING	ERICSSON (AIR32 KRD901146-1_B66A_B2A)	56.6 x 12.9 x 8.7	150'	120°				(1) 6x12 HYBRID CABLE (±180°)
B2	EXISTING	RFS (APXVAARR24_43-U-NA20)	95.9 x 24 x 8.7	150'	120°	(E) RADIO 4449 B71 (1), (P) RADIO 4415 B66A (1)	(E) GENERIC TWIN STYLE 1B (1)	(P) COMMSCOPE - SDX192 6Q-43 (E14F05P86) (1)	
B3	PROPOSED	ERICSSON (AIR6449 B41)	33.1 x 20.6 x 8.6	150'	120°				
C1	EXISTING	ERICSSON (AIR32 KRD901146-1_B66A_B2A)	56.6 x 12.9 x 8.7	150'	250°				(1) 6x12 HYBRID CABLE (±180°)
C2	EXISTING	RFS (APXVAARR24_43-U-NA20)	95.9 x 24 x 8.7	150'	250°	(E) RADIO 4449 B71 (1), (P) RADIO 4415 B66A (1)	(E) GENERIC TWIN STYLE 1B (1)	(P) COMMSCOPE - SDX192 6Q-43 (E14F05P86) (1)	
C3	PROPOSED	ERICSSON (AIR6449 B41)	33.1 x 20.6 x 8.6	150'	250°				



T-MOBILE NORTHEAST LLC WIRELESS COMMUNICATIONS FACILITY CT720/TOWN OF ORANGE_MP SITE ID: CT1720A 26 S ORANGE CENTER RD ORANGE, CT 06477	(203) 489-0590 (203) 489-8387 Fax 43-2 North Branford Road Branford, CT 06405 www.CentekEng.com		 				PROFESSIONAL ENGINEER SEAL
	DATE:	07/02/20					
	SCALE:	AS NOTED					
	JOB NO.	20074.55					
	SITE LOCATION PLAN						
	C-1						

Sheet No. 3
of 7

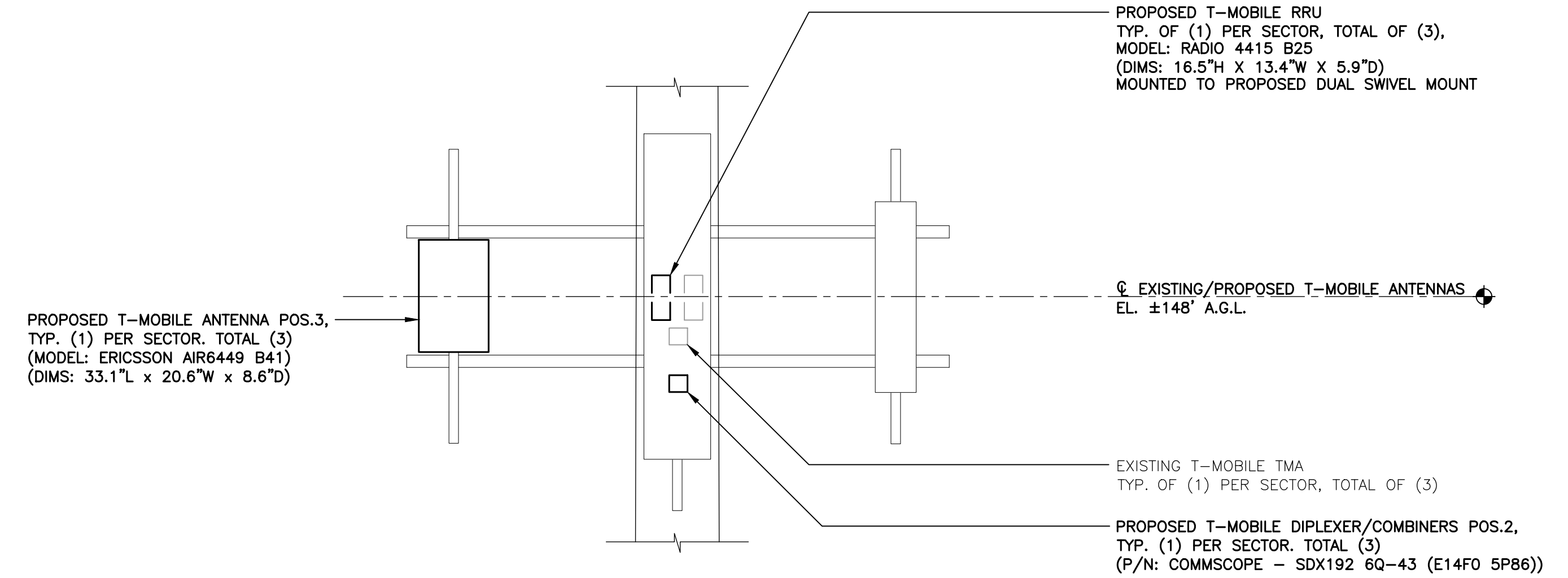
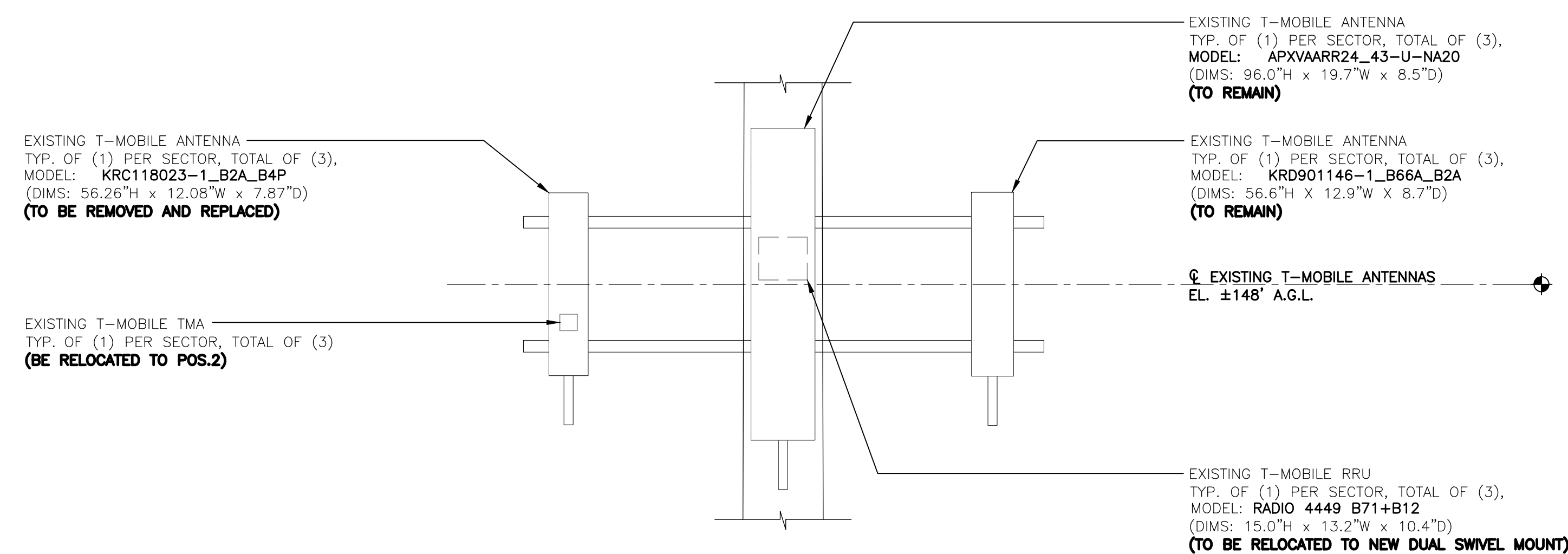
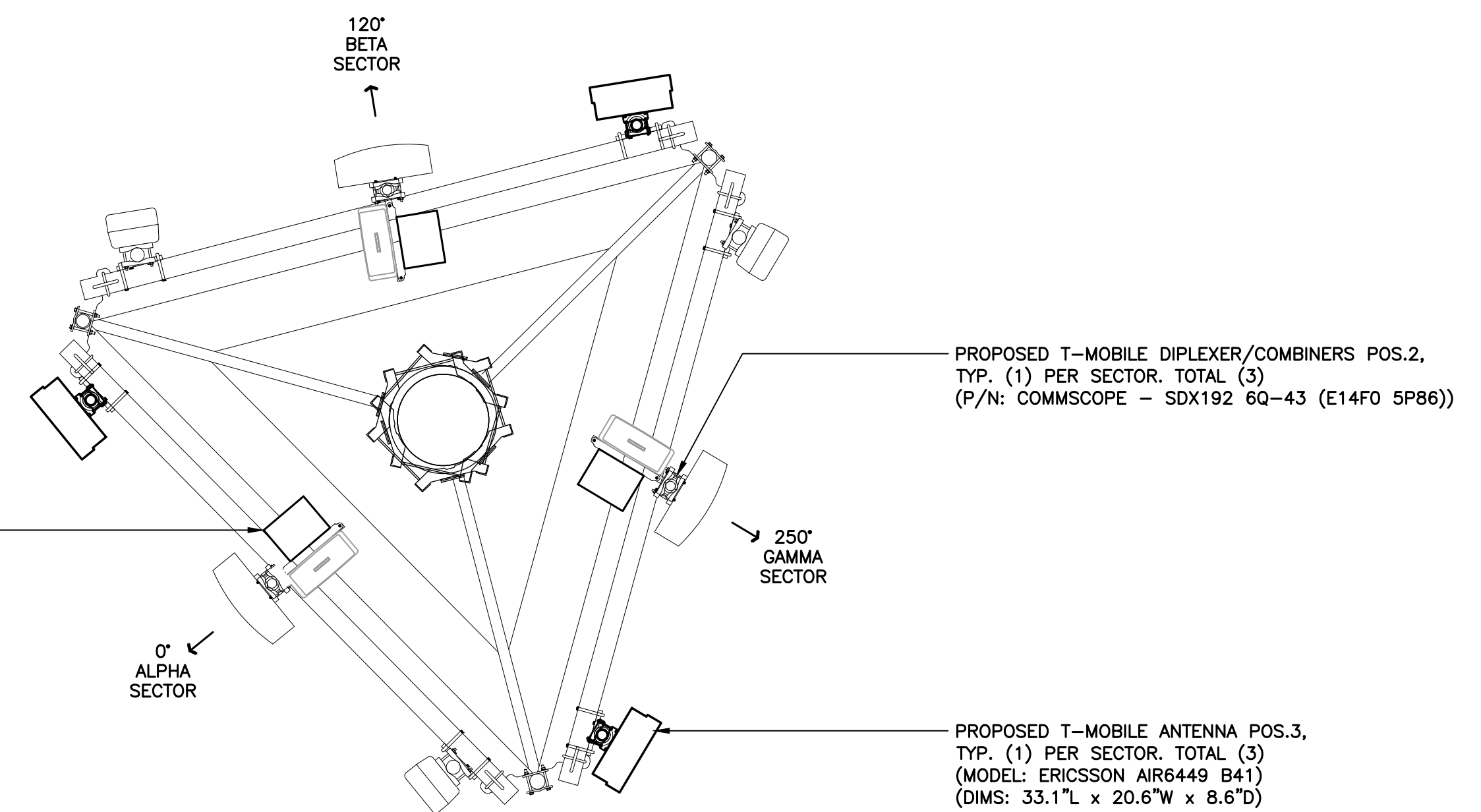
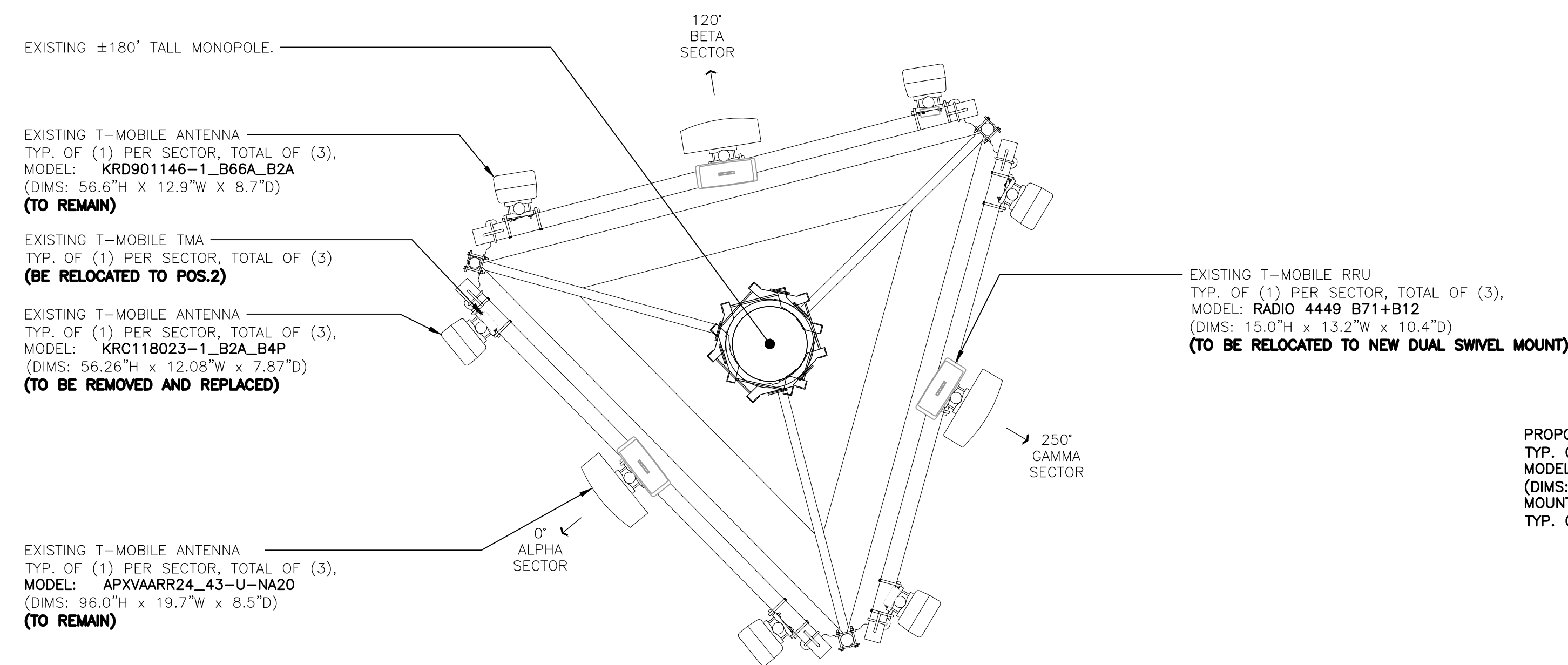


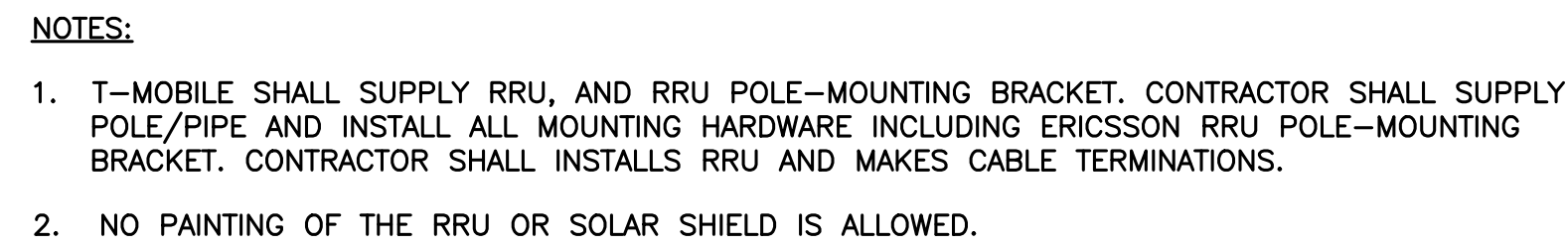
NOTE: NO EQUIPMENT SHALL BE INSTALLED ON THE HOSTING STRUCTURE WITHOUT A PASSING STRUCTURAL ANALYSIS REPORT AND CONTRACTOR PRIOR CONFIRMATION THAT ANY AND ALL REQUISITE MODIFICATIONS HAVE BEEN COMPLETED.



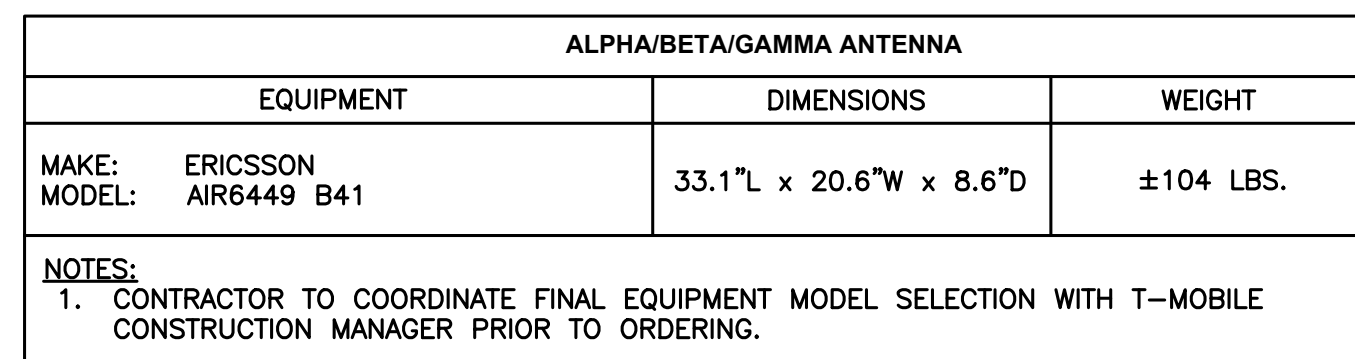
C-2

Sheet No. 4 of 7





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

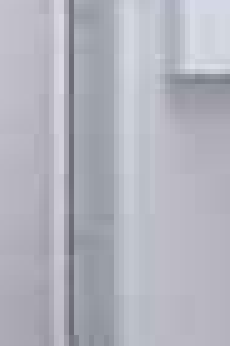


RRU (REMOTE RADIO UNIT)				
EQUIPMENT		DIMENSIONS	WEIGHT	CLEARANCES
MAKE:	ERICSSON	14.9"L x 13.2"W x 5.4"D	±46 LBS.	BEHIND ANT.: 8" MIN.
MODEL:	RADIO 4415 B25			BELOW ANT.: 20" MIN.
				BELOW RRU: 16" MIN.
NOTES:				
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T-MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.				



Enclosure 6160 AC

EQUIPMENT CABINET			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE:	ERICSSON	62.0"H x 26.0"W x 26.0"D	±1200 LBS
MODEL:	ENCLOSURE 6160		



EQUIPMENT CABINET			
EQUIPMENT		DIMENSIONS	WEIGHT
MAKE:	ERICSSON	62.0"H x 26.0"W x 26.0"D	±1883 LBS
MODEL:	BATTERY CABINET B160		

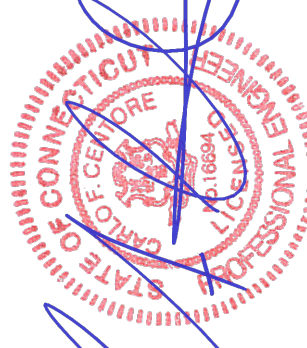
DIPLEXER		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: COMMSCOPE MODEL: SDZ1926Q-43(E14F05P86)	4.2"L x 7.0"W x 3.0"D	-
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T-MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.		

[illegible]

RRU DUAL SWIVEL MOUNT		
EQUIPMENT		WEIGHT
MAKE: SITE PRO 1	27.75"L x 6.5"W x 4.7"D	39.4 LBS.
PART NO.: RRU0SM		

[illegible]

PROFESSIONAL ENGINEER SEAL



T-Mobile
Transcend Wireless

CEN^{TEK} engineering
Centered on Solutions™

(203) 488-0580
(203) 488-8387 Fax
43-2 North Branford Road
Branford, CT 06405

www.CenterEng.com

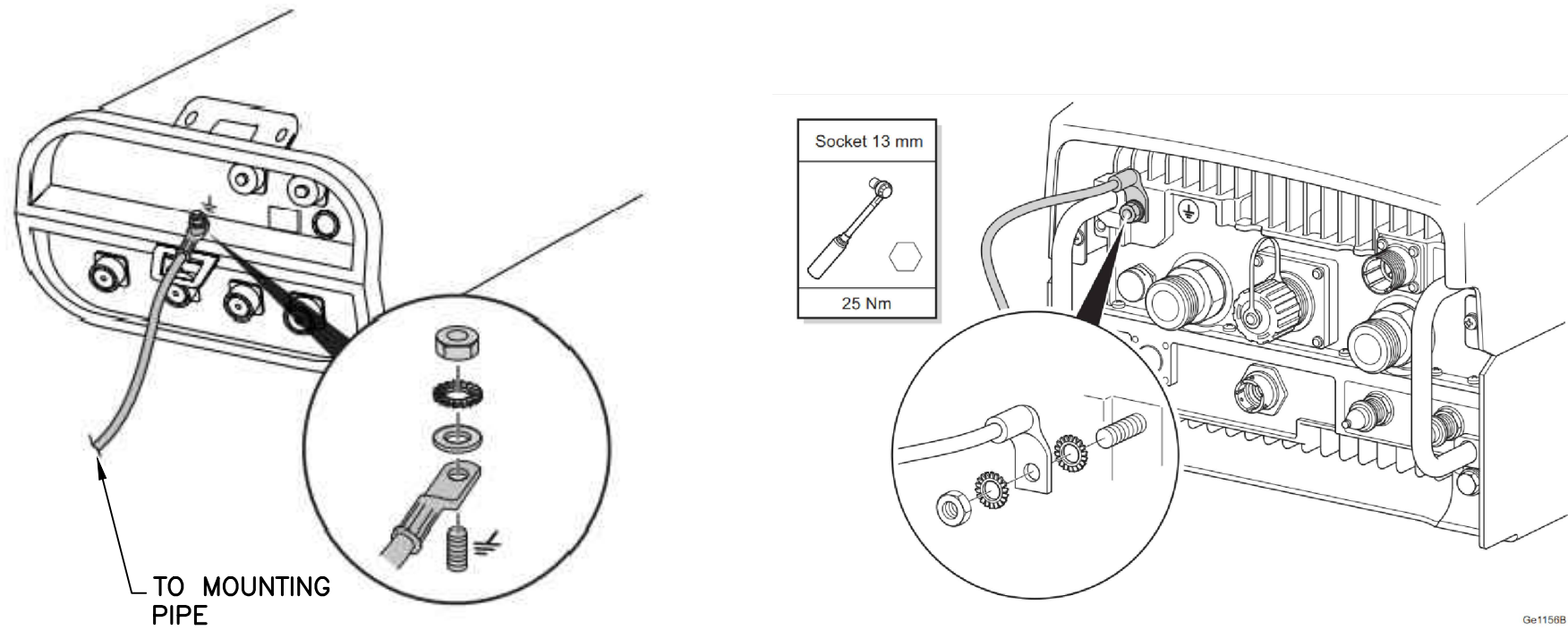
T-MOBILE NORTHEAST LLC
WIRELESS COMMUNICATIONS FACILITY
CT1720/TOWN OF ORANGE_MP
SITE ID: CT11720A
26 S ORANGE CENTER RD
ORANGE CT 06477

DATE:	07/02/20
SCALE:	AS NOTED
JOB NO.	20074.55

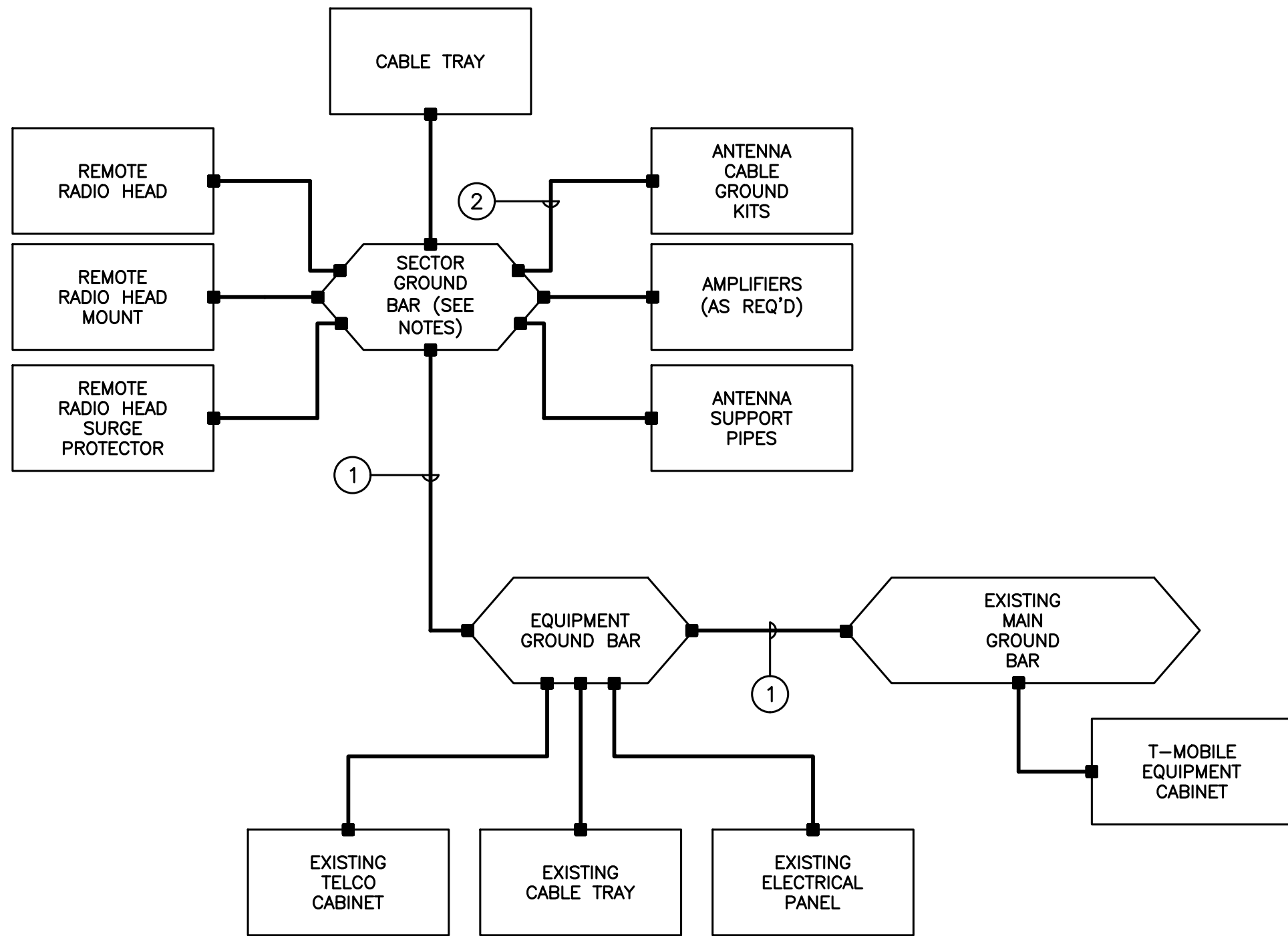
TYPICAL EQUIPMENT DETAILS

C-4

Sheet No. 6 of 7



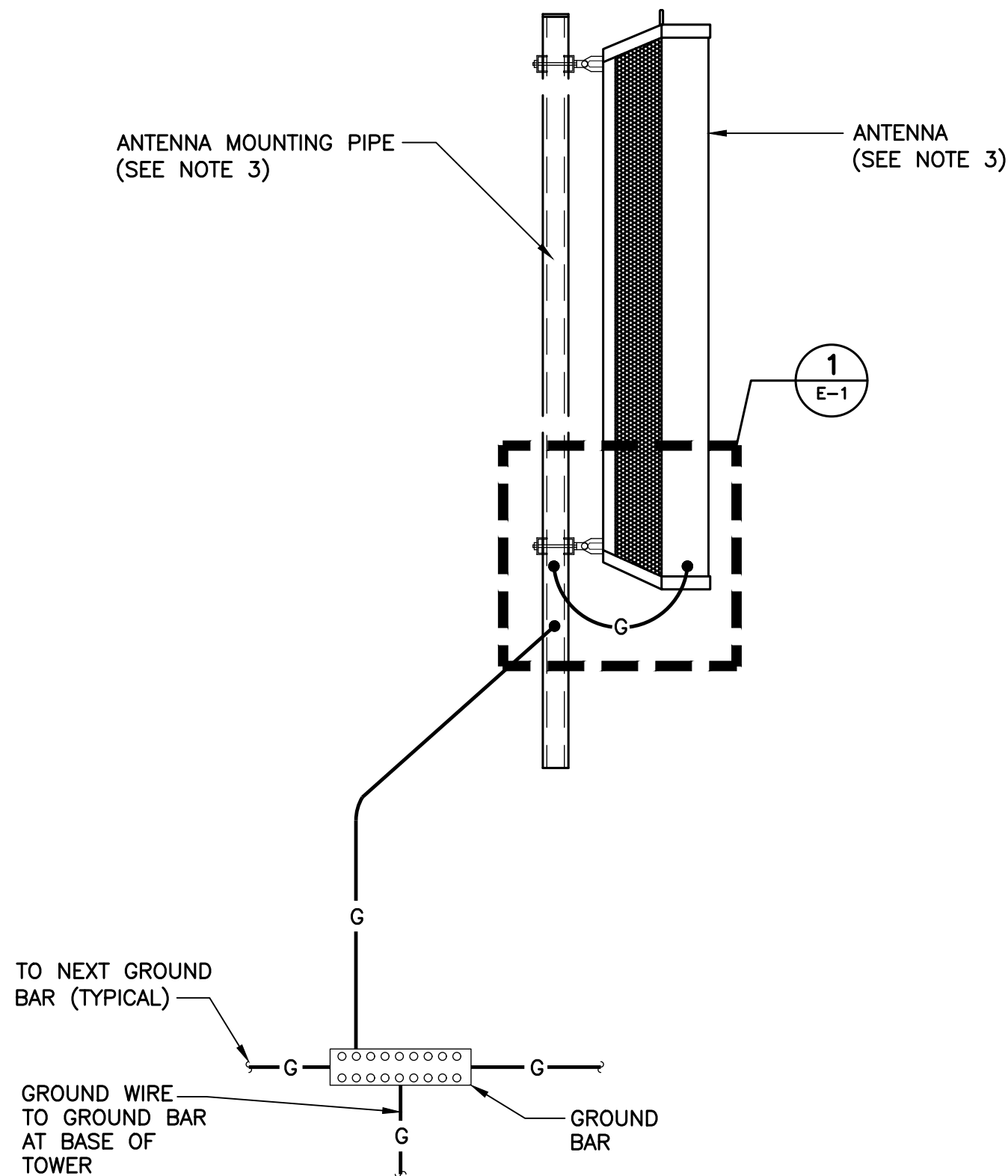
1
E-1
TYPICAL ANTENNA/RRU GROUNDING DETAILS
SCALE: NOT TO SCALE



GROUNDING SCHEMATIC NOTES

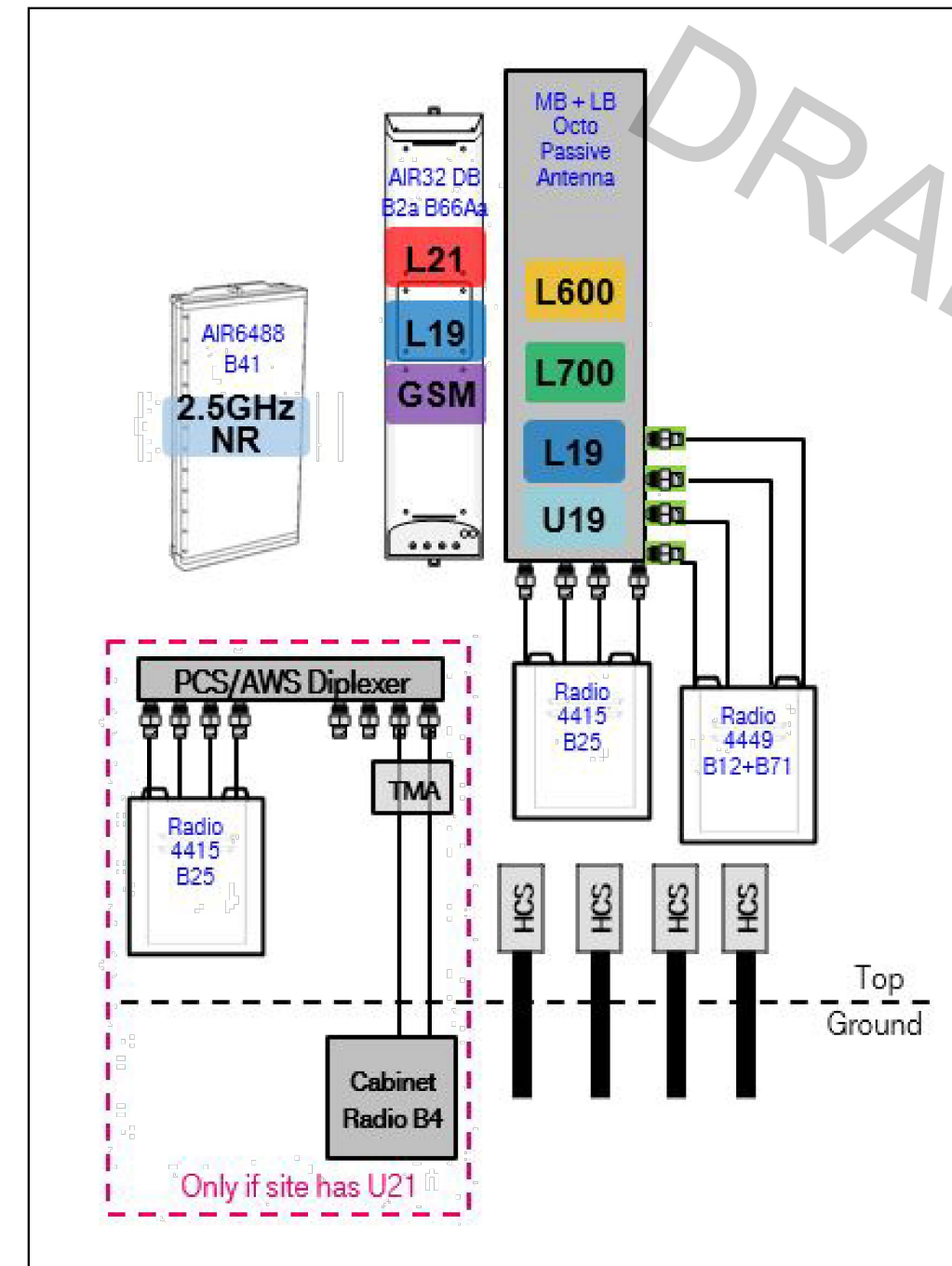
- 1 #2 AWG
2 #6 AWG
- GENERAL NOTES:
- ALL SURGE SUPPRESSION EQUIPMENT SHALL BE BONDED TO GROUND PER MANUFACTURER'S SPECIFICATIONS
 - UNLESS OTHERWISE NOTED OR REQUIRED BY CODE, GROUND CONDUCTORS SHOWN SHALL BE #2 AWG (SOLID TINNED BCW - EXTERIOR; STRANDED GREEN INSULATED - INTERIOR).
 - ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW.
 - BOND ALL EQUIPMENT CABINETS AND BATTERY CABINETS TO GROUND PER MANUFACTURER'S SPECIFICATIONS.
 - COORDINATE ALL ROOF MOUNTED EQUIPMENT WITH OWNER.
 - ALL ROOF MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
 - ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.

4
E-1
TYPICAL GROUNDING SCHEMATIC DETAIL
SCALE: NOT TO SCALE



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

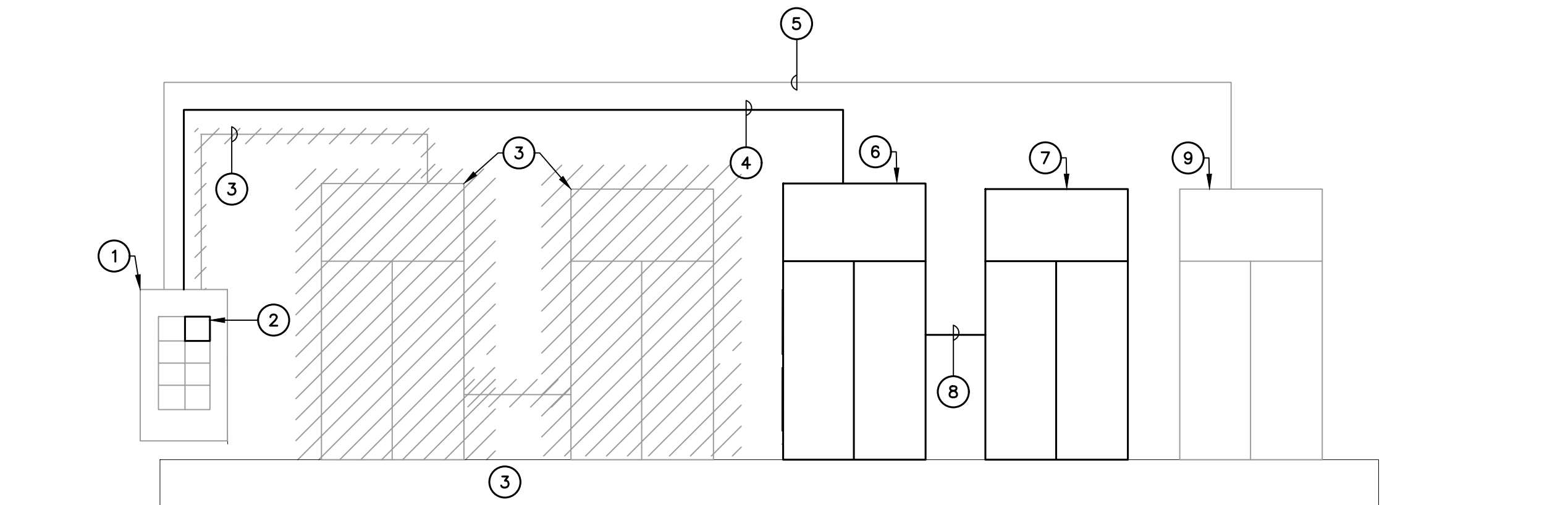
2
E-1
TYPICAL ANTENNA GROUNDING DETAIL
SCALE: NOT TO SCALE



3
E-1
PROPOSED PLUMBING DIAGRAM
SCALE: NOT TO SCALE

RISER DIAGRAM NOTES

- EXISTING 200A, PPC CABINET TO REMAIN.
- NEW 100A/2P CIRCUIT BREAKER TO SERVE NEW EQUIPMENT CABINET.
- EXISTING CABINETS AND ASSOCIATED CONDUITS AND CONDUCTORS TO BE REMOVED.
- (3) #1 AWG, (1) #8 AWG GROUND, 1-1/4" CONDUIT.
- EXISTING CONDUITS AND CONDUCTORS TO REMAIN.
- NEW T-MOBILE EQUIPMENT CABINET
- NEW T-MOBILE BATTERY CABINET
- DC CONDUIT AND CONDUCTORS FOR BATTERY CABINET CONNECTION PER MANUFACTURERS SPECIFICATIONS.
- EXISTING CABINET TO REMAIN.



5
E-1
ELECTRICAL POWER RISER DIAGRAM
SCALE: NOT TO SCALE

Exhibit D

Structural Analysis Report

Structural Analysis Report

180-ft Existing Rohn Monopole

*Proposed T-Mobile
Antenna Upgrade*

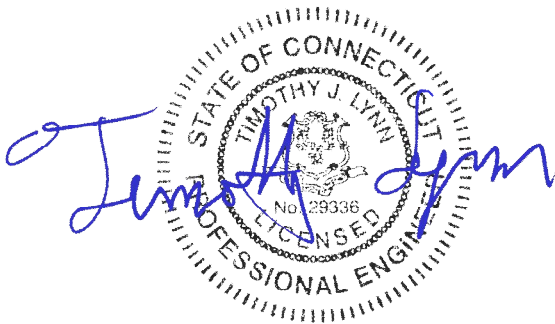
Site Ref: CT11720A

*26 South Orange Center Road
Orange, CT*

CENTEK Project No. 20074.55

Date: July 8, 2020

Max Stress Ratio = 64.4 %



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

Table of Contents

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- INTRODUCTION
- ANTENNA AND APPURTENANCE SUMMARY
- PRIMARY ASSUMPTIONS USED IN THE ANALYSIS
- ANALYSIS
- TOWER LOADING
- TOWER CAPACITY
- FOUNDATION AND ANCHORS
- CONCLUSION

SECTION 2 – CONDITIONS & SOFTWARE

- STANDARD ENGINEERING CONDITIONS
- GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

SECTION 3 – CALCULATIONS

- tnxTower INPUT/OUTPUT SUMMARY
- tnxTower DETAILED OUTPUT
- ANCHOR BOLT AND BASE PLATE ANALYSIS
- FOUNDATION ANALYSIS

SECTION 4 – REFERENCE MATERIAL

- RF DATA SHEET

I n t r o d u c t i o n

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 of 2001. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural report prepared by Centek job no. 19027.09 dated April 23, 2019. 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.

A n t e n n a a n d A p p u r t e n a n c e S u m m a r y

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" $\varnothing$ 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" $\varnothing$ Hybriflex cables running on the inside of the existing tower.
- **VERIZON (EXISTING):**
Antennas: Six (6) Commscope JAHH-65B-R3B panel antennas, three (3) Antel BXA-70063-4CF panel antenna, three (3) Samsung B5/B13 remote radio heads, three (3) Samsung B2/B66 remote radio heads and two (2) main distribution boxes mounted on a low profile platform with a RAD center elevation of 115-ft above grade level.
Coax Cables: Twelve (12) 1-5/8" $\varnothing$ coax cables and two (2) 1-5/8" $\varnothing$ fiber cable running inside 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 remote radio units and three (3) Ericsson KRY112 TMAs mounted on a low profile platform with a RAD center elevation of 150-ft above grade level
Cables: Twelve (12) 1-5/8" Ø coax cables and two (2) 6x12 fiber lines 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 150-ft above grade level.
- **T-MOBILE (PROPOSED):**
Antennas: Three (3) Ericsson AIR6449 panel antennas, three (3) Ericsson 4415 remote radio units and three (3) Commscope SDX1926Q-43 diplexers mounted on a platform with a RAD center elevation of 150-ft above grade level.
Cables: One (1) 6x12 fiber line 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 CSBC¹ 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:	<u>Load Case 1</u> ; 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]
	<u>Load Case 2</u> ; 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).

T o w e r C a p a c i t y

- Calculated stresses were found to be within allowable limits. This tower was found to be at **64.4%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	40.75'-82.75'	64.4%	PASS

F o u n d a t i o n a n d A n c h o r s

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"Ø, 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	65 kips
	Moment	4763 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	10.98	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	50.8%	PASS
Base Plate	Bending	57.7%	PASS

Conclusion

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

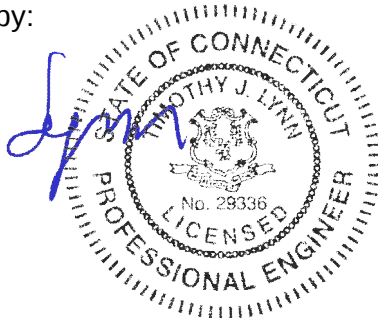
The analysis is based, in part, on the information provided to this office by T-Mobile. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

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:

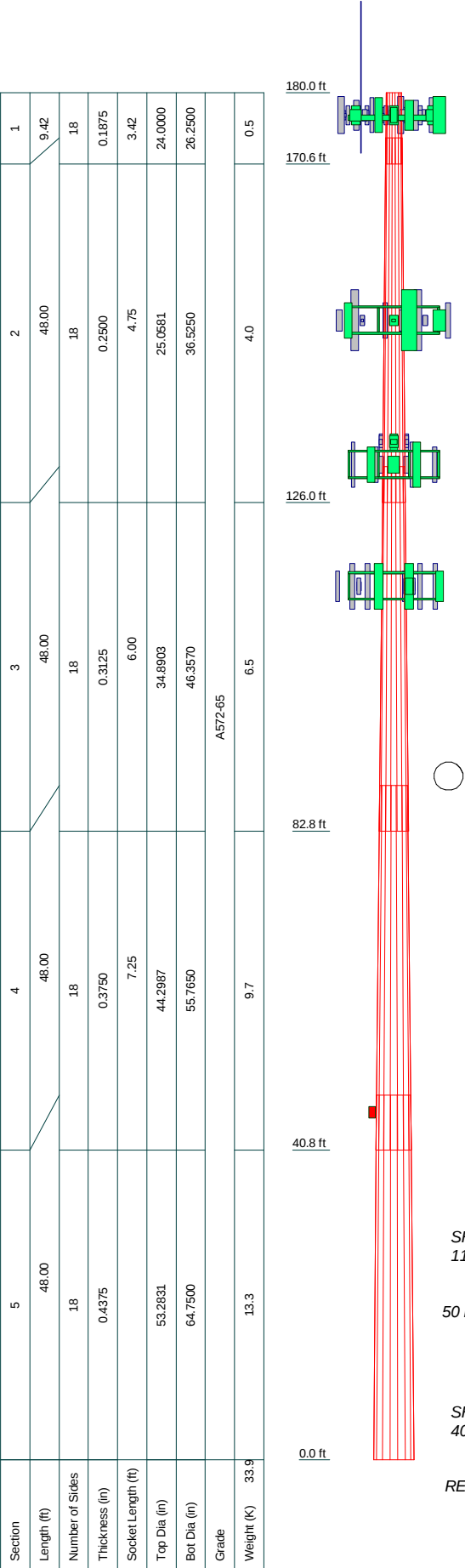
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or 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.



ALL REACTIONS
ARE FACTORED

AXIAL
105 K

SHEAR
11 K

MOMENT
1341 k

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

AXIAL
65 K

SHEAR
40 K

MOMENT
4763 kip-ft

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)	150
7770.00 (ATI)	177	4415 B25 (T-Mobile - Proposed)	150
OPA-65R-LCUU-H4 (ATI)	177	4415 B25 (T-Mobile - Proposed)	150
SBNHH-1D65A (ATI)	177	4415 B25 (T-Mobile - Proposed)	150
80010964 (ATI)	177	SDX1926Q-43 (T-Mobile - Proposed)	150
7770.00 (ATI)	177	SDX1926Q-43 (T-Mobile - Proposed)	150
OPA-65R-LCUU-H4 (ATI)	177	SDX1926Q-43 (T-Mobile - Proposed)	150
SBNHH-1D65A (ATI)	177	SDX1926Q-43 (T-Mobile - Proposed)	150
80010964 (ATI)	177	13' Platform w/rails (T-Mobile - Existing)	150
7770.00 (ATI)	177	FD-RRH 4x45 1900 (Sprint)	134
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 2x50 800 (Sprint)	134
(2) TPX-070821 (ATI)	177	FD-RRH 2x50 800 (Sprint)	134
(2) TPX-070821 (ATI)	177	FD-RRH 2x50 800 (Sprint)	134
(2) TPX-070821 (ATI)	177	Notch Filter (Sprint)	134
(2) LGP21401 TMA (ATI)	177	Notch Filter (Sprint)	134
(2) LGP21401 TMA (ATI)	177	Notch Filter (Sprint)	134
(2) LGP21401 TMA (ATI)	177	APXVSP18-C-A20 (Sprint)	131
(3) RRUS-32 (ATI)	177	APXVTM14 (Sprint)	131
(3) RRUS-32 (ATI)	177	APXVSP18-C-A20 (Sprint)	131
(3) RRUS-32 (ATI)	177	APXVTM14 (Sprint)	131
B14 4478 (ATI)	177	APXVSP18-C-A20 (Sprint)	131
B14 4478 (ATI)	177	APXVTM14 (Sprint)	131
B14 4478 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
(2) RRUS-11 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
(2) RRUS-11 (ATI)	177	TD-RRH8x20-25 (Sprint)	131
(2) RRUS-11 (ATI)	177	13' Platform w/rails (Sprint)	131
DC6-48-60-18-8F Surge Arrestor (ATI)	177	BXA-70063/4CF (Verizon)	115
DC6-48-60-18-8F Surge Arrestor (ATI)	177	JAHH-65B-R3B (Verizon)	115
DC6-48-60-18-8F Surge Arrestor (ATI)	177	JAHH-65B-R3B (Verizon)	115
EEI 14-ft Low Profile Platform (ATI)	177	BXA-70063/4CF (Verizon)	115
AIR6449 (T-Mobile - Proposed)	150	JAHH-65B-R3B (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	150	JAHH-65B-R3B (Verizon)	115
AIR32 (T-Mobile - Existing)	150	BXA-70063/4CF (Verizon)	115
AIR6449 (T-Mobile - Proposed)	150	JAHH-65B-R3B (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	150	JAHH-65B-R3B (Verizon)	115
AIR32 (T-Mobile - Existing)	150	B5/B15 RRH - BRO4C (Verizon)	115
APXVAARR24-43 (T-Mobile - Existing)	150	B5/B15 RRH - BRO4C (Verizon)	115
AIR32 (T-Mobile - Existing)	150	B5/B15 RRH - BRO4C (Verizon)	115
KRY 112 TMA (T-Mobile - Existing)	150	B2/B66A RRH (Verizon)	115
KRY 112 TMA (T-Mobile - Existing)	150	B2/B66A RRH (Verizon)	115
KRY 112 TMA (T-Mobile - Existing)	150	B2/B66A RRH (Verizon)	115
Radio 4449 B71 B12 (T-Mobile - Existing)	150	RC2DC-3315-PF-48 (Verizon)	115
Radio 4449 B71 B12 (T-Mobile - Existing)	150	DB-T1-6Z-8AB-OZ (Verizon)	115
Radio 4449 B71 B12 (T-Mobile - Existing)	150	EEI 14-ft Platform w/ Rails (Verizon)	115
Radio 4449 B71 B12 (T-Mobile - Existing)	150	GPS	45

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: 64.4%

Centek Engineering Inc.

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

Job: 20074.55 - CT11720A

Project: 180' Monopole - 26 South Orange Center Road, Orange, CT

Client: T-Mobile

Code: TIA-222-G

Path: j:\jobs\20074.55\20074.55 - CT11720A\05 - Structural Tower Analysis\Output Documents\enr\180' Monopole - Orange, CT.dwg

Drawn by: T.JL

Date: 07/08/20

App'd:

Scale: NTS

Dwg No. E-1

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

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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	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	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
HYBRIFLEX 1-5/8" (T-Mobile - Proposed)	C	Yes	Surface Ar (CaAa)	102.00 - 3.00	1	1	0.000 0.000	1.9800		1.90
1 5/8 (Verizon)	C	Yes	Surface Ar (CaAa)	115.00 - 0.00	6	6	0.000 0.000	1.9800		1.04

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Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C _A A _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	12	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	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	2	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 _A A _A In Face ft ²	C _A A _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	42.124	0.000	1.98
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	58.212	0.000	2.59
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	55.886	0.000	2.42

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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 _A A _A In Face ft ²	C _A A _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	72.453	0.000	2.88
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	102.475	0.000	3.84
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	96.301	0.000	3.54

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _o No Ice	K _o Ice
L2	6	HYBRIFLEX 1-5/8"	126.00 - 102.00	1.0000	1.0000
L2	10	1 5/8	126.00 - 115.00	1.0000	1.0000
L3	6	HYBRIFLEX 1-5/8"	82.75 - 102.00	1.0000	1.0000
L3	10	1 5/8	82.75 - 115.00	1.0000	1.0000
L4	6	HYBRIFLEX 1-5/8"	40.75 - 82.75	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 Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
4-ft Lightning Rod (Town - Existing)	A	From Face	4.00	0.0000	182.00	No Ice	0.40	0.01
			0.00			1/2" Ice	0.81	0.01
			0.00			1" Ice	1.06	0.02
7770.00 (AT&T)	A	From Face	3.50	0.0000	177.00	No Ice	5.51	0.04
			-6.00			1/2" Ice	5.87	0.07
			0.00			1" Ice	6.23	0.11
OPA-65R-LCUU-H4 (AT&T)	A	From Face	3.50	0.0000	177.00	No Ice	5.94	0.06
			-2.00			1/2" Ice	6.28	0.10

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

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
B14 4478 (AT&T)	A	From Face	0.00 3.00 0.00 0.00	0.0000	177.00	1" Ice 3.81 No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	2.86 1.06 1.20 1.34	0.14 0.06 0.08 0.09
B14 4478 (AT&T)	B	From Face	0.00 3.00 0.00 0.00	0.0000	177.00	No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	1.06 1.20 1.34	0.06 0.08 0.09
B14 4478 (AT&T)	C	From Face	0.00 3.00 0.00 0.00	0.0000	177.00	No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	1.06 1.20 1.34	0.06 0.08 0.09
(2) RRUS-11 (AT&T)	A	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 2.57 1/2" Ice 2.76 1" Ice 2.97	1.07 1.21 1.36	0.05 0.07 0.09
(2) RRUS-11 (AT&T)	B	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 2.57 1/2" Ice 2.76 1" Ice 2.97	1.07 1.21 1.36	0.05 0.07 0.09
(2) RRUS-11 (AT&T)	C	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 2.57 1/2" Ice 2.76 1" Ice 2.97	1.07 1.21 1.36	0.05 0.07 0.09
DC6-48-60-18-8F Surge Arrestor (AT&T)	A	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 1.91 1/2" Ice 2.10 1" Ice 2.29	1.91 2.10 2.29	0.02 0.04 0.06
DC6-48-60-18-8F Surge Arrestor (AT&T)	B	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 1.91 1/2" Ice 2.10 1" Ice 2.29	1.91 2.10 2.29	0.02 0.04 0.06
DC6-48-60-18-8F Surge Arrestor (AT&T)	C	From Face	0.00 0.50 0.00 0.00	0.0000	177.00	No Ice 1.91 1/2" Ice 2.10 1" Ice 2.29	1.91 2.10 2.29	0.02 0.04 0.06
EEI 14-ft Low Profile Platform (AT&T)	C	None		0.0000	177.00	No Ice 16.50 1/2" Ice 20.00 1" Ice 23.50	16.50 20.00 23.50	1.55 1.80 2.05
AIR6449 (T-Mobile - Proposed)	A	From Face	3.50 -6.00 0.00 0.00	0.0000	150.00	No Ice 5.65 1/2" Ice 5.96 1" Ice 6.26	2.42 2.64 2.87	0.10 0.14 0.18
APXVAARR24-43 (T-Mobile - Existing)	A	From Face	3.50 -2.00 0.00 0.00	0.0000	150.00	No Ice 20.24 1/2" Ice 20.89 1" Ice 21.54	8.89 9.49 10.09	0.15 0.27 0.39
AIR32 (T-Mobile - Existing)	A	From Face	3.50 6.00 0.00 0.00	0.0000	150.00	No Ice 6.51 1/2" Ice 6.89 1" Ice 7.27	4.71 5.07 5.43	0.13 0.18 0.23
AIR6449 (T-Mobile - Proposed)	B	From Face	3.50 -6.00 0.00 0.00	0.0000	150.00	No Ice 5.65 1/2" Ice 5.96 1" Ice 6.26	2.42 2.64 2.87	0.10 0.14 0.18
APXVAARR24-43 (T-Mobile - Existing)	B	From Face	3.50 -2.00 0.00 0.00	0.0000	150.00	No Ice 20.24 1/2" Ice 20.89 1" Ice 21.54	8.89 9.49 10.09	0.15 0.27 0.39
AIR32 (T-Mobile - Existing)	B	From Face	3.50 6.00 0.00 0.00	0.0000	150.00	No Ice 6.51 1/2" Ice 6.89 1" Ice 7.27	4.71 5.07 5.43	0.13 0.18 0.23
AIR6449 (T-Mobile - Proposed)	C	From Face	3.50 -6.00 0.00 0.00	0.0000	150.00	No Ice 5.65 1/2" Ice 5.96 1" Ice 6.26	2.42 2.64 2.87	0.10 0.14 0.18
APXVAARR24-43 (T-Mobile - Existing)	C	From Face	3.50 -2.00 0.00 0.00	0.0000	150.00	No Ice 20.24 1/2" Ice 20.89 1" Ice 21.54	8.89 9.49 10.09	0.15 0.27 0.39
AIR32 (T-Mobile - Existing)	C	From Face	3.50 6.00 0.00 0.00	0.0000	150.00	No Ice 6.51 1/2" Ice 6.89 1" Ice 7.27	4.71 5.07 5.43	0.13 0.18 0.23

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	Project 180' Monopole - 26 South Orange Center Road, Orange, CT	Date 13:21:03 07/08/20
	Client T-Mobile	Designed by TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
KRY 112 TMA (T-Mobile - Existing)	A	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	1" Ice 7.27 No Ice 0.78 1/2" Ice 0.90 1" Ice 1.03	5.43 0.49 0.59 0.70	0.23 0.03 0.03 0.04
KRY 112 TMA (T-Mobile - Existing)	B	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 0.78 1/2" Ice 0.90 1" Ice 1.03	0.49 0.59 0.70	0.03 0.03 0.04
KRY 112 TMA (T-Mobile - Existing)	C	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 0.78 1/2" Ice 0.90 1" Ice 1.03	0.49 0.59 0.70	0.03 0.03 0.04
Radio 4449 B71 B12 (T-Mobile - Existing)	A	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.64 1/2" Ice 1.80 1" Ice 1.97	1.29 1.44 1.59	0.07 0.09 0.11
Radio 4449 B71 B12 (T-Mobile - Existing)	B	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.64 1/2" Ice 1.80 1" Ice 1.97	1.29 1.44 1.59	0.07 0.09 0.11
Radio 4449 B71 B12 (T-Mobile - Existing)	C	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.64 1/2" Ice 1.80 1" Ice 1.97	1.29 1.44 1.59	0.07 0.09 0.11
4415 B25 (T-Mobile - Proposed)	A	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	0.82 0.94 1.07	0.05 0.06 0.08
4415 B25 (T-Mobile - Proposed)	B	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	0.82 0.94 1.07	0.05 0.06 0.08
4415 B25 (T-Mobile - Proposed)	C	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 1.84 1/2" Ice 2.01 1" Ice 2.19	0.82 0.94 1.07	0.05 0.06 0.08
SDX1926Q-43 (T-Mobile - Proposed)	A	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 0.24 1/2" Ice 0.31 1" Ice 0.38	0.10 0.14 0.19	0.03 0.03 0.04
SDX1926Q-43 (T-Mobile - Proposed)	B	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 0.24 1/2" Ice 0.31 1" Ice 0.38	0.10 0.14 0.19	0.03 0.03 0.04
SDX1926Q-43 (T-Mobile - Proposed)	C	From Face	0.00 3.50 0.00 0.00	0.0000	150.00	No Ice 0.24 1/2" Ice 0.31 1" Ice 0.38	0.10 0.14 0.19	0.03 0.03 0.04
13' Platform w/rails (T-Mobile - Existing)	C	None		0.0000	150.00	No Ice 31.30 1/2" Ice 40.20 1" Ice 49.10	31.30 40.20 49.10	1.82 2.45 3.08
APXVSPP18-C-A20 (Sprint)	A	From Face	3.00 -3.00 0.00	0.0000	131.00	No Ice 8.02 1/2" Ice 8.48 1" Ice 8.94	5.28 5.74 6.20	0.06 0.11 0.16
APXVTM14 (Sprint)	A	From Face	3.00 3.00 0.00	0.0000	131.00	No Ice 6.34 1/2" Ice 6.72 1" Ice 7.10	3.61 3.97 4.33	0.06 0.10 0.14
APXVSPP18-C-A20 (Sprint)	B	From Face	3.00 -3.00 0.00	0.0000	131.00	No Ice 8.02 1/2" Ice 8.48 1" Ice 8.94	5.28 5.74 6.20	0.06 0.11 0.16
APXVTM14 (Sprint)	B	From Face	3.00 3.00 0.00	0.0000	131.00	No Ice 6.34 1/2" Ice 6.72 1" Ice 7.10	3.61 3.97 4.33	0.06 0.10 0.14
APXVSPP18-C-A20 (Sprint)	C	From Face	3.00 -3.00 0.00	0.0000	131.00	No Ice 8.02 1/2" Ice 8.48 1" Ice 8.94	5.28 5.74 6.20	0.06 0.11 0.16
APXVTM14 (Sprint)	C	From Face	3.00 3.00	0.0000	131.00	No Ice 6.34 1/2" Ice 6.72	3.61 3.97	0.06 0.10

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	Project 180' Monopole - 26 South Orange Center Road, Orange, CT	Date 13:21:03 07/08/20
	Client T-Mobile	Designed by TJJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
TD-RRH8x20-25 (Sprint)	A	From Face	0.00	0.0000	131.00	1" Ice	7.10	4.33	0.14
			0.50			No Ice	4.05	1.53	0.07
			0.00			1/2" Ice	4.30	1.71	0.10
TD-RRH8x20-25 (Sprint)	B	From Face	0.00	0.0000	131.00	1" Ice	4.56	1.90	0.13
			0.50			No Ice	4.05	1.53	0.07
			0.00			1/2" Ice	4.30	1.71	0.10
TD-RRH8x20-25 (Sprint)	C	From Face	0.00	0.0000	131.00	1" Ice	4.56	1.90	0.13
			0.50			No Ice	4.05	1.53	0.07
			0.00			1/2" Ice	4.30	1.71	0.10
FD-RRH 4x45 1900 (Sprint)	A	From Face	0.00	0.0000	134.00	1" Ice	4.56	1.90	0.13
			0.50			No Ice	2.32	2.38	0.06
			0.00			1/2" Ice	2.52	2.59	0.08
FD-RRH 4x45 1900 (Sprint)	B	From Face	0.00	0.0000	134.00	1" Ice	2.74	2.80	0.11
			0.50			No Ice	2.32	2.38	0.06
			0.00			1/2" Ice	2.52	2.59	0.08
FD-RRH 4x45 1900 (Sprint)	C	From Face	0.00	0.0000	134.00	1" Ice	2.74	2.80	0.11
			0.50			No Ice	2.32	2.38	0.06
			0.00			1/2" Ice	2.52	2.59	0.08
FD-RRH 2x50 800 (Sprint)	A	From Face	0.00	0.0000	134.00	1" Ice	2.74	2.80	0.11
			0.50			No Ice	2.06	1.93	0.06
			0.00			1/2" Ice	2.24	2.11	0.09
FD-RRH 2x50 800 (Sprint)	B	From Face	0.00	0.0000	134.00	1" Ice	2.43	2.29	0.11
			0.50			No Ice	2.06	1.93	0.06
			0.00			1/2" Ice	2.24	2.11	0.09
FD-RRH 2x50 800 (Sprint)	C	From Face	0.00	0.0000	134.00	1" Ice	2.43	2.29	0.11
			0.50			No Ice	2.06	1.93	0.06
			0.00			1/2" Ice	2.24	2.11	0.09
Notch Filter (Sprint)	A	From Face	0.00	0.0000	134.00	1" Ice	2.43	2.29	0.11
			0.50			No Ice	0.74	0.32	0.01
			0.00			1/2" Ice	0.85	0.40	0.02
Notch Filter (Sprint)	B	From Face	0.00	0.0000	134.00	1" Ice	0.97	0.48	0.02
			0.50			No Ice	0.74	0.32	0.01
			0.00			1/2" Ice	0.85	0.40	0.02
Notch Filter (Sprint)	C	From Face	0.00	0.0000	134.00	1" Ice	0.97	0.48	0.02
			0.50			No Ice	0.74	0.32	0.01
			0.00			1/2" Ice	0.85	0.40	0.02
13' Platform w/rails (Sprint)	C	None	0.00	0.0000	131.00	1" Ice	0.97	0.48	0.02
						No Ice	31.30	31.30	1.82
						1/2" Ice	40.20	40.20	2.45
BXA-70063/4CF (Verizon)	A	From Face	0.00	0.0000	115.00	1" Ice	49.10	49.10	3.08
			3.50			No Ice	4.71	2.44	0.01
			-6.00			1/2" Ice	5.03	2.74	0.04
JAHH-65B-R3B (Verizon)	A	From Face	0.00	0.0000	115.00	1" Ice	5.35	3.05	0.07
			3.50			No Ice	9.11	5.98	0.06
			2.00			1/2" Ice	9.58	6.44	0.12
JAHH-65B-R3B (Verizon)	A	From Face	0.00	0.0000	115.00	1" Ice	10.05	6.91	0.19
			3.50			No Ice	9.11	5.98	0.06
			-2.00			1/2" Ice	9.58	6.44	0.12
BXA-70063/4CF (Verizon)	B	From Face	0.00	0.0000	115.00	1" Ice	10.05	6.91	0.19
			3.50			No Ice	4.71	2.44	0.01
			-6.00			1/2" Ice	5.03	2.74	0.04
JAHH-65B-R3B (Verizon)	B	From Face	0.00	0.0000	115.00	1" Ice	5.35	3.05	0.07
			3.50			No Ice	9.11	5.98	0.06
			2.00			1/2" Ice	9.58	6.44	0.12
JAHH-65B-R3B (Verizon)	B	From Face	0.00	0.0000	115.00	1" Ice	10.05	6.91	0.19
			3.50			No Ice	9.11	5.98	0.06
			-2.00			1/2" Ice	9.58	6.44	0.12

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	Project	180' Monopole - 26 South Orange Center Road, Orange, CT	Date	13:21:03 07/08/20
	Client	T-Mobile	Designed by	TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
BXA-70063/4CF (Verizon)	C	From Face	0.00 3.50 -6.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 4.71 5.03	6.91 2.44 2.74	0.19 0.01 0.04
JAAH-65B-R3B (Verizon)	C	From Face	0.00 3.50 2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	5.35 9.11 9.58	3.05 5.98 6.44	0.07 0.06 0.12
JAAH-65B-R3B (Verizon)	C	From Face	0.00 3.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 9.11 9.58	6.91 5.98 6.44	0.19 0.06 0.12
B5/B15 RRH -BRO4C (Verizon)	A	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 1.87 2.03	6.91 1.02 1.15	0.19 0.07 0.09
B5/B15 RRH -BRO4C (Verizon)	B	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 1.87 2.03	6.91 1.02 1.15	0.19 0.07 0.09
B5/B15 RRH -BRO4C (Verizon)	C	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 1.87 2.03	6.91 1.02 1.15	0.19 0.07 0.09
B2/B66A RRH (Verizon)	A	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 2.54 2.75	6.91 1.61 1.79	0.19 0.06 0.08
B2/B66A RRH (Verizon)	B	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 2.54 2.75	6.91 1.61 1.79	0.19 0.06 0.08
B2/B66A RRH (Verizon)	C	From Face	0.00 2.50 -2.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 2.54 2.75	6.91 1.61 1.79	0.19 0.06 0.08
RC2DC-3315-PF-48 (Verizon)	A	From Face	0.00 0.50 0.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 3.01 3.23	6.91 1.96 2.15	0.19 0.03 0.05
DB-T1-6Z-8AB-0Z (Verizon)	B	From Face	0.00 0.50 0.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	10.05 4.80 5.07	6.91 2.00 2.19	0.19 0.04 0.08
EEI 14-ft Platform w/ Rails (Verizon)	C	None	0.00	0.0000	115.00	1" Ice No Ice 1/2" Ice	5.35 19.00 24.00	2.39 19.00 24.00	0.12 1.75 2.00
GPS	A	From Face	0.00 1.00 0.00 0.00	0.0000	45.00	1" Ice No Ice 1/2" Ice 1" Ice	29.00 1.00 1.50 2.00	29.00 1.00 1.50 2.00	2.25 0.01 0.01 0.02

Tower Pressures - No Ice

$$G_H = 1.100$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		psf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1	175.22	1.424	33	20.005	A	0.000	20.005	20.005	100.00	0.000	0.000

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	Client	T-Mobile	Designed by	TJL

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		psf	ft ²		ft ²	ft ²	ft ²			
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	42.124	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	58.212	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	55.886	0.000

Tower Pressure - With Ice

$$G_H = 1.100$$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		psf	in	ft ²		ft ²	ft ²	ft ²			
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	72.453	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	102.475	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	96.301	0.000

Tower Pressure - Service

$$G_H = 1.100$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		psf	ft ²		ft ²	ft ²	ft ²			
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

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Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L3 126.00-82.75	103.71	1.275	10	150.576	C	0.000	117.553		100.00	0.000	0.000
					A	0.000	150.576	150.576	100.00	0.000	0.000
					B	0.000	150.576		100.00	0.000	0.000
					C	0.000	150.576		100.00	42.124	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	58.212	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	55.886	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C
			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2 170.58-126.00	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3 126.00-82.75	1.98	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4 82.75-40.75	2.59	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C
			B	1	0.65		1	1	180.157			
			C	1	0.65		1	1	180.157			
L5 40.75-0.00	2.42	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:	7.83	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	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	0.48	A	1	0.65	33	1	1	20.005	0.47	49.49	C
			B	1	0.65		1	1	20.005			
			C	1	0.65		1	1	20.005			
L2 170.58-126.00	0.73	3.96	A	1	0.65	31	1	1	117.553	2.64	59.19	C
			B	1	0.65		1	1	117.553			
			C	1	0.65		1	1	117.553			
L3 126.00-82.75	1.98	6.53	A	1	0.65	29	1	1	150.576	3.14	72.55	C
			B	1	0.65		1	1	150.576			
			C	1	0.65		1	1	150.576			
L4	2.59	9.65	A	1	0.65	26	1	1	180.157	3.35	79.86	C

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	Client T-Mobile	Designed by TJJ

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
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	2.42	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:	7.83	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	F a c e	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	1.98	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	2.59	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	2.42	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:	7.83	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	F a c e	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	1.98	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	2.59	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			

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Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L5 40.75-0.00	2.42	13.29	C	1	0.65	21	1	1	180.157	3.09	75.76	C
			A	1	0.65		1	1	206.259			
			B	1	0.65		1	1	206.259			
			C	1	0.65		1	1	206.259			
Sum Weight:	7.83	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	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2 170.58-126.00	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3 126.00-82.75	2.88	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4 82.75-40.75	3.84	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	3.54	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:	11.08	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	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2 170.58-126.00	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3 126.00-82.75	2.88	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4 82.75-40.75	3.84	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			

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Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L5 40.75-0.00	3.54	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:	11.08	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	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2 170.58-126.00	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3 126.00-82.75	2.88	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4 82.75-40.75	3.84	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	3.54	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:	11.08	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	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 180.00-170.58	0.10	1.03	A	1	1.2	9	1	1	22.788	0.26	27.65	C
			B	1	1.2		1	1	22.788			
			C	1	1.2		1	1	22.788			
L2 170.58-126.00	0.73	7.12	A	1	1.2	8	1	1	130.723	1.44	32.29	C
			B	1	1.2		1	1	130.723			
			C	1	1.2		1	1	130.723			
L3 126.00-82.75	2.88	10.38	A	1	1.2	8	1	1	163.132	1.67	38.55	C
			B	1	1.2		1	1	163.132			
			C	1	1.2		1	1	163.132			
L4 82.75-40.75	3.84	13.99	A	1	1.2	7	1	1	191.931	1.75	41.74	C
			B	1	1.2		1	1	191.931			
			C	1	1.2		1	1	191.931			
L5 40.75-0.00	3.54	17.70	A	1	1.2	6	1	1	217.100	1.59	39.11	C

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
ft	K	K										
Sum Weight:	11.08	50.21	B C	1 1	1.2 1.2		1 1	1 1 OTM	217.100 217.100 570.91 kip-ft	6.71		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
ft	K	K										
L1 180.00-170.58	0.10	0.48	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	20.005 20.005 20.005	0.16	16.94	C
L2 170.58-126.00	0.73	3.96	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	117.553 117.553 117.553	0.90	20.26	C
L3 126.00-82.75	1.98	6.53	A B C	1 1 1	0.65 0.65 0.65	10	1 1 1	1 1 1	150.576 150.576 150.576	1.07	24.84	C
L4 82.75-40.75	2.59	9.65	A B C	1 1 1	0.65 0.65 0.65	9	1 1 1	1 1 1	180.157 180.157 180.157	1.15	27.34	C
L5 40.75-0.00	2.42	13.29	A B C	1 1 1	0.65 0.65 0.65	7	1 1 1	1 1 1	206.259 206.259 206.259	1.06	25.93	C
Sum Weight:	7.83	33.90						OTM	364.61 kip-ft	4.34		

Tower Forces - Service - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
ft	K	K										
L1 180.00-170.58	0.10	0.48	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	20.005 20.005 20.005	0.16	16.94	C
L2 170.58-126.00	0.73	3.96	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	117.553 117.553 117.553	0.90	20.26	C
L3 126.00-82.75	1.98	6.53	A B C	1 1 1	0.65 0.65 0.65	10	1 1 1	1 1 1	150.576 150.576 150.576	1.07	24.84	C
L4 82.75-40.75	2.59	9.65	A B C	1 1 1	0.65 0.65 0.65	9	1 1 1	1 1 1	180.157 180.157 180.157	1.15	27.34	C
L5 40.75-0.00	2.42	13.29	A B	1 1	0.65 0.65	7	1 1	1 1	206.259 206.259	1.06	25.93	C

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K				psf			ft ²	K	plf	
Sum Weight:	7.83	33.90	C	1	0.65		1	1 OTM	206.259 364.61 kip-ft	4.34		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K				psf			ft ²	K	plf	
L1 180.00-170.58	0.10	0.48	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	20.005 20.005 20.005	0.16	16.94	C
L2 170.58-126.00	0.73	3.96	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	117.553 117.553 117.553	0.90	20.26	C
L3 126.00-82.75	1.98	6.53	A B C	1 1 1	0.65 0.65 0.65	10	1 1 1	1 1 1	150.576 150.576 150.576	1.07	24.84	C
L4 82.75-40.75	2.59	9.65	A B C	1 1 1	0.65 0.65 0.65	9	1 1 1	1 1 1	180.157 180.157 180.157	1.15	27.34	C
L5 40.75-0.00	2.42	13.29	A B C	1 1 1	0.65 0.65 0.65	7	1 1 1	1 1 1	206.259 206.259 206.259	1.06	25.93	C
Sum Weight:	7.83	33.90						OTM	364.61 kip-ft	4.34		

Tower Forces - Service - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K				psf			ft ²	K	plf	
L1 180.00-170.58	0.10	0.48	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	20.005 20.005 20.005	0.16	16.94	C
L2 170.58-126.00	0.73	3.96	A B C	1 1 1	0.65 0.65 0.65	11	1 1 1	1 1 1	117.553 117.553 117.553	0.90	20.26	C
L3 126.00-82.75	1.98	6.53	A B C	1 1 1	0.65 0.65 0.65	10	1 1 1	1 1 1	150.576 150.576 150.576	1.07	24.84	C
L4 82.75-40.75	2.59	9.65	A B C	1 1 1	0.65 0.65 0.65	9	1 1 1	1 1 1	180.157 180.157 180.157	1.15	27.34	C
L5 40.75-0.00	2.42	13.29	A B C	1 1 1	0.65 0.65 0.65	7	1 1 1	1 1 1	206.259 206.259 206.259	1.06	25.93	C

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
Sum Weight:	7.83	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			-0.12	0.05	
Total Weight	54.33			-0.12	0.05	
Wind 0 deg - No Ice		0.02	-24.78	-2858.51	-2.23	-0.14
Wind 30 deg - No Ice		12.43	-21.47	-2476.70	-1434.03	-0.21
Wind 45 deg - No Ice		17.57	-17.53	-2022.92	-2026.86	-0.23
Wind 60 deg - No Ice		21.51	-12.41	-1431.29	-2481.56	-0.23
Wind 90 deg - No Ice		24.83	-0.02	-2.40	-2864.15	-0.19
Wind 120 deg - No Ice		21.49	12.37	1427.10	-2479.28	-0.10
Wind 135 deg - No Ice		17.54	17.51	2019.46	-2023.63	-0.04
Wind 150 deg - No Ice		12.40	21.45	2474.18	-1430.07	0.02
Wind 180 deg - No Ice		-0.02	24.78	2858.28	2.34	0.14
Wind 210 deg - No Ice		-12.43	21.47	2476.47	1434.14	0.21
Wind 225 deg - No Ice		-17.57	17.53	2022.69	2026.97	0.23
Wind 240 deg - No Ice		-21.51	12.41	1431.06	2481.67	0.23
Wind 270 deg - No Ice		-24.83	0.02	2.17	2864.26	0.19
Wind 300 deg - No Ice		-21.49	-12.37	-1427.33	2479.38	0.10
Wind 315 deg - No Ice		-17.54	-17.51	-2019.69	2023.73	0.04
Wind 330 deg - No Ice		-12.40	-21.45	-2474.41	1430.17	-0.02
Member Ice	16.31					
Total Weight Ice	91.76			-0.47	0.13	
Wind 0 deg - Ice		0.01	-11.26	-1242.96	-0.53	-0.11
Wind 30 deg - Ice		5.64	-9.76	-1076.83	-622.54	-0.15
Wind 45 deg - Ice		7.98	-7.97	-879.51	-880.11	-0.15
Wind 60 deg - Ice		9.77	-5.64	-622.29	-1077.70	-0.15
Wind 90 deg - Ice		11.28	-0.01	-1.13	-1244.05	-0.10
Wind 120 deg - Ice		9.76	5.63	620.21	-1077.03	-0.03
Wind 135 deg - Ice		7.97	7.96	877.64	-879.17	0.01
Wind 150 deg - Ice		5.63	9.75	1075.23	-621.39	0.04
Wind 180 deg - Ice		-0.01	11.26	1242.03	0.80	0.11
Wind 210 deg - Ice		-5.64	9.76	1075.90	622.80	0.15
Wind 225 deg - Ice		-7.98	7.97	878.58	880.37	0.15
Wind 240 deg - Ice		-9.77	5.64	621.35	1077.96	0.15
Wind 270 deg - Ice		-11.28	0.01	0.20	1244.32	0.10
Wind 300 deg - Ice		-9.76	-5.63	-621.14	1077.30	0.03
Wind 315 deg - Ice		-7.97	-7.96	-878.57	879.43	-0.01
Wind 330 deg - Ice		-5.63	-9.75	-1076.17	621.65	-0.04
Total Weight	54.33			-0.12	0.05	
Wind 0 deg - Service		0.01	-8.48	-978.65	-0.73	-0.05
Wind 30 deg - Service		4.26	-7.35	-847.94	-490.89	-0.07
Wind 45 deg - Service		6.01	-6.00	-692.60	-693.84	-0.08
Wind 60 deg - Service		7.36	-4.25	-490.06	-849.50	-0.08
Wind 90 deg - Service		8.50	-0.01	-0.90	-980.47	-0.07
Wind 120 deg - Service		7.36	4.24	488.47	-848.71	-0.03

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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 135 deg - Service		6.01	5.99	691.26	-692.73	-0.01
Wind 150 deg - Service		4.24	7.34	846.93	-489.53	0.01
Wind 180 deg - Service		-0.01	8.48	978.42	0.84	0.05
Wind 210 deg - Service		-4.26	7.35	847.71	490.99	0.07
Wind 225 deg - Service		-6.01	6.00	692.37	693.94	0.08
Wind 240 deg - Service		-7.36	4.25	489.83	849.60	0.08
Wind 270 deg - Service		-8.50	0.01	0.67	980.58	0.07
Wind 300 deg - Service		-7.36	-4.24	-488.70	848.82	0.03
Wind 315 deg - Service		-6.01	-5.99	-691.49	692.83	0.01
Wind 330 deg - Service		-4.24	-7.34	-847.16	489.64	-0.01

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
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

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Comb. No.	Description
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
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	0.02
			Max. My	2	-4.23	0.04	22.37
			Max. Vy	26	-7.41	22.39	0.02
			Max. Vx	2	-7.41	0.04	22.37
			Max. Torque	4			0.12
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-35.85	0.17	0.10
			Max. Mx	26	-16.11	539.01	0.02
L2	170.58 - 126	Pole	Max. My	2	-16.12	0.03	538.95
			Max. Vy	26	-21.29	539.01	0.02
			Max. Vx	2	-21.28	0.03	538.95
			Max. Torque	4			0.12
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-56.52	0.06	0.44
			Max. Mx	26	-28.77	1638.51	-0.77
			Max. My	2	-28.78	-0.86	1636.34
			Max. Vy	26	-30.07	1638.51	-0.77
			Max. Vx	2	-29.99	-0.86	1636.34
L3	126 - 82.75	Pole	Max. Torque	8			0.25
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-76.08	0.06	0.44
			Max. Mx	26	-43.04	2962.99	-2.10
			Max. My	2	-43.04	-2.19	2957.43
			Max. Vy	26	-34.85	2962.99	-2.10
			Max. Vx	2	-34.77	-2.19	2957.43
			Max. Torque	8			0.25
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-76.08	0.06	0.44
L4	82.75 - 40.75	Pole	Max. Mx	26	-43.04	2962.99	-2.10
			Max. My	2	-43.04	-2.19	2957.43
			Max. Vy	26	-34.85	2962.99	-2.10
			Max. Vx	2	-34.77	-2.19	2957.43
			Max. Torque	8			0.25
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-76.08	0.06	0.44
			Max. Mx	26	-43.04	2962.99	-2.10
			Max. My	2	-43.04	-2.19	2957.43
			Max. Vy	26	-34.85	2962.99	-2.10

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L5	40.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-104.69	0.14	0.49
			Max. M _x	26	-65.18	4761.74	-3.64
			Max. M _y	2	-65.18	-3.71	4752.23
			Max. V _y	26	-39.76	4761.74	-3.64
			Max. V _x	2	-39.68	-3.71	4752.23
			Max. Torque	8			0.37

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	47	104.69	11.28	-0.01
	Max. H _x	26	65.20	39.73	-0.03
	Max. H _z	2	65.20	-0.03	39.64
	Max. M _x	2	4752.23	-0.03	39.64
	Max. M _z	10	4761.60	-39.73	0.03
	Max. Torsion	8	0.37	-34.42	19.85
	Min. Vert	15	48.90	-28.07	-28.01
	Min. H _x	10	65.20	-39.73	0.03
	Min. H _z	18	65.20	0.03	-39.64
	Min. M _x	18	-4751.93	0.03	-39.64
	Min. M _z	26	-4761.74	39.73	-0.03
	Min. Torsion	24	-0.37	34.42	-19.85

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	54.33	0.00	0.00	-0.12	0.05	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	65.20	0.03	-39.64	-4752.23	-3.71	-0.22
0.9 Dead+1.6 Wind 0 deg - No Ice	48.90	0.03	-39.64	-4704.67	-3.70	-0.22
1.2 Dead+1.6 Wind 30 deg - No Ice	65.20	19.89	-34.35	-4117.47	-2384.06	-0.35
0.9 Dead+1.6 Wind 30 deg - No Ice	48.90	19.89	-34.35	-4076.25	-2360.24	-0.34
1.2 Dead+1.6 Wind 45 deg - No Ice	65.20	28.11	-28.06	-3363.05	-3369.63	-0.37
0.9 Dead+1.6 Wind 45 deg - No Ice	48.90	28.11	-28.06	-3329.38	-3335.96	-0.37
1.2 Dead+1.6 Wind 60 deg - No Ice	65.20	34.42	-19.85	-2379.46	-4125.57	-0.37
0.9 Dead+1.6 Wind 60 deg - No Ice	48.90	34.42	-19.85	-2355.63	-4084.33	-0.37
1.2 Dead+1.6 Wind 90 deg - No Ice	65.20	39.73	-0.03	-3.93	-4761.60	-0.30
0.9 Dead+1.6 Wind 90 deg - No Ice	48.90	39.73	-0.03	-3.86	-4714.02	-0.30
1.2 Dead+1.6 Wind 120 deg -	65.20	34.39	19.79	2372.63	-4121.79	-0.15

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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 120 deg - No Ice	48.90	34.39	19.79	2348.92	-4080.59	-0.15
1.2 Dead+1.6 Wind 135 deg - No Ice	65.20	28.07	28.01	3357.42	-3364.29	-0.06
0.9 Dead+1.6 Wind 135 deg - No Ice	48.90	28.07	28.01	3323.87	-3330.66	-0.06
1.2 Dead+1.6 Wind 150 deg - No Ice	65.20	19.84	34.32	4113.40	-2377.51	0.04
0.9 Dead+1.6 Wind 150 deg - No Ice	48.90	19.84	34.32	4072.29	-2353.75	0.04
1.2 Dead+1.6 Wind 180 deg - No Ice	65.20	-0.03	39.64	4751.93	3.85	0.22
0.9 Dead+1.6 Wind 180 deg - No Ice	48.90	-0.03	39.64	4704.45	3.80	0.22
1.2 Dead+1.6 Wind 210 deg - No Ice	65.20	-19.89	34.35	4117.17	2384.19	0.34
0.9 Dead+1.6 Wind 210 deg - No Ice	48.90	-19.89	34.35	4076.03	2360.34	0.34
1.2 Dead+1.6 Wind 225 deg - No Ice	65.20	-28.11	28.06	3362.76	3369.77	0.37
0.9 Dead+1.6 Wind 225 deg - No Ice	48.90	-28.11	28.06	3329.16	3336.06	0.37
1.2 Dead+1.6 Wind 240 deg - No Ice	65.20	-34.42	19.85	2379.17	4125.70	0.37
0.9 Dead+1.6 Wind 240 deg - No Ice	48.90	-34.42	19.85	2355.41	4084.43	0.37
1.2 Dead+1.6 Wind 270 deg - No Ice	65.20	-39.73	0.03	3.64	4761.74	0.30
0.9 Dead+1.6 Wind 270 deg - No Ice	48.90	-39.73	0.03	3.64	4714.12	0.30
1.2 Dead+1.6 Wind 300 deg - No Ice	65.20	-34.39	-19.79	-2372.92	4121.93	0.15
0.9 Dead+1.6 Wind 300 deg - No Ice	48.90	-34.39	-19.79	-2349.14	4080.69	0.15
1.2 Dead+1.6 Wind 315 deg - No Ice	65.20	-28.07	-28.01	-3357.71	3364.43	0.06
0.9 Dead+1.6 Wind 315 deg - No Ice	48.90	-28.07	-28.01	-3324.08	3330.76	0.06
1.2 Dead+1.6 Wind 330 deg - No Ice	65.20	-19.84	-34.32	-4113.70	2377.65	-0.04
0.9 Dead+1.6 Wind 330 deg - No Ice	48.90	-19.84	-34.32	-4072.51	2353.85	-0.04
1.2 Dead+1.0 Ice+1.0 Temp	104.69	0.00	0.00	-0.49	0.14	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	104.69	0.01	-11.26	-1339.03	-0.55	-0.12
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	104.69	5.64	-9.76	-1160.06	-670.59	-0.15
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	104.69	7.98	-7.97	-947.50	-948.05	-0.16
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	104.69	9.77	-5.64	-670.40	-1160.90	-0.15
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	104.69	11.28	-0.01	-1.26	-1340.11	-0.10
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	104.69	9.76	5.63	668.06	-1160.19	-0.03
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	104.69	7.97	7.96	945.38	-947.05	0.01
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	104.69	5.63	9.75	1158.24	-669.36	0.05
1.2 Dead+1.0 Wind 180	104.69	-0.01	11.26	1337.91	0.87	0.12

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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
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 210	104.69	-5.64	9.76	1158.94	670.91	0.15
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 225	104.69	-7.98	7.97	946.38	948.38	0.16
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 240	104.69	-9.77	5.64	669.29	1161.23	0.15
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 270	104.69	-11.28	0.01	0.15	1340.43	0.10
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 300	104.69	-9.76	-5.63	-669.18	1160.52	0.03
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 315	104.69	-7.97	-7.96	-946.50	947.38	-0.01
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 330	104.69	-5.63	-9.75	-1159.35	669.69	-0.05
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	54.33	0.01	-8.48	-1011.11	-0.75	-0.05
Dead+Wind 30 deg - Service	54.33	4.26	-7.35	-876.06	-507.16	-0.07
Dead+Wind 45 deg - Service	54.33	6.02	-6.00	-715.56	-716.83	-0.08
Dead+Wind 60 deg - Service	54.33	7.36	-4.25	-506.31	-877.66	-0.08
Dead+Wind 90 deg - Service	54.33	8.50	-0.01	-0.93	-1012.97	-0.07
Dead+Wind 120 deg - Service	54.33	7.36	4.24	504.67	-876.85	-0.03
Dead+Wind 135 deg - Service	54.33	6.01	5.99	714.18	-715.69	-0.01
Dead+Wind 150 deg - Service	54.33	4.24	7.34	875.01	-505.76	0.01
Dead+Wind 180 deg - Service	54.33	-0.01	8.48	1010.86	0.86	0.05
Dead+Wind 210 deg - Service	54.33	-4.26	7.35	875.82	507.27	0.07
Dead+Wind 225 deg - Service	54.33	-6.02	6.00	715.32	716.95	0.08
Dead+Wind 240 deg - Service	54.33	-7.36	4.25	506.07	877.77	0.08
Dead+Wind 270 deg - Service	54.33	-8.50	0.01	0.68	1013.09	0.07
Dead+Wind 300 deg - Service	54.33	-7.36	-4.24	-504.92	876.96	0.03
Dead+Wind 315 deg - Service	54.33	-6.01	-5.99	-714.43	715.81	0.01
Dead+Wind 330 deg - Service	54.33	-4.24	-7.34	-875.26	505.87	-0.01

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-54.33	0.00	0.00	54.33	0.00	0.000%
2	0.03	-65.20	-39.64	-0.03	65.20	39.64	0.000%
3	0.03	-48.90	-39.64	-0.03	48.90	39.64	0.000%
4	19.89	-65.20	-34.35	-19.89	65.20	34.35	0.000%
5	19.89	-48.90	-34.35	-19.89	48.90	34.35	0.000%
6	28.11	-65.20	-28.06	-28.11	65.20	28.06	0.000%
7	28.11	-48.90	-28.06	-28.11	48.90	28.06	0.000%
8	34.42	-65.20	-19.85	-34.42	65.20	19.85	0.000%
9	34.42	-48.90	-19.85	-34.42	48.90	19.85	0.000%
10	39.73	-65.20	-0.03	-39.73	65.20	0.03	0.000%
11	39.73	-48.90	-0.03	-39.73	48.90	0.03	0.000%
12	34.39	-65.20	19.79	-34.39	65.20	-19.79	0.000%
13	34.39	-48.90	19.79	-34.39	48.90	-19.79	0.000%
14	28.07	-65.20	28.01	-28.07	65.20	-28.01	0.000%
15	28.07	-48.90	28.01	-28.07	48.90	-28.01	0.000%
16	19.84	-65.20	34.32	-19.84	65.20	-34.32	0.000%
17	19.84	-48.90	34.32	-19.84	48.90	-34.32	0.000%
18	-0.03	-65.20	39.64	0.03	65.20	-39.64	0.000%
19	-0.03	-48.90	39.64	0.03	48.90	-39.64	0.000%
20	-19.89	-65.20	34.35	19.89	65.20	-34.35	0.000%
21	-19.89	-48.90	34.35	19.89	48.90	-34.35	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
22	-28.11	-65.20	28.06	28.11	65.20	-28.06	0.000%
23	-28.11	-48.90	28.06	28.11	48.90	-28.06	0.000%
24	-34.42	-65.20	19.85	34.42	65.20	-19.85	0.000%
25	-34.42	-48.90	19.85	34.42	48.90	-19.85	0.000%
26	-39.73	-65.20	0.03	39.73	65.20	-0.03	0.000%
27	-39.73	-48.90	0.03	39.73	48.90	-0.03	0.000%
28	-34.39	-65.20	-19.79	34.39	65.20	19.79	0.000%
29	-34.39	-48.90	-19.79	34.39	48.90	19.79	0.000%
30	-28.07	-65.20	-28.01	28.07	65.20	28.01	0.000%
31	-28.07	-48.90	-28.01	28.07	48.90	28.01	0.000%
32	-19.84	-65.20	-34.32	19.84	65.20	34.32	0.000%
33	-19.84	-48.90	-34.32	19.84	48.90	34.32	0.000%
34	0.00	-104.69	0.00	0.00	104.69	0.00	0.000%
35	0.01	-104.69	-11.26	-0.01	104.69	11.26	0.000%
36	5.64	-104.69	-9.76	-5.64	104.69	9.76	0.000%
37	7.98	-104.69	-7.97	-7.98	104.69	7.97	0.000%
38	9.77	-104.69	-5.64	-9.77	104.69	5.64	0.000%
39	11.28	-104.69	-0.01	-11.28	104.69	0.01	0.000%
40	9.76	-104.69	5.63	-9.76	104.69	-5.63	0.000%
41	7.97	-104.69	7.96	-7.97	104.69	-7.96	0.000%
42	5.63	-104.69	9.75	-5.63	104.69	-9.75	0.000%
43	-0.01	-104.69	11.26	0.01	104.69	-11.26	0.000%
44	-5.64	-104.69	9.76	5.64	104.69	-9.76	0.000%
45	-7.98	-104.69	7.97	7.98	104.69	-7.97	0.000%
46	-9.77	-104.69	5.64	9.77	104.69	-5.64	0.000%
47	-11.28	-104.69	0.01	11.28	104.69	-0.01	0.000%
48	-9.76	-104.69	-5.63	9.76	104.69	5.63	0.000%
49	-7.97	-104.69	-7.96	7.97	104.69	7.96	0.000%
50	-5.63	-104.69	-9.75	5.63	104.69	9.75	0.000%
51	0.01	-54.33	-8.48	-0.01	54.33	8.48	0.000%
52	4.26	-54.33	-7.35	-4.26	54.33	7.35	0.000%
53	6.01	-54.33	-6.00	-6.01	54.33	6.00	0.000%
54	7.36	-54.33	-4.25	-7.36	54.33	4.25	0.000%
55	8.50	-54.33	-0.01	-8.50	54.33	0.01	0.000%
56	7.36	-54.33	4.24	-7.36	54.33	-4.24	0.000%
57	6.01	-54.33	5.99	-6.01	54.33	-5.99	0.000%
58	4.24	-54.33	7.34	-4.24	54.33	-7.34	0.000%
59	-0.01	-54.33	8.48	0.01	54.33	-8.48	0.000%
60	-4.26	-54.33	7.35	4.26	54.33	-7.35	0.000%
61	-6.01	-54.33	6.00	6.01	54.33	-6.00	0.000%
62	-7.36	-54.33	4.25	7.36	54.33	-4.25	0.000%
63	-8.50	-54.33	0.01	8.50	54.33	-0.01	0.000%
64	-7.36	-54.33	-4.24	7.36	54.33	4.24	0.000%
65	-6.01	-54.33	-5.99	6.01	54.33	5.99	0.000%
66	-4.24	-54.33	-7.34	4.24	54.33	7.34	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	0.00029769
3	Yes	4	0.00000001	0.00012383
4	Yes	5	0.00000001	0.00090828
5	Yes	5	0.00000001	0.00040831
6	Yes	6	0.00000001	0.00004763

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7	Yes	5	0.00000001	0.00045268
8	Yes	5	0.00000001	0.00091492
9	Yes	5	0.00000001	0.00041150
10	Yes	4	0.00000001	0.00032287
11	Yes	4	0.00000001	0.00014739
12	Yes	5	0.00000001	0.00090749
13	Yes	5	0.00000001	0.00040814
14	Yes	6	0.00000001	0.00004752
15	Yes	5	0.00000001	0.00045177
16	Yes	5	0.00000001	0.00090830
17	Yes	5	0.00000001	0.00040862
18	Yes	4	0.00000001	0.00031450
19	Yes	4	0.00000001	0.00013979
20	Yes	5	0.00000001	0.00091467
21	Yes	5	0.00000001	0.00041146
22	Yes	6	0.00000001	0.00004762
23	Yes	5	0.00000001	0.00045265
24	Yes	5	0.00000001	0.00090795
25	Yes	5	0.00000001	0.00040809
26	Yes	4	0.00000001	0.00030159
27	Yes	4	0.00000001	0.00012754
28	Yes	5	0.00000001	0.00091040
29	Yes	5	0.00000001	0.00040952
30	Yes	6	0.00000001	0.00004754
31	Yes	5	0.00000001	0.00045188
32	Yes	5	0.00000001	0.00090967
33	Yes	5	0.00000001	0.00040922
34	Yes	4	0.00000001	0.00000001
35	Yes	5	0.00000001	0.00033254
36	Yes	5	0.00000001	0.00041879
37	Yes	5	0.00000001	0.00044469
38	Yes	5	0.00000001	0.00042028
39	Yes	5	0.00000001	0.00033254
40	Yes	5	0.00000001	0.00041827
41	Yes	5	0.00000001	0.00044333
42	Yes	5	0.00000001	0.00041800
43	Yes	5	0.00000001	0.00033203
44	Yes	5	0.00000001	0.00041973
45	Yes	5	0.00000001	0.00044422
46	Yes	5	0.00000001	0.00041854
47	Yes	5	0.00000001	0.00033272
48	Yes	5	0.00000001	0.00041948
49	Yes	5	0.00000001	0.00044440
50	Yes	5	0.00000001	0.00041946
51	Yes	4	0.00000001	0.00004402
52	Yes	4	0.00000001	0.00023924
53	Yes	4	0.00000001	0.00027819
54	Yes	4	0.00000001	0.00024520
55	Yes	4	0.00000001	0.00004426
56	Yes	4	0.00000001	0.00023990
57	Yes	4	0.00000001	0.00027696
58	Yes	4	0.00000001	0.00024049
59	Yes	4	0.00000001	0.00004407
60	Yes	4	0.00000001	0.00024482
61	Yes	4	0.00000001	0.00027807
62	Yes	4	0.00000001	0.00023905
63	Yes	4	0.00000001	0.00004418
64	Yes	4	0.00000001	0.00024254
65	Yes	4	0.00000001	0.00027739
66	Yes	4	0.00000001	0.00024177

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Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 170.58	22.769	63	1.1036	0.0003
L2	174 - 126	21.383	54	1.1017	0.0003
L3	130.75 - 82.75	12.079	54	0.9055	0.0002
L4	88.75 - 40.75	5.371	54	0.5888	0.0001
L5	48 - 0	1.537	54	0.2916	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	63	22.769	1.1036	0.0003	47468
177.00	7770.00	54	22.075	1.1032	0.0003	47468
150.00	AIR6449	54	16.007	1.0249	0.0002	12454
134.00	FD-RRH 4x45 1900	54	12.709	0.9278	0.0002	8608
131.00	APXVSPP18-C-A20	54	12.127	0.9072	0.0002	8230
115.00	BXA-70063/4CF	54	9.248	0.7911	0.0001	7910
45.00	GPS	54	1.365	0.2717	0.0000	7381

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 170.58	107.107	26	5.1960	0.0017
L2	174 - 126	100.589	26	5.1876	0.0015
L3	130.75 - 82.75	56.824	26	4.2641	0.0008
L4	88.75 - 40.75	25.264	8	2.7716	0.0004
L5	48 - 0	7.227	8	1.3717	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	107.107	5.1960	0.0017	10302
177.00	7770.00	26	103.845	5.1943	0.0016	10302
150.00	AIR6449	26	75.305	4.8266	0.0009	2682
134.00	FD-RRH 4x45 1900	26	59.787	4.3690	0.0008	1848
131.00	APXVSPP18-C-A20	26	57.049	4.2723	0.0008	1766
115.00	BXA-70063/4CF	26	43.506	3.7249	0.0006	1693
45.00	GPS	8	6.419	1.2781	0.0002	1570

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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	-16.11	1861.24	0.009
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	48.00	0.00	0.0	44.2487	-28.77	2935.51	0.010
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	48.00	0.00	0.0	63.8666	-43.04	4233.02	0.010
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	48.00	0.00	0.0	89.3059	-65.18	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	539.01	1345.93	0.400	0.00	1345.93	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	1638.72	2695.18	0.608	0.00	2695.18	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	2963.52	4674.70	0.634	0.00	4674.70	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	4762.57	7749.95	0.615	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	21.29	930.62	0.023	0.06	2698.04	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.3125	30.08	1467.75	0.020	0.25	5402.66	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	34.86	2116.51	0.016	0.25	9370.75	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	39.77	2927.02	0.014	0.37	15534.83	0.000

Pole Interaction Design Data

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Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	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	0.400	0.000	0.023	0.000	0.410 ✓	1.000	4.8.2 ✓
L3	126 - 82.75 (3)	0.010	0.608	0.000	0.020	0.000	0.618 ✓	1.000	4.8.2 ✓
L4	82.75 - 40.75 (4)	0.010	0.634	0.000	0.016	0.000	0.644 ✓	1.000	4.8.2 ✓
L5	40.75 - 0 (5)	0.011	0.615	0.000	0.014	0.000	0.626 ✓	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	-16.11	1861.24	41.0	Pass
L3	126 - 82.75	Pole	TP46.357x34.8903x0.3125	3	-28.77	2935.51	61.8	Pass
L4	82.75 - 40.75	Pole	TP55.765x44.2987x0.375	4	-43.04	4233.02	64.4	Pass
L5	40.75 - 0	Pole	TP64.75x53.2831x0.4375	5	-65.18	5854.04	62.6	Pass
							Summary	
							Pole (L4)	64.4
							RATING =	64.4
								Pass

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturing Moment =	$M_U := 4763\text{-ft-kips}$	(Input From trnTower)
Shear Force =	Shear := 40-kips	(Input From trnTower)
Axial Force =	$R_U := 65\text{-kips}$	(Input From trnTower)

Anchor Bolt Data:

ASTMA615 Grade 75

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

Base Plate Data:

ASTMA572 Grade 60

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

Anchor Bolt Analysis:

GrossArea of Bolt =

$$A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot \text{in}^2$$

NetArea of Bolt =

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

Tensile Root Diameter =

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

Plastic Section Modulus =

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

Maximum Anchor Rod Force =

$$P_u := \frac{n_c \cdot \pi \cdot M_u}{N \cdot D_{BC}} + \frac{R_u}{N} = 127.9 \cdot \text{kips}$$

Maximum Shear Force =

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

Design Tensile Strength =

$$\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot \text{k}$$

Bolt % of Capacity =

$$\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 50.8$$

Condition1 =

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

Condition1 = "OK"

Design Shear Strength =

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

Design Flexural Strength =

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

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

Bolt % of Capacity =

$$\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \right] \cdot 100 = 24.3$$

Condition2 =

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

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 =

$$w_1 := 0.25 \text{ in}$$

Effective Pole Outside Diameter =

$$D_e := D_T + w_1 = 65 \text{ in}$$

Effective Base Plate Outside Diameter =

$$D_{oe} := \begin{cases} D_{OD} & \text{if } D_{OD} \leq (D_{BC} + 6 \cdot t_{TP}) \\ (D_{BC} + 6 \cdot t_{TP}) & \text{otherwise} \end{cases} = 77.25 \text{ in}$$

Half-Angle Between Radial Lines Extending from Pole
 Centerline Through Midpoints Between Adjacent Anchor

$$\theta_1 := \frac{\pi}{N} = 0.157$$

Rods =

Angle Defining Limiting Effective Base Plate Width
 Based on Plate Thickness =

$$\theta_2 := \arcsin\left(\frac{12 \cdot t_{TP}}{D_{BC}}\right) = 0.476$$

Angle Defining Limiting Effective Base Plate Width
 Based on Distance Between Anchor Rod Bolt Circle and
 Effective Pole Outside Diameter =

$$\theta_3 := \arccos\left(\frac{D_{BC} + D_e}{2 \cdot D_{BC}}\right) = 0.313$$

Governing Angle Defining Effective Base Plate Width
 Resisting Bending =

$$\theta := \min(\theta_1, \theta_2, \theta_3) = 0.157$$

Effective Moment Arm of Anchor Rod Force =

$$x := 0.5 \cdot (D_{BC} - D_e) = 3.5 \text{ in}$$

Effective Base Plate Width Resisting Bending from
 Transverse Bend Line =

$$B_{et} := D_{BC} \cdot \sin(\theta) = 11.263 \text{ in}$$

Effective Base Plate Width Resisting Bending from
 Radial Bend Lines =

$$B_{er} := (D_{oe} - D_e) \cdot \sin(\theta) = 1.916 \text{ in}$$

Total Effective Base Plate Width Resisting Bending =

$$B_{eff} := B_{et} + B_{er} = 13.18 \text{ in}$$

Required Base Plate Thickness =

$$t_{TP,Req} := \sqrt{\frac{4 \cdot P_u \cdot x}{\phi_b \cdot F_{yf} \cdot B_{eff}}} = 1.586 \text{ in}$$

Plate Bending Stress % of Capacity =

$$\frac{t_{TP,Req}}{t_{TP}} = 57.7\%$$

Condition2 =

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

Condition3 = "Ok"

Required Base Plate Thickness =

$$t_{TP,Req} := \frac{\phi_b \cdot t_T \cdot F_{yp}}{\phi_v \cdot 0.6 \cdot F_{yf}} = 0.711 \text{ in}$$

Plate Bending Stress % of Capacity =

$$\frac{t_{TP,Req}}{t_{TP}} = 25.9\%$$

Condition2 =

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

Condition4 = "Ok"

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	OM := 4763-ft-kips	(User Input)
Shear Force =	Shear := 40-kip	(User Input)
Axial Force =	Axial := 65-kip	(User Input)
Tower Height =	H _t := 180-ft	(User Input)

Footing Data:

Overall Depth of Footing =	D _f := 7.0-ft	(User Input)
Length of Pier =	L _p := 2.0-ft	(User Input)
Extension of Pier Above Grade =	L _{pag} := 1-ft	(User Input)
Diameter of Pier =	d _p := 8.0-ft	(User Input)
Thickness of Footing =	T _f := 6.0-ft	(User Input)
Width of Footing =	W _f := 48.0-ft	(User Input)

Material Properties:

Concrete Compressive Strength =	f _c := 3000-psi	(User Input)
Steel Reinforcement Yield Strength =	f _y := 60000-psi	(User Input)
Anchor Bolt Yield Strength =	f _{ya} := 75000-psi	(User Input)
Internal Friction Angle of Soil =	Φ _s := 32-deg	(User Input)
Ultimate Soil Bearing Capacity =	q _u := 12000-psf	(User Input)
Allowable Soil Bearing Capacity =	q _a := $\frac{q_u}{2}$ = 6000-psf	(User Input)
Unit Weight of Soil =	γ _{soil} := 120-pcf	(User Input)
Unit Weight of Concrete =	γ _{conc} := 150-pcf	(User Input)
Foundation Bouyancy =	Bouyancy := 0	(User Input) (Yes=1 / No=0)
Depth to Neglect =	n := 0-ft	(User Input)
Cohesion of Clay Type Soil =	c := 0-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 =	μ := 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 =

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

Adjusted Soil Unit Weight =

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

Passive Pressure =

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

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

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

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

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

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

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

Ultimate Shear =

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

Weight of Concrete Pad =

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

Weight of Soil Above Footing =

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

Weight of Soil Wedge at Back Face =

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

Weight of Soil Wedge at back face Corners =

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

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 2.427 \times 10^3 \text{kip}$$

Resisting Weight =

$$WT_R := 0.9 \cdot WT_c + 0.75 \cdot WT_{s1} + 0.75 \cdot \text{Axial} = 2.134 \times 10^3 \text{kip}$$

Resisting Moment =

$$M_r := (WT_R) \cdot \frac{W_f}{2} + 0.75 \cdot S_u \cdot \frac{T_f}{3} + 0.75 \cdot \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \frac{D_f \cdot \tan(\phi_s)}{3} \right) \right] = 55795 \text{kip-ft}$$

Overtuning Moment =

$$M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 5083 \text{kip-ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 10.98$$

Factor of Safety Required =

$$FS_{req} := 1$$

$$\text{OverTurning_Moment_Check} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$$

$$\text{OverTurning_Moment_Check} = \text{"Okay"}$$

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot W_{T_{tot}}}{FS_{req}} = 1.542 \times 10^3 \text{ kips}$$

$$\text{Shear_Check} := \text{if}(S_p > \text{Shear}, \text{"Okay"}, \text{"No Good"})$$

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 =

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

Maximum Pressure in Mat =

$$P_{max} := \frac{W_{T_{tot}}}{A_{mat}} + \frac{M_{ot}}{S} = 1.329 \text{ ksf}$$

$$\text{Max_Pressure_Check} := \text{if}(P_{max} < .75 \cdot q_u, \text{"Okay"}, \text{"No Good"})$$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat =

$$P_{min} := \frac{W_{T_{tot}}}{A_{mat}} - \frac{M_{ot}}{S} = 0.777 \text{ ksf}$$

$$\text{Min_Pressure_Check} := \text{if}((P_{min} \geq 0) \cdot (P_{min} < .75 \cdot q_u), \text{"Okay"}, \text{"No Good"})$$

Min_Pressure_Check = "Okay"

RAN Template: 67D5A997DB Outdoor	A&L Template: 67D5997DB_2xAIR+1OP (U21 Market)
--	--

CT11720A_Anchor_4_draft

Print Name: Standard (RFDS_for_Scoping)
PORs: Anchor_Phase 3

Section 1 - Site Information

Site ID: CT11720A
Status: Draft
Version: 4
Project Type: Anchor
Approved: Not Approved
Approved By: Not Approved
Last Modified: 7/1/2020 11:46:16 AM
Last Modified By: Hansraj.Rana4@T-Mobile.com

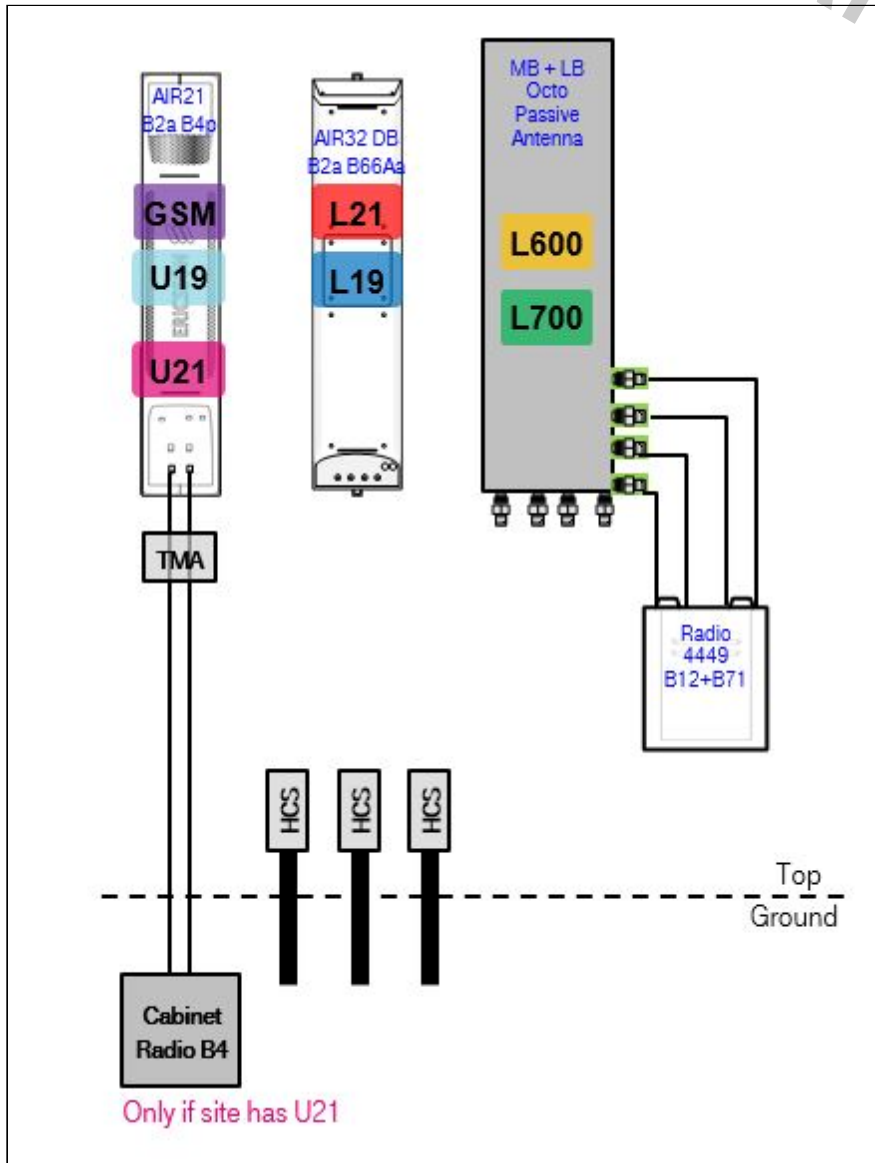
Site Name: CT720/Town of Orange_MP
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2020
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: Crown Castle

Latitude: 41.25572100
Longitude: -73.01081800
Address: 26 So. Orange Center Rd
City, State: Orange, CT
Region: NORTHEAST

RAN Template: 67D5A997DB Outdoor**AL Template:** 67D5997DB_2xAIR+1OP (U21 Market)**Sector Count:** 3**Antenna Count:** 9**Coax Line Count:** 12**TMA Count:** 3**RRU Count:** 6

Section 2 - Existing Template Images

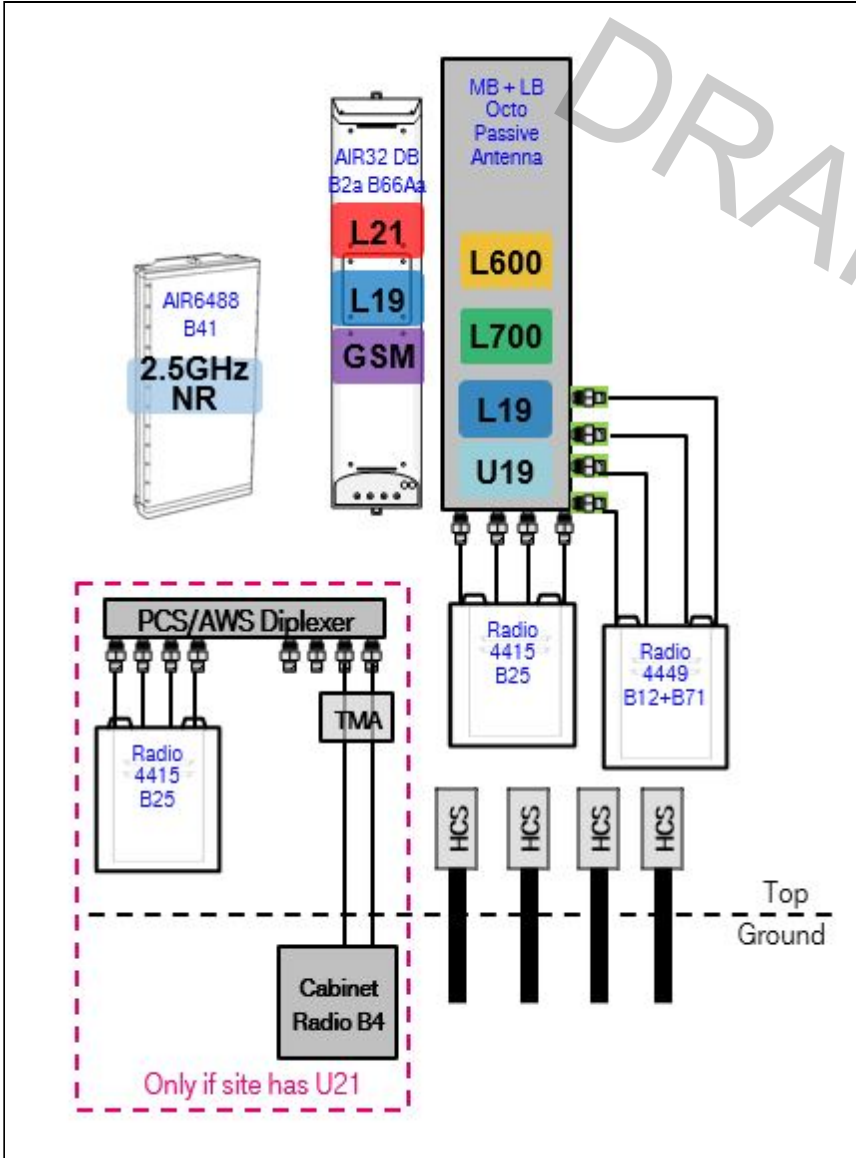
67D92DB_2xAIR+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D5997DB_2xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

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

DRAFT

RAN Template: 67D5A997DB Outdoor	A&L Template: 67D5997DB_2xAIR+1OP (U21 Market)
--	--

CT11720A_Anchor_4_draft

Print Name: Standard (RFDS_for_Scoping)
PORs: Anchor_Phase 3

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D92DB Outdoor

Enclosure	1	2
Enclosure Type	RBS 6131	Ancillary Equipment (Ericsson)
Baseband	DUW30 U1900 DUW30 U2100 DUG20 G1900 BB 6630 L700 L600 L2100 L1900 BB 6630 N600	
Hybrid Cable System		Ericsson 6x12 HCS 4AWG 60m
Radio	RU22 (x 6) U2100	

Proposed RAN Equipment

Template: 67D5A997DB Outdoor

Enclosure	1	2	3
Enclosure Type	RBS 6131	Enclosure 6160	B160
Baseband	DUW30 U1900 DUW30 U2100 DUG20 G1900 BB 6630 L2100 L1900 L700 L600 BB 6630 N600	BB 6630 L2500 BB 6648 N2500	
Hybrid Cable System	Ericsson 6x12 HCS 4AWG 60m Ericsson 6x12 HCS *Select AWG & Length*	Ericsson 6x12 HCS *Select AWG & Length*	
Radio	RU22 (x 6) U2100		

RAN Scope of Work:

Check AC service, and upgrade AC Service, Breakers, and PPC where necessary.

Remove XMU from existing RBS6131 cabinet, if present.

Replace BB5216 with (1) BB6630 for L2100, L1900 (both Carriers), L700, and L600 in existing RBS6131 cabinet, if still present.

Add (1) Enclosure 6160.

Add (1) Battery Cabinet B160.

Add (1) iXRe Router to new Enclosure 6160.

Add (1) BB6630 for L2500 to new Enclosure 6160.

Add (1) BB6648 for N2500 to new Enclosure 6160.

Existing: (12) Coaxial Lines; 2-6X12 HCS

Add (1) 6X12 HCS for Anchor A&L Equipment. Length of new HCS will match that of existing HCS.

Keep (6) coax lines for U2100. and keep (6) unconnected.

Section 6 - A&L Equipment

Existing Template: 67D92DB_2xAIR+1OP
Proposed Template: 67D5997DB_2xAIR+1OP (U21 Market)

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 N600	L700 L600 N600			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' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPER 6' SUREFL EX DIN MALE-DIN MALE (x2)						
TMA's		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B8 5 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template: 67D5A997DB Outdoor	A&L Template: 67D5997DB_2xAIR+1OP (U21 Market)
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CT11720A_Anchor_4_draft

Print Name: Standard (RFDS_for_Scoping)
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	0		0				0			
M. Tilt	0		0				0			
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	U1900 L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) 1-5/8" Coax - 198 ft. (x2)	Fiber Jumper		Fiber Jumper	
TMA's						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)	SHARED Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)				
Radio			Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 198 ft.

Cable: 1-5/8" Coax - 198 ft.

Scope of Work:

Remove AIR21 B2A/B4P from Position 1.

Install AIR6449 B41 for L2500 and N2500 in Position 1.

Add (1) PCS/AWS 8:4 diplexer to Position 2 at antenna, and connect its four output ports to the Mid-Band ports of the Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier and U1900 to Position 2 near antenna, and connect its ports to the four PCS input ports of the diplexer.

Move coaxial lines and AWS TMA for U2100 to Position 2 near antenna, and connect its ports to two AWS input ports of the diplexer.

Make sure to install metal caps on all empty ports of AWS/PCS diplexer for load balancing.

Move GSM to AIR32 DB in Position 3. GSM will share B2 Radios with L1900 1st Carrier.

Ensure RET control is enabled for all technology layers according to the Design Documents.

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

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 N600	L700 L600 N600			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' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPER 6' SUREFL EX DIN MALE-DIN MALE (x2)						
TMA's			Generic Twin Style 1B - AWS (AtAntenna)									
Diplexers / Combiners												
Radio					Radio 4449 B71+B8 5 (At Antenna)							
Sector Equipment												
Unconnected Equipment:												
Scope of Work:												

RAN Template: 67D5A997DB Outdoor	A&L Template: 67D5997DB_2xAIR+1OP (U21 Market)
--	--

CT11720A_Anchor_4_draft

Print Name: Standard (RFDS_for_Scoping)
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	120		120				120			
M. Tilt	0		0				0			
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	U1900 L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) 1-5/8" Coax - 198 ft. (x2)	Fiber Jumper		Fiber Jumper	
TMA's						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)	SHARED Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)				
Radio			Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 198 ft.

Cable: 1-5/8" Coax - 198 ft.

Scope of Work:

Remove AIR21 B2A/B4P from Position 1.

Install AIR6449 B41 for L2500 and N2500 in Position 1.

Add (1) PCS/AWS 8:4 diplexer to Position 2 at antenna, and connect its four output ports to the Mid-Band ports of the Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier and U1900 to Position 2 near antenna, and connect its ports to the four PCS input ports of the diplexer.

Move coaxial lines and AWS TMA for U2100 to Position 2 near antenna, and connect its ports to two AWS input ports of the diplexer.

Make sure to install metal caps on all empty ports of AWS/PCS diplexer for load balancing.

Move GSM to AIR32 DB in Position 3. GSM will share B2 Radios with L1900 1st Carrier.

Ensure RET control is enabled for all technology layers according to the Design Documents.

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

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 N600	L700 L600 N600			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' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPER 6' SUREFL EX DIN MALE-DIN MALE (x2)						
TMA's			Generic Twin Style 1B - AWS (AtAntenna)									
Diplexers / Combiners												
Radio					Radio 4449 B71+B8 5 (At Antenna)							
Sector Equipment												
Unconnected Equipment:												
Scope of Work:												

RAN Template: 67D5A997DB Outdoor	A&L Template: 67D5997DB_2xAIR+1OP (U21 Market)
--	--

CT11720A_Anchor_4_draft

Print Name: Standard (RFDS_for_Scoping)
PORs: Anchor_Phase 3

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	250		250				250			
M. Tilt	0		0				0			
Height	150		150				150			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	U1900 L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2)	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) Fiber Jumper	JUMPE R 6' SUREFL EX DIN MALE-DIN MALE (x2) 1-5/8" Coax - 198 ft. (x2)	Fiber Jumper		Fiber Jumper	
TMA's						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)	SHARED Comms cope - SDX192 6Q-43 (E14F0 5P86) (AtAntenna)				
Radio			Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 198 ft.

Cable: 1-5/8" Coax - 198 ft.

Scope of Work:

Remove AIR21 B2A/B4P from Position 1.

Install AIR6449 B41 for L2500 and N2500 in Position 1.

Add (1) PCS/AWS 8:4 diplexer to Position 2 at antenna, and connect its four output ports to the Mid-Band ports of the Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier and U1900 to Position 2 near antenna, and connect its ports to the four PCS input ports of the diplexer.

Move coaxial lines and AWS TMA for U2100 to Position 2 near antenna, and connect its ports to two AWS input ports of the diplexer.

Make sure to install metal caps on all empty ports of AWS/PCS diplexer for load balancing.

Move GSM to AIR32 DB in Position 3. GSM will share B2 Radios with L1900 1st Carrier.

Ensure RET control is enabled for all technology layers according to the Design Documents.

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

Section 7 - Power Systems Equipment
Existing Power Systems Equipment
----- This section is intentionally blank. -----
Proposed Power Systems Equipment

Exhibit E

Mount Analysis

Structural Analysis Report

Antenna Mount Analysis

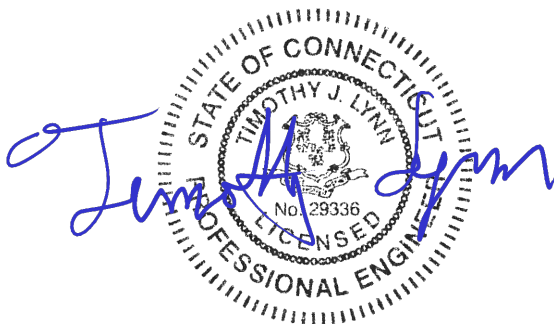
T-Mobile Site #: CT11720A

*26 S Orange Center Rd
Orange, CT*

Centek Project No. 20074.55

Date: July 8, 2020

Max Stress Ratio = 79.6 %



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 07/06/2020

July 8, 2020

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. 20074.55

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 AIR6449 panel antennas, three (3) Ericsson AIR32 panel antennas, three (3) RFS APXVAARR24_43 panel antennas, three (3) KRY112 TMAs, three (3) Ericsson 4449 remote radio units, three (3) Ericsson 4415 remote radio units and three (3) Commscope SDX1926Q-43 diplexers mounted on one (1) low profile platform with a RAD center elevation of 150-ft +/- AGL.

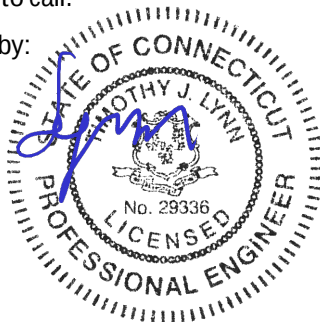
The antenna mount was analyzed per the requirements of the 2015 International Building Code as modified by the 2018 Connecticut State Building Code considering a nominal design wind speed of 97 mph for Orange as required in Appendix N of the 2018 Connecticut State Building Code.

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:


Timothy J. Lynn, PE
Structural Engineer



CEN TEK Engineering, Inc.
Structural Analysis – Mount Analysis
T-Mobile Site Ref. ~ CT11720A
Orange, CT
July 8, 2020

Section 2 - Calculations

**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 =

 $h := 180$ ft (User Input)

Height to Center of Antennas =

 $z_{Ant} := 150$ ft (User Input)

Radial Ice Thickness =

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

Radial Ice Density =

 $\rho_i := 56.00$ pcf (User Input)

Topographic 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 =

 $K_d := \begin{cases} 0.95 & \text{if Structure_Type} = \text{Pole} \\ 0.85 & \text{if Structure_Type} = \text{Lattice} \end{cases} = 0.95$ (Per Table 2-2 of TIA-222-G)

Importance Factors =

 $I_{Wind} := \begin{cases} 0.87 & \text{if SC} = 1 \\ 1.00 & \text{if SC} = 2 \\ 1.15 & \text{if SC} = 3 \end{cases} = 1$ (Per Table 2-3 of TIA-222-G) $I_{Wind_w_Ice} := \begin{cases} 0 & \text{if SC} = 1 \\ 1.00 & \text{if SC} = 2 \\ 1.00 & \text{if SC} = 3 \end{cases} = 1$ $I_{ice} := \begin{cases} 0 & \text{if SC} = 1 \\ 1.00 & \text{if SC} = 2 \\ 1.25 & \text{if SC} = 3 \end{cases} = 1$

$$K_{iz} := \left(\frac{z_{Ant}}{33} \right)^{0.1} = 1.163$$

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 1.745$$

$$K_{z_{Ant}} := 2.01 \left(\left(\frac{z_{Ant}}{z_g} \right)^{\frac{2}{\alpha}} \right) = 1.378$$

Velocity Pressure Coefficient Antennas =

$$q_{z_{Ant}} := 0.00256 \cdot K_d \cdot K_{z_{Ant}} \cdot V^2 \cdot I_{Wind} = 31.541$$

Velocity Pressure w/o Ice Antennas =

Velocity Pressure with Ice Antennas =

$$q_{z_{ice.Ant}} := 0.00256 \cdot K_d \cdot K_{z_{Ant}} \cdot V_i^2 \cdot I_{Wind} = 8.381$$

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFSAPXVAARR24-43
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
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Total Antenna Wind Force =	$F_{ant} := qZ_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 702$	lbs
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Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 5.8$	sf
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Total Antenna Wind Force =	$F_{ant} := qZ_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 255$	lbs
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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
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Total Antenna Wind Force w/ Ice =	$F_{ant} := qZ_{ice,ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 222$	lbs
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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
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Total Antenna Wind Force w/ Ice =	$F_{ant} := qZ_{ice,ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 98$	lbs
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Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 153$	lbs
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Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \times 10^4$	cu in
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Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz})(T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 1 \times 10^4$	cu in
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Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 430$	lbs
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Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 430$	lbs
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Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AR32
Antenna Shape =	Flat (User Input)
Antenna Height =	$L_{ant} := 56.6$ in (User Input)
Antenna Width =	$W_{ant} := 12.9$ in (User Input)
Antenna Thickness =	$T_{ant} := 8.7$ in (User Input)
Antenna Weight =	$WT_{ant} := 132$ 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 =	$F_{ant} := qZ_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 226$	lbs

Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 3.4$	sf
Total Antenna Wind Force =	$F_{ant} := qZ_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 152$	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
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Total Antenna Wind Force w/ Ice =	$F_{ant} := qZ_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 81$	lbs
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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
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Total Antenna Wind Force w/ Ice =	$F_{ant} := qZ_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 60$	lbs
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Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 132$	lbs
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Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6352$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 5654$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 183$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 183$	lbs

Development of Wind & Ice Load on Antennas**Antenna Data:**

Antenna Model =	Ericsson AR6449
Antenna Shape =	Flat (User Input)
Antenna Height =	$L_{ant} := 33.1$ in (User Input)
Antenna Width =	$W_{ant} := 20.5$ in (User Input)
Antenna Thickness =	$T_{ant} := 8.3$ in (User Input)
Antenna Weight =	$WT_{ant} := 103$ lbs (User Input)
Number of Antennas =	$N_{ant} := 1$ (User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 1.6$
Antenna Force Coefficient =	$Ca_{ant} = 1.2$

Wind Load (without ice)

$$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.7 \quad sf$$

$$F_{ant} := qZ_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 196 \quad lbs$$

$$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 1.9 \quad sf$$

$$F_{ant} := qZ_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 79 \quad lbs$$

Wind Load (with ice)

$$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 6.1 \quad sf$$

$$F_{ant} := qZ_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 67 \quad lbs$$

$$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 3 \quad sf$$

$$F_{ant} := qZ_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 33 \quad lbs$$

Gravity Load (without ice)

$$WT_{ant} \cdot N_{ant} = 103 \quad lbs$$

Gravity Loads (ice only)

$$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5632 \quad cu \text{ in}$$

$$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 4718 \quad cu \text{ in}$$

$$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 153 \quad lbs$$

$$W_{ICEant} \cdot N_{ant} = 153 \quad lbs$$

Development of Wind & Ice Load on RRUS

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 =	$W_{T_{RRUS}} := 74$ lbs (User Input)
Number of RRUSs =	$N_{RRUS} := 1$ (User Input)
RRUS Aspect Ratio =	$A_{r_{RRUS}} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$
RRUS Force Coefficient =	$C_{a_{RRUS}} = 1.2$

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 =	$F_{RRUS} := q_{Z_{Ant}} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{RRUSF} = 57$ lbs

Surface Area for One RRUS =	$SA_{RRUS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.1$ sf
Total RRUS Wind Force =	$F_{RRUS} := q_{Z_{Ant}} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{RRUS} = 45$ 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
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Total RRUS Wind Force w/ Ice =	$F_{i_{RRUS}} := q_{Z_{ice}} \cdot A_{nt} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{ICERRUSF} = 24$ lbs
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Surface Area for One RRUS w/ Ice =	$SA_{ICERRUS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.8$ sf
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Total RRUS Wind Force w/ Ice =	$F_{i_{RRUS}} := q_{Z_{ice}} \cdot A_{nt} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{ICERRUS} = 20$ lbs
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Gravity Load (without ice)

Weight of All RRUSs =	$W_{T_{RRUS}} \cdot N_{RRUS} = 74$ lbs
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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 =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz})(T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2$ cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot \rho_d = 72$ lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 72$ lbs

Development of Wind & Ice Load on RRUS

RRUS Data:

RRUS Model =	Ericsson 4415 B25
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 =	$T_{RRUS} := 5.4$ in (User Input)
RRUS Weight =	$W_{T_{RRUS}} := 47$ lbs (User Input)
Number of RRUSs =	$N_{RRUS} := 1$ (User Input)
RRUS Aspect Ratio =	$A_{r_{RRUS}} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$
RRUS Force Coefficient =	$C_{a_{RRUS}} = 1.2$

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 =	$F_{RRUS} := q_{Z_{Ant}} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{RRUSF} = 57$ lbs

Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 0.6$ sf
Total RRUS Wind Force =	$F_{RRUS} := q_{Z_{Ant}} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{RRUSS} = 23$ 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 =	$F_{i_{RRUS}} := q_{Z_{ice}} \cdot A_{nt} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{ICERRUSF} = 24$ lbs

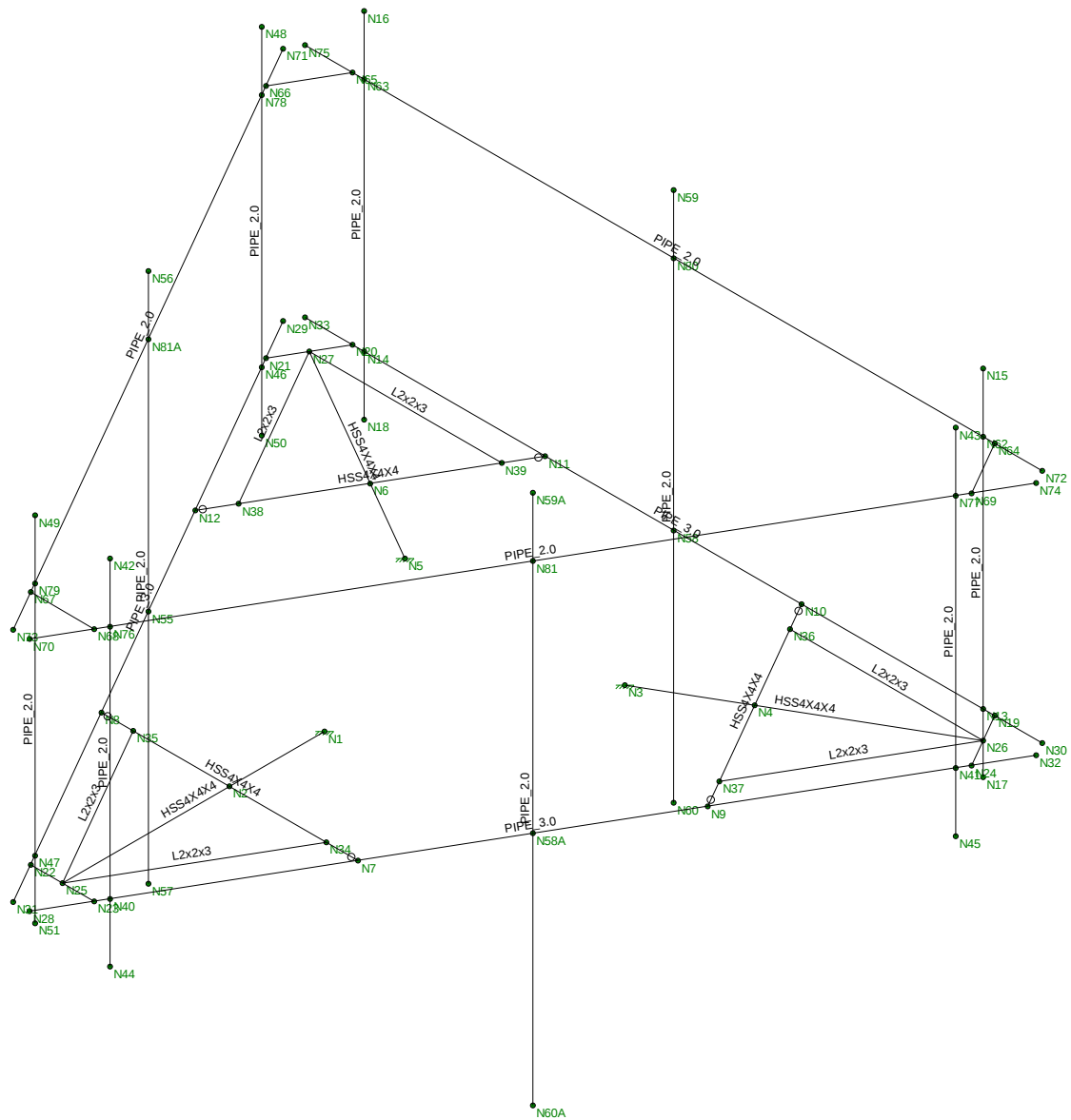
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.1$ sf
Total RRUS Wind Force w/ Ice =	$F_{i_{RRUS}} := q_{Z_{ice}} \cdot A_{nt} \cdot G_H \cdot C_{a_{RRUS}} \cdot K_a \cdot SA_{ICERRUSS} = 13$ lbs

Gravity Load (without ice)

Weight of All RRUSs =	$W_{T_{RRUS}} \cdot N_{RRUS} = 47$ lbs
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Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 1062$ cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz})(T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 1667$ cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot \rho_d = 54$ lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 54$ lbs



Envelope Only Solution

Centek

TJL

20074.55

CT11720A - Mount
Member Framing

July 8, 2020 at 12:52 PM

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
Parame 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
Footing Overturning Safety Factor	1
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	150.001
Footing Concrete f'c (ksi)	4
Footing Concrete Ec (ksi)	3644
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	2
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iyy [in4]	Izz [in4]	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 Flange	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

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...]	Lcomp bot[...]	L-torq...	Kyy	Kzz	Cb	Funci...
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									Lateral
9	M9	Horz	12.5			Lbyy						Lateral
10	M10	Antenna Mast	6			Lbyy						Lateral
11	M11	Antenna Mast	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
16	M19	L2x2	3.271			Lbyy						Lateral
17	M20	L2x2	3.27			Lbyy						Lateral
18	M21	Antenna Mast	6			Lbyy						Lateral
19	M22	Antenna Mast	6			Lbyy						Lateral
20	M23	Antenna Mast	6			Lbyy						Lateral
21	M24	Antenna Mast	6			Lbyy						Lateral
22	M27	Antenna Mast	9	Segment	Segment	Segment	Segment	Segm...				Lateral
23	M26	Antenna Mast	9	Segment	Segment	Segment	Segment	Segm...				Lateral
24	M25	Antenna Mast	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

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	N1	N25			Outrigger	Beam	Tube	A500 Gr...	Typical
2	M2	N7	N8			Support	Beam	Tube	A500 Gr...	Typical
3	M3	N3	N26			Outrigger	Beam	Tube	A500 Gr...	Typical
4	M4	N9	N10			Support	Beam	Tube	A500 Gr...	Typical
5	M5	N5	N27			Outrigger	Beam	Tube	A500 Gr...	Typical
6	M6	N11	N12			Support	Beam	Tube	A500 Gr...	Typical
7	M7	N28	N32			Horz	Beam	Pipe	A53 Gra...	Typical
8	M8	N30	N33			Horz	Beam	Pipe	A53 Gra...	Typical
9	M9	N29	N31			Horz	Beam	Pipe	A53 Gra...	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
10	M10	N17	N15			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
11	M11	N18	N16			Antenna Mast	VBrace	Wide Flange	A53 Gra...	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 Gra...	Typical
22	M22	N45	N43			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
23	M23	N50	N48			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
24	M24	N51	N49			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
25	M27	N59	N60			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
26	M26	N56	N57			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
27	M25	N59A	N60A			Antenna Mast	VBrace	Wide Flange	A53 Gra...	Typical
28	M28	N74	N70			Handrail	Beam	Tube	A53 Gra...	Typical
29	M29	N73	N71			Handrail	Beam	Tube	A53 Gra...	Typical
30	M30	N75	N72			Handrail	Beam	Tube	A53 Gra...	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 Dia...
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	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
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	
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	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
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	Reaction	Reaction	Reaction
2	N3	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N5	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Member Point Loads (BLC 2 : Equipment Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Y	-.052	2
2	M24	Y	-.052	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	-.052	2
8	M11	Y	-.052	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	-.052	2
14	M22	Y	-.052	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	-.047	3
22	M27	Y	-.011	1
23	M27	Y	-.074	2
24	M25	Y	-.011	1
25	M25	Y	-.074	2
26	M27	Y	-.047	3
27	M25	Y	-.047	3

Member Point Loads (BLC 3 : Ice Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Y	-.077	2
2	M24	Y	-.077	5
3	M26	Y	-.215	.5

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
4	M26	Y	-.215	4.5
5	M23	Y	-.091	.5
6	M23	Y	-.091	4.5
7	M11	Y	-.077	2
8	M11	Y	-.077	5
9	M27	Y	-.215	.5
10	M27	Y	-.215	4.5
11	M10	Y	-.091	.5
12	M10	Y	-.091	4.5
13	M22	Y	-.077	2
14	M22	Y	-.077	5
15	M25	Y	-.215	4.5
16	M25	Y	-.215	.5
17	M21	Y	-.091	4.5
18	M21	Y	-.091	.5
19	M26	Y	-.021	1
20	M26	Y	-.072	2
21	M26	Y	-.054	3
22	M27	Y	-.021	1
23	M27	Y	-.072	2
24	M25	Y	-.021	1
25	M25	Y	-.072	2
26	M27	Y	-.054	3
27	M25	Y	-.054	3

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	X	.034	2
2	M24	X	.034	5
3	M26	X	.111	.5
4	M26	X	.111	4.5
5	M23	X	.04	.5
6	M23	X	.04	4.5
7	M11	X	.017	2
8	M11	X	.017	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	.034	2
14	M22	X	.034	5
15	M25	X	.111	.5
16	M25	X	.111	4.5
17	M21	X	.04	.5
18	M21	X	.04	4.5
19	M26	X	.009	1
20	M26	X	.024	2
21	M26	X	.023	3
22	M27	X	.006	1
23	M27	X	.02	2
24	M25	X	.009	1

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
25	M25	X	.024	2
26	M27	X	.013	3
27	M25	X	.023	3

Member Point Loads (BLC 5 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	X	.098	2
2	M24	X	.098	5
3	M26	X	.349	.5
4	M26	X	.349	4.5
5	M23	X	.113	.5
6	M23	X	.113	4.5
7	M11	X	.04	2
8	M11	X	.04	5
9	M27	X	.128	.5
10	M27	X	.128	4.5
11	M10	X	.076	.5
12	M10	X	.076	4.5
13	M22	X	.098	2
14	M22	X	.098	5
15	M25	X	.351	.5
16	M25	X	.351	4.5
17	M21	X	.113	.5
18	M21	X	.113	4.5
19	M26	X	.017	1
20	M26	X	.057	2
21	M26	X	.057	3
22	M22	X	.008	1
23	M27	X	.045	2
24	M25	X	.017	1
25	M25	X	.057	2
26	M27	X	.024	3
27	M25	X	.057	3

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Z	.017	2
2	M24	Z	.017	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	.034	2
8	M11	Z	.034	5
9	M27	Z	.111	.5
10	M27	Z	.111	4.5
11	M10	Z	.04	4.5
12	M10	Z	.04	.5
13	M22	Z	.017	2
14	M22	Z	.017	5
15	M25	Z	.049	4.5

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
16	M25	Z	.049	.5
17	M21	Z	.03	.5
18	M21	Z	.03	4.5
19	M26	Z	.006	1
20	M26	Z	.02	2
21	M26	Z	.013	3
22	M27	Z	.009	1
23	M27	Z	.024	2
24	M25	Z	.006	1
25	M25	Z	.02	2
26	M27	Z	.023	3
27	M25	Z	.013	3

Member Point Loads (BLC 7 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M24	Z	.04	2
2	M24	Z	.04	5
3	M26	Z	.128	.5
4	M26	Z	.128	4.5
5	M23	Z	.076	.5
6	M23	Z	.076	4.5
7	M11	Z	.098	2
8	M11	Z	.098	5
9	M27	Z	.351	.5
10	M27	Z	.351	4.5
11	M10	Z	.113	.5
12	M10	Z	.113	4.5
13	M22	Z	.04	2
14	M22	Z	.04	5
15	M25	Z	.128	4.5
16	M25	Z	.128	.5
17	M21	Z	.076	4.5
18	M21	Z	.076	.5
19	M26	Z	.008	1
20	M26	Z	.045	2
21	M26	Z	.024	3
22	M27	Z	.017	1
23	M27	Z	.057	2
24	M25	Z	.008	1
25	M25	Z	.045	2
26	M27	Z	.057	3
27	M25	Z	.024	3

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

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	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

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

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

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

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	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,...	End Magnitude[k/ft,F...	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,...	End Magnitude[k/ft,F...	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

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

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
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 Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib...	Area(...	Surfa...
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...	S...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...
1	1.2D + 1.6W (X-direc...	Yes	Y		1	1.2	2	1.2	5	1.6					
2	0.9D + 1.6W (X-direc...	Yes	Y		1	.9	2	.9	5	1.6					
3	1.2D + 1.0Di + 1.0Wi...	Yes	Y		1	1.2	2	1.2	3	1	4	1			
4	1.2D + 1.6W (X-direc...	Yes	Y		1	1.2	2	1.2	7	1.6					
5	0.9D + 1.6W (X-direc...	Yes	Y		1	.9	2	.9	7	1.6					
6	1.2D + 1.0Di + 1.0Wi...	Yes	Y		1	1.2	2	1.2	3	1	6	1			

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	-.009	6	2.419	4	.085	3	-1.355	2	-.013	6	2.025	1
2		min	-1.833	2	.781	2	-2.124	5	-4.94	4	-2.053	2	.012	6
3	N3	max	.477	4	2.381	1	.719	2	1.806	3	.943	5	4.718	1
4		min	-2.022	2	.088	5	-1.51	4	-1.45	5	-.043	1	.473	5
5	N5	max	-.166	6	1.8	6	-.196	3	1.463	3	.015	3	1.969	2
6		min	-2.109	1	-.564	2	-1.541	4	-1.491	5	-1.042	5	-2.684	6
7	Totals:	max	0	6	5.854	6	0	3						
8		min	-5.953	1	2.336	2	-5.163	4						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
1	N1	max	0	6	0	6	0	6	0	6	0	6	0	6
2		min	0	1	0	1	0	1	0	1	0	1	0	1
3	N2	max	.015	2	-.012	2	0	5	3.85e-03	4	7.374e-04	2	-1.93e-05	6
4		min	0	6	-.048	4	0	3	9.366e-04	2	7.594e-06	6	-3.294e-03	1
5	N3	max	0	6	0	6	0	6	0	6	0	6	0	6
6		min	0	1	0	1	0	1	0	1	0	1	0	1

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
7	N4	max	.003	5	.004	5	.005	4	2.347e-03	5	4.577e-04	2	-7.897e-04	5
8		min	0	1	-.048	1	-.003	2	-1.104e-03	3	-1.032e-04	4	-4.094e-03	1
9	N5	max	0	6	0	6	0	6	0	6	0	6	0	6
10		min	0	1	0	1	0	1	0	1	0	1	0	1
11	N6	max	0	3	.018	2	.006	5	2.414e-03	5	4.559e-04	2	1.895e-03	6
12		min	-.003	5	-.026	6	0	3	-1.079e-03	3	3.748e-05	6	-2.173e-03	2
13	N7	max	.016	2	-.066	6	.001	5	3.573e-03	1	-3.397e-05	6	-2.043e-03	6
14		min	0	6	-.12	1	-.013	1	2.101e-03	6	-2.899e-04	2	-7.024e-03	1
15	N8	max	.016	2	.07	2	.013	1	3.398e-03	4	2.63e-04	5	3.324e-03	4
16		min	0	6	-.08	4	0	6	-1.913e-03	2	-3.008e-04	1	-5.792e-03	2
17	N9	max	.016	1	-.061	5	.004	5	3.625e-03	1	8.089e-04	2	-2.426e-03	6
18		min	.001	6	-.123	1	-.012	1	9.927e-04	6	7.788e-06	6	-7.523e-03	1
19	N10	max	0	6	.075	5	.007	4	6.639e-03	5	6.448e-04	4	-6.871e-04	6
20		min	-.014	1	-.056	3	.001	3	-2.172e-03	3	3.515e-05	3	-1.803e-03	1
21	N11	max	0	6	.076	5	.007	5	6.699e-03	5	1.062e-04	2	8.01e-04	4
22		min	-.014	1	-.052	3	-.005	1	-1.879e-03	3	-6.226e-04	4	-9.455e-04	2
23	N12	max	.016	1	.073	2	.012	1	2.379e-03	4	8.083e-04	1	2.893e-03	4
24		min	-.003	5	-.07	4	.001	6	-3.38e-03	2	-9.088e-05	5	-5.427e-03	2
25	N13	max	0	6	.067	5	.005	4	5.331e-03	5	8.465e-04	1	-1.101e-03	5
26		min	-.015	1	-.184	1	-.016	2	-1.196e-03	3	6.103e-05	6	-6.319e-03	1
27	N14	max	0	6	.071	2	.016	1	5.602e-03	5	8.672e-04	1	2.134e-03	6
28		min	-.015	1	-.086	6	.002	6	-1.288e-03	3	-1.383e-04	5	-4.196e-03	2
29	N15	max	.516	1	.069	5	.631	4	8.155e-03	4	7.259e-03	4	8.166e-04	4
30		min	-.015	4	-.184	1	.003	3	-5.118e-04	2	9.995e-04	3	-7.244e-03	2
31	N16	max	.517	1	.072	5	.652	4	8.435e-03	4	5.326e-03	1	-3.345e-04	6
32		min	.002	6	-.087	3	.002	2	3.871e-04	3	-7.125e-03	4	-7.41e-03	1
33	N17	max	-.014	5	.067	5	.012	3	5.107e-03	5	8.465e-04	1	-1.101e-03	5
34		min	-.089	1	-.184	1	-.056	5	-1.195e-03	3	6.103e-05	6	-6.143e-03	1
35	N18	max	.025	6	.071	2	.028	1	5.602e-03	5	8.672e-04	1	2.134e-03	6
36		min	-.065	2	-.086	6	-.059	5	-1.288e-03	3	-1.383e-04	5	-4.171e-03	2
37	N19	max	0	6	.064	5	.005	4	4.974e-03	5	8.094e-04	1	-1.404e-03	5
38		min	-.015	1	-.199	1	-.018	2	-1.192e-03	3	6.91e-05	6	-6.486e-03	1
39	N20	max	0	6	.081	2	.018	1	5.182e-03	5	8.359e-04	1	2.292e-03	6
40		min	-.015	1	-.092	6	.002	6	-1.292e-03	3	-1.671e-04	5	-4.232e-03	2
41	N21	max	0	3	.118	2	.023	1	5.182e-03	5	8.359e-04	1	2.292e-03	6
42		min	-.006	2	-.107	6	.002	6	-1.292e-03	3	-1.671e-04	5	-4.232e-03	2
43	N22	max	.034	1	-.005	2	.002	2	5.856e-03	4	3.685e-04	1	-5.578e-05	6
44		min	0	6	-.22	4	0	6	1.067e-03	2	1.616e-05	6	-7.032e-03	1
45	N23	max	.034	1	-.095	2	.001	5	5.856e-03	4	3.685e-04	1	-5.578e-05	6
46		min	0	6	-.221	4	-.002	1	1.067e-03	2	1.616e-05	6	-7.032e-03	1
47	N24	max	.003	5	0	5	.003	5	4.974e-03	5	8.094e-04	1	-1.404e-03	5
48		min	-.006	1	-.237	1	-.023	1	-1.192e-03	3	6.91e-05	6	-6.486e-03	1
49	N25	max	.034	1	-.05	2	.001	5	5.856e-03	4	3.685e-04	1	-5.578e-05	6
50		min	0	6	-.22	4	0	3	1.067e-03	2	1.616e-05	6	-7.032e-03	1
51	N26	max	.001	5	.032	5	.004	5	4.974e-03	5	8.094e-04	1	-1.404e-03	5
52		min	-.01	1	-.218	1	-.021	1	-1.192e-03	3	6.91e-05	6	-6.486e-03	1
53	N27	max	0	6	.1	2	.021	1	5.182e-03	5	8.359e-04	1	2.292e-03	6
54		min	-.01	2	-.099	6	.002	6	-1.292e-03	3	-1.671e-04	5	-4.232e-03	2
55	N28	max	.038	1	-.07	2	.001	5	5.857e-03	4	3.709e-04	1	-5.497e-05	6
56		min	0	6	-.27	4	0	1	1.068e-03	2	1.616e-05	6	-7.031e-03	1
57	N29	max	0	6	.131	2	.027	1	5.181e-03	5	8.335e-04	1	2.293e-03	6
58		min	-.013	1	-.118	6	.001	6	-1.294e-03	3	-1.671e-04	5	-4.231e-03	2

Envelope Joint Displacements (Continued)

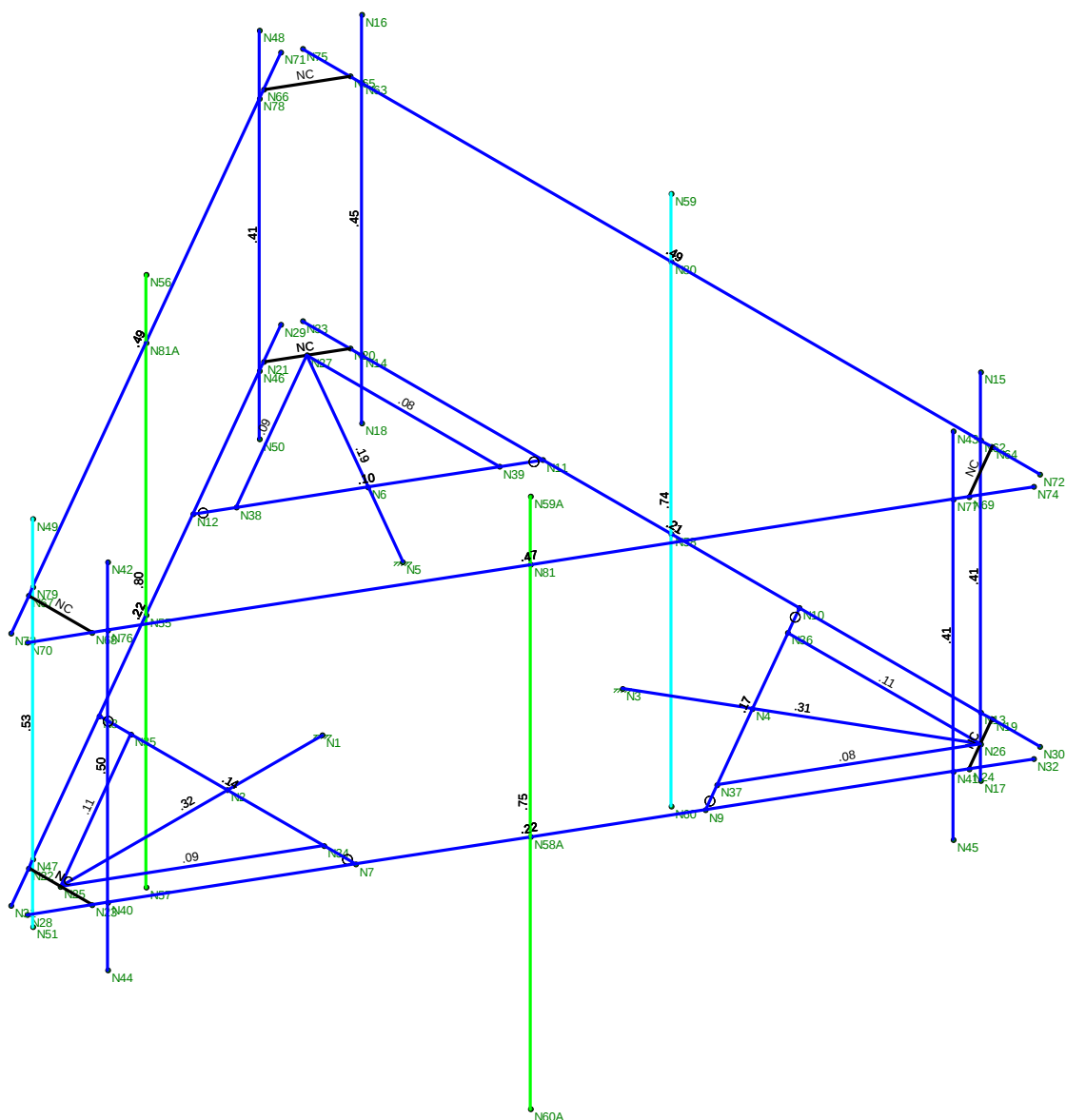
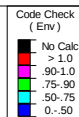
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
59	N30	max	0	6	.05	5	.002	5	4.974e-03	5	8.094e-04	1	-1.405e-03	5
60		min	-.015	1	-.262	1	-.026	1	-1.192e-03	3	6.864e-05	6	-6.488e-03	1
61	N31	max	.038	1	-.048	2	.001	5	5.857e-03	4	3.709e-04	1	-5.658e-05	6
62		min	0	6	-.269	4	0	3	1.068e-03	2	1.616e-05	6	-7.033e-03	1
63	N32	max	0	5	.034	5	.001	5	4.973e-03	5	8.07e-04	1	-1.404e-03	5
64		min	-.013	1	-.271	1	-.027	1	-1.193e-03	3	6.91e-05	6	-6.487e-03	1
65	N33	max	0	6	.122	2	.026	1	5.182e-03	5	8.359e-04	1	2.293e-03	6
66		min	-.015	1	-.114	6	.001	6	-1.292e-03	3	-1.643e-04	5	-4.23e-03	2
67	N34	max	.015	2	-.056	6	0	5	3.565e-03	4	3.945e-04	1	-1.497e-03	6
68		min	0	6	-.093	1	-.01	1	2.138e-03	3	-4.082e-05	5	-4.192e-03	1
69	N35	max	.015	2	.05	2	.01	1	3.53e-03	4	4.08e-04	1	1.639e-03	4
70		min	0	6	-.068	4	0	6	-1.184e-03	2	4.035e-05	6	-3.141e-03	2
71	N36	max	0	5	.056	5	.006	4	3.48e-03	5	6.527e-04	1	4.499e-04	5
72		min	-.011	1	-.048	3	0	3	-2.027e-03	3	6.756e-05	6	-2.425e-03	1
73	N37	max	.011	1	-.045	5	.005	5	1.891e-03	4	8.277e-04	1	-1.845e-03	5
74		min	0	6	-.101	1	-.009	1	3.515e-04	3	4.435e-05	6	-5.582e-03	1
75	N38	max	.011	1	.058	2	.009	1	1.928e-03	4	8.35e-04	1	2.337e-03	6
76		min	-.003	5	-.052	4	.001	6	-6.522e-04	2	-7.355e-05	5	-3.46e-03	2
77	N39	max	0	6	.058	5	.006	5	3.567e-03	5	6.465e-04	1	6.657e-04	6
78		min	-.011	1	-.042	3	-.003	1	-1.841e-03	3	-1.594e-04	5	-1.38e-03	2
79	N40	max	.034	1	-.101	2	.001	5	5.939e-03	4	4.064e-04	1	-1.272e-04	6
80		min	0	6	-.209	4	-.003	1	1.5e-03	2	1.735e-05	6	-7.175e-03	1
81	N41	max	.003	4	-.009	5	.003	5	4.919e-03	5	8.116e-04	1	-1.612e-03	5
82		min	-.004	1	-.229	1	-.022	1	-1.106e-03	3	6.835e-05	6	-6.898e-03	1
83	N42	max	.786	1	-.103	2	.529	4	7.384e-03	5	-1.536e-04	6	-7.316e-05	6
84		min	.005	6	-.21	4	.012	3	-5.901e-05	3	-7.9e-03	1	-8.788e-03	1
85	N43	max	.617	1	-.011	5	.563	4	6.8e-03	4	7.052e-03	1	2.479e-04	6
86		min	.014	6	-.23	1	-.04	1	-1.631e-04	2	1.349e-03	6	-8.642e-03	2
87	N44	max	0	5	-.101	2	-.021	2	5.763e-03	4	4.064e-04	1	-1.271e-04	6
88		min	-.05	1	-.209	4	-.068	4	1.5e-03	2	1.735e-05	6	-6.95e-03	1
89	N45	max	-.016	5	-.009	5	.009	3	4.895e-03	5	8.116e-04	1	-1.612e-03	5
90		min	-.087	1	-.229	1	-.056	5	-1.106e-03	3	6.835e-05	6	-6.898e-03	1
91	N46	max	0	3	.115	2	.022	1	5.084e-03	5	8.322e-04	1	2.295e-03	6
92		min	-.005	5	-.104	6	.002	6	-1.213e-03	3	-1.675e-04	5	-4.633e-03	2
93	N47	max	.034	1	.005	2	.003	2	5.966e-03	4	4.083e-04	1	7.032e-05	5
94		min	0	6	-.208	4	0	6	5.577e-04	2	1.444e-05	6	-7.197e-03	1
95	N48	max	.615	1	.116	2	.583	4	6.957e-03	4	6.808e-03	1	3.398e-04	5
96		min	-.095	5	-.105	6	.009	3	1.446e-04	3	-5.949e-03	4	-8.78e-03	1
97	N49	max	.788	1	.008	2	.53	4	7.419e-03	5	5.902e-04	4	3.772e-04	5
98		min	.004	6	-.208	4	-.074	1	-1.241e-03	1	-7.815e-03	1	-8.95e-03	1
99	N50	max	.027	6	.115	2	.035	1	4.909e-03	5	8.322e-04	1	2.294e-03	6
100		min	-.057	2	-.104	6	-.052	5	-1.212e-03	3	-1.675e-04	5	-4.408e-03	2
101	N51	max	.003	4	.005	2	-.004	2	5.941e-03	4	4.083e-04	1	7.031e-05	5
102		min	-.053	1	-.208	4	-.07	4	5.577e-04	2	1.444e-05	6	-7.196e-03	1
103	N58	max	0	6	.08	5	.028	4	1.008e-02	5	-5.222e-06	6	-2.021e-05	6
104		min	-.014	1	-.059	3	0	2	-1.776e-03	3	-3.751e-04	1	-5.869e-04	1
105	N59	max	.491	1	.08	5	1.376	5	2.45e-02	4	1.437e-04	4	1.931e-05	4
106		min	-.006	4	-.061	3	-.018	3	1.521e-04	2	-2.516e-03	1	-5.208e-03	1
107	N60	max	.014	2	.08	5	.086	3	1.007e-02	5	-5.222e-06	6	9.61e-04	2
108		min	-.003	4	-.059	3	-.456	5	-1.775e-03	3	-3.751e-04	1	-3.456e-05	4
109	N55	max	.031	1	.077	2	.008	5	2.907e-03	4	1.214e-04	5	4.166e-03	4
110		min	-.006	5	-.076	4	0	3	-4.361e-03	2	-9.863e-05	1	-8.227e-03	2

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
111	N56	max	1.268	1	.076	2	.651	4	8.36e-03	4	2.355e-03	4	5.614e-03	5
112		min	-.247	4	-.077	4	-.351	2	-8.309e-03	1	4.488e-04	3	-2.136e-02	1
113	N57	max	.194	4	.077	2	.213	2	1.36e-03	4	1.214e-04	5	4.163e-03	4
114		min	-.363	2	-.076	4	-.076	4	-4.359e-03	2	-9.863e-05	1	-8.223e-03	2
115	N58A	max	.031	2	-.069	5	.006	5	5.202e-03	1	-1.7e-05	3	-2.277e-03	6
116		min	.001	6	-.126	1	-.004	1	1.467e-03	6	-1.447e-04	4	-9.711e-03	1
117	N59A	max	1.29	1	-.069	5	.64	4	8.292e-03	5	2.156e-03	1	-1.081e-03	6
118		min	.071	6	-.127	1	.083	3	1.616e-03	3	-2.072e-03	4	-2.127e-02	1
119	N60A	max	-.108	6	-.069	5	-.06	6	5.199e-03	1	-1.7e-05	3	-2.276e-03	6
120		min	-.435	1	-.126	1	-.253	1	1.21e-03	6	-1.447e-04	4	-9.704e-03	1
121	N81	max	1.036	1	-.069	5	.541	4	8.227e-03	1	2.156e-03	1	-1.08e-03	6
122		min	.058	6	-.127	1	.064	3	1.615e-03	3	-2.072e-03	4	-2.057e-02	1
123	N62	max	.429	1	.069	5	.533	4	8.155e-03	4	7.259e-03	4	8.166e-04	4
124		min	-.005	4	-.184	1	.002	3	-5.118e-04	2	9.995e-04	3	-7.22e-03	2
125	N63	max	.428	1	.072	5	.55	4	8.435e-03	4	5.326e-03	1	-3.345e-04	6
126		min	-.005	4	-.087	3	-.007	2	3.871e-04	3	-7.125e-03	4	-7.385e-03	1
127	N64	max	.429	1	.071	5	.517	4	6.568e-03	4	6.663e-03	4	8.223e-04	4
128		min	-.005	4	-.201	1	-.005	1	-8.105e-04	2	1.24e-03	3	-7.649e-03	2
129	N65	max	.428	1	.088	2	.535	4	6.774e-03	4	6.142e-03	1	-3.668e-04	6
130		min	-.005	4	-.085	6	0	3	3.73e-04	3	-6.547e-03	4	-7.794e-03	1
131	N66	max	.497	1	.127	2	.492	4	6.774e-03	4	6.142e-03	1	-3.668e-04	6
132		min	-.078	4	-.101	6	.008	3	3.73e-04	3	-6.547e-03	4	-7.794e-03	1
133	N67	max	.665	1	0	2	.441	4	7.371e-03	5	6.114e-05	4	-5.269e-05	6
134		min	.003	6	-.223	4	-.05	1	-2.862e-04	3	-7.802e-03	1	-7.406e-03	1
135	N68	max	.665	1	-.095	2	.44	4	7.371e-03	5	6.114e-05	4	-5.269e-05	6
136		min	.003	6	-.224	4	.011	3	-2.862e-04	3	-7.802e-03	1	-7.406e-03	1
137	N69	max	.5	1	.003	5	.474	4	6.568e-03	4	6.663e-03	4	8.223e-04	4
138		min	.014	6	-.241	1	-.046	1	-8.105e-04	2	1.24e-03	3	-7.649e-03	2
139	N70	max	.6	1	-.059	2	.441	4	7.373e-03	5	6.748e-05	4	-5.088e-05	6
140		min	.004	6	-.285	4	.003	3	-2.831e-04	3	-7.791e-03	1	-7.404e-03	1
141	N71	max	.446	1	.173	2	.461	4	6.771e-03	4	6.131e-03	1	-3.65e-04	6
142		min	-.024	4	-.086	6	.014	3	3.698e-04	3	-6.541e-03	4	-7.793e-03	1
143	N72	max	.429	1	.078	5	.453	4	6.568e-03	4	6.651e-03	4	8.187e-04	4
144		min	-.005	4	-.275	1	-.066	1	-8.105e-04	2	1.24e-03	3	-7.652e-03	2
145	N73	max	.6	1	-.035	2	.441	4	7.373e-03	5	5.482e-05	4	-5.448e-05	6
146		min	.004	6	-.285	4	-.013	2	-2.831e-04	3	-7.791e-03	1	-7.408e-03	1
147	N74	max	.447	1	.061	5	.442	4	6.565e-03	4	6.657e-03	4	8.205e-04	4
148		min	.002	6	-.285	1	-.076	1	-8.128e-04	2	1.238e-03	3	-7.651e-03	2
149	N75	max	.428	1	.163	2	.471	4	6.774e-03	4	6.142e-03	1	-3.632e-04	6
150		min	-.005	4	-.082	6	.012	3	3.73e-04	3	-6.534e-03	4	-7.791e-03	1
151	N76	max	.681	1	-.103	2	.441	4	7.36e-03	5	-1.536e-04	6	-7.316e-05	6
152		min	.004	6	-.21	4	.013	3	-5.901e-05	3	-7.9e-03	1	-8.788e-03	1
153	N77	max	.513	1	-.011	5	.482	4	6.775e-03	4	7.052e-03	1	2.479e-04	6
154		min	.017	6	-.23	1	-.038	1	-1.631e-04	2	1.349e-03	6	-8.642e-03	2
155	N78	max	.51	1	.116	2	.499	4	6.933e-03	4	6.808e-03	1	3.398e-04	5
156		min	-.091	4	-.105	6	.007	3	1.446e-04	3	-5.949e-03	4	-8.78e-03	1
157	N79	max	.681	1	.008	2	.442	4	7.395e-03	5	5.902e-04	4	3.772e-04	5
158		min	.003	6	-.208	4	-.059	1	-1.241e-03	1	-7.815e-03	1	-8.95e-03	1
159	N80	max	.428	1	.08	5	1.083	5	2.38e-02	4	1.437e-04	4	1.931e-05	4
160		min	-.005	4	-.061	3	-.02	3	1.52e-04	2	-2.516e-03	1	-4.93e-03	1
161	N81A	max	1.013	2	.076	2	.551	4	8.08e-03	4	2.355e-03	4	5.613e-03	5
162		min	-.18	4	-.077	4	-.252	2	-8.307e-03	1	4.488e-04	3	-2.067e-02	1

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

Member	Shape	Code Check	Lo...	LC	She...	Lo...	phi*P...	phi*P...	phi*...	phi*...	Cb	Eqn	
1	M1	HSS4X4X4	.317	0	4	.196	0	z 1	128...	139...	16.181	16.181	2.3...H1-...
2	M2	HSS4X4X4	.136	2....	4	.111	2....	y 1	128...	139...	16.181	16.181	1.3...H1-...
3	M3	HSS4X4X4	.314	0	1	.137	0	z 4	128...	139...	16.181	16.181	2.3...H1-...
4	M4	HSS4X4X4	.169	2....	1	.086	3....	z 4	128...	139...	16.181	16.181	1.3...H1-...
5	M5	HSS4X4X4	.194	0	6	.141	0	z 4	128...	139...	16.181	16.181	3.1...H1-...
6	M6	HSS4X4X4	.097	2....	6	.088	0	z 4	128...	139...	16.181	16.181	1.3...H1-...
7	M7	PIPE 3.0	.219	1....	1	.188	11...	1	28.251	65.205	5.749	5.749	1.8...H1-...
8	M8	PIPE 3.0	.207	4....	1	.210	11...	4	28.251	65.205	5.749	5.749	1.6...H1-...
9	M9	PIPE 3.0	.216	11...	1	.207	11...	2	28.251	65.205	5.749	5.749	2.2...H1-...
10	M10	PIPE 2.0	.410	1	4	.137	1	4	20.867	32.13	1.872	1.872	1.6...H1-...
11	M11	PIPE 2.0	.451	1	4	.149	1	4	20.867	32.13	1.872	1.872	1.5...H1-...
12	M15	L2x2x3	.094	3....	4	.007	3....	y 1	13.688	23.393	.558	1.202	1.4...H2-1
13	M16	L2x2x3	.113	3....	1	.008	3....	y 1	13.688	23.393	.558	1.186	1.34 H2-1
14	M17	L2x2x3	.111	3.27	1	.005	3.27	y 6	13.689	23.393	.558	1.145	1.0...H2-1
15	M18	L2x2x3	.083	0	5	.005	3....	y 4	13.689	23.393	.558	1.131	1.0...H2-1
16	M19	L2x2x3	.094	0	5	.006	3....	y 4	13.689	23.393	.558	1.201	1.44 H2-1
17	M20	L2x2x3	.082	3.27	4	.007	3.27	y 4	13.689	23.393	.558	1.237	1.7...H2-1
18	M21	PIPE 2.0	.496	1	1	.164	1	1	20.867	32.13	1.872	1.872	1.7...H1-...
19	M22	PIPE 2.0	.414	1	4	.129	1	2	20.867	32.13	1.872	1.872	1.8...H1-...
20	M23	PIPE 2.0	.412	1	1	.122	1	4	20.867	32.13	1.872	1.872	1.8...H1-...
21	M24	PIPE 2.0	.532	1	1	.176	1	1	20.867	32.13	1.872	1.872	1.9...H1-...
22	M27	PIPE 2.0	.740	4....	4	.108	4....	1	26.521	32.13	1.872	1.872	2.2...H1-...
23	M26	PIPE 2.0	.796	4....	1	.143	4.5	1	26.521	32.13	1.872	1.872	2.5...H1-...
24	M25	PIPE 2.0	.753	4....	2	.140	4.5	2	26.521	32.13	1.872	1.872	2.5...H1-...
25	M28	PIPE 2.0	.467	11...	2	.658	11...	2	6.295	32.13	1.872	1.872	1.6...H3-6
26	M29	PIPE 2.0	.492	.911	1	.698	.911	1	6.295	32.13	1.872	1.872	1.7...H3-6
27	M30	PIPE 2.0	.487	.911	4	.592	.911	4	6.295	32.13	1.872	1.872	1.5...H3-6



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek	CT11720A - Mount Unity Check	
TJL		July 8, 2020 at 12:52 PM
20074.55		CT11720A_AMA.r3d

Exhibit F

Power Density/RF Emissions Report



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, Connecticut 06477

July 25, 2020

EBI Project Number: 6220003392

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general population allowable limit:	17.64%



July 25, 2020

T-Mobile

Attn: Jason Overbey, RF Manager

35 Griffin Road South

Bloomfield, Connecticut 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 in Orange, Connecticut** for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The number of $\mu\text{W}/\text{cm}^2$ 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 ($\mu\text{W}/\text{cm}^2$). The general population exposure limits for the 600 MHz and 700 MHz frequency bands are approximately $400 \mu\text{W}/\text{cm}^2$ and $467 \mu\text{W}/\text{cm}^2$, respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 1.1 GHz frequency bands is $1000 \mu\text{W}/\text{cm}^2$. 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 in Orange, Connecticut using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report, the sample point is the top of a 6-foot person standing at the base of the tower.

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

- 1) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 2) 1 NR channel (600 MHz Band) was considered for each sector of the proposed installation. This Channel has a transmit power of 80 Watts.
- 3) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 4) 4 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 5) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.



- 6) 4 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 7) 2 UMTS channels (AWS Band - 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 8) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 9) 2 LTE channels (BRS Band - 2500 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.
- 10) 2 NR channels (BRS Band - 2500 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.
- 11) 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.
- 12) For the following calculations, the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 13) The antennas used in this modeling are the Ericsson AIR 6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector A, the Ericsson AIR 6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector B, the Ericsson AIR 6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector C. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels



are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

- 14) The antenna mounting height centerline of the proposed antennas is 150 feet above ground level (AGL).
- 15) 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.
- 16) All calculations were done with respect to uncontrolled / general population threshold limits.



T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR 6449	Make / Model:	Ericsson AIR 6449	Make / Model:	Ericsson AIR 6449
Frequency Bands:	2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz
Gain:	22.05 dBd / 22.05 dBd	Gain:	22.05 dBd / 22.05 dBd	Gain:	22.05 dBd / 22.05 dBd
Height (AGL):	150 feet	Height (AGL):	150 feet	Height (AGL):	150 feet
Channel Count:	4	Channel Count:	4	Channel Count:	4
Total TX Power (W):	160 Watts	Total TX Power (W):	160 Watts	Total TX Power (W):	160 Watts
ERP (W):	25,651.93	ERP (W):	25,651.93	ERP (W):	25,651.93
Antenna A1 MPE %:	4.10%	Antenna B1 MPE %:	4.10%	Antenna C1 MPE %:	4.10%
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz
Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd
Height (AGL):	150 feet	Height (AGL):	150 feet	Height (AGL):	150 feet
Channel Count:	11	Channel Count:	11	Channel Count:	11
Total TX Power (W):	440 Watts	Total TX Power (W):	440 Watts	Total TX Power (W):	440 Watts
ERP (W):	13,259.22	ERP (W):	13,259.22	ERP (W):	13,259.22
Antenna A2 MPE %:	3.02%	Antenna B2 MPE %:	3.02%	Antenna C2 MPE %:	3.02%
Antenna #:	3	Antenna #:	3	Antenna #:	3
Make / Model:	Ericsson AIR 32	Make / Model:	Ericsson AIR 32	Make / Model:	Ericsson AIR 32
Frequency Bands:	1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	1900 MHz / 1900 MHz / 2100 MHz
Gain:	15.35 dBd / 15.35 dBd / 15.85 dBd	Gain:	15.35 dBd / 15.35 dBd / 15.85 dBd	Gain:	15.35 dBd / 15.35 dBd / 15.85 dBd
Height (AGL):	150 feet	Height (AGL):	150 feet	Height (AGL):	150 feet
Channel Count:	8	Channel Count:	8	Channel Count:	8
Total TX Power (W):	360 Watts	Total TX Power (W):	360 Watts	Total TX Power (W):	360 Watts
ERP (W):	12,841.53	ERP (W):	12,841.53	ERP (W):	12,841.53
Antenna A3 MPE %:	2.05%	Antenna B3 MPE %:	2.05%	Antenna C3 MPE %:	2.05%



Site Composite MPE %	
Carrier	MPE %
T-Mobile (Max at Sector A):	9.17%
Sprint	1.04%
Clearwire	0.13%
AT&T	2.98%
Verizon	3.88%
Nextel	0.44%
Site Total MPE % :	17.64%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	9.17%
T-Mobile Sector B Total:	9.17%
T-Mobile Sector C Total:	9.17%
Site Total MPE % :	17.64%

T-Mobile Maximum MPE Power Values (Sector A)

T-Mobile Frequency Band / Technology (Sector A)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu\text{W}/\text{cm}^2$)	Frequency (MHz)	Allowable MPE ($\mu\text{W}/\text{cm}^2$)	Calculated % MPE
T-Mobile 2500 MHz LTE	2	6412.98	150.0	20.49	2500 MHz LTE	1000	2.05%
T-Mobile 2500 MHz NR	2	6412.98	150.0	20.49	2500 MHz NR	1000	2.05%
T-Mobile 600 MHz LTE	2	591.73	150.0	1.89	600 MHz LTE	400	0.47%
T-Mobile 600 MHz NR	1	1577.94	150.0	2.52	600 MHz NR	400	0.63%
T-Mobile 700 MHz LTE	2	648.82	150.0	2.07	700 MHz LTE	467	0.44%
T-Mobile 1900 MHz UMTS	2	1101.85	150.0	3.52	1900 MHz UMTS	1000	0.35%
T-Mobile 1900 MHz LTE	2	2203.69	150.0	7.04	1900 MHz LTE	1000	0.70%
T-Mobile 2100 MHz UMTS	2	1294.56	150.0	4.14	2100 MHz UMTS	1000	0.41%
T-Mobile 1900 MHz GSM	4	1028.30	150.0	6.57	1900 MHz GSM	1000	0.66%
T-Mobile 1900 MHz LTE	2	2056.61	150.0	6.57	1900 MHz LTE	1000	0.66%
T-Mobile 2100 MHz LTE	2	2307.55	150.0	7.37	2100 MHz LTE	1000	0.74%
						Total:	9.17%

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



Summary

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

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

T-Mobile Sector	Power Density Value (%)
Sector A:	9.17%
Sector B:	9.17%
Sector C:	9.17%
T-Mobile Maximum MPE % (Sector A):	9.17%
Site Total:	17.64%
Site Compliance Status:	COMPLIANT

The anticipated composite MPE value for this site assuming all carriers present is **17.64%** 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 G

Mailing Receipts/Proof of Notice

View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialogue box that appears. Note: If your browser does not support this function, select Print from the File menu to print the label.
2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.
3. **GETTING YOUR SHIPMENT TO UPS**

Customers with a scheduled Pickup
 - Your driver will pickup your shipment(s) as usual.

Customers without a scheduled Pickup
 - Schedule a Pickup on ups.com to have a UPS driver pickup all of your packages.
 - Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. To find the location nearest you, please visit the 'Locations' Quick link at ups.com.

UPS Access Point™
MICHAELS STORE # 7773
75 INTERSTATE SHOP CTR
RAMSEY NJ

UPS Access Point™
THE UPS STORE
115 FRANKLIN TPKE
MAHWAH NJ

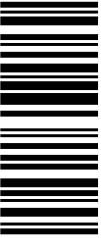
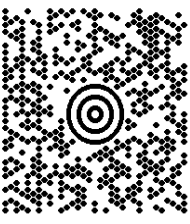
UPS Access Point™
THE UPS STORE
120 E MAIN ST
RAMSEY NJ

FOLD HERE

NEIL GUERRIERO
3473040176
TRANSCEND WIRELESS
10 INDUSTRIAL AVE
MAHWAH NJ 07430

SHIP TO:
JAMES ZEOLI, FIRST SELECTMA
TOWN OF ORANGE
617 ORANGE CENTER ROAD
ORANGE CT 06477

0.0 LBS LTR 1 OF 1



CT 064 7-02

UPS 2ND DAY AIR
TRACKING #: 1Z V25 742 02 9216 3567

2



BILLING: P/P
UPS CARBON NEUTRAL SHIPMENT

Reference #1: CT11720A
Reference #2: 1s Sel


XOL 20.08.05 NV45 31.0A 07/2020

View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialogue box that appears. Note: If your browser does not support this function, select Print from the File menu to print the label.
2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.
3. **GETTING YOUR SHIPMENT TO UPS**

Customers with a scheduled Pickup
 - Your driver will pickup your shipment(s) as usual.

Customers without a scheduled Pickup
 - Schedule a Pickup on ups.com to have a UPS driver pickup all of your packages.
 - Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. To find the location nearest you, please visit the 'Locations' Quick link at ups.com.

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MICHAELS STORE # 7773
75 INTERSTATE SHOP CTR
RAMSEY NJ

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THE UPS STORE
115 FRANKLIN TPKE
MAHWAH NJ

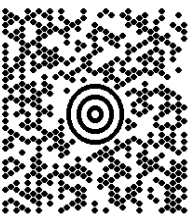
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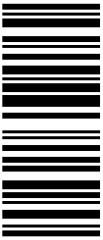
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NEIL GUERRIERO
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TRANSCEND WIRELESS
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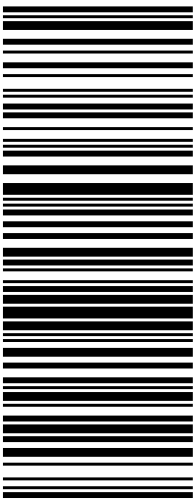
SHIP TO:
JACK DEMIRJIAN, ZONING
TOWN OF ORANGE
617 ORANGE CENTER ROAD
ORANGE CT 06477

0.0 LBS LTR 1 OF 1



CT 064 7-02


UPS 2ND DAY AIR
2
TRACKING #: 1Z V25 742 02 9259 3576



BILLING: P/P
UPS CARBON NEUTRAL SHIPMENT

Reference #1: CT11720A
Reference #2: ZEO


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