Transcend Wireless

10 Industrial Ave,
Suite 3
Mahwah NJ 07430

Phone: 201.684.0055
Fax: 201.684.0066

March 26, 2020

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

RE: Notice of Exempt Modification
303 Boxwood Lane, Danbury, CT 06811
Latitude: 41.3947215600
Longitude: -73.4866659000
T-Mobile Site#: CTFF703A – L600

Dear Ms. Bachman:

T-Mobile currently maintains nine (9) antennas at the 83-foot level of the existing 100-foot lattice tower at 303 Boxwood Lane, Danbury, CT. The 100-foot lattice tower and property are owned by Western Connecticut State University (State of Connecticut). T-Mobile now intends to replace three (3) of its existing antennas with three (3) new 600/700/2100 MHz antennas. T-Mobile also intends to remove (3) existing antennas. The new antennas will be installed at the same 83-foot level of the tower.

Planned Modifications:
Tower:

Remove
(3) AIR 21 KRC 118023 B2A B4P 1900/2100 MHz
(6) 1-5/8" Coax

Remove and Replace:
(3) LNX-6515DS (Remove) – APXVAARR18_43-U-NA20 Antenna (Replace) 600/700/2100 MHz
(3) RRUS11B12 (Remove) – Radio 4449 B71+B12 RRU (Replace)

Install New:
(3) 1-3/8" Hybrid Cables

Existing to Remain:
(3) AIR 32 KRD 901146-1_B66A_B2A Antenna 1900/2100 MHz
(3) TMA
(1) 1-3/8" Hybrid Cable
(6) 1-5/8" Coax

Ground:
Install New: Equipment inside existing 6102 Cabinet

This facility was originally approved by the Council in Docket No. 176 dated October 21, 1996. This proposed modification complies with the original approval.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to the Mayor -Mark Boughton, Elected Official, Sharon Calitro, Director of Planning & Zoning for the City of Danbury, as well as the 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,

Kyle Richers
Transcend Wireless
Cell: 908-447-4716
Email: krichers@transcendwireless.com

Attachments
cc: Mark Boughton – City of Danbury Mayor
Sharon Calitro – City of Danbury Director of Planning & Zoning
State of Connecticut – Owner
Western Connecticut State University- Owner

UPS Internet Shipping: View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialog 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 Daily Pickup
   Your driver will pickup your shipment(s) as usual.

   Customers without a Daily Pickup
   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. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the 'Find Locations' Quick link at ups.com.
   Schedule a same day or future day Pickup to have a UPS driver pickup all of your Internet Shipping packages.
   Hand the package to any UPS driver in your area.

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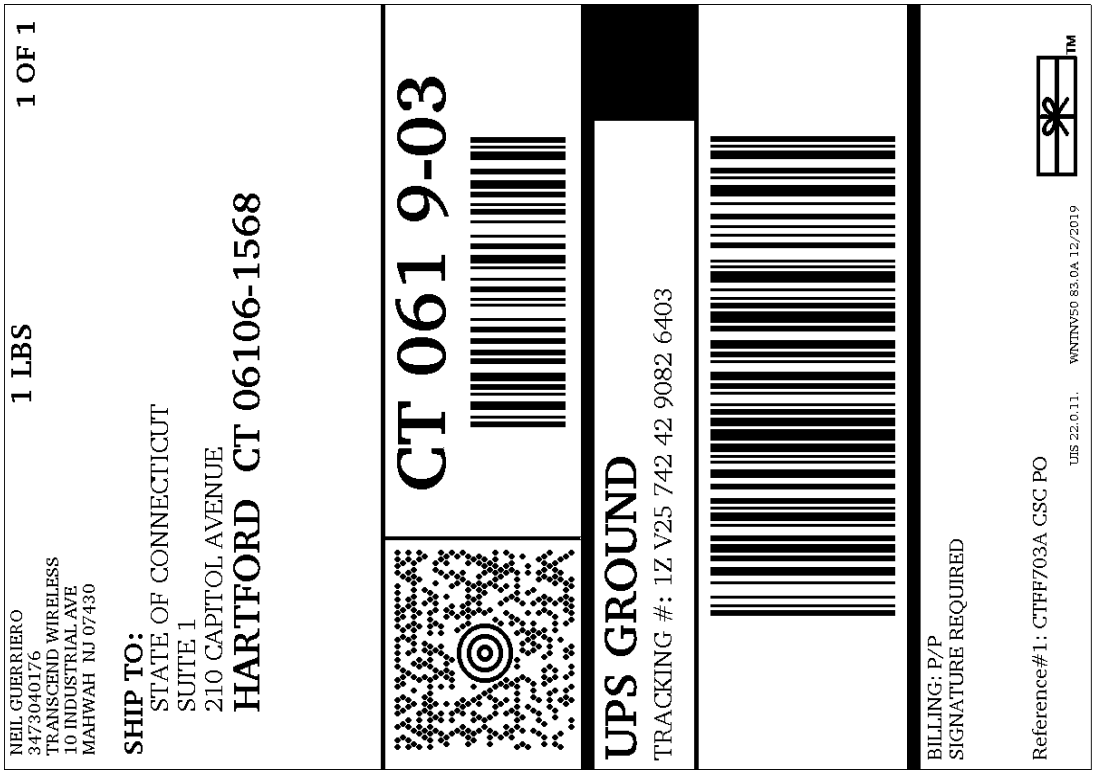
115 FRANKLIN TPKE
MAHWAH ,NJ 07430

UPS Access Point™
THE UPS STORE
120 E MAIN ST
RAMSEY ,NJ 07446

UPS Access Point™
CVS STORE # 5491
45 FRANKLIN TPKE
MAHWAH ,NJ 07430

FOLD HERE



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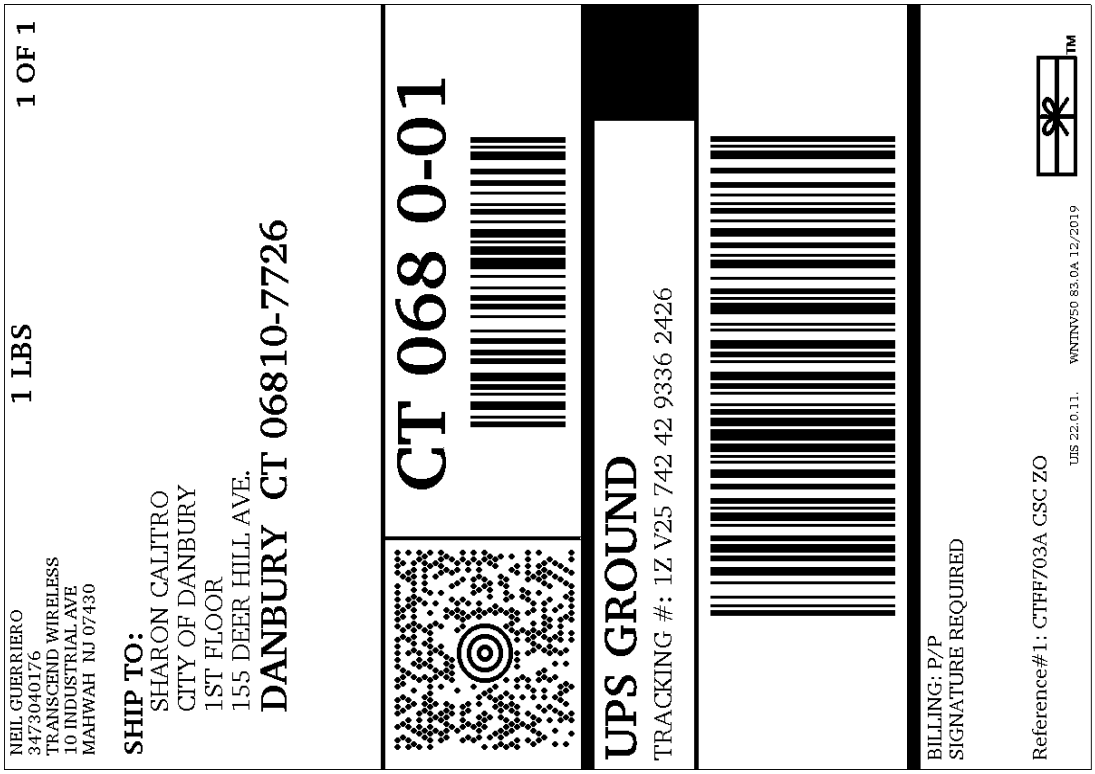

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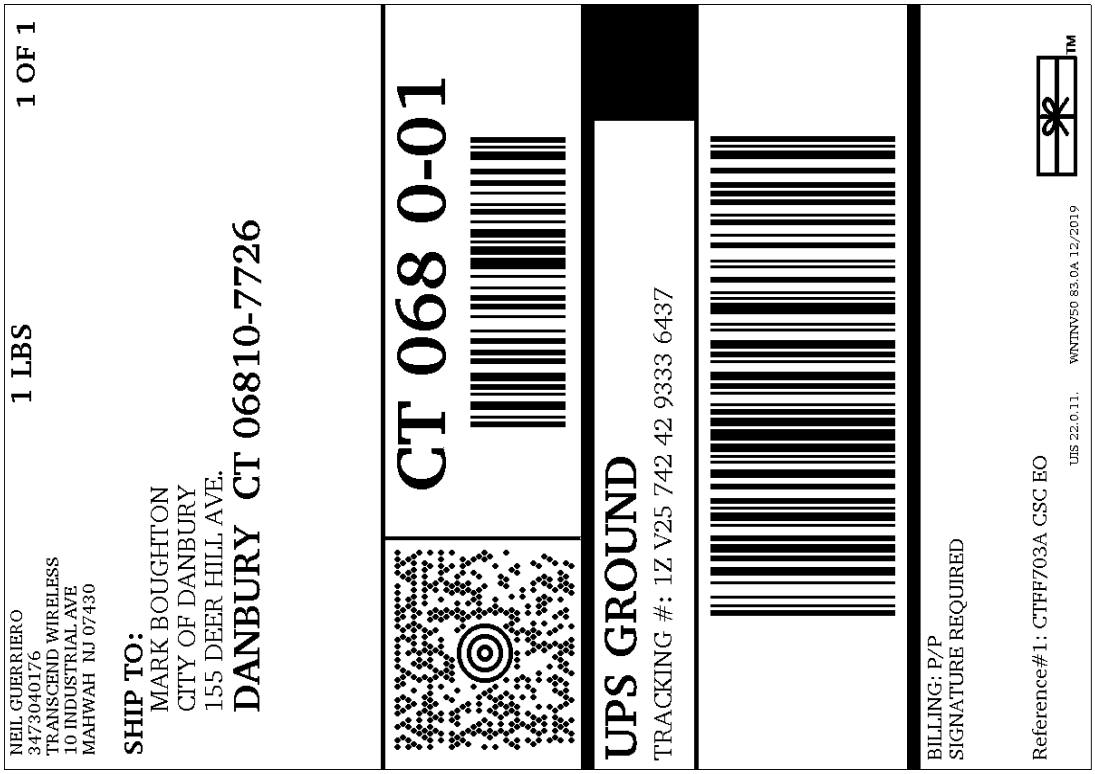

303 BOXWOOD LN

Location	303 BOXWOOD LN	**Mblu**	F14/ / 96/ /
Acct#		**Owner**	STATE OF CONNECTICUT
Assessment	$69,100	**Appraisal**	$98,700
PID	24557	**Building Count**	1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$0	$98,700	$98,700
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$0	$69,100	$69,100

Owner of Record

Owner	STATE OF CONNECTICUT	**Sale Price**	$0
Co-Owner	WATER STORAGE&PUMPING STATION	**Book & Page**	0482/0104
Address	210 CAPITOL AVE STE 1 HARTFROD, CT 06106	**Sale Date**	01/02/1970

Ownership History

Ownership History			
Owner	**Sale Price**	**Book & Page**	**Sale Date**
STATE OF CONNECTICUT	$0	0482/0104	01/02/1970

Building Information

Building 1 : Section 1

Year Built:
Living Area: 0
Replacement Cost: $0
Building Percent Good:
Replacement Cost Less Depreciation: $0

Building Attributes	
Field	**Description**
Style	Vacant Land

Model	
Grade:	
Stories:	
Occupancy	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure:	
Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Flr 1	
Interior Flr 2	
Heat Fuel	
Heat Type:	
AC Type:	
Total Bedrooms:	
Total Bthrms:	
Total Half Baths:	
Total Xtra Fixtrs:	
Total Rooms:	
Bath Style:	
Kitchen Style:	
Fireplaces	
Whirlpool	
Addn'l Kitchen	
Bsm Gar	
Fin Bsm Area	
Fin Bsm Qual	
Nhbd	
MH Park	

Building Photo

(http://images.vgsi.com/photos2/DanburyCTPhotos//default.jpg)

Building Layout

(http://images.vgsi.com/photos2/DanburyCTPhotos//Sketches/24

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

Extra Features

Extra Features	Legend
No Data for Extra Features	

Land

Land Use

Use Code 946V

Land Line Valuation

Size (Acres) 1.86

Description	Rec. Vacant	**Frontage**	0
Zone	RA40	**Depth**	0
Neighborhood		**Assessed Value**	$69,100
Alt Land Appr	No	**Appraised Value**	$98,700
Category			

Outbuildings

Outbuildings	Legend
No Data for Outbuildings	

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$0	$98,700	$98,700
2016	$0	$94,000	$94,000
2015	$0	$94,000	$94,000

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2017	$0	$69,100	$69,100
2016	$0	$65,800	$65,800
2015	$0	$65,800	$65,800

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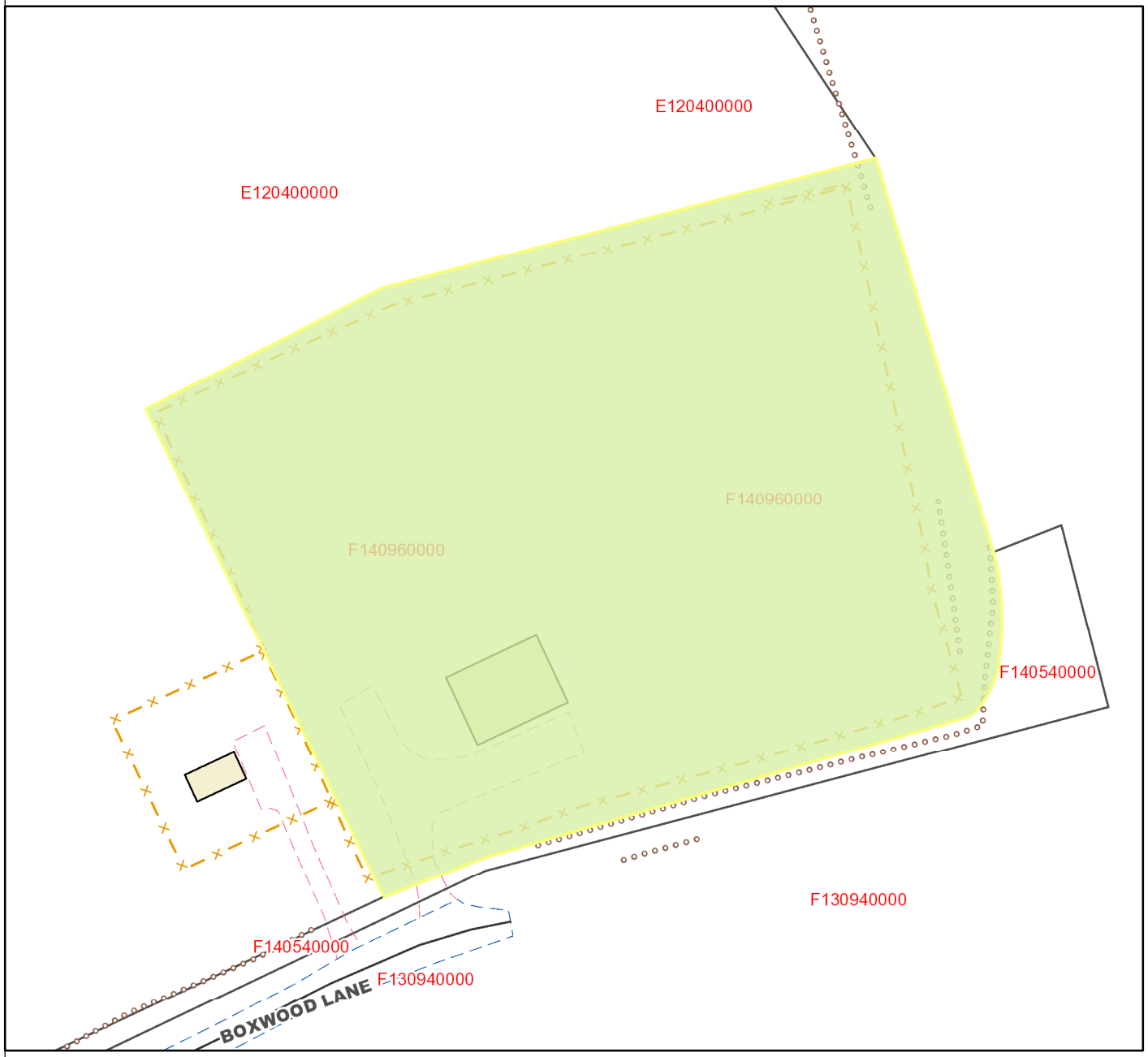
CTFF703A



Channel
Stream
Paved
Unpaved
Driveway (Paved)
Driveway (Unpaved)
Light Pole
Building
Foundation
House Trailer
Ruins
Deck
Bridges
Curb
Road (Paved)
Road (Unpaved)
Fence
Stone Wall
Parking (Paved)
Parking (Unpaved)
Sidewalk
Other
Parcel
Private Right of Way
Public Right of Way
Rail Right of Way
Traffic Island
Water

Not a legal survey.

T-Mobile

WIRELESS COMMUNICATIONS FACILITY

CT703/WCSU ET
SITE ID: CTFF703A
303 BOXWOOD LANE
DANBURY, CT 06811

T-MOBILE RF CONFIGURATION

67D92DBL__2xAIR+1OP

PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK CONSISTS OF A MODIFICATION TO THE EXISTING UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:
   - A. REMOVE (6) EXISTING ANTENNAS, TYP. (2) PER SECTOR
   - B. INSTALL (3) NEW RFS ANTENNAS, TYP. (1) PER SECTOR
   - C. REMOVE (3) EXISTING RRUS11 B12, TYP. (1) PER SECTOR
   - D. INSTALL (3) NEW RADIO 4449 B71+B12'S, TYP. (1) PER SECTOR
   - E. UPGRADE CABINET WITH 125 BREAKER
   - F. INSTALL (1) ADDITIONAL BB6630 FOR FUTURE 5G N600
   - G. REMOVE (6) EXISTING COAX CABLES
   - H. INSTALL (3) 6x12 HYBRID CABLES

GENERAL NOTES

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

SITE DIRECTIONS

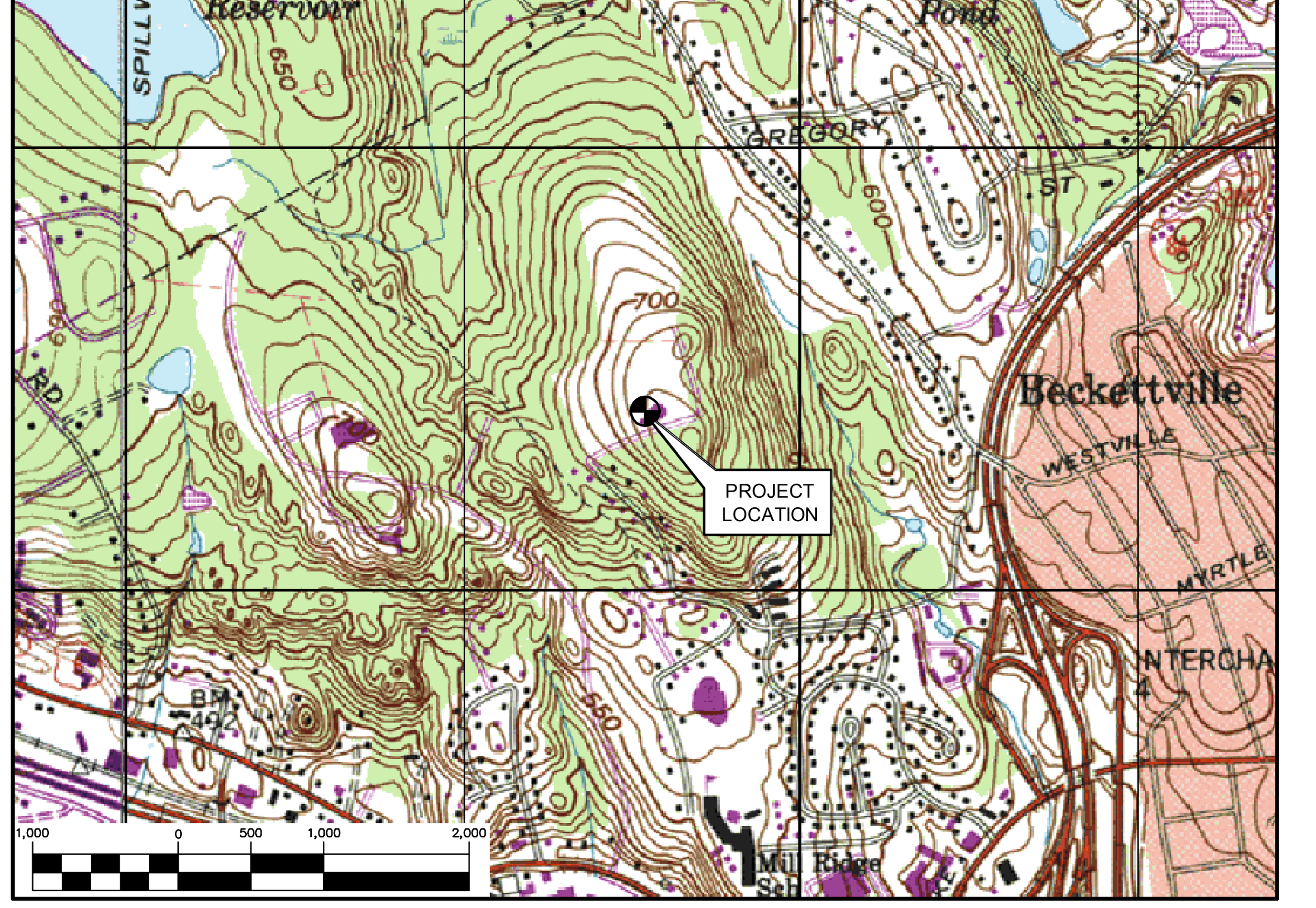
FROM: 35 GRIFFIN ROAD SOUTH, BLOOMFIELD, CT 06002
TO: 303 BOXWOOD LANE, DANBURY, CT 06811

1.	TURN LEFT ONTO CAPITOL BLVD	0.4 MI
2.	TURN LEFT ONTO WEST STREET	0.2 MI
3.	TAKE RAMP LEFT FOR I-91 S	0.3 MI
4.	AT EXIT 18, TAKE RAMP RIGHT FOR I-691 WEST TOWARD MERIDEN/WATERBURY	8.8 MI
5.	CONTINUE ONTO I-691 WEST.	7.7 MI
6.	AT EXIT 1, TAKE RAMP LEFT FOR I-84 WEST TOWARD WATERBURY/DANBURY, MERGE ONTO I-84 WEST.	35.9 MI
7.	TAKE EXIST 4 FOR US-6 WEST/US-202 WEST TOWARD LAKE AVE.	0.3 MI
8.	TURN RIGHT ONTO US-202 WEST/US-6 WEST/LAKE AVE. EXT.	404 FT
9.	TURN RIGHT ONTO MILL RIDGE ROAD	0.3 MI
10.	TURN RIGHT ONTO HIGH RIDGE ROAD	0.2 MI
11.	TURN LEFT AT THE 1ST CROSS STREET ONTO SCUPPO ROAD	89 FT
12.	SLIGHT RIGHT ONTO BOXWOOD LANE	0.1 MI
		0.1 MI

VICINITY MAP

SCALE: 1" = 1000'

NORTH



PROJECT INFORMATION

SITE NAME:	CT703/WCSU ET
SITE ID:	CTFF703A
SITE ADDRESS:	303 BOXWOOD LANE DANBURY, CT 06811
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	DAN REID (PROJECT MANAGER) TRANSCEND WIRELESS, LLC (203) 592-8291
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405
PROJECT COORDINATES:	LATITUDE: 41°-23'-41.90" N LONGITUDE: 73°-29'-12.27" W GROUND ELEVATION: 730'± AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM CSC WEBLOG.

SHEET INDEX

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	08/14/19	RTS	CAG	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

T-Mobile
Transcend Wireless

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

T-MOBILE NORTHEAST LLC
WIRELESS COMMUNICATIONS FACILITY
CT703/WCSU ET
SITE ID: CTFF703A
303 BOXWOOD LANE
DANBURY, CT 06811

DATE:	05/16/19
SCALE:	AS NOTED
JOB NO.	19027.54

TITLE SHEET

T-1

Sheet No. 1 of 7

DESIGN BASIS:

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

1. DESIGN CRITERIA:

- WIND LOAD: PER TIA 222 G (ANTENNA MOUNTS): 90-110 MPH (3 SECOND GUST)
- RISK CATEGORY: II (BASED ON IBC APPENDIX N)
- NOMINAL DESIGN SPEED (TOWER): 93 MPH (Vasd) (EXPOSURE C/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-10) PER 2015 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE.
- SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

GENERAL NOTES:

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

STRUCTURAL STEEL

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

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	06/14/19	RTS	CAG	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION

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WIRELESS COMMUNICATIONS FACILITY

CT703/WCSU ET

SITE ID: CTFF703A

303 BOXWOOD LANE
DANBURY, CT 06811

DATE: 05/16/19

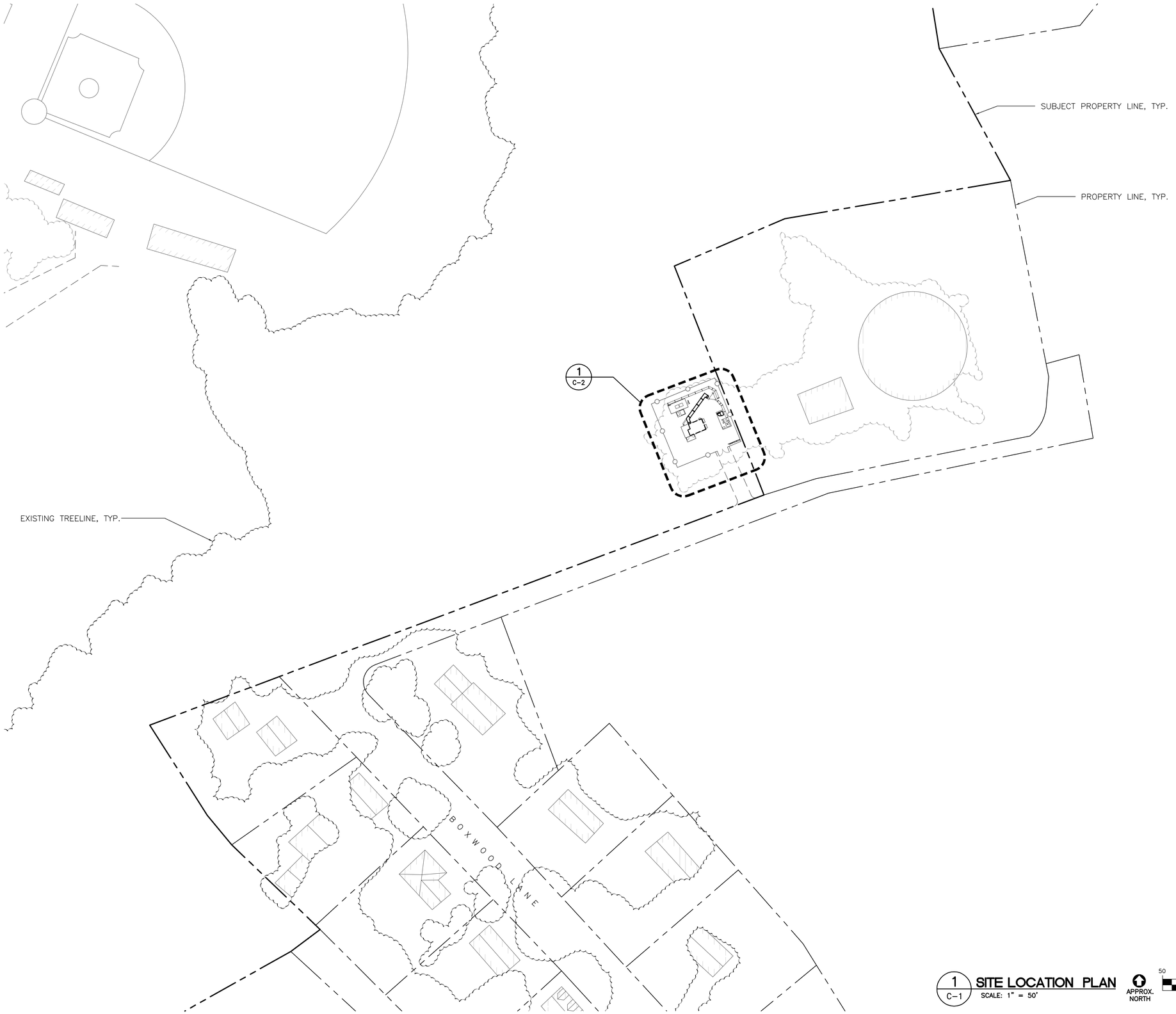
SCALE: AS NOTED

JOB NO. 19027.54

DESIGN BASIS AND SITE NOTES

N-1

Sheet No. 2 of 7



1 / C-1 **SITE LOCATION PLAN**
SCALE: 1" = 50'

APPROX. NORTH

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

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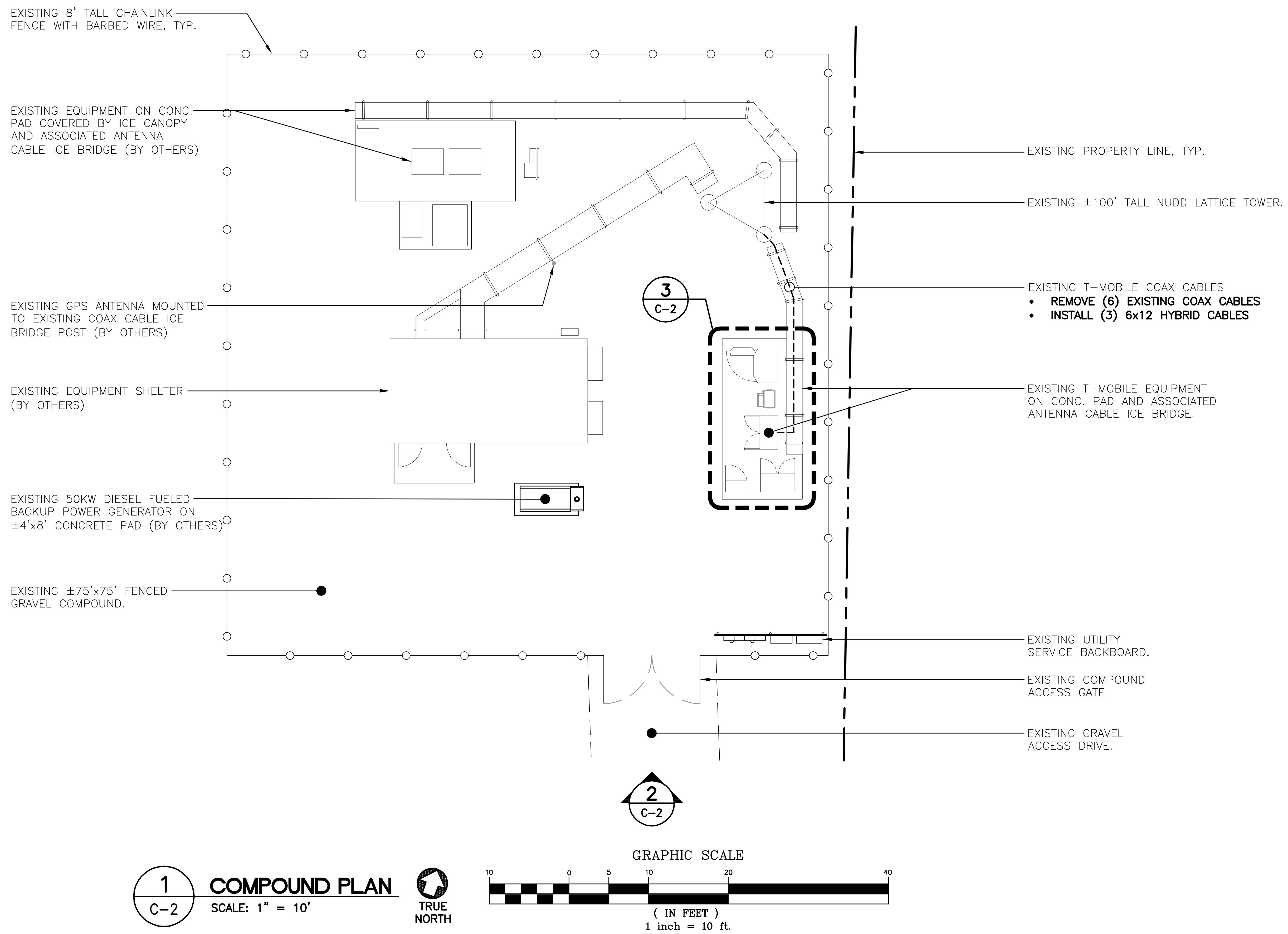
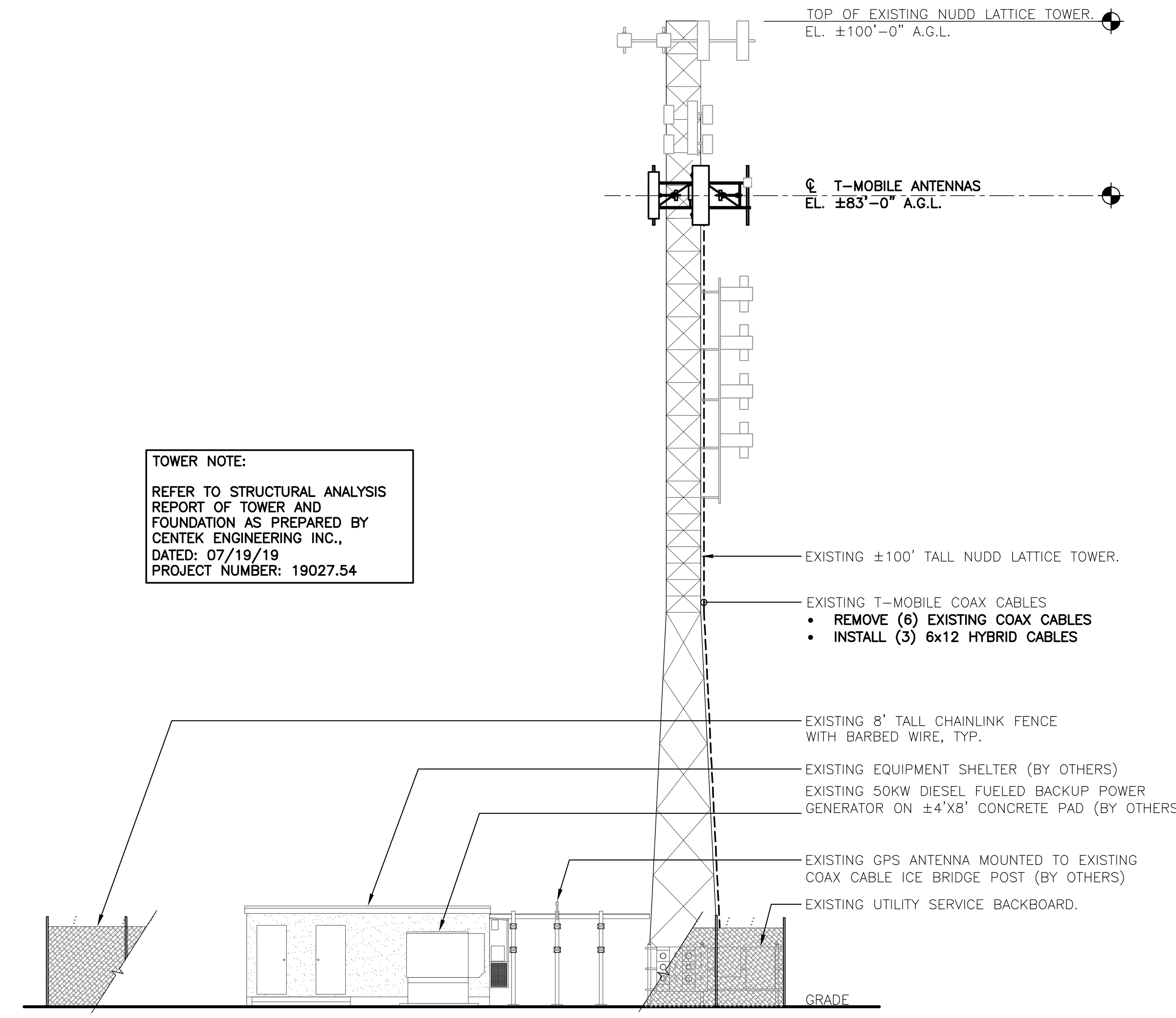
SITE LOCATION PLAN

C-1

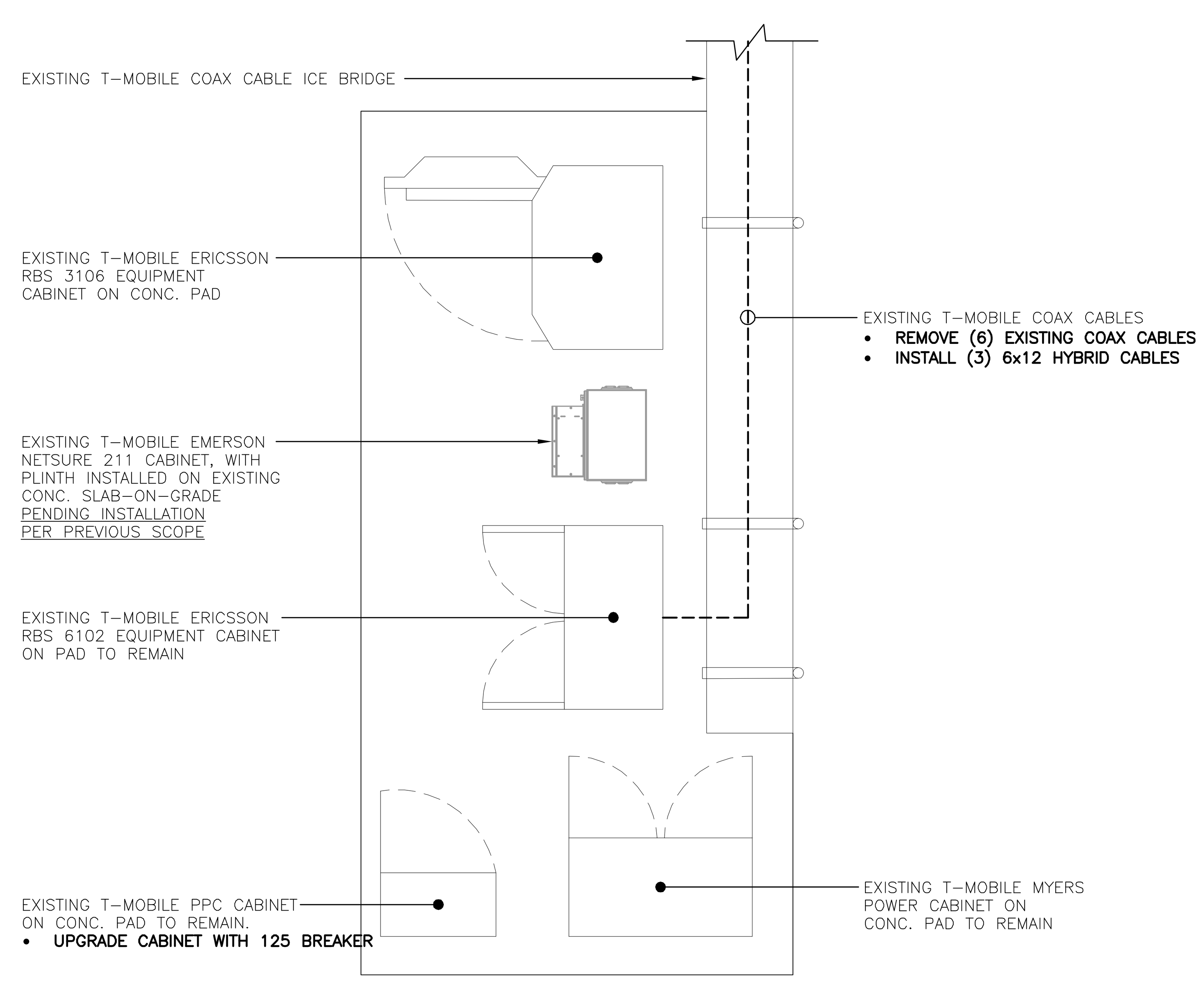
Sheet No. 3 of 7



1 C-2 **COMPOUND PLAN**
SCALE: 1" = 10'



2 C-2 **NORTH TOWER ELEVATION - PROPOSED**
SCALE: 1" = 10'



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

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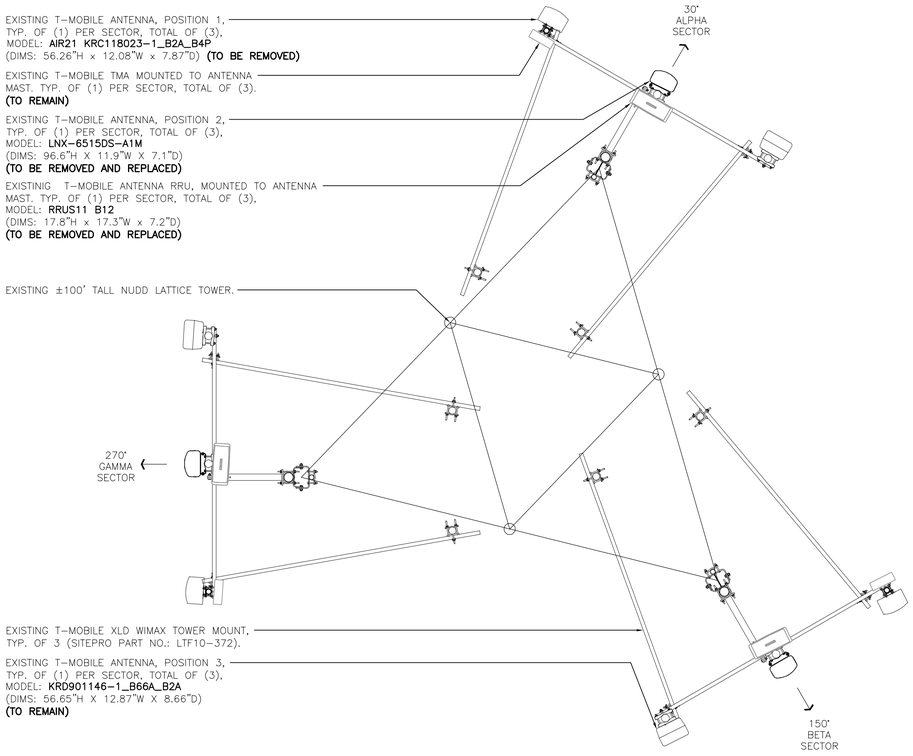
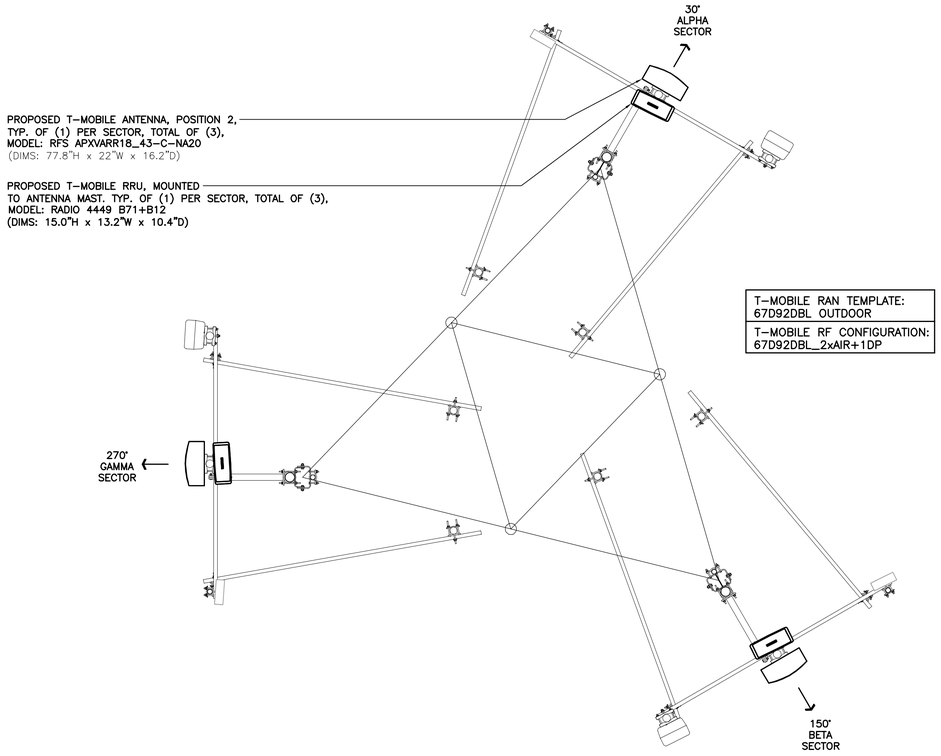
COMPOUND PLAN, AND ELEVATION

C-2

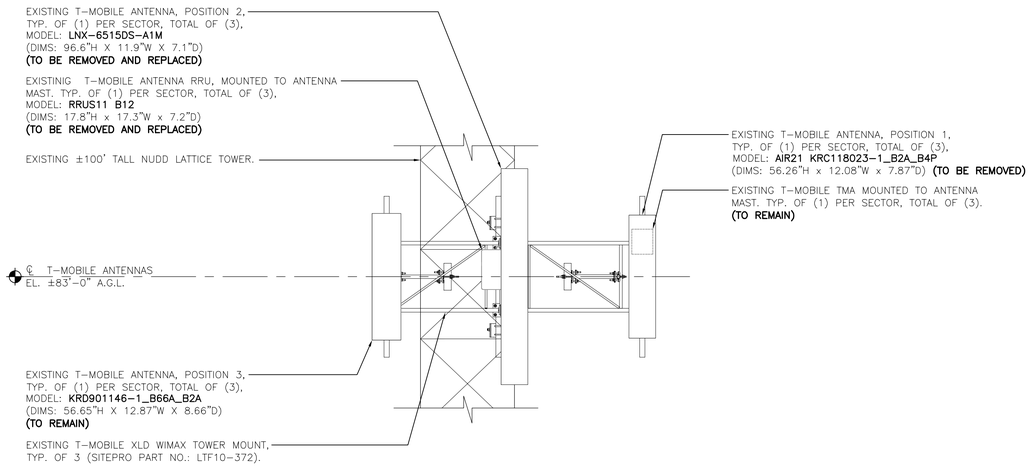
Sheet No. 4 of 7



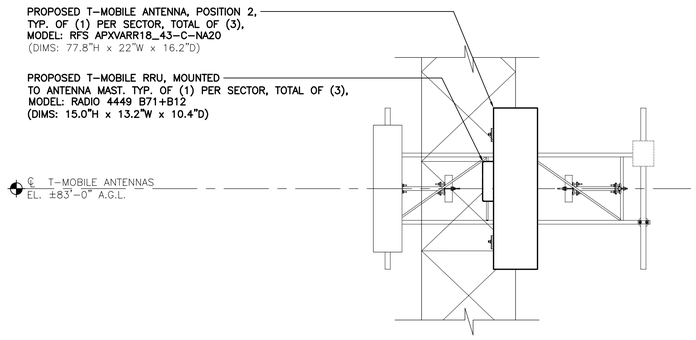
1 C-3 **EXISTING ANTENNA MOUNTING CONFIGURATION** SCALE: 3/8" = 1' — 83' ELEVATION — TRUE NORTH



2 C-3 **PROPOSED ANTENNA MOUNTING CONFIGURATION** SCALE: 3/8" = 1' — 83' ELEVATION — TRUE NORTH



3 C-3 **ANTENNA ELEVATION - EXISTING** SCALE: 3/8" = 1'



4 C-3 **ANTENNA ELEVATION - PROPOSED** SCALE: 3/8" = 1'

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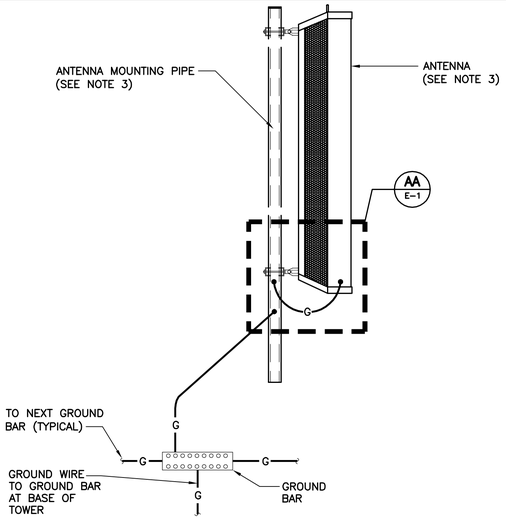
ANTENNA MOUNTING CONFIGURATION

C-3

Sheet No. 5 of 7

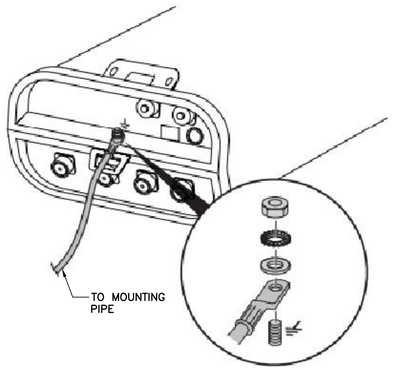


NOTES:

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

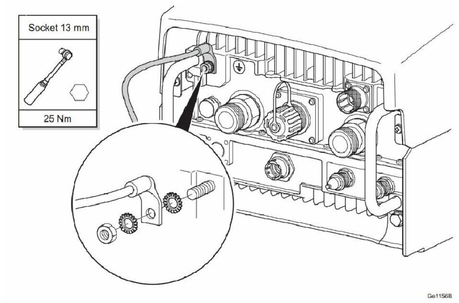
1 / E-1 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NONE



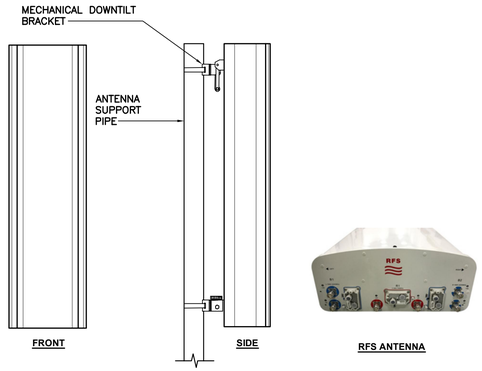
AA / E-1 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NOT TO SCALE



2 / E-1 TYPICAL RRU GROUNDING DETAIL

NOT TO SCALE



ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: RFS MODEL: APXVARR18_43-C-NA20	72.0"H x 19.7"W x 8.5"D	73.9 LBS

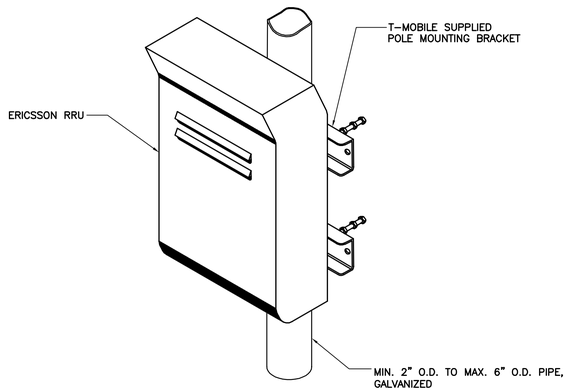
3 / E-1 PROPOSED ANTENNAS DETAIL

SCALE: NOT TO SCALE

RRH (REMOTE RADIO HEAD)		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ERICSSON MODEL: RRU 4449 B71+B12	14.9"H x 13.2"W x 9.3"D	±74 LBS

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

SCALE: NOT TO SCALE



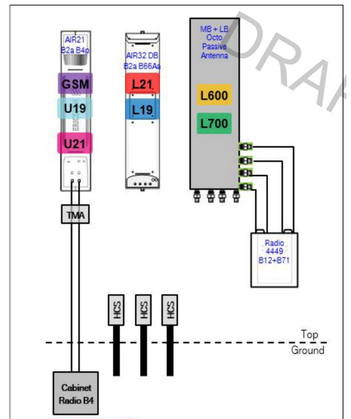
ISOMETRIC VIEW

NOTES:

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

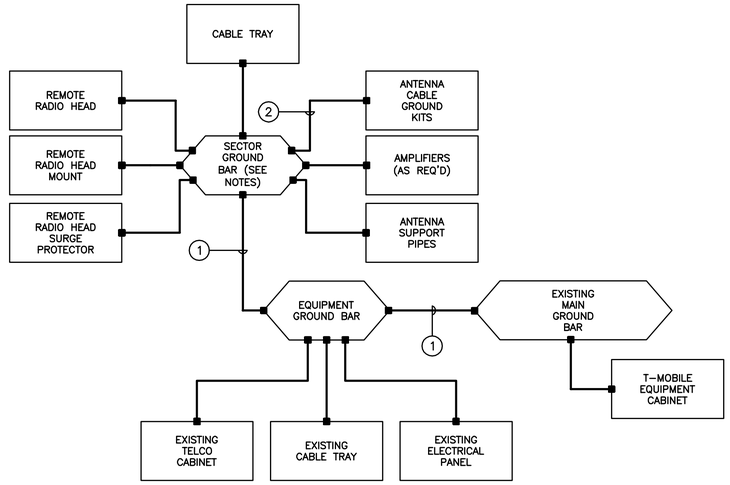
5 / E-1 TYPICAL RRUS MOUNTING DETAILS

SCALE: NOT TO SCALE



6 / E-1 PROPOSED PLUMBING DIAGRAM

SCALE: NONE



GROUNDING SCHEMATIC NOTES

(1) #2 AWG

(2) #6 AWG

GENERAL NOTES:

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

7 / E-1 TYPICAL GROUNDING SCHEMATIC DETAIL

SCALE: NOT TO SCALE

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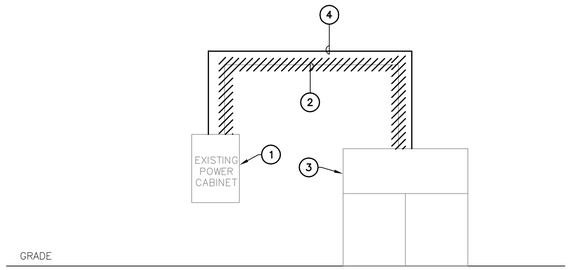
TYPICAL ELECTRICAL DETAILS

E-1

Sheet No. 6 of 7

RISER DIAGRAM NOTES

1. EXISTING POWER CABINET TO REMAIN
2. EXISTING CONDUITS, CONDUCTORS AND ASSOCIATED CIRCUIT BREAKER TO BE REMOVED.
3. EXISTING RADIO CABINET TO REMAIN
4. (3) #1 AWG, (1) #6 AWG GROUND, 1-1/2" CONDUIT CONNECTED TO NEW 125A/2P CIRCUIT BREAKER.



1 / E-2 **ELECTRICAL POWER RISER DIAGRAM**
SCALE: NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

E-2

Sheet No. 7 of 7

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

100' Existing NUDD Lattice Tower

Proposed T-Mobile
Antenna Upgrade (L600)

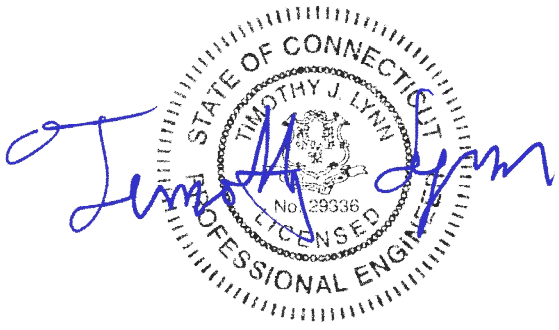
T-Mobile Site Ref: CTFF703A

303 Boxwood Lane
Danbury, CT

Centek Project No. 19027.54

~~Date: May 20, 2019~~
Rev 1: July 19, 2019

Max Stress Ratio = 99.3%



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by T-Mobile on the existing self supporting lattice tower located in Danbury, Connecticut.

The host tower is a 100-ft, three-legged self-support lattice tower originally designed and manufactured by Fred A. Nudd Corporation; file no: 96-4992 dated January 21, 1997. Subsequent reinforcements were made to the tower per Centek job no. 361A dated November 28, 2001 and Centek job no. 10106 dated August 16, 2010. The tower geometry, structure member sizes and the foundation system information were taken from the aforementioned design documents.

Antenna and appurtenance information were obtained from a previous structural report prepared by Centek job no. 18027.00 dated August 14, 2018 and a RF data sheet.

The tower is made up of five (5) steel sections consisting of A500-42, A500-50, and A500-61ksi pipe legs. Diagonal lateral support bracing consists of A36 single angle and steel rod construction. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by welded connections (40'-100'), bolted and welded gusset connections (0'-40'). The tower face width is 7.5-ft at the bottom tapering to 3.5-ft at the top.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- Unknown (Existing):
  Antennas: One (1) 3' parabolic grid antenna with a RAD center elevation of 96-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Sprint (Existing/Reserved):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas, six (6) Alcatel-Lucent 1900 MHz RRH's, three (3) Alcatel-Lucent 800 MHz RRH's and three (3) Alcatel-Lucent TD-RRH8x20 remote radio heads mounted on three (3) sector frames with a RAD center elevation of 89-ft above the existing tower base.
  Coax Cables: Four (4) 1-1/4" ∅ fiber cables and one (1) RET cable.
- WCSU FM (Existing):
  Antennas: One (1) 4-Bay Shively Labs 6810 FM Antenna w/ Radomes with a RAD center elevation of 65-ft above the existing tower base.
  Coax Cables: One (1) 1 5/8" ∅ coax cable.
- Sprint (Existing):
  Antennas: (1) GPS antenna mounted to a 2' standoff mount with a RAD center elevation of 30-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.

- AT&T Mobility (Existing to Remain):
  Antennas: Six (6) CCI OPA-65R-LUCC-H4 panel antennas, three (3) Commscope SBNHH-1D65A panel antennas, six (6) Ericsson RRUS-11 remote radio heads, three (3) Ericsson RRUS-12 remote radio heads, three (3) Ericsson RRUS-32 remote radio heads, three (3) Ericsson RRUS-32 B2 remote radio heads, three (3) Ericsson RRUS-32 B66 remote radio heads, three (3) Ericsson RRUS-E2 remote radio heads and three (3) Raycap DC6-48-60-18-8F surge arrestors mounted on (3) sector mounts with a RAD center elevation of 98-ft above the existing tower base.
  Coax Cables: Three (3) fiber cable, six (6) dc control cables and six (6) RET cables running on a face of the existing tower.
- T-Mobile: (Existing to Remain):
  Antennas: Three (3) AIR32 panel antennas and three (3) TMAs mounted on three (3) 10-ft T-Frames with RAD center elevations of 83-ft above the existing tower base.
  Coax Cables: Six (6) 1 5/8" ∅ coax cables and one (1) 9x18 fiber cable running on a leg/face of the tower.
- T-Mobile: (Existing to Remove):
  Antennas: Three (3) Ericsson AIR21 panel antennas, three (3) Andrew LNX-6515DS panel antennas and three (3) Ericsson RRUS-11 remote radio heads mounted on three (3) 10-ft T-Frames with RAD center elevations of 81.5-ft above the existing tower base.
  Coax Cables: Six (6) 1 5/8" ∅ coax cables running on a leg/face of the tower.
- **T-Mobile: (Proposed):**
  Antennas: Three (3) RFS APXVAARR18_43 panel antennas and three (3) Ericsson 4449 B71 B12 remote radio heads mounted on three (3) 10-ft T-Frames with RAD center elevations of 81.5-ft above the existing tower base.
  Coax Cables: Three (3) 6x12 fiber cables running on a leg/face of the tower.

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.
- 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 shall be routed as specified on in Section 3 of this report.

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Danbury; v = 93 mph (3 second gust)	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 93 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

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

Tower Capacity

- Calculated stresses **were found** to be within allowable limits. This tower was found to be at **99.3%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T4)	40'-0"-53'-4"	99.3%	**PASS**
Diagonal (T2)	60'-0"-80'-0"	95.3%	**PASS**

Foundation and Anchors

The existing foundation consists of three (3) 2.0-ft ∅ x 4.25-ft long reinforced concrete piers on a 14.5-ft square x 3-ft thick reinforced concrete pad bearing directly on existing sub grade. The existing foundation dimensions and sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned manufacturers original design documents; Fred A. Nudd Corporation; file no: 96-4992. Tower legs are connected to the foundation by means of (4) 1.5" ∅, ASTM A36 anchor bolts per leg, embedded into the concrete foundation structure.

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

Reactions	Vector	Proposed Base Reactions
Base	Shear	**14 kips**
	Compression	**24 kips**
	Moment	**978 kip-ft**
Leg	Shear	**11 kips**
	Compression	**158 kips**
	Uplift	**142 kips**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	61.1%	**PASS**

- 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 Mat	OTM[2]	1.0	1.57	**PASS**

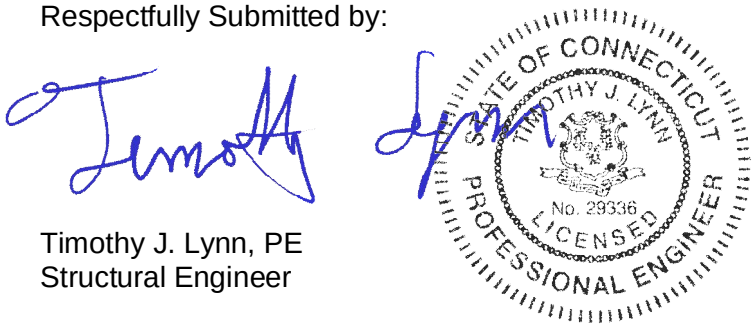
C o n c l u s i o n

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 provide to CENTEK engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the “as new” condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. CENTEK engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

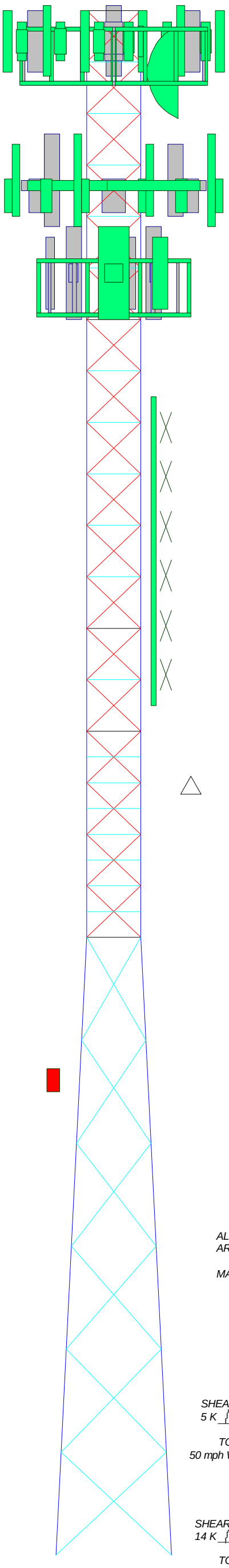
General Description of Structural Analysis Program

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

tnxTower Features:

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

Section	T1	T2	T3	T4	T5	T6
Legs	P2.5x.276	P2.5x.276 (GR)	P3x.3 (GR)	P3x.3 (GR)	P5x.258 (GR)	P5x.258 (GR)
Leg Grade	A500-50	A500-50	A500M-61	A500M-61	A500-42	A500-42
Diagonals	SR 5/8	SR 5/8	SR 3/4	SR 3/4	L2x2x3/16	L2 1/2x2 1/2x3/16
Diagonal Grade	A36	A36	A36	A36	A36	A36
Top Girts	L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16	N.A.	N.A.
Bottom Girts	N.A.	N.A.	2L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16	N.A.	N.A.
Horizontals	N.A.	N.A.	2L1 1/2x1 1/2x3/16	L2 1/2x2 1/2x5/16	N.A.	N.A.
Sec. Horizontals	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Face Width (ft) 7.5	3.5	3.5	2 @ 3.335	4 @ 3.3325	5.5	6 @ 6.66667
# Panels @ (ft)	12 @ 3.33333	12 @ 3.33333	2 @ 3.335	4 @ 3.3325	6 @ 6.66667	6 @ 6.66667
Weight (K) 8.8	0.8	1.1	0.5	1.3	2.5	2.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) OPA-65R-LCUU-H4 (ATI - Existing)	98	APXVTM14 (Sprint - Existing)	89
(2) OPA-65R-LCUU-H4 (ATI - Existing)	98	APXVTM14 (Sprint - Existing)	89
(2) OPA-65R-LCUU-H4 (ATI - Existing)	98	13-ft T-Frame (Sprint - Existing)	89
SBNHH-1D65A (ATI - Existing)	98	13-ft T-Frame (Sprint - Existing)	89
SBNHH-1D65A (ATI - Existing)	98	13-ft T-Frame (Sprint - Existing)	89
SBNHH-1D65A (ATI - Existing)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
(2) RRUS-11 (ATI - Existing)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
RRUS-12 (ATI - Existing)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
RRUS-32 (ATI - Existing)	98	TD-RRH8x20-25 (Sprint - Existing)	88
(2) RRUS-32 (ATI - Existing)	98	TD-RRH8x20-25 (Sprint - Existing)	88
RRUS-E2 (ATI - Existing)	98	TD-RRH8x20-25 (Sprint - Existing)	88
(2) RRUS-11 (ATI - Existing)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
RRUS-12 (ATI - Existing)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
RRUS-32 (ATI - Existing)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
(2) RRUS-32 (ATI - Existing)	98	APXVAARR18-43 (T-Mobile - Proposed)	83
RRUS-E2 (ATI - Existing)	98	APXVAARR18-43 (T-Mobile - Proposed)	83
(2) RRUS-11 (ATI - Existing)	98	APXVAARR18-43 (T-Mobile - Proposed)	83
RRUS-12 (ATI - Existing)	98	AIR32 (T-Mobile - Existing)	83
RRUS-32 (ATI - Existing)	98	AIR32 (T-Mobile - Existing)	83
(2) RRUS-32 (ATI - Existing)	98	AIR32 (T-Mobile - Existing)	83
RRUS-E2 (ATI - Existing)	98	Radio 4449 B71 B12 (T-Mobile - Proposed)	83
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	98	Radio 4449 B71 B12 (T-Mobile - Proposed)	83
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	98	Radio 4449 B71 B12 (T-Mobile - Proposed)	83
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	98	10-ft T-Frame (T-Mobile - Existing)	82
12' Boom Starmount (ATI - Existing)	97	10-ft T-Frame (T-Mobile - Existing)	82
Mount Mods (ATI - Existing)	97	10-ft T-Frame (T-Mobile - Existing)	82
12' Boom Starmount (ATI - Existing)	97	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
Mount Mods (ATI - Existing)	97		
12' Boom Starmount (ATI - Existing)	97	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
Mount Mods (ATI - Existing)	97		
Parabolic Grid	96	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
APXVSPP18-C-A20 (Sprint - Existing)	89	6810 4 Bay	65
APXVSPP18-C-A20 (Sprint - Existing)	89	2.5" Tube x 2' Standoff (Sprint)	30
APXVSPP18-C-A20 (Sprint - Existing)	89	GPS (Sprint)	30
APXVTM14 (Sprint - Existing)	89		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A500M-61	61 ksi	75 ksi
A36	36 ksi	58 ksi	A500-42	42 ksi	58 ksi

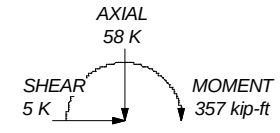
TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 93 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. Grouted pipe f'c is 5 ksi
8. 3/4" dia SR used for sections T3 _T4 to account for 5/8" SR with 1/4" bar
9. TOWER RATING: 99.3%

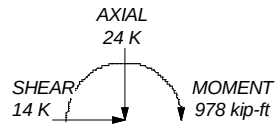
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 158 K
SHEAR: 11 K

UPLIFT: -142 K
SHEAR: 10 K



TORQUE 2 kip-ft
50 mph WIND - 0.7500 in ICE



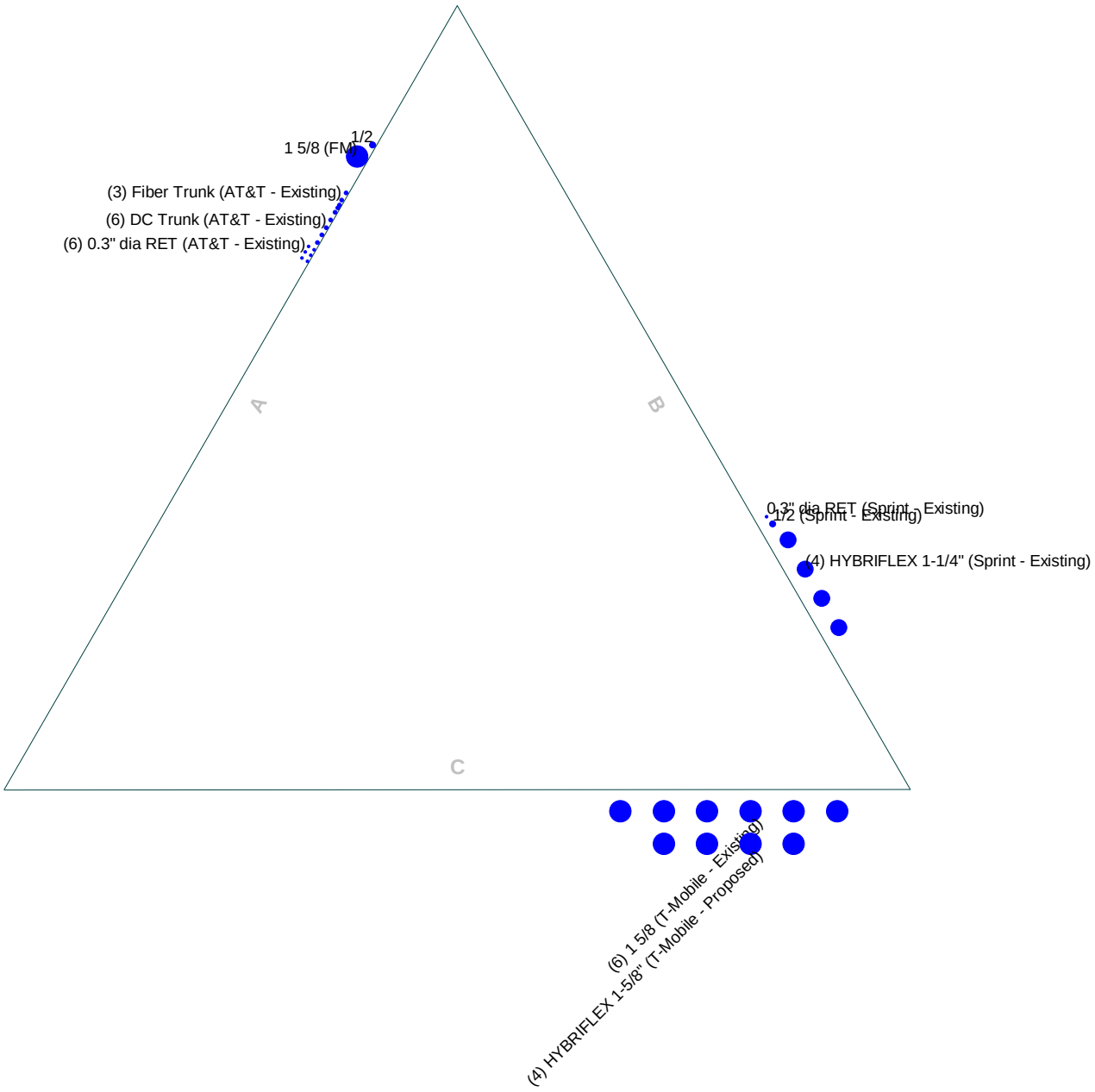
TORQUE 5 kip-ft
REACTIONS - 93 mph WIND

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

Job: 19027.54 - CTFF703A			
Project: 100' Nudd Lattice - 303 Boxwood Lane, Danbury, CT			
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 07/19/19	Scale: NTS	
Path:		Dwg No. E-1	

Feed Line Plan

Round Flat App In Face App Out Face

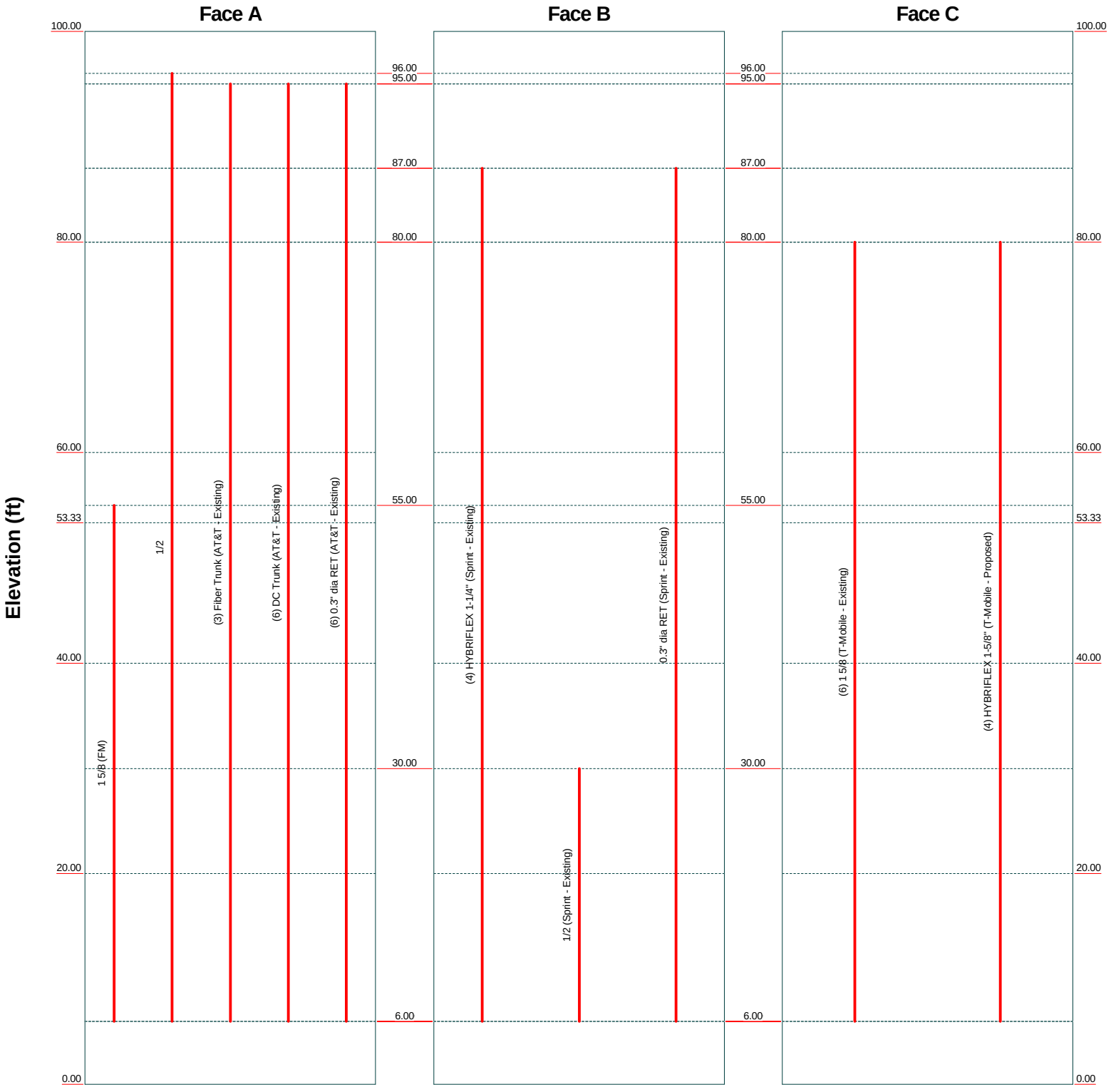


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	***19027.54 - CTFF703A***		
Project:	***100' Nudd Lattice - 303 Boxwood Lane, Danbury, CT***		
Client: T-Mobile		Drawn by: TJL	App'd:
Code: TIA-222-G		Date: 07/19/19	Scale: NTS
Path:			Dwg No. E-7

Feed Line Distribution Chart
0' - 100'

Round | Flat | App In Face | App Out Face | Truss Leg



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Job: **19027.54 - CTFF703A**		
Project: ***100' Nudd Lattice - 303 Boxwood Lane, Danbury, CT***		
Client: T-Mobile	Drawn by: TJL	App'd:
Code: TIA-222-G	Date: 07/19/19	Scale: NTS
Path:		Dwg No. E-7

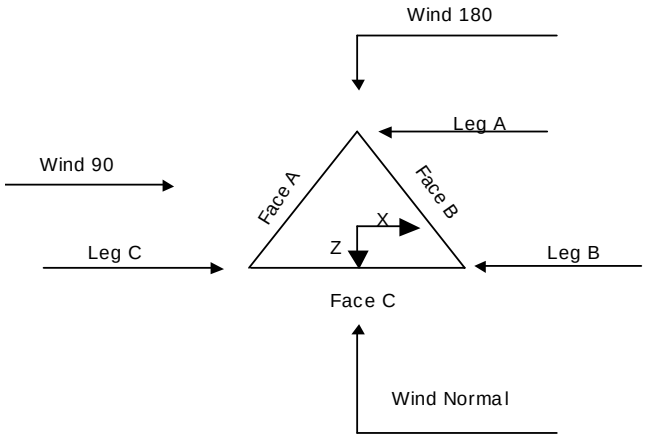
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 100.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 3.50 ft at the top and 7.50 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 93 mph.
Structure Class II.
Exposure Category B.
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.
3/4" dia SR used for sections T3 & T4 to account for 5/8" SR with 1/4" bar.
Tension only take-up is 0.0313 in.
A non-linear (P-delta) analysis was used.
Grouted pipe f'_c is 5 ksi.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	100.00-80.00			3.50	1	20.00
T2	80.00-60.00			3.50	1	20.00
T3	60.00-53.33			3.50	1	6.67
T4	53.33-40.00			3.50	1	13.33
T5	40.00-20.00			3.50	1	20.00
T6	20.00-0.00			5.50	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	100.00-80.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T2	80.00-60.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T3	60.00-53.33	3.34	TX Brace	No	Yes	0.0000	0.0000
T4	53.33-40.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T5	40.00-20.00	6.67	X Brace	No	No	0.0000	0.0000
T6	20.00-0.00	6.67	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 100.00-80.00	Pipe	P2.5x.276	A500-50 (50 ksi)	Solid Round	5/8	A36 (36 ksi)
T2 80.00-60.00	Grouted Pipe	P2.5x.276	A500-50 (50 ksi)	Solid Round	5/8	A36 (36 ksi)
T3 60.00-53.33	Grouted Pipe	P3x.3	A500M-61 (61 ksi)	Solid Round	3/4	A36 (36 ksi)
T4 53.33-40.00	Grouted Pipe	P3x.3	A500M-61 (61 ksi)	Solid Round	3/4	A36 (36 ksi)
T5 40.00-20.00	Grouted Pipe	P5x.258	A500-42 (42 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T6 20.00-0.00	Grouted Pipe	P5x.258	A500-42 (42 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 100.00-80.00	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T2 80.00-60.00	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 60.00-53.33	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T4 53.33-40.00	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 100.00-80.00	None	Solid Round		A572-50 (50 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T2 80.00-60.00	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 60.00-53.33	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T4 53.33-40.00	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T4 53.33-40.00	Equal Angle	L2 1/2x2 1/2x5/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 60.00-53.33	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 53.33-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	Yes	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
60.00-53.33				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
53.33-40.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T6 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 100.00-80.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 80.00-60.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 60.00-53.33	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 53.33-40.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 40.00-20.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 20.00-0.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 100.00-80.00	Flange	0.7500 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T2 80.00-60.00	Flange	0.7500 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T3 60.00-53.33	Flange	0.7500 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T4 53.33-40.00	Flange	1.0000 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.7500 A325N	1
T5 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T6 20.00-0.00	Flange	1.5000 A36	4	0.6250 A325N	1	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0

Grouted Pipe Properties

Size	F_y ksi	A_s in^2	A_c in^2	Wt plf	E_c ksi	E_m ksi	F_{ym} ksi
P2.5x.276 (GR)	50	2.2535	4.2383	16.498	4031	35064	58
P3x.3 (GR)	55	3.0159	6.6052	24.023	4031	36062	64
P5x.258 (GR)	42	4.2999	20.0058	56.310	4031	44002	62

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (FM)	A	No	No	Ar (CaAa)	55.00 - 6.00	0.0000	0.3	1	1	1.9800	1.9800		1.04

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1/2	A	No	No	Ar (CaAa)	96.00 - 6.00	0.0000	0.32	1	1	0.5800	0.5800		0.25
HYBRIFLEX 1-1/4" (Sprint - Existing)	B	No	No	Ar (CaAa)	87.00 - 6.00	1.0000	0.25	4	4	1.5400	1.5400		1.30
1/2 (Sprint - Existing)	B	No	No	Ar (CaAa)	30.00 - 6.00	1.0000	0.17	1	1	0.5800	0.5800		0.25
0.3" dia RET (Sprint - Existing)	B	No	No	Ar (CaAa)	87.00 - 6.00	1.0000	0.16	1	1	0.3000	0.3000		0.00
1 5/8 (T-Mobile - Existing)	C	No	No	Ar (CaAa)	80.00 - 6.00	1.0000	-0.3	6	6	1.9800	1.9800		1.04
Fiber Trunk (AT&T - Existing)	A	No	No	Ar (CaAa)	95.00 - 6.00	0.0000	0.25	3	3	0.4000	0.4000		1.00
DC Trunk (AT&T - Existing)	A	No	No	Ar (CaAa)	95.00 - 6.00	0.0000	0.22	6	6	0.4000	0.4000		0.11
0.3" dia RET (AT&T - Existing)	A	No	No	Ar (CaAa)	95.00 - 6.00	0.0000	0.18	6	3	0.3000	0.3000		0.00
HYBRIFLEX 1-5/8" (T-Mobile - Proposed)	C	No	No	Ar (CaAa)	80.00 - 6.00	4.0000	-0.3	4	4	1.9800	1.9800		1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	100.00-80.00	A	0.000	0.000	9.028	0.000	0.06
		B	0.000	0.000	4.522	0.000	0.04
		C	0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	0.000	0.000	11.960	0.000	0.08
		B	0.000	0.000	12.920	0.000	0.10
		C	0.000	0.000	39.600	0.000	0.28
T3	60.00-53.33	A	0.000	0.000	4.319	0.000	0.03
		B	0.000	0.000	4.309	0.000	0.03
		C	0.000	0.000	13.207	0.000	0.09
T4	53.33-40.00	A	0.000	0.000	10.611	0.000	0.07
		B	0.000	0.000	8.611	0.000	0.07
		C	0.000	0.000	26.393	0.000	0.18
T5	40.00-20.00	A	0.000	0.000	15.920	0.000	0.10
		B	0.000	0.000	13.500	0.000	0.11
		C	0.000	0.000	39.600	0.000	0.28
T6	20.00-0.00	A	0.000	0.000	11.144	0.000	0.07
		B	0.000	0.000	9.856	0.000	0.08
		C	0.000	0.000	27.720	0.000	0.19

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	100.00-80.00	A	1.658	0.000	0.000	46.460	0.000	0.47
		B		0.000	0.000	15.578	0.000	0.22
		C		0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	1.617	0.000	0.000	60.411	0.000	0.60
		B		0.000	0.000	44.082	0.000	0.60
		C		0.000	0.000	108.560	0.000	1.65
T3	60.00-53.33	A	1.583	0.000	0.000	20.728	0.000	0.21
		B		0.000	0.000	14.585	0.000	0.20
		C		0.000	0.000	36.068	0.000	0.54
T4	53.33-40.00	A	1.553	0.000	0.000	45.987	0.000	0.49
		B		0.000	0.000	28.938	0.000	0.39
		C		0.000	0.000	71.835	0.000	1.07
T5	40.00-20.00	A	1.486	0.000	0.000	67.075	0.000	0.69
		B		0.000	0.000	46.276	0.000	0.60
		C		0.000	0.000	106.967	0.000	1.56
T6	20.00-0.00	A	1.331	0.000	0.000	43.859	0.000	0.42
		B		0.000	0.000	33.334	0.000	0.40
		C		0.000	0.000	73.573	0.000	1.01

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	100.00-80.00	0.4209	-2.2572	-0.0504	-3.1381
T2	80.00-60.00	6.1208	4.4167	4.9496	2.4342
T3	60.00-53.33	5.7532	4.0206	4.7332	2.2449
T4	53.33-40.00	4.8271	3.1061	3.3018	1.3676
T5	40.00-20.00	5.7914	3.4515	6.5722	2.4602
T6	20.00-0.00	5.6951	3.2122	7.7701	2.8135

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	2	1/2	80.00 - 96.00	0.6000	0.4243
T1	4	HYBRIFLEX 1-1/4"	80.00 - 87.00	0.6000	0.4243
T1	6	0.3" dia RET	80.00 - 87.00	0.6000	0.4243
T1	9	Fiber Trunk	80.00 - 95.00	0.6000	0.4243
T1	10	DC Trunk	80.00 - 95.00	0.6000	0.4243
T1	11	0.3" dia RET	80.00 - 95.00	0.6000	0.4243
T2	2	1/2	60.00 - 80.00	0.6000	0.4331
T2	4	HYBRIFLEX 1-1/4"	60.00 - 80.00	0.6000	0.4331
T2	6	0.3" dia RET	60.00 - 80.00	0.6000	0.4331
T2	7	1 5/8	60.00 - 80.00	0.6000	0.4331
T2	9	Fiber Trunk	60.00 - 80.00	0.6000	0.4331
T2	10	DC Trunk	60.00 - 80.00	0.6000	0.4331
T2	11	0.3" dia RET	60.00 - 80.00	0.6000	0.4331
T2	14	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.4331
T3	1	1 5/8	53.33 - 55.00	0.6000	0.4183

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T3	2	1/2	53.33 - 60.00	0.6000	0.4183
T3	4	HYBRIFLEX 1-1/4"	53.33 - 60.00	0.6000	0.4183
T3	6	0.3" dia RET	53.33 - 60.00	0.6000	0.4183
T3	7	1 5/8	53.33 - 60.00	0.6000	0.4183
T3	9	Fiber Trunk	53.33 - 60.00	0.6000	0.4183
T3	10	DC Trunk	53.33 - 60.00	0.6000	0.4183
T3	11	0.3" dia RET	53.33 - 60.00	0.6000	0.4183
T3	14	HYBRIFLEX 1-5/8"	53.33 - 60.00	0.6000	0.4183
T4	1	1 5/8	40.00 - 53.33	0.6000	0.2922
T4	2	1/2	40.00 - 53.33	0.6000	0.2922
T4	4	HYBRIFLEX 1-1/4"	40.00 - 53.33	0.6000	0.2922
T4	6	0.3" dia RET	40.00 - 53.33	0.6000	0.2922
T4	7	1 5/8	40.00 - 53.33	0.6000	0.2922
T4	9	Fiber Trunk	40.00 - 53.33	0.6000	0.2922
T4	10	DC Trunk	40.00 - 53.33	0.6000	0.2922
T4	11	0.3" dia RET	40.00 - 53.33	0.6000	0.2922
T4	14	HYBRIFLEX 1-5/8"	40.00 - 53.33	0.6000	0.2922
T5	1	1 5/8	20.00 - 40.00	0.6000	0.5531
T5	2	1/2	20.00 - 40.00	0.6000	0.5531
T5	4	HYBRIFLEX 1-1/4"	20.00 - 40.00	0.6000	0.5531
T5	5	1/2	20.00 - 30.00	0.6000	0.5531
T5	6	0.3" dia RET	20.00 - 40.00	0.6000	0.5531
T5	7	1 5/8	20.00 - 40.00	0.6000	0.5531
T5	9	Fiber Trunk	20.00 - 40.00	0.6000	0.5531
T5	10	DC Trunk	20.00 - 40.00	0.6000	0.5531
T5	11	0.3" dia RET	20.00 - 40.00	0.6000	0.5531
T5	14	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.5531
T6	1	1 5/8	6.00 - 20.00	0.6000	0.6000
T6	2	1/2	6.00 - 20.00	0.6000	0.6000
T6	4	HYBRIFLEX 1-1/4"	6.00 - 20.00	0.6000	0.6000
T6	5	1/2	6.00 - 20.00	0.6000	0.6000
T6	6	0.3" dia RET	6.00 - 20.00	0.6000	0.6000
T6	7	1 5/8	6.00 - 20.00	0.6000	0.6000
T6	9	Fiber Trunk	6.00 - 20.00	0.6000	0.6000
T6	10	DC Trunk	6.00 - 20.00	0.6000	0.6000
T6	11	0.3" dia RET	6.00 - 20.00	0.6000	0.6000
T6	14	HYBRIFLEX 1-5/8"	6.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) OPA-65R-LCUU-H4 (AT&T - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	5.94 6.28 6.62	3.36 3.66 3.97	0.06 0.10 0.14
(2) OPA-65R-LCUU-H4 (AT&T - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	5.94 6.28 6.62	3.36 3.66 3.97	0.06 0.10 0.14
(2) OPA-65R-LCUU-H4 (AT&T - Existing)	C	From Leg	3.00 0.00	0.0000	98.00	No Ice 1/2" Ice	5.94 6.28	3.36 3.66	0.06 0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	6.62	3.97	0.14
SBNHH-1D65A	A	From Leg	3.00	0.0000	98.00	No Ice	5.88	3.86	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.25	4.22	0.08
			0.00			1" Ice	6.62	4.57	0.12
SBNHH-1D65A	B	From Leg	3.00	0.0000	98.00	No Ice	5.88	3.86	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.25	4.22	0.08
			0.00			1" Ice	6.62	4.57	0.12
SBNHH-1D65A	C	From Leg	3.00	0.0000	98.00	No Ice	5.88	3.86	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.25	4.22	0.08
			0.00			1" Ice	6.62	4.57	0.12
(2) RRUS-11	A	From Leg	2.00	0.0000	98.00	No Ice	2.57	1.07	0.05
(AT&T - Existing)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-12	A	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
RRUS-32	A	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
(2) RRUS-32	A	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-E2	A	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
(2) RRUS-11	B	From Leg	2.00	0.0000	98.00	No Ice	2.57	1.07	0.05
(AT&T - Existing)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-12	B	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
RRUS-32	B	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
(2) RRUS-32	B	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-E2	B	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
(2) RRUS-11	C	From Leg	2.00	0.0000	98.00	No Ice	2.57	1.07	0.05
(AT&T - Existing)			0.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-12	C	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
RRUS-32	C	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
(2) RRUS-32	C	From Leg	2.00	0.0000	98.00	No Ice	3.31	2.42	0.08
(AT&T - Existing)			0.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-E2	C	From Leg	2.00	0.0000	98.00	No Ice	3.15	1.29	0.06
(AT&T - Existing)			0.00			1/2" Ice	3.36	1.44	0.08
			0.00			1" Ice	3.59	1.60	0.11
DC6-48-60-18-8F Surge Arrestor	A	From Leg	0.00	0.0000	98.00	No Ice	1.91	1.91	0.02
			0.00			1/2" Ice	2.10	2.10	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - Existing)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge	B	From Leg	0.00	0.0000	98.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T - Existing)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge	C	From Leg	0.00	0.0000	98.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T - Existing)			0.00			1" Ice	2.29	2.29	0.06
12' Boom Starmount	A	From Leg	1.50	0.0000	97.00	No Ice	15.00	8.00	0.47
(AT&T - Existing)			0.00			1/2" Ice	20.00	11.00	0.68
			0.00			1" Ice	26.00	14.00	0.88
Mount Mods	A	From Leg	1.50	0.0000	97.00	No Ice	5.00	5.00	0.12
(AT&T - Existing)			0.00			1/2" Ice	8.00	8.00	0.15
			0.00			1" Ice	11.00	11.00	0.18
12' Boom Starmount	B	From Leg	1.50	0.0000	97.00	No Ice	15.00	8.00	0.47
(AT&T - Existing)			0.00			1/2" Ice	20.00	11.00	0.68
			0.00			1" Ice	26.00	14.00	0.88
Mount Mods	B	From Leg	1.50	0.0000	97.00	No Ice	5.00	5.00	0.12
(AT&T - Existing)			0.00			1/2" Ice	8.00	8.00	0.15
			0.00			1" Ice	11.00	11.00	0.18
12' Boom Starmount	C	From Leg	1.50	0.0000	97.00	No Ice	15.00	8.00	0.47
(AT&T - Existing)			0.00			1/2" Ice	20.00	11.00	0.68
			0.00			1" Ice	26.00	14.00	0.88
Mount Mods	C	From Leg	1.50	0.0000	97.00	No Ice	5.00	5.00	0.12
(AT&T - Existing)			0.00			1/2" Ice	8.00	8.00	0.15
			0.00			1" Ice	11.00	11.00	0.18
Parabolic Grid	B	From Leg	0.50	0.0000	96.00	No Ice	1.20	1.20	0.02
			0.00			1/2" Ice	2.00	2.00	0.04
			0.00			1" Ice	2.80	2.80	0.06
APXVSPP18-C-A20	A	From Leg	3.00	0.0000	89.00	No Ice	8.02	5.28	0.06
(Sprint - Existing)			-4.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVSPP18-C-A20	B	From Leg	3.00	0.0000	89.00	No Ice	8.02	5.28	0.06
(Sprint - Existing)			-4.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVSPP18-C-A20	C	From Leg	3.00	0.0000	89.00	No Ice	8.02	5.28	0.06
(Sprint - Existing)			-4.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	A	From Leg	3.00	0.0000	89.00	No Ice	6.34	3.61	0.06
(Sprint - Existing)			4.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVTM14	B	From Leg	3.00	0.0000	89.00	No Ice	6.34	3.61	0.06
(Sprint - Existing)			4.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVTM14	C	From Leg	3.00	0.0000	89.00	No Ice	6.34	3.61	0.06
(Sprint - Existing)			4.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
(2) FD-RRH 4x45 1900	A	From Leg	3.00	0.0000	88.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
(2) FD-RRH 4x45 1900	B	From Leg	3.00	0.0000	88.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
(2) FD-RRH 4x45 1900	C	From Leg	3.00	0.0000	88.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
FD-RRH 2x50 800	A	From Leg	3.00	0.0000	88.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	B	From Leg	3.00	0.0000	88.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	C	From Leg	3.00	0.0000	88.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
TD-RRH8x20-25	A	From Leg	3.00	0.0000	88.00	No Ice	4.05	1.53	0.07
(Sprint - Existing)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Leg	3.00	0.0000	88.00	No Ice	4.05	1.53	0.07
(Sprint - Existing)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Leg	3.00	0.0000	88.00	No Ice	4.05	1.53	0.07
(Sprint - Existing)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
13-ft T-Frame	A	From Leg	1.00	0.0000	89.00	No Ice	11.70	11.70	0.53
(Sprint - Existing)			0.00			1/2" Ice	16.40	16.40	0.74
			0.00			1" Ice	21.10	21.10	0.96
13-ft T-Frame	B	From Leg	1.00	0.0000	89.00	No Ice	11.70	11.70	0.53
(Sprint - Existing)			0.00			1/2" Ice	16.40	16.40	0.74
			0.00			1" Ice	21.10	21.10	0.96
13-ft T-Frame	C	From Leg	1.00	0.0000	89.00	No Ice	11.70	11.70	0.53
(Sprint - Existing)			0.00			1/2" Ice	16.40	16.40	0.74
			0.00			1" Ice	21.10	21.10	0.96
6810 4 Bay	B	From Leg	1.00	0.0000	65.00	No Ice	28.90	28.90	0.43
			0.00			1/2" Ice	34.00	34.00	1.01
			0.00			1" Ice	39.10	39.10	1.60
2.5" Tube x 2' Standoff	C	From Leg	1.00	0.0000	30.00	No Ice	1.11	0.63	0.12
(Sprint)			0.00			1/2" Ice	1.44	0.84	0.13
			0.00			1" Ice	1.79	1.06	0.14
GPS	C	From Leg	2.00	0.0000	30.00	No Ice	1.00	1.00	0.01
(Sprint)			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
APXVAARR18-43	A	From Face	2.00	0.0000	83.00	No Ice	14.67	6.16	0.13
(T-Mobile - Proposed)			0.00			1/2" Ice	15.18	6.62	0.22
			0.00			1" Ice	15.71	7.09	0.31
APXVAARR18-43	B	From Face	2.00	0.0000	83.00	No Ice	14.67	6.16	0.13
(T-Mobile - Proposed)			0.00			1/2" Ice	15.18	6.62	0.22
			0.00			1" Ice	15.71	7.09	0.31
APXVAARR18-43	C	From Face	2.00	0.0000	83.00	No Ice	14.67	6.16	0.13
(T-Mobile - Proposed)			0.00			1/2" Ice	15.18	6.62	0.22
			0.00			1" Ice	15.71	7.09	0.31
AIR32	A	From Face	2.00	0.0000	83.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			-3.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR32	B	From Face	2.00	0.0000	83.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			-3.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR32	C	From Face	2.00	0.0000	83.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			-3.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
Radio 4449 B71 B12	A	From Face	2.00	0.0000	83.00	No Ice	1.64	1.29	0.07
(T-Mobile - Proposed)			0.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	B	From Face	2.00	0.0000	83.00	No Ice	1.64	1.29	0.07
(T-Mobile - Proposed)			0.00			1/2" Ice	1.80	1.44	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	C	From Face	2.00	0.0000	83.00	No Ice	1.64	1.29	0.07
(T-Mobile - Proposed)			0.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
ATMAA1412D-1A20 Twin	A	From Face	1.00	0.0000	80.00	No Ice	0.00	0.33	0.01
TMA			0.00			1/2" Ice	0.00	0.41	0.02
(T-Mobile - Existing)			0.00			1" Ice	0.00	0.50	0.03
ATMAA1412D-1A20 Twin	B	From Face	1.00	0.0000	80.00	No Ice	0.00	0.33	0.01
TMA			0.00			1/2" Ice	0.00	0.41	0.02
(T-Mobile - Existing)			0.00			1" Ice	0.00	0.50	0.03
ATMAA1412D-1A20 Twin	C	From Face	1.00	0.0000	80.00	No Ice	0.00	0.33	0.01
TMA			0.00			1/2" Ice	0.00	0.41	0.02
(T-Mobile - Existing)			0.00			1" Ice	0.00	0.50	0.03
10-ft T-Frame	A	From Face	1.00	0.0000	82.00	No Ice	13.60	13.60	0.38
(T-Mobile - Existing)			0.00			1/2" Ice	17.50	17.50	0.53
			0.00			1" Ice	21.40	21.40	0.68
10-ft T-Frame	B	From Face	1.00	0.0000	82.00	No Ice	13.60	13.60	0.38
(T-Mobile - Existing)			0.00			1/2" Ice	17.50	17.50	0.53
			0.00			1" Ice	21.40	21.40	0.68
10-ft T-Frame	C	From Face	1.00	0.0000	82.00	No Ice	13.60	13.60	0.38
(T-Mobile - Existing)			0.00			1/2" Ice	17.50	17.50	0.53
			0.00			1" Ice	21.40	21.40	0.68

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	90.00	0.959	18	74.792	A	2.445	12.397	9.583	64.57	9.028	0.000
100.00-80.00					B	2.445	12.397		64.57	4.522	0.000
					C	2.445	12.397		64.57	0.000	0.000
T2 80.00-60.00	70.00	0.892	17	74.792	A	2.445	12.397	9.583	64.57	11.960	0.000
					B	2.445	12.397		64.57	12.920	0.000
					C	2.445	12.397		64.57	39.600	0.000
T3 60.00-53.33	56.67	0.84	16	25.290	A	0.809	5.003	3.891	66.95	4.319	0.000
					B	0.809	5.003		66.95	4.309	0.000
					C	0.809	5.003		66.95	13.207	0.000
T4 53.33-40.00	46.67	0.795	15	50.543	A	4.679	9.991	7.776	53.01	10.611	0.000
					B	4.679	9.991		53.01	8.611	0.000
					C	4.679	9.991		53.01	26.393	0.000
T5 40.00-20.00	30.00	0.701	13	99.283	A	7.278	18.574	18.574	71.85	15.920	0.000
					B	7.278	18.574		71.85	13.500	0.000
					C	7.278	18.574		71.85	39.600	0.000
T6 20.00-0.00	10.00	0.7	13	139.283	A	10.818	18.574	18.574	63.19	11.144	0.000
					B	10.818	18.574		63.19	9.856	0.000
					C	10.818	18.574		63.19	27.720	0.000

Tower Pressure - With Ice

G_H = 0.850

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 100.00-80.00	90.00	0.959	5	1.6583	80.319	A	2.445	43.792	20.639	44.64	46.460	0.000
						B	2.445	43.792		44.64	15.578	0.000
						C	2.445	43.792		44.64	0.000	0.000
T2 80.00-60.00	70.00	0.892	5	1.6171	80.182	A	2.445	43.013	20.364	44.80	60.411	0.000
						B	2.445	43.013		44.80	44.082	0.000
						C	2.445	43.013		44.80	108.560	0.000
T3 60.00-53.33	56.67	0.84	5	1.5833	27.051	A	0.809	14.927	7.411	47.10	20.728	0.000
						B	0.809	14.927		47.10	14.585	0.000
						C	0.809	14.927		47.10	36.068	0.000
T4 53.33-40.00	46.67	0.795	4	1.5529	53.993	A	4.679	33.537	14.676	38.40	45.987	0.000
						B	4.679	33.537		38.40	28.938	0.000
						C	4.679	33.537		38.40	71.835	0.000
T5 40.00-20.00	30.00	0.701	4	1.4858	104.242	A	7.278	39.309	28.496	61.17	67.075	0.000
						B	7.278	39.309		61.17	46.276	0.000
						C	7.278	39.309		61.17	106.967	0.000
T6 20.00-0.00	10.00	0.7	4	1.3312	143.726	A	10.818	38.984	27.464	55.15	43.859	0.000
						B	10.818	38.984		55.15	33.334	0.000
						C	10.818	38.984		55.15	73.573	0.000

Tower Pressure - Service

G_H = 0.850

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	90.00	0.959	8	74.792	A	2.445	12.397	9.583	64.57	9.028	0.000
100.00-80.00					B	2.445	12.397		64.57	4.522	0.000
					C	2.445	12.397		64.57	0.000	0.000
T2 80.00-60.00	70.00	0.892	7	74.792	A	2.445	12.397	9.583	64.57	11.960	0.000
					B	2.445	12.397		64.57	12.920	0.000
					C	2.445	12.397		64.57	39.600	0.000
T3 60.00-53.33	56.67	0.84	7	25.290	A	0.809	5.003	3.891	66.95	4.319	0.000
					B	0.809	5.003		66.95	4.309	0.000
					C	0.809	5.003		66.95	13.207	0.000
T4 53.33-40.00	46.67	0.795	6	50.543	A	4.679	9.991	7.776	53.01	10.611	0.000
					B	4.679	9.991		53.01	8.611	0.000
					C	4.679	9.991		53.01	26.393	0.000
T5 40.00-20.00	30.00	0.701	5	99.283	A	7.278	18.574	18.574	71.85	15.920	0.000
					B	7.278	18.574		71.85	13.500	0.000
					C	7.278	18.574		71.85	39.600	0.000
T6 20.00-0.00	10.00	0.7	5	139.283	A	10.818	18.574	18.574	63.19	11.144	0.000
					B	10.818	18.574		63.19	9.856	0.000
					C	10.818	18.574		63.19	27.720	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	18	1	1	9.564	0.51	25.32	C
100.00-80.00			B	0.198	2.601		1	1	9.564			
			C	0.198	2.601		1	1	9.564			
T2	0.46	1.13	A	0.198	2.601	17	1	1	9.564	0.91	45.38	C
80.00-60.00			B	0.198	2.601		1	1	9.564			
			C	0.198	2.601		1	1	9.564			
T3	0.15	0.51	A	0.23	2.499	16	1	1	3.712	0.30	45.10	C
60.00-53.33			B	0.23	2.499		1	1	3.712			
			C	0.23	2.499		1	1	3.712			
T4	0.32	1.26	A	0.29	2.322	15	1	1	10.633	0.66	49.66	C
53.33-40.00			B	0.29	2.322		1	1	10.633			
			C	0.29	2.322		1	1	10.633			
T5	0.48	2.48	A	0.26	2.407	13	1	1	17.943	0.95	47.40	C
40.00-20.00			B	0.26	2.407		1	1	17.943			
			C	0.26	2.407		1	1	17.943			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	13	1	1	21.232	0.94	46.79	C
			B	0.211	2.56		1	1	21.232			
			C	0.211	2.56		1	1	21.232			
Sum Weight:	1.85	8.78						OTM	194.84 kip-ft	4.26		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	18	0.8	1	9.075	0.49	24.34	C
100.00-80.00			B	0.198	2.601		0.8	1	9.075			
			C	0.198	2.601		0.8	1	9.075			
T2	0.46	1.13	A	0.198	2.601	17	0.8	1	9.075	0.89	44.47	C
80.00-60.00			B	0.198	2.601		0.8	1	9.075			
			C	0.198	2.601		0.8	1	9.075			
T3	0.15	0.51	A	0.23	2.499	16	0.8	1	3.550	0.30	44.28	C
60.00-53.33			B	0.23	2.499		0.8	1	3.550			
			C	0.23	2.499		0.8	1	3.550			
T4	0.32	1.26	A	0.29	2.322	15	0.8	1	9.697	0.63	47.59	C
53.33-40.00			B	0.29	2.322		0.8	1	9.697			
			C	0.29	2.322		0.8	1	9.697			
T5	0.48	2.48	A	0.26	2.407	13	0.8	1	16.487	0.91	45.44	C
40.00-20.00			B	0.26	2.407		0.8	1	16.487			
			C	0.26	2.407		0.8	1	16.487			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	13	0.8	1	19.068	0.87	43.69	C
			B	0.211	2.56		0.8	1	19.068			
			C	0.211	2.56		0.8	1	19.068			
Sum Weight:	1.85	8.78						OTM	188.41 kip-ft	4.09		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	18	0.85	1	9.197	0.49	24.59	C
100.00-80.00			B	0.198	2.601		0.85	1	9.197			
			C	0.198	2.601		0.85	1	9.197			
T2	0.46	1.13	A	0.198	2.601	17	0.85	1	9.197	0.89	44.70	C
80.00-60.00			B	0.198	2.601		0.85	1	9.197			
			C	0.198	2.601		0.85	1	9.197			
T3	0.15	0.51	A	0.23	2.499	16	0.85	1	3.591	0.30	44.49	C
60.00-53.33			B	0.23	2.499		0.85	1	3.591			
			C	0.23	2.499		0.85	1	3.591			
T4	0.32	1.26	A	0.29	2.322	15	0.85	1	9.931	0.64	48.11	C
53.33-40.00			B	0.29	2.322		0.85	1	9.931			
			C	0.29	2.322		0.85	1	9.931			
T5	0.48	2.48	A	0.26	2.407	13	0.85	1	16.851	0.92	45.93	C
40.00-20.00			B	0.26	2.407		0.85	1	16.851			
			C	0.26	2.407		0.85	1	16.851			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	13	0.85	1	19.609	0.89	44.47	C
			B	0.211	2.56		0.85	1	19.609			
			C	0.211	2.56		0.85	1	19.609			
Sum Weight:	1.85	8.78						OTM	190.02 kip-ft	4.13		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.69	2.59	A	0.576	1.821	5	1	1	34.354	0.39	19.71	C
100.00-80.00			B	0.576	1.821		1	1	34.354			
			C	0.576	1.821		1	1	34.354			
T2	2.86	3.01	A	0.567	1.828	5	1	1	33.558	0.63	31.70	C
80.00-60.00			B	0.567	1.828		1	1	33.558			
			C	0.567	1.828		1	1	33.558			
T3	0.95	1.15	A	0.582	1.816	5	1	1	11.740	0.20	29.81	C
60.00-53.33			B	0.582	1.816		1	1	11.740			
			C	0.582	1.816		1	1	11.740			
T4	1.94	3.01	A	0.708	1.777	4	1	1	32.066	0.37	27.53	C
53.33-40.00			B	0.708	1.777		1	1	32.066			
			C	0.708	1.777		1	1	32.066			
T5	2.85	4.39	A	0.447	1.979	4	1	1	33.134	0.61	30.36	C
40.00-20.00			B	0.447	1.979		1	1	33.134			
			C	0.447	1.979		1	1	33.134			
T6 20.00-0.00	1.84	4.65	A	0.347	2.18	4	1	1	34.784	0.54	26.91	C
			B	0.347	2.18		1	1	34.784			
			C	0.347	2.18		1	1	34.784			
Sum Weight:	11.13	18.80						OTM	131.84 kip-ft	2.74		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.69	2.59	A	0.576	1.821	5	0.8	1	33.864	0.39	19.51	C
100.00-80.00			B	0.576	1.821		0.8	1	33.864			
			C	0.576	1.821		0.8	1	33.864			
T2	2.86	3.01	A	0.567	1.828	5	0.8	1	33.068	0.63	31.51	C
80.00-60.00			B	0.567	1.828		0.8	1	33.068			
			C	0.567	1.828		0.8	1	33.068			
T3	0.95	1.15	A	0.582	1.816	5	0.8	1	11.579	0.20	29.64	C
60.00-53.33			B	0.582	1.816		0.8	1	11.579			
			C	0.582	1.816		0.8	1	11.579			
T4	1.94	3.01	A	0.708	1.777	4	0.8	1	31.130	0.36	27.07	C
53.33-40.00			B	0.708	1.777		0.8	1	31.130			
			C	0.708	1.777		0.8	1	31.130			
T5	2.85	4.39	A	0.447	1.979	4	0.8	1	31.679	0.60	29.89	C
40.00-20.00			B	0.447	1.979		0.8	1	31.679			
			C	0.447	1.979		0.8	1	31.679			
T6 20.00-0.00	1.84	4.65	A	0.347	2.18	4	0.8	1	32.620	0.52	26.15	C
			B	0.347	2.18		0.8	1	32.620			
			C	0.347	2.18		0.8	1	32.620			
Sum Weight:	11.13	18.80						OTM	130.44 kip-ft	2.70		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.69	2.59	A	0.576	1.821	5	0.85	1	33.987	0.39	19.56	C
100.00-80.00			B	0.576	1.821		0.85	1	33.987			
			C	0.576	1.821		0.85	1	33.987			
T2	2.86	3.01	A	0.567	1.828	5	0.85	1	33.191	0.63	31.56	C
80.00-60.00			B	0.567	1.828		0.85	1	33.191			
			C	0.567	1.828		0.85	1	33.191			
T3	0.95	1.15	A	0.582	1.816	5	0.85	1	11.619	0.20	29.68	C
60.00-53.33			B	0.582	1.816		0.85	1	11.619			
			C	0.582	1.816		0.85	1	11.619			
T4	1.94	3.01	A	0.708	1.777	4	0.85	1	31.364	0.36	27.19	C
53.33-40.00			B	0.708	1.777		0.85	1	31.364			
			C	0.708	1.777		0.85	1	31.364			
T5	2.85	4.39	A	0.447	1.979	4	0.85	1	32.043	0.60	30.01	C
40.00-20.00			B	0.447	1.979		0.85	1	32.043			
			C	0.447	1.979		0.85	1	32.043			
T6 20.00-0.00	1.84	4.65	A	0.347	2.18	4	0.85	1	33.161	0.53	26.34	C
			B	0.347	2.18		0.85	1	33.161			
			C	0.347	2.18		0.85	1	33.161			
Sum Weight:	11.13	18.80						OTM	130.79 kip-ft	2.71		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	8	1	1	9.564	0.21	10.54	C
100.00-80.00			B	0.198	2.601		1	1	9.564			
			C	0.198	2.601		1	1	9.564			
T2	0.46	1.13	A	0.198	2.601	7	1	1	9.564	0.38	18.89	C
80.00-60.00			B	0.198	2.601		1	1	9.564			
			C	0.198	2.601		1	1	9.564			
T3	0.15	0.51	A	0.23	2.499	7	1	1	3.712	0.13	18.77	C
60.00-53.33			B	0.23	2.499		1	1	3.712			
			C	0.23	2.499		1	1	3.712			
T4	0.32	1.26	A	0.29	2.322	6	1	1	10.633	0.28	20.67	C
53.33-40.00			B	0.29	2.322		1	1	10.633			
			C	0.29	2.322		1	1	10.633			
T5	0.48	2.48	A	0.26	2.407	5	1	1	17.943	0.39	19.73	C
40.00-20.00			B	0.26	2.407		1	1	17.943			
			C	0.26	2.407		1	1	17.943			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	5	1	1	21.232	0.39	19.48	C
			B	0.211	2.56		1	1	21.232			
			C	0.211	2.56		1	1	21.232			
Sum Weight:	1.85	8.78						OTM	81.10 kip-ft	1.77		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	8	0.8	1	9.075	0.20	10.13	C
100.00-80.00			B	0.198	2.601		0.8	1	9.075			
			C	0.198	2.601		0.8	1	9.075			
T2	0.46	1.13	A	0.198	2.601	7	0.8	1	9.075	0.37	18.51	C
80.00-60.00			B	0.198	2.601		0.8	1	9.075			
			C	0.198	2.601		0.8	1	9.075			
T3	0.15	0.51	A	0.23	2.499	7	0.8	1	3.550	0.12	18.43	C
60.00-53.33			B	0.23	2.499		0.8	1	3.550			
			C	0.23	2.499		0.8	1	3.550			
T4	0.32	1.26	A	0.29	2.322	6	0.8	1	9.697	0.26	19.81	C
53.33-40.00			B	0.29	2.322		0.8	1	9.697			
			C	0.29	2.322		0.8	1	9.697			
T5	0.48	2.48	A	0.26	2.407	5	0.8	1	16.487	0.38	18.91	C
40.00-20.00			B	0.26	2.407		0.8	1	16.487			
			C	0.26	2.407		0.8	1	16.487			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	5	0.8	1	19.068	0.36	18.19	C
			B	0.211	2.56		0.8	1	19.068			
			C	0.211	2.56		0.8	1	19.068			
Sum Weight:	1.85	8.78						OTM	78.42 kip-ft	1.70		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.10	0.75	A	0.198	2.601	8	0.85	1	9.197	0.20	10.23	C
100.00-80.00			B	0.198	2.601		0.85	1	9.197			
			C	0.198	2.601		0.85	1	9.197			
T2	0.46	1.13	A	0.198	2.601	7	0.85	1	9.197	0.37	18.60	C
80.00-60.00			B	0.198	2.601		0.85	1	9.197			
			C	0.198	2.601		0.85	1	9.197			
T3	0.15	0.51	A	0.23	2.499	7	0.85	1	3.591	0.12	18.52	C
60.00-53.33			B	0.23	2.499		0.85	1	3.591			
			C	0.23	2.499		0.85	1	3.591			
T4	0.32	1.26	A	0.29	2.322	6	0.85	1	9.931	0.27	20.02	C
53.33-40.00			B	0.29	2.322		0.85	1	9.931			
			C	0.29	2.322		0.85	1	9.931			
T5	0.48	2.48	A	0.26	2.407	5	0.85	1	16.851	0.38	19.12	C
40.00-20.00			B	0.26	2.407		0.85	1	16.851			
			C	0.26	2.407		0.85	1	16.851			
T6 20.00-0.00	0.34	2.65	A	0.211	2.56	5	0.85	1	19.609	0.37	18.51	C
			B	0.211	2.56		0.85	1	19.609			
			C	0.211	2.56		0.85	1	19.609			
Sum Weight:	1.85	8.78						OTM	79.09 kip-ft	1.72		

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	6.48					
Bracing Weight	2.30					
Total Member Self-Weight	8.78			1.96	-2.61	
Total Weight	19.77			1.96	-2.61	
Wind 0 deg - No Ice		0.00	-8.79	-593.56	-2.68	2.82
Wind 30 deg - No Ice		4.33	-7.50	-509.64	-298.06	3.28
Wind 60 deg - No Ice		7.47	-4.31	-292.65	-512.89	2.86
Wind 90 deg - No Ice		8.66	-0.00	1.89	-593.40	1.68
Wind 120 deg - No Ice		7.61	4.39	299.66	-518.38	0.04
Wind 150 deg - No Ice		4.33	7.50	513.49	-297.94	-1.61
Wind 180 deg - No Ice		-0.00	8.62	591.06	-2.54	-2.82
Wind 210 deg - No Ice		-4.33	7.50	513.56	292.84	-3.28
Wind 240 deg - No Ice		-7.61	4.40	299.78	513.23	-2.86
Wind 270 deg - No Ice		-8.66	0.00	2.03	588.18	-1.68
Wind 300 deg - No Ice		-7.46	-4.31	-292.53	507.60	-0.04
Wind 330 deg - No Ice		-4.33	-7.50	-509.57	292.72	1.61
Member Ice	10.02					
Total Weight Ice	54.54			8.81	-15.43	
Wind 0 deg - Ice		0.00	-4.85	-310.03	-15.47	1.59

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 30 deg - Ice		2.41	-4.18	-266.42	-174.38	1.72
Wind 60 deg - Ice		4.17	-2.41	-149.94	-290.40	1.38
Wind 90 deg - Ice		4.82	-0.00	8.78	-333.26	0.68
Wind 120 deg - Ice		4.20	2.42	168.20	-291.57	-0.21
Wind 150 deg - Ice		2.41	4.17	284.01	-174.32	-1.04
Wind 180 deg - Ice		-0.00	4.81	326.26	-15.40	-1.59
Wind 210 deg - Ice		-2.41	4.18	284.05	143.52	-1.72
Wind 240 deg - Ice		-4.20	2.43	168.26	260.75	-1.38
Wind 270 deg - Ice		-4.82	0.00	8.85	302.40	-0.68
Wind 300 deg - Ice		-4.17	-2.40	-149.88	259.50	0.21
Wind 330 deg - Ice		-2.41	-4.17	-266.39	143.46	1.04
Total Weight	19.77			1.96	-2.61	
Wind 0 deg - Service		0.00	-3.66	-246.97	-0.81	1.18
Wind 30 deg - Service		1.80	-3.12	-212.04	-123.75	1.37
Wind 60 deg - Service		3.11	-1.79	-121.72	-213.17	1.19
Wind 90 deg - Service		3.61	-0.00	0.88	-246.68	0.70
Wind 120 deg - Service		3.17	1.83	124.82	-215.46	0.02
Wind 150 deg - Service		1.80	3.12	213.83	-123.70	-0.67
Wind 180 deg - Service		-0.00	3.59	246.11	-0.75	-1.18
Wind 210 deg - Service		-1.80	3.12	213.85	122.20	-1.37
Wind 240 deg - Service		-3.17	1.83	124.87	213.93	-1.19
Wind 270 deg - Service		-3.61	0.00	0.94	245.13	-0.70
Wind 300 deg - Service		-3.11	-1.79	-121.67	211.59	-0.02
Wind 330 deg - Service		-1.80	-3.12	-212.01	122.15	0.67

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	1.2D+1.6W (pattern 1) 0 deg - No Ice
4	1.2D+1.6W (pattern 2) 0 deg - No Ice
5	0.9 Dead+1.6 Wind 0 deg - No Ice
6	1.2 Dead+1.6 Wind 30 deg - No Ice
7	1.2D+1.6W (pattern 1) 30 deg - No Ice
8	1.2D+1.6W (pattern 2) 30 deg - No Ice
9	0.9 Dead+1.6 Wind 30 deg - No Ice
10	1.2 Dead+1.6 Wind 60 deg - No Ice
11	1.2D+1.6W (pattern 1) 60 deg - No Ice
12	1.2D+1.6W (pattern 2) 60 deg - No Ice
13	0.9 Dead+1.6 Wind 60 deg - No Ice
14	1.2 Dead+1.6 Wind 90 deg - No Ice
15	1.2D+1.6W (pattern 1) 90 deg - No Ice
16	1.2D+1.6W (pattern 2) 90 deg - No Ice
17	0.9 Dead+1.6 Wind 90 deg - No Ice
18	1.2 Dead+1.6 Wind 120 deg - No Ice
19	1.2D+1.6W (pattern 1) 120 deg - No Ice
20	1.2D+1.6W (pattern 2) 120 deg - No Ice
21	0.9 Dead+1.6 Wind 120 deg - No Ice
22	1.2 Dead+1.6 Wind 150 deg - No Ice
23	1.2D+1.6W (pattern 1) 150 deg - No Ice
24	1.2D+1.6W (pattern 2) 150 deg - No Ice
25	0.9 Dead+1.6 Wind 150 deg - No Ice
26	1.2 Dead+1.6 Wind 180 deg - No Ice
27	1.2D+1.6W (pattern 1) 180 deg - No Ice

Comb. No.	Description
28	1.2D+1.6W (pattern 2) 180 deg - No Ice
29	0.9 Dead+1.6 Wind 180 deg - No Ice
30	1.2 Dead+1.6 Wind 210 deg - No Ice
31	1.2D+1.6W (pattern 1) 210 deg - No Ice
32	1.2D+1.6W (pattern 2) 210 deg - No Ice
33	0.9 Dead+1.6 Wind 210 deg - No Ice
34	1.2 Dead+1.6 Wind 240 deg - No Ice
35	1.2D+1.6W (pattern 1) 240 deg - No Ice
36	1.2D+1.6W (pattern 2) 240 deg - No Ice
37	0.9 Dead+1.6 Wind 240 deg - No Ice
38	1.2 Dead+1.6 Wind 270 deg - No Ice
39	1.2D+1.6W (pattern 1) 270 deg - No Ice
40	1.2D+1.6W (pattern 2) 270 deg - No Ice
41	0.9 Dead+1.6 Wind 270 deg - No Ice
42	1.2 Dead+1.6 Wind 300 deg - No Ice
43	1.2D+1.6W (pattern 1) 300 deg - No Ice
44	1.2D+1.6W (pattern 2) 300 deg - No Ice
45	0.9 Dead+1.6 Wind 300 deg - No Ice
46	1.2 Dead+1.6 Wind 330 deg - No Ice
47	1.2D+1.6W (pattern 1) 330 deg - No Ice
48	1.2D+1.6W (pattern 2) 330 deg - No Ice
49	0.9 Dead+1.6 Wind 330 deg - No Ice
50	1.2 Dead+1.0 Ice+1.0 Temp
51	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
52	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
53	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
54	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
55	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
56	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
57	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
58	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
59	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
60	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
61	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
62	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
63	Dead+Wind 0 deg - Service
64	Dead+Wind 30 deg - Service
65	Dead+Wind 60 deg - Service
66	Dead+Wind 90 deg - Service
67	Dead+Wind 120 deg - Service
68	Dead+Wind 150 deg - Service
69	Dead+Wind 180 deg - Service
70	Dead+Wind 210 deg - Service
71	Dead+Wind 240 deg - Service
72	Dead+Wind 270 deg - Service
73	Dead+Wind 300 deg - Service
74	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
T1	100 - 80	Leg	Max Tension	13	16.97	-0.09	0.05
			Max. Compression	18	-32.53	-0.12	-0.07
			Max. Mx	14	-6.78	0.49	-0.00
			Max. My	2	-6.91	0.01	-0.49
			Max. Vy	14	0.80	-0.26	-0.02
			Max. Vx	2	-0.80	0.00	0.27

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max Tension	22	7.24	0.00	0.00
		Horizontal	Max Tension	18	0.56	0.00	0.00
			Max. Compression	26	-5.97	0.00	0.00
			Max. Mx	50	0.25	-0.02	0.00
			Max. My	30	0.51	0.00	0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	30	-0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-3.04	0.00	0.00
			Max. Mx	50	-2.93	-0.02	0.00
			Max. My	30	-2.94	0.00	0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	30	-0.00	0.00	0.00
T2	80 - 60	Leg	Max Tension	13	69.22	-0.22	0.08
			Max. Compression	18	-89.76	-0.37	-0.22
			Max. Mx	17	-76.12	-0.45	0.01
			Max. My	2	26.94	-0.02	0.47
			Max. Vy	13	-0.20	-0.25	0.17
			Max. Vx	6	0.27	-0.16	0.28
		Diagonal	Max Tension	26	9.47	0.00	0.00
		Horizontal	Max Tension	18	1.55	0.00	0.00
			Max. Compression	20	-8.54	0.00	0.00
			Max. Mx	50	0.27	0.02	0.00
			Max. My	30	1.34	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	20	-6.80	0.00	0.00
			Max. Mx	50	-5.58	0.02	0.00
			Max. My	30	-5.94	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
T3	60 - 53.33	Leg	Max Tension	13	88.71	-0.42	0.24
			Max. Compression	18	-112.80	-0.56	-0.33
			Max. Mx	14	-99.24	-0.67	-0.04
			Max. My	26	-63.15	-0.15	-0.68
			Max. Vy	6	-0.14	-0.29	0.39
			Max. Vx	26	-0.14	-0.00	-0.51
		Diagonal	Max Tension	26	11.50	0.00	0.00
		Horizontal	Max Tension	18	1.95	0.00	0.00
			Max. Compression	18	-11.64	0.00	0.00
			Max. Mx	50	0.31	0.02	0.00
			Max. My	30	1.69	0.00	-0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-9.93	0.00	0.00
			Max. Mx	50	-6.82	0.02	0.00
			Max. My	30	-7.33	0.00	-0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
T4	53.33 - 40	Leg	Max Tension	13	132.53	0.42	-0.24
			Max. Compression	18	-159.46	-2.08	-1.20
			Max. Mx	37	-155.09	2.30	-1.07
			Max. My	5	-155.09	0.22	2.53
			Max. Vy	46	1.29	1.34	0.85
			Max. Vx	26	-1.44	0.01	-1.70
		Diagonal	Max Tension	26	12.74	0.00	0.00
		Horizontal	Max Tension	18	2.76	0.00	0.00
			Max. Compression	18	-11.91	0.00	0.00
			Max. Mx	50	0.35	0.02	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	30	2.39	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	18	2.76	0.00	0.00
			Max. Compression	18	-2.76	0.00	0.00
			Max. Mx	50	0.35	-0.02	0.00
			Max. My	30	2.39	0.00	0.00
			Max. Vy	50	0.03	0.00	0.00
			Max. Vx	30	-0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-11.22	0.00	0.00
			Max. Mx	50	-7.56	0.02	0.00
			Max. My	30	-8.05	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
		Bottom Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-6.24	0.00	0.00
			Max. Mx	50	-3.87	0.02	0.00
			Max. My	30	-4.26	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
T5	40 - 20	Leg	Max Tension	13	143.74	-1.17	-0.04
			Max. Compression	18	-156.44	1.72	-0.00
			Max. Mx	21	-151.00	2.54	0.00
			Max. My	30	-6.42	-0.27	2.97
			Max. Vy	37	0.29	2.53	0.22
			Max. Vx	6	-0.41	-0.27	-2.97
		Diagonal	Max Tension	5	3.82	0.00	0.00
			Max. Compression	26	-4.44	0.00	0.00
			Max. Mx	26	-1.04	0.07	-0.01
			Max. My	26	1.03	-0.03	0.02
			Max. Vy	55	-0.02	0.05	-0.00
			Max. Vx	26	-0.01	0.00	0.00
T6	20 - 0	Leg	Max Tension	29	141.58	-1.15	0.01
			Max. Compression	18	-156.75	0.80	0.00
			Max. Mx	18	-155.10	1.27	0.00
			Max. My	30	-8.29	-0.09	1.95
			Max. Vy	42	-0.18	-0.95	0.00
			Max. Vx	30	0.34	-0.09	1.95
		Diagonal	Max Tension	9	1.93	0.00	0.00
			Max. Compression	6	-2.15	0.00	0.00
			Max. Mx	18	-0.22	0.10	0.00
			Max. My	30	-0.13	0.06	0.02
			Max. Vy	55	-0.03	0.06	0.00
			Max. Vx	30	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	34	157.65	9.44	-5.03
	Max. H_x	34	157.65	9.44	-5.03
	Max. H_z	13	-141.80	-8.41	4.45
	Min. Vert	13	-141.80	-8.41	4.45
	Min. H_x	13	-141.80	-8.41	4.45

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. H_z	34	157.65	9.44	-5.03
Leg B	Max. Vert	18	158.48	-9.27	-5.35
	Max. H_x	45	-141.12	8.22	4.74
	Max. H_z	45	-141.12	8.22	4.74
	Min. Vert	45	-141.12	8.22	4.74
	Min. H_x	18	158.48	-9.27	-5.35
	Min. H_z	18	158.48	-9.27	-5.35
Leg A	Max. Vert	2	157.49	0.35	10.68
	Max. H_x	16	7.55	0.99	0.52
	Max. H_z	2	157.49	0.35	10.68
	Min. Vert	29	-141.86	-0.35	-9.50
	Min. H_x	34	-67.46	-1.02	-4.53
	Min. H_z	29	-141.86	-0.35	-9.50

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	19.77	0.00	0.00	2.01	-2.69	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	23.73	0.00	-14.06	-971.57	-3.38	4.58
1.2D+1.6W (pattern 1) 0 deg - No Ice	23.73	0.00	-10.83	-670.16	-3.37	4.53
1.2D+1.6W (pattern 2) 0 deg - No Ice	23.73	0.00	-12.40	-902.93	-3.32	3.87
0.9 Dead+1.6 Wind 0 deg - No Ice	17.80	0.00	-14.06	-966.84	-2.55	4.56
1.2 Dead+1.6 Wind 30 deg - No Ice	23.73	6.93	-12.00	-834.33	-486.53	5.35
1.2D+1.6W (pattern 1) 30 deg - No Ice	23.73	5.32	-9.21	-574.17	-336.30	5.27
1.2D+1.6W (pattern 2) 30 deg - No Ice	23.73	6.14	-10.63	-777.08	-453.41	4.49
0.9 Dead+1.6 Wind 30 deg - No Ice	17.80	6.93	-12.00	-830.32	-482.98	5.30
1.2 Dead+1.6 Wind 60 deg - No Ice	23.73	11.95	-6.90	-479.44	-837.89	4.65
1.2D+1.6W (pattern 1) 60 deg - No Ice	23.73	9.16	-5.29	-329.40	-577.99	4.59
1.2D+1.6W (pattern 2) 60 deg - No Ice	23.73	10.60	-6.12	-446.80	-781.33	3.88
0.9 Dead+1.6 Wind 60 deg - No Ice	17.80	11.95	-6.90	-477.34	-832.37	4.63
1.2 Dead+1.6 Wind 90 deg - No Ice	23.73	13.86	-0.00	2.29	-969.50	2.70
1.2D+1.6W (pattern 1) 90 deg - No Ice	23.73	10.64	-0.00	2.30	-669.09	2.69
1.2D+1.6W (pattern 2) 90 deg - No Ice	23.73	12.28	-0.00	2.34	-903.37	2.24
0.9 Dead+1.6 Wind 90 deg - No Ice	17.80	13.86	-0.00	1.71	-963.30	2.72
1.2 Dead+1.6 Wind 120 deg - No Ice	23.73	12.18	7.03	489.29	-846.75	0.07
1.2D+1.6W (pattern 1) 120 deg - No Ice	23.73	9.38	5.41	338.60	-585.74	0.07
1.2D+1.6W (pattern 2) 120 deg	23.73	10.74	6.20	455.02	-787.30	0.03

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	17.80	12.18	7.03	486.02	-841.31	0.07
1.2 Dead+1.6 Wind 150 deg - No Ice	23.73	6.93	12.00	839.07	-486.27	-2.59
1.2D+1.6W (pattern 1) 150 deg - No Ice	23.73	5.32	9.21	578.90	-336.06	-2.57
1.2D+1.6W (pattern 2) 150 deg - No Ice	23.73	6.14	10.63	781.87	-453.24	-2.20
0.9 Dead+1.6 Wind 150 deg - No Ice	17.80	6.93	12.00	833.78	-482.79	-2.60
1.2 Dead+1.6 Wind 180 deg - No Ice	23.73	-0.00	13.79	965.98	-3.15	-4.58
1.2D+1.6W (pattern 1) 180 deg - No Ice	23.73	-0.00	10.57	665.88	-3.14	-4.53
1.2D+1.6W (pattern 2) 180 deg - No Ice	23.73	-0.00	12.23	900.76	-3.19	-3.87
0.9 Dead+1.6 Wind 180 deg - No Ice	17.80	-0.00	13.79	959.94	-2.33	-4.57
1.2 Dead+1.6 Wind 210 deg - No Ice	23.73	-6.93	12.00	839.22	479.96	-5.35
1.2D+1.6W (pattern 1) 210 deg - No Ice	23.73	-5.32	9.21	579.04	329.77	-5.27
1.2D+1.6W (pattern 2) 210 deg - No Ice	23.73	-6.14	10.63	781.97	446.86	-4.49
0.9 Dead+1.6 Wind 210 deg - No Ice	17.80	-6.93	12.00	833.93	478.14	-5.30
1.2 Dead+1.6 Wind 240 deg - No Ice	23.73	-12.18	7.03	489.54	840.41	-4.65
1.2D+1.6W (pattern 1) 240 deg - No Ice	23.73	-9.39	5.42	338.83	579.39	-4.60
1.2D+1.6W (pattern 2) 240 deg - No Ice	23.73	-10.74	6.20	455.17	780.90	-3.88
0.9 Dead+1.6 Wind 240 deg - No Ice	17.80	-12.18	7.03	486.25	836.61	-4.63
1.2 Dead+1.6 Wind 270 deg - No Ice	23.73	-13.86	0.00	2.53	963.05	-2.70
1.2D+1.6W (pattern 1) 270 deg - No Ice	23.73	-10.64	0.00	2.53	662.63	-2.69
1.2D+1.6W (pattern 2) 270 deg - No Ice	23.73	-12.28	0.00	2.47	896.92	-2.24
0.9 Dead+1.6 Wind 270 deg - No Ice	17.80	-13.86	0.00	1.95	958.50	-2.72
1.2 Dead+1.6 Wind 300 deg - No Ice	23.73	-11.94	-6.89	-479.28	831.30	-0.07
1.2D+1.6W (pattern 1) 300 deg - No Ice	23.73	-9.16	-5.28	-329.22	571.40	-0.07
1.2D+1.6W (pattern 2) 300 deg - No Ice	23.73	-10.60	-6.11	-446.71	774.79	-0.02
0.9 Dead+1.6 Wind 300 deg - No Ice	17.80	-11.94	-6.89	-477.18	827.42	-0.07
1.2 Dead+1.6 Wind 330 deg - No Ice	23.73	-6.93	-12.00	-834.25	479.81	2.59
1.2D+1.6W (pattern 1) 330 deg - No Ice	23.73	-5.32	-9.21	-574.08	329.60	2.57
1.2D+1.6W (pattern 2) 330 deg - No Ice	23.73	-6.14	-10.63	-777.05	446.80	2.20
0.9 Dead+1.6 Wind 330 deg - No Ice	17.80	-6.93	-12.00	-830.23	477.92	2.60
1.2 Dead+1.0 Ice+1.0 Temp	58.49	-0.00	-0.00	9.89	-17.20	0.00
1.2 Dead+1.0 Wind 0 deg+1.0	58.49	0.00	-4.85	-327.49	-17.27	1.70

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
Ice+1.0 Temp 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	58.49	2.41	-4.18	-281.39	-185.44	1.84
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	58.49	4.17	-2.41	-158.13	-308.22	1.48
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	58.49	4.82	-0.00	9.85	-353.54	0.73
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	58.49	4.20	2.42	178.53	-309.38	-0.21
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	58.49	2.41	4.17	301.11	-185.34	-1.10
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	58.49	-0.00	4.81	345.87	-17.14	-1.70
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	58.49	-2.41	4.18	301.18	150.99	-1.84
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	58.49	-4.20	2.43	178.63	275.01	-1.49
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	58.49	-4.82	0.00	9.94	319.13	-0.73
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	58.49	-4.17	-2.40	-158.06	273.76	0.21
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	58.49	-2.41	-4.17	-281.35	150.91	1.10
Dead+Wind 0 deg - Service	19.77	0.00	-3.66	-250.47	-2.72	1.19
Dead+Wind 30 deg - Service	19.77	1.80	-3.12	-214.89	-127.94	1.38
Dead+Wind 60 deg - Service	19.77	3.11	-1.79	-122.90	-219.02	1.21
Dead+Wind 90 deg - Service	19.77	3.61	-0.00	1.97	-253.14	0.71
Dead+Wind 120 deg - Service	19.77	3.17	1.83	128.21	-221.33	0.02
Dead+Wind 150 deg - Service	19.77	1.80	3.12	218.87	-127.88	-0.68
Dead+Wind 180 deg - Service	19.77	-0.00	3.59	251.76	-2.65	-1.19
Dead+Wind 210 deg - Service	19.77	-1.80	3.12	218.90	122.58	-1.38
Dead+Wind 240 deg - Service	19.77	-3.17	1.83	128.27	216.01	-1.21
Dead+Wind 270 deg - Service	19.77	-3.61	0.00	2.03	247.79	-0.71
Dead+Wind 300 deg - Service	19.77	-3.11	-1.79	-122.85	213.63	-0.02
Dead+Wind 330 deg - Service	19.77	-1.80	-3.12	-214.87	122.53	0.68

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-19.77	0.00	0.00	19.77	0.00	0.000%
2	0.00	-23.73	-14.06	-0.00	23.73	14.06	0.000%
3	0.00	-23.73	-10.83	-0.00	23.73	10.83	0.000%
4	0.00	-23.73	-12.40	-0.00	23.73	12.40	0.000%
5	0.00	-17.80	-14.06	-0.00	17.80	14.06	0.000%
6	6.93	-23.73	-12.00	-6.93	23.73	12.00	0.000%
7	5.32	-23.73	-9.21	-5.32	23.73	9.21	0.000%
8	6.14	-23.73	-10.63	-6.14	23.73	10.63	0.000%
9	6.93	-17.80	-12.00	-6.93	17.80	12.00	0.000%
10	11.95	-23.73	-6.90	-11.95	23.73	6.90	0.000%
11	9.16	-23.73	-5.29	-9.16	23.73	5.29	0.000%
12	10.60	-23.73	-6.12	-10.60	23.73	6.12	0.000%
13	11.95	-17.80	-6.90	-11.95	17.80	6.90	0.000%
14	13.86	-23.73	-0.00	-13.86	23.73	0.00	0.000%
15	10.64	-23.73	-0.00	-10.64	23.73	0.00	0.000%
16	12.28	-23.73	-0.00	-12.28	23.73	0.00	0.000%
17	13.86	-17.80	-0.00	-13.86	17.80	0.00	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
18	12.18	-23.73	7.03	-12.18	23.73	-7.03	0.000%
19	9.38	-23.73	5.41	-9.38	23.73	-5.41	0.000%
20	10.74	-23.73	6.20	-10.74	23.73	-6.20	0.000%
21	12.18	-17.80	7.03	-12.18	17.80	-7.03	0.000%
22	6.93	-23.73	12.00	-6.93	23.73	-12.00	0.000%
23	5.32	-23.73	9.21	-5.32	23.73	-9.21	0.000%
24	6.14	-23.73	10.63	-6.14	23.73	-10.63	0.000%
25	6.93	-17.80	12.00	-6.93	17.80	-12.00	0.000%
26	-0.00	-23.73	13.79	0.00	23.73	-13.79	0.000%
27	-0.00	-23.73	10.57	0.00	23.73	-10.57	0.000%
28	-0.00	-23.73	12.23	0.00	23.73	-12.23	0.000%
29	-0.00	-17.80	13.79	0.00	17.80	-13.79	0.000%
30	-6.93	-23.73	12.00	6.93	23.73	-12.00	0.000%
31	-5.32	-23.73	9.21	5.32	23.73	-9.21	0.000%
32	-6.14	-23.73	10.63	6.14	23.73	-10.63	0.000%
33	-6.93	-17.80	12.00	6.93	17.80	-12.00	0.000%
34	-12.18	-23.73	7.03	12.18	23.73	-7.03	0.000%
35	-9.39	-23.73	5.42	9.39	23.73	-5.42	0.000%
36	-10.74	-23.73	6.20	10.74	23.73	-6.20	0.000%
37	-12.18	-17.80	7.03	12.18	17.80	-7.03	0.000%
38	-13.86	-23.73	0.00	13.86	23.73	-0.00	0.000%
39	-10.64	-23.73	0.00	10.64	23.73	-0.00	0.000%
40	-12.28	-23.73	0.00	12.28	23.73	-0.00	0.000%
41	-13.86	-17.80	0.00	13.86	17.80	-0.00	0.000%
42	-11.94	-23.73	-6.89	11.94	23.73	6.89	0.000%
43	-9.16	-23.73	-5.28	9.16	23.73	5.28	0.000%
44	-10.60	-23.73	-6.11	10.60	23.73	6.11	0.000%
45	-11.94	-17.80	-6.89	11.94	17.80	6.89	0.000%
46	-6.93	-23.73	-12.00	6.93	23.73	12.00	0.000%
47	-5.32	-23.73	-9.21	5.32	23.73	9.21	0.000%
48	-6.14	-23.73	-10.63	6.14	23.73	10.63	0.000%
49	-6.93	-17.80	-12.00	6.93	17.80	12.00	0.000%
50	0.00	-58.49	0.00	0.00	58.49	0.00	0.000%
51	0.00	-58.49	-4.85	-0.00	58.49	4.85	0.000%
52	2.41	-58.49	-4.18	-2.41	58.49	4.18	0.000%
53	4.17	-58.49	-2.41	-4.17	58.49	2.41	0.000%
54	4.82	-58.49	-0.00	-4.82	58.49	0.00	0.000%
55	4.20	-58.49	2.42	-4.20	58.49	-2.42	0.000%
56	2.41	-58.49	4.17	-2.41	58.49	-4.17	0.000%
57	-0.00	-58.49	4.81	0.00	58.49	-4.81	0.000%
58	-2.41	-58.49	4.18	2.41	58.49	-4.18	0.000%
59	-4.20	-58.49	2.43	4.20	58.49	-2.43	0.000%
60	-4.82	-58.49	0.00	4.82	58.49	-0.00	0.000%
61	-4.17	-58.49	-2.40	4.17	58.49	2.40	0.000%
62	-2.41	-58.49	-4.17	2.41	58.49	4.17	0.000%
63	0.00	-19.77	-3.66	-0.00	19.77	3.66	0.000%
64	1.80	-19.77	-3.12	-1.80	19.77	3.12	0.000%
65	3.11	-19.77	-1.79	-3.11	19.77	1.79	0.000%
66	3.61	-19.77	-0.00	-3.61	19.77	0.00	0.000%
67	3.17	-19.77	1.83	-3.17	19.77	-1.83	0.000%
68	1.80	-19.77	3.12	-1.80	19.77	-3.12	0.000%
69	-0.00	-19.77	3.59	0.00	19.77	-3.59	0.000%
70	-1.80	-19.77	3.12	1.80	19.77	-3.12	0.000%
71	-3.17	-19.77	1.83	3.17	19.77	-1.83	0.000%
72	-3.61	-19.77	0.00	3.61	19.77	-0.00	0.000%
73	-3.11	-19.77	-1.79	3.11	19.77	1.79	0.000%
74	-1.80	-19.77	-3.12	1.80	19.77	3.12	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	0.00042375
3	Yes	4	0.00000001	0.00003976
4	Yes	4	0.00000001	0.00015237
5	Yes	4	0.00000001	0.00070943
6	Yes	4	0.00000001	0.00013645
7	Yes	4	0.00000001	0.00004236
8	Yes	4	0.00000001	0.00004202
9	Yes	4	0.00000001	0.00042679
10	Yes	4	0.00000001	0.00004175
11	Yes	4	0.00000001	0.00004398
12	Yes	4	0.00000001	0.00004186
13	Yes	4	0.00000001	0.00003188
14	Yes	4	0.00000001	0.00007575
15	Yes	4	0.00000001	0.00004171
16	Yes	4	0.00000001	0.00004637
17	Yes	4	0.00000001	0.00063219
18	Yes	4	0.00000001	0.00007709
19	Yes	4	0.00000001	0.00003966
20	Yes	4	0.00000001	0.00005665
21	Yes	4	0.00000001	0.00027289
22	Yes	4	0.00000001	0.00007936
23	Yes	4	0.00000001	0.00004175
24	Yes	4	0.00000001	0.00006366
25	Yes	4	0.00000001	0.00067655
26	Yes	4	0.00000001	0.00004167
27	Yes	4	0.00000001	0.00004395
28	Yes	4	0.00000001	0.00004178
29	Yes	4	0.00000001	0.00004935
30	Yes	4	0.00000001	0.00013622
31	Yes	4	0.00000001	0.00004235
32	Yes	4	0.00000001	0.00004175
33	Yes	4	0.00000001	0.00042648
34	Yes	4	0.00000001	0.00041696
35	Yes	4	0.00000001	0.00003979
36	Yes	4	0.00000001	0.00014888
37	Yes	4	0.00000001	0.00070349
38	Yes	4	0.00000001	0.00007632
39	Yes	4	0.00000001	0.00004176
40	Yes	4	0.00000001	0.00004654
41	Yes	4	0.00000001	0.00065075
42	Yes	4	0.00000001	0.00004162
43	Yes	4	0.00000001	0.00004384
44	Yes	4	0.00000001	0.00004178
45	Yes	4	0.00000001	0.00001635
46	Yes	4	0.00000001	0.00007999
47	Yes	4	0.00000001	0.00004180
48	Yes	4	0.00000001	0.00006446
49	Yes	4	0.00000001	0.00069588
50	Yes	4	0.00000001	0.00007366
51	Yes	4	0.00000001	0.00053802
52	Yes	4	0.00000001	0.00055250
53	Yes	4	0.00000001	0.00056268
54	Yes	4	0.00000001	0.00055905
55	Yes	4	0.00000001	0.00055448
56	Yes	4	0.00000001	0.00055876
57	Yes	4	0.00000001	0.00056195
58	Yes	4	0.00000001	0.00055133
59	Yes	4	0.00000001	0.00053680

60	Yes	4	0.00000001	0.00053424
61	Yes	4	0.00000001	0.00053770
62	Yes	4	0.00000001	0.00053515
63	Yes	4	0.00000001	0.00002270
64	Yes	4	0.00000001	0.00002331
65	Yes	4	0.00000001	0.00002380
66	Yes	4	0.00000001	0.00002327
67	Yes	4	0.00000001	0.00002754
68	Yes	4	0.00000001	0.00002327
69	Yes	4	0.00000001	0.00002380
70	Yes	4	0.00000001	0.00002331
71	Yes	4	0.00000001	0.00002271
72	Yes	4	0.00000001	0.00002314
73	Yes	4	0.00000001	0.00002663
74	Yes	4	0.00000001	0.00002314

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	5.903	67	0.5019	0.0831
T2	80 - 60	3.800	67	0.4793	0.0825
T3	60 - 53.33	1.931	67	0.3677	0.0676
T4	53.33 - 40	1.435	67	0.3196	0.0567
T5	40 - 20	0.682	67	0.1899	0.0324
T6	20 - 0	0.148	67	0.0764	0.0078

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
98.00	(2) OPA-65R-LCUU-H4	67	5.690	0.5019	0.0833	109150
97.00	12' Boom Starmount	67	5.583	0.5018	0.0833	109150
96.00	Parabolic Grid	67	5.477	0.5017	0.0834	109150
89.00	APXVSPP18-C-A20	67	4.735	0.4981	0.0836	49614
88.00	(2) FD-RRH 4x45 1900	67	4.630	0.4970	0.0836	45479
83.00	APXVAARR18-43	67	4.108	0.4880	0.0831	31912
82.00	10-ft T-Frame	67	4.005	0.4854	0.0830	29754
80.00	ATMAA1412D-1A20 Twin TMA	67	3.800	0.4793	0.0825	25284
65.00	6810 4 Bay	67	2.352	0.4006	0.0736	8343
30.00	2.5" Tube x 2' Standoff	67	0.341	0.1209	0.0177	8027

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	22.545	18	1.9174	0.4340
T2	80 - 60	14.520	21	1.8301	0.4296

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T3	60 - 53.33	7.378	21	1.4014	0.3534
T4	53.33 - 40	5.485	21	1.2188	0.2941
T5	40 - 20	2.606	18	0.7240	0.1253
T6	20 - 0	0.567	18	0.2916	0.0303

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
98.00	(2) OPA-65R-LCUU-H4	18	21.731	1.9172	0.4350	28128
97.00	12' Boom Starmount	18	21.324	1.9170	0.4354	28128
96.00	Parabolic Grid	18	20.918	1.9165	0.4358	28128
89.00	APXVSPP18-C-A20	18	18.086	1.9026	0.4370	12785
88.00	(2) FD-RRH 4x45 1900	18	17.684	1.8982	0.4368	11719
83.00	APXVAARR18-43	21	15.695	1.8636	0.4336	8224
82.00	10-ft T-Frame	21	15.302	1.8536	0.4324	7668
80.00	ATMAA1412D-1A20 Twin TMA	21	14.520	1.8301	0.4296	6519
65.00	6810 4 Bay	21	8.989	1.5272	0.3784	2152
30.00	2.5" Tube x 2' Standoff	18	1.301	0.4612	0.0675	2061

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	100	Leg	A325N	0.7500	4	4.24	29.82	0.142 ✔	1	Bolt Tension
T2	80	Leg	A325N	0.7500	4	17.31	29.82	0.580 ✔	1	Bolt Tension
T4	53.33	Leg	A325N	1.0000	4	33.12	53.01	0.625 ✔	1	Bolt Tension
		Secondary Horizontal	A325N	0.7500	1	2.76	15.77	0.175 ✔	1	Member Bearing
T5	40	Leg	A325N	1.0000	6	23.59	53.01	0.445 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	3.82	7.83	0.488 ✔	1	Member Bearing
T6	20	Leg	A36	1.5000	4	35.22	57.65	0.611 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	1.93	7.83	0.246 ✔	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	P2.5x.276	20.00	3.33	43.3 K=1.00	2.2535	-32.53	88.43	0.368 [1] ✔
T2	80 - 60	P2.5x.276 (GR)	20.00	3.33	43.3 K=1.00	2.2535	-89.76	96.20	0.933 [1] ✔
T3	60 - 53.33	P3x.3 (GR)	6.67	3.34	35.2 K=1.00	3.0159	-112.80	148.57	0.759 [1] ✔
T4	53.33 - 40	P3x.3 (GR)	13.33	1.67	17.6 K=1.00	3.0159	-159.46	160.63	0.993 [1] ✔
T5	40 - 20	P5x.258 (GR)	20.03	6.68	42.7 K=1.00	4.2999	-156.44	198.12	0.790 [1] ✔
T6	20 - 0	P5x.258 (GR)	20.03	6.68	42.7 K=1.00	4.2999	-156.75	198.12	0.791 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T5	40 - 20	L2x2x3/16	7.69	3.68	114.1 K=1.02	0.7150	-4.44	11.67	0.380 [1] ✔
T6	20 - 0	L2 1/2x2 1/2x3/16	9.79	4.69	115.2 K=1.01	0.9020	-2.15	14.53	0.148 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	128.2 K=0.96	0.5273	-5.97	7.19	0.830 [1] ✔
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	85.7 K=1.00	1.0547	-8.54	23.22	0.368 [1] ✔
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3 K=1.00	1.0547	-11.64	23.51	0.495 [1] ✔
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3 K=1.00	1.0547	-11.91	23.51	0.507 [1] ✔

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	53.33 - 40	L2 1/2x2 1/2x5/16	3.50	2.94	96.0 K=1.33	1.4600	-2.76	29.11	0.095 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	128.2 K=0.96	0.5273	-3.04	7.19	0.422 [1] ✔
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	85.7 K=1.00	1.0547	-6.80	23.22	0.293 [1] ✔
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.26	85.7 K=1.00	1.0547	-9.93	23.22	0.428 [1] ✔
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3 K=1.00	1.0547	-11.22	23.51	0.477 [1] ✔

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3 K=1.00	1.0547	-6.24	23.51	0.265 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	P2.5x.276	20.00	3.33	43.3	2.2535	16.97	101.41	0.167 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T2	80 - 60	P2.5x.276 (GR)	20.00	3.33	43.3	2.2535	69.22	101.41	0.683 [1]
T3	60 - 53.33	P3x.3 (GR)	6.67	3.34	35.2	3.0159	88.71	165.57	0.536 [1]
T4	53.33 - 40	P3x.3 (GR)	13.33	1.67	17.6	3.0159	132.53	165.57	0.800 [1]
T5	40 - 20	P5x.258 (GR)	20.03	6.68	42.7	4.2999	143.74	162.54	0.884 [1]
T6	20 - 0	P5x.258 (GR)	20.03	6.68	42.7	4.2999	141.58	162.54	0.871 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	5/8	4.83	4.50	345.8	0.3068	7.24	9.94	0.728 [1]
T2	80 - 60	5/8	4.83	4.50	345.8	0.3068	9.47	9.94	0.953 [1]
T3	60 - 53.33	3/4	4.83	4.43	283.6	0.4418	11.50	14.31	0.803 [1]
T4	53.33 - 40	3/4	4.83	4.43	283.5	0.4418	12.74	14.31	0.890 [1]
T5	40 - 20	L2x2x3/16	7.69	3.68	74.0	0.7150	3.82	23.17	0.165 [1]
T6	20 - 0	L2 1/2x2 1/2x3/16	9.79	4.69	74.1	0.9020	1.93	29.22	0.066 [1]

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	85.7	0.5273	0.56	17.09	0.033 [1]
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	85.7	1.0547	1.55	34.17	0.045 [1]
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3	1.0547	1.95	34.17	0.057 [1]
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3	1.0547	2.76	34.17	0.081 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
									✔

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	53.33 - 40	L2 1/2x2 1/2x5/16	3.50	2.94	50.6	1.4600	2.76	47.30	0.058 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	100 - 80	Leg	P2.5x.276	2	-32.53	88.43	36.8	Pass
T2	80 - 60	Leg	P2.5x.276 (GR)	59	-89.76	96.20	93.3	Pass
T3	60 - 53.33	Leg	P3x.3 (GR)	119	-112.80	148.57	75.9	Pass
T4	53.33 - 40	Leg	P3x.3 (GR)	137	-159.46	160.63	99.3	Pass
T5	40 - 20	Leg	P5x.258 (GR)	190	143.74	162.54	88.4	Pass
T6	20 - 0	Leg	P5x.258 (GR)	213	141.58	162.54	87.1	Pass
T1	100 - 80	Diagonal	5/8	10	7.24	9.94	72.8	Pass
T2	80 - 60	Diagonal	5/8	70	9.47	9.94	95.3	Pass
T3	60 - 53.33	Diagonal	3/4	124	11.50	14.31	80.3	Pass
T4	53.33 - 40	Diagonal	3/4	148	12.74	14.31	89.0	Pass
T5	40 - 20	Diagonal	L2x2x3/16	205	-4.44	11.67	38.0	Pass
T6	20 - 0	Diagonal	L2 1/2x2 1/2x3/16	217	-2.15	14.53	48.8 (b) 14.8 24.6 (b)	Pass
T1	100 - 80	Horizontal	L1 1/2x1 1/2x3/16	49	-5.97	7.19	83.0	Pass
T2	80 - 60	Horizontal	2L1 1/2x1 1/2x3/16	75	-8.54	23.22	36.8	Pass
T3	60 - 53.33	Horizontal	2L1 1/2x1 1/2x3/16	129	-11.64	23.51	49.5	Pass
T4	53.33 - 40	Horizontal	2L1 1/2x1 1/2x3/16	153	-11.91	23.51	50.7	Pass
T4	53.33 - 40	Secondary Horizontal	L2 1/2x2 1/2x5/16	154	-2.76	29.11	9.5 17.5 (b)	Pass
T1	100 - 80	Top Girt	L1 1/2x1 1/2x3/16	4	-3.04	7.19	42.2	Pass
T2	80 - 60	Top Girt	2L1 1/2x1 1/2x3/16	63	-6.80	23.22	29.3	Pass
T3	60 - 53.33	Top Girt	2L1 1/2x1 1/2x3/16	66	-9.93	23.22	42.8	Pass
T4	53.33 - 40	Top Girt	2L1 1/2x1 1/2x3/16	141	-11.22	23.51	47.7	Pass
T4	53.33 - 40	Bottom Girt	2L1 1/2x1 1/2x3/16	144	-6.24	23.51	26.5	Pass
							Summary	
							Leg (T4) 99.3	Pass
							Diagonal (T2) 95.3	Pass
							Horizontal (T1) 83.0	Pass
							Secondary Horizontal 17.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						(T4) Top Girt	47.7	Pass
						(T4) Bottom Girt	26.5	Pass
						(T4) Bolt Checks	62.5	Pass
						RATING =	**99.3**	**Pass**

Program Version 8.0.5.0 - 11/28/2018 File:J:/Jobs/1902700.WI/54_CTFF703A/05_Structural/Tower Analysis/Backup Documentation/Calcs/Rev (1)/ERI Files/100-ft NUDD Lattice Tower Danbury, CT.eri

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Subject:	FOUNDATION ANALYSIS
Location:	Danbury, CT
Rev. 1: 7/19/19	Prepared by: T.J.L. Checked by: C.A.G. Job No. 19027.54

Pier and Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 978 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 14 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 24 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 158 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 142 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 100 \cdot ft$	(User Input)	
Tower Width =	$W_t := 7.5 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 7.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 4.25 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.25 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 2.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 3.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 14.5 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 10000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.0 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 8$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 4 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 6$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 0.750 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 15$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.000 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 15$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.785 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.442 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$

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

Load Factor = $LF := 1$

Stability of Footing:

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

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

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.44 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 1.44 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.52 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.98 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 3 \cdot ft$

$A_p := W_f \cdot T_p = 43.5 \cdot ft^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 86.13 \cdot kip$

Weight of Concrete = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4} L_p\right)\right] \cdot \gamma_c = 100.621 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left[W_f^2 - (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4}\right)\right] \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 96.4 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right] \cdot \gamma_s = 24.612 \cdot kip$

Foundation has undercut toe per Fred A. Nudd dwg 96-4992-1

Tower Offset = $X_{t1} := \left[\frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{2}\right]$ $X_{t2} := \frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{3}$

$X_t := if(Pos_t = 1, X_{t1}, X_{t2}) = 5.085$

$X_{off1} := \frac{W_f}{2} - \left[\frac{(W_t \cdot \cos(30 \cdot deg))}{3} + X_t\right] = 0$ $X_{off2} := 0$

$X_{off} := if(Pos_t = 1, X_{off1}, X_{off2})$ $X_{off} = 0 \cdot ft$

Total Weight = $WT_{tot} := 0.9WT_c + 0.75WT_{s1} = 162.9 \cdot kip$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_f}{2} + 0.9WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right) + 0.75\left(S_u \cdot \frac{T_p}{3}\right) + 0.75WT_{s2} \cdot \left[W_f + \frac{(D_f - n) \cdot \tan(\Phi_s)}{3}\right] = 1694 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + S_t \cdot (L_p + T_f) = 1079.5 \cdot kip \cdot ft$

Foundation has undercut toe per Fred A. Nudd dwg 96-4992-1

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 1.57$

Factor of Safety Required = $FS_{req} := 1$ $OverTurning\_Moment\_Check := if(FS \geq FS_{req}, "Okay", "No Good")$

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 159.415 \cdot kips$

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

$Shear\_Check = "Okay"$

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_{s1} + WT_t = 221 \cdot kip$

Area of the Mat = $A_{mat} := W_f^2 = 210.25$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 508.1 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 3.176 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < 0.75q_s, "Okay", "No Good")$

$Max\_Pressure\_Check = "Okay"$

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.073 \cdot ksf$

$Min\_Pressure\_Check := if[(P_{min} \geq 0) \cdot (P_{min} < 0.75q_s), "Okay", "No Good"]$

$Min\_Pressure\_Check = "No Good"$

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 3.612$

Distance to Kern = $X_k := \frac{W_f}{6} = 2.417$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 4.884$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 4.295 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 4.295 \cdot ksf$

$Pressure\_Check := if(q_{adj} < 0.75q_s, "Okay", "No Good")$

$Pressure\_Check = "Okay"$

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 999.78 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot C_t, "Okay", "No Good")$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 32 \cdot in$

$FL := LF \cdot \frac{C_t}{W_f^2} = 0.751 \cdot ksf$

$V_{req} := FL \cdot (X_t - .5 \cdot d_p - d) \cdot W_f = 15.454 \cdot kips$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d = 599 \cdot kip$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 14.7$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 17.1$

Required Shear Strength = $V_{req} := FL \cdot (W_f^2 - A_{bo}) = 145 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1210.6 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

Maximum Moment in Pad = $M_{max} := 352 \cdot kip \cdot ft$ (User Input)

Design Moment = $M_n := \frac{LF \cdot M_{max}}{\phi_m} = 391.111 \cdot kips \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000\right)}{1000}\right] \cdot 0.5\right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p = 101.942 \cdot in$

$A_s := \frac{M_n}{(f_y \cdot d)} = 2.444 \cdot in^2$

$a := \frac{A_s \cdot f_y}{\beta \cdot f_c \cdot b_{eff}} = 0.423 \cdot in$

$A_s := \frac{M_n}{f_y \cdot \left(d - \frac{a}{2}\right)} = 2.461 \cdot in^2$

$\rho := \frac{A_s}{b_{eff} d} = 0.00905 \cdot in$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018$$ (ACI-2008 7.12.2.1)

Check Bottom Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 2.9 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 11.8 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if\left(As_{prov} > As, "Okay", "No\ Good"\right)$$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 2.9 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 6.6 \cdot in^2$$

$$Pad\_Reinforcement\_Top := if\left(As_{prov} > As, "Okay", "No\ Good"\right)$$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 10.93 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 23.7 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

$$L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin"\right) = "Use\ L.dbt"$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 39 \cdot in$$

$$Lpad\_Check := if\left(L_{Pad} > L_{dbt}, "Okay", "No\ Good"\right)$$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 452.39 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 2.26 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 6.28 \cdot in^2$

$Steel\_Area\_Check := if(A_{sprov} > A_{smin}, "Okay", "No Good")$

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 8.425 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 18 \cdot in$

Maximum Moment in Pier = $M_p := S_t \cdot (L_p) \cdot LF = 714 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$(D \;\; N \;\; n \;\; P_u \;\; M_{xu}) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{C_t \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$

$(D \;\; N \;\; n \;\; P_u \;\; M_{xu}) = (24 \;\; 8 \;\; 8 \;\; 210.614 \;\; 714)$

$(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) := (0 \;\; 0 \;\; 0 \;\; 0)$

$(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) := \phi P'_n(D, N, n, P_u, M_{xu})^T$

$(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) = (695.892 \;\; 2.359 \times 10^3 \;\; -16.5 \;\; 0.014)$

$Axial\_Load\_Check := if(\phi P_n \geq P_u, "Okay", "No Good")$

Axial_Load_Check = "Okay"

$Bending\_Check := if(\phi M_{xn} \geq M_{xu}, "Okay", "No Good")$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 48 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 33 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 23.72 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 13.282 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right) = 23.717 \cdot in$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 18.974 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 18 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 18.974 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

FEATURES / BENEFITS

This antenna provides a 8 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- 24 Inch Width For Easier Zoning
- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality
- Superior elevation pattern performance across the entire electrical down tilt range
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional daisy chain of two high band RET motors for one single AISG point of high band tilt control.
- Low band arrays driven by a single RET motor

Technical Features

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

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	14.1 +/- .3	14.5 +/- .4
Horizontal Beamwidth @3dB	Deg	66.1+/-4.3	63.1+/-2.3
Vertical Beamwidth @3dB	Deg	14.2+/-0.8	13.0+/-0.5
Electrical Downtilt Range	Deg	0-14	
Upper Side Lobe Suppression 0 to +20	dB	20.5	21.4
Front-to-Back, at +/-30°, Copolar	dB	22.4	21.8
Cross Polar Discrimination (XPD) @ Boresight	dB	21.4	20.1
Cross Polar Discrimination (XPD) @ +/-60	dB	5.2	3.5
3rd Order PIM 2 x 43dBm	dBc	-153	
VSWR	-	1.5:1	
Cross Polar Isolation	dB	25	
Maximum Effective Power per Port	Watt	250	

LOW BAND RIGHT ARRAY (617-746 MHZ) [R2]

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	13.8 +/- .3	14.1 +/- .4
Horizontal Beamwidth @3dB	Deg	66.5+/-4.9	63.3+/-2.2
Vertical Beamwidth @3dB	Deg	14.2+/-0.8	12.9+/-0.6
Electrical Downtilt Range	Deg	0-14	
Upper Side Lobe Suppression 0 to +20	dB	20.3	21.3
Front-to-Back, at +/-30°, Copolar	dB	22.4	21.4
Cross Polar Discrimination (XPD) @ Boresight	dB	20.2	19.7
Cross Polar Discrimination (XPD) @ +/-60	dB	4.5	1.7
3rd Order PIM 2 x 43dBm	dBc	-153	
VSWR	-	1.5:1	
Cross Polar Isolation	dB	25	
Maximum Effective Power per Port	Watt	250	

All information contained in the present datasheet is subject to confirmation at time of ordering

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 14.9/14.5/18.6/18.6 dBi, 1.8m (6ft), VET, RET, 0-14°/0-14°/2-12°/2-12°

ELECTRICAL SPECIFICATIONS

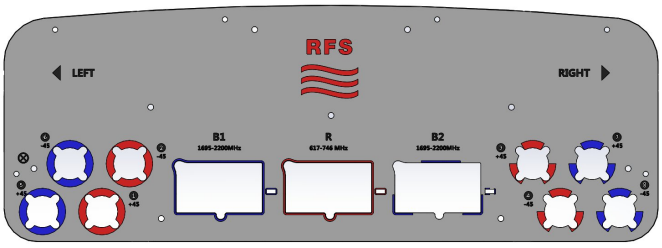
Impedance	Ohm	50.0
Polarization	Deg	±45°

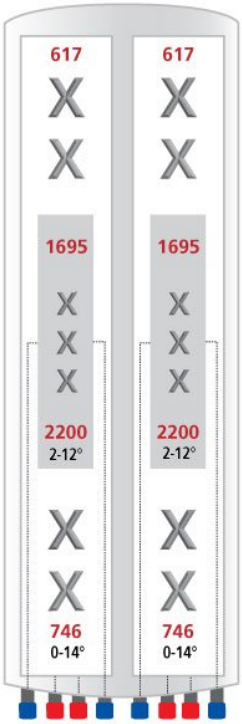
MECHANICAL SPECIFICATIONS

Dimensions - H x W x D	mm (in)	1829 x 609 x 215 (72 x 24 x 8.5)
Weight (Antenna Only)	kg (lb)	48 (106)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.3)
Packing size- HxWxD	mm (in)	1980 x 735 x 375 (77.9 x 28.9 x 14.8)
Shipping Weight	kg (lb)	70 (154)
Connector type		8 x 4.3-10 female at bottom + 6 AISG connectors (3 male, 3 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable) + Manual Override + External Tilt Indicator
Mounting Hardware Material		Galvanized steel
Radome Material / Color		Fiber Glass / Light Grey RAL7035

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		IEC 61000-4-5
Survival/Rated Wind Velocity	km/h	240 (150)
Wind Load @Rated Wind Front	N	1072.0
Wind Load @Rated Wind Side	N	326.0
Wind Load @Rated Wind Rear	N	1160.0
Environmental		ETSI 300-019-2-4 Class 4.1E





All information contained in the present datasheet is subject to confirmation at time of ordering

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

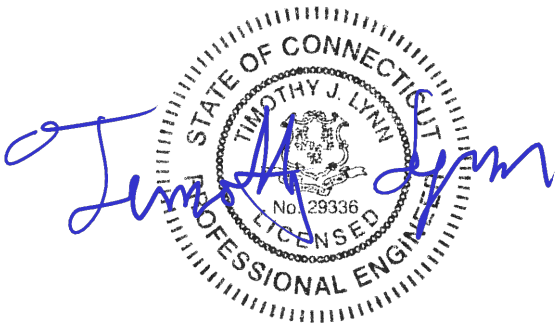
T-Mobile Site #: CTFF703A

303 Boxwood Lane
Danbury, CT

Centek Project No. 19027.54

~~Date: May 20, 2019~~
Rev 1: July 30, 2019

Max Stress Ratio = 34.8%



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

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CENTEK engineering

Centered on Solutions℠

July 30, 2019

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

Re: Structural Letter ~ Antenna Mount
T-Mobile – Site Ref: CTFF703A
303 Boxwood Lane
Danbury, CT 06811

Centek Project No. 19027.54 ~ Rev.1

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 three (3) 10-ft (SitePro: LTF10-3XX) T-Frames 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:
  T-Frames: Three (3) RFS APXVAARR18_43-C-NA20 panel antennas, three (3) Ericsson AIR32 KRD901146-1_B66A_B2A panel antennas, three (3) KRY112 TMAs and three (3) Ericsson 4449 B71_B12 remote radio units mounted on three (3) T-Frames with a RAD center elevation of 83-ft +/- AGL.

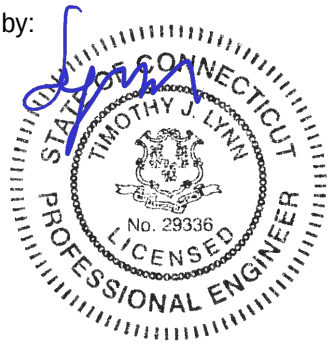
The antenna mount was analyzed per the requirements of the 2015 International Building Code as modified by the 2018 Connecticut State Building Code considering a nominal design wind speed of 93 mph for Danbury as required in Appendix N of the 2018 Connecticut State Building Code.

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 subject antenna mount has sufficient capacity to support the aforementioned antenna configuration. If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer



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Section 2 - Calculations

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Subject: Loads on Equipment

Location: Danbury, CT

Rev. 1: 07/30/19

Prepared by: F.J.P Checked by: C.A.G.
Job No. 19027.54

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

Wind Speeds

Basic Wind Speed	$V := 93$	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 := Lattice		(User Input)
Structure Category =	SC := II		(User Input)
Exposure Category =	Exp := C		(User Input)
Structure Height =	$h := 100$	ft	(User Input)
Height to Center of Antennas =	$z := 83$	ft	(User Input)
Radial Ice Thickness =	$t_i := 0.75$	in	(User Input per Annex B of TIA-222-G)
Radial Ice Density =	$Id := 56.00$	pcf	(User Input)
Topograpic Factor =	$K_{zt} := 1.0$		(User Input)
	$K_a := 1.0$		(User Input)
Gust Response Factor =	$G_H = 1.2$		(User Input)

Output

Wind Direction Probability Factor =

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

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

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

Importance Factors =

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

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

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

$$K_{iz} := \left(\frac{z}{33}\right)^{0.1} = 1.097$$

Velocity Pressure Coefficient Antennas =

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 1.645$$

$$Kz := 2.01 \cdot \left(\left(\frac{z}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.217$$

Velocity Pressure w/o Ice Antennas = $qz := 0.00256 \cdot K_d \cdot Kz \cdot V^2 \cdot I_{Wind} = 22.903$ psf

Velocity Pressure with Ice Antennas = $qz_{ice} := 0.00256 \cdot K_d \cdot Kz \cdot V_i^2 \cdot I_{Wind} = 6.62$ psf

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVARR18_43-C-NA20		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 19.7$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.5$	in	(User Input)
Antenna Weight =	$WT_{ant} := 99.3$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.7$		
Antenna Force Coefficient =	$Ca_{ant} = 1.25$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 9.9$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 339$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 4.3$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 146$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 12$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 119$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 6.2$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 61$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 99$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \cdot 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 8351$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 271$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 271$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson - AIR32 KRD901146-1_B66A_B2A		
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 =	$WT_{ant} := 133$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.4$		
Antenna Force Coefficient =	$Ca_{ant} = 1.28$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.1$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 179$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 3.4$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 121$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 6.7$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 69$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 5$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 51$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 133$	lbs

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 =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 5273$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 171$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 171$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

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

Wind Load (without ice)

Surface Area for One RRUS =	$SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.4$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 45$	lbs
Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.1$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 35$	lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.1$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 20$	lbs
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.7$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 16$	lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 2045$	cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2061$	cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 67$	lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 67$	lbs

Development of Wind & Ice Load on TMA's

TMA Data:

TMA Model =	Ericsson KRY112 TMA		
TMA Shape =	Flat	in	(User Input)
TMA Height =	$L_{TMA} := 6.9$	in	(User Input)
TMA Width =	$W_{TMA} := 6.1$	in	(User Input)
TMA Thickness =	$T_{TMA} := 2.8$	lbs	(User Input)
TMA Weight =	$WT_{TMA} := 11$		(User Input)
Number of TMA's =	$N_{TMA} := 1$		(User Input)
TMA Aspect Ratio =	$Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1.1$		
TMA Force Coefficient =	$Ca_{TMA} = 1.2$		

Wind Load (without ice)

Surface Area for One TMA =	$SA_{TMAF} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.3$	sf
Total TMA Wind Force =	$F_{TMA} := qz \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAF} = 10$	lbs
Surface Area for One TMA =	$SA_{TMAS} := \frac{L_{TMA} \cdot T_{TMA}}{144} = 0.1$	sf
Total TMA Wind Force =	$F_{TMA} := qz \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAS} = 4$	lbs

Wind Load (with ice)

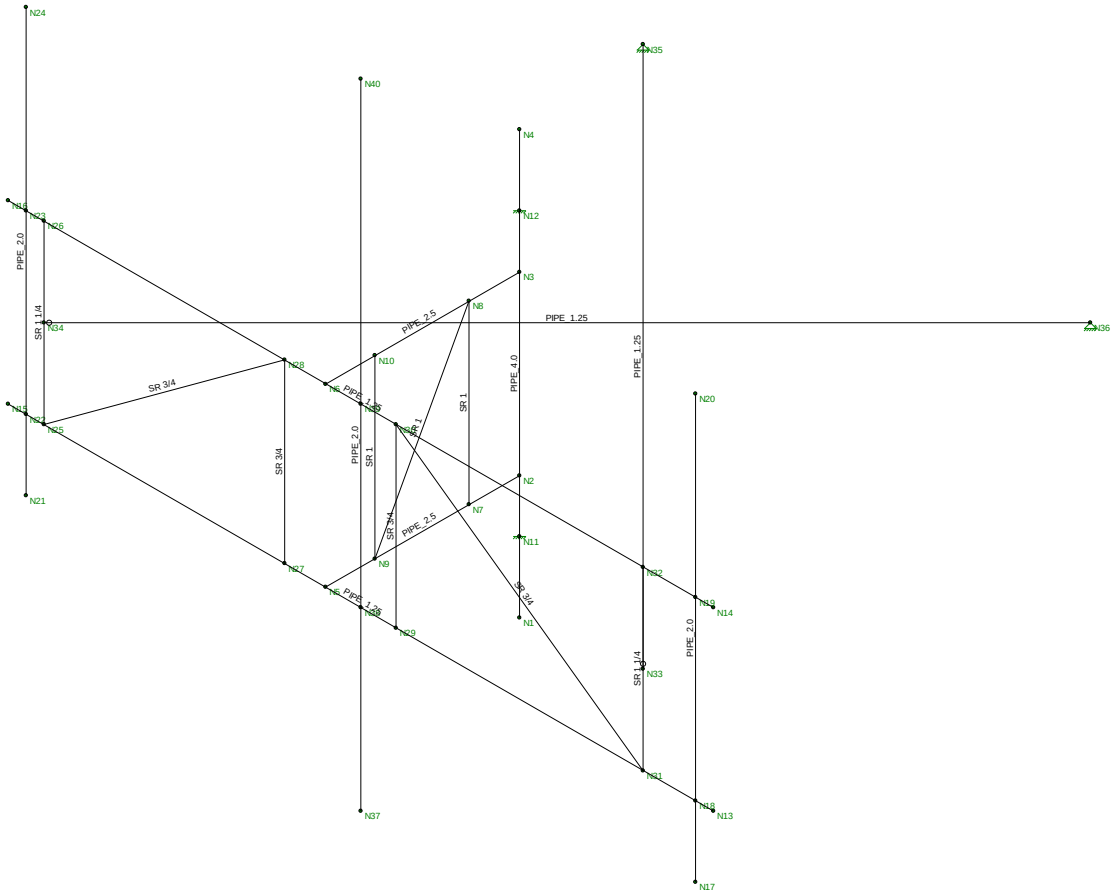
Surface Area for One TMA w/ Ice =	$SA_{ICETMAF} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz})}{144} = 0.7$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAF} = 6$	lbs
Surface Area for One TMA w/ Ice =	$SA_{ICETMAS} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz})}{144} = 0.4$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAS} = 4$	lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each TMA =	$V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 118$	cu in
Volume of Ice on Each TMA =	$V_{ice} := (L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz}) - V_{TMA} = 465$	cu in
Weight of Ice on Each TMA =	$W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 15$	lbs
Weight of Ice on All TMAs =	$W_{ICETMA} \cdot N_{TMA} = 15$	lbs



Centek		
FJP	CTFF703A - Mount_Rev.1	July 30, 2019 at 10:05 AM
19027.54	Member Framing	CTFF703A_AMA_Rev.1.r3d

(Global) Model Settings

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

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

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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	(E) Pipe 4" Std	PIPE_4.0	Column	Pipe	A53 Grade B	Typical	2.96	6.82	6.82	13.6
2	(E) Pipe 1.25" Std	PIPE_1.25	Beam	Pipe	A53 Grade B	Typical	.625	.184	.184	.368
3	(E) Pipe 2.0" Std.	PIPE_2.0	Column	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
4	(E) Pipe 2.5" Std	PIPE_2.5	Beam	Pipe	A53 Grade B	Typical	1.61	1.45	1.45	2.89
5	(E) SR1-1/4	SR 1 1/4	Column	BAR	A36 Gr.36	Typical	1.227	.12	.12	.24
6	(E)SR1	SR 1	Column	BAR	A36 Gr.36	Typical	.785	.049	.049	.098
7	(E)SR5/8	SR 5/8	Column	BAR	A36 Gr.36	Typical	.307	.007	.007	.015
8	(E)SR3/4	SR 3/4	Column	BAR	A36 Gr.36	Typical	.442	.016	.016	.031
9	(E) Stabilizer	PIPE_1.25	Beam	Pipe	A53 Grade B	Typical	.625	.184	.184	.368
10	(P) Antenna Mast	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	(E) Pipe 4" ...	6			Lbyy						Lateral
2	M2	(E) Pipe 2.5...	2.75			Lbyy						Lateral
3	M3	(E) Pipe 2.5...	2.75			Lbyy						Lateral
4	M4	(E) Pipe 1.2...	10	Segment	Segment	Lbyy						Lateral
5	M5	(E) Pipe 1.2...	10	2.75	2.75	2.75	2.75	2.75				Lateral
6	M6	(E)SR1	2.5			Lbyy						Lateral
7	M7	(E)SR1	2.833			Lbyy						Lateral
8	M8	(E)SR1	2.5			Lbyy						Lateral
9	M9	(E) Pipe 2.0...	6			Lbyy						Lateral
10	M10	(E) Pipe 2.0...	6			Lbyy						Lateral
11	M11	(E) SR1-1/4	2.5			Lbyy						Lateral
12	M12	(E) SR1-1/4	2.5			Lbyy						Lateral
13	M13	(E)SR3/4	2.5			Lbyy						Lateral
14	M14	(E)SR3/4	2.5			Lbyy						Lateral
15	M15	(E)SR3/4	4.234			Lbyy						Lateral
16	M16	(E)SR3/4	4.301			Lbyy						Lateral
17	M17	(E) Stabilizer	10.5			Lbyy						Lateral
18	M18	(E) Stabilizer	10.503			Lbyy						Lateral
19	M19	(E) Pipe 2.0...	9			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	N4			(E) Pipe 4" Std	Column	Pipe	A53 Gra...	Typical
2	M2	N6	N3			(E) Pipe 2.5" Std	Beam	Pipe	A53 Gra...	Typical
3	M3	N5	N2			(E) Pipe 2.5" Std	Beam	Pipe	A53 Gra...	Typical
4	M4	N16	N14			(E) Pipe 1.25" Std	Beam	Pipe	A53 Gra...	Typical
5	M5	N15	N13			(E) Pipe 1.25" Std	Beam	Pipe	A53 Gra...	Typical
6	M6	N8	N7			(E)SR1	Column	BAR	A36 Gr.36	Typical
7	M7	N8	N9			(E)SR1	Column	BAR	A36 Gr.36	Typical
8	M8	N9	N10			(E)SR1	Column	BAR	A36 Gr.36	Typical
9	M9	N17	N20			(E) Pipe 2.0" Std.	Column	Pipe	A53 Gra...	Typical
10	M10	N21	N24			(E) Pipe 2.0" Std.	Column	Pipe	A53 Gra...	Typical
11	M11	N31	N32			(E) SR1-1/4	Column	BAR	A36 Gr.36	Typical
12	M12	N25	N26			(E) SR1-1/4	Column	BAR	A36 Gr.36	Typical
13	M13	N27	N28			(E)SR3/4	Column	BAR	A36 Gr.36	Typical
14	M14	N29	N30			(E)SR3/4	Column	BAR	A36 Gr.36	Typical
15	M15	N25	N28			(E)SR3/4	Column	BAR	A36 Gr.36	Typical
16	M16	N31	N30			(E)SR3/4	Column	BAR	A36 Gr.36	Typical
17	M17	N34	N36			(E) Stabilizer	Beam	Pipe	A53 Gra...	Typical
18	M18	N33	N35			(E) Stabilizer	Beam	Pipe	A53 Gra...	Typical
19	M19	N37	N40			(E) Pipe 2.0" Std.	Column	Pipe	A53 Gra...	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	0	-.25	0	0	
2	N2	0	1.5	0	0	
3	N3	0	4	0	0	
4	N4	0	5.75	0	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
5	N5	0	1.5	2.75	0	
6	N6	0	4	2.75	0	
7	N7	0	1.5	0.716667	0	
8	N8	0	4	0.716667	0	
9	N9	0	1.5	2.05	0	
10	N10	0	4	2.05	0	
11	N11	0	.75	0	0	
12	N12	0	4.75	0	0	
13	N13	5.5	1.5	2.75	0	
14	N14	5.5	4	2.75	0	
15	N15	-4.5	1.5	2.75	0	
16	N16	-4.5	4	2.75	0	
17	N17	5.25	.5	2.75	0	
18	N18	5.25	1.5	2.75	0	
19	N19	5.25	4	2.75	0	
20	N20	5.25	6.5	2.75	0	
21	N21	-4.25	.5	2.75	0	
22	N22	-4.25	1.5	2.75	0	
23	N23	-4.25	4	2.75	0	
24	N24	-4.25	6.5	2.75	0	
25	N25	-4	1.5	2.75	0	
26	N26	-4	4	2.75	0	
27	N27	-0.583333	1.5	2.75	0	
28	N28	-0.583333	4	2.75	0	
29	N29	1	1.5	2.75	0	
30	N30	1	4	2.75	0	
31	N31	4.5	1.5	2.75	0	
32	N32	4.5	4	2.75	0	
33	N33	4.5	2.75	2.75	0	
34	N34	-4	2.75	2.75	0	
35	N35	-2.924621	3	-4.674621	0	
36	N36	3.424621	2.75	-4.674621	0	
37	N37	.5	-1	2.75	0	
38	N38	.5	1.5	2.75	0	
39	N39	.5	4	2.75	0	
40	N40	.5	8	2.75	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	N12	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N11	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N36	Reaction	Reaction	Reaction			
4	N35	Reaction	Reaction	Reaction			

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	Y	-.05	.5
2	M19	Y	-.05	6.5
3	M10	Y	-.076	.5

Member Point Loads (BLC 2 : Dead Load) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
4	M10	Y	-.076	4.333
5	M19	Y	-.074	3.75
6	M9	Y	-.011	3.75

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	Y	-.136	.5
2	M19	Y	-.136	6.5
3	M10	Y	-.086	.5
4	M10	Y	-.086	4.333
5	M19	Y	-.067	3.75
6	M9	Y	-.015	3.75

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	X	.03	.5
2	M19	X	.03	6.5
3	M10	X	.026	.5
4	M10	X	.026	4.333
5	M19	X	.004	3.75
6	M9	X	.004	3.75

Member Point Loads (BLC 5 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	X	.073	.5
2	M19	X	.073	6.5
3	M10	X	.06	.5
4	M10	X	.06	4.333
5	M19	X	.035	3.75
6	M9	X	.004	3.75

Member Point Loads (BLC 6 : Wind with Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	Z	-.06	.5
2	M19	Z	-.06	6.5
3	M10	Z	-.035	.5
4	M10	Z	-.035	4.333
5	M19	Z	-.02	3.75
6	M9	Z	-.006	3.75

Member Point Loads (BLC 7 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M19	Z	-.17	.5
2	M19	Z	-.17	6.5
3	M10	Z	-.089	.5
4	M10	Z	-.089	4.333
5	M19	Z	-.045	3.75
6	M9	Z	-.01	3.75

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.003	.003	0	0
2	M2	X	.002	.002	0	0
3	M3	X	.002	.002	0	0
4	M6	X	.0006	.0006	0	0
5	M7	X	.0006	.0006	0	0
6	M8	X	.0006	.0006	0	0
7	M9	X	.001	.001	0	0
8	M10	X	.001	.001	0	0
9	M13	X	.0004	.0004	0	0
10	M14	X	.0004	.0004	0	0
11	M15	X	.0004	.0004	0	0
12	M16	X	.0004	.0004	0	0
13	M17	X	.0009	.0009	0	0
14	M18	X	.0009	.0009	0	0
15	M19	X	.001	.001	0	0

Member Distributed Loads (BLC 5 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.009	.009	0	0
2	M2	X	.005	.005	0	0
3	M3	X	.005	.005	0	0
4	M6	X	.002	.002	0	0
5	M7	X	.002	.002	0	0
6	M8	X	.002	.002	0	0
7	M9	X	.005	.005	0	0
8	M10	X	.005	.005	0	0
9	M13	X	.001	.001	0	0
10	M14	X	.001	.001	0	0
11	M15	X	.001	.001	0	0
12	M16	X	.001	.001	0	0
13	M17	X	.003	.003	0	0
14	M18	X	.003	.003	0	0
15	M19	X	.005	.005	0	0

Member Distributed Loads (BLC 6 : Wind with Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	-.003	-.003	0	0
2	M4	Z	-.0009	-.0009	0	0
3	M5	Z	-.0009	-.0009	0	0
4	M9	Z	-.001	-.001	0	0
5	M10	Z	-.001	-.001	0	.5
6	M10	Z	-.001	-.001	4.333	0
7	M11	Z	-.0006	-.0006	0	0
8	M12	Z	-.0006	-.0006	0	0
9	M13	Z	-.0004	-.0004	0	0
10	M14	Z	-.0004	-.0004	0	0
11	M15	Z	-.0004	-.0004	0	0
12	M16	Z	-.0004	-.0004	0	0
13	M17	Z	-.0009	-.0009	0	0
14	M18	Z	-.0009	-.0009	0	0

Member Distributed Loads (BLC 6 : Wind with Ice Z) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
15	M19	Z	-.001	-.001	0	.5
16	M19	Z	-.001	-.001	6.5	0

Member Distributed Loads (BLC 7 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	-.009	-.009	0	0
2	M4	Z	-.003	-.003	0	0
3	M5	Z	-.003	-.003	0	0
4	M9	Z	-.005	-.005	0	0
5	M10	Z	-.005	-.005	0	.5
6	M10	Z	-.005	-.005	4.333	0
7	M11	Z	-.002	-.002	0	0
8	M12	Z	-.002	-.002	0	0
9	M13	Z	-.001	-.001	0	0
10	M14	Z	-.001	-.001	0	0
11	M15	Z	-.001	-.001	0	0
12	M16	Z	-.001	-.001	0	0
13	M17	Z	-.003	-.003	0	0
14	M18	Z	-.003	-.003	0	0
15	M19	Z	-.005	-.005	0	.5
16	M19	Z	-.005	-.005	6.5	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Grav...	Joint	Point	Distribu...	Area(M...	Surface(Plate/Wall)
1	Self Weight	DL		-1						
2	Dead Load	None					6			
3	Ice Load	None					6			
4	Wind with Ice X	None					6	15		
5	Wind X	None					6	15		
6	Wind with Ice Z	None					6	16		
7	Wind Z	None					6	16		

Load Combinations

	Description	Solve	PD...	SR...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.2D + 1.6W (X-direction)	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9D + 1.6W (X-direction)	Yes	Y		1	.9	2	.9	5	1.6														
3	1.2D + 1.0Di + 1.0Wi (X-...	Yes	Y		1	1.2	2	1.2	3	1	4	1												
4	1.2D + 1.6W (Z-direction)	Yes	Y		1	1.2	2	1.2	7	1.6														
5	0.9D + 1.6W (Z-direction)	Yes	Y		1	.9	2	.9	7	1.6														
6	1.2D + 1.0Di + 1.0Wi (Z-...	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	N12	max	.31	6	.707	3	-.009	5	.302	3	.375	6	.099	4
2		min	-.391	2	.272	5	-.975	3	-.08	5	-.921	2	-.258	2
3	N11	max	.01	5	.578	6	1.051	6	.407	6	.063	5	.3	1
4		min	-.585	1	.26	2	.407	2	.154	2	-1.14	1	-.047	5

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
5	N36	max	.003	2	.013	1	.402	4	0	6	0	6	0	6
6		min	-.376	4	.01	5	-.03	2	0	1	0	1	0	1
7	N35	max	.15	4	.013	3	.177	4	0	6	0	6	0	6
8		min	0	2	.005	5	.007	3	0	1	0	1	0	1
9	Totals:	max	0	6	1.304	6	1.337	5						
10		min	-.937	1	.585	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
1	N1	max	0	2	0	5	0	3	2.087e-06	5	0	6	2.087e-06	2
2		min	0	4	0	1	0	4	0	1	0	1	0	4
3	N2	max	0	1	0	2	0	2	-7.912e-07	1	8.119e-04	1	3.282e-05	4
4		min	0	5	0	6	0	4	-4.37e-05	5	-4.46e-05	5	-6.777e-05	2
5	N3	max	0	2	0	5	0	3	7.247e-05	4	6.557e-04	2	8.895e-05	1
6		min	0	4	0	3	0	5	1.922e-05	2	-2.667e-04	6	-7.297e-06	5
7	N4	max	0	2	0	5	0	3	0	3	0	6	0	6
8		min	0	4	0	1	0	4	-2.087e-06	4	0	1	-2.087e-06	1
9	N5	max	.174	1	-.01	2	0	2	1.563e-03	6	6.85e-03	1	2.214e-03	6
10		min	.005	5	-.022	6	-.002	6	7.371e-04	2	5.541e-04	5	5.977e-04	2
11	N6	max	.128	2	-.008	2	0	3	1.322e-03	3	5.122e-03	2	2.24e-03	6
12		min	-.074	6	-.022	6	0	5	9.883e-05	5	-2.725e-03	6	7.642e-04	2
13	N7	max	.023	1	-.001	2	0	2	2.925e-04	6	3.973e-03	1	6.173e-04	6
14		min	0	5	-.003	6	-.001	6	1.097e-04	2	1.567e-05	5	1.055e-04	2
15	N8	max	.017	2	-.002	2	0	3	4.205e-04	6	2.923e-03	2	6.503e-04	3
16		min	-.009	6	-.004	6	0	5	1.879e-04	2	-1.717e-03	6	2.276e-04	5
17	N9	max	.115	1	-.004	2	0	2	1.046e-03	3	6.844e-03	1	1.717e-03	6
18		min	.002	5	-.01	6	-.002	6	4.885e-04	5	3.012e-04	5	4.385e-04	2
19	N10	max	.085	2	-.004	2	0	3	9.355e-04	6	5.035e-03	2	1.738e-03	6
20		min	-.05	6	-.011	6	0	5	2.957e-04	2	-2.919e-03	6	6.115e-04	2
21	N11	max	0	6	0	6	0	6	0	6	0	6	0	6
22		min	0	1	0	1	0	1	0	1	0	1	0	1
23	N12	max	0	6	0	6	0	6	0	6	0	6	0	6
24		min	0	1	0	1	0	1	0	1	0	1	0	1
25	N13	max	.174	1	.258	6	.017	5	1.707e-03	3	1.327e-03	2	4.492e-03	6
26		min	.005	5	.065	2	-.178	1	-1.361e-03	5	-1.169e-04	6	1.23e-03	2
27	N14	max	.129	2	.258	6	.023	6	1.677e-03	3	1.333e-03	2	4.469e-03	6
28		min	-.074	6	.065	2	-.16	2	-2.39e-03	5	2.55e-05	6	1.083e-03	2
29	N15	max	.176	1	-.081	2	.172	1	-3.716e-04	2	1.887e-03	2	4.83e-03	6
30		min	.006	5	-.27	6	-.056	5	-1.642e-03	4	-3.309e-03	4	1.512e-03	2
31	N16	max	.128	2	-.079	2	.16	2	-2.361e-04	2	1.978e-03	1	4.753e-03	6
32		min	-.075	6	-.27	6	-.163	4	-5.622e-03	4	-3.814e-03	5	9.588e-04	2
33	N17	max	.195	1	.245	6	.035	5	1.707e-03	3	1.327e-03	2	4.492e-03	6
34		min	.027	5	.062	2	-.184	1	-1.349e-03	5	-1.17e-04	6	1.242e-03	2
35	N18	max	.174	1	.245	6	.019	5	1.707e-03	3	1.327e-03	2	4.492e-03	6
36		min	.005	5	.062	2	-.174	1	-1.361e-03	5	-1.17e-04	6	1.23e-03	2
37	N19	max	.129	2	.245	6	.023	6	1.677e-03	3	1.333e-03	2	4.469e-03	6
38		min	-.074	6	.062	2	-.156	2	-2.39e-03	5	2.542e-05	6	1.083e-03	2
39	N20	max	.1	2	.245	6	.05	6	1.678e-03	3	1.333e-03	2	4.472e-03	6
40		min	-.208	6	.062	2	-.141	2	-2.585e-03	5	2.542e-05	6	8.914e-04	2
41	N21	max	.203	1	-.076	2	.173	1	-3.716e-04	2	1.887e-03	2	4.827e-03	6

Envelope Joint Displacements (Continued)

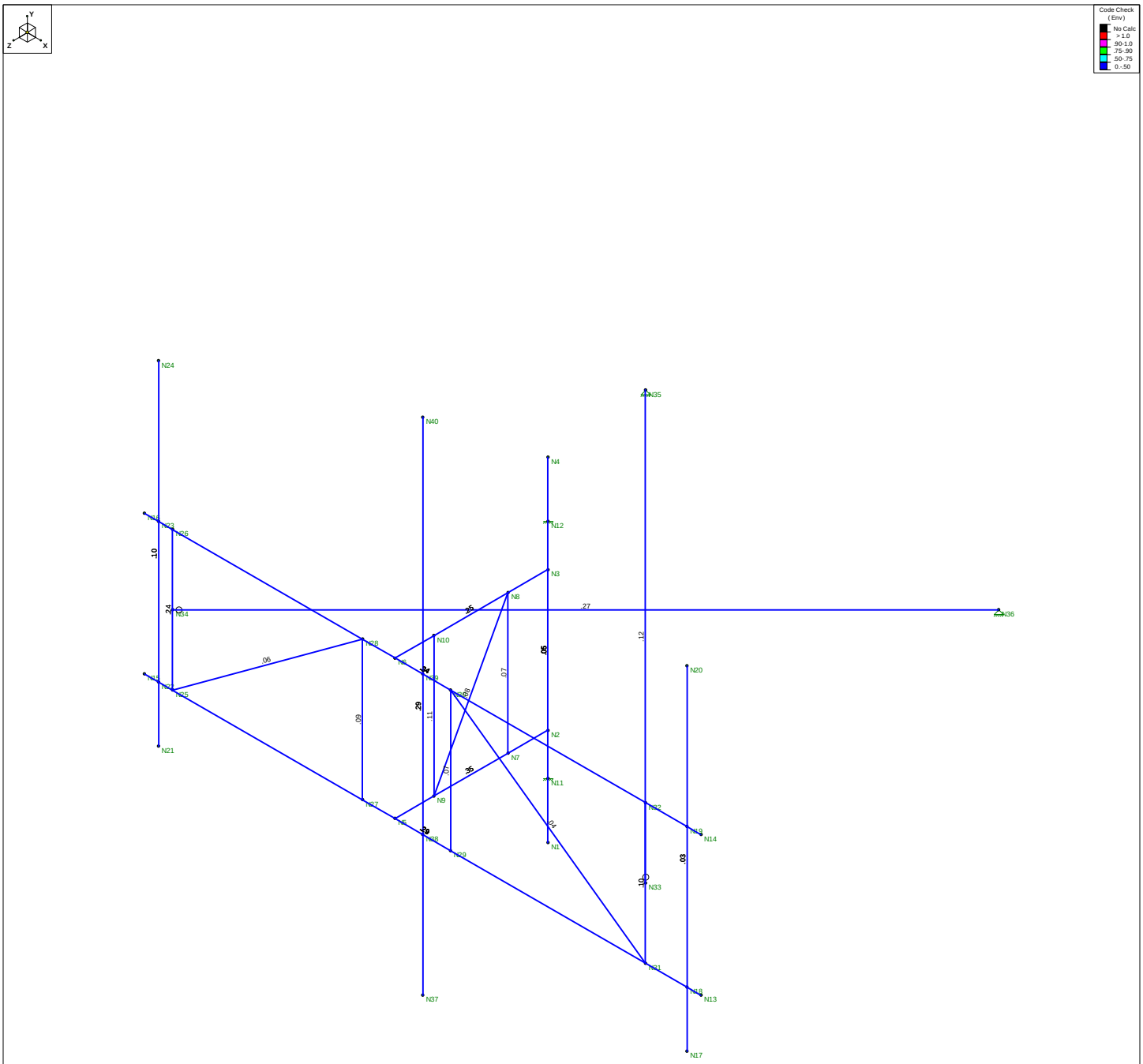
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
42		min	.029	5	-.256	6	-.031	5	-1.515e-03	6	-3.308e-03	4	1.644e-03	2
43	N22	max	.176	1	-.076	2	.167	1	-3.716e-04	2	1.887e-03	2	4.83e-03	6
44		min	.006	5	-.256	6	-.047	5	-1.642e-03	4	-3.308e-03	4	1.512e-03	2
45	N23	max	.128	2	-.076	2	.155	2	-2.361e-04	2	1.978e-03	1	4.753e-03	6
46		min	-.075	6	-.256	6	-.151	4	-5.622e-03	4	-3.813e-03	5	9.587e-04	2
47	N24	max	.113	2	-.076	2	.147	2	-2.363e-04	2	1.978e-03	1	4.767e-03	6
48		min	-.218	6	-.256	6	-.338	4	-6.306e-03	4	-3.813e-03	5	4.368e-04	2
49	N25	max	.176	1	-.072	2	.161	1	-3.909e-04	2	1.866e-03	2	5.053e-03	6
50		min	.006	5	-.241	6	-.037	5	-1.33e-03	6	-2.998e-03	4	1.287e-03	2
51	N26	max	.128	2	-.072	2	.149	2	-1.589e-04	2	2.005e-03	1	4.772e-03	3
52		min	-.075	6	-.241	6	-.14	4	-5.89e-03	4	-3.805e-03	5	1.306e-03	2
53	N27	max	.174	1	-.017	2	.042	1	9.597e-04	6	5.377e-03	1	3.987e-03	6
54		min	.005	5	-.045	6	.001	5	5.046e-04	2	2.718e-04	5	1.16e-03	2
55	N28	max	.128	2	-.017	2	.033	2	7.19e-04	3	4.319e-03	2	4.13e-03	6
56		min	-.074	6	-.046	6	-.015	6	-7.561e-04	5	-2.255e-03	4	1.527e-03	2
57	N29	max	.174	1	.017	6	-.011	5	3.466e-03	4	4.333e-03	1	3.878e-03	6
58		min	.005	5	.002	2	-.066	1	4.209e-04	2	2.732e-04	5	8.487e-04	2
59	N30	max	.128	2	.017	6	.016	6	1.008e-03	3	3.779e-03	2	3.839e-03	6
60		min	-.074	6	0	2	-.053	2	-2.842e-03	5	-6.33e-04	6	1.103e-03	2
61	N31	max	.174	1	.205	6	.019	5	1.693e-03	3	1.326e-03	2	4.473e-03	6
62		min	.005	5	.051	2	-.162	1	-2.762e-04	5	-2.813e-04	6	1.085e-03	2
63	N32	max	.129	2	.205	6	.024	6	1.597e-03	3	1.335e-03	2	4.578e-03	6
64		min	-.074	6	.051	2	-.144	2	-2.885e-03	5	4.881e-05	6	1.295e-03	2
65	N33	max	.15	2	.205	6	.012	4	1.746e-03	3	1.331e-03	2	4.514e-03	6
66		min	-.011	4	.051	2	-.149	2	-1.655e-03	5	-1.162e-04	6	1.236e-03	2
67	N34	max	.151	1	-.072	2	.151	1	-3.533e-04	2	1.928e-03	1	4.486e-03	6
68		min	-.044	5	-.241	6	-.051	5	-3.568e-03	4	-3.395e-03	5	1.26e-03	2
69	N35	max	0	6	0	6	0	6	4.902e-03	3	7.545e-03	2	1.301e-03	3
70		min	0	1	0	1	0	1	2.e-03	5	8.592e-04	6	-1.936e-03	4
71	N36	max	0	6	0	6	0	6	2.33e-03	1	7.585e-03	1	7.605e-03	6
72		min	0	1	0	1	0	1	1.761e-04	5	-6.426e-03	5	3.415e-03	2
73	N37	max	.294	1	-.003	5	-.047	2	9.544e-03	4	5.283e-03	1	4.642e-03	1
74		min	.052	5	-.006	3	-.253	4	3.831e-04	2	9.306e-04	5	1.553e-03	5
75	N38	max	.174	1	-.003	5	-.008	5	4.091e-03	4	5.283e-03	1	3.829e-03	3
76		min	.005	5	-.006	3	-.037	1	3.834e-04	2	9.306e-04	5	1.554e-03	5
77	N39	max	.128	2	-.003	5	.011	6	8.978e-04	3	4.562e-03	2	3.739e-03	6
78		min	-.074	6	-.006	3	-.029	2	-3.045e-03	5	-9.191e-04	6	3.514e-04	2
79	N40	max	.194	2	-.003	5	.048	3	9.054e-04	3	4.562e-03	2	3.771e-03	6
80		min	-.255	6	-.006	3	-.299	5	-6.816e-03	5	-9.191e-04	6	-1.73e-03	2

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

	Me...	Shape	Code C...	Loc...	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pn...	phi*P...	phi*Mn...	phi*...	Cb	Eqn
1	M1	PIPE 4.0	.046	4.25	3	.148	1		1	83.098	93.24	10.631	10.631	2.147	H1-1b
2	M2	PIPE 2.5	.250	2.75	2	.110	2.75		6	47.672	50.715	3.596	3.596	2.339	H1-1b
3	M3	PIPE 2.5	.348	2.75	1	.096	.688		3	47.672	50.715	3.596	3.596	1.672	H1-1b
4	M4	PIPE 1.25	.338	4.5...	4	.336	4.583		4	19.565	19.688	.801	.801	1.929	H3-6
5	M5	PIPE 1.25	.291	5	3	.300	4.583		5	16.292	19.688	.801	.801	1	H1-1b
6	M6	SR 1	.068	2.5	6	.030	0		6	11.923	25.447	.424	.424	2.252	H1-1b*
7	M7	SR 1	.078	0	3	.032	2.833		3	9.593	25.447	.424	.424	2.386	H1-1b
8	M8	SR 1	.110	0	6	.054	0		6	11.923	25.447	.424	.424	2.272	H1-1b

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

	Me...	Shape	Code C...	Loc...	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pn...	phi*P...	phi*Mn...	phi*...	Cb	Eqn
9	M9	PIPE_2.0	.026	3.5	4	.014	3.5		4	20.867	32.13	1.872	1.872	2.052	H1-1b
10	M10	PIPE_2.0	.098	3.5	5	.028	3.5		5	20.867	32.13	1.872	1.872	2.532	H1-1b
11	M11	SR 1 1/4	.096	1.25	4	.018	1.25		4	24.476	39.761	.828	.828	1.787	H1-1b
12	M12	SR 1 1/4	.243	1.25	4	.024	1.25		5	24.476	39.761	.828	.828	1.815	H1-1b
13	M13	SR 3/4	.087	0	6	.025	0		6	3.899	14.314	.179	.179	2.254	H1-1b
14	M14	SR 3/4	.066	0	1	.011	2.5		3	3.899	14.314	.179	.179	2.2	H1-1b*
15	M15	SR 3/4	.064	0	4	.010	0		1	1.36	14.314	.179	.179	2.894	H1-1b
16	M16	SR 3/4	.036	4.3...	4	.012	4.301		4	1.317	14.314	.179	.179	2.474	H1-1b
17	M17	PIPE_1.25	.271	5.5...	4	.004	10.5		4	2.618	19.688	.801	.801	1.136	H1-1a
18	M18	PIPE_1.25	.118	5.3...	4	.004	10.503		4	2.617	19.688	.801	.801	1.136	H1-1b
19	M19	PIPE_2.0	.286	2.4...	4	.062	4.969		3	12.144	32.13	1.872	1.872	2.443	H1-1b



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek		
FJP	CTFF703A - Mount_Rev.1	July 30, 2019 at 10:57 AM
19027.54	Member Unity Check	CTFF703A_AMA_Rev.1.r3d

EBI Consulting

environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CTFF703A

CT703/WCSU ET
303 Boxwood Lane
Danbury, Connecticut 06811

March 24, 2020

EBI Project Number: 6220001247

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**42.66%**

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

March 24, 2020

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

Emissions Analysis for Site: CTFF703A - CT703/WCSU ET

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **303 Boxwood Lane** in **Danbury, Connecticut** for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

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

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 600 MHz and 700 MHz frequency bands are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$, respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 11 GHz frequency bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at 303 Boxwood Lane in Danbury, 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. These Channels have a transmit power of 80 Watts per Channel.

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 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.

6) 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.

7) 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.

8) 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.

9) 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.

10) The antennas used in this modeling are the RFS APXVAARR18_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 1900 MHz channel(s) in Sector A, the RFS APXVAARR18_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 1900 MHz / 1900 MHz / 2100 MHz channel(s) in Sector B, the RFS APXVAARR18_43-U-NA20 for the 600 MHz / 600 MHz / 700 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.

11) The antenna mounting height centerline of the proposed antennas is 83 feet above ground level (AGL).

12) 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.

13) 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 #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	RFS APXVAARR18_43-U-NA20	Make / Model:	RFS APXVAARR18_43-U-NA20	Make / Model:	RFS APXVAARR18_43-U-NA20
Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 2100 MHz
Gain:	11.95 dBd / 11.95 dBd / 12.35 dBd / 15.55 dBd	Gain:	11.95 dBd / 11.95 dBd / 12.35 dBd / 15.55 dBd	Gain:	11.95 dBd / 11.95 dBd / 12.35 dBd / 15.55 dBd
Height (AGL):	83 feet	Height (AGL):	83 feet	Height (AGL):	83 feet
Channel Count:	7	Channel Count:	7	Channel Count:	7
Total TX Power (W):	260 Watts	Total TX Power (W):	260 Watts	Total TX Power (W):	260 Watts
ERP (W):	5,377.73	ERP (W):	5,377.73	ERP (W):	5,377.73
Antenna A2 MPE %:	**5.14%**	Antenna B2 MPE %:	**5.14%**	Antenna C2 MPE %:	**5.14%**
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	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):	83 feet	Height (AGL):	83 feet	Height (AGL):	83 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 %:	**6.70%**	Antenna B3 MPE %:	**6.70%**	Antenna C3 MPE %:	**6.70%**

Site Composite MPE %	
Carrier	MPE %
T-Mobile (Max at Sector A):	11.84%
AT&T	7.6%
Sprint	7.72%
WCXI (WCSU)	15.5%
Site Total MPE % :	42.66%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	11.84%
T-Mobile Sector B Total:	11.84%
T-Mobile Sector C Total:	11.84%
Site Total MPE % :	42.66%

T-Mobile Maximum MPE Power Values (Sector A)

T-Mobile Frequency Band / Technology (Sector A)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density (μW/cm²)	Frequency (MHz)	Allowable MPE (μW/cm²)	Calculated % MPE
T-Mobile 600 MHz LTE	2	470.03	83.0	4.91	600 MHz LTE	400	1.23%
T-Mobile 600 MHz NR	1	1253.40	83.0	6.54	600 MHz NR	400	1.64%
T-Mobile 700 MHz LTE	2	515.37	83.0	5.38	700 MHz LTE	467	1.15%
T-Mobile 2100 MHz UMTS	2	1076.77	83.0	11.24	2100 MHz UMTS	1000	1.12%
T-Mobile 1900 MHz GSM	4	1028.30	83.0	21.47	1900 MHz GSM	1000	2.15%
T-Mobile 1900 MHz LTE	2	2056.61	83.0	21.47	1900 MHz LTE	1000	2.15%
T-Mobile 2100 MHz LTE	2	2307.55	83.0	24.08	2100 MHz LTE	1000	2.41%
						Total:	**11.84%**

• 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:	11.84%
Sector B:	11.84%
Sector C:	11.84%
T-Mobile Maximum MPE % (Sector A):	11.84%
Site Total:	42.66%
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **42.66%** 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.