[redacted] Industrial Ave,
[redacted]te 3
[redacted]ahwah NJ 07430

[redacted]one: 201.684.0055
[redacted]x: 201.684.0066

Transcend Wireless

April 8, 2022

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

RE: Notice of Exempt Modification
1657 Berlin Turnpike, Berlin, CT
Latitude: 41.60621666
Longitude: -72.74968611
T-Mobile Site#: CTHA231A - Anchor

Dear Ms. Bachman:

T-Mobile currently maintains nine (9) antennas at the 160-foot level of the existing 175-foot monopole at 1657 Berlin Turnpike, Berlin, CT. The 175-foot monopole and property are owned and operated by the Berlin Volunteer Fire Department. T-Mobile now intends to remove (3) antennas and replace (3) antennas to the 160-foot level of the existing monopole. These antennas will support 5G services.

Planned Modifications:
Tower:
Install New:
(3) Ericsson AIR 6419 B41 Antennas
(3) Radio 4460 B25 B66
(1) 6x24 Hybrid Cables

To Be Removed:
(3) Ericsson AIR21 Antennas
(3) Ericsson AIR32 Antennas
(3) Twin Style 1B AWS TMAs
(3) Existing Coax cables

To Remain:
(3) RFS APXVAARR24 Antennas
(3) Radio 4449 B12 B71

Ground:
Install (1) 6160 Power Enclosure
Install (1) B160 Battery Cabinet
Install 150A Circuit Breaker
Remove (1) 6131 Cabinet

This facility was approved by the Town of Berlin on 9/26/2002. A copy of their approval is attached along with the Council's approval of Sprint's Tower Share on 9/26/2002, with no record of conditions that would restrict exempt modifications. Therefore, this modification complies with the aforementioned 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 Mayor Mark Kaczynski, Elected Official, and Maureen Giusti, Town Planner, as well as the tower and property owner.

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

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

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

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

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

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

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

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

Sincerely,

Eric Breun
Transcend Wireless
Cell: 201-658-7728
Email: ebreun@transcendwireless.com

Attachments
cc: Mark Kaczynski - Mayor of Berlin
Maureen Giusti - Town Planner
Berlin Fire Department - Property Owner

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS

1 OF 1

SHIP TO:
MAYOR MARK KACZYNSKI
240 KENSINGTON ROAD
BERLIN CT 06037

CT 061 9-02

UPS GROUND
TRACKING #: 1Z V25 742 03 9906 7988

BILLING: P/P

Reference #1: CTHA231A

XOL 22.03.13 NV45 14.0A 03/2022*

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS

1 OF 1

SHIP TO:
MAUREEN GIUSTI
240 KENSINGTON ROAD
BERLIN CT 06037

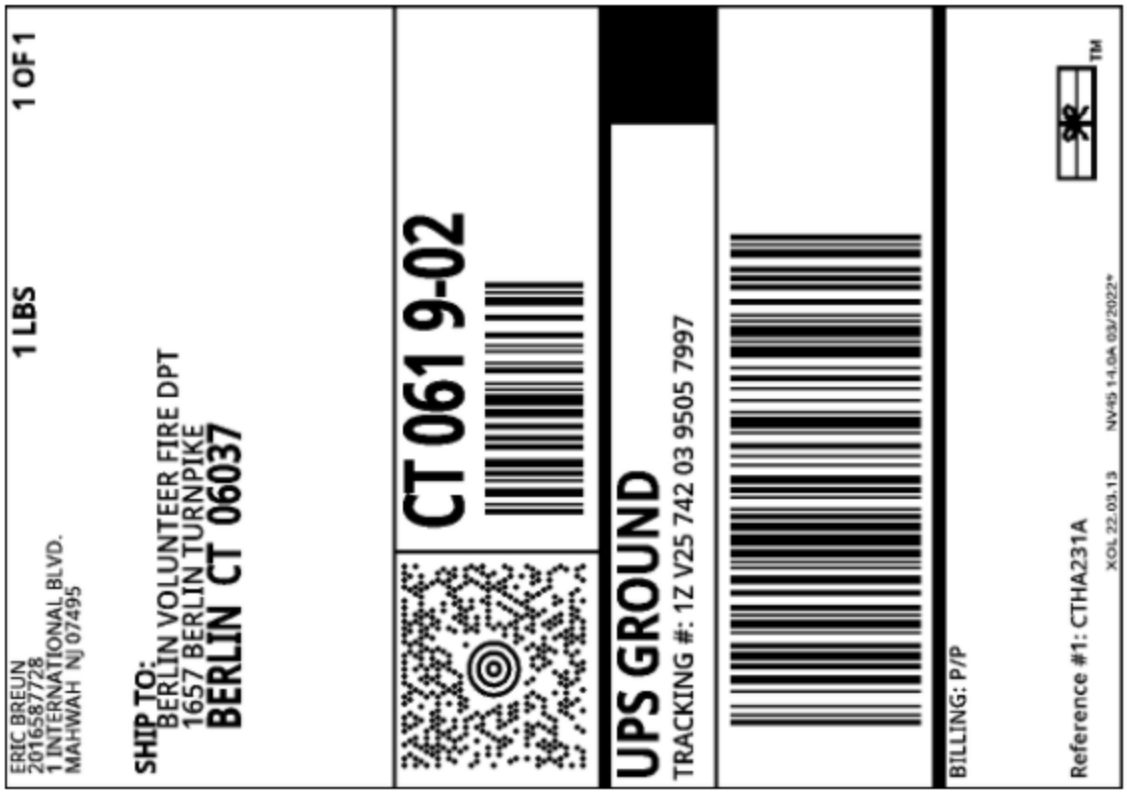
CT 061 9-02

UPS GROUND
TRACKING #: 1Z V25 742 03 9321 0627

BILLING: P/P

Reference #1: CTHA231A

XOL 22.03.13 NV45 14.0A 03/2022*



Hello, your package has been delivered.

Delivery Date: Wednesday, 03/30/2022

Delivery Time: 12:43 PM

Left At: INSIDE DELIV

Signed by: BUSH

TRANSCEND WIRELESS

Tracking Number:	1ZV257420393210627
Ship To:	MAUREEN GIUSTI 240 KENSINGTON ROAD BERLIN, CT 06037 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CTHA231A

Hello, your package has been delivered.

Delivery Date: Wednesday, 03/30/2022

Delivery Time: 12:43 PM

Left At: INSIDE DELIV

Signed by: BUSH

TRANSCEND WIRELESS

Tracking Number:	1ZV257420399067988
Ship To:	MAYOR MARK KACZYNSKI 240 KENSINGTON ROAD BERLIN, CT 06037 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CTHA231A

Hello, your package has been delivered.

Delivery Date: Wednesday, 03/30/2022

Delivery Time: 1:06 PM

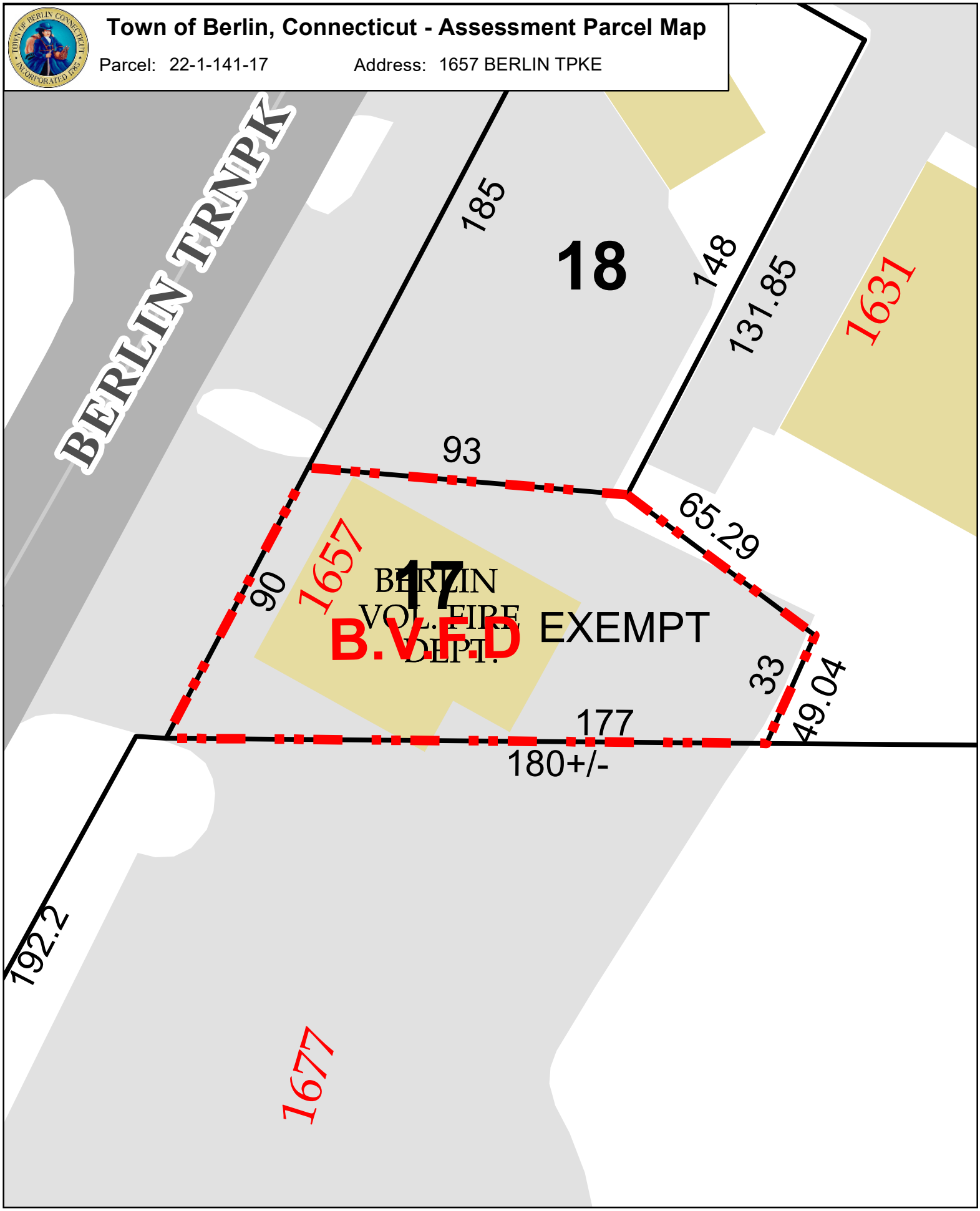
Left At: FRONT DOOR

TRANSCEND WIRELESS

Tracking Number:	1ZV257420395057997
Ship To:	BERLIN VOLUNTEER FIRE DPT 1657 BERLIN TURNPIKE BERLIN, CT 06037 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CTHA231A

Town of Berlin, Connecticut - Assessment Parcel Map

Parcel: 22-1-141-17 Address: 1657 BERLIN TPKE



N W E S

NEGEO
New England GeoSystems
www.negeosystems.com
420 East Main Street - Bldg 3 Suite 18
Branford, CT 06405 • (203) 404 - 7129

Approximate Scale: 1 inch = 34 feet

0 10 20 30 40 Feet

Map Produced: February 2022

Town of Berlin, CT

Property Listing Report

Map Block Lot	22-1-141-17	Building #	1	PID	8039	Account	1101290

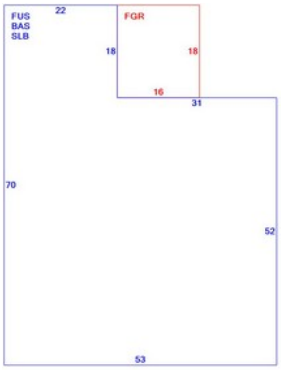
Property Information

Property Location	1657 BERLIN TPKE
Owner	BERLIN VOLUNTEER FIRE DEPT
Co-Owner	BERLIN FIREHOUSE
Mailing Address	1657 BERLIN TPKE BERLIN CT 06037
Land Use	903I Municipal MDL-96
Land Class	E
Zoning Code	BT-1
Census Tract	4002

District	7
Acreage	0.23
Utilities	All Public
Book / Page	0114/0272

Photo

Sketch



Primary Construction Details

Year Built	1946
Building Desc.	Municipal MDL-96
Building Style	Other Municip
Stories	2
Occupancy	1.00
Exterior Walls	Brick Veneer
Exterior Walls 2	
Roof Style	Mansard
Roof Cover	Rolled Compos
Interior Walls	Plaster/Drywal
Interior Walls 2	
Interior Floors 1	Hardwood
Interior Floors 2	Carpet

Heating Fuel	Oil/Gas
Heating Type	Hot Air-no Duc
AC Type	Central
Bedrooms	0
Full Bathrooms	0
Half Bathrooms	0
Extra Fixtures	0
Total Rooms	
Bath Style	
Kitchen Style	
Fin BSMT Area	
Fin BSMT Quality	
Fin BSMT Area 2	
Fin BSMT Qual 2	

BSMT Garages	0
Fireplaces	0
Whirlpool Tub	0
Building Use	Ind/Comm
Building Condition	A

Industrial / Commercial Details
(*Residential Not Applicable)

Heat / AC	HEAT/AC SPLIT
Frame Type	MASONRY
Baths / Plumbing	AVERAGE
Ceiling / Wall	SUS-CEIL & WL
Rooms / Prtns	AVERAGE
Wall Height	12
First Floor Use	903I

Report Created On 3/29/2022

Town of Berlin, CT

Property Listing Report

Map Block Lot	22-1-141-17	Building #	1	PID	8039	Account	1101290

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	1125100	787600
Extras	0	0
Improvements		
Outbuildings	21500	15100
Land	78800	55200
Total	1225400	857900

Outbuilding and Extra Features

Type	Description
Garage - Good	288 S.F.
Paving - Asphalt	5000 S.F.

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
Garage, Attached	288	0
Upper Story, Finished	3152	3152
First Floor	3152	3152
Slab	3152	0
Total Area	9744	6304

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
BERLIN VOLUNTEER FIRE DEPT	0114/0272	1956-06-27	0

Report Created On 3/29/2022

PROP NO. 101290 PERMIT NO. B 3786

TOWN OF BERLIN

240 Kensington Road
Berlin, CT. 06037

Nicholas G. Chirico
(860) 828-7012

BUILDING PERMIT

LOCATION: 1657 WILBUR CROSS HWY
OWNER..... BERLIN VOLUNTEER FIRE DEPT
PERMIT ISSUED TO:

RED/ SPRINT PCS/ M. ROGAN
637 WILBUR CR HWY

BERLIN, CT. 06037
250-0356

TENANT:
HOME OWNER ADDRESS:

BERLIN VOLUNTEER FIRE DEPT
1657 WILBUR CR HWY

BERLIN, CT. 06037

Build (use#:	437	AAC: NonRes	EST. VALUE:	0		Issue Date:	9/26/2002
Prop Type:	COMM	Commercial	BLDG PRMT:	B	3786	Application Date:	9/19/2002
Prop Class:	PRIV	Priv Owned					
Bldg Type:	41	Comm Tower					
Bldg Frame:	3	Metal Fr					
No. Buildings:	1						
No. Res/Units:	1						

Distance E Side:
Distance W Side:
Distance S Side:
Distance N Side:

Comments.....

INSTALLATION OF COMMUNICATION TOWER, RAISED STEEL DECK & RELATED EQUIPMENT, AT BERLIN FIRE DEPT. HEADQUARTERS.

Receipt

TOTAL RECEIPTS:

TOTAL AMOUNT

Building Inspection Division

Inspector: Nicholas G. Chirico

Permission must be obtained from the Engineering Division before Building Material can be placed in the highway. Surface or subsurface drains, roof drains and sump pumps must not be connected with the sanitary sewer.

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@po.state.ct.us
Web Site: www.state.ct.us/csc/index.htm

September 26, 2002

Thomas J. Regan, Esq.
Brown Rudnick Berlack Israels LLP
185 Asylum Street, CityPlace I
Hartford, CT 06103-3402

RE: **TS-SPRINT-007-020821** - Sprint Spectrum L.P. d/b/a Sprint PCS request for an order to approve tower sharing at a proposed telecommunications facility located at 1657 Wilbur Cross Highway, Berlin, Connecticut.

Dear Attorney Regan:

At a public meeting held September 25, 2002, the Connecticut Siting Council (Council) ruled that the shared use of this tower site is technically, legally, environmentally, and economically feasible and meets public safety concerns, and therefore, in compliance with General Statutes § 16-50aa, the Council has ordered the shared use of this facility to avoid the unnecessary proliferation of tower structures. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies which will be used on this tower.

This decision is under the exclusive jurisdiction of the Council. Any additional change to this facility may require an explicit request to this agency pursuant to General Statutes § 16-50aa or notice pursuant to Regulations of Connecticut State Agencies Section 16-50j-73, as applicable. Such request or notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

This decision applies only to this request for tower sharing and is not applicable to any other request or construction.

The proposed shared use is to be implemented as specified in your letter dated August 20, 2002.

Thank you for your attention and cooperation.

Very truly yours,

Mortimer A. Gelston
Chairman

MAG/laf

c: Honorable Paul C. Argazzi, Mayor, Town of Berlin
Brian J. Miller, Town Planner, Town of Berlin
Michael J. Rogan, Assistant Chief, Berlin Fire Department

SITE NAME: HA231/BERLIN FD TOWER
SITE ID: CTHA231A
1657 BERLIN TURNPIKE
BERLIN, CT 06525

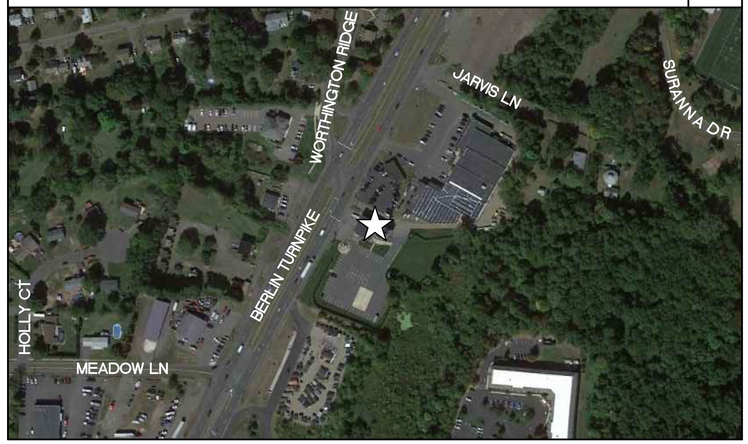
T-MOBILE A/L TEMPLATE (PROVIDED BY RFDS)
67D5998E_1xAIR+1OP

T-MOBILE RAN TEMPLATE (PROVIDED BY RFDS)
67D5D3998E 6160

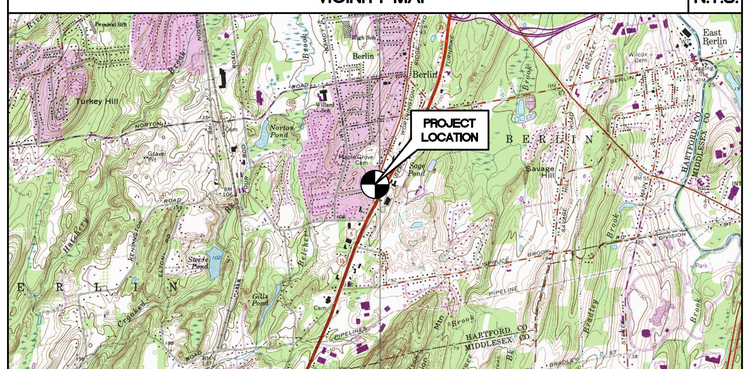
GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. 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.
4. 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.
5. 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 AND ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
14. 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.
15. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
16. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
17. 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.
18. 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.
19. 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.
20. 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.
21. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUITS AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND CONFIRMED WITH THE PROJECT MANAGER AND OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK
22. 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.
23. 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.
24. CONTRACTOR SHALL COMPLY WITH THE OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.
25. THE COUNTY/CITY/TOWN MAY MAKE PERIODIC FIELD INSPECTIONS TO ENSURE COMPLIANCE WITH THE DESIGN PLANS, SPECIFICATIONS, AND CONTRACT DOCUMENTS.
26. THE COUNTY/CITY/TOWN MUST BE NOTIFIED (2) WORKING DAYS PRIOR TO CONCEALMENT/BURIAL OF ANY SYSTEM OR MATERIAL THAT WILL PREVENT THE DIRECT INSPECTION OF MATERIALS, METHODS OR WORKMANSHIP. EXAMPLES OF THESE PROCESSES ARE BACKFILLING A GROUND RING OR TOWER FOUNDATION, POURING TOWER FOUNDATIONS, BURYING GROUND RODS, PLATES OR GRIDS, ETC. THE CONTRACTOR MAY PROCEED WITH THE SCHEDULED PROCESS (2) WORKING DAYS AFTER PROVIDING NOTICE UNLESS NOTIFIED OTHERWISE BY THE COUNTY/CITY/TOWN.
27. PRIOR TO THE SUBMISSION OF BIDS, THE CONTRACTOR SHALL VISIT THE SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER ON RECORD, PRIOR TO THE COMMENCEMENT OF ANY WORK.

SITE LOCATION MAP — N.T.S.



VICINITY MAP — N.T.S.



COORDINATES AND GROUND ELEVATION ARE REFERENCED FROM GOOGLE EARTH.

SITE COORDINATES: LATITUDE: 41° 36' 22" N
LONGITUDE: 72° 44' 58" W
GROUND ELEVATION: ±134' AMSL

NORTH

PROJECT SUMMARY

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

1. REMOVE 6131 CABINET LOCATED ON EXISTING ELEVATED STEEL PLATFORM.
2. REMOVE (3) ERICSSON – AIR21 KRC118023-1_B2A_B4P ANTENNAS.
3. REMOVE (3) ERICSSON – AIR32 KRD901146-1_B66A_B2A ANTENNAS.
4. REMOVE (3) EXISTING GENERIC TWIN STYLE 1B – AWS TMAs.
5. REMOVE (3) EXISTING COAX, RETAIN (3) 6X12 HYBRID CABLES, AND INSTALL (1) 6/24 4AWG HYBRID CABLE
6. INSTALL (1) 6160 POWER CABINET
7. INSTALL (1) B160 BATTERY CABINET
8. INSTALL (1) ERICSSON: AIR6419 B41 ANTENNA PER SECTOR, TOTAL OF (3)
9. INSTALL (1) RADIO 4460 B25+B66 PER SECTOR, TOTAL OF (3)
10. INSTALL 150A CIRCUIT BREAKER TO SERVE NEW EQUIPMENT

PROJECT INFORMATION

SITE NAME:	HA231/BERLIN FD TOWER
SITE ID:	CTHA231A
SITE ADDRESS:	1657 BERLIN TURNPIKE BERLIN, CT. 06525
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT. 06002
CONTACT PERSON:	DAN REID (PROJECT MANAGER) TRANSCEND WIRELESS, LLC (203) 592-8291
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD ROAD BRANFORD, CT. 06405 CARLO F. CENTORE, PE (203) 488-0580 EXT. 122
SITE COORDINATES:	LATITUDE: 41°-36'-22" N LONGITUDE: 72°-44'-58" W GROUND ELEVATION: 134'± AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

SHEET. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	NOTES, SPECIFICATIONS, AND ANTENNA SCHEDULE	0
C-1	EQUIPMENT PLANS AND COMPOUND ELEVATION	0
C-2	ANTENNA PLANS AND ELEVATIONS	0
C-3	TYPICAL EQUIPMENT DETAILS	0
E-1	ELECTRICAL RISER DIAGRAM AND CONDUIT ROUTING	0
E-2	TYPICAL GROUNDING DETAILS	0
E-3	ELECTRICAL SPECIFICATONS	0

PROFESSIONAL ENGINEER SEAL

REV.	DATE	DRAWN BY	CHECKED BY	DESCRIPTION
0	03/29/22	ANC	TJR	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION

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
SITE NAME: HA231/BERLIN FD TOWER
SITE ID: CTHA231A
1657 BERLIN TURNPIKE
BERLIN, CT 06525

DATE: 02/23/22
SCALE: AS NOTED
JOB NO. 20143.15

TITLE SHEET

T-1

SHEET NO. 1 OF 8

NOTES AND SPECIFICATIONS:

DESIGN BASIS:

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

1. DESIGN CRITERIA:

- RISK CATEGORY II (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED: 97 MPH (Vasd)
  (EXPOSURE B/ IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-10).

SITE NOTES

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

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. 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.
4. 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.
5. 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 AND ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
14. 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.
15. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
16. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
17. 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.
18. 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.
19. 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.
20. 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.
21. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUITS AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND CONFIRMED WITH THE PROJECT MANAGER AND OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK
22. 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.
23. 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.
24. CONTRACTOR SHALL COMPLY WITH THE OWNER'S ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.
25. THE COUNTY/CITY/TOWN MAY MAKE PERIODIC FIELD INSPECTIONS TO ENSURE COMPLIANCE WITH THE DESIGN PLANS, SPECIFICATIONS, AND CONTRACT DOCUMENTS.
26. THE COUNTY/CITY/TOWN MUST BE NOTIFIED (2) WORKING DAYS PRIOR TO CONCEALMENT/BURIAL OF ANY SYSTEM OR MATERIAL THAT WILL PREVENT THE DIRECT INSPECTION OF MATERIALS, METHODS OR WORKMANSHIP. EXAMPLES OF THESE PROCESSES ARE BACKFILLING A GROUND RING OR TOWER FOUNDATION, POURING TOWER FOUNDATIONS, BURYING GROUND RODS, PLATES OR GRIDS, ETC. THE CONTRACTOR MAY PROCEED WITH THE SCHEDULED PROCESS (2) WORKING DAYS AFTER PROVIDING NOTICE UNLESS NOTIFIED OTHERWISE BY THE COUNTY/CITY/TOWN.
27. PRIOR TO THE SUBMISSION OF BIDS, THE CONTRACTOR SHALL VISIT THE SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER ON RECORD, PRIOR TO THE COMMENCEMENT OF ANY WORK.

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.

ANTENNA SCHEDULE

SECTOR	EXISTING/PROPOSED	ANTENNA	SIZE (INCHES) (L x W x D)	ANTENNA © HEIGHT	AZIMUTH	(E/P) RRU	(E/P) TMA & DIPLEXER (QTY)	(QTY) PROPOSED CABLE(S)
A1	EXISTING	RFS (APXVAARR24_43-U-N-NA20)	95.9 x 24 x 8.7	160'	30°	(E) RADIO 4449 B71+B85 & (P) RADIO 4460 B25+B66		(1) 6x24 HYBRID CABLE
A2	PROPOSED	ERICSSON (AIR6419 B41)	33.0 x 16.0 x 9.0	160'	30°			
B1	EXISTING	RFS (APXVAARR24_43-U-N-NA20)	95.9 x 24 x 8.7	160'	180°	(E) RADIO 4449 B71+B85 & (P) RADIO 4460 B25+B66		
B2	PROPOSED	ERICSSON (AIR6419 B41)	33"L x 16"W x 9"D	160'	180°			
C1	EXISTING	RFS (APXVAARR24_43-U-N-NA20)	95.9 x 24 x 8.7	160'	290°	(E) RADIO 4449 B71+B85 & (P) RADIO 4460 B25+B66		
C2	PROPOSED	ERICSSON (AIR6419 B41)	33"L x 16"W x 9"D	160'	290°			

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

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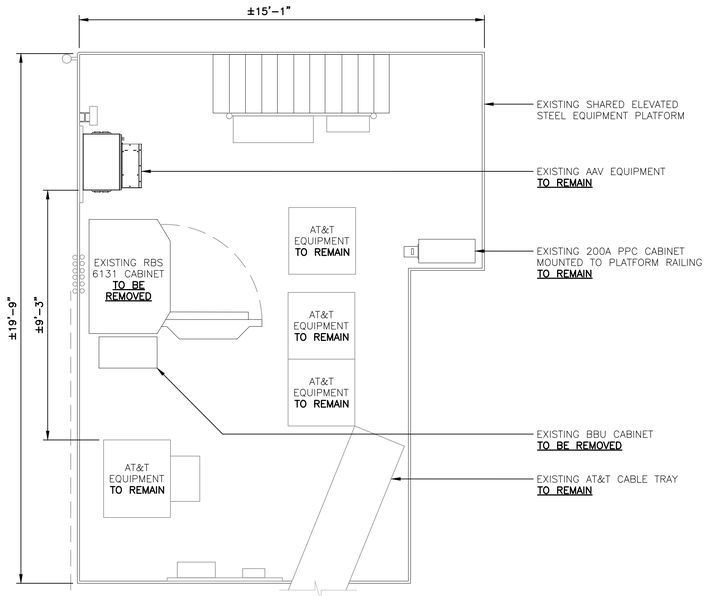
SITE ID: CTHA231A
1657 BERLIN TURNPIKE
BERLIN, CT 06525

DATE: 02/23/22
SCALE: AS NOTED
JOB NO. 20143.15

NOTES, SPECIFICATIONS, AND ANTENNA SCHEDULE

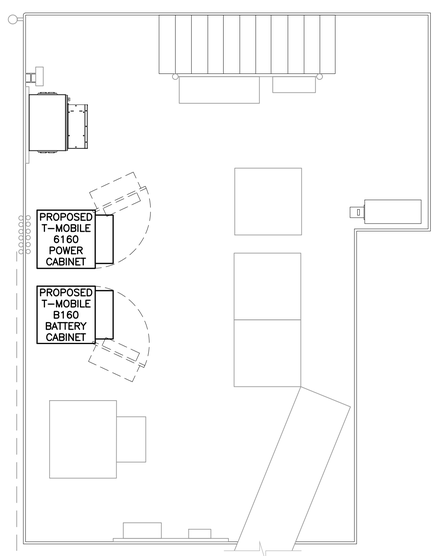
N-1

SHEET NO. 2 OF 8



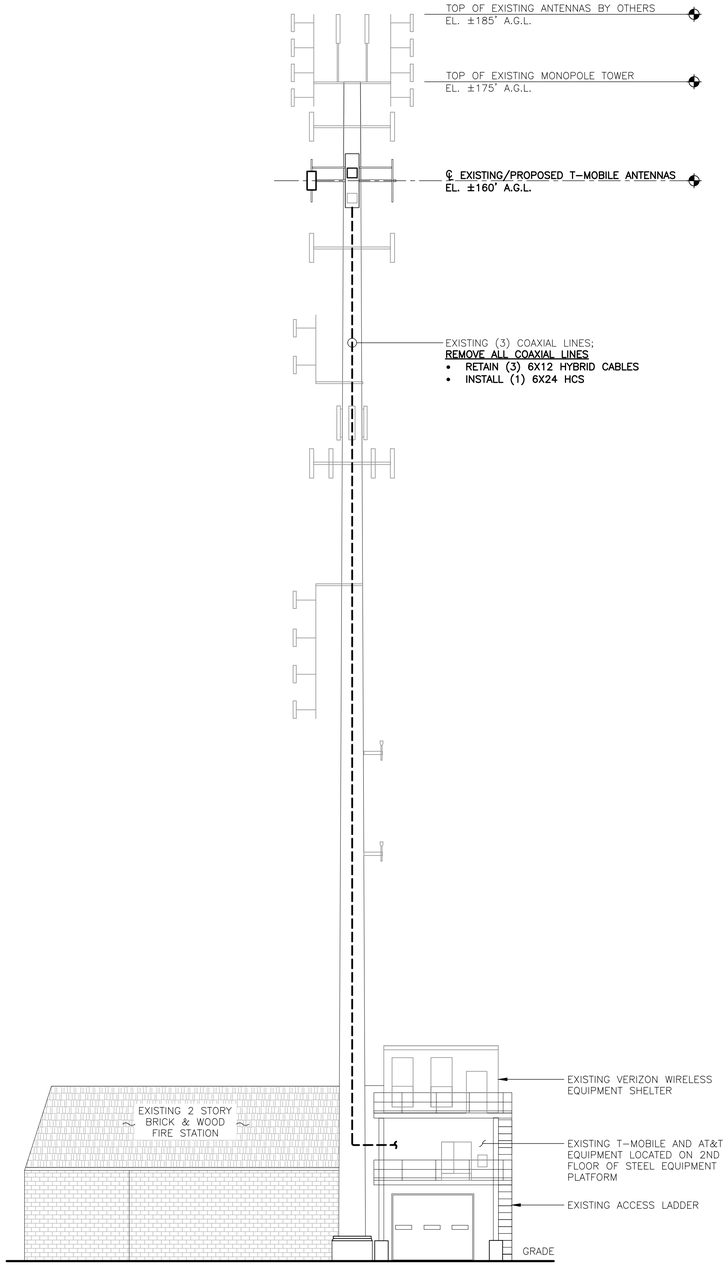
1 C-1 **EQUIPMENT PLAN - EXISTING**
SCALE: 3/8" = 1'

TRUE NORTH



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

TRUE NORTH



3 C-1 **COMPOUND ELEVATION - PROPOSED**
SCALE: 3/32" = 1'

STRUCTURAL COMPLIANCE

ANTENNA MOUNTS AND EQUIPMENT PLATFORM

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

REFER TO THE ANTENNA MOUNT ANALYSIS AND EQUIPMENT PLATFORM ANALYSIS REPORTS PREPARED BY CENTEK ENGINEERING (PROJECT # 20143.15) DATED 02/23/22 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TOWER AND TOWER FOUNDATION

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

REFER TO THE STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 20143.15) DATED 02/22/22 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

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

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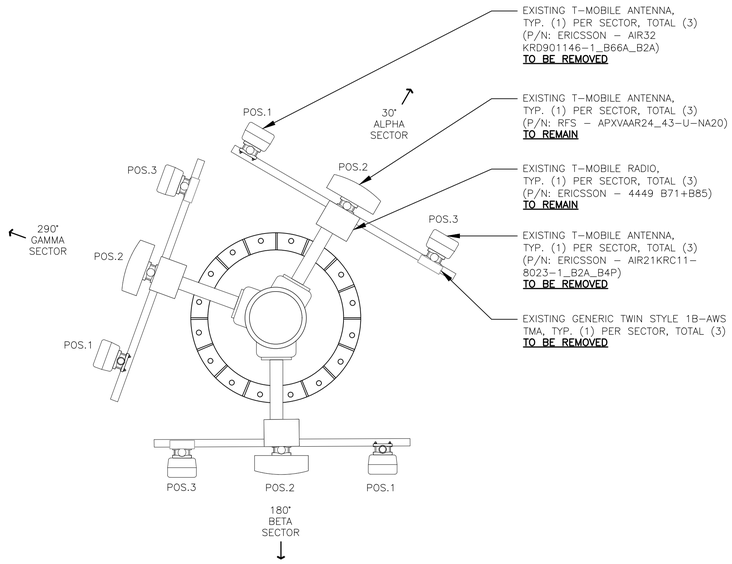
EQUIPMENT PLANS AND COMPOUND ELEVATION

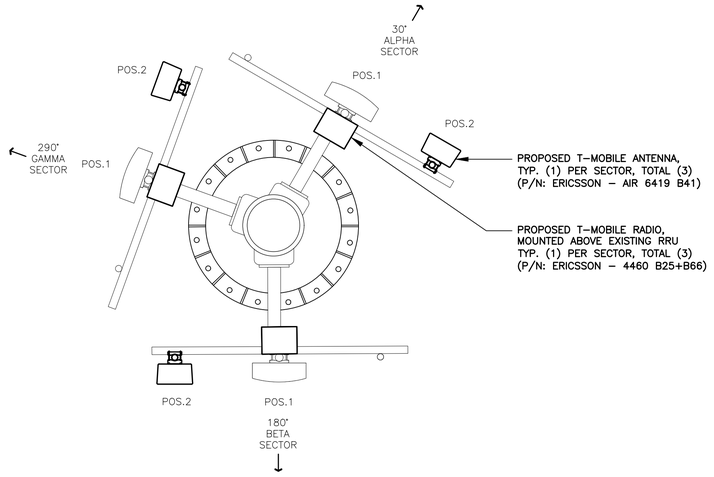
C-1

SHEET NO. 3 OF 8



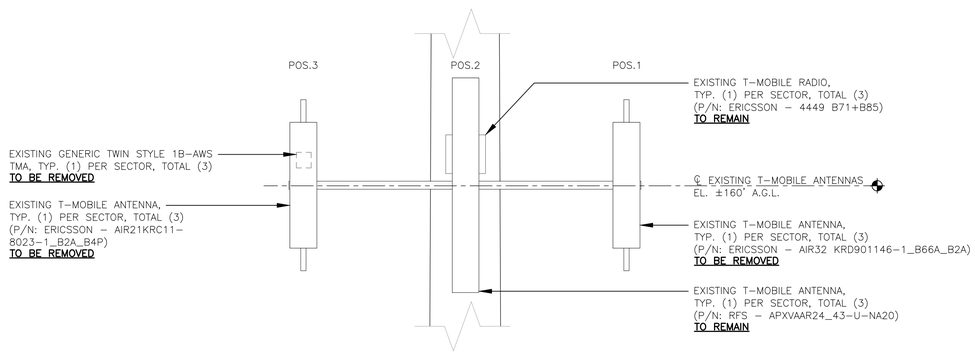
1 C-2 **ANTENNA PLAN - EXISTING** TRUE NORTH

SCALE: 3/8" = 1'



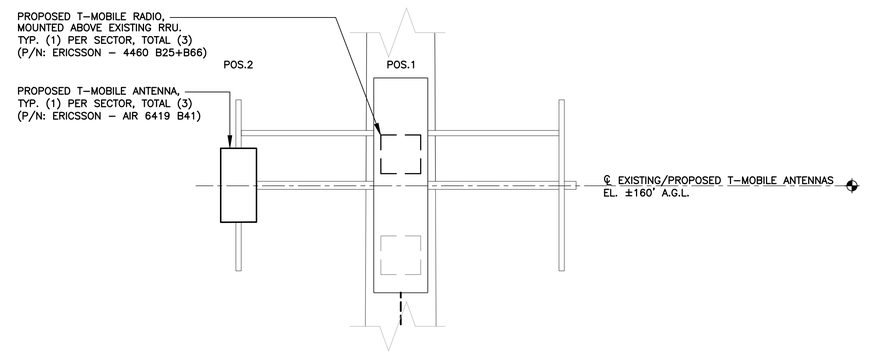
2 C-2 **ANTENNA PLAN - PROPOSED** TRUE NORTH

SCALE: 3/8" = 1'



1A C-2 **ANTENNA ELEVATION - EXISTING**

SCALE: 3/8" = 1'



2A C-2 **ANTENNA ELEVATION - PROPOSED**

SCALE: 3/8" = 1'

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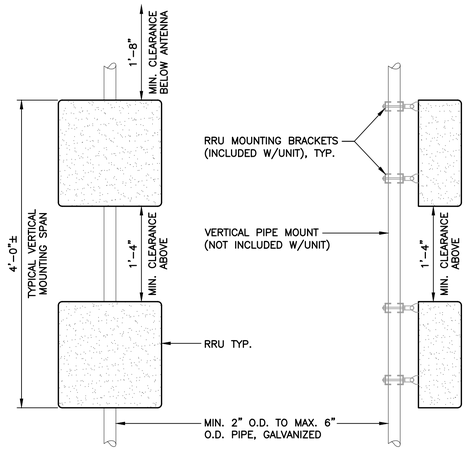
ANTENNA PLANS AND ELEVATIONS

C-2

SHEET NO. 4 OF 8

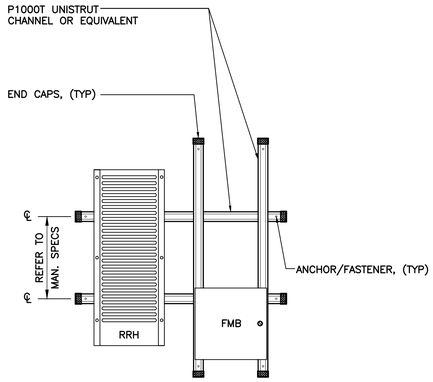


NOTES: (PIPE MOUNTING)

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

1 C–3 TYPICAL RRU MOUNTING DETAILS

SCALE: NOT TO SCALE



NOTES: (UNISTRUT MOUNTING)

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

AIR6419 B41

ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ERICSSON MODEL: AIR6419 B41	33"L x 16"W x 9"D	±41 LBS.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.		

2 C–3 PROPOSED ANTENNA DETAIL

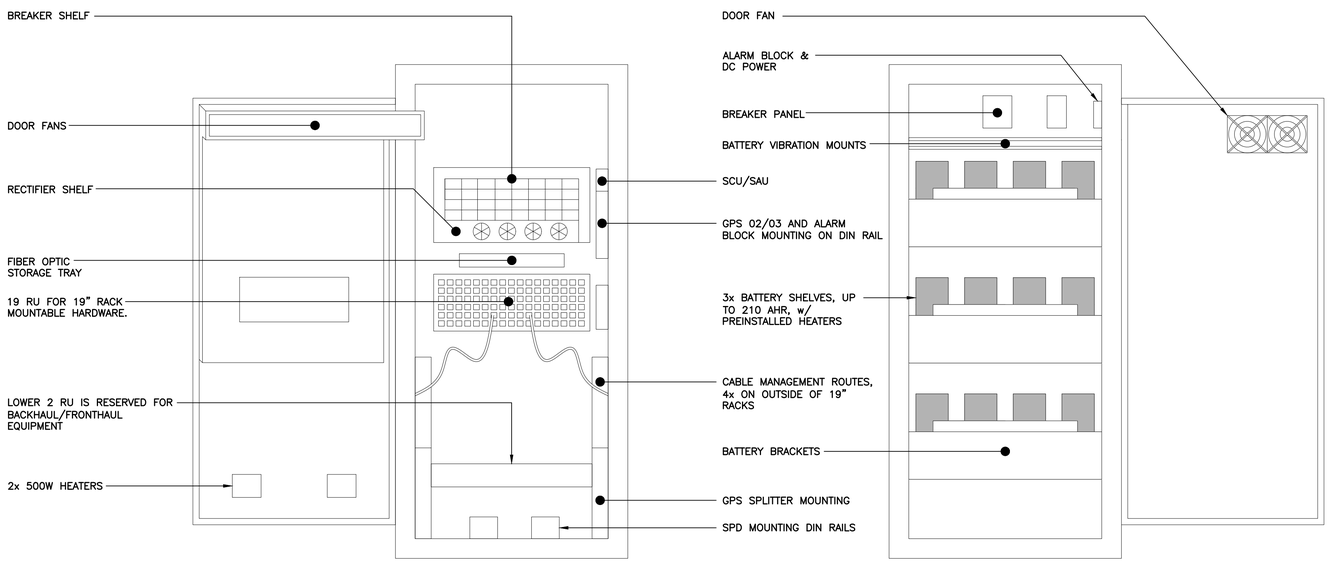
SCALE: NOT TO SCALE

RADIO 4460 B25+B66

RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RADIO 4460 B25+B66	19.6"L x 15.7"W x 12.1"D	±109 LBS.	BEHIND ANT.: 8" MIN. BELOW ANT.: 20" MIN. BELOW RRU: 16" MIN.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.			

3 C–3 PROPOSED RRU DETAIL

SCALE: NOT TO SCALE



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

4 C–3 ENCLOSURE 6160 CABINET DETAIL

SCALE: NOT TO SCALE

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

5 C–3 BATTERY B160 CABINET DETAIL

SCALE: NOT TO SCALE

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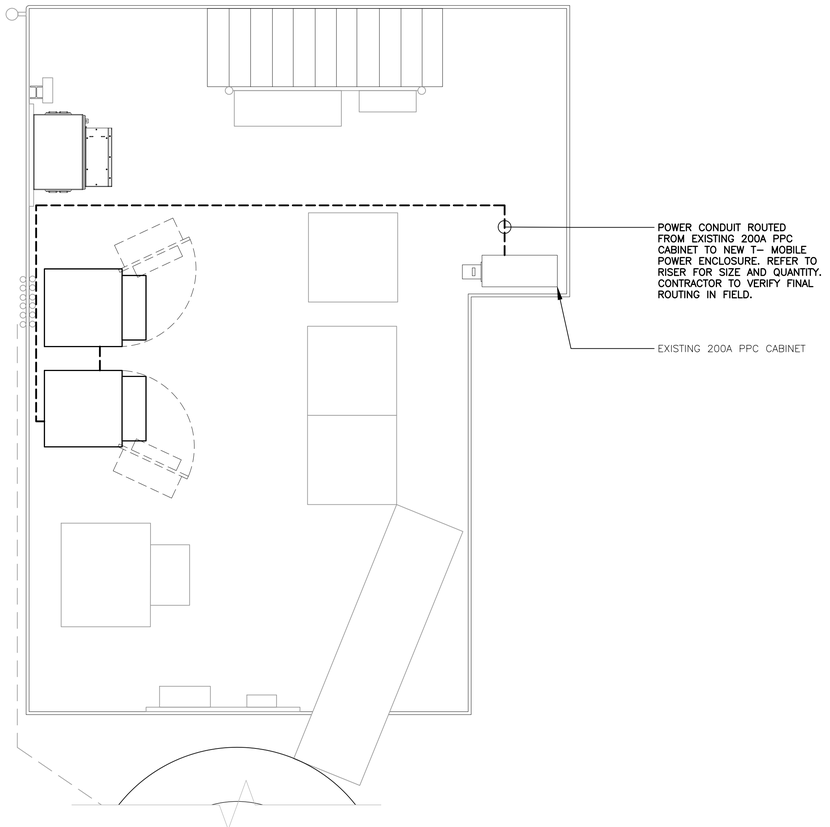
TYPICAL EQUIPMENT DETAILS

C-3

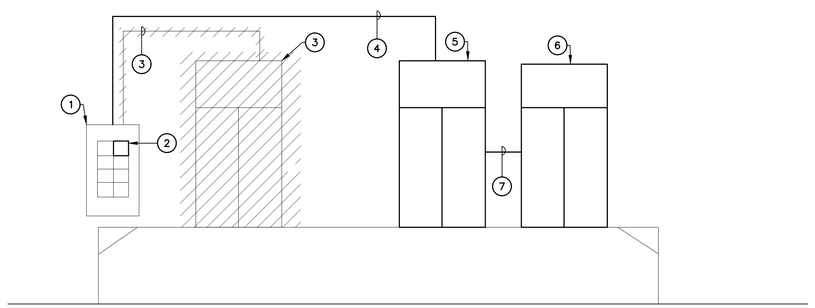
SHEET NO. 5 OF 8



1 E-1 **ELECTRICAL CONDUIT ROUTING**
SCALE: NOT TO SCALE

RISER DIAGRAM NOTES

1. EXISTING 200A, PPC CABINET TO REMAIN.
2. NEW 150A/2P CIRCUIT BREAKER TO SERVE NEW EQUIPMENT CABINET.
3. EXISTING CABINETS AND ASSOCIATED CONDUITS, CONDUCTORS AND CIRCUIT BREAKER TO BE REMOVED.
4. (3) 1/0 AWG, (1) #6 AWG GROUND, 1–1/2" CONDUIT.
5. NEW T–MOBILE EQUIPMENT CABINET
6. NEW T–MOBILE BATTERY CABINET
7. DC CONDUIT AND CONDUCTORS FOR BATTERY CABINET CONNECTION PER MANUFACTURERS SPECIFICATIONS.



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

REV.	DATE	DRAWN BY	CHECKED BY	DESCRIPTION
0	03/29/22	ANC	TJR	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

STATE OF CONNECTICUT — TIMOTHY J. ROBERGE — LICENSED PROFESSIONAL ENGINEER

T-Mobile — Transcend Wireless

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www.CentekEng.com

T-MOBILE NORTHEAST LLC

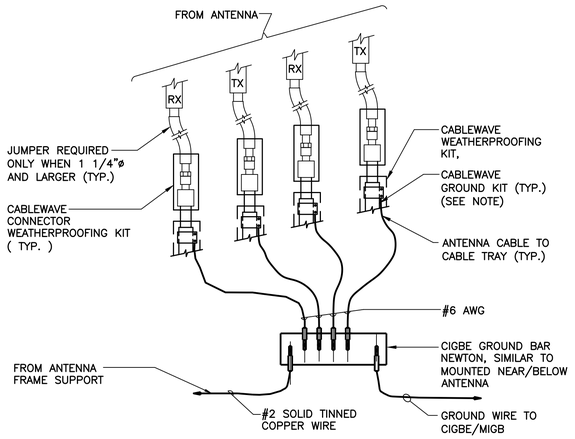
SITE NAME: HA231/BERLIN FD TOWER
SITE ID: CTHA231A
1657 BERLIN TURNPIKE
BERLIN, CT 06525

DATE:	02/23/22
SCALE:	AS NOTED
JOB NO.	20143.15

ELECTRICAL RISER DIAGRAM AND CONDUIT ROUTING

E-1

SHEET NO. 6 OF 8

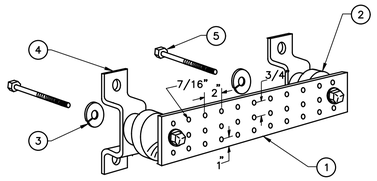


NOTES:

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

1 E-2 CONNECTION OF GROUND WIRES TO GROUND BAR

SCALE: NOT TO SCALE

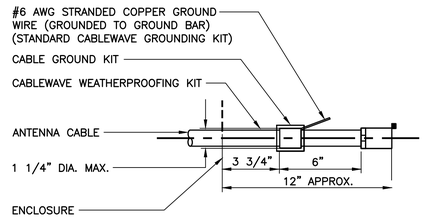


NOTES

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

2 E-2 GROUND BAR DETAIL

SCALE: NOT TO SCALE

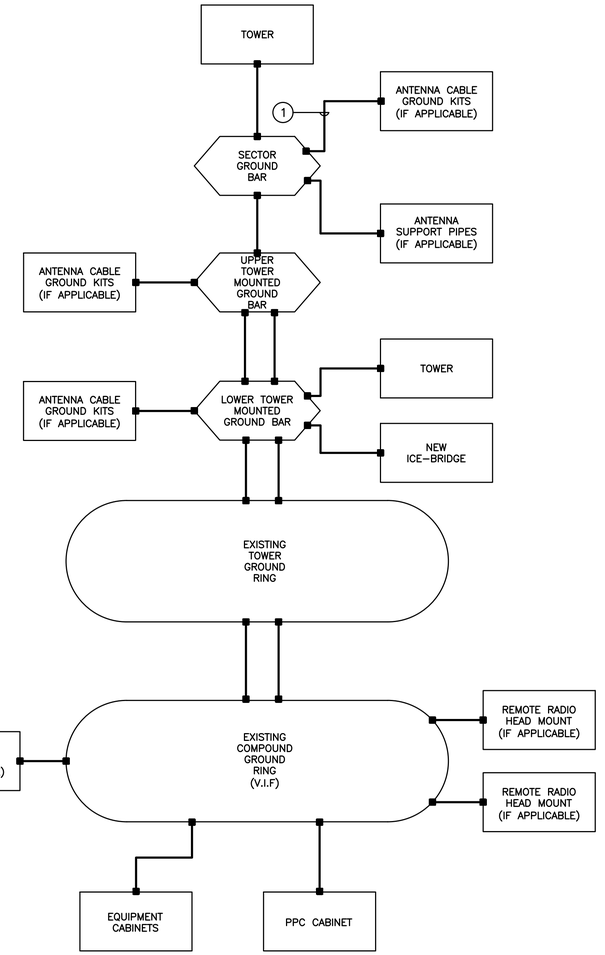


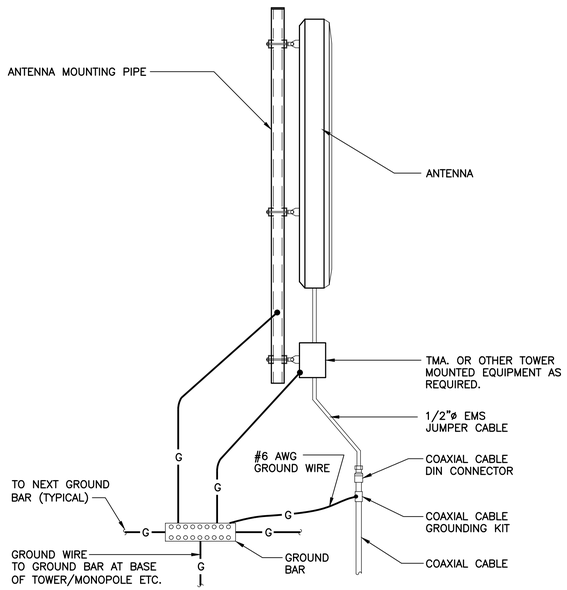
NOTES:

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

3 E-2 ANTENNA CABLE GROUNDING DETAIL

SCALE: NOT TO SCALE

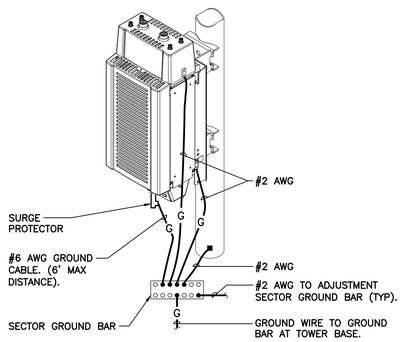




4 E-2 TYPICAL ANTENNA GROUNDING DETAIL

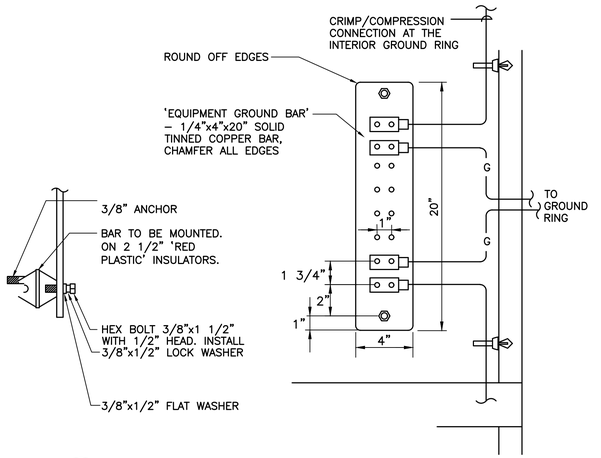
SCALE: NOT TO SCALE

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



5 E-2 RRH POLE MOUNT GROUNDING

SCALE: NOT TO SCALE



6 E-2 EQUIPMENT GROUND BAR DETAIL

SCALE: NOT TO SCALE

GROUNDING SCHEMATIC NOTES

#6 AWG

GENERAL NOTES:

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

7 E-2 ELECTRICAL SCHEMATIC DIAGRAM

SCALE: NOT TO SCALE

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TYPICAL GROUNDING DETAILS

E-2

SHEET NO. 7 OF 8

ELECTRICAL SPECIFICATIONS

SECTION 16010

1.02. GENERAL REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

M. SHOP DRAWINGS:

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

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

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

SECTION 16111

1.01. CONDUITS

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

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

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

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

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

CONDUIT SCHEDULE SECTION 16111

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

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

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

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

SECTION 16123

1.01. CONDUCTORS

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

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

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

SECTION 16130

1.01. BOXES

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

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

SECTION 16140

1.01. WIRING DEVICES

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

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

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

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

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

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

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

SECTION 16170

1.01. DISCONNECT SWITCHES

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

SECTION 16190

1.01. SEISMIC RESTRAINT

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

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

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

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

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

SECTION 16450

1.01. GROUNDING

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

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

C. GROUNDING OF PANELBOARDS:

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

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

D. EQUIPMENT GROUNDING CONDUCTOR:

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

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

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

E. CELLULAR GROUNDING SYSTEM:

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

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

1. GROUND BARS

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

3. ANTENNA GROUND CONNECTIONS AND PLATES.

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

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

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

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

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

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

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

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

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

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

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

3. GRAPHICAL DESCRIPTION OF TESTING METHOD ACTUALLY IMPLEMENTED.

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

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

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

SECTION 16961

1.01. TESTS BY CONTRACTOR

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

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

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

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ELECTRICAL SPECIFICATIONS

E-3

SHEET NO. 8 OF 8

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

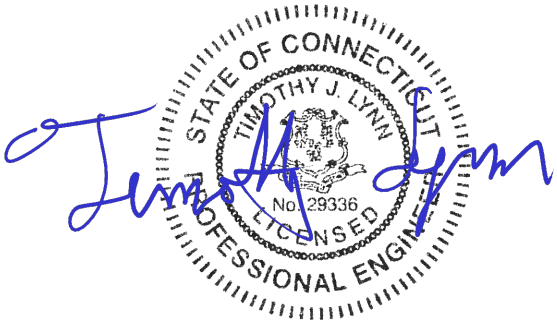
T-Mobile Site #: CTHA231A

1657 Berlin Turnpike
Berlin, CT

Centek Project No. 20143.15

Date(Rev 1): February 23, 2022

Max Stress Ratio = 97.0%



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

CENTEK engineering

Centered on Solutions℠

February 23, 2022

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

Re: Structural Letter ~ Antenna Mount
T-Mobile – Site Ref: CTHA231A
1657 Berlin Turnpike
Berlin, CT 06037

Centek Project No. 20143.15

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) 12-ft T-Arms with stabilizer kit. 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-Arms: Three (3) Ericsson AIR6419 panel antennas, three (3) RFS APXVAARR24_43-U-NA20 panel antennas, three (3) Ericsson 4449 remote radio units, three (3) Ericsson 4460 remote radio heads and three (3) Commscope SDX1926Q-43 diplexers mounted on three (3) T-Arms with a RAD center elevation of 160-ft +/- AGL.

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

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

Section 2 - Calculations

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

Subject: TIA-222-G Loads

Location: Berlin, CT

Rev. 1: 2/22/22

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 20143.15

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

Wind Speeds

Basic Wind Speed $V := 97$ mph (User Input - 2018 CSBC Appendix N)

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

Input

Structure Type = Structure_Type := Pole (User Input)

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

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

Structure Height = $h := 176$ ft (User Input)

Height to Center of Antennas = $z_{Ant} := 160$ ft (User Input)

Radial Ice Thickness = $t_i := 1.00$ in (User Input per Annex B of TIA-222-G)

Radial Ice Density = $Id := 56.00$ pcf (User Input)

Topograpic Factor = $K_{zt} := 1.0$ (User Input)

$K_a := 1.0$ (User Input)

Gust Response Factor = $G_H = 1.1$ (User Input)

Output

Wind Direction Probability Factor =

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

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

Importance Factors =

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

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

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

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

$$K_{iz} := \left(\frac{z_{Ant}}{33}\right)^{0.1} = 1.171$$

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.928$$

Velocity Pressure Coefficient Antennas =

$$Kz_{Ant} := 2.01\left(\left(\frac{z_{Ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.13$$

Velocity Pressure w/o Ice Antennas =

$$qz_{Ant} := 0.00256 \cdot K_d \cdot Kz_{Ant} \cdot V^2 \cdot I_{Wind} = 29.743$$

Velocity Pressure with Ice Antennas =

$$qz_{ice.Ant} := 0.00256 \cdot K_d \cdot Kz_{Ant} \cdot V_i^2 \cdot I_{Wind} = 7.903$$

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Rev. 1: 2/22/22

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 20143.15

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVAARR24-43		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 95.9$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in	(User Input)
Antenna Weight =	$WT_{ant} := 153$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.27$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 662$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 5.8$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 240$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 21.1$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 232$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 10.3$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 113$	lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \times 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 2 \times 10^4$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 784$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 784$	lbs

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Subject: TIA-222-G Loads

Location: Berlin, CT

Rev. 1: 2/22/22

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 20143.15

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AIR6419		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 33.1$	in	(User Input)
Antenna Width =	$W_{ant} := 16$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9$	in	(User Input)
Antenna Weight =	$WT_{ant} := 41$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 2.1$		
Antenna Force Coefficient =	$Ca_{ant} = 1.2$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 3.7$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 144$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 2.1$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 81$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 5.9$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 62$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 4$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 42$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 41$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 4766$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 7881$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 255$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 255$	lbs

Development of Wind & Ice Load on RRUS

RRUS Data:

RRUS Model = Ericsson 4449

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 = $N_{RRUS} := 1$ (User Input)

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 = $F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 54$ lbs

Surface Area for One RRUS = $SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.1$ sf

Total RRUS Wind Force = $F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 42$ lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.7$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 29$ lbs

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 2.3$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 24$ 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 = $V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2$ cu in

Weight of Ice on Each RRUS = $W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 142$ lbs

Weight of Ice on All RRUSs = $W_{ICERRUS} \cdot N_{RRUS} = 142$ lbs

Development of Wind & Ice Load on RRUS

RRUS Data:

RRUS Model = Ericsson 4460

RRUS Shape = Flat (User Input)

RRUS Height = $L_{RRUS} := 19.6$ in (User Input)

RRUS Width = $W_{RRUS} := 15.7$ in (User Input)

RRUS Thickness = $T_{RRUS} := 12.1$ in (User Input)

RRUS Weight = $WT_{RRUS} := 109$ lbs (User Input)

Number of RRUS's = $N_{RRUS} := 1$ (User Input)

RRUS Aspect Ratio = $Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.2$

RRUS Force Coefficient = $Ca_{RRUS} = 1.2$

Wind Load (without ice)

Surface Area for One RRUS = $SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 2.1$ sf

Total RRUS Wind Force = $F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 84$ lbs

Surface Area for One RRUS = $SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.6$ sf

Total RRUS Wind Force = $F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 65$ lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 3.8$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 40$ lbs

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 3.2$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 33$ lbs

Gravity Load (without ice)

Weight of All RRUSs = $WT_{RRUS} \cdot N_{RRUS} = 109$ lbs

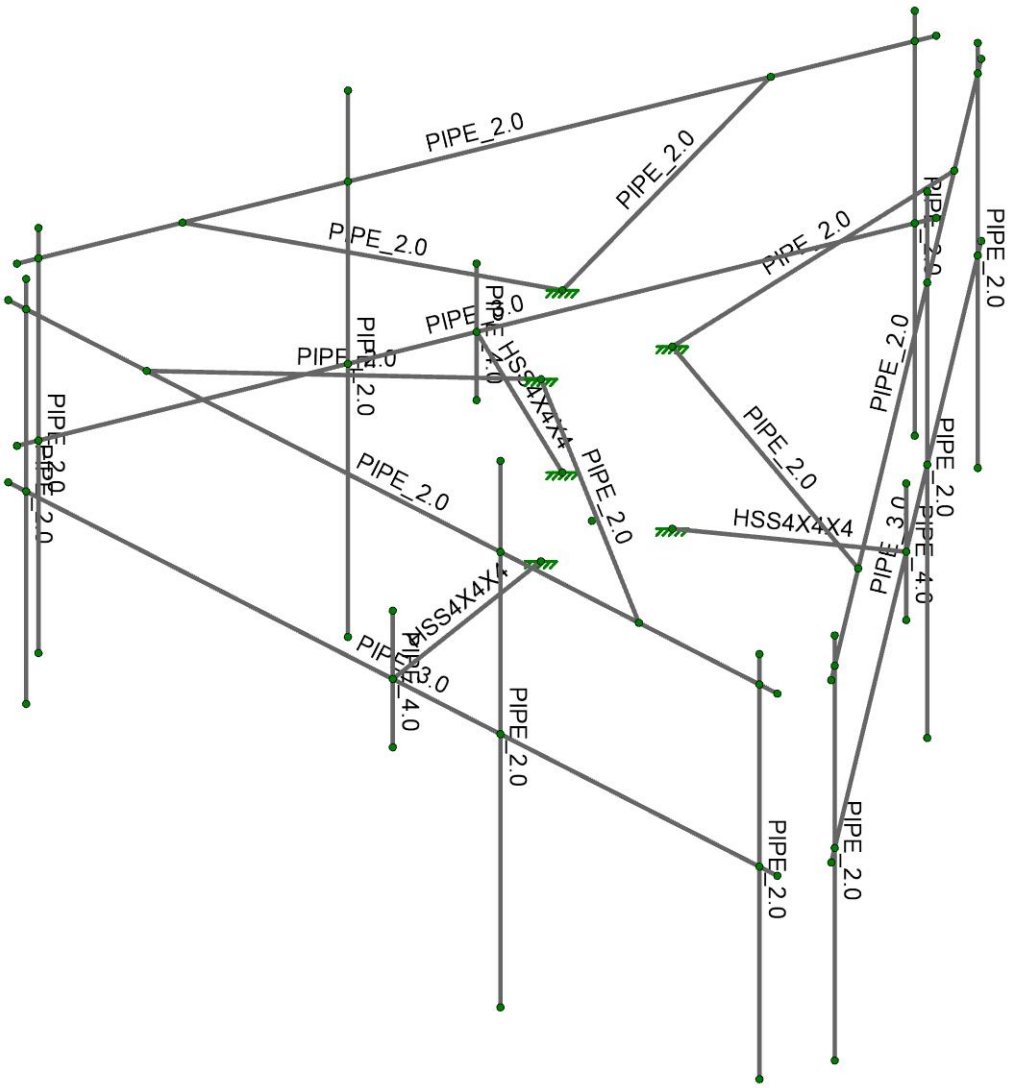
Gravity Loads (ice only)

Volume of Each RRUS = $V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 3723$ cu in

Volume of Ice on Each RRUS = $V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 6128$ cu in

Weight of Ice on Each RRUS = $W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 199$ lbs

Weight of Ice on All RRUSs = $W_{ICERRUS} \cdot N_{RRUS} = 199$ lbs



Envelope Only Solution

Centek	CTHA231A - Mount Analysis	SK-1
TJL		Feb 22, 2022
20143.15		CTHA231A_AMA.r3d

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	0	0	1.03125	
3	N3	0	0	4.03125	
4	N4	0	1.125	4.03125	
5	N5	0	-1.125	4.03125	
6	N6	6.25	0	4.03125	
7	N7	-6.25	0	4.03125	
8	N8	5.958333	0	4.03125	
9	N9	-5.958333	0	4.03125	
10	N10	5.958333	-3.5	4.03125	
11	N11	-5.958333	-3.5	4.03125	
12	N12	5.958333	3.5	4.03125	
13	N13	-5.958333	3.5	4.03125	
14	N14	1.75	0	4.03125	
15	N15	1.75	-4.5	4.03125	
16	N16	1.75	4.5	4.03125	
17	N17	-0.893089	0	-0.515625	
18	N18	-3.491165	0	-2.015625	
19	N19	-3.491165	1.125	-2.015625	
20	N20	-3.491165	-1.125	-2.015625	
21	N21	-6.616165	0	3.397034	
22	N22	-0.366165	0	-7.428284	
23	N23	-6.470332	0	3.144443	
24	N24	-0.511998	0	-7.175693	
25	N25	-6.470332	-3.5	3.144443	
26	N26	-0.511998	-3.5	-7.175693	
27	N27	-6.470332	3.5	3.144443	
28	N28	-0.511998	3.5	-7.175693	
29	N29	-4.366165	0	-0.500081	
30	N30	-4.366165	-4.5	-0.500081	
31	N31	-4.366165	4.5	-0.500081	
32	N32	0.893089	0	-0.515625	
33	N33	3.491165	0	-2.015625	
34	N34	3.491165	1.125	-2.015625	
35	N35	3.491165	-1.125	-2.015625	
36	N36	0.366165	0	-7.428284	
37	N37	6.616165	0	3.397034	
38	N38	0.511998	0	-7.175693	
39	N39	6.470332	0	3.144443	
40	N40	0.511998	-3.5	-7.175693	
41	N41	6.470332	-3.5	3.144443	
42	N42	0.511998	3.5	-7.175693	
43	N43	6.470332	3.5	3.144443	
44	N44	2.616165	0	-3.531169	
45	N45	2.616165	-4.5	-3.531169	
46	N46	2.616165	4.5	-3.531169	
47	N47	6.25	3	4.03125	
48	N48	-6.25	3	4.03125	
49	N49	5.958333	3	4.03125	
50	N50	-5.958333	3	4.03125	
51	N51	1.75	3	4.03125	
52	N52	-6.616165	3	3.397034	
53	N53	-0.366165	3	-7.428284	
54	N54	-6.470332	3	3.144443	
55	N55	-0.511998	3	-7.175693	
56	N56	-4.366165	3	-0.500081	
57	N57	0.366165	3	-7.428284	
58	N58	6.616165	3	3.397034	

Node Coordinates (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
59	N59	0.511998	3	-7.175693	
60	N60	6.470332	3	3.144443	
61	N61	2.616165	3	-3.531169	
62	N62	0	3	1.03125	
63	N63	4	3	4.03125	
64	N64	-4	3	4.03125	
65	N65	0.893089	3	-0.515625	
66	N66	1.491165	3	-5.479727	
67	N67	5.491165	3	1.448477	
68	N68	-0.893089	3	-0.515625	
69	N69	-5.491165	3	1.448477	
70	N70	-1.491165	3	-5.479727	

Node Boundary Conditions

	Node 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	N2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N17	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N32	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	N62	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
5	N65	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
6	N68	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [k/ft^{3}]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	58	1.2
3	A992	29000	11154	0.3	0.65	0.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	0.3	0.65	0.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.2	58	1.1
6	A53 Grade B	29000	11154	0.3	0.65	0.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Length [ft]	Lb y-y [ft]	Lb z-z [ft]	Lcomp top [ft]	Lcomp bot [ft]	L-Torque [ft]	Function
1	M1	(E)Outrigger	3			Lbyy			Lateral
2	M2	Vert	2.25			Lbyy			Lateral
3	M3	(E) Horz	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
4	M4	(E)Antenna Mast	7			Lbyy			Lateral
5	M5	(E)Antenna Mast	7			Lbyy			Lateral
6	M6	(P) Antenna Mast	9			Lbyy			Lateral
7	M7	(E)Outrigger	3			Lbyy			Lateral
8	M8	Vert	2.25			Lbyy			Lateral
9	M9	(E) Horz	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
10	M10	(E)Antenna Mast	7			Lbyy			Lateral
11	M11	(E)Antenna Mast	7			Lbyy			Lateral
12	M12	(P) Antenna Mast	9			Lbyy			Lateral
13	M13	(E)Outrigger	3			Lbyy			Lateral
14	M14	Vert	2.25			Lbyy			Lateral
15	M15	(E) Horz	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
16	M16	(E)Antenna Mast	7			Lbyy			Lateral
17	M17	(E)Antenna Mast	7			Lbyy			Lateral
18	M18	(P) Antenna Mast	9			Lbyy			Lateral
19	M19	(P) Stabilizer	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
20	M20	(P) Stabilizer	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
21	M21	(P) Stabilizer	12.5	Segment	Segment	Segment	Segment	Segment	Lateral
22	M22	(P) Stabilizer	5			Lbyy			Lateral
23	M23	(P) Stabilizer	5			Lbyy			Lateral
24	M24	(P) Stabilizer	5			Lbyy			Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length [ft]	Lb y-y [ft]	Lb z-z [ft]	Lcomp top [ft]	Lcomp bot [ft]	L-Torque [ft]	Function
25	M25	(P) Stabilizer	5			Lbyy			Lateral
26	M26	(P) Stabilizer	5			Lbyy			Lateral
27	M27	(P) Stabilizer	5			Lbyy			Lateral

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	Y	-0.077	1	Active
2	M12	Y	-0.077	1	Active
3	M18	Y	-0.077	1	Active
4	M6	Y	-0.077	7	Active
5	M12	Y	-0.077	7	Active
6	M18	Y	-0.077	7	Active
7	M4	Y	-0.021	1	Active
8	M10	Y	-0.021	1	Active
9	M16	Y	-0.021	1	Active
10	M4	Y	-0.021	4	Active
11	M10	Y	-0.021	4	Active
12	M16	Y	-0.021	4	Active
13	M6	Y	-0.074	3	Active
14	M12	Y	-0.074	3	Active
15	M18	Y	-0.074	3	Active
16	M6	Y	-0.109	8	Active
17	M12	Y	-0.109	8	Active
18	M18	Y	-0.109	8	Active

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	Y	-0.392	1	Active
2	M12	Y	-0.392	1	Active
3	M18	Y	-0.392	1	Active
4	M6	Y	-0.392	7	Active
5	M12	Y	-0.392	7	Active
6	M18	Y	-0.392	7	Active
7	M4	Y	-0.128	1	Active
8	M10	Y	-0.128	1	Active
9	M16	Y	-0.128	1	Active
10	M4	Y	-0.128	4	Active
11	M10	Y	-0.128	4	Active
12	M16	Y	-0.128	4	Active
13	M6	Y	-0.142	3	Active
14	M12	Y	-0.142	3	Active
15	M18	Y	-0.142	3	Active
16	M6	Y	-0.199	8	Active
17	M12	Y	-0.199	8	Active
18	M18	Y	-0.199	8	Active

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	X	0.057	1	Active
2	M6	X	0.057	7	Active
3	M12	X	0.116	1	Active
4	M18	X	0.116	1	Active
5	M12	X	0.116	7	Active
6	M18	X	0.116	7	Active
7	M4	X	0.021	1	Active
8	M4	X	0.021	4	Active
9	M10	X	0.031	1	Active

Member Point Loads (Continued)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
10	M16	X	0.031	1	Active
11	M10	X	0.031	4	Active
12	M16	X	0.031	4	Active
13	M6	X	0.024	3	Active
14	M6	X	0.033	8	Active
15	M12	X	0.04	8	Active
16	M18	X	0.04	8	Active

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	X	0.12	1	Active
2	M6	X	0.12	7	Active
3	M12	X	0.331	1	Active
4	M18	X	0.331	1	Active
5	M12	X	0.331	7	Active
6	M18	X	0.331	7	Active
7	M4	X	0.041	1	Active
8	M4	X	0.041	4	Active
9	M10	X	0.072	1	Active
10	M16	X	0.072	1	Active
11	M10	X	0.072	4	Active
12	M16	X	0.072	4	Active
13	M6	X	0.042	3	Active
14	M6	X	0.065	8	Active
15	M12	X	0.084	8	Active
16	M18	X	0.084	8	Active

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	Z	0.116	1	Active
2	M6	Z	0.116	7	Active
3	M12	Z	0.057	1	Active
4	M18	Z	0.057	1	Active
5	M12	Z	0.057	7	Active
6	M18	Z	0.057	7	Active
7	M4	Z	0.031	1	Active
8	M4	Z	0.031	4	Active
9	M10	Z	0.021	1	Active
10	M16	Z	0.021	1	Active
11	M10	Z	0.021	4	Active
12	M16	Z	0.021	4	Active
13	M12	Z	0.024	3	Active
14	M18	Z	0.024	3	Active
15	M12	Z	0.033	8	Active
16	M18	Z	0.033	8	Active
17	M6	Z	0.04	8	Active

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M6	Z	0.331	1	Active
2	M6	Z	0.331	7	Active
3	M12	Z	0.12	1	Active
4	M18	Z	0.12	1	Active
5	M12	Z	0.12	7	Active
6	M18	Z	0.12	7	Active
7	M4	Z	0.072	1	Active
8	M4	Z	0.072	4	Active

Member Point Loads (Continued)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
9	M10	Z	0.041	1	Active
10	M16	Z	0.041	1	Active
11	M10	Z	0.041	4	Active
12	M16	Z	0.041	4	Active
13	M12	Z	0.042	3	Active
14	M18	Z	0.042	3	Active
15	M12	Z	0.065	8	Active
16	M18	Z	0.065	8	Active
17	M6	Z	0.084	8	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(ft, %)]	End Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M4	X	0.002	0.002	0	%100	Active
2	M5	X	0.002	0.002	0	%100	Active
3	M6	X	0.002	0.002	0	%100	Active
4	M9	X	0.003	0.003	0	%100	Active
5	M15	X	0.003	0.003	0	%100	Active
6	M20	X	0.002	0.002	0	%100	Active
7	M21	X	0.002	0.002	0	%100	Active
8	M1	X	0.003	0.003	0	%100	Active
9	M2	X	0.003	0.003	0	%100	Active
10	M7	X	0.003	0.003	0	%100	Active
11	M8	X	0.003	0.003	0	%100	Active
12	M13	X	0.003	0.003	0	%100	Active
13	M14	X	0.003	0.003	0	%100	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(ft, %)]	End Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M4	X	0.007	0.007	0	%100	Active
2	M5	X	0.007	0.007	0	%100	Active
3	M6	X	0.008	0.008	0	%100	Active
4	M9	X	0.008	0.008	0	%100	Active
5	M15	X	0.008	0.008	0	%100	Active
6	M20	X	0.007	0.007	0	%100	Active
7	M21	X	0.007	0.007	0	%100	Active
8	M1	X	0.011	0.011	0	%100	Active
9	M2	X	0.012	0.012	0	%100	Active
10	M7	X	0.011	0.011	0	%100	Active
11	M8	X	0.012	0.012	0	%100	Active
12	M13	X	0.011	0.011	0	%100	Active
13	M14	X	0.012	0.012	0	%100	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(ft, %)]	End Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M3	Z	0.003	0.003	0	%100	Active
2	M9	Z	0.003	0.003	0	%100	Active
3	M11	Z	0.002	0.002	0	%100	Active
4	M12	Z	0.002	0.002	0	%100	Active
5	M15	Z	0.002	0.002	0	%100	Active
6	M16	Z	0.002	0.002	0	%100	Active
7	M17	Z	0.002	0.002	0	%100	Active
8	M18	Z	0.002	0.002	0	%100	Active
9	M19	Z	0.002	0.002	0	%100	Active
10	M20	Z	0.002	0.002	0	%100	Active
11	M21	Z	0.002	0.002	0	%100	Active
12	M2	Z	0.003	0.003	0	%100	Active
13	M7	Z	0.003	0.003	0	%100	Active
14	M8	Z	0.003	0.003	0	%100	Active

Member Distributed Loads (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(ft, %)]	End Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
14	M8	Z	0.003	0.003	0	%100	Active
15	M13	Z	0.003	0.003	0	%100	Active
16	M14	Z	0.003	0.003	0	%100	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(ft, %)]	End Location [(ft, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	M3	Z	0.009	0.009	0	%100	Active
2	M9	Z	0.009	0.009	0	%100	Active
3	M15	Z	0.007	0.007	0	%100	Active
4	M19	Z	0.007	0.007	0	%100	Active
5	M20	Z	0.007	0.007	0	%100	Active
6	M21	Z	0.007	0.007	0	%100	Active
7	M16	Z	0.007	0.007	0	%100	Active
8	M17	Z	0.007	0.007	0	%100	Active
9	M18	Z	0.003	0.003	0	%100	Active
10	M11	Z	0.007	0.007	0	%100	Active
11	M12	Z	0.003	0.003	0	%100	Active
12	M2	Z	0.012	0.012	0	%100	Active
13	M7	Z	0.012	0.012	0	%100	Active
14	M8	Z	0.012	0.012	0	%100	Active
15	M13	Z	0.012	0.012	0	%100	Active
16	M14	Z	0.012	0.012	0	%100	Active

Member Area Loads

No Data to Print...

Load Combinations

	Description	Solve	PDelta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
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	0.9	2	0.9	5	1.6		
3	1.2D + 1.0Di + 1.0Wi (X-direction)	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	0.9	2	0.9	7	1.6		
6	1.2D + 1.0Di + 1.0Wi (Z-direction)	Yes	Y	1	1.2	2	1.2	3	1	6	1

Envelope Node Reactions

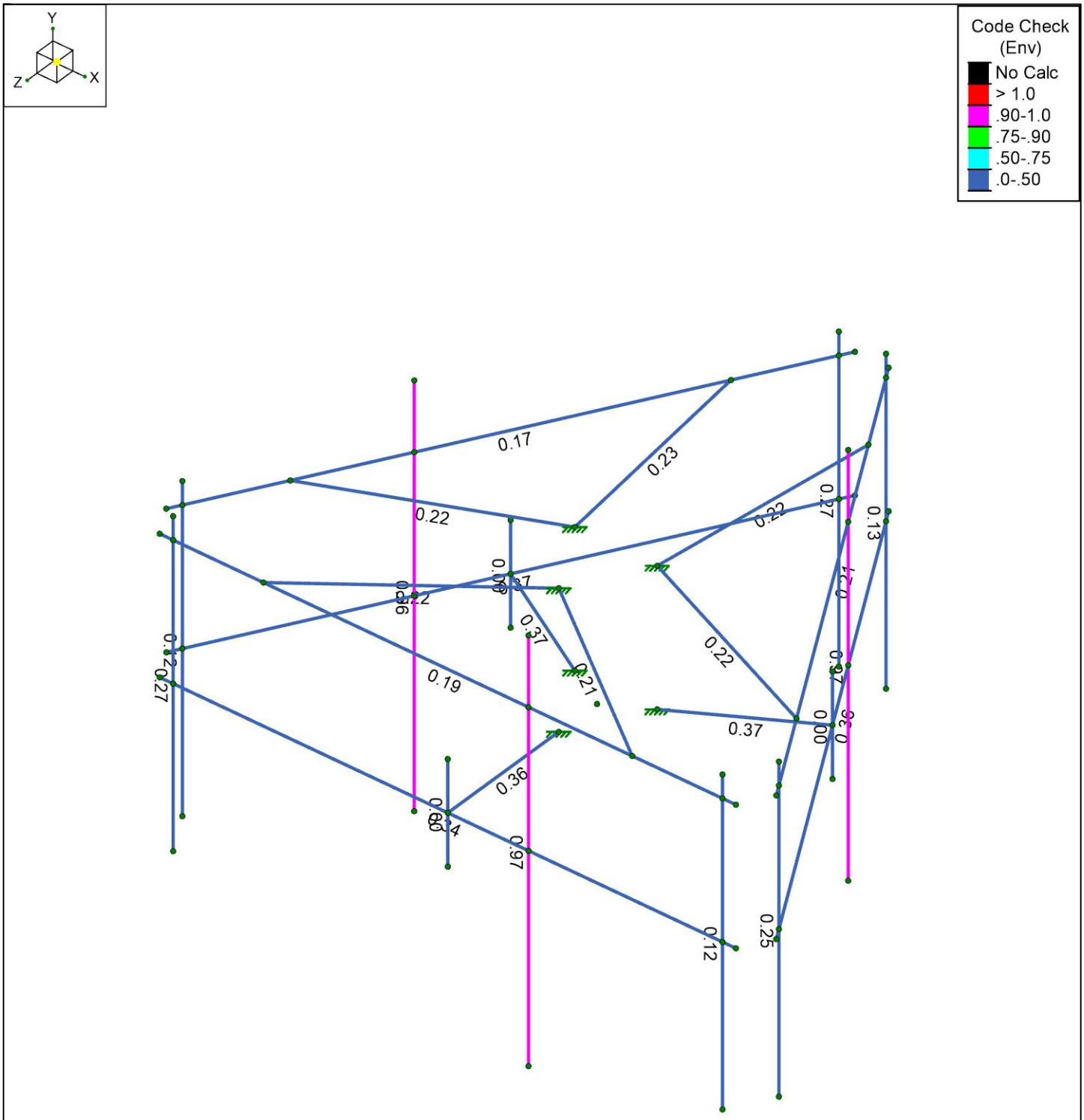
	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	0.087	6	1.947	6	0.249	3	-0.393	5	0.6	4	0.645	6
2		min	-0.9	2	0.543	2	-1.121	5	-5.227	3	-2.647	2	0.004	2
3	N17	max	0.013	5	1.942	6	0.135	1	2.149	3	1.856	1	-1.58	5
4		min	-1.406	1	0.493	2	-0.98	5	0.767	5	-2.879	5	-5.019	3
5	N32	max	0.148	6	1.943	3	-0.201	2	3.22	6	2.801	1	4.261	6
6		min	-1.249	2	0.525	5	-1.109	4	0.536	2	0.638	3	0.27	2
7	N62	max	-0.045	5	0.256	3	-0.059	2	-0.057	5	0.127	5	0.009	4
8		min	-0.162	1	0.047	5	-0.69	4	-0.493	3	-0.426	1	-0.024	2
9	N65	max	0.058	5	0.263	6	0.23	3	0.261	6	0.507	2	0.439	6
10		min	-0.576	1	0.061	2	-0.157	5	0.043	2	0.055	3	0.076	2
11	N68	max	0.24	6	0.268	3	0.014	3	0.255	3	0.219	2	-0.152	5
12		min	-0.433	2	0.076	5	-0.24	4	0.05	5	-0.574	4	-0.454	3
13	Totals:	max	0	5	6.598	3	0	1						
14		min	-4.671	1	1.841	5	-4.247	5						

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

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn y-y [k-ft]	phi*Mn z-z [k-ft]	Cb	Eqn
1	M1	HSS4X4X4	0.364	0	3	0.098	0	y	6	134.361	139.518	16.181	16.181	1.797	H1-1b
2	M2	PIPE_4.0	0.001	1.125	1	0	1.125		1	91.742	93.24	10.631	10.631	1.562	H1-1b

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

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn y-y [k-ft]	phi*Mn z-z [k-ft]	Cb	Eqn
3	M3	PIPE_3.0	0.337	6.25	6	0.288	6.25		4	53.919	65.205	5.749	5.749	2.745	H1-1b
4	M4	PIPE_2.0	0.27	3.5	3	0.062	3.5		3	17.855	32.13	1.872	1.872	1.831	H1-1b
5	M5	PIPE_2.0	0.116	0.51	6	0.034	3.5		5	17.855	32.13	1.872	1.872	1.885	H1-1b
6	M6	PIPE_2.0	0.966	4.5	4	0.152	4.5		4	12.144	32.13	1.872	1.872	1.859	H1-1b
7	M7	HSS4X4X4	0.373	0	6	0.098	0	y	3	134.361	139.518	16.181	16.181	1.773	H1-1b
8	M8	PIPE_4.0	0.001	1.125	4	0	1.125		5	91.742	93.24	10.631	10.631	1.316	H1-1b
9	M9	PIPE_3.0	0.368	6.25	3	0.2	6.25		2	53.919	65.205	5.749	5.749	2.733	H1-1b
10	M10	PIPE_2.0	0.266	3.5	6	0.062	3.5		6	17.855	32.13	1.872	1.872	1.875	H1-1b
11	M11	PIPE_2.0	0.124	0.51	1	0.051	3.5		1	17.855	32.13	1.872	1.872	1.603	H1-1b
12	M12	PIPE_2.0	0.961	4.5	1	0.134	4.5		2	12.144	32.13	1.872	1.872	1.739	H1-1b
13	M13	HSS4X4X4	0.373	0	6	0.1	0	y	3	134.361	139.518	16.181	16.181	1.774	H1-1b
14	M14	PIPE_4.0	0.001	1.125	1	0	1.125		1	91.742	93.24	10.631	10.631	1.563	H1-1b
15	M15	PIPE_3.0	0.362	6.25	6	0.253	6.25		1	53.919	65.205	5.749	5.749	2.739	H1-1b
16	M16	PIPE_2.0	0.251	3.5	3	0.058	0.51		6	17.855	32.13	1.872	1.872	1.806	H1-1b
17	M17	PIPE_2.0	0.13	0.51	1	0.039	3.5		6	17.855	32.13	1.872	1.872	1.477	H1-1b
18	M18	PIPE_2.0	0.967	4.5	1	0.144	4.5		1	12.144	32.13	1.872	1.872	1.734	H1-1b
19	M19	PIPE_2.0	0.194	8.073	4	0.131	10.156		5	30.238	32.13	1.872	1.872	1.577	H1-1b
20	M20	PIPE_2.0	0.172	8.073	1	0.133	10.156		1	30.238	32.13	1.872	1.872	1.31	H1-1b
21	M21	PIPE_2.0	0.206	8.073	1	0.112	10.156		2	30.238	32.13	1.872	1.872	1.549	H1-1b
22	M22	PIPE_2.0	0.224	5	3	0.031	5		3	23.809	32.13	1.872	1.872	2.224	H1-1b
23	M23	PIPE_2.0	0.207	0	3	0.015	0		6	23.809	32.13	1.872	1.872	2.226	H1-1b
24	M24	PIPE_2.0	0.221	5	6	0.034	5		6	23.809	32.13	1.872	1.872	2.225	H1-1b
25	M25	PIPE_2.0	0.216	0	6	0.021	0		1	23.809	32.13	1.872	1.872	2.219	H1-1b
26	M26	PIPE_2.0	0.225	5	3	0.035	5		3	23.809	32.13	1.872	1.872	2.224	H1-1b
27	M27	PIPE_2.0	0.217	0	3	0.015	0		6	23.809	32.13	1.872	1.872	2.221	H1-1b



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek	CTHA231A - Mount Analysis	SK-2
TJL		Feb 22, 2022
20143.15		CTHA231A_AMA.r3d

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Equipment Platform

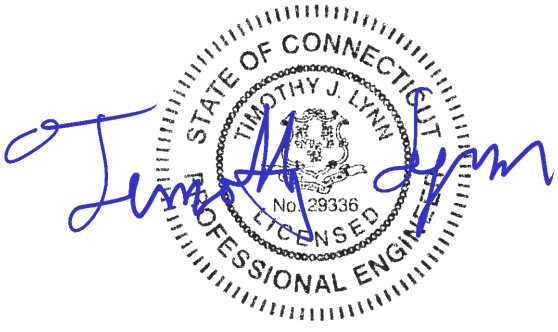
Proposed T-Mobile
Equipment Upgrade-Anchor

Site Ref: CT11005D

1657 Berlin Turnpike
Berlin, CT

CENTEK Project No. 20143.15

Date: February 23, 2022



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

Introduction

The purpose of this structural analysis report (SAR) is to summarize the results, of the impacted structural components, by the modified equipment upgrade proposed by T-Mobile on the existing equipment platform located in Berlin, CT.

The T-Mobile equipment cabinets are mounted on a steel dunnage platform at the exterior of the building. The T-Mobile Equipment shares the same platform as equipment by others, along with a platform above by others.

The existing platform structure geometry and member size information were obtained from previous CDs/structural report and a site visit performed by Centek personnel on February 16, 2022.

The existing platform consists of steel beams and (4) steel columns bearing directly on concrete footings.

Primary Assumptions Used in the Analysis

- The host structure's theoretical capacity not including any assessment of the condition of the host structure.
- The existing elevated steel platform carries the horizontal and vertical loads due to the weight of equipment, and wind and transfers into host structure.
- Proposed reinforcement and support steel will be properly installed and maintained.
- Structure is in plumb condition.
- Loading for equipment and enclosure 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 observed during roof framing mapping.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.

Equipment Summary

Location	Appurtenance / Equipment		Elevation (AGL)	Mount Type
Equipment Platform	**(1) Ericsson B160**	1883 lbs.	-	Steel Platform mounted on steel columns
	(1) Ericsson 6160	1200 lbs.	-	
	Existing equipment by others (assumed)	3000 lbs.	-	
	Platform by others above	10,000 per column	-	

Equipment – Indicates equipment to be installed.
~~Equipment~~ – Indicates equipment to be removed.

Analysis

The antenna frames and equipment platform were analyzed using a comprehensive computer program titled Risa3D. The program analyzes the equipment platform and antenna mounts considering the worst case code prescribed loading condition. The structures were considered to be loaded by concentric forces, and the model assumes that the members are subjected to bending, axial, and shear forces.

Design Loading

Loading was determined per the requirements of the 2015 International Building Code amended by the 2018 CSBC and ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures”.

Wind Speed:	V_{ult} = 125 mph	*Appendix N of the 2018 CT State Building Code*
Risk Category:	II	*2015 IBC; Table 1604.05*
Exposure Category:	Surface Roughness B	*ASCE 7-10; Section 26.7.2*
Ground Snow Load	30 psf	*Appendix N of the 2018 CT State Building Code*
Dead Load	Equipment and framing self-weight	*Identified within SAR design calculations*
Live Load	20 psf	*ASCE 7-10; Table 4-1 “Roofs – All Other Construction”*

Reference Standards

2015 International Building Code:

1. ACI 318-14, *Building Code Requirements for Structural Concrete*.
2. ACI 530-13, *Building Code Requirements for Masonry Structures*.
3. AISC 360-10, *Specification for Structural Steel Buildings*
4. AWS D1.1 – 00, *Structural Welding Code – Steel*.
5. AF&PA-12, Span Tables for Joists and Rafters.
6. ANSI/AWC NDS-2015, National Design Specifications (NDS) for Wood Construction – with 2012 Supplement.

Results

Member stresses and design reactions were calculated utilizing the structural analysis software RISA 3D.

The following table provides a summary of structural components impacted by the proposed upgrade along with associated member percent capacity and PASS/FAIL result:

Location	Component	Capacity (%)	Result
Equipment Platform	W12X26 Platform Member	41%	**PASS**
	W12X16 Platform Member	72%	**PASS**
	W8X48 Platform Column	34%	**PASS**

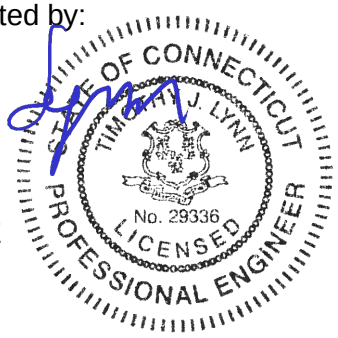
Conclusion

This analysis shows that the subject equipment platform **has sufficient capacity** to support the proposed modified equipment 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.

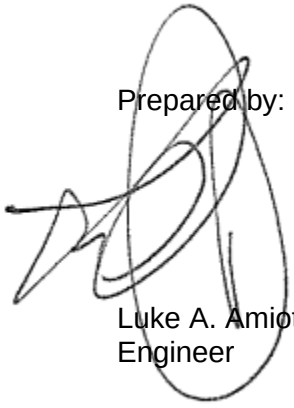
Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Prepared by:



Luke A. Amiot
Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

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Subject: Wind Load on Equipment per ASCE 7-10

Location: Berlin, CT

Rev. 0: 02/17/22

Prepared by: L.A.A.;Checked by: T.J.L.
Job No. 20143.15

Design Wind Load on Other Structures:

(Based on IBC 2015, CSBC 2018 and ASCE 7-10)

Wind Speed =	$V := 125$	mph	(User Input)	(CSBC Appendix-N)
Risk Category =	$BC := II$		(User Input)	(IBC Table 1604.5)
Exposure Category =	$Exp := C$		(User Input)	
Height Above Grade =	$Z := 12$	ft	(User Input)	
Structure Type =	$Structuretype := Square\_Chimney$			
Structure Height =	$Height := 7$	ft	(User Input) (User Input)	
Horizontal Dimension of Structure =	$Width := 4$	ft	(User Input)	

Terrain Exposure Constants:

Nominal Height of the Atmospheric Boundary Layer =

$$zg := \begin{cases} 1200 & \text{if } Exp = B \\ 900 & \text{if } Exp = C \\ 700 & \text{if } Exp = D \end{cases} = 900$$

(Table 26.9-1)

3-Sec Gust Speed Power Law Exponent =

$$\alpha := \begin{cases} 7 & \text{if } Exp = B \\ 9.5 & \text{if } Exp = C \\ 11.5 & \text{if } Exp = D \end{cases} = 9.5$$

(Table 26.9-1)

Integral Length Scale Factor =

$$l := \begin{cases} 320 & \text{if } Exp = B \\ 500 & \text{if } Exp = C \\ 650 & \text{if } Exp = D \end{cases} = 500$$

(Table 26.9-1)

Integral Length Scale Power Law Exponent =

$$E := \begin{cases} \frac{1}{3} & \text{if } Exp = B \\ \frac{1}{5} & \text{if } Exp = C \\ \frac{1}{8} & \text{if } Exp = D \end{cases} = 0.2$$

(Table 26.9-1)

Turbulence Intensity Factor =

$$c := \begin{cases} 0.3 & \text{if } Exp = B \\ 0.2 & \text{if } Exp = C \\ 0.15 & \text{if } Exp = D \end{cases} = 0.2$$

(Table 26.9-1)

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Exposure Constant = $Z_{min} := \left\| \begin{array}{l} \text{if } Exp = B \\ \quad 30 \\ \text{if } Exp = C \\ \quad 15 \\ \text{if } Exp = D \\ \quad 7 \end{array} \right. = 15$ (Table 26.9-1)

Exposure Coefficient = $K_z := \left\| \begin{array}{l} \text{if } 15 \le Z \le zg \\ \quad 2.01 \cdot \left(\frac{Z}{zg}\right)^{\left(\frac{2}{\alpha}\right)} \\ \text{if } Z < 15 \\ \quad 2.01 \cdot \left(\frac{15}{zg}\right)^{\left(\frac{2}{\alpha}\right)} \end{array} \right. = 0.85$ (Table 29.3-1)

Topographic Factor = $K_{zt} := 1$ (Eq. 26.8-2)

Wind Directionality Factor = $K_d = 0.9$ (Table 26.6-1)

Velocity Pressure = $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 = 30.56$ (Eq. 29.3-1)

Peak Factor for Background Response = $g_Q := 3.4$ (Sec 26.9.4)

Peak Factor for Wind Response = $g_v := 3.4$ (Sec 26.9.4)

Equivalent Height of Structure = $z := \left\| \begin{array}{l} \text{if } Z_{min} > 0.6 \cdot Height \\ \quad Z_{min} \\ \text{else} \\ \quad 0.6 \cdot Height \end{array} \right. = 15$ (Sec 26.9.4)

Intensity of Turbulence = $I_z := c \cdot \left(\frac{33}{z}\right)^{\left(\frac{1}{6}\right)} = 0.228$ (Eq. 26.9-7)

Integral Length Scale of Turbulence = $L_Z := l \cdot \left(\frac{z}{33}\right)^{E} = 427.057$ (Eq. 26.9-9)

Background Response Factor = $Q := \sqrt{\frac{1}{1 + 0.63 \cdot \left(\frac{Width + Height}{L_Z}\right)^{0.63}}} = 0.97$ (Eq. 26.9-8)

Gust Response Factor = $G := 0.925 \cdot \left(\frac{\left(1 + 1.7 \cdot g_Q \cdot I_z \cdot Q\right)}{1 + 1.7 \cdot g_v \cdot I_z}\right) = 0.909$ (Eq. 26.9-6)

Force Coefficient = $GC_f := 1.9$ (Section 29.5-1)

Wind Force = $F := q_z \cdot G \cdot C_f = 36$ psf

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Development of Wind on Equipment

Equipment Data:

Equipment Model =	Ericsson B160 Battery Cabinet		
Equipment Shape =	Flat		(User Input)
Equipment Height =	$L_{Eq} := 63$	in	(User Input)
Equipment Width =	$W_{Eq} := 26$	in	(User Input)
Equipment Thickness =	$T_{Eq} := 26$	in	(User Input)
Equipment Weight =	$WT_{Eq} := 1883$	lbs	(User Input)
Equipment Bearing Points =	$N_{Bp} := 4$		(User Input)
Number of Equipment =	$N_{Eq} := 1$		(User Input)

Gravity Load (without ice)

Weight of All Equipments = $\frac{WT_{Eq}}{N_{Bp}} = 471$ lbs

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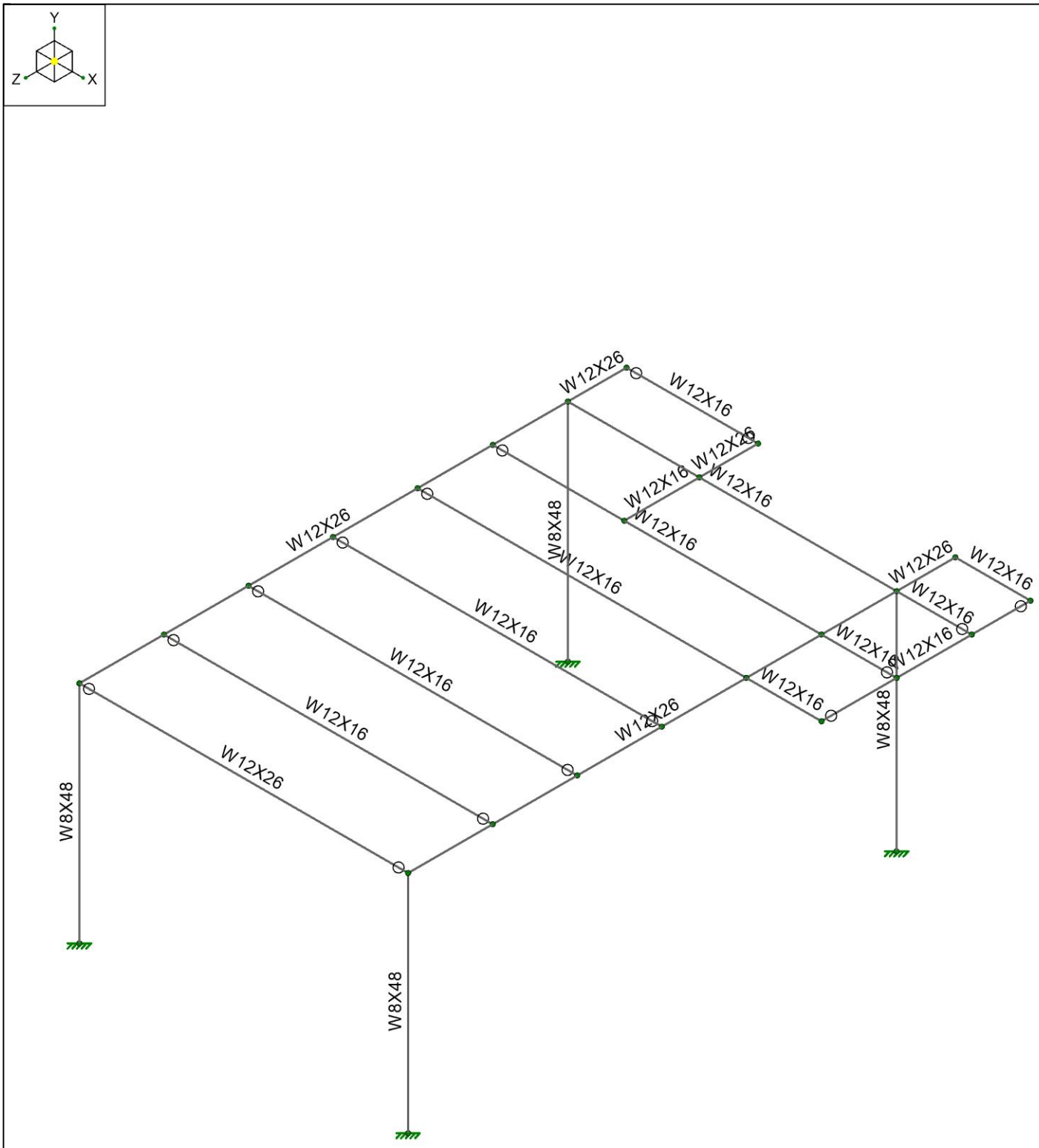
Development of Wind on Equipment

Equipment Data:

Equipment Model =	Ericsson 6160 Cabinet		
Equipment Shape =	Flat		(User Input)
Equipment Height =	$L_{Eq} := 63$	in	(User Input)
Equipment Width =	$W_{Eq} := 26$	in	(User Input)
Equipment Thickness =	$T_{Eq} := 26$	in	(User Input)
Equipment Weight =	$WT_{Eq} := 1200$	lbs	(User Input)
Equipment Bearing Points =	$N_{Bp} := 4$		(User Input)
Number of Equipment =	$N_{Eq} := 1$		(User Input)

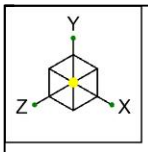
Gravity Load (without ice)

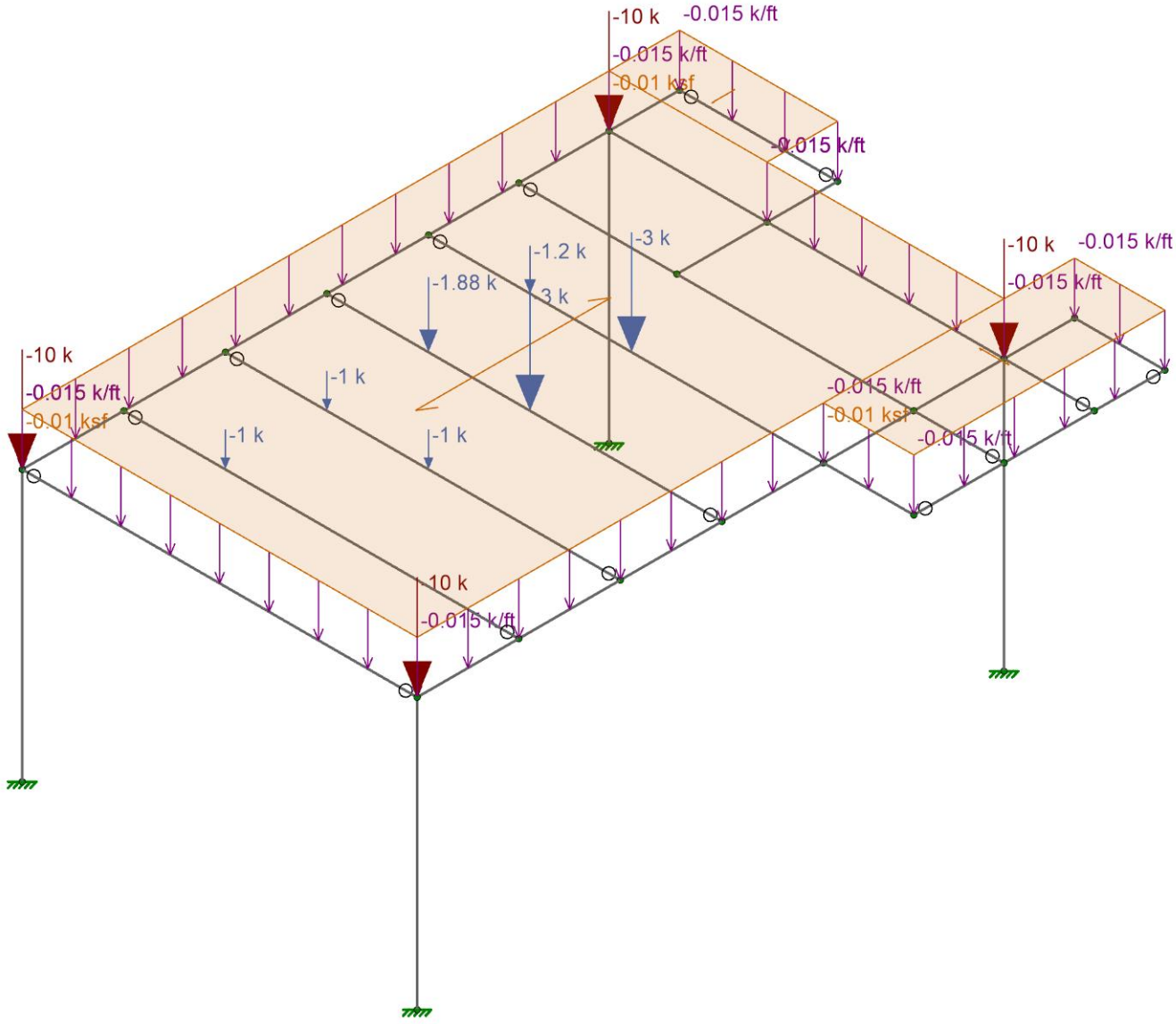
Weight of All Equipments =	$\frac{WT_{Eq}}{N_{Bp}} = 300$	lbs



Envelope Only Solution

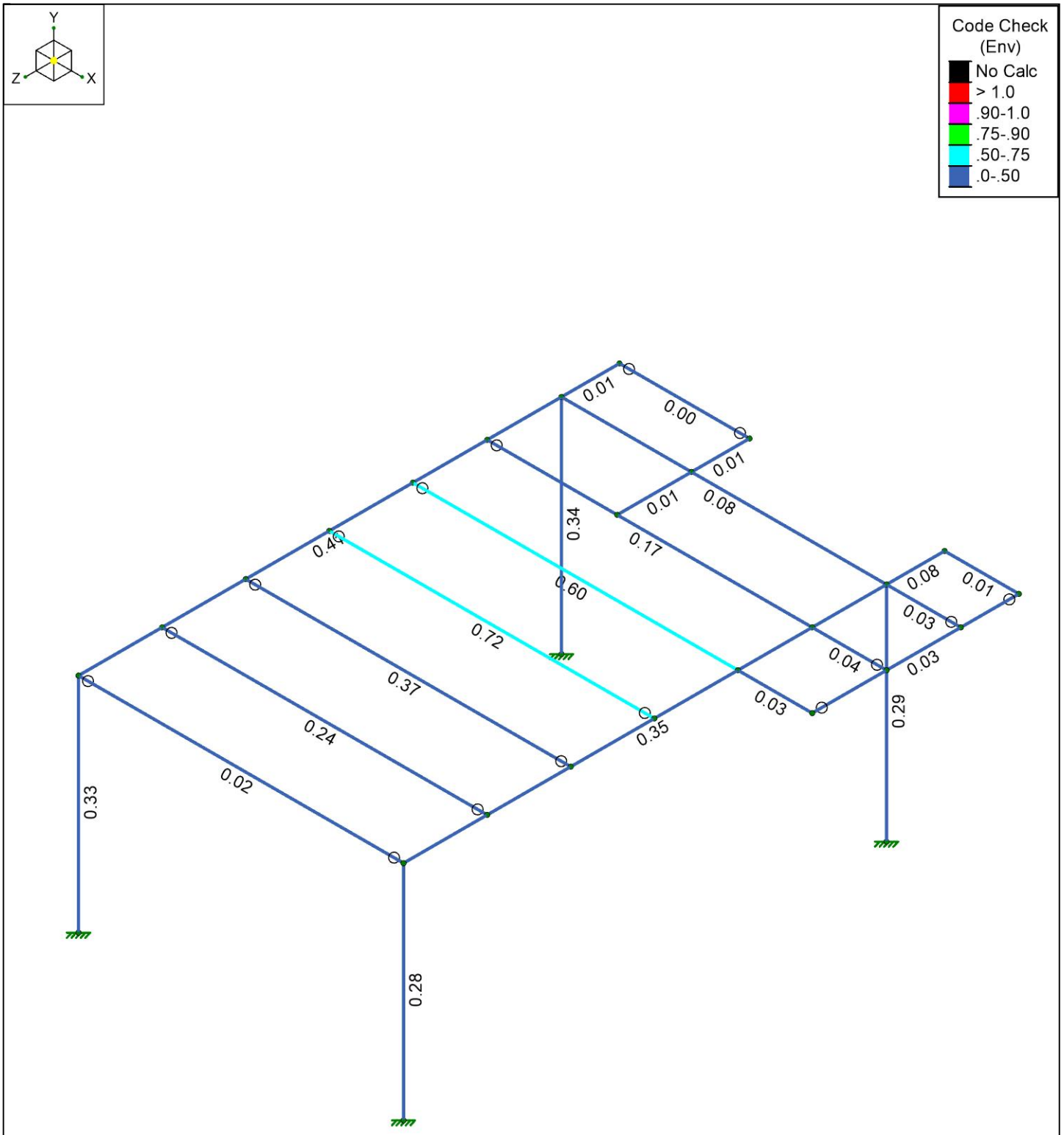
Centek Engineering	CTHA231A - Eq. PLatform - Rev.1	SK-1
LAA		Feb 17, 2022
20143.15		Eq.Platform_Rev.0.r3d





Loads: LC 1, IBC 16-8
Envelope Only Solution

Centek Engineering	CTHA231A - Eq. PLatform - Rev.1	SK-2
LAA		Feb 17, 2022
20143.15		Eq.Platform_Rev.0.r3d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering	CTHA231A - Eq. PLatform - Rev.1	SK-3
LAA		Feb 17, 2022
20143.15		Eq.Platform_Rev.0.r3d

Node Coordinates

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	140	0	0	
3	N3	0	0	32	
4	N4	0	0	64	
5	N5	0	0	100	
6	N6	140	0	100	
7	N7	140	0	64	
8	N8	140	0	32	
9	N9	140	0	136	
10	N10	0	0	136	
11	N11	140	0	172	
12	N12	0	0	172	
13	N13	140	0	208	
14	N14	0	0	208	
15	N15	172	0	0	
16	N16	172	0	64	
17	N17	172	0	32	
18	N18	0	0	-25	
19	N19	140	0	-25	
20	N20	172	0	-25	
21	N21	56	0	0	
22	N22	56	0	-25	
23	N23	0	-96	0	
24	N24	140	-96	0	
25	N25	140	-96	208	
26	N26	0	-96	208	
27	N27	56	0	32	

Node Boundary Conditions

	Node 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	N24	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N23	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N25	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	N26	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [k/ft^{3}]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50	1.4	65	1.3

Hot Rolled Steel Design Parameters

	Label	Shape	Length [in]	Lcomp top [in]	Function
1	M1	W8X48	96	Lbyy	Lateral
2	M2	W8X48	96	Lbyy	Lateral
3	M3	W8X48	96	Lbyy	Lateral
4	M4	W8X48	96	Lbyy	Lateral
5	M5	W12X26	208	Lbyy	Lateral
6	M6	W12X26	25	Lbyy	Lateral
7	M7	W12X26	208	Lbyy	Lateral
8	M8	W12X26	25	Lbyy	Lateral
9	M9	W12X26	140	Lbyy	Lateral
10	M10	W12X16	140	Lbyy	Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length [in]	Lcomp top [in]	Function
11	M11	W12X16	140	Lbyy	Lateral
12	M12	W12X16	140	Lbyy	Lateral
13	M13	W12X16	140	Lbyy	Lateral
14	M14	W12X16	140	Lbyy	Lateral
15	M15	W12X16	140	Lbyy	Lateral
16	M16	W12X16	32	Lbyy	Lateral
17	M17	W12X16	32	Lbyy	Lateral
18	M18	W12X16	32	Lbyy	Lateral
19	M19	W12X16	32	Lbyy	Lateral
20	M20	W12X16	89	Lbyy	Lateral
21	M21	W12X26	25	Lbyy	Lateral
22	M22	W12X16	56	Lbyy	Lateral
23	M23	W12X16	32	Lbyy	Lateral

Member Point Loads

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	M13	Y	-1.2	36	Active
2	M12	Y	-1.88	36	Active
3	M13	Y	-3	72	Active
4	M12	Y	-3	72	Active
5	M11	Y	-1	72	Active
6	M11	Y	-1	36	Active
7	M10	Y	-1	36	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(in, %)]	End Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	M5	Y	-0.015	-0.015	0	%100	Active
2	M9	Y	-0.015	-0.015	0	%100	Active
3	M7	Y	-0.015	-0.015	0	144	Active
4	M16	Y	-0.015	-0.015	0	%100	Active
5	M20	Y	-0.015	-0.015	0	%100	Active
6	M19	Y	-0.015	-0.015	0	%100	Active
7	M22	Y	-0.015	-0.015	0	%100	Active
8	M6	Y	-0.015	-0.015	0	%100	Active
9	M21	Y	-0.015	-0.015	0	%100	Active
10	M8	Y	-0.015	-0.015	0	%100	Active
11	M15	Y	-0.015	-0.015	56	140	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(in, %)]	End Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	M9	Y	-0.015	-0.015	0	140	Active
2	M10	Y	-0.03	-0.03	7.105e-15	140	Active
3	M11	Y	-0.03	-0.03	1.243e-14	140	Active
4	M12	Y	-0.03	-0.03	7.105e-15	140	Active
5	M13	Y	-0.02	-0.031	0	28	Active
6	M13	Y	-0.031	-0.028	28	56	Active
7	M13	Y	-0.028	-0.028	56	84	Active
8	M13	Y	-0.028	-0.031	84	112	Active
9	M13	Y	-0.031	-0.02	112	140	Active
10	M14	Y	-0.026	-0.026	0	28	Active
11	M14	Y	-0.026	-0.029	28	56	Active
12	M14	Y	-0.029	-0.029	56	84	Active
13	M14	Y	-0.029	-0.026	84	112	Active
14	M14	Y	-0.026	-0.026	112	140	Active
15	M15	Y	-0.013	-0.013	7.994e-15	140	Active
16	M7	Y	-0.013	-0.013	144	208	Active
17	M8	Y	-0.013	-0.013	0	25	Active

Member Distributed Loads (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(in, %)]	End Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
18	M20	Y	-0.015	-0.015	0	29.667	Active
19	M20	Y	-0.015	-0.013	29.667	59.333	Active
20	M20	Y	-0.013	-0.01	59.333	89	Active
21	M15	Y	-0.01	-0.01	0	56	Active
22	M22	Y	-0.01	-0.01	0	56	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(in, %)]	End Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	M9	Y	-0.03	-0.03	0	140	Active
2	M10	Y	-0.06	-0.06	7.105e-15	140	Active
3	M11	Y	-0.06	-0.06	1.243e-14	140	Active
4	M12	Y	-0.06	-0.06	7.105e-15	140	Active
5	M13	Y	-0.039	-0.062	0	28	Active
6	M13	Y	-0.062	-0.057	28	56	Active
7	M13	Y	-0.057	-0.057	56	84	Active
8	M13	Y	-0.057	-0.062	84	112	Active
9	M13	Y	-0.062	-0.039	112	140	Active
10	M14	Y	-0.052	-0.052	0	28	Active
11	M14	Y	-0.052	-0.059	28	56	Active
12	M14	Y	-0.059	-0.059	56	84	Active
13	M14	Y	-0.059	-0.052	84	112	Active
14	M14	Y	-0.052	-0.052	112	140	Active
15	M15	Y	-0.027	-0.027	7.994e-15	140	Active
16	M15	Y	-0.021	-0.021	0	56	Active
17	M22	Y	-0.021	-0.021	0	56	Active
18	M16	Y	-0.027	-0.027	1.776e-15	32	Active
19	M17	Y	-0.053	-0.053	1.776e-15	32	Active
20	M18	Y	-0.047	-0.047	0	32	Active
21	M19	Y	-0.021	-0.021	0	32	Active

Member Distributed Loads

	Member Label	Direction	Start Magnitude [k/ft, F, ksf]	End Magnitude [k/ft, F, ksf]	Start Location [(in, %)]	End Location [(in, %)]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	M9	Y	-0.045	-0.045	0	140	Active
2	M10	Y	-0.09	-0.09	7.105e-15	140	Active
3	M11	Y	-0.09	-0.09	1.243e-14	140	Active
4	M12	Y	-0.09	-0.09	7.105e-15	140	Active
5	M13	Y	-0.059	-0.093	0	28	Active
6	M13	Y	-0.093	-0.085	28	56	Active
7	M13	Y	-0.085	-0.085	56	84	Active
8	M13	Y	-0.085	-0.093	84	112	Active
9	M13	Y	-0.093	-0.059	112	140	Active
10	M14	Y	-0.078	-0.078	0	28	Active
11	M14	Y	-0.078	-0.088	28	56	Active
12	M14	Y	-0.088	-0.088	56	84	Active
13	M14	Y	-0.088	-0.078	84	112	Active
14	M14	Y	-0.078	-0.078	112	140	Active
15	M15	Y	-0.04	-0.04	7.994e-15	140	Active
16	M15	Y	-0.031	-0.031	0	56	Active
17	M22	Y	-0.031	-0.031	0	56	Active
18	M16	Y	-0.04	-0.04	1.776e-15	32	Active
19	M17	Y	-0.08	-0.08	1.776e-15	32	Active
20	M18	Y	-0.071	-0.071	0	32	Active
21	M19	Y	-0.031	-0.031	0	32	Active

Member Area Loads

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N14	N1	N2	N13	Y	A-B	-0.01	Active
2	N7	N16	N20	N19	Y	A-B	-0.01	Active
3	N1	N18	N22	N21	Y	A-B	-0.01	Active

Member Area Loads

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N14	N1	N2	N13	Y	A-B	-0.02	Active
2	N1	N18	N22	N21	Y	A-B	-0.02	Active
3	N7	N19	N20	N16	Y	A-B	-0.02	Active

Member Area Loads

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]	Inactive [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N14	N1	N2	N13	Y	A-B	-0.03	Active
2	N1	N18	N22	N21	Y	A-B	-0.03	Active
3	N7	N19	N20	N16	Y	A-B	-0.03	Active

Load Combinations

	Description	Solve	PDelta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 16-8	Yes	Y	DL	1										
2	IBC 16-9	Yes	Y	DL	1	LL	1	LLS	1						
3	IBC 16-10 (b)	Yes	Y	DL	1	SL	1	SLN	1						
4	IBC 16-11 (b)	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
5	IBC 16-12 (a) (a)	Yes	Y	DL	1	WLX	0.6								
6	IBC 16-12 (a) (b)	Yes	Y	DL	1	WLZ	0.6								
7	IBC 16-12 (a) (c)	Yes	Y	DL	1	WLX	-0.6								
8	IBC 16-12 (a) (d)	Yes	Y	DL	1	WLZ	-0.6								
9	IBC 16-13 (a) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75				
10	IBC 16-13 (a) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75				
11	IBC 16-13 (a) (c)	Yes	Y	DL	1	WLX	-0.45	LL	0.75	LLS	0.75				
12	IBC 16-13 (a) (d)	Yes	Y	DL	1	WLZ	-0.45	LL	0.75	LLS	0.75				
13	IBC 16-13 (b) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
14	IBC 16-13 (b) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
15	IBC 16-13 (b) (c)	Yes	Y	DL	1	WLX	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
16	IBC 16-13 (b) (d)	Yes	Y	DL	1	WLZ	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
17	IBC 16-15 (a)	Yes	Y	DL	0.6	WLX	0.6								
18	IBC 16-15 (b)	Yes	Y	DL	0.6	WLZ	0.6								
19	IBC 16-15 (c)	Yes	Y	DL	0.6	WLX	-0.6								
20	IBC 16-15 (d)	Yes	Y	DL	0.6	WLZ	-0.6								

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N24	max	-0.013	20	17.796	16	1.952	16	5.079	16	0	16	0.684	16
2		min	-0.128	4	9.053	17	0.808	17	2.106	17	0	17	0.19	17
3	N23	max	0.129	16	17.764	16	2.287	16	5.993	16	0	16	0.214	8
4		min	0.013	17	9.37	17	1.051	17	2.743	17	0	17	0.073	4
5	N25	max	0	20	15.991	16	-0.809	20	-2.148	20	0.002	16	0.002	8
6		min	-0.002	4	8.415	17	-1.953	4	-5.195	4	0	17	0	4
7	N26	max	0	16	17.045	16	-1.05	20	-2.788	20	0.002	16	-0.001	20
8		min	0	17	9.106	17	-2.286	4	-6.041	4	0	17	-0.005	4
9	Totals:	max	0	3	68.595	16	0	20						
10		min	0	2	35.943	17	0	4						

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

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W8X48	0.329	96	16	0.016	48	z	16	271.657	303.952	41.138	88.024	1.816	H1-1b
2	M2	W8X48	0.283	96	16	0.014	48	z	16	271.657	303.952	41.138	88.024	1.749	H1-1b

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

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
3	M3	W8X48	0.292	96	16	0.014	48	z	16	271.657	303.952	41.138	88.024	2.176	H1-1b
4	M4	W8X48	0.343	96	16	0.016	48	z	16	271.657	303.952	41.138	88.024	1.596	H1-1b
5	M5	W12X26	0.408	108.333	16	0.112	208	y	16	60.104	229.042	20.384	60.902	1.329	H1-1b
6	M6	W12X26	0.005	0	16	0.005	0	y	16	208.014	229.042	20.384	92.814	1.764	H1-1b
7	M7	W12X26	0.351	108.333	16	0.1	177.667	y	16	60.104	229.042	20.384	60.8	1.326	H1-1b
8	M8	W12X26	0.077	0	16	0.03	12.5	z	16	208.014	229.042	20.384	92.814	1.737	H1-1b
9	M9	W12X26	0.024	70	16	0.012	140	y	16	121.346	229.042	20.384	79.51	1.136	H1-1b
10	M10	W12X16	0.24	51.042	16	0.032	0	y	16	21.626	141.018	5.639	18.338	1.131	H1-1b
11	M11	W12X16	0.372	71.458	16	0.041	0	y	16	21.626	141.018	5.639	18.968	1.17	H1-1b
12	M12	W12X16	0.722	71.458	16	0.072	0	y	16	21.626	141.018	5.639	19.588	1.208	H1-1b
13	M13	W12X16	0.6	71.458	16	0.058	0	y	16	21.626	141.018	5.639	20.231	1.248	H1-1b
14	M14	W12X16	0.167	84.583	16	0.018	0	y	16	21.626	141.018	5.639	18.275	1.127	H1-1b
15	M15	W12X16	0.076	140	16	0.017	140	y	16	21.626	141.018	5.639	34.577	2.133	H1-1b
16	M16	W12X16	0.034	0	16	0.014	0	y	16	111.782	141.018	5.639	50.15	1.748	H1-1b
17	M17	W12X16	0.038	0	8	0.019	32	y	16	111.782	141.018	5.639	50.15	1.653	H1-1b
18	M18	W12X16	0.028	0	16	0.016	0	y	16	111.782	141.018	5.639	50.15	1.807	H1-1b
19	M19	W12X16	0.013	0	16	0.006	0	y	16	111.782	141.018	5.639	50.15	1.873	H1-1b
20	M20	W12X16	0.026	32.448	8	0.015	0	y	16	53.512	141.018	5.639	49.479	1.532	H1-1b
21	M21	W12X26	0.005	0	16	0.005	0	y	16	208.014	229.042	20.384	92.814	1.755	H1-1b
22	M22	W12X16	0.005	28	16	0.006	56	y	16	91.865	141.018	5.639	48.617	1.136	H1-1b
23	M23	W12X16	0.01	32	16	0.005	32	y	16	111.782	141.018	5.639	50.15	1.729	H1-1b

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

175-ft Existing EEI Monopole

Proposed T-Mobile
Antenna Upgrade

Site Ref: CTHA231A

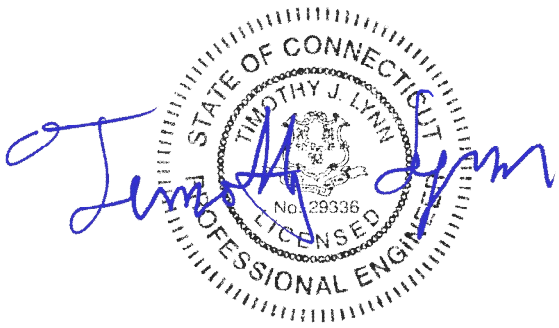
1657 Berlin Turnpike
Berlin, CT

CENTEK Project No. 20143.15

~~Date: November 4, 2020~~

Rev 1: February 22, 2022

Max Stress Ratio = 82%



Prepared for:

T-Mobile USA
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Bloomfield, CT 06002

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Introduction

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

The host tower is a 175-ft tall, four-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 11129 dated September 16, 2002. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by Paul J. Ford & company job no. 4921-0004.003.7805 dated April 22, 2021.

Antenna and appurtenance information were obtained from the aforementioned structural report and a T-Mobile RF sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 21.0-in at the top and 60.5-in at the base.

Antenna and Appurtenance Summary

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

- TOWN (EXISTING TO REMAIN):
  Antennas: Two (2) 2'x2' panels, two (2) Kathrein paraflector antennas, one (1) 10-ft omni-directional antenna, two (2) 4-ft omni-directional antennas and two (2) 20-ft dipole antennas mounted on a 13-ft low profile platform with an elevation of 1765-ft above grade level.
  Coax Cables: Four (4) 7/8"∅, three (3) 1-1/4" ∅ and two (2) Cat5e cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Three (3) Kathrein 800-10121 panel antennas, three (3) CCI HPA-65R-BUU-H6 panel antennas, six (6) LGP21401 TMAs, three (3) Ericsson RRUS-11 remote radio heads, three (3) Ericsson RRUS-32 remote radio heads and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on a platform w/ handrails with a RAD center elevation of 170-ft above grade level.
  Cables: Six (6) 1-5/8" ∅ coax cables, one (1) fiber cable and two (2) dc control cables running on the inside of the existing tower.
- TOWN (EXISTING TO REMAIN):
  Antennas: One (1) 4' grid dish and one (1) 3-ft dipole mounted on a 6-ft sidearm with an elevation of 164-ft above grade level.
  Coax Cables: Two (2) 7/8"∅ cables running on the inside of the existing tower.

- SPRINT (EXISTING):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas, three (3) ALU 1900 MHz RRHs, three (3) ALU 800 MHz RRHs, three (3) ALU TD-RRH-8x20-25 RRHs and five (5) 2-ft microwave dishes mounted on a low profile platform with a RAD center elevation of 150-ft above grade level.
  Coax Cables: Four (4) 1-5/8" ∅ Hybriflex cables and four (4) 1/2" ∅ coax cable running on the inside of the existing tower.
- TOWN (EXISTING TO REMAIN):
  Antennas: One (1) 10-ft dipole and one (1) 2'x2' panel antenna mounted on a 6-ft sidearm with an elevation of 136-ft above grade level.
  Coax Cables: One (1) 1/2"∅ and one (1) Cat5e cables running on the inside of the existing tower.
- VERIZON (EXISTING):
  Antennas: Three (3) Antel BXA-70063-6CF panel antennas, six (6) Commscope NHH-65B-R2B panel antenna, three (3) Samsung MT6407-77A panel antennas, three (3) Samsung B2/B66A RRHs, three (3) Samsung B5/B13 RRHs and two (2) OVP boxes mounted on a 13-ft low profile platform w_ handrail with a RAD center elevation of 118-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and two (2) fiber cables running inside the monopole.
- TOWN (EXISTING TO REMAIN):
  Antennas: One (1) 4' grid dish, one (1) 10-ft dipole and one (1) 2'x2' panel antenna mounted on a 6-ft sidearm with an elevation of 104-ft above grade level.
  Coax Cables: One (1) 1/2"∅ and one (1) Cat5e cables running on the inside of the existing tower.
- UNKNOWN (EXISTING):
  Antennas: One (1) GPS antenna mounted on a standoff with an elevation of 78-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- UNKNOWN (EXISTING):
  Antennas: One (1) GPS antenna mounted on a standoff with an elevation of 35.25-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- T-MOBILE (Existing to Remain):
  Antennas: Three (3) RFS APXVAARR24_43 panel antennas and three (3) Ericsson 4449 remote radio heads mounted on three (3) existing T-Arms w_ stabilizer kit with a RAD center elevation of 160-ft above grade.
  Coax Cables: Three (3) 6x12 fiber cables running on the inside of the existing tower.

- T-MOBILE (EXISTING TO REMOVE):
  Antennas: Three (3) Ericsson AIR21 panel antennas, three (3) Ericsson AIR32 panel antennas and three (3) TMAs mounted on three (3) existing T-Arms w_ stabilizer kit with a RAD center elevation of 160-ft above grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **T-MOBILE (PROPOSED):**
  Antennas: Three (3) Ericsson AIR6419 panel antennas and three (3) Ericsson 4460 remote radio heads mounted on three (3) existing T-Arms w_ stabilizer kit with a RAD center elevation of 160-ft above grade.
  Coax Cables: One (1) 6x24 fiber cable running on the inside of the existing 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 or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables to be installed as indicated in this report.

Analysis

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

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

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

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 1.00" radial ice on the tower structure and its components.

Basic Wind Speed:	Berlin; v = 97 mph	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" 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 **81.9%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	86.12'-130.75'	81.9%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.5 ∅ x 39.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned URS structural report. The base of the tower is connected to the foundation by means of (18) 2.25"∅, ASTM A615-75 anchor bolts embedded into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	39 kips
	Compression	59 kips
	Moment	4972 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	62.5%	**PASS**
	Lateral Deflection	0.25 in.(1)	**PASS**

(1) Lateral deflection limited to 0.75 in under service load combination per TIA-222-G section 9.5.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	82.0%	**PASS**
Base Plate	Bending	62.0%	**PASS**

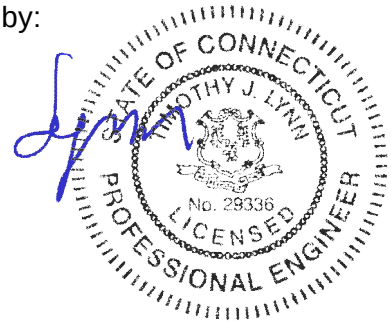
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

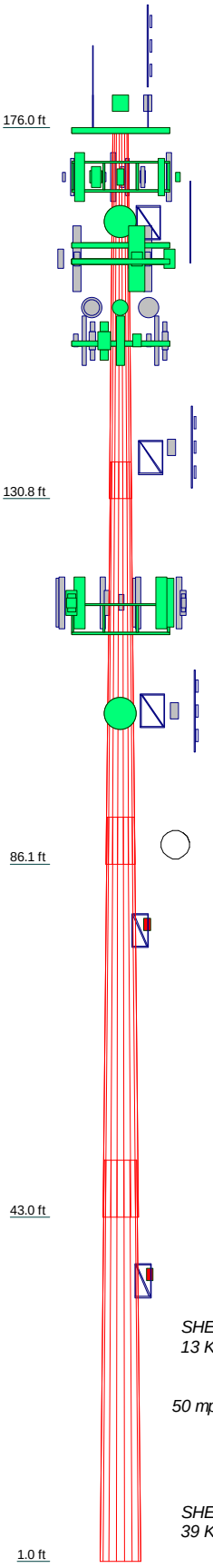
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

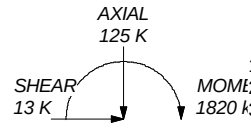
tnxTower Features:

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

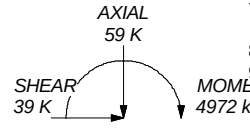
Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	45.25	18	0.2500	4.50	21.0000	31.8000		3.2
2	49.13	18	0.3125	5.75	30.2260	41.8200		5.9
3	48.87	18	0.3750	7.00	39.8381	51.3600		9.0
4	49.00	18	0.4375		48.9596	60.5000		12.6
							A572-65	30.6



ALL REACTIONS ARE FACTORED



TORQUE 3 kip-ft
50 mph WIND - 1.0000 in ICE



TORQUE 8 kip-ft
REACTIONS - 97 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2'x2' Panel	176	VHLP800-11-DW1 (Sprint)	154
2'x2' Panel	176	VHLP800-11-DW1 (Sprint)	154
PR-900	176	VHLP2-11-DW1 (Sprint)	154
PR-900	176	VHLP2-11-DW1 (Sprint)	154
10' x 2" Dia Omni	176	VHLP2-11-DW1 (Sprint)	154
4' x 2" Dia Omni	176	FD-RRH 4x45 1900 (Sprint Existing)	150
4' x 2" Dia Omni	176	FD-RRH 2x50 800 (Sprint Existing)	150
20' 4-Bay Dipole	176	FD-RRH 2x50 800 (Sprint Existing)	150
20' 4-Bay Dipole	176	FD-RRH 2x50 800 (Sprint Existing)	150
EEI 12-ft Low Profile Platform	176	TD-RRH8x20-25 (Sprint Existing)	150
800-10121 (ATI Existing)	170	TD-RRH8x20-25 (Sprint Existing)	150
HPA-65R-BUU-H6 (ATI Existing)	170	TD-RRH8x20-25 (Sprint Existing)	150
800-10121 (ATI Existing)	170	EEI 12-ft Low Profile Platform (Sprint Existing)	150
HPA-65R-BUU-H6 (ATI Existing)	170		
800-10121 (ATI Existing)	170	APXVSPP18-C-A20 (Sprint Existing)	150
HPA-65R-BUU-H6 (ATI Existing)	170	APXVSPP18-C-A20 (Sprint Existing)	150
(2) LGP21401 TMA (ATI Existing)	170	APXVTM14 (Sprint Existing)	150
(2) LGP21401 TMA (ATI Existing)	170	APXVTM14 (Sprint Existing)	150
(2) LGP21401 TMA (ATI Existing)	170	APXVTM14 (Sprint Existing)	150
RRUS-11 (ATI Existing)	170	FD-RRH 4x45 1900 (Sprint Existing)	150
RRUS-11 (ATI Existing)	170	FD-RRH 4x45 1900 (Sprint Existing)	150
RRUS-11 (ATI Existing)	170	APXVSPP18-C-A20 (Sprint Existing)	150
RRUS-32 (ATI Existing)	170	10' Dipole	137
RRUS-32 (ATI Existing)	170	2'x2' Panel	137
RRUS-32 (ATI Existing)	170	6' Extension Arm Mount	135.75
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	170	B2/B66A RRH (Verizon Existing)	118
		B5/B13 RRH (Verizon Existing)	118
Valmont 13' Platform w/Rails (ATI Existing)	170	B5/B13 RRH (Verizon Existing)	118
		B5/B13 RRH (Verizon Existing)	118
3' Whip	164.5	(2) RC2DC-3315-PF-48 (Verizon Existing)	118
4-ft Grid Dish	164.5		
6' Extension Arm Mount	164.42	BXA-70063/6CF (Verizon Existing)	118
Monopole Sector Stabilizer Kit VSK-M (T-Mobile Existing)	162	(2) NHH-65B-R2B (Verizon Existing)	118
		MT6407-77A (Verizon Existing)	118
AIR6419 (T-Mobile Proposed)	160	B2/B66A RRH (Verizon Existing)	118
APXVAARR24-43 (T-Mobile Existing)	160	B2/B66A RRH (Verizon Existing)	118
Radio 4449 B71 B12 (T-Mobile Existing)	160	MT6407-77A (Verizon Existing)	118
		BXA-70063/6CF (Verizon Existing)	118
Radio 4449 B71 B12 (T-Mobile Existing)	160	(2) NHH-65B-R2B (Verizon Existing)	118
		MT6407-77A (Verizon Existing)	118
Radio 4449 B71 B12 (T-Mobile Existing)	160	BXA-70063/6CF (Verizon Existing)	118
		(2) NHH-65B-R2B (Verizon Existing)	118
4460 B25+B66 (T-Mobile Proposed)	160	Valmont 13' Platform w/Rails (Verizon Existing)	116
4460 B25+B66 (T-Mobile Proposed)	160		
4460 B25+B66 (T-Mobile Proposed)	160	10' Dipole	104.83
Valmont T-Arm (1) (T-Mobile Existing)	160	2'x2' Panel	104.83
Valmont T-Arm (1) (T-Mobile Existing)	160	6' Extension Arm Mount	104.83
Valmont T-Arm (1) (T-Mobile Existing)	160	4-ft Grid Dish	104.5
APXVAARR24-43 (T-Mobile Existing)	160	3' GPS Stand-off Mount	78
AIR6419 (T-Mobile Proposed)	160	GPS	78
AIR6419 (T-Mobile Proposed)	160	GPS	35.25
APXVAARR24-43 (T-Mobile Existing)	160	3' GPS Stand-off Mount	35.25

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 81.9%

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

Job:	**20143.15 - CTHA231A**		
Project:	**175' EEI Monopole - 1657 Berlin Turnpike Berlin, CT**		
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 02/22/22	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

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

Basic wind speed of 97 mph.
Structure Class III.
Exposure Category B.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 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.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	176.00-130.75	45.25	4.50	18	21.0000	31.8000	0.2500	1.0000	A572-65 (65 ksi)
L2	130.75-86.12	49.13	5.75	18	30.2260	41.8200	0.3125	1.2500	A572-65 (65 ksi)
L3	86.12-43.00	48.87	7.00	18	39.8381	51.3600	0.3750	1.5000	A572-65 (65 ksi)
L4	43.00-1.00	49.00		18	48.9596	60.5000	0.4375	1.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	21.2854	16.4651	895.6507	7.3663	10.6680	83.9568	1792.4800	8.2341	3.2560	13.024
	32.2520	25.0349	3148.3461	11.2003	16.1544	194.8909	6300.8349	12.5198	5.1568	20.627
L2	31.7224	29.6704	3354.2440	10.6193	15.3548	218.4493	6712.9015	14.8380	4.7698	15.263
	42.4169	41.1703	8961.3641	14.7352	21.2446	421.8192	17934.5198	20.5890	6.8103	21.793
L3	41.7714	46.9709	9241.6271	14.0094	20.2377	456.6531	18495.4146	23.4899	6.3515	16.937
	52.0945	60.6849	19929.7987	18.0997	26.0909	763.8607	39885.8215	30.3482	8.3794	22.345
L4	51.3215	67.3790	20042.0460	17.2254	24.8715	805.8240	40110.4639	33.6959	7.8469	17.936
	61.3658	83.4043	38013.0437	21.3222	30.7340	1236.8401	76076.1060	41.7101	9.8780	22.578

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 176.00-130.75				1	1	1			
L2 130.75-86.12				1	1	1			
L3 86.12-43.00				1	1	1			
L4 43.00-1.00				1	1	1			

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	18
Embedment length	48.0000 in
f'_c	4 ksi
Grout space	2.0000 in
Base plate grade	A572-60
Base plate thickness	2.0000 in
Bolt circle diameter	70.0000 in
Outer diameter	76.0000 in
Inner diameter	60.7500 in
Base plate type	Stiffened Plate
Bolts per stiffener	1

Base Plate Data	
Stiffener thickness	0.5000 in
Stiffener height	12.0000 in

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 1/4	A	No	No	Inside Pole	176.00 - 4.00	3	No Ice	0.00	0.66
(Town Existing)							1/2" Ice	0.00	0.66
							1" Ice	0.00	0.66
7/8	A	No	No	Inside Pole	176.00 - 4.00	4	No Ice	0.00	0.54
(Town Existing)							1/2" Ice	0.00	0.54
							1" Ice	0.00	0.54
Cat5e	A	No	No	Inside Pole	176.00 - 4.00	2	No Ice	0.00	0.06
(Town Existing)							1/2" Ice	0.00	0.06
							1" Ice	0.00	0.06
1 5/8	A	No	No	Inside Pole	171.00 - 4.00	6	No Ice	0.00	1.04
(AT&T Existing)							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
RG6-Fiber	A	No	No	Inside Pole	171.00 - 4.00	1	No Ice	0.00	0.00
(AT&T Existing)							1/2" Ice	0.00	0.00
							1" Ice	0.00	0.00
#8 AWG Copper WIre	A	No	No	Inside Pole	171.00 - 4.00	2	No Ice	0.00	0.00
							1/2" Ice	0.00	0.00
(AT&T Existing)							1" Ice	0.00	0.00
7/8	A	No	No	Inside Pole	166.00 - 4.00	2	No Ice	0.00	0.54
(Town Existing)							1/2" Ice	0.00	0.54
							1" Ice	0.00	0.54
HYBRIFLEX 1-1/4"	B	No	No	Inside Pole	161.00 - 4.00	3	No Ice	0.00	1.30
(T-Mobile Existing)							1/2" Ice	0.00	1.30
							1" Ice	0.00	1.30
HYBRIFLEX 1-5/8"	B	No	No	Inside Pole	161.00 - 4.00	1	No Ice	0.00	1.90
(T-Mobile Proposed)							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
HYBRIFLEX 1-1/4"	B	No	No	Inside Pole	151.00 - 7.00	4	No Ice	0.00	1.30
(Sprint Existing)							1/2" Ice	0.00	1.30
							1" Ice	0.00	1.30
1/2	B	No	No	Inside Pole	151.00 - 7.00	4	No Ice	0.00	0.25
(Sprint Existing)							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
1/2	A	No	No	Inside Pole	136.00 - 4.00	1	No Ice	0.00	0.25
(Town Existing)							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
Cat5e	A	No	No	Inside Pole	136.00 - 4.00	1	No Ice	0.00	0.06
(Town Existing)							1/2" Ice	0.00	0.06
							1" Ice	0.00	0.06
1 5/8	C	No	No	Inside Pole	115.00 - 7.00	6	No Ice	0.00	1.04
(Verizon Existing)							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
HYBRIFLEX 1-5/8"	C	No	No	Inside Pole	115.00 - 7.00	2	No Ice	0.00	1.90
(Verizon Existing)							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
1/2	A	No	No	Inside Pole	106.00 - 4.00	1	No Ice	0.00	0.25
(Town Existing)							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
Cat5e	A	No	No	Inside Pole	106.00 - 4.00	1	No Ice	0.00	0.06
(Town Existing)							1/2" Ice	0.00	0.06
							1" Ice	0.00	0.06

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1/2 (Town Existing)	A	No	No	Inside Pole	79.00 - 4.00	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
1/2 (Town Existing)	A	No	No	Inside Pole	36.00 - 4.00	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	176.00-130.75	A	0.000	0.000	0.000	0.000	0.48
		B	0.000	0.000	0.000	0.000	0.30
		C	0.000	0.000	0.000	0.000	0.00
L2	130.75-86.12	A	0.000	0.000	0.000	0.000	0.54
		B	0.000	0.000	0.000	0.000	0.54
		C	0.000	0.000	0.000	0.000	0.29
L3	86.12-43.00	A	0.000	0.000	0.000	0.000	0.54
		B	0.000	0.000	0.000	0.000	0.52
		C	0.000	0.000	0.000	0.000	0.43
L4	43.00-1.00	A	0.000	0.000	0.000	0.000	0.49
		B	0.000	0.000	0.000	0.000	0.45
		C	0.000	0.000	0.000	0.000	0.36

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	176.00-130.75	A	2.913	0.000	0.000	0.000	0.000	0.48
		B		0.000	0.000	0.000	0.000	0.30
		C		0.000	0.000	0.000	0.000	0.00
L2	130.75-86.12	A	2.814	0.000	0.000	0.000	0.000	0.54
		B		0.000	0.000	0.000	0.000	0.54
		C		0.000	0.000	0.000	0.000	0.29
L3	86.12-43.00	A	2.672	0.000	0.000	0.000	0.000	0.54
		B		0.000	0.000	0.000	0.000	0.52
		C		0.000	0.000	0.000	0.000	0.43
L4	43.00-1.00	A	2.395	0.000	0.000	0.000	0.000	0.49
		B		0.000	0.000	0.000	0.000	0.45
		C		0.000	0.000	0.000	0.000	0.36

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	176.00-130.75	0.0000	0.0000	0.0000	0.0000
L2	130.75-86.12	0.0000	0.0000	0.0000	0.0000
L3	86.12-43.00	0.0000	0.0000	0.0000	0.0000
L4	43.00-1.00	0.0000	0.0000	0.0000	0.0000

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

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'x2' Panel	B	From Face	3.00	0.0000	176.00	No Ice	4.80	0.72	0.02
			0.00			1/2" Ice	5.07	0.87	0.05
			3.00			1" Ice	5.35	1.03	0.07
2'x2' Panel	C	From Face	3.00	0.0000	176.00	No Ice	4.80	0.72	0.02
			0.00			1/2" Ice	5.07	0.87	0.05
			3.00			1" Ice	5.35	1.03	0.07
PR-900	A	From Face	3.00	0.0000	176.00	No Ice	6.35	6.35	0.04
			0.00			1/2" Ice	11.43	11.43	0.05
			0.00			1" Ice	16.51	16.51	0.06
PR-900	C	From Face	3.00	0.0000	176.00	No Ice	6.35	6.35	0.04
			0.00			1/2" Ice	11.43	11.43	0.05
			0.00			1" Ice	16.51	16.51	0.06
10' x 2" Dia Omni	A	From Face	3.00	0.0000	176.00	No Ice	2.00	2.00	0.02
			0.00			1/2" Ice	3.02	3.02	0.03
			5.00			1" Ice	4.07	4.07	0.05
4' x 2" Dia Omni	A	From Face	3.00	0.0000	176.00	No Ice	0.79	0.79	0.02
			0.00			1/2" Ice	1.03	1.03	0.03
			2.00			1" Ice	1.28	1.28	0.04
4' x 2" Dia Omni	B	From Face	3.00	0.0000	176.00	No Ice	0.79	0.79	0.02
			0.00			1/2" Ice	1.03	1.03	0.03
			2.00			1" Ice	1.28	1.28	0.04
20' 4-Bay Dipole	B	From Face	3.00	0.0000	176.00	No Ice	4.00	4.00	0.06
			0.00			1/2" Ice	6.00	6.00	0.10
			10.00			1" Ice	8.00	8.00	0.14
20' 4-Bay Dipole	C	From Face	3.00	0.0000	176.00	No Ice	4.00	4.00	0.06
			0.00			1/2" Ice	6.00	6.00	0.10
			10.00			1" Ice	8.00	8.00	0.14
EEI 12-ft Low Profile Platform	C	None		0.0000	176.00	No Ice	15.00	15.00	1.50
						1/2" Ice	18.40	18.40	1.75
						1" Ice	21.80	21.80	2.00
800-10121 (AT&T Existing)	A	From Face	3.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			-5.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
HPA-65R-BUU-H6 (AT&T Existing)	A	From Face	3.00	0.0000	170.00	No Ice	9.66	6.45	0.05
			5.00			1/2" Ice	10.13	6.91	0.11
			0.00			1" Ice	10.61	7.38	0.18
800-10121 (AT&T Existing)	B	From Face	3.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			-5.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12

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
HPA-65R-BUU-H6	B	From Face	3.00	0.0000	170.00	No Ice	9.66	6.45	0.05
(AT&T Existing)			5.00			1/2" Ice	10.13	6.91	0.11
			0.00			1" Ice	10.61	7.38	0.18
800-10121	C	From Face	3.00	0.0000	170.00	No Ice	5.16	3.29	0.05
(AT&T Existing)			-5.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
HPA-65R-BUU-H6	C	From Face	3.00	0.0000	170.00	No Ice	9.66	6.45	0.05
(AT&T Existing)			5.00			1/2" Ice	10.13	6.91	0.11
			0.00			1" Ice	10.61	7.38	0.18
(2) LGP21401 TMA	A	From Face	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	B	From Face	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	C	From Face	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
RRUS-11	A	From Face	0.50	0.0000	170.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			3.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	B	From Face	0.50	0.0000	170.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			3.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	C	From Face	0.50	0.0000	170.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			3.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-32	A	From Face	0.50	0.0000	170.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	B	From Face	0.50	0.0000	170.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	C	From Face	0.50	0.0000	170.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	170.00	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
Valmont 13' Platform w/Rails	C	None		0.0000	170.00	No Ice	53.00	53.00	2.00
(AT&T Existing)						1/2" Ice	68.00	68.00	3.00
						1" Ice	83.00	83.00	4.00
AIR6419	A	From Face	4.00	0.0000	160.00	No Ice	3.66	1.66	0.07
(T-Mobile Proposed)			-6.00			1/2" Ice	3.91	1.85	0.09
			0.00			1" Ice	4.16	2.05	0.12
APXVAARR24-43	A	From Face	4.00	0.0000	160.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR6419	B	From Face	4.00	0.0000	160.00	No Ice	3.66	1.66	0.07
(T-Mobile Proposed)			-6.00			1/2" Ice	3.91	1.85	0.09
			0.00			1" Ice	4.16	2.05	0.12
APXVAARR24-43	B	From Face	4.00	0.0000	160.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR6419	C	From Face	4.00	0.0000	160.00	No Ice	3.66	1.66	0.07
(T-Mobile Proposed)			-6.00			1/2" Ice	3.91	1.85	0.09
			0.00			1" Ice	4.16	2.05	0.12

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
APXVAARR24-43	C	From Face	4.00	0.0000	160.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
Radio 4449 B71 B12	A	From Face	4.00	0.0000	160.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			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	4.00	0.0000	160.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	C	From Face	4.00	0.0000	160.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
4460 B25+B66	A	From Face	4.00	0.0000	160.00	No Ice	2.56	1.98	0.11
(T-Mobile Proposed)			-2.00			1/2" Ice	2.76	2.16	0.13
			0.00			1" Ice	2.97	2.34	0.16
4460 B25+B66	B	From Face	4.00	0.0000	160.00	No Ice	2.56	1.98	0.11
(T-Mobile Proposed)			-2.00			1/2" Ice	2.76	2.16	0.13
			0.00			1" Ice	2.97	2.34	0.16
4460 B25+B66	C	From Face	4.00	0.0000	160.00	No Ice	2.56	1.98	0.11
(T-Mobile Proposed)			-2.00			1/2" Ice	2.76	2.16	0.13
			0.00			1" Ice	2.97	2.34	0.16
Valmont T-Arm (1)	A	None		0.0000	160.00	No Ice	10.54	10.54	0.34
(T-Mobile Existing)						1/2" Ice	14.45	14.45	0.41
						1" Ice	18.36	18.36	0.49
Valmont T-Arm (1)	B	None		0.0000	160.00	No Ice	10.54	10.54	0.34
(T-Mobile Existing)						1/2" Ice	14.45	14.45	0.41
						1" Ice	18.36	18.36	0.49
Valmont T-Arm (1)	C	None		0.0000	160.00	No Ice	10.54	10.54	0.34
(T-Mobile Existing)						1/2" Ice	14.45	14.45	0.41
						1" Ice	18.36	18.36	0.49
Monopole Sector Stabilizer	C	None		0.0000	162.00	No Ice	9.00	9.00	0.35
Kit VSK-M						1/2" Ice	11.50	11.50	0.42
(T-Mobile Existing)						1" Ice	14.00	14.00	0.50
APXVSPP18-C-A20	A	From Face	4.00	0.0000	150.00	No Ice	8.02	5.28	0.06
(Sprint Existing)			0.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVSPP18-C-A20	B	From Face	4.00	0.0000	150.00	No Ice	8.02	5.28	0.06
(Sprint Existing)			0.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVSPP18-C-A20	C	From Face	4.00	0.0000	150.00	No Ice	8.02	5.28	0.06
(Sprint Existing)			0.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	A	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVTM14	B	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVTM14	C	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
FD-RRH 4x45 1900	A	From Face	4.00	0.0000	150.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	B	From Face	4.00	0.0000	150.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
FD-RRH 4x45 1900	C	From Face	4.00	0.0000	150.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00			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 Face	4.00	0.0000	150.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	B	From Face	4.00	0.0000	150.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00			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 Face	4.00	0.0000	150.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
TD-RRH8x20-25	A	From Face	4.00	0.0000	150.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	4.00	0.0000	150.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	4.00	0.0000	150.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
EEI 12-ft Low Profile	C	None		0.0000	150.00	No Ice	15.00	15.00	1.50
Platform						1/2" Ice	18.40	18.40	1.75
(Sprint Existing)						1" Ice	21.80	21.80	2.00
BXA-70063/6CF	A	From Face	4.00	0.0000	118.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.02	4.60	0.05
			0.00			1" Ice	8.47	5.04	0.10
(2) NHH-65B-R2B	A	From Face	4.00	0.0000	118.00	No Ice	11.19	8.69	0.07
(Verizon Existing)			0.00			1/2" Ice	11.69	9.17	0.15
			0.00			1" Ice	12.20	9.66	0.24
MT6407-77A	A	From Face	4.00	0.0000	118.00	No Ice	4.71	1.84	0.00
(Verizon Existing)			6.00			1/2" Ice	5.00	2.06	0.03
			0.00			1" Ice	5.29	2.29	0.06
BXA-70063/6CF	B	From Face	4.00	0.0000	118.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.02	4.60	0.05
			0.00			1" Ice	8.47	5.04	0.10
(2) NHH-65B-R2B	B	From Face	4.00	0.0000	118.00	No Ice	11.19	8.69	0.07
(Verizon Existing)			0.00			1/2" Ice	11.69	9.17	0.15
			0.00			1" Ice	12.20	9.66	0.24
MT6407-77A	B	From Face	4.00	0.0000	118.00	No Ice	4.71	1.84	0.00
(Verizon Existing)			6.00			1/2" Ice	5.00	2.06	0.03
			0.00			1" Ice	5.29	2.29	0.06
BXA-70063/6CF	C	From Face	4.00	0.0000	118.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.02	4.60	0.05
			0.00			1" Ice	8.47	5.04	0.10
(2) NHH-65B-R2B	C	From Face	4.00	0.0000	118.00	No Ice	11.19	8.69	0.07
(Verizon Existing)			0.00			1/2" Ice	11.69	9.17	0.15
			0.00			1" Ice	12.20	9.66	0.24
MT6407-77A	C	From Face	4.00	0.0000	118.00	No Ice	4.71	1.84	0.00
(Verizon Existing)			6.00			1/2" Ice	5.00	2.06	0.03
			0.00			1" Ice	5.29	2.29	0.06
B2/B66A RRH	A	From Face	4.00	0.0000	118.00	No Ice	2.54	1.61	0.06
(Verizon Existing)			6.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10
B2/B66A RRH	B	From Face	4.00	0.0000	118.00	No Ice	2.54	1.61	0.06
(Verizon Existing)			6.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10

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
B2/B66A RRH	C	From Face	4.00	0.0000	118.00	No Ice	2.54	1.61	0.06
(Verizon Existing)			6.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10
B5/B13 RRH	A	From Face	4.00	0.0000	118.00	No Ice	1.87	1.02	0.07
(Verizon Existing)			6.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
B5/B13 RRH	B	From Face	4.00	0.0000	118.00	No Ice	1.87	1.02	0.07
(Verizon Existing)			6.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
B5/B13 RRH	C	From Face	4.00	0.0000	118.00	No Ice	1.87	1.02	0.07
(Verizon Existing)			6.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
(2) RC2DC-3315-PF-48	B	From Face	1.00	0.0000	118.00	No Ice	3.01	1.96	0.03
(Verizon Existing)			1.00			1/2" Ice	3.23	2.15	0.05
			0.00			1" Ice	3.46	2.35	0.08
Valmont 13' Platform w/Rails	C	None		0.0000	116.00	No Ice	53.00	53.00	2.00
(Verizon Existing)						1/2" Ice	68.00	68.00	3.00
						1" Ice	83.00	83.00	4.00
3' Whip	B	From Face	6.00	0.0000	164.50	No Ice	1.25	1.25	0.01
			5.00			1/2" Ice	1.56	1.56	0.04
			0.00			1" Ice	1.87	1.87	0.07
6' Extension Arm Mount	B	From Face	3.00	0.0000	164.42	No Ice	5.01	5.01	0.13
			0.00			1/2" Ice	6.77	6.77	0.17
			0.00			1" Ice	8.53	8.53	0.20
10' Dipole	B	From Face	6.00	0.0000	137.00	No Ice	4.00	4.00	0.05
			5.00			1/2" Ice	6.00	6.00	0.07
			0.00			1" Ice	8.00	8.00	0.10
2'x2' Panel	B	From Face	6.00	0.0000	137.00	No Ice	4.80	0.72	0.02
			0.00			1/2" Ice	5.07	0.87	0.05
			0.00			1" Ice	5.35	1.03	0.07
6' Extension Arm Mount	B	From Face	3.00	0.0000	135.75	No Ice	5.01	5.01	0.13
			0.00			1/2" Ice	6.77	6.77	0.17
			0.00			1" Ice	8.53	8.53	0.20
10' Dipole	B	From Face	6.00	0.0000	104.83	No Ice	4.00	4.00	0.05
			5.00			1/2" Ice	6.00	6.00	0.07
			0.00			1" Ice	8.00	8.00	0.10
2'x2' Panel	B	From Face	6.00	0.0000	104.83	No Ice	4.80	0.72	0.02
			0.00			1/2" Ice	5.07	0.87	0.05
			0.00			1" Ice	5.35	1.03	0.07
6' Extension Arm Mount	B	From Face	3.00	0.0000	104.83	No Ice	5.01	5.01	0.13
			0.00			1/2" Ice	6.77	6.77	0.17
			0.00			1" Ice	8.53	8.53	0.20
3' GPS Stand-off Mount	B	From Face	1.00	0.0000	78.00	No Ice	2.45	2.45	0.05
			0.00			1/2" Ice	3.98	3.98	0.07
			0.00			1" Ice	5.51	5.51	0.10
GPS	B	From Face	2.00	0.0000	78.00	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
3' GPS Stand-off Mount	B	From Face	1.00	0.0000	35.25	No Ice	2.45	2.45	0.05
			0.00			1/2" Ice	3.98	3.98	0.07
			0.00			1" Ice	5.51	5.51	0.10
GPS	B	From Face	2.00	0.0000	35.25	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
VHLP800-11-DW1 (Sprint)	A	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		154.00	2.50	No Ice 1/2" Ice 1" Ice	4.91 5.24 5.57	0.05 0.08 0.10
VHLP800-11-DW1 (Sprint)	B	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		154.00	2.50	No Ice 1/2" Ice 1" Ice	4.91 5.24 5.57	0.05 0.08 0.10
VHLP2-11-DW1 (Sprint)	A	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		154.00	2.00	No Ice 1/2" Ice 1" Ice	3.14 3.41 3.68	0.04 0.02 0.00
VHLP2-11-DW1 (Sprint)	B	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		154.00	2.00	No Ice 1/2" Ice 1" Ice	3.14 3.41 3.68	0.04 0.02 0.00
VHLP2-11-DW1 (Sprint)	C	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		154.00	2.00	No Ice 1/2" Ice 1" Ice	3.14 3.41 3.68	0.04 0.02 0.00
4-ft Grid Dish		Grid	None		Worst		164.50	4.00	No Ice 1/2" Ice 1" Ice	7.50 13.10 18.70	0.05 0.08 0.11
4-ft Grid Dish		Grid	None		Worst		104.50	4.00	No Ice 1/2" Ice 1" Ice	7.50 13.10 18.70	0.05 0.08 0.11

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg % %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	152.07	1.114	29	100.940	A	0.000	100.940	100.940	100.00	0.000	0.000
176.00-130.75					B	0.000	100.940		100.00	0.000	0.000
					C	0.000	100.940		100.00	0.000	0.000
L2	107.69	1.009	27	137.868	A	0.000	137.868	137.868	100.00	0.000	0.000
130.75-86.12					B	0.000	137.868		100.00	0.000	0.000
					C	0.000	137.868		100.00	0.000	0.000
L3 86.12-43.00	64.29	0.871	23	168.646	A	0.000	168.646	168.646	100.00	0.000	0.000
					B	0.000	168.646		100.00	0.000	0.000
					C	0.000	168.646		100.00	0.000	0.000
L4 43.00-1.00	21.49	0.7	19	197.203	A	0.000	197.203	197.203	100.00	0.000	0.000
					B	0.000	197.203		100.00	0.000	0.000
					C	0.000	197.203		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	152.07	1.114	7	2.9127	122.907	A	0.000	122.907	122.907	100.00	0.000	0.000
176.00-130.75						B	0.000	122.907		100.00	0.000	0.000
						C	0.000	122.907		100.00	0.000	0.000
L2 130.75-86.12	107.69	1.009	6	2.8139	159.534	A	0.000	159.534	159.534	100.00	0.000	0.000
						B	0.000	159.534		100.00	0.000	0.000
						C	0.000	159.534		100.00	0.000	0.000
L3 86.12-43.00	64.29	0.871	5	2.6724	188.868	A	0.000	188.868	188.868	100.00	0.000	0.000
						B	0.000	188.868		100.00	0.000	0.000
						C	0.000	188.868		100.00	0.000	0.000
L4 43.00-1.00	21.49	0.7	4	2.3951	215.910	A	0.000	215.910	215.910	100.00	0.000	0.000
						B	0.000	215.910		100.00	0.000	0.000
						C	0.000	215.910		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	152.07	1.114	9	100.940	A	0.000	100.940	100.940	100.00	0.000	0.000
176.00-130.75					B	0.000	100.940		100.00	0.000	0.000
					C	0.000	100.940		100.00	0.000	0.000
L2	107.69	1.009	8	137.868	A	0.000	137.868	137.868	100.00	0.000	0.000
130.75-86.12					B	0.000	137.868		100.00	0.000	0.000
					C	0.000	137.868		100.00	0.000	0.000
L3 86.12-43.00	64.29	0.871	7	168.646	A	0.000	168.646	168.646	100.00	0.000	0.000
					B	0.000	168.646		100.00	0.000	0.000
					C	0.000	168.646		100.00	0.000	0.000
L4 43.00-1.00	21.49	0.7	6	197.203	A	0.000	197.203	197.203	100.00	0.000	0.000
					B	0.000	197.203		100.00	0.000	0.000
					C	0.000	197.203		100.00	0.000	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
L1	0.79	3.20	A	1	0.65	29	1	1	100.940	2.11	46.71	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	27	1	1	137.868	2.61	58.55	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	23	1	1	168.646	2.75	63.76	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	19	1	1	197.203	2.63	62.51	C
			B	1	0.65		1	1	197.203			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	825.90 kip-ft	10.10		

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
L1	0.79	3.20	A	1	0.65	29	1	1	100.940	2.11	46.71	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	27	1	1	137.868	2.61	58.55	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	23	1	1	168.646	2.75	63.76	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	19	1	1	197.203	2.63	62.51	C
			B	1	0.65		1	1	197.203			
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	825.90 kip-ft	10.10		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	3.20	A	1	0.65	29	1	1	100.940	2.11	46.71	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	27	1	1	137.868	2.61	58.55	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	23	1	1	168.646	2.75	63.76	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	19	1	1	197.203	2.63	62.51	C
			B	1	0.65		1	1	197.203			
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	825.90 kip-ft	10.10		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	7.96	A	1	1.2	7	1	1	122.907	1.10	24.26	C
176.00-130.75			B	1	1.2		1	1	122.907			
			C	1	1.2		1	1	122.907			
L2	1.36	12.02	A	1	1.2	6	1	1	158.799	1.28	28.77	C
130.75-86.12			B	1	1.2		1	1	158.799			
			C	1	1.2		1	1	158.799			
L3	1.49	15.91	A	1	1.2	5	1	1	187.851	1.31	30.30	C
86.12-43.00			B	1	1.2		1	1	187.851			
			C	1	1.2		1	1	187.851			
L4 43.00-1.00	1.31	19.77	A	1	1.2	4	1	1	213.968	1.21	28.93	C
			B	1	1.2		1	1	213.968			
			C	1	1.2		1	1	213.968			
Sum Weight:	4.94	55.67						OTM	410.38 kip-ft	4.90		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	7.96	A	1	1.2	7	1	1	122.907	1.10	24.26	C
176.00-130.75			B	1	1.2		1	1	122.907			
			C	1	1.2		1	1	122.907			
L2	1.36	12.02	A	1	1.2	6	1	1	158.799	1.28	28.77	C
130.75-86.12			B	1	1.2		1	1	158.799			
			C	1	1.2		1	1	158.799			
L3	1.49	15.91	A	1	1.2	5	1	1	187.851	1.31	30.30	C
86.12-43.00			B	1	1.2		1	1	187.851			
			C	1	1.2		1	1	187.851			
L4 43.00-1.00	1.31	19.77	A	1	1.2	4	1	1	213.968	1.21	28.93	C
			B	1	1.2		1	1	213.968			
			C	1	1.2		1	1	213.968			
Sum Weight:	4.94	55.67						OTM	410.38 kip-ft	4.90		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	7.96	A	1	1.2	7	1	1	122.907	1.10	24.26	C
176.00-130.75			B	1	1.2		1	1	122.907			
			C	1	1.2		1	1	122.907			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L2	1.36	12.02	A	1	1.2	6	1	1	158.799	1.28	28.77	C
130.75-86.12			B	1	1.2		1	1	158.799			
			C	1	1.2		1	1	158.799			
L3	1.49	15.91	A	1	1.2	5	1	1	187.851	1.31	30.30	C
86.12-43.00			B	1	1.2		1	1	187.851			
			C	1	1.2		1	1	187.851			
L4 43.00-1.00	1.31	19.77	A	1	1.2	4	1	1	213.968	1.21	28.93	C
			B	1	1.2		1	1	213.968			
			C	1	1.2		1	1	213.968			
Sum Weight:	4.94	55.67						OTM	410.38 kip-ft	4.90		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	3.20	A	1	0.65	9	1	1	100.940	0.63	13.90	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	8	1	1	137.868	0.78	17.43	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	7	1	1	168.646	0.82	18.98	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	6	1	1	197.203	0.78	18.61	C
			B	1	0.65		1	1	197.203			
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	245.86 kip-ft	3.01		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.79	3.20	A	1	0.65	9	1	1	100.940	0.63	13.90	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	8	1	1	137.868	0.78	17.43	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	7	1	1	168.646	0.82	18.98	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	6	1	1	197.203	0.78	18.61	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			B	1	0.65		1	1	197.203			
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	245.86 kip-ft	3.01		

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 ft²	F K	w plf	Ctrl. Face
L1	0.79	3.20	A	1	0.65	9	1	1	100.940	0.63	13.90	C
176.00-130.75			B	1	0.65		1	1	100.940			
			C	1	0.65		1	1	100.940			
L2	1.36	5.92	A	1	0.65	8	1	1	137.868	0.78	17.43	C
130.75-86.12			B	1	0.65		1	1	137.868			
			C	1	0.65		1	1	137.868			
L3	1.49	8.95	A	1	0.65	7	1	1	168.646	0.82	18.98	C
86.12-43.00			B	1	0.65		1	1	168.646			
			C	1	0.65		1	1	168.646			
L4 43.00-1.00	1.31	12.57	A	1	0.65	6	1	1	197.203	0.78	18.61	C
			B	1	0.65		1	1	197.203			
			C	1	0.65		1	1	197.203			
Sum Weight:	4.94	30.64						OTM	245.86 kip-ft	3.01		

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	30.64					
Bracing Weight	0.00					
Total Member Self-Weight	30.64			-1.20	-3.22	
Total Weight	49.06			-1.20	-3.22	
Wind 0 deg - No Ice		0.19	-24.39	-2932.28	-29.26	4.84
Wind 30 deg - No Ice		12.40	-21.22	-2552.61	-1494.07	3.57
Wind 60 deg - No Ice		21.28	-12.36	-1489.29	-2559.41	1.36
Wind 90 deg - No Ice		24.47	-0.19	-27.23	-2939.82	-1.22
Wind 120 deg - No Ice		21.10	12.03	1441.80	-2533.37	-3.48
Wind 150 deg - No Ice		12.07	21.03	2524.18	-1448.97	-4.80
Wind 180 deg - No Ice		-0.19	24.39	2929.89	22.81	-4.84
Wind 210 deg - No Ice		-12.40	21.22	2550.22	1487.62	-3.57
Wind 240 deg - No Ice		-21.28	12.36	1486.89	2552.96	-1.36
Wind 270 deg - No Ice		-24.47	0.19	24.84	2933.37	1.22
Wind 300 deg - No Ice		-21.10	-12.03	-1444.19	2526.92	3.48
Wind 330 deg - No Ice		-12.07	-21.03	-2526.58	1442.53	4.80
Member Ice	25.03					

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*
Total Weight Ice	112.59			-4.07	-16.13	
Wind 0 deg - Ice		0.05	-12.55	-1546.06	-23.18	2.77
Wind 30 deg - Ice		6.33	-10.89	-1342.99	-793.96	2.19
Wind 60 deg - Ice		10.91	-6.32	-781.16	-1356.33	1.02
Wind 90 deg - Ice		12.57	-0.05	-11.11	-1559.59	-0.42
Wind 120 deg - Ice		10.86	6.23	760.83	-1349.28	-1.75
Wind 150 deg - Ice		6.24	10.84	1327.81	-781.76	-2.61
Wind 180 deg - Ice		-0.05	12.55	1537.92	-9.09	-2.77
Wind 210 deg - Ice		-6.33	10.89	1334.86	761.70	-2.19
Wind 240 deg - Ice		-10.91	6.32	773.03	1324.06	-1.02
Wind 270 deg - Ice		-12.57	0.05	2.98	1527.32	0.42
Wind 300 deg - Ice		-10.86	-6.23	-768.96	1317.02	1.75
Wind 330 deg - Ice		-6.24	-10.84	-1335.95	749.49	2.61
Total Weight	49.06			-1.20	-3.22	
Wind 0 deg - Service		0.06	-7.26	-873.74	-10.97	1.44
Wind 30 deg - Service		3.69	-6.32	-760.71	-447.03	1.06
Wind 60 deg - Service		6.34	-3.68	-444.18	-764.16	0.40
Wind 90 deg - Service		7.28	-0.06	-8.95	-877.40	-0.36
Wind 120 deg - Service		6.28	3.58	428.36	-756.41	-1.04
Wind 150 deg - Service		3.59	6.26	750.57	-433.60	-1.43
Wind 180 deg - Service		-0.06	7.26	871.34	4.53	-1.44
Wind 210 deg - Service		-3.69	6.32	758.32	440.58	-1.06
Wind 240 deg - Service		-6.34	3.68	441.78	757.71	-0.40
Wind 270 deg - Service		-7.28	0.06	6.55	870.95	0.36
Wind 300 deg - Service		-6.28	-3.58	-430.76	749.96	1.04
Wind 330 deg - Service		-3.59	-6.26	-752.96	427.15	1.43

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice

Comb. No.	Description
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	176 - 130.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-46.19	-10.37	2.29
			Max. Mx	8	-14.34	-546.01	5.50
			Max. My	2	-14.34	-6.62	549.48
			Max. Vy	8	20.72	-546.01	5.50
			Max. Vx	2	-20.73	-6.62	549.48
			Max. Torque	3			-3.73
L2	130.75 - 86.12	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-77.31	-18.91	4.39
			Max. Mx	8	-26.30	-1698.38	16.70
			Max. My	2	-26.31	-18.96	1698.80
			Max. Vy	8	31.56	-1698.38	16.70
			Max. Vx	2	-31.44	-18.96	1698.80
			Max. Torque	2			-7.05
L3	86.12 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-96.77	-20.60	4.99
			Max. Mx	8	-39.01	-3104.16	30.10
			Max. My	2	-39.02	-32.57	3099.08
			Max. Vy	8	35.40	-3104.16	30.10
			Max. Vx	2	-35.27	-32.57	3099.08
			Max. Torque	2			-7.43
L4	43 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-125.15	-21.49	5.41
			Max. Mx	8	-58.85	-4936.62	45.33
			Max. My	2	-58.85	-47.90	4925.16
			Max. Vy	8	39.19	-4936.62	45.33
			Max. Vx	2	-39.06	-47.90	4925.16
			Max. Torque	2			-7.76

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	29	125.15	-10.91	6.32
	Max. H_x	21	44.16	39.15	-0.30
	Max. H_z	2	58.88	-0.30	39.02
	Max. M_x	2	4925.16	-0.30	39.02
	Max. M_z	8	4936.62	-39.15	0.30
	Max. Torsion	14	7.70	0.30	-39.02
	Min. Vert	5	44.16	-19.84	33.94
	Min. H_x	8	58.88	-39.15	0.30
	Min. H_z	14	58.88	0.30	-39.02
	Min. M_x	14	-4922.07	0.30	-39.02
	Min. M_z	20	-4928.29	39.15	-0.30
	Min. Torsion	2	-7.75	-0.30	39.02

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	49.06	0.00	0.00	-1.25	-3.36	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	58.88	0.30	-39.02	-4925.16	-47.90	7.75
0.9 Dead+1.6 Wind 0 deg - No Ice	44.16	0.30	-39.02	-4861.08	-46.22	7.73
1.2 Dead+1.6 Wind 30 deg - No Ice	58.88	19.84	-33.94	-4287.30	-2508.19	5.72
0.9 Dead+1.6 Wind 30 deg - No Ice	44.16	19.84	-33.94	-4231.46	-2474.76	5.70
1.2 Dead+1.6 Wind 60 deg - No Ice	58.88	34.05	-19.77	-2501.22	-4297.54	2.16
0.9 Dead+1.6 Wind 60 deg - No Ice	44.16	34.05	-19.77	-2468.47	-4241.01	2.15
1.2 Dead+1.6 Wind 90 deg - No Ice	58.88	39.15	-0.30	-45.33	-4936.62	-1.96
0.9 Dead+1.6 Wind 90 deg - No Ice	44.16	39.15	-0.30	-44.34	-4871.85	-1.96
1.2 Dead+1.6 Wind 120 deg - No Ice	58.88	33.75	19.25	2422.46	-4254.03	-5.53
0.9 Dead+1.6 Wind 120 deg - No Ice	44.16	33.75	19.25	2391.53	-4198.07	-5.52
1.2 Dead+1.6 Wind 150 deg - No Ice	58.88	19.31	33.64	4240.71	-2432.50	-7.63
0.9 Dead+1.6 Wind 150 deg - No Ice	44.16	19.31	33.64	4186.26	-2400.07	-7.61
1.2 Dead+1.6 Wind 180 deg - No Ice	58.88	-0.30	39.02	4922.07	39.69	-7.70
0.9 Dead+1.6 Wind 180 deg - No Ice	44.16	-0.30	39.02	4858.81	40.20	-7.68

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.6 Wind 210 deg - No Ice	58.88	-19.84	33.94	4284.16	2499.94	-5.73
0.9 Dead+1.6 Wind 210 deg - No Ice	44.16	-19.84	33.94	4229.16	2468.71	-5.71
1.2 Dead+1.6 Wind 240 deg - No Ice	58.88	-34.05	19.77	2498.09	4289.23	-2.22
0.9 Dead+1.6 Wind 240 deg - No Ice	44.16	-34.05	19.77	2466.17	4234.91	-2.21
1.2 Dead+1.6 Wind 270 deg - No Ice	58.88	-39.15	0.30	42.26	4928.29	1.91
0.9 Dead+1.6 Wind 270 deg - No Ice	44.16	-39.15	0.30	42.09	4865.72	1.91
1.2 Dead+1.6 Wind 300 deg - No Ice	58.88	-33.75	-19.25	-2425.48	4245.73	5.54
0.9 Dead+1.6 Wind 300 deg - No Ice	44.16	-33.75	-19.25	-2393.74	4191.98	5.53
1.2 Dead+1.6 Wind 330 deg - No Ice	58.88	-19.31	-33.64	-4243.74	2424.26	7.69
0.9 Dead+1.6 Wind 330 deg - No Ice	44.16	-19.31	-33.64	-4188.48	2394.02	7.67
1.2 Dead+1.0 Ice+1.0 Temp	125.15	0.00	-0.00	-5.41	-21.49	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	125.15	0.05	-12.55	-1795.93	-29.82	2.95
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	125.15	6.33	-10.89	-1560.15	-924.68	2.34
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	125.15	10.91	-6.32	-907.79	-1577.57	1.10
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	125.15	12.57	-0.05	-13.64	-1813.56	-0.43
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	125.15	10.86	6.23	882.70	-1569.39	-1.85
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	125.15	6.24	10.84	1541.07	-910.50	-2.76
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	125.15	-0.05	12.55	1785.04	-13.43	-2.94
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	125.15	-6.33	10.89	1549.25	881.43	-2.34
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	125.15	-10.91	6.32	896.88	1534.31	-1.10
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	125.15	-12.57	0.05	2.75	1770.28	0.43
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	125.15	-10.86	-6.23	-893.59	1526.12	1.85
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	125.15	-6.24	-10.84	-1551.95	867.24	2.77
Dead+Wind 0 deg - Service	49.06	0.06	-7.26	-911.23	-11.55	1.45
Dead+Wind 30 deg - Service	49.06	3.69	-6.32	-793.36	-466.26	1.08
Dead+Wind 60 deg - Service	49.06	6.34	-3.68	-463.26	-796.96	0.41
Dead+Wind 90 deg - Service	49.06	7.28	-0.06	-9.38	-915.04	-0.36
Dead+Wind 120 deg - Service	49.06	6.28	3.58	446.68	-788.87	-1.04
Dead+Wind 150 deg - Service	49.06	3.59	6.26	782.70	-452.24	-1.44
Dead+Wind 180 deg - Service	49.06	-0.06	7.26	908.66	4.63	-1.45
Dead+Wind 210 deg - Service	49.06	-3.69	6.32	790.79	459.34	-1.08
Dead+Wind 240 deg - Service	49.06	-6.34	3.68	460.69	790.04	-0.41
Dead+Wind 270 deg - Service	49.06	-7.28	0.06	6.81	908.12	0.36
Dead+Wind 300 deg - Service	49.06	-6.28	-3.58	-449.25	781.95	1.04
Dead+Wind 330 deg - Service	49.06	-3.59	-6.26	-785.27	445.32	1.44

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	-49.06	0.00	-0.00	49.06	0.00	0.000%
2	0.30	-58.88	-39.02	-0.30	58.88	39.02	0.000%
3	0.30	-44.16	-39.02	-0.30	44.16	39.02	0.000%
4	19.84	-58.88	-33.94	-19.84	58.88	33.94	0.000%
5	19.84	-44.16	-33.94	-19.84	44.16	33.94	0.000%
6	34.05	-58.88	-19.77	-34.05	58.88	19.77	0.000%
7	34.05	-44.16	-19.77	-34.05	44.16	19.77	0.000%
8	39.15	-58.88	-0.30	-39.15	58.88	0.30	0.000%
9	39.15	-44.16	-0.30	-39.15	44.16	0.30	0.000%
10	33.75	-58.88	19.25	-33.75	58.88	-19.25	0.000%
11	33.75	-44.16	19.25	-33.75	44.16	-19.25	0.000%
12	19.31	-58.88	33.64	-19.31	58.88	-33.64	0.000%
13	19.31	-44.16	33.64	-19.31	44.16	-33.64	0.000%
14	-0.30	-58.88	39.02	0.30	58.88	-39.02	0.000%
15	-0.30	-44.16	39.02	0.30	44.16	-39.02	0.000%
16	-19.84	-58.88	33.94	19.84	58.88	-33.94	0.000%
17	-19.84	-44.16	33.94	19.84	44.16	-33.94	0.000%
18	-34.05	-58.88	19.77	34.05	58.88	-19.77	0.000%
19	-34.05	-44.16	19.77	34.05	44.16	-19.77	0.000%
20	-39.15	-58.88	0.30	39.15	58.88	-0.30	0.000%
21	-39.15	-44.16	0.30	39.15	44.16	-0.30	0.000%
22	-33.75	-58.88	-19.25	33.75	58.88	19.25	0.000%
23	-33.75	-44.16	-19.25	33.75	44.16	19.25	0.000%
24	-19.31	-58.88	-33.64	19.31	58.88	33.64	0.000%
25	-19.31	-44.16	-33.64	19.31	44.16	33.64	0.000%
26	0.00	-125.15	0.00	-0.00	125.15	0.00	0.000%
27	0.05	-125.15	-12.55	-0.05	125.15	12.55	0.000%
28	6.33	-125.15	-10.89	-6.33	125.15	10.89	0.000%
29	10.91	-125.15	-6.32	-10.91	125.15	6.32	0.000%
30	12.57	-125.15	-0.05	-12.57	125.15	0.05	0.000%
31	10.86	-125.15	6.23	-10.86	125.15	-6.23	0.000%
32	6.24	-125.15	10.84	-6.24	125.15	-10.84	0.000%
33	-0.05	-125.15	12.55	0.05	125.15	-12.55	0.000%
34	-6.33	-125.15	10.89	6.33	125.15	-10.89	0.000%
35	-10.91	-125.15	6.32	10.91	125.15	-6.32	0.000%
36	-12.57	-125.15	0.05	12.57	125.15	-0.05	0.000%
37	-10.86	-125.15	-6.23	10.86	125.15	6.23	0.000%
38	-6.24	-125.15	-10.84	6.24	125.15	10.84	0.000%
39	0.06	-49.06	-7.26	-0.06	49.06	7.26	0.000%
40	3.69	-49.06	-6.32	-3.69	49.06	6.32	0.000%
41	6.34	-49.06	-3.68	-6.34	49.06	3.68	0.000%
42	7.28	-49.06	-0.06	-7.28	49.06	0.06	0.000%
43	6.28	-49.06	3.58	-6.28	49.06	-3.58	0.000%
44	3.59	-49.06	6.26	-3.59	49.06	-6.26	0.000%
45	-0.06	-49.06	7.26	0.06	49.06	-7.26	0.000%
46	-3.69	-49.06	6.32	3.69	49.06	-6.32	0.000%
47	-6.34	-49.06	3.68	6.34	49.06	-3.68	0.000%
48	-7.28	-49.06	0.06	7.28	49.06	-0.06	0.000%
49	-6.28	-49.06	-3.58	6.28	49.06	3.58	0.000%
50	-3.59	-49.06	-6.26	3.59	49.06	6.26	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	5	0.00000001	0.00036340
3	Yes	5	0.00000001	0.00016514
4	Yes	6	0.00000001	0.00017202
5	Yes	6	0.00000001	0.00005259
6	Yes	6	0.00000001	0.00016026
7	Yes	6	0.00000001	0.00004840
8	Yes	5	0.00000001	0.00013637
9	Yes	5	0.00000001	0.00006127
10	Yes	6	0.00000001	0.00015107
11	Yes	6	0.00000001	0.00004587
12	Yes	6	0.00000001	0.00016982
13	Yes	6	0.00000001	0.00005258
14	Yes	5	0.00000001	0.00023556
15	Yes	5	0.00000001	0.00010833
16	Yes	6	0.00000001	0.00015532
17	Yes	6	0.00000001	0.00004680
18	Yes	6	0.00000001	0.00016569
19	Yes	6	0.00000001	0.00005050
20	Yes	5	0.00000001	0.00002496
21	Yes	4	0.00000001	0.00039431
22	Yes	6	0.00000001	0.00016561
23	Yes	6	0.00000001	0.00005116
24	Yes	6	0.00000001	0.00014826
25	Yes	6	0.00000001	0.00004495
26	Yes	4	0.00000001	0.00020492
27	Yes	6	0.00000001	0.00036303
28	Yes	6	0.00000001	0.00070632
29	Yes	6	0.00000001	0.00067064
30	Yes	6	0.00000001	0.00035331
31	Yes	6	0.00000001	0.00064538
32	Yes	6	0.00000001	0.00068467
33	Yes	6	0.00000001	0.00035686
34	Yes	6	0.00000001	0.00061244
35	Yes	6	0.00000001	0.00064250
36	Yes	6	0.00000001	0.00033855
37	Yes	6	0.00000001	0.00064186
38	Yes	6	0.00000001	0.00060740
39	Yes	4	0.00000001	0.00022243
40	Yes	4	0.00000001	0.00051042
41	Yes	4	0.00000001	0.00040223
42	Yes	4	0.00000001	0.00008960
43	Yes	4	0.00000001	0.00035594
44	Yes	4	0.00000001	0.00051565
45	Yes	4	0.00000001	0.00020623
46	Yes	4	0.00000001	0.00036650
47	Yes	4	0.00000001	0.00043804
48	Yes	4	0.00000001	0.00007926
49	Yes	4	0.00000001	0.00046890
50	Yes	4	0.00000001	0.00034573

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	26.175	41	1.3619	0.0052

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	135.25 - 86.12	15.170	41	1.1431	0.0048
L3	91.87 - 43	6.561	41	0.7181	0.0023
L4	50 - 1	1.827	41	0.3436	0.0009

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	2'x2' Panel	41	26.175	1.3619	0.0052	47849
170.00	800-10121	41	24.473	1.3366	0.0053	39874
164.50	4-ft Grid Dish	41	22.923	1.3127	0.0053	20803
164.42	6' Extension Arm Mount	41	22.900	1.3123	0.0053	20660
162.00	Monopole Sector Stabilizer Kit VSK-M	41	22.223	1.3013	0.0053	17088
160.00	AIR6419	41	21.667	1.2920	0.0052	14952
154.00	VHLP800-11-DW1	41	20.018	1.2622	0.0052	10874
150.00	APXVSPP18-C-A20	41	18.940	1.2405	0.0052	9201
137.00	10' Dipole	41	15.597	1.1563	0.0049	6170
135.75	6' Extension Arm Mount	41	15.292	1.1469	0.0048	6036
118.00	BXA-70063/6CF	41	11.293	0.9885	0.0039	5944
116.00	Valmont 13' Platform w/Rails	41	10.882	0.9685	0.0038	5952
104.83	10' Dipole	41	8.737	0.8529	0.0031	5998
104.50	4-ft Grid Dish	41	8.677	0.8494	0.0031	6000
78.00	3' GPS Stand-off Mount	41	4.602	0.5831	0.0017	5988
35.25	3' GPS Stand-off Mount	41	0.984	0.2331	0.0006	8396

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	140.707	4	7.3417	0.0277
L2	135.25 - 86.12	81.674	6	6.1600	0.0256
L3	91.87 - 43	35.373	6	3.8730	0.0125
L4	50 - 1	9.855	6	1.8542	0.0046

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	2'x2' Panel	4	140.707	7.3417	0.0279	9195
170.00	800-10121	4	131.575	7.2049	0.0279	7663
164.50	4-ft Grid Dish	6	123.262	7.0753	0.0279	3996
164.42	6' Extension Arm Mount	6	123.141	7.0734	0.0279	3969
162.00	Monopole Sector Stabilizer Kit VSK-M	6	119.511	7.0140	0.0279	3282
160.00	AIR6419	6	116.526	6.9635	0.0279	2871

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
154.00	VHLP800-11-DW1	6	107.684	6.8025	0.0277	2086
150.00	APXVSPP18-C-A20	6	101.903	6.6855	0.0275	1764
137.00	10' Dipole	6	83.968	6.2315	0.0259	1179
135.75	6' Extension Arm Mount	6	82.326	6.1807	0.0257	1153
118.00	BXA-70063/6CF	6	60.839	5.3278	0.0210	1126
116.00	Valmont 13' Platform w/Rails	6	58.631	5.2203	0.0204	1127
104.83	10' Dipole	6	47.090	4.5988	0.0166	1131
104.50	4-ft Grid Dish	6	46.770	4.5802	0.0165	1131
78.00	3' GPS Stand-off Mount	6	24.820	3.1457	0.0091	1119
35.25	3' GPS Stand-off Mount	6	5.310	1.2580	0.0029	1558

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.0000	18	2.2500	183.28 223.65 0.82	189.82 371.27 0.51	32.155 54.000 0.60	33.523 54.000 0.62	Bolt T	0.82 ✔

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	45.25	175.00	194.1	24.1827	-14.31	145.00	0.099
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	49.13	175.00	147.3	39.8244	-26.28	414.47	0.063
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	48.87	175.00	119.9	58.7205	-38.99	922.68	0.042
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.00	175.00	98.5	83.4043	-58.85	1942.46	0.030

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	553.27	1063.91	0.520	0.00	1063.91	0.000
L2	130.75 - 86.12	TP41.82x30.226x0.3125	1713.03	2268.91	0.755	0.00	2268.91	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L3	86.12 - 43 (2) (3)	TP51.36x39.8381x0.375	3128.42	4077.31	0.767	0.00	4077.31	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	4972.42	6942.81	0.716	0.00	6942.81	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	20.90	849.12	0.025	2.72	2133.05	0.001
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	31.74	1373.95	0.023	5.31	4548.70	0.001
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	35.64	2009.04	0.018	2.16	8173.96	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	39.42	2809.06	0.014	2.16	13917.92	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	176 - 130.75 (1)	0.099	0.520	0.000	0.025	0.001	0.619 ✔	1.000	4.8.2 ✔
L2	130.75 - 86.12 (2)	0.063	0.755	0.000	0.023	0.001	0.819 ✔	1.000	4.8.2 ✔
L3	86.12 - 43 (3)	0.042	0.767	0.000	0.018	0.000	0.810 ✔	1.000	4.8.2 ✔
L4	43 - 1 (4)	0.030	0.716	0.000	0.014	0.000	0.747 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	176 - 130.75	Pole	TP31.8x21x0.25	1	-14.31	145.00	61.9	Pass
L2	130.75 - 86.12	Pole	TP41.82x30.226x0.3125	2	-26.28	414.47	81.9	Pass
L3	86.12 - 43	Pole	TP51.36x39.8381x0.375	3	-38.99	922.68	81.0	Pass
L4	43 - 1	Pole	TP60.5x48.9596x0.4375	4	-58.85	1942.46	74.7	Pass
							Summary	
						Pole (L2)	81.9	Pass
						Base Plate	81.9	Pass
						RATING =	**81.9**	**Pass**

Program Version 8.1.1.0 - 6/3/2021 File:J:/Jobs/2014300.WI/15_CTHA231A_1657 Berlin Turnpike/05_Structural/Tower Analysis/Backup Documentation/Rev (1)/ERI Files/175' EEI Monopole Berlin, CT.eri

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

Subject:	CAISSON FOUNDATION
Location:	175-ft EEI Monopole Berlin, CT
Rev. 1: 2/22/22	Prepared by: TJL Checked by: C.A.G. Job No. 20143.15

Caisson Foundation:

Input Data:

Shear Force =	$S := 39k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 4972ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 59k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 5281ft \cdot k$	*USER INPUT--FROM LPILE*
Moment Capacity =	$Mn := 9228ft \cdot k$	*USER INPUT--FROM LPILE*
Foundation Diameter =	$d := 7.5ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 39.0ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 4.0ft$	*USER INPUT*
Number of Rebar =	$n := 30$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 4ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9 \cdot Mn}{Mu} = 1.6$

Factor of Safety Required = $FS_{reqd} := 1$

$FOSCheck := if(FS \geq FS_{reqd}, "OK", "NO GOOD")$

FOSCheck = "OK"

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\2014300.WI\15_CTHA231A_1657 Berlin Turnpike\05_Structural\Tower Analysis\Backup Documentation\Rev (1)\Foundation\
Name of input data file: Caisson Analysis.lpd
Name of output file: Caisson Analysis.lpo
Name of plot output file: Caisson Analysis.lpp
Name of runtime file: Caisson Analysis.lpr

Time and Date of Analysis

Date: February 22, 2022 Time: 9:25:43

Problem Title

20143.15 - CTHA231A

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 3:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment
  Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- Analysis includes computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-04 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 8

Pile Structural Properties and Geometry

Pile Length = 468.00 in

Depth of ground surface below top of pile = 48.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	90.00000000	3220623.	6361.0000	3600000.
2	468.0000	90.00000000	3220623.	6361.0000	3600000.

Please note that because this analysis makes computations of ultimate
moment capacity and pile response using nonlinear bending stiffness
that the above values of moment of inertia and modulus of are not used
for any computations other than total stress due to combined axial
loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 4 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer   =   48.000 in
Distance from top of pile to bottom of layer =   60.000 in
p-y subgrade modulus k for top of soil layer =   1.000 lbs/in**3
p-y subgrade modulus k for bottom of layer   =   1.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer   =   60.000 in
Distance from top of pile to bottom of layer =   132.000 in
p-y subgrade modulus k for top of soil layer =   25.000 lbs/in**3
p-y subgrade modulus k for bottom of layer   =   25.000 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer   =   132.000 in
Distance from top of pile to bottom of layer =   192.000 in
p-y subgrade modulus k for top of soil layer =   35.000 lbs/in**3
p-y subgrade modulus k for bottom of layer   =   35.000 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer   =   192.000 in
Distance from top of pile to bottom of layer =   468.000 in
p-y subgrade modulus k for top of soil layer =   120.000 lbs/in**3
p-y subgrade modulus k for bottom of layer   =   120.000 lbs/in**3

(Depth of lowest layer extends   0.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 8 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	48.00	0.03600
2	60.00	0.03600
3	60.00	0.03600
4	132.00	0.03600
5	132.00	0.03600
6	192.00	0.03600
7	192.00	0.03600

8 468.00 0.03600

Shear Strength of Soils

Shear strength parameters with depth defined using 8 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	48.000	0.00000	30.00	------	------
2	60.000	0.00000	30.00	------	------
3	60.000	0.00000	32.00	------	------
4	132.000	0.00000	32.00	------	------
5	132.000	0.00000	34.00	------	------
6	192.000	0.00000	34.00	------	------
7	192.000	0.00000	36.00	------	------
8	468.000	0.00000	36.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

Loading Type

Static loading criteria was used for computation of p-y curves.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 39000.000 lbs
Bending moment at pile head = 59664000.000 in-lbs

Axial load at pile head = 59000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment) condition.

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 15000.000 lbs
Bending moment at pile head = 22908000.000 in-lbs
Axial load at pile head = 59000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment) condition.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Number of sections = 1

Pile Section No. 1

The sectional shape is a circular drilled shaft (bored pile).

Outside Diameter = 90.0000 in

Material Properties:

Compressive Strength of Concrete	= 4.000	kip/in**2
Yield Stress of Reinforcement	= 60.	kip/in**2
Modulus of Elasticity of Reinforcement	= 29000.	kip/in**2
Number of Reinforcing Bars	= 30	
Area of Single Bar	= 1.56000	in**2
Number of Rows of Reinforcing Bars	= 15	
Area of Steel	= 46.800	in**2
Area of Shaft	= 6361.725	in**2
Percentage of Steel Reinforcement	= 0.736	percent
Cover Thickness (edge to bar center)	= 4.000	in

Unfactored Axial Squash Load Capacity = 24278.75 kip

Distribution and Area of Steel Reinforcement

Row	Area of	Distance to

Number	Reinforcement in**2	Centroidal Axis in
1	3.120	40.775
2	3.120	38.993
3	3.120	35.507
4	3.120	30.469
5	3.120	24.099
6	3.120	16.676
7	3.120	8.524
8	3.120	0.000
9	3.120	-8.524
10	3.120	-16.676
11	3.120	-24.099
12	3.120	-30.469
13	3.120	-35.507
14	3.120	-38.993
15	3.120	-40.775

Axial Thrust Force = 59000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
8014271.	1.282283E+13	6.250000E-07	0.00003066	49.05707315	108.91010	812.58853
15953292.	1.276263E+13	0.00000125	0.00005889	47.11502776	207.49863	1554.77792
23818467.	1.270318E+13	0.00000188	0.00008717	46.48846105	304.72315	2298.09732
31607785.	1.264311E+13	0.00000250	0.00011540	46.15952566	400.31060	3040.28194
31607785.	1.011449E+13	0.00000313	0.00007548	24.15363416	260.76765	5584.47232
31607785.	8.428743E+12	0.00000375	0.00008883	23.68915334	305.63291	6751.87907
31607785.	7.224636E+12	0.00000438	0.00010199	23.31224129	349.49503	7925.01297
31607785.	6.321557E+12	0.00000500	0.00011516	23.03248420	393.09410	9097.72246
31607785.	5.619162E+12	0.00000563	0.00012835	22.81751856	436.42945	10270.00404
31607785.	5.057246E+12	0.00000625	0.00014155	22.64791444	479.50015	11441.85634
31607785.	4.597496E+12	0.00000688	0.00015477	22.51132026	522.30556	

12613.27544
   31607785. 4.214371E+12   0.00000750   0.00016839   22.45172158   566.14545
13772.89956
   31607785. 3.890189E+12   0.00000813   0.00018161   22.35159740   608.31848
14944.23295
   31607785. 3.612318E+12   0.00000875   0.00019484   22.26763889   650.22863
16115.09380
   31607785. 3.371497E+12   0.00000938   0.00020809   22.19662204   691.87498
17285.47963
   31607785. 3.160778E+12   0.00001000   0.00022136   22.13613287   733.25669
18455.38680
   31607785. 2.974850E+12   0.00001063   0.00023465   22.08432600   774.37297
19624.81147
   31607785. 2.809581E+12   0.00001125   0.00024795   22.03976110   815.22281
20793.75145
   31607785. 2.661708E+12   0.00001188   0.00026127   22.00130895   855.80550
21962.20182
   31607785. 2.528623E+12   0.00001250   0.00027460   21.96805492   896.11984
23130.16176
   32580293. 2.482308E+12   0.00001313   0.00028795   21.93926945   936.16511
24297.62632
   34045690. 2.476050E+12   0.00001375   0.00030132   21.91435441   975.94049
25464.59101
   35509564. 2.470231E+12   0.00001438   0.00031471   21.89280823   1015.44483
26631.05449
   36971907. 2.464794E+12   0.00001500   0.00032811   21.87421784   1054.67720
27797.01324
   38432716. 2.459694E+12   0.00001563   0.00034153   21.85823992   1093.63680
28962.46212
   39891980. 2.454891E+12   0.00001625   0.00035497   21.84457943   1132.32262
30127.39812
   41349687. 2.450352E+12   0.00001688   0.00036843   21.83298424   1170.73359
31291.81859
   42805838. 2.446048E+12   0.00001750   0.00038191   21.82324514   1208.86897
32455.71743
   44260412. 2.441954E+12   0.00001813   0.00039540   21.81517169   1246.72749
33619.09380
   45713404. 2.438048E+12   0.00001875   0.00040891   21.80860564   1284.30823
34781.94319
   47164808. 2.434313E+12   0.00001938   0.00042244   21.80341020   1321.61029
35944.26048
   48614620. 2.430731E+12   0.00002000   0.00043599   21.79946467   1358.63272
37106.04116
   50062815. 2.427288E+12   0.00002063   0.00044956   21.79665640   1395.37417
38267.28465
   51509391. 2.423971E+12   0.00002125   0.00046314   21.79489419   1431.83376
39427.98530
   52954346. 2.420770E+12   0.00002188   0.00047675   21.79409757   1468.01061
40588.13727
   54397661. 2.417674E+12   0.00002250   0.00049037   21.79418877   1503.90342
41747.73883

55839329.	2.414674E+12	0.00002313	0.00050401	21.79510340	1539.51123
42906.78487					
57279342.	2.411762E+12	0.00002375	0.00051767	21.79678246	1574.83292
44065.27125					
58717685.	2.408931E+12	0.00002438	0.00053135	21.79917231	1609.86736
45223.19433					
61589332.	2.403486E+12	0.00002563	0.00055878	21.80590197	1679.07017
47537.33152					
64454191.	2.398295E+12	0.00002688	0.00058628	21.81496784	1747.11073
49849.16003					
67312175.	2.393322E+12	0.00002813	0.00061386	21.82610169	1813.97972
52158.64457					
70163189.	2.388534E+12	0.00002938	0.00064152	21.83908090	1879.66754
54465.74988					
73007155.	2.383907E+12	0.00003063	0.00066927	21.85372576	1944.16476
56770.43490					
75843981.	2.379419E+12	0.00003188	0.00069710	21.86988339	2007.46152
59072.65980					
78394465.	2.366625E+12	0.00003313	0.00072410	21.85949787	2067.44242
60000.00000					
80354245.	2.337578E+12	0.00003438	0.00074918	21.79442480	2121.85699
60000.00000					
82105493.	2.304716E+12	0.00003563	0.00077360	21.71519503	2173.68092
60000.00000					
83566957.	2.266223E+12	0.00003688	0.00079704	21.61458537	2222.32202
60000.00000					
85024818.	2.230159E+12	0.00003813	0.00082052	21.52189627	2270.08460
60000.00000					
86169849.	2.188441E+12	0.00003938	0.00084282	21.40487954	2314.41530
60000.00000					
87247421.	2.147629E+12	0.00004063	0.00086490	21.28974304	2357.42364
60000.00000					
88322134.	2.109185E+12	0.00004188	0.00088702	21.18249223	2399.64631
60000.00000					
89385543.	2.072708E+12	0.00004313	0.00090914	21.08156070	2441.00473
60000.00000					
90377150.	2.036668E+12	0.00004438	0.00093188	21.00000009	2482.63750
60000.00000					
90955555.	1.993546E+12	0.00004563	0.00095373	20.90359345	2521.71834
60000.00000					
91704155.	1.956355E+12	0.00004688	0.00097412	20.78131154	2557.31829
60000.00000					
92450654.	1.921053E+12	0.00004813	0.00099456	20.66614553	2592.24688
60000.00000					
93195022.	1.887494E+12	0.00004938	0.00101503	20.55755898	2626.50027
60000.00000					
93861466.	1.854054E+12	0.00005063	0.00103509	20.44615075	2659.30849
60000.00000					
94361720.	1.819021E+12	0.00005188	0.00105420	20.32186255	2689.83325
60000.00000					
94860349.	1.785607E+12	0.00005313	0.00107334	20.20400897	2719.76634

60000.00000
   95357307. 1.753698E+12   0.00005438   0.00109251   20.09214476   2749.10434
60000.00000
   95852599. 1.723193E+12   0.00005563   0.00111171   19.98587295   2777.84452
60000.00000
   96346229. 1.694000E+12   0.00005688   0.00113095   19.88483146   2805.98412
60000.00000
   96838157. 1.666033E+12   0.00005813   0.00115022   19.78868231   2833.51969
60000.00000
   97328383. 1.639215E+12   0.00005938   0.00116952   19.69712242   2860.44835
60000.00000
   97816883. 1.613474E+12   0.00006063   0.00118885   19.60987017   2886.76684
60000.00000
   98179947. 1.586747E+12   0.00006188   0.00120729   19.51180860   2911.20507
60000.00000
   98582359. 1.561701E+12   0.00006313   0.00123091   19.49952140   2941.97303
60000.00000
   98885330. 1.536083E+12   0.00006438   0.00124839   19.39251199   2963.79462
60000.00000
   99187121. 1.511423E+12   0.00006563   0.00126591   19.28998992   2985.11786
60000.00000
   99487688. 1.487666E+12   0.00006688   0.00128344   19.19170037   3005.93991
60000.00000
   99787054. 1.464764E+12   0.00006813   0.00130101   19.09741804   3026.25878
60000.00000
1.000852E+08 1.442670E+12   0.00006938   0.00131861   19.00692835   3046.07201
60000.00000
1.003821E+08 1.421340E+12   0.00007063   0.00133623   18.92003015   3065.37694
60000.00000
1.006778E+08 1.400735E+12   0.00007188   0.00135388   18.83654103   3084.17131
60000.00000
1.009723E+08 1.380817E+12   0.00007313   0.00137155   18.75628933   3102.45266
60000.00000
1.012655E+08 1.361552E+12   0.00007438   0.00138926   18.67911145   3120.21821
60000.00000
1.018481E+08 1.324853E+12   0.00007688   0.00142475   18.53339240   3154.19212
60000.00000
1.023021E+08 1.288845E+12   0.00007938   0.00145900   18.38113144   3184.82757
60000.00000
1.026524E+08 1.253769E+12   0.00008188   0.00149225   18.22599515   3212.57476
60000.00000
1.029986E+08 1.220724E+12   0.00008438   0.00152560   18.08123365   3238.48635
60000.00000
1.037583E+08 1.194341E+12   0.00008688   0.00156375   18.00000027   3265.95599
60000.00000
1.037700E+08 1.161063E+12   0.00008938   0.00160069   17.90980563   3290.07914
60000.00000
1.040861E+08 1.132910E+12   0.00009188   0.00163289   17.77298078   3309.01605
60000.00000
1.043986E+08 1.106211E+12   0.00009438   0.00166520   17.64445469   3326.21710
60000.00000

1.047074E+08 1.080851E+12 0.00009688 0.00169760 17.52359971 3341.66540
60000.00000
1.050124E+08 1.056729E+12 0.00009938 0.00173010 17.40985528 3355.34380
60000.00000
1.053137E+08 1.033754E+12 0.00010188 0.00176271 17.30270907 3367.23441
60000.00000
1.056111E+08 1.011842E+12 0.00010438 0.00179543 17.20169976 3377.31909
60000.00000
1.059021E+08 9.908967E+11 0.00010688 0.00182820 17.10599050 3385.56868
60000.00000
1.060634E+08 9.697226E+11 0.00010938 0.00185875 16.99431136 3391.56297
60000.00000
1.062217E+08 9.494676E+11 0.00011188 0.00188940 16.88844994 3395.96966
60000.00000
1.063769E+08 9.300710E+11 0.00011438 0.00192013 16.78803340 3398.77332
60000.00000
1.065289E+08 9.114773E+11 0.00011688 0.00195096 16.69272110 3399.95821
60000.00000
1.066719E+08 8.935864E+11 0.00011938 0.00198189 16.60220459 3394.05809
60000.00000
1.068114E+08 8.764016E+11 0.00012188 0.00201291 16.51619419 3386.35629
60000.00000
1.068114E+08 8.587855E+11 0.00012438 0.00205219 16.49999902 3390.75123
60000.00000
1.071905E+08 8.448511E+11 0.00012688 0.00209098 16.48064688 3395.97269
60000.00000
1.073138E+08 8.294785E+11 0.00012938 0.00212077 16.39240757 3398.42904
60000.00000
1.074358E+08 8.146793E+11 0.00013188 0.00215065 16.30826399 3399.75317
60000.00000
1.075557E+08 8.004146E+11 0.00013438 0.00218069 16.22838780 3397.76024
60000.00000
1.076729E+08 7.866513E+11 0.00013688 0.00221091 16.15277097 3391.26124
60000.00000
1.077892E+08 7.733756E+11 0.00013938 0.00224121 16.08041570 3384.74203
60000.00000
1.079047E+08 7.605619E+11 0.00014188 0.00227158 16.01116374 3383.48610
60000.00000
1.080193E+08 7.481859E+11 0.00014438 0.00230204 15.94485417 3388.39650
60000.00000
1.081331E+08 7.362252E+11 0.00014688 0.00233257 15.88134751 3392.45646
60000.00000
1.082459E+08 7.246588E+11 0.00014938 0.00236319 15.82050964 3395.65619
60000.00000
1.083578E+08 7.134673E+11 0.00015188 0.00239389 15.76221719 3397.98577
60000.00000
1.084689E+08 7.026324E+11 0.00015438 0.00242467 15.70635483 3399.43500
60000.00000
1.085789E+08 6.921367E+11 0.00015688 0.00245553 15.65281257 3399.99345
60000.00000
1.086858E+08 6.819504E+11 0.00015938 0.00248664 15.60244873 3394.94931

60000.00000
1.087919E+08 6.720733E+11 0.00016188 0.00251783 15.55415019 3389.18570
60000.00000
1.088408E+08 6.621497E+11 0.00016438 0.00254687 15.49425915 3383.98940
60000.00000
1.088867E+08 6.525046E+11 0.00016688 0.00257585 15.43579772 3378.80918
60000.00000
1.089322E+08 6.431424E+11 0.00016938 0.00260488 15.37935331 3376.87528
60000.00000
1.089775E+08 6.340506E+11 0.00017188 0.00263396 15.32483742 3381.41246
60000.00000
1.090223E+08 6.252176E+11 0.00017438 0.00266308 15.27216956 3385.46646
60000.00000
1.091110E+08 6.082844E+11 0.00017938 0.00272149 15.17208025 3392.10673
60000.00000
1.091983E+08 5.922619E+11 0.00018438 0.00278010 15.07852480 3396.75875
60000.00000
1.093686E+08 5.775242E+11 0.00018938 0.00284063 15.00000045 3399.46480
60000.00000
1.101242E+08 5.665554E+11 0.00019438 0.00291563 15.00000045 3393.31839
60000.00000
1.107360E+08 5.554155E+11 0.00019938 0.00299063 15.00000045 3380.43715
60000.00000
1.107360E+08 5.418273E+11 0.00020438 0.00306061 14.97543946 3368.88224
60000.00000
1.107360E+08 5.288882E+11 0.00020938 0.00312040 14.90339264 3374.24226
60000.00000
1.107360E+08 5.165526E+11 0.00021438 0.00318036 14.83551398 3381.87191
60000.00000
1.107360E+08 5.047793E+11 0.00021938 0.00324051 14.77153793 3388.20297
60000.00000
1.107360E+08 4.935307E+11 0.00022438 0.00330083 14.71122310 3393.20886
60000.00000
1.107360E+08 4.827726E+11 0.00022938 0.00336134 14.65435490 3396.86202
60000.00000
1.107360E+08 4.724734E+11 0.00023438 0.00342205 14.60073218 3399.13345
60000.00000
1.107360E+08 4.626045E+11 0.00023938 0.00348295 14.55017254 3399.99299
60000.00000
1.107360E+08 4.531395E+11 0.00024438 0.00354535 14.50781509 3393.14407
60000.00000
1.107360E+08 4.440540E+11 0.00024938 0.00361057 14.47847441 3384.82814
60000.00000
1.107360E+08 4.353256E+11 0.00025438 0.00367597 14.45099249 3376.46480
60000.00000
1.107360E+08 4.269338E+11 0.00025938 0.00374156 14.42528352 3368.05257
60000.00000
1.107360E+08 4.188594E+11 0.00026438 0.00380734 14.40127239 3359.58966
60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 110735.95693

in-kip

Axial Thrust Force = 59000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
8014271.	1.282283E+13	6.250000E-07	0.00003066	49.05707315	108.91010	812.58853
15953292.	1.276263E+13	0.00000125	0.00005889	47.11502776	207.49863	1554.77792
23818467.	1.270318E+13	0.00000188	0.00008717	46.48846105	304.72315	2298.09732
31607785.	1.264311E+13	0.00000250	0.00011540	46.15952566	400.31060	3040.28194
31607785.	1.011449E+13	0.00000313	0.00007548	24.15363416	260.76765	5584.47232
31607785.	8.428743E+12	0.00000375	0.00008883	23.68915334	305.63291	6751.87907
31607785.	7.224636E+12	0.00000438	0.00010199	23.31224129	349.49503	7925.01297
31607785.	6.321557E+12	0.00000500	0.00011516	23.03248420	393.09410	9097.72246
31607785.	5.619162E+12	0.00000563	0.00012835	22.81751856	436.42945	10270.00404
31607785.	5.057246E+12	0.00000625	0.00014155	22.64791444	479.50015	11441.85634
31607785.	4.597496E+12	0.00000688	0.00015477	22.51132026	522.30556	12613.27544
31607785.	4.214371E+12	0.00000750	0.00016839	22.45172158	566.14545	13772.89956
31607785.	3.890189E+12	0.00000813	0.00018161	22.35159740	608.31848	14944.23295
31607785.	3.612318E+12	0.00000875	0.00019484	22.26763889	650.22863	16115.09380
31607785.	3.371497E+12	0.00000938	0.00020809	22.19662204	691.87498	17285.47963
31607785.	3.160778E+12	0.00001000	0.00022136	22.13613287	733.25669	18455.38680
31607785.	2.974850E+12	0.00001063	0.00023465	22.08432600	774.37297	19624.81147
31607785.	2.809581E+12	0.00001125	0.00024795	22.03976110	815.22281	20793.75145

```
   31607785.  2.661708E+12    0.00001188    0.00026127   22.00130895     855.80550
21962.20182
   31607785.  2.528623E+12    0.00001250    0.00027460   21.96805492     896.11984
23130.16176
   32580293.  2.482308E+12    0.00001313    0.00028795   21.93926945     936.16511
24297.62632
   34045690.  2.476050E+12    0.00001375    0.00030132   21.91435441     975.94049
25464.59101
   35509564.  2.470231E+12    0.00001438    0.00031471   21.89280823    1015.44483
26631.05449
   36971907.  2.464794E+12    0.00001500    0.00032811   21.87421784    1054.67720
27797.01324
   38432716.  2.459694E+12    0.00001563    0.00034153   21.85823992    1093.63680
28962.46212
   39891980.  2.454891E+12    0.00001625    0.00035497   21.84457943    1132.32262
30127.39812
   41349687.  2.450352E+12    0.00001688    0.00036843   21.83298424    1170.73359
31291.81859
   42805838.  2.446048E+12    0.00001750    0.00038191   21.82324514    1208.86897
32455.71743
   44260412.  2.441954E+12    0.00001813    0.00039540   21.81517169    1246.72749
33619.09380
   45713404.  2.438048E+12    0.00001875    0.00040891   21.80860564    1284.30823
34781.94319
   47164808.  2.434313E+12    0.00001938    0.00042244   21.80341020    1321.61029
35944.26048
   48614620.  2.430731E+12    0.00002000    0.00043599   21.79946467    1358.63272
37106.04116
   50062815.  2.427288E+12    0.00002063    0.00044956   21.79665640    1395.37417
38267.28465
   51509391.  2.423971E+12    0.00002125    0.00046314   21.79489419    1431.83376
39427.98530
   52954346.  2.420770E+12    0.00002188    0.00047675   21.79409757    1468.01061
40588.13727
   54397661.  2.417674E+12    0.00002250    0.00049037   21.79418877    1503.90342
41747.73883
   55839329.  2.414674E+12    0.00002313    0.00050401   21.79510340    1539.51123
42906.78487
   57279342.  2.411762E+12    0.00002375    0.00051767   21.79678246    1574.83292
44065.27125
   58717685.  2.408931E+12    0.00002438    0.00053135   21.79917231    1609.86736
45223.19433
   61589332.  2.403486E+12    0.00002563    0.00055878   21.80590197    1679.07017
47537.33152
   64454191.  2.398295E+12    0.00002688    0.00058628   21.81496784    1747.11073
49849.16003
   67312175.  2.393322E+12    0.00002813    0.00061386   21.82610169    1813.97972
52158.64457
   70163189.  2.388534E+12    0.00002938    0.00064152   21.83908090    1879.66754
54465.74988
   73007155.  2.383907E+12    0.00003063    0.00066927   21.85372576    1944.16476
```

56770.43490
   75843981. 2.379419E+12   0.00003188   0.00069710   21.86988339   2007.46152
59072.65980
   78394465. 2.366625E+12   0.00003313   0.00072410   21.85949787   2067.44242
60000.00000
   80354245. 2.337578E+12   0.00003438   0.00074918   21.79442480   2121.85699
60000.00000
   82105493. 2.304716E+12   0.00003563   0.00077360   21.71519503   2173.68092
60000.00000
   83566957. 2.266223E+12   0.00003688   0.00079704   21.61458537   2222.32202
60000.00000
   85024818. 2.230159E+12   0.00003813   0.00082052   21.52189627   2270.08460
60000.00000
   86169849. 2.188441E+12   0.00003938   0.00084282   21.40487954   2314.41530
60000.00000
   87247421. 2.147629E+12   0.00004063   0.00086490   21.28974304   2357.42364
60000.00000
   88322134. 2.109185E+12   0.00004188   0.00088702   21.18249223   2399.64631
60000.00000
   89385543. 2.072708E+12   0.00004313   0.00090914   21.08156070   2441.00473
60000.00000
   90377150. 2.036668E+12   0.00004438   0.00093188   21.00000009   2482.63750
60000.00000
   90955555. 1.993546E+12   0.00004563   0.00095373   20.90359345   2521.71834
60000.00000
   91704155. 1.956355E+12   0.00004688   0.00097412   20.78131154   2557.31829
60000.00000
   92450654. 1.921053E+12   0.00004813   0.00099456   20.66614553   2592.24688
60000.00000
   93195022. 1.887494E+12   0.00004938   0.00101503   20.55755898   2626.50027
60000.00000
   93861466. 1.854054E+12   0.00005063   0.00103509   20.44615075   2659.30849
60000.00000
   94361720. 1.819021E+12   0.00005188   0.00105420   20.32186255   2689.83325
60000.00000
   94860349. 1.785607E+12   0.00005313   0.00107334   20.20400897   2719.76634
60000.00000
   95357307. 1.753698E+12   0.00005438   0.00109251   20.09214476   2749.10434
60000.00000
   95852599. 1.723193E+12   0.00005563   0.00111171   19.98587295   2777.84452
60000.00000
   96346229. 1.694000E+12   0.00005688   0.00113095   19.88483146   2805.98412
60000.00000
   96838157. 1.666033E+12   0.00005813   0.00115022   19.78868231   2833.51969
60000.00000
   97328383. 1.639215E+12   0.00005938   0.00116952   19.69712242   2860.44835
60000.00000
   97816883. 1.613474E+12   0.00006063   0.00118885   19.60987017   2886.76684
60000.00000
   98179947. 1.586747E+12   0.00006188   0.00120729   19.51180860   2911.20507
60000.00000

98582359.	1.561701E+12	0.00006313	0.00123091	19.49952140	2941.97303
60000.00000					
98885330.	1.536083E+12	0.00006438	0.00124839	19.39251199	2963.79462
60000.00000					
99187121.	1.511423E+12	0.00006563	0.00126591	19.28998992	2985.11786
60000.00000					
99487688.	1.487666E+12	0.00006688	0.00128344	19.19170037	3005.93991
60000.00000					
99787054.	1.464764E+12	0.00006813	0.00130101	19.09741804	3026.25878
60000.00000					
1.000852E+08	1.442670E+12	0.00006938	0.00131861	19.00692835	3046.07201
60000.00000					
1.003821E+08	1.421340E+12	0.00007063	0.00133623	18.92003015	3065.37694
60000.00000					
1.006778E+08	1.400735E+12	0.00007188	0.00135388	18.83654103	3084.17131
60000.00000					
1.009723E+08	1.380817E+12	0.00007313	0.00137155	18.75628933	3102.45266
60000.00000					
1.012655E+08	1.361552E+12	0.00007438	0.00138926	18.67911145	3120.21821
60000.00000					
1.018481E+08	1.324853E+12	0.00007688	0.00142475	18.53339240	3154.19212
60000.00000					
1.023021E+08	1.288845E+12	0.00007938	0.00145900	18.38113144	3184.82757
60000.00000					
1.026524E+08	1.253769E+12	0.00008188	0.00149225	18.22599515	3212.57476
60000.00000					
1.029986E+08	1.220724E+12	0.00008438	0.00152560	18.08123365	3238.48635
60000.00000					
1.037583E+08	1.194341E+12	0.00008688	0.00156375	18.00000027	3265.95599
60000.00000					
1.037700E+08	1.161063E+12	0.00008938	0.00160069	17.90980563	3290.07914
60000.00000					
1.040861E+08	1.132910E+12	0.00009188	0.00163289	17.77298078	3309.01605
60000.00000					
1.043986E+08	1.106211E+12	0.00009438	0.00166520	17.64445469	3326.21710
60000.00000					
1.047074E+08	1.080851E+12	0.00009688	0.00169760	17.52359971	3341.66540
60000.00000					
1.050124E+08	1.056729E+12	0.00009938	0.00173010	17.40985528	3355.34380
60000.00000					
1.053137E+08	1.033754E+12	0.00010188	0.00176271	17.30270907	3367.23441
60000.00000					
1.056111E+08	1.011842E+12	0.00010438	0.00179543	17.20169976	3377.31909
60000.00000					
1.059021E+08	9.908967E+11	0.00010688	0.00182820	17.10599050	3385.56868
60000.00000					
1.060634E+08	9.697226E+11	0.00010938	0.00185875	16.99431136	3391.56297
60000.00000					
1.062217E+08	9.494676E+11	0.00011188	0.00188940	16.88844994	3395.96966
60000.00000					
1.063769E+08	9.300710E+11	0.00011438	0.00192013	16.78803340	3398.77332

60000.00000
1.065289E+08 9.114773E+11 0.00011688 0.00195096 16.69272110 3399.95821
60000.00000
1.066719E+08 8.935864E+11 0.00011938 0.00198189 16.60220459 3394.05809
60000.00000
1.068114E+08 8.764016E+11 0.00012188 0.00201291 16.51619419 3386.35629
60000.00000
1.068114E+08 8.587855E+11 0.00012438 0.00205219 16.49999902 3390.75123
60000.00000
1.071905E+08 8.448511E+11 0.00012688 0.00209098 16.48064688 3395.97269
60000.00000
1.073138E+08 8.294785E+11 0.00012938 0.00212077 16.39240757 3398.42904
60000.00000
1.074358E+08 8.146793E+11 0.00013188 0.00215065 16.30826399 3399.75317
60000.00000
1.075557E+08 8.004146E+11 0.00013438 0.00218069 16.22838780 3397.76024
60000.00000
1.076729E+08 7.866513E+11 0.00013688 0.00221091 16.15277097 3391.26124
60000.00000
1.077892E+08 7.733756E+11 0.00013938 0.00224121 16.08041570 3384.74203
60000.00000
1.079047E+08 7.605619E+11 0.00014188 0.00227158 16.01116374 3383.48610
60000.00000
1.080193E+08 7.481859E+11 0.00014438 0.00230204 15.94485417 3388.39650
60000.00000
1.081331E+08 7.362252E+11 0.00014688 0.00233257 15.88134751 3392.45646
60000.00000
1.082459E+08 7.246588E+11 0.00014938 0.00236319 15.82050964 3395.65619
60000.00000
1.083578E+08 7.134673E+11 0.00015188 0.00239389 15.76221719 3397.98577
60000.00000
1.084689E+08 7.026324E+11 0.00015438 0.00242467 15.70635483 3399.43500
60000.00000
1.085789E+08 6.921367E+11 0.00015688 0.00245553 15.65281257 3399.99345
60000.00000
1.086858E+08 6.819504E+11 0.00015938 0.00248664 15.60244873 3394.94931
60000.00000
1.087919E+08 6.720733E+11 0.00016188 0.00251783 15.55415019 3389.18570
60000.00000
1.088408E+08 6.621497E+11 0.00016438 0.00254687 15.49425915 3383.98940
60000.00000
1.088867E+08 6.525046E+11 0.00016688 0.00257585 15.43579772 3378.80918
60000.00000
1.089322E+08 6.431424E+11 0.00016938 0.00260488 15.37935331 3376.87528
60000.00000
1.089775E+08 6.340506E+11 0.00017188 0.00263396 15.32483742 3381.41246
60000.00000
1.090223E+08 6.252176E+11 0.00017438 0.00266308 15.27216956 3385.46646
60000.00000
1.091110E+08 6.082844E+11 0.00017938 0.00272149 15.17208025 3392.10673
60000.00000

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  1.091983E+08  5.922619E+11    0.00018438    0.00278010   15.07852480    3396.75875
  60000.00000
  1.093686E+08  5.775242E+11    0.00018938    0.00284063   15.00000045    3399.46480
  60000.00000
  1.101242E+08  5.665554E+11    0.00019438    0.00291563   15.00000045    3393.31839
  60000.00000
  1.107360E+08  5.554155E+11    0.00019938    0.00299063   15.00000045    3380.43715
  60000.00000
  1.107360E+08  5.418273E+11    0.00020438    0.00306061   14.97543946    3368.88224
  60000.00000
  1.107360E+08  5.288882E+11    0.00020938    0.00312040   14.90339264    3374.24226
  60000.00000
  1.107360E+08  5.165526E+11    0.00021438    0.00318036   14.83551398    3381.87191
  60000.00000
  1.107360E+08  5.047793E+11    0.00021938    0.00324051   14.77153793    3388.20297
  60000.00000
  1.107360E+08  4.935307E+11    0.00022438    0.00330083   14.71122310    3393.20886
  60000.00000
  1.107360E+08  4.827726E+11    0.00022938    0.00336134   14.65435490    3396.86202
  60000.00000
  1.107360E+08  4.724734E+11    0.00023438    0.00342205   14.60073218    3399.13345
  60000.00000
  1.107360E+08  4.626045E+11    0.00023938    0.00348295   14.55017254    3399.99299
  60000.00000
  1.107360E+08  4.531395E+11    0.00024438    0.00354535   14.50781509    3393.14407
  60000.00000
  1.107360E+08  4.440540E+11    0.00024938    0.00361057   14.47847441    3384.82814
  60000.00000
  1.107360E+08  4.353256E+11    0.00025438    0.00367597   14.45099249    3376.46480
  60000.00000
  1.107360E+08  4.269338E+11    0.00025938    0.00374156   14.42528352    3368.05257
  60000.00000
  1.107360E+08  4.188594E+11    0.00026438    0.00380734   14.40127239    3359.58966
  60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =  110735.95693
in-kip



------------------------------------------------------------------------------
             Computed Values of Load Distribution and Deflection
                 for Lateral Loading for Load Case Number  1
------------------------------------------------------------------------------

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head  =       39000.000 lbs
Specified moment at pile head       =    59664000.000 in-lbs
Specified axial load at pile head   =       59000.000 lbs
```

Depth	Deflect.	Moment	Shear	Slope	Total	Flx. Rig.	Soil Res. Es*h
X	y	M	V	S	Stress	EI	p F/L
in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in
0.000	1.416	5.97E+07	39000.	-0.008457	842.928	2.41E+12	0.000 0.000
37.440	1.117	6.11E+07	39000.	-0.007517	863.576	2.40E+12	0.000 0.000
74.880	0.853104	6.26E+07	33571.	-0.006553	883.684	2.40E+12	-488.743 2681.174
112.320	0.626125	6.34E+07	4383.791	-0.005570	894.597	2.40E+12	-976.660 7300.095
149.760	0.436081	6.28E+07	-40966.	-0.004584	886.247	2.40E+12	-1451.837 15581.
187.200	0.282576	6.02E+07	-93483.	-0.003623	850.966	2.41E+12	-1311.063 21714.
224.640	0.164054	5.52E+07	-1.85E+05	-0.002722	780.556	2.42E+12	-2747.760 78386.
262.080	0.077372	4.65E+07	-2.76E+05	-0.001933	658.437	2.44E+12	-1829.370 1.11E+05
299.520	0.017299	3.52E+07	-3.19E+05	-0.001307	500.646	2.47E+12	-486.749 1.32E+05
336.960	-0.026816	2.32E+07	-3.12E+05	-0.001128	333.242	1.27E+13	875.002 1.53E+05
374.400	-0.067980	1.25E+07	-2.51E+05	-0.001076	183.430	1.28E+13	2284.992 1.57E+05
411.840	-0.107747	4.75E+06	-1.60E+05	-0.001052	75.681	1.28E+13	2505.998 1.09E+05
449.280	-0.146963	5.73E+05	-59915.	-0.001045	17.275	1.28E+13	3005.643 95714.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 1.41569321 in
Computed slope at pile head = -0.00845722
Maximum bending moment = 63373273. lbs-in
Maximum shear force = -322422.85342 lbs

Depth of maximum bending moment = 117.00000 in
Depth of maximum shear force = 313.56000 in
Number of iterations = 23
Number of zero deflection points = 1

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 15000.000 lbs
Specified moment at pile head = 22908000.000 in-lbs
Specified axial load at pile head = 59000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. Es*h p F/L lbs/in
0.000	0.244194	2.29E+07	15000.	-0.001035	329.356	1.27E+13	0.000
37.440	0.206722	2.35E+07	15000.	-0.000967	337.234	1.27E+13	0.000
74.880	0.171839	2.40E+07	13756.	-0.000897	344.990	1.27E+13	-107.202
112.320	0.139607	2.44E+07	7496.705	-0.000825	350.762	1.27E+13	-217.767
149.760	0.110071	2.45E+07	-3306.218	-0.000753	352.195	1.27E+13	-366.457
187.200	0.083239	2.42E+07	-17579.	-0.000681	346.787	1.27E+13	-386.203
224.640	0.059067	2.29E+07	-56273.	-0.000611	328.616	1.27E+13	-1131.192
262.080	0.037401	2.00E+07	-94444.	-0.000548	288.795	1.27E+13	-884.297
299.520	0.017927	1.59E+07	-1.21E+05	-0.000495	231.866	1.28E+13	-504.403
336.960	0.000197	1.12E+07	-1.31E+05	-0.000455	165.245	1.28E+13	-6.433
374.400	-0.016309	6.40E+06	-1.20E+05	-0.000429	98.679	1.28E+13	605.428
411.840	-0.032108	2.50E+06	-83936.	-0.000417	44.161	1.28E+13	1323.268
449.280	-0.047618	3.02E+05	-31547.	-0.000413	13.492	1.28E+13	1579.336

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.24419399 in
Computed slope at pile head	=	-0.00103488
Maximum bending moment	=	24557164. lbs-in
Maximum shear force	=	-130733.38035 lbs
Depth of maximum bending moment	=	140.40000 in
Depth of maximum shear force	=	336.96000 in
Number of iterations	=	7
Number of zero deflection points	=	1

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 39000.	M= 5.97E+07	59000.0000	1.4157	6.3373E+07	-322423.
1	V= 15000.	M= 2.29E+07	59000.0000	0.2441940	2.4557E+07	-130733.

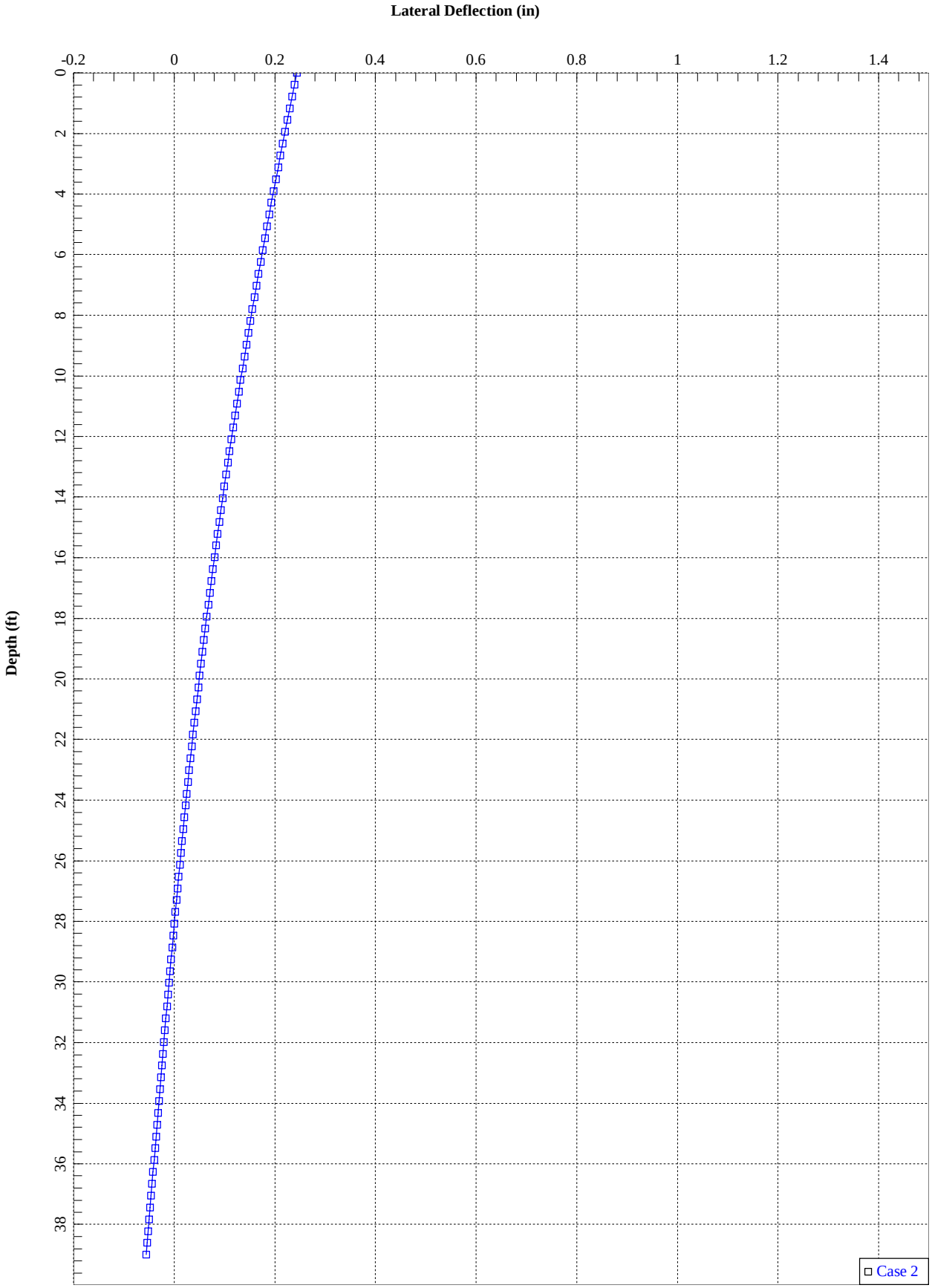
Computed Pile-head Stiffness Matrix Members
K22, K23, K32, K33 for Superstructure

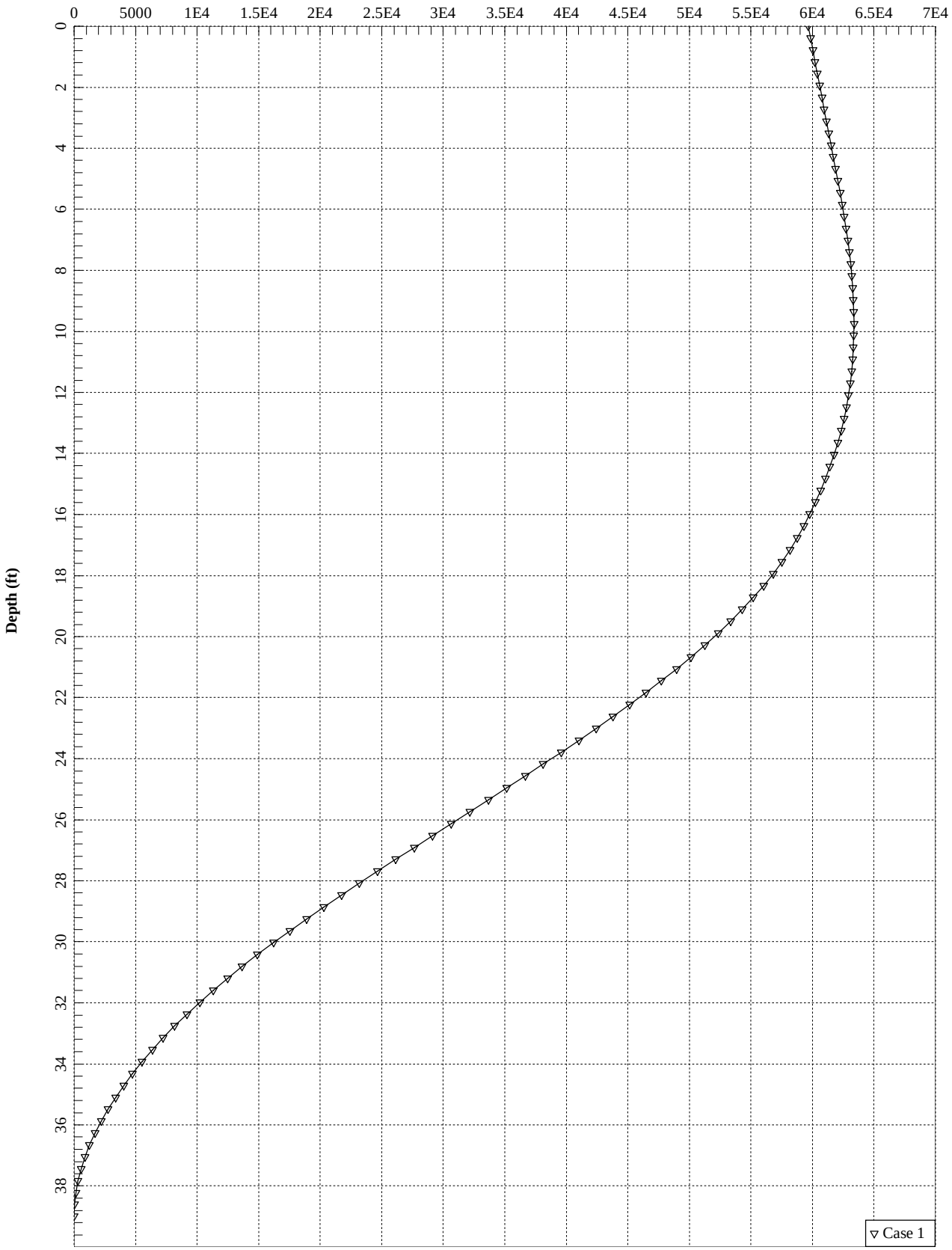
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00253607	3900.00006	876657.85158	1537815.	3.456764E+08
0.00763432	11740.16983	2639003.	1537815.	3.456764E+08
0.01210011	18607.72893	4182721.	1537815.	3.456764E+08
0.01526863	23480.33966	5278006.	1537815.	3.456764E+08
0.01772634	27259.83017	6127575.	1537815.	3.456764E+08
0.01973442	30347.89877	6821724.	1537815.	3.456764E+08
0.02143224	32958.82356	7408618.	1537815.	3.456764E+08
0.02290295	35220.50949	7917009.	1537815.	3.456764E+08
0.02420055	37215.45787	8365401.	1537794.	3.456699E+08
0.02536189	39000.00000	8766427.	1537740.	3.456535E+08

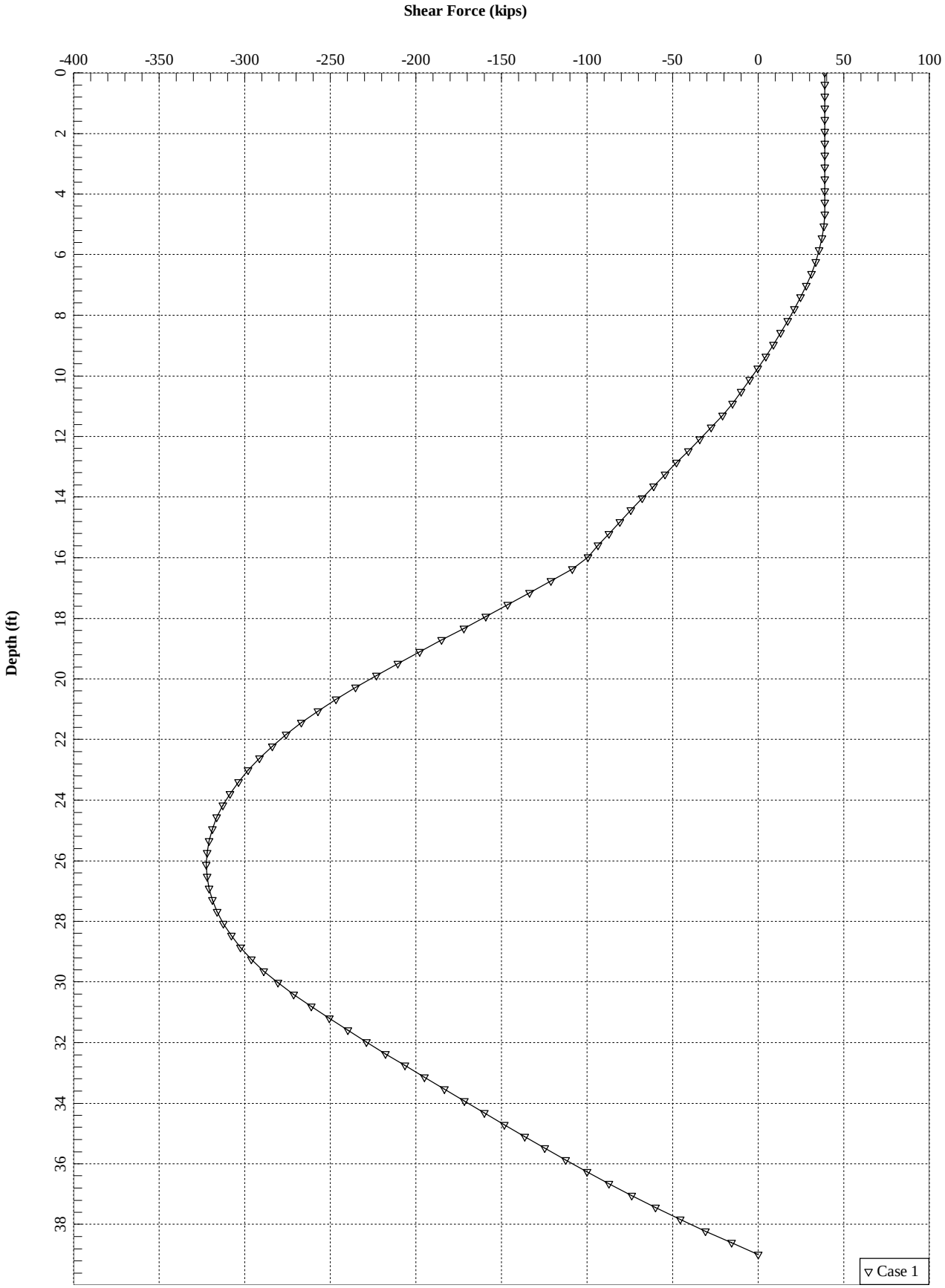
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00005724	19785.98354	5966400.	3.456764E+08	1.042376E+11
0.00017283	59575.17884	17960654.	3.447014E+08	1.039202E+11
0.00027496	94460.16929	28466963.	3.435450E+08	1.035323E+11
0.00037441	119345.23405	35921307.	3.187596E+08	9.594234E+10
0.00108097	147135.88374	41703346.	1.361148E+08	3.857960E+10
0.00138592	170524.69605	46427616.	1.230405E+08	3.349941E+10
0.00159227	189421.73541	50421929.	1.189631E+08	3.166663E+10
0.00176995	206284.57674	53881961.	1.165483E+08	3.044266E+10
0.00192499	221466.60015	56933925.	1.150484E+08	2.957629E+10
0.00205190	234484.41246	59664000.	1.142769E+08	2.907749E+10

K22 = abs(Shear Reaction/Top y)
K23 = abs(Shear Reaction/Top Rotation)
K32 = abs(Moment Reaction/Top y)
K33 = abs(Moment Reaction/Top Rotation)

The analysis ended normally.


Lateral Deflection (in)
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Case 2


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
4.5E4
5E4
5.5E4
6E4
6.5E4
7E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
▽ Case 1


Shear Force (kips)
-400
-350
-300
-250
-200
-150
-100
-50
0
50
100
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Case 1

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 1 - Site Information

Site ID: CTHA231A
Status: Final
Version: 9
Project Type: Anchor
Approved: 2/4/2022 1:18:01 PM
Approved By: Michael.Lucey@T-Mobile.com
Last Modified: 2/4/2022 1:18:01 PM
Last Modified By: Michael.Lucey@T-Mobile.com

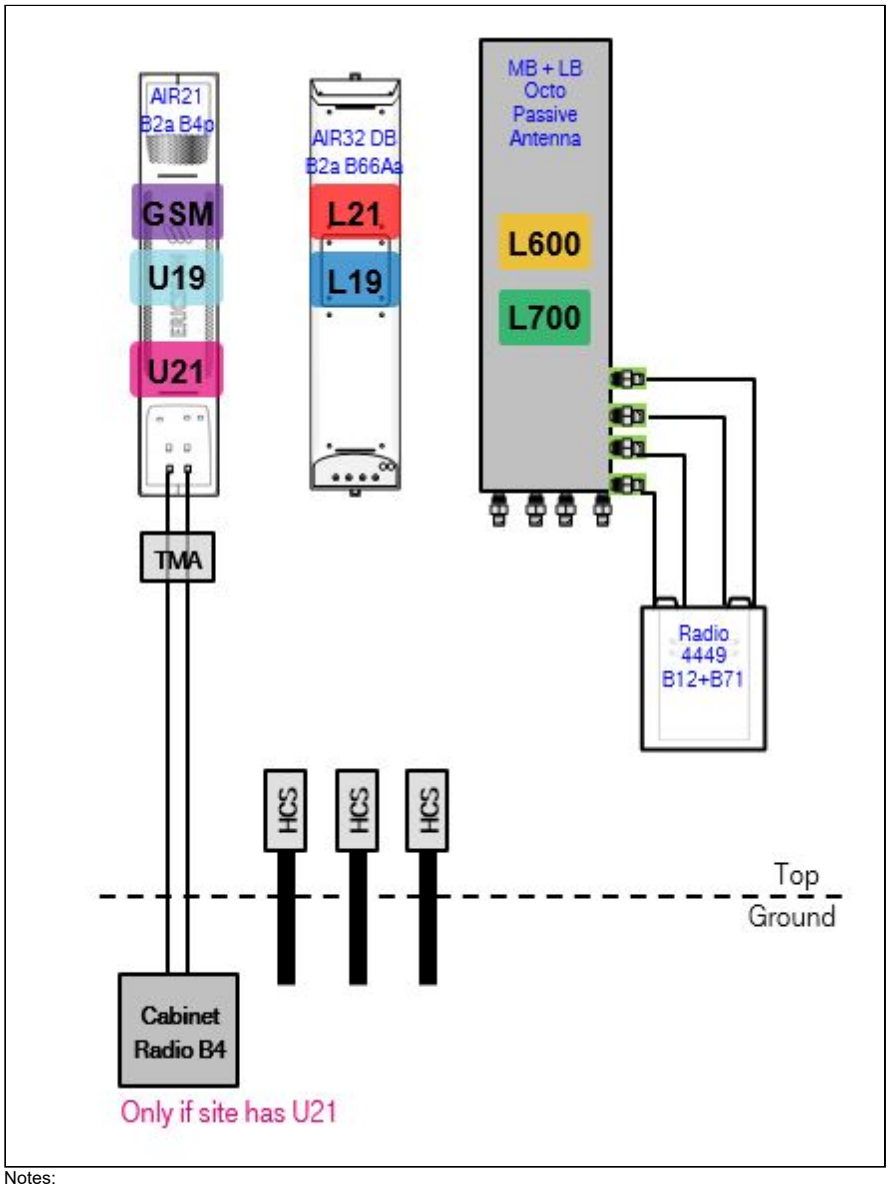
Site Name: HA231/Berlin FD Tower
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2022
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: Berlin FD

Latitude: 41.60653995
Longitude: -72.75059557
Address: 1657 Berlin Turnpike
City, State: Berlin, CT
Region: NORTHEAST

RAN Template: 67D5D3998E 6160			AL Template: 67D5998E_1xAIR+1OP	
Sector Count: 3	**Antenna Count:** 6	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 6

Section 2 - Existing Template Images

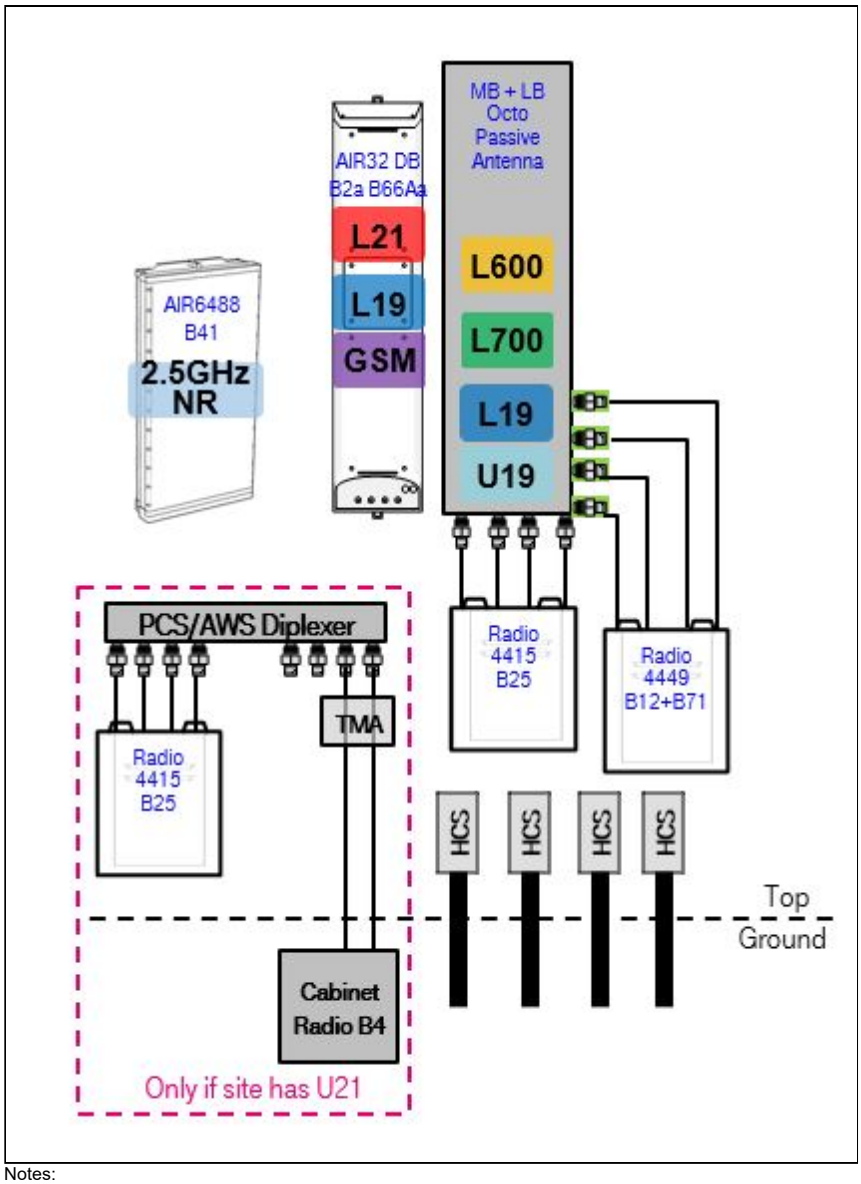
67D92DB_2xAIR+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D5997DB_2xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

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RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D92DB Outdoor

Enclosure	**1**
Enclosure Type	RBS 6131
Baseband	DUW30 [U2100] · DUG20 [G1900] · BB 6630 [L2100, L1900] · BB 6630 [L700, L600, N600]
Hybrid Cable System	Ericsson 9x18 HCS *Select Length* · Ericsson 6x12 HCS *Select Length & AWG* **(x 3)**
Radio	RUS01 B4 **(x 6)** [U2100]

Proposed RAN Equipment

Template: 67D5D3998E 6160

	1	2	3
Enclosure Type	Enclosure 6160 AC V1	B160	RBS 6601
Baseband	RP 6651 [N2500] · DUG20 [G1900] · DUW30 [U2100] · BB 6630 [L2100, L1900] · BB 6630 [L700, L600, N600] · RP 6651 [L2500]		DUG20 [G1900]
Hybrid Cable System	Ericsson Hybrid Trunk 6/24 4AWG 100m · PSU 4813 vR2A (Kit) · PSU 4813 vR4A (Kit) · Ericsson 6x12 HCS *Select Length & AWG* **(x 3)**		
Transport System	CSR IXRe V2 (Gen2)		

RAN Scope of Work:

Location of new cabinets to be determined.

Remove all cabinet radios.

Add (1) Enclosure 6160.

Add (1) Battery Cabinet B160.

Add (1) iXRe Router to new Enclosure 6160.

Add (1) BB6648 for L2500/N2500 (MMBB) to new Enclosure 6160.

Add (1) PSU4813 Voltage Booster to new Enclosure 6160.

Existing: (6) Coaxial Lines; (3) 6X12 HCS ([1] per sector)

Remove All Coaxial lines.

Add (1) 6X24 HCS terminating at the Enclosure 6160. Connect DC for the AIR6449 B41 to the PSU4813 Voltage Booster.

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 6 - A&L Equipment

Existing Template: 67D92DB_2xAIR+1OP
Proposed Template: 67D5998E_1xAIR+1OP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	30				30				30	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2			5	5
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro					
Antenna	1				2	
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)				AIR 6419 B41 (Active Antenna - Massive MIMO)	
Azimuth	30				30	
M. Tilt	0				2	
Height	160				160	
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
Active Tech.	L700 L600 N600	L700 L600 N600	G1900 L2100 L1900 U2100	G1900 L2100 L1900 U2100	N2500 L2500	N2500 L2500
Dark Tech.						
Restricted Tech.						
Decomm. Tech.						
E. Tilt	2	2	5	5	5	5
Cables	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs						
Diplexers / Combiners						
Radio	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment						

Unconnected Equipment:

Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft.

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro								
Antenna	1				2			3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)			Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	180				180			180	
M. Tilt	2				0			2	
Height	160				160			160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	2	2	2	2	2	2			2	2
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro					
Antenna	1				2	
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)				AIR 6419 B41 (Active Antenna - Massive MIMO)	
Azimuth	180				180	
M. Tilt	0				2	
Height	160				160	
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
Active Tech.	L700 L600 N600	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 G1900 U2100	L2500 N2500	L2500 N2500
Dark Tech.						
Restricted Tech.						
Decomm. Tech.						
E. Tilt	2	2	5	5	5	5
Cables	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs						
Diplexers / Combiners						
Radio	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment						

Unconnected Equipment:

Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft.

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro								
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	290				290				290	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2			5	5
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro					
Antenna	1				2	
Antenna Model	RFS - APXVAARR24_43-U-NA20 (Octo)				AIR 6419 B41 (Active Antenna - Massive MIMO)	
Azimuth	290				290	
M. Tilt	0				2	
Height	160				160	
Ports	P1	P2	P3	P4	P5	P6
Active Tech.	L700 L600 N600	L700 L600 N600	L2100 L1900 G1900 U2100	L2100 L1900 G1900 U2100	L2500 N2500	L2500 N2500
Dark Tech.						
Restricted Tech.						
Decomm. Tech.						
E. Tilt	2	2	5	5	5	5
Cables	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs						
Diplexers / Combiners						
Radio	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment						

Unconnected Equipment:

Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft. | Cable: Fiber Jumper - 15 ft.

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

RAN Template:	A&L Template:
67D5D3998E 6160	67D5998E_1xAIR+1OP

CTHA231A_Anchor_9

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 7 - Power Systems Equipment

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

	Proposed Power Systems Equipment
Enclosure	1
Enclosure Type	Enclosure 6160 AC V1

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 1 - Site Information

Site ID: CTHA231A
Status: Draft
Version: 9
Project Type: Anchor
Approved: Not Approved
Approved By: Not Approved
Last Modified: 12/9/2021 12:56:19 PM
Last Modified By: Pratik.Patil30@T-Mobile.com

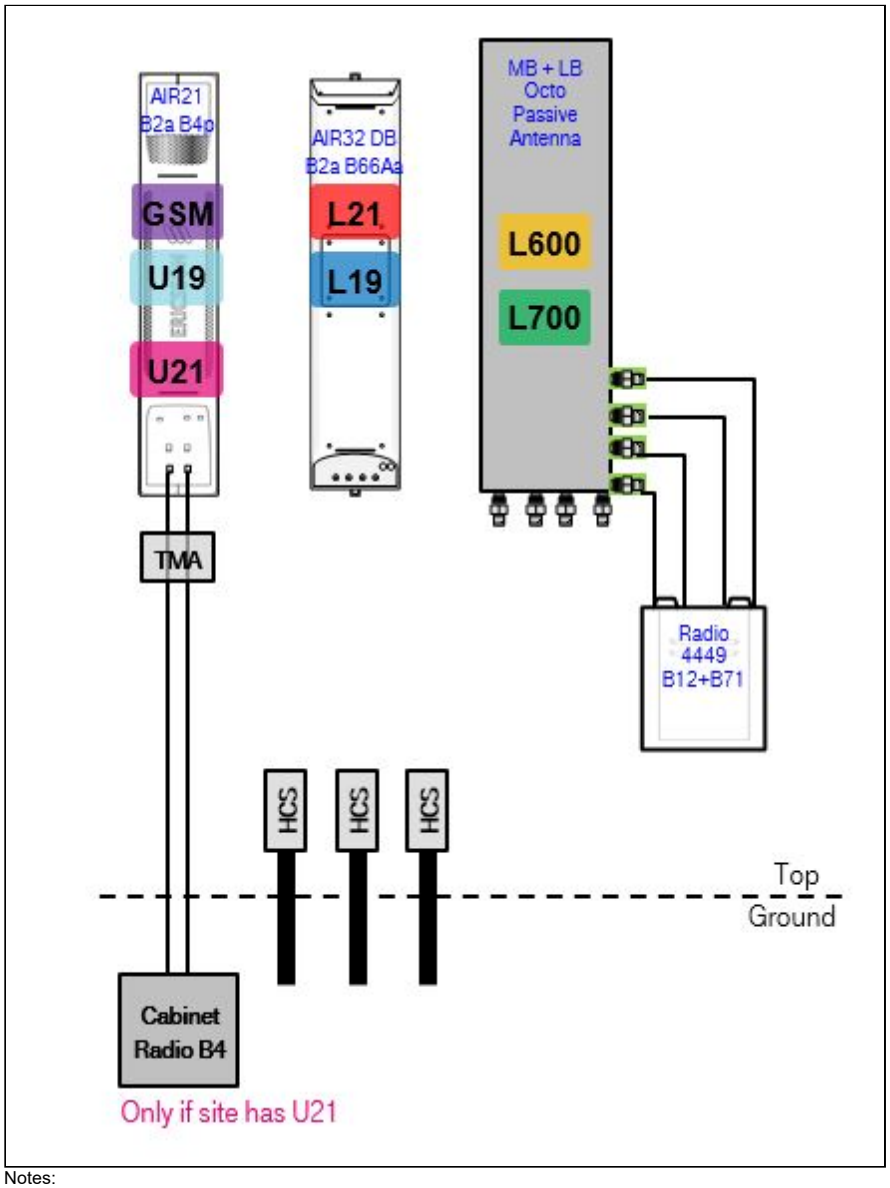
Site Name: HA231/Berlin FD Tower
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2022
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: Berlin FD

Latitude: 41.60653995
Longitude: -72.75059557
Address: 1657 Berlin Turnpike
City, State: Berlin, CT
Region: NORTHEAST

RAN Template: 67D5A997DB Outdoor			AL Template: 67D5997DB_2xAIR+1OP (U21 Market)	
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 6

Section 2 - Existing Template Images

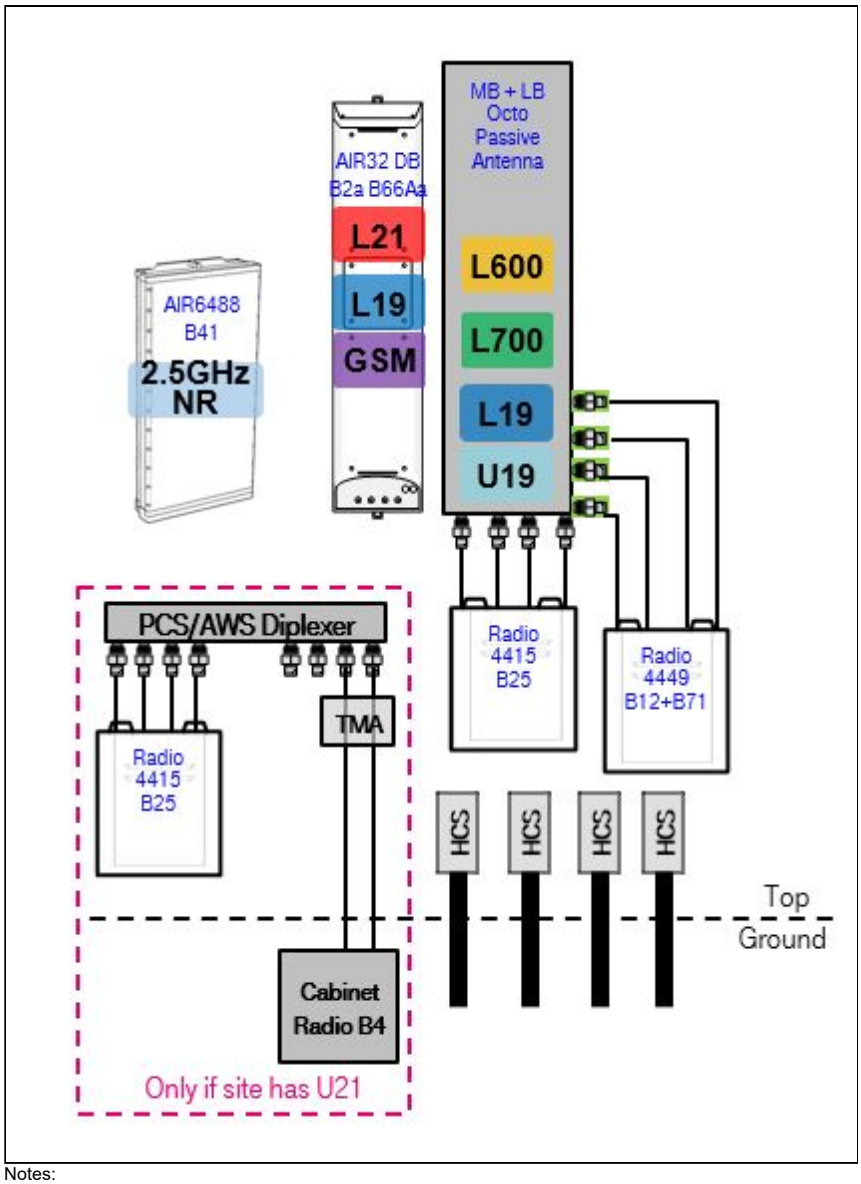
67D92DB_2xAIR+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D5997DB_2xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D92DB Outdoor

Enclosure	**1**
Enclosure Type	RBS 6131
Baseband	DUW30 (U2100); DUG20 (G1900); BB 6630 (L2100, L1900); BB 6630 (L700, L600, N600)
Hybrid Cable System	Ericsson 9x18 HCS *Select Length*; Ericsson 6x12 HCS *Select Length & AWG* **(x 3)**
Radio	RUS01 B4 **(x 6)** (U2100)

Proposed RAN Equipment

Template: 67D5A997DB Outdoor

	1	2	3
Enclosure Type	RBS 6131	Enclosure 6160 AC V1	B160
Baseband	DUW30 (U2100); DUG20 (G1900); BB 6630 (L2100, L1900); BB 6630 (L700, L600, N600)	BB 6648 (N2500, L2500)	
Hybrid Cable System	Ericsson 6x12 HCS *Select Length & AWG* **(x 3)**	Ericsson Hybrid Trunk 6/24 4AWG 100m; PSU 4813 vR2A (Kit)	
Transport System		CSR IXRe V2 (Gen2)	

RAN Scope of Work:

Location of new cabinets to be determined.

Remove all cabinet radios.

Add (1) Enclosure 6160.

Add (1) Battery Cabinet B160.

Add (1) iXRe Router to new Enclosure 6160.

Add (1) BB6648 for L2500/N2500 (MMBB) to new Enclosure 6160.

Add (1) PSU4813 Voltage Booster to new Enclosure 6160.

Existing: (6) Coaxial Lines; (3) 6X12 HCS ([1] per sector)

Remove All Coaxial lines.

Add (1) 6X24 HCS terminating at the Enclosure 6160. Connect DC for the AIR6449 B41 to the PSU4813 Voltage Booster.

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 6 - A&L Equipment

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

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	30				30				30	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2			5	5
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)	
Azimuth	30				30				30	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	G1900 L1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	N2500 L2500	N2500 L2500
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2	5	5	5	5
Cables	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs										
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	180				180				180	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	2	2	2	2	2	2			2	2
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)	
Azimuth	180				180				180	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900 G1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	L2500 N2500	L2500 N2500
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	2	2	2	2	2	2	2	2	2	2
Cables	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs										
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)	
Azimuth	290				290				290	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600			U2100	G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2			5	5
Cables	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.				1-5/8" Coax - 170 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs									Generic Twin Style 1B - AWS (AtAntenna)	
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Add handrail kit.

Replace LB Dual in Position 2 with (1) LB/MB Octo.
Replace RRUS11 B12 with (1) Radio 4449 B71+B12 for L600 and L700.
Replace AIR21 B2P/B4A in Position 1 with (1) AIR32 DB for L1900 and L2100.

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1				2				3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)				RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)	
Azimuth	290				290				290	
M. Tilt	2				0				2	
Height	160				160				160	
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2100	L2100	L1900 G1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	L2500 N2500	L2500 N2500
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt	5	5	5	5	2	2	5	5	5	5
Cables	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. Coax Jumper	Fiber Jumper - 15 ft. **(x2)**	Fiber Jumper - 15 ft. **(x2)**
TMAs										
Diplexers / Combiners										
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)		
Sector Equipment										

Unconnected Equipment:

Scope of Work:

Remove all Coaxial lines.

Remove all TMA's.

Add (1) Radio 4460 B25+B66 for L1900 2nd Carrier and U2100 to Position 2 near antenna,

Remove AIR21 B2A/B4P from Position 3.

Install (1) AIR6449 B41 for L2500 and N2500 in Position 3.

Move GSM to AIR32 Dual Band antenna in Position 1. GSM will share B2 radios with L1900 1st Carrier.

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

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

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

CTHA231A_Anchor_9_draft

Print Name: Preliminary (RFDS_Corrections)
PORs: Anchor_Phase 3

Section 7 - Power Systems Equipment

Existing Power Systems Equipment
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	Proposed Power Systems Equipment
Enclosure	1
Enclosure Type	Enclosure 6160 AC V1

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: CTHA231A

HA231/Berlin FD Tower
1657 Berlin Turnpike
Berlin, Connecticut 06037

April 7, 2022

EBI Project Number: 6222002440

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**28.61%**

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

April 7, 2022

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

Emissions Analysis for Site: CTHA231A - HA231/Berlin FD Tower

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **1657 Berlin Turnpike** in **Berlin, 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 1657 Berlin Turnpike in Berlin, Connecticut using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report, the sample point is the top of a 6-foot person standing at the base of the tower.

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

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

2) 1 NR channel (600 MHz Band) was considered for each sector of the proposed installation. This Channel has a transmit power of 80 Watts.

3) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

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

5) 2 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) 1 LTE Traffic channel (LTE 1C and 2C BRS Band - 2500 MHz) was considered for each sector of the proposed installation. This Channel has a transmit power of 60 Watts.

9) 1 LTE Broadcast channel (LTE 1C and 2C BRS Band - 2500 MHz) was considered for each sector of the proposed installation. This Channel has a transmit power of 20 Watts.

10) 1 NR Traffic channel (BRS Band - 2500 MHz) was considered for each sector of the proposed installation. This Channel has a transmit power of 120 Watts.

11) 1 NR Broadcast channel (BRS Band - 2500 MHz) was considered for each sector of the proposed installation. This Channel has a transmit power of 40 Watts.

12) 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.

13) 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.

14) The antennas used in this modeling are the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz channel(s), the Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz channel(s) in Sector A, the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz channel(s), the Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz channel(s) in Sector B, the RFS APXVAARR24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz channel(s), the Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 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.

15) The antenna mounting height centerline of the proposed antennas is 160 feet above ground level (AGL).

16) 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.

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

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz / 1900 MHz / 1900 MHz / 2100 MHz / 2100 MHz
Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd / 16.35 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd / 16.35 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.35 dBd / 15.65 dBd / 15.65 dBd / 16.35 dBd / 16.35 dBd
Height (AGL):	160 feet	Height (AGL):	160 feet	Height (AGL):	160 feet
Channel Count:	15	Channel Count:	15	Channel Count:	15
Total TX Power (W):	620.00 Watts	Total TX Power (W):	620.00 Watts	Total TX Power (W):	620.00 Watts
ERP (W):	20,641.14	ERP (W):	20,641.14	ERP (W):	20,641.14
Antenna A1 MPE %:	**3.98%**	Antenna B1 MPE %:	**3.98%**	Antenna C1 MPE %:	**3.98%**
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	Ericsson AIR 6419	Make / Model:	Ericsson AIR 6419	Make / Model:	Ericsson AIR 6419
Frequency Bands:	2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz
Gain:	22.05 dBd / 15.55 dBd / 22.05 dBd / 15.55 dBd	Gain:	22.05 dBd / 15.55 dBd / 22.05 dBd / 15.55 dBd	Gain:	22.05 dBd / 15.55 dBd / 22.05 dBd / 15.55 dBd
Height (AGL):	160 feet	Height (AGL):	160 feet	Height (AGL):	160 feet
Channel Count:	4	Channel Count:	4	Channel Count:	4
Total TX Power (W):	240.00 Watts	Total TX Power (W):	240.00 Watts	Total TX Power (W):	240.00 Watts
ERP (W):	31,011.95	ERP (W):	31,011.95	ERP (W):	31,011.95
Antenna A2 MPE %:	**4.70%**	Antenna B2 MPE %:	**4.70%**	Antenna C2 MPE %:	**4.70%**

Site Composite MPE %	
Carrier	**MPE %**
T-Mobile (Max at Sector A):	8.68%
Various Others	0.28%
Sprint	2.56%
Clearwire	0.09%
AT&T	1.65%
Verizon	15.35%
Site Total MPE % :	28.61%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	8.68%
T-Mobile Sector B Total:	8.68%
T-Mobile Sector C Total:	8.68%
Site Total MPE % :	28.61%

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	591.73	160.0	1.79	600 MHz LTE	400	0.45%
T-Mobile 600 MHz NR	1	1577.94	160.0	2.39	600 MHz NR	400	0.60%
T-Mobile 700 MHz LTE	2	648.82	160.0	1.97	700 MHz LTE	467	0.42%
T-Mobile 1900 MHz GSM	4	1101.85	160.0	6.68	1900 MHz GSM	1000	0.67%
T-Mobile 1900 MHz LTE	2	2203.69	160.0	6.68	1900 MHz LTE	1000	0.67%
T-Mobile 2100 MHz UMTS	2	1294.56	160.0	3.92	2100 MHz UMTS	1000	0.39%
T-Mobile 2100 MHz LTE	2	2589.11	160.0	7.85	2100 MHz LTE	1000	0.78%
T-Mobile 2500 MHz LTE 1C & 2C Traffic	1	9619.47	160.0	14.58	2500 MHz LTE 1C & 2C Traffic	1000	1.46%
T-Mobile 2500 MHz LTE 1C & 2C Broadcast	1	717.84	160.0	1.09	2500 MHz LTE 1C & 2C Broadcast	1000	0.11%
T-Mobile 2500 MHz NR Traffic	1	19238.94	160.0	29.16	2500 MHz NR Traffic	1000	2.92%
T-Mobile 2500 MHz NR Broadcast	1	1435.69	160.0	2.18	2500 MHz NR Broadcast	1000	0.22%
						Total:	**8.68%**

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

Summary

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

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

T-Mobile Sector	Power Density Value (%)
Sector A:	8.68%
Sector B:	8.68%
Sector C:	8.68%
T-Mobile Maximum MPE % (Sector A):	8.68%
Site Total:	28.61%
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **28.61%** 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.