1 NDUSTRIAL AVE,
S TE 3
N HWAH NJ 07430

P NE: 201.684.0055
F : 201.684.0066

Transcend Wireless

May 13th, 2022

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

RE: Notice of Exempt Modification
227 Boom Bridge Road, North Stonington, CT 06359
Latitude: 41.42879694
Longitude: -71.80907720
T-Mobile Site#: CT11048A - Anchor

Dear Ms. Bachman:

T-Mobile currently maintains nine (9) antennas at the 120-foot level of the existing 180-foot guyed tower at 227 Boom Bridge Road, North Stonington, CT. The 180-foot guyed tower is owned by Wireless Solutions LLC. The property is owned by David Babcock Lewis LLC. T-Mobile now intends to remove and replace (6) antennas. These antennas will support 5G services.

Planned Modifications:
Tower:
Install New:
(3) Ericsson AIR 6419 B41 Antennas
(3) Commscope VV-65A-R1 Antennas
(3) Radio 4480 B25 B66
(1) 6x24 Hybrid Cables
To Remain:
(3) RFS APXVAALL24 Antennas
(3) Radio 4449 B71 B85
To Be Removed:
(6) AIR21 Antennas
(3) KRY 112 144/1 TMAs
(1) 9x18 Hybrid Cables
All existing coax cables

Ground:
Install (1) 6160 Power Enclosure
Install (1) B160 Battery Cabinet

This facility was approved by the Town of North Stonington Zoning and Building Official in 1997 (Building Permit No. 97-012). The proposed modification complies with the original approval.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to First Selectman Bob Carlson, Elected Official, and Nathan Reichert, Planning Development and Zoning Official for the Town of North Stonington, 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: Bob Carlson - First Selectman of North Stonington
Nathan Reichert - Planning Development and Zoning Official for North Stonington
Lewis David Babcock LLC - Property Owner
Wireless Solutions - Tower Owner

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS

1 OF 1

SHIP TO:
NATHAN REICHERT
40 MAIN STREET
NORTH STONINGTON CT 06359

CT 063 0-02

UPS GROUND
TRACKING #: 1Z V25 742 03 9132 2840

BILLING: P/P

Reference #1: CT11048A

XOL 22.04.20 NV45 20.0A 05/2022*

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS

1 OF 1

SHIP TO:
BOB CARLSON
40 MAIN STREET
NORTH STONINGTON CT 06359

CT 063 0-02

UPS GROUND
TRACKING #: 1Z V25 742 03 9238 4835

BILLING: P/P

Reference #1: CT11048A

XOL 22.04.20 NV45 20.0A 05/2022*

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS **1 OF 1**

SHIP TO:
LEWIS DAVID BABCOCK LLC
273 BOOMBRIDGE ROAD
NORTH STONINGTON CT 06359

CT 063 0-02

UPS GROUND
TRACKING #: 1Z V25 742 03 9630 8240

BILLING: P/P

Reference #1: CT11048A

XOL 22.04.20 NV45 20.0A 05/2022*

ERIC BREUN
2016587728
1 INTERNATIONAL BLVD.
MAHWAH NJ 07495

1 LBS **1 OF 1**

SHIP TO:
KEN THOMAS
WIRELESS SOLUTIONS
53 BECKWITH HILL DRIVE
SALEM CT 06420

CT 063 0-01

UPS GROUND
TRACKING #: 1Z V25 742 03 9046 4850

BILLING: P/P

Reference #1: CT11048A

XOL 22.04.20 NV45 20.0A 05/2022*

Hello, your package has been delivered.

Delivery Date: Wednesday, 05/11/2022

Delivery Time: 10:21 AM

Signed by: PANCARO

TRANSCEND WIRELESS

Tracking Number:	1ZV257420391322840
Ship To:	NATHAN REICHERT 40 MAIN STREET NORTH STONINGTON, CT 06359 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CT11048A

Hello, your package has been delivered.

Delivery Date: Wednesday, 05/11/2022

Delivery Time: 10:21 AM

Signed by: PANCARO

TRANSCEND WIRELESS

Tracking Number:	1ZV257420392384835
Ship To:	BOB CARLSON 40 MAIN STREET NORTH STONINGTON, CT 06359 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CT11048A

Hello, your package has been delivered.

Delivery Date: Wednesday, 05/11/2022

Delivery Time: 12:32 PM

Signed by: LEWIS

TRANSCEND WIRELESS

Tracking Number:	1ZV257420396308240
Ship To:	LEWIS DAVID BABCOCK LLC 273 BOOMBRIDGE ROAD NORTH STONINGTON, CT 06359 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CT11048A

Hello, your package has been delivered.

Delivery Date: Wednesday, 05/11/2022

Delivery Time: 12:54 PM

Left At: GARAGE

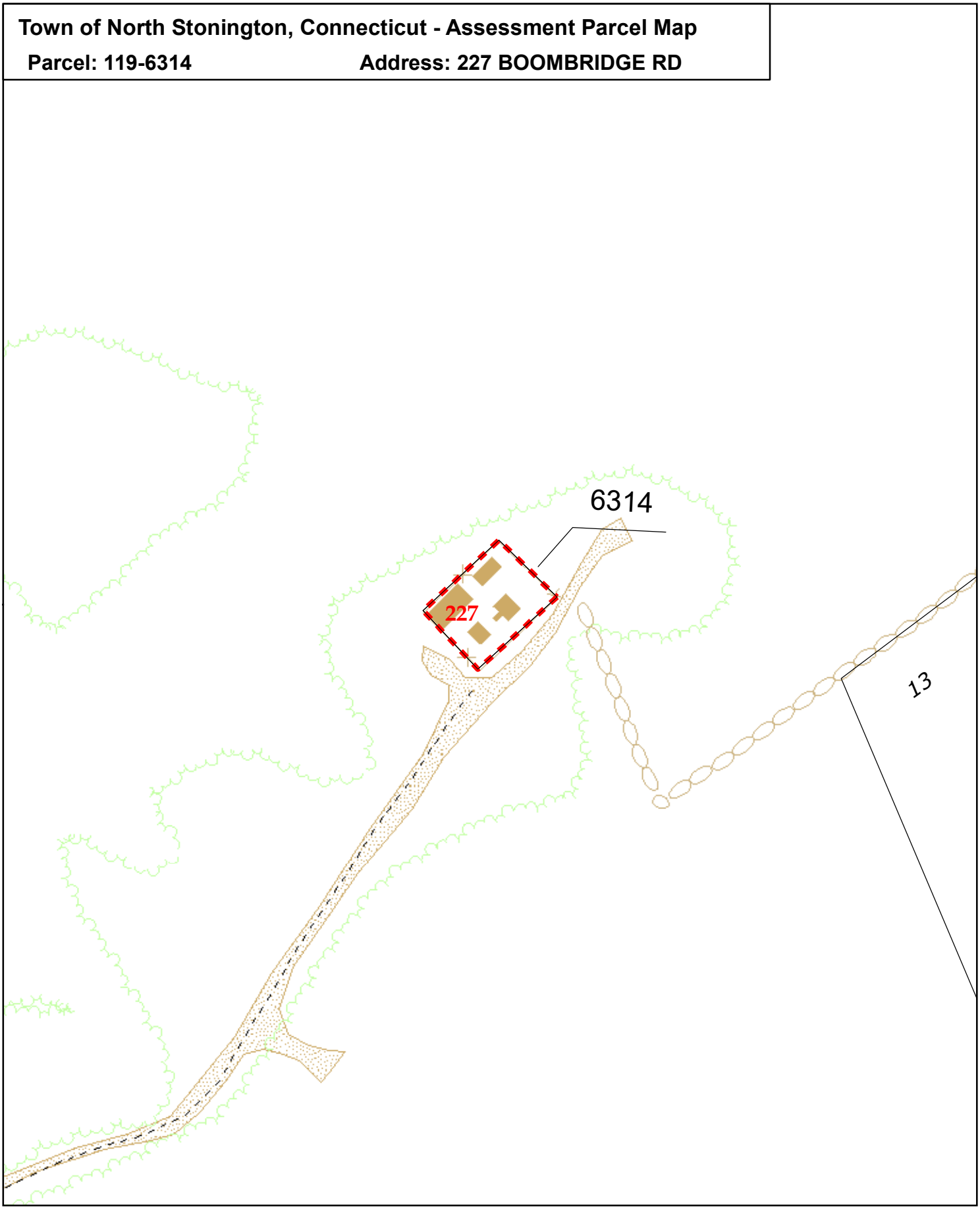
Set Delivery Instructions | Manage Preferences

TRANSCEND WIRELESS

Tracking Number:	1ZV257420390464850
Ship To:	WIRELESS SOLUTIONS 53 BECKWITH HILL DRIVE SALEM, CT 06420 US
Number of Packages:	1
UPS Service:	UPS Ground
Package Weight:	1.0 LBS
Reference Number:	CT11048A

Town of North Stonington, Connecticut - Assessment Parcel Map

Parcel: 119-6314 **Address: 227 BOOMBRIDGE RD**



Approximate Scale: 1:1,200

0 20 40 80 120 160 Feet

Map Produced June 2020

Town of North Stonington, CT

Property Listing Report | Map Block Lot **119 6314** | Building # | Unique Identifier **L9857560**

Property Information

Property Location	227 BOOMBRIDGE RD
Mailing Address	273 BOOMBRIDGE RD NORTH CT 06359
Land Use	Cell Tower
Zoning Code	R60
Neighborhood	C120

Owner	LEWIS DAVID BABCOCK LLC
Co-Owner	
Book / Page	0140/0513
Land Class	Vacant Land
Census Tract	7071
Acreage	1.38

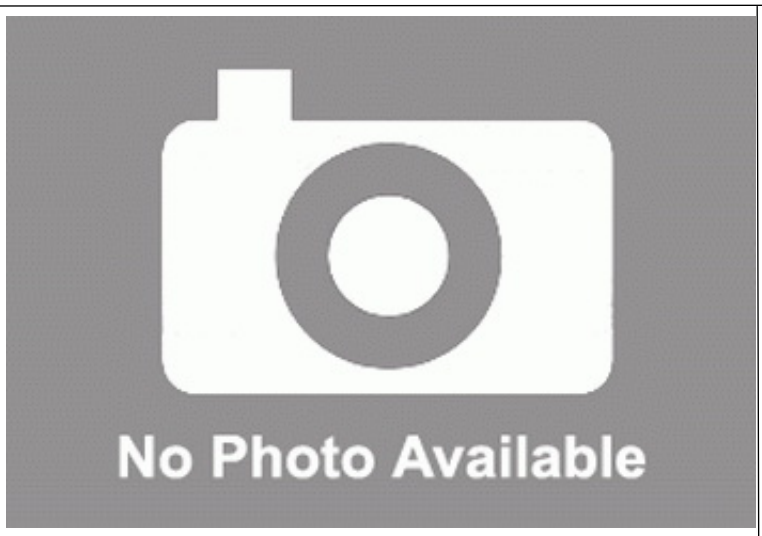
Valuation Summary

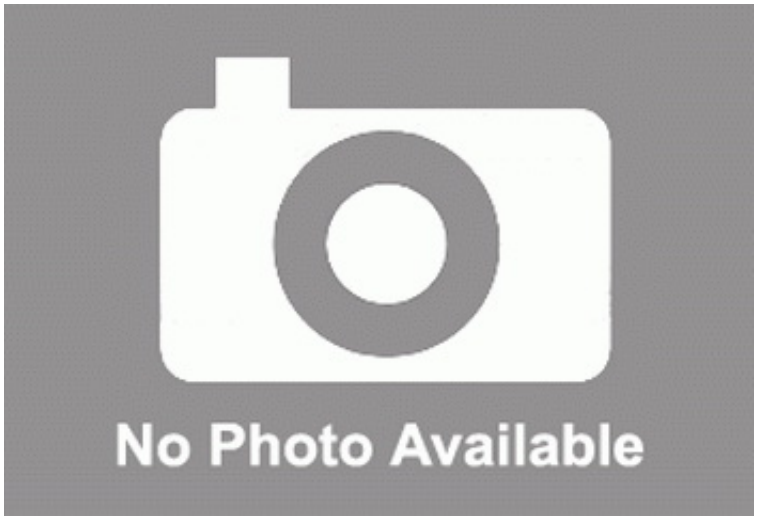
(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	0	0
Outbuildings	0	0
Land	444000	310800
Total	444000	310800

Utility Information

Electric	No
Gas	No
Sewer	No
Public Water	No
Well	No





Primary Construction Details

Year Built		Heating Fuel		Building Use	
Building Desc.		Heating Type		Building Condition	
Building Style		AC Type		Frame Type	
Stories		Bedrooms		Fireplaces	
Exterior Walls		Full Bathrooms		Bsmt Gar	
Exterior Walls 2		Half Bathrooms		Fin Bsmt Area	
Interior Walls		Extra Fixtures		Fin Bsmt Quality	
Interior Walls 2		Total Rooms		Building Grade	
Interior Floors 1		Bath Style		Roof Style	
Interior Floors 2		Kitchen Style		Roof Cover	
		Occupancy			

Report Created On **5/10/2022**

Town of North Stonington, CT

Property Listing Report | Map Block Lot **119 6314** | Building # | Unique Identifier **L9857560**

Detached Outbuildings

Type	Description	Area (sq ft)	Condition	Year Built

Attached Extra Features

Type	Description	Area (sq ft)	Condition	Year Built

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
LEWIS DAVID BABCOCK LLC	0140_0513	12/28/2001	0
LEWIS ROSALIND M	0126_0960	8/5/1999	0
LEWIS DAVID B EST & ROSALIND M	0116_0313	10/15/1997	0
LEWIS DAVID B & ROSALIND M	0032_0296	6/9/1964	0

Report Created On **5/10/2022**

Town of North Stonington

Building Permit

Date: Feb 5 1987 Permit Number: 87002

Expiration Date of Permit: Feb 5 1988

Number of Stories: 0 [illegible] (Proposed Use)

Location: [illegible]

Zoning District: R-60

Subdivision: _____ Lot _____ Map. _____

I HEREBY CERTIFY THAT THE PROPOSED WORK IS AUTHORIZED BY THE OWNER OF RECORD AND I HAVE BEEN AUTHORIZED BY THE OWNER TO MAKE THIS APPLICATION AS HIS OR HER AUTHORIZED AGENT.

Signature of Authorized Agent _____

Address _____

_____ License Number: _____

Area in Square Feet: [illegible]

Estimated Cost of Construction: $2,000 Permit Fee: $25.00

Owner: David Lewis

Address: [illegible]

Building Official: [illegible] Date: 2-5-87

Copy Distribution

White - Applicant Canary - File Pink - Assessor

SITE NAME: NORTHSTONINGTON/CDT_1

SITE ID: CT11048A

174 BOOMBRIDGE RD
NORTH STONINGTON, CT 06359

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

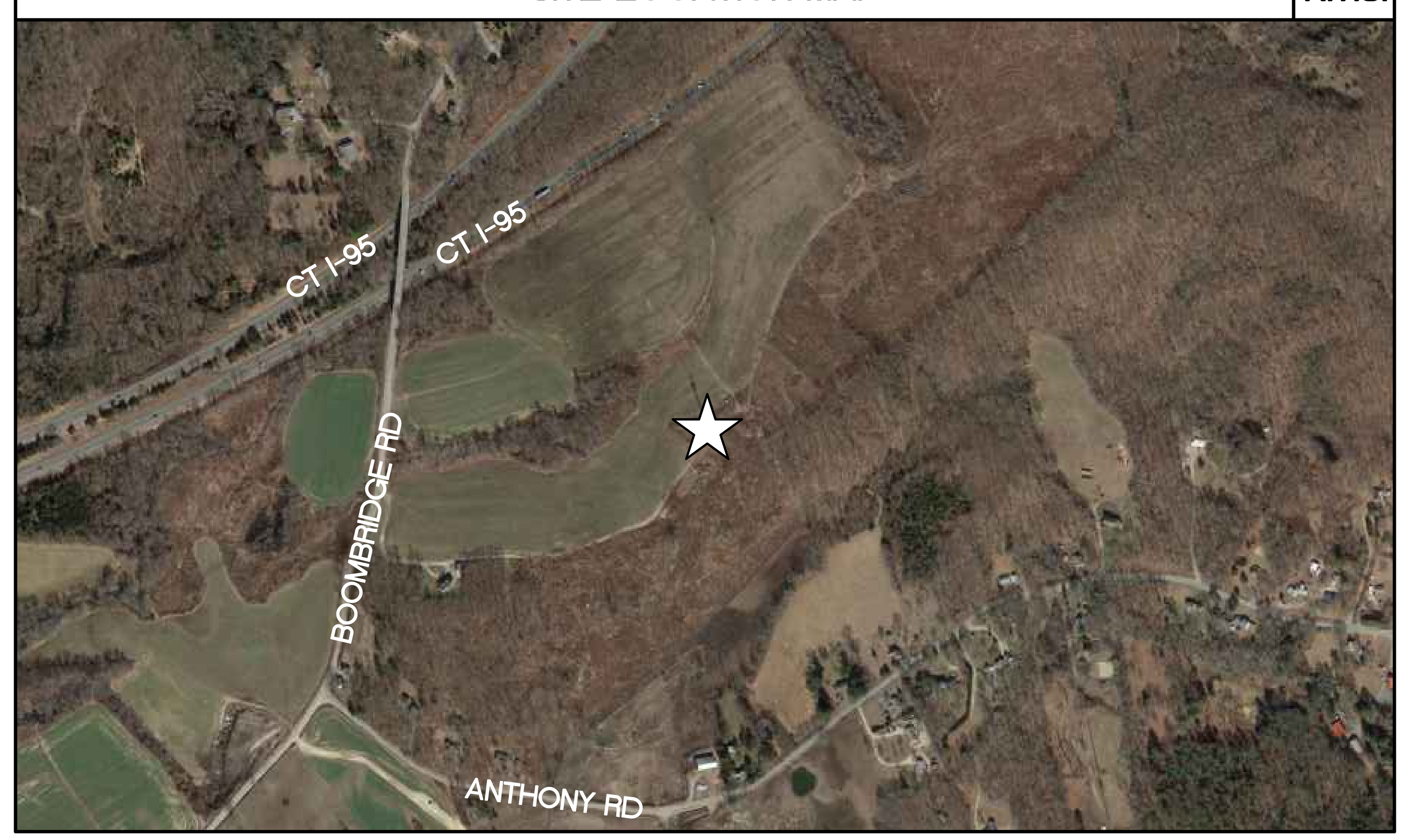
T-MOBILE RAN TEMPLATE (PROVIDED BY RFDS)
67D5D998E 6160

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.

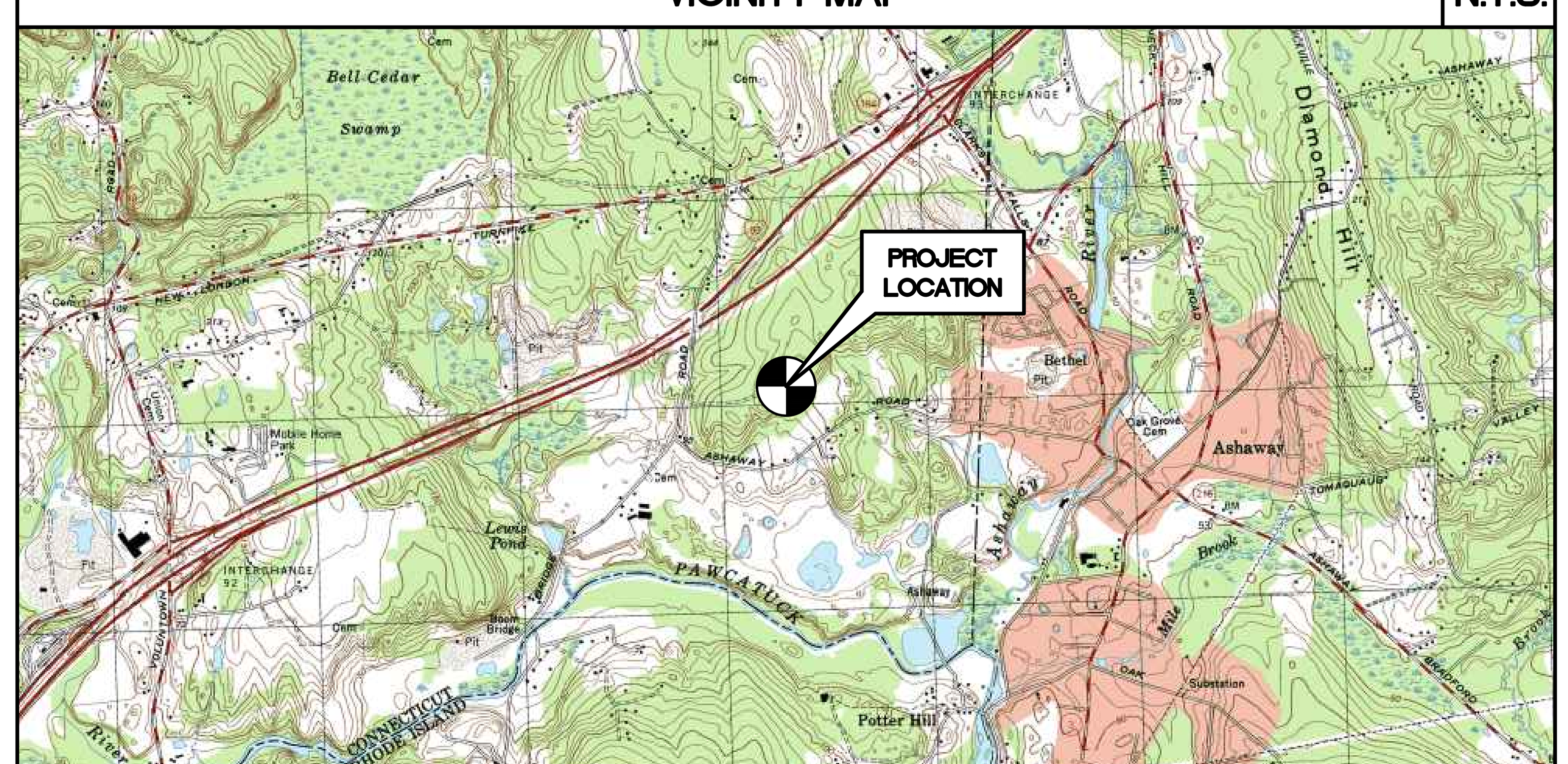
SITE LOCATION MAP

N.T.S.



VICINITY MAP

N.T.S.



COORDINATES AND GROUND ELEVATION ARE REFERENCED FROM GOOGLE EARTH.

SITE COORDINATES: LATITUDE: 41°-25'-43" N
LONGITUDE: 71°-48'-32" W
GROUND ELEVATION: ±190' AMSL

NORTH

PROJECT SUMMARY

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

1. REMOVE EXISTING COAX CABLES
2. REMOVE EXISTING CHAIN LINK FENCE AND ACCESS GATE
3. REMOVE (1) 9x18 HYBRID CABLE
4. REMOVE ALL TMAS AND DIPLEXERS
5. REMOVE EXISTING AIR21 KRC118023-1_B2A_B4P ANTENNA, TYP. (1) PER SECTOR, TOTAL OF (3)
6. REMOVE EXISTING AIR21 B4A/B2P ANTENNA, TYP. (1) PER SECTOR, TOTAL OF (3)
7. INSTALL (1) 6x24 HYBRID CABLE
8. INSTALL ERICSSON: AIR6419 B41 ANTENNA, TYP. (1) PER SECTOR, TOTAL OF (3)
9. INSTALL COMMSCOPE: VV-65A-R1 ANTENNA, TYP. (1) PER SECTOR, TOTAL OF (3)
10. INSTALL ERICSSON: RADIO 4460 B25+B66, TYP. (1) PER SECTOR, TOTAL OF (3)
11. INSTALL T-MOBILE 6160 POWER ENCLOSURE
12. INSTALL T-MOBILE B160 BATTERY CABINET
13. INSTALL NEW 100A CIRCUIT BREAKER TO SERVE NEW EQUIPMENT
14. INSTALL 4'x7' CONCRETE PAD ON GRADE

PROJECT INFORMATION

SITE NAME:	NORTHSTONINGTON/CDT_1
SITE ID:	CT11048A
SITE ADDRESS:	174 BOOMBRIDGE NORTH STONINGTON, CT 06359
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°-25'-43" N LONGITUDE: 71°-48'-32" W GROUND ELEVATION: ±190' AMSL SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

REV.	DATE	DRAWN BY	CHECKED BY	DESCRIPTION
0	04/27/22	JLD	TJR	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

T-Mobile · Transcend Wireless

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

T-MOBILE NORTHEAST LLC
SITE NAME: NORTHSTONINGTON/CDT_1
SITE ID: CT11048A
174 BOOMBRIDGE RD
NORTH STONINGTON, CT 06359

DATE:	03/14/22
SCALE:	AS NOTED
JOB NO.	22022.04

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: 105 MPH (Vult)
  (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.
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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/APPURTENANCE SCHEDULE

SECTOR	EXISTING/PROPOSED	ANTENNA	SIZE (INCHES) (L x W x D)	ANTENNA ℄ HEIGHT	AZIMUTH	(E/P) RRU (QTY)	(E/P) TMA (QTY)	(QTY) PROPOSED HYBRID/COAX
A1	PROPOSED	ERICSSON (AIR6419 B41)	33 x 16 x 9	120'	40°			(1) 6x24 HYBRID CABLE
A2	PROPOSED	COMMSCOPE (VV-65A-R1)	54.7 x 12.1 x 4.6	120'	40°	(P) RADIO 4460 B25+B66 (1)		
A3	EXISTING	RFS (APXVAALL24_43-U_NA20)	72 x 24 x 8.5	120'	40°	(E) RADIO 4449 B71+B12 (1)		
B1	PROPOSED	ERICSSON (AIR6419 B41)	33 x 16 x 9	120'	140°			
B2	PROPOSED	COMMSCOPE (VV-65A-R1)	54.7 x 12.1 x 4.6	120'	140°	(P) RADIO 4460 B25+B66 (1)		
B3	EXISTING	RFS (APXVAALL24_43-U_NA20)	72 x 24 x 8.5	120'	140°	(E) RADIO 4449 B71+B12 (1)		
C1	PROPOSED	ERICSSON (AIR6419 B41)	33 x 16 x 9	120'	260°			
C2	PROPOSED	COMMSCOPE (VV-65A-R1)	54.7 x 12.1 x 4.6	120'	260°	(P) RADIO 4460 B25+B66 (1)		
C3	EXISTING	RFS (APXVAALL24_43-U_NA20)	72 x 24 x 8.5	120'	260°	(E) RADIO 4449 B71+B12 (1)		

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

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SITE ID: CT11048A
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NORTH STONINGTON, CT 06359

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SCALE: AS NOTED
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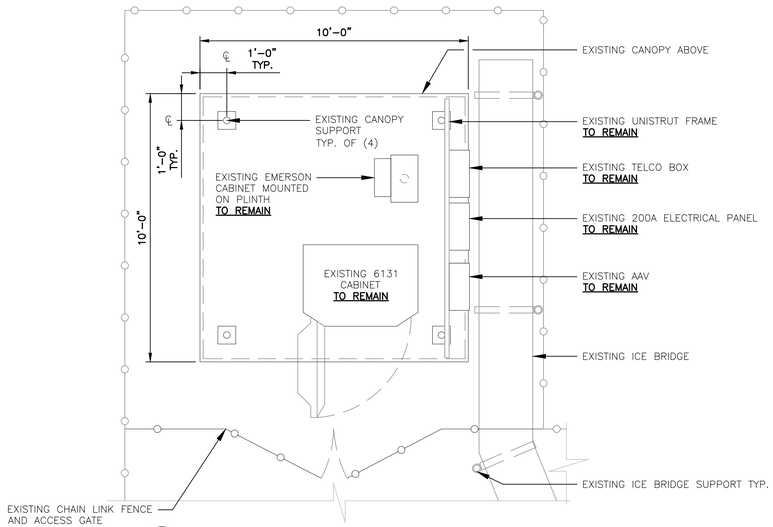
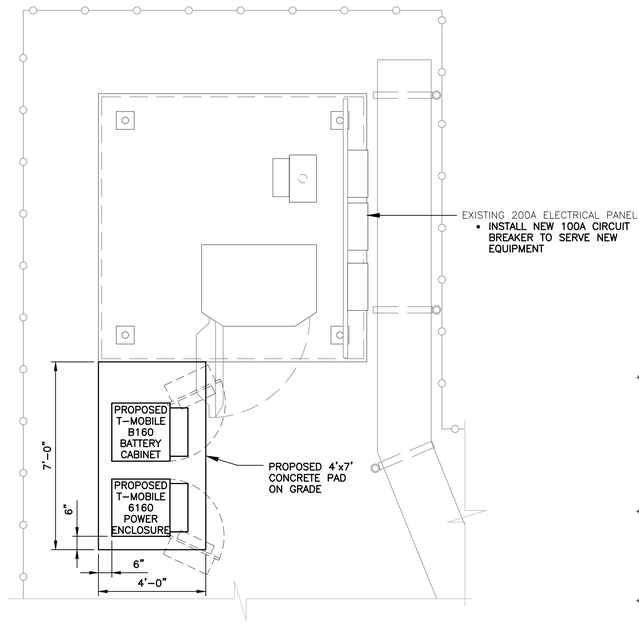
NOTES AND SPECIFICATIONS, ANT. SCHEDULE

N-1

SHEET NO. 2 OF 8



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



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

STRUCTURAL COMPLIANCE

ANTENNA MOUNTS

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

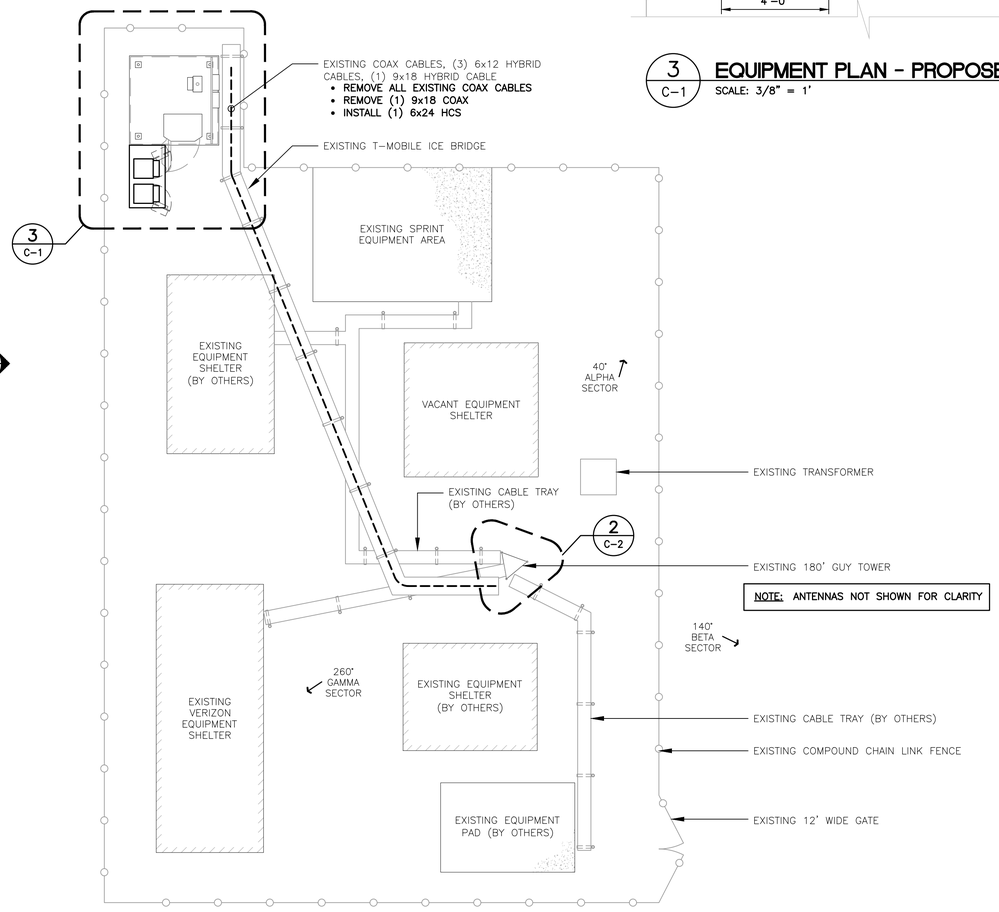
REFER TO THE ANTENNA MOUNT ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 22022.04) DATED 05/06/22 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TOWER AND TOWER FOUNDATION

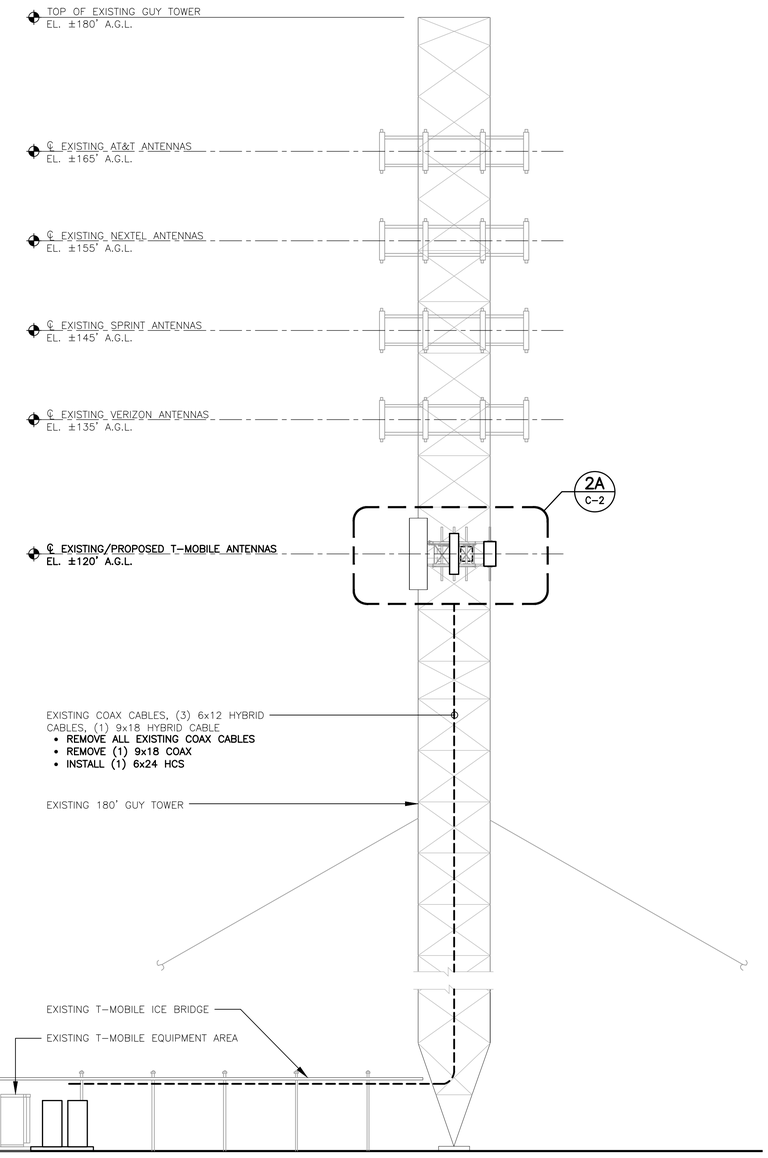
A STRUCTURAL ANALYSIS OF THE TOWER AND TOWER FOUNDATION WAS PERFORMED FOR THE PROPOSED EQUIPMENT INSTALLATION AND THEY WERE FOUND TO BE STRUCTURALLY SUFFICIENT TO ACCOMMODATE THE PROPOSED LOADING.

REFER TO THE STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 22022.04) DATED 05/06/22 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.



1 C-1 **COMPOUND PLAN - PROPOSED** TRUE NORTH
SCALE: 1" = 8'



4 C-1 **WEST TOWER ELEVATION - PROPOSED**
SCALE: 1" = 8'

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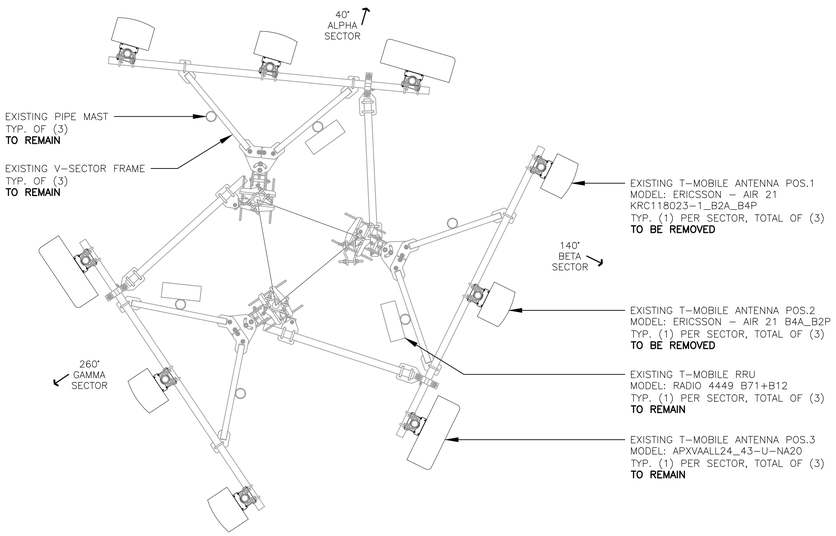
COMPOUND PLAN, EQUIPMENT PLANS, AND ELEVATION

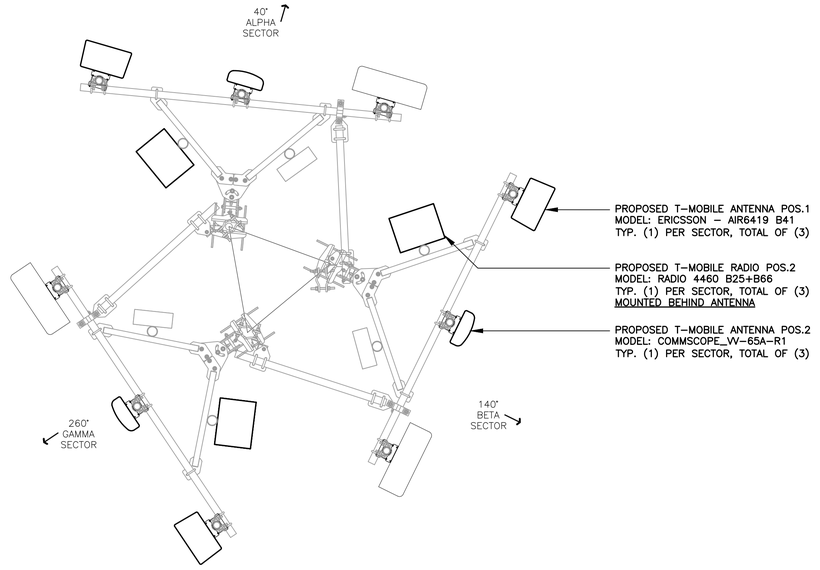
C-1

SHEET NO. 3 OF 8



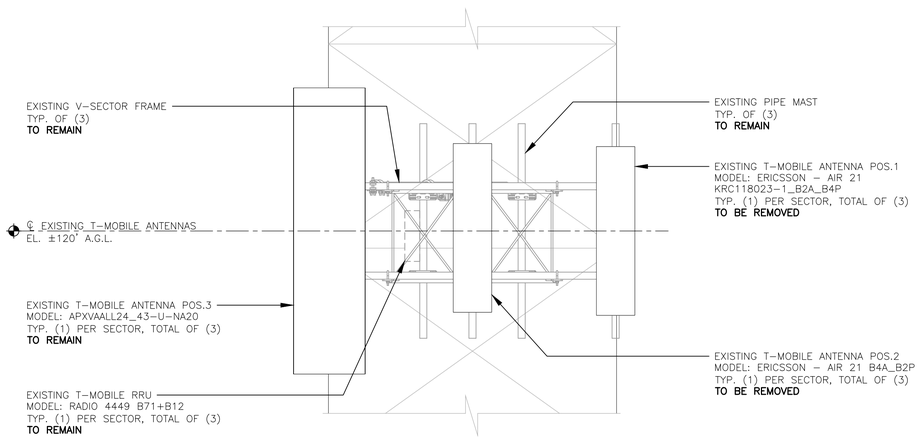
1 C-2 **ANTENNA PLAN - EXISTING** TRUE NORTH

SCALE: 1/2" = 1'



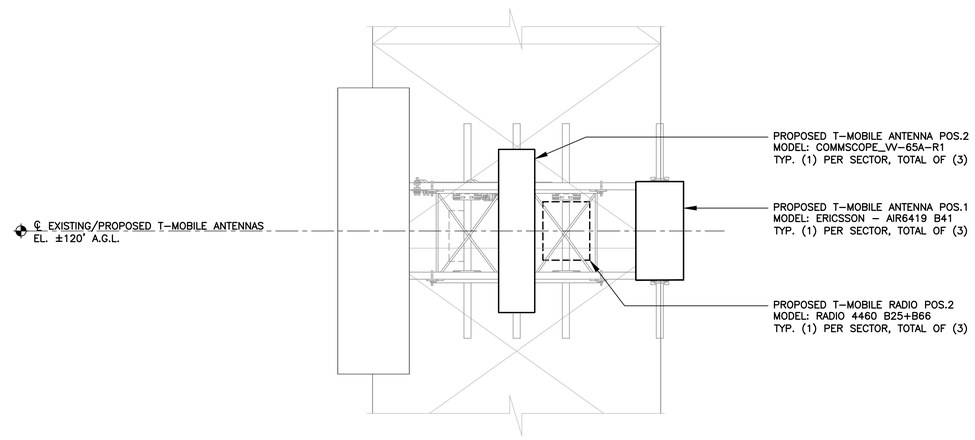
2 C-2 **ANTENNA PLAN - PROPOSED** TRUE NORTH

SCALE: 1/2" = 1'



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

SCALE: 1/2" = 1'



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

SCALE: 1/2" = 1'

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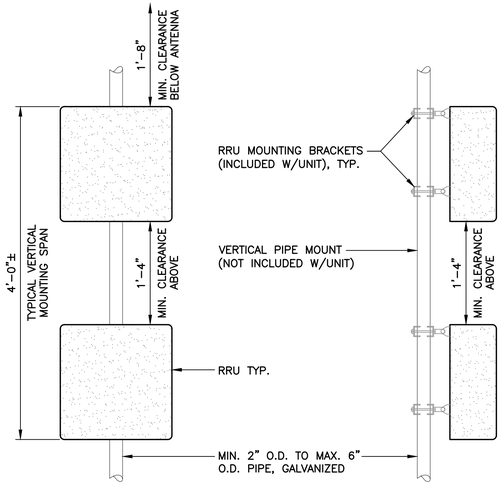
ANTENNA PLANS AND ELEVATIONS

C-2

SHEET NO. 4 OF 8



FRONT ELEVATION

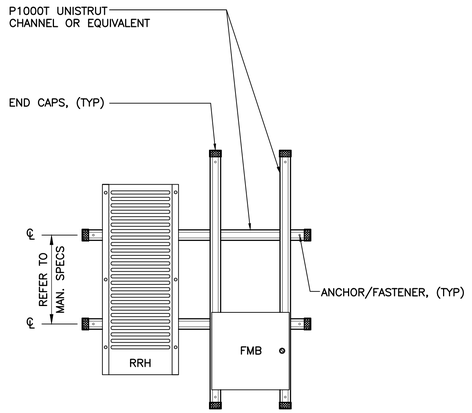
SIDE ELEVATION

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



FRONT ELEVATION

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

VV-65A-R1

ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ERICSSON MODEL: AIR6419 B41	33"L x 16"W x 9"D	±41 LBS.
MAKE: COMMSCOPE MODEL: VV–65A–R1	54.7"L x 12.08"W x 4.6"D	±23 LBS.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.		

2 C–3 PROPOSED ANTENNA DETAIL

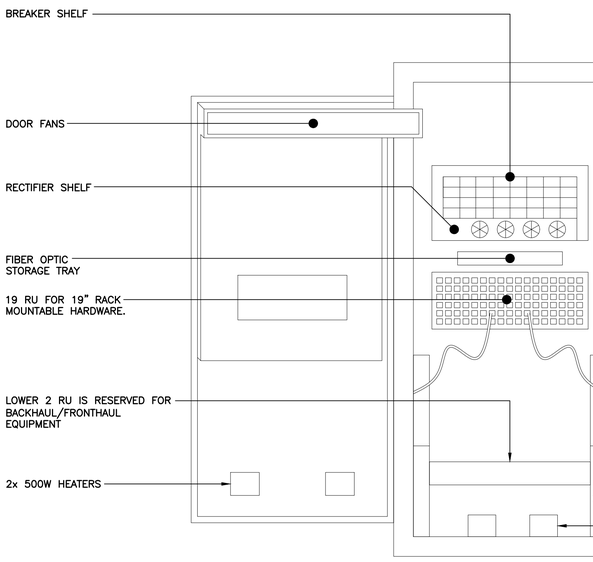
SCALE: NOT TO SCALE

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

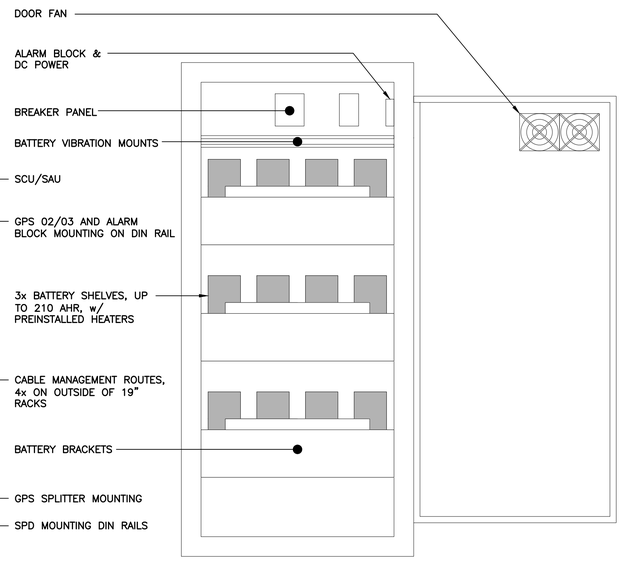
SCALE: NOT TO SCALE



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

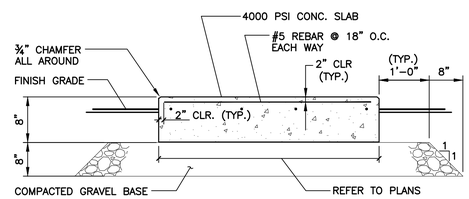
SCALE: NOT TO SCALE



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



6 C–3 TYPICAL CONCRETE PAD DETAIL

SCALE: NOT TO SCALE

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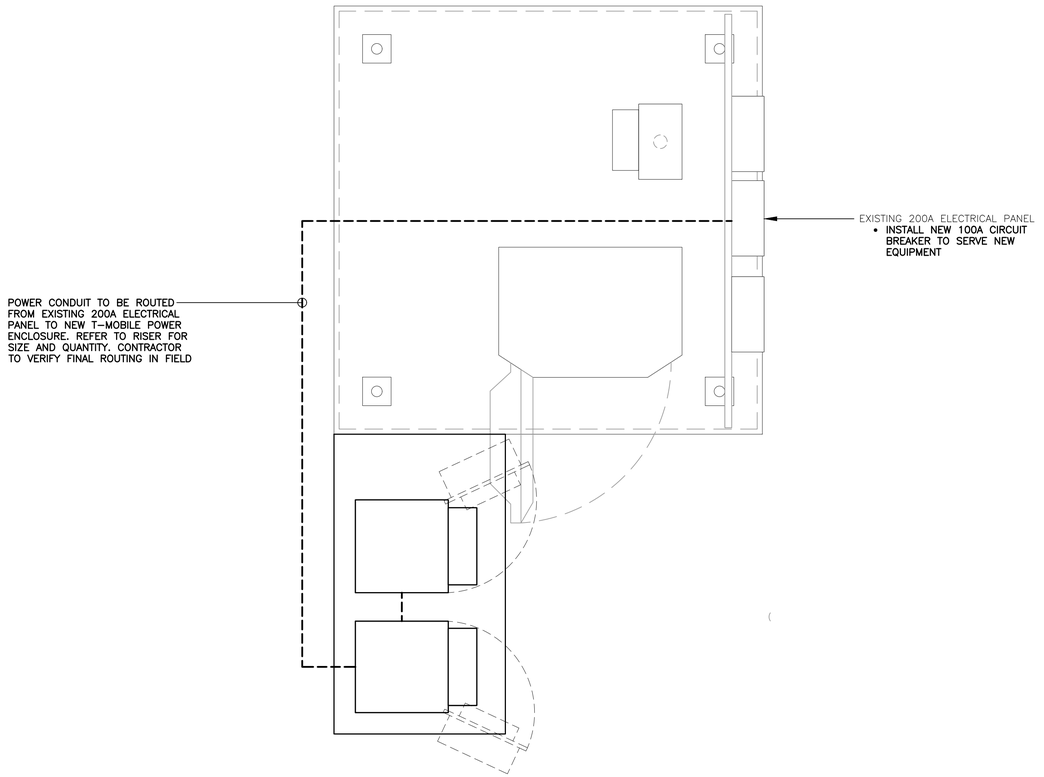
TYPICAL EQUIPMENT DETAILS

C-3

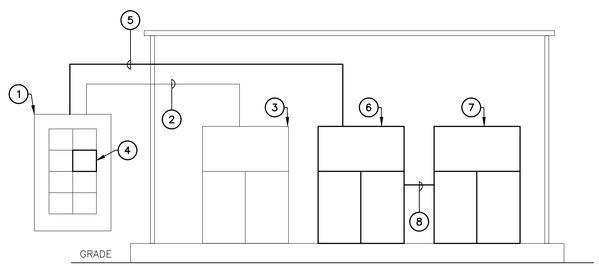
SHEET NO. 5 OF 8



1 / E–1 **ELECTRICAL CONDUIT ROUTING PLAN**
SCALE: 1/4" = 1'

RISER DIAGRAM NOTES

1. EXISTING 200A, 120/240V, SINGLE PHASE, ELECTRICAL PANEL TO REMAIN.
2. EXISTING CONDUITS AND CONDUCTORS TO REMAIN.
3. EXISTING EQUIPMENT CABINET TO REMAIN.
4. NEW 100A/2P CIRCUIT BREAKER TO SERVE NEW EQUIPMENT CABINET.
5. (3) #1 AWG, (1) #8 AWG GROUND, 1–1/2" CONDUIT.
6. NEW RADIO EQUIPMENT CABINET.
7. NEW BATTERY CABINET.
8. DC CONDUIT AND CONDUCTORS FOR BATTERY CABINET CONNECTION PER MANUFACTURERS SPECIFICATIONS.



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

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SITE ID: CT11048A
174 BOOMBRIDGE RD
NORTH STONINGTON, CT 06359

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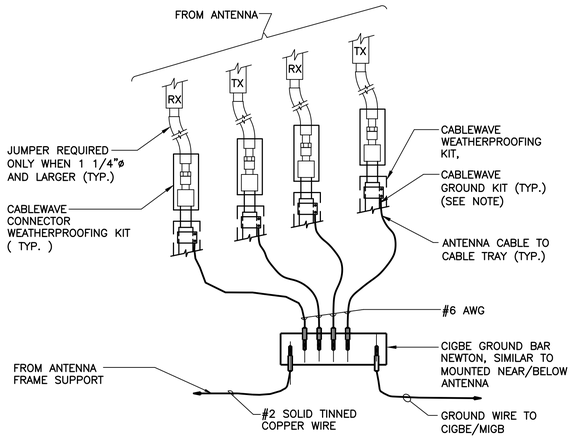
ELECTRICAL DIAGRAM AND CONDUIT ROUTING

E-1

SHEET NO. 6 OF 8

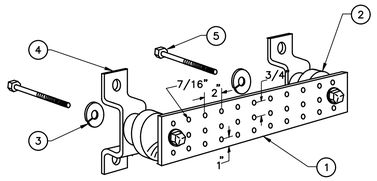


NOTES:

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

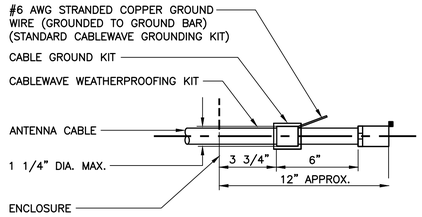


NOTES

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

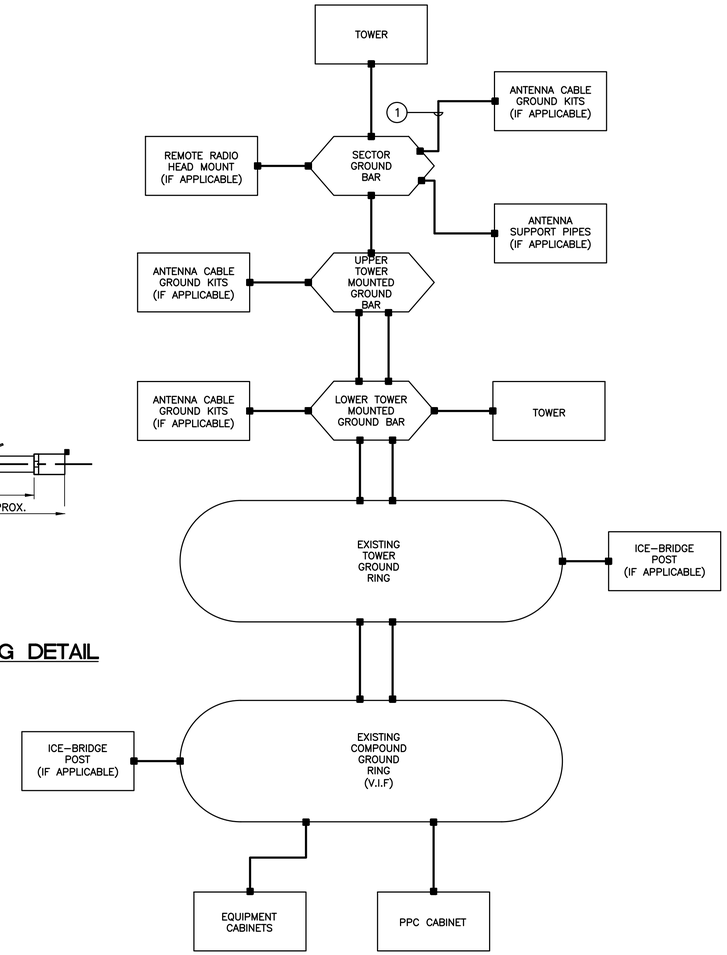


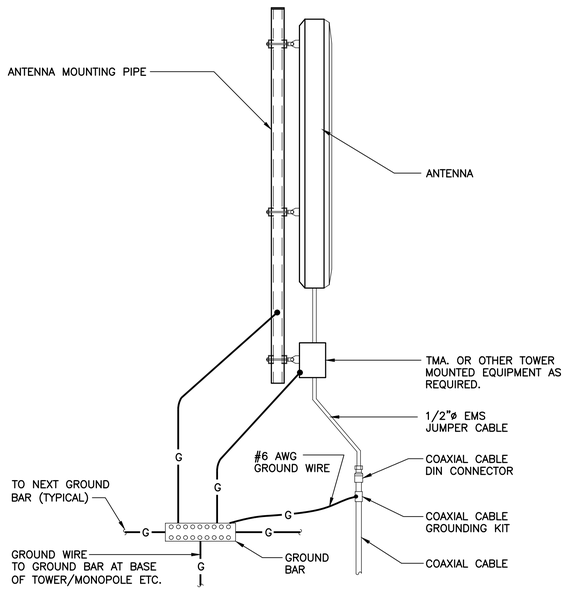
NOTES:

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

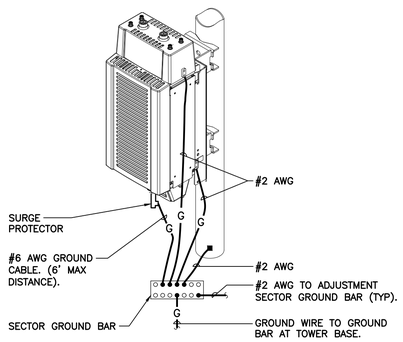




4 E-2 TYPICAL ANTENNA GROUNDING DETAIL

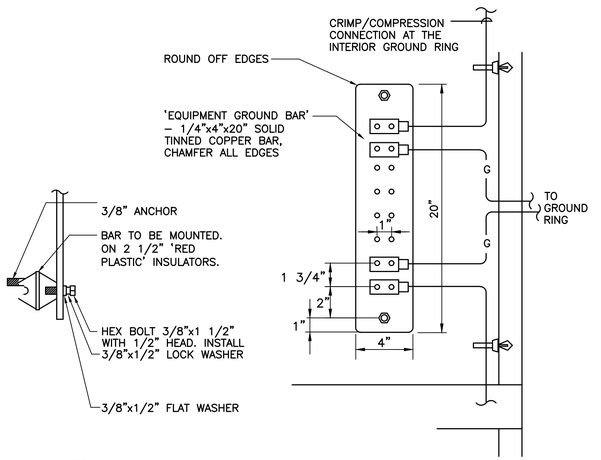
SCALE: NOT TO SCALE

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

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TYPICAL ELECTRICAL 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

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CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing Guyed Lattice Tower

Proposed T-Mobile
Antenna Modification

T-Mobile Site Ref: CT11048A

174 Boom Bridge Road,
North Stonington, CT

Centek Project No. 22022.04

Date: May 6, 2022

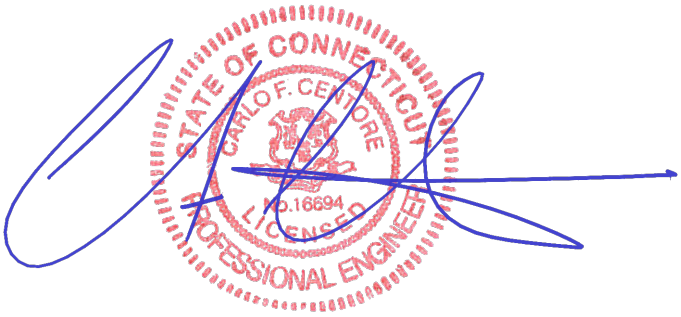

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Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by T-Mobile on the existing guyed lattice tower located in North Stonington, CT.

The host tower is a 180-ft, three face, guyed steel lattice tower originally manufactured by UNR ROHN circa 1997; job no. 33353PH. The tower geometry and structure member information was obtained from UNR-ROHN assembly drawing D951097, file no. 33353PH dated November 10, 1997. Subsequent tower reinforcement design information was obtained from a structural analysis and reinforcement design report prepared for Verizon Wireless by Centek Engineering, dated December 1, 2011. Guy anchor foundation information was obtained from the standard UNR-ROHN foundation drawing no. C620643, dated August 18, 1977.

Antenna and appurtenance information were obtained from a structural analysis report prepared byTectonic; job no. 9927.CT11048A, dated October 13, 2020, a structural analysis report prepared by Centek Engineering; job no. 11079.00 dated December 13, 2011, and an RF data sheet provided by T-Mobile, dated March 2, 2022.

The tower consists of ten (10) vertical sections constructed of steel pipe legs conforming to ASTM A572-50. Diagonal and horizontal lateral support bracing consists of a combination of steel angle and steel pipe construction conforming to ASTM A36 and ASTM A53-B-42. The vertical tower sections are connected by bolted flange plates with the diagonal and horizontal bracing to pipe legs consisting of bolted connections. The width of the tower face is 3.42-ft throughout its length with the exception of a 5'-0" high tapered base section.

Antenna and Appurtenance Summary

The existing tower supports several communication antennas. The existing and proposed loads considered in the analysis consist of the following:

- AT&T (Existing):
  Antennas: Three (3) Powerwave 7770, three (3) CCI TPA-65RLCUUUU-H8, two (2) Powerwave P65-17-XLH-RR, one (1) Commscope SBNH-1D6565C, three (3) Ericsson RRUS-11, three (3) Ericsson 4415 B25, six (6) Kaelus DBC0061F1V51-2 and three (3) TMAs mounted on three (3) existing 15-ft ROHN boom gates with a RAD center elevation of ±180-ft above the existing tower base.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax, one (1) fiber trunk and one (1) DC trunk cables running on the leg/face(s) of the existing tower as specified within Section 3 of this report.

- SPRINT (Existing):
  Antennas: Three (3) Commscope NNVV-65B-R4, three (3) RFS APXVTM14, six (6) FD-RRH 2X50 800, three (3) FD-RRH 4X45 1900, three (3) TD-RRH 8X20-25 mounted on three (3) existing 15-ft ROHN boom gates with a RAD center elevation of ±152-ft above the existing tower base.
  Coax Cables: Six (6) 1-5/8" ∅ coax and four (4) 1-5/8" ∅ hybriflex cables running on a leg/face of the existing tower as specified within Section 3 of this report.

- VERIZON (Existing):
  Antennas: Six (6) Antel LPA 80080/4CF, six (6) Qunitel QS6656-5D, three (3) Samsung B2/B66A and three (3) Samsung B5/B13 mounted on three (3) SitePro VFA12-HD 12-ft V-Frames with a RAD center elevation of ±136-ft above the existing tower base.
  Coax Cables: Six (6) 1-5/8" ∅ coax and two (2) 1-5/8" ∅ hybriflex cables running on a leg/face of the existing tower as specified within Section 3 of this report.

- SPRINT (Existing):
  Antennas: One (1) GPS antenna mounted on a 1-ft stand-off frame with a RAD center elevation of ±98-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the face of the existing tower as specified within Section 3 of this report.

- T-MOBILE (Existing to be removed):
  Antennas: Three (3) Ericsson AIR21 KRC118023-1_B2A_B4P panel antennas and three (3) Ericsson AIR21 B4A_B2P panel antennas with a RAD center elevation of ±120-ft above the existing tower base.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and one (1) 9x18 hybrid cable running on a leg/face of the existing tower as specified within Section 3 of this report.

- T-MOBILE (Existing to remain):
  Antennas: Three (3) RFS APXVAALL24-43-U-NA20 panel antennas and three (3) Ericsson 4449 B71+B12 remote radio units with a RAD center elevation of ±120-ft above the existing tower base.
  Coax Cables: Three (3) 6x12 hybrid cables running on a leg/face of the existing tower as specified within Section 3 of this report.

- **T-MOBILE (Proposed):**
  Antennas: Three (3) Ericsson AIR6419 B41 panel antennas, three (3) Commscope VV-65A-R1 panel antennas and three (3) Ericsson 4460 B25+B66 remote radio heads mounted on three (3) existing 15-ft ROHN boom gates with a RAD center elevation of ±120-ft above the existing tower base.
  Coax Cables: One (1) 6x24 hybrid cable running on a leg/face of the existing tower as specified within Section 3 of this report.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	North Stonington v = 105 mph (3 second gust)	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 105 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

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

Tower Capacity

- Calculated stresses were found to be within allowable limits. This tower was found to be at **89.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T8)	20' - 40'	82.0%	**PASS**
Diagonal (T5)	80' - 100'	80.1%	**PASS**
Bottom Girt (T9)	5' - 20'	89.7%	**PASS**
Guy A (T3)	132.159'	71.6%	**PASS**
Bolt Check	-	89.7%	**PASS**

Foundations and Anchorage

The existing tower base foundation, type CB No. 9, consists of a 2-ft square pedestal with a 6-ft square reinforced concrete pad bearing directly on the existing sub grade, obtained from the standard ROHN 'Concrete Base Foundation Schedule', drawing No. C610621, dated January 9, 1985. The reinforced concrete anchor support blocks at the 142-ft guy radius were based on the typical ROHN 10a foundation and the reinforced concrete anchor support blocks at the 162-ft radius were based on the ROHN 10e foundation. The guy anchor foundation information was obtained from ROHN drawing No. C620643, dated August 18, 1977. Three (3) additional guy anchor foundations consistent of 12'x6'x4' reinforced concrete blocks were installed at a 100-ft guy radius. Reinforcement information was attained from construction drawings prepared by Centek Engineering, job no. 11079, dated December 13, 2011.

The worst case tower base and guy anchor reactions developed from the governing Load Case were used in the verification of the anchorage foundations:

Tower Guy Reactions			
Vector	**Inner** (100' Rad.)	**Center** (142' Rad.)	**Outer** (162' Rad.)
Horizontal (In Plane of GW)	28 kips	27 kips	12 kips
Horizontal (Out of Plane of GW)	0 kips	1 kips	0 kips
Vertical	20 kips	28 kips	12 kips
Resultant Force at end of Guy Wire	34 kips	39 kips	17 kips

Tower Base Reactions	
Vector	**Proposed Reaction**
Horizontal Shear	2 kips
Axial Compression	183 kips

Foundation	Design Limit	TIA-222-G Section 9.4 FS(1)	Proposed Loading (FS)(1)	Result
Reinf. Conc. Anchor Block (C) at 142-ft radius.	Uplift	1.0	2.15	**PASS**
	Sliding	1.0	1.2	**PASS**
		Ultimate Bearing	**Proposed**	
Base Foundation	Bearing	12.0 ksf	5.25 ksf	**PASS**

Conclusion

This analysis shows that the subject tower **is structurally 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:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Pablo Perez-Gomez
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.

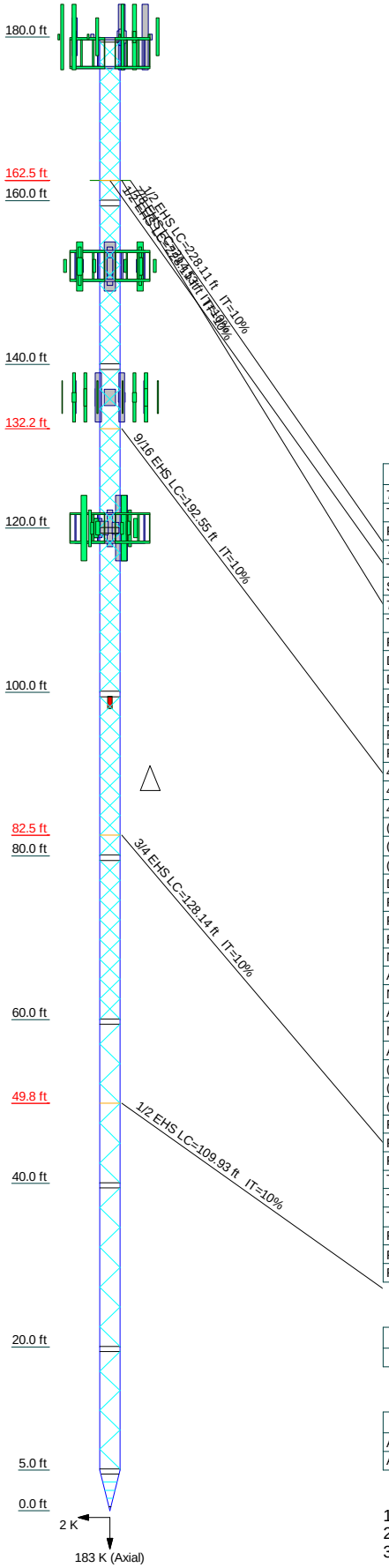
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

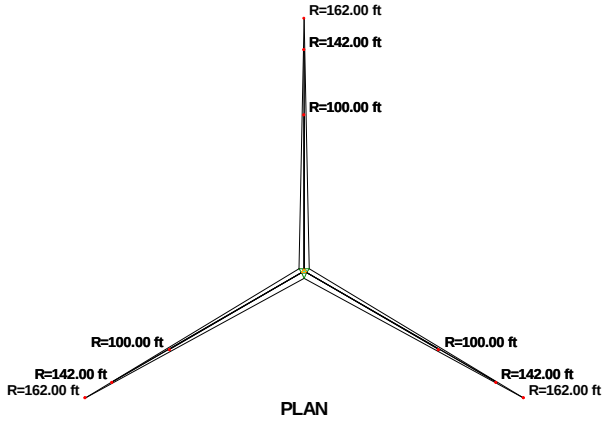
TnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, TnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

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	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	
Legs	ROHN 2.5 X-STR										1.7
Leg Grade	A572-50										
Diagonals		ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x16 ga		N.A.	L2x2x1/4
Diagonal Grade	A53-B-42									N.A.	A36
Top Girts		ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x16 ga		A	L2x2x1/4
Bottom Girts		ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x11 ga	ROHN TS1.5x16 ga	ROHN TS1.5x16 ga	L3x3x1/2	A	L2x2x1/4
Horizontals	N.A.									A	
Top Guy Pull-Offs	2L2x2x1/4x3/8	N.A.	4x3/8	N.A.	2L2x2x1/4x3/8	N.A.	4x3/8	N.A.			
Face Width (ft)	3.417										
# Panels @ (ft)	64 @ 2.40885								6 @ 2.37847	5 @ 1	0.3
Weight (K)		0.9	0.8	0.9	0.8	0.9	0.7	0.6	0.5		8.1





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
7770.00 (ATT)	180	LPA-80080/4CF (Verizon)	136
TPA-65R-LCUUUU-H8 (ATT)	180	QS6656-5D (Verizon)	136
P65-17-XLH-RR (ATT)	180	QS6656-5D (Verizon)	136
7770.00 (ATT)	180	LPA-80080/4CF (Verizon)	136
TPA-65R-LCUUUU-H8 (ATT)	180	LPA-80080/4CF (Verizon)	136
SBNH-1D6565C (ATT)	180	QS6656-5D (Verizon)	136
7770.00 (ATT)	180	QS6656-5D (Verizon)	136
TPA-65R-LCUUUU-H8 (ATT)	180	LPA-80080/4CF (Verizon)	136
P65-17-XLH-RR (ATT)	180	LPA-80080/4CF (Verizon)	136
DTMABP7819VG12A TMA (ATT)	180	QS6656-5D (Verizon)	136
DTMABP7819VG12A TMA (ATT)	180	QS6656-5D (Verizon)	136
DTMABP7819VG12A TMA (ATT)	180	LPA-80080/4CF (Verizon)	136
RRUS-11 (ATT)	180	B2/B66A RRH (Verizon)	136
RRUS-11 (ATT)	180	B2/B66A RRH (Verizon)	136
RRUS-11 (ATT)	180	B2/B66A RRH (Verizon)	136
4415 B25 (ATT)	180	B5/B13 RRH (Verizon)	136
4415 B25 (ATT)	180	B5/B13 RRH (Verizon)	136
4415 B25 (ATT)	180	B5/B13 RRH (Verizon)	136
(2) DBC0061F1V51-2 (ATT)	180	DB-T1-6Z-8AB-0Z (Verizon)	136
(2) DBC0061F1V51-2 (ATT)	180	SitePro VFA12-HD (Verizon)	136
(2) DBC0061F1V51-2 (ATT)	180	SitePro VFA12-HD (Verizon)	136
DC6-48-60-18-8F Surge Arrestor (ATT)	180	SitePro VFA12-HD (Verizon)	136
ROHN 6'x15' Boom Gate (1) (ATT)	178	APXVAALL24-43 (T-Mobile)	120
ROHN 6'x15' Boom Gate (1) (ATT)	178	APXVAALL24-43 (T-Mobile)	120
ROHN 6'x15' Boom Gate (1) (ATT)	178	APXVAALL24-43 (T-Mobile)	120
NNVV-65B-R4 (Sprint)	152	VV-65A-R1 (T-Mobile)	120
APXVTM14 (Sprint)	152	VV-65A-R1 (T-Mobile)	120
NNVV-65B-R4 (Sprint)	152	VV-65A-R1 (T-Mobile)	120
APXVTM14 (Sprint)	152	AIR6419 (T-Mobile)	120
NNVV-65B-R4 (Sprint)	152	AIR6419 (T-Mobile)	120
APXVTM14 (Sprint)	152	AIR6419 (T-Mobile)	120
(2) FD-RRH 2x50 800 (Sprint)	152	4460 B25+B66 (T-Mobile)	120
(2) FD-RRH 2x50 800 (Sprint)	152	4460 B25+B66 (T-Mobile)	120
(2) FD-RRH 2x50 800 (Sprint)	152	4460 B25+B66 (T-Mobile)	120
FD-RRH 4x45 1900 (Sprint)	152	4449 B5/B12 (T-Mobile)	120
FD-RRH 4x45 1900 (Sprint)	152	4449 B5/B12 (T-Mobile)	120
FD-RRH 4x45 1900 (Sprint)	152	4449 B5/B12 (T-Mobile)	120
TD-RRH8x20-25 (Sprint)	152	ROHN 6'x15' Boom Gate (1) (T-Mobile)	120
TD-RRH8x20-25 (Sprint)	152	ROHN 6'x15' Boom Gate (1) (T-Mobile)	120
TD-RRH8x20-25 (Sprint)	152	ROHN 6'x15' Boom Gate (1) (T-Mobile)	120
ROHN 6'x15' Boom Gate (1) (Sprint)	152	GPS	98
ROHN 6'x15' Boom Gate (1) (Sprint)	152	1' Standoff	98
ROHN 6'x15' Boom Gate (1) (Sprint)	152		

SYMBOL LIST

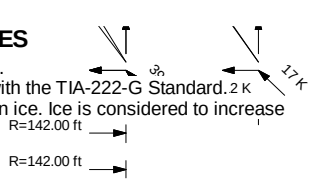
MARK	SIZE	MARK	SIZE
A	L4x4x1/4		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A53-B-42	42 ksi	63 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 105 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 89.7%

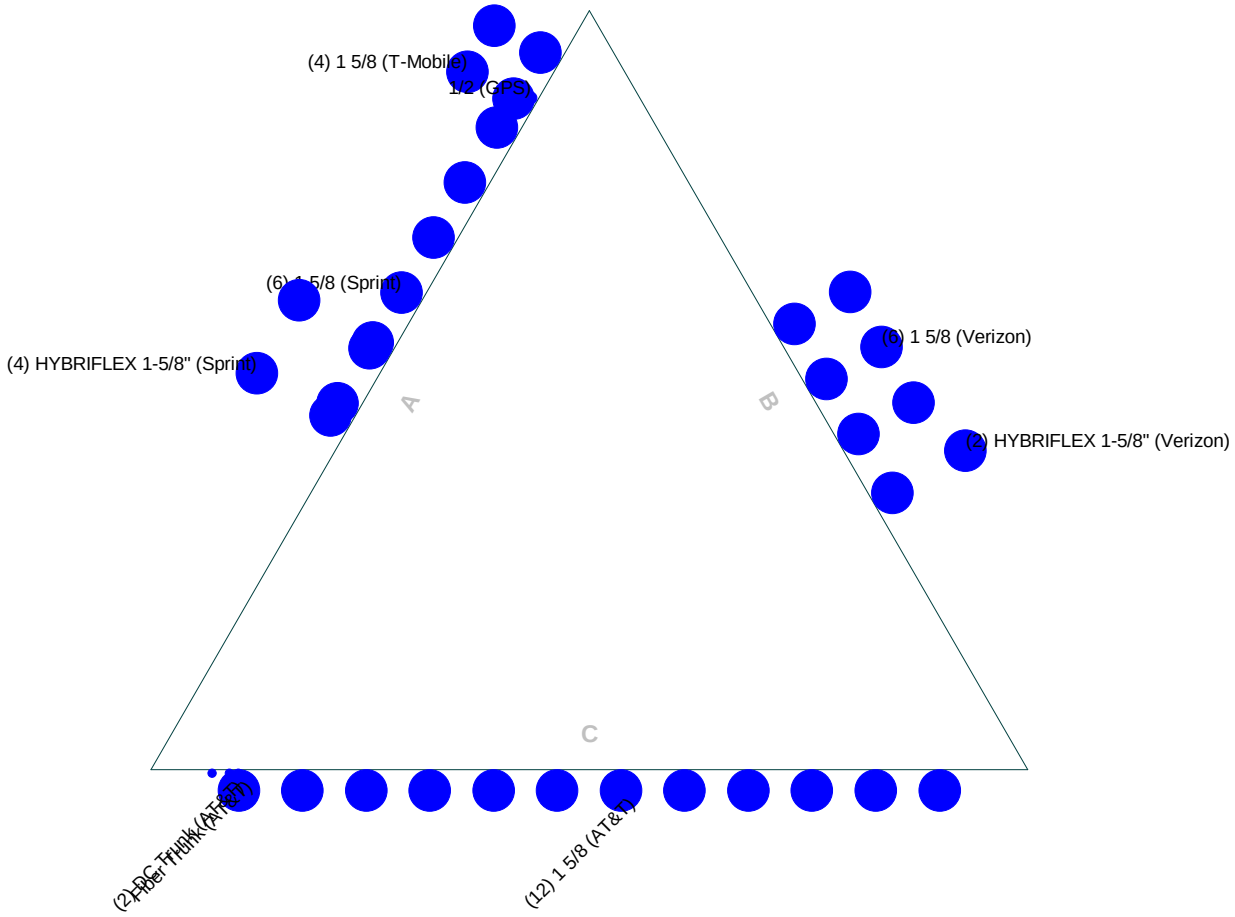


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	***180' ROHN Model 80 Guyed Tower***		
Project:	***174 Boom Bridge Road, Stonington, CT***		
Client: T-Mobile CT11048A	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 04/04/22	Scale: NTS	
Path: J:\Jobs\2202200.WI\04_CT11048A\05_Structural\02_Design\CAL\CSCT11048A 180' Guyed Rohn Tower 22022.04.ert		Dwg No. E-1	

Feed Line Plan

Round Flat App In Face App Out Face



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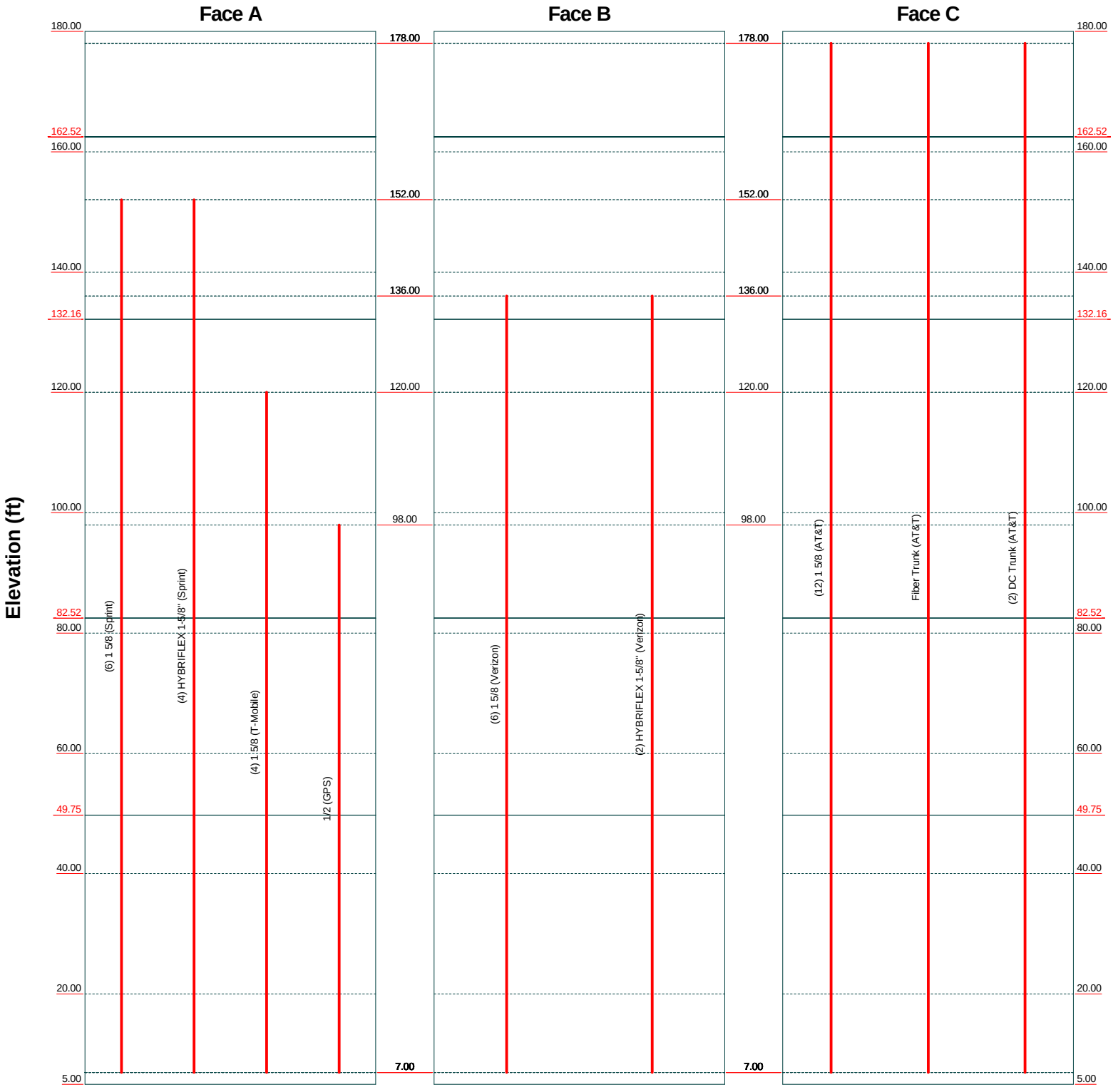
	Path: J:\Jobs\2202200.WI\04_CT11048A\05_Structural\02_Design\CAL\CSCT11048A 180' Guyed Rohn Tower 22022.04.ec		Dwg No. E-7

Feed Line Distribution Chart
5' - 180'

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



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Code: TIA-222-G		Date: 04/04/22	Scale: NTS
Path: J:\Jobs\2202200.WI\04_CT11048A\05_Structural\02_Design\CAL\CSC\T11048A 180' Guyed Rohn Tower 22022.04.ec			Dwg No. E-7

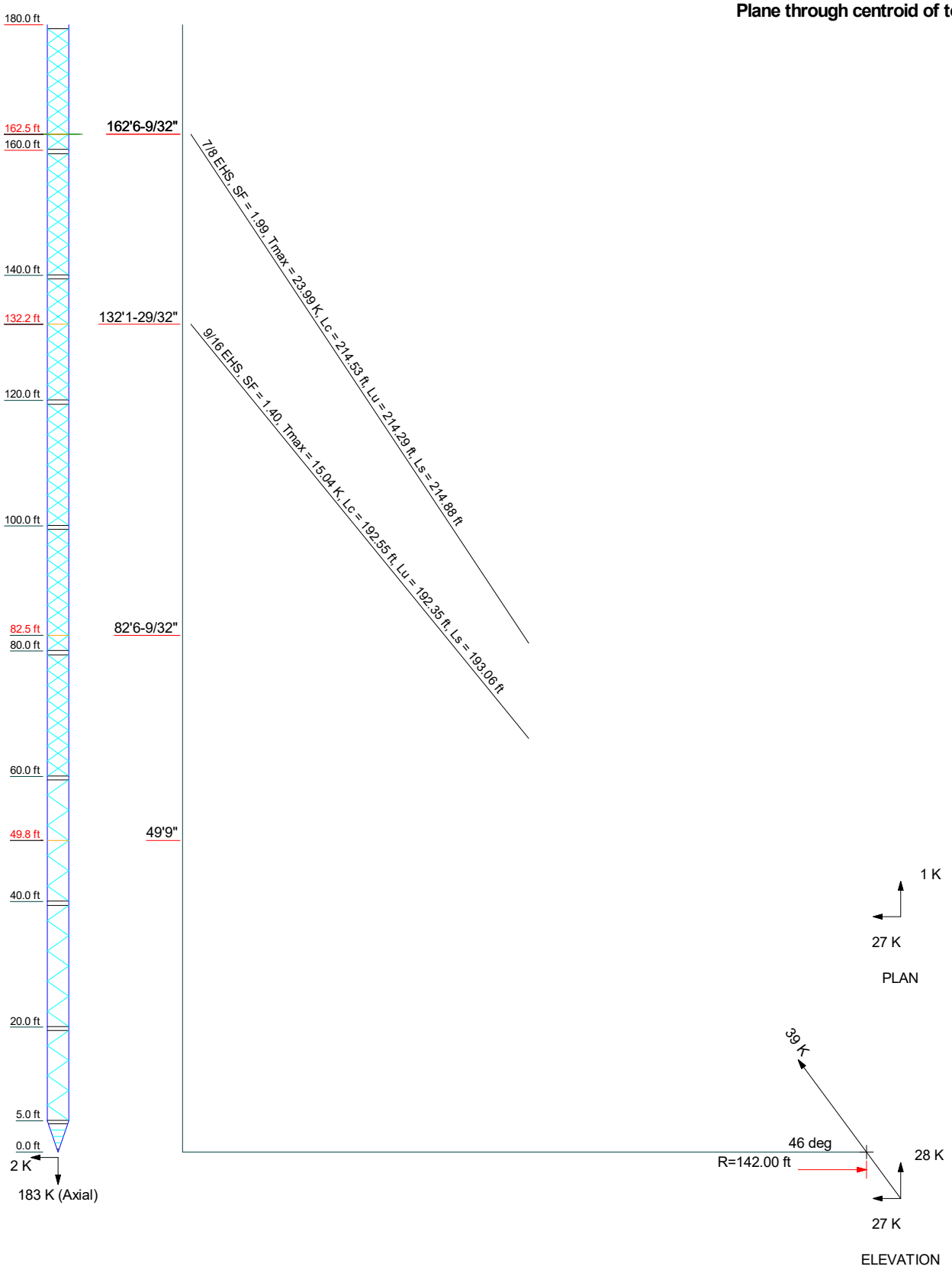
Guy Tensions and Tower Reactions

TIA-222-G - 105 mph/50 mph 0.7500 in Ice Exposure C

Maximum Values

Anchor 'C'@142 ft Azimuth 240 deg Elev 0 ft

Plane through centroid of tower



Centek Engineering 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***180' ROHN Model 80 Guyed Tower***		
	Project: ***174 Boom Bridge Road, Stonington, CT***		
	Client: T-Mobile CT11048A	Drawn by: PPG	App'd:
	Code: TIA-222-G	Date: 04/05/22	Scale: NTS
	Path: J:\Jobs\2202200.W\04_CT11048A\05_Structural\02_Design\CALCS\Tower\CT11048A 180' Guyed Rohn Tower 22022.04.eri		Dwg No. E-6

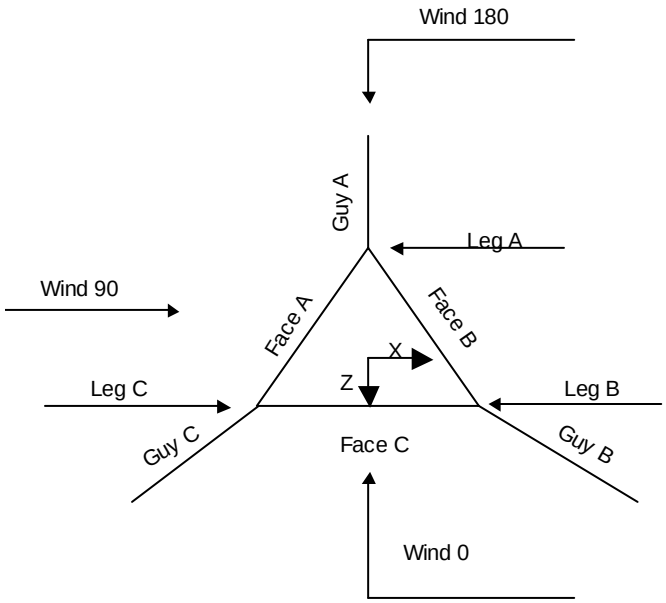
Tower Input Data

The main tower is a 3x guyed tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 3.42 ft at the top and tapered at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

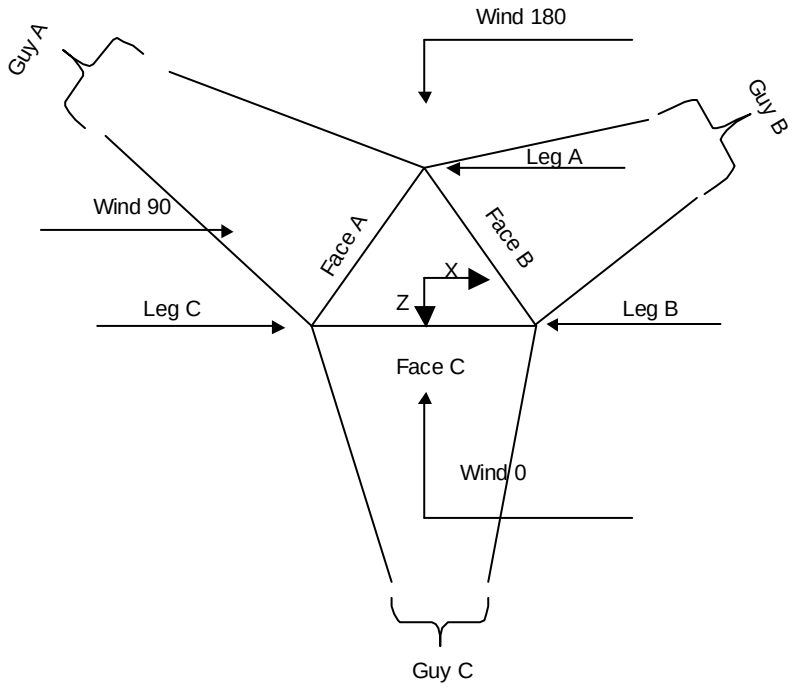
Basic wind speed of 105 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Safety factor used in guy 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



Corner & Starmount Guyed Tower



Face Guyed

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	180.00-160.00			3.42	1	20.00
T2	160.00-140.00			3.42	1	20.00
T3	140.00-120.00			3.42	1	20.00
T4	120.00-100.00			3.42	1	20.00
T5	100.00-80.00			3.42	1	20.00
T6	80.00-60.00			3.42	1	20.00
T7	60.00-40.00			3.42	1	20.00
T8	40.00-20.00			3.42	1	20.00
T9	20.00-5.00			3.42	1	15.00
T10	5.00-0.00			3.42	1	5.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	180.00-160.00	2.41	CX Brace	No	No	7.3750	1.3750
T2	160.00-140.00	2.41	CX Brace	No	No	7.3750	1.3750
T3	140.00-120.00	2.41	CX Brace	No	No	7.3750	1.3750
T4	120.00-100.00	2.41	CX Brace	No	No	7.3750	1.3750
T5	100.00-80.00	2.41	CX Brace	No	No	7.3750	1.3750
T6	80.00-60.00	2.41	CX Brace	No	No	7.3750	1.3750
T7	60.00-40.00	2.41	K Brace Right	No	No	7.3750	1.3750
T8	40.00-20.00	2.41	K Brace Right	No	No	7.3750	1.3750
T9	20.00-5.00	2.38	K Brace Right	No	No	7.3750	1.3750
T10	5.00-0.00	1.00	X Brace	No	Yes	6.0000	6.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T2 160.00-140.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)
T3 140.00-120.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T4 120.00-100.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)
T5 100.00-80.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T6 80.00-60.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)
T7 60.00-40.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T8 40.00-20.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T9 20.00-5.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T10 5.00-0.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-160.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T2 160.00-140.00	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)
T3 140.00-120.00	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 ga	A53-B-42 (42 ksi)
T4 120.00-100.00	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x11 ga	A53-B-42 (42 ksi)
T5 100.00-80.00	Pipe	ROHN TS1.5x16 ga	A53-B-42	Pipe	ROHN TS1.5x16 ga	A53-B-42

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T6 80.00-60.00	Pipe	ROHN TS1.5x11 ga	(42 ksi) A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x11 ga	(42 ksi) A53-B-42 (42 ksi)
T7 60.00-40.00	Pipe	ROHN TS1.5x16 ga	(42 ksi) A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 ga	(42 ksi) A53-B-42 (42 ksi)
T8 40.00-20.00	Pipe	ROHN TS1.5x16 ga	(42 ksi) A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 ga	(42 ksi) A53-B-42 (42 ksi)
T9 20.00-5.00	Pipe	ROHN TS1.5x16 ga	(42 ksi) A53-B-42 (42 ksi)	Equal Angle	L3x3x1/2	(36 ksi) A36 (36 ksi)
T10 5.00-0.00	Equal Angle	L4x4x1/4	A36 (36 ksi)	Equal Angle	L4x4x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T10 5.00-0.00	None	Single Angle		A36 (36 ksi)	Equal Angle	L4x4x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 180.00-160.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 160.00-140.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 140.00-120.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 120.00-100.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 100.00-80.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 80.00-60.00	1.21	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 60.00-40.00	0.74	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 40.00-20.00	0.74	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 20.00-5.00	0.60	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T10 5.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	Yes	1	1	1	1	1	1	1	1
180.00-160.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
160.00-140.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T9 20.00-5.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T10 5.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
180.00-160.00														
T2	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
160.00-140.00														
T3	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
140.00-120.00														
T4	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
120.00-100.00														
T5	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
100.00-80.00														
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-5.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 5.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-160.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 160.00-140.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 140.00-120.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 120.00-100.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-80.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 80.00-60.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-5.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 5.00-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.7500 A325N	0	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 160.00-140.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-5.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T10 5.00-0.00	Flange	0.7500 A325N	4	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0

Guy Data

Guy Elevation ft	Guy Grade		Guy Size	Initial Tension K	%	Guy Modulus ksi	Guy Weight plf	L_u ft	Anchor Radius ft	Anchor Azimuth Adj. °	Anchor Elevation ft	End Fitting Efficiency %
162.523	EHS	A	1/2	2.69	10%	21000	0.517	227.92	162.00	0.0000	0.00	100%
		B	1/2	2.69	10%	21000	0.517	227.92	162.00	0.0000	0.00	100%
		C	1/2	2.69	10%	21000	0.517	227.92	162.00	0.0000	0.00	100%
132.159	EHS	A	9/16	3.50	10%	21000	0.671	192.38	142.00	0.0000	0.00	100%
		B	9/16	3.50	10%	21000	0.671	192.38	142.00	0.0000	0.00	100%
		C	9/16	3.50	10%	21000	0.671	192.38	142.00	0.0000	0.00	100%
82.5234	EHS	A	3/4	5.83	10%	19000	1.155	128.02	100.00	0.0000	0.00	100%
		B	3/4	5.83	10%	19000	1.155	128.02	100.00	0.0000	0.00	100%
		C	3/4	5.83	10%	19000	1.155	128.02	100.00	0.0000	0.00	100%
162.523	EHS	A	7/8	7.97	10%	19000	1.581	214.33	142.00	0.0000	0.00	100%
		B	7/8	7.97	10%	19000	1.581	214.33	142.00	0.0000	0.00	100%
		C	7/8	7.97	10%	19000	1.581	214.33	142.00	0.0000	0.00	100%
49.75	EHS	A	1/2	2.69	10%	21000	0.517	109.84	100.00	0.0000	0.00	100%
		B	1/2	2.69	10%	21000	0.517	109.84	100.00	0.0000	0.00	100%
		C	1/2	2.69	10%	21000	0.517	109.84	100.00	0.0000	0.00	100%

Guy Data *(cont'd)*

Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
162.523	Torque Arm	6.83	0.0000	Channel	A36 (36 ksi)	Channel	C12x20.7
132.159	Corner						
82.5234	Corner						
162.523	Corner						
49.75	Corner						

Guy Data *(cont'd)*

Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
162.52	A53-B-42 (42 ksi)	Pipe				A36 (36 ksi)	Double Angle	
132.16	A53-B-42 (42 ksi)	Pipe			Yes	A36 (36 ksi)	Flat Bar	4x3/8
82.52	A53-B-42 (42 ksi)	Pipe			No	A36 (36 ksi)	Double Equal Angle	2L2x2x1/4x3/8
162.52	A53-B-42 (42 ksi)	Pipe			No	A36 (36 ksi)	Double Equal Angle	2L2x2x1/4x3/8
49.75	A53-B-42 (42 ksi)	Pipe			Yes	A36 (36 ksi)	Flat Bar	4x3/8

Guy Data *(cont'd)*

Guy Elevation ft	Cable Weight A K	Cable Weight B K	Cable Weight C K	Cable Weight D K	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
162.523	0.12	0.12	0.12		4.92 3.8 sec/pulse	4.92 3.8 sec/pulse	4.92 3.8 sec/pulse	
132.159	0.13	0.13	0.13		3.51 3.2 sec/pulse	3.51 3.2 sec/pulse	3.51 3.2 sec/pulse	
82.5234	0.15	0.15	0.15		1.61 2.2 sec/pulse	1.61 2.2 sec/pulse	1.61 2.2 sec/pulse	
162.523	0.34	0.34	0.34		4.49 3.7 sec/pulse	4.49 3.7 sec/pulse	4.49 3.7 sec/pulse	
49.75	0.06	0.06	0.06		1.15 1.9 sec/pulse	1.15 1.9 sec/pulse	1.15 1.9 sec/pulse	

Guy Data *(cont'd)*

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm K_x	Torque Arm K_y	Pull Off K_x	Pull Off K_y	Diagonal K_x	Diagonal K_y
162.523	Yes	No	1	1	1	1	1	1
132.159	No	No			1	1	1	1
82.5234	No	No			1	1	1	1
162.523	No	No			1	1	1	1
49.75	No	No			1	1	1	1

Guy Data *(cont'd)*

Guy Elevation ft	Torque-Arm Bolt Size in	Torque-Arm Number	Torque-Arm Net Width Deduct in	Torque-Arm U	Pull Off Bolt Size in	Pull Off Number	Pull Off Net Width Deduct in	Pull Off U	Diagonal Bolt Size in	Diagonal Number	Diagonal Net Width Deduct in	Diagonal U
162.523	0.0000 A325N	0	0.0000	1	0.5000 A325N	0	0.0000	0.75	0.0000 A490N	1	0.0000	0.75
132.159	0.0000 A325N	0	0.0000	1	0.6250 A325N	2	0.0000	0.75	0.0000 A325N	1	0.0000	0.75
82.5234	0.0000 A325N	0	0.0000	1	0.6250 A325N	2	0.0000	0.75	0.0000 A325N	1	0.0000	0.75
162.523	0.0000 A325N	0	0.0000	1	0.6250 A325N	2	0.0000	0.75	0.0000 A490N	1	0.0000	0.75
49.75	0.6250 A325N	0	0.0000	0.75	0.6250 A325N	2	0.0000	0.75	0.0000 A325N	1	0.0000	0.75

Guy Pressures

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
162.523	A	81.26	29	7	1.6415
	B	81.26	29	7	1.6415

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
	C	81.26	29	7	1.6415
132.159	A	66.08	28	6	1.6079
	B	66.08	28	6	1.6079
	C	66.08	28	6	1.6079
82.5234	A	41.26	25	6	1.5339
	B	41.26	25	6	1.5339
	C	41.26	25	6	1.5339
162.523	A	81.26	29	7	1.6415
	B	81.26	29	7	1.6415
	C	81.26	29	7	1.6415
49.75	A	24.88	23	5	1.4582
	B	24.88	23	5	1.4582
	C	24.88	23	5	1.4582

Guy-Mast Forces (Excluding Wind) - No Ice

Guy Elevation ft	Guy Location	Chord Angle °	Guy Tension Top / Bottom K	F_x K	F_y K	F_z K	M_x kip-ft	M_y kip-ft	M_z kip-ft
162.523	A	45.4369	2.77 / 2.69	-0.04	2.01	-1.92	-3.96	6.63	-6.85
	A	45.4369	2.77 / 2.69	0.04	2.01	-1.92	-3.96	-6.63	6.85
	B	45.4369	2.77 / 2.69	1.68	2.01	0.92	7.91	6.63	0.00
	B	45.4369	2.77 / 2.69	1.64	2.01	0.99	-3.96	-6.63	-6.85
	C	45.4369	2.77 / 2.69	-1.64	2.01	0.99	-3.96	6.63	6.85
	C	45.4369	2.77 / 2.69	-1.68	2.01	0.92	7.91	-6.63	0.00
			Sum:	0.00	12.03	0.00	-0.00	0.00	0.00
132.159	A	43.3442	3.59 / 3.50	0.00	2.50	-2.58	-4.93	0.00	0.00
	B	43.3442	3.59 / 3.50	2.23	2.50	1.29	2.46	0.00	-4.27
	C	43.3442	3.59 / 3.50	-2.23	2.50	1.29	2.46	-0.00	4.27
			Sum:	0.00	7.49	0.00	0.00	0.00	0.00
82.5234	A	40.0921	5.93 / 5.83	0.00	3.86	-4.50	-7.61	0.00	0.00
	B	40.0921	5.93 / 5.83	3.89	3.86	2.25	3.81	0.00	-6.59
	C	40.0921	5.93 / 5.83	-3.89	3.86	2.25	3.81	-0.00	6.59
			Sum:	0.00	11.58	0.00	0.00	0.00	0.00
162.523	A	49.2524	8.23 / 7.97	0.00	6.30	-5.29	-12.44	0.00	0.00
	B	49.2524	8.23 / 7.97	4.58	6.30	2.64	6.22	0.00	-10.77
	C	49.2524	8.23 / 7.97	-4.58	6.30	2.64	6.22	-0.00	10.77
			Sum:	0.00	18.91	0.00	0.00	0.00	0.00
49.75	A	26.9084	2.72 / 2.69	0.00	1.25	-2.41	-2.47	0.00	0.00
	B	26.9084	2.72	2.09	1.25	1.21	1.23	0.00	-2.14

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top / Bottom / K	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		K	K	K	kip-ft	kip-ft	kip-ft
			2.69						
	C	26.9084	2.72	-2.09	1.25	1.21	1.23	0.00	2.14
			2.69						
			Sum:	0.00	3.75	0.00	0.00	0.00	0.00

Guy-Mast Forces (Excluding Wind) - Ice

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top / Bottom / K	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		K	K	K	kip-ft	kip-ft	kip-ft
162.523	A	45.4369	6.28	-0.09	4.74	-4.12	-9.36	14.25	-16.21
			5.50						
	A	45.4369	6.28	0.09	4.74	-4.12	-9.36	-14.25	16.21
			5.50						
	B	45.4369	6.28	3.61	4.74	1.98	18.72	14.25	0.00
			5.50						
	B	45.4369	6.28	3.52	4.74	2.14	-9.36	-14.25	-16.21
			5.50						
	C	45.4369	6.28	-3.52	4.74	2.14	-9.36	14.25	16.21
			5.50						
	C	45.4369	6.28	-3.61	4.74	1.98	18.72	-14.25	0.00
			5.50						
			Sum:	0.00	28.46	0.00	-0.00	0.00	0.00
132.159	A	43.3442	6.94	0.00	5.01	-4.80	-9.89	0.00	0.00
			6.29						
	B	43.3442	6.94	4.16	5.01	2.40	4.94	0.00	-8.56
			6.29						
	C	43.3442	6.94	-4.16	5.01	2.40	4.94	-0.00	8.56
			6.29						
			Sum:	0.00	15.04	0.00	0.00	0.00	0.00
82.5234	A	40.0921	9.05	0.00	6.03	-6.75	-11.90	0.00	0.00
			8.60						
	B	40.0921	9.05	5.84	6.03	3.37	5.95	0.00	-10.30
			8.60						
	C	40.0921	9.05	-5.84	6.03	3.37	5.95	-0.00	10.30
			8.60						
			Sum:	0.00	18.09	0.00	0.00	0.00	0.00
162.523	A	49.2524	13.16	0.00	10.27	-8.23	-20.26	0.00	0.00
			12.08						
	B	49.2524	13.16	7.13	10.27	4.11	10.13	0.00	-17.55
			12.08						
	C	49.2524	13.16	-7.13	10.27	4.11	10.13	-0.00	17.55
			12.08						
			Sum:	0.00	30.81	0.00	0.00	0.00	0.00
49.75	A	26.9084	4.73	0.00	2.31	-4.12	-4.56	0.00	0.00
			4.53						
	B	26.9084	4.73	3.57	2.31	2.06	2.28	0.00	-3.95
			4.53						
	C	26.9084	4.73	-3.57	2.31	2.06	2.28	-0.00	3.95
			4.53						
			Sum:	0.00	6.94	0.00	0.00	0.00	0.00

Guy-Mast Forces (Excluding Wind) - Service

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top / Bottom	F_x	F_y	F_z	M_x	M_y	M_z
ft		°	K	K	K	K	kip-ft	kip-ft	kip-ft
162.523	A	45.4369	2.77 / 2.69	-0.04	2.01	-1.92	-3.96	6.63	-6.85
	A	45.4369	2.77 / 2.69	0.04	2.01	-1.92	-3.96	-6.63	6.85
	B	45.4369	2.77 / 2.69	1.68	2.01	0.92	7.91	6.63	0.00
	B	45.4369	2.77 / 2.69	1.64	2.01	0.99	-3.96	-6.63	-6.85
	C	45.4369	2.77 / 2.69	-1.64	2.01	0.99	-3.96	6.63	6.85
	C	45.4369	2.77 / 2.69	-1.68	2.01	0.92	7.91	-6.63	0.00
			Sum:	0.00	12.03	0.00	-0.00	0.00	0.00
132.159	A	43.3442	3.59 / 3.50	0.00	2.50	-2.58	-4.93	0.00	0.00
	B	43.3442	3.59 / 3.50	2.23	2.50	1.29	2.46	0.00	-4.27
	C	43.3442	3.59 / 3.50	-2.23	2.50	1.29	2.46	-0.00	4.27
			Sum:	0.00	7.49	0.00	0.00	0.00	0.00
82.5234	A	40.0921	5.93 / 5.83	0.00	3.86	-4.50	-7.61	0.00	0.00
	B	40.0921	5.93 / 5.83	3.89	3.86	2.25	3.81	0.00	-6.59
	C	40.0921	5.93 / 5.83	-3.89	3.86	2.25	3.81	-0.00	6.59
			Sum:	0.00	11.58	0.00	0.00	0.00	0.00
162.523	A	49.2524	8.23 / 7.97	0.00	6.30	-5.29	-12.44	0.00	0.00
	B	49.2524	8.23 / 7.97	4.58	6.30	2.64	6.22	0.00	-10.77
	C	49.2524	8.23 / 7.97	-4.58	6.30	2.64	6.22	-0.00	10.77
			Sum:	0.00	18.91	0.00	0.00	0.00	0.00
49.75	A	26.9084	2.72 / 2.69	0.00	1.25	-2.41	-2.47	0.00	0.00
	B	26.9084	2.72 / 2.69	2.09	1.25	1.21	1.23	0.00	-2.14
	C	26.9084	2.72 / 2.69	-2.09	1.25	1.21	1.23	0.00	2.14
			Sum:	0.00	3.75	0.00	0.00	0.00	0.00

Guy-Tensioning Information

Temperature At Time Of Tensioning						
0 F	20 F	40 F	60 F	80 F	100 F	120 F

Guy Elevation ft		H ft	V ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft
162.523	A	160.06	162.52	3.257	4.07	3.066	4.32	2.877	4.60	2.690	4.92	2.507	5.27	2.327	5.68	2.152	6.13
	B	160.06	162.52	3.257	4.07	3.066	4.32	2.877	4.60	2.690	4.92	2.507	5.27	2.327	5.68	2.152	6.13
	C	160.06	162.52	3.257	4.07	3.066	4.32	2.877	4.60	2.690	4.92	2.507	5.27	2.327	5.68	2.152	6.13
132.159	A	140.03	132.16	4.303	2.86	4.033	3.05	3.765	3.26	3.500	3.51	3.239	3.79	2.983	4.11	2.733	4.48
	B	140.03	132.16	4.303	2.86	4.033	3.05	3.765	3.26	3.500	3.51	3.239	3.79	2.983	4.11	2.733	4.48
	C	140.03	132.16	4.303	2.86	4.033	3.05	3.765	3.26	3.500	3.51	3.239	3.79	2.983	4.11	2.733	4.48
82.5234	A	98.03	82.52	7.254	1.30	6.777	1.39	6.302	1.49	5.830	1.61	5.362	1.75	4.899	1.92	4.443	2.11
	B	98.03	82.52	7.254	1.30	6.777	1.39	6.302	1.49	5.830	1.61	5.362	1.75	4.899	1.92	4.443	2.11
	C	98.03	82.52	7.254	1.30	6.777	1.39	6.302	1.49	5.830	1.61	5.362	1.75	4.899	1.92	4.443	2.11
162.523	A	140.03	162.52	9.349	3.83	8.886	4.03	8.426	4.25	7.970	4.49	7.519	4.75	7.074	5.05	6.635	5.38
	B	140.03	162.52	9.349	3.83	8.886	4.03	8.426	4.25	7.970	4.49	7.519	4.75	7.074	5.05	6.635	5.38
	C	140.03	162.52	9.349	3.83	8.886	4.03	8.426	4.25	7.970	4.49	7.519	4.75	7.074	5.05	6.635	5.38
49.75	A	98.03	49.75	3.645	0.85	3.325	0.93	3.006	1.03	2.690	1.15	2.377	1.31	2.070	1.50	1.773	1.75
	B	98.03	49.75	3.645	0.85	3.325	0.93	3.006	1.03	2.690	1.15	2.377	1.31	2.070	1.50	1.773	1.75
	C	98.03	49.75	3.645	0.85	3.325	0.93	3.006	1.03	2.690	1.15	2.377	1.31	2.070	1.50	1.773	1.75

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (AT&T)	C	No	No	Ar (CaAa)	178.00 - 7.00	0.0000	0	12	12	1.0000	1.9800		1.04
Fiber Trunk (AT&T)	C	No	No	Ar (CaAa)	178.00 - 7.00	0.0000	0.4	1	1	0.4000	0.4000		1.00
DC Trunk (AT&T)	C	No	No	Ar (CaAa)	178.00 - 7.00	0.0000	0.42	2	2	0.4000	0.4000		0.11
1 5/8 (Sprint)	A	No	No	Ar (CaAa)	152.00 - 7.00	0.0000	0.15	6	6	1.0000	1.9800		1.04
HYBRIFLEX 1-5/8" (Sprint)	A	No	No	Ar (CaAa)	152.00 - 7.00	0.0000	0	4	2	1.9800	1.9800		1.90
1 5/8 (Verizon)	B	No	No	Ar (CaAa)	136.00 - 7.00	0.0000	0	6	3	1.0000	1.9800		1.04
HYBRIFLEX 1-5/8" (Verizon)	B	No	No	Ar (CaAa)	136.00 - 7.00	0.0000	0.15	2	1	1.9800	1.9800		1.90
1 5/8 (T-Mobile)	A	No	No	Ar (CaAa)	120.00 - 7.00	0.0000	0.4	4	2	0.5000	1.9800		1.04
1/2 (GPS)	A	No	No	Ar (CaAa)	98.00 - 7.00	0.0000	0.38	1	1	0.5800	0.5800		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
T1	180.00-160.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	44.928	0.000	0.25
T2	160.00-140.00	A	0.000	0.000	23.760	0.000	0.17
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	49.920	0.000	0.27
T3	140.00-120.00	A	0.000	0.000	39.600	0.000	0.28
		B	0.000	0.000	25.344	0.000	0.16
		C	0.000	0.000	49.920	0.000	0.27

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
T4	120.00-100.00	A	0.000	0.000	55.440	0.000	0.36
		B	0.000	0.000	31.680	0.000	0.20
		C	0.000	0.000	49.920	0.000	0.27
T5	100.00-80.00	A	0.000	0.000	56.484	0.000	0.36
		B	0.000	0.000	31.680	0.000	0.20
		C	0.000	0.000	49.920	0.000	0.27
T6	80.00-60.00	A	0.000	0.000	56.600	0.000	0.36
		B	0.000	0.000	31.680	0.000	0.20
		C	0.000	0.000	49.920	0.000	0.27
T7	60.00-40.00	A	0.000	0.000	56.600	0.000	0.36
		B	0.000	0.000	31.680	0.000	0.20
		C	0.000	0.000	49.920	0.000	0.27
T8	40.00-20.00	A	0.000	0.000	56.600	0.000	0.36
		B	0.000	0.000	31.680	0.000	0.20
		C	0.000	0.000	49.920	0.000	0.27
T9	20.00-5.00	A	0.000	0.000	36.790	0.000	0.24
		B	0.000	0.000	20.592	0.000	0.13
		C	0.000	0.000	32.448	0.000	0.18
T10	5.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	1.767	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	107.984	0.000	1.61
T2	160.00-140.00	A	1.745	0.000	0.000	51.643	0.000	0.90
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	119.615	0.000	1.77
T3	140.00-120.00	A	1.720	0.000	0.000	85.745	0.000	1.48
		B		0.000	0.000	49.960	0.000	0.85
		C		0.000	0.000	119.201	0.000	1.75
T4	120.00-100.00	A	1.692	0.000	0.000	113.101	0.000	1.88
		B		0.000	0.000	62.056	0.000	1.05
		C		0.000	0.000	118.725	0.000	1.73
T5	100.00-80.00	A	1.658	0.000	0.000	119.434	0.000	1.94
		B		0.000	0.000	61.592	0.000	1.03
		C		0.000	0.000	118.164	0.000	1.70
T6	80.00-60.00	A	1.617	0.000	0.000	119.216	0.000	1.91
		B		0.000	0.000	61.023	0.000	1.01
		C		0.000	0.000	117.478	0.000	1.66
T7	60.00-40.00	A	1.564	0.000	0.000	117.919	0.000	1.86
		B		0.000	0.000	60.285	0.000	0.98
		C		0.000	0.000	116.586	0.000	1.62
T8	40.00-20.00	A	1.486	0.000	0.000	116.034	0.000	1.79
		B		0.000	0.000	59.211	0.000	0.94
		C		0.000	0.000	115.290	0.000	1.56
T9	20.00-5.00	A	1.361	0.000	0.000	73.464	0.000	1.10
		B		0.000	0.000	37.372	0.000	0.57
		C		0.000	0.000	73.593	0.000	0.95
T10	5.00-0.00	A	1.159	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	180.00-160.00	-0.3143	5.2707	-0.8764	3.4866
T2	160.00-140.00	-2.2872	3.3276	-2.3936	2.6550
T3	140.00-120.00	-0.5921	0.5649	-1.1125	0.8321
T4	120.00-100.00	-0.4185	-1.5276	-0.9655	-0.5152
T5	100.00-80.00	-0.4272	-1.6162	-0.9606	-0.7625
T6	80.00-60.00	-0.4328	-1.6407	-1.0060	-0.8198
T7	60.00-40.00	-0.4450	-1.6908	-1.2074	-0.9746
T8	40.00-20.00	-0.4549	-1.7222	-1.2304	-0.9761
T9	20.00-5.00	-0.4303	-1.6366	-1.1541	-0.8921
T10	5.00-0.00	0.0000	0.0000	0.0000	0.0000

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	1 5/8	160.00 - 178.00	0.6000	0.2875
T1	2	Fiber Trunk	160.00 - 178.00	0.6000	0.2875
T1	3	DC Trunk	160.00 - 178.00	0.6000	0.2875
T2	1	1 5/8	140.00 - 160.00	0.6000	0.3468
T2	2	Fiber Trunk	140.00 - 160.00	0.6000	0.3468
T2	3	DC Trunk	140.00 - 160.00	0.6000	0.3468
T2	4	1 5/8	140.00 - 152.00	0.6000	0.3468
T2	5	HYBRIFLEX 1-5/8"	140.00 - 152.00	0.6000	0.3468
T3	1	1 5/8	120.00 - 140.00	0.6000	0.3269
T3	2	Fiber Trunk	120.00 - 140.00	0.6000	0.3269
T3	3	DC Trunk	120.00 - 140.00	0.6000	0.3269
T3	4	1 5/8	120.00 - 140.00	0.6000	0.3269
T3	5	HYBRIFLEX 1-5/8"	120.00 - 140.00	0.6000	0.3269
T3	6	1 5/8	120.00 - 136.00	0.6000	0.3269
T3	7	HYBRIFLEX 1-5/8"	120.00 - 136.00	0.6000	0.3269
T4	1	1 5/8	100.00 - 120.00	0.6000	0.3578
T4	2	Fiber Trunk	100.00 -	0.6000	0.3578

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			120.00		
T4	3	DC Trunk	100.00 - 120.00	0.6000	0.3578
T4	4	1 5/8	100.00 - 120.00	0.6000	0.3578
T4	5	HYBRIFLEX 1-5/8"	100.00 - 120.00	0.6000	0.3578
T4	6	1 5/8	100.00 - 120.00	0.6000	0.3578
T4	7	HYBRIFLEX 1-5/8"	100.00 - 120.00	0.6000	0.3578
T4	8	1 5/8	100.00 - 120.00	0.6000	0.3578
T5	1	1 5/8	80.00 - 100.00	0.6000	0.3468
T5	2	Fiber Trunk	80.00 - 100.00	0.6000	0.3468
T5	3	DC Trunk	80.00 - 100.00	0.6000	0.3468
T5	4	1 5/8	80.00 - 100.00	0.6000	0.3468
T5	5	HYBRIFLEX 1-5/8"	80.00 - 100.00	0.6000	0.3468
T5	6	1 5/8	80.00 - 100.00	0.6000	0.3468
T5	7	HYBRIFLEX 1-5/8"	80.00 - 100.00	0.6000	0.3468
T5	8	1 5/8	80.00 - 100.00	0.6000	0.3468
T5	9	1/2	80.00 - 98.00	0.6000	0.3468
T6	1	1 5/8	60.00 - 80.00	0.6000	0.3733
T6	2	Fiber Trunk	60.00 - 80.00	0.6000	0.3733
T6	3	DC Trunk	60.00 - 80.00	0.6000	0.3733
T6	4	1 5/8	60.00 - 80.00	0.6000	0.3733
T6	5	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.3733
T6	6	1 5/8	60.00 - 80.00	0.6000	0.3733
T6	7	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.3733
T6	8	1 5/8	60.00 - 80.00	0.6000	0.3733
T6	9	1/2	60.00 - 80.00	0.6000	0.3733
T7	1	1 5/8	40.00 - 60.00	0.6000	0.5210
T7	2	Fiber Trunk	40.00 - 60.00	0.6000	0.5210
T7	3	DC Trunk	40.00 - 60.00	0.6000	0.5210
T7	4	1 5/8	40.00 - 60.00	0.6000	0.5210
T7	5	HYBRIFLEX 1-5/8"	40.00 - 60.00	0.6000	0.5210
T7	6	1 5/8	40.00 - 60.00	0.6000	0.5210
T7	7	HYBRIFLEX 1-5/8"	40.00 - 60.00	0.6000	0.5210
T7	8	1 5/8	40.00 - 60.00	0.6000	0.5210
T7	9	1/2	40.00 - 60.00	0.6000	0.5210
T8	1	1 5/8	20.00 - 40.00	0.6000	0.5567
T8	2	Fiber Trunk	20.00 - 40.00	0.6000	0.5567
T8	3	DC Trunk	20.00 - 40.00	0.6000	0.5567
T8	4	1 5/8	20.00 - 40.00	0.6000	0.5567
T8	5	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.5567
T8	6	1 5/8	20.00 - 40.00	0.6000	0.5567
T8	7	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.5567
T8	8	1 5/8	20.00 - 40.00	0.6000	0.5567
T8	9	1/2	20.00 - 40.00	0.6000	0.5567
T9	1	1 5/8	7.00 - 20.00	0.6000	0.5579
T9	2	Fiber Trunk	7.00 - 20.00	0.6000	0.5579
T9	3	DC Trunk	7.00 - 20.00	0.6000	0.5579
T9	4	1 5/8	7.00 - 20.00	0.6000	0.5579
T9	5	HYBRIFLEX 1-5/8"	7.00 - 20.00	0.6000	0.5579
T9	6	1 5/8	7.00 - 20.00	0.6000	0.5579
T9	7	HYBRIFLEX 1-5/8"	7.00 - 20.00	0.6000	0.5579
T9	8	1 5/8	7.00 - 20.00	0.6000	0.5579
T9	9	1/2	7.00 - 20.00	0.6000	0.5579

Discrete Tower Loads

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
7770.00	A	From Leg	4.00	0.0000	180.00	No Ice	5.51	2.93	0.04
(ATT)			-6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
TPA-65R-LCUUUU-H8	A	From Leg	4.00	0.0000	180.00	No Ice	13.30	8.82	0.08
(ATT)			2.00			1/2" Ice	13.90	9.42	0.15
			0.00			1" Ice	14.50	10.03	0.24
P65-17-XLH-RR	A	From Leg	4.00	0.0000	180.00	No Ice	11.47	6.80	0.06
(ATT)			6.00			1/2" Ice	12.08	7.38	0.12
			0.00			1" Ice	12.71	7.98	0.19
7770.00	B	From Leg	4.00	0.0000	180.00	No Ice	5.51	2.93	0.04
(ATT)			-6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
TPA-65R-LCUUUU-H8	B	From Leg	4.00	0.0000	180.00	No Ice	13.30	8.82	0.08
(ATT)			2.00			1/2" Ice	13.90	9.42	0.15
			0.00			1" Ice	14.50	10.03	0.24
SBNH-1D6565C	B	From Leg	4.00	0.0000	180.00	No Ice	11.41	7.70	0.06
(ATT)			6.00			1/2" Ice	12.03	8.29	0.13
			0.00			1" Ice	12.65	8.89	0.20
7770.00	C	From Leg	4.00	0.0000	180.00	No Ice	5.51	2.93	0.04
(ATT)			-6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
TPA-65R-LCUUUU-H8	C	From Leg	4.00	0.0000	180.00	No Ice	13.30	8.82	0.08
(ATT)			2.00			1/2" Ice	13.90	9.42	0.15
			0.00			1" Ice	14.50	10.03	0.24
P65-17-XLH-RR	C	From Leg	4.00	0.0000	180.00	No Ice	11.47	6.80	0.06
(ATT)			6.00			1/2" Ice	12.08	7.38	0.12
			0.00			1" Ice	12.71	7.98	0.19
DTMABP7819VG12A TMA	A	From Leg	4.00	0.0000	180.00	No Ice	1.36	0.51	0.02
(ATT)			2.00			1/2" Ice	1.51	0.61	0.03
			0.00			1" Ice	1.66	0.72	0.04
DTMABP7819VG12A TMA	B	From Leg	4.00	0.0000	180.00	No Ice	1.36	0.51	0.02
(ATT)			2.00			1/2" Ice	1.51	0.61	0.03
			0.00			1" Ice	1.66	0.72	0.04
DTMABP7819VG12A TMA	C	From Leg	4.00	0.0000	180.00	No Ice	1.36	0.51	0.02
(ATT)			2.00			1/2" Ice	1.51	0.61	0.03
			0.00			1" Ice	1.66	0.72	0.04
RRUS-11	A	From Leg	4.00	0.0000	180.00	No Ice	2.57	1.07	0.05
(ATT)			2.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	B	From Leg	4.00	0.0000	180.00	No Ice	2.57	1.07	0.05
(ATT)			2.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	C	From Leg	4.00	0.0000	180.00	No Ice	2.57	1.07	0.05
(ATT)			2.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
4415 B25	A	From Leg	4.00	0.0000	180.00	No Ice	1.84	0.82	0.05
(ATT)			2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	B	From Leg	4.00	0.0000	180.00	No Ice	1.84	0.82	0.05
(ATT)			2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08

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
4415 B25	C	From Leg	4.00	0.0000	180.00	No Ice	1.84	0.82	0.05
(ATT)			2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
(2) DBC0061F1V51-2	A	From Leg	4.00	0.0000	180.00	No Ice	0.41	0.43	0.02
(ATT)			2.00			1/2" Ice	0.50	0.51	0.02
			0.00			1" Ice	0.59	0.61	0.03
(2) DBC0061F1V51-2	B	From Leg	4.00	0.0000	180.00	No Ice	0.41	0.43	0.02
(ATT)			2.00			1/2" Ice	0.50	0.51	0.02
			0.00			1" Ice	0.59	0.61	0.03
(2) DBC0061F1V51-2	C	From Leg	4.00	0.0000	180.00	No Ice	0.41	0.43	0.02
(ATT)			2.00			1/2" Ice	0.50	0.51	0.02
			0.00			1" Ice	0.59	0.61	0.03
DC6-48-60-18-8F Surge	A	From Leg	4.00	0.0000	180.00	No Ice	1.91	1.91	0.02
Arrestor			2.00			1/2" Ice	2.10	2.10	0.04
(ATT)			0.00			1" Ice	2.29	2.29	0.06
ROHN 6'x15' Boom Gate (1)	A	From Leg	2.50	0.0000	178.00	No Ice	17.75	17.75	0.60
(ATT)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
ROHN 6'x15' Boom Gate (1)	B	From Leg	2.50	0.0000	178.00	No Ice	17.75	17.75	0.60
(ATT)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
ROHN 6'x15' Boom Gate (1)	C	From Leg	2.50	0.0000	178.00	No Ice	17.75	17.75	0.60
(ATT)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
NNVV-65B-R4	A	From Leg	4.00	0.0000	152.00	No Ice	14.61	9.17	0.11
(Sprint)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
APXVTM14	A	From Leg	4.00	0.0000	152.00	No Ice	6.34	3.61	0.06
(Sprint)			0.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
NNVV-65B-R4	B	From Leg	4.00	0.0000	152.00	No Ice	14.61	9.17	0.11
(Sprint)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
APXVTM14	B	From Leg	4.00	0.0000	152.00	No Ice	6.34	3.61	0.06
(Sprint)			0.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
NNVV-65B-R4	C	From Leg	4.00	0.0000	152.00	No Ice	14.61	9.17	0.11
(Sprint)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
APXVTM14	C	From Leg	4.00	0.0000	152.00	No Ice	6.34	3.61	0.06
(Sprint)			0.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
(2) FD-RRH 2x50 800	A	From Leg	4.00	0.0000	152.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
(2) FD-RRH 2x50 800	B	From Leg	4.00	0.0000	152.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
(2) FD-RRH 2x50 800	C	From Leg	4.00	0.0000	152.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 4x45 1900	A	From Leg	4.00	0.0000	152.00	No Ice	2.32	2.38	0.06
(Sprint)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	B	From Leg	4.00	0.0000	152.00	No Ice	2.32	2.38	0.06
(Sprint)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral 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 Leg	4.00	0.0000	152.00	No Ice	2.32	2.38	0.06
(Sprint)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
TD-RRH8x20-25	A	From Leg	4.00	0.0000	152.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Leg	4.00	0.0000	152.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Leg	4.00	0.0000	152.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
ROHN 6'x15' Boom Gate (1)	A	From Leg	2.50	0.0000	152.00	No Ice	17.75	17.75	0.60
(Sprint)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
ROHN 6'x15' Boom Gate (1)	B	From Leg	2.50	0.0000	152.00	No Ice	17.75	17.75	0.60
(Sprint)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
ROHN 6'x15' Boom Gate (1)	C	From Leg	2.50	0.0000	152.00	No Ice	17.75	17.75	0.60
(Sprint)			0.00			1/2" Ice	21.10	21.10	0.07
			0.00			1" Ice	24.50	24.50	0.89
LPA-80080/4CF	A	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			-6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08
QS6656-5D	A	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			-2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
QS6656-5D	A	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
LPA-80080/4CF	A	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08
LPA-80080/4CF	B	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			-6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08
QS6656-5D	B	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			-2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
QS6656-5D	B	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
LPA-80080/4CF	B	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08
LPA-80080/4CF	C	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			-6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08
QS6656-5D	C	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			-2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
QS6656-5D	C	From Leg	4.00	0.0000	136.00	No Ice	8.13	6.80	0.10
(Verizon)			2.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
LPA-80080/4CF	C	From Leg	4.00	0.0000	136.00	No Ice	2.62	5.40	0.01
(Verizon)			6.00			1/2" Ice	2.92	5.73	0.05
			0.00			1" Ice	3.23	6.06	0.08

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
B2/B66A RRH	A	From Leg	4.00	0.0000	136.00	No Ice	2.54	1.61	0.06
(Verizon)			-2.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10
B2/B66A RRH	B	From Leg	4.00	0.0000	136.00	No Ice	2.54	1.61	0.06
(Verizon)			-2.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10
B2/B66A RRH	C	From Leg	4.00	0.0000	136.00	No Ice	2.54	1.61	0.06
(Verizon)			-2.00			1/2" Ice	2.75	1.79	0.08
			0.00			1" Ice	2.97	1.98	0.10
B5/B13 RRH	A	From Leg	4.00	0.0000	136.00	No Ice	1.87	1.02	0.07
(Verizon)			2.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
B5/B13 RRH	B	From Leg	4.00	0.0000	136.00	No Ice	1.87	1.02	0.07
(Verizon)			2.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
B5/B13 RRH	C	From Leg	4.00	0.0000	136.00	No Ice	1.87	1.02	0.07
(Verizon)			2.00			1/2" Ice	2.03	1.15	0.09
			0.00			1" Ice	2.21	1.29	0.11
DB-T1-6Z-8AB-0Z	A	From Leg	4.00	0.0000	136.00	No Ice	4.80	2.00	0.04
(Verizon)			0.00			1/2" Ice	5.07	2.19	0.08
			0.00			1" Ice	5.35	2.39	0.12
SitePro VFA12-HD	A	From Leg	2.50	0.0000	136.00	No Ice	21.00	21.00	0.75
(Verizon)			0.00			1/2" Ice	25.00	25.00	0.90
			0.00			1" Ice	29.00	29.00	1.05
SitePro VFA12-HD	B	From Leg	2.50	0.0000	136.00	No Ice	21.00	21.00	0.75
(Verizon)			0.00			1/2" Ice	25.00	25.00	0.90
			0.00			1" Ice	29.00	29.00	1.05
SitePro VFA12-HD	C	From Leg	2.50	0.0000	136.00	No Ice	21.00	21.00	0.75
(Verizon)			0.00			1/2" Ice	25.00	25.00	0.90
			0.00			1" Ice	29.00	29.00	1.05
APXVAALL24-43	A	From Leg	2.00	0.0000	120.00	No Ice	20.24	8.89	0.15
(T-Mobile)			2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
APXVAALL24-43	B	From Leg	2.00	0.0000	120.00	No Ice	20.24	8.89	0.15
(T-Mobile)			2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
APXVAALL24-43	C	From Leg	2.00	0.0000	120.00	No Ice	20.24	8.89	0.15
(T-Mobile)			2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
VV-65A-R1	A	From Leg	2.00	0.0000	120.00	No Ice	5.93	2.76	0.03
(T-Mobile)			0.00			1/2" Ice	6.29	3.10	0.06
			0.00			1" Ice	6.66	3.45	0.10
VV-65A-R1	B	From Leg	2.00	0.0000	120.00	No Ice	5.93	2.76	0.03
(T-Mobile)			0.00			1/2" Ice	6.29	3.10	0.06
			0.00			1" Ice	6.66	3.45	0.10
VV-65A-R1	C	From Leg	2.00	0.0000	120.00	No Ice	5.93	2.76	0.03
(T-Mobile)			0.00			1/2" Ice	6.29	3.10	0.06
			0.00			1" Ice	6.66	3.45	0.10
AIR6419	A	From Leg	2.00	0.0000	120.00	No Ice	3.66	1.66	0.07
(T-Mobile)			-2.00			1/2" Ice	3.91	1.85	0.09
			0.00			1" Ice	4.16	2.05	0.12
AIR6419	B	From Leg	2.00	0.0000	120.00	No Ice	3.66	1.66	0.07
(T-Mobile)			-2.00			1/2" Ice	3.91	1.85	0.09
			0.00			1" Ice	4.16	2.05	0.12
AIR6419	C	From Leg	2.00	0.0000	120.00	No Ice	3.66	1.66	0.07
(T-Mobile)			-2.00			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
4460 B25+B66 (T-Mobile)	A	From Leg	1.00 -1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	2.56 2.76 2.97	1.98 2.16 2.34	0.11 0.13 0.16
4460 B25+B66 (T-Mobile)	B	From Leg	1.00 -1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	2.56 2.76 2.97	1.98 2.16 2.34	0.11 0.13 0.16
4460 B25+B66 (T-Mobile)	C	From Leg	1.00 -1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	2.56 2.76 2.97	1.98 2.16 2.34	0.11 0.13 0.16
4449 B5/B12 (T-Mobile)	A	From Leg	1.00 1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	1.97 2.14 2.33	1.41 1.56 1.73	0.07 0.09 0.11
4449 B5/B12 (T-Mobile)	B	From Leg	1.00 1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	1.97 2.14 2.33	1.41 1.56 1.73	0.07 0.09 0.11
4449 B5/B12 (T-Mobile)	C	From Leg	1.00 1.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	1.97 2.14 2.33	1.41 1.56 1.73	0.07 0.09 0.11
ROHN 6'x15' Boom Gate (1) (T-Mobile)	A	From Leg	2.50 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	17.75 21.10 24.50	17.75 21.10 24.50	0.60 0.07 0.89
ROHN 6'x15' Boom Gate (1) (T-Mobile)	B	From Leg	2.50 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	17.75 21.10 24.50	17.75 21.10 24.50	0.60 0.07 0.89
ROHN 6'x15' Boom Gate (1) (T-Mobile)	C	From Leg	2.50 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	17.75 21.10 24.50	17.75 21.10 24.50	0.60 0.07 0.89
GPS	A	From Leg	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	1.00 1.50 2.00	1.00 1.50 2.00	0.01 0.01 0.02
1' Standoff	A	From Leg	0.50 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	1.00 1.26 1.52	1.00 1.26 1.52	0.01 0.01 0.01

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % 	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 180.00-160.00	170.00	1.415	34	73.132	A B C	13.162 13.162 13.162	9.583 9.583 9.583	9.583	42.13 42.13 42.13	0.000 0.000 44.928	0.000 0.000 0.000
T2 160.00-140.00	150.00	1.378	33	73.132	A B C	1.206 1.206 1.206	18.153 18.153 18.153	9.583	49.50 49.50 49.50	23.760 0.000 49.920	0.000 0.000 0.000
T3 140.00-120.00	130.00	1.337	32	73.132	A B	2.265 2.265	18.153 18.153	9.583	46.94 46.94	39.600 25.344	0.000 0.000

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
					C	2.265	18.153		46.94	49.920	0.000
T4	110.00	1.291	31	73.132	A	1.206	18.153	9.583	49.50	55.440	0.000
120.00-100.00					B	1.206	18.153		49.50	31.680	0.000
					C	1.206	18.153		49.50	49.920	0.000
T5	90.00	1.238	30	73.132	A	1.736	18.153	9.583	48.19	56.484	0.000
100.00-80.00					B	1.736	18.153		48.19	31.680	0.000
					C	1.736	18.153		48.19	49.920	0.000
T6 80.00-60.00	70.00	1.174	28	73.132	A	1.206	18.153	9.583	49.50	56.600	0.000
					B	1.206	18.153		49.50	31.680	0.000
					C	1.206	18.153		49.50	49.920	0.000
T7 60.00-40.00	50.00	1.094	26	73.132	A	1.799	14.265	9.583	59.66	56.600	0.000
					B	1.799	14.265		59.66	31.680	0.000
					C	1.799	14.265		59.66	49.920	0.000
T8 40.00-20.00	30.00	0.982	24	73.132	A	0.740	14.265	9.583	63.87	56.600	0.000
					B	0.740	14.265		63.87	31.680	0.000
					C	0.740	14.265		63.87	49.920	0.000
T9 20.00-5.00	12.50	0.85	20	54.849	A	1.394	10.488	7.188	60.49	36.790	0.000
					B	1.394	10.488		60.49	20.592	0.000
					C	1.394	10.488		60.49	32.448	0.000
T10 5.00-0.00	2.50	0.85	20	9.808	A	2.448	2.576	2.576	51.27	0.000	0.000
					B	2.448	2.576		51.27	0.000	0.000
					C	2.448	2.576		51.27	0.000	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	170.00	1.415	8	1.7672	79.022	A	13.162	43.139	21.365	37.95	0.000	0.000
180.00-160.00						B	13.162	43.139		37.95	0.000	0.000
						C	13.162	43.139		37.95	107.984	0.000
T2	150.00	1.378	7	1.7452	78.949	A	1.206	50.367	21.218	41.14	51.643	0.000
160.00-140.00						B	1.206	50.367		41.14	0.000	0.000
						C	1.206	50.367		41.14	119.615	0.000
T3	130.00	1.337	7	1.7204	78.866	A	2.265	50.821	21.053	39.66	85.745	0.000
140.00-120.00						B	2.265	50.821		39.66	49.960	0.000
						C	2.265	50.821		39.66	119.201	0.000
T4	110.00	1.291	7	1.6919	78.771	A	1.206	49.384	20.863	41.24	113.101	0.000
120.00-100.00						B	1.206	49.384		41.24	62.056	0.000
						C	1.206	49.384		41.24	118.725	0.000
T5 100.00-80.00	90.00	1.238	7	1.6583	78.659	A	1.736	49.641	20.639	40.17	119.434	0.000
						B	1.736	49.641		40.17	61.592	0.000
						C	1.736	49.641		40.17	118.164	0.000
T6 80.00-60.00	70.00	1.174	6	1.6171	78.522	A	1.206	48.003	20.364	41.38	119.216	0.000
						B	1.206	48.003		41.38	61.023	0.000
						C	1.206	48.003		41.38	117.478	0.000
T7 60.00-40.00	50.00	1.094	6	1.5636	78.344	A	1.799	35.727	20.008	53.32	117.919	0.000
						B	1.799	35.727		53.32	60.285	0.000
						C	1.799	35.727		53.32	116.586	0.000
T8 40.00-20.00	30.00	0.982	5	1.4858	78.084	A	0.740	33.872	19.488	56.31	116.034	0.000
						B	0.740	33.872		56.31	59.211	0.000
						C	0.740	33.872		56.31	115.290	0.000
T9 20.00-5.00	12.50	0.85	5	1.3612	58.252	A	1.394	24.357	13.994	54.34	73.464	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						B	1.394	24.357		54.34	37.372	0.000
						C	1.394	24.357		54.34	73.593	0.000
T10 5.00-0.00	2.50	0.85	5	1.1589	10.829	A	2.448	6.071	4.652	54.61	0.000	0.000
						B	2.448	6.071		54.61	0.000	0.000
						C	2.448	6.071		54.61	0.000	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	170.00	1.415	11	73.132	A	13.162	9.583	9.583	42.13	0.000	0.000
180.00-160.00					B	13.162	9.583		42.13	0.000	0.000
					C	13.162	9.583		42.13	44.928	0.000
T2	150.00	1.378	11	73.132	A	1.206	18.153	9.583	49.50	23.760	0.000
160.00-140.00					B	1.206	18.153		49.50	0.000	0.000
					C	1.206	18.153		49.50	49.920	0.000
T3	130.00	1.337	10	73.132	A	2.265	18.153	9.583	46.94	39.600	0.000
140.00-120.00					B	2.265	18.153		46.94	25.344	0.000
					C	2.265	18.153		46.94	49.920	0.000
T4	110.00	1.291	10	73.132	A	1.206	18.153	9.583	49.50	55.440	0.000
120.00-100.00					B	1.206	18.153		49.50	31.680	0.000
					C	1.206	18.153		49.50	49.920	0.000
T5	90.00	1.238	10	73.132	A	1.736	18.153	9.583	48.19	56.484	0.000
100.00-80.00					B	1.736	18.153		48.19	31.680	0.000
					C	1.736	18.153		48.19	49.920	0.000
T6 80.00-60.00	70.00	1.174	9	73.132	A	1.206	18.153	9.583	49.50	56.600	0.000
					B	1.206	18.153		49.50	31.680	0.000
					C	1.206	18.153		49.50	49.920	0.000
T7 60.00-40.00	50.00	1.094	9	73.132	A	1.799	14.265	9.583	59.66	56.600	0.000
					B	1.799	14.265		59.66	31.680	0.000
					C	1.799	14.265		59.66	49.920	0.000
T8 40.00-20.00	30.00	0.982	8	73.132	A	0.740	14.265	9.583	63.87	56.600	0.000
					B	0.740	14.265		63.87	31.680	0.000
					C	0.740	14.265		63.87	49.920	0.000
T9 20.00-5.00	12.50	0.85	7	54.849	A	1.394	10.488	7.188	60.49	36.790	0.000
					B	1.394	10.488		60.49	20.592	0.000
					C	1.394	10.488		60.49	32.448	0.000
T10 5.00-0.00	2.50	0.85	7	9.808	A	2.448	2.576	2.576	51.27	0.000	0.000
					B	2.448	2.576		51.27	0.000	0.000
					C	2.448	2.576		51.27	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 ft²	F K	w plf	Ctrl. Face
T1	0.30	1.23	A	0.311	2.267	34	1	1	18.935	2.02	100.84	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
180.00-160.00		TA 0.42	B	0.311	2.267		1	1	18.935			
			C	0.311	2.267		1	1	18.935			
T2	0.50	0.85	A	0.265	2.394	33	1	1	11.894	2.04	102.15	C
160.00-140.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T3	0.77	0.71	A	0.279	2.353	32	1	1	13.025	2.72	135.77	C
140.00-120.00			B	0.279	2.353		1	1	13.025			
			C	0.279	2.353		1	1	13.025			
T4	0.89	0.85	A	0.265	2.394	31	1	1	11.894	2.91	145.74	C
120.00-100.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T5	0.89	0.72	A	0.272	2.373	30	1	1	12.459	2.84	141.88	C
100.00-80.00			B	0.272	2.373		1	1	12.459			
			C	0.272	2.373		1	1	12.459			
T6	0.90	0.85	A	0.265	2.394	28	1	1	11.894	2.67	133.35	C
80.00-60.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T7	0.87	0.62	A	0.22	2.532	26	1	1	10.047	2.42	120.84	C
60.00-40.00			B	0.22	2.532		1	1	10.047			
			C	0.22	2.532		1	1	10.047			
T8	0.87	0.57	A	0.205	2.579	24	1	1	8.948	2.12	106.15	C
40.00-20.00			B	0.205	2.579		1	1	8.948			
			C	0.205	2.579		1	1	8.948			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	20	1	1	7.452	1.26	84.17	C
			B	0.217	2.541		1	1	7.452			
			C	0.217	2.541		1	1	7.452			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	20	1	1	4.230	0.14	27.63	C
			B	0.512	1.885		1	1	4.230			
			C	0.512	1.885		1	1	4.230			
Sum Weight:	6.57	8.07								21.14		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.30	1.23	A	0.311	2.267	34	0.8	1	16.303	1.84	92.23	C
180.00-160.00		TA 0.42	B	0.311	2.267		0.8	1	16.303			
			C	0.311	2.267		0.8	1	16.303			
T2	0.50	0.85	A	0.265	2.394	33	0.8	1	11.652	2.03	101.34	C
160.00-140.00			B	0.265	2.394		0.8	1	11.652			
			C	0.265	2.394		0.8	1	11.652			
T3	0.77	0.71	A	0.279	2.353	32	0.8	1	12.572	2.69	134.32	C
140.00-120.00			B	0.279	2.353		0.8	1	12.572			
			C	0.279	2.353		0.8	1	12.572			
T4	0.89	0.85	A	0.265	2.394	31	0.8	1	11.652	2.90	144.98	C
120.00-100.00			B	0.265	2.394		0.8	1	11.652			
			C	0.265	2.394		0.8	1	11.652			
T5	0.89	0.72	A	0.272	2.373	30	0.8	1	12.111	2.82	140.84	C
100.00-80.00			B	0.272	2.373		0.8	1	12.111			
			C	0.272	2.373		0.8	1	12.111			
T6	0.90	0.85	A	0.265	2.394	28	0.8	1	11.652	2.65	132.66	C
80.00-60.00			B	0.265	2.394		0.8	1	11.652			

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	0.265	2.394		0.8	1	11.652			
T7	0.87	0.62	A	0.22	2.532	26	0.8	1	9.688	2.40	119.82	C
60.00-40.00			B	0.22	2.532		0.8	1	9.688			
			C	0.22	2.532		0.8	1	9.688			
T8	0.87	0.57	A	0.205	2.579	24	0.8	1	8.800	2.12	105.77	C
40.00-20.00			B	0.205	2.579		0.8	1	8.800			
			C	0.205	2.579		0.8	1	8.800			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	20	0.8	1	7.173	1.25	83.35	C
			B	0.217	2.541		0.8	1	7.173			
			C	0.217	2.541		0.8	1	7.173			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	20	0.8	1	3.740	0.12	24.43	C
			B	0.512	1.885		0.8	1	3.740			
			C	0.512	1.885		0.8	1	3.740			
Sum Weight:	6.57	8.07								20.81		

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
T1	0.30	1.23	A	0.311	2.267	34	0.85	1	16.961	1.89	94.38	C
180.00-160.00		TA 0.42	B	0.311	2.267		0.85	1	16.961			
			C	0.311	2.267		0.85	1	16.961			
T2	0.50	0.85	A	0.265	2.394	33	0.85	1	11.713	2.03	101.54	C
160.00-140.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T3	0.77	0.71	A	0.279	2.353	32	0.85	1	12.685	2.69	134.68	C
140.00-120.00			B	0.279	2.353		0.85	1	12.685			
			C	0.279	2.353		0.85	1	12.685			
T4	0.89	0.85	A	0.265	2.394	31	0.85	1	11.713	2.90	145.17	C
120.00-100.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T5	0.89	0.72	A	0.272	2.373	30	0.85	1	12.198	2.82	141.10	C
100.00-80.00			B	0.272	2.373		0.85	1	12.198			
			C	0.272	2.373		0.85	1	12.198			
T6	0.90	0.85	A	0.265	2.394	28	0.85	1	11.713	2.66	132.83	C
80.00-60.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T7	0.87	0.62	A	0.22	2.532	26	0.85	1	9.777	2.40	120.08	C
60.00-40.00			B	0.22	2.532		0.85	1	9.777			
			C	0.22	2.532		0.85	1	9.777			
T8	0.87	0.57	A	0.205	2.579	24	0.85	1	8.837	2.12	105.87	C
40.00-20.00			B	0.205	2.579		0.85	1	8.837			
			C	0.205	2.579		0.85	1	8.837			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	20	0.85	1	7.243	1.25	83.55	C
			B	0.217	2.541		0.85	1	7.243			
			C	0.217	2.541		0.85	1	7.243			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	20	0.85	1	3.862	0.13	25.23	C
			B	0.512	1.885		0.85	1	3.862			
			C	0.512	1.885		0.85	1	3.862			
Sum Weight:	6.57	8.07								20.89		

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
T1	1.73	4.16	A	0.712	1.777	8	1	1	48.006	0.76	38.07	C
180.00-160.00		TA 1.05	B	0.712	1.777		1	1	48.006			
			C	0.712	1.777		1	1	48.006			
T2	2.79	2.97	A	0.653	1.781	7	1	1	39.926	0.83	41.58	C
160.00-140.00			B	0.653	1.781		1	1	39.926			
			C	0.653	1.781		1	1	39.926			
T3	4.20	2.91	A	0.673	1.777	7	1	1	42.027	0.98	48.86	C
140.00-120.00			B	0.673	1.777		1	1	42.027			
			C	0.673	1.777		1	1	42.027			
T4	4.77	2.88	A	0.642	1.784	7	1	1	38.814	0.99*	49.38	C
120.00-100.00			B	0.642	1.784		1	1	38.814			
			C	0.642	1.784		1	1	38.814			
T5	4.79	2.82	A	0.653	1.781	7	1	1	39.912	0.95*	47.27	C
100.00-80.00			B	0.653	1.781		1	1	39.912			
			C	0.653	1.781		1	1	39.912			
T6	4.70	2.75	A	0.627	1.79	6	1	1	37.284	0.90*	44.76	C
80.00-60.00			B	0.627	1.79		1	1	37.284			
			C	0.627	1.79		1	1	37.284			
T7	4.53	1.95	A	0.479	1.929	6	1	1	25.573	0.83*	41.60	C
60.00-40.00			B	0.479	1.929		1	1	25.573			
			C	0.479	1.929		1	1	25.573			
T8	4.36	1.70	A	0.443	1.985	5	1	1	22.681	0.74*	37.24	C
40.00-20.00			B	0.443	1.985		1	1	22.681			
			C	0.443	1.985		1	1	22.681			
T9 20.00-5.00	2.67	1.34	A	0.442	1.987	5	1	1	17.129	0.48*	32.05	C
			B	0.442	1.987		1	1	17.129			
			C	0.442	1.987		1	1	17.129			
T10 5.00-0.00	0.00	0.63	A	0.787	1.807	5	1	1	7.761	0.06	11.02	C
			B	0.787	1.807		1	1	7.761			
			C	0.787	1.807		1	1	7.761			
Sum Weight:	34.55	25.57			*2.1A_g limit					7.51		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	1.73	4.16	A	0.712	1.777	8	0.8	1	45.373	0.73	36.54	C
180.00-160.00		TA 1.05	B	0.712	1.777		0.8	1	45.373			
			C	0.712	1.777		0.8	1	45.373			
T2	2.79	2.97	A	0.653	1.781	7	0.8	1	39.685	0.83	41.44	C
160.00-140.00			B	0.653	1.781		0.8	1	39.685			
			C	0.653	1.781		0.8	1	39.685			
T3	4.20	2.91	A	0.673	1.777	7	0.8	1	41.574	0.97	48.61	C
140.00-120.00			B	0.673	1.777		0.8	1	41.574			
			C	0.673	1.777		0.8	1	41.574			
T4	4.77	2.88	A	0.642	1.784	7	0.8	1	38.573	0.99*	49.38	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
120.00-100.00			B	0.642	1.784		0.8	1	38.573			
			C	0.642	1.784		0.8	1	38.573			
T5	4.79	2.82	A	0.653	1.781	7	0.8	1	39.565	0.95*	47.27	C
100.00-80.00			B	0.653	1.781		0.8	1	39.565			
			C	0.653	1.781		0.8	1	39.565			
T6	4.70	2.75	A	0.627	1.79	6	0.8	1	37.043	0.90*	44.76	C
80.00-60.00			B	0.627	1.79		0.8	1	37.043			
			C	0.627	1.79		0.8	1	37.043			
T7	4.53	1.95	A	0.479	1.929	6	0.8	1	25.213	0.83*	41.60	C
60.00-40.00			B	0.479	1.929		0.8	1	25.213			
			C	0.479	1.929		0.8	1	25.213			
T8	4.36	1.70	A	0.443	1.985	5	0.8	1	22.533	0.74*	37.24	C
40.00-20.00			B	0.443	1.985		0.8	1	22.533			
			C	0.443	1.985		0.8	1	22.533			
T9 20.00-5.00	2.67	1.34	A	0.442	1.987	5	0.8	1	16.850	0.48*	32.05	C
			B	0.442	1.987		0.8	1	16.850			
			C	0.442	1.987		0.8	1	16.850			
T10 5.00-0.00	0.00	0.63	A	0.787	1.807	5	0.8	1	7.272	0.05	10.33	C
			B	0.787	1.807		0.8	1	7.272			
			C	0.787	1.807		0.8	1	7.272			
Sum Weight:	34.55	25.57			*2.1A_g limit					7.47		

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 ft²	F K	w plf	Ctrl. Face
T1	1.73	4.16	A	0.712	1.777	8	0.85	1	46.031	0.74	36.93	C
180.00-160.00		TA 1.05	B	0.712	1.777		0.85	1	46.031			
			C	0.712	1.777		0.85	1	46.031			
T2	2.79	2.97	A	0.653	1.781	7	0.85	1	39.745	0.83	41.48	C
160.00-140.00			B	0.653	1.781		0.85	1	39.745			
			C	0.653	1.781		0.85	1	39.745			
T3	4.20	2.91	A	0.673	1.777	7	0.85	1	41.688	0.97	48.67	C
140.00-120.00			B	0.673	1.777		0.85	1	41.688			
			C	0.673	1.777		0.85	1	41.688			
T4	4.77	2.88	A	0.642	1.784	7	0.85	1	38.634	0.99*	49.38	C
120.00-100.00			B	0.642	1.784		0.85	1	38.634			
			C	0.642	1.784		0.85	1	38.634			
T5	4.79	2.82	A	0.653	1.781	7	0.85	1	39.652	0.95*	47.27	C
100.00-80.00			B	0.653	1.781		0.85	1	39.652			
			C	0.653	1.781		0.85	1	39.652			
T6	4.70	2.75	A	0.627	1.79	6	0.85	1	37.103	0.90*	44.76	C
80.00-60.00			B	0.627	1.79		0.85	1	37.103			
			C	0.627	1.79		0.85	1	37.103			
T7	4.53	1.95	A	0.479	1.929	6	0.85	1	25.303	0.83*	41.60	C
60.00-40.00			B	0.479	1.929		0.85	1	25.303			
			C	0.479	1.929		0.85	1	25.303			
T8	4.36	1.70	A	0.443	1.985	5	0.85	1	22.570	0.74*	37.24	C
40.00-20.00			B	0.443	1.985		0.85	1	22.570			
			C	0.443	1.985		0.85	1	22.570			
T9 20.00-5.00	2.67	1.34	A	0.442	1.987	5	0.85	1	16.920	0.48*	32.05	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			B	0.442	1.987		0.85	1	16.920			
			C	0.442	1.987		0.85	1	16.920			
T10 5.00-0.00	0.00	0.63	A	0.787	1.807	5	0.85	1	7.394	0.05	10.50	C
			B	0.787	1.807		0.85	1	7.394			
			C	0.787	1.807		0.85	1	7.394			
Sum Weight:	34.55	25.57			*2.1A_g limit					7.48		

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
T1	0.30	1.23	A	0.311	2.267	11	1	1	18.935	0.66	32.93	C
180.00-160.00		TA 0.42	B	0.311	2.267		1	1	18.935			
			C	0.311	2.267		1	1	18.935			
T2	0.50	0.85	A	0.265	2.394	11	1	1	11.894	0.67	33.35	C
160.00-140.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T3	0.77	0.71	A	0.279	2.353	10	1	1	13.025	0.89	44.33	C
140.00-120.00			B	0.279	2.353		1	1	13.025			
			C	0.279	2.353		1	1	13.025			
T4	0.89	0.85	A	0.265	2.394	10	1	1	11.894	0.95	47.59	C
120.00-100.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T5	0.89	0.72	A	0.272	2.373	10	1	1	12.459	0.93	46.33	C
100.00-80.00			B	0.272	2.373		1	1	12.459			
			C	0.272	2.373		1	1	12.459			
T6	0.90	0.85	A	0.265	2.394	9	1	1	11.894	0.87	43.54	C
80.00-60.00			B	0.265	2.394		1	1	11.894			
			C	0.265	2.394		1	1	11.894			
T7	0.87	0.62	A	0.22	2.532	9	1	1	10.047	0.79	39.46	C
60.00-40.00			B	0.22	2.532		1	1	10.047			
			C	0.22	2.532		1	1	10.047			
T8	0.87	0.57	A	0.205	2.579	8	1	1	8.948	0.69	34.66	C
40.00-20.00			B	0.205	2.579		1	1	8.948			
			C	0.205	2.579		1	1	8.948			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	7	1	1	7.452	0.41	27.48	C
			B	0.217	2.541		1	1	7.452			
			C	0.217	2.541		1	1	7.452			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	7	1	1	4.230	0.05	9.02	C
			B	0.512	1.885		1	1	4.230			
			C	0.512	1.885		1	1	4.230			
Sum Weight:	6.57	8.07								6.90		

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
T1	0.30	1.23	A	0.311	2.267	11	0.8	1	16.303	0.60	30.11	C
180.00-160.00		TA 0.42	B	0.311	2.267		0.8	1	16.303			
			C	0.311	2.267		0.8	1	16.303			
T2	0.50	0.85	A	0.265	2.394	11	0.8	1	11.652	0.66	33.09	C
160.00-140.00			B	0.265	2.394		0.8	1	11.652			
			C	0.265	2.394		0.8	1	11.652			
T3	0.77	0.71	A	0.279	2.353	10	0.8	1	12.572	0.88	43.86	C
140.00-120.00			B	0.279	2.353		0.8	1	12.572			
			C	0.279	2.353		0.8	1	12.572			
T4	0.89	0.85	A	0.265	2.394	10	0.8	1	11.652	0.95	47.34	C
120.00-100.00			B	0.265	2.394		0.8	1	11.652			
			C	0.265	2.394		0.8	1	11.652			
T5	0.89	0.72	A	0.272	2.373	10	0.8	1	12.111	0.92	45.99	C
100.00-80.00			B	0.272	2.373		0.8	1	12.111			
			C	0.272	2.373		0.8	1	12.111			
T6	0.90	0.85	A	0.265	2.394	9	0.8	1	11.652	0.87	43.32	C
80.00-60.00			B	0.265	2.394		0.8	1	11.652			
			C	0.265	2.394		0.8	1	11.652			
T7	0.87	0.62	A	0.22	2.532	9	0.8	1	9.688	0.78	39.13	C
60.00-40.00			B	0.22	2.532		0.8	1	9.688			
			C	0.22	2.532		0.8	1	9.688			
T8	0.87	0.57	A	0.205	2.579	8	0.8	1	8.800	0.69	34.54	C
40.00-20.00			B	0.205	2.579		0.8	1	8.800			
			C	0.205	2.579		0.8	1	8.800			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	7	0.8	1	7.173	0.41	27.22	C
			B	0.217	2.541		0.8	1	7.173			
			C	0.217	2.541		0.8	1	7.173			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	7	0.8	1	3.740	0.04	7.98	C
			B	0.512	1.885		0.8	1	3.740			
			C	0.512	1.885		0.8	1	3.740			
Sum Weight:	6.57	8.07								6.80		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.30	1.23	A	0.311	2.267	11	0.85	1	16.961	0.62	30.82	C
180.00-160.00		TA 0.42	B	0.311	2.267		0.85	1	16.961			
			C	0.311	2.267		0.85	1	16.961			
T2	0.50	0.85	A	0.265	2.394	11	0.85	1	11.713	0.66	33.16	C
160.00-140.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T3	0.77	0.71	A	0.279	2.353	10	0.85	1	12.685	0.88	43.98	C
140.00-120.00			B	0.279	2.353		0.85	1	12.685			
			C	0.279	2.353		0.85	1	12.685			
T4	0.89	0.85	A	0.265	2.394	10	0.85	1	11.713	0.95	47.40	C
120.00-100.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T5	0.89	0.72	A	0.272	2.373	10	0.85	1	12.198	0.92	46.07	C
100.00-80.00			B	0.272	2.373		0.85	1	12.198			
			C	0.272	2.373		0.85	1	12.198			
T6	0.90	0.85	A	0.265	2.394	9	0.85	1	11.713	0.87	43.37	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
80.00-60.00			B	0.265	2.394		0.85	1	11.713			
			C	0.265	2.394		0.85	1	11.713			
T7	0.87	0.62	A	0.22	2.532	9	0.85	1	9.777	0.78	39.21	C
60.00-40.00			B	0.22	2.532		0.85	1	9.777			
			C	0.22	2.532		0.85	1	9.777			
T8	0.87	0.57	A	0.205	2.579	8	0.85	1	8.837	0.69	34.57	C
40.00-20.00			B	0.205	2.579		0.85	1	8.837			
			C	0.205	2.579		0.85	1	8.837			
T9 20.00-5.00	0.57	0.52	A	0.217	2.541	7	0.85	1	7.243	0.41	27.28	C
			B	0.217	2.541		0.85	1	7.243			
			C	0.217	2.541		0.85	1	7.243			
T10 5.00-0.00	0.00	0.29	A	0.512	1.885	7	0.85	1	3.862	0.04	8.24	C
			B	0.512	1.885		0.85	1	3.862			
			C	0.512	1.885		0.85	1	3.862			
Sum Weight:	6.57	8.07								6.82		

Force Totals (Does not include forces on guys)

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Torques kip-ft
Leg Weight	4.15			
Bracing Weight	3.49			
Total Member Self-Weight	7.64			
Gusset Weight	0.43			
Guy Weight	2.72			
Total Weight	29.28			
Wind 0 deg - No Ice		0.01	-33.71	-0.89
Wind 30 deg - No Ice		16.70	-28.99	-1.28
Wind 60 deg - No Ice		28.85	-16.70	-1.33
Wind 90 deg - No Ice		33.39	-0.01	-1.02
Wind 120 deg - No Ice		29.12	16.84	-0.44
Wind 150 deg - No Ice		16.69	28.98	0.26
Wind 180 deg - No Ice		-0.01	33.38	0.89
Wind 210 deg - No Ice		-16.70	28.99	1.28
Wind 240 deg - No Ice		-29.13	16.86	1.33
Wind 270 deg - No Ice		-33.39	0.01	1.02
Wind 300 deg - No Ice		-28.84	-16.68	0.44
Wind 330 deg - No Ice		-16.69	-28.98	-0.26
Member Ice	17.50			
Gusset Ice	0.49			
Guy Ice	14.37			
Total Weight Ice	106.42			
Wind 0 deg - Ice		0.00	-11.50	-0.67
Wind 30 deg - Ice		5.73	-9.93	-0.62
Wind 60 deg - Ice		9.91	-5.73	-0.40
Wind 90 deg - Ice		11.45	-0.00	-0.07
Wind 120 deg - Ice		9.94	5.75	0.28
Wind 150 deg - Ice		5.72	9.93	0.55
Wind 180 deg - Ice		-0.00	11.46	0.67
Wind 210 deg - Ice		-5.73	9.93	0.62
Wind 240 deg - Ice		-9.95	5.75	0.39
Wind 270 deg - Ice		-11.45	0.00	0.07

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Torques kip-ft
Wind 300 deg - Ice		-9.91	-5.73	-0.28
Wind 330 deg - Ice		-5.72	-9.93	-0.55
Total Weight	29.28			
Wind 0 deg - Service		0.00	-11.01	-0.29
Wind 30 deg - Service		5.45	-9.46	-0.42
Wind 60 deg - Service		9.42	-5.45	-0.43
Wind 90 deg - Service		10.90	-0.00	-0.33
Wind 120 deg - Service		9.51	5.50	-0.14
Wind 150 deg - Service		5.45	9.46	0.08
Wind 180 deg - Service		-0.00	10.90	0.29
Wind 210 deg - Service		-5.45	9.46	0.42
Wind 240 deg - Service		-9.51	5.51	0.43
Wind 270 deg - Service		-10.90	0.00	0.33
Wind 300 deg - Service		-9.42	-5.45	0.14
Wind 330 deg - Service		-5.45	-9.46	-0.08

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy
3	1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy
4	1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy
5	1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy
6	1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy
7	1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy
8	1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy
9	1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy
10	1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy
11	1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy
12	1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy
13	1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy
14	1.2 Dead+1.0 Ice+1.0 Temp+Guy
15	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy
16	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy
17	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy
18	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy
19	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy
20	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy
21	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy
22	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy
23	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy
24	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy
25	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy
26	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy

Comb. No.	Description
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy
38	Dead+Wind 330 deg - Service+Guy

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	8	31.93	0.01	-0.06
			Max. Compression	10	-36.30	-0.23	0.09
			Max. Mx	11	-27.75	1.58	-0.29
			Max. My	2	-30.62	-0.07	1.78
			Max. Vy	11	4.07	1.52	0.15
			Max. Vx	2	4.56	-0.07	1.78
		Diagonal	Max Tension	9	5.02	0.00	0.00
			Max. Compression	10	-7.35	0.00	0.00
			Max. Mx	15	-0.48	-0.02	0.00
			Max. My	26	-0.74	0.00	-0.00
			Max. Vy	15	0.02	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Top Girt	Max Tension	10	0.86	0.00	0.00
			Max. Compression	8	-0.87	0.00	0.00
			Max. Mx	14	0.01	-0.02	0.00
			Max. My	26	0.02	0.00	-0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Bottom Girt	Max Tension	2	2.31	0.00	0.00
			Max. Compression	12	-0.32	0.00	0.00
			Max. Mx	14	1.19	-0.02	0.00
			Max. My	5	0.76	0.00	-0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
		Guy A	Bottom Tension	9	8.81		
			Top Tension	9	8.89		
			Top Cable Vert	9	6.43		
			Top Cable Norm	9	6.14		
			Top Cable Tan	9	0.06		
			Bot Cable Vert	9	-6.15		
			Bot Cable Norm	9	6.30		
			Bot Cable Tan	9	0.11		
		Guy A	Bottom Tension	8	23.74		
			Top Tension	8	23.99		
			Top Cable Vert	8	18.35		
			Top Cable Norm	8	15.46		
			Top Cable Tan	8	0.00		
			Bot Cable Vert	8	-17.73		
			Bot Cable Norm	8	15.78		
			Bot Cable Tan	8	0.00		
		Guy B	Bottom Tension	13	8.66		
			Top Tension	13	8.74		
			Top Cable Vert	13	6.32		
			Top Cable Norm	13	6.04		
			Top Cable Tan	13	0.06		
			Bot Cable Vert	13	-6.05		
			Bot Cable Norm	13	6.20		
			Bot Cable Tan	13	0.11		
		Guy B	Bottom Tension	12	23.70		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Top Tension	12	23.95		
			Top Cable Vert	12	18.32		
			Top Cable Norm	12	15.43		
			Top Cable Tan	12	0.00		
			Bot Cable Vert	12	-17.70		
			Bot Cable Norm	12	15.75		
			Bot Cable Tan	12	0.00		
		Guy C	Bottom Tension	3	8.81		
			Top Tension	3	8.89		
			Top Cable Vert	3	6.42		
			Top Cable Norm	3	6.14		
			Top Cable Tan	3	0.06		
			Bot Cable Vert	3	-6.15		
			Bot Cable Norm	3	6.30		
			Bot Cable Tan	3	0.11		
		Guy C	Bottom Tension	4	23.71		
			Top Tension	4	23.97		
			Top Cable Vert	4	18.33		
			Top Cable Norm	4	15.44		
			Top Cable Tan	4	0.00		
			Bot Cable Vert	4	-17.71		
			Bot Cable Norm	4	15.77		
			Bot Cable Tan	4	0.00		
		Top Guy Pull-Off	Max Tension	7	8.26	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	4.98	0.03	0.00
			Max. My	5	5.74	0.00	0.00
			Max. Vy	14	-0.04	0.00	0.00
			Max. Vx	5	-0.00	0.00	0.00
		Torque Arm Top	Max Tension	9	6.56	-5.07	0.00
			Max. Compression	3	-2.77	-19.39	0.00
			Max. Mx	9	0.45	-19.92	0.00
			Max. My	5	4.55	-12.72	-0.00
			Max. Vy	9	5.87	-19.92	0.00
			Max. Vx	5	-0.00	-12.72	-0.00
T2	160 - 140	Leg	Max Tension	2	17.60	-0.03	0.57
			Max. Compression	12	-49.85	0.02	0.14
			Max. Mx	11	-8.87	-1.45	-0.36
			Max. My	8	-5.54	-0.08	1.58
			Max. Vy	11	4.07	1.05	0.07
			Max. Vx	2	4.58	-0.05	1.26
		Diagonal	Max Tension	9	5.56	0.00	0.00
			Max. Compression	9	-6.04	0.00	0.00
			Max. Mx	15	0.79	0.02	0.00
			Max. My	26	0.72	0.00	0.00
			Max. Vy	15	-0.02	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Top Girt	Max Tension	8	1.92	0.00	0.00
			Max. Compression	2	-1.42	0.00	0.00
			Max. Mx	14	0.41	0.01	0.00
			Max. My	26	0.40	0.00	0.00
			Max. Vy	14	-0.02	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	2	1.01	0.00	0.00
			Max. Compression	8	-0.24	0.00	0.00
			Max. Mx	14	0.40	0.01	0.00
			Max. My	5	0.21	0.00	0.00
			Max. Vy	14	-0.02	0.00	0.00
			Max. Vx	5	-0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	2	32.06	-0.02	-0.33
			Max. Compression	8	-75.63	0.01	0.60

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	5	-27.90	0.97	-0.01
			Max. My	8	-2.11	-0.09	0.92
			Max. Vy	6	-1.38	-0.26	-0.26
			Max. Vx	2	1.79	-0.03	0.36
		Diagonal	Max Tension	9	2.27	0.00	0.00
			Max. Compression	9	-2.40	0.00	0.00
			Max. Mx	15	0.05	0.01	0.00
			Max. My	26	-0.07	0.00	0.00
			Max. Vy	15	0.01	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Top Girt	Max Tension	7	0.30	0.00	0.00
			Max. Compression	10	-0.04	0.00	0.00
			Max. Mx	14	0.21	0.01	0.00
			Max. My	26	0.21	0.00	0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Bottom Girt	Max Tension	10	0.86	0.00	0.00
			Max. Compression	12	-0.36	0.00	0.00
			Max. Mx	14	0.29	0.01	0.00
			Max. My	4	0.46	0.00	0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	4	-0.00	0.00	0.00
		Guy A	Bottom Tension	8	14.95		
			Top Tension	8	15.04		
			Top Cable Vert	8	10.39		
			Top Cable Norm	8	10.87		
			Top Cable Tan	8	0.00		
			Bot Cable Vert	8	-10.12		
			Bot Cable Norm	8	11.00		
			Bot Cable Tan	8	0.00		
		Guy B	Bottom Tension	12	14.93		
			Top Tension	12	15.02		
			Top Cable Vert	12	10.38		
			Top Cable Norm	12	10.85		
			Top Cable Tan	12	0.00		
			Bot Cable Vert	12	-10.11		
			Bot Cable Norm	12	10.99		
			Bot Cable Tan	12	0.00		
		Guy C	Bottom Tension	4	14.93		
			Top Tension	4	15.02		
			Top Cable Vert	4	10.38		
			Top Cable Norm	4	10.85		
			Top Cable Tan	4	0.00		
			Bot Cable Vert	4	-10.11		
			Bot Cable Norm	4	10.99		
			Bot Cable Tan	4	0.00		
		Top Guy Pull-Off	Max Tension	2	6.06	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	2.99	0.03	0.00
			Max. My	5	3.56	0.00	0.00
			Max. Vy	14	-0.03	0.00	0.00
			Max. Vx	5	-0.00	0.00	0.00
T4	120 - 100	Leg	Max Tension	2	32.06	-0.02	-0.41
			Max. Compression	8	-76.87	-0.04	0.18
			Max. Mx	5	-48.76	1.40	-0.20
			Max. My	8	-48.17	0.02	1.47
			Max. Vy	5	3.06	1.05	-0.16
			Max. Vx	8	3.24	0.02	1.10
		Diagonal	Max Tension	5	3.58	0.00	0.00
			Max. Compression	5	-4.33	0.00	0.00
			Max. Mx	25	0.09	0.02	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	20	-0.92	0.00	-0.00
			Max. Vy	25	-0.01	0.00	0.00
			Max. Vx	20	0.00	0.00	0.00
		Top Girt	Max Tension	2	1.48	0.00	0.00
			Max. Compression	8	-0.57	0.00	0.00
			Max. Mx	14	0.55	0.01	0.00
			Max. My	4	0.83	0.00	0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	4	-0.00	0.00	0.00
		Bottom Girt	Max Tension	8	0.93	0.00	0.00
			Max. Compression	2	-0.02	0.00	0.00
			Max. Mx	14	0.59	0.01	0.00
			Max. My	11	0.34	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
T5	100 - 80	Leg	Max Tension	8	4.15	0.00	-0.03
			Max. Compression	2	-56.23	-0.02	0.36
			Max. Mx	5	-48.76	1.05	-0.16
			Max. My	2	-2.60	0.02	1.11
			Max. Vy	5	3.08	-0.84	0.05
			Max. Vx	8	3.27	-0.02	-0.91
		Diagonal	Max Tension	5	4.69	0.00	0.00
			Max. Compression	5	-4.76	0.00	0.00
			Max. Mx	26	0.95	0.01	0.00
			Max. My	20	-0.54	0.00	-0.00
			Max. Vy	26	0.01	0.00	0.00
			Max. Vx	20	0.00	0.00	0.00
		Top Girt	Max Tension	2	1.08	0.00	0.00
			Max. Compression	8	-0.54	0.00	0.00
			Max. Mx	14	0.33	0.01	0.00
			Max. My	11	0.22	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
		Bottom Girt	Max Tension	15	0.78	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	0.74	0.01	0.00
			Max. My	11	0.53	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
		Guy A	Bottom Tension	7	24.27		
			Top Tension	7	24.36		
			Top Cable Vert	7	15.73		
			Top Cable Norm	7	18.60		
			Top Cable Tan	7	0.03		
			Bot Cable Vert	7	-15.48		
			Bot Cable Norm	7	18.69		
			Bot Cable Tan	7	0.15		
		Guy B	Bottom Tension	13	24.28		
			Top Tension	13	24.37		
			Top Cable Vert	13	15.74		
			Top Cable Norm	13	18.61		
			Top Cable Tan	13	0.03		
			Bot Cable Vert	13	-15.49		
			Bot Cable Norm	13	18.70		
			Bot Cable Tan	13	0.15		
		Guy C	Bottom Tension	3	24.28		
			Top Tension	3	24.37		
			Top Cable Vert	3	15.74		
			Top Cable Norm	3	18.61		
			Top Cable Tan	3	0.03		
			Bot Cable Vert	3	-15.49		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Bot Cable Norm	3	18.69		
			Bot Cable Tan	3	0.16		
		Top Guy Pull-Off	Max Tension	2	9.80	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	4.71	0.03	0.00
			Max. My	11	6.17	0.00	-0.00
			Max. Vy	14	0.03	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
T6	80 - 60	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	2	-56.23	0.02	-0.33
			Max. Mx	11	-22.13	-0.67	-0.33
			Max. My	8	-10.14	-0.03	0.80
			Max. Vy	12	1.51	0.28	0.21
			Max. Vx	8	-1.87	0.01	-0.34
		Diagonal	Max Tension	4	1.71	0.00	0.00
			Max. Compression	9	-2.43	0.00	0.00
			Max. Mx	26	0.14	0.01	0.00
			Max. My	11	-0.03	0.00	-0.00
			Max. Vy	26	0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
		Top Girt	Max Tension	8	1.47	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	0.98	0.01	0.00
			Max. My	11	0.63	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
		Bottom Girt	Max Tension	10	0.81	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	14	0.72	0.01	0.00
			Max. My	11	0.73	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	11	0.00	0.00	0.00
T7	60 - 40	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	20	-58.41	-0.22	0.07
			Max. Mx	5	-39.72	-0.59	-0.18
			Max. My	13	-40.20	0.20	0.64
			Max. Vy	11	1.42	0.53	-0.13
			Max. Vx	8	-1.43	-0.25	-0.40
		Diagonal	Max Tension	9	3.80	0.00	0.00
			Max. Compression	9	-4.02	0.00	0.00
			Max. Mx	26	-0.04	0.01	0.00
			Max. My	26	-0.10	0.00	0.00
			Max. Vy	26	-0.01	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Top Girt	Max Tension	11	0.38	0.00	0.00
			Max. Compression	3	-0.33	0.00	0.00
			Max. Mx	14	0.04	0.01	0.00
			Max. My	5	-0.26	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
		Bottom Girt	Max Tension	4	1.17	0.00	0.00
			Max. Compression	10	-1.02	0.00	0.00
			Max. Mx	19	0.18	0.01	0.00
			Max. My	5	-0.69	0.00	-0.00
			Max. Vy	19	-0.01	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
		Guy A	Bottom Tension	7	9.97		
			Top Tension	7	10.00		
			Top Cable Vert	7	4.55		
			Top Cable Norm	7	8.90		
			Top Cable Tan	7	0.00		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Bot Cable Vert	7	-4.46		
			Bot Cable Norm	7	8.92		
			Bot Cable Tan	7	0.05		
		Guy B	Bottom Tension	13	9.97		
			Top Tension	13	10.00		
			Top Cable Vert	13	4.55		
			Top Cable Norm	13	8.90		
			Top Cable Tan	13	0.00		
			Bot Cable Vert	13	-4.46		
			Bot Cable Norm	13	8.92		
			Bot Cable Tan	13	0.05		
		Guy C	Bottom Tension	3	9.97		
			Top Tension	3	10.00		
			Top Cable Vert	3	4.55		
			Top Cable Norm	3	8.90		
			Top Cable Tan	3	0.00		
			Bot Cable Vert	3	-4.46		
			Bot Cable Norm	3	8.92		
			Bot Cable Tan	3	0.06		
		Top Guy Pull-Off	Max Tension	11	5.35	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	19	2.94	0.02	0.00
			Max. My	5	4.76	0.00	-0.00
			Max. Vy	19	0.03	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
T8	40 - 20	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	21	-62.49	-0.17	0.21
			Max. Mx	5	-46.27	0.58	-0.19
			Max. My	8	-39.14	-0.05	0.64
			Max. Vy	11	1.43	0.36	-0.15
			Max. Vx	8	-1.43	-0.22	-0.24
		Diagonal	Max Tension	3	2.82	0.00	0.00
			Max. Compression	9	-3.08	0.00	0.00
			Max. Mx	20	-0.03	0.01	0.00
			Max. My	26	0.00	0.00	0.00
			Max. Vy	20	0.01	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Top Girt	Max Tension	10	1.08	0.00	0.00
			Max. Compression	4	-0.87	0.00	0.00
			Max. Mx	19	0.09	0.01	0.00
			Max. My	5	0.81	0.00	-0.00
			Max. Vy	19	0.01	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
		Bottom Girt	Max Tension	5	0.26	0.00	0.00
			Max. Compression	11	-0.08	0.00	0.00
			Max. Mx	14	0.11	0.01	0.00
			Max. My	5	0.26	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
T9	20 - 5	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	21	-62.57	0.04	-0.00
			Max. Mx	24	-61.72	1.74	0.88
			Max. My	21	-61.86	-0.09	-1.96
			Max. Vy	25	-16.55	1.74	0.90
			Max. Vx	21	19.14	-0.09	-1.96
		Diagonal	Max Tension	11	1.90	0.00	0.00
			Max. Compression	5	-2.09	0.00	0.00
			Max. Mx	20	0.44	0.01	0.00
			Max. My	15	0.05	0.00	0.00
			Max. Vy	20	-0.01	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Top Girt	Max Tension	11	0.37	0.00	0.00
			Max. Compression	6	-0.16	0.00	0.00
			Max. Mx	14	0.15	0.01	0.00
			Max. My	5	-0.15	0.00	-0.00
			Max. Vy	14	-0.01	0.00	0.00
			Max. Vx	5	0.00	0.00	0.00
		Bottom Girt	Max Tension	21	11.15	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	19	11.10	-0.03	0.00
			Max. My	5	8.51	0.00	0.00
			Max. Vy	19	0.04	0.00	0.00
			Max. Vx	5	-0.00	0.00	0.00
T10	5 - 0	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	21	-66.67	-0.04	-0.04
			Max. Mx	21	-64.56	1.96	-0.08
			Max. My	5	-41.83	0.84	-0.22
			Max. Vy	19	4.97	-0.74	-0.06
			Max. Vx	5	-0.47	-0.99	0.03
		Horizontal	Max Tension	2	0.07	0.17	-0.05
			Max. Compression	19	-0.34	0.10	-0.05
			Max. Mx	10	-0.14	0.32	-0.17
			Max. My	10	-0.15	0.26	-0.17
			Max. Vy	10	-0.17	0.32	-0.17
			Max. Vx	10	0.11	0.15	-0.06
		Top Girt	Max Tension	19	3.30	0.31	-0.09
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	10	2.29	0.36	-0.12
			Max. My	10	2.34	0.26	-0.15
			Max. Vy	10	-0.11	0.36	-0.12
			Max. Vx	6	-0.03	0.13	-0.06
		Bottom Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	5	-2.20	0.86	-0.35
			Max. Mx	10	-2.13	0.89	-0.43
			Max. My	10	-2.13	0.89	-0.43
			Max. Vy	10	-1.58	0.89	-0.43
			Max. Vx	10	0.77	0.35	-0.16

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Mast	Max. Vert	15	183.37	-0.02	0.39
	Max. H_x	12	112.60	1.73	0.99
	Max. H_z	2	137.99	0.00	1.38
	Max. M_x	1	0.00	-0.00	-0.01
	Max. M_z	1	0.00	-0.00	-0.01
	Max. Torsion	1	0.00	-0.00	-0.01
	Min. Vert	1	80.29	-0.00	-0.01
	Min. H_x	4	112.62	-1.74	0.99
	Min. H_z	8	112.66	-0.00	-2.01
	Min. M_x	1	0.00	-0.00	-0.01
	Min. M_z	1	0.00	-0.00	-0.01
	Min. Torsion	1	0.00	-0.00	-0.01
Guy C @ 162 ft Elev 0 ft Azimuth 240 deg	Max. Vert	10	-0.89	-0.58	0.34

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. H_x	10	-0.89	-0.58	0.34
	Max. H_z	3	-11.86	-10.41	6.28
	Min. Vert	4	-11.88	-10.55	6.10
	Min. H_x	5	-11.83	-10.62	5.87
	Min. H_z	10	-0.89	-0.58	0.34
Guy B @ 162 ft Elev 0 ft Azimuth 120 deg	Max. Vert	6	-0.89	0.59	0.34
	Max. H_x	11	-11.84	10.62	5.87
	Max. H_z	13	-11.85	10.41	6.27
	Min. Vert	12	-11.87	10.54	6.09
	Min. H_x	6	-0.89	0.59	0.34
	Min. H_z	6	-0.89	0.59	0.34
Guy A @ 162 ft Elev 0 ft Azimuth 0 deg	Max. Vert	2	-0.89	-0.00	-0.67
	Max. H_x	11	-7.09	0.50	-7.11
	Max. H_z	2	-0.89	-0.00	-0.67
	Min. Vert	8	-11.89	0.00	-12.20
	Min. H_x	5	-7.08	-0.50	-7.09
	Min. H_z	8	-11.89	0.00	-12.20
Guy C @ 142 ft Elev 0 ft Azimuth 240 deg	Max. Vert	10	-0.86	-0.51	0.29
	Max. H_x	10	-0.86	-0.51	0.29
	Max. H_z	3	-27.68	-22.87	13.61
	Min. Vert	4	-27.82	-23.17	13.38
	Min. H_x	4	-27.82	-23.17	13.38
	Min. H_z	10	-0.86	-0.51	0.29
Guy B @ 142 ft Elev 0 ft Azimuth 120 deg	Max. Vert	6	-0.86	0.51	0.29
	Max. H_x	11	-27.62	23.17	12.98
	Max. H_z	13	-27.66	22.86	13.60
	Min. Vert	12	-27.81	23.16	13.37
	Min. H_x	6	-0.86	0.51	0.29
	Min. H_z	6	-0.86	0.51	0.29
Guy A @ 142 ft Elev 0 ft Azimuth 0 deg	Max. Vert	2	-0.86	-0.00	-0.58
	Max. H_x	11	-14.15	0.66	-13.36
	Max. H_z	2	-0.86	-0.00	-0.58
	Min. Vert	8	-27.86	0.00	-26.78
	Min. H_x	5	-14.12	-0.66	-13.33
	Min. H_z	8	-27.86	0.00	-26.78
Guy C @ 100 ft Elev 0 ft Azimuth 240 deg	Max. Vert	10	-0.05	-0.06	0.03
	Max. H_x	10	-0.05	-0.06	0.03
	Max. H_z	3	-19.95	-23.81	13.99
	Min. Vert	3	-19.95	-23.81	13.99
	Min. H_x	5	-19.92	-23.99	13.62
	Min. H_z	10	-0.05	-0.06	0.03
Guy B @ 100 ft Elev 0 ft Azimuth 120 deg	Max. Vert	6	-0.05	0.06	0.03
	Max. H_x	11	-19.92	23.98	13.61
	Max. H_z	13	-19.95	23.81	13.99
	Min. Vert	13	-19.95	23.81	13.99
	Min. H_x	6	-0.05	0.06	0.03
	Min. H_z	6	-0.05	0.06	0.03

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Guy A @ 100 ft Elev 0 ft Azimuth 0 deg	Max. Vert	2	-0.05	-0.00	-0.07
	Max. H_x	10	-17.14	0.35	-23.79
	Max. H_z	2	-0.05	-0.00	-0.07
	Min. Vert	7	-19.94	-0.21	-27.61
	Min. H_x	6	-17.15	-0.35	-23.79
	Min. H_z	7	-19.94	-0.21	-27.61

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	80.29	0.00	0.01	0.00	0.00	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy	137.99	-0.00	-1.38	0.00	0.00	0.00
1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy	129.18	1.05	-1.27	0.00	0.00	0.00
1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy	112.62	1.74	-0.99	0.00	0.00	0.00
1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy	128.96	1.65	-0.27	0.00	0.00	0.00
1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy	137.76	1.22	0.70	0.00	0.00	0.00
1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy	129.03	0.59	1.56	0.00	0.00	0.00
1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy	112.66	0.00	2.01	0.00	0.00	0.00
1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy	129.09	-0.59	1.56	0.00	0.00	0.00
1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy	137.83	-1.21	0.70	0.00	0.00	0.00
1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy	129.00	-1.64	-0.26	0.00	0.00	0.00
1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy	112.60	-1.73	-0.99	0.00	0.00	0.00
1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy	129.16	-1.05	-1.27	0.00	0.00	0.00
1.2 Dead+1.0 Ice+1.0 Temp+Guy	180.63	0.02	0.03	0.00	0.00	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy	183.37	0.02	-0.39	0.00	0.00	0.00
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.84	0.22	-0.34	0.00	0.00	0.00
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.43	0.38	-0.17	0.00	0.00	0.00
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.83	0.44	0.05	0.00	0.00	0.00
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy	183.35	0.39	0.25	0.00	0.00	0.00
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.83	0.24	0.39	0.00	0.00	0.00
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.43	0.02	0.45	0.00	0.00	0.00
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.82	-0.20	0.39	0.00	0.00	0.00

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
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy	183.35	-0.35	0.25	0.00	0.00	0.00
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.83	-0.40	0.05	0.00	0.00	0.00
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.44	-0.34	-0.17	0.00	0.00	0.00
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy	182.85	-0.18	-0.34	0.00	0.00	0.00
Dead+Wind 0 deg - Service+Guy	80.76	0.00	-0.48	0.00	0.00	0.00
Dead+Wind 30 deg - Service+Guy	80.75	0.24	-0.41	0.00	0.00	0.00
Dead+Wind 60 deg - Service+Guy	80.77	0.42	-0.23	0.00	0.00	0.00
Dead+Wind 90 deg - Service+Guy	80.75	0.48	0.01	0.00	0.00	0.00
Dead+Wind 120 deg - Service+Guy	80.76	0.43	0.25	0.00	0.00	0.00
Dead+Wind 150 deg - Service+Guy	80.75	0.25	0.42	0.00	0.00	0.00
Dead+Wind 180 deg - Service+Guy	80.77	0.00	0.48	0.00	0.00	0.00
Dead+Wind 210 deg - Service+Guy	80.75	-0.24	0.42	0.00	0.00	0.00
Dead+Wind 240 deg - Service+Guy	80.76	-0.42	0.25	0.00	0.00	0.00
Dead+Wind 270 deg - Service+Guy	80.75	-0.48	0.01	0.00	0.00	0.00
Dead+Wind 300 deg - Service+Guy	80.77	-0.41	-0.23	0.00	0.00	0.00
Dead+Wind 330 deg - Service+Guy	80.75	-0.24	-0.41	0.00	0.00	0.00

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	-29.28	0.00	-0.00	29.28	0.00	0.003%
2	0.02	-34.89	-58.97	-0.02	34.89	58.97	0.003%
3	29.24	-34.59	-50.73	-29.24	34.59	50.73	0.002%
4	50.53	-34.30	-29.24	-50.53	34.30	29.24	0.001%
5	58.46	-34.59	-0.02	-58.46	34.59	0.02	0.003%
6	50.96	-34.89	29.47	-50.96	34.89	-29.47	0.003%
7	29.21	-34.59	50.72	-29.21	34.59	-50.72	0.002%
8	-0.02	-34.30	58.45	0.02	34.30	-58.45	0.002%
9	-29.24	-34.59	50.73	29.24	34.59	-50.73	0.002%
10	-50.98	-34.89	29.50	50.97	34.89	-29.50	0.004%
11	-58.46	-34.59	0.02	58.46	34.59	-0.01	0.003%
12	-50.51	-34.30	-29.21	50.51	34.30	29.21	0.001%
13	-29.21	-34.59	-50.72	29.21	34.59	50.72	0.002%
14	0.00	-111.73	0.00	-0.00	111.73	-0.00	0.002%
15	0.00	-111.99	-15.94	-0.00	111.99	15.94	0.002%
16	7.94	-111.73	-13.77	-7.94	111.73	13.77	0.001%
17	13.76	-111.46	-7.95	-13.75	111.46	7.95	0.002%
18	15.89	-111.73	-0.00	-15.88	111.73	0.00	0.001%
19	13.79	-111.99	7.97	-13.79	111.99	-7.97	0.002%
20	7.94	-111.73	13.77	-7.94	111.73	-13.77	0.001%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
21	-0.00	-111.46	15.90	0.00	111.46	-15.90	0.002%
22	-7.94	-111.73	13.77	7.94	111.73	-13.77	0.001%
23	-13.79	-111.99	7.97	13.79	111.99	-7.97	0.002%
24	-15.89	-111.73	0.00	15.88	111.73	-0.00	0.001%
25	-13.75	-111.46	-7.95	13.75	111.46	7.95	0.002%
26	-7.94	-111.73	-13.77	7.94	111.73	13.77	0.001%
27	0.00	-29.34	-12.03	-0.00	29.34	12.03	0.003%
28	5.97	-29.28	-10.35	-5.97	29.28	10.35	0.002%
29	10.31	-29.22	-5.97	-10.31	29.22	5.97	0.002%
30	11.93	-29.28	-0.00	-11.93	29.28	0.00	0.003%
31	10.40	-29.34	6.01	-10.40	29.34	-6.01	0.003%
32	5.96	-29.28	10.35	-5.96	29.28	-10.35	0.002%
33	-0.00	-29.22	11.93	0.00	29.22	-11.93	0.002%
34	-5.97	-29.28	10.35	5.97	29.28	-10.35	0.002%
35	-10.40	-29.34	6.02	10.40	29.34	-6.02	0.003%
36	-11.93	-29.28	0.00	11.93	29.28	-0.00	0.003%
37	-10.31	-29.22	-5.96	10.31	29.22	5.96	0.002%
38	-5.96	-29.28	-10.35	5.96	29.28	10.35	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	7	0.00000001	0.00007629
2	Yes	15	0.00000001	0.00009164
3	Yes	15	0.00000001	0.00008744
4	Yes	12	0.00000001	0.00006189
5	Yes	15	0.00000001	0.00011660
6	Yes	15	0.00000001	0.00011077
7	Yes	15	0.00000001	0.00006043
8	Yes	11	0.00000001	0.00011938
9	Yes	15	0.00000001	0.00008678
10	Yes	15	0.00000001	0.00014154
11	Yes	15	0.00000001	0.00011571
12	Yes	12	0.00000001	0.00004575
13	Yes	15	0.00000001	0.00006049
14	Yes	6	0.00000001	0.00008692
15	Yes	11	0.00000001	0.00010461
16	Yes	11	0.00000001	0.00007342
17	Yes	10	0.00000001	0.00014435
18	Yes	11	0.00000001	0.00007154
19	Yes	11	0.00000001	0.00009602
20	Yes	11	0.00000001	0.00007261
21	Yes	10	0.00000001	0.00014226
22	Yes	11	0.00000001	0.00006991
23	Yes	11	0.00000001	0.00009898
24	Yes	11	0.00000001	0.00007103
25	Yes	10	0.00000001	0.00014034
26	Yes	11	0.00000001	0.00007609
27	Yes	9	0.00000001	0.00008486
28	Yes	9	0.00000001	0.00007312
29	Yes	9	0.00000001	0.00006536
30	Yes	9	0.00000001	0.00007996
31	Yes	9	0.00000001	0.00008624
32	Yes	9	0.00000001	0.00006520
33	Yes	9	0.00000001	0.00005154

34	Yes	9	0.00000001	0.00007177
35	Yes	9	0.00000001	0.00009467
36	Yes	9	0.00000001	0.00007924
37	Yes	9	0.00000001	0.00005418
38	Yes	9	0.00000001	0.00006603

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	1.000	33	0.0421	0.0385
T2	160 - 140	1.180	33	0.0726	0.0404
T3	140 - 120	1.449	37	0.0488	0.0609
T4	120 - 100	1.514	29	0.0234	0.1034
T5	100 - 80	1.249	29	0.0878	0.1245
T6	80 - 60	0.843	27	0.0720	0.1519
T7	60 - 40	0.613	31	0.0482	0.1633
T8	40 - 20	0.461	31	0.0374	0.1963
T9	20 - 5	0.289	31	0.0561	0.2124
T10	5 - 0	0.075	31	0.0693	0.2192

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	7770.00	33	1.000	0.0421	0.0385	96014
178.00	ROHN 6'x15' Boom Gate (1)	33	1.015	0.0463	0.0384	96014
162.52	Guy	33	1.150	0.0712	0.0395	28004
162.52	Guy	33	1.150	0.0712	0.0395	28004
152.00	NNVV-65B-R4	33	1.289	0.0700	0.0451	296113
136.00	LPA-80080/4CF	37	1.487	0.0382	0.0690	16472
132.16	Guy	37	1.512	0.0283	0.0777	15248
120.00	APXVAALL24-43	29	1.514	0.0234	0.1034	12772
98.00	GPS	29	1.209	0.0905	0.1270	31301
82.52	Guy	27	0.888	0.0765	0.1492	20466
49.75	Guy	31	0.532	0.0396	0.1794	168931

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	10.812	2	0.2794	0.2021
T2	160 - 140	12.171	2	0.4278	0.2141
T3	140 - 120	13.890	2	0.2578	0.3052
T4	120 - 100	14.198	2	0.1840	0.4861
T5	100 - 80	12.351	2	0.6153	0.5746
T6	80 - 60	9.360	2	0.6199	0.6855
T7	60 - 40	6.980	2	0.5442	0.7395

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T8	40 - 20	4.911	2	0.4953	0.8813
T9	20 - 5	2.756	6	0.5923	0.9646
T10	5 - 0	0.704	6	0.6597	0.9867

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	7770.00	2	10.812	0.2794	0.2021	19568
178.00	ROHN 6'x15' Boom Gate (1)	2	10.932	0.3023	0.2020	19568
162.52	Guy	2	11.966	0.4257	0.2099	5723
162.52	Guy	2	11.966	0.4257	0.2099	5723
152.00	NNVV-65B-R4	2	12.894	0.3893	0.2362	42279
136.00	LPA-80080/4CF	2	14.114	0.2103	0.3400	2541
132.16	Guy	2	14.258	0.1728	0.3771	2374
120.00	APXVAALL24-43	2	14.198	0.1840	0.4861	2027
98.00	GPS	2	12.072	0.6399	0.5848	4221
82.52	Guy	2	9.724	0.6341	0.6746	4007
49.75	Guy	2	5.905	0.5064	0.8072	24148

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Diagonal	A325N	0.6250	1	7.35	12.43	0.591 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	1	0.86	9.11	0.094 ✔	1	Member Block Shear
		Bottom Girt	A325N	0.6250	1	2.31	9.11	0.254 ✔	1	Member Block Shear
		Top Guy Pull-Off@162.523	A325N	0.6250	2	4.13	16.45	0.251 ✔	1	Member Block Shear
T2	160	Leg	A325N	0.7500	4	2.56	29.82	0.086 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	6.04	7.95	0.760 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	1.92	7.95	0.241 ✔	1	Bolt Shear
		Bottom Girt	A325N	0.5000	1	1.01	7.95	0.127 ✔	1	Bolt Shear
T3	140	Leg	A325N	0.7500	4	4.40	29.82	0.148 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	2.27	5.92	0.384 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	1.31	4.17	0.314 ✔	1	Member Bearing
		Bottom Girt	A325N	0.5000	1	1.31	4.17	0.314 ✔	1	Member Bearing
		Top Guy Pull-Off@132.159	A325N	0.6250	2	3.03	12.43	0.244 ✔	1	Bolt Shear
T4	120	Leg	A325N	0.7500	4	8.02	29.82	0.269 ✔	1	Bolt Tension

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
		Diagonal	A325N	0.5000	1	4.33	7.95	0.544 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	1.48	7.95	0.186 ✔	1	Bolt Shear
		Bottom Girt	A325N	0.5000	1	1.33	7.95	0.167 ✔	1	Bolt Shear
T5	100	Leg	A325N	0.7500	4	4.06	29.82	0.136 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	4.69	5.92	0.791 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	1.08	4.17	0.260 ✔	1	Member Bearing
		Bottom Girt	A325N	0.5000	1	0.97	4.17	0.234 ✔	1	Member Bearing
		Top Guy Pull-Off@82.5234	A325N	0.6250	2	4.90	16.45	0.298 ✔	1	Member Block Shear
T6	80	Leg	A325N	0.7500	4	4.69	29.82	0.157 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	2.43	7.95	0.306 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	1.47	7.95	0.185 ✔	1	Bolt Shear
		Bottom Girt	A325N	0.5000	1	0.97	7.95	0.122 ✔	1	Bolt Shear
T7	60	Leg	A325N	0.7500	4	4.51	29.82	0.151 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	3.80	5.92	0.642 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	1.01	4.17	0.243 ✔	1	Member Bearing
		Bottom Girt	A325N	0.5000	1	1.17	4.17	0.281 ✔	1	Member Bearing
		Top Guy Pull-Off@49.75	A325N	0.6250	2	2.68	12.43	0.215 ✔	1	Bolt Shear
T8	40	Leg	A325N	0.7500	4	4.87	29.82	0.163 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	2.82	5.92	0.476 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	1.08	4.17	0.260 ✔	1	Member Bearing
		Bottom Girt	A325N	0.5000	1	1.08	4.17	0.260 ✔	1	Member Bearing
T9	20	Leg	A325N	0.7500	4	5.21	29.82	0.175 ✔	1	Bolt Tension
		Diagonal	A325N	0.5000	1	1.90	5.92	0.321 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	1.08	4.17	0.260 ✔	1	Member Bearing
		Bottom Girt	A325N	0.6250	1	11.15	12.43	0.897 ✔	1	Bolt Shear
T10	5	Leg	A325N	0.7500	4	5.38	29.82	0.180 ✔	1	Bolt Tension

Guy Design Data

Section No.	Elevation ft	Size	Initial Tension K	Breaking Load K	Actual T_u K	Allowable ϕT_n K	Required S.F.	Actual S.F.
T1	162.52 (A) (462)	1/2 EHS	2.69	26.90	8.74	16.14	1.000	1.846 ✔
	162.52 (A) (463)	1/2 EHS	2.69	26.90	8.89	16.14	1.000	1.816 ✔
	162.52 (B) (458)	1/2 EHS	2.69	26.90	8.72	16.14	1.000	1.851 ✔
	162.52 (B)	1/2 EHS	2.69	26.90	8.74	16.14	1.000	1.846 ✔

Section No.	Elevation ft	Size	Initial Tension K	Breaking Load K	Actual T_u K	Allowable ϕT_n K	Required S.F.	Actual S.F.
	(459)							
	162.52 (C) (454)	1/2 EHS	2.69	26.90	8.89	16.14	1.000	1.816 ✔
	162.52 (C) (455)	1/2 EHS	2.69	26.90	8.72	16.14	1.000	1.851 ✔
	162.52 (A) (483)	7/8 EHS	7.97	79.70	23.99	47.82	1.000	1.993 ✔
	162.52 (B) (482)	7/8 EHS	7.97	79.70	23.95	47.82	1.000	1.997 ✔
	162.52 (C) (478)	7/8 EHS	7.97	79.70	23.97	47.82	1.000	1.995 ✔
T3	132.16 (A) (471)	9/16 EHS	3.50	35.00	15.04	21.00	1.000	1.396 ✔
	132.16 (B) (470)	9/16 EHS	3.50	35.00	15.02	21.00	1.000	1.398 ✔
	132.16 (C) (466)	9/16 EHS	3.50	35.00	15.02	21.00	1.000	1.398 ✔
T5	82.52 (A) (477)	3/4 EHS	5.83	58.30	24.36	34.98	1.000	1.436 ✔
	82.52 (B) (476)	3/4 EHS	5.83	58.30	24.37	34.98	1.000	1.435 ✔
	82.52 (C) (472)	3/4 EHS	5.83	58.30	24.37	34.98	1.000	1.435 ✔
T7	49.75 (A) (489)	1/2 EHS	2.69	26.90	10.00	16.14	1.000	1.614 ✔
	49.75 (B) (488)	1/2 EHS	2.69	26.90	10.00	16.14	1.000	1.615 ✔
	49.75 (C) (484)	1/2 EHS	2.69	26.90	10.00	16.14	1.000	1.614 ✔

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	Mast Stability Index	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	1.00	-36.30	94.41	0.384 [1] ✔
T2	160 - 140	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	1.00	-49.85	94.41	0.528 [1] ✔
T3	140 - 120	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	0.99	-75.63	93.73	0.807 [1] ✔
T4	120 - 100	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	0.99	-76.87	93.71	0.820 [1] ✔
T5	100 - 80	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	0.99	-56.22	93.19	0.603 [1] ✔
T6	80 - 60	ROHN 2.5 X-STR	20.00	2.41	31.3 K=1.00	2.2535	1.00	-56.23	94.41	0.596 [1] ✔
T7	60 - 40	ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	1.00	-58.41	76.17	0.767 [1] ✔
T8	40 - 20	ROHN 2.5 X-STR	20.00	2.41	62.6 K=2.00	2.2535	1.00	-62.49	76.17	0.820 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	Mast Stability Index	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T9	20 - 5	ROHN 2.5 X-STR	15.00	2.38	61.8 K=2.00	2.2535	1.00	-62.57	76.72	0.816 [1]
T10	5 - 0	ROHN 2.5 X-STR	5.38	1.08	14.0 K=1.00	2.2535	0.92	-66.67	92.19	0.723 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	4.18	3.65	116.0 K=1.04	0.9380	-7.35	14.97	0.491 [1]
T2	160 - 140	ROHN TS1.5x11 ga	4.18	3.89	95.3 K=1.00	0.5202	-6.04	11.26	0.536 [1]
T3	140 - 120	ROHN TS1.5x16 ga	4.18	3.89	91.4 K=1.00	0.2627	-2.40	5.94	0.404 [1]
T4	120 - 100	ROHN TS1.5x11 ga	4.18	3.89	95.3 K=1.00	0.5202	-4.33	11.26	0.384 [1]
T5	100 - 80	ROHN TS1.5x16 ga	4.18	3.89	91.4 K=1.00	0.2627	-4.76	5.94	0.801 [1]
T6	80 - 60	ROHN TS1.5x11 ga	4.18	3.89	95.3 K=1.00	0.5202	-2.43	11.26	0.216 [1]
T7	60 - 40	ROHN TS1.5x16 ga	4.18	3.89	91.4 K=1.00	0.2627	-4.02	5.94	0.676 [1]
T8	40 - 20	ROHN TS1.5x16 ga	4.18	3.89	91.4 K=1.00	0.2627	-3.08	5.94	0.518 [1]
T9	20 - 5	ROHN TS1.5x16 ga	4.16	3.87	91.0 K=1.00	0.2627	-2.09	5.97	0.350 [1]

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T10	5 - 0	L4x4x1/4	2.39	2.15	76.2 K=2.35	1.9400	-1.22	45.18	0.027 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	3.42	2.94	105.1 K=1.17	0.9380	-0.87	16.99	0.051 [1] ✔
T2	160 - 140	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-1.42	13.55	0.105 [1] ✔
T3	140 - 120	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.31	7.05	0.186 [1] ✔
T4	120 - 100	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-1.33	13.55	0.098 [1] ✔
T5	100 - 80	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-0.97	7.05	0.138 [1] ✔
T6	80 - 60	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-0.97	13.55	0.072 [1] ✔
T7	60 - 40	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.01	7.05	0.144 [1] ✔
T8	40 - 20	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.08	7.05	0.154 [1] ✔
T9	20 - 5	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.08	7.05	0.154 [1] ✔
T10	5 - 0	L4x4x1/4	3.08	2.84	81.4 K=1.90	1.9400	-1.22	43.35	0.028 [1] ✔

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	3.42	2.94	105.1 K=1.17	0.9380	-0.63	16.99	0.037 [1] ✔
T2	160 - 140	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-0.86	13.55	0.064 [1] ✔
T3	140 - 120	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.31	7.05	0.186 [1] ✔
T4	120 - 100	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-1.33	13.55	0.098 [1] ✔
T5	100 - 80	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-0.97	7.05	0.138 [1] ✔
T6	80 - 60	ROHN TS1.5x11 ga	3.42	3.18	77.9 K=1.00	0.5202	-0.97	13.55	0.072 [1] ✔
T7	60 - 40	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.02	7.05	0.144 [1] ✔
T8	40 - 20	ROHN TS1.5x16 ga	3.42	3.18	74.7 K=1.00	0.2627	-1.08	7.05	0.154 [1] ✔
T9	20 - 5	L3x3x1/2	3.42	2.84	89.2 K=1.53	2.7500	-1.08	58.60	0.018 [1] ✔
T10	5 - 0	L4x4x1/4	0.34	0.10	60.8	1.9400	-2.20	50.33	0.044 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
					K=39.43				✔

[1] P_u / ϕP_n controls

Torque-Arm Top Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160 (456)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.71	173.42	0.010
T1	180 - 160 (457)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.69	173.42	0.010
T1	180 - 160 (460)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.58	173.42	0.009
T1	180 - 160 (461)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.50	173.42	0.009
T1	180 - 160 (464)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.62	173.42	0.009
T1	180 - 160 (465)	C12x20.7	3.42	3.30	49.5 K=1.00	6.0900	-1.52	173.42	0.009

Torque-Arm Top 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 $\frac{M_{uy}}{\phi M_{ny}}$
T1	180 - 160 (456)	C12x20.7	-19.85	68.58	0.289	-0.00	7.01	0.000
T1	180 - 160 (457)	C12x20.7	-19.85	68.58	0.289	0.00	7.01	0.000
T1	180 - 160 (460)	C12x20.7	-19.78	68.58	0.288	0.00	7.01	0.000
T1	180 - 160 (461)	C12x20.7	-19.78	68.58	0.288	-0.00	7.01	0.000
T1	180 - 160 (464)	C12x20.7	-19.82	68.58	0.289	0.00	7.01	0.000
T1	180 - 160 (465)	C12x20.7	-19.82	68.58	0.289	0.00	7.01	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	180 - 160 (456)	C12x20.7	0.010	0.289	0.000	0.294 ✔	1.000	4.8.1 ✔
T1	180 - 160 (457)	C12x20.7	0.010	0.289	0.000	0.294 ✔	1.000	4.8.1 ✔
T1	180 - 160 (460)	C12x20.7	0.009	0.288	0.000	0.293 ✔	1.000	4.8.1 ✔
T1	180 - 160 (461)	C12x20.7	0.009	0.288	0.000	0.293	1.000	4.8.1 ✔

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	180 - 160 (464)	C12x20.7	0.009	0.289	0.000	0.294	1.000	4.8.1
T1	180 - 160 (465)	C12x20.7	0.009	0.289	0.000	0.293	1.000	4.8.1

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2.5 X-STR	20.00	2.41	31.3	2.2535	31.93	101.41	0.315 [1]
T2	160 - 140	ROHN 2.5 X-STR	20.00	2.41	31.3	2.2535	17.60	101.41	0.174 [1]
T3	140 - 120	ROHN 2.5 X-STR	20.00	2.41	31.3	2.2535	32.06	101.41	0.316 [1]
T4	120 - 100	ROHN 2.5 X-STR	20.00	2.41	31.3	2.2535	32.06	101.41	0.316 [1]
T5	100 - 80	ROHN 2.5 X-STR	20.00	2.41	31.3	2.2535	4.15	101.41	0.041 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	4.18	3.65	76.6	0.5629	5.02	24.49	0.205 [1]
T2	160 - 140	ROHN TS1.5x11 ga	4.18	3.89	95.3	0.5202	5.56	19.67	0.283 [1]
T3	140 - 120	ROHN TS1.5x16 ga	4.18	3.89	91.4	0.2627	2.27	9.93	0.229 [1]
T4	120 - 100	ROHN TS1.5x11 ga	4.18	3.89	95.3	0.5202	3.58	19.67	0.182 [1]
T5	100 - 80	ROHN TS1.5x16 ga	4.18	3.89	91.4	0.2627	4.69	9.93	0.472 [1]
T6	80 - 60	ROHN TS1.5x11 ga	4.18	3.89	95.3	0.5202	1.71	19.67	0.087 [1]
T7	60 - 40	ROHN TS1.5x16 ga	4.18	3.89	91.4	0.2627	3.80	9.93	0.383 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	40 - 20	ROHN TS1.5x16 ga	4.18	3.89	91.4	0.2627	2.82	9.93	0.283 [1] ✔
T9	20 - 5	ROHN TS1.5x16 ga	4.16	3.87	91.0	0.2627	1.90	9.93	0.191 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T10	5 - 0	L4x4x1/4	2.39	2.15	20.7	1.9400	1.22	62.86	0.019 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	3.42	2.94	62.6	0.5629	0.86	24.49	0.035 [1] ✔
T2	160 - 140	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	1.92	19.67	0.097 [1] ✔
T3	140 - 120	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.31	9.93	0.132 [1] ✔
T4	120 - 100	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	1.48	19.67	0.075 [1] ✔
T5	100 - 80	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.08	9.93	0.109 [1] ✔
T6	80 - 60	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	1.47	19.67	0.075 [1] ✔
T7	60 - 40	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.01	9.93	0.102 [1] ✔
T8	40 - 20	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.08	9.93	0.109 [1] ✔
T9	20 - 5	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.08	9.93	0.109 [1] ✔
T10	5 - 0	L4x4x1/4	3.08	2.84	27.2	1.9400	3.30	62.86	0.052 [1] ✔

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	3.42	2.94	62.6	0.5629	2.31	24.49	0.094 [1] ✔
T2	160 - 140	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	1.01	19.67	0.051 [1] ✔
T3	140 - 120	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.31	9.93	0.132 [1] ✔
T4	120 - 100	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	1.33	19.67	0.068 [1] ✔
T5	100 - 80	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	0.97	9.93	0.098 [1] ✔
T6	80 - 60	ROHN TS1.5x11 ga	3.42	3.18	77.9	0.5202	0.97	19.67	0.050 [1] ✔
T7	60 - 40	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.17	9.93	0.118 [1] ✔
T8	40 - 20	ROHN TS1.5x16 ga	3.42	3.18	74.7	0.2627	1.08	9.93	0.109 [1] ✔
T9	20 - 5	L3x3x1/2	3.42	2.84	42.5	1.7813	11.15	77.48	0.144 [1] ✔

[1] P_u / ϕP_n controls

Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	2L2x2x1/4x3/8 2L 'a' > 18.3601 in - 479	3.42	3.18	62.6	1.1287	8.26	49.10	0.168 [1]
T3	140 - 120	4x3/8	3.42	3.18	352.2	0.9141	6.06	39.76	0.152 [1]
T5	100 - 80	2L2x2x1/4x3/8 2L 'a' > 18.3601 in - 473	3.42	3.18	62.6	1.1287	9.80	49.10	0.200 [1]
T7	60 - 40	4x3/8	3.42	3.18	352.2	0.9141	5.35	39.76	0.135 [1]

[1] P_u / ϕP_n controls

Top Guy Pull-Off 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 $\frac{M_{uy}}{\phi M_{ny}}$
T1	180 - 160	2L2x2x1/4x3/8	0.00	2.00	0.000	0.00	3.39	0.000
T3	140 - 120	4x3/8	0.00	4.05	0.000	0.00	0.38	0.000
T5	100 - 80	2L2x2x1/4x3/8	0.00	2.00	0.000	0.00	3.39	0.000
T7	60 - 40	4x3/8	0.00	4.05	0.000	0.00	0.38	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 $\frac{M_{uy}}{\phi M_{ny}}$

Top Guy Pull-Off Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	180 - 160	2L2x2x1/4x3/8	0.168	0.000	0.000	0.168 [1] ✔	1.000	4.8.1 ✔
T3	140 - 120	4x3/8	0.152	0.000	0.000	0.152 [1] ✔	1.000	4.8.1 ✔
T5	100 - 80	2L2x2x1/4x3/8	0.200	0.000	0.000	0.200 [1] ✔	1.000	4.8.1 ✔
T7	60 - 40	4x3/8	0.135	0.000	0.000	0.135 [1] ✔	1.000	4.8.1 ✔

[1] P_u / ϕP_n controls

Torque-Arm Top Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160 (456)	C12x20.7	3.42	3.30	49.5	6.0900	0.27	197.32	0.001
T1	180 - 160 (457)	C12x20.7	3.42	3.30	49.5	6.0900	0.28	197.32	0.001
T1	180 - 160 (460)	C12x20.7	3.42	3.30	49.5	6.0900	0.30	197.32	0.002
T1	180 - 160 (461)	C12x20.7	3.42	3.30	49.5	6.0900	0.46	197.32	0.002
T1	180 - 160 (464)	C12x20.7	3.42	3.30	49.5	6.0900	0.28	197.32	0.001
T1	180 - 160 (465)	C12x20.7	3.42	3.30	49.5	6.0900	0.45	197.32	0.002

Torque-Arm Top 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 $\frac{M_{uy}}{\phi M_{ny}}$
T1	180 - 160 (456)	C12x20.7	-19.79	68.58	0.289	-0.00	7.01	0.000
T1	180 - 160 (457)	C12x20.7	-19.74	68.58	0.288	0.00	7.01	0.000
T1	180 - 160 (460)	C12x20.7	-19.74	68.58	0.288	-0.00	7.01	0.000
T1	180 - 160 (461)	C12x20.7	-19.91	68.58	0.290	-0.00	7.01	0.000
T1	180 - 160 (464)	C12x20.7	-19.80	68.58	0.289	0.00	7.01	0.000
T1	180 - 160 (465)	C12x20.7	-19.92	68.58	0.290	0.00	7.01	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	180 - 160 (456)	C12x20.7	0.001	0.289	0.000	0.289 ✔	1.000	4.8.1 ✔
T1	180 - 160 (457)	C12x20.7	0.001	0.288	0.000	0.288 ✔	1.000	4.8.1 ✔
T1	180 - 160 (460)	C12x20.7	0.002	0.288	0.000	0.289 ✔	1.000	4.8.1 ✔
T1	180 - 160 (461)	C12x20.7	0.002	0.290	0.000	0.292 ✔	1.000	4.8.1 ✔
T1	180 - 160 (464)	C12x20.7	0.001	0.289	0.000	0.289 ✔	1.000	4.8.1 ✔
T1	180 - 160 (465)	C12x20.7	0.002	0.290	0.000	0.292 ✔	1.000	4.8.1 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 2.5 X-STR	1	-36.30	94.41	38.4	Pass
T2	160 - 140	Leg	ROHN 2.5 X-STR	59	-49.85	94.41	52.8	Pass
T3	140 - 120	Leg	ROHN 2.5 X-STR	117	-75.63	93.73	80.7	Pass
T4	120 - 100	Leg	ROHN 2.5 X-STR	174	-76.87	93.71	82.0	Pass
T5	100 - 80	Leg	ROHN 2.5 X-STR	231	-56.22	93.19	60.3	Pass
T6	80 - 60	Leg	ROHN 2.5 X-STR	288	-56.23	94.41	59.6	Pass
T7	60 - 40	Leg	ROHN 2.5 X-STR	345	-58.41	76.17	76.7	Pass
T8	40 - 20	Leg	ROHN 2.5 X-STR	378	-62.49	76.17	82.0	Pass
T9	20 - 5	Leg	ROHN 2.5 X-STR	411	-62.57	76.72	81.6	Pass
T10	5 - 0	Leg	ROHN 2.5 X-STR	438	-66.67	92.19	72.3	Pass
T1	180 - 160	Diagonal	L2x2x1/4	14	-7.35	14.97	49.1 59.1 (b)	Pass
T2	160 - 140	Diagonal	ROHN TS1.5x11 ga	113	-6.04	11.26	53.6 76.0 (b)	Pass
T3	140 - 120	Diagonal	ROHN TS1.5x16 ga	152	-2.40	5.94	40.4	Pass
T4	120 - 100	Diagonal	ROHN TS1.5x11 ga	182	-4.33	11.26	38.4 54.4 (b)	Pass
T5	100 - 80	Diagonal	ROHN TS1.5x16 ga	245	-4.76	5.94	80.1	Pass
T6	80 - 60	Diagonal	ROHN TS1.5x11 ga	341	-2.43	11.26	21.6 30.6 (b)	Pass
T7	60 - 40	Diagonal	ROHN TS1.5x16 ga	363	-4.02	5.94	67.6	Pass
T8	40 - 20	Diagonal	ROHN TS1.5x16 ga	408	-3.08	5.94	51.8	Pass
T9	20 - 5	Diagonal	ROHN TS1.5x16 ga	418	-2.09	5.97	35.0	Pass
T10	5 - 0	Horizontal	L4x4x1/4	452	-1.22	45.18	2.7	Pass
T1	180 - 160	Top Girt	L2x2x1/4	4	-0.87	16.99	5.1 9.4 (b)	Pass
T2	160 - 140	Top Girt	ROHN TS1.5x11 ga	61	-1.42	13.55	10.5 24.1 (b)	Pass
T3	140 - 120	Top Girt	ROHN TS1.5x16 ga	119	-1.31	7.05	18.6 31.4 (b)	Pass
T4	120 - 100	Top Girt	ROHN TS1.5x11 ga	176	-1.33	13.55	9.8 18.6 (b)	Pass
T5	100 - 80	Top Girt	ROHN TS1.5x16 ga	233	-0.97	7.05	13.8 26.0 (b)	Pass
T6	80 - 60	Top Girt	ROHN TS1.5x11 ga	289	1.47	19.67	7.5 18.5 (b)	Pass
T7	60 - 40	Top Girt	ROHN TS1.5x16 ga	347	-1.01	7.05	14.4	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
							24.3 (b)	
T8	40 - 20	Top Girt	ROHN TS1.5x16 ga	380	-1.08	7.05	15.4	Pass
							26.0 (b)	
T9	20 - 5	Top Girt	ROHN TS1.5x16 ga	413	-1.08	7.05	15.4	Pass
							26.0 (b)	
T10	5 - 0	Top Girt	L4x4x1/4	441	3.30	62.86	5.2	Pass
T1	180 - 160	Bottom Girt	L2x2x1/4	7	2.31	24.49	9.4	Pass
							25.4 (b)	
T2	160 - 140	Bottom Girt	ROHN TS1.5x11 ga	64	-0.86	13.55	6.4	Pass
							12.7 (b)	
T3	140 - 120	Bottom Girt	ROHN TS1.5x16 ga	122	-1.31	7.05	18.6	Pass
							31.4 (b)	
T4	120 - 100	Bottom Girt	ROHN TS1.5x11 ga	179	-1.33	13.55	9.8	Pass
							16.7 (b)	
T5	100 - 80	Bottom Girt	ROHN TS1.5x16 ga	236	-0.97	7.05	13.8	Pass
							23.4 (b)	
T6	80 - 60	Bottom Girt	ROHN TS1.5x11 ga	293	-0.97	13.55	7.2	Pass
							12.2 (b)	
T7	60 - 40	Bottom Girt	ROHN TS1.5x16 ga	351	-1.02	7.05	14.4	Pass
							28.1 (b)	
T8	40 - 20	Bottom Girt	ROHN TS1.5x16 ga	383	-1.08	7.05	15.4	Pass
							26.0 (b)	
T9	20 - 5	Bottom Girt	L3x3x1/2	417	11.15	77.48	14.4	Pass
							89.7 (b)	
T10	5 - 0	Bottom Girt	L4x4x1/4	442	-2.20	50.33	8.1	Pass
T1	180 - 160	Guy A@162.523	1/2	463	8.89	16.14	55.1	Pass
		Guy A@162.523	7/8	483	23.99	47.82	50.2	Pass
T3	140 - 120	Guy A@132.159	9/16	471	15.04	21.00	71.6	Pass
T5	100 - 80	Guy A@82.5234	3/4	477	24.36	34.98	69.6	Pass
T7	60 - 40	Guy A@49.75	1/2	489	10.00	16.14	61.9	Pass
T1	180 - 160	Guy B@162.523	1/2	459	8.74	16.14	54.2	Pass
		Guy B@162.523	7/8	482	23.95	47.82	50.1	Pass
T3	140 - 120	Guy B@132.159	9/16	470	15.02	21.00	71.5	Pass
T5	100 - 80	Guy B@82.5234	3/4	476	24.37	34.98	69.7	Pass
T7	60 - 40	Guy B@49.75	1/2	488	10.00	16.14	61.9	Pass
T1	180 - 160	Guy C@162.523	1/2	454	8.89	16.14	55.1	Pass
		Guy C@162.523	7/8	478	23.97	47.82	50.1	Pass
T3	140 - 120	Guy C@132.159	9/16	466	15.02	21.00	71.5	Pass
T5	100 - 80	Guy C@82.5234	3/4	472	24.37	34.98	69.7	Pass
T7	60 - 40	Guy C@49.75	1/2	484	10.00	16.14	62.0	Pass
T1	180 - 160	Top Guy Pull-Off@162.523	2L2x2x1/4x3/8	479	8.26	49.10	16.8	Pass
							25.1 (b)	
T3	140 - 120	Top Guy Pull-Off@132.159	4x3/8	467	6.06	39.76	15.2	Pass
							24.4 (b)	
T5	100 - 80	Top Guy Pull-Off@82.5234	2L2x2x1/4x3/8	473	9.80	49.10	20.0	Pass
							29.8 (b)	
T7	60 - 40	Top Guy Pull-Off@49.75	4x3/8	486	5.35	39.76	13.5	Pass
							21.5 (b)	
T1	180 - 160	Torque Arm Top@162.523	C12x20.7	456	-1.71	173.42	29.4	Pass

Summary		
Leg (T8)	82.0	Pass
Diagonal (T5)	80.1	Pass
Horizontal (T10)	2.7	Pass
Top Girt (T3)	31.4	Pass
Bottom Girt (T9)	89.7	Pass
Guy A (T3)	71.6	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						Guy B (T3)	71.5	Pass
						Guy C (T3)	71.5	Pass
						Top Guy Pull-Off (T5)	29.8	Pass
						Torque Arm Top (T1)	29.4	Pass
						Bolt Checks	89.7	Pass
						RATING =	**89.7**	**Pass**

CENTEK engineering
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Branford, CT 06405 F: (203) 488-8587

Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	22022.04	Sheet	1	of	2
Address:	174 Boom bridge RD., North Stonington, CT	Computed by	PPG	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	TJL	Date			

CHECK UPLIFT RESISTANCE

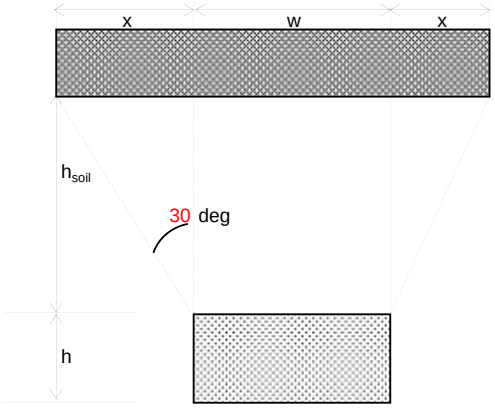
ANCHOR (B) AT 100ft RADIUS

RESULTS FROM COMPUTER ANALYSIS:

Uplift =	20	kips
Sliding =	28	kips
Wdepth =	0	ft

CONCRETE PARAMETERS:

γ_{conc} =	150	pcf
$\gamma_{conc.sub}$ =	87.6	pcf
w =	6	ft
h =	4	ft
d =	12	ft
Vol. =	0.00	ft^3
Vol.sub =	288.00	ft^3
Wc =	*25.23*	kips
Ø =	*0.90*	
	22.71	



Foundation Section

SOIL PARAMETERS:

γ_{soil} =	110	pcf
$\gamma_{soil.sub}$ =	47.6	pcf
h_{soil} =	6	ft
x =	*3.46*	ft

Soil Weight (Wr):

B1 =	72.00
B2 =	244.71
B3 =	244.71

W.soil =	0.00	kips
W.soil.sub =	42.79	kips
Total =	*42.79*	kips
Ø =	*0.75*	
	32.09	

SF AGAINST SLIDING

3.40 **>** *1* ***OK***

GUY ANCHORS AGAINST UPLIFT ARE ADEQUATE

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Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	21140.00	Sheet	2	of	2
Address:	812 Providence Pike, Danileson, CT	Computed by	TJL	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	CFC	Date			

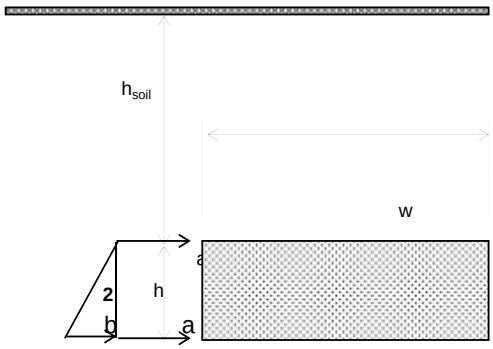
CHECK SLIDING RESISTANCE

SOIL PARAMETERS

$\gamma soil$ =	110	pcf
$\gamma soil$ =	47.6	pcf
h_{soil} =	6	ft
h =	4	ft
ϕ =	30	degrees

ANCHOR PARAMETERS

w =	6.0	ft
h =	4.0	ft
d =	12.0	ft



Foundation Elevation View

κ_p = 3.00

HORIZONTAL FORCES

		0.86	ksf
		1.43	ksf
RESIST TO SLIDING =		54.84	k
SOIL & CONCRETE WEIGHT =	Wr + Wc =	54.80	k
UPLIFT REACTIONS =		-20	k
SUM =		34.80	k
COEF. OF FRICTION, (0.45) =		15.66	k
RESIST TO SLIDING =		54.84	k
SUM =		70.49	k

SF AGAINST SLIDING

SF = 2.5 > 1 OK

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Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	22022.04	Sheet	1	of	2
Address:	174 Boom bridge RD., North Stonington, CT	Computed by	PPG	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	TJL	Date			

CHECK UPLIFT RESISTANCE

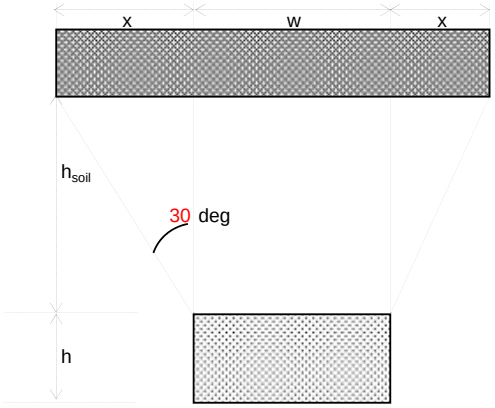
ANCHOR (B) AT 142ft RADIUS

RESULTS FROM COMPUTER ANALYSIS:

Uplift =	28	kips
Sliding =	27	kips
Wdepth =	0	ft

CONCRETE PARAMETERS:

γ_{conc} =	150	pcf
$\gamma_{conc.sub}$ =	87.6	pcf
w =	5	ft
h =	2	ft
d =	9	ft
Vol. =	0.00	ft^3
Vol.sub =	90.00	ft^3
Wc =	*7.88*	kips
Ø =	*0.90*	
	7.10	



Foundation Section

SOIL PARAMETERS:

γ_{soil} =	110	pcf
$\gamma_{soil.sub}$ =	47.6	pcf
h_{soil} =	8	ft
x =	*4.62*	ft

Soil Weight (Wr):

B1 =	45.00
B2 =	259.66
B3 =	259.66

W.soil =	0.00	kips
W.soil.sub =	52.39	kips
Total =	*52.39*	kips
Ø =	*0.75*	
	39.29	

SF AGAINST UPLIFT

2.15 **>** *1* ***OK***

GUY ANCHORS AGAINST UPLIFT ARE ADEQUATE

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Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	21140.00	Sheet	2	of	2
Address:	812 Providence Pike, Danileson, CT	Computed by	TJL	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	CFC	Date			

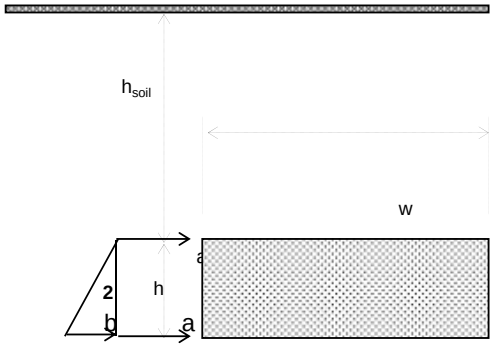
CHECK SLIDING RESISTANCE

SOIL PARAMETERS

$\gamma soil$ =	110	pcf
$\gamma soil$ =	47.6	pcf
h_{soil} =	8	ft
h =	2	ft
ϕ =	30	degrees

ANCHOR PARAMETERS

w =	5.0	ft
h =	2.0	ft
d =	9.0	ft



Foundation Elevation View

K_p = 3.00

HORIZONTAL FORCES

		1.14	ksf
		1.43	ksf
RESIST TO SLIDING =		23.13	k
SOIL & CONCRETE WEIGHT =	Wr + Wc =	46.39	k
UPLIFT REACTIONS =		-28	k
SUM =		18.39	k
COEF. OF FRICTION, (0.45) =		8.28	k
RESIST TO SLIDING =		23.13	k
SUM =		31.41	k

SF AGAINST SLIDING

SF = 1.2 > 1 OK

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Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	22022.04	Sheet	1	of	2
Address:	174 Boom bridge RD., North Stonington, CT	Computed by	PPG	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	TJL	Date			

CHECK UPLIFT RESISTANCE

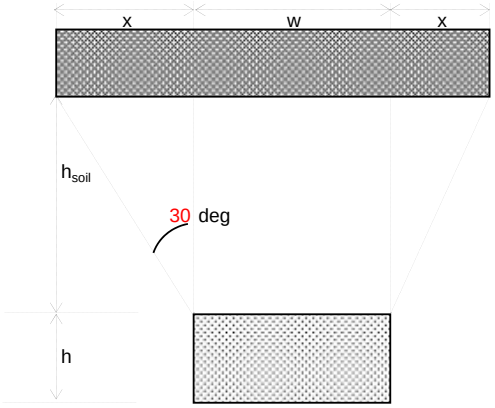
ANCHOR (B) AT 162ft RADIUS

RESULTS FROM COMPUTER ANALYSIS:

Uplift =	12	kips
Sliding =	12	kips
Wdepth =	0	ft

CONCRETE PARAMETERS:

γ_{conc} =	150	pcf
$\gamma_{conc.sub}$ =	87.6	pcf
w =	5	ft
h =	2	ft
d =	9	ft
Vol. =	0.00	ft^3
Vol.sub =	90.00	ft^3
Wc =	*7.88*	kips
Ø =	*0.90*	
	7.10	



Foundation Section

SOIL PARAMETERS:

γ_{soil} =	110	pcf
$\gamma_{soil.sub}$ =	47.6	pcf
h_{soil} =	8	ft
x =	*4.62*	ft

Soil Weight (Wr):

B1 =	45.00
B2 =	259.66
B3 =	259.66

W.soil =	0.00	kips
W.soil.sub =	52.39	kips
Total =	*52.39*	kips
Ø =	*0.75*	
	39.29	

SF AGAINST SLIDING

5.02 **>** *1* ***OK***

GUY ANCHORS AGAINST UPLIFT ARE ADEQUATE

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63-2 North Branford Road P: (203) 488-0580
Branford, CT 06405 F: (203) 488-8587

Job :	T-Mobile ~ CT11048A: 180-ft Guyed Lattice Tower	Project No.	21140.00	Sheet	2	of	2
Address:	812 Providence Pike, Danileson, CT	Computed by	TJL	Date		4/4/22	
Description:	Guy Anchor Evaluation	Checked by	CFC	Date			

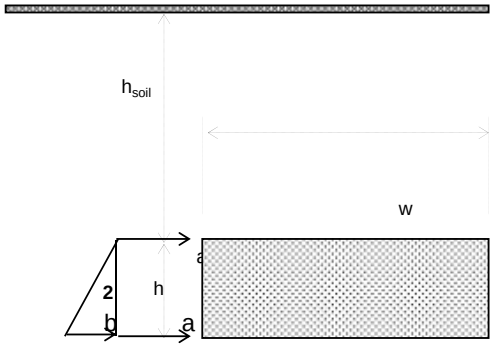
CHECK SLIDING RESISTANCE

SOIL PARAMETERS

$\gamma soil$ =	110	pcf
$\gamma soil$ =	47.6	pcf
h_{soil} =	8	ft
h =	2	ft
ϕ =	30	degrees

ANCHOR PARAMETERS

w =	5.0	ft
h =	2.0	ft
d =	9.0	ft



Foundation Elevation View

κ_p = 3.00

HORIZONTAL FORCES

		1.14	ksf
		1.43	ksf
RESIST TO SLIDING =		23.13	k
SOIL & CONCRETE WEIGHT =	Wr + Wc =	46.39	k
UPLIFT REACTIONS =		-12	k
SUM =		34.39	k
COEF. OF FRICTION, (0.45) =		15.48	k
RESIST TO SLIDING =		23.13	k
SUM =		38.61	k

SF AGAINST SLIDING

SF = 3.2 > 1 OK

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Branford, CT 06405 F: (203) 488-8587

Subject: Base Foundation Analysis - 180-ft Guyed Lattice Tower

Location: Madison, CT

Rev. 0: 4/4/22

Prepared by: PPG Checked by: C.F.C.
Job No. 22022.04

Guyed Tower Base Foundation:

Input Data:

Tower Data

Shear Force =	$Shear := 2 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$Axial := 183 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 180 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 4.5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 3.5 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$D_p := 2.0 \cdot ft$	(User Input)	
Width of Pad =	$W_{pad} := 6.0 \cdot ft$	(User Input)	
Length of Pad =	$L_{pad} := 6.0 \cdot ft$	(User Input)	
Thickness of Pad =	$t_{pad} := 1.5 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcement Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_s := 12000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 110 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Buoyancy =	$Bouyancy := 1$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1.0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Calculated Factors:

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

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Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}\left(Bouyancy = 1, \gamma_{conc} - 62.4 \cdot pcf, \gamma_{conc}\right) = 87.6\ pcf$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}\left(Bouyancy = 1, \gamma_{soil} - 62.4 \cdot pcf, \gamma_{soil}\right) = 47.6\ pcf$

Passive Pressure = $P_{top} := 0$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 0.643\ ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.321\ ksf$

$A_p := D_p \cdot L_p = 7$

Soil Shear Resistance = $Sl_1 := P_{ave} \cdot A_p = 2.25\ kip$

Weight of Concrete = $WT_c := \left(\left({D_p}^2 \cdot L_p\right) + \left(W_{pad} \cdot L_{pad} \cdot t_{pad}\right)\right) \cdot \gamma_c = 5.96\ kip$

Total Weight = $WT_{tot} := WT_c + Axial = 188.96\ kip$

Soil/Concrete Friction Resistance = $Sl_2 := \mu \cdot WT_{tot} = 85.03\ kips$

Total Sliding Resistance = $Sl_{tot} := Sl_1 + Sl_2 = 87.28\ kips$

Sliding Resistance Ratio = $Sliding\_Resistance_{ratio} := \frac{0.75 \cdot Sl_{tot}}{Shear} = 32.73$

$Sliding\_Resistance\_Check := \text{if}\left(\left(\frac{Shear}{0.75 \cdot Sl_{tot}} < 1.0\right), \text{“Okay”}, \text{“No Good”}\right)$

$Sliding\_Resistance\_Check = \text{“Okay”}$

Bearing Pressure Caused by Footing:

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{W_{pad} \cdot L_{pad}} = 5.25\ ksf$

$Max\_Pressure\_Check := \text{if}\left(P_{max} < 0.6 \cdot q_s, \text{“Okay”}, \text{“No Good”}\right)$

$Max\_Pressure\_Check = \text{“Okay”}$

Sheet1

UNR-ROHN

6718 W. PLANK ROAD,P.O. BOX 2000,PEORIA,ILLINOIS PHONE: (309) 697-4400 FAX: (309) 697-5612

ROHN PRODUCT REVIEW SUMMARY FORM

NOVEMBER 10,1997

PRODUCT REVIEW FOR:	180' 80 TOWER ANALYSIS FOR NORTH STONINGTON,CT. SITE
PRODUCT ASSEMBLY DRAWING:	D951097
ROHN FILE NUMBER:	33353PH
REQUEST FORM NUMBER:	930423
REVIEW CRITERIA:	ANSI/EIA-222-E 1991,90 MPH BASIC WIND SPEED (1/2" RADIAL ICE)

THE RESULTS OF THE REVIEW ARE SUMMARIZED AS FOLLOWS:

1. ALL EXISTING STRUCTURAL MEMBER ARE ADEQUATE WITH THE ADDITION OF A NEW GUY WIRE AT 140'. ALSO C12X20.7 CHANNEL TORQUE ARM WITH 7/16" EHS GUY WIRES AT 166' AS REQUESTED.
2. REACTIONS EXCEED THE REACTIONS LISTED FOR THE ORIGINAL BASE PIER AND ANCHOR BLOCK DESIGNS PROVIDED BY OTHERS. REFER BELOW FOR REACTIONS TO BE INVESTIGATED BY OTHERS.

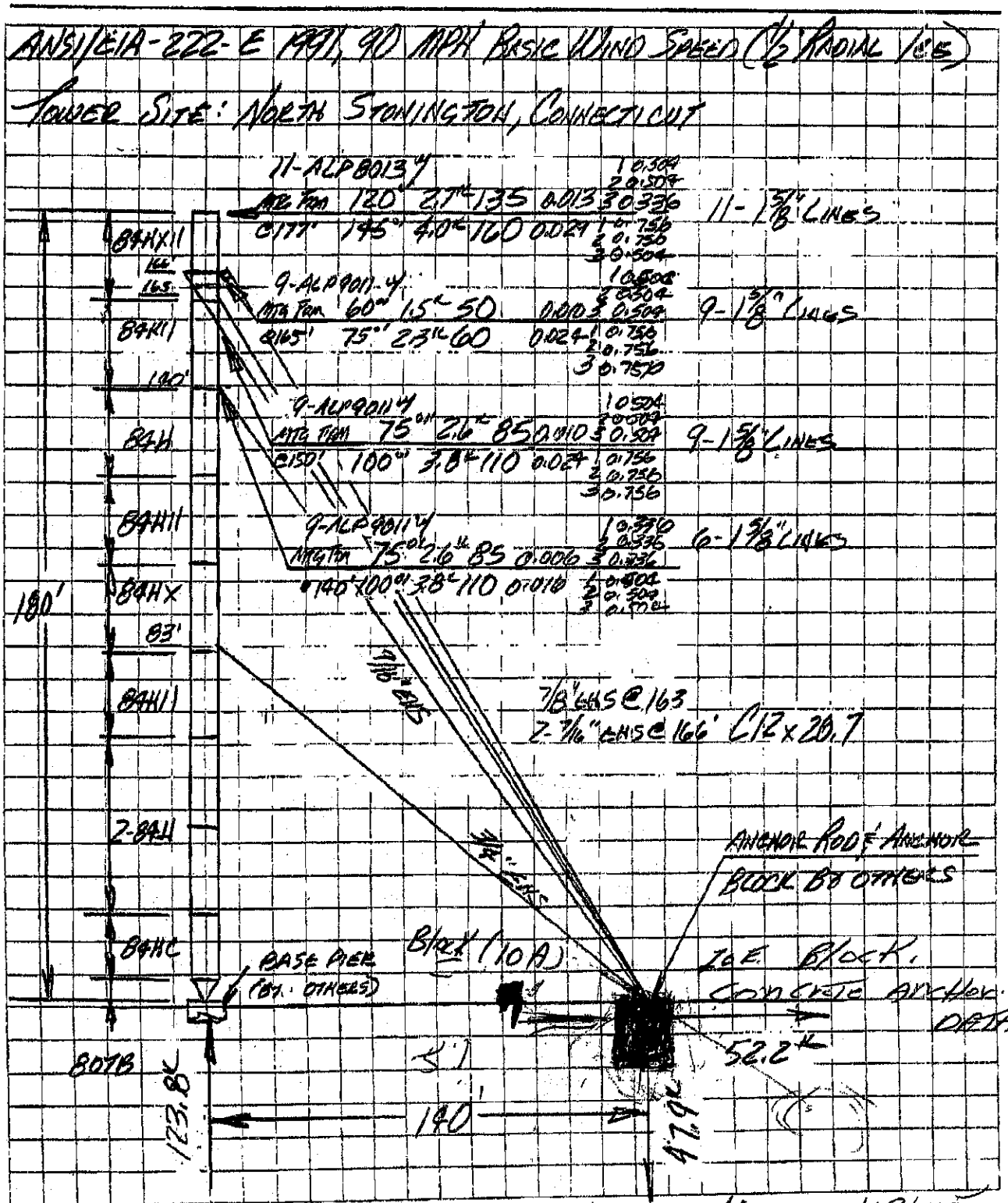
BASE PIER = 125.8 KIPS
ANCHOR BLOCKS
VERTICAL = 47.9 KIPS
HORIZONTAL = 52.2 KIPS

ROBB MORECRAFT
ROHN ENGINEERING DEPARTMENT

PS: ONLY CONTACT THE ABOVE PERSON FOR TECHNICAL TOWER QUESTIONS, ALL OTHER QUESTIONS SHOULD BE DIRECTED TO YOUR SALES CONTACT

180' 80 TOWER FOR SNET CELLULAR ONE - 33353PH-ROH - 11097

ROHN
6718 W. Plank Rd. P.O. Box 2000 Peoria, Illinois 61656 PH: (309) 697-4400 FAX: (309) 697-5612
1100 Industrial Blvd. P.O. Box 1470 Bessemer, Alabama 35021 PH: (205) 428-4000 FAX: (205) 428-9362
184 S. Clinton County 200 W. P.O. Box 609 Frankfort, Indiana 46041 PH: (317) 654-4491 FAX: (317) 659-2782



180' 80 Tower For SNET Cellular One - 33353PH-Rohh-6-259;

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Frankfort, Indiana 46041
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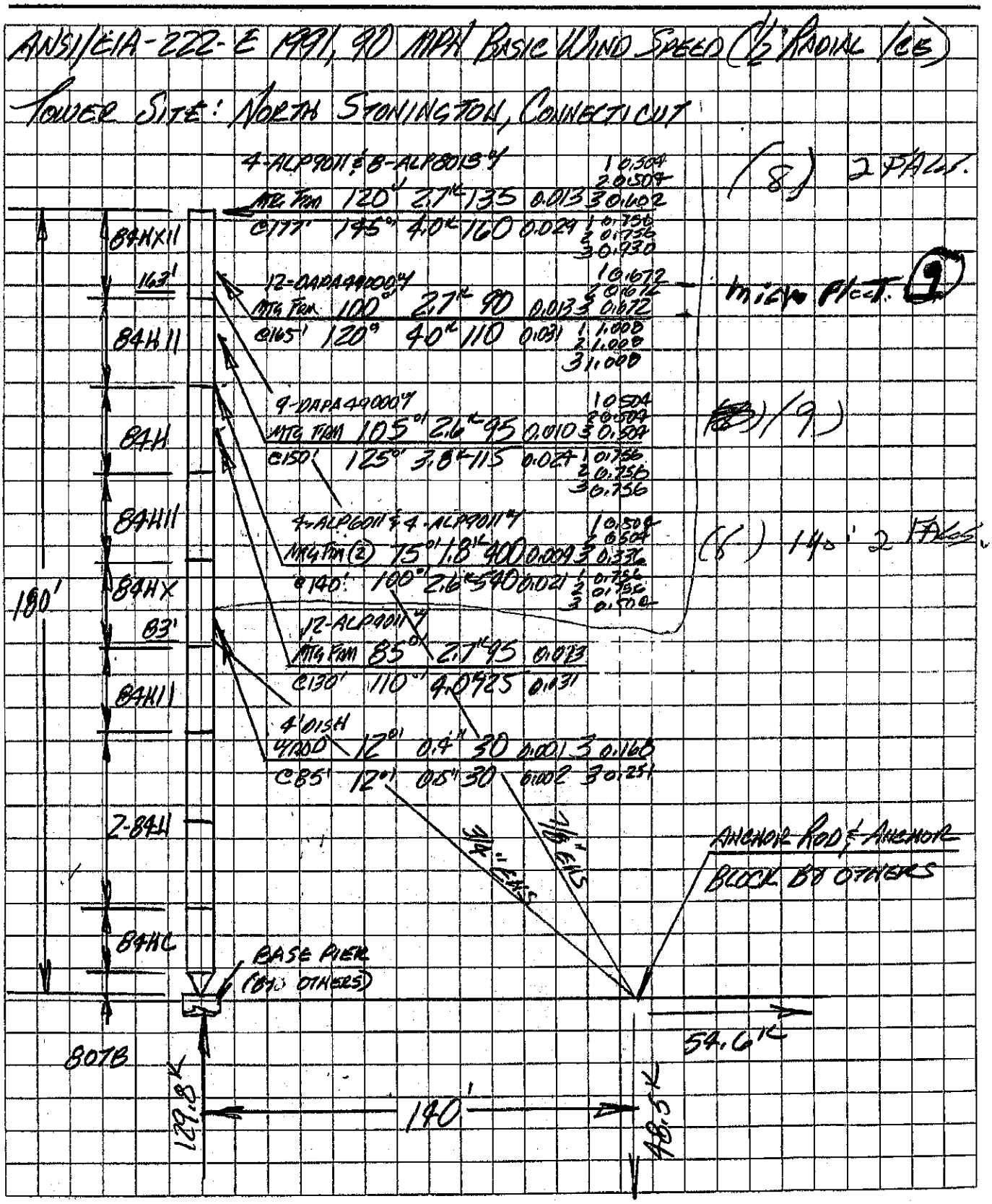
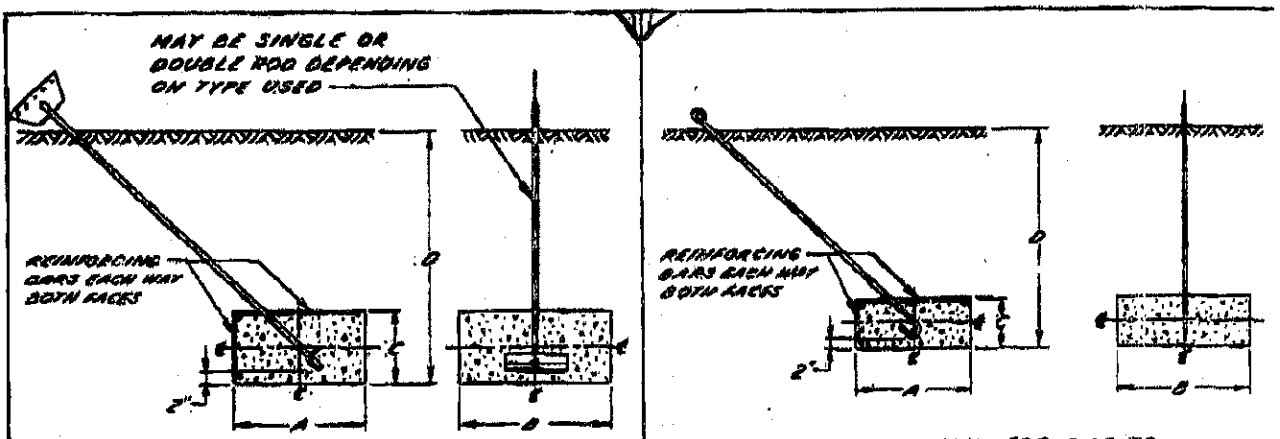




ANCHOR DETAIL FOR GAC 30, 36, 52 & 56 SHOWN ON DWG NO. C 660415

ANCHOR DETAIL FOR GAC 37D

NOTE: DUE TO VARIANCES ENCOUNTERED IN SOIL AND OTHER INSTALLATIONS, IT SHALL BE THE CUSTOMER'S OR INSTALLER'S RESPONSIBILITY TO PROVIDE STRUCTURALLY ADEQUATE FOUNDATIONS FOR GUYED & ANCHOR CONNECTIONS. IT MAY ALSO BE NECESSARY FOR THE CUSTOMER OR INSTALLER TO SECURE THE SERVICE OF A LOCAL ENGINEER TO DETERMINE THAT INSTALLATION COMPLIES WITH LOCAL BUILDING CODES.

General Notes

FOR REQUIRED MATERIAL SPECIFICATIONS, INSTALLATION NOTES AND TOLERANCES, SEE DRAWING NUMBER 0641500.

1. MINIMUM ½" DIAMETER REINFORCING BARS IN ALL ANCHORS WITH MAXIMUM SPACING OF 12" EXCEPT NO. 10 BLOCK MAXIMUM SPACING OF 6".

CONCRETE ANCHOR DATA

DEPTH, D (FT.)	ROD NO.	BLOCK NO.	ANCHOR DIMENSIONS (FT.) A	B	C	WEIGHT CONCRETE (LBS)	CONCRETE (CU. YDS.)	UPLIFT * CAPACITY (LBS)	LATERAL CAPACITY (LBS)
3	GAC 30	3a	1.5	1.5	1	310	.08	300	1,500
		3b	2	2	1	560	.15	1,320	2,000
		3c	2.5	2.5	1	870	.23	1,810	2,500
		3d	3	3	1	1,250	.33	2,335	3,000
		3e	3	4	1	1,680	.44	3,050	4,000
4	GAC 30 OR GAC 37	4a	3	3	1.5	1,890	.50	3,490	5,450
		4b	3	4	1.5	2,520	.67	4,360	7,800
		4c	3	5	1.5	3,150	.84	4,983	9,750
		4d	3	6	1.5	3,780	1.00	6,090	11,700
		4e	4	6	1.5	5,050	1.33	7,660	11,700
6	GAC 56	6a	3	4	1.5	2,520	.67	10,033	12,600
		6b	3	5	1.5	3,150	.84	11,600	15,750
		6c	3	6	1.5	3,780	1.00	13,150	18,900
		6d	4	6	1.5	5,050	1.33	15,350	18,900
8	GAC 37	8a	3	5	1.5	3,150	.84	22,150	21,750
		8b	3	6	1.5	3,780	1.00	24,700	26,100
		8c	4	6	1.5	5,050	1.33	28,300	26,100
		8d	6	6	2.0	10,800	2.67	33,380	34,200
7 10	GAC 56	10a	3	6	2.0	5,040	1.33	37,450	43,200
		10b	4	6	2.0	6,720	1.78	42,700	43,200
		10c	4	7	2.0	7,840	2.07	46,800	50,400
		10d	5	7	2.0	9,800	2.59	52,350	50,400
		10e	5	9	2.0	12,600	3.33	61,700	64,800

* INCLUDES SAFETY FACTOR OF 3

** NORMAL SOIL IS A COHESIVE TYPE SOIL WITH A HORIZONTAL BEARING CAPACITY OF 400 POUNDS PER SQUARE FOOT PER LINEAL FOOT OF DEPTH. ROCK, NON-COHESIVE SOILS, OR SATURATED OR SUBMERGED SOILS ARE NOT TO BE CONSIDERED AS NORMAL.

10E Block. 2 of Block. 42.5° 7½" in Foot 5 Pcs.

P/3	INCREASED ROD LENGTHS; MAST NO. GAC30 WAS GAC25	F.Stine	
P/2	ADD 90° NOTE / ADDED DIMENSION NOTE	I-1-93	

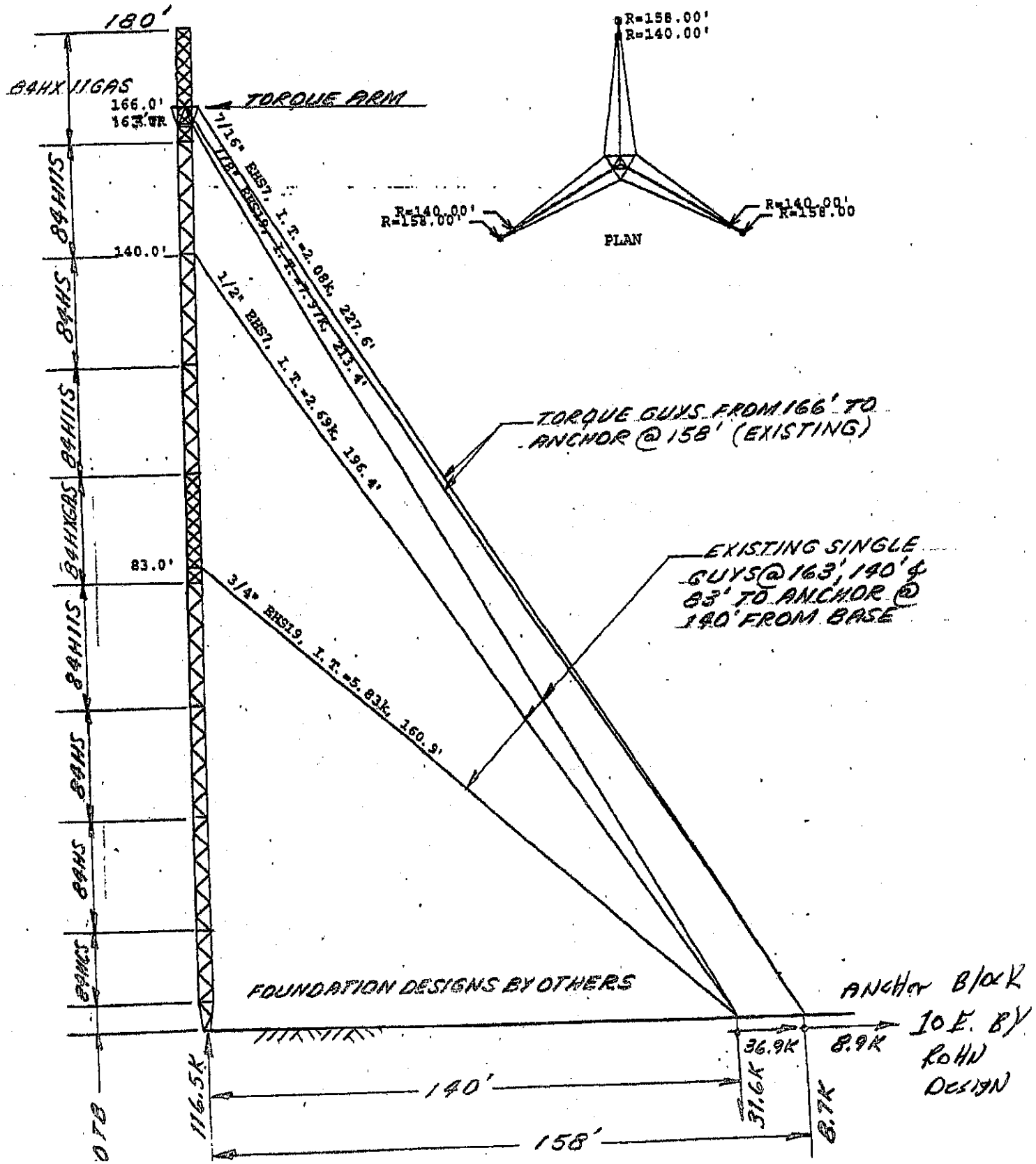
P/1	ADDED ANCHOR DETAIL FOR GAC 37D	4-8-93	GLS
P/0	REVISED D, A & B FOR GAC 56 ANCHOR	3-8-93	GLS
9	ADDED NOTE	7-6-92	GLS
8	REVISED DESIGN LOAD 1.	1-29-92	GLS
7	REVISE DESIGN NOTE 1 & TYPE BLOCK	11-14-91	GLS
6	GAC-37 WAS GA-25	12-7-89	GLS
5	ADDED FOR 114 FT RTT-A	4-18-85	GLS
No.	DESCRIPTION	DATE	BY

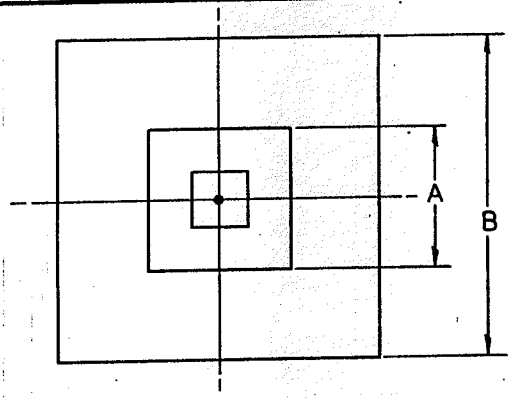
REVISIONS

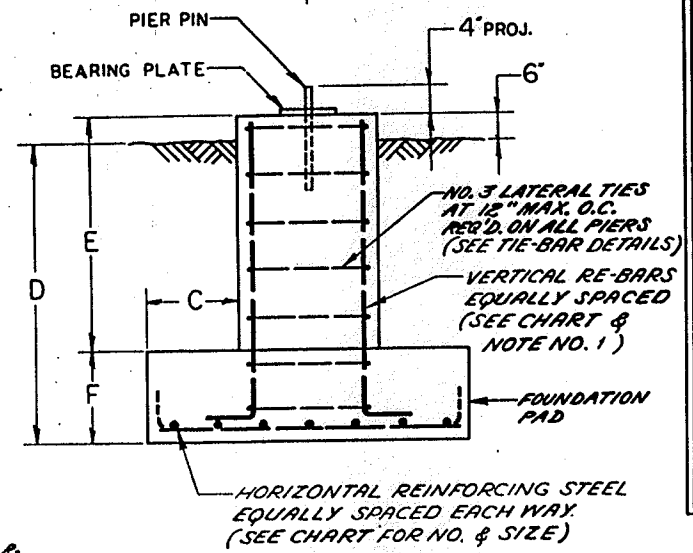
ROHN. STANDARD CONCRETE ANCHOR

DRAWN BY	DATE	SCALE
GLS	1-4-88	NONE
CHECKED BY	DATE	
	1-4-88	
APPROVED BY	DATE	
	1-4-88	

DWG. NO. C 620643

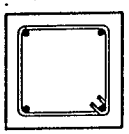

180'
84HX 11GAS
166.0'
163'UR
84HHS
140.0'
84HS
84HHS
84HXGBS
83.0'
84HHS
84HS
84HS
84HS
60'TB
TORQUE ARM
7/16" EHS7, I.T.=2.08k, 227.6'
1/2" EHS7, I.T.=2.69k, 213.4'
1/2" EHS7, I.T.=2.69k, 196.4'
3/4" EHS19, I.T.=5.83k, 160.9'
R=158.00'
R=140.00'
R=140.00'
R=158.00'
R=140.00'
R=158.00
PLAN
TORQUE GUYS FROM 166' TO ANCHOR @ 158' (EXISTING)
EXISTING SINGLE GUYS @ 163', 140' & 83' TO ANCHOR @ 140' FROM BASE
FOUNDATION DESIGNS BY OTHERS
ANCHOR BLOCK
10 E. BY
ROHN
DESIGN
116.5K
140'
158'
36.9K
8.9K
31.6K
8.7K



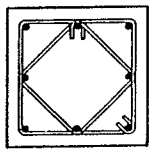


CONCRETE BASE SCHEDULE

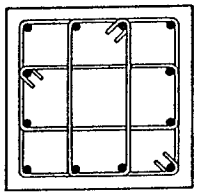
CB NO.	TOWER BASE REACTION	DIMENSIONS						BEARING PLATE	CONC. (CU. YDS.)	VERTICAL BARS (NO. & SIZE)	HORIZ. BARS (NO. & SIZE)
		A	B	C	D	E	F				
1	14000	2'-0	2'-0	0	4'-0	0	0	BP 6	.70	4-NO.6	NONE*
2	22000	2'-6	2'-6	0	4'-0	0	0	BP 6	1.00	4-NO.6	NONE*
3	32000	3'-0	3'-0	0	4'-0	0	0	BP 6	1.50	4-NO.6	NONE*
4	44000	3'-6	3'-6	0	4'-0	0	0	BP 6	2.10	4-NO.6	NONE*
5	58000	2'-0	4'-0	1'-0"	4'-0	3'-3	1'-3	BP 6	1.22	4-NO.6	6-NO.4
6	74000	2'-0	4'-6	1'-3"	4'-0	3'-3	1'-3	BP 6	1.42	4-NO.6	6-NO.5
7	90000	2'-0	5'-0	1'-6	4'-6	3'-9	1'-3	BP 10	1.70	8-NO.6	6-NO.5
8	109000	2'-0	5'-6	1'-9	4'-6	3'-9	1'-3	BP 10	2.00	8-NO.6	6-NO.5
9	130000	2'-0	6'-0	2'-0	4'-6	3'-6	1'-6	BP 10	2.50	8-NO.6	7-NO.5
10	150000	2'-0	6'-6	2'-3	4'-6	3'-6	1'-6	BP 10	2.90	8-NO.6	8-NO.5
11	173000	2'-6	7'-0	2'-3	5'-0	3'-9	1'-9	BP 15	4.00	8-NO.7	8-NO.6
12	198000	2'-6	7'-6	2'-6	5'-0	3'-9	1'-9	BP 15	4.50	8-NO.7	8-NO.6
13	224000	2'-6	8'-0	2'-9	5'-0	3'-9	1'-9	BP 15	5.00	8-NO.7	9-NO.6
14	251000	3'-0	8'-6	2'-9	5'-0	3'-6	2'-0	BP 15	6.50	12-NO.7	9-NO.7
15	279000	3'-0	9'-0	3'-0	5'-0	3'-6	2'-0	BP 15	7.20	12-NO.7	10-NO.7



CB1 THRU CB6



CB7 THRU CB13



CB14 & CB 15

TIE BAR DETAILS

R2 NOTE: DUE TO VARIABLES INVOLVED IN ROOF AND OTHER INSTALLATIONS, IT SHALL BE THE CUSTOMER'S OR INSTALLER'S RESPONSIBILITY TO PROVIDE STRUCTURALLY ADEQUATE SUPPORTS FOR PIER & ANCHOR CONNECTIONS. IT MAY ALSO BE NECESSARY FOR THE CUSTOMER OR INSTALLER TO SECURE THE SERVICE OF A LOCAL ENGINEER TO DETERMINE THAT INSTALLATION COMPLIES WITH LOCAL BUILDING CODES.

General Notes:

FOR REQUIRED MATERIAL SPECIFICATION, INSTALLATION NOTES AND TOLERANCES SEE DRAWING NUMBER B841300.

1. VERTICAL REINFORCING STEEL MAY BE PLACED WITH AN OPTIONAL STANDARD ACI 90° BEND AT BOTTOM.
2. BEARING PLATE PROVIDED ONLY ON TOWERS WITH TAPERED BASE.
*3. HORIZ. BARS IN CHART REFER ONLY TO THE BARS IN THE FOUNDATION PAD.

NO.	DESCRIPTION	DATE	BY
R2	ADDED NOTE	7-6-76	DH
R1	RE-DRAWN-SUPERSEDES C-6106210	2-26-75	DH

REVISIONS

NO.	DESCRIPTION	DATE	BY
R6	REV GEN. NOTES ADDED B841300 NOTE.	1-9-85	RKB
R5	ADDED GENERAL NOTE #9	1-21-80	JHD
R4	REMOVED RS-222-B FROM GEN. NOTE NO. 7.	3/7/77	GLS
R3	DELETE SIZE PIER PIN.	7/29/76	GLS

ROHN® MANUFACTURING
DIVISION OF FMC

TITLE: CONCRETE BASE SCHEDULE

FILE NO

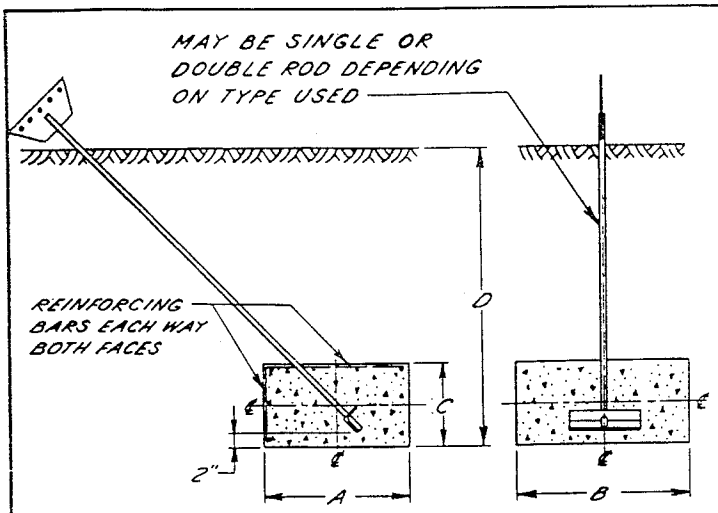
SCALE ~ | MATERIAL | FINISH

DWN. BY DH DATE 2-26-75
CHK. BY WDH DATE 3-7-75
APPD. ENGR. DW DATE 3-7-75
APPD. BY DR DATE 3-15-75

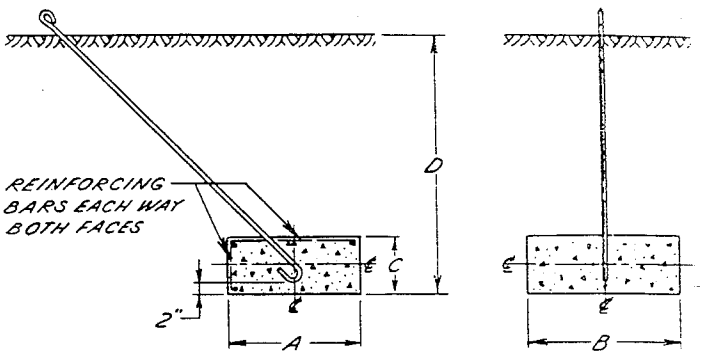
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE GIVEN IN INCHES

TOLERANCES: DEC. ± | FRAC. ± | ANGLES ±

DWG NO. C 610621 R



ANCHOR DETAIL FOR GAC 34, 56, 57, & 58
SHOWN ON DWG. NO. C 660415



ANCHOR DETAIL FOR GAC 30

R9 NOTE: DUE TO VARIABLES INVOLVED IN ROOF AND OTHER INSTALLATIONS, IT SHALL BE THE CUSTOMER'S OR INSTALLER'S RESPONSIBILITY TO PROVIDE STRUCTURALLY ADEQUATE SUPPORTS FOR PIER & ANCHOR CONNECTIONS. IT MAY ALSO BE NECESSARY FOR THE CUSTOMER OR INSTALLER TO SECURE THE SERVICE OF A LOCAL ENGINEER TO DETERMINE THAT INSTALLATION COMPLIES WITH LOCAL BUILDING CODES.

General Notes

FOR REQUIRED MATERIAL SPECIFICATIONS, INSTALLATION NOTES AND TOLERANCES SEE DRAWING NUMBER B841300.

1. MINIMUM ½" DIAMETER REINFORCING BARS IN ALL ANCHORS WITH MAXIMUM SPACING OF 12" EXCEPT NO. 10 BLOCK MAXIMUM SPACING OF 6".

CONCRETE ANCHOR DATA

DEPTH, D (FT.)	ROD NO.	BLOCK NO.	ANCHOR DIMENSIONS (FT.) A	B	C	WEIGHT CONCRETE (LBS)	CONCRETE (CU. YDS.)	UPLIFT * CAPACITY (LBS)	LATERAL CAPACITY (LBS.)
3	GAC 30	3a	1.5	1.5	1	310	.08	900	1,500
		3b	2	2	1	560	.15	1,320	2,000
		3c	2.5	2.5	1	870	.23	1,810	2,500
		3d	3	3	1	1,260	.33	2,535	3,000
		3e	3	4	1	1,680	.44	3,020	4,000
4	GAC 30 OR GAC 34	4a	3	3	1.5	1,890	.50	3,490	5,850
		4b	3	4	1.5	2,520	.67	4,360	7,800
		4c	3	5	1.5	3,150	.84	4,985	9,750
		4d	3	6	1.5	3,780	1.00	6,090	11,700
		4e	4	6	1.5	5,050	1.33	7,660	11,700
6	GAC 56	6a	3	4	1.5	2,520	.67	10,035	12,600
		6b	3	5	1.5	3,150	.84	11,600	15,750
		6c	3	6	1.5	3,780	1.00	13,150	18,900
		6d	4	6	1.5	5,050	1.33	15,850	18,900
8	GAC 57	8a	3	5	1.5	3,150	.84	22,150	21,750
		8b	3	6	1.5	3,780	1.00	24,700	26,100
		8c	4	6	1.5	5,050	1.33	28,500	26,100
		8d	6	6	2.0	10,800	2.67	33,380	33,600
10	GAC 58	10a	3	6	2.0	5,040	1.33	37,450	43,200
		10b	4	6	2.0	6,720	1.78	42,700	43,200
		10c	4	7	2.0	7,840	2.07	46,800	50,400
		10d	5	7	2.0	9,800	2.59	52,350	50,400
		10e	5	9	2.0	12,600	3.33	61,700	64,800

* INCLUDES SAFETY FACTOR OF 2

** NORMAL SOIL IS A COHESIVE TYPE SOIL WITH A HORIZONTAL BEARING CAPACITY OF 400 POUNDS PER SQUARE FOOT PER LINEAL FOOT OF DEPTH. ROCK, NON-COHESIVE SOILS, OR SATURATED OR SUBMERGED SOILS ARE NOT TO BE CONSIDERED AS NORMAL.

NO.	DESCRIPTION	DATE	BY
R13	INCREASED ROD LENGTHS; PART NO. GAC30 WAS GAC25	6-30-86	15 KBA
R12	REVISED ANCHOR DETAIL DWG. NO.	8-18-77	RLH
R11	REMOVED RS-222-B FROM GEN. NOTE NO. 1.	9/7/77	GLS
R10	ADDED NOTE	7-6-76	OH
R9	REVISE DESIGN NOTE 1.	1-14-75	LWH
R8	REVISE DESIGN NOTE 1. & TITLE BLOCK	11-21-74	LWH
R7	GAC-25 WAS GA-25	12-7-73	JER
R6	REVISED FOR EIA RS-222-B	9/9/73	GLS

ROHN® MANUFACTURING
DIVISION OF MARMON GROUP

TITLE: STANDARD CONCRETE ANCHOR

FILE NO.

SCALE: NONE | MATERIAL | FINISH | WT.

DWN BY GLS | DATE 4/4/77 | UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE GIVEN IN INCHES

CHK'D [illegible] | DATE 4-4-73

APP'D DWG | DATE 4-4-73

APP'D [illegible] | DATE 11-6-75

TOLERANCES: DEC. ± | FRAC. ± | ANGLES ±

DWG. NO. C 620643

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

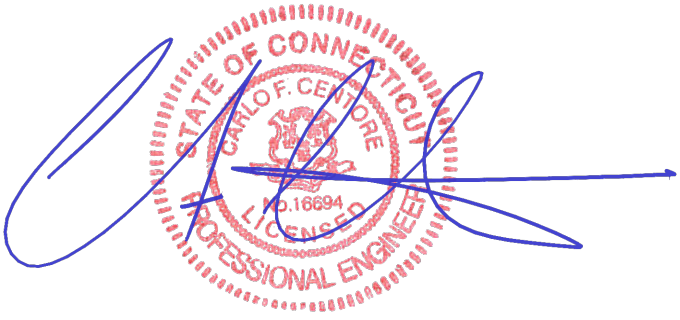
Proposed T-Mobile Antenna Upgrade

Site Ref: CT11048A

174 Boom Bridge Road
North Stonington, CT

CENTEK Project No. 22022.04

Date: May 6, 2022



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

Introduction

This structural analysis report (SAR) was prepared to address the structural viability of installing T-Mobile's proposed antenna configuration attached to the existing V-Frame sector mounts. The antenna mounts are attached to the legs of an 180-ft, 3-legged, host guyed lattice tower located at 174 Boom Bridge Road, North Stonington, Connecticut.

The antenna mount assembly consists of three (3) pipe masts, the V-Frame sector Mount and a stiff arm used to stabilize the mount assembly. This structural analysis report variffies the adequacy of aforementioned antenna mount assembly only. For structural adequacy of the host guyed lattice tower, see structural analysis report named "180-ft Existing Guyed Lattice Tower," prepared by Centek Engineering, job no. 22022.04, dated 04/05/2022.

The antenna mount assembly geometry and member information were gathered through a site visit to investigate the current conditions, performed by Centek personnel on 03/10/2022, construction drawings prepared by Tectonic, Job No. 9927.CT11048A, dated 02/12/21, and a mount analysis report prepared by Tectonic, Job No. 9927.CT11048A - Rev 1, dated 10/16/20. Proposed/existing antenna and appurtenance information was taken from an RF data sheet dated 03/15/2022 provided by T-Mobile.

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 antenna frames carry the horizontal and vertical loads due to the weight of equipment, and wind and transfers into host structure.
- 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 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.

Antenna and Equipment Summary

Location	Appurtenance / Equipment	Rad Center Elevation (AGL)	Mount Type
Per Sector	**(1) Ericsson Air 6419 B41 Antenna** **(1) Commscope VV-65A-R1 Antenna** (1) RFS APXVAALL24_43-U_NA20 Antenna **(1) Ericsson 4460 B25+B66 Radio** (1) 4449 B71+B12 Radio	120-ft	V-Frame sector mounts attached to host lattice tower legs

Equipment – Indicates existing equipment to remain.
Equipment – Indicates proposed equipment to be installed.

Analysis

The antenna frames were analyzed using a comprehensive computer program titled Risa3D. The program examines the 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 2006 ANSI TIA-222-G, 2015 International Building Code amended by the 2018 CSBC and ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures”.

Basic Wind Speed:	V_{asd} = 105 mph	*Appendix N of the 2018 CT State Building Code*
Basic Wind Speed w/ Ice:	V_i = 50 mph	*Annex B of TIA-222-G*
Risk Category:	II	*2015 IBC; Table 1604.05*
Exposure Category:	Surface Roughness C	*ASCE 7-10; Section 26.7.2*
Dead Load	Equipment and framing self-weight	*Identified within SAR design calculations*

Reference Standards

2015 International Building Code:

1. AISC 360-10, *Specification for Structural Steel Buildings.*

Results

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

The antenna mounting assembly and impacted host building components were found to be structurally acceptable as presented in the following table:

Sector	Component	Stress Ratio (percentage of capacity)	Result
All Sectors	Pipe 2.0 STD (Proposed Antenna Mast)	25%	**PASS**
	Pipe 2.0 STD (Existing V-Frame Horizontal)	34%	**PASS**
	Pipe 1.25 STD (Existing V-Frame Horizontal)	26%	**PASS**
	5/8" Solid Rod (Existing V-Frame Diagonal)	97%	**PASS**

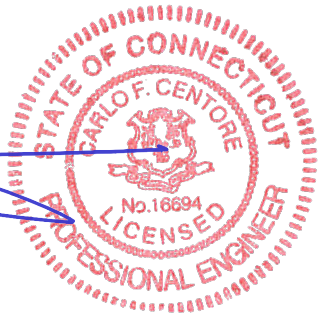
Conclusion

This analysis shows that the proposed subject antenna mount assemblies are **STRUCTURALLY ADEQUETE** to support the proposed T-Mobile 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:



Carlo F. Centore, PE
Principle ~ Structural Engineer

Prepared by:

Pablo Perez-Gomez
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: TIA-222-G Loads on Equipment

Location: North Stonington, CT

Rev. 0: 04/13/2022 Prepared by: PPG Checked by: CFC
Job No. 22022.04

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

Wind Speeds

Basic Wind Speed	$V := 105$	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 =	$Structure\_Type := Guyed\_Mast$		(User Input)
Structure Category =	$SC := II$		(User Input)
Exposure Category =	$Exp := C$		(User Input)
Structure Height =	$h := 180$	ft	(User Input)
Height to Center of Antennas =	$z := 120$	ft	(User Input)
Radial Ice Thickness =	$t_i := 0.75$	in	(User Input per Annex B of TIA-222-G)
Radial Ice Density =	$Id := 56.00$	pcf	(User Input)
Topographic Factor =	$K_{zt} := 1.0$		(User Input)
	$K_a := 1.0$		(User Input)
Gust Effect Factor =	$G_H = 0.85$		(User Input)

Output

Wind Direction Probability Factor =

$$K_d := \begin{vmatrix} \text{if } Structure\_Type = Pole \\ \quad 0.95 \\ \text{if } Structure\_Type = Lattice \\ \quad 0.85 \\ \text{if } Structure\_Type = Guyed\_Mast \\ \quad 0.85 \end{vmatrix} = 0.85$$

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

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

Importance Factors =

$$I_{Wind} := \begin{vmatrix} \text{if } SC = 1 \\ \quad 0.87 \\ \text{if } SC = 2 \\ \quad 1.00 \\ \text{if } SC = 3 \\ \quad 1.15 \end{vmatrix} = 1 \qquad I_{Wind\_w\_Ice} := \begin{vmatrix} \text{if } SC = 1 \\ \quad 0 \\ \text{if } SC = 2 \\ \quad 1.00 \\ \text{if } SC = 3 \\ \quad 1.00 \end{vmatrix} = 1 \qquad I_{ice} := \begin{vmatrix} \text{if } SC = 1 \\ \quad 0 \\ \text{if } SC = 2 \\ \quad 1.00 \\ \text{if } SC = 3 \\ \quad 1.25 \end{vmatrix} = 1$$

Height Escalation factor for Ice Thickness = $K_{iz} := \left(\frac{z}{33}\right)^{0.1} = 1.138$

Factored Ice Thickness = $t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot {K_{zt}}^{0.35} = 1.707$

Velocity Pressure Coefficient Antennas = $Kz := 2.01 \cdot \left(\left(\frac{z}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.315$

Velocity Pressure w/o Ice Antennas = $qz := 0.00256 \cdot K_d \cdot Kz \cdot K_{zt} \cdot V^2 \cdot I_{Wind} = 31.551$ psf

Velocity Pressure with Ice Antennas = $qz_{ice} := 0.00256 \cdot K_d \cdot Kz \cdot K_{zt} \cdot {V_i}^2 \cdot I_{Wind\_w\_Ice} = 7.154$ psf

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS APXVAALL24_43-U-NA20		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 95.9$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.9$	in	(User Input)
Antenna Weight =	$WT_{ant} := 136$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.27$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 543$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 5.9$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 201$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 18.9$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 146$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 8.5$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 65$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 136$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \cdot 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 1 \cdot 10^4$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 423$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 423$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AIR6419 B41		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 33$	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 Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 118$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 2.1$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 66$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 4.9$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 36$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 3.1$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 23$	lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 4752$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 4023$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 130$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 130$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Commscope VV-65A-R1		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 54.7$	in	(User Input)
Antenna Width =	$W_{ant} := 12.08$	in	(User Input)
Antenna Thickness =	$T_{ant} := 4.6$	in	(User Input)
Antenna Weight =	$WT_{ant} := 23$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.5$		
Antenna Force Coefficient =	$Ca_{ant} = 1.29$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.6$	sf
Total Antenna Wind Force Front =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 159$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 1.7$	sf
Total Antenna Wind Force Side =	$F_{ant} := qz \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 60$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 6.3$	sf
Total Antenna Wind Force w/ Ice Front =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 49$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 3.2$	sf
Total Antenna Wind Force w/ Ice Side =	$Fi_{ant} := qz_{ice} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 25$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 23$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 3040$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 4175$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 135$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 135$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model = Ericsson 4449 B71+B12

RRUS Shape = Flat (User Input)

RRUS Height = $L_{RRUS} := 14.9$ in (User Input)

RRUS Width = $W_{RRUS} := 13.2$ in (User Input)

RRUS Thickness = $T_{RRUS} := 10.4$ in (User Input)

RRUS Weight = $WT_{RRUS} := 74$ lbs (User Input)

Number of RRUS's = $N_{RRUS} := 1$

RRUS Aspect Ratio = $Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$

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

Wind Load (without ice)

Surface Area for One RRUS = $SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.4$ sf

Total RRUS Wind Force = $F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 44$ lbs

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

Total RRUS Wind Force = $F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 35$ lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.1$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 15$ lbs

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.8$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 13$ lbs

Gravity Load (without ice)

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

Gravity Loads (ice only)

Volume of Each RRUS = $V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 2045$ cu in

Volume of Ice on Each RRUS = $V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2157$ cu in

Weight of Ice on Each RRUS = $W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 70$ lbs

Weight of Ice on All RRUSs = $W_{ICERRUS} \cdot N_{RRUS} = 70$ lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model = Ericsson 4460 B25+B66

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 = $N_{RRUS} := 1$

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 = $F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 69$ lbs

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

Total RRUS Wind Force = $F_{RRUS} := qz \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 53$ lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 3.1$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 22$ lbs

Surface Area for One RRUS w/ Ice = $SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 2.5$ sf

Total RRUS Wind Force w/ Ice = $Fi_{RRUS} := qz_{ice} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 18$ lbs

Gravity Load (without ice)

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

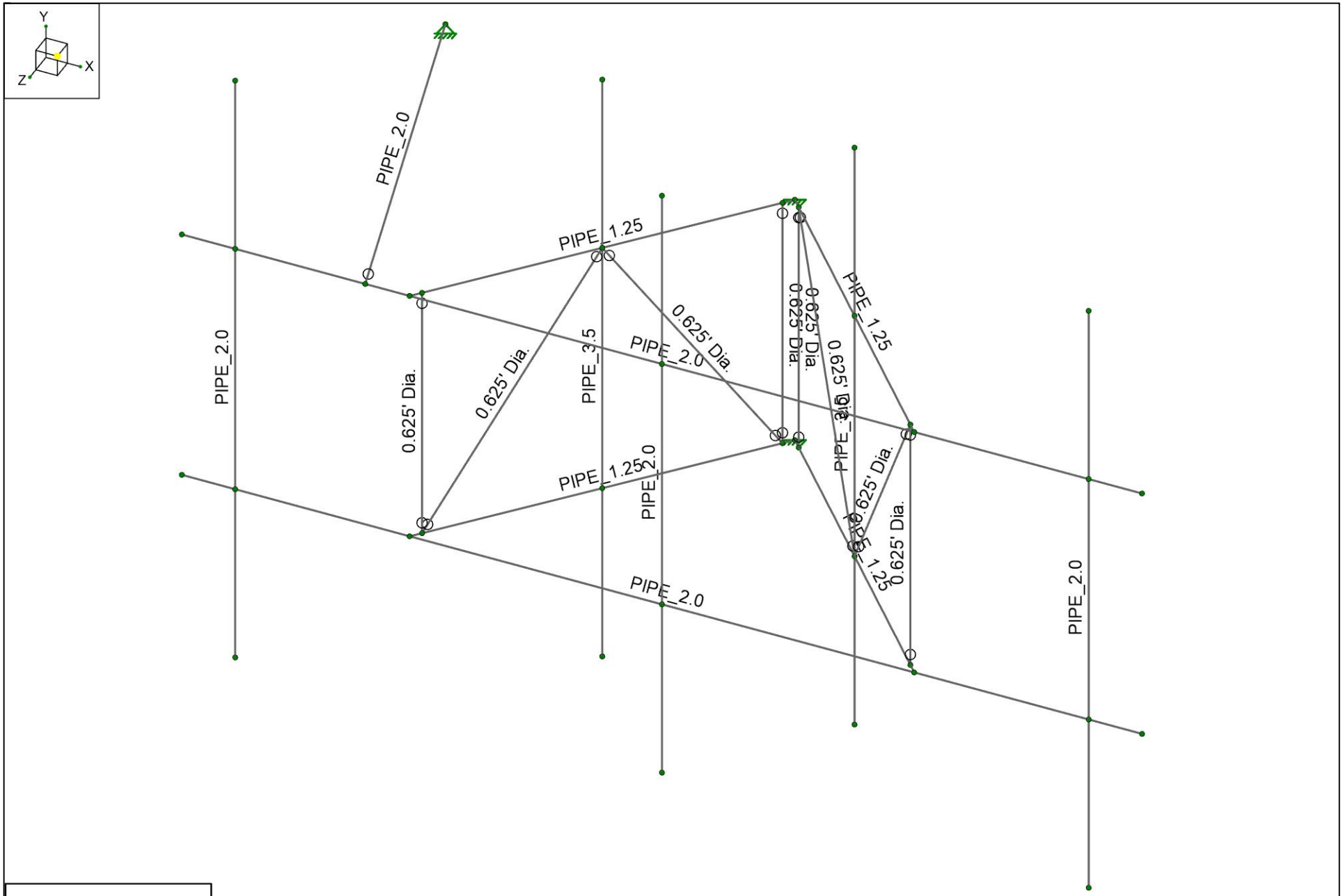
Gravity Loads (ice only)

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

Volume of Ice on Each RRUS = $V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 3100$ cu in

Weight of Ice on Each RRUS = $W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 100$ lbs

Weight of Ice on All RRUSs = $W_{ICERRUS} \cdot N_{RRUS} = 100$ lbs



Envelope Only Solution

Centek Engineering	CT11048A	SK-3
PPG		May 09, 2022
21022.04		CT11048A_AMA.r3d

Nodes

	Label	X [in]	Y [in]	Z [in]	Temp [deg F]	Detach From Dia…
1	N1	-13.5	4.998	-2		
2	N3	14.875	4.998	30		
3	N4	-13.5	34.998	-2		
4	N6	14.875	34.998	30		
5	N12	-67.5	4.998	30		
6	N13	-67.5	34.998	30		
7	N14	40.5	4.998	30		
8	N15	40.5	34.998	30		
9	N22	0.6875	4.998	14		
10	N23	-12.587748	4.998	-0.971204		
11	N24	-12.587748	34.998	-0.971204		
12	N25	13.962748	4.998	28.971204		
13	N26	13.962748	34.998	28.971204		
14	N27	-41.875	4.998	30		
15	N28	-41.875	34.998	30		
16	N29	-27.6875	34.998	14		
17	N31	-14.412252	4.998	-0.971204		
18	N32	-14.412252	34.998	-0.971204		
19	N33	-40.962748	4.998	28.971204		
20	N34	-40.962748	34.998	28.971204		
21	N45	-46.875	34.998	30		
22	N46	-58.875	34.998	-15		
23	N47	-13.5	34.998	30		
24	N48	-13.5	4.998	30		
25	N30	34.5	4.998	30		
26	N35	34.5	34.998	30		
27	N36	-61.5	4.998	30		
28	N37	-61.5	34.998	30		
29	N38	-13.5	-16.002	30		
30	N39	34.5	-16.002	30		
31	N40	-61.5	-16.002	30		
32	N41	-13.5	55.998	30		
33	N42	34.5	55.998	30		
34	N43	-61.5	55.998	30		
35	N44	0.6875	34.998	14		
36	N49	-27.6875	4.998	14		
37	N50	0.6875	-16.002	14		
38	N51	-27.6875	-16.002	14		
39	N52	0.6875	55.998	14		
40	N53	-27.6875	55.998	14		

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	N1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N4	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N23						
4	N24						
5	N31						
6	N32						
7	N46	Reaction	Reaction	Reaction			

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. C…	Density [k…	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

Hot Rolled Steel Properties (Continued)

	Label	E [ksi]	G [ksi]	Nu	Therm. C…	Density [k…	Yield [ksi]	Ry	Fu [ksi]	Rt
5	A500 Gr.46	29000	11154	0.3	0.65	0.49	46	1.2	58	1.1
6	A53 Grad…	29000	11154	0.3	0.65	0.49	35	1.5	58	1.2

General Section Sets

	Label	Shape	Type	Material	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	GEN1A	RE4X4	Beam	gen_Conc3NW	16	21.333	21.333	31.573
2	RIGID		None	RIGID	1e+06	1e+06	1e+06	1e+06

Hot Rolled Member Properties

	Label	Shape	Length [in]	Lb y-y [in]	Lb z-z [in]	Lcomp t…	Lcomp…	L-Torqu…	K y-y	K z-z	Cb	Function
1	M3	(E) Pipe…	42.768			Lbyy						Lateral
2	M4	(E) Pipe…	42.768			Lbyy						Lateral
3	M6	(E) Hori…	108			Lbyy						Lateral
4	M7	(E) Hori…	108			Lbyy						Lateral
5	M9	(E) SR5/8	30			Lbyy						Lateral
6	M10	(E) SR5/8	36.061			Lbyy						Lateral
7	M11	(E) SR5/8	36.061			Lbyy						Lateral
8	M12	(E) SR5/8	30			Lbyy						Lateral
9	M13	(E) Pipe…	42.768			Lbyy						Lateral
10	M14	(E) Pipe…	42.768			Lbyy						Lateral
11	M15	(E) SR5/8	30			Lbyy						Lateral
12	M16	(E) SR5/8	36.061			Lbyy						Lateral
13	M17	(E) SR5/8	36.061			Lbyy						Lateral
14	M18	(E) SR5/8	30			Lbyy						Lateral
15	M21	(E) Hori…	46.573			Lbyy						Lateral
16	M19	PIPE_2.0	72			Lbyy						Lateral
17	M20	PIPE_2.0	72			Lbyy						Lateral
18	M22	PIPE_2.0	72			Lbyy						Lateral
19	M23	PIPE_3.5	72			Lbyy						Lateral
20	M24	PIPE_3.5	72			Lbyy						Lateral

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	Y	-0.136	%50	Active
2	M20	Y	-0.041	%50	Active
3	M19	Y	-0.023	%50	Active
4	M23	Y	-0.074	%50	Active
5	M24	Y	-0.109	%50	Active

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	Y	-0.423	%50	Active
2	M20	Y	-0.13	%50	Active
3	M19	Y	-0.135	%50	Active
4	M23	Y	-0.07	%50	Active
5	M24	Y	-0.1	%50	Active

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

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	X	0.065	%50	Active
2	M20	X	0.023	%50	Active
3	M19	X	0.025	%50	Active
4	M23	X	0.015	%50	Active
5	M24	X	0.022	%50	Active

Member Point Loads (BLC 5 : Wind X)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	X	0.201	%50	Active
2	M20	X	0.066	%50	Active
3	M19	X	0.06	%50	Active
4	M23	X	0.044	%50	Active
5	M24	X	0.069	%50	Active

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

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	Z	0.146	%50	Active
2	M20	Z	0.036	%50	Active
3	M19	Z	0.049	%50	Active
4	M23	Z	0.013	%50	Active
5	M24	Z	0.018	%50	Active

Member Point Loads (BLC 7 : Wind Z)

	Member Label	Direction	Magnitude [k, k-ft]	Location [(in, %)]	Inactive [(k, k-ft), (in,…
1	M22	Z	0.543	%50	Active
2	M20	Z	0.118	%50	Active
3	M19	Z	0.159	%50	Active
4	M23	Z	0.035	%50	Active
5	M24	Z	0.053	%50	Active

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

	Member Label	Direction	Start Magnitud…	End Magnitude…	Start Location […	End Location [(…	Inactive [(k, k-f…
1	M22	X	0.001	0.001	0	%100	Active
2	M19	X	0.001	0.001	0	%100	Active
3	M20	X	0.001	0.001	0	%100	Active
4	M13	X	0.001	0.001	0	%100	Active
5	M14	X	0.001	0.001	0	%100	Active
6	M4	X	0.001	0.001	0	%100	Active
7	M3	X	0.001	0.001	0	%100	Active
8	M23	X	0.002	0.002	0	%100	Active
9	M24	X	0.002	0.002	0	%100	Active
10	M21	X	0.001	0.001	0	%100	Active

Member Distributed Loads (BLC 5 : Wind X)

	Member Label	Direction	Start Magnitud…	End Magnitude…	Start Location […	End Location [(…	Inactive [(k, k-f…
1	M22	X	0.006	0.006	0	%100	Active
2	M19	X	0.006	0.006	0	%100	Active
3	M20	X	0.006	0.006	0	%100	Active
4	M13	X	0.004	0.004	0	%100	Active
5	M14	X	0.004	0.004	0	%100	Active
6	M3	X	0.004	0.004	0	%100	Active
7	M4	X	0.004	0.004	0	%100	Active
8	M23	X	0.008	0.008	0	%100	Active
9	M24	X	0.008	0.008	0	%100	Active
10	M21	X	0.006	0.006	0	%100	Active

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

	Member Label	Direction	Start Magnitud…	End Magnitude…	Start Location […	End Location [(…	Inactive [(k, k-f…
1	M13	Z	0.001	0.001	0	%100	Active
2	M3	Z	0.001	0.001	0	%100	Active
3	M4	Z	0.001	0.001	0	%100	Active
4	M14	Z	0.001	0.001	0	%100	Active
5	M23	Z	0.002	0.002	0	%100	Active
6	M24	Z	0.002	0.002	0	%100	Active

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

	Member Label	Direction	Start Magnitud…	End Magnitude…	Start Location […	End Location [(…	Inactive [(k, k-f…
7	M21	Z	0.001	0.001	0	%100	Active
8	M6	Z	0.001	0.001	0	%100	Active
9	M7	Z	0.001	0.001	0	%100	Active
10	M19	Z	0.001	0.001	63	72	Active
11	M19	Z	0.001	0.001	0	9	Active
12	M20	Z	0.001	0.001	0	21	Active
13	M20	Z	0.001	0.001	51	72	Active

Member Distributed Loads (BLC 7 : Wind Z)

	Member Label	Direction	Start Magnitud…	End Magnitude…	Start Location […	End Location [(…	Inactive [(k, k-f…
1	M23	Z	0.008	0.008	0	%100	Active
2	M24	Z	0.008	0.008	0	%100	Active
3	M20	Z	0.006	0.006	0	21	Active
4	M20	Z	0.006	0.006	51	72	Active
5	M19	Z	0.006	0.006	0	9	Active
6	M19	Z	0.006	0.006	63	72	Active
7	M6	Z	0.006	0.006	0	%100	Active
8	M7	Z	0.006	0.006	0	%100	Active
9	M13	Z	0.004	0.004	0	%100	Active
10	M3	Z	0.004	0.004	0	%100	Active
11	M14	Z	0.004	0.004	0	%100	Active
12	M4	Z	0.004	0.004	0	%100	Active
13	M21	Z	0.006	0.006	0	%100	Active

Basic Load Cases

	BLC Desc…	Category	X Gravity	Y Gravity	Z Gravity	Nodal	Point	Distributed	Area(Me…	Surface(P…
1	Self Weight	DL		-1						
2	Dead Load	None					5			
3	Ice Load	None					5			
4	Wind with…	None					5	10		
5	Wind X	None					5	10		
6	Wind with…	None					5	13		
7	Wind Z	None					5	13		

Load Combinations

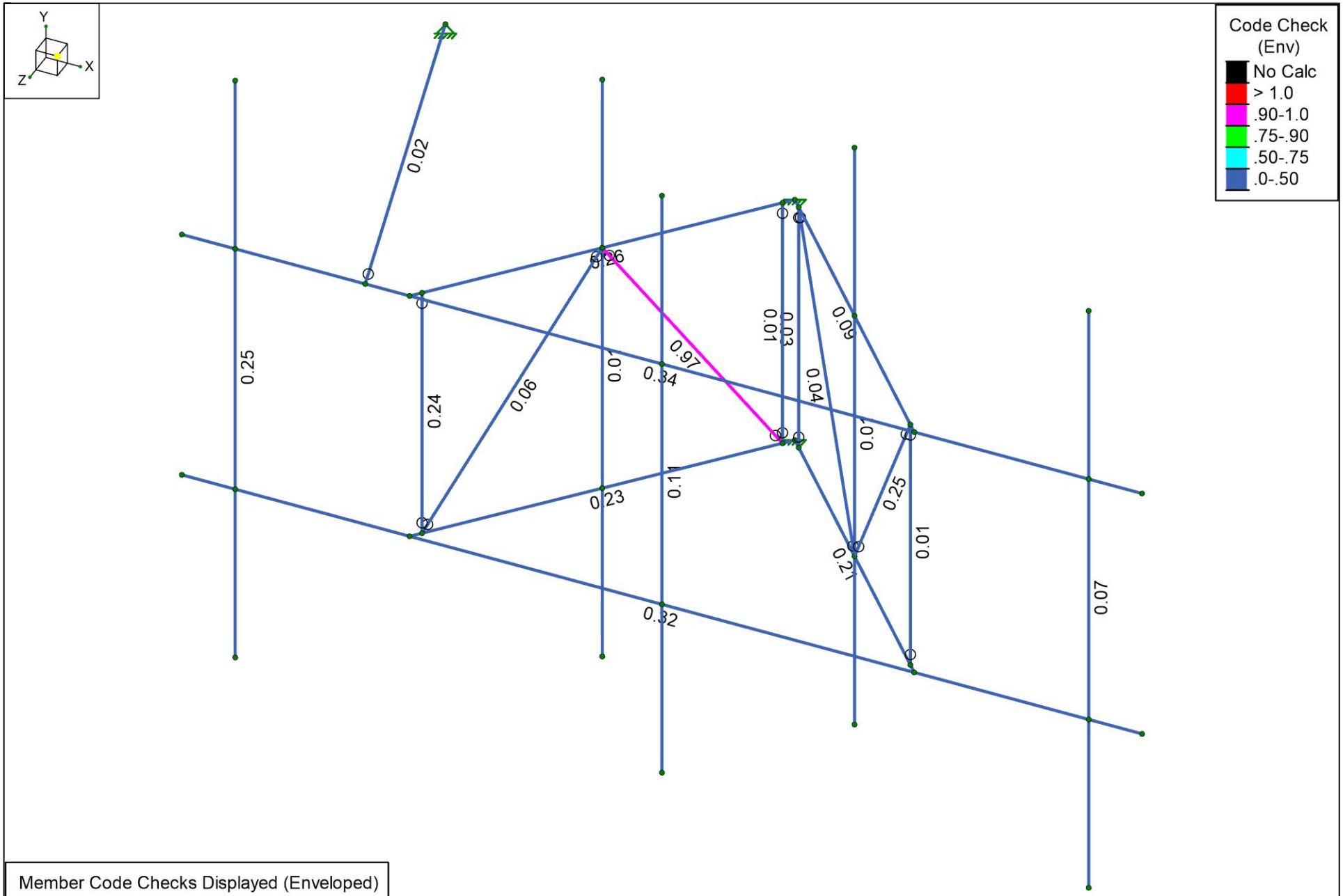
	De…	So…	PD…	SR…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…	BLC	Fa…
1	1.2…	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9…	Yes	Y		1	0.9	2	0.9	5	1.6														
3	1.2…	Yes	Y		1	1.2	2	1.2	3	1	4	1												
4	1.2…	Yes	Y		1	1.2	2	1.2	7	1.6														
5	0.9…	Yes	Y		1	0.9	2	0.9	7	1.6														
6	1.2…	Yes	Y		1	1.2	2	1.2	3	1	6	1												

Node Reactions

	Node…		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	-0.098	5	1.05	6	1.385	3	-0.045	2	-0.038	5	-0.045	2
2		min	-0.706	1	0.429	2	-0.509	5	-0.118	6	-0.209	1	-0.082	6
3	N4	max	0.625	6	0.613	3	0.174	2	-0.026	5	0.116	4	0	3
4		min	-0.308	2	0.158	5	-1.427	6	-0.085	6	-0.081	2	-0.022	5
5	N46	max	-0.031	3	0.008	4	-0.11	3	0	6	0	6	0	6
6		min	-0.204	5	0.006	2	-0.786	5	0	1	0	1	0	1
7	Totals:	max	0	6	1.67	6	0	2						
8		min	-1.159	1	0.609	2	-1.956	4						

Material Take-Off

	Material	Size	Pieces	Length [in]	Weight [k]
1	Hot Rolled Steel				
2	A36 Gr.36	0.625' Dia.	8	264.2	0.023
3	A36 Gr.36	PIPE_2.0	3	216	0.062
4	A36 Gr.36	PIPE_3.5	2	144	0.102
5	A53 Grade B	PIPE_1.25	4	171.1	0.03
6	A53 Grade B	PIPE_2.0	3	262.6	0.076
7	Total HR Steel		20	1057.9	0.294



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering	CT11048A	SK-2
PPG		May 09, 2022
21022.04		CT11048A_AMA.r3d

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: Connection to Guyed Lattice Tower

Location: North Stonington, CT

Date: 03/14/2022

Prepared by: PPG; Checked by: CFC
Job No. 22022.04

V-Frame Connection to Guyed Tower:

Anchor Data

1/2" Dia. X 15" Long SAE J429 GR-2 Thru Bolt

Diameter of Bolts =	$D := 0.5 \cdot in$	(User Input)
Number of Bolts =	$N := 2$	(User Input)
Spacing Between Bolts =	$S := 4\ in$	(User Input)
Tensile Strength =	$F_{ut} := 74000\ psi$	(User Input)
Yield Strength =	$F_{uv} := 57000\ psi$	(User Input)
Design Tension Strength =	$\Phi F_{nt} := \frac{1}{4} \cdot D^2 \cdot \pi \cdot F_{ut} = 14.53\ kip$	(User Input)
Design Shear Strength=	$\Phi F_{nv} := \frac{1}{4} \cdot D^2 \cdot \pi \cdot F_{uv} = 11.192\ kip$	(User Input)

Design Reactions:

Node 1 - Load Combination 3 (Worst Case)

Force X =	$Shear_x := 0.697 \cdot kip$	(User Input)
Force Y=	$Vertical := 1.049\ kip$	(User Input)
Force Z=	$Shear_z := 1.385 \cdot kip$	(User Input)
Moment X=	$M_X := 0.117 \cdot kip \cdot ft$	(User Input)
Moment Y=	$M_Y := 0.077 \cdot kip \cdot ft$	(User Input)
Moment Z=	$M_Z := 0.081\ kip \cdot ft$	(User Input)

Anchor Check:

Max Tension Force = $T_{Max} := \frac{Shear_z}{N} + \frac{M_Y + M_X}{S \cdot \frac{N}{2}} = 1.27\ kip$

Max Shear Force = $V_{Max} := \frac{Shear_x + Vertical}{N} + \frac{M_Z}{S \cdot \frac{N}{2}} = 1.12\ kip$

Condition 1 = $Condition1 := \text{if}\left(\frac{T_{Max}}{\Phi F_{nt}} \le 1.00\ , \text{“OK”}\ , \text{“NG”}\right) = \text{“OK”}$

Condition 2 = $Condition2 := \text{if}\left(\frac{V_{Max}}{\Phi F_{nv}} \le 1.00\ , \text{“OK”}\ , \text{“NG”}\right) = \text{“OK”}$

Condition 3 = $Condition3 := \text{if}\left(\frac{T_{Max}}{\Phi F_{nt}} + \frac{V_{Max}}{\Phi F_{nv}} \le 1.0\ , \text{“OK”}\ , \text{“NG”}\right) = \text{“OK”}$

% of Capacity = $\max\left(\frac{T_{Max}}{\Phi F_{nt}}, \frac{V_{Max}}{\Phi F_{nv}}, \left(\frac{T_{Max}}{\Phi F_{nt}}\right) + \left(\frac{V_{Max}}{\Phi F_{nv}}\right)\right) = 18.74\%$

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Section 1 - Site Information

Site ID: CT11048A
Status: Final
Version: 4
Project Type: Anchor
Approved: 3/1/2022 2:42:27 PM
Approved By: Michael.Low1@T-Mobile.com
Last Modified: 3/1/2022 2:42:27 PM
Last Modified By: Michael.Low1@T-Mobile.com

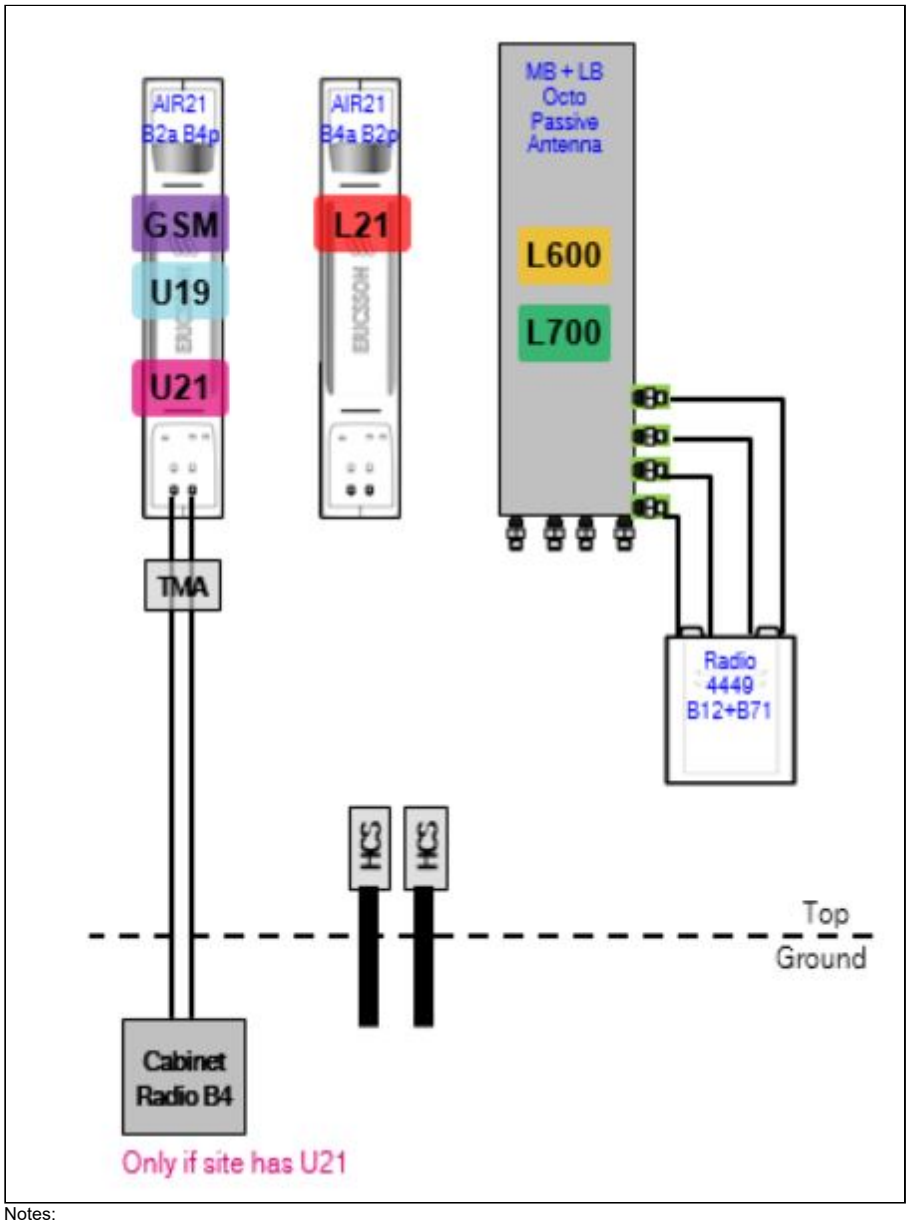
Site Name: NorthStonington/CDT_1
Site Class: Self Support Tower
Site Type: Structure Non Building
Plan Year: 2022
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: <undefined>

Latitude: 41.42879694
Longitude: -71.80907720
Address: 174 Boom Bridge Rd.
City, State: North Stonington, CT
Region: NORTHEAST

RAN Template: 67D5D998E 6160			AL Template: 67D5998E_1xAIR+1OP+1QP	
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 6

Section 2 - Existing Template Images

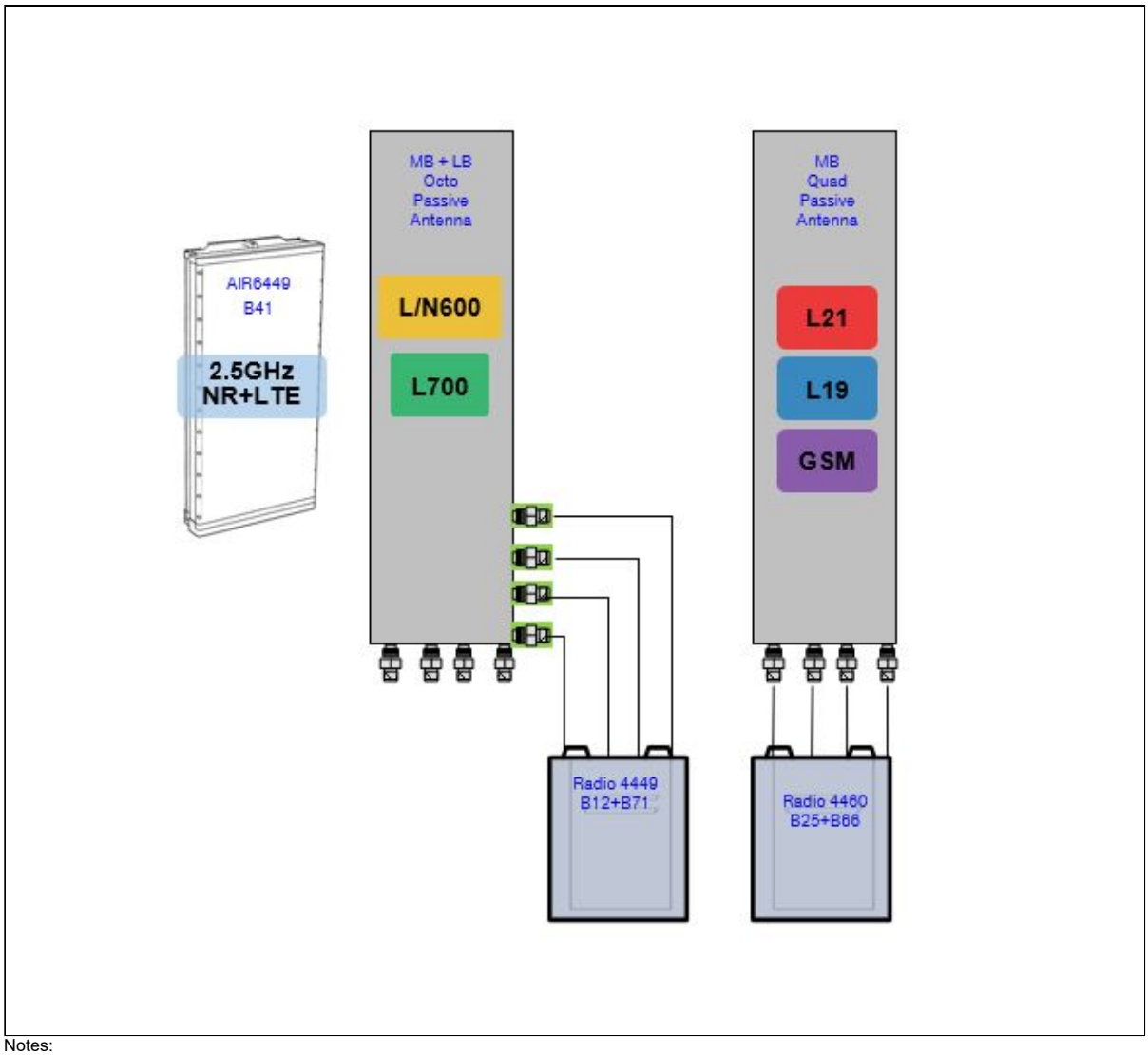
67D02C.JPG



Notes:

Section 3 - Proposed Template Images

67D5998E_1xAIR+1OP+1QP.JPG



Notes:

Section 4 - Siteplan Images

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

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D02C Outdoor

Enclosure	1	2
Enclosure Type	RBS 6131	S8000 Outdoor
Baseband	DUW30 (U1900); DUG20 (G1900); BB 6630 (L2100); BB 6648 (L700, L600, N600)	
Hybrid Cable System	Ericsson 9x18 HCS *Select Length* Ericsson 6x12 HCS *Select Length & AWG* **(x 2)** Ericsson 6x12 HCS *Select AWG & Length*	

Proposed RAN Equipment

Template: 67D5D998E 6160

Enclosure	1	2	3
Enclosure Type	Enclosure 6160 AC V1	B160	RBS 6131
Baseband	RP 6651 (N2500); RP 6651 (L2500)		DUG20 (G1900); DUW30 (U1900); BB 6630 (L2100, L1900); BB 6648 (L700, L600, N600)
Hybrid Cable System	Ericsson Hybrid Trunk 6/24 4AWG 70m PSU 4813 vR4A (Kit)		Ericsson 6x12 HCS *Select Length & AWG* **(x 3)**
Transport System	CSR IXRe V2 (Gen2)		

RAN Scope of Work:

Remove and return all cabinet radios from existing base station cabinet.

Add (1) Enclosure 6160.

Add (1) iXRe Router to new Enclosure 6160.

Add (1) RP 6651 for N2500 to new Enclosure 6160.

Add (1) RP 6651 for L2500 to new Enclosure 6160.

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

Add (1) Battery Cabinet B160.

Existing : (3) 6x12, (1) 9x18

Remove all Coax, remove (1) 9x18

Add (1) 6X24 HCS terminating at the Enclosure 6160 Connect DC for the AIR6419 B41 to the PSU4813 Voltage Booster.

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Section 6 - A&L Equipment

Existing Template: 67D02C_2xAIR+1OP
Proposed Template: 67D5998E_1xAIR+1OP+1QP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 B4A/B12P 4ft (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	40		40		40			
M. Tilt								
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	U1900 G1900		L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2				
Cables	Fiber Jumper - 15 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.			
TMAs								
Diplexers / Combiners								
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

*** AIR21 B4A/B12P in Position 2 ***
Remove Existing AWS TMA in Position 1.
Remove RRUS11 B12 in Position 2.
Add new mount for Position 3.
Add (1) LB/MB Octo to Position 3.
Add (1) Radio 4449 B71+B12 to Position 3 for L600 and L700.

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

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	AIR 6419 B41 (Active Antenna - Massive MIMO)		Commscope_VV-65A-R1 (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	40		40		40			
M. Tilt	0		0		0			
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2500 N2500	L2500 N2500	L2100 L1900 G1900 U1900	L2100 L1900 G1900 U1900	L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2	2	2		
Cables	Fiber Jumper **(x2)**	Fiber Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper		
TMAs								
Diplexers / Combiners								
Radio			Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

There will be Three antennae per sector.

Remove all TMAs.

Remove all diplexers.

Remove all Coaxial Lines.

Replace AIR21 B2A/B4P from Position 1 with (1) AIR6419 B41 for L2500 and N2500.

Replace AIR21 B2P/B4A with (1) mid-band Quad VV-65A-R1 in Position 2 .

Add (1) Radio 4460 B25+B66 for L2100, L1900 (Both carriers), and GSM to Position 2 at antenna.

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:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 B4A/B12P 4ft (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	140		140		140			
M. Tilt								
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	U1900 G1900		L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2				
Cables	Fiber Jumper - 15 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.			
TMAs								
Diplexers / Combiners								
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

*** AIR21 B4A/B12P in Position 2 ***
Remove Existing AWS TMA in Position 1.
Remove RRUS11 B12 in Position 2.
Add new mount for Position 3.
Add (1) LB/MB Octo to Position 3.
Add (1) Radio 4449 B71+B12 to Position 3 for L600 and L700.

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

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	AIR 6419 B41 (Active Antenna - Massive MIMO)		Commscope_VV-65A-R1 (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	140		140		140			
M. Tilt	0		0		0			
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2500 N2500	L2500 N2500	L2100 L1900 G1900 U1900	L2100 L1900 G1900 U1900	L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2	2	2		
Cables	Fiber Jumper **(x2)**	Fiber Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper		
TMAs								
Diplexers / Combiners								
Radio			Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

There will be Three antennae per sector.

Remove all TMAs.

Remove all diplexers.

Remove all Coaxial Lines.

Replace AIR21 B2A/B4P from Position 1 with (1) AIR6419 B41 for L2500 and N2500.

Replace AIR21 B2P/B4A with (1) mid-band Quad VV-65A-R1 in Position 2 .

Add (1) Radio 4460 B25+B66 for L2100, L1900 (Both carriers), and GSM to Position 2 at antenna.

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:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 B4A/B12P 4ft (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	260		260		260			
M. Tilt								
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	U1900 G1900		L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2				
Cables	Fiber Jumper - 15 ft. **(x2)**	1-5/8" Coax - 150 ft. **(x2)**	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.			
TMAs								
Diplexers / Combiners								
Radio					Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

*** AIR21 B4A/B12P in Position 2 ***
Remove Existing AWS TMA in Position 1.
Remove RRUS11 B12 in Position 2.
Add new mount for Position 3.
Add (1) LB/MB Octo to Position 3.
Add (1) Radio 4449 B71+B12 to Position 3 for L600 and L700.

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

RAN Template:	A&L Template:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
PORs: Anchor_Phase 3

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	AIR 6419 B41 (Active Antenna - Massive MIMO)		Commscope_VV-65A-R1 (Quad)		RFS - APXVAALL24_43-U-NA20 (Octo)			
Azimuth	260		260		260			
M. Tilt	0		0		0			
Height	120		120		120			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2500 N2500	L2500 N2500	L2100 L1900 G1900 U1900	L2100 L1900 G1900 U1900	L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2	2	2	2	2	2		
Cables	Fiber Jumper **(x2)**	Fiber Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper		
TMAs								
Diplexers / Combiners								
Radio			Radio 4460 B25+B66 (At Antenna)	SHARED Radio 4460 B25+B66 (At Antenna)	Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)		
Sector Equipment								

Unconnected Equipment:

Scope of Work:

There will be Three antennae per sector.

Remove all TMAs.

Remove all diplexers.

Remove all Coaxial Lines.

Replace AIR21 B2A/B4P from Position 1 with (1) AIR6419 B41 for L2500 and N2500.

Replace AIR21 B2P/B4A with (1) mid-band Quad VV-65A-R1 in Position 2 .

Add (1) Radio 4460 B25+B66 for L2100, L1900 (Both carriers), and GSM to Position 2 at antenna.

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:
67D5D998E 6160	67D5998E_1xAIR+1OP+1QP

CT11048A_Anchor_4

Print Name: Preliminary (RFDS_For_Scoping)
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

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: CT11048A

NorthStonington/CDT_1
174 Boom Bridge Road
North Stonington, Connecticut 06359

April 28, 2022

EBI Project Number: 6222002871

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**24.17%**

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

April 28, 2022

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

Emissions Analysis for Site: CT11048A - NorthStonington/CDT_1

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **174 Boom Bridge Road** in **North Stonington, 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 174 Boom Bridge Road in North Stonington, Connecticut using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report, the sample point is the top of a 6-foot person standing at the base of the tower.

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

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

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

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

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

5) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

6) 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.

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 Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz channel(s), the Commscope VV-65A-R1 for the 1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the RFS APXVAALL24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz channel(s) in Sector A, the Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz channel(s), the Commscope VV-65A-R1 for the 1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the RFS APXVAALL24_43-U-NA20 for the 600 MHz / 600 MHz / 700 MHz channel(s) in Sector B, the Ericsson AIR 6419 for the 2500 MHz / 2500 MHz / 2500 MHz / 2500 MHz channel(s), the Commscope VV-65A-R1 for the 1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz channel(s), the RFS APXVAALL24_43-U-NA20 for the 600 MHz / 600 MHz / 700 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 120 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:	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):	120 feet	Height (AGL):	120 feet	Height (AGL):	120 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 A1 MPE %:	**8.58%**	Antenna B1 MPE %:	**8.58%**	Antenna C1 MPE %:	**8.58%**
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	Commscope VV-65A-R1	Make / Model:	Commscope VV-65A-R1	Make / Model:	Commscope VV-65A-R1
Frequency Bands:	1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	1900 MHz / 1900 MHz / 1900 MHz / 2100 MHz
Gain:	15.55 dBd / 15.55 dBd / 15.55 dBd / 16.05 dBd	Gain:	15.55 dBd / 15.55 dBd / 15.55 dBd / 16.05 dBd	Gain:	15.55 dBd / 15.55 dBd / 15.55 dBd / 16.05 dBd
Height (AGL):	120 feet	Height (AGL):	120 feet	Height (AGL):	120 feet
Channel Count:	10	Channel Count:	10	Channel Count:	10
Total TX Power (W):	420.00 Watts	Total TX Power (W):	420.00 Watts	Total TX Power (W):	420.00 Watts
ERP (W):	15,600.26	ERP (W):	15,600.26	ERP (W):	15,600.26
Antenna A2 MPE %:	**4.32%**	Antenna B2 MPE %:	**4.32%**	Antenna C2 MPE %:	**4.32%**
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	RFS APXVAALL24_43-U-NA20	Make / Model:	RFS APXVAALL24_43-U-NA20	Make / Model:	RFS APXVAALL24_43-U-NA20
Frequency Bands:	600 MHz / 600 MHz / 700 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz	Frequency Bands:	600 MHz / 600 MHz / 700 MHz
Gain:	12.95 dBd / 12.95 dBd / 13.65 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.65 dBd	Gain:	12.95 dBd / 12.95 dBd / 13.65 dBd
Height (AGL):	120 feet	Height (AGL):	120 feet	Height (AGL):	120 feet
Channel Count:	5	Channel Count:	5	Channel Count:	5
Total TX Power (W):	200.00 Watts	Total TX Power (W):	200.00 Watts	Total TX Power (W):	200.00 Watts
ERP (W):	4,151.83	ERP (W):	4,151.83	ERP (W):	4,151.83
Antenna A3 MPE %:	**2.73%**	Antenna B3 MPE %:	**2.73%**	Antenna C3 MPE %:	**2.73%**

Site Composite MPE %	
Carrier	**MPE %**
T-Mobile (Max at Sector A):	15.63%
AT&T	2.18%
Sprint	2.25%
Verizon	4.11%
Site Total MPE % :	24.17%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	15.63%
T-Mobile Sector B Total:	15.63%
T-Mobile Sector C Total:	15.63%
Site Total MPE % :	24.17%

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 2500 MHz LTE 1C & 2C Traffic	1	9619.47	120.0	26.61	2500 MHz LTE 1C & 2C Traffic	1000	2.66%
T-Mobile 2500 MHz LTE 1C & 2C Broadcast	1	717.84	120.0	1.99	2500 MHz LTE 1C & 2C Broadcast	1000	0.20%
T-Mobile 2500 MHz NR Traffic	1	19238.94	120.0	53.22	2500 MHz NR Traffic	1000	5.32%
T-Mobile 2500 MHz NR Broadcast	1	1435.69	120.0	3.97	2500 MHz NR Broadcast	1000	0.40%
T-Mobile 1900 MHz GSM:	4	1076.77	120.0	11.91	1900 MHz GSM:	1000	1.19%
T-Mobile 1900 MHz UMTS	2	1076.77	120.0	5.96	1900 MHz UMTS	1000	0.60%
T-Mobile 1900 MHz LTE	2	2153.53	120.0	11.91	1900 MHz LTE	1000	1.19%
T-Mobile 2100 MHz LTE	2	2416.30	120.0	13.37	2100 MHz LTE	1000	1.34%
T-Mobile 600 MHz LTE	2	591.73	120.0	3.27	600 MHz LTE	400	0.82%
T-Mobile 600 MHz NR	1	1577.94	120.0	4.37	600 MHz NR	400	1.09%
T-Mobile 700 MHz LTE	2	695.22	120.0	3.85	700 MHz LTE	467	0.82%
						Total:	**15.63%**

• 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:	15.63%
Sector B:	15.63%
Sector C:	15.63%
T-Mobile Maximum MPE % (Sector A):	15.63%
Site Total:	24.17%
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **24.17%** 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.