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and New York

January 3, 2024

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Request of Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of an Existing State Police Tower at 15 Old Hartford Road, Colchester, Connecticut**

Dear Attorney Bachman:

Pursuant to Connecticut General Statutes ("C.G.S.") §16-50aa, as amended, Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby requests an order from the Siting Council ("Council") to approve the shared use of an existing telecommunications tower located on a 2.8-acre parcel at 15 Old Hartford Road in Colchester (the "Property"). The Property is owned by the Connecticut State Police. The tower is owned by the State of Connecticut ("the State"). Cellco identifies this site as its "Colchester 4 Facility". The existing 100-foot lattice tower was approved by the Siting Council ("Council") in July of 1989. A copy of the Council's approval is included in Attachment 1.

Cellco requests that the Council find that the proposed shared use of the existing tower satisfies the criteria of C.G.S § 16-50aa and issue an order approving this request. A copy of this filing is being sent to Colchester First Selectman, Andreas Bisbikos and Planning Director, Demian Sorrentino.

Background

Cellco is licensed by the Federal Communications Commission ("FCC") to provide wireless services throughout the State of Connecticut. Cellco and the State have agreed to the proposed shared use of the Old Hartford Road tower pursuant to mutually acceptable terms and

conditions. Likewise, the State and Cellco have agreed to the proposed installation of equipment on the ground near the base of the tower. The State has authorized Cellco to apply for all necessary permits and approvals that may be required to share the existing tower. (*See* Attachment 2).

Cellco proposes to install nine (9) antennas and six (6) remote radio heads ("RRHs") on an antenna platform at a centerline height of 85 feet above ground level ("AGL"). Cellco will also install one equipment cabinet on a concrete pad on the ground near the base of the tower. Included in Attachment 3 are Cellco's project plans showing the location of Cellco's proposed site improvements. Attachment 4 contains specifications for Cellco's proposed antennas and RRHs.

C.G.S. § 16-50aa(c)(1) provides that, upon written request for approval of a proposed shared use, "if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use." Cellco respectfully submits that the shared use of the tower satisfies these criteria.

A. Technical Feasibility. The existing tower is structurally capable of supporting Cellco's antennas, RRHs, antenna platform and related equipment. The proposed shared use of this tower is, therefore, technically feasible. A Structural Analysis ("SA") dated September 20, 2023 prepared by Centek Engineering, confirms that the tower can support Cellco's proposed antennas and related equipment. Likewise, an Antenna Mount Analysis ("MA") dated September 20, 2023 also confirms that the proposed antenna, RRHs and mounting system can support Cellco's proposed shared use. Copies of the SA and MA are included in Attachment 5.

B. Legal Feasibility. Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the shared use of an existing tower, such as the existing Old Hartford Road tower. This authority complements the Council's prior-existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. In addition, § 16-50x(a) directs the Council to "give such consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing tower facilities. Under the statutory authority vested in the Council, an order by the Council approving the requested shared use would permit the Applicant to obtain a building permit for the proposed installations.

C. Environmental Feasibility. The proposed shared use of the existing tower would have minimal environmental effects, for the following reasons:

1. The proposed installation of nine (9) antennas and six (6) RRHs on an antenna platform at a height of 85 feet AGL on the existing 100-foot tower would have an insignificant incremental visual impact on the area around the Property. As mentioned above, all of Cellco's equipment will be located within a fenced facility compound near the base of the tower. Cellco's shared use of the existing tower would, therefore, not cause any significant change or alteration in the physical or environmental characteristics of the existing facility.

2. Noise associated with Cellco's proposed facility will comply with State and local noise standards. There will be no noise associated with Cellco's proposed facility.

3. Operation of Cellco's antennas at this site would not exceed the RF emissions standards adopted by the Federal Communications Commission ("FCC"). Included in Attachment 6 of this filing is a Calculated Radio Frequency Emissions Report that demonstrates that the modified facility will operate well within the FCC's safety standards.

4. Under ordinary operating conditions, the proposed installation would not require the use of any water or sanitary facilities and would not generate air emissions or discharges to water bodies or sanitary facilities. After construction is complete the proposed installations would not generate any increased traffic to the facility other than periodic maintenance visits to the cell site.

The proposed shared use of the existing tower would, therefore, have a minimal environmental effect, and is environmentally feasible.

D. Economic Feasibility. As previously mentioned, Cellco has entered into an agreement with the State for the shared use of the existing tower subject to mutually agreeable terms. The proposed tower sharing is, therefore, economically feasible.

E. Public Safety Concerns. As discussed above, the tower and antenna mounts are structurally capable of supporting Cellco's antennas, antenna mounting frame, RRHs and all related equipment. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing Old Hartford Road tower. In fact, the provision of new and improved wireless service through Cellco's shared use of the existing tower would enhance the safety and welfare of area residents and members of the general public traveling through the Town of

Colchester.

A Certificate of Mailing verifying that a copy of this filing was sent to the municipal officials, the Property owner, and the tower owner is included in Attachment 7.

Conclusion

For the reasons discussed above, the proposed shared use of the existing tower at the Property satisfies the criteria stated in C.G.S. § 16-50aa and advances the General Assembly's and the Council's goal of preventing the unnecessary proliferation of towers in Connecticut. The Applicant, therefore, respectfully requests that the Council issue an order approving the proposed shared use.

Thank you for your consideration of this matter.

Very truly yours,

Kenneth C. Baldwin

Enclosures
Copy to:
Andreas Bisbikos, First Selectman
Demian Sorrentino, Planning Director
Connecticut State Police, Property Owner
State of Connecticut Department of Emergency Services and Public Protection, Tower Owner
Tim Parks, Verizon Wireless

ATTACHMENT 1

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

136 Main Street, Suite 401
New Britain, Connecticut 06051
Phone : 827-7682

FILE COPY

July 11, 1989

Captain Ronald P. Milkulka
Deputy Commanding Officer
Police Support Services
Department of Public Safety
Division of State Police
294 Colony Street
Meriden, CT 06450-2098

RE: State Police notice pursuant to Regulations of State Agencies 16-50j-73 of intent to erect an exempt telecommunications tower and associated equipment at Troop K, 15 Old Hartford Road, Colchester, Connecticut.

Dear Captain Milkula:

At a meeting on July 6, 1989, the Connecticut Siting Council acknowledged your notice of intent to erect an exempt telecommunications tower and associated equipment at Troop K, 15 Old Hartford Road, Colchester, pursuant to Section 16-50j-73 of the Regulations of State Agencies (RSA).

The proposed modification is to be implemented as specified in your notice dated May 11, 1989. As proposed, the modification is in compliance with the exception criteria specified in RSA 16-50j-72 for changes to an existing facility site that do not increase the tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by 6 decibels, and add radio frequency sending or receiving capability which increases the total radio frequency electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to Section 22a-162 of the Connecticut General Statutes.

The Council is pleased to note that the shared use of an existing tower meets the Council's long-term goal and the public interest to avoid proliferation of additional tower structures.

Please notify the Council upon completion of construction.

Enclosed for your information is a copy of the staff report on this project.

Very truly yours,

Gloria Dibble Pond/R

Gloria Dibble Pond
Chairperson

GDP/JMR/go

Enclosure

cc: Peter Seaha
Robert F. Vacchelli

3253E

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

136 Main Street, Suite 401
New Britain, Connecticut 06051
Phone: 827-7682

Staff Report
State Police - Exempt Modification Proposal
for Troop K, Colchester, Connecticut
June 5, 1989
Revised July 6, 1989

Pursuant to section 16-50j-73 of the Regulations of State Agencies, the Connecticut State Police have provided notice of its intent to erect an exempt telecommunications tower and associated equipment at Trook K, 15 Old Hartford Road, Colchester, Connecticut.

The State Police propose to replace an existing 100-foot lattice tower owned and operated by the Colchester Emergency Communications, Inc. (CEC) with a stronger 100-foot lattice tower to be owned and operated by the State Police, relocate equipment from a room in the Troop K barracks to a new 15-foot by 25-foot equipment shelter, fence the site, and remove the old tower.

The existing tower presently holds six whip antennas. The proposed tower would hold ten whip antennas and one four foot diameter dish antenna.

The project is part of a State Police effort to upgrade its state-wide system. The tower would be shared by the State Police, CEC, and the State Office of Emergency Management.

The State Police contend that because the replacement tower 1) would be no higher than the existing tower; 2) would not extend beyond the boundaries of the existing site; 3) would not increase noise levels at the existing facility by six decibels or more; and 4) would not increase the total radio frequency electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the Department of Environmental Protection, the project is in compliance with exemption criteria for changes to an existing facility pursuant to RSA 16-50j-72(b).

At a Council meeting held June 5, 1989, the Council tabled this item pending the submittal of information regarding the sharing of the State Police tower on Windham Avenue in Colchester.

On June 9, 1989, the State Police responded by explaining the different uses of the two towers and how each tower would fit into the statewide communications network to be used by the State Police.

The 100-foot Troop K tower will primarily be used as a dispatch center for the State Police, Office of Emergency Management (OEM), Colchester Emergency Communications (CEC) and as part of a communications network for the Nuclear Emergency Communications System (NEC).

From the Troop K Dispatch Center, the State Police and the OEM would, via microwave, use the 320-foot Windham Avenue tower for their main transmission. The CEC would use, via microwave, a tower on Buckley Hill in Colchester for their main transmission.

The State Police, OEM, and CEC would, however, maintain back-up antennas at the Troop K facility.

JMR/ktq

3179E

ATTACHMENT 2

STATE OF CONNECTICUT

DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION
Division of Statewide Emergency Telecommunications

Letter of Authorization

June 27, 2023

Andrew Candiello
Principal Engineer-RE/Regulatory
Cellco Partnership d/b/a Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Re: Development Application Letter of Authorization for Site #51 (Troop K): 15 Old Hartford Road, Colchester, CT 06415

Dear Mr. Candiello,

The State of Connecticut Department of Emergency Services and Public Protection ("DESPP") owns the tower facility at 15 Old Hartford Road, Colchester, CT 06415 (the "Property"). DESPP hereby authorizes Cellco Partnership d/b/a Verizon Wireless ("Verizon") and its agent, Airosmith Development, to file applications for the sole purpose of gaining any zoning approval and building permit(s) to install new telecommunications equipment ("Equipment") on an existing Self-Supported tower on the Property. Verizon and its afore mentioned agent shall not have authority to agree to any stipulations associated with their business before the Building Department that results in a duty on the part of DESPP that DESPP has not expressly permitted in writing.

Verizon shall not be permitted to install the Equipment on the property until Verizon provides a copy of its building permit from the Town and until Verizon complies with any and all requirements set forth in Verizon's lease with DESPP.

Please contact me at 860-508-9684 or mark.gorka@ct.gov should you have any questions or concerns.

Sincerely,

Mark Gorka
Planning Specialist
Connecticut DESPP / CTS Unit

ATTACHMENT 3

verizon

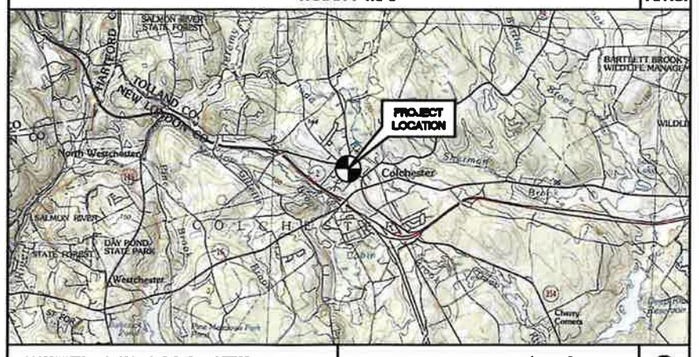
SITE NAME: COLCHESTER 4 CT
SITE ID: 617249387
15 OLD HARTFORD RD
COLCHESTER, CT 06415

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2021 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2022 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "H" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2022 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 VERIZON WIRELESS 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 REFERENCED FROM GOOGLE EARTH PRO ON-LINE SOFTWARE.

SITE COORDINATES: LATITUDE 41°-34'-44.38"
LONGITUDE 72°-20'-19.28"
GROUND ELEVATION: 423.2'± A.M.S.L.

NORTH

PROJECT SUMMARY

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

1. INSTALL (6) PROPOSED COMMSCOPE: NHH-65B-R2B ANTENNAS
2. INSTALL (3) PROPOSED SAMSUNG: MT6413-77A ANTENNA WITH INTEGRATED RRU
3. INSTALL (3) PROPOSED SAMSUNG: B2/B66A RRH ORAN (RF4439d-25A) RADIOS
4. INSTALL (3) PROPOSED SAMSUNG: RF4461d-13A RADIOS
5. INSTALL (1) PROPOSED RAYCAP 12-OVP BOX
6. INSTALL (2) PROPOSED 6x12 HYBRID CABLES
7. INSTALL (3) PROPOSED SITEPRO: VFA12-HD SECTOR ANTENNA FRAMES
8. INSTALL NEW CONCRET EQUIPMENT PAD WITH CUSTOM STEEL ICE-CANOPY
9. INSTALL NEW TELCO BOX
10. INSTALL NEW 200A POWER TRANSFER LOAD CENTER
11. INSTALL NEW FIBER SERVICE

PROJECT SUMMARY (STRUCTURAL)

FOR REQUIRED STRUCTURAL MODIFICATIONS, SEE SHEET(S) S-1 FOR ADDITIONAL DETAILS. FOR REQUIRED SPECIAL INSPECTIONS,

1. CUSTOM ICE-CANOPY TO BE INSTALLED AND ATTACHED TO EXISTING ICE-BRIDGE SYSTEM..

PROJECT INFORMATION

SITE NAME:	COLCHESTER 4 CT
SITE ID:	617249387
SITE ADDRESS:	15 OLD HARTFORD RD COLCHESTER, CT 06415
APPLICANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 20 ALEXANDER DRIVE WALLINGFORD, CT 06492
CONTACT PERSON:	MICHAEL HUMPHREYS (CONSTRUCTION MANAGER) VERIZON WIRELESS (860) 560-8410
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° 34' 44.38" N LONGITUDE: 72° 20' 19.28" W GROUND ELEVATION: ±423.2' AMSL COORDINATES AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH PRO ON-LINE SOFTWARE.

SHEET INDEX

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	09/20/23	BSP	TJR	CONSTRUCTION DRAWINGS - REVISED PER NEWLY ISSUED RFDS
0	07/13/23	BSP	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
A	05/05/23	BSP	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

verizon

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

VERIZON WIRELESS

COLCHESTER 4 CT
15 OLD HARTFORD RD.
COLCHESTER, CT 06415

DATE: 05/05/23
SCALE: AS NOTED
JOB NO. 22017.14

TITLE SHEET

T-1

Sheet No. 1 of 14

NOTES AND SPECIFICATIONS:

DESIGN BASIS

GOVERNING CODE: 2021 INTERNATIONAL BUILDING (IBC) AS MODIFIED BY THE 2022 CONNECTICUT STATE BUILDING CODE.

1. DESIGN CRITERIA:

- RISK CATEGORY II (BASED ON IBC TABLE 1604.5)
- ULTIMATE DESIGN SPEED: 125 MPH (Vasd)
  (EXPOSURE B/ IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-16).

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 2021 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2022 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "H" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2022 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
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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 VERIZON WIRELESS 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.

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

ANTENNA/APPURTENANCE SCHEDULE

SECTOR	EXISTING/PROPOSED	ANTENNA	SIZE (INCHES) (L x W x D)	ANTENNA ℄ HEIGHT	AZIMUTH	(E/P) RRU (QTY)	(E/P) OVP (QTY)	(QTY) PROPOSED HYBRID/COAX
A1	PROPOSED	COMMSCOPE (NHH-65B-R2B)	71.9 x 11.8 x 7.0	85'	300°	(P) SAMSUNG: B2/B66A RRH ORAN (RF4439d-25A) (1)	(P) 12-OVP BOX (1)	(2) 6x12 HYBRID CABLE
A2	PROPOSED	SAMSUNG (MT6413-77A)	28.9 x 15.75 x 5.5	85'	300°	(P) SAMSUNG: RF4461d-13A (1)		
B1	PROPOSED	COMMSCOPE (NHH-65B-R2B)	71.9 x 11.8 x 7.0	85'	90°	(P) SAMSUNG: B2/B66A RRH ORAN (RF4439d-25A) (1)		
B2	PROPOSED	SAMSUNG (MT6413-77A)	28.9 x 15.75 x 5.5	85'	90°	(P) SAMSUNG: RF4461d-13A (1)		
C1	PROPOSED	COMMSCOPE (NHH-65B-R2B)	71.9 x 11.8 x 7.0	85'	185°	(P) SAMSUNG: B2/B66A RRH ORAN (RF4439d-25A) (1)		
C2	PROPOSED	SAMSUNG (MT6413-77A)	28.9 x 15.75 x 5.5	85'	185°	(P) SAMSUNG: RF4461d-13A (1)		

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
1	06/30/23	BSP	TJR	CONSTRUCTION DRAWINGS - REVISED PER NEWLY ISSUED RFDS
0	07/13/23	BSP	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
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SPECIFICATIONS, NOTES, & ANT. SCHEDULE

N-1

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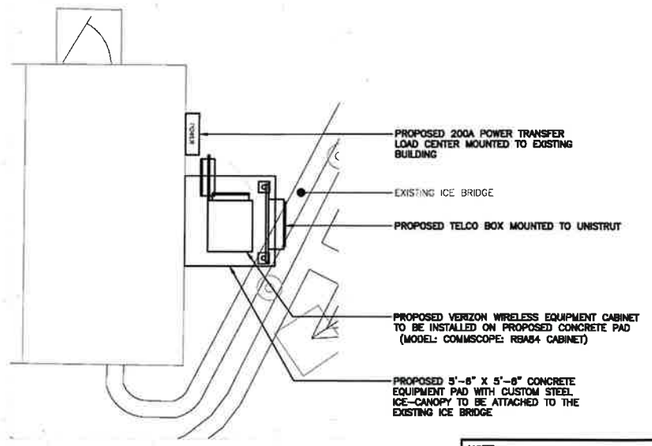


1 / C-1 **PROPOSED EQUIPMENT PLAN** — SCALE: 1/4" = 1'-0" — NORTH

NOTE:

CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION OF STEEL ICE-CANOPY. CONFIGURATION MAY VARY DEPENDING ON THE EXACT LOCATION OF THE INSTALLED CONCRETE PAD IN RELATION TO THE EXISTING ICE-BRIDGE SYSTEM.

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..

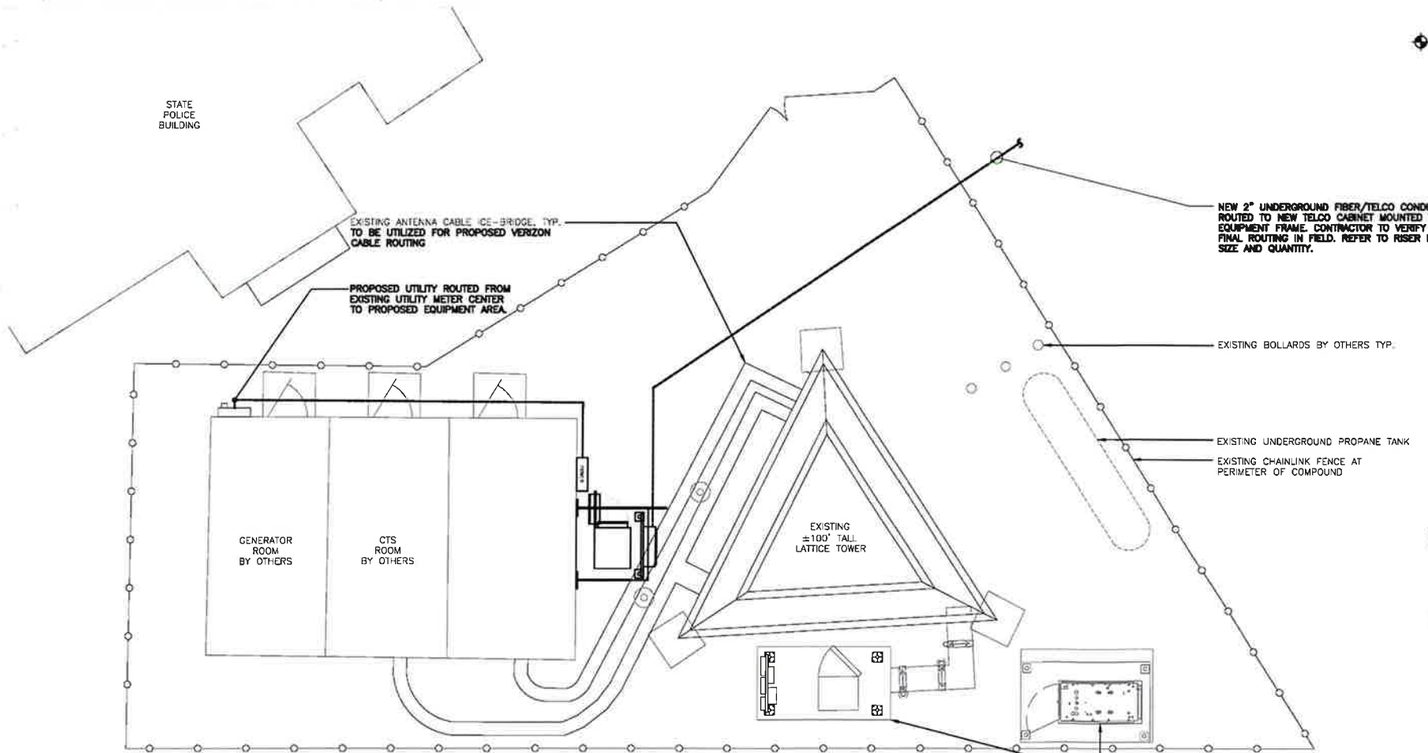
REFER TO THE ANTENNA MOUNT ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 22017.14) DATED 09/20/23 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TOWER AND TOWER FOUNDATION

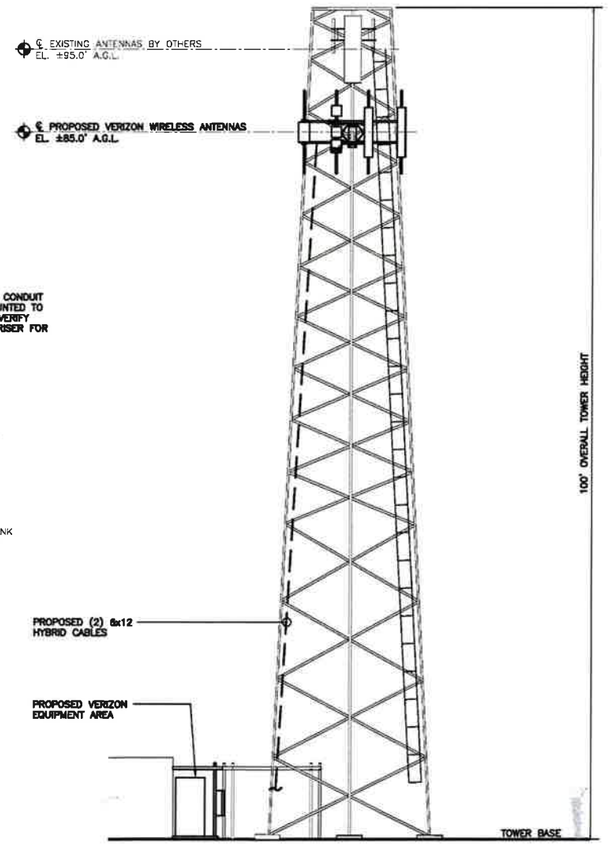
A STRUCTURAL ANALYSIS OF THE TOWER AND TOWER FOUNDATION WAS PERFORMED FOR THE PROPOSED EQUIPMENT INSTALLATION AND THEY WERE FOUND TO BE STRUCTURALLY SUFFICIENT TO ACCOMMODATE THE PROPOSED LOADING.

REFER TO THE STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING (PROJECT # 22017.14) DATED 09/20/23 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.



2 / C-1 **PROPOSED SITE/COMPOUND PLAN** — SCALE: 1" = 5'-0" — NORTH



3 / C-1 **PROPOSED TOWER ELEVATION** — SCALE: 1/8" = 1'-0"

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1	06/20/23	BSP	TJR	CONSTRUCTION DRAWINGS – REVISED PER NEWLY ISSUED RFDS
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SITE PLAN, EQUIPMENT PLAN, AND ELEVATION

C-1
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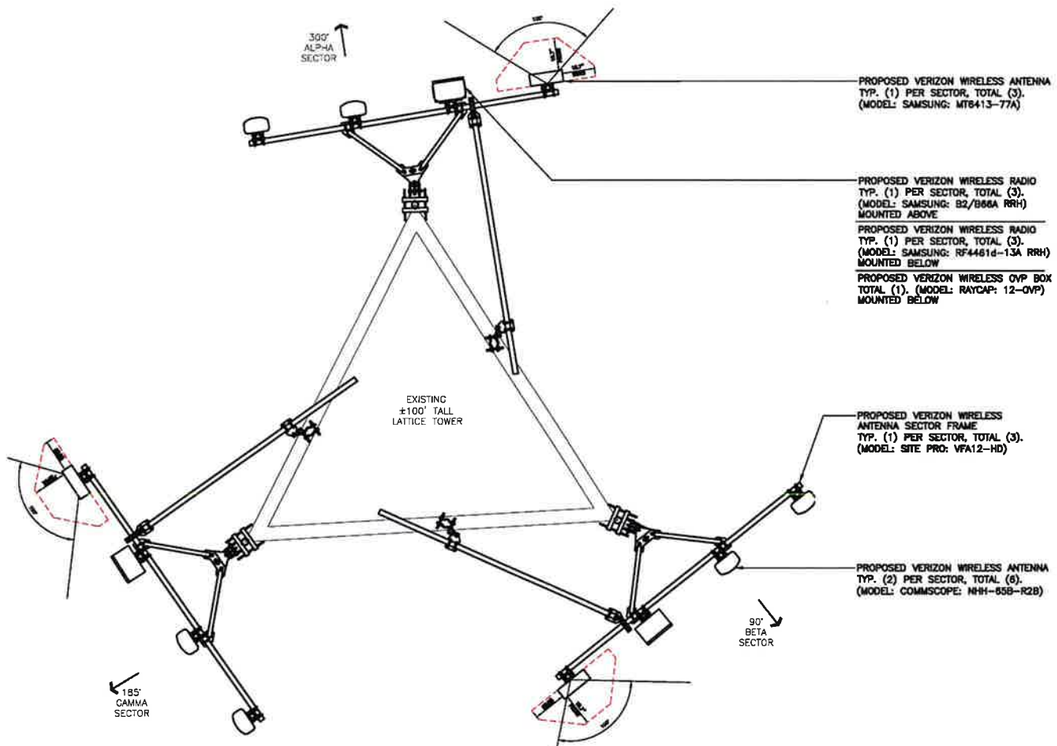
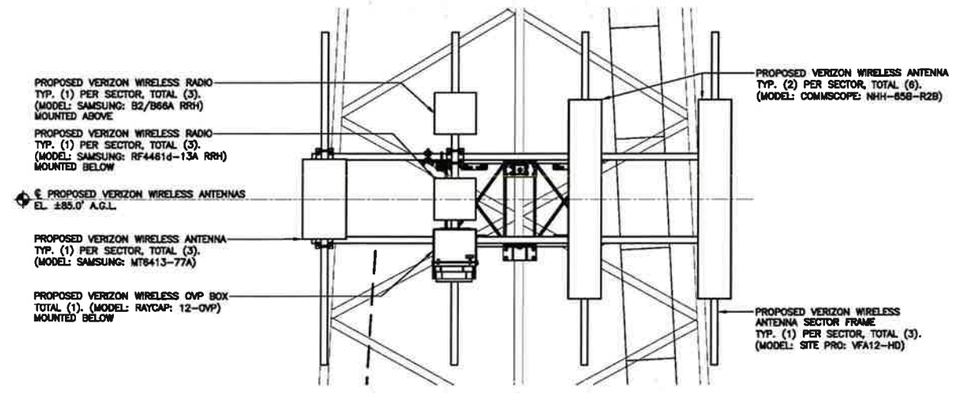


1 C-2 **PROPOSED ANTENNA CONFIGURATION PLAN**
SCALE: 3/8" = 1'-0"



2 C-2 **PROPOSED ANTENNA CONFIGURATION ELEVATION**
SCALE: 1/2" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	09/20/23	BSP	TJR	CONSTRUCTION DRAWINGS - REVISED PER NEWLY ISSUED RFDS
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ANTENNA CONFIGURATION PLAN AND ELEVATION

C-2

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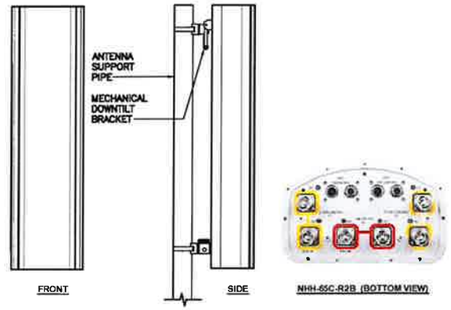
ANTENNA FRONT

SECTOR ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: MT8413-77A	28.9"H x 15.75"W x 5.51"D	57.3 LBS.
NOTES: 1. THIS ANTENNA HAS ITS OWN BUILT-IN RRH.		

1 C-3 **PROPOSED ANTENNA DETAIL**
SCALE: NOT TO SCALE



6-PORT SECTOR ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT (WITH MOUNTING KIT)
MAKE: COMMSCOPE MODEL: NHH-65B-R2B	72.0"L x 11.9"W x 7.0"D	43.7 LBS.

2 C-3 **ANTENNA DETAIL**
NOT TO SCALE

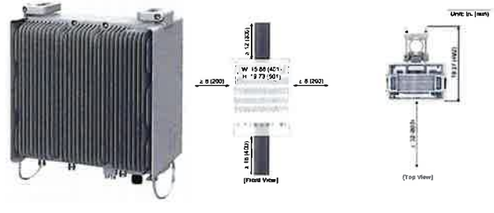
OVP BOX		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: RAYCAP MODEL: RVZDC-6627-PF-48	19.18"H x 15.73"W x 10.25"D	28.9 LBS.
NOTES: 1. CONTRACTOR TO CONFIRM OVP BOX MAKE/MODEL AND QUANTITY WITH VERIZON WIRELESS CONSTRUCTION MANAGER PRIOR TO ORDERING. 2. UNIT PROVIDES DC SURGE PROTECTION FOR 12 RRH UNITS.		

3 C-3 **PROPOSED OVER-VOLTAGE PROTECTION BOX**
SCALE: NOT TO SCALE

RRH - ISOMETRIC RRH CLEARANCES

DUAL BAND RRU (REMOTE RADIO UNIT)			
EQUIPMENT	BANDS	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: RF4439d-25A	B2: PCS (1900 MHz) B66: AWS (2100 MHz)	15.0"H x 15.0"W x 10.0"D	74.7 LBS.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH VERIZON WIRELESS CONSTRUCTION MANAGER PRIOR TO ORDERING.			

4 C-3 **DUAL-BAND AWS/PCS MACRO RADIO UNIT DETAIL**
SCALE: NOT TO SCALE



RRH - ISOMETRIC RRH CLEARANCES

DUAL BAND RRU (REMOTE RADIO UNIT)			
EQUIPMENT	BANDS	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: RF4461d-13A	B5: 850 MHz B13: 700 MHz	15.0"H x 15.0"W x 10.23"D	79.1 LBS.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH VERIZON WIRELESS CONSTRUCTION MANAGER PRIOR TO ORDERING.			

5 C-3 **DUAL-BAND 700/850 MHZ MACRO RADIO UNIT DETAIL**
SCALE: NOT TO SCALE

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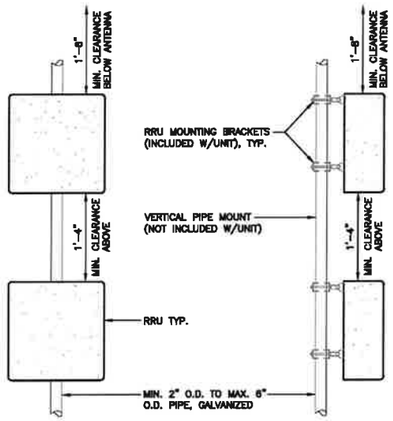
TYPICAL EQUIPMENT DETAILS

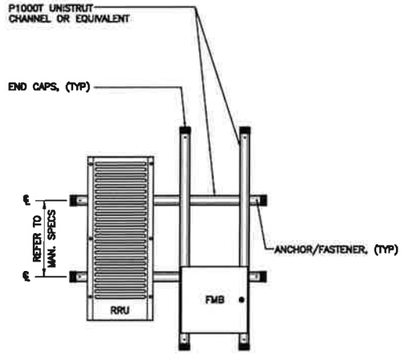
C-3



FRONT ELEVATION SIDE ELEVATION

NOTES: (PIPE MOUNTING)

1. VERIZON 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.

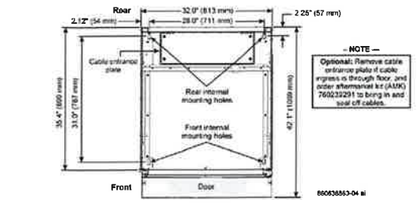


FRONT ELEVATION

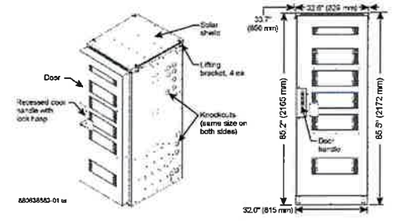
NOTES: (UNISTRUT MOUNTING)

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.

1 C-4 **TYPICAL RRU MOUNTING DETAILS**
SCALE: NOT TO SCALE



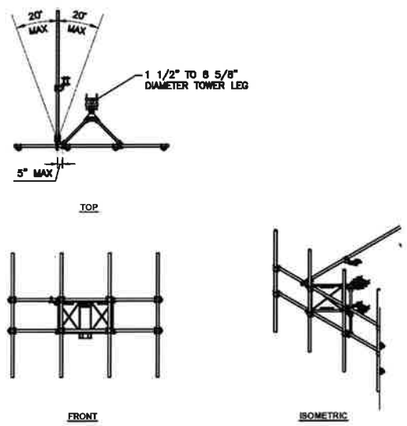
BOTTOM



ISOMETRIC FRONT

EQUIPMENT CABINET		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: COMMSCOPE MODEL: RBA84 CABINET	85.2"H x 32.8"W x 42.1"D	±1955 LBS

2 C-4 **COMMSCOPE RBA84 CABINET DETAIL**
SCALE: NOT TO SCALE



SITE PRO: VFA12-HD

3 C-4 **SECTOR FRAME MOUNT DETAIL**
SCALE: NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	09/20/23	BSP	TJR	CONSTRUCTION DRAWINGS – REVISED PER NEWLY ISSUED RFDS
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TYPICAL EQUIPMENT DETAILS

C-4

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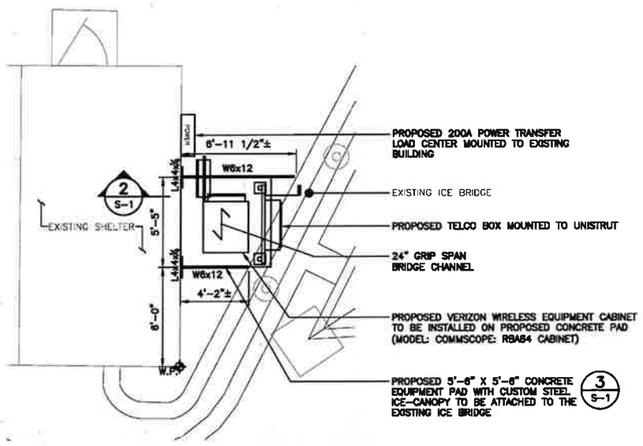


1. ⊕ = W.P. = WORKING POINT

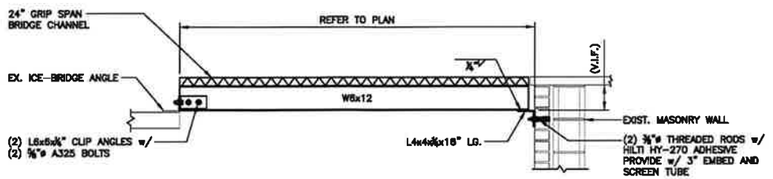
1 S-1 PARTIAL PLAN VIEW AT NEW CABINET

SCALE: 1/4" = 1'-0"

NORTH

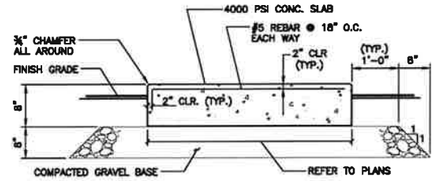
NOTE:

CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION OF STEEL ICE-CANOPY. CONFIGURATION MAY VARY DEPENDING ON THE EXACT LOCATION OF THE INSTALLED CONCRETE PAD IN RELATION TO THE EXISTING ICE-BRIDGE SYSTEM.



2 S-1 SECTION AT NEW CUSTOM ICE CANOPY

SCALE: 3/4" = 1'-0"



3 S-1 TYPICAL CONCRETE PAD DETAIL

SCALE: NOT TO SCALE

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STRUCTURAL DETAILS

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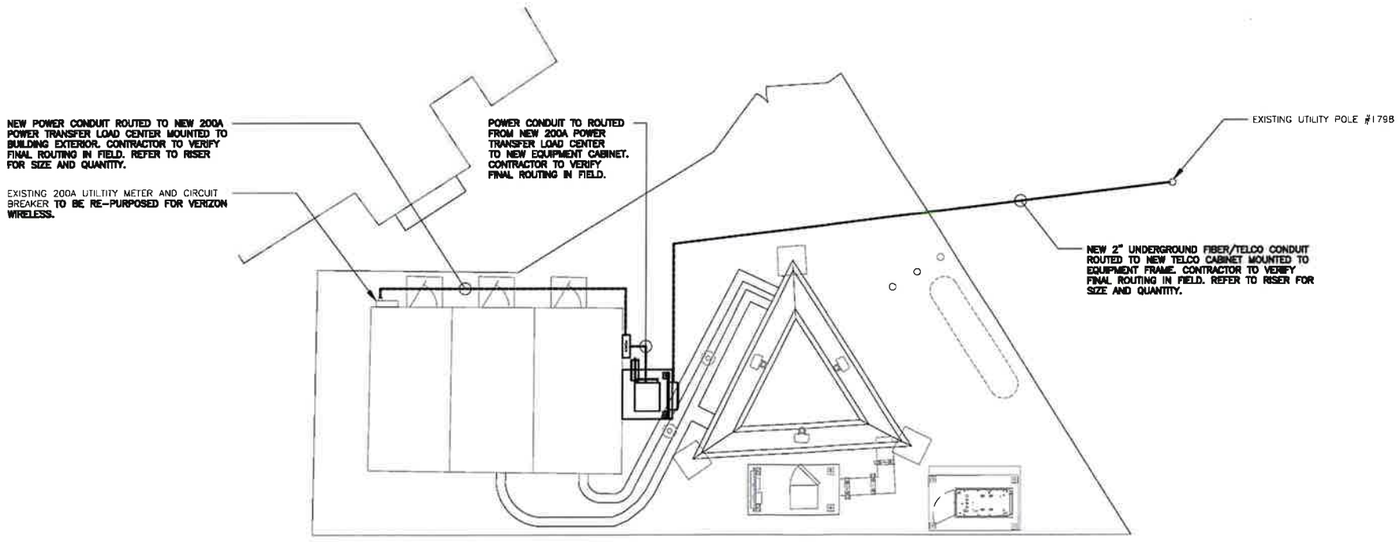

1 E-1 **ELECTRICAL CONDUIT ROUTING PLAN**
SCALE: 3/8" = 1'

NORTH

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ELECTRICAL CONDUIT ROUTING PLAN

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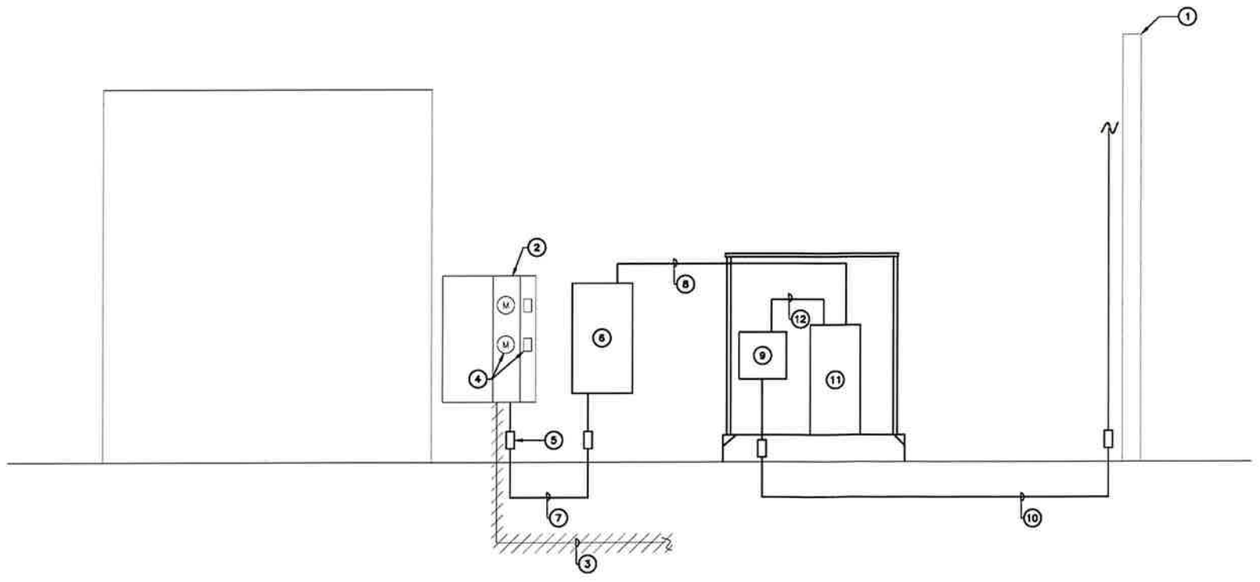
RISER DIAGRAM NOTES

1. EXISTING UTILITY POLE #1798 TO BE UTILIZED.
2. EXISTING 2-GANG METER CENTER TO REMAIN.
3. EXISTING CONDUITS AND CONDUCTORS TO BE REMOVED.
4. EXISTING 200A RATED UTILITY METER AND 200A CIRCUIT BREAKER TO BE RE-PURPOSED FOR VERIZON WIRELESS.
5. EXPANSION COUPLINGS TYP.
6. 200A, 120/240V, THREE PHASE, 30 POSITION, 2 SOURCE, POWER TRANSFER LOAD CENTER WITH DOUBLE TVSS, COPPER BUS, DOOR-IN-DOOR HINGE FRAME, BOLT-ON BREAKERS.
7. (3) 3/0 AWG, (1) #6 AWG GROUND, 2" CONDUIT
8. POWER CONDUITS AND CONDUCTORS FOR EQUIPMENT CABINETS AS REQUIRED BY MANUFACTURER FOR PROPER OPERATION.
9. 3' X 3' X 1' NEMA-3R HOFFMAN BOX AT EQUIPMENT FOR TELCO CONNECTIONS.
10. (1) 2" CONDUIT WITH PULL ROPES FOR TELEPHONE COMPANY CONDUCTORS. CONDUCTORS PROVIDED BY TELEPHONE COMPANY. PROVIDE ALL COUPLINGS, ADAPTERS, SWEEPS, AND ASSOCIATED HARDWARE. MATERIAL SHALL BE PER TELEPHONE COMPANY SPECIFICATIONS
11. VERIZON WIRELESS EQUIPMENT CABINET. INSTALL PER MANUFACTURER REQUIREMENTS
12. CONDUITS AND CONDUCTORS FOR TELCO CONNECTION TO EQUIPMENT CABINETS AS REQUIRED BY MANUFACTURER AND CONSTRUCTION MANAGER FOR PROPER OPERATION OF EQUIPMENT



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

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ELECTRICAL RISER DIAGRAM

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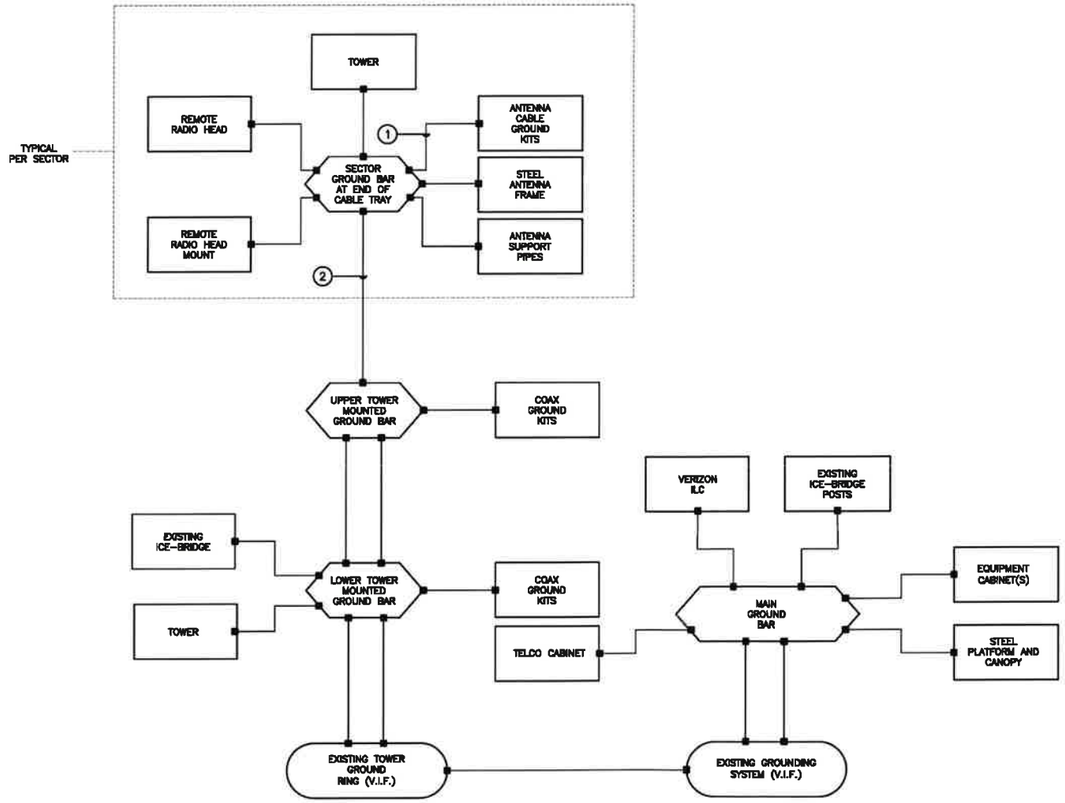

1 / E-3 **ELECTRICAL SCHEMATIC DIAGRAM**
SCALE: NOT TO SCALE

GROUNDING SCHEMATIC NOTES

1. #2/0 GREEN INSULATED
2. #6 AWG
3. REFER TO RISER DIAGRAM FOR SPECIFICATIONS

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 AND ICE BRIDGE 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 GROUNDING PLAN FOR LOCATION OF GROUNDING DEVICES.
7. REFER TO ALL ELECTRICAL AND GROUNDING DETAILS.
8. COORDINATE ALL ROOF MOUNTED EQUIPMENT WITH OWNER.
9. ALL ROOF MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
10. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.

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ELECTRICAL SCHEMATIC DIAGRAM

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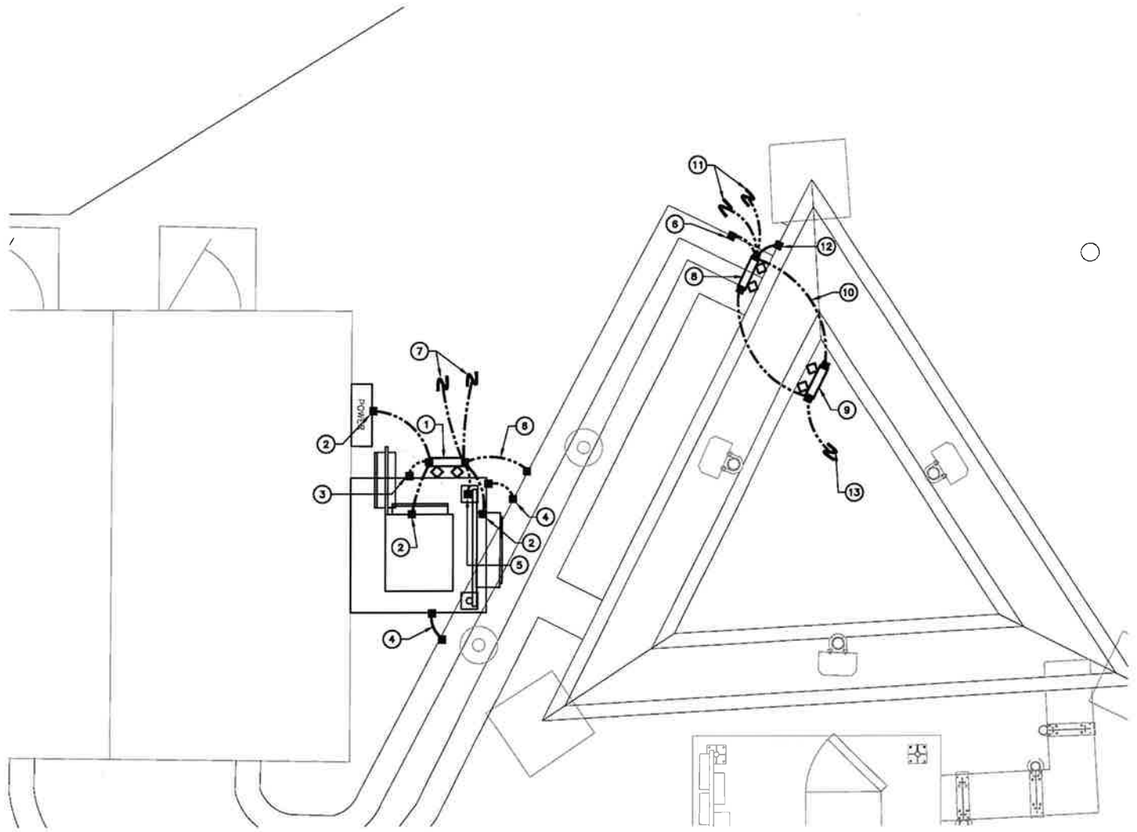
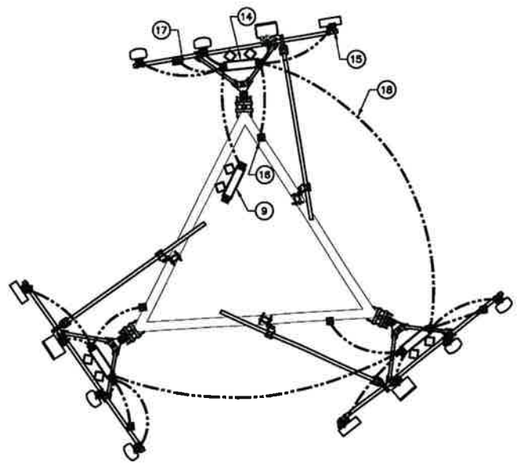


1 E-4 COMPOUND GROUNDING PLAN
SCALE: NOT TO SCALE

GROUNDING PLAN NOTES:

1. MAIN GROUND BAR TYP.
2. BOND EQUIPMENT CABINETS TO MAIN GROUND BAR, TYP.
3. BOND STEEL PLATFORM TO MAIN GROUND BAR TYP.
4. BOND NEW STEEL EQUIPMENT CANOPY TO EXISTING ICE-BRIDGE STEEL.
5. BOND GROUND BAR TO STEEL CANOPY POST.
6. BOND GROUND BAR TO EXISTING ICE-BRIDGE.
7. BOND GROUND BAR TO EXISTING GROUNDING SYSTEM TYP. 2 LEADS.
8. LOWER TOWER MOUNTED GROUND BAR.
9. UPPER TOWER MOUNTED GROUND BAR.
10. BOND LOWER TOWER MOUNTED GROUND BAR TO UPPER TOWER MOUNTED GROUND BAR TYP. 2 LEADS
11. BOND LOWER TOWER MOUNTED GROUND BAR TO TOWER GORUND RING. TYP. 2 LEADS.
12. BOND LOWER TOWER MOUNTED GROUND BAR TO TOWER STEEL.
13. CONNECT UPPER TOWER MOUNTED GROUND BAR TO SECTOR GROUND BAR.
14. SECTOR GROUND BAR, TYP.
15. BOND ANTENNA MOUNTING PIPES TO SECTOR GROUND BAR. TYP.
16. BOND SECTOR GROUND BAR TO TOWER STEEL.
17. BOND SECTOR GROUND BAR TO ANTENNA STEEL FRAME
18. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW



2 E-4 ANTENNA SECTOR GROUNDING PLAN TYP.
SCALE: NOT TO SCALE

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ELECTRICAL GROUNDING PLANS

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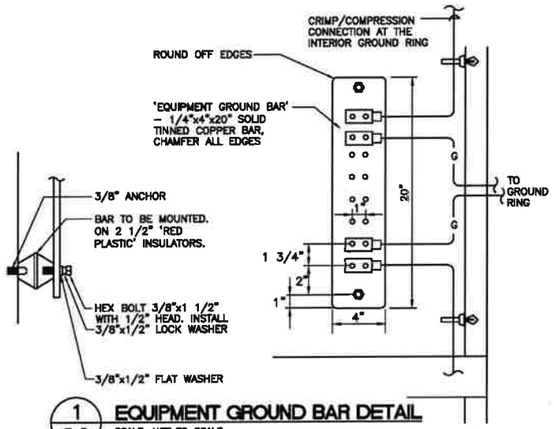
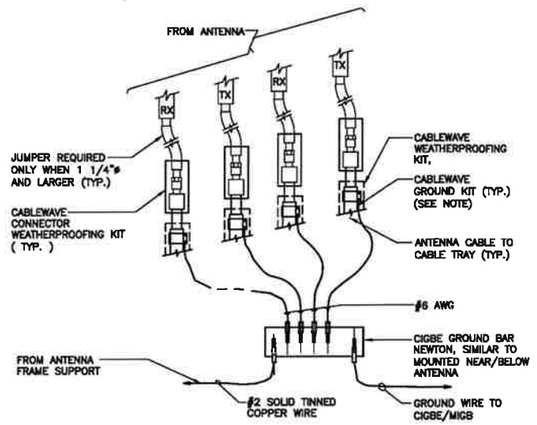
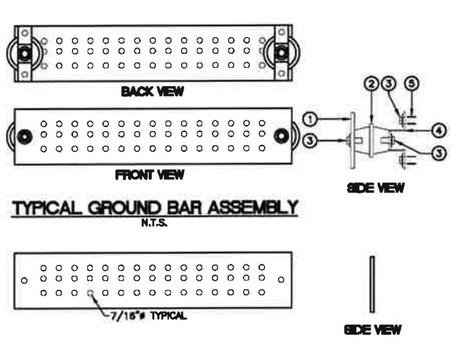


1 E-5 **EQUIPMENT GROUND BAR DETAIL**
SCALE: NOT TO SCALE



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

2 E-5 **CONNECTION OF GROUND WIRES TO GROUND BAR**
SCALE: NOT TO SCALE



TYPICAL GROUND BAR ASSEMBLY
N.T.S.

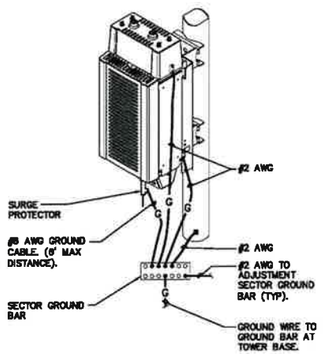
TYPICAL GROUND BAR - DIMENSIONS
N.T.S.

BRACKET FOR GROUND BAR-DIMENSIONS
N.T.S.

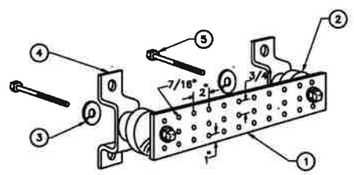
NOTES
1. HIGH CONDUCTIVITY TINNED COPPER BAR 1'-8"Lx4"Wx1/4"D.
2. RED COLORED STANDOFF INSULATOR PLASTIC #1872-1A.
3. STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS, SPLIT LOCKWASHER AND FLAT WASHER.
4. 1"Wx1/8"T STAINLESS STEEL TYPE 304 BRACKET.
5. STAINLESS STEEL TYPE 304 HARDWARE – 3/8"ø EXPANSION BOLT FOR CONCRETE.

3 E-5 **MASTER/EQUIPMENT GROUND BAR DETAILS**
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.

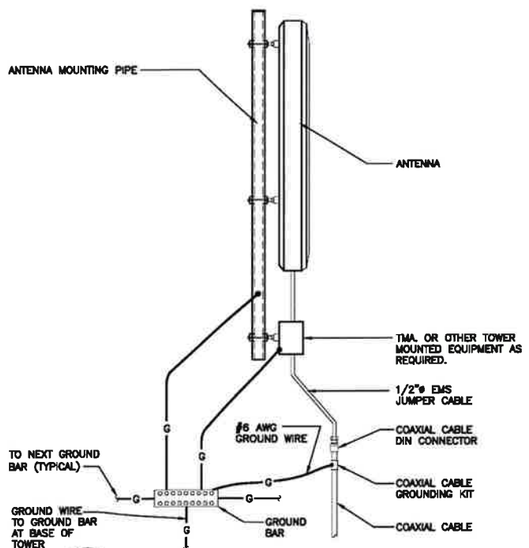


4 E-5 **RRH POLE MOUNT GROUNDING**
SCALE: NOT TO SCALE

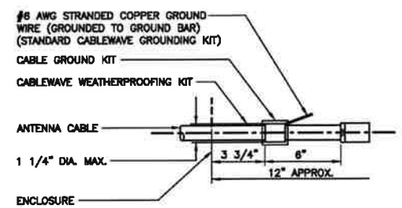


NOTES
1. TINNED COPPER GROUND BAR, 1/4" x 4" x 20", NEWTON INSTRUMENT CO. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
2. INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4.
3. 5/8" LOCK WASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8.
4. WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT NO. A-6058.
5. 5/8-11 x 1" STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS.

5 E-5 **GROUND BAR DETAIL**
SCALE: NOT TO SCALE



6 E-5 **TYPICAL ANTENNA GROUNDING 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.

7 E-5 **ANTENNA CABLE GROUNDING DETAIL**
SCALE: NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

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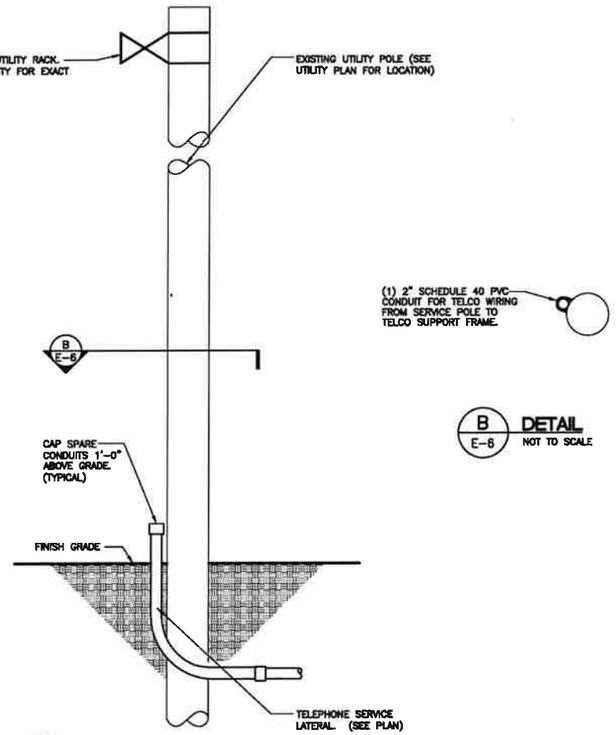
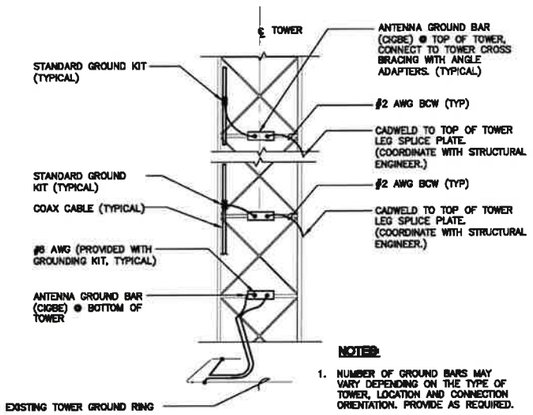
SERVICE RISER NOTES:

1. THE LOCATION SHOWN FOR THE CONNECTION TO UTILITIES, AND INCOMING TELEPHONE SERVICES IS FOR CONCEPT ONLY. THE CONTRACTOR SHALL COORDINATE THE ACTUAL LOCATION WITH LOCAL TELEPHONE COMPANY, THE OWNER AND LOCAL ELECTRIC UTILITY COMPANY.
2. CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS WITH LOCAL UTILITY COMPANY AND LOCAL TELEPHONE COMPANY FOR A TIMELY INSTALLATION OF THE INCOMING POWER AND TELEPHONE SERVICE. CONTRACTOR WILL OBTAIN AN ELECTRIC SERVICE ORDER (ESO) FOR THE SITE FROM LOCAL UTILITY COMPANY AND LOCAL TELEPHONE COMPANY PRIOR TO CONSTRUCTION.
3. FOR INCOMING UNDERGROUND TELEPHONE SERVICE, THE CONTRACTOR SHALL INSTALL CONDUIT AND PULL WIRES BETWEEN THE RISER POLE AND THE TELCO SERVICE CABINET. THE CONTRACTOR SHALL PROVIDE PRE CAST PULL-BOXES INCLUSIVE OF THE PRE CAST COVERS OF THE TYPE AND AS REQUIRED BY LOCAL TELEPHONE COMPANY THE MAXIMUM DISTANCE BETWEEN PULL-BOXES CAN NOT EXCEED 750' (CONTRACTOR TO CONFIRM WITH LOCAL UTILITY). AT THE PROPOSED RISER POLE EXTEND THE TELEPHONE CONDUIT UP THE POLE APPROXIMATELY 8' AND SEAL.
4. THIS SITE MAY CONTAIN CRITICAL UNDERGROUND ELECTRIC AND TELEPHONE SERVICES IN THE VICINITY OF THE NEW UNDERGROUND SERVICE AND THE EQUIPMENT SUPPORTS. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DISRUPTION OF THESE EXISTING FACILITIES. THE CONTRACTOR SHALL ALSO CONTACT LOCAL UTILITY COMPANY AND LOCAL TELEPHONE COMPANY AND ALL THE APPROPRIATE AGENCIES PRIOR TO EXCAVATION AT THIS SITE.



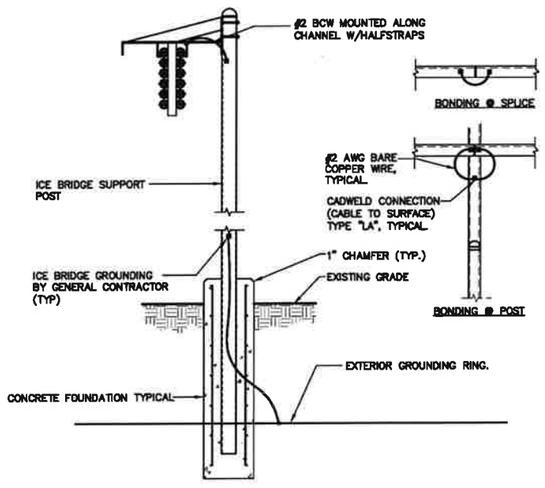
1 E-6 **INCOMING SERVICE POLE RISER**
SCALE: NOT TO SCALE

B E-6 **DETAIL**
NOT TO SCALE



NOTES:
1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, LOCATION AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.

2 E-6 **ANTENNA CABLE GROUNDING - LATTICE TOWER**
SCALE: NOT TO SCALE



3 E-6 **ICE BRIDGE BONDING DETAIL**
SCALE: NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

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ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

A. WORK SHALL INCLUDE ALL LABOR, EQUIPMENT AND SERVICES REQUIRED TO COMPLETE (MAKE READY FOR OPERATION) ALL THE ELECTRICAL WORK INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

1. NEW SITE TELEPHONE SERVICE AS SPECIFIED BY TELEPHONE COMPANY.
2. FEEDERS AND BRANCH CIRCUIT WIRING TO PANELS, RECEPTACLES, EQUIPMENT, ETC. AS INDICATED OR NOTED ON PLANS.
3. CELLULAR GROUNDING SYSTEMS, CONSISTING OF ANTENNA GROUNDING, INTERIOR GROUNDING RING, GROUND BARS, ETC.
4. FIELD MEASURE EXISTING ELECTRICAL SERVICES TO CONFIRM AVAILABLE EXISTING POWER.
5. COORDINATE ALL WORK SHOWN, ON THESE PLANS WITH LOCAL UTILITY COMPANIES.

B. LOCAL UTILITY COMPANIES SHALL PROVIDE THE FOLLOWING:

1. TELEPHONE CABLES.

C. CONTRACTOR SHALL CONFER WITH LOCAL UTILITY COMPANIES TO ASCERTAIN THE LIMITS OF THEIR WORK AND SHALL INCLUDE IN BID ANY CHARGES OR FEES MADE BY THE UTILITY COMPANIES FOR THEIR PORTION OF THE WORK AND SHALL PROVIDE AND INSTALL ALL ITEMS REQUIRED, BUT NOT PROVIDED BY UTILITY COMPANY.

D. CONTRACTOR SHALL COORDINATE WITH TELEPHONE UTILITY COMPANY FOR LOCATION OF TELEPHONE SERVICE AND TO DETERMINE ANY REQUIRED EQUIPMENT TO BE INSTALLED BY CONTRACTOR.

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 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. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH LOCAL TELEPHONE COMPANY THAT MAY BE REQUIRED FOR THE INSTALLATION OF TELEPHONE SERVICE TO THE PROPOSED CELLULAR SITE.

F. 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.

G. 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.

H. 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.

I. 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.

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

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

L. 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.

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

N. 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.

O. 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. CONDUIT

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]
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.

D. PROVIDE NAMEPLATE FOR PORTABLE ENGINE/GENERATOR CONNECTION SHOWING VOLTAGE KVA/KW RATING, # PHASE, AND # OF WIRES. PLATE TO BE PLASTIC ENGRAVED, RED WITH WHITE LETTERS.

E. ALL RECEPTACLES, SWITCHES, DISCONNECT SWITCHES, ETC. SHALL BE LABELED WITH THE CORRECT BRANCH CIRCUIT NUMBER SERVED BY MEANS OF PERMANENT PRESSED TYPE BLACK 1/4" TRANSFER LETTERING. (FOR EXAMPLE: "MDP-5", ETC.).

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 16060).

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 SO CONNECTED TO THE PANELBOARDS SUCH 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.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	09/20/23	BSP	TJR	CONSTRUCTION DRAWINGS - REVISED PER NEWLY ISSUED RFDS
0	07/13/23	BSP	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
A	05/05/23	BSP	TJR	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

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(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

VERIZON WIRELESS

COLCHESTER 4 CT
15 OLD HARTFORD RD.
COLCHESTER, CT 06415

DATE: 05/05/23
SCALE: AS NOTED
JOB NO. 22017.14

ELECTRICAL SPECIFICATIONS

E-7

Sheet No. 14 of 14

ATTACHMENT 4

NHH-65B-R2B

6-port sector antenna, 2x 698–896 and 4x 1695–2360 MHz, 65° HPBW, 2x RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- Separate RS-485 RET input/output for low and high band
- One RET for low band and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO

General Specifications

Antenna Type	Sector
Band	Multiband
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN
Radome Material	Fiberglass, UV resistant
Radiator Material	Low loss circuit board
Reflector Material	Aluminum
RF Connector Interface	4.3-10 Female
RF Connector Location	Bottom
RF Connector Quantity, high band	4
RF Connector Quantity, low band	2
RF Connector Quantity, total	6

Remote Electrical Tilt (RET) Information

RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male
Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 3
Internal RET	High band (1) | Low band (1)
Power Consumption, idle state, maximum	2 W
Power Consumption, normal conditions, maximum	13 W

NHH-65B-R2B

Protocol	3GPP/AISG 2.0 (Single RET)

Dimensions

Width	301 mm | 11.85 in
Depth	180 mm | 7.087 in
Length	1828 mm | 71.969 in
Net Weight, without mounting kit	19.8 kg | 43.651 lb

Array Layout

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-896	1-2	1	AN[illegible]1
Y1	1695-2360	3-4	2	AN[illegible]2
Y2	1695-2360	5-6		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz

NHH-65B-R2B

Polarization	±45°
Total Input Power, maximum	900 W @ 50 °C

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	14.9	15	17.7	17.9	18.4	18.7
Beamwidth, Horizontal, degrees	65	60	71	69	64	57
Beamwidth, Vertical, degrees	12.4	11.2	5.7	5.2	4.9	4.6
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	13	14	18	18	19	18
Front-to-Back Ratio at 180°, dB	30	29	31	30	29	31
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	30	30	30	30
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port at 50°C, maximum, watts	300	300	300	300	300	300

Electrical Specifications, BASTA

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.5	14.5	17.3	17.7	18.1	18.5
Gain by all Beam Tilts Tolerance, dB	±0.6	±1.1	±0.4	±0.4	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.4 7 ° | 14.6 14 ° | 14.3	0 ° | 14.7 7 ° | 14.7 14 ° | 14.1	0 ° | 17.2 4 ° | 17.3 7 ° | 17.3	0 ° | 17.6 4 ° | 17.7 7 ° | 17.7	0 ° | 18.0 4 ° | 18.2 7 ° | 18.1	0 ° | 18.3 4 ° | 18.5 7 ° | 18.6
Beamwidth, Horizontal Tolerance, degrees	±2	±2.1	±3	±4.1	±6.5	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.7	±0.7	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	13	14	16	16	17	15
Front-to-Back Total Power at 180° ± 30°, dB	23	22	27	27	25	25
CPR at Boresight, dB	22	21	23	23	22	19

NHH-65B-R2B

CPR at Sector, dB	10	7	16	13	11	4

Mechanical Specifications

Effective Projective Area (EPA), frontal	0.26 m² | 2.799 ft²
Effective Projective Area (EPA), lateral	0.22 m² | 2.368 ft²
Wind Loading @ Velocity, frontal	278.0 N @ 150 km/h (62.5 lbf @ 150 km/h)
Wind Loading @ Velocity, lateral	230.0 N @ 150 km/h (51.7 lbf @ 150 km/h)
Wind Loading @ Velocity, maximum	537.0 N @ 150 km/h (120.7 lbf @ 150 km/h)
Wind Loading @ Velocity, rear	282.0 N @ 150 km/h (63.4 lbf @ 150 km/h)
Wind Speed, maximum	241 km/h | 149.75 mph

Packaging and Weights

Width, packed	409 mm | 16.102 in
Depth, packed	299 mm | 11.772 in
Length, packed	1952 mm | 76.85 in
Weight, gross	32.3 kg | 71.209 lb

Regulatory Compliance/Certifications

Agency	**Classification**
CHINA-ROHS	Below maximum concentration value
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
ROHS	Compliant

Included Products

BSAMNT-3	–	Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

C-band 64T64R

SAMSUNG

Gen 2

Gen 2 : Higher conducted power radio with reduced size/volume/weight vs Gen 1 and also SOC embedded for flexibility to support new features

※ Preliminary Design: External appearance and mechanical design can be subject to change

Gen 2. 64T64R C-band MMU Dimensions	
Size (WxHxD)	**400 x 734 x 140 mm (15.75 x 28.90 x 5.51 inch)**
Weight	**26kg (57.3 lb)**

Item	Gen 2 64T64R (MT6413-77A)
Air Technology	NR n77/TDD
Frequency	3700 – 3980 MHz
IBW	200 MHz
OBW	200 MHz
Carrier Bandwidth	20(HW ready)/40/60/80/100 MHz
# of Carriers	2 carriers
Layer	DL : 16L, UL : 16RX (8L)
RF Chain	64T64R
Antenna Configuration	4V16H with 192 AE
EIRP	80.5 dBm @320W (55 dBm + 25.5 dBi)
Conductive Power	320W
Spectrum Analyzer	TX/RX support
RX Sensitivity	Typical -97.8dBm @(1Rx, 18.36MHz with 30kHz,51RBs)
Modulation	DL 256QAM support, (DL 1024QAM with 1~2dB power back-off)
Function Split	DL/UL option 7-2x
Input Power	-48 VDC (-38 VDC to -57 VDC)
Power Consumption	1,287W (100% load, room temp.)
Size (WHD)	**400 x 734 x 140 mm (15.75 x 28.90 x 5.51 inch)**
Volume	**41.1L**
Weight	**26kg (57.3 lb)**
Operating Temperature	-40℃ - 55℃ (w/o solar load)
Cooling	Natural convection
Unwanted Emission	3GPP 38.104 FCC 47 CFR 27.53 : < -13dBm/MHz < -40 dBm/MHz @ above 4 GHz <-50 dBm /MHz @ 4,040 ~ 4,050 MHz, <-60 dBm /MHz @ above 4,050 MHz
Optic Interface	15km, 4 ports (25Gbps x 4), SFP28, single mode, Bi-di (Option: Duplex)
Mounting Options	Pole, wall
NB-IoT	Not support
External Alarm	4RX
Fronthaul Interface	eCPRI

SAMSUNG

AWS/PCS MACRO RADIO

DUAL-BAND AND HIGH POWER FOR MACRO COVERAGE

Samsung's future proof dual-band radio is designed to help effectively increase the coverage areas in wireless networks. This AWS/PCS 4T4R dual-band radio has 4Tx/4Rx to 2Tx/2Rx RF chains options and a total output power of 320W, making it ideal for macro sites.

Model Code RF4439d-25A

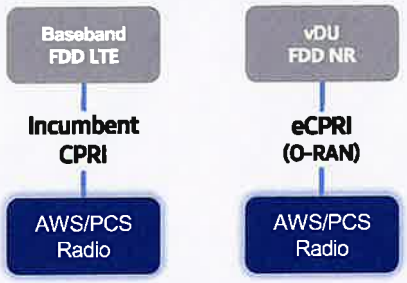
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

Samsung's AWS/PCS macro radio can support each incumbent CPRI interface as well as advanced eCPRI interfaces. This feature provides installable options for both legacy LTE networks and added NR networks.



O-RAN Compliant

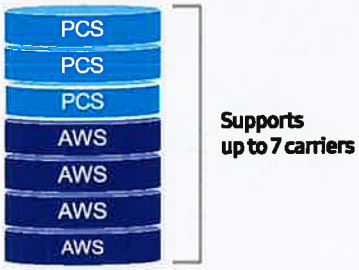
A standardized O-RAN radio can help in implementing cost-effective networks, which are capable of sending more data without compromising additional investments.

Samsung's state-of-the-art O-RAN technology will help accelerate the effort toward constructing a solid O-RAN ecosystem.

Optimum Spectrum Utilization

The number of required carriers varies according to site (region). Supporting many carriers is essential for using all frequencies that the operator has available.

The new AWS/PCS dual-band radio can support up to 3 carriers in the PCS (1.9GHz) band and 4 carriers in the AWS (2.1GHz) band, respectively.



Brand New Features in a Compact Size

Samsung's AWS/PCS macro radio offers several features, such as dual connectivity for baseband for both CDU and vDU, O-RAN capability, more carriers and an enlarged PCS spectrum, combined into an incumbent radio volume of 36.8L.

+

- **2 FH connectivity**
- **O-RAN capability**
- **More carriers and spectrum**

Same as an incumbent radio volume

Technical Specifications

Item	Specification
Tech	LTE / NR
Brand	B25(PCS), B66(AWS)
Frequency Band	DL: 1930 – 1995MHz, UL: 1850 – 1915MHz DL: 2110 – 2200MHz, UL: 1710 – 1780MHz
RF Power	(B25) 4 × 40W or 2 × 60W (B66) 4 × 60W or 2 × 80W
IBW/OBW	(B25) 65MHz / 30MHz (B66) DL 90MHz, UL 70MHz / 60MHz
Installation	Pole, Wall
Size/ Weight	14.96 x 14.96 x 10.04inch (36.8L) / 74.7lb

700/850 4T4R Macro 320W ORU - New Filter (RF4461d-13A)

SAMSUNG

Specifications

Item	Specification	
Air Interface	LTE, NR(HW resource ready)	
Band	Band13 (700MHz)	Band5 (850MHz)
Frequency	DL: 746~756MHz UL: 777~787MHz	DL: 869~894MHz UL: 824~849MHz
IBW	10MHz	25MHz
OBW	10MHz	25MHz
Carrier Bandwidth	LTE/NR 5*/10MHz	LTE 5/10MHz NR 5/10/15/20MHz
# of carriers	2C*	3C
Total # of carriers	4C + B13 (SDL) 1C	
RF Chain	4T4R/2T4R/2T2R/1T2R 2T2R+2T2R bi-sector	
RF Output Power	Total : 320W	
	4 x 40W or 2 x 60W	4 x 40W or 2 x 60W
Spectrum Analyzer	TX/RX Support	
RX Sensitivity	Typ. -104.5dBm @1Rx (25RBs 5MHz)	
Modulation	256QAM support, (1024QAM with 1~2dB power back-off)	
Input Power	-48VDC (-38VDC to -57VDC)	
Power Consumption	1,165 Watt @ 100% RF load, room temperature	
Size (WHD)	380 x 380 x 260 mm (14.96 x 14.96 x 10.23 inch)	
Volume	37.5 L	
Weight (W/o Solar Shield & finger guard)	35.9 kg (79.1 lb)	
Operating Temperature	-40°C (-40°F) ~ 55°C (131°F) (Without solar load)	
Cooling	Natural convection	
Unwanted Emission	3GPP 36.104	3GPP 36.104
	FCC 47 CFR 27.53 c), f)	FCC 47 CFR 22.917
	-	-69 dBm/100 kHz per path @ 896 ~901MHz
CPRI Cascade	Not supported	
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP+, single mode, Duplex (Option: Bi-di)	
RET & TMA Interface	AISG 3.0	
Bias-T	4 ports (2 ports per band)	
Mounting Options	Pole, wall	
NB-IoT	2GB+2IB or 4IB	2SA+2GB or 2GB+2IB or 4GB
PIM Cancellation	Support	
# of antenna port	4	
External Alarm	4	
Fronthaul Interface	Opt. 8 CPRI / Opt. 7-2x selectable (not simultaneous support)	
CPRI compression	Not Support	

* 5MHz supporting in B13(700MHz) depends on 3GPP std. and UE capability.
External filters in interferer and victim sides for Mexican boarder to support 5MHz service need to be considered
** Finger guard is not needed.

ATTACHMENT 5

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

100' Existing Lattice Tower

Proposed Verizon
Antenna Installation

Verizon Site Ref: Colchester 4

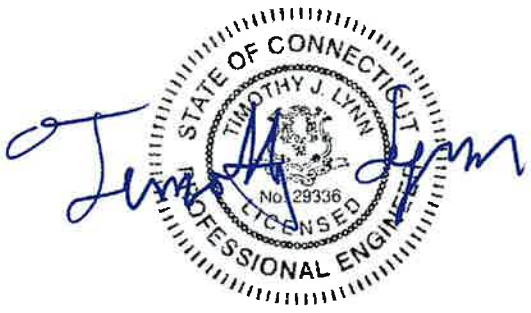
CSP Tower Ref: #51

15 Old Hartford Road
Colchester, CT

CENTEK Project No. 22017.14

~~Date: April 12, 2023~~
Rev 1: September 20, 2023

Max Stress Ratio = 53%



Prepared for:

Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

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 Verizon on the existing lattice tower located in Colchester, Connecticut.

The host tower is a 100-ft, three legged, lattice tower originally designed and manufactured by Andrew Corporation dated October 14, 1990. The tower geometry, structure member sizes and foundation information were taken from a previous structural analysis report prepared by AECOM job no. 60604313 dated May 12, 2019.

Antenna and appurtenance inventory was taken a tower mapping conducted by CSB Communications dated March 31, 2023 and information provided by Verizon.

The tower consists of five (5) vertical sections consisting of steel pipe legs and steel angle lateral bracing. 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 15-ft at the top and 24.17-ft at the bottom.

Antenna and Appurtenance Summary

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

- Tower:
  Antenna: One (1) lightning rod pipe mounted to the top of the tower.
- Unknown (Existing):
  Antenna: One (1) 2-ft microwave dish pipe mounted with an elevation of 101-ft AGL.
  Cables: One (1) 7/8"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- T-MOBILE (EXISTING):
  Antennas: Three (3) RFS APXV18-206516 panel antennas mounted on three (3) face mounts with a RAD center elevation of +/- 98-ft AGL.
  Cables: Six (6) 1-1/4" ∅ coax cables routed along the exterior of the tower
- Unknown (Existing):
  Antenna: One (1) 10-ft omni antenna face mounted with an elevation of 98-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: Two (2) grid dishes face mounted with an elevation of 97-ft AGL.
  Cables: Two (2) 7/8"∅ cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: One (1) 3-ft microwave dish pipe mounted with an elevation of 92.5-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: One (1) 3-ft microwave dish pipe mounted with an elevation of 85-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.

- Unknown (Existing):
  Antenna: One (1) 12-ft dipole mounted on a 4-ft sidearm with an elevation of 82-ft AGL.
  Cables: One (1) 3/8"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: One (1) 9-ft omni antenna mounted on a 2-ft sidearm with an elevation of 82-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: One (1) 20-ft dipole mounted on a 4-ft sidearm with an elevation of 65-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: One (1) 14-ft omni antenna mounted on a 6-ft sidearm with an elevation of 62-ft AGL.
  Cables: One (1) 7/8"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- Unknown (Existing):
  Antenna: Two (2) 3-ft omni antennas (one upright and one inverted) mounted on a 3-ft sidearm with an elevation of 30-ft AGL.
  Cables: Two (2) 1/2"∅ cables running on a leg/face of the existing tower as specified in Section 3 of this report
- Unknown (Existing):
  Antenna: One (1) ANT790F2 omni antenna mounted on a 2-ft sidearm with an elevation of 25-ft AGL.
  Cables: One (1) 1/2"∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report
- **VERIZON (Final Configuration):**
  Antennas: Six (6) Commscope NHH-65B-R2B panel antennas, three (3) Samsung MT6413-77A panel antennas, three (3) Samsung RF4439d-25A (B2/B66A) RRHs, three (3) Samsung RF4461d-13A (B5/B13) RRHs and one (1) main distribution box mounted on three (3) SitePro 12-ft V-Frames (p/n VFA12-HD) with a RAD center elevation of +/- 85-ft AGL.
  Cables: Two (2) hybrid cables routed along the exterior of the tower

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables should be routed as specified in section 3 of this report.

Analysis

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

The existing tower was analyzed for the controlling basic wind speed with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-H entitled "Structural Standard for Antenna Support Structures, Antennas and Small Wind Turbine Support Structures", 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-H Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-H, gravity loads of the tower structure and its components, and the application of 1.0" radial ice on the tower structure and its components.

Load Cases:	Load Case 1; 135 mph (Risk Cat III) wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix P of the 2022 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-H]*
	Load Case 3; 90 mph wind speed w/ 0.5" radial ice plus gravity load – used in calculation of tower twist and sway.	*[TIA-222-F used for calculation of tower twist and sway per the requirements of the CSP]*

[1] The 2021 International Building Code as amended by the 2022 Connecticut State Building Code (CSBC).

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower.

- Calculated stresses **were found to be within allowable limits**.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T5)	0.0' - 20.0'	30.0%	**PASS**
Diagonal (T2)	60.0' – 80.0'	53.1%	**PASS**

- The tower combined deflection **was found to be within allowable limits**.

Deflection Criteria	Proposed (degrees)	Allowable (degrees)	Result
Sway (Tilt)	0.0845	n/a	**n/a**
Twist	0.0127	n/a	**n/a**
Combined	0.0972	0.75	**PASS**

TIA-222-F standard used for calculation of tower twist and sway per the requirements of the CSP.

Foundation and Anchors

The existing foundation consists of a (3) 2.6-ft diameter x 8.0-ft long reinforced concrete piers supported on (3) 9.33-ft square x 2.0-ft thick reinforced concrete pads. The base of the tower is connected to the foundation by means of (6) 1.25"∅ anchor bolts per leg embedded into the concrete foundation structure.

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

Load Effect	Proposed Tower Reactions
Leg Shear	21 kips
Leg Compression	118 kips
Leg Tension	94 kips
Base Moment	2,265 ft-kips
Base Shear	37 kips

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

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Shear	53.3%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	(percentage of capacity)	Result
Reinforced Concrete Pad and Pier (typ. of 3)	Uplift	66%	**PASS**
	Bearing	45%	**PASS**

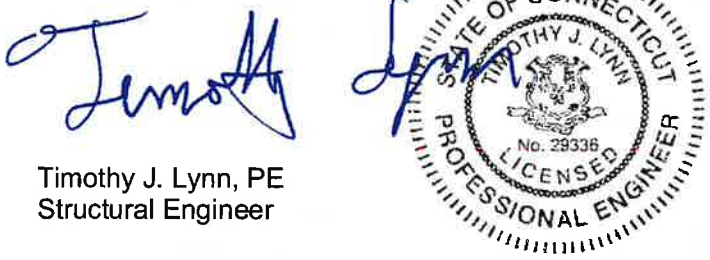
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

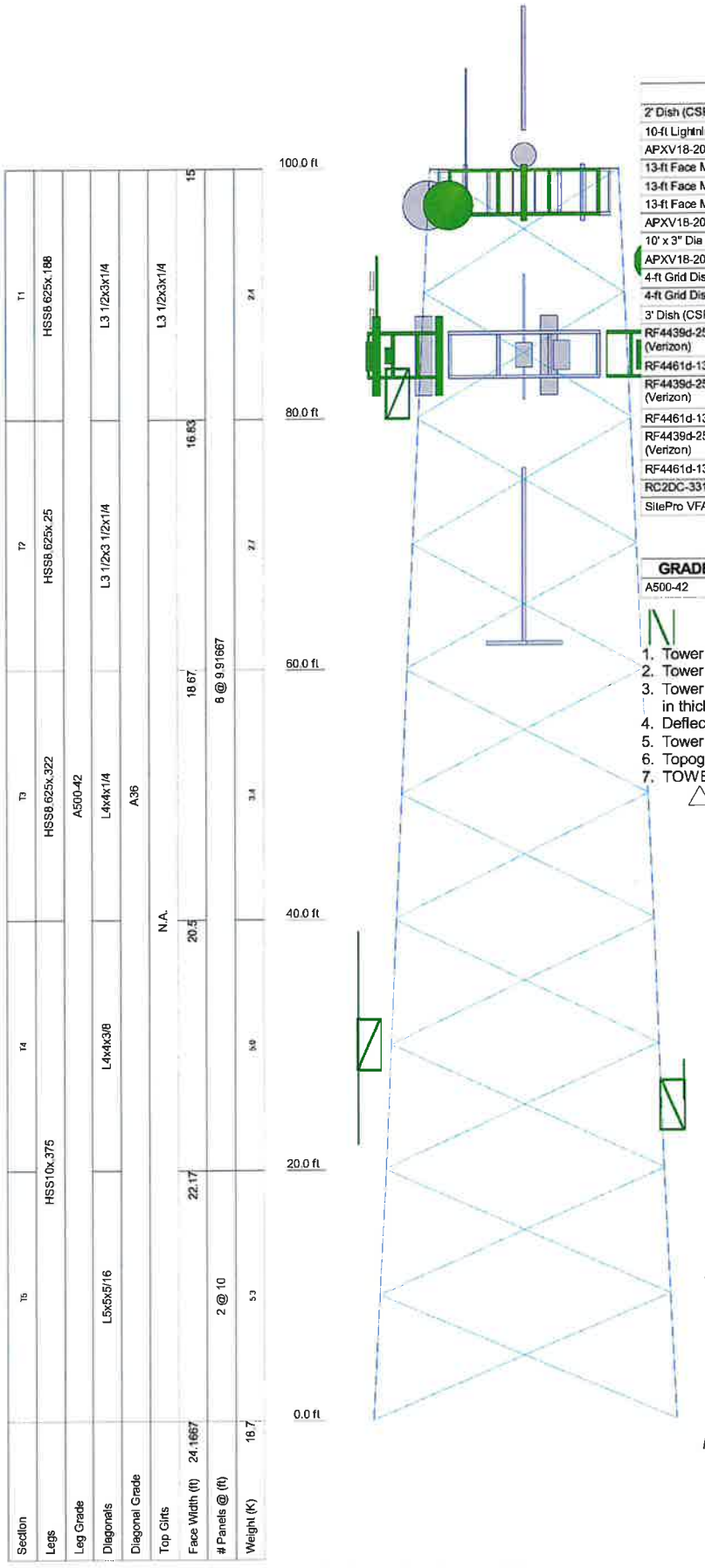
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISA Tower, 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-H standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 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.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2' Dish (CSP)	101	SitePro VFA12-HD (Verizon)	85
10-ft Lightning Rod	100	SitePro VFA12-HD (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	MT6413-77A (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	MT6413-77A (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	3' Dish (CSP)	85
10' x 3" Dia Omni	98	MT6413-77A (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
4-ft Grid Dish	97	12' Dipole	82
4-ft Grid Dish	97	ROHN 4-ft Side Arm	82
3' Dish (CSP)	92.5	9-ft Omni	82
RF4439d-25A (B2/B66A RRH) (Verizon)	85	2-ft Stand Off	82
RF4461d-13A (Verizon)	85	20' 8 Bay Di-Pole	65
RF4439d-25A (B2/B66A RRH) (Verizon)	85	ROHN 4-ft Side Arm	63
RF4461d-13A (Verizon)	85	14' x 3" Dia Omni	62
RF4439d-25A (B2/B66A RRH) (Verizon)	85	6' Standoff Arm	62
RF4461d-13A (Verizon)	85	ROHN 3-ft Side Arm	30
RC2DC-3315-PF-48 (Verizon)	85	3' Whip	30
SitePro VFA12-HD (Verizon)	85	3' Whip (Inverted)	30
		2-ft Stand Off	25
		ANT790F2	25

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi	A36	36 ksi	58 ksi

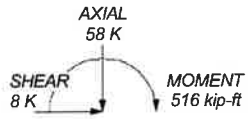
TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 135 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 53.1%

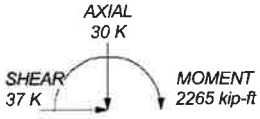
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 118 K
SHEAR: 21 K

UPLIFT: -94 K
SHEAR: 18 K



TORQUE 2 kip-ft
50 mph WIND - 1.0000 in ICE



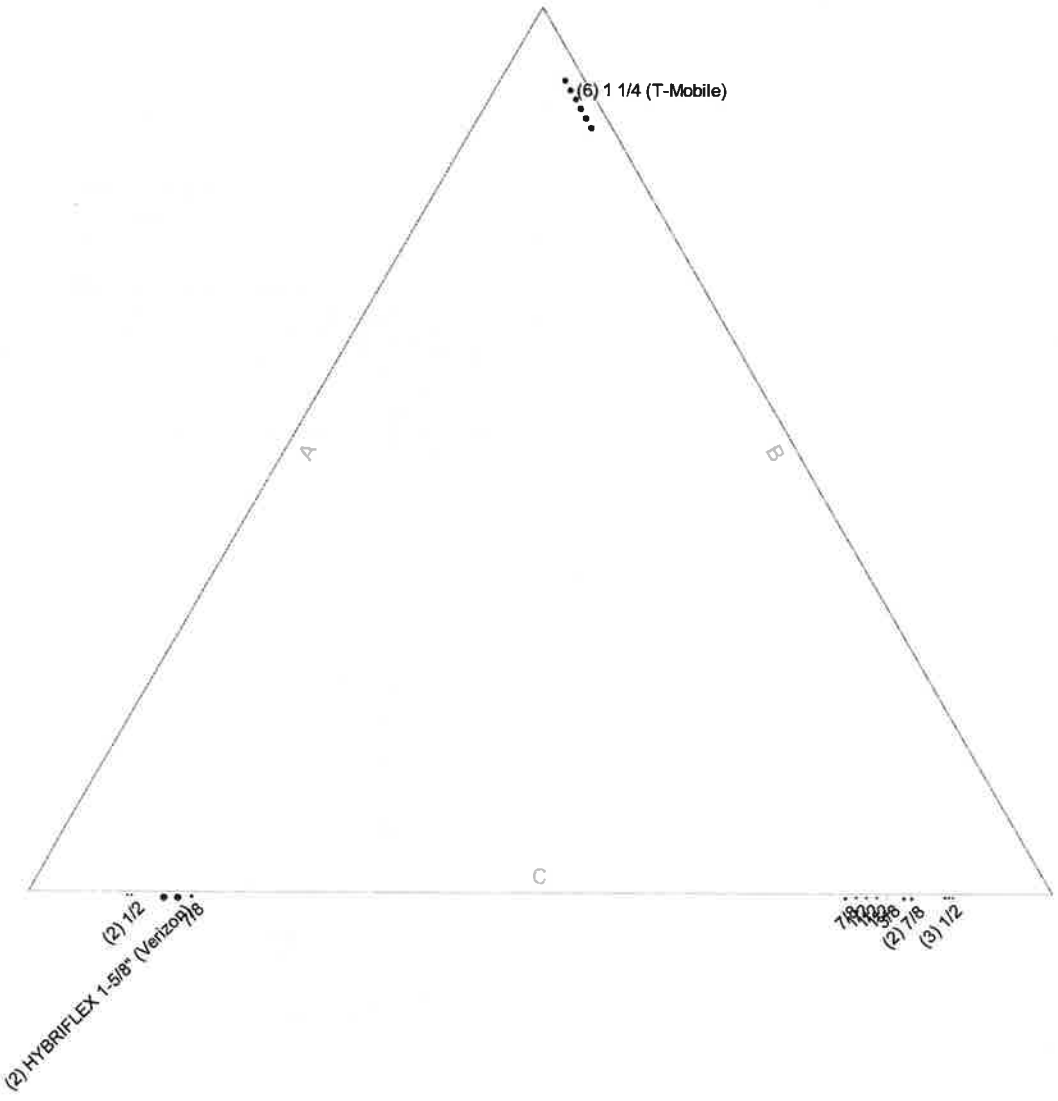
TORQUE 13 kip-ft
REACTIONS - 135 mph WIND

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

Job: 22017.14 - Colchester 4			
Project: 100-ft Lattice Tower #51 Colchester			
Client: Verizon	Drawn by: TJL	App'd:	
Code: TIA-222-H	Date: 09/20/23	Scale: NTS	
Path:		Dwg No. E-1	

Feed Line Plan

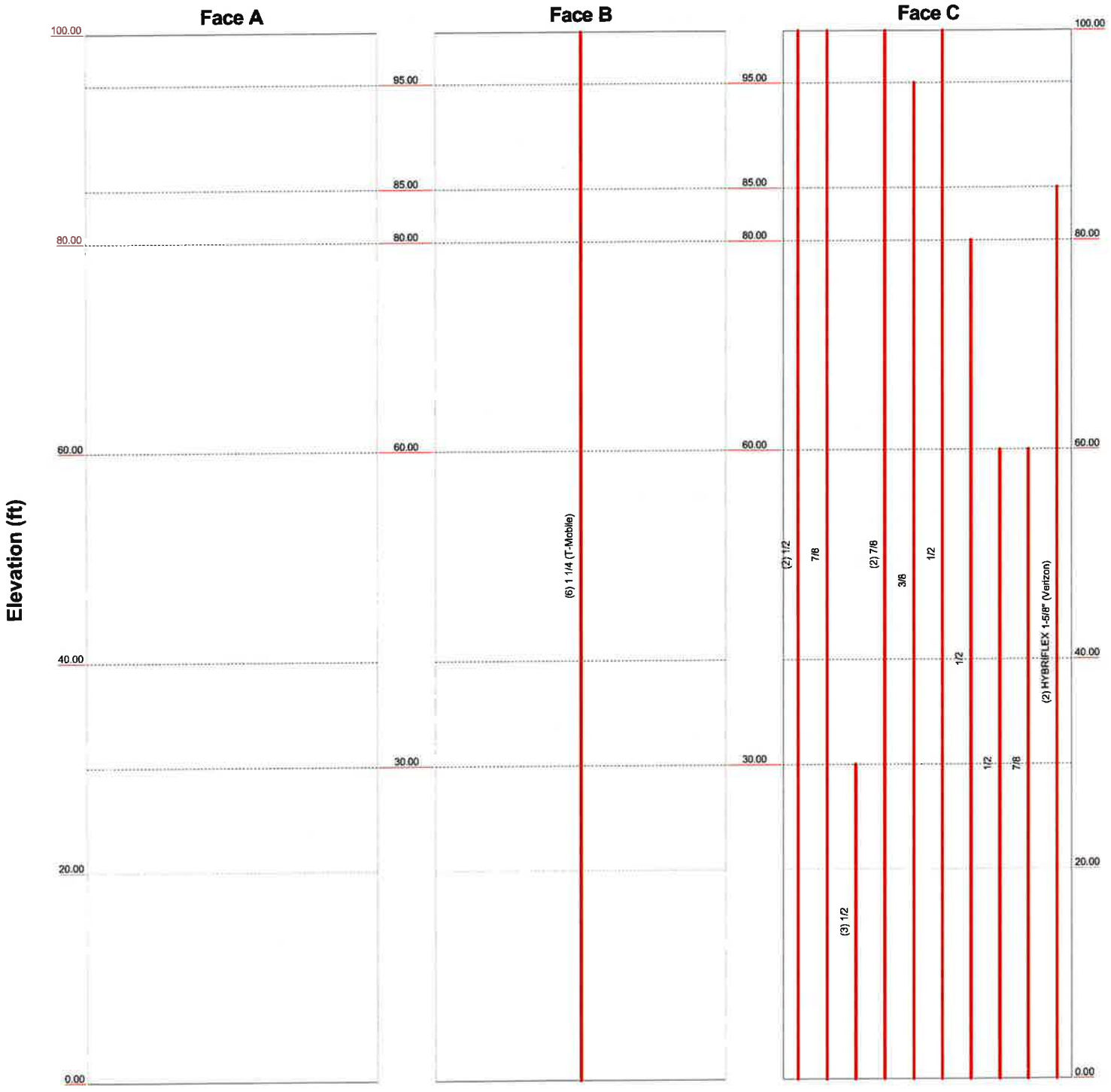
_____ Round _____ Flat _____ App In Face _____ App Out Face



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **22017.14 - Colchester 4**		
	Project: ***100-ft Lattice Tower #51 Colchester***		
	Client: Verizon	Drawn by: TJL	App'd:
	Code: TIA-222-H	Date: 09/20/23	Scale: NTS
	Path:		Dwg No. E-7

Feed Line Distribution Chart
0' - 100'

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



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***22017.14 - Colchester 4***		
	Project: ***100-ft Lattice Tower #51 Colchester***		
	Client: Verizon	Drawn by: TJL	App'd:
	Code: TIA-222-H	Date: 09/20/23	Scale: NTS
	Path:		Dwg No. E-7

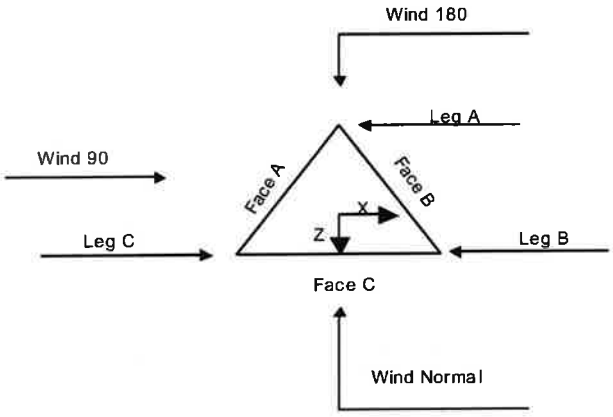
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 100.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 15.00 ft at the top and 24.17 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

Tower base elevation above sea level: 0.00 ft.
Basic wind speed of 135 mph.
Risk Category III.
Exposure Category C.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 1.
Crest Height: 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	100.00-80.00			15.00	1	20.00
T2	80.00-60.00			16.83	1	20.00
T3	60.00-40.00			18.67	1	20.00
T4	40.00-20.00			20.50	1	20.00
T5	20.00-0.00			22.17	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	100.00-80.00	9.92	X Brace	No	No	1.0000	1.0000
T2	80.00-60.00	9.92	X Brace	No	No	1.0000	1.0000
T3	60.00-40.00	9.92	X Brace	No	No	1.0000	1.0000
T4	40.00-20.00	9.92	X Brace	No	No	1.0000	1.0000
T5	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 100.00-80.00	Pipe	HSS8.625x.188	A500-42 (42 ksi)	Single Angle	L3 1/2x3x1/4	A36 (36 ksi)
T2 80.00-60.00	Pipe	HSS8.625x.25	A500-42 (42 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T3 60.00-40.00	Pipe	HSS8.625x.322	A500-42 (42 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T4 40.00-20.00	Pipe	HSS10x.375	A500-42 (42 ksi)	Single Angle	L4x4x3/8	A36 (36 ksi)
T5 20.00-0.00	Pipe	HSS10x.375	A500-42 (42 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 100.00-80.00	Single Angle	L3 1/2x3x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	24.0000	24.0000	36.0000
T2 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	24.0000	24.0000	36.0000
T3 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	24.0000	24.0000	36.0000
T4 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	24.0000	24.0000	36.0000
T5 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	24.0000	24.0000	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 100.00-80.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Brace Diags X	K Brace Diags Y	Single Diags X	Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T2	Yes	No	1	1		1		1		1		1		1		1	
80.00-60.00				1		1		1		1		1		1		1	
T3	Yes	No	1	1		1		1		1		1		1		1	
60.00-40.00				1		1		1		1		1		1		1	
T4	Yes	No	1	1		1		1		1		1		1		1	
40.00-20.00				1		1		1		1		1		1		1	
T5 20.00-0.00	Yes	No	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	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.6250	0.75	0.0000	0.75	0.0000	0.75
100.00-80.00														
T2 80.00-60.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.6250	0.75	0.0000	0.75	0.0000	0.75
T3 60.00-40.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.6250	0.75	0.0000	0.75	0.0000	0.75
T4 40.00-20.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.6250	0.75	0.0000	0.75	0.0000	0.75
T5 20.00-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.6250	0.75	0.0000	0.75	0.0000	0.75

Tower Elevation ft	Redundant Horizontal Net Width Deduct in	Redundant Horizontal U	Redundant Diagonal Net Width Deduct in	Redundant Diagonal U	Redundant Sub-Diagonal Net Width Deduct in	Redundant Sub-Diagonal U	Redundant Sub-Horizontal Net Width Deduct in	Redundant Sub-Horizontal U	Redundant Vertical Net Width Deduct in	Redundant Vertical U	Redundant Hip Net Width Deduct in	Redundant Hip U	Redundant Hip Diagonal Net Width Deduct in	Redundant Hip Diagonal U
T1	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
100.00-80.00														
T2 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
T3 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
T4 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
T5 20.00-0.00	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	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T1 100.00-80.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T2 80.00-60.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T3 60.00-40.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T4 40.00-20.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T5 20.00-0.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 100.00-80.00	Flange	0.8750 A325N	5	0.7500 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325X	2	0.6250 A325X	2
T2 80.00-60.00	Flange	1.0000 A325N	5	0.7500 A325N	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	2	0.6250 A325X	0
T3 60.00-40.00	Flange	1.2500 A325N	5	0.8750 A325N	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	2	0.6250 A325X	0
T4 40.00-20.00	Flange	1.2500 A325N	5	0.8750 A325N	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	2	0.6250 A325X	0
T5 20.00-0.00	Flange	1.2500 A325N	5	0.8750 A325N	1	0.6250 A325X	0	0.0000 A325N	0	0.6250 A325X	0	0.6250 A325X	2	0.6250 A325X	0

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 1/4 (T-Mobile)	B	No	No	Ar (CaAa)	100.00 - 0.00	-4.0000	-0.4	6	6	1.5500	1.5500		0.66
1/2	C	No	No	Ar (CaAa)	100.00 - 0.00	1.0000	0.4	2	2	0.5800	0.5800		0.25
7/8	C	No	No	Ar (CaAa)	100.00 - 0.00	1.0000	0.34	1	1	1.1100	1.1100		0.54
1/2	C	No	No	Ar (CaAa)	30.00 - 0.00	1.0000	-0.4	3	3	0.5800	0.5800		0.25
7/8	C	No	No	Ar (CaAa)	100.00 - 0.00	1.0000	-0.36	2	2	1.1100	1.1100		0.54
3/8	C	No	No	Ar (CaAa)	95.00 - 0.00	1.0000	-0.34	1	1	0.5000	0.5000		0.40
1/2	C	No	No	Ar (CaAa)	100.00 - 0.00	1.0000	-0.33	1	1	0.5800	0.5800		0.25
1/2	C	No	No	Ar (CaAa)	80.00 - 0.00	1.0000	-0.32	1	1	0.5800	0.5800		0.25
1/2	C	No	No	Ar (CaAa)	60.00 - 0.00	1.0000	-0.31	1	1	0.5800	0.5800		0.25
7/8	C	No	No	Ar (CaAa)	60.00 - 0.00	1.0000	-0.3	1	1	1.1100	1.1100		0.54
HYBRIFLEX 1-5/8"	C	No	No	Ar (CaAa)	85.00 - 0.00	1.0000	0.36	2	2	1.9800	1.9800		1.90

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
(Verizon)													

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	100.00-80.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	18.600	0.000	0.08
		C	0.000	0.000	12.870	0.000	0.07
T2	80.00-60.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	18.600	0.000	0.08
		C	0.000	0.000	20.220	0.000	0.14
T3	60.00-40.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	18.600	0.000	0.08
		C	0.000	0.000	23.600	0.000	0.15
T4	40.00-20.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	18.600	0.000	0.08
		C	0.000	0.000	25.340	0.000	0.16
T5	20.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	18.600	0.000	0.08
		C	0.000	0.000	27.080	0.000	0.17

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	100.00-80.00	A	1.271	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	50.039	0.000	0.59
		C		0.000	0.000	54.664	0.000	0.51
T2	80.00-60.00	A	1.240	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	49.853	0.000	0.58
		C		0.000	0.000	79.300	0.000	0.79
T3	60.00-40.00	A	1.199	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	49.610	0.000	0.56
		C		0.000	0.000	90.768	0.000	0.90
T4	40.00-20.00	A	1.139	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	49.259	0.000	0.54
		C		0.000	0.000	95.499	0.000	0.90
T5	20.00-0.00	A	1.021	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	48.565	0.000	0.50
		C		0.000	0.000	96.810	0.000	0.85

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	100.00-80.00	0.3205	-5.1937	0.6886	-4.4508
T2	80.00-60.00	-1.3345	-3.3354	-1.5057	-0.2625
T3	60.00-40.00	-0.2161	-2.1782	0.8771	1.8340
T4	40.00-20.00	0.5322	-1.6363	2.6751	2.8368
T5	20.00-0.00	1.1409	-1.0221	4.0500	3.2136

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	1 1/4	80.00 - 100.00	0.6000	0.6000
T1	2	1/2	80.00 - 100.00	0.6000	0.6000
T1	3	7/8	80.00 - 100.00	0.6000	0.6000
T1	5	7/8	80.00 - 100.00	0.6000	0.6000
T1	6	3/8	80.00 - 95.00	0.6000	0.6000
T1	7	1/2	80.00 - 100.00	0.6000	0.6000
T1	11	HYBRIFLEX 1-5/8"	80.00 - 85.00	0.6000	0.6000
T2	1	1 1/4	60.00 - 80.00	0.6000	0.6000
T2	2	1/2	60.00 - 80.00	0.6000	0.6000
T2	3	7/8	60.00 - 80.00	0.6000	0.6000
T2	5	7/8	60.00 - 80.00	0.6000	0.6000
T2	6	3/8	60.00 - 80.00	0.6000	0.6000
T2	7	1/2	60.00 - 80.00	0.6000	0.6000
T2	8	1/2	60.00 - 80.00	0.6000	0.6000
T2	11	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	1	1 1/4	40.00 - 60.00	0.6000	0.6000
T3	2	1/2	40.00 - 60.00	0.6000	0.6000
T3	3	7/8	40.00 - 60.00	0.6000	0.6000
T3	5	7/8	40.00 - 60.00	0.6000	0.6000
T3	6	3/8	40.00 - 60.00	0.6000	0.6000
T3	7	1/2	40.00 - 60.00	0.6000	0.6000
T3	8	1/2	40.00 - 60.00	0.6000	0.6000
T3	9	1/2	40.00 - 60.00	0.6000	0.6000
T3	10	7/8	40.00 - 60.00	0.6000	0.6000
T3	11	HYBRIFLEX 1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	1	1 1/4	20.00 - 40.00	0.6000	0.6000
T4	2	1/2	20.00 - 40.00	0.6000	0.6000
T4	3	7/8	20.00 - 40.00	0.6000	0.6000
T4	4	1/2	20.00 - 30.00	0.6000	0.6000
T4	5	7/8	20.00 - 40.00	0.6000	0.6000
T4	6	3/8	20.00 - 40.00	0.6000	0.6000
T4	7	1/2	20.00 - 40.00	0.6000	0.6000
T4	8	1/2	20.00 - 40.00	0.6000	0.6000
T4	9	1/2	20.00 - 40.00	0.6000	0.6000
T4	10	7/8	20.00 - 40.00	0.6000	0.6000
T4	11	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	1	1 1/4	0.00 - 20.00	0.6000	0.6000
T5	2	1/2	0.00 - 20.00	0.6000	0.6000
T5	3	7/8	0.00 - 20.00	0.6000	0.6000
T5	4	1/2	0.00 - 20.00	0.6000	0.6000
T5	5	7/8	0.00 - 20.00	0.6000	0.6000
T5	6	3/8	0.00 - 20.00	0.6000	0.6000
T5	7	1/2	0.00 - 20.00	0.6000	0.6000
T5	8	1/2	0.00 - 20.00	0.6000	0.6000
T5	9	1/2	0.00 - 20.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	10	7/8	0.00 - 20.00	0.6000	0.6000
T5	11	HYBRIFLEX 1-5/8"	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXV18-206516S-C-A20 (T-Mobile)	A	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	3.62 3.97 4.30	2.01 2.33 2.66	0.03 0.05 0.08
APXV18-206516S-C-A20 (T-Mobile)	B	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	3.62 3.97 4.30	2.01 2.33 2.66	0.03 0.05 0.08
APXV18-206516S-C-A20 (T-Mobile)	C	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	3.62 3.97 4.30	2.01 2.33 2.66	0.03 0.05 0.08
13-ft Face Mount Frame (T-Mobile)	A	From Face	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	6.50 7.80 9.10	6.50 7.80 9.10	0.30 0.35 0.55
13-ft Face Mount Frame (T-Mobile)	B	From Face	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	6.50 7.80 9.10	6.50 7.80 9.10	0.30 0.35 0.55
13-ft Face Mount Frame (T-Mobile)	C	From Face	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	6.50 7.80 9.10	6.50 7.80 9.10	0.30 0.35 0.55
(2) NHH-65B-R2B (Verizon)	A	From Leg	3.00 -3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	11.19 11.69 12.20	8.69 9.17 9.66	0.07 0.15 0.24
MT6413-77A (Verizon)	A	From Leg	3.00 3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	3.79 4.04 4.30	1.46 1.65 1.85	0.06 0.08 0.11
(2) NHH-65B-R2B (Verizon)	B	From Leg	3.00 -3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	11.19 11.69 12.20	8.69 9.17 9.66	0.07 0.15 0.24
MT6413-77A (Verizon)	B	From Leg	3.00 3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	3.79 4.04 4.30	1.46 1.65 1.85	0.06 0.08 0.11
(2) NHH-65B-R2B (Verizon)	C	From Leg	3.00 -3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	11.19 11.69 12.20	8.69 9.17 9.66	0.07 0.15 0.24
MT6413-77A (Verizon)	C	From Leg	3.00 3.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	3.79 4.04 4.30	1.46 1.65 1.85	0.06 0.08 0.11
RF4439d-25A (B2/B66A RRH) (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.25 1.39 1.54	0.08 0.09 0.11
RF4461d-13A (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	1.87 2.03 2.21	1.28 1.42 1.57	0.08 0.10 0.12
RF4439d-25A (B2/B66A	B	From Leg	3.00	0.0000	85.00	No Ice	1.88	1.25	0.08

tnxTower	Job: 22017.14 - Colchester 4	Page: 9 of 33
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 100-ft Lattice Tower #51 Colchester	Date: 16:09:44 09/20/23
	Client: Verizon	Designed by: TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
RRH)			0.00			1/2" Ice	2.05	1.39	0.09
(Verizon)			0.00			1" Ice	2.22	1.54	0.11
RF4461d-13A	B	From Leg	3.00	0.0000	85.00	No Ice	1.87	1.28	0.08
(Verizon)			0.00			1/2" Ice	2.03	1.42	0.10
			0.00			1" Ice	2.21	1.57	0.12
RF4439d-25A (B2/B66A	C	From Leg	3.00	0.0000	85.00	No Ice	1.88	1.25	0.08
RRH)			0.00			1/2" Ice	2.05	1.39	0.09
(Verizon)			0.00			1" Ice	2.22	1.54	0.11
RF4461d-13A	C	From Leg	3.00	0.0000	85.00	No Ice	1.87	1.28	0.08
(Verizon)			0.00			1/2" Ice	2.03	1.42	0.10
			0.00			1" Ice	2.21	1.57	0.12
RC2DC-3315-PF-48	A	From Leg	3.00	0.0000	85.00	No Ice	3.01	1.96	0.03
(Verizon)			0.00			1/2" Ice	3.23	2.15	0.05
			0.00			1" Ice	3.46	2.35	0.08
SitePro VFA12-HD	A	From Leg	1.50	0.0000	85.00	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	1.50	0.0000	85.00	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	1.50	0.0000	85.00	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
10-ft Lightning Rod	A	From Leg	1.00	0.0000	100.00	No Ice	3.00	3.00	0.05
			0.00			1/2" Ice	4.03	4.03	0.07
			8.00			1" Ice	5.03	5.03	0.10
9-ft Omni	A	From Leg	3.00	0.0000	82.00	No Ice	2.25	2.25	0.03
			0.00			1/2" Ice	3.18	3.18	0.05
			4.50			1" Ice	4.11	4.11	0.07
2-ft Stand Off	A	From Leg	1.00	0.0000	82.00	No Ice	1.07	1.07	0.02
			0.00			1/2" Ice	1.62	1.62	0.03
			0.00			1" Ice	2.17	2.17	0.04
14' x 3" Dia Omni	A	From Leg	6.00	0.0000	62.00	No Ice	4.20	4.20	0.04
			0.00			1/2" Ice	5.63	5.63	0.07
			7.00			1" Ice	7.08	7.08	0.11
6' Standoff Arm	A	From Leg	3.00	0.0000	62.00	No Ice	2.40	0.13	0.05
			0.00			1/2" Ice	2.83	0.18	0.07
			0.00			1" Ice	3.26	0.24	0.10
20' 8 Bay Di-Pole	B	From Leg	4.00	0.0000	65.00	No Ice	4.00	4.00	0.06
			0.00			1/2" Ice	6.00	6.00	0.10
			10.00			1" Ice	8.00	8.00	0.14
ROHN 4-ft Side Arm	B	From Leg	2.00	0.0000	63.00	No Ice	5.28	5.28	0.07
			0.00			1/2" Ice	7.88	7.88	0.08
			0.00			1" Ice	10.48	10.48	0.10
ANT790F2	B	From Leg	2.00	0.0000	25.00	No Ice	0.69	0.69	0.01
			0.00			1/2" Ice	0.89	0.89	0.01
			2.00			1" Ice	1.10	1.10	0.02
2-ft Stand Off	B	From Leg	1.00	0.0000	25.00	No Ice	1.07	1.07	0.02
			0.00			1/2" Ice	1.62	1.62	0.03
			0.00			1" Ice	2.17	2.17	0.04
12' Dipole	C	From Leg	4.00	0.0000	82.00	No Ice	6.00	6.00	0.07
			0.00			1/2" Ice	8.00	8.00	0.09
			6.00			1" Ice	10.00	10.00	0.11
ROHN 4-ft Side Arm	C	From Leg	2.00	0.0000	82.00	No Ice	5.28	5.28	0.07
			0.00			1/2" Ice	7.88	7.88	0.08
			0.00			1" Ice	10.48	10.48	0.10
3' Whip	C	From Leg	3.00	0.0000	30.00	No Ice	1.25	1.25	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1/2" Ice	1.56	1.56	0.04
			4.00			1" Ice	1.87	1.87	0.07
3' Whip (Inverted)	C	From Leg	3.00	0.0000	30.00	No Ice	1.25	1.25	0.01
			0.00			1/2" Ice	1.56	1.56	0.04
			-3.00			1" Ice	1.87	1.87	0.07
ROHN 3-ft Side Arm	C	From Leg	2.00	0.0000	30.00	No Ice	3.10	3.10	0.07
			0.00			1/2" Ice	5.00	5.00	0.10
			0.00			1" Ice	6.90	6.90	0.13
10' x 3" Dia Omni	A	From Face	1.00	0.0000	98.00	No Ice	3.00	3.00	0.03
			0.00			1/2" Ice	4.03	4.03	0.05
			5.00			1" Ice	5.03	5.03	0.08

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
2' Dish (CSP)	A	Paraboloid w/Radome	From Leg	1.00	Worst		101.00	2.00	No Ice	28.27	0.05
				0.00					1/2" Ice	29.07	0.10
				0.00					1" Ice	29.87	0.12
3' Dish (CSP)	B	Paraboloid w/Radome	From Leg	1.00	Worst		92.50	3.00	No Ice	28.27	0.05
				0.00					1/2" Ice	29.07	0.10
				0.00					1" Ice	29.87	0.12
3' Dish (CSP)	B	Paraboloid w/Radome	From Leg	1.00	Worst		85.00	3.00	No Ice	28.27	0.05
				0.00					1/2" Ice	29.07	0.10
				0.00					1" Ice	29.87	0.12
4-ft Grid Dish	A	Grid	From Face	1.00	Worst		97.00	4.00	No Ice	7.50	0.05
				-6.00					1/2" Ice	13.10	0.08
				0.00					1" Ice	18.70	0.11
4-ft Grid Dish	C	Grid	From Face	1.00	Worst		97.00	4.00	No Ice	7.50	0.05
				6.00					1/2" Ice	13.10	0.08
				0.00					1" Ice	18.70	0.11

222-H Verification Constants

Constant	Value
K_d	0.85
Ice Thickness Importance Factor	1.15
Z_g	900
α	9.5
K_{zmin}	0.85
K_c	n/a
K_t	1
f	1
K_e	1

222-H Section Verification ArRr By Element

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
T1 100.00-80.00	1	HSS8.625x.188	107.956	51.771	C	0.163	0.242	14.395	18.639	6.127	10.866
	1	HSS8.625x.188	107.956	51.771	A	0.163	0.242	14.395	18.639	6.127	10.866
	2	HSS8.625x.188	107.956	51.771	C	0.163	0.242	14.395	18.639	6.127	10.866
	2	HSS8.625x.188	107.956	51.771	B	0.163	0.242	14.395	18.639	6.127	10.866
	3	HSS8.625x.188	107.956	51.771	B	0.163	0.242	14.395	18.639	6.127	10.866
	3	HSS8.625x.188	107.956	51.771	A	0.163	0.242	14.395	18.639	6.127	10.866
					A		Sum:	28.790	37.278	12.253	21.732
					B			28.790	37.278	12.253	21.732
					C			28.790	37.278	12.253	21.732
T2 80.00-60.00	19	HSS8.625x.25	105.137	50.135	C	0.141	0.205	14.395	18.534	5.961	10.665
	19	HSS8.625x.25	105.137	50.135	A	0.141	0.205	14.395	18.534	5.961	10.665
	20	HSS8.625x.25	105.137	50.135	C	0.141	0.205	14.395	18.534	5.961	10.665
	20	HSS8.625x.25	105.137	50.135	B	0.141	0.205	14.395	18.534	5.961	10.665
	21	HSS8.625x.25	105.137	50.135	B	0.141	0.205	14.395	18.534	5.961	10.665
	21	HSS8.625x.25	105.137	50.135	A	0.141	0.205	14.395	18.534	5.961	10.665
					A		Sum:	28.791	37.068	11.921	21.331
					B			28.791	37.068	11.921	21.331
					C			28.791	37.068	11.921	21.331
T3 60.00-40.00	34	HSS8.625x.322	101.479	48.033	C	0.142	0.202	14.395	18.397	5.966	10.574
	34	HSS8.625x.322	101.479	48.033	A	0.142	0.202	14.395	18.397	5.966	10.574
	35	HSS8.625x.322	101.479	48.033	C	0.142	0.202	14.395	18.397	5.966	10.574
	35	HSS8.625x.322	101.479	48.033	B	0.142	0.202	14.395	18.397	5.966	10.574
	36	HSS8.625x.322	101.479	48.033	B	0.142	0.202	14.395	18.397	5.966	10.574
	36	HSS8.625x.322	101.479	48.033	A	0.142	0.202	14.395	18.397	5.966	10.574
					A		Sum:	28.790	36.793	11.932	21.147
					B			28.790	36.793	11.932	21.147
					C			28.790	36.793	11.932	21.147
T4 40.00-20.00	49	HSS10x.375	111.497	50.703	C	0.145	0.2	16.686	20.487	6.941	11.768
	49	HSS10x.375	111.497	50.703	A	0.145	0.2	16.686	20.487	6.941	11.768
	50	HSS10x.375	111.497	50.703	C	0.145	0.2	16.686	20.487	6.941	11.768
	50	HSS10x.375	111.497	50.703	B	0.145	0.2	16.686	20.487	6.941	11.768
	51	HSS10x.375	111.497	50.703	B	0.145	0.2	16.686	20.487	6.941	11.768
	51	HSS10x.375	111.497	50.703	A	0.145	0.2	16.686	20.487	6.941	11.768
					A		Sum:	33.372	40.975	13.883	23.537
					B			33.372	40.975	13.883	23.537
					C			33.372	40.975	13.883	23.537
T5 20.00-0.00	64	HSS10x.375	103.72	46.256	C	0.156	0.203	16.694	20.102	7.038	11.560
	64	HSS10x.375	103.72	46.256	A	0.156	0.203	16.694	20.102	7.038	11.560
	65	HSS10x.375	103.72	46.256	C	0.156	0.203	16.694	20.102	7.038	11.560
	65	HSS10x.375	103.72	46.256	B	0.156	0.203	16.694	20.102	7.038	11.560
	66	HSS10x.375	103.72	46.256	B	0.156	0.203	16.694	20.102	7.038	11.560
	66	HSS10x.375	103.72	46.256	A	0.156	0.203	16.694	20.102	7.038	11.560
					A		Sum:	33.389	40.204	14.075	23.121
					B			33.389	40.204	14.075	23.121
					C			33.389	40.204	14.075	23.121

222-H Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 100.00-80.00	90.00		1.238	1	1		49	A	0.163	12.253
								B	0.163	12.253
								C	0.163	12.253
T2 80.00-60.00	70.00		1.174	1	1		47	A	0.141	11.921
								B	0.141	11.921
								C	0.141	11.921
T3 60.00-40.00	50.00		1.094	1	1		43	A	0.142	11.932
								B	0.142	11.932
								C	0.142	11.932
T4 40.00-20.00	30.00		0.982	1	1		39	A	0.145	13.883
								B	0.145	13.883
								C	0.145	13.883
T5 20.00-0.00	10.00		0.85	1	1		34	A	0.156	14.075
								B	0.156	14.075
								C	0.156	14.075

222-H Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 100.00-80.00	90.00	90.00	1.238	1	1	1.2714	7	A	0.242	32.556
								B	0.242	32.556
								C	0.242	32.556
T2 80.00-60.00	70.00	70.00	1.174	1	1	1.2398	6	A	0.205	30.796
								B	0.205	30.796
								C	0.205	30.796
T3 60.00-40.00	50.00	50.00	1.094	1	1	1.1988	6	A	0.202	31.028
								B	0.202	31.028
								C	0.202	31.028
T4 40.00-20.00	30.00	30.00	0.982	1	1	1.1391	5	A	0.2	33.603
								B	0.2	33.603
								C	0.2	33.603
T5 20.00-0.00	10.00	10.00	0.85	1	1	1.0206	5	A	0.203	32.816
								B	0.203	32.816
								C	0.203	32.816

222-H Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 100.00-80.00	90.00		1.238	1	1		10	A	0.163	15.432
								B	0.163	15.432
								C	0.163	15.432
T2 80.00-60.00	70.00		1.174	1	1		9	A	0.141	15.444
								B	0.141	15.444
								C	0.141	15.444
T3 60.00-40.00	50.00		1.094	1	1		9	A	0.142	15.630
								B	0.142	15.630
								C	0.142	15.630
T4 40.00-20.00	30.00		0.982	1	1		8	A	0.145	17.559

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	$A_r R_r$ ft²
T5 20.00-0.00	10.00		0.85	1	1		7	B	0.145	17.559
								C	0.145	17.559
								A	0.156	18.078
								B	0.156	18.078
								C	0.156	18.078

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	$C_A A_A$ In Face ft²	$C_A A_A$ Out Face ft²
T1	90.00	1.238	49	332.690	A	25.556	28.790	28.790	52.98	0.000	0.000
100.00-80.00					B	25.556	28.790		52.98	18.600	0.000
					C	25.556	28.790		52.98	12.870	0.000
T2 80.00-60.00	70.00	1.174	47	369.390	A	23.217	28.791	28.791	55.36	0.000	0.000
					B	23.217	28.791		55.36	18.600	0.000
					C	23.217	28.791		55.36	20.220	0.000
T3 60.00-40.00	50.00	1.094	43	406.090	A	28.680	28.790	28.790	50.10	0.000	0.000
					B	28.680	28.790		50.10	18.600	0.000
					C	28.680	28.790		50.10	23.600	0.000
T4 40.00-20.00	30.00	0.982	39	443.381	A	30.769	33.372	33.372	52.03	0.000	0.000
					B	30.769	33.372		52.03	18.600	0.000
					C	30.769	33.372		52.03	25.340	0.000
T5 20.00-0.00	10.00	0.85	34	480.054	A	41.298	33.389	33.389	44.71	0.000	0.000
					B	41.298	33.389		44.71	18.600	0.000
					C	41.298	33.389		44.71	27.080	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 %	$C_A A_A$ In Face ft²	$C_A A_A$ Out Face ft²
T1 100.00-80.00	90.00	1.238	7	1.2714	336.932	A	25.556	55.844	37.278	45.80	0.000	0.000
						B	25.556	55.844		45.80	50.039	0.000
						C	25.556	55.844		45.80	54.664	0.000
T2 80.00-60.00	70.00	1.174	6	1.2398	373.527	A	23.217	53.516	37.068	48.31	0.000	0.000
						B	23.217	53.516		48.31	49.853	0.000
						C	23.217	53.516		48.31	79.300	0.000
T3 60.00-40.00	50.00	1.094	6	1.1988	410.090	A	28.680	53.984	36.793	44.51	0.000	0.000
						B	28.680	53.984		44.51	49.610	0.000
						C	28.680	53.984		44.51	90.768	0.000
T4 40.00-20.00	30.00	0.982	5	1.1391	447.181	A	30.769	58.499	40.975	45.90	0.000	0.000
						B	30.769	58.499		45.90	49.259	0.000
						C	30.769	58.499		45.90	95.499	0.000
T5 20.00-0.00	10.00	0.85	5	1.0206	483.461	A	41.298	57.063	40.204	40.87	0.000	0.000
						B	41.298	57.063		40.87	48.565	0.000
						C	41.298	57.063		40.87	96.810	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	90.00	1.238	10	332.690	A	25.556	28.790	28.790	52.98	0.000	0.000
100.00-80.00					B	25.556	28.790		52.98	18.600	0.000
					C	25.556	28.790		52.98	12.870	0.000
T2 80.00-60.00	70.00	1.174	9	369.390	A	23.217	28.791	28.791	55.36	0.000	0.000
					B	23.217	28.791		55.36	18.600	0.000
					C	23.217	28.791		55.36	20.220	0.000
T3 60.00-40.00	50.00	1.094	9	406.090	A	28.680	28.790	28.790	50.10	0.000	0.000
					B	28.680	28.790		50.10	18.600	0.000
					C	28.680	28.790		50.10	23.600	0.000
T4 40.00-20.00	30.00	0.982	8	443.381	A	30.769	33.372	33.372	52.03	0.000	0.000
					B	30.769	33.372		52.03	18.600	0.000
					C	30.769	33.372		52.03	25.340	0.000
T5 20.00-0.00	10.00	0.85	7	480.054	A	41.298	33.389	33.389	44.71	0.000	0.000
					B	41.298	33.389		44.71	18.600	0.000
					C	41.298	33.389		44.71	27.080	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	0.15	2.40	A	0.163	2.723	49	1	1	37.809	5.08	254.19	C
100.00-80.00			B	0.163	2.723		1	1	37.809			
			C	0.163	2.723		1	1	37.809			
T2	0.22	2.68	A	0.141	2.806	47	1	1	35.139	4.82	241.18	C
80.00-60.00			B	0.141	2.806		1	1	35.139			
			C	0.141	2.806		1	1	35.139			
T3	0.23	3.37	A	0.142	2.803	43	1	1	40.612	5.13	256.53	C
60.00-40.00			B	0.142	2.803		1	1	40.612			
			C	0.142	2.803		1	1	40.612			
T4	0.24	4.96	A	0.145	2.791	39	1	1	44.652	5.00	249.98	C
40.00-20.00			B	0.145	2.791		1	1	44.652			
			C	0.145	2.791		1	1	44.652			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	34	1	1	55.373	5.15	257.51	C
			B	0.156	2.751		1	1	55.373			
			C	0.156	2.751		1	1	55.373			
Sum Weight:	1.08	18.74						OTM	1253.21 kip-ft	25.19		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	49	0.825	1	33.337	4.58	228.78	C
100.00-80.00			B	0.163	2.723		0.825	1	33.337			
			C	0.163	2.723		0.825	1	33.337			
T2	0.22	2.68	A	0.141	2.806	47	0.825	1	31.076	4.37	218.62	C
80.00-60.00			B	0.141	2.806		0.825	1	31.076			
			C	0.141	2.806		0.825	1	31.076			
T3	0.23	3.37	A	0.142	2.803	43	0.825	1	35.593	4.61	230.59	C
60.00-40.00			B	0.142	2.803		0.825	1	35.593			
			C	0.142	2.803		0.825	1	35.593			
T4	0.24	4.96	A	0.145	2.791	39	0.825	1	39.267	4.50	225.10	C
40.00-20.00			B	0.145	2.791		0.825	1	39.267			
			C	0.145	2.791		0.825	1	39.267			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	34	0.825	1	48.146	4.58	229.02	C
			B	0.156	2.751		0.825	1	48.146			
			C	0.156	2.751		0.825	1	48.146			
Sum Weight:	1.08	18.74						OTM	1129.33 kip-ft	22.64		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	49	0.8	1	32.698	4.50	225.15	C
100.00-80.00			B	0.163	2.723		0.8	1	32.698			
			C	0.163	2.723		0.8	1	32.698			
T2	0.22	2.68	A	0.141	2.806	47	0.8	1	30.495	4.31	215.40	C
80.00-60.00			B	0.141	2.806		0.8	1	30.495			
			C	0.141	2.806		0.8	1	30.495			
T3	0.23	3.37	A	0.142	2.803	43	0.8	1	34.876	4.54	226.89	C
60.00-40.00			B	0.142	2.803		0.8	1	34.876			
			C	0.142	2.803		0.8	1	34.876			
T4	0.24	4.96	A	0.145	2.791	39	0.8	1	38.498	4.43	221.55	C
40.00-20.00			B	0.145	2.791		0.8	1	38.498			
			C	0.145	2.791		0.8	1	38.498			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	34	0.8	1	47.113	4.50	224.95	C
			B	0.156	2.751		0.8	1	47.113			
			C	0.156	2.751		0.8	1	47.113			
Sum Weight:	1.08	18.74						OTM	1111.64 kip-ft	22.28		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	49	0.85	1	33.976	4.65	232.41	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
100.00-80.00			B	0.163	2.723		0.85	1	33.976			
			C	0.163	2.723		0.85	1	33.976			
T2	0.22	2.68	A	0.141	2.806	47	0.85	1	31.656	4.44	221.84	C
80.00-60.00			B	0.141	2.806		0.85	1	31.656			
			C	0.141	2.806		0.85	1	31.656			
T3	0.23	3.37	A	0.142	2.803	43	0.85	1	36.310	4.69	234.30	C
60.00-40.00			B	0.142	2.803		0.85	1	36.310			
			C	0.142	2.803		0.85	1	36.310			
T4	0.24	4.96	A	0.145	2.791	39	0.85	1	40.036	4.57	228.65	C
40.00-20.00			B	0.145	2.791		0.85	1	40.036			
			C	0.145	2.791		0.85	1	40.036			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	34	0.85	1	49.178	4.66	233.09	C
			B	0.156	2.751		0.85	1	49.178			
			C	0.156	2.751		0.85	1	49.178			
Sum Weight:	1.08	18.74						OTM	1147.03 kip-ft	23.01		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.10	5.74	A	0.242	2.463	7	1	1	58.112	1.18	58.94	C
100.00-80.00			B	0.242	2.463		1	1	58.112			
			C	0.242	2.463		1	1	58.112			
T2	1.36	5.82	A	0.205	2.578	6	1	1	54.013	1.18	58.83	C
80.00-60.00			B	0.205	2.578		1	1	54.013			
			C	0.205	2.578		1	1	54.013			
T3	1.46	6.83	A	0.202	2.591	6	1	1	59.708	1.21	60.42	C
60.00-40.00			B	0.202	2.591		1	1	59.708			
			C	0.202	2.591		1	1	59.708			
T4	1.44	8.51	A	0.2	2.597	5	1	1	64.371	1.15	57.69	C
40.00-20.00			B	0.2	2.597		1	1	64.371			
			C	0.2	2.597		1	1	64.371			
T5 20.00-0.00	1.35	9.16	A	0.203	2.585	5	1	1	74.114	1.10	54.78	C
			B	0.203	2.585		1	1	74.114			
			C	0.203	2.585		1	1	74.114			
Sum Weight:	6.72	36.06						OTM	294.45 kip-ft	5.81		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.10	5.74	A	0.242	2.463	7	0.825	1	53.640	1.12	55.79	C
100.00-80.00			B	0.242	2.463		0.825	1	53.640			

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
			C	0.242	2.463		0.825	1	53.640			
T2	1.36	5.82	A	0.205	2.578	6	0.825	1	49.950	1.12	55.99	C
80.00-60.00			B	0.205	2.578		0.825	1	49.950			
			C	0.205	2.578		0.825	1	49.950			
T3	1.46	6.83	A	0.202	2.591	6	0.825	1	54.689	1.14	57.13	C
60.00-40.00			B	0.202	2.591		0.825	1	54.689			
			C	0.202	2.591		0.825	1	54.689			
T4	1.44	8.51	A	0.2	2.597	5	0.825	1	58.987	1.09	54.52	C
40.00-20.00			B	0.2	2.597		0.825	1	58.987			
			C	0.2	2.597		0.825	1	58.987			
T5 20.00-0.00	1.35	9.16	A	0.203	2.585	5	0.825	1	66.887	1.02	51.11	C
			B	0.203	2.585		0.825	1	66.887			
			C	0.203	2.585		0.825	1	66.887			
Sum Weight:	6.72	36.06						OTM	278.87 kip-ft	5.49		

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 ft²	F K	w plf	Ctrl. Face
T1	1.10	5.74	A	0.242	2.463	7	0.8	1	53.001	1.11	55.34	C
100.00-80.00			B	0.242	2.463		0.8	1	53.001			
			C	0.242	2.463		0.8	1	53.001			
T2	1.36	5.82	A	0.205	2.578	6	0.8	1	49.370	1.11	55.58	C
80.00-60.00			B	0.205	2.578		0.8	1	49.370			
			C	0.205	2.578		0.8	1	49.370			
T3	1.46	6.83	A	0.202	2.591	6	0.8	1	53.972	1.13	56.66	C
60.00-40.00			B	0.202	2.591		0.8	1	53.972			
			C	0.202	2.591		0.8	1	53.972			
T4	1.44	8.51	A	0.2	2.597	5	0.8	1	58.218	1.08	54.06	C
40.00-20.00			B	0.2	2.597		0.8	1	58.218			
			C	0.2	2.597		0.8	1	58.218			
T5 20.00-0.00	1.35	9.16	A	0.203	2.585	5	0.8	1	65.855	1.01	50.59	C
			B	0.203	2.585		0.8	1	65.855			
			C	0.203	2.585		0.8	1	65.855			
Sum Weight:	6.72	36.06						OTM	276.64 kip-ft	5.44		

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	1.10	5.74	A	0.242	2.463	7	0.85	1	54.279	1.12	56.24	C
100.00-80.00			B	0.242	2.463		0.85	1	54.279			
			C	0.242	2.463		0.85	1	54.279			

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
T2	1.36	5.82	A	0.205	2.578	6	0.85	1	50.530	1.13	56.39	C
80.00-60.00			B	0.205	2.578		0.85	1	50.530			
			C	0.205	2.578		0.85	1	50.530			
T3	1.46	6.83	A	0.202	2.591	6	0.85	1	55.406	1.15	57.60	C
60.00-40.00			B	0.202	2.591		0.85	1	55.406			
			C	0.202	2.591		0.85	1	55.406			
T4	1.44	8.51	A	0.2	2.597	5	0.85	1	59.756	1.10	54.97	C
40.00-20.00			B	0.2	2.597		0.85	1	59.756			
			C	0.2	2.597		0.85	1	59.756			
T5 20.00-0.00	1.35	9.16	A	0.203	2.585	5	0.85	1	67.919	1.03	51.64	C
			B	0.203	2.585		0.85	1	67.919			
			C	0.203	2.585		0.85	1	67.919			
Sum Weight:	6.72	36.06						OTM	281.09 kip-ft	5.54		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	10	1	1	40.988	1.08	53.78	C
100.00-80.00			B	0.163	2.723		1	1	40.988			
			C	0.163	2.723		1	1	40.988			
T2	0.22	2.68	A	0.141	2.806	9	1	1	38.661	1.03	51.50	C
80.00-60.00			B	0.141	2.806		1	1	38.661			
			C	0.141	2.806		1	1	38.661			
T3	0.23	3.37	A	0.142	2.803	9	1	1	44.311	1.09	54.45	C
60.00-40.00			B	0.142	2.803		1	1	44.311			
			C	0.142	2.803		1	1	44.311			
T4	0.24	4.96	A	0.145	2.791	8	1	1	48.327	1.05	52.73	C
40.00-20.00			B	0.145	2.791		1	1	48.327			
			C	0.145	2.791		1	1	48.327			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	7	1	1	59.376	1.08	53.98	C
			B	0.156	2.751		1	1	59.376			
			C	0.156	2.751		1	1	59.376			
Sum Weight:	1.08	18.74						OTM	265.79 kip-ft	5.33		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	10	0.825	1	36.515	0.98	48.76	C
100.00-80.00			B	0.163	2.723		0.825	1	36.515			
			C	0.163	2.723		0.825	1	36.515			
T2	0.22	2.68	A	0.141	2.806	9	0.825	1	34.598	0.94	47.05	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
80.00-60.00			B	0.141	2.806		0.825	1	34.598			
			C	0.141	2.806		0.825	1	34.598			
T3	0.23	3.37	A	0.142	2.803	9	0.825	1	39.292	0.99	49.32	C
60.00-40.00			B	0.142	2.803		0.825	1	39.292			
			C	0.142	2.803		0.825	1	39.292			
T4	0.24	4.96	A	0.145	2.791	8	0.825	1	42.943	0.96	47.82	C
40.00-20.00			B	0.145	2.791		0.825	1	42.943			
			C	0.145	2.791		0.825	1	42.943			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	7	0.825	1	52.149	0.97	48.36	C
			B	0.156	2.751		0.825	1	52.149			
			C	0.156	2.751		0.825	1	52.149			
Sum Weight:	1.08	18.74						OTM	241.32 kip-ft	4.83		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	10	0.8	1	35.876	0.96	48.04	C
100.00-80.00			B	0.163	2.723		0.8	1	35.876			
			C	0.163	2.723		0.8	1	35.876			
T2	0.22	2.68	A	0.141	2.806	9	0.8	1	34.018	0.93	46.41	C
80.00-60.00			B	0.141	2.806		0.8	1	34.018			
			C	0.141	2.806		0.8	1	34.018			
T3	0.23	3.37	A	0.142	2.803	9	0.8	1	38.574	0.97	48.59	C
60.00-40.00			B	0.142	2.803		0.8	1	38.574			
			C	0.142	2.803		0.8	1	38.574			
T4	0.24	4.96	A	0.145	2.791	8	0.8	1	42.174	0.94	47.12	C
40.00-20.00			B	0.145	2.791		0.8	1	42.174			
			C	0.145	2.791		0.8	1	42.174			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	7	0.8	1	51.117	0.95	47.55	C
			B	0.156	2.751		0.8	1	51.117			
			C	0.156	2.751		0.8	1	51.117			
Sum Weight:	1.08	18.74						OTM	237.82 kip-ft	4.75		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	2.40	A	0.163	2.723	10	0.85	1	37.154	0.99	49.48	C
100.00-80.00			B	0.163	2.723		0.85	1	37.154			
			C	0.163	2.723		0.85	1	37.154			
T2	0.22	2.68	A	0.141	2.806	9	0.85	1	35.179	0.95	47.68	C
80.00-60.00			B	0.141	2.806		0.85	1	35.179			

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	0.141	2.806		0.85	1	35.179			
T3	0.23	3.37	A	0.142	2.803	9	0.85	1	40.009	1.00	50.06	C
60.00-40.00			B	0.142	2.803		0.85	1	40.009			
			C	0.142	2.803		0.85	1	40.009			
T4	0.24	4.96	A	0.145	2.791	8	0.85	1	43.712	0.97	48.52	C
40.00-20.00			B	0.145	2.791		0.85	1	43.712			
			C	0.145	2.791		0.85	1	43.712			
T5 20.00-0.00	0.25	5.33	A	0.156	2.751	7	0.85	1	53.181	0.98	49.16	C
			B	0.156	2.751		0.85	1	53.181			
			C	0.156	2.751		0.85	1	53.181			
Sum Weight:	1.08	18.74						OTM	244.81 kip-ft	4.90		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	8.29					
Bracing Weight	10.45					
Total Member Self-Weight	18.74			0.44	1.84	
Total Weight	25.02			0.44	1.84	
Wind 0 deg - No Ice		0.00	-36.79	-2263.97	1.84	12.51
Wind 30 deg - No Ice		17.24	-29.97	-1868.64	-1073.09	9.36
Wind 45 deg - No Ice		24.13	-24.21	-1513.15	-1505.82	6.76
Wind 60 deg - No Ice		29.23	-16.94	-1060.98	-1829.34	3.70
Wind 90 deg - No Ice		34.48	0.00	0.44	-2148.02	-2.95
Wind 120 deg - No Ice		31.75	18.39	1132.64	-1951.94	-8.81
Wind 135 deg - No Ice		25.15	25.24	1564.07	-1555.88	-10.94
Wind 150 deg - No Ice		17.24	29.97	1869.51	-1073.09	-12.31
Wind 180 deg - No Ice		0.00	33.88	2123.27	1.84	-12.51
Wind 210 deg - No Ice		-17.24	29.97	1869.51	1076.77	-9.36
Wind 225 deg - No Ice		-24.13	24.21	1514.02	1509.51	-6.76
Wind 240 deg - No Ice		-31.75	18.39	1132.64	1955.63	-3.70
Wind 270 deg - No Ice		-34.48	0.00	0.44	2151.70	2.95
Wind 300 deg - No Ice		-29.23	-16.94	-1060.98	1833.03	8.81
Wind 315 deg - No Ice		-24.13	-24.21	-1513.15	1509.51	10.94
Wind 330 deg - No Ice		-17.24	-29.97	-1868.64	1076.77	12.31
Member Ice	17.31					
Total Weight Ice	53.34			-3.53	1.02	
Wind 0 deg - Ice		0.00	-8.30	-515.33	1.02	-0.11
Wind 30 deg - Ice		4.00	-6.95	-435.19	-247.46	0.99
Wind 45 deg - Ice		5.63	-5.64	-354.41	-348.81	1.45
Wind 60 deg - Ice		6.85	-3.97	-250.52	-425.51	1.82
Wind 90 deg - Ice		8.00	0.00	-3.53	-495.94	2.17
Wind 120 deg - Ice		7.17	4.15	252.37	-440.93	1.94
Wind 135 deg - Ice		5.76	5.77	353.65	-355.11	1.62
Wind 150 deg - Ice		4.00	6.95	428.14	-247.46	1.18
Wind 180 deg - Ice		0.00	7.93	490.46	1.02	0.11
Wind 210 deg - Ice		-4.00	6.95	428.14	249.50	-0.99
Wind 225 deg - Ice		-5.63	5.64	347.35	350.85	-1.45
Wind 240 deg - Ice		-7.17	4.15	252.37	442.97	-1.82
Wind 270 deg - Ice		-8.00	0.00	-3.53	497.98	-2.17

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 300 deg - Ice		-6.85	-3.97	-250.52	427.54	-1.94
Wind 315 deg - Ice		-5.63	-5.64	-354.41	350.85	-1.62
Wind 330 deg - Ice		-4.00	-6.95	-435.19	249.50	-1.18
Total Weight	25.02			0.44	1.84	
Wind 0 deg - Service		0.00	-7.62	-465.47	0.81	2.47
Wind 30 deg - Service		3.58	-6.23	-384.94	-220.64	1.85
Wind 45 deg - Service		5.02	-5.03	-311.82	-309.90	1.34
Wind 60 deg - Service		6.08	-3.52	-218.72	-376.70	0.73
Wind 90 deg - Service		7.16	0.00	0.06	-442.09	-0.58
Wind 120 deg - Service		6.58	3.81	232.82	-400.92	-1.74
Wind 135 deg - Service		5.22	5.24	321.82	-319.78	-2.16
Wind 150 deg - Service		3.58	6.23	385.06	-220.64	-2.43
Wind 180 deg - Service		0.00	7.05	437.63	0.81	-2.47
Wind 210 deg - Service		-3.58	6.23	385.06	222.26	-1.85
Wind 225 deg - Service		-5.02	5.03	311.94	311.52	-1.34
Wind 240 deg - Service		-6.58	3.81	232.82	402.54	-0.73
Wind 270 deg - Service		-7.16	0.00	0.06	443.71	0.58
Wind 300 deg - Service		-6.08	-3.52	-218.72	378.32	1.74
Wind 315 deg - Service		-5.02	-5.03	-311.82	311.52	2.16
Wind 330 deg - Service		-3.58	-6.23	-384.94	222.26	2.43

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 45 deg - No Ice
7	0.9 Dead+1.0 Wind 45 deg - No Ice
8	1.2 Dead+1.0 Wind 60 deg - No Ice
9	0.9 Dead+1.0 Wind 60 deg - No Ice
10	1.2 Dead+1.0 Wind 90 deg - No Ice
11	0.9 Dead+1.0 Wind 90 deg - No Ice
12	1.2 Dead+1.0 Wind 120 deg - No Ice
13	0.9 Dead+1.0 Wind 120 deg - No Ice
14	1.2 Dead+1.0 Wind 135 deg - No Ice
15	0.9 Dead+1.0 Wind 135 deg - No Ice
16	1.2 Dead+1.0 Wind 150 deg - No Ice
17	0.9 Dead+1.0 Wind 150 deg - No Ice
18	1.2 Dead+1.0 Wind 180 deg - No Ice
19	0.9 Dead+1.0 Wind 180 deg - No Ice
20	1.2 Dead+1.0 Wind 210 deg - No Ice
21	0.9 Dead+1.0 Wind 210 deg - No Ice
22	1.2 Dead+1.0 Wind 225 deg - No Ice
23	0.9 Dead+1.0 Wind 225 deg - No Ice
24	1.2 Dead+1.0 Wind 240 deg - No Ice
25	0.9 Dead+1.0 Wind 240 deg - No Ice
26	1.2 Dead+1.0 Wind 270 deg - No Ice
27	0.9 Dead+1.0 Wind 270 deg - No Ice
28	1.2 Dead+1.0 Wind 300 deg - No Ice
29	0.9 Dead+1.0 Wind 300 deg - No Ice
30	1.2 Dead+1.0 Wind 315 deg - No Ice
31	0.9 Dead+1.0 Wind 315 deg - No Ice

Comb. No.	Description
32	1.2 Dead+1.0 Wind 330 deg - No Ice
33	0.9 Dead+1.0 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	100 - 80	Leg	Max Tension	29	8.05	-1.43	0.04
			Max. Compression	24	-13.63	1.96	0.11
			Max. Mx	18	2.87	3.81	0.12
			Max. My	20	-1.09	-0.11	-4.23
			Max. Vy	2	-7.69	1.97	-0.09
			Max. Vx	4	2.67	-0.05	-2.07
		Diagonal	Max Tension	30	4.51	0.00	0.00
			Max. Compression	14	-4.71	0.00	0.00
			Max. Mx	48	0.72	0.15	0.02
			Max. My	42	-0.83	0.15	-0.02
			Max. Vy	48	0.08	0.15	0.02
			Max. Vx	42	-0.00	0.00	0.00
		Top Girt	Max Tension	25	0.06	0.00	0.00
			Max. Compression	28	-0.18	0.00	0.00
			Max. Mx	34	-0.07	-0.44	0.00
			Max. My	50	-0.07	0.00	0.01
			Max. Vy	34	-0.12	0.00	0.00
			Max. Vx	50	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
T2	80 - 60	Leg	Max Tension	29	28.23	-0.09	-0.04
			Max. Compression	2	-37.10	0.92	-0.12
			Max. Mx	18	7.18	-2.64	0.12
			Max. My	20	-2.85	-0.03	2.29
			Max. Vy	2	-9.41	0.92	-0.12
			Max. Vx	20	-3.42	0.04	0.58
		Diagonal	Max Tension	16	6.70	0.00	0.00
			Max. Compression	32	-6.76	0.00	0.00
			Max. Mx	49	1.26	0.19	0.02
			Max. My	40	-0.04	0.19	-0.02
			Max. Vy	49	0.09	0.19	0.02
			Max. Vx	40	-0.00	0.00	0.00
T3	60 - 40	Leg	Max Tension	19	49.71	-0.08	0.01
			Max. Compression	2	-62.60	1.10	-0.04
			Max. Mx	48	-0.51	-1.73	0.01
			Max. My	10	-4.79	-0.05	0.94
			Max. Vy	2	-11.18	1.10	-0.04
			Max. Vx	20	-3.78	0.07	0.70
		Diagonal	Max Tension	32	7.85	0.00	0.00
			Max. Compression	16	-7.95	0.00	0.00
			Max. Mx	37	0.70	0.24	0.03
			Max. My	42	-0.64	0.23	-0.03
			Max. Vy	48	0.11	0.24	0.03
			Max. Vx	42	-0.01	0.00	0.00
T4	40 - 20	Leg	Max Tension	19	72.35	-0.41	0.01
			Max. Compression	2	-90.71	1.74	-0.03
			Max. Mx	48	0.40	-5.39	0.01
			Max. My	4	-6.20	-0.08	-1.31
			Max. Vy	2	-13.49	1.74	-0.03
			Max. Vx	4	4.06	0.13	-0.51
		Diagonal	Max Tension	16	8.98	0.00	0.00
			Max. Compression	14	-9.13	0.00	0.00
			Max. Mx	38	0.36	0.35	-0.04
			Max. My	48	-2.84	0.34	0.04
			Max. Vy	38	0.14	0.35	-0.04
			Max. Vx	49	0.01	0.00	0.00
T5	20 - 0	Leg	Max Tension	19	88.46	0.61	-0.04
			Max. Compression	2	-111.16	1.57	-0.03
			Max. Mx	46	-34.50	6.59	0.01
			Max. My	20	-8.60	-0.09	1.95
			Max. Vy	46	-1.12	6.59	0.01
			Max. Vx	10	-0.34	-0.09	1.94
		Diagonal	Max Tension	16	9.52	0.00	0.00
			Max. Compression	14	-9.80	0.00	0.00
			Max. Mx	49	-1.85	0.54	-0.05
			Max. My	39	-5.35	0.52	-0.06
			Max. Vy	49	0.17	0.54	-0.05
			Max. Vx	39	0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	24	118.07	18.58	-10.63
	Max. H_x	24	118.07	18.58	-10.63
	Max. H_z	7	-91.01	-14.78	9.49

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. Vert	9	-93.59	-15.62	8.92
	Min. H_x	9	-93.59	-15.62	8.92
	Min. H_z	24	118.07	18.58	-10.63
Leg B	Max. Vert	12	117.89	-18.43	-10.89
	Max. H_x	29	-93.73	15.47	9.19
	Max. H_z	31	-91.15	14.57	9.86
	Min. Vert	29	-93.73	15.47	9.19
	Min. H_x	12	117.89	-18.43	-10.89
	Min. H_z	14	111.81	-16.80	-11.19
Leg A	Max. Vert	2	118.25	0.30	21.46
	Max. H_x	27	7.49	3.91	0.80
	Max. H_z	2	118.25	0.30	21.46
	Min. Vert	19	-93.99	-0.30	-18.04
	Min. H_x	10	9.98	-3.91	1.07
	Min. H_z	19	-93.99	-0.30	-18.04

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	25.02	0.00	0.00	0.43	1.84	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	30.02	0.00	-36.79	-2265.31	2.21	12.51
0.9 Dead+1.0 Wind 0 deg - No Ice	22.52	0.00	-36.79	-2265.08	1.65	12.51
1.2 Dead+1.0 Wind 30 deg - No Ice	30.03	17.24	-29.97	-1869.73	-1073.39	9.32
0.9 Dead+1.0 Wind 30 deg - No Ice	22.52	17.24	-29.97	-1869.57	-1073.78	9.31
1.2 Dead+1.0 Wind 45 deg - No Ice	30.02	24.13	-24.21	-1514.01	-1506.40	6.71
0.9 Dead+1.0 Wind 45 deg - No Ice	22.52	24.13	-24.21	-1513.91	-1506.72	6.71
1.2 Dead+1.0 Wind 60 deg - No Ice	30.02	29.23	-16.94	-1061.56	-1830.12	3.65
0.9 Dead+1.0 Wind 60 deg - No Ice	22.52	29.23	-16.94	-1061.53	-1830.39	3.65
1.2 Dead+1.0 Wind 90 deg - No Ice	30.03	34.48	-0.00	0.52	-2149.00	-3.00
0.9 Dead+1.0 Wind 90 deg - No Ice	22.52	34.48	-0.00	0.39	-2149.22	-3.00
1.2 Dead+1.0 Wind 120 deg - No Ice	30.02	31.75	18.39	1133.43	-1952.80	-8.87
0.9 Dead+1.0 Wind 120 deg - No Ice	22.52	31.75	18.39	1133.12	-1953.05	-8.87
1.2 Dead+1.0 Wind 135 deg - No Ice	30.02	25.15	25.24	1565.13	-1556.49	-10.99
0.9 Dead+1.0 Wind 135 deg - No Ice	22.52	25.15	25.24	1564.76	-1556.80	-10.99
1.2 Dead+1.0 Wind 150 deg - No Ice	30.02	17.24	29.97	1870.77	-1073.40	-12.35
0.9 Dead+1.0 Wind 150 deg - No Ice	22.52	17.24	29.97	1870.35	-1073.79	-12.36
1.2 Dead+1.0 Wind 180 deg - No Ice	30.02	0.00	33.88	2124.68	2.21	-12.51
0.9 Dead+1.0 Wind 180 deg -	22.52	0.00	33.88	2124.22	1.65	-12.51

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
No Ice						
1.2 Dead+1.0 Wind 210 deg - No Ice	30.03	-17.24	29.97	1870.77	1077.82	-9.32
0.9 Dead+1.0 Wind 210 deg - No Ice	22.52	-17.24	29.97	1870.35	1077.10	-9.31
1.2 Dead+1.0 Wind 225 deg - No Ice	30.02	-24.13	24.21	1515.06	1510.83	-6.71
0.9 Dead+1.0 Wind 225 deg - No Ice	22.52	-24.13	24.21	1514.69	1510.04	-6.71
1.2 Dead+1.0 Wind 240 deg - No Ice	30.02	-31.75	18.39	1133.43	1957.23	-3.65
0.9 Dead+1.0 Wind 240 deg - No Ice	22.52	-31.75	18.39	1133.13	1956.37	-3.65
1.2 Dead+1.0 Wind 270 deg - No Ice	30.03	-34.48	-0.00	0.52	2153.42	3.00
0.9 Dead+1.0 Wind 270 deg - No Ice	22.52	-34.48	-0.00	0.39	2152.54	3.00
1.2 Dead+1.0 Wind 300 deg - No Ice	30.02	-29.23	-16.94	-1061.57	1834.54	8.87
0.9 Dead+1.0 Wind 300 deg - No Ice	22.52	-29.23	-16.94	-1061.53	1833.70	8.87
1.2 Dead+1.0 Wind 315 deg - No Ice	30.02	-24.13	-24.21	-1514.02	1510.82	10.98
0.9 Dead+1.0 Wind 315 deg - No Ice	22.52	-24.13	-24.21	-1513.91	1510.03	10.98
1.2 Dead+1.0 Wind 330 deg - No Ice	30.02	-17.24	-29.97	-1869.74	1077.81	12.35
0.9 Dead+1.0 Wind 330 deg - No Ice	22.52	-17.24	-29.97	-1869.58	1077.09	12.36
1.2 Dead+1.0 Ice+1.0 Temp	58.34	0.00	0.00	-3.45	1.39	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	58.34	0.00	-8.30	-515.77	1.39	-0.11
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	58.34	4.00	-6.95	-435.53	-247.33	0.98
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	58.34	5.63	-5.64	-354.67	-348.78	1.45
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	58.34	6.85	-3.97	-250.69	-425.55	1.81
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	58.34	8.00	0.00	-3.46	-496.05	2.16
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	58.34	7.17	4.15	252.70	-441.00	1.93
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	58.34	5.76	5.77	354.06	-355.11	1.61
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	58.34	4.00	6.95	428.62	-247.33	1.18
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	58.34	0.00	7.93	491.01	1.39	0.11
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	58.34	-4.00	6.95	428.62	250.11	-0.98
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	58.34	-5.63	5.64	347.76	351.58	-1.44
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	58.34	-7.17	4.15	252.70	443.78	-1.81
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	58.34	-8.00	0.00	-3.46	498.83	-2.16
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	58.34	-6.85	-3.97	-250.69	428.32	-1.93
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	58.34	-5.63	-5.64	-354.67	351.56	-1.61
1.2 Dead+1.0 Wind 330	58.34	-4.00	-6.95	-435.53	250.11	-1.18

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	25.02	0.00	-7.62	-465.32	1.84	2.47
Dead+Wind 30 deg - Service	25.02	3.58	-6.23	-384.75	-219.72	1.84
Dead+Wind 45 deg - Service	25.02	5.02	-5.03	-311.59	-309.02	1.32
Dead+Wind 60 deg - Service	25.02	6.08	-3.52	-218.46	-375.85	0.72
Dead+Wind 90 deg - Service	25.02	7.16	0.00	0.43	-441.27	-0.59
Dead+Wind 120 deg - Service	25.02	6.58	3.81	233.31	-400.07	-1.75
Dead+Wind 135 deg - Service	25.02	5.22	5.24	322.35	-318.90	-2.17
Dead+Wind 150 deg - Service	25.02	3.58	6.23	385.61	-219.71	-2.44
Dead+Wind 180 deg - Service	25.02	0.00	7.05	438.21	1.84	-2.47
Dead+Wind 210 deg - Service	25.02	-3.58	6.23	385.61	223.40	-1.84
Dead+Wind 225 deg - Service	25.02	-5.02	5.03	312.46	312.70	-1.33
Dead+Wind 240 deg - Service	25.02	-6.58	3.81	233.31	403.76	-0.72
Dead+Wind 270 deg - Service	25.02	-7.16	0.00	0.43	444.96	0.59
Dead+Wind 300 deg - Service	25.02	-6.08	-3.52	-218.46	379.54	1.75
Dead+Wind 315 deg - Service	25.02	-5.02	-5.03	-311.59	312.70	2.18
Dead+Wind 330 deg - Service	25.02	-3.58	-6.23	-384.75	223.40	2.44

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-25.02	0.00	0.00	25.02	0.00	0.000%
2	0.00	-30.02	-36.79	-0.00	30.02	36.79	0.000%
3	0.00	-22.52	-36.79	-0.00	22.52	36.79	0.000%
4	17.24	-30.02	-29.97	-17.24	30.03	29.97	0.002%
5	17.24	-22.52	-29.97	-17.24	22.52	29.97	0.000%
6	24.13	-30.02	-24.21	-24.13	30.02	24.21	0.000%
7	24.13	-22.52	-24.21	-24.13	22.52	24.21	0.000%
8	29.23	-30.02	-16.94	-29.23	30.02	16.94	0.000%
9	29.23	-22.52	-16.94	-29.23	22.52	16.94	0.000%
10	34.48	-30.02	0.00	-34.48	30.03	0.00	0.002%
11	34.48	-22.52	0.00	-34.48	22.52	0.00	0.000%
12	31.75	-30.02	18.39	-31.75	30.02	-18.39	0.000%
13	31.75	-22.52	18.39	-31.75	22.52	-18.39	0.000%
14	25.15	-30.02	25.24	-25.15	30.02	-25.24	0.000%
15	25.15	-22.52	25.24	-25.15	22.52	-25.24	0.000%
16	17.24	-30.02	29.97	-17.24	30.02	-29.97	0.000%
17	17.24	-22.52	29.97	-17.24	22.52	-29.97	0.000%
18	0.00	-30.02	33.88	-0.00	30.02	-33.88	0.000%
19	0.00	-22.52	33.88	-0.00	22.52	-33.88	0.000%
20	-17.24	-30.02	29.97	17.24	30.03	-29.97	0.002%
21	-17.24	-22.52	29.97	17.24	22.52	-29.97	0.000%
22	-24.13	-30.02	24.21	24.13	30.02	-24.21	0.000%
23	-24.13	-22.52	24.21	24.13	22.52	-24.21	0.000%
24	-31.75	-30.02	18.39	31.75	30.02	-18.39	0.000%
25	-31.75	-22.52	18.39	31.75	22.52	-18.39	0.000%
26	-34.48	-30.02	0.00	34.48	30.03	0.00	0.002%
27	-34.48	-22.52	0.00	34.48	22.52	0.00	0.000%
28	-29.23	-30.02	-16.94	29.23	30.02	16.94	0.000%
29	-29.23	-22.52	-16.94	29.23	22.52	16.94	0.000%
30	-24.13	-30.02	-24.21	24.13	30.02	24.21	0.000%
31	-24.13	-22.52	-24.21	24.13	22.52	24.21	0.000%
32	-17.24	-30.02	-29.97	17.24	30.02	29.97	0.000%
33	-17.24	-22.52	-29.97	17.24	22.52	29.97	0.000%
34	0.00	-58.34	0.00	0.00	58.34	0.00	0.000%
35	0.00	-58.34	-8.30	0.00	58.34	8.30	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
36	4.00	-58.34	-6.95	-4.00	58.34	6.95	0.000%
37	5.63	-58.34	-5.64	-5.63	58.34	5.64	0.000%
38	6.85	-58.34	-3.97	-6.85	58.34	3.97	0.000%
39	8.00	-58.34	0.00	-8.00	58.34	-0.00	0.000%
40	7.17	-58.34	4.15	-7.17	58.34	-4.15	0.000%
41	5.76	-58.34	5.77	-5.76	58.34	-5.77	0.000%
42	4.00	-58.34	6.95	-4.00	58.34	-6.95	0.000%
43	0.00	-58.34	7.93	0.00	58.34	-7.93	0.000%
44	-4.00	-58.34	6.95	4.00	58.34	-6.95	0.000%
45	-5.63	-58.34	5.64	5.63	58.34	-5.64	0.000%
46	-7.17	-58.34	4.15	7.17	58.34	-4.15	0.000%
47	-8.00	-58.34	0.00	8.00	58.34	-0.00	0.000%
48	-6.85	-58.34	-3.97	6.85	58.34	3.97	0.000%
49	-5.63	-58.34	-5.64	5.63	58.34	5.64	0.000%
50	-4.00	-58.34	-6.95	4.00	58.34	6.95	0.000%
51	0.00	-25.02	-7.62	0.00	25.02	7.62	0.000%
52	3.58	-25.02	-6.23	-3.58	25.02	6.23	0.000%
53	5.02	-25.02	-5.03	-5.02	25.02	5.03	0.000%
54	6.08	-25.02	-3.52	-6.08	25.02	3.52	0.000%
55	7.16	-25.02	0.00	-7.16	25.02	0.00	0.000%
56	6.58	-25.02	3.81	-6.58	25.02	-3.81	0.000%
57	5.22	-25.02	5.24	-5.22	25.02	-5.24	0.000%
58	3.58	-25.02	6.23	-3.58	25.02	-6.23	0.000%
59	0.00	-25.02	7.05	0.00	25.02	-7.05	0.000%
60	-3.58	-25.02	6.23	3.58	25.02	-6.23	0.000%
61	-5.02	-25.02	5.03	5.02	25.02	-5.03	0.000%
62	-6.58	-25.02	3.81	6.58	25.02	-3.81	0.000%
63	-7.16	-25.02	0.00	7.16	25.02	0.00	0.000%
64	-6.08	-25.02	-3.52	6.08	25.02	3.52	0.000%
65	-5.02	-25.02	-5.03	5.02	25.02	5.03	0.000%
66	-3.58	-25.02	-6.23	3.58	25.02	6.23	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00003276
3	Yes	4	0.00000001	0.00003223
4	Yes	4	0.00000001	0.00003174
5	Yes	4	0.00000001	0.00003093
6	Yes	4	0.00000001	0.00003142
7	Yes	4	0.00000001	0.00003090
8	Yes	4	0.00000001	0.00003136
9	Yes	4	0.00000001	0.00003084
10	Yes	4	0.00000001	0.00003182
11	Yes	4	0.00000001	0.00003100
12	Yes	4	0.00000001	0.00003261
13	Yes	4	0.00000001	0.00003209
14	Yes	4	0.00000001	0.00003237
15	Yes	4	0.00000001	0.00003185
16	Yes	4	0.00000001	0.00003205
17	Yes	4	0.00000001	0.00003155
18	Yes	4	0.00000001	0.00003144
19	Yes	4	0.00000001	0.00003093
20	Yes	4	0.00000001	0.00003174

21	Yes	4	0.00000001	0.00003092
22	Yes	4	0.00000001	0.00003130
23	Yes	4	0.00000001	0.00003079
24	Yes	4	0.00000001	0.00003267
25	Yes	4	0.00000001	0.00003214
26	Yes	4	0.00000001	0.00003190
27	Yes	4	0.00000001	0.00003106
28	Yes	4	0.00000001	0.00003143
29	Yes	4	0.00000001	0.00003090
30	Yes	4	0.00000001	0.00003185
31	Yes	4	0.00000001	0.00003132
32	Yes	4	0.00000001	0.00003213
33	Yes	4	0.00000001	0.00003161
34	Yes	4	0.00000001	0.00008200
35	Yes	4	0.00000001	0.00009272
36	Yes	4	0.00000001	0.00009274
37	Yes	4	0.00000001	0.00009253
38	Yes	4	0.00000001	0.00009247
39	Yes	4	0.00000001	0.00009235
40	Yes	4	0.00000001	0.00009234
41	Yes	4	0.00000001	0.00010024
42	Yes	4	0.00000001	0.00009241
43	Yes	4	0.00000001	0.00009228
44	Yes	4	0.00000001	0.00009249
45	Yes	4	0.00000001	0.00010039
46	Yes	4	0.00000001	0.00009249
47	Yes	4	0.00000001	0.00009253
48	Yes	4	0.00000001	0.00009264
49	Yes	4	0.00000001	0.00009268
50	Yes	4	0.00000001	0.00009284
51	Yes	4	0.00000001	0.00001116
52	Yes	4	0.00000001	0.00000001
53	Yes	4	0.00000001	0.00000001
54	Yes	4	0.00000001	0.00000001
55	Yes	4	0.00000001	0.00000001
56	Yes	4	0.00000001	0.00001107
57	Yes	4	0.00000001	0.00000001
58	Yes	4	0.00000001	0.00000001
59	Yes	4	0.00000001	0.00000001
60	Yes	4	0.00000001	0.00000001
61	Yes	4	0.00000001	0.00000001
62	Yes	4	0.00000001	0.00001115
63	Yes	4	0.00000001	0.00000001
64	Yes	4	0.00000001	0.00000001
65	Yes	4	0.00000001	0.00000001
66	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	0.283	51	0.0156	0.0030
T2	80 - 60	0.210	51	0.0151	0.0023
T3	60 - 40	0.134	51	0.0128	0.0015
T4	40 - 20	0.070	51	0.0092	0.0008
T5	20 - 0	0.025	51	0.0052	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	2' Dish	51	0.283	0.0156	0.0030	Inf
100.00	10-ft Lightning Rod	51	0.283	0.0156	0.0030	Inf
98.00	APXV18-206516S-C-A20	51	0.275	0.0156	0.0029	Inf
97.00	4-ft Grid Dish	51	0.272	0.0156	0.0029	Inf
92.50	3' Dish	51	0.256	0.0155	0.0027	Inf
85.00	3' Dish	51	0.228	0.0154	0.0025	724868
82.00	9-ft Omni	51	0.217	0.0152	0.0024	627068
65.00	20' 8 Bay Di-Pole	51	0.152	0.0136	0.0018	527166
63.00	ROHN 4-ft Side Arm	51	0.145	0.0133	0.0017	422521
62.00	14' x 3" Dia Omni	51	0.141	0.0131	0.0016	387011
30.00	3' Whip	51	0.045	0.0073	0.0005	220378
25.00	ANT790F2	51	0.034	0.0063	0.0004	210058

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	1.379	2	0.0759	0.0152
T2	80 - 60	1.023	2	0.0739	0.0119
T3	60 - 40	0.652	2	0.0627	0.0078
T4	40 - 20	0.339	2	0.0448	0.0039
T5	20 - 0	0.123	2	0.0252	0.0017

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	2' Dish	2	1.379	0.0759	0.0152	456710
100.00	10-ft Lightning Rod	2	1.379	0.0759	0.0152	456710
98.00	APXV18-206516S-C-A20	2	1.344	0.0759	0.0149	456710
97.00	4-ft Grid Dish	2	1.327	0.0759	0.0147	456710
92.50	3' Dish	2	1.248	0.0758	0.0138	304474
85.00	3' Dish	2	1.114	0.0751	0.0126	152237
82.00	9-ft Omni	2	1.060	0.0745	0.0122	131835
65.00	20' 8 Bay Di-Pole	2	0.742	0.0664	0.0089	105290
63.00	ROHN 4-ft Side Arm	2	0.705	0.0649	0.0085	84305
62.00	14' x 3" Dia Omni	2	0.687	0.0642	0.0083	77249
30.00	3' Whip	2	0.217	0.0355	0.0027	45029
25.00	ANT790F2	2	0.167	0.0305	0.0022	43000

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	100	Leg	A325N	0.8750	5	1.61	41.56	0.039 ✔	1	Bolt Tension
		Diagonal	A325N	0.7500	1	4.51	12.62	0.358 ✔	1	Member Bearing
		Top Girt	A325N	0.6250	1	0.18	13.81	0.013 ✔	1	Bolt Shear
T2	80	Leg	A325N	1.0000	5	5.65	54.52	0.104 ✔	1	Bolt Tension
		Diagonal	A325N	0.7500	1	6.70	12.62	0.531 ✔	1	Member Bearing
T3	60	Leg	A325N	1.2500	5	9.94	87.22	0.114 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	7.85	14.79	0.531 ✔	1	Member Bearing
T4	40	Leg	A325N	1.2500	5	14.47	87.22	0.166 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	8.98	22.18	0.405 ✔	1	Member Bearing
T5	20	Leg	A325N	1.2500	5	17.69	87.22	0.203 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	9.52	18.49	0.515 ✔	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	HSS8.625x.188	20.03	9.93	39.9 K=1.00	4.6196	-13.63	158.38	0.086 [1] ✔
T2	80 - 60	HSS8.625x.25	20.03	9.93	40.1 K=1.00	6.1429	-37.10	210.31	0.176 [1] ✔
T3	60 - 40	HSS8.625x.322	20.03	9.93	40.5 K=1.00	7.8461	-62.60	268.21	0.233 [1] ✔
T4	40 - 20	HSS10x.375	20.02	9.93	34.9 K=1.00	10.5815	-90.71	371.16	0.244 [1] ✔
T5	20 - 0	HSS10x.375	20.03	10.02	35.2 K=1.00	10.5815	-111.16	370.67	0.300 [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	100 - 80	L3 1/2x3x1/4	18.71	9.48	180.3 K=1.00	1.5600	-4.71	13.73	0.343 [1] ✔
T2	80 - 60	L3 1/2x3 1/2x1/4	20.30	10.27	177.5	1.6900	-6.76	15.35	0.440 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	60 - 40	L4x4x1/4	21.91	11.05	166.8 K=1.00	1.9400	-7.95	19.95	0.399 [1] ✔
T4	40 - 20	L4x4x3/8	23.45	11.80	179.7 K=1.00	2.8600	-9.13	25.36	0.360 [1] ✔
T5	20 - 0	L5x5x5/16	25.24	12.73	153.7 K=1.00	3.0300	-9.80	36.70	0.267 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L3 1/2x3x1/4	15.01	14.05	267.2 K=1.00	1.5600	0.18	6.25	0.028 [1] ✔
		KL/R > 200 (C) - 6							

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	HSS8.625x.188	20.03	9.93	39.9	4.6196	8.05	174.62	0.046 [1] ✔
T2	80 - 60	HSS8.625x.25	20.03	9.93	40.1	6.1429	28.23	232.20	0.122 [1] ✔
T3	60 - 40	HSS8.625x.322	20.03	9.93	40.5	7.8461	49.72	296.58	0.168 [1] ✔
T4	40 - 20	HSS10x.375	20.02	9.93	34.9	10.5815	72.35	399.98	0.181 [1] ✔
T5	20 - 0	HSS10x.375	20.03	10.02	35.2	10.5815	88.46	399.98	0.221 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L3 1/2x3x1/4	18.71	9.48	126.4	1.0059	4.51	43.76	0.103 [1] ✔
T2	80 - 60	L3 1/2x3 1/2x1/4	20.30	10.27	114.5	1.1034	6.70	48.00	0.140 [1] ✔
T3	60 - 40	L4x4x1/4	21.91	11.05	107.6	1.2675	7.85	55.14	0.142 [1] ✔
T4	40 - 20	L4x4x3/8	23.45	11.80	116.6	1.8637	8.98	81.07	0.111 [1] ✔
T5	20 - 0	L5x5x5/16	25.24	12.73	98.5	2.0381	9.52	88.66	0.107 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

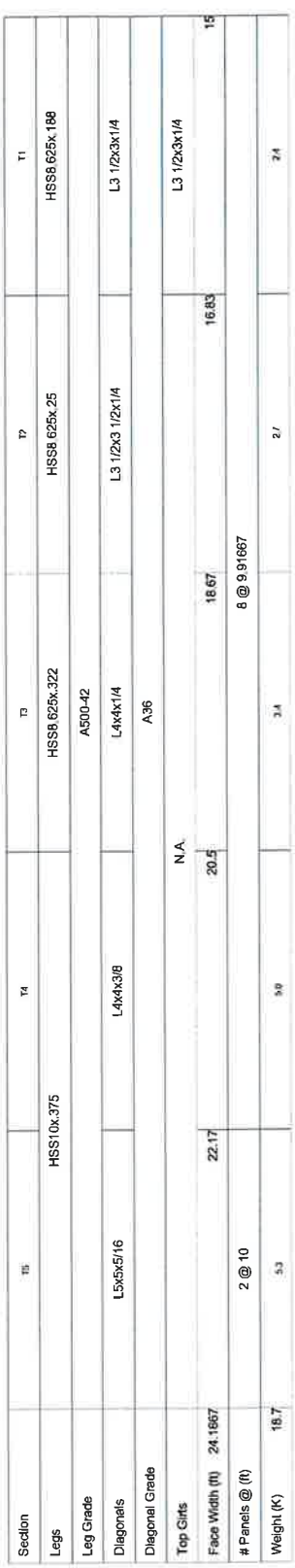
Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	100 - 80	L3 1/2x3x1/4	15.01	14.05	187.8	1.0294	0.06	44.78	0.001 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	100 - 80	Leg	HSS8.625x.188	3	-13.60	158.38	14.7	Pass
T2	80 - 60	Leg	HSS8.625x.25	21	-37.10	210.31	17.6	Pass
T3	60 - 40	Leg	HSS8.625x.322	36	-62.60	268.21	23.3	Pass
T4	40 - 20	Leg	HSS10x.375	51	-90.71	371.16	24.4	Pass
T5	20 - 0	Leg	HSS10x.375	66	-111.16	370.67	30.0	Pass
T1	100 - 80	Diagonal	L3 1/2x3x1/4	9	-4.71	13.73	34.3 35.8 (b)	Pass
T2	80 - 60	Diagonal	L3 1/2x3 1/2x1/4	25	-6.76	15.35	44.0 53.1 (b)	Pass
T3	60 - 40	Diagonal	L4x4x1/4	39	-7.95	19.95	39.9 53.1 (b)	Pass
T4	40 - 20	Diagonal	L4x4x3/8	54	-9.13	25.36	36.0 40.5 (b)	Pass
T5	20 - 0	Diagonal	L5x5x5/16	69	-9.80	36.70	26.7 51.5 (b)	Pass
T1	100 - 80	Top Girt	L3 1/2x3x1/4	6	-0.18	6.25	2.8	Pass
							Summary	
							Leg (T5) 30.0	Pass
							Diagonal (T3) 53.1	Pass
							Top Girt 2.8	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						(T1)		
						Bolt Checks	53.1	Pass
						RATING =	**53.1**	**Pass**



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2' Dish (CSP)	101	SitePro VFA12-HD (Verizon)	85
10-ft Lightning Rod	100	SitePro VFA12-HD (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	MT6413-77A (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
13-ft Face Mount Frame (T-Mobile)	98	MT6413-77A (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	3' Dish (CSP)	85
10' x 3" Dia Omni	98	MT6413-77A (Verizon)	85
APXV18-206516S-C-A20 (T-Mobile)	98	(2) NHH-65B-R2B (Verizon)	85
4-ft Grid Dish	97	12' Dipole	82
4-ft Grid Dish	97	ROHN 4-ft Side Arm	82
3' Dish (CSP)	92.5	9-ft Omni	82
RF4439d-25A (B2/B66A RRH) (Verizon)	85	2-ft Stand Off	82
		20' 8 Bay Di-Pole	65
RF4461d-13A (Verizon)	85	ROHN 4-ft Side Arm	63
RF4439d-25A (B2/B66A RRH) (Verizon)	85	14' x 3" Dia Omni	62
		6' Standoff Arm	62
RF4461d-13A (Verizon)	85	ROHN 3-ft Side Arm	30
RF4439d-25A (B2/B66A RRH) (Verizon)	85	3' Whip	30
		3' Whip (Inverted)	30
RF4461d-13A (Verizon)	85	2-ft Stand Off	25
RC2DC-3315-PF-48 (Verizon)	85	ANT790F2	25
SitePro VFA12-HD (Verizon)	85		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 90 mph wind.

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

Job: 22017.14 - Colchester 4			
Project: 100-ft Lattice Tower #51 Colchester			
Client: Verizon	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 09/20/23	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	22017.14 - Colchester 4	1 of 3
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 100-ft Lattice Tower #51 Colchester	**Date** 16:13:05 09/20/23
	Client Verizon	**Designed by** TJL

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	1.204	35	0.0659	0.0127
T2	80 - 60	0.895	35	0.0643	0.0097
T3	60 - 40	0.572	35	0.0547	0.0065
T4	40 - 20	0.298	35	0.0392	0.0033
T5	20 - 0	0.109	35	0.0220	0.0015

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	2' Dish	35	1.204	0.0659	0.0127	491180
100.00	10-ft Lightning Rod	35	1.204	0.0659	0.0127	491180
98.00	APXV18-206516S-C-A20	35	1.174	0.0659	0.0124	491180
97.00	4-ft Grid Dish	35	1.159	0.0659	0.0123	491180
92.50	3' Dish	35	1.090	0.0658	0.0116	327455
85.00	3' Dish	35	0.975	0.0652	0.0105	163727
82.00	9-ft Omni	35	0.927	0.0647	0.0100	141577
65.00	20' 8 Bay Di-Pole	35	0.651	0.0578	0.0074	125578
63.00	ROHN 4-ft Side Arm	35	0.619	0.0566	0.0070	99498
62.00	14' x 3" Dia Omni	35	0.603	0.0560	0.0069	90840
30.00	3' Whip	35	0.192	0.0310	0.0023	51839
25.00	ANT790F2	35	0.147	0.0267	0.0019	49659

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	100 - 80	1.537	19	0.0845	0.0127
T2	80 - 60	1.140	19	0.0822	0.0097
T3	60 - 40	0.729	19	0.0698	0.0065
T4	40 - 20	0.380	19	0.0500	0.0033
T5	20 - 0	0.138	19	0.0281	0.0015

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	2' Dish	19	1.537	0.0845	0.0127	447570
100.00	10-ft Lightning Rod	19	1.537	0.0845	0.0127	447570
98.00	APXV18-206516S-C-A20	19	1.498	0.0845	0.0124	447570
97.00	4-ft Grid Dish	19	1.478	0.0845	0.0123	447570
92.50	3' Dish	19	1.390	0.0844	0.0116	298379
85.00	3' Dish	19	1.242	0.0835	0.0105	149190
82.00	9-ft Omni	19	1.181	0.0828	0.0100	129263
65.00	20' 8 Bay Di-Pole	19	0.829	0.0738	0.0074	99714
63.00	ROHN 4-ft Side Arm	19	0.788	0.0723	0.0070	80107

tnxTower	Job	Page
	22017.14 - Colchester 4	3 of 3
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 100-ft Lattice Tower #51 Colchester	**Date** 16:13:05 09/20/23
	Client Verizon	**Designed by** TJL

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	°	°	*ft*
62.00	14' x 3" Dia Omni	19	0.768	0.0714	0.0069	73442
30.00	3' Whip	19	0.245	0.0396	0.0023	40621
25.00	ANT790F2	19	0.188	0.0341	0.0019	38927

Program Version 8.1.1.0 - 6/3/2021 File:J:/Jobs/2201700.WI/14_Colchester 4 CT/05_Structural/Tower Analysis/Backup Documentation/Rev (1)/Tnxtower/Twist and Sway/100-ft Lattice Tower #51 Colchester.eri

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

Subject: Anchor Bolt Analysis

Location: 100-ft Lattice Tower
Colchester, CT

Rev. 1: 9/20/23

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 22017.14

Anchor Bolt Analysis:

Input Data:

Tower Reactions:

Tension Force =	Tension := 94·kips	(Input From tnxTower)
Compression Force =	Compression := 118·kips	(Input From tnxTower)
Shear Force =	Shear := 21·kips	(Input From tnxTower)

Anchor Bolt Data:

ASTMA36

Number of Anchor Bolts =	N := 6	(User Input)
Bolt Ultimate Strength =	F_u := 58·ksi	(User Input)
Bolt Yield Strength =	F_y := 36·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 1.25·in	(User Input)
Threads per Inch =	n := 7	(User Input)
Length from Top of Pier to Bottom of Leveling Nut =	L_{ar} := 1.5·in	(User Input)

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Subject:	Anchor Bolt Analysis
Location:	100-ft Lattice Tower Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 1.227 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n} \right)^2 = 0.969 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 1.111 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.278 \cdot in$

Elastic Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.135 \cdot in^3$

Plastic Section Modulus of Bolt = $Z_x := \frac{D_n^3}{6} = 0.228 \cdot in^3$

Anchor Bolt Design Strength:

Resistance Factor for Flexure = $\phi_f := 0.9$

Resistance Factor for Compression = $\phi_c := 0.9$

Resistance Factor for Tension = $\phi_t := 0.75$

Resistance Factor for Shear = $\phi_v := 0.75$

Design Tensile Strength = $\Phi R_{nt} := \phi_t \cdot F_u \cdot A_n = 42.2 \cdot k$

Design Compression Strength = $\Phi R_{nc} := \phi_c \cdot F_y \cdot A_g = 39.8 \cdot k$

Design Shear Strength (Tension) = $\Phi R_{nv} := \phi_v \cdot 0.5 F_u \cdot A_g = 26.7 \cdot k$

Design Shear Strength (Compression) = $\Phi R_{nvc} := \phi_c \cdot 0.6 F_y \cdot A_g \cdot 0.75 = 17.9 \cdot k$

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Subject: Anchor Bolt Analysis

Location: 100-ft Lattice Tower
Colchester, CT

Rev. 1: 9/20/23

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 22017.14

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $P_{ut} := \frac{\text{Tension}}{N} = 15.7 \cdot \text{kips}$

Maximum Compressive Force = $P_{uc} := \frac{\text{Compression}}{N} = 19.7 \cdot \text{kips}$

Maximum Shear Force = $V_u := \frac{\text{Shear}}{N} = 3.5 \cdot \text{kips}$

Condition1 = $\text{Condition1} := \text{if}\left[\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2\right] \le 1.00, \text{"OK"}, \text{"Overstressed"}\right]$

Condition1 = "OK"

Condition2 = $\text{Condition2} := \text{if}\left[\left[\left(\frac{P_{uc}}{\Phi R_{nc}}\right) + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right] \le 1.00, \text{"OK"}, \text{"Overstressed"}\right]$

Condition2 = "OK"

Bolt % of Capacity = $\max\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2, \left(\frac{P_{uc}}{\Phi R_{nc}}\right) + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right] = 53.3 \cdot \%$

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Subject:	PAD AND PIER
Location:	100-ft Lattice Tower Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

Pad & Pier Foundation

Input Data:

Max. Loads at Tower Leg:

Uplift =	Uplift := 94·kips	(User Input from tnxTower)
Compression =	Comp := 118·kips	(User Input from tnxTower)
Max Shear =	Shear := 21·kips	(User Input from tnxTower)

Pier and Pad Properties:

Pier Height =	$P_H := 8 \cdot ft$	(User Input)
Pier Projection Above Grade =	$P_P := 1 \cdot ft$	(User Input)
Pier Diameter =	$P_d := 2.6 \cdot ft$	(User Input)
Pad Thickness =	$PD_t := 2 \cdot ft$	(User Input)
Pad Width =	$PD_w := 9.33 \cdot ft$	(User Input)
Reinforcemnet Bar Diameter =	$d_{bar} := 1 \cdot in$	(User Input)
Number of Reinforcemnet Bars =	$N_{bar} := 20$	(User Input)
Reinforcemnet Bar Strength =	$f_y := 60 \cdot ksi$	(User Input)
Eccentricity of Anchor Bolts from CL of Pier =	$OS_{bolts} := 9 \cdot in$	(User Input)

Subgrade Properties:

Concrete Unit Weight =	$\gamma c := 150 \cdot pcf$	(User Input)
Water Unit Weight =	$\gamma w := 62.4 \cdot pcf$	(User Input)
Soil Unit Weight =	$\gamma s := 110 \cdot pcf$	(User Input)
Uplift Angle =	$\phi := 30 \cdot deg$	(User Input)
Soil Bearing Capacity =	$q_u := 8 \cdot ksf$	(User Input)
Distance to Water Table =	$D_{wt} := 5 \cdot ft$	(User Input)
Concrete Compressive Strength =	$f_c := 3 \cdot ksi$	(User Input)

Calculated Data:

Active Pressure =

$$K_a := \frac{(1 - \sin(\phi))}{(1 + \sin(\phi))} = 0.333$$

$$P_a := \frac{1}{2}\cdot\left(P_H + PD_t\right)^2\cdot P_d\cdot\gamma s\cdot K_a = 4.77\cdot kips$$

Passive Pressure =

$$K_p := \frac{(1 + \sin(\phi))}{(1 - \sin(\phi))} = 3$$

$$P_p := \frac{1}{2}\cdot\left(P_H + PD_t\right)^2\cdot P_d\cdot\gamma s\cdot K_p = 42.9\cdot kips$$

Area of Reinforcement Bar =

$$A_{bar} := \frac{\pi\cdot d_{bar}^{\,2}}{4} = 0.785\cdot in^2$$

Area of Pier =

$$A_{pier} := \pi\cdot\frac{P_d^{\,2}}{4} = 5.31\,ft^2$$

Cross Sectional Area of Pad =

$$A_{pad} := PD_w^{\,2} = 87.05\,ft^2$$

Section Modulus of Pad =

$$S_{pad} := \frac{PD_w\cdot PD_w^{\,2}}{6} = 135.4\cdot ft^3$$

Volume of Concrete =

$$V_{Conc} := P_H\cdot\left(A_{pier}\right) + A_{pad}\cdot PD_t = 216.6\cdot ft^3$$

$$H_s := P_H - P_P = 7\,ft$$

$$B_1 := PD_w^{\,2} = 87\,ft^2$$

$$B_2 := \left(2\cdot\tan(\phi)\cdot H_s + PD_w\right)^2 = 303.2\,ft^2$$

Volume of Soil =

$$V_{Soil} := \left[\frac{\left(H_s\right)}{3}\cdot\left(B_1 + B_2 + \sqrt{B_1\cdot B_2}\right)\right] - \left(H_s\cdot A_{pier}\right) = 1252.5\cdot ft^3$$

Mass of Soil Above Footing =

$$Mass_{Soil.AF} := \left(PD_w^{\,2} - A_{pier}\right)\cdot H_s\cdot\gamma s = 62.9\cdot kips$$

Mass of Soil Tot =

$$Mass_{Soil.Tot} := V_{Soil}\cdot\gamma s = 137.8\cdot kips$$

Mass of Concrete =

$$Mass_{Conc} := V_{Conc}\cdot\gamma c = 32.5\cdot kips$$

Total Mass =

$$Mass_{Tot} := 0.9Mass_{Soil.AF} + 0.75\left(Mass_{Soil.Tot} - Mass_{Soil.AF}\right) + 0.9Mass_{Conc} = 142.01\cdot kips$$

Check Uplift:

Required Factor of Safety=

$F_S := 1$

$ActualFS := \frac{Mass_{Tot}}{Uplift} = 1.51$

$Uplift\_Check := if\left(\frac{Mass_{Tot}}{Uplift} \geq F_S, "OK", "Overstressed"\right)$

Uplift_Check = "OK"

Check Bearing:

$P_{tot} := Comp + 1.2 \cdot Mass_{Conc} + 1.2 Mass_{Soil.AF} = 233 \cdot kips$

$Bearing := \frac{P_{tot}}{A_{pad}} = 2.67 \cdot ksf$

$Bearing\_Check := if\left(Bearing \leq 0.75 q_u, "OK", "No Good"\right)$

Bearing_Check = "OK"

Check Punching Shear:

$$p_u := \frac{\left(Comp + 1.2 A_{pier} \cdot P_H \cdot \gamma c\right)}{A_{pad}} + \frac{\left[Shear \cdot \left(P_H + PD_t\right) + Comp \cdot OS_{bolts} + \left(P_a - P_p\right)\frac{\left(P_H + PD_t\right)}{3}\right]}{S_{pad}} = 2.71 \cdot ksf$$

$d := PD_t - \left(3 \cdot in + d_{bar}\right) = 1.667\,ft$

$b_o := \left(P_d + d\right) \cdot \pi = 13.404\,ft$

$Aout_{bo} := A_{pad} - \pi \cdot \frac{\left(P_d + d\right)^2}{4} = 72.751\,ft^2$

$V_u := Aout_{bo} \cdot p_u = 197.123 \cdot kips$

$\phi V_c := 0.75 \cdot 4 \cdot \sqrt{\left(f_c \cdot \frac{lb}{in^2}\right)} \cdot b_o \cdot d = 528.6 \cdot kips$

$Punching\_Shear\_Check := if\left(V_u \leq \phi V_c, "OK", "No Good"\right)$

Punching_Shear_Check = "OK"

Check Beam Shear:

$$V_u := p_u \cdot PD_w \cdot \left[\frac{(PD_w - P_d)}{2} - \frac{d}{2} \right] = 64 \cdot kips$$

$$\phi V_c := 0.75 \cdot 2 \cdot \sqrt{\left(f_c \cdot \frac{lb}{in^2} \right)} \cdot PD_w \cdot d = 184 \cdot kips$$

$$Beam\_Shear\_Check := if\left(V_u \le \phi V_c, "OK", "No\ Good"\right)$$

Beam_Shear_Check = "OK"

Check Bending:

$$As_{provided} := N_{bar} \cdot A_{bar} = 15.708 \cdot in^2$$

$$M_{req} := \frac{p_u \cdot PD_w \cdot \left(\frac{PD_w - P_d}{2} \right)^2}{2} = 143.126 \cdot kip \cdot ft$$

$$a := \frac{As_{provided} \cdot f_y}{0.85 \cdot f_c \cdot PD_w} = 3.301 \cdot in$$

$$M_{Avail} := 0.9 \cdot As_{provided} \cdot f_y \cdot \left(d - \frac{a}{2} \right) = 1297 \cdot kip \cdot ft$$

$$Bending\_Check := if\left(M_{Avail} > M_{req}, "OK", "No\ Good"\right)$$

Bending_Check = "OK"

verizon
NPP RFDS

NORTHEAST > North East > New England > Wallingford-1 > Colchester 4 CT

Stevens, Wesley - wesley.stevens@verizonwireless.com - 20230914_132744

Project Details		Location Information	
Carrier Aggregation	N	Site Id	617249387
Ecip	N	Search Ring#	
Project Name	COLCHESTER 4 CT	E-NodeB ID#	null
Project Alt Name	COLCHESTER 4 CT - CAPACITY NEW BUILD	PSLC#	765820
Project Id	16900838	Switch Name	Wallingford-1
Designed Sector Carrier 4G	12	Tower Type	
Designed Sector Carrier 5G	6	Site Type	MACRO
Additional Sector Carrier 4G	null	Street Address	15 Old Hartford Road
Additional Sector Carrier 5G	null	City	Colchester
Suffix	Rev1_20230914	State	CT
FP Solution Type & Tech Type	MCR;4G_700;5G_850;4G_850;4G_AWS;5G_L-Sub6;4G_PCS	Zip Code	06415
		County	New London
		Latitude	41.57899/ 41° 34' 44.364"
		Longitude	-72.33869/ 72° 20' 19.284"

Project Scope

New Build Macro
Side-by-side NHH-65B antennas
64T C-Band radios

Rev1_20230914: updated radio models, removed mount
Rev0_20230403: initial design

Antenna Summary

Added Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity
				5G	Samsung	MT6413-77A	85	86.2	300(A),90(B),185(C)	PHYSICAL	3
LTE	5G,LTE	LTE	LTE		COMMSCOPE	NHH-65B-R2B	85	88	300(A),90(B),185(C)	PHYSICAL	6

Removed Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Retained Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Added: 9	Removed: 0	Retained: 0

Non Antenna Summary

Added Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity
OVP	Tower						12 OVP	PHYSICAL	1
Hybrid Cable	Tower					N/A	6x12 Hybrid Cable	PHYSICAL	2
RRU	Tower			LTE	LTE	Samsung	B2/B66A RRH ORAN (RF4439d-25A)	PHYSICAL	3
RRU	Tower	LTE	5G,LTE			Samsung	RF4461d-13A	PHYSICAL	3

Removed Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Retained Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Added: 9	Removed: 0	Retained: 0

Services		
700 LTE		**0002 (8276126)**

Sector	01	02	03
Azimuth	300	90	185
Cell/Enodeb-Id	064341	064341	064341
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	5230	5230	5230
Mech Down-tilt	0	0	0
Elect Down-tilt	2	2	2
Tip Height	88	88	88
Regulatory Power	80.12 (W/MHz) ERP	80.12 (W/MHz) ERP	80.12 (W/MHz) ERP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686689	12686690	12686691
Source	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)	43.6	43.6	43.6

Services		
850 LTE		**0002 (8276126)**

Sector	01	02	03
Azimuth	300	90	185
Cell/Enodeb-Id	064341	064341	064341
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	2450	2450	2450
Mech Down-tilt	0	0	0
Elect Down-tilt	2	2	2
Tip Height	88	88	88
Regulatory Power	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686683	12686684	12686685
Source	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)	43.6	43.6	43.6

Services		
850 NR		0002 (8276126)

Sector	0001	0002	0003
Azimuth	300	90	185
Cell/Enodeb-Id	0649403	0649403	0649403
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	2450	2450	2450
Mech Down-tilt	0	0	0
Elect Down-tilt	2	2	2
Tip Height	88	88	88
Regulatory Power	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686683	12686684	12686685
Source	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)	43.6	43.6	43.6

Services				
1900 LTE		0002 (8276126)		
Sector		01	02	03
Azimuth		300	90	185
Cell/Enodeb-Id		064341	064341	064341
Antenna Model		NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make		COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline		85	85	85
DLEARFCN		1075	1075	1075
Mech Down-tilt		0	0	0
Elect Down-tilt		0	0	0
Tip Height		88	88	88
Regulatory Power		180.87 (W/MHz) EIRP	180.87 (W/MHz) EIRP	180.87 (W/MHz) EIRP
Cell Max Power		46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make		Samsung	Samsung	Samsung
RRU Model		B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx		4 , 4	4 , 4	4 , 4
Position				
Transmitter Id		12686695	12686696	12686697
Source		VZNPP	VZNPP	VZNPP
Bandwidth		15	15	15
Ant. Dimensions H x W x D(inch)		72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1
Weight(lb)		43.7	43.7	43.7

Services		
AWS LTE		**0002 (8276126)**

Sector	01	02	03
Azimuth	300	90	185
Cell/Enodeb-Id	064341	064341	064341
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	2250	2250	2250
Mech Down-tilt	0	0	0
Elect Down-tilt	0	0	0
Tip Height	88	88	88
Regulatory Power	158.39 (W/MHz) EIRP	158.39 (W/MHz) EIRP	158.39 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686686	12686687	12686688
Source	VZNPP	VZNPP	VZNPP
Bandwidth	20	20	20
Ant. Dimensions H x W x D(inch)	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1
Weight(lb)	43.7	43.7	43.7

Services		
CBAND NR		**0002 (8276126)**

Sector	0001	0002	0003
Azimuth	300	90	185
Cell/Enodeb-Id	0649403	0649403	0649403
Antenna Model	MT6413-77A	MT6413-77A	MT6413-77A
Antenna Make	Samsung	Samsung	Samsung
Centerline	85	85	85
DLEARFCN	650006, 655324	650006, 655324	650006, 655324
Mech Down-tilt	0	0	0
Elect Down-tilt	1	1	1
Tip Height	86.2	86.2	86.2
Regulatory Power	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP
Cell Max Power	52.0 dBm	52.0 dBm	52.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	MT6413-77A	MT6413-77A	MT6413-77A
Number of Tx,Rx	2 , 2	2 , 2	2 , 2
Position			
Transmitter Id	12686692	12686693	12686694
Source	VZNPP	VZNPP	VZNPP
Bandwidth	100, 60	100, 60	100, 60
Ant. Dimensions H x W x D(inch)	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51
Weight(lb)	55.1	55.1	55.1

Callsigns Per Antenna

Sector	Make	Model	Ant CL Height AG	Ant Tip Height	Azimuth	Elect Down-tilt	Mech Down-tilt	Gain	Bandwidth	Regulatory Power	700	850	1900	2100	28 GHz	31 GHz	39 GHz	LSub-6	CBRS
0002	Samsung	MT6413-77A	85	86.2	90	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	
0002	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		60,75	325.7		KNKA745							
0001	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		60,75	325.7		KNKA745							
01	COMMSCOPE	NHH-65B-R2	85	88	300	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
01	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		64.75	80.12	WQJQ689								
02	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		60,75	325.7		KNKA745							
0002	Samsung	MT6413-77A	85	86.2	90	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
01	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		60.75	325.7		KNKA745							
0003	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		60,75	325.7		KNKA745							
03	COMMSCOPE	NHH-65B-R2	85	88	185	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
02	COMMSCOPE	NHH-65B-R2	85	88	90	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
0001	Samsung	MT6413-77A	85	86.2	300	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
0003	Samsung	MT6413-77A	85	86.2	185	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
03	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		60.75	325.7		KNKA745							
03	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		64.75	80.12	WQJQ689								
02	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		64.75	80.12	WQJQ689								
0001	Samsung	MT6413-77A	85	86.2	300	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	
0003	Samsung	MT6413-77A	85	86.2	185	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	

Callsigns

Callsign	Market	Radio Code	Market #	Block	State	County	License Name	Wholly Owner	Total MHZ	Freq Range 1	Freq Range 2	Freq Range 3	Freq Range 4	Regulatory Power	Threshold (W)	POPs/Sq. mil	Status	Action	Approve for Insvc
WQJQ689	Northeast	WU	REA001	C	CT	9011	Cellco Partnership	Yes	22.000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	80.12	1000	403.90	proposed	added	1
KNKA745	New London-Norwich, CT	CL	CMA154	A	CT	9011	Cellco Partnership	Yes	25.000	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	325.7	400	403.90	proposed	added	1
WQEM954	New London-Norwich, CT	CW	BTA319	C	CT	9011	Cellco Partnership	Yes	10.000	1895.000 1900.000/.000 - .000	1975.000 1980.000/.000 - .000	1895.000 1900.000/.000 - .000	1975.000 1980.000/.000 - .000	180.87	1640	403.90	proposed	added	1
WQDU931	New London-Norwich, CT	CW	BTA319	C	CT	9011	Cellco Partnership	Yes	10.000	1900.000 1905.000/.000 - .000	1980.000 1985.000/.000 - .000	1900.000 1905.000/.000 - .000	1980.000 1985.000/.000 - .000	180.87	1640	403.90	proposed	added	1
KNLH263	New London-Norwich, CT	CW	BTA319	F	CT	9011	Cellco Partnership	Yes	10.000	1890.000 1895.000/.000 - .000	1970.000 1975.000/.000 - .000	1890.000 1895.000/.000 - .000	1970.000 1975.000/.000 - .000	180.87	1640	403.90	proposed	added	1
WRNE581	New York, NY	PM	PEA001	A1	CT	9011	Cellco Partnership	Yes	20.000	3700.000 3720.000/.000 - .000	.000 - .000/.000 - .000	3700.000 3720.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE582	New York, NY	PM	PEA001	A2	CT	9011	Cellco Partnership	Yes	20.000	3720.000 3740.000/.000 - .000	.000 - .000/.000 - .000	3720.000 3740.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE583	New York, NY	PM	PEA001	A3	CT	9011	Cellco Partnership	Yes	20.000	3740.000 3760.000/.000 - .000	.000 - .000/.000 - .000	3740.000 3760.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE584	New York, NY	PM	PEA001	A4	CT	9011	Cellco Partnership	Yes	20.000	3760.000 3780.000/.000 - .000	.000 - .000/.000 - .000	3760.000 3780.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE585	New York, NY	PM	PEA001	A5	CT	9011	Cellco Partnership	Yes	20.000	3780.000 3800.000/.000 - .000	.000 - .000/.000 - .000	3780.000 3800.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE586	New York, NY	PM	PEA001	B1	CT	9011	Cellco Partnership	Yes	20.000	3800.000 3820.000/.000 - .000	.000 - .000/.000 - .000	3800.000 3820.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE587	New York, NY	PM	PEA001	B2	CT	9011	Cellco Partnership	Yes	20.000	3820.000 3840.000/.000 - .000	.000 - .000/.000 - .000	3820.000 3840.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE588	New York, NY	PM	PEA001	B3	CT	9011	Cellco Partnership	Yes	20.000	3840.000 3860.000/.000 - .000	.000 - .000/.000 - .000	3840.000 3860.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1

CENTEK engineering

Centered on Solutions℠

Antenna Mount Analysis Report

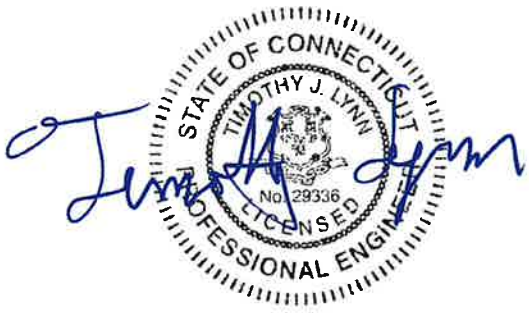
Site Ref: Colchester 4

15 Old Hartford Road
Colchester, CT

Centek Project No. 22017.14

~~Date: April 28, 2023~~
Rev 1: September 20, 2023

Max Stress Ratio = 69.7%



Prepared for:

Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

CENTEK engineering

Centered on Solutions℠

September 20, 2023

Mr. Chuck Bruttomesso
Airosmith Development
21 Lyme Street
Old Lyme, CT

Re: Structural Letter ~ Antenna Mount
Verizon – Site Ref: Colchester 4
15 Old Hartford Road
Colchester, CT

Centek Project No. 22017.14

Dear Mr. Bruttomesso,

Centek Engineering, Inc. has reviewed the Verizon antenna installation at the above referenced site. The purpose of the review is to determine the structural adequacy of the **proposed mount, consisting of three (3) V-frame sector mounts (SitePro P/N: VFA12-HD)** to support the proposed equipment configuration. The review considered the effects of wind load, dead load and ice load in accordance with the 2021 International Building Code as modified by the 2022 Connecticut State Building Code (CTBC) including ASCE 7-16 and ANSI/TIA-222-H *Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures"*.

The loads considered in this analysis consist of the following:

- **Verizon:**
  V-Frames: Six (6) Commscope NHH-65B-R2B panel antennas, three (3) Samsung MT6413-77A panel antennas, three (3) Samsung RF4439d-25A (B2/B66A) RRHs, three (3) Samsung RF4461d-13A RRHs and one (1) OVP Box mounted on three (3) V-Frames with a RAD center elevation of 85 ft +/- AGL.
- **Unknown:**
  Relocated to Verizon V-Frames: One (1) omni-directional whip antennas and one (1) dipole antenna.

The antenna mount was analyzed per the requirements of the 2021 International Building Code as modified by the 2022 Connecticut State Building Code considering a Ultimate design wind speed of 135 mph for Colchester as required in Appendix P of the 2022 Connecticut State Building Code.

Based on our review of the installation, it is our opinion that the **subject antenna mount has sufficient capacity** to support the aforementioned antenna configuration.

If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

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

CENTEK Engineering, Inc.
Mount Analysis
Verizon Site Ref. ~ Colchester 4
Colchester, CT
Rev 1 ~ September 20, 2023

Section 2 - Calculations

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Subject:	TIA-222-H Loads
Location:	Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

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

Wind Speeds

Basic Wind Speed	$V := 135$	mph	(User Input - CSBC 2022 Appendix P)
Basic Wind Speed with Ice	$V_i := 50$	mph	(User Input - TIA-222-H Annex B)
Basic Wind Speed (Mount)	$V_m := 30$	mph	(User Input - TIA-222-H Section 16.3)

Input

Structure Type =	Structure_Type := Flexible		(User Input)
Structure Category =	SC := III		(User Input)
Exposure Category =	Exp := C		(User Input)
Structure Height =	$h := 100$	ft	(User Input)
Height to Center of Antennas =	$z_{ant} := 85$	ft	(User Input)
Radial Ice Thickness =	$t_i := 1.0$	in	(User Input per Annex B of TIA-222-H)
Radial Ice Density =	Id := 56.00	pcf	(User Input)
Topograpic Factor =	$K_{zt} := 1$		(User Input)
Shielding Factor for Appurtenances =	$K_a := 1.0$		(User Input)
Rooftop Wind Speed-up Factor =	$K_s := 1.0$		(User Input)
Ground Elevation Factor =	$K_e = 0.996$		(User Input)
Gust Response Factor =	$G_H = 1.35$		(User Input)

Output

Wind Direction Probability Factor = $K_d := 0.95$ (Per Table 2-2 of TIA-222-H)

Importance Factors = $I_{ice} := \begin{cases} 0 & \text{if SC = 1} \\ 1.00 & \text{if SC = 2} \\ 1.15 & \text{if SC = 3} \\ 1.25 & \text{if SC = 4} \end{cases} = 1.15$ (Per Table 2-3 of TIA-222-H)

$I_{Seismic} := \begin{cases} 0 & \text{if SC = 1} \\ 1.00 & \text{if SC = 2} \\ 1.25 & \text{if SC = 3} \\ 1.50 & \text{if SC = 4} \end{cases} = 1.25$

$K_{iz} := \left(\frac{z_{ant}}{33}\right)^{0.1} = 1.099$

$t_{iz} := t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 1.264$

Velocity Pressure Coefficient Antennas = $Kz_{ant} := 2.01\left(\left(\frac{z_{ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.223$

Velocity Pressure w/o Ice Antennas = $qz_{ant} := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V^2 = 53.971$

Velocity Pressure with Ice Antennas = $qz_{ice.ant} := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V_i^2 = 7.403$

Velocity Pressure with Ice Antennas = $qz_m := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V_m^2 = 2.665$

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Subject:	TIA-222-H Loads
Location:	Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Commscope NHH-65B-R2B		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 71.969$	in	(User Input)
Appurtenance Width =	$W_{app} := 11.85$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 7.087$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 48$	lbs	(User Input)
Number of Appurtenances=	$N_{app} := 2$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 6.1$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.36$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 5.9$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 586$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 3.5$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 351$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 7.4$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 101$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 5$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 68$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 5.9$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 29$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 3.5$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 17$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 6044$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 4255$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 138$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 276$	lbs

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Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Samsung MT6413-77A		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 28.9$	in	(User Input)
Appurtenance Width =	$W_{app} := 15.75$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 5.51$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 60$	lbs	(User Input)
Number of Appurtenances=	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.8$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.2$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 276$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 97$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 4$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 48$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.8$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 21$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.2$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 14$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 5$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2508$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 2110$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 68$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 68$	lbs

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Location:	Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Samsung RF4439-25A(B2/B66A)RRH		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 15$	in	(User Input)
Appurtenance Width =	$W_{app} := 15$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 10$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 75$	lbs	(User Input)
Number of Appurtenances=	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.0$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 137$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 91$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 2.1$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 26$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.5$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 18$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 7$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 4$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2250$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 1599$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 52$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 52$	lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Samsung RF4461d-13ARRH		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 15$	in	(User Input)
Appurtenance Width =	$W_{app} := 15$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 10.23$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 80$	lbs	(User Input)
Number of Appurtenances=	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.0$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 137$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 93$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 2.1$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 26$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.6$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 19$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 7$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 5$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2302$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 1618$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 52$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 52$	lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	OVP Box		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 29.5$	in	(User Input)
Appurtenance Width =	$W_{app} := 16.5$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 12.6$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 32$	lbs	(User Input)
Number of Appurtenances =	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.8$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.4$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 296$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 2.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 226$	lbs

Wind Load (with ice)

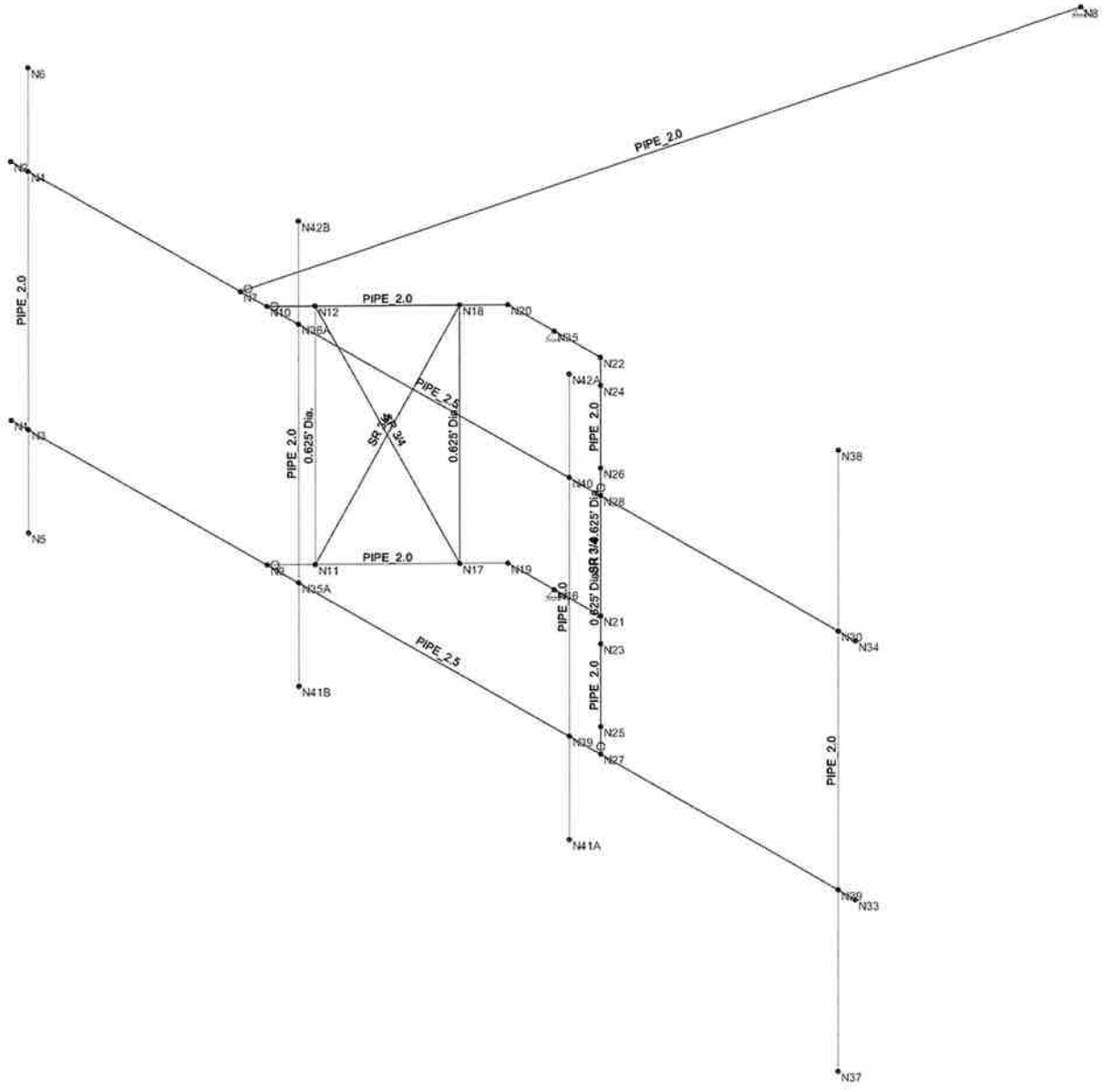
Surface Area for One Appurtenance w/ Ice (Front) =	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 4.2$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 51$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 3.4$	sf
Total Appurtenance Wind Force w/ Ice =	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 40$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.4$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 15$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 2.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 11$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 6133$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 3087$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 100$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 100$	lbs



Envelope Only Solution

Centek Engineering		
TJL	Colchester	Sept 20, 2023 at 4:48 PM
22017.14	Member Framing	Mount.R3D

(Global) Model Settings

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

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 15th(360-16): LRFD
Cold Formed Steel Code	AISI S100-10: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	150.001
Footing Concrete f'c (ksi)	4
Footing Concrete Ec (ksi)	3644
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	2
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Antenna Mast_2.0...	PIPE_2.0	Column	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
2	Horizontal_2.5 ST...	PIPE_2.5	Beam	Pipe	A53 Grade B	Typical	1.61	1.45	1.45	2.89
3	Outrigger_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
4	Stabilizer_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
5	0.625" Dia. Bar	0.625' Dia.	Column	BAR	A36 Gr.36	Typical	.307	.007	.007	.015
6	0.75"Dia. Bar	SR 3/4	Column	BAR	A36 Gr.36	Typical	.442	.016	.016	.031

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
2	M2	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
3	M3	Stabilizer_2.0 STD ...	10.18			Lbyy						Lateral
4	M4	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
5	M5	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
6	M6	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
7	M7	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
8	M8	0.625" Dia. Bar	3.333									Lateral
9	M9	0.625" Dia. Bar	3.333									Lateral
10	M10	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
11	M11	0.625" Dia. Bar	3.333									Lateral
12	M12	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
13	M13	0.625" Dia. Bar	3.333									Lateral
14	M14	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
15	M15	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
16	PS.2	Antenna Mast_2.0 ...	6			Lbyy						Lateral
17	PS.1	Antenna Mast_2.0 ...	8			Lbyy						Lateral
18	M19	Antenna Mast_2.0 ...	6			Lbyy						Lateral
19	M21A	Antenna Mast_2.0 ...	6			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	N2	N34			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
2	M2	N1	N33			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
3	M3	N7	N8			Stabilizer_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
4	M4	N10	N20			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
5	M5	N9	N19			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
6	M6	N28	N22			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
7	M7	N27	N21			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
8	M8	N12	N11			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
9	M9	N18	N17			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
10	M10	N12	N17			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
11	M11	N26	N25			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
12	M12	N18	N11			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
13	M13	N24	N23			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
14	M14	N26	N23			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
15	M15	N24	N25			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
16	PS.2	N5	N6			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
17	PS.1	N37	N38			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
18	M19	N41A	N42A			Antenna Mast_2.0 STD Pi..	Column	Pipe	A53 Grade B	Typical
19	M20	N19	N21			RIGID	None	None	RIGID	Typical
20	M21	N20	N22			RIGID	None	None	RIGID	Typical
21	M21A	N41B	N42B			Antenna Mast_2.0 STD Pi..	Column	Pipe	A53 Grade B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	0	0.	-0.	0	
2	N2	0	3.333334	-0.	0	
3	N3	.25	0.	-0.	0	
4	N4	.25	3.333334	-0.	0	
5	N5	.25	-1.333333	-0.	0	
6	N6	.25	4.666667	-0.	0	
7	N7	3.390625	3.333334	-0.	0	
8	N8	6.025403	3.333334	-9.833125	0	
9	N9	3.78125	0.	-0.	0	
10	N10	3.78125	3.333334	-0.	0	
11	N11	4.138628	0.	-0.357378	0	
12	N12	4.138628	3.333334	-0.357378	0	
13	N17	5.206335	0.	-1.425085	0	
14	N18	5.206335	3.333334	-1.425085	0	
15	N19	5.563713	0.	-1.782463	0	
16	N20	5.563713	3.333334	-1.782463	0	
17	N21	6.936287	0.	-1.782463	0	
18	N22	6.936287	3.333334	-1.782463	0	
19	N23	7.293665	0.	-1.425085	0	
20	N24	7.293665	3.333334	-1.425085	0	
21	N25	8.361372	0.	-0.357378	0	
22	N26	8.361372	3.333334	-0.357378	0	
23	N27	8.71875	0.	-0.	0	
24	N28	8.71875	3.333334	-0.	0	
25	N29	12.25	0.	-0.	0	
26	N30	12.25	3.333334	-0.	0	
27	N33	12.5	0.	-0.	0	
28	N34	12.5	3.333334	-0.	0	
29	N35	6.25	3.333334	-1.782463	0	
30	N36	6.25	0.	-1.782463	0	
31	N35A	4.25	0.	-0.	0	
32	N36A	4.25	3.333334	-0.	0	
33	N37	12.25	-2.333333	0	0	
34	N38	12.25	5.666667	0	0	
35	N39	8.25	0.	-0.	0	
36	N40	8.25	3.333334	-0.	0	
37	N41A	8.25	-1.333333	-0.	0	
38	N42A	8.25	4.666667	-0.	0	
39	N41B	4.25	-1.333333	-0.	0	
40	N42B	4.25	4.666667	-0.	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N8	Reaction	Reaction	Reaction			
2	N19						
3	N20						
4	N17						
5	N18						
6	N21						
7	N22						
8	N23						
9	N24						
10	N35	Reaction	Reaction	Reaction			
11	N36	Reaction	Reaction	Reaction			

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Y	-.048	1.5
2	PS.1	Y	-.048	6.5
3	PS.2	Y	-.03	2
4	PS.2	Y	-.03	4
5	PS.1	Y	-.075	3
6	PS.1	Y	-.08	5
7	M19	Y	-.032	%50
8	M21A	Y	-.05	%50

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Y	-.276	1.5
2	PS.1	Y	-.276	6.5
3	PS.2	Y	-.034	2
4	PS.2	Y	-.034	4
5	PS.1	Y	-.052	3
6	PS.1	Y	-.052	5
7	M19	Y	-.1	%50
8	M21A	Y	-.085	%50

Member Point Loads (BLC 4 : Lm Maintenance Load (500lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Y	-.5	%50

Member Point Loads (BLC 5 : Lv Maintenance Load (250lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.25	12

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

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	X	.034	1.5
2	PS.1	X	.034	6.5
3	PS.2	X	.011	2

Member Point Loads (BLC 6 : Wind with Ice X) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
4	PS.2	X	.011	4
5	PS.1	X	.018	3
6	PS.1	X	.019	5
7	M19	X	.04	%50
8	M21A	X	.045	%50

Member Point Loads (BLC 7 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	X	.176	1.5
2	PS.1	X	.176	6.5
3	PS.2	X	.049	2
4	PS.2	X	.049	4
5	PS.1	X	.091	3
6	PS.1	X	.093	5
7	M19	X	.226	%50
8	M21A	X	.1	%50

Member Point Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	X	.009	1.5
2	PS.1	X	.009	6.5
3	PS.2	X	.003	2
4	PS.2	X	.003	4
5	PS.1	X	.004	3
6	PS.1	X	.005	5
7	M19	X	.011	%50
8	M21A	X	.03	%50

Member Point Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Z	.101	1.5
2	PS.1	Z	.101	6.5
3	PS.2	Z	.024	2
4	PS.2	Z	.024	4
5	M19	Z	.051	%50
6	M21A	Z	.045	%50

Member Point Loads (BLC 10 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Z	.586	1.5
2	PS.1	Z	.586	6.5
3	PS.2	Z	.138	2
4	PS.2	Z	.138	4
5	M19	Z	.296	%50
6	M21A	Z	.1	%50

Member Point Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Z	.029	1.5

Member Point Loads (BLC 11 : Wm Wind Z) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
2	PS.1	Z	.029	6.5
3	PS.2	Z	.007	2
4	PS.2	Z	.007	4
5	M19	Z	.015	%50
6	M21A	Z	.03	%50

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

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 7 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.018	.018	0	0
2	M4	X	.018	.018	0	0
3	M5	X	.018	.018	0	0
4	M6	X	.018	.018	0	0
5	M7	X	.018	.018	0	0
6	M8	X	.018	.018	0	0
7	M9	X	.018	.018	0	0
8	M10	X	.018	.018	0	0
9	M11	X	.018	.018	0	0
10	M12	X	.018	.018	0	0
11	M13	X	.018	.018	0	0
12	M14	X	.018	.018	0	0
13	M15	X	.018	.018	0	0
14	PS.2	X	.018	.018	0	0
15	PS.1	X	.018	.018	0	0
16	M19	X	.018	.018	0	0
17	M20	X	.018	.018	0	0
18	M21	X	.018	.018	0	0
19	M21A	X	.018	.018	0	0

Member Distributed Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0
20	M21A	Z	.003	.003	0	0

Member Distributed Loads (BLC 10 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.018	.018	0	0
2	M2	Z	.018	.018	0	0
3	M3	Z	.018	.018	0	0
4	M4	Z	.018	.018	0	0
5	M5	Z	.018	.018	0	0
6	M6	Z	.018	.018	0	0

Member Distributed Loads (BLC 10 : Wind Z) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
7	M7	Z	.018	.018	0	0
8	M8	Z	.018	.018	0	0
9	M9	Z	.018	.018	0	0
10	M10	Z	.018	.018	0	0
11	M11	Z	.018	.018	0	0
12	M12	Z	.018	.018	0	0
13	M13	Z	.018	.018	0	0
14	M14	Z	.018	.018	0	0
15	M15	Z	.018	.018	0	0
16	PS.2	Z	.018	.018	0	0
17	M19	Z	.018	.018	0	0
18	M20	Z	.018	.018	0	0
19	M21	Z	.018	.018	0	0
20	M21A	Z	.018	.018	0	0

Member Distributed Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0
20	M21A	Z	.003	.003	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	None		-1						
2	Dead Load	None					8			
3	Ice Load	None					8			
4	Lm Maintenance Load (500lb)	None					1			
5	Lv Maintenance Load (250lb)	None					1			
6	Wind with Ice X	None					8	19		
7	Wind X	None					8	19		
8	Wm Wind X	None					8	19		
9	Wind with Ice Z	None					6	20		
10	Wind Z	None					6	20		

Basic Load Cases (Continued)

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
11	Wm Wind Z	None					6	20		

Load Combinations

	Description	So...	P...	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	1.4D	Yes	Y		1	1.4	2	1.4																
2	1.2D +1.5Lv	Yes	Y		1	1.2	2	1.2	5	1.5														
3	1.2D + 1.0W (X-directi...	Yes	Y		1	1.2	2	1.2	7	1														
4	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	6	1												
5	1.2D +1.5Lm+ 1.0Wm ...	Yes	Y		1	1.2	2	1.2	4	1.5	8	1												
6	1.2D + 1.0W (Z-directi...	Yes	Y		1	1.2	2	1.2	10	1														
7	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	9	1												
8	1.2D +1.5Lm+ 1.0Wm ...	Yes	Y		1	1.2	2	1.2	4	1.5	11	1												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	.281	3	.025	1	1.932	6	0	8	0	8	0	8
2		min	-.544	6	.021	4	-1.392	3	0	1	0	1	0	1
3	N35	max	.15	6	.914	7	.961	3	0	8	0	8	0	8
4		min	-1.943	5	.407	3	-4.227	6	0	1	0	1	0	1
5	N36	max	1.745	8	.876	4	.918	4	0	8	0	8	0	8
6		min	-.685	3	.285	6	-1.241	6	0	1	0	1	0	1
7	Totals:	max	0	8	1.781	7	0	3						
8		min	-2.346	3	.872	3	-3.536	6						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	.074	3	.142	8	.321	6	6.562e-03	6	1.532e-02	6	1.077e-03	3
2		min	-.187	6	-.036	3	-.106	5	-2.582e-03	3	-1.009e-03	5	-1.851e-03	6
3	N2	max	.041	3	.142	8	.589	6	4.851e-03	6	1.582e-02	6	1.196e-03	3
4		min	-.073	6	-.037	3	-.021	5	-2.683e-03	3	-8.893e-04	5	-1.874e-03	6
5	N3	max	.074	3	.137	8	.275	6	6.562e-03	6	1.532e-02	6	1.077e-03	3
6		min	-.187	6	-.033	3	-.103	5	-2.582e-03	3	-1.009e-03	5	-1.851e-03	6
7	N4	max	.041	3	.137	8	.542	6	4.851e-03	6	1.582e-02	6	1.196e-03	3
8		min	-.073	6	-.033	3	-.019	5	-2.683e-03	3	-8.893e-04	5	-1.874e-03	6
9	N5	max	.092	3	.137	8	.171	6	6.492e-03	6	1.532e-02	6	1.147e-03	3
10		min	-.216	6	-.033	3	-.134	5	-2.582e-03	3	-1.009e-03	5	-1.851e-03	6
11	N6	max	.057	5	.137	8	.62	6	4.922e-03	6	1.582e-02	6	1.125e-03	3
12		min	-.043	6	-.033	3	-.048	3	-2.683e-03	3	-8.893e-04	5	-1.874e-03	6
13	N7	max	.041	3	.082	8	.019	3	2.734e-03	6	1.37e-02	6	6.864e-04	3
14		min	-.073	6	.009	3	-.031	6	-1.364e-03	3	-1.489e-03	3	-1.52e-03	8
15	N8	max	0	8	0	8	0	8	1.973e-03	6	7.931e-03	3	1.432e-03	3
16		min	0	1	0	1	0	1	1.417e-03	3	5.848e-05	1	-1.543e-03	8
17	N9	max	.074	3	.075	5	.095	3	3.475e-03	6	6.467e-03	6	3.835e-04	3
18		min	-.187	6	.012	3	-.251	6	-1.002e-03	3	-1.539e-03	5	-1.705e-03	8
19	N10	max	.041	3	.075	8	.026	3	2.471e-03	6	1.236e-02	6	4.614e-04	3
20		min	-.073	6	.012	3	-.094	6	-1.2e-03	3	-1.371e-03	3	-1.677e-03	8
21	N11	max	.058	3	.078	8	.08	3	3.084e-03	6	3.615e-03	3	1.685e-04	3

Envelope Joint Displacements (Continued)

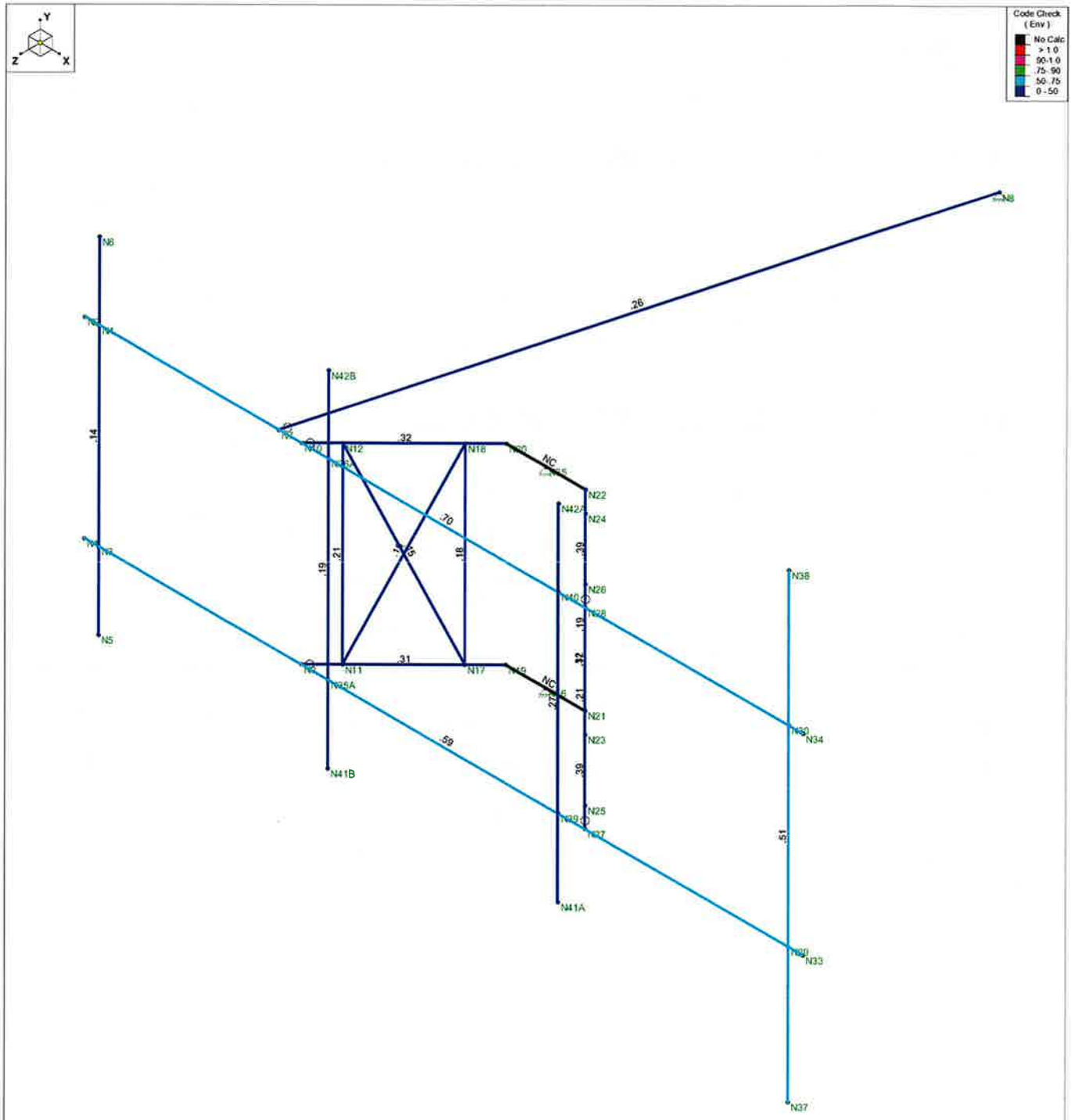
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
22		min	-.147	6	.011	3	-.212	6	-6.658e-04	3	-9.111e-03	6	-1.737e-03	8
23	N12	max	.027	3	.078	8	.013	3	2.423e-03	6	3.032e-03	3	5.501e-04	3
24		min	-.057	6	.012	3	-.079	6	-8.54e-04	3	-3.476e-03	6	-1.599e-03	8
25	N17	max	.013	3	.071	8	.035	3	1.638e-03	6	3.196e-03	3	-3.503e-04	3
26		min	-.035	6	.002	3	-.101	6	6.568e-05	3	-8.257e-03	6	-4.628e-03	8
27	N18	max	-.001	3	.071	8	-.006	1	1.545e-03	7	4.949e-04	3	-1.294e-04	3
28		min	-.014	6	.002	3	-.039	6	-1.078e-04	3	-3.115e-03	6	-4.565e-03	8
29	N19	max	0	8	.052	8	.022	3	8.605e-04	7	2.711e-03	3	-2.908e-04	3
30		min	0	1	.002	3	-.066	6	4.186e-04	3	-8.007e-03	6	-6.326e-03	8
31	N20	max	0	8	.052	8	-.005	1	8.354e-04	7	-5.805e-04	1	-3.033e-04	3
32		min	0	1	.002	3	-.026	6	4.372e-04	3	-3.148e-03	6	-6.324e-03	8
33	N21	max	0	8	-.002	3	.066	6	8.605e-04	7	2.711e-03	3	-2.908e-04	3
34		min	0	1	-.052	8	-.022	3	4.186e-04	3	-8.007e-03	6	-6.326e-03	8
35	N22	max	0	8	-.002	3	.026	6	8.354e-04	7	-5.805e-04	1	-3.033e-04	3
36		min	0	1	-.052	8	.005	1	4.372e-04	3	-3.148e-03	6	-6.324e-03	8
37	N23	max	.013	3	-.006	3	.102	6	3.64e-04	3	3.2e-03	3	-5.142e-04	3
38		min	-.036	6	-.078	8	-.035	3	-8.828e-04	8	-8.562e-03	6	-4.987e-03	8
39	N24	max	-.001	3	-.006	3	.041	6	6.096e-04	3	5.703e-04	3	-2.602e-04	3
40		min	-.014	6	-.078	8	.006	1	-9.358e-04	8	-3.518e-03	6	-5.03e-03	8
41	N25	max	.058	3	-.019	3	.217	6	5.818e-04	3	3.638e-03	3	-1.184e-03	3
42		min	-.15	6	-.091	8	-.08	3	-2.768e-03	8	-9.049e-03	6	-4.463e-03	8
43	N26	max	.028	3	-.018	3	.089	6	7.505e-04	3	3.201e-03	3	-4.753e-04	3
44		min	-.06	6	-.091	8	-.016	3	-2.817e-03	8	-3.687e-03	6	-4.505e-03	8
45	N27	max	.074	3	-.028	3	.256	6	1.148e-03	3	3.554e-03	3	-1.798e-03	3
46		min	-.188	6	-.103	8	-.096	3	-3.071e-03	6	-2.608e-02	6	-6.971e-03	8
47	N28	max	.042	3	-.025	3	.105	6	1.265e-03	3	2.478e-03	3	-1.26e-03	3
48		min	-.075	6	-.103	8	-.03	3	-1.505e-03	6	-2.332e-02	6	-6.985e-03	8
49	N29	max	.074	3	-.117	3	1.784	6	1.749e-03	3	2.976e-03	3	-5.537e-04	3
50		min	-.188	6	-.521	8	-.23	3	-8.291e-03	6	-4.093e-02	6	-7.689e-03	8
51	N30	max	.042	3	-.117	3	1.602	6	1.811e-03	3	3.005e-03	3	-1.668e-03	3
52		min	-.075	6	-.521	8	-.151	3	-1.759e-03	8	-4.114e-02	6	-7.685e-03	8
53	N33	max	.074	3	-.118	3	1.907	6	1.749e-03	3	2.976e-03	3	-5.538e-04	3
54		min	-.188	6	-.544	8	-.239	3	-8.291e-03	6	-4.093e-02	6	-7.689e-03	8
55	N34	max	.042	3	-.122	3	1.726	6	1.811e-03	3	3.005e-03	3	-1.668e-03	3
56		min	-.075	6	-.544	8	-.16	3	-1.759e-03	8	-4.114e-02	6	-7.685e-03	8
57	N35	max	0	8	0	8	0	8	8.354e-04	7	-5.805e-04	1	-3.033e-04	3
58		min	0	1	0	1	0	1	4.372e-04	3	-3.148e-03	6	-6.324e-03	8
59	N36	max	0	8	0	8	0	8	8.605e-04	7	2.711e-03	3	-2.908e-04	3
60		min	0	1	0	1	0	1	4.186e-04	3	-8.007e-03	6	-6.326e-03	8
61	N35A	max	.074	3	.065	5	.084	3	3.046e-03	6	4.107e-03	6	1.765e-04	3
62		min	-.187	6	.01	6	-.281	6	-9.03e-04	3	-1.644e-03	5	-1.836e-03	8
63	N36A	max	.041	3	.065	5	.032	3	2.168e-03	6	9.772e-03	6	2.575e-04	3
64		min	-.073	6	.01	6	-.156	6	-1.054e-03	3	-7.063e-04	3	-1.813e-03	8
65	N37	max	.081	3	-.117	3	2.067	6	1.747e-03	3	2.976e-03	3	4.283e-04	3
66		min	-.303	6	-.521	8	-.279	3	-1.03e-02	6	-4.093e-02	6	-7.682e-03	8
67	N38	max	.246	5	-.117	3	1.663	6	2.398e-03	6	3.005e-03	3	-2.599e-03	1
68		min	.039	6	-.521	8	-.1	3	-1.66e-03	8	-4.114e-02	6	-7.692e-03	8
69	N39	max	.074	3	-.018	6	.12	6	1.059e-03	3	3.656e-03	3	-1.242e-03	3
70		min	-.188	6	-.07	5	-.075	3	-2.541e-03	6	-2.218e-02	6	-5.092e-03	8
71	N40	max	.042	3	-.018	6	-.002	1	1.139e-03	3	2.339e-03	3	-6.811e-04	3
72		min	-.075	6	-.07	5	-.017	3	-1.782e-03	6	-1.879e-02	6	-5.104e-03	8
73	N41A	max	.055	3	-.018	6	.162	6	1.059e-03	3	3.656e-03	3	-1.172e-03	3

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
74		min	-.221	6	-.07	5	-.092	3	-2.611e-03	6	-2.218e-02	6	-5.092e-03	8
75	N42A	max	.112	5	-.018	6	.001	3	1.139e-03	3	2.339e-03	3	-7.515e-04	3
76		min	-.041	6	-.07	5	-.04	6	-1.712e-03	6	-1.879e-02	6	-5.104e-03	8
77	N41B	max	.077	3	.065	5	.099	3	2.976e-03	6	4.107e-03	6	2.469e-04	3
78		min	-.202	6	.01	6	-.329	6	-9.03e-04	3	-1.644e-03	5	-1.836e-03	8
79	N42B	max	.059	5	.065	5	.032	5	2.239e-03	6	9.772e-03	6	1.872e-04	3
80		min	-.059	6	.01	6	-.12	6	-1.054e-03	3	-7.063e-04	3	-1.814e-03	8

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Mem...	Shape	Code Check	L...	LC	Sh...	Loc[ft]	Dir	...phi*P...	phi*P...	phi*Mn y-y [k-ft]	phi*...	Cb	Eqn
1	M1	PIPE 2.5	.697	8....	6	.196	3.776		6 14.559	50.715	3.596	3.5...	2....	H1...
2	M2	PIPE 2.5	.588	8....	6	.146	8.724		6 14.559	50.715	3.596	3.5...	2....	H1...
3	M3	PIPE 2.0	.260	4....	6	.009	10.18		3 9.492	32.13	1.872	1.8...	1....	H1...
4	M4	PIPE 2.0	.322	2....	5	.100	2.521		4 32.032	32.13	1.872	1.8...	1....	H1...
5	M5	PIPE 2.0	.305	2....	8	.091	2.521		4 32.032	32.13	1.872	1.8...	1....	H1...
6	M6	PIPE 2.0	.391	2....	8	.128	.499		5 32.032	32.13	1.872	1.8...	1....	H1...
7	M7	PIPE 2.0	.387	2....	8	.134	.499		7 32.032	32.13	1.872	1.8...	1....	H1...
8	M8	0.625' Dia.	.208	3....	6	.034	0		8 1.058	9.94	.104	.104	2....	H1...
9	M9	0.625' Dia.	.182	3....	6	.030	3.333		6 1.058	9.94	.104	.104	2....	H1...
10	M10	SR 3/4	.145	0	3	.028	3.659		6 6.954	14.314	.179	.179	1	H1...
11	M11	0.625' Dia.	.210	0	6	.035	3.333		8 1.058	9.94	.104	.104	2....	H1...
12	M12	SR 3/4	.147	0	3	.030	3.659		6 6.954	14.314	.179	.179	2....	H1...
13	M13	0.625' Dia.	.195	0	3	.030	0		6 1.058	9.94	.104	.104	2....	H1...
14	M14	SR 3/4	.324	0	5	.025	0		6 6.954	14.314	.179	.179	2....	H1...
15	M15	SR 3/4	.173	3....	8	.027	0		6 6.954	14.314	.179	.179	2....	H1...
16	PS.2	PIPE 2.0	.142	1....	6	.039	1.375		6 20.867	32.13	1.872	1.8...	1....	H1...
17	PS.1	PIPE 2.0	.512	2....	8	.064	5.667		6 14.916	32.13	1.872	1.8...	4....	H1...
18	M19	PIPE 2.0	.270	4....	5	.092	4.625		6 20.867	32.13	1.872	1.8...	1....	H1...
19	M21A	PIPE 2.0	.190	1....	6	.124	1.375		6 20.867	32.13	1.872	1.8...	1....	H1...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering		
TJL	Colchester	Sept 20, 2023 at 4:48 PM
22017.14	Unity Check	Mount.R3D

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

Subject:	Connection to Host Structure
Location:	Colchester, CT
Rev. 1: 9/20/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 22017.14

Antenna Mount Connection:

Anchor Data:

A307 Threaded Rod =

Number of Anchor Bolts = $N := 4$ (User Input)

Diameter of Bolts = $D := 0.625in$ (User Input)

Design Tension = $T_{design} := 10.4 \cdot kips$ (User Input)

Design Shear = $V_{design} := 6.23 \cdot kips$ (User Input)

Design Reactions:

Fx = $F_x := 1.9 \cdot kips$ (User Input)

Fy = $F_y := 0.9 \cdot kips$ (User Input)

Fz = $F_z := 4.3 \cdot kips$ (User Input)

Anchor Check:

Max Tension Force = $T_{Max} := \frac{F_z}{N} = 1075lb$

Max Shear Force = $V_{Max} := \frac{F_y}{N} + \frac{F_x}{N} = 700lb$

Condition 1 = $Condition1 := if\left(\frac{T_{Max}}{T_{design}} + \frac{V_{Max}}{V_{design}} \le 1.0, "OK", "NG"\right) = "OK"$

% of Capacity = $\max\left[\frac{T_{Max}}{T_{design}}, \frac{V_{Max}}{V_{design}}, \left(\frac{\frac{T_{Max}}{T_{design}} + \frac{V_{Max}}{V_{design}}}{1.0}\right)\right] = 21.6 \cdot \%$

verizon
NPP RFDS

NORTHEAST > North East > New England > Wallingford-1 > Colchester 4 CT

Stevens, Wesley - wesley.stevens@verizonwireless.com - 20230914_132744

Project Details		Location Information	
Carrier Aggregation	N	Site Id	617249387
Ecip	N	Search Ring#	
Project Name	COLCHESTER 4 CT	E-NodeB ID#	null
Project Alt Name	COLCHESTER 4 CT - CAPACITY NEW BUILD	PSLC#	765820
Project Id	16900838	Switch Name	Wallingford-1
Designed Sector Carrier 4G	12	Tower Type	
Designed Sector Carrier 5G	6	Site Type	MACRO
Additional Sector Carrier 4G	null	Street Address	15 Old Hartford Road
Additional Sector Carrier 5G	null	City	Colchester
Suffix	Rev1_20230914	State	CT
FP Solution Type & Tech Type	MCR;4G_700;5G_850;4G_850;4G_AWS;5G _L-Sub6;4G_PCS	Zip Code	06415
		County	New London
		Latitude	41.57899/ 41° 34' 44.364"
		Longitude	-72.33869/ 72° 20' 19.284"

Project Scope

New Build Macro
Side-by-side NHH-65B antennas
64T C-Band radios

Rev1_20230914: updated radio models, removed mount
Rev0_20230403: initial design

Antenna Summary

Added Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity
				5G	Samsung	MT6413-77A	85	86.2	300(A),90(B),185(C)	PHYSICAL	3
LTE	5G,LTE	LTE	LTE		COMMSCOPE	NHH-65B-R2B	85	88	300(A),90(B),185(C)	PHYSICAL	6

Removed Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Retained Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Added: 9	Removed: 0	Retained: 0

Non Antenna Summary

Added Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity
OVP	Tower						12 OVP	PHYSICAL	1
Hybrid Cable	Tower					N/A	6x12 Hybrid Cable	PHYSICAL	2
RRU	Tower			LTE	LTE	Samsung	B2/B66A RRH ORAN (RF4439d-25A)	PHYSICAL	3
RRU	Tower	LTE	5G,LTE			Samsung	RF4461d-13A	PHYSICAL	3

Removed Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Retained Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Added: 9	Removed: 0	Retained: 0

Services		
700 LTE		**0002 (8276126)**

Sector	01	02	03
Azimuth	300	90	185
Cell/Enodeb-Id	064341	064341	064341
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	5230	5230	5230
Mech Down-tilt	0	0	0
Elect Down-tilt	2	2	2
Tip Height	88	88	88
Regulatory Power	80.12 (W/MHz) ERP	80.12 (W/MHz) ERP	80.12 (W/MHz) ERP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686689	12686690	12686691
Source	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)	43.6	43.6	43.6

Services				
850 LTE		**0002 (8276126)**		
Sector		01	02	03
Azimuth		300	90	185
Cell/Enodeb-Id		064341	064341	064341
Antenna Model		NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make		COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline		85	85	85
DLEARFCN		2450	2450	2450
Mech Down-tilt		0	0	0
Elect Down-tilt		2	2	2
Tip Height		88	88	88
Regulatory Power		325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD
Cell Max Power		46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make		Samsung	Samsung	Samsung
RRU Model		RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx		4 , 4	4 , 4	4 , 4
Position				
Transmitter Id		12686683	12686684	12686685
Source		VZNPP	VZNPP	VZNPP
Bandwidth		10	10	10
Ant. Dimensions H x W x D(inch)		72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)		43.6	43.6	43.6

Services		
850 NR		**0002 (8276126)**

Sector	0001	0002	0003
Azimuth	300	90	185
Cell/Enodeb-Id	0649403	0649403	0649403
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	2450	2450	2450
Mech Down-tilt	0	0	0
Elect Down-tilt	2	2	2
Tip Height	88	88	88
Regulatory Power	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD	325.70 (W/MHz) ERPSD
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686683	12686684	12686685
Source	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08	72.0 x 11.88 x 7.08
Weight(lb)	43.6	43.6	43.6

Services				
1900 LTE		0002 (8276126)		
Sector		01	02	03
Azimuth		300	90	185
Cell/Enodeb-Id		064341	064341	064341
Antenna Model		NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make		COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline		85	85	85
DLEARFCN		1075	1075	1075
Mech Down-tilt		0	0	0
Elect Down-tilt		0	0	0
Tip Height		88	88	88
Regulatory Power		180.87 (W/MHz) EIRP	180.87 (W/MHz) EIRP	180.87 (W/MHz) EIRP
Cell Max Power		46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make		Samsung	Samsung	Samsung
RRU Model		B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx		4 , 4	4 , 4	4 , 4
Position				
Transmitter Id		12686695	12686696	12686697
Source		VZNPP	VZNPP	VZNPP
Bandwidth		15	15	15
Ant. Dimensions H x W x D(inch)		72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1
Weight(lb)		43.7	43.7	43.7

Services		
AWS LTE		**0002 (8276126)**

Sector	01	02	03
Azimuth	300	90	185
Cell/Enodeb-Id	064341	064341	064341
Antenna Model	NHH-65B-R2B	NHH-65B-R2B	NHH-65B-R2B
Antenna Make	COMMSCOPE	COMMSCOPE	COMMSCOPE
Centerline	85	85	85
DLEARFCN	2250	2250	2250
Mech Down-tilt	0	0	0
Elect Down-tilt	0	0	0
Tip Height	88	88	88
Regulatory Power	158.39 (W/MHz) EIRP	158.39 (W/MHz) EIRP	158.39 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4
Position			
Transmitter Id	12686686	12686687	12686688
Source	VZNPP	VZNPP	VZNPP
Bandwidth	20	20	20
Ant. Dimensions H x W x D(inch)	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1	72.0 x 11.9 x 7.1
Weight(lb)	43.7	43.7	43.7

Services		
CBAND NR		**0002 (8276126)**

Sector	0001	0002	0003
Azimuth	300	90	185
Cell/Enodeb-Id	0649403	0649403	0649403
Antenna Model	MT6413-77A	MT6413-77A	MT6413-77A
Antenna Make	Samsung	Samsung	Samsung
Centerline	85	85	85
DLEARFCN	650006, 655324	650006, 655324	650006, 655324
Mech Down-tilt	0	0	0
Elect Down-tilt	1	1	1
Tip Height	86.2	86.2	86.2
Regulatory Power	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP	739.92 (W/MHz) EIRP, 739.92 (W/MHz) EIRP
Cell Max Power	52.0 dBm	52.0 dBm	52.0 dBm
TMA Make			
TMA Model			
RRU Make	Samsung	Samsung	Samsung
RRU Model	MT6413-77A	MT6413-77A	MT6413-77A
Number of Tx,Rx	2 , 2	2 , 2	2 , 2
Position			
Transmitter Id	12686692	12686693	12686694
Source	VZNPP	VZNPP	VZNPP
Bandwidth	100, 60	100, 60	100, 60
Ant. Dimensions H x W x D(inch)	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51
Weight(lb)	55.1	55.1	55.1

Callsigns Per Antenna

Sector	Make	Model	Ant CL Height AG	Ant Tip Height	Azimuth	Elect Down-tilt	Mech Down-tilt	Gain	Bandwidth	Regulatory Power	700	850	1900	2100	28 GHz	31 GHz	39 GHz	LSub-6	CBRS
0002	Samsung	MT6413-77A	85	86.2	90	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	
0002	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		60.75	325.7		KNKA745							
0001	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		60.75	325.7		KNKA745							
01	COMMSCOPE	NHH-65B-R2	85	88	300	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
01	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		64.75	80.12	WQJQ689								
02	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		60.75	325.7		KNKA745							
0002	Samsung	MT6413-77A	85	86.2	90	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
01	COMMSCOPE	NHH-65B-R2	85	88	300	2	0		60.75	325.7		KNKA745							
0003	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		60.75	325.7		KNKA745							
03	COMMSCOPE	NHH-65B-R2	85	88	185	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
02	COMMSCOPE	NHH-65B-R2	85	88	90	0	0		67	180.87			KNLH263,WQDU931,WQEM954						
0001	Samsung	MT6413-77A	85	86.2	300	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
0003	Samsung	MT6413-77A	85	86.2	185	1	0		105	739.92								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
03	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		60.75	325.7		KNKA745							
03	COMMSCOPE	NHH-65B-R2	85	88	185	2	0		64.75	80.12	WQJQ689								
02	COMMSCOPE	NHH-65B-R2	85	88	90	2	0		64.75	80.12	WQJQ689								
0001	Samsung	MT6413-77A	85	86.2	300	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	
0003	Samsung	MT6413-77A	85	86.2	185	1	0		105	739.92								WRNE585,WRNE586,WRNE587,WRNE58	

CallSigns

Callsign	Market	Radio Code	Market #	Block	State	County	License Name	Wholly Owner	Total MHZ	Freq Range 1	Freq Range 2	Freq Range 3	Freq Range 4	Regulatory Power	Threshold (W)	POPs/Sq. mil	Status	Action	Approve for Insvc
WQJQ689	Northeast	WU	REA001	C	CT	9011	Cellco Partnership	Yes	22.000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	80.12	1000	403.90	proposed	added	1
KNKA745	New London-Norwich, CT	CL	CMA154	A	CT	9011	Cellco Partnership	Yes	25.000	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	325.7	400	403.90	proposed	added	1
WQEM954	New London-Norwich, CT	CW	BTA319	C	CT	9011	Cellco Partnership	Yes	10.000	1895.000 1900.000/.000 - .000	1975.000 1980.000/.000 - .000	1895.000 1900.000/.000 - .000	1975.000 1980.000/.000 - .000	180.87	1640	403.90	proposed	added	1
WQDU931	New London-Norwich, CT	CW	BTA319	C	CT	9011	Cellco Partnership	Yes	10.000	1900.000 1905.000/.000 - .000	1980.000 1985.000/.000 - .000	1900.000 1905.000/.000 - .000	1980.000 1985.000/.000 - .000	180.87	1640	403.90	proposed	added	1
KNLH263	New London-Norwich, CT	CW	BTA319	F	CT	9011	Cellco Partnership	Yes	10.000	1890.000 1895.000/.000 - .000	1970.000 1975.000/.000 - .000	1890.000 1895.000/.000 - .000	1970.000 1975.000/.000 - .000	180.87	1640	403.90	proposed	added	1
WRNE581	New York, NY	PM	PEA001	A1	CT	9011	Cellco Partnership	Yes	20.000	3700.000 3720.000/.000 - .000	.000 - .000/.000 - .000	3700.000 3720.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE582	New York, NY	PM	PEA001	A2	CT	9011	Cellco Partnership	Yes	20.000	3720.000 3740.000/.000 - .000	.000 - .000/.000 - .000	3720.000 3740.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE583	New York, NY	PM	PEA001	A3	CT	9011	Cellco Partnership	Yes	20.000	3740.000 3760.000/.000 - .000	.000 - .000/.000 - .000	3740.000 3760.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE584	New York, NY	PM	PEA001	A4	CT	9011	Cellco Partnership	Yes	20.000	3760.000 3780.000/.000 - .000	.000 - .000/.000 - .000	3760.000 3780.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE585	New York, NY	PM	PEA001	A5	CT	9011	Cellco Partnership	Yes	20.000	3780.000 3800.000/.000 - .000	.000 - .000/.000 - .000	3780.000 3800.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE586	New York, NY	PM	PEA001	B1	CT	9011	Cellco Partnership	Yes	20.000	3800.000 3820.000/.000 - .000	.000 - .000/.000 - .000	3800.000 3820.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE587	New York, NY	PM	PEA001	B2	CT	9011	Cellco Partnership	Yes	20.000	3820.000 3840.000/.000 - .000	.000 - .000/.000 - .000	3820.000 3840.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1
WRNE588	New York, NY	PM	PEA001	B3	CT	9011	Cellco Partnership	Yes	20.000	3840.000 3860.000/.000 - .000	.000 - .000/.000 - .000	3840.000 3860.000/.000 - .000	.000 - .000/.000 - .000	739.92	1640	403.90	proposed	added	1

ATTACHMENT 6

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions Report

verizon

Colchester 4

15 Old Hartford Road, Colchester, CT 06415

October 11, 2023

Table of Contents

List of Figures

List of Tables

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed installation of Verizon's antenna arrays to be mounted at 85' AGL on an existing self-support tower located at 15 Old Hartford Road in Colchester, CT. The coordinates of the monopole tower are 41° 34' 44.36" N, 72° 20' 19.28" W.

Verizon is proposing the following:

1) Install nine (9) multi-band antennas, three (3) per sector to support its commercial LTE network.

This report considers the planned antenna configuration for Verizon[1] and the existing antennas for T-Mobile[2] to derive the resulting % MPE of its proposed installation.

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment C of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment C contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

[1] As referenced to Verizon's Radio Frequency Design Sheet updated 04/03/2023.

[2] As referenced to Radio Frequency Emissions Analysis Report by EBI Consulting, Dated 05/20/2019

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{\text{GRF}^2 \times 1.64 \times \text{ERP}}{4\pi \times R^2}\right) \text{X Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

Ground reflection factor (GRF) of 1.6

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the final installations.

4. Antenna Inventory

Table 1 below outlines Verizon's proposed antenna configuration for the site. The associated data sheets and antenna patterns for these specific antenna models are included in Attachments C.

Operator	Sector / Call Sign	TX Freq (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech. Tilt	Length (ft)	Antenna Centerline Height (ft)
Verizon	Alpha / 300°	700	160	14.9	4944	NHH-65B-R2B	65	0	5.99	85
		850	160	15	5060		60			
		1900	160	17.9	9866		71			
		2100	240	18.4	16604		64			
		3700	160	25.5	56770	MT6413-77A	105	0	2.46	85
	Beta / 90°	700	160	14.9	4944	NHH-65B-R2B	65	0	5.99	85
		850	160	15	5060		60			
		1900	160	17.9	9866		71			
		2100	240	18.4	16604		64			
		3700	160	25.5	56770	MT6413-77A	105	0	2.46	85
	Gamma / 185°	700	160	14.9	4944	NHH-65B-R2B	65	0	5.99	85
		850	160	15	5060		60			
		1900	160	17.9	9866		71			
		2100	240	18.4	16604		64			
		3700	160	25.5	56770	MT6413-77A	105	0	2.46	85

Table 1: Proposed Antenna Inventory[3] [4]

[3] Antenna heights are in reference to Verizon's Radio Frequency Design Sheet updated 04/03/2023.

[4] Transmit power assumes 0 dB of cable loss.

5. Calculation Results

The calculated power density results are shown in Figure 1 below. For completeness, the calculations for this analysis range from 0 feet horizontal distance (directly below the antennas) to a value of 3,000 feet horizontal distance from the site. In addition to the other worst-case scenario considerations that were previously mentioned, the power density calculations to each horizontal distance point away from the antennas was completed using a local maximum off beam antenna gain (within ± 5 degrees of the true mathematical angle) to incorporate a realistic worst-case scenario.

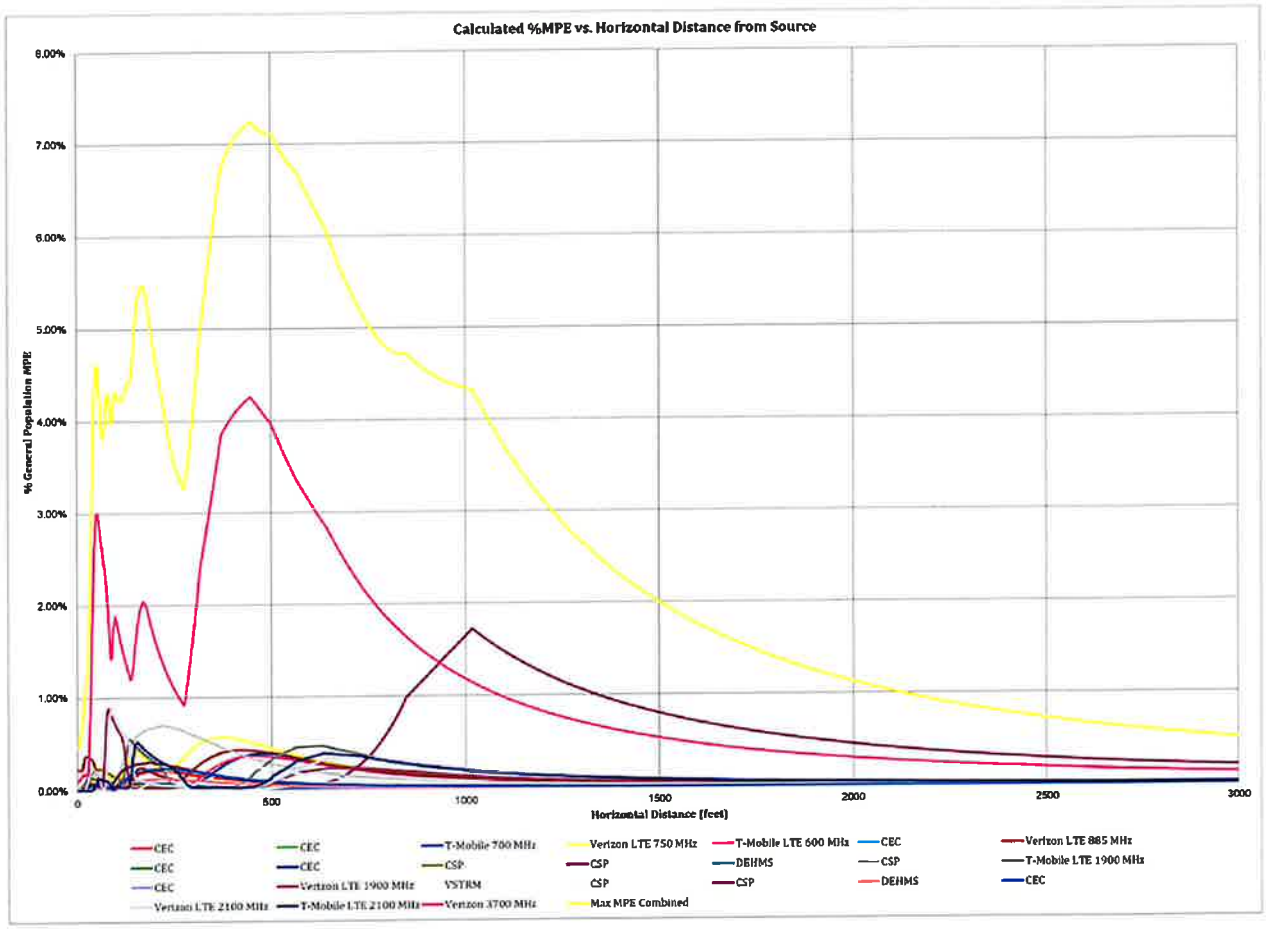


Figure 1: Graph of General Population % MPE vs. Distance

The highest percent of MPE (7.25% of the General Population limit) is calculated to occur at a horizontal distance of 448 feet from antennas. Please note that the percent of MPE calculations close to the site take into account off beam loss, which is determined from the vertical pattern of the antennas used. Therefore, RF power density levels may increase as the distance from the site increases. At distances of approximately 1500 feet and beyond, one would now be in the main beam of the antenna pattern and off beam loss is no longer considered. Beyond this point, RF levels become calculated solely on distance from the site and the percent of MPE decreases significantly as distance from the site increases.

Table 2 below lists percent of MPE values as well as the associated parameters that were included in the calculations. The highest percent of MPE value was calculated to occur at a horizontal distance of 448 feet from the site (reference Figure 1).

As stated in Section 3, all calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. In addition, a six foot height offset was considered in this analysis to account for average human height. As a result, the predicted signal levels are significantly higher than the actual signal levels will be from the final configuration. The results presented in Figure 1 and Table 2 assume level ground elevation from the base of the tower out to the horizontal distances calculated.

Carrier	Number of Transmitters	Power out of Base Station Per Transmitter (Watts)	Antenna Height (Feet)	Distance to the Base of Antennas (Feet)	Power Density (mW/cm^2)	Limit (mW/cm^2)	% MPE
CEC	1	110.0	100.0	448	0.000188	0.200	0.09%
CEC	1	50.0	100.0	448	0.000060	0.306	0.02%
CEC	1	30.0	99.0	448	0.000038	0.309	0.01%
CEC	2	2.0	99.0	448	0.000005	0.302	0.00%
CEC	1	5.0	94.0	448	0.000099	1.000	0.01%
CEC	1	2.0	99.0	448	0.000004	0.302	0.00%
CEC	1	110.0	100.0	448	0.000225	0.200	0.11%
CSP	2	10.0	30.0	448	0.000043	0.567	0.01%
CSP	1	5.0	95.0	448	0.000157	1.000	0.02%
CSP	1	330.0	100.0	448	0.000676	0.200	0.34%
CSP	1	100.0	100.0	448	0.001327	0.515	0.26%
CSP	1	100.0	85.0	448	0.000211	0.200	0.11%
DEHMS	1	30.0	80.0	448	0.000055	0.200	0.03%
DEHMS	1	60.0	100.0	448	0.000123	0.200	0.06%
T-Mobile 700 MHz	2	30.0	95.0	448	0.001769	0.467	0.38%
T-Mobile LTE 1900 MHz	1	160.0	95.0	448	0.001481	1.000	0.15%
T-Mobile LTE 2100 MHz	1	120.0	95.0	448	0.000358	1.000	0.04%
T-Mobile LTE 600 MHz	2	30.0	95.0	448	0.001446	0.400	0.36%
Verizon 3700 MHz	1	160.0	85.0	448	0.042579	1.000	4.26%
Verizon LTE 1900 MHz	1	160.0	85.0	448	0.000260	1.000	0.03%
Verizon LTE 2100 MHz	1	240.0	85.0	448	0.000256	1.000	0.03%
Verizon LTE 750 MHz	1	160.0	85.0	448	0.002548	0.500	0.51%
Verizon LTE 885 MHz	1	160.0	85.0	448	0.002411	0.567	0.43%
VSTRM	2	20.0	97.0	448	0.000118	1.000	0.01%
						Total	**7.25%**

Table 2: Maximum Percent of General Population Exposure Values

6. Conclusion

The above analysis verifies that RF exposure levels from the site with Verizon's proposed antenna configuration will be well below the maximum permissible levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Using the conservative calculation methods and parameters detailed above, the maximum cumulative percent of MPE in consideration of all transmitters is calculated to be **7.25% of the FCC limit (General Population/Uncontrolled)**. This maximum cumulative percent of MPE value is calculated to occur 448 feet away from the site.

7. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.

Report Prepared By: Ram Acharya
RF Engineer 1
C Squared Systems, LLC

October 9, 2023
Date

Reviewed/Approved By: Martin Lavin
Senior RF Engineer
C Squared Systems, LLC

October 11, 2023
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

IEEE C95.1-2005, IEEE Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz IEEE-SA Standards Board

IEEE C95.3-2002 (R2008), IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz-300 GHz IEEE-SA Standards Board

Verizon's Radio Frequency Design Sheet updated 10/21/2022

AT&T's filing, Connecticut Siting Council Notice of Exempt Modification – Antenna Add - 15 Old Hartford Road (aka 1 Service Road) Colchester, CT, dated 9/23/2022

As referenced to Dish Wireless LLC's filing, Connecticut Siting Council Tower Share Application – 15 Old Hartford Road , Colchester, CT, dated 11/19/2021

T-Mobile's filing, Connecticut Siting Council Notice of Exempt Modification – 15 Old Hartford Road , Colchester, CT, dated 10/1/2020

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[5]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[6]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 3: FCC Limits for Maximum Permissible Exposure

[5] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

[6] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

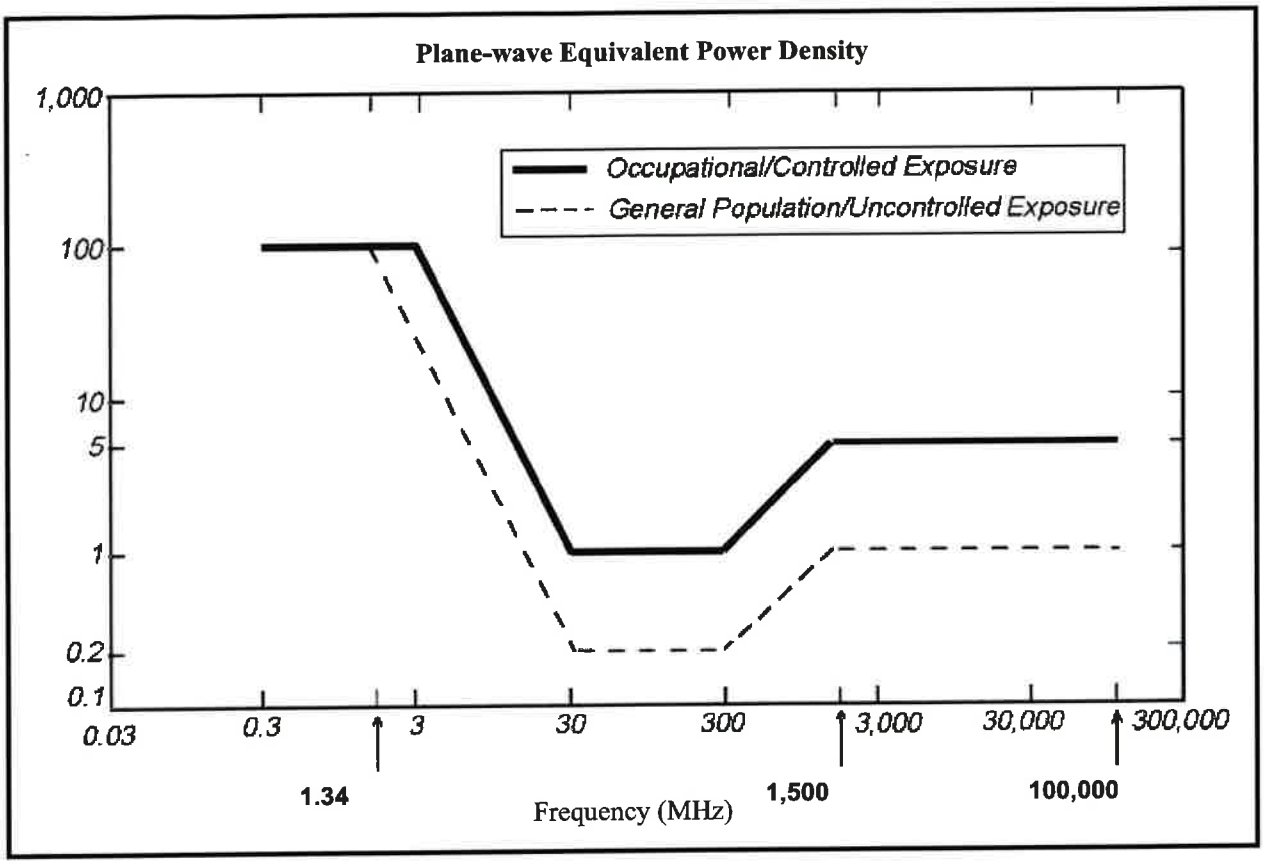
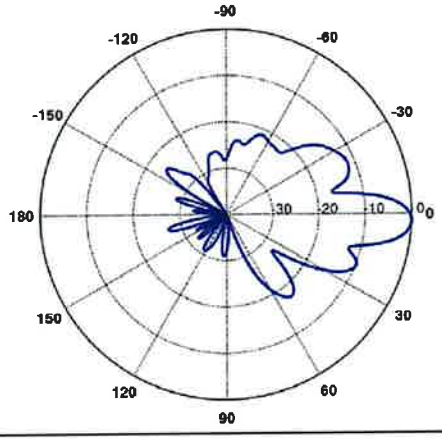


Figure 2: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Verizon Antenna Model Data Sheets and Electrical Patterns

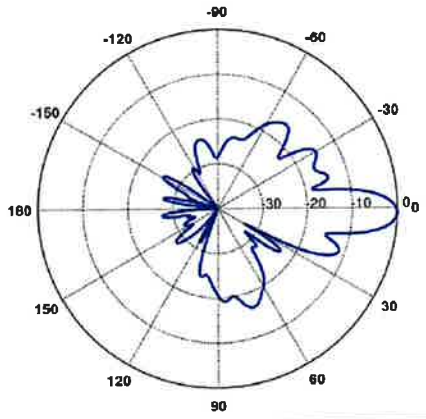
750 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-65B-R2B
Frequency Band:	698-806 MHz
Gain:	14.9 dBi
Vertical Beamwidth:	12.4°
Horizontal Beamwidth:	65.0°
Polarization:	±45°
Dimensions (L x W x D):	71.96" x 7.08" x 11.85"



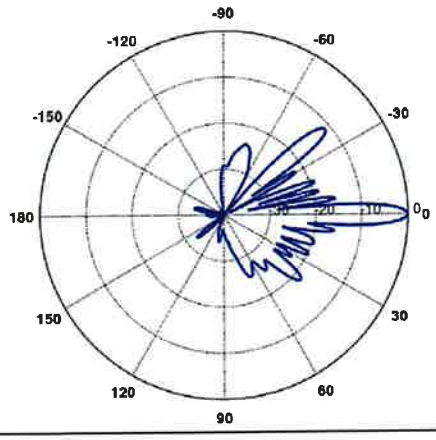
885 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-65B-R2B
Frequency Band:	806-896 MHz
Gain:	15 dBi
Vertical Beamwidth:	11.2°
Horizontal Beamwidth:	60°
Polarization:	±45°
Dimensions (L x W x D):	71.96" x 7.08" x 11.85"



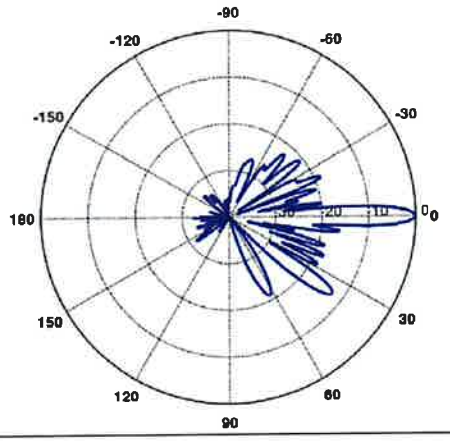
1900 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-65B-R2B
Frequency Band:	1850-1990 MHz
Gain:	17.9 dBi
Vertical Beamwidth:	4.9°
Horizontal Beamwidth:	64.0°
Polarization:	±45°
Dimensions (L x W x D):	71.96" x 7.08" x 11.85"



2100 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-65B-R2B
Frequency Band:	1920-2200 MHz
Gain:	18.4 dBi
Vertical Beamwidth:	4.9°
Horizontal Beamwidth:	64°
Polarization:	±45°
Dimensions (L x W x D):	71.96" x 7.08" x 11.85"



ATTACHMENT 7

Verizon/Colchester 4

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