STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP	:	SUB-PETITION NO. 1133
D/B/A VERIZON WIRELESS FOR	:	541 BROADBRIDGE ROAD
MODIFICATIONS TO AN EXISTING	:	BRIDGEPORT, CT
WIRELESS TELECOMMUNICATIONS	:	
FACILITY AT 541 BROADBRIDGE ROAD	:	
IN BRIDGEPORT, CONNECTICUT	:	FEBRUARY 24, 2022

SUB-PETITION FOR DECLARATORY RULING:
ELIGIBLE FACILITIES REQUEST FOR MODIFICATIONS
THAT WILL NOT SUBSTANTIALLY CHANGE THE
PHYSICAL DIMENSIONS OF AN EXISTING BASE STATION

I. Introduction

Pursuant to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, codified at 47 U.S.C. § 1455(a) ("Section 6409(a)") and the October 21, 2014 Report and Order (FCC-14-153) issued by the Federal Communications Commission ("FCC") (the "FCC Order"), Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby petitions the Connecticut Siting Council (the "Council") for a declaratory ruling ("Sub-Petition") that the installation of replacement antennas and related telecommunications equipment at the existing wireless telecommunications base station at 541 Broadbridge Road in Bridgeport, Connecticut (the "Property") constitutes an Eligible Facilities Request ("EFR") under the FCC Order. Cellco has designated this site as its "Bridgeport NE Facility".

II. Factual Background

On August 31, 2017, the Council approved Cellco's application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance and operation of a wireless telecommunications facility at the Property (Docket No 472). The approved facility

consists of a 100-foot flagpole tower within a fenced compound area. All antennas are located within an RF transparent screening shroud 36-inches in diameter. Equipment associated with the existing antennas is located on the ground adjacent to the flagpole tower.

III. Cellco's Proposed Facility Modifications

Cellco is licensed to provide wireless telecommunications services in the 700 MHz, 800 MHz, 1900 MHz, 2100 MHz and 3000 MHz frequency ranges in Bridgeport and throughout the State of Connecticut. Cellco intends to remove its six (6) existing antennas and install three (3) model NNH4-65B-R6 antennas at the 92-foot level and three (3) model MX08FIT265-01 antennas at the 82-foot level on the tower. Cellco will also install nine (9) remote radio heads ("RRHs") between the two levels of antennas. To accommodate Cellco's new antennas/RRHs the existing antenna screening shroud will need to be replaced with a larger (48" diameter) shroud. There will be no changes to Cellco's ground equipment.

Project Plans and Specifications for Cellco's antennas and RRHs for the Bridgeport NE Facility modifications are included in Attachment 1. According to the attached Structural Analysis ("SA") and Mount Analysis ("MA"), the existing tower, tower foundation, existing and new antenna mounts can support Cellco's proposed modifications. No modifications to Cellco's existing antenna mounts are required as part of this facility modification. The attached SA therefore, does not reference the MA provided. Copies of the SA and MA are included in Attachment 2.

IV. Discussion

A. The Proposed Modification Will Not Cause a Substantial Change to the Physical Dimensions of the Existing Base Station

Section 6409(a) provides, in relevant part, that "a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless

tower or base station that does not substantially change the physical dimensions of such tower or base station." Pursuant to the FCC Order, the proposed modification does not substantially change the physical dimensions of the base station if the following criteria are satisfied.

1. *The proposed modified facility will not increase the height of the tower by more than ten (10) percent of the height.* Cellco does not intend to increase the height of the existing flagpole tower. Cellco's antennas will be located at the same 92-foot and 82-foot levels within the existing 100-foot flagpole tower.

2. *The proposed facility modification will not protrude from the edge of the structure more than six (6) feet.* Cellco's antennas and RRHs will be located inside the existing flagpole tower, therefore, will not protrude more than six (6) feet from the face of the tower.

3. *The proposed facility does not involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets.* No changes in ground equipment are planned as part of these facility modifications.

4. *The proposed facility does not entail any excavation or deployment outside the current site of the base station.* Cellco's proposed facility modifications will remain within the limits of the Property and the existing fenced compound.

5. *The proposed facility does not defeat the existing concealment elements of the base station.* The existing facility consists of a flagpole tower with stealth screening elements. To accommodate Cellco's new antennas and RRHs, the flagpole antenna shroud will increase from 36-inch diameter to 48-inch diameter. All antennas will however remain concealed.

6. *The proposed facility complies with conditions associated with the prior approval of construction or modification of the base station.* Cellco's proposed facility

modifications are consistent with the Siting Council's approval in Docket No. 472.

B. FCC Compliance

Included in Attachment 3 is a cumulative power density calculation table for Cellco's proposed modifications confirming that the facility will operate within the FCC safety standards for radio frequency emissions.

C. Notice to the City, Property Owner and Abutting Landowners

On February 24, 2022, a copy of this Sub-Petition was sent to Bridgeport's Mayor, Joseph Ganim and Dennis Buckley, Bridgeport's Zoning Administrator; and Beardsley Plaza Limited, the owner of the Property. Copies of the letters sent to Mayor Ganim, Dennis Buckley, and Beardsley Plaza Limited are included in Attachment 4. A copy of this Sub-Petition was also sent to the owners of land that abut the Property. A sample abutter's letter and the list of those abutting landowners who were sent notice and a copy of this filing is included in Attachment 5.

V. Conclusion

Based on the information provided above, Cellco respectfully submits that the proposed modification of the existing base station at the Property constitutes an "eligible facilities request" under Section 6409(a) and the FCC Order.

Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

By 

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Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
(860) 275-8200
Its Attorneys

ATTACHMENT 1

verizon

BRIDGEPORT NE CT
541 BROADBRIDGE RD
BRIDGEPORT, CT 06610

GENERAL NOTES AND SPECIFICATIONS

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES, 2017 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE, AND LOCAL CODES.
2. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
4. 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.
5. 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.
6. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, AND ALL TRADES AS APPLICABLE PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
7. 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.
8. 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.
9. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING BUILDING'S/PROPERTY'S OPERATIONS, COORDINATE WORK WITH BUILDING/PROPERTY OWNER.
10. 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.
11. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
12. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MFR.'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
13. 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.
14. 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.
15. 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.
16. 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.
17. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUIT AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
18. 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.
19. 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.
20. 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 PRIOR TO ANY EXCAVATION WORK. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
21. ALL CONSTRUCTION SHALL BE IN COMPLIANCE WITH THE GOVERNING BUILDING CODE.
22. 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.
23. ALL DIMENSIONS, ELEVATIONS, AND OTHER REFERENCES TO EXISTING STRUCTURES, SURFACE, AND SUBSURFACE CONDITIONS ARE APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL DIMENSIONS, ELEVATIONS, ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
24. 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.

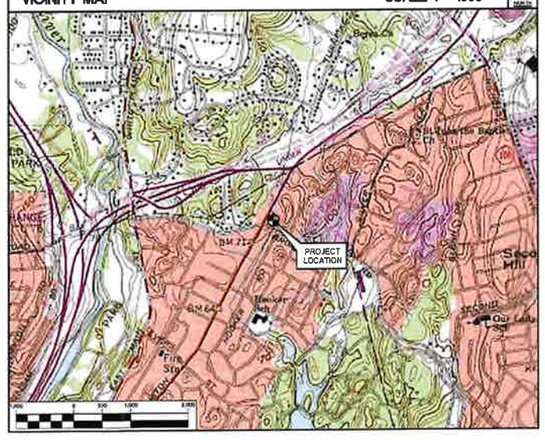
SITE DIRECTIONS

FROM: 20 ALEXANDER DRIVE, WALLINGFORD, CONNECTICUT **TO:** 541 BROADBRIDGE RD, BRIDGEPORT, CT 06610

1.	START OUT GOING NORTH ON ALEXANDER DR TOWARD BARNES INDUSTRIAL RD.	0.18 MI
2.	TURN RIGHT ONTO BARNES INDUSTRIAL RD.	0.11 MI
3.	TAKE THE 1ST LEFT ONTO CT-68.	0.35 MI
4.	TURN RIGHT ONTO RAMP.	0.17 MI
5.	TURN RIGHT ONTO N COLONY RD/US-5 N.	0.40 MI
6.	MERGE ONTO CT-15 S TOWARD NEW HAVEN.	0.30 MI
7.	MERGE ONTO CT-15 S.	28.20 MI
8.	TAKE EXIT 52 FOR STATE ROUTE 108S/STATE ROUTE 8 S TOWARD BRIDGEPORT.	0.60 MI
9.	KEEP RIGHT, FOLLOW SIGNS FOR CT-108/STRATFORD.	0.30 MI
10.	TURN LEFT ONTO CT-108 W/NICHOLS AVE.	0.20 MI
11.	TURN RIGHT ONTO PENNY AVE.	0.60 MI
12.	CONTINUE ONTO HUNTINGTON TURNPIKE.	0.30 MI
13.	TURN LEFT ONTO BROADBRIDGE RD.	0.06 MI
14.	TURN LEFT AT THE 1ST CROSS STREET ONTO HOOKER RD.	0.03 MI
15.	ARRIVE AT 541 BROADBRIDGE RD BRIDGEPORT, CT.	

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

1. THE PROPOSED UPGRADE SCOPE OF WORK AT THE EXISTING UNMANNED TELECOMMUNICATIONS FACILITY GENERALLY INCLUDES THE FOLLOWING:

A. AT THE EXISTING FLAGPOLE MOUNTED ANTENNA SECTORS:
- REMOVE (6) EXISTING ANDREW - SBJAHH-1D65B-DL ANTENNAS.
- REMOVE (9) EXISTING NOKIA RADIOS.
- REMOVE (24) EXISTING KAELUS QUADPLEXERS.
- REPLACE THE UPPER 20-FT SECTION OF THE EXISTING CONCEALMENT TOWER RADOME WITH THAT OF LARGER DIAMETER AS DESCRIBED HEREIN (DESIGN BY OTHERS).
- INSTALL CUSTOM DESIGNED BENT PLATE ANTENNA MOUNTS AT THE LOWER TIER ANTENNA LEVEL AS PER DESIGN HEREIN.
- INSTALL (6) COMMSCOPE - CBC6192JT-DS-43 DIPLEXERS.
- RETAIN (12) COAX CABLES.
- INSTALL (3) COMMSCOPE - NNH4-65B-R6 ANTENNAS.
- INSTALL (3) JMA - MX08FIT265-01 ANTENNAS.
- INSTALL (1) OVP-6 BOX.
- INSTALL (1) 6x12 HYBRID CABLE.
- INSTALL (1) PRE-FABRICATED SITE PRO - UTSM-L UNIVERSAL TRI SECTOR MOUNT KIT AT THE UPPER TIER ANTENNA LEVEL.

B. AT THE EXISTING VERIZON WIRELESS EQUIPMENT AREA:
- INSTALL (3) SAMSUNG - B2/B66A RRH ORAN (RF4439d-25A).
- INSTALL (3) SAMSUNG - B5/B13 B5/B13 RRH ORAN (RF4440d-13A).
- INSTALL (3) SAMSUNG - RT-8808-77A RRUs.
- INSTALL (6) COMMSCOPE - CBC6192JT-DS-43 DIPLEXERS.

PROJECT INFORMATION

SITE NAME:	BRIDGEPORT NE CT
SITE ADDRESS:	541 BROADBRIDGE RD BRIDGEPORT, CT 06610
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 20 ALEXANDER DRIVE WALLINGFORD, CT 06492
CONTACT PERSON:	WALTER CHARCZNSKI (CONSTRUCTION MANAGER) VERIZON WIRELESS (860) 306-1806
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT. 06405 (203) 488-0580
PROJECT COORDINATES:	LATITUDE: 41° 13' 19.494"N LONGITUDE: 73° 10' 2.504"W (COORDINATES REFERENCED FROM VERIZON WIRELESS RFDS DATED 11/19/2021)

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	NOTES AND SPECIFICATIONS	0
B-1	RF BILL OF MATERIALS	0
C-1	PARTIAL SITE PLAN AND ELEVATION	0
C-2	ANTENNA SECTOR CONFIGURATION DETAILS	0
C-3	RF DETAILS	0
E-1	ELECTRICAL DETAILS AND SPECIFICATIONS	0

REV:	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	10/07/21	DMD	ANC	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
A	11/22/21	ANC	GMD	CONSTRUCTION DRAWINGS - REVISED PER RFDS DATED 11/19/2021
B	11/19/21	JLD	DMD	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

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Branford, CT 06405
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Cellco Partnership d/b/a Verizon Wireless

BRIDGEPORT NE CT
541 BROADBRIDGE RD
BRIDGEPORT, CT 06610

DATE: 11/18/21
SCALE: AS NOTED
JOB NO. 21007.89

TITLE SHEET

T-1

Sheet No. 1 of 7

NOTES AND SPECIFICATIONS

DESIGN BASIS

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

1. DESIGN CRITERIA:
   - RISK CATEGORY: II (BASED ON TABLE 1604.5 OF THE 2015 IBC)
   - NOMINAL DESIGN SPEED (TOWER): 125 MPH (Vasd) (EXPOSURE B/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-10) PER 2015 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE.
   - SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

STRUCTURAL STEEL

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

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	07/07/21	DMD	ANC	CONSTRUCTION DRAWINGS - ISSUED FOR CONSTRUCTION
A	11/22/21	ANC	DMD	CONSTRUCTION DRAWINGS - REVISED PER RFDS DATED 11/19/2021
	11/18/21	ALD	DMD	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

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DATE: 11/18/21
SCALE: AS NOTED
JOB NO. 21007.59

NOTES AND SPECIFICATIONS

N-1

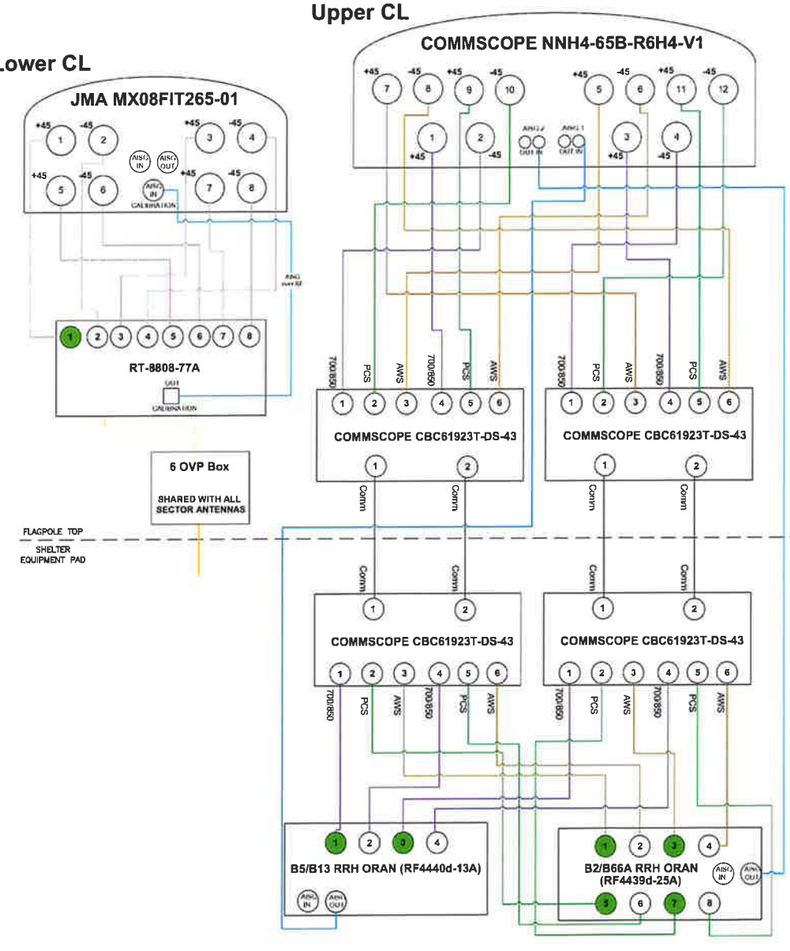
Sheet No. 2 of 7

COMMSCOPE NNH4-65B-R6H4-V1

JMA MX08FIT265-01

Upper CL

Lower CL



PLUMBING DIAGRAM NOTES:

1. PORTS 1, 2, 3 & 4 ARE FOR LOW BAND (698–896 MHz).
2. PORTS 5, 6, 7, 8, 9, 10, 11 & 12 ARE FOR HIGH BAND (1695–2380 MHz).
3. SMART BIAS TEE (SBT) IS THROUGH ANTENNA PORTS 1 & 4 FOR LOW BAND AND 5, 7, 10 & 12 FOR HIGH BAND.
4. AISG CABLE IS ONLY NEEDED WHEN DRAWN IN THE DIAGRAMS BELOW. IF IT IS NOT DRAWN THEN SBT IS ENOUGH TO CONTROL ALL RET MOTORS.
5. NOT ALL SBT PORTS ARE NEEDED TO CONTROL RET. ONLY GREEN PORT CONNECTION TO GREEN PORT WILL CONTROL RET.

RET DC SIGNAL PASS FOR RET (PORT THAT WILL CONTROL RET)

PLUMBING DIAGRAM COMMENTS:

A. DIAGRAMS SHOW ANTENNA PORT CONFIGURATIONS AS VIEWED FROM STANDING BEHIND THE ANTENNAS.

B. ANTENNAS WILL BE INSTALLED IN THAT ORDER FROM LEFT TO RIGHT.

C. CAP AND WEATHERPROOF UNUSED ANTENNA PORTS.

D. ALL PLUMBING DIAGRAM COLORS ARE IRRELEVANT EXCEPT FOR AISG AND HYBRIFLEX CABLE. (FOR THE COAX COLORS, FOLLOW COAX COLORS GUIDE ABOVE)

DC SIGNAL CAPABLE PORT

AISG CABLE

RET DC SIGNAL PASS FOR RET (PORT THAT WILL CONTROL RET)

HYBRIFLEX CABLES

NOTES:

1. INFORMATION SHOWN HEREIN IS FOR USE BY VERIZON WIRELESS EQUIPMENT OPERATIONS.
2. THIS B.O.M. DRAWING IS BASED ON FACILITY UPGRADE DESIGN DRAWINGS PREPARED BY CENTEK ENGINEERING (REV.0 DATED: 02/03/2022), & VERIZON WIRELESS RF ANTENNA EQUIPMENT RECOMMENDATION (DATED 11/19/2021).

BILL OF MATERIALS

TECHNOLOGY	QUANTITY	ANTENNA
LTE 700 LTE 850 LTE PCS 1900 LTE AWS 2100	3	COMMSCOPE ANTENNA MODEL: NNH4-65B-R6
5G	3	JMA ANTENNA MODEL: MX08FIT265-01

CABLES	QUANTITY	LENGTH EA	COMMENTS
HYBRID CABLE	1	±110 FT EA	6X12 HYBRID CABLE

RADIOS	QUANTITY	COMMENTS
LTE 700 LTE 850 5G	3	SAMSUNG: B5/B13 RRH ORAN (RF4440d-13A)
LTE PCS 1900 LTE AWS 2100	3	SAMSUNG: B2/B66A RRH ORAN (RF4439d-25A)
5G	3	SAMSUNG MODEL: RT-8808-77A

DIPLEXERS	QUANTITY	COMMENTS
QUADRUPLEXER	12	CBC61923T-DS-43

OVP BOXES	QUANTITY	COMMENTS
OVP	1	OVP-6

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
	02/03/22	DMD	ARC	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION
	11/23/21	JLD	DMD	CONSTRUCTION DRAWINGS – REVISED PER RFDS DATED 11/19/2021
	11/18/21	DMD	ARC	CONSTRUCTION DRAWINGS – ISSUED FOR CLIENT REVIEW

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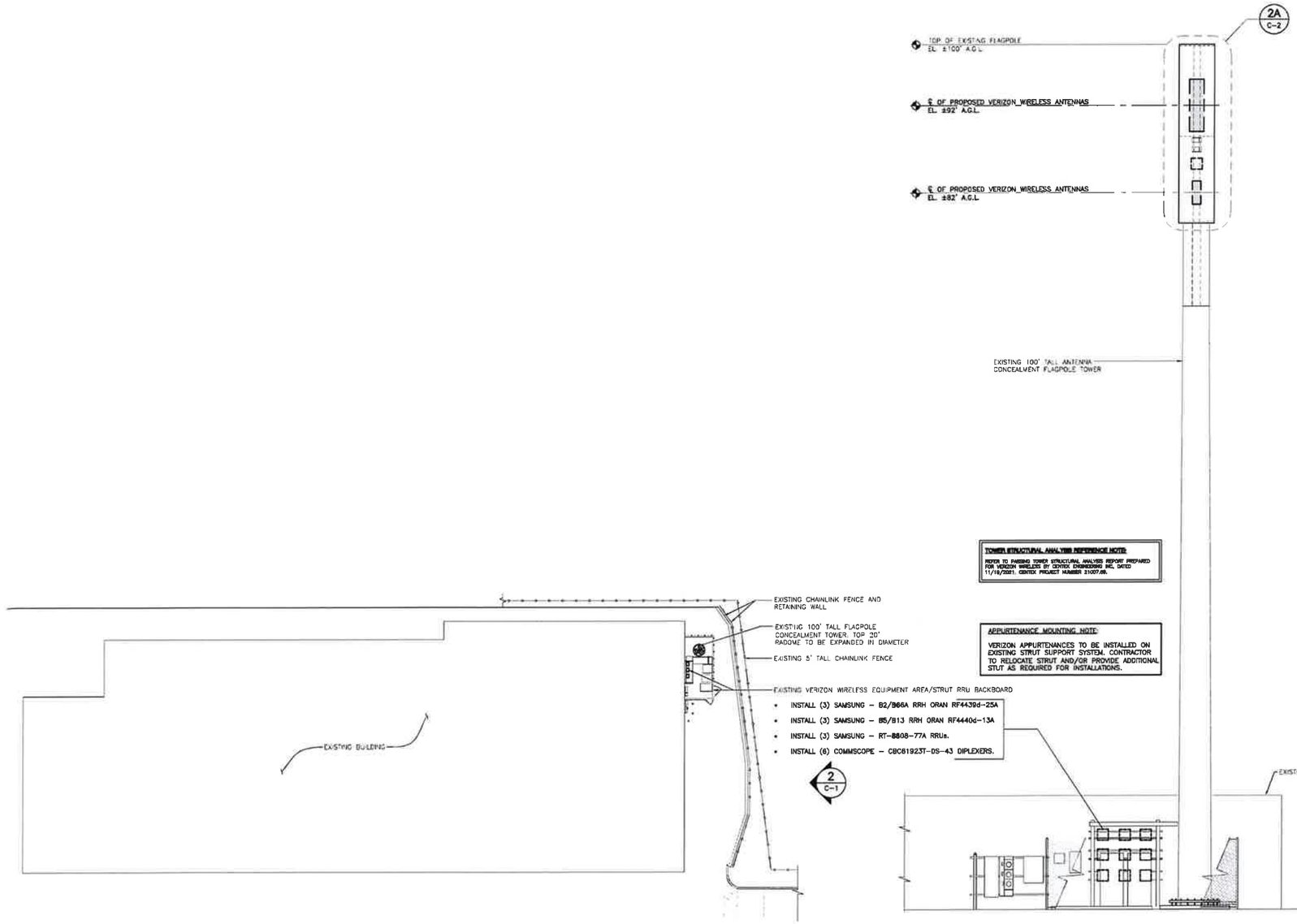
RF BILL OF MATERIALS

B-1

Sheet No. 3 of 7



1 / C-1 **PARTIAL SITE PLAN** SCALE: 1/16" = 1'

APPROXIMATE NORTH

2 / C-1 **SOUTHEAST ELEVATION - PROPOSED** SCALE: 3/16" = 1'

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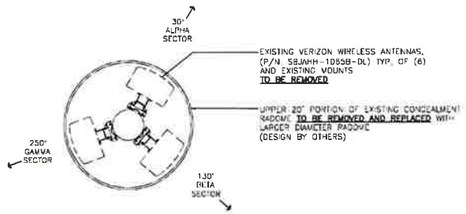
PARTIAL SITE PLAN AND ELEVATION

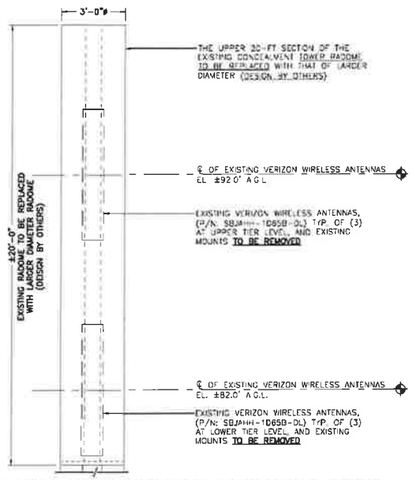
C-1

Sheet No. 4 of 7

EXISTING ANTENNA CONFIGURATIONS



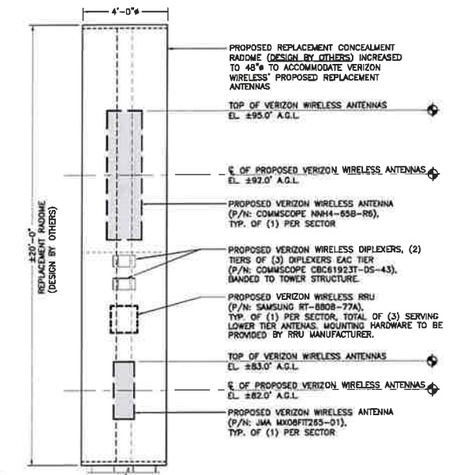
1 C-2 **EXISTING SECTOR CONFIGURATION PLAN**
SCALE: 3/4" = 1'-0" — 82' + 92' ELEVATION



2 C-2 **EXISTING SECTOR CONFIGURATION ELEVATION**
SCALE: 3/8" = 1'-0"

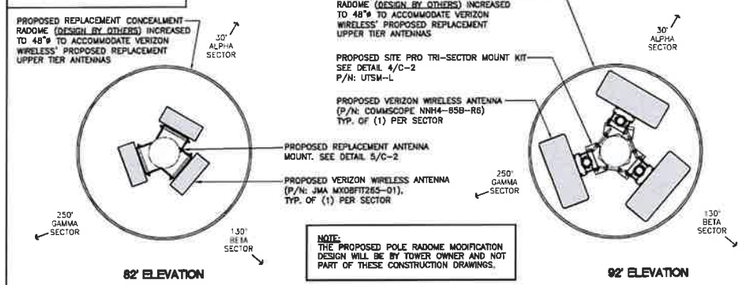
ANTENNA MOUNT ANALYSIS REFERENCE NOTE:

REFER TO PASSING VERIZON WIRELESS MOUNT ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, DATED 01/12/22 FOR ADDITIONAL INFORMATION. CENTEK PROJECT NUMBER 21007.69.



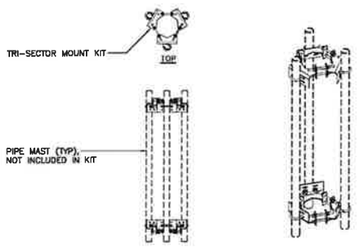
2A C-2 **PROPOSED SECTOR CONFIGURATION ELEVATION**
SCALE: 3/8" = 1'- 0"

PROPOSED ANTENNA CONFIGURATIONS



NOTE:
THE PROPOSED POLE RADOME MODIFICATION DESIGN WILL BE BY TOWER OWNER AND NOT PART OF THESE CONSTRUCTION DRAWINGS.

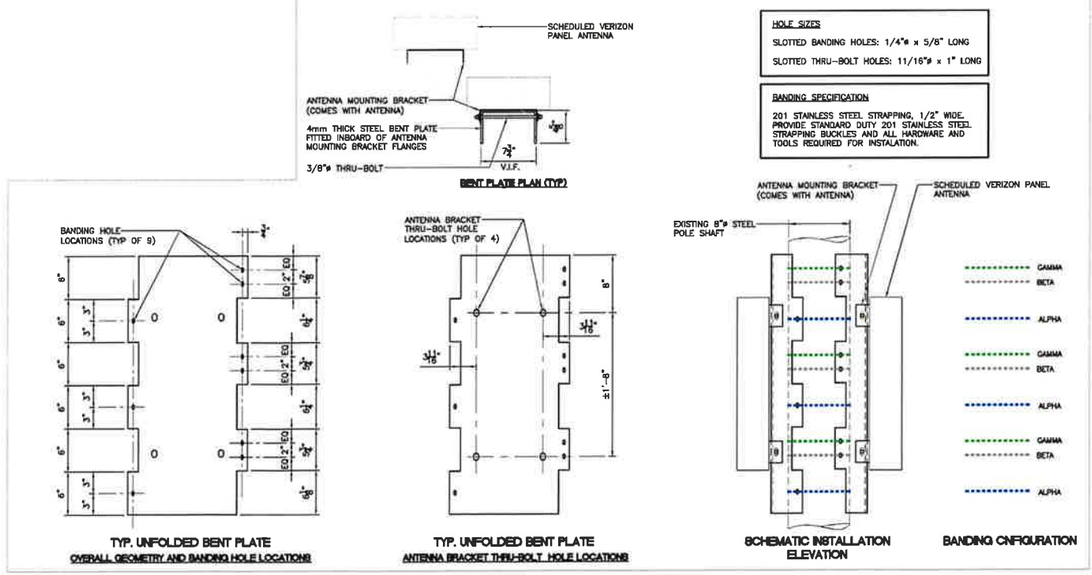
3 C-2 **PROPOSED SECTOR CONFIGURATION SECTIONS**
SCALE: 3/4" = 1'- 0"



TRI-SECTOR MOUNT KIT			
EQUIPMENT	DESCRIPTION	PIPE MASTS QTY & SIZE	WEIGHT
MAKE: SITE PRO MODEL: UTSM-L	UNIVERSAL MOUNT KIT FOR LARGER LEGS (6"ø TO 10"ø)	(3) 2-3/8"ø x 96" (SCHEDULE 40) SEE NOTE 1 BELOW	49.87 LBS

NOTES:
1. PIPE MASTS SIZES AND QUANTITIES ARE SHOWN AS COURTESY. PIPES ARE NOT INCLUDED IN KIT.

4 C-2 **ANTENNA REPLACEMENT MOUNT KIT DETAIL**
SCALE: 1/2" = 1' — 92' ELEVATION



5 C-2 **PROPOSED REPLACEMENT ANTENNA MOUNT**
SCALE:1-1/2" = 1'-0" — 82' ELEVATION

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0	07/15/22	DMD	ANC	CONSTRUCTION DRAWINGS – ISSUED FOR CONSTRUCTION
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ANTENNA SECTOR CONFIGURATION DETAILS

C-2
Sheet No. 5 of 7

DIPLEXER			
EQUIPMENT	DESCRIPTION	DIMENSIONS	WEIGHT
MAKE: COMMSCOPE MODEL: CBC61923T-DS-43	DIPLEXER 700MHz/850MHz/1900MHz	6.9"H x 7.8"W x 4.6"D	14.3 LBS. (W/MNTG HDWR)

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH VERIZON WIRELESS CONSTRUCTION MANAGER PRIOR TO ORDERING.

1/C-3 **DIPLEXER DETAIL**
NOT TO SCALE

ELEVATION

NNH4-65B-R6 (BOTTOM VIEW)

12 PORT SECTOR ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: COMMSCOPE MODEL: NNH4-65B-R6	72.0"L x 19.6"W x 7.8"D	83.1 LBS.

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

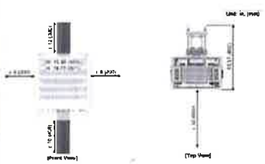
ELEVATION

MX08FIT265-01 (BOTTOM VIEW)

8 PORT SECTOR ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: JMA MODEL: MX08FIT265-01	32.0"L x 11.6"W x 4.5"D	26.5 LBS.

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

RRH - ISOMETRIC



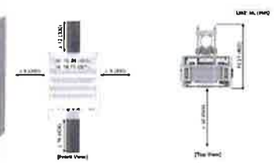
RRH CLEARANCES

DUAL BAND RRU (REMOTE RADIO UNIT)			
EQUIPMENT	BANDS	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: RF4439d-25A	B25: 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**
NOT TO SCALE

RRH - ISOMETRIC



RRH CLEARANCES

DUAL BAND RRU (REMOTE RADIO UNIT)			
EQUIPMENT	BANDS	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: RF440d-13A	B5: 850 MHz B13: 700 MHz	15.0"H x 15.0"W x 9.0"D	70.3 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**
NOT TO SCALE

RRH - ISOMETRIC

C BAND 8T8R 320W RRU (REMOTE RADIO UNIT)			
EQUIPMENT	BANDS	DIMENSIONS	WEIGHT
MAKE: SAMSUNG MODEL: RT-8808-77A	N77: 3700 MHz	15.0"H x 15.0"W x 6.8"D	59.5 LBS.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH VERIZON WIRELESS CONSTRUCTION MANAGER PRIOR TO ORDERING.

6/C-3 **C-BAND 8T8R 320W RADIO UNIT DETAIL**
NOT TO SCALE

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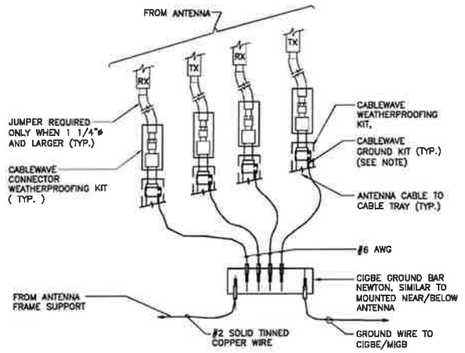
RF DETAILS

C-3

Sheet No. 6 of 7



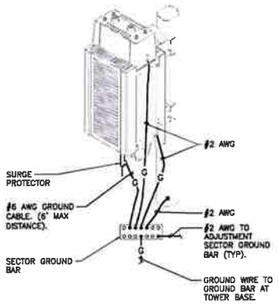
NOTES:

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

1 E-1 CONNECTION OF GROUND WIRES TO GROUND BAR

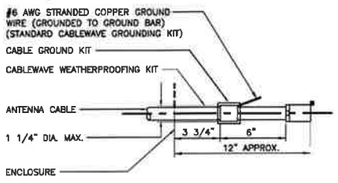
NOT TO SCALE

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



2 E-1 RRH POLE MOUNT GROUNDING

NOT TO SCALE

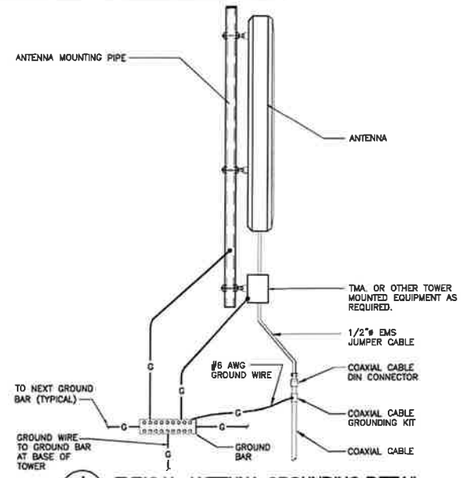


NOTES:

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

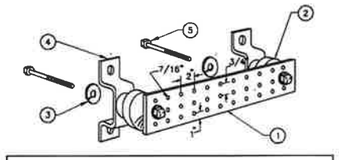
3 E-1 ANTENNA CABLE GROUNDING DETAIL

NOT TO SCALE



4 E-1 TYPICAL ANTENNA GROUNDING DETAIL

NOT TO SCALE



NOTES

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

5 E-1 GROUND BAR DETAIL

NOT TO SCALE

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. CELLULAR GROUNDING SYSTEMS CONSISTING OF ANTENNA GROUNDING, GROUND BARS, ETC.

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

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

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

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

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

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

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

L. 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 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. 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.

D. CELLULAR GROUNDING SYSTEM:

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

1. GROUND BARS.
2. ANTENNA GROUND CONNECTIONS AND PLATES.

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

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ELECTRICAL DETAILS AND SPECIFICATIONS

E-1

Sheet No. 7 of 7

JMA WIRELESS

MX08FIT265-01

NWAV™ Panel Antenna

8-Port 32 in. FIT (Form in Tighter), 3700 - 4200 MHz

- 5G C-Band 8T8R beamforming antenna
- Optimized antenna array design for all C-Band beam-forming combinations
- Excellent passive intermodulation (PIM) performance reduces harmful interference
- Integrated (internal RET) for remote electrical tilt control

nwav

Electrical specification (minimum/maximum)	Ports 1, 2, 3, 4, 5, 6, 7, 8
Frequency bands, MHz	3700-4200
Gain, dBi	17.1
Horizontal beamwidth (HBW), degrees	85
Horizontal beamwidth tolerance, degrees	±5
Front-to-back ratio, co-polar power @180°± 30°, dB	27
Vertical beamwidth (VBW), degrees[1]	5.5
Vertical beamwidth tolerance, degrees	±0.3
Remote electrical downtilt (EDT) range, degrees	2-12
First upper side lobe (USLS) suppression, dB[1]	15
Coupling level, Amp, Antenna port to Cal port, dB	26
Coupling level, max Amp Δ, Antenna port to Cal port, dB	±0.6
Coupler, max Amp Δ, Antenna port to Cal port, dB	0.65
Coupler, max Phase Δ, Antenna port to Cal port, degrees	4
Cross-polar isolation, port-to-port, dB[1]	25
Max VSWR / return loss, dB	1.5:1 / -14.0
Max passive intermodulation (PIM), 2x20W carrier, dBc	-145
Max input power per port at 50 °C, watts	75

1 Typical value over frequency and tilt

MX08FIT265-01

NWAV™ Panel Antenna

Electrical specification, Broadcast 65°	Ports 1, 2, 3, 4, 5, 6, 7, 8
Frequency bands, MHz	3700-4200
Gain over all tilts, dBi	22.5
Horizontal beamwidth (HBW), degrees1	65
Horizontal beamwidth tolerance, degrees	±6
Vertical beamwidth (VBW), degrees[1]	5.5
Vertical beamwidth tolerance, degrees	±0.3
First upper side lobe (USLS) suppression, dB[1]	<-16

Electrical specification, Service Beam	Ports 1, 2, 3, 4, 5, 6, 7, 8
Frequency bands, MHz	3700-4200
Steered 0° gain, dBi	22.5
Steered 0° Gain tolerance, dBi	±0.6
Steered 0° Beamwidth, Horizontal, degrees	22
Steered 0° CPR at beampeak, dB	18
Steered 0° Horizontal Sidelobe, dB	12
Steered 30° Gain, dBi (max)	21.8
Steered 30° Gain tolerance, dBi	±0.6
Steered 30° Gain, dBi	21
Steered 30° Beamwidth, Horizontal, degree	22.2
Steered 30° CPR at beampeak, dB	18
Steered 30° Horizontal Sidelobe, dB	10

Electrical specification, Soft Split	Ports 1, 2, 3, 4, 5, 6, 7, 8
Frequency bands, MHz	3700-4200
Gain over all tilts, dBi	21.8
Horizontal beamwidth (HBW), degrees[1]	32
First upper side lobe (USLS) suppression, dB[1]	15

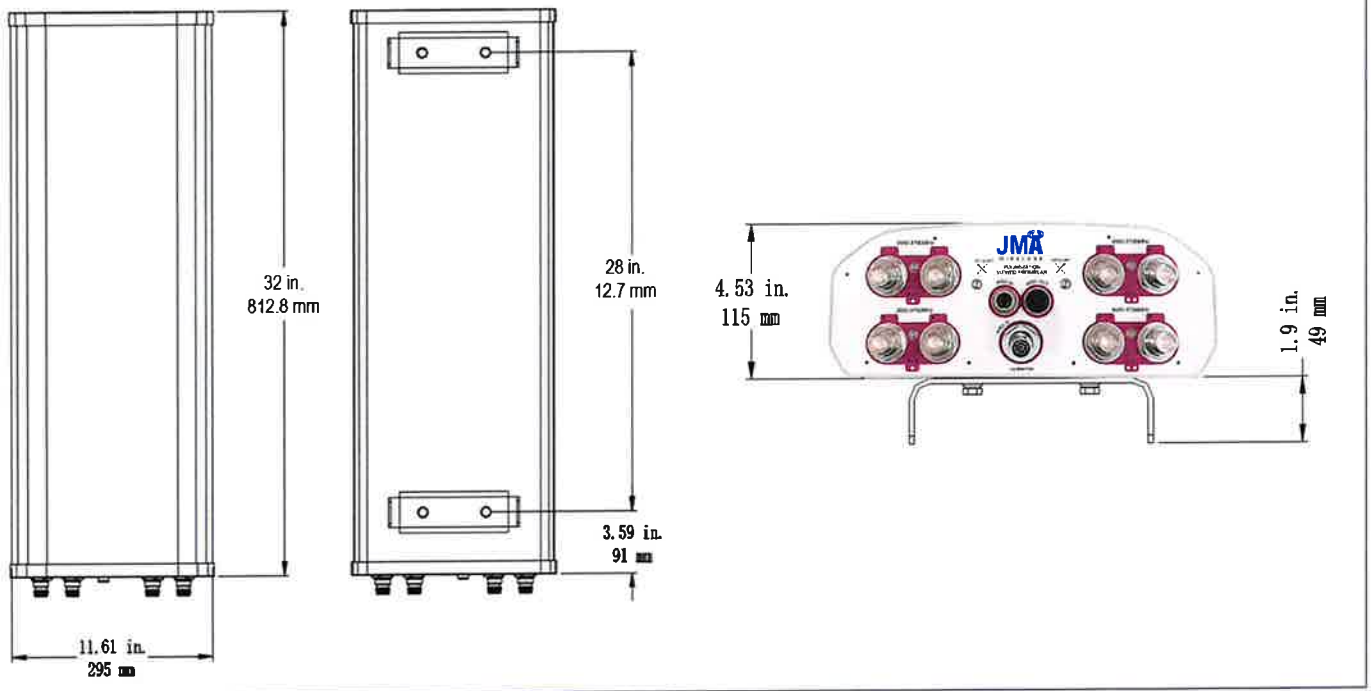
Beamforming weighting table available upon request

MX08FIT265-01

NWAV™ Panel Antenna

Mechanical specifications	
Dimensions height/width/depth, inches (mm)	32.0/ 11.6/ 4.53 (812.8/ 295/ 115)
Shipping dimensions length/width/height, inches (mm)	37.0/ 16.9/ 11.8 (939.8/ 430/ 300)
No. of RF input ports, connector type, and location	8 x 4.3-10 female, bottom
Calibration interface port, connector type, and location	1 x 4.3-10 female, bottom
RF connector torque	96 lbf·in (10.85 N·m or 8 lbf·ft)
Net antenna weight, lb (kg)	23.2 (10.52)
Weight with supplied pipe mount bracket, lb (kg)	26.5 (12.02)
Shipping weight, lb (kg)	49.1 (22.27)
Rated wind survival speed, mph (km/h)	150 (241)
Frontal wind loading @ 150 km/h, lbf (N)	56.9

Front view **Back view** **Bottom view**



Ordering information	
Antenna model	**Description**
MX08FIT265-01	32-inch 8T8R beamforming antenna, 3700-4200 MHz with RET
Mounting kit (included)	91900330 BRACKET KIT, range of mechanical up/down tilt -2° to 12°
Optional accessories	
AISG cables	M/F cables for AISG connections
PCU-1000 RET controller	Stand-alone controller for RET control and configurations

MX08FIT265-01

NWAV™ Panel Antenna

Remote electrical tilt (RET 1000) information	
RET location	Integrated into antenna
RET interface connector type	8-pin AISG connector per IEC 60130-9 or RF port Bias-T
RET connector torque	Min 0.5 N·m to max 1.0 N·m (hand pressure & finger tight)
RET interface connector quantity	1 pair of AISG male/female connectors and 1 RF port Bias-T
RET interface connector location	Bottom of the antenna
Total no. of internal RETs	1
RET input operating voltage, vdc	10-30
RET max power consumption, idle state, W	≤ 2.0
RET max power consumption, normal operating conditions, W	≤ 13.0
RET communication protocol	AISG 2.0 / 3GPP

RET and RF connector topology

Each RET device can be controlled either via the designated external AISG connector or RF port as shown below:

RET device	Band	RF port
1	3700-4200	1-8

Array topology

1 set of radiating arrays

P1: 3700-4200 MHz

Band	RF port
3700-4200	1-8

SAMSUNG

Radio Access Network

102 RRU
Product Specification

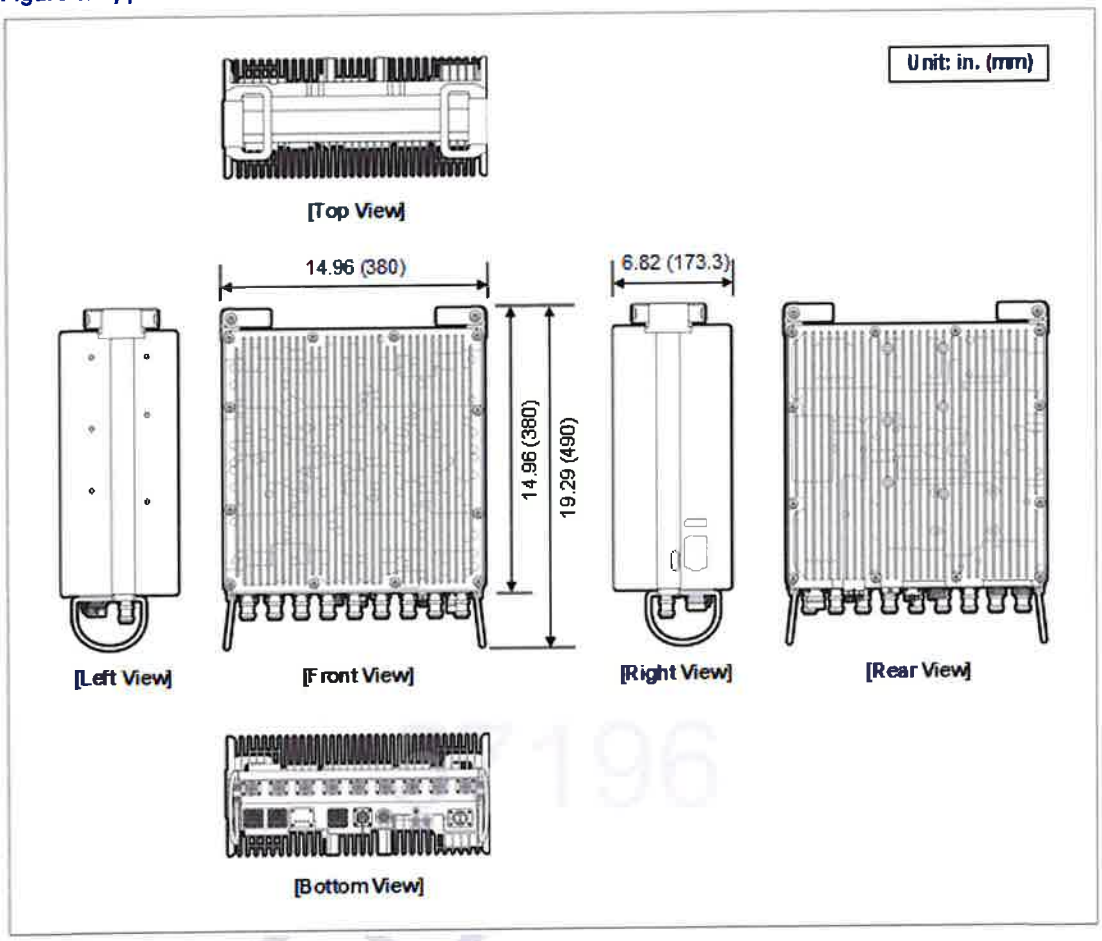
for RT8808-77A

Specifies hardware configuration, functions, specifications, components, ports, and LED information for the radio units.

Document Version 1.0
June 2021

Document Number: 2600-00T7PZGA2

Figure 1. Appearance



The RT8808-77A can be mounted on a wall or pole as displayed in the following installation scenario:

Specifications

The following table outlines the main specifications of RT8808-77A.

Table 2. Specifications (RT8808-77A)

Item	RT8808-77A
Radio Technology	5G NR
Operating Frequency	3700 to 3980 MHz
Channel Bandwidth	20/40/60/80/100 MHz
RF Chain	• 8T8R, 4T4R+4T4R Bi-sector • 2T2R+2T2R+2T2R Tri-sector • 4T8R+4T8R split mode
RF Output Power	Max. 320W (8 x 40W)
Capacity	Total Max 2C
CPRI interface	15km, 2 ports (25Gbps x 2), SFP28, single mode, Bi-di (Option: Duplex)
Input Voltage	-48 V DC (-38 V DC to -57 V DC)
Power Consumption (Max.)	1,192 W (100% load, 25°C) (w/o RET)
Operating Humidity	5% to 100%RH (Condensing, not to exceed 30g/m3 absolute humidity)
Operating Temperature	-40°C to 55°C (without solar load)
Dimension (in./mm)	14.96/380 (W) × 6.82/173.3(D) × 14.96/380 (H)
Weight (kg)	27 or less than
Cooling	Natural convection
Waterproof/Dustproof	IP65
Wind Resistance	Telcordia GR-487-CORE Issue5 • Wind Resistance (Section 3.36)
Earthquake Specification	Telcordia GR-63-CORE, Issue5, □ Earthquake (Section 4.4.1)
Vibration Specification	Telcordia GR-63-CORE, Issue5, • Office Vibration (Section 4.4.4) • Transportation Vibration (Section 4.4.5)
Altitude	Telcordia GR-63-CORE, Issue5, • Altitude (Section 4.1.3)
EMC	FCC Title 47 CFR Part 15
RF	FCC Title 47 CFR Part 27, 24
Safety	UL 62368-1, 2nd Edition
Installation	Pole, Wall, Tower

The power consumption is predicted with a simulation and the measured value is subject to change by ±10%

SAMSUNG

700/850MHZ 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 700/850MHz 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	RF4440d-13A

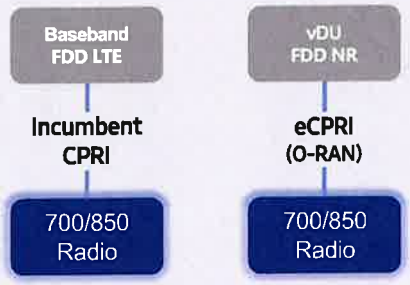
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

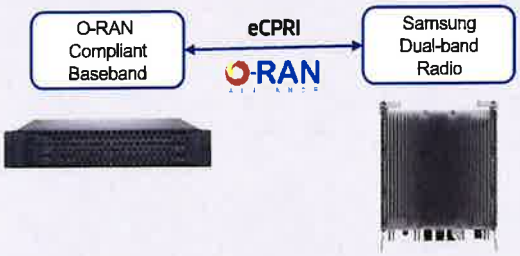
Samsung's 700/850MHz macro radio can support each incumbent CPRI interface as well as an advanced eCPRI interface. This feature provides installable options for both legacy LTE networks and added NR networks.



O-RAN Compliant

A standardized O-RAN radio can help when implementing cost-effective networks because it is 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

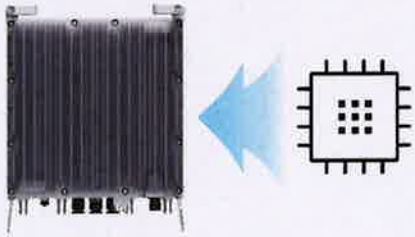
The number of required carriers varies according to site (region). The ability to support many carriers is essential for using all frequencies that the operator has available.

The new 700/850MHz dual-band radio can support up to 2 carriers in the B13 (700MHz) band and 3 carriers in the B5 (850MHz) band, respectively.

Secured Integrity

Access to sensitive data is allowed only to authorized software.

The Samsung radio's CPU can protect root of trust, which is credential information to verify SW integrity, and secure storage provides access control to sensitive data by using dedicated hardware (TPM).



Technical Specifications

Item	Specification
Tech	LTE / NR
Brand	B13(700MHz), B5(850MHz)
Frequency Band	DL: 746 – 756MHz, UL: 777 – 787MHz DL: 869 – 894MHz, UL: 824 – 849MHz
RF Power	(B13) 4 × 40W or 2 × 60W (B5) 4 × 40W or 2 × 60W
IBW/OBW	(B13) 10MHz / 10MHz (B5) 25MHz / 25MHz
Installation	Pole, Wall
Size/ Weight	14.96 x 14.96 x 9.05inch (33.2L) / 70.33 lb

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

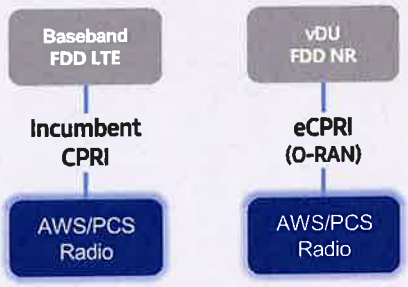
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

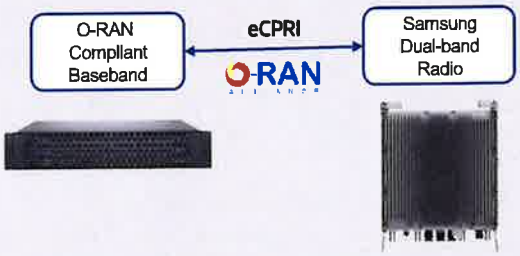
Samsung's AWS/PCS macro radio can support each incumbent CPRI interface as well as advanced eCPRI interfaces. This feature provides installable options for both legacy LTE networks and added NR networks.



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.

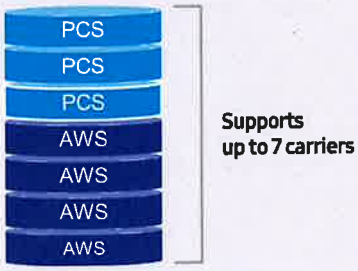
Samsung's state-of-the-art O-RAN technology will help accelerate the effort toward constructing a solid O-RAN ecosystem.



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

□□H4□6□B□□6

□□port □ector □□te□□□□4x 698□896 □□d 8x □69□□236□ MHz□6□□ H□B□ □6x □E□□

- F□at□r□s broadband Lo□ Band □□98□89□ □ H□□and High Band □□□95□□□□ □ H□□arra□s for 4T4□ □4X □ I□ □□capabilit□ for Band □4, AWS, □CS and WCS applications□
- Ind□p□nd□nt tilt for all arra□s□
- Arra□ config□ration pro□id□s capabilit□ for 4T4□ □4□ □ I□ □□on Lo□ band and D□al 4T4□ □4□ □ I□ □□on High band
- □ pti□ i□□d S□□ p□rfor□ anc□ across all op□rating bands
- E□c□ll□nt □ ind loading charact□ristics

Ge□er□l □pecific□tio□□

□ ntenna □□pe	S□ctor
Band	□ □ltiband
Grounding □□pe	□F conn□ctor inn□r cond□ctor and bod□ gro□nd□d to r□fl□ctor and □ o□nting brack□t
Performance Note	□□tdoor □sag□ □ Wind loading fig□r□s ar□ □alidat□d b□□ ind t□nn□l □ □as□r□□ □nts d□scrib□d in □ hit□ pap□r W□□□□5□4□E□
□adome Materia□	Fib□rglass, UV r□sistant
□adiator Materia□	Lo□ loss circ□it board
□ef□ector Materia□	Al□□ in□□
□F Connector Interface	4□□□□ F□□ al□
□F Connector □ocation	Botto□
□F Connector Quantit□, high band	8
□F Connector Quantit□, □ow band	4
□F Connector Quantit□, tota□	□□

□e□ ote Electric□ □ilt □□E□) □for□ □tio□

□□□ Hardware	Co□ □ □ET □□
□□□ Interface	8□pin DI□ F□□ al□ □ 8□pin DI□ □ al□
□□□ Interface, quantit□	□ f□□ al□ □ □ □ al□
Input □ o□tage	□□–□□ Vdc
Interna□□ □□	High band □4□ □ Lo□ band □□□
Power Consumption, id□e state, maximum	□ W
Power Consumption, norma□conditions, maximum	8 W

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[illegible] H4[illegible]6[illegible]B[illegible]6

Protocol — [illegible]G[illegible]AISG [illegible] [illegible]ti[illegible] ET[illegible]

Dimensions

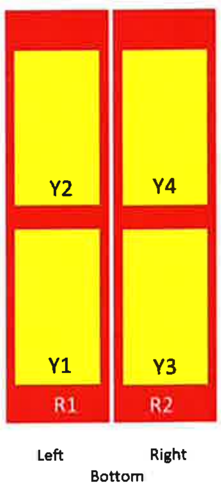
Width — 498 [illegible] in

Depth — [illegible]9[illegible] [illegible]5[illegible] in

Length — [illegible]8[illegible]8 [illegible]9[illegible]9 in

Net Weight, without mounting kit — [illegible] kg [illegible] 8[illegible]4 lb

Array Layout



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-896	1-2	1	CPxxxxxxxxxxxxxxxxmm.1
R2	698-896	3-4	2	CPxxxxxxxxxxxxxxxxmm.2
Y1	1695-2360	5-6	3	CPxxxxxxxxxxxxxxxxmm.3
Y2	1695-2360	7-8	4	CPxxxxxxxxxxxxxxxxmm.4
Y3	1695-2360	9-10	5	CPxxxxxxxxxxxxxxxxmm.5
Y4	1695-2360	11-12	6	CPxxxxxxxxxxxxxxxxmm.6

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

Port Configuration

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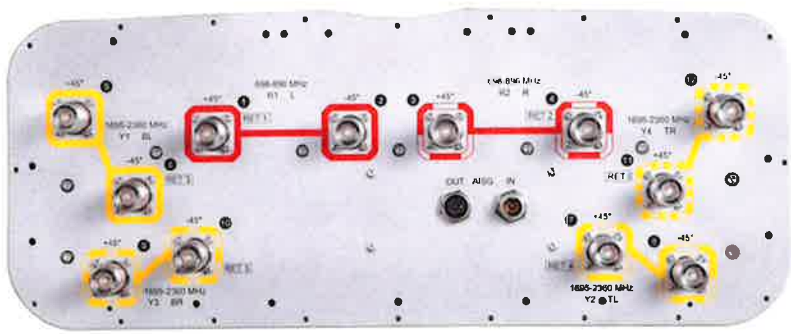
??H4?6?B??6



Electric? ?pecific?tio??

Impedance	5? oh?
? perating Frequenc? Band	??95 – ???? ? H? ? ?98 – 89? ? H?
Po?ari?ation	±45?
?ota? Input Power, maximum	9?? W @ 5? ?C

Electric? ?pecific?tio??

Frequenc? Band, MH?	**?98?8??**	**8???89?**	**??9???88?**	**?8????99?**	**?9?????8?**	**?????????**
Gain, dBi	?4?4	?5	?5??	???	???5	???9
Beamwidth, Hori?onta?, degrees	?9	?5	58	??	??	58
Beamwidth, ?ertica?, degrees	??	???5	???	???4	9?8	8?8
Beam ?i?t, degrees	?–?4	?–?4	?–?4	?–?4	?–?4	?–?4
???? ?First ?obe?, dB	??	?8	?8	?9	?9	??
Front?to?Bac? ?atio at ?8??, dB	?8	??	??	?8	?5	??
Iso?ation, Cross Po?ari?ation, dB	?5	?5	?5	?5	?5	?5
Iso?ation, Inter?band, dB	?5	?5	?5	?5	?5	?5
??? ? ?? eturn ?oss, dB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

▯▯H4▯6▯B▯▯6

PIM, ▯rd ▯rder, ▯ x ▯▯ ▯ , dBc	▯▯5▯	▯▯5▯	▯▯5▯	▯▯5▯	▯▯5▯	▯▯5▯
Input Power per Port at ▯▯▯C, maximum, watts	▯▯▯	▯▯▯	▯5▯	▯5▯	▯5▯	▯▯▯

Electric▯ ▯pecific▯tio▯▯▯BA▯▯A

Frequenc▯ Band, MH▯	▯98▯ 8▯▯	**8▯▯▯ 89▯**	**▯▯9▯▯▯ 88▯**	**▯8▯▯▯▯ 99▯**	**▯9▯▯▯▯▯ 8▯**	**▯▯▯▯▯▯▯▯▯▯**
Gain b▯ a▯▯Beam ▯i▯ts, average, dBi	▯4	▯4▯▯	▯5▯▯	▯▯	▯▯▯▯	▯▯▯5
Gain b▯ a▯▯Beam ▯i▯ts ▯o▯erance, dB	±▯▯5	±▯▯▯	±▯▯8	±▯▯5	±▯▯4	±▯▯5
Gain b▯ Beam ▯i▯t, average, dBi	▯ ▯ ▯▯4▯▯ 8 ▯ ▯▯4▯▯ ▯4 ▯ ▯▯▯▯▯	▯ ▯ ▯▯4▯8 8 ▯ ▯▯4▯8 ▯4 ▯ ▯▯▯4▯▯	▯ ▯ ▯▯5▯▯ 8 ▯ ▯▯5▯▯ ▯4 ▯ ▯▯5▯▯	▯ ▯ ▯▯▯▯▯ 8 ▯ ▯▯▯▯▯ ▯4 ▯ ▯▯▯59	▯ ▯ ▯▯▯▯▯ 8 ▯ ▯▯▯▯▯ ▯4 ▯ ▯▯▯▯▯	▯ ▯ ▯▯▯▯5 8 ▯ ▯▯▯▯4 ▯4 ▯ ▯▯▯▯4
Beamwidth, Hori▯onta▯ ▯o▯erance, degrees	±▯▯▯	±4▯▯	±5▯▯	±▯▯8	±▯▯8	±▯▯▯
Beamwidth, ▯ ertica▯ ▯o▯erance, degrees	±▯▯9	±▯▯9	±▯▯8	±▯▯5	±▯▯▯	±▯▯4
▯ ▯▯▯, beampea▯ to ▯▯▯ above beampea▯, dB	▯▯	▯▯	▯8	▯9	▯▯	▯▯
Front▯to▯Bac▯ ▯ ota▯Power at ▯8▯▯▯ ▯▯▯, dB	▯▯	▯▯	▯8	▯▯	▯8	▯8
CP▯ at Boresight, dB	▯▯	▯4	▯5	▯▯	▯▯	▯▯
CP▯ at ▯ ector, dB	▯▯	5	9	8	▯	9

Mech▯▯ic▯ ▯pecific▯tio▯▯

▯ffective Projective ▯ rea ▯▯P▯▯, fronta▯	▯▯▯4▯ ² ▯ ▯▯889 ft²
▯ffective Projective ▯ rea ▯▯P▯▯, ▯atera▯	▯▯▯▯ ▯ ² ▯ ▯▯▯▯8 ft²
▯ ind ▯oading ▯ ▯e▯ocit▯, fronta▯	▯85▯▯ ▯ @ ▯5▯ k▯ ▯h ▯▯54▯▯ lbf @ ▯5▯ k▯ ▯h▯
▯ ind ▯oading ▯ ▯e▯ocit▯, ▯atera▯	▯▯▯▯▯ ▯ @ ▯5▯ k▯ ▯h ▯5▯▯▯ lbf @ ▯5▯ k▯ ▯h▯
▯ ind ▯oading ▯ ▯e▯ocit▯, maximum	889▯▯ ▯ @ ▯5▯ k▯ ▯h ▯▯99▯9 lbf @ ▯5▯ k▯ ▯h▯
▯ ind ▯oading ▯ ▯e▯ocit▯, rear	5▯4▯▯ ▯ @ ▯5▯ k▯ ▯h ▯▯▯▯▯8 lbf @ ▯5▯ k▯ ▯h▯
▯ ind ▯peed, maximum	▯4▯ k▯ ▯h ▯ ▯49▯▯5▯ ph

▯▯ck▯gi▯g ▯▯d ▯ eight▯

▯ idth, pac▯ed	▯▯8▯ ▯ ▯ ▯▯▯9▯▯ in
▯ epth, pac▯ed	▯5▯ ▯ ▯ ▯ ▯▯▯858 in
▯ength, pac▯ed	▯▯▯▯ ▯ ▯ ▯ ▯9▯▯4 in
▯ eight, gross	5▯ kg ▯ ▯▯▯▯845 lb

COMMSCOPE®

[illegible]H4[illegible]6[illegible]B[illegible]6

Regulatory Compliance/Certifications

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

Included Products

BSA[illegible]T[illegible]	–	Wide Profile Antenna Downtilt Mounting Kit for [illegible] in [illegible] 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

ATTACHMENT 2

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

98-ft Existing Flagpole

Proposed Verizon
Antenna Upgrade

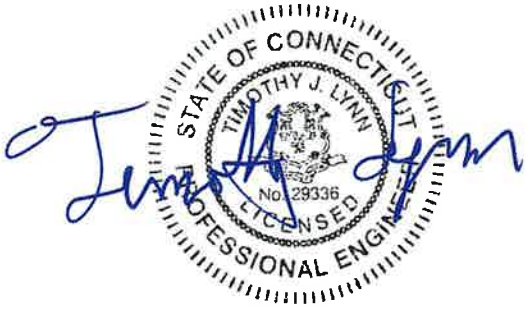
Site Ref: Bridgeport NE CT

541 Broadbridge Road
Bridgeport, CT

Centek Project No. 21007.69

Date: November 19, 2021

Max Stress Ratio = 65%



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 upgrade proposed by Verizon on the existing flagpole (tower) located in Bridgeport, Connecticut.

The host tower consists of three (3) 10-ft concealment canister sections supported on a 68.0-ft tall, two-section, eighteen sided, tapered monopole original designed by EEI jo no. 18280-D01 dated 02/20/2018. The tower geometry and structure member sizes were obtained the original design documents.

Antenna and appurtenance information were obtained from a previous structural analysis report prepared by Engineered Endeavors; dated February 19, 2018 and a Verizon RF data sheet.

The tower is made up of two (2) tapered vertical sections consisting of A572-65 sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 35.5-in at the top and 45.00-in at the base.

Antenna and Appurtenance Summary

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

- **VERIZON(EXISTING TO REMOVE):**
  Antennas: Six (6) Commscope SBJAHH-1D65B-DL panel antennas with rad center elevation of ±92&82-ft above grade level.
  Appurtenances: Three(3) Nokia B13 RRH 4x30 radio head units, three (3) Nokia B25 RRH 4x30 radio head units, three (3) Nokia B66A RRH 4x45 radio head units and twenty four (24) Kaelus QBC0002F1V51-1 Quadplexer.
- **VERIZON (Proposed):**
  Antennas: Three (3) Commscope NNH4-65B-R6 panel antennas and three (3) JMA MX08FIT265-01 panel antennas mounted within a concealment canister with rad center elevations of ±92&82-ft above grade level.
  Appurtenances: Three(3) Samsung RT-8808-77A radio head units, six (6) Commscope CBC61923T-DS-43 diplexers and one 6 OVP box.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Bridgeport; v = 97 mph (Vasd – Risk Cat II)	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

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

Tower Capacity

- Calculated stresses were found to be within allowable limits.

Tower Section	Elevation (AGL)	Stress Ratio (percentage of capacity)	Result
Antenna Pole (Inside Canister – L3)	68.5' - 78.0'	64.7%	**PASS**
Pole Shaft (L6)	1.0' - 38.3'	35.7%	**PASS**

Foundation and Anchors

The existing foundation consists of a one (1) 6-ft Ø round x 18.75-ft tall pier. The existing foundation properties were obtained from the aforementioned design documents. The base of the tower is connected to the foundation by means of (6) 1.75"∅, ASTM A615-75 anchor bolts embedded approximately 5.17-ft into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	11 kips
	Compression	15 kips
	Moment	683 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	23.8%	**PASS**
	Lateral Deflection	0.27 in.(1)	**PASS**

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

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Bending	64.7%	**PASS**
Base Plate	Bending	61.5%	**PASS**

Conclusion

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

- Replacement of the top two (2) 10-ft concealment canisters with 10-ft x 48" diameter canisters (designed by others) is required to accommodate the proposed antennas.

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

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

Prepared by:

Fernando J. Palacios
Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

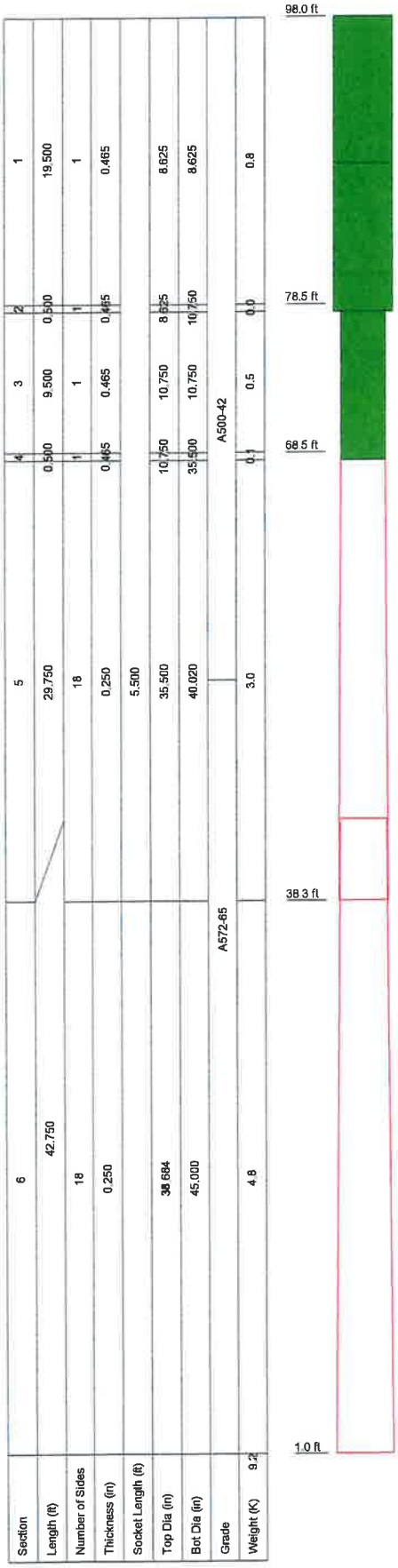
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or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

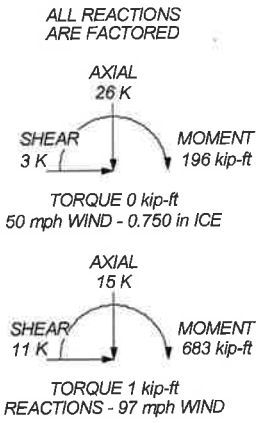
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

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





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10'x48" Canister	98 - 88	RRFDC-3315-PF-48 (Verizon - Proposed)	92
NNH4-65B-R6 (Verizon - Proposed)	92	10'x48" Canister	88 - 78
NNH4-65B-R6 (Verizon - Proposed)	92	RT-8808-77A (Verizon - Proposed)	82
NNH4-65B-R6 (Verizon - Proposed)	92	RT-8808-77A (Verizon - Proposed)	82
(2) CBC61923T-DS-43 - Diplexer (Verizon - Proposed)	92	RT-8808-77A (Verizon - Proposed)	82
(2) CBC61923T-DS-43 - Diplexer (Verizon - Proposed)	92	MX08FIT265-01 (Verizon - Proposed)	82
(2) CBC61923T-DS-43 - Diplexer (Verizon - Proposed)	92	MX08FIT265-01 (Verizon - Proposed)	82
		MX08FIT265-01 (Verizon - Proposed)	82
		10'x36" Canister	78 - 68

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.000 ft
7. TOWER RATING: 64.7%

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

Job: 21007.69 vZw Bridgeport NE CT		
Project: 98-ft Flag pole- 541 Broadbridge Road | Bridgeport, CT 06610		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA-222-G	Date: 11/19/21	Scale: NTS
Path:		Dwg No. E-1

Tower Input Data

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

Basic wind speed of 97 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.000 ft.
Nominal ice thickness of 0.750 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	98.000-78.500	19.500	0.000	Round	8.625	8.625	0.465		A500-42 (42 ksi)

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L2	78.500-78.000	0.500	0.000	Round	8.625	10.750	0.465		A500-42 (42 ksi)
L3	78.000-68.500	9.500	0.000	Round	10.750	10.750	0.465		A500-42 (42 ksi)
L4	68.500-68.000	0.500	0.000	Round	10.750	35.500	0.465		A500-42 (42 ksi)
L5	68.000-38.250	29.750	5.500	18	35.500	40.020	0.250	1.000	A572-65 (65 ksi)
L6	38.250-1.000	42.750		18	38.684	45.000	0.250	1.000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	8.625	11.920	99.539	2.890	4.313	23.081	199.077	5.957	0.000	0
	8.625	11.920	99.539	2.890	4.313	23.081	199.077	5.957	0.000	0
L2	8.625	11.920	99.539	2.890	4.313	23.081	199.077	5.957	0.000	0
	10.750	15.025	199.073	3.640	5.375	37.037	398.146	7.508	0.000	0
L3	10.750	15.025	199.073	3.640	5.375	37.037	398.146	7.508	0.000	0
	10.750	15.025	199.073	3.640	5.375	37.037	398.146	7.508	0.000	0
L4	10.750	15.025	199.073	3.640	5.375	37.037	398.146	7.508	0.000	0
	35.500	51.181	7854.087	12.388	17.750	442.484	15708.174	25.575	0.000	0
L5	36.009	27.971	4390.983	12.514	18.034	243.484	8787.744	13.988	5.808	23.232
	40.599	31.557	6305.959	14.118	20.330	310.178	12620.216	15.782	6.604	26.414
L6	40.068	30.498	5691.722	13.644	19.652	289.631	11390.933	15.252	6.368	25.474
	45.656	35.509	8983.871	15.886	22.860	392.995	17979.563	17.758	7.480	29.92

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 98.000-78.500				0	1	1			
L2 78.500-78.000				0	1	1			
L3 78.000-68.500				0	1	1			
L4 68.500-68.000				0	1	1			
L5 68.000-38.250				1	1	1			
L6 38.250-1.000				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight klf

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
LDF5-50A (7/8 FOAM) (Verizon)	C	No	Yes	Inside Pole	93.000 - 5.000	18	No Ice	0.000	0.000
							1/2" Ice	0.000	0.000
							1" Ice	0.000	0.000
LDF5-50A (7/8 FOAM) (Verizon)	C	No	Yes	Inside Pole	83.000 - 5.000	18	No Ice	0.000	0.000
							1/2" Ice	0.000	0.000
							1" Ice	0.000	0.000
LDF5-50A (7/8 FOAM) (Verizon)	C	No	Yes	Inside Pole	73.000 - 5.000	18	No Ice	0.000	0.000
							1/2" Ice	0.000	0.000
							1" Ice	0.000	0.000

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	98.000-78.500	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.113
L2	78.500-78.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.006
L3	78.000-68.500	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.140
L4	68.500-68.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.009
L5	68.000-38.250	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.530
L6	38.250-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.593

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	98.000-78.500	A	1.655	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.113
L2	78.500-78.000	A	1.635	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.006
L3	78.000-68.500	A	1.625	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.140
L4	68.500-68.000	A	1.613	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.009

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L5	68.000-38.250	A	1.572	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.530
L6	38.250-1.000	A	1.426	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.593

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	98.000-78.500	0.000	0.000	0.000	0.000
L2	78.500-78.000	0.000	0.000	0.000	0.000
L3	78.000-68.500	0.000	0.000	0.000	0.000
L4	68.500-68.000	0.000	0.000	0.000	0.000
L5	68.000-38.250	0.000	0.000	0.000	0.000
L6	38.250-1.000	0.000	0.000	0.000	0.000

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
MX08FIT265-01	A	From Face	0.500	0.000	82.000	No Ice	3.123	1.411	0.027
(Verizon - Proposed)			0.000			1/2" Ice	3.359	1.613	0.047
			0.000			1" Ice	3.603	1.821	0.070
MX08FIT265-01	B	From Face	0.500	0.000	82.000	No Ice	3.123	1.411	0.027
(Verizon - Proposed)			0.000			1/2" Ice	3.359	1.613	0.047
			0.000			1" Ice	3.603	1.821	0.070
MX08FIT265-01	C	From Face	0.500	0.000	82.000	No Ice	3.123	1.411	0.027
(Verizon - Proposed)			0.000			1/2" Ice	3.359	1.613	0.047
			0.000			1" Ice	3.603	1.821	0.070
NNH4-65B-R6	A	From Face	0.500	0.000	92.000	No Ice	12.268	5.721	0.083
(Verizon - Proposed)			0.000			1/2" Ice	12.763	6.178	0.155
			0.000			1" Ice	13.265	6.642	0.234
NNH4-65B-R6	B	From Face	0.500	0.000	92.000	No Ice	12.268	5.721	0.083
(Verizon - Proposed)			0.000			1/2" Ice	12.763	6.178	0.155
			0.000			1" Ice	13.265	6.642	0.234
NNH4-65B-R6	C	From Face	0.500	0.000	92.000	No Ice	12.268	5.721	0.083
(Verizon - Proposed)			0.000			1/2" Ice	12.763	6.178	0.155
			0.000			1" Ice	13.265	6.642	0.234
(2) CBC61923T-DS-43 - Diplexer	A	From Face	0.500	0.000	92.000	No Ice	0.449	0.265	0.014
(Verizon - Proposed)			0.000			1/2" Ice	0.534	0.332	0.019
			0.000			1" Ice	0.627	0.407	0.025

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) CBC61923T-DS-43 - Diplexer (Verizon - Proposed)	B	From Face	0.500 0.000 0.000	0.000	92.000	No Ice 1/2" Ice 1" Ice	0.449 0.534 0.627	0.265 0.332 0.407	0.014 0.019 0.025
(2) CBC61923T-DS-43 - Diplexer (Verizon - Proposed)	C	From Face	0.500 0.000 0.000	0.000	92.000	No Ice 1/2" Ice 1" Ice	0.449 0.534 0.627	0.265 0.332 0.407	0.014 0.019 0.025
RT-8808-77A (Verizon - Proposed)	A	From Face	0.500 0.000 0.000	0.000	82.000	No Ice 1/2" Ice 1" Ice	1.875 2.045 2.223	0.850 0.975 1.107	0.060 0.075 0.092
RT-8808-77A (Verizon - Proposed)	B	From Face	0.500 0.000 0.000	0.000	82.000	No Ice 1/2" Ice 1" Ice	1.875 2.045 2.223	0.850 0.975 1.107	0.060 0.075 0.092
RT-8808-77A (Verizon - Proposed)	C	From Face	0.500 0.000 0.000	0.000	82.000	No Ice 1/2" Ice 1" Ice	1.875 2.045 2.223	0.850 0.975 1.107	0.060 0.075 0.092
10'x48" Canister	C	From Face	0.000 0.000 0.000	0.000	98.000 - 88.000	No Ice 1/2" Ice 1" Ice	20.000 28.822 29.653	20.000 28.822 29.653	0.400 0.757 1.126
10'x48" Canister	C	From Face	0.000 0.000 0.000	0.000	88.000 - 78.000	No Ice 1/2" Ice 1" Ice	20.000 28.822 29.653	20.000 28.822 29.653	0.400 0.757 1.126
10'x36" Canister	C	From Face	0.000 0.000 0.000	0.000	78.000 - 68.000	No Ice 1/2" Ice 1" Ice	15.556 22.295 23.044	15.556 22.295 23.044	0.350 0.608 0.876
RRFDC-3315-PF-48 (Verizon - Proposed)	C	From Face	0.500 0.000 0.000	0.000	92.000	No Ice 1/2" Ice 1" Ice	3.015 3.234 3.460	1.965 2.153 2.349	0.025 0.051 0.081

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 98.000-78.500	88.250	1.233	0.028	14.016	A B C	0.000 0.000 0.000	14.016 14.016 14.016	14.016	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L2 78.500-78.000	78.241	1.202	0.028	0.404	A B C	0.000 0.000 0.000	0.404 0.404 0.404	0.404	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L3 78.000-68.500	73.250	1.185	0.027	8.510	A B C	0.000 0.000 0.000	8.510 8.510 8.510	8.510	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L4 68.500-68.000	68.205	1.168	0.027	0.964	A B C	0.000 0.000 0.000	0.964 0.964 0.964	0.964	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L5 68.000-38.250	52.828	1.107	0.025	94.962	A B	0.000 0.000	94.962 94.962	94.962	100.00 100.00	0.000 0.000	0.000 0.000

Section Elevation ft	z ft	K_Z	q_z ksf	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
L6 38.250-1.000	19.854	0.9	0.021	133.050	C	0.000	94.962		100.00	0.000	0.000
					A	0.000	133.050	133.050	100.00	0.000	0.000
					B	0.000	133.050		100.00	0.000	0.000
					C	0.000	133.050		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 98.000-78.500	88.250	1.233	0.007	1.655	19.395	A	0.000	19.395	19.395	100.00	0.000	0.000
						B	0.000	19.395		100.00	0.000	0.000
						C	0.000	19.395		100.00	0.000	0.000
L2 78.500-78.000	78.241	1.202	0.007	1.635	0.540	A	0.000	0.540	0.540	100.00	0.000	0.000
						B	0.000	0.540		100.00	0.000	0.000
						C	0.000	0.540		100.00	0.000	0.000
L3 78.000-68.500	73.250	1.185	0.007	1.625	11.083	A	0.000	11.083	11.083	100.00	0.000	0.000
						B	0.000	11.083		100.00	0.000	0.000
						C	0.000	11.083		100.00	0.000	0.000
L4 68.500-68.000	68.205	1.168	0.007	1.613	1.098	A	0.000	1.098	1.098	100.00	0.000	0.000
						B	0.000	1.098		100.00	0.000	0.000
						C	0.000	1.098		100.00	0.000	0.000
L5 68.000-38.250	52.828	1.107	0.007	1.572	102.758	A	0.000	102.758	102.758	100.00	0.000	0.000
						B	0.000	102.758		100.00	0.000	0.000
						C	0.000	102.758		100.00	0.000	0.000
L6 38.250-1.000	19.854	0.9	0.006	1.426	142.811	A	0.000	142.811	142.811	100.00	0.000	0.000
						B	0.000	142.811		100.00	0.000	0.000
						C	0.000	142.811		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 98.000-78.500	88.250	1.233	0.010	14.016	A	0.000	14.016	14.016	100.00	0.000	0.000
					B	0.000	14.016		100.00	0.000	0.000
					C	0.000	14.016		100.00	0.000	0.000
L2 78.500-78.000	78.241	1.202	0.009	0.404	A	0.000	0.404	0.404	100.00	0.000	0.000
					B	0.000	0.404		100.00	0.000	0.000
					C	0.000	0.404		100.00	0.000	0.000
L3 78.000-68.500	73.250	1.185	0.009	8.510	A	0.000	8.510	8.510	100.00	0.000	0.000
					B	0.000	8.510		100.00	0.000	0.000
					C	0.000	8.510		100.00	0.000	0.000
L4 68.500-68.000	68.205	1.168	0.009	0.964	A	0.000	0.964	0.964	100.00	0.000	0.000
					B	0.000	0.964		100.00	0.000	0.000
					C	0.000	0.964		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	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
L5 68.000-38.250	52.828	1.107	0.009	94.962	A	0.000	94.962	94.962	100.00	0.000	0.000
					B	0.000	94.962		100.00	0.000	0.000
					C	0.000	94.962		100.00	0.000	0.000
L6 38.250-1.000	19.854	0.9	0.007	133.050	A	0.000	133.050	133.050	100.00	0.000	0.000
					B	0.000	133.050		100.00	0.000	0.000
					C	0.000	133.050		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 98.000-78.500	0.113	0.791	A	1	0.6	0.028	1	1	14.016	0.261	0.013	C
			B	1	0.6		1	1	14.016			
			C	1	0.6		1	1	14.016			
L2 78.500-78.000	0.006	0.023	A	1	0.6	0.028	1	1	0.404	0.007	0.015	C
			B	1	0.6		1	1	0.404			
			C	1	0.6		1	1	0.404			
L3 78.000-68.500	0.140	0.486	A	1	0.6	0.027	1	1	8.510	0.152	0.016	C
			B	1	0.6		1	1	8.510			
			C	1	0.6		1	1	8.510			
L4 68.500-68.000	0.009	0.056	A	1	0.6	0.027	1	1	0.964	0.017	0.034	C
			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5 68.000-38.250	0.530	3.013	A	1	0.65	0.025	1	1	94.962	1.719	0.058	C
			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6 38.250-1.000	0.593	4.801	A	1	0.65	0.021	1	1	133.050	1.981	0.053	C
			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	161.934 kip-ft	4.138		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 98.000-78.500	0.113	0.791	A	1	0.6	0.028	1	1	14.016	0.261	0.013	C
			B	1	0.6		1	1	14.016			
			C	1	0.6		1	1	14.016			
L2 78.500-78.000	0.006	0.023	A	1	0.6	0.028	1	1	0.404	0.007	0.015	C
			B	1	0.6		1	1	0.404			
			C	1	0.6		1	1	0.404			
L3 78.000-68.500	0.140	0.486	A	1	0.6	0.027	1	1	8.510	0.152	0.016	C
			B	1	0.6		1	1	8.510			
			C	1	0.6		1	1	8.510			
L4 68.500-68.000	0.009	0.056	A	1	0.6	0.027	1	1	0.964	0.017	0.034	C
			B	1	0.6		1	1	0.964			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.025	1	1	94.962	1.719	0.058	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.021	1	1	133.050	1.981	0.053	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	161.934 kip-ft	4.138		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	0.791	A	1	0.6	0.028	1	1	14.016	0.261	0.013	C
98.000-78.500			B	1	0.6		1	1	14.016			
			C	1	0.6		1	1	14.016			
L2	0.006	0.023	A	1	0.6	0.028	1	1	0.404	0.007	0.015	C
78.500-78.000			B	1	0.6		1	1	0.404			
			C	1	0.6		1	1	0.404			
L3	0.140	0.486	A	1	0.6	0.027	1	1	8.510	0.152	0.016	C
78.000-68.500			B	1	0.6		1	1	8.510			
			C	1	0.6		1	1	8.510			
L4	0.009	0.056	A	1	0.6	0.027	1	1	0.964	0.017	0.034	C
68.500-68.000			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.025	1	1	94.962	1.719	0.058	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.021	1	1	133.050	1.981	0.053	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	161.934 kip-ft	4.138		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	0.791	A	1	0.6	0.028	1	1	14.016	0.261	0.013	C
98.000-78.500			B	1	0.6		1	1	14.016			
			C	1	0.6		1	1	14.016			
L2	0.006	0.023	A	1	0.6	0.028	1	1	0.404	0.007	0.015	C
78.500-78.000			B	1	0.6		1	1	0.404			
			C	1	0.6		1	1	0.404			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L3	0.140	0.486	A	1	0.6	0.027	1	1	8.510	0.152	0.016	C
78.000-68.500			B	1	0.6		1	1	8.510			
			C	1	0.6		1	1	8.510			
L4	0.009	0.056	A	1	0.6	0.027	1	1	0.964	0.017	0.034	C
68.500-68.000			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.025	1	1	94.962	1.719	0.058	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.021	1	1	133.050	1.981	0.053	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	161.934 kip-ft	4.138		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	1.196	A	1	1.2	0.007	1	1	19.395	0.192	0.010	C
98.000-78.500			B	1	1.2		1	1	19.395			
			C	1	1.2		1	1	19.395			
L2	0.006	0.034	A	1	1.2	0.007	1	1	0.540	0.005	0.010	C
78.500-78.000			B	1	1.2		1	1	0.540			
			C	1	1.2		1	1	0.540			
L3	0.140	0.719	A	1	1.2	0.007	1	1	11.083	0.105	0.011	C
78.000-68.500			B	1	1.2		1	1	11.083			
			C	1	1.2		1	1	11.083			
L4	0.009	0.081	A	1	1.2	0.007	1	1	1.098	0.010	0.021	C
68.500-68.000			B	1	1.2		1	1	1.098			
			C	1	1.2		1	1	1.098			
L5	0.530	5.284	A	1	1.2	0.007	1	1	102.758	0.913	0.031	C
68.000-38.250			B	1	1.2		1	1	102.758			
			C	1	1.2		1	1	102.758			
L6	0.593	7.664	A	1	1.2	0.006	1	1	141.901	1.036	0.028	C
38.250-1.000			B	1	1.2		1	1	141.901			
			C	1	1.2		1	1	141.901			
Sum Weight:	1.390	14.978						OTM	92.288 kip-ft	2.262		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	1.196	A	1	1.2	0.007	1	1	19.395	0.192	0.010	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
98.000-78.500			B	1	1.2		1	1	19.395			
			C	1	1.2		1	1	19.395			
L2	0.006	0.034	A	1	1.2	0.007	1	1	0.540	0.005	0.010	C
78.500-78.000			B	1	1.2		1	1	0.540			
			C	1	1.2		1	1	0.540			
L3	0.140	0.719	A	1	1.2	0.007	1	1	11.083	0.105	0.011	C
78.000-68.500			B	1	1.2		1	1	11.083			
			C	1	1.2		1	1	11.083			
L4	0.009	0.081	A	1	1.2	0.007	1	1	1.098	0.010	0.021	C
68.500-68.000			B	1	1.2		1	1	1.098			
			C	1	1.2		1	1	1.098			
L5	0.530	5.284	A	1	1.2	0.007	1	1	102.758	0.913	0.031	C
68.000-38.250			B	1	1.2		1	1	102.758			
			C	1	1.2		1	1	102.758			
L6	0.593	7.664	A	1	1.2	0.006	1	1	141.901	1.036	0.028	C
38.250-1.000			B	1	1.2		1	1	141.901			
			C	1	1.2		1	1	141.901			
Sum Weight:	1.390	14.978						OTM	92.288 kip-ft	2.262		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	1.196	A	1	1.2	0.007	1	1	19.395	0.192	0.010	C
98.000-78.500			B	1	1.2		1	1	19.395			
			C	1	1.2		1	1	19.395			
L2	0.006	0.034	A	1	1.2	0.007	1	1	0.540	0.005	0.010	C
78.500-78.000			B	1	1.2		1	1	0.540			
			C	1	1.2		1	1	0.540			
L3	0.140	0.719	A	1	1.2	0.007	1	1	11.083	0.105	0.011	C
78.000-68.500			B	1	1.2		1	1	11.083			
			C	1	1.2		1	1	11.083			
L4	0.009	0.081	A	1	1.2	0.007	1	1	1.098	0.010	0.021	C
68.500-68.000			B	1	1.2		1	1	1.098			
			C	1	1.2		1	1	1.098			
L5	0.530	5.284	A	1	1.2	0.007	1	1	102.758	0.913	0.031	C
68.000-38.250			B	1	1.2		1	1	102.758			
			C	1	1.2		1	1	102.758			
L6	0.593	7.664	A	1	1.2	0.006	1	1	141.901	1.036	0.028	C
38.250-1.000			B	1	1.2		1	1	141.901			
			C	1	1.2		1	1	141.901			
Sum Weight:	1.390	14.978						OTM	92.288 kip-ft	2.262		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 98.000-78.500	0.113	1.196	A	1	1.2	0.007	1	1	19.395	0.192	0.010	C
			B	1	1.2		1	1	19.395			
			C	1	1.2		1	1	19.395			
L2 78.500-78.000	0.006	0.034	A	1	1.2	0.007	1	1	0.540	0.005	0.010	C
			B	1	1.2		1	1	0.540			
			C	1	1.2		1	1	0.540			
L3 78.000-68.500	0.140	0.719	A	1	1.2	0.007	1	1	11.083	0.105	0.011	C
			B	1	1.2		1	1	11.083			
			C	1	1.2		1	1	11.083			
L4 68.500-68.000	0.009	0.081	A	1	1.2	0.007	1	1	1.098	0.010	0.021	C
			B	1	1.2		1	1	1.098			
			C	1	1.2		1	1	1.098			
L5 68.000-38.250	0.530	5.284	A	1	1.2	0.007	1	1	102.758	0.913	0.031	C
			B	1	1.2		1	1	102.758			
			C	1	1.2		1	1	102.758			
L6 38.250-1.000	0.593	7.664	A	1	1.2	0.006	1	1	141.901	1.036	0.028	C
			B	1	1.2		1	1	141.901			
			C	1	1.2		1	1	141.901			
Sum Weight:	1.390	14.978						OTM	92.288 kip-ft	2.262		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 98.000-78.500	0.113	0.791	A	1	0.802	0.010	1	1	14.016	0.119	0.006	C
			B	1	0.802		1	1	14.016			
			C	1	0.802		1	1	14.016			
L2 78.500-78.000	0.006	0.023	A	1	0.723	0.009	1	1	0.404	0.003	0.006	C
			B	1	0.723		1	1	0.404			
			C	1	0.723		1	1	0.404			
L3 78.000-68.500	0.140	0.486	A	1	0.656	0.009	1	1	8.510	0.057	0.006	C
			B	1	0.656		1	1	8.510			
			C	1	0.656		1	1	8.510			
L4 68.500-68.000	0.009	0.056	A	1	0.6	0.009	1	1	0.964	0.006	0.012	C
			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5 68.000-38.250	0.530	3.013	A	1	0.65	0.009	1	1	94.962	0.589	0.020	C
			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6 38.250-1.000	0.593	4.801	A	1	0.65	0.007	1	1	133.050	0.678	0.018	C
			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	58.452 kip-ft	1.452		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	0.791	A	1	0.802	0.010	1	1	14.016	0.119	0.006	C
98.000-78.500			B	1	0.802		1	1	14.016			
			C	1	0.802		1	1	14.016			
L2	0.006	0.023	A	1	0.723	0.009	1	1	0.404	0.003	0.006	C
78.500-78.000			B	1	0.723		1	1	0.404			
			C	1	0.723		1	1	0.404			
L3	0.140	0.486	A	1	0.656	0.009	1	1	8.510	0.057	0.006	C
78.000-68.500			B	1	0.656		1	1	8.510			
			C	1	0.656		1	1	8.510			
L4	0.009	0.056	A	1	0.6	0.009	1	1	0.964	0.006	0.012	C
68.500-68.000			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.009	1	1	94.962	0.589	0.020	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.007	1	1	133.050	0.678	0.018	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	58.452 kip-ft	1.452		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	0.791	A	1	0.802	0.010	1	1	14.016	0.119	0.006	C
98.000-78.500			B	1	0.802		1	1	14.016			
			C	1	0.802		1	1	14.016			
L2	0.006	0.023	A	1	0.723	0.009	1	1	0.404	0.003	0.006	C
78.500-78.000			B	1	0.723		1	1	0.404			
			C	1	0.723		1	1	0.404			
L3	0.140	0.486	A	1	0.656	0.009	1	1	8.510	0.057	0.006	C
78.000-68.500			B	1	0.656		1	1	8.510			
			C	1	0.656		1	1	8.510			
L4	0.009	0.056	A	1	0.6	0.009	1	1	0.964	0.006	0.012	C
68.500-68.000			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.009	1	1	94.962	0.589	0.020	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.007	1	1	133.050	0.678	0.018	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	58.452 kip-ft	1.452		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.113	0.791	A	1	0.802	0.010	1	1	14.016	0.119	0.006	C
98.000-78.500			B	1	0.802		1	1	14.016			
			C	1	0.802		1	1	14.016			
L2	0.006	0.023	A	1	0.723	0.009	1	1	0.404	0.003	0.006	C
78.500-78.000			B	1	0.723		1	1	0.404			
			C	1	0.723		1	1	0.404			
L3	0.140	0.486	A	1	0.656	0.009	1	1	8.510	0.057	0.006	C
78.000-68.500			B	1	0.656		1	1	8.510			
			C	1	0.656		1	1	8.510			
L4	0.009	0.056	A	1	0.6	0.009	1	1	0.964	0.006	0.012	C
68.500-68.000			B	1	0.6		1	1	0.964			
			C	1	0.6		1	1	0.964			
L5	0.530	3.013	A	1	0.65	0.009	1	1	94.962	0.589	0.020	C
68.000-38.250			B	1	0.65		1	1	94.962			
			C	1	0.65		1	1	94.962			
L6	0.593	4.801	A	1	0.65	0.007	1	1	133.050	0.678	0.018	C
38.250-1.000			B	1	0.65		1	1	133.050			
			C	1	0.65		1	1	133.050			
Sum Weight:	1.390	9.170						OTM	58.452 kip-ft	1.452		

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	9.170					
Bracing Weight	0.000					
Total Member Self-Weight	9.170			0.476	0.000	
Total Weight	12.329			0.476	0.000	
Wind 0 deg - No Ice		0.000	-7.180	-421.310	0.000	0.000
Wind 30 deg - No Ice		3.574	-6.218	-364.801	-209.397	0.360
Wind 45 deg - No Ice		5.054	-5.077	-297.772	-296.132	0.509
Wind 60 deg - No Ice		6.190	-3.590	-210.417	-362.686	0.623
Wind 90 deg - No Ice		7.147	0.000	0.476	-418.794	0.720
Wind 120 deg - No Ice		6.190	3.590	211.368	-362.686	0.623
Wind 135 deg - No Ice		5.054	5.077	298.723	-296.132	0.509
Wind 150 deg - No Ice		3.574	6.218	365.753	-209.397	0.360
Wind 180 deg - No Ice		0.000	7.180	422.261	0.000	0.000
Wind 210 deg - No Ice		-3.574	6.218	365.753	209.397	-0.360
Wind 225 deg - No Ice		-5.054	5.077	298.723	296.132	-0.509
Wind 240 deg - No Ice		-6.190	3.590	211.368	362.686	-0.623
Wind 270 deg - No Ice		-7.147	0.000	0.476	418.794	-0.720
Wind 300 deg - No Ice		-6.190	-3.590	-210.417	362.686	-0.623
Wind 315 deg - No Ice		-5.054	-5.077	-297.772	296.132	-0.509
Wind 330 deg - No Ice		-3.574	-6.218	-364.801	209.397	-0.360
Member Ice	5.808					
Total Weight Ice	22.939			1.867	0.000	
Wind 0 deg - Ice		0.000	-3.406	-187.749	0.000	0.000
Wind 30 deg - Ice		1.698	-2.950	-162.345	-94.372	0.146

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 45 deg - Ice		2.402	-2.408	-132.212	-133.462	0.206
Wind 60 deg - Ice		2.941	-1.703	-92.941	-163.457	0.252
Wind 90 deg - Ice		3.396	0.000	1.867	-188.744	0.291
Wind 120 deg - Ice		2.941	1.703	96.675	-163.457	0.252
Wind 135 deg - Ice		2.402	2.408	135.945	-133.462	0.206
Wind 150 deg - Ice		1.698	2.950	166.079	-94.372	0.146
Wind 180 deg - Ice		0.000	3.406	191.482	0.000	0.000
Wind 210 deg - Ice		-1.698	2.950	166.079	94.372	-0.146
Wind 225 deg - Ice		-2.402	2.408	135.945	133.462	-0.206
Wind 240 deg - Ice		-2.941	1.703	96.675	163.457	-0.252
Wind 270 deg - Ice		-3.396	0.000	1.867	188.744	-0.291
Wind 300 deg - Ice		-2.941	-1.703	-92.941	163.457	-0.252
Wind 315 deg - Ice		-2.402	-2.408	-132.212	133.462	-0.206
Wind 330 deg - Ice		-1.698	-2.950	-162.345	94.372	-0.146
Total Weight	12.329			0.476	0.000	
Wind 0 deg - Service		0.000	-2.494	-146.934	0.000	0.000
Wind 30 deg - Service		1.241	-2.159	-127.185	-73.193	0.123
Wind 45 deg - Service		1.755	-1.763	-103.759	-103.510	0.174
Wind 60 deg - Service		2.150	-1.247	-73.229	-126.773	0.213
Wind 90 deg - Service		2.482	0.000	0.476	-146.385	0.246
Wind 120 deg - Service		2.150	1.247	74.180	-126.773	0.213
Wind 135 deg - Service		1.755	1.763	104.710	-103.510	0.174
Wind 150 deg - Service		1.241	2.159	128.136	-73.193	0.123
Wind 180 deg - Service		0.000	2.494	147.885	0.000	0.000
Wind 210 deg - Service		-1.241	2.159	128.136	73.193	-0.123
Wind 225 deg - Service		-1.755	1.763	104.710	103.510	-0.174
Wind 240 deg - Service		-2.150	1.247	74.180	126.773	-0.213
Wind 270 deg - Service		-2.482	0.000	0.476	146.385	-0.246
Wind 300 deg - Service		-2.150	-1.247	-73.229	126.773	-0.213
Wind 315 deg - Service		-1.755	-1.763	-103.759	103.510	-0.174
Wind 330 deg - Service		-1.241	-2.159	-127.185	73.193	-0.123

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 45 deg - No Ice
7	0.9 Dead+1.6 Wind 45 deg - No Ice
8	1.2 Dead+1.6 Wind 60 deg - No Ice
9	0.9 Dead+1.6 Wind 60 deg - No Ice
10	1.2 Dead+1.6 Wind 90 deg - No Ice
11	0.9 Dead+1.6 Wind 90 deg - No Ice
12	1.2 Dead+1.6 Wind 120 deg - No Ice
13	0.9 Dead+1.6 Wind 120 deg - No Ice
14	1.2 Dead+1.6 Wind 135 deg - No Ice
15	0.9 Dead+1.6 Wind 135 deg - No Ice
16	1.2 Dead+1.6 Wind 150 deg - No Ice
17	0.9 Dead+1.6 Wind 150 deg - No Ice
18	1.2 Dead+1.6 Wind 180 deg - No Ice
19	0.9 Dead+1.6 Wind 180 deg - No Ice
20	1.2 Dead+1.6 Wind 210 deg - No Ice

Comb. No.	Description
21	0.9 Dead+1.6 Wind 210 deg - No Ice
22	1.2 Dead+1.6 Wind 225 deg - No Ice
23	0.9 Dead+1.6 Wind 225 deg - No Ice
24	1.2 Dead+1.6 Wind 240 deg - No Ice
25	0.9 Dead+1.6 Wind 240 deg - No Ice
26	1.2 Dead+1.6 Wind 270 deg - No Ice
27	0.9 Dead+1.6 Wind 270 deg - No Ice
28	1.2 Dead+1.6 Wind 300 deg - No Ice
29	0.9 Dead+1.6 Wind 300 deg - No Ice
30	1.2 Dead+1.6 Wind 315 deg - No Ice
31	0.9 Dead+1.6 Wind 315 deg - No Ice
32	1.2 Dead+1.6 Wind 330 deg - No Ice
33	0.9 Dead+1.6 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	98 - 78.5	Pole	Max Tension	35	0.000	0.000	-0.000
			Max. Compression	34	-7.031	0.000	-1.372
			Max. Mx	10	-2.604	-47.048	-0.359
			Max. My	18	-2.599	0.000	-48.139
			Max. Vy	10	4.537	-47.048	-0.359
			Max. Vx	18	4.591	0.000	-48.139
			Max. Torque	10			-0.779

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L2	78.5 - 78	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-7.162	0.000	-1.409
			Max. Mx	10	-2.667	-49.331	-0.368
			Max. My	18	-2.663	0.000	-50.458
			Max. Vy	10	4.596	-49.331	-0.368
			Max. Vx	18	4.650	0.000	-50.458
			Max. Torque	10			-0.799
L3	78 - 68.5	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-9.380	0.000	-1.986
			Max. Mx	10	-3.873	-97.425	-0.547
			Max. My	18	-3.871	0.000	-99.241
			Max. Vy	10	5.521	-97.425	-0.547
			Max. Vx	18	5.575	0.000	-99.241
			Max. Torque	10			-1.114
L4	68.5 - 68	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-9.547	0.000	-2.049
			Max. Mx	10	-3.979	-100.198	-0.567
			Max. My	18	-3.977	0.000	-102.061
			Max. Vy	10	5.582	-100.198	-0.567
			Max. Vx	18	5.636	0.000	-102.061
			Max. Torque	10			-1.149
L5	68 - 38.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-14.831	0.000	-2.051
			Max. Mx	10	-7.406	-262.410	-0.578
			Max. My	18	-7.404	0.000	-265.569
			Max. Vy	10	7.827	-262.410	-0.578
			Max. Vx	18	7.881	0.000	-265.569
			Max. Torque	10			-1.149
L6	38.25 - 1	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-25.828	0.000	-2.051
			Max. Mx	10	-14.791	-677.192	-0.585
			Max. My	18	-14.791	0.000	-682.626
			Max. Vy	10	11.441	-677.192	-0.585
			Max. Vx	18	11.494	0.000	-682.626
			Max. Torque	10			-1.149

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	43	25.828	0.000	-3.406
	Max. H_x	27	11.096	11.436	0.000
	Max. H_z	2	14.795	0.000	11.489
	Max. M_x	2	681.455	0.000	11.489
	Max. M_z	10	677.192	-11.436	0.000
	Max. Torsion	26	1.149	11.436	0.000
	Min. Vert	7	11.096	-8.086	8.124
	Min. H_x	10	14.795	-11.436	0.000
	Min. H_z	18	14.795	0.000	-11.489
	Min. M_x	18	-682.626	0.000	-11.489
	Min. M_z	26	-677.192	11.436	0.000
	Min. Torsion	10	-1.149	-11.436	0.000

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	12.329	0.000	0.000	0.481	0.000	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	14.795	0.000	-11.489	-681.455	0.000	0.000
0.9 Dead+1.6 Wind 0 deg - No Ice	11.096	0.000	-11.489	-679.766	0.000	0.000
1.2 Dead+1.6 Wind 30 deg - No Ice	14.795	5.718	-9.949	-590.080	-338.595	0.574
0.9 Dead+1.6 Wind 30 deg - No Ice	11.096	5.718	-9.949	-588.637	-337.684	0.574
1.2 Dead+1.6 Wind 45 deg - No Ice	14.795	8.086	-8.124	-481.691	-478.846	0.812
0.9 Dead+1.6 Wind 45 deg - No Ice	11.096	8.086	-8.124	-480.540	-477.557	0.812
1.2 Dead+1.6 Wind 60 deg - No Ice	14.795	9.904	-5.744	-340.436	-586.464	0.995
0.9 Dead+1.6 Wind 60 deg - No Ice	11.096	9.904	-5.744	-339.666	-584.886	0.995
1.2 Dead+1.6 Wind 90 deg - No Ice	14.795	11.436	0.000	0.585	-677.192	1.149
0.9 Dead+1.6 Wind 90 deg - No Ice	11.096	11.436	0.000	0.435	-675.369	1.149
1.2 Dead+1.6 Wind 120 deg - No Ice	14.795	9.904	5.744	341.606	-586.465	0.995
0.9 Dead+1.6 Wind 120 deg - No Ice	11.096	9.904	5.744	340.537	-584.887	0.995
1.2 Dead+1.6 Wind 135 deg - No Ice	14.795	8.086	8.124	482.861	-478.846	0.813
0.9 Dead+1.6 Wind 135 deg - No Ice	11.096	8.086	8.124	481.412	-477.558	0.812
1.2 Dead+1.6 Wind 150 deg - No Ice	14.795	5.718	9.949	591.250	-338.595	0.575
0.9 Dead+1.6 Wind 150 deg - No Ice	11.096	5.718	9.949	589.509	-337.684	0.575
1.2 Dead+1.6 Wind 180 deg - No Ice	14.795	0.000	11.489	682.626	0.000	0.000
0.9 Dead+1.6 Wind 180 deg - No Ice	11.096	0.000	11.489	680.638	0.000	0.000
1.2 Dead+1.6 Wind 210 deg - No Ice	14.795	-5.718	9.949	591.250	338.595	-0.575
0.9 Dead+1.6 Wind 210 deg - No Ice	11.096	-5.718	9.949	589.509	337.684	-0.575
1.2 Dead+1.6 Wind 225 deg - No Ice	14.795	-8.086	8.124	482.861	478.846	-0.813
0.9 Dead+1.6 Wind 225 deg - No Ice	11.096	-8.086	8.124	481.412	477.558	-0.812
1.2 Dead+1.6 Wind 240 deg - No Ice	14.795	-9.904	5.744	341.606	586.465	-0.995
0.9 Dead+1.6 Wind 240 deg - No Ice	11.096	-9.904	5.744	340.537	584.887	-0.995
1.2 Dead+1.6 Wind 270 deg - No Ice	14.795	-11.436	0.000	0.585	677.192	-1.149
0.9 Dead+1.6 Wind 270 deg - No Ice	11.096	-11.436	0.000	0.435	675.369	-1.149
1.2 Dead+1.6 Wind 300 deg - No Ice	14.795	-9.904	-5.744	-340.436	586.464	-0.995
0.9 Dead+1.6 Wind 300 deg - No Ice	11.096	-9.904	-5.744	-339.666	584.886	-0.995
1.2 Dead+1.6 Wind 315 deg -	14.795	-8.086	-8.124	-481.691	478.846	-0.812

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 0.9 Dead+1.6 Wind 315 deg - No Ice	11.096	-8.086	-8.124	-480.540	477.557	-0.812
1.2 Dead+1.6 Wind 330 deg - No Ice	14.795	-5.718	-9.949	-590.080	338.595	-0.574
0.9 Dead+1.6 Wind 330 deg - No Ice	11.096	-5.718	-9.949	-588.637	337.684	-0.574
1.2 Dead+1.0 Ice+1.0 Temp	25.828	0.000	0.000	2.051	0.000	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	25.828	0.000	-3.406	-191.788	0.000	0.000
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	25.828	1.698	-2.950	-165.813	-96.493	0.146
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	25.828	2.402	-2.408	-135.001	-136.461	0.206
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	25.828	2.941	-1.703	-94.847	-167.130	0.253
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	25.828	3.396	0.000	2.095	-192.985	0.292
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	25.828	2.941	1.703	99.036	-167.130	0.253
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	25.828	2.402	2.408	139.191	-136.461	0.206
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	25.828	1.698	2.950	170.003	-96.493	0.146
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	25.828	0.000	3.406	195.978	0.000	0.000
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	25.828	-1.698	2.950	170.003	96.493	-0.146
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	25.828	-2.402	2.408	139.191	136.461	-0.206
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	25.828	-2.941	1.703	99.036	167.130	-0.253
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	25.828	-3.396	0.000	2.095	192.985	-0.292
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	25.828	-2.941	-1.703	-94.847	167.130	-0.253
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	25.828	-2.402	-2.408	-135.001	136.461	-0.206
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	25.828	-1.698	-2.950	-165.813	96.493	-0.146
Dead+Wind 0 deg - Service	12.329	0.000	-2.494	-148.246	0.000	0.000
Dead+Wind 30 deg - Service	12.329	1.241	-2.159	-128.320	-73.848	0.123
Dead+Wind 45 deg - Service	12.329	1.755	-1.763	-104.683	-104.438	0.174
Dead+Wind 60 deg - Service	12.329	2.150	-1.247	-73.880	-127.909	0.213
Dead+Wind 90 deg - Service	12.329	2.482	0.000	0.487	-147.697	0.246
Dead+Wind 120 deg - Service	12.329	2.150	1.247	74.853	-127.909	0.213
Dead+Wind 135 deg - Service	12.329	1.755	1.763	105.657	-104.438	0.174
Dead+Wind 150 deg - Service	12.329	1.241	2.159	129.293	-73.849	0.123
Dead+Wind 180 deg - Service	12.329	0.000	2.494	149.219	0.000	0.000
Dead+Wind 210 deg - Service	12.329	-1.241	2.159	129.293	73.849	-0.123
Dead+Wind 225 deg - Service	12.329	-1.755	1.763	105.657	104.438	-0.174
Dead+Wind 240 deg - Service	12.329	-2.150	1.247	74.853	127.909	-0.213
Dead+Wind 270 deg - Service	12.329	-2.482	0.000	0.487	147.697	-0.246
Dead+Wind 300 deg - Service	12.329	-2.150	-1.247	-73.880	127.909	-0.213
Dead+Wind 315 deg - Service	12.329	-1.755	-1.763	-104.683	104.438	-0.174
Dead+Wind 330 deg - Service	12.329	-1.241	-2.159	-128.320	73.848	-0.123

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.000	-12.329	0.000	0.000	12.329	0.000	0.000%
2	0.000	-14.795	-11.489	0.000	14.795	11.489	0.000%
3	0.000	-11.096	-11.489	0.000	11.096	11.489	0.000%
4	5.718	-14.795	-9.949	-5.718	14.795	9.949	0.000%
5	5.718	-11.096	-9.949	-5.718	11.096	9.949	0.000%
6	8.086	-14.795	-8.124	-8.086	14.795	8.124	0.000%
7	8.086	-11.096	-8.124	-8.086	11.096	8.124	0.000%
8	9.904	-14.795	-5.744	-9.904	14.795	5.744	0.000%
9	9.904	-11.096	-5.744	-9.904	11.096	5.744	0.000%
10	11.436	-14.795	0.000	-11.436	14.795	0.000	0.000%
11	11.436	-11.096	0.000	-11.436	11.096	0.000	0.000%
12	9.904	-14.795	5.744	-9.904	14.795	-5.744	0.000%
13	9.904	-11.096	5.744	-9.904	11.096	-5.744	0.000%
14	8.086	-14.795	8.124	-8.086	14.795	-8.124	0.000%
15	8.086	-11.096	8.124	-8.086	11.096	-8.124	0.000%
16	5.718	-14.795	9.949	-5.718	14.795	-9.949	0.000%
17	5.718	-11.096	9.949	-5.718	11.096	-9.949	0.000%
18	0.000	-14.795	11.489	0.000	14.795	-11.489	0.000%
19	0.000	-11.096	11.489	0.000	11.096	-11.489	0.000%
20	-5.718	-14.795	9.949	5.718	14.795	-9.949	0.000%
21	-5.718	-11.096	9.949	5.718	11.096	-9.949	0.000%
22	-8.086	-14.795	8.124	8.086	14.795	-8.124	0.000%
23	-8.086	-11.096	8.124	8.086	11.096	-8.124	0.000%
24	-9.904	-14.795	5.744	9.904	14.795	-5.744	0.000%
25	-9.904	-11.096	5.744	9.904	11.096	-5.744	0.000%
26	-11.436	-14.795	0.000	11.436	14.795	0.000	0.000%
27	-11.436	-11.096	0.000	11.436	11.096	0.000	0.000%
28	-9.904	-14.795	-5.744	9.904	14.795	5.744	0.000%
29	-9.904	-11.096	-5.744	9.904	11.096	5.744	0.000%
30	-8.086	-14.795	-8.124	8.086	14.795	8.124	0.000%
31	-8.086	-11.096	-8.124	8.086	11.096	8.124	0.000%
32	-5.718	-14.795	-9.949	5.718	14.795	9.949	0.000%
33	-5.718	-11.096	-9.949	5.718	11.096	9.949	0.000%
34	0.000	-25.828	0.000	0.000	25.828	-0.000	0.000%
35	0.000	-25.828	-3.406	0.000	25.828	3.406	0.000%
36	1.698	-25.828	-2.950	-1.698	25.828	2.950	0.000%
37	2.402	-25.828	-2.408	-2.402	25.828	2.408	0.000%
38	2.941	-25.828	-1.703	-2.941	25.828	1.703	0.000%
39	3.396	-25.828	0.000	-3.396	25.828	-0.000	0.000%
40	2.941	-25.828	1.703	-2.941	25.828	-1.703	0.000%
41	2.402	-25.828	2.408	-2.402	25.828	-2.408	0.000%
42	1.698	-25.828	2.950	-1.698	25.828	-2.950	0.000%
43	0.000	-25.828	3.406	0.000	25.828	-3.406	0.000%
44	-1.698	-25.828	2.950	1.698	25.828	-2.950	0.000%
45	-2.402	-25.828	2.408	2.402	25.828	-2.408	0.000%
46	-2.941	-25.828	1.703	2.941	25.828	-1.703	0.000%
47	-3.396	-25.828	0.000	3.396	25.828	-0.000	0.000%
48	-2.941	-25.828	-1.703	2.941	25.828	1.703	0.000%
49	-2.402	-25.828	-2.408	2.402	25.828	2.408	0.000%
50	-1.698	-25.828	-2.950	1.698	25.828	2.950	0.000%
51	0.000	-12.329	-2.494	0.000	12.329	2.494	0.000%
52	1.241	-12.329	-2.159	-1.241	12.329	2.159	0.000%
53	1.755	-12.329	-1.763	-1.755	12.329	1.763	0.000%
54	2.150	-12.329	-1.247	-2.150	12.329	1.247	0.000%
55	2.482	-12.329	0.000	-2.482	12.329	0.000	0.000%
56	2.150	-12.329	1.247	-2.150	12.329	-1.247	0.000%
57	1.755	-12.329	1.763	-1.755	12.329	-1.763	0.000%
58	1.241	-12.329	2.159	-1.241	12.329	-2.159	0.000%
59	0.000	-12.329	2.494	0.000	12.329	-2.494	0.000%
60	-1.241	-12.329	2.159	1.241	12.329	-2.159	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
61	-1.755	-12.329	1.763	1.755	12.329	-1.763	0.000%
62	-2.150	-12.329	1.247	2.150	12.329	-1.247	0.000%
63	-2.482	-12.329	0.000	2.482	12.329	0.000	0.000%
64	-2.150	-12.329	-1.247	2.150	12.329	1.247	0.000%
65	-1.755	-12.329	-1.763	1.755	12.329	1.763	0.000%
66	-1.241	-12.329	-2.159	1.241	12.329	2.159	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	0.00001123
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00055133
5	Yes	4	0.00000001	0.00034508
6	Yes	4	0.00000001	0.00057126
7	Yes	4	0.00000001	0.00035695
8	Yes	4	0.00000001	0.00040423
9	Yes	4	0.00000001	0.00025296
10	Yes	4	0.00000001	0.00030930
11	Yes	4	0.00000001	0.00019545
12	Yes	4	0.00000001	0.00063808
13	Yes	4	0.00000001	0.00040039
14	Yes	4	0.00000001	0.00057226
15	Yes	4	0.00000001	0.00035646
16	Yes	4	0.00000001	0.00040679
17	Yes	4	0.00000001	0.00025188
18	Yes	4	0.00000001	0.00001129
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00040679
21	Yes	4	0.00000001	0.00025188
22	Yes	4	0.00000001	0.00057226
23	Yes	4	0.00000001	0.00035646
24	Yes	4	0.00000001	0.00063808
25	Yes	4	0.00000001	0.00040039
26	Yes	4	0.00000001	0.00030930
27	Yes	4	0.00000001	0.00019545
28	Yes	4	0.00000001	0.00040423
29	Yes	4	0.00000001	0.00025296
30	Yes	4	0.00000001	0.00057126
31	Yes	4	0.00000001	0.00035695
32	Yes	4	0.00000001	0.00055133
33	Yes	4	0.00000001	0.00034508
34	Yes	4	0.00000001	0.00006958
35	Yes	5	0.00000001	0.00004589
36	Yes	5	0.00000001	0.00004733
37	Yes	5	0.00000001	0.00004800
38	Yes	5	0.00000001	0.00004805
39	Yes	5	0.00000001	0.00004839
40	Yes	5	0.00000001	0.00005108
41	Yes	5	0.00000001	0.00005196
42	Yes	5	0.00000001	0.00005194
43	Yes	5	0.00000001	0.00005115
44	Yes	5	0.00000001	0.00005194
45	Yes	5	0.00000001	0.00005196

46	Yes	5	0.00000001	0.00005108
47	Yes	5	0.00000001	0.00004839
48	Yes	5	0.00000001	0.00004805
49	Yes	5	0.00000001	0.00004800
50	Yes	5	0.00000001	0.00004733
51	Yes	4	0.00000001	0.00000001
52	Yes	4	0.00000001	0.00000001
53	Yes	4	0.00000001	0.00001453
54	Yes	4	0.00000001	0.00000001
55	Yes	4	0.00000001	0.00001720
56	Yes	4	0.00000001	0.00001892
57	Yes	4	0.00000001	0.00001479
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	0.00001479
62	Yes	4	0.00000001	0.00001892
63	Yes	4	0.00000001	0.00001720
64	Yes	4	0.00000001	0.00000001
65	Yes	4	0.00000001	0.00001453
66	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	98 - 78.5	4.923	59	0.646	0.011
L2	78.5 - 78	2.485	59	0.444	0.005
L3	78 - 68.5	2.439	59	0.436	0.005
L4	68.5 - 68	1.771	59	0.211	0.001
L5	68 - 38.25	1.749	59	0.211	0.001
L6	43.75 - 1	0.799	59	0.158	0.001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
98.000	10'x48" Canister	59	4.923	0.646	0.011	9595
93.000	10'x48" Canister	59	4.224	0.605	0.009	9595
92.000	NNH4-65B-R6	59	4.087	0.597	0.009	7996
88.000	10'x48" Canister	59	3.556	0.560	0.008	4797
83.000	10'x48" Canister	59	2.951	0.505	0.006	3200
82.000	MX08FIT265-01	59	2.840	0.493	0.006	3035
78.000	10'x48" Canister	59	2.439	0.436	0.005	2858
73.000	10'x36" Canister	59	2.033	0.299	0.002	2450
68.000	10'x36" Canister	59	1.749	0.211	0.001	4433

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	98 - 78.5	22.238	18	2.892	0.051
L2	78.5 - 78	11.304	18	2.002	0.022
L3	78 - 68.5	11.096	18	1.967	0.021
L4	68.5 - 68	8.075	18	0.960	0.004
L5	68 - 38.25	7.974	18	0.959	0.004
L6	43.75 - 1	3.646	18	0.721	0.002

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
98.000	10'x48" Canister	18	22.238	2.892	0.051	2176
93.000	10'x48" Canister	18	19.107	2.714	0.043	2176
92.000	NNH4-65B-R6	18	18.493	2.677	0.042	1813
88.000	10'x48" Canister	18	16.114	2.515	0.036	1088
83.000	10'x48" Canister	18	13.398	2.273	0.028	725
82.000	MX08FIT265-01	18	12.900	2.218	0.027	687
78.000	10'x48" Canister	18	11.096	1.967	0.021	644
73.000	10'x36" Canister	18	9.261	1.352	0.011	548
68.000	10'x36" Canister	18	7.974	0.959	0.004	991

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	98 - 96.9737	TP8.625x8.625x0.465	19.500	0.000	0.0	11.920	-0.254	450.593	0.001
	96.9737 - 95.9474					11.920	-0.200	450.593	0.000
	95.9474 - 94.9211					11.920	-0.300	450.593	0.001
	94.9211 - 93.8947					11.920	-0.400	450.593	0.001
	93.8947 - 92.8684					11.920	-0.500	450.593	0.001
	92.8684 - 91.8421					11.920	-0.948	450.593	0.002
	91.8421 - 90.8158					11.920	-1.048	450.593	0.002
	90.8158 - 89.7895					11.920	-1.149	450.593	0.003
	89.7895 - 88.7632					11.920	-1.250	450.593	0.003
	88.7632 - 87.7368					11.920	-1.352	450.593	0.003
	87.7368 - 86.7105					11.920	-1.454	450.593	0.003

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
	86.7105 - 85.6842					11.920	-1.557	450.593	0.003
	85.6842 - 84.6579					11.920	-1.661	450.593	0.004
	84.6579 - 83.6316					11.920	-1.766	450.593	0.004
	83.6316 - 82.6053					11.920	-1.871	450.593	0.004
	82.6053 - 81.5789					11.920	-2.268	450.593	0.005
	81.5789 - 80.5526					11.920	-2.377	450.593	0.005
	80.5526 - 79.5263					11.920	-2.487	450.593	0.006
	79.5263 - 78.5					11.920	-2.599	450.593	0.006
L2	78.5 - 78 (2)	TP10.75x8.625x0.465	0.500	0.000	0.0	11.920	-2.634	450.593	0.006
L3	78 - 76.9444	TP10.75x10.75x0.465	9.500	0.000	0.0	15.025	-2.791	567.935	0.005
	76.9444 - 75.8889					15.025	-2.923	567.935	0.005
	75.8889 - 74.8333					15.025	-3.055	567.935	0.005
	74.8333 - 73.7778					15.025	-3.188	567.935	0.006
	73.7778 - 72.7222					15.025	-3.322	567.935	0.006
	72.7222 - 71.6667					15.025	-3.458	567.935	0.006
	71.6667 - 70.6111					15.025	-3.594	567.935	0.006
	70.6111 - 69.5556					15.025	-3.732	567.935	0.007
	69.5556 - 68.5					15.025	-3.871	567.935	0.007
L4	68.5 - 68 (4)	TP35.5x10.75x0.465	0.500	0.000	0.0	15.025	-3.928	567.935	0.007
L5	68 - 66.7237	TP40.02x35.5x0.25	29.750	0.000	0.0	28.125	-4.149	1870.960	0.002
	66.7237 - 65.4474					28.279	-4.322	1877.110	0.002
	65.4474 - 64.1711					28.433	-4.496	1883.220	0.002
	64.1711 - 62.8947					28.586	-4.671	1889.280	0.002
	62.8947 - 61.6184					28.740	-4.847	1895.290	0.003
	61.6184 - 60.3421					28.894	-5.024	1901.260	0.003
	60.3421 - 59.0658					29.048	-5.202	1907.190	0.003
	59.0658 - 57.7895					29.202	-5.380	1913.070	0.003
	57.7895 - 56.5132					29.356	-5.560	1918.910	0.003
	56.5132 - 55.2368					29.510	-5.740	1924.710	0.003
	55.2368 - 53.9605					29.663	-5.922	1930.460	0.003
	53.9605 - 52.6842					29.817	-6.104	1936.160	0.003
	52.6842 - 51.4079					29.971	-6.287	1941.820	0.003
	51.4079 - 50.1316					30.125	-6.471	1947.440	0.003

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	50.1316 - 48.8553					30.279	-6.656	1953.010	0.003
	48.8553 - 47.5789					30.433	-6.841	1958.540	0.003
	47.5789 - 46.3026					30.587	-7.028	1964.020	0.004
	46.3026 - 45.0263					30.741	-7.216	1969.460	0.004
	45.0263 - 43.75					30.894	-7.404	1974.850	0.004
	43.75 - 38.25					31.558	-4.513	1997.580	0.002
L6	43.75 - 38.25	TP45x38.684x0.25	42.750	0.000	0.0	31.142	-4.399	1983.450	0.002
	38.25 - 36.2895					31.372	-9.203	1991.320	0.005
	36.2895 - 34.3289					31.602	-9.495	1999.080	0.005
	34.3289 - 32.3684					31.832	-9.789	2006.750	0.005
	32.3684 - 30.4079					32.062	-10.085	2014.320	0.005
	30.4079 - 28.4474					32.292	-10.384	2021.790	0.005
	28.4474 - 26.4868					32.521	-10.684	2029.160	0.005
	26.4868 - 24.5263					32.751	-10.987	2036.430	0.005
	24.5263 - 22.5658					32.981	-11.292	2043.600	0.006
	22.5658 - 20.6053					33.211	-11.599	2050.670	0.006
	20.6053 - 18.6447					33.441	-11.908	2057.650	0.006
	18.6447 - 16.6842					33.671	-12.220	2064.520	0.006
	16.6842 - 14.7237					33.900	-12.534	2071.300	0.006
	14.7237 - 12.7632					34.130	-12.849	2077.970	0.006
	12.7632 - 10.8026					34.360	-13.168	2084.550	0.006
	10.8026 - 8.84211					34.590	-13.488	2091.030	0.006
	8.84211 - 6.88158					34.820	-13.810	2097.400	0.007
	6.88158 - 4.92105					35.049	-14.135	2103.680	0.007
	4.92105 - 2.96053					35.279	-14.461	2109.860	0.007
	2.96053 - 1					35.509	-14.791	2115.940	0.007

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	98 - 96.9737	TP8.625x8.625x0.465	0.084	97.637	0.001	0.000	97.637	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	96.9737 - 95.9474		0.303	97.637	0.003	0.000	97.637	0.000
	95.9474 - 94.9211		0.654	97.637	0.007	0.000	97.637	0.000
	94.9211 - 93.8947		1.140	97.637	0.012	0.000	97.637	0.000
	93.8947 - 92.8684		1.759	97.637	0.018	0.000	97.637	0.000
	92.8684 - 91.8421		2.795	97.637	0.029	0.000	97.637	0.000
	91.8421 - 90.8158		5.353	97.637	0.055	0.000	97.637	0.000
	90.8158 - 89.7895		8.044	97.637	0.082	0.000	97.637	0.000
	89.7895 - 88.7632		10.869	97.637	0.111	0.000	97.637	0.000
	88.7632 - 87.7368		13.826	97.637	0.142	0.000	97.637	0.000
	87.7368 - 86.7105		16.914	97.637	0.173	0.000	97.637	0.000
	86.7105 - 85.6842		20.131	97.637	0.206	0.000	97.637	0.000
	85.6842 - 84.6579		23.478	97.637	0.240	0.000	97.637	0.000
	84.6579 - 83.6316		26.953	97.637	0.276	0.000	97.637	0.000
	83.6316 - 82.6053		30.556	97.637	0.313	0.000	97.637	0.000
	82.6053 - 81.5789		34.516	97.637	0.354	0.000	97.637	0.000
	81.5789 - 80.5526		38.932	97.637	0.399	0.000	97.637	0.000
	80.5526 - 79.5263		43.473	97.637	0.445	0.000	97.637	0.000
	79.5263 - 78.5		48.139	97.637	0.493	0.000	97.637	0.000
L2	78.5 - 78 (2)	TP10.75x8.625x0.465	48.139	97.637	0.493	0.000	97.637	0.000
L3	78 - 76.9444	TP10.75x10.75x0.465	55.441	155.048	0.358	0.000	155.048	0.000
	76.9444 - 75.8889		60.536	155.048	0.390	0.000	155.048	0.000
	75.8889 - 74.8333		65.742	155.048	0.424	0.000	155.048	0.000
	74.8333 - 73.7778		71.057	155.048	0.458	0.000	155.048	0.000
	73.7778 - 72.7222		76.480	155.048	0.493	0.000	155.048	0.000
	72.7222 - 71.6667		82.012	155.048	0.529	0.000	155.048	0.000
	71.6667 - 70.6111		87.650	155.048	0.565	0.000	155.048	0.000
	70.6111 - 69.5556		93.393	155.048	0.602	0.000	155.048	0.000
	69.5556 - 68.5		99.241	155.048	0.640	0.000	155.048	0.000
L4	68.5 - 68 (4)	TP35.5x10.75x0.465	99.241	155.048	0.640	0.000	155.048	0.000
L5	68 - 66.7237	TP40.02x35.5x0.25	109.327	1364.725	0.080	0.000	1364.725	0.000
	66.7237 - 65.4474		116.737	1376.758	0.085	0.000	1376.758	0.000
	65.4474 - 64.1711		124.293	1388.800	0.089	0.000	1388.800	0.000
	64.1711 - 62.8947		131.996	1400.867	0.094	0.000	1400.867	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	62.8947 - 61.6184		139.846	1412.942	0.099	0.000	1412.942	0.000
	61.6184 - 60.3421		147.844	1425.033	0.104	0.000	1425.033	0.000
	60.3421 - 59.0658		155.991	1437.142	0.109	0.000	1437.142	0.000
	59.0658 - 57.7895		164.287	1449.267	0.113	0.000	1449.267	0.000
	57.7895 - 56.5132		172.732	1461.400	0.118	0.000	1461.400	0.000
	56.5132 - 55.2368		181.328	1473.542	0.123	0.000	1473.542	0.000
	55.2368 - 53.9605		190.076	1485.708	0.128	0.000	1485.708	0.000
	53.9605 - 52.6842		198.974	1497.875	0.133	0.000	1497.875	0.000
	52.6842 - 51.4079		208.026	1510.058	0.138	0.000	1510.058	0.000
	51.4079 - 50.1316		217.230	1522.250	0.143	0.000	1522.250	0.000
	50.1316 - 48.8553		226.588	1534.458	0.148	0.000	1534.458	0.000
	48.8553 - 47.5789		236.101	1546.667	0.153	0.000	1546.667	0.000
	47.5789 - 46.3026		245.768	1558.892	0.158	0.000	1558.892	0.000
	46.3026 - 45.0263		255.590	1571.125	0.163	0.000	1571.125	0.000
	45.0263 - 43.75		265.568	1583.358	0.168	0.000	1583.358	0.000
	43.75 - 38.25		158.369	1636.183	0.097	0.000	1636.183	0.000
L6	43.75 - 38.25	TP45x38.684x0.25	152.036	1603.100	0.095	0.000	1603.100	0.000
	38.25 - 36.2895		327.092	1621.417	0.202	0.000	1621.417	0.000
	36.2895 - 34.3289		344.115	1639.742	0.210	0.000	1639.742	0.000
	34.3289 - 32.3684		361.471	1658.075	0.218	0.000	1658.075	0.000
	32.3684 - 30.4079		379.157	1676.417	0.226	0.000	1676.417	0.000
	30.4079 - 28.4474		397.172	1694.767	0.234	0.000	1694.767	0.000
	28.4474 - 26.4868		415.513	1713.125	0.243	0.000	1713.125	0.000
	26.4868 - 24.5263		434.179	1731.492	0.251	0.000	1731.492	0.000
	24.5263 - 22.5658		453.167	1749.850	0.259	0.000	1749.850	0.000
	22.5658 - 20.6053		472.474	1768.217	0.267	0.000	1768.217	0.000
	20.6053 - 18.6447		492.099	1786.583	0.275	0.000	1786.583	0.000
	18.6447 - 16.6842		512.040	1804.942	0.284	0.000	1804.942	0.000
	16.6842 - 14.7237		532.293	1823.300	0.292	0.000	1823.300	0.000
	14.7237 - 12.7632		552.857	1841.650	0.300	0.000	1841.650	0.000
	12.7632 - 10.8026		573.728	1859.992	0.308	0.000	1859.992	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	10.8026 - 8.84211		594.906	1878.317	0.317	0.000	1878.317	0.000
	8.84211 - 6.88158		616.388	1896.642	0.325	0.000	1896.642	0.000
	6.88158 - 4.92105		638.169	1914.942	0.333	0.000	1914.942	0.000
	4.92105 - 2.96053		660.250	1933.233	0.342	0.000	1933.233	0.000
	2.96053 - 1		682.627	1951.508	0.350	0.000	1951.508	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	98 - 96.9737	TP8.625x8.625x0.465	0.040	225.297	0.000	0.000	145.412	0.000
	96.9737 - 95.9474		0.260	225.297	0.001	0.000	145.412	0.000
	95.9474 - 94.9211		0.391	225.297	0.002	0.000	145.412	0.000
	94.9211 - 93.8947		0.521	225.297	0.002	0.000	145.412	0.000
	93.8947 - 92.8684		0.651	225.297	0.003	0.000	145.412	0.000
	92.8684 - 91.8421		2.410	225.297	0.011	0.000	145.412	0.000
	91.8421 - 90.8158		2.540	225.297	0.011	0.000	145.412	0.000
	90.8158 - 89.7895		2.670	225.297	0.012	0.000	145.412	0.000
	89.7895 - 88.7632		2.800	225.297	0.012	0.000	145.412	0.000
	88.7632 - 87.7368		2.929	225.297	0.013	0.000	145.412	0.000
	87.7368 - 86.7105		3.055	225.297	0.014	0.000	145.412	0.000
	86.7105 - 85.6842		3.181	225.297	0.014	0.000	145.412	0.000
	85.6842 - 84.6579		3.307	225.297	0.015	0.000	145.412	0.000
	84.6579 - 83.6316		3.432	225.297	0.015	0.000	145.412	0.000
	83.6316 - 82.6053		3.557	225.297	0.016	0.000	145.412	0.000
	82.6053 - 81.5789		4.226	225.297	0.019	0.000	145.412	0.000
	81.5789 - 80.5526		4.349	225.297	0.019	0.000	145.412	0.000
	80.5526 - 79.5263		4.471	225.297	0.020	0.000	145.412	0.000
	79.5263 - 78.5		4.591	225.297	0.020	0.000	145.412	0.000
L2	78.5 - 78 (2)	TP10.75x8.625x0.465	4.650	283.968	0.016	0.000	145.412	0.000
L3	78 - 76.9444	TP10.75x10.75x0.465	4.757	283.968	0.017	0.000	233.333	0.000
	76.9444 - 75.8889		4.863	283.968	0.017	0.000	233.333	0.000
	75.8889 -		4.967	283.968	0.017	0.000	233.333	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
	74.8333							
	74.8333 - 73.7778		5.071	283.968	0.018	0.000	233.333	0.000
	73.7778 - 72.7222		5.174	283.968	0.018	0.000	233.333	0.000
	72.7222 - 71.6667		5.276	283.968	0.019	0.000	233.333	0.000
	71.6667 - 70.6111		5.377	283.968	0.019	0.000	233.333	0.000
	70.6111 - 69.5556		5.476	283.968	0.019	0.000	233.333	0.000
	69.5556 - 68.5		5.575	283.968	0.020	0.000	233.333	0.000
L4	68.5 - 68 (4)	TP35.5x10.75x0.465	5.636	967.312	0.006	0.000	233.333	0.000
L5	68 - 66.7237	TP40.02x35.5x0.25	5.749	935.481	0.006	0.000	2735.708	0.000
	66.7237 - 65.4474		5.864	938.555	0.006	0.000	2759.808	0.000
	65.4474 - 64.1711		5.978	941.608	0.006	0.000	2783.933	0.000
	64.1711 - 62.8947		6.093	944.638	0.006	0.000	2808.100	0.000
	62.8947 - 61.6184		6.209	947.646	0.007	0.000	2832.292	0.000
	61.6184 - 60.3421		6.325	950.632	0.007	0.000	2856.517	0.000
	60.3421 - 59.0658		6.442	953.596	0.007	0.000	2880.767	0.000
	59.0658 - 57.7895		6.559	956.537	0.007	0.000	2905.050	0.000
	57.7895 - 56.5132		6.677	959.457	0.007	0.000	2929.358	0.000
	56.5132 - 55.2368		6.795	962.353	0.007	0.000	2953.692	0.000
	55.2368 - 53.9605		6.914	965.228	0.007	0.000	2978.050	0.000
	53.9605 - 52.6842		7.033	968.081	0.007	0.000	3002.433	0.000
	52.6842 - 51.4079		7.152	970.911	0.007	0.000	3026.833	0.000
	51.4079 - 50.1316		7.273	973.719	0.007	0.000	3051.258	0.000
	50.1316 - 48.8553		7.393	976.505	0.008	0.000	3075.708	0.000
	48.8553 - 47.5789		7.514	979.268	0.008	0.000	3100.175	0.000
	47.5789 - 46.3026		7.636	982.009	0.008	0.000	3124.658	0.000
	46.3026 - 45.0263		7.758	984.728	0.008	0.000	3149.158	0.000
	45.0263 - 43.75		7.881	987.425	0.008	0.000	3173.675	0.000
	43.75 - 38.25		4.429	998.792	0.004	0.000	3279.475	0.000
L6	43.75 - 38.25	TP45x38.684x0.25	4.000	991.725	0.004	0.000	3213.217	0.000
	38.25 - 36.2895		8.600	995.658	0.009	0.000	3249.900	0.000
	36.2895 - 34.3289		8.770	999.542	0.009	0.000	3286.600	0.000
	34.3289 - 32.3684		8.940	1003.380	0.009	0.000	3323.325	0.000
	32.3684 - 30.4079		9.108	1007.160	0.009	0.000	3360.075	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
	30.4079 - 28.4474		9.275	1010.890	0.009	0.000	3396.833	0.000
	28.4474 - 26.4868		9.441	1014.580	0.009	0.000	3433.608	0.000
	26.4868 - 24.5263		9.606	1018.210	0.009	0.000	3470.383	0.000
	24.5263 - 22.5658		9.770	1021.800	0.010	0.000	3507.175	0.000
	22.5658 - 20.6053		9.933	1025.340	0.010	0.000	3543.958	0.000
	20.6053 - 18.6447		10.094	1028.820	0.010	0.000	3580.742	0.000
	18.6447 - 16.6842		10.255	1032.260	0.010	0.000	3617.517	0.000
	16.6842 - 14.7237		10.414	1035.650	0.010	0.000	3654.292	0.000
	14.7237 - 12.7632		10.572	1038.990	0.010	0.000	3691.042	0.000
	12.7632 - 10.8026		10.729	1042.270	0.010	0.000	3727.783	0.000
	10.8026 - 8.84211		10.884	1045.510	0.010	0.000	3764.500	0.000
	8.84211 - 6.88158		11.039	1048.700	0.011	0.000	3801.192	0.000
	6.88158 - 4.92105		11.192	1051.840	0.011	0.000	3837.850	0.000
	4.92105 - 2.96053		11.344	1054.930	0.011	0.000	3874.492	0.000
	2.96053 - 1		11.494	1057.970	0.011	0.000	3911.083	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	98 - 96.9737	0.001	0.001	0.000	0.000	0.000	0.001 ✔	1.000	4.8.2 ✔
	96.9737 - 95.9474	0.000	0.003	0.000	0.001	0.000	0.004 ✔	1.000	4.8.2 ✔
	95.9474 - 94.9211	0.001	0.007	0.000	0.002	0.000	0.007 ✔	1.000	4.8.2 ✔
	94.9211 - 93.8947	0.001	0.012	0.000	0.002	0.000	0.013 ✔	1.000	4.8.2 ✔
	93.8947 - 92.8684	0.001	0.018	0.000	0.003	0.000	0.019 ✔	1.000	4.8.2 ✔
	92.8684 - 91.8421	0.002	0.029	0.000	0.011	0.000	0.031 ✔	1.000	4.8.2 ✔
	91.8421 - 90.8158	0.002	0.055	0.000	0.011	0.000	0.057 ✔	1.000	4.8.2 ✔
	90.8158 - 89.7895	0.003	0.082	0.000	0.012	0.000	0.085 ✔	1.000	4.8.2 ✔
	89.7895 -	0.003	0.111	0.000	0.012	0.000	0.114	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	88.7632						✔		
	88.7632 - 87.7368	0.003	0.142	0.000	0.013	0.000	0.145 ✔	1.000	4.8.2 ✔
	87.7368 - 86.7105	0.003	0.173	0.000	0.014	0.000	0.177 ✔	1.000	4.8.2 ✔
	86.7105 - 85.6842	0.003	0.206	0.000	0.014	0.000	0.210 ✔	1.000	4.8.2 ✔
	85.6842 - 84.6579	0.004	0.240	0.000	0.015	0.000	0.244 ✔	1.000	4.8.2 ✔
	84.6579 - 83.6316	0.004	0.276	0.000	0.015	0.000	0.280 ✔	1.000	4.8.2 ✔
	83.6316 - 82.6053	0.004	0.313	0.000	0.016	0.000	0.317 ✔	1.000	4.8.2 ✔
	82.6053 - 81.5789	0.005	0.354	0.000	0.019	0.000	0.359 ✔	1.000	4.8.2 ✔
	81.5789 - 80.5526	0.005	0.399	0.000	0.019	0.000	0.404 ✔	1.000	4.8.2 ✔
	80.5526 - 79.5263	0.006	0.445	0.000	0.020	0.000	0.451 ✔	1.000	4.8.2 ✔
	79.5263 - 78.5	0.006	0.493	0.000	0.020	0.000	0.499 ✔	1.000	4.8.2 ✔
L2	78.5 - 78 (2)	0.006	0.493	0.000	0.016	0.000	0.499 ✔	1.000	4.8.2 ✔
L3	78 - 76.9444	0.005	0.358	0.000	0.017	0.000	0.363 ✔	1.000	4.8.2 ✔
	76.9444 - 75.8889	0.005	0.390	0.000	0.017	0.000	0.396 ✔	1.000	4.8.2 ✔
	75.8889 - 74.8333	0.005	0.424	0.000	0.017	0.000	0.430 ✔	1.000	4.8.2 ✔
	74.8333 - 73.7778	0.006	0.458	0.000	0.018	0.000	0.464 ✔	1.000	4.8.2 ✔
	73.7778 - 72.7222	0.006	0.493	0.000	0.018	0.000	0.499 ✔	1.000	4.8.2 ✔
	72.7222 - 71.6667	0.006	0.529	0.000	0.019	0.000	0.535 ✔	1.000	4.8.2 ✔
	71.6667 - 70.6111	0.006	0.565	0.000	0.019	0.000	0.572 ✔	1.000	4.8.2 ✔
	70.6111 - 69.5556	0.007	0.602	0.000	0.019	0.000	0.609 ✔	1.000	4.8.2 ✔
	69.5556 - 68.5	0.007	0.640	0.000	0.020	0.000	0.647 ✔	1.000	4.8.2 ✔
L4	68.5 - 68 (4)	0.007	0.640	0.000	0.006	0.000	0.647 ✔	1.000	4.8.2 ✔
L5	68 - 66.7237	0.002	0.080	0.000	0.006	0.000	0.082 ✔	1.000	4.8.2 ✔
	66.7237 - 65.4474	0.002	0.085	0.000	0.006	0.000	0.087 ✔	1.000	4.8.2 ✔
	65.4474 - 64.1711	0.002	0.089	0.000	0.006	0.000	0.092 ✔	1.000	4.8.2 ✔
	64.1711 - 62.8947	0.002	0.094	0.000	0.006	0.000	0.097 ✔	1.000	4.8.2 ✔
	62.8947 -	0.003	0.099	0.000	0.007	0.000	0.102	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	61.6184						✔		
	61.6184 - 60.3421	0.003	0.104	0.000	0.007	0.000	0.106 ✔	1.000	4.8.2 ✔
	60.3421 - 59.0658	0.003	0.109	0.000	0.007	0.000	0.111 ✔	1.000	4.8.2 ✔
	59.0658 - 57.7895	0.003	0.113	0.000	0.007	0.000	0.116 ✔	1.000	4.8.2 ✔
	57.7895 - 56.5132	0.003	0.118	0.000	0.007	0.000	0.121 ✔	1.000	4.8.2 ✔
	56.5132 - 55.2368	0.003	0.123	0.000	0.007	0.000	0.126 ✔	1.000	4.8.2 ✔
	55.2368 - 53.9605	0.003	0.128	0.000	0.007	0.000	0.131 ✔	1.000	4.8.2 ✔
	53.9605 - 52.6842	0.003	0.133	0.000	0.007	0.000	0.136 ✔	1.000	4.8.2 ✔
	52.6842 - 51.4079	0.003	0.138	0.000	0.007	0.000	0.141 ✔	1.000	4.8.2 ✔
	51.4079 - 50.1316	0.003	0.143	0.000	0.007	0.000	0.146 ✔	1.000	4.8.2 ✔
	50.1316 - 48.8553	0.003	0.148	0.000	0.008	0.000	0.151 ✔	1.000	4.8.2 ✔
	48.8553 - 47.5789	0.003	0.153	0.000	0.008	0.000	0.156 ✔	1.000	4.8.2 ✔
	47.5789 - 46.3026	0.004	0.158	0.000	0.008	0.000	0.161 ✔	1.000	4.8.2 ✔
	46.3026 - 45.0263	0.004	0.163	0.000	0.008	0.000	0.166 ✔	1.000	4.8.2 ✔
	45.0263 - 43.75	0.004	0.168	0.000	0.008	0.000	0.172 ✔	1.000	4.8.2 ✔
	43.75 - 38.25	0.002	0.097	0.000	0.004	0.000	0.099 ✔	1.000	4.8.2 ✔
L6	43.75 - 38.25	0.002	0.095	0.000	0.004	0.000	0.097 ✔	1.000	4.8.2 ✔
	38.25 - 36.2895	0.005	0.202	0.000	0.009	0.000	0.206 ✔	1.000	4.8.2 ✔
	36.2895 - 34.3289	0.005	0.210	0.000	0.009	0.000	0.215 ✔	1.000	4.8.2 ✔
	34.3289 - 32.3684	0.005	0.218	0.000	0.009	0.000	0.223 ✔	1.000	4.8.2 ✔
	32.3684 - 30.4079	0.005	0.226	0.000	0.009	0.000	0.231 ✔	1.000	4.8.2 ✔
	30.4079 - 28.4474	0.005	0.234	0.000	0.009	0.000	0.240 ✔	1.000	4.8.2 ✔
	28.4474 - 26.4868	0.005	0.243	0.000	0.009	0.000	0.248 ✔	1.000	4.8.2 ✔
	26.4868 - 24.5263	0.005	0.251	0.000	0.009	0.000	0.256 ✔	1.000	4.8.2 ✔
	24.5263 - 22.5658	0.006	0.259	0.000	0.010	0.000	0.265 ✔	1.000	4.8.2 ✔
	22.5658 - 20.6053	0.006	0.267	0.000	0.010	0.000	0.273 ✔	1.000	4.8.2 ✔
	20.6053 -	0.006	0.275	0.000	0.010	0.000	0.281 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	18.6447						✔		
	18.6447 - 16.6842	0.006	0.284	0.000	0.010	0.000	0.290 ✔	1.000	4.8.2 ✔
	16.6842 - 14.7237	0.006	0.292	0.000	0.010	0.000	0.298 ✔	1.000	4.8.2 ✔
	14.7237 - 12.7632	0.006	0.300	0.000	0.010	0.000	0.306 ✔	1.000	4.8.2 ✔
	12.7632 - 10.8026	0.006	0.308	0.000	0.010	0.000	0.315 ✔	1.000	4.8.2 ✔
	10.8026 - 8.84211	0.006	0.317	0.000	0.010	0.000	0.323 ✔	1.000	4.8.2 ✔
	8.84211 - 6.88158	0.007	0.325	0.000	0.011	0.000	0.332 ✔	1.000	4.8.2 ✔
	6.88158 - 4.92105	0.007	0.333	0.000	0.011	0.000	0.340 ✔	1.000	4.8.2 ✔
	4.92105 - 2.96053	0.007	0.342	0.000	0.011	0.000	0.348 ✔	1.000	4.8.2 ✔
	2.96053 - 1	0.007	0.350	0.000	0.011	0.000	0.357 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	98 - 78.5	Pole	TP8.625x8.625x0.465	1	-2.599	450.593	49.9	Pass
L2	78.5 - 78	Pole	TP10.75x8.625x0.465	2	-2.634	450.593	49.9	Pass
L3	78 - 68.5	Pole	TP10.75x10.75x0.465	3	-3.871	567.935	64.7	Pass
L4	68.5 - 68	Pole	TP35.5x10.75x0.465	4	-3.928	567.935	64.7	Pass
L5	68 - 38.25	Pole	TP40.02x35.5x0.25	5	-7.404	1974.850	17.2	Pass
L6	38.25 - 1	Pole	TP45x38.684x0.25	6	-14.791	2115.940	35.7	Pass
							Summary	
						Pole (L3)	64.7	Pass
						RATING =	**64.7**	**Pass**

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		98-FT Flagpole Bridgeport, CT
Rev. 0: 11/19/21		Prepared by: T.J.L. Checked by: C.F.C. Job No. 21007.69

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M_u := 683 \cdot ft \cdot kips$	(Input From tnxTower)
Shear Force =	$Shear := 11 \cdot kips$	(Input From tnxTower)
Axial Force =	$R_u := 15 \cdot kips$	(Input From tnxTower)

Anchor Bolt Data:

ASTMA615 Grade 75

Number of Anchor Bolts =	$N := 6$	(User Input)
Diameter of Bolt Circle =	$D_{BC} := 51.25 \cdot in$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 1.75 \cdot in$	(User Input)
Threads per Inch =	$n := 5$	(User Input)
Top of Concrete to Bot Leveling Nut =	$l_{ar} := 2 \cdot in$	(User Input)
Anchor Rod Force Correction Factor =	$n_c := 1.1$	

Base Plate Data:

Use AST MA572 Grade 50

Plate Yield Strength =	$F_{yf} := 50 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{TP} := 1.75 \cdot in$	(User Input)
Base Plate Diameter =	$D_{OD} := 56.25 \cdot in$	(User Input)
Outer Pole Diameter =	$D_T := 45.5 \cdot in$	(User Input)
Pole Wall Thickness =	$t_T := 0.25 \cdot in$	(User Input)
Pole Design Yield Strength =	$F_{yp} := 65 \cdot ksi$	(User Input)
	$\eta := 0.5$	For Ungrouted Base Plate per TIA-222-G Section 4.9.9

Anchor Bolt Analysis:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 2.405 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n} \right)^2 = 1.899 \cdot in^2$

Tensile Root Diameter = $d_{rt} := D - \frac{0.9743 \cdot in}{n} = 1.555 \cdot in$

Plastic Section Modulus = $Z := \frac{d_{rt}^3}{6} = 0.627 \cdot in^3$

Maximum Anchor Rod Force = $P_u := \frac{n_c \cdot \pi \cdot M_u}{N \cdot D_{BC}} + \frac{R_u}{N} = 94.6 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 1.8 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 151.956 \cdot k$

Bolt % of Capacity = $\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 64.7$

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

Condition1 = "OK"

Design Shear Strength = $\Phi R_{nv} := 0.75 \cdot 0.45 \cdot F_u \cdot A_g = 81.178 \cdot k$

Design Flexural Strength = $\Phi R_{nm} := 0.9 \cdot F_y \cdot Z = 42.312 \cdot in \cdot k$

$M_u := \begin{cases} 0 & \text{if } l_{ar} < D \\ 0.65 \cdot l_{ar} \cdot V_u & \text{otherwise} \end{cases} = 2.383 \cdot in \cdot k$

Bolt % of Capacity = $\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \right] \cdot 100 = 46.1$

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

Condition2 = "OK"

Base Plate Analysis:

Strength Resistance Factor for Yielding due to Bending =
$\phi_b := 0.9$

Strength Resistance Factor for Yielding due to Shear =
$\phi_v := 1.0$

Outside Fillet Horizontal Leg Dimension =
$w_1 := 0.25 \cdot in$

Effective Pole Outside Diameter =
$D_e := D_T + w_1 = 45.75 \cdot in$

Effective Base Plate Outside Diameter =
$D_{oe} := \begin{cases} D_{OD} & \text{if } D_{OD} \le \left(D_{BC} + 6 \cdot t_{TP}\right) \\ \left(D_{BC} + 6 \cdot t_{TP}\right) & \text{otherwise} \end{cases} = 56.25 \cdot in$

Half-Angle Between Radial Lines Extending from Pole Centerline Through Midpoints Between Adjacent Anchor Rods =
$\theta_1 := \frac{\pi}{N} = 0.524$

Angle Defining Limiting Effective Base Plate Width Based on Plate Thickness =
$\theta_2 := \operatorname{asin}\left(\frac{12 \cdot t_{TP}}{D_{BC}}\right) = 0.422$

Angle Defining Limiting Effective Base Plate Width Based on Distance Between Anchor Rod Bolt Circle and Effective Pole Outside Diameter =
$\theta_3 := \operatorname{acos}\left(\frac{D_{BC} + D_e}{2 \cdot D_{BC}}\right) = 0.329$

Governing Angle Defining Effective Base Plate Width Resisting Bending =
$\theta := \min\left(\theta_1, \theta_2, \theta_3\right) = 0.329$

Effective Moment Arm of Anchor Rod Force =
$x := 0.5 \cdot \left(D_{BC} - D_e\right) = 2.75 \cdot in$

Effective Base Plate Width Resisting Bending from Transverse Bend Line =
$B_{et} := D_{BC} \cdot \sin(\theta) = 16.562 \cdot in$

Effective Base Plate Width Resisting Bending from Radial Bend Lines =
$B_{er} := \left(D_{oe} - D_e\right) \cdot \sin(\theta) = 3.393 \cdot in$

Total Effective Base Plate Width Resisting Bending =
$B_{eff} := B_{et} + B_{er} = 19.956 \cdot in$

Required Base Plate Thickness =
$t_{TP.Req} := \sqrt{\frac{4 \cdot P_u \cdot x}{\phi_b \cdot F_{yf} \cdot B_{eff}}} = 1.077 \cdot in$

Plate Bending Stress % of Capacity =
$\frac{t_{TP.Req}}{t_{TP}} = 61.5 \cdot \%$

Condition2 =
$\text{Condition3} := \text{if}\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition3 = "Ok"

Required Base Plate Thickness =
$t_{TP.Req} := \frac{\phi_b \cdot t_T \cdot F_{yp}}{\phi_v \cdot 0.6 \cdot F_{yf}} = 0.488 \cdot in$

Plate Bending Stress % of Capacity =
$\frac{t_{TP.Req}}{t_{TP}} = 27.9 \cdot \%$

Condition2 =
$\text{Condition4} := \text{if}\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition4 = "Ok"

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Subject: CAISSON FOUNDATION

Location: 98-ft EEI Flagpole
Bridgeport, CT

Rev. 0: 11/19/21

Prepared by: TJL Checked by: C.F.C.
Job No. 21007.69

Caisson Foundation:

Input Data:

Shear Force =	S := 11k	*USER INPUT-FROM tnxTower*
Overturning Moment =	M := 683ft·k	*USER INPUT-FROM tnxTower*
Applied Axial Load =	A1 := 15k	*USER INPUT-FROM tnxTower*
Bending Moment =	Mu := 712ft·k	*USER INPUT–FROM LPILE*
Moment Capacity =	Mn := 3324ft·k	*USER INPUT–FROM LPILE*
Foundation Diameter =	d := 6ft	*USER INPUT*
Overall Length of Caisson =	L_c := 18.75ft	*USER INPUT*
Depth From Top of Caisson to Grade =	L_{pag} := 0.75ft	*USER INPUT*
Number of Rebar =	n := 26	*USER INPUT*
Area of Rebar =	Ar := $0.785in^2$	*USER INPUT*
Rebar Yield Strength =	fy := 60ksi	*USER INPUT*
Concrete Comp Strength =	f'c := 4ksi	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9Mn}{Mu} = 4.2$

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

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

FOSCheck = "OK"

```
================================================================================

                LPILE Plus for Windows, Version 5.0 (5.0.47)

              Analysis of Individual Piles and Drilled Shafts
            Subjected to Lateral Loading Using the p-y Method

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================================================================================

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--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:      J:\Jobs\2100700.WI\69_Bridgeport NE
CT\05_Structural\Backup Documentation\Calcs\LPile\
Name of input data file:     Caisson.lpd
Name of output file:         Caisson.lpo
Name of plot output file:    Caisson.lpp
Name of runtime file:        Caisson.lpr


--------------------------------------------------------------------------------
                          Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  November 19, 2021     Time:  12:09:44


--------------------------------------------------------------------------------
                                Problem Title
--------------------------------------------------------------------------------

21007.69 Bridgeport NE


--------------------------------------------------------------------------------
                                Program Options
--------------------------------------------------------------------------------

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

Basic Program Options:
```

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

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output summary table of values for pile-head deflection, maximum bending moment, and shear force only
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Only summary tables of pile-head deflection, maximum bending moment, and maximum shear force are to be printed in output file.

Pile Structural Properties and Geometry

Pile Length = 225.00 in

Depth of ground surface below top of pile = 9.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	72.00000000	1319167.	4071.5000	3604996.
2	225.0000	72.00000000	1319167.	4071.5000	3604996.

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

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 9.000 in
Distance from top of pile to bottom of layer = 210.000 in
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 210.000 in
Distance from top of pile to bottom of layer = 240.000 in
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 15.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 4 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	9.00	0.07200
2	210.00	0.07200
3	210.00	0.08100
4	240.00	0.08100

Shear Strength of Soils

Shear strength parameters with depth defined using 4 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	9.000	0.00000	32.00	------	------
2	210.000	0.00000	32.00	------	------
3	210.000	0.00000	40.00	------	------
4	240.000	0.00000	40.00	------	------

Notes:

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

Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 11000.000 lbs
Bending moment at pile head = 8196000.000 in-lbs
Axial load at pile head = 15000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 72.0000 in

Material Properties:

Compressive Strength of Concrete	=	4.000	kip/in**2
Yield Stress of Reinforcement	=	60.	kip/in**2
Modulus of Elasticity of Reinforcement	=	29000.	kip/in**2
Number of Reinforcing Bars	=	26	
Area of Single Bar	=	0.79000	in**2
Number of Rows of Reinforcing Bars	=	13	
Area of Steel	=	20.540	in**2
Area of Shaft	=	4071.504	in**2
Percentage of Steel Reinforcement	=	0.504	percent
Cover Thickness (edge to bar center)	=	3.000	in

Unfactored Axial Squash Load Capacity = 15005.68 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.580	32.759
2	1.580	30.856
3	1.580	27.158
4	1.580	21.883
5	1.580	15.336
6	1.580	7.897
7	1.580	0.000
8	1.580	-7.897
9	1.580	-15.336
10	1.580	-21.883
11	1.580	-27.158
12	1.580	-30.856
13	1.580	-32.759

Axial Thrust Force = 15000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress

psi						
4256323.	5.107588E+12	8.333333E-07	0.00003108	37.30122006	110.31403	823.13148
8469489.	5.081693E+12	0.00000167	0.00006121	36.72786033	215.44648	1618.55057
12638586.	5.055434E+12	0.00000250	0.00009132	36.52819884	318.79769	2413.35040
16763961.	5.029188E+12	0.00000333	0.00012143	36.42826402	420.44286	3208.14016
16763961.	4.023351E+12	0.00000417	0.00006732	16.15610039	231.62965	6356.23117
16763961.	3.352792E+12	0.00000500	0.00007979	15.95764911	273.51577	7656.25284
16763961.	2.873822E+12	0.00000583	0.00009227	15.81827724	315.17124	8955.87206
16763961.	2.514594E+12	0.00000667	0.00010477	15.71584046	356.59534	10255.08679
16763961.	2.235195E+12	0.00000750	0.00011729	15.63804138	397.78746	11553.89394
16763961.	2.011675E+12	0.00000833	0.00013000	15.59999907	439.38322	12846.85350
16763961.	1.828796E+12	0.00000917	0.00014283	15.58177507	481.08733	14136.38339
16763961.	1.676396E+12	0.00001000	0.00015540	15.53952062	521.58998	15433.76294
16763961.	1.547443E+12	0.00001083	0.00016797	15.50523126	561.86237	16730.68243
16763961.	1.436911E+12	0.00001167	0.00018057	15.47720754	601.90366	18027.13936
16763961.	1.341117E+12	0.00001250	0.00019318	15.45420706	641.71317	19323.12985
16763961.	1.257297E+12	0.00001333	0.00020580	15.43529427	681.29003	20618.65145
16763961.	1.183338E+12	0.00001417	0.00021845	15.41975462	720.63341	21913.70137
16763961.	1.117597E+12	0.00001500	0.00023111	15.40703666	759.74268	23208.27494
16763961.	1.058776E+12	0.00001583	0.00024378	15.39670050	798.61696	24502.36957
16763961.	1.005838E+12	0.00001667	0.00025647	15.38839853	837.25557	25795.98059
16763961.	9.579406E+11	0.00001750	0.00026918	15.38184106	875.65739	27089.10753
16763961.	9.143979E+11	0.00001833	0.00028191	15.37680280	913.82193	28381.74371
16763961.	8.746414E+11	0.00001917	0.00029465	15.37308848	951.74818	29673.88751
16763961.	8.381981E+11	0.00002000	0.00030741	15.37053931	989.43531	30965.53505

16763961.	8.046701E+11	0.00002083	0.00032019	15.36902010	1026.88241
32256.68353					
16763961.	7.737213E+11	0.00002167	0.00033298	15.36842144	1064.08885
33547.32704					
16763961.	7.450649E+11	0.00002250	0.00034579	15.36864460	1101.05363
34837.46323					
16999781.	7.285620E+11	0.00002333	0.00035862	15.36960590	1137.77579
36127.08917					
17587282.	7.277496E+11	0.00002417	0.00037147	15.37123668	1174.25462
37416.19944					
18174207.	7.269683E+11	0.00002500	0.00038434	15.37347257	1210.48901
38704.79220					
18760555.	7.262150E+11	0.00002583	0.00039722	15.37626421	1246.47837
39992.86053					
19346318.	7.254869E+11	0.00002667	0.00041012	15.37956011	1282.22144
41280.40398					
19931499.	7.247818E+11	0.00002750	0.00042304	15.38332379	1317.71765
42567.41507					
20516087.	7.240972E+11	0.00002833	0.00043598	15.38751447	1352.96570
43853.89340					
21100081.	7.234313E+11	0.00002917	0.00044894	15.39210212	1387.96480
45139.83340					
21683482.	7.227827E+11	0.00003000	0.00046191	15.39706099	1422.71420
46425.22871					
22266283.	7.221497E+11	0.00003083	0.00047491	15.40236318	1457.21273
47710.07736					
22848478.	7.215309E+11	0.00003167	0.00048792	15.40798509	1491.45931
48994.37612					
23430067.	7.209251E+11	0.00003250	0.00050095	15.41390955	1525.45322
50278.11800					
24591406.	7.197485E+11	0.00003417	0.00052708	15.42659104	1592.67859
52843.91779					
25750270.	7.186122E+11	0.00003583	0.00055328	15.44028318	1658.88068
55407.44146					
26906627.	7.175101E+11	0.00003750	0.00057956	15.45488513	1724.05120
57968.65215					
28014962.	7.152756E+11	0.00003917	0.00060556	15.46112072	1787.27995
60000.00000					
28870482.	7.070322E+11	0.00004083	0.00062963	15.41942203	1844.53322
60000.00000					
29586617.	6.961557E+11	0.00004250	0.00065261	15.35560048	1898.14445
60000.00000					
30196472.	6.836937E+11	0.00004417	0.00067472	15.27657831	1948.71572
60000.00000					
30717962.	6.702101E+11	0.00004583	0.00069608	15.18726289	1996.70381
60000.00000					
31238313.	6.576487E+11	0.00004750	0.00071749	15.10509288	2043.98088
60000.00000					
31676439.	6.442666E+11	0.00004917	0.00073812	15.01270473	2088.69522
60000.00000					
32034685.	6.301905E+11	0.00005083	0.00075800	14.91139448	2130.96863

60000.00000
32392072. 6.169918E+11 0.00005250 0.00077790 14.81715882 2172.62311
60000.00000
32748581. 6.045892E+11 0.00005417 0.00079784 14.72934544 2213.65501
60000.00000
33104211. 5.929112E+11 0.00005583 0.00081781 14.64738572 2254.06137
60000.00000
33374856. 5.804323E+11 0.00005750 0.00083681 14.55329812 2291.75347
60000.00000
33606473. 5.679967E+11 0.00005917 0.00085539 14.45726216 2327.93962
60000.00000
33941665. 5.579452E+11 0.00006083 0.00087600 14.40000021 2367.61443
60000.00000
34094097. 5.455056E+11 0.00006250 0.00089674 14.34779370 2406.78708
60000.00000
34319730. 5.348529E+11 0.00006417 0.00091482 14.25686896 2440.07204
60000.00000
34544743. 5.247303E+11 0.00006583 0.00093292 14.17097604 2472.84324
60000.00000
34769135. 5.150983E+11 0.00006750 0.00095106 14.08974588 2505.09832
60000.00000
34992905. 5.059215E+11 0.00006917 0.00096922 14.01284587 2536.83502
60000.00000
35132394. 4.959867E+11 0.00007083 0.00098601 13.92008436 2565.51460
60000.00000
35268344. 4.864599E+11 0.00007250 0.00100276 13.83119595 2593.65934
60000.00000
35403817. 4.773548E+11 0.00007417 0.00101954 13.74661410 2621.36150
60000.00000
35538819. 4.686438E+11 0.00007583 0.00103634 13.66605985 2648.61960
60000.00000
35673344. 4.603012E+11 0.00007750 0.00105317 13.58927357 2675.43151
60000.00000
35807389. 4.523039E+11 0.00007917 0.00107002 13.51601923 2701.79529
60000.00000
35940952. 4.446303E+11 0.00008083 0.00108689 13.44608009 2727.70901
60000.00000
36074028. 4.372609E+11 0.00008250 0.00110379 13.37925661 2753.17062
60000.00000
36206626. 4.301777E+11 0.00008417 0.00112071 13.31536853 2778.17855
60000.00000
36338726. 4.233638E+11 0.00008583 0.00113766 13.25424206 2802.73017
60000.00000
36338726. 4.152997E+11 0.00008750 0.00115500 13.19999921 2827.38227
60000.00000
36545033. 4.098508E+11 0.00008917 0.00117700 13.19999921 2858.29423
60000.00000
36759897. 4.046961E+11 0.00009083 0.00119566 13.16322291 2883.62507
60000.00000
36831708. 3.981806E+11 0.00009250 0.00121065 13.08814466 2903.26734
60000.00000

36903193.	3.918923E+11	0.00009417	0.00122567	13.01592886	2922.55503
60000.00000					
36974352.	3.858193E+11	0.00009583	0.00124070	12.94642746	2941.48673
60000.00000					
37045178.	3.799505E+11	0.00009750	0.00125575	12.87950099	2960.06081
60000.00000					
37115678.	3.742757E+11	0.00009917	0.00127082	12.81502283	2978.27610
60000.00000					
37255664.	3.634699E+11	0.00010250	0.00130103	12.69293082	3013.62345
60000.00000					
37394308.	3.533320E+11	0.00010583	0.00133131	12.57928240	3047.51721
60000.00000					
37531576.	3.438007E+11	0.00010917	0.00136167	12.47330725	3079.94462
60000.00000					
37667474.	3.348220E+11	0.00011250	0.00139211	12.37433589	3110.89394
60000.00000					
37801979.	3.263480E+11	0.00011583	0.00142264	12.28176963	3140.35235
60000.00000					
37935064.	3.183362E+11	0.00011917	0.00145325	12.19507635	3168.30678
60000.00000					
38066732.	3.107488E+11	0.00012250	0.00148394	12.11378825	3194.74471
60000.00000					
38196961.	3.035520E+11	0.00012583	0.00151472	12.03748262	3219.65276
60000.00000					
38489907.	2.979864E+11	0.00012917	0.00155000	12.00000036	3246.45226
60000.00000					
38489907.	2.904899E+11	0.00013250	0.00158714	11.97838819	3272.40595
60000.00000					
38496344.	2.834087E+11	0.00013583	0.00161406	11.88267195	3289.36218
60000.00000					
38556543.	2.770530E+11	0.00013917	0.00164106	11.79202831	3305.15122
60000.00000					
38615787.	2.709880E+11	0.00014250	0.00166812	11.70610964	3319.76384
60000.00000					
38674056.	2.651935E+11	0.00014583	0.00169525	11.62459409	3333.19010
60000.00000					
38731341.	2.596514E+11	0.00014917	0.00172246	11.54719198	3345.42022
60000.00000					
38787638.	2.543452E+11	0.00015250	0.00174973	11.47363937	3356.44425
60000.00000					
38842924.	2.492594E+11	0.00015583	0.00177708	11.40369165	3366.25185
60000.00000					
38897202.	2.443803E+11	0.00015917	0.00180449	11.33712995	3374.83283
60000.00000					
38950449.	2.396951E+11	0.00016250	0.00183198	11.27374828	3382.17653
60000.00000					
39002664.	2.351919E+11	0.00016583	0.00185955	11.21336210	3388.27235
60000.00000					
39053828.	2.308601E+11	0.00016917	0.00188719	11.15579760	3393.10930
60000.00000					
39103939.	2.266895E+11	0.00017250	0.00191490	11.10089815	3396.67634

60000.00000
39152976. 2.226710E+11 0.00017583 0.00194270 11.04851568 3398.96212
60000.00000
39200930. 2.187959E+11 0.00017917 0.00197057 10.99851501 3399.95511
60000.00000
39245176. 2.150421E+11 0.00018250 0.00199852 10.95077169 3394.94090
60000.00000
39288015. 2.114153E+11 0.00018583 0.00202654 10.90516984 3388.06345
60000.00000
39330457. 2.079143E+11 0.00018917 0.00205465 10.86160004 3381.16475
60000.00000
39372504. 2.045325E+11 0.00019250 0.00208284 10.81996357 3382.66262
60000.00000
39372504. 2.010511E+11 0.00019583 0.00211500 10.79999936 3388.78992
60000.00000
39372504. 1.976862E+11 0.00019917 0.00215100 10.79999936 3394.17923
60000.00000
39372504. 1.944321E+11 0.00020250 0.00218700 10.79999936 3397.81817
60000.00000
39559465. 1.921917E+11 0.00020583 0.00222300 10.79999936 3399.70674
60000.00000
39610701. 1.893739E+11 0.00020917 0.00225095 10.76151502 3398.78959
60000.00000
39622159. 1.864572E+11 0.00021250 0.00227579 10.70959175 3393.81200
60000.00000
39633517. 1.836302E+11 0.00021583 0.00230067 10.65949023 3388.82199
60000.00000
39644756. 1.808886E+11 0.00021917 0.00232560 10.61112463 3383.81970
60000.00000
39655896. 1.782287E+11 0.00022250 0.00235058 10.56442416 3378.80472
60000.00000
39666912. 1.756468E+11 0.00022583 0.00237561 10.51931155 3373.77725
60000.00000
39677825. 1.731396E+11 0.00022917 0.00240069 10.47572458 3376.12785
60000.00000
39688611. 1.707037E+11 0.00023250 0.00242581 10.43359458 3380.51401
60000.00000
39709844. 1.660342E+11 0.00023917 0.00247621 10.35348022 3387.98400
60000.00000
39730597. 1.616160E+11 0.00024583 0.00252680 10.27852857 3393.68856
60000.00000
39750857. 1.574291E+11 0.00025250 0.00257761 10.20834696 3397.59222
60000.00000
39770607. 1.534557E+11 0.00025917 0.00262862 10.14258349 3399.65826
60000.00000
39789302. 1.496776E+11 0.00026583 0.00268001 10.08155787 3396.65885
60000.00000
39806856. 1.460802E+11 0.00027250 0.00273181 10.02500403 3388.25646
60000.00000
39824183. 1.426538E+11 0.00027917 0.00278374 9.97160017 3379.82095
60000.00000

```
   39841273.  1.393864E+11    0.00028583    0.00283579    9.92113173    3371.35189
  60000.00000
   39858117.  1.362671E+11    0.00029250    0.00288797    9.87340343    3362.84885
  60000.00000
   39874733.  1.332860E+11    0.00029917    0.00294028    9.82824361    3366.32702
  60000.00000
   39891083.  1.304341E+11    0.00030583    0.00299273    9.78548491    3374.59268
  60000.00000
   39907190.  1.277030E+11    0.00031250    0.00304531    9.74498570    3381.73249
  60000.00000
   39923019.  1.250852E+11    0.00031917    0.00309803    9.70660651    3387.72708
  60000.00000
   39932239.  1.225542E+11    0.00032583    0.00315298    9.67665589    3392.90944
  60000.00000
   39939785.  1.201197E+11    0.00033250    0.00320854    9.64973938    3396.74797
  60000.00000
   39946930.  1.177796E+11    0.00033917    0.00326430    9.62446225    3399.12072
  60000.00000
   39953652.  1.155286E+11    0.00034583    0.00332026    9.60074294    3399.99576
  60000.00000
   40062972.  1.136538E+11    0.00035250    0.00338400    9.60000050    3391.11370
  60000.00000
   40171630.  1.118468E+11    0.00035917    0.00344800    9.60000050    3381.60139
  60000.00000
   40276552.  1.100954E+11    0.00036583    0.00351200    9.60000050    3372.08908
  60000.00000
   40377738.  1.083966E+11    0.00037250    0.00357600    9.60000050    3362.57678
  60000.00000
   40475188.  1.067477E+11    0.00037917    0.00364000    9.60000050    3353.06447
  60000.00000
   40568901.  1.051462E+11    0.00038583    0.00370400    9.60000050    3343.55216
  60000.00000
   40658879.  1.035895E+11    0.00039250    0.00376800    9.60000050    3352.34735
  60000.00000
   40745120.  1.020755E+11    0.00039917    0.00383200    9.60000050    3363.63978
  60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =   39893.31100
in-kip


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

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head  =       11000.000 lbs
Specified moment at pile head       =     8196000.000 in-lbs
```

Specified axial load at pile head = 15000.000 lbs

Output Verification:

Computed forces and moments are within specified convergence limits.

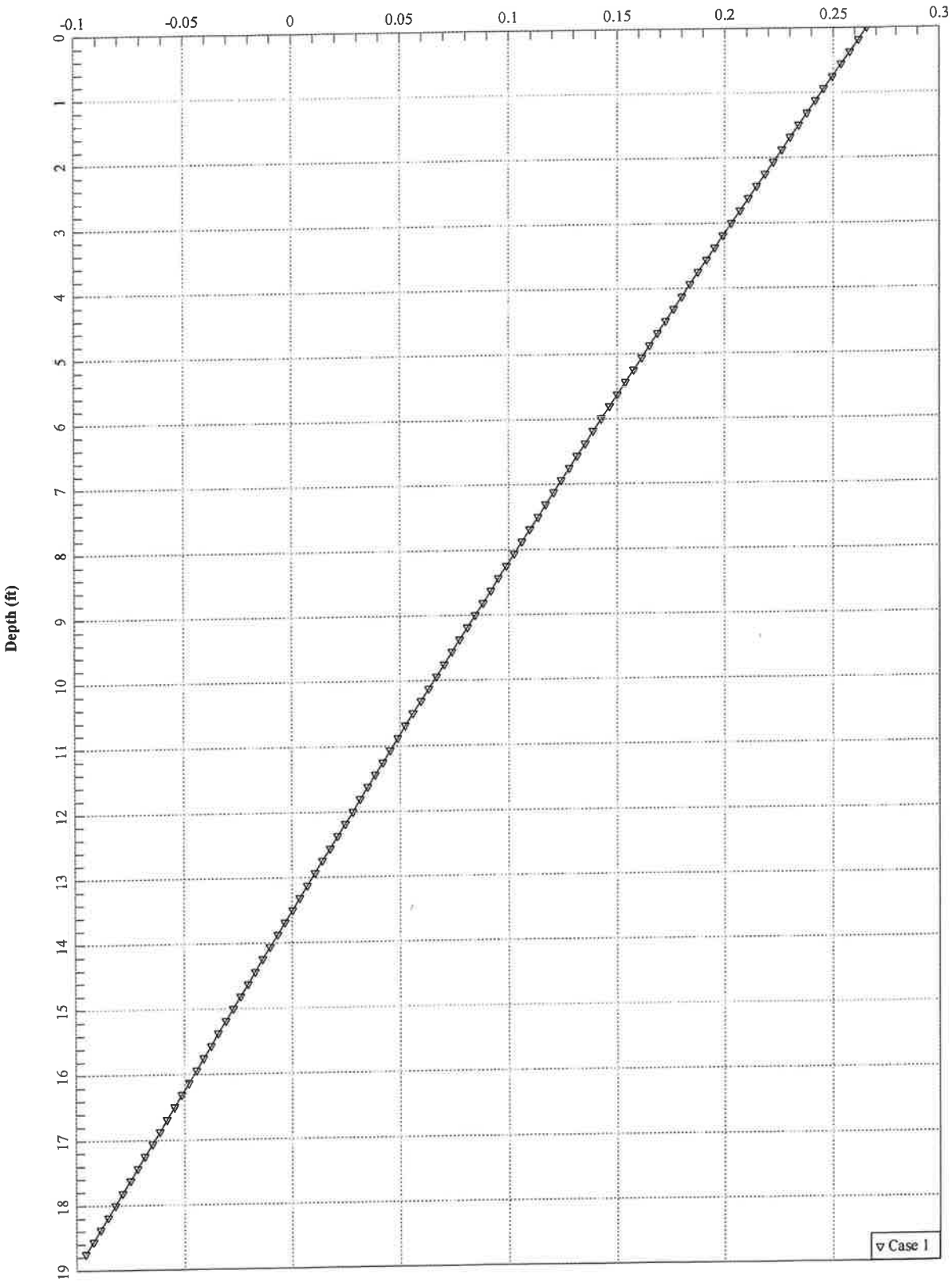
Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

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

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 11000.	M= 8.20E+06	15000.0000	0.2654159	8540881.	-73819.4214

The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Case 1

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

Antenna Mount Analysis

Proposed Verizon
Antenna Upgrade

Site Ref: Bridgeport NE CT

541 Broadbridge Road
Bridgeport, CT

Centek Project No. 21007.69

Date: January 12, 2022

Max Stress Ratio = 1.3%

Prepared for:

Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Table of Contents

CENTEK engineering

Centered on Solutions℠

January 12, 2022

Mr. Andrew Leone
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Re: Structural Letter ~ Antenna Mount
Verizon – Site Ref: Bridgeport NE CT
541 Broadbridge Road
Bridgeport, CT 06610

Centek Project No. 21007.69

Dear Mr. Leone,

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 three (3) antenna masts, Pipe 2.0 STD X 8- FT and three (3) bend over plated as detailed on the Centek Engineering construction drawings entitled "Verizon, Bridgeport NE CT, 541 Broadbridge Road Bridgeport, CT" issued 11/22/2021 (Rev. B). The antennas are being proposed inside concealment canisters in an existing flagpole. The review considered the effects of dead load and ice load in accordance with the 2015 International Building Code as modified by the 2018 Connecticut State Building Code (CTBC), including ASCE 7-10 and ANSI/TIA-222-G *Structural Standards for Steel Antenna Towers and Supporting Structures.*

The loads considered in this analysis consist of the following:

- **Verizon:**
  Antenna Masts: Three (3) Commscope NNH4-65B-R6 panel antennas, three (3) JMA MX08FIT265-01 panel antenna, three(3) Samsung RT-8808-77A RRU's and three(3) Commscope CBC61923T-DS-43 diplexers the proposed antenna mounts inside concealments canisters with RAD center elevations of 92 ft +/- & 82 ft +/- AGL.

The antenna mount was analyzed per the requirements of the 2015 International Building Code as modified by the 2018 Connecticut State Building Code, considering a design ice thickness of 0.75-in Bridgeport as required in Annex B of the ANSI/TIA-222-G *Structural Standards for Steel Antenna Towers and Supporting Structures*.

Based on our review of the installation, it is our opinion that **the proposed antenna masts have sufficient capacity** to support the aforementioned antenna configuration. If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

STATE OF CONNECTICUT · CARLO F. CENTORE · No. 16694 · LICENSED PROFESSIONAL ENGINEER

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Fernando J. Palacios
Engineer

CENTEK Engineering, Inc.
Structural Analysis – Mount Analysis
Verizon Antenna Upgrade – Bridgeport NE CT
Bridgeport, CT
January 12, 2022

Section 2 - Calculations

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

Subject: Loads on Equipment

Location: Bridgeport , CT

Rev. 0: 01/12/2022 Prepared by: F.J.P Checked by: T.J.L.
Job No. 21007.69

Development of Design Heights of Ice on Equipment Per TIA-222-G

Input

Structure Type =	Structure_Type := Pole		(User Input)
Structure Category =	SC := II		(User Input)
Height to Center of Antennas =	z := 92	ft	(User Input)
Radial Ice Thickness =	$t_i := 0.75$	in	(User Input per Annex B of TIA-222-G)
Radial Ice Density =	Id := 56.00	pcf	(User Input)
Topographic Factor =	$K_{zt} := 1.0$		(User Input)

Output

Ice Importance factor= $I_{ice} :=$ if SC = 1, 0; if SC = 2, 1.00; if SC = 3, 1.25 $= 1$ (TIA 222-G, Table 2-3)

Height escalation factor for ice thickness= $K_{Iz} := \left(\frac{z}{33}\right)^{0.1} = 1.108$ (TIA 222-G, Sec, 2.6.8)

Nominal thickness of radial glaze ice at height z= $t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{Iz} \cdot K_{zt}^{0.35} = 1.66$ in (TIA 222-G, Sec, 2.6.8)

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Subject: Loads on Equipment

Location: Bridgeport , CT

Rev. 0: 01/12/2022 Prepared by: F.J.P Checked by: T.J.L.
Job No. 21007.69

Development of Ice Load on Antennas

Antenna Data:

Antenna Model =	Commscope NNH4-65B-R6		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72.0$	in	(User Input)
Antenna Width =	$W_{ant} := 19.6$	in	(User Input)
Antenna Thickness =	$T_{ant} := 7.8$	in	(User Input)
Antenna Weight =	$WT_{ant} := 83.1$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 3.7$		

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 83$ lbs

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \cdot 10^4$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 8200$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 266$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 266$ lbs

Development of Ice Load on Antennas

Antenna Data:

Antenna Model =	JMA MX08FIT265-01		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 33.1$	in	(User Input)
Antenna Width =	$W_{ant} := 11.6$	in	(User Input)
Antenna Thickness =	$T_{ant} := 4.5$	in	(User Input)
Antenna Weight =	$WT_{ant} := 26.5$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 2.9$		

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 27$ lbs

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1728$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 2525$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 82$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 82$ lbs

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Subject: Loads on Equipment

Location: Bridgeport , CT

Rev. 0: 01/12/2022 Prepared by: F.J.P Checked by: T.J.L.
Job No. 21007.69

Development of Ice Load on RRUS's

RRUS Data:

RRUS Model =	Samsung RT-8808-77A		
RRUS Shape =	Flat		(User Input)
RRUS Height =	$L_{RRUS} := 15$	in	(User Input)
RRUS Width =	$W_{RRUS} := 15$	in	(User Input)
RRUS Thickness =	$T_{RRUS} := 6.8$	in	(User Input)
RRUS Weight =	$WT_{RRUS} := 59.5$	lbs	(User Input)
Number of RRUS's =	$N_{RRUS} := 1$		

Gravity Load (without ice)

Weight of All RRUSs = $WT_{RRUS} \cdot N_{RRUS} = 60$ lbs

Gravity Loads (ice only)

Volume of Each RRUS = $V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 1530$ cu in

Volume of Ice on Each RRUS = $V_{ice} := (L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 1869$ cu in

Weight of Ice on Each RRUS = $W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 61$ lbs

Weight of Ice on All RRUSs = $W_{ICERRUS} \cdot N_{RRUS} = 61$ lbs

Development of Ice Load on Diplexers

Diplexer Data:

Diplexer Model =	Commscope CBC61923T-DS-43		
Diplexer Shape =	Flat		(User Input)
Diplexer Height =	$L_{Dipl} := 6.9$	in	(User Input)
Diplexer Width =	$W_{Dipl} := 7.8$	in	(User Input)
Diplexer Thickness =	$T_{Dipl} := 4.6$	in	(User Input)
Diplexer Weight =	$WT_{Dipl} := 14.3$	lbs	(User Input)
Number of Diplexer =	$N_{Dipl} := 2$		(User Input)

Gravity Load (without ice)

Weight of All Diplexer = $WT_{Dipl} \cdot N_{Dipl} = 29$ lbs

Gravity Loads (ice only)

Volume of Each Diplexer = $V_{Dipl} := L_{Dipl} \cdot W_{Dipl} \cdot T_{Dipl} = 248$ cu in

Volume of Ice on Each Diplexer = $V_{ice} := (L_{Dipl} + 2 \cdot t_{iz}) \cdot (W_{Dipl} + 2 \cdot t_{iz}) \cdot (T_{Dipl} + 2 \cdot t_{iz}) - V_{Dipl} = 654$ cu in

Weight of Ice on Each Diplexer = $W_{ICEDipl} := \frac{V_{ice}}{1728} \cdot Id = 21$ lbs

Weight of Ice on All Diplexer = $W_{ICEDipl} \cdot N_{Dipl} = 42$ lbs

Envelope Only Solution

Centek Engineering		
FJP	Bridgeport NE CT - Mount	Jan 12, 2022 at 9:02 AM
21007.69	Member Framing	Bridgeprt NE CT_AMA.r3d

(Global) Model Settings

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

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

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
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

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design Li...	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	(P) Antenna Mast PIPE 2....	PIPE 2.0	Column	None	A53 Grade B	Typical	1.02	.627	.627	1.25
2	(P)Folded Plate	Folded Plate 7.75x..	Column	None	A36 Gr.36	Typical	2.626	5.835	26.377	.021

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	(P) Antenn...	8			Lbyy						Lateral
2	M2	(P)Folded ...	3									Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	N12	N10			(P) Antenna Mast PIPE 2.0 STD	Colu...	None	A53 Gr...	Typical
2	M2	N6	N5			(P)Folded Plate	Colu...	None	A36 Gr...	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N10	0	-8	-0.	0	
2	N12	0	0	-0.	0	
3	N3	0	-1.5	-0.	0	
4	N4	0	-6.5	-0.	0	
5	N5	0	-13	-0.	0	
6	N6	0	-10	-0.	0	
7	N7	0	-10.666667	-0.	0	
8	N8	0	-12.333333	-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	N3	Reaction	Reaction	Reaction		Reaction	
2	N4	Reaction	Reaction	Reaction		Reaction	
3	N7	Reaction	Reaction	Reaction		Reaction	
4	N8	Reaction	Reaction	Reaction		Reaction	

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.042	1
2	M1	Y	-.042	7
3	M2	Y	-.014	.25
4	M2	Y	-.014	2.75

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.134	1
2	M1	Y	-.134	7
3	M2	Y	-.041	.25
4	M2	Y	-.041	2.75

Member Distributed Loads

Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[f...End Location[ft...
No Data to Print ...				

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	J...	Point	Distributed	Area(Me...	Surface(...
1	Self Weight	None		-1						
2	Dead Load	None					4			
3	Ice Load	None					4			

Load Combinations

	Description	Solve	PDelta	...	B...	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.2D + 1.6W (X-directi...	Yes	Y		1	1.2	2	1.2	5	1.6														
2	0.9D + 1.6W (X-directi...	Yes	Y		1	.9	2	.9	5	1.6														
3	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	4	1												
4	1.2D + 1.6W (Z-directi...	Yes	Y		1	1.2	2	1.2	7	1.6														
5	0.9D + 1.6W (Z-directi...	Yes	Y		1	.9	2	.9	7	1.6														
6	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	6	1												

Envelope Joint Reactions

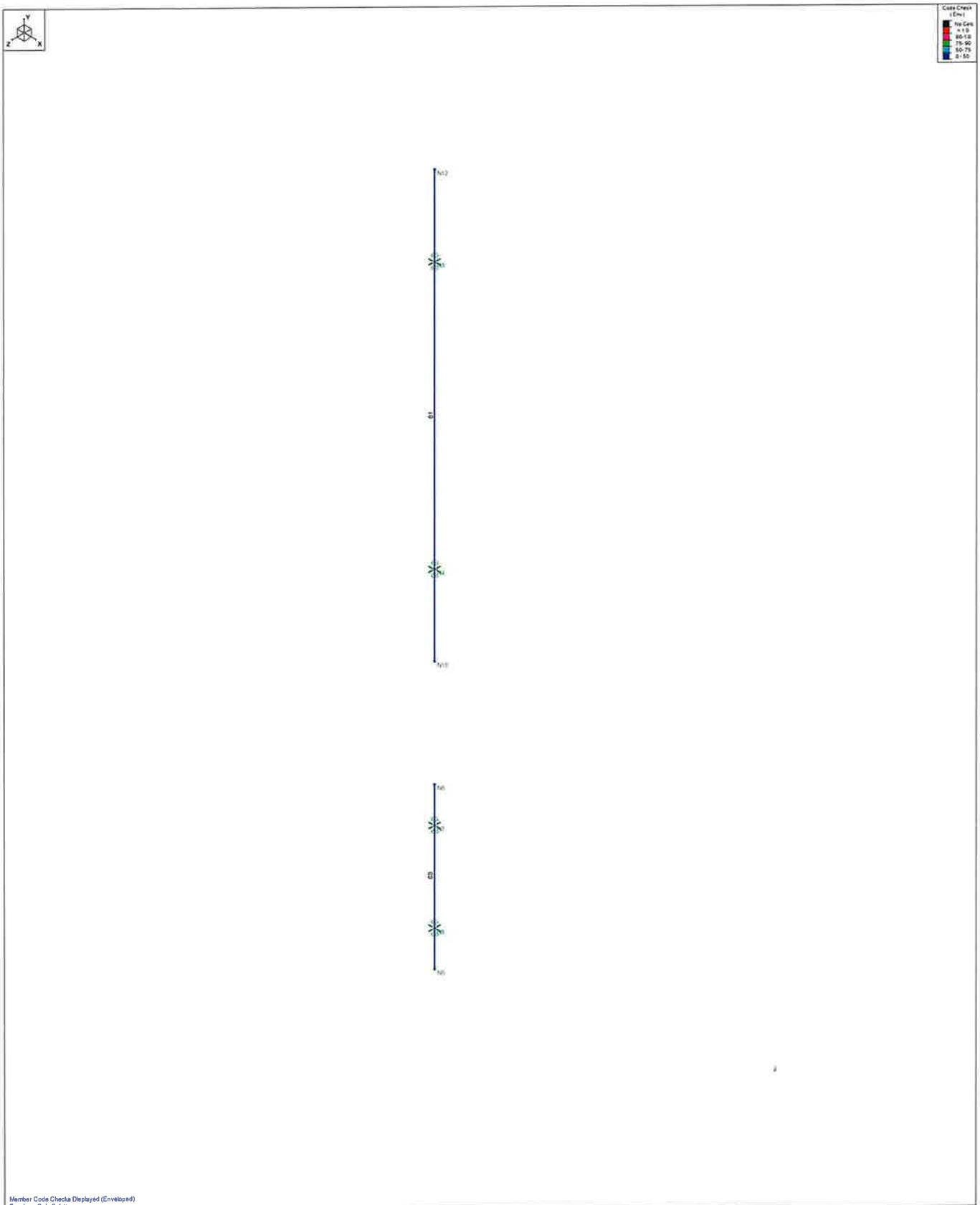
	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N3	max	0	6	.201	6	0	6	0	6	0	6	0	6
2		min	0	1	.05	2	0	1	0	1	0	1	0	1
3	N4	max	0	6	.201	6	0	6	0	6	0	6	0	6
4		min	0	1	.05	2	0	1	0	1	0	1	0	1
5	N7	max	0	6	.074	6	0	6	0	6	0	6	0	6
6		min	0	1	.025	2	0	1	0	1	0	1	0	1
7	N8	max	0	6	.074	6	0	6	0	6	0	6	0	6
8		min	0	1	.025	2	0	1	0	1	0	1	0	1
9	Totals:	max	0	6	.549	6	0	6						
10		min	0	1	.15	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...	LC	Y Rotation [...	LC	Z Rotation [...	LC
1	N10	max	0	6	0	5	0	6	0	6	0	6	0	6
2		min	0	1	0	3	0	1	0	1	0	1	0	1
3	N12	max	0	6	0	5	0	6	0	6	0	6	0	6
4		min	0	1	0	3	0	1	0	1	0	1	0	1
5	N3	max	0	6	0	6	0	6	0	6	0	6	0	6
6		min	0	1	0	1	0	1	0	1	0	1	0	1
7	N4	max	0	6	0	6	0	6	0	6	0	6	0	6
8		min	0	1	0	1	0	1	0	1	0	1	0	1
9	N5	max	0	6	0	5	0	6	0	6	0	6	0	6
10		min	0	1	0	3	0	1	0	1	0	1	0	1
11	N6	max	0	6	0	5	0	6	0	6	0	6	0	6
12		min	0	1	0	3	0	1	0	1	0	1	0	1
13	N7	max	0	6	0	6	0	6	0	6	0	6	0	6
14		min	0	1	0	1	0	1	0	1	0	1	0	1
15	N8	max	0	6	0	6	0	6	0	6	0	6	0	6
16		min	0	1	0	1	0	1	0	1	0	1	0	1

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

	Me...	Sha...	Code C...	Lo...	LC	Shea...	Loc...	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn y...	phi*Mn...	Cb	Eqn
1	M1	PIP...	.013	1.5	6	.000	0		6	14.916	32.13	1.872	1.872	1	H1-1b*
2	M2	Fol...	.001	.656	6	.000	0	y	6	50.818	85.091	7.62	20.797	1	H1-1b



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering		
FJP	Bridgeport NE CT - Mount	Jan 12, 2022 at 9:03 AM
21007.69	Member Unity Check	Bridgeprt NE CT_AMA.r3d

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Subject: Connection to Host Structure

Location: Bridgeport, CT

Rev. 0: 01/12/2022

Prepared by: F.J.P; Checked by: T.J.L.
Job No. 21007.69

Proposed Connection to Host Structure for Mounts Supporting Antenna at 92 - ft Rad. Elevation

Bolts Grade	A325	
Number of Bolts =	$n_b := 2$	(User Input)
Bolt Diameter =	$d\phi := \frac{1}{2}\,in$	(User Input)
Nominal Tensile Strength=	$F_{nt} := 90\,ksi$	(AISC, Steel construction manual 14th ed., Table J3.2)
Nominal Shear Strength=	$F_{nv} := 54\,ksi$	(AISC, Steel construction manual 14th ed., Table J3.2)
Safety Factor=	$\phi := 0.75$	(User Input)
Horizontal Spacing Between Bolts=	$S := 3\,in$	(User Input)

Reactions at Connection:

Shear X =	$Shear_x := 0 \cdot kip$	(User Input)
Vertical=	$Vertical := 0.201\,kip$	(User Input)
Shear Z =	$Shear_z := 0 \cdot kip$	(User Input)
Moment X=	$M_X := 0 \cdot kip \cdot ft$	(User Input)
Moment Y=	$M_Y := 0 \cdot kip \cdot ft$	(User Input)
Moment Z=	$M_Z := 0\,kip \cdot ft$	(User Input)

Anchor Check:

Bolt Area= $a_b := \pi \cdot \left(\frac{d\phi}{2}\right)^2 = 0.196\,in^2$

Shear Strength= $R_{nv} := F_{nv} \cdot a_b \cdot \phi = 7.952\,kip$ (AISC, Steel construction manual 14th ed., Formula J3-1)

Shear Stress per Bolt= $V_{act} := \frac{\sqrt{Shear_x^2 + Vertical^2}}{n_b} + \frac{M_Z}{S \cdot \frac{n_b}{2}} = 0.101\,kip$

$Condition1 := if\left(V_{act} \le R_{nv}, "OK", "Overstressed"\right) = "OK"$ $\frac{V_{act}}{R_{nv}} = 1.3\%$

$Condition1 = "OK"$

$f_v := \frac{V_{act}}{a_b} = 0.512\,ksi$

Tensile Stress Adjusted for Shear= $F'_{nt} := \left\| \begin{array}{l} \text{if } \left(1.3\,F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) \le F_{nt} \\ \quad 1.3\,F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \\ \text{else} \\ \quad F_{nt} \end{array} \right\| = 90\,ksi$ (AISC, Steel construction manual 14th ed., Formula J3-3A)

Tensile Strength= $R_{nt} := F'_{nt} \cdot a_b \cdot \phi = 13.254\,kip$ (AISC, Steel construction manual 14th ed., Formula J3-2)

Tension Force Each Bolt= $T_{act} := \frac{Shear_z}{n_b} + \frac{M_Y}{S \cdot \frac{n_b}{2}} + \frac{M_X}{S \cdot \frac{n_b}{2}} = 0\,kip$

Tension Stress Each Bolt= $f_t := \frac{T_{act}}{a_b} = 0\,ksi$

$Condition2 := if\left(f_t \le F'_{nt} \cdot \phi, "OK", "Overstressed"\right) = "OK"$ $\frac{T_{act}}{R_{nt}} = 0$

$Condition2 = "OK"$

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Subject: Connection to Host Structure

Location: Bridgeport, CT

Rev. 0: 01/12/2022

Prepared by: F.J.P; Checked by: T.J.L.
Job No. 21007.69

Proposed Connection to Host Structure for Mounts Supporting Antenna at 82 - ft Rad. Elevation

Bolts Grade: A325

Number of Bolts = $n_b := 2$ (User Input)

Bolt Diameter = $d\phi := \frac{1}{2}\,in$ (User Input)

Nominal Tensile Strength= $F_{nt} := 90\,ksi$ (AISC, Steel construction manual 14th ed., Table J3.2)

Nominal Shear Strength= $F_{nv} := 54\,ksi$ (AISC, Steel construction manual 14th ed., Table J3.2)

Safety Factor= $\phi := 0.75$ (User Input)

Horizontal Spacing Between Bolts= $S := 3\,in$ (User Input)

Reactions at Connection:

Shear X = $Shear_x := 0 \cdot kip$ (User Input)

Vertical= $Vertical := 0.074\,kip$ (User Input)

Shear Z = $Shear_z := 0 \cdot kip$ (User Input)

Moment X= $M_X := 0 \cdot kip \cdot ft$ (User Input)

Moment Y= $M_Y := 0 \cdot kip \cdot ft$ (User Input)

Moment Z= $M_Z := 0\,kip \cdot ft$ (User Input)

Anchor Check:

Bolt Area= $a_b := \pi \cdot \left(\frac{d\phi}{2}\right)^2 = 0.196\,in^2$

Shear Strength= $R_{nv} := F_{nv} \cdot a_b \cdot \phi = 7.952\,kip$ (AISC, Steel construction manual 14th ed., Formula J3-1)

Shear Stress per Bolt= $V_{act} := \frac{\sqrt{Shear_z^2 + Vertical^2}}{n_b} + \frac{M_Z}{S \cdot \frac{n_b}{2}} = 0.037\,kip$

$Condition1 := if\left(V_{act} \le R_{nv}, "OK", "Overstressed"\right) = "OK"$ $\frac{V_{act}}{R_{nv}} = 0.5\%$

Condition1 = "OK"

$f_v := \frac{V_{act}}{a_b} = 0.188\,ksi$

Tensile Stress Adjusted for Shear= $F'_{nt} := \left| \text{if } \left(1.3 F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v\right) \le F_{nt} \left| \begin{array}{l} 1.3 F_{nt} - \frac{F_{nt}}{\phi \cdot F_{nv}} \cdot f_v \\ \text{else} \\ F_{nt} \end{array} \right. \right| = 90\,ksi$ (AISC, Steel construction manual 14th ed., Formula J3-3A)

Tensile Strength= $R_{nt} := F'_{nt} \cdot a_b \cdot \phi = 13.254\,kip$ (AISC, Steel construction manual 14th ed., Formula J3-2)

Tension Force Each Bolt= $T_{act} := \frac{Shear_x}{n_b} + \frac{M_Y}{S \cdot \frac{n_b}{2}} + \frac{M_X}{S \cdot \frac{n_b}{2}} = 0\,kip$

Tension Stress Each Bolt= $f_t := \frac{T_{act}}{a_b} = 0\,ksi$

$Condition2 := if\left(f_t \le F'_{nt} \cdot \phi, "OK", "Overstressed"\right) = "OK"$ $\frac{T_{act}}{R_{nt}} = 0$

Condition2 = "OK"

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Subject: Flange Bolts and Flange Plate Analysis

Location: Bridgeport, CT

Rev. 0: 01/31/22

Prepared by: PPG Checked by: C.F.C.
Job No. 21007.69

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 99.241 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$Shear := 5.64 \cdot kips$	(Input From RisaTower)
Axial Force =	$Axial := 9.547 \cdot kips$	(Input From RisaTower)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	$N := 12$	(User Input)
Diameter of Bolt Circle =	$D_{bc} := 32 \cdot in$	(User Input)
Bolt Minimum Tensile Strength =	$F_{ub} := 120 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Flange Bolts =	$D := 1.00 \cdot in$	(User Input)
Threads per Inch =	$n := 8$	(User Input)

Flange Plate Data:

Use ASTM A572 Grade 50

Plate Yield Strength =	$Fy_{bp} := 50 \cdot ksi$	(User Input)
Flange Plate Thickness =	$t_{bp} := 1.25 \cdot in$	(User Input)
Flange Plate Diameter =	$D_{bp} := 35 \cdot in$	(User Input)
Outer Pole Diameter =	$D_{pole} := 10. \cdot in$	(User Input)

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Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle = $R_{bc} := \frac{D_{bc}}{2} = 16\ in$

Distance to Bolts = $i := 1 .. N$

$$d_i := \left\| \begin{array}{l} \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{array} \right.$$

$d_1 = 8.00\ in$ $d_7 = -8.00\ in$

$d_2 = 13.86\ in$ $d_8 = -13.86\ in$

$d_3 = 16.00\ in$ $d_9 = -16.00\ in$

$d_4 = 13.86\ in$ $d_{10} = -13.86\ in$

$d_5 = 8.00\ in$ $d_{11} = -8.00\ in$

$d_6 = 0.00\ in$ $d_{12} = 0.00\ in$

$$d = \begin{bmatrix} 0 \\ \vdots \end{bmatrix} in$$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 5\ in$

Moment Arms of Bolts about Neutral Axis = $MA_i := \text{if}\left(d_i \geq R_{pole}, d_i - R_{pole}, 0 \cdot in\right)$

$MA_1 = 3.00\ in$ $MA_7 = 0.00\ in$

$MA_2 = 8.86\ in$ $MA_8 = 0.00\ in$

$MA_3 = 11.00\ in$ $MA_9 = 0.00\ in$

$MA_4 = 8.86\ in$ $MA_{10} = 0.00\ in$

$MA_5 = 3.00\ in$ $MA_{11} = 0.00\ in$

$MA_6 = 0.00\ in$ $MA_{12} = 0.00\ in$

$$MA = \begin{bmatrix} 0 \\ \vdots \end{bmatrix} in$$

Effective Width of Flange plate for Bending = $B_{eff} := 0.8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 26.8\ in$

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Subject: Flange Bolts and Flange Plate Analysis

Location: Bridgeport, CT

Rev. 0: 01/31/22

Prepared by: PPG Checked by: C.F.C.
Job No. 21007.69

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = \left(1.536 \cdot 10^3\right)\ in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785\ in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.606\ in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878\ in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22\ in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot {D_n}^3}{32} = 0.066\ in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 11.6\ kips$

Maximum Shear Force = $V_{Max} := \frac{Shear}{N} = 0.47\ kips$

Design Tensile Strength = $\Phi R_{nt} := \left(0.75 \cdot F_{ub} \cdot 0.75 \cdot A_g\right) = 53\ kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{\Phi R_{nt}} = 21.90\%$

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

$Condition1 = \text{“OK”}$

Design Shear Strength = $\Phi R_{nv} := \left(0.75 \cdot 0.45 \cdot F_{ub} \cdot A_g\right) = 31.8\ kips$

Bolt Tension % of Capacity = $\frac{V_{Max}}{\Phi R_{nv}} = 1.48\%$

Condition2 = $Condition2 := \text{if}\left(\left(\frac{V_{Max}}{\Phi R_{nv}}\right)^2 + \left(\frac{T_{Max}}{\Phi R_{nt}}\right)^2 \le 1.00\ ,\ \text{“OK”}\ ,\ \text{“Overstressed”}\right) = \text{“OK”}$

$Condition2 = \text{“OK”}$

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

Flange Plate Analysis:

Force from Bolts =

$$C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$C_1 = 7.0\ kips$ $C_7 = -5.4\ kips$

$C_2 = 11.5\ kips$ $C_8 = -9.9\ kips$

$C_3 = 13.2\ kips$ $C_9 = -11.6\ kips$

$C_4 = 11.5\ kips$ $C_{10} = -9.9\ kips$ $C = \begin{bmatrix} 0 \\ \vdots \end{bmatrix} kips$

$C_5 = 7.0\ kips$ $C_{11} = -5.4\ kips$

$C_6 = 0.8\ kips$ $C_{12} = 0.8\ kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{4 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^{\ 2}\right)} = 37.4\ ksi$$

$$F_{bp} := 0.9 \cdot Fy_{bp} = 45\ ksi$$

Allowable Bending Stress in Plate =

$$\frac{f_{bp}}{F_{bp}} = 83.0\%$$

Plate Bending Stress % of Capacity =

$$Condition3 := \text{if}\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{“Ok”}, \text{“Overstressed”}\right)$$

Condition3 =

$$Condition3 = \text{“Ok”}$$

ATTACHMENT 3

Site Name: ***BRIDGEPORT NE CT***

Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissible Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW 700	751	4	510	2041	92	0.0087	0.5007	1.73%
VZW CDMA	876.03	2	0	0	92	0.0000	0.5840	0.00%
VZW Cellular	874	4	744	2978	92	0.0127	0.5827	2.17%
VZW PCS	1980	4	879	3514	92	0.0149	1.0000	1.49%
VZW AWS	2120	4	1016	4063	92	0.0173	1.0000	1.73%
VZW CBRS	3625	4	0	0	82	0.0000	1.0000	0.00%
VZW CBAND	3730.08	2	5493	10986	82	0.0588	1.0000	5.88%
Total Percentage of Maximum Permissible Exposure								13.00%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

**Calculation includes a -10 dB Off Beam Antenna Pattern Adjustment pursuant to Attachments B and C of the Siting Council's November 10, 2015 Memorandum for Exempt Modification filings

MHz = Megahertz

mW/cm^2 = milliwatts per square centimeter

ERP = Effective Radiated Power

Absolute worst case maximum values used.

ATTACHMENT 4

Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts and New York

February 24, 2022

Via Certificate of Mailing

Joseph Ganim, Mayor
City of Bridgeport
Margaret E. Morton Government Center
999 Broad Street
Bridgeport, CT 06604

Re: **Proposed Modifications to an Existing Telecommunications Facility at 541 Broadbridge Road in Bridgeport, Connecticut**

Dear Mayor Ganim:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to modify its existing wireless telecommunications facility at 541 Broadbridge Road in Bridgeport, Connecticut (the "Property"). Cellco intends to install replace six (6) antennas with six (6) newer model antennas at the same levels within the flag pole tower and replace nine (9) remote radio heads ("RRHs") with nine (9) newer model RRHs within the flag pole tower. In order to accommodate Cellco's replacement antennas, the upper portions of the flag pole tower screening shroud will be widened from 36 inch diameter to 48 inch diameter. Equipment associated with Cellco's antennas will not change as part of these facility modifications.

As presented in the Sub-Petition, the proposed facility modifications constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-153). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

24327913-v1

Robinson+Cole

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson+Cole

KENNETH C. BALDWIN

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Hartford, CT 06103-3597
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kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts
and New York

February 24, 2022

Via Certificate of Mailing

Dennis Buckley, Zoning Administrator
City of Bridgeport
45 Lyon Terrace
Bridgeport, CT 06604

Re: **Proposed Modifications to an Existing Telecommunications Facility at 541 Broadbridge Road in Bridgeport, Connecticut**

Dear Mr. Buckley:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to modify its existing wireless telecommunications facility at 541 Broadbridge Road in Bridgeport, Connecticut (the "Property"). Cellco intends to install replace six (6) antennas with six (6) newer model antennas at the same levels within the flag pole tower and replace nine (9) remote radio heads ("RRHs") with nine (9) newer model RRHs within the flag pole tower. In order to accommodate Cellco's replacement antennas, the upper portions of the flag pole tower screening shroud will be widened from 36 inch diameter to 48 inch diameter. Equipment associated with Cellco's antennas will not change as part of these facility modifications.

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Robinson+Cole

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson+Cole

KENNETH C. BALDWIN

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Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts and New York

February 24, 2022

Via Certificate of Mailing

Beardsley Plaza Limited
P.O. Box 3580
Stamford, CT 06905

Re: **Proposed Modifications to an Existing Telecommunications Facility at 541 Broadbridge Road in Bridgeport, Connecticut**

Dear Sir or Madam:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to modify its existing wireless telecommunications facility at 541 Broadbridge Road in Bridgeport, Connecticut (the "Property"). Cellco intends to install replace six (6) antennas with six (6) newer model antennas at the same levels within the flag pole tower and replace nine (9) remote radio heads ("RRHs") with nine (9) newer model RRHs within the flag pole tower. In order to accommodate Cellco's replacement antennas, the upper portions of the flag pole tower screening shroud will be widened from 36 inch diameter to 48 inch diameter. Equipment associated with Cellco's antennas will not change as part of these facility modifications.

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Robinson+Cole

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

ATTACHMENT 5

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts
and New York

February 24, 2022

Via Certificate of Mailing

«Name_and_Address»

Re: **Proposed Modifications to a Telecommunications Facility at 541 Broadbridge Road in Bridgeport, Connecticut**

Dear «Salutation»:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to modify its existing wireless telecommunications facility at 541 Broadbridge Road in Bridgeport, Connecticut (the "Property"). Cellco intends to install replace six (6) antennas with six (6) newer model antennas at the same levels within the flag pole tower and replace nine (9) remote radio heads ("RRHs") with nine (9) newer model RRHs within the flag pole tower. In order to accommodate Cellco's replacement antennas, the upper portions of the flag pole tower screening shroud will be expanded from 36 inch diameter to 48 inch diameter. Equipment associated with Cellco's antennas will not change as part of these facility modifications.

As presented in the Sub-Petition, the proposed facility modifications constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-153). A copy of the full Sub-Petition is attached for your review.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

This notice is being sent to you because you are listed as an owner of land that abuts the Property. If you have any questions regarding the Sub-Petition, the Council's process for reviewing the Sub-Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact me or the Council directly at 860-827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

ABUTTING PROPERTY OWNERS

541 BROADBRIDGE ROAD
BRIDGEPORT, CONNECTICUT

	Property Address	Owner's and Mailing Address
1.	1086 Huntington Turnpike	Johnny Zevallas, Jr. 805 93rd Avenue North Naples, FL 34108
2.	29 Holland Road	Stephanie Ferreira 29 Holland Road Bridgeport, CT 06610
3.	559 Broadbridge Road	Beardsley Plaza Limited P.O. Box 3580 Stamford, CT 06905
4.	570 Broadbridge Road	Peter and Wilma Stevens and Luna Taylor 570 Broadbridge Road Bridgeport, CT 06610-1241
5.	495 Hooker Road	Rockman Ferrigno, Et Al 1000 Huntington Turnpike Bridgeport, CT 06610
6.	1000 Huntington Turnpike	Treelands Incorporated 1000 Huntington Turnpike Bridgeport, CT 06610
7.	1055 Huntington Turnpike	1055 Huntington Turnpike LLC 1425 Noble Avenue Bridgeport, CT 06606
8.	1077 Huntington Turnpike	Robert Discala 175 Hilltop Circle Trumbull, CT 06611