EVERSOURCE ENERGY

56 Prospect Street,
P.O. Box 270
Hartford, CT 06103

Kathleen M. Shanley
Manager – Transmission Siting
Tel: (860) 728-4527

March 11, 2022

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

RE: **EM-EVER-057-210416 Modification Approval Request**
Eversource Site # ES-158 Greenwich Hospital
5 Perryridge Road, Greenwich, CT 06830
Latitude: 41-2-3.14 N / Longitude: 73-37-51.03 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") received Connecticut Siting Council approval for an exempt modification on May 10, 2021 allowing Eversource to install two antennas mounted at 114 feet above ground level ("AGL") on an existing 164-foot monopole owned by Greenwich Hospital.

During the antenna commissioning it was determined that the approved antenna configuration created transmitter induced noise that created passive intermodulation, or PIM, noise located on the receive frequencies, which limits the system level coverage capability of the site.

In order to eliminate the PIM issue, Eversource plans to install one 9-foot 4-inch tall receive only dipole antenna to be mounted at 114 feet AGL, and one 5-foot 6-inch inverted dipole transmit antenna mounted at 114 feet AGL, in place of the originally proposed antennas. There will be no other changes to the previously approved scope of work. The proposed configuration is depicted on Attachment A, Construction Drawings, dated February 10, 2022 and Attachment B, Structural Analysis, dated January 24, 2022. The antennas will be mounted to the existing tower by a crossover pipe-to-pipe mount with bracing on the existing low-profile platform. See Attachment C, Mount Analysis. The operation of the revised antenna configuration will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard as shown in the attached Radio Frequency Emissions Report, dated February 8, 2022. See Attachment D, Power Density Report[1].

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to Fred

[1] Any receive-only antennas are not included in the Power Density Report, as they are irrelevant in terms of the % MPE calculations.

Camillo, First Selectman for the Town of Greenwich and Katie DeLuca, AICP, Director of Planning and Zoning for the Town of Greenwich, via private carrier. Proof of delivery is attached. See Attachment E, Proof of Delivery of Notice.

For the foregoing reasons, Eversource respectfully requests administrative approval by the Connecticut Siting Council to change the antenna configuration as noted above. One original and two copies of this notice are enclosed.

Communications regarding this request for administrative approval should be directed to Kathleen Shanley at (860) 728-4527.

By: _____
Kathleen M. Shanley
Manager – Transmission Siting

cc: Honorable Fred Camillo, First Selectman, Town of Greenwich
Katie DeLuca, AICP, Director of Planning & Zoning, Town of Greenwich
Greenwich Hospital

Attachments

A. Construction Drawings
B. Structural Analysis
C. Mount Analysis
D. Power Density Report
E. Proof of Delivery of Notice

ATTACHMENT A – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

GREENWICH HOSPITAL
5 PERRYRIDGE ROAD
GREENWICH, CT 06830

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (1) NEW DIPOLE ANTENNA AT ELEVATION 123'–10"± AGL INSTEAD OF (1) OMNI/WHIP ANTENNA AT ELEVATION 119'–9"± AGL, AND INSTALL (1) OMNI/WHIP ANTENNA AT ELEVATION 112'–3"± AGL.
2. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING SHELTER

GOVERNING CODES

2018 CONNECTICUT STATE BUILDING CODE (2015 IBC BASIS)
2017 NATIONAL ELECTRIC CODE
TIA–222–H

GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. A TECHNICIAN WILL VISIT THE SITE AS REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE; NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

SITE INFORMATION

SITE NAME:	GREENWICH HOSPITAL
SITE ADDRESS:	5 PERRYRIDGE ROAD GREENWICH, CT 06830
MAP: LOT: ZONE:	247 1, 2, 3 AND 4 H–1
LATITUDE: LONGITUDE: ELEVATION:	41° 2' 3.14" N 73° 37' 51.03" W 121'± AMSL
FEMA/FIRM DESIGNATION: ACREAGE:	X 7.3274± AC (BOOK: 6265, PAGE: 4)

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

PROPERTY OWNER:
GREENWICH HOSPITAL
C/O NANCYE FRITZ FACILITIES MGMT
5 PERRYRIDGE ROAD
GREENWICH, CT 06830

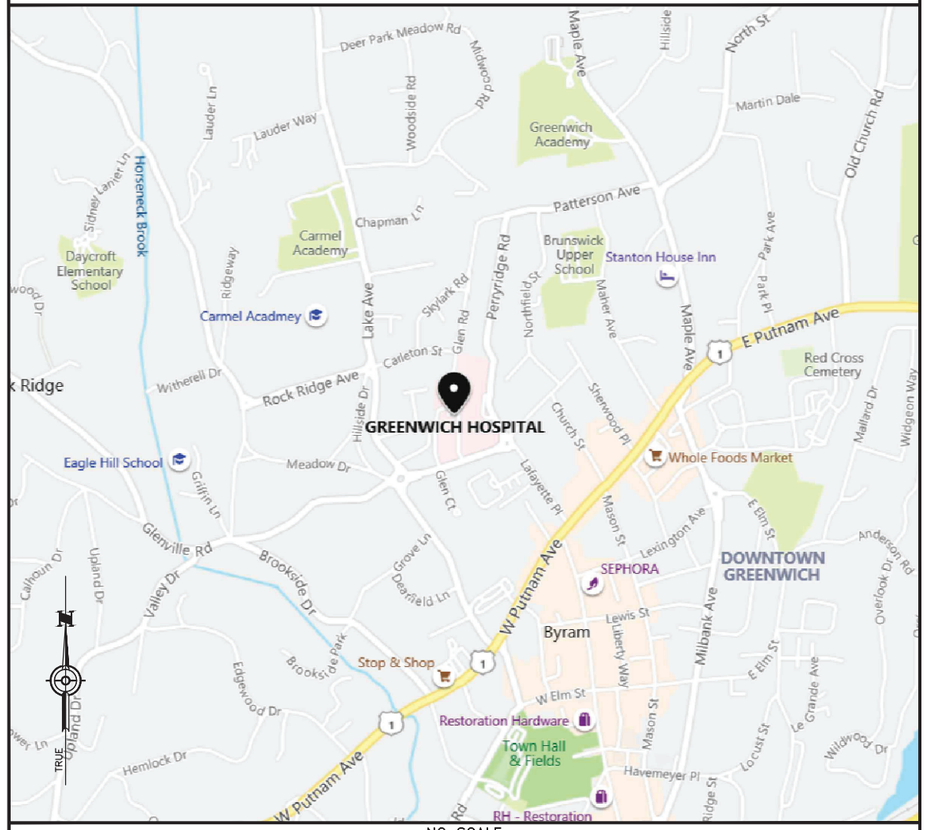
EVERSOURCE ENERGY
PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286–2000

TELCO PROVIDER:
FRONTIER
(800) 921–8102

CALL BEFORE YOU DIG:
(800) 922–4455

LOCATION MAP



NO SCALE

DESIGN TYPE

SITE UPGRADE
MONOPOLE

DRAWING INDEX

SHEET NO:	SHEET TITLE
T–1	TITLE SHEET
C–1	PARTIAL SITE PLAN
C–2	COMPOUND PLAN
C–3	TOWER ELEVATION
C–4	ANTENNA EQUIPMENT
G–1	GROUNDING DETAILS
N–1	NOTES & SPECIFICATIONS
N–2	NOTES & SPECIFICATIONS
N–3	NOTES & SPECIFICATIONS

DO NOT SCALE DRAWINGS

SUBCONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME

UNDERGROUND SERVICE ALERT

UTILITIES PROTECTION CENTER, INC.
811

48 HOURS BEFORE YOU DIG

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286–2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–2522

PROJECT NO:	405025
DRAWN BY:	TYW
CHECKED BY:	JR

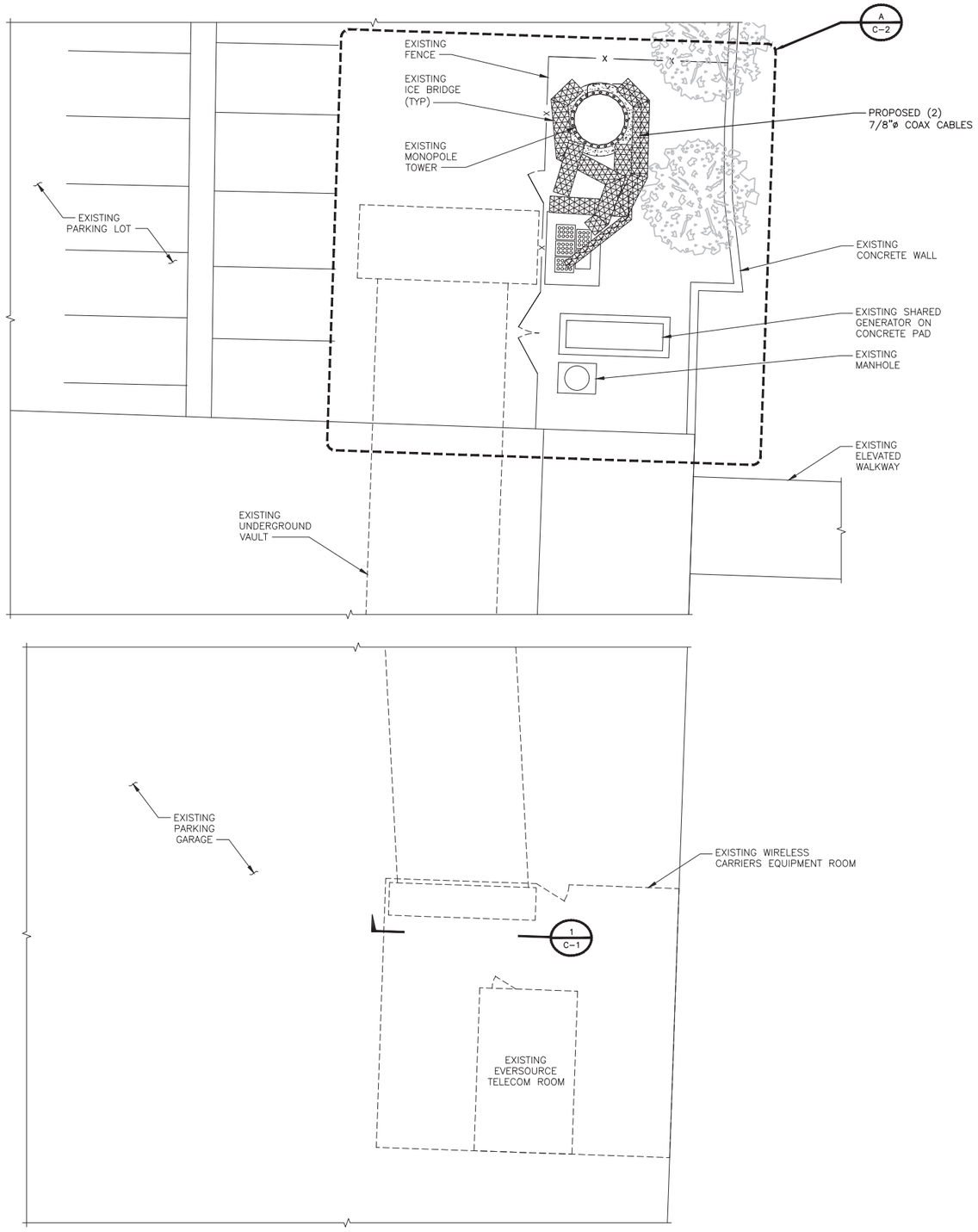
REV	DATE	DESCRIPTION
2	02/10/22	ISSUED FOR FILING
1	01/18/22	ISSUED FOR FILING
0	03/02/21	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
02/10/2022

GREENWICH HOSPITAL
5 PERRYRIDGE ROAD
GREENWICH, CT 06830

SHEET TITLE
TITLE SHEET

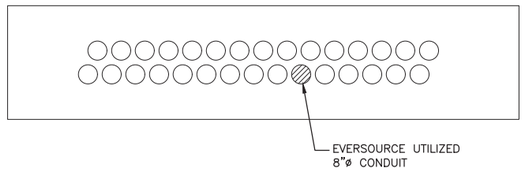
SHEET NUMBER
T-1



PARTIAL SITE PLAN
NO SCALE

NOTES

1. UNDERGROUND COAX BANK IS APPRXIMATELY 135 FT FROM CABLE PORTS IN COMPOUND TO CONDUITS IN EQUIPMENT ROOM.



SECTION 1
NO SCALE

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
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SHEET TITLE
PARTIAL SITE PLAN

SHEET NUMBER
C-1

DETAIL A
COMPOUND PLAN
NO SCALE

EVERSOURCE ENERGY

107 SELDEN STREET
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BLACK & VEATCH

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02/10/2022

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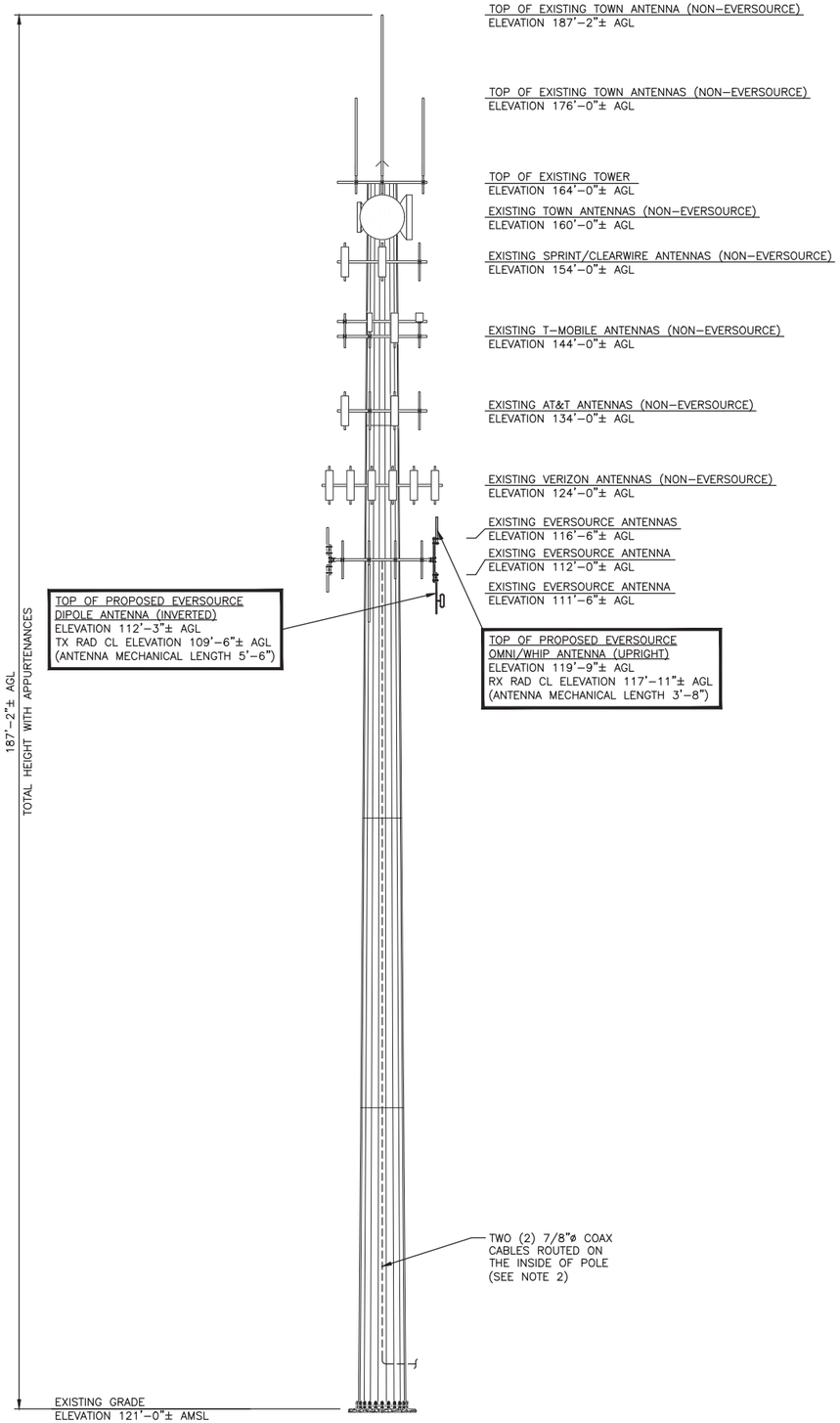
GREENWICH, CT 06830

SHEET TITLE

COMPOUND PLAN

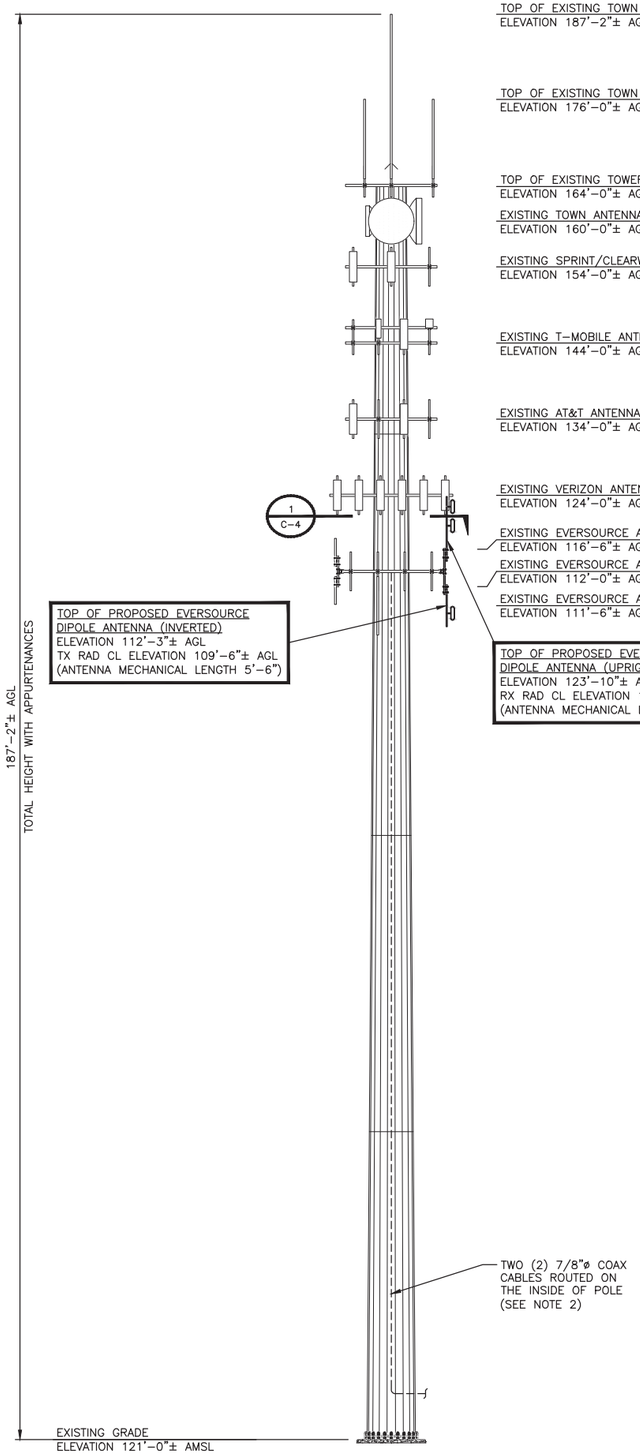
SHEET NUMBER

C-2



CSC SUBMITTED INSTALLATION CONFIGURATION

NO SCALE



CURRENT INSTALLATION CONFIGURATION

NO SCALE

NOTES

1. BLACK & VEATCH HAS NOT EVALUATED THE EXISTING STRUCTURE FOR THIS SITE AND ASSUMES NO RESPONSIBILITY FOR ITS STRUCTURAL INTEGRITY. REFER TO THE STRUCTURAL ANALYSIS BY OTHERS PRIOR TO ANY CONSTRUCTION.
2. COAX CABLES TO BE ROUTED INSIDE POLE PER STRUCTURAL ANALYSIS BY OTHERS.
3. RESERVED TOWER LOADING NOT SHOWN PER CLIENT REQUEST.

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GREENWICH HOSPITAL
5 PERRYRIDGE ROAD
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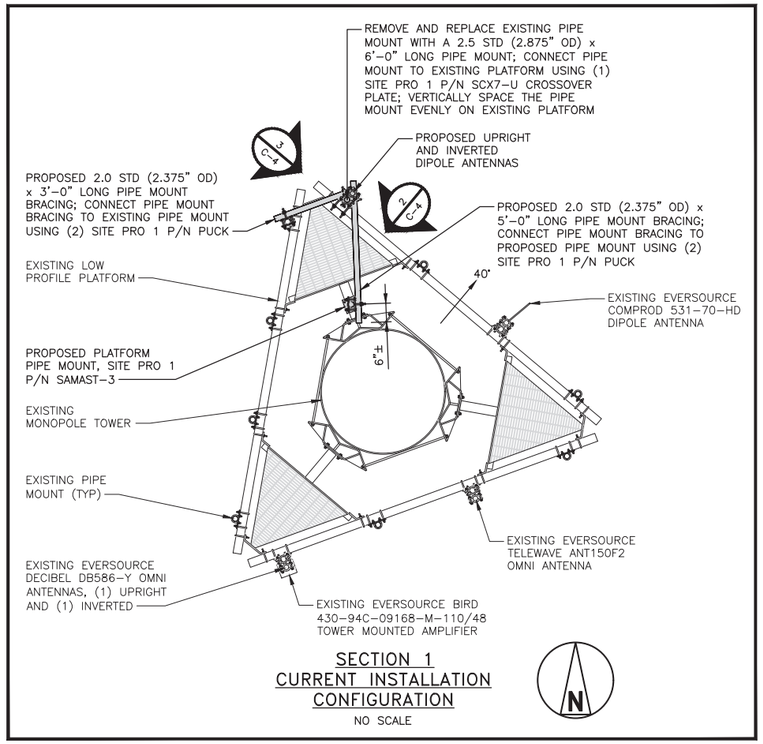
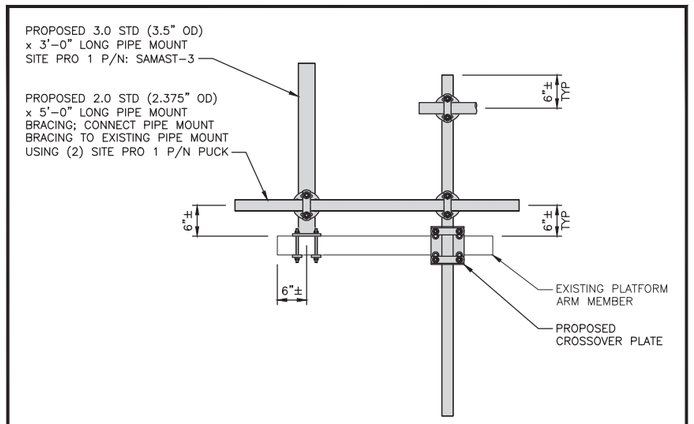
SHEET TITLE
TOWER ELEVATION

SHEET NUMBER
C-3



SECTION 1
CURRENT INSTALLATION CONFIGURATION

NO SCALE

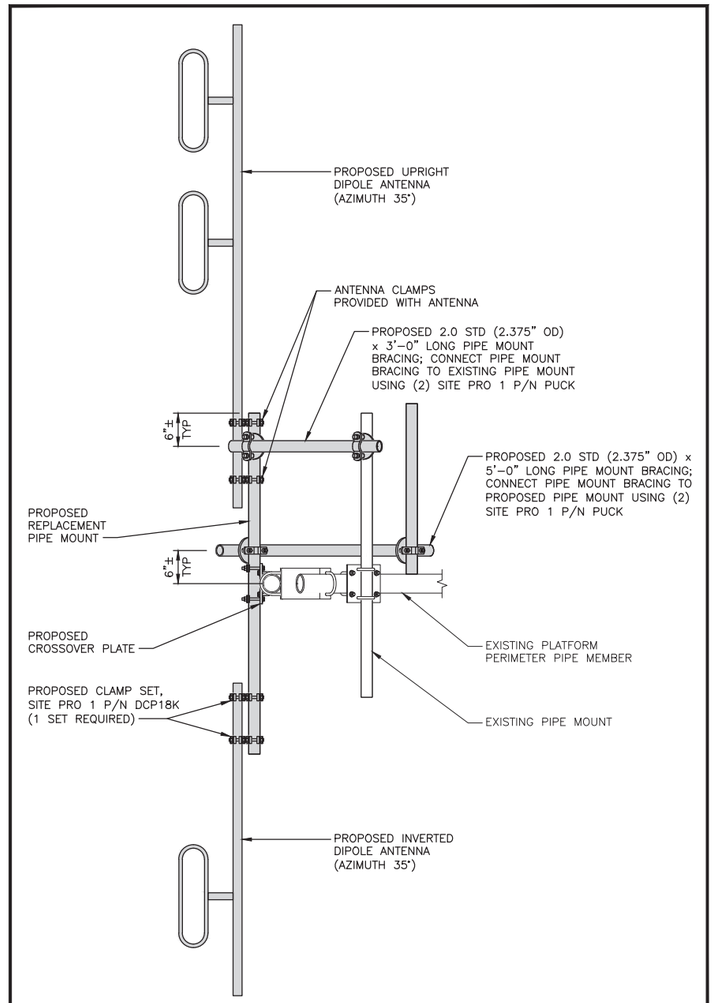


NOTE

1. EXISTING PERIMETER PIPE MEMBER NOT SHOWN FOR CLARITY.

SECTION 2
CURRENT INSTALLATION CONFIGURATION

NO SCALE



SECTION 3
CURRENT INSTALLATION CONFIGURATION

NO SCALE

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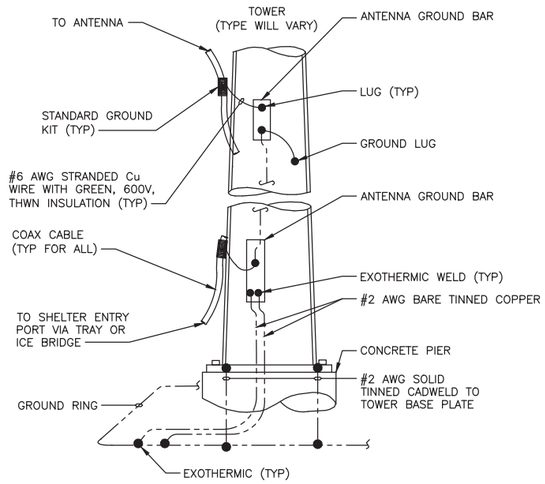
SHEET TITLE
ANTENNA EQUIPMENT

SHEET NUMBER
C-4

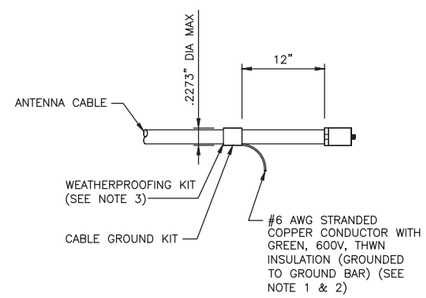


NOTE

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

ANTENNA CABLE GROUNDING

NO SCALE

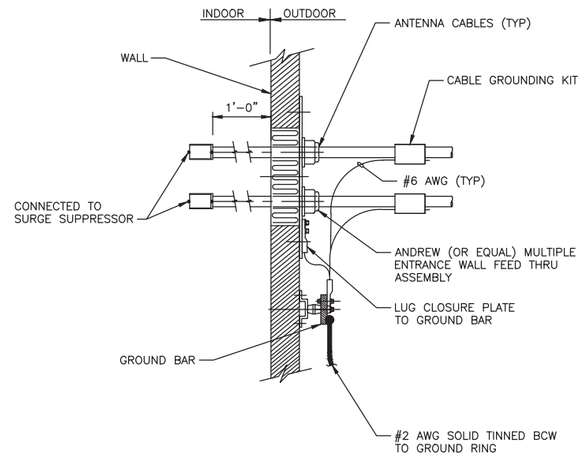


NOTES

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.
2. GROUNDING KIT SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
3. WEATHER PROOFING SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.

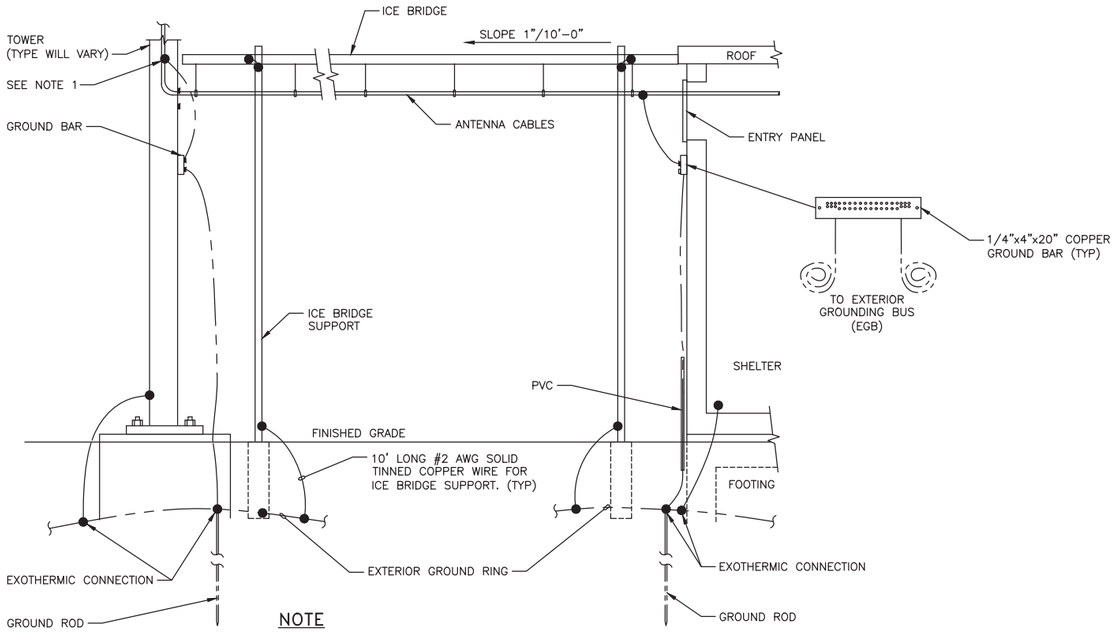
CONNECTION OF CABLE GROUND KIT TO ANTENNA CABLE

NO SCALE



CABLE INSTALLATION WITH WALL FEED THRU ASSEMBLY

NO SCALE



NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA CABLE DETAIL

NO SCALE

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GREENWICH, CT 06830

SHEET TITLE

GROUNDING DETAILS

SHEET NUMBER

G-1

DESIGN BASIS

1. GOVERNING CODE: 2018 CONNECTICUT STATE BUILDING CODE (2015 IBC BASIS).

GENERAL CONDITIONS

1. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL BUILDING CODES, PERMIT CONDITIONS AND SAFETY CODES DURING CONSTRUCTION.

2. THE ENGINEER IS NOT: A GUARANTOR OF THE INSTALLING CONTRACTOR'S WORK; RESPONSIBLE FOR SAFETY IN, ON OR ABOUT THE WORK SITE; IN CONTROL OF THE SAFETY OR ADEQUACY OF ANY BUILDING COMPONENT, SCAFFOLDING OR SUPERINTENDING THE WORK.

3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL PERMITS, INSPECTIONS, TESTING AND CERTIFICATES NEEDED FOR LEGAL OCCUPANCY OF THE FINISHED PROJECT.

4. THE CONTRACTOR IS RESPONSIBLE TO REVIEW THIS COMPLETE PLAN SET AND VERIFY THE EXISTING CONDITIONS SHOWN IN THESE PLANS AS THEY RELATE TO THE WORK PRIOR TO SUBMITTING PRICE. SIGNIFICANT DEVIATIONS FROM WHAT IS SHOWN AFFECTING THE WORK SHALL BE REPORTED IMMEDIATELY TO THE CONSTRUCTION MANAGER.

5. DETAILS INCLUDED IN THIS PLAN SET ARE TYPICAL AND APPLY TO SIMILAR CONDITIONS.

6. EXISTING ELECTRICAL AND MECHANICAL FIXTURES, PIPING, WIRING, AND EQUIPMENT OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER. TEMPORARY SERVICE INTERRUPTIONS MUST BE COORDINATED WITH OWNER.

7. THE CONTRACTOR SHALL DILIGENTLY PROTECT THE EXISTING BUILDING/SITE CONDITIONS AND THOSE OF ANY ADJOINING BUILDING/SITES AND RESTORE ANY DAMAGE CAUSED BY HIS ACTIVITIES TO THE PRE-CONSTRUCTION CONDITION.

8. THE CONTRACTOR SHALL SAFEGUARD AGAINST: CREATING A FIRE HAZARD, AFFECTING TENANT EGRESS OR COMPROMISING BUILDING SITE SECURITY MEASURES.

9. THE CONTRACTOR SHALL REMOVE ALL DEBRIS AND CONSTRUCTION WASTE FROM THE SITE EACH DAY. WORK AREAS SHALL BE SWEPT AND MADE CLEAN AT THE END OF EACH WORK DAY.

10. THE CONTRACTOR'S HOURS OF WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES AND ORDINANCES AND BE APPROVED BY OWNER.

11. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER IF ASBESTOS IS ENCOUNTERED DURING THE EXECUTION OF HIS WORK. THE CONTRACTOR SHALL CEASE ALL ACTIVITIES WHERE THE ASBESTOS MATERIAL IS FOUND UNTIL NOTIFIED BY THE CONSTRUCTION MANAGER TO RESUME OPERATIONS.

THERMAL & MOISTURE PROTECTION

1. FIRE-STOP ALL PENETRATIONS FOR ELECTRICAL CONDUITS OR WAVEGUIDE CABLING THROUGH BUILDING WALLS, FLOORS, AND CEILINGS SHALL BE FIRESTOPPED WITH ACCEPTED MATERIALS TO MAINTAIN THE FIRE RATING OF THE EXISTING ASSEMBLY. ALL FILL MATERIAL SHALL BE SHAPED, FITTED, AND PERMANENTLY SECURED IN PLACE. FIRESTOPPING SHALL BE INSTALLED IN ACCORDANCE WITH ASTM E814.

2. HILTI CP620 FIRE FOAM OR 3M FIRE BARRIER FILL, VOID OR CAVITY MATERIAL OR ACCEPTED EQUAL SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ASSOCIATED UNDERWRITERS LABORATORIES (UL) SYSTEM NUMBER.

3. FIRESTOPPING SHALL BE APPLIED AS SOON AS PRACTICABLE AFTER PENETRATIONS ARE MADE AND EQUIPMENT INSTALLED.

4. FIRESTOPPED PENETRATIONS SHALL BE LEFT EXPOSED AND MADE AVAILABLE FOR INSPECTION BEFORE CONCEALING SUCH PENETRATIONS. FIRESTOPPING MATERIAL CERTIFICATES SHALL BE MADE AVAILABLE AT THE TIME OF INSPECTION.

5. ANY BUILDING ROOF PENETRATION AND/OR RESTORATION SHALL BE PERFORMED SO THAT THE ROOF WARRANTY IN PLACE IS NOT COMPROMISED. CONTRACTOR SHALL ARRANGE FOR OWNER'S ROOFING CONTRACTOR TO PERFORM ANY AND ALL ROOFING WORK IF SO REQUIRED BY EXISTING ROOF WARRANTY. OTHERWISE, ROOF SHALL BE MADE WATERTIGHT WITH LIKE CONSTRUCTION AS SOON AS PRACTICABLE AND AT COMPLETION OF CONSTRUCTION.

6. ALL PENETRATIONS INTO AND/OR THROUGH BUILDING EXTERIOR WALLS SHALL BE SEALED WITH SILICONE SEALER.

7. WHERE CONDUIT AND CABLES PENETRATES FIRE RATED WALLS AND FLOORS, FIRE GROUT ALL PENETRATIONS IN ORDER TO MAINTAIN THE FIRE RATING USING A LISTED FIRE SEALING DEVICE OR GROUT.

8. CONTRACTOR TO REMOVE AND RE-INSTALL ALL FIRE PROOFING AS REQUIRED DURING CONSTRUCTION.

SUBMITTALS

1. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO ENGINEER FOR REVIEW PRIOR TO FABRICATION.

2. CONTRACTOR TO NOTIFY ENGINEER FOR INSPECTION PRIOR TO CLOSING PENETRATIONS.

3. CONTRACTORS SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD PRIOR TO FABRICATION AND ERECTION OF ANY MATERIAL. THE ENGINEER SHALL BE NOTIFIED OF ANY CONDITIONS WHICH PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

4. ALL STEEL MATERIAL EXPOSED TO WEATHER SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 " ZINC (HOT-DIPPED GALVANIZED) COATINGS" ON IRON AND STEEL PRODUCTS.

5. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS FOR REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

STEEL

1. MATERIAL:

WIDE FLANGE:	ASTM A572, GR 50
TUBING:	ASTM A500, GR C
PIPE:	ASTM A53, GR B AND ASTM A572, GR 50
ANGLE:	ASTM A570, GR 50 AND ASTM A36
BOLTS:	ASTM A325
GRATING:	TYPE GW-2 (1"x3/16" BARS)
MISC. MATERIAL:	ASTM A36

ALL STEEL SHAPES SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 WITH A COATING WEIGHT OF 2 OZ/SF.

2. DAMAGED GALVANIZED SURFACES SHALL BE CLEANED WITH A WIRE BRUSH AND PAINTED WITH TWO COATS OF COLD ZINC, "GALVANOX", "DRY GALV", "ZINC IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES. TOUCH UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT IN SHOP OR FIELD.

3. DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC "MANUAL OF STEEL CONSTRUCTION" 13TH EDITION.

4. THE STEEL STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER COMPLETION. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE BUILDING AND ITS COMPONENT PARTS DURING ERECTION.

5. ALL STEEL ELEMENTS SHALL BE INSTALLED PLUMB AND LEVEL.

6. TOWER MANUFACTURER'S DESIGNS SHALL PREVAIL FOR TOWER.

SITE GENERAL

1. CONTRACTOR SHALL FOLLOW CONDITIONS OF ALL APPLICABLE PERMITS AND WORK IN ACCORDANCE WITH OSHA REGULATIONS.

2. THESE PLANS DEPICT KNOWN UNDERGROUND STRUCTURES, CONDUITS, AND/OR PIPELINES. THE LOCATIONS FOR THESE ELEMENTS ARE BASED UPON THE VARIOUS RECORD DRAWINGS AVAILABLE. THE CONTRACTOR IS HEREBY ADVISED THAT THESE DRAWINGS MAY NOT ACCURATELY DEPICT AS-BUILT LOCATIONS AND OTHER UNKNOWN STRUCTURES. THE CONTRACTOR SHALL THEREFORE DETERMINE THE EXACT LOCATION OF EXISTING UNDERGROUND ELEMENTS AND EXCAVATE WITH CARE AFTER CALLING MARKOUT SERVICE AT 1-800-272-4480 48 HOURS BEFORE DIGGING, DRILLING OR BLASTING.

3. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, AND OTHER UTILITIES WHERE ENCOUNTERED, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION, SHALL BE RELOCATED AS DIRECTED BY ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR PIER DRILLING AROUND OR NEAR UTILITIES. CONTRACTOR SHALL HAND DIG UTILITIES AS NEEDED. CONTRACTOR SHALL PROVIDE, BUT IS NOT LIMITED TO, APPROPRIATE A) FALL PROTECTION, B) CONFINED SPACE ENTRY, C) ELECTRICAL SAFETY, AND D) TRENCHING AND EXCAVATION.

4. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.

5. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, OR OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT THE POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF THE CONSTRUCTION MANAGER.

6. CONTRACTOR IS RESPONSIBLE FOR REPAIRING OR REPLACING STRUCTURES OR UTILITIES DAMAGED DURING CONSTRUCTION.

7. CONTRACTOR SHALL PROTECT EXISTING PAVED AND GRAVEL SURFACES, CURBS, LANDSCAPE AND STRUCTURES AND RESTORE SITE OR PRE-CONSTRUCTION CONDITION WITH AS GOOD, OR BETTER, MATERIALS. NEW MATERIALS SHALL MATCH EXISTING THICKNESS AND TYPE.

8. THE CONTRACTOR SHALL SHORE ALL TRENCH EXCAVATIONS GREATER THAN 5 FEET IN DEPTH OR LESS WHERE SOIL CONDITIONS ARE DEEMED UNSTABLE. ALL SHEETING AND/OR SHORING METHODS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER.

9. THE CONTRACTOR IS RESPONSIBLE FOR MANAGING GROUNDWATER LEVELS IN THE VICINITY OF EXCAVATIONS TO PROTECT ADJACENT PROPERTIES AND NEW WORK. GROUNDWATER SHALL BE DRAINED IN ACCORDANCE WITH LOCAL SEDIMENTATION AND EROSION CONTROL GUIDELINES.

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PROJECT NO:	405025
DRAWN BY:	TYW
CHECKED BY:	JR

REV	DATE	DESCRIPTION
2	02/10/22	ISSUED FOR FILING
1	01/18/22	ISSUED FOR FILING
0	03/02/21	ISSUED FOR FILING

GREENWICH HOSPITAL
5 PERRYRIDGE ROAD
GREENWICH, CT 06830

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
N-1

ELECTRICAL

1. CONTRACTOR SHALL VERIFY EXISTING ELECTRIC SERVICE TYPE AND CAPACITY AND ORDER NEW ELECTRIC SERVICE FROM LOCAL ELECTRIC UTILITY, WHERE APPLICABLE.
2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES, AND SHALL BE ACCEPTABLE TO ALL AUTHORITIES HAVING JURISDICTION. WHERE A CONFLICT EXISTS BETWEEN CODES, PLAN AND SPECIFICATIONS, OR AUTHORITIES HAVING JURISDICTION, THE MORE STRINGENT AUTHORITIES SHALL APPLY.
3. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC, FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN AND/OR OTHERWISE REQUIRED.
4. ALL ELECTRICAL CONDUCTORS SHALL BE 100% COPPER AND SHALL HAVE TYPE THHN INSULATION UNLESS INDICATED OTHERWISE.
5. CONDUIT SHALL BE THREADED RIGID GALVANIZED STEEL OR EMT WITH ONLY COMPRESSION TYPE COUPLINGS AND CONNECTORS, ALL MADE UP WRENCH TIGHT.
6. ALL BURIED CONDUIT SHALL BE MINIMUM SCH 40 PVC UNLESS NOTED OTHERWISE, OR AS PER LOCAL CODE REQUIREMENTS.
7. PROVIDE FLEXIBLE STEEL CONDUIT OR LIQUID TIGHT FLEXIBLE STEEL CONDUIT TO ALL VIBRATING EQUIPMENT, INCLUDING HVAC UNITS, TRANSFORMERS, MOTORS, ETC, OR WHERE EQUIPMENT IS PLACED UPON A SLAB ON GRADE.
8. ALL BRANCH CIRCUITS AND FEEDERS SHALL HAVE A SEPARATE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR BONDED TO ALL ENCLOSURES, PULLBOXES, ETC.
9. CONDUIT AND CABLE WITHIN CORRIDORS SHALL BE CONCEALED AND EXPOSED ELSEWHERE, UNLESS NOTED OTHERWISE.
10. ELECTRICAL MATERIALS INSTALLED ON ROOFTOP SHALL BE LISTED FOR NEMA 3R USE. –AND ALL WIRING WITHIN A VENTILATION DUCT SHALL BE LISTED FOR SUCH USE. IN GENERAL WIRING METHODS WITHIN A DUCT SHALL BE AN MC CABLE WITH SMOOTH OR CORRUGATED METAL JACKET AND HAVE NO OUTER COVERING OVER THE METAL JACKET. INTERLOCKED ARMOR TYPE OF MC CABLE IS NOT ACCEPTABLE FOR THIS APPLICATION. CONTRACTOR CAN ALSO USE TYPE MI CABLE IN THE VENTILATION DUCT PROVIDED IT DOES NOT HAVE ANY OUTER COVERINGS OVER THE METAL EXTERIOR.
11. WIRING DEVICES SHALL BE SPECIFICATION GRADE, AND WIRING DEVICE COVER PLATES SHALL BE PLASTIC WITH ENGRAVING AS SPECIFIED.

GROUNDING

1. #6 THWN SHALL BE STRANDED #6 COPPER WITH GREEN THWN INSULATION SUITABLE FOR WET INSTALLATIONS.
2. #2 THWN SHALL BE STRANDED #2 COPPER WITH THWN INSULATION SUITABLE FOR WET INSTALLATIONS.
3. #2 BARE TINNED SHALL BE SOLID COPPER TINNED. ALL BURIED WIRE SHALL MEET THIS CRITERIA.
4. ALL LUGS SHALL BE 2–HOLE, LONG BARREL, TINNED SOLID COPPER UNLESS OTHERWISE SPECIFIED, LUGS SHALL BE THOMAS AND BETTS SERIES 548##BE OR EQUIVALENT (IE #2 THWN – 54856BE, #2 SOLID – 54856BE, AND #6 THWN – 54852BE).
5. ALL HARDWARE, BOLTS, NUTS, AND WASHERS SHALL BE 18–8 STAINLESS STEEL. EVERY CONNECTION SHALL BE BOLT–FLAT WASHER–BUSS–LUG–FLAT WASHER–BELLEVILLE WASHER–NUT IN THAT EXACT ORDER. BACK–TO–BACK LUGGING, BOLT–FLAT WASHER–LUG–BUSS–LUG–FLAT WASHER–BELLEVILLE WASHER–NUT, IN THAT EXACT ORDER, IS ACCEPTED WHERE NECESSARY TO CONNECT MANY LUGS TO A BUSS BAR. STACKING OF LUGS, BUSS–LUG–LUG, IS NOT ACCEPTABLE.
6. WHERE CONNECTIONS ARE MADE TO STEEL OR DISSIMILAR METALS, A THOMAS AND BETTS DRAGON TOOTH WASHER MODEL DTWXXX SHALL BE USED BETWEEN THE LUG AND THE STEEL, BOLT–FLAT WASHER–STEEL–DRAGON TOOTH WASHER–LUG–FLAT WASHER–BELEVILE WASHER–NUT.
7. ALL CONNECTIONS, INTERIOR AND EXTERIOR, SHALL BE MADE WITH THOMAS AND BETTS KPOR–SHIELD. COAT ALL WIRES BEFORE LUGGING AND COAT ALL SURFACES BEFORE CONNECTING.
8. THE MINIMUM BEND RADIUS SHALL BE 8 INCHES FOR #6 WIRE AND SMALLER AND 12 INCHES FOR WIRE LARGER THAN #6.
9. ALL CONNECTIONS TO THE GROUND RING SHALL BE EXOTHERMIC WELD.
10. BOND THE FENCE TO THE GROUND RING AT EACH CORNER, AND AT EACH GATE POST WITH #2 SOLID TINNED WIRE. EXOTHERMIC WELD BOTH ENDS.
11. GROUND KITS SHALL BE SOLID COPPER STRAP WITH #6 WIRE 2–HOLE COMPRESSION CRIMPED LUGS AND SHALL BE SEALED ACCORDING TO MANUFACTURER INSTRUCTIONS.
12. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL BE USED.
13. GROUND BARS SHALL BE FURNISHED AND INSTALLED WITH PRE–DRILLED HOLE DIAMETERS AND SPACINGS. GROUND BARS SHALL NEITHER BE FIELD FABRICATED NOR NEW HOLES DRILLED. GROUND LUGS SHALL MATCH THE SPACING ON THE BAR. HARDWARE DIAMETER SHALL BE MINIMUM 3.8 INCH.
14. MGB GROUND CONNECTION SHALL BE EXOTHERMIC WELDED TO THE GROUND SYSTEM.
15. ALL CABLE TRAY AND/OR PLATFORM STEEL SHALL BE BONDED TOGETHER WITH JUMPERS (#6 IN EQUIPMENT ROOM, #2 ELSEWHERE AND HOMERUN).

ANTENNA & CABLE NOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRANSMISSION CABLES, JUMPERS, CONNECTORS, GROUNDING STRAPS, ANTENNAS, MOUNTS AND HARDWARE. ALL MATERIALS SHALL BE INSPECTED BY THE CONTRACTOR FOR DAMAGE UPON DELIVERY. JUMPERS SHALL BE SUPPLIED AT ANTENNAS AND EQUIPMENT INSIDE SHELTER COORDINATE LENGTH OF JUMP CABLES WITH EVERSOURCE. COORDINATE AND VERIFY ALL OF THE MATERIALS TO BE PROVIDED WITH EVERSOURCE PRIOR TO SUBMITTING BID AND ORDERING MATERIALS.
2. AFTER INSTALLATION, THE TRANSMISSION LINE SYSTEM SHALL BE PIM/SWEEP TESTED FOR PROPER INSTALLATION AND DAMAGE WITH ANTENNAS CONNECTED. CONTRACTOR TO OBTAIN LATEST TESTING PROCEDURES FROM EVERSOURCE PRIOR TO BIDDING.
3. ANTENNA CABLES SHALL BE COLOR CODED AT THE FOLLOWING LOCATIONS:
   – AT THE ANTENNAS.
   – AT THE WAVEGUIDE ENTRY PLATE ON BOTH SIDES OF THE EQUIPMENT SHELTER WALL.
   – JUMPER CABLES AT THE EQUIPMENT ENTER.
4. SYSTEM INSTALLATION:
   THE CONTRACTOR SHALL INSTALL ALL CABLES AND ANTENNAS TO THE MANUFACTURER'S SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR THE PROCUREMENT AND INSTALLATION OF THE FOLLOWING:
   – ALL CONNECTORS, ASSOCIATED CABLE MOUNTING, AND GROUNDING HARDWARE.
   – WALL MOUNTS, STANDOFFS, AND ASSOCIATED HARDWARE.
   – 1/2 INCH HELIAX ANTENNA JUMPERS OF APPROPRIATE LENGTHS.
5. MINIMUM BENDING RADIUS FOR COAXIAL CABLES:
   – 7/8 INCH, RMIN = 15 INCHES
   – 1 5/8 INCH, RMIN = 25 INCHES
6. CABLE SHALL BE INSTALLED WITH A MINIMUM NUMBER OF BENDS WHERE POSSIBLE. CABLE SHALL NOT BE LEFT UNTERMINATED AND SHALL BE SEALED IMMEDIATELY AFTER BEING INSTALLED.
7. ALL CABLE CONNECTIONS OUTSIDE SHALL BE COVERED WITH WATERPROOF SPLICING KIT.
8. CONTRACTOR SHALL VERIFY EXACT LENGTH AND DIRECTION OF TRAVEL IN FIELD PRIOR TO CONSTRUCTION.
9. CABLE SHALL BE FURNISHED WITHOUT SPLICES AND WITH CONNECTORS AT EACH END.

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SHEET TITLE
NOTES
& SPECIFICATIONS

SHEET NUMBER
N-2

DEMOLITION SPECIFICATIONS AND NOTES

1. REMOVE AND LEGALLY DISPOSE OF ITEMS EXCEPT THOSE INDICATED TO BE REINSTALLED, SALVAGED, OR TO REMAIN THE OWNER'S PROPERTY.
2. PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING DEMOLITION. WHEN PERMITTED, ITEMS MAY BE REMOVED TO A SUITABLE, PROTECTED STORAGE AREA DURING DEMOLITION AND THEN CLEANED AND REINSTALLED IN THEIR ORIGINAL LOCATIONS.
3. DEMOLISHED MATERIALS SHALL BECOME THE CONTRACTOR'S PROPERTY AND SHALL BE REMOVED FROM THE SITE WITH FURTHER DISPOSITION AT THE CONTRACTOR'S OPTION.
4. COMPLY WITH GOVERNING LOCAL, STATE AND FEDERAL NOTIFICATION REGULATIONS BEFORE STARTING DEMOLITION.
5. BUILDING COMPONENTS TO BE DEMOLISHED SHALL BE VACATED AND THEIR USE DISCONTINUED BEFORE START OF DEMOLITION.
6. STORAGE OR SALE OF REMOVED ITEMS OR MATERIALS ON-SITE WILL NOT BE PERMITTED.
7. ARRANGE DEMOLITION ACTIVITIES SO AS NOT TO INTERFERE WITH THE OWNER'S ON-SITE OPERATIONS. OTHERWISE LIMIT CONSTRUCTION AND DEMOLITION WORK TO WITHIN THE NORMAL HOURS OF 8AM TO 6PM.
8. VERIFY THAT ALL UTILITIES HAVE BEEN DISCONNECTED AND CAPPED.
9. PERFORM INSPECTIONS AS THE DEMOLITION PROGRESSES TO DETECT HAZARDS RESULTING FROM SAID ACTIVITIES.
10. MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN IN SERVICE AND PROTECT THEM AGAINST DAMAGE DURING DEMOLITION OPERATIONS.
11. DO NOT CLOSE OR OBSTRUCT STREETS, WALKS, OR OTHER ADJACENT OCCUPIED OR USED AREAS WITHOUT PERMISSION FROM OWNER. IF REQUIRED, PROVIDE FOR ALTERNATE ROUTES AROUND CLOSED OR OBSTRUCTED TRAFFIC WAYS.
12. CONDUCT DEMOLITION OPERATIONS TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT AREAS, BUILDINGS, AND/OR FACILITIES TO REMAIN. ENSURE SAFE PASSAGE OF PEOPLE AROUND DEMOLITION AREAS.
13. PROVIDE AND MAINTAIN INTERIOR AND EXTERIOR SHORING, BRACING, OR STRUCTURAL SUPPORT TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF PERIPHERAL STRUCTURES AND/OR AREAS.
14. USE WATER MIST, TEMPORARY ENCLOSURES, AND OTHER SUITABLE METHODS TO LIMIT THE SPREAD OF DUST AND DIRT. COMPLY WITH GOVERNING ENVIRONMENTAL PROTECTION REGULATIONS.
15. DO NOT CREATE HAZARDOUS OR OBJECTIONABLE CONDITIONS, SUCH AS ICE, FLOODING, AND POLLUTION, WHEN USING WATER.
16. REMOVE AND TRANSPORT DEBRIS IN A MANNER THAT WILL PREVENT SPILLAGE ON ADJACENT SURFACES AND AREAS.
17. CLEAN ADJACENT AREAS AND IMPROVEMENTS OF DUST, DIRT AND DEBRIS CAUSED BY DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO ORIGINAL CONDITION AFTER COMPLETION OF DEMOLITION ACTIVITIES.
18. USE METHODS REQUIRED TO COMPLETE DEMOLITION WITHIN LIMITATIONS OF GOVERNING REGULATIONS.
19. DISPERSE DEMOLITION EQUIPMENT THROUGHOUT THE BUILDING AND REMOVE DEBRIS AND MATERIALS SO AS NOT TO IMPOSE EXCESSIVE LOADS ON SUPPORTING WALLS, FLOORS, OR FRAMING.
20. REMOVE AIR-CONDITIONING EQUIPMENT WITHOUT RELEASING REFRIGERANTS.
21. BREAKUP AND REMOVE CONCRETE SLABS ON GRADE, UNLESS OTHERWISE NOTED.
22. REMOVE BELOW-GRADE CONSTRUCTION, INCLUDING FOUNDATION WALLS, TO AT LEAST 24 INCHES BELOW GRADE.
23. BREAK UP BELOW-GRADE CONCRETE SLABS IN SECTIONS NO LARGER THAN 24 INCHES SQUARE. PROMPTLY REPAIR DAMAGES TO ADJACENT FACILITIES CAUSED BY DEMOLITION.
24. PATCH TO PRODUCE SUITABLE SURFACES FOR NEW MATERIALS WHEN REPAIRING EXISTING SURFACES.
25. EXTEND RESTORED, EXPOSED FINISHES OF PATCH SURFACES INTO ADJOINING CONSTRUCTION IN A MANNER THAT ELIMINATES EVIDENCE OF PATCHING AND RESURFACING.
26. DO NOT BURN DEMOLISHED MATERIALS.
27. PROMPTLY SUBMIT A WRITTEN REPORT TO THE ENGINEER SHOULD UNANTICIPATED STRUCTURAL, ELECTRICAL, OR MECHANICAL CONDITIONS BE ENCOUNTERED. THE SUBMITTED REPORT SHALL INCLUDE SUFFICIENT DETAIL REGARDING THE EXTENT AND NATURE OF THE CONDITION.
28. MAINTAIN BUILDING SECURITY TO ADJACENT AND COMMON AREAS DURING DEMOLITION ACTIVITIES TO PREVENT UNAUTHORIZED PERSON FROM ENTERING THE SITE.
29. DUE CARE SHALL BE TAKEN SO THAT THE EQUIPMENT AND ITS INSTALLATION ARE HANDLED IN A MANNER THAT WILL NOT AFFECT FIRE SAFETY OR CREATE A FIRE HAZARD.

SYMBOLS

●	EXOTHERMIC CONNECTION
■	COMPRESSION CONNECTION
⏚●	5/8"ø x 10'-0" COPPER CLAD STEEL GROUND ROD.
⏚▣	TEST GROUND ROD WITH INSPECTION SLEEVE
— — —	GROUNDING CONDUCTOR
(A)	KEY NOTES
CHAINLINK FENCE	X — X — X — X — X
WOOD FENCE	□ — □ — □ — □ — □ — □ — □ — □
LEASE AREA	— — — — — — — — — — — — — —
ICE BRIDGE	▨
CABLE TRAY	▦
GAS LINE	G — G — G — G — G
UNDERGROUND ELECTRICAL/TELCO	E/T — E/T — E/T — E/T
UNDERGROUND ELECTRICAL/CONTROL	E/C — E/C — E/C — E/C
UNDERGROUND ELECTRICAL	E — E — E — E — E
UNDERGROUND TELCO	T — T — T — T — T
PROPERTY LINE (PL)	— — — — — — — — — — — —

ABBREVIATIONS

AC	ALTERNATING CURRENT	MGB	MASTER GROUNDING BAR
AIC	AMPERAGE INTERRUPTION CAPACITY	MIN	MINIMUM
ANI	AUXILIARY NETWORK INTERFACE	MW	MICROWAVE
ATM	ASYNCHRONOUS TRANSFER MODE	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	NEC	NATIONAL ELECTRICAL CODE
AWG	AMERICAN WIRE GAUGE	OC	ON CENTER
AWS	ADVANCED WIRELESS SERVICES	PP	POLARIZING PRESERVING
BATT	BATTERY	PCU	PRIMARY CONTROL UNIT
BBU	BASEBAND UNIT	PDU	PROTOCOL DATA UNIT
BTC	BARE TINNED COPPER CONDUCTOR	PWR	POWER
BTS	BASE TRANSCEIVER STATION	RECT	RECTIFIER
CCU	CLIMATE CONTROL UNIT	RET	REMOTE ELECTRICAL TILT
CDMA	CODE DIVISION MULTIPLE ACCESS	RMC	RIGID METALLIC CONDUIT
CHG	CHARGING	RF	RADIO FREQUENCY
CLU	CLIMATE UNIT	RUC	RACK USER COMMISSIONING
COMM	COMMON	RRH	REMOTE RADIO HEAD
DC	DIRECT CURRENT	RRU	REMOTE RADIO UNIT
DIA	DIAMETER	RWY	RACEWAY
DWG	DRAWING	SFP	SMALL FORM-FACTOR PLUGGABLE
EC	ELECTRICAL CONDUCTOR	SIAD	SMART INTEGRATED ACCESS DEVICE
EMT	ELECTRICAL METALLIC TUBING	SSC	SITE SOLUTIONS CABINET
FIF	FACILITY INTERFACE FRAME	T1	1544KBPS DIGITAL LINE
GEN	GENERATOR	TDMA	TIME-DIVISION MULTIPLE ACCESS
GPS	GLOBAL POSITIONING SYSTEM	TMA	TOWER MOUNT AMPLIFIER
GSM	GLOBAL SYSTEM FOR MOBILE	TVSS	TRANSIENT VOLTAGE SUPPRESSION SYSTEM
HVAC	HEAT/VENTILATION/AIR CONDITIONING	TYP	TYPICAL
ICF	INTERCONNECTION FRAME	UMTS	UNIVERSAL MOBILE TELECOMMUNICATION SYSTEM
IGR	INTERIOR GROUNDING RING (HALO)	UPS	UNINTERRUPTIBLE POWER SUPPLY (DC POWER PLANT)
LTE	LONG TERM EVOLUTION		

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STATE OF CONNECTICUT · JOSHUA J. RILEY · 33208 · LICENSED PROFESSIONAL ENGINEER
02/10/2022

GREENWICH HOSPITAL
5 PERRYRIDGE ROAD
GREENWICH, CT 06830

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
N-3

REFERENCE CUTSHEETS

870 Series 220MHz Exposed Dipoles

The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

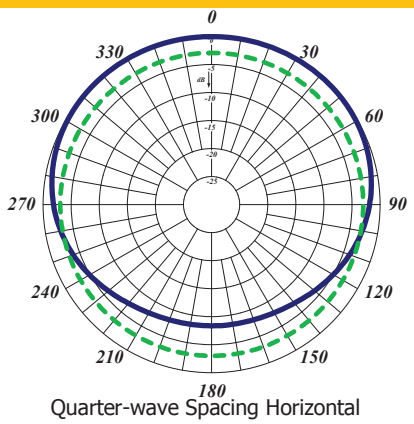
Electrical Specifications	871F-70-2	872F-70-2	874F-70-2
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type N Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft^2 (m^2)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)

* See next page for ordering information (page 3) *

872F-70-2

220MHz EXPOSED DIPOLES — 215-225 MHz

871F-70-2



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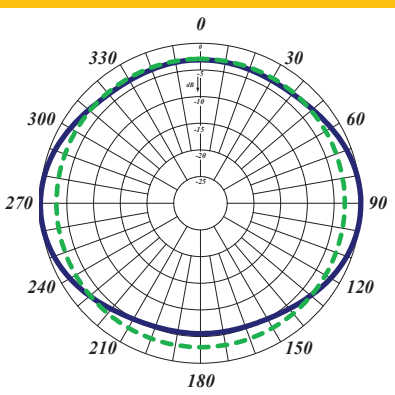

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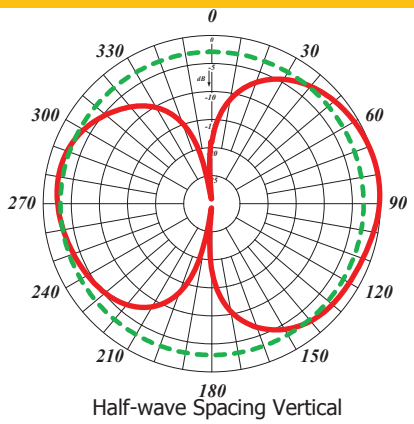
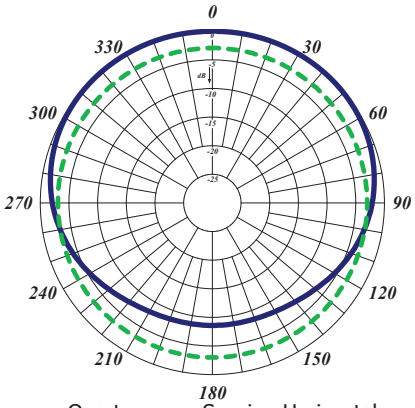


Half-wave Spacing Vertical

872F-70-2



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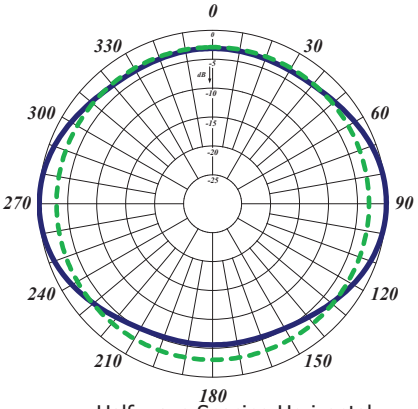

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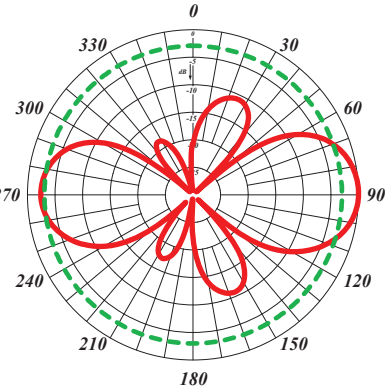
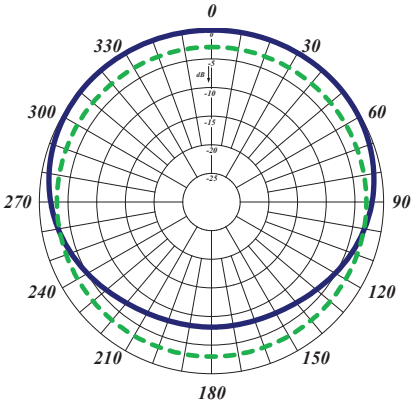


Half-wave Spacing Vertical

874F-70-2



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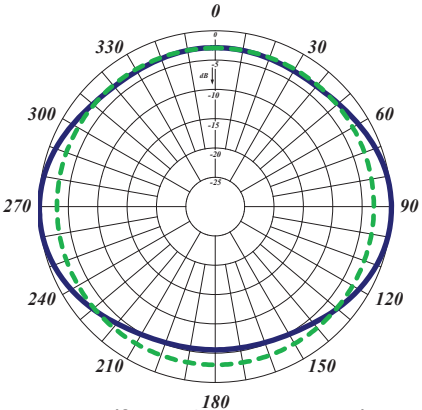

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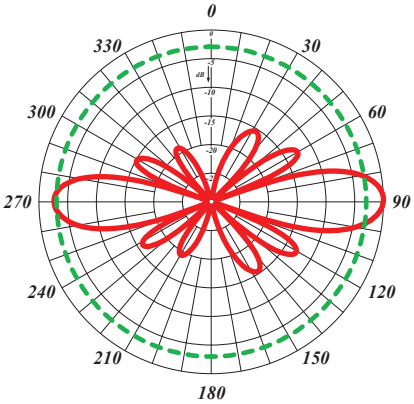

Half-wave Spacing Vertical

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TELEWAVE, INC.®

195 - 260 MHz

ORIGINALLY PROPOSED ANTENNA, REMOVED AND REPLACED.

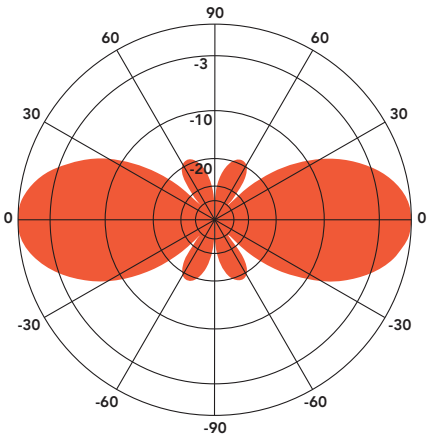
ANT220F2DIN

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

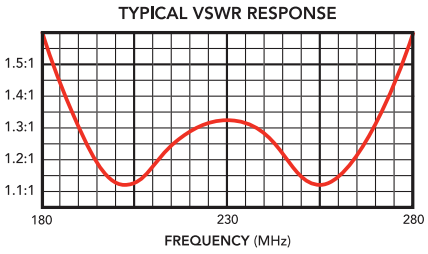
The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

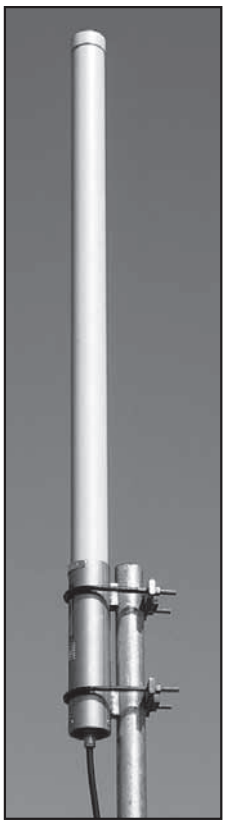
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.



ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd





SPECIFICATIONS			
Frequency (continuous)	195-260 MHz	**Dimensions (L x base diam.) in.**	44 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	11 lb.
Power rating (typ.)	500 watts	**Shipping weight**	14 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	44 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	47 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

870 Series 220MHz Exposed Dipoles

The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

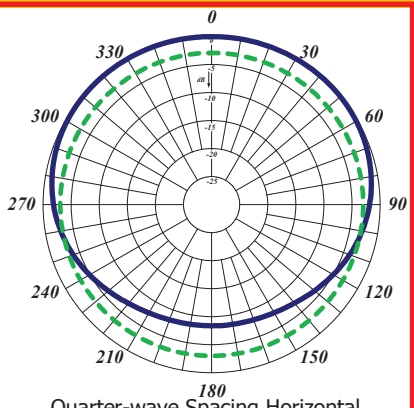
- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

Electrical Specifications	871F-70-2	872F-70-2	874F-70-2
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type DIN Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft^2 (m^2)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)
* See next page for ordering information (page 3) *			

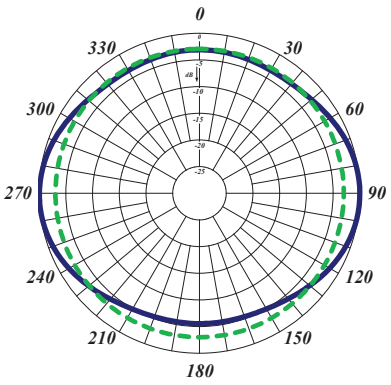
872F-70-2

220MHz EXPOSED DIPOLES — 215-225 MHz

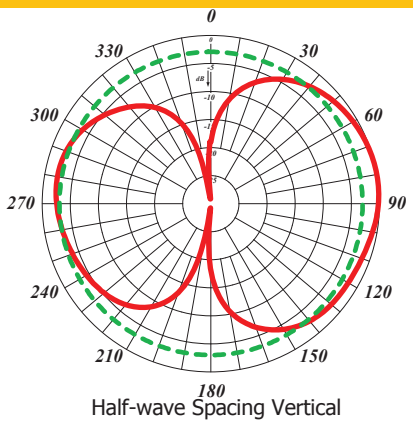
871F-70-2



Quarter-wave Spacing Horizontal

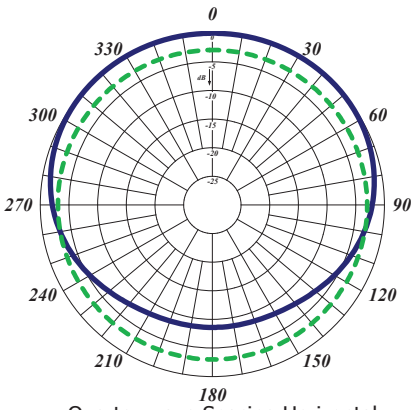


Half-wave Spacing Horizontal

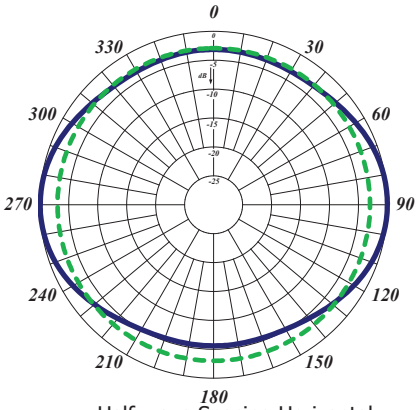


Half-wave Spacing Vertical

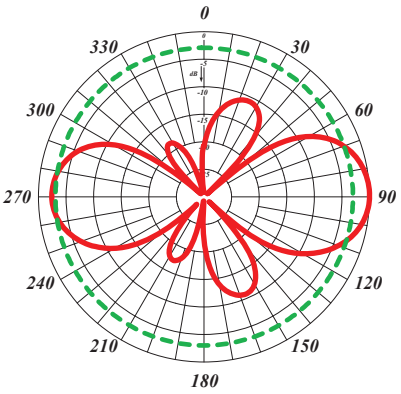
872F-70-2



Quarter-wave Spacing Horizontal

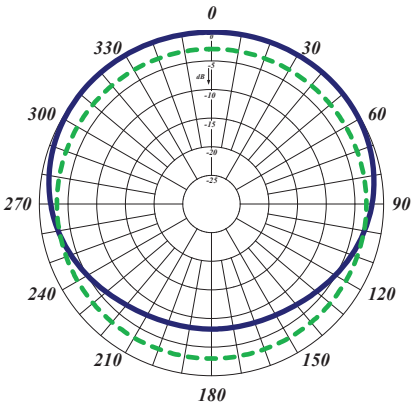


Half-wave Spacing Horizontal

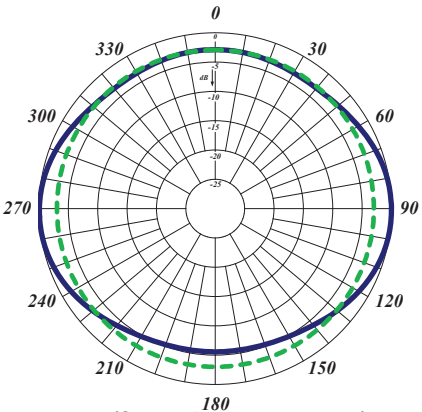


Half-wave Spacing Vertical

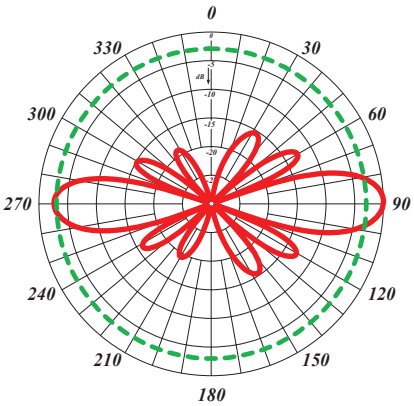
874F-70-2



Quarter-wave Spacing Horizontal



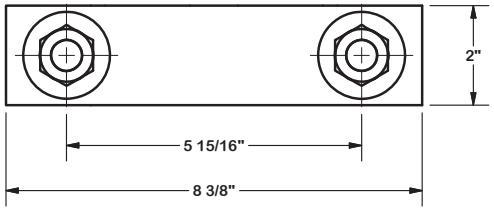
Half-wave Spacing Horizontal

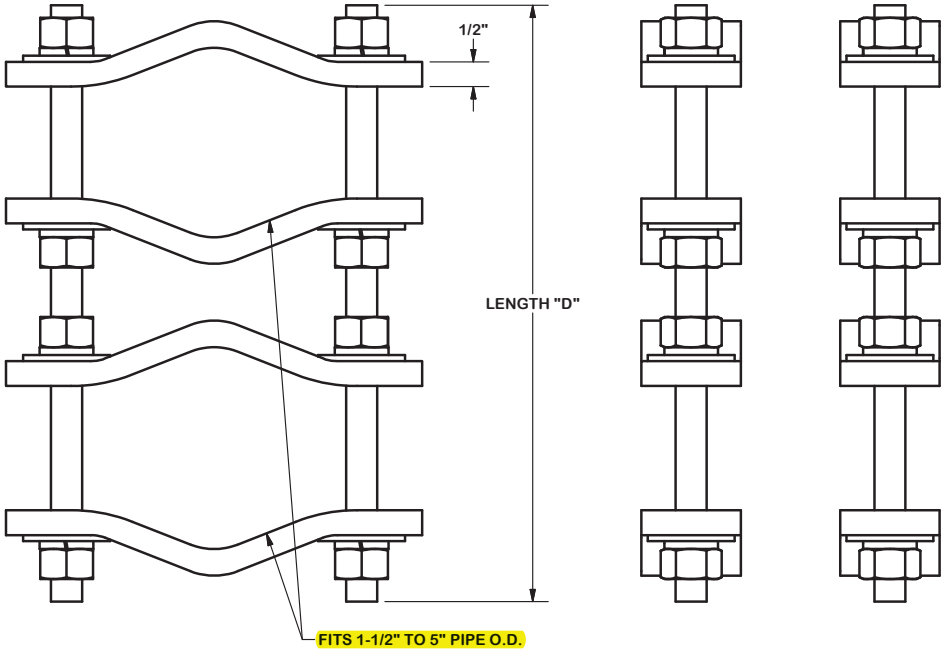


Half-wave Spacing Vertical

COMPROD Simplifying RF Solutions
www.comprodcom.com
Tel: US 1.877.825.2007 / CAN 1.800.603.1454
Email: sales@comprodcom.com
Fax: 1.800.554.1033

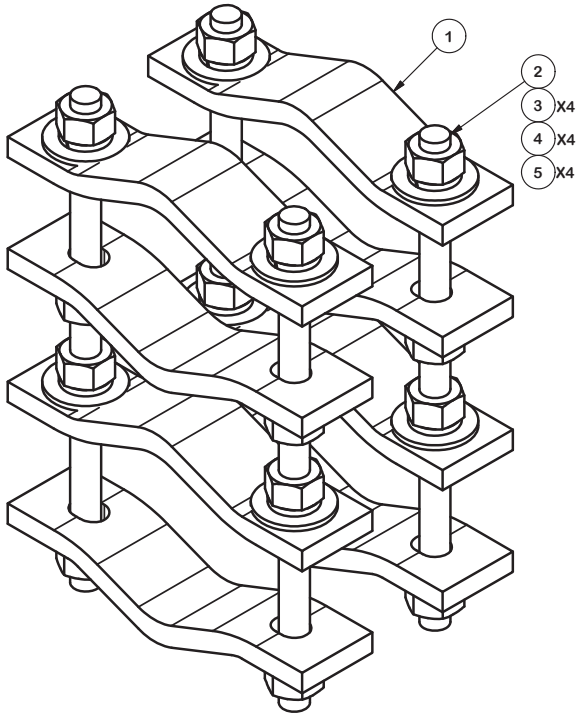
ONE SITE PRO 1 P/N DCP18K CLAMP SET REQUIRED.





PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	8	DCP	CLAMP HALF, 1/2" THICK, 8-3/8"		2.40	19.20
2	B	C	5/8" THREADED ROD	D	E	F
3	16	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	2.08
4	16	G58LW	5/8" HDG LOCKWASHER		0.03	0.42
5	16	G58FW	5/8" HDG USS FLATWASHER		0.07	1.13

VARIABLE PARTS TABLE						
ASSEMBLY "A"	QTY "B"	PART "C"	LENGTH "D"	UNIT WT. "E"	NET WT. "F"	TOTAL WEIGHT
DCP12K	4	G58R-12	12"	1.05	4.18	27.01
DCP18K	4	G58R-18	18"	1.57	6.27	29.10



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION
PIPE TO PIPE CLAMP SET
1-1/2" TO 5" PIPE
1/2" THICK CLAMP

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

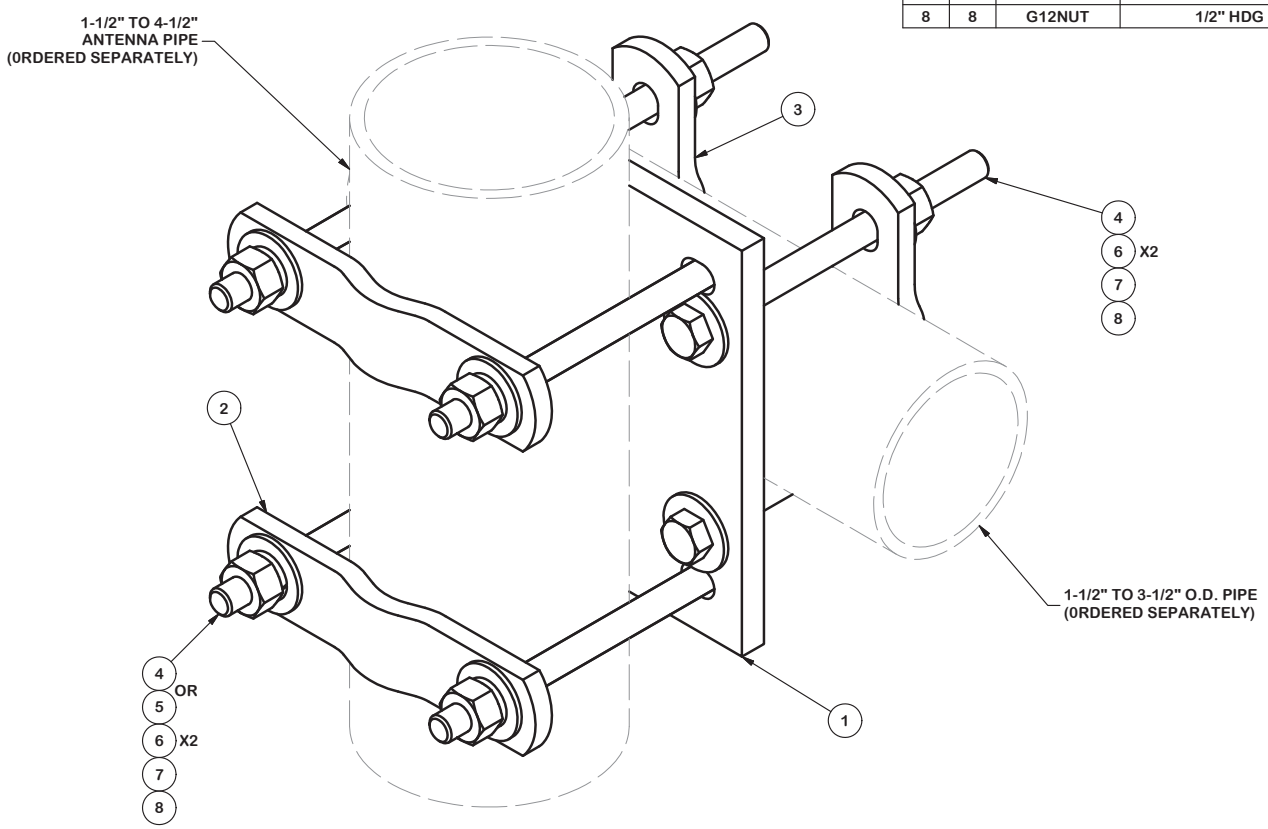
CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	KC8 8/21/2012		SEE ASSEMBLY "A"	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	CEK 1/22/2013	DCPxxK

ONE (1) 2.5 STD (2.875" OD) X 6' LONG ASTM GR. B PIPE MOUNT REQUIRED.

PARTS LIST

ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	SCX7	CROSSOVER PLATE	8 in	7.55	7.55
2	2	X-115765	5" V-CLAMP		1.02	2.04
3	2	X-100064	CLAMP (S) (4" V-CLAMP) GALVANIZED		0.91	1.83
4	8	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	6 1/2 in	0.41	3.28
5	4	G12045	1/2" x 4.5" HDG HEX BOLT GR5 FULL THREAD	4 1/2 in	0.30	1.19
6	16	G12FW	1/2" HDG USS FLATWASHER		0.03	0.54
7	8	G12LW	1/2" HDG LOCKWASHER		0.01	0.11
8	8	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	0.57
					TOTAL WT. #	16.98



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: CROSSOVER PLATE (V-CLAMP STYLE)

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	CEK 10/7/2010		SCX7-U	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	BMC 10/8/2010	SCX7-U

ATTACHMENT B – STRUCTURAL ANALYSIS

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

164-ft Existing EEI Monopole

Proposed Eversource
Antenna Upgrade

Site Ref: Greenwich Hospital

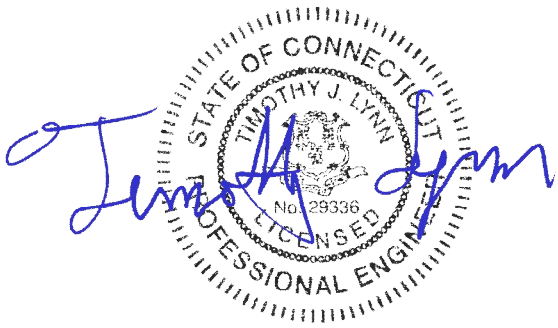
5 Perryridge Road
Greenwich, CT

Centek Project No. 21009.00

~~Date: February 10, 2021~~

Rev 2: January 24, 2022

Max Stress Ratio =63.8%



Prepared for:

Eversource
56 Prospect Street
Hartford, CT 06103

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 Eversource on the existing monopole (tower) owned and operated by Greenwich Hospital located in Greenwich, Connecticut.

The host tower is a 164-ft tall, five-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 11030 dated August 21, 2002. The tower geometry, structure member sizes and foundation system information were obtained from the original manufacturers design documents.

Antenna and appurtenance information were obtained a previous structural analysis report prepared by Centek job no. 20074.46 dated July 13, 2020, a previous structural analysis report prepared by Paul J. Ford & Company job no. A42921-0002.002.7805 dated July 13, 2021 and information provided by Eversource.

The tower is made up of five (5) tapered vertical sections consisting of A572-65 pole sections. The bottom four (4) vertical tower sections are slip joint connected while the top section is flange connected. The diameter of the pole (flat-flat) is 47.0-in at the top and 76.0-in at the base.

Antenna and Appurtenance Summary

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

- TOWN (EXISTING TO REMAIN):
  Antennas: Four (4) 12-ft Omni-directional whip antennas, one (1) Sinclair SC229-SFXLDF Omni-directional whip antenna, two (2) Sinclair SC479-HF1LDF Omni-directional whip antennas, one (1) Bird 432E-83I-01-T tower top amplifier and one (1) camera mounted on a PiROD 13-ft low profile platform with an elevation of 164-ft above grade level.
  Coax Cables: Two (2) 1/2"∅, two (2) 7/8"∅, six (6) 1-1/4" ∅ and one (1) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (EXISTING):
  Antennas: Two (2) 4-ft Dishes and one (1) 2-ft Dish mounted on three 4'x4" pipes with a RAD center elevation of 160-ft above grade level.
  Coax Cables: Three (3) 1-1/4" ∅ coax cables running on the inside of the existing tower.
- CLEARWIRE (EXISTING):
  Antennas: Three (3) Argus LLPX310R panel antennas, three (3) Samsung FDD-R6-RRH, two (2) Dragonwave Horizon ODU's and two (2) Dragonwave A-ANT-23-G-2-C dishes mounted on the Sprint 13-ft low profile platform with a RAD center elevation of 154-ft above the existing tower base plate.
  Coax Cables: Two (2) 2" ∅ conduits and two (2) 5/8" ∅ coax cables running on the inside of the existing tower.

- SPRINT (EXISTING):
  Antennas: Two (2) RFS APXVSPP18-C-A20 panel antennas, one (1) Powerwave P40-16-XLPP-RR-A panel antennas, three (3) RFS APXVTM14 panel antennas and one (1) GPS antenna mounted to a low profile platform with a RAD center elevation of 154-ft above the existing tower base plate. Three (3) ALU 1900 MHz RRH's, three (3) ALU 800 MHz RRH's and three (3) ALU TD-RRH-820 remote radio heads mounted on a universal tr-bracket below the existing low profile platform.
  Coax Cables: Six (6) 1-5/8" ∅ Hybriflex cables and one (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- T-MOBILE (EXISTING):
  Antennas: Three (3) Ericsson AIR32 panel antennas, three (3) RFS APXVAARR24_43 panel antennas, three (3) Ericsson AIR6449 panel antennas, three (3) Ericsson 4449 remote radio units, three (3) Ericsson 4415 remote radio units, three (3) Commscope SDX1926Q-43 diplexers and three (3) TMAs mounted on a platform w/ handrail with a RAD center elevation of 144-ft above grade level.
  Cables: Six (6) 1-5/8" ∅ coax cables and six (6) 6x12 fiber cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Three (3) Powerwave 7770.00 panel antennas, three (3) Quintel QS66512 panel antennas, three (3) Kathrein 80010965 panel antennas, three (3) Powerwave P65-16-XLH-RR panel antennas, six (6) LGP21401 TMA's, six (6) CCI TPX-070821 triplexers and three (3) Ericsson RRUS-32-B2 remote radio heads, three (3) Ericsson RRUS-32-B66 remote radio heads, three (3) Ericsson B14 4478 remote radio heads, three (3) ION-M23 RRHs, three (3) Commscope CBC23SR-43 diplexers and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on a 16-ft low profile platform with a RAD center elevation of 134-ft above grade level. Three (3) Ericsson RRUS-11 remote radio heads, three (3) Ericsson RRUS-32 remote radio heads and two (2) Raycap DC6-48-60-18-8F surge arrestor mounted to one (1) universal ring mount with a RAD center elevation of 138-ft above grade level.
  Cables: Twelve (12) 1-5/8" ∅ coax cables, two (2) fiber cable and six (6) dc control cables running on the inside of the existing tower.
- VERIZON (EXISTING):
  Antennas: Six (6) Decibel DB844H65E-XY panel antennas, three (3) Samsung 64T64R MMUs, six (6) Quintel QS6656-5D panel antennas, three (3) Samsung B2/B66 remote radio heads, three (3) Samsung B5/B13 remote radio heads, three (3) Samsung CBRS remote radio heads and two (2) Raycap RC2DC-3315-PF-48 main distribution boxes mounted on a 13-ft low profile platform with a RAD center elevation of 124-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and two (2) 1-5/8" ∅ fiber cables running inside the monopole.
- UNKNOWN (EXISTING):
  Antennas: Three GPS antennas mounted on three (3) standoffs with a RAD center elevation of 50-ft above grade level.
  Coax Cables: Three (3) 7/8" ∅ coax cables running on the exterior of the existing tower.

- EVERSOURCE ENERGY (EXISTING TO REMAIN):
  Antennas: Two (2) Decibel DB586-Y omni-directional whips (one upright and one inverted), one (1) Telewave ANT150F2 omni-directional whip, one (1) Comprod 531-70HD dipole and one (1) tower top amplifier mounted on a PiROD 13-ft low profile platform with an elevation of 114-ft above grade level.
  Coax Cables: Two (2) 1-5/8" ∅, two (2) 7/8" ∅ and one (1) 1/2" ∅ coax cables running on the inside of the existing tower.
- **EVERSOURCE ENERGY (PROPOSED):**
  Antennas: One (1) Comprod 872F-70-2 dipole (120.5-ft rad center) and one (1) Comprod 871F-70-2 dipole mounted on a PiROD 13-ft low profile platform with an elevation of 114-ft above grade level.
  Coax Cables: Two (2) 7/8" ∅ coax cables running on the inside of the existing tower.
  Mount Mods: Two (2) 2 Std. pipe mounts braces.

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-H entitled "Structural Standard for Antenna Support Structures, Antennas and Small Wind Turbine Support Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

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

Tower Loading

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

Load Cases:	Load Case 1; 130 mph (Risk Cat III) wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-H]*

[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	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L5)	1.50'-39.88'	53.2%	**PASS**

Foundation and Anchors

The existing foundation consists of a 9.0 ∅ x 28.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; project no. 11030 dated August 21, 2002. The base of the tower is connected to the foundation by means of (30) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-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	63 kips
	Compression	105 kips
	Moment	7139 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	66.7%	**PASS**
	Lateral Deflection	0.13 in.(1)	**PASS**

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

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Tension	56.6%	**PASS**
Flange Plate	Bending	45.2%	**PASS**

- 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	41.4%	**PASS**
Base Plate	Bending	63.8%	**PASS**

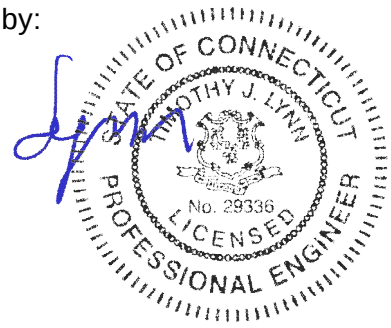
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

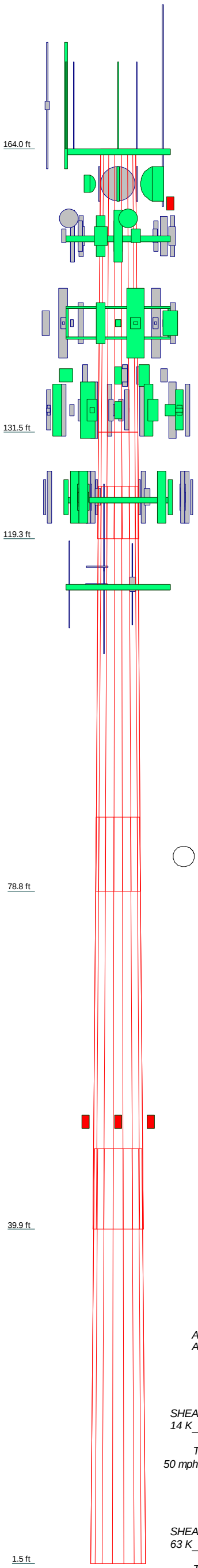
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

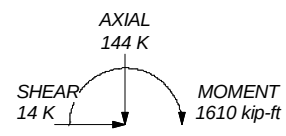
tnxTower Features:

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

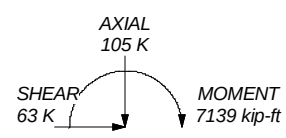
Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	32.50	18	0.3125		47.0000	53.4200		5.5
2	12.21	18	0.3750	6.00	53.4200	56.1500		2.7
3	46.50	18	0.4375	8.42	54.0585	62.9700	A572-65	12.8
4	47.33	18	0.5625	9.25	60.4813	69.6600		18.5
5	47.63	18	0.5625		66.7412	76.0000		20.5
								60.0



ALL REACTIONS ARE FACTORED



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



TORQUE 7 kip-ft
REACTIONS - 130 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
12' x 3" Dia Omni (Town Existing)	164	RRUS-11 (AT⌶ Existing)	138
12' x 3" Dia Omni (Town Existing)	164	RRUS-11 (AT⌶ Existing)	138
12' x 3" Dia Omni (Town Existing)	164	RRUS-11 (AT⌶ Existing)	138
12' x 3" Dia Omni (Town Existing)	164	QS66512-2 (AT⌶ Existing)	134
Camera (Town Existing)	164	80010965 (AT⌶ Existing)	134
SC479-HF1LDF (Town Existing)	164	P65-16-XLH-RR (AT⌶ Existing)	134
TX/RX 432E-83I-01T (Town Existing)	164	7770.00 (AT⌶ Existing)	134
SC229-SFXLDF (Town Existing)	164	QS66512-2 (AT⌶ Existing)	134
SC479-HF1LDF (Town Existing)	164	80010965 (AT⌶ Existing)	134
Low Profile Platform (Town Existing)	164	P65-16-XLH-RR (AT⌶ Existing)	134
4'x4" Pipe Mount (Town Existing)	160	(2) LGP21401 TMA (AT⌶ Existing)	134
4'x4" Pipe Mount (Town Existing)	160	(2) LGP21401 TMA (AT⌶ Existing)	134
4'x4" Pipe Mount (Town Existing)	160	(2) LGP21401 TMA (AT⌶ Existing)	134
4 FT DISH (Town Existing)	160	(2) TPX-070821 (AT⌶ Existing)	134
4 FT DISH (Town Existing)	160	(2) TPX-070821 (AT⌶ Existing)	134
2 FT DISH (Town Existing)	160	(2) TPX-070821 (AT⌶ Existing)	134
Horizon ODU (Clearwire Existing)	154	RRUS-32 (AT⌶ Existing)	134
Horizon ODU (Clearwire Existing)	154	RRUS-32 (AT⌶ Existing)	134
APXVSPP18-C-A20 (Sprint Existing)	154	RRUS-32 (AT⌶ Existing)	134
P40-16-XLPP-RR-A (Sprint Existing)	154	RRUS-32 (AT⌶ Existing)	134
APXVSPP18-C-A20 (Sprint Existing)	154	RRUS-32 (AT⌶ Existing)	134
FD-RRH 4x45 1900 (Sprint Existing)	154	RRUS-32 (AT⌶ Existing)	134
FD-RRH 4x45 1900 (Sprint Existing)	154	B14 4478 (AT⌶ Existing)	134
FD-RRH 4x45 1900 (Sprint Existing)	154	B14 4478 (AT⌶ Existing)	134
FD-RRH 2x50 800 (Sprint Existing)	154	B14 4478 (AT⌶ Existing)	134
FD-RRH 2x50 800 (Sprint Existing)	154	RRU (AT⌶ Existing)	134
FD-RRH 2x50 800 (Sprint Existing)	154	RRU (AT⌶ Existing)	134
GPS (Sprint Existing)	154	RRU (AT⌶ Existing)	134
APXVTM14 (Sprint Existing)	154	CBC23SR-43 (AT⌶ Existing)	134
APXVTM14 (Sprint Existing)	154	CBC23SR-43 (AT⌶ Existing)	134
APXVTM14 (Sprint Existing)	154	CBC23SR-43 (AT⌶ Existing)	134
TD-RRH8x20-25 (Sprint Existing)	154	DC6-48-60-18-8F Surge Arrestor (AT⌶ Existing)	134
TD-RRH8x20-25 (Sprint Existing)	154	EEI 16-ft Low Profile Platform (AT⌶ Existing)	134
TD-RRH8x20-25 (Sprint Existing)	154	7770.00 (AT⌶ Existing)	134
Low Profile Platform (Sprint Existing)	154	QS66512-2 (AT⌶ Existing)	134
LLPX310R (Clearwire Existing)	154	80010965 (AT⌶ Existing)	134
LLPX310R (Clearwire Existing)	154	P65-16-XLH-RR (AT⌶ Existing)	134
LLPX310R (Clearwire Existing)	154	7770.00 (AT⌶ Existing)	134
A-Ant-23G-2-C (Clearwire Existing)	154	(2) QS6656-5D (Verizon Existing)	124
A-Ant-23G-2-C (Clearwire Existing)	154	64T65R MMU (Verizon Existing)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	DB844H65E-XY (Verizon Existing)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	DB844H65E-XY (Verizon Existing)	124
Valmont Uni-Tri Bracket (Sprint Existing)	151.5	(2) QS6656-5D (Verizon Existing)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	64T65R MMU (Verizon Existing)	124
AIR32 (T-Mobile Existing)	144	DB844H65E-XY (Verizon Existing)	124
AIR6449 (T-Mobile Existing)	144	B2/B66A RRH (Verizon Existing)	124
APXVAARR24-43 (T-Mobile Existing)	144	B2/B66A RRH (Verizon Existing)	124
AIR32 (T-Mobile Existing)	144	B2/B66A RRH (Verizon Existing)	124
Radio 4449 B71 B12 (T-Mobile Existing)	144	B5/B13 RRH (Verizon Existing)	124
Radio 4449 B71 B12 (T-Mobile Existing)	144	B5/B13 RRH (Verizon Existing)	124
Radio 4449 B71 B12 (T-Mobile Existing)	144	B5/B13 RRH (Verizon Existing)	124
TMA 10"x8"x3" (T-Mobile Existing)	144	CBRS Antenna/RRH (Verizon Existing)	124
TMA 10"x8"x3" (T-Mobile Existing)	144	CBRS Antenna/RRH (Verizon Existing)	124
TMA 10"x8"x3" (T-Mobile Existing)	144	CBRS Antenna/RRH (Verizon Existing)	124
4415 B25 (T-Mobile Existing)	144	RC2DC-3315-PF-48 (Verizon Existing)	124
4415 B25 (T-Mobile Existing)	144	RC2DC-3315-PF-48 (Verizon Existing)	124
4415 B25 (T-Mobile Existing)	144	Low Profile Platform (Verizon Existing)	124
SDX1926Q-43 (T-Mobile Existing)	144	DB844H65E-XY (Verizon Existing)	124
SDX1926Q-43 (T-Mobile Existing)	144	(2) QS6656-5D (Verizon Existing)	124
SDX1926Q-43 (T-Mobile Existing)	144	64T65R MMU (Verizon Existing)	124
EEI 16-ft Platform w/ Handrail (T-Mobile Existing)	144	DB844H65E-XY (Verizon Existing)	124
APXVAARR24-43 (T-Mobile Existing)	144	DB844H65E-XY (Verizon Existing)	124
AIR32 (T-Mobile Existing)	144	872F-70-2 (Eversource Proposed)	116
AIR6449 (T-Mobile Existing)	144	2 Std. 5' Horz Pipe (Eversource Proposed)	116
APXVAARR24-43 (T-Mobile Existing)	144	871F-70 (Eversource Proposed)	114
AIR6449 (T-Mobile Existing)	144	2 Std. 5' Horz Pipe (Eversource Proposed)	114
RRUS-32 (AT⌶ Existing)	138	Low Profile Platform	114
RRUS-32 (AT⌶ Existing)	138	531-70HD (Eversource Existing)	114
RRUS-32 (AT⌶ Existing)	138	DB586-Y (Eversource Existing)	114
Valmont Uni-Tri Bracket (AT⌶ Existing)	138	DB586-Y (Eversource Existing)	114
DC6-48-60-18-8F Surge Arrestor (AT⌶ Existing)	138	ANT150F2 (Eversource Existing)	114
DC6-48-60-18-8F Surge Arrestor (AT⌶ Existing)	138	Tower Top Amplifier (Eversource Existing)	114
		GPS	51.5
		GPS	51.5
		GPS	51.5

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 53.2%

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

Job: **21009.00 - Greenwich Hospital**			
Project: **164' EEI Monopole - 5 Perryridge Rd., Greenwich, CT**			
Client: Eversource	Drawn by: TJL	App'd:	
Code: TIA-222-H	Date: 01/24/22	Scale: NTS	
Path: J:\Jobs\2100\900.W\05_Structural\Tower Analysis\Backup Documentation\Rev 2\EEI Files\164' EEI Monopole Greenwich, CT.eri		Dwg No. E-1	

Tower Input Data

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

Tower base elevation above sea level: 1.50 ft.
Basic wind speed of 130 mph.
Risk Category III.
Exposure Category C.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 1.
Crest Height: 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

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	164.00-131.50	32.50	0.00	18	47.0000	53.4200	0.3125	1.2500	A572-65 (65 ksi)
L2	131.50-119.29	12.21	6.00	18	53.4200	56.1500	0.3750	1.5000	A572-65 (65 ksi)
L3	119.29-78.79	46.50	8.42	18	54.0585	62.9700	0.4375	1.7500	A572-65 (65 ksi)
L4	78.79-39.88	47.33	9.25	18	60.4813	69.6600	0.5625	2.2500	A572-65 (65 ksi)
L5	39.88-1.50	47.63		18	66.7412	76.0000	0.5625	2.2500	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	47.6768	46.3082	12752.5270	16.5741	23.8760	534.1149	25521.8341	23.1585	7.7220	24.71
	54.1959	52.6760	18769.9004	18.8532	27.1374	691.6627	37564.4987	26.3430	8.8519	28.326
L2	54.1862	63.1368	22444.4518	18.8310	27.1374	827.0684	44918.4365	31.5744	8.7419	23.312
	56.9584	66.3862	26091.2194	19.8001	28.5242	914.7047	52216.7704	33.1994	9.2224	24.593
L3	55.9925	74.4594	27047.4664	19.0354	27.4617	984.9157	54130.5226	37.2368	8.7443	19.987
	63.8739	86.8342	42898.2727	22.1990	31.9888	1341.0421	85852.9920	43.4253	10.3127	23.572
L4	62.9857	106.9776	48524.0640	21.2712	30.7245	1579.3269	97111.9772	53.4990	9.6547	17.164
	70.6478	123.3649	74413.8720	24.5296	35.3873	2102.8424	148925.6597	61.6942	11.2702	20.036
L5	69.5098	118.1537	65376.3628	23.4934	33.9045	1928.2499	130838.7495	59.0881	10.7564	19.123
	77.0856	134.6842	96834.1984	26.7803	38.6080	2508.1382	193795.8137	67.3549	12.3860	22.02

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 164.00-131.50				1	1	1			
L2 131.50-119.29				1	1	1			
L3 119.29-78.79				1	1	1			
L4 78.79-39.88				1	1	1			
L5 39.88-1.50				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
7/8	B	No	Surface Ar (CaAa)	51.50 - 4.50	3	3	0.000 0.000	1.1100		0.54
HYBRIFLEX 1-5/8"	B	No	Surface Ar	144.00 -	3	3	0.000	1.9800		1.90

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
(T-Mobile - Existing)			(CaAa)	7.50			0.000			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1/2 (Town Existing)	A	No	No	Inside Pole	164.00 - 4.50	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
1 1/4 (Town Existing)	A	No	No	Inside Pole	164.00 - 4.50	6	No Ice	0.00	0.66
							1/2" Ice	0.00	0.66
							1" Ice	0.00	0.66
1/2 (Sprint Existing)	B	No	No	Inside Pole	154.00 - 7.50	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
2" Rigid Conduit (Clearwire Existing)	B	No	No	Inside Pole	154.00 - 7.50	2	No Ice	0.00	2.80
							1/2" Ice	0.00	2.80
							1" Ice	0.00	2.80
LDF4.5-50 (5/8 FOAM) (Clearwire Existing)	B	No	No	Inside Pole	154.00 - 7.50	2	No Ice	0.00	0.15
							1/2" Ice	0.00	0.15
							1" Ice	0.00	0.15
1 5/8 (T-Mobile Existing)	B	No	No	Inside Pole	144.00 - 4.50	6	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
1 5/8 (AT&T Existing)	A	No	No	Inside Pole	134.00 - 11.50	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
1 5/8 (Verizon Existing)	C	No	No	Inside Pole	124.00 - 7.50	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
RG6-Fiber (AT&T Existing)	A	No	No	Inside Pole	134.00 - 11.50	2	No Ice	0.00	0.00
							1/2" Ice	0.00	0.00
							1" Ice	0.00	0.00
#8 AWG Copper WIre (AT&T Existing)	A	No	No	Inside Pole	134.00 - 11.50	4	No Ice	0.00	0.00
							1/2" Ice	0.00	0.00
							1" Ice	0.00	0.00
HYBRIFLEX 1-5/8" (Sprint Existing)	B	No	No	Inside Pole	154.00 - 7.50	6	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
HYBRIFLEX 1-5/8" (Verizon Existing)	C	No	No	Inside Pole	124.00 - 7.50	2	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
7/8 (Eversource Existing)	C	No	No	Inside Pole	114.00 - 1.50	2	No Ice	0.00	0.54
							1/2" Ice	0.00	0.54
							1" Ice	0.00	0.54
1 5/8 (Eversource Existing)	C	No	No	Inside Pole	114.00 - 1.50	2	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
1/2 (Eversource Existing)	C	No	No	Inside Pole	114.00 - 1.50	1	No Ice	0.00	0.25
							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
HYBRIFLEX 1-5/8" (T-Mobile - Existing)	B	No	No	Inside Pole	144.00 - 7.50	3	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
1 5/8	A	No	No	Inside Pole	164.00 - 4.50	1	No Ice	0.00	1.04

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
(Town Existing)							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
7/8	A	No	No	Inside Pole	164.00 - 4.50	2	No Ice	0.00	0.54
(Town Existing)							1/2" Ice	0.00	0.54
							1" Ice	0.00	0.54
1/2	A	No	No	Inside Pole	164.00 - 4.50	1	No Ice	0.00	0.25
(Town Existing)							1/2" Ice	0.00	0.25
							1" Ice	0.00	0.25
#8 AWG Copper	A	No	No	Inside Pole	134.00 - 11.50	2	No Ice	0.00	0.05
WIre							1/2" Ice	0.00	0.05
(AT&T Existing)							1" Ice	0.00	0.05
7/8	C	No	No	Inside Pole	114.00 - 1.50	2	No Ice	0.00	0.54
(Eversource							1/2" Ice	0.00	0.54
Proposed)							1" Ice	0.00	0.54

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	164.00-131.50	A	0.000	0.000	0.000	0.000	0.25
		B	0.000	0.000	7.425	0.000	0.62
		C	0.000	0.000	0.000	0.000	0.00
L2	131.50-119.29	A	0.000	0.000	0.000	0.000	0.23
		B	0.000	0.000	7.253	0.000	0.43
		C	0.000	0.000	0.000	0.000	0.08
L3	119.29-78.79	A	0.000	0.000	0.000	0.000	0.78
		B	0.000	0.000	24.057	0.000	1.43
		C	0.000	0.000	0.000	0.000	0.82
L4	78.79-39.88	A	0.000	0.000	0.000	0.000	0.75
		B	0.000	0.000	26.982	0.000	1.39
		C	0.000	0.000	0.000	0.000	0.81
L5	39.88-1.50	A	0.000	0.000	0.000	0.000	0.59
		B	0.000	0.000	31.015	0.000	1.22
		C	0.000	0.000	0.000	0.000	0.70

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	164.00-131.50	A	1.336	0.000	0.000	0.000	0.000	0.25
		B		0.000	0.000	13.455	0.000	0.74
		C		0.000	0.000	0.000	0.000	0.00
L2	131.50-119.29	A	1.314	0.000	0.000	0.000	0.000	0.23
		B		0.000	0.000	13.077	0.000	0.55
		C		0.000	0.000	0.000	0.000	0.08
L3	119.29-78.79	A	1.283	0.000	0.000	0.000	0.000	0.78
		B		0.000	0.000	43.377	0.000	1.83
		C		0.000	0.000	0.000	0.000	0.82
L4	78.79-39.88	A	1.219	0.000	0.000	0.000	0.000	0.75

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
		B		0.000	0.000	49.939	0.000	1.84
		C		0.000	0.000	0.000	0.000	0.81
L5	39.88-1.50	A	1.099	0.000	0.000	0.000	0.000	0.59
		B		0.000	0.000	59.426	0.000	1.72
		C		0.000	0.000	0.000	0.000	0.70

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	164.00-131.50	1.6105	-0.9298	1.6188	-0.9346
L2	131.50-119.29	3.6734	-2.1208	3.5256	-2.0355
L3	119.29-78.79	3.7047	-2.1389	3.5864	-2.0706
L4	78.79-39.88	4.2990	-2.4820	4.2499	-2.4537
L5	39.88-1.50	4.8795	-2.8172	4.9357	-2.8496

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	22	HYBRIFLEX 1-5/8"	131.50 - 144.00	1.0000	1.0000
L2	22	HYBRIFLEX 1-5/8"	119.29 - 131.50	1.0000	1.0000
L3	22	HYBRIFLEX 1-5/8"	78.79 - 119.29	1.0000	1.0000
L4	11	7/8	39.88 - 51.50	1.0000	1.0000
L4	22	HYBRIFLEX 1-5/8"	39.88 - 78.79	1.0000	1.0000
L5	11	7/8	4.50 - 39.88	1.0000	1.0000
L5	22	HYBRIFLEX 1-5/8"	7.50 - 39.88	1.0000	1.0000

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
4'x4" Pipe Mount	A	From Face	0.50	0.0000	160.00	No Ice		1.06	1.06	0.04

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
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00			1" Ice	1.84	1.84	0.07
4'x4" Pipe Mount	B	From Face	0.50	0.0000	160.00	No Ice	1.06	1.06	0.04
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00			1" Ice	1.84	1.84	0.07
4'x4" Pipe Mount	C	From Face	0.50	0.0000	160.00	No Ice	1.06	1.06	0.04
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00			1" Ice	1.84	1.84	0.07
12' x 3" Dia Omni	A	From Face	4.00	0.0000	164.00	No Ice	3.60	3.60	0.04
(Town Existing)			0.00			1/2" Ice	4.83	4.83	0.06
			5.00			1" Ice	6.08	6.08	0.09
12' x 3" Dia Omni	B	From Face	4.00	0.0000	164.00	No Ice	3.60	3.60	0.04
(Town Existing)			-6.00			1/2" Ice	4.83	4.83	0.06
			5.00			1" Ice	6.08	6.08	0.09
12' x 3" Dia Omni	C	From Face	4.00	0.0000	164.00	No Ice	3.60	3.60	0.04
(Town Existing)			6.00			1/2" Ice	4.83	4.83	0.06
			5.00			1" Ice	6.08	6.08	0.09
12' x 3" Dia Omni	C	From Face	4.00	0.0000	164.00	No Ice	3.60	3.60	0.04
(Town Existing)			0.00			1/2" Ice	4.83	4.83	0.06
			5.00			1" Ice	6.08	6.08	0.09
Camera	B	From Face	4.00	0.0000	164.00	No Ice	3.00	3.00	0.10
(Town Existing)			-6.00			1/2" Ice	4.00	4.00	0.15
			2.00			1" Ice	5.00	5.00	0.20
SC479-HF1LDF	A	From Face	4.00	0.0000	164.00	No Ice	4.39	4.39	0.03
(Town Existing)			-6.00			1/2" Ice	6.54	6.54	0.07
			5.00			1" Ice	8.04	8.04	0.11
TX/RX 432E-83I-01T	A	From Face	4.00	0.0000	164.00	No Ice	1.20	0.75	0.03
(Town Existing)			-6.00			1/2" Ice	1.34	0.86	0.04
			5.00			1" Ice	1.48	0.98	0.05
SC229-SFXLDF	B	From Face	4.00	0.0000	164.00	No Ice	6.67	6.67	0.03
(Town Existing)			0.00			1/2" Ice	9.02	9.02	0.08
			5.00			1" Ice	11.39	11.39	0.14
SC479-HF1LDF	C	From Face	4.00	0.0000	164.00	No Ice	4.39	4.39	0.03
(Town Existing)			6.00			1/2" Ice	6.54	6.54	0.07
			5.00			1" Ice	8.04	8.04	0.11
Low Profile Platform	C	None		0.0000	164.00	No Ice	15.70	15.70	1.30
(Town Existing)						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
LLPX310R	A	From Face	3.00	0.0000	154.00	No Ice	4.30	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	4.60	2.21	0.05
			0.00			1" Ice	4.90	2.49	0.08
LLPX310R	B	From Face	3.00	0.0000	154.00	No Ice	4.30	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	4.60	2.21	0.05
			0.00			1" Ice	4.90	2.49	0.08
LLPX310R	C	From Face	3.00	0.0000	154.00	No Ice	4.30	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	4.60	2.21	0.05
			0.00			1" Ice	4.90	2.49	0.08
Remote Radio Head FD R6	A	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00			1" Ice	2.18	1.07	0.06
Remote Radio Head FD R6	B	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00			1" Ice	2.18	1.07	0.06
Remote Radio Head FD R6	C	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00			1" Ice	2.18	1.07	0.06
Horizon ODU	A	None		0.0000	154.00	No Ice	0.68	0.16	0.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Clearwire Existing)							1/2" Ice	0.78	0.22	0.00
							1" Ice	0.89	0.29	0.01
Horizon ODU	C	None			0.0000	154.00	No Ice	0.68	0.16	0.00
(Clearwire Existing)							1/2" Ice	0.78	0.22	0.00
							1" Ice	0.89	0.29	0.01
APXVSPP18-C-A20	A	From Face	4.00		0.0000	154.00	No Ice	8.02	5.28	0.06
(Sprint Existing)			0.00				1/2" Ice	8.48	5.74	0.11
			0.00				1" Ice	8.94	6.20	0.16
P40-16-XLPP-RR-A	B	From Face	4.00		0.0000	154.00	No Ice	9.07	3.52	0.05
(Sprint Existing)			0.00				1/2" Ice	9.47	3.87	0.11
			0.00				1" Ice	9.87	4.22	0.16
APXVSPP18-C-A20	C	From Face	4.00		0.0000	154.00	No Ice	8.02	5.28	0.06
(Sprint Existing)			0.00				1/2" Ice	8.48	5.74	0.11
			0.00				1" Ice	8.94	6.20	0.16
FD-RRH 4x45 1900	A	From Face	4.00		0.0000	154.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00				1/2" Ice	2.52	2.59	0.08
			0.00				1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	B	From Face	4.00		0.0000	154.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00				1/2" Ice	2.52	2.59	0.08
			0.00				1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	C	From Face	4.00		0.0000	154.00	No Ice	2.32	2.38	0.06
(Sprint Existing)			2.00				1/2" Ice	2.52	2.59	0.08
			0.00				1" Ice	2.74	2.80	0.11
FD-RRH 2x50 800	A	From Face	4.00		0.0000	154.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	B	From Face	4.00		0.0000	154.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	C	From Face	4.00		0.0000	154.00	No Ice	2.06	1.93	0.06
(Sprint Existing)			-2.00				1/2" Ice	2.24	2.11	0.09
			0.00				1" Ice	2.43	2.29	0.11
GPS	C	From Face	4.00		0.0000	154.00	No Ice	1.00	1.00	0.01
(Sprint Existing)			-6.00				1/2" Ice	1.50	1.50	0.01
			3.00				1" Ice	2.00	2.00	0.02
APXVTM14	A	From Face	4.00		0.0000	154.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00				1/2" Ice	6.72	3.97	0.10
			0.00				1" Ice	7.10	4.33	0.14
APXVTM14	B	From Face	4.00		0.0000	154.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00				1/2" Ice	6.72	3.97	0.10
			0.00				1" Ice	7.10	4.33	0.14
APXVTM14	C	From Face	4.00		0.0000	154.00	No Ice	6.34	3.61	0.06
(Sprint Existing)			2.00				1/2" Ice	6.72	3.97	0.10
			0.00				1" Ice	7.10	4.33	0.14
TD-RRH8x20-25	A	From Face	4.00		0.0000	154.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	4.00		0.0000	154.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	4.00		0.0000	154.00	No Ice	4.05	1.53	0.07
(Sprint Existing)			2.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
Valmont Uni-Tri Bracket	A	None			0.0000	151.50	No Ice	1.75	1.75	0.29
(Sprint Existing)							1/2" Ice	1.94	1.94	0.31
							1" Ice	2.13	2.13	0.32
Low Profile Platform	C	None			0.0000	154.00	No Ice	15.70	15.70	1.30

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Sprint Existing)						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
AIR6449	A	From Face	4.00	0.0000	144.00	No Ice	5.65	2.42	0.10
(T-Mobile Existing)			-6.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
APXVAARR24-43	A	From Face	4.00	0.0000	144.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	A	From Face	4.00	0.0000	144.00	No Ice	6.51	4.71	0.13
(T-Mobile Existing)			2.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR6449	B	From Face	4.00	0.0000	144.00	No Ice	5.65	2.42	0.10
(T-Mobile Existing)			-6.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
APXVAARR24-43	B	From Face	4.00	0.0000	144.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	B	From Face	4.00	0.0000	144.00	No Ice	6.51	4.71	0.13
(T-Mobile Existing)			2.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR6449	C	From Face	4.00	0.0000	144.00	No Ice	5.65	2.42	0.10
(T-Mobile Existing)			-6.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
APXVAARR24-43	C	From Face	4.00	0.0000	144.00	No Ice	20.24	8.89	0.15
(T-Mobile Existing)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
AIR32	C	From Face	4.00	0.0000	144.00	No Ice	6.51	4.71	0.13
(T-Mobile Existing)			2.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
Radio 4449 B71 B12	A	From Face	4.00	0.0000	144.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	B	From Face	4.00	0.0000	144.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
Radio 4449 B71 B12	C	From Face	4.00	0.0000	144.00	No Ice	1.64	1.29	0.07
(T-Mobile Existing)			-2.00			1/2" Ice	1.80	1.44	0.09
			0.00			1" Ice	1.97	1.59	0.11
TMA 10"x8"x3"	A	From Face	4.00	0.0000	144.00	No Ice	0.67	0.26	0.02
(T-Mobile Existing)			0.00			1/2" Ice	0.77	0.33	0.02
			0.00			1" Ice	0.88	0.41	0.03
TMA 10"x8"x3"	B	From Face	4.00	0.0000	144.00	No Ice	0.67	0.26	0.02
(T-Mobile Existing)			0.00			1/2" Ice	0.77	0.33	0.02
			0.00			1" Ice	0.88	0.41	0.03
TMA 10"x8"x3"	C	From Face	4.00	0.0000	144.00	No Ice	0.67	0.26	0.02
(T-Mobile Existing)			0.00			1/2" Ice	0.77	0.33	0.02
			0.00			1" Ice	0.88	0.41	0.03
4415 B25	A	From Face	4.00	0.0000	144.00	No Ice	1.84	0.82	0.05
(T-Mobile Existing)			-2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	B	From Face	4.00	0.0000	144.00	No Ice	1.84	0.82	0.05
(T-Mobile Existing)			-2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	C	From Face	4.00	0.0000	144.00	No Ice	1.84	0.82	0.05
(T-Mobile Existing)			-2.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
SDX1926Q-43	A	From Face	4.00	0.0000	144.00	No Ice	0.24	0.10	0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(T-Mobile Existing)			-2.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
SDX1926Q-43	B	From Face	4.00	0.0000	144.00	No Ice	0.24	0.10	0.03
(T-Mobile Existing)			-2.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
SDX1926Q-43	C	From Face	4.00	0.0000	144.00	No Ice	0.24	0.10	0.03
(T-Mobile Existing)			-2.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
EEI 16-ft Platform w/ Handrail	C	None		0.0000	144.00	No Ice	26.00	26.00	2.30
						1/2" Ice	32.00	32.00	2.75
(T-Mobile Existing)						1" Ice	38.00	38.00	3.20
DC6-48-60-18-8F Surge Arrestor	B	From Face	0.50	0.0000	138.00	No Ice	1.91	1.91	0.02
			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T Existing)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge Arrestor	C	From Face	0.50	0.0000	138.00	No Ice	1.91	1.91	0.02
			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T Existing)			0.00			1" Ice	2.29	2.29	0.06
RRUS-11	A	From Face	0.50	0.0000	138.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			6.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	B	From Face	0.50	0.0000	138.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			6.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-11	C	From Face	0.50	0.0000	138.00	No Ice	2.57	1.07	0.05
(AT&T Existing)			6.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
RRUS-32	A	From Face	0.50	0.0000	138.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	B	From Face	0.50	0.0000	138.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	C	From Face	0.50	0.0000	138.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
Valmont Uni-Tri Bracket	C	None		0.0000	138.00	No Ice	1.75	1.75	0.29
(AT&T Existing)						1/2" Ice	1.94	1.94	0.31
						1" Ice	2.13	2.13	0.32
7770.00	A	From Face	3.00	0.0000	134.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			-7.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
QS66512-2	A	From Face	3.00	0.0000	134.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-3.50			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
80010965	A	From Face	3.00	0.0000	134.00	No Ice	13.81	5.83	0.11
(AT&T Existing)			3.50			1/2" Ice	14.35	6.32	0.19
			0.00			1" Ice	14.89	6.82	0.27
P65-16-XLH-RR	A	From Face	3.00	0.0000	134.00	No Ice	8.13	4.70	0.06
(AT&T Existing)			7.00			1/2" Ice	8.59	5.15	0.11
			0.00			1" Ice	9.05	5.60	0.16
7770.00	B	From Face	3.00	0.0000	134.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			-7.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
QS66512-2	B	From Face	3.00	0.0000	134.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-3.50			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
80010965	B	From Face	3.00	0.0000	134.00	No Ice	13.81	5.83	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T Existing)			3.50			1/2" Ice	14.35	6.32	0.19
			0.00			1" Ice	14.89	6.82	0.27
P65-16-XLH-RR	B	From Face	3.00	0.0000	134.00	No Ice	8.13	4.70	0.06
(AT&T Existing)			7.00			1/2" Ice	8.59	5.15	0.11
			0.00			1" Ice	9.05	5.60	0.16
7770.00	C	From Face	3.00	0.0000	134.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			-7.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
QS66512-2	C	From Face	3.00	0.0000	134.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-3.50			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
80010965	C	From Face	3.00	0.0000	134.00	No Ice	13.81	5.83	0.11
(AT&T Existing)			3.50			1/2" Ice	14.35	6.32	0.19
			0.00			1" Ice	14.89	6.82	0.27
P65-16-XLH-RR	C	From Face	3.00	0.0000	134.00	No Ice	8.13	4.70	0.06
(AT&T Existing)			7.00			1/2" Ice	8.59	5.15	0.11
			0.00			1" Ice	9.05	5.60	0.16
(2) LGP21401 TMA	A	From Face	3.00	0.0000	134.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	B	From Face	3.00	0.0000	134.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	C	From Face	3.00	0.0000	134.00	No Ice	0.82	0.35	0.02
(AT&T Existing)			-2.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) TPX-070821	A	From Face	3.00	0.0000	134.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			-2.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	B	From Face	3.00	0.0000	134.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			-2.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	C	From Face	3.00	0.0000	134.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			-2.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
RRUS-32	A	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	B	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	C	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			3.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	A	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-4.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	B	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-4.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
RRUS-32	C	From Face	0.50	0.0000	134.00	No Ice	3.31	2.42	0.08
(AT&T Existing)			-4.00			1/2" Ice	3.56	2.64	0.10
			0.00			1" Ice	3.81	2.86	0.14
B14 4478	A	From Face	0.50	0.0000	134.00	No Ice	1.84	1.06	0.06
(AT&T Existing)			-6.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09
B14 4478	B	From Face	0.50	0.0000	134.00	No Ice	1.84	1.06	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T Existing)			-6.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09
B14 4478	C	From Face	0.50	0.0000	134.00	No Ice	1.84	1.06	0.06
(AT&T Existing)			-6.00			1/2" Ice	2.01	1.20	0.08
			0.00			1" Ice	2.19	1.34	0.09
RRU	A	From Face	0.50	0.0000	134.00	No Ice	1.80	0.78	0.03
(AT&T Existing)			3.00			1/2" Ice	2.00	0.92	0.04
			0.00			1" Ice	2.20	1.06	0.06
RRU	B	From Face	0.50	0.0000	134.00	No Ice	1.80	0.78	0.03
(AT&T Existing)			3.00			1/2" Ice	2.00	0.92	0.04
			0.00			1" Ice	2.20	1.06	0.06
RRU	C	From Face	0.50	0.0000	134.00	No Ice	1.80	0.78	0.03
(AT&T Existing)			3.00			1/2" Ice	2.00	0.92	0.04
			0.00			1" Ice	2.20	1.06	0.06
CBC23SR-43	A	From Face	0.50	0.0000	134.00	No Ice	0.42	0.15	0.01
(AT&T Existing)			3.00			1/2" Ice	0.50	0.20	0.01
			0.00			1" Ice	0.59	0.27	0.01
CBC23SR-43	B	From Face	0.50	0.0000	134.00	No Ice	0.42	0.15	0.01
(AT&T Existing)			3.00			1/2" Ice	0.50	0.20	0.01
			0.00			1" Ice	0.59	0.27	0.01
CBC23SR-43	C	From Face	0.50	0.0000	134.00	No Ice	0.42	0.15	0.01
(AT&T Existing)			3.00			1/2" Ice	0.50	0.20	0.01
			0.00			1" Ice	0.59	0.27	0.01
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	134.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T Existing)			0.00			1" Ice	2.29	2.29	0.06
EEI 16-ft Low Profile	C	None		0.0000	134.00	No Ice	21.00	21.00	2.00
Platform						1/2" Ice	26.00	26.00	2.40
(AT&T Existing)						1" Ice	31.00	31.00	2.80
DB844H65E-XY	A	From Face	4.00	0.0000	124.00	No Ice	2.87	3.98	0.01
(Verizon Existing)			-6.00			1/2" Ice	3.18	4.29	0.04
			0.00			1" Ice	3.49	4.61	0.07
(2) QS6656-5D	A	From Face	4.00	0.0000	124.00	No Ice	8.13	6.80	0.10
(Verizon Existing)			0.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
64T65R MMU	A	From Face	4.00	0.0000	124.00	No Ice	4.71	1.84	0.08
(Verizon Existing)			4.00			1/2" Ice	5.00	2.06	0.11
			0.00			1" Ice	5.29	2.29	0.14
DB844H65E-XY	A	From Face	4.00	0.0000	124.00	No Ice	2.87	3.98	0.01
(Verizon Existing)			6.00			1/2" Ice	3.18	4.29	0.04
			0.00			1" Ice	3.49	4.61	0.07
DB844H65E-XY	B	From Face	4.00	0.0000	124.00	No Ice	2.87	3.98	0.01
(Verizon Existing)			-6.00			1/2" Ice	3.18	4.29	0.04
			0.00			1" Ice	3.49	4.61	0.07
(2) QS6656-5D	B	From Face	4.00	0.0000	124.00	No Ice	8.13	6.80	0.10
(Verizon Existing)			0.00			1/2" Ice	8.59	7.27	0.16
			0.00			1" Ice	9.05	7.72	0.22
64T65R MMU	B	From Face	4.00	0.0000	124.00	No Ice	4.71	1.84	0.08
(Verizon Existing)			4.00			1/2" Ice	5.00	2.06	0.11
			0.00			1" Ice	5.29	2.29	0.14
DB844H65E-XY	B	From Face	4.00	0.0000	124.00	No Ice	2.87	3.98	0.01
(Verizon Existing)			6.00			1/2" Ice	3.18	4.29	0.04
			0.00			1" Ice	3.49	4.61	0.07
DB844H65E-XY	C	From Face	4.00	0.0000	124.00	No Ice	2.87	3.98	0.01
(Verizon Existing)			-6.00			1/2" Ice	3.18	4.29	0.04
			0.00			1" Ice	3.49	4.61	0.07
(2) QS6656-5D	C	From Face	4.00	0.0000	124.00	No Ice	8.13	6.80	0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon Existing)			0.00				1/2" Ice	8.59	7.27	0.16
			0.00				1" Ice	9.05	7.72	0.22
64T65R MMU	C	From Face	4.00	0.0000	124.00		No Ice	4.71	1.84	0.08
(Verizon Existing)			4.00				1/2" Ice	5.00	2.06	0.11
			0.00				1" Ice	5.29	2.29	0.14
DB844H65E-XY	C	From Face	4.00	0.0000	124.00		No Ice	2.87	3.98	0.01
(Verizon Existing)			6.00				1/2" Ice	3.18	4.29	0.04
			0.00				1" Ice	3.49	4.61	0.07
B2/B66A RRH	A	From Face	4.00	0.0000	124.00		No Ice	2.54	1.61	0.06
(Verizon Existing)			4.00				1/2" Ice	2.75	1.79	0.08
			0.00				1" Ice	2.97	1.98	0.10
B2/B66A RRH	B	From Face	4.00	0.0000	124.00		No Ice	2.54	1.61	0.06
(Verizon Existing)			4.00				1/2" Ice	2.75	1.79	0.08
			0.00				1" Ice	2.97	1.98	0.10
B2/B66A RRH	C	From Face	4.00	0.0000	124.00		No Ice	2.54	1.61	0.06
(Verizon Existing)			4.00				1/2" Ice	2.75	1.79	0.08
			0.00				1" Ice	2.97	1.98	0.10
B5/B13 RRH	A	From Face	4.00	0.0000	124.00		No Ice	1.87	1.02	0.07
(Verizon Existing)			4.00				1/2" Ice	2.03	1.15	0.09
			0.00				1" Ice	2.21	1.29	0.11
B5/B13 RRH	B	From Face	4.00	0.0000	124.00		No Ice	1.87	1.02	0.07
(Verizon Existing)			4.00				1/2" Ice	2.03	1.15	0.09
			0.00				1" Ice	2.21	1.29	0.11
B5/B13 RRH	C	From Face	4.00	0.0000	124.00		No Ice	1.87	1.02	0.07
(Verizon Existing)			4.00				1/2" Ice	2.03	1.15	0.09
			0.00				1" Ice	2.21	1.29	0.11
CBRS Antenna/RRH	A	From Face	4.00	0.0000	124.00		No Ice	1.72	1.17	0.03
(Verizon Existing)			4.00				1/2" Ice	1.93	1.44	0.05
			0.00				1" Ice	2.14	1.71	0.07
CBRS Antenna/RRH	B	From Face	4.00	0.0000	124.00		No Ice	1.72	1.17	0.03
(Verizon Existing)			4.00				1/2" Ice	1.93	1.44	0.05
			0.00				1" Ice	2.14	1.71	0.07
CBRS Antenna/RRH	C	From Face	4.00	0.0000	124.00		No Ice	1.72	1.17	0.03
(Verizon Existing)			4.00				1/2" Ice	1.93	1.44	0.05
			0.00				1" Ice	2.14	1.71	0.07
RC2DC-3315-PF-48	A	From Face	1.00	0.0000	124.00		No Ice	3.01	1.96	0.03
(Verizon Existing)			1.00				1/2" Ice	3.23	2.15	0.05
			0.00				1" Ice	3.46	2.35	0.08
RC2DC-3315-PF-48	B	From Face	1.00	0.0000	124.00		No Ice	3.01	1.96	0.03
(Verizon Existing)			1.00				1/2" Ice	3.23	2.15	0.05
			0.00				1" Ice	3.46	2.35	0.08
Low Profile Platform	C	None			0.0000	124.00	No Ice	15.70	15.70	1.30
(Verizon Existing)							1/2" Ice	20.10	20.10	1.76
							1" Ice	24.50	24.50	2.23
531-70HD	A	From Face	3.00		0.0000	114.00	No Ice	6.00	6.00	0.04
(Eversource Existing)			-2.00				1/2" Ice	6.90	6.90	0.05
			0.00				1" Ice	7.80	7.80	0.06
DB586-Y	B	From Face	3.00		0.0000	114.00	No Ice	1.01	1.01	0.01
(Eversource Existing)			-6.00				1/2" Ice	1.28	1.28	0.02
			2.50				1" Ice	1.56	1.56	0.03
DB586-Y	B	From Face	3.00		0.0000	114.00	No Ice	1.01	1.01	0.01
(Eversource Existing)			-6.00				1/2" Ice	1.28	1.28	0.02
			-2.50				1" Ice	1.56	1.56	0.03
ANT150F2	B	From Face	3.00		0.0000	114.00	No Ice	1.30	1.30	0.02
(Eversource Existing)			2.00				1/2" Ice	1.60	1.60	0.02
			2.50				1" Ice	1.90	1.90	0.03
Tower Top Amplifier	B	From Face	3.00		0.0000	114.00	No Ice	2.67	1.03	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Eversource Existing)			-6.00			1/2" Ice	2.87	1.17	0.06
			0.00			1" Ice	3.08	1.32	0.08
872F-70-2	A	From Face	3.00	0.0000	116.00	No Ice	3.60	3.60	0.02
(Eversource Proposed)			6.00			1/2" Ice	5.00	5.00	0.04
			4.50			1" Ice	6.40	6.40	0.07
871F-70	A	From Face	3.00	0.0000	114.00	No Ice	2.40	2.40	0.01
(Eversource Proposed)			6.00			1/2" Ice	3.20	3.20	0.03
			-3.00			1" Ice	4.00	4.00	0.04
2 Std. 5' Horz Pipe	A	From Face	0.50	0.0000	116.00	No Ice	0.49	0.49	0.02
(Eversource Proposed)			0.00			1/2" Ice	1.00	1.00	0.12
			0.00			1" Ice	1.32	1.32	0.23
2 Std. 5' Horz Pipe	A	From Face	0.50	0.0000	114.00	No Ice	0.49	0.49	0.02
(Eversource Proposed)			0.00			1/2" Ice	1.00	1.00	0.12
			0.00			1" Ice	1.32	1.32	0.23
Low Profile Platform	C	None		0.0000	114.00	No Ice	15.70	15.70	1.30
						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
GPS	A	From Face	1.50	0.0000	51.50	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
GPS	B	From Face	1.50	0.0000	51.50	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
GPS	C	From Face	1.50	0.0000	51.50	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
4 FT DISH	A	Paraboloid	From	1.00	Worst		160.00	4.00	No Ice	12.56	0.17
(Town Existing)		w/Shroud (HP)	Leg	0.00					1/2" Ice	13.09	0.24
				0.00					1" Ice	13.62	0.30
4 FT DISH	B	Paraboloid	From	1.00	Worst		160.00	4.00	No Ice	12.56	0.17
(Town Existing)		w/Shroud (HP)	Leg	0.00					1/2" Ice	13.09	0.24
				0.00					1" Ice	13.62	0.30
2 FT DISH	C	Paraboloid	From	1.00	Worst		160.00	2.00	No Ice	3.14	0.03
(Town Existing)		w/Shroud (HP)	Leg	0.00					1/2" Ice	3.41	0.04
				0.00					1" Ice	3.67	0.06
A-Ant-23G-2-C	A	Paraboloid	From	3.10	Worst		154.00	2.17	No Ice	3.72	0.03
(Clearwire Existing)		w/Radome	Face	-2.52					1/2" Ice	4.01	0.05
				2.00					1" Ice	4.30	0.07
A-Ant-23G-2-C	C	Paraboloid	From	3.80	Worst		154.00	2.17	No Ice	3.72	0.03
(Clearwire Existing)		w/Radome	Face	-1.24					1/2" Ice	4.01	0.05
				2.00					1" Ice	4.30	0.07

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	147.50	1.374	56	137.953	A	0.000	137.953	137.953	100.00	0.000	0.000
164.00-131.50					B	0.000	137.953		100.00	7.425	0.000
					C	0.000	137.953		100.00	0.000	0.000
L2	125.34	1.327	55	56.545	A	0.000	56.545	56.545	100.00	0.000	0.000
131.50-119.29					B	0.000	56.545		100.00	7.253	0.000
					C	0.000	56.545		100.00	0.000	0.000
L3	98.81	1.262	52	202.275	A	0.000	202.275	202.275	100.00	0.000	0.000
119.29-78.79					B	0.000	202.275		100.00	24.057	0.000
					C	0.000	202.275		100.00	0.000	0.000
L4 78.79-39.88	59.30	1.134	46	216.653	A	0.000	216.653	216.653	100.00	0.000	0.000
					B	0.000	216.653		100.00	26.982	0.000
					C	0.000	216.653		100.00	0.000	0.000
L5 39.88-1.50	21.06	0.912	38	234.431	A	0.000	234.431	234.431	100.00	0.000	0.000
					B	0.000	234.431		100.00	31.015	0.000
					C	0.000	234.431		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G 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	147.50	1.374	8	1.3357	145.188	A	0.000	145.188	145.188	100.00	0.000	0.000
164.00-131.50						B	0.000	145.188		100.00	13.455	0.000
						C	0.000	145.188		100.00	0.000	0.000
L2	125.34	1.327	8	1.3142	59.219	A	0.000	59.219	59.219	100.00	0.000	0.000
131.50-119.29						B	0.000	59.219		100.00	13.077	0.000
						C	0.000	59.219		100.00	0.000	0.000
L3 119.29-78.79	98.81	1.262	8	1.2833	211.145	A	0.000	211.145	211.145	100.00	0.000	0.000
						B	0.000	211.145		100.00	43.377	0.000
						C	0.000	211.145		100.00	0.000	0.000
L4 78.79-39.88	59.30	1.134	7	1.2194	224.976	A	0.000	224.976	224.976	100.00	0.000	0.000
						B	0.000	224.976		100.00	49.939	0.000
						C	0.000	224.976		100.00	0.000	0.000
L5 39.88-1.50	21.06	0.912	6	1.0995	242.231	A	0.000	242.231	242.231	100.00	0.000	0.000
						B	0.000	242.231		100.00	59.426	0.000
						C	0.000	242.231		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G 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	147.50	1.374	11	137.953	A	0.000	137.953	137.953	100.00	0.000	0.000
164.00-131.50					B	0.000	137.953		100.00	7.425	0.000
					C	0.000	137.953		100.00	0.000	0.000
L2	125.34	1.327	10	56.545	A	0.000	56.545	56.545	100.00	0.000	0.000
131.50-119.29					B	0.000	56.545		100.00	7.253	0.000
					C	0.000	56.545		100.00	0.000	0.000
L3	98.81	1.262	10	202.275	A	0.000	202.275	202.275	100.00	0.000	0.000
119.29-78.79					B	0.000	202.275		100.00	24.057	0.000
					C	0.000	202.275		100.00	0.000	0.000
L4 78.79-39.88	59.30	1.134	9	216.653	A	0.000	216.653	216.653	100.00	0.000	0.000
					B	0.000	216.653		100.00	26.982	0.000
					C	0.000	216.653		100.00	0.000	0.000
L5 39.88-1.50	21.06	0.912	7	234.431	A	0.000	234.431	234.431	100.00	0.000	0.000
					B	0.000	234.431		100.00	31.015	0.000
					C	0.000	234.431		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	56	1	1	137.953	6.25	192.35	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	55	1	1	56.545	2.48	202.86	C
131.50-119.29			B	1	0.73		1	1	56.545			
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	52	1	1	202.275	8.42	207.82	C
119.29-78.79			B	1	0.73		1	1	202.275			
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	46	1	1	216.653	8.08	207.63	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	38	1	1	234.431	7.08	184.48	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	2643.93 kip-ft	32.30		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	56	1	1	137.953	6.25	192.35	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	55	1	1	56.545	2.48	202.86	C
131.50-119.29			B	1	0.73		1	1	56.545			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	52	1	1	202.275	8.42	207.82	C
119.29-78.79			B	1	0.73		1	1	202.275			
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	46	1	1	216.653	8.08	207.63	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	38	1	1	234.431	7.08	184.48	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	2643.93 kip-ft	32.30		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	56	1	1	137.953	6.25	192.35	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	55	1	1	56.545	2.53	207.05	B
131.50-119.29			B	1	0.745		1	1	56.545			
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	52	1	1	202.275	8.42	207.82	C
119.29-78.79			B	1	0.73		1	1	202.275			
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	46	1	1	216.653	8.08	207.63	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	38	1	1	234.431	7.08	184.48	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	2650.27 kip-ft	32.35		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.99	8.24	A	1	1.2	8	1	1	145.188	1.60	49.23	C
164.00-131.50			B	1	1.2		1	1	145.188			
			C	1	1.2		1	1	145.188			
L2	0.86	3.80	A	1	1.2	8	1	1	59.219	0.63	51.66	C
131.50-119.29			B	1	1.2		1	1	59.219			
			C	1	1.2		1	1	59.219			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3	3.42	16.63	A	1	1.2	8	1	1	210.937	2.13	52.70	C
119.29-78.79			B	1	1.2		1	1	210.937			
			C	1	1.2		1	1	210.937			
L4	3.39	22.48	A	1	1.2	7	1	1	224.561	2.04	52.33	C
78.79-39.88			B	1	1.2		1	1	224.561			
			C	1	1.2		1	1	224.561			
L5 39.88-1.50	3.01	24.31	A	1	1.2	6	1	1	241.464	1.77	46.20	C
			B	1	1.2		1	1	241.464			
			C	1	1.2		1	1	241.464			
Sum Weight:	11.67	75.46						OTM	671.78 kip-ft	8.17		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.99	8.24	A	1	1.2	8	1	1	145.188	1.60	49.23	C
164.00-131.50			B	1	1.2		1	1	145.188			
			C	1	1.2		1	1	145.188			
L2	0.86	3.80	A	1	1.2	8	1	1	59.219	0.63	51.66	C
131.50-119.29			B	1	1.2		1	1	59.219			
			C	1	1.2		1	1	59.219			
L3	3.42	16.63	A	1	1.2	8	1	1	210.937	2.13	52.70	C
119.29-78.79			B	1	1.2		1	1	210.937			
			C	1	1.2		1	1	210.937			
L4	3.39	22.48	A	1	1.2	7	1	1	224.561	2.04	52.33	C
78.79-39.88			B	1	1.2		1	1	224.561			
			C	1	1.2		1	1	224.561			
L5 39.88-1.50	3.01	24.31	A	1	1.2	6	1	1	241.464	1.77	46.20	C
			B	1	1.2		1	1	241.464			
			C	1	1.2		1	1	241.464			
Sum Weight:	11.67	75.46						OTM	671.78 kip-ft	8.17		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.99	8.24	A	1	1.2	8	1	1	145.188	1.60	49.23	C
164.00-131.50			B	1	1.2		1	1	145.188			
			C	1	1.2		1	1	145.188			
L2	0.86	3.80	A	1	1.2	8	1	1	59.219	0.63	51.66	C
131.50-119.29			B	1	1.2		1	1	59.219			
			C	1	1.2		1	1	59.219			
L3	3.42	16.63	A	1	1.2	8	1	1	210.937	2.13	52.70	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
119.29-78.79			B	1	1.2		1	1	210.937			
			C	1	1.2		1	1	210.937			
L4	3.39	22.48	A	1	1.2	7	1	1	224.561	2.04	52.33	C
78.79-39.88			B	1	1.2		1	1	224.561			
			C	1	1.2		1	1	224.561			
L5 39.88-1.50	3.01	24.31	A	1	1.2	6	1	1	241.464	1.77	46.20	C
			B	1	1.2		1	1	241.464			
			C	1	1.2		1	1	241.464			
Sum Weight:	11.67	75.46						OTM	671.78 kip-ft	8.17		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	11	1	1	137.953	1.19	36.66	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	10	1	1	56.545	0.47	38.66	C
131.50-119.29			B	1	0.73		1	1	56.545			
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	10	1	1	202.275	1.60	39.61	C
119.29-78.79			B	1	0.73		1	1	202.275			
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	9	1	1	216.653	1.54	39.57	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	7	1	1	234.431	1.35	35.16	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	503.92 kip-ft	6.16		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	11	1	1	137.953	1.19	36.66	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	10	1	1	56.545	0.47	38.66	C
131.50-119.29			B	1	0.73		1	1	56.545			
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	10	1	1	202.275	1.60	39.61	C
119.29-78.79			B	1	0.73		1	1	202.275			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	9	1	1	216.653	1.54	39.57	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	7	1	1	234.431	1.35	35.16	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	503.92 kip-ft	6.16		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	5.47	A	1	0.73	11	1	1	137.953	1.19	36.66	C
164.00-131.50			B	1	0.73		1	1	137.953			
			C	1	0.73		1	1	137.953			
L2	0.74	2.69	A	1	0.73	10	1	1	56.545	0.48	39.46	B
131.50-119.29			B	1	0.745		1	1	56.545			
			C	1	0.73		1	1	56.545			
L3	3.02	12.76	A	1	0.73	10	1	1	202.275	1.60	39.61	C
119.29-78.79			B	1	0.73		1	1	202.275			
			C	1	0.73		1	1	202.275			
L4	2.94	18.55	A	1	0.73	9	1	1	216.653	1.54	39.57	C
78.79-39.88			B	1	0.73		1	1	216.653			
			C	1	0.73		1	1	216.653			
L5 39.88-1.50	2.50	20.49	A	1	0.73	7	1	1	234.431	1.35	35.16	C
			B	1	0.73		1	1	234.431			
			C	1	0.73		1	1	234.431			
Sum Weight:	10.07	59.96						OTM	505.13 kip-ft	6.17		

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	59.96					
Bracing Weight	0.00					
Total Member Self-Weight	59.96			-2.56	-1.49	
Total Weight	87.81			-2.56	-1.49	
Wind 0 deg - No Ice		0.09	-63.26	-6968.98	-13.38	-4.86
Wind 30 deg - No Ice		31.80	-54.83	-6041.60	-3507.36	-6.51
Wind 60 deg - No Ice		54.99	-31.71	-3496.07	-6061.94	-6.42
Wind 90 deg - No Ice		63.45	-0.09	-14.45	-6992.62	-4.61
Wind 120 deg - No Ice		54.90	31.55	3470.35	-6050.04	-1.56

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 150 deg - No Ice		31.67	54.79	6030.08	-3489.93	1.90
Wind 180 deg - No Ice		-0.09	63.26	6963.87	10.40	4.86
Wind 210 deg - No Ice		-31.80	54.83	6036.49	3504.38	6.51
Wind 240 deg - No Ice		-54.99	31.71	3490.95	6058.96	6.42
Wind 270 deg - No Ice		-63.45	0.09	9.34	6989.65	4.61
Wind 300 deg - No Ice		-54.90	-31.55	-3475.47	6047.07	1.56
Wind 330 deg - No Ice		-31.67	-54.79	-6035.20	3486.95	-1.90
Member Ice	15.50					
Total Weight Ice	124.38			-7.50	-2.70	
Wind 0 deg - Ice		0.01	-14.45	-1557.22	-4.55	-1.38
Wind 30 deg - Ice		7.25	-12.52	-1350.52	-781.13	-1.77
Wind 60 deg - Ice		12.55	-7.24	-783.96	-1349.13	-1.69
Wind 90 deg - Ice		14.48	-0.01	-9.35	-1556.35	-1.15
Wind 120 deg - Ice		12.53	7.21	765.76	-1347.28	-0.31
Wind 150 deg - Ice		7.23	12.51	1333.67	-777.92	0.61
Wind 180 deg - Ice		-0.01	14.45	1542.22	-0.85	1.38
Wind 210 deg - Ice		-7.25	12.52	1335.52	775.73	1.77
Wind 240 deg - Ice		-12.55	7.24	768.96	1343.74	1.69
Wind 270 deg - Ice		-14.48	0.01	-5.65	1550.96	1.15
Wind 300 deg - Ice		-12.53	-7.21	-780.76	1341.89	0.31
Wind 330 deg - Ice		-7.23	-12.51	-1348.67	772.53	-0.61
Total Weight	87.81			-2.56	-1.49	
Wind 0 deg - Service		0.02	-12.08	-1333.36	-1.73	-1.04
Wind 30 deg - Service		6.07	-10.47	-1156.04	-669.77	-1.31
Wind 60 deg - Service		10.50	-6.06	-669.34	-1158.19	-1.22
Wind 90 deg - Service		12.12	-0.02	-3.66	-1336.14	-0.81
Wind 120 deg - Service		10.49	6.03	662.63	-1155.93	-0.18
Wind 150 deg - Service		6.05	10.46	1152.04	-666.44	0.49
Wind 180 deg - Service		-0.02	12.08	1330.58	2.80	1.04
Wind 210 deg - Service		-6.07	10.47	1153.26	670.83	1.31
Wind 240 deg - Service		-10.50	6.06	666.56	1159.26	1.22
Wind 270 deg - Service		-12.12	0.02	0.88	1337.21	0.81
Wind 300 deg - Service		-10.49	-6.03	-665.41	1157.00	0.18
Wind 330 deg - Service		-6.05	-10.46	-1154.82	667.51	-0.49

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice

Comb. No.	Description
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	164 - 131.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-40.53	1.31	0.85
			Max. Mx	20	-22.81	496.89	-0.23
			Max. My	2	-22.82	-0.72	495.10
			Max. Vy	8	30.68	-496.36	1.62
			Max. Vx	2	-30.59	-0.72	495.10
			Max. Torque	2			3.94
L2	131.5 - 119.29	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-43.23	1.10	0.97
			Max. Mx	20	-24.87	691.28	-0.47
			Max. My	2	-24.87	-1.10	689.09
			Max. Vy	8	31.97	-690.92	2.00
			Max. Vx	2	-31.88	-1.10	689.09
			Max. Torque	24			2.84
L3	119.29 - 78.79	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-75.76	1.23	5.57
			Max. Mx	8	-47.09	-2319.78	6.42
			Max. My	2	-47.09	-4.51	2312.54
			Max. Vy	8	47.53	-2319.78	6.42
			Max. Vx	2	-47.34	-4.51	2312.54

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	4			6.56
L4	78.79 - 39.88	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-104.97	-0.46	6.55
			Max. Mx	8	-71.50	-4284.00	10.38
			Max. My	2	-71.51	-8.66	4269.35
			Max. Vy	8	55.54	-4284.00	10.38
			Max. Vx	2	-55.35	-8.66	4269.35
			Max. Torque	4			6.56
L5	39.88 - 1.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-144.28	-2.99	8.01
			Max. Mx	8	-105.35	-7133.01	15.29
			Max. My	2	-105.35	-13.96	7109.13
			Max. Vy	8	63.48	-7133.01	15.29
			Max. Vx	2	-63.30	-13.96	7109.13
			Max. Torque	4			6.55

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	144.28	0.00	0.00
	Max. H_x	20	105.37	63.45	-0.09
	Max. H_z	2	105.37	-0.09	63.26
	Max. M_x	2	7109.13	-0.09	63.26
	Max. M_z	8	7133.01	-63.45	0.09
	Max. Torsion	4	6.55	-31.80	54.83
	Min. Vert	13	79.03	-31.67	-54.79
	Min. H_x	8	105.37	-63.45	0.09
	Min. H_z	14	105.37	0.09	-63.26
	Min. M_x	14	-7102.83	0.09	-63.26
	Min. M_z	20	-7129.39	63.45	-0.09
	Min. Torsion	16	-6.55	31.80	-54.83

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	87.81	0.00	0.00	-2.56	-1.49	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	105.37	0.09	-63.26	-7109.13	-13.96	-4.89
0.9 Dead+1.0 Wind 0 deg - No Ice	79.03	0.09	-63.26	-7072.43	-13.44	-4.88
1.2 Dead+1.0 Wind 30 deg - No Ice	105.37	31.80	-54.83	-6163.17	-3577.94	-6.55
0.9 Dead+1.0 Wind 30 deg - No Ice	79.03	31.80	-54.83	-6131.25	-3559.41	-6.54
1.2 Dead+1.0 Wind 60 deg - No Ice	105.37	54.99	-31.71	-3566.64	-6183.69	-6.46
0.9 Dead+1.0 Wind 60 deg - No Ice	79.03	54.99	-31.71	-3547.84	-6151.99	-6.44
1.2 Dead+1.0 Wind 90 deg - No	105.37	63.45	-0.09	-15.29	-7133.01	-4.63

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Ice						
0.9 Dead+1.0 Wind 90 deg - No Ice	79.03	63.45	-0.09	-14.42	-7096.53	-4.62
1.2 Dead+1.0 Wind 120 deg - No Ice	105.37	54.90	31.55	3539.32	-6171.55	-1.57
0.9 Dead+1.0 Wind 120 deg - No Ice	79.03	54.90	31.55	3522.23	-6139.92	-1.57
1.2 Dead+1.0 Wind 150 deg - No Ice	105.37	31.67	54.79	6150.33	-3560.14	1.92
0.9 Dead+1.0 Wind 150 deg - No Ice	79.03	31.67	54.79	6120.05	-3541.71	1.91
1.2 Dead+1.0 Wind 180 deg - No Ice	105.37	-0.09	63.26	7102.83	10.32	4.89
0.9 Dead+1.0 Wind 180 deg - No Ice	79.03	-0.09	63.26	7067.74	10.72	4.88
1.2 Dead+1.0 Wind 210 deg - No Ice	105.37	-31.80	54.83	6156.87	3574.30	6.55
0.9 Dead+1.0 Wind 210 deg - No Ice	79.03	-31.80	54.83	6126.56	3556.69	6.54
1.2 Dead+1.0 Wind 240 deg - No Ice	105.37	-54.99	31.71	3560.35	6180.05	6.46
0.9 Dead+1.0 Wind 240 deg - No Ice	79.03	-54.99	31.71	3543.15	6149.28	6.45
1.2 Dead+1.0 Wind 270 deg - No Ice	105.37	-63.45	0.09	8.99	7129.39	4.64
0.9 Dead+1.0 Wind 270 deg - No Ice	79.03	-63.45	0.09	9.73	7093.82	4.63
1.2 Dead+1.0 Wind 300 deg - No Ice	105.37	-54.90	-31.55	-3545.62	6167.92	1.57
0.9 Dead+1.0 Wind 300 deg - No Ice	79.03	-54.90	-31.55	-3526.93	6137.21	1.57
1.2 Dead+1.0 Wind 330 deg - No Ice	105.37	-31.67	-54.79	-6156.64	3556.51	-1.92
0.9 Dead+1.0 Wind 330 deg - No Ice	79.03	-31.67	-54.79	-6124.75	3538.99	-1.91
1.2 Dead+1.0 Ice+1.0 Temp	144.28	0.00	0.00	-8.01	-2.99	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	144.28	0.01	-14.45	-1606.81	-4.93	-1.40
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	144.28	7.25	-12.52	-1393.61	-805.93	-1.80
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	144.28	12.55	-7.24	-809.24	-1391.80	-1.72
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	144.28	14.48	-0.01	-10.27	-1605.54	-1.17
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	144.28	12.53	7.21	789.22	-1389.89	-0.31
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	144.28	7.23	12.51	1374.99	-802.62	0.63
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	144.28	-0.01	14.45	1590.10	-1.11	1.40
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	144.28	-7.25	12.52	1376.90	799.90	1.80
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	144.28	-12.55	7.24	792.53	1385.77	1.72
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	144.28	-14.48	0.01	-6.45	1599.51	1.17
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	144.28	-12.53	-7.21	-805.93	1383.85	0.31
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	144.28	-7.23	-12.51	-1391.70	796.59	-0.63
Dead+Wind 0 deg - Service	87.81	0.02	-12.08	-1356.97	-3.81	-1.05

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
Dead+Wind 30 deg - Service	87.81	6.07	-10.47	-1176.68	-683.08	-1.32
Dead+Wind 60 deg - Service	87.81	10.50	-6.06	-681.79	-1179.72	-1.23
Dead+Wind 90 deg - Service	87.81	12.12	-0.02	-4.92	-1360.66	-0.82
Dead+Wind 120 deg - Service	87.81	10.49	6.03	672.57	-1177.41	-0.18
Dead+Wind 150 deg - Service	87.81	6.05	10.46	1170.20	-679.70	0.50
Dead+Wind 180 deg - Service	87.81	-0.02	12.08	1351.74	0.80	1.05
Dead+Wind 210 deg - Service	87.81	-6.07	10.47	1171.45	680.06	1.31
Dead+Wind 240 deg - Service	87.81	-10.50	6.06	676.56	1176.70	1.23
Dead+Wind 270 deg - Service	87.81	-12.12	0.02	-0.31	1357.64	0.82
Dead+Wind 300 deg - Service	87.81	-10.49	-6.03	-677.80	1174.40	0.18
Dead+Wind 330 deg - Service	87.81	-6.05	-10.46	-1175.44	676.68	-0.50

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-87.81	0.00	0.00	87.81	0.00	0.000%
2	0.09	-105.37	-63.26	-0.09	105.37	63.26	0.000%
3	0.09	-79.03	-63.26	-0.09	79.03	63.26	0.000%
4	31.80	-105.37	-54.83	-31.80	105.37	54.83	0.000%
5	31.80	-79.03	-54.83	-31.80	79.03	54.83	0.000%
6	54.99	-105.37	-31.71	-54.99	105.37	31.71	0.000%
7	54.99	-79.03	-31.71	-54.99	79.03	31.71	0.000%
8	63.45	-105.37	-0.09	-63.45	105.37	0.09	0.000%
9	63.45	-79.03	-0.09	-63.45	79.03	0.09	0.000%
10	54.90	-105.37	31.55	-54.90	105.37	-31.55	0.000%
11	54.90	-79.03	31.55	-54.90	79.03	-31.55	0.000%
12	31.67	-105.37	54.79	-31.67	105.37	-54.79	0.000%
13	31.67	-79.03	54.79	-31.67	79.03	-54.79	0.000%
14	-0.09	-105.37	63.26	0.09	105.37	-63.26	0.000%
15	-0.09	-79.03	63.26	0.09	79.03	-63.26	0.000%
16	-31.80	-105.37	54.83	31.80	105.37	-54.83	0.000%
17	-31.80	-79.03	54.83	31.80	79.03	-54.83	0.000%
18	-54.99	-105.37	31.71	54.99	105.37	-31.71	0.000%
19	-54.99	-79.03	31.71	54.99	79.03	-31.71	0.000%
20	-63.45	-105.37	0.09	63.45	105.37	-0.09	0.000%
21	-63.45	-79.03	0.09	63.45	79.03	-0.09	0.000%
22	-54.90	-105.37	-31.55	54.90	105.37	31.55	0.000%
23	-54.90	-79.03	-31.55	54.90	79.03	31.55	0.000%
24	-31.67	-105.37	-54.79	31.67	105.37	54.79	0.000%
25	-31.67	-79.03	-54.79	31.67	79.03	54.79	0.000%
26	0.00	-144.28	0.00	0.00	144.28	0.00	0.000%
27	0.01	-144.28	-14.45	-0.01	144.28	14.45	0.000%
28	7.25	-144.28	-12.52	-7.25	144.28	12.52	0.000%
29	12.55	-144.28	-7.24	-12.55	144.28	7.24	0.000%
30	14.48	-144.28	-0.01	-14.48	144.28	0.01	0.000%
31	12.53	-144.28	7.21	-12.53	144.28	-7.21	0.000%
32	7.23	-144.28	12.51	-7.23	144.28	-12.51	0.000%
33	-0.01	-144.28	14.45	0.01	144.28	-14.45	0.000%
34	-7.25	-144.28	12.52	7.25	144.28	-12.52	0.000%
35	-12.55	-144.28	7.24	12.55	144.28	-7.24	0.000%
36	-14.48	-144.28	0.01	14.48	144.28	-0.01	0.000%
37	-12.53	-144.28	-7.21	12.53	144.28	7.21	0.000%
38	-7.23	-144.28	-12.51	7.23	144.28	12.51	0.000%
39	0.02	-87.81	-12.08	-0.02	87.81	12.08	0.000%
40	6.07	-87.81	-10.47	-6.07	87.81	10.47	0.000%
41	10.50	-87.81	-6.06	-10.50	87.81	6.06	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
42	12.12	-87.81	-0.02	-12.12	87.81	0.02	0.000%
43	10.49	-87.81	6.03	-10.49	87.81	-6.03	0.000%
44	6.05	-87.81	10.46	-6.05	87.81	-10.46	0.000%
45	-0.02	-87.81	12.08	0.02	87.81	-12.08	0.000%
46	-6.07	-87.81	10.47	6.07	87.81	-10.47	0.000%
47	-10.50	-87.81	6.06	10.50	87.81	-6.06	0.000%
48	-12.12	-87.81	0.02	12.12	87.81	-0.02	0.000%
49	-10.49	-87.81	-6.03	10.49	87.81	6.03	0.000%
50	-6.05	-87.81	-10.46	6.05	87.81	10.46	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	0.00031649
3	Yes	4	0.00000001	0.00020475
4	Yes	5	0.00000001	0.00004585
5	Yes	5	0.00000001	0.00002169
6	Yes	5	0.00000001	0.00005465
7	Yes	5	0.00000001	0.00002606
8	Yes	4	0.00000001	0.00027961
9	Yes	4	0.00000001	0.00017922
10	Yes	5	0.00000001	0.00004838
11	Yes	5	0.00000001	0.00002298
12	Yes	5	0.00000001	0.00004759
13	Yes	5	0.00000001	0.00002259
14	Yes	4	0.00000001	0.00033239
15	Yes	4	0.00000001	0.00021535
16	Yes	5	0.00000001	0.00005469
17	Yes	5	0.00000001	0.00002611
18	Yes	5	0.00000001	0.00004584
19	Yes	5	0.00000001	0.00002170
20	Yes	4	0.00000001	0.00026339
21	Yes	4	0.00000001	0.00016844
22	Yes	5	0.00000001	0.00004997
23	Yes	5	0.00000001	0.00002375
24	Yes	5	0.00000001	0.00005102
25	Yes	5	0.00000001	0.00002428
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00097916
28	Yes	5	0.00000001	0.00003848
29	Yes	5	0.00000001	0.00003853
30	Yes	4	0.00000001	0.00097412
31	Yes	5	0.00000001	0.00003799
32	Yes	5	0.00000001	0.00003786
33	Yes	4	0.00000001	0.00096456
34	Yes	5	0.00000001	0.00003806
35	Yes	5	0.00000001	0.00003808
36	Yes	4	0.00000001	0.00097393
37	Yes	5	0.00000001	0.00003835
38	Yes	5	0.00000001	0.00003841
39	Yes	4	0.00000001	0.00002055
40	Yes	4	0.00000001	0.00002897
41	Yes	4	0.00000001	0.00003579
42	Yes	4	0.00000001	0.00001779

43	Yes	4	0.00000001	0.00002817
44	Yes	4	0.00000001	0.00002738
45	Yes	4	0.00000001	0.00002052
46	Yes	4	0.00000001	0.00003653
47	Yes	4	0.00000001	0.00002818
48	Yes	4	0.00000001	0.00001770
49	Yes	4	0.00000001	0.00002884
50	Yes	4	0.00000001	0.00003152

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	164 - 131.5	8.292	41	0.3836	0.0014
L2	131.5 - 119.29	5.720	41	0.3643	0.0010
L3	125.29 - 78.79	5.252	41	0.3557	0.0010
L4	87.21 - 39.88	2.695	41	0.2702	0.0005
L5	49.13 - 1.5	0.909	41	0.1649	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
164.00	12' x 3" Dia Omni	41	8.292	0.3836	0.0014	298610
160.00	4 FT DISH	41	7.970	0.3824	0.0014	298610
156.00	A-Ant-23G-2-C	41	7.648	0.3811	0.0013	186631
154.00	LLPX310R	41	7.488	0.3804	0.0013	149305
151.50	Remote Radio Head FD R6 RRH	41	7.288	0.3794	0.0012	119444
144.00	AIR6449	41	6.692	0.3755	0.0011	74652
138.00	DC6-48-60-18-8F Surge Arrestor	41	6.221	0.3710	0.0011	57425
134.00	7770.00	41	5.912	0.3671	0.0010	49705
124.00	DB844H65E-XY	41	5.156	0.3536	0.0010	35985
116.00	872F-70-2	41	4.575	0.3391	0.0009	32346
114.00	531-70HD	41	4.433	0.3350	0.0009	31596
51.50	GPS	41	0.989	0.1721	0.0003	14328

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	164 - 131.5	43.416	6	2.0075	0.0069
L2	131.5 - 119.29	29.960	6	1.9074	0.0050
L3	125.29 - 78.79	27.508	6	1.8625	0.0048
L4	87.21 - 39.88	14.122	6	1.4156	0.0027
L5	49.13 - 1.5	4.762	6	0.8639	0.0013

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
164.00	12' x 3" Dia Omni	6	43.416	2.0075	0.0069	57912
160.00	4 FT DISH	6	41.731	2.0015	0.0066	57912
156.00	A-Ant-23G-2-C	6	40.048	1.9950	0.0063	36195
154.00	LLPX310R	6	39.209	1.9913	0.0062	28956
151.50	Remote Radio Head FD R6 RRH	6	38.162	1.9862	0.0060	23164
144.00	AIR6449	6	35.044	1.9660	0.0056	14477
138.00	DC6-48-60-18-8F Surge Arrestor	6	32.583	1.9426	0.0052	11136
134.00	7770.00	6	30.962	1.9223	0.0051	9636
124.00	DB844H65E-XY	6	27.006	1.8518	0.0047	6910
116.00	872F-70-2	6	23.963	1.7759	0.0044	6204
114.00	531-70HD	6	23.221	1.7547	0.0043	6059
51.50	GPS	6	5.182	0.9017	0.0013	2736

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	164 - 131.5 (1)	TP53.42x47x0.3125	32.50	162.50	103.4	52.6760	-22.81	1112.38	0.021
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	12.21	162.50	100.9	64.7894	-24.87	1437.35	0.017
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	46.50	162.50	90.2	84.5934	-47.08	2284.89	0.021
L4	78.79 - 39.88 (4)	TP69.66x60.4813x0.5625	47.33	162.50	81.6	120.1620	-71.50	3732.12	0.019
L5	39.88 - 1.5 (5)	TP76x66.7412x0.5625	47.63	162.50	72.8	134.6840	-105.35	4759.96	0.022

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	164 - 131.5 (1)	TP53.42x47x0.3125	496.97	3478.16	0.143	0.00	3478.16	0.000
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	691.69	4715.67	0.147	0.00	4715.67	0.000
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	2322.24	7005.47	0.331	0.00	7005.47	0.000
L4	78.79 - 39.88 (4)	TP69.66x60.4813x0.5625	4287.82	11587.92	0.370	0.00	11587.92	0.000
L5	39.88 - 1.5 (5)	TP76x66.7412x0.5625	7138.55	14008.00	0.510	0.00	14008.00	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	164 - 131.5 (1)	TP53.42x47x0.3125	30.70	924.46	0.033	0.62	4299.57	0.000
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	31.99	1137.05	0.028	0.62	5420.35	0.000
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	47.56	1484.61	0.032	6.46	7920.37	0.001
L4	78.79 - 39.88 (4)	TP69.66x60.4813x0.5625	55.57	2108.85	0.026	6.46	12429.83	0.001
L5	39.88 - 1.5 (5)	TP76x66.7412x0.5625	63.52	2363.71	0.027	6.46	15615.67	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	164 - 131.5 (1)	0.021	0.143	0.000	0.033	0.000	0.165 ✔	1.000	4.8.2 ✔
L2	131.5 - 119.29 (2)	0.017	0.147	0.000	0.028	0.000	0.165 ✔	1.000	4.8.2 ✔
L3	119.29 - 78.79 (3)	0.021	0.331	0.000	0.032	0.001	0.353 ✔	1.000	4.8.2 ✔
L4	78.79 - 39.88 (4)	0.019	0.370	0.000	0.026	0.001	0.390 ✔	1.000	4.8.2 ✔
L5	39.88 - 1.5 (5)	0.022	0.510	0.000	0.027	0.000	0.532 ✔	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	164 - 131.5	Pole	TP53.42x47x0.3125	1	-22.81	1112.38	16.5	Pass
L2	131.5 - 119.29	Pole	TP56.15x53.42x0.375	2	-24.87	1437.35	16.5	Pass
L3	119.29 - 78.79	Pole	TP62.97x54.0585x0.4375	3	-47.08	2284.89	35.3	Pass
L4	78.79 - 39.88	Pole	TP69.66x60.4813x0.5625	4	-71.50	3732.12	39.0	Pass
L5	39.88 - 1.5	Pole	TP76x66.7412x0.5625	5	-105.35	4759.96	53.2	Pass
							Summary	
						Pole (L5)	53.2	Pass
						RATING =	**53.2**	**Pass**

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Subject:	Flange Bolts and Flangeplate Analysis
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 2: 1/24/22	Prepared by: T.J.L. Checked by: C.F.C. Job No. 21009.00

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 497·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 31·kips	(Input From tnxTower)
Axial Force =	Axial := 41·kips	(Input From tnxTower)

Flange Bolt Data:

Use AST MA325

Number of Flange Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 58·in	(User Input)
Bolt Minimum Tensile Strength =	F_{ub} := 120·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 1.00·in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

Use AST MA36

Plate Yield Strength =	Fy_{bp} := 36·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.0·in	(User Input)
Flange Plate Diameter =	D_{bp} := 61.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 53.42·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 29 \cdot in$

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

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

$d_1 = 14.50 \cdot in$ $d_7 = -14.50 \cdot in$

$d_2 = 25.11 \cdot in$ $d_8 = -25.11 \cdot in$

$d_3 = 29.00 \cdot in$ $d_9 = -29.00 \cdot in$

$d_4 = 25.11 \cdot in$ $d_{10} = -25.11 \cdot in$

$d_5 = 14.50 \cdot in$ $d_{11} = -14.50 \cdot in$

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

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 26.71 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 2.29 \cdot in$ $MA_9 = 0.00 \cdot in$

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

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

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

Effective Width of Flangeplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 23.6 \cdot in$

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 5.046 \times 10^3 \cdot in^2$

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

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

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

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

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

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 30.9 \cdot kips$

Maximum Shear Force = $V_{Max} := \frac{Shear}{N} = 2.6 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := \left(0.75 \cdot F_{ub} \cdot A_n\right) = 54.5 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{\Phi R_{nt}} = 56.60 \cdot \%$

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

Condition1 = "OK"

Design Shear Strength = $\Phi R_{nv} := \left(0.625 \cdot F_{ub} \cdot 0.8 \cdot A_g\right) = 47.1 \cdot kips$

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

Condition2 = "OK"

Flange Plate Analysis:

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

$C_1 = 20.6 \cdot kips$ $C_7 = -13.7 \cdot kips$

$C_2 = 33.1 \cdot kips$ $C_8 = -26.3 \cdot kips$

$C_3 = 37.7 \cdot kips$ $C_9 = -30.9 \cdot kips$

$C_4 = 33.1 \cdot kips$ $C_{10} = -26.3 \cdot kips$

$C_5 = 20.6 \cdot kips$ $C_{11} = -13.7 \cdot kips$

$C_6 = 3.4 \cdot kips$ $C_{12} = 3.4 \cdot kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{4 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 14.7 \cdot ksi$$

Allowable Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 32.4 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 45.2 \cdot \%$

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

Condition3 = "Ok"

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	164-FT Monopole Greenwich, CT
Rev. 2: 1/24/22	Prepafred by: T.J.L. Checked by: C.F.C. Job No. 21009.00

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M_u := 7139 \cdot ft \cdot kips$	(Input From tnxTower)
Shear Force =	$Shear := 63 \cdot kips$	(Input From tnxTower)
Axial Force =	$R_u := 105 \cdot kips$	(Input From tnxTower)

Anchor Bolt Data:

ASTMA615 Grade 75

Number of Anchor Bolts =	$N := 30$	(User Input)
Diameter of Bolt Circle =	$D_{BC} := 86 \cdot in$	(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 =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)
Top of Concrete to Bot Leveling Nut =	$l_{ar} := 2 \cdot in$	(User Input)
Anchor Rod Force Correction Factor =	$n_c = 1$	Table 2-1 Addendum 3

Base Plate Data:

ASTMA572 Grade 60

Plate Yield Strength =	$F_{yf} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{TP} := 3.0 \cdot in$	(User Input)
Base Plate Diameter =	$D_{OD} := 92.0 \cdot in$	(User Input)
Outer Pole Diameter =	$D_T := 76.0 \cdot in$	(User Input)
Pole Wall Thickness =	$t_T := 0.5625 \cdot in$	(User Input)
Pole Design Yield Strength =	$F_{yp} := 65 \cdot ksi$	(User Input)

Anchor Bolt Analysis:

Gross Area of Bolt = $A_g := \frac{\pi}{4}\cdot D^2 = 3.976\cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 = 3.248\cdot in^2$

Tensile Root Diameter = $d_{rt} := D - \frac{0.9743\cdot in}{n} = 2.033\cdot in$

Plastic Section Modulus = $Z := \frac{d_{rt}^3}{6} = 1.401\cdot in^3$

Maximum Anchor Rod Force = $P_{ut} := \frac{n_c\cdot\pi\cdot M_u}{N\cdot D_{BC}} - \frac{R_u}{N} = 100.8\cdot kips$

Maximum Anchor Rod Force = $P_{uc} := \frac{n_c\cdot\pi\cdot M_u}{N\cdot D_{BC}} + \frac{R_u}{N} = 107.8\cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 2.1\cdot kips$

$\Phi_t := 0.75 \quad \Phi_v := 0.75 \quad \Phi_c := 1.0$

Design Tensile Strength = $\Phi R_{nt} := \Phi_t\cdot F_u\cdot A_n = 243.576\cdot k$

Design Compression Strength = $\Phi R_{nc} := \Phi_c\cdot F_y\cdot A_n = 243.576\cdot k$

Design Shear Rupture Strength = $\Phi R_{nv} := \Phi_v\cdot 0.5\cdot F_u\cdot A_g = 149.103\cdot k$

Design Shear Yield Strength = $\Phi R_{nvc} := \Phi_c\cdot 0.6\cdot F_y\cdot \frac{A_n}{2} = 73.073\cdot k$

Bolt % of Capacity = $\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2\right]\cdot 100 = 17.2$ $\quad \frac{P_{ut}}{\Phi R_{nt}} = 0.414$

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

Condition1 = "OK"

Bolt % of Capacity = $\left[\left(\frac{P_{uc}}{\Phi R_{nc}}\right)^2 + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right]\cdot 100 = 19.7$

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

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 = $D_e := D_T + w_1 = 76.25 \cdot in$

Effective Base Plate Outside Diameter = $D_{oe} := \begin{cases} D_{OD} & \text{if } D_{OD} \le \left(D_{BC} + 6 \cdot t_{TP}\right) \\ \left(D_{BC} + 6 \cdot t_{TP}\right) & \text{otherwise} \end{cases} = 92 \cdot in$

Half-Angle Between Radial Lines Extending from Pole Centerline Through Midpoints Between Adjacent Anchor Rods = $\theta_1 := \frac{\pi}{N} = 0.105$

Angle Defining Limiting Effective Base Plate Width Based on Plate Thickness = $\theta_2 := \operatorname{asin}\left(\frac{12 \cdot t_{TP}}{D_{BC}}\right) = 0.432$

Angle Defining Limiting Effective Base Plate Width Based on Distance Between Anchor Rod Bolt Circle and Effective Pole Outside Diameter = $\theta_3 := \operatorname{acos}\left(\frac{D_{BC} + D_e}{2 \cdot D_{BC}}\right) = 0.338$

Governing Angle Defining Effective Base Plate Width Resisting Bending = $\theta := \min\left(\theta_1, \theta_2, \theta_3\right) = 0.105$

Effective Moment Arm of Anchor Rod Force = $x := 0.5 \cdot \left(D_{BC} - D_e\right) = 4.875 \cdot in$

Effective Base Plate Width Resisting Bending from Transverse Bend Line = $B_{et} := D_{BC} \cdot \sin(\theta) = 8.989 \cdot in$

Effective Base Plate Width Resisting Bending from Radial Bend Lines = $B_{er} := \left(D_{oe} - D_e\right) \cdot \sin(\theta) = 1.646 \cdot in$

Total Effective Base Plate Width Resisting Bending = $B_{eff} := B_{et} + B_{er} = 10.636 \cdot in$

Required Base Plate Thickness = $t_{TP.Req} := \sqrt{\frac{4 \cdot P_{uc} \cdot x}{\phi_b \cdot F_{yf} \cdot B_{eff}}} = 1.913 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 63.8 \cdot \%$

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

Condition3 = "Ok"

Required Base Plate Thickness = $t_{TP.Req} := \frac{\phi_b \cdot t_T \cdot F_{yp}}{\phi_v \cdot 0.6 \cdot F_{yf}} = 0.914 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 30.5 \cdot \%$

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

Condition4 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 2: 1/24/22	Prepared by: TJL Checked by: C.F.C. Job No. 21009.00

Caisson Foundation:

Input Data:

Shear Force =	$S := 63k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 7139ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 105k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 7478ft \cdot k$	*USER INPUT--FROM LPILE*
Moment Capacity =	$Mn := 12372ft \cdot k$	*USER INPUT--FROM LPILE*
Foundation Diameter =	$d := 9.0ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 28.0ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 33$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 3ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9 \cdot Mn}{Mu} = 1.5$

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

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

FOSCheck = "OK"

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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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This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\2100900.WI\05_Structural\Tower Analysis\Backup Documentation\Rev (2)\Foundation\
Name of input data file: Greenwich Hospital Caisson Analysis.lpd
Name of output file: Greenwich Hospital Caisson Analysis.lpo
Name of plot output file: Greenwich Hospital Caisson Analysis.lpp
Name of runtime file: Greenwich Hospital Caisson Analysis.lpr

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Time and Date of Analysis

Date: January 24, 2022 Time: 8:54:21

Problem Title

21009.00 - Greenwich Hospital

Program Options

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

Basic Program Options:

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

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

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

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

Pile Structural Properties and Geometry

Pile Length = 336.00 in

Depth of ground surface below top of pile = 12.00 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	108.00000	6678285.	9160.9000	3600000.
2	336.0000	108.00000	6678285.	9160.9000	3600000.

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

Soil and Rock Layering Information

The soil profile is modelled using 4 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 12.000 in
Distance from top of pile to bottom of layer = 48.000 in
p-y subgrade modulus k for top of soil layer = 20.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 20.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 48.000 in
Distance from top of pile to bottom of layer = 72.000 in
p-y subgrade modulus k for top of soil layer = 90.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 90.000 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 72.000 in
Distance from top of pile to bottom of layer = 132.000 in
p-y subgrade modulus k for top of soil layer = 150.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 150.000 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 132.000 in
Distance from top of pile to bottom of layer = 360.000 in
p-y subgrade modulus k for top of soil layer = 250.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 250.000 lbs/in**3

(Depth of lowest layer extends 24.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 8 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.05800
2	48.00	0.05800
3	48.00	0.06900
4	72.00	0.06900
5	72.00	0.06900
6	132.00	0.06900
7	132.00	0.07500

8	360.00	0.07500

Shear Strength of Soils

Shear strength parameters with depth defined using 8 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	0.00000	20.00	------	------
2	48.000	0.00000	20.00	------	------
3	48.000	0.00000	30.00	------	------
4	72.000	0.00000	30.00	------	------
5	72.000	0.00000	35.00	------	------
6	132.000	0.00000	35.00	------	------
7	132.000	0.00000	42.00	------	------
8	360.000	0.00000	42.00	------	------

Notes:

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

Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 63000.000 lbs
Bending moment at pile head = 85668000.000 in-lbs

Axial load at pile head = 105000.000 lbs

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

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 14000.000 lbs
Bending moment at pile head = 18336000.000 in-lbs
Axial load at pile head = 105000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 108.0000 in

Material Properties:

Compressive Strength of Concrete	=	3.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Number of Reinforcing Bars	=	33
Area of Single Bar	=	1.56000 in**2
Number of Rows of Reinforcing Bars	=	33
Area of Steel	=	51.480 in**2
Area of Shaft	=	9160.884 in**2
Percentage of Steel Reinforcement	=	0.562 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 26317.78 kip

Distribution and Area of Steel Reinforcement

Row	Area of	Distance to

Number	Reinforcement in**2	Centroidal Axis in
1	1.560	49.943
2	1.560	49.491
3	1.560	48.591
4	1.560	47.250
5	1.560	45.482
6	1.560	43.301
7	1.560	40.729
8	1.560	37.787
9	1.560	34.504
10	1.560	30.908
11	1.560	27.032
12	1.560	22.911
13	1.560	18.583
14	1.560	14.087
15	1.560	9.463
16	1.560	4.753
17	1.560	0.000
18	1.560	-4.753
19	1.560	-9.463
20	1.560	-14.087
21	1.560	-18.583
22	1.560	-22.911
23	1.560	-27.032
24	1.560	-30.908
25	1.560	-34.504
26	1.560	-37.787
27	1.560	-40.729
28	1.560	-43.301
29	1.560	-45.482
30	1.560	-47.250
31	1.560	-48.591
32	1.560	-49.491
33	1.560	-49.943

Axial Thrust Force = 105000.00 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
11412273.	2.282455E+13	5.000000E-07	0.00003060	61.20000118	94.07059618	828.57884
22709716.	2.270972E+13	0.00000100	0.00005770	57.69642895	175.73805	

```
 1555.55408
   33889425.  2.259295E+13    0.00000150    0.00008483   56.55283910     256.13334
 2283.58496
   44945754.  2.247288E+13    0.00000200    0.00011192   55.96208149     335.03262
 3010.51601
   55887932.  2.235517E+13    0.00000250    0.00013911   55.64593917     412.82732
 3740.22469
   55887932.  1.862931E+13    0.00000300    0.00008777   29.25626940     260.87894
 6497.77749
   55887932.  1.596798E+13    0.00000350    0.00010032   28.66196483     296.83675
 7641.06232
   55887932.  1.397198E+13    0.00000400    0.00011256   28.14087492     331.62450
 8793.08908
   55887932.  1.241954E+13    0.00000450    0.00012482   27.73879784     366.18376
 9944.69627
   55887932.  1.117759E+13    0.00000500    0.00013710   27.42004842     400.51382
11095.88119
   55887932.  1.016144E+13    0.00000550    0.00014939   27.16191584     434.61391
12246.64145
   55887932.  9.314655E+12    0.00000600    0.00016200   26.99999839     469.34939
13388.14613
   55887932.  8.598143E+12    0.00000650    0.00017438   26.82765251     503.14924
14536.31217
   55887932.  7.983990E+12    0.00000700    0.00018666   26.66508812     536.38160
15687.49060
   55887932.  7.451724E+12    0.00000750    0.00019895   26.52633208     569.38637
16838.20509
   55887932.  6.985992E+12    0.00000800    0.00021126   26.40692979     602.16266
17988.45342
   55887932.  6.575051E+12    0.00000850    0.00022358   26.30348235     634.70974
19138.23156
   55887932.  6.209770E+12    0.00000900    0.00023592   26.21334082     667.02673
20287.53682
   55887932.  5.882940E+12    0.00000950    0.00024828   26.13441950     699.11289
21436.36502
   55887932.  5.588793E+12    0.00001000    0.00026065   26.06504792     730.96742
22584.71252
   55887932.  5.322660E+12    0.00001050    0.00027304   26.00386781     762.58931
23732.57749
   55887932.  5.080721E+12    0.00001100    0.00028545   25.94978160     793.97798
24879.95373
   55887932.  4.859820E+12    0.00001150    0.00029787   25.90186554     825.13230
26026.84072
   55887932.  4.657328E+12    0.00001200    0.00031031   25.85936326     856.05154
27173.23329
   55887932.  4.471035E+12    0.00001250    0.00032277   25.82163745     886.73490
28319.12695
   55887932.  4.299072E+12    0.00001300    0.00033525   25.78814417     917.18142
29464.51899
   55887932.  4.139847E+12    0.00001350    0.00034774   25.75841993     947.39011
30609.40676
```

57559887.	4.111420E+12	0.00001400	0.00036025	25.73207527	977.36024
31753.78442					
59470009.	4.101380E+12	0.00001450	0.00037278	25.70876902	1007.09088
32897.64843					
61377927.	4.091862E+12	0.00001500	0.00038532	25.68820184	1036.58094
34040.99682					
63283640.	4.082815E+12	0.00001550	0.00039789	25.67012268	1065.82969
35183.82330					
65187132.	4.074196E+12	0.00001600	0.00041047	25.65430623	1094.83616
36326.12418					
67088384.	4.065963E+12	0.00001650	0.00042307	25.64055294	1123.59931
37467.89651					
68987381.	4.058081E+12	0.00001700	0.00043569	25.62868899	1152.11817
38609.13624					
70884117.	4.050521E+12	0.00001750	0.00044832	25.61856312	1180.39187
39749.83795					
72778571.	4.043254E+12	0.00001800	0.00046098	25.61003691	1208.41935
40889.99829					
74670737.	4.036256E+12	0.00001850	0.00047366	25.60299128	1236.19973
42029.61155					
76560590.	4.029505E+12	0.00001900	0.00048635	25.59731358	1263.73184
43168.67541					
78448126.	4.022981E+12	0.00001950	0.00049906	25.59291047	1291.01484
44307.18315					
82216164.	4.010545E+12	0.00002050	0.00052455	25.58757716	1344.82902
46582.51703					
85974732.	3.998825E+12	0.00002150	0.00055011	25.58638948	1397.63395
48855.57546					
89723689.	3.987720E+12	0.00002250	0.00057575	25.58884853	1449.42084
51126.32327					
93462930.	3.977146E+12	0.00002350	0.00060147	25.59455198	1500.18120
53394.71741					
97192304.	3.967033E+12	0.00002450	0.00062728	25.60315543	1549.90583
55660.72029					
1.009117E+08	3.957321E+12	0.00002550	0.00065317	25.61437565	1598.58559
57924.28907					
1.045980E+08	3.947095E+12	0.00002650	0.00067909	25.62602395	1646.11421
60000.00000					
1.075432E+08	3.910664E+12	0.00002750	0.00070343	25.57916361	1689.52651
60000.00000					
1.099879E+08	3.859226E+12	0.00002850	0.00072667	25.49719423	1729.91716
60000.00000					
1.121215E+08	3.800730E+12	0.00002950	0.00074922	25.39737099	1768.13298
60000.00000					
1.140107E+08	3.738055E+12	0.00003050	0.00077122	25.28580934	1804.48765
60000.00000					
1.158936E+08	3.679162E+12	0.00003150	0.00079380	25.20000011	1840.95386
60000.00000					
1.173461E+08	3.610649E+12	0.00003250	0.00081674	25.13040322	1877.08062
60000.00000					
1.187292E+08	3.544154E+12	0.00003350	0.00083717	24.99025673	1908.31513

60000.00000
1.200710E+08 3.480319E+12 0.00003450 0.00085753 24.85606152 1938.69181
60000.00000
1.212255E+08 3.414804E+12 0.00003550 0.00087732 24.71321779 1967.46612
60000.00000
1.223766E+08 3.352782E+12 0.00003650 0.00089715 24.57933480 1995.60756
60000.00000
1.233753E+08 3.290007E+12 0.00003750 0.00091647 24.43932670 2022.33990
60000.00000
1.243470E+08 3.229792E+12 0.00003850 0.00093576 24.30535358 2048.34512
60000.00000
1.252784E+08 3.171606E+12 0.00003950 0.00095493 24.17547137 2073.54845
60000.00000
1.260910E+08 3.113357E+12 0.00004050 0.00097369 24.04171389 2097.54960
60000.00000
1.269006E+08 3.057846E+12 0.00004150 0.00099248 23.91527563 2120.97731
60000.00000
1.276962E+08 3.004617E+12 0.00004250 0.00101127 23.79452151 2143.76804
60000.00000
1.283669E+08 2.950964E+12 0.00004350 0.00102956 23.66812509 2165.34139
60000.00000
1.290350E+08 2.899663E+12 0.00004450 0.00104789 23.54817563 2186.36672
60000.00000
1.297005E+08 2.850560E+12 0.00004550 0.00106626 23.43425471 2206.84091
60000.00000
1.302336E+08 2.800722E+12 0.00004650 0.00108810 23.39999861 2230.60863
60000.00000
1.309764E+08 2.757398E+12 0.00004750 0.00110693 23.30386072 2250.28456
60000.00000
1.315069E+08 2.711482E+12 0.00004850 0.00112427 23.18072480 2267.76378
60000.00000
1.320352E+08 2.667378E+12 0.00004950 0.00114163 23.06321186 2284.75047
60000.00000
1.325614E+08 2.624978E+12 0.00005050 0.00115903 22.95099682 2301.24197
60000.00000
1.330366E+08 2.583234E+12 0.00005150 0.00117616 22.83814770 2316.95952
60000.00000
1.334605E+08 2.542105E+12 0.00005250 0.00119304 22.72461623 2331.92338
60000.00000
1.338825E+08 2.502476E+12 0.00005350 0.00120995 22.61589342 2346.41763
60000.00000
1.343025E+08 2.464265E+12 0.00005450 0.00122689 22.51172501 2360.43992
60000.00000
1.347205E+08 2.427396E+12 0.00005550 0.00124386 22.41186315 2373.98729
60000.00000
1.351365E+08 2.391796E+12 0.00005650 0.00126086 22.31608897 2387.05732
60000.00000
1.354898E+08 2.356345E+12 0.00005750 0.00127748 22.21707362 2399.33402
60000.00000
1.358215E+08 2.321735E+12 0.00005850 0.00129400 22.11966115 2411.05331
60000.00000

1.361514E+08 2.288258E+12 0.00005950 0.00131055 22.02601451 2422.31878
60000.00000
1.368056E+08 2.224481E+12 0.00006150 0.00134373 21.84930414 2443.47841
60000.00000
1.374524E+08 2.164605E+12 0.00006350 0.00137704 21.68561643 2462.79237
60000.00000
1.386452E+08 2.116721E+12 0.00006550 0.00141480 21.60000032 2482.48043
60000.00000
1.386452E+08 2.054003E+12 0.00006750 0.00144968 21.47670346 2498.36789
60000.00000
1.390856E+08 2.001232E+12 0.00006950 0.00148094 21.30846781 2510.72668
60000.00000
1.395528E+08 1.951788E+12 0.00007150 0.00151231 21.15123993 2521.43549
60000.00000
1.400032E+08 1.904806E+12 0.00007350 0.00154369 21.00261873 2530.44417
60000.00000
1.403548E+08 1.859004E+12 0.00007550 0.00157420 20.85036367 2537.56090
60000.00000
1.407008E+08 1.815494E+12 0.00007750 0.00160482 20.70738477 2543.09259
60000.00000
1.410411E+08 1.774102E+12 0.00007950 0.00163555 20.57300287 2547.02093
60000.00000
1.413756E+08 1.734670E+12 0.00008150 0.00166640 20.44660646 2549.32718
60000.00000
1.417033E+08 1.697046E+12 0.00008350 0.00169736 20.32764512 2549.49942
60000.00000
1.420043E+08 1.660869E+12 0.00008550 0.00172825 20.21350211 2544.39577
60000.00000
1.422396E+08 1.625595E+12 0.00008750 0.00175845 20.09658140 2540.82166
60000.00000
1.424724E+08 1.591870E+12 0.00008950 0.00178876 19.98613662 2544.92472
60000.00000
1.427026E+08 1.559592E+12 0.00009150 0.00181918 19.88176543 2547.83163
60000.00000
1.427026E+08 1.526231E+12 0.00009350 0.00185130 19.79999882 2549.59126
60000.00000
1.428175E+08 1.495471E+12 0.00009550 0.00189090 19.79999882 2547.59774
60000.00000
1.434988E+08 1.471782E+12 0.00009750 0.00192620 19.75591618 2542.35274
60000.00000
1.437027E+08 1.444248E+12 0.00009950 0.00195577 19.65602535 2538.11269
60000.00000
1.439051E+08 1.417784E+12 0.00010150 0.00198544 19.56097537 2542.00664
60000.00000
1.440521E+08 1.391807E+12 0.00010350 0.00201413 19.46022838 2545.10220
60000.00000
1.441941E+08 1.366769E+12 0.00010550 0.00204284 19.36341780 2547.44463
60000.00000
1.443350E+08 1.342651E+12 0.00010750 0.00207163 19.27101034 2549.03701
60000.00000
1.444745E+08 1.319402E+12 0.00010950 0.00210051 19.18277425 2549.86945

60000.00000
1.446116E+08 1.296965E+12 0.00011150 0.00212954 19.09900242 2548.52058
60000.00000
1.447463E+08 1.275298E+12 0.00011350 0.00215871 19.01947600 2544.98232
60000.00000
1.448803E+08 1.254375E+12 0.00011550 0.00218794 18.94323260 2541.43334
60000.00000
1.450135E+08 1.234157E+12 0.00011750 0.00221724 18.87011129 2537.87351
60000.00000
1.451459E+08 1.214610E+12 0.00011950 0.00224660 18.79996079 2534.65765
60000.00000
1.452775E+08 1.195700E+12 0.00012150 0.00227602 18.73264593 2538.49174
60000.00000
1.454084E+08 1.177396E+12 0.00012350 0.00230550 18.66802830 2541.78694
60000.00000
1.454998E+08 1.159361E+12 0.00012550 0.00233405 18.59800333 2544.39009
60000.00000
1.455901E+08 1.141883E+12 0.00012750 0.00236265 18.53055006 2546.50417
60000.00000
1.456797E+08 1.124940E+12 0.00012950 0.00239130 18.46563953 2548.12571
60000.00000
1.457687E+08 1.108507E+12 0.00013150 0.00242002 18.40316552 2549.24922
60000.00000
1.458570E+08 1.092562E+12 0.00013350 0.00244879 18.34302181 2549.86899
60000.00000
1.459441E+08 1.077078E+12 0.00013550 0.00247767 18.28541118 2549.18108
60000.00000
1.460292E+08 1.062030E+12 0.00013750 0.00250670 18.23054606 2546.29970
60000.00000
1.461140E+08 1.047412E+12 0.00013950 0.00253577 18.17752844 2543.41160
60000.00000
1.462825E+08 1.019391E+12 0.00014350 0.00259401 18.07672995 2537.61520
60000.00000
1.466286E+08 9.940921E+11 0.00014750 0.00265500 18.00000054 2531.33751
60000.00000
1.476109E+08 9.743296E+11 0.00015150 0.00272700 18.00000054 2536.11274
60000.00000
1.484654E+08 9.547614E+11 0.00015550 0.00279900 18.00000054 2543.79153
60000.00000
1.484654E+08 9.308175E+11 0.00015950 0.00287010 17.99433571 2548.34886
60000.00000
1.484654E+08 9.080452E+11 0.00016350 0.00292687 17.90136498 2549.72462
60000.00000
1.484654E+08 8.863606E+11 0.00016750 0.00298435 17.81700414 2548.55401
60000.00000
1.484654E+08 8.656874E+11 0.00017150 0.00304339 17.74574000 2543.88008
60000.00000
1.484654E+08 8.459567E+11 0.00017550 0.00310256 17.67841548 2539.18488
60000.00000
1.484654E+08 8.271053E+11 0.00017950 0.00316185 17.61478275 2534.46792
60000.00000

1.484654E+08	8.090757E+11	0.00018350	0.00322127	17.55461973	2529.72856
60000.00000					
1.484654E+08	7.918154E+11	0.00018750	0.00328082	17.49771720	2524.96640
60000.00000					
1.484654E+08	7.752762E+11	0.00019150	0.00334051	17.44389170	2520.32206
60000.00000					
1.484654E+08	7.594138E+11	0.00019550	0.00340089	17.39584368	2526.96308
60000.00000					
1.484654E+08	7.441874E+11	0.00019950	0.00346245	17.35563308	2533.06809
60000.00000					
1.484654E+08	7.295597E+11	0.00020350	0.00352419	17.31791049	2538.27456
60000.00000					
1.484654E+08	7.154959E+11	0.00020750	0.00358613	17.28256005	2542.55961
60000.00000					
1.484654E+08	7.019640E+11	0.00021150	0.00364827	17.24948841	2545.89954
60000.00000					
1.484654E+08	6.889345E+11	0.00021550	0.00370890	17.21065217	2548.12531
60000.00000					
1.484654E+08	6.763799E+11	0.00021950	0.00376898	17.17074412	2549.46645
60000.00000					
1.484654E+08	6.642747E+11	0.00022350	0.00382923	17.13303119	2549.99260
60000.00000					

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 148465.39377 in-kip

Axial Thrust Force = 105000.00 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
11412273.	2.282455E+13	5.000000E-07	0.00003060	61.20000118	94.07059618	828.57884
22709716.	2.270972E+13	0.00000100	0.00005770	57.69642895	175.73805	1555.55408
33889425.	2.259295E+13	0.00000150	0.00008483	56.55283910	256.13334	2283.58496
44945754.	2.247288E+13	0.00000200	0.00011192	55.96208149	335.03262	3010.51601
55887932.	2.235517E+13	0.00000250	0.00013911	55.64593917	412.82732	3740.22469
55887932.	1.862931E+13	0.00000300	0.00008777	29.25626940	260.87894	6497.77749

```
  55887932.  1.596798E+13    0.00000350    0.00010032   28.66196483     296.83675
 7641.06232
  55887932.  1.397198E+13    0.00000400    0.00011256   28.14087492     331.62450
 8793.08908
  55887932.  1.241954E+13    0.00000450    0.00012482   27.73879784     366.18376
 9944.69627
  55887932.  1.117759E+13    0.00000500    0.00013710   27.42004842     400.51382
11095.88119
  55887932.  1.016144E+13    0.00000550    0.00014939   27.16191584     434.61391
12246.64145
  55887932.  9.314655E+12    0.00000600    0.00016200   26.99999839     469.34939
13388.14613
  55887932.  8.598143E+12    0.00000650    0.00017438   26.82765251     503.14924
14536.31217
  55887932.  7.983990E+12    0.00000700    0.00018666   26.66508812     536.38160
15687.49060
  55887932.  7.451724E+12    0.00000750    0.00019895   26.52633208     569.38637
16838.20509
  55887932.  6.985992E+12    0.00000800    0.00021126   26.40692979     602.16266
17988.45342
  55887932.  6.575051E+12    0.00000850    0.00022358   26.30348235     634.70974
19138.23156
  55887932.  6.209770E+12    0.00000900    0.00023592   26.21334082     667.02673
20287.53682
  55887932.  5.882940E+12    0.00000950    0.00024828   26.13441950     699.11289
21436.36502
  55887932.  5.588793E+12    0.00001000    0.00026065   26.06504792     730.96742
22584.71252
  55887932.  5.322660E+12    0.00001050    0.00027304   26.00386781     762.58931
23732.57749
  55887932.  5.080721E+12    0.00001100    0.00028545   25.94978160     793.97798
24879.95373
  55887932.  4.859820E+12    0.00001150    0.00029787   25.90186554     825.13230
26026.84072
  55887932.  4.657328E+12    0.00001200    0.00031031   25.85936326     856.05154
27173.23329
  55887932.  4.471035E+12    0.00001250    0.00032277   25.82163745     886.73490
28319.12695
  55887932.  4.299072E+12    0.00001300    0.00033525   25.78814417     917.18142
29464.51899
  55887932.  4.139847E+12    0.00001350    0.00034774   25.75841993     947.39011
30609.40676
  57559887.  4.111420E+12    0.00001400    0.00036025   25.73207527     977.36024
31753.78442
  59470009.  4.101380E+12    0.00001450    0.00037278   25.70876902    1007.09088
32897.64843
  61377927.  4.091862E+12    0.00001500    0.00038532   25.68820184    1036.58094
34040.99682
  63283640.  4.082815E+12    0.00001550    0.00039789   25.67012268    1065.82969
35183.82330
  65187132.  4.074196E+12    0.00001600    0.00041047   25.65430623    1094.83616
```

36326.12418
   67088384. 4.065963E+12   0.00001650   0.00042307   25.64055294   1123.59931
37467.89651
   68987381. 4.058081E+12   0.00001700   0.00043569   25.62868899   1152.11817
38609.13624
   70884117. 4.050521E+12   0.00001750   0.00044832   25.61856312   1180.39187
39749.83795
   72778571. 4.043254E+12   0.00001800   0.00046098   25.61003691   1208.41935
40889.99829
   74670737. 4.036256E+12   0.00001850   0.00047366   25.60299128   1236.19973
42029.61155
   76560590. 4.029505E+12   0.00001900   0.00048635   25.59731358   1263.73184
43168.67541
   78448126. 4.022981E+12   0.00001950   0.00049906   25.59291047   1291.01484
44307.18315
   82216164. 4.010545E+12   0.00002050   0.00052455   25.58757716   1344.82902
46582.51703
   85974732. 3.998825E+12   0.00002150   0.00055011   25.58638948   1397.63395
48855.57546
   89723689. 3.987720E+12   0.00002250   0.00057575   25.58884853   1449.42084
51126.32327
   93462930. 3.977146E+12   0.00002350   0.00060147   25.59455198   1500.18120
53394.71741
   97192304. 3.967033E+12   0.00002450   0.00062728   25.60315543   1549.90583
55660.72029
1.009117E+08 3.957321E+12   0.00002550   0.00065317   25.61437565   1598.58559
57924.28907
1.045980E+08 3.947095E+12   0.00002650   0.00067909   25.62602395   1646.11421
60000.00000
1.075432E+08 3.910664E+12   0.00002750   0.00070343   25.57916361   1689.52651
60000.00000
1.099879E+08 3.859226E+12   0.00002850   0.00072667   25.49719423   1729.91716
60000.00000
1.121215E+08 3.800730E+12   0.00002950   0.00074922   25.39737099   1768.13298
60000.00000
1.140107E+08 3.738055E+12   0.00003050   0.00077122   25.28580934   1804.48765
60000.00000
1.158936E+08 3.679162E+12   0.00003150   0.00079380   25.20000011   1840.95386
60000.00000
1.173461E+08 3.610649E+12   0.00003250   0.00081674   25.13040322   1877.08062
60000.00000
1.187292E+08 3.544154E+12   0.00003350   0.00083717   24.99025673   1908.31513
60000.00000
1.200710E+08 3.480319E+12   0.00003450   0.00085753   24.85606152   1938.69181
60000.00000
1.212255E+08 3.414804E+12   0.00003550   0.00087732   24.71321779   1967.46612
60000.00000
1.223766E+08 3.352782E+12   0.00003650   0.00089715   24.57933480   1995.60756
60000.00000
1.233753E+08 3.290007E+12   0.00003750   0.00091647   24.43932670   2022.33990
60000.00000

1.243470E+08 3.229792E+12 0.00003850 0.00093576 24.30535358 2048.34512
60000.00000
1.252784E+08 3.171606E+12 0.00003950 0.00095493 24.17547137 2073.54845
60000.00000
1.260910E+08 3.113357E+12 0.00004050 0.00097369 24.04171389 2097.54960
60000.00000
1.269006E+08 3.057846E+12 0.00004150 0.00099248 23.91527563 2120.97731
60000.00000
1.276962E+08 3.004617E+12 0.00004250 0.00101127 23.79452151 2143.76804
60000.00000
1.283669E+08 2.950964E+12 0.00004350 0.00102956 23.66812509 2165.34139
60000.00000
1.290350E+08 2.899663E+12 0.00004450 0.00104789 23.54817563 2186.36672
60000.00000
1.297005E+08 2.850560E+12 0.00004550 0.00106626 23.43425471 2206.84091
60000.00000
1.302336E+08 2.800722E+12 0.00004650 0.00108810 23.39999861 2230.60863
60000.00000
1.309764E+08 2.757398E+12 0.00004750 0.00110693 23.30386072 2250.28456
60000.00000
1.315069E+08 2.711482E+12 0.00004850 0.00112427 23.18072480 2267.76378
60000.00000
1.320352E+08 2.667378E+12 0.00004950 0.00114163 23.06321186 2284.75047
60000.00000
1.325614E+08 2.624978E+12 0.00005050 0.00115903 22.95099682 2301.24197
60000.00000
1.330366E+08 2.583234E+12 0.00005150 0.00117616 22.83814770 2316.95952
60000.00000
1.334605E+08 2.542105E+12 0.00005250 0.00119304 22.72461623 2331.92338
60000.00000
1.338825E+08 2.502476E+12 0.00005350 0.00120995 22.61589342 2346.41763
60000.00000
1.343025E+08 2.464265E+12 0.00005450 0.00122689 22.51172501 2360.43992
60000.00000
1.347205E+08 2.427396E+12 0.00005550 0.00124386 22.41186315 2373.98729
60000.00000
1.351365E+08 2.391796E+12 0.00005650 0.00126086 22.31608897 2387.05732
60000.00000
1.354898E+08 2.356345E+12 0.00005750 0.00127748 22.21707362 2399.33402
60000.00000
1.358215E+08 2.321735E+12 0.00005850 0.00129400 22.11966115 2411.05331
60000.00000
1.361514E+08 2.288258E+12 0.00005950 0.00131055 22.02601451 2422.31878
60000.00000
1.368056E+08 2.224481E+12 0.00006150 0.00134373 21.84930414 2443.47841
60000.00000
1.374524E+08 2.164605E+12 0.00006350 0.00137704 21.68561643 2462.79237
60000.00000
1.386452E+08 2.116721E+12 0.00006550 0.00141480 21.60000032 2482.48043
60000.00000
1.386452E+08 2.054003E+12 0.00006750 0.00144968 21.47670346 2498.36789

60000.00000
1.390856E+08 2.001232E+12 0.00006950 0.00148094 21.30846781 2510.72668
60000.00000
1.395528E+08 1.951788E+12 0.00007150 0.00151231 21.15123993 2521.43549
60000.00000
1.400032E+08 1.904806E+12 0.00007350 0.00154369 21.00261873 2530.44417
60000.00000
1.403548E+08 1.859004E+12 0.00007550 0.00157420 20.85036367 2537.56090
60000.00000
1.407008E+08 1.815494E+12 0.00007750 0.00160482 20.70738477 2543.09259
60000.00000
1.410411E+08 1.774102E+12 0.00007950 0.00163555 20.57300287 2547.02093
60000.00000
1.413756E+08 1.734670E+12 0.00008150 0.00166640 20.44660646 2549.32718
60000.00000
1.417033E+08 1.697046E+12 0.00008350 0.00169736 20.32764512 2549.49942
60000.00000
1.420043E+08 1.660869E+12 0.00008550 0.00172825 20.21350211 2544.39577
60000.00000
1.422396E+08 1.625595E+12 0.00008750 0.00175845 20.09658140 2540.82166
60000.00000
1.424724E+08 1.591870E+12 0.00008950 0.00178876 19.98613662 2544.92472
60000.00000
1.427026E+08 1.559592E+12 0.00009150 0.00181918 19.88176543 2547.83163
60000.00000
1.427026E+08 1.526231E+12 0.00009350 0.00185130 19.79999882 2549.59126
60000.00000
1.428175E+08 1.495471E+12 0.00009550 0.00189090 19.79999882 2547.59774
60000.00000
1.434988E+08 1.471782E+12 0.00009750 0.00192620 19.75591618 2542.35274
60000.00000
1.437027E+08 1.444248E+12 0.00009950 0.00195577 19.65602535 2538.11269
60000.00000
1.439051E+08 1.417784E+12 0.00010150 0.00198544 19.56097537 2542.00664
60000.00000
1.440521E+08 1.391807E+12 0.00010350 0.00201413 19.46022838 2545.10220
60000.00000
1.441941E+08 1.366769E+12 0.00010550 0.00204284 19.36341780 2547.44463
60000.00000
1.443350E+08 1.342651E+12 0.00010750 0.00207163 19.27101034 2549.03701
60000.00000
1.444745E+08 1.319402E+12 0.00010950 0.00210051 19.18277425 2549.86945
60000.00000
1.446116E+08 1.296965E+12 0.00011150 0.00212954 19.09900242 2548.52058
60000.00000
1.447463E+08 1.275298E+12 0.00011350 0.00215871 19.01947600 2544.98232
60000.00000
1.448803E+08 1.254375E+12 0.00011550 0.00218794 18.94323260 2541.43334
60000.00000
1.450135E+08 1.234157E+12 0.00011750 0.00221724 18.87011129 2537.87351
60000.00000

1.451459E+08 1.214610E+12 0.00011950 0.00224660 18.79996079 2534.65765
60000.00000
1.452775E+08 1.195700E+12 0.00012150 0.00227602 18.73264593 2538.49174
60000.00000
1.454084E+08 1.177396E+12 0.00012350 0.00230550 18.66802830 2541.78694
60000.00000
1.454998E+08 1.159361E+12 0.00012550 0.00233405 18.59800333 2544.39009
60000.00000
1.455901E+08 1.141883E+12 0.00012750 0.00236265 18.53055006 2546.50417
60000.00000
1.456797E+08 1.124940E+12 0.00012950 0.00239130 18.46563953 2548.12571
60000.00000
1.457687E+08 1.108507E+12 0.00013150 0.00242002 18.40316552 2549.24922
60000.00000
1.458570E+08 1.092562E+12 0.00013350 0.00244879 18.34302181 2549.86899
60000.00000
1.459441E+08 1.077078E+12 0.00013550 0.00247767 18.28541118 2549.18108
60000.00000
1.460292E+08 1.062030E+12 0.00013750 0.00250670 18.23054606 2546.29970
60000.00000
1.461140E+08 1.047412E+12 0.00013950 0.00253577 18.17752844 2543.41160
60000.00000
1.462825E+08 1.019391E+12 0.00014350 0.00259401 18.07672995 2537.61520
60000.00000
1.466286E+08 9.940921E+11 0.00014750 0.00265500 18.00000054 2531.33751
60000.00000
1.476109E+08 9.743296E+11 0.00015150 0.00272700 18.00000054 2536.11274
60000.00000
1.484654E+08 9.547614E+11 0.00015550 0.00279900 18.00000054 2543.79153
60000.00000
1.484654E+08 9.308175E+11 0.00015950 0.00287010 17.99433571 2548.34886
60000.00000
1.484654E+08 9.080452E+11 0.00016350 0.00292687 17.90136498 2549.72462
60000.00000
1.484654E+08 8.863606E+11 0.00016750 0.00298435 17.81700414 2548.55401
60000.00000
1.484654E+08 8.656874E+11 0.00017150 0.00304339 17.74574000 2543.88008
60000.00000
1.484654E+08 8.459567E+11 0.00017550 0.00310256 17.67841548 2539.18488
60000.00000
1.484654E+08 8.271053E+11 0.00017950 0.00316185 17.61478275 2534.46792
60000.00000
1.484654E+08 8.090757E+11 0.00018350 0.00322127 17.55461973 2529.72856
60000.00000
1.484654E+08 7.918154E+11 0.00018750 0.00328082 17.49771720 2524.96640
60000.00000
1.484654E+08 7.752762E+11 0.00019150 0.00334051 17.44389170 2520.32206
60000.00000
1.484654E+08 7.594138E+11 0.00019550 0.00340089 17.39584368 2526.96308
60000.00000
1.484654E+08 7.441874E+11 0.00019950 0.00346245 17.35563308 2533.06809

```
  60000.00000
  1.484654E+08  7.295597E+11    0.00020350    0.00352419   17.31791049    2538.27456
  60000.00000
  1.484654E+08  7.154959E+11    0.00020750    0.00358613   17.28256005    2542.55961
  60000.00000
  1.484654E+08  7.019640E+11    0.00021150    0.00364827   17.24948841    2545.89954
  60000.00000
  1.484654E+08  6.889345E+11    0.00021550    0.00370890   17.21065217    2548.12531
  60000.00000
  1.484654E+08  6.763799E+11    0.00021950    0.00376898   17.17074412    2549.46645
  60000.00000
  1.484654E+08  6.642747E+11    0.00022350    0.00382923   17.13303119    2549.99260
  60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =  148465.39377
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  =       63000.000 lbs
Specified moment at pile head       =    85668000.000 in-lbs
Specified axial load at pile head   =      105000.000 lbs

  Depth   Deflect.  Moment     Shear     Slope     Total   Flx. Rig. Soil Res.
Es*h
    X        y        M          V         S       Stress      EI        p
F/L
    in       in      lbs-in      lbs       Rad.  lbs/in**2 lbs-in**2  lbs/in
-------- --------- --------- --------- --------- --------- --------- ---------
---------
   0.000  0.985683  8.57E+07    63000. -0.006628   704.165  4.00E+12     0.000
0.000
  26.880  0.815318  8.74E+07    61111. -0.006046   717.928  3.99E+12  -242.639
999.936
  53.760  0.660754  8.89E+07    48076. -0.005452   730.265  3.99E+12 -1008.182
5126.709
  80.640  0.522276  8.97E+07  6725.292 -0.004850   736.947  3.99E+12 -2195.494
14124.
 107.520  0.400029  8.90E+07   -68122. -0.004247   730.962  3.99E+12 -3351.517
28151.
 134.400  0.293859  8.58E+07 -1.73E+05 -0.003657   705.492  4.00E+12 -5416.721
61935.
 161.280  0.203139  7.91E+07 -3.30E+05 -0.003102   650.983  4.02E+12 -5646.274
93392.
```

```
 188.160  0.126568  6.83E+07 -4.66E+05 -0.002609   563.955  4.06E+12 -4368.504
1.16E+05
 215.040  0.061995  5.44E+07 -5.60E+05 -0.002256   451.647  2.24E+13 -2556.365
1.39E+05
 241.920  0.002162  3.87E+07 -5.97E+05 -0.002200   324.722  2.25E+13  -103.703
1.61E+05
 268.800 -0.056427  2.30E+07 -5.59E+05 -0.002163   197.542  2.27E+13  3085.160
1.84E+05
 295.680 -0.114278  9.56E+06 -4.25E+05 -0.002144    88.742  2.28E+13  7016.091
2.06E+05
 322.560 -0.171812  1.22E+06 -1.75E+05 -0.002138    21.294  2.28E+13    11703.
2.29E+05
```

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.98568298 in
Computed slope at pile head      =    -0.00662785
Maximum bending moment           =      89734093. lbs-in
Maximum shear force              =  -597225.45209 lbs
Depth of maximum bending moment  =    84.00000000 in
Depth of maximum shear force     =      241.92000 in
Number of iterations             =             45
Number of zero deflection points =              1
```

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

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)

```
Specified shear force at pile head  =       14000.000 lbs
Specified moment at pile head       =    18336000.000 in-lbs
Specified axial load at pile head   =      105000.000 lbs
```

```
  Depth   Deflect.  Moment     Shear     Slope     Total   Flx. Rig. Soil Res.
Es*h
    X        y        M         V         S       Stress      EI        p
```

F/L

in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in
0.000	0.130657	1.83E+07	14000.	-0.000636	159.725	2.27E+13	0.000
0.000							
26.880	0.113859	1.87E+07	13738.	-0.000614	162.772	2.27E+13	-33.884
999.936							
53.760	0.097656	1.91E+07	11183.	-0.000592	165.606	2.27E+13	-286.054
9842.069							
80.640	0.082059	1.92E+07	-197.585	-0.000569	167.003	2.27E+13	-629.918
25793.							
107.520	0.067072	1.90E+07	-19472.	-0.000546	164.957	2.27E+13	-785.307
39340.							
134.400	0.052687	1.82E+07	-41882.	-0.000524	158.375	2.27E+13	-1110.389
70813.							
161.280	0.038877	1.66E+07	-71709.	-0.000504	146.027	2.28E+13	-1080.603
93392.							
188.160	0.025594	1.43E+07	-98464.	-0.000485	127.446	2.28E+13	-883.386
1.16E+05							
215.040	0.012764	1.14E+07	-1.18E+05	-0.000470	103.779	2.28E+13	-526.337
1.39E+05							
241.920	0.000295	8.12E+06	-1.25E+05	-0.000458	77.112	2.28E+13	-14.146
1.61E+05							
268.800	-0.011917	4.82E+06	-1.17E+05	-0.000451	50.436	2.28E+13	651.579
1.84E+05							
295.680	-0.023976	2.00E+06	-88935.	-0.000447	27.640	2.28E+13	1471.995
2.06E+05							
322.560	-0.035968	2.54E+05	-36575.	-0.000446	13.519	2.28E+13	2449.972
2.29E+05							

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.13065654 in
Computed slope at pile head	=	-0.00063582
Maximum bending moment	=	19236147. lbs-in
Maximum shear force	=	-125360.11577 lbs
Depth of maximum bending moment	=	80.64000000 in
Depth of maximum shear force	=	241.92000 in
Number of iterations	=	5

Number of zero deflection points = 1

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

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

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 63000.	M= 8.57E+07	105000.	0.9856830	8.9734E+07	-597225.
1	V= 14000.	M= 1.83E+07	105000.	0.1306565	1.9236E+07	-125360.

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

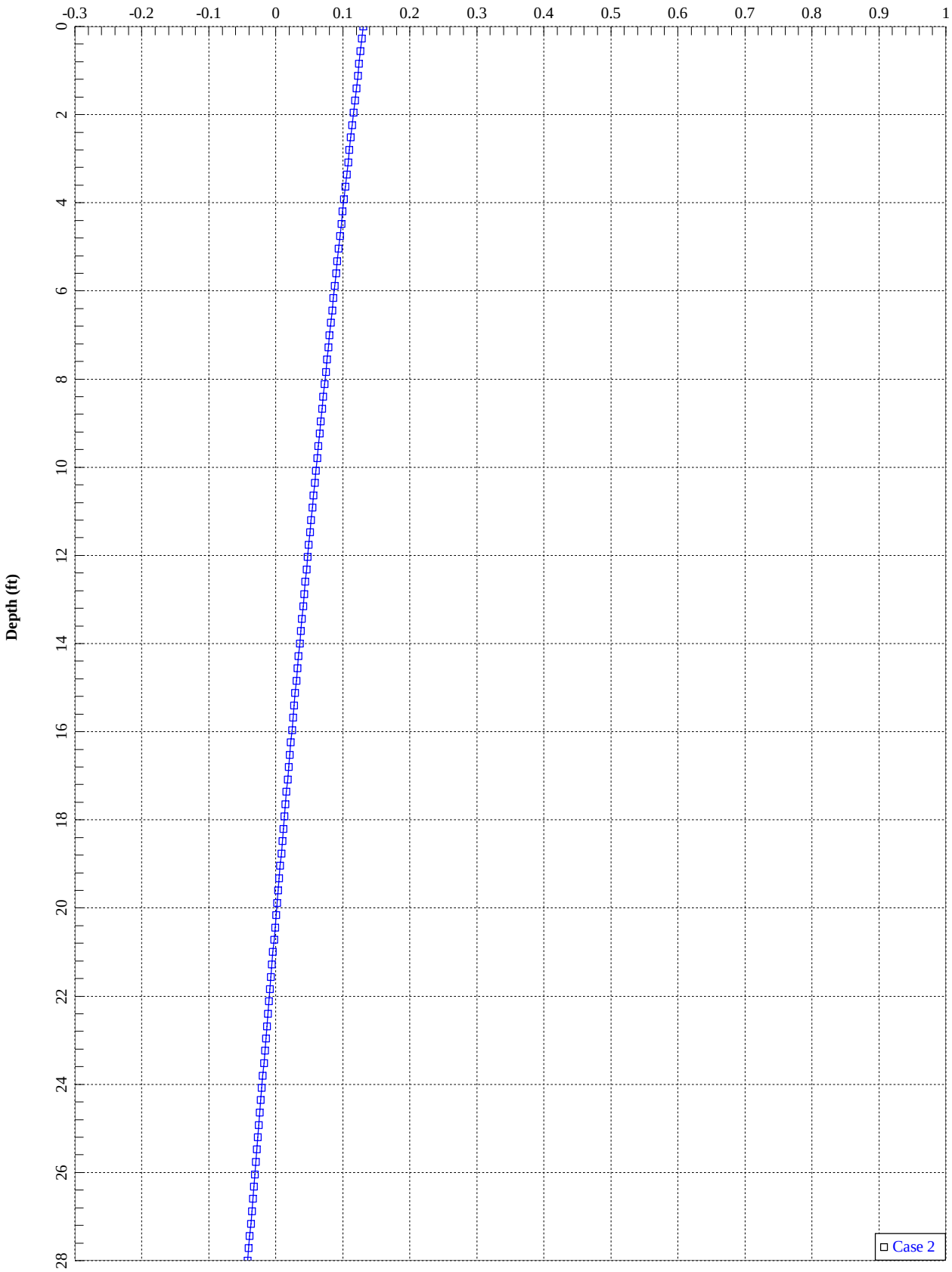
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00162801	6300.00009	1259429.	3869756.	7.736006E+08
0.00490080	18964.88973	3791260.	3869756.	7.736006E+08
0.00776758	30058.63905	6009005.	3869756.	7.736006E+08
0.00980159	37929.77945	7582520.	3869756.	7.736006E+08
0.01137930	44035.11027	8803033.	3869756.	7.736006E+08
0.01266838	49023.52877	9800264.	3869756.	7.736006E+08
0.01375828	53241.17652	10643412.	3869756.	7.736006E+08
0.01470239	56894.66918	11373779.	3869756.	7.736006E+08
0.01553546	60117.27809	12017959.	3869682.	7.735827E+08
0.01628109	63000.00000	12594122.	3869520.	7.735430E+08

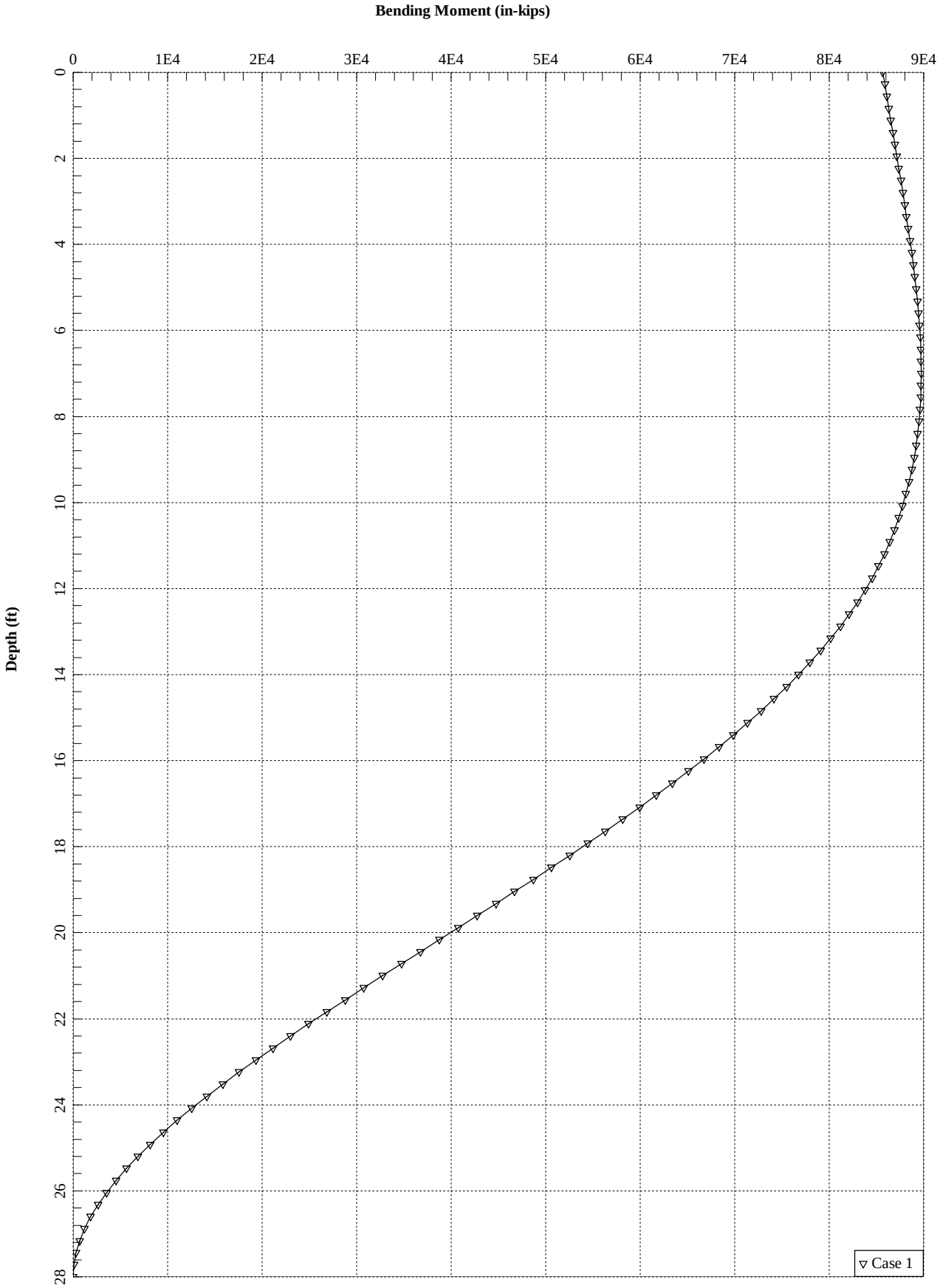
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00004559	35266.64415	8566800.	7.736006E+08	1.879193E+11
0.00013761	106176.41716	25788638.	7.715903E+08	1.874075E+11
0.00021885	168320.13368	40874024.	7.691181E+08	1.867688E+11

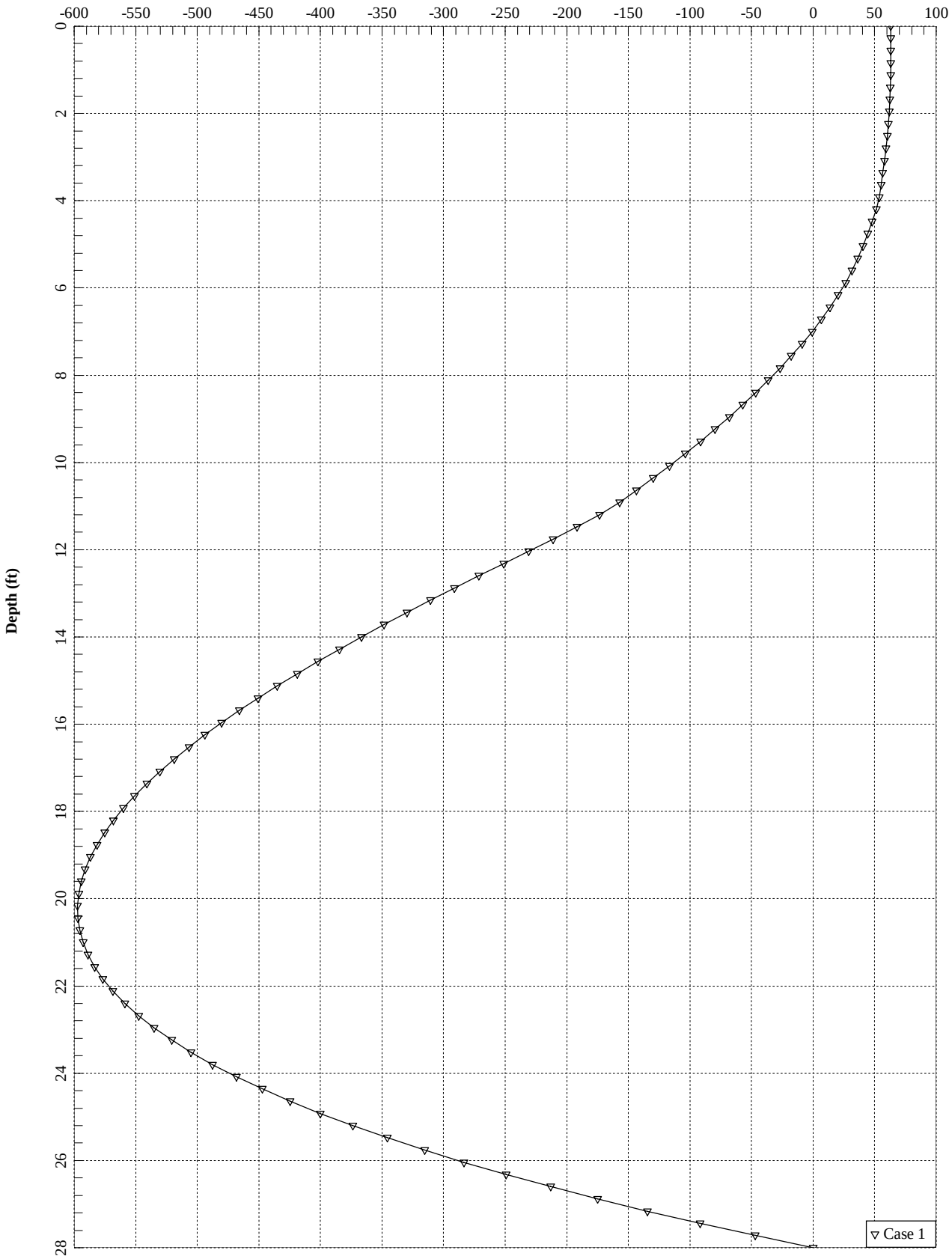
0.00027685	212429.94078	51577275.	7.673010E+08	1.862981E+11
0.00032769	246675.46826	59879362.	7.527691E+08	1.827313E+11
0.00070745	278353.70100	66662661.	3.934583E+08	9.422896E+10
0.00095489	308064.74844	72397859.	3.226193E+08	7.581831E+10
0.00112158	333819.23481	77365913.	2.976320E+08	6.897916E+10
0.00126812	357404.30811	81748047.	2.818390E+08	6.446422E+10
0.00138661	378332.75224	85668000.	2.728466E+08	6.178218E+10

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

The analysis ended normally.


Lateral Deflection (in)
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 2


Bending Moment (in-kips)
0
1E4
2E4
3E4
4E4
5E4
6E4
7E4
8E4
9E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1


Shear Force (kips)
-600
-550
-500
-450
-400
-350
-300
-250
-200
-150
-100
-50
0
50
100
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1

ATTACHMENT C – MOUNT ANALYSIS

BLACK & VEATCH
Building a world of difference.
BLACK & VEATCH CORPORATION
6800 W 115TH ST, SUITE 2292, OVERLAND PARK, KS 66211
+1 913-458-2522 | RILEYJJ@BV.COM

January 13, 2022

MOUNT EVALUATION LETTER

Site Name: GREENWICH HOSPITAL
Site Data: 5 Perryridge Road
Greenwich, CT 06830
Latitude: 41° 2' 3.14"
Longitude: -73° 37' 51.03"

Black & Veatch Corporation is pleased to submit this "Mount Evaluation Letter" to determine the structural integrity of antenna mounting system on the above-mentioned site. The purpose of this evaluation is to determine the capacity of the system in supporting the final loading in the attached "Loading Summary".

Based on our evaluation we have determined the antenna mounting system to be: **SUFFICIENT**

Structure Rating (max from all components) =	71.3%

The existing mounting system will be capable of supporting the existing and proposed equipment, under the assumptions described in Section 4 of the report and the following conditions:

- Contractor shall be responsible for the means and methods of construction.
- Contractor shall inspect the condition of all existing and proposed structural members, all relevant members and connections and report any deficiencies to the engineer prior to installation of any new antennas and other equipment.

The scope of this evaluation pertains only to the existing antenna mounting system and does not include examination of the loads imparted by the antenna mounting system to the existing tower and its structural components. This document was prepared based on information provided to Black & Veatch. If existing conditions do not reflect those represented, this analysis is no longer valid.

Please contact Josh Riley in our Overland Park Office
at 913-458-2522 if you have any questions or comments.

Sincerely,
Black & Veatch Corporation

Prepared By: Joohwan Jung
Submitted By: Josh Riley, P.E.

Riley, Joshua J Joshua J", O=Black Veatch, C=US
Digitally signed by Riley, Joshua J
DN: CN="Riley,
Date: 2022.01.14 08:00:49-06'00'

TABLE OF CONTENTS

1. LOADING SUMMARY

Appurtenance								
Carrier	Position	Sector	Antenna RAD Center (ft)	Mount Centerline (ft)	Qty	Type	Manufacturer	Model
Eversource	1	A	120.5	114	1	Dipoles	COMPROD	872F-70-2
Eversource	1	A	109.5	114	1	Dipoles	COMPROD	871F-70-2
Eversource	2	B	116.5	114	1	Omni	Telewave	ANT150F2
Eversource	3	A	114	114	1	Dipoles	COMPROD	531-70-HD
Eversource	4	B	116.5 / 111.5	114	2	Omni	Commscope	DB586-Y

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 130 mph
WIND SPEED WITH ICE	50 mph with 1" radial ice thickness
EXPOSURE CATEGORY	C
RISK CATEGORY	III
TOPO CATEGORY	Flat
CREST HEIGHT	N/A

3. REFERENCES

- American Institute of Steel Construction, AISC 15th Edition
- Telecommunications Industry Association Standard, TIA-222-H & 2018 Connecticut State Building Code
- Previous Antenna Mount Analysis by CENTEK engineering, dated 02/24/2021

4. ASSUMPTIONS

This analysis may be affected if any assumptions are not valid or have been made in error. Black & Veatch should be notified to determine the effect on the structural integrity of the antenna mounting system.

- The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- The configuration of antennas, mounts, and other appurtenances are as specified in the Loading Summary and the referenced drawings.
- All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
- Sector frame center line: located equidistant between top & bottom boom; Platform center line: located at the base perimeter of platform, unless otherwise specified.
- Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM 500 (GR B-46)
Pipe	ASTM A53 (GR B-35)
Connection Bolts	ASTM A325

5. RESULTS SUMMARY

Name	Bending Stress Ratio		Shear Stress Ratio	
Perimeter: Pipe 3.0 Std	21.0%	Pass	15.5%	Pass
Perimeter Corner: PL6x1/2	15.2%	Pass	62.9%	Pass
Arm: HSS4X4X4	31.2%	Pass	10.4%	Pass
Cross Arm: HSS4X4X4	9.4%	Pass	4.8%	Pass
Cross Arm Cnxn: PL6x3/8	27.6%	Pass	71.3%	Pass
Grating Support: L2x2x3	23.7%	Pass	0.9%	Pass
Pipe bracing: Pipe 2.0 Std	5.8%	Pass	8.1%	Pass
Mount Pipe 2.0 STD: Pipe 2.0 Std	53.7%	Pass	65.9%	Pass
Mount Pipe 2.5 STD: Pipe 2.5 Std	46.5%	Pass	13.2%	Pass
	Tension SR		*Shear SR*	
Bolt Checks on M1 in Load Case 21	24.6%	Pass	7.1%	Pass
	Weld SR		*Base Metal SR*	
Weld Checks on M1 in Load Case 21	69.1%	Pass	26.2%	Pass

*Von Mises SR = (Max Von Mises Value From RISA-3D)/(0.9*Fy)

**Capacity rating per TIA-222-H Section 15.5.

APPENDIX 1:
MOUNT ANALYSIS REPORT

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	GREENWICH HOSPITAL ()	Date: 1/13/2022
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 1/13/2022

Dead and Live Loads

Grating Dead Load: DL = 10 psf
Maintenance Live Load: L_V = 250 lb
Installation Live Load: L_M = 500 lb

Appurtenance Dead Loads	
Name	Weight (lb)
872F-70-2	21
871F-70-2	12.5
ANT150F2	12
531-70-HD	43
DB586-Y	7.937
TMA	40

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: GREENWICH HOSPITAL ()		Date: 1/13/2022
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 1/13/2022

Appurtenance Wind Loading

Exposure Category =	C	
Risk Category =	III	
Topographic Category =	1	
Basic Wind Speed, V =	130	mph
Height Above Ground, z =	120.5	ft
Crest Height, H =	N/A	ft
Velocity Pressure Coefficient, K_z =	1.32	
Topographic Factor, K_{zt} =	1.00	
Wind Directionality Factor, K_d =	0.95	
Shielding Factor, K_a =	0.90	
Ground Elevation Factor, K_e =	1.000	
Wind Velocity Pressure, q_z =	54.10	psf
Gust Effect Factor, G_h =	1.00	

Equations

$K_z = 2.01\ (z / z_g)^{2/\alpha}$

$K_h = e^{(f \cdot z / H)}$

$K_{zt} = [1 + K_c K_t / K_h]^2$

$K_e = e^{-0.000032 z^2}$

$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$

$F_A = q_z G_h (EPA)$

$F_M = q_z G_h C_f D_p$

TIA-222-H
2.6.5.2
2.6.6.2.1
2.6.6.2.1
2.6.8
2.6.11.6
2.6.11.2
2.6.11.2

Appurtenance Wind Loads

Name	Height (ft)	Width (ft)	Depth (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
872F-70-2	9.33	2.58	0.33	2.00	5.60	302.95	2.00	5.60	302.95
871F-70-2	5.50	2.58	0.33	1.72	2.83	153.23	1.72	2.83	153.23
ANT150F2	5.00	0.23	0.23	1.89	1.95	105.66	1.89	1.95	105.66
531-70-HD	15.75	7.25	0.21	2.00	5.91	319.52	2.00	5.91	319.52
DB586-Y	4.92	0.25	0.25	1.82	2.02	109.05	1.82	2.02	109.05
TMA	2.00	1.00	1.00	1.20	2.16	116.85	1.20	2.16	116.85

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: GREENWICH HOSPITAL ()		Date: 1/13/2022
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 1/13/2022

Member Wind Loading

Exposure Category =	C	
Risk Category =	III	
Topographic Category =	1	
Basic Wind Speed, V =	130	mph
Height Above Ground, z =	120.5	ft
Crest Height, H =	N/A	ft
Velocity Pressure Coefficient, K_z =	1.32	
Topographic Factor, K_{zt} =	1.00	
Wind Directionality Factor, K_d =	0.95	
Shielding Factor, K_a =	0.90	
Ground Elevation Factor, K_e =	1.000	
Wind Velocity Pressure, q_z =	54.10	psf
Gust Effect Factor, G_h =	1.00	

Equations

	TIA-222-H
$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_e = e^{-0.000032 \cdot zs}$	2.6.8
$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
$F_A = q_z G_h (EPA)$	2.6.11.2
$F_M = q_z G_h C_f D_p$	2.6.11.2

Member Wind Loads

Name	Depth (ft)	Width (ft)	C_f	D_p (ft)	F_M (lb)
Perimeter: Pipe 3.0 Std	0.29		1.2	0.29	18.93
Perimeter Corner: PL6x1/2	0.50	0.04	2	0.50	54.10
Arm: HSS4X4X4	0.33	0.33	2	0.33	36.07
Cross Arm: HSS4X4X4	0.33	0.33	2	0.33	36.07
Cross Arm Cnxn: PL6x3/8	0.50	0.03	2	0.50	54.10
Grating Support: L2x2x3	0.17	0.17	2	0.17	18.03
Pipe bracing: Pipe 2.0 Std	0.20		1.2	0.20	12.85
Mount Pipe 2.0 STD: Pipe 2.0 Std	0.20		1.2	0.20	12.85
Mount Pipe 2.5 STD: Pipe 2.5 Std	0.24		1.2	0.24	15.55

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	GREENWICH HOSPITAL ()	Date:	1/13/2022
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	1/13/2022

BLACK & VEATCH

Appurtenance Ice Dead Loading

Exposure Category =	C		
Risk Category =	III		
Topographic Category =	1		
Height Above Ground, z =	120.5	ft	
Crest Height, H =	N/A	ft	
Design Ice Thickness, T_i =	1.00	in	
Importance Factor, I =	1.15		
Topographic Factor, K_{zt} =	1.00		
Height Escalation Factor, K_{iz} =	1.14		
Factored Ice Thickness, T_{iz} =	1.31	in	
Grating Ice Dead Load, D_{Gice} =	6.11	psf	

Equations

$K_h = e^{(f \cdot z / H)}$

$K_{zt} = [1 + K_c K_t / K_h]^2$

$K_{iz} = (z/33)^{0.10}$

$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$

$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$

TIA-222-H

2.6.6.2.1

2.6.6.2.1

2.6.10

2.6.10

Appurtenance Ice Dead Loads

Name	Height w/ ice (ft)	Width w/ice (ft)	Depth w/ ice (ft)	V_{ice} (ft^3)	DL_{ice} (lb)
872F-70-2	9.55	2.80	0.55	1.87	104.61
871F-70-2	5.72	2.80	0.55	1.13	63.17
ANT150F2	5.22	0.45	0.45	0.78	43.77
531-70-HD	15.97	7.47	0.43	2.22	124.38
DB586-Y	5.13	0.47	0.47	0.82	45.82
TMA	2.22	1.22	1.22	1.29	72.33

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: GREENWICH HOSPITAL ()		Date: 1/13/2022
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 1/13/2022

Member Ice Dead Loading

Exposure Category =	C	
Risk Category =	III	
Topographic Category =	1	
Height Above Ground, z =	120.5	ft
Crest Height, H =	N/A	ft
Design Ice Thickness, T_i =	1.00	in
Importance Factor, I =	1.15	
Topographic Factor, K_{zt} =	1.00	
Height Escalation Factor, K_{iz} =	1.14	
Factored Ice Thickness, T_{iz} =	1.31	in
Grating Ice Dead Load, D_{Gice} =	6.11	psf

Equations

	TIA-222-H
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_{iz} = (z/33)^{0.10}$	2.6.10
$T_{iz} = T_i I K_{iz} (K_{zt})^{0.35}$	2.6.10
Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
DL_{ice}=Aiz*56pcf	

Member Ice Dead Loads

Name	Depth w/ ice (ft)	Width w/ ice (ft)	Dc (ft)	Aiz (ft^2)	DL_{ice} (lb/ft)
Perimeter: Pipe 3.0 Std	0.51		0.29	0.14	7.69
Perimeter Corner: PL6x1/2	0.72	0.26	0.50	0.21	11.72
Arm: HSS4X4X4	0.55	0.55	0.47	0.20	11.14
Cross Arm: HSS4X4X4	0.55	0.55	0.47	0.20	11.14
Cross Arm Cnxn: PL6x3/8	0.72	0.25	0.50	0.21	11.71
Grating Support: L2x2x3	0.38	0.38	0.24	0.12	6.62
Pipe bracing: Pipe 2.0 Std	0.42		0.20	0.11	5.89
Mount Pipe 2.0 STD: Pipe 2.0 Std	0.42		0.20	0.11	5.89
Mount Pipe 2.5 STD: Pipe 2.5 Std	0.46		0.24	0.12	6.69

BLACK & VEATCH

Client: Eversource | Computed By: Joohwan Jung
Site Name: GREENWICH HOSPITAL () | Date: 1/13/2022
Verified By: JW
Title: MOUNT ANALYSIS REPORT | Date: 1/13/2022

Appurtenance Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	C		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	120.5	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	1.000		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	8.003			
Factored Ice Thickness, T_{iz} =	1.31	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Appurtenance Ice Wind Loads

Name	Height w/ Ice (ft)	Width w/ Ice (ft)	Depth w/ Ice (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
872F-70-2	9.55	2.80	0.55	-	6.88	55.07	-	6.88	55.07
871F-70-2	5.72	2.80	0.55	-	3.53	28.29	-	3.53	28.29
ANT150F2	5.22	0.45	0.45	-	2.57	20.57	-	2.57	20.57
531-70-HD	15.97	7.47	0.43	-	9.72	77.77	-	9.72	77.77
DB586-Y	5.13	0.47	0.47	-	2.63	21.08	-	2.63	21.08
TMA	2.22	1.22	1.22	-	2.60	20.83	-	2.60	20.83

Member Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	C		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	120.5	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32	psf	$K_e = e^{-0.000032 z s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	1.000		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	8.003			
Factored Ice Thickness, T_{iz} =	1.31	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Member Ice Wind Loads

Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Perimeter: Pipe 3.0 Std	0.51		1.2	0.51	4.90
Perimeter Corner: PL6x1/2	0.72	0.26	2	0.72	11.49
Arm: HSS4X4X4	0.55	0.55	2	0.55	8.83
Cross Arm: HSS4X4X4	0.55	0.55	2	0.55	8.83
Cross Arm Cnxn: PL6x3/8	0.72	0.25	2	0.72	11.49
Grating Support: L2x2x3	0.38	0.38	2	0.38	6.16
Pipe bracing: Pipe 2.0 Std	0.42		1.2	0.42	4.00
Mount Pipe 2.0 STD: Pipe 2.0 Std	0.42		1.2	0.42	4.00
Mount Pipe 2.5 STD: Pipe 2.5 Std	0.46		1.2	0.46	4.40

BLACK & VEATCH	Client: Eversource	Computed By: Joohwan Jung	
	Site Name: GREENWICH HOSPITAL ()	Date: 1/13/2022	
		Verified By: JW	
	Title: MOUNT ANALYSIS REPORT	Date: 1/13/2022	

Rectangular Weld Analysis for Antenna Mount to Tower Connection

The forces acting on the plate are from M1 from RISA-3D Load Combination 21

Design Method: LRFD

Applied Loads:

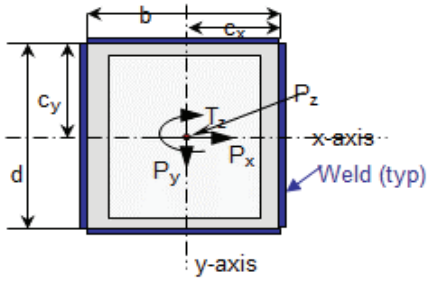
P_x =	0.167	kip	M_x =	57.117	kip-in
P_y =	1.543	kip	M_y =	3.243	kip-in
P_z =	0.3	kip	M_z =	9.283	kip-in
ϕF_w =	1.392	($^{kip}/_{in}$)/($^{1}/_{16}$" weld)		AISC Eq. (8-2a)	

Base Metal Properties:

$d_{(arm)}$ =	4	in	$t_{(arm)}$ =	0.25	in
$b_{(arm)}$ =	4	in	$t_{(plate)}$ =	0.5	in
$F_{y(arm)}$ =	46	ksi	$F_{y(plate)}$ =	36	ksi
$F_{u(arm)}$ =	58	ksi	$F_{u(plate)}$ =	58	ksi

CALCULATIONS

Distance from y-axis to Edge of Weld, c_x =	2	in
Distance from x-axis to Edge of Weld, c_y =	2	in
Total Length of Weld in x-direction, L_x =	8	in
Total Length of Weld in y-direction, L_y =	8	in
Total Length of Weld, L_w =	16	in
Section Modulus of Weld About x-axis, S_x =	21.333	in^2
Section Modulus of Weld About y-axis, S_y =	21.333	in^2
Polar Moment of Inertia About z-axis, I_z =	85.333	in^3
Shear Stress on x-axis of Weld, f_{vx} =	0.021	kip/in
Shear Stress on y-axis of Weld, f_{vy} =	0.193	kip/in
Torsional Stress on x-axis of Weld, f_{tx} =	0.218	kip/in
Torsional Stress on y-axis of Weld, f_{ty} =	0.218	kip/in
Axial Stress on Weld, f_a =	0.019	kip/in
Bending Stress about x-axis of Weld, f_{bx} =	2.677	kip/in
Bending Stress about y-axis of Weld, f_{by} =	0.152	kip/in
Total Force Acting in x-direction, f_1 =	0.239	kip/in
Total Force Acting in y-direction, f_2 =	0.411	kip/in
Total Force Acting in z-direction, f_3 =	2.848	kip/in
Resultant Force on Weld, f_r =	2.887	kip/in



Weld Strength Check

Existing Weld Size, t_w =	0.1875	in
Weld Stress Ratio, SR_w =	69.13%	

Base Metal Check

Arm Tensile Rupture Strength, ϕT_{arm} =	174	kip
Arm Shear Rupture Strength, ϕV_{arm} =	41.4	kip
Plate Tensile Rupture Strength, ϕT_{plate} =	348	kip
Plate Shear Rupture Strength, ϕV_{plate} =	64.8	kip
Base Metal Stress Ratio, SR_b =	26.19%	

P_x = Major axis load (x-axis) P_y = Minor axis load (y-axis) P_z = Axial Load (z-axis) F_{EXX} = 70 ksi Assumed

M_x = Moment about x-axis M_y = Moment about y-axis T_z = Torque about z-axis

$c_x = b/2$	$L_y = 2d$	$f_{vy} = P_y/L_y$	$f_{by} = M_y/S_y$	$S_y = b/3(3d + b)$	$f_1 = f_{vx} + f_{tx}$	$f_r = (f_1^2 + f_2^2 + f_3^2)^{1/2}$
$c_y = d/2$	$L_w = L_x + L_y$	$f_a = P_z/L_w$	$f_{tx} = T_z(c_y/I_z)$	$S_x = d/3(3b + d)$	$f_2 = f_{vy} + f_{ty}$	$\phi T = 0.75(F_u t L_w)$
$L_x = 2b$	$f_{vx} = P_x/L_x$	$f_{bx} = M_x/S_x$	$f_{ty} = T_z(c_x/I_z)$	$I_z = [(b + d)^3]/6$	$f_3 = f_a + f_{bx} + f_{by}$	$\phi V = 0.75(0.6F_y t L_x)$
	$SR_T = f_3 L_w/\phi T_{plate}$			$SR_w = f_r/(\phi F_w t_w 16)$		$SR_V = f_2 L_x/\phi V_{plate}$

BLACK & VEATCH

Client: Eversource | Computed By: Joohwan Jung
Site Name: GREENWICH HOSPITAL () | Date: 1/13/2022
Verified By: JW
Title: MOUNT ANALYSIS REPORT | Date: 1/13/2022

Bolt Analysis of Antenna Mount Arm to Tower Connection

The forces acting on the plate are from M1 from RISA-3D Load Combination 21

Design Method: LRFD

Applied Loads:

P_x =	0.167	kip
P_y =	1.543	kip
P_z =	0.3	kip
M_x =	57.117	kip-in
M_y =	3.243	kip-in
M_z =	9.283	kip-in

Bolt Properties:

d_b =	0.625	in
A_b =	0.307	in^2
N_b =	4	

Load Location Coordinates:

X_o =	4	in
Y_o =	4	in

Bolt Strength: A325 AISC Table (J3.2)

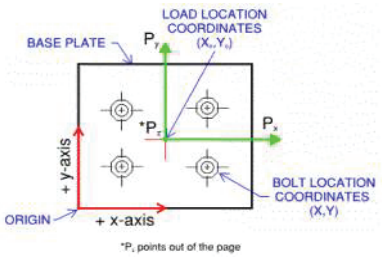
F_{nt} =	90	ksi
F_{nv} =	54	ksi

Bolt Location Coordinates (in):

Bolt #	X_b	Y_b
#1	1	1
#2	1	7
#3	7	7
#4	7	1

CALCULATIONS

Bolt Group Centroid y-coordinate, Y_c =	4	in
Bolt Group Centroid x-coordinate, X_c =	4	in
Load Eccentricity in x-direction, e_x =	0	in
Load Eccentricity in y-direction, e_y =	0	in
Total Moment Including Load Eccentricity, ΣM_x =	57.12	kip-in
Total Moment Including Load Eccentricity, ΣM_y =	3.24	kip-in
Total Moment Including Load Eccentricity, ΣM_z =	9.28	kip-in



Bolt #	Centroid Dist. (in)		Polar Moments of Inertia (in^4/in^2)			Force per Bolt (kip)	
	d_x	d_y	I_x	I_y	I_{xy}	Tension	Shear
#1	-3	-3	9	9	9	4.415	0.428
#2	3	-3	9	9	-9	4.955	0.883
#3	3	3	9	9	9	4.565	0.846
#4	-3	3	9	9	-9	5.105	0.345
SUM:			36	36	0		

Bolt Shear Strength Check

Available Shear Strength per Bolt, ϕV_n =	12.43	kip	AISC Eq. (J3-1)
Bolt Shear Stress Ratio, SR_V =	7.10%		

Bolt Tensile Strength Check

Nom. Tensile Stress (Including Effects of Shear), F'_{nt} =	90	ksi	AISC Eq. (J3-3a)
Available Tensile Strength per Bolt, ϕT_n =	20.72	kip	AISC Eq. (J3-2)
Bolt Tension Stress Ratio, SR_T =	24.64%		

P_x = Major Axis Load (X-Axis) | M_x = Moment About X-Axis | d_b = Diameter of Bolt

P_y = Minor Axis Load (Y-Axis) | M_y = Moment About Y-Axis | A_b = Cross-Sectional Area of Bolt

P_z = Axial Load (Z-Axis) | M_z = Torque About Z-Axis | N_b = Number of Bolts

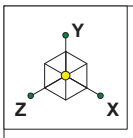
$d_x = Y_b - Y_c$ | $I_{xy} = d_x d_y$ | $SR_V = V_u/\phi V_n$ | $F'_{nt} = 1.3F_{nt} - (F_{nt}/\phi F_{nv})(V_u/A_b) \le F_{nt}$

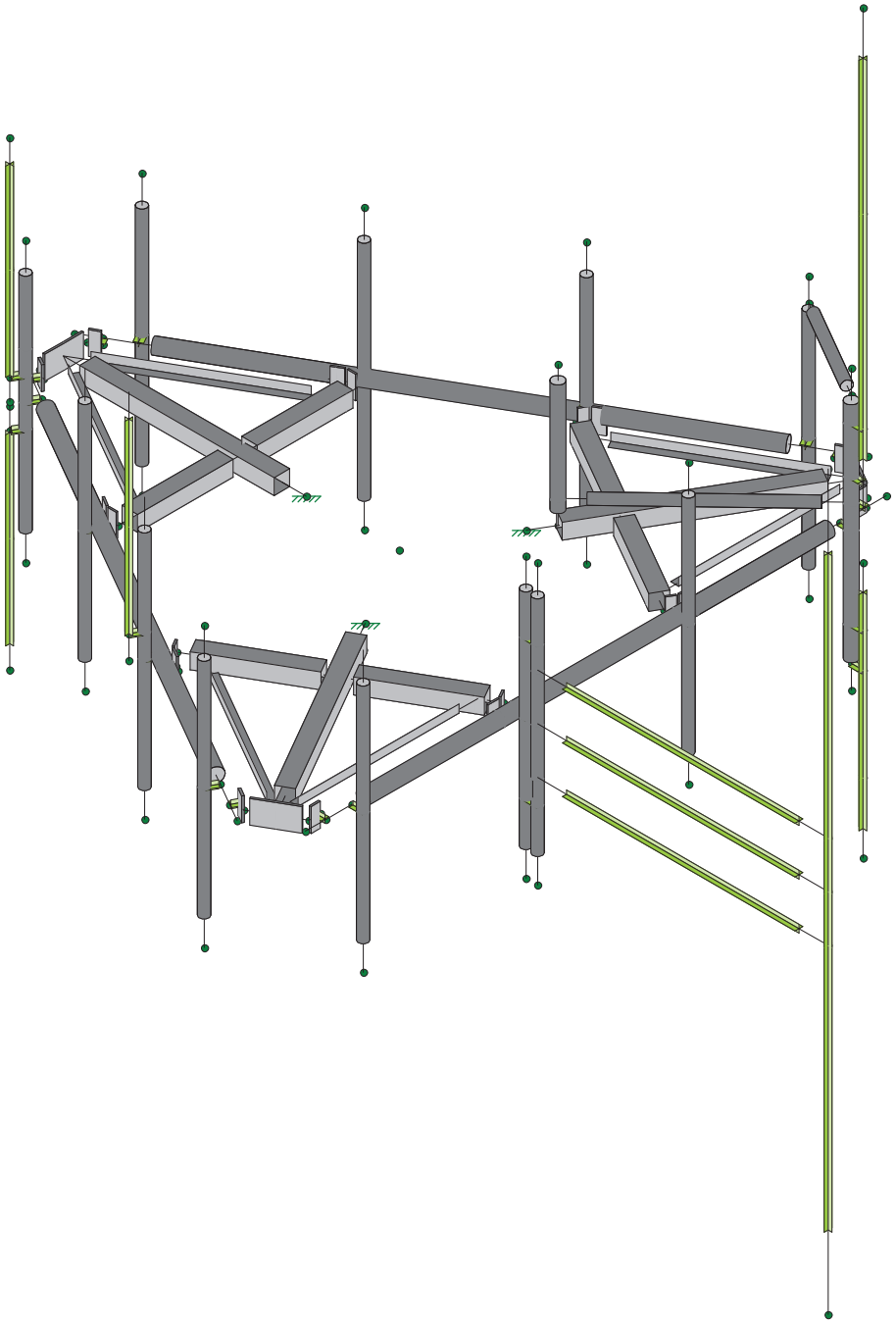
$d_y = X_b - X_c$ | $\Sigma M_x = M_x + P_z(e_y)$ | $SR_T = T_u/\phi T_n$ | $T_{ui} = \Sigma P_z/N_b - [(\Sigma M_x \Sigma I_y + \Sigma M_y \Sigma I_{xy})/(\Sigma I_x \Sigma I_y - \Sigma I_{xy}^2)]d_x + [(\Sigma M_y \Sigma I_x + \Sigma M_x \Sigma I_{xy})/(\Sigma I_x \Sigma I_y - \Sigma I_{xy}^2)]d_y$

$I_x = d_y^2$ | $\Sigma M_y = M_y + P_z(e_x)$ | $\phi V_n = 0.75F_{nv}A_b$

$I_y = d_x^2$ | $\Sigma M_z = M_z + P_x(e_y) + P_y(e_x)$ | $\phi T_n = 0.75F'_{nt}A_b$ | $V_{ui} = [(\Sigma P_x/N_b - \Sigma M_z d_y/(\Sigma I_x + \Sigma I_y))^2 + (\Sigma P_y/N_b - \Sigma M_z d_x/(\Sigma I_x + \Sigma I_y))^2]^{1/2}$

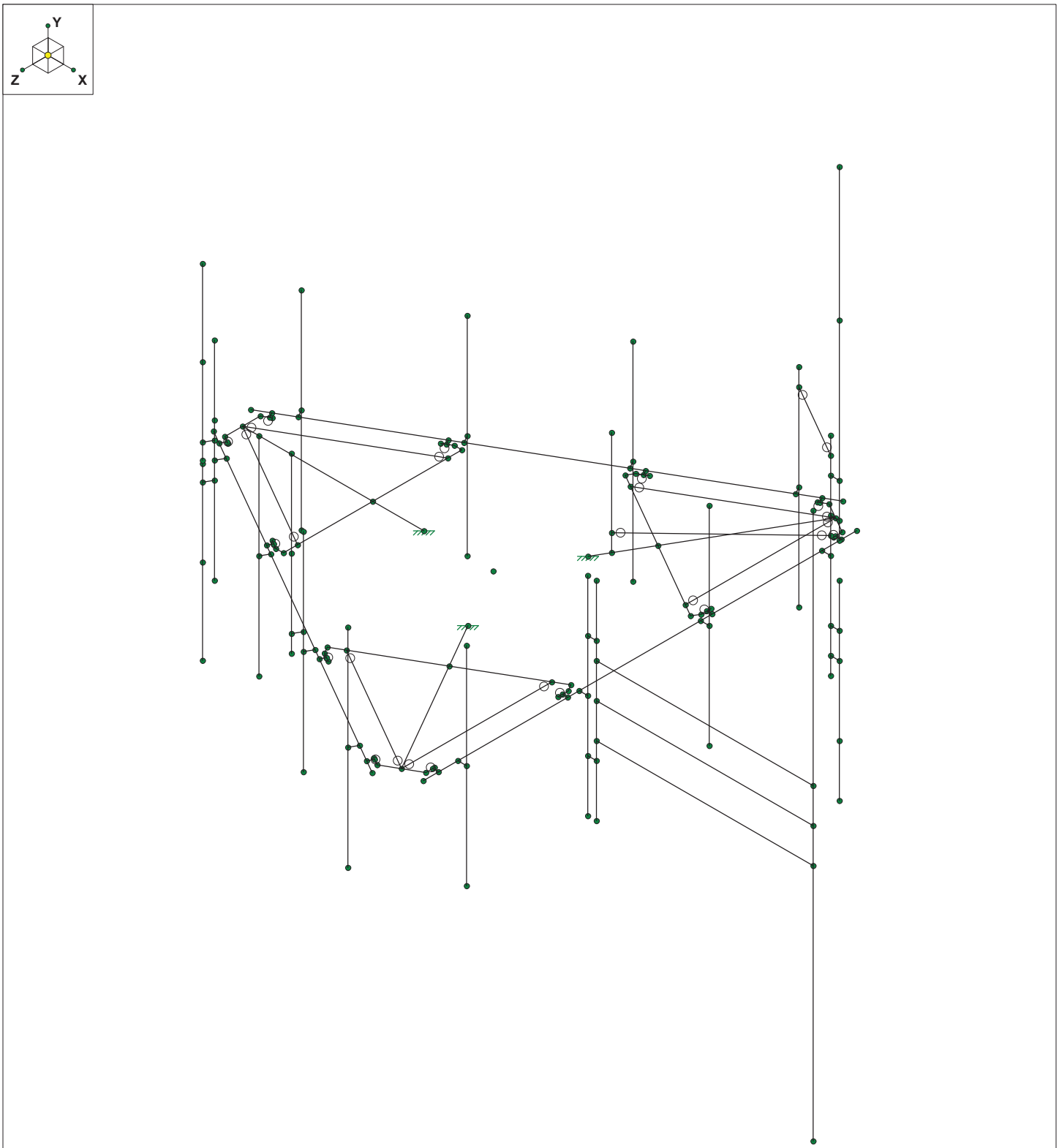
APPENDIX 2:
RISA PRINTOUTS





Envelope Only Solution

Black & Veatch Corp.	Greenwich Hospital	SK - 1
Joohwan Jung		Jan 13, 2022 at 5:12 PM
405025.3022.2200		Greenwich Hospital Risa Model.R3D



Envelope Only Solution

Black & Veatch Corp.	Greenwich Hospital	SK - 2
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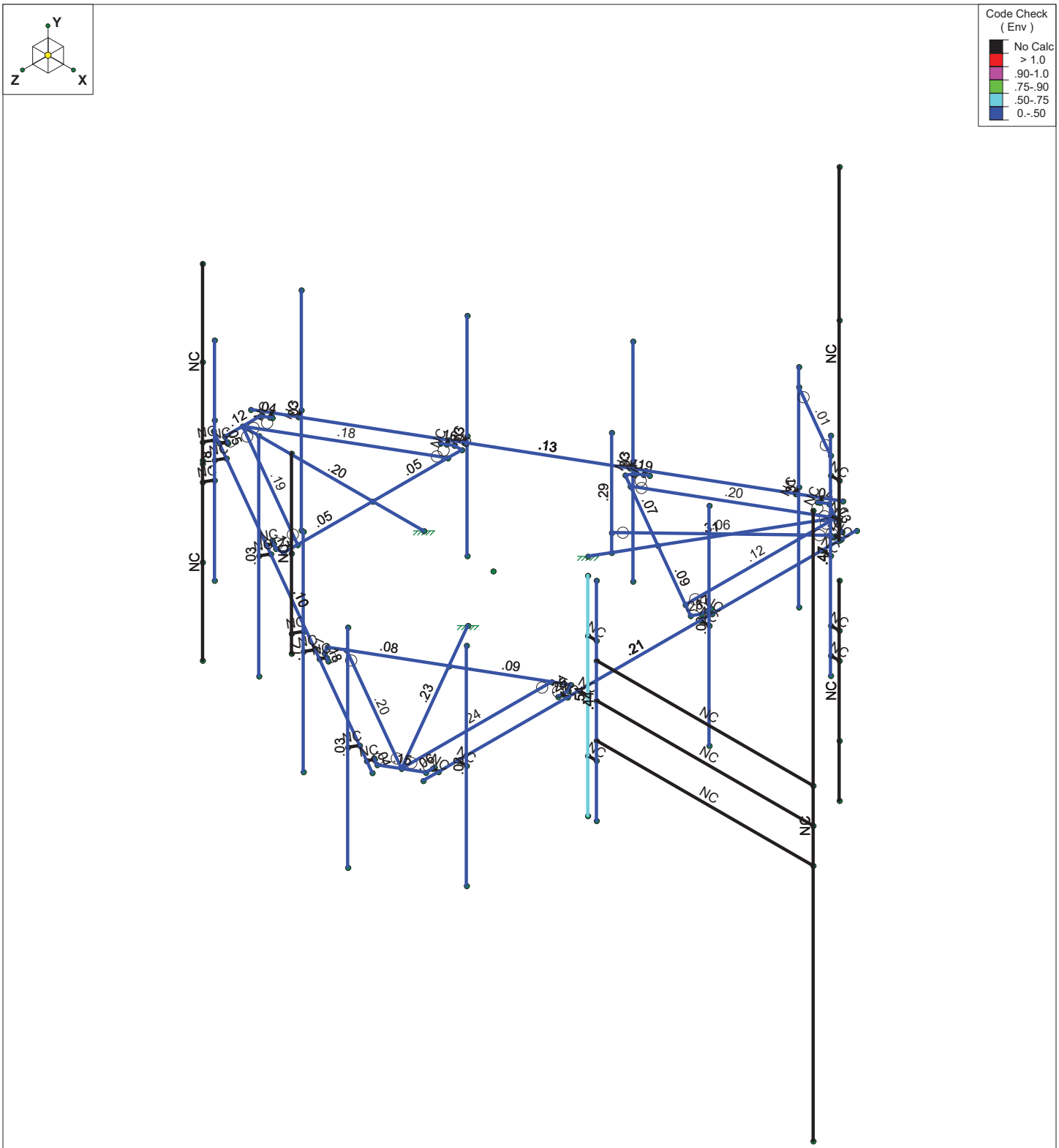

Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch Corp.	Greenwich Hospital	SK - 3
Joohwan Jung		Jan 13, 2022 at 5:13 PM
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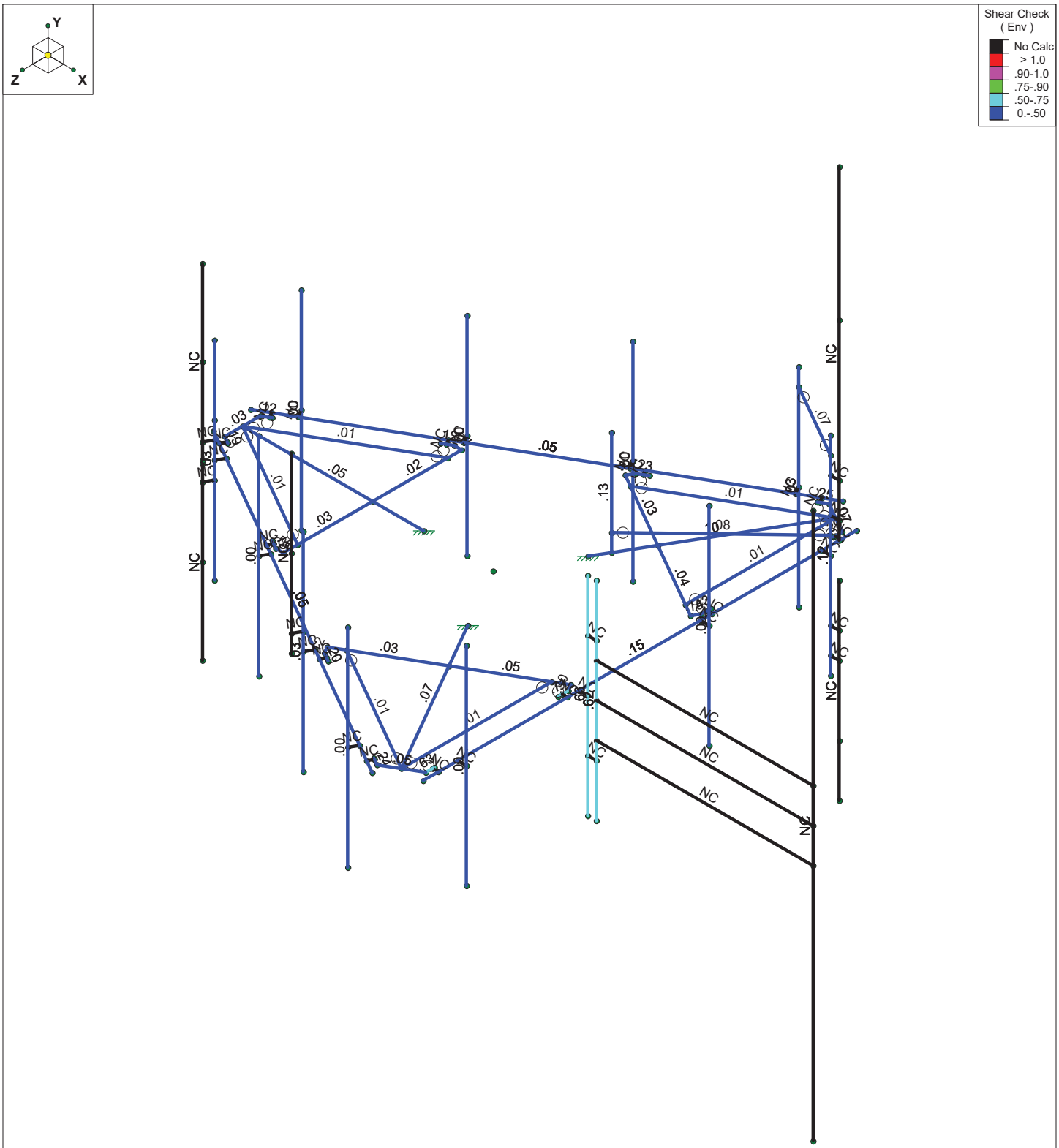

Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch Corp.	Greenwich Hospital	SK - 4
Joohwan Jung		Jan 13, 2022 at 5:13 PM
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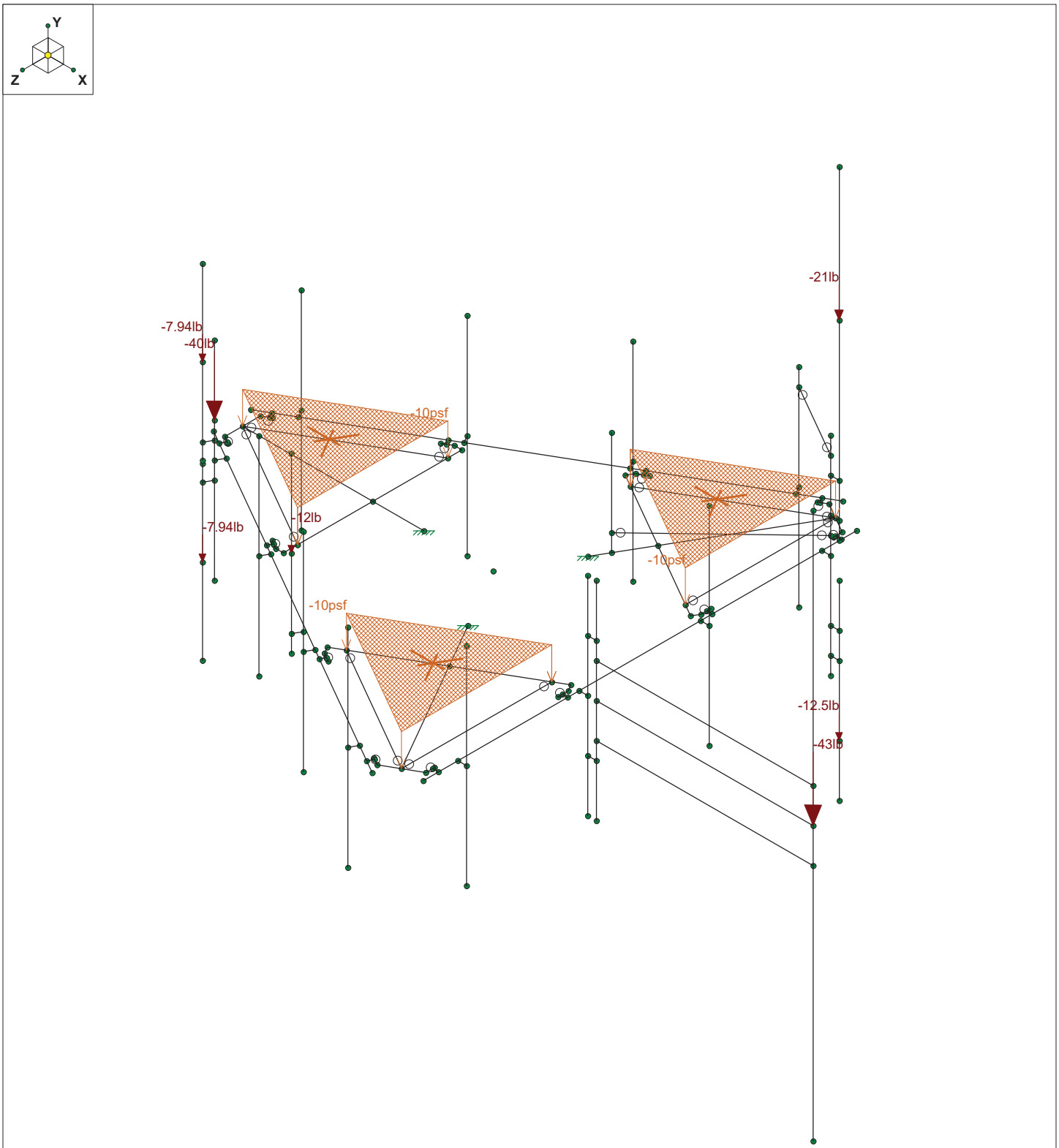


Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch Corp.	Greenwich Hospital	SK - 5
Joohwan Jung		Jan 13, 2022 at 5:13 PM
405025.3022.2200		Greenwich Hospital Risa Model.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 (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

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	None
Seismic Base Elevation (in)	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

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/f...	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	65	1.1
3	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
4	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
5	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Perimeter	PIPE 3.0	Beam	None	A53 Gr.B	Typical	2.07	2.85	2.85	5.69
2	Perimeter Corner	PL6x1/2	Beam	None	A36 Gr.36	Typical	3	.063	9	.237
3	Arm	HSS4X4X4	Beam	None	A500 Gr.B R...	Typical	3.37	7.8	7.8	12.8
4	Cross Arm	HSS4X4X4	Beam	None	A500 Gr.B R...	Typical	3.37	7.8	7.8	12.8
5	Cross Arm Cnxn	PL6x3/8	Beam	None	A36 Gr.36	Typical	2.25	.026	6.75	.101
6	Grating Support	L2x2x3	Beam	None	A36 Gr.36	Typical	.722	.271	.271	.009
7	Pipe bracing	PIPE_2.0	Beam	None	A53 Gr.B	Typical	1.02	.627	.627	1.25
8	Mount Pipe 2.0 STD	PIPE_2.0	Column	None	A53 Gr.B	Typical	1.02	.627	.627	1.25
9	Mount Pipe 2.5 STD	PIPE_2.5	Column	None	A53 Gr.B	Typical	1.61	1.45	1.45	2.89

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10100	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	gen_Plywood	1800	38	0	.3	.035
8	RIGID	1e+6		.3	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	N1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N24	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	N47	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	N139						
5	N140						
6	N144						

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N3	N1			Arm	Beam	None	A500 Gr.B...	Typical
2	M2	N2	N3			Grating Support	Beam	None	A36 Gr.36	Typical
3	M3	N3	N4			Grating Support	Beam	None	A36 Gr.36	Typical
4	M4	N10	N5			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
5	M5	N11	N6			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
6	M6	N6	N7			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
7	M7	N8	N9			RIGID	None	None	RIGID	Typical
8	M8	N14	N10			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
9	M9	N20	N11			Cross Arm	Beam	None	A500 Gr.B...	Typical
10	M10	N12	N13			RIGID	None	None	RIGID	Typical
11	M11	N14	N15			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
12	M12	N21	N16			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
13	M13	N16	N17			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
14	M14	N18	N19			RIGID	None	None	RIGID	Typical
15	M15	N20	N21			Cross Arm	Beam	None	A500 Gr.B...	Typical
16	M16	N22	N23			RIGID	None	None	RIGID	Typical
17	M17	N26	N24			Arm	Beam	None	A500 Gr.B...	Typical
18	M18	N33	N28			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
19	M19	N34	N29			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
20	M20	N29	N30			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
21	M21	N31	N32			RIGID	None	None	RIGID	Typical
22	M22	N37	N33			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
23	M23	N43	N34			Cross Arm	Beam	None	A500 Gr.B...	Typical
24	M24	N35	N36			RIGID	None	None	RIGID	Typical
25	M25	N37	N38			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
26	M26	N44	N39			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
27	M27	N39	N40			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
28	M28	N41	N42			RIGID	None	None	RIGID	Typical
29	M29	N43	N44			Cross Arm	Beam	None	A500 Gr.B...	Typical
30	M30	N45	N46			RIGID	None	None	RIGID	Typical
31	M31	N49	N47			Arm	Beam	None	A500 Gr.B...	Typical
32	M32	N56	N51			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
33	M33	N57	N52			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
34	M34	N52	N53			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
35	M35	N54	N55			RIGID	None	None	RIGID	Typical
36	M36	N60	N56			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
37	M37	N66	N57			Cross Arm	Beam	None	A500 Gr.B...	Typical
38	M38	N58	N59			RIGID	None	None	RIGID	Typical
39	M39	N60	N61			Perimeter Cor...	Beam	None	A36 Gr.36	Typical
40	M40	N67	N62			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
41	M41	N62	N63			Cross Arm Cnxn	Beam	None	A36 Gr.36	Typical
42	M42	N64	N65			RIGID	None	None	RIGID	Typical
43	M43	N66	N67			Cross Arm	Beam	None	A500 Gr.B...	Typical
44	M44	N68	N69			RIGID	None	None	RIGID	Typical
45	M45	N70	N71			Perimeter	Beam	None	A53 Gr.B	Typical
46	M46	N72	N73			Perimeter	Beam	None	A53 Gr.B	Typical
47	M47	N74	N75			Perimeter	Beam	None	A53 Gr.B	Typical
48	M48	N27	N26			Grating Support	Beam	None	A36 Gr.36	Typical
49	M49	N26	N25			Grating Support	Beam	None	A36 Gr.36	Typical
50	M50	N50	N49			Grating Support	Beam	None	A36 Gr.36	Typical
51	M51	N49	N48			Grating Support	Beam	None	A36 Gr.36	Typical
52	M52	N78	N79			Mount Pipe 2.5...	Column	None	A53 Gr.B	Typical
53	M53	N80	N77			RIGID	None	None	RIGID	Typical
54	M54	N81	N82			RIGID	None	None	RIGID	Typical
55	M55	N84	N85			Mount Pipe 2.0...	Column	None	A53 Gr.B	Typical
56	M56	N86	N83			RIGID	None	None	RIGID	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
57	M57	N88	N89			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
58	M58	N90	N87			RIGID	None	None	RIGID	Typical
59	M59	N92	N93			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
60	M60	N94	N91			RIGID	None	None	RIGID	Typical
61	M61	N96	N97			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
62	M62	N98	N95			RIGID	None	None	RIGID	Typical
63	M63	N100	N101			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
64	M64	N102	N99			RIGID	None	None	RIGID	Typical
65	M65	N104	N105			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
66	M66	N106	N103			RIGID	None	None	RIGID	Typical
67	M67	N108	N109			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
68	M68	N110	N107			RIGID	None	None	RIGID	Typical
69	M69	N112	N113			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
70	M70	N114	N111			RIGID	None	None	RIGID	Typical
71	M71	N116	N117			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
72	M72	N118	N115			RIGID	None	None	RIGID	Typical
73	M73	N120	N121			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
74	M74	N122	N119			RIGID	None	None	RIGID	Typical
75	M75	N124	N125			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
76	M76	N126	N123			RIGID	None	None	RIGID	Typical
77	M77	N127	N128			RIGID	None	None	RIGID	Typical
78	M78	N129	N130			RIGID	None	None	RIGID	Typical
79	M79	N133	N135			RIGID	None	None	RIGID	Typical
80	M80	N132	N134			RIGID	None	None	RIGID	Typical
81	M81	N136	N138			RIGID	None	None	RIGID	Typical
82	M82	N139	N140			Mount Pipe 2.5..	Column	None	A53 Gr.B	Typical
83	M83	N142	N141			Pipe bracing	Beam	None	A53 Gr.B	Typical
84	M84	N143	N144			Pipe bracing	Beam	None	A53 Gr.B	Typical
85	M85	N147	N149			RIGID	None	None	RIGID	Typical
86	M86	N150	N148			RIGID	None	None	RIGID	Typical
87	M87	N152	N154			RIGID	None	None	RIGID	Typical
88	M88	N153	N155			RIGID	None	None	RIGID	Typical
89	M89	N157	N158			RIGID	None	None	RIGID	Typical
90	M90	N160	N159			RIGID	None	None	RIGID	Typical
91	M91	N162	N163			RIGID	None	None	RIGID	Typical
92	M92	N164	N165			Mount Pipe 2.0..	Column	None	A53 Gr.B	Typical
93	M93	N166	N167			RIGID	None	None	RIGID	Typical
94	M94	N168	N169			RIGID	None	None	RIGID	Typical
95	M95	N170	N161			RIGID	None	None	RIGID	Typical
96	M96	N172	N171			RIGID	None	None	RIGID	Typical
97	M97	N174	N173			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
1	M1						Yes				None
2	M2	BenPIN	BenPIN				Yes				None
3	M3	BenPIN	BenPIN				Yes				None
4	M4						Yes				None
5	M5						Yes				None
6	M6						Yes				None
7	M7		OOOOOO				Yes	** NA **			None
8	M8						Yes				None
9	M9						Yes				None
10	M10		OOOOOO				Yes	** NA **			None
11	M11						Yes				None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
12	M12						Yes				None
13	M13						Yes				None
14	M14		OOOOOO				Yes	** NA **			None
15	M15						Yes				None
16	M16		OOOOOO				Yes	** NA **			None
17	M17						Yes				None
18	M18						Yes				None
19	M19						Yes				None
20	M20						Yes				None
21	M21		OOOOOO				Yes	** NA **			None
22	M22						Yes				None
23	M23						Yes				None
24	M24		OOOOOO				Yes	** NA **			None
25	M25						Yes				None
26	M26						Yes				None
27	M27						Yes				None
28	M28		OOOOOO				Yes	** NA **			None
29	M29						Yes				None
30	M30		OOOOOO				Yes	** NA **			None
31	M31						Yes				None
32	M32						Yes				None
33	M33						Yes				None
34	M34						Yes				None
35	M35		OOOOOO				Yes	** NA **			None
36	M36						Yes				None
37	M37						Yes				None
38	M38		OOOOOO				Yes	** NA **			None
39	M39						Yes				None
40	M40						Yes				None
41	M41						Yes				None
42	M42		OOOOOO				Yes	** NA **			None
43	M43						Yes				None
44	M44		OOOOOO				Yes	** NA **			None
45	M45						Yes				None
46	M46						Yes				None
47	M47						Yes				None
48	M48	BenPIN	BenPIN				Yes				None
49	M49	BenPIN	BenPIN				Yes				None
50	M50	BenPIN	BenPIN				Yes				None
51	M51	BenPIN	BenPIN				Yes				None
52	M52						Yes	** NA **			None
53	M53						Yes	** NA **			None
54	M54						Yes	** NA **			None
55	M55						Yes	** NA **			None
56	M56						Yes	** NA **			None
57	M57						Yes	** NA **			None
58	M58						Yes	** NA **			None
59	M59						Yes	** NA **			None
60	M60						Yes	** NA **			None
61	M61						Yes	** NA **			None
62	M62						Yes	** NA **			None
63	M63						Yes	** NA **			None
64	M64						Yes	** NA **			None
65	M65						Yes	** NA **			None
66	M66						Yes	** NA **			None
67	M67						Yes	** NA **			None
68	M68						Yes	** NA **			None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
69	M69						Yes	** NA **			None
70	M70						Yes	** NA **			None
71	M71						Yes	** NA **			None
72	M72						Yes	** NA **			None
73	M73						Yes	** NA **			None
74	M74						Yes	** NA **			None
75	M75						Yes	** NA **			None
76	M76						Yes	** NA **			None
77	M77						Yes	** NA **			None
78	M78						Yes	** NA **			None
79	M79						Yes	** NA **			None
80	M80						Yes	** NA **			None
81	M81						Yes	** NA **			None
82	M82						Yes	** NA **			None
83	M83	BenPIN	BenPIN				Yes				None
84	M84	BenPIN	BenPIN				Yes				None
85	M85						Yes	** NA **			None
86	M86						Yes	** NA **			None
87	M87						Yes	** NA **			None
88	M88						Yes	** NA **			None
89	M89						Yes	** NA **			None
90	M90						Yes	** NA **			None
91	M91						Yes	** NA **			None
92	M92						Yes	** NA **			None
93	M93						Yes	** NA **			None
94	M94						Yes	** NA **			None
95	M95						Yes	** NA **			None
96	M96						Yes	** NA **			None
97	M97						Yes	** NA **			None

Hot Rolled Steel Design Parameters

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Arm	62.75									Lateral
2	M2	Grating Sup...	52									Lateral
3	M3	Grating Sup...	52									Lateral
4	M4	Perimeter C...	3									Lateral
5	M5	Cross Arm ...	2.625									Lateral
6	M6	Cross Arm ...	3.5									Lateral
7	M8	Perimeter C...	12.375									Lateral
8	M9	Cross Arm	30.875									Lateral
9	M11	Perimeter C...	3									Lateral
10	M12	Cross Arm ...	2.625									Lateral
11	M13	Cross Arm ...	3.5									Lateral
12	M15	Cross Arm	30.875									Lateral
13	M17	Arm	62.75									Lateral
14	M18	Perimeter C...	3									Lateral
15	M19	Cross Arm ...	2.625									Lateral
16	M20	Cross Arm ...	3.5									Lateral
17	M22	Perimeter C...	12.375									Lateral
18	M23	Cross Arm	30.875									Lateral
19	M25	Perimeter C...	3									Lateral
20	M26	Cross Arm ...	2.625									Lateral
21	M27	Cross Arm ...	3.5									Lateral
22	M29	Cross Arm	30.875									Lateral
23	M31	Arm	62.75									Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
24	M32	Perimeter C...	3									Lateral
25	M33	Cross Arm ...	2.625									Lateral
26	M34	Cross Arm ...	3.5									Lateral
27	M36	Perimeter C...	12.375									Lateral
28	M37	Cross Arm	30.875									Lateral
29	M39	Perimeter C...	3									Lateral
30	M40	Cross Arm ...	2.625									Lateral
31	M41	Cross Arm ...	3.5									Lateral
32	M43	Cross Arm	30.875									Lateral
33	M45	Perimeter	150									Lateral
34	M46	Perimeter	150									Lateral
35	M47	Perimeter	150									Lateral
36	M48	Grating Sup...	52									Lateral
37	M49	Grating Sup...	52									Lateral
38	M50	Grating Sup...	52									Lateral
39	M51	Grating Sup...	52									Lateral
40	M52	Mount Pipe ...	72									Lateral
41	M55	Mount Pipe ...	72									Lateral
42	M57	Mount Pipe ...	72									Lateral
43	M59	Mount Pipe ...	72									Lateral
44	M61	Mount Pipe ...	72									Lateral
45	M63	Mount Pipe ...	72									Lateral
46	M65	Mount Pipe ...	72									Lateral
47	M67	Mount Pipe ...	72									Lateral
48	M69	Mount Pipe ...	72									Lateral
49	M71	Mount Pipe ...	72									Lateral
50	M73	Mount Pipe ...	72									Lateral
51	M75	Mount Pipe ...	72									Lateral
52	M82	Mount Pipe ...	36									Lateral
53	M83	Pipe bracing	30.069			Lbyy						Lateral
54	M84	Pipe bracing	53.579			Lbyy						Lateral
55	M92	Mount Pipe ...	72									Lateral

Member Area Loads (BLC 1 : DL)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N48	N49	N50		Y	Two Way	-10
2	N4	N3	N2		Y	Two Way	-10
3	N25	N26	N27		Y	Two Way	-10

Member Area Loads (BLC 28 : Ice DL)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N48	N49	N50		Y	Two Way	-6.109
2	N4	N3	N2		Y	Two Way	-6.109
3	N25	N26	N27		Y	Two Way	-6.109

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	DL	DL		-1		7			3	
2	Maintenance LL - LV	LL				1				
3	Installation LL - LM	LL				1				
4	Wind - 0 Deg (X)	WL				7		55		
5	Wind - 30 Deg (X)	WL				7		55		
6	Wind - 60 Deg (X)	WL				7		55		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
7	Wind - 90 Deg (X)	WL				7		55		
8	Wind - 120 Deg (X)	WL				7		55		
9	Wind - 150 Deg (X)	WL				7		55		
10	Wind - 180 Deg (X)	WL				7		55		
11	Wind - 210 Deg (X)	WL				7		55		
12	Wind - 240 Deg (X)	WL				7		55		
13	Wind - 270 Deg (X)	WL				7		55		
14	Wind - 300 Deg (X)	WL				7		55		
15	Wind - 330 Deg (X)	WL				7		55		
16	Wind - 0 Deg (Z)	WL				7		55		
17	Wind - 30 Deg (Z)	WL				7		55		
18	Wind - 60 Deg (Z)	WL				7		55		
19	Wind - 90 Deg (Z)	WL				7		55		
20	Wind - 120 Deg (Z)	WL				7		55		
21	Wind - 150 Deg (Z)	WL				7		55		
22	Wind - 180 Deg (Z)	WL				7		55		
23	Wind - 210 Deg (Z)	WL				7		55		
24	Wind - 240 Deg (Z)	WL				7		55		
25	Wind - 270 Deg (Z)	WL				7		55		
26	Wind - 300 Deg (Z)	WL				7		55		
27	Wind - 330 Deg (Z)	WL				7		55		
28	Ice DL	DL				7		55	3	
29	Ice Wind - 0 Deg (X)	WL				7		55		
30	Ice Wind - 30 Deg (X)	WL				7		55		
31	Ice Wind - 60 Deg (X)	WL				7		55		
32	Ice Wind - 90 Deg (X)	WL				7		55		
33	Ice Wind - 120 Deg (X)	WL				7		55		
34	Ice Wind - 150 Deg (X)	WL				7		55		
35	Ice Wind - 180 Deg (X)	WL				7		55		
36	Ice Wind - 210 Deg (X)	WL				7		55		
37	Ice Wind - 240 Deg (X)	WL				7		55		
38	Ice Wind - 270 Deg (X)	WL				7		55		
39	Ice Wind - 300 Deg (X)	WL				7		55		
40	Ice Wind - 330 Deg (X)	WL				7		55		
41	Ice Wind - 0 Deg (Z)	WL				7		55		
42	Ice Wind - 30 Deg (Z)	WL				7		55		
43	Ice Wind - 60 Deg (Z)	WL				7		55		
44	Ice Wind - 90 Deg (Z)	WL				7		55		
45	Ice Wind - 120 Deg (Z)	WL				7		55		
46	Ice Wind - 150 Deg (Z)	WL				7		55		
47	Ice Wind - 180 Deg (Z)	WL				7		55		
48	Ice Wind - 210 Deg (Z)	WL				7		55		
49	Ice Wind - 240 Deg (Z)	WL				7		55		
50	Ice Wind - 270 Deg (Z)	WL				7		55		
51	Ice Wind - 300 Deg (Z)	WL				7		55		
52	Ice Wind - 330 Deg (Z)	WL				7		55		
53	BLC 1 Transient Area...	None						21		
54	BLC 28 Transient Are...	None						21		

Load Combinations

	Description	S...	P...	SR...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	WIND LOAD COMBOS (130 MPH)																									
2	1.2DL + WL (0 DEG)	Yes	Y		1	1.2	4	1	16	1																
3	1.2DL + WL (30 DEG)	Yes	Y		1	1.2	5	1	17	1																
4	1.2DL + WL (60 DEG)	Yes	Y		1	1.2	6	1	18	1																

Load Combinations (Continued)

	Description	S...	P...	SR...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
5	1.2DL + WL (90 DEG)	Yes	Y		1	1.2	7	1	19	1														
6	1.2DL + WL (120 DEG)	Yes	Y		1	1.2	8	1	20	1														
7	1.2DL + WL (150 DEG)	Yes	Y		1	1.2	9	1	21	1														
8	1.2DL + WL (180 DEG)	Yes	Y		1	1.2	10	1	22	1														
9	1.2DL + WL (210 DEG)	Yes	Y		1	1.2	11	1	23	1														
10	1.2DL + WL (240 DEG)	Yes	Y		1	1.2	12	1	24	1														
11	1.2DL + WL (270 DEG)	Yes	Y		1	1.2	13	1	25	1														
12	1.2DL + WL (300 DEG)	Yes	Y		1	1.2	14	1	26	1														
13	1.2DL + WL (330 DEG)	Yes	Y		1	1.2	15	1	27	1														
14																								
15	MOUNT LOAD COMBOS (30 MP...																							
16	1.4DL	Yes	Y		1	1.4																		
17	1.2DL + 1.5LV	Yes	Y		1	1.2	2	1.5																
18	1.2DL + 1.5LM + WL (0 DEG)	Yes	Y		1	1.2	3	1.5	4	.053	16	.053												
19	1.2DL + 1.5LM + WL (30 DEG)	Yes	Y		1	1.2	3	1.5	5	.053	17	.053												
20	1.2DL + 1.5LM + WL (60 DEG)	Yes	Y		1	1.2	3	1.5	6	.053	18	.053												
21	1.2DL + 1.5LM + WL (90 DEG)	Yes	Y		1	1.2	3	1.5	7	.053	19	.053												
22	1.2DL + 1.5LM + WL (120 DEG)	Yes	Y		1	1.2	3	1.5	8	.053	20	.053												
23	1.2DL + 1.5LM + WL (150 DEG)	Yes	Y		1	1.2	3	1.5	9	.053	21	.053												
24	1.2DL + 1.5LM + WL (180 DEG)	Yes	Y		1	1.2	3	1.5	10	.053	22	.053												
25	1.2DL + 1.5LM + WL (210 DEG)	Yes	Y		1	1.2	3	1.5	11	.053	23	.053												
26	1.2DL + 1.5LM + WL (240 DEG)	Yes	Y		1	1.2	3	1.5	12	.053	24	.053												
27	1.2DL + 1.5LM + WL (270 DEG)	Yes	Y		1	1.2	3	1.5	13	.053	25	.053												
28	1.2DL + 1.5LM + WL (300 DEG)	Yes	Y		1	1.2	3	1.5	14	.053	26	.053												
29	1.2DL + 1.5LM + WL (330 DEG)	Yes	Y		1	1.2	3	1.5	15	.053	27	.053												
30																								
31	ICE LOAD COMBOS (1", 50 MPH)																							
32	1.2DL + Ice DL + Ice WL (0 DEG)	Yes	Y		1	1.2	28	1	29	1	41	1												
33	1.2DL + Ice DL + Ice WL (30 DEG)	Yes	Y		1	1.2	28	1	30	1	42	1												
34	1.2DL + Ice DL + Ice WL (60 DEG)	Yes	Y		1	1.2	28	1	31	1	43	1												
35	1.2DL + Ice DL + Ice WL (90 DEG)	Yes	Y		1	1.2	28	1	32	1	44	1												
36	1.2DL + Ice DL + Ice WL (120 DE...	Yes	Y		1	1.2	28	1	33	1	45	1												
37	1.2DL + Ice DL + Ice WL (150 DE...	Yes	Y		1	1.2	28	1	34	1	46	1												
38	1.2DL + Ice DL + Ice WL (180 DE...	Yes	Y		1	1.2	28	1	35	1	47	1												
39	1.2DL + Ice DL + Ice WL (210 DE...	Yes	Y		1	1.2	28	1	36	1	48	1												
40	1.2DL + Ice DL + Ice WL (240 DE...	Yes	Y		1	1.2	28	1	37	1	49	1												
41	1.2DL + Ice DL + Ice WL (270 DE...	Yes	Y		1	1.2	28	1	38	1	50	1												
42	1.2DL + Ice DL + Ice WL (300 DE...	Yes	Y		1	1.2	28	1	39	1	51	1												
43	1.2DL + Ice DL + Ice WL (330 DE...	Yes	Y		1	1.2	28	1	40	1	52	1												
44																								

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-in]	LC	MY [k-in]	LC	MZ [k-in]	LC
1	N1	max	1609.709	2	1543.446	22	2561.652	6	44.823	21	24.065	10	36.99	23
2		min	-1610.678	8	598.926	12	-2416.63	12	2.548	11	-25.537	4	1.192	13
3	N24	max	1769.318	2	1114.393	33	788.069	5	1.082	5	9.648	6	-13.583	8
4		min	-1667.378	8	411.653	25	-761.051	11	-2.828	41	-8.732	12	-36.358	32
5	N47	max	1609.163	2	1298.61	39	1973.632	4	-11.136	5	17.488	12	24.372	39
6		min	-1710.127	8	468.559	3	-2146.847	10	-30.255	41	-15.661	6	7.193	3
7	Totals:	max	4988.19	2	3831.419	37	4988.165	5						
8		min	-4988.183	8	1792.73	13	-4988.166	11						

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

	Member	Shape	Code Check	Loc[...	LC	Shear...	Loc[...	Dir	LC	phi*Pnc...	phi*Pnt...	phi*Mn ...	phi*Mn ...	Cb	Eqn
1	M1	HSS4X4X4	.312	62.75	21	.104	62.75	z	9	124431...	139518	194.166	194.166	2...	H1-1b
2	M2	L2x2x3	.203	25.4...	4	.008	0	y	40	9131.325	23392.8	6.693	12.778	1...	H2-1
3	M3	L2x2x3	.125	27.6...	37	.007	0	z	2	9131.322	23392.8	6.693	12.778	1...	H2-1
4	M4	PL6x1/2	.040	0	4	.252	2.312	y	3	95014....	97200	12.15	145.8	1...	H1-1b
5	M5	PL6x3/8	.138	0	5	.066	0	y	36	70677....	72900	6.834	109.35	1...	H1-1b
6	M6	PL6x3/8	.192	1.969	11	.231	0	y	9	68996.63	72900	6.834	109.35	1...	H1-1b
7	M8	PL6x1/2	.129	6.188	5	.065	6.188	y	18	66009....	97200	12.15	145.8	1...	H1-1b
8	M9	HSS4X4X4	.067	0	35	.031	26.0...	z	4	135705...	139518	194.166	194.166	1...	H1-1b
9	M11	PL6x1/2	.102	2.313	5	.293	2.313	y	9	95014....	97200	12.15	145.8	1...	H1-1b
10	M12	PL6x3/8	.276	0	10	.146	0	y	35	70677....	72900	6.834	109.35	1...	H1-1b
11	M13	PL6x3/8	.170	1.969	35	.434	0	y	40	68996.63	72900	6.834	109.35	1...	H1-1b
12	M15	HSS4X4X4	.094	0	34	.042	0	y	40	135705...	139518	194.166	194.166	1...	H1-1b
13	M17	HSS4X4X4	.204	62.75	35	.046	62.75	y	41	124431...	139518	194.166	194.166	2...	H1-1b
14	M18	PL6x1/2	.040	0	4	.118	2.313	y	3	95014....	97200	12.15	145.8	1...	H1-1b
15	M19	PL6x3/8	.187	0	4	.070	0	y	3	70677....	72900	6.834	109.35	1...	H1-1b
16	M20	PL6x3/8	.165	1.969	4	.115	0	y	4	68996.63	72900	6.834	109.35	2...	H1-1b
17	M22	PL6x1/2	.125	6.188	3	.033	6.188	y	41	66009....	97200	12.15	145.8	1...	H1-1b
18	M23	HSS4X4X4	.050	0	3	.022	26.0...	z	4	135705...	139518	194.166	194.166	1...	H1-1b
19	M25	PL6x1/2	.045	0	12	.193	0	y	12	95014....	97200	12.15	145.8	1...	H1-1b
20	M26	PL6x3/8	.112	0	12	.064	0	y	13	70677....	72900	6.834	109.35	1...	H1-1b
21	M27	PL6x3/8	.166	1.969	12	.192	0	y	12	68996.63	72900	6.834	109.35	1...	H1-1b
22	M29	HSS4X4X4	.052	0	43	.028	26.0...	z	12	135705...	139518	194.166	194.166	1...	H1-1b
23	M31	HSS4X4X4	.234	62.75	42	.071	62.75	y	39	124431...	139518	194.166	194.166	2...	H1-1b
24	M32	PL6x1/2	.040	2.312	9	.235	0	y	42	95014....	97200	12.15	145.8	1...	H1-1b
25	M33	PL6x3/8	.110	0	10	.123	0	y	42	70677....	72900	6.834	109.35	1...	H1-1b
26	M34	PL6x3/8	.176	1.969	11	.195	0	y	12	68996.63	72900	6.834	109.35	1...	H1-1b
27	M36	PL6x1/2	.152	6.188	10	.055	6.188	y	37	66009....	97200	12.15	145.8	1...	H1-1b
28	M37	HSS4X4X4	.075	0	37	.028	26.0...	z	11	135705...	139518	194.166	194.166	1...	H1-1b
29	M39	PL6x1/2	.063	2.313	11	.629	0	y	40	95014....	97200	12.15	145.8	1...	H1-1b
30	M40	PL6x3/8	.210	0	11	.300	0	y	39	70677....	72900	6.834	109.35	1...	H1-1b
31	M41	PL6x3/8	.250	1.969	8	.713	0	y	39	68996.63	72900	6.834	109.35	1...	H1-1b
32	M43	HSS4X4X4	.094	0	39	.048	0	y	39	135705...	139518	194.166	194.166	1...	H1-1b
33	M45	PIPE_3.0	.210	95.3...	5	.155	98.4...		38	28250....	65205	68.985	68.985	1...	H1-1b
34	M46	PIPE_3.0	.099	98.4...	41	.055	98.4...		12	28250....	65205	68.985	68.985	1...	H1-1b
35	M47	PIPE_3.0	.127	51.5...	23	.054	50		10	28250....	65205	68.985	68.985	1...	H1-1b
36	M48	L2x2x3	.187	26	13	.007	0	y	41	9131.322	23392.8	6.693	12.792	1...	H2-1
37	M49	L2x2x3	.183	26.5...	4	.007	52	y	42	9131.325	23392.8	6.693	12.778	1...	H2-1
38	M50	L2x2x3	.237	25.4...	8	.006	0	y	35	9131.322	23392.8	6.693	12.778	1...	H2-1
39	M51	L2x2x3	.203	26	11	.009	52	y	38	9131.322	23392.8	6.693	12.792	1...	H2-1
40	M52	PIPE_2.5	.465	30	12	.124	30		6	37773....	50715	43.155	43.155	2...	H1-1b
41	M55	PIPE_2.0	.031	36	8	.004	36		8	20866....	32130	22.459	22.459	1...	H1-1b
42	M57	PIPE_2.0	.537	36	11	.659	36		11	20866....	32130	22.459	22.459	1...	H3-6
43	M59	PIPE_2.0	.031	36	8	.004	36		8	20866....	32130	22.459	22.459	1...	H1-1b
44	M61	PIPE_2.0	.031	36	3	.004	36		2	20866....	32130	22.459	22.459	1...	H1-1b
45	M63	PIPE_2.0	.031	36	4	.004	36		4	20866....	32130	22.459	22.459	1...	H1-1b
46	M65	PIPE_2.0	.031	36	4	.004	36		5	20866....	32130	22.459	22.459	1...	H1-1b
47	M67	PIPE_2.0	.314	36	9	.026	36		9	20866....	32130	22.459	22.459	1...	H1-1b
48	M69	PIPE_2.0	.031	36	11	.004	36		11	20866....	32130	22.459	22.459	1...	H1-1b
49	M71	PIPE_2.0	.175	36	12	.031	36		9	20866....	32130	22.459	22.459	1...	H1-1b
50	M73	PIPE_2.0	.031	36	12	.004	36		12	20866....	32130	22.459	22.459	1...	H1-1b
51	M75	PIPE_2.0	.176	36	12	.031	36		3	20866....	32130	22.459	22.459	1...	H1-1b
52	M82	PIPE_2.5	.294	0	7	.132	0		7	47114....	50715	43.155	43.155	4...	H1-1b
53	M83	PIPE_2.0	.007	15.3...	11	.066	0		7	29799....	32130	22.459	22.459	1...	H1-1b
54	M84	PIPE_2.0	.058	53.5...	13	.081	0		10	25299....	32130	22.459	22.459	1...	H1-1b*
55	M92	PIPE_2.0	.442	18	11	.625	18		11	20866....	32130	22.459	22.459	1...	H3-6

Member Section Forces (By Combination)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-in]	y-y Moment[k-in]	z-z Moment[k-in]
1	21	M1	1	.572	-.466	.019	-3.958	-.978	-.86
2			2	.57	-.489	.021	-3.958	-.664	6.606
3			3	.567	-.526	.022	-3.958	-.331	14.562
4			4	.498	-1.492	.396	-7.745	-1.601	28.617
5			5	-.3	-1.543	.167	-9.283	3.243	57.117

APPENDIX 3:
ATTACHMENTS

ORDER WITH DIN CONNECTOR
ONE SITE PRO 1 P/N DCP18K CLAMP SET REQUIRED.

870 Series 220MHz Exposed Dipoles

The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

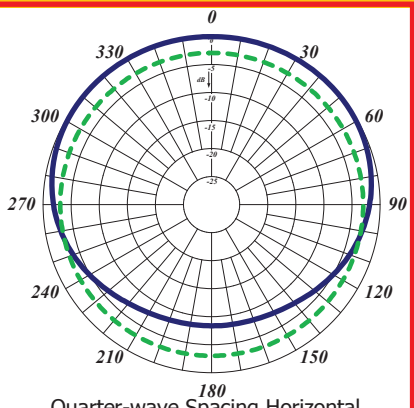
Electrical Specifications	871F-70-2	872F-70-2	874F-70-2
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type DIN Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft^2 (m^2)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)
* See next page for ordering information (page 3) *			

872F-70-2

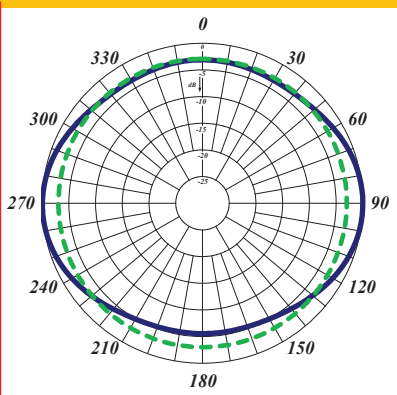
Tel: US 1.877.825.2007 / CAN 1.800.603.1454
Email: sales@comprodcom.com
Fax: 1.800.554.1033

220MHz EXPOSED DIPOLES — 215-225 MHz

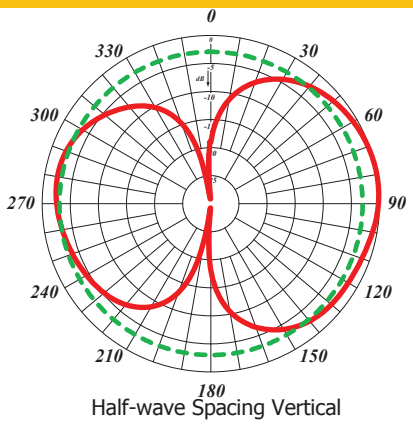
871F-70-2



Quarter-wave Spacing Horizontal

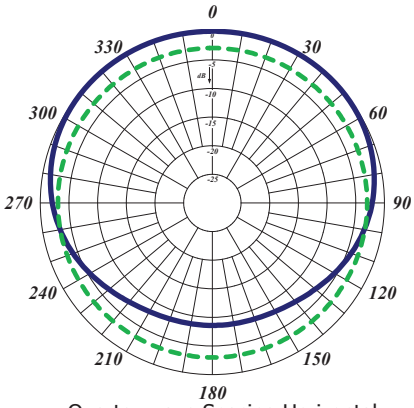


Half-wave Spacing Horizontal

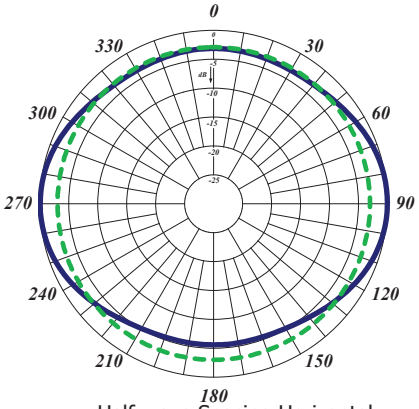


Half-wave Spacing Vertical

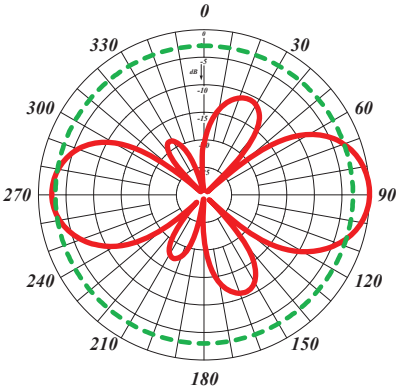
872F-70-2



Quarter-wave Spacing Horizontal

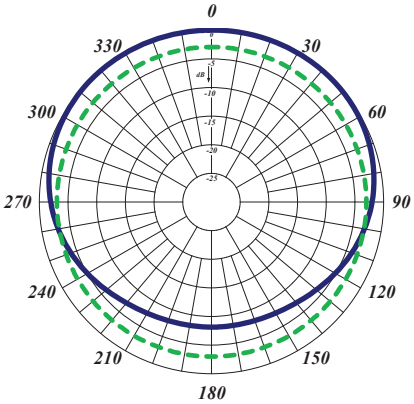


Half-wave Spacing Horizontal

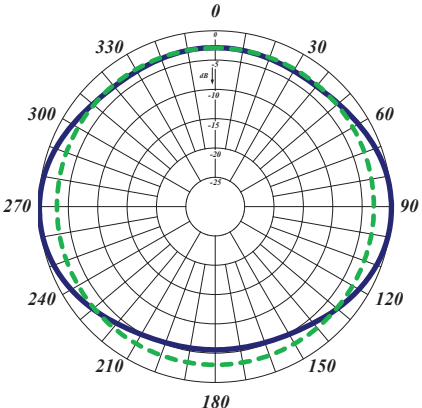


Half-wave Spacing Vertical

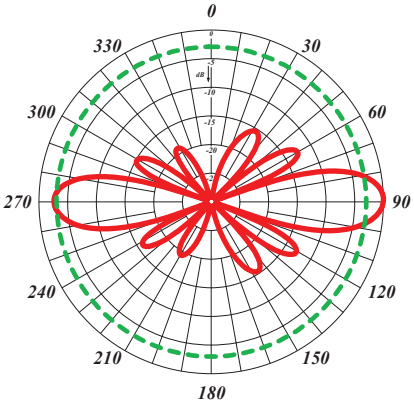
874F-70-2



Quarter-wave Spacing Horizontal



Half-wave Spacing Horizontal



Half-wave Spacing Vertical

COMPROD Simplifying RF Solutions
www.comprodcom.com
Tel: US 1.877.825.2007 / CAN 1.800.603.1454
Email: sales@comprodcom.com
Fax: 1.800.554.1033

ORDER WITH N CONNECTOR
Part # 531-70*4 (36-38 MHz) 12' Face Tower (Item No. F-33483)

LOW BAND EXPOSED DIPOLE ANTEN

The antenna length @ 37.74 MHz is 210" (17.5'), according to Comprod and will stand off approximately 39" from the tower.

530 Series Low Band Exposed Dipole Antenna

The Low Band Exposed Dipole Antenna Series are available in our standard or heavy-duty construction. These exposed dipole antennas come in both single and dual configurations, depending on the gain required. They are constructed from high strength, corrosion resistant aluminum alloy, hot galvanized steel mounting hardware, and use unique PVC off-set support arms. Our heavy-duty versions have dual support braces and use a superior anti-torque support. All components are oversized.

- Each antenna has a rugged design to withstand the most extreme environmental conditions.
- Supplied with anti-torque supports.
- DC ground for lightning protection.
- Can be black anodized coating for enhanced anti-corrosion and de-icing properties

Electrical Specifications	531-70	531-70-HD	532-70	532-70-HD
Frequency Range, MHz (in splits)	30-76	30-76	30-76	30-76
Nominal Gain, dBd	2.5	2.5	5.5	5.5
Bandwidth 1.5:1 VSWR, MHz	7%	7%	7%	7%
Polarization	Vertical	Vertical	Vertical	Vertical
Pattern	Offset	Offset	Offset	Offset
Power Rating, Watts	300	300	300	300
Nominal Impedance, Ohms	50	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground
Standard Termination	Type N Male	Type N Male	Type N Male	Type N Male
Mechanical Specifications	**531-70**	**531-70-HD**	**532-70**	**532-70-HD**
Length @ 30 MHz, in (mm)	189 (4800)	189 (4800)	472 (11989)	472 (11989)
Width, in (mm)	87 (2210)	87 (2210)	87 (2210)	87 (2210)
Weight, lbs. (kg)	37 (17)	43 (19.5)	79 (36)	91 (41)
Rated Wind Velocity, No Ice, mph (km/h)	143 (230)	200 (322)	143 (230)	200 (322)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	98 (158)	160 (258)	98 (158)	160 (258)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	133 (60.8)	160 (72.3)	266 (121.6)	320 (144.6)
Projected Area, ft^2 (m^2)	4.98 (0.46)	5.94 (0.55)	9.96 (0.92)	11.88 (1.10)
Mounting Information Mast O.D., mm (number of clamps needed)	1.25"-2.38" (4)	1.25"-2.38" (6)	1.25"-2.38" (8)	1.25"-2.38" (12)

* See next page for ordering information of different frequency splits (page 3) *

Tel: US 1.877.825.2007 / CAN 1.800.603.1454
Email: sales@comprodcom.com
Fax: 1.800.554.1033

DB586-Y

1-port omni antenna, 890–960 MHz, 360° HPBW, fixed electrical tilt, fits on 38–51 mm (1-1/2 to 2 in) OD pipe

- Light weight, low profile omnidirectional antenna ideal for low to moderate gain applications
- Integral dual purpose mount allows top or side mounting

General Specifications

Antenna Type	Omni
Band	Single band
Color	Horizon blue
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Performance Note	Outdoor usage
Radome Material	Fiberglass, UV resistant
Radiator Material	Brass
RF Connector Interface	N Female
RF Connector Location	Bottom
RF Connector Quantity, low band	1
RF Connector Quantity, total	1

Dimensions

Length	1,498.6 mm | 59 in
Net Weight, without mounting kit	3.6 kg | 7.937 lb
Outer Diameter	38.1 mm | 1.5 in

Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	890 – 960 MHz
Polarization	Vertical

Electrical Specifications

Frequency Band, MHz	**890–960**

TELEWAVE, INC.®

148 - 174 MHz

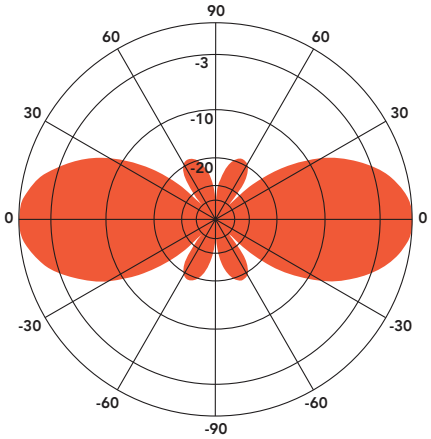
ANT150F2DIN

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

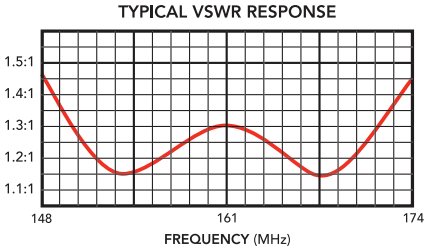
The Telewave ANT150F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to DC ground for lightning impulse protection.

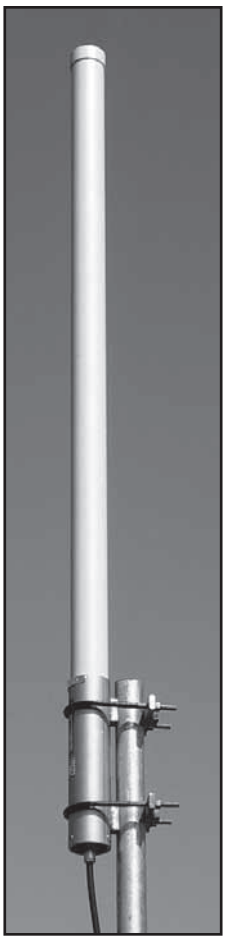
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT150F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.



ANT150F2 156 MHz
Vertical Plane
Gain = 2.55 dBd



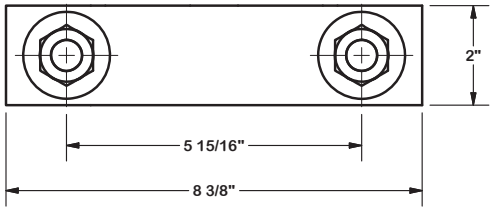


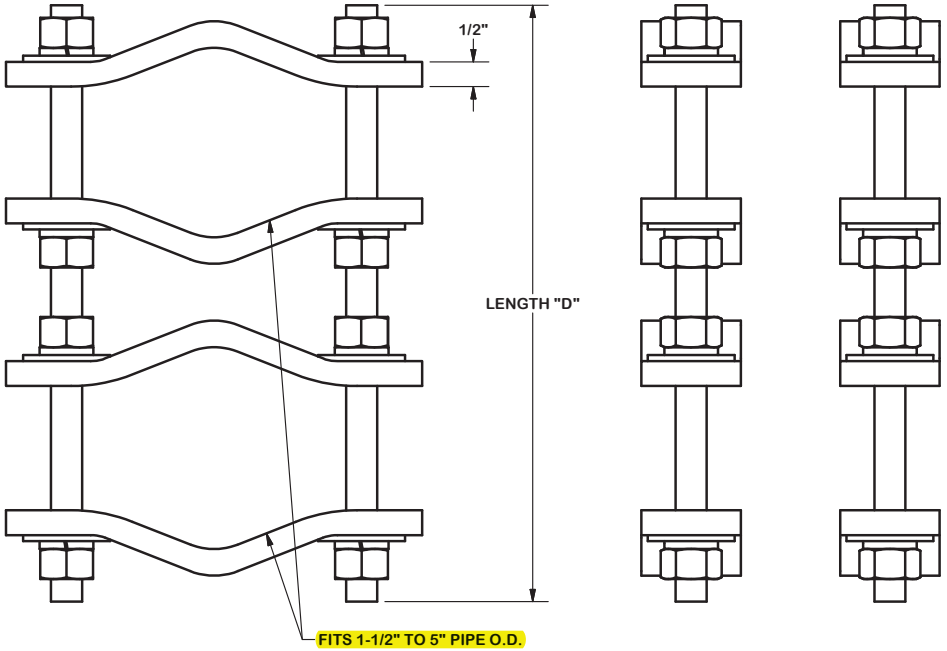
SPECIFICATIONS			
Frequency (continuous)	148-174 MHz	**Dimensions (L x base diam.) in.**	60 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	12 lb.
Power rating (typ.)	500 watts	**Shipping weight**	16 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.3 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	50 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	67 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

Telewave, Inc. • San Jose, CA • 1-800-331-3396 ~ 408-929-4400 • www.telewave.com

TWDS-7017 Rev. 1/11

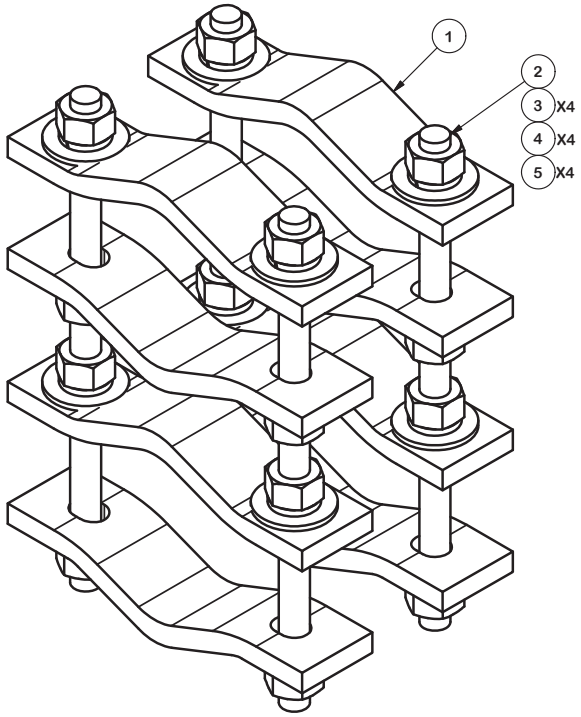
TOTAL OF (1) REQUIRED.





PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	8	DCP	CLAMP HALF, 1/2" THICK, 8-3/8"		2.40	19.20
2	B	C	5/8" THREADED ROD	D	E	F
3	16	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	2.08
4	16	G58LW	5/8" HDG LOCKWASHER		0.03	0.42
5	16	G58FW	5/8" HDG USS FLATWASHER		0.07	1.13

VARIABLE PARTS TABLE						
ASSEMBLY "A"	QTY "B"	PART "C"	LENGTH "D"	UNIT WT. "E"	NET WT. "F"	TOTAL WEIGHT
DCP12K	4	G58R-12	12"	1.05	4.18	27.01
DCP18K	4	G58R-18	18"	1.57	6.27	29.10



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: PIPE TO PIPE CLAMP SET
1-1/2" TO 5" PIPE
1/2" THICK CLAMP

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

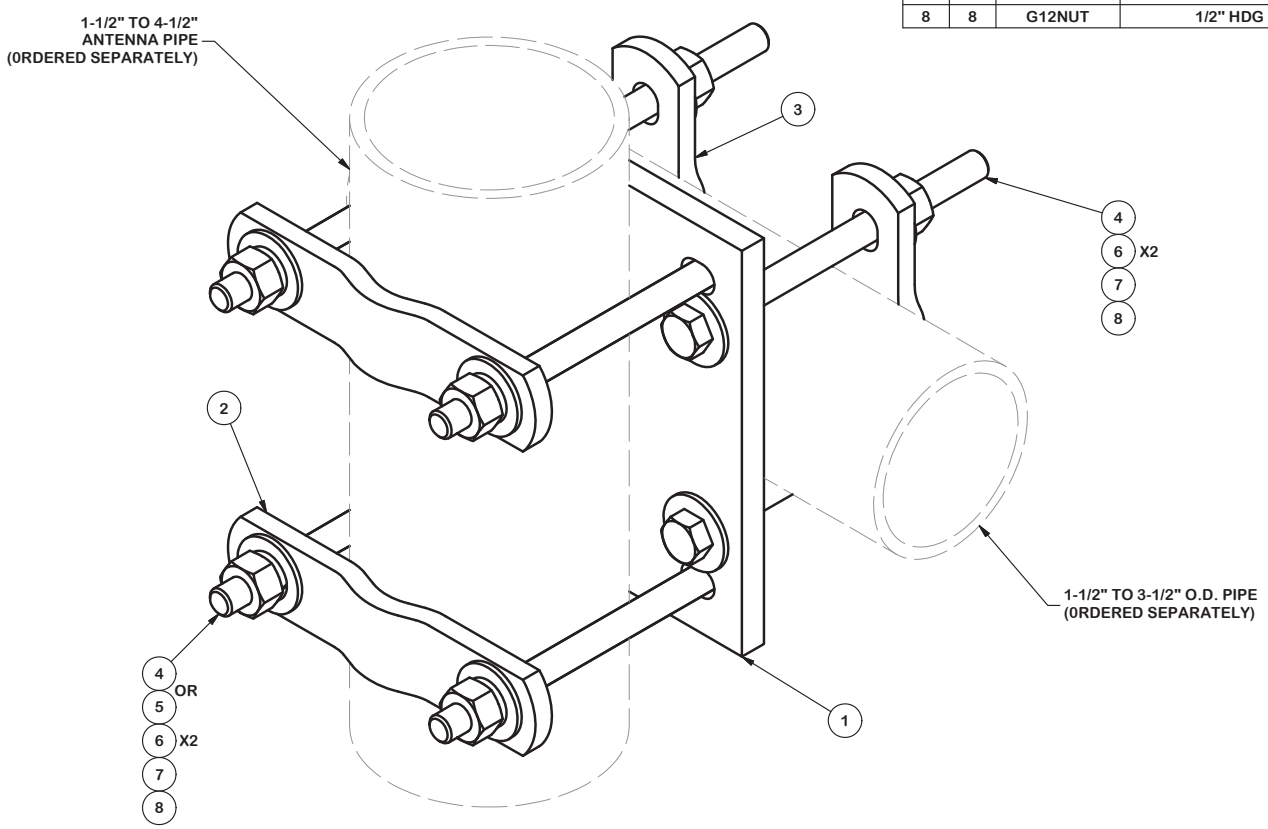
Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	KC8 8/21/2012		SEE ASSEMBLY "A"	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	CEK 1/22/2013	DCPxxK

TOTAL OF (1) REQUIRED.

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	SCX7	CROSSOVER PLATE	8 in	7.55	7.55
2	2	X-115765	5" V-CLAMP		1.02	2.04
3	2	X-100064	CLAMP (S) (4" V-CLAMP) GALVANIZED		0.91	1.83
4	8	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	6 1/2 in	0.41	3.28
5	4	G12045	1/2" x 4.5" HDG HEX BOLT GR5 FULL THREAD	4 1/2 in	0.30	1.19
6	16	G12FW	1/2" HDG USS FLATWASHER		0.03	0.54
7	8	G12LW	1/2" HDG LOCKWASHER		0.01	0.11
8	8	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	0.57
					TOTAL WT. #	16.98



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: CROSSOVER PLATE (V-CLAMP STYLE)

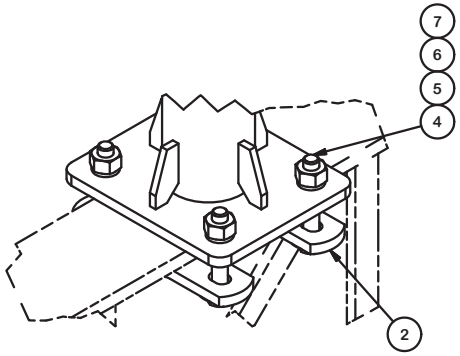
SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

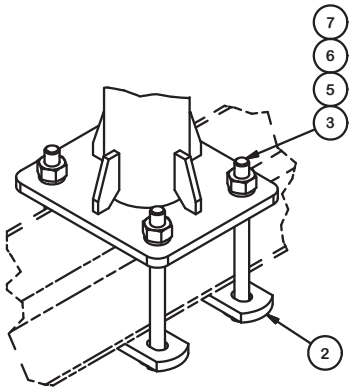
CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	CEK 10/7/2010		SCX7-U	1 OF 1
CLASS / SUB	DRAWING USAGE	CHECKED BY	DWG. NO.	
81 / 01	CUSTOMER	BMC 10/8/2010	SCX7-U	

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	X-SAMAST-3	3' STANDOFF ARM MAST WELDMENT		23.19	23.19
2	2	X-115765	5" V-CLAMP	7 1/16 in	1.03	2.05
3	4	G1206	1/2" x 6" HDG HEX BOLT GR5 FULL THREAD	2 in	0.38	1.53
4	4	G1203	1/2" x 3" HDG HEX BOLT GR5 FULL THREAD	3 in	0.22	0.87
5	4	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	0.14
6	4	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	0.06
7	4	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	0.29
					TOTAL WT. #	28.11

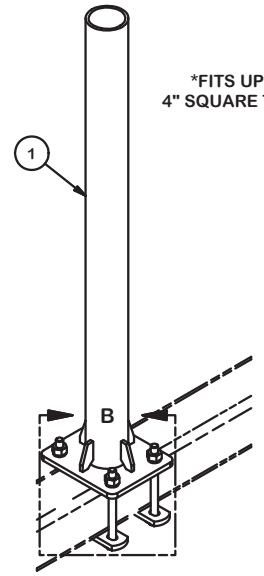


DETAIL A

TRUSS ARM
MOUNTING OPTION



DETAIL B



*FITS UP TO
4" SQUARE TUBES

SQUARE TUBE
MOUNTING OPTION

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS AND ANGLES ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: 3' STANDOFF ARM MAST

SITE PRO 1 — A valmont COMPANY

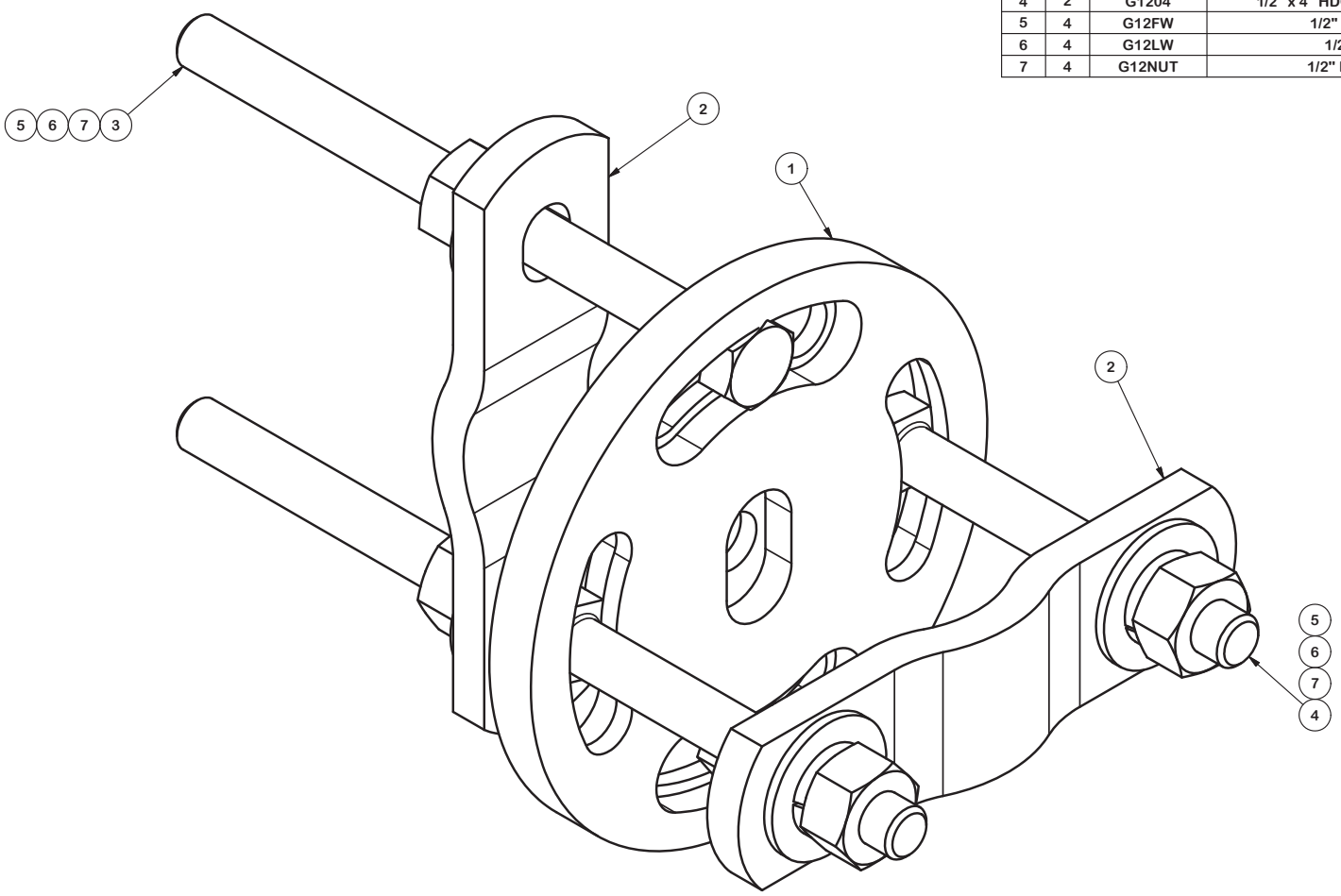
Engineering Support Team: 1-888-753-7446

Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX; Tampa, FL

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	CEK 6/19/2019		SAMAST-3	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	02	CUSTOMER	BMC 6/19/2019	SAMAST-3

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	X-127594	FLAT DISK CLAMP PLATE 4" CENTERS (GALVANIZED)		2.48	2.48
2	2	X-100064	CLAMP (S) (4" V-CLAMP) GALVANIZED		0.91	1.83
3	2	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	6 1/2 in	0.41	0.82
4	2	G1204	1/2" x 4" HDG HEX BOLT GR5 FULL THREAD	4 in	0.27	0.54
5	4	G12FW	1/2" HDG USS FLATWASHER		0.03	0.14
6	4	G12LW	1/2" HDG LOCKWASHER		0.01	0.06
7	4	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	0.29
					TOTAL WT. #	6.16



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION
ADJUSTABLE CLAMP PLATE
TIE-BACK ASSEMBLY

SITE PRO 1
A valmont COMPANY

Engineering Support Team:
1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	CEK 8/30/2010		PUCK	1 OF 1
CLASS / SUB	DRAWING USAGE	CHECKED BY	DWG. NO.	
81 / 01	CUSTOMER	BMC 9/1/2010	PUCK	

SITE PRO 1
A valmont COMPANY

Product Info

Pxxx: Bulk Pipe

TOTAL OF (1) REQUIRED.

Features:

- Factory cut end, hot-dip galvanized pipe

Construction:

- ASTM A53 Grade B
- Schedule 40

Design Criteria:

- ASTM A53 Grade B (Yield Fy = 35 ksi [240 MPa] / Tensile Fu = 60 ksi [415 MPa])
- Hot dip galvanized in accordance with ASTM A123 requirements

TRIM LENGTH AS REQUIRED TO MEET LENGTH IN DRAWINGS.

Part #	Length	OD x Length (in)	Weight
P263	5′-3″	2-3/8″ x 63″	20 lb
P272	6′-0″	2-3/8″ x 72″	22 lb
P284	7′-0″	2-3/8″ x 84″	26 lb
P296	8′-0″	2-3/8″ x 96″	30 lb
P2120	10′-0″	2-3/8″ x 120″	37 lb
P2126	10′-6″	2-3/8″ x 126″	39 lb
P2150	12′-6″	2-3/8″ x 150″	46 lb
P2174	14′-6″	2-3/8″ x 174″	53 lb
P3084	7′-0″	2-7/8″ x 84″	41 lb
P3096	8′-0″	2-7/8″ x 96″	47 lb
P30120	10'-0"	2-7/8" x 120"	58 lb
P30126	10′-6″	2-7/8″ x 126″	61 lb
P30150	12′-6″	2-7/8″ x 150″	73 lb
P30174	14′-6″	2-7/8″ x 174″	84 lb
P360	5′-0″	3-1/2″ x 60″	38 lb
P372	6′-0″	3-1/2″ x 72″	46 lb
P396	8′-0″	3-1/2″ x 96″	61 lb
P3150	12′-6″	3-1/2″ x 150″	95 lb
P3160	13′-4″	3-1/2″ x 160″	101 lb
P3174	14′-6″	3-1/2″ x 174″	110 lb
P3216	18′-0″	3-1/2″ x 216″	137 lb
P472	6′-0″	4-1/2″ x 72″	65 lb
P4126	10′-6″	4-1/2″ x 126″	114 lb

created on: 04/05/2019

ATTACHMENT D – POWER DENSITY REPORT

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

Calculated Radio Frequency Emissions Report

ES-158

5 Perryridge Road

Greenwich, CT 06830

February 8, 2022

Table of Contents

List of Tables

List of Figures

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the Eversource installation on the tower at 5 Perryridge Road in Greenwich, CT. Eversource has recently installed two omnidirectional antennas – one for transmit, one for receive only – as part of its 220 MHz communications system. The original proposal also consisted of two omnidirectional antennas; however, the model and centerline height of the installed receive only antenna had been changed from what was detailed in its Notice of Exempt Modification (EM-EVER-057-210416[1]).

This report considers the updated antenna configuration as detailed by Eversource along with % MPE (Maximum Permissible Exposure) measurements around the existing tower taken prior to the modifications to determine FCC compliance of the facility.

Additionally, power density changes between the existing (at time of % MPE measurements) and the proposed Verizon installation as detailed in its two most recent Notices for Exempt Modification dated March 2, 2020 (EM-VER-057-200304) and July 22, 2021 (EM-VER-057-210723) is included for completeness.

Site Address	5 Perryridge Road
Latitude	41° 02' 03.14" N
Longitude	73° 37' 51.03" W
Site Elevation AMSL	121’
Survey Engineer	Marc Salas
Survey Date/Time	3/2/2021; 11:00 AM – 1:00 PM

Table 1: Survey Information

[1] Connecticut Siting Council Notice of Exempt Modification, 5 Perryridge Road, Greenwich, CT dated April 16, 2021 https://portal.ct.gov/-/media/CSC/2_EMS-medialibrary/Greenwich/PerryridgeRd/EVERSOURCE/EM-EVER-057-210416_filing_PerryridgeRd.pdf

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

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

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

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

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

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

3. Power Density Calculation Methods

The power density calculation results were generated using the following formula as outlined in FCC bulletin OET 65, and Connecticut Siting Council recommendations:

$$\text{Power Density} = \left(\frac{1.6^2 \times 1.64 \times \text{ERP}}{4\pi \times R^2}\right) \text{X Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power = 1.64 x ERP

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

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

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

4. Proposed Antenna Configuration

Table 2 below lists the technical details of the proposed Eversource installation. These parameters are applied to the above calculation methods in order to calculate the % MPE values of the proposed equipment. Any proposed receive-only antennas have not been included in the table as they are irrelevant in terms of the % MPE calculations.

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power per Channel (ERP-Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	COMPROD 871F-70-2	217	2.5	124	4	~110°	5.5	109.5

Table 2: Eversource Antenna Configuration (Proposed)[2] [3]

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

[3] Transmit antenna height listed for the proposed antenna is based on the CENTEK Engineering Inc. Structural Analysis Report dated Jan 24, 2022 and the overall mechanical length of the antenna.

5. Measurement Procedure

Frequencies from 300 KHz to 50 GHz were measured using the Narda Probe EA 5091, E-Field, shaped, FCC probe in conjunction with the NBM550 survey meter. The EA 5091 probe is “shaped” such that in a mixed signal environment (i.e.: more than one frequency band is used in a particular location), it accurately measures the percent of MPE.

From FCC OET Bulletin No. 65 - Edition 97-01 – “A useful characteristic of broadband probes used in multiple-frequency RF environments is a frequency-dependent response that corresponds to the variation in MPE limits with frequency. Broadband probes having such a "shaped" response permit direct assessment of compliance at sites where RF fields result from antennas transmitting over a wide range of frequencies. Such probes can express the composite RF field as a percentage of the applicable MPEs”.

Probe Description - As suggested in FCC OET Bulletin No. 65 - Edition 97-01, the response of the measurement instrument should be essentially isotropic, (i.e., independent of orientation or rotation angle of the probe). For this reason, the Narda EA 5091 probe was used for these measurements.

Sampling Description - At each measurement location, a spatially averaged measurement is collected over the height of an average human body. The NBM550 survey meter performs a time average measurement while the user slowly moves the probe over a distance range of 20 cm to 200 cm (about 6 feet) above ground level. The results recorded at each measurement location include average values over the spatial distance.

Instrumentation Information - A summary of specifications for the equipment used is provided in the table below.

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 0116			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Meter	NBM550, Serial# E-1069			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 3: Instrumentation Information

Instrument Measurement Uncertainty - The total measurement uncertainty of the NARDA measurement probe and meter is no greater than ±3 dB (0.5% to 6%), ±1 dB (6% to 100%), ±2 dB (100% to 600%). The factors which contribute to this include the probe’s frequency response deviation, calibration uncertainty, ellipse ratio, and isotropic response[4]. Every effort is taken to reduce the overall uncertainty during measurement collection including pointing the probe directly at the likely highest source of emissions.

[4] For further details, please refer to Narda Safety Test Solutions NBM550 Probe Specifications, pg. 64
http://www.narda-sts.us/pdf_files/DataSheets/NBM-Probes_DataSheet.pdf

6. Surveyed and Calculated % MPE Results

Measured and calculated results and a description of each survey location are detailed in the table below. Measurements were recorded on March 2, 2021 between 11:00 AM and 1:00 PM. The calculated % MPE contribution from the proposed equipment modifications was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 3. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 23 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 2.06% (Average Uncontrolled / General Population MPE) and was recorded at Location 12 near the center of the top level of the parking garage. The highest composite (measured + calculated) % MPE value is calculated to be 3.47% (Average Uncontrolled / General Population) and is calculated to occur recorded at Location 13, on the north side of the top level of the parking garage.

To consider the impact of any recent equipment modifications by the other operators on site, the previous structural analysis (CENTEK, dated Feb. 24, 2021) used in our original March 2021 MPE report was reviewed against the latest structural analysis provided (CENTEK, Jan. 24, 2022). Additionally, any recent CSC applications for this facility were reviewed. The review concludes that Verizon has been approved for the modifications requested under EM-VER-057-210723. The % MPE reported for their equipment in that application (12.75%) is less than what was reported in its prior filing (17.08%) under EM-VER-057-210723. To maintain a conservative approach, this report assumes that the Verizon configuration in place at the time of the measurements would be worst-case based on this information, so no additional adjustments have been made to the composite % MPE values listed below.

Meas. Location	Location Description	Latitude	Longitude	Dist. From Site (feet)	Measured % MPE (Uncontrolled / General)	Calculated % MPE (Eversource Proposed)	Composite % MPE (Uncontrolled / General)
1	SW corner of fenced compound	-73.63088	41.03413	31	< 1.00%	2.30%	< 3.30%
2	West side of fenced compound	-73.63088	41.03420	10	< 1.00%	0.84%	< 1.84%
3	North side of fenced compound	-73.63084	41.03427	23	< 1.00%	1.53%	< 2.53%
4	East side of Greenwich Radiological Group building by mailbox	-73.63114	41.03464	180	< 1.00%	1.45%	< 2.45%
5	Southend of Glen Rd under tree in cul de sac	-73.63096	41.03504	305	< 1.00%	0.68%	< 1.68%
6	Ground level, east-NE side of parking garage	-73.63089	41.03376	163	< 1.00%	1.89%	< 2.89%
7	Ground level, west-NW side of parking garage	-73.63134	41.03380	201	< 1.00%	1.43%	< 2.43%
8	NW corner of parking lot in front of parking garage	-73.63135	41.03420	139	< 1.00%	1.97%	< 2.97%
9	SW corner in front of parking garage on sidewalk	-73.63150	41.03319	412	1.00%	0.42%	< 2.42%
10	SW corner of parking garage at top level	-73.63142	41.03313	423	< 1.00%	0.42%	< 1.42%
11	South side of parking garage at top level	-73.63111	41.03315	392	1.14%	0.49%	1.63%
12	**Center of parking garage at top level**	**-73.63112**	**41.03362**	**226**	**2.06%**	**1.20%**	**3.27%**
13	**North side of parking garage at top level**	**-73.63101**	**41.03399**	**92**	**1.33%**	**3.81%**	**5.14%**
14	NE corner of parking garage at top level	-73.63133	41.03405	147	1.75%	2.19%	3.94%
15	West side of parking garage at top level	-73.63137	41.03360	265	< 1.00%	0.94%	< 1.94%
16	Lake Ave by street leading up to emergency room entrance	-73.63047	41.03305	435	1.25%	0.40%	1.65%
17	Lower walking path south of Garden Café	-73.63019	41.03350	312	< 1.00%	0.76%	< 1.76%
18	Walking path by SE corner of hospital	-73.62960	41.03377	379	< 1.00%	0.55%	< 1.55%
19	In front of Greenwich Gynecology sign by sidewalk	-73.62951	41.03438	372	< 1.00%	0.57%	< 1.57%
20	Intersection of Perryridge Rd & NE corner hospital exit street	-73.62955	41.03526	523	1.77%	0.31%	2.07%
21	Crosswalk by intersection of Lake Ave & Pennyridge Rd	-73.62925	41.03358	495	< 1.00%	0.33%	< 1.33%
22	Intersection of Propsect Dr & Farley St	-73.63212	41.03391	369	< 1.00%	0.57%	< 1.57%
23	East end of Cassidy St	-73.63185	41.03481	355	< 1.00%	0.58%	< 1.58%

Table 4: Measured and Calculated % MPE Results [5] [6]

[5] Due to measurement uncertainty at low levels (See Table 3), any readings outside the measurement range of the probe (< 1.00 % FCC General Population/Uncontrolled MPE) are noted as such.

[6] Measured and calculated % MPE values listed are rounded to two decimal points and the composite % MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not identically match the total composite value reflected in the table.

Figures 2 and 3 below are aerial views[7] of the tower location and the surrounding area, along with the measurement locations listed in Table 4.

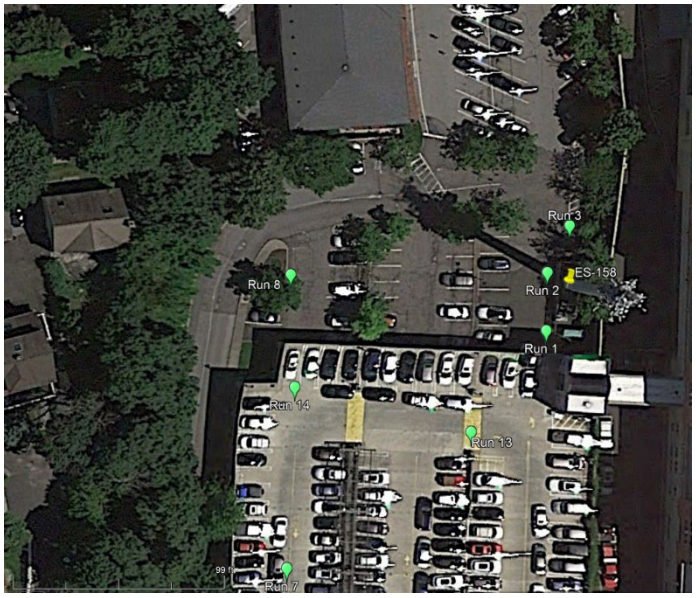


Figure 2: Measurement Points – Zoom In

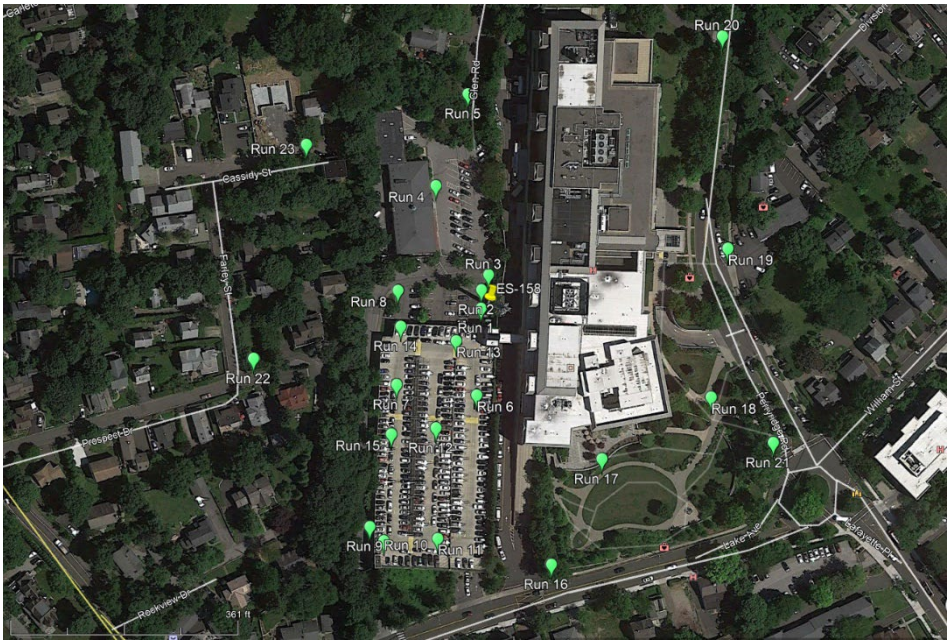


Figure 3: All Measurement Points

[7] Map showing location of telecommunications facility and the surrounding area. *Google Earth*, https://earth.google.com/web/.

7. Conclusion

A number of accessible areas around the tower at 5 Perryridge Road in Greenwich, CT were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged % MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population is 2.06% MPE. This measurement was recorded at Location 12 near the center of the top level of the parking garage. The highest composite (measured + calculated) power density is **5.14% of the FCC General Population MPE limit** with the proposed Eversource equipment is calculated to occur at Location 13, on the north side of the top level of the parking garage.

The above analysis concludes that RF exposure at ground level around the tower, both currently and with the proposed antenna installation, will be below the maximum power density limits as outlined by the FCC in the OET Bulletin 65 Ed. 97-01.

As noted previously, the calculated % MPE levels are more conservative (higher) than the actual levels will be from the finished installation.

8. Statement of Certification

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

Sohail Usmani

February 8, 2022

Report Prepared By: Sohail Usmani
Sr. RF Engineer
C Squared Systems, LLC

Date

Keith Vellante

February 9, 2022

Reviewed/Approved By: Keith Vellante
Director of RF Services
C Squared Systems, LLC

Date

Attachment A: References

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

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

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

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

(A) Limits for Occupational/Controlled Exposure[8]

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

(B) Limits for General Population/Uncontrolled Exposure[9]

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

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

Table 5: FCC Limits for Maximum Permissible Exposure (MPE)

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

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

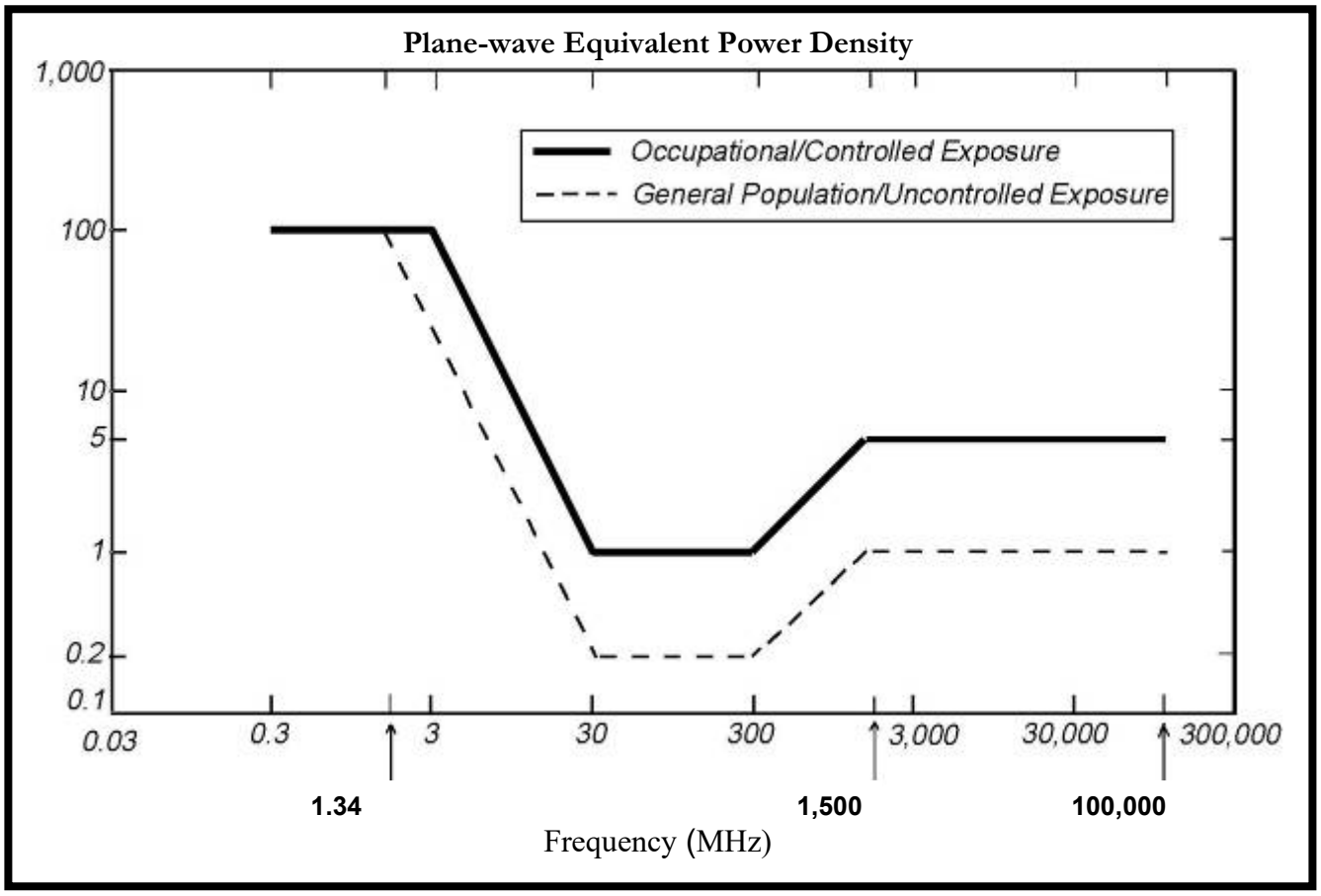
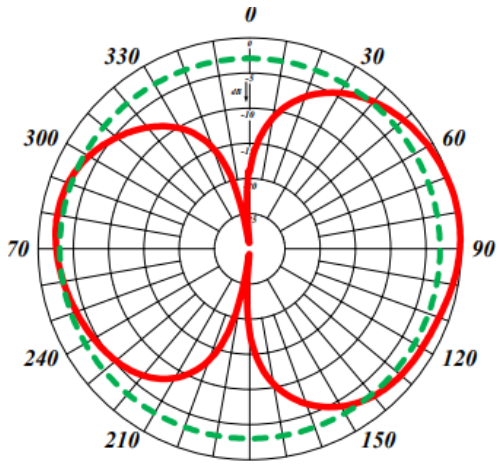


Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns

220 MHz

Manufacturer:	Comprod
Model #:	871F-70-2
Frequency Band:	215 - 225 MHz
Gain:	2.5 dBd
Vertical Beamwidth:	~110°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	5.5’



Half-wave Spacing Vertical

ATTACHMENT E – PROOF OF DELIVERY OF NOTICE

Ref:
Dep:

Date: 23Feb22
Wgt: 2.00 LBS

DV: 100.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 6437 3911 1925

ORIGIN ID:EFBA (203) 562-9885
SHIPPING
JOSEPH MERRITT CO.
60 HAMILTON STREET

NEW HAVEN, CT 065115920
UNITED STATES US

SHIP DATE: 23FEB22
ACTWGT: 2.00 LB MAN
CAD: 0517347/CAFE3509

BILL THIRD PARTY

KATIE DELUCA
TOWN OF GREENWICH
101 FIELD POINT ROAD
2ND FLOOR
GREENWICH CT 06830

PO: S0424361

FedEx Express

TRK# 6437 3911 1925

THU - 24 FEB 10:30A
PRIORITY OVERNIGHT

EH CTXA

06830
CT-US SWF

Part # 156148-434 RIT2 01/14

Ref:
Dep:

Date: 23Feb22
Wgt: 2.00 LBS

DV: 100.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 6437 3911 1936

ORIGIN ID:EFBA (203) 562-9885
SHIPPING
JOSEPH MERRITT CO.
HAMILTON STREET

NEW HAVEN, CT 065115920
UNITED STATES US

SHIP DATE: 23FEB22
ACTWGT: 2.00 LB MAN
CAD: 0517347/CAFE3509

BILL THIRD PARTY

MICHAEL WOLPENSINGER
GREENWICH HOSPITAL
5 PERRYRIDGE ROAD

GREENWICH CT 06830

PO: S0424361

FedEx Express

TRK# 6437 3911 1936

THU - 24 FEB 10:30A
PRIORITY OVERNIGHT

EH CTXA

06830
CT-US SWF

Part # 156148-434 RITZ 01/14

Ref:
Dep:

Date: 23Feb22
Wgt: 2.00 LBS
DV: 100.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 6437 3911 1914

ORIGIN ID:EFBA (203) 562-9885
SHIPPING
JOSEPH MERRITT CO.
60 HAMILTON STREET

NEW HAVEN, CT 065115920
UNITED STATES US

SHIP DATE: 23FEB22
ACTWGT: 2.00 LB MAN
CAD: 0517347/CAFE3509

BILL THIRD PARTY

TO HONORABLE FRED CAMILLO, FIRST SLECT
TOWN OF GREENWICH
101 FIELD POINT ROAD

GREENWICH CT 06830

PO: S0424361

FedEx Express

THU - 24 FEB 10:30A
PRIORITY OVERNIGHT

TRK# 0201 6437 3911 1914

FH CTXA

06830
CT-US SWF

Part # 156148-434 RIT2 01/14

Ref:
Dep:

Date: 23Feb22
Wgt: 4.00 LBS

DV: 200.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 6437 3911 1947

ORIGIN ID:EFBA (203) 562-9885
SHIPPING
JOSEPH MERRITT CO.
60 HAMILTON STREET

NEW HAVEN, CT 065115920
UNITED STATES US

SHIP DATE: 23FEB22
ACTWGT: 4.00 LB MAN
CAD: 0517347/CAFE3509

BILL THIRD PARTY

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051

PO: S0424361

FedEx
Express

THU - 24 FEB 10:30A
PRIORITY OVERNIGHT

TRK# 0201 6437 3911 1947

00 BDLA

06051
CT-US BDL

Part # 156148-434 RIT2 01/14