PULLMAN & COMLEY LLC
ATTORNEYS AT LAW

EM-POCKET-005-090113

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ORIGINAL

January 12, 2009

Via Federal Express

S. Derek Phelps, Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Notice of Exempt Modification
Verizon Wireless Telecommunications Facility
31 Rust Road, aka Rust Rd/New Hartford Rd, Barkhamsted, Connecticut

Dear Mr. Phelps:

Youghiogheny Communications-Northeast, LLC, doing business as Pocket Communications ("Pocket"), intends to install antennas and appurtenant equipment at the existing 145-foot monopine facility owned by Verizon Wireless and located at 31 Rust Road, aka Rust Rd/New Hartford Rd, Barkhamsted, Connecticut ("Facility"). Pocket Communications provides prepaid, flat rate wireless voice and data services to more than a quarter of a million subscribers. Pocket is licensed by the Federal Communications Commission (FCC) to provide PCS wireless telecommunications service in the State of Connecticut, which includes the area to be served by the proposed installation. This installation constitutes an exempt modification pursuant to the Public Utility Environmental Standards Act, Connecticut General Statutes Section 16-50g et. seq. (PUESA), and Section 16-50j-72(b)(2) of the Regulations of the Connecticut State Agencies adopted pursuant to PUESA. In accordance with R.C.S.A. Section 16-50j-73, a copy of this notice has been sent to Donald S. Stein, First Selectman, Town of Barkhamsted.

The existing Facility consists of a 145-foot self-supporting monopine tower capable of supporting multiple carriers within a fenced compound. The coordinates for the Facility are **Lat: 41°-53'-37" and Long: 72°–59'-47".** The tower is located in the southwestern portion of Barkhamsted, off the end of Rust Road. The Facility is roughly 2,200 feet south of Old County Road and roughly 2,300 feet west of Route 44 (see Site Map, attached as Exhibit A). The tower currently supports T-Mobile antennas at the one hundred one foot (101') level centerline AGL (above ground level), AT&T antennas at the one hundred fourteen foot level (114') AGL, Nextel antennas at the one hundred twenty seven foot level (127') AGL, Verizon antennas at the one hundred thirty three foot level (133') AGL, and Sprint antennas at the one hundred forty two foot level (188') AGL. Pocket proposes to install three RFS APXV18-206517S-C flush mount antennas on the tower at the ninety three foot centerline (93') AGL, and a Nortel CDMA Micro

BTS 3231 cabinet, mounted on an "H-Frame," contained within a six foot by six foot (6'-0" x 6'-0") lease area. A small GPS antenna will be mounted to an ice bridge which will run from the lease area to the tower. Utilities will be run via a proposed underground conduit from an existing utility backboard, within the compound (See Design Drawings and Equipment Specifications, attached as Exhibits B and C respectively).

For the following reasons, the proposed modifications to the Rust Road Facility meet the exempt modification criteria set forth in R.C.S.A. Section 16-50j-72(b)(2):

1. The proposed modification will not increase the height of the tower as Pocket's antennas will be installed at a center line height of approximately 93 feet.

2. The installation of Pocket's equipment and shelter will not require an extension of the site boundaries.

3. The proposed modifications will not increase the noise levels at the existing Facility by six decibels or more.

4. The operation of the additional antennas will not increase the total radio frequency (RF) power density, measured at the site boundary, to a level at or above the standard adopted by the Connecticut Department of Environmental Protection as set forth in Section 22a-162 of the Connecticut General Statutes and MPE limits established by the Federal Communications Commission. The worst-case RF power density calculations for the proposed Pocket antennas would be 20.66% of the FCC standard (see general power density calculations table, attached as Exhibit D).

Also attached, Exhibit E, is a structural analysis confirming that the tower can support the existing and proposed antennas and associated equipment.

For the foregoing reasons, Pocket respectfully submits that the proposed antenna installation and equipment at the Barkhamsted Facility constitutes an exempt modification under R.C.S.A. Section 16-50j-72(b)(2).

Respectfully Submitted,

Carrie L. Larson

cc: Donald S. Stein, First Selectman
Regional Refuse Disposal, underlying property owner

Exhibit A

Site Map

Pocket Site NHCT0155A

31 Rust Road

aka Rust Rd/New Hartford Rd

Barkhamsted, Connecticut

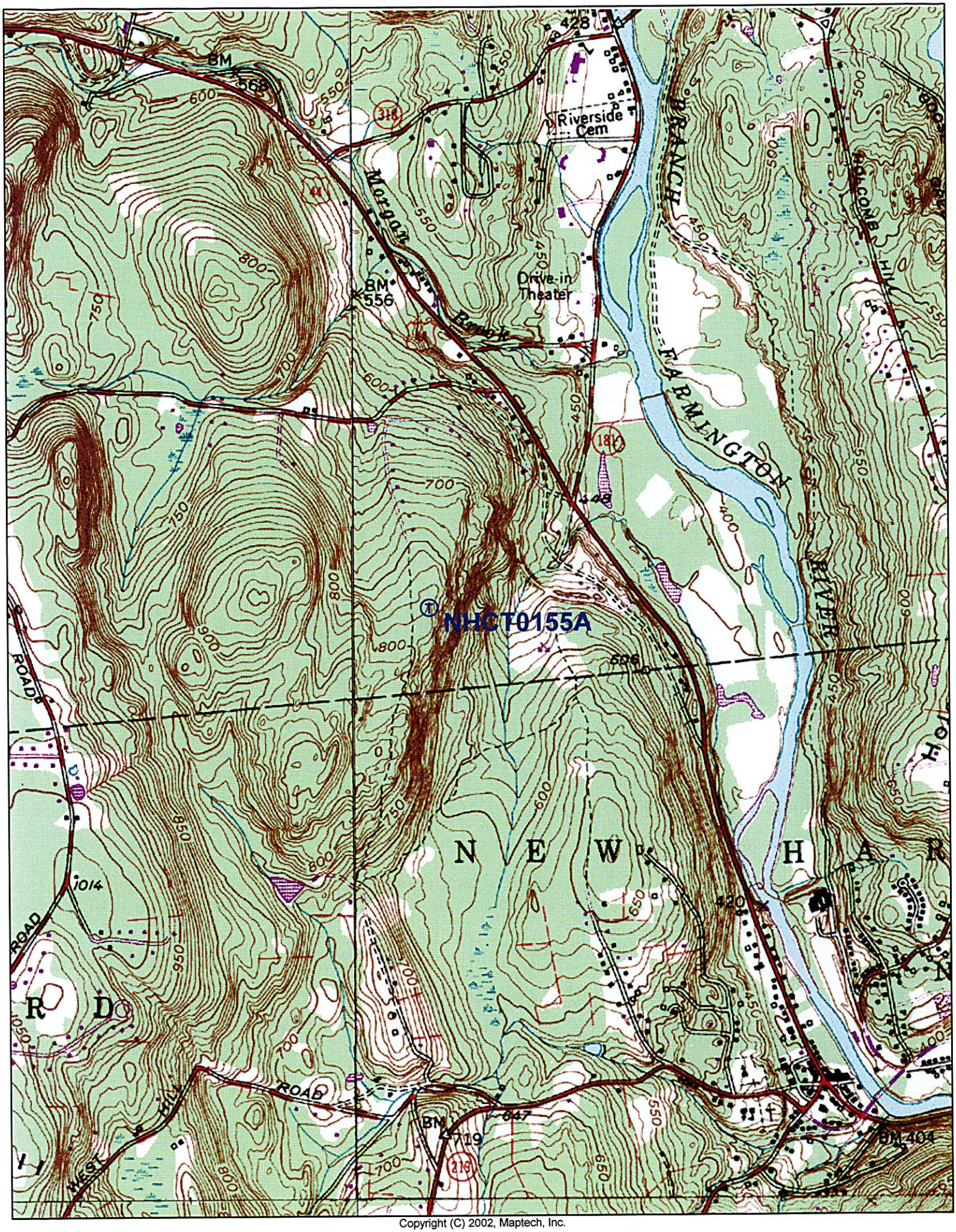

Exhibit B

Design Drawings

Pocket Site NHCT0155A

31 Rust Road

aka Rust Rd/New Hartford Rd

Barkhamsted, Connecticut

SITE INFORMATION

PROPERTY OWNER:	VERIZON WIRELESS 99 EAST RIVER DRIVE 9th FLOOR EAST HARTFORD, CT 06108
SITE NAME:	BARKHAMSTEAD SOUTH
SITE NUMBER:	NHCT0155A
SITE ADDRESS:	31 RUST ROAD BARKHAMSTEAD, CT 06063
APPLICANT:	YOUGHIOGHENY COMMUNICATIONS NORTHEAST LLC 2819 NW LOOP 410 SAN ANTONIO, TX 78230
COUNTY:	LITCHFIELD COUNTY
LATITUDE:	41° 53' 36.48"
LONGITUDE:	72° 59' 47.21"
ZONING JURISDICTION:	CSC
POWER COMPANY:	CONNECTICUT LIGHT & POWER 860-947-2000
TELEPHONE COMPANY:	AT&T 866-505-1765
DESIGN FIRM:	AERIAL SPECTRUM, INC. 599 NORTH AVENUE, SUITE 8 WAKEFIELD, MA 01880

DRAWING INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	D
A-1	COMPOUND PLAN	D
A-2	TOWER ELEVATION & RF SYSTEM	D
	DESIGN PLAN	
S-1	EQUIPMENT DETAILS	D
S-2	COAX SUPPORT STRUCTURE DETAILS	D
	& GROUNDING DETAILS	
G-1	GROUNDING DETAILS	D
E-1	ELECTRICAL DETAILS	D

APPROVALS

_____ REAL ESTATE

_____ RF

_____ OPS/CONSTRUCTION

_____ LEGAL/COMPLIANCE

_____ NET DESIGN

pocket™ COMMUNICATIONS

NHCT0155A

BARKHAMSTEAD SOUTH

MONOPINE

LOCATION MAP

DRIVING DIRECTIONS

FROM NEW HAVEN, CT: TAKE CT-8 N TOWARD WATERBURY. CT-8 N BECOMES US-44/NEW HARTFORD ROAD. TURN RIGHT ONTO EDDY ROAD. TURN LEFT ONTO OLD COLONY ROAD. TURN RIGHT ONTO RUST ROAD.SITE IS LOCATED ON THE LEFT.

APPLICABLE BUILDING CODES AND STANDARDS

CONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.
2005 NEC NFPA 70, 200 IECC CODES AND THE 2004 CITY PUBLIC SERVICE ELECTRICAL SERVICE STANDARDS.

BUILDING CODE:
INTERNATIONAL BUILDING CODE (IBC) 2006.

ELECTRICAL CODE:
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70 2005, NATIONAL ELECTRICAL CODE.

LIGHTNING PROTECTION CODE:
NFPA 780 2005, LIGHTNING PROTECTION CODE.

CONTRACTOR'S WORK SHALL COMPLY WITH THE LATEST EDITION OF THE FOLLOWING STANDARDS.

AMERICAN CONCRETE INSTITUTE (ACI) 318, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), MANUAL OF STEEL CONSTRUCTION ASD NINTH EDITION.

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 22-F, STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWER AND ANTENNA SUPPORTING STRUCTURES.

TIA 607, COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS.

INSTITUTE FOR ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) 81, GUIDE FOR MEASURING EARTH RESISTIVITY, GROUND IMPEDANCE, AND EARTH SURFACE POTENTIALS OF A GROUND SYSTEM.

IEEE 1100 (1999) RECOMMENDED PRACTICE FOR POWERING AND GROUNDING OF ELECTRONIC EQUIPMENT.

IEEE C62.41, RECOMMENDED PRACTICES ON SURGE VOLTAGES IN LOW VOLTAGE AC POWER CIRCUITS (FOR LOCATION CATEGORY C3 AND HIGH SYSTEM EXPOSURE).

TELCORDIA GR-1275, GENERAL INSTALLATION REQUIREMENTS.

TELCORDIA GR-1503, COAXIAL CABLE CONNECTIONS.

ANSI T1.311, FOR TELECOMMUNICATIONS - DC POWER SYSTEMS - TELECOM, ENVIRONMENTAL PROTECTION.

FOR ANY CONFLICTS BETWEEN SECTIONS OF LISTED CODES AND STANDARDS REGARDING MATERIAL, METHODS OF CONSTRUCTION OR OTHER REQUIREMENTS, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. WHERE THERE IS CONFLICT BETWEEN A GENERAL REQUIREMENT AND A SPECIFIC REQUIREMENT, THE SPECIFIC REQUIREMENT SHALL GOVERN.

PROJECT SUMMARY

1. THIS SITE IS UNMANNED AND IS RESTRICTED TO OUTDOOR EQUIPMENT. IT WILL BE USED FOR THE TRANSMISSION OF RADIO SIGNALS FOR THE PURPOSE OF PROVIDING PUBLIC CELLULAR SERVICE.
2. POCKET COMMUNICATIONS CERTIFIES THAT THIS TELEPHONE EQUIPMENT FACILITY WILL BE SERVICED ONLY BY POCKET COMMUNICATIONS EMPLOYEES AND THE WORK ASSOCIATED WITH ANY EQUIPMENT CANNOT BE PERFORMED BY HANDICAPPED PERSONS. THIS FACILITY WILL BE FREQUENTED ONLY BY SERVICE PERSONNEL FOR REPAIR PURPOSES. THIS FACILITY IS EXEMPT FROM THE AMERICANS WITH DISABILITIES ACT (ADA). APPENDIX B, SECTION 4.11(5)(B).
3. NO POTABLE WATER IS TO BE SUPPLIED AT THIS LOCATION.
4. NO WASTE WATER WILL BE GENERATED AT THIS LOCATION.
5. NO SOLID WASTE WILL BE GENERATED AT THIS LOCATION.
6. POCKET COMMUNICATIONS MAINTENANCE CREW (TYPICALLY ONE PERSON) WILL MAKE AN AVERAGE OF ONE TRIP PER MONTH AT ONE HOUR PER VISIT.

Call Before You Dig
Call Toll Free for Connecticut - 1-800-922-4455

pocket COMMUNICATIONS

AERIAL SPECTRUM
Lakeside Office Park
599 North Avenue, Suite 8
Wakefield, MA 01880
tel. (781) 295 0818
fax (781) 295 0825
e-mail mitch@aerialspectrum.com

STATE OF CONNECTICUT — PAUL M. WOOD — LICENSED PROFESSIONAL ENGINEER

JOB NO.	NHCT0155A
DRAWN BY:	MJM
CHECKED BY:	PLM

SUBMITTALS

REV	DATE	DESCRIPTION
D	01/06/09	AZIMUTH CHANGE
C	01/05/09	ISSUED FOR REVIEW
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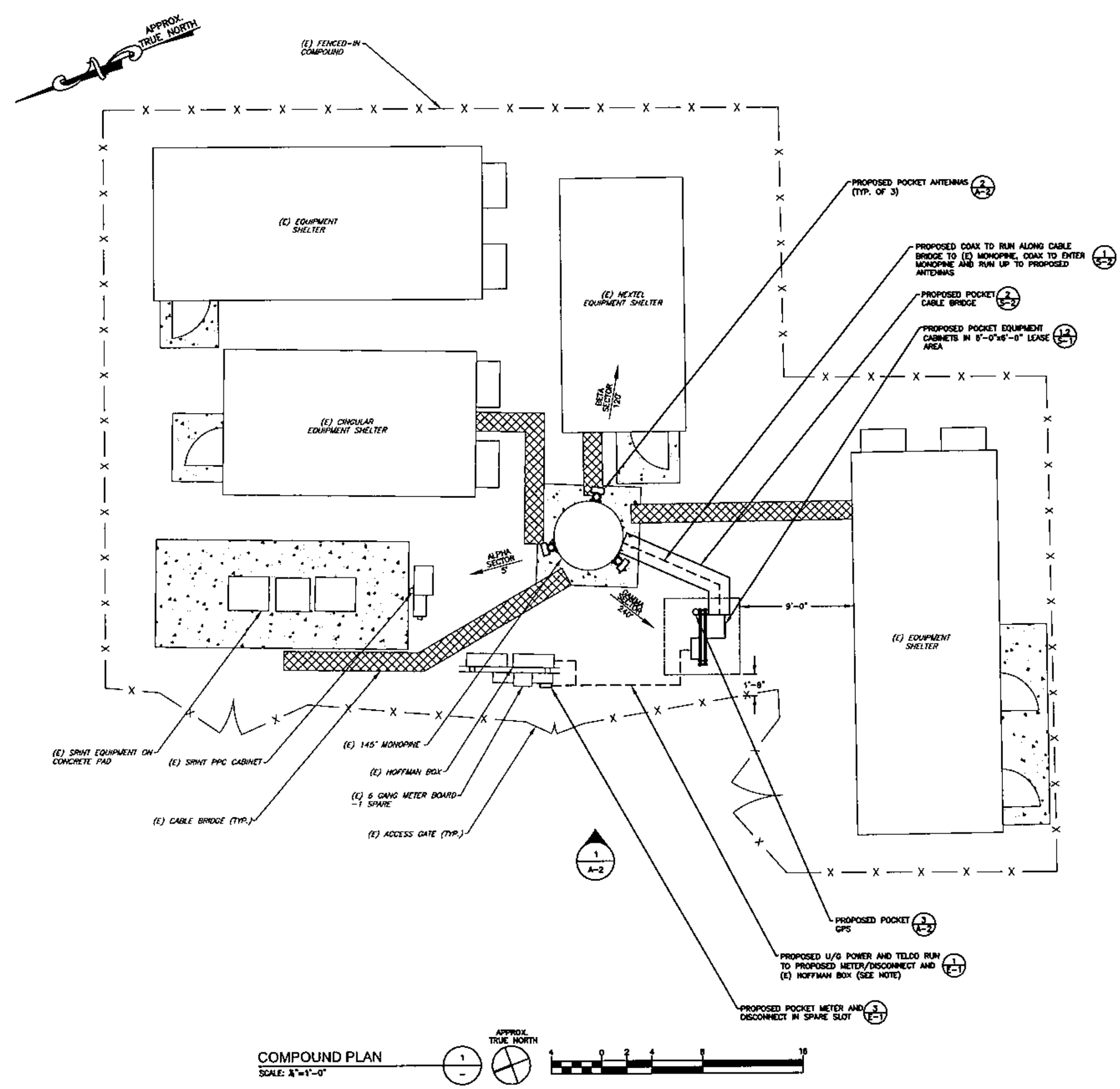
NHCT0155A
BARKHAMSTEAD SOUTH
MONOPINE

31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1



COMPOUND PLAN
SCALE: ⅛"=1'-0"

1 –

APPROX. TRUE NORTH

4 0 2 4 8 16

CONSTRUCTION NOTES

1. FIELD VERIFICATION: CONTRACTOR SHALL FIELD VERIFY SCOPE OF WORK, POCKET COMMUNICATIONS ANTENNA MOUNT LOCATION AND ANTENNAS TO BE INSTALLED.

2. COORDINATION OF WORK: CONTRACTOR SHALL COORDINATE RF WORK AND PROCEDURES WITH POCKET COMMUNICATIONS.

3. GRAVEL SURFACE IN AREAS OF COMPOUND THAT ARE DISTURBED DURING CONSTRUCTION SHALL BE REPLACED TO ORIGINAL CONDITION BY CONTRACTOR.

GENERAL NOTES

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:

CONTRACTOR - GENERAL CONTRACTOR
OWNER - POCKET COMMUNICATIONS
OEM - ORIGINAL EQUIPMENT MANUFACTURER

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING CONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHOULD BE BROUGHT TO THE ATTENTION OF CONTRACTOR.

3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.

4. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.

5. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.

6. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION FOR APPROVAL.

7. CONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER & T1 CABLES, AND GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING.

8. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, AND GROUNDING CABLES AS SHOWN ON THE ELECTRICAL PLAN.

9. CONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNERS DESIGNATED LOCATION.

10. CONTRACTOR TO OBTAIN REQUIRED NOTICE TO PROCEED DOCUMENTS FORM THE TOWER OWNER BEFORE COMMENCING CONSTRUCTION.

pocket COMMUNICATIONS

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599 North Avenue, Suite 5
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fax (781) 295 0825
e-mail mitch@aerialspectrum.com

JOB NO:	NHCT0155A
DRAWN BY:	MJM
CHECKED BY:	PLM

SUBMITTALS

REV	DATE	DESCRIPTION
D	01/06/09	AZIMUTH CHANGE
C	01/05/09	ISSUED FOR REVIEW
B	12/05/06	ISSUED FOR REVIEW
A	12/04/06	ISSUED FOR REVIEW

NHCT0155A
BARKHAMSTEAD SOUTH
MONOPINE

31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
COMPOUND PLAN

SHEET NUMBER
A-1

ANTENNA KEY

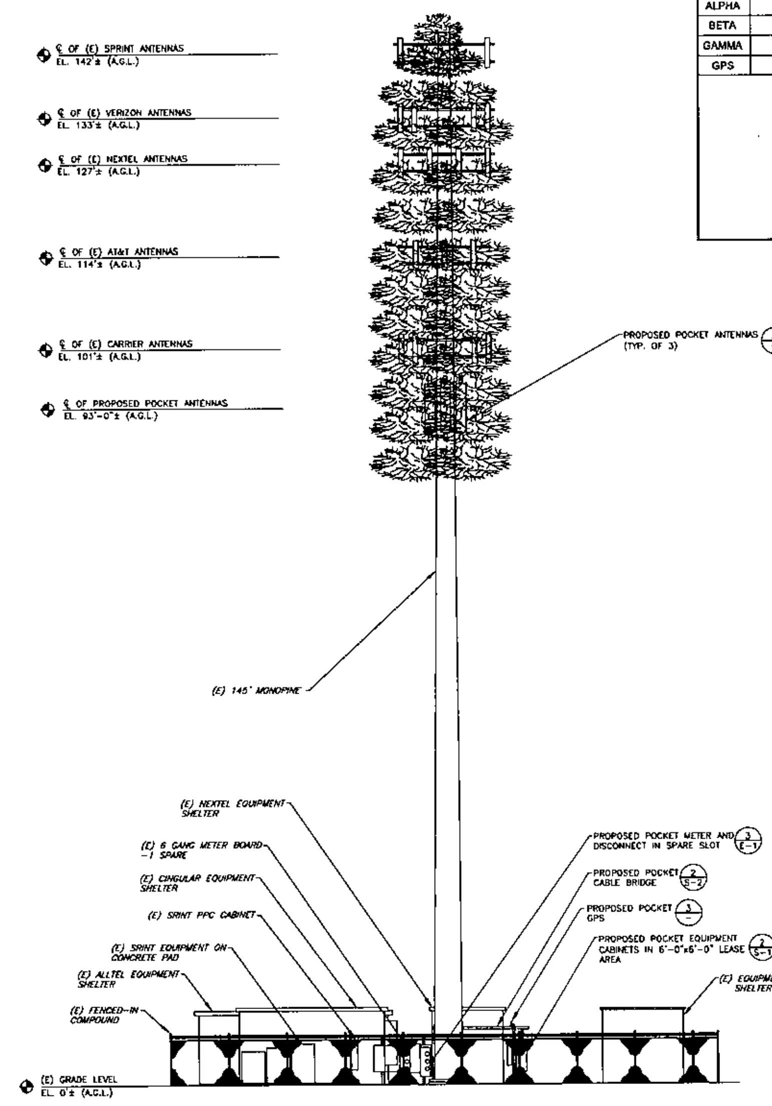
SECTOR	ANTENNAS PER SECTOR	ANTENNA NUMBER	COAX COLOR CODE	ANTENNA VENDOR	MODEL NUMBER	AZIMUTH	℄ HEIGHT	MECHANICAL DOWN-TILT	ELECTRICAL DOWN-TILT	COAX SIZE	COAX PER ANTENNA	COAX MODEL NUMBER	COAX LENGTH
ALPHA	1	A-1	(1)-RED BAND	RFS	APXV18-18-206517S-C	5°	93'-0"	0°	0°	1⅝"	2	RFS	120'±
BETA	1	B-1	(1)-BLUE BAND	RFS	APXV18-18-206517S-C	120°	93'-0"	0°	0°	1⅝"	2	RFS	120'±
GAMMA	1	C-1	(1)-GREEN BAND	RFS	APXV18-18-206517S-C	240°	93'-0"	0°	0°	1⅝"	2	RFS	120'±
GPS	N/A	POCKET	N/A	PC TEL ANT	GPS-TMG-26NMS	N/A	8'-0"	N/A	N/A	½"	1	ANDREW	6'±

TOWER NOTES:

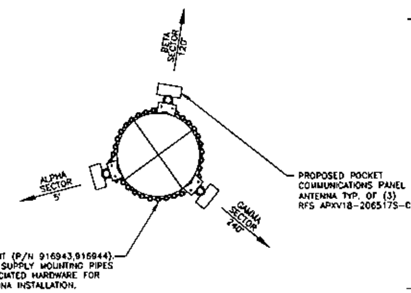
1. FOR DETAILED TOWER INFORMATION, REFER TO TOWER ERECTION DRAWINGS BY OTHERS. THE TOWER ON THIS SHEET IS SHOWN FOR GENERAL CONFIGURATION PURPOSES ONLY.
2. ANTENNA CONFIGURATION IS SUBJECT TO CHANGE, VERIFY ANTENNA HEIGHT, DOWN-TILT, AND AZIMUTH WITH PROJECT MANAGER PRIOR TO CONSTRUCTION.

ANTENNA NOTES:

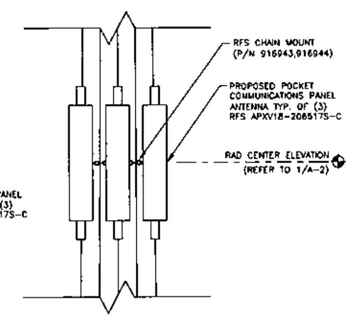
1. ALL COAX SHALL BE COLOR-CODED AT (3) PLACES EACH: AT ANTENNA, EXTERIOR OF SHELTER AND INTERIOR OF SHELTER.
2. (2) COLOR BANDS DENOTES TRANSMIT.
3. PRIOR TO ORDERING ANY ANTENNAS OR COAX, CONTRACTOR SHALL CONTACT POCKET COMMUNICATION'S CONSTRUCTION MANAGER AND OBTAIN APPROVAL FOR MATERIALS LISTED. CONTRACTOR IS SOLELY RESPONSIBLE FOR THIS COORDINATION.



ELEVATION 1
SCALE: ⅛"=1'-0"



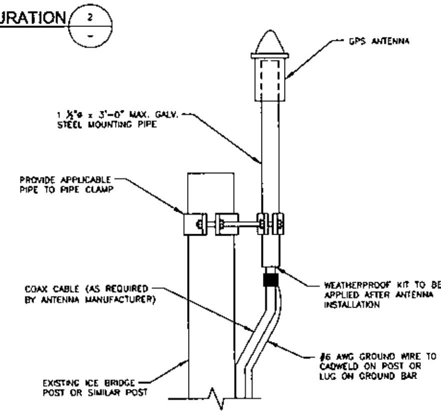
PLAN VIEW



TYPICAL SECTOR ELEVATION

APPROX. TRUE NORTH

ANTENNA MOUNTING CONFIGURATION 2
SCALE: NTS



NOTES:

1. LOCATION OF ANTENNA MUST HAVE A CLEAR VIEW OF SOUTHERN SKY AND CANNOT HAVE ANY BLOCKAGES EXCEEDING 25% OF THE SURFACE AREA OF A HEMISPHERE AROUND THE GPS ANTENNA.
2. ALL GPS ANTENNA LOCATIONS MUST BE ABLE TO RECEIVE CLEAR SIGNALS FROM A MINIMUM OF FOUR (4) SATELLITES. VERIFY WITH HAND HELD GPS BEFORE FINAL LOCATION OF GPS ANTENNA.

GPS ANTENNA PIPE MOUNT 3
SCALE: NTS

pocket COMMUNICATIONS

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586 North Avenue, Suite 8
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fax (781) 295 0825
e-mail mitch@aerialspectrum.com

JOB NO: NHCT0155A

DRAWN BY: MJM

CHECKED BY: PLM

SUBMITTALS

REV	DATE	DESCRIPTION
D	01/06/09	AZIMUTH CHANGE
C	01/05/09	ISSUED FOR REVIEW
B	12/05/08	ISSUED FOR REVIEW
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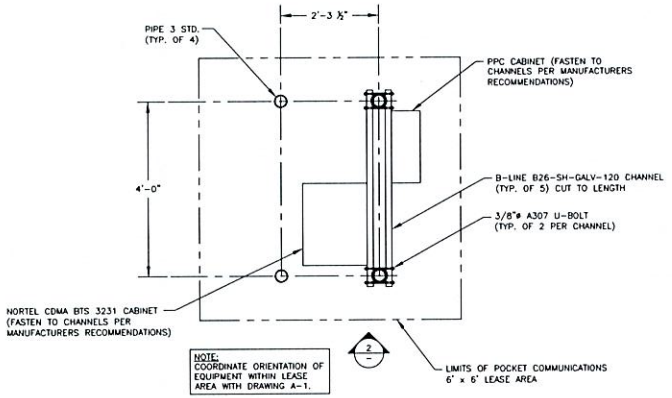
NHCT0155A
BARKHAMSTEAD SOUTH
MONOPINE

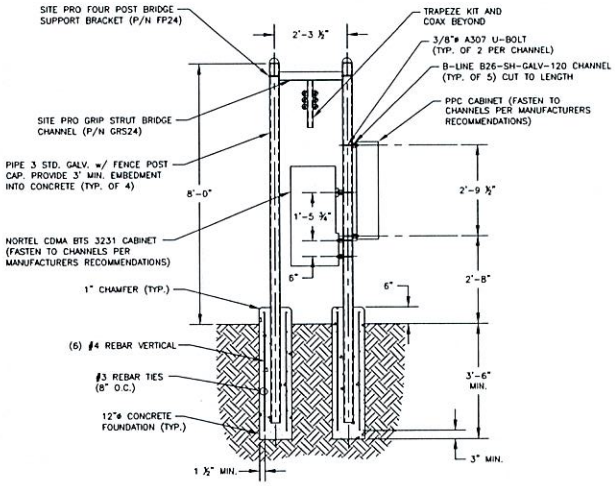
31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
TOWER ELEVATION & RF SYSTEM DESIGN PLAN

SHEET NUMBER
A-2



EQUIPMENT CABINET
SUPPORT FRAME PLAN
SCALE: NTS
1



EQUIPMENT CABINET
SUPPORT FRAME ELEVATION
SCALE: NTS
2

pocket
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599 North Avenue, Suite 8
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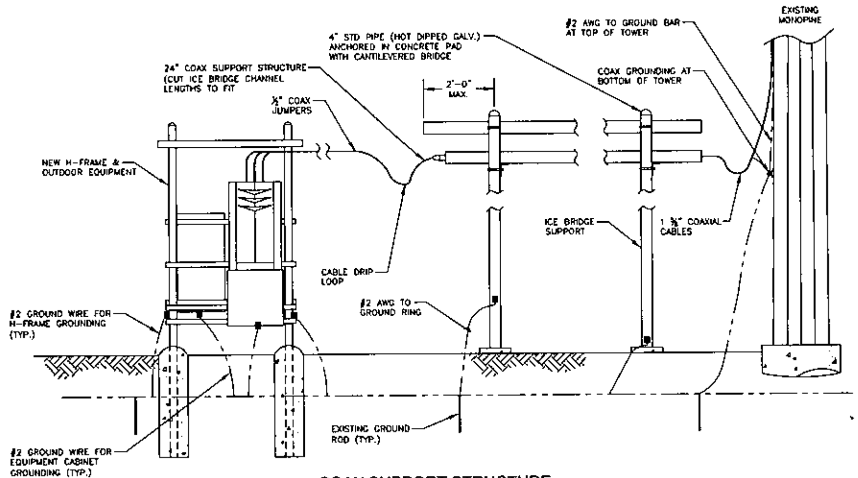
NHCT0155A
BARKHAMSTEAD SOUTH
MONOPINE

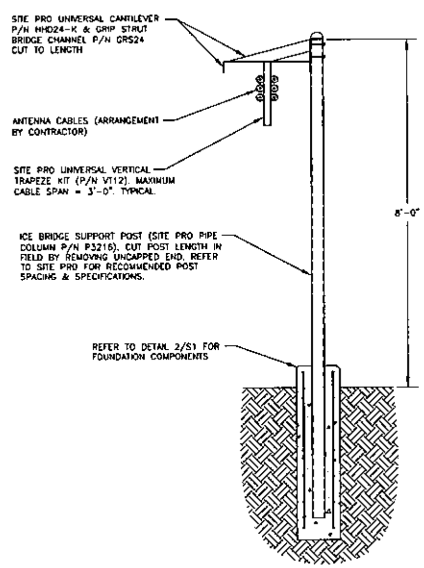
31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
EQUIPMENT
DETAILS

SHEET NUMBER
S-1



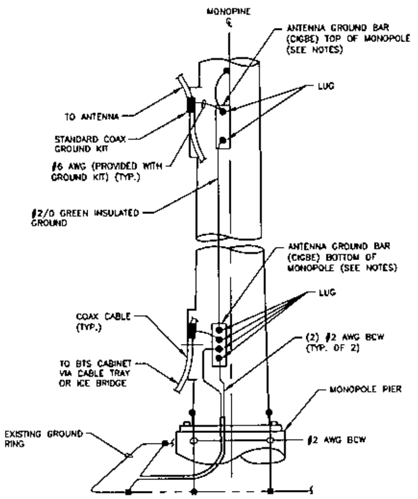
COAX SUPPORT STRUCTURE
OUTDOOR EQUIPMENT CABINETS (1/–)
SCALE: NTS



NOTES.

1. WHEN USING COMPONENTS AS SHOWN IN STANDARD DETAILS, MAXIMUM ALLOWABLE SPAN BETWEEN SUPPORTS ON A CONTINUOUS SINGLE SECTION OF BRIDGE CHANNEL SHALL BE 8' FOR 10' BRIDGE CHANNEL.
2. WHEN USING COMPONENTS FOR SPLICING BRIDGE CHANNEL SECTIONS THE SPLICE SHOULD BE PROVIDED AT THE SUPPORT, IF POSSIBLE OR AT A MAXIMUM OF 2' FROM THE SUPPORT.
3. WHEN USING COMPONENTS, SUPPORT SHOULD BE PROVIDED AS CLOSE AS POSSIBLE TO THE ENDS OF THE ICE BRIDGES, WITH A MAXIMUM CANTILEVER DISTANCE OF 2' FROM THE SUPPORT TO THE FREE END OF THE ICE BRIDGE.
4. CUT BRIDGE CHANNEL SECTIONS SHALL HAVE RAW EDGES TREATED WITH A MATERIAL TO RESTORE THESE EDGES TO THE ORIGINAL CHANNEL FINISH, OR EQUIVALENT FINISH.
5. ICE BRIDGES MAY BE CONSTRUCTED WITH COMPONENTS FROM OTHER MANUFACTURERS, PROVIDED THE MANUFACTURER'S INSTALLATION GUIDELINES ARE FOLLOWED.
6. DEVIATIONS FROM STANDARDS FOR COMPONENT INSTALLATIONS ARE PERMITTED WITH THE RESPECTIVE MANUFACTURER'S APPROVAL.
7. DEVIATIONS FROM ICE BRIDGE FOUNDATIONS REQUIRE ENGINEERING APPROVAL.
8. THE DESIGN IS BASED ON ASCE 7-98, 3 SECOND GUST WIND SPEED OF 110 MPH, EXPOSURE C, ELEVATION AT GRADE.
9. THIS DESIGN IS BASED ON 24" WIDE ICE BRIDGE AND (12) 1 ⅝" DIA COAX CABLES AND MAX. POST SUPPORT SPACING OF 10'-0".

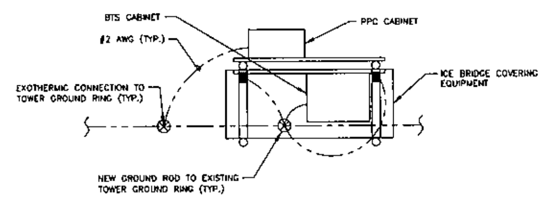
ICE BRIDGE DETAIL (2/–)
SCALE: NTS



NOTES:

1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, LOCATION OF ANTENNAS AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.
2. A SEPERATE GROUND BAR TO BE USED FOR GPS ANTENNA IF REQUIRED.

ANTENNA CABLE
GROUNDING DETAIL (3/–)
SCALE: NTS



NOTE:
THE CONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR NEW GROUND ELECTRODE SYSTEMS. THE CONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.

TYPICAL CABINET AND
PLATFORM GROUNDING (4/–)
SCALE: NTS

pocket COMMUNICATIONS

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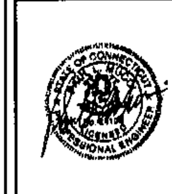
e-mail mitch@
aerialspectrum.com



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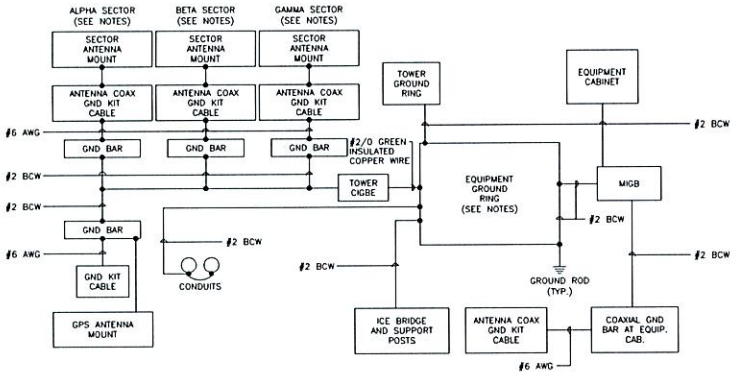
BARKHAMSTEAD SOUTH
MONOPINE

31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
COAX SUPPORT STRUCTURE DETAILS & GROUNDING DETAILS

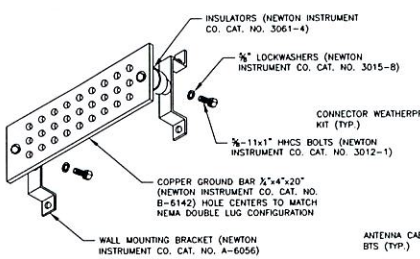
SHEET NUMBER
S-2



NOTES:

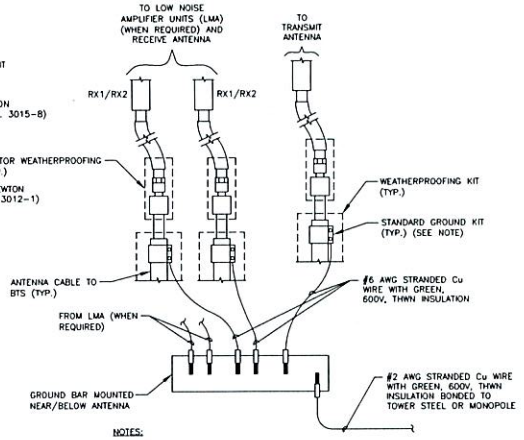
1. BOND ANTENNA GROUNDING KIT CABLE AND ANY OTHER ELEMENTS REQUIRING A GROUND CONNECTION (TMA'S, ETC.) TO GROUND BAR.
2. FOR GROUNDING CONNECTION AND DETAILS SEE LAYOUT DRAWINGS.

SCHEMATIC DIAGRAM GROUNDING SYSTEM (1)
SCALE: NTS



NOTE:
SECTOR CICBE GROUND BAR TO BE SIZED FOR (4) ANTENNAS AND (4) BRACKETS OR MASTS ALL OTHER GROUND BARS SHALL BE SIZED TO ACCOMMODATE ALL GROUNDING CONNECTIONS REQUIRED PLUS PROVIDE 50% SPARE CAPACITY

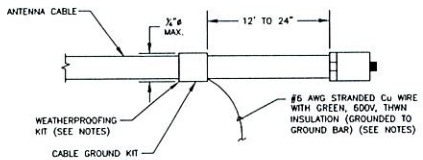
GROUND BAR (TYP.) (2)
SCALE: NTS



NOTES:

1. DO NOT INSTALL CABLE GROUND KITS AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO CIGBE.
2. JUMPER REQUIRED ONLY FOR 1 ⅝"ø COAX OR FOR EASE OF CONNECTION (TYP.).

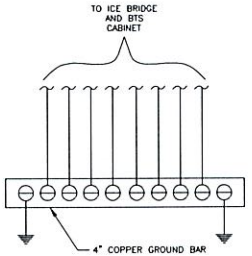
CONNECTION OF GROUND WIRE TO GROUNDING BAR (3)
SCALE: NTS



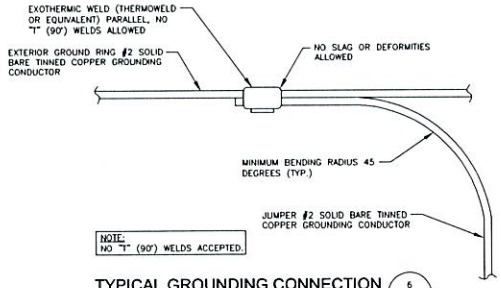
NOTES:

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. WEATHERPROOFING SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.

CONNECTION OF CABLE GROUND KIT TO ANTENNA CABLE (4)
SCALE: NTS

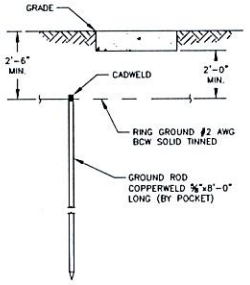


LOWER 4" GROUND BAR (5)
SCALE: NTS

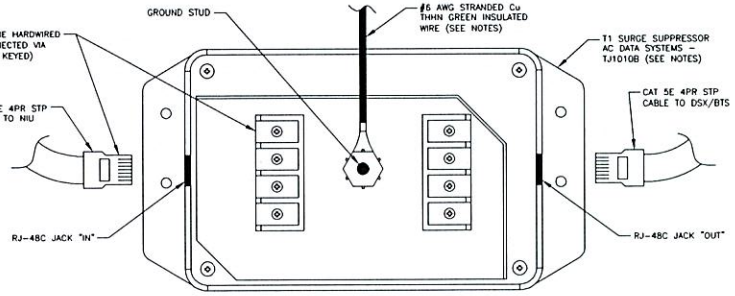


NOTE:
NO "T" (90°) WELDS ACCEPTED.

TYPICAL GROUNDING CONNECTION (6)
SCALE: NTS



STANDARD GROUND ROD DETAIL (7)
SCALE: NTS



NOTES:

1. MOUNT T1-TVSS UNIT ON EQUIPMENT FRAME HOUSING THE DSX UNIT. USE APPROPRIATE STAINLESS STEEL BOLTS WITH FLAT WASHERS AND A LOCK WASHER ON THE NUT SIDE. THE TVSS MAY BE LOCATED ON THE TELCO BACKBOARD. REFER TO MANUFACTURE'S INSTRUCTIONS.
2. ATTACH RING TERMINAL FROM SUPPLIED GROUND CONDUCTOR TO TVSS GROUND STUD, SECURELY FASTEN WITH SUPPLIED WASHER AND NUT. REFER TO MANUFACTURER'S INSTRUCTIONS. FOR PROPER PERFORMANCE, THE GROUND CONDUCTOR LENGTH SHOULD BE LIMITED WITH NO SHARP BENDS ON COILS.
3. WHEN TVSS IS MOUNTED ON EQUIPMENT FRAME BOND THE GROUND CONDUCTOR TO THE EQUIPMENT FRAME GROUND. ENSURE PROPER GROUNDING SURFACES. WHEN TVSS IS MOUNTED ON THE TELCO BACKBOARD BOND THE GROUND CONDUCTOR TO THE TELCO GROUND BAR OR NEAREST GROUND BAR.

T1 SURGE PROTECTOR (8)
SCALE: NTS

pocket COMMUNICATIONS

AERIAL SPECTRUM
Lakeside Office Park
599 North Avenue, Suite 8
Wakefield, MA 01880
tel. (781) 295 0818
fax (781) 295 0825
e-mail mitch@aerialspectrum.com

STATE OF CONNECTICUT — MICHAEL P. LICENSED PROFESSIONAL ENGINEER

JOB NO:	NHCT0155A
DRAWN BY:	MJM
CHECKED BY:	PLM

SUBMITTALS

REV	DATE	DESCRIPTION
D	01/06/09	AZIMUTH CHANGE
C	01/05/09	ISSUED FOR REVIEW
B	12/05/08	ISSUED FOR REVIEW
A	12/04/08	ISSUED FOR REVIEW

NHCT0155A
BARKHAMSTEAD SOUTH MONOPINE

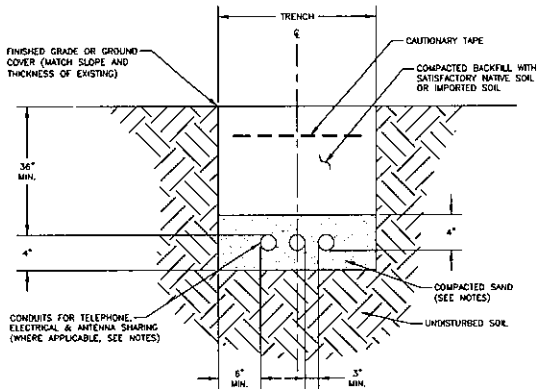
31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
GROUNDING DETAILS

SHEET NUMBER
G-1

PANEL "SSC"								
LOAD DESCRIPTION	LOAD (KVA)	BREAKER SIZE	CIRCUIT NO.	PHASE A	PHASE B	CIRCUIT NO.	BREAKER SIZE	LOAD (KVA)	LOAD DESCRIPTION
BTS CABINET	2.5	30/2	1	●		2	30/2	2.2	TVSS
	2.5		3		●	4		2.2	
LIGHTING	0.9	10/1	5	●		6	-	-	SPACE
SPACE	-	-	7		●	8	-	-	SPACE
SPACE	-	-	9	●		10	-	-	SPACE
SPACE	-	-	11		●	12	-	-	SPACE
SPACE	-	-	13	●		14	-	-	SPACE
SPACE	-	-	15		●	16	-	-	SPACE
SPACE	-	-	17	●		18	-	-	SPACE
SPACE	-	-	19		●	20	-	-	SPACE
SPACE	-	-	21	●		22	-	-	SPACE
SPACE	-	-	23		●	24	-	-	SPACE
LOAD SUB-TOTAL	5.9	LOAD TOTAL		10.3 KVA				4.4	LOAD SUB-TOTAL

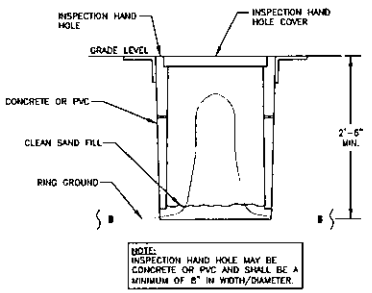
100A MCB, 120/240V, 1Ø, 3W, 65,000 AIC		
TOTAL CONNECTED LOAD	10.3 KW	
25% OF LARGEST CONT. LOAD	1250 W	
TOTAL LOADS	11.5 KW	47.9 AMPS
NOTE: ALL NON-OPTIONAL BREAKERS PROVIDED BY SSC MFR		



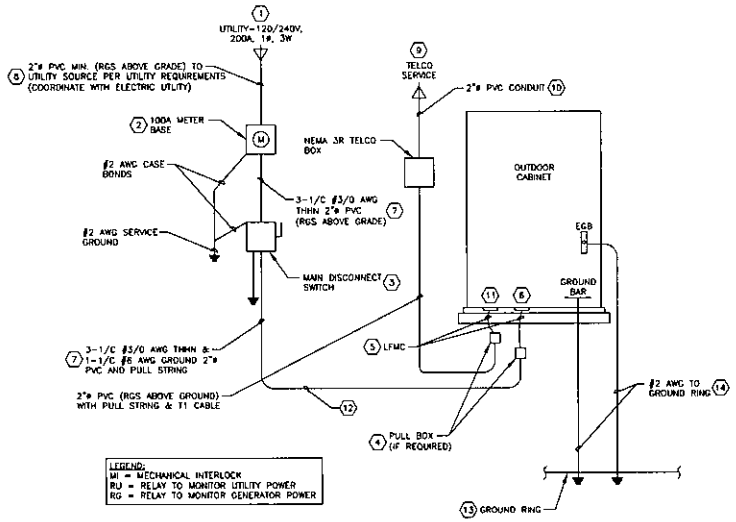
NOTES:

1. LEAN CONCRETE, RED-COLORED TOP MAY BE USED IN PLACE OF COMPACTED SAND.
2. CONDUIT SIZE, TYPE QUANTITY AND SEPARATION DIMENSION TO BE VERIFIED WITH LOCAL UTILITY COMPANY REQUIREMENTS.

DIRECT BURIED CONDUIT (1)
SCALE: NTS



INSPECTION HAND HOLE (2)
SCALE: NTS



POWER, TELCO & GROUND SINGLE LINE DIAGRAM FOR OUTDOOR CABINET (3)
SCALE: NTS

REFERENCE NOTES:

(1) ELECTRICAL DEMARCATION POINT. ELECTRICAL CONTRACTOR TO COORDINATE WITH LOCAL POWER FOR SERVICE TO METER.

(2) CONTRACTOR TO SUPPLY AND INSTALL A 100A, 120/208/240V, 1Ø, 3W METER BASE. METER BASE TO BE NEMA 3R RATED AND ACCEPTABLE TO LOCAL UTILITY. PROVIDE WITH MECHANICALLY ATTACHED ENGRAVED IDENTIFICATION LABEL INDICATING "POCKET COMMUNICATIONS METER".

(3) CONTRACTOR TO SUPPLY AND INSTALL NEMA 3R 100A FUSIBLE DISCONNECT SWITCH WITH LOCKABLE HANDLE. PROVIDE WITH 100A FUSES, AIC RATING TO COORDINATE WITH LOCAL UTILITY REQUIREMENTS. PROVIDE WITH MECHANICALLY ATTACHED ENGRAVED IDENTIFICATION LABEL INDICATING "POCKET COMMUNICATIONS SERVICE DISCONNECT".

(4) WEATHER TIGHT JUNCTION BOX (IF REQUIRED). SIZE TO NEC CODE FOR APPLICATION.

(5) LIQUID TIGHT FLEXIBLE METALLIC CONDUIT WITH WEATHER TIGHT FITTINGS AND SUPPORTS. SIZE AND CONTENTS TO MATCH ASSOCIATED USE (POWER OR TELCO).

(6) UTILITY POWER ENTRY INTO CABINET. COORDINATE TERMINATION WITH CABINET MANUFACTURER.

(7) CONTRACTOR TO SUPPLY AND INSTALL 2" GRC, AFG AND PVC 24" BFG C/W #3/0 AWG THHN & (1) #6 G FOR UTILITY SERVICE.

(8) CONTRACTOR TO SUPPLY AND INSTALL 4" GRC, AFG AND PVC 24" BFG C/W #3/0 AWG THHN FOR UTILITY SERVICE.

(9) TELCO DEMARCATION POINT. ELECTRICAL CONTRACTOR TO COORDINATE WITH LOCAL TELCO FOR SERVICE TO TELCO BOX OR CABINET.

(10) CONTRACTOR TO SUPPLY AND INSTALL (1) 2" GRC, AFG AND PVC 24" BFG C/W PULL CORDS FOR TELCO SERVICE TO CABINET TERMINATION POINT.

(11) TELCO SERVICE ENTRY INTO CABINET. COORDINATE TERMINATION WITH CABINET MANUFACTURER.

(12) CONTRACTOR TO ARRANGE AND PAY FOR UNDERGROUND UTILITY LOCATION SURVEYS FOR ALL TRENCHING. REUSE NATIVE BACKFILL AND REINSTATE TO ORIGINAL CONDITION. INSTALL 6" WIDE METALLIC LINED PLASTIC MARKER TAPE 6" ABOVE ALL BURIED CONDUIT.

(13) PART OF CABINET BURIED GROUND RING.

(14) (1) #2 SOLID BARE TINNED CU GEC BONDED TO ⅝"x10' COPPER CLAD STEEL GROUNDING ELECTRODES. LOCATE GROUNDING ELECTRODE ADJACENT TO CABINET. BOND GROUNDING ELECTRODE SYSTEM TO CABINET GROUND RING.

ELECTRICAL NOTES

1. ALL ELECTRICAL AND GROUNDING WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, NEC AND ALL APPLICABLE LOCAL CODES.

2. CONDUIT ROUTINGS ARE SCHEMATIC. CONTRACTOR SHALL VERIFY ROUTING AND LENGTHS PRIOR TO CONSTRUCTION.

3. WIRING, RACEWAY AND SUPPORT METHODS AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE NEC AND TELCORDIA.

4. THE CONTRACTOR SHALL NOTIFY AND OBTAIN NECESSARY AUTHORIZATION BEFORE COMMENCING WORK ON THE AC POWER DISTRIBUTION PANELS.

5. THE CONTRACTOR SHALL PROVIDE NECESSARY TAGGING ON THE BREAKERS, CABLES AND DISTRIBUTION PANELS IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS TO SAFEGUARD AGAINST LIFE AND PROPERTY.

6. CONTRACTOR SHALL PROVIDE 100A, 1Ø, 120/240V, 60HZ SERVICE FOR SITE.

7. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANY BEFORE THE START OF CONSTRUCTION. POWER AND TELCO CONDUIT SHALL BE PROVIDED AND INSTALLED PER UTILITY REQUIREMENTS.

8. FOR COMPLETE INTERNAL WIRING AND ARRANGEMENT REFER TO DRAWINGS PROVIDED BY AC OR TELCO PANEL MANUFACTURER.

9. ALL SERVICE EQUIPMENT AND INSTALLATIONS SHALL COMPLY WITH THE NEC, UTILITY COMPANY AND LOCAL CODE REQUIREMENTS.

10. CONTRACTOR SHALL INSTALL SUFFICIENT LENGTHS OF LFMC INCLUDING ALL CONDUIT FITTINGS (NUTS, REDUCING BUSHINGS, ELBOWS, COUPLINGS, ETC) NECESSARY FOR CONNECTION FROM IMC CONDUIT TO THE PURCELL POWER CABINET.

11. CONTRACTOR SHALL PROVIDE ELECTRICAL SERVICE EQUIPMENT WITH FAULT CURRENT RATINGS GREATER THAN THE AVAILABLE FAULT CURRENT FROM THE POWER UTILITY.

12. CONTRACTOR SHALL VERIFY THAT THE MAIN BONDING JUMPER AND GROUNDING ELECTRODE CONDUCTOR IS INSTALLED PROPERLY IN MAIN DISCONNECT SWITCH.

pocket COMMUNICATIONS

AERIAL SPECTRUM
Lakeside Office Park
600 North Avenue, Suite 6
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tel (781) 295-0818
fax (781) 295-0825
e-mail mhcht@
aerialspectrum.com

STATE OF CONNECTICUT — PAUL L. MOORE — LICENSED PROFESSIONAL ENGINEER

JOB NO:	NHCT0155A
DRAWN BY:	MJM
CHECKED BY:	PLM

SUBMITTALS

REV	DATE	DESCRIPTION
D	01/06/09	AZIMUTH CHANGE
C	01/05/09	ISSUED FOR REVIEW
B	12/05/08	ISSUED FOR REVIEW
A	12/04/08	ISSUED FOR REVIEW

NHCT0155A
BARKHAMSTEAD SOUTH
MONOPINE

31 RUST ROAD
BARKHAMSTEAD, CT 06063

SHEET TITLE
ELECTRICAL DETAILS

SHEET NUMBER
E-1

Exhibit C

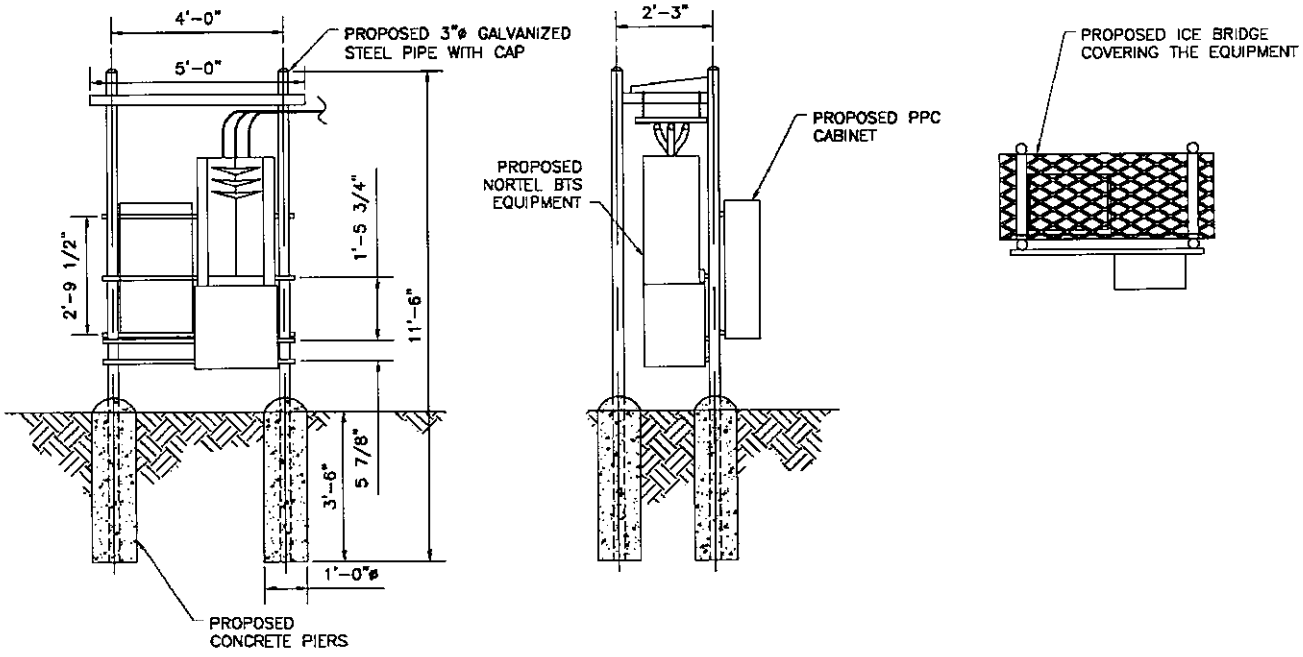
Equipment Specifications

Pocket Site NHCT0155A

31 Rust Road

aka Rust Rd/New Hartford Rd

Barkhamsted, Connecticut



Pocket/Youghiogheny Communications – Northeast, LLC
Rack Detail

>BUSINESS MADE **SIMPLE**

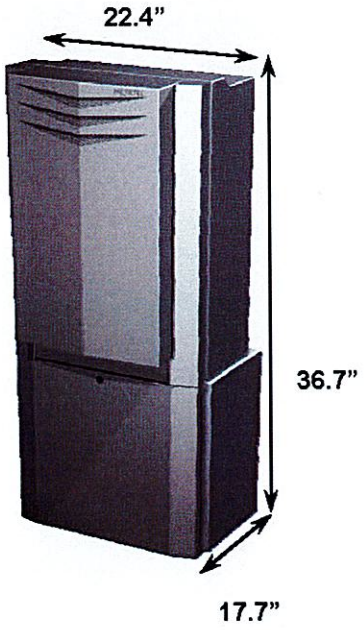
NORTEL

CDMA BTS 3231 AWS 1.7/2.1 GHz (Outdoor/Indoor)

CDMA BTS 3231

Industry's Highest Capacity AWS Micro BTS

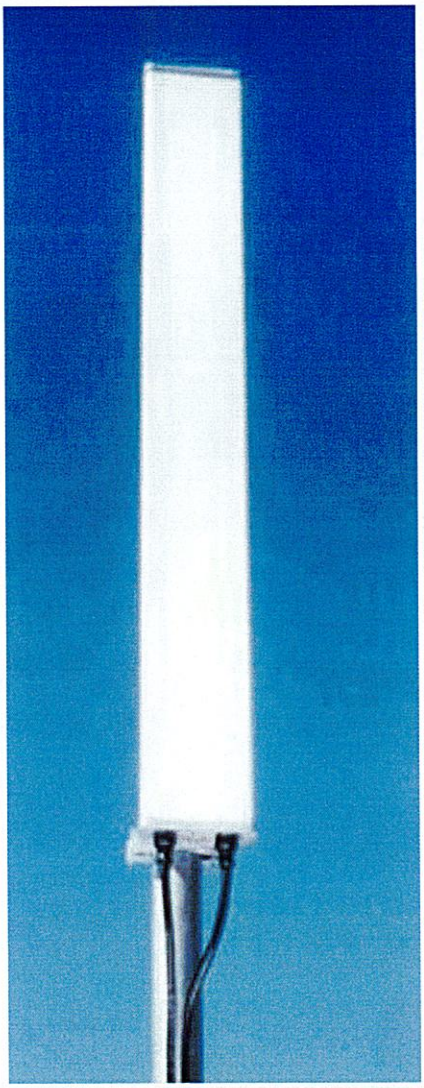
The CDMA BTS 3231 is the latest extension to Nortel Networks BTS (Base Transceiver Station) portfolio providing the ideal solution for urban, sub-urban and rural deployments. The CDMA BTS 3231 is a 3-carrier, 3-sector outdoor/indoor BTS operating at the AWS band of 1.7/2.1 GHz supporting IS-95, 1XRTT and 1xEV-DO simultaneously. BTS 3231 provides flexible deployments solutions including floor, rack, and wall mount options. The power consumption of BTS3231 is industry leading consuming only 630W for 3C3S. The BTS 3231 is also very light at 240lbs making it easy to transport to hard to reach locations such as the top of a high rise building.



Technical Data Sheet | APXV18-206517S-C

Product Description

This variable tilt antenna provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features null fill and a wide downtilt range with optional remote tilt.



Features/Benefits

- Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.
- High Suppression of all Upper Sidelobes (Typically <-20dB).
- Optional remote tilt - can be retrofitted.
- Broadband design.
- Dual polarization.
- Low profile for low visual impact.

Technical Features

Frequency Band	3G/UMTS (Single, Broad, Dual and Triple-Band)
Horizontal Pattern	Directional
Antenna Type	Panel Dual Polarized
Electrical Down Tilt Option	Variable

Technical Data Sheet	APXV18-206517S-C

Gain, dBi (dBd)	18.8 (16.7) , 19.0 (16.9)
Frequency Range, MHz	1710-1900, 1900-2170
Connector Type	(2) 7-16 DIN Female
Connector Location	Bottom
Mount Type	Downtilt
Electrical Downtilt, deg	0-10
Horizontal Beamwidth, deg	67 , 63
Mounting Hardware	APM40-2
Rated Wind Speed, km/h (mph)	160 (100)
VSWR	< 1.5:1
Vertical Beamwidth, deg	5.0 , 4.6
Upper Sidelobe Suppression, dB	>17 , >18 all (Typically >20)
Polarization	Dual pol +/-45°
Front-To-Back Ratio, dB	>30
Maximum Power Input, W	300
Isolation between Ports, dB	>30
Lightning Protection	Direct Ground
3rd Order IMP @ 2 x 43 dBm, dBc	>150
7th Order IMP @ 2x46 dBm, dBc	>170
Impedance, Ohms	50
Overall Length, m (ft)	1.85 (6.06)
Mounting Hardware Weight, kg (lb)	3.4 (7.5)
Dimensions - HxWxD, mm (in)	1850 x 175 x 80 (72.0 x 6.8 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)
Weight w/ Mtg Hardware, kg (lb)	14.8 (32.5)
Radiating Element Material	Brass
Radome Color	Light Grey RAL7035
Radome Material	Fiberglass
Mounting Hardware Material	Diecasted Aluminum
Reflector Material	Aluminum
Max Wind Loading Area, m² (ft²)	0.31 (3.3)
Survival Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	558 (125)
Front Thrust @ Rated Wind, N (lbf)	558 (125)
Shipping Weight, kg (lb)	18.3 (39.8)
Packing Dimensions, HxWxD, mm (in)	2021 x 260 x 200 (79.5 x 10.2 x 7.8)
Packing Dimensions - HxWxD, m (ft)	2.0 x 0.26 x 0.2 (6.6 x 0.85 x 0.65)

Notes

For additional mounting information please click "External Document Link" below.

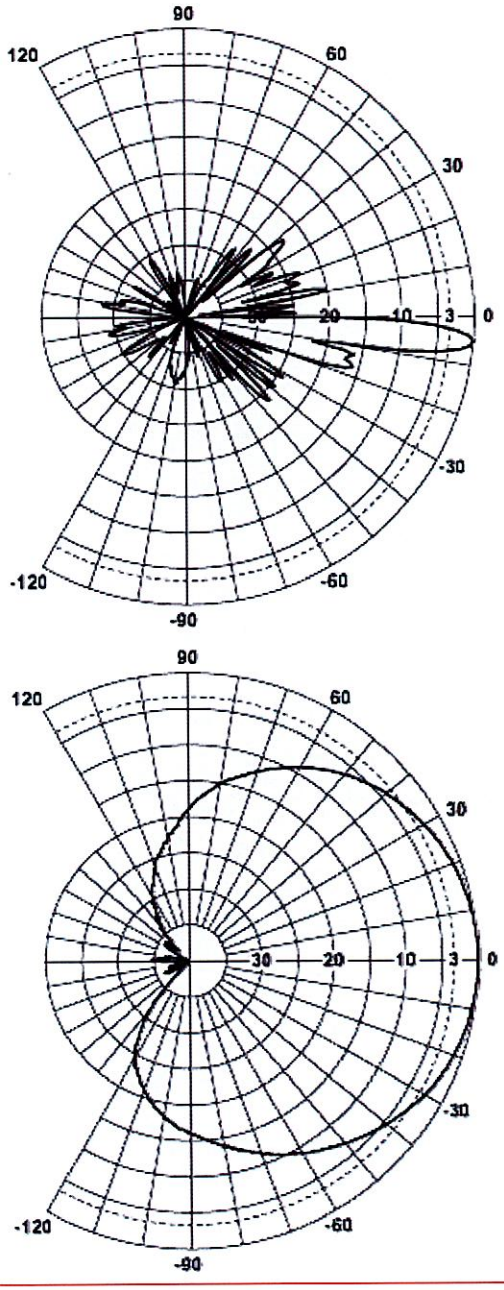


Exhibit D

Power Density Calculations

Pocket Site NHCT0155A

31 Rust Road

aka Rust Rd/New Hartford Rd

Barkhamsted, Connecticut

C Squared Systems, LLC
920 Candia Road
Manchester, NH 03109
Phone: (603) 657 9702
E-mail:
support@csquaredsystems.com

Calculated Radio Frequency Emissions

NHCT0155

31 Rust Road, Barkhamsted, CT

(aka: Rust Rd/New Hartford Rd)

Table of Contents

List of Tables

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Pocket antennas to be installed on the existing monopine tower at 31 Rust Road, Barkhamsted, CT.

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are much more conservative (higher) than the actual signal levels will be from the finished installation.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter (mW/ cm^2). The number of mW/cm^2 emitted is called the power density. The general population exposure limit for the cellular band is 0.567-0.593 mW/ cm^2, and the general population exposure limit for the PCS/AWS band is 1.0 mW/ cm^2. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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.

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 (through training), 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."

The FCC describes exposure to radio frequency (RF) energy in terms of percentage of maximum permissible exposure (MPE) with 100% being the maximum allowed. Rather than the FCC presenting the user specification in terms of complex power density figures over a specified surface area, this MPE measure is particularly useful, and even more so when considering that power density limits actually vary by frequency because of the different absorptive properties of the human body at different frequencies.

MPE limits are specified as time-averaged exposure limits. This means that exposure can be averaged over 30 minutes for general population / uncontrolled exposure (or 6 minutes for occupational / controlled exposure). However, for the case of exposure of the general public, time averaging is usually not applied because of uncertainties over exact exposure conditions and difficulty in controlling time of exposure. Therefore, the typical conservative approach is to assume that any RF exposure to the general public will be continuous.

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.

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 limits for Maximum Permissible Exposure (MPE) for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based on exposure limits recommended by the National Council on Radiation Protection and Measurements (NCRP), the exposure limits developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit. As shown in these excerpts, each frequency band has different exposure limits, requiring power density to be reported as a percent of Maximum Permissible Exposure (MPE) when dealing with carriers transmitting in different frequency bands.

3. RF Exposure Prediction Methods

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

$$\text{Power Density} = \left(\frac{0.64 \times EIRP}{\pi \times R^2} \right) \times \text{Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

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

H = Horizontal Distance from antenna

V = Vertical Distance from bottom of antenna

Off Beam Loss is determined by the selected antenna patterns

4. Calculation Results

Table 1 below outlines the power density information for the site. All information for carriers other than Pocket was obtained from current CSC database, except where otherwise noted. [1]

Carrier	Number of Trans.	Effective Radiated Power (ERP) Per Transmitter (Watts)	Antenna Height (Feet)	Power Density (mw/cm^2)	Operating Frequency (MHz)	Limit	%MPE
Sprint	11	338.55	142	0.0664	1962.5	1.0000	6.64%
Verizon	9	485	133	0.0887	1970	1.0000	8.87%
Verizon	9	200	133	0.0366	875	0.5833	6.27%
Sprint-Nextel	9	100	127	0.0201	851	0.5673	3.54%
AT&T TDMA	16	100	114	0.0443	880	0.5867	7.55%
AT&T GSM	2	296	114	0.0164	880	0.5867	2.79%
AT&T GSM	2	427	114	0.0236	1930	1.0000	2.36%
T-Mobile	8	168	101.5	0.0469	1945	1.0000	4.69%
Pocket	3	631	93	0.0899	2130-2133.75	1.0000	8.99%
						Total	20.66%

Table 1: Proposed Carrier Information

5. Conclusion

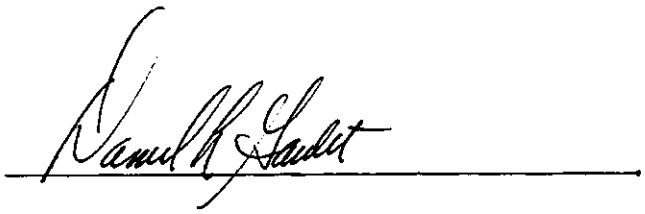
The above analysis verifies that emissions from the proposed site will be well below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the cumulative power density from the proposed transmit antennas at the existing facility is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at the base of the tower is 20.66% of the FCC limit.

As noted in the introduction, obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished installation.

[1] Based on the structural analysis report submitted by the engineering firm of Natcomm, Inc on December 15, 2008, Sprint's antennas centerline should be 142', in lieu of the 154' listed in CSC database. The associated %MPE value has been updated based on the new height. The total %MPE calculation has included this update for the purpose of the composite analysis. (Gray type denotes recommended updates to CSC database.)

6. Statement of Certification

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



December 23, 2008
Date

Daniel l. Goulet
C Squared Systems, LLC

Attachment A: References

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

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

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

(A) Limits for Occupational/Controlled Exposure

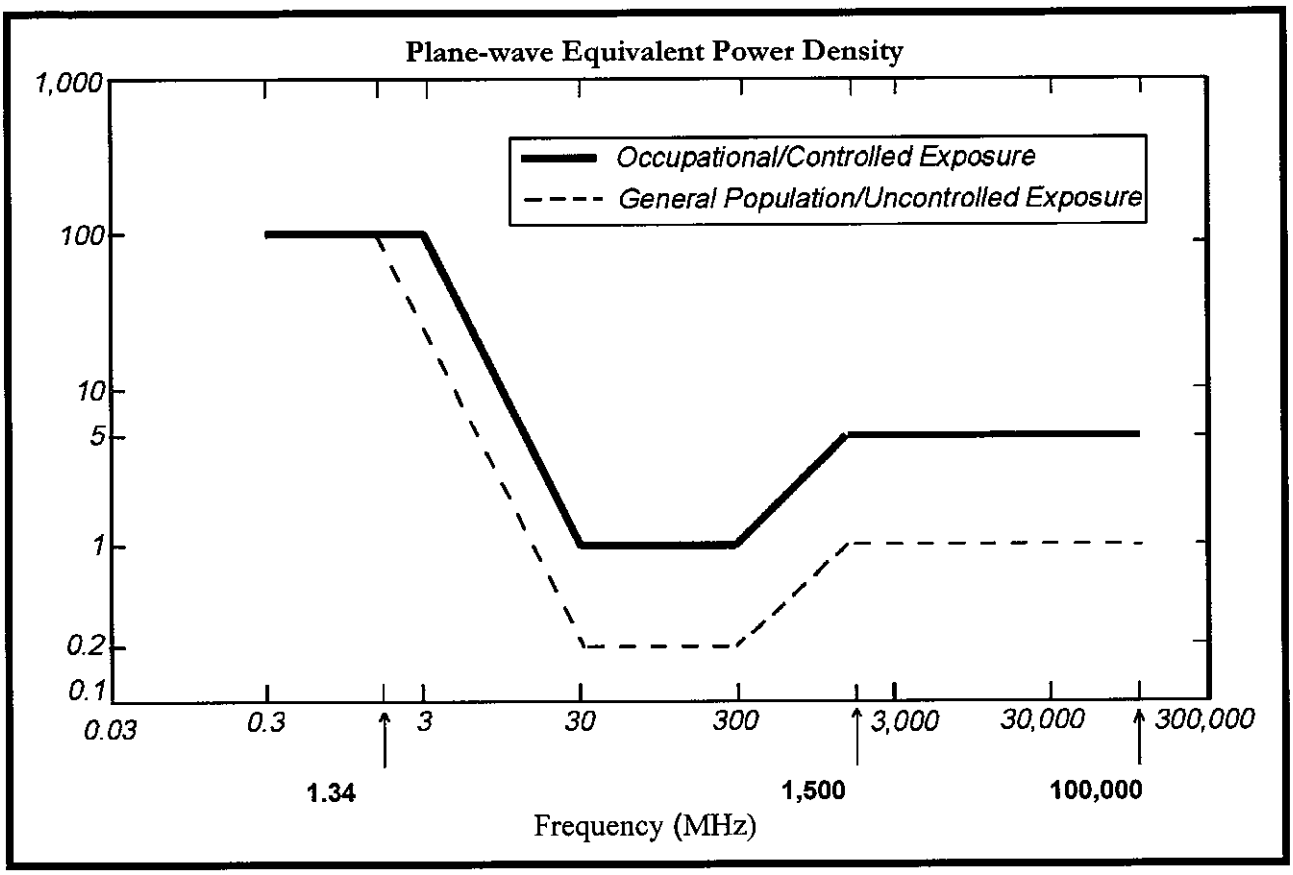
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure

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

NOTE 1: 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.
NOTE 2: 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.



• FCC Limits for Maximum Permissible Exposure (MPE)

Exhibit E

Structural Analysis

Pocket Site NHCT0155A

31 Rust Road

aka Rust Rd/New Hartford Rd

Barkhamsted, Connecticut

#1115 ?

NATCOMM INC.
CONSULTING ENGINEERS

Structural Analysis Report

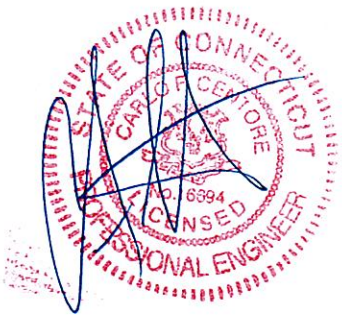
145' Existing Monopole
(Tree pole)

Pocket Wireless Site Ref: NHCT-0155A

Barkhamsted South
31 Rust Road
Barkhamsted, CT

Natcomm Project No. 08136-CO-10

Date: December 15, 2008



Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

p: 203.488.0580
f: 203.488.8587
w: nat-eng.com
63-2 N. Branford Rd.
Branford, CT 06405

Table of Contents

Natcomm, Inc.
Structural Monopole Analysis
145' Existing Summit Monopole
Barkhamsted, CT
December 15, 2008

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by Pocket Wireless on the existing Verizon Wireless monopole (tower) located in Barkhamsted, Connecticut.

The host tower is a 145-ft, four-section, eighteen sided, tapered monopole (tree-pole) originally manufactured by Summit Manufacturing and designed by Paul J. Ford and Company job no: 29200-1316, dated September 7, 2000. The tower geometry, structure member sizes and foundation system information were taken from the Summit Manufacturing design report. Antenna and appurtenance information were taken from a previous structural analysis report prepared by Natcomm Inc., job no. 08136-CO5, Rev 1, signed and sealed October 21, 2008.

The tower is made up of four (4) tapered vertical sections consisting of A607-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 25.41-in at the top and 66.05-in at the base.

Pocket Wireless is proposing the installation of three (3) RFS APXV18-206517-C panel antennas flush mounted to the existing tower. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna configuration.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- SPRINT (Existing):
  Antennas: Six (6) Decibel DB980F90E-M panel antennas on three (3) existing T-Arms with a RAD center elevation of 141-ft above the existing tower base plate.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- VERIZON WIRELESS (Reserved): [1]
  Antennas: Fifteen (15) 72"x12" panel antennas on three (3) existing T-Arms with a RAD center elevation of 133.3-ft above the existing tower base plate.
  Coax Cables: Fifteen (15) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- VACANT (Existing):
  T-Arms: Three (3) Generic T-Arms with a RAD center elevation of 126.5-ft above the existing tower base plate.

- SPRINT/NEXTEL (Existing):
  Antennas: Twelve (12) Decibel DB844H90E-XY panel antennas on three (3) existing T-Arms with a RAD center elevation of 123-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 7/8" ∅ coax cables running on the inside of the existing tower.
- AT&T (Existing):
  Antennas: Nine (9) CSS DUO4-8670 panel antennas and three (3) TMA's on three (3) existing T-Arms with a RAD center elevation of 111.5-ft above the existing tower base plate.
  Coax Cables: Twelve (9) 7/8" ∅ coax cables running on the inside of the existing tower.
- T-MOBILE (Reserved):
  Antennas: Nine (9) RFS APX16DWV-16WV-S-E-ACU panel antennas and Six (6) CCI DTMA-1819-DD-12 TMA's on three (3) T-Arms with a RAD center elevation of 101.5-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **POCKET WIRELESS (Proposed):**
  Antennas: (3) RFS APXV18-206517-C antennas flush mounted on a universal tri-bracket assembly at a RAD center elevation of 93-ft above the existing tower base plate.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.

Note: [1] Reserved Verizon Wireless antenna loading is conservative to allow for future antenna growth. Existing antenna configuration consists of (4) Antel LPA80063/4CF, (2) Antel LPA80080/4CF, (4) Andrew DB948F65E-M and (2) Andrew DB948G85E-M panel antennas.

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 existing coax cables to be installed within tower through engineered port holes.

Analysis

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

The existing tower was analyzed for 80 mph basic wind speed (fastest mile) with no ice and 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice tower structure and its components.

Basic Wind Speed:	Litchfield; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Barkhamsted; v = 90 mph (3 second gust) equivalent to v = 75 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design of monopole towers.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed. This load case typically controls the design of lattice towers.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1610.1.3 of State Bldg. Code 2005] does not control in the design of this structure type*

Natcomm, Inc.
Structural Monopole Analysis
145' Existing Summit Monopole
Barkhamsted, CT
December 15, 2008

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISATower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **78.3%** of its total capacity.

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	1.67'-43.67'	78.3%	**PASS**

Foundation and Anchors

The existing foundation consists of a 8.0-ft square reinforced concrete pedestal with a 31.5-ft square reinforced concrete pad bearing directly on existing sub-grade. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned structural analysis report; Natcomm; job no: 08136-CO5, Rev 1, dated October 21, 2008. The base of the tower is connected to the foundation by means of (24) 2.25" ∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Base Reactions	Vector	Proposed Load (kips/ft-kips)
Base	Shear	**55.0**
	Axial	**54.0**
	Moment	**5637.0**

- The foundation was found to be within allowable limits.

Foundation	Vector	IBC 2003/2005 CT State Building Code Section 3108.4.2	Proposed Loading	Result
Reinf Conc. Pad and Pier	OTM	2.0	2.04	**PASS**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Compression	63.0%	**PASS**
Flange Plate	Bending	24.0%	**PASS**
Anchor Bolts	Compression	79.0%	**PASS**
Base Plate	Bending	69.0%	**PASS**

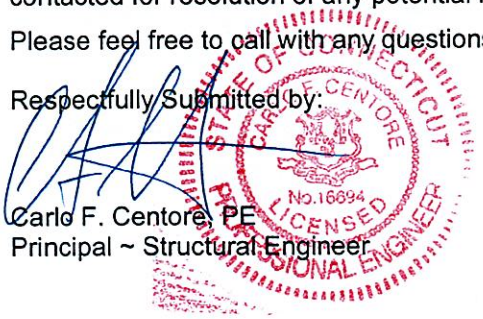
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Carlo F. Centore, PE
Principal ~ Structural Engineer

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 Natcomm, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provide to Natcomm, 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. Natcomm, 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

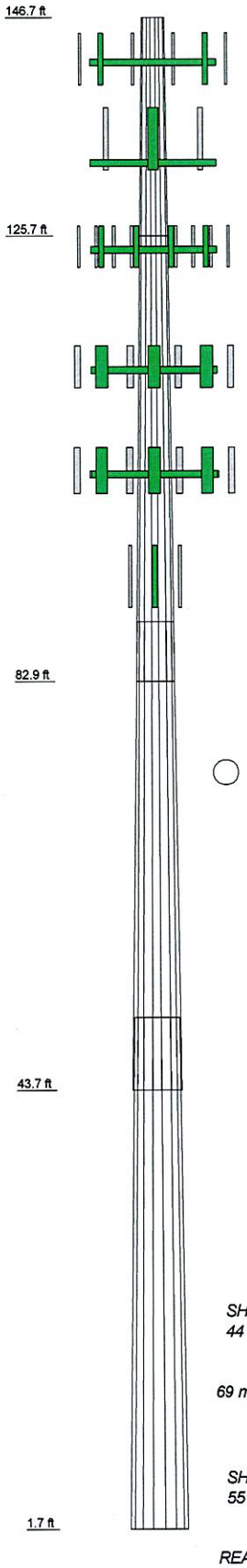
RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

- RISATower 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.
- RISATower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	1	2	3	4
Length (ft)	21.00	42.75	45.00	49.00
Number of Sides	18	18	18	18
Thickness (in)	0.2500	0.3750	0.4375	0.5000
Lap Splice (ft)		5.75	7.00	
Top Dia (in)	25.4100	32.5080	42.2513	52.1537
Bot Dia (in)	32.5080	44.6320	55.0140	66.0500
Grade	A607-65			
Weight (K)	1.6	6.6	10.2	15.5

34.0



AXIAL
66 K
SHEAR
44 K
MOMENT
4651 kip-ft
TORQUE 48 kip-ft
69 mph WIND - 0.5000 in ICE

AXIAL
54 K
SHEAR
55 K
MOMENT
5637 kip-ft
TORQUE 64 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Barkhamsted Branch 1	153.96	TMA (ATI/Cingular)	113.17
(2) DB980F90E-M (Sprint/Nextel)	142.67	Valmont T-Arm (1) (ATI/Cingular)	113.17
(2) DB980F90E-M (Sprint/Nextel)	142.67	Valmont T-Arm (1) (ATI/Cingular)	113.17
(2) DB980F90E-M (Sprint/Nextel)	142.67	Valmont T-Arm (1) (ATI/Cingular)	113.17
Valmont T-Arm (1) (Sprint/Nextel)	142.67	Barkhamsted Branch 4	110.55
Valmont T-Arm (1) (Sprint/Nextel)	142.67	Pirod 12' T-Frame Sector Mount (1) (T-Mobile - reserved)	103.17
Valmont T-Arm (1) (Sprint/Nextel)	142.67	Pirod 12' T-Frame Sector Mount (1) (T-Mobile - reserved)	103.17
Barkhamsted Branch 2	138.86	Pirod 12' T-Frame Sector Mount (1) (T-Mobile - reserved)	103.17
(5) 72" x 12" x 6" Panel (Verizon - reserved)	135	(3) APX16DWV-16DWV-S-E-ACU (T-Mobile - reserved)	103.17
(5) 72" x 12" x 6" Panel (Verizon - reserved)	135	(3) APX16DWV-16DWV-S-E-ACU (T-Mobile - reserved)	103.17
(5) 72" x 12" x 6" Panel (Verizon - reserved)	135	(3) APX16DWV-16DWV-S-E-ACU (T-Mobile - reserved)	103.17
Valmont T-Arm (1) (Verizon)	133	(2) DTMA-1819-DD-12 (T-Mobile - reserved)	103.17
Valmont T-Arm (1) (Verizon)	133	(2) DTMA-1819-DD-12 (T-Mobile - reserved)	103.17
Valmont T-Arm (1) (Verizon)	133	(2) DTMA-1819-DD-12 (T-Mobile - reserved)	103.17
Generic T-Arm Mount	128.17	APXV18-206517-C w/mount pipe (Pocket)	93
Generic T-Arm Mount	128.17	APXV18-206517-C w/mount pipe (Pocket)	93
Generic T-Arm Mount	128.17	APXV18-206517-C w/mount pipe (Pocket)	93
(4) DB844H90E-XY (Sprint/Nextel)	124.67	Barkhamsted Branch 5	92.3
(4) DB844H90E-XY (Sprint/Nextel)	124.67	Barkhamsted Branch 6	83.5
(4) DB844H90E-XY (Sprint/Nextel)	124.67		
Valmont T-Arm (1) (Sprint/Nextel)	124.67		
Valmont T-Arm (1) (Sprint/Nextel)	124.67		
Valmont T-Arm (1) (Sprint/Nextel)	124.67		
Barkhamsted Branch 3	122.09		
(3) DU04-8670 (ATI/Cingular)	113.17		
(3) DU04-8670 (ATI/Cingular)	113.17		
(3) DU04-8670 (ATI/Cingular)	113.17		
TMA (ATI/Cingular)	113.17		
TMA (ATI/Cingular)	113.17		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. TOWER RATING: 78.3%

NATCOMM INC
63-3 N Branford Rd
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 145' Summit Monopole w/ Branches			
Project: 31 Rust Road, Barkhamsted, CT			
Client: Verizon/Pocket	Drawn by: Staff	App'd:	
Code: TIA/EIA-222-F	Date: 12/15/08	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Treat Feedline Bundles As Cylinder
	Consider Moments - Horizontals		Assume Legs Pinned		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Calculate Redundant Bracing Forces
	Use Moment Magnification		Use Clear Spans For Wind Area		Ignore Redundant Members in FEA
√	Use Code Stress Ratios		Use Clear Spans For KL/r		SR Leg Bolts Resist Compression
	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		All Leg Panels Have Same Allowable
	Escalate Ice	√	Bypass Mast Stability Checks		Offset Girt At Foundation
	Always Use Max Kz		Use Azimuth Dish Coefficients		Consider Feedline Torque
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Include Angle Block Shear Check
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
	Leg Bolts Are At Top Of Section		SR Members Have Cut Ends	√	Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component	√	Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	Add IBC .6D+W Combination				

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	146.67-125.67	21.00	0.00	18	25.4100	32.5080	0.2500	1.0000	A607-65 (65 ksi)
L2	125.67-82.92	42.75	5.75	18	32.5080	44.6320	0.3750	1.5000	A607-65 (65 ksi)
L3	82.92-43.67	45.00	7.00	18	42.2513	55.0140	0.4375	1.7500	A607-65 (65 ksi)
L4	43.67-1.67	49.00		18	52.1537	66.0500	0.5000	2.0000	A607-65 (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	25.8020	19.9645	1596.6741	8.9318	12.9083	123.6938	3195.4492	9.9841	4.0322	16.129
	33.0095	25.5967	3365.0901	11.4516	16.5141	203.7712	6734.6080	12.8008	5.2814	21.126
L2	33.0095	38.2463	4989.1833	11.4072	16.5141	302.1172	9984.9316	19.1268	5.0614	13.497
	45.3205	52.6769	13035.3157	15.7112	22.6731	574.9254	26087.7837	26.3435	7.1952	19.187
L3	44.5590	58.0637	12825.6955	14.8439	21.4637	597.5542	25668.2673	29.0374	6.6662	15.237
	55.8627	75.7863	28519.3401	19.3747	27.9471	1020.4754	57076.2067	37.9003	8.9125	20.371
L4	54.9741	81.9744	27632.3873	18.3371	26.4941	1042.9648	55301.1340	40.9950	8.2990	16.598
	67.0689	104.0279	56471.9085	23.2703	33.5534	1683.0458	113018.124 1	52.0238	10.7448	21.49

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
L1 146.67-125.67				1	1	1		
L2 125.67-82.92				1	1	1		
L3 82.92-43.67				1	1	1		
L4 43.67-1.67				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (Sprint/Nextel)	C	No	Inside Pole	142.67 - 4.67	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon - reserved)	C	No	Inside Pole	133.00 - 4.67	15	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
7/8 (Sprint/Nextel)	C	No	Inside Pole	124.67 - 4.67	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8 (Cingular)	C	No	Inside Pole	113.17 - 4.67	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 5/8 (T-Mobile - reserved)	C	No	Inside Pole	103.17 - 4.67	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Pocket - proposed)	B	No	Inside Pole	93.00 - 4.67	6	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00

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	146.67-125.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.22
L2	125.67-82.92	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.65

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
L3	82.92-43.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.86
L4	43.67-1.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.84

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	146.67-125.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.22
L2	125.67-82.92	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.65
L3	82.92-43.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.86
L4	43.67-1.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.84

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
Barkhamsted Branch 1	A	From Face	3.00	0.0000	153.96	No Ice	48.51	48.51	0.32
			0.00			1/2" Ice	48.51	48.51	0.73
			0.00						
Barkhamsted Branch 2	A	From Face	3.00	0.0000	138.86	No Ice	120.49	120.49	2.29
			0.00			1/2" Ice	120.49	120.49	3.83
			0.00						
Barkhamsted Branch 3	A	From Face	3.00	0.0000	122.09	No Ice	13.86	13.86	0.09
			0.00			1/2" Ice	13.86	13.86	0.21
			0.00						
Barkhamsted Branch 4	A	From Face	3.00	0.0000	110.55	No Ice	134.66	134.66	2.56
			0.00			1/2" Ice	134.66	134.66	4.28
			0.00						
Barkhamsted Branch 5	A	From Face	3.00	0.0000	92.30	No Ice	28.62	28.62	0.90
			0.00			1/2" Ice	28.62	28.62	1.44
			0.00						
Barkhamsted Branch 6	A	From Face	3.00	0.0000	83.50	No Ice	22.07	22.07	0.77
			0.00			1/2" Ice	22.07	22.07	1.30
			0.00						
(2) DB980F90E-M (Sprint/Nextel)	A	From Face	4.00	0.0000	142.67	No Ice	3.90	2.29	0.01
			0.00			1/2" Ice	4.28	2.65	0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
(2) DB980F90E-M (Sprint/Nextel)	B	From Face	4.00 0.00 0.00	0.0000	142.67	No Ice 1/2" Ice	3.90 4.28	2.29 2.65	0.01 0.03
(2) DB980F90E-M (Sprint/Nextel)	C	From Face	4.00 0.00 0.00	0.0000	142.67	No Ice 1/2" Ice	3.90 4.28	2.29 2.65	0.01 0.03
Valmont T-Arm (1) (Sprint/Nextel)	A	From Face	2.00 0.00 0.00	0.0000	142.67	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Valmont T-Arm (1) (Sprint/Nextel)	B	From Face	2.00 0.00 0.00	0.0000	142.67	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Valmont T-Arm (1) (Sprint/Nextel)	C	From Face	2.00 0.00 0.00	0.0000	142.67	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
(5) 72" x 12" x 6" Panel (Verizon - reserved)	A	From Face	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	0.04 0.08
(5) 72" x 12" x 6" Panel (Verizon - reserved)	B	From Face	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	0.04 0.08
(5) 72" x 12" x 6" Panel (Verizon - reserved)	C	From Face	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	0.04 0.08
Valmont T-Arm (1) (Verizon)	A	From Face	2.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Valmont T-Arm (1) (Verizon)	B	From Face	2.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Valmont T-Arm (1) (Verizon)	C	From Face	2.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Generic T-Arm Mount	A	From Face	2.00 0.00 0.00	0.0000	128.17	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
Generic T-Arm Mount	B	From Face	2.00 0.00 0.00	0.0000	128.17	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
Generic T-Arm Mount	C	From Face	2.00 0.00 0.00	0.0000	128.17	No Ice 1/2" Ice	5.50 6.90	5.50 6.90	0.13 0.17
(4) DB844H90E-XY (Sprint/Nextel)	A	From Face	4.00 0.00 0.00	0.0000	124.67	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
(4) DB844H90E-XY (Sprint/Nextel)	B	From Face	4.00 0.00 0.00	0.0000	124.67	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
(4) DB844H90E-XY (Sprint/Nextel)	C	From Face	4.00 0.00 0.00	0.0000	124.67	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
Valmont T-Arm (1) (Sprint/Nextel)	A	From Face	2.00 0.00 0.00	0.0000	124.67	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41
Valmont T-Arm (1) (Sprint/Nextel)	B	From Face	2.00 0.00	0.0000	124.67	No Ice 1/2" Ice	10.54 14.45	10.54 14.45	0.34 0.41

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
Valmont T-Arm (1)	C	From Face	2.00	0.0000	124.67	No Ice	10.54	10.54	0.34
(Sprint/Nextel)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00						
(3) DU04-8670	A	From Face	4.00	0.0000	113.17	No Ice	6.53	4.20	0.03
(AT&T/Cingular)			0.00			1/2" Ice	6.94	4.57	0.07
			0.00						
(3) DU04-8670	B	From Face	4.00	0.0000	113.17	No Ice	6.53	4.20	0.03
(AT&T/Cingular)			0.00			1/2" Ice	6.94	4.57	0.07
			0.00						
(3) DU04-8670	C	From Face	4.00	0.0000	113.17	No Ice	6.53	4.20	0.03
(AT&T/Cingular)			0.00			1/2" Ice	6.94	4.57	0.07
			0.00						
TMA	A	From Face	4.00	0.0000	113.17	No Ice	0.47	0.47	0.03
(AT&T/Cingular)			0.00			1/2" Ice	0.56	0.56	0.03
			0.00						
TMA	B	From Face	4.00	0.0000	113.17	No Ice	0.47	0.47	0.03
(AT&T/Cingular)			0.00			1/2" Ice	0.56	0.56	0.03
			0.00						
TMA	C	From Face	4.00	0.0000	113.17	No Ice	0.47	0.47	0.03
(AT&T/Cingular)			0.00			1/2" Ice	0.56	0.56	0.03
			0.00						
Valmont T-Arm (1)	A	From Face	2.00	0.0000	113.17	No Ice	10.54	10.54	0.34
(AT&T/Cingular)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00						
Valmont T-Arm (1)	B	From Face	2.00	0.0000	113.17	No Ice	10.54	10.54	0.34
(AT&T/Cingular)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00						
Valmont T-Arm (1)	C	From Face	2.00	0.0000	113.17	No Ice	10.54	10.54	0.34
(AT&T/Cingular)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00						
Pirod 12' T-Frame Sector	A	From Face	2.00	0.0000	103.17	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(T-Mobile - reserved)			0.00						
Pirod 12' T-Frame Sector	B	From Face	2.00	0.0000	103.17	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(T-Mobile - reserved)			0.00						
Pirod 12' T-Frame Sector	C	From Face	2.00	0.0000	103.17	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(T-Mobile - reserved)			0.00						
(3) APX16DWV-16DWV-S-	A	From Face	4.00	0.0000	103.17	No Ice	6.70	2.00	0.04
E-ACU			0.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - reserved)			0.00						
(3) APX16DWV-16DWV-S-	B	From Face	4.00	0.0000	103.17	No Ice	6.70	2.00	0.04
E-ACU			0.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - reserved)			0.00						
(3) APX16DWV-16DWV-S-	C	From Face	4.00	0.0000	103.17	No Ice	6.70	2.00	0.04
E-ACU			0.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - reserved)			0.00						
(2) DTMA-1819-DD-12	A	From Face	3.50	0.0000	103.17	No Ice	0.71	0.41	0.01
(T-Mobile - reserved)			0.00			1/2" Ice	0.83	0.52	0.02
			0.00						
(2) DTMA-1819-DD-12	B	From Face	3.50	0.0000	103.17	No Ice	0.71	0.41	0.01
(T-Mobile - reserved)			0.00			1/2" Ice	0.83	0.52	0.02
			0.00						
(2) DTMA-1819-DD-12	C	From Face	3.50	0.0000	103.17	No Ice	0.71	0.41	0.01
(T-Mobile - reserved)			0.00			1/2" Ice	0.83	0.52	0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
APXV18-206517-C w/mount pipe	A	From Face	1.00 0.00	0.0000	93.00	No Ice 1/2" Ice	5.17 5.62	4.46 5.39	0.05 0.09
(Pocket)			0.00						
APXV18-206517-C w/mount pipe	B	From Face	1.00 0.00	0.0000	93.00	No Ice 1/2" Ice	5.17 5.62	4.46 5.39	0.05 0.09
(Pocket)			0.00						
APXV18-206517-C w/mount pipe	C	From Face	1.00 0.00	0.0000	93.00	No Ice 1/2" Ice	5.17 5.62	4.46 5.39	0.05 0.09
(Pocket)			0.00						

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 146.67-125.67	135.74	1.498	25	50.678	A	0.000	50.678	50.678	100.00	0.000	0.000
					B	0.000	50.678		100.00	0.000	0.000
					C	0.000	50.678		100.00	0.000	0.000
L2 125.67-82.92	103.49	1.386	23	137.406	A	0.000	137.406	137.406	100.00	0.000	0.000
					B	0.000	137.406		100.00	0.000	0.000
					C	0.000	137.406		100.00	0.000	0.000
L3 82.92-43.67	63.00	1.203	20	161.736	A	0.000	161.736	161.736	100.00	0.000	0.000
					B	0.000	161.736		100.00	0.000	0.000
					C	0.000	161.736		100.00	0.000	0.000
L4 43.67-1.67	21.98	1	16	210.331	A	0.000	210.331	210.331	100.00	0.000	0.000
					B	0.000	210.331		100.00	0.000	0.000
					C	0.000	210.331		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 146.67-125.67	135.74	1.498	18	0.5000	52.428	A	0.000	52.428	52.428	100.00	0.000	0.000
						B	0.000	52.428		100.00	0.000	0.000
						C	0.000	52.428		100.00	0.000	0.000
L2 125.67-82.92	103.49	1.386	17	0.5000	140.968	A	0.000	140.968	140.968	100.00	0.000	0.000
						B	0.000	140.968		100.00	0.000	0.000
						C	0.000	140.968		100.00	0.000	0.000
L3 82.92-43.67	63.00	1.203	15	0.5000	165.007	A	0.000	165.007	165.007	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						B	0.000	165.007		100.00	0.000	0.000
						C	0.000	165.007		100.00	0.000	0.000
L4 43.67-1.67	21.98	1	12	0.5000	213.831	A	0.000	213.831	213.831	100.00	0.000	0.000
						B	0.000	213.831		100.00	0.000	0.000
						C	0.000	213.831		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

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 146.67-125.67	135.74	1.498	10	50.678	A	0.000	50.678	50.678	100.00	0.000	0.000
					B	0.000	50.678		100.00	0.000	0.000
					C	0.000	50.678		100.00	0.000	0.000
L2 125.67-82.92	103.49	1.386	9	137.406	A	0.000	137.406	137.406	100.00	0.000	0.000
					B	0.000	137.406		100.00	0.000	0.000
					C	0.000	137.406		100.00	0.000	0.000
L3 82.92-43.67	63.00	1.203	8	161.736	A	0.000	161.736	161.736	100.00	0.000	0.000
					B	0.000	161.736		100.00	0.000	0.000
					C	0.000	161.736		100.00	0.000	0.000
L4 43.67-1.67	21.98	1	6	210.331	A	0.000	210.331	210.331	100.00	0.000	0.000
					B	0.000	210.331		100.00	0.000	0.000
					C	0.000	210.331		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	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	2.52	120.11	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	6.32	147.75	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	6.44	163.96	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	6.99	166.40	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	1517.86 kip-ft	22.26		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	2.52	120.11	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	6.32	147.75	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	6.44	163.96	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	6.99	166.40	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	1517.86 kip-ft	22.26		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	2.52	120.11	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	6.32	147.75	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	6.44	163.96	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	6.99	166.40	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	1517.86 kip-ft	22.26		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	2.52	120.11	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	6.32	147.75	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	6.44	163.96	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	6.99	166.40	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	1517.86 kip-ft	22.26		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	2.01	A	1	1.2	1	1	1	52.428	1.96	93.19	C
			B	1	1.2	1	1	1	52.428			
			C	1	1.2	1	1	1	52.428			
L2 125.67-82.92	1.65	7.64	A	1	1.2	1	1	1	140.968	4.86	113.69	C
			B	1	1.2	1	1	1	140.968			
			C	1	1.2	1	1	1	140.968			
L3 82.92-43.67	1.86	11.46	A	1	1.2	1	1	1	165.007	4.92	125.46	C
			B	1	1.2	1	1	1	165.007			
			C	1	1.2	1	1	1	165.007			
L4 43.67-1.67	1.84	17.08	A	1	1.2	1	1	1	213.831	5.33	126.87	C
			B	1	1.2	1	1	1	213.831			
			C	1	1.2	1	1	1	213.831			
Sum Weight:	5.57	38.19						OTM	1167.41 kip-ft	17.07		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	2.01	A	1	1.2	1	1	1	52.428	1.96	93.19	C
			B	1	1.2	1	1	1	52.428			
			C	1	1.2	1	1	1	52.428			
L2 125.67-82.92	1.65	7.64	A	1	1.2	1	1	1	140.968	4.86	113.69	C
			B	1	1.2	1	1	1	140.968			
			C	1	1.2	1	1	1	140.968			
L3 82.92-43.67	1.86	11.46	A	1	1.2	1	1	1	165.007	4.92	125.46	C
			B	1	1.2	1	1	1	165.007			
			C	1	1.2	1	1	1	165.007			
L4 43.67-1.67	1.84	17.08	A	1	1.2	1	1	1	213.831	5.33	126.87	C
			B	1	1.2	1	1	1	213.831			
			C	1	1.2	1	1	1	213.831			
Sum Weight:	5.57	38.19						OTM	1167.41 kip-ft	17.07		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	2.01	A	1	1.2	1	1	1	52.428	1.96	93.19	C
			B	1	1.2	1	1	1	52.428			
			C	1	1.2	1	1	1	52.428			
L2 125.67-82.92	1.65	7.64	A	1	1.2	1	1	1	140.968	4.86	113.69	C
			B	1	1.2	1	1	1	140.968			
			C	1	1.2	1	1	1	140.968			
L3 82.92-43.67	1.86	11.46	A	1	1.2	1	1	1	165.007	4.92	125.46	C
			B	1	1.2	1	1	1	165.007			
			C	1	1.2	1	1	1	165.007			
L4 43.67-1.67	1.84	17.08	A	1	1.2	1	1	1	213.831	5.33	126.87	C
			B	1	1.2	1	1	1	213.831			
			C	1	1.2	1	1	1	213.831			
Sum Weight:	5.57	38.19						OTM	1167.41 kip-ft	17.07		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	2.01	A	1	1.2	1	1	1	52.428	1.96	93.19	C
			B	1	1.2	1	1	1	52.428			
			C	1	1.2	1	1	1	52.428			
L2 125.67-82.92	1.65	7.64	A	1	1.2	1	1	1	140.968	4.86	113.69	C
			B	1	1.2	1	1	1	140.968			
			C	1	1.2	1	1	1	140.968			
L3 82.92-43.67	1.86	11.46	A	1	1.2	1	1	1	165.007	4.92	125.46	C
			B	1	1.2	1	1	1	165.007			
			C	1	1.2	1	1	1	165.007			
L4 43.67-1.67	1.84	17.08	A	1	1.2	1	1	1	213.831	5.33	126.87	C
			B	1	1.2	1	1	1	213.831			
			C	1	1.2	1	1	1	213.831			
Sum Weight:	5.57	38.19						OTM	1167.41 kip-ft	17.07		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	0.99	46.92	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-	1.65	6.61	A	1	1.2	1	1	1	137.406	2.47	57.72	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
82.92			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	2.51	64.05	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	2.73	65.00	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	592.91 kip-ft	8.70		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	0.99	46.92	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	2.47	57.72	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	2.51	64.05	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	2.73	65.00	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	592.91 kip-ft	8.70		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	0.99	46.92	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	2.47	57.72	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	2.51	64.05	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	2.73	65.00	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	592.91	8.70		

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
									kip-ft			

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 146.67-125.67	0.22	1.63	A	1	1.2	1	1	1	50.678	0.99	46.92	C
			B	1	1.2	1	1	1	50.678			
			C	1	1.2	1	1	1	50.678			
L2 125.67-82.92	1.65	6.61	A	1	1.2	1	1	1	137.406	2.47	57.72	C
			B	1	1.2	1	1	1	137.406			
			C	1	1.2	1	1	1	137.406			
L3 82.92-43.67	1.86	10.25	A	1	1.2	1	1	1	161.736	2.51	64.05	C
			B	1	1.2	1	1	1	161.736			
			C	1	1.2	1	1	1	161.736			
L4 43.67-1.67	1.84	15.51	A	1	1.2	1	1	1	210.331	2.73	65.00	C
			B	1	1.2	1	1	1	210.331			
			C	1	1.2	1	1	1	210.331			
Sum Weight:	5.57	34.00						OTM	592.91 kip-ft	8.70		

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	34.00					
Bracing Weight	0.00					
Total Member Self-Weight	34.00			-15.43	26.72	
Total Weight	54.01			-15.43	26.72	
Wind 0 deg - No Ice		0.00	-55.04	-5524.67	26.72	-56.01
Wind 30 deg - No Ice		27.52	-47.66	-4786.57	-2727.90	-64.68
Wind 45 deg - No Ice		38.92	-38.92	-3911.05	-3868.90	-62.47
Wind 60 deg - No Ice		47.66	-27.52	-2770.05	-4744.42	-56.01
Wind 90 deg - No Ice		55.04	0.00	-15.43	-5482.52	-32.34
Wind 120 deg - No Ice		47.66	27.52	2739.19	-4744.42	0.00
Wind 135 deg - No Ice		38.92	38.92	3880.20	-3868.90	16.74
Wind 150 deg - No Ice		27.52	47.66	4755.72	-2727.90	32.34
Wind 180 deg - No Ice		0.00	55.04	5493.82	26.72	56.01
Wind 210 deg - No Ice		-27.52	47.66	4755.72	2781.34	64.68
Wind 225 deg - No Ice		-38.92	38.92	3880.20	3922.34	62.47
Wind 240 deg - No Ice		-47.66	27.52	2739.19	4797.87	56.01
Wind 270 deg - No Ice		-55.04	0.00	-15.43	5535.96	32.34
Wind 300 deg - No Ice		-47.66	-27.52	-2770.05	4797.87	0.00
Wind 315 deg - No Ice		-38.92	-38.92	-3911.05	3922.34	-16.74
Wind 330 deg - No Ice		-27.52	-47.66	-4786.57	2781.34	-32.34
Member Ice	4.19					
Total Weight Ice	66.43			-26.20	45.38	

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 0 deg - Ice		0.00	-44.34	-4513.50	45.38	-42.01
Wind 30 deg - Ice		22.17	-38.40	-3912.32	-2198.27	-48.51
Wind 45 deg - Ice		31.35	-31.35	-3199.20	-3127.62	-46.85
Wind 60 deg - Ice		38.40	-22.17	-2269.85	-3840.74	-42.01
Wind 90 deg - Ice		44.34	0.00	-26.20	-4441.92	-24.25
Wind 120 deg - Ice		38.40	22.17	2217.45	-3840.74	0.00
Wind 135 deg - Ice		31.35	31.35	3146.80	-3127.62	12.55
Wind 150 deg - Ice		22.17	38.40	3859.92	-2198.27	24.25
Wind 180 deg - Ice		0.00	44.34	4461.10	45.38	42.01
Wind 210 deg - Ice		-22.17	38.40	3859.92	2289.03	48.51
Wind 225 deg - Ice		-31.35	31.35	3146.80	3218.38	46.85
Wind 240 deg - Ice		-38.40	22.17	2217.45	3931.50	42.01
Wind 270 deg - Ice		-44.34	0.00	-26.20	4532.68	24.25
Wind 300 deg - Ice		-38.40	-22.17	-2269.85	3931.50	0.00
Wind 315 deg - Ice		-31.35	-31.35	-3199.20	3218.38	-12.55
Wind 330 deg - Ice		-22.17	-38.40	-3912.32	2289.03	-24.25
Total Weight	54.01			-15.43	26.72	
Wind 0 deg - Service		0.00	-21.50	-2167.48	26.72	-21.88
Wind 30 deg - Service		10.75	-18.62	-1879.16	-1049.30	-25.26
Wind 45 deg - Service		15.20	-15.20	-1537.16	-1495.01	-24.40
Wind 60 deg - Service		18.62	-10.75	-1091.45	-1837.01	-21.88
Wind 90 deg - Service		21.50	0.00	-15.43	-2125.33	-12.63
Wind 120 deg - Service		18.62	10.75	1060.60	-1837.01	0.00
Wind 135 deg - Service		15.20	15.20	1506.30	-1495.01	6.54
Wind 150 deg - Service		10.75	18.62	1848.30	-1049.30	12.63
Wind 180 deg - Service		0.00	21.50	2136.62	26.72	21.88
Wind 210 deg - Service		-10.75	18.62	1848.30	1102.75	25.26
Wind 225 deg - Service		-15.20	15.20	1506.30	1548.45	24.40
Wind 240 deg - Service		-18.62	10.75	1060.60	1890.45	21.88
Wind 270 deg - Service		-21.50	0.00	-15.43	2178.77	12.63
Wind 300 deg - Service		-18.62	-10.75	-1091.45	1890.45	0.00
Wind 315 deg - Service		-15.20	-15.20	-1537.16	1548.45	-6.54
Wind 330 deg - Service		-10.75	-18.62	-1879.16	1102.75	-12.63

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp

Comb. No.	Description
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	146.67 - 125.67	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-11.18	16.60	9.58
			Max. Mx	14	-6.40	250.32	4.87
			Max. My	2	-6.40	8.44	246.33
			Max. Vy	14	-18.23	250.32	4.87
			Max. Vx	2	-18.22	8.44	246.33
			Max. Torque	11			-29.15
L2	125.67 - 82.92	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-31.49	40.90	23.61
			Max. Mx	14	-20.71	1416.19	13.26
			Max. My	2	-20.71	22.96	1406.12
			Max. Vy	14	-40.87	1416.19	13.26
			Max. Vx	2	-40.87	22.96	1406.12
			Max. Torque	11			-60.43
L3	82.92 - 43.67	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-45.17	47.07	27.18
			Max. Mx	14	-33.39	3114.76	15.69
			Max. My	2	-33.39	27.17	3103.21
			Max. Vy	14	-47.70	3114.76	15.69
			Max. Vx	2	-47.69	27.17	3103.21

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	11			-64.35
L4	43.67 - 1.67	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-66.43	47.36	27.34
			Max. Mx	14	-53.98	5632.37	15.82
			Max. My	2	-53.98	27.40	5620.76
			Max. Vy	14	-55.07	5632.37	15.82
			Max. Vx	2	-55.07	27.40	5620.76
			Max. Torque	11			-64.27

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	66.43	44.34	-0.00
	Max. H_x	14	54.01	55.04	0.00
	Max. H_z	2	54.01	0.00	55.04
	Max. M_x	2	5620.76	0.00	55.04
	Max. M_z	6	5577.46	-55.04	0.00
	Max. Torsion	3	64.23	-27.52	47.66
	Min. Vert	1	54.01	0.00	0.00
	Min. H_x	6	54.01	-55.04	0.00
	Min. H_z	10	54.01	0.00	-55.04
	Min. M_x	10	-5589.06	0.00	-55.04
	Min. M_z	14	-5632.37	55.04	0.00
	Min. Torsion	11	-64.23	27.52	-47.66

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	54.01	-0.00	-0.00	-15.89	27.52	0.00
Dead+Wind 0 deg - No Ice	54.01	-0.00	-55.04	-5620.76	27.39	-55.62
Dead+Wind 30 deg - No Ice	54.01	27.52	-47.66	-4869.81	-2775.07	-64.23
Dead+Wind 45 deg - No Ice	54.01	38.92	-38.92	-3979.07	-3935.87	-62.05
Dead+Wind 60 deg - No Ice	54.01	47.66	-27.52	-2818.25	-4826.58	-55.63
Dead+Wind 90 deg - No Ice	54.01	55.04	0.00	-15.81	-5577.46	-32.12
Dead+Wind 120 deg - No Ice	54.01	47.66	27.52	2786.60	-4826.54	0.00
Dead+Wind 135 deg - No Ice	54.01	38.92	38.92	3947.41	-3935.83	16.63
Dead+Wind 150 deg - No Ice	54.01	27.52	47.66	4838.13	-2775.03	32.12
Dead+Wind 180 deg - No Ice	54.01	-0.00	55.04	5589.06	27.39	55.63
Dead+Wind 210 deg - No Ice	54.01	-27.52	47.66	4838.19	2829.85	64.23
Dead+Wind 225 deg - No Ice	54.01	-38.92	38.92	3947.47	3990.67	62.04
Dead+Wind 240 deg - No Ice	54.01	-47.66	27.52	2786.66	4881.42	55.62
Dead+Wind 270 deg - No Ice	54.01	-55.04	0.00	-15.81	5632.37	32.11
Dead+Wind 300 deg - No Ice	54.01	-47.66	-27.52	-2818.31	4881.45	0.00
Dead+Wind 315 deg - No Ice	54.01	-38.92	-38.92	-3979.14	3990.71	-16.62
Dead+Wind 330 deg - No Ice	54.01	-27.52	-47.66	-4869.87	2829.88	-32.11
Dead+Ice+Temp	66.43	-0.00	-0.00	-27.34	47.36	0.00
Dead+Wind 0 deg+Ice+Temp	66.43	0.00	-44.34	-4623.86	47.22	-41.74
Dead+Wind 30 deg+Ice+Temp	66.43	22.17	-38.40	-4008.01	-2251.06	-48.20
Dead+Wind 45 deg+Ice+Temp	66.43	31.35	-31.35	-3277.53	-3203.03	-46.56

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 60 deg+Ice+Temp	66.43	38.40	-22.17	-2325.54	-3933.50	-41.75
Dead+Wind 90 deg+Ice+Temp	66.43	44.34	0.00	-27.27	-4549.30	-24.11
Dead+Wind 120 deg+Ice+Temp	66.43	38.40	22.17	2270.99	-3933.47	0.00
Dead+Wind 135 deg+Ice+Temp	66.43	31.35	31.35	3222.97	-3203.00	12.48
Dead+Wind 150 deg+Ice+Temp	66.43	22.17	38.40	3953.44	-2251.03	24.11
Dead+Wind 180 deg+Ice+Temp	66.43	0.00	44.34	4569.28	47.23	41.75
Dead+Wind 210 deg+Ice+Temp	66.43	-22.17	38.40	3953.48	2345.51	48.20
Dead+Wind 225 deg+Ice+Temp	66.43	-31.35	31.35	3223.01	3297.50	46.56
Dead+Wind 240 deg+Ice+Temp	66.43	-38.40	22.17	2271.03	4027.99	41.74
Dead+Wind 270 deg+Ice+Temp	66.43	-44.34	0.00	-27.26	4643.83	24.10
Dead+Wind 300 deg+Ice+Temp	66.43	-38.40	-22.17	-2325.57	4028.00	0.00
Dead+Wind 315 deg+Ice+Temp	66.43	-31.35	-31.35	-3277.56	3297.52	-12.47
Dead+Wind 330 deg+Ice+Temp	66.43	-22.17	-38.40	-4008.04	2345.52	-24.10
Dead+Wind 0 deg - Service	54.01	0.00	-21.50	-2206.46	27.54	-21.81
Dead+Wind 30 deg - Service	54.01	10.75	-18.62	-1912.98	-1067.73	-25.19
Dead+Wind 45 deg - Service	54.01	15.20	-15.20	-1564.86	-1521.41	-24.33
Dead+Wind 60 deg - Service	54.01	18.62	-10.75	-1111.18	-1869.53	-21.82
Dead+Wind 90 deg - Service	54.01	21.50	-0.00	-15.90	-2163.00	-12.60
Dead+Wind 120 deg - Service	54.01	18.62	10.75	1079.37	-1869.52	0.00
Dead+Wind 135 deg - Service	54.01	15.20	15.20	1533.04	-1521.40	6.52
Dead+Wind 150 deg - Service	54.01	10.75	18.62	1881.16	-1067.73	12.60
Dead+Wind 180 deg - Service	54.01	0.00	21.50	2174.65	27.54	21.82
Dead+Wind 210 deg - Service	54.01	-10.75	18.62	1881.17	1122.82	25.19
Dead+Wind 225 deg - Service	54.01	-15.20	15.20	1533.06	1576.50	24.33
Dead+Wind 240 deg - Service	54.01	-18.62	10.75	1079.38	1924.62	21.81
Dead+Wind 270 deg - Service	54.01	-21.50	-0.00	-15.90	2218.11	12.59
Dead+Wind 300 deg - Service	54.01	-18.62	-10.75	-1111.18	1924.63	0.00
Dead+Wind 315 deg - Service	54.01	-15.20	-15.20	-1564.87	1576.51	-6.52
Dead+Wind 330 deg - Service	54.01	-10.75	-18.62	-1912.99	1122.83	-12.59

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	-54.01	0.00	0.00	54.01	0.00	0.000%
2	0.00	-54.01	-55.04	0.00	54.01	55.04	0.000%
3	27.52	-54.01	-47.66	-27.52	54.01	47.66	0.000%
4	38.92	-54.01	-38.92	-38.92	54.01	38.92	0.000%
5	47.66	-54.01	-27.52	-47.66	54.01	27.52	0.000%
6	55.04	-54.01	0.00	-55.04	54.01	0.00	0.000%
7	47.66	-54.01	27.52	-47.66	54.01	-27.52	0.000%
8	38.92	-54.01	38.92	-38.92	54.01	-38.92	0.000%
9	27.52	-54.01	47.66	-27.52	54.01	-47.66	0.000%
10	0.00	-54.01	55.04	0.00	54.01	-55.04	0.000%
11	-27.52	-54.01	47.66	27.52	54.01	-47.66	0.000%
12	-38.92	-54.01	38.92	38.92	54.01	-38.92	0.000%
13	-47.66	-54.01	27.52	47.66	54.01	-27.52	0.000%
14	-55.04	-54.01	0.00	55.04	54.01	0.00	0.000%
15	-47.66	-54.01	-27.52	47.66	54.01	27.52	0.000%
16	-38.92	-54.01	-38.92	38.92	54.01	38.92	0.000%
17	-27.52	-54.01	-47.66	27.52	54.01	47.66	0.000%
18	0.00	-66.43	0.00	0.00	66.43	0.00	0.000%
19	0.00	-66.43	-44.34	-0.00	66.43	44.34	0.000%
20	22.17	-66.43	-38.40	-22.17	66.43	38.40	0.000%
21	31.35	-66.43	-31.35	-31.35	66.43	31.35	0.000%
22	38.40	-66.43	-22.17	-38.40	66.43	22.17	0.000%
23	44.34	-66.43	0.00	-44.34	66.43	-0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
24	38.40	-66.43	22.17	-38.40	66.43	-22.17	0.000%
25	31.35	-66.43	31.35	-31.35	66.43	-31.35	0.000%
26	22.17	-66.43	38.40	-22.17	66.43	-38.40	0.000%
27	0.00	-66.43	44.34	-0.00	66.43	-44.34	0.000%
28	-22.17	-66.43	38.40	22.17	66.43	-38.40	0.000%
29	-31.35	-66.43	31.35	31.35	66.43	-31.35	0.000%
30	-38.40	-66.43	22.17	38.40	66.43	-22.17	0.000%
31	-44.34	-66.43	0.00	44.34	66.43	-0.00	0.000%
32	-38.40	-66.43	-22.17	38.40	66.43	22.17	0.000%
33	-31.35	-66.43	-31.35	31.35	66.43	31.35	0.000%
34	-22.17	-66.43	-38.40	22.17	66.43	38.40	0.000%
35	0.00	-54.01	-21.50	0.00	54.01	21.50	0.000%
36	10.75	-54.01	-18.62	-10.75	54.01	18.62	0.000%
37	15.20	-54.01	-15.20	-15.20	54.01	15.20	0.000%
38	18.62	-54.01	-10.75	-18.62	54.01	10.75	0.000%
39	21.50	-54.01	0.00	-21.50	54.01	0.00	0.000%
40	18.62	-54.01	10.75	-18.62	54.01	-10.75	0.000%
41	15.20	-54.01	15.20	-15.20	54.01	-15.20	0.000%
42	10.75	-54.01	18.62	-10.75	54.01	-18.62	0.000%
43	0.00	-54.01	21.50	0.00	54.01	-21.50	0.000%
44	-10.75	-54.01	18.62	10.75	54.01	-18.62	0.000%
45	-15.20	-54.01	15.20	15.20	54.01	-15.20	0.000%
46	-18.62	-54.01	10.75	18.62	54.01	-10.75	0.000%
47	-21.50	-54.01	0.00	21.50	54.01	0.00	0.000%
48	-18.62	-54.01	-10.75	18.62	54.01	10.75	0.000%
49	-15.20	-54.01	-15.20	15.20	54.01	15.20	0.000%
50	-10.75	-54.01	-18.62	10.75	54.01	18.62	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00010717
3	Yes	5	0.00000001	0.00011475
4	Yes	5	0.00000001	0.00014783
5	Yes	5	0.00000001	0.00015546
6	Yes	5	0.00000001	0.00006174
7	Yes	5	0.00000001	0.00006137
8	Yes	5	0.00000001	0.00007650
9	Yes	5	0.00000001	0.00006328
10	Yes	5	0.00000001	0.00010690
11	Yes	5	0.00000001	0.00017284
12	Yes	5	0.00000001	0.00014860
13	Yes	5	0.00000001	0.00009954
14	Yes	5	0.00000001	0.00006202
15	Yes	5	0.00000001	0.00006503
16	Yes	5	0.00000001	0.00007996
17	Yes	5	0.00000001	0.00011437
18	Yes	4	0.00000001	0.00005671
19	Yes	5	0.00000001	0.00020326
20	Yes	5	0.00000001	0.00021961
21	Yes	5	0.00000001	0.00027277
22	Yes	5	0.00000001	0.00028094
23	Yes	5	0.00000001	0.00012179
24	Yes	5	0.00000001	0.00013922

25	Yes	5	0.00000001	0.00016726
26	Yes	5	0.00000001	0.00014370
27	Yes	5	0.00000001	0.00019998
28	Yes	5	0.00000001	0.00031303
29	Yes	5	0.00000001	0.00027738
30	Yes	5	0.00000001	0.00019900
31	Yes	5	0.00000001	0.00012529
32	Yes	5	0.00000001	0.00015584
33	Yes	5	0.00000001	0.00018503
34	Yes	5	0.00000001	0.00022517
35	Yes	5	0.00000001	0.00002922
36	Yes	5	0.00000001	0.00003007
37	Yes	5	0.00000001	0.00003269
38	Yes	5	0.00000001	0.00003231
39	Yes	4	0.00000001	0.00072997
40	Yes	4	0.00000001	0.00030680
41	Yes	4	0.00000001	0.00051289
42	Yes	4	0.00000001	0.00063169
43	Yes	5	0.00000001	0.00002846
44	Yes	5	0.00000001	0.00003728
45	Yes	5	0.00000001	0.00003323
46	Yes	5	0.00000001	0.00002602
47	Yes	4	0.00000001	0.00076624
48	Yes	4	0.00000001	0.00037457
49	Yes	4	0.00000001	0.00058117
50	Yes	4	0.00000001	0.00099274

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	146.67 - 125.67	25.529	48	1.5123	0.0837
L2	125.67 - 82.92	19.025	48	1.4154	0.0582
L3	88.67 - 43.67	9.355	48	1.0300	0.0280
L4	50.67 - 1.67	2.932	48	0.5476	0.0105

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
153.96	Barkhamsted Branch 1	48	25.529	1.5123	0.0837	29364
142.67	(2) DB980F90E-M	48	24.267	1.4972	0.0786	29364
138.86	Barkhamsted Branch 2	48	23.070	1.4822	0.0738	18799
135.00	(5) 72" x 12" x 6" Panel	48	21.866	1.4656	0.0690	12581
133.00	Valmont T-Arm (1)	48	21.248	1.4562	0.0666	10740
128.17	Generic T-Arm Mount	48	19.775	1.4306	0.0610	7970
124.67	(4) DB844H90E-XY	48	18.729	1.4089	0.0572	7018
122.09	Barkhamsted Branch 3	48	17.971	1.3909	0.0545	6718
113.17	(3) DU04-8670	48	15.445	1.3167	0.0460	6109
110.55	Barkhamsted Branch 4	48	14.732	1.2916	0.0438	5951
103.17	Pirod 12' T-Frame Sector Mount (1)	48	12.800	1.2131	0.0379	5549
93.00	APXV18-206517-C w/mount pipe	48	10.332	1.0883	0.0308	5075
92.30	Barkhamsted Branch 5	48	10.171	1.0791	0.0304	5046

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
83.50	Barkhamsted Branch 6	48	8.248	0.9571	0.0249	4694

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	146.67 - 125.67	64.043	15	3.7611	0.2137
L2	125.67 - 82.92	47.850	15	3.5396	0.1486
L3	88.67 - 43.67	23.616	15	2.5922	0.0715
L4	50.67 - 1.67	7.422	15	1.3850	0.0268

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
153.96	Barkhamsted Branch 1	15	64.043	3.7611	0.2137	12478
142.67	(2) DB980F90E-M	15	60.904	3.7285	0.2007	12478
138.86	Barkhamsted Branch 2	15	57.925	3.6955	0.1884	7988
135.00	(5) 72" x 12" x 6" Panel	15	54.930	3.6581	0.1762	5345
133.00	Valmont T-Arm (1)	15	53.390	3.6365	0.1700	4563
128.17	Generic T-Arm Mount	15	49.719	3.5763	0.1557	3384
124.67	(4) DB844H90E-XY	15	47.110	3.5237	0.1459	2972
122.09	Barkhamsted Branch 3	15	45.218	3.4795	0.1390	2834
113.17	(3) DU04-8670	15	38.903	3.2943	0.1173	2540
110.55	Barkhamsted Branch 4	15	37.118	3.2312	0.1116	2465
103.17	Pirod 12' T-Frame Sector Mount (1)	15	32.274	3.0357	0.0966	2276
93.00	APXV18-206517-C w/mount pipe	15	26.075	2.7311	0.0785	2059
92.30	Barkhamsted Branch 5	15	25.670	2.7090	0.0773	2045
83.50	Barkhamsted Branch 6	15	20.830	2.4213	0.0636	1891

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	146.67 - 125.67 (1)	TP32.508x25.41x0.25	21.00	0.00	0.0	39.000	25.5967	-6.40	998.27	0.006
L2	125.67 - 82.92 (2)	TP44.632x32.508x0.375	42.75	0.00	0.0	39.000	50.7359	-20.70	1978.70	0.010
L3	82.92 - 43.67 (3)	TP55.014x42.2513x0.4375	45.00	0.00	0.0	39.000	73.0294	-33.39	2848.15	0.012
L4	43.67 - 1.67 (4)	TP66.05x52.1537x0.5	49.00	0.00	0.0	39.000	104.0280	-53.98	4057.09	0.013

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	146.67 - 125.67 (1)	TP32.508x25.41x0.25	251.78	14.827	39.000	0.380	0.00	0.000	39.000	0.000
L2	125.67 - 82.92 (2)	TP44.632x32.508x0.375	1419.88	31.957	39.000	0.819	0.00	0.000	39.000	0.000
L3	82.92 - 43.67 (3)	TP55.014x42.2513x0.4375	3118.98	39.510	39.000	1.013	0.00	0.000	39.000	0.000
L4	43.67 - 1.67 (4)	TP66.05x52.1537x0.5	5636.61	40.189	39.000	1.030	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	146.67 - 125.67 (1)	TP32.508x25.41x0.25	18.23	0.712	26.000	0.055	0.00	0.000	26.000	0.000
L2	125.67 - 82.92 (2)	TP44.632x32.508x0.375	40.87	0.806	26.000	0.062	0.00	0.000	26.000	0.000
L3	82.92 - 43.67 (3)	TP55.014x42.2513x0.4375	47.70	0.653	26.000	0.050	0.00	0.000	26.000	0.000
L4	43.67 - 1.67 (4)	TP66.05x52.1537x0.5	55.07	0.529	26.000	0.041	0.00	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	146.67 - 125.67 (1)	0.006	0.380	0.000	0.055	0.000	0.387 ✔	1.333	H1-3+VT ✔
L2	125.67 - 82.92 (2)	0.010	0.819	0.000	0.062	0.000	0.831 ✔	1.333	H1-3+VT ✔
L3	82.92 - 43.67 (3)	0.012	1.013	0.000	0.050	0.000	1.025 ✔	1.333	H1-3+VT ✔
L4	43.67 - 1.67 (4)	0.013	1.030	0.000	0.041	0.000	1.044 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	146.67 - 125.67	Pole	TP32.508x25.41x0.25	1	-6.40	1330.70	29.1	Pass
L2	125.67 - 82.92	Pole	TP44.632x32.508x0.375	2	-20.70	2637.61	62.3	Pass
L3	82.92 - 43.67	Pole	TP55.014x42.2513x0.4375	3	-33.39	3796.58	76.9	Pass
L4	43.67 - 1.67	Pole	TP66.05x52.1537x0.5	4	-53.98	5408.10	78.3	Pass
							Summary	
						Pole (L4)	78.3	Pass
						RATING =	**78.3**	**Pass**

ANCHOR BOLT AND BASEPLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 5637 \cdot kips \cdot ft$	*user input*
Shear Force:	$Shear := 55 \cdot kips$	*user input*
Axial Force:	$Axial := 54 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts = N	$N := 24$	*user input*
Bolt Ultimate Strength:	$F_u := 100 \cdot ksi$	*user input*
Bolt Allowable Strength:	$Fy := 75 \cdot ksi$	*user input*
Diameter Of Anchor Bolts	$D := 2.25in$	*user input*
Threaded length per inch	$n := 4.5$	*user input*
Bolt "Column" Distance:	$l := 3in$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*

Base Plate Data:

Use ASTM A572 Grade 55

Plate Yield Strength:	$Fy_{bp} := 55 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThicknessProvide := 3.25 \cdot in$	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

Distances for loading condition (see detail):

$d_1 := 36.8784 \cdot in$ *user input*

$d_2 := 35.7038 \cdot in$ *user input*

$d_3 := 34.0009 \cdot in$ *user input*

$d_4 := 14.5925 \cdot in$ *user input*

$d_5 := 8.9115 \cdot in$ *user input*

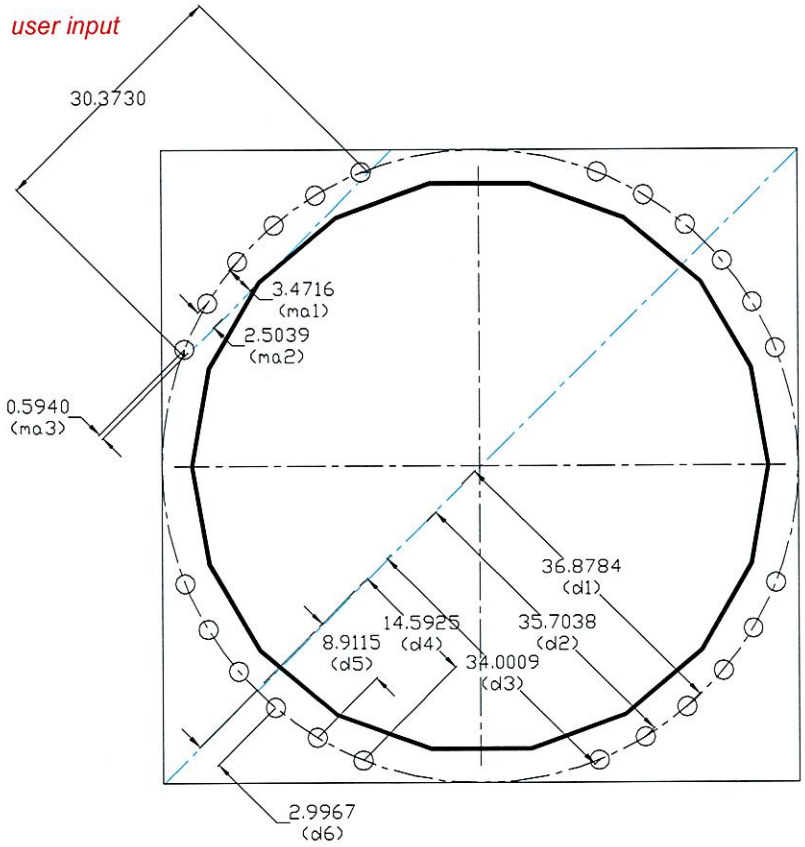
$d_6 := 2.9967 \cdot in$ *user input*

$MomentArm_1 := 3.4716 \cdot in$ *user input*

$MomentArm_2 := 2.5039 \cdot in$ *user input*

$MomentArm_3 := 0.5940 \cdot in$ *user input*

$EffectiveWidth := 30.3730 \cdot in$ *user input*



DETAIL - ANCHOR BOLT AND PLATE

Anchor Bolt Section Properties:

Polar Moment of Inertia (J) divided by Area (A) = Σd

$$\Sigma d := (d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 4 + (d_5)^2 \cdot 4 + (d_6)^2 \cdot 4 \qquad \Sigma d = 1.64 \times 10^4 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 3.98 \cdot in^2$$

Net Area of Bolt:

$$A_{net} := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n} \right)^2 \qquad A_{net} = 3.25 \cdot in^2$$

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_{net}}}{\sqrt{\pi}} \qquad D_n = 2.03 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.51 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^3}{32} \qquad S_x = 0.83 \cdot in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N} \right) \cdot l \qquad M_x = 0.57 \cdot kips \cdot ft$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 8.33 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 59.98 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Anchor Bolt Tensile Stress Check:

Maximum Tensile Force (Gross Area):

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 174.9 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$F_{net.area} := 1.333 \cdot (0.60 \cdot A_{net} \cdot Fy)$ $F_{net.area} = 194.81 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Maximum Applied Tension:

$$MaxTension := \frac{OM \cdot d_1}{\Sigma d} - \frac{Axial}{N}$$ $MaxTension = 150.15 \cdot kips$

Check Stresses:

Note: Bolts supplied are "upset bolts." Use net area for checking per AISC.

$AnchorBoltStress := if(F_{net.area} > MaxTension, "Not Overstressed", "Overstressed")$

$AnchorBoltStress = "Not Overstressed"$

$$PercentStressed := 100 \cdot \frac{MaxTension}{F_{net.area}}$$

$PercentStressed = 77.1$

Note: Shear Stress is negligible

Check Compression & Combined Stresses (if required):

Check to see if a complete combined stress analysis is required:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

Set the clear space between the plate and bolt to zero if a combined stress analysis is not required and set the bending stress to zero:

$$l := \begin{cases} 1 & \text{if } 1 > 2 \cdot D_n \\ 0.0\text{in} & \text{otherwise} \end{cases} \qquad l = 0 \qquad f_{bx} := \begin{cases} f_{bx} & \text{if } 1 > 2 \cdot D_n \\ 0.0\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 0 \cdot \text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 87.36$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 45 \cdot \text{ksi}$$

$$F_a := 1.333 \cdot F_a \quad \text{Note: 1.333 increase allowed per TIA/EIA} \qquad F_a = 59.98 \cdot \text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot d_1}{\Sigma d} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 154.65 \cdot \text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_{net}} \qquad f_a = 47.62 \cdot \text{ksi}$$

Check Combined Stresses:

$$\text{StressRatio} := \frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \qquad \text{StressRatio} = 0.79$$

$$\text{Condition} := \text{if}(\text{StressRatio} \le 1.0, \text{"Not Overstressed"}, \text{"Overstressed"})$$

Condition = "Not Overstressed"

Base Plate Analysis:

Force From Bolt(s):

$$C_1 := \frac{OM \cdot d_1}{\Sigma d} + \frac{Axial}{N} \qquad C_1 = 154.65 \cdot kips$$

$$C_2 := \frac{OM \cdot d_2}{\Sigma d} + \frac{Axial}{N} \qquad C_2 = 149.8 \cdot kips$$

$$C_3 := \frac{OM \cdot d_3}{\Sigma d} + \frac{Axial}{N} \qquad C_3 = 142.76 \cdot kips$$

Bending Stress In Plate:

$$f_{bp} := \frac{6 \cdot \left(2C_1 \cdot MomentArm_1 + 2C_2 \cdot MomentArm_2 + 2C_3 \cdot MomentArm_3\right)}{EffectiveWidth \cdot PlateThicknessProvide^2} \qquad f_{bp} = 37.28 \cdot ksi$$

Check Stresses:

$$BasePlateRatio := \frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}}$$ BasePlateRatio = 0.68

BasePlateStress := if(BasePlateRatio < 1, "Not Over Stress" , "Is Over Stress")

BasePlateStress = "Not Over Stress"

FLANGE BOLT AND PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 250.3 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 18.3 \cdot kips$	*user input*
Axial Force:	$Axial := 11.2 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A325		*user input*
Number of Bolts = N	$N := 12$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 37.0in$	*user input*
Bolt "Column" Distance:	$l := 0.125in$	*user input*
Bolt Ultimate Strength:	$F_u := 120 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 92 \cdot ksi$	*user input*
Bolt Diameter	$D := 1.00in$	*user input*
Threads per Inch:	$n := 8$	*user input*

Base Plate Data:

Use ASTM A572 Grade 50		*user input*
Plate Yield Strength:	$Fy_{bp} := 50 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 1.25 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 41.00 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 32.51in$	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

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

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

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

$d_1 = 9.25 \cdot in$ $d_7 = -9.25 \cdot in$

$d_2 = 16.02 \cdot in$ $d_8 = -16.02 \cdot in$

$d_3 = 18.50 \cdot in$ $d_9 = -18.50 \cdot in$

$d_4 = 16.02 \cdot in$ $d_{10} = -16.02 \cdot in$

$d_5 = 9.25 \cdot in$ $d_{11} = -9.25 \cdot in$

$d_6 = 0.00 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 16.25 \cdot in$

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

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

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

$MA_3 = 2.25 \cdot in$ $MA_9 = 0.00 \cdot in$

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

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

$MA_6 = 0.00 \cdot in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := 0.8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 19.99 \cdot in$

Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 2.053 \times 10^3 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 0.785 \cdot in^2$$

Net Area of Bolt:

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

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 0.88 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.22 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^{\,3}}{32} \qquad S_x = 0.066 \cdot in^3$$

Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.016 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 2.9 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 73.6 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Maximum Allowable Tensile Force (Gross Area):

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 41.5 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $MaxTension = 26.1 \cdot kips$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.63$$

$$Condition := if\left(\frac{MaxTension}{AllowableTension} \le 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

Note: Shear Stress is negligible

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 14.5 \cdot kips$ $C_7 = -12.6 \cdot kips$

$C_2 = 24.4 \cdot kips$ $C_8 = -22.5 \cdot kips$

$C_3 = 28.0 \cdot kips$ $C_9 = -26.1 \cdot kips$

$C_4 = 24.4 \cdot kips$ $C_{10} = -22.5 \cdot kips$

$C_5 = 14.5 \cdot kips$ $C_{11} = -12.6 \cdot kips$

$C_6 = 0.9 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 12.1 \cdot ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.24$$

$$Condition := if\left(\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

NATCOMM

Job	145' Summit Monopole - Barkhamsted, CT	Project No.	08136.CO10	Page	of
Description	Foundation Analysis	Computed by	Staff	Sheet 1	of 9
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				Date	

MONOPOLE FOUNDATION ANALYSIS

TOWER FORCES:

Moment Caused by Tower	$M_t := 5637 \cdot ft \cdot kips$
Shear at Base of Tower	$S_t := 55kip$
Max Compressive Force	$C_t := 54 \cdot kip$
Height of Tower	$H_t := 145 \cdot ft$
Base Plate Bolt Circle	$MP := 74.0in$

FOOTING DIMENSIONS:

Overall Depth of Footing	$D_f := 9.0ft$
Length of Pier	$L_p := 5.5 \cdot ft$
Extension of Pier Above Grade	$L_{pag} := 0.5 \cdot ft$
Diameter of Pier	$d_p := 8.0 \cdot ft$
Thickness of Footing	$T_f := 4.0 \cdot ft$
Width of Footing:	$W_f := 31.5ft$
Length of Anchor Bolts:	$L_{st} := 96.0in$
Projection of anchor bolts above pier	$A_{BP} := 12.0 \cdot in$
Anchor Bolt Diameter	$d_{anchor} := 2.25in$
Anchor bolt area	$A_{anchor} := 3.98 \cdot in^2$

PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000psi$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$
Yield Strength of Anchor Bolt	$fya := 75000 \cdot psi$
Internal Friction Angle of Soil	$\phi_s := 30 \cdot deg$
Allowable Bearing Capacity	$q_s := 4000 \cdot psf$
Unit Weight of Soil	$\gamma_{soil} := 120pcf$
Unit Weight of Concrete	$\gamma_{conc} := 150 \cdot pcf$
Is foundation subject to bouyancy (Yes=1/N=0):	$Bouyancy := 1$
Depth to Neglect	$n := 0.0ft$
Cohesion of Clay Type Soil Note: Use 0 for Sandy Soil	$c := 0 \cdot ksf$
Seismic Zone Factor:	$Z := 2$
IBC Fig 23-2	
Coefficient of Friction between Concrete:	$\mu := 0.45$
Clear Cover of Reinforcement Pier:	$Cvr_{pier} := 3 \cdot in$
Clear Cover of Reinforcement Pad:	$Cvr_{pad} := 3 \cdot in$

PIER REINFORCEMENT:

Bar Size	$BSpier := 11$	Bar Diameter	$d_{bpier} := 1.410 \cdot in$
Number of Bars	$NBpier := 60$	Bar Area	$A_{bpier} := 1.560 \cdot in^2$

PAD REINFORCEMENT:

TOP:	Bar Size	$BS_{top} := 11$	Bar Diameter	$d_{btop} := 1.410 \cdot in$
	Number of Bars	$NB_{top} := 48$	Bar Area	$A_{btop} := 1.560 \cdot in^2$
BOTTOM:	Bar Size	$BS_{bot} := 11$	Bar Diameter	$d_{bbot} := 1.410 \cdot in$
	Number of Bars	$NB_{bot} := 48$	Bar Area	$A_{bot} := 1.560 \cdot in^2$

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

Load Factor (EIA 3.1.1): $LF := if\left[H_t \le 700 \cdot ft, 1.333, if\left[H_t \ge 1200, 1.7, 1.333 + \left(\frac{H_t - 700}{1200 - 700}\right) \cdot 0.4\right]\right]$ $LF = 1.333$

STABILITY OF FOOTING

Adjusted Unit Weights:

$\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc})$ $\quad \gamma_c = 87.6 \cdot \text{pcf}$

$\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil})$ $\quad \gamma_s = 57.6 \cdot \text{pcf}$

Passive Pressure:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pn} = 0 \cdot \text{ksf}$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pt} = 0.864 \cdot \text{ksf}$

$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}]$ $\quad P_{top} = 0.864 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{bot} = 1.5552 \cdot \text{ksf}$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\quad P_{ave} = 1.2096 \cdot \text{ksf}$

$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)]$ $\quad T_p = 4 \cdot \text{ft}$

$A_p := W_f \cdot T_p$ $\quad A_p = 126 \cdot \text{ft}^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_p$ $\quad S_u = 152.4096 \cdot \text{kip}$

Weight of Concrete Pad:

$WT_c := \left[\left(W_f^2 \cdot T_f \right) + \frac{d_p^2 \cdot \pi}{4} L_p \right] \cdot \gamma_c$ $\quad WT_c = 371.9023 \cdot \text{kip}$

Weight of Soil: above Footing:

$WT_{s1} := \left[W_f^2 \cdot \left(\left| L_p - L_{pag} - n \right| \right) - \frac{d_p^2 \cdot \pi}{4} \cdot \left(\left| L_p - L_{pag} - n \right| \right) \right] \cdot \gamma_s$ $\quad WT_{s1} = 271.2915 \cdot \text{kip}$

Weight of Soil Wedge at back face:

$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\phi_s)}{2} \cdot W_f \right) \cdot \gamma_s$ $\quad WT_{s2} = 42.4255 \cdot \text{kip}$

Total Weight:

$WT_{tot} := WT_c + WT_{s1} + C_t$ $\quad WT_{tot} = 697.1939 \cdot \text{kip}$

Resisting Moment:

$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + WT_{s2} \cdot \left(W_f + \frac{D_f \cdot \tan(\phi_s)}{3} \right)$ $\quad M_r = 12593.9038 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f)$ $\quad M_{ot} = 6159.5 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety:

$FS := \frac{M_r}{M_{ot}}$ $\quad FS_{req} := 2$ $\quad FS = 2.04$

$\text{SafetyCheck} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$ $\quad \text{SafetyCheck} = \text{"Okay"}$

SHEAR CAPACITY IN PIER

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} \qquad S_p = 233.0734 \cdot kips$$

$$ShearCheck := if\left(S_p > S_t, "Okay", "No Good"\right) \qquad ShearCheck = "Okay"$$

BEARING PRESSURE CAUSED BY FOOTING

$$A_{mat} := W_f^{\,2} \qquad A_{mat} = 992.25 \cdot ft^2$$

$$S := \frac{W_f^{\,3}}{6} \qquad S = 5209.3125 \cdot ft^3$$

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} \qquad P_{max} = 1.885 \cdot ksf$$

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} \qquad P_{min} = -0.4798 \cdot ksf$$

$$MaxPressure := if\left(P_{max} < q_s, "Okay", "No Good"\right) \qquad MaxPressure = "Okay"$$

$$MinPressure := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), "Okay", "No Good"\right] \qquad MinPressure = "No Good"$$

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} \qquad X_p = 8.3698 \cdot ft$$

Distance to Kern: $X_k := \frac{W_f}{6}$ $\qquad X_k = 5.25 \cdot ft$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity: $e := \frac{M_{ot}}{WT_{tot}}$ $\qquad e = 8.8347$

Adjusted Soil Pressure: $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$ $\qquad P_a = 2.1337 \cdot ksf$

$$q_{adj} := if\left(P_{min} < 0, P_a, \frac{P_{max}}{ft^2}\right) \qquad q_{adj} = 2.1337 \cdot ksf$$

$$PressureCheck := if\left(q_{adj} < q_s, "Okay", "No Good"\right) \qquad PressureCheck = "Okay"$$

CONCRETE BEARING CAPACITY (ACI 10.17)

(ACI 9.3.2.2) $\phi_c := 0.75$

$$P_b := \phi_c \cdot 0.85 \cdot f'c \cdot \frac{d_p^2 \cdot \pi}{4} \qquad P_b = 13843.1139 \cdot kip$$

$$\text{BearingCheck} := \text{if}\left(P_b > LF \cdot C_t, \text{"Okay"}, \text{"No Good"}\right) \qquad \text{BearingCheck} = \text{"Okay"}$$

SHEAR STRENGTH OF CONCRETE

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

(ACI 9.3.2.3) $\phi_{vc} := .85$

$$d := T_f - Cvr_{pad} - d_{bbot} \qquad d = 43.59 \cdot in$$

$$d_1 := \frac{W_f}{2} - \frac{d_p}{2} \qquad d_1 = 11.75 \cdot ft$$

$$d_2 := d_1 - d \qquad d_2 = 8.1175 \cdot ft$$

$$L := \left(\frac{W_f}{2} - e\right) \cdot 3 \qquad L = 20.7459 \cdot ft$$

$$\text{Slope} := \text{if}\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right) \qquad \text{Slope} = 0.1029 \cdot kcf$$

$$V_{req} := LF \cdot \left[\left(q_{adj} - \text{Slope} \cdot d_1\right) + \left(\frac{\text{Slope} \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1 \qquad V_{req} = 754.6131 \cdot kip$$

ACI 11.3.1.1 $V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \cdot d \qquad V_{Avail} = 1534.222 \cdot kip$

$$\text{BeamShearCheck} := \text{if}\left(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"}\right) \qquad \text{BeamShearCheck} = \text{"Okay"}$$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.12.2.1)

$$b_o := \left(d_p + d\right) \cdot \pi \qquad b_o = 36.5446 \cdot ft$$

Area included inside bo: $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} \qquad A_{bo} = 106.2762 \cdot ft^2$

Area outside of bo: $A_{out} := A_{mat} - A_{bo} \qquad A_{out} = 885.9738 \cdot ft^2$

Guess Value: $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := \text{Find}(v_u)$ $v_u = 5.252 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f$ $V_u = 600.9539 \cdot kips$

$V_{req} := LF \cdot V_u$ $V_{req} = 801.0716 \cdot kips$

$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f'c \cdot psi} \cdot b_o \cdot d$ $V_{Avail} = 3559.8409 \cdot kips$

$PunchingShearCheck := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$ PunchingShearCheck = "Okay"

STEEL REINFORCEMENT IN THE PAD

ACI 9.3.2.2 $\phi_m := .90$

Take Maximum Bending at face of Pier:

$q_b := q_{adj} - d_1 \cdot Slope$ $q_b = 0.9252 \cdot ksf$

$M_n := \frac{1}{LF \cdot \phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f$ $M_n = 3137.3032 \cdot kip \cdot ft$

ACI 10.2.7.3 $\beta := \text{if}\left[f'c \le 4000 \cdot psi, .85, \text{if}\left[f'c \ge 8000 \cdot psi, .65, .85 - \left(\frac{\frac{f'c}{psi} - 4000}{1000} \right) \cdot .05 \right] \right]$ $\beta = 0.85$

$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2}$ $R_u = 8386.7\ lbf$

$\rho := \frac{0.85 \cdot f'c}{fy} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f'c}} \right)$ $\rho = 0.001$

$\rho_{min} := 1.333 \cdot \rho$ $\rho_{min} = 0.00131$

TEMPERATURE AND SHRINKAGE

$\rho_{sh} := \text{if}(fy \geq 60000 \cdot psi, 0.0018, 0.0020)$ $\quad \rho_{sh} = 0.0018$

(ACI 7.12.2.1b)

FOR BOTTOM BARS: $As := \max(\rho\rho_{min}, \rho_{sh}) \cdot W_f \cdot d$ $\quad As = 29.6586 \cdot in^2$

$As_{prov} := A_{bot} \cdot NB_{bot}$ $\quad As_{prov} = 74.88 \cdot in^2$

$PadReinforcement := \text{if}(As_{prov} > As, \text{"Okay"}, \text{"No Good"})$ $\quad PadReinforcement = \text{"Okay"}$

FOR TOP BARS: $As := \rho_{sh} \cdot (W_f \cdot d)$ $\quad As = 29.6586 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top}$ $\quad As_{prov} = 74.88 \cdot in^2$

$PadReinforcement := \text{if}(As_{prov} > As, \text{"Okay"}, \text{"No Good"})$ $\quad PadReinforcement = \text{"Okay"}$

DEVELOPMENT LENGTH OF PAD REINFORCEMENT

TENSION (ACI 12.2.3)

Bar Spacing: $B_{sPad} := \dfrac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1}$ $\quad B_{sPad} = 6.4749 \cdot in$

Development Length Factors:

Reinforcement Location Factor	$\alpha := 1.0$	
Coating Factor	$\beta := 1.0$	
Concrete strength Factor	$\lambda := 1.0$	
Reinforcement Size Factor	$\gamma := 1.0$	

Spacing or Cover Dimension: $c := \text{if}\left(Cvr_{pad} < \dfrac{B_{sPad}}{2}, Cvr_{pad}, \dfrac{B_{sPad}}{2}\right)$ $\quad c = 3 \cdot in$

Transverse Reinforcement Index:

As allowed by ACI 12.2.4 $k_{tr} := 0$

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot}$$ $\quad L_{dbt} = 54.4464 \cdot in$

$L_{dbmin} := 12 \cdot in$

Minimum Development Length: (ACI 12.2.1) $L_{dbtCheck} := \text{if}(L_{dbt} \geq L_{dbmin}, \text{"Use L.dbt"}, \text{"Use L.dbmin"})$ $\quad L_{dbtCheck} = \text{"Use L.dbt"}$

Available Length in Pad: $L_{Pad} := \dfrac{W_f}{2} - \dfrac{d_p}{2} - Cvr_{pad}$ $\quad L_{Pad} = 138 \cdot in$

$LpadTension := \text{if}(L_{Pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$ $\quad LpadTension = \text{"Okay"}$

REINFORCEMENT IN PIER

Pier Area:

$$A_p := \frac{\pi \cdot d_p^{\,2}}{4} \qquad A_p = 7238.2295 \cdot in^2$$

(ACI 10.8.4 and 10.9.1)

$$A_{smin} := 0.01 \cdot 0.05 \cdot A_p \qquad A_{smin} = 3.6191 \cdot in^2$$

$$A_{sprov} := NBpier \cdot A_{bpier} \qquad A_{sprov} = 93.6 \cdot in^2$$

$$SteelAreaCheck := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right) \qquad SteelAreaCheck = "Okay"$$

NOTE: Anchor Bolts are not accounted for in reinforcement calculation and will provide additional reinforcement to satisfy minimum requirement of steel.

Bar Spacing In Pier:

$$B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier} \qquad B_{sPier} = 3.6165 \cdot in$$

Diameter of Reinforcement Cage:

$$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} \qquad Diam_{cage} = 90 \cdot in$$

Maximum Moment in Pier:

$$M_p := \left[M_t + S_t \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF \qquad M_p = 95448.132 \cdot in \cdot kips$$

Pier Check evaluated from outside program and results are listed below;

(defined variables)

$$\left(f'_c \;\; f_y \;\; cl \;\; Spiral\right) = (3 \;\; 60 \;\; 3 \;\; 0)$$

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches:

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := (96 \;\; 60 \;\; 11 \;\; 72 \;\; 95500)$$

Clears any previous output:

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$$

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio:

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (143.5948 \;\; 190462.4888 \;\; -60 \;\; 0.0129)$$

Column size and reinforcement may be changed to match capacity to the applied load.

$$AxialLoadCheck := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right) \qquad AxialLoadCheck = "Okay"$$

$$BendingCheck := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right) \qquad BendingCheck = "Okay"$$

DEVELOPMENT LENGTH OF PIER REINFORCEMENT

TENSION (ACI 12.2.3)

Factors for development:

Reinforcement Location Factor $\alpha := 1.0$

Coating Factor $\beta := 1.0$

Concrete strength Factor $\lambda := 1.0$

Reinforcement Size Factor $\gamma := 1.0$

Spacing or Cover Dimension: $c := \text{if}\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right)$ $c = 1.8083 \cdot in$

Transverse Reinforcement:

As allowed by ACI 12.2.4 $k_{tr} := 0$

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 90.3287 \cdot in$$

$L_{dbmin} := 12 \cdot in$

Minimum Development Length: (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f'c}{psi}}} \cdot .7 \qquad L_{dh} = 21.6241 \cdot in$$

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$ $L_{db} = 90.3287 \cdot in$

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 30.8916 \cdot in$$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot fy\right)$ $L_{dbmin} = 25.38 \cdot in$

$L_{dbc} := \text{if}\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right)$ $L_{dbc} = 30.8916 \cdot in$

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier}$ $L_{pier} = 63 \cdot in$

$L_{pad} := T_f - Cvr_{pad}$ $L_{pad} = 45 \cdot in$

$L_{tension} := \text{if}\left(L_{pier} + L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"}\right) = \text{"Okay"}$ $L_{tension} = \text{"Okay"}$

$L_{compression} := \text{if}\left(L_{pier} + L_{pad} > L_{dbc}, \text{"Okay"}, \text{"No Good"}\right)$ $L_{compression} = \text{"Okay"}$

NOTE: Anchor bolts and plate provided

TIE SIZE AND SPACING IN COLUMN

Minimum Tie Size:

$Tie_{min} := if(BSpier \le 10, 3, 4)$ $\quad Tie_{min} = 4$

Used #4 Ties

$d_{Tie} := 4$

Seismic factor:
(ACI 21.10.5)

$z := if(Z \le 2, 1, 0.5)$ $\quad z = 1$

$s_{lim1} := 16 \cdot d_{bpier} \cdot z$ $\quad s_{lim1} = 22.56 \cdot in$

$s_{lim2} := \frac{48 \cdot d_{Tie} \cdot in}{8} \cdot z$ $\quad s_{lim2} = 24 \cdot in$

$s_{lim3} := D_f \cdot z$ $\quad s_{lim3} = 108 \cdot in$

$s_{lim4} := 18in$ $\quad s_{lim4} = 18 \cdot in$

Maximum Spacing:

$s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right)$ $\quad s_{tie} = 18 \cdot in$

Number of Ties Required:

$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1$ $\quad n_{tie} = 4.3333$

CHECK ANCHOR STEEL EMBEDMENT

Depth:

$D_{ab} := L_{st} - A_{BP}$ $\quad D_{ab} = 7 \cdot ft$ $\quad L_{anchor} := \frac{(0.11 \cdot fya) \cdot in}{\sqrt{fc \cdot psi}}$ $\quad L_{anchor} = 12.552 \cdot ft$

$DepthCheck := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

$DepthCheck = "No Good"$

Note: Anchor plate is provided