QC Development
PO Box 916
Storrs, CT 06268
860-670-9068
Mark.Roberts@QCDevelopment.net

October 16, 2017

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

Notice of Exempt Modification – New Cingular Wireless PCS, LLC (AT&T)
880 Post Road East, Westport, CT 06880 – AT&T Site # CT2147
N 41-08-14.97
W 73-20-03.61

Dear Ms. Bachman:

AT&T currently maintains nine (9) antennas at the 133-foot level of the existing 180-foot Self Support Tower at 880 Post Road East, Westport. The tower is owned by the Connecticut Department of Public Safety and the property is owned by the State of Connecticut. This notice supersedes AT&T's prior notification from July 2017 (EM-CING-158-170724). The tower structural modifications that were previously associated with this project have been re-designed and no longer account for the proposed future Sprint loading. The AT&T equipment modifications are unchanged: AT&T intends to remove three (3) Powerwave antennas and install three (3) new CCI HPA-65R-BUU-H6 antennas. These antennas would be installed at the 133-foot level of the tower. AT&T also intends to remove three (3) Ericsson RRUS-11 and install three (3) Ericsson RRUS-32 B2 radio heads, also at the 133-foot level.

This facility was approved by the Connecticut Siting Council, Docket No. 123 on March 29, 1990. There were no conditions that could feasibly be violated by this modification, including total facility height or mounting restrictions. This modification therefore complies with the aforementioned approval.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Mr. James Marpe, First Selectman of the Town of Westport, the Westport Planning and Zoning Director and the property and tower owner.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing structure.

2. The proposed modifications will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

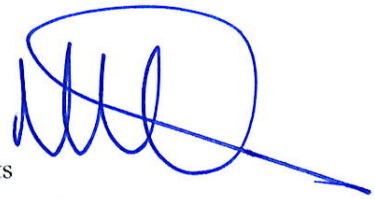
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, AT&T respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Please feel free to call me at (860) 670-9068 with any questions regarding this matter. Thank you for your consideration.

Sincerely,



Mark Roberts
QC Development
Consultant for AT&T

Attachments

cc: Mr. James Marpe – First Selectman, Town of Westport
Mary Young – Westport Planning and Zoning Director
CT State Police - Tower and Property Owner

Power Density

Existing Loading on Tower

Carrier	# of Channels	ERP/Ch (W)	Antenna Centerline Height (ft)	Power Density (mW/cm^2)	Freq. Band (MHz**)	Limit S (mW /cm^2)	%MPE
Other Carriers*							5.42%
AT&T UMTS	2	500	133	0.0223	880	0.5867	0.38%
AT&T UMTS	1	500	133	0.0111	1900	1.0000	0.11%
AT&T LTE	1	500	133	0.0111	700	0.4667	0.24%
AT&T LTE	1	500	133	0.0111	1900	1.0000	0.11%
AT&T LTE	1	500	133	0.0111	2300	1.0000	0.11%
Site Total							6.37%

*Per CSC Records (available upon request, includes calculation formulas)

** If a range of frequencies are used, such as 880-894, enter the lowest value, i.e. 880

Proposed Loading on Tower

Carrier	# of Channels	ERP/Ch (W)	Antenna Centerline Height (ft)	Power Density (mW/cm^2)	Freq. Band (MHz**)	Limit S (mW /cm^2)	%MPE
Other Carriers*							5.42%
AT&T UMTS	2	368	133	0.0164	880	0.5867	0.28%
AT&T UMTS	2	483	133	0.0215	1900	1.0000	0.22%
AT&T LTE	1	1476	133	0.0329	700	0.4667	0.71%
AT&T LTE	1	2421	133	0.0540	1900	1.0000	0.54%
Site Total							7.16%

*Per CSC Records (available upon request, includes calculation formulas)

** If a range of frequencies are used, such as 880-894, enter the lowest value, i.e. 880

Note: Proposed Loading may also include corrections to certain Existing Loading values

PROJECT INFORMATION

SCOPE OF WORK:	TELECOMMUNICATIONS FACILITY UPGRADE (LTE BWE 2017 UPGRADE):
SITE ADDRESS:	880 POST ROAD EAST WESTPORT, CT 06880
LATITUDE:	41.137463° N, 41° 8' 14.84" N
LONGITUDE:	73.334360° W, 73° 20' 3.69" W
TYPE OF SITE:	LATTICE TOWER / INDOOR EQUIPMENT
TOWER HEIGHT:	180'
RAD CENTER:	133'±
CURRENT USE:	TELECOMMUNICATIONS FACILITY
PROPOSED USE:	TELECOMMUNICATIONS FACILITY

SITE NUMBER: CT2147

SITE NAME: WESTPORT SP TWR

PROJECT: LTE BWE 2017 UPGRADE

DRAWING INDEX

VICINITY MAP

DIRECTIONS TO SITE:

START OUT GOING NORTHEAST ON ENTERPRISE DR TOWARD CAPITOL BLVD. 0.4 MI TURN LEFT ONTO CAPITOL BLVD. 0.3 MI TURN LEFT ONTO WEST ST. 0.3 MI MERGE ONTO I-91 S VIA THE RAMP ON THE LEFT TOWARD NEW HAVEN. 29.1 MI MERGE ONTO I-95 S/GOVERNOR JOHN DAVIS LODGE TURNPIKE VIA THE EXIT ON THE LEFT TOWARD N.Y. CITY. 24.5 MI TAKE EXIT 19 TOWARD US-1/SOUTHPORT. 0.2 MI STAY STRAIGHT TO GO ONTO PEASE AVE. 0.1 MI TURN SLIGHT RIGHT ONTO POST RD E/US-1 S. 2.4 MI TURN LEFT ONTO SHERWOOD ISLAND CONNECTOR.

GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF AT&T. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE AT&T MOBILITY REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

72 HOURS

CALL
BEFORE YOU DIG
CALL TOLL FREE 1-800-922-4455
OR CALL 811

UNDERGROUND SERVICE ALERT

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 3090
N. ANDOVER, MA 01845
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SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: EB

STATE OF CONNECTICUT — NOT FOR CONSTRUCTION UNLESS RELEASED — No. 23581 — LICENSED PROFESSIONAL ENGINEER

AT&T
TITLE SHEET
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	T-1	1

GROUNDING NOTES

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.

2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.

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

4. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.

5. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS 2 AWG STRANDED COPPER FOR OUTDOOR BTS.

6. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.

7. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.

8. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO GROUND BAR.

9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.

10. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.

11. METAL CONDUIT SHALL BE MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWS COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.

12. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE OF 1/2 IN. OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID BARE TINNED COPPER GROUND WIRE, PER NEC 250.50

GENERAL NOTES

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

   CONTRACTOR – SAI
   SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
   OWNER – AT&T MOBILITY

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR 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 SHALL 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. SUBCONTRACTOR 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. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.

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

6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.

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

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

9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.

10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.

11. SUBCONTRACTOR 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 OWNER'S DESIGNATED LOCATION.

12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.

13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.

14. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.

15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.

16. CONSTRUCTION SHALL COMPLY WITH SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T SITES."

17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.

18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.

19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

20. APPLICABLE BUILDING CODES:
    SUBCONTRACTOR'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.
    BUILDING CODE: IBC 2015 & 2016 BUILDING CODE OF NEW YORK STATE
    ELECTRICAL CODE: REFER TO ELECTRICAL DRAWINGS
    LIGHTENING CODE: REFER TO ELECTRICAL DRAWINGS

    SUBCONTRACTOR'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, FOURTEENTH EDITION;

    TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 222-G, STRUCTURAL STANDARDS FOR STEEL

    EQUIPMENT AND ANTENNA SUPPORTING STRUCTURES; REFER TO ELECTRICAL DRAWINGS FOR SPECIFIC ELECTRICAL STANDARDS.

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.

ABBREVIATIONS

AGL	ABOVE GRADE LEVEL	EQ	EQUAL	REQ	REQUIRED
AWG	AMERICAN WIRE GAUGE	GC	GENERAL CONTRACTOR	RF	RADIO FREQUENCY
BBU	BATTERY BACKUP UNIT	GRC	GALVANIZED RIGID CONDUIT	TBD	TO BE DETERMINED
BTCW	BARE TINNED SOLID COPPER WIRE	MGB	MASTER GROUND BAR	TBR	TO BE REMOVED
BGR	BURIED GROUND RING	MIN	MINIMUM	TBRR	TO BE REMOVED AND REPLACED
BTS	BASE TRANSCEIVER STATION	P	PROPOSED	TYP	TYPICAL
E	EXISTING	NTS	NOT TO SCALE	UG	UNDER GROUND
EGB	EQUIPMENT GROUND BAR	RAD	RADIATION CENTER LINE (ANTENNA)	VIF	VERIFY IN FIELD
EGR	EQUIPMENT GROUND RING	REF	REFERENCE		

Hudson Design Group LLC
1600 OSGOOD STREET
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N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

SAI
27 NORTHWESTERN DR.
SALEM, NH 03079

SITE NUMBER: CT2147
SITE NAME: WESTPORT SP TWR
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WESTPORT, CT 06880
FAIRFIELD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
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A	07/12/16	ISSUED FOR REVIEW	EB	AT	DJC

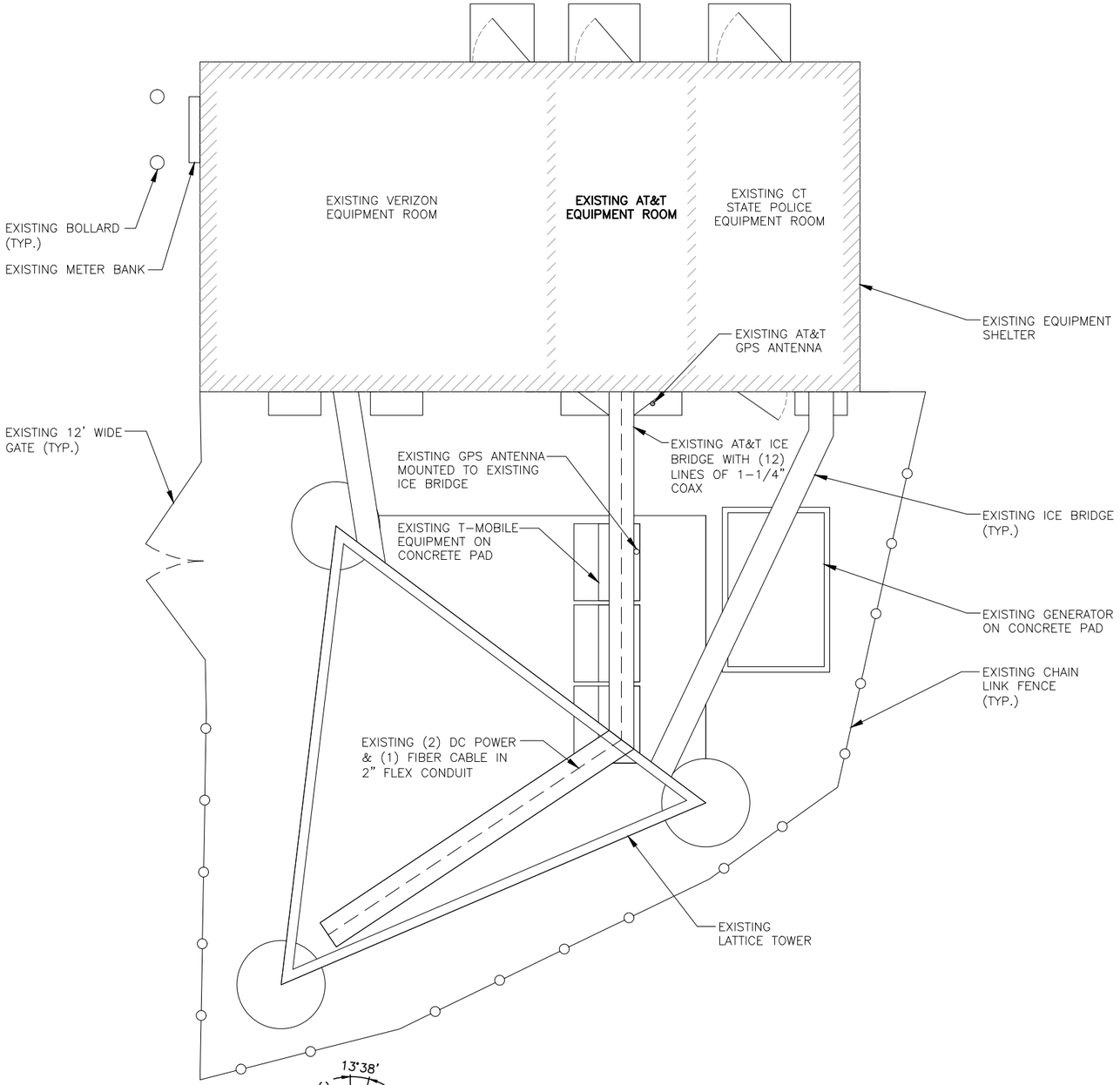
SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: EB

STATE OF CONNECTICUT · DEREK J. CREASEY · 29295 · LICENSED PROFESSIONAL ENGINEER

AT&T

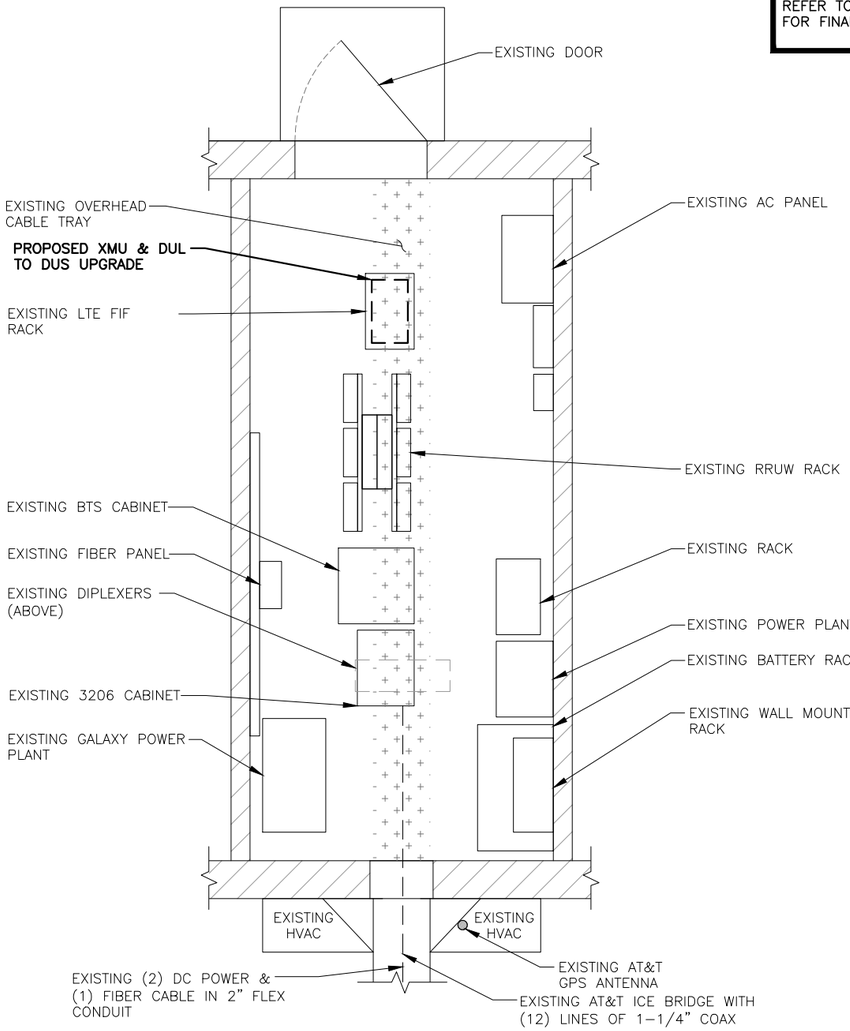
GENERAL NOTES
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	GN-1	1



COMPOUND PLAN (1 / A-1)
22x34 SCALE: 1/4"=1'-0"
11x17 SCALE: 1/8"=1'-0"

0 2'-0" 4'-0" 8'-0" 12'-0"



EQUIPMENT PLAN (2 / A-1)
22x34 SCALE: 1/2"=1'-0"
11x17 SCALE: 1/4"=1'-0"

0 1'-0" 2'-0" 4'-0" 6'-0"

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.

NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

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STATE OF CONNECTICUT
DEREK J. CREASEY
No. 23551
LICENSED PROFESSIONAL ENGINEER

AT&T

COMPOUND & EQUIPMENT PLAN
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	A-1	1

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AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.

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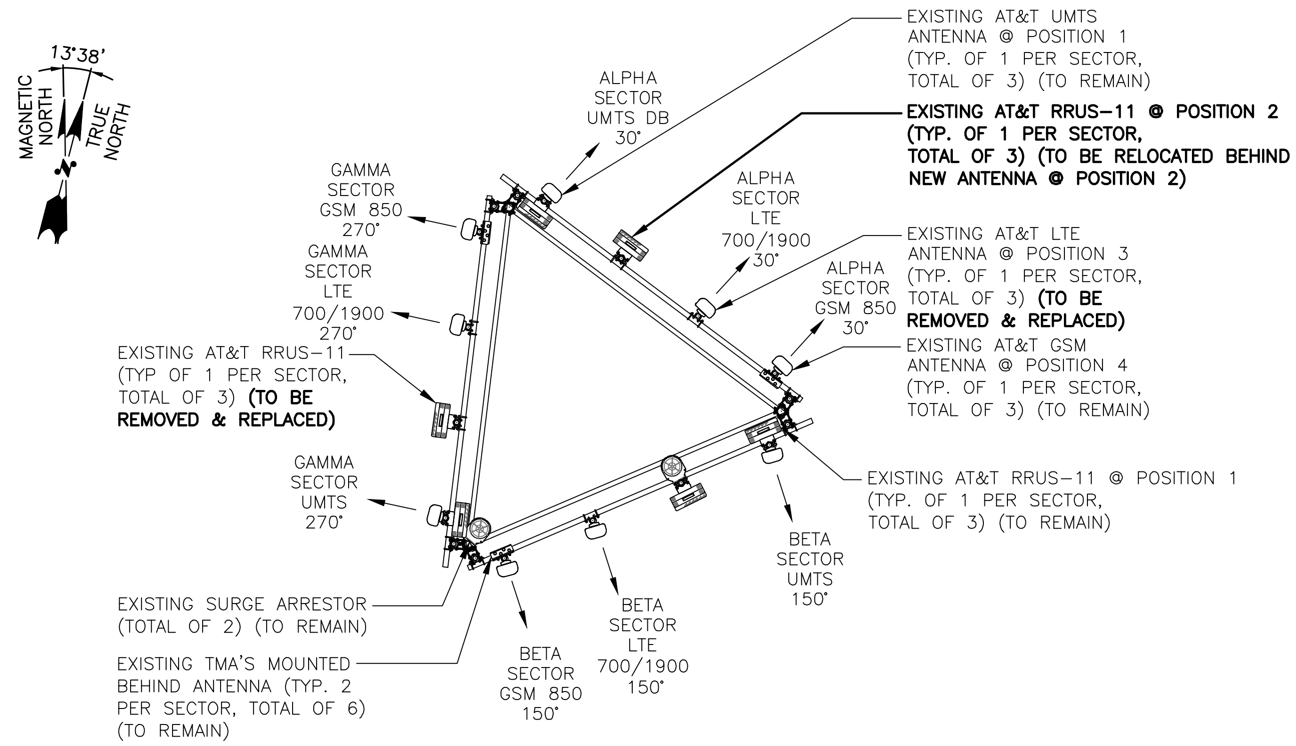
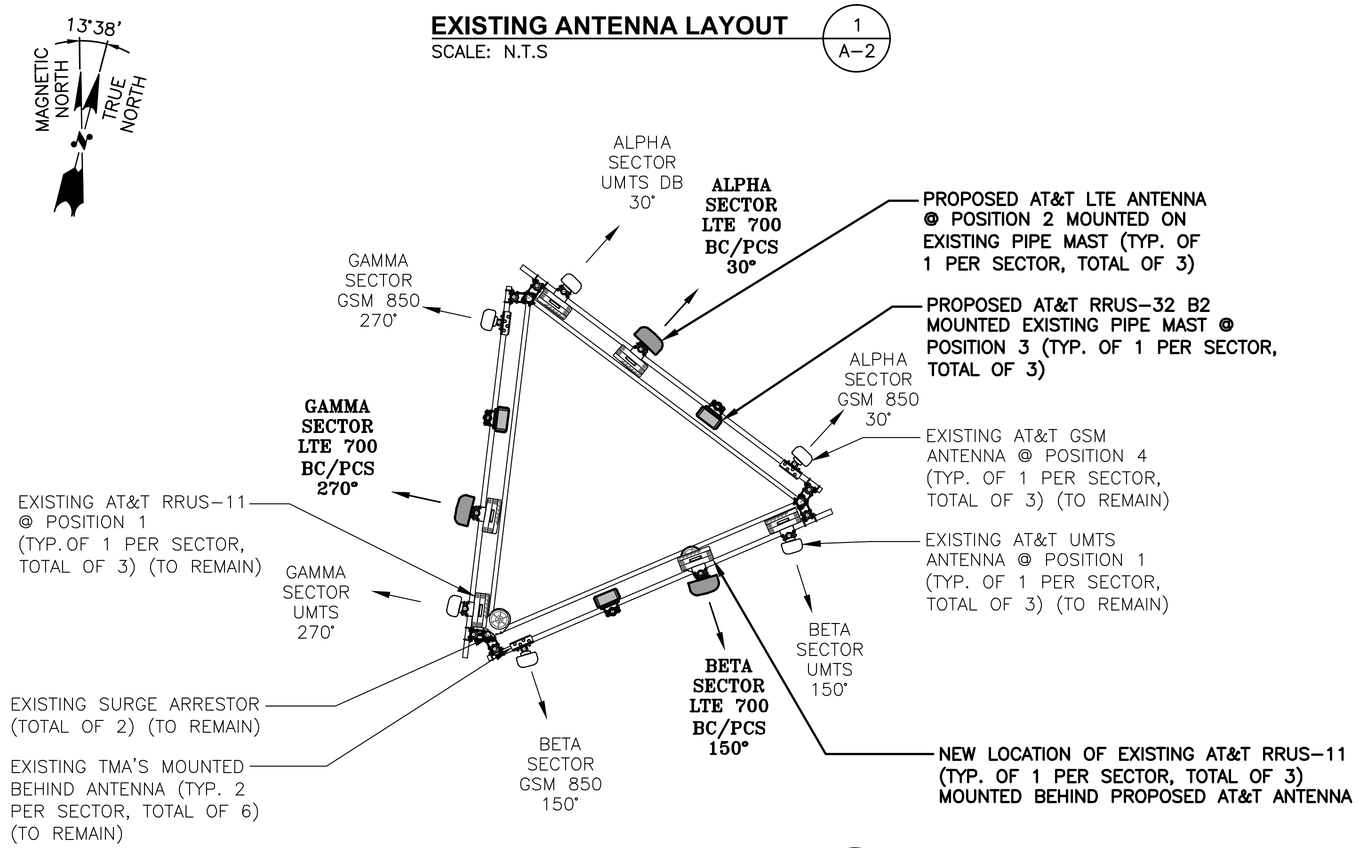
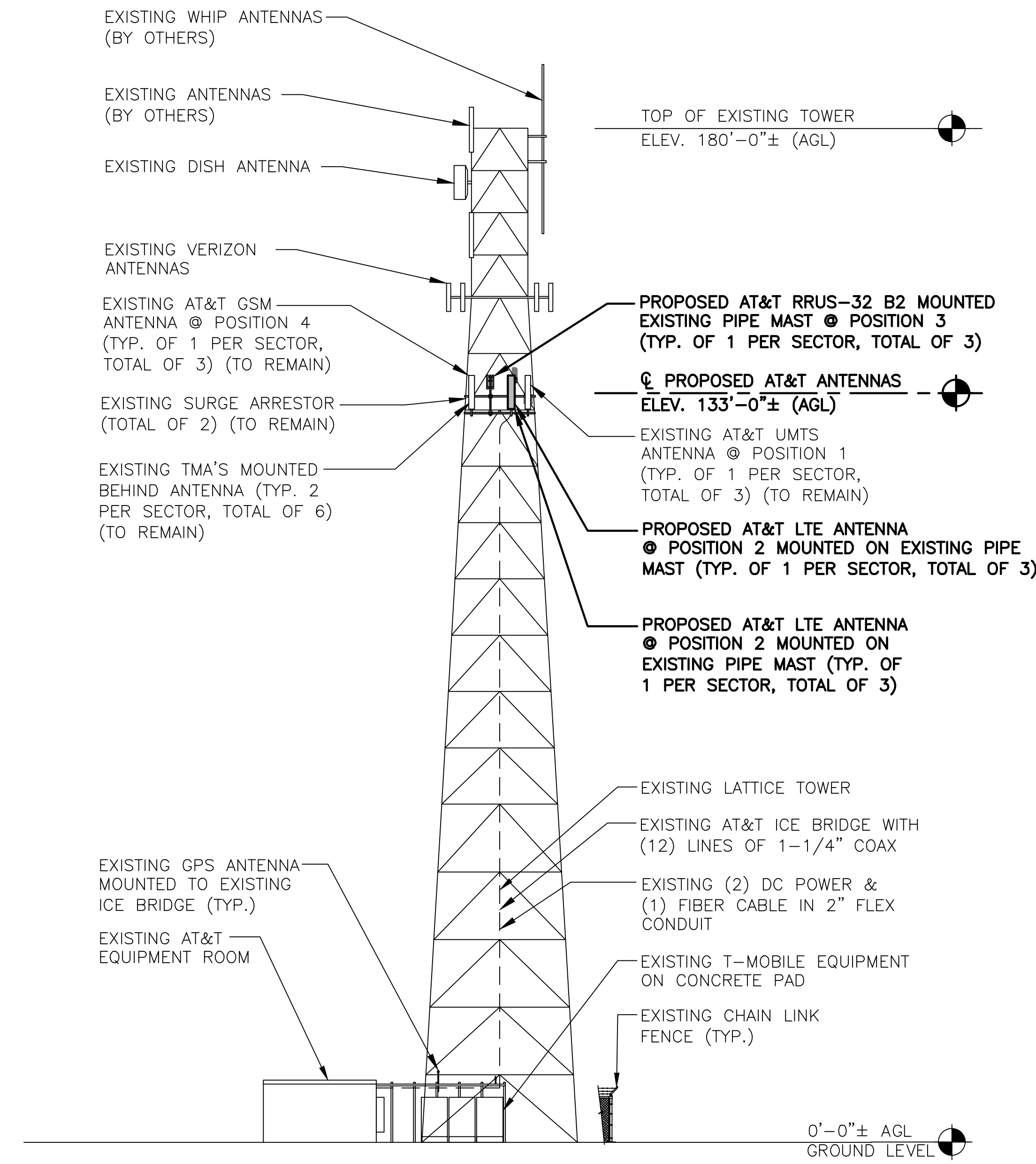


EXISTING ANTENNA LAYOUT 1 / A-2
SCALE: N.T.S



PROPOSED ANTENNA LAYOUT 2 / A-2
SCALE: N.T.S



ELEVATION 3 / A-2
22x34 SCALE: 1/16"=1'-0"
11x17 SCALE: 1/32"=1'-0"
0 8'-0" 16'-0" 32'-0" 48'-0"

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STATE OF CONNECTICUT — DEREK CREASER — LICENSED PROFESSIONAL ENGINEER

AT&T
ANTENNA LAYOUTS & ELEVATION
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	A-2	1

EXISTING ANTENNA SCHEDULE

SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6
	POWERWAVE	P65-16-XLH-RR	72X12X6
BETA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6
	POWERWAVE	P65-16-XLH-RR	72X12X6
GAMMA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6
	POWERWAVE	P65-16-XLH-RR	72X12X6

PROPOSED ANTENNA SCHEDULE

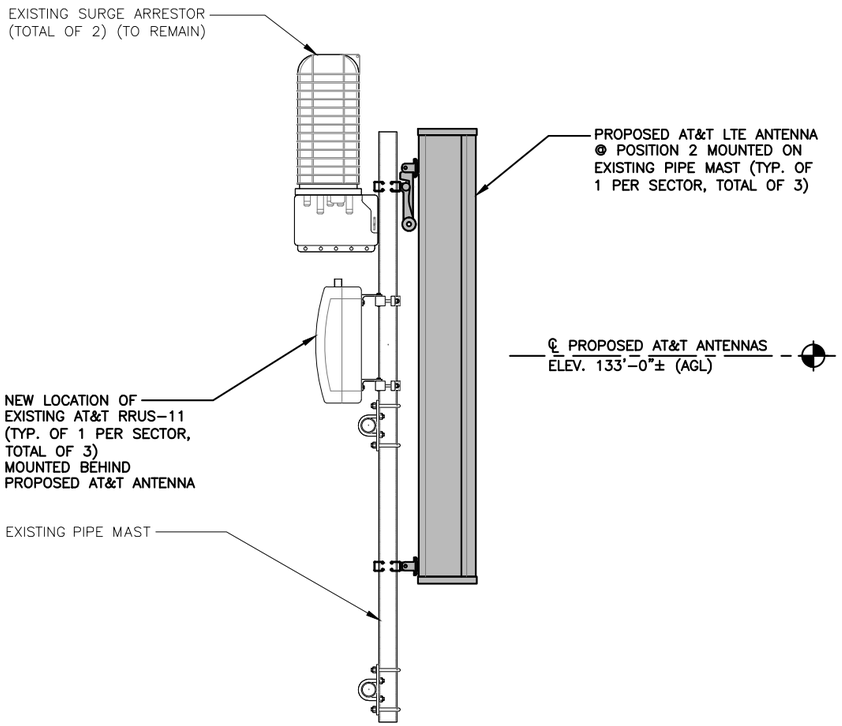
SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	CCI	HPA-65R-BUU-H6	72X14.8X9
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6
BETA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	CCI	HPA-65R-BUU-H6	72X14.8X9
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6
GAMMA:	POWERWAVE	P65-16-XLH-RR	72X12X6
	CCI	HPA-65R-BUU-H6	72X14.8X9
	–	–	–
	POWERWAVE	P65-16-XLH-RR	72X12X6

NOTE:

ALL ANTENNAS AND LINES TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CROWN CASTLE AND FINAL AT&T RF DATA SHEET.

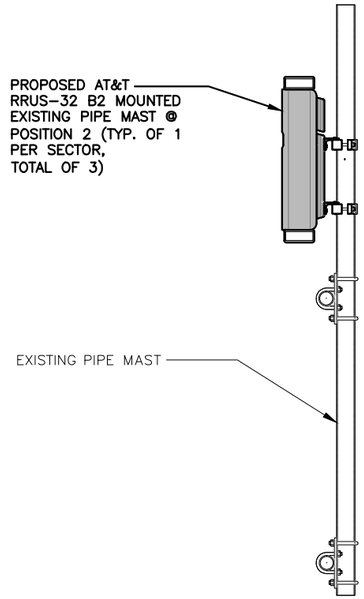
NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.



PROPOSED ANTENNA MOUNTING DETAIL (1 / A-3)
22x34 SCALE: 1"=1'-0"
11x17 SCALE: 1/2"=1'-0"

0 0'-6" 1'-0" 2'-0" 3'-0"



PROPOSED RRU MOUNTING DETAIL (2 / A-3)
22x34 SCALE: 1"=1'-0"
11x17 SCALE: 1/2"=1'-0"

0 0'-6" 1'-0" 2'-0" 3'-0"

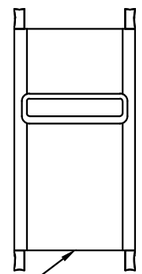
RRU CHART

QUANTITY	MODEL	L	W	D
6 (E)	RRUS-11	19.7"	17.0"	7.2"
–	RRUS-12	20.4"	18.5"	7.5"
3 (P)	RRUS-32	27.2"	12.1"	7.0"
–	RRUS-E2	20.4"	18.5"	7.5"
–	LTE-A2	16.4"	15.2"	3.4"

NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS

NOTE:

SEE RFDS FOR RRH FREQUENCY AND MODEL NUMBER



PROPOSED RRU REFER TO THE FINAL RFDS AND CHART FOR QUANTITY, MODEL AND DIMENSIONS

NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

RRU DETAIL (3 / A-3)
SCALE: N.T.S

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 3090
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

SAI
27 NORTHWESTERN DR.
SALEM, NH 03079

SITE NUMBER: CT2147
SITE NAME: WESTPORT SP TWR
880 POST ROAD EAST
WESTPORT, CT 06880
FAIRFIELD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

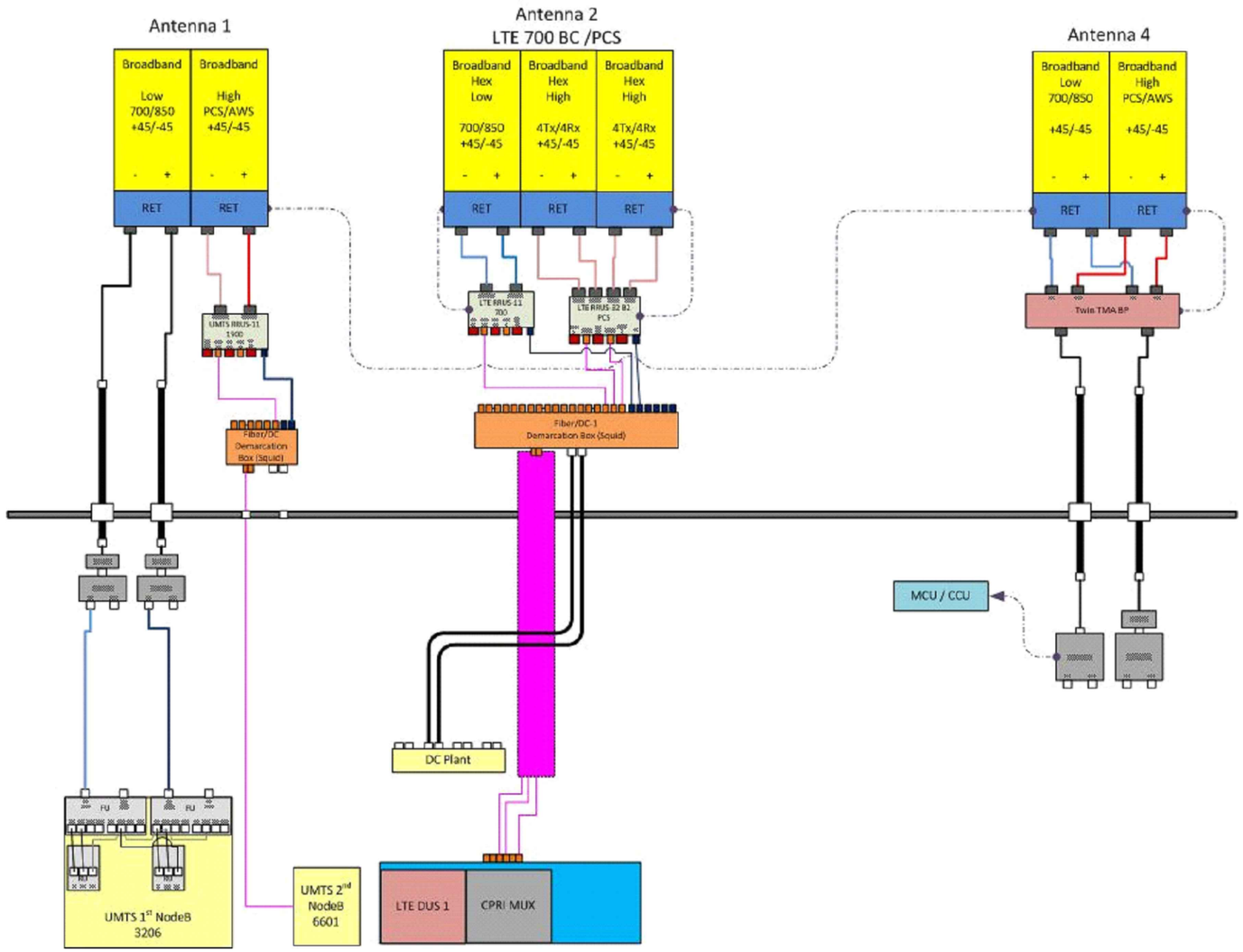
NO.	DATE	REVISIONS	BY	CHK	APP'D
1	08/18/16	ISSUED FOR CONSTRUCTION	SG	AT	DJC
A	07/12/16	ISSUED FOR REVIEW	EB	AT	DJC

SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: EB

STATE OF CONNECTICUT
DEREK J. CREASEY
26,295
LICENSED PROFESSIONAL ENGINEER

AT&T
DETAILS
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	A-3	1



RF PLUMBING DIAGRAM (1 / RF–1)
SCALE: N.T.S

NOTE:
1. CONTRACTOR TO CONFIRM ALL PARTS.
2. INSTALL ALL EQUIPMENT TO MANUFACTURER'S RECOMMENDATIONS

NOTE:
REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 3090
N. ANDOVER, MA 01845
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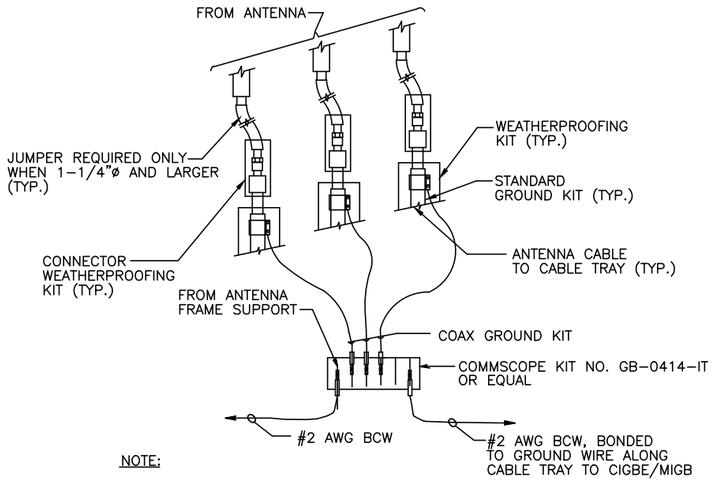
SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: EB

STATE OF CONNECTICUT — DEREK J. CREASEY — No. 23567 — LICENSED PROFESSIONAL ENGINEER

AT&T

RF PLUMBING DIAGRAM
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	RF–1	1



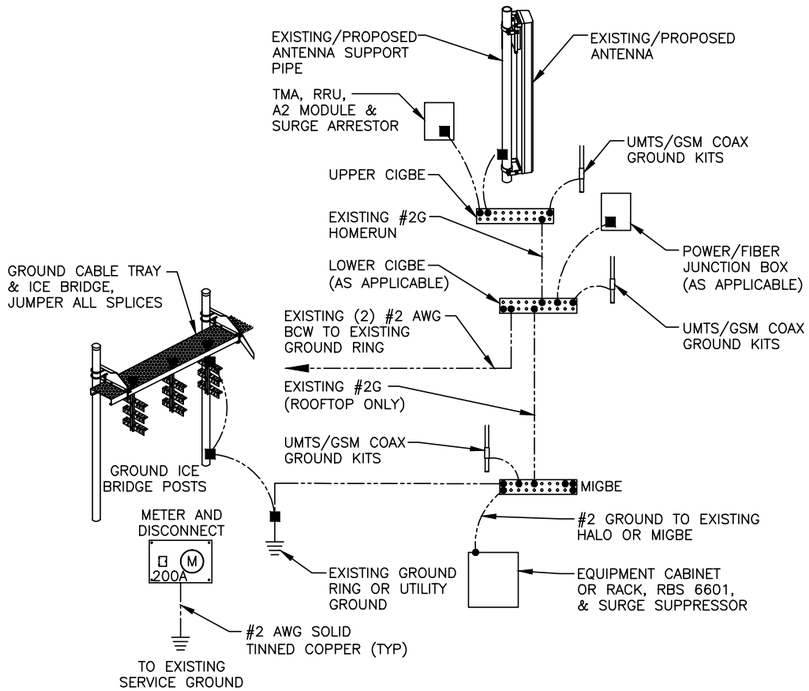
NOTE:

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

GROUND WIRE TO GROUND BAR CONNECTION DETAIL

SCALE: N.T.S

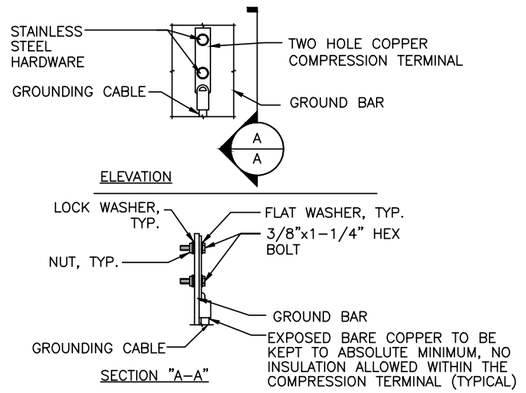
1 / G-1



GROUNDING RISER DIAGRAM

SCALE: N.T.S

2 / G-1



NOTE:

1. "DOUBLING UP" OR "STACKING" OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATION.
3. CADWELD DOWNLEADS FROM UPPER EGB, LOWER EGB, AND MGB

TYPICAL GROUND BAR CONNECTION DETAIL

SCALE: N.T.S

3 / G-1

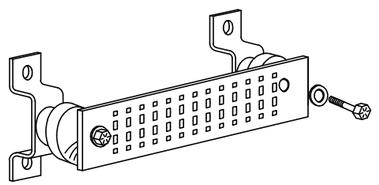
EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR SHALL HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION.

SECTION "P" – SURGE PRODUCERS

CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

SECTION "A" – SURGE ABSORBERS

INTERIOR GROUND RING (#2)
EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
BUILDING STEEL (IF AVAILABLE) (#2)



GROUND BAR - DETAIL

SCALE: N.T.S

4 / G-1

Hudson Design Group LLC
1600 OSGOOD STREET
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N. ANDOVER, MA 01845
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SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: EB

STATE OF CONNECTICUT
DEREK J. CREASEY
No. 23551
LICENSED PROFESSIONAL ENGINEER

AT&T

GROUNDING DETAILS
(LTE BWE)

SITE NUMBER	DRAWING NUMBER	REV
CT2147	G-1	1

AECOM

Submitted to
Verizon Wireless
99 East River Drive
East Hartford, CT 06108

AT&T
500 Enterprise Drive
Suite 3A
Rocky Hill, CT 06067

Submitted by
AECOM
500 Enterprise Drive,
Suite 3B
Rocky Hill, CT 06067
September 20, 2017

DETAILED STRUCTURAL ANALYSIS AND MODIFICATION OF AN EXISTING 180' SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

verizonwireless

at&t

Site ID : CT2147
Site Name: CT State Police Tower
Site Address: 880 Post Road East
Westport, Connecticut
CSP Tower # 32

60519605 / VZ5-202
60553537 / SAI-099

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis and modification of the 180' self-supporting lattice tower located at 880 Post Road East in Westport, Connecticut.

The structural analysis was conducted in accordance with the 2016 Connecticut State Building Code which includes the TIA-222-G[1] Standard, 2012 International Building Code, the 2016 Connecticut State Building Code Amendments, the AISC[2] Load Resistance Factor Design (LRFD), the ASCE 7[3] design Code, and the Connecticut State Police Requirements which include the TIA/EIA-222-F[4].

The antenna loading considered in the analysis consists of all the existing antennas, transmission lines and ancillary items as outlined in the Introduction Section of this report.

The proposed Verizon Wireless (VZW) and AT&T antenna modifications are listed below:

Antennas and other Appurtenances	Carrier	Antenna Center Elevation
Remove:		
(2) P65-15-XL-2 Panels (Alpha & Gamma Sectors – 700 MHz / LTE) **(1) LNX-6512DS-T4M Panel Antenna (Beta Sector – 700 MHz / LTE)** **(3) BXA-171063-12CF-EDIN-2 Panel Antennas (1900 MHz / PCS)** **(3) BXA-171063-12CF-EDIN-2 Panel Antennas (2100 MHz / AWS)** **(3) Alcatel Lucent 2x40-AWS RRH Units** **(6) Diplexer Units** **(4) 1-5/8" Coaxial Cables**	**VZW (existing)**	**@ 160'**
(3) P65-16-XLH-RR Panel Antennas **(3) RRUS-11 RRH Units**	**AT&T (existing)**	**@ 133'**
(3) Windload Dishes	**CSP (existing)**	**@ 180'**
Install:		
(3) Commscope SBNHH-1D65B Panel Antennas (700 MHz / LTE shared with 1900 MHz / PCS) **(3) Alcatel Lucent 2x60-700MHz RRH Units** **(1) DB-T1-6Z-8AB-0Z Distribution Box (700 MHz / LTE)** **(3) Alcatel Lucent 2x90-1900MHz RRH Units (B66a RRH Units)** **(3) Commscope SBNHH-1D65B Panel Antennas (2100 MHz / AWS)** **(3) Alcatel Lucent 2x60-AWS (2100 MHz) RRH Units** **(2) 1-5/8 Hybriflex Hybrid Coaxial Cables**	**VZW (Proposed)**	**@ 160'**
(3) CCI HPA-65R-BUU-6 Panel Antennas **(3) RRUS-32 RRH Units**	**AT&T (Proposed)**	**@ 133'**

1. TIA = Telecommunications Industry Association Structural Standard for Antenna Supporting Structures and Antennas (Version G)

2. AISC = American Institute of Steel Construction (14th Edition)

3. ASCE 7 = American Society of Civil Engineers Standard 7 (2010 Edition)

4. TIA/EIA = Telecommunications Industry Association Structural Standard for Antenna Supporting Structures and Antennas (Version F)

1. EXECUTIVE SUMMARY *(continued)*

The results of an initial analysis indicated the existing tower structure did not have enough capacity for the proposed loading conditions above. The tower structure requires modifications shown on SK-1 and SK-2. **Once the modifications indicated on sheets SK-1 and SK-2 are performed, the modified structure is considered structurally adequate with the wind load specification specified above with the existing and proposed antenna loading herein.**

The results of the analysis indicate the modified tower's sway (deflection) is 0.4835 degrees and the modified tower's twist (rotation) is 0.0718 degrees. These figures combined are within the Connecticut State Police requirements of 0.75 degrees for combined twist (rotation) and sway (deflection) when applying the TIA/EIA-222-F design conditions.

This analysis is based on:

1) The tower structure's theoretical capacity not including any assessment of the condition of the tower.
2) Original tower report prepared by Rohn Industries, Inc., engineering file 26263DL and drawing C910693 dated February 1, 1991.
3) Soil investigation and foundation capacity report prepared by Dr. Clarence Welti, P.E., P.C., dated October 10, 2002.
4) Tower Mapping and Inventory by D&K Nationwide Communications Inc., performed on March 18, 2016.
5) Existing antenna inventory provided by Motorola / Connecticut State Police via e-mail dated June 22, 2016.
6) Proposed antenna inventory provided by Verizon Wireless via Radio Frequency Data Sheet (RFDS), dated April 19, 2016.
7) Proposed antenna inventory provided by AT&T via RFDS sheet, dated May 13, 2016, obtained via e-mail dated July 1, 2016.
8) Previous structural analysis and evaluation provided by AECOM on behalf of Motorola / Connecticut State Police, project PNS-606 / 60509756.06, signed and sealed on September 16, 2016.
9) Previous structural analysis and evaluation performed by AECOM on behalf of Verizon, project number 60519605 / VZ5-202, and on behalf of AT&T, project number 60518646 / SAI-094, signed and sealed on December 28, 2016.
10) Antenna and mount configuration as specified on the following page of this report.

This report is only valid as per the information and data provided by others for antenna inventory, mounts, tower structure, existing foundation and associated cables. The user of this report shall field verify the antenna, cabling and mount configuration used, as well as the physical condition of the tower members, connections and foundations. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

AECOM, *contracting as URS Corporation AES*

Richard A. Sambor, P.E.
Senior Structural Engineer
RAS/mcd

2. INTRODUCTION

The subject tower is located at 880 Post Road East in Westport, Connecticut. The structure is a 180' self-supporting lattice tower manufactured by Rohn Industries Incorporated.

The structural analysis was conducted in accordance with the following:

- TIA-222-G Standard for Standard for a wind velocity of range of 95 mph to 115 mph (3-second gust) and 50 mph (3-second gust) concurrent with 0.75" ice thickness, considered to increase in thickness with height
- 2012 International Building Code with 2016 Connecticut State Building Code Amendments for a wind speed of 101 mph (3-second gust) – increased to county maximum speed due to location within ASCE "Special Wind Region" → 110 mph
- 2010 AISC Load Resistance Factor Design (LRFD)
- 2010 ASCE 7 Minimum Design Loads for Buildings and Other Structures for the ice thickness referenced in the TIA-222-G Standard
- Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) and 90 mph (fastest mile) concurrent with 0.5" ice. Twist (rotation) and sway (deflection) were determined in accordance with Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) concurrent with 0.5" ice, analyzed under the TIA/EIA-222-F design Standard.

The inventory together with the proposed Verizon Wireless and AT&T antenna arrangement is summarized in the table below:

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) Decibel DB-536 Omni Antenna	D&K-53 CSP-45 (existing)	Mount shared with D&K #48	@ 178'	(1) LDF5-50A
(1) Sinclair SE419-SWBPALDF(D00) Panel Antenna (Troop G (RX))	CSP (existing)	4' Side Arm Mount	@ 175'	(1) LDF4-50A Jumper from below TTA (Tr. G)
(1) Celwave PA6-65 Dish with Radome	D&K-52 CSP-42 (existing)	Dish Standoff	@ 177'	(1) EW-63
(1) Scala AP11-850 antenna	D&K-49 CSP-46 (existing)	*Shared with above mount*	@ 175'	(1) LDF7-50A
(1) Amphenol WPA-700102-4CF-EDIN-9 Panel Antenna (Troop G (TX))	CSP (existing)	*Shared with below Mount*	@ 170'	(1) AVA7-50A
(1) Bird 432E-83I-01T TTA Unit (Troop G)	CSP (existing)	Existing Antenna Mount Frame	@ 170'	(1) AVA7-50A (1) LDF4-50A
(1) Sinclair SE419-SWBPALDF(D00) Panel Antenna	CSP (existing)	*Shared with above Mount*	@ 170'	(1) LDF4-50A Jumper from above TTA (Tr. G)
(1) 4' Yagi Antenna	D&K-51 CSP-1 (existing)	Pipe Mounted to Leg	@ 169'	(1) LDF5-50A
(1) (inverted) Scala OGT9-806 Omni Antenna	D&K-48 CSP-49 (existing)	4' Side Arm Mount	@ 164'	(1) LDF7-50A

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(3) Commscope SBNHH-1D65B Panel Antennas (700 MHz / LTE shared with 1900 MHz / PCS) (3) Alcatel Lucent 2x60-700MHz RRH Units (1) DB-T1-6Z-8AB-0Z Distribution Box (700 MHz / LTE) (3) Alcatel Lucent 2x90-1900MHz RRH Units (B66a RRH Units) (3) Commscope SBNHH-1D65B Panel Antennas (2100 MHz / AWS) (3) Alcatel Lucent 2x60-AWS (2100 MHz) RRH Units	**Verizon (Proposed)**	*See below Mount*	**@ 160'**	**(2) 1 5/8" Fiber Optic Cable**
(1) Amphenol BXA 70080-4CF Panel Antennas (Alpha Sector) (2) Amphenol 70063-4CF Panel Antennas (Beta and Gamma Sectors) (1) Raycap DB-T1-6Z-8AB-0Z Distribution Box	D&K-27 – 46 Verizon (existing)	(3) 15' T-Frames	@ 160'	(8) LDF7-50A (1) 1 5/8" Fiber
(1) (inverted) Scala OGT9-806 Omni Antenna	D&K-47 CSP-48 (existing)	3' Side Arm Mount	@ 159'	(1) LDF7-50A
(3) CCI HPA-65R-BUU-6 Panel Antennas (3) RRUS-32 RRH Units	**AT&T (Proposed)**	*See Below Mounts*	**@ 133'**	*See Below Cables*
(6) P65-16-XLH-H-RR Panel Antennas (6) RRUS-11 Units (2) DC6-48-60-18-8F Distribution Box (3) TT19-08BP111-001 Twin TMA's	D&K-13 – 26 AT&T (existing)	(3) Existing Antenna Mount Frames	@ 133'	(12) LDF6-50A (2) Fiber Optic Cable (4) DC Cables
(9) TMAs (6) Ericsson Air 21 antennas (3) Commscope LNX-6515DS-VTM Panel Antennas (3) Ericsson RRUS-11 Remote Radio Units	D&K-2 – 12 T-Mobile (existing)	(3) Antenna Frame Mounts (Valmont Site Pro 1 part # LTF12-372)	@ 125'	(18) LDF7-50A (1) LDF4-50A (1) Huber Suhner Hybrid cable

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) GPS Antenna	D&K-1 CSP-43 (existing)	Leg Mount	@ 61'	(1) LDF4-50A

NOTES: Antenna ID Numbering and elevations obtained from Tower Mapping and Existing inventory via tower climb performed by D&K Nationwide Communications, Inc. on March 18, 2016.

This structural analysis of the communications tower was performed by AECOM for Verizon Wireless (VZW) and AT&T. The purpose of this analysis was to assess the modified tower for its existing and proposed antenna loads. This analysis was conducted to evaluate twist (rotation), sway (deflection), stress on the tower, and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with, the TIA-222-G–Structural Standard for Antenna Towers and Antenna Supporting Structures and Antennas, the 2012 International Building Code with 2016 Connecticut State Building Code Amendments and the American Institute of Steel Construction (AISC) Manual of Steel Construction – Load Resistance Factor Design (LRFD)

The structural analysis was conducted using TNX Tower version 7.0.7.0 and used the following conditions for this tower review (following the TIA/EIA-222-G Standard):

- Structure Class 3 – (Essential Communications)
  - NOTE: ASCE 7 and CT State Building Code Applied Risk Category 4 for design wind loads (see below)
- Topographic Category 1 – (No Abrupt Changes in General Topography)
- Exposure Class C – (Open Terrain with scattered obstructions)
- Load Conditions:
  - Two load conditions were evaluated as shown which were compared to design stresses according to AISC and TIA/EIA-222-G Standard.

Basic Wind Speed:

- TIA-222-G:
  - Fairfield County (Wind Speed Range): V = 90 mph - 110 mph (3-second gust) [Annex of TIA-222-G 2006]
- IBC 2012 w/ 2016 CT State Building Code Amendment:
  - (2012) IBC Section 1609.1.1 – Determination of Wind Loads – Exception 5 "Designs using TIA-222" applies for determination of Design Wind Load obtained as "V.ult" are to be converted to "V.asd" when applying the TIA-222-G design Standard (under Section 1609.3) for Basic Wind Speed.
  - (2016) CT State Building Code Amendment to the IBC Section 1609.3 wind loads are obtained from Appendix N of the State Building Code.
    - V.asd = 101 mph (3-Second Gust) Wind Design Parameter for the Town of Southbury, Connecticut for Risk Category four (IV) for essential communications (Connecticut State Police).
    - NOTE: Due to the location of the Tower and Risk Category for the structure, the wind speed shall be increased to the TIA-222-G maximum listed speed (indicated above) to address additional wind effects within the "Special Wind Region" designated by ASCE and indicated within the "Wind-Borne Debris Region" per the CT State Building Code.

LOAD CONDITION 1 = 110 MPH (3-SECOND GUST) WIND LOAD (WITHOUT ICE) + TOWER DEAD LOAD
Load Condition 2 = 50 mph (3-second gust) Wind Load (with ice) + Ice Load + Tower Dead Load

Ice thickness used for this analysis is **0.75 inch** (assumed to start at the base of the tower) and is considered to increase in thickness with height. The initial ice thickness for design is referenced in the Annex of TIA-222-G and follows the same design criteria as the ASCE 7 Standard.

The load condition below implements the design requirements of the Connecticut State Police for the tower structures deflection limits with the allowable deflection limit of the combination of the tower's sway (deflection) and twist (rotation) under the TIA/EIA-222-F design Standard. This design limit required the design combined value of sway (deflection) and twist (rotation) to be under 0.75 degrees following the TIA/EIA-222-F design Standard.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS (cont.)

Load Condition 3 = 90 mph (fastest mile) Wind Load (with Ice) + Ice Load + Dead Load

Seismic event consideration factors/values for design:

- S.s = 0.226 (2016 CT State Building Code – Location Specific Value)
- S.1 = 0.067 (2016 CT State Building Code – Location Specific Value)
- Site Classification = "D"
- Seismic Design Category = "A" – (2012 International Building Code)
- F.a = 1.6 (Obtained from TIA-222-G Table 2-12 Considering above conditions)
- F.v = 2.4 (Obtained from TIA-222-G Table 2-13 Considering above conditions)

Strength Limit State Load Combinations (TIA-222-G Section 2.3.2):

The structural analysis herein has considered the following load combinations within the analysis:

1. ***1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.6 Wind load without ice***
2. 1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.0 Dead weight of ice due to factored ice thickness + 1.0 Concurrent wind load with factored ice thickness + 1.0 Load effects due to temperature
3. 1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.0 Earthquake Load

NOTE 1: The above **bolded** load combination is considered to create the governing design loads per the results of the analysis.

NOTE 2: The above "Dead Load Guy Assemblies" are not considered as part of the analysis and are considered as a value of zero.

NOTE 3: The "Load effects due to temperature" do not apply for structures that are self-supporting (from the TIA-222-G Standard)

4. FINDINGS AND EVALUATION

The combined axial and bending stresses on the tower structure were evaluated to compare with the strength design in accordance with AISC (LRFD). The results of an initial analysis indicated that the existing tower did not have enough capacity to support the proposed loading conditions. The tower structure requires modifications shown on SK-1 and SK-2. **Once the modification indicated on sheets SK-1 and SK-2 are performed, the modified structure and foundation are considered structurally adequate with the wind load classification specified with the existing and proposed antenna loading noted herein.**

The tower sway (deflection) is 0.4835 degrees and the tower twist (rotation) is 0.0718 degrees. These figures combined ARE within the Connecticut State Police specification of 0.75 degrees for sway (deflection) and twist (rotation).

Tower Base Reactions (TIA-222-G):

Description	Ultimate Reactions (Geotech 10/10/2002) (TIA-222-G)	Current (Factored) TIA-222-G	Stress (% capacity)	Pass/ Fail
Pier Compression (kips)	665	410	61.7	Pass
Pier Uplift (kips)	492	376	76.4	Pass
Overall Overturning (kip-ft)	---	9406	---	---
Overall Shear (kips)	---	97	---	---
Shear per Leg (kips)	---	56	---	---

Tower Component Stress vs. Capacity Summary:

Component / (Section No.)	Controlling Component/ Elevation	Stress (% capacity)	Pass/ Fail	Comments:
Tower Leg (T12)	ROHN 8 EHS / 20' – 30'	87.8	Pass	
Diagonal (T6)	ROHN 2.5 EH / 100' – 120'	96.4	Pass	
Horizontal (T11)	ROHN 2.5 STD / 30'-40'	83.8	Pass	
Top Girt (T12)	ROHN 2.5 STD / 20'-30'	77.6	Pass	
Redund Horz 1 Bracing (T13)	ROHN 1.5 STD / 0'-20'	32.3	Pass	
Redund Diag 1 Bracing (T13)	Pipe 1.5x0.200 / 0'-20'	69.7	Pass	
Redund Hip 1 Bracing (T13)	ROHN 2.5 STD / 0'-20'	0.1	Pass	
Inner Bracing (T5)	L2x2x1/8 / 120'-126.667'	5.6	Pass	
Tower Bolt	(6) 3/4" A325N Bolts / Leg Flange / 100'	89.1	Pass	
Anchor Bolts – Uplift & Shear Capacity (TIA-222-G – 4.9.9)	1" Dia. / Tension	78.9	Pass	(10) ASTM A 354 – Gr BC Bolts – 1" Diameter

4. FINDINGS AND EVALUATION (cont.)

Maximum Deformations – Proposed Condition

TIA-222-G Section 2.8.2 - Limit State Deformations

1. A rotation of 4 degrees about the vertical axis (twist) or any horizontal axis (sway) of the structure
2. A horizontal displacement (in feet) of 3% of the height of the structure.

Load Case Description	Current		Allowable	
	Sway (degree)	Displacement (Feet)	Sway (degree)	Displacement (Feet)
Service Wind Load	0.1152	0.2083	4.0	5.40

Tower Twist & Sway at Top (Connecticut State Police Requirements – TIA/EIA-222-F):

Description	Current	Total	Allowable
Tower Twist (degrees)	0.0718	0.5553	0.750
Tower Sway (degrees)	0.4835		

5. CONCLUSIONS

The results of an initial analysis indicated the existing tower structure did not have enough capacity for the proposed loading conditions above. The tower structure requires modifications shown on SK-1 and SK-2. **Once the modifications indicated on sheets SK-1 and SK-2 are performed, the modified structure is considered structurally adequate with the wind load specification specified above with the existing and proposed antenna loading herein.**

The results of the analysis indicate the modified tower's sway (deflection) is 0.4835 degrees and the modified tower's twist (rotation) is 0.0718 degrees. These figures combined are within the Connecticut State Police requirements of 0.75 degrees for combined twist (rotation) and sway (deflection) when applying the TIA/EIA-222-F design conditions.

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations are in good condition without defects and were properly constructed to support original design loads as specified in the original design documents.

AECOM is not responsible for any modifications completed prior to or hereafter in which AECOM is not or was not directly involved. Modifications include but are not limited to:

A. Adding antennas
B. Removing/replacing antennas
C. Adding coaxial cables

AECOM hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact AECOM. AECOM disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

Ongoing and Periodic Inspection and Maintenance:

After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA-222-G Section 14.2 for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. It is also recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions.

6. DRAWINGS AND DATA

REINFORCEMENT DRAWINGS SK-1 AND SK-2

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL COMPLY WITH THE CONNECTICUT STATE BUILDING AND LIFE SAFETY CODES, SUPPLEMENTS AND AMENDMENTS.
2. CONTRACTOR IS TO REVIEW ALL DRAWINGS AND NOTES IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUB-CONTRACTORS AND ALL RELATED PARTIES. THE SUB-CONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON DRAWINGS OR WRITTEN IN SPECIFICATIONS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION AND ELECTRICAL SUB-CONTRACTORS SHALL PAY FOR THEIR PERMITS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS ON SITE AT ALL TIMES AND ENSURE THE DISTRIBUTION OF NEW DRAWINGS TO SUB-CONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. CONTRACTOR SHALL FURNISH 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
7. INSTALLATION OF THIS WIRELESS COMMUNICATIONS EQUIPMENT SITE REQUIRES WORK IN THE IMMEDIATE VICINITY OF EXISTING OPERATING TELECOMMUNICATION SYSTEMS. THE CONTRACTOR SHALL PROVIDE AND COORDINATE THE METHODS OF PROTECTION WITH THE VARIOUS TELECOMMUNICATION CARRIERS AND THE TOWER OWNER. THERE SHALL BE NO INTERRUPTION OF OPERATION WITHOUT TIMELY COORDINATION WITH AND APPROVAL BY THE VARIOUS COMMUNICATIONS OPERATORS INCLUDING THE CONNECTICUT STATE POLICE.
8. THE REINFORCEMENT OF PORTIONS OF THIS TOWER STRUCTURE WILL AFFECT CRITICAL CONNECTICUT STATE POLICE ANTENNAS. NO MOVEMENT, ALTERATION, OR DISCONNECTION OF CONNECTICUT STATE POLICE ANTENNAS MAY OCCUR WITHOUT THE NOTIFICATION AND APPROVAL OF THE CONNECTICUT STATE POLICE. CONTACT THE NETWORK CONTROL CENTER AT 860-865-8008.
9. TOWER REINFORCING WORK AFFECTING CRITICAL CONNECTICUT STATE POLICE ANTENNAS MAY BE REQUIRED TO BE CONDUCTED AT TIMES AS DETERMINED BY THE REQUIREMENTS OF THE CONNECTICUT STATE POLICE.
10. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER MFR'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR ARCHITECT.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
12. SHOP DRAWINGS ARE REQUIRED. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS ON THE TOWER AND INCLUDE THE GATHERED INFORMATION ON THE SHOP DRAWINGS. NOTE ANY DISCREPANCIES ENCOUNTERED ON THE SHOP DRAWINGS. NO FABRICATION OR INSTALLATION OF STEEL SHALL OCCUR PRIOR TO THE RECEIPT AND APPROVAL OF SHOP DRAWINGS.
13. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ARCHITECT FOR REVIEW. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTAL TO THE ARCHITECT FOR REVIEW.
14. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURE AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.
15. CONTRACTOR TO CONTACT "CALL BEFORE YOU DIG" AT 1-800-922-4455 TO VERIFY AND IDENTIFY THE EXACT LOCATIONS OF ALL UNDERGROUND UTILITIES AND OBSTRUCTIONS IDENTIFIED PRIOR TO COMMENCING WORK IN THE CONTRACT AREA.
16. CONTRACTOR SHALL COMPLY WITH OWNER ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.
17. DIMENSIONS OF EXISTING TOWER ARE BASED ON MANUFACTURER'S DRAWINGS PREPARED BY ROHN INDUSTRIES. DATED FEBRUARY 1, 1991, AND ARE NOT GUARANTEED. CONTRACTOR SHALL TAKE FIELD DIMENSIONS AS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK AND SHALL ASSUME FULL RESPONSIBILITY FOR THEIR ACCURACY. WHEN SHOP DRAWINGS BASED ON FIELD MEASUREMENT ARE SUBMITTED FOR REVIEW, DIMENSIONS ARE PROVIDED FOR THE ENGINEER'S REFERENCE ONLY.
18. TOWER INVENTORY IS BASED ON INFORMATION OBTAINED FROM MOTOROLA/CONNECTICUT STATE POLICE DATED JUNE 22, 2016. TOWER MAPPING AND EXISTING INVENTORY OBTAINED FROM D&K NATIONWIDE COMMUNICATIONS, INC. DATED MARCH 18, 2016.
19. CONTRACTOR TO VERIFY REQUIRED CLEARANCES INCLUDING BUT NOT LIMITED TO EXISTING BUILDINGS, EQUIPMENT PADS AND SHELTERS PRIOR TO COMMENCING WORK.
20. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION. NO MEMBER OF THE TOWER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY. THE CONTRACTOR SHALL BE AWARE OF WEATHER AND WIND CONDITIONS AND NOT PERFORM MEMBER REPLACEMENT IN A WIND GUSTING MORE THAN 10 MPH.

STRUCTURAL NOTES

STRUCTURAL STEEL MATERIAL:

PIPE/TUBE LEG	ASTM A572-50
1/3 HSS MATERIAL	ASTM 500-Gr. B (42 ksi)
PLATES & ANGLES	ASTM, A36
BOLTS	ASTM, A325N, 325X, A490X

STRUCTURAL STEEL SHALL CONFORM TO ALL THE REQUIREMENTS OF THE ASTM SPECIFICATION, AS REFERENCED IN THE CODE.

UNLESS OTHERWISE NOTED, ALL STEEL WILL BE GALVANIZED IN ACCORDANCE WITH ASTM 123 AFTER FABRICATION. TOUCH UP ALL DAMAGED GALVANIZED STEEL WITH APPROVED COLD ZINC, "GALVANOX", "DRY GALV", "ZINC-IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. TOUCH-UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.

SHOP AND ERECTION DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL STEEL WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. SUBMIT 2 SETS OF PRINTS FOR THE ENGINEER REVIEW. REFER TO NOTE 12 ABOVE

MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

THE OMISSION OF ANY MATERIAL THAT WAS SHOWN ON THE CONTRACT DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR OF PROVIDING THE SAME.

CONNECTIONS / FIELD ASSEMBLY:

BOLTED CONNECTIONS: UNLESS OTHERWISE NOTED, ALL JOINTS ARE SLIP CRITICAL TYPE, REQUIRING 5/8", 3/4", 7/8" & 1" DIA. A325N BOLTS, A563 NUTS AND F436 WASHERS, ALL GALVANIZED. BEVELED WASHERS SHALL BE USED ON BEAM FLANGES HAVING A SLOPE GREATER THAN 1:20.

STRUCTURE IS DESIGNED TO BE LEVEL AND PLUMB, SELF-SUPPORTING AND STABLE AFTER WORK IS COMPLETED.

COMMENCEMENT OF WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

INSPECTIONS:

SPECIAL INSPECTIONS ARE REQUIRED PER THE CODE FOR STRUCTURAL STEEL WORK.

OWNER WILL SUPPLY THE SERVICES OF A SPECIAL INSPECTOR AND TESTING AGENTS AS REQUIRED. CONTRACTOR SHALL COORDINATE INSPECTIONS OF FABRICATOR'S AND ERECTOR'S WORK AND MATERIALS TO MEET THE REQUIREMENTS OF THE STATEMENT OF SPECIAL INSPECTIONS FOR THIS PROJECT.

COPIES OF TESTING AND INSPECTION REPORTS WILL BE PROVIDED TO THE OWNER, BUILDING OFFICIAL, ENGINEER OF RECORD AND CONTRACTOR.

STATE OF CONNECTICUT
RICHARD A. SAMBOR
No. 9057
LICENSED PROFESSIONAL ENGINEER

PROJECT NO. 60553537
Designed by: MCD
Drawn by: PD
Checked by: ICA
Approved by: RAS

AECOM
500 ENTERPRISE DRIVE
ROCKY HILL, CONNECTICUT
(860)-529-8882

verizon at&t

SITE ADDRESS: WESTPORT, CSP SITE #32
880 POST ROAD EAST
WESTPORT, CONNECTICUT

REV.	DATE:	DESCRIPTION
1	10/02/2017	REVIEW

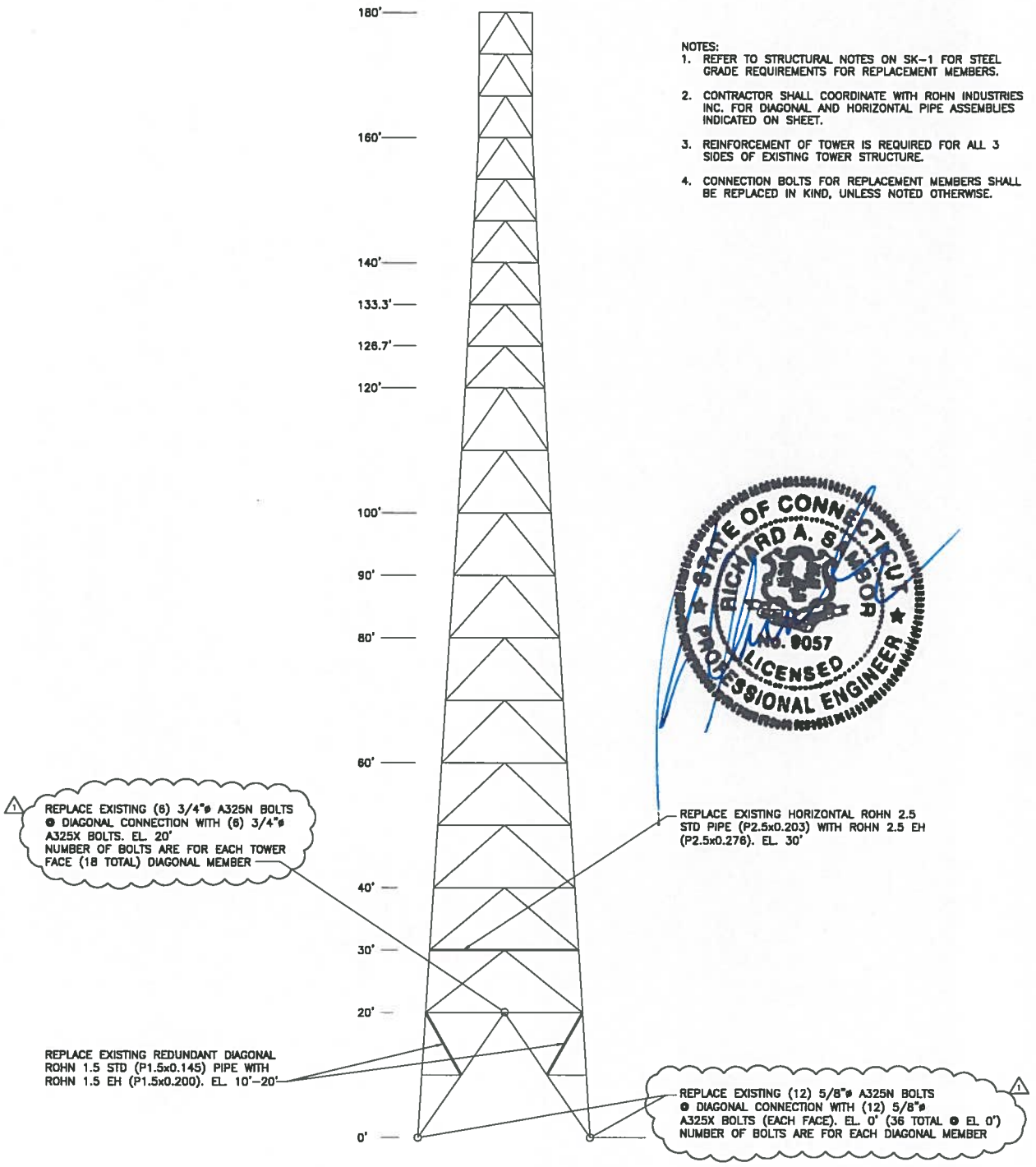
Scale: AS NOTED | Date: 09/20/17
Job No. | File No.

Dwg. No. SK-1
Dwg. 1 of 2

STRUCTURAL NOTES

SEE SHEET SK-1 FOR STRUCTURAL NOTES

NOTES:
1. REFER TO STRUCTURAL NOTES ON SK-1 FOR STEEL GRADE REQUIREMENTS FOR REPLACEMENT MEMBERS.
2. CONTRACTOR SHALL COORDINATE WITH ROHN INDUSTRIES INC. FOR DIAGONAL AND HORIZONTAL PIPE ASSEMBLIES INDICATED ON SHEET.
3. REINFORCEMENT OF TOWER IS REQUIRED FOR ALL 3 SIDES OF EXISTING TOWER STRUCTURE.
4. CONNECTION BOLTS FOR REPLACEMENT MEMBERS SHALL BE REPLACED IN KIND, UNLESS NOTED OTHERWISE.



STATE OF CONNECTICUT
RICHARD A. SIMBOO
No. 9057
LICENSED
PROFESSIONAL ENGINEER

1 / SK-2 TOWER ELEVATION
SCALE: 1" = 25'-0"

PROJECT NO. 60553537
Designed by: MCD
Drawn by: PD
Checked by: ICA
Approved by: RAS

AECOM
500 ENTERPRISE DRIVE
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WESTPORT, CONNECTICUT

REV.	DATE:	DESCRIPTION
1	10/02/2017	REVIEW

Scale: AS NOTED | Date: 09/20/17
Job No. | File No.

Dwg. No. SK-2
Dwg. 2 of 2

SEISMIC BASE SHEAR ANALYSIS

AECOM

Seismic (Vs) Base Shear Implementing ANSI/TIA–222-G, IBC 2012 & Connecticut State Building Code of 2016

Calculation of Seismic Base Shear Implementing ANSI/TIA-222-G, IBC 2012 & & CT State Building Code 2016.

Location: Westport, CT -Site Class "D"

$S_{DS} = \frac{2}{3} F_A S_S$, where $S_S = 0.226$ and $F_A = 1.6$ $S_{DS} = \frac{2}{3} F_A S_S = \frac{2}{3} * 1.6 * 0.226 = 0.241$

$S_{D1} = \frac{2}{3} F_V S_1$, where $S_1 = 0.067$ and $F_V = 2.4$ $S_{D1} = \frac{2}{3} F_V S_1 = \frac{2}{3} * 2.4 * 0.067 = 0.107$

TIA-222-G SECTION 2.7 EARTHQUAKE LOADS (PROCEDURES):

1. Importance Factor "I" (tables 2-3 TIA-222-G) = 1.5 (Structure Class 3)

ANSI/TIA-222-G 2.7.7.1 (TOTAL BASE SEISMIC SHEAR (Vs)

W=DL TOWER	= 32.102	Kips
W=Antennas/Mounts	= 11.36	Kips
W=Cables	= 7.275	Kips
	50.737 Kip	= WT Total = "W"

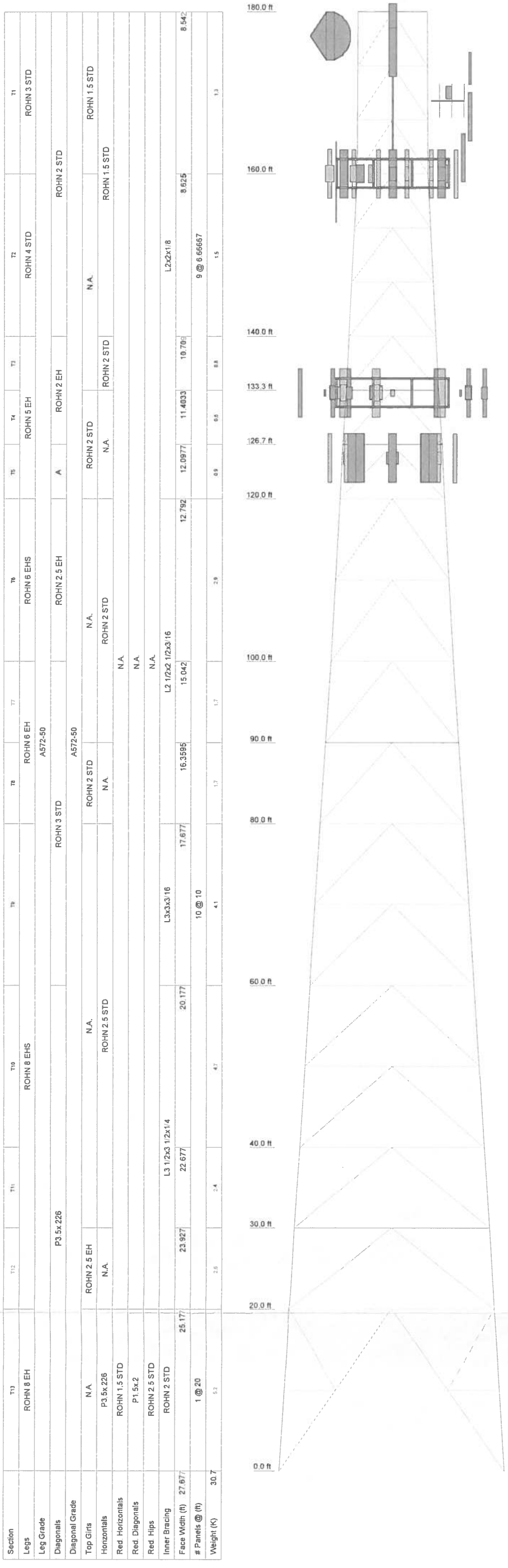
$$V_s = \frac{S_{DS} * W * I}{R} = \frac{0.241 * 50.737 kips * 1.5}{3.0} = 6.1138 \ kips,$$ where R = 3.0 for Lattice Tower

$$V_{S.min} = \frac{0.5 * S_{D1} * W * I}{R} = \frac{0.5 * 0.107 * 50.737 kips * 1.5}{3.0} = 1.3572 \ kips$$

*By visual inspection, the above "Base Shear" value when considering the following Load Combination is less that the base shear of wind on structure.

$1.2 * DL + 1.0\ E < 1.2\ DL + 1.6\ W$, (56.0 Kips), therefore seismic effect on structure Does NOT control Design.

TNX TOWER INPUT / OUTPUT SUMMARY



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
AP11-850/090/ADT w/Mount Pipe (DNK-54 / CSP-47)	178	Pirod 15' T-Frame Sector Mount (1) (ATI)	133
4'x4" Pipe Mount (DNK-52)	177	P65-16-XLH-RR (ATI)	133
PA6-65AC (DNK-52 / CSP-42)	177	P65-16-XLH-RR (ATI)	133
SE419-SWBPALDF Panel Antenna (Troop G SZ)	175	RRUS-11 (ATI)	133
2" Dia 10' Omni (DNK-48 / CSP-49)	171	HPA-65R-BUU-H6 Panel (ATI - Proposed)	133
4' Standoff (DNK-48 53)	171	RRUS-32 (ATI - Proposed)	133
2" Dia 10' Omni (DNK-53 / CSP-45)	171	RRUS-11 (ATI)	133
WPA-700102-4CF-EDIN-X w/ Mount Kit (Troop G TX)	170	DC6-48-60-18-8F (Squid) Suppressor (ATI)	133
432E-83I-01T TTA Unit (Troop G)	170	DC6-48-60-18-8F (Squid) Suppressor (ATI)	133
SE419-SWBPALDF(D00) (Troop G RX)	170	TT19-08BP111-001 TMA's (ATI)	133
6' Side-Arm (Troop G)	170	P65-16-XLH-RR (ATI)	133
3' Yagi (DNK-51 / CSP-1)	169	P65-16-XLH-RR (ATI)	133
AP11-850/090/ADT w/Mount Pipe (DNK-49 / CSP-46)	162	RRUS-11 (ATI)	133
5' Standoff (DNK-49 / CSP-46)	162	HPA-65R-BUU-H6 Panel (ATI - Proposed)	133
8'x2 1/2" Pipe Mount (DNK-50 / CSP-60)	162	RRUS-32 (ATI - Proposed)	133
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	RRUS-11 (ATI)	133
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	TT19-08BP111-001 TMA's (ATI)	133
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	P65-16-XLH-RR (ATI)	133
SBNHH-1D65B (Verizon - LTE_PCS)	160	P65-16-XLH-RR (ATI)	133
RH_2x60-07-L (700 MHz) (Verizon LTE)	160	RRUS-11 (ATI)	133
DB-T1-6Z-8AB-0Z Dist. Box (Verizon LTE)	160	HPA-65R-BUU-H6 Panel (ATI - Proposed)	133
B66A RRH Unit (Verizon PCS)	160	RRUS-32 (ATI - Proposed)	133
SBNHH-1D65B (Verizon AWS)	160	RRUS-11 (ATI)	133
RRH_2x60-AWS (Verizon AWS)	160	TT19-08BP111-001 TMA's (ATI)	133
DB-T1-6Z-8AB-0Z Dist. Box (Verizon AWS)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
BXA-70080-4CF-EDIN Panel (Verizon 850 MHz)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
SBNHH-1D65B (Verizon - LTE_PCS)	160	AIR21 B2A/B4P (T-Mobile)	125
RH_2x60-07-L (700 MHz) (Verizon LTE)	160	AIR21 B2A/B4P (T-Mobile)	125
B66A RRH Unit (Verizon PCS)	160	AIR21 B2A/B4P (T-Mobile)	125
SBNHH-1D65B (Verizon AWS)	160	LNX-6515DS-VTM (T-Mobile)	125
RRH_2x60-AWS (Verizon AWS)	160	LNX-6515DS-VTM (T-Mobile)	125
BXA-70080-4CF-EDIN Panel (Verizon 850 MHz)	160	AIR21 B2A/B4P (T-Mobile)	125
2" Dia 10' Omni (DNK-47 / CSP-48)	159	TMA (T-Mobile)	125
3' Side Arm (DNK-47 / CSP-48)	159	AIR21 B2A/B4P (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (ATI)	133	RRUS-11 (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (ATI)	133	RRUS-11 (T-Mobile)	125
		RRUS-11 (T-Mobile)	125
		TMA (T-Mobile)	125
		TMA (T-Mobile)	125
		LNX-6515DS-VTM (T-Mobile)	125
		LTF12=372 Sector Mount (1) (T-Mobile)	125
		AIR21 B2A/B4P (T-Mobile)	125
		GPS (DNK-1 / GPS)	60
		4' Standoff (DNK-1 / GPS)	60

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	ROHN 2 X-STR		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi			

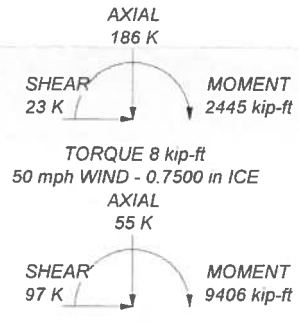
TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 110 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. P-Delta for analysis does not apply for this case - TIA-222-G Section 3.5
8. NOTE: The location of the tower lies within a "Special Wind Region" for Structure Class 3 / Risk Category 4, therefore the maximum applied wind speed will be used for TIA-222-G with Importance Factor applied (1.15)
9. TOWER RATING: 96.4%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 410 K
SHEAR: 56 K

UPLIFT: -376 K
SHEAR: 53 K



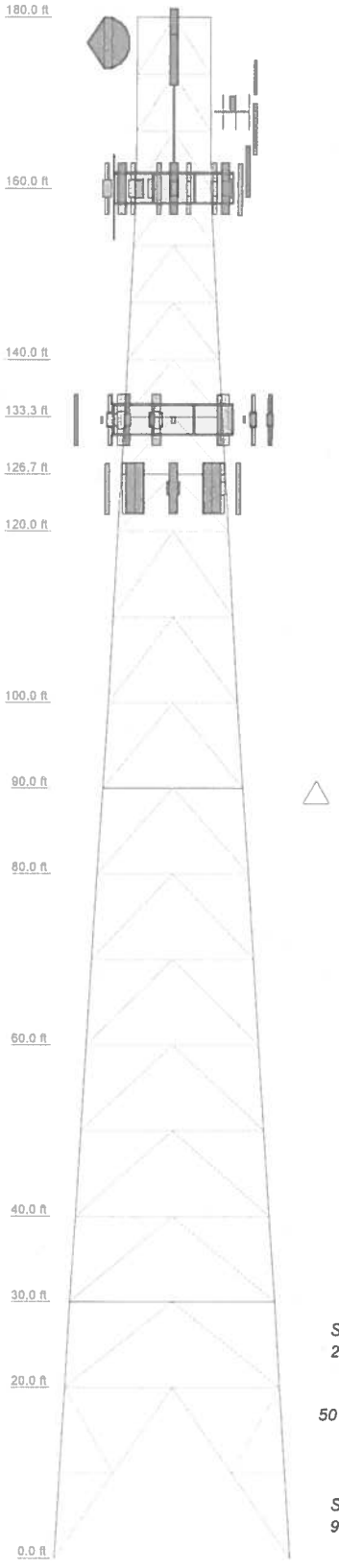
TORQUE 8 kip-ft
50 mph WIND - 0.7500 in ICE

TORQUE 45 kip-ft
REACTIONS - 110 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-529-8882
FAX: 860-529-3991

Job: 180' CSP Lattice Tower			
Project: Westport, Connecticut			
Client: (VZW) VZ5-202 / (AT&T) SAI-099	Drawn by: MCD	App'd:	
Code: TIA-222-G	Date: 09/20/17	Scale: NTS	
Path:		Dwg No. E-1	

Section	T13	T12	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	ROHN 8 EH			ROHN 8 EHS		ROHN 6 EH		ROHN 6 EHS	ROHN 5 EH			ROHN 4 STD	ROHN 3 STD
Leg Grade						A572-50							
Diagonals	P3.5x.226				ROHN 3 STD			ROHN 2.5 EH	A	ROHN 2 EH		ROHN 2 STD	
Diagonal Grade						A572-50							
Top Girts	N.A.	ROHN 2.5 EH		N.A.		ROHN 2 STD		N.A.	ROHN 2 STD			N.A.	ROHN 1.5 STD
Horizontals	P3.5x.226	N.A.		ROHN 2.5 STD		N.A.		ROHN 2 STD	N.A.		B	ROHN 1.5 STD	
Red. Horizontals	ROHN 1.5 STD					N.A.							
Red. Diagonals	P1.5x.2					N.A.							
Red. Hips	ROHN 2.5 STD					N.A.							
Inner Bracing	ROHN 2 STD			L3 1/2x3 1/2x1/4		L3x3x3/16		L2 1/2x2 1/2x3/16				L2x2x1/8	
Face Width (ft)	27.677	25.177		22.677	20.177	17.677	16.395	15.042	12.7917	11.4033	10.709	8.625	8.542
# Panels @ (ft)	1 @ 20			10 @ 10								9 @ 6.66667	
Weight (K)	30.7	5.2	2.6	2.4	4.7	4.1	1.7	2.9	0.9	0.8	0.8	1.5	1.2



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	ROHN 2 X-STR	B	ROHN 2 STD

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi			

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 110 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. P-Delta for analysis does not apply for this case - TIA-222-G Section 3.5
8. NOTE: The location of the tower lies within a "Special Wind Region" for Structure Class 3 / Risk Category 4, therefore the maximum applied wind speed will be used for TIA-222-G with Importance Factor applied (1.15)
9. TOWER RATING: 96.4%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 410 K
SHEAR: 56 K

UPLIFT: -376 K
SHEAR: 53 K

AXIAL 186 K
SHEAR 23 K *MOMENT 2445 kip-ft*

TORQUE 8 kip-ft
50 mph WIND - 0.7500 in ICE

AXIAL 55 K
SHEAR 97 K *MOMENT 9406 kip-ft*

TORQUE 45 kip-ft
REACTIONS - 110 mph WIND

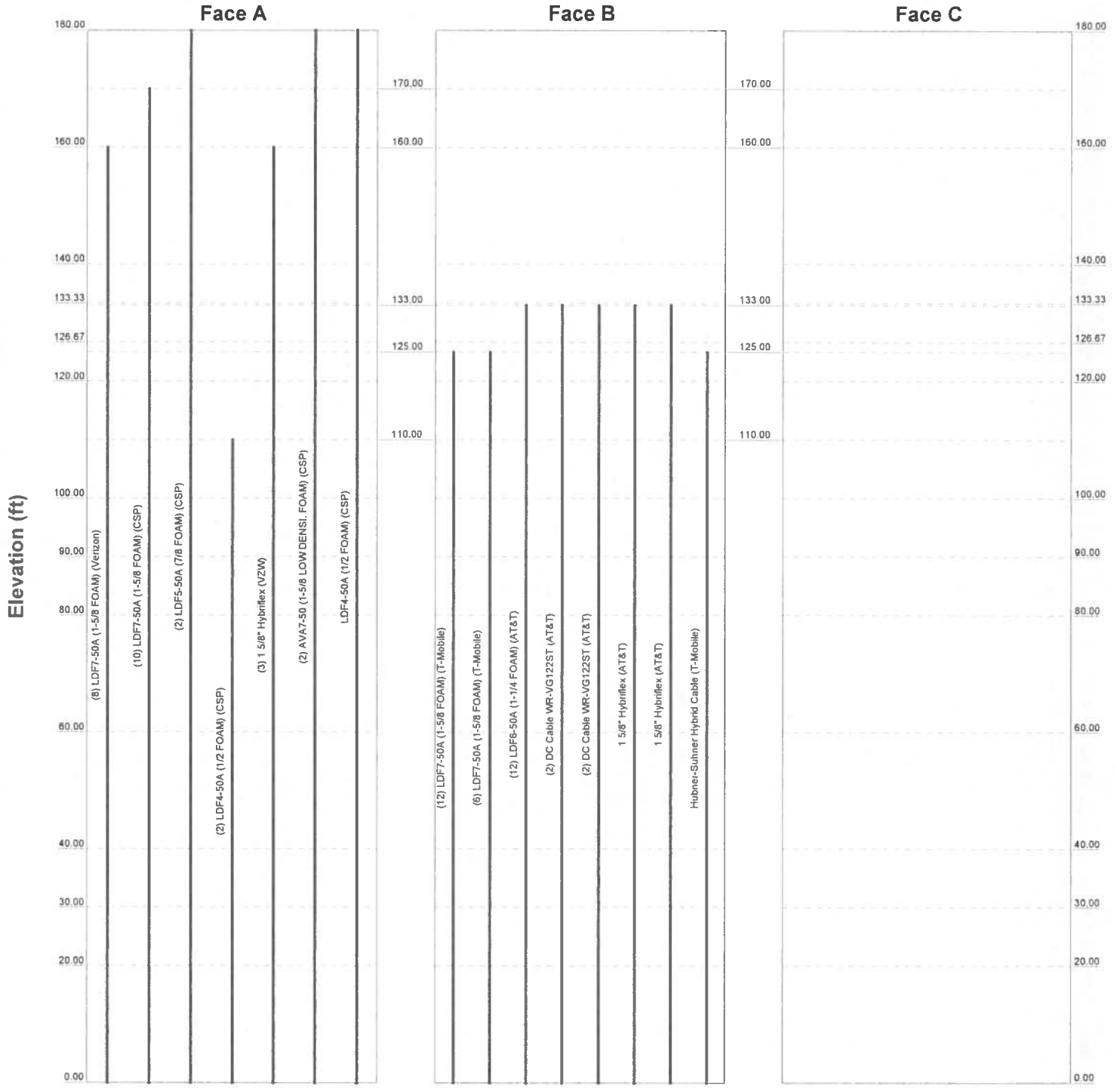
AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-529-8882
FAX: 860-529-3991

Job: 180' CSP Lattice Tower			
Project: Westport, Connecticut			
Client: (VZW) VZ5-202 / (AT&T) SAI-099	Drawn by: MCD	App'd:	
Code: TIA-222-G	Date: 09/20/17	Scale: NTS	
Path:		Dwg No: E-	

TNX TOWER FEEDLINE DISTRIBUTION

Feed Line Distribution Chart
0' - 180'

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



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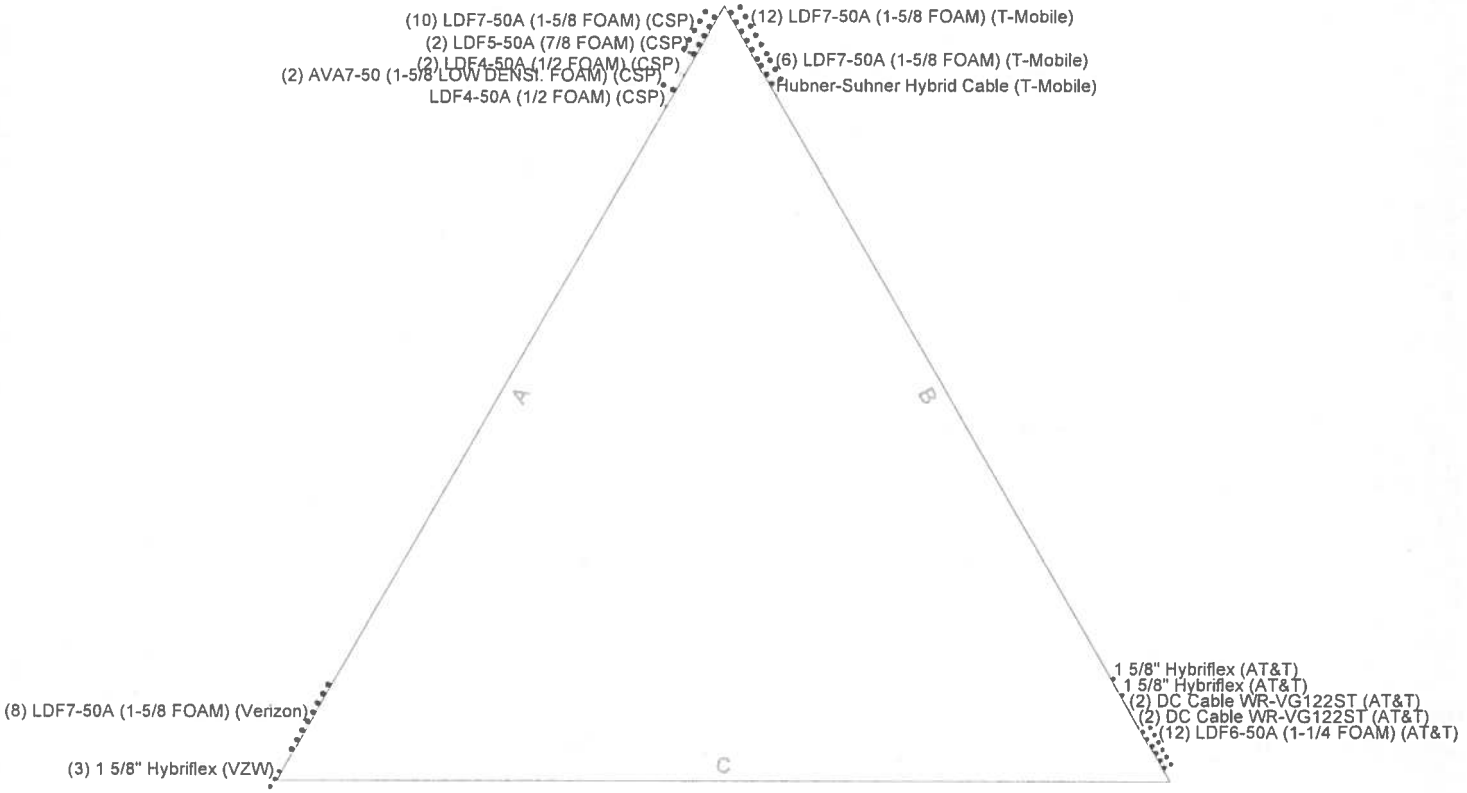
Job: *180' CSP Lattice Tower*			
Project: *Westport, Connecticut*			
Client: (VZW) VZ5-202 / (AT&T) SAI-099	Drawn by: MCD	App'd:	
Code: TIA-222-G	Date: 09/20/17	Scale: NT	
Path:		Dwg No: E-	

TNX TOWER FEEDLINE PLAN

Feed Line Plan

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



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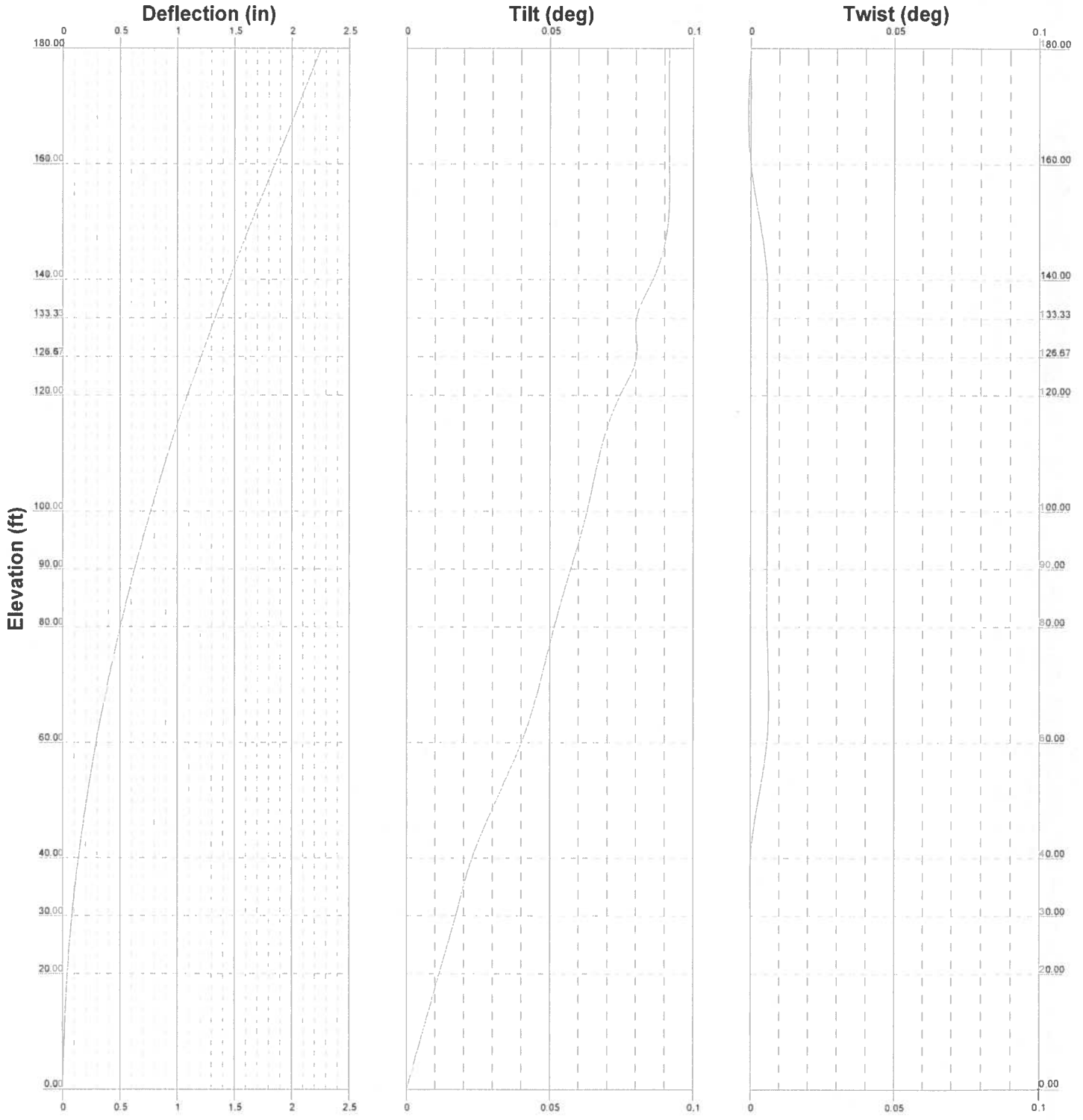
Code: TIA-222-G	Date: 09/20/17	Scale: NT	
Path:		Dwg No: E-	

TNX TOWER DEFLECTION, TILT, AND TWIST

TIA-222-G - Service - 60 mph

Maximum Values



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Rocky Hill, CT
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FAX: 860-529-3991

Job: ***180' CSP Lattice Tower***			
Project: ***Westport, Connecticut***			
Client: (VZW) VZ5-202 / (AT&T) SAI-099	Drawn by: MCD		App'd
Code: TIA-222-G	Date: 09/20/17		Scale: NT
Path:			Dwg No. E-

DETAILED OUTPUT

tnxTower	Job	Page
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	180' CSP Lattice Tower	1 of 69
	Project Westport, Connecticut	Date 15:28:53 09/20/17
	Client (VZW) VZ5-202 / (AT&T) SAI-099	Designed by MCD

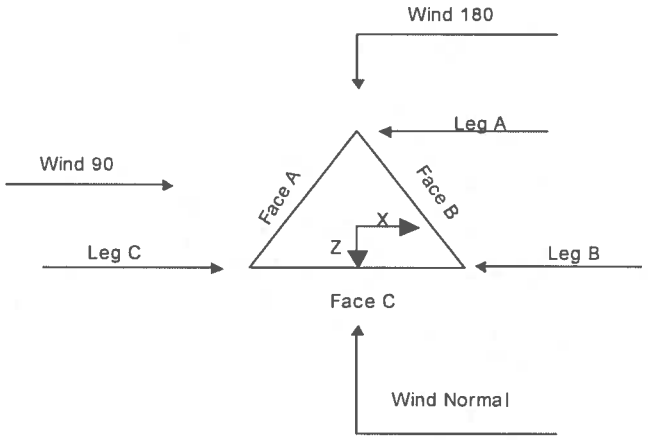
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 8.54 ft at the top and 27.68 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 110 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Deflections calculated using a wind speed of 60 mph.
P-Delta for analysis does not apply for this case - TIA-222-G Section 3.5.
NOTE: The location of the tower lies within a "Special Wind Region" for Structure Class 3 / Risk Category 4, therefore the maximum applied wind speed will be used for TIA-222-G with Importance Factor applied (1.15).
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Diagonals	Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	√ Use Clear Spans For Wind Area	√ SR Leg Bolts Resist Compression
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	√ All Leg Panels Have Same Allowable
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	Offset Girt At Foundation
Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt	Use TIA-222-G Bracing Resist. Exemption
√ Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Use TIA-222-G Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combination	Poles
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	√ Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
√ SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric		



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	180.00-160.00			8.54	1	20.00
T2	160.00-140.00			8.63	1	20.00
T3	140.00-133.33			10.71	1	6.67
T4	133.33-126.67			11.40	1	6.67
T5	126.67-120.00			12.10	1	6.67
T6	120.00-100.00			12.79	1	20.00
T7	100.00-90.00			15.04	1	10.00
T8	90.00-80.00			16.36	1	10.00
T9	80.00-60.00			17.68	1	20.00
T10	60.00-40.00			20.18	1	20.00
T11	40.00-30.00			22.68	1	10.00
T12	30.00-20.00			23.93	1	10.00
T13	20.00-0.00			25.18	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	180.00-160.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T2	160.00-140.00	6.67	K Brace Down	No	Yes	0.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T3	140.00-133.33	6.67	K Brace Down	No	Yes	0.0000	0.0000
T4	133.33-126.67	6.67	K Brace Down	No	Yes	0.0000	0.0000
T5	126.67-120.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T6	120.00-100.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T7	100.00-90.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T8	90.00-80.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T9	80.00-60.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T10	60.00-40.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T11	40.00-30.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T12	30.00-20.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T13	20.00-0.00	20.00	K1 Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T2 160.00-140.00	Pipe	ROHN 4 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T3 140.00-133.33	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T4 133.33-126.67	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T5 126.67-120.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)
T6 120.00-100.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)
T7 100.00-90.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T8 90.00-80.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T9 80.00-60.00	Pipe	ROHN 8 EHS	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T10 60.00-40.00	Pipe	ROHN 8 EHS	A572-50 (50 ksi)	Pipe	P3.5x.226	A572-50 (50 ksi)
T11 40.00-30.00	Pipe	ROHN 8 EHS	A572-50 (50 ksi)	Pipe	P3.5x.226	A572-50 (50 ksi)
T12 30.00-20.00	Pipe	ROHN 8 EHS	A572-50 (50 ksi)	Pipe	P3.5x.226	A572-50 (50 ksi)
T13 20.00-0.00	Pipe	ROHN 8 EH	A572-50 (50 ksi)	Pipe	P3.5x.226	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T4 133.33-126.67	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T5 126.67-120.00	Pipe	ROHN 2 STD	A572-50	Solid Round		A36

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T8 90.00-80.00	Pipe	ROHN 2 STD	(50 ksi) A572-50 (50 ksi)	Single Angle		(36 ksi) A36 (36 ksi)
T12 30.00-20.00	Pipe	ROHN 2.5 EH	(50 ksi) A572-50 (50 ksi)	Single Angle		(36 ksi) A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 180.00-160.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 1.5 STD	A572-50 (50 ksi)
T2 160.00-140.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 1.5 STD	A572-50 (50 ksi)
T3 140.00-133.33	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T4 133.33-126.67	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T5 126.67-120.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T6 120.00-100.00	None	Single Angle		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T7 100.00-90.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T8 90.00-80.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T9 80.00-60.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T10 60.00-40.00	None	Single Angle		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T11 40.00-30.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T12 30.00-20.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T13 20.00-0.00	None	Flat Bar		A36 (36 ksi)	Pipe	P3.5x.226	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 180.00-160.00	Solid Round		A36 (36 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)
T2 160.00-140.00	Solid Round		A36 (36 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)
T3 140.00-133.33	Solid Round		A36 (36 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T4 133.33-126.67	Solid Round		A36 (36 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)
T5 126.67-120.00	Solid Round		A36 (36 ksi)	Single Angle	L2x2x1/8	A36 (36 ksi)
T6 120.00-100.00	Single Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 100.00-90.00	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 90.00-80.00	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 80.00-60.00	Solid Round		A36 (36 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T10 60.00-40.00	Single Angle		A36 (36 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T11 40.00-30.00	Single Angle		A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T12 30.00-20.00	Single Angle		A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T13 20.00-0.00	Solid Round		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T13 20.00-0.00	A572-50 (50 ksi)	Horizontal (1)	Pipe	ROHN 1.5 STD	0.8
		Diagonal (1)	Pipe	P1.5x.2	0.8
		Hip (1)	Pipe	ROHN 2.5 STD	0.8

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 140.00-133.33	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 133.33-126.67	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 126.67-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 100.00-90.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T8 90.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T10 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T11 40.00-30.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T12 30.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T13 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz X Y	Sec Horiz X Y	Inner Brace X Y
T1 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-133.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 133.33-126.67	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 126.67-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 100.00-90.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 90.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T10 60.00-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T11 40.00-30.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T12 30.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T13 20.00-0.00	Yes	Yes	1	1 1	0.5 0.5	1 1	1 1	1 1	1 1	1 1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-160.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 160.00-140.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 140.00-133.33	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 133.33-126.67	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 126.67-120.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 120.00-100.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 100.00-90.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 90.00-80.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 80.00-60.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 60.00-40.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T11 40.00-30.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T12 30.00-20.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T13 20.00-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T1 180.00-160.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T2 160.00-140.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T3 140.00-133.33	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T4 133.33-126.67	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T5 126.67-120.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T6 120.00-100.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T7 100.00-90.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T8 90.00-80.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T9 80.00-60.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T10 60.00-40.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000

Tower Elevation	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T11 40.00-30.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T12 30.00-20.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T13 20.00-0.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T2 160.00-140.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T3 140.00-133.33	Flange	0.7500 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T4 133.33-126.67	Flange	0.7500 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T5 126.67-120.00	Flange	0.7500 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T6 120.00-100.00	Flange	0.7500 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T7 100.00-90.00	Flange	0.7500 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T8 90.00-80.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T9 80.00-60.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T10 60.00-40.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T11 40.00-30.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T12 30.00-20.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T13 20.00-0.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM) (Verizon)	A	No	Ar (CaAa)	160.00 - 0.00	0.0000	-0.42	8	8	1.9800	1.9800		0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM) (T-Mobile)	B	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.46	12	6	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (T-Mobile)	B	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.41	6	3	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (CSP)	A	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.46	10	5	1.9800	1.9800		0.82
LDF5-50A (7/8 FOAM) (CSP)	A	No	Ar (CaAa)	180.00 - 0.00	0.0000	0.435	2	1	1.0900	1.0900		0.33
LDF4-50A (1/2 FOAM) (CSP)	A	No	Ar (CaAa)	110.00 - 0.00	0.0000	0.41	2	1	0.6300	0.6300		0.15
1 5/8" Hybriflex (VZW)	A	No	Ar (CaAa)	160.00 - 0.00	0.0000	-0.5	3	3	1.6250	1.6250		0.21
LDF6-50A (1-1/4 FOAM) (AT&T)	B	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.46	12	6	1.5500	1.5500		0.66
DC Cable WR-VG122ST (AT&T)	B	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.43	2	2	0.4000	0.4000		0.25
DC Cable WR-VG122ST (AT&T)	B	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.41	2	2	0.4000	0.4000		0.25
1 5/8" Hybriflex (AT&T)	B	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.39	1	1	1.6250	1.6250		0.21
1 5/8" Hybriflex (AT&T)	B	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.37	1	1	1.6250	1.6250		0.21
Hubner-Suhner Hybrid Cable (T-Mobile)	B	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.385	1	1	0.7087	0.7087		0.48
AVA7-50 (1-5/8 LOW DENSI FOAM) (CSP)	A	No	Ar (CaAa)	180.00 - 0.00	0.0000	0.39	2	1	1.9800	1.9800		0.72
LDF4-50A (1/2 FOAM) (CSP)	A	No	Ar (CaAa)	180.00 - 0.00	0.0000	0.37	1	1	0.6300	0.6300		0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	0.000	0.000	33.340	0.000	0.13
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.000	0.000	94.570	0.000	0.35
		B	0.000	0.000	0.000	0.000	0.00

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
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	0.000	0.000	31.523	0.000	0.12
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	0.000	0.000	31.523	0.000	0.12
		B	0.000	0.000	14.852	0.000	0.06
		C	0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	0.000	0.000	31.523	0.000	0.12
		B	0.000	0.000	33.808	0.000	0.14
		C	0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	0.000	0.000	95.830	0.000	0.36
		B	0.000	0.000	119.597	0.000	0.49
		C	0.000	0.000	0.000	0.000	0.00
T7	100.00-90.00	A	0.000	0.000	48.545	0.000	0.18
		B	0.000	0.000	59.799	0.000	0.25
		C	0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	0.000	0.000	48.545	0.000	0.18
		B	0.000	0.000	59.799	0.000	0.25
		C	0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	0.000	0.000	97.090	0.000	0.36
		B	0.000	0.000	119.597	0.000	0.49
		C	0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	0.000	0.000	97.090	0.000	0.36
		B	0.000	0.000	119.597	0.000	0.49
		C	0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	0.000	0.000	48.545	0.000	0.18
		B	0.000	0.000	59.799	0.000	0.25
		C	0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	0.000	0.000	48.545	0.000	0.18
		B	0.000	0.000	59.799	0.000	0.25
		C	0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	0.000	0.000	97.090	0.000	0.36
		B	0.000	0.000	119.597	0.000	0.49
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	2.209	0.000	0.000	94.841	0.000	1.83
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	2.182	0.000	0.000	246.078	0.000	4.66
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	2.161	0.000	0.000	81.777	0.000	1.54
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	2.151	0.000	0.000	81.644	0.000	1.53
		B		0.000	0.000	37.292	0.000	0.68
		C		0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	2.139	0.000	0.000	81.505	0.000	1.53
		B		0.000	0.000	70.057	0.000	1.49
		C		0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	2.115	0.000	0.000	253.383	0.000	4.67
		B		0.000	0.000	239.961	0.000	5.19
		C		0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T7	100.00-90.00	A	2.084	0.000	0.000	130.899	0.000	2.38
		B		0.000	0.000	119.271	0.000	2.57
		C		0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	2.061	0.000	0.000	130.392	0.000	2.35
		B		0.000	0.000	118.740	0.000	2.54
		C		0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	2.021	0.000	0.000	259.044	0.000	4.61
		B		0.000	0.000	235.654	0.000	5.01
		C		0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	1.955	0.000	0.000	256.108	0.000	4.47
		B		0.000	0.000	232.574	0.000	4.89
		C		0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	1.886	0.000	0.000	126.552	0.000	2.16
		B		0.000	0.000	114.711	0.000	2.38
		C		0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	1.824	0.000	0.000	125.185	0.000	2.10
		B		0.000	0.000	113.275	0.000	2.32
		C		0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	1.664	0.000	0.000	243.390	0.000	3.87
		B		0.000	0.000	219.210	0.000	4.35
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-160.00	-0.7265	-7.1715	-0.7073	-6.0763
T2	160.00-140.00	-4.9523	-4.2662	-4.2068	-2.7931
T3	140.00-133.33	-5.3186	-4.5937	-4.6439	-3.0700
T4	133.33-126.67	-0.0778	-1.6493	-1.2390	-1.3007
T5	126.67-120.00	0.5025	-5.8031	-0.7557	-3.4567
T6	120.00-100.00	0.6223	-7.5235	-0.7624	-4.7404
T7	100.00-90.00	0.6639	-8.3732	-0.8795	-5.4954
T8	90.00-80.00	0.7085	-9.0131	-0.9573	-5.9108
T9	80.00-60.00	0.7450	-9.5780	-1.0556	-6.3935
T10	60.00-40.00	0.8151	-10.5969	-1.2093	-7.1026
T11	40.00-30.00	0.8719	-11.4135	-1.3418	-7.6454
T12	30.00-20.00	0.9092	-11.9498	-1.4428	-8.0021
T13	20.00-0.00	0.9836	-12.9965	-1.6737	-8.6770

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	4	LDF7-50A (1-5/8 FOAM)	160.00 - 170.00	0.6000	0.6000
T1	5	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T1	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	160.00 - 180.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	15	LDF4-50A (1/2 FOAM)	160.00 - 180.00	0.6000	0.6000
T2	1	LDF7-50A (1-5/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T2	4	LDF7-50A (1-5/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T2	5	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T2	7	1 5/8" Hybriflex	140.00 - 160.00	0.6000	0.6000
T2	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	140.00 - 160.00	0.6000	0.6000
T2	15	LDF4-50A (1/2 FOAM)	140.00 - 160.00	0.6000	0.6000
T3	1	LDF7-50A (1-5/8 FOAM)	133.33 - 140.00	0.6000	0.6000
T3	4	LDF7-50A (1-5/8 FOAM)	133.33 - 140.00	0.6000	0.6000
T3	5	LDF5-50A (7/8 FOAM)	133.33 - 140.00	0.6000	0.6000
T3	7	1 5/8" Hybriflex	133.33 - 140.00	0.6000	0.6000
T3	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	133.33 - 140.00	0.6000	0.6000
T3	15	LDF4-50A (1/2 FOAM)	133.33 - 140.00	0.6000	0.6000
T4	1	LDF7-50A (1-5/8 FOAM)	126.67 - 133.33	0.6000	0.6000
T4	4	LDF7-50A (1-5/8 FOAM)	126.67 - 133.33	0.6000	0.6000
T4	5	LDF5-50A (7/8 FOAM)	126.67 - 133.33	0.6000	0.6000
T4	7	1 5/8" Hybriflex	126.67 - 133.33	0.6000	0.6000
T4	8	LDF6-50A (1-1/4 FOAM)	126.67 - 133.00	0.6000	0.6000
T4	9	DC Cable WR-VG122ST	126.67 - 133.00	0.6000	0.6000
T4	10	DC Cable WR-VG122ST	126.67 - 133.00	0.6000	0.6000
T4	11	1 5/8" Hybriflex	126.67 - 133.00	0.6000	0.6000
T4	12	1 5/8" Hybriflex	126.67 - 133.00	0.6000	0.6000
T4	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	126.67 - 133.33	0.6000	0.6000
T4	15	LDF4-50A (1/2 FOAM)	126.67 - 133.33	0.6000	0.6000
T5	1	LDF7-50A (1-5/8 FOAM)	120.00 - 126.67	0.6000	0.6000
T5	2	LDF7-50A (1-5/8 FOAM)	120.00 - 125.00	0.6000	0.6000
T5	3	LDF7-50A (1-5/8 FOAM)	120.00 - 125.00	0.6000	0.6000
T5	4	LDF7-50A (1-5/8 FOAM)	120.00 - 126.67	0.6000	0.6000
T5	5	LDF5-50A (7/8 FOAM)	120.00 - 126.67	0.6000	0.6000
T5	7	1 5/8" Hybriflex	120.00 - 126.67	0.6000	0.6000
T5	8	LDF6-50A (1-1/4 FOAM)	120.00 - 126.67	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	9	DC Cable WR-VG122ST	120.00 - 126.67	0.6000	0.6000
T5	10	DC Cable WR-VG122ST	120.00 - 126.67	0.6000	0.6000
T5	11	1 5/8" Hybriflex	120.00 - 126.67	0.6000	0.6000
T5	12	1 5/8" Hybriflex	120.00 - 126.67	0.6000	0.6000
T5	13	Hubner-Suhner Hybrid Cable	120.00 - 125.00	0.6000	0.6000
T5	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	120.00 - 126.67	0.6000	0.6000
T5	15	LDF4-50A (1/2 FOAM)	120.00 - 126.67	0.6000	0.6000
T6	1	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	2	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	3	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	4	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	5	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	6	LDF4-50A (1/2 FOAM)	100.00 - 110.00	0.6000	0.6000
T6	7	1 5/8" Hybriflex	100.00 - 120.00	0.6000	0.6000
T6	8	LDF6-50A (1-1/4 FOAM)	100.00 - 120.00	0.6000	0.6000
T6	9	DC Cable WR-VG122ST	100.00 - 120.00	0.6000	0.6000
T6	10	DC Cable WR-VG122ST	100.00 - 120.00	0.6000	0.6000
T6	11	1 5/8" Hybriflex	100.00 - 120.00	0.6000	0.6000
T6	12	1 5/8" Hybriflex	100.00 - 120.00	0.6000	0.6000
T6	13	Hubner-Suhner Hybrid Cable	100.00 - 120.00	0.6000	0.6000
T6	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 120.00	0.6000	0.6000
T6	15	LDF4-50A (1/2 FOAM)	100.00 - 120.00	0.6000	0.6000
T7	1	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	2	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	3	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	4	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	5	LDF5-50A (7/8 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	6	LDF4-50A (1/2 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	7	1 5/8" Hybriflex	90.00 - 100.00	0.6000	0.6000
T7	8	LDF6-50A (1-1/4 FOAM)	90.00 - 100.00	0.6000	0.6000
T7	9	DC Cable WR-VG122ST	90.00 - 100.00	0.6000	0.6000
T7	10	DC Cable WR-VG122ST	90.00 - 100.00	0.6000	0.6000
T7	11	1 5/8" Hybriflex	90.00 - 100.00	0.6000	0.6000
T7	12	1 5/8" Hybriflex	90.00 - 100.00	0.6000	0.6000
T7	13	Hubner-Suhner Hybrid Cable	90.00 - 100.00	0.6000	0.6000
T7	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	90.00 - 100.00	0.6000	0.6000
T7	15	LDF4-50A (1/2 FOAM)	90.00 - 100.00	0.6000	0.6000
T8	1	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	2	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T8	3	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	4	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	5	LDF5-50A (7/8 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	6	LDF4-50A (1/2 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	7	1 5/8" Hybriflex	80.00 - 90.00	0.6000	0.6000
T8	8	LDF6-50A (1-1/4 FOAM)	80.00 - 90.00	0.6000	0.6000
T8	9	DC Cable WR-VG122ST	80.00 - 90.00	0.6000	0.6000
T8	10	DC Cable WR-VG122ST	80.00 - 90.00	0.6000	0.6000
T8	11	1 5/8" Hybriflex	80.00 - 90.00	0.6000	0.6000
T8	12	1 5/8" Hybriflex	80.00 - 90.00	0.6000	0.6000
T8	13	Hubner-Suhner Hybrid Cable	80.00 - 90.00	0.6000	0.6000
T8	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	80.00 - 90.00	0.6000	0.6000
T8	15	LDF4-50A (1/2 FOAM)	80.00 - 90.00	0.6000	0.6000
T9	1	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	2	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	3	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	4	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	5	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	6	LDF4-50A (1/2 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	7	1 5/8" Hybriflex	60.00 - 80.00	0.6000	0.6000
T9	8	LDF6-50A (1-1/4 FOAM)	60.00 - 80.00	0.6000	0.6000
T9	9	DC Cable WR-VG122ST	60.00 - 80.00	0.6000	0.6000
T9	10	DC Cable WR-VG122ST	60.00 - 80.00	0.6000	0.6000
T9	11	1 5/8" Hybriflex	60.00 - 80.00	0.6000	0.6000
T9	12	1 5/8" Hybriflex	60.00 - 80.00	0.6000	0.6000
T9	13	Hubner-Suhner Hybrid Cable	60.00 - 80.00	0.6000	0.6000
T9	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	60.00 - 80.00	0.6000	0.6000
T9	15	LDF4-50A (1/2 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	1	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	2	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	3	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	4	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	5	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	6	LDF4-50A (1/2 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	7	1 5/8" Hybriflex	40.00 - 60.00	0.6000	0.6000
T10	8	LDF6-50A (1-1/4 FOAM)	40.00 - 60.00	0.6000	0.6000
T10	9	DC Cable WR-VG122ST	40.00 - 60.00	0.6000	0.6000
T10	10	DC Cable WR-VG122ST	40.00 - 60.00	0.6000	0.6000
T10	11	1 5/8" Hybriflex	40.00 - 60.00	0.6000	0.6000
T10	12	1 5/8" Hybriflex	40.00 - 60.00	0.6000	0.6000
T10	13	Hubner-Suhner Hybrid Cable	40.00 - 60.00	0.6000	0.6000
T10	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	40.00 - 60.00	0.6000	0.6000
T10	15	LDF4-50A (1/2 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	1	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	2	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	3	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	4	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	5	LDF5-50A (7/8 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	6	LDF4-50A (1/2 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	7	1 5/8" Hybriflex	30.00 - 40.00	0.6000	0.6000
T11	8	LDF6-50A (1-1/4 FOAM)	30.00 - 40.00	0.6000	0.6000
T11	9	DC Cable WR-VG122ST	30.00 - 40.00	0.6000	0.6000
T11	10	DC Cable WR-VG122ST	30.00 - 40.00	0.6000	0.6000
T11	11	1 5/8" Hybriflex	30.00 - 40.00	0.6000	0.6000
T11	12	1 5/8" Hybriflex	30.00 - 40.00	0.6000	0.6000
T11	13	Hubner-Suhner Hybrid Cable	30.00 - 40.00	0.6000	0.6000
T11	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	30.00 - 40.00	0.6000	0.6000
T11	15	LDF4-50A (1/2 FOAM)	30.00 - 40.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev	K_a No Ice	K_a Ice
T12	1	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	2	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	3	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	4	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	5	LDF5-50A (7/8 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	6	LDF4-50A (1/2 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	7	1 5/8" Hybriflex	20.00 - 30.00	0.6000	0.6000
T12	8	LDF6-50A (1-1/4 FOAM)	20.00 - 30.00	0.6000	0.6000
T12	9	DC Cable WR-VG122ST	20.00 - 30.00	0.6000	0.6000
T12	10	DC Cable WR-VG122ST	20.00 - 30.00	0.6000	0.6000
T12	11	1 5/8" Hybriflex	20.00 - 30.00	0.6000	0.6000
T12	12	1 5/8" Hybriflex	20.00 - 30.00	0.6000	0.6000
T12	13	Hubner-Suhner Hybrid Cable	20.00 - 30.00	0.6000	0.6000
T12	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	20.00 - 30.00	0.6000	0.6000
T12	15	LDF4-50A (1/2 FOAM)	20.00 - 30.00	0.6000	0.6000
T13	1	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	2	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	3	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	4	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	5	LDF5-50A (7/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	6	LDF4-50A (1/2 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	7	1 5/8" Hybriflex	0.00 - 20.00	0.6000	0.6000
T13	8	LDF6-50A (1-1/4 FOAM)	0.00 - 20.00	0.6000	0.6000
T13	9	DC Cable WR-VG122ST	0.00 - 20.00	0.6000	0.6000
T13	10	DC Cable WR-VG122ST	0.00 - 20.00	0.6000	0.6000
T13	11	1 5/8" Hybriflex	0.00 - 20.00	0.6000	0.6000
T13	12	1 5/8" Hybriflex	0.00 - 20.00	0.6000	0.6000
T13	13	Hubner-Suhner Hybrid Cable	0.00 - 20.00	0.6000	0.6000
T13	14	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 20.00	0.6000	0.6000
T13	15	LDF4-50A (1/2 FOAM)	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
AIR21 B2A/B4P (T-Mobile)	A	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice	6.05 6.42 6.80	5.54 6.19 6.85	0.11 0.17 0.23
AIR21 B2A/B4P (T-Mobile)	B	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice	6.05 6.42 6.80	5.54 6.19 6.85	0.11 0.17 0.23
AIR21 B2A/B4P (T-Mobile)	C	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice	6.05 6.42 6.80	5.54 6.19 6.85	0.11 0.17 0.23
TMA (T-Mobile)	A	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice	1.06 1.21 1.37	0.45 0.57 0.71	0.02 0.03 0.03
TMA	B	From Face	3.00	0.0000	125.00	No Ice	1.06	0.45	0.02

tnxTower	Job: 180' CSP Lattice Tower	Page: 16 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project: Westport, Connecticut	Date: 15:28:53 09/20/17
	Client: (VZW) VZ5-202 / (AT&T) SAI-099	Designed by: MCD

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
(T-Mobile)			0.00				1/2" Ice	1.21	0.57	0.03
			0.00				1" Ice	1.37	0.71	0.03
TMA	C	From Face	3.00		0.0000	125.00	No Ice	1.06	0.45	0.02
(T-Mobile)			0.00				1/2" Ice	1.21	0.57	0.03
			0.00				1" Ice	1.37	0.71	0.03
LNX-6515DS-VTM	A	From Face	3.00		0.0000	125.00	No Ice	11.39	9.92	0.09
(T-Mobile)			0.00				1/2" Ice	12.01	11.38	0.18
			0.00				1" Ice	12.63	12.46	0.28
LNX-6515DS-VTM	B	From Face	3.00		0.0000	125.00	No Ice	11.39	9.92	0.09
(T-Mobile)			0.00				1/2" Ice	12.01	11.38	0.18
			0.00				1" Ice	12.63	12.46	0.28
LNX-6515DS-VTM	C	From Face	3.00		0.0000	125.00	No Ice	11.39	9.92	0.09
(T-Mobile)			0.00				1/2" Ice	12.01	11.38	0.18
			0.00				1" Ice	12.63	12.46	0.28
AIR21 B2A/B4P	A	From Face	3.00		0.0000	125.00	No Ice	6.05	5.54	0.11
(T-Mobile)			4.00				1/2" Ice	6.42	6.19	0.17
			0.00				1" Ice	6.80	6.85	0.23
AIR21 B2A/B4P	B	From Face	3.00		0.0000	125.00	No Ice	6.05	5.54	0.11
(T-Mobile)			4.00				1/2" Ice	6.42	6.19	0.17
			0.00				1" Ice	6.80	6.85	0.23
AIR21 B2A/B4P	C	From Face	3.00		0.0000	125.00	No Ice	6.05	5.54	0.11
(T-Mobile)			4.00				1/2" Ice	6.42	6.19	0.17
			0.00				1" Ice	6.80	6.85	0.23
LTF12=372 Sector Mount (1)	A	None			0.0000	125.00	No Ice	13.60	13.60	0.47
(T-Mobile)							1/2" Ice	18.40	18.40	0.60
							1" Ice	23.20	23.20	0.73
LTF12=372 Sector Mount (1)	B	None			0.0000	125.00	No Ice	13.60	13.60	0.47
(T-Mobile)							1/2" Ice	18.40	18.40	0.60
							1" Ice	23.20	23.20	0.73
LTF12=372 Sector Mount (1)	C	None			0.0000	125.00	No Ice	13.60	13.60	0.47
(T-Mobile)							1/2" Ice	18.40	18.40	0.60
							1" Ice	23.20	23.20	0.73
RRUS-11	A	From Face	3.00		0.0000	125.00	No Ice	2.57	1.07	0.05
(T-Mobile)			0.00				1/2" Ice	2.76	1.21	0.07
			0.00				1" Ice	2.97	1.36	0.09
RRUS-11	B	From Face	3.00		0.0000	125.00	No Ice	2.57	1.07	0.05
(T-Mobile)			0.00				1/2" Ice	2.76	1.21	0.07
			0.00				1" Ice	2.97	1.36	0.09
RRUS-11	C	From Face	3.00		0.0000	125.00	No Ice	2.57	1.07	0.05
(T-Mobile)			0.00				1/2" Ice	2.76	1.21	0.07
			0.00				1" Ice	2.97	1.36	0.09
GPS	C	From Face	1.00		0.0000	60.00	No Ice	0.00	0.00	0.00
(DNK-1 / GPS)			0.00				1/2" Ice	0.00	0.00	0.00
			0.00				1" Ice	0.00	0.00	0.00
4' Standoff	C	None			0.0000	60.00	No Ice	3.42	3.42	0.11
(DNK-1 / GPS)							1/2" Ice	3.67	3.67	0.15
							1" Ice	3.92	3.92	0.19
2" Dia 10' Omni	C	From Leg	3.00		0.0000	159.00	No Ice	2.00	2.00	0.01
(DNK-47 / CSP-48)			0.00				1/2" Ice	3.03	3.03	0.03
			0.00				1" Ice	4.06	4.06	0.04
3' Side Arm	C	None			0.0000	159.00	No Ice	2.72	2.72	0.05
(DNK-47 / CSP-48)							1/2" Ice	4.91	4.91	0.09
							1" Ice	7.10	7.10	0.13
2" Dia 10' Omni	A	From Leg	4.00		0.0000	171.00	No Ice	2.00	2.00	0.01
(DNK-48 / CSP-49)			0.00				1/2" Ice	3.03	3.03	0.03
			-3.00				1" Ice	4.06	4.06	0.04
4' Standoff	A	None			0.0000	171.00	No Ice	3.42	3.42	0.11

tnxTower	Job: 180' CSP Lattice Tower	Page: 17 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project: Westport, Connecticut	Date: 15:28:53 09/20/17
	Client: (VZW) VZ5-202 / (AT&T) SAI-099	Designed by: MCD

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert ft / ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(DNK-48,53)						1/2" Ice	3.67	3.67	0.15
						1" Ice	3.92	3.92	0.19
2" Dia 10' Omni	A	From Leg	4.00	0.0000	171.00	No Ice	2.00	2.00	0.01
(DNK-53 / CSP-45)			0.00			1/2" Ice	3.03	3.03	0.03
			3.00			1" Ice	4.06	4.06	0.04
AP11-850/090/ADT w/Mount Pipe	B	From Leg	5.00	0.0000	162.00	No Ice	5.31	3.92	0.04
			0.00			1/2" Ice	5.93	4.96	0.08
(DNK-49 / CSP-46)			0.00			1" Ice	6.44	5.72	0.14
5' Standoff	B	None		0.0000	162.00	No Ice	3.42	3.42	0.11
(DNK-49 / CSP-46)						1/2" Ice	3.67	3.67	0.15
						1" Ice	3.92	3.92	0.19
8'x2 1/2" Pipe Mount	C	None		0.0000	162.00	No Ice	2.20	2.20	0.04
(DNK-50 / CSP-60)						1/2" Ice	3.13	3.13	0.06
						1" Ice	3.62	3.62	0.08
3' Yagi	B	From Leg	0.50	0.0000	169.00	No Ice	2.08	2.08	0.03
(DNK-51 / CSP-1)			0.00			1/2" Ice	3.79	3.79	0.05
			0.00			1" Ice	5.52	5.52	0.09
4'x4" Pipe Mount	C	None		0.0000	177.00	No Ice	1.00	1.00	0.04
(DNK-52)						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
AP11-850/090/ADT w/Mount Pipe	B	None		0.0000	178.00	No Ice	5.31	3.92	0.04
						1/2" Ice	5.93	4.96	0.08
(DNK-54 / CSP-47)						1" Ice	6.44	5.72	0.14
WPA-700102-4CF-EDIN-X w/ Mount Kit	B	From Leg	6.00	0.0000	170.00	No Ice	3.58	3.66	0.04
			0.00			1/2" Ice	3.88	4.21	0.08
(Troop G TX)			3.00			1" Ice	4.20	4.77	0.12
432E-83I-01T TTA Unit	B	From Leg	3.00	0.0000	170.00	No Ice	2.85	0.97	0.03
(Troop G)			0.00			1/2" Ice	3.06	1.11	0.04
			0.00			1" Ice	3.28	1.26	0.07
SE419-SWBPALDF(D00)	B	From Leg	6.00	0.0000	170.00	No Ice	25.03	9.80	0.05
(Troop G RX)			0.00			1/2" Ice	25.87	10.44	0.18
			-3.00			1" Ice	26.71	11.09	0.31
SE419-SWBPALDF Panel Antenna	B	None		0.0000	175.00	No Ice	11.64	7.88	0.05
						1/2" Ice	12.29	8.51	0.11
(Troop G SZ)						1" Ice	12.95	9.14	0.19
6' Side-Arm	B	None		0.0000	170.00	No Ice	10.60	10.60	0.14
(Troop G)						1/2" Ice	15.40	15.40	0.21
						1" Ice	20.20	20.20	0.28
*** VZW Antennas 12/20/2016									
Pirod 15' T-Frame Sector Mount (1)	A	None		0.0000	160.00	No Ice	15.00	15.00	0.50
						1/2" Ice	20.60	20.60	0.65
(Verizon)						1" Ice	26.20	26.20	0.80
Pirod 15' T-Frame Sector Mount (1)	B	None		0.0000	160.00	No Ice	15.00	15.00	0.50
						1/2" Ice	20.60	20.60	0.65
(Verizon)						1" Ice	26.20	26.20	0.80
Pirod 15' T-Frame Sector Mount (1)	C	None		0.0000	160.00	No Ice	15.00	15.00	0.50
						1/2" Ice	20.60	20.60	0.65
(Verizon)						1" Ice	26.20	26.20	0.80
SBNHH-1D65B	A	From Face	3.00	0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon - LTE & PCS)			0.00			1/2" Ice	8.66	5.88	0.09
			0.00			1" Ice	9.13	6.35	0.15
RH_2x60-07-L (700 MHz)	A	From Face	3.00	0.0000	160.00	No Ice	1.82	1.52	0.06
(Verizon LTE)			0.00			1/2" Ice	1.99	1.69	0.08
			0.00			1" Ice	2.18	1.86	0.10
DB-T1-6Z-8AB-0Z Dist. Box	A	From Face	3.00	0.0000	160.00	No Ice	4.80	2.00	0.05
(Verizon LTE)			0.00			1/2" Ice	5.07	2.19	0.08

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
			0.00				1" Ice	5.35	2.39	0.12
** SBNHH-1D65B Shared (above)										
B66A RRH Unit	A	From Face	3.00		0.0000	160.00	No Ice	2.58	1.63	0.08
(Verizon PCS)			4.00				1/2" Ice	2.79	1.81	0.10
			0.00				1" Ice	3.01	2.00	0.12
SBNHH-1D65B	A	From Face	3.00		0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon AWS)			-6.00				1/2" Ice	8.66	5.88	0.09
			0.00				1" Ice	9.13	6.35	0.15
RRH_2x60-AWS	A	From Face	3.00		0.0000	160.00	No Ice	1.87	1.23	0.04
(Verizon AWS)			-6.00				1/2" Ice	2.04	1.38	0.06
			0.00				1" Ice	2.23	1.53	0.08
DB-T1-6Z-8AB-0Z Dist. Box	A	From Face	3.00		0.0000	160.00	No Ice	4.80	2.00	0.05
(Verizon AWS)			-6.00				1/2" Ice	5.07	2.19	0.08
			0.00				1" Ice	5.35	2.39	0.12
BXA-70080-4CF-EDIN	A	From Face	3.00		0.0000	160.00	No Ice	3.62	5.03	0.04
Panel			6.00				1/2" Ice	3.93	5.59	0.08
(Verizon 850 MHz)			0.00				1" Ice	4.25	6.17	0.13
SBNHH-1D65B	B	From Face	3.00		0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon - LTE & PCS)			0.00				1/2" Ice	8.66	5.88	0.09
			0.00				1" Ice	9.13	6.35	0.15
RH_2x60-07-L (700 MHz)	B	From Face	3.00		0.0000	160.00	No Ice	1.82	1.52	0.06
(Verizon LTE)			0.00				1/2" Ice	1.99	1.69	0.08
			0.00				1" Ice	2.18	1.86	0.10
** SBNHH-1D65B Shared (above)										
B66A RRH Unit	B	From Face	3.00		0.0000	160.00	No Ice	2.58	1.63	0.08
(Verizon PCS)			4.00				1/2" Ice	2.79	1.81	0.10
			0.00				1" Ice	3.01	2.00	0.12
SBNHH-1D65B	B	From Face	3.00		0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon AWS)			-6.00				1/2" Ice	8.66	5.88	0.09
			0.00				1" Ice	9.13	6.35	0.15
RRH_2x60-AWS	B	From Face	3.00		0.0000	160.00	No Ice	1.87	1.23	0.04
(Verizon AWS)			-6.00				1/2" Ice	2.04	1.38	0.06
			0.00				1" Ice	2.23	1.53	0.08
BXA-70080-4CF-EDIN	B	From Face	3.00		0.0000	160.00	No Ice	3.62	5.03	0.04
Panel			6.00				1/2" Ice	3.93	5.59	0.08
(Verizon 850 MHz)			0.00				1" Ice	4.25	6.17	0.13
SBNHH-1D65B	C	From Face	3.00		0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon - LTE & PCS)			0.00				1/2" Ice	8.66	5.88	0.09
			0.00				1" Ice	9.13	6.35	0.15
RH_2x60-07-L (700 MHz)	C	From Face	3.00		0.0000	160.00	No Ice	1.82	1.52	0.06
(Verizon LTE)			0.00				1/2" Ice	1.99	1.69	0.08
			0.00				1" Ice	2.18	1.86	0.10
** SBNHH-1D65B Shared (above)										
B66A RRH Unit	C	From Face	3.00		0.0000	160.00	No Ice	2.58	1.63	0.08
(Verizon PCS)			4.00				1/2" Ice	2.79	1.81	0.10
			0.00				1" Ice	3.01	2.00	0.12
SBNHH-1D65B	C	From Face	3.00		0.0000	160.00	No Ice	8.20	5.42	0.04
(Verizon AWS)			-6.00				1/2" Ice	8.66	5.88	0.09
			0.00				1" Ice	9.13	6.35	0.15
RRH_2x60-AWS	C	From Face	3.00		0.0000	160.00	No Ice	1.87	1.23	0.04
(Verizon AWS)			-6.00				1/2" Ice	2.04	1.38	0.06
			0.00				1" Ice	2.23	1.53	0.08
BXA-70080-4CF-EDIN	C	From Face	3.00		0.0000	160.00	No Ice	3.62	5.03	0.04
Panel			6.00				1/2" Ice	3.93	5.59	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft ft ft	°	ft		ft^2	ft^2	K
(Verizon 850 MHz) *** AT-T Antennas 12/20/2016			0.00			1" Ice	4.25	6.17	0.13
Pirod 15' T-Frame Sector Mount (1) (AT&T)	A	None		0.0000	133.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	0.50 0.65 0.80
Pirod 15' T-Frame Sector Mount (1) (AT&T)	B	None		0.0000	133.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	0.50 0.65 0.80
Pirod 15' T-Frame Sector Mount (1) (AT&T)	C	None		0.0000	133.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	0.50 0.65 0.80
P65-16-XLH-RR (AT&T)	A	From Leg	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	8.40 8.95 9.51	4.70 5.15 5.60	0.06 0.11 0.16
P65-16-XLH-RR (AT&T)	A	From Leg	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	8.40 8.95 9.51	4.70 5.15 5.60	0.06 0.11 0.16
RRUS-11 (AT&T)	A	From Leg	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	2.57 2.76 2.97	1.07 1.21 1.36	0.05 0.07 0.09
HPA-65R-BUU-H6 Panel (AT&T - Proposed)	A	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	9.49 9.96 10.43	5.49 5.94 6.41	0.05 0.11 0.17
RRUS-32 (AT&T - Proposed)	A	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	3.33 3.55 3.78	2.36 2.56 2.76	0.08 0.11 0.15
RRUS-11 (AT&T)	A	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	2.57 2.76 2.97	1.07 1.21 1.36	0.05 0.07 0.09
DC6-48-60-18-8F (Squid) Suppressor (AT&T)	A	From Leg	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	0.79 1.27 1.45	0.79 1.27 1.45	0.02 0.04 0.05
DC6-48-60-18-8F (Squid) Suppressor (AT&T)	A	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	0.79 1.27 1.45	0.79 1.27 1.45	0.02 0.04 0.05
TT19-08BP111-001 TMA's (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	0.55 0.65 0.75	0.45 0.53 0.63	0.02 0.02 0.03
P65-16-XLH-RR (AT&T)	B	From Leg	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	8.40 8.95 9.51	4.70 5.15 5.60	0.06 0.11 0.16
P65-16-XLH-RR (AT&T)	B	From Leg	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	8.40 8.95 9.51	4.70 5.15 5.60	0.06 0.11 0.16
RRUS-11 (AT&T)	B	From Leg	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	2.57 2.76 2.97	1.07 1.21 1.36	0.05 0.07 0.09
HPA-65R-BUU-H6 Panel (AT&T - Proposed)	B	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	9.49 9.96 10.43	5.49 5.94 6.41	0.05 0.11 0.17
RRUS-32 (AT&T - Proposed)	B	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	3.33 3.55 3.78	2.36 2.56 2.76	0.08 0.11 0.15
RRUS-11 (AT&T)	B	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice 1" Ice	2.57 2.76 2.97	1.07 1.21 1.36	0.05 0.07 0.09

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
TT19-08BP111-001 TMA's	B	From Leg	3.00	0.0000	133.00	No Ice	0.55	0.45	0.02
(AT&T)			0.00			1/2" Ice	0.65	0.53	0.02
			0.00			1" Ice	0.75	0.63	0.03
P65-16-XLH-RR	C	From Leg	3.00	0.0000	133.00	No Ice	8.40	4.70	0.06
(AT&T)			-6.00			1/2" Ice	8.95	5.15	0.11
			0.00			1" Ice	9.51	5.60	0.16
P65-16-XLH-RR	C	From Leg	3.00	0.0000	133.00	No Ice	8.40	4.70	0.06
(AT&T)			6.00			1/2" Ice	8.95	5.15	0.11
			0.00			1" Ice	9.51	5.60	0.16
RRUS-11	C	From Leg	3.00	0.0000	133.00	No Ice	2.57	1.07	0.05
(AT&T)			-6.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
HPA-65R-BUU-H6 Panel	C	From Leg	3.00	0.0000	133.00	No Ice	9.49	5.49	0.05
(AT&T - Proposed)			-2.00			1/2" Ice	9.96	5.94	0.11
			0.00			1" Ice	10.43	6.41	0.17
RRUS-32	C	From Leg	3.00	0.0000	133.00	No Ice	3.33	2.36	0.08
(AT&T - Proposed)			-2.00			1/2" Ice	3.55	2.56	0.11
			0.00			1" Ice	3.78	2.76	0.15
RRUS-11	C	From Leg	3.00	0.0000	133.00	No Ice	2.57	1.07	0.05
(AT&T)			-2.00			1/2" Ice	2.76	1.21	0.07
			0.00			1" Ice	2.97	1.36	0.09
TT19-08BP111-001 TMA's	C	From Leg	3.00	0.0000	133.00	No Ice	0.55	0.45	0.02
(AT&T)			0.00			1/2" Ice	0.65	0.53	0.02
			0.00			1" Ice	0.75	0.63	0.03

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
PA6-65AC	C	Paraboloid	From	1.00	0.0000		177.00	6.00	No Ice	28.27	0.09
(DNK-52 / CSP-42)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39

222-G Verification Constants

Constant	Value
Wind Importance Factor Without Ice	1.15
Wind Importance Factor With Ice Factor	1
Ice Importance Factor	1.25
K_d	0.85
Z_g	900
α	9.5
K_{zmin}	0.85
K_e	1
K_t	1

tnxTower	Job	Page
	180' CSP Lattice Tower	21 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project Westport, Connecticut	Date 15:28:53 09/20/17
	Client (VZW) VZ5-202 / (AT&T) SAI-099	Designed by MCD

Constant	Value
f	1

222-G Section Verification ArRr By Element

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
T1 180.00-160.00	1	ROHN 3 STD	40.93	39.248	C	0.139	0.354	5.833	13.197	3.055	8.151
	1	ROHN 3 STD	40.93	39.248	A	0.139	0.354	5.833	13.197	3.055	8.151
	2	ROHN 3 STD	40.93	39.248	C	0.139	0.354	5.833	13.197	3.055	8.151
	2	ROHN 3 STD	40.93	39.248	B	0.139	0.354	5.833	13.197	3.055	8.151
	3	ROHN 3 STD	40.93	39.248	B	0.139	0.354	5.833	13.197	3.055	8.151
	3	ROHN 3 STD	40.93	39.248	A	0.139	0.354	5.833	13.197	3.055	8.151
	4	ROHN 1.5 STD	22.219	31.317	C	0.139	0.354	1.306	4.344	0.740	2.683
	5	ROHN 1.5 STD	22.219	31.317	B	0.139	0.354	1.306	4.344	0.740	2.683
	6	ROHN 1.5 STD	22.219	31.317	A	0.139	0.354	1.306	4.344	0.740	2.683
	7	ROHN 1.5 STD	22.219	31.317	C	0.139	0.354	1.315	4.373	0.745	2.701
	8	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.518	4.343	0.860	2.682
	9	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.518	4.343	0.860	2.682
	10	ROHN 1.5 STD	22.219	31.317	B	0.139	0.354	1.315	4.373	0.745	2.701
	11	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.518	4.343	0.860	2.682
	12	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.518	4.343	0.860	2.682
	13	ROHN 1.5 STD	22.219	31.317	A	0.139	0.354	1.315	4.373	0.745	2.701
	14	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.518	4.343	0.860	2.682
	15	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.518	4.343	0.860	2.682
	19	ROHN 1.5 STD	22.219	31.317	C	0.139	0.354	1.311	4.358	0.743	2.692
	20	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.517	4.338	0.859	2.680
	21	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.517	4.338	0.859	2.680
	22	ROHN 1.5 STD	22.219	31.317	B	0.139	0.354	1.311	4.358	0.743	2.692
	23	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.517	4.338	0.859	2.680
	24	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.517	4.338	0.859	2.680
	25	ROHN 1.5 STD	22.219	31.317	A	0.139	0.354	1.311	4.358	0.743	2.692
	26	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.517	4.338	0.859	2.680
	27	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.517	4.338	0.859	2.680
	31	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.515	4.333	0.858	2.677
	32	ROHN 2 STD	27.774	33.671	C	0.139	0.354	1.515	4.333	0.858	2.677
	33	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.515	4.333	0.858	2.677
	34	ROHN 2 STD	27.774	33.671	B	0.139	0.354	1.515	4.333	0.858	2.677
	35	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.515	4.333	0.858	2.677
	36	ROHN 2 STD	27.774	33.671	A	0.139	0.354	1.515	4.333	0.858	2.677
					A		Sum	24.699	65.497	13.494	40.456
					B			24.699	65.497	13.494	40.456
					C			24.699	65.497	13.494	40.456
T2 160.00-140.00	40	ROHN 4 STD	51.935	43.357	C	0.144	0.34	7.514	14.798	3.550	9.061
	40	ROHN 4 STD	51.935	43.357	A	0.144	0.34	7.514	14.798	3.550	9.061
	41	ROHN 4 STD	51.935	43.357	C	0.144	0.34	7.514	14.798	3.550	9.061
	41	ROHN 4 STD	51.935	43.357	B	0.144	0.34	7.514	14.798	3.550	9.061
	42	ROHN 4 STD	51.935	43.357	B	0.144	0.34	7.514	14.798	3.550	9.061
	42	ROHN 4 STD	51.935	43.357	A	0.144	0.34	7.514	14.798	3.550	9.061
	43	ROHN 1.5 STD	21.928	30.638	C	0.144	0.34	1.526	5.031	0.865	3.080
	44	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.634	4.635	0.926	2.838
	45	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.634	4.635	0.926	2.838
	46	ROHN 1.5 STD	21.928	30.638	B	0.144	0.34	1.526	5.031	0.865	3.080
	47	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.634	4.635	0.926	2.838
	48	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.634	4.635	0.926	2.838
	49	ROHN 1.5 STD	21.928	30.638	A	0.144	0.34	1.526	5.031	0.865	3.080
	50	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.634	4.635	0.926	2.838

tnxTower	Job: 180' CSP Lattice Tower	Page: 22 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project: Westport, Connecticut	Date: 15:28:53 09/20/17
	Client: (VZW) VZ5-202 / (AT&T) SAI-099	Designed by: MCD

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
	51	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.634	4.635	0.926	2.838
	55	ROHN 1.5 STD	21.928	30.638	C	0.144	0.34	1.416	4.668	0.803	2.858
	56	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.589	4.508	0.901	2.760
	57	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.589	4.508	0.901	2.760
	58	ROHN 1.5 STD	21.928	30.638	B	0.144	0.34	1.416	4.668	0.803	2.858
	59	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.589	4.508	0.901	2.760
	60	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.589	4.508	0.901	2.760
	61	ROHN 1.5 STD	21.928	30.638	A	0.144	0.34	1.416	4.668	0.803	2.858
	62	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.589	4.508	0.901	2.760
	63	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.589	4.508	0.901	2.760
	67	ROHN 1.5 STD	21.928	30.638	C	0.144	0.34	1.319	4.349	0.748	2.663
	68	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.546	4.385	0.876	2.685
	69	ROHN 2 STD	27.41	32.962	C	0.144	0.34	1.546	4.385	0.876	2.685
	70	ROHN 1.5 STD	21.928	30.638	B	0.144	0.34	1.319	4.349	0.748	2.663
	71	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.546	4.385	0.876	2.685
	72	ROHN 2 STD	27.41	32.962	B	0.144	0.34	1.546	4.385	0.876	2.685
	73	ROHN 1.5 STD	21.928	30.638	A	0.144	0.34	1.319	4.349	0.748	2.663
	74	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.546	4.385	0.876	2.685
	75	ROHN 2 STD	27.41	32.962	A	0.144	0.34	1.546	4.385	0.876	2.685
					A		Sum	28.825	70.700	14.923	43.287
					B			28.825	70.700	14.923	43.287
					C			28.825	70.700	14.923	43.287
T3 140.00-133.33	79	ROHN 5 EH	63.577	47.888	C	0.151	0.33	3.096	5.502	1.304	3.351
	79	ROHN 5 EH	63.577	47.888	A	0.151	0.33	3.096	5.502	1.304	3.351
	80	ROHN 5 EH	63.577	47.888	C	0.151	0.33	3.096	5.502	1.304	3.351
	80	ROHN 5 EH	63.577	47.888	B	0.151	0.33	3.096	5.502	1.304	3.351
	81	ROHN 5 EH	63.577	47.888	B	0.151	0.33	3.096	5.502	1.304	3.351
	81	ROHN 5 EH	63.577	47.888	A	0.151	0.33	3.096	5.502	1.304	3.351
	82	ROHN 2 STD	27.143	32.444	C	0.151	0.33	2.045	5.768	1.161	3.513
	83	ROHN 2 EH	27.2	32.469	C	0.151	0.33	1.670	4.702	0.948	2.863
	84	ROHN 2 EH	27.2	32.469	C	0.151	0.33	1.670	4.702	0.948	2.863
	85	ROHN 2 STD	27.143	32.444	B	0.151	0.33	2.045	5.768	1.161	3.513
	86	ROHN 2 EH	27.2	32.469	B	0.151	0.33	1.670	4.702	0.948	2.863
	87	ROHN 2 EH	27.2	32.469	B	0.151	0.33	1.670	4.702	0.948	2.863
	88	ROHN 2 STD	27.143	32.444	A	0.151	0.33	2.045	5.768	1.161	3.513
	89	ROHN 2 EH	27.2	32.469	A	0.151	0.33	1.670	4.702	0.948	2.863
	90	ROHN 2 EH	27.2	32.469	A	0.151	0.33	1.670	4.702	0.948	2.863
					A		Sum	11.577	26.175	5.663	15.941
					B			11.577	26.175	5.663	15.941
					C			11.577	26.175	5.663	15.941
T4 133.33-126.67	94	ROHN 5 EH	63.243	47.532	C	0.145	0.319	3.096	5.490	1.299	3.321
	94	ROHN 5 EH	63.243	47.532	A	0.145	0.319	3.096	5.490	1.299	3.321
	95	ROHN 5 EH	63.243	47.532	C	0.145	0.319	3.096	5.490	1.299	3.321
	95	ROHN 5 EH	63.243	47.532	B	0.145	0.319	3.096	5.490	1.299	3.321
	96	ROHN 5 EH	63.243	47.532	B	0.145	0.319	3.096	5.490	1.299	3.321
	96	ROHN 5 EH	63.243	47.532	A	0.145	0.319	3.096	5.490	1.299	3.321
	97	ROHN 2 STD	27	32.17	C	0.145	0.319	2.165	6.086	1.228	3.682
	98	ROHN 2 STD	27	32.17	B	0.145	0.319	2.165	6.086	1.228	3.682
	99	ROHN 2 STD	27	32.17	A	0.145	0.319	2.165	6.086	1.228	3.682
	100	ROHN 2 EH	27.057	32.194	C	0.145	0.319	1.717	4.821	0.974	2.916
	101	ROHN 2 EH	27.057	32.194	C	0.145	0.319	1.717	4.821	0.974	2.916
	102	ROHN 2 EH	27.057	32.194	B	0.145	0.319	1.717	4.821	0.974	2.916
	103	ROHN 2 EH	27.057	32.194	B	0.145	0.319	1.717	4.821	0.974	2.916
	104	ROHN 2 EH	27.057	32.194	A	0.145	0.319	1.717	4.821	0.974	2.916
	105	ROHN 2 EH	27.057	32.194	A	0.145	0.319	1.717	4.821	0.974	2.916
					A		Sum	11.792	26.708	5.774	16.157
					B			11.792	26.708	5.774	16.157
					C			11.792	26.708	5.774	16.157

tnxTower	Job: 180' CSP Lattice Tower	Page: 23 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project: Westport, Connecticut	Date: 15:28:53 09/20/17
	Client: (VZW) VZ5-202 / (AT&T) SAI-099	Designed by: MCD

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
T5 126.67-120.00	109	ROHN 5 EH	62.894	47.161	C	0.14	0.308	3.096	5.477	1.297	3.295
	109	ROHN 5 EH	62.894	47.161	A	0.14	0.308	3.096	5.477	1.297	3.295
	110	ROHN 5 EH	62.894	47.161	C	0.14	0.308	3.096	5.477	1.297	3.295
	110	ROHN 5 EH	62.894	47.161	B	0.14	0.308	3.096	5.477	1.297	3.295
	111	ROHN 5 EH	62.894	47.161	B	0.14	0.308	3.096	5.477	1.297	3.295
	111	ROHN 5 EH	62.894	47.161	A	0.14	0.308	3.096	5.477	1.297	3.295
	112	ROHN 2 STD	26.851	31.884	C	0.14	0.308	2.303	6.451	1.305	3.881
	113	ROHN 2 STD	26.851	31.884	B	0.14	0.308	2.303	6.451	1.305	3.881
	114	ROHN 2 STD	26.851	31.884	A	0.14	0.308	2.303	6.451	1.305	3.881
	115	ROHN 2 X-STR	26.851	31.884	C	0.14	0.308	1.763	4.938	0.999	2.971
	116	ROHN 2 X-STR	26.851	31.884	C	0.14	0.308	1.763	4.938	0.999	2.971
	117	ROHN 2 X-STR	26.851	31.884	B	0.14	0.308	1.763	4.938	0.999	2.971
	118	ROHN 2 X-STR	26.851	31.884	B	0.14	0.308	1.763	4.938	0.999	2.971
	119	ROHN 2 X-STR	26.851	31.884	A	0.14	0.308	1.763	4.938	0.999	2.971
	120	ROHN 2 X-STR	26.851	31.884	A	0.14	0.308	1.763	4.938	0.999	2.971
					A		Sum	12.020	27.281	5.895	16.413
					B			12.020	27.281	5.895	16.413
					C			12.020	27.281	5.895	16.413
T6 120.00-100.00	124	ROHN 6 EHS	74.004	51.395	C	0.133	0.265	11.065	18.129	4.542	10.675
	124	ROHN 6 EHS	74.004	51.395	A	0.133	0.265	11.065	18.129	4.542	10.675
	125	ROHN 6 EHS	74.004	51.395	C	0.133	0.265	11.065	18.129	4.542	10.675
	125	ROHN 6 EHS	74.004	51.395	B	0.133	0.265	11.065	18.129	4.542	10.675
	126	ROHN 6 EHS	74.004	51.395	B	0.133	0.265	11.065	18.129	4.542	10.675
	126	ROHN 6 EHS	74.004	51.395	A	0.133	0.265	11.065	18.129	4.542	10.675
	127	ROHN 2 STD	26.53	31.272	C	0.133	0.265	2.645	7.356	1.497	4.331
	128	ROHN 2.5 EH	32.115	33.639	C	0.133	0.265	2.889	7.139	1.634	4.204
	129	ROHN 2.5 EH	32.115	33.639	C	0.133	0.265	2.889	7.139	1.634	4.204
	130	ROHN 2 STD	26.53	31.272	B	0.133	0.265	2.645	7.356	1.497	4.331
	131	ROHN 2.5 EH	32.115	33.639	B	0.133	0.265	2.889	7.139	1.634	4.204
	132	ROHN 2.5 EH	32.115	33.639	B	0.133	0.265	2.889	7.139	1.634	4.204
	133	ROHN 2 STD	26.53	31.272	A	0.133	0.265	2.645	7.356	1.497	4.331
	134	ROHN 2.5 EH	32.115	33.639	A	0.133	0.265	2.889	7.139	1.634	4.204
	135	ROHN 2.5 EH	32.115	33.639	A	0.133	0.265	2.889	7.139	1.634	4.204
	139	ROHN 2 STD	26.53	31.272	C	0.133	0.265	2.440	6.786	1.381	3.995
	140	ROHN 2.5 EH	32.115	33.639	C	0.133	0.265	2.804	6.930	1.586	4.080
	141	ROHN 2.5 EH	32.115	33.639	C	0.133	0.265	2.804	6.930	1.586	4.080
	142	ROHN 2 STD	26.53	31.272	B	0.133	0.265	2.440	6.786	1.381	3.995
	143	ROHN 2.5 EH	32.115	33.639	B	0.133	0.265	2.804	6.930	1.586	4.080
	144	ROHN 2.5 EH	32.115	33.639	B	0.133	0.265	2.804	6.930	1.586	4.080
	145	ROHN 2 STD	26.53	31.272	A	0.133	0.265	2.440	6.786	1.381	3.995
	146	ROHN 2.5 EH	32.115	33.639	A	0.133	0.265	2.804	6.930	1.586	4.080
	147	ROHN 2.5 EH	32.115	33.639	A	0.133	0.265	2.804	6.930	1.586	4.080
					A		Sum	38.601	78.538	18.400	46.244
					B			38.601	78.538	18.400	46.244
					C			38.601	78.538	18.400	46.244
T7 100.00-90.00	151	ROHN 6 EH	72.871	50.321	C	0.131	0.252	5.537	9.020	2.265	5.282
	151	ROHN 6 EH	72.871	50.321	A	0.131	0.252	5.537	9.020	2.265	5.282
	152	ROHN 6 EH	72.871	50.321	C	0.131	0.252	5.537	9.020	2.265	5.282
	152	ROHN 6 EH	72.871	50.321	B	0.131	0.252	5.537	9.020	2.265	5.282
	153	ROHN 6 EH	72.871	50.321	B	0.131	0.252	5.537	9.020	2.265	5.282
	153	ROHN 6 EH	72.871	50.321	A	0.131	0.252	5.537	9.020	2.265	5.282
	154	ROHN 2 STD	26.123	30.506	C	0.131	0.252	2.868	7.901	1.623	4.627
	155	ROHN 3 STD	38.498	35.751	C	0.131	0.252	3.643	7.981	1.945	4.674
	156	ROHN 3 STD	38.498	35.751	C	0.131	0.252	3.643	7.981	1.945	4.674
	157	ROHN 2 STD	26.123	30.506	B	0.131	0.252	2.868	7.901	1.623	4.627
	158	ROHN 3 STD	38.498	35.751	B	0.131	0.252	3.643	7.981	1.945	4.674
	159	ROHN 3 STD	38.498	35.751	B	0.131	0.252	3.643	7.981	1.945	4.674
	160	ROHN 2 STD	26.123	30.506	A	0.131	0.252	2.868	7.901	1.623	4.627

tnxTower	Job: 180' CSP Lattice Tower	Page: 24 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project: Westport, Connecticut	Date: 15:28:53 09/20/17
	Client: (VZW) VZ5-202 / (AT&T) SAI-099	Designed by: MCD

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
	161	ROHN 3 STD	38.498	35.751	A	0.131	0.252	3.643	7.981	1.945	4.674
	162	ROHN 3 STD	38.498	35.751	A	0.131	0.252	3.643	7.981	1.945	4.674
					A		Sum	21.227	41.903	10.043	24.538
					B			21.227	41.903	10.043	24.538
					C			21.227	41.903	10.043	24.538
T8 90.00-80.00	166	ROHN 6 EH	72.022	49.523	C	0.124	0.24	5.537	8.982	2.247	5.232
	166	ROHN 6 EH	72.022	49.523	A	0.124	0.24	5.537	8.982	2.247	5.232
	167	ROHN 6 EH	72.022	49.523	C	0.124	0.24	5.537	8.982	2.247	5.232
	167	ROHN 6 EH	72.022	49.523	B	0.124	0.24	5.537	8.982	2.247	5.232
	168	ROHN 6 EH	72.022	49.523	B	0.124	0.24	5.537	8.982	2.247	5.232
	168	ROHN 6 EH	72.022	49.523	A	0.124	0.24	5.537	8.982	2.247	5.232
	169	ROHN 2 STD	25.819	29.939	C	0.124	0.24	3.129	8.559	1.769	4.986
	170	ROHN 2 STD	25.819	29.939	B	0.124	0.24	3.129	8.559	1.769	4.986
	171	ROHN 2 STD	25.819	29.939	A	0.124	0.24	3.129	8.559	1.769	4.986
	172	ROHN 3 STD	38.05	35.123	C	0.124	0.24	3.773	8.216	2.019	4.786
	173	ROHN 3 STD	38.05	35.123	C	0.124	0.24	3.773	8.216	2.019	4.786
	174	ROHN 3 STD	38.05	35.123	B	0.124	0.24	3.773	8.216	2.019	4.786
	175	ROHN 3 STD	38.05	35.123	B	0.124	0.24	3.773	8.216	2.019	4.786
	176	ROHN 3 STD	38.05	35.123	A	0.124	0.24	3.773	8.216	2.019	4.786
	177	ROHN 3 STD	38.05	35.123	A	0.124	0.24	3.773	8.216	2.019	4.786
					A		Sum	21.747	42.954	10.301	25.023
					B			21.747	42.954	10.301	25.023
					C			21.747	42.954	10.301	25.023
T9 80.00-60.00	181	ROHN 8 EHS	91.868	57.192	C	0.135	0.242	14.412	21.168	5.926	12.341
	181	ROHN 8 EHS	91.868	57.192	A	0.135	0.242	14.412	21.168	5.926	12.341
	182	ROHN 8 EHS	91.868	57.192	C	0.135	0.242	14.412	21.168	5.926	12.341
	182	ROHN 8 EHS	91.868	57.192	B	0.135	0.242	14.412	21.168	5.926	12.341
	183	ROHN 8 EHS	91.868	57.192	B	0.135	0.242	14.412	21.168	5.926	12.341
	183	ROHN 8 EHS	91.868	57.192	A	0.135	0.242	14.412	21.168	5.926	12.341
	184	ROHN 2.5 STD	30.623	31.233	C	0.135	0.242	4.362	10.497	2.470	6.120
	185	ROHN 3 STD	37.28	34.054	C	0.135	0.242	3.997	8.614	2.161	5.022
	186	ROHN 3 STD	37.28	34.054	C	0.135	0.242	3.997	8.614	2.161	5.022
	187	ROHN 2.5 STD	30.623	31.233	B	0.135	0.242	4.362	10.497	2.470	6.120
	188	ROHN 3 STD	37.28	34.054	B	0.135	0.242	3.997	8.614	2.161	5.022
	189	ROHN 3 STD	37.28	34.054	B	0.135	0.242	3.997	8.614	2.161	5.022
	190	ROHN 2.5 STD	30.623	31.233	A	0.135	0.242	4.362	10.497	2.470	6.120
	191	ROHN 3 STD	37.28	34.054	A	0.135	0.242	3.997	8.614	2.161	5.022
	192	ROHN 3 STD	37.28	34.054	A	0.135	0.242	3.997	8.614	2.161	5.022
	196	ROHN 2.5 STD	30.623	31.233	C	0.135	0.242	4.103	9.872	2.323	5.756
	197	ROHN 3 STD	37.28	34.054	C	0.135	0.242	3.865	8.329	2.089	4.856
	198	ROHN 3 STD	37.28	34.054	C	0.135	0.242	3.865	8.329	2.089	4.856
	199	ROHN 2.5 STD	30.623	31.233	B	0.135	0.242	4.103	9.872	2.323	5.756
	200	ROHN 3 STD	37.28	34.054	B	0.135	0.242	3.865	8.329	2.089	4.856
	201	ROHN 3 STD	37.28	34.054	B	0.135	0.242	3.865	8.329	2.089	4.856
	202	ROHN 2.5 STD	30.623	31.233	A	0.135	0.242	4.103	9.872	2.323	5.756
	203	ROHN 3 STD	37.28	34.054	A	0.135	0.242	3.865	8.329	2.089	4.856
	204	ROHN 3 STD	37.28	34.054	A	0.135	0.242	3.865	8.329	2.089	4.856
					A		Sum	53.013	96.590	25.145	56.312
					B			53.013	96.590	25.145	56.312
					C			53.013	96.590	25.145	56.312
T10 60.00-40.00	208	ROHN 8 EHS	88.671	54.619	C	0.13	0.228	14.412	20.944	5.893	12.148
	208	ROHN 8 EHS	88.671	54.619	A	0.13	0.228	14.412	20.944	5.893	12.148
	209	ROHN 8 EHS	88.671	54.619	C	0.13	0.228	14.412	20.944	5.893	12.148
	209	ROHN 8 EHS	88.671	54.619	B	0.13	0.228	14.412	20.944	5.893	12.148
	210	ROHN 8 EHS	88.671	54.619	B	0.13	0.228	14.412	20.944	5.893	12.148
	210	ROHN 8 EHS	88.671	54.619	A	0.13	0.228	14.412	20.944	5.893	12.148
	211	ROHN 2.5 STD	29.557	29.563	C	0.13	0.228	4.961	11.707	2.807	6.790
	212	P3.5x.226	41.123	34.465	C	0.13	0.228	4.881	9.651	2.543	5.598
	213	P3.5x.226	41.123	34.465	C	0.13	0.228	4.881	9.651	2.543	5.598
	214	ROHN 2.5 STD	29.557	29.563	B	0.13	0.228	4.961	11.707	2.807	6.790

tnxTower	Job	Page
	180' CSP Lattice Tower	25 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project Westport, Connecticut	Date 15:28:53 09/20/17
	Client (VZW) VZ5-202 / (AT&T) SAI-099	Designed by MCD

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
	215	P3.5x.226	41.123	34.465	B	0.13	0.228	4.881	9.651	2.543	5.598
	216	P3.5x.226	41.123	34.465	B	0.13	0.228	4.881	9.651	2.543	5.598
	217	ROHN 2.5 STD	29.557	29.563	A	0.13	0.228	4.961	11.707	2.807	6.790
	218	P3.5x.226	41.123	34.465	A	0.13	0.228	4.881	9.651	2.543	5.598
	219	P3.5x.226	41.123	34.465	A	0.13	0.228	4.881	9.651	2.543	5.598
	223	ROHN 2.5 STD	29.557	29.563	C	0.13	0.228	4.662	11.001	2.638	6.380
	224	P3.5x.226	41.123	34.465	C	0.13	0.228	4.723	9.338	2.461	5.416
	225	P3.5x.226	41.123	34.465	C	0.13	0.228	4.723	9.338	2.461	5.416
	226	ROHN 2.5 STD	29.557	29.563	B	0.13	0.228	4.662	11.001	2.638	6.380
	227	P3.5x.226	41.123	34.465	B	0.13	0.228	4.723	9.338	2.461	5.416
	228	P3.5x.226	41.123	34.465	B	0.13	0.228	4.723	9.338	2.461	5.416
	229	ROHN 2.5 STD	29.557	29.563	A	0.13	0.228	4.662	11.001	2.638	6.380
	230	P3.5x.226	41.123	34.465	A	0.13	0.228	4.723	9.338	2.461	5.416
	231	P3.5x.226	41.123	34.465	A	0.13	0.228	4.723	9.338	2.461	5.416
					A		Sum	57.656	102.576	27.240	59.493
					B			57.656	102.576	27.240	59.493
					C			57.656	102.576	27.240	59.493
T11 40.00-30.00	235	ROHN 8 EHS	85.404	52.032	C	0.124	0.216	7.206	10.358	2.925	5.980
	235	ROHN 8 EHS	85.404	52.032	A	0.124	0.216	7.206	10.358	2.925	5.980
	236	ROHN 8 EHS	85.404	52.032	C	0.124	0.216	7.206	10.358	2.925	5.980
	236	ROHN 8 EHS	85.404	52.032	B	0.124	0.216	7.206	10.358	2.925	5.980
	237	ROHN 8 EHS	85.404	52.032	B	0.124	0.216	7.206	10.358	2.925	5.980
	237	ROHN 8 EHS	85.404	52.032	A	0.124	0.216	7.206	10.358	2.925	5.980
	238	ROHN 2.5 STD	28.468	27.899	C	0.124	0.216	5.261	12.163	2.974	7.023
	239	P3.5x.226	39.608	32.62	C	0.124	0.216	5.043	9.798	2.660	5.657
	240	P3.5x.226	39.608	32.62	C	0.124	0.216	5.043	9.798	2.660	5.657
	241	ROHN 2.5 STD	28.468	27.899	B	0.124	0.216	5.261	12.163	2.974	7.023
	242	P3.5x.226	39.608	32.62	B	0.124	0.216	5.043	9.798	2.660	5.657
	243	P3.5x.226	39.608	32.62	B	0.124	0.216	5.043	9.798	2.660	5.657
	244	ROHN 2.5 STD	28.468	27.899	A	0.124	0.216	5.261	12.163	2.974	7.023
	245	P3.5x.226	39.608	32.62	A	0.124	0.216	5.043	9.798	2.660	5.657
	246	P3.5x.226	39.608	32.62	A	0.124	0.216	5.043	9.798	2.660	5.657
					A		Sum	29.759	52.475	14.144	30.299
					B			29.759	52.475	14.144	30.299
					C			29.759	52.475	14.144	30.299
T12 30.00-20.00	250	ROHN 8 EHS	82.432	49.716	C	0.12	0.207	7.206	10.254	2.913	5.904
	250	ROHN 8 EHS	82.432	49.716	A	0.12	0.207	7.206	10.254	2.913	5.904
	251	ROHN 8 EHS	82.432	49.716	C	0.12	0.207	7.206	10.254	2.913	5.904
	251	ROHN 8 EHS	82.432	49.716	B	0.12	0.207	7.206	10.254	2.913	5.904
	252	ROHN 8 EHS	82.432	49.716	B	0.12	0.207	7.206	10.254	2.913	5.904
	252	ROHN 8 EHS	82.432	49.716	A	0.12	0.207	7.206	10.254	2.913	5.904
	253	ROHN 2.5 EH	27.477	26.422	C	0.12	0.207	5.560	12.614	3.143	7.263
	254	ROHN 2.5 EH	27.477	26.422	B	0.12	0.207	5.560	12.614	3.143	7.263
	255	ROHN 2.5 EH	27.477	26.422	A	0.12	0.207	5.560	12.614	3.143	7.263
	256	P3.5x.226	38.229	30.98	C	0.12	0.207	5.207	9.956	2.780	5.733
	257	P3.5x.226	38.229	30.98	C	0.12	0.207	5.207	9.956	2.780	5.733
	258	P3.5x.226	38.229	30.98	B	0.12	0.207	5.207	9.956	2.780	5.733
	259	P3.5x.226	38.229	30.98	B	0.12	0.207	5.207	9.956	2.780	5.733
	260	P3.5x.226	38.229	30.98	A	0.12	0.207	5.207	9.956	2.780	5.733
	261	P3.5x.226	38.229	30.98	A	0.12	0.207	5.207	9.956	2.780	5.733
					A		Sum	30.387	53.033	14.528	30.537
					B			30.387	53.033	14.528	30.537
					C			30.387	53.033	14.528	30.537
T13 20.00-0.00	265	ROHN 8 EH	78.168	45.917	C	0.107	0.179	14.412	19.973	5.738	11.408
	265	ROHN 8 EH	78.168	45.917	A	0.107	0.179	14.412	19.973	5.738	11.408
	266	ROHN 8 EH	78.168	45.917	C	0.107	0.179	14.412	19.973	5.738	11.408
	266	ROHN 8 EH	78.168	45.917	B	0.107	0.179	14.412	19.973	5.738	11.408
	267	ROHN 8 EH	78.168	45.917	B	0.107	0.179	14.412	19.973	5.738	11.408
	267	ROHN 8 EH	78.168	45.917	A	0.107	0.179	14.412	19.973	5.738	11.408
	268	P3.5x.226	36.252	28.15	C	0.107	0.179	8.153	14.936	4.423	8.531

Section Elevation ft	Elem Num	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
	269	P3.5x.226	36.252	28.15	C	0.107	0.179	7.900	14.473	4.286	8.267
	270	ROHN 1.5 STD	17.22	20.083	C	0.107	0.179	0.940	2.586	0.531	1.477
	271	P1.5x.2	17.22	20.083	C	0.107	0.179	1.706	4.694	0.963	2.681
	272	P3.5x.226	36.252	28.15	C	0.107	0.179	7.900	14.473	4.286	8.267
	273	ROHN 1.5 STD	17.22	20.083	C	0.107	0.179	0.940	2.586	0.531	1.477
	274	P1.5x.2	17.22	20.083	C	0.107	0.179	1.706	4.694	0.963	2.681
	275	P3.5x.226	36.252	28.15	B	0.107	0.179	8.153	14.936	4.423	8.531
	276	P3.5x.226	36.252	28.15	B	0.107	0.179	7.900	14.473	4.286	8.267
	277	ROHN 1.5 STD	17.22	20.083	B	0.107	0.179	0.940	2.586	0.531	1.477
	278	P1.5x.2	17.22	20.083	B	0.107	0.179	1.706	4.694	0.963	2.681
	279	P3.5x.226	36.252	28.15	B	0.107	0.179	7.900	14.473	4.286	8.267
	280	ROHN 1.5 STD	17.22	20.083	B	0.107	0.179	0.940	2.586	0.531	1.477
	281	P1.5x.2	17.22	20.083	B	0.107	0.179	1.706	4.694	0.963	2.681
	283	P3.5x.226	36.252	28.15	A	0.107	0.179	8.153	14.936	4.423	8.531
	284	P3.5x.226	36.252	28.15	A	0.107	0.179	7.900	14.473	4.286	8.267
	285	ROHN 1.5 STD	17.22	20.083	A	0.107	0.179	0.940	2.586	0.531	1.477
	286	P1.5x.2	17.22	20.083	A	0.107	0.179	1.706	4.694	0.963	2.681
	287	P3.5x.226	36.252	28.15	A	0.107	0.179	7.900	14.473	4.286	8.267
	288	ROHN 1.5 STD	17.22	20.083	A	0.107	0.179	0.940	2.586	0.531	1.477
	289	P1.5x.2	17.22	20.083	A	0.107	0.179	1.706	4.694	0.963	2.681
					A		Sum	58.069	98.387	27.457	56.196
					B			58.069	98.387	27.457	56.196
					C			58.069	98.387	27.457	56.196

222-G Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z m	q_z psf	Face	e	A_rR_r ft²
T1 180.00-160.00	170.00		1.415	1	1		43	A	0.139	13.494
								B	0.139	13.494
								C	0.139	13.494
T2 160.00-140.00	150.00		1.378	1	1		42	A	0.144	14.923
								B	0.144	14.923
								C	0.144	14.923
T3 140.00-133.33	136.67		1.352	1	1		41	A	0.151	5.663
								B	0.151	5.663
								C	0.151	5.663
T4 133.33-126.67	130.00		1.337	1	1		40	A	0.145	5.774
								B	0.145	5.774
								C	0.145	5.774
T5 126.67-120.00	123.33		1.323	1	1		40	A	0.14	5.895
								B	0.14	5.895
								C	0.14	5.895
T6 120.00-100.00	110.00		1.291	1	1		39	A	0.133	18.400
								B	0.133	18.400
								C	0.133	18.400
T7 100.00-90.00	95.00		1.252	1	1		38	A	0.131	10.043
								B	0.131	10.043
								C	0.131	10.043
T8 90.00-80.00	85.00		1.223	1	1		37	A	0.124	10.301
								B	0.124	10.301

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
								C	0.124	10.301
T9 80.00-60.00	70.00		1.174	1	1		36	A	0.135	25.145
								B	0.135	25.145
								C	0.135	25.145
T10 60.00-40.00	50.00		1.094	1	1		33	A	0.13	27.240
								B	0.13	27.240
								C	0.13	27.240
T11 40.00-30.00	35.00		1.015	1	1		31	A	0.124	14.144
								B	0.124	14.144
								C	0.124	14.144
T12 30.00-20.00	25.00		0.945	1	1		29	A	0.12	14.528
								B	0.12	14.528
								C	0.12	14.528
T13 20.00-0.00	10.00		0.85	1	1		26	A	0.107	28.308
								B	0.107	28.308
								C	0.107	28.308

222-G Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 180.00-160.00	170.00	170.00	1.415	1	1	2.2090	8	A	0.354	40.456
								B	0.354	40.456
								C	0.354	40.456
T2 160.00-140.00	150.00	150.00	1.378	1	1	2.1815	7	A	0.34	43.287
								B	0.34	43.287
								C	0.34	43.287
T3 140.00-133.33	136.67	136.67	1.352	1	1	2.1613	7	A	0.33	15.941
								B	0.33	15.941
								C	0.33	15.941
T4 133.33-126.67	130.00	130.00	1.337	1	1	2.1505	7	A	0.319	16.157
								B	0.319	16.157
								C	0.319	16.157
T5 126.67-120.00	123.33	123.33	1.323	1	1	2.1392	7	A	0.308	16.413
								B	0.308	16.413
								C	0.308	16.413
T6 120.00-100.00	110.00	110.00	1.291	1	1	2.1149	7	A	0.265	46.244
								B	0.265	46.244
								C	0.265	46.244
T7 100.00-90.00	95.00	95.00	1.252	1	1	2.0841	7	A	0.252	24.538
								B	0.252	24.538
								C	0.252	24.538
T8 90.00-80.00	85.00	85.00	1.223	1	1	2.0611	7	A	0.24	25.023
								B	0.24	25.023
								C	0.24	25.023
T9 80.00-60.00	70.00	70.00	1.174	1	1	2.0214	6	A	0.242	56.312
								B	0.242	56.312
								C	0.242	56.312
T10 60.00-40.00	50.00	50.00	1.094	1	1	1.9546	6	A	0.228	59.493
								B	0.228	59.493
								C	0.228	59.493
T11 40.00-30.00	35.00	35.00	1.015	1	1	1.8861	6	A	0.216	30.299
								B	0.216	30.299
								C	0.216	30.299
T12 30.00-20.00	25.00	25.00	0.945	1	1	1.8237	5	A	0.207	30.537

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T13 20.00-0.00	10.00	10.00	0.85	1	1	1.6640	5	B	0.207	30.537
								C	0.207	30.537
								A	0.179	58.054
								B	0.179	58.054
								C	0.179	58.054

222-G Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 180.00-160.00	170.00		1.415	1	1		11	A	0.139	13.494
								B	0.139	13.494
								C	0.139	13.494
T2 160.00-140.00	150.00		1.378	1	1		11	A	0.144	14.923
								B	0.144	14.923
								C	0.144	14.923
T3 140.00-133.33	136.67		1.352	1	1		11	A	0.151	5.663
								B	0.151	5.663
								C	0.151	5.663
T4 133.33-126.67	130.00		1.337	1	1		10	A	0.145	5.774
								B	0.145	5.774
								C	0.145	5.774
T5 126.67-120.00	123.33		1.323	1	1		10	A	0.14	5.895
								B	0.14	5.895
								C	0.14	5.895
T6 120.00-100.00	110.00		1.291	1	1		10	A	0.133	18.400
								B	0.133	18.400
								C	0.133	18.400
T7 100.00-90.00	95.00		1.252	1	1		10	A	0.131	10.043
								B	0.131	10.043
								C	0.131	10.043
T8 90.00-80.00	85.00		1.223	1	1		10	A	0.124	10.301
								B	0.124	10.301
								C	0.124	10.301
T9 80.00-60.00	70.00		1.174	1	1		9	A	0.135	25.145
								B	0.135	25.145
								C	0.135	25.145
T10 60.00-40.00	50.00		1.094	1	1		9	A	0.13	27.240
								B	0.13	27.240
								C	0.13	27.240
T11 40.00-30.00	35.00		1.015	1	1		8	A	0.124	14.144
								B	0.124	14.144
								C	0.124	14.144
T12 30.00-20.00	25.00		0.945	1	1		7	A	0.12	14.528
								B	0.12	14.528
								C	0.12	14.528
T13 20.00-0.00	10.00		0.85	1	1		7	A	0.107	28.308
								B	0.107	28.308
								C	0.107	28.308

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.415	43	177.503	A	0.000	24.699	11.667	47.24	33.340	0.000
					B	0.000	24.699		47.24	0.000	0.000
					C	0.000	24.699		47.24	0.000	0.000
T2 160.00-140.00	150.00	1.378	42	200.850	A	0.000	28.825	15.027	52.13	94.570	0.000
					B	0.000	28.825		52.13	0.000	0.000
					C	0.000	28.825		52.13	0.000	0.000
T3 140.00-133.33	136.67	1.352	41	76.803	A	0.000	11.577	6.192	53.49	31.523	0.000
					B	0.000	11.577		53.49	0.000	0.000
					C	0.000	11.577		53.49	0.000	0.000
T4 133.33-126.67	130.00	1.337	40	81.431	A	0.000	11.792	6.192	52.51	31.523	0.000
					B	0.000	11.792		52.51	14.852	0.000
					C	0.000	11.792		52.51	0.000	0.000
T5 126.67-120.00	123.33	1.323	40	86.060	A	0.000	12.020	6.192	51.52	31.523	0.000
					B	0.000	12.020		51.52	33.808	0.000
					C	0.000	12.020		51.52	0.000	0.000
T6 120.00-100.00	110.00	1.291	39	289.399	A	0.000	38.601	22.130	57.33	95.830	0.000
					B	0.000	38.601		57.33	119.597	0.000
					C	0.000	38.601		57.33	0.000	0.000
T7 100.00-90.00	95.00	1.252	38	162.540	A	0.000	21.227	11.074	52.17	48.545	0.000
					B	0.000	21.227		52.17	59.799	0.000
					C	0.000	21.227		52.17	0.000	0.000
T8 90.00-80.00	85.00	1.223	37	175.715	A	0.000	21.747	11.074	50.92	48.545	0.000
					B	0.000	21.747		50.92	59.799	0.000
					C	0.000	21.747		50.92	0.000	0.000
T9 80.00-60.00	70.00	1.174	36	392.943	A	0.000	53.013	28.825	54.37	97.090	0.000
					B	0.000	53.013		54.37	119.597	0.000
					C	0.000	53.013		54.37	0.000	0.000
T10 60.00-40.00	50.00	1.094	33	442.943	A	0.000	57.656	28.825	49.99	97.090	0.000
					B	0.000	57.656		49.99	119.597	0.000
					C	0.000	57.656		49.99	0.000	0.000
T11 40.00-30.00	35.00	1.015	31	240.222	A	0.000	29.759	14.412	48.43	48.545	0.000
					B	0.000	29.759		48.43	59.799	0.000
					C	0.000	29.759		48.43	0.000	0.000
T12 30.00-20.00	25.00	0.945	29	252.722	A	0.000	30.387	14.412	47.43	48.545	0.000
					B	0.000	30.387		47.43	59.799	0.000
					C	0.000	30.387		47.43	0.000	0.000
T13 20.00-0.00	10.00	0.85	26	542.943	A	0.000	58.069	28.825	49.64	97.090	0.000
					B	0.000	58.069		49.64	119.597	0.000
					C	0.000	58.069		49.64	0.000	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.415	8	2.2090	184.867	A	0.000	65.497	26.393	40.30	94.841	0.000
						B	0.000	65.497		40.30	0.000	0.000
						C	0.000	65.497		40.30	0.000	0.000
T2 160.00-140.00	150.00	1.378	7	2.1815	208.132	A	0.000	70.700	29.597	41.86	246.078	0.000
						B	0.000	70.700		41.86	0.000	0.000
						C	0.000	70.700		41.86	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
T3	136.67	1.352	7	2.1613	79.207	A	0.000	26.175	11.004	42.04	81.777	0.000
140.00-133.33						B	0.000	26.175		42.04	0.000	0.000
						C	0.000	26.175		42.04	0.000	0.000
T4	130.00	1.337	7	2.1505	83.824	A	0.000	26.708	10.980	41.11	81.644	0.000
133.33-126.67						B	0.000	26.708		41.11	37.292	0.000
						C	0.000	26.708		41.11	0.000	0.000
T5	123.33	1.323	7	2.1392	88.440	A	0.000	27.281	10.955	40.15	81.505	0.000
126.67-120.00						B	0.000	27.281		40.15	70.057	0.000
						C	0.000	27.281		40.15	0.000	0.000
T6	110.00	1.291	7	2.1149	296.460	A	0.000	78.538	36.259	46.17	253.383	0.000
120.00-100.00						B	0.000	78.538		46.17	239.961	0.000
						C	0.000	78.538		46.17	0.000	0.000
T7 100.00-90.00	95.00	1.252	7	2.0841	166.021	A	0.000	41.903	18.041	43.05	130.899	0.000
						B	0.000	41.903		43.05	119.271	0.000
						C	0.000	41.903		43.05	0.000	0.000
T8 90.00-80.00	85.00	1.223	7	2.0611	179.158	A	0.000	42.954	17.964	41.82	130.392	0.000
						B	0.000	42.954		41.82	118.740	0.000
						C	0.000	42.954		41.82	0.000	0.000
T9 80.00-60.00	70.00	1.174	6	2.0214	399.694	A	0.000	96.590	42.336	43.83	259.044	0.000
						B	0.000	96.590		43.83	235.654	0.000
						C	0.000	96.590		43.83	0.000	0.000
T10 60.00-40.00	50.00	1.094	6	1.9546	449.471	A	0.000	102.576	41.889	40.84	256.108	0.000
						B	0.000	102.576		40.84	232.574	0.000
						C	0.000	102.576		40.84	0.000	0.000
T11 40.00-30.00	35.00	1.015	6	1.8861	243.371	A	0.000	52.475	20.716	39.48	126.552	0.000
						B	0.000	52.475		39.48	114.711	0.000
						C	0.000	52.475		39.48	0.000	0.000
T12 30.00-20.00	25.00	0.945	5	1.8237	255.767	A	0.000	53.033	20.507	38.67	125.185	0.000
						B	0.000	53.033		38.67	113.275	0.000
						C	0.000	53.033		38.67	0.000	0.000
T13 20.00-0.00	10.00	0.85	5	1.6640	548.500	A	0.000	98.387	39.947	40.60	243.390	0.000
						B	0.000	98.387		40.60	219.210	0.000
						C	0.000	98.387		40.60	0.000	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	170.00	1.415	11	177.503	A	0.000	24.699	11.667	47.24	33.340	0.000
180.00-160.00					B	0.000	24.699		47.24	0.000	0.000
					C	0.000	24.699		47.24	0.000	0.000
T2	150.00	1.378	11	200.850	A	0.000	28.825	15.027	52.13	94.570	0.000
160.00-140.00					B	0.000	28.825		52.13	0.000	0.000
					C	0.000	28.825		52.13	0.000	0.000
T3	136.67	1.352	11	76.803	A	0.000	11.577	6.192	53.49	31.523	0.000
140.00-133.33					B	0.000	11.577		53.49	0.000	0.000
					C	0.000	11.577		53.49	0.000	0.000
T4	130.00	1.337	10	81.431	A	0.000	11.792	6.192	52.51	31.523	0.000
133.33-126.67					B	0.000	11.792		52.51	14.852	0.000
					C	0.000	11.792		52.51	0.000	0.000
T5	123.33	1.323	10	86.060	A	0.000	12.020	6.192	51.52	31.523	0.000

Section Elevation ft	z ft	K_z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
126.67-120.00					B	0.000	12.020		51.52	33.808	0.000
					C	0.000	12.020		51.52	0.000	0.000
T6	110.00	1.291	10	289.399	A	0.000	38.601	22.130	57.33	95.830	0.000
120.00-100.00					B	0.000	38.601		57.33	119.597	0.000
					C	0.000	38.601		57.33	0.000	0.000
T7	95.00	1.252	10	162.540	A	0.000	21.227	11.074	52.17	48.545	0.000
100.00-90.00					B	0.000	21.227		52.17	59.799	0.000
					C	0.000	21.227		52.17	0.000	0.000
T8 90.00-80.00	85.00	1.223	10	175.715	A	0.000	21.747	11.074	50.92	48.545	0.000
					B	0.000	21.747		50.92	59.799	0.000
					C	0.000	21.747		50.92	0.000	0.000
T9 80.00-60.00	70.00	1.174	9	392.943	A	0.000	53.013	28.825	54.37	97.090	0.000
					B	0.000	53.013		54.37	119.597	0.000
					C	0.000	53.013		54.37	0.000	0.000
T10	50.00	1.094	9	442.943	A	0.000	57.656	28.825	49.99	97.090	0.000
60.00-40.00					B	0.000	57.656		49.99	119.597	0.000
					C	0.000	57.656		49.99	0.000	0.000
T11	35.00	1.015	8	240.222	A	0.000	29.759	14.412	48.43	48.545	0.000
40.00-30.00					B	0.000	29.759		48.43	59.799	0.000
					C	0.000	29.759		48.43	0.000	0.000
T12	25.00	0.945	7	252.722	A	0.000	30.387	14.412	47.43	48.545	0.000
30.00-20.00					B	0.000	30.387		47.43	59.799	0.000
					C	0.000	30.387		47.43	0.000	0.000
T13 20.00-0.00	10.00	0.85	7	542.943	A	0.000	58.069	28.825	49.64	97.090	0.000
					B	0.000	58.069		49.64	119.597	0.000
					C	0.000	58.069		49.64	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl Face
T1	0.13	1.25	A	0.139	2.812	43	1	1	13.494	2.11	105.53	C
180.00-160.00			B	0.139	2.812		1	1	13.494			
			C	0.139	2.812		1	1	13.494			
T2	0.35	1.50	A	0.144	2.796	42	1	1	14.923	3.49	174.65	C
160.00-140.00			B	0.144	2.796		1	1	14.923			
			C	0.144	2.796		1	1	14.923			
T3	0.12	0.83	A	0.151	2.769	41	1	1	5.663	1.20	180.52	C
140.00-133.33			B	0.151	2.769		1	1	5.663			
			C	0.151	2.769		1	1	5.663			
T4	0.18	0.84	A	0.145	2.791	40	1	1	5.774	1.51	226.87	C
133.33-126.67			B	0.145	2.791		1	1	5.774			
			C	0.145	2.791		1	1	5.774			
T5	0.26	0.86	A	0.14	2.81	40	1	1	5.895	1.90	284.76	C
126.67-120.00			B	0.14	2.81		1	1	5.895			
			C	0.14	2.81		1	1	5.895			
T6	0.85	2.93	A	0.133	2.834	39	1	1	18.400	6.03	301.42	C
120.00-100.00			B	0.133	2.834		1	1	18.400			
			C	0.133	2.834		1	1	18.400			
T7	0.43	1.68	A	0.131	2.844	38	1	1	10.043	3.02	301.52	C
100.00-90.00			B	0.131	2.844		1	1	10.043			
			C	0.131	2.844		1	1	10.043			
T8	0.43	1.72	A	0.124	2.87	37	1	1	10.301	2.98	297.70	C
90.00-80.00			B	0.124	2.87		1	1	10.301			
			C	0.124	2.87		1	1	10.301			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T9	0.85	4.10	A	0.135	2.828	36	1	1	25.145	6.08	303.86	C
80.00-60.00			B	0.135	2.828		1	1	25.145			
			C	0.135	2.828		1	1	25.145			
T10	0.85	4.70	A	0.13	2.846	33	1	1	27.240	5.84	292.11	C
60.00-40.00			B	0.13	2.846		1	1	27.240			
			C	0.13	2.846		1	1	27.240			
T11	0.43	2.44	A	0.124	2.87	31	1	1	14.144	2.76	275.77	C
40.00-30.00			B	0.124	2.87		1	1	14.144			
			C	0.124	2.87		1	1	14.144			
T12	0.43	2.63	A	0.12	2.884	29	1	1	14.528	2.60	260.08	C
30.00-20.00			B	0.12	2.884		1	1	14.528			
			C	0.12	2.884		1	1	14.528			
T13	0.85	5.23	A	0.107	2.936	26	1	1	28.308	4.66	233.13	C
20.00-0.00			B	0.107	2.936		1	1	28.308			
			C	0.107	2.936		1	1	28.308			
Sum Weight:	6.13	30.71						OTM	3606.28 kip-ft	44.18		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	43	0.825	1	13.494	2.11	105.53	C
180.00-160.00			B	0.139	2.812		0.825	1	13.494			
			C	0.139	2.812		0.825	1	13.494			
T2	0.35	1.50	A	0.144	2.796	42	0.825	1	14.923	3.49	174.65	C
160.00-140.00			B	0.144	2.796		0.825	1	14.923			
			C	0.144	2.796		0.825	1	14.923			
T3	0.12	0.83	A	0.151	2.769	41	0.825	1	5.663	1.20	180.52	C
140.00-133.33			B	0.151	2.769		0.825	1	5.663			
			C	0.151	2.769		0.825	1	5.663			
T4	0.18	0.84	A	0.145	2.791	40	0.825	1	5.774	1.51	226.87	C
133.33-126.67			B	0.145	2.791		0.825	1	5.774			
			C	0.145	2.791		0.825	1	5.774			
T5	0.26	0.86	A	0.14	2.81	40	0.825	1	5.895	1.90	284.76	C
126.67-120.00			B	0.14	2.81		0.825	1	5.895			
			C	0.14	2.81		0.825	1	5.895			
T6	0.85	2.93	A	0.133	2.834	39	0.825	1	18.400	6.03	301.42	C
120.00-100.00			B	0.133	2.834		0.825	1	18.400			
			C	0.133	2.834		0.825	1	18.400			
T7	0.43	1.68	A	0.131	2.844	38	0.825	1	10.043	3.02	301.52	C
100.00-90.00			B	0.131	2.844		0.825	1	10.043			
			C	0.131	2.844		0.825	1	10.043			
T8	0.43	1.72	A	0.124	2.87	37	0.825	1	10.301	2.98	297.70	C
90.00-80.00			B	0.124	2.87		0.825	1	10.301			
			C	0.124	2.87		0.825	1	10.301			
T9	0.85	4.10	A	0.135	2.828	36	0.825	1	25.145	6.08	303.86	C
80.00-60.00			B	0.135	2.828		0.825	1	25.145			
			C	0.135	2.828		0.825	1	25.145			
T10	0.85	4.70	A	0.13	2.846	33	0.825	1	27.240	5.84	292.11	C
60.00-40.00			B	0.13	2.846		0.825	1	27.240			
			C	0.13	2.846		0.825	1	27.240			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_F ft²	F K	w plf	Ctrl. Face
T11	0.43	2.44	A	0.124	2.87	31	0.825	1	14.144	2.76	275.77	C
40.00-30.00			B	0.124	2.87		0.825	1	14.144			
			C	0.124	2.87		0.825	1	14.144			
T12	0.43	2.63	A	0.12	2.884	29	0.825	1	14.528	2.60	260.08	C
30.00-20.00			B	0.12	2.884		0.825	1	14.528			
			C	0.12	2.884		0.825	1	14.528			
T13	0.85	5.23	A	0.107	2.936	26	0.825	1	28.308	4.66	233.13	C
20.00-0.00			B	0.107	2.936		0.825	1	28.308			
			C	0.107	2.936		0.825	1	28.308			
Sum Weight:	6.13	30.71						OTM	3606.28 kip-ft	44.18		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_F ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	43	0.8	1	13.494	2.11	105.53	C
180.00-160.00			B	0.139	2.812		0.8	1	13.494			
			C	0.139	2.812		0.8	1	13.494			
T2	0.35	1.50	A	0.144	2.796	42	0.8	1	14.923	3.49	174.65	C
160.00-140.00			B	0.144	2.796		0.8	1	14.923			
			C	0.144	2.796		0.8	1	14.923			
T3	0.12	0.83	A	0.151	2.769	41	0.8	1	5.663	1.20	180.52	C
140.00-133.33			B	0.151	2.769		0.8	1	5.663			
			C	0.151	2.769		0.8	1	5.663			
T4	0.18	0.84	A	0.145	2.791	40	0.8	1	5.774	1.51	226.87	C
133.33-126.67			B	0.145	2.791		0.8	1	5.774			
			C	0.145	2.791		0.8	1	5.774			
T5	0.26	0.86	A	0.14	2.81	40	0.8	1	5.895	1.90	284.76	C
126.67-120.00			B	0.14	2.81		0.8	1	5.895			
			C	0.14	2.81		0.8	1	5.895			
T6	0.85	2.93	A	0.133	2.834	39	0.8	1	18.400	6.03	301.42	C
120.00-100.00			B	0.133	2.834		0.8	1	18.400			
			C	0.133	2.834		0.8	1	18.400			
T7	0.43	1.68	A	0.131	2.844	38	0.8	1	10.043	3.02	301.52	C
100.00-90.00			B	0.131	2.844		0.8	1	10.043			
			C	0.131	2.844		0.8	1	10.043			
T8	0.43	1.72	A	0.124	2.87	37	0.8	1	10.301	2.98	297.70	C
90.00-80.00			B	0.124	2.87		0.8	1	10.301			
			C	0.124	2.87		0.8	1	10.301			
T9	0.85	4.10	A	0.135	2.828	36	0.8	1	25.145	6.08	303.86	C
80.00-60.00			B	0.135	2.828		0.8	1	25.145			
			C	0.135	2.828		0.8	1	25.145			
T10	0.85	4.70	A	0.13	2.846	33	0.8	1	27.240	5.84	292.11	C
60.00-40.00			B	0.13	2.846		0.8	1	27.240			
			C	0.13	2.846		0.8	1	27.240			
T11	0.43	2.44	A	0.124	2.87	31	0.8	1	14.144	2.76	275.77	C
40.00-30.00			B	0.124	2.87		0.8	1	14.144			
			C	0.124	2.87		0.8	1	14.144			
T12	0.43	2.63	A	0.12	2.884	29	0.8	1	14.528	2.60	260.08	C
30.00-20.00			B	0.12	2.884		0.8	1	14.528			
			C	0.12	2.884		0.8	1	14.528			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T13	0.85	5.23	A	0.107	2.936	26	0.8	1	28.308	4.66	233.13	C
20.00-0.00			B	0.107	2.936		0.8	1	28.308			
			C	0.107	2.936		0.8	1	28.308			
Sum Weight:	6.13	30.71						OTM	3606.28 kip-ft	44.18		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	43	0.85	1	13.494	2.11	105.53	C
180.00-160.00			B	0.139	2.812		0.85	1	13.494			
			C	0.139	2.812		0.85	1	13.494			
T2	0.35	1.50	A	0.144	2.796	42	0.85	1	14.923	3.49	174.65	C
160.00-140.00			B	0.144	2.796		0.85	1	14.923			
			C	0.144	2.796		0.85	1	14.923			
T3	0.12	0.83	A	0.151	2.769	41	0.85	1	5.663	1.20	180.52	C
140.00-133.33			B	0.151	2.769		0.85	1	5.663			
			C	0.151	2.769		0.85	1	5.663			
T4	0.18	0.84	A	0.145	2.791	40	0.85	1	5.774	1.51	226.87	C
133.33-126.67			B	0.145	2.791		0.85	1	5.774			
			C	0.145	2.791		0.85	1	5.774			
T5	0.26	0.86	A	0.14	2.81	40	0.85	1	5.895	1.90	284.76	C
126.67-120.00			B	0.14	2.81		0.85	1	5.895			
			C	0.14	2.81		0.85	1	5.895			
T6	0.85	2.93	A	0.133	2.834	39	0.85	1	18.400	6.03	301.42	C
120.00-100.00			B	0.133	2.834		0.85	1	18.400			
			C	0.133	2.834		0.85	1	18.400			
T7	0.43	1.68	A	0.131	2.844	38	0.85	1	10.043	3.02	301.52	C
100.00-90.00			B	0.131	2.844		0.85	1	10.043			
			C	0.131	2.844		0.85	1	10.043			
T8	0.43	1.72	A	0.124	2.87	37	0.85	1	10.301	2.98	297.70	C
90.00-80.00			B	0.124	2.87		0.85	1	10.301			
			C	0.124	2.87		0.85	1	10.301			
T9	0.85	4.10	A	0.135	2.828	36	0.85	1	25.145	6.08	303.86	C
80.00-60.00			B	0.135	2.828		0.85	1	25.145			
			C	0.135	2.828		0.85	1	25.145			
T10	0.85	4.70	A	0.13	2.846	33	0.85	1	27.240	5.84	292.11	C
60.00-40.00			B	0.13	2.846		0.85	1	27.240			
			C	0.13	2.846		0.85	1	27.240			
T11	0.43	2.44	A	0.124	2.87	31	0.85	1	14.144	2.76	275.77	C
40.00-30.00			B	0.124	2.87		0.85	1	14.144			
			C	0.124	2.87		0.85	1	14.144			
T12	0.43	2.63	A	0.12	2.884	29	0.85	1	14.528	2.60	260.08	C
30.00-20.00			B	0.12	2.884		0.85	1	14.528			
			C	0.12	2.884		0.85	1	14.528			
T13	0.85	5.23	A	0.107	2.936	26	0.85	1	28.308	4.66	233.13	C
20.00-0.00			B	0.107	2.936		0.85	1	28.308			
			C	0.107	2.936		0.85	1	28.308			
Sum Weight:	6.13	30.71						OTM	3606.28 kip-ft	44.18		

tnxTower	Job	Page
	180' CSP Lattice Tower	35 of 69
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-529-8882 FAX: 860-529-3991	Project Westport, Connecticut	Date 15:28:53 09/20/17
	Client (VZW) VZ5-202 / (AT&T) SAI-099	Designed by MCD

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.83	5.32	A	0.354	2.162	8	1	1	40.456	0.94	47.23	C
180.00-160.00			B	0.354	2.162		1	1	40.456			
			C	0.354	2.162		1	1	40.456			
T2	4.66	5.86	A	0.34	2.196	7	1	1	43.287	1.55	77.34	C
160.00-140.00			B	0.34	2.196		1	1	43.287			
			C	0.34	2.196		1	1	43.287			
T3	1.54	2.46	A	0.33	2.218	7	1	1	15.941	0.53	79.15	C
140.00-133.33			B	0.33	2.218		1	1	15.941			
			C	0.33	2.218		1	1	15.941			
T4	2.22	2.52	A	0.319	2.248	7	1	1	16.157	0.67	99.89	C
133.33-126.67			B	0.319	2.248		1	1	16.157			
			C	0.319	2.248		1	1	16.157			
T5	3.02	2.58	A	0.308	2.274	7	1	1	16.413	0.78	117.67	C
126.67-120.00			B	0.308	2.274		1	1	16.413			
			C	0.308	2.274		1	1	16.413			
T6	9.87	7.71	A	0.265	2.393	7	1	1	46.244	2.43	121.41	C
120.00-100.00			B	0.265	2.393		1	1	46.244			
			C	0.265	2.393		1	1	46.244			
T7	4.94	4.29	A	0.252	2.43	7	1	1	24.538	1.21	121.42	C
100.00-90.00			B	0.252	2.43		1	1	24.538			
			C	0.252	2.43		1	1	24.538			
T8	4.89	4.40	A	0.24	2.469	7	1	1	25.023	1.19	119.47	C
90.00-80.00			B	0.24	2.469		1	1	25.023			
			C	0.24	2.469		1	1	25.023			
T9	9.63	10.15	A	0.242	2.463	6	1	1	56.312	2.36	118.21	C
80.00-60.00			B	0.242	2.463		1	1	56.312			
			C	0.242	2.463		1	1	56.312			
T10	9.36	11.23	A	0.228	2.504	6	1	1	59.493	2.24	111.83	C
60.00-40.00			B	0.228	2.504		1	1	59.493			
			C	0.228	2.504		1	1	59.493			
T11	4.54	5.72	A	0.216	2.545	6	1	1	30.299	1.04	104.09	C
40.00-30.00			B	0.216	2.545		1	1	30.299			
			C	0.216	2.545		1	1	30.299			
T12	4.42	5.88	A	0.207	2.572	5	1	1	30.537	0.97	96.86	C
30.00-20.00			B	0.207	2.572		1	1	30.537			
			C	0.207	2.572		1	1	30.537			
T13	8.23	10.30	A	0.179	2.666	5	1	1	58.054	1.70	84.97	C
20.00-0.00			B	0.179	2.666		1	1	58.054			
			C	0.179	2.666		1	1	58.054			
Sum Weight:	69.14	78.42						OTM	1487.03 kip-ft	17.62		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.83	5.32	A	0.354	2.162	8	0.825	1	40.456	0.94	47.23	C
180.00-160.00			B	0.354	2.162		0.825	1	40.456			
			C	0.354	2.162		0.825	1	40.456			
T2	4.66	5.86	A	0.34	2.196	7	0.825	1	43.287	1.55	77.34	C
160.00-140.00			B	0.34	2.196		0.825	1	43.287			
			C	0.34	2.196		0.825	1	43.287			
T3	1.54	2.46	A	0.33	2.218	7	0.825	1	15.941	0.53	79.15	C
140.00-133.33			B	0.33	2.218		0.825	1	15.941			
			C	0.33	2.218		0.825	1	15.941			
T4	2.22	2.52	A	0.319	2.248	7	0.825	1	16.157	0.67	99.89	C
133.33-126.67			B	0.319	2.248		0.825	1	16.157			
			C	0.319	2.248		0.825	1	16.157			
T5	3.02	2.58	A	0.308	2.274	7	0.825	1	16.413	0.78	117.67	C
126.67-120.00			B	0.308	2.274		0.825	1	16.413			
			C	0.308	2.274		0.825	1	16.413			
T6	9.87	7.71	A	0.265	2.393	7	0.825	1	46.244	2.43	121.41	C
120.00-100.00			B	0.265	2.393		0.825	1	46.244			
			C	0.265	2.393		0.825	1	46.244			
T7	4.94	4.29	A	0.252	2.43	7	0.825	1	24.538	1.21	121.42	C
100.00-90.00			B	0.252	2.43		0.825	1	24.538			
			C	0.252	2.43		0.825	1	24.538			
T8	4.89	4.40	A	0.24	2.469	7	0.825	1	25.023	1.19	119.47	C
90.00-80.00			B	0.24	2.469		0.825	1	25.023			
			C	0.24	2.469		0.825	1	25.023			
T9	9.63	10.15	A	0.242	2.463	6	0.825	1	56.312	2.36	118.21	C
80.00-60.00			B	0.242	2.463		0.825	1	56.312			
			C	0.242	2.463		0.825	1	56.312			
T10	9.36	11.23	A	0.228	2.504	6	0.825	1	59.493	2.24	111.83	C
60.00-40.00			B	0.228	2.504		0.825	1	59.493			
			C	0.228	2.504		0.825	1	59.493			
T11	4.54	5.72	A	0.216	2.545	6	0.825	1	30.299	1.04	104.09	C
40.00-30.00			B	0.216	2.545		0.825	1	30.299			
			C	0.216	2.545		0.825	1	30.299			
T12	4.42	5.88	A	0.207	2.572	5	0.825	1	30.537	0.97	96.86	C
30.00-20.00			B	0.207	2.572		0.825	1	30.537			
			C	0.207	2.572		0.825	1	30.537			
T13	8.23	10.30	A	0.179	2.666	5	0.825	1	58.054	1.70	84.97	C
20.00-0.00			B	0.179	2.666		0.825	1	58.054			
			C	0.179	2.666		0.825	1	58.054			
Sum Weight:	69.14	78.42						OTM	1487.03 kip-ft	17.62		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.83	5.32	A	0.354	2.162	8	0.8	1	40.456	0.94	47.23	C
180.00-160.00			B	0.354	2.162		0.8	1	40.456			
			C	0.354	2.162		0.8	1	40.456			
T2	4.66	5.86	A	0.34	2.196	7	0.8	1	43.287	1.55	77.34	C
160.00-140.00			B	0.34	2.196		0.8	1	43.287			
			C	0.34	2.196		0.8	1	43.287			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T3	1.54	2.46	A	0.33	2.218	7	0.8	1	15.941	0.53	79.15	C
140.00-133.33			B	0.33	2.218		0.8	1	15.941			
			C	0.33	2.218		0.8	1	15.941			
T4	2.22	2.52	A	0.319	2.248	7	0.8	1	16.157	0.67	99.89	C
133.33-126.67			B	0.319	2.248		0.8	1	16.157			
			C	0.319	2.248		0.8	1	16.157			
T5	3.02	2.58	A	0.308	2.274	7	0.8	1	16.413	0.78	117.67	C
126.67-120.00			B	0.308	2.274		0.8	1	16.413			
			C	0.308	2.274		0.8	1	16.413			
T6	9.87	7.71	A	0.265	2.393	7	0.8	1	46.244	2.43	121.41	C
120.00-100.00			B	0.265	2.393		0.8	1	46.244			
			C	0.265	2.393		0.8	1	46.244			
T7	4.94	4.29	A	0.252	2.43	7	0.8	1	24.538	1.21	121.42	C
100.00-90.00			B	0.252	2.43		0.8	1	24.538			
			C	0.252	2.43		0.8	1	24.538			
T8	4.89	4.40	A	0.24	2.469	7	0.8	1	25.023	1.19	119.47	C
90.00-80.00			B	0.24	2.469		0.8	1	25.023			
			C	0.24	2.469		0.8	1	25.023			
T9	9.63	10.15	A	0.242	2.463	6	0.8	1	56.312	2.36	118.21	C
80.00-60.00			B	0.242	2.463		0.8	1	56.312			
			C	0.242	2.463		0.8	1	56.312			
T10	9.36	11.23	A	0.228	2.504	6	0.8	1	59.493	2.24	111.83	C
60.00-40.00			B	0.228	2.504		0.8	1	59.493			
			C	0.228	2.504		0.8	1	59.493			
T11	4.54	5.72	A	0.216	2.545	6	0.8	1	30.299	1.04	104.09	C
40.00-30.00			B	0.216	2.545		0.8	1	30.299			
			C	0.216	2.545		0.8	1	30.299			
T12	4.42	5.88	A	0.207	2.572	5	0.8	1	30.537	0.97	96.86	C
30.00-20.00			B	0.207	2.572		0.8	1	30.537			
			C	0.207	2.572		0.8	1	30.537			
T13	8.23	10.30	A	0.179	2.666	5	0.8	1	58.054	1.70	84.97	C
20.00-0.00			B	0.179	2.666		0.8	1	58.054			
			C	0.179	2.666		0.8	1	58.054			
Sum Weight:	69.14	78.42						OTM	1487.03 kip-ft	17.62		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.83	5.32	A	0.354	2.162	8	0.85	1	40.456	0.94	47.23	C
180.00-160.00			B	0.354	2.162		0.85	1	40.456			
			C	0.354	2.162		0.85	1	40.456			
T2	4.66	5.86	A	0.34	2.196	7	0.85	1	43.287	1.55	77.34	C
160.00-140.00			B	0.34	2.196		0.85	1	43.287			
			C	0.34	2.196		0.85	1	43.287			
T3	1.54	2.46	A	0.33	2.218	7	0.85	1	15.941	0.53	79.15	C
140.00-133.33			B	0.33	2.218		0.85	1	15.941			
			C	0.33	2.218		0.85	1	15.941			
T4	2.22	2.52	A	0.319	2.248	7	0.85	1	16.157	0.67	99.89	C
133.33-126.67			B	0.319	2.248		0.85	1	16.157			
			C	0.319	2.248		0.85	1	16.157			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T5	3.02	2.58	A	0.308	2.274	7	0.85	1	16.413	0.78	117.67	C
126.67-120.00			B	0.308	2.274		0.85	1	16.413			
			C	0.308	2.274		0.85	1	16.413			
T6	9.87	7.71	A	0.265	2.393	7	0.85	1	46.244	2.43	121.41	C
120.00-100.00			B	0.265	2.393		0.85	1	46.244			
			C	0.265	2.393		0.85	1	46.244			
T7	4.94	4.29	A	0.252	2.43	7	0.85	1	24.538	1.21	121.42	C
100.00-90.00			B	0.252	2.43		0.85	1	24.538			
			C	0.252	2.43		0.85	1	24.538			
T8	4.89	4.40	A	0.24	2.469	7	0.85	1	25.023	1.19	119.47	C
90.00-80.00			B	0.24	2.469		0.85	1	25.023			
			C	0.24	2.469		0.85	1	25.023			
T9	9.63	10.15	A	0.242	2.463	6	0.85	1	56.312	2.36	118.21	C
80.00-60.00			B	0.242	2.463		0.85	1	56.312			
			C	0.242	2.463		0.85	1	56.312			
T10	9.36	11.23	A	0.228	2.504	6	0.85	1	59.493	2.24	111.83	C
60.00-40.00			B	0.228	2.504		0.85	1	59.493			
			C	0.228	2.504		0.85	1	59.493			
T11	4.54	5.72	A	0.216	2.545	6	0.85	1	30.299	1.04	104.09	C
40.00-30.00			B	0.216	2.545		0.85	1	30.299			
			C	0.216	2.545		0.85	1	30.299			
T12	4.42	5.88	A	0.207	2.572	5	0.85	1	30.537	0.97	96.86	C
30.00-20.00			B	0.207	2.572		0.85	1	30.537			
			C	0.207	2.572		0.85	1	30.537			
T13	8.23	10.30	A	0.179	2.666	5	0.85	1	58.054	1.70	84.97	C
20.00-0.00			B	0.179	2.666		0.85	1	58.054			
			C	0.179	2.666		0.85	1	58.054			
Sum Weight:	69.14	78.42						OTM	1487.03 kip-ft	17.62		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	11	1	1	13.494	0.55	27.30	C
180.00-160.00			B	0.139	2.812		1	1	13.494			
			C	0.139	2.812		1	1	13.494			
T2	0.35	1.50	A	0.144	2.796	11	1	1	14.923	0.90	45.18	C
160.00-140.00			B	0.144	2.796		1	1	14.923			
			C	0.144	2.796		1	1	14.923			
T3	0.12	0.83	A	0.151	2.769	11	1	1	5.663	0.31	46.70	C
140.00-133.33			B	0.151	2.769		1	1	5.663			
			C	0.151	2.769		1	1	5.663			
T4	0.18	0.84	A	0.145	2.791	10	1	1	5.774	0.39	58.70	C
133.33-126.67			B	0.145	2.791		1	1	5.774			
			C	0.145	2.791		1	1	5.774			
T5	0.26	0.86	A	0.14	2.81	10	1	1	5.895	0.49	73.67	C
126.67-120.00			B	0.14	2.81		1	1	5.895			
			C	0.14	2.81		1	1	5.895			
T6	0.85	2.93	A	0.133	2.834	10	1	1	18.400	1.56	77.98	C
120.00-100.00			B	0.133	2.834		1	1	18.400			
			C	0.133	2.834		1	1	18.400			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7	0.43	1.68	A	0.131	2.844	10	1	1	10.043	0.78	78.01	C
100.00-90.00			B	0.131	2.844		1	1	10.043			
			C	0.131	2.844		1	1	10.043			
T8	0.43	1.72	A	0.124	2.87	10	1	1	10.301	0.77	77.02	C
90.00-80.00			B	0.124	2.87		1	1	10.301			
			C	0.124	2.87		1	1	10.301			
T9	0.85	4.10	A	0.135	2.828	9	1	1	25.145	1.57	78.61	C
80.00-60.00			B	0.135	2.828		1	1	25.145			
			C	0.135	2.828		1	1	25.145			
T10	0.85	4.70	A	0.13	2.846	9	1	1	27.240	1.51	75.57	C
60.00-40.00			B	0.13	2.846		1	1	27.240			
			C	0.13	2.846		1	1	27.240			
T11	0.43	2.44	A	0.124	2.87	8	1	1	14.144	0.71	71.34	C
40.00-30.00			B	0.124	2.87		1	1	14.144			
			C	0.124	2.87		1	1	14.144			
T12	0.43	2.63	A	0.12	2.884	7	1	1	14.528	0.67	67.29	C
30.00-20.00			B	0.12	2.884		1	1	14.528			
			C	0.12	2.884		1	1	14.528			
T13	0.85	5.23	A	0.107	2.936	7	1	1	28.308	1.21	60.31	C
20.00-0.00			B	0.107	2.936		1	1	28.308			
			C	0.107	2.936		1	1	28.308			
Sum Weight:	6.13	30.71						OTM	932.99 kip-ft	11.43		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	11	0.825	1	13.494	0.55	27.30	C
180.00-160.00			B	0.139	2.812		0.825	1	13.494			
			C	0.139	2.812		0.825	1	13.494			
T2	0.35	1.50	A	0.144	2.796	11	0.825	1	14.923	0.90	45.18	C
160.00-140.00			B	0.144	2.796		0.825	1	14.923			
			C	0.144	2.796		0.825	1	14.923			
T3	0.12	0.83	A	0.151	2.769	11	0.825	1	5.663	0.31	46.70	C
140.00-133.33			B	0.151	2.769		0.825	1	5.663			
			C	0.151	2.769		0.825	1	5.663			
T4	0.18	0.84	A	0.145	2.791	10	0.825	1	5.774	0.39	58.70	C
133.33-126.67			B	0.145	2.791		0.825	1	5.774			
			C	0.145	2.791		0.825	1	5.774			
T5	0.26	0.86	A	0.14	2.81	10	0.825	1	5.895	0.49	73.67	C
126.67-120.00			B	0.14	2.81		0.825	1	5.895			
			C	0.14	2.81		0.825	1	5.895			
T6	0.85	2.93	A	0.133	2.834	10	0.825	1	18.400	1.56	77.98	C
120.00-100.00			B	0.133	2.834		0.825	1	18.400			
			C	0.133	2.834		0.825	1	18.400			
T7	0.43	1.68	A	0.131	2.844	10	0.825	1	10.043	0.78	78.01	C
100.00-90.00			B	0.131	2.844		0.825	1	10.043			
			C	0.131	2.844		0.825	1	10.043			
T8	0.43	1.72	A	0.124	2.87	10	0.825	1	10.301	0.77	77.02	C
90.00-80.00			B	0.124	2.87		0.825	1	10.301			
			C	0.124	2.87		0.825	1	10.301			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T9	0.85	4.10	A	0.135	2.828	9	0.825	1	25.145	1.57	78.61	C
80.00-60.00			B	0.135	2.828		0.825	1	25.145			
			C	0.135	2.828		0.825	1	25.145			
T10	0.85	4.70	A	0.13	2.846	9	0.825	1	27.240	1.51	75.57	C
60.00-40.00			B	0.13	2.846		0.825	1	27.240			
			C	0.13	2.846		0.825	1	27.240			
T11	0.43	2.44	A	0.124	2.87	8	0.825	1	14.144	0.71	71.34	C
40.00-30.00			B	0.124	2.87		0.825	1	14.144			
			C	0.124	2.87		0.825	1	14.144			
T12	0.43	2.63	A	0.12	2.884	7	0.825	1	14.528	0.67	67.29	C
30.00-20.00			B	0.12	2.884		0.825	1	14.528			
			C	0.12	2.884		0.825	1	14.528			
T13	0.85	5.23	A	0.107	2.936	7	0.825	1	28.308	1.21	60.31	C
20.00-0.00			B	0.107	2.936		0.825	1	28.308			
			C	0.107	2.936		0.825	1	28.308			
Sum Weight:	6.13	30.71						OTM	932.99 kip-ft	11.43		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	11	0.8	1	13.494	0.55	27.30	C
180.00-160.00			B	0.139	2.812		0.8	1	13.494			
			C	0.139	2.812		0.8	1	13.494			
T2	0.35	1.50	A	0.144	2.796	11	0.8	1	14.923	0.90	45.18	C
160.00-140.00			B	0.144	2.796		0.8	1	14.923			
			C	0.144	2.796		0.8	1	14.923			
T3	0.12	0.83	A	0.151	2.769	11	0.8	1	5.663	0.31	46.70	C
140.00-133.33			B	0.151	2.769		0.8	1	5.663			
			C	0.151	2.769		0.8	1	5.663			
T4	0.18	0.84	A	0.145	2.791	10	0.8	1	5.774	0.39	58.70	C
133.33-126.67			B	0.145	2.791		0.8	1	5.774			
			C	0.145	2.791		0.8	1	5.774			
T5	0.26	0.86	A	0.14	2.81	10	0.8	1	5.895	0.49	73.67	C
126.67-120.00			B	0.14	2.81		0.8	1	5.895			
			C	0.14	2.81		0.8	1	5.895			
T6	0.85	2.93	A	0.133	2.834	10	0.8	1	18.400	1.56	77.98	C
120.00-100.00			B	0.133	2.834		0.8	1	18.400			
			C	0.133	2.834		0.8	1	18.400			
T7	0.43	1.68	A	0.131	2.844	10	0.8	1	10.043	0.78	78.01	C
100.00-90.00			B	0.131	2.844		0.8	1	10.043			
			C	0.131	2.844		0.8	1	10.043			
T8	0.43	1.72	A	0.124	2.87	10	0.8	1	10.301	0.77	77.02	C
90.00-80.00			B	0.124	2.87		0.8	1	10.301			
			C	0.124	2.87		0.8	1	10.301			
T9	0.85	4.10	A	0.135	2.828	9	0.8	1	25.145	1.57	78.61	C
80.00-60.00			B	0.135	2.828		0.8	1	25.145			
			C	0.135	2.828		0.8	1	25.145			
T10	0.85	4.70	A	0.13	2.846	9	0.8	1	27.240	1.51	75.57	C
60.00-40.00			B	0.13	2.846		0.8	1	27.240			
			C	0.13	2.846		0.8	1	27.240			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_F ft²	F K	w plf	Ctrl. Face
T11	0.43	2.44	A	0.124	2.87	8	0.8	1	14.144	0.71	71.34	C
40.00-30.00			B	0.124	2.87		0.8	1	14.144			
			C	0.124	2.87		0.8	1	14.144			
T12	0.43	2.63	A	0.12	2.884	7	0.8	1	14.528	0.67	67.29	C
30.00-20.00			B	0.12	2.884		0.8	1	14.528			
			C	0.12	2.884		0.8	1	14.528			
T13	0.85	5.23	A	0.107	2.936	7	0.8	1	28.308	1.21	60.31	C
20.00-0.00			B	0.107	2.936		0.8	1	28.308			
			C	0.107	2.936		0.8	1	28.308			
Sum Weight:	6.13	30.71						OTM	932.99 kip-ft	11.43		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_F ft²	F K	w plf	Ctrl. Face
T1	0.13	1.25	A	0.139	2.812	11	0.85	1	13.494	0.55	27.30	C
180.00-160.00			B	0.139	2.812		0.85	1	13.494			
			C	0.139	2.812		0.85	1	13.494			
T2	0.35	1.50	A	0.144	2.796	11	0.85	1	14.923	0.90	45.18	C
160.00-140.00			B	0.144	2.796		0.85	1	14.923			
			C	0.144	2.796		0.85	1	14.923			
T3	0.12	0.83	A	0.151	2.769	11	0.85	1	5.663	0.31	46.70	C
140.00-133.33			B	0.151	2.769		0.85	1	5.663			
			C	0.151	2.769		0.85	1	5.663			
T4	0.18	0.84	A	0.145	2.791	10	0.85	1	5.774	0.39	58.70	C
133.33-126.67			B	0.145	2.791		0.85	1	5.774			
			C	0.145	2.791		0.85	1	5.774			
T5	0.26	0.86	A	0.14	2.81	10	0.85	1	5.895	0.49	73.67	C
126.67-120.00			B	0.14	2.81		0.85	1	5.895			
			C	0.14	2.81		0.85	1	5.895			
T6	0.85	2.93	A	0.133	2.834	10	0.85	1	18.400	1.56	77.98	C
120.00-100.00			B	0.133	2.834		0.85	1	18.400			
			C	0.133	2.834		0.85	1	18.400			
T7	0.43	1.68	A	0.131	2.844	10	0.85	1	10.043	0.78	78.01	C
100.00-90.00			B	0.131	2.844		0.85	1	10.043			
			C	0.131	2.844		0.85	1	10.043			
T8	0.43	1.72	A	0.124	2.87	10	0.85	1	10.301	0.77	77.02	C
90.00-80.00			B	0.124	2.87		0.85	1	10.301			
			C	0.124	2.87		0.85	1	10.301			
T9	0.85	4.10	A	0.135	2.828	9	0.85	1	25.145	1.57	78.61	C
80.00-60.00			B	0.135	2.828		0.85	1	25.145			
			C	0.135	2.828		0.85	1	25.145			
T10	0.85	4.70	A	0.13	2.846	9	0.85	1	27.240	1.51	75.57	C
60.00-40.00			B	0.13	2.846		0.85	1	27.240			
			C	0.13	2.846		0.85	1	27.240			
T11	0.43	2.44	A	0.124	2.87	8	0.85	1	14.144	0.71	71.34	C
40.00-30.00			B	0.124	2.87		0.85	1	14.144			
			C	0.124	2.87		0.85	1	14.144			
T12	0.43	2.63	A	0.12	2.884	7	0.85	1	14.528	0.67	67.29	C
30.00-20.00			B	0.12	2.884		0.85	1	14.528			
			C	0.12	2.884		0.85	1	14.528			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T13 20.00-0.00	0.85	5.23	A B C	0.107 0.107 0.107	2.936 2.936 2.936	7	0.85 0.85 0.85	1 1 1	28.308 28.308 28.308	1.21	60.31	C
Sum Weight:	6.13	30.71						OTM	932.99 kip-ft	11.43		

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	14.03					
Bracing Weight	16.68					
Total Member Self-Weight	30.71			-26.07	-2.58	
Total Weight	45.53			-26.07	-2.58	
Wind 0 deg - No Ice		-0.26	-60.27	-5974.10	39.11	1.64
Wind 30 deg - No Ice		30.16	-52.19	-5179.18	-2983.18	-12.66
Wind 45 deg - No Ice		42.83	-42.52	-4217.12	-4245.07	-18.50
Wind 60 deg - No Ice		52.58	-29.92	-2966.49	-5220.09	-23.44
Wind 90 deg - No Ice		60.94	0.35	31.49	-6063.46	-27.93
Wind 120 deg - No Ice		52.82	30.36	2984.05	-5257.43	-25.08
Wind 135 deg - No Ice		43.20	42.68	4187.15	-4304.10	-21.15
Wind 150 deg - No Ice		30.68	52.10	5106.48	-3065.95	-15.53
Wind 180 deg - No Ice		0.41	60.00	5874.38	-70.69	-1.59
Wind 210 deg - No Ice		-30.02	51.95	5083.02	2952.03	12.81
Wind 225 deg - No Ice		-42.66	42.37	4140.00	4209.56	18.99
Wind 240 deg - No Ice		-52.43	29.83	2898.56	5187.57	23.44
Wind 270 deg - No Ice		-60.65	-0.35	-84.12	6007.18	27.78
Wind 300 deg - No Ice		-52.51	-30.36	-3035.27	5197.84	25.03
Wind 315 deg - No Ice		-42.93	-42.75	-4251.56	4252.55	21.01
Wind 330 deg - No Ice		-30.44	-52.24	-5183.03	3018.51	15.53
Member Ice	47.71					
Total Weight Ice	177.08			-265.02	0.50	
Wind 0 deg - Ice		-0.04	-22.86	-2515.86	7.36	-1.48
Wind 30 deg - Ice		11.44	-19.80	-2215.37	-1126.61	-5.17
Wind 45 deg - Ice		16.21	-16.15	-1854.64	-1598.15	-6.49
Wind 60 deg - Ice		19.87	-11.40	-1384.99	-1961.19	-7.44
Wind 90 deg - Ice		22.98	0.06	-255.03	-2271.02	-7.72
Wind 120 deg - Ice		19.91	11.47	866.34	-1967.19	-5.96
Wind 135 deg - Ice		16.27	16.17	1327.05	-1607.87	-4.46
Wind 150 deg - Ice		11.53	19.78	1679.92	-1140.58	-2.60
Wind 180 deg - Ice		0.07	22.81	1976.43	-11.57	1.49
Wind 210 deg - Ice		-11.41	19.75	1676.65	1122.49	5.20
Wind 225 deg - Ice		-16.17	16.12	1319.67	1593.17	6.59
Wind 240 deg - Ice		-19.84	11.38	851.84	1956.80	7.44
Wind 270 deg - Ice		-22.93	-0.06	-275.11	2261.95	7.69
Wind 300 deg - Ice		-19.85	-11.47	-1396.20	1957.47	5.95
Wind 315 deg - Ice		-16.22	-16.18	-1859.51	1599.72	4.43
Wind 330 deg - Ice		-11.48	-19.80	-2214.77	1133.24	2.60
Total Weight	45.53			-26.07	-2.58	
Wind 0 deg - Service		-0.07	-15.59	-1538.21	10.56	0.42
Wind 30 deg - Service		7.80	-13.50	-1332.56	-771.35	-3.28
Wind 45 deg - Service		11.08	-11.00	-1083.66	-1097.82	-4.79

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 60 deg - Service		13.60	-7.74	-760.10	-1350.07	-6.06
Wind 90 deg - Service		15.77	0.09	15.51	-1568.26	-7.23
Wind 120 deg - Service		13.66	7.85	779.38	-1359.73	-6.49
Wind 135 deg - Service		11.18	11.04	1090.64	-1113.09	-5.47
Wind 150 deg - Service		7.94	13.48	1328.48	-792.77	-4.02
Wind 180 deg - Service		0.11	15.52	1527.15	-17.85	-0.41
Wind 210 deg - Service		-7.77	13.44	1322.41	764.17	3.32
Wind 225 deg - Service		-11.04	10.96	1078.44	1089.51	4.91
Wind 240 deg - Service		-13.56	7.72	757.26	1342.53	6.06
Wind 270 deg - Service		-15.69	-0.09	-14.40	1554.58	7.19
Wind 300 deg - Service		-13.59	-7.85	-777.90	1345.19	6.48
Wind 315 deg - Service		-11.11	-11.06	-1092.57	1100.63	5.44
Wind 330 deg - Service		-7.87	-13.52	-1333.55	781.37	4.02

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 45 deg - No Ice
7	0.9 Dead+1.6 Wind 45 deg - No Ice
8	1.2 Dead+1.6 Wind 60 deg - No Ice
9	0.9 Dead+1.6 Wind 60 deg - No Ice
10	1.2 Dead+1.6 Wind 90 deg - No Ice
11	0.9 Dead+1.6 Wind 90 deg - No Ice
12	1.2 Dead+1.6 Wind 120 deg - No Ice
13	0.9 Dead+1.6 Wind 120 deg - No Ice
14	1.2 Dead+1.6 Wind 135 deg - No Ice
15	0.9 Dead+1.6 Wind 135 deg - No Ice
16	1.2 Dead+1.6 Wind 150 deg - No Ice
17	0.9 Dead+1.6 Wind 150 deg - No Ice
18	1.2 Dead+1.6 Wind 180 deg - No Ice
19	0.9 Dead+1.6 Wind 180 deg - No Ice
20	1.2 Dead+1.6 Wind 210 deg - No Ice
21	0.9 Dead+1.6 Wind 210 deg - No Ice
22	1.2 Dead+1.6 Wind 225 deg - No Ice
23	0.9 Dead+1.6 Wind 225 deg - No Ice
24	1.2 Dead+1.6 Wind 240 deg - No Ice
25	0.9 Dead+1.6 Wind 240 deg - No Ice
26	1.2 Dead+1.6 Wind 270 deg - No Ice
27	0.9 Dead+1.6 Wind 270 deg - No Ice
28	1.2 Dead+1.6 Wind 300 deg - No Ice
29	0.9 Dead+1.6 Wind 300 deg - No Ice
30	1.2 Dead+1.6 Wind 315 deg - No Ice
31	0.9 Dead+1.6 Wind 315 deg - No Ice
32	1.2 Dead+1.6 Wind 330 deg - No Ice
33	0.9 Dead+1.6 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	9	4.86	-0.38	-0.35
			Max. Compression	12	-5.73	0.05	-0.02
			Max. Mx	28	0.28	0.96	0.11
			Max. My	20	-0.20	-0.01	-1.26
			Max. Vy	13	0.64	0.95	-0.16
			Max. Vx	5	-0.70	0.01	-0.97
		Diagonal	Max Tension	11	5.48	0.00	0.00
			Max. Compression	10	-5.55	0.00	0.00
			Max. Mx	34	-0.11	0.07	0.00
			Max. Vy	34	-0.04	0.00	0.00
		Horizontal	Max Tension	10	2.95	0.00	0.00
			Max. Compression	11	-3.02	0.00	0.00
			Max. Mx	38	-0.00	-0.04	-0.00
			Max. My	13	0.61	-0.00	0.01
			Max. Vy	38	0.04	-0.04	-0.00
			Max. Vx	13	-0.00	-0.00	0.01
		Top Girt	Max Tension	5	0.48	-0.01	0.00
			Max. Compression	2	-0.50	-0.01	-0.00
			Max. Mx	48	-0.04	-0.03	-0.00
			Max. My	8	-0.15	-0.01	-0.00
			Max. Vy	48	0.04	-0.03	-0.00
			Max. Vx	8	0.00	0.00	0.00
		Inner Bracing	Max Tension	2	0.01	0.00	0.00
			Max. Compression	2	-0.01	0.00	0.00
			Max. Mx	34	-0.00	-0.04	0.00

Section No	Elevation ft	Component Type	Condition	Gov. Load Comb	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	-0.03	0.00	0.00
T2	160 - 140	Leg	Max Tension	9	34.65	-0.15	0.03
			Max. Compression	12	-39.86	0.24	-0.00
			Max. Mx	28	33.51	-0.24	0.00
			Max. My	11	-0.76	-0.01	0.32
			Max. Vy	28	-2.56	-0.04	0.02
			Max. Vx	16	-2.68	0.01	-0.03
		Diagonal	Max Tension	11	9.71	0.00	0.00
			Max. Compression	10	-9.78	0.00	0.00
			Max. Mx	34	-0.18	0.09	0.00
			Max. Vy	34	-0.04	0.00	0.00
		Horizontal	Max Tension	10	5.95	0.00	0.00
			Max. Compression	11	-5.92	0.00	0.00
			Max. Mx	48	-0.04	-0.05	-0.00
			Max. My	12	2.00	-0.00	0.01
			Max. Vy	48	-0.05	-0.05	-0.00
			Max. Vx	12	-0.00	-0.00	0.01
		Inner Bracing	Max Tension	13	0.01	0.00	0.00
			Max. Compression	28	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.05	0.00
			Max. Vy	34	-0.04	0.00	0.00
T3	140 - 133.333	Leg	Max Tension	9	46.31	-0.24	0.01
			Max. Compression	12	-52.43	0.22	0.00
			Max. Mx	28	45.39	-0.24	0.00
			Max. My	11	-0.56	-0.01	0.32
			Max. Vy	18	-0.09	-0.24	-0.02
			Max. Vx	27	-0.12	0.00	-0.31
		Diagonal	Max Tension	11	9.47	0.00	0.00
			Max. Compression	10	-9.59	0.00	0.00
			Max. Mx	34	-0.24	0.11	0.00
			Max. Vy	34	-0.05	0.00	0.00
		Horizontal	Max Tension	10	6.19	0.00	0.00
			Max. Compression	11	-6.16	0.00	0.00
			Max. Mx	48	-0.02	-0.07	-0.00
			Max. My	13	0.55	0.00	0.02
			Max. Vy	48	-0.06	-0.07	-0.00
			Max. Vx	13	0.00	0.00	0.00
		Inner Bracing	Max Tension	13	0.01	0.00	0.00
			Max. Compression	28	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.05	0.00
			Max. Vy	34	0.04	0.00	0.00
T4	133.333 - 126.667	Leg	Max Tension	9	57.65	-0.22	0.01
			Max. Compression	12	-65.99	1.21	0.01
			Max. Mx	28	55.85	-1.28	-0.01
			Max. My	11	-1.55	-0.03	1.25
			Max. Vy	18	-2.25	-0.21	-0.00
			Max. Vx	11	2.23	-0.01	0.15
		Diagonal	Max Tension	11	12.57	0.00	0.00
			Max. Compression	10	-12.69	0.00	0.00
			Max. Mx	34	-0.27	0.12	0.00
			Max. Vy	34	-0.05	0.00	0.00
		Top Girt	Max Tension	11	8.46	0.00	0.00
			Max. Compression	10	-8.47	0.00	0.00
			Max. Mx	48	-0.36	-0.08	-0.01
			Max. My	12	1.46	-0.00	0.02
			Max. Vy	48	-0.06	-0.08	-0.01
			Max. Vx	12	0.00	0.00	0.00
		Inner Bracing	Max Tension	10	0.15	0.00	0.00
			Max. Compression	10	-0.15	0.00	0.00
			Max. Mx	34	0.00	-0.06	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	0.04	0.00	0.00
T5	126.667 - 120	Leg	Max Tension	29	72.38	-1.27	-0.01
			Max. Compression	12	-83.38	1.31	0.05
			Max. Mx	18	66.02	1.52	0.02
			Max. My	27	-6.48	-0.01	1.49
			Max. Vy	18	-1.69	-1.27	0.01
			Max. Vx	27	-1.66	-0.02	-1.24
		Diagonal	Max Tension	11	15.26	0.00	0.00
			Max. Compression	10	-15.39	0.00	0.00
			Max. Mx	34	-0.29	0.13	0.00
			Max. Vy	34	0.06	0.00	0.00
		Top Girt	Max Tension	10	10.59	0.00	0.00
			Max. Compression	10	-10.58	0.00	0.00
			Max. Mx	48	-0.36	-0.09	-0.01
			Max. My	12	1.47	-0.00	0.03
			Max. Vy	48	0.06	-0.09	-0.01
			Max. Vx	12	-0.00	-0.00	0.03
		Inner Bracing	Max Tension	10	0.18	0.00	0.00
			Max. Compression	10	-0.19	0.00	0.00
			Max. Mx	34	0.00	-0.07	0.00
			Max. Vy	34	0.05	0.00	0.00
T6	120 - 100	Leg	Max Tension	29	118.00	-0.51	-0.09
			Max. Compression	12	-132.06	0.78	0.08
			Max. Mx	28	88.83	-1.35	-0.06
			Max. My	11	-2.39	-0.04	1.40
			Max. Vy	18	-0.23	-1.33	0.02
			Max. Vx	11	0.27	-0.04	1.40
		Diagonal	Max Tension	11	19.86	0.00	0.00
			Max. Compression	10	-20.06	0.00	0.00
			Max. Mx	34	-0.43	0.26	0.00
			Max. Vy	34	-0.08	0.00	0.00
		Horizontal	Max Tension	16	11.97	-0.03	-0.00
			Max. Compression	17	-11.91	-0.02	-0.00
			Max. Mx	48	-0.29	-0.11	-0.01
			Max. My	13	1.14	0.01	0.03
			Max. Vy	48	-0.07	-0.11	-0.01
			Max. Vx	13	0.00	0.00	0.00
		Inner Bracing	Max Tension	13	0.01	0.00	0.00
			Max. Compression	28	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.11	0.00
			Max. Vy	34	0.06	0.00	0.00
T7	100 - 90	Leg	Max Tension	29	145.07	-0.79	-0.09
			Max. Compression	12	-160.64	0.66	0.07
			Max. Mx	28	143.25	-0.80	-0.09
			Max. My	11	-3.18	-0.03	0.81
			Max. Vy	18	-0.16	-0.78	0.02
			Max. Vx	26	-0.19	-0.01	-0.80
		Diagonal	Max Tension	17	18.79	0.00	0.00
			Max. Compression	16	-19.02	0.00	0.00
			Max. Mx	34	-0.53	0.31	0.00
			Max. Vy	34	0.10	0.00	0.00
		Horizontal	Max Tension	31	11.93	0.00	0.00
			Max. Compression	14	-12.01	-0.04	-0.01
			Max. Mx	48	-0.64	-0.12	-0.01
			Max. My	12	1.17	-0.01	0.02
			Max. Vy	48	-0.08	-0.12	-0.01
			Max. Vx	12	-0.00	-0.01	0.02
		Inner Bracing	Max Tension	13	0.00	0.00	0.00
			Max. Compression	43	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.13	0.00
			Max. Vy	34	0.07	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T8	90 - 80	Leg	Max Tension	29	169.57	-0.70	-0.08
			Max. Compression	12	-186.67	1.01	0.08
			Max. Mx	28	167.28	-1.04	-0.09
			Max. My	10	-6.42	-0.04	1.20
			Max. Vy	18	0.18	-1.03	0.02
			Max. Vx	10	-0.23	-0.04	1.20
		Diagonal	Max Tension	17	18.97	0.00	0.00
			Max. Compression	16	-19.21	0.00	0.00
			Max. Mx	34	-0.59	0.34	0.00
			Max. Vy	34	0.10	0.00	0.00
		Top Girt	Max Tension	16	12.64	-0.04	-0.00
			Max. Compression	17	-12.57	-0.03	-0.00
			Max. Mx	48	-0.37	-0.14	-0.01
			Max. My	13	0.60	-0.01	0.02
			Max. Vy	48	-0.08	-0.14	-0.01
			Max. Vx	13	0.00	-0.01	0.02
		Inner Bracing	Max Tension	33	0.21	0.00	0.00
			Max. Compression	32	-0.22	0.00	0.00
			Max. Mx	34	-0.00	-0.15	0.00
			Max. Vy	34	0.07	0.00	0.00
T9	80 - 60	Leg	Max Tension	29	217.41	-1.34	-0.06
			Max. Compression	12	-237.89	1.62	0.08
			Max. Mx	28	214.62	-1.65	-0.09
			Max. My	10	-8.24	-0.04	1.72
			Max. Vy	18	0.20	-1.62	0.03
			Max. Vx	27	0.25	-0.00	-1.70
		Diagonal	Max Tension	17	20.35	0.00	0.00
			Max. Compression	16	-20.69	0.00	0.00
			Max. Mx	34	-0.74	0.41	0.00
			Max. Vy	34	-0.11	0.00	0.00
		Horizontal	Max Tension	16	14.60	-0.08	-0.00
			Max. Compression	17	-14.46	-0.06	-0.00
			Max. Mx	48	-0.34	-0.24	-0.01
			Max. My	28	-0.23	-0.11	-0.03
			Max. Vy	48	-0.12	-0.24	-0.01
			Max. Vx	28	-0.00	-0.11	-0.03
		Inner Bracing	Max Tension	13	0.00	0.00	0.00
			Max. Compression	43	-0.02	0.00	0.00
			Max. Mx	34	-0.02	-0.22	0.00
			Max. Vy	34	0.09	0.00	0.00
T10	60 - 40	Leg	Max Tension	29	264.81	-1.42	-0.06
			Max. Compression	12	-289.09	1.12	0.05
			Max. Mx	28	238.48	-1.65	-0.09
			Max. My	10	-8.68	-0.04	1.72
			Max. Vy	18	-0.24	-1.62	0.03
			Max. Vx	11	0.28	-0.04	1.72
		Diagonal	Max Tension	17	21.35	0.00	0.00
			Max. Compression	16	-21.81	0.00	0.00
			Max. Mx	34	-0.91	0.54	0.00
			Max. Vy	34	-0.14	0.00	0.00
		Horizontal	Max Tension	16	16.25	-0.10	-0.00
			Max. Compression	17	-16.02	-0.08	-0.00
			Max. Mx	48	-0.27	-0.29	-0.01
			Max. My	28	-1.49	-0.13	-0.03
			Max. Vy	48	-0.13	-0.29	-0.01
			Max. Vx	28	0.00	-0.13	-0.03
		Inner Bracing	Max Tension	13	0.00	0.00	0.00
			Max. Compression	43	-0.02	0.00	0.00
			Max. Mx	34	-0.02	-0.34	0.00
			Max. Vy	34	-0.13	0.00	0.00
T11	40 - 30	Leg	Max Tension	29	288.11	-1.19	-0.07

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	12	-314.37	2.76	0.04
			Max. Mx	12	-314.37	2.76	0.04
			Max. My	10	-10.93	-0.06	1.53
			Max. Vy	18	0.29	-2.55	0.02
			Max. Vx	10	0.23	-0.06	1.53
		Diagonal	Max Tension	17	21.71	0.00	0.00
			Max. Compression	16	-22.21	0.00	0.00
			Max. Mx	34	-0.97	0.57	0.00
			Max. Vy	34	-0.15	0.00	0.00
		Horizontal	Max Tension	16	16.92	-0.12	-0.00
			Max. Compression	17	-16.68	-0.09	-0.00
			Max. Mx	48	-0.32	-0.31	-0.01
			Max. My	28	-0.12	-0.15	-0.03
			Max. Vy	48	-0.13	-0.31	-0.01
			Max. Vx	28	0.00	-0.15	-0.03
		Inner Bracing	Max Tension	13	0.00	0.00	0.00
			Max. Compression	43	-0.02	0.00	0.00
			Max. Mx	34	-0.02	-0.36	0.00
			Max. Vy	34	0.13	0.00	0.00
T12	30 - 20	Leg	Max Tension	29	310.96	-2.62	-0.05
			Max. Compression	12	-339.26	-2.83	0.18
			Max. Mx	12	-339.26	-2.83	0.18
			Max. My	10	-12.63	-0.38	4.74
			Max. Vy	12	0.67	2.76	0.04
			Max. Vx	10	-0.54	-0.38	4.74
		Diagonal	Max Tension	17	22.23	0.00	0.00
			Max. Compression	16	-22.81	0.00	0.00
			Max. Mx	34	-1.03	0.61	0.00
			Max. Vy	34	-0.15	0.00	0.00
		Top Girt	Max Tension	16	17.76	-0.17	-0.00
			Max. Compression	17	-17.40	-0.13	-0.00
			Max. Mx	48	0.01	-0.38	-0.01
			Max. My	28	0.64	-0.22	-0.03
			Max. Vy	48	-0.15	-0.38	-0.01
			Max. Vx	28	-0.00	0.00	0.00
		Inner Bracing	Max Tension	33	0.30	0.00	0.00
			Max. Compression	32	-0.31	0.00	0.00
			Max. Mx	34	-0.02	-0.39	0.00
			Max. Vy	34	0.13	0.00	0.00
T13	20 - 0	Leg	Max Tension	29	331.58	2.13	-0.20
			Max. Compression	12	-362.87	0.00	0.00
			Max. Mx	12	-362.52	8.75	-0.25
			Max. My	10	-13.58	-0.38	4.74
			Max. Vy	12	-1.26	8.75	-0.25
			Max. Vx	10	0.97	-0.38	4.74
		Diagonal	Max Tension	17	32.48	-0.22	-0.07
			Max. Compression	16	-33.20	0.00	0.00
			Max. Mx	30	21.89	-0.33	-0.08
			Max. My	12	-28.87	0.12	-0.10
			Max. Vy	37	-0.10	-0.24	-0.00
			Max. Vx	12	-0.01	0.12	-0.10
		Horizontal	Max Tension	16	18.33	-0.23	-0.00
			Max. Compression	17	-18.22	-0.18	-0.00
			Max. Mx	38	-0.76	-0.54	-0.01
			Max. My	28	-0.56	-0.40	-0.06
			Max. Vy	38	0.18	-0.54	-0.01
			Max. Vx	28	-0.00	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	12	6.30	0.00	0.00
			Max. Compression	12	-6.30	0.00	0.00
			Max. Mx	34	1.21	0.05	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	0.03	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	12	5.76	0.00	0.00
			Max. Compression	12	-5.76	0.00	0.00
			Max. Mx	34	1.11	0.09	0.00
			Max. Vy	34	-0.03	0.00	0.00
		Redund Hip 1 Bracing	Max Tension	13	0.01	0.00	0.00
			Max. Compression	28	-0.03	0.00	0.00
			Max. Mx	34	-0.02	0.08	0.00
			Max. Vy	34	-0.05	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	35	-0.02	0.00	0.00
			Max. Mx	34	-0.02	0.25	0.00
			Max. Vy	34	-0.08	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	24	402.79	47.96	-28.59
	Max. H_x	24	402.79	47.96	-28.59
	Max. H_z	7	-360.16	-42.89	28.45
	Min. Vert	9	-374.36	-45.80	27.31
	Min. H_x	9	-374.36	-45.80	27.31
	Min. H_z	22	388.10	45.01	-29.72
Leg B	Max. Vert	12	409.60	-48.45	-28.95
	Max. H_x	29	-375.50	45.89	27.44
	Max. H_z	31	-361.87	43.02	28.63
	Min. Vert	29	-375.50	45.89	27.44
	Min. H_x	12	409.60	-48.45	-28.95
	Min. H_z	14	395.07	-45.51	-30.10
Leg A	Max. Vert	2	404.25	0.07	55.81
	Max. H_x	26	23.39	11.00	1.93
	Max. H_z	2	404.25	0.07	55.81
	Min. Vert	19	-366.92	-0.08	-52.79
	Min. H_x	11	10.80	-11.02	0.83
	Min. H_z	19	-366.92	-0.08	-52.79

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	45.53	0.00	0.00	-26.07	-2.58	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	54.63	-0.42	-96.43	-9252.97	63.61	2.63
0.9 Dead+1.6 Wind 0 deg - No Ice	40.97	-0.42	-96.43	-9245.15	64.38	2.63
1.2 Dead+1.6 Wind 30 deg - No Ice	54.63	48.26	-83.51	-8020.64	-4624.47	-20.26
0.9 Dead+1.6 Wind 30 deg - No	40.97	48.26	-83.51	-8012.82	-4623.70	-20.26

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
1.2 Dead+1.6 Wind 45 deg - No Ice	54.63	68.52	-68.03	-6528.25	-6582.37	-29.61
0.9 Dead+1.6 Wind 45 deg - No Ice	40.97	68.52	-68.03	-6520.43	-6581.60	-29.61
1.2 Dead+1.6 Wind 60 deg - No Ice	54.63	84.13	-47.88	-4588.38	-8095.49	-37.50
0.9 Dead+1.6 Wind 60 deg - No Ice	40.97	84.13	-47.88	-4580.56	-8094.72	-37.50
1.2 Dead+1.6 Wind 90 deg - No Ice	54.63	97.50	0.56	60.81	-9405.35	-44.70
0.9 Dead+1.6 Wind 90 deg - No Ice	40.97	97.50	0.56	68.63	-9404.57	-44.70
1.2 Dead+1.6 Wind 120 deg - No Ice	54.63	84.51	48.58	4637.33	-8155.24	-40.13
0.9 Dead+1.6 Wind 120 deg - No Ice	40.97	84.51	48.58	4645.15	-8154.46	-40.13
1.2 Dead+1.6 Wind 135 deg - No Ice	54.63	69.11	68.28	6501.16	-6676.82	-33.84
0.9 Dead+1.6 Wind 135 deg - No Ice	40.97	69.11	68.28	6508.98	-6676.05	-33.84
1.2 Dead+1.6 Wind 150 deg - No Ice	54.63	49.08	83.36	7925.18	-4756.92	-24.85
0.9 Dead+1.6 Wind 150 deg - No Ice	40.97	49.08	83.36	7933.00	-4756.14	-24.85
1.2 Dead+1.6 Wind 180 deg - No Ice	54.63	0.66	96.00	9114.27	-112.07	-2.55
0.9 Dead+1.6 Wind 180 deg - No Ice	40.97	0.66	96.00	9122.09	-111.30	-2.55
1.2 Dead+1.6 Wind 210 deg - No Ice	54.63	-48.03	83.11	7887.64	4576.69	20.50
0.9 Dead+1.6 Wind 210 deg - No Ice	40.97	-48.03	83.11	7895.47	4577.47	20.50
1.2 Dead+1.6 Wind 225 deg - No Ice	54.63	-68.25	67.80	6425.71	6527.62	30.38
0.9 Dead+1.6 Wind 225 deg - No Ice	40.97	-68.25	67.80	6433.53	6528.40	30.38
1.2 Dead+1.6 Wind 240 deg - No Ice	54.63	-83.88	47.74	4500.54	8045.52	37.50
0.9 Dead+1.6 Wind 240 deg - No Ice	40.97	-83.88	47.74	4508.36	8046.30	37.50
1.2 Dead+1.6 Wind 270 deg - No Ice	54.63	-97.04	-0.56	-124.16	9317.36	44.45
0.9 Dead+1.6 Wind 270 deg - No Ice	40.97	-97.04	-0.56	-116.34	9318.14	44.45
1.2 Dead+1.6 Wind 300 deg - No Ice	54.63	-84.02	-48.57	-4698.43	8061.97	40.05
0.9 Dead+1.6 Wind 300 deg - No Ice	40.97	-84.02	-48.57	-4690.61	8062.74	40.05
1.2 Dead+1.6 Wind 315 deg - No Ice	54.63	-68.69	-68.39	-6583.37	6596.40	33.62
0.9 Dead+1.6 Wind 315 deg - No Ice	40.97	-68.69	-68.39	-6575.55	6597.17	33.62
1.2 Dead+1.6 Wind 330 deg - No Ice	54.63	-48.70	-83.58	-8026.81	4683.07	24.85
0.9 Dead+1.6 Wind 330 deg - No Ice	40.97	-48.70	-83.58	-8018.98	4683.84	24.85
1.2 Dead+1.0 Ice	186.19	0.00	0.00	-270.23	-0.01	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice	186.19	-0.04	-22.86	-2444.52	6.85	-1.48
1.2 Dead+1.0 Wind 30 deg+1.0	186.19	11.44	-19.80	-2154.29	-1088.85	-5.17

Load Combination	Vertical K	Shear$_x$ K	Shear$_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Ice						
1.2 Dead+1.0 Wind 45 deg+1.0 Ice	186.19	16.21	-16.15	-1805.72	-1544.54	-6.49
1.2 Dead+1.0 Wind 60 deg+1.0 Ice	186.19	19.87	-11.40	-1351.93	-1895.41	-7.44
1.2 Dead+1.0 Wind 90 deg+1.0 Ice	186.19	22.98	0.06	-260.24	-2194.98	-7.72
1.2 Dead+1.0 Wind 120 deg+1.0 Ice	186.19	19.91	11.47	822.85	-1901.41	-5.96
1.2 Dead+1.0 Wind 135 deg+1.0 Ice	186.19	16.27	16.17	1267.70	-1554.25	-4.46
1.2 Dead+1.0 Wind 150 deg+1.0 Ice	186.19	11.53	19.78	1608.40	-1102.82	-2.60
1.2 Dead+1.0 Wind 180 deg+1.0 Ice	186.19	0.07	22.81	1894.66	-12.09	1.49
1.2 Dead+1.0 Wind 210 deg+1.0 Ice	186.19	-11.41	19.75	1605.14	1083.69	5.20
1.2 Dead+1.0 Wind 225 deg+1.0 Ice	186.19	-16.17	16.12	1260.32	1538.52	6.59
1.2 Dead+1.0 Wind 240 deg+1.0 Ice	186.19	-19.84	11.38	808.35	1889.98	7.44
1.2 Dead+1.0 Wind 270 deg+1.0 Ice	186.19	-22.93	-0.06	-280.32	2184.87	7.69
1.2 Dead+1.0 Wind 300 deg+1.0 Ice	186.19	-19.85	-11.47	-1363.14	1890.65	5.95
1.2 Dead+1.0 Wind 315 deg+1.0 Ice	186.19	-16.22	-16.18	-1810.59	1545.07	4.43
1.2 Dead+1.0 Wind 330 deg+1.0 Ice	186.19	-11.48	-19.80	-2153.68	1094.45	2.60
Dead+Wind 0 deg - Service	45.53	-0.07	-15.59	-1517.18	8.20	0.42
Dead+Wind 30 deg - Service	45.53	7.80	-13.50	-1317.92	-749.84	-3.28
Dead+Wind 45 deg - Service	45.53	11.08	-11.00	-1076.60	-1066.42	-4.79
Dead+Wind 60 deg - Service	45.53	13.60	-7.74	-762.93	-1311.09	-6.06
Dead+Wind 90 deg - Service	45.53	15.77	0.09	-11.18	-1522.89	-7.23
Dead+Wind 120 deg - Service	45.53	13.66	7.85	728.83	-1320.75	-6.49
Dead+Wind 135 deg - Service	45.53	11.18	11.04	1030.20	-1081.70	-5.47
Dead+Wind 150 deg - Service	45.53	7.94	13.48	1260.46	-771.26	-4.02
Dead+Wind 180 deg - Service	45.53	0.11	15.52	1452.73	-20.20	-0.41
Dead+Wind 210 deg - Service	45.53	-7.77	13.44	1254.39	737.95	3.32
Dead+Wind 225 deg - Service	45.53	-11.04	10.96	1018.00	1053.41	4.91
Dead+Wind 240 deg - Service	45.53	-13.56	7.72	706.71	1298.85	6.06
Dead+Wind 270 deg - Service	45.53	-15.69	-0.09	-41.09	1504.50	7.19
Dead+Wind 300 deg - Service	45.53	-13.59	-7.85	-780.73	1301.51	6.48
Dead+Wind 315 deg - Service	45.53	-11.11	-11.06	-1085.51	1064.53	5.44
Dead+Wind 330 deg - Service	45.53	-7.87	-13.52	-1318.91	755.15	4.02

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-45.53	0.00	0.00	45.53	0.00	0.000%
2	-0.42	-54.63	-96.43	0.42	54.63	96.43	0.000%
3	-0.42	-40.97	-96.43	0.42	40.97	96.43	0.000%
4	48.26	-54.63	-83.51	-48.26	54.63	83.51	0.000%
5	48.26	-40.97	-83.51	-48.26	40.97	83.51	0.000%
6	68.52	-54.63	-68.03	-68.52	54.63	68.03	0.000%
7	68.52	-40.97	-68.03	-68.52	40.97	68.03	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
8	84.13	-54.63	-47.88	-84.13	54.63	47.88	0.000%
9	84.13	-40.97	-47.88	-84.13	40.97	47.88	0.000%
10	97.50	-54.63	0.56	-97.50	54.63	-0.56	0.000%
11	97.50	-40.97	0.56	-97.50	40.97	-0.56	0.000%
12	84.51	-54.63	48.58	-84.51	54.63	-48.58	0.000%
13	84.51	-40.97	48.58	-84.51	40.97	-48.58	0.000%
14	69.11	-54.63	68.28	-69.11	54.63	-68.28	0.000%
15	69.11	-40.97	68.28	-69.11	40.97	-68.28	0.000%
16	49.08	-54.63	83.36	-49.08	54.63	-83.36	0.000%
17	49.08	-40.97	83.36	-49.08	40.97	-83.36	0.000%
18	0.66	-54.63	96.00	-0.66	54.63	-96.00	0.000%
19	0.66	-40.97	96.00	-0.66	40.97	-96.00	0.000%
20	-48.03	-54.63	83.11	48.03	54.63	-83.11	0.000%
21	-48.03	-40.97	83.11	48.03	40.97	-83.11	0.000%
22	-68.25	-54.63	67.80	68.25	54.63	-67.80	0.000%
23	-68.25	-40.97	67.80	68.25	40.97	-67.80	0.000%
24	-83.88	-54.63	47.74	83.88	54.63	-47.74	0.000%
25	-83.88	-40.97	47.74	83.88	40.97	-47.74	0.000%
26	-97.04	-54.63	-0.56	97.04	54.63	0.56	0.000%
27	-97.04	-40.97	-0.56	97.04	40.97	0.56	0.000%
28	-84.02	-54.63	-48.57	84.02	54.63	48.57	0.000%
29	-84.02	-40.97	-48.57	84.02	40.97	48.57	0.000%
30	-68.69	-54.63	-68.39	68.69	54.63	68.39	0.000%
31	-68.69	-40.97	-68.39	68.69	40.97	68.39	0.000%
32	-48.70	-54.63	-83.58	48.70	54.63	83.58	0.000%
33	-48.70	-40.97	-83.58	48.70	40.97	83.58	0.000%
34	0.00	-186.19	0.00	0.00	186.19	0.00	0.000%
35	-0.04	-186.19	-22.86	0.04	186.19	22.86	0.000%
36	11.44	-186.19	-19.80	-11.44	186.19	19.80	0.000%
37	16.21	-186.19	-16.15	-16.21	186.19	16.15	0.000%
38	19.87	-186.19	-11.40	-19.87	186.19	11.40	0.000%
39	22.98	-186.19	0.06	-22.98	186.19	-0.06	0.000%
40	19.91	-186.19	11.47	-19.91	186.19	-11.47	0.000%
41	16.27	-186.19	16.17	-16.27	186.19	-16.17	0.000%
42	11.53	-186.19	19.78	-11.53	186.19	-19.78	0.000%
43	0.07	-186.19	22.81	-0.07	186.19	-22.81	0.000%
44	-11.41	-186.19	19.75	11.41	186.19	-19.75	0.000%
45	-16.17	-186.19	16.12	16.17	186.19	-16.12	0.000%
46	-19.84	-186.19	11.38	19.84	186.19	-11.38	0.000%
47	-22.93	-186.19	-0.06	22.93	186.19	0.06	0.000%
48	-19.85	-186.19	-11.47	19.85	186.19	11.47	0.000%
49	-16.22	-186.19	-16.18	16.22	186.19	16.18	0.000%
50	-11.48	-186.19	-19.80	11.48	186.19	19.80	0.000%
51	-0.07	-45.53	-15.59	0.07	45.53	15.59	0.000%
52	7.80	-45.53	-13.50	-7.80	45.53	13.50	0.000%
53	11.08	-45.53	-11.00	-11.08	45.53	11.00	0.000%
54	13.60	-45.53	-7.74	-13.60	45.53	7.74	0.000%
55	15.77	-45.53	0.09	-15.77	45.53	-0.09	0.000%
56	13.66	-45.53	7.85	-13.66	45.53	-7.85	0.000%
57	11.18	-45.53	11.04	-11.18	45.53	-11.04	0.000%
58	7.94	-45.53	13.48	-7.94	45.53	-13.48	0.000%
59	0.11	-45.53	15.52	-0.11	45.53	-15.52	0.000%
60	-7.77	-45.53	13.44	7.77	45.53	-13.44	0.000%
61	-11.04	-45.53	10.96	11.04	45.53	-10.96	0.000%
62	-13.56	-45.53	7.72	13.56	45.53	-7.72	0.000%
63	-15.69	-45.53	-0.09	15.69	45.53	0.09	0.000%
64	-13.59	-45.53	-7.85	13.59	45.53	7.85	0.000%
65	-11.11	-45.53	-11.06	11.11	45.53	11.06	0.000%
66	-7.87	-45.53	-13.52	7.87	45.53	13.52	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	2.254	55	0.0941	0.0013
T2	160 - 140	1.852	55	0.0929	0.0026
T3	140 - 133.333	1.451	55	0.0852	0.0053
T4	133.333 - 126.667	1.328	55	0.0827	0.0057
T5	126.667 - 120	1.206	55	0.0799	0.0060
T6	120 - 100	1.086	55	0.0765	0.0061
T7	100 - 90	0.768	55	0.0642	0.0058
T8	90 - 80	0.629	55	0.0581	0.0053
T9	80 - 60	0.503	55	0.0516	0.0048
T10	60 - 40	0.292	55	0.0392	0.0037
T11	40 - 30	0.137	55	0.0256	0.0026
T12	30 - 20	0.080	56	0.0185	0.0019
T13	20 - 0	0.040	58	0.0111	0.0014

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.00	AP11-850/090/ADT w/Mount Pipe	55	2.214	0.0942	0.0014	722761
177.00	PA6-65AC	55	2.194	0.0942	0.0015	722761
175.00	SE419-SWBPALDF Panel Antenna	55	2.155	0.0942	0.0016	722761
171.00	2" Dia 10' Omni	55	2.075	0.0942	0.0018	401539
170.00	WPA-700102-4CF-EDIN-X w/ Mount Kit	55	2.055	0.0942	0.0019	361384
169.00	3' Yagi	55	2.035	0.0941	0.0020	328532
162.00	AP11-850/090/ADT w/Mount Pipe	55	1.893	0.0933	0.0025	211631
160.00	Pirod 15' T-Frame Sector Mount (1)	55	1.852	0.0929	0.0026	229791
159.00	2" Dia 10' Omni	55	1.832	0.0926	0.0027	263902
133.00	Pirod 15' T-Frame Sector Mount (1)	55	1.322	0.0826	0.0057	Inf
125.00	AIR21 B2A/B4P	55	1.176	0.0791	0.0060	168087
60.00	GPS	55	0.292	0.0392	0.0037	83088

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	13.937	10	0.5817	0.0079
T2	160 - 140	11.452	10	0.5747	0.0161
T3	140 - 133.333	8.967	10	0.5270	0.0330
T4	133.333 - 126.667	8.207	10	0.5117	0.0354
T5	126.667 - 120	7.453	10	0.4941	0.0368
T6	120 - 100	6.710	10	0.4731	0.0376
T7	100 - 90	4.747	10	0.3966	0.0357
T8	90 - 80	3.889	10	0.3592	0.0330
T9	80 - 60	3.111	10	0.3187	0.0298

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb	Tilt °	Twist °
T10	60 - 40	1.805	10	0.2422	0.0229
T11	40 - 30	0.846	10	0.1580	0.0158
T12	30 - 20	0.494	12	0.1139	0.0119
T13	20 - 0	0.245	12	0.0685	0.0084

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.00	AP11-850/090/ADT w/Mount Pipe	10	13.690	0.5821	0.0087	120734
177.00	PA6-65AC	10	13.567	0.5823	0.0091	120734
175.00	SE419-SWBPALDF Panel Antenna	10	13.321	0.5826	0.0098	120734
171.00	2" Dia 10' Omni	10	12.826	0.5827	0.0114	67075
170.00	WPA-700102-4CF-EDIN-X w/ Mount Kit	10	12.703	0.5825	0.0118	60367
169.00	3' Yagi	10	12.579	0.5823	0.0122	54879
162.00	AP11-850/090/ADT w/Mount Pipe	10	11.704	0.5773	0.0152	35379
160.00	Pirod 15' T-Frame Sector Mount (1)	10	11.452	0.5747	0.0161	38523
159.00	2" Dia 10' Omni	10	11.326	0.5731	0.0165	44408
133.00	Pirod 15' T-Frame Sector Mount (1)	10	8.169	0.5109	0.0355	320110
125.00	AIR21 B2A/B4P	10	7.265	0.4891	0.0371	26957
60.00	GPS	10	1.805	0.2422	0.0229	13450

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.8750	4	1.22	40.59	0.030 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	1.85	12.43	0.149 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	1.51	12.43	0.122 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	0.25	12.43	0.020 ✓	1	Bolt Shear
T2	160	Leg	A325N	0.8750	4	8.66	40.59	0.213 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	3.26	12.43	0.262 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	2.97	12.43	0.239 ✓	1	Bolt Shear
T3	140	Leg	A325N	0.7500	6	7.72	29.82	0.259 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	3.20	12.43	0.257 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	3.10	12.43	0.249 ✓	1	Bolt Shear
T4	133.333	Leg	A325N	0.7500	6	9.61	29.82	0.322 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	4.23	12.43	0.341 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	4.23	12.43	0.341 ✓	1	Bolt Shear
T5	126.667	Leg	A325N	0.7500	6	12.06	29.82	0.405 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	5.13	12.43	0.413 ✓	1	Bolt Shear

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
		Top Girt	A325N	0.6250	2	5.29	12.43	0.426 ✓	1	Bolt Shear
T6	120	Leg	A325N	0.7500	6	19.67	29.82	0.660 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6.69	12.43	0.538 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	5.98	12.43	0.482 ✓	1	Bolt Shear
T7	100	Leg	A325N	0.7500	6	24.18	29.82	0.811 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6.34	12.43	0.510 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	6.00	12.43	0.483 ✓	1	Bolt Shear
T8	90	Leg	A325N	1.0000	6	28.26	53.01	0.533 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6.40	12.43	0.515 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	6.32	12.43	0.509 ✓	1	Bolt Shear
T9	80	Leg	A325N	1.0000	6	36.24	53.01	0.684 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6.90	12.43	0.555 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	7.30	12.43	0.587 ✓	1	Bolt Shear
T10	60	Leg	A325N	1.0000	8	33.10	53.01	0.624 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	7.27	12.43	0.585 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	8.13	12.43	0.654 ✓	1	Bolt Shear
T11	40	Leg	A325N	1.0000	8	36.01	53.01	0.679 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	7.40	12.43	0.596 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	8.46	12.43	0.681 ✓	1	Bolt Shear
T12	30	Leg	A325N	1.0000	8	38.87	53.01	0.733 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	7.60	12.43	0.612 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	8.88	12.43	0.715 ✓	1	Bolt Shear
T13	20	Leg	A325N	1.0000	8	41.39	53.01	0.781 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	11.07	12.43	0.891 ✓	1	Bolt Shear
		Horizontal	A325N	0.7500	2	9.17	17.89	0.512 ✓	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8 K=1.00	2.2285	-5.73	70.98	0.081 [1] ✓
T2	160 - 140	ROHN 4 STD	20.04	6.68	53.1 K=1.00	3.1741	-39.86	116.23	0.343 [1] ✓
T3	140 - 133.333	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-52.43	239.38	0.219 [1] ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	133.333 - 126.667	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-65.99	239.38	0.276 [1] ✓
T5	126.667 - 120	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-83.38	239.38	0.348 [1] ✓
T6	120 - 100	ROHN 6 EHS	20.04	10.02	54.0 K=1.00	6.7133	-132.07	244.02	0.541 [1] ✓
T7	100 - 90	ROHN 6 EH	10.03	10.03	54.8 K=1.00	8.4049	-160.64	303.58	0.529 [1] ✓
T8	90 - 80	ROHN 6 EH	10.03	10.03	54.8 K=1.00	8.4049	-186.67	303.58	0.615 [1] ✓
T9	80 - 60	ROHN 8 EHS	20.05	10.03	41.2 K=1.00	9.7193	-237.89	386.31	0.616 [1] ✓
T10	60 - 40	ROHN 8 EHS	20.05	10.03	41.2 K=1.00	9.7193	-289.09	386.31	0.748 [1] ✓
T11	40 - 30	ROHN 8 EHS	10.03	10.03	41.2 K=1.00	9.7193	-314.37	386.31	0.814 [1] ✓
T12	30 - 20	ROHN 8 EHS	10.03	10.03	41.2 K=1.00	9.7193	-339.26	386.31	0.878 [1] ✓
T13	20 - 0	ROHN 8 EH	20.05	10.03	41.8 K=1.00	12.7627	-362.87	505.43	0.718 [1] ✓

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0 K=1.00	1.0745	-5.55	17.75	0.312 [1] ✓
T2	160 - 140	ROHN 2 STD	8.55	8.25	125.8 K=1.00	1.0745	-9.54	15.33	0.622 [1] ✓
T3	140 - 133.333	ROHN 2 EH	8.77	8.42	131.5 K=1.00	1.4807	-9.59	19.35	0.496 [1] ✓
T4	133.333 - 126.667	ROHN 2 EH	9.00	8.66	135.3 K=1.00	1.4807	-12.69	18.29	0.694 [1] ✓
T5	126.667 - 120	ROHN 2 X-STR	9.24	8.91	139.4 K=1.00	1.4773	-15.39	17.17	0.897 [1] ✓
T6	120 - 100	ROHN 2.5 EH	12.52	12.06	156.6 K=1.00	2.2535	-20.03	20.76	0.964 [1] ✓
T7	100 - 90	ROHN 3 STD	12.92	12.49	128.8 K=1.00	2.2285	-19.02	30.35	0.627 [1] ✓
T8	90 - 80	ROHN 3 STD	13.35	12.93	133.4 K=1.00	2.2285	-19.21	28.29	0.679 [1] ✓
T9	80 - 60	ROHN 3 STD	14.21	13.70	141.3 K=1.00	2.2285	-20.69	25.21	0.821 [1] ✓
T10	60 - 40	P3.5x.226	15.12	14.64	131.5 K=1.00	2.6795	-21.81	35.03	0.623 [1] ✓
T11	40 - 30	P3.5x.226	15.60	15.13	135.8 K=1.00	2.6795	-22.21	32.82	0.677 [1] ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T12	30 - 20	P3.5x.226	16.08	15.62	140.2 K=1.00	2.6795	-22.81	30.78	0.741 [1] ✓
T13	20 - 0	P3.5x.226	24.33	23.70	106.4 K=0.50	2.6795	-33.20	52.71	0.630 [1] ✓

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.0 K=1.00	0.7995	-3.02	22.52	0.134 [1] ✓
T2	160 - 140	ROHN 1.5 STD	10.01	4.82	92.9 K=1.00	0.7995	-5.92	19.14	0.309 [1] ✓
T3	140 - 133.333	ROHN 2 STD	10.71	5.17	78.8 K=1.00	1.0745	-6.16	30.72	0.201 [1] ✓
T6	120 - 100	ROHN 2 STD	13.92	6.68	101.9 K=1.00	1.0745	-11.91	22.64	0.526 [1] ✓
T7	100 - 90	ROHN 2 STD	15.04	7.24	110.5 K=1.00	1.0745	-12.01	19.82	0.606 [1] ✓
T9	80 - 60	ROHN 2.5 STD	18.93	9.10	115.3 K=1.00	1.7040	-14.46	28.95	0.500 [1] ✓
T10	60 - 40	ROHN 2.5 STD	21.43	10.35	131.1 K=1.00	1.7040	-16.02	22.38	0.716 [1] ✓
T11	40 - 30	ROHN 2.5 STD	22.68	10.98	139.1 K=1.00	1.7040	-16.68	19.91	0.838 [1] ✓
T13	20 - 0	P3.5x.226	25.18	12.23	109.8 K=1.00	2.6795	-18.22	49.95	0.365 [1] ✓

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.54	4.13	79.5 K=1.00	0.7995	-0.50	22.66	0.022 [1] ✓
T4	133.333 - 126.667	ROHN 2 STD	11.40	5.47	83.4 K=1.00	1.0745	-8.47	29.08	0.291 [1] ✓
T5	126.667 - 120	ROHN 2 STD	12.10	5.82	88.7 K=1.00	1.0745	-10.58	27.21	0.389 [1] ✓
T8	90 - 80	ROHN 2 STD	16.36	7.90	120.5 K=1.00	1.0745	-12.57	16.72	0.752 [1]

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T12	30 - 20	ROHN 2.5 EH	23.93	11.60	150.7 K=1.00	2.2535	-17.40	22.42	0.776 [1]

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Compression)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	ROHN 1.5 STD	6.29	5.93	91.5 K=0.80	0.7995	-6.30	19.50	0.323 [1]

[1] P_u / ϕP_n controls

Redundant Diagonal (1) Design Data (Compression)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	P1.5x.2	11.50	10.77	170.9 K=0.80	1.0681	-5.76	8.26	0.697 [1]

[1] P_u / ϕP_n controls

Redundant Hip (1) Design Data (Compression)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	ROHN 2.5 STD	6.29	6.29	63.8 K=0.80	1.7040	-0.03	56.95	0.000 [1]

[1] P_u / ϕP_n controls

Inner Bracing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	4.27	4.27	128.9 K=1.00	0.4844	-0.01	6.51	0.001 [1] ✓
T2	160 - 140	L2x2x1/8	5.01	5.01	151.1 K=1.00	0.4844	-0.01	4.79	0.001 [1] ✓
T3	140 - 133.333	L2x2x1/8	5.35	5.35	161.6 K=1.00	0.4844	-0.01	4.19	0.002 [1] ✓
T4	133.333 - 126.667	L2x2x1/8	5.70	5.70	172.1 K=1.00	0.4844	-0.15	3.69	0.040 [1] ✓
T5	126.667 - 120	L2x2x1/8	6.05	6.05	182.6 K=1.00	0.4844	-0.19	3.28	0.056 [1] ✓
T6	120 - 100	L2 1/2x2 1/2x3/16	6.96	6.96	168.7 K=1.00	0.9020	-0.01	7.16	0.002 [1] ✓
T7	100 - 90	L2 1/2x2 1/2x3/16	7.52	7.52	182.3 K=1.00	0.9020	-0.01	6.13	0.002 [1] ✓
T8	90 - 80	L2 1/2x2 1/2x3/16	8.18	8.18	198.3 K=1.00	0.9020	-0.22	5.18	0.043 [1] ✓
T9	80 - 60	L3x3x3/16	9.46	9.46	190.5 K=1.00	1.0900	-0.02	6.78	0.003 [1] ✓
T10	60 - 40	L3 1/2x3 1/2x1/4	10.71	10.71	185.2 K=1.00	1.6900	-0.02	11.13	0.002 [1] ✓
T11	40 - 30	L3 1/2x3 1/2x1/4	11.34	11.34	196.1 K=1.00	1.6900	-0.02	9.93	0.002 [1] ✓
T12	30 - 20	L3 1/2x3 1/2x1/4	11.96	11.96	206.9 K=1.00	1.6900	-0.31	8.92	0.035 [1] ✓
T13	20 - 0	ROHN 2 STD	12.59	12.59	191.9 K=1.00	1.0745	-0.02	6.59	0.003 [1] ✓

[1] $P_u / \phi P_n$ controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8	2.2285	4.86	100.28	0.049 [1] ✓
T2	160 - 140	ROHN 4 STD	20.04	6.68	53.1	3.1741	34.65	142.83	0.243 [1] ✓
T3	140 - 133.333	ROHN 5 EH	6.68	6.68	43.6	6.1120	46.31	275.04	0.168 [1] ✓
T4	133.333 - 126.667	ROHN 5 EH	6.68	6.68	43.6	6.1120	57.65	275.04	0.210 [1] ✓
T5	126.667 - 120	ROHN 5 EH	6.68	6.68	43.6	6.1120	72.38	275.04	0.263 [1] ✓
T6	120 - 100	ROHN 6 EHS	20.04	10.02	54.0	6.7133	118.01	302.10	0.391 [1] ✓

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T7	100 - 90	ROHN 6 EH	10.03	10.03	54.8	8.4049	145.07	378.22	0.384 [1]
T8	90 - 80	ROHN 6 EH	10.03	10.03	54.8	8.4049	169.57	378.22	0.448 [1]
T9	80 - 60	ROHN 8 EHS	20.05	10.03	41.2	9.7193	217.41	437.37	0.497 [1]
T10	60 - 40	ROHN 8 EHS	20.05	10.03	41.2	9.7193	264.81	437.37	0.605 [1]
T11	40 - 30	ROHN 8 EHS	10.03	10.03	41.2	9.7193	288.11	437.37	0.659 [1]
T12	30 - 20	ROHN 8 EHS	10.03	10.03	41.2	9.7193	310.96	437.37	0.711 [1]
T13	20 - 0	ROHN 8 EH	20.05	10.03	41.8	12.7627	331.58	574.32	0.577 [1]

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0	1.0745	5.48	48.35	0.113 [1]
T2	160 - 140	ROHN 2 STD	8.14	7.84	119.5	1.0745	9.71	48.35	0.201 [1]
T3	140 - 133.333	ROHN 2 EH	8.77	8.42	131.5	1.4807	9.47	66.63	0.142 [1]
T4	133.333 - 126.667	ROHN 2 EH	9.00	8.66	135.3	1.4807	12.57	66.63	0.189 [1]
T5	126.667 - 120	ROHN 2 X-STR	9.24	8.91	139.4	1.4773	15.26	66.48	0.230 [1]
T6	120 - 100	ROHN 2.5 EH	12.19	11.73	152.3	2.2535	19.86	101.41	0.196 [1]
T7	100 - 90	ROHN 3 STD	12.92	12.49	128.8	2.2285	18.79	100.28	0.187 [1]
T8	90 - 80	ROHN 3 STD	13.35	12.93	133.4	2.2285	18.97	100.28	0.189 [1]
T9	80 - 60	ROHN 3 STD	14.21	13.70	141.3	2.2285	20.35	100.28	0.203 [1]
T10	60 - 40	P3.5x.226	15.12	14.64	131.5	2.6795	21.35	120.58	0.177 [1]
T11	40 - 30	P3.5x.226	15.60	15.13	135.8	2.6795	21.71	120.58	0.180 [1]
T12	30 - 20	P3.5x.226	16.08	15.62	140.2	2.6795	22.23	120.58	0.184 [1]
T13	20 - 0	P3.5x.226	24.33	23.70	212.8	2.6795	32.48	120.58	0.269 [1]

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.0	0.7995	2.95	35.98	0.082 [1] ✓
T2	160 - 140	ROHN 1.5 STD	10.01	4.82	92.9	0.7995	5.95	35.98	0.165 [1] ✓
T3	140 - 133.333	ROHN 2 STD	10.71	5.17	78.8	1.0745	6.19	48.35	0.128 [1] ✓
T6	120 - 100	ROHN 2 STD	13.92	6.68	101.9	1.0745	11.97	48.35	0.247 [1] ✓
T7	100 - 90	ROHN 2 STD	15.04	7.24	110.5	1.0745	11.93	48.35	0.247 [1] ✓
T9	80 - 60	ROHN 2.5 STD	18.93	9.10	115.3	1.7040	14.60	76.68	0.190 [1] ✓
T10	60 - 40	ROHN 2.5 STD	21.43	10.35	131.1	1.7040	16.25	76.68	0.212 [1] ✓
T11	40 - 30	ROHN 2.5 STD	22.68	10.98	139.1	1.7040	16.92	76.68	0.221 [1] ✓
T13	20 - 0	P3.5x.226	25.18	12.23	109.8	2.6795	18.33	120.58	0.152 [1] ✓

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.54	4.13	79.5	0.7995	0.48	35.98	0.013 [1] ✓
T4	133.333 - 126.667	ROHN 2 STD	11.40	5.47	83.4	1.0745	8.46	48.35	0.175 [1] ✓
T5	126.667 - 120	ROHN 2 STD	12.10	5.82	88.7	1.0745	10.59	48.35	0.219 [1] ✓
T8	90 - 80	ROHN 2 STD	16.36	7.90	120.5	1.0745	12.64	48.35	0.261 [1] ✓
T12	30 - 20	ROHN 2.5 EH	23.93	11.60	150.7	2.2535	17.76	101.41	0.175 [1] ✓

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	ROHN 1.5 STD	6.29	5.93	114.4	0.7995	6.30	35.98	0.175 [1] ✔

[1] $P_u / \phi P_n$ controls

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	P1.5x 2	11.50	10.77	213.6	1.0681	5.76	48.07	0.120 [1] ✔

[1] $P_u / \phi P_n$ controls

Redundant Hip (1) Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T13	20 - 0	ROHN 2.5 STD	6.29	6.29	79.7	1.7040	0.01	76.68	0.000 [1] ✔

[1] $P_u / \phi P_n$ controls

Inner Bracing Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T1	180 - 160	L2x2x1/8	4.27	4.27	81.8	0.4844	0.01	15.69	0.001 [1] ✔
T2	160 - 140	L2x2x1/8	4.31	4.31	82.6	0.4844	0.01	15.69	0.000 [1] ✔
T3	140 - 133.333	L2x2x1/8	5.35	5.35	102.6	0.4844	0.01	15.69	0.000 [1] ✔
T4	133.333 - 126.667	L2x2x1/8	5.70	5.70	109.3	0.4844	0.15	15.69	0.009 [1] ✔
T5	126.667 - 120	L2x2x1/8	6.05	6.05	115.9	0.4844	0.18	15.69	0.012 [1] ✔
T6	120 - 100	L2 1/2x2 1/2x3/16	6.40	6.40	98.7	0.9020	0.01	29.22	0.000 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	100 - 90	L2 1/2x2 1/2x3/16	7.52	7.52	116.0	0.9020	0.00	29.22	0.000 [1]
T8	90 - 80	L2 1/2x2 1/2x3/16	8.18	8.18	126.2	0.9020	0.21	29.22	0.007 [1]
T9	80 - 60	L3x3x3/16	8.84	8.84	113.0	1.0900	0.00	35.32	0.000 [1]
T10	60 - 40	L3 1/2x3 1/2x1/4	10.09	10.09	111.1	1.6900	0.00	76.05	0.000 [1]
T11	40 - 30	L3 1/2x3 1/2x1/4	11.34	11.34	124.8	1.6900	0.00	76.05	0.000 [1]
T12	30 - 20	L3 1/2x3 1/2x1/4	11.96	11.96	131.7	1.6900	0.30	76.05	0.004 [1]

[1] $P_u / \phi P_n$ controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 3 STD	1	-5.55	70.98	7.8	Pass
		Leg	ROHN 3 STD	2	-5.73	70.98	8.1	Pass
		Leg	ROHN 3 STD	3	-5.48	70.98	7.7	Pass
T2	160 - 140	Leg	ROHN 4 STD	40	-38.00	116.23	32.7	Pass
		Leg	ROHN 4 STD	41	-39.86	116.23	34.3	Pass
		Leg	ROHN 4 STD	42	-37.74	116.23	32.5	Pass
T3	140 - 133.333	Leg	ROHN 5 EH	79	-50.07	239.38	20.9 25.9 (b)	Pass
		Leg	ROHN 5 EH	80	-52.43	239.38	21.9 25.7 (b)	Pass
		Leg	ROHN 5 EH	81	-49.79	239.38	20.8 24.1 (b)	Pass
T4	133.333 - 126.667	Leg	ROHN 5 EH	94	-63.14	239.38	26.4 32.2 (b)	Pass
		Leg	ROHN 5 EH	95	-65.99	239.38	27.6 32.2 (b)	Pass
		Leg	ROHN 5 EH	96	-62.91	239.38	26.3 30.2 (b)	Pass
T5	126.667 - 120	Leg	ROHN 5 EH	109	-80.07	239.38	33.4 40.4 (b)	Pass
		Leg	ROHN 5 EH	110	-83.38	239.38	34.8 40.5 (b)	Pass
		Leg	ROHN 5 EH	111	-79.92	239.38	33.4 38.2 (b)	Pass
T6	120 - 100	Leg	ROHN 6 EHS	124	-127.78	244.02	52.4 65.7 (b)	Pass
		Leg	ROHN 6 EHS	125	-132.07	244.02	54.1 66.0 (b)	Pass
		Leg	ROHN 6 EHS	126	-127.99	244.02	52.5 63.1 (b)	Pass
T7	100 - 90	Leg	ROHN 6 EH	151	-155.90	303.58	51.4 80.8 (b)	Pass
		Leg	ROHN 6 EH	152	-160.64	303.58	52.9 81.1 (b)	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Leg	ROHN 6 EH	153	-156.26	303.58	51.5 77.9 (b)	Pass
T8	90 - 80	Leg	ROHN 6 EH	166	-181.60	303.58	59.8	Pass
		Leg	ROHN 6 EH	167	-186.67	303.58	61.5	Pass
		Leg	ROHN 6 EH	168	-182.11	303.58	60.0	Pass
T9	80 - 60	Leg	ROHN 8 EHS	181	-232.27	386.31	60.1 68.1 (b)	Pass
		Leg	ROHN 8 EHS	182	-237.89	386.31	61.6 68.4 (b)	Pass
		Leg	ROHN 8 EHS	183	-233.06	386.31	60.3 66.2 (b)	Pass
T10	60 - 40	Leg	ROHN 8 EHS	208	-283.02	386.31	73.3	Pass
		Leg	ROHN 8 EHS	209	-289.09	386.31	74.8	Pass
		Leg	ROHN 8 EHS	210	-284.07	386.31	73.5	Pass
T11	40 - 30	Leg	ROHN 8 EHS	235	-308.11	386.31	79.8	Pass
		Leg	ROHN 8 EHS	236	-314.37	386.31	81.4	Pass
		Leg	ROHN 8 EHS	237	-309.30	386.31	80.1	Pass
T12	30 - 20	Leg	ROHN 8 EHS	250	-332.83	386.31	86.2	Pass
		Leg	ROHN 8 EHS	251	-339.26	386.31	87.8	Pass
		Leg	ROHN 8 EHS	252	-334.14	386.31	86.5	Pass
T13	20 - 0	Leg	ROHN 8 EH	265	-356.28	505.43	70.5 77.8 (b)	Pass
		Leg	ROHN 8 EH	266	-362.87	505.43	71.8 78.1 (b)	Pass
		Leg	ROHN 8 EH	267	-357.95	505.43	70.8 76.1 (b)	Pass
T1	180 - 160	Diagonal	ROHN 2 STD	8	-5.30	17.75	29.9	Pass
		Diagonal	ROHN 2 STD	9	-5.55	17.75	31.2	Pass
		Diagonal	ROHN 2 STD	11	-4.79	17.75	27.0	Pass
		Diagonal	ROHN 2 STD	12	-4.79	17.75	27.0	Pass
		Diagonal	ROHN 2 STD	14	-3.69	17.75	20.8	Pass
		Diagonal	ROHN 2 STD	15	-3.45	17.75	19.4	Pass
		Diagonal	ROHN 2 STD	20	-3.50	17.78	19.7	Pass
		Diagonal	ROHN 2 STD	21	-3.79	17.78	21.3	Pass
		Diagonal	ROHN 2 STD	23	-2.52	17.78	14.2	Pass
		Diagonal	ROHN 2 STD	24	-2.52	17.78	14.2	Pass
		Diagonal	ROHN 2 STD	26	-3.18	17.78	17.9	Pass
		Diagonal	ROHN 2 STD	27	-2.90	17.78	16.3	Pass
		Diagonal	ROHN 2 STD	31	-0.63	17.82	3.5	Pass
		Diagonal	ROHN 2 STD	32	-0.75	17.82	4.2	Pass
		Diagonal	ROHN 2 STD	33	-0.24	17.82	1.4	Pass
		Diagonal	ROHN 2 STD	34	-0.23	17.82	1.3	Pass
		Diagonal	ROHN 2 STD	35	-0.93	17.82	5.2	Pass
		Diagonal	ROHN 2 STD	36	-0.81	17.82	4.5	Pass
T2	160 - 140	Diagonal	ROHN 2 STD	44	-9.39	15.33	61.2	Pass
		Diagonal	ROHN 2 STD	45	-9.54	15.33	62.2	Pass
		Diagonal	ROHN 2 STD	47	-8.71	15.33	56.8	Pass
		Diagonal	ROHN 2 STD	48	-8.71	15.33	56.8	Pass
		Diagonal	ROHN 2 STD	50	-8.44	15.33	55.1	Pass
		Diagonal	ROHN 2 STD	51	-8.30	15.33	54.1	Pass
		Diagonal	ROHN 2 STD	56	-9.52	16.15	59.0	Pass
		Diagonal	ROHN 2 STD	57	-9.69	16.15	60.0	Pass
		Diagonal	ROHN 2 STD	59	-8.72	16.15	54.0	Pass
		Diagonal	ROHN 2 STD	60	-8.72	16.15	54.0	Pass
		Diagonal	ROHN 2 STD	62	-8.28	16.15	51.2	Pass
		Diagonal	ROHN 2 STD	63	-8.11	16.15	50.2	Pass
		Diagonal	ROHN 2 STD	68	-9.59	17.01	56.4	Pass
		Diagonal	ROHN 2 STD	69	-9.78	17.01	57.5	Pass
		Diagonal	ROHN 2 STD	71	-8.66	17.01	50.9	Pass
		Diagonal	ROHN 2 STD	72	-8.67	17.01	51.0	Pass
		Diagonal	ROHN 2 STD	74	-8.01	17.01	47.1	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Diagonal	ROHN 2 STD	75	-7.82	17.01	46.0	Pass
T3	140 - 133.333	Diagonal	ROHN 2 EH	83	-9.45	19.35	48.8	Pass
		Diagonal	ROHN 2 EH	84	-9.59	19.35	49.6	Pass
		Diagonal	ROHN 2 EH	86	-8.87	19.35	45.9	Pass
		Diagonal	ROHN 2 EH	87	-8.86	19.35	45.8	Pass
		Diagonal	ROHN 2 EH	89	-8.75	19.35	45.2	Pass
		Diagonal	ROHN 2 EH	90	-8.62	19.35	44.6	Pass
T4	133.333 - 126.667	Diagonal	ROHN 2 EH	100	-12.57	18.29	68.7	Pass
		Diagonal	ROHN 2 EH	101	-12.69	18.29	69.4	Pass
		Diagonal	ROHN 2 EH	102	-12.14	18.29	66.4	Pass
		Diagonal	ROHN 2 EH	103	-12.13	18.29	66.3	Pass
		Diagonal	ROHN 2 EH	104	-12.13	18.29	66.3	Pass
		Diagonal	ROHN 2 EH	105	-12.01	18.29	65.7	Pass
T5	126.667 - 120	Diagonal	ROHN 2 X-STR	115	-15.27	17.17	89.0	Pass
		Diagonal	ROHN 2 X-STR	116	-15.39	17.17	89.7	Pass
		Diagonal	ROHN 2 X-STR	117	-14.98	17.17	87.2	Pass
		Diagonal	ROHN 2 X-STR	118	-14.96	17.17	87.1	Pass
		Diagonal	ROHN 2 X-STR	119	-14.95	17.17	87.1	Pass
		Diagonal	ROHN 2 X-STR	120	-14.85	17.17	86.5	Pass
T6	120 - 100	Diagonal	ROHN 2.5 EH	128	-19.73	20.76	95.0	Pass
		Diagonal	ROHN 2.5 EH	129	-19.84	20.76	95.5	Pass
		Diagonal	ROHN 2.5 EH	131	-20.03	20.76	96.4	Pass
		Diagonal	ROHN 2.5 EH	132	-19.99	20.76	96.3	Pass
		Diagonal	ROHN 2.5 EH	134	-19.92	20.76	96.0	Pass
		Diagonal	ROHN 2.5 EH	135	-19.86	20.76	95.6	Pass
		Diagonal	ROHN 2.5 EH	140	-19.93	21.95	90.8	Pass
		Diagonal	ROHN 2.5 EH	141	-20.06	21.95	91.4	Pass
		Diagonal	ROHN 2.5 EH	143	-19.88	21.95	90.6	Pass
		Diagonal	ROHN 2.5 EH	144	-19.85	21.95	90.4	Pass
		Diagonal	ROHN 2.5 EH	146	-19.81	21.95	90.3	Pass
		Diagonal	ROHN 2.5 EH	147	-19.72	21.95	89.9	Pass
T7	100 - 90	Diagonal	ROHN 3 STD	155	-18.42	30.35	60.7	Pass
		Diagonal	ROHN 3 STD	156	-18.49	30.35	60.9	Pass
		Diagonal	ROHN 3 STD	158	-19.02	30.35	62.7	Pass
		Diagonal	ROHN 3 STD	159	-18.96	30.35	62.5	Pass
		Diagonal	ROHN 3 STD	161	-18.89	30.35	62.2	Pass
		Diagonal	ROHN 3 STD	162	-18.87	30.35	62.2	Pass
T8	90 - 80	Diagonal	ROHN 3 STD	172	-18.40	28.29	65.0	Pass
		Diagonal	ROHN 3 STD	173	-18.46	28.29	65.2	Pass
		Diagonal	ROHN 3 STD	174	-19.21	28.29	67.9	Pass
		Diagonal	ROHN 3 STD	175	-19.15	28.29	67.7	Pass
		Diagonal	ROHN 3 STD	176	-19.06	28.29	67.4	Pass
		Diagonal	ROHN 3 STD	177	-19.06	28.29	67.4	Pass
T9	80 - 60	Diagonal	ROHN 3 STD	185	-19.52	25.21	77.5	Pass
		Diagonal	ROHN 3 STD	186	-19.57	25.21	77.7	Pass
		Diagonal	ROHN 3 STD	188	-20.69	25.21	82.1	Pass
		Diagonal	ROHN 3 STD	189	-20.62	25.21	81.8	Pass
		Diagonal	ROHN 3 STD	191	-20.50	25.21	81.3	Pass
		Diagonal	ROHN 3 STD	192	-20.51	25.21	81.4	Pass
		Diagonal	ROHN 3 STD	197	-19.22	26.89	71.5	Pass
		Diagonal	ROHN 3 STD	198	-19.28	26.89	71.7	Pass
		Diagonal	ROHN 3 STD	200	-20.23	26.89	75.2	Pass
		Diagonal	ROHN 3 STD	201	-20.16	26.89	75.0	Pass
		Diagonal	ROHN 3 STD	203	-20.05	26.89	74.6	Pass
		Diagonal	ROHN 3 STD	204	-20.06	26.89	74.6	Pass
T10	60 - 40	Diagonal	P3.5x.226	212	-20.37	35.03	58.1	Pass
		Diagonal	P3.5x.226	213	-20.41	35.03	58.3	Pass
		Diagonal	P3.5x.226	215	-21.81	35.03	62.3	Pass
		Diagonal	P3.5x.226	216	-21.74	35.03	62.1	Pass
		Diagonal	P3.5x.226	218	-21.59	35.03	61.6	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Diagonal	P3.5x.226	219	-21.63	35.03	61.7	Pass
		Diagonal	P3.5x.226	224	-20.06	37.35	53.7	Pass
							53.8 (b)	
		Diagonal	P3.5x.226	225	-20.10	37.35	53.8	Pass
							53.9 (b)	
		Diagonal	P3.5x.226	227	-21.38	37.35	57.3	Pass
							57.4 (b)	
		Diagonal	P3.5x.226	228	-21.31	37.35	57.1	Pass
							57.2 (b)	
		Diagonal	P3.5x.226	230	-21.18	37.35	56.7	Pass
							56.8 (b)	
		Diagonal	P3.5x.226	231	-21.21	37.35	56.8	Pass
							56.9 (b)	
T11	40 - 30	Diagonal	P3.5x.226	239	-20.65	32.82	62.9	Pass
		Diagonal	P3.5x.226	240	-20.68	32.82	63.0	Pass
		Diagonal	P3.5x.226	242	-22.21	32.82	67.7	Pass
		Diagonal	P3.5x.226	243	-22.13	32.82	67.4	Pass
		Diagonal	P3.5x.226	245	-21.98	32.82	67.0	Pass
		Diagonal	P3.5x.226	246	-22.03	32.82	67.1	Pass
T12	30 - 20	Diagonal	P3.5x.226	256	-21.19	30.78	68.9	Pass
		Diagonal	P3.5x.226	257	-21.22	30.78	69.0	Pass
		Diagonal	P3.5x.226	258	-22.81	30.78	74.1	Pass
		Diagonal	P3.5x.226	259	-22.72	30.78	73.8	Pass
		Diagonal	P3.5x.226	260	-22.57	30.78	73.3	Pass
		Diagonal	P3.5x.226	261	-22.62	30.78	73.5	Pass
T13	20 - 0	Diagonal	P3.5x.226	269	-30.57	52.71	58.0	Pass
							82.0 (b)	
		Diagonal	P3.5x.226	272	-30.64	52.71	58.1	Pass
							82.2 (b)	
		Diagonal	P3.5x.226	276	-33.20	52.71	63.0	Pass
							89.1 (b)	
		Diagonal	P3.5x.226	279	-33.04	52.71	62.7	Pass
							88.6 (b)	
		Diagonal	P3.5x.226	284	-32.79	52.71	62.2	Pass
							88.0 (b)	
		Diagonal	P3.5x.226	287	-32.88	52.71	62.4	Pass
							88.2 (b)	
T1	180 - 160	Horizontal	ROHN 1.5 STD	7	-3.02	22.52	13.4	Pass
		Horizontal	ROHN 1.5 STD	10	-2.61	22.52	11.6	Pass
		Horizontal	ROHN 1.5 STD	13	-1.96	22.52	8.7	Pass
		Horizontal	ROHN 1.5 STD	19	-2.13	22.59	9.4	Pass
		Horizontal	ROHN 1.5 STD	22	-1.64	22.59	7.3	Pass
		Horizontal	ROHN 1.5 STD	25	-1.88	22.59	8.3	Pass
T2	160 - 140	Horizontal	ROHN 1.5 STD	43	-5.92	19.14	30.9	Pass
		Horizontal	ROHN 1.5 STD	46	-5.40	19.14	28.2	Pass
		Horizontal	ROHN 1.5 STD	49	-5.23	19.14	27.3	Pass
		Horizontal	ROHN 1.5 STD	55	-5.77	20.90	27.6	Pass
		Horizontal	ROHN 1.5 STD	58	-5.19	20.90	24.9	Pass
		Horizontal	ROHN 1.5 STD	61	-4.93	20.90	23.6	Pass
		Horizontal	ROHN 1.5 STD	67	-5.73	22.66	25.3	Pass
		Horizontal	ROHN 1.5 STD	70	-5.37	22.66	23.7	Pass
		Horizontal	ROHN 1.5 STD	73	-4.96	22.66	21.9	Pass
T3	140 - 133.333	Horizontal	ROHN 2 STD	82	-6.16	30.72	20.1	Pass
							24.9 (b)	
		Horizontal	ROHN 2 STD	85	-5.70	30.72	18.5	Pass
							23.0 (b)	
		Horizontal	ROHN 2 STD	88	-5.62	30.72	18.3	Pass
							22.7 (b)	
T6	120 - 100	Horizontal	ROHN 2 STD	127	-11.79	22.64	52.1	Pass
		Horizontal	ROHN 2 STD	130	-11.91	22.64	52.6	Pass
		Horizontal	ROHN 2 STD	133	-11.85	22.64	52.3	Pass

Section No	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Horizontal	ROHN 2 STD	139	-11.36	25.59	44.4 45.7 (b)	Pass
		Horizontal	ROHN 2 STD	142	-11.26	25.59	44.0 45.3 (b)	Pass
		Horizontal	ROHN 2 STD	145	-11.22	25.59	43.9 45.2 (b)	Pass
T7	100 - 90	Horizontal	ROHN 2 STD	154	-11.61	19.82	58.6	Pass
		Horizontal	ROHN 2 STD	157	-12.01	19.82	60.6	Pass
		Horizontal	ROHN 2 STD	160	-11.89	19.82	60.0	Pass
T9	80 - 60	Horizontal	ROHN 2.5 STD	184	-13.67	28.95	47.2 55.6 (b)	Pass
		Horizontal	ROHN 2.5 STD	187	-14.46	28.95	50.0 58.7 (b)	Pass
		Horizontal	ROHN 2.5 STD	190	-14.34	28.95	49.5 58.2 (b)	Pass
		Horizontal	ROHN 2.5 STD	196	-13.04	32.99	39.5 53.0 (b)	Pass
		Horizontal	ROHN 2.5 STD	199	-13.69	32.99	41.5 55.6 (b)	Pass
		Horizontal	ROHN 2.5 STD	202	-13.58	32.99	41.2 55.1 (b)	Pass
T10	60 - 40	Horizontal	ROHN 2.5 STD	211	-14.97	22.38	66.9	Pass
		Horizontal	ROHN 2.5 STD	214	-16.02	22.38	71.6	Pass
		Horizontal	ROHN 2.5 STD	217	-15.88	22.38	70.9	Pass
		Horizontal	ROHN 2.5 STD	223	-14.41	25.35	56.9 58.6 (b)	Pass
		Horizontal	ROHN 2.5 STD	226	-15.34	25.35	60.5 62.4 (b)	Pass
		Horizontal	ROHN 2.5 STD	229	-15.21	25.35	60.0 61.8 (b)	Pass
T11	40 - 30	Horizontal	ROHN 2.5 STD	238	-15.51	19.91	77.9	Pass
		Horizontal	ROHN 2.5 STD	241	-16.68	19.91	83.8	Pass
		Horizontal	ROHN 2.5 STD	244	-16.53	19.91	83.0	Pass
T13	20 - 0	Horizontal	P3.5x.226	268	-16.78	49.95	33.6 47.2 (b)	Pass
		Horizontal	P3.5x.226	275	-18.22	49.95	36.5 51.2 (b)	Pass
		Horizontal	P3.5x.226	283	-18.06	49.95	36.2 50.8 (b)	Pass
T1	180 - 160	Top Girt	ROHN 1.5 STD	4	-0.44	22.66	1.9	Pass
		Top Girt	ROHN 1.5 STD	5	-0.24	22.66	1.1	Pass
		Top Girt	ROHN 1.5 STD	6	-0.50	22.66	2.2	Pass
T4	133.333 - 126.667	Top Girt	ROHN 2 STD	97	-8.47	29.08	29.1 34.1 (b)	Pass
		Top Girt	ROHN 2 STD	98	-8.27	29.08	28.4 33.3 (b)	Pass
		Top Girt	ROHN 2 STD	99	-8.14	29.08	28.0 32.8 (b)	Pass
T5	126.667 - 120	Top Girt	ROHN 2 STD	112	-10.58	27.21	38.9 42.6 (b)	Pass
		Top Girt	ROHN 2 STD	113	-10.39	27.21	38.2 41.8 (b)	Pass
		Top Girt	ROHN 2 STD	114	-10.28	27.21	37.8 41.4 (b)	Pass
T8	90 - 80	Top Girt	ROHN 2 STD	169	-12.07	16.72	72.2	Pass
		Top Girt	ROHN 2 STD	170	-12.57	16.72	75.2	Pass
		Top Girt	ROHN 2 STD	171	-12.47	16.72	74.6	Pass
T12	30 - 20	Top Girt	ROHN 2.5 EH	253	-16.17	22.42	72.1	Pass
		Top Girt	ROHN 2.5 EH	254	-17.40	22.42	77.6	Pass
		Top Girt	ROHN 2.5 EH	255	-17.25	22.42	77.0	Pass
T13	20 - 0	Redund Horz 1	ROHN 1.5 STD	270	-6.19	19.50	31.7	Pass

Section No	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Bracing						
		Redund Horz 1 Bracing	ROHN 1.5 STD	273	-6.30	19.50	32.3	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	277	-6.30	19.50	32.3	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	280	-6.21	19.50	31.9	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	285	-6.21	19.50	31.9	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	288	-6.19	19.50	31.7	Pass
T13	20 - 0	Redund Diag 1 Bracing	P1.5x.2	271	-5.65	8.26	68.4	Pass
		Redund Diag 1 Bracing	P1.5x.2	274	-5.76	8.26	69.7	Pass
		Redund Diag 1 Bracing	P1.5x.2	278	-5.76	8.26	69.7	Pass
		Redund Diag 1 Bracing	P1.5x.2	281	-5.68	8.26	68.7	Pass
		Redund Diag 1 Bracing	P1.5x.2	286	-5.68	8.26	68.7	Pass
		Redund Diag 1 Bracing	P1.5x.2	289	-5.65	8.26	68.4	Pass
T13	20 - 0	Redund Hip 1 Bracing	ROHN 2.5 STD	282	-0.03	56.95	0.1	Pass
		Redund Hip 1 Bracing	ROHN 2.5 STD	290	-0.03	56.95	0.1	Pass
		Redund Hip 1 Bracing	ROHN 2.5 STD	291	-0.03	56.95	0.1	Pass
T1	180 - 160	Inner Bracing	L2x2x1/8	16	-0.00	6.44	0.7	Pass
		Inner Bracing	L2x2x1/8	17	-0.00	6.44	0.7	Pass
		Inner Bracing	L2x2x1/8	18	-0.00	6.44	0.7	Pass
		Inner Bracing	L2x2x1/8	28	-0.00	6.48	0.7	Pass
		Inner Bracing	L2x2x1/8	29	-0.00	6.48	0.7	Pass
		Inner Bracing	L2x2x1/8	30	-0.00	6.48	0.7	Pass
		Inner Bracing	L2x2x1/8	37	-0.01	6.51	0.7	Pass
		Inner Bracing	L2x2x1/8	38	-0.01	6.51	0.7	Pass
		Inner Bracing	L2x2x1/8	39	-0.01	6.51	0.7	Pass
T2	160 - 140	Inner Bracing	L2x2x1/8	52	-0.01	4.79	0.8	Pass
		Inner Bracing	L2x2x1/8	53	-0.01	4.79	0.8	Pass
		Inner Bracing	L2x2x1/8	54	-0.01	4.79	0.8	Pass
		Inner Bracing	L2x2x1/8	64	-0.01	5.53	0.7	Pass
		Inner Bracing	L2x2x1/8	65	-0.01	5.53	0.7	Pass
		Inner Bracing	L2x2x1/8	66	-0.01	5.53	0.7	Pass
		Inner Bracing	L2x2x1/8	76	-0.01	6.40	0.7	Pass
		Inner Bracing	L2x2x1/8	77	-0.01	6.40	0.7	Pass
		Inner Bracing	L2x2x1/8	78	-0.01	6.40	0.7	Pass
T3	140 - 133.333	Inner Bracing	L2x2x1/8	91	-0.01	4.19	0.8	Pass
		Inner Bracing	L2x2x1/8	92	-0.01	4.19	0.8	Pass
		Inner Bracing	L2x2x1/8	93	-0.01	4.19	0.8	Pass
T4	133.333 - 126.667	Inner Bracing	L2x2x1/8	106	-0.15	3.69	4.0	Pass
		Inner Bracing	L2x2x1/8	107	-0.14	3.69	3.9	Pass
		Inner Bracing	L2x2x1/8	108	-0.15	3.69	4.0	Pass
T5	126.667 - 120	Inner Bracing	L2x2x1/8	121	-0.19	3.28	5.6	Pass
		Inner Bracing	L2x2x1/8	122	-0.18	3.28	5.5	Pass
		Inner Bracing	L2x2x1/8	123	-0.19	3.28	5.6	Pass
T6	120 - 100	Inner Bracing	L2 1/2x2 1/2x3/16	136	-0.01	7.16	0.7	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	137	-0.01	7.16	0.7	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	138	-0.01	7.16	0.7	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	148	-0.01	8.48	0.6	Pass

Section No	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
		Inner Bracing	L2 1/2x2 1/2x3/16	149	-0.01	8.48	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	150	-0.01	8.48	0.6	Pass
T7	100 - 90	Inner Bracing	L2 1/2x2 1/2x3/16	163	-0.01	6.13	0.7	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	164	-0.01	6.13	0.7	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	165	-0.01	6.13	0.7	Pass
T8	90 - 80	Inner Bracing	L2 1/2x2 1/2x3/16	178	-0.22	5.18	4.3	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	179	-0.22	5.18	4.3	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	180	-0.22	5.18	4.3	Pass
T9	80 - 60	Inner Bracing	L3x3x3/16	193	-0.02	6.78	0.9	Pass
		Inner Bracing	L3x3x3/16	194	-0.02	6.78	0.9	Pass
		Inner Bracing	L3x3x3/16	195	-0.02	6.78	0.9	Pass
		Inner Bracing	L3x3x3/16	205	-0.02	7.78	0.8	Pass
		Inner Bracing	L3x3x3/16	206	-0.02	7.78	0.8	Pass
		Inner Bracing	L3x3x3/16	207	-0.02	7.78	0.8	Pass
T10	60 - 40	Inner Bracing	L3 1/2x3 1/2x1/4	220	-0.02	11.13	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	221	-0.02	11.13	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	222	-0.02	11.13	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	232	-0.02	12.55	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	233	-0.02	12.55	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	234	-0.02	12.55	0.5	Pass
T11	40 - 30	Inner Bracing	L3 1/2x3 1/2x1/4	247	-0.02	9.93	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	248	-0.02	9.93	0.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	249	-0.02	9.93	0.5	Pass
T12	30 - 20	Inner Bracing	L3 1/2x3 1/2x1/4	262	-0.31	8.92	3.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	263	-0.31	8.92	3.5	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	264	-0.31	8.92	3.5	Pass
T13	20 - 0	Inner Bracing	ROHN 2 STD	292	-0.02	6.59	0.3	Pass
		Inner Bracing	ROHN 2 STD	293	-0.02	6.59	0.3	Pass
		Inner Bracing	ROHN 2 STD	294	-0.02	6.59	0.3	Pass
							Summary	
						Leg (T12)	87.8	Pass
						Diagonal (T6)	96.4	Pass
						Horizontal (T11)	83.8	Pass
						Top Girt (T12)	77.6	Pass
						Redund Horz 1 Bracing (T13)	32.3	Pass
						Redund Diag 1 Bracing (T13)	69.7	Pass
						Redund Hip 1 Bracing (T13)	0.1	Pass
						Inner Bracing (T5)	5.6	Pass
						Bolt Checks	89.1	Pass
						RATING =	**96.4**	**Pass**

ANCHOR BOLT EVALUATION

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift:	Uplift := 376·kips	*user input*	
Shear:	Shear := 56·kips	*user input*	
Compression:	Compression := 410·kips	*user input*	

Anchor Bolt Data:

Use ASTM A354 Gr. BC

Number of Anchor Bolts = N	$N := 10$	*user input*	
Bolt Ultimate Strength:	$F_u := 125 \cdot ksi$	*user input*	
Bolt Yield Strength:	$Fy := 109 \cdot ksi$	*user input*	
Bolt Modulus:	$E := 29000\,ksi$	*user input*	
Thickness of Anchor Bolts	$D := 1.0in$	*user input*	
Threads per Inch:	$n := 8$	*user input*	
Coefficient of Friction:	$\mu := 0.55$	*user input*	(for baseplate with grout ASCE 10-15)
Length from top of pier to bottom of leveling nut:	$L_{ar} := 0in$	*user input*	
Bolt Modulus:	$E_s := 29000 \cdot ksi$	*user input*	

Anchor Bolt Section Properties:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 0.79\cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 0.61\cdot in^2$$

Net Diameter:

$$D_n := D - \frac{0.9743 in}{n} \qquad D_n = 0.88\cdot in$$

Radius of Gyration of Bolt:

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

Plastic Section Modulus of Bolt:

$$Z_x := \frac{D_n^3}{6} \qquad Z_x = 0.11\cdot in^3$$

Forces:

Tension Force:

$$T_u := \frac{Uplift}{N}$$

$T_u = 37.6\cdot kip$

$T_{ub} := T_u$

Shear Force:

$$V_u := \frac{Shear}{N}$$

$V_u = 5.6\cdot kip$ $\qquad V_{ub} := V_u$

Resistance Factor for Flexure (ANSI/TIA-222-G 4.7):

$\phi_f := 0.9$

Resistance Factor for Anchor Bolt (ANSI/TIA-222-G 4.5.4.2):

$\phi_b := 0.80$

Resistance Factor for Tension (ANSI/TIA-222-G 4.9.6.1):

$\phi_t := 0.75$

Resistance Factor for Shear (ANSI/TIA-222-G 4.9.6.3):

$\phi_v := 0.75$

ANSI/TIA-222-G 4.7.1 Flexural Members:

Nominal Flexure Strength, Mn:

$M_n := Fy \cdot Z_x$

$M_n = 1.03 \cdot ft \cdot kip$

$\phi_f \cdot M_n = 0.92 \cdot ft \cdot kip$

Applied Moment due to Shear (worst case lever arm), Mu:

$M_u := L_{ar} \cdot V_u$

$M_u = 0 \cdot ft \cdot kip$

Flexure Check:

$FlexureCheck := if(M_u \le \phi_f \cdot M_n, "OK", "NO GOOD")$

$FlexureCheck = "OK"$

$$\frac{M_u}{\phi_f \cdot M_n} = 0 \cdot \%$$

ANSI/TIA-222-G 4.9.6.1 Tensile Strength:

Design Tensile Strength, Rnt:

$R_{nt} := F_u \cdot A_n$

$R_{nt} = 75.72 \cdot ft \cdot kip$

$\phi_t \cdot R_{nt} = 56.79 \cdot ft \cdot kip$

Tension Check:

$TensionCheck := if(T_u \le \phi_t \cdot R_{nt}, "OK", "NO GOOD")$

$TensionCheck = "OK"$

$$\frac{T_u}{\phi_t \cdot R_{nt}} = 66.21 \cdot \%$$

ANSI/TIA-222-G 4.9.6.3 Design Shear Strength:

Design Shear Strength, Rnv:

$R_{nv} := 0.45 \cdot F_u \cdot A_g$

$R_{nv} = 44.18 \cdot ft \cdot kip$

$\phi_v \cdot R_{nv} = 33.13 \cdot ft \cdot kip$

Shear Check:

$ShearCheck := if(V_u \le \phi_v \cdot R_{nv}, "OK", "NO GOOD")$

$ShearCheck = "OK"$

$$\frac{V_u}{\phi_v \cdot R_{nv}} = 16.9 \cdot \%$$

ANSI/TIA-222-G 4.9.6.4 Combined Shear and Tension:

$$\left[\frac{V_{ub}}{(\phi_v \cdot R_{nv})}\right]^2 + \left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 \le 1$$

$$\left[\frac{V_{ub}}{(\phi_v \cdot R_{nv})}\right]^2 + \left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 = 0.47$$

Combined Shear and Tension Check:

$$\text{ShearAndTensionCheck} := \text{if}\left[\left[\frac{V_{ub}}{(\phi_v \cdot R_{nv})}\right]^2 + \left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 \le 1, \text{"OK"}, \text{"NO GOOD"}\right]$$

ShearAndTensionCheck = "OK"

ANSI/TIA-222-G 4.9.9 Anchor Rods (Capacity):

$$\frac{\left[T_u + \left(\frac{V_u}{\eta}\right)\right]}{\phi_b \cdot P_n} \le 1$$

$\eta := 0.55$ *user input from ANSI/TIA-222-G 4.9.9*

$$\frac{\left[T_u + \left(\frac{V_u}{\eta}\right)\right]}{\phi_b \cdot F_u \cdot A_n} = 0.789$$

Capacity Check:

$$\text{CapacityCheck} := \text{if}\left[\frac{\left[T_u + \left(\frac{V_u}{\eta}\right)\right]}{\phi_b \cdot F_u \cdot A_n} \le 1, \text{"OK"}, \text{"NO GOOD"}\right]$$

CapacityCheck = "OK"

FOUNDATION ANALYSIS
(PERFORMED BY DR. CLARENCE WELTI, P.E., P.C.)

DR. CLARENCE WELTI, P.E., P.C.

GEOTECHNICAL ENGINEERING

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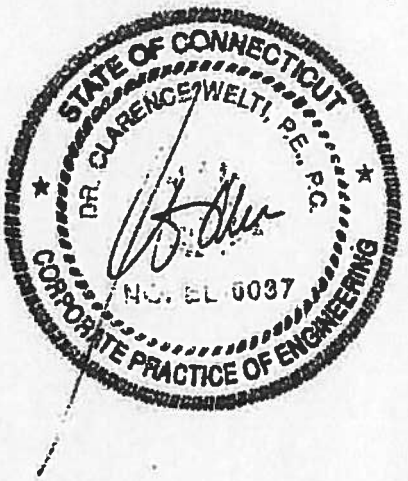


October 10, 2002

Mr. Mohsen Sahirad
URS Corporation
500 Enterprise Drive; Suite 3B
Rocky Hill, CT 06067

Re: Telecommunications Tower; 880 Post Road; Westport, CT ; Evaluation of Existing Foundation for Increased Design Loads

Dear Mohsen:

1.0 Herewith are boring data pertaining to the above. Two borings were drilled to a maximum depth of 12 feet. One boring was drilled 10 feet into bedrock and the second boring was drilled to the top of bedrock. The two borings are shown on the attached photo. Boring B-1 was about 11 feet from the tower leg and boring B-2 was about 15 feet from the tower leg. Considering that the rock outcrops at the third leg, the two borings define rock sufficiently to permit a reasonable interpolation of rock at the actual leg foundations. The former police station site is undergoing environmental remediation. *The borings were drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The purpose of this study is to assess the capability of tower legs to receive the proposed revised loadings. The load summary, including initial and revised design loadings is as follows:

Loading Type	Original Reaction	Revised Reactions
Uplift	276.7 kips	324 kips
Download	319.9 kips	374 kips
Shear	41.0 kips	48 kips

3.0 The initial boring data (1990 data from Test Craig Laboratories) indicated bedrock over the entire site. It is understood that there is information indicating that two of the legs were placed in earth instead of rock. The recent boring tends to belie this. The analyses for uplift (which is the only critical item on the above reaction schedule) have been done for both earth and rock. The reference for both analyses is FHWA-1F-025 Publication "Drilled Shafts: Construction Procedures and Design Methods".

3.0.1 The tower legs were each placed on 4.5 feet diameter shafts installed 27 feet deep into either earth or rock. The design uplift was and is based on an effective length of 21 feet.

3.1 Regarding the shaft in earth analysis there were no deep blow counts in the borings, since rock was encountered within 2 feet of grade. It is however reasonable to assume the N value (blows per 12" on split spoon) will be about 60 in the till overlying rock. Using the procedure indicated on the attached calculations the ultimate uplift capacity would be 831 kips. Design capacity would be ½ of this value or 415 kips. In reviewing the reference you cited (Foundation Engineering by Das, 4th edition) a similar ultimate load capacity can also be found if one assumes an angle of internal friction of about 40° (which would be typical for N = 60) and a δ/ϕ ratio of 1.0 (relative density of soil ≥ 85+%).

3.2 Regarding the shaft in rock the friction is defined in the attached calculations. The ultimate uplift of the shaft placed the Straits Schist rock formation would be about 10 kips/sf. With a factor of safety of 3 (using 3 kips/sf) the allowable loading would be 888 kips.

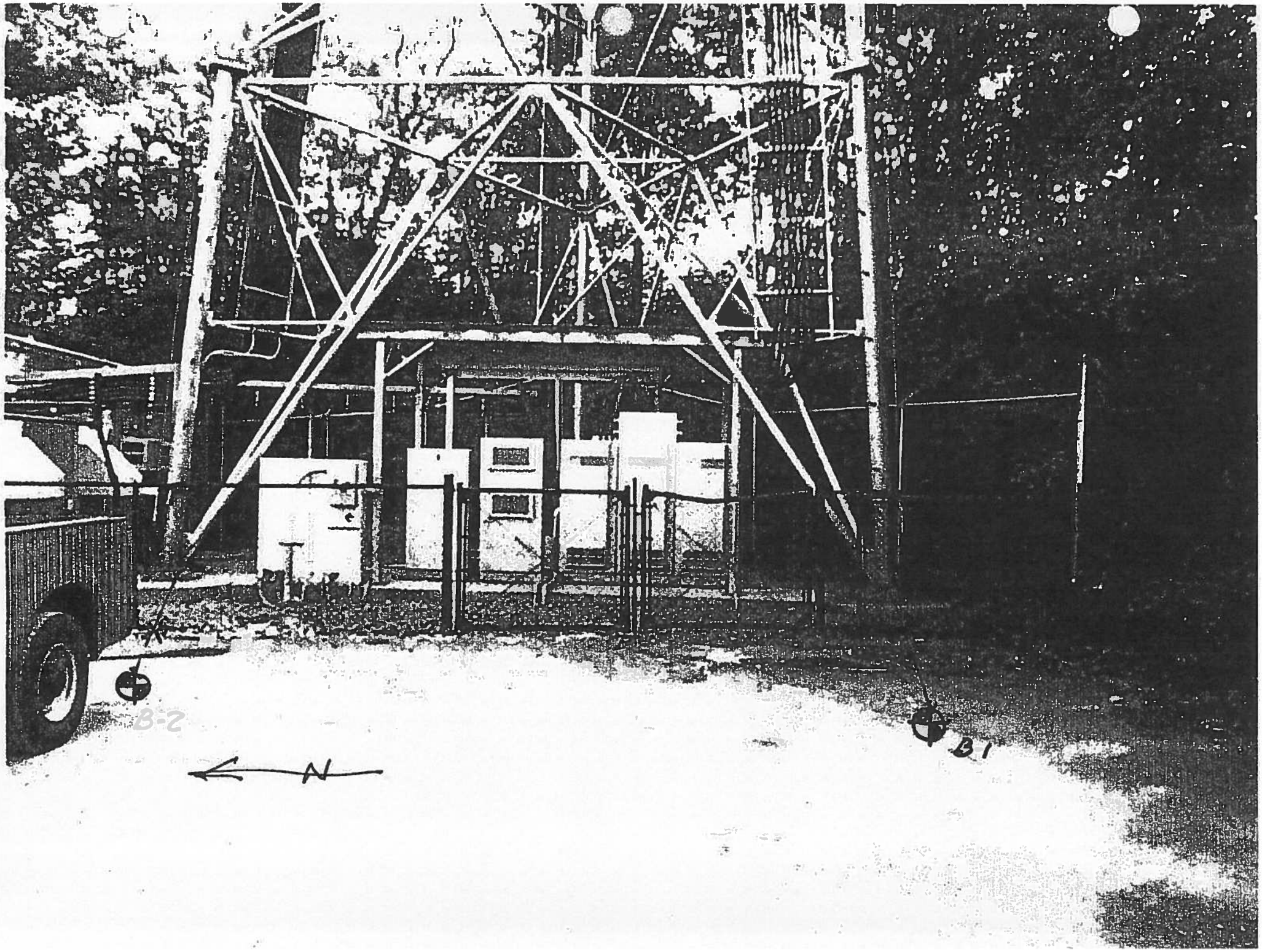
4.0 In summary it is believed that the shafts are in rock. The rock is a Schist with steep foliation and may have been drilled with only moderate effort. If the actual shaft are in earth there would have to have been a deep depression between the rock outcrop (which was cut down about 5 feet at the east leg) and the boring locations west of the two west legs, which indicated rock at 2 feet below grade similar to the original borings on the site. If there was a depression in the rock, the soil would be glacial till similar to what is being excavated to the northwest of the site at the old State Police Station. The analyses included herewith indicate that with either rock or till overburden the shafts have adequate capacity for the revised loading.

If you have any questions, please call me.

Very truly yours.

Clarence Welti, PhD, P. E.
Pres. Dr. Clarence Welti, P. E., P.C.

A:\urstoweranalysis9/04/02


B-2
B1
N

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
URS CORPORATION

PROJECT NAME
CELL TOWER SITE
LOCATION
880 POST ROAD
WESTPORT, CT

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	NX
SIZE I.D.	3.75"		1.5"	2.0"
HAMMER WT.			140lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.
HOLE NO. B-1

GROUND WATER OBSERVATIONS
AT 2.0 FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 10/7/02
FINISH DATE 10/7/02

DEPTH	SAMPLE NO.	SAMPLE BLOWS/6"	SAMPLE DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0	1	4-13-20-60	0.00'-1.50'		ASPHALT	.10
					BR. FINE-CRS. SAND AND FINE GRAVEL - FILL	.80
					GRAY ROCK FRAGMENTS, LITTLE SILT AND FINE SAND	1.5
					GRAY ROCK FRAGMENTS	2.0
					CORED ROCK -	
					RUN #1 2.0' - 7.0' RECOVERED 50"	
5					RUN #2 7.0' - 12.0' RECOVERED 60"	
10						
					BOTTOM OF BORING @ 12.0'	12.0
					NOTE: BORING WAS DRILLED 11.0' WEST OF TOWER LEG	
15						
20						
25						
30						
35						

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BROMLEY
INSPECTOR:

SHEET 1 OF 1 HOLE NO. B-1

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
URS CORPORATION

PROJECT NAME
CELL TOWER SITE

LOCATION
880 POST ROAD
WESTPORT, CT

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	
SIZE I.D.	3.75"		1.5"	
HAMMER WT.			140lbs	
HAMMER FALL			30"	

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-2

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

START DATE 10/7/02
FINISH DATE 10/7/02

DEPTH	SAMPLE NO.	SAMPLE BLOWS/6"	SAMPLE DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0	1	1-8-12-60	0.00'-1.50'		DARK BR. FINE-CRS. SAND, SOME FINE-MED. GRAVEL, TRACE SILT - FILL	1.0
					BR./GRAY ROCK FRAGMENTS, SILT AND FINE SAND	1.5
					GRAY ROCK FRAGMENTS	2.0
					AUGER REFUSAL @ 2.0'	
					NOTE: BORING WAS DRILLED 15'WEST OF TOWER LEG	
5						
10						
15						
20						
25						
30						
35						

LEGEND: COL. A:
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: BROMLEY
INSPECTOR:

SHEET 1 OF 1 HOLE NO. B-2

DR. CLARENCE WELTI, PE, PC
P.O. BOX 397
GLASTONBURY, CONNECTICUT 06033 • (860) 633-4623

CLIENT URS.
PROJECT Communication Tower [illegible]
SUBJECT Assessment of Capacity
BY CW DATE 10/ /02 SHEET NO.

Reference: Drilled Shafts Construction Procedures & Design Methods PUBLICATION NO FHWA-IF-99-025

Material: "Intermediate Geo material" N > 50B/12"
(IGM)

(1) $f_{max} = \sigma'_{v1} K_{0i} \tan \phi'_i$

σ'_{v1} vertical effective stress at mid [illegible] ≈ 1.18 ksf

K_{0i} design value of earth pressure coefficient [illegible]

ϕ'_i design value of angle of friction [illegible]

(2) $\phi'_i = \tan^{-1}\left\{\left[\frac{N_{60}\ (\text{Layer } i)}{12.3 + 20.3\left(\frac{\sigma'_{v1}}{p_a}\right)}\right]^{0.34}\right\}$

p_a 2 ksf ≈ 14.7 psi

N_{60} (Layer i) = 60

$= \tan^{-1}\left\{\left[\frac{150}{12.3 + 20.3 \times .59}\right]^{.34}\right\} = \tan^{-1}(1.96)^{.34} = 51.5°$

(3) $K_{0i} = (1 - \sin \phi'_i)\left[\frac{0.2\ p_a\ N_{60}\ (\text{Layer})}{\sigma'_{v1}}\right]^{\sin \phi_i}$

$= (1 - .78)\left[\frac{0.2 \times 2 \times 60}{1.18}\right]^{.78} = 1.65$

$f_a = f_{max}(1) = 3.73$ ksf $\times$ 0.75 uplift $= 2.8$ ksf

21' × 4.5 × π × 2.8 = 831 KIPS ULTIMATE UPLIFT CAPACITY

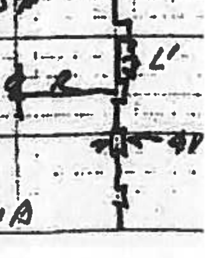
FOR SHAFT IN ROCK

$f_{max} = 0.8\left[\frac{4''}{R}\left(\frac{L'}{L}\right)\right]^{0.45} q_u$

q_u = 5200 psi × 333 TSF

L = 27'

ΔR = 0.5' L' = 0.2'



f_{max} = 5.37 TSF = 10.78 ksf

21' × π × 4.5 = 296 SF

Assume 1/3 for f_{all} ≈ 3 ksf. Q = 888 KIPS

AECOM

V25.202/SAE-099

Job Westport, CT (CSP tower) Project No. VEW/SAE Page 1 of 3

Description Evaluating Foundation Capacity from 2002 assessment Computed by MCD Sheet ___ of ___

Checked by ___ Date 9/20/2017

Reference

from Dr. Clarence Welti, P.E., P.C.

From original Welti Calculation;

Given values:

$N_{60} = 60$

$\sigma'_v = 1.8\,ksf$

$P_a = 2000\,psf$ (Atmospheric pressure)

Dpier = 4.5 ft

Htpier = 21 ft

FHWA-IF-99-025 (Reference for Design for cohesionless IGM – compression.

EQ (B.61)
$$\phi' = \tan^{-1}\left[\left[\frac{N_{60}}{12.2+20.3\left(\frac{\sigma'_v}{P_a}\right)}\right]^{0.34}\right] = \tan^{-1}\left[\left[\frac{60}{12.2+20.3\left(\frac{1.8}{2}\right)}\right]^{0.34}\right]$$

EQ
$$\phi' = 51.5^\circ$$

(B.60)
$$\text{"OCR"} = \frac{\sigma'_p}{\sigma'_v} = \frac{(0.2)(N_{60})(P_a)}{\sigma'_v} = \frac{(0.2)(60)(2\,ksf)}{1.8\,ksf} = 13.3$$

Eq. (B.59) ↑

EQ (B.51)
$$K_o = (1-\sin\phi')(OCR)^{\sin\phi'} = (1-\sin 51.5^\circ)(13.3)^{\sin 51.5^\circ}$$

$$K_o = 1.65$$

EQ. (B.62)
$$f_{max} = \sigma'_v \times K_o \times \tan\phi' = 1.8\,ksf \times 1.65 \times \tan 51.5^\circ = 3.734\,ksf$$

$3.734\,ksf \times 21\,ft \times 4.5\,ft \times \pi = R_n = 1109\,kip \times 0.60$ (cons.)

ϕ_{LRFD} (FHWA factor)

$= 665\,kip$ ↓ (Comp LRFD Capacity)

Pg 50 table L/B → ψ factor EQ (B.46)

L = 21 ft

B = 4.5 ft $\quad \frac{L}{B} \approx 5 \rightarrow \psi = 0.74$

Uplift = (ψ)(comp) = 492 k Uplift Cap LRFD

Reference

FHWA-NHI-10-016 – Drilled Shafts: Construction Procedures & LRFD Design Methods (follows up to AASHTO LRFD 2009)

13.3.5.1 – Cohesionless Soil – Side Resistance

EQ (13-5) $R_n = \#\pi B \Delta z (\sigma'_v K \tan\delta)$ $\beta = K \cdot \tan\delta$

$= \#\pi B \Delta z (\sigma'_v \beta)$

[EQ 13-12] (Gravelly Soils) Given by Welti calculation:

$\frac{\sigma'_p}{P_a} = 0.15 \times N_{60}$

$N_{60} = 60$ $z = 27$ ft

$P_a = 2.116$ ksf $B = 4.5$ ft.

$\sigma'_v = 1.8$ ksf

$\sigma'_p = 0.15 \times N_{60} \times P_a = (0.15)(60)(2.116\ \text{ksf})$

$= 19.044$ ksf

[EQ 13-13] $\beta \approx (1 - \sin\phi')\left(\frac{\sigma'_p}{\sigma'_v}\right)^{\sin\phi'} \times \tan\phi' \leq K_p \times \tan\phi$

$\phi' = 27.5 + 9.2[\text{Log}(N_1)_{60}] \rightarrow 27.5 + 9.2[\text{Log}(60)] = 43.85^\circ = \phi'$

[EQ 3-8]
(cons.)

[EQ 13-13] $\beta \approx (1 - \sin(43.85))\left(\frac{19.044}{1.8}\right)^{\sin 43.85^\circ} \times \tan 43.85^\circ = 1.513$

$K_p \times \tan\phi' = \tan^2\left(45 + \frac{\phi}{2}\right) \times \tan\phi = \tan^2\left(45 + \frac{43.85^\circ}{2}\right) \times \tan 43.85^\circ$

$= 5.29$

$1.513 \leq 5.29$ (OK) $\rightarrow$ Use $\beta = 1.513$

$\delta = \phi = 43.85^\circ$

[Eq 13-7] $f_{SN} = \sigma'_N \beta = 1.8\,ksf \times 1.513 = 2.7234\,ksf$

[Eq 13-5] $R_{SN} = (\pi)(B)(\Delta z)(f_{SN}) = \pi \times 4.5ft \times 27ft \times 2.7434\,ksf$

$= 1039.5\,kips$ Slide/Uplift Resistance (Nominal)

TIA-222-G Reduction factor 0.75 – Uplift Rock/soil

FHWA pg. 13-13 "Casing reduction factors of 0.6–0.75 are commonly used" (for "Permanent Casing").

Check $(0.75 = \phi)_{red}$

$\therefore 1039.5\,kips \times 0.75 = 779.625\,kip$ Uplift (Ult. capacity)

Check $(0.6C = \phi_{red})$

$1039.5\,kips \times 0.6 = 623.7\,kip$ Uplift (Ult. capacity)

$\therefore$ Based off of given Soil/Geotechnical parameters provided in "Evaluation of Existing Foundation for Increased Design Loads" Provided by Dr. Clarence Welti, P.E., P.C., the following shall be used for uplift & compression capacities.

* Uplift (LRFD) = 492 kips (614.94 kip) *

Compression (LRFD) = 665 kips
Bearing on Rock

*DR Welti's 2002 Assessment (Attached)

About AECOM

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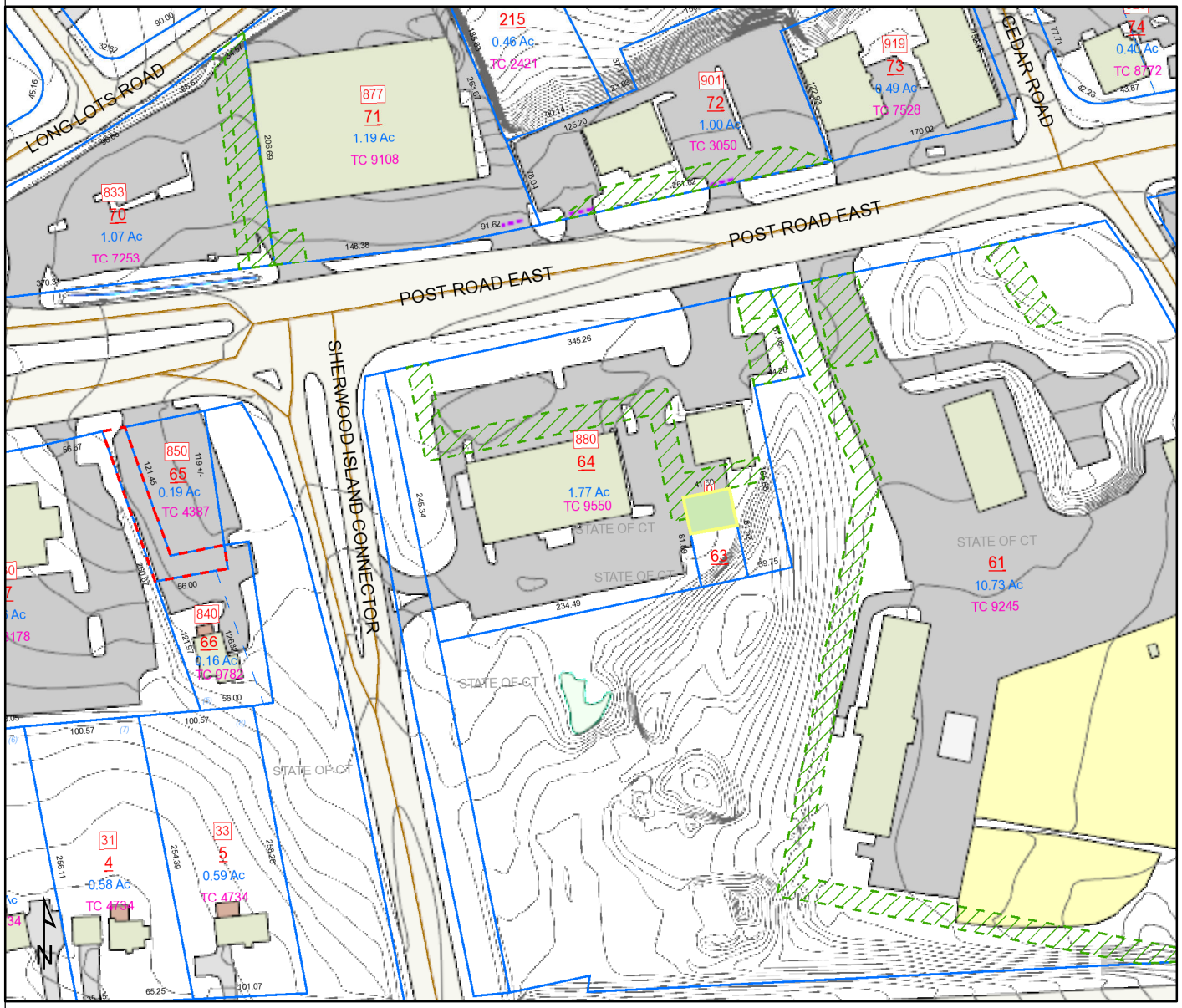


Westport CT Web GIS Map Legend

CAM_line	Culvert	Golf Path
Deleted_Wetland	Dam	Paved Parking
Amended_Wetland	Ditch	Unpaved Parking
dot_line	Rip Rap	Paved Driveway
Tidal_Wetland	Elevation Well	Unpaved Driveway
Waterbody_Watercourse	Fence	Public Sidewalk
wet_text_line	Guardrail	Treeline
Wetland	Hedge	Wet Area
100 Year Flood Zone	Retaining Wall	Sound, Lake, Pond, or River
500 Year Flood Zone	Stone Wall	Pool
Floodway in Zone AE	Trails	Golf Green
Basins	Abandoned Railroad Tracks	Golf Bunker
Spot Elevation	Railroad Tracks	Tennis Court
Water Spot Elevation	Paved Road Centerline	Golf Tee
bulkhead_polylines	Unpaved Road Centerline	Wharf, Dock, or Pier
landhook_polylines	Stream	Park
original_parcel_polylines	Coast Line	Athletic Field
Index	Easement	Golf Course
Index Depression	Utility Right of Way	index_polygon
Index Obscured	Private Right of Way	HYDRIC SOILS
Index Depression Obscured	Proposed Right of Way	NON-HYDRIC SOILS
Intermediate	Public Right of Way	WATER
Intermediate Depression	Parcel	A
Intermediate Obscured	Fuel Tank	AA
Intermediate Depression (Obs)	Water Tank	AAA
Tree	Quarry or Pit	B
Pipe	Building	BCD
Outfall	Building Construction	BPD
Catchbasin	Cement Pad	CPD
Manhole	Deck	DDD4
Electrical Box	Foundation	GBD
Hydrant	Greenhouse	GBD/S
Light Pole	Mobile Home	HDD
Utility Pole	Ruins	HSD
Sign	Silo	MHP
Unknown	Somkestack	OSRD
Billboard	Substation	PRD
Pipeline Above Ground	Bridge	RBD
Tower	Paved Road	RORD
townline_polyline	Runway	RPOD
Unknown Lines	Unpaved Road	

1 inch = 142 feet

Property Location: POST RD E | **MAP ID:** F09/ / 063/000 / | **Bldg Name:** | **State Use:** 435

Vision ID: 100302 | **Account #** 14621 | **Bldg #:** 1 of 1 | **Sec #:** 1 of 1 | **Card** 1 of 1 | **Print Date:** 06/28/2017 14:51

CURRENT OWNER	TOPO.	UTILITIES	STRT./ROAD	LOCATION
CONNECTICUT STATE OF CELL TOWER/WALGREENS 30 TRINITY ST HARTFORD, CT 06106 Additional Owners:				

SUPPLEMENTAL DATA

Other ID:	53184
Historic ID	
Census	
WestportCode	
Survey Map	
Survey Map	
GIS ID: F09063000	
Lift Hse	
ASSOC PID#	

CURRENT ASSESSMENT

Description	Code	Appraised Value	Assessed Value
UTL BLDG	4-2	1,000	700
UTL OUTBL	4-3	984,000	688,800
	Total	985,000	689,500

6158
WESTPORT, CT

VISION

RECORD OF OWNERSHIP

RECORD OF OWNERSHIP	BK-VOL/PAGE	SALE DATE	q/u	v/i	SALE PRICE	V.C.
CONNECTICUT STATE OF	0/ 0	10/01/2005	U	I		

PREVIOUS ASSESSMENTS (HISTORY)

Yr.	Code	Assessed Value	Yr.	Code	Assessed Value	Yr.	Code	Assessed Value
2016	4-2	700	2015	4-3	343,600	2014	4-3	343,600
2016	4-3	688,800						
	Total:	689,500		Total:	343,600		Total:	343,600

EXEMPTIONS

Year	Type	Description	Amount
		Total:	

OTHER ASSESSMENTS

Code	Description	Number	Amount	Comm. Int.

This signature acknowledges a visit by a Data Collector or Assessor

APPRAISED VALUE SUMMARY

Appraised Bldg. Value (Card)	0
Appraised XF (B) Value (Bldg)	0
Appraised OB (L) Value (Bldg)	984,000
Appraised Land Value (Bldg)	0
Special Land Value	0
Total Appraised Parcel Value	985,000
Valuation Method:	I
Adjustment:	0
Net Total Appraised Parcel Value	**985,000**

ASSESSING NEIGHBORHOOD

NBHD/ SUB	NBHD Name	Street Index Name	Tracing	Batch
0001/A				

NOTES

CELL TOWER BEHIND THE WALGREENS AT
880 POST RD E
3 CELL SITES

TOWER VALUE= 2000 X 12=24000 X .75=18000
18000/.11=163,600 X 3=490,800

BUILDING PERMIT RECORD

Permit ID	Issue Date	Type	Description	Amount	Insp. Date	% Comp.	Date Comp.	Comments

VISIT/ CHANGE HISTORY

Date	Type	IS	ID	Cd.	Purpose/Result
05/13/2010			J	11	QC - Check/Field Review

LAND LINE VALUATION SECTION

B #	Use Code	Use Description	Zone	D	Front	Depth	Units		Unit Price	I. Factor	S.A.		C. Factor	ST. Idx	Adj.	Notes- Adj	Special Pricing: Spec Use	Special Pricing: Spec Calc	S Adj Fact	Adj. Unit Price	Land Value
1	435	Cell Site Vac Lnd	GBD				0	SF	0.00	1.0000	C		1.00		0.00				.00		0

Total Card Land Units:	0.00	AC	Parcel Total Land Area:	0 AC	Total Land Value:	0

Property Location: POST RD E **MAP ID:** F09/ / 063/000 / **Bldg Name:** **State Use:** 435

Vision ID: 100302 **Account #** 14621 **Bldg #:** 1 of 1 **Sec #:** 1 of 1 **Card** 1 of 1 **Print Date:** 06/28/2017 14:51

CONSTRUCTION DETAIL

Element	Cd.	Ch.	Description
Model	00		Vacant

CONSTRUCTION DETAIL (CONTINUED)

Element	Cd.	Ch.	Description

MIXED USE

Code	Description	Percentage
435	Cell Site Vac Lnd	100

COST/MARKET VALUATION

Adj. Base Rate:	0.00
	0
Net Other Adj:	0.00
Replace Cost	0
AYB	
Dep Code	
Remodel Rating	
Year Remodeled	
Dep %	
Functional Obslnc	
External Obslnc	
Cost Trend Factor	
Special Condition Code	
% Complete	
Overall % Cond	
Apprais Val	
Dep % Ovr	0
Dep Ovr Comment	
Misc Imp Ovr	0
Misc Imp Ovr Comment	
Cost to Cure Ovr	0
Cost to Cure Ovr Comment	

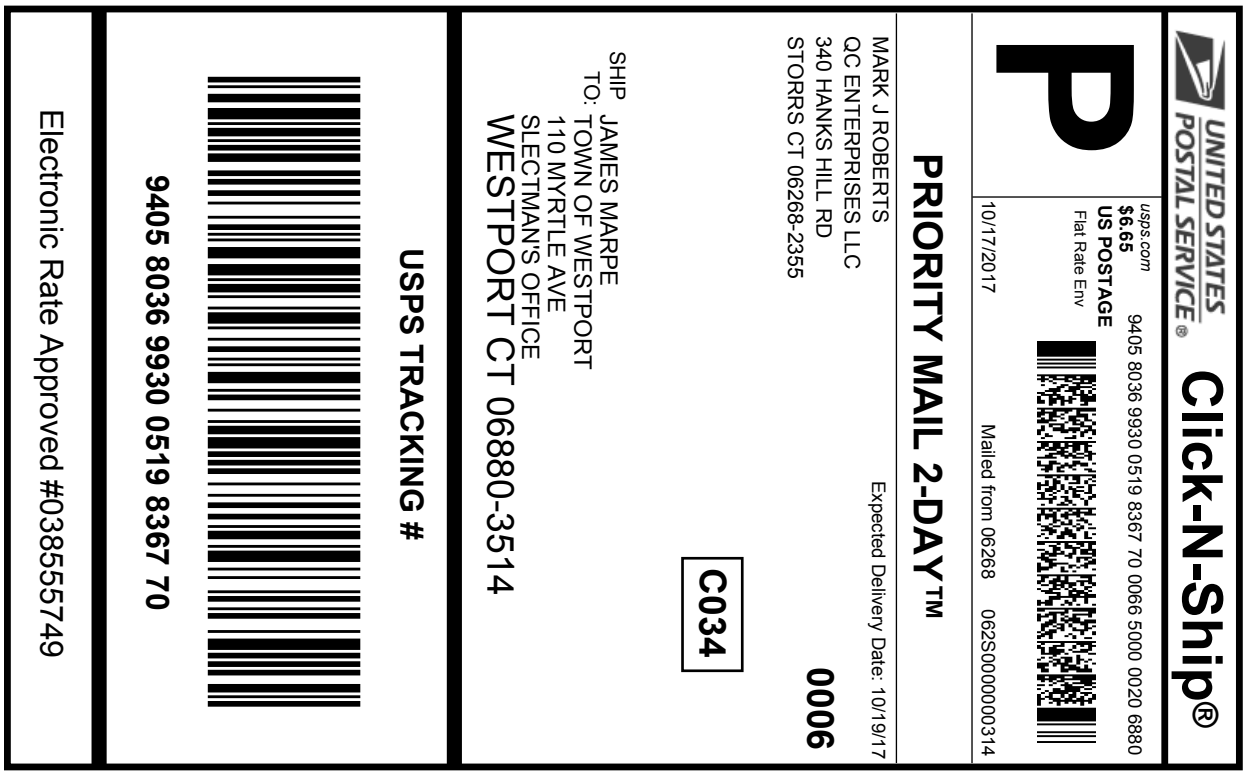
OB-OUTBUILDING & YARD ITEMS(L) / XF-BUILDING EXTRA FEATURES(B)

Code	Description	Sub	Sub Descript	L/B	Units	Unit Price	Yr	Gde	Dp Rt	Cnd	%Cnd	Apr Value
CELL	Cell on TWR	TW		L	3	328,000.00	2010		0		100	984,000

BUILDING SUB-AREA SUMMARY SECTION

Code	Description	Living Area	Gross Area	Eff. Area	Unit Cost	Undeprec. Value
	Ttl. Gross Liv/Lease Area:	0	0			

No Photo On Record



Cut on dotted line.

Instructions

1. **Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.**
2. **Place your label so it does not wrap around the edge of the package.**
3. **Adhere your label to the package. A self-adhesive label is recommended. If tape or glue is used, DO NOT TAPE OVER BARCODE. Be sure all edges are secure.**
4. **To mail your package with PC Postage®, you may schedule a Package Pickup online, hand to your letter carrier, take to a Post Office™, or drop in a USPS collection box.**
5. **Mail your package on the "Ship Date" you selected when creating this label.**

Click-N-Ship® Label Record

USPS TRACKING # / Insurance Number:
9405 8036 9930 0519 8367 70

Trans. #:	417202948
Print Date:	10/17/2017
Ship Date:	10/17/2017
Expected Delivery Date:	10/19/2017
Insured Value:	$50.00

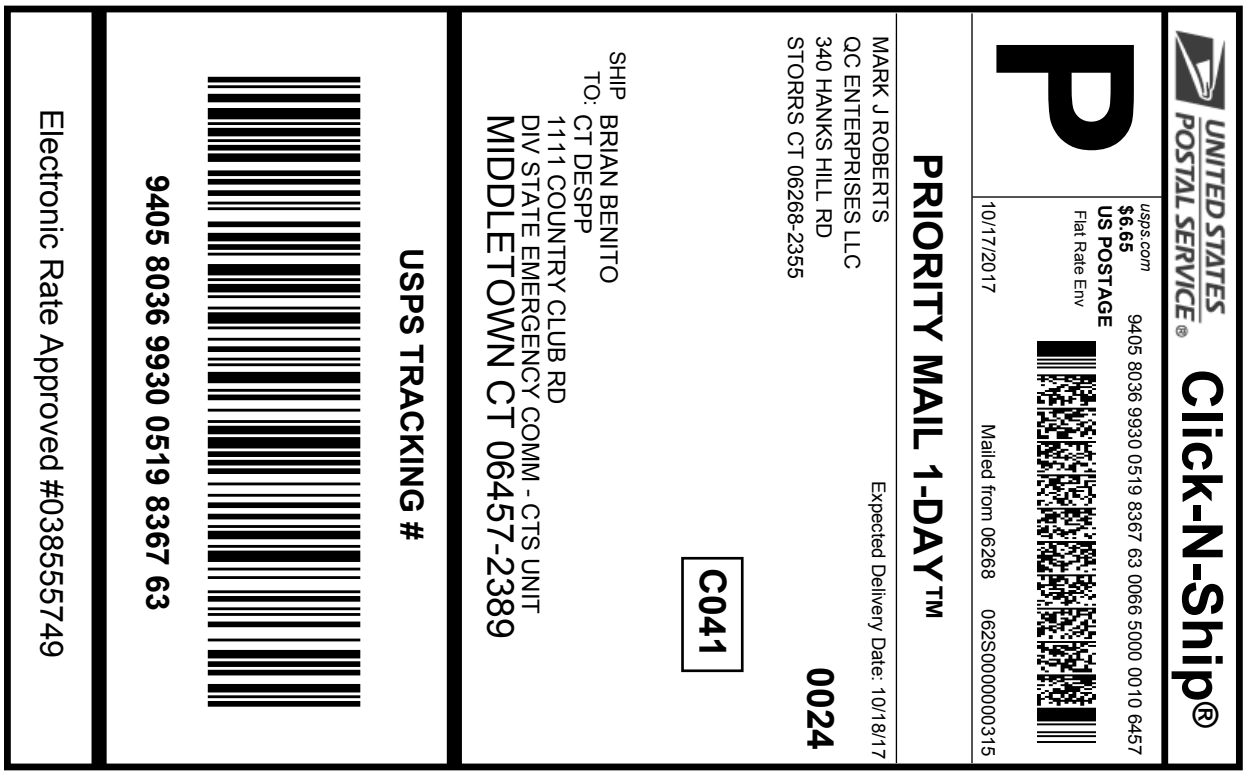
Priority Mail® Postage:	**$6.65**
Insurance Fee	**$0.00**
Total	**$6.65**

From: MARK J ROBERTS
QC ENTERPRISES LLC
340 HANKS HILL RD
STORRS CT 06268-2355

To: JAMES MARPE
TOWN OF WESTPORT
110 MYRTLE AVE
SLECTMAN'S OFFICE
WESTPORT CT 06880-3514

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.

Thank you for shipping with the United States Postal Service!
Check the status of your shipment on the USPS Tracking® page at usps.com



Cut on dotted line.

Instructions

1. **Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.**
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5. **Mail your package on the "Ship Date" you selected when creating this label.**

Click-N-Ship® Label Record

USPS TRACKING # / Insurance Number:
9405 8036 9930 0519 8367 63

Trans. #:	417202948
Print Date:	10/17/2017
Ship Date:	10/17/2017
Expected Delivery Date:	10/18/2017
Insured Value:	$50.00

Priority Mail® Postage:	**$6.65**
Insurance Fee	**$0.00**
Total	**$6.65**

From: MARK J ROBERTS
QC ENTERPRISES LLC
340 HANKS HILL RD
STORRS CT 06268-2355

To: BRIAN BENITO
CT DESPP
1111 COUNTRY CLUB RD
DIV STATE EMERGENCY COMM - CTS UNIT
MIDDLETOWN CT 06457-2389

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.

Thank you for shipping with the United States Postal Service!
Check the status of your shipment on the USPS Tracking® page at usps.com

DIV. SITE ACQUISITION, LLC
27 NORTHWESTERN DRIVE
SALEM, NH 03079

BANK OF AMERICA 54-49/114 **59917**

Pay: **********Six hundred twenty-five dollars and no cents

DATE	CHECK NO.	AMOUNT
October 6, 2017	59917	$********625.00

PAY TO THE ORDER OF
Connecticut Siting Council
10 Franklin Sq
New Britain, CT 06051

⑈059917⑈ ⑆011400495⑆ 000089877441⑈

SAI
DIV. SITE ACQUISITION, LLC
59917

CONN03 Connecticut Siting Council

DATE	INVOICE NO.	DESCRIPTION	INVOICE AMOUNT	DEDUCTION	BALANCE
10-06-17	CR100617	CT2147 - Exempt Mod	625.00		625.00
CHECK DATE	10-06-17	CHECK NUMBER 59917	TOTALS	625.00		625.00