NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

Northeast Site Solutions
Victoria Masse
420 Main Street #2, Sturbridge, MA 01566
860-306-2326
victoria@northeastsitesolutions.com

August 25, 2020

Members of the Siting Council
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

RE: Notice of Exempt Modification
785 Park Avenue, Bloomfield CT 06002
Latitude: 41.82879494
Longitude: -72.73446217
T-Mobile Site#: CTHA140A_Anchor

Dear Ms. Bachman:

T-Mobile currently maintains nine (9) antennas at the 138-foot level of the existing 136-foot monopole tower at 785 Park Avenue, Bloomfield CT. The 136-foot tower and property are both owned by the Town of Bloomfield (Police Station). T-Mobile now intends to replace three (3) of its existing antennas with three (3) new 2500 MHz antenna. The new antennas would be installed at the 138-foot level of the tower.
Planned Modifications:
Remove: NONE

Remove and Replace:
(3) AIR21 B2A/B4P (Remove) – AIR6449 B41 Antenna 2500 Mhz (Replace)

Install New:
(1) Fiber line
(3) RRU 4415 B25
(3) Diplexers
(1) HRK12 Handrail Kit

Existing to Remain:
(18) 1-5/8" Coax
(2) Fiber Hybrid Line
(3) Twin TMA
(3) RRU 4449 B12/B71
(3) AIR32 KRD901146-1 B66A_B2A Antenna 1900/2100 MHz
(3) APXVAARR24_43-U-NA20 Antenna 600/700/1900/2100 MHz

NORTHEAST SITE SOLUTIONS

Turnkey Wireless Development

This facility was approved by the Bloomfield ZBA–on April 17, 2002 Town of Bloomfield was approved to erect two (2) tower shelters and a tower. Please see attached provided by the Town of Bloomfield Zoning Department.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to Mayor Suzette DeBeatham-Brown, Elected Official and Jose Giner, Zoning Director for the Town of Bloomfield, as well as the property owner and the 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, T-Mobile 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).

Sincerely,

Victoria Masse
Mobile: 860-306-2326
Fax: 413-521-0558
Office: 420 Main Street, Unit 2, Sturbridge MA 01566
Email: victoria@northeastsitesolutions.com

NORTHEAST
SITE SOLUTIONS
Turnkey Wireless Development

Attachments
cc: Suzette DeBeatham-Brown- Mayor -Wethersfield elected official
Jose Giner – Director of Planning and Zoning
Town of Bloomfield - as property and tower owner

NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST. BUILDING #4, 2nd FLOOR
Sturbridge, MA 01566

WEBSTER BANK
51-7010/2111

4114

08/19/2020

PAY TO THE ORDER OF Connecticut Siting Council

$ *625.00

EXACTLY SIX HUNDRED TWENTY-FIVE DOLLARS

DOLLARS

Connecticut Siting Council
10 Franklin Square
New Britain CT 06051

MEMO CTHA140A Anchor

AUTHORIZED SIGNATURE

⑈004114⑈ ⑆211170101⑆10 0010608887⑈

Check#: 4114 **Date: 08/19/2020** **Vendor#: 10023 Connecticut Siting Co** **Check Total: *625.00** 4114

Invoice#	*Invoice Date*	*Job/Description*	*Balance*	*Retain*	*Discount*	*This Check*
CTHA140A CSC Zoning	08/19/2020	2 TMO Anchor Program	625.00			625.00

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CTHA140A CSC Zoning	08/19/2020	2 TMO Anchor Program	625.00			625.00

Exhibit A

TOWN OF BLOOMFIELD

800 Bloomfield Avenue - P.O. Box 337
Bloomfield, CT 06002
(860) 769-3516

BUILDING PERMIT APPLICATION

Job Location: 785 Park Ave, Bloomfield, CT	**Lot #:**	**Zone:**
Purpose of Permit: To construct a wireless communications facility consisting of a 140' monopole structure, it is designed to accomadate town police + rescue communications and four wireless carriers.		

Building Permit No: 21872	Use Group: U	Code:
Type of Construction:		

Property Owner - Name/Address	Contractor - Name/Address	Arch/Eng/Agent - Name/Address
Town of Bloomfield 800 Bloomfield Ave Bloomfield, CT, 06002 Phone:	Construction Services of Branford, Inc., 63-3 North Branford Rd, Branford, CT, 06405 Phone: (203) 488-0712	Natcomm, Inc 63-2 North Branford Rd, Branford, CT, 06405 Phone: (203) 488-0580

USE:

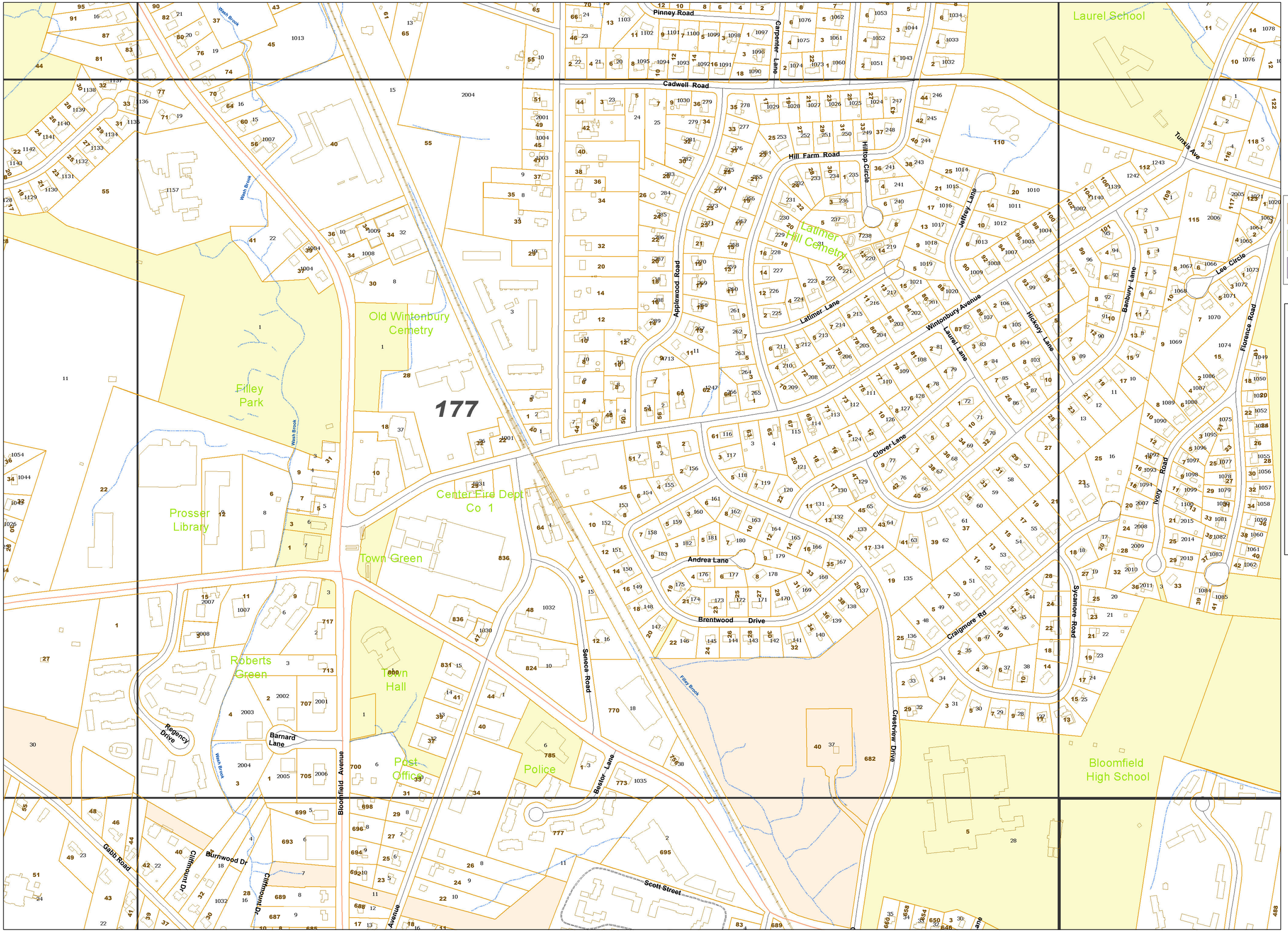
☐ Residential Use	☐ Public Assembly	☐ Industrial
☐ Single Family	☐ Business	☐ Storage
☐ Multi Family	☐ Educational	☐ Utility

FEE INCLUDES:	ESTIMATED COST	FEE
☑ General Contractor	$ 110,000	$
☐ Plumbing Permit #:	$	$
☐ Heating Permit #:	$	$
☐ A/C Permit #:	$	$
☐ Electric Permit #:	$	$
☐ Sprinkler Permit #:	$	$
☐ #:	$	$
	TOTAL $ 110,000	TOTAL $ 1,540.00

CERTIFICATION: I hereby certify that: ☐ I am the owner of record of the named property or ☑ that the proposed work is authorized by the owner of record and/or I have been authorized to make this application as an agent, and we agree to conform to all applicable laws, regulations and ordinances. All information contained within is true and accurate to the best of my knowledge and belief.

Signed: _____ ☐ Owner ☐ Contractor ☑ Agent	Date: 10/25/02	Contractor's License #: mco.900576

Exhibit B



CL&P

Town of Bloomfield

State of Connecticut

House Nos. in **Brown**
Lot Nos. in **Black**

State Route
Town Road (Paved)
Town Road (Unpaved)
Private Road

Town of Bloomfield, CT

Property Listing Report | Map Block Lot 177-3-6 | Account R90068

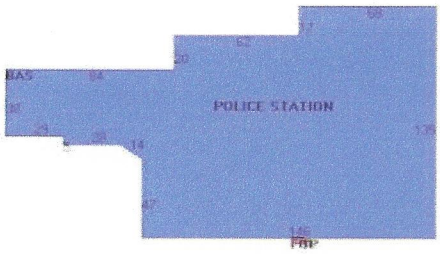
Property Information

Property Location	785 PARK AVE
Owner	BLOOMFIELD TOWN OF
Co-Owner	POLICE STATION
Mailing Address	800 BLOOMFIELD AVE. BLOOMFIELD CT 06002
Land Use	922 Mun Bldg Com
Land Class	E
Zoning Code	BCD
Census Tract	
Sub Lot	

Neighborhood	
Acreage	2.25
Utilities	
Lot Setting/Desc	
Survey Map	
Foundation	POURED CONC.

Photo

Sketch



Primary Construction Details

Year Built	1991
Stories	1
Building Style	City/Town Hall
Building Use	Commercial
Building Condition	B
Floors	Carpet
Total Rooms	

Bedrooms	
Full Bathrooms	
Half Bathrooms	
Bath Style	
Kitchen Style	
Roof Style	Gable
Roof Cover	Asphalt Shingl

Exterior Walls	Concrete
Interior Walls	Drywall
Heating Type	Forced Air
Heating Fuel	Gas
AC Type	
Gross Bldg Area	20917
Total Living Area	20887

Report Created On 8/28/2018

Town of Bloomfield, CT

Property Listing Report | **Map Block Lot** 177-3-6 | **Account** R90068

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	2511900	1758330
Extras	0	0
Outbuildings	0	0
Land	560000	392000
Total	3071900	2150330

Outbuilding and Extra Items

Type	Description

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
Finished Open Porch	30	0
First Floor	20887	20887
Total Area	20917	20887

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
BLOOMFIELD TOWN OF	33/ 70		0

Report Created On 8/28/2018

Exhibit C

UPGRADE OF EXISTING WIRELESS FACILITY

T-Mobile

T-MOBILE NORTHEAST LLC

PROJECT: ANCHOR

SITE NUMBER: CTHA140A

SITE NAME: HA140/BLOOMFIELD POLICE_MP

SITE ADDRESS: 785 PARK AVENUE

BLOOMFIELD, CT 06002

(RF CONFIGURATION: 67D5997DB_2XAIR+1OP (U21 MARKET))

PROJECT NOTES:

1. THIS IS AN UNMANNED TELECOMMUNICATION FACILITY AND NOT FOR HUMAN HABITATION:
   HANDICAPPED ACCESS IS NOT REQUIRED.
   POTABLE WATER OR SANITARY SERVICE IS NOT REQUIRED.
   NO OUTDOOR STORAGE OR ANY
   SOLID WASTE RECEPTACLES REQUIRED.
2. CONTRACTOR SHALL VERIFY ALL PLANS, EXISTING DIMENSIONS, AND CONDITIONS ON THE JOB SITE. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK. FAILURE TO NOTIFY THE ARCHITECT/ENGINEER PLACES THE RESPONSIBILITY ON THE CONTRACTOR TO CORRECT THE DISCREPANCIES AT THE CONTRACTOR'S EXPENSE.
3. DEVELOPMENT AND USE OF THE SITE WILL CONFORM TO ALL APPLICABLE CODES, ORDINANCES AND SPECIFICATIONS.
4. REFER TO STRUCTURAL ANALYSIS REPORT TITLED "STRUCTURAL ANALYSIS REPORT" SITE ID: CTHA140A, DATED AUGUST 07, 2020 AND AND ANTENNA MOUNT ANALYSIS DATED AUGUST 3, 2020 BOTH PREPARED BY CENTEK ENGINEERING, INC.

CODE COMPLIANCE:

ALL WORK SHALL COMPLY WITH THE CURRENT NATIONAL AND CONNECTICUT STATE BUILDING AND LIFE SAFETY CODES, SUPPLEMENTS AND AMENDMENTS INCLUDING BUT NOT LIMITED TO THE LATEST EDITION OF:

CONNECTICUT STATE BUILDING CODE (CSBC).

ANSI/TIA-222-G STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS.

NATIONAL ELECTRICAL CODE (NEC) FOR POWER AND GROUNDING REQUIREMENTS.

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA).

NFPA - NATIONAL FIRE PROTECTION ASSOCIATION.

APPROVALS:

FSA CM	DATE
RF ENGINEER	DATE
FOPS	DATE
T-MOBILE ENGINEERING AND DEVELOPMENT	DATE
	DATE
	DATE

SITE IMAGE:

VICINITY MAP:

PROJECT SCOPE:

UPGRADE OF EXISTING WIRELESS FACILITY AS FOLLOWS:
UPGRADE EXISTING RBS 3206 CABINET INTERNALLY.
REPLACE (3) OF (9) EXISTING ANTENNAS ON MONOPOLE.
ADD (3) REMOTE RADIO UNITS AND (3) DIPLEXERS AT ANTENNAS.
ADD (1) 6230 POWER CABINET IN A NEW 19" RACK.
ADD BATTERIES IN THE EXISTING 19" RACK.
ADD (1) 6X 12 HCS, FOR FINAL COUNT OF (3) 6X12 HCS AND (18) 1-5/8" COAX CABLES.

PROJECT INFORMATION:

ADDRESS:	785 PARK AVENUE BLOOMFIELD, CT 06002
PID:	7721
MAP BLOCK LOT:	177-3-6
ZONING:	BCD
LAND USE:	922 MUN BLDG COM
COORDINATES:	41°49' 42.61" N 72° 44' 01" W
AVERAGE GROUND ELEVATION:	111'± (AMSL)

PROJECT TEAM:

APPLICANT:	T-MOBILE NORTHEAST, LLC. 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002 860-692-7100
LANDLORD:	TOWN OF BLOOMFIELD POLICE STATION 800 PARK AVE BLOOMFIELD, CT 06002
PROJECT MANAGER:	NORTHEAST SITE SOLUTIONS 420 MAIN STREET, BLDG 4 STURBRIDGE, MA 01566 SHELDON FREINCLE SHELDON@NORTHEASTSITESOLUTIONS.COM 201-776-8521
CONSULTANTS:	FORESITE LLC 462 WALNUT ST NEWTON, MA 02460 SAEED MOSSAVAT SMOSSAVAT@FORESITELLC.COM 617-212-3123

SHEET INDEX:

APPLICANT:

T-Mobile

T-MOBILE NORTHEAST LLC

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

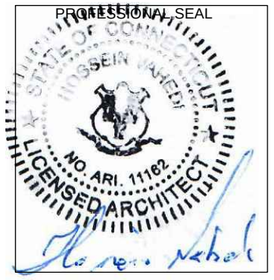
PROJECT MANAGER

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
420 MAIN STREET, BLDG 4
STURBRIDGE, MA 01566
203-275-6669

CONSULTANT:

FORESITE LLC
Architects . Engineers . Surveyors
462 WALNUT STREET
NEWTON, MA 02460
617-212-3123

PROFESSIONAL SEAL



REV	DESCRIPTION	DATE
A	PRELIMINARY	08/10/20
0	FINAL ISSUED	08/24/20

SITE NUMBER: CTHA140A
SITE NAME: HA140/BLOOMFIELD POLICE_MP
SITE ADDRESS: 785 PARK AVENUE
BLOOMFIELD, CT 06002

SHEET TITLE:

T-1: TITLE SHEET

GENERAL NOTES:

1. THE CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY, MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES BEARING ON THE PERFORMANCE OF THE WORK. THE WORK PERFORMED ON THE PROJECT AND THE MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES.

2. THE ARCHITECT/ENGINEER HAS MADE EVERY EFFORT TO SET FORTH IN THE CONSTRUCTION AND CONTRACT DOCUMENTS THE COMPLETE SCOPE OF WORK. THE CONTRACTOR BIDDING THE JOB IS NEVERTHELESS CAUTIONED THAT MINOR OMISSIONS OR ERRORS IN THE DRAWINGS AND OR SPECIFICATIONS SHALL NOT EXCUSE SAID CONTRACTOR FROM COMPLETING THE PROJECT AND IMPROVEMENTS IN ACCORDANCE WITH THE INTENT OF THESE DOCUMENTS.

3. THE CONTRACTOR OR BIDDER SHALL BEAR THE RESPONSIBILITY OF NOTIFYING (IN WRITING) THE CLIENT'S REPRESENTATIVE OF ANY CONFLICTS, ERRORS, OR OMISSIONS PRIOR TO THE SUBMISSION OF CONTRACTOR'S PROPOSAL OR PERFORMANCE OF WORK.

5. THE CONTRACTOR SHALL VISIT THE JOB SITE PRIOR TO THE SUBMISSION OF BIDS OR PERFORMING WORK TO FAMILIARIZE HIMSELF WITH THE FIELD CONDITIONS AND TO VERIFY THAT THE PROJECT CAN BE CONSTRUCTED IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS.

6. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS ACCORDING TO THE MANUFACTURER'S / VENDOR'S SPECIFICATIONS UNLESS NOTED OTHERWISE OR WHERE LOCAL CODES OR ORDINANCES TAKE PRECEDENCE.

7. THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS TO PROTECT EXISTING IMPROVEMENTS DURING CONSTRUCTION.

8. THE CONTRACTOR SHALL COMPLY WITH ALL PERTINENT SECTIONS OF THE BASIC STATE BUILDING CODE, LATEST EDITION, AND ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJEC

9. THE CONTRACTOR SHALL NOTIFY THE CLIENT'S REPRESENTATIVE IN WRITING WHERE A CONFLICT OCCURS ON ANY OF THE CONTRACT DOCUMENTS. THE CONTRACTOR IS NOT TO ORDER MATERIAL OR CONSTRUCT ANY PORTION OF THE WORK THAT IS IN CONFLICT UNTIL CONFLICT IS RESOLVED BY THE CLIENT'S REPRESENTATIVE.

10. THE WORK SHALL CONFORM TO THE CODES AND STANDARDS OF THE FOLLOWING AGENCIES AS FURTHER CITED HEREIN:

A. ASTM: AMERICAN SOCIETY FOR TESTING AND MATERIALS, AS PUBLISHED IN "COMPILATION OF ASTM STANDARDS BUILDING CODES" OR LATEST EDITION.

B. AWS: AMERICAN WELDING SOCIETY INC. AS PUBLISHED IN "STANDARD D1.1-08, STRUCTURAL WELDING CODE" OR LATEST EDITION.

C. AISC: AMERICAN INSTITUTE FOR STEEL CONSTRUCTION AS PUBLISHED IN "CODE FOR STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"; "SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS" (LATEST EDITION).

11. BOLTING:

A. BOLTS SHALL BE CONFORMING TO ASTM A325 HIGH STRENGTH, HOT DIP GALVANIZED WITH ASTM A153 HEAVY HEX TYPE NUTS.

B. BOLTS SHALL BE 3/4"Φ MINIMUM (UNLESS OTHERWISE NOTED)

C. ALL CONNECTIONS SHALL BE 2 BOLTS MINIMUM.

12. FABRICATION:

A. FABRICATION OF STEEL SHALL CONFORM TO THE AISC AND AWS STANDARDS AND CODES (LATEST EDITION).

B. ALL STRUCTURAL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 (LATEST EDITION), UNLESS OTHERWISE NOTED.

13. ERECTION OF STEEL:

A. PROVIDE ALL ERECTION EQUIPMENT, BRACING, PLANKING, FIELD BOLTS, NUTS, WASHERS, DRIFT PINS, AND SIMILAR MATERIALS WHICH DO NOT FORM A PART OF THE COMPLETED CONSTRUCTION BUT ARE NECESSARY FOR ITS PROPER ERECTION.

B. ERECT AND ANCHOR ALL STRUCTURAL STEEL IN ACCORDANCE WITH AISC REFERENCE STANDARDS. ALL WORK SHALL BE ACCURATELY SET TO ESTABLISHED LINES AND ELEVATIONS AND RIGIDLY FASTENED IN PLACE WITH SUITABLE ATTACHMENTS TO THE CONSTRUCTION OF THE BUILDING.

C. TEMPORARY BRACING, GUYING AND SUPPORT SHALL BE PROVIDED TO KEEP THE STRUCTURE SAFE AND ALIGNED AT ALL TIMES DURING CONSTRUCTION, AND TO PREVENT DANGER TO PERSONS AND PROPERTY. CHECK ALL TEMPORARY LOADS AND STAY WITHIN SAFE CAPACITY OF ALL BUILDING COMPONENTS.

14. ANTENNA INSTALLATION:

A. INSTALL ANTENNAS AS INDICATED ON DRAWINGS AND CLIENT'S REPRESENTATIVE SPECIFICATIONS.

B. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.

C. INSTALL COAXIAL / FIBER CABLES AND TERMINATIONS BETWEEN ANTENNAS AND EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. WEATHERPROOF ALL CONNECTORS BETWEEN THE ANTENNA AND EQUIPMENT PER MANUFACTURER'S REQUIREMENTS.

15. ANTENNA AND COAXIAL / FIBER CABLE GROUNDING:

A. ALL EXTERIOR #6 GREEN GROUND WIRE "DAISY CHAIN" CONNECTIONS ARE TO BE WEATHER SEALED WITH ANDREWS CONNECTOR/SPLICE WEATHERPROOFING KIT TYPE #221213 OR EQUAL.

B. ALL COAXIAL / FIBER CABLE GROUNDING KITS ARE TO BE INSTALLED ON STRAIGHT RUNS OF COAXIAL / FIBER CABLE (NOT WITHIN BENDS).

16. RELATED WORK, FURNISH THE FOLLOWING WORK AS SPECIFIED UNDER CONSTRUCTION DOCUMENTS, BUT COORDINATE WITH OTHER TRADES PRIOR TO BID:

A. FLASHING OF OPENING INTO OUTSIDE WALLS

B. SEALING AND CAULKING ALL OPENINGS

C. PAINTING

D. CUTTING AND PATCHING

17. REQUIREMENTS OF REGULATORY AGENCIES:

A. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE. INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.

B. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, AND SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS WORK INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

C. TIA-EIA - 222 (LATEST EDITION). STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.

D. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-IH, OBSTRUCTION MARKING AND LIGHTING.

E. FCC - FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATION FOR ANTENNA STRUCTURES AND FORM 715A, HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.

F. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS (LATEST EDITION).

G. NEC - NATIONAL ELECTRICAL CODE - ON TOWER LIGHTING KITS.

H. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.

I. IN ALL CASES, PART 77 OF THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.

J. 2009 LIFE SAFETY CODE NFPA - 101.

APPLICANT:
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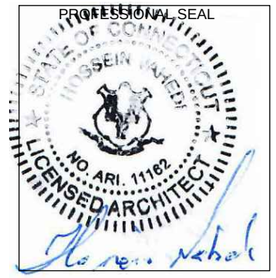

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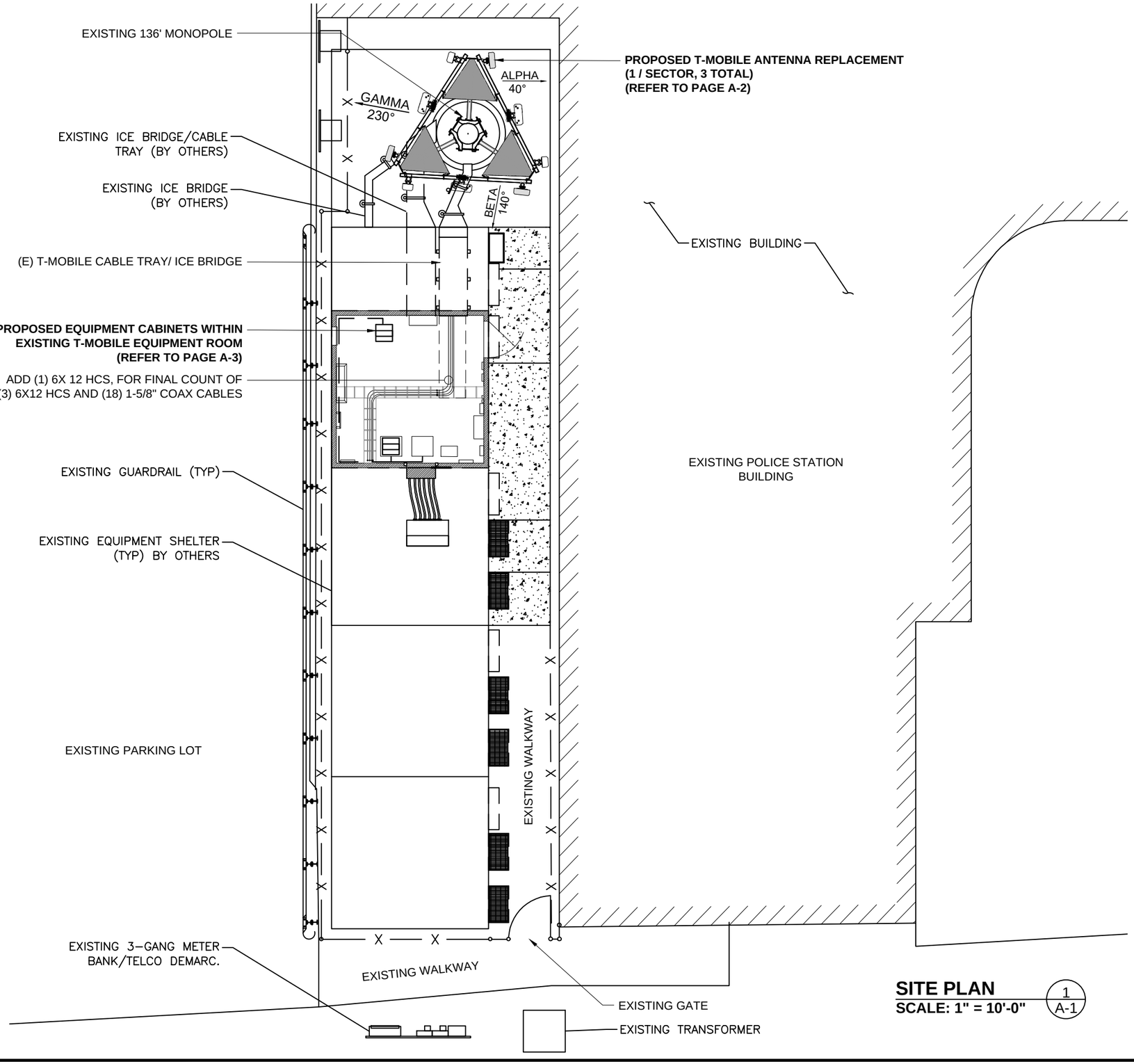
SITE ADDRESS: 785 PARK AVENUE
BLOOMFIELD, CT 06002

SHEET TITLE:
N-1: NOTES AND DISCLAIMERS



SITE PLAN 1 / A-1
SCALE: 1" = 10'-0"

APPLICANT:
T-Mobile
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
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860-692-7100

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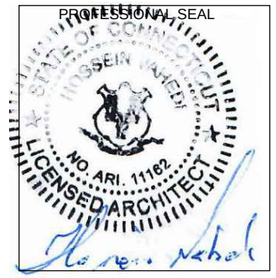

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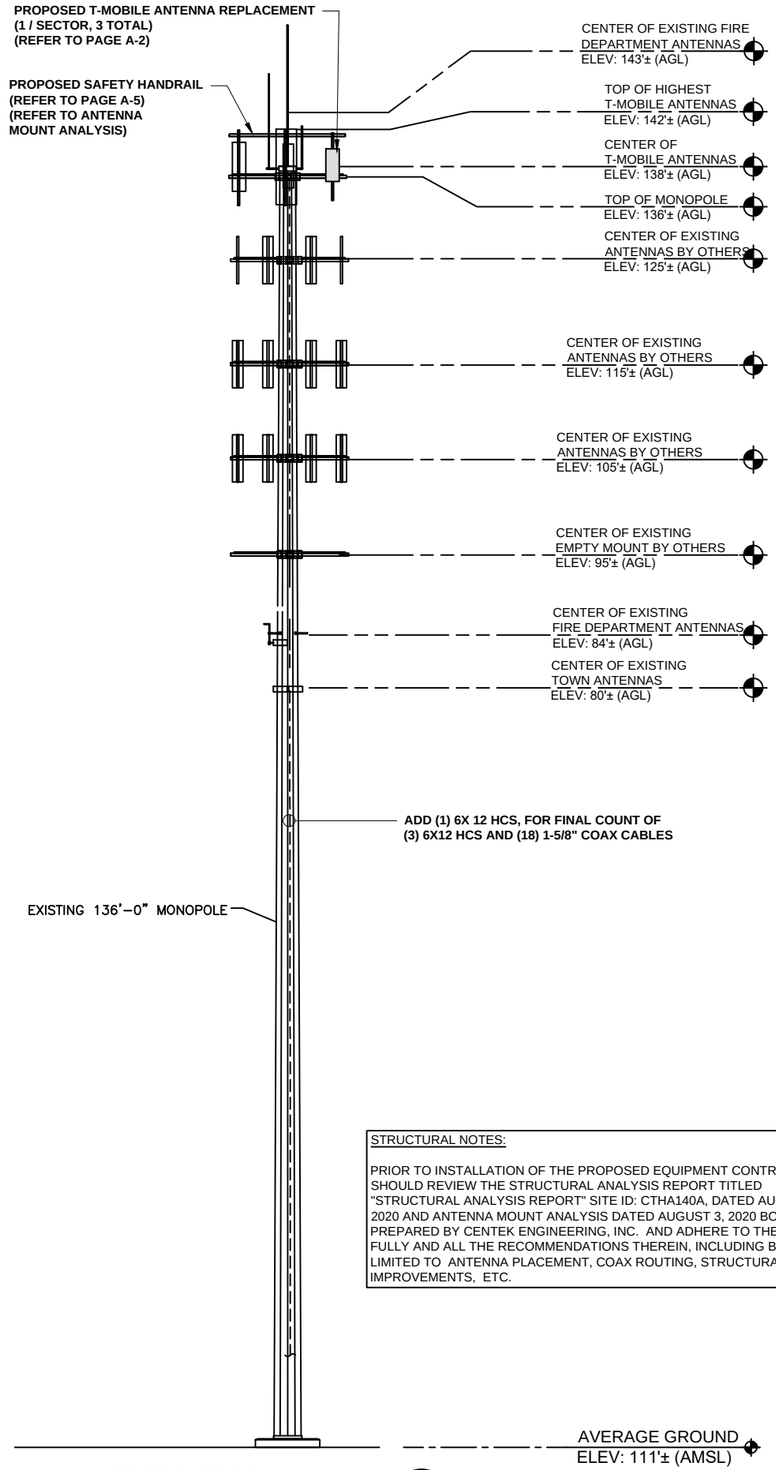
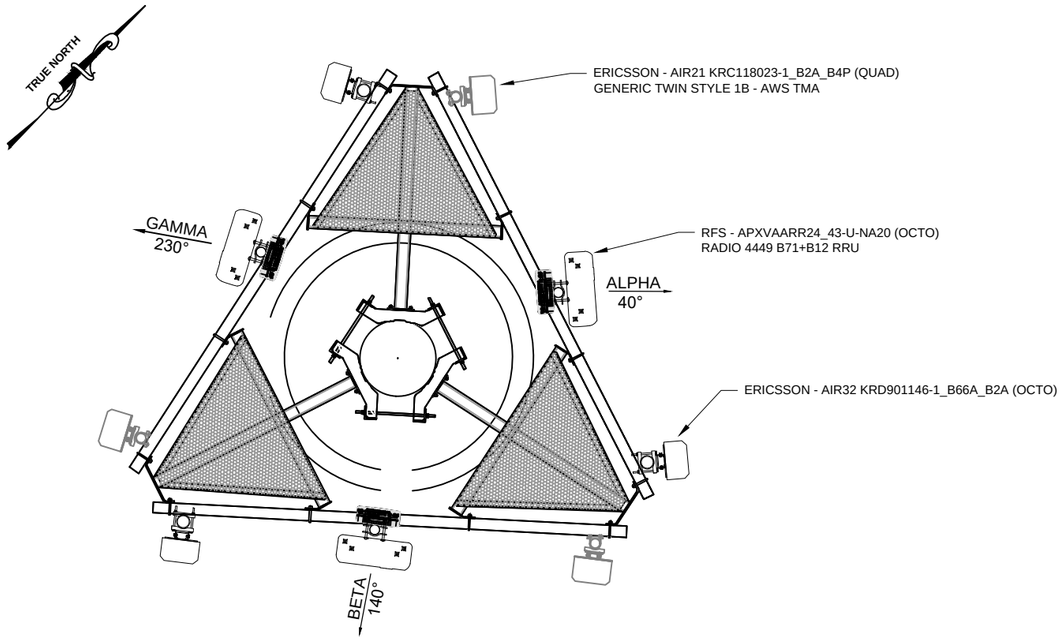
SHEET TITLE:
A-1: PLAN



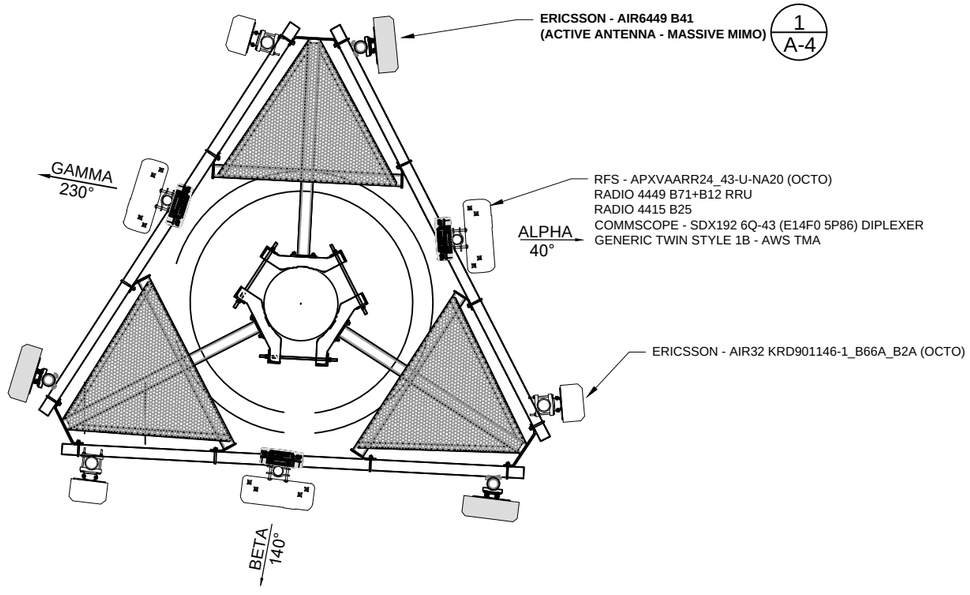
ELEVATION
SCALE: 1/16" = 1'-0"
1 / A-2

STRUCTURAL NOTES:

PRIOR TO INSTALLATION OF THE PROPOSED EQUIPMENT CONTRACTOR SHOULD REVIEW THE STRUCTURAL ANALYSIS REPORT TITLED "STRUCTURAL ANALYSIS REPORT" SITE ID: CTHA140A, DATED AUGUST 07, 2020 AND ANTENNA MOUNT ANALYSIS DATED AUGUST 3, 2020 BOTH PREPARED BY CENTEK ENGINEERING, INC. AND ADHERE TO THE REPORT FULLY AND ALL THE RECOMMENDATIONS THEREIN, INCLUDING BUT NOT LIMITED TO ANTENNA PLACEMENT, COAX ROUTING, STRUCTURAL IMPROVEMENTS, ETC.



EXISTING ANTENNA PLAN
SCALE: NTS
2 / A-2



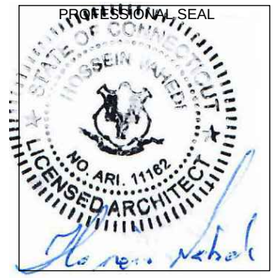
FINAL ANTENNA PLAN
SCALE: NTS
3 / A-2

APPLICANT:
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

PROJECT MANAGER
NORTHEAST SITE SOLUTIONS
420 MAIN STREET, BLDG 4
STURBRIDGE, MA 01566
203-275-6669

CONSULTANT:
FORESITE LLC
Architects . Engineers . Surveyors
462 WALNUT STREET
NEWTON, MA 02460
617-212-3123

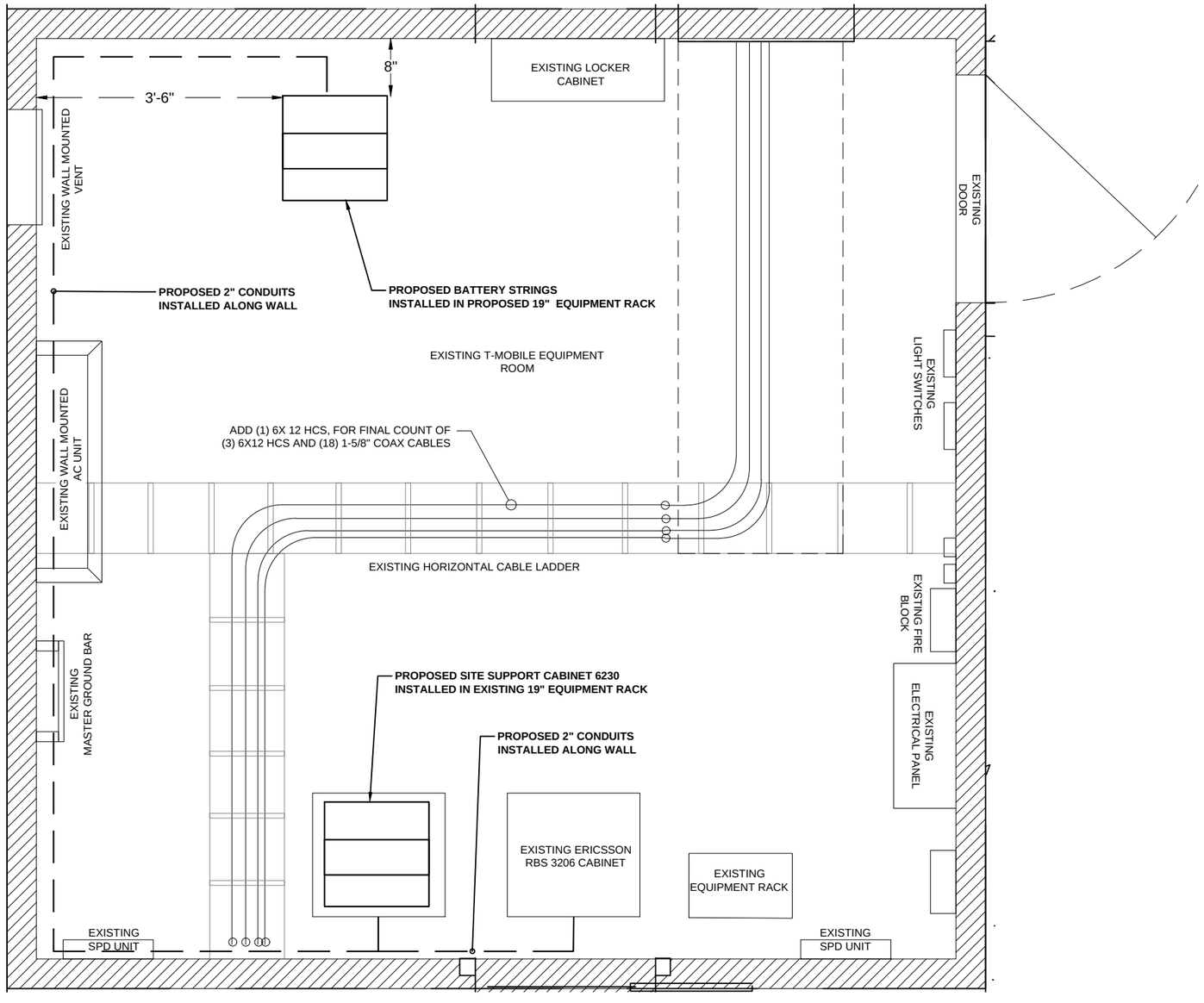
PROFESSIONAL SEAL



REV	DESCRIPTION	DATE
A	PRELIMINARY	08/10/20
0	FINAL ISSUED	08/24/20

SITE NUMBER: CTHA140A
SITE NAME: HA140/BLOOMFIELD POLICE_MP
SITE ADDRESS: 785 PARK AVENUE
BLOOMFIELD, CT 06002

SHEET TITLE:
A-2: ELEVATION AND ANTENNA PLANS



EQUIPMENT ROOM LAYOUT

1
A-3

SCALE: NTS

APPLICANT:

T-Mobile

T-MOBILE NORTHEAST LLC

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
860-692-7100

PROJECT MANAGER

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development
420 MAIN STREET, BLDG 4
STURBRIDGE, MA 01566
203-275-6669

CONSULTANT:

FORESITE LLC
Architects . Engineers . Surveyors
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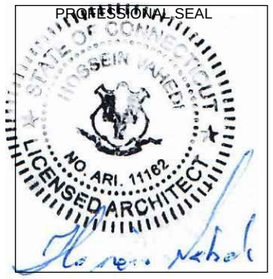
NEWTON, MA 02460
617-212-3123

PROFESSIONAL SEAL



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0	FINAL ISSUED	08/24/20

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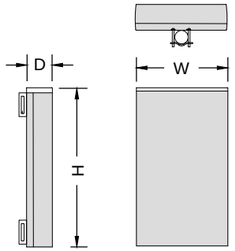
BLOOMFIELD, CT 06002

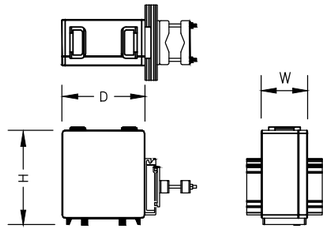
SHEET TITLE:

A-3: EQUIPMENT ROOM LAYOUT



ERICSON ANTENNA SPECIFICATIONS	
MODEL #	AIR6449 B41
MANUF.	ERICSSON
HEIGHT	33.1"
WIDTH	20.5"
DEPTH	8.3"
WEIGHT	103 LB

ERICSSON ANTENNA 1 A-4
N.T.S

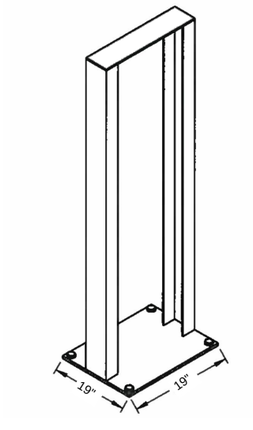


REMOTE RADIO UNIT SPECIFICATIONS	
MODEL #	RADIO 4415 B25
MANUF.	ERICSSON
HEIGHT	14.9"
WIDTH	13.2"
DEPTH	5.4"
WEIGHT	46.3 LB

REMOTE RADIO UNIT 2 A-4
N.T.S

BATTERY CABINET SPECIFICATIONS	
MODEL #	POWER 6230
MANUF.	ERICSSON
HEIGHT	19"
WIDTH	26"
DEPTH	26"
WEIGHT	200 LBS

BATTERY SYSTEM 3 A-4
N.T.S



NOTE: CONTRACTOR SHALL SECURE RACK AS PER MANUFACTURER RECOMMENDATIONS

INDOOR EQUIPMENT RACK 4 A-4
N.T.S

APPLICANT:
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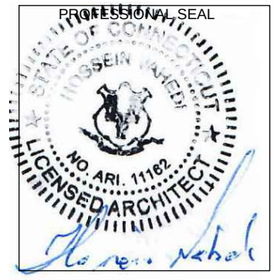
617-212-3123

PROFESSIONAL SEAL



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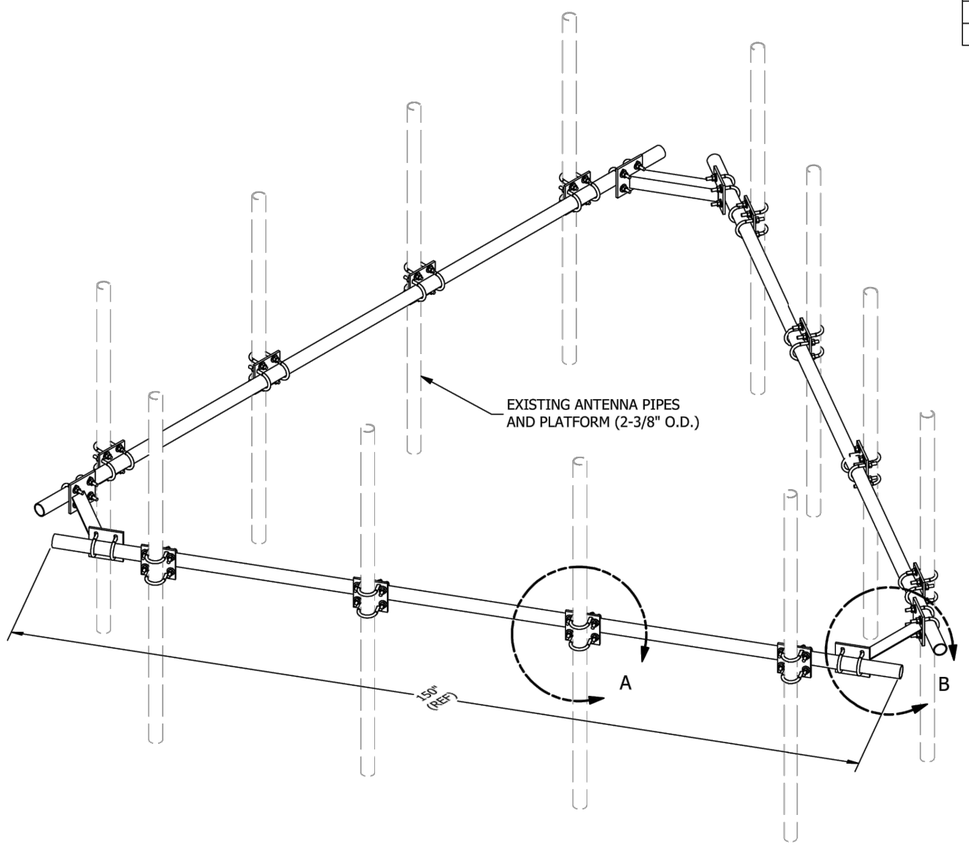
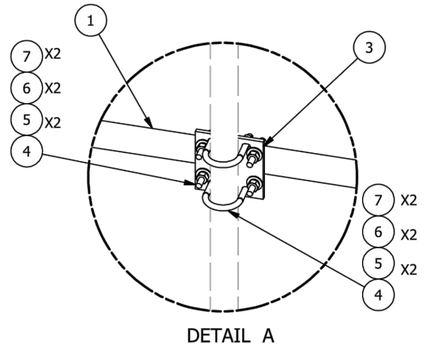
0	FINAL ISSUED	08/24/20

SITE NUMBER: CTHA140A
SITE NAME: HA140/BLOOMFIELD POLICE_MP
SITE ADDRESS: 785 PARK AVENUE
BLOOMFIELD, CT 06002

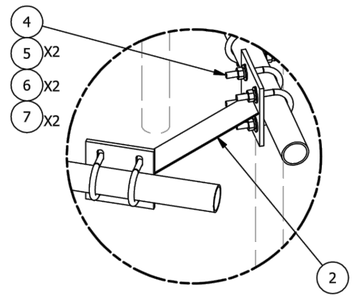
SHEET TITLE:
A-4: EQUIPMENT SPECIFICATIONS

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	3	P2150	2-3/8" O.D. X 150" SCH 40 GALVANIZED PIPE	150 in	45.77	137.31
2	3	X-AHCP	ANGLE HANDRAIL CORNER PLATE		12.92	38.76
3	12	SCX1	CROSSOVER PLATE 2-3/8" X 2-3/8"	6 in	3.71	44.50
4	60	X-UB1212	1/2" X 2-1/2" X 4-1/2" X 2" U-BOLT (HDG.)		0.63	37.51
5	120	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	4.09
6	120	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	1.67
7	120	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	8.60
					TOTAL WT. #	272.43





DETAIL A



DETAIL B

REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
A	REPLACED HCP WITH X-AHCP		CEK	7/10/2014
REVISION HISTORY				

TOLERANCE NOTES

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

DESCRIPTION: HANDRAIL KIT FOR 12'-6" FACE

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	KC8 5/30/2012		HRK12	1 OF 1
CLASS / SUB	DRAWING USAGE	CHECKED BY	DWG. NO.	
81 / 01	CUSTOMER	BMC 7/13/2014	HRK12	

SITE PRO 1 — A valmont COMPANY
Engineering Support Team: 1-888-753-7446
Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

APPLICANT:
T-MOBILE NORTHEAST LLC
35 GRIFFIN ROAD SOUTH
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860-692-7100

PROJECT MANAGER
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CONSULTANT:
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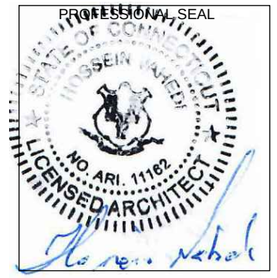
PROFESSIONAL SEAL



REV	DESCRIPTION	DATE
A	PRELIMINARY	08/10/20
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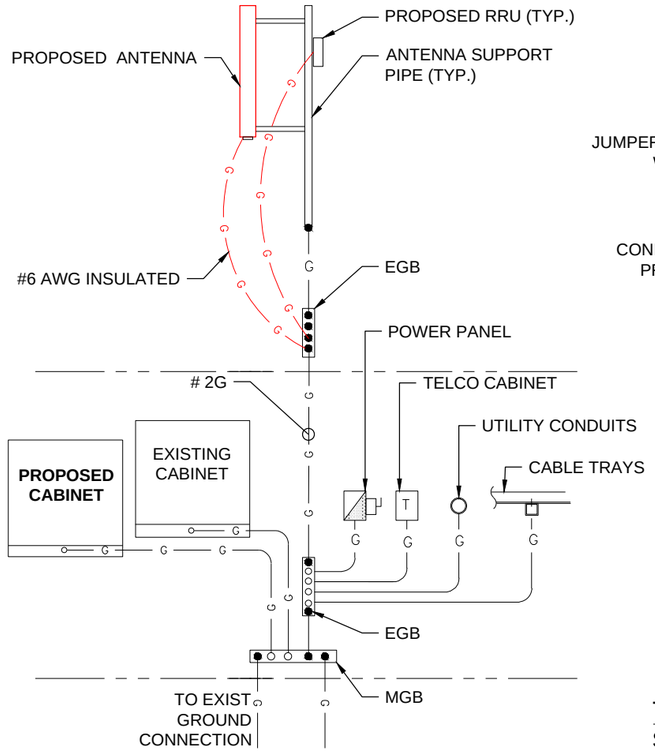
SITE NUMBER: CTHA140A
SITE NAME: HA140/BLOOMFIELD POLICE_MP
SITE ADDRESS: 785 PARK AVENUE
BLOOMFIELD, CT 06002

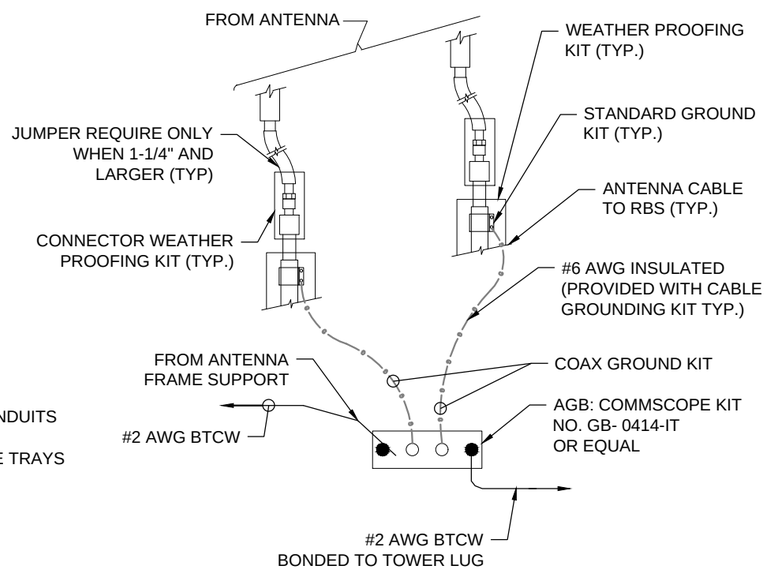
SHEET TITLE:
A-5: HANDRAIL DETAILS

ELECTRICAL & GROUNDING NOTES

1. ALL ELECTRICAL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC) AS WELL AS APPLICABLE STATE AND LOCAL CODES.
2. ALL ELECTRICAL ITEMS SHALL BE U.L. APPROVED OR LISTED AND PRODUCED PER SPECIFICATION REQUIREMENTS.
3. THE ELECTRICAL WORK INCLUDES ALL LABOR AND MATERIAL DESCRIBED BY DRAWINGS AND SPECIFICATION INCLUDING INCIDENTAL WORK TO PROVIDE COMPLETE OPERATING AND APPROVED ELECTRICAL SYSTEM.
4. GENERAL CONTRACTOR SHALL PAY FEES FOR PERMITS, AND RESPONSIBLE FOR OBTAINING SAID PERMITS AND COORDINATION OF INSPECTIONS.
5. ELECTRICAL AND TELCO WIRING OUTSIDE A BUILDING AND EXPOSED TO WEATHER SHALL BE IN WATER TIGHT GALVANIZED RIGID STEEL CONDUITS OR SCHEDULE 80 PVC (AS PERMITTED BY CODE) ND WHERE REQUIRED IN LIQUID TIGHT FLEXIBLE METAL OR NONMETALLIC CONDUITS.
6. RIGID STEEL CONDUITS SHALL BE GROUNDED AT BOTH ENDS.
7. ELECTRICAL WIRING SHALL BE COPPER WITH TYPE XHHW, THWN, OR THIN INSULATION.
8. RUN ELECTRICAL CONDUIT OR CABLING BETWEEN ELECTRICAL ROOM AND PROPOSED CELL SITE ARE PEDESTAL AS INDICATED ON THIS DRAWING. PROVIDE FULL LENGTH PULL ROPE. COORDINATE INSTALLATION WITH UTILITY COMPANY.
9. RUN TELCO CONDUIT OR CABLE BETWEEN TELEPHONE UTILITY DEMARCATION POINT AND PROPOSED CELL SITE TELECOM CABINET AND RBS CABINET AS INDICATED ON DRAWING A -1. PROVIDE FULL LENGTH PULL ROPE INSTALLED TELCO CONDUIT. PROVIDE GREENLEE CONDUIT MEASURING TAPE AT EACH END.
10. ALL EQUIPMENT LOCATED OUTSIDE SHALL HAVE NAME 3R ENCLOSURE.
11. GROUNDING SHALL COMPLY WITH NEC ART. 250.
12. GROUNDING COAX CABLE SHIELDS MINIMUM AT BOTH ENDS USING MANUFACTURES COAX CABLE GROUNDING KITS SUPPLIED BY PROJECT OWNER.
13. USE #6 COPPER STRANDED WIRE WITH GREEN COLOR INSTALLATION FOR ABOVE GRADE GROUNDING (UNLESS OTHERWISE SPECIFIED) AND #2 SOLID TINNED BARE COPPER WIRE FOR BELOW GRADE GROUNDING AS INDICATED ON THE GROUND.
14. ALL GROUND CONNECTION TO BE BURNDY HYGROUND COMPRESSION TYPE CONNECTORS OR CADWELD EXOTHERMIC WELD. DO NOT ALLOW BARE COPPER WIRE TO BE IN CONTACT WITH GALVANIZED STEEL.
15. ROUTE GROUNDING CONDUCTORS ALONG THE SHORTEST AND STRAIGHTEST PATH POSSIBLE, EXCEPT AS OTHERWISE INDICATED. GROUNDING LEADS SHOULD NEVER BE BENT AS RIGHT ANGLE. ALWAYS MAKE AT LEAST 12" RADIUS BENDS. #6 WIRE CAN BE BENT AT 6" RADIUS WHEN NECESSARY BOND ANY METER OBJECTS WITHIN 7 FEET OF PROPOSED EQUIPMENT OR CABINET TO MASTER GROUND BAR.
16. CONNECTIONS TO MGB SHALL BE ARRANGED IN THREE MAIN GROUPS: SURGE PROCEDURES (COAXIAL CABLE GROUND KITS, TELCO AND POWER PANEL GROUND); (GROUNDING ELECTRODE RING OR BUILDING STEEL); NON-SURGING OBJECTS (EGB GROUND IN RBS UNIT).
17. CONNECTIONS TO GROUND BARS SHALL BE MADE WITH TWO HOLE COMPRESSION TYPE COPPER LUGS. APPLY OXIDE INHIBITING COMPOUND TO ALL LOCATIONS.
18. APPLY OXIDE INHIBITING COMPOUND TO ALL COMPRESSION TYPE GROUND CONNECTION.
19. BOND ANTENNA MOUNTING BRACKETS, COAXIAL CABLE GROUND KITS, AND ALNA TO EGB PLACED NEAR THE ANTENNA LOCATION.
20 BOND ANTENNA EGB'S AND MGB TO WATER MAIN.
21. TEST COMPLETED GROUND SYSTEM AND RECORD RESULTS FOR PROJECT CLOSE-OUT DOCUMENTATION.
22. BOND ANY METAL OBJECTS WITHIN 7 FEET OF PROPOSED EQUIPMENT OR CABINET TO MASTER GROUND BAR.
23. VERIFY PROPOSED SERVICE UPGRADE WITH LOCAL UTILITY COMPANY PRIOR TO CONSTRUCTION.



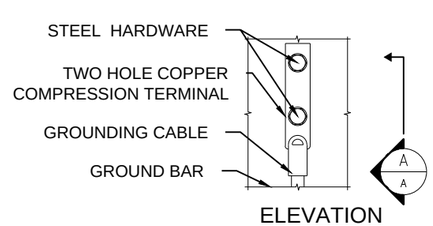
GROUNDING RISER DIAGRAM (1 / E-1)
SCALE: N.T.S



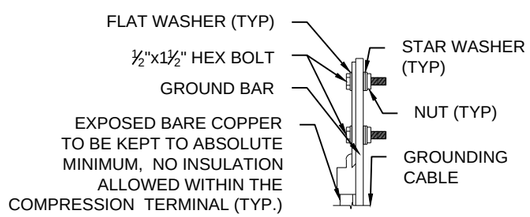
NOTES:
INSTALL CABLE GROUND KIT ABOVE HORIZONTAL BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO AGB/EGB

TOWER TOP CABLE GROUNDING DETAIL (2 / E-1)
SCALE: N.T.S

SPECIAL CONTRACTOR NOTES:
CONTRACTOR TO VERIFY THE POWER FEED & PHASE OF METER BANK AND THAT THE EXISTING AND PROPOSED CONDUITS AND WIRE SIZES ARE ADEQUATE FOR THE PROPOSED LOADING IN ACCORDANCE WITH NEC AND INCLUDE ELECTRICAL UPGRADES IN THE SCOPE OF WORK AS REQUIRED.



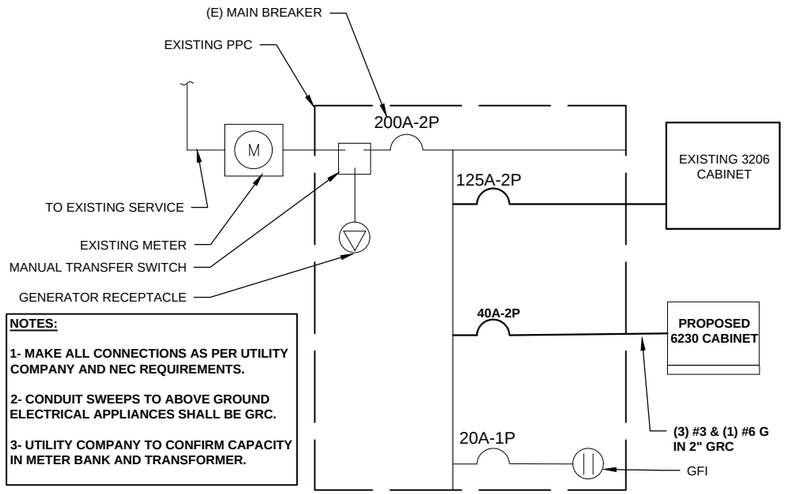
ELEVATION



SECTION A-A

NOTES:
1. "DOUBLING UP" OR "STACKING " OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.

TYPICAL GROUND BAR CONNECTIONS DETAIL (3 / E-1)
SCALE: N.T.S



NOTES:

1- MAKE ALL CONNECTIONS AS PER UTILITY COMPANY AND NEC REQUIREMENTS.

2- CONDUIT SWEEPS TO ABOVE GROUND ELECTRICAL APPLIANCES SHALL BE GRC.

3- UTILITY COMPANY TO CONFIRM CAPACITY IN METER BANK AND TRANSFORMER.

TYPICAL ONE LINE DIAGRAM (4 / E-1)
N.T.S.

APPLICANT:
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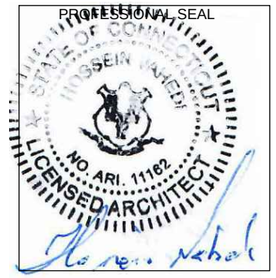

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BLOOMFIELD, CT 06002

SHEET TITLE:
E-1: GROUNDING AND ELECTRICAL DETAILS

Exhibit D

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

136-ft Existing Summit Monopole

Proposed T-Mobile
Antenna Upgrade

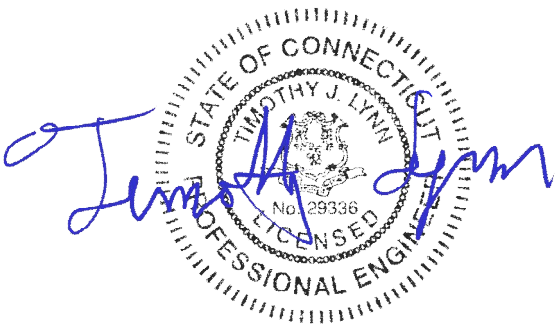
Site Ref: CTHA140A

785 Park Avenue
Bloomfield, CT

CENTEK Project No. 20114.00

Date: August 3, 2020

Max Stress Ratio = 86.0%



Prepared for:

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

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by T-Mobile on the existing monopole (tower) located in Bloomfield, CT.

The host tower is a 136-ft, three-section, eighteen sided, tapered monopole, originally manufactured by PennSummit Tubular, LLC job no; 18633 dated February 6, 2003 and designed by Paul J. Ford and Company job no; 29202-0288, dated August 20, 2002. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned design documents.

Antenna and appurtenance information were obtained from a previous structural report prepared by Centek Engineering job no. 19121.00 dated August 29, 2019 and a RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A607-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 23.00-in at the top and 43.36-in at the base.

Antenna and Appurtenance Summary

- FIRE DEPT. (EXISTING TO REMAIN):
  Antennas: One (1) RFI BA8080-67-DIN dipole antenna pipe mounted with an elevation of 143-ft above existing grade.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (EXISTING):
  Antennas: One (1) Motorola PTP400 microwave antenna pipe mounted with an elevation of 142-ft above existing grade.
  Coax Cables: One (1) Category 5e cable running on the inside of the existing tower.
- SPRINT (EXISTING):
  Antennas: Three (3) Commscope NNVV-65B panel antennas, three (3) Nokia AAHC panel antennas, six (6) 800 MHz RRUs, three (3) 1900 MHz RRUs and one (1) dish mounted on a universal tri-bracket assembly with three (3) dual standoff mounts with an elevation of 115-ft above existing grade.
  Coax Cables: Four (4) 1-5/8" fiber cables running on the exterior of the tower as specified in Section 3 of this report**.**
- VERIZON (EXISTING):
  Antennas: One (1) Antel BXA-70063-6CF panel antenna, two (2) Swedcom SLCP 2X6014 panel antennas, one (1) Antel BXA-80080-6CF panel antennas, one (1) Antel BXA-80063-4BF panel antenna, one (1) Antel BXA-80080-4CF panel antenna, six (6) Andrew SBNHH-1D65B panel antenna, three (3) RRH4x30-B13 remote radio heads, three (3) RRH2x60 remote radio heads and two (2) Raycap main distribution boxes mounted on a low profile platform with a RAD center elevation of 105-ft above existing grade.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower and two (2) 1-5/8" ∅ fiber lines running on the exterior of the existing monopole.

- EMPTY MOUNT (EXISTING):
  Mount: One (1) 13-ft low profile platform with a RAD center elevation of 95-ft above the existing grade.
- FIRE DEPT. (EXISTING TO REMAIN):
  Antennas: One (1) RFS SC1-190AB dish and one (1) RFS SC3-W100SGT1C dish mounted on a SitePro chain mount (p/n CHM2) with an elevation of 84-ft above the existing grade.
  Coax Cables: Two (2) 3/8" diameter cables running on the inside of the existing tower.
- TOWN (EXISTING):
  Antennas: Three (3) Motorola PTP400 microwave antennas on three (3) 4'-6" by 3" ∅ pipe mounts with an elevation of 80-ft above the existing grade.
  Coax Cables: Three (3) Category 5e (1 Wire) cables running on the inside of the existing tower.
- T-MOBILE (EXISTING TO REMAIN):
  Antennas: Three (3) Ericsson AIR32 panel antennas, three (3) RFS APXVAARR24_43 panel antennas, three (3) TMAs and three (3) Ericsson 4449 remote radio units mounted on one (1) 12-ft low profile platform with a RAD center elevation of 138-ft above existing grade.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower, six (6) 1-5/8" ∅ coax cables running on the exterior of the tower and two (2) 6x12 fiber cables running on the exterior of the existing tower.
- **T-MOBILE (EXISTING TO REMOVE):**
  Antennas: Three (3) Ericsson AIR21 panel antennas mounted on one (1) 12-ft low profile platform with a RAD center elevation of 138-ft above existing grade.
- **T-MOBILE (PROPOSED):**
  Antennas: Three (3) Ericsson AIR6449 panel antennas, three (3) Ericsson 4415 remote radio units and three (3) Commscope SDX1926Q-43 diplexers mounted on one (1) 12-ft low profile platform with a RAD center elevation of 138-ft above existing grade. (SitePro handrail (p/n HRK12) to be installed on platform)
  Cables: One (1) 6x12 fiber cable running on the exterior of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 1.00" radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford; v = 90-105 mph	*[Annex B of TIA-222-G-2005]*
	Bloomfield; v = 97 mph	*[Appendix N of the 2018 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2018 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

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

Tower Capacity

- Calculated stresses were found to be within allowable limits. The maximum tower steel usage was found to be at **86.0%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	88.25'-137.00'	86.0%	**PASS**
Pole Shaft (L2)	47.25'-88.25'	70.5%	**PASS**
Pole Shaft (L3)	1.00'-47.25'	71.4%	**PASS**

Foundation and Anchors

The existing foundation consists of a 6.0-ft ∅ x 45.5-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned design documents. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	31 kips
	Compression	41 kips
	Moment	3130 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	82.0%	**PASS**
	Lateral Deflection	0.36 in (1)	

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

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Shear	72.3%	**PASS**
Base Plate	Bending	67.3%	**PASS**

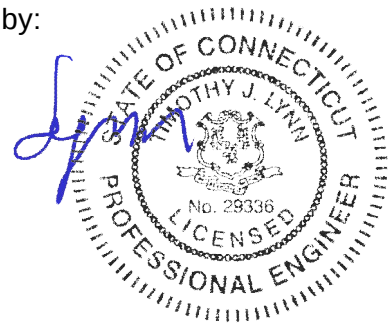
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

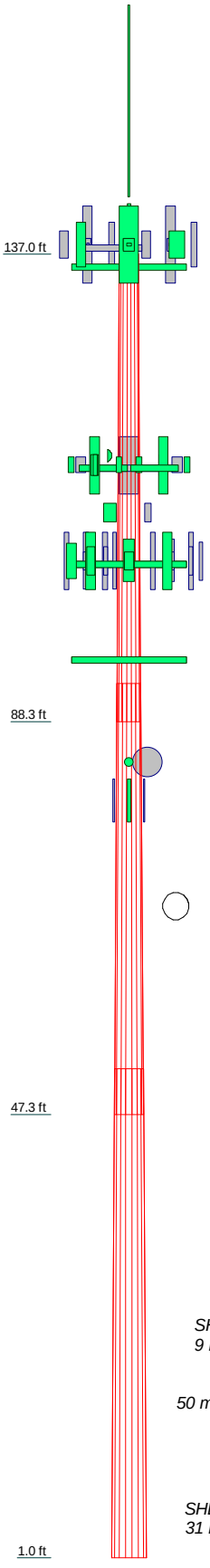
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

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

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	48.75	18	0.1875	4.00	23.0000	30.7000		2.6
2	45.00	18	0.3750	4.75	29.6932	36.8100	A607-65	6.0
3	51.00	18	0.5000		35.3088	43.3600		10.7
								19.3



ALL REACTIONS ARE FACTORED

AXIAL 97 K

SHEAR 9 K

MOMENT 946 kip-ft

TORQUE 1 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 41 K

SHEAR 31 K

MOMENT 3130 kip-ft

TORQUE 1 kip-ft
REACTIONS - 97 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
BA8080-67-DIN (FD - Proposed)	143	Dual Standoff Mount B1827 (Sprint - Existing)	115
PTP400 (Town - Existing)	142	Dual Standoff Mount B1827 (Sprint - Existing)	115
4'6"x3" Pipe Mount (Town - Existing)	140	Dual Standoff Mount B1827 (Sprint - Existing)	115
AIR6449 (T-Mobile - Proposed)	138	RRFDC-3315-PF-48 (Verizon - Existing)	110
AIR6449 (T-Mobile - Proposed)	138	RRFDC-3315-PF-48 (Verizon - Existing)	110
AIR6449 (T-Mobile - Proposed)	138	Valmont Uni-Tri Bracket (Verizon - Existing)	110
AIR32 (T-Mobile - Existing)	138	SBNHH-1D65B (Verizon - Existing)	105
AIR32 (T-Mobile - Existing)	138	SLCP 2x6014 (Verizon - Existing)	105
AIR32 (T-Mobile - Existing)	138	SBNHH-1D65B (Verizon - Existing)	105
APXVAARR24-43 (T-Mobile - Existing)	138	BXA-80063-4BF (Verizon - Existing)	105
APXVAARR24-43 (T-Mobile - Existing)	138	RRH2x60-AWS (Verizon - Existing)	105
APXVAARR24-43 (T-Mobile - Existing)	138	RRH2x60-AWS (Verizon - Existing)	105
KRY 112 TMA (T-Mobile - Existing)	138	RRH2x60-AWS (Verizon - Existing)	105
KRY 112 TMA (T-Mobile - Existing)	138	RRH4x30-B13 (Verizon - Existing)	105
KRY 112 TMA (T-Mobile - Existing)	138	RRH4x30-B13 (Verizon - Existing)	105
4449 B12,B71 (T-Mobile - Existing)	138	RRH4x30-B13 (Verizon - Existing)	105
4449 B12,B71 (T-Mobile - Existing)	138	13' Low Profile Platform (Verizon - Existing)	105
4449 B12,B71 (T-Mobile - Existing)	138	SBNHH-1D65B (Verizon - Existing)	105
4415 B25 (T-Mobile - Proposed)	138	BXA-70063/6CF (Verizon - Existing)	105
4415 B25 (T-Mobile - Proposed)	138	SBNHH-1D65B (Verizon - Existing)	105
4415 B25 (T-Mobile - Proposed)	138	BXA-80080-6CF (Verizon - Existing)	105
SDX1926Q-43 (T-Mobile - Proposed)	138	SBNHH-1D65B (Verizon - Existing)	105
SDX1926Q-43 (T-Mobile - Proposed)	138	SLCP 2x6014 (Verizon - Existing)	105
SDX1926Q-43 (T-Mobile - Proposed)	138	SBNHH-1D65B (Verizon - Existing)	105
SitePro 12' Handrail Kit HRK12 (T-Mobile - Proposed)	138	BXA-80080-4CF (Verizon - Existing)	105
Valmont 13' Low Profile Platform (T-Mobile - Existing)	136	13' Low Profile Platform (Empty)	95
		Site Pro CHM2 Chain Mount (FD)	84
VHLP1-23 (Sprint)	116	SC1-190AB (FD - Proposed)	84
NNVV-65B-R4 (Sprint - Existing)	115	SC3-W100XGT1C (FD - Proposed)	84
NNVV-65B-R4 (Sprint - Existing)	115	PTP400 (Town - Existing)	80
NNVV-65B-R4 (Sprint - Existing)	115	PTP400 (Town - Existing)	80
AAHC (Sprint - Existing)	115	PTP400 (Town - Existing)	80
AAHC (Sprint - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	80
AAHC (Sprint - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	80
(2) FD-RRH 2x50 800 (Sprint - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	80
(2) FD-RRH 2x50 800 (Sprint - Existing)	115		
(2) FD-RRH 2x50 800 (Sprint - Existing)	115		
FD-RRH 4x45 1900 (Sprint - Existing)	115		
FD-RRH 4x45 1900 (Sprint - Existing)	115		
FD-RRH 4x45 1900 (Sprint - Existing)	115		
Valmont Uni-Tri Bracket (Sprint - Existing)	115		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 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. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 86%

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

Job: **20114.00 - CTHA140A**			
Project: **136' Summit Monopole - 785 Park Ave., Bloomfield, CT**			
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 08/03/20	Scale: NTS	
Path: J:\Jobs\20114000.WI\05_Structural\Tower Analysis\Backup Documentation\ERI Files\136' Summit Monopole Bloomfield CT.eri		Dwg No. E-1	

Tower Input Data

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

Basic wind speed of 97 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56.0 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	*Elevation*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	137.00-88.25	48.75	4.00	18	23.0000	30.7000	0.1875	0.7500	A607-65 (65 ksi)
L2	88.25-47.25	45.00	4.75	18	29.6932	36.8100	0.3750	1.5000	A607-65 (65 ksi)
L3	47.25-1.00	51.00		18	35.3088	43.3600	0.5000	2.0000	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	23.3259	13.5763	892.6152	8.0984	11.6840	76.3964	1786.4050	6.7894	3.7180	19.829
	31.1447	18.1588	2135.8907	10.8319	15.5956	136.9547	4274.5918	9.0811	5.0732	27.057
L2	30.7358	34.8960	3789.5511	10.4080	15.0841	251.2274	7584.0887	17.4513	4.5660	12.176
	37.3200	43.3668	7273.3077	12.9344	18.6995	388.9578	14556.1858	21.6875	5.8186	15.516
L3	36.5378	55.2415	8456.3100	12.3571	17.9369	471.4487	16923.7470	27.6260	5.3343	10.669
	43.9518	68.0188	15785.9556	15.2153	22.0269	716.6678	31592.6828	34.0159	6.7514	13.503

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 137.00-88.25				1	1	1			
L2 88.25-47.25				1	1	1			
L3 47.25-1.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
HYBRIFLEX 1-5/8" (Verizon)	B	No	Surface Ar (CaAa)	106.00 - 4.00	2	2	0.000 0.000	0.0000		1.90
1 5/8 (T-Mobile)	A	No	Surface Ar (CaAa)	137.00 - 4.00	6	6	0.000 0.000	1.9800		1.04
HYBRIFLEX 1-5/8" (T-Mobile)	A	No	Surface Ar (CaAa)	137.00 - 4.00	3	3	0.000 0.000	1.9800		1.90
HYBRIFLEX 1-1/4" (Sprint)	C	No	Surface Ar (CaAa)	115.00 - 1.00	4	4	0.000 0.000	1.5400		1.30

Feed Line/Linear Appurtenances - Entered As Area

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

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (T-Mobile)	A	No	No	Inside Pole	137.00 - 4.00	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
1 5/8 (Verizon)	B	No	No	Inside Pole	106.00 - 4.00	12	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
CATEGORY 5e (1 WIRE) (Town)	C	No	No	Inside Pole	137.00 - 4.00	1	No Ice	0.00	0.21
							1/2" Ice	0.00	0.21
							1" Ice	0.00	0.21
CATEGORY 5e (1 WIRE) (Town)	A	No	No	Inside Pole	86.00 - 4.00	3	No Ice	0.00	0.21
							1/2" Ice	0.00	0.21
							1" Ice	0.00	0.21
1 5/8 (Town)	B	No	No	Inside Pole	137.00 - 4.00	3	No Ice	0.00	1.04
							1/2" Ice	0.00	1.04
							1" Ice	0.00	1.04
3/8 (FD)	B	No	No	Inside Pole	84.00 - 4.00	2	No Ice	0.00	0.40
							1/2" Ice	0.00	0.40
							1" Ice	0.00	0.40

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	137.00-88.25	A	0.000	0.000	86.873	0.000	1.19
		B	0.000	0.000	0.000	0.000	0.44
		C	0.000	0.000	16.478	0.000	0.15
L2	88.25-47.25	A	0.000	0.000	73.062	0.000	1.03
		B	0.000	0.000	0.000	0.000	0.82
		C	0.000	0.000	25.256	0.000	0.22
L3	47.25-1.00	A	0.000	0.000	77.072	0.000	1.08
		B	0.000	0.000	0.000	0.000	0.87
		C	0.000	0.000	28.490	0.000	0.25

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	137.00-88.25	A	2.824	0.000	0.000	177.432	0.000	4.40
		B		0.000	0.000	12.533	0.000	0.61
		C		0.000	0.000	39.485	0.000	0.84
L2	88.25-47.25	A	2.685	0.000	0.000	149.225	0.000	3.73
		B		0.000	0.000	28.949	0.000	1.22
		C		0.000	0.000	60.519	0.000	1.28
L3	47.25-1.00	A	2.426	0.000	0.000	154.405	0.000	3.76
		B		0.000	0.000	29.033	0.000	1.25
		C		0.000	0.000	66.659	0.000	1.36

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	137.00-88.25	-6.1876	-2.1562	-3.9592	-1.4940
L2	88.25-47.25	-6.4675	-1.1844	-3.4404	-0.9292
L3	47.25-1.00	-6.7030	-1.0229	-3.7328	-0.8397

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	3	HYBRIFLEX 1-5/8"	88.25 - 106.00	1.0000	1.0000
L1	7	1 5/8	88.25 - 137.00	1.0000	1.0000
L1	8	HYBRIFLEX 1-5/8"	88.25 - 137.00	1.0000	1.0000
L1	9	HYBRIFLEX 1-1/4"	88.25 - 115.00	1.0000	1.0000
L2	3	HYBRIFLEX 1-5/8"	47.25 - 88.25	1.0000	1.0000
L2	7	1 5/8	47.25 - 88.25	1.0000	1.0000
L2	8	HYBRIFLEX 1-5/8"	47.25 - 88.25	1.0000	1.0000
L2	9	HYBRIFLEX 1-1/4"	47.25 - 88.25	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
BA8080-67-DIN	C	From Face	1.00	0.0000	143.00	No Ice	6.50	6.50	0.04
(FD - Proposed)			0.00			1/2" Ice	10.90	10.90	0.09
			10.00			1" Ice	15.30	15.30	0.14
PTP400	C	From Face	1.00	0.0000	142.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00			1/2" Ice	2.24	0.65	0.02
			0.00			1" Ice	2.44	0.78	0.04
4'6"x3" Pipe Mount	C	From Face	1.00	0.0000	140.00	No Ice	1.20	1.20	0.03
(Town - Existing)			0.00			1/2" Ice	1.57	1.57	0.05
			0.00			1" Ice	1.86	1.86	0.06
NNVV-65B-R4	A	From Leg	3.00	0.0000	115.00	No Ice	14.61	9.17	0.11
(Sprint - Existing)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
NNVV-65B-R4	B	From Leg	3.00	0.0000	115.00	No Ice	14.61	9.17	0.11
(Sprint - Existing)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32

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
NNVV-65B-R4	C	From Leg	3.00	0.0000	115.00	No Ice	14.61	9.17	0.11
(Sprint - Existing)			0.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
AAHC	A	From Leg	3.00	0.0000	115.00	No Ice	4.20	2.06	0.10
(Sprint - Existing)			0.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
AAHC	B	From Leg	3.00	0.0000	115.00	No Ice	4.20	2.06	0.10
(Sprint - Existing)			0.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
AAHC	C	From Leg	3.00	0.0000	115.00	No Ice	4.20	2.06	0.10
(Sprint - Existing)			0.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
(2) FD-RRH 2x50 800	A	From Leg	3.00	0.0000	115.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
(2) FD-RRH 2x50 800	B	From Leg	3.00	0.0000	115.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
(2) FD-RRH 2x50 800	C	From Leg	3.00	0.0000	115.00	No Ice	2.06	1.93	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 4x45 1900	A	From Leg	3.00	0.0000	115.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	B	From Leg	3.00	0.0000	115.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
FD-RRH 4x45 1900	C	From Leg	3.00	0.0000	115.00	No Ice	2.32	2.38	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.52	2.59	0.08
			0.00			1" Ice	2.74	2.80	0.11
Valmont Uni-Tri Bracket	C	From Leg	1.00	0.0000	115.00	No Ice	1.75	1.75	0.29
(Sprint - Existing)			0.00			1/2" Ice	1.94	1.94	0.31
			0.00			1" Ice	2.13	2.13	0.32
Dual Standoff Mount B1827	A	From Leg	2.00	0.0000	115.00	No Ice	1.40	1.40	0.10
(Sprint - Existing)			0.00			1/2" Ice	1.75	1.75	0.13
			0.00			1" Ice	2.10	2.10	0.16
Dual Standoff Mount B1827	B	From Leg	2.00	0.0000	115.00	No Ice	1.40	1.40	0.10
(Sprint - Existing)			0.00			1/2" Ice	1.75	1.75	0.13
			0.00			1" Ice	2.10	2.10	0.16
Dual Standoff Mount B1827	C	From Leg	2.00	0.0000	115.00	No Ice	1.40	1.40	0.10
(Sprint - Existing)			0.00			1/2" Ice	1.75	1.75	0.13
			0.00			1" Ice	2.10	2.10	0.16
SBNHH-1D65B	A	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15
BXA-70063/6CF	A	From Face	4.00	0.0000	105.00	No Ice	7.57	4.16	0.01
(Verizon - Existing)			0.00			1/2" Ice	8.02	4.60	0.05
			0.00			1" Ice	8.47	5.04	0.10
SBNHH-1D65B	A	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15
BXA-80080-6CF	A	From Face	4.00	0.0000	105.00	No Ice	5.77	4.56	0.02
(Verizon - Existing)			6.00			1/2" Ice	6.22	5.00	0.05
			0.00			1" Ice	6.68	5.45	0.10
SBNHH-1D65B	B	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15

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
SLCP 2x6014	B	From Face	4.00	0.0000	105.00	No Ice	6.48	5.28	0.02
(Verizon - Existing)			0.00			1/2" Ice	6.84	5.62	0.07
			0.00			1" Ice	7.21	5.98	0.13
SBNHH-1D65B	B	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15
BXA-80080-4CF	B	From Face	4.00	0.0000	105.00	No Ice	3.57	2.79	0.01
(Verizon - Existing)			6.00			1/2" Ice	3.87	3.10	0.04
			0.00			1" Ice	4.18	3.41	0.07
SBNHH-1D65B	C	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15
SLCP 2x6014	C	From Face	4.00	0.0000	105.00	No Ice	6.48	5.28	0.02
(Verizon - Existing)			0.00			1/2" Ice	6.84	5.62	0.07
			0.00			1" Ice	7.21	5.98	0.13
SBNHH-1D65B	C	From Face	4.00	0.0000	105.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00			1/2" Ice	8.53	5.79	0.09
			0.00			1" Ice	9.00	6.26	0.15
BXA-80063-4BF	C	From Face	4.00	0.0000	105.00	No Ice	4.39	2.38	0.01
(Verizon - Existing)			6.00			1/2" Ice	4.69	2.66	0.04
			0.00			1" Ice	5.00	2.96	0.07
RRH2x60-AWS	A	From Face	4.00	0.0000	105.00	No Ice	3.36	2.03	0.06
(Verizon - Existing)			4.00			1/2" Ice	3.61	2.26	0.08
			0.00			1" Ice	3.88	2.50	0.11
RRH2x60-AWS	B	From Face	4.00	0.0000	105.00	No Ice	3.36	2.03	0.06
(Verizon - Existing)			4.00			1/2" Ice	3.61	2.26	0.08
			0.00			1" Ice	3.88	2.50	0.11
RRH2x60-AWS	C	From Face	4.00	0.0000	105.00	No Ice	3.36	2.03	0.06
(Verizon - Existing)			4.00			1/2" Ice	3.61	2.26	0.08
			0.00			1" Ice	3.88	2.50	0.11
RRH4x30-B13	A	From Face	4.00	0.0000	105.00	No Ice	2.16	1.62	0.06
(Verizon - Existing)			0.00			1/2" Ice	2.35	1.79	0.08
			0.00			1" Ice	2.55	1.97	0.10
RRH4x30-B13	B	From Face	4.00	0.0000	105.00	No Ice	2.16	1.62	0.06
(Verizon - Existing)			0.00			1/2" Ice	2.35	1.79	0.08
			0.00			1" Ice	2.55	1.97	0.10
RRH4x30-B13	C	From Face	4.00	0.0000	105.00	No Ice	2.16	1.62	0.06
(Verizon - Existing)			0.00			1/2" Ice	2.35	1.79	0.08
			0.00			1" Ice	2.55	1.97	0.10
RRFDC-3315-PF-48	C	From Face	0.00	0.0000	110.00	No Ice	3.01	1.96	0.03
(Verizon - Existing)			2.00			1/2" Ice	3.23	2.15	0.05
			0.00			1" Ice	3.46	2.35	0.08
RRFDC-3315-PF-48	B	From Face	0.00	0.0000	110.00	No Ice	3.01	1.96	0.03
(Verizon - Existing)			2.00			1/2" Ice	3.23	2.15	0.05
			0.00			1" Ice	3.46	2.35	0.08
Valmont Uni-Tri Bracket	C	From Face	0.00	0.0000	110.00	No Ice	1.75	1.75	0.29
(Verizon - Existing)			0.00			1/2" Ice	1.94	1.94	0.31
			0.00			1" Ice	2.13	2.13	0.32
13' Low Profile Platform	C	None		0.0000	105.00	No Ice	15.70	15.70	1.30
(Verizon - Existing)						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
13' Low Profile Platform	C	None		0.0000	95.00	No Ice	15.70	15.70	1.30
(Empty)						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
PTP400	A	From Face	1.00	0.0000	80.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00			1/2" Ice	2.24	0.65	0.02
			0.00			1" Ice	2.44	0.78	0.04

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
PTP400	B	From Face	1.00	0.0000	80.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00			1/2" Ice	2.24	0.65	0.02
			0.00			1" Ice	2.44	0.78	0.04
PTP400	C	From Face	1.00	0.0000	80.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00			1/2" Ice	2.24	0.65	0.02
			0.00			1" Ice	2.44	0.78	0.04
4'6"x3" Pipe Mount	A	From Face	0.50	0.0000	80.00	No Ice	1.26	1.26	0.03
(Town - Existing)			0.00			1/2" Ice	1.57	1.57	0.05
			0.00			1" Ice	1.86	1.86	0.06
4'6"x3" Pipe Mount	B	From Face	0.50	0.0000	80.00	No Ice	1.26	1.26	0.03
(Town - Existing)			0.00			1/2" Ice	1.57	1.57	0.05
			0.00			1" Ice	1.86	1.86	0.06
4'6"x3" Pipe Mount	C	From Face	0.50	0.0000	80.00	No Ice	1.26	1.26	0.03
(Town - Existing)			0.00			1/2" Ice	1.57	1.57	0.05
			0.00			1" Ice	1.86	1.86	0.06
AIR6449	A	From Face	4.00	0.0000	138.00	No Ice	5.65	2.42	0.10
(T-Mobile - Proposed)			-5.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
AIR6449	B	From Face	4.00	0.0000	138.00	No Ice	5.65	2.42	0.10
(T-Mobile - Proposed)			-5.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
AIR6449	C	From Face	4.00	0.0000	138.00	No Ice	5.65	2.42	0.10
(T-Mobile - Proposed)			-5.00			1/2" Ice	5.96	2.64	0.14
			0.00			1" Ice	6.26	2.87	0.18
AIR32	A	From Face	4.00	0.0000	138.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR32	B	From Face	4.00	0.0000	138.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
AIR32	C	From Face	4.00	0.0000	138.00	No Ice	6.51	4.71	0.13
(T-Mobile - Existing)			5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
APXVAARR24-43	A	From Face	4.00	0.0000	138.00	No Ice	20.24	8.89	0.15
(T-Mobile - Existing)			0.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
APXVAARR24-43	B	From Face	4.00	0.0000	138.00	No Ice	20.24	8.89	0.15
(T-Mobile - Existing)			0.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
APXVAARR24-43	C	From Face	4.00	0.0000	138.00	No Ice	20.24	8.89	0.15
(T-Mobile - Existing)			0.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
KRY 112 TMA	A	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04
KRY 112 TMA	B	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04
KRY 112 TMA	C	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00			1" Ice	1.03	0.70	0.04
4449 B12,B71	A	From Face	4.00	0.0000	138.00	No Ice	1.65	1.16	0.08
(T-Mobile - Existing)			0.00			1/2" Ice	1.81	1.29	0.10
			0.00			1" Ice	1.98	1.44	0.11
4449 B12,B71	B	From Face	4.00	0.0000	138.00	No Ice	1.65	1.16	0.08
(T-Mobile - Existing)			0.00			1/2" Ice	1.81	1.29	0.10
			0.00			1" Ice	1.98	1.44	0.11

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
4449 B12,B71	C	From Face	4.00	0.0000	138.00	No Ice	1.65	1.16	0.08
(T-Mobile - Existing)			0.00			1/2" Ice	1.81	1.29	0.10
			0.00			1" Ice	1.98	1.44	0.11
4415 B25	A	From Face	4.00	0.0000	138.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	B	From Face	4.00	0.0000	138.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
4415 B25	C	From Face	4.00	0.0000	138.00	No Ice	1.84	0.82	0.05
(T-Mobile - Proposed)			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
SDX1926Q-43	A	From Face	4.00	0.0000	138.00	No Ice	0.24	0.10	0.03
(T-Mobile - Proposed)			0.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
SDX1926Q-43	B	From Face	4.00	0.0000	138.00	No Ice	0.24	0.10	0.03
(T-Mobile - Proposed)			0.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
SDX1926Q-43	C	From Face	4.00	0.0000	138.00	No Ice	0.24	0.10	0.03
(T-Mobile - Proposed)			0.00			1/2" Ice	0.31	0.14	0.03
			0.00			1" Ice	0.38	0.19	0.04
SitePro 12' Handrail Kit	A	From Face	1.00	0.0000	138.00	No Ice	5.00	5.00	0.27
HRK12			0.00			1/2" Ice	8.00	8.00	0.35
(T-Mobile - Proposed)			0.00			1" Ice	11.00	11.00	0.44
Valmont 13' Low Profile	A	From Face	1.00	0.0000	136.00	No Ice	15.70	15.70	1.30
Platform			0.00			1/2" Ice	20.10	20.10	1.76
(T-Mobile - Existing)			0.00			1" Ice	24.50	24.50	2.23
Site Pro CHM2 Chain Mount	C	None		0.0000	84.00	No Ice	1.75	1.75	0.15
(FD)						1/2" Ice	1.94	1.94	0.23
						1" Ice	2.13	2.13	0.30

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
SC1-190AB	C	Paraboloid w/o	From	1.00	Worst		84.00	1.00	No Ice	0.79	0.01
(FD - Proposed)		Radome	Face	0.00					1/2" Ice	0.92	0.02
				0.00					1" Ice	1.06	0.02
SC3-W100XGT1C	B	Paraboloid w/o	From	1.00	Worst		84.00	3.28	No Ice	8.45	0.05
(FD - Proposed)		Radome	Face	0.00					1/2" Ice	8.88	0.10
				0.00					1" Ice	9.32	0.14
VHLP1-23	C	Paraboloid w/o	From	1.00	Worst		116.00	1.27	No Ice	1.28	0.01
(Sprint)		Radome	Leg	0.00					1/2" Ice	1.45	0.01
				0.00					1" Ice	1.62	0.01

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	111.74	1.296	34.04	110.643	A	0.000	110.643	110.643	100.00	86.873	0.000
137.00-88.25					B	0.000	110.643		100.00	0.000	0.000
					C	0.000	110.643		100.00	16.478	0.000
L2 88.25-47.25	67.42	1.165	30.56	116.262	A	0.000	116.262	116.262	100.00	73.062	0.000
					B	0.000	116.262		100.00	0.000	0.000
					C	0.000	116.262		100.00	25.256	0.000
L3 47.25-1.00	24.45	0.941	24.47	155.110	A	0.000	155.110	155.110	100.00	77.072	0.000
					B	0.000	155.110		100.00	0.000	0.000
					C	0.000	155.110		100.00	28.490	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 137.00-88.25	111.74	1.296	7.87	2.8243	133.591	A	0.000	133.591	133.591	100.00	177.432	0.000
						B	0.000	133.591		100.00	12.533	0.000
						C	0.000	133.591		100.00	39.485	0.000
L2 88.25-47.25	67.42	1.165	7.06	2.6851	135.561	A	0.000	135.561	135.561	100.00	149.225	0.000
						B	0.000	135.561		100.00	28.949	0.000
						C	0.000	135.561		100.00	60.519	0.000
L3 47.25-1.00	24.45	0.941	5.65	2.4262	175.808	A	0.000	175.808	175.808	100.00	154.405	0.000
						B	0.000	175.808		100.00	29.033	0.000
						C	0.000	175.808		100.00	66.659	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	111.74	1.296	10.13	110.643	A	0.000	110.643	110.643	100.00	86.873	0.000
137.00-88.25					B	0.000	110.643		100.00	0.000	0.000
					C	0.000	110.643		100.00	16.478	0.000
L2 88.25-47.25	67.42	1.165	9.10	116.262	A	0.000	116.262	116.262	100.00	73.062	0.000
					B	0.000	116.262		100.00	0.000	0.000
					C	0.000	116.262		100.00	25.256	0.000
L3 47.25-1.00	24.45	0.941	7.29	155.110	A	0.000	155.110	155.110	100.00	77.072	0.000
					B	0.000	155.110		100.00	0.000	0.000
					C	0.000	155.110		100.00	28.490	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.78	2.63	A	1	0.65	34.04	1	1	110.643	2.69	55.24	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	30.56	1	1	116.262	2.54	61.96	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	24.47	1	1	155.110	2.71	58.68	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	530.60 kip-ft	7.95		

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
L1	1.78	2.63	A	1	0.65	34.04	1	1	110.643	2.69	55.24	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	30.56	1	1	116.262	2.54	61.96	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	24.47	1	1	155.110	2.71	58.68	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	530.60 kip-ft	7.95		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.78	2.63	A	1	0.65	34.04	1	1	110.643	2.69	55.24	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	30.56	1	1	116.262	2.54	61.96	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	24.47	1	1	155.110	2.71	58.68	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	6.06	19.32						OTM	530.60 kip-ft	7.95		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.78	2.63	A	1	0.739	34.04	1	1	110.643	3.06	62.76	A
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.682	30.56	1	1	116.262	2.67	65.01	A
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	24.47	1	1	155.110	2.71	58.68	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	579.51 kip-ft	8.44		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	5.86	7.68	A	1	1.2	7.87	1	1	133.591	1.39	28.45	C
137.00-88.25			B	1	1.2		1	1	133.591			
			C	1	1.2		1	1	133.591			
L2	6.23	10.92	A	1	1.2	7.06	1	1	135.561	1.26	30.82	C
88.25-47.25			B	1	1.2		1	1	135.561			
			C	1	1.2		1	1	135.561			
L3 47.25-1.00	6.38	16.53	A	1	1.2	5.65	1	1	175.808	1.31	28.37	C
			B	1	1.2		1	1	175.808			
			C	1	1.2		1	1	175.808			
Sum Weight:	18.46	35.13						OTM	268.28 kip-ft	3.96		

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 ft^2	F K	w plf	Ctrl. Face
L1	5.86	7.68	A	1	1.2	7.87	1	1	133.591	1.39	28.45	C
137.00-88.25			B	1	1.2		1	1	133.591			
			C	1	1.2		1	1	133.591			
L2	6.23	10.92	A	1	1.2	7.06	1	1	135.561	1.26	30.82	C
88.25-47.25			B	1	1.2		1	1	135.561			
			C	1	1.2		1	1	135.561			
L3 47.25-1.00	6.38	16.53	A	1	1.2	5.65	1	1	175.808	1.31	28.37	C
			B	1	1.2		1	1	175.808			
			C	1	1.2		1	1	175.808			
Sum Weight:	18.46	35.13						OTM	268.28 kip-ft	3.96		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	5.86	7.68	A	1	1.2	7.87	1	1	133.591	1.39	28.45	C
137.00-88.25			B	1	1.2		1	1	133.591			
			C	1	1.2		1	1	133.591			
L2	6.23	10.92	A	1	1.2	7.06	1	1	135.561	1.26	30.82	C
88.25-47.25			B	1	1.2		1	1	135.561			
			C	1	1.2		1	1	135.561			
L3 47.25-1.00	6.38	16.53	A	1	1.2	5.65	1	1	175.808	1.31	28.37	C
			B	1	1.2		1	1	175.808			
			C	1	1.2		1	1	175.808			
Sum Weight:	18.46	35.13						OTM	268.28 kip-ft	3.96		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	5.86	7.68	A	1	1.2	7.87	1	1	133.591	1.39	28.45	C
137.00-88.25			B	1	1.2		1	1	133.591			
			C	1	1.2		1	1	133.591			
L2	6.23	10.92	A	1	1.2	7.06	1	1	135.561	1.26	30.82	C
88.25-47.25			B	1	1.2		1	1	135.561			
			C	1	1.2		1	1	135.561			
L3 47.25-1.00	6.38	16.53	A	1	1.2	5.65	1	1	175.808	1.31	28.37	C
			B	1	1.2		1	1	175.808			
			C	1	1.2		1	1	175.808			
Sum Weight:	18.46	35.13						OTM	268.28 kip-ft	3.96		

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
L1	1.78	2.63	A	1	0.65	10.13	1	1	110.643	0.80	16.44	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	9.10	1	1	116.262	0.76	18.45	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	7.29	1	1	155.110	0.81	17.47	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	157.95 kip-ft	2.37		

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
L1	1.78	2.63	A	1	0.65	10.13	1	1	110.643	0.80	16.44	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	9.10	1	1	116.262	0.76	18.45	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	7.29	1	1	155.110	0.81	17.47	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	157.95 kip-ft	2.37		

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
L1	1.78	2.63	A	1	0.65	10.13	1	1	110.643	0.80	16.44	C
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.65	9.10	1	1	116.262	0.76	18.45	C
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3 47.25-1.00	2.21	10.70	A	1	0.65	7.29	1	1	155.110	0.81	17.47	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	157.95 kip-ft	2.37		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.78	2.63	A	1	0.739	10.13	1	1	110.643	0.91	18.68	A
137.00-88.25			B	1	0.65		1	1	110.643			
			C	1	0.65		1	1	110.643			
L2	2.07	5.99	A	1	0.682	9.10	1	1	116.262	0.79	19.35	A
88.25-47.25			B	1	0.65		1	1	116.262			
			C	1	0.65		1	1	116.262			
L3 47.25-1.00	2.21	10.70	A	1	0.65	7.29	1	1	155.110	0.81	17.47	C
			B	1	0.65		1	1	155.110			
			C	1	0.65		1	1	155.110			
Sum Weight:	6.06	19.32						OTM	172.51 kip-ft	2.51		

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	19.32					
Bracing Weight	0.00					
Total Member Self-Weight	19.32			-1.29	4.59	
Total Weight	34.48			-1.29	4.59	
Wind 0 deg - No Ice		-0.02	-19.18	-1831.88	6.62	-0.73
Wind 30 deg - No Ice		9.78	-17.02	-1627.96	-928.45	-0.96
Wind 45 deg - No Ice		13.49	-13.55	-1294.27	-1281.41	-0.98
Wind 60 deg - No Ice		16.53	-9.57	-914.82	-1571.17	-0.94
Wind 90 deg - No Ice		19.10	0.02	0.75	-1816.12	-0.66
Wind 120 deg - No Ice		16.55	9.61	915.77	-1573.21	-0.21
Wind 135 deg - No Ice		13.52	13.57	1294.58	-1284.29	0.05
Wind 150 deg - No Ice		9.57	16.62	1585.07	-907.53	0.30
Wind 180 deg - No Ice		0.02	19.18	1829.31	2.55	0.73
Wind 210 deg - No Ice		-9.78	17.02	1625.39	937.62	0.96
Wind 225 deg - No Ice		-13.49	13.55	1291.70	1290.58	0.98
Wind 240 deg - No Ice		-16.53	9.57	912.24	1580.34	0.94
Wind 270 deg - No Ice		-19.10	-0.02	-3.32	1825.29	0.66
Wind 300 deg - No Ice		-16.55	-9.61	-918.35	1582.38	0.21
Wind 315 deg - No Ice		-13.52	-13.57	-1297.15	1293.46	-0.05

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 330 deg - No Ice		-9.57	-16.62	-1587.65	916.70	-0.30
Member Ice	15.81					
Total Weight Ice	88.99			-5.95	19.47	
Wind 0 deg - Ice		-0.00	-8.52	-809.41	19.87	-0.84
Wind 30 deg - Ice		4.25	-7.38	-701.57	-380.44	-0.74
Wind 45 deg - Ice		6.01	-6.02	-573.80	-546.29	-0.61
Wind 60 deg - Ice		7.36	-4.26	-407.33	-673.59	-0.45
Wind 90 deg - Ice		8.50	0.00	-5.54	-781.04	-0.03
Wind 120 deg - Ice		7.36	4.26	396.13	-673.99	0.39
Wind 135 deg - Ice		6.01	6.03	562.47	-546.86	0.57
Wind 150 deg - Ice		4.25	7.38	690.08	-381.13	0.71
Wind 180 deg - Ice		0.00	8.52	797.52	19.07	0.84
Wind 210 deg - Ice		-4.25	7.38	689.67	419.37	0.74
Wind 225 deg - Ice		-6.01	6.02	561.91	585.23	0.61
Wind 240 deg - Ice		-7.36	4.26	395.44	712.53	0.45
Wind 270 deg - Ice		-8.50	-0.00	-6.35	819.97	0.03
Wind 300 deg - Ice		-7.36	-4.26	-408.02	712.93	-0.39
Wind 315 deg - Ice		-6.01	-6.03	-574.36	585.79	-0.57
Wind 330 deg - Ice		-4.25	-7.38	-701.97	420.07	-0.71
Total Weight	34.48			-1.29	4.59	
Wind 0 deg - Service		-0.01	-5.71	-545.68	3.68	-0.22
Wind 30 deg - Service		2.91	-5.07	-484.98	-274.68	-0.29
Wind 45 deg - Service		4.02	-4.03	-385.65	-379.75	-0.29
Wind 60 deg - Service		4.92	-2.85	-272.69	-466.00	-0.28
Wind 90 deg - Service		5.69	0.01	-0.14	-538.92	-0.20
Wind 120 deg - Service		4.93	2.86	272.25	-466.61	-0.06
Wind 135 deg - Service		4.03	4.04	385.02	-380.60	0.01
Wind 150 deg - Service		2.85	4.95	471.49	-268.45	0.09
Wind 180 deg - Service		0.01	5.71	544.20	2.47	0.22
Wind 210 deg - Service		-2.91	5.07	483.49	280.83	0.29
Wind 225 deg - Service		-4.02	4.03	384.16	385.89	0.29
Wind 240 deg - Service		-4.92	2.85	271.20	472.15	0.28
Wind 270 deg - Service		-5.69	-0.01	-1.35	545.07	0.20
Wind 300 deg - Service		-4.93	-2.86	-273.74	472.76	0.06
Wind 315 deg - Service		-4.03	-4.04	-386.50	386.75	-0.01
Wind 330 deg - Service		-2.85	-4.95	-472.98	274.60	-0.09

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	137 - 88.25	Pole	Max Tension	39	0.00	0.00	0.00
			Max. Compression	34	-48.73	15.14	4.72

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	26	-13.52	573.05	1.48
			Max. My	2	-13.50	4.72	575.03
			Max. Vy	26	-21.63	573.05	1.48
			Max. Vx	2	-21.75	4.72	575.03
			Max. Torque	19			-2.64
L2	88.25 - 47.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-68.71	19.86	6.48
			Max. Mx	26	-23.52	1566.82	3.09
			Max. My	2	-23.50	6.78	1573.53
			Max. Vy	26	-26.89	1566.82	3.09
			Max. Vx	2	-27.01	6.78	1573.53
			Max. Torque	19			-2.63
L3	47.25 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	34	-96.97	25.23	7.76
			Max. Mx	26	-41.34	3043.24	5.04
			Max. My	2	-41.34	9.27	3055.59
			Max. Vy	26	-30.62	3043.24	5.04
			Max. Vx	2	-30.73	9.27	3055.59
			Max. Torque	7			1.49

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	47	96.97	8.50	0.00
	Max. H_x	26	41.38	30.57	0.03
	Max. H_z	3	31.04	0.03	30.68
	Max. M_x	2	3055.59	0.03	30.68
	Max. M_z	10	3031.53	-30.57	-0.03
	Max. Torsion	7	1.49	-21.59	21.67
	Min. Vert	23	31.04	21.59	-21.67
	Min. H_x	10	41.38	-30.57	-0.03
	Min. H_z	19	31.04	-0.03	-30.68
	Min. M_x	18	-3052.31	-0.03	-30.68
	Min. M_z	26	-3043.24	30.57	0.03
	Min. Torsion	23	-1.44	21.59	-21.67

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	34.48	-0.00	0.00	-1.36	4.83	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	41.38	-0.03	-30.68	-3055.59	9.27	-1.02
0.9 Dead+1.6 Wind 0 deg - No Ice	31.04	-0.03	-30.68	-3021.32	7.68	-1.05
1.2 Dead+1.6 Wind 30 deg - No Ice	41.38	15.65	-27.24	-2715.08	-1550.45	-1.40
0.9 Dead+1.6 Wind 30 deg - No Ice	31.04	15.65	-27.24	-2684.61	-1534.79	-1.44
1.2 Dead+1.6 Wind 45 deg - No	41.38	21.59	-21.67	-2158.77	-2139.48	-1.46

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Ice 0.9 Dead+1.6 Wind 45 deg - No Ice	31.04	21.59	-21.67	-2134.43	-2117.28	-1.49
1.2 Dead+1.6 Wind 60 deg - No Ice	41.38	26.46	-15.31	-1525.74	-2622.90	-1.41
0.9 Dead+1.6 Wind 60 deg - No Ice	31.04	26.46	-15.31	-1508.40	-2595.35	-1.43
1.2 Dead+1.6 Wind 90 deg - No Ice	41.38	30.57	0.03	1.74	-3031.53	-1.01
0.9 Dead+1.6 Wind 90 deg - No Ice	31.04	30.57	0.03	2.14	-2999.47	-1.02
1.2 Dead+1.6 Wind 120 deg - No Ice	41.38	26.49	15.37	1528.31	-2626.28	-0.35
0.9 Dead+1.6 Wind 120 deg - No Ice	31.04	26.49	15.37	1511.78	-2598.69	-0.34
1.2 Dead+1.6 Wind 135 deg - No Ice	41.38	21.64	21.72	2160.26	-2144.26	0.03
0.9 Dead+1.6 Wind 135 deg - No Ice	31.04	21.64	21.72	2136.73	-2122.01	0.04
1.2 Dead+1.6 Wind 150 deg - No Ice	41.38	15.31	26.59	2644.87	-1515.73	0.40
0.9 Dead+1.6 Wind 150 deg - No Ice	31.04	15.31	26.59	2615.98	-1500.44	0.42
1.2 Dead+1.6 Wind 180 deg - No Ice	41.38	0.03	30.68	3052.31	2.49	1.02
0.9 Dead+1.6 Wind 180 deg - No Ice	31.04	0.03	30.68	3018.90	0.97	1.05
1.2 Dead+1.6 Wind 210 deg - No Ice	41.38	-15.65	27.24	2711.77	1562.20	1.37
0.9 Dead+1.6 Wind 210 deg - No Ice	31.04	-15.65	27.24	2682.17	1543.44	1.40
1.2 Dead+1.6 Wind 225 deg - No Ice	41.38	-21.59	21.67	2155.45	2151.22	1.41
0.9 Dead+1.6 Wind 225 deg - No Ice	31.04	-21.59	21.67	2131.98	2125.92	1.44
1.2 Dead+1.6 Wind 240 deg - No Ice	41.38	-26.46	15.31	1522.42	2634.63	1.37
0.9 Dead+1.6 Wind 240 deg - No Ice	31.04	-26.46	15.31	1505.97	2603.98	1.39
1.2 Dead+1.6 Wind 270 deg - No Ice	41.38	-30.57	-0.03	-5.04	3043.24	1.01
0.9 Dead+1.6 Wind 270 deg - No Ice	31.04	-30.57	-0.03	-4.57	3008.08	1.02
1.2 Dead+1.6 Wind 300 deg - No Ice	41.38	-26.49	-15.37	-1531.57	2638.00	0.39
0.9 Dead+1.6 Wind 300 deg - No Ice	31.04	-26.49	-15.37	-1514.19	2607.31	0.38
1.2 Dead+1.6 Wind 315 deg - No Ice	41.38	-21.64	-21.72	-2163.52	2155.99	0.02
0.9 Dead+1.6 Wind 315 deg - No Ice	31.04	-21.64	-21.72	-2139.13	2130.65	0.00
1.2 Dead+1.6 Wind 330 deg - No Ice	41.38	-15.31	-26.59	-2648.14	1527.48	-0.36
0.9 Dead+1.6 Wind 330 deg - No Ice	31.04	-15.31	-26.59	-2618.38	1509.08	-0.38
1.2 Dead+1.0 Ice+1.0 Temp	96.97	-0.00	-0.00	-7.76	25.23	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	96.97	-0.00	-8.52	-929.68	25.73	-0.73
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	96.97	4.25	-7.38	-806.02	-433.57	-0.61
1.2 Dead+1.0 Wind 45 deg+1.0	96.97	6.01	-6.02	-659.41	-623.87	-0.49

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+1.0 Temp 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	96.97	7.36	-4.26	-468.39	-769.94	-0.33
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	96.97	8.50	0.00	-7.33	-893.15	0.04
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	96.97	7.36	4.26	453.61	-770.40	0.40
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	96.97	6.01	6.03	644.49	-624.52	0.54
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	96.97	4.25	7.38	790.92	-434.36	0.65
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	96.97	0.00	8.52	914.13	24.83	0.72
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	96.97	-4.25	7.38	790.46	484.14	0.60
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	96.97	-6.01	6.02	643.84	674.44	0.48
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	96.97	-7.36	4.26	452.82	820.50	0.32
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	96.97	-8.50	-0.00	-8.24	943.69	-0.05
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	96.97	-7.36	-4.26	-469.16	820.94	-0.40
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	96.97	-6.01	-6.03	-660.04	675.07	-0.55
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	96.97	-4.25	-7.38	-806.46	484.92	-0.65
Dead+Wind 0 deg - Service	34.48	-0.01	-5.71	-566.40	5.51	-0.20
Dead+Wind 30 deg - Service	34.48	2.91	-5.07	-503.44	-283.09	-0.27
Dead+Wind 45 deg - Service	34.48	4.02	-4.03	-400.46	-392.03	-0.28
Dead+Wind 60 deg - Service	34.48	4.92	-2.85	-283.34	-481.47	-0.27
Dead+Wind 90 deg - Service	34.48	5.69	0.01	-0.74	-557.07	-0.19
Dead+Wind 120 deg - Service	34.48	4.93	2.86	281.69	-482.10	-0.07
Dead+Wind 135 deg - Service	34.48	4.03	4.04	398.61	-392.92	0.01
Dead+Wind 150 deg - Service	34.48	2.85	4.95	488.27	-276.63	0.08
Dead+Wind 180 deg - Service	34.48	0.01	5.71	563.66	4.26	0.20
Dead+Wind 210 deg - Service	34.48	-2.91	5.07	500.70	292.86	0.27
Dead+Wind 225 deg - Service	34.48	-4.02	4.03	397.72	401.80	0.27
Dead+Wind 240 deg - Service	34.48	-4.92	2.85	280.60	491.24	0.26
Dead+Wind 270 deg - Service	34.48	-5.69	-0.01	-2.00	566.84	0.19
Dead+Wind 300 deg - Service	34.48	-4.93	-2.86	-284.43	491.86	0.07
Dead+Wind 315 deg - Service	34.48	-4.03	-4.04	-401.35	402.69	-0.00
Dead+Wind 330 deg - Service	34.48	-2.85	-4.95	-491.01	286.41	-0.08

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	-34.48	0.00	0.00	34.48	0.00	0.000%
2	-0.03	-41.38	-30.68	0.03	41.38	30.68	0.000%
3	-0.03	-31.04	-30.68	0.03	31.04	30.68	0.000%
4	15.65	-41.38	-27.24	-15.65	41.38	27.24	0.000%
5	15.65	-31.04	-27.24	-15.65	31.04	27.24	0.000%
6	21.59	-41.38	-21.67	-21.59	41.38	21.67	0.000%
7	21.59	-31.04	-21.67	-21.59	31.04	21.67	0.000%
8	26.46	-41.38	-15.31	-26.46	41.38	15.31	0.000%
9	26.46	-31.04	-15.31	-26.46	31.04	15.31	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
10	30.57	-41.38	0.03	-30.57	41.38	-0.03	0.000%
11	30.57	-31.04	0.03	-30.57	31.04	-0.03	0.000%
12	26.49	-41.38	15.37	-26.49	41.38	-15.37	0.000%
13	26.49	-31.04	15.37	-26.49	31.04	-15.37	0.000%
14	21.64	-41.38	21.72	-21.64	41.38	-21.72	0.000%
15	21.64	-31.04	21.72	-21.64	31.04	-21.72	0.000%
16	15.31	-41.38	26.59	-15.31	41.38	-26.59	0.000%
17	15.31	-31.04	26.59	-15.31	31.04	-26.59	0.000%
18	0.03	-41.38	30.68	-0.03	41.38	-30.68	0.000%
19	0.03	-31.04	30.68	-0.03	31.04	-30.68	0.000%
20	-15.65	-41.38	27.24	15.65	41.38	-27.24	0.000%
21	-15.65	-31.04	27.24	15.65	31.04	-27.24	0.000%
22	-21.59	-41.38	21.67	21.59	41.38	-21.67	0.000%
23	-21.59	-31.04	21.67	21.59	31.04	-21.67	0.000%
24	-26.46	-41.38	15.31	26.46	41.38	-15.31	0.000%
25	-26.46	-31.04	15.31	26.46	31.04	-15.31	0.000%
26	-30.57	-41.38	-0.03	30.57	41.38	0.03	0.000%
27	-30.57	-31.04	-0.03	30.57	31.04	0.03	0.000%
28	-26.49	-41.38	-15.37	26.49	41.38	15.37	0.000%
29	-26.49	-31.04	-15.37	26.49	31.04	15.37	0.000%
30	-21.64	-41.38	-21.72	21.64	41.38	21.72	0.000%
31	-21.64	-31.04	-21.72	21.64	31.04	21.72	0.000%
32	-15.31	-41.38	-26.59	15.31	41.38	26.59	0.000%
33	-15.31	-31.04	-26.59	15.31	31.04	26.59	0.000%
34	0.00	-96.97	0.00	0.00	96.97	0.00	0.000%
35	-0.00	-96.97	-8.52	0.00	96.97	8.52	0.000%
36	4.25	-96.97	-7.38	-4.25	96.97	7.38	0.000%
37	6.01	-96.97	-6.02	-6.01	96.97	6.02	0.000%
38	7.36	-96.97	-4.26	-7.36	96.97	4.26	0.000%
39	8.50	-96.97	0.00	-8.50	96.97	-0.00	0.000%
40	7.36	-96.97	4.26	-7.36	96.97	-4.26	0.000%
41	6.01	-96.97	6.03	-6.01	96.97	-6.03	0.000%
42	4.25	-96.97	7.38	-4.25	96.97	-7.38	0.000%
43	0.00	-96.97	8.52	-0.00	96.97	-8.52	0.000%
44	-4.25	-96.97	7.38	4.25	96.97	-7.38	0.000%
45	-6.01	-96.97	6.02	6.01	96.97	-6.02	0.000%
46	-7.36	-96.97	4.26	7.36	96.97	-4.26	0.000%
47	-8.50	-96.97	-0.00	8.50	96.97	0.00	0.000%
48	-7.36	-96.97	-4.26	7.36	96.97	4.26	0.000%
49	-6.01	-96.97	-6.03	6.01	96.97	6.03	0.000%
50	-4.25	-96.97	-7.38	4.25	96.97	7.38	0.000%
51	-0.01	-34.48	-5.71	0.01	34.48	5.71	0.000%
52	2.91	-34.48	-5.07	-2.91	34.48	5.07	0.000%
53	4.02	-34.48	-4.03	-4.02	34.48	4.03	0.000%
54	4.92	-34.48	-2.85	-4.92	34.48	2.85	0.000%
55	5.69	-34.48	0.01	-5.69	34.48	-0.01	0.000%
56	4.93	-34.48	2.86	-4.93	34.48	-2.86	0.000%
57	4.03	-34.48	4.04	-4.03	34.48	-4.04	0.000%
58	2.85	-34.48	4.95	-2.85	34.48	-4.95	0.000%
59	0.01	-34.48	5.71	-0.01	34.48	-5.71	0.000%
60	-2.91	-34.48	5.07	2.91	34.48	-5.07	0.000%
61	-4.02	-34.48	4.03	4.02	34.48	-4.03	0.000%
62	-4.92	-34.48	2.85	4.92	34.48	-2.85	0.000%
63	-5.69	-34.48	-0.01	5.69	34.48	0.01	0.000%
64	-4.93	-34.48	-2.86	4.93	34.48	2.86	0.000%
65	-4.03	-34.48	-4.04	4.03	34.48	4.04	0.000%
66	-2.85	-34.48	-4.95	2.85	34.48	4.95	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00006058
3	Yes	4	0.00000001	0.00075197
4	Yes	6	0.00000001	0.00004714
5	Yes	5	0.00000001	0.00041578
6	Yes	6	0.00000001	0.00005067
7	Yes	5	0.00000001	0.00045032
8	Yes	6	0.00000001	0.00004817
9	Yes	5	0.00000001	0.00042678
10	Yes	4	0.00000001	0.00060275
11	Yes	4	0.00000001	0.00030797
12	Yes	5	0.00000001	0.00099293
13	Yes	5	0.00000001	0.00041640
14	Yes	6	0.00000001	0.00005071
15	Yes	5	0.00000001	0.00045055
16	Yes	5	0.00000001	0.00097796
17	Yes	5	0.00000001	0.00040884
18	Yes	5	0.00000001	0.00005573
19	Yes	4	0.00000001	0.00069334
20	Yes	6	0.00000001	0.00005038
21	Yes	5	0.00000001	0.00044503
22	Yes	6	0.00000001	0.00005092
23	Yes	5	0.00000001	0.00045218
24	Yes	5	0.00000001	0.00097428
25	Yes	5	0.00000001	0.00040557
26	Yes	4	0.00000001	0.00069308
27	Yes	4	0.00000001	0.00037098
28	Yes	6	0.00000001	0.00004731
29	Yes	5	0.00000001	0.00041799
30	Yes	6	0.00000001	0.00005105
31	Yes	5	0.00000001	0.00045308
32	Yes	6	0.00000001	0.00004825
33	Yes	5	0.00000001	0.00042660
34	Yes	4	0.00000001	0.00021910
35	Yes	5	0.00011435	0.00079450
36	Yes	6	0.00000001	0.00018634
37	Yes	6	0.00000001	0.00020791
38	Yes	6	0.00000001	0.00019301
39	Yes	5	0.00011388	0.00072295
40	Yes	6	0.00000001	0.00018653
41	Yes	6	0.00000001	0.00020090
42	Yes	6	0.00000001	0.00018023
43	Yes	5	0.00011415	0.00077031
44	Yes	6	0.00000001	0.00021125
45	Yes	6	0.00000001	0.00022516
46	Yes	6	0.00000001	0.00020321
47	Yes	5	0.00011453	0.00079294
48	Yes	6	0.00000001	0.00021150
49	Yes	6	0.00000001	0.00023467
50	Yes	6	0.00000001	0.00022018
51	Yes	4	0.00000001	0.00005871
52	Yes	4	0.00000001	0.00018628
53	Yes	4	0.00000001	0.00022293
54	Yes	4	0.00000001	0.00021057
55	Yes	4	0.00000001	0.00003248
56	Yes	4	0.00000001	0.00018945
57	Yes	4	0.00000001	0.00021778
58	Yes	4	0.00000001	0.00017848
59	Yes	4	0.00000001	0.00005723

60	Yes	4	0.00000001	0.00024182
61	Yes	4	0.00000001	0.00023491
62	Yes	4	0.00000001	0.00018484
63	Yes	4	0.00000001	0.00003441
64	Yes	4	0.00000001	0.00020565
65	Yes	4	0.00000001	0.00023862
66	Yes	4	0.00000001	0.00022104

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	137 - 88.25	19.941	60	1.2811	0.0058
L2	92.25 - 47.25	9.090	60	0.9309	0.0012
L3	52 - 1	2.850	60	0.5108	0.0004

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	BA8080-67-DIN	60	19.941	1.2811	0.0058	43201
142.00	PTP400	60	19.941	1.2811	0.0058	43201
140.00	4'6"x3" Pipe Mount	60	19.941	1.2811	0.0058	43201
138.00	AIR6449	60	19.941	1.2811	0.0058	43201
136.00	Valmont 13' Low Profile Platform	60	19.680	1.2736	0.0057	43201
116.00	VHLP1-23	60	14.550	1.1275	0.0032	10285
115.00	NNVV-65B-R4	60	14.302	1.1200	0.0030	9818
110.00	RRFDC-3315-PF-48	60	13.081	1.0816	0.0025	7999
105.00	SBNHH-1D65B	60	11.896	1.0417	0.0021	6749
95.00	13' Low Profile Platform	60	9.665	0.9560	0.0014	5150
84.00	SC1-190AB	60	7.473	0.8510	0.0009	4758
80.00	PTP400	60	6.751	0.8103	0.0008	4725

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	137 - 88.25	107.224	20	6.8721	0.0313
L2	92.25 - 47.25	48.993	20	5.0203	0.0066
L3	52 - 1	15.374	20	2.7571	0.0022

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	BA8080-67-DIN	20	107.224	6.8721	0.0316	8449
142.00	PTP400	20	107.224	6.8721	0.0316	8449
140.00	4'6"x3" Pipe Mount	20	107.224	6.8721	0.0316	8449
138.00	AIR6449	20	107.224	6.8721	0.0316	8449
136.00	Valmont 13' Low Profile Platform	20	105.826	6.8350	0.0309	8449
116.00	VHLP1-23	20	78.314	6.0728	0.0171	2008
115.00	NNVV-65B-R4	20	76.983	6.0327	0.0164	1917
110.00	RRFDC-3315-PF-48	20	70.430	5.8279	0.0138	1560
105.00	SBNHH-1D65B	20	64.072	5.6145	0.0114	1315
95.00	13' Low Profile Platform	20	52.088	5.1554	0.0074	1001
84.00	SC1-190AB	20	40.299	4.5911	0.0048	910
80.00	PTP400	20	36.409	4.3722	0.0042	898

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	137 - 88.25 (1)	TP30.7x23x0.1875	48.75	0.00	0.0	17.7828	-13.42	1124.71	0.012
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	45.00	0.00	0.0	42.4726	-23.44	3155.50	0.007
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	51.00	0.00	0.0	68.0188	-41.34	5053.46	0.008

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	137 - 88.25 (1)	TP30.7x23x0.1875	585.83	692.16	0.846	0.00	692.16	0.000
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	1609.55	2309.36	0.697	0.00	2309.36	0.000
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	3129.56	4437.07	0.705	0.00	4437.07	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	137 - 88.25 (1)	TP30.7x23x0.1875	22.25	562.35	0.040	2.37	1387.33	0.002
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	27.74	1577.75	0.018	1.37	4631.69	0.000
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	31.46	2526.73	0.012	1.37	8900.58	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	137 - 88.25 (1)	0.012	0.846	0.000	0.040	0.002	0.860 ✔	1.000	4.8.2 ✔
L2	88.25 - 47.25 (2)	0.007	0.697	0.000	0.018	0.000	0.705 ✔	1.000	4.8.2 ✔
L3	47.25 - 1 (3)	0.008	0.705	0.000	0.012	0.000	0.714 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	137 - 88.25	Pole	TP30.7x23x0.1875	1	-13.42	1124.71	86.0	Pass
L2	88.25 - 47.25	Pole	TP36.81x29.6932x0.375	2	-23.44	3155.50	70.5	Pass
L3	47.25 - 1	Pole	TP43.36x35.3088x0.5	3	-41.34	5053.46	71.4	Pass
							Summary	
						Pole (L1)	86.0	Pass
						RATING =	**86.0**	**Pass**

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

Subject:	Anchor Bolt and Baseplate Analysis
Location:	136-ft Summit Monopole Bloomfield, CT
Rev. 0: 8/3/20	Prepared by: T.J.L. Checked by: C.F.C. Job No. 20114.00

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 3130·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 31·kips	(Input From tnxTower)
Axial Force =	Axial := 41·kips	(Input From tnxTower)

Anchor Bolt Data:

Use AST MA615 Grade 75

Number of Anchor Bolts =	N := 16	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)
Top of Concrete to Bot Leveling Nut =	l_{ar} := 2·in	(User Input)

Base Plate Data:

Use AST MA572 Gr. 55

Plate Yield Strength =	Fy_{bp} := 55·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 3.0·in	(User Input)
η := 0.5	For Ungrouted Base Plate per TIA-222-G Section 4.9.9	

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 24.875in$ (User Input)

$d_2 := 23.375in$ (User Input)

$d_3 := 8.875in$ (User Input)

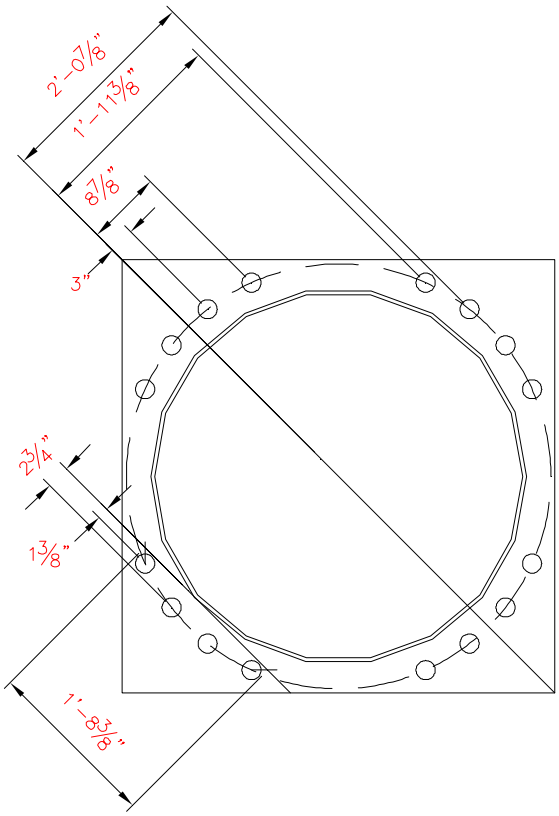
$d_4 := 3.0in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.75in$ (User Input)

$ma_2 := 1.375in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 20.375in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	136-ft Summit Monopole Bloomfield, CT
Rev. 0: 8/3/20	Prepared by: T.J.L. Checked by: C.F.C. Job No. 20114.00

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[\left(d_1\right)^2 \cdot 4 + \left(d_2\right)^2 \cdot 4 + \left(d_3\right)^2 \cdot 4 + \left(d_4\right)^2 \cdot 4 \right] = 5012 \cdot in^2$

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

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

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

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

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

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $P_u := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 183.9 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 1.9 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot k$

Bolt % of Capacity = $\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 72.3$

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

Condition1 = "OK"

Design Shear Strength = $\Phi R_{nv} := 0.75 \cdot 0.45 \cdot F_u \cdot A_g = 134.193 \cdot k$

Design Flexural Strength = $\Phi R_{nm} := 0.9 \cdot F_y \cdot Z = 94.597 \cdot in \cdot k$

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

Bolt % of Capacity = $\left[\left(\frac{V_u}{\Phi R_{nv}}\right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}}\right)^2\right] \cdot 100 = 50.1$

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 188.988 \cdot kips$

$C_2 := \frac{OM \cdot d_2}{I_p} + \frac{Axial}{N} = 177.746 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{4 \cdot \left(2C_1 \cdot ma_1 + 2C_2 \cdot ma_2\right)}{B_{eff} \, t_{bp}^2} = 33.34 \cdot ksi$

Design Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 49.5 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 67.3 \cdot \%$

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

Condition3 = "Ok"

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Branford, CT 06405 F: (203) 488-8587

Subject:	CAISSON FOUNDATION
Location:	136-ft Summit Monopole Bloomfield, CT
Rev. 0: 8/3/20	Prepared by: T.J.L.. Checked by: C.F.C. Job No. 20114.00

Caisson Foundation:

Input Data:

Shear Force =	$S := 31k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 3130ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 41k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 3414ft \cdot k$	*USER INPUT--FROM LPILE*
Moment Capacity =	$Mn := 4644ft \cdot k$	*USER INPUT--FROM LPILE*
Foundation Diameter =	$d := 6.0ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 45.5ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 0.5ft$	*USER INPUT*
Number of Rebar =	$n := 20$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 3ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9Mn}{Mu} = 1.22$

Factor of Safety Required = $FS_{reqd} := 1.0$

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

FOSCheck = "OK"

==========

LPILE Plus for Windows, Version 5.0 (5.0.47)

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

==========

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\2011400.WI\05_Structural\Tower Analysis\Backup Documentation\MathCad\Foundation\
Name of input data file: Bloomfield Caisson Analysis.lpd
Name of output file: Bloomfield Caisson Analysis.lpo
Name of plot output file: Bloomfield Caisson Analysis.lpp
Name of runtime file: Bloomfield Caisson Analysis.lpr

Time and Date of Analysis

Date: August 3, 2020 Time: 13:48:09

Problem Title

20114.00 - CTHA140A

Program Options

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

Basic Program Options:

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

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

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 1000
- Deflection tolerance for convergence = 1.0000E-04 in
- Maximum allowable deflection = 1.0000E+02 in

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

Pile Structural Properties and Geometry

Pile Length = 546.00 in

Depth of ground surface below top of pile = 66.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	72.00000000	1319167.	4071.0000	3122019.
2	546.0000	72.00000000	1319167.	4071.0000	3122019.

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

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 66.000 in
Distance from top of pile to bottom of layer = 126.000 in
p-y subgrade modulus k for top of soil layer = 60.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 60.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 126.000 in
Distance from top of pile to bottom of layer = 900.000 in
p-y subgrade modulus k for top of soil layer = 60.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 60.000 lbs/in**3

(Depth of lowest layer extends 354.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 4 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	66.00	0.03300
2	126.00	0.03300
3	126.00	0.03900
4	900.00	0.03900

Shear Strength of Soils

Shear strength parameters with depth defined using 4 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	66.000	0.00000	30.00	------	------
2	126.000	0.00000	30.00	------	------
3	126.000	0.00000	22.00	------	------

4	900.000	0.00000	22.00	------	------

Notes:

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

Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 31000.000 lbs
Bending moment at pile head = 37560000.000 in-lbs
Axial load at pile head = 41000.000 lbs

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

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 12000.000 lbs
Bending moment at pile head = 14412000.000 in-lbs
Axial load at pile head = 41000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 72.0000 in

Material Properties:

Compressive Strength of Concrete	=	3.000	kip/in**2
Yield Stress of Reinforcement	=	60.	kip/in**2
Modulus of Elasticity of Reinforcement	=	29000.	kip/in**2
Number of Reinforcing Bars	=	20	
Area of Single Bar	=	1.56000	in**2
Number of Rows of Reinforcing Bars	=	11	
Area of Steel	=	31.200	in**2
Area of Shaft	=	4071.504	in**2
Percentage of Steel Reinforcement	=	0.766	percent
Cover Thickness (edge to bar center)	=	4.000	in

Unfactored Axial Squash Load Capacity = 12174.78 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	32.000
2	3.120	30.434
3	3.120	25.889
4	3.120	18.809
5	3.120	9.889
6	3.120	0.000
7	3.120	-9.889
8	3.120	-18.809
9	3.120	-25.889
10	3.120	-30.434
11	1.560	-32.000

Axial Thrust Force = 41000.00 lbs

Bending	Bending	Bending	Maximum	Neutral Axis	Max. Concrete	Max. Steel

Moment	Stiffness	Curvature	Strain	Position	Stress
in-lbs	lb-in2	rad/in	in/in	inches	psi
3834376.	4.601252E+12	8.333333E-07	0.00003312	39.73992741	101.68838
863.71491					
7626560.	4.575936E+12	0.00000167	0.00006326	37.95468771	192.30589
1641.14324					
11373791.	4.549517E+12	0.00000250	0.00009336	37.34311831	281.09218
2417.37608					
15078761.	4.523628E+12	0.00000333	0.00012354	37.06224167	368.41634
3196.01670					
15078761.	3.618903E+12	0.00000417	0.00008511	20.42728007	253.54704
5748.37033					
15078761.	3.015752E+12	0.00000500	0.00010013	20.02647007	296.73454
6956.16184					
15078761.	2.584930E+12	0.00000583	0.00011499	19.71306574	339.04831
8168.53971					
15078761.	2.261814E+12	0.00000667	0.00012987	19.48118770	381.02248
9380.30371					
15078761.	2.010501E+12	0.00000750	0.00014478	19.30368125	422.65574
10591.44933					
15078761.	1.809451E+12	0.00000833	0.00016000	19.19999993	464.79518
11793.33335					
15078761.	1.644956E+12	0.00000917	0.00017495	19.08565629	505.75027
13003.06304					
15078761.	1.507876E+12	0.00001000	0.00018988	18.98816550	546.23762
14213.43201					
15078761.	1.391886E+12	0.00001083	0.00020483	18.90783441	586.38471
15423.12202					
15078761.	1.292465E+12	0.00001167	0.00021981	18.84099805	626.18997
16632.12899					
15078761.	1.206301E+12	0.00001250	0.00023481	18.78497636	665.65204
17840.44607					
15078761.	1.130907E+12	0.00001333	0.00024984	18.73775661	704.76944
19048.06744					
15078761.	1.064383E+12	0.00001417	0.00026489	18.69779813	743.54061
20254.98793					
15078761.	1.005251E+12	0.00001500	0.00027996	18.66390574	781.96410
21461.20100					
15842193.	1.000560E+12	0.00001583	0.00029506	18.63513529	820.03839
22666.70038					
16624341.	9.974605E+11	0.00001667	0.00031018	18.61073363	857.76203
23871.47875					
17405354.	9.945917E+11	0.00001750	0.00032533	18.59008491	895.13327
25075.53191					
18185226.	9.919214E+11	0.00001833	0.00034050	18.57269132	932.15062
26278.85245					
18963949.	9.894234E+11	0.00001917	0.00035570	18.55814087	968.81250

27481.43336
   19741516. 9.870758E+11   0.00002000   0.00037092   18.54609025   1005.11732
28683.26766
   20517915. 9.848599E+11   0.00002083   0.00038617   18.53624761   1041.06328
29884.35040
   21293140. 9.827603E+11   0.00002167   0.00040145   18.52837265   1076.64891
31084.67252
   22067181. 9.807636E+11   0.00002250   0.00041675   18.52225506   1111.87238
32284.22857
   22840031. 9.788585E+11   0.00002333   0.00043208   18.51771891   1146.73209
33483.01020
   23611680. 9.770350E+11   0.00002417   0.00044744   18.51460969   1181.22623
34681.01104
   24382117. 9.752847E+11   0.00002500   0.00046282   18.51279438   1215.35302
35878.22408
   25151338. 9.736002E+11   0.00002583   0.00047823   18.51216137   1249.11089
37074.63910
   25919326. 9.719747E+11   0.00002667   0.00049367   18.51260340   1282.49766
38270.25337
   26686079. 9.704029E+11   0.00002750   0.00050914   18.51403892   1315.51189
39465.05396
   27451583. 9.688794E+11   0.00002833   0.00052463   18.51638639   1348.15152
40659.03585
   28215828. 9.673998E+11   0.00002917   0.00054015   18.51957715   1380.41467
41852.19100
   28978802. 9.659601E+11   0.00003000   0.00055571   18.52354896   1412.29933
43044.51240
   29740503. 9.645568E+11   0.00003083   0.00057129   18.52825248   1443.80389
44235.98757
   30500914. 9.631868E+11   0.00003167   0.00058690   18.53363621   1474.92617
45426.61074
   31260023. 9.618469E+11   0.00003250   0.00060254   18.53965509   1505.66407
46616.37508
   32774306. 9.592480E+11   0.00003417   0.00063391   18.55345666   1565.97921
48993.28336
   34283262. 9.567422E+11   0.00003583   0.00066540   18.56939113   1624.73271
51366.64105
   35786798. 9.543146E+11   0.00003750   0.00069702   18.58724177   1681.90745
53736.37458
   37284825. 9.519530E+11   0.00003917   0.00072877   18.60683477   1737.48603
56102.40351
   38777240. 9.496467E+11   0.00004083   0.00076064   18.62802207   1791.45012
58464.65053
   40199921. 9.458805E+11   0.00004250   0.00079220   18.63995039   1843.02473
60000.00000
   41307938. 9.352741E+11   0.00004417   0.00082162   18.60262048   1889.36446
60000.00000
   42242185. 9.216477E+11   0.00004583   0.00084987   18.54264414   1932.33316
60000.00000
   43172962. 9.089045E+11   0.00004750   0.00087822   18.48883259   1973.99618
60000.00000

43816235.	8.911777E+11	0.00004917	0.00090430	18.39246619	2010.92013
60000.00000					
44425462.	8.739435E+11	0.00005083	0.00093018	18.29865968	2046.35364
60000.00000					
45032248.	8.577571E+11	0.00005250	0.00095614	18.21217668	2080.67972
60000.00000					
45636572.	8.425213E+11	0.00005417	0.00098217	18.13236272	2113.88945
60000.00000					
46238394.	8.281503E+11	0.00005583	0.00100827	18.05863631	2145.97326
60000.00000					
46637039.	8.110789E+11	0.00005750	0.00103500	17.99999893	2177.58022
60000.00000					
47039969.	7.950417E+11	0.00005917	0.00105931	17.90389001	2205.11140
60000.00000					
47390419.	7.790206E+11	0.00006083	0.00108265	17.79693210	2230.49356
60000.00000					
47739249.	7.638280E+11	0.00006250	0.00110604	17.69661963	2254.96868
60000.00000					
48086430.	7.493989E+11	0.00006417	0.00112949	17.60244191	2278.52956
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48431961.	7.356754E+11	0.00006583	0.00115300	17.51395047	2301.16956
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48775812.	7.226046E+11	0.00006750	0.00117657	17.43073118	2322.88120
60000.00000					
49117963.	7.101392E+11	0.00006917	0.00120021	17.35241497	2343.65720
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49458398.	6.982362E+11	0.00007083	0.00122391	17.27866709	2363.49009
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49766153.	6.864297E+11	0.00007250	0.00124720	17.20282495	2381.99979
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49944911.	6.734145E+11	0.00007417	0.00126866	17.10549080	2398.12627
60000.00000					
50122497.	6.609560E+11	0.00007583	0.00129016	17.01308119	2413.47493
60000.00000					
50298908.	6.490182E+11	0.00007750	0.00131171	16.92528713	2428.04036
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50474116.	6.375678E+11	0.00007917	0.00133331	16.84181893	2441.81670
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50787691.	6.283013E+11	0.00008083	0.00135800	16.80000007	2456.63808
60000.00000					
50854573.	6.164191E+11	0.00008250	0.00138180	16.74912822	2469.87402
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51021439.	6.061953E+11	0.00008417	0.00140291	16.66825426	2480.70673
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51187188.	5.963556E+11	0.00008583	0.00142407	16.59112036	2490.77773
60000.00000					
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60000.00000					
51515278.	5.777414E+11	0.00008917	0.00146655	16.44725740	2508.61127
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51677592.	5.689276E+11	0.00009083	0.00148786	16.38015926	2516.36190

60000.00000
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60000.00000
   52157499. 5.442522E+11   0.00009583   0.00155214   16.19627345   2534.87613
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   52315078. 5.365649E+11   0.00009750   0.00157368   16.14030755   2539.44714
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   52471438. 5.291237E+11   0.00009917   0.00159527   16.08679426   2543.20708
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   52780448. 5.149312E+11   0.00010250   0.00163863   15.98667490   2548.26673
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   52955560. 5.003675E+11   0.00010583   0.00167883   15.86292207   2549.98430
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   53612950. 4.376567E+11   0.00012250   0.00188446   15.38332593   2542.17635
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   53724587. 4.269504E+11   0.00012583   0.00192328   15.28432024   2544.73581
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   55722995.  2.998547E+11    0.00018583    0.00265623   14.29360664    2544.14597
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   55722995.  2.707190E+11    0.00020583    0.00287063   13.94636142    2538.81934
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   55767824.  2.208627E+11    0.00025250    0.00339687   13.45293796    2530.52770
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   55797381.  2.152954E+11    0.00025917    0.00347308   13.40096962    2524.87648
60000.00000
   55826124.  2.100042E+11    0.00026583    0.00354957   13.35261261    2530.03581
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55836268. 1.953455E+11 0.00028583 0.00379745 13.28555310 2547.43098
60000.00000
55838135. 1.908996E+11 0.00029250 0.00388071 13.26739562 2549.60562
60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 55722.99491 in-kip

Axial Thrust Force = 41000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
3834376.	4.601252E+12	8.333333E-07	0.00003312	39.73992741	101.68838	863.71491
7626560.	4.575936E+12	0.00000167	0.00006326	37.95468771	192.30589	1641.14324
11373791.	4.549517E+12	0.00000250	0.00009336	37.34311831	281.09218	2417.37608
15078761.	4.523628E+12	0.00000333	0.00012354	37.06224167	368.41634	3196.01670
15078761.	3.618903E+12	0.00000417	0.00008511	20.42728007	253.54704	5748.37033
15078761.	3.015752E+12	0.00000500	0.00010013	20.02647007	296.73454	6956.16184
15078761.	2.584930E+12	0.00000583	0.00011499	19.71306574	339.04831	8168.53971
15078761.	2.261814E+12	0.00000667	0.00012987	19.48118770	381.02248	9380.30371
15078761.	2.010501E+12	0.00000750	0.00014478	19.30368125	422.65574	10591.44933
15078761.	1.809451E+12	0.00000833	0.00016000	19.19999993	464.79518	11793.33335
15078761.	1.644956E+12	0.00000917	0.00017495	19.08565629	505.75027	13003.06304
15078761.	1.507876E+12	0.00001000	0.00018988	18.98816550	546.23762	14213.43201
15078761.	1.391886E+12	0.00001083	0.00020483	18.90783441	586.38471	15423.12202
15078761.	1.292465E+12	0.00001167	0.00021981	18.84099805	626.18997	

16632.12899
   15078761. 1.206301E+12   0.00001250   0.00023481   18.78497636   665.65204
17840.44607
   15078761. 1.130907E+12   0.00001333   0.00024984   18.73775661   704.76944
19048.06744
   15078761. 1.064383E+12   0.00001417   0.00026489   18.69779813   743.54061
20254.98793
   15078761. 1.005251E+12   0.00001500   0.00027996   18.66390574   781.96410
21461.20100
   15842193. 1.000560E+12   0.00001583   0.00029506   18.63513529   820.03839
22666.70038
   16624341. 9.974605E+11   0.00001667   0.00031018   18.61073363   857.76203
23871.47875
   17405354. 9.945917E+11   0.00001750   0.00032533   18.59008491   895.13327
25075.53191
   18185226. 9.919214E+11   0.00001833   0.00034050   18.57269132   932.15062
26278.85245
   18963949. 9.894234E+11   0.00001917   0.00035570   18.55814087   968.81250
27481.43336
   19741516. 9.870758E+11   0.00002000   0.00037092   18.54609025   1005.11732
28683.26766
   20517915. 9.848599E+11   0.00002083   0.00038617   18.53624761   1041.06328
29884.35040
   21293140. 9.827603E+11   0.00002167   0.00040145   18.52837265   1076.64891
31084.67252
   22067181. 9.807636E+11   0.00002250   0.00041675   18.52225506   1111.87238
32284.22857
   22840031. 9.788585E+11   0.00002333   0.00043208   18.51771891   1146.73209
33483.01020
   23611680. 9.770350E+11   0.00002417   0.00044744   18.51460969   1181.22623
34681.01104
   24382117. 9.752847E+11   0.00002500   0.00046282   18.51279438   1215.35302
35878.22408
   25151338. 9.736002E+11   0.00002583   0.00047823   18.51216137   1249.11089
37074.63910
   25919326. 9.719747E+11   0.00002667   0.00049367   18.51260340   1282.49766
38270.25337
   26686079. 9.704029E+11   0.00002750   0.00050914   18.51403892   1315.51189
39465.05396
   27451583. 9.688794E+11   0.00002833   0.00052463   18.51638639   1348.15152
40659.03585
   28215828. 9.673998E+11   0.00002917   0.00054015   18.51957715   1380.41467
41852.19100
   28978802. 9.659601E+11   0.00003000   0.00055571   18.52354896   1412.29933
43044.51240
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44235.98757
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46616.37508

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51366.64105
   35786798.  9.543146E+11    0.00003750    0.00069702   18.58724177    1681.90745
53736.37458
   37284825.  9.519530E+11    0.00003917    0.00072877   18.60683477    1737.48603
56102.40351
   38777240.  9.496467E+11    0.00004083    0.00076064   18.62802207    1791.45012
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60000.00000
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60000.00000
   43816235.  8.911777E+11    0.00004917    0.00090430   18.39246619    2010.92013
60000.00000
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   54860933.  3.376057E+11    0.00016250    0.00236162   14.53303993    2539.51691
60000.00000
   54957470.  3.314018E+11    0.00016583    0.00240238   14.48671067    2537.69845
60000.00000
   55053340.  3.254385E+11    0.00016917    0.00244325   14.44284689    2542.19233
60000.00000
   55148523.  3.197016E+11    0.00017250    0.00248423   14.40131557    2545.68335
60000.00000
   55423428.  3.152043E+11    0.00017583    0.00253200   14.40000021    2548.67933
60000.00000
   55722995.  3.110121E+11    0.00017917    0.00258000   14.40000021    2549.95439
60000.00000
   55722995.  3.053315E+11    0.00018250    0.00262066   14.35976064    2547.22826
60000.00000
   55722995.  2.998547E+11    0.00018583    0.00265623   14.29360664    2544.14597
60000.00000
   55722995.  2.945709E+11    0.00018917    0.00269185   14.23002541    2541.05567
60000.00000
   55722995.  2.894701E+11    0.00019250    0.00272751   14.16888177    2537.95742
60000.00000
   55722995.  2.845430E+11    0.00019583    0.00276322   14.11005342    2534.85113
60000.00000
   55722995.  2.797807E+11    0.00019917    0.00279897   14.05342877    2532.30932
60000.00000
   55722995.  2.751753E+11    0.00020250    0.00283478   13.99889624    2535.74460
60000.00000
   55722995.  2.707190E+11    0.00020583    0.00287063   13.94636142    2538.81934
60000.00000
   55722995.  2.664048E+11    0.00020917    0.00290658   13.89597881    2541.53917
60000.00000
   55722995.  2.622259E+11    0.00021250    0.00294387   13.85348833    2544.08574
60000.00000
   55722995.  2.581760E+11    0.00021583    0.00298122   13.81259215    2546.18500
60000.00000
   55722995.  2.542494E+11    0.00021917    0.00301863   13.77322161    2547.83158
60000.00000
   55722995.  2.504404E+11    0.00022250    0.00305611   13.73531234    2549.02001
```

```
  60000.00000
     55722995.  2.467439E+11    0.00022583    0.00309365   13.69880211    2549.74463
  60000.00000
     55722995.  2.431549E+11    0.00022917    0.00313125   13.66363513    2549.99972
  60000.00000
     55722995.  2.396688E+11    0.00023250    0.00316908   13.63046372    2547.32886
  60000.00000
     55722995.  2.329881E+11    0.00023917    0.00324487   13.56739318    2541.75349
  60000.00000
     55737956.  2.267307E+11    0.00024583    0.00332080   13.50832021    2536.15324
  60000.00000
     55767824.  2.208627E+11    0.00025250    0.00339687   13.45293796    2530.52770
  60000.00000
     55797381.  2.152954E+11    0.00025917    0.00347308   13.40096962    2524.87648
  60000.00000
     55826124.  2.100042E+11    0.00026583    0.00354957   13.35261261    2530.03581
  60000.00000
     55830228.  2.048816E+11    0.00027250    0.00363189   13.32805216    2537.59206
  60000.00000
     55833623.  2.000010E+11    0.00027917    0.00371452   13.30573833    2543.40793
  60000.00000
     55836268.  1.953455E+11    0.00028583    0.00379745   13.28555310    2547.43098
  60000.00000
     55838135.  1.908996E+11    0.00029250    0.00388071   13.26739562    2549.60562
  60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 =   55722.99491
in-kip




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

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head  =       31000.000 lbs
Specified moment at pile head       =    37560000.000 in-lbs
Specified axial load at pile head   =       41000.000 lbs

  Depth   Deflect.  Moment     Shear     Slope     Total   Flx. Rig. Soil Res.
Es*h
    X        y        M          V         S       Stress      EI        p
F/L
    in       in      lbs-in      lbs       Rad.  lbs/in**2 lbs-in**2  lbs/in
-------- --------- --------- --------- --------- --------- --------- ---------
---------
   0.000     2.458  3.76E+07    31000. -0.014217  1035.082  9.51E+11     0.000
0.000
```

```
  43.680     1.875  3.89E+07    31000. -0.012459  1072.687  9.49E+11     0.000
0.000
  87.360     1.370  4.03E+07    27470. -0.010632  1109.563  9.45E+11  -333.451
1328.676
 131.040  0.946993  4.10E+07 -1529.701 -0.008741  1128.115  9.38E+11  -743.757
4288.220
 174.720  0.606647  4.01E+07   -40467. -0.006853  1104.628  9.46E+11 -1005.706
9051.643
 218.400  0.346948  3.74E+07   -86044. -0.005062  1029.705  9.52E+11 -1047.167
16480.
 262.080  0.161810  3.27E+07 -1.28E+05 -0.003454   901.253  9.59E+11  -843.327
28457.
 305.760  0.041349  2.64E+07 -1.57E+05 -0.002113   729.524  9.71E+11  -429.342
56693.
 349.440 -0.027431  1.93E+07 -1.59E+05 -0.001093   537.708  9.88E+11   280.149
55762.
 393.120 -0.060756  1.27E+07 -1.42E+05 -0.000600   357.680  4.54E+12   491.364
44158.
 436.800 -0.084704  7.08E+06 -1.16E+05 -0.000506   203.246  4.58E+12   705.861
45500.
 480.480 -0.105652  2.77E+06   -79290. -0.000460    85.729  4.60E+12   976.173
50448.
 524.160 -0.125385  3.35E+05   -30006. -0.000447    19.215  4.60E+12  1287.933
56084.
```

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     2.45770598 in
Computed slope at pile head      =    -0.01421699
Maximum bending moment           =      40969079. lbs-in
Maximum shear force              =  -162606.45118 lbs
Depth of maximum bending moment  =      131.04000 in
Depth of maximum shear force     =      327.60000 in
Number of iterations             =             35
Number of zero deflection points =              1
```

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

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 12000.000 lbs
Specified moment at pile head = 14412000.000 in-lbs
Specified axial load at pile head = 41000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. Es*h p lbs/in	F/L
0.000	0.364473	1.44E+07	12000.	-0.002463	403.374	4.53E+12	0.000	0.000
43.680	0.259970	1.49E+07	12000.	-0.002321	417.795	4.52E+12	0.000	0.000
87.360	0.164876	1.55E+07	9991.502	-0.001905	431.838	1.00E+12	-186.939	6190.656
131.040	0.096496	1.56E+07	-3685.659	-0.001225	436.478	1.00E+12	-375.901	21269.
174.720	0.057600	1.51E+07	-22249.	-0.000611	421.321	3.67E+12	-430.959	40851.
218.400	0.034114	1.37E+07	-39438.	-0.000469	384.192	4.53E+12	-344.649	55161.
262.080	0.016378	1.17E+07	-51630.	-0.000346	329.323	4.55E+12	-208.386	69471.
305.760	0.003538	9.29E+06	-57386.	-0.000246	263.672	4.56E+12	-54.288	83780.
349.440	-0.005419	6.78E+06	-56414.	-0.000169	195.176	4.58E+12	97.347	98090.
393.120	-0.011542	4.45E+06	-49932.	-0.000115	131.443	4.59E+12	182.650	86402.
436.800	-0.015806	2.46E+06	-40561.	-8.30E-05	77.187	4.60E+12	254.353	87862.
480.480	-0.019034	9.58E+05	-27516.	-6.72E-05	36.214	4.60E+12	344.313	98768.
524.160	-0.021842	1.15E+05	-10323.	-6.27E-05	13.214	4.60E+12	445.077	1.11E+05

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.36447259 in
Computed slope at pile head	=	-0.00246284
Maximum bending moment	=	15642483. lbs-in
Maximum shear force	=	-57800.53643 lbs
Depth of maximum bending moment	=	120.12000 in
Depth of maximum shear force	=	322.14000 in
Number of iterations	=	123
Number of zero deflection points	=	1

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

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

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 31000.	M= 3.76E+07	41000.0000	2.4577	4.0969E+07	-162606.
1	V= 12000.	M= 1.44E+07	41000.0000	0.3644726	1.5642E+07	-57800.5364

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

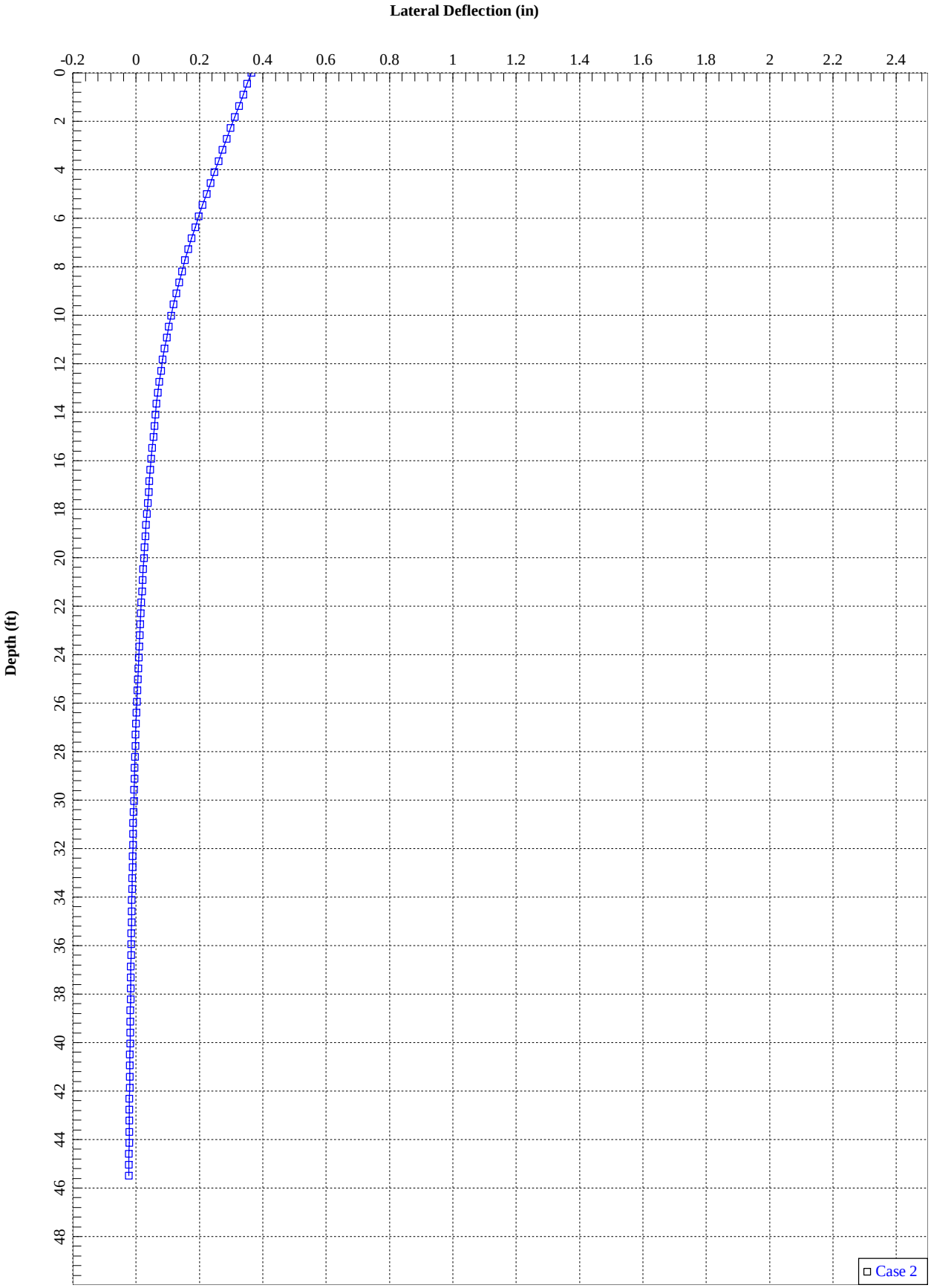
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00322352	3100.00005	529094.34981	961681.68669	1.641356E+08
0.00970376	9331.92987	1592733.	961681.68669	1.641356E+08
0.01538010	14790.75890	2524422.	961681.68669	1.641356E+08
0.01940752	18663.85973	3185465.	961681.68669	1.641356E+08
0.02253144	21668.07013	3698211.	961681.68669	1.641356E+08

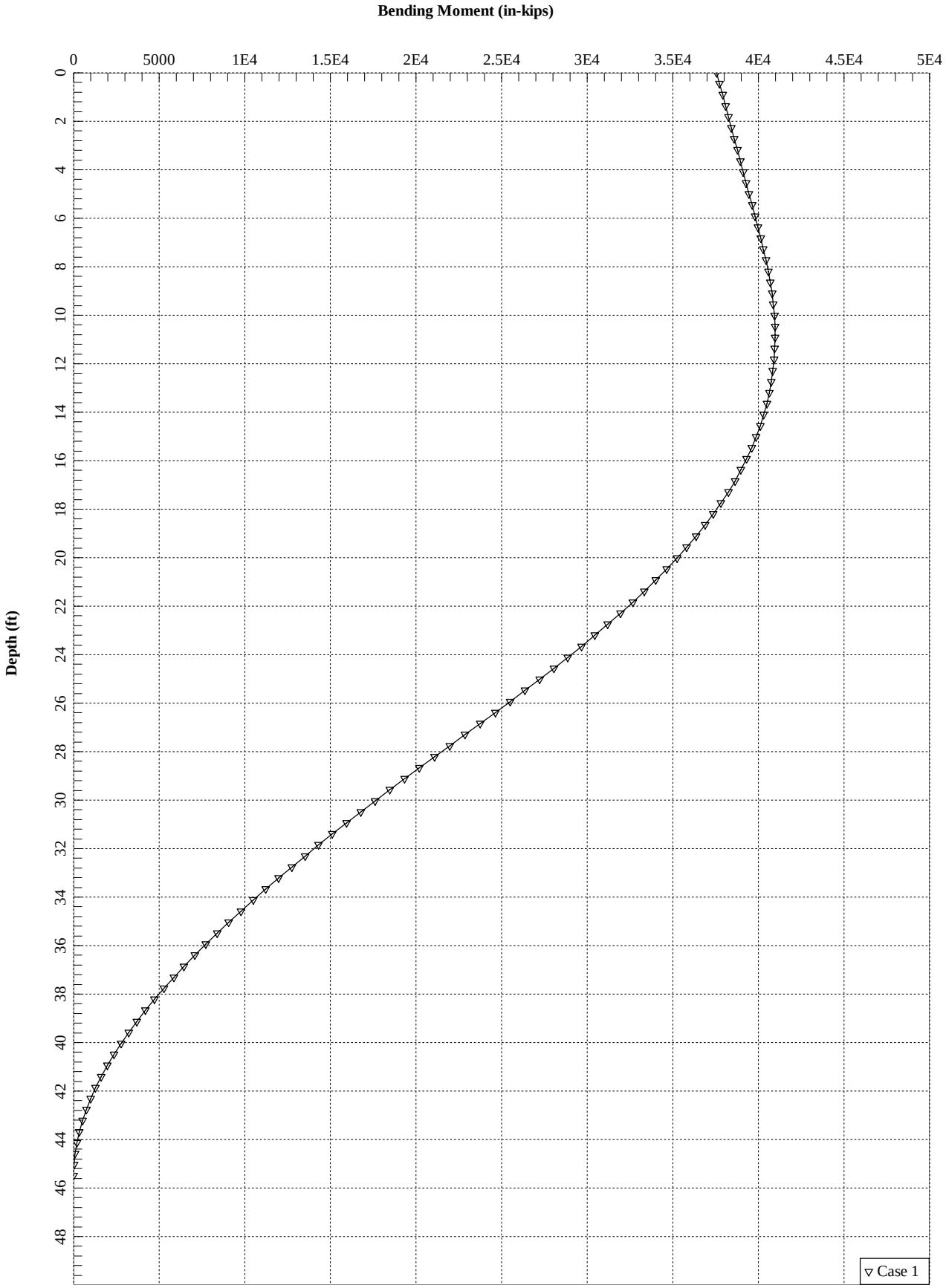
0.02508467	24122.68876	4117085.	961650.51476	1.641275E+08
0.02724511	26198.03924	4471089.	961568.45196	1.641061E+08
0.02911757	27995.78960	4777646.	961474.20785	1.640812E+08
0.03076982	29581.51779	5047985.	961380.87810	1.640563E+08
0.03224818	31000.00000	5289771.	961294.54046	1.640332E+08

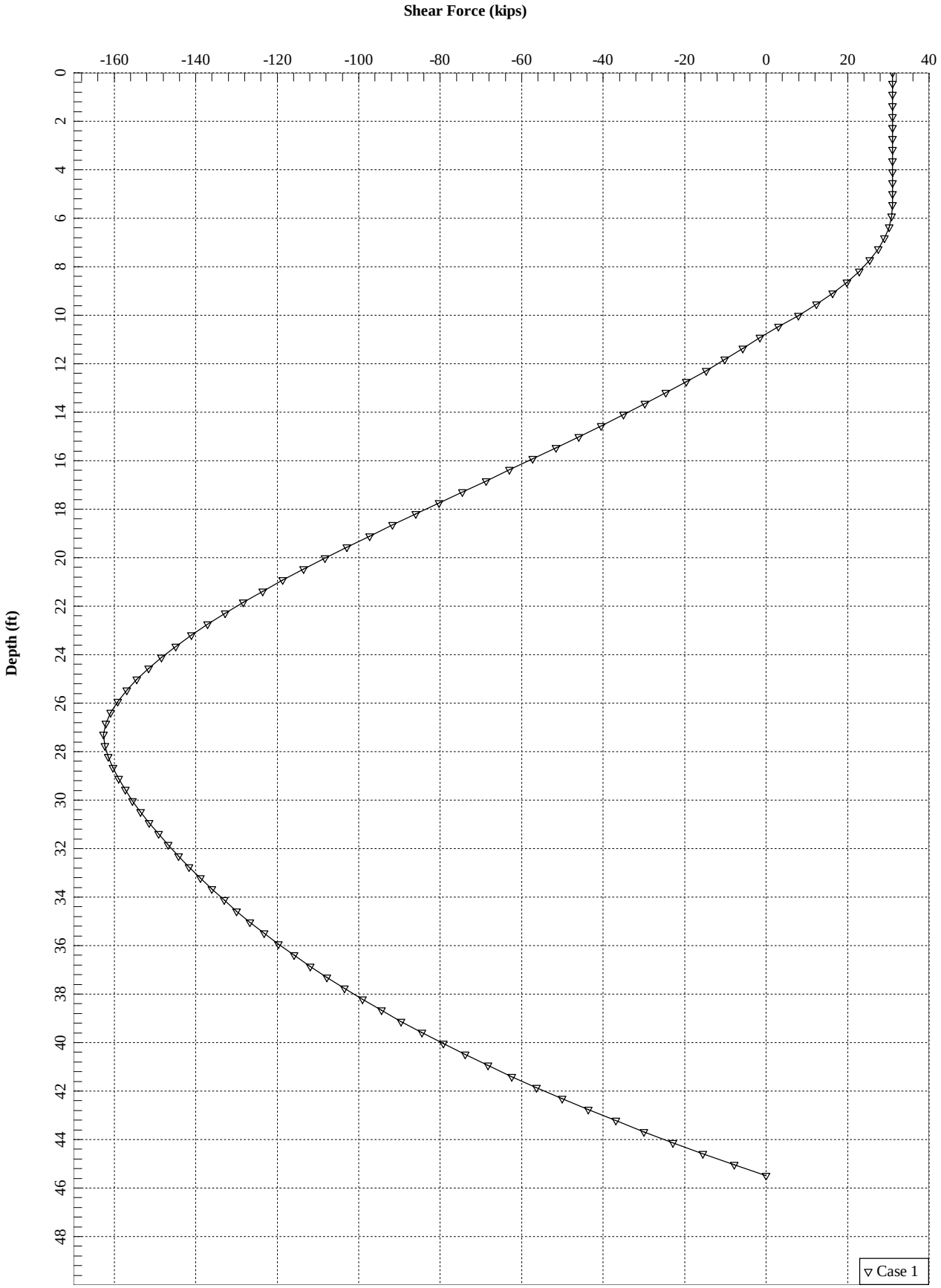
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00008939	14671.64318	3756000.	1.641356E+08	4.201938E+10
0.00027086	44186.71082	11306687.	1.631328E+08	4.174312E+10
0.00083527	72156.86570	17920674.	86387468.	2.145495E+10
0.00148668	99331.95507	22613373.	66814601.	1.521065E+10
0.00192142	120177.59323	26253313.	62546299.	1.366351E+10
0.00227320	133690.27703	29227361.	58811497.	1.285737E+10
0.00258056	145238.12677	31741882.	56281617.	1.230038E+10
0.00285666	155414.47985	33920060.	54404321.	1.187404E+10
0.00308484	163524.90031	35841349.	53009210.	1.161855E+10
0.00330013	170360.41055	37560000.	51622366.	1.138138E+10

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

The analysis ended normally.


Lateral Deflection (in)
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Case 2


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
4.5E4
5E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Case 1


Shear Force (kips)
-160
-140
-120
-100
-80
-60
-40
-20
0
20
40
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
▽ Case 1

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Section 1 - Site Information

Site ID: CTHA140A
Status: Draft
Version: 5
Project Type: Anchor
Approved: Not Approved
Approved By: Not Approved
Last Modified: 7/1/2020 10:56:29 AM
Last Modified By: Hansraj.Rana4@T-Mobile.com

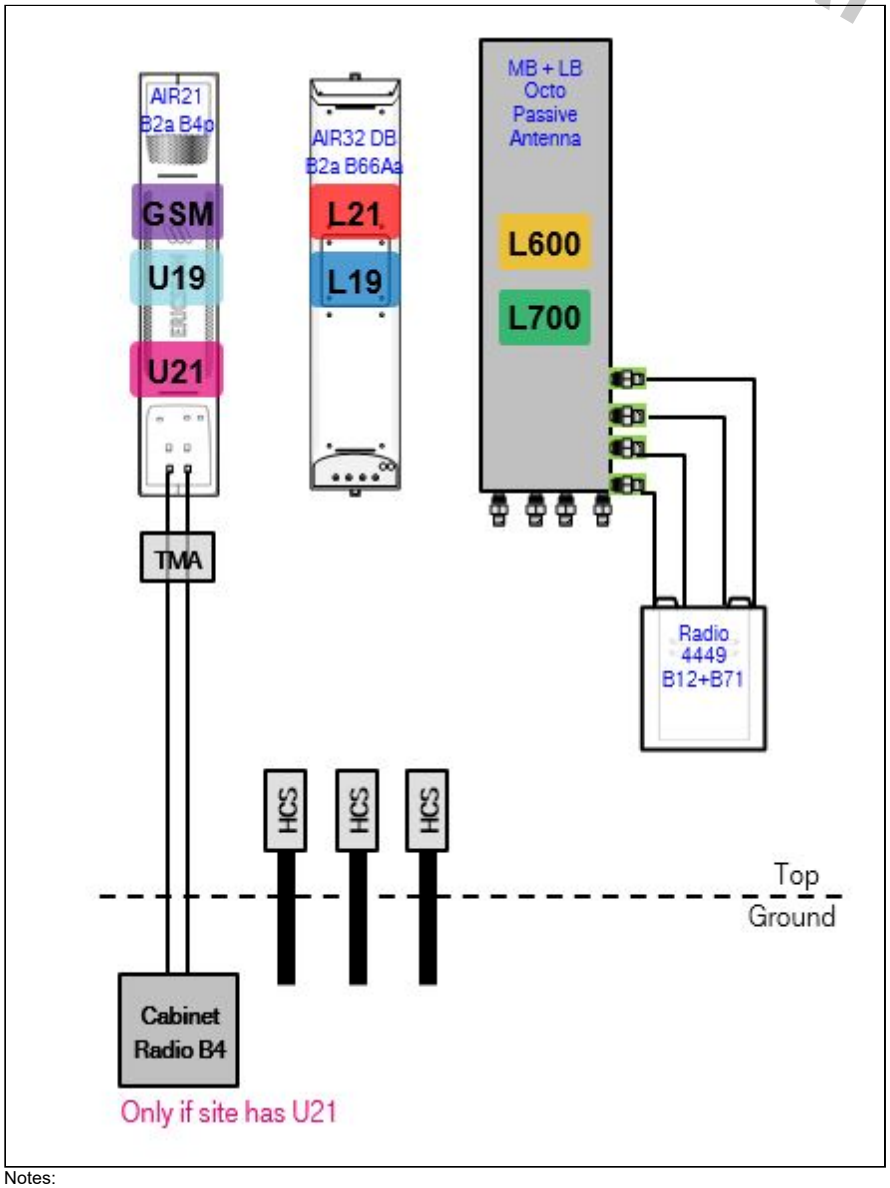
Site Name: HA140/BloomfieldPolice_MP
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2020
Market: CONNECTICUT CT
Vendor: Ericsson
Landlord: Town of Bloomfield

Latitude: 41.82879494
Longitude: -72.73446217
Address: 785 Park Avenue
City, State: Bloomfield, CT
Region: NORTHEAST

RAN Template: 67D5A997DB Indoor			AL Template: 67D5997DB_2xAIR+1OP (U21 Market)	
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 18	**TMA Count:** 3	**RRU Count:** 6

Section 2 - Existing Template Images

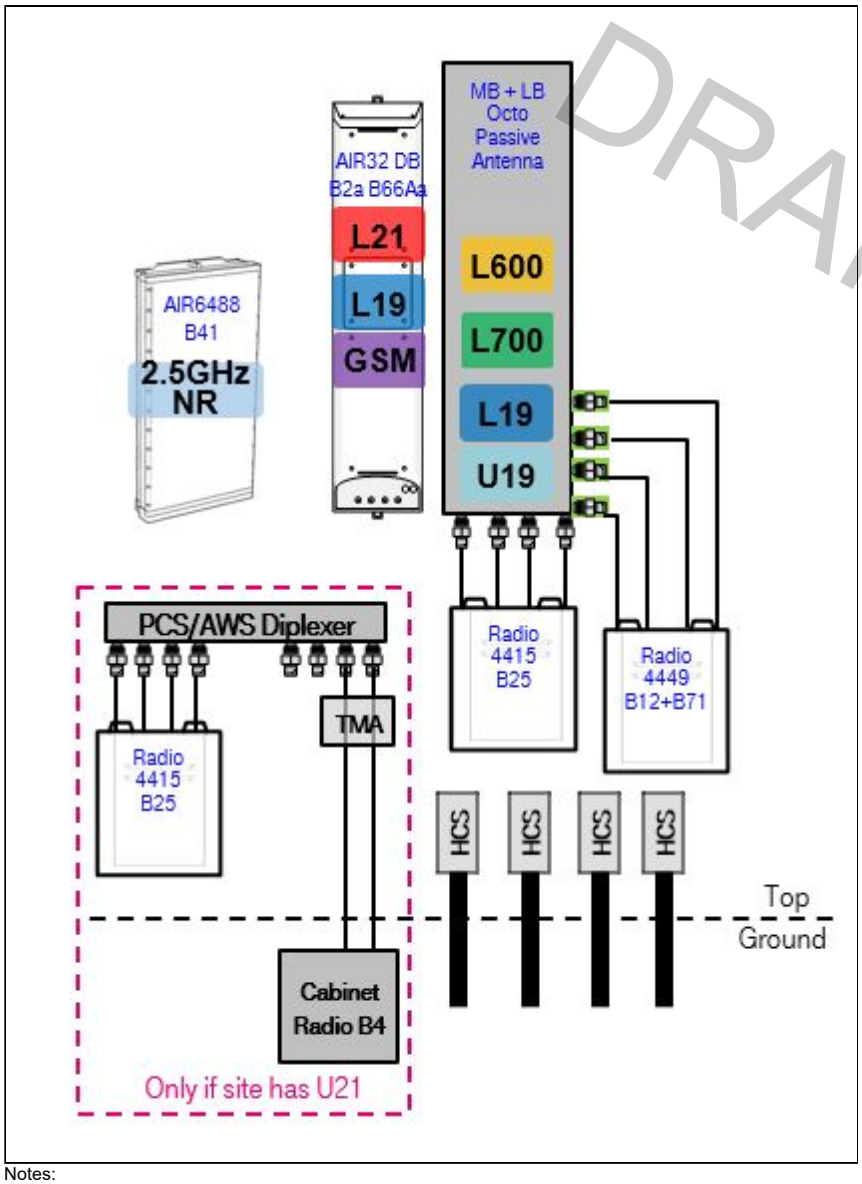
67D92DB_2xAIR+1OP.JPG



Notes:

Section 3 - Proposed Template Images

67D5997DB_2xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D92DB Indoor

Enclosure	1	2
Enclosure Type	RBS 6601	Ancillary Equipment (Ericsson)
Baseband	DUW30 DUW30 U2100 DUG20 G1900 BB 6630 L700 L600 L1900 L2100 BB 6630 N600	
Hybrid Cable System		Ericsson 9x18 HCS *Select Length* Ericsson 6x12 HCS *Select Length & AWG* Ericsson 6x12 HCS 4AWG 60m
Radio	RU22 **(x 6)** U2100	

Proposed RAN Equipment

Template: 67D5A997DB Indoor

Enclosure	1	2	3	4	5
Enclosure Type	RBS 3206	RBS 6601	Ancillary Equipment (Ericsson)	19 Inch Rack (Ericsson)	Power 6230
Baseband	DUW30 U2100	DUG20 G1900		BB 6630 L700 L600 N600 BB 6630 L2100 L1900 BB 6648 N2500 BB 6630 L2500	
Hybrid Cable System			Ericsson 6x12 HCS *Select Length & AWG* **(x 2)** Ericsson 6x12 HCS *Select AWG & Length* PSU 4813		
Radio	RU22 **(x 6)** U2100				

RAN Scope of Work:

*** Indoor cabinet site ***

Use existing (1) 19 Inch Rack.

Add (1) Power 6230 Cabinet.

Add (1) iXRe Router.

Add (1) BB6630 for L2500 to existing 19" Rack

Add (1) BB6648 for N2500 to existing 19" Rack

Add (1) PSU 4813 Power Booster

Existing: (18) 1-5/8" coax lines & (2) 6x12 HCS (*9x18 not present on site*)

Existing (6) Coax lines will be used for U2100.

Add (1) 6X12 HCS. Length of new HCS will match that of existing HCS.

Keep (12) unconnected coaxial lines.

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Section 6 - A&L Equipment

Existing Template: 67D92DB_2xAIR+1OP
Proposed Template: 67D5997DB_2xAIR+1OP (U21 Market)

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	40		40				40			
M. Tilt	0		0				0			
Height	140		140				140			
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	G1900	U2100	L700 L600 N600	L700 L600 N600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		Generic Feeder Coax **(x2)** Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B85 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	40		40				40			
M. Tilt	0		0				0			
Height	138		138				138			
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900 G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** 1-5/8" Coax - 180 ft. **(x2)**	Fiber Jumper	Fiber Jumper	Fiber Jumper	Fiber Jumper
TMAs						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)	SHARED Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)				
Radio			Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft.

Scope of Work:

Swap P1 AIR21-B2A/B4P antenna with (1) AIR6449 B41 for L2500/N2500.

Move GSM to AIR32-DB antenna with L19-C1 in Mixed mode.

Add (1) 8x4 diplexer Commscope - SDX1926Q-43 with P2 Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier to P2 Octo antenna, and connect its ports to the four PCS input ports of the diplexer.

Move U21 to P2 Octo antenna with existing (2) Coax lines and AWS TMA. Connect two coax lines/jumper from AWS TMA to the AWS input ports of the diplexer.

U21 will be diplexed with L1900 C2 using 8x4 diplexer Commscope - SDX1926Q-43 on Octo antenna as shown in diagram.

Make sure to place metal caps on the unused ports of the diplexer.

Ensure RET control is enabled for all technology layers according to the Design Documents.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	**1**		**2**				**3**			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	140		140				140			
M. Tilt	0		0				0			
Height	140		140				140			
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	G1900	U2100	L700 L600 N600	L700 L600 N600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		Generic Feeder Coax **(x2)** Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B85 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	140		140				140			
M. Tilt	0		0				0			
Height	138		138				138			
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900 G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** 1-5/8" Coax - 180 ft. **(x2)**	Fiber Jumper	Fiber Jumper	Fiber Jumper	Fiber Jumper
TMAs						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)	SHARED Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)				
Radio			Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft.

Scope of Work:

Swap P1 AIR21-B2A/B4P antenna with (1) AIR6449 B41 for L2500/N2500.

Move GSM to AIR32-DB antenna with L19-C1 in Mixed mode.

Add (1) 8x4 diplexer Commscope - SDX1926Q-43 with P2 Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier to P2 Octo antenna, and connect its ports to the four PCS input ports of the diplexer.

Move U21 to P2 Octo antenna with existing (2) Coax lines and AWS TMA. Connect two coax lines/jumper from AWS TMA to the AWS input ports of the diplexer.

U21 will be diplexed with L1900 C2 using 8x4 diplexer Commscope - SDX1926Q-43 on Octo antenna as shown in diagram.

Make sure to place metal caps on the unused ports of the diplexer.

Ensure RET control is enabled for all technology layers according to the Design Documents.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	**1**		**2**				**3**			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	230		230				230			
M. Tilt	0		0				0			
Height	140		140				140			
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	G1900	U2100	L700 L600 N600	L700 L600 N600			L2100	L2100	L1900	L1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables		Generic Feeder Coax **(x2)** Coax Jumper **(x2)**	Coax Jumper **(x2)**	Coax Jumper **(x2)**						
TMAs		Generic Twin Style 1B - AWS (AtAntenna)								
Diplexers / Combiners										
Radio			Radio 4449 B71+B85 (At Antenna)							
Sector Equipment										

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro									
Antenna	1		2				3			
Antenna Model	Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)		RFS - APXVAARR24_43-U-NA20 (Octo)				Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			
Azimuth	230		230				230			
M. Tilt	0		0				0			
Height	138		138				138			
Ports	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
Active Tech.	L2500 N2500	L2500 N2500	L700 L600 N600	L700 L600 N600	L1900	L1900 U2100	L2100	L2100	L1900 G1900	L1900 G1900
Dark Tech.										
Restricted Tech.										
Decomm. Tech.										
E. Tilt										
Cables	Fiber Jumper	Fiber Jumper	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)**	Coax Jumper **(x2)** Fiber Jumper	Coax Jumper **(x2)** 1-5/8" Coax - 180 ft. **(x2)**	Fiber Jumper	Fiber Jumper	Fiber Jumper	Fiber Jumper
TMAs						Generic Twin Style 1B - AWS (AtAntenna)				
Diplexers / Combiners					Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)	SHARED Commscope - SDX1926Q-43 (E14F05P86) (AtAntenna)				
Radio			Radio 4449 B71+B85 (At Antenna)	SHARED Radio 4449 B71+B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)				
Sector Equipment										

Unconnected Equipment:

Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft. | Cable: 1-5/8" Coax - 180 ft.

Scope of Work:

Swap P1 AIR21-B2A/B4P antenna with (1) AIR6449 B41 for L2500/N2500.

Move GSM to AIR32-DB antenna with L19-C1 in Mixed mode.

Add (1) 8x4 diplexer Commscope - SDX1926Q-43 with P2 Octo antenna.

Add (1) Radio 4415 B25 for L1900 2nd Carrier to P2 Octo antenna, and connect its ports to the four PCS input ports of the diplexer.

Move U21 to P2 Octo antenna with existing (2) Coax lines and AWS TMA. Connect two coax lines/jumper from AWS TMA to the AWS input ports of the diplexer.

U21 will be diplexed with L1900 C2 using 8x4 diplexer Commscope - SDX1926Q-43 on Octo antenna as shown in diagram.

Make sure to place metal caps on the unused ports of the diplexer.

Ensure RET control is enabled for all technology layers according to the Design Documents.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:	A&L Template:
67D5A997DB Indoor	67D5997DB_2xAIR+1OP (U21 Market)

CTHA140A_Anchor_5_draft

Print Name: Standard
PORs: Anchor_Phase 3

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

----- This section is intentionally blank. -----

Proposed Power Systems Equipment

Exhibit E

CENTEK engineering

Centered on Solutions℠

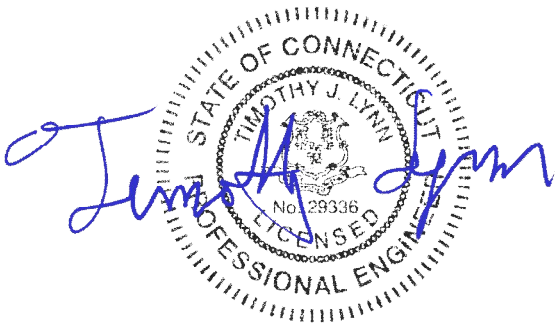
Structural Analysis Report

Antenna Mount Analysis

T-Mobile Site #: CTHA140A

785 Park Ave
Bloomfield, CT

Centek Project No. 20114.00



Date: August 3, 2020

Max Stress Ratio = 90.3%

Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

CENTEK engineering

Centered on Solutions℠

August 3, 2020

Mr. Sheldon Freincle
Northeast Site Solutions
420 Main Street
Sturbridge, MA 01566

Re: Structural Letter ~ Antenna Mount
T-Mobile – Site Ref: CTHA140A
785 Park Avenue
Bloomfield, CT 06002

Centek Project No. 20114.00

Dear Mr. Freincle,

Centek Engineering, Inc. has reviewed the T-Mobile antenna installation at the above referenced site. The purpose of the review is to determine the structural adequacy of the existing mount, consisting of one (1) low profile platform to support the equipment configuration. The review considered the effects of wind load, dead load and ice load in accordance with the 2015 International Building Code as modified by the 2018 Connecticut State Building Code including ASCE 7-10 and ANSI/TIA-222-G *Structural Standards for Steel Antenna Towers and Supporting Structures*.

The loads considered in this analysis consist of the following:

- T-Mobile:
  Platform: Three (3) Ericsson AIR32 panel antennas, three (3) Ericsson AIR6449 panel antennas, three (3) RFS APXVAARR24-43-NA20 panel antennas, three (3) KRY112 TMAs, three (3) Ericsson 4449 remote radio units, three (3) Ericsson 4415 remote radio units and three (3) Commscope SDX1926Q-43 diplexers mounted on one (1) low profile platform with a RAD center elevation of 138-ft +/- AGL.

The antenna mount was analyzed per the requirements of the 2015 International Building Code as modified by the 2018 Connecticut State Building Code considering a nominal design wind speed of 97 mph for Bloomfield as required in Appendix N of the 2018 Connecticut State Building Code.

A structural analysis of tower and foundation needs to be completed prior to any work.

Based on our review of the equipment upgrade, it is our opinion that the existing antenna platform with the installation of one (1) SitePro handrail (p/n HRK12), is structurally adequate to support the proposed antenna configuration. If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

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

Section 2 - Calculations

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

Subject: TIA-222-G Loads

Location: Bloomfield, CT

Rev. 0: 8/3/20

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 20114.00

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

Wind Speeds

Basic Wind Speed $V := 97$ mph (User Input - 2016 CSBC Appendix N)

Basic Wind Speed with Ice $V_i := 50$ mph (User Input per Annex B of TIA-222-G)

Input

Structure Type = Structure_Type := Pole (User Input)

Structure Category = $SC := II$ (User Input)

Exposure Category = $Exp := C$ (User Input)

Structure Height = $h := 136$ ft (User Input)

Height to Center of Antennas = $z_{Ant} := 138$ ft (User Input)

Radial Ice Thickness = $t_i := 1.00$ in (User Input per Annex B of TIA-222-G)

Radial Ice Density = $Id := 56.00$ pcf (User Input)

Topograpic Factor = $K_{zt} := 1.0$ (User Input)

$K_a := 1.0$ (User Input)

Gust Response Factor = $G_H = 1.1$ (User Input)

Output

Wind Direction Probability Factor =

$$K_d := \begin{cases} 0.95 & \text{if Structure\_Type = Pole} \\ 0.85 & \text{if Structure\_Type = Lattice} \end{cases} = 0.95$$

(Per Table 2-2 of TIA-222-G)

Importance Factors =

$$I_{Wind} := \begin{cases} 0.87 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.15 & \text{if } SC = 3 \end{cases} = 1$$

(Per Table 2-3 of TIA-222-G)

$$I_{Wind\_w\_Ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.00 & \text{if } SC = 3 \end{cases} = 1$$

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

$$K_{iz} := \left(\frac{z_{Ant}}{33}\right)^{0.1} = 1.154$$

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.308$$

Velocity Pressure Coefficient Antennas =

$$Kz_{Ant} := 2.01\left(\left(\frac{z_{Ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.354$$

Velocity Pressure w/o Ice Antennas =

$$qz_{Ant} := 0.00256 \cdot K_d \cdot Kz_{Ant} \cdot V^2 \cdot I_{Wind} = 30.993$$

Velocity Pressure with Ice Antennas =

$$qz_{ice.Ant} := 0.00256 \cdot K_d \cdot Kz_{Ant} \cdot V_i^2 \cdot I_{Wind} = 8.235$$

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Subject:	TIA-222-G Loads
Location:	Bloomfield, CT
Rev. 0: 8/3/20	Prepared by: T.J.L. Checked by: C.F.C. Job No. 20114.00

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AIR32		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 56.6$	in	(User Input)
Antenna Width =	$W_{ant} := 12.9$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in	(User Input)
Antenna Weight =	$WT_{ant} := 133$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.4$		
Antenna Force Coefficient =	$Ca_{ant} = 1.28$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.1$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 222$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 3.4$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 150$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 7.4$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 87$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 5.7$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 66$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 133$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6352$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 7924$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 257$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 257$	lbs

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Ericsson AIR6449		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 33.1$	in	(User Input)
Antenna Width =	$W_{ant} := 20.5$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.3$	in	(User Input)
Antenna Weight =	$WT_{ant} := 103$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 1.6$		
Antenna Force Coefficient =	$Ca_{ant} = 1.2$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.7$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 193$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 1.9$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 78$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 6.6$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 72$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 3.4$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 37$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 103$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5632$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 6602$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 214$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 214$	lbs

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Subject:	TIA-222-G Loads
Location:	Bloomfield, CT
Rev. 0: 8/3/20	Prepared by: T.J.L. Checked by: C.F.C. Job No. 20114.00

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFSAPXVAARR24-43		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 95.9$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in	(User Input)
Antenna Weight =	$WT_{ant} := 153$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.27$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{antF} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antF} = 690$	lbs
Surface Area for One Antenna =	$SA_{antS} := \frac{L_{ant} \cdot T_{ant}}{144} = 5.8$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{antS} = 250$	lbs

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEantF} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 20$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantF} = 229$	lbs
Surface Area for One Antenna w/ Ice =	$SA_{ICEantS} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz})}{144} = 9.3$	sf
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.Ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot SA_{ICEantS} = 107$	lbs

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 153$	lbs

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \times 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 2 \times 10^4$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 592$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 592$	lbs

Development of Wind & Ice Load on TMA's

TMA Data:

TMA Model =	Ericsson KRY112 TMA		
TMA Shape =	Flat		(User Input)
TMA Height =	$L_{TMA} := 7.7$	in	(User Input)
TMA Width =	$W_{TMA} := 7.5$	in	(User Input)
TMA Thickness =	$T_{TMA} := 3.4$	in	(User Input)
TMA Weight =	$WT_{TMA} := 11$	lbs	(User Input)
Number of TMA's =	$N_{TMA} := 1$		(User Input)
TMA Aspect Ratio =	$Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1$		
TMA Force Coefficient =	$Ca_{TMA} = 1.2$		

Wind Load (without ice)

Surface Area for One TMA =	$SA_{TMAF} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.4$	sf
Total TMA Wind Force =	$F_{TMA} := qz_{Ant} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAF} = 16$	lbs
Surface Area for One TMA =	$SA_{TMAS} := \frac{L_{TMA} \cdot T_{TMA}}{144} = 0.2$	sf
Total TMA Wind Force =	$F_{TMA} := qz_{Ant} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{TMAS} = 7$	lbs

Wind Load (with ice)

Surface Area for One TMA w/ Ice =	$SA_{ICETMAF} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz})}{144} = 1$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice.Ant} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAF} = 11$	lbs
Surface Area for One TMA w/ Ice =	$SA_{ICETMAS} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz})}{144} = 0.7$	sf
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice.Ant} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot SA_{ICETMAS} = 7$	lbs

Gravity Load (without ice)

Weight of All TMAs =	$WT_{TMA} \cdot N_{TMA} = 11$	lbs

Gravity Loads (ice only)

Volume of Each TMA =	$V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 196$	cu in
Volume of Ice on Each TMA =	$V_{ice} := (L_{TMA} + 2 \cdot t_{iz})(W_{TMA} + 2 \cdot t_{iz}) \cdot (T_{TMA} + 2 \cdot t_{iz}) - V_{TMA} = 1000$	cu in
Weight of Ice on Each TMA =	$W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 32$	lbs
Weight of Ice on All TMAs =	$W_{ICETMA} \cdot N_{TMA} = 32$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model =	Ericsson 4449		
RRUS Shape =	Flat		(User Input)
RRUS Height =	$L_{RRUS} := 14.9$	in	(User Input)
RRUS Width =	$W_{RRUS} := 13.2$	in	(User Input)
RRUS Thickness =	$T_{RRUS} := 10.4$	in	(User Input)
RRUS Weight =	$WT_{RRUS} := 74$	lbs	(User Input)
Number of RRUS's =	$N_{RRUS} := 1$		(User Input)
RRUS Aspect Ratio =	$Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$		
RRUS Force Coefficient =	$Ca_{RRUS} = 1.2$		

Wind Load (without ice)

Surface Area for One RRUS =	$SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.4$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 56$	lbs
Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 1.1$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 44$	lbs

Wind Load (with ice)

Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.4$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 26$	lbs
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 2$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 22$	lbs

Gravity Load (without ice)

Weight of All RRUSs =	$WT_{RRUS} \cdot N_{RRUS} = 74$	lbs

Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 2045$	cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 3176$	cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 103$	lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 103$	lbs

Development of Wind & Ice Load on RRUS's

RRUS Data:

RRUS Model =	Ericsson 4415		
RRUS Shape =	Flat		(User Input)
RRUS Height =	$L_{RRUS} := 14.9$	in	(User Input)
RRUS Width =	$W_{RRUS} := 13.2$	in	(User Input)
RRUS Thickness =	$T_{RRUS} := 5.4$	in	(User Input)
RRUS Weight =	$WT_{RRUS} := 47$	lbs	(User Input)
Number of RRUS's =	$N_{RRUS} := 1$		(User Input)
RRUS Aspect Ratio =	$Ar_{RRUS} := \frac{L_{RRUS}}{W_{RRUS}} = 1.1$		
RRUS Force Coefficient =	$Ca_{RRUS} = 1.2$		

Wind Load (without ice)

Surface Area for One RRUS =	$SA_{RRUSF} := \frac{L_{RRUS} \cdot W_{RRUS}}{144} = 1.4$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSF} = 56$	lbs
Surface Area for One RRUS =	$SA_{RRUSS} := \frac{L_{RRUS} \cdot T_{RRUS}}{144} = 0.6$	sf
Total RRUS Wind Force =	$F_{RRUS} := qz_{Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{RRUSS} = 23$	lbs

Wind Load (with ice)

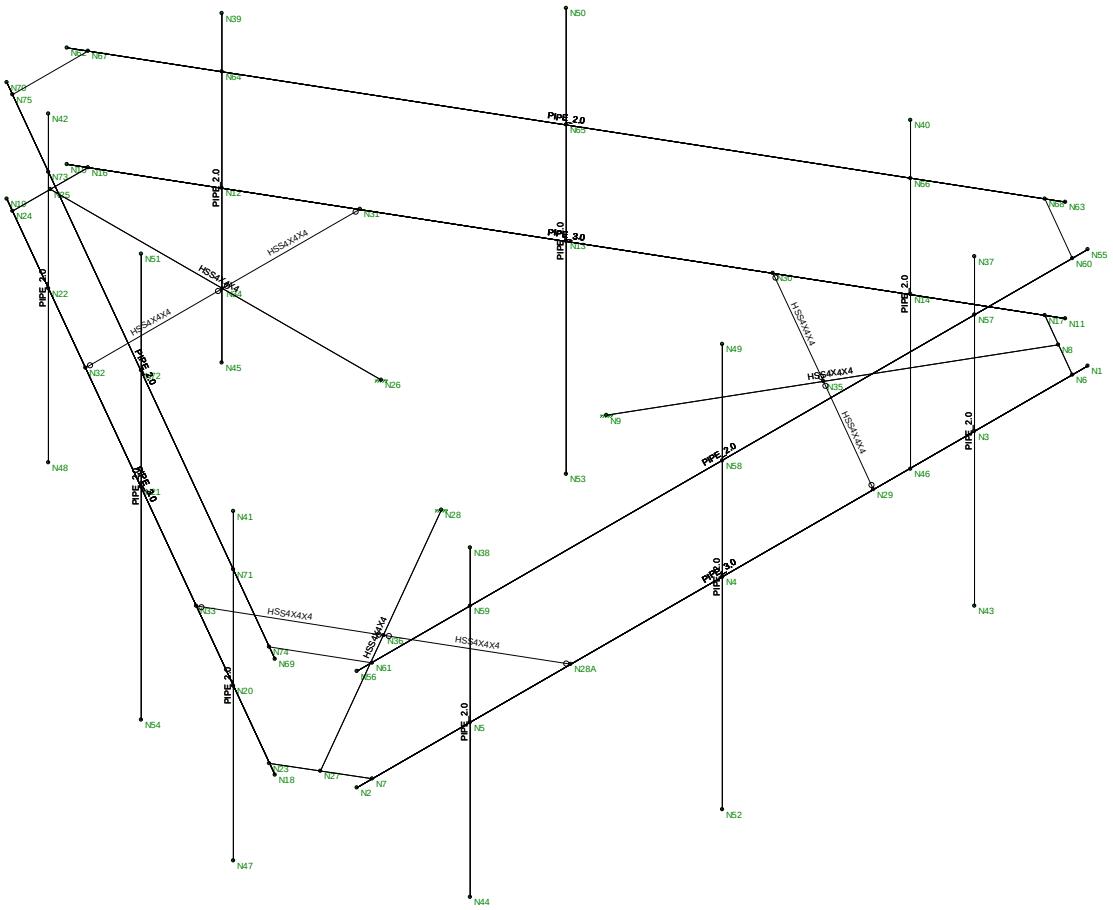
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSF} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (W_{RRUS} + 2 \cdot t_{iz})}{144} = 2.4$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSF} = 26$	lbs
Surface Area for One RRUS w/ Ice =	$SA_{ICERRUSS} := \frac{(L_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz})}{144} = 1.4$	sf
Total RRUS Wind Force w/ Ice =	$Fi_{RRUS} := qz_{ice.Ant} \cdot G_H \cdot Ca_{RRUS} \cdot K_a \cdot SA_{ICERRUSS} = 15$	lbs

Gravity Load (without ice)

Weight of All RRUSs =	$WT_{RRUS} \cdot N_{RRUS} = 47$	lbs

Gravity Loads (ice only)

Volume of Each RRUS =	$V_{RRUS} := L_{RRUS} \cdot W_{RRUS} \cdot T_{RRUS} = 1062$	cu in
Volume of Ice on Each RRUS =	$V_{ice} := (L_{RRUS} + 2 \cdot t_{iz})(W_{RRUS} + 2 \cdot t_{iz}) \cdot (T_{RRUS} + 2 \cdot t_{iz}) - V_{RRUS} = 2420$	cu in
Weight of Ice on Each RRUS =	$W_{ICERRUS} := \frac{V_{ice}}{1728} \cdot Id = 78$	lbs
Weight of Ice on All RRUSs =	$W_{ICERRUS} \cdot N_{RRUS} = 78$	lbs



Envelope Only Solution

Centek		
TJL	CTHA140A - Mount	Aug 3, 2020 at 1:19 PM
20114.00	Member Framing	Mount.r3d

(Global) Model Settings

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

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	No
RISAConnection Code	AISC 13th(360-05): ASD
Cold Formed Steel Code	AISI S100-10: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

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

(Global) Model Settings, Continued

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

Hot Rolled Steel Properties

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

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Outrigger	HSS4X4X4	Beam	Pipe	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
2	Horz Pipe	PIPE_3.0	Beam	Pipe	A53 Gr B	Typical	2.07	2.85	2.85	5.69
3	Antenna Pipe	PIPE_2.0	Column	Wide Flange	A53 Gr B	Typical	1.02	.627	.627	1.25
4	Support	HSS4X4X4	Beam	Pipe	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
5	Handrail	PIPE_2.0	Beam	Pipe	A53 Gr B	Typical	1.02	.627	.627	1.25

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Outrigger	6.564			Lbyy						Lateral
2	M2	Outrigger	6.564			Lbyy						Lateral
3	M3	Outrigger	6.564			Lbyy						Lateral
4	M4	Horz Pipe	14.5			Lbyy						Lateral
5	M5	Horz Pipe	14.5			Lbyy						Lateral
6	M6	Horz Pipe	14.5			Lbyy						Lateral
7	M10	Support	2.721			Lbyy						Lateral
8	M11	Support	2.721			Lbyy						Lateral
9	M12	Support	2.721			Lbyy						Lateral
10	M13	Support	2.721			Lbyy						Lateral
11	M14	Support	2.721			Lbyy						Lateral
12	M15	Support	2.721			Lbyy						Lateral
13	M16	Antenna Pipe	6			Lbyy						Lateral
14	M17	Antenna Pipe	8			Lbyy						Lateral
15	M18	Antenna Pipe	6			Lbyy						Lateral
16	M19	Antenna Pipe	6			Lbyy						Lateral
17	M20	Antenna Pipe	8			Lbyy						Lateral
18	M21	Antenna Pipe	6			Lbyy						Lateral
19	M22	Antenna Pipe	6			Lbyy						Lateral
20	M23	Antenna Pipe	8			Lbyy						Lateral
21	M24	Antenna Pipe	6			Lbyy						Lateral
22	M25	Handrail	14.5			Lbyy						Lateral
23	M26	Handrail	14.5			Lbyy						Lateral
24	M27	Handrail	14.5			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	N26	N25			Outrigger	Beam	Pipe	A500 Gr....	Typical
2	M2	N28	N27			Outrigger	Beam	Pipe	A500 Gr....	Typical
3	M3	N9	N8			Outrigger	Beam	Pipe	A500 Gr....	Typical
4	M4	N19	N18			Horz Pipe	Beam	Pipe	A53 Gr B	Typical
5	M5	N2	N1			Horz Pipe	Beam	Pipe	A53 Gr B	Typical
6	M6	N11	N10			Horz Pipe	Beam	Pipe	A53 Gr B	Typical
7	M7	N24	N16			RIGID	None	None	RIGID	Typical
8	M8	N17	N6			RIGID	None	None	RIGID	Typical
9	M9	N23	N7			RIGID	None	None	RIGID	Typical
10	M10	N32	N34			Support	Beam	Pipe	A500 Gr....	Typical
11	M11	N30	N35			Support	Beam	Pipe	A500 Gr....	Typical
12	M12	N28A	N36			Support	Beam	Pipe	A500 Gr....	Typical
13	M13	N34	N31			Support	Beam	Pipe	A500 Gr....	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
14	M14	N35	N29			Support	Beam	Pipe	A500 Gr....	Typical
15	M15	N36	N33			Support	Beam	Pipe	A500 Gr....	Typical
16	M16	N48	N42			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
17	M17	N54	N51			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
18	M18	N47	N41			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
19	M19	N44	N38			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
20	M20	N52	N49			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
21	M21	N43	N37			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
22	M22	N46	N40			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
23	M23	N53	N50			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
24	M24	N45	N39			Antenna Pipe	Column	Wide Flange	A53 Gr B	Typical
25	M25	N70	N69			Handrail	Beam	Pipe	A53 Gr B	Typical
26	M26	N56	N55			Handrail	Beam	Pipe	A53 Gr B	Typical
27	M27	N63	N62			Handrail	Beam	Pipe	A53 Gr B	Typical
28	M28	N75	N67			RIGID	None	None	RIGID	Typical
29	M29	N68	N60			RIGID	None	None	RIGID	Typical
30	M30	N74	N61			RIGID	None	None	RIGID	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	4.873916	0	-7.25	0	
2	N2	4.873916	0	7.25	0	
3	N3	4.873916	0	-5	0	
4	N4	4.873916	0	0	0	
5	N5	4.873916	0	5	0	
6	N6	4.873916	0	-6.944529	0	
7	N7	4.873916	0	6.944529	0	
8	N8	4.225548	0	-7.318864	0	
9	N9	0.943673	0	-1.634489	0	
10	N10	-8.715642	0	-0.595935	0	
11	N11	3.841726	0	-7.845935	0	
12	N12	-6.767085	0	-1.720935	0	
13	N13	-2.436958	0	-4.220935	0	
14	N14	1.893169	0	-6.720935	0	
15	N16	-8.451096	0	-0.748671	0	
16	N17	3.57718	0	-7.693199	0	
17	N18	3.841726	0	7.845935	0	
18	N19	-8.715642	0	0.595935	0	
19	N20	1.893169	0	6.720935	0	
20	N21	-2.436958	0	4.220935	0	
21	N22	-6.767085	0	1.720935	0	
22	N23	3.57718	0	7.693199	0	
23	N24	-8.451096	0	0.748671	0	
24	N25	-8.451096	0	0	0	
25	N26	-1.887346	0	0	0	
26	N27	4.225548	0	7.318864	0	
27	N28	0.943673	0	1.634489	0	
28	N28A	4.873916	0	3	0	
29	N29	4.873916	0	-3	0	
30	N30	0.161118	0	-5.720935	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
31	N31	-5.035034	0	-2.720935	0	
32	N32	-5.035034	0	2.720935	0	
33	N33	0.161118	0	5.720935	0	
34	N34	-5.035034	0	0.	0	
35	N35	2.517517	0	-4.360467	0	
36	N36	2.517517	0	4.360467	0	
37	N37	4.873916	3	-5	0	
38	N38	4.873916	3	5	0	
39	N39	-6.767085	3	-1.720935	0	
40	N40	1.893169	3	-6.720935	0	
41	N41	1.893169	3	6.720935	0	
42	N42	-6.767085	3	1.720935	0	
43	N43	4.873916	-3	-5	0	
44	N44	4.873916	-3	5	0	
45	N45	-6.767085	-3	-1.720935	0	
46	N46	1.893169	-3	-6.720935	0	
47	N47	1.893169	-3	6.720935	0	
48	N48	-6.767085	-3	1.720935	0	
49	N49	4.873916	4	0	0	
50	N50	-2.436958	4	-4.220935	0	
51	N51	-2.436958	4	4.220935	0	
52	N52	4.873916	-4	0	0	
53	N53	-2.436958	-4	-4.220935	0	
54	N54	-2.436958	-4	4.220935	0	
55	N55	4.873916	2	-7.25	0	
56	N56	4.873916	2	7.25	0	
57	N57	4.873916	2	-5	0	
58	N58	4.873916	2	0	0	
59	N59	4.873916	2	5	0	
60	N60	4.873916	2	-6.944529	0	
61	N61	4.873916	2	6.944529	0	
62	N62	-8.715642	2	-0.595935	0	
63	N63	3.841726	2	-7.845935	0	
64	N64	-6.767085	2	-1.720935	0	
65	N65	-2.436958	2	-4.220935	0	
66	N66	1.893169	2	-6.720935	0	
67	N67	-8.451096	2	-0.748671	0	
68	N68	3.57718	2	-7.693199	0	
69	N69	3.841726	2	7.845935	0	
70	N70	-8.715642	2	0.595935	0	
71	N71	1.893169	2	6.720935	0	
72	N72	-2.436958	2	4.220935	0	
73	N73	-6.767085	2	1.720935	0	
74	N74	3.57718	2	7.693199	0	
75	N75	-8.451096	2	0.748671	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N9	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N26	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Joint Boundary Conditions (Continued)

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
3	N28	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Member Point Loads (BLC 2 : Equipment Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	Y	-.077	1
2	M20	Y	-.077	1
3	M23	Y	-.077	1
4	M17	Y	-.077	7
5	M20	Y	-.077	7
6	M23	Y	-.077	7
7	M18	Y	-.052	2
8	M21	Y	-.052	2
9	M24	Y	-.052	2
10	M18	Y	-.052	5
11	M21	Y	-.052	5
12	M24	Y	-.052	5
13	M16	Y	-.067	1
14	M19	Y	-.067	1
15	M22	Y	-.067	1
16	M16	Y	-.067	5
17	M19	Y	-.067	5
18	M22	Y	-.067	5
19	M17	Y	-.074	5
20	M20	Y	-.074	5
21	M23	Y	-.074	5
22	M17	Y	-.047	2
23	M20	Y	-.047	2
24	M23	Y	-.047	2
25	M17	Y	-.011	6
26	M20	Y	-.011	6
27	M23	Y	-.011	6

Member Point Loads (BLC 3 : Ice Weight)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	Y	-.296	1
2	M20	Y	-.296	1
3	M23	Y	-.296	1
4	M17	Y	-.296	7
5	M20	Y	-.296	7
6	M23	Y	-.296	7
7	M18	Y	-.107	2
8	M21	Y	-.107	2
9	M24	Y	-.107	2
10	M18	Y	-.107	5
11	M21	Y	-.107	5
12	M24	Y	-.107	5
13	M16	Y	-.129	1
14	M19	Y	-.129	1
15	M22	Y	-.129	1
16	M16	Y	-.129	5

Member Point Loads (BLC 3 : Ice Weight) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
17	M19	Y	-.129	5
18	M22	Y	-.129	5
19	M17	Y	-.103	5
20	M20	Y	-.103	5
21	M23	Y	-.103	5
22	M17	Y	-.078	2
23	M20	Y	-.078	2
24	M23	Y	-.078	2
25	M17	Y	-.032	6
26	M20	Y	-.032	6
27	M23	Y	-.032	6

Member Point Loads (BLC 4 : Wind w/ Ice X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	X	.054	1
2	M23	X	.054	1
3	M17	X	.054	7
4	M23	X	.054	7
5	M20	X	.115	1
6	M20	X	.115	7
7	M18	X	.019	2
8	M24	X	.019	2
9	M18	X	.019	5
10	M24	X	.019	5
11	M21	X	.036	2
12	M21	X	.036	5
13	M19	X	.044	1
14	M19	X	.044	5
15	M16	X	.033	1
16	M22	X	.033	1
17	M16	X	.033	5
18	M22	X	.033	5
19	M17	X	.022	5
20	M23	X	.022	5
21	M17	X	.015	2
22	M23	X	.015	2
23	M17	X	.007	6
24	M23	X	.007	6

Member Point Loads (BLC 5 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	X	.125	1
2	M23	X	.125	1
3	M17	X	.125	7
4	M23	X	.125	7
5	M20	X	.345	1
6	M20	X	.345	7
7	M18	X	.039	2
8	M24	X	.039	2
9	M18	X	.039	5
10	M24	X	.039	5

Member Point Loads (BLC 5 : Wind X) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
11	M21	X	.097	2
12	M21	X	.097	5
13	M19	X	.111	1
14	M19	X	.111	5
15	M16	X	.075	1
16	M22	X	.075	1
17	M16	X	.075	5
18	M22	X	.075	5
19	M17	X	.044	5
20	M23	X	.044	5
21	M17	X	.023	2
22	M23	X	.023	2
23	M17	X	.007	6
24	M23	X	.007	6

Member Point Loads (BLC 6 : Wind w/ Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	Z	.115	1
2	M23	Z	.115	1
3	M17	Z	.115	7
4	M23	Z	.115	7
5	M20	Z	.054	1
6	M20	Z	.054	7
7	M18	Z	.036	2
8	M24	Z	.036	2
9	M18	Z	.036	5
10	M24	Z	.036	5
11	M21	Z	.019	2
12	M21	Z	.019	5
13	M19	Z	.033	1
14	M19	Z	.033	5
15	M16	Z	.044	1
16	M22	Z	.044	1
17	M16	Z	.044	5
18	M22	Z	.044	5
19	M20	Z	.022	5
20	M20	Z	.015	2
21	M20	Z	.007	6

Member Point Loads (BLC 7 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M17	Z	.345	1
2	M23	Z	.345	1
3	M17	Z	.345	7
4	M23	Z	.345	7
5	M20	Z	.125	1
6	M20	Z	.125	7
7	M18	Z	.097	2
8	M24	Z	.097	2
9	M18	Z	.097	5
10	M24	Z	.097	5

Member Point Loads (BLC 7 : Wind Z) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
11	M21	Z	.039	2
12	M21	Z	.039	5
13	M19	Z	.075	1
14	M19	Z	.075	5
15	M16	Z	.111	1
16	M22	Z	.111	1
17	M16	Z	.111	5
18	M22	Z	.111	5
19	M20	Z	.044	5
20	M20	Z	.023	2
21	M20	Z	.007	6

Member Distributed Loads (BLC 4 : Wind w/ Ice X)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M24	X	.002	.002	0	0
2	M23	X	.002	.002	0	0
3	M22	X	.002	.002	0	0
4	M16	X	.002	.002	0	0
5	M17	X	.002	.002	0	0
6	M18	X	.002	.002	0	0
7	M4	X	.003	.003	0	0
8	M6	X	.003	.003	0	0
9	M25	X	.003	.003	0	0
10	M27	X	.003	.003	0	0

Member Distributed Loads (BLC 5 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M24	X	.006	.006	0	0
2	M23	X	.006	.006	0	0
3	M22	X	.006	.006	0	0
4	M16	X	.006	.006	0	0
5	M17	X	.006	.006	0	0
6	M18	X	.006	.006	0	0
7	M4	X	.009	.009	0	0
8	M6	X	.009	.009	0	0
9	M25	X	.009	.009	0	0
10	M27	X	.009	.009	0	0

Member Distributed Loads (BLC 6 : Wind w/ Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M19	Z	.002	.002	0	0
2	M20	Z	.002	.002	0	0
3	M21	Z	.002	.002	0	0
4	M6	Z	.003	.003	0	0
5	M27	Z	.003	.003	0	0

Member Distributed Loads (BLC 7 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M19	Z	.006	.006	0	0

Member Distributed Loads (BLC 7 : Wind Z) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
2	M20	Z	.006	.006	0	0
3	M21	Z	.006	.006	0	0
4	M6	Z	.009	.009	0	0
5	M27	Z	.009	.009	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	DL		-1						
2	Equipment Weight	None					27			
3	Ice Weight	None					27			
4	Wind w/ Ice X	None					24	10		
5	Wind X	None					24	10		
6	Wind w/ Ice Z	None					21	5		
7	Wind Z	None					21	5		

Load Combinations

	Description	Solve	P...	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	1.2D + 1.6W (X-direc...	Yes	Y		1	1.2	2	1.2	5	1.6																
2	0.9D + 1.6W (X-direc...	Yes	Y		1	.9	2	.9	5	1.6																
3	1.2D + 1.0Di + 1.0Wi...	Yes	Y		1	1.2	2	1.2	3	1	4	1														
4	1.2D + 1.6W (Z-direc...	Yes	Y		1	1.2	2	1.2	7	1.6																
5	0.9D + 1.6W (Z-direc...	Yes	Y		1	.9	2	.9	7	1.6																
6	1.2D + 1.0Di + 1.0Wi...	Yes	Y		1	1.2	2	1.2	3	1	6	1														

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N9	max	.495	4	2.348	3	.309	2	6.426	3	1.945	2	3.711	3
2		min	-1.366	2	.739	5	-1.801	4	1.935	5	.174	6	1.189	5
3	N26	max	.044	5	2.339	6	.048	1	-.005	2	.112	2	-2.026	2
4		min	-2.042	1	.691	2	-1.675	5	-.172	4	-3.494	4	-7.386	6
5	N28	max	-.098	6	2.349	3	-.061	3	-2.252	2	.235	5	3.747	3
6		min	-1.359	2	.845	5	-1.567	5	-6.423	6	-1.852	1	1.329	5
7	Totals:	max	0	5	7.012	6	0	3						
8		min	-4.755	1	2.386	2	-5.032	4						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
1	N1	max	.019	2	-.166	5	.003	2	-1.259e-03	5	1.818e-03	4	-1.201e-03	5
2		min	-.043	4	-.555	3	-.038	4	-5.323e-03	3	2.099e-04	3	-3.081e-03	3
3	N2	max	.045	4	-.205	2	0	2	5.294e-03	6	1.642e-03	4	-1.087e-03	5
4		min	.004	3	-.556	3	-.038	4	1.661e-03	2	-9.726e-04	2	-3.318e-03	3
5	N3	max	.033	2	-.158	5	.003	2	5.476e-04	5	1.387e-03	4	-1.516e-03	5
6		min	0	6	-.492	3	-.038	4	-1.184e-05	1	7.583e-05	3	-4.199e-03	3
7	N4	max	.079	1	-.178	5	.002	2	6.571e-05	3	-1.643e-07	3	-2.723e-04	2
8		min	.001	6	-.547	3	-.037	4	-4.448e-04	5	-9.36e-04	4	-6.495e-03	6
9	N5	max	.031	2	-.173	5	.001	2	3.489e-04	4	1.312e-03	5	-1.431e-03	5

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
10		min	-.003	6	-.497	3	-.038	4	-2.925e-04	3	-2.993e-04	1	-4.224e-03	3
11	N6	max	.022	2	-.161	5	.003	2	-1.259e-03	5	1.818e-03	4	-1.201e-03	5
12		min	-.036	4	-.535	3	-.038	4	-5.323e-03	3	2.099e-04	3	-3.081e-03	3
13	N7	max	.039	4	-.198	5	0	2	5.294e-03	6	1.642e-03	4	-1.087e-03	5
14		min	.004	3	-.537	3	-.038	4	1.661e-03	2	-9.726e-04	2	-3.318e-03	3
15	N8	max	.019	2	-.158	5	.01	2	-1.259e-03	5	1.818e-03	4	-1.201e-03	5
16		min	-.044	4	-.535	3	-.024	4	-5.323e-03	3	2.099e-04	3	-3.081e-03	3
17	N9	max	0	6	0	6	0	6	0	6	0	6	0	6
18		min	0	1	0	1	0	1	0	1	0	1	0	1
19	N10	max	.002	1	-.139	2	.086	4	1.137e-03	4	1.118e-05	3	6.09e-03	6
20		min	0	3	-.549	6	-.004	2	3.044e-05	2	-1.508e-04	5	1.348e-03	2
21	N11	max	.013	2	-.16	5	.014	1	-1.259e-03	5	1.818e-03	4	-1.201e-03	5
22		min	-.056	4	-.555	3	-.015	5	-5.323e-03	3	2.099e-04	3	-3.081e-03	3
23	N12	max	.002	6	-.132	2	.082	4	3.264e-04	5	6.287e-04	4	1.787e-03	6
24		min	-.002	5	-.482	6	-.004	2	-3.548e-03	3	4.377e-05	3	-1.312e-04	2
25	N13	max	.02	2	-.144	5	.09	5	-1.41e-03	2	3.204e-04	5	3.228e-03	3
26		min	.003	6	-.54	3	.006	3	-5.818e-03	6	-6.496e-04	1	7.429e-04	5
27	N14	max	.023	1	-.14	5	.03	1	-6.182e-04	5	1.175e-03	5	2.271e-03	6
28		min	-.035	5	-.491	3	.007	6	-3.413e-03	3	5.03e-05	3	-4.928e-05	2
29	N16	max	.002	1	-.134	2	.087	4	1.137e-03	4	1.116e-05	3	6.09e-03	6
30		min	0	3	-.529	6	-.004	2	3.041e-05	2	-1.509e-04	5	1.347e-03	2
31	N17	max	.015	2	-.154	5	.017	1	-1.259e-03	5	1.818e-03	4	-1.201e-03	5
32		min	-.052	4	-.535	3	-.01	5	-5.323e-03	3	2.099e-04	3	-3.081e-03	3
33	N18	max	.057	4	-.195	2	-.002	6	5.294e-03	6	1.642e-03	4	-1.087e-03	5
34		min	.002	3	-.555	6	-.018	4	1.661e-03	2	-9.726e-04	2	-3.318e-03	3
35	N19	max	.002	1	-.139	2	.086	4	1.137e-03	4	1.115e-05	3	6.09e-03	6
36		min	-.001	5	-.554	6	-.004	2	3.039e-05	2	-1.509e-04	5	1.348e-03	2
37	N20	max	.038	4	-.156	2	.015	5	3.489e-03	6	1.125e-03	4	2.188e-03	6
38		min	.005	3	-.49	6	-.029	1	9.057e-04	2	-4.057e-04	2	-3.234e-04	2
39	N21	max	.017	2	-.149	2	.085	4	5.461e-03	3	6.124e-04	2	3.341e-03	3
40		min	-.002	6	-.545	6	-.028	2	8.485e-05	5	9.412e-05	6	1.e-03	5
41	N22	max	.002	4	-.13	2	.081	5	3.878e-03	6	5.933e-04	5	1.835e-03	6
42		min	0	6	-.496	6	-.003	1	9.451e-04	2	-1.226e-04	1	1.033e-04	2
43	N23	max	.054	4	-.187	2	-.001	6	5.294e-03	6	1.642e-03	4	-1.087e-03	5
44		min	.002	3	-.535	6	-.014	1	1.661e-03	2	-9.726e-04	2	-3.318e-03	3
45	N24	max	.002	1	-.135	2	.087	4	1.137e-03	4	1.116e-05	3	6.09e-03	6
46		min	-.001	5	-.535	6	-.004	2	3.041e-05	2	-1.509e-04	5	1.347e-03	2
47	N25	max	.002	1	-.135	2	.087	4	1.137e-03	4	1.116e-05	3	6.09e-03	6
48		min	0	5	-.532	6	-.004	2	3.041e-05	2	-1.509e-04	5	1.347e-03	2
49	N26	max	0	6	0	6	0	6	0	6	0	6	0	6
50		min	0	1	0	1	0	1	0	1	0	1	0	1
51	N27	max	.046	4	-.193	2	-.002	3	5.294e-03	6	1.642e-03	4	-1.087e-03	5
52		min	.003	3	-.536	6	-.025	4	1.661e-03	2	-9.726e-04	2	-3.318e-03	3
53	N28	max	0	6	0	6	0	6	0	6	0	6	0	6
54		min	0	1	0	1	0	1	0	1	0	1	0	1
55	N28A	max	.039	2	-.169	5	.002	2	2.649e-04	4	1.681e-04	5	-1.924e-03	2
56		min	-.018	4	-.514	3	-.037	4	-3.408e-04	3	-8.875e-04	1	-7.182e-03	6
57	N29	max	.039	2	-.171	5	.002	2	5.118e-04	6	8.559e-04	1	-2.145e-03	2
58		min	.005	6	-.509	3	-.037	4	-1.793e-04	1	8.96e-05	6	-7.161e-03	6
59	N30	max	.023	2	-.146	5	.044	4	-1.845e-03	2	1.42e-03	5	3.903e-03	6
60		min	-.023	4	-.506	3	.007	3	-5.989e-03	3	-7.273e-05	3	6.244e-04	2
61	N31	max	.003	2	-.128	5	.07	4	-1.439e-03	5	2.045e-05	6	3.166e-03	6

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
62		min	-.008	4	-.502	3	-.002	2	-6.347e-03	3	-5.217e-04	2	6.036e-04	2
63	N32	max	.008	4	-.141	2	.07	5	6.36e-03	6	4.196e-04	2	3.241e-03	6
64		min	0	6	-.515	6	-.003	1	1.686e-03	2	-1.096e-04	6	6.85e-04	2
65	N33	max	.025	4	-.144	2	.038	4	5.935e-03	6	1.477e-03	4	3.877e-03	6
66		min	.003	6	-.506	6	-.032	2	1.742e-03	2	-6.12e-05	2	5.089e-04	2
67	N34	max	0	1	-.051	2	.069	4	5.453e-04	4	1.721e-03	4	7.469e-03	6
68		min	0	5	-.192	6	-.002	2	1.458e-05	2	-7.3e-05	2	1.906e-03	2
69	N35	max	.03	2	-.058	5	.017	1	-1.846e-03	5	4.501e-04	4	-1.293e-03	5
70		min	.001	4	-.193	3	.001	6	-6.505e-03	3	-6.551e-04	2	-3.76e-03	3
71	N36	max	.028	2	-.069	2	0	6	6.492e-03	6	5.632e-04	1	-1.327e-03	5
72		min	0	6	-.193	6	-.016	1	2.167e-03	2	6.04e-05	6	-3.872e-03	3
73	N37	max	.171	1	-.158	5	.007	6	1.007e-03	4	2.652e-03	1	-4.194e-04	5
74		min	.026	5	-.492	3	-.002	2	-2.58e-04	2	1.799e-03	5	-4.205e-03	1
75	N38	max	.168	1	-.174	5	.004	2	8.716e-04	5	2.741e-04	5	-4.771e-04	5
76		min	.025	5	-.497	3	-.002	3	-1.734e-04	3	-2.72e-03	1	-4.259e-03	1
77	N39	max	.059	2	-.132	2	.194	5	3.635e-03	5	1.945e-03	3	-2.181e-04	6
78		min	-.011	6	-.482	6	-.039	3	-5.653e-04	3	-5.954e-04	5	-1.728e-03	2
79	N40	max	.079	2	-.14	5	.12	5	3.509e-03	5	2.363e-03	5	3.767e-04	6
80		min	-.027	6	-.491	3	-.031	3	-3.999e-04	3	-1.935e-03	3	-1.549e-03	2
81	N41	max	.073	2	-.156	2	.124	4	3.21e-03	4	3.455e-03	4	1.07e-03	4
82		min	-.025	6	-.49	6	-.039	2	-7.17e-04	2	-1.837e-04	2	-1.485e-03	2
83	N42	max	.06	2	-.13	2	.215	4	3.919e-03	4	-8.445e-06	2	1.81e-03	4
84		min	-.049	4	-.497	6	-.009	2	-6.132e-04	2	-2.326e-03	6	-1.813e-03	2
85	N43	max	-.024	2	-.158	5	.003	1	2.331e-04	3	1.387e-03	4	-1.515e-03	5
86		min	-.146	6	-.492	3	-.04	5	-7.482e-05	4	7.583e-05	3	-4.049e-03	6
87	N44	max	.049	2	-.173	5	.019	6	-3.726e-05	1	1.312e-03	5	1.088e-03	2
88		min	-.152	6	-.497	3	.003	1	-1.901e-03	5	-2.993e-04	1	-4.137e-03	6
89	N45	max	.066	6	-.132	2	.14	6	-2.879e-04	5	6.287e-04	4	1.781e-03	6
90		min	.014	2	-.482	6	.029	2	-3.537e-03	3	4.377e-05	3	4.577e-04	2
91	N46	max	.1	3	-.14	5	.146	6	-9.78e-04	2	1.175e-03	5	2.747e-03	3
92		min	-.017	5	-.491	3	.065	2	-4.021e-03	6	5.03e-05	3	5.049e-04	5
93	N47	max	.085	6	-.156	2	-.028	5	3.336e-03	6	1.125e-03	4	2.18e-03	6
94		min	.023	2	-.49	6	-.127	3	9.048e-04	2	-4.057e-04	2	2.657e-04	2
95	N48	max	.08	3	-.131	2	.089	5	3.672e-03	3	5.933e-04	5	2.597e-03	1
96		min	.027	5	-.497	6	-.135	3	-8.387e-04	5	-1.226e-04	1	6.964e-04	5
97	N49	max	.591	1	-.178	5	.041	5	2.26e-03	5	2.923e-05	3	-1.478e-03	5
98		min	.083	5	-.547	3	0	3	-6.564e-06	2	-6.191e-04	5	-1.404e-02	1
99	N50	max	.126	2	-.144	5	.436	5	1.056e-02	5	5.529e-04	4	1.159e-03	6
100		min	-.076	6	-.54	3	-.163	3	-2.93e-03	3	-5.905e-04	2	-3.188e-03	5
101	N51	max	.124	2	-.149	2	.52	4	1.203e-02	4	6.808e-04	4	4.133e-03	4
102		min	-.167	4	-.546	6	-.05	2	-1.03e-03	2	1.457e-04	3	-3.14e-03	2
103	N52	max	.776	2	-.178	5	.294	5	6.46e-05	3	-1.643e-07	3	1.934e-02	2
104		min	-.307	6	-.547	3	-.003	3	-8.939e-03	5	-9.36e-04	4	-6.386e-03	6
105	N53	max	.397	1	-.144	5	.964	4	-1.405e-03	2	3.204e-04	5	9.9e-03	1
106		min	.039	5	-.54	3	.093	2	-2.302e-02	4	-6.496e-04	1	7.4e-04	5
107	N54	max	.396	1	-.149	2	.79	5	5.369e-03	3	6.124e-04	2	9.921e-03	1
108		min	.047	5	-.546	6	-.266	3	-1.953e-02	5	9.412e-05	6	9.964e-04	5
109	N55	max	.062	2	-.124	5	.001	2	1.624e-03	5	2.584e-03	5	9.955e-05	4
110		min	-.043	4	-.497	3	-.01	4	-5.888e-04	1	2.588e-04	3	-1.348e-03	2
111	N56	max	.056	2	-.201	2	.002	1	1.458e-03	4	2.045e-03	5	-3.263e-04	6
112		min	.007	6	-.499	6	-.01	4	1.507e-04	3	-1.383e-03	1	-1.483e-03	1
113	N57	max	.121	1	-.158	5	.001	2	9.948e-04	4	2.652e-03	1	-4.194e-04	5

Envelope Joint Displacements (Continued)

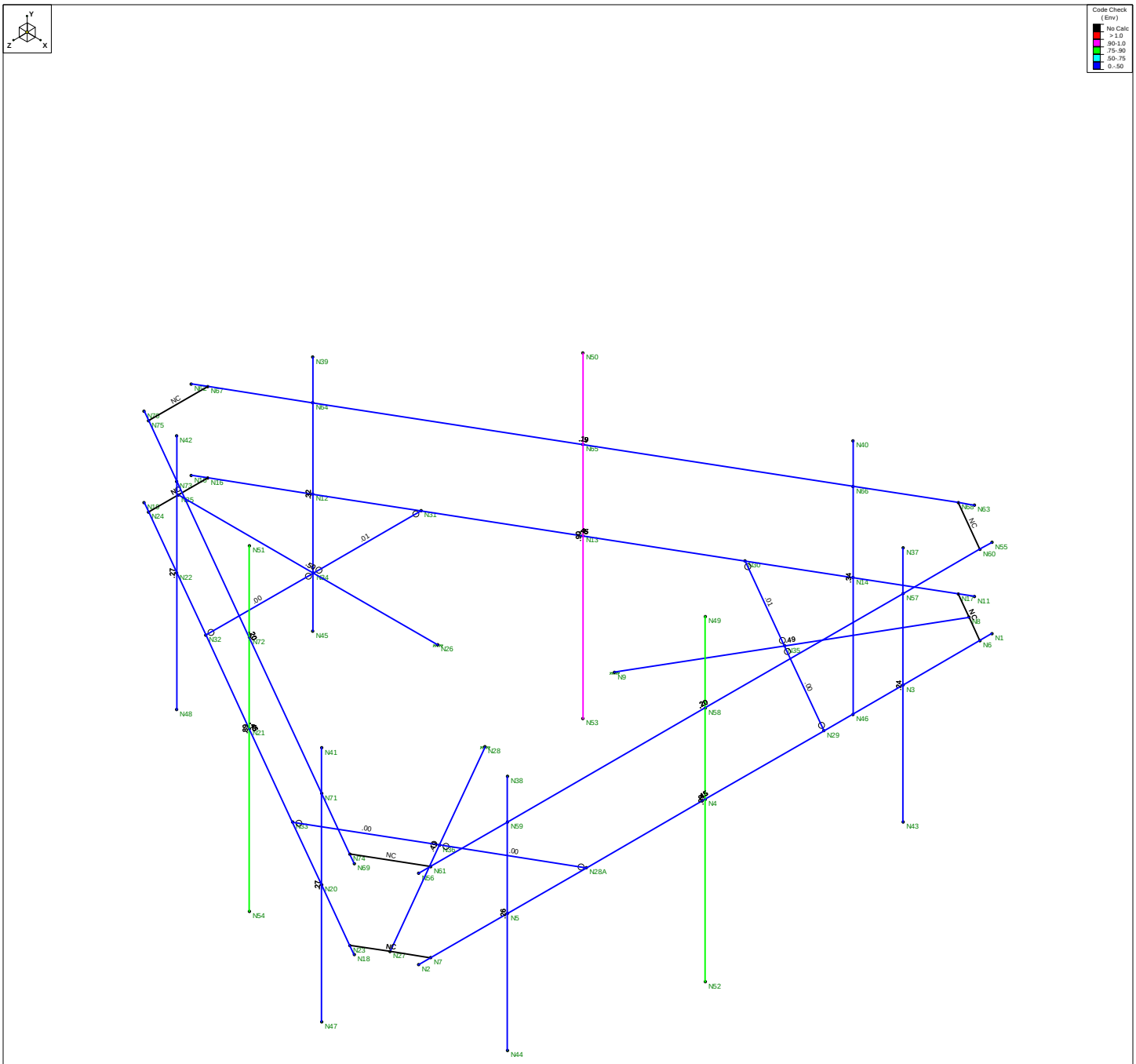
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
114		min	.021	5	-.492	3	-.01	4	-2.58e-04	2	1.799e-03	5	-4.205e-03	1
115	N58	max	.262	1	-.178	5	.002	2	1.365e-03	5	2.923e-05	3	-1.477e-03	5
116		min	.047	5	-.547	3	-.01	4	-6.56e-06	2	-6.191e-04	5	-1.184e-02	1
117	N59	max	.116	1	-.174	5	.002	1	8.589e-04	5	2.741e-04	5	-4.771e-04	5
118		min	.019	5	-.497	3	-.01	4	-1.734e-04	3	-2.72e-03	1	-4.259e-03	1
119	N60	max	.067	2	-.13	5	.001	2	1.624e-03	5	2.584e-03	5	9.955e-05	4
120		min	-.033	4	-.495	3	-.01	4	-5.887e-04	1	2.588e-04	3	-1.348e-03	2
121	N61	max	.061	2	-.198	5	.002	1	1.458e-03	4	2.045e-03	5	-3.263e-04	6
122		min	.006	6	-.498	3	-.01	4	1.506e-04	3	-1.383e-03	1	-1.483e-03	1
123	N62	max	.04	2	-.095	2	.136	5	1.672e-03	4	1.906e-05	2	1.608e-04	6
124		min	.002	6	-.485	6	-.005	2	-4.204e-05	2	-8.907e-04	4	-1.657e-03	2
125	N63	max	.053	2	-.114	5	.022	5	1.624e-03	5	2.583e-03	5	9.941e-05	4
126		min	-.061	4	-.496	3	.003	3	-5.887e-04	1	2.587e-04	3	-1.348e-03	2
127	N64	max	.038	2	-.132	2	.151	5	3.635e-03	5	1.945e-03	3	-2.181e-04	6
128		min	-.014	6	-.482	6	-.033	3	-5.653e-04	3	-5.954e-04	5	-1.715e-03	2
129	N65	max	.054	2	-.144	5	.19	5	8.37e-03	5	5.529e-04	4	1.259e-03	3
130		min	-.048	6	-.54	3	-.093	3	-2.92e-03	3	-5.905e-04	2	-3.186e-03	5
131	N66	max	.061	2	-.14	5	.078	5	3.509e-03	5	2.363e-03	5	3.767e-04	6
132		min	-.031	4	-.491	3	-.027	3	-3.999e-04	3	-1.935e-03	3	-1.536e-03	2
133	N67	max	.04	2	-.1	2	.139	5	1.672e-03	4	1.879e-05	2	1.606e-04	6
134		min	.002	6	-.484	6	-.005	2	-4.21e-05	2	-8.912e-04	4	-1.657e-03	2
135	N68	max	.055	2	-.117	5	.03	5	1.624e-03	5	2.584e-03	5	9.955e-05	4
136		min	-.057	4	-.495	3	.004	3	-5.887e-04	1	2.588e-04	3	-1.348e-03	2
137	N69	max	.062	4	-.186	2	.016	5	1.458e-03	4	2.045e-03	5	-3.265e-04	6
138		min	.01	6	-.498	6	-.015	1	1.507e-04	3	-1.383e-03	1	-1.483e-03	1
139	N70	max	.04	2	-.094	2	.136	5	1.672e-03	4	1.852e-05	2	1.608e-04	6
140		min	-.008	4	-.493	6	-.005	2	-4.216e-05	2	-8.912e-04	4	-1.657e-03	2
141	N71	max	.055	2	-.156	2	.085	4	3.21e-03	4	3.455e-03	4	1.07e-03	4
142		min	-.016	6	-.49	6	-.03	2	-7.17e-04	2	-1.837e-04	2	-1.472e-03	2
143	N72	max	.052	2	-.149	2	.239	4	9.835e-03	4	6.808e-04	4	4.129e-03	4
144		min	-.072	6	-.546	6	-.025	2	-1.029e-03	2	1.457e-04	3	-2.245e-03	2
145	N73	max	.038	2	-.13	2	.168	4	3.919e-03	4	-8.445e-06	2	1.81e-03	4
146		min	-.027	4	-.497	6	-.002	2	-6.132e-04	2	-2.326e-03	6	-1.8e-03	2
147	N74	max	.058	4	-.18	2	.022	5	1.458e-03	4	2.045e-03	5	-3.263e-04	6
148		min	.009	6	-.496	6	-.02	1	1.506e-04	3	-1.383e-03	1	-1.483e-03	1
149	N75	max	.04	2	-.1	2	.139	5	1.672e-03	4	1.879e-05	2	1.606e-04	6
150		min	-.01	4	-.493	6	-.005	2	-4.21e-05	2	-8.912e-04	4	-1.657e-03	2

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

	Member	Shape	Code Check	Lo...	LC	She...	Lo...	...	...	phi*P...	phi*P...	phi*...	phi*...	Cb	Eqn
1	M23	PIPE_2.0	.903	4	4	.064	6		4	14.916	32.13	1.872	1.872	1.4...	H1-...
2	M17	PIPE_2.0	.895	4	4	.065	6		4	14.916	32.13	1.872	1.872	1.3...	H1-...
3	M20	PIPE_2.0	.889	4	1	.058	6		2	14.916	32.13	1.872	1.872	1.47	H1-...
4	M1	HSS4X4X4	.500	0	6	.065	0	y	6	116.5	139....	16.181	16.181	2.1...	H1-...
5	M3	HSS4X4X4	.487	0	3	.061	0	y	3	116.5	139....	16.181	16.181	2.1...	H1-...
6	M2	HSS4X4X4	.486	0	3	.065	0	y	3	116.5	139....	16.181	16.181	2.1...	H1-...
7	M5	PIPE_3.0	.451	.453	3	.166	12...		6	21.266	65.205	5.749	5.749	2.8...	H1-...
8	M4	PIPE_3.0	.449	14...	6	.168	12...		3	21.266	65.205	5.749	5.749	2.8...	H1-...
9	M6	PIPE_3.0	.446	.453	3	.174	12...		6	21.266	65.205	5.749	5.749	2.7...	H1-...
10	M22	PIPE_2.0	.342	3	4	.089	3		3	20.867	32.13	1.872	1.872	1.3...	H1-...

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

	Member	Shape	Code Check	Lo...	LC	She...	Lo...	...	...	phi*P...	phi*P...	phi*...	phi*...	Cb	Eqn
11	M24	PIPE 2.0	.324	3	4	.081	3		3	20.867	32.13	1.872	1.872	1.4...	H1-...
12	M18	PIPE 2.0	.270	3	3	.093	3		6	20.867	32.13	1.872	1.872	1.9...	H1-...
13	M16	PIPE 2.0	.266	3	3	.089	3		6	20.867	32.13	1.872	1.872	1.5...	H1-...
14	M19	PIPE 2.0	.257	3	6	.092	3		6	20.867	32.13	1.872	1.872	1.7...	H1-...
15	M21	PIPE 2.0	.240	3	6	.091	3		3	20.867	32.13	1.872	1.872	1.7...	H1-...
16	M26	PIPE 2.0	.196	.453	6	.101	12...		1	4.679	32.13	1.872	1.872	1.5...	H1-...
17	M25	PIPE 2.0	.195	14...	6	.096	2....		4	4.679	32.13	1.872	1.872	1.5...	H1-...
18	M27	PIPE 2.0	.192	.453	3	.088	12...		5	4.679	32.13	1.872	1.872	1.5...	H1-...
19	M13	HSS4X4X4	.009	0	4	.115	2....	y	6	135....	139....	16.181	16.181	1.1...	H1-...
20	M11	HSS4X4X4	.007	0	4	.113	2....	y	3	135....	139....	16.181	16.181	1.1...	H1-...
21	M12	HSS4X4X4	.004	1.36	1	.114	0	y	3	135....	139....	16.181	16.181	1.1...	H1-...
22	M14	HSS4X4X4	.004	1.36	1	.115	2....	y	3	135....	139....	16.181	16.181	1.1...	H1-...
23	M10	HSS4X4X4	.004	1.36	4	.113	2....	y	6	135....	139....	16.181	16.181	1.1...	H1-...
24	M15	HSS4X4X4	.004	1.36	4	.116	0	y	6	135....	139....	16.181	16.181	1.1...	H1-...



Centek		
TJL	CTHA140A - Mount	Aug 3, 2020 at 1:19 PM
20114.00	Unity Check	Mount.r3d

Exhibit F

EBI Consulting

environmental | engineering | due diligence

RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CTHA140A

HA140/BloomfieldPolice_MP
785 Park Avenue
Bloomfield, Connecticut 06002

August 12, 2020

EBI Project Number: 6220003898

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**22.30%**

21 B Street, Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

August 12, 2020

T-Mobile
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, Connecticut 06002

Emissions Analysis for Site: CTHA140A - HA140/BloomfieldPolice_MP

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **785 Park Avenue** in **Bloomfield, Connecticut** for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu W/cm^2$). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits; therefore, it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general population may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 600 MHz and 700 MHz frequency bands are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$, respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 11 GHz frequency bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at 785 Park Avenue in Bloomfield, Connecticut using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was focused at the base of the tower. For this report, the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

1) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

2) 1 NR channel (600 MHz Band) was considered for each sector of the proposed installation. This Channel has a transmit power of 80 Watts.

3) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

4) 4 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

5) 4 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

6) 2 UMTS channels (AWS Band - 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

7) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

8) 2 LTE channels (BRS Band - 2500 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

9) 2 NR channels (BRS Band - 2500 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

10) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

11) For the following calculations, the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

12) The antennas used in this modeling are the Ericsson AIR6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 2100 MHz / 1900 MHz / 1900 MHz channel(s) in Sector A, the Ericsson AIR6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 2100 MHz / 1900 MHz / 1900 MHz channel(s) in Sector B, the Ericsson AIR6449 for the 2500 MHz / 2500 MHz channel(s), the RFS APXVAARR24_43-U-NA20 for the 700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz channel(s), the Ericsson AIR 32 for the 2100 MHz / 1900 MHz / 1900 MHz channel(s) in Sector C. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufacturer's supplied specifications, minus 10 dB for directional panel antennas and 20 dB for highly focused parabolic microwave dishes, was used for all calculations. This value is a

very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

13) The antenna mounting height centerline of the proposed antennas is 138 feet above ground level (AGL).

14) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

15) All calculations were done with respect to uncontrolled / general population threshold limits.

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR6449	Make / Model:	Ericsson AIR6449	Make / Model:	Ericsson AIR6449
Frequency Bands:	2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz	Frequency Bands:	2500 MHz / 2500 MHz
Gain:	22.05 dBd / 22.05 dBd	Gain:	22.05 dBd / 22.05 dBd	Gain:	22.05 dBd / 22.05 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Channel Count:	4	Channel Count:	4	Channel Count:	4
Total TX Power (W):	160 Watts	Total TX Power (W):	160 Watts	Total TX Power (W):	160 Watts
ERP (W):	25,651.93	ERP (W):	25,651.93	ERP (W):	25,651.93
Antenna A1 MPE %:	**4.84%**	Antenna B1 MPE %:	**4.84%**	Antenna C1 MPE %:	**4.84%**
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Frequency Bands:	700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz	Frequency Bands:	700 MHz / 600 MHz / 600 MHz / 1900 MHz / 2100 MHz
Gain:	13.35 dBd / 12.95 dBd / 12.95 dBd / 15.65 dBd / 16.35 dBd	Gain:	13.35 dBd / 12.95 dBd / 12.95 dBd / 15.65 dBd / 16.35 dBd	Gain:	13.35 dBd / 12.95 dBd / 12.95 dBd / 15.65 dBd / 16.35 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Channel Count:	9	Channel Count:	9	Channel Count:	9
Total TX Power (W):	380 Watts	Total TX Power (W):	380 Watts	Total TX Power (W):	380 Watts
ERP (W):	11,055.53	ERP (W):	11,055.53	ERP (W):	11,055.53
Antenna A2 MPE %:	**3.15%**	Antenna B2 MPE %:	**3.15%**	Antenna C2 MPE %:	**3.15%**
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	Ericsson AIR 32	Make / Model:	Ericsson AIR 32	Make / Model:	Ericsson AIR 32
Frequency Bands:	2100 MHz / 1900 MHz / 1900 MHz	Frequency Bands:	2100 MHz / 1900 MHz / 1900 MHz	Frequency Bands:	2100 MHz / 1900 MHz / 1900 MHz
Gain:	15.85 dBd / 15.35 dBd / 15.35 dBd	Gain:	15.85 dBd / 15.35 dBd / 15.35 dBd	Gain:	15.85 dBd / 15.35 dBd / 15.35 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Channel Count:	8	Channel Count:	8	Channel Count:	8
Total TX Power (W):	360 Watts	Total TX Power (W):	360 Watts	Total TX Power (W):	360 Watts
ERP (W):	12,841.53	ERP (W):	12,841.53	ERP (W):	12,841.53
Antenna A3 MPE %:	**2.42%**	Antenna B3 MPE %:	**2.42%**	Antenna C3 MPE %:	**2.42%**

Site Composite MPE %	
Carrier	**MPE %**
T-Mobile (Max at Sector A):	10.42%
Police	0.17%
Hartford Co. Fire	0.08%
State Police	0.36%
NPSAC	0.01%
RAFS	0.12%
Verizon	5.42%
Sprint	4.46%
Nextel	1.1%
Clearwire	0.16%
Site Total MPE % :	22.30%

T-Mobile MPE % Per Sector	
T-Mobile Sector A Total:	10.42%
T-Mobile Sector B Total:	10.42%
T-Mobile Sector C Total:	10.42%
Site Total MPE % :	22.30%

T-Mobile Maximum MPE Power Values (Sector A)

T-Mobile Frequency Band / Technology (Sector A)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density (μW/cm²)	Frequency (MHz)	Allowable MPE (μW/cm²)	Calculated % MPE
T-Mobile 2500 MHz LTE	2	6412.98	138.0	24.21	2500 MHz LTE	1000	2.42%
T-Mobile 2500 MHz NR	2	6412.98	138.0	24.21	2500 MHz NR	1000	2.42%
T-Mobile 700 MHz LTE	2	648.82	138.0	2.45	700 MHz LTE	467	0.52%
T-Mobile 600 MHz LTE	2	591.73	138.0	2.23	600 MHz LTE	400	0.56%
T-Mobile 600 MHz NR	1	1577.94	138.0	2.98	600 MHz NR	400	0.74%
T-Mobile 1900 MHz LTE	2	2203.69	138.0	8.32	1900 MHz LTE	1000	0.83%
T-Mobile 2100 MHz UMTS	2	1294.56	138.0	4.89	2100 MHz UMTS	1000	0.49%
T-Mobile 2100 MHz LTE	2	2307.55	138.0	8.71	2100 MHz LTE	1000	0.87%
T-Mobile 1900 MHz LTE	2	2056.61	138.0	7.76	1900 MHz LTE	1000	0.78%
T-Mobile 1900 MHz GSM	4	1028.30	138.0	7.76	1900 MHz GSM	1000	0.78%
						Total:	**10.42%**

• NOTE: Totals may vary by approximately 0.01% due to summation of remainders in calculations.

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general population exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	10.42%
Sector B:	10.42%
Sector C:	10.42%
T-Mobile Maximum MPE % (Sector A):	10.42%
Site Total:	22.30%
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **22.30%** of the allowable FCC established general population limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

Exhibit G

Contact Suzette DeBeatham-Brown

Your name *

DEBORAH A CHASE

Your e-mail address *

deborah@northeastsitesolutions.com

Subject *

785 Park Avenue, Bloomfield CT 06002

Message *

Good afternoon,
This is to inform you that you will be receiving a copy of T-Mobile's Exempt Modification (Zoning)
Application to the CT Siting Council for the site listed above.
It will be delivered via Priority Mail.
The attachment is very large so I am unable to send it through this email system.
Please let me know if you have any questions.
Thank you very much

Deborah Chase
Northeast Site Solutions
Senior Project Coordinator & Analyst
860-490-8839

Attachments

Files must be less than **2 MB**.
Allowed file types: **txt doc pdf docx jpg gif png**.
Attachment #1

Choose File No file chosen

Contact Jose Giner

Your name *

DEBORAH A CHASE

Your e-mail address *

deborah@northeastsitesolutions.com

Subject *

785 Park Avenue, Bloomfield CT 06002

Message *

Good afternoon,
This is to inform you that you will be receiving a copy of T-Mobile's Exempt Modification (Zoning) Application to the CT Siting Council for the site listed above.
It will be delivered via Priority Mail.
The attachment is very large so I am unable to send it through this email system.
Please let me know if you have any questions.
Thank you very much

Deborah Chase
Northeast Site Solutions
Senior Project Coordinator & Analyst
860-490-8839

Attachments

Files must be less than **2 MB**.
Allowed file types: **txt doc pdf docx jpg gif png**.
Attachment #1

Choose File No file chosen

Contact Marguerite Phillips

Your name *

DEBORAH A CHASE

Your e-mail address *

deborah@northeastsitesolutions.com

Subject *

785 Park Avenue, Bloomfield CT 06002

Message *

```
Good afternoon,
This is to inform you that you will be receiving a copy of T-Mobile's Exempt Modification (Zoning)
Application to the CT Siting Council for the site listed above.
It will be delivered via Priority Mail.
The attachment is very large so I am unable to send it through this email system.
Please let me know if you have any questions.
Thank you very much

Deborah Chase
Northeast Site Solutions
Senior Project Coordinator & Analyst
860-490-8839
```

Attachments

Files must be less than **2 MB**.
Allowed file types: **txt doc pdf docx jpg gif png**.

Attachment #1

Choose File No file chosen

Attachment #2

Choose File No file chosen

Exhibit H

UNITED STATES POSTAL SERVICE®

Click-N-Ship®

9405 5036 9930 0004 8656 80 0077 5000 0010 6002

usps.com
$7.75
US POSTAGE
Flat Rate Env

08/26/2020 Mailed from 01566 062S0000001310

P

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Expected Delivery Date: 08/29/20
Ref#: HA140ANCH

0006

Carrier -- Leave if No Response

C017

SHIP TO: SUZETTE DEBEATHAM-BROWN
MAYOR -TOWN OF BLOOMFIELD
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

USPS TRACKING #

9405 5036 9930 0004 8656 80

Electronic Rate Approved #038555749

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 # :
9405 5036 9930 0004 8656 80

Trans. #:	503856389
Print Date:	08/25/2020
Ship Date:	08/26/2020
Expected Delivery Date:	08/29/2020

Priority Mail® Postage:	**$7.75**
Total:	**$7.75**

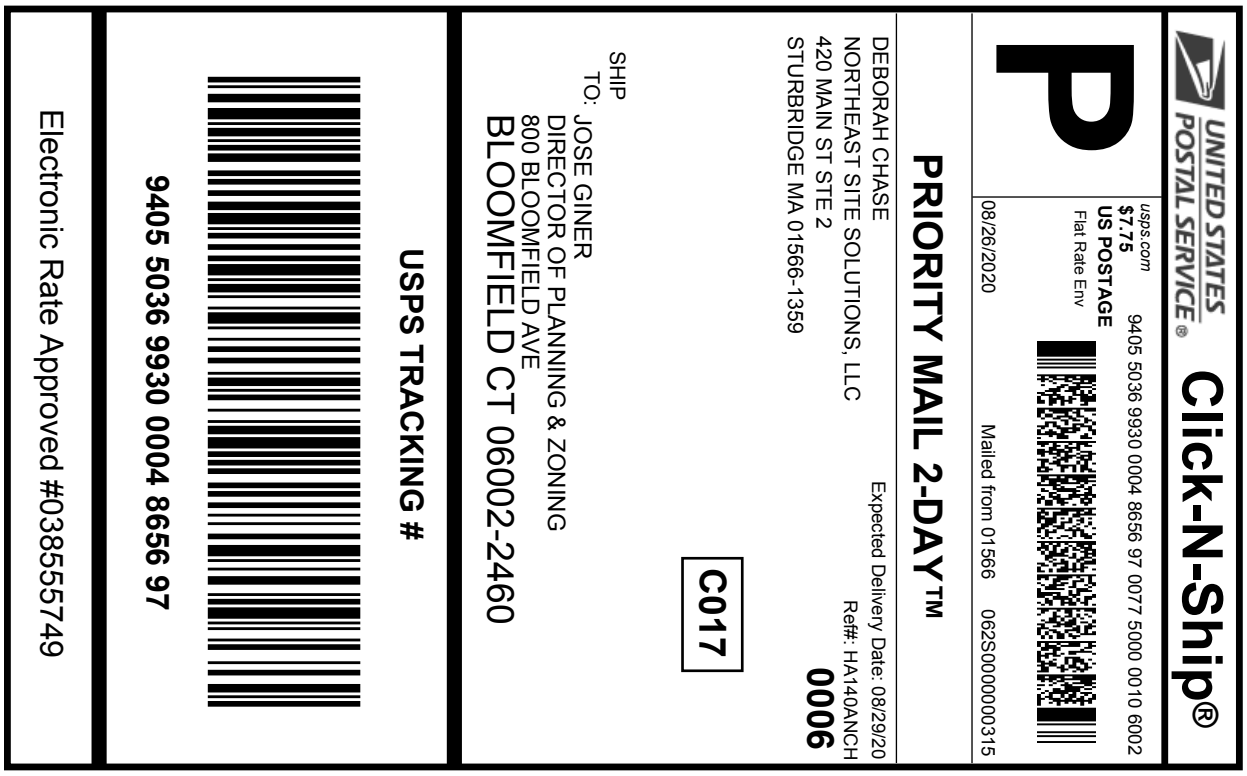
From: DEBORAH CHASE Ref#: HA140ANCH
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

To: SUZETTE DEBEATHAM-BROWN
MAYOR -TOWN OF BLOOMFIELD
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

* 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.

UNITED STATES POSTAL SERVICE®

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.

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Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0004 8656 97

Trans. #:	503856389
Print Date:	08/25/2020
Ship Date:	08/26/2020
Expected Delivery Date:	08/29/2020

Priority Mail® Postage:	**$7.75**
Total:	**$7.75**

From: DEBORAH CHASE Ref#: HA140ANCH
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

To: JOSE GINER
DIRECTOR OF PLANNING & ZONING
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

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UNITED STATES POSTAL SERVICE®

Click-N-Ship®

9405 5036 9930 0004 8657 03 0077 5000 0010 6002

usps.com
$7.75
US POSTAGE
Flat Rate Env

08/26/2020 Mailed from 01566 062S0000000315

P

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

Expected Delivery Date: 08/29/20
Ref#: HA140ANCH

0006

Carrier -- Leave if No Response

C017

SHIP TO: MARGUERITE PHILLIPS
TOWN CLERK- TOWN OF BLOOMFILED
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

USPS TRACKING #

9405 5036 9930 0004 8657 03

Electronic Rate Approved #038555749

Cut on dotted line.

Instructions

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Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0004 8657 03

Trans. #:	503856389
Print Date:	08/25/2020
Ship Date:	08/26/2020
Expected Delivery Date:	08/29/2020

Priority Mail® Postage:	**$7.75**
Total:	**$7.75**

From: DEBORAH CHASE Ref#: HA140ANCH
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

To: MARGUERITE PHILLIPS
TOWN CLERK- TOWN OF BLOOMFILED
800 BLOOMFIELD AVE
BLOOMFIELD CT 06002-2460

* 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.

UNITED STATES POSTAL SERVICE®

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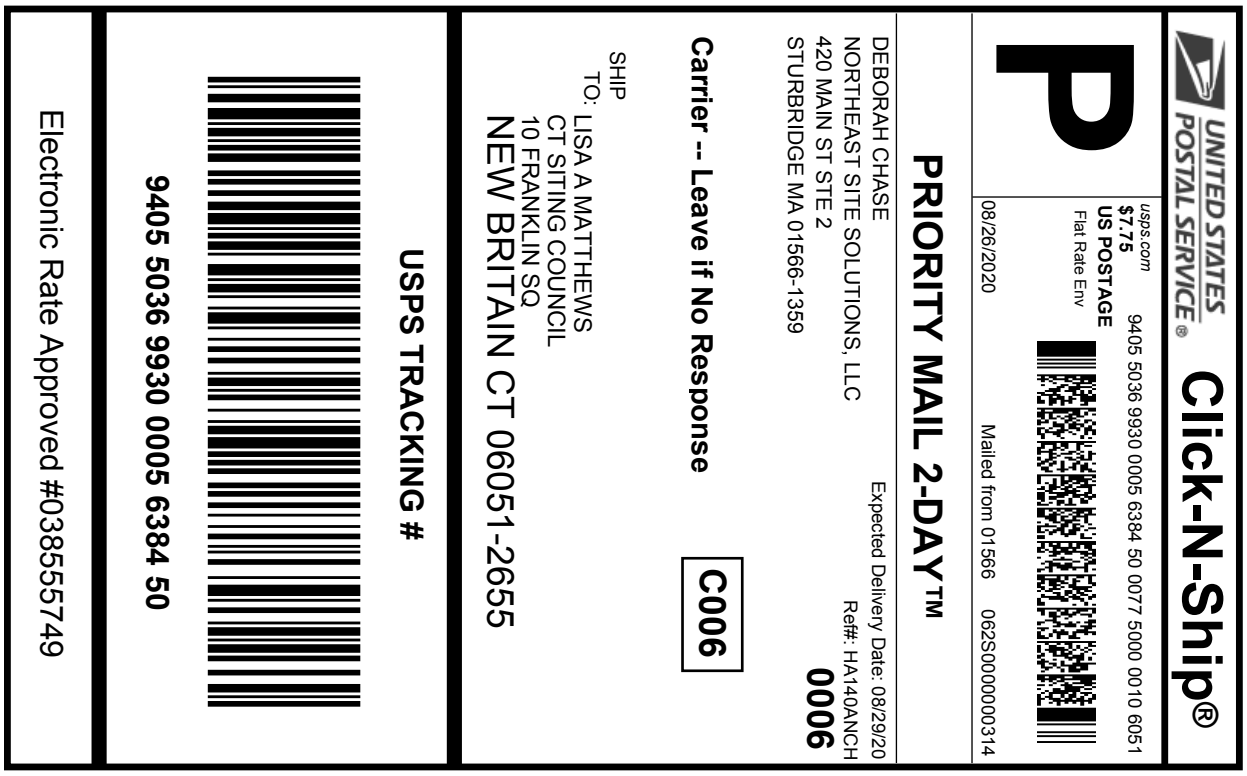

Cut on dotted line.

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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 # :
9405 5036 9930 0005 6384 50

Trans. #:	503910142
Print Date:	08/26/2020
Ship Date:	08/26/2020
Expected Delivery Date:	08/29/2020

Priority Mail® Postage:	**$7.75**
Total:	**$7.75**

From: DEBORAH CHASE Ref#: HA140ANCH
NORTHEAST SITE SOLUTIONS, LLC
420 MAIN ST STE 2
STURBRIDGE MA 01566-1359

To: LISA A MATTHEWS
CT SITING COUNCIL
10 FRANKLIN SQ
NEW BRITAIN CT 06051-2655

* 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.

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