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Also admitted in Massachusetts
and New York

August 12, 2020

Via Electronic Mail

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

Re: **Notice of Exempt Modification – Facility Modification**
880 Post Road East, Westport, Connecticut

Dear Attorney Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 160-foot level of the existing 180-foot tower at 880 Boston Post Road in Westport, Connecticut (the "Property"). The tower and underlying Property are owned by Connecticut State Police ("CSP"). The existing tower was approved by the Siting Council ("Council") for CSP in 1990 (Docket No. 123). A copy of the Council's Decision and Order for Docket No. 123 is included in Attachment 1.

Cellco intends to modify its facility by replacing three (3) existing antennas with three (3) new combined antenna/remote radio head units, removing six (3) remote radio heads ("RRHs") and installing three (3) new RRHs. A set of project plans showing the proposed facility modifications and the specifications for Cellco's new antenna/RRH units and RRHs are included in Attachment 2.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Westport's First Selectman, James Marpe; Mary Young, Westport's Planning & Zoning Director; and Connecticut State Police, the tower and Property 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 State Police tower. Cellco's replacement antenna/RRH units and RRHs will be installed at the 160-foot level on the 180-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, 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 installation of new antenna/RRH units and RRHs will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative Power Density table for the modified facility is included in Attachment 3.

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

6. The tower, its foundation and antenna mounts can support Cellco's proposed facility modifications. (*See* Structural Analysis Report included in Attachment 4 and Mount Structural Analysis Report included in Attachment 5).

A copy of the parcel map and Property owner information is included in Attachment 6. A Certificate of Mailing verifying that a copy of this filing was sent to municipal officials is included in Attachment 7.

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
James Marpe, Westport First Selectman
Mary Young, Planning & Zoning Director
Brian Benito, Connecticut State Police
Tim Parks

ATTACHMENT 1

An application of the Department of Public Safety, Division of State Police, for a Certificate of Environmental Compatibility and Public Need for the construction, operation, and maintenance of a telecommunications tower and associated equipment in the Town of Westport, Connecticut.	:	Docket 123 Connecticut Siting Council March 29, 1990

DECISION AND ORDER

Pursuant to the foregoing Findings of Fact and Opinion, the Connecticut Siting Council finds that the effects associated with the construction, operation, and maintenance of a telecommunications tower, building, and associated equipment at the proposed Westport, Connecticut, site including effects on the natural environment; ecological integrity and balance; public health and safety; scenic, historic, and recreational values; forests and parks; air and water purity; and fish and wildlife are not significant either alone or cumulatively with other effects, are not in conflict with the policies of the State concerning such effects, and are not sufficient reason to deny the application, and therefore directs that a Certificate of Environmental Compatibility and Public Need, as provided by Section 16-50k of the General Statutes of Connecticut (CGS), be issued to Department of Public Safety, Division of State Police, for the construction, operation, and maintenance of a telecommunications tower, associated equipment, and building at the proposed Troop "G" site in Westport, Connecticut.

The facility shall be constructed, operated, and maintained substantially as specified in the Council's record in this proceeding, and subject to the following conditions:

1. The self-supporting lattice tower shall be no taller than necessary to provide the proposed communications and in no event shall the Westport, Troop "G", tower exceed 180 feet above ground level, with antennas and all appurtenances.

2. The facility shall be constructed in accordance with the State of Connecticut Basic Building Code.

3. The Certificate Holder shall prepare a Development and Management (D&M) Plan for this site in compliance with Sections 16-50j-75 through 16-50j-77 of the Regulations of State Agencies. The D&M plan shall include detailed plans for the site's preparation including the tower and building foundation, site access, and erosion and sedimentation controls.

4. The Certificate Holder shall comply with any future radio frequency (RF) standards, promulgated by State or federal regulatory agencies. Upon the establishment of any new governmental RF standards, the facilities granted in this Decision and Order shall be brought into compliance with such standards.

5. The Certificate Holder shall provide the Council a recalculated report of power density if and when circumstances in operation cause a change in power density above the levels originally calculated and provided in the application.

6. The Certificate Holder shall permit public or private entities to share space on the proposed tower for fair consideration, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing.

7. If the facility does not initially provide, or permanently ceases to provide telecommunications service following completion of construction, this Decision and Order shall be void, and the tower and all associated equipment shall be dismantled and removed or reapplication for any new use shall be made to the Council before any such new use is made.

8. Unless otherwise approved by the Council, this Decision and Order shall be void if all construction authorized herein is not completed within three years of the effective date of this Decision and Order.

Pursuant to Section 16-50p, we hereby direct that a copy of the Findings of Fact, Opinion, and Decision and Order be served on each person listed below. A notice of issuance shall be published in the Bridgeport Post, The Hour, and the Advocate.

By this Decision and Order, the Council disposes of the legal rights, duties, and privileges of each party named or admitted to the proceeding in accordance with section 16-50j-17 of the Regulations of State Agencies.

The parties or intervenors to this proceeding are:

Party	Its Representatives
Department of Public Safety Division of State Police	Captain Ronald P. Milkulka Commanding Officer Connecticut State Police Police Support Services 294 Colony Street Building No. 5 Meriden, Connecticut 06450 L.D. McCallum and Robert F. Vachelli Assistant Attorneys General MacKenzie Hall 110 Sherman Street Hartford, Connecticut 06105

Party	Its Representative
Metro Mobile CTS, of Fairfield County, Inc. 50 Rockland Road South Norwalk, Connecticut 06854	Henry H. Sprague, Esq. Robinson & Cole One Commercial Plaza Hartford, Connecticut 06105

Party	Its Representative
Metro Mobile CTS, of 110 East 59th Street New York, New York 10022	Henry H. Sprague, Esq. Robinson & Cole One Commercial Plaza Hartford, Connecticut 06105

Party	Its Representative
Town of Westport 110 Myrtle Avenue Westport, Connecticut 06880	Paul L. Brozdowski Office of Town Attorney 110 Myrtle Avenue Westport, Connecticut 06880

4052E

<u>CERTIFICATION</u>

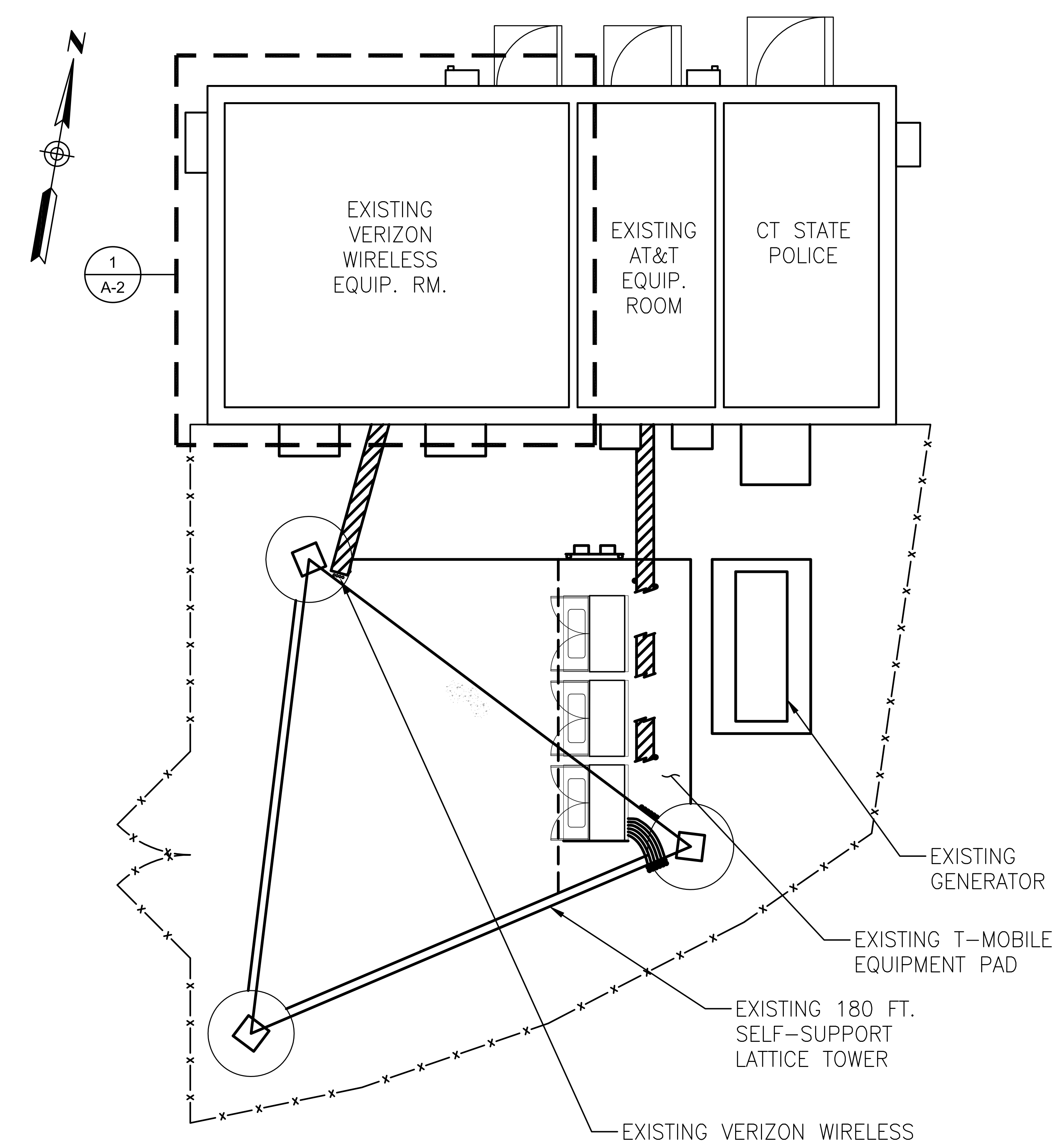
The undersigned members of the Connecticut Siting Council hereby certify that they have heard this case in Docket No. 123 - An application of the Department of Public Safety, Division of State Police for a Certificate of Environmental Compatibility and Public Need for the construction, operation, and maintenance of a telecommunications tower and associated equipment in the Town of Westport, Connecticut or read the record thereof, and that we voted as follows:

Dated at New Britain, Connecticut the 26th day of March, 1990.

Council Members	Vote Cast
Gloria Dibble Pond Chairperson	Yes
Commissioner Peter Boucher Designee: Mark Marcus	Abstain
Commissioner Leslie Carothers Designee: Brian Emerick	Yes
Harry E. Covey	Yes
Mortimer A. Gelston	Yes
Daniel P. Lynch, Jr.	Yes
Paulann H. Sheets	Abstain
William H. Smith	Yes
Colin C. Tait	Absent

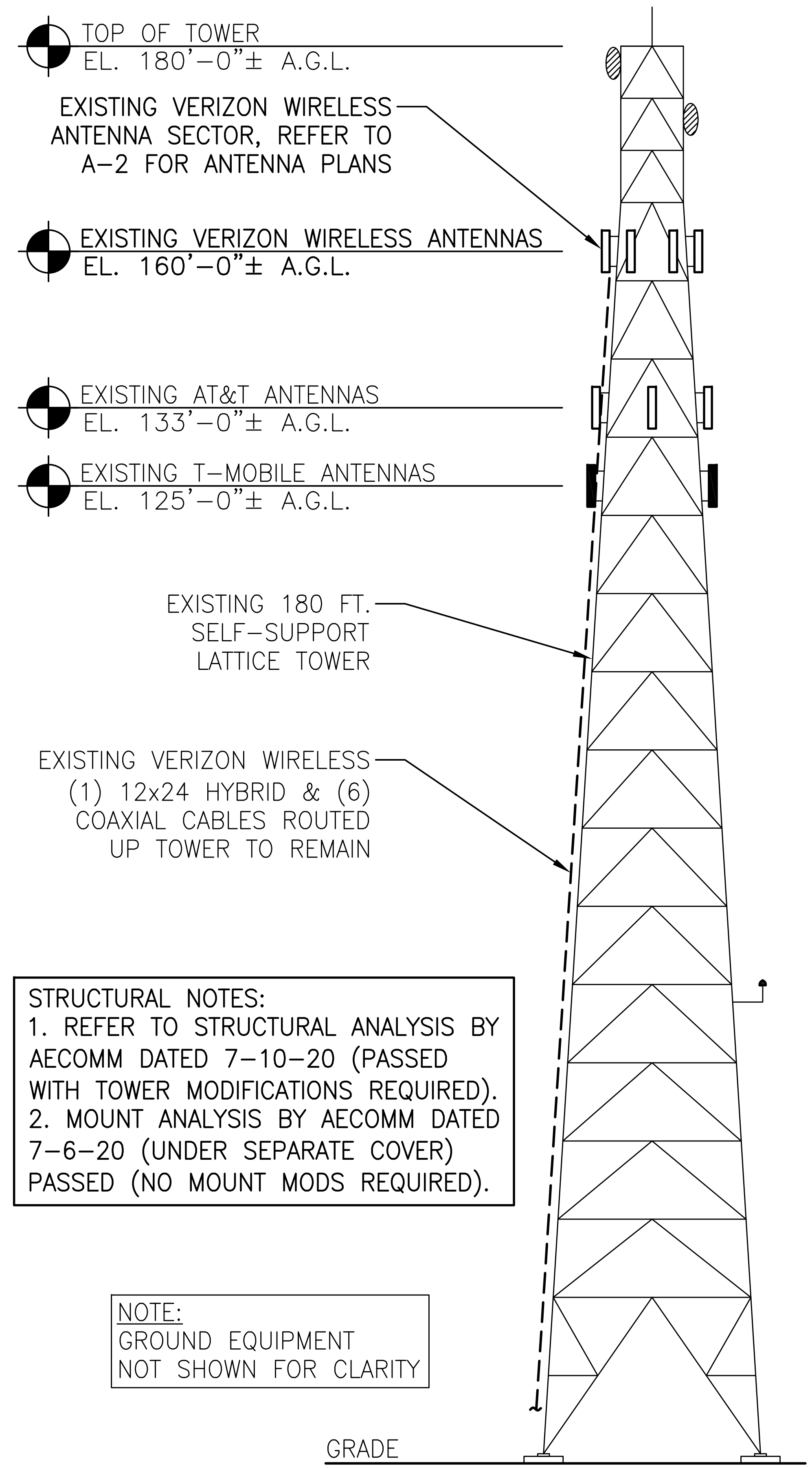
4235E-2

ATTACHMENT 2



NOTES:
1. COMPOUND PLAN IS BASED EXISTING DRAWINGS ON FILE WITH CT SITING COUNCIL AND A LIMITED DESIGN VISIT ON 3-10-20 FOR A PROPOSED VERIZON EQUIPMENT UPGRADE. A COMPOUND SURVEY WAS NOT PERFORMED.
2. PLANS ARE DIAGRAMMATIC ONLY AND NOT TO BE SCALED.
3. REFER TO STRUCTURAL NOTES, THIS PAGE.

1 SITE LAYOUT
Scale: 1/8" = 1'-0"



STRUCTURAL NOTES:
1. REFER TO STRUCTURAL ANALYSIS BY AECOMM DATED 7-10-20 (PASSED WITH TOWER MODIFICATIONS REQUIRED).
2. MOUNT ANALYSIS BY AECOMM DATED 7-6-20 (UNDER SEPARATE COVER) PASSED (NO MOUNT MODS REQUIRED).

NOTE:
GROUND EQUIPMENT NOT SHOWN FOR CLARITY

2 ELEVATION
Scale: NTS

verizon
WIRELESS COMMUNICATIONS FACILITY

20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

On Air Engineering, LLC
88 Foundry Pond Road
Cold Spring, NY 10516
201-456-4624
onair@optonline.net

LICENSURE

STATE OF CONNECTICUT · DAVID A. WEINPAHL · NO. 22144 · LICENSED PROFESSIONAL ENGINEER

DAVID WEINPAHL, P.E.
CT LIC NO. 22144

SUBMITTALS

NO	DATE	DESCRIPTION
0	03.10.20	REVIEW
1	08.04.20	REV. PER UPDATED STRUCT. REPORTS

DRAWN BY: MF
CHECKED BY: DW

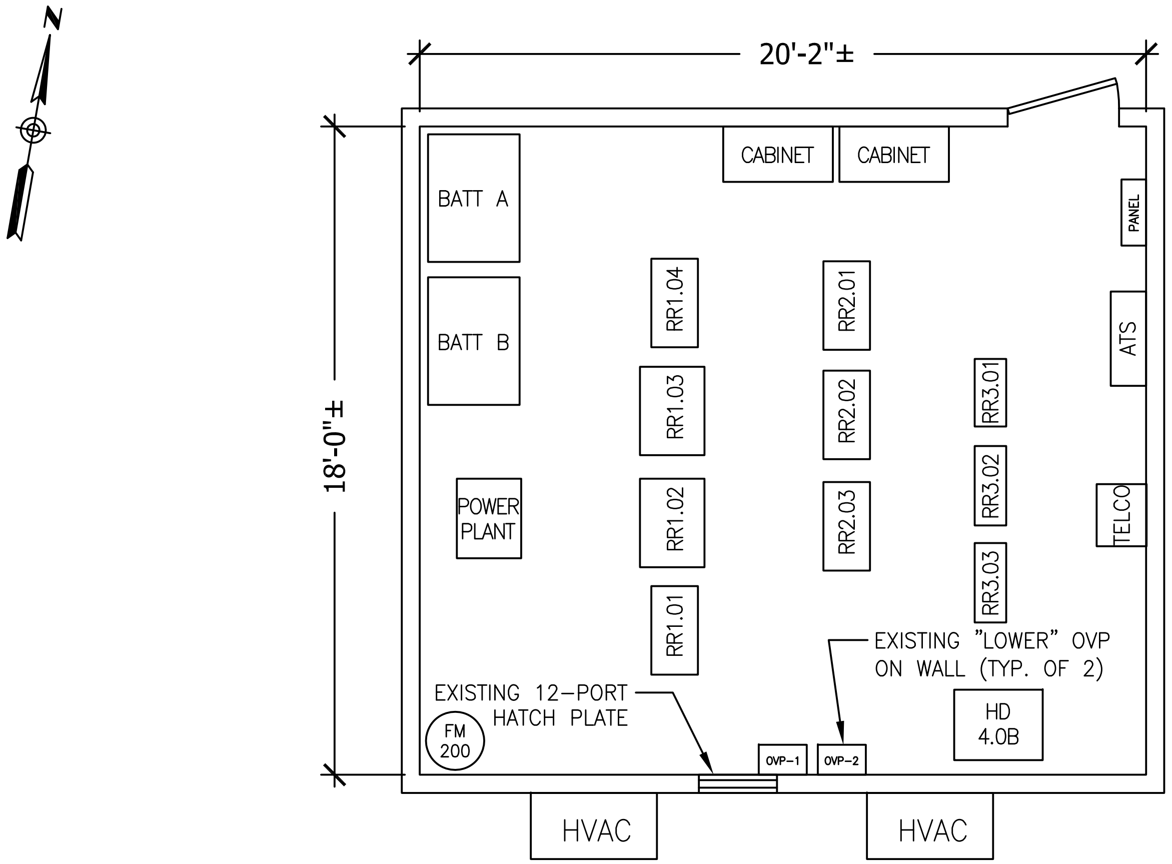
PROJECT NAME:
ANTMO CBRS CARRIER ADD DESIGN EXHIBITS

SITE NAME:
WESTPORT CT

SITE ADDRESS:
CT STATE POLICE TOWER
880 POST ROAD E (US-1)
WESTPORT, CT 06880

SHEET TITLE:
SITE LAYOUT & ELEVATION

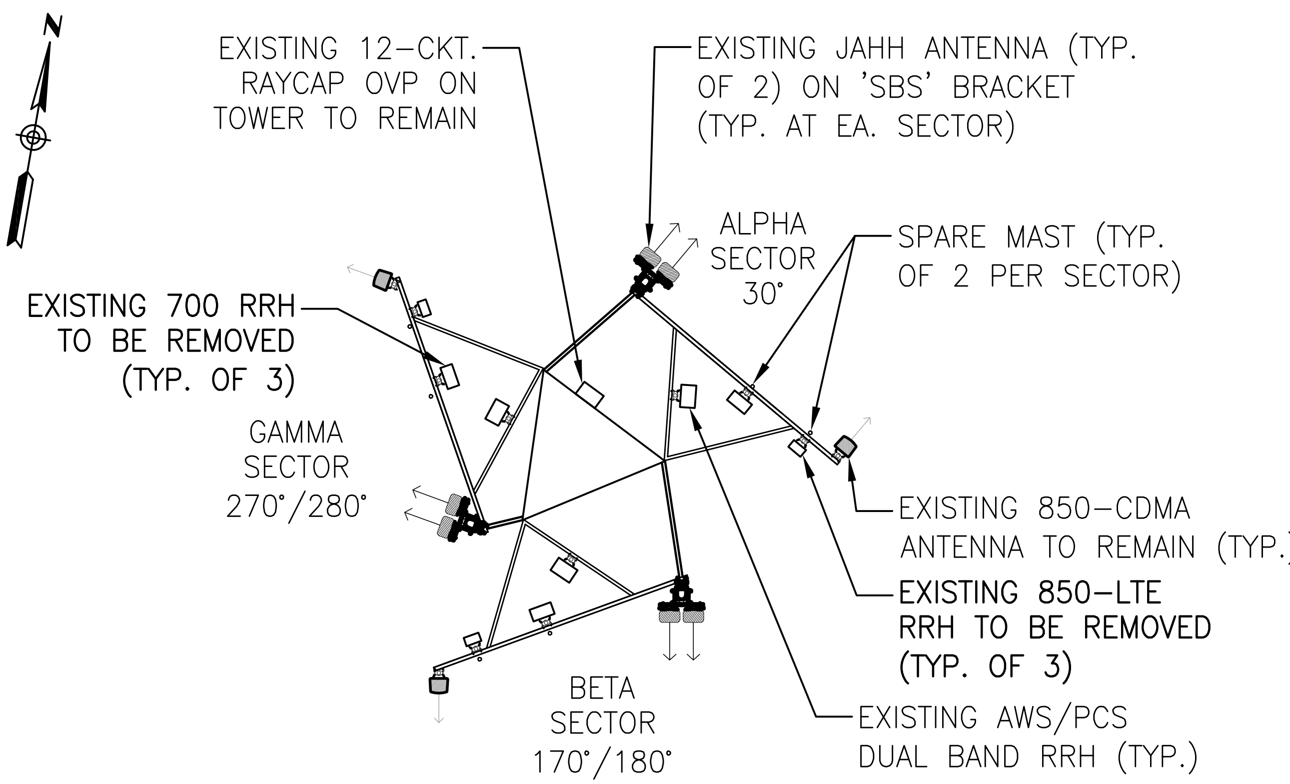
SHEET NUMBER:
A-1



NOTES:
1. CONTRACTOR TO INSTALL NEW AND/OR MODIFY EXISTING SHELTER CABLE ENTRY PORTS FOR THE PROJECT AS REQUIRED INCLUDING THE REMOVAL OF ANY EXISTING COAXIAL CABLES AS DIRECTED BY VERIZON WIRELESS.
2. EQUIPMENT PLAN IS BASED ON EXISTING ROOM PLANS PROVIDED BY VERIZON.

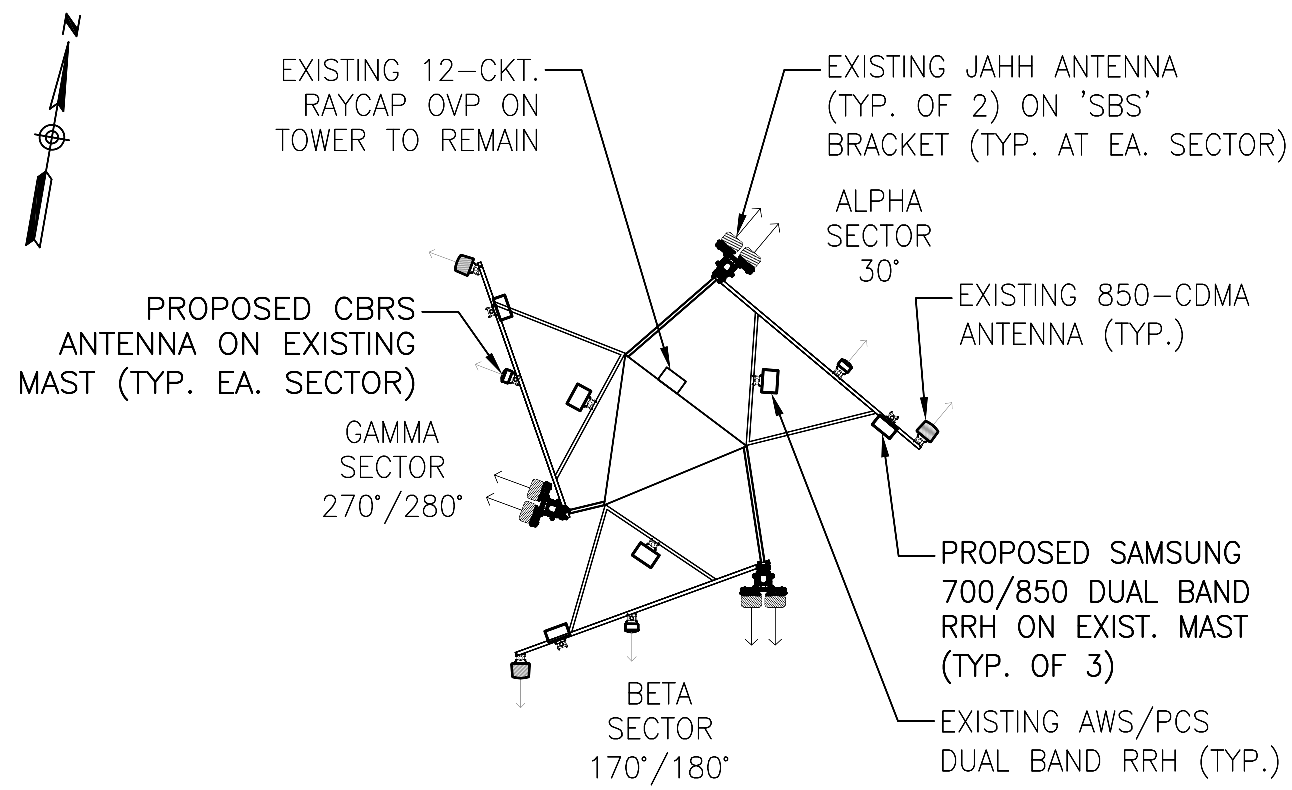
1 EQUIPMENT PLAN - BLDG. AT GRADE

Scale: 1/4" = 1'-0"



2 ANTENNA PLAN @ 160 FT. - EXISTING

Scale: 3/32" = 1'-0"



3 ANTENNA PLAN @ 160 FT. - PROPOSED

Scale: 3/32" = 1'-0"

verizon
WIRELESS COMMUNICATIONS FACILITY
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

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DRAWN BY: MF
CHECKED BY: DW

PROJECT NAME:
ANTMO CBRS CARRIER ADD DESIGN EXHIBITS

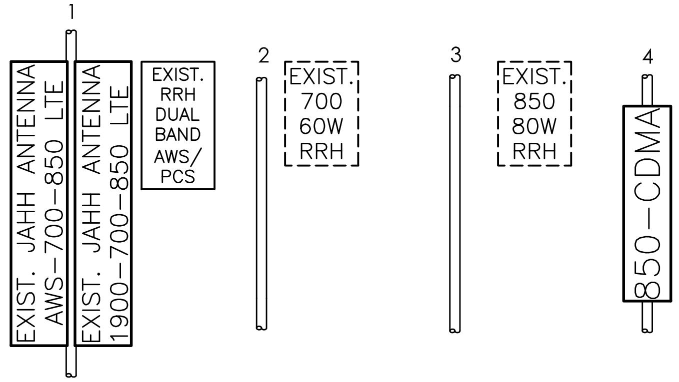
SITE NAME:
WESTPORT CT

SITE ADDRESS:
CT STATE POLICE TOWER
880 POST ROAD E (US-1)
WESTPORT, CT 06880

SHEET TITLE:
EQUIPMENT PLAN & ANTENNA PLANS

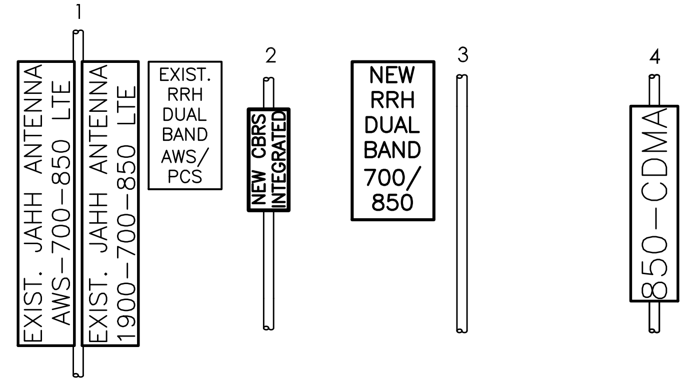
SHEET NUMBER:
A-2

EXISTING - ALPHA



(VIEWED FROM REAR)

PROPOSED - ALPHA



(VIEWED FROM REAR)

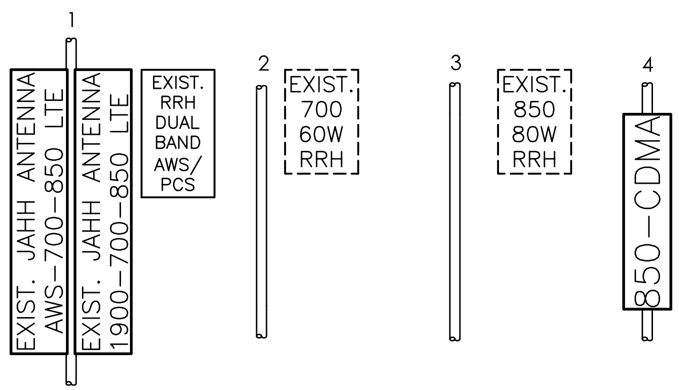
SECTOR: ALPHA				
POSITION	EXISTING ANTENNA	PROPOSED		
		ANTENNA	RRH	OVP
1	AWS-700-850-LTE 1900-700-850-LTE	EXIST. (2) JAHH ON SBS BRACKET	EXIST. AWS/PCS TO REMAIN	-
2	SPARE MAST	NEW CBRS SEE NOTE 1	-	-
3	SPARE MAST	SPARE MAST	NEW 700/850-LTE SEE NOTE 2	SEE NOTE 3
4	850-CDMA	EXISTING TO REMAIN	-	-

NOTES:
1. NEW CBRS INTEGRATED ANTENNA ON SPARE MAST AT POS. 2
2. NEW 700/850-LTE DUAL BAND RRH LOCATED ON BACKSIDE OF POS. 3 MAST; REMOVE EXISTING 700 & 850-LTE RRH'S
3. EXISTING (1) 12-CKT. RAYCAP OVP MOUNTED ON TOWER NEAR GAMMA FRAME TO REMAIN AND FEED ALL SECTOR RRH'S; REFER TO A-4 FOR DIAGRAM

1 ANTENNA SECTOR CONFIGURATIONS - ALPHA

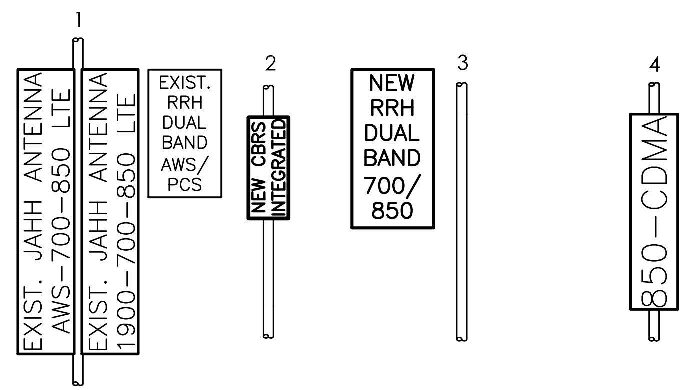
Scale: N.T.S.

EXISTING - BETA



(VIEWED FROM REAR)

PROPOSED - BETA



(VIEWED FROM REAR)

SECTOR: BETA				
POSITION	EXISTING ANTENNA	PROPOSED		
		ANTENNA	RRH	OVP
1	AWS-700-850-LTE 1900-700-850-LTE	EXIST. (2) JAHH ON SBS BRACKET	EXIST. AWS/PCS TO REMAIN	-
2	SPARE MAST	NEW CBRS SEE NOTE 1	-	-
3	SPARE MAST	SPARE MAST	NEW 700/850-LTE SEE NOTE 2	SEE NOTE 3
4	850-CDMA	EXISTING TO REMAIN	-	-

NOTES:
1. NEW CBRS INTEGRATED ANTENNA ON SPARE MAST AT POS. 2
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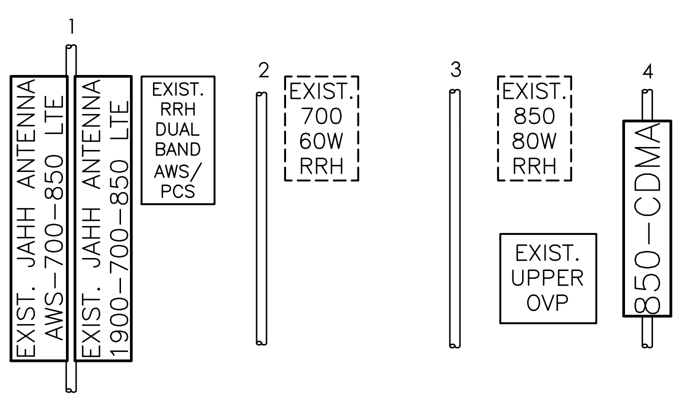
3. EXISTING (1) 12-CKT. RAYCAP OVP MOUNTED ON TOWER NEAR GAMMA FRAME TO REMAIN AND FEED ALL SECTOR RRH'S; REFER TO A-4 FOR DIAGRAM

2 ANTENNA SECTOR CONFIGURATIONS - BETA

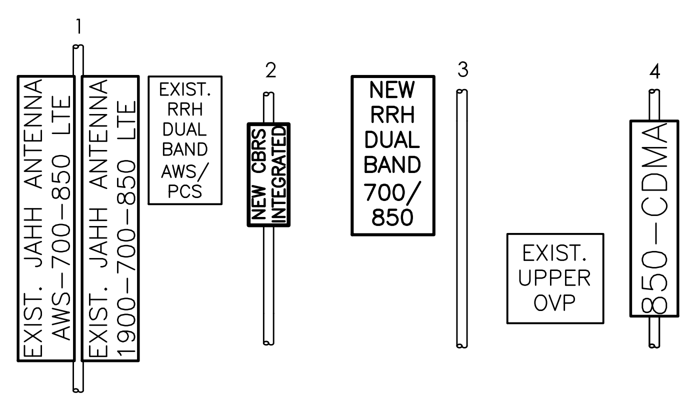
Scale: N.T.S.

EXISTING - GAMMA



(VIEWED FROM REAR)

PROPOSED - GAMMA



(VIEWED FROM REAR)

SECTOR: GAMMA				
POSITION	EXISTING ANTENNA	PROPOSED		
		ANTENNA	RRH	OVP
1	AWS-700-850-LTE 1900-700-850-LTE	EXIST. (2) JAHH ON SBS BRACKET	EXIST. AWS/PCS TO REMAIN	-
2	SPARE MAST	NEW CBRS SEE NOTE 1	-	-
3	SPARE MAST	SPARE MAST	NEW 700/850-LTE SEE NOTE 2	SEE NOTE 3
4	850-CDMA	EXISTING TO REMAIN	-	-

NOTES:
1. NEW CBRS INTEGRATED ANTENNA ON SPARE MAST AT POS. 2
2. NEW 700/850-LTE DUAL BAND RRH LOCATED ON BACKSIDE OF POS. 3 MAST; REMOVE EXISTING 700 & 850-LTE RRH'S
3. EXISTING (1) 12-CKT. RAYCAP OVP MOUNTED ON TOWER NEAR GAMMA FRAME TO REMAIN AND FEED ALL SECTOR RRH'S; REFER TO A-4 FOR DIAGRAM

3 ANTENNA SECTOR CONFIGURATIONS - GAMMA

Scale: N.T.S.

verizon
WIRELESS COMMUNICATIONS FACILITY

20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

On Air Engineering, LLC
88 Foundry Pond Road
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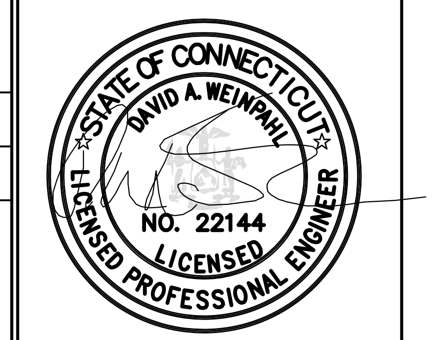
LICENSURE



DAVID WEINPAHL, P.E.
CT LIC NO. 22144

SUBMITTALS

NO	DATE	DESCRIPTION
0	03.10.20	REVIEW
1	08.04.20	REV. PER UPDATED STRUCT. REPORTS

DRAWN BY: MF
CHECKED BY: DW

PROJECT NAME:
ANTMO CBRS CARRIER ADD DESIGN EXHIBITS

SITE NAME:
WESTPORT CT

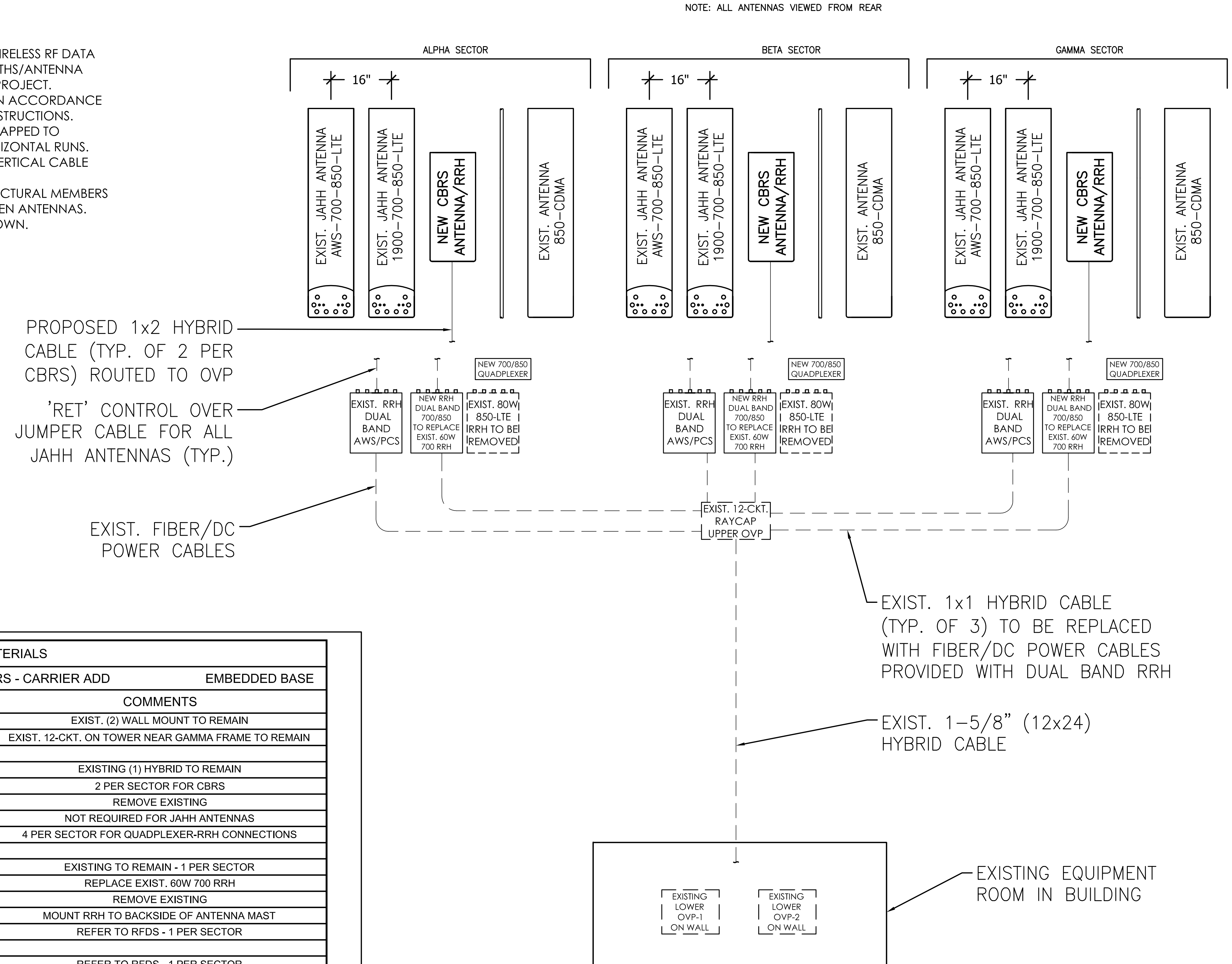
SITE ADDRESS:
CT STATE POLICE TOWER
880 POST ROAD E (US-1)
WESTPORT, CT 06880

SHEET TITLE:
ANTENNA SECTOR CONFIGURATIONS

SHEET NUMBER:
A-3

GENERAL NOTES:

1. CONTRACTOR SHALL REFER TO THE LATEST VERIZON WIRELESS RF DATA SHEET WHICH MAY INCLUDE ANTENNA SECTOR AZIMUTHS/ANTENNA CHANGES, ETC. THAT ARE REQUIRED AS PART OF THE PROJECT.
2. CONTRACTOR SHALL SECURE ALL CONTROL CABLES IN ACCORDANCE WITH INDUSTRY STANDARDS AND MANUFACTURERS INSTRUCTIONS. EXTERIOR CONTROL CABLES MAY BE TAPED OR TIE-WRAPPED TO EXISTING COAXIAL CABLES EVERY 4 FT. MAX. FOR HORIZONTAL RUNS. CONTRACTOR MAY USE HOISTING GRIPS AT TOP OF VERTICAL CABLE RUNS IN CERTAIN APPLICATIONS.
3. ALL CABLES SHALL BE ROUTED AND SECURED ON STRUCTURAL MEMBERS ONLY - DO NOT "LOOP" THE CABLES IN MID-AIR BETWEEN ANTENNAS.
4. COAXIAL CABLES AND QUADPLEXER WIRING NOT SHOWN.



BILL OF MATERIALS			
SITE NAME: WESTPORT CT		ANTMO CBRS - CARRIER ADD	EMBEDDED BASE
DESCRIPTION	QTY	LENGTH	COMMENTS
LOWER OVP	-	-	EXIST. (2) WALL MOUNT TO REMAIN
UPPER OVP	-	-	EXIST. 12-CKT. ON TOWER NEAR GAMMA FRAME TO REMAIN
12x24 HYBRID CABLE	-	-	EXISTING (1) HYBRID TO REMAIN
1x2 HYBRID CABLE	6	30 FT.	2 PER SECTOR FOR CBRS
1x1 HYBRID CABLE	-	-	REMOVE EXISTING
RET CONTROL CABLE	-	-	NOT REQUIRED FOR JAHH ANTENNAS
1/2" JUMPER CABLE	12	6 FT.	4 PER SECTOR FOR QUADPLEXER-RRH CONNECTIONS
AWS/PCS DUAL BAND RRH	-	-	EXISTING TO REMAIN - 1 PER SECTOR
700/850 DUAL BAND RRH	3	-	REPLACE EXIST. 60W 700 RRH
850-LTE RRH	-	-	REMOVE EXISTING
RRH PIPE MOUNT BRACKET	3	-	MOUNT RRH TO BACKSIDE OF ANTENNA MAST
QUADPLEXER	3	-	REFER TO RFDS - 1 PER SECTOR
CBRS INTEGRATED ANTENNA/RRH	3	-	REFER TO RFDS - 1 PER SECTOR
AWS-700-850-LTE ANTENNA	-	-	EXIST. JAHH ON 'SBS' BRACKET TO REMAIN - 1 PER SECTOR
1900-700-850-LTE ANTENNA	-	-	EXIST. JAHH ON 'SBS' BRACKET TO REMAIN - 1 PER SECTOR
850 CDMA ANTENNA	-	-	EXISTING TO REMAIN - 1 PER SECTOR
1900 PLACEHOLDER	-	-	REMOVE EXISTING

NOTES:
1. ITEMS SHOWN ARE FOR MAJOR DESIGN ELEMENTS ONLY. REFER TO VERIZON WIRELESS B.O.M. FOR ALL MANUFACTURER PART NUMBERS AND ACCESSORY ITEMS REQUIRED FOR A COMPLETE INSTALLATION.
2. EXISTING JUMPERS TO REMAIN; RE-CONNECT EXISTING 700 & 850-LTE RRH JUMPERS TO NEW DUAL BAND RRH; JUMPER LENGTH NOTED IS AVERAGE LENGTH; CONTRACTOR TO VERIFY ALL LENGTHS.

1 BILL OF MATERIALS
Scale: NTS

2 RF PLUMBING DIAGRAM
Scale: NTS

verizon
WIRELESS COMMUNICATIONS FACILITY

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NO	DATE	DESCRIPTION

DRAWN BY: MF
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PROJECT NAME:
ANTMO CBRS CARRIER ADD DESIGN EXHIBITS

SITE NAME:
WESTPORT CT

SITE ADDRESS:
CT STATE POLICE TOWER
880 POST ROAD E (US-1)
WESTPORT, CT 06880

SHEET TITLE:
RF PLUMBING DIAGRAM & B.O.M.

SHEET NUMBER:
A-4

SAMSUNG

Dual-Band Radio Unit
700/850MHz (B13/B5)
RFV01U-D2A

Samsung’s RFV01U-D2A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.

The RFV01U-D2A RU targets dual-band support across Band 13 (700MHz) and Band 5 (850MHz), making it an ideal product for broad coverage footprints across multiple common low-end, long-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung’s CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B13: DL(746-756MHz)/UL(777-787MHz)
B5: DL(869-894MHz)/UL(824-849MHz)
Instantaneous Bandwidth: 10MHz(B13) + 25MHz(B5)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 207mm (29.9L)
Weight: 31.9kg
Input Power: -48V DC
Operating Temp.: -40 - 55°(w/o solar load)
Cooling: Natural convection

[CBRS] Clip-on Antenna Specifications

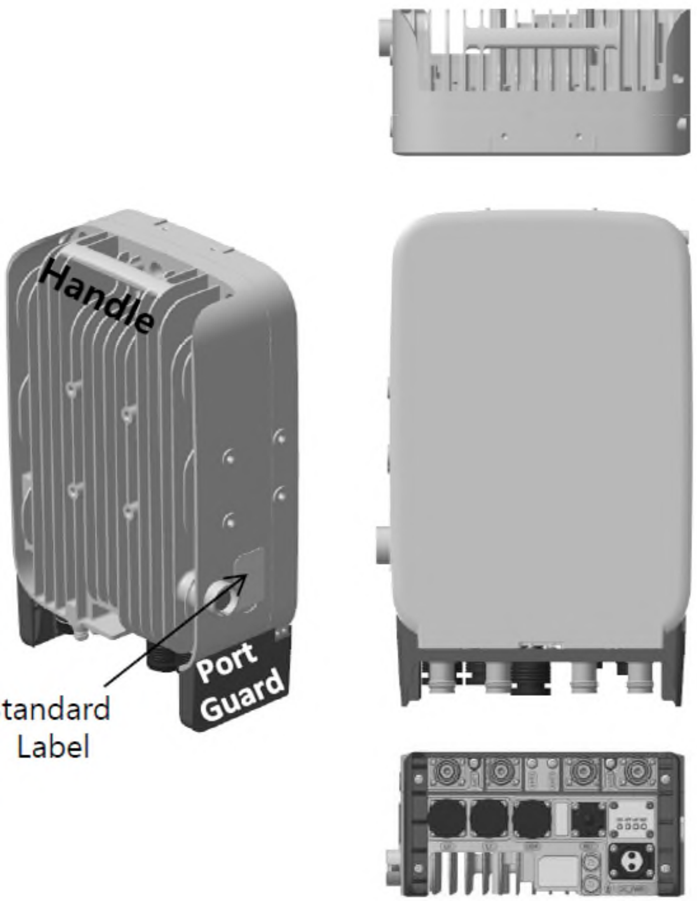
VzW accepted IP45 in FLD,
but IP55 is Samsung Spec.

Items	Clip-on Antenna, BASTA**
Antenna Gain	12.5 ± 0.5 dBi (Max 13 dBi)
Horizontal BW (-3dB)	65° ± 5°
Vertical BW (-3dB)	17° ±3°
Electrical Tilt	8° (fixed) ±2°
Front-to-Back Ratio	> 25 dB
Port-to-Port Tracking	< 3 dB
VSWR	< 1.5
Isolation	> 25 dB
Ingress Protection	**IP55**
Size	220(W)×313(H)×34.3(D) mm (*) (8.7 x 12.3 x 1.4 inch.)
Weight	< **2.0** kg [Typ. 1.3 kg]
It is required that the radio should be weatherproofed properly with JMA WPS Boot with external antenna or with Weatherproof Boot for clip-on antennas.	

Antenna includes integrated cable with connector
* Design is subject to minor change

** Ant. spec. follows NGMN recommendations on Base Station Antenna Standards (BASTA). For example, 'mean ± tolerance of 86.6%' is applied to double-sided specification of statistical RF parameters.

[CBRS RRH] Spec.



Current Size: 216 x 307 x 105.5 mm (6.99L)
(8.5 x 12.1 x 4.1 inch., excluding Port Guard)
Design is subject to minor change

Item	Specification
Band	Band 48 (3.5 GHz)
Frequency	3550~3700 MHz
IBW	150 MHz
OBW	80 MHz
# of Carriers	5/10/15/20 MHz x 4 carriers
RF Chain	4TX / 4RX
RF Output Power & EIRP	4 path x 5 W (Total: 20 W = 43 dBm) (EIRP: 47 dBm / 10 MHz)
RX Sensitivity	Typical : -101.5 dBm @ 1 Rx (3GPP 36.104, Wide Area)
Modulation	256-QAM support (1024-QAM with 1~2dB power back-off)
Input Power	-48 VDC (-38 to -57 VDC, 1 SKU), with clip-on AC-DC converter (Option)
Power Consumption	About 160 Watt @ 100% RF load, typical conditions
Volume	**Under 7L** (w/o Antenna), Under 9.6L (with antenna)
Weight	**Under 8.0 kg** (**18.64** lb) (w/o Antenna), Under 10.5 Kg (with ant.)
Operating Temperature	-40°C (-40°F) ~ 55°C (131°F) (W/o solar load)
Cooling	Natural convection
Unwanted Emission	3GPP 36.104 Category A
	[B48] : FCC 47 CFR 96.41 e)
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, duplex or Bi-Di
CPRI Cascade	Not supported
# of Antenna Port	4
External Alarm (UDA)	4
RET	AISG 2.2
TMA & built-in Bias-T I//F and PIM cancellation	Not supported
Mounting Options	Pole, wall, tower, back to back, side by side (for external ant), 3 RRH with Clip-on Antenna on the pole
Antenna Type	Integrated (Clip-on) antenna (Option), External antenna (Option)
NB-IoT	Not Supported (HW Resource reserved for 1 Guard Band NB-IoT per LTE carrier)
Spectrum Analyzer	TX/RX Support
External Alarm (UDA)	4
5G NR	Support with S/W upgrade
XRAN	Support with S/W upgrade

ATTACHMENT 3

	General	Power	Density					
Site Name: Westport								
Structure Height: 180 Ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T	1	368	133	850	0.0082	0.5667	0.14%	
*AT&T	1	1476	133	737	0.0329	0.4913	0.67%	
*AT&T	1	4842	133	1900	0.1080	1.0000	1.08%	
*AT&T	1	3837	133	2100	0.0856	1.0000	0.86%	
*AT&T	1	1285	133	2300	0.0287	1.0000	0.29%	
*T-Mobile	4	1167	125	1900	0.1185	1.0000	1.19%	
*T-Mobile	1	865	125	700	0.0220	0.4667	0.47%	
*T-Mobile	2	2334	125	2100	0.1185	1.0000	1.19%	
*State Police	1	330	180	42.04	0.0039	0.2000	0.20%	
*State Police	1	51	169	954.4	0.0007	0.6363	0.01%	
5G 28GHz	**0**	**610**	**160**	**0**	**28000**	**1.0000**	**0.00%**	
VZW CBRS	**1**	**50**	**160**	**0.0007**	**3600**	**1.0000**	**0.07%**	
VZW PCS	**1**	**1586**	**160**	**0.0223**	**1970**	**1.0**	**2.23%**	
VZW Cellular LTE	**1**	**2925**	**160**	**0.0070**	**869**	**0.579333**	**1.21%**	
VZW Cellular	**1**		**160**	**0.0070**	**869**	**0.57933**	**1.21%**	
VZW AWS	**1**	**4550**	**160**	**0.0220**	**2145**	**1.0**	**2.20%**	
VZW 700	**1**	**2450**	**160**	**0.0091**	**746**	**0.497333**	**1.82%**	
								14.83%
* Source: Siting Council								

ATTACHMENT 4

Submitted to
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Submitted by
AECOM
500 Enterprise Drive,
Suite 3B
Rocky Hill, CT 06067
July 10, 2020

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

Site Name: CT State Police Tower
Site ID : 325126
Site Address: 880 Post Road East
Westport, Connecticut
CSP Tower # 32

60620140
VZ5-224 Revision 1

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

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

The structural analysis was conducted in accordance with the 2018 Connecticut State Building Code which includes the TIA-222-H[1] Standard, 2018 International Building Code, the 2018 Connecticut State Building Code Amendments, the AISC[2] Load Resistance Factor Design (LRFD), the ASCE 7[3] design Code, and the Connecticut State Police Requirements which include the TIA/EIA-222-F[4] Standard.

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

The proposed Verizon Wireless (VZW) antenna modifications are listed below:

Antennas and other Appurtenances	Carrier	Antenna Center Elevation
<u>Remove:</u> **(3) Antel BXA-171063-12CF-EDIN-2 Panel Antennas** **(3) Nokia B13 (4x30) RRH Units** **(3) Nokia 4T4R B5 (160W) RRH Units**	**VZW (existing)**	**@ 160'**
<u>Install:</u> **(3) Samsung XXDWMM-12.5-65-8T-CBRS Panel Antennas** **(3) Commscope CBC78T-DS-43-2X Quadplexer Units** **(3) Samsung B5/B13 (RFV01U-D2A) RRH Units** **(3) Samsung CBRS RT4401-48A RRH Units** **(6) 1x2 Hybrid Jumper cables for CBRS Units (Antennna to TMA connections)**	**VZW (Proposed)**	**@ 160'**

The results of an initial analysis indicated the existing tower structure was unable to contain the Department of Emergency Services and Public Protection) / Connecticut State Police (DESPP / CSP) requirement of 0.75 degrees of combined twist (rotation) and sway (deflection) with the proposed load classification stated above. The tower structure requires modifications stated in SK-1 through SK-3. **Once the modifications indicated on sheets SK-1 though SK-3 are performed, the modified tower structure, existing tower anchors and foundations are considered structurally adequate with the wind load specification indicated above with the existing and proposed antenna loading herein. The maximum structural capacity calculated herein (after modification) is <u>86.8 %</u>**

The modified tower sway (deflection) is 0.3892 degrees and the modified tower twist (rotation) is 0.3201 degrees. These figures combined ARE within the DESPP / CSP specification of 0.75 degrees combined for sway (deflection) and twist (rotation).

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

2. AISC = American Institute of Steel Construction (15th Edition)

3. ASCE 7 = American Society of Civil Engineers Standard 7 (2016 Edition)

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

1. EXECUTIVE SUMMARY *(continued)*

This analysis is based on:

1) The tower structure's theoretical capacity not including any assessment of the condition of the tower.
2) Original tower report prepared by Rohn Industries, Inc., engineering file 26263DL and drawing C910693 dated February 1, 1991.
3) Soil investigation and foundation capacity report prepared by Dr. Clarence Welti, P.E., P.C., dated October 10, 2002.
4) Tower Mapping and Inventory by D&K Nationwide Communications Inc., performed on March 18, 2016.
5) Previous structural analysis and evaluation provided by AECOM on behalf of Motorola / Connecticut State Police, project PNS-606 / 60509756.06, signed and sealed on September 16, 2016.
6) Previous structural analysis and modification performed by AECOM on behalf of AT&T, project number 60581632 / SMK-004, signed and sealed on July 13, 2018.
7) Previous structural analysis and evaluation performed by AECOM on behalf of T-Mobile, project number TWM-020 / 60607321 signed and sealed on June 19, 2019.
8) Proposed Verizon Wireless (VZW) antenna inventory from Radio Frequency Data Sheet (RFDS) dated March 11, 2020, obtained via e-mail dated June 9, 2020.
9) Update of Department of Emergency Services and Public Protection) / Connecticut State Police (DESPP / CSP) service antennas obtained via e-mail dated June 9, 2020.
10) Previous structural analysis performed by AECOM on behalf of Verizon Wireless (VZW), project number 60620140 / VZ5-224, signed and sealed on June 25, 2020.
11) Previous structural analysis of Verizon Wireless equipment mount, performed by AECOM on behalf of Verizon Wireless (VZW), project VZ5-224, signed and sealed on July 6, 2020.
12) Antenna and mount configuration as specified on the following pages of this report.

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

If you should have any questions, please contact Michael Egan at (860) 263-5817.

Sincerely,

AECOM,

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

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

cc: DJR – AECOM
CF/Book

2. INTRODUCTION

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

The structural analysis was conducted in accordance with the following:

- 2018 International Building Code (compliant with the TIA-222-H design loads)
- 2018 International Building Code with 2018 Connecticut State Building Code Amendments for a wind speed of 130 mph (3-second gust – factored wind)
- 2016 AISC Load Resistance Factor Design (LRFD)
- 2016 ASCE 7 Minimum Design Loads for Buildings and Other Structures for the ice thickness referenced in the TIA-222-H Standard
- Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) and 90 mph (fastest mile) concurrent with 0.5" ice. Twist (rotation) and sway (deflection) were determined in accordance with Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) concurrent with 0.5" ice, analyzed under the TIA/EIA-222-F design Standard.

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

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) Telewave ANT490Y10-WR Yagi Antenna	D&K-51 CSP-1 (existing)	Mounted to Tower Safety Cable assembly	@ 187'	(1) LDF5-50A
(1) Scala OGT9-806 Omni Antenna	D&K-48 CSP-49 (existing)	6' Side Arm Mount @ 175'	@ 184'	(1) LDF7-50A
(1) Telewave ANT150Y7-WR Yagi Antenna	CSP-22 (existing)	Pipe Mounted to Leg	@ 181'	(1) LDF5-50A
(1) Celwave PA6-65 Dish with Radome	D&K-52 CSP-42 (existing)	Dish Standoff	@ 177'	(1) EW-63
(3) RFI BPA7496-180-14 Panel Antennas (on (3) Antenna Pipe Mounts on Frame) (1) Bird 432E-83I-01T TTA Unit (Re-located to updated mount frame)	CSP – 47, 80, 81, 82 (existing)	(1) SitePro1 USF12-396-U Sector Frame Mount w/ (1) Stiff-Arm Support	@ 170'	(3) AVA7-50A (1) LDF4-50A
(1) 4' Yagi Antenna	CSP (existing)	Pipe Mounted to Leg	@ 169'	(1) LDF5-50A

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(3) Samsung XXDWMM-12.5-65-8T-CBRS Panel Antennas (3) Commscope CBC78T-DS-43-2X Quadplexer Units (3) Samsung B5/B13 (RFV01U-D2A) RRH Units (3) Samsung CBRS RT4401-48A RRH Units	**Verizon (Proposed)**	*Shared with Below Mount*	**@ 160'**	**(6) 1x2 Hybrid Jumper for CBRS Units**
(6) JAHH-65B-R3B Panel Antennas (1) Amphenol BXA 70080-4CF Panel Antennas (Alpha Sector) (2) Amphenol BXA-70063-4CF Panel Antennas (Beta and Gamma Sectors) (2) Raycap DB-T1-6Z-8AB-0Z Distribution Boxes (3) Samsung 4x40_B2/B66 RRH Units	D&K-27 – 46 Verizon (existing)	(3) Commscope BSAMNT-SBS-2-2 Antenna Mount Assembly for JAHH Panel Antennas (1 per Sector) shared with (3) 15' T-Frames	@ 160'	(6) LDF7-50A (2) 1 5/8" Fiber
(6) P65-16-XLH-H-RR Panel Antennas (3) CCI HPA-65R-BUU-6 Panel Antennas (6) RRUS-11 Units (2) DC6-48-60-18-8F Distribution Box (3) TT19-08BP111-001 Twin TMA's (3) RRUS-32 RRH Units	D&K-13 – 26 AT&T (existing)	(3) Existing Antenna Mount Frames	@ 133'	(12) LDF6-50A (2) Fiber Optic Cable (4) DC Cables
(3) Ericsson AIR 32 B66|B2A Panel Antennas (3) RFS APXVAARR24_43-U-NA20 Panel Antennas (3) Ericsson Radio 4449 B71+B12 RRH Units (3) TMAs (3) Ericsson AIR 21 B2A|B4P Panel antennas	D&K-2 – 12 T-Mobile (existing)	(3) Antenna Frame Mounts (Valmont Site Pro 1 part # LTF12-372)	@ 125'	(6) LDF7-50A (3) Ericsson 6x12 HCS Hybrid Cables (1) Huber Suhner Hybrid cable

Antenna Type	Carrier	Mount	Antenna Centerline Elevation	Cable
(1) Telewave ANT150D 1-Bay Dipole Antenna	CSP (existing)	Pipe Mounted to Leg	@ 113’	(1) LDF4-50A
(1) GPS Antenna	D&K-1 CSP-43 (existing)	Leg Mount	@ 61’	(1) LDF4-50A

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

This structural analysis of the communications tower was performed by AECOM, for Verizon Wireless. The purpose of this analysis was to investigate the structural integrity of the modified tower and existing foundation for existing and proposed antenna loads in compliance with the 2018 Connecticut State Building Code and the forthcoming TIA-222-H Standard. This analysis was conducted to evaluate stress on the tower and the effect forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with, the TIA-222-H–Structural Standard for Antenna Towers and Antenna Supporting Structures and Antennas, the 2015 International Building Code with 2018 Connecticut State Building Code Amendments, the 2018 International Building Code (in compliance with the TIA-222-H Standard) and the American Institute of Steel Construction (AISC) Manual of Steel Construction– Load Resistance Factor Design (LRFD)

The structural analysis was conducted using TNX Tower version 8.0.5.0 and used the following conditions for this tower review (following the TIA/EIA-222-H Standard):

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

Basic Wind Speed:

- IBC 2018 w/ 2018 CT State Building Code Amendment:
  - (2018) IBC Section 1609.1.1 – Determination of Wind Loads – Exception 5 “Designs using TIA-222” applies for determination of Design Wind Load obtained as “V.ult” are to be converted to “V.asd” when applying the TIA-222-H design Standard (under Section 1609.3) for Basic Wind Speed. The TNX program implements the use of the V.ult for design and analysis and internally applies this loading exception.
  - (2018) CT State Building Code Amendment to the IBC Section 1609.3 wind loads are obtained from Appendix N of the State Building Code.
    - **V.ult = 130 mph** (3-Second Gust) Wind Design Parameter for the Town of Westport, Connecticut for Risk Category four (IV) for essential communications (Connecticut State Police). *NOTE: Risk category 3 (III) requires equivalent wind speed for design loading.*

LOAD CONDITION 1 = 130 MPH (3-SECOND GUST) WIND LOAD (WITHOUT ICE) + TOWER DEAD LOAD
Load Condition 2 = 50 mph (3-second gust) Wind Load (with ice) + Ice Load + Tower Dead Load

Ice thickness used for this analysis is **1.00 inch** (assumed to start at the base of the tower) and is considered to increase in thickness with height. The initial ice thickness for design is referenced in the Annex of TIA-222-H and follows the same design criteria as the ASCE 7 (2016) Standard.

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

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS (cont.)

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

Seismic event consideration factors/values for design:

- S.s = 0.226 (2018 CT State Building Code – Location Specific Value)
- S.1 = 0.067 (2018 CT State Building Code – Location Specific Value)
- Site Classification = "D"
- Seismic Design Category = "A" – (2018 International Building Code)
- F.a = 1.6 (Obtained from TIA-222-H Table 2-11 Considering above conditions)
- F.v = 2.4 (Obtained from TIA-222-H Table 2-12 Considering above conditions)

NOTE: TIA-222-H Section 9.8 require S.s values to be greater than 1.0 to be applied for analysis. Due to the S.s value below this threshold, the seismic base shear calculation is omitted from this structural analysis report.

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

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

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

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

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

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

4. FINDINGS AND EVALUATION

The combined axial and bending stresses on the tower structure were evaluated to compare with the strength design in accordance with AISC (LRFD). The results of an initial analysis indicated that the existing tower structure was unable to contain the Department of Emergency Services and Public Protection / Connecticut State Police (DESPP / CSP) requirement of 0.75 degrees of combined twist (rotation) and sway (deflection) with the proposed load classification stated herein. The tower structure required modifications indicated on sheets SK-1 thorough SK-3. **Once the modifications indicated on sheets SK-1 through SK-3 are performed, the modified tower structure, existing tower anchors and foundation is considered structurally adequate with the wind load specification indicated herein with the existing and proposed antenna loading.**

The modified tower sway (deflection) is 0.3892 degrees and the modified tower twist (rotation) is 0.3201 degrees. These figures combined ARE within the DESPP / CSP specification of 0.75 degrees combined for sway (deflection) and twist (rotation).

Tower Base Reactions (TIA-222-H):

Description	Ultimate Reactions (Geotech 10/10/2002) (TIA-222-H)	Current (Factored) TIA-222-H	Stress (% capacity)	Pass/ Fail
Pier Compression (kips)	665	390	58.6	Pass
Pier Uplift (kips)	492	345	70.1	Pass
Overall Overturning (kip-ft)	---	8990	---	---
Overall Shear (kips)	---	95.9	---	---
Shear per Leg (kips)	---	55.5	---	---

Tower Component Stress vs. Capacity Summary:

Component / (Section No.)	Controlling Component/ Elevation	Stress (% capacity)	Pass/ Fail	Comments:
Tower Leg (T13)	1/3 9.6250x0.375 U-Bolted to ROHN 8 EHS (previous modification) / 0' – 20'	68.9	Pass	
Diagonal (T12)	ROHN 3 EH / 20' – 30'	86.8	Pass	
Horizontal (T11)	ROHN 2.5 STD / 30'-40'	79.8	Pass	
Top Girt (T12)	ROHN 2.5 EH / 20'-30'	73.8	Pass	
Redund Horz 1 Bracing (T13)	ROHN 1.5 STD / 0'-20'	42.5	Pass	
Redund Diag 1 Bracing (T13)	Pipe 1.5x0.200 / 0'-20'	59.5	Pass	
Redund Hip 1 Bracing (T13)	ROHN 2.5 STD / 0'-20'	0.2	Pass	
Inner Bracing (T5)	L2x2x1/8 / 120'-126.667'	4.7	Pass	
Tower Bolt	(6) 3/4" A325N Bolts / Leg Flange / 20'	68.9	Pass	
Anchor Bolts – Uplift & Shear Capacity (TIA-222-H – 4.9.9)	1" Dia. / Tension	51.6	Pass	(10) ASTM A 354 – Gr BC Bolts – 1" Diameter

Structure Rating (Maximum from all components) =	86.8	**Pass**

4. FINDINGS AND EVALUATION (cont.)

Maximum Deformations – Proposed Condition

TIA-222-H Section 2.8.2 - Limit State Deformations

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

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

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

Description	Current	Total	Allowable
Tower Twist (degrees)	0.3892	0.7093	0.750
Tower Sway (degrees)	0.3201		

NOTE: Values of combined twist and sway are required to be below 0.75 degrees combined under the DESPP / CSP required loading and shall not be considered "passing" until below this limit.

5. CONCLUSIONS

The results of an initial analysis indicated the existing tower structure was unable to contain the Department of Emergency Services and Public Protection) / Connecticut State Police (DESPP / CSP) requirement of 0.75 degrees of combined twist (rotation) and sway (deflection) with the proposed load classification stated above. The tower structure requires modifications stated in SK-1 through SK-3. **Once the modifications indicated on sheets SK-1 though SK-3 are performed, the modified tower structure, existing tower anchors and foundations are considered structurally adequate with the wind load specification indicated above with the existing and proposed antenna loading herein. The maximum structural capacity calculated herein (after modification) is 86.8 %**

The modified tower sway (deflection) is 0.3892 degrees and the modified tower twist (rotation) is 0.3201 degrees. These figures combined ARE within the DESPP / CSP specification of 0.75 degrees combined for sway (deflection) and twist (rotation).

Limitations/Assumptions:

This report is based on the following:

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

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

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

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

Ongoing and Periodic Inspection and Maintenance:

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

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

6. DRAWINGS AND DATA

REINFORCEMENT DRAWINGS SK-1 THROUGH SK-3

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL COMPLY WITH THE CONNECTICUT STATE BUILDING AND LIFE SAFETY CODES, SUPPLEMENTS AND AMENDMENTS.

2. CONTRACTOR IS TO REVIEW ALL DRAWINGS AND NOTES IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUB-CONTRACTORS AND ALL RELATED PARTIES. THE SUB-CONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.

3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON DRAWINGS OR WRITTEN IN SPECIFICATIONS.

4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.

5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION AND ELECTRICAL SUB-CONTRACTORS SHALL PAY FOR THEIR PERMITS.

6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS ON SITE AT ALL TIMES AND ENSURE THE DISTRIBUTION OF NEW DRAWINGS TO SUB-CONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. CONTRACTOR SHALL FURNISH 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.

7. INSTALLATION OF THIS WIRELESS COMMUNICATIONS EQUIPMENT SITE REQUIRES WORK IN THE IMMEDIATE VICINITY OF EXISTING OPERATING TELECOMMUNICATION SYSTEMS. THE CONTRACTOR SHALL PROVIDE AND COORDINATE THE METHODS OF PROTECTION WITH THE VARIOUS TELECOMMUNICATION CARRIERS AND THE TOWER OWNER. THERE SHALL BE NO INTERRUPTION OF OPERATION WITHOUT TIMELY COORDINATION WITH AND APPROVAL BY THE VARIOUS COMMUNICATIONS OPERATORS INCLUDING THE CONNECTICUT STATE POLICE.

8. THE REINFORCEMENT OF PORTIONS OF THIS TOWER STRUCTURE WILL AFFECT CRITICAL CONNECTICUT STATE POLICE ANTENNAS. NO MOVEMENT, ALTERATION, OR DISCONNECTION OF CONNECTICUT STATE POLICE ANTENNAS MAY OCCUR WITHOUT THE NOTIFICATION AND APPROVAL OF THE CONNECTICUT STATE POLICE. CONTACT THE NETWORK CONTROL CENTER AT 860-865-8008.

9. TOWER REINFORCING WORK AFFECTING CRITICAL CONNECTICUT STATE POLICE ANTENNAS MAY BE REQUIRED TO BE CONDUCTED AT TIMES AS DETERMINED BY THE REQUIREMENTS OF THE CONNECTICUT STATE POLICE.

10. IT SHALL BE MANDATORY TO USE STEEL MATERIALS PLANNED FOR CONSTRUCTION THAT ARE MANUFACTURED IN THE UNITED STATES OF AMERICA. MATERIAL SPECIFICATION DOCUMENTS SHALL BE MADE AVAILABLE TO THE ENGINEER TO VERIFY STEEL FABRICATION PRIOR TO PURCHASE AND IMPLEMENTATION. DEVIATIONS FROM THIS SHALL REQUIRE EXPRESSED WRITTEN PERMISSION FROM THE ENGINEER AND CONNECTICUT STATE POLICE.

11. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER MFR'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR ARCHITECT.

12. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

13. SHOP DRAWINGS ARE REQUIRED. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS ON THE TOWER AND INCLUDE THE GATHERED INFORMATION ON THE SHOP DRAWINGS. NOTE ANY DISCREPANCIES ENCOUNTERED ON THE SHOP DRAWINGS. NO FABRICATION OR INSTALLATION OF STEEL SHALL OCCUR PRIOR TO THE RECEIPT AND APPROVAL OF SHOP DRAWINGS.

14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ARCHITECT FOR REVIEW. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTAL TO THE ARCHITECT FOR REVIEW.

15. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURE AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.

16. CONTRACTOR TO CONTACT "CALL BEFORE YOU DIG" AT 1-800-922-4455 TO VERIFY AND IDENTIFY THE EXACT LOCATIONS OF ALL UNDERGROUND UTILITIES AND OBSTRUCTIONS IDENTIFIED PRIOR TO COMMENCING WORK IN THE CONTRACT AREA.

17. CONTRACTOR SHALL COMPLY WITH OWNER ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

18. DIMENSIONS OF EXISTING TOWER ARE BASED ON MANUFACTURER'S DRAWINGS PREPARED BY ROHN INDUSTRIES. DATED FEBRUARY 1, 1991, AND ARE NOT GUARANTEED. CONTRACTOR SHALL TAKE FIELD DIMENSIONS AS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK AND SHALL ASSUME FULL RESPONSIBILITY FOR THEIR ACCURACY. WHEN SHOP DRAWINGS BASED ON FIELD MEASUREMENT ARE SUBMITTED FOR REVIEW, DIMENSIONS ARE PROVIDED FOR THE ENGINEER'S REFERENCE ONLY.

19. TOWER INVENTORY IS BASED ON INFORMATION OBTAINED FROM MOTOROLA/CONNECTICUT STATE POLICE DATED JUNE 22, 2016, AT&T DATED APRIL 6, 2018 AND VERIZON WIRELESS (VZW) DATED MARCH 11, 2020. TOWER MAPPING AND EXISTING INVENTORY OBTAINED FROM D&K NATIONWIDE COMMUNICATIONS, INC. DATED MARCH 18, 2016.

20. CONTRACTOR TO VERIFY REQUIRED CLEARANCES INCLUDING BUT NOT LIMITED TO EXISTING BUILDINGS, EQUIPMENT PADS AND SHELTERS PRIOR TO COMMENCING WORK.

21. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION. NO MEMBER OF THE TOWER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY. THE CONTRACTOR SHALL BE AWARE OF WEATHER AND WIND CONDITIONS AND NOT PERFORM MEMBER REPLACEMENT IN A WIND GUSTING MORE THAN 10 MPH.

STRUCTURAL NOTES

STRUCTURAL STEEL MATERIAL:

EXISTING PIPE/TUBE LEG .... ASTM A572-50
1/3 HSS REINFORCING .... ASTM 501-Gr. B (50 ksi)
EXISTING PLATES & ANGLES .... ASTM A36
BOLTS .... ASTM A325N, 325X

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

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

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

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

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

CONNECTIONS / FIELD ASSEMBLY:

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

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

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

INSPECTIONS:

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

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

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

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

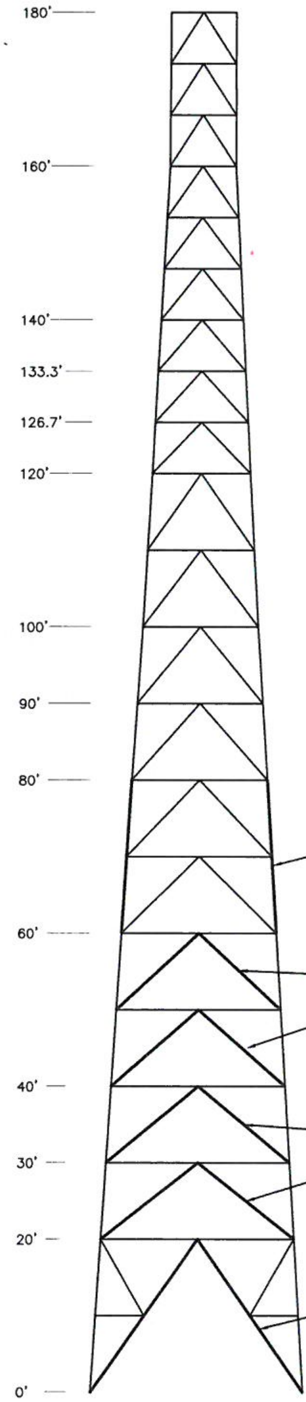
PROJECT NO. 60519605 Designed by: MCD Drawn by: GAT Checked by: DJR Approved by: RAS	AECOM 500 ENTERPRISE DRIVE ROCKY HILL, CONNECTICUT (860)-529-8882	verizon SITE ADDRESS: WESTPORT, CT 880 POST ROAD EAST WESTPORT, CONNECTICUT	REV. / DATE: / DESCRIPTION Scale: AS NOTED / Date: 7/10/2020 Job No. VZ5-224 / File No. Dwg. No. SK-1 Dwg. 1 of 3

STRUCTURAL NOTES

SEE SHEET SK-1 FOR STRUCTURAL NOTES

NOTES:
1. REFER TO STRUCTURAL NOTES ON SK-1 FOR STEEL GRADE REQUIREMENTS FOR REPLACEMENT AND REINFORCEMENT MEMBERS.
2. CONTRACTOR SHALL VERIFY EXISTING TOWER INFORMATION AND DIAGONAL MEMBER ORIENTATION PRIOR TO ORDERING MATERIALS. CONTRACTOR SHALL COORDINATE WITH ROHN INDUSTRIES, INC. FOR DIAGONAL PIPE ASSEMBLIES RELATED TO EXISTING END CONNECTIONS OF DIAGONAL MEMBERS.
3. REINFORCEMENT OF TOWER IS REQUIRED FOR ALL 3 SIDES OF EXISTING TOWER STRUCTURE.
4. CONNECTION BOLTS FOR REPLACEMENT MEMBERS SHALL BE REPLACED IN KIND. EXISTING BOLTS SHALL NOT BE RE-USED FOR CONNECTION OF REPLACEMENT MEMBERS.
5. REFER TO SK-3 FOR DETAILS ASSOCIATED WITH THE INSTALLATION OF U-BOLTED CONNECTIONS INDICATED ON THIS SHEET.

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



INSTALL 1/3 (120 DEGREE) 9.625x0.375 ON ROHN 8 EH (8.625x0.276) WITH ROHN 3 EH (3.50x0.375) AT ELEVATION RANGE 60'-80'.

REPLACE EXISTING ROHN 2.5 EH (2.875x0.276) WITH ROHN 3 EH (3.50x0.3) AT ELEVATION RANGE 40'-60'.

REPLACE EXISTING ROHN 3 STD (3.50x0.216) WITH ROHN 3 EH (3.50x0.3) AT ELEVATION RANGE 20'-40'.

REPLACE EXISTING ROHN 2.5 EH (2.875x0.276) WITH ROHN 3 EH (3.50x0.3) AT ELEVATION RANGE 0'-20'.

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

PROJECT NO. 60519605
Designed by: MCD
Drawn by: GAT
Checked by: DJR
Approved by: RAS

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

verizon✓

SITE ADDRESS: WESTPORT, CT
880 POST ROAD EAST
WESTPORT, CONNECTICUT

REV.	DATE:	DESCRIPTION

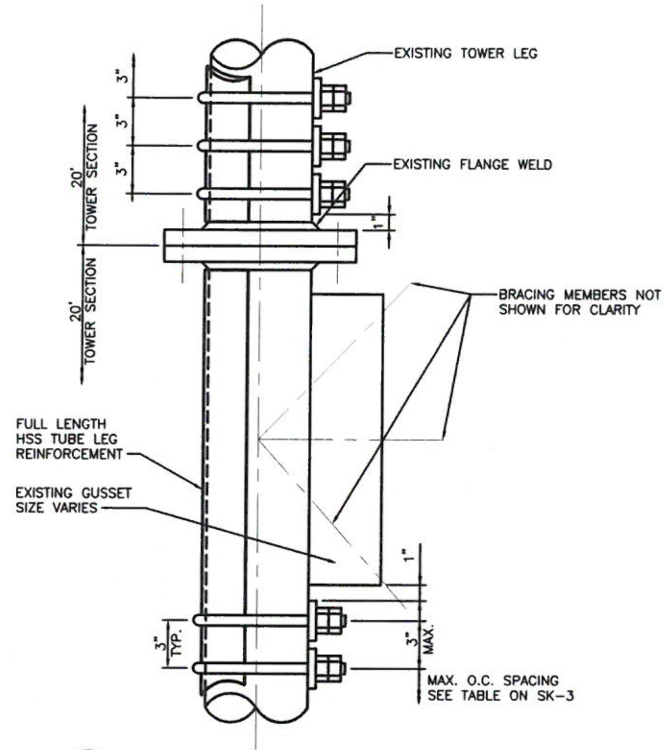
Scale: AS NOTED
Date: 7/10/2020
Job No. [illegible]
File No.

Dwg. No. SK-2

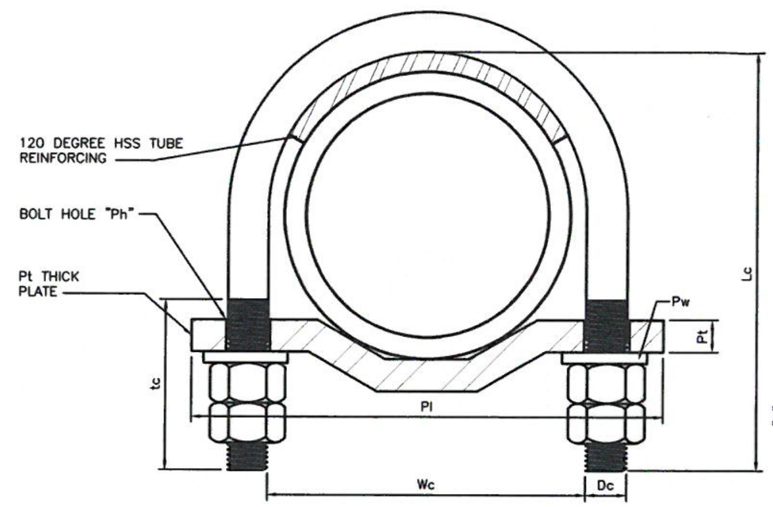
Dwg. 2 of 3

ELEVATION	EXISTING TOWER LEG DIAMETER HSS TUBE SIZE (IN)	HSS TUBE REINFORCING DIMENSIONS (IN)	U-BOLT -AT-ENDS (EACH END) OF 20' SECTIONS SPACED AS INDICATED C-TO-C # (PER TOWER LEG)	MIN. U-BOLTS REMAIN PER LEG	TOTAL U-BOLTS PER LEG PER 20' SECTION	DIAMETER U-BOLTS (IN)	MIN. SPACING REMAINING U-BOLTS C-TO-C (IN)	MAX. SPACING REMAINING U-BOLTS C-TO-C (IN)	INSTALLING PRETENSION FORCE ON U-BOLT CONNECTION (KIPS)(LRFD)
60'-80'	8.750x0.3750	9.625x0.375	13	13	39	5/8	11	12	9.5

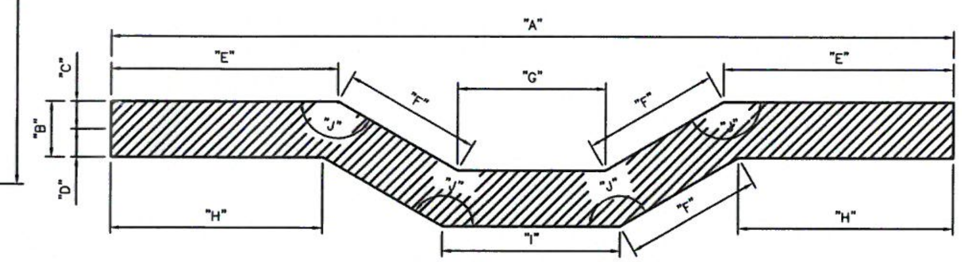
NOTES:
- U-BOLTS SHALL MEET THE STRENGTH REQUIREMENTS OF ASTM A449. BASIS OF DESIGN IS PORTLAND BOLT OF PORTLAND, OREGON, USA. ALTERNATIVE SUPPLIER SHALL MATCH OR EXCEED QUALITY OF PORTLAND BOLT
- CONTRACTOR SHALL TAKE SPECIFIC CARE WHEN INSTALLING U-BOLTS AND NOT ALLOW ANY VISUAL DEFORMATION OF THE EXISTING TOWER LEG MEMBERS.
- 120 DEGREE HSS TUBE REFERS TO THE REQUIRED PORTION OF HSS TUBING TO BE INSTALLED FOR REINFORCING.
- SPACING DIMENSIONS FOR U-BOLTS ARE MAXIMUM ALLOWABLE DISTANCES (CENTER-TO-CENTER). ADDITIONAL U-BOLTS MAY BE REQUIRED DUE TO INTERRUPTION CAUSED BY EXISTING TOWER CONDITIONS. SHOP DRAWINGS SHALL ILLUSTRATE ACTUAL BOLT SPACING REQUIRED BASED ON VERIFIED FIELD CONDITIONS.
- 120 DEGREE TUBES SHALL BE CONTINUOUS, SINGLE PIECE MEMBERS APPROXIMATELY 20' LENGTH (TO BE FIELD VERIFIED BEFORE ORDERING).



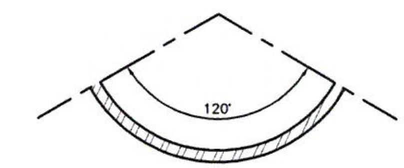
3 / SK-3 REINFORCEMENT DETAIL
SCALE: 1" = 1'-0"



1 / SK-3 U-BOLT FOR LEG REINFORCEMENT
SCALE: N.T.S.



U-BOLT CONNECTION PLATE DETAILS
COORDINATE WITH DIMENSIONS IN TABLE (BELOW)

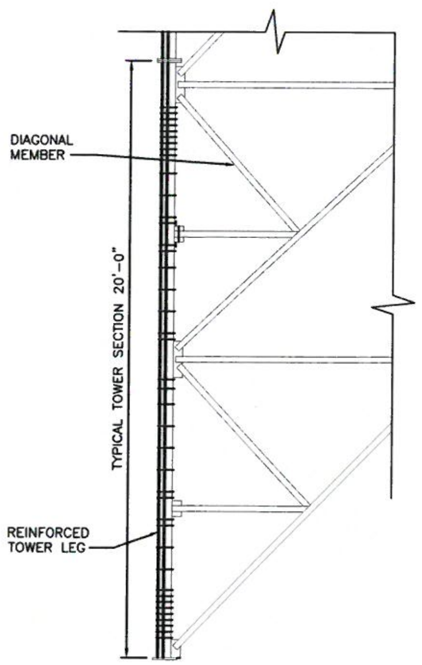


PLAN VIEW OF 120 DEGREE HSS TUBE

2 / SK-3 HSS TUBE DETAILS
SCALE: N.T.S.

ELEVATION	HSS TUBE REINFORCING DIMENSIONS OUTER DIA. (in)	U-BOLT DIA. Dc (IN)	U-BOLT LENGTH Lc (IN)	U-BOLT CLEAR WIDTH Wc (IN)	U-BOLT LENGTH THREADING tc (IN)	U-BOLT HEIGHT CONNECTION PLATE Pw (IN)	U-BOLT STANDARD HOLE IN CONNECTION PLATE Ph (IN)	U-BOLT CONNECTION PLATE DIM. "A" (IN)	U-BOLT CONNECTION PLATE DIM. "B" (IN)	U-BOLT CONNECTION PLATE DIM. "C" (IN)	U-BOLT CONNECTION PLATE DIM. "D" (IN)	U-BOLT CONNECTION PLATE DIM. "E" (IN)	U-BOLT CONNECTION PLATE DIM. "F" (IN)	U-BOLT CONNECTION PLATE DIM. "G" (IN)	U-BOLT CONNECTION PLATE DIM. "H" (IN)	U-BOLT CONNECTION PLATE DIM. "I" (IN)	U-BOLT CONNECTION PLATE DIM. "J" (DEG)
60'-80'	9.63	5/8"	10"	9 5/8"	3"	3"	11/16"	12 1/4"	2 7/16"	3/4"	1 11/16"	2 7/16"	2 3/4"	3"	2 13/16"	3 1/2"	142

NOTE: U-BOLT ATTACHMENT PLATE MATERIAL SHALL BE MINIMUM 50 KSI. COORDINATE WITH ABOVE U-BOLT TABLE FOR QUANTITIES AND SPACING OF U-BOLT FOR ASSEMBLY.



4 / SK-3 DIAGRAMATIC U-BOLT LAYOUT AT TOWER SECTIONS
SCALE: 1/8" = 1'-0"

NOTE: ABOVE IMAGE IS DIAGRAMMATIC REPRESENTATION OF CLAMP SPACING. IMAGE MAY VARY FROM FIELD CONDITIONS WHICH SHALL BE VERIFIED PRIOR TO PURCHASE AND INSTALLATION OF PROPOSED REINFORCEMENT.

PROJECT NO. 60519605
Designed by: MCD
Drawn by: GAT
Checked by: DJR
Approved by: RAS

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

verizon

SITE ADDRESS: WESTPORT, CT
880 POST ROAD EAST
WESTPORT, CONNECTICUT

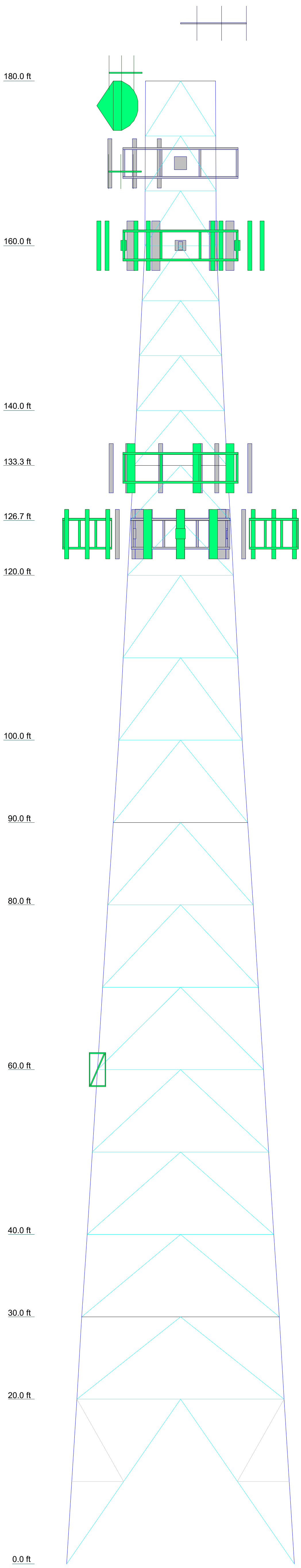
REV.	DATE:	DESCRIPTION

Scale: AS NOTED | Date: 7/10/2020
Job No. VZ5-224 | File No.

Dwg. No. SK-3

TNX TOWER INPUT / OUTPUT SUMMARY

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13
Legs	ROHN 3 STD	ROHN 4 STD	ROHN 5 EH			ROHN 6 EHS	ROHN 6 EH		A	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe			B
Leg Grade	A572-50								A572-42				
Diagonals	ROHN 2 STD		ROHN 2 EH		ROHN 2 XXS	Pipe 2.5 XXS	ROHN 3 STD			ROHN 3 EH			
Diagonal Grade	A572-50												
Top Girts	ROHN 1.5 STD	N.A.		ROHN 2 STD		N.A.		ROHN 2 STD	N.A.			ROHN 2.5 EH	N.A.
Horizontals	ROHN 1.5 STD		ROHN 2 STD	N.A.		ROHN 2 STD		N.A.	ROHN 2.5 STD			N.A.	P3.5x226
Red. Horizontals	N.A.												ROHN 1.5 STD
Red. Diagonals	N.A.												ROHN 2 STD
Red. Hips	N.A.												ROHN 2.5 STD
Inner Bracing	L2x2x1/8					L2 1/2x2 1/2x3/16			L3x3x3/16	L3 1/2x3 1/2x1/4			ROHN 2 STD
Face Width (ft) 27.677	8.542	8.625	10.709	11.4033	12.0977	12.792	15.042	16.3595	17.677	20.177	22.677	23.927	25.177
# Panels @ (ft)	9 @ 6.66667					10 @ 10							1 @ 20
Weight (lb) 35588.4	1250.4	1495.6	825.9	842.2	1080.4	3821.3	1682.8	1722.7	4897.5	5700.5	2942.5	3139.0	6187.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
ANT940Y10-WR (CSP)	187	RRUS-32 B66 (ATT)	133
ANT940Y10-WR (CSP - Yagi Antenna)	181	RRUS-32 (ATT)	133
PA6-65AC (DNK-52 / CSP-42)	177	DBC0061F1V51-2 Combiner Units (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-80)	170	800-10798 Kathrein Panel (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-81)	170	RRUS-32 B66 (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-82)	170	RRUS-32 (ATT)	133
SitePro1 USF12-396-U Mount Assembly w/ (3) 96" Mount Pipes (CSP 47, 80, 81, 82)	170	DBC0061F1V51-2 Combiner Units (ATT)	133
432E-83I-01T TTA Unit (Re-Located TMA (CSP))	170	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
3' Yagi (CSP)	169	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
DB-T1-6Z-8AB-0Z Distribution Box (Verizon)	160	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	P65-16-XLH-RR (ATT)	133
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	RRUS-11 (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	HPA-65R-BUU-H6 Panel (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	RRUS-32 (ATT)	133
BXA-70063-4CF Panel Antenna (Verizon)	160	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	P65-16-XLH-RR (ATT)	133
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	RRUS-11 (ATT)	133
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	HPA-65R-BUU-H6 Panel (ATT)	133
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	RRUS-32 (ATT)	133
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	P65-16-XLH-RR (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	RRUS-11 (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	HPA-65R-BUU-H6 Panel (ATT)	133
BXA-70063-4CF Panel Antenna (Verizon)	160	RRUS-32 (ATT)	133
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
JAHH-65B-R3B Panel Antenna (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
JAHH-65B-R3B Panel Antenna (Verizon)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
BXA-70080-4CF-EDIN Panel (Verizon)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
800-10798 Kathrein Panel (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
RRUS-32 B66 (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
RRUS-32 (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
DBC0061F1V51-2 Combiner Units (ATT)	133	ANT150D (CSP - 1-Bay Dipole)	113
800-10798 Kathrein Panel (ATT)	133	4' Standoff (DNK-1 / GPS)	60
		GPS (DNK-1 / GPS)	60

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	120deg_9.6250x0.375 BU on ROHN 8 EHS	B	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-42	42 ksi	60 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category IV.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. P-Delta for analysis does not apply for this case - TIA-222-H Section 3.5
8. TOWER RATING: 86.8%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 383359 lb
SHEAR: 53686 lb

UPLIFT: -341373 lb
SHEAR: 49366 lb

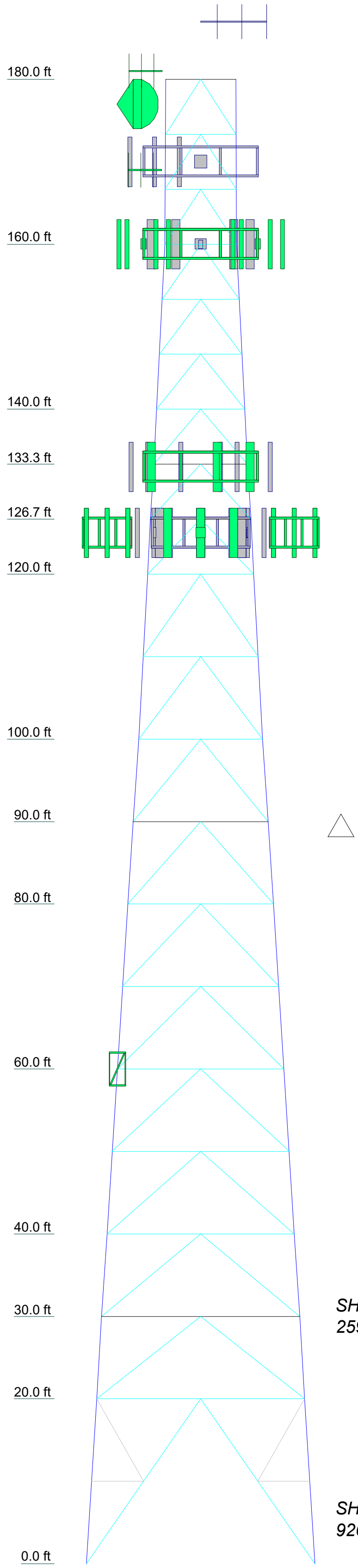
AXIAL 137466 lb
SHEAR 25968 lb
MOMENT 2458 kip-ft
TORQUE 21 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 61858 lb
SHEAR 92655 lb
MOMENT 8695 kip-ft
TORQUE 51 kip-ft
REACTIONS - 130 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: **180' CSP Lattice Tower - Analysis**			
Project: **Westport, Connecticut / TIA-222-H Loading**			
Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD	App'd:
Code: TIA-222-H	Date: 07/10/20	Scale: NTS
Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-H\20200708_VZW_MODification_H_180' SST.eri		Dwg No. E-1

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	
Legs	ROHN 3 STD	ROHN 4 STD	ROHN 5 EH			ROHN 6 EHS	ROHN 6 EH		A	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe			B	
Leg Grade	A572-50									A572-42				
Diagonals	ROHN 2 STD		ROHN 2 EH		C	Pipe 2.5 XXS	ROHN 3 STD			ROHN 3 EH				
Diagonal Grade	A572-50													
Top Girts	ROHN 1.5 STD	N.A.	ROHN 2 STD			N.A.		D	N.A.			E	N.A.	
Horizontals	ROHN 1.5 STD		D	N.A.		ROHN 2 STD		N.A.	ROHN 2.5 STD			N.A.	P3.5x.226	
Red. Horizontals	N.A.												ROHN 1.5 STD	
Red. Diagonals	N.A.												ROHN 2 STD	
Red. Hips	N.A.												ROHN 2.5 STD	
Inner Bracing	L2x2x1/8					L2 1/2x2 1/2x3/16			L3x3x3/16		L3 1/2x3 1/2x1/4		ROHN 2 STD	
Face Width (ft)	8.542	8.625	10.709	11.4033	12.0977	12.792	15.042	16.3595	17.677	20.177	22.677	23.927	25.177	27.677
# Panels @ (ft)	9 @ 6.66667					10 @ 10							1 @ 20	
Weight (lb)	1250.4	1495.6	825.9	842.2	1080.4	3821.3	1682.8	1722.7	4897.5	5700.5	2942.5	3139.0	6187.6	35588.4



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	120deg_9.6250x0.375 BU on ROHN 8 EHS	D	ROHN 2 STD
B	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	E	ROHN 2.5 EH
C	ROHN 2 XXS		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A572-42	42 ksi	60 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category IV.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. P-Delta for analysis does not apply for this case - TIA-222-H Section 3.5
8. TOWER RATING: 86.8%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 383359 lb
SHEAR: 53686 lb

UPLIFT: -341373 lb
SHEAR: 49366 lb

AXIAL 137466 lb
SHEAR 25968 lb
MOMENT 2458 kip-ft
TORQUE 21 kip-ft
50 mph WIND - 1.0000 in ICE

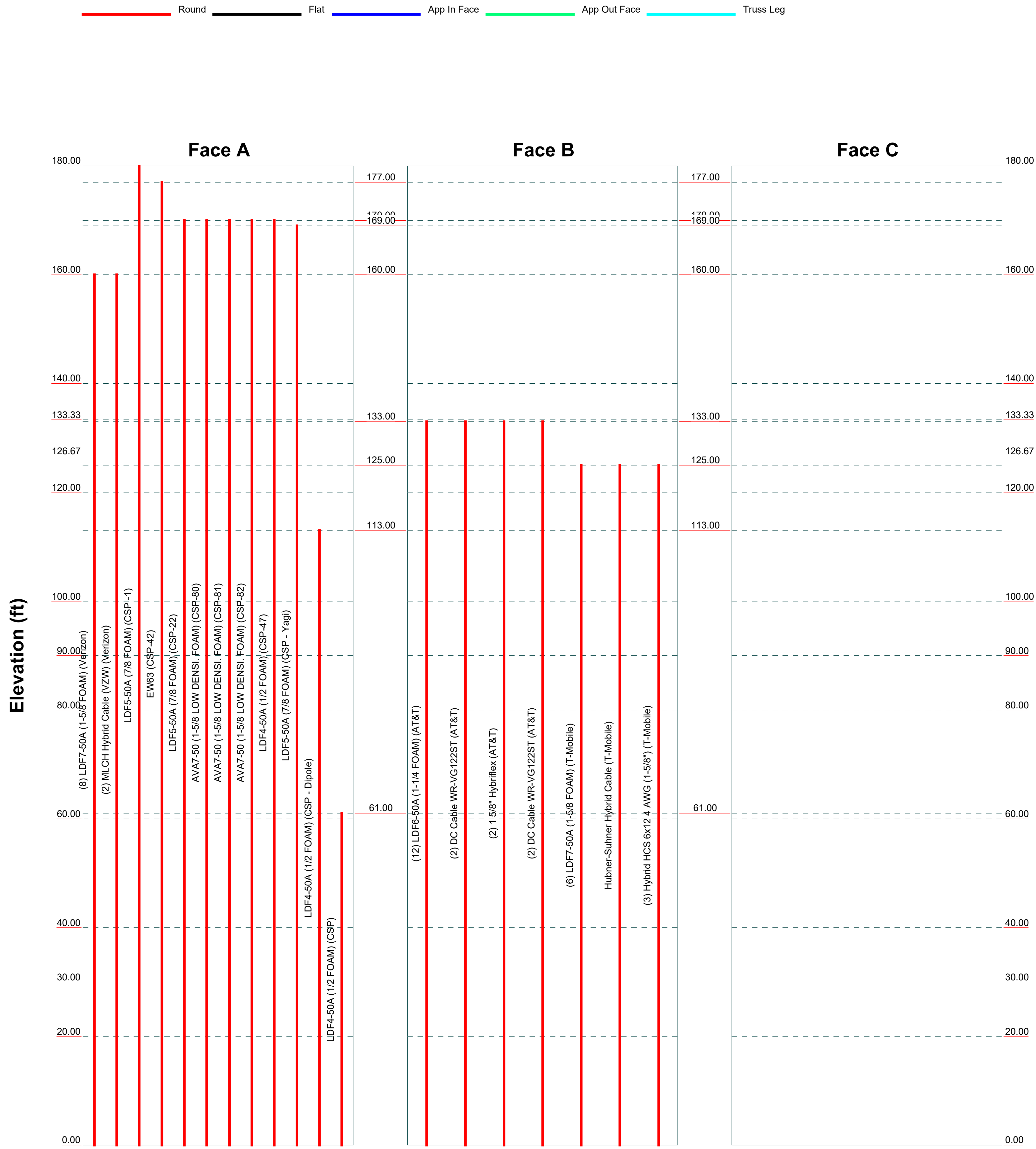
AXIAL 61858 lb
SHEAR 92655 lb
MOMENT 8695 kip-ft
TORQUE 51 kip-ft
REACTIONS - 130 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: **180' CSP Lattice Tower - Analysis**			
Project: **Westport, Connecticut / TIA-222-H Loading**			
Client: Verizon Wireless / VZ5-224 / Modification		Drawn by: MCD	App'd:
Code: TIA-222-H		Date: 07/10/20	Scale: NTS
Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-H\20200708_VZW_MODification_H_180' SST.eri			Dwg No. E-1

TNX TOWER FEEDLINE DISTRIBUTION

Feed Line Distribution Chart
0' - 180'

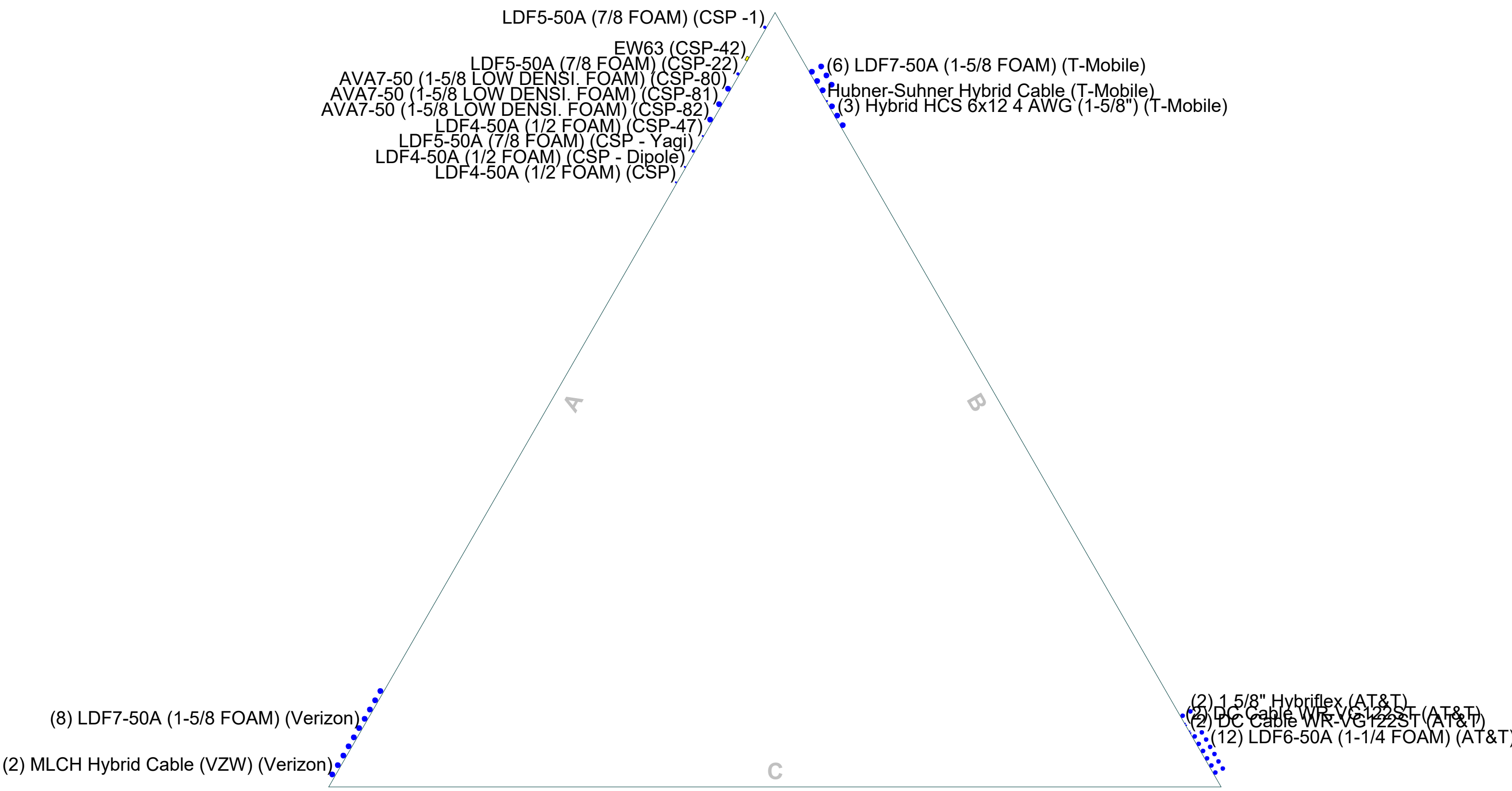


AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***180' CSP Lattice Tower - Analysis*** Project: ***Westport, Connecticut / TIA-222-H Loading*** Client: Verizon Wireless / VZ5-224 / Modification — Drawn by: MCD — App'd: Code: TIA-222-H — Date: 07/10/20 — Scale: NTS Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-H\20200708_VZW_MODification_H_180' SST.eri — Dwg No. E-7

TNX TOWER FEEDLINE PLAN

Feed Line Plan

Round | Flat | App In Face | App Out Face

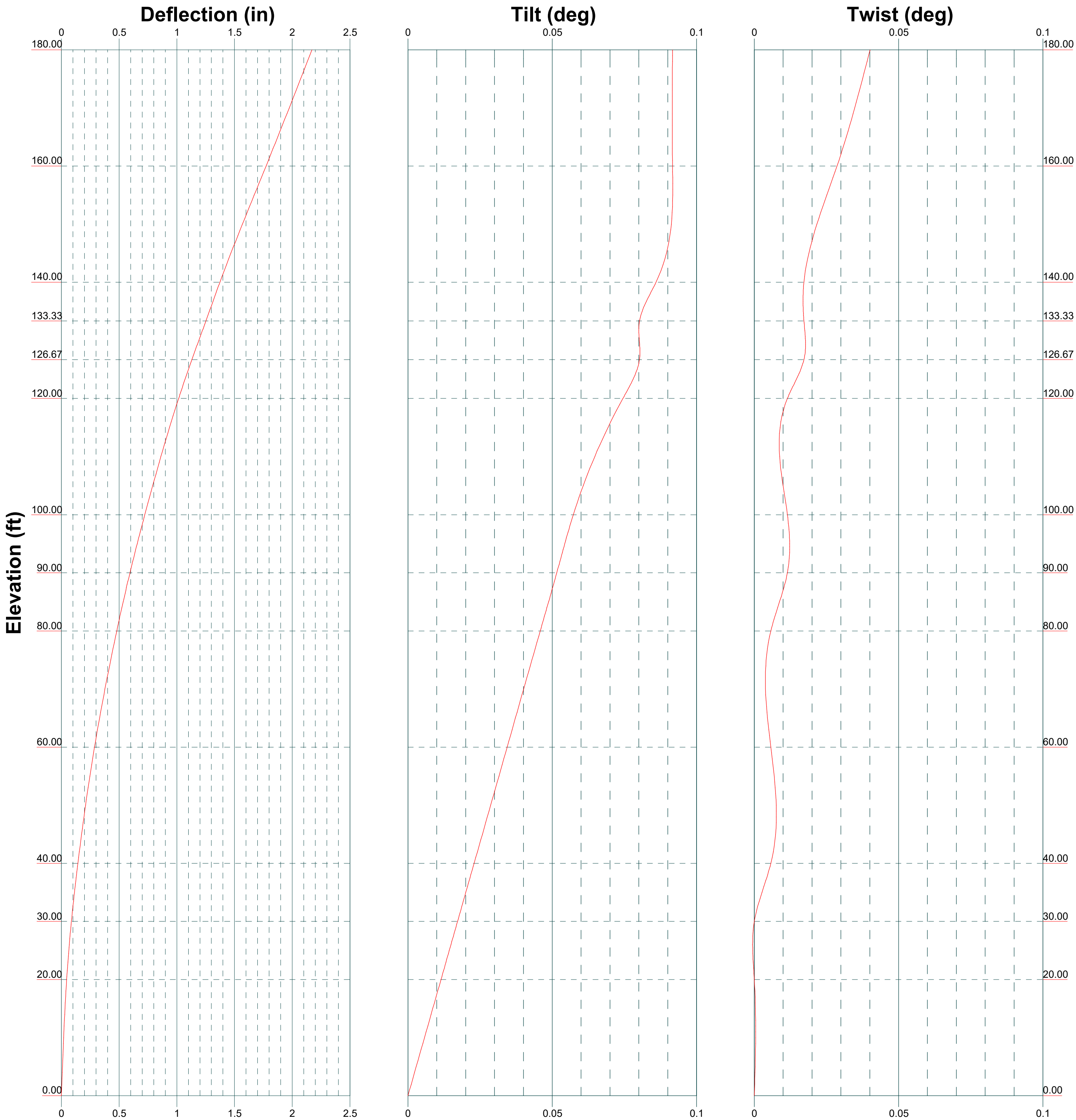


AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***180' CSP Lattice Tower - Analysis***				
	Project: ***Westport, Connecticut / TIA-222-H Loading***				
	Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD		App'd:	
	Code: TIA-222-H	Date: 07/10/20		Scale: NTS	
	Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-H\20200708_VZW_MODification_H_180' SST.eri			Dwg No. E-7	

TNX TOWER DEFLECTION, TILT, AND TWIST

TIA-222-H - Service - 60 mph

Maximum Values



AECOM	Job: ***180' CSP Lattice Tower - Analysis***		
500 Enterprise Drive, Suite 3B	Project: ***Westport, Connecticut / TIA-222-H Loading***		
Rocky Hill, CT	Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD	App'd:
Phone: 860-263-5800	Code: TIA-222-H	Date: 07/10/20	Scale: NTS
FAX: 860-812-2094	Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-H\20200708_VZW_MODification_H_180' SST.eri		Dwg No. E-5

DETAILED OUTPUT

Tower Input Data

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

- Tower base elevation above sea level: 0.00 ft.
- Basic wind speed of 130 mph.
- Risk Category IV.
- Exposure Category C.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Deflections calculated using a wind speed of 60 mph.
- P-Delta for analysis does not apply for this case - TIA-222-H Section 3.5.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

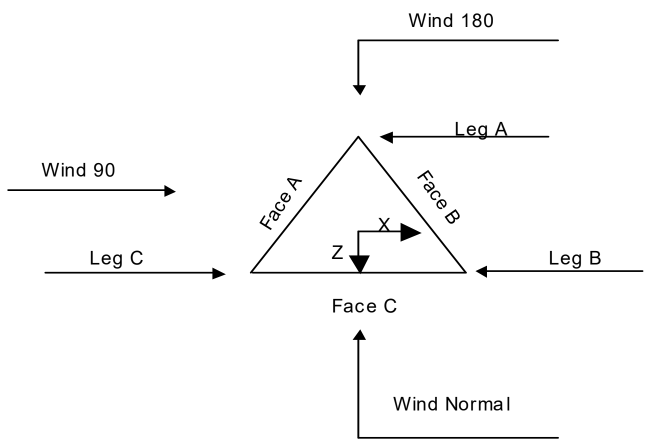
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
√ SR Members Have Cut Ends
SR Members Are Concentric

Distribute Leg Loads As Uniform
Assume Legs Pinned
Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
Add IBC .6D+W Combination
√ Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
Treat Feed Line Bundles As Cylinder
Ignore KL/ry For 60 Deg. Angle Legs

Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
√ SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feed Line Torque
√ Include Angle Block Shear Check
Use TIA-222-H Bracing Resist. Exemption
Use TIA-222-H Tension Splice Exemption

Poles

√ Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets
Pole Without Linear Attachments
Pole With Shroud Or No Appurtenances
Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T2 160.00-140.00	Pipe	ROHN 4 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T3 140.00-133.33	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T4 133.33-126.67	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T5 126.67-120.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 XXS	A572-50 (50 ksi)
T6 120.00-100.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Pipe	Pipe 2.5 XXS	A572-50 (50 ksi)
T7 100.00-90.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T8 90.00-80.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T9 80.00-60.00	Arbitrary Shape	120deg_9.6250x0.375 BU on ROHN 8 EHS	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T10 60.00-40.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-42 (42 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T11 40.00-30.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-42 (42 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T12 30.00-20.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-42 (42 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T13 20.00-0.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	A572-42 (42 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

Tower Elevation *ft*	*Gusset Area (per face)* *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*
T8 90.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T10 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T11 40.00-30.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T12 30.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T13 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.8750 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T2 160.00-140.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T3 140.00-133.33	Flange	1.0000 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T4 133.33-126.67	Flange	0.7500 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T5 126.67-120.00	Flange	0.7500 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T6 120.00-100.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T7 100.00-90.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T8 90.00-80.00	Flange	1.0000 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T9 80.00-60.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T10 60.00-40.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T11 40.00-30.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T12 30.00-20.00	Flange	1.0000 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T13 20.00-0.00	Flange	1.0000 A325N	8	0.6250 A325X	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
*													
LDF6-50A	B	No	No	Ar (CaAa)	133.00 -	0.0000	0.46	12	6	1.5500	1.5500		0.66

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
(1-1/4 FOAM) (AT&T)					0.00								
DC Cable WR-VG122ST (AT&T)	B	No	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.43	2	2	0.4000	0.4000		0.25
1 5/8" Hybriflex (AT&T)	B	No	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.41	2	1	1.6250	1.6250		1.13
DC Cable WR-VG122ST (AT&T)	B	No	No	Ar (CaAa)	133.00 - 0.00	0.0000	0.42	2	2	0.4000	0.4000		0.25
*													
LDF7-50A (1-5/8 FOAM) (T-Mobile)	B	No	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.41	6	3	1.9800	1.9800		0.82
Hubner-Suhner Hybrid Cable (T-Mobile)	B	No	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.385	1	1	0.7087	0.7087		0.48
Hybrid HCS 6x12 4 AWG (1-5/8") (T-Mobile)	B	No	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.365	3	3	1.9900	1.9900		1.90
*													
LDF7-50A (1-5/8 FOAM) (Verizon)	A	No	No	Ar (CaAa)	160.00 - 0.00	0.0000	-0.42	8	8	1.9800	1.9800		0.82
MLCH Hybrid Cable (VZW) (Verizon)	A	No	No	Ar (CaAa)	160.00 - 0.00	0.0000	-0.48	2	2	2.0126	2.0126		3.04
*													
LDF5-50A (7/8 FOAM) (CSP -1)	A	No	No	Ar (CaAa)	180.00 - 0.00	0.0000	0.48	1	1	1.0900	1.0900		0.33
EW63 (CSP-42)	A	No	No	Af (CaAa)	177.00 - 0.00	0.0000	0.44	1	1	1.5742	1.5742		0.51
LDF5-50A (7/8 FOAM) (CSP-22)	A	No	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.42	1	1	1.0900	1.0900		0.33
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-80)	A	No	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.4	1	1	1.9800	1.9800		0.72
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-81)	A	No	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.38	1	1	1.9800	1.9800		0.72
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-82)	A	No	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.36	1	1	1.9800	1.9800		0.72
LDF4-50A (1/2 FOAM) (CSP-47)	A	No	No	Ar (CaAa)	170.00 - 0.00	0.0000	0.34	1	1	0.6300	0.6300		0.15
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	169.00 - 0.00	0.0000	0.32	1	1	1.0900	1.0900		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
(CSP - Yagi) LDF4-50A (1/2 FOAM)	A	No	No	Ar (CaAa)	113.00 - 0.00	0.0000	0.3	1	1	0.6300	0.6300		0.15
(CSP - Dipole) LDF4-50A (1/2 FOAM) (CSP)	A	No	No	Ar (CaAa)	61.00 - 0.00	0.0000	0.28	1	1	0.6300	0.6300		0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	180.00-160.00	A	0.000	0.000	15.281	0.000	44.64
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.000	0.000	64.658	0.000	329.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	0.000	0.000	21.553	0.000	109.67
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	0.000	0.000	21.553	0.000	109.67
		B	0.000	0.000	14.852	0.000	70.81
		C	0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	0.000	0.000	21.553	0.000	109.67
		B	0.000	0.000	24.913	0.000	130.04
		C	0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	0.000	0.000	65.477	0.000	330.95
		B	0.000	0.000	84.017	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T7	100.00-90.00	A	0.000	0.000	32.959	0.000	166.00
		B	0.000	0.000	42.009	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	0.000	0.000	32.959	0.000	166.00
		B	0.000	0.000	42.009	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	0.000	0.000	65.981	0.000	332.15
		B	0.000	0.000	84.017	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	0.000	0.000	67.178	0.000	335.00
		B	0.000	0.000	84.017	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	0.000	0.000	33.589	0.000	167.50
		B	0.000	0.000	42.009	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	0.000	0.000	33.589	0.000	167.50
		B	0.000	0.000	42.009	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	0.000	0.000	67.178	0.000	335.00
		B	0.000	0.000	84.017	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	180.00-160.00	A	1.473	0.000	0.000	43.556	0.000	552.25
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	1.454	0.000	0.000	179.426	0.000	2420.98
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	1.441	0.000	0.000	59.609	0.000	799.84
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	1.434	0.000	0.000	59.502	0.000	796.03
		B		0.000	0.000	32.201	0.000	494.30
		C		0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	1.426	0.000	0.000	59.391	0.000	792.06
		B		0.000	0.000	53.843	0.000	857.37
		C		0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	1.410	0.000	0.000	181.936	0.000	2398.19
		B		0.000	0.000	180.819	0.000	2888.00
		C		0.000	0.000	0.000	0.000	0.00
T7	100.00-90.00	A	1.389	0.000	0.000	91.678	0.000	1194.96
		B		0.000	0.000	89.951	0.000	1429.42
		C		0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	1.374	0.000	0.000	91.306	0.000	1182.33
		B		0.000	0.000	89.607	0.000	1418.55
		C		0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	1.348	0.000	0.000	181.664	0.000	2324.96
		B		0.000	0.000	178.034	0.000	2799.96
		C		0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	1.303	0.000	0.000	185.645	0.000	2314.21
		B		0.000	0.000	176.043	0.000	2737.88
		C		0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	1.257	0.000	0.000	91.626	0.000	1119.08
		B		0.000	0.000	87.003	0.000	1337.56
		C		0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	1.216	0.000	0.000	90.536	0.000	1084.98
		B		0.000	0.000	86.075	0.000	1309.33
		C		0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	1.109	0.000	0.000	175.498	0.000	2000.12
		B		0.000	0.000	167.410	0.000	2477.23
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-160.00	-1.5005	-14.6984	-2.0239	-19.4249
T2	160.00-140.00	-21.8519	-3.5603	-24.8270	-4.6548
T3	140.00-133.33	-23.6499	-3.8270	-27.2422	-5.0056
T4	133.33-126.67	1.4743	6.5409	-3.2502	4.7154
T5	126.67-120.00	3.6049	-4.6087	-0.7234	-5.4736
T6	120.00-100.00	4.1706	-8.7969	-0.5362	-9.8169
T7	100.00-90.00	4.4587	-9.7083	-0.7776	-11.0464
T8	90.00-80.00	4.7415	-10.3716	-0.9045	-11.7624
T9	80.00-60.00	3.9905	-9.2471	-1.0233	-11.9424

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T10	60.00-40.00	4.2348	-10.5942	-1.6292	-14.0312
T11	40.00-30.00	4.5058	-11.3145	-1.9206	-14.7580
T12	30.00-20.00	4.6843	-11.7883	-2.1646	-15.1336
T13	20.00-0.00	5.0352	-12.7153	-2.7605	-15.5135

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	17	LDF5-50A (7/8 FOAM)	160.00 - 180.00	1.0000	1.0000
T1	19	EW63	160.00 - 177.00	1.0000	1.0000
T1	20	LDF5-50A (7/8 FOAM)	160.00 - 170.00	1.0000	1.0000
T1	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	160.00 - 170.00	1.0000	1.0000
T1	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	160.00 - 170.00	1.0000	1.0000
T1	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	160.00 - 170.00	1.0000	1.0000
T1	24	LDF4-50A (1/2 FOAM)	160.00 - 170.00	1.0000	1.0000
T1	25	LDF5-50A (7/8 FOAM)	160.00 - 169.00	1.0000	1.0000
T2	14	LDF7-50A (1-5/8 FOAM)	140.00 - 160.00	1.0000	1.0000
T2	15	MLCH Hybrid Cable (VZW)	140.00 - 160.00	1.0000	1.0000
T2	17	LDF5-50A (7/8 FOAM)	140.00 - 160.00	1.0000	1.0000
T2	19	EW63	140.00 - 160.00	1.0000	1.0000
T2	20	LDF5-50A (7/8 FOAM)	140.00 - 160.00	1.0000	1.0000
T2	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	140.00 - 160.00	1.0000	1.0000
T2	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	140.00 - 160.00	1.0000	1.0000
T2	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	140.00 - 160.00	1.0000	1.0000
T2	24	LDF4-50A (1/2 FOAM)	140.00 - 160.00	1.0000	1.0000
T2	25	LDF5-50A (7/8 FOAM)	140.00 - 160.00	1.0000	1.0000
T3	14	LDF7-50A (1-5/8 FOAM)	133.33 - 140.00	1.0000	1.0000
T3	15	MLCH Hybrid Cable (VZW)	133.33 - 140.00	1.0000	1.0000
T3	17	LDF5-50A (7/8 FOAM)	133.33 - 140.00	1.0000	1.0000
T3	19	EW63	133.33 - 140.00	1.0000	1.0000
T3	20	LDF5-50A (7/8 FOAM)	133.33 - 140.00	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T3	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	133.33 - 140.00	1.0000	1.0000
T3	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	133.33 - 140.00	1.0000	1.0000
T3	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	133.33 - 140.00	1.0000	1.0000
T3	24	LDF4-50A (1/2 FOAM)	133.33 - 140.00	1.0000	1.0000
T3	25	LDF5-50A (7/8 FOAM)	133.33 - 140.00	1.0000	1.0000
T4	2	LDF6-50A (1-1/4 FOAM)	126.67 - 133.00	1.0000	1.0000
T4	3	DC Cable WR-VG122ST	126.67 - 133.00	1.0000	1.0000
T4	4	1 5/8" Hybriflex	126.67 - 133.00	1.0000	1.0000
T4	6	DC Cable WR-VG122ST	126.67 - 133.00	1.0000	1.0000
T4	14	LDF7-50A (1-5/8 FOAM)	126.67 - 133.33	1.0000	1.0000
T4	15	MLCH Hybrid Cable (VZW)	126.67 - 133.33	1.0000	1.0000
T4	17	LDF5-50A (7/8 FOAM)	126.67 - 133.33	1.0000	1.0000
T4	19	EW63	126.67 - 133.33	1.0000	1.0000
T4	20	LDF5-50A (7/8 FOAM)	126.67 - 133.33	1.0000	1.0000
T4	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	126.67 - 133.33	1.0000	1.0000
T4	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	126.67 - 133.33	1.0000	1.0000
T4	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	126.67 - 133.33	1.0000	1.0000
T4	24	LDF4-50A (1/2 FOAM)	126.67 - 133.33	1.0000	1.0000
T4	25	LDF5-50A (7/8 FOAM)	126.67 - 133.33	1.0000	1.0000
T5	2	LDF6-50A (1-1/4 FOAM)	120.00 - 126.67	1.0000	1.0000
T5	3	DC Cable WR-VG122ST	120.00 - 126.67	1.0000	1.0000
T5	4	1 5/8" Hybriflex	120.00 - 126.67	1.0000	1.0000
T5	6	DC Cable WR-VG122ST	120.00 - 126.67	1.0000	1.0000
T5	10	LDF7-50A (1-5/8 FOAM)	120.00 - 125.00	1.0000	1.0000
T5	11	Hubner-Suhner Hybrid Cable	120.00 - 125.00	1.0000	1.0000
T5	12	Hybrid HCS 6x12 4 AWG (1-5/8")	120.00 - 125.00	1.0000	1.0000
T5	14	LDF7-50A (1-5/8 FOAM)	120.00 - 126.67	1.0000	1.0000
T5	15	MLCH Hybrid Cable (VZW)	120.00 - 126.67	1.0000	1.0000
T5	17	LDF5-50A (7/8 FOAM)	120.00 - 126.67	1.0000	1.0000
T5	19	EW63	120.00 - 126.67	1.0000	1.0000
T5	20	LDF5-50A (7/8 FOAM)	120.00 - 126.67	1.0000	1.0000

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	K_a *No Ice*	K_a *Ice*
T5	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	120.00 - 126.67	1.0000	1.0000
T5	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	120.00 - 126.67	1.0000	1.0000
T5	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	120.00 - 126.67	1.0000	1.0000
T5	24	LDF4-50A (1/2 FOAM)	120.00 - 126.67	1.0000	1.0000
T5	25	LDF5-50A (7/8 FOAM)	120.00 - 126.67	1.0000	1.0000
T6	2	LDF6-50A (1-1/4 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	3	DC Cable WR-VG122ST	100.00 - 120.00	1.0000	1.0000
T6	4	1 5/8" Hybriflex	100.00 - 120.00	1.0000	1.0000
T6	6	DC Cable WR-VG122ST	100.00 - 120.00	1.0000	1.0000
T6	10	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	11	Hubner-Suhner Hybrid Cable	100.00 - 120.00	1.0000	1.0000
T6	12	Hybrid HCS 6x12 4 AWG (1-5/8")	100.00 - 120.00	1.0000	1.0000
T6	14	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	15	MLCH Hybrid Cable (VZW)	100.00 - 120.00	1.0000	1.0000
T6	17	LDF5-50A (7/8 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	19	EW63	100.00 - 120.00	1.0000	1.0000
T6	20	LDF5-50A (7/8 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 120.00	1.0000	1.0000
T6	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 120.00	1.0000	1.0000
T6	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 120.00	1.0000	1.0000
T6	24	LDF4-50A (1/2 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	25	LDF5-50A (7/8 FOAM)	100.00 - 120.00	1.0000	1.0000
T6	26	LDF4-50A (1/2 FOAM)	100.00 - 113.00	1.0000	1.0000
T7	2	LDF6-50A (1-1/4 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	3	DC Cable WR-VG122ST	90.00 - 100.00	1.0000	1.0000
T7	4	1 5/8" Hybriflex	90.00 - 100.00	1.0000	1.0000
T7	6	DC Cable WR-VG122ST	90.00 - 100.00	1.0000	1.0000
T7	10	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	11	Hubner-Suhner Hybrid Cable	90.00 - 100.00	1.0000	1.0000
T7	12	Hybrid HCS 6x12 4 AWG (1-5/8")	90.00 - 100.00	1.0000	1.0000
T7	14	LDF7-50A (1-5/8 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	15	MLCH Hybrid Cable (VZW)	90.00 - 100.00	1.0000	1.0000
T7	17	LDF5-50A (7/8 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	19	EW63	90.00 - 100.00	1.0000	1.0000
T7	20	LDF5-50A (7/8 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	90.00 - 100.00	1.0000	1.0000
T7	22	AVA7-50 (1-5/8 LOW	90.00 - 100.00	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
		DENSI. FOAM)			
T7	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	90.00 - 100.00	1.0000	1.0000
T7	24	LDF4-50A (1/2 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	25	LDF5-50A (7/8 FOAM)	90.00 - 100.00	1.0000	1.0000
T7	26	LDF4-50A (1/2 FOAM)	90.00 - 100.00	1.0000	1.0000
T8	2	LDF6-50A (1-1/4 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	3	DC Cable WR-VG122ST	80.00 - 90.00	1.0000	1.0000
T8	4	1 5/8" Hybriflex	80.00 - 90.00	1.0000	1.0000
T8	6	DC Cable WR-VG122ST	80.00 - 90.00	1.0000	1.0000
T8	10	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	11	Hubner-Suhner Hybrid Cable	80.00 - 90.00	1.0000	1.0000
T8	12	Hybrid HCS 6x12 4 AWG (1-5/8")	80.00 - 90.00	1.0000	1.0000
T8	14	LDF7-50A (1-5/8 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	15	MLCH Hybrid Cable (VZW)	80.00 - 90.00	1.0000	1.0000
T8	17	LDF5-50A (7/8 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	19	EW63	80.00 - 90.00	1.0000	1.0000
T8	20	LDF5-50A (7/8 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	80.00 - 90.00	1.0000	1.0000
T8	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	80.00 - 90.00	1.0000	1.0000
T8	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	80.00 - 90.00	1.0000	1.0000
T8	24	LDF4-50A (1/2 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	25	LDF5-50A (7/8 FOAM)	80.00 - 90.00	1.0000	1.0000
T8	26	LDF4-50A (1/2 FOAM)	80.00 - 90.00	1.0000	1.0000
T9	2	LDF6-50A (1-1/4 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	3	DC Cable WR-VG122ST	60.00 - 80.00	1.0000	1.0000
T9	4	1 5/8" Hybriflex	60.00 - 80.00	1.0000	1.0000
T9	6	DC Cable WR-VG122ST	60.00 - 80.00	1.0000	1.0000
T9	10	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	11	Hubner-Suhner Hybrid Cable	60.00 - 80.00	1.0000	1.0000
T9	12	Hybrid HCS 6x12 4 AWG (1-5/8")	60.00 - 80.00	1.0000	1.0000
T9	14	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	15	MLCH Hybrid Cable (VZW)	60.00 - 80.00	1.0000	1.0000
T9	17	LDF5-50A (7/8 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	19	EW63	60.00 - 80.00	1.0000	1.0000
T9	20	LDF5-50A (7/8 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	60.00 - 80.00	1.0000	1.0000
T9	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	60.00 - 80.00	1.0000	1.0000
T9	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	60.00 - 80.00	1.0000	1.0000
T9	24	LDF4-50A (1/2 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	25	LDF5-50A (7/8 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	26	LDF4-50A (1/2 FOAM)	60.00 - 80.00	1.0000	1.0000
T9	27	LDF4-50A (1/2 FOAM)	60.00 - 61.00	1.0000	1.0000
T10	2	LDF6-50A (1-1/4 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	3	DC Cable WR-VG122ST	40.00 - 60.00	1.0000	1.0000
T10	4	1 5/8" Hybriflex	40.00 - 60.00	1.0000	1.0000
T10	6	DC Cable WR-VG122ST	40.00 - 60.00	1.0000	1.0000
T10	10	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	11	Hubner-Suhner Hybrid Cable	40.00 - 60.00	1.0000	1.0000
T10	12	Hybrid HCS 6x12 4 AWG (1-5/8")	40.00 - 60.00	1.0000	1.0000
T10	14	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	15	MLCH Hybrid Cable (VZW)	40.00 - 60.00	1.0000	1.0000
T10	17	LDF5-50A (7/8 FOAM)	40.00 - 60.00	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T10	19	EW63	40.00 - 60.00	1.0000	1.0000
T10	20	LDF5-50A (7/8 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	40.00 - 60.00	1.0000	1.0000
T10	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	40.00 - 60.00	1.0000	1.0000
T10	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	40.00 - 60.00	1.0000	1.0000
T10	24	LDF4-50A (1/2 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	25	LDF5-50A (7/8 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	26	LDF4-50A (1/2 FOAM)	40.00 - 60.00	1.0000	1.0000
T10	27	LDF4-50A (1/2 FOAM)	40.00 - 60.00	1.0000	1.0000
T11	2	LDF6-50A (1-1/4 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	3	DC Cable WR-VG122ST	30.00 - 40.00	1.0000	1.0000
T11	4	1 5/8" Hybriflex	30.00 - 40.00	1.0000	1.0000
T11	6	DC Cable WR-VG122ST	30.00 - 40.00	1.0000	1.0000
T11	10	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	11	Hubner-Suhner Hybrid Cable	30.00 - 40.00	1.0000	1.0000
T11	12	Hybrid HCS 6x12 4 AWG (1-5/8")	30.00 - 40.00	1.0000	1.0000
T11	14	LDF7-50A (1-5/8 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	15	MLCH Hybrid Cable (VZW)	30.00 - 40.00	1.0000	1.0000
T11	17	LDF5-50A (7/8 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	19	EW63	30.00 - 40.00	1.0000	1.0000
T11	20	LDF5-50A (7/8 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	30.00 - 40.00	1.0000	1.0000
T11	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	30.00 - 40.00	1.0000	1.0000
T11	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	30.00 - 40.00	1.0000	1.0000
T11	24	LDF4-50A (1/2 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	25	LDF5-50A (7/8 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	26	LDF4-50A (1/2 FOAM)	30.00 - 40.00	1.0000	1.0000
T11	27	LDF4-50A (1/2 FOAM)	30.00 - 40.00	1.0000	1.0000
T12	2	LDF6-50A (1-1/4 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	3	DC Cable WR-VG122ST	20.00 - 30.00	1.0000	1.0000
T12	4	1 5/8" Hybriflex	20.00 - 30.00	1.0000	1.0000
T12	6	DC Cable WR-VG122ST	20.00 - 30.00	1.0000	1.0000
T12	10	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	11	Hubner-Suhner Hybrid Cable	20.00 - 30.00	1.0000	1.0000
T12	12	Hybrid HCS 6x12 4 AWG (1-5/8")	20.00 - 30.00	1.0000	1.0000
T12	14	LDF7-50A (1-5/8 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	15	MLCH Hybrid Cable (VZW)	20.00 - 30.00	1.0000	1.0000
T12	17	LDF5-50A (7/8 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	19	EW63	20.00 - 30.00	1.0000	1.0000
T12	20	LDF5-50A (7/8 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	20.00 - 30.00	1.0000	1.0000
T12	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	20.00 - 30.00	1.0000	1.0000
T12	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	20.00 - 30.00	1.0000	1.0000
T12	24	LDF4-50A (1/2 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	25	LDF5-50A (7/8 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	26	LDF4-50A (1/2 FOAM)	20.00 - 30.00	1.0000	1.0000
T12	27	LDF4-50A (1/2 FOAM)	20.00 - 30.00	1.0000	1.0000
T13	2	LDF6-50A (1-1/4 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	3	DC Cable WR-VG122ST	0.00 - 20.00	1.0000	1.0000
T13	4	1 5/8" Hybriflex	0.00 - 20.00	1.0000	1.0000
T13	6	DC Cable WR-VG122ST	0.00 - 20.00	1.0000	1.0000

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	*K_a No Ice*	*K_a Ice*
T13	10	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	11	Hubner-Suhner Hybrid Cable	0.00 - 20.00	1.0000	1.0000
T13	12	Hybrid HCS 6x12 4 AWG (1-5/8")	0.00 - 20.00	1.0000	1.0000
T13	14	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	15	MLCH Hybrid Cable (VZW)	0.00 - 20.00	1.0000	1.0000
T13	17	LDF5-50A (7/8 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	19	EW63	0.00 - 20.00	1.0000	1.0000
T13	20	LDF5-50A (7/8 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	21	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 20.00	1.0000	1.0000
T13	22	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 20.00	1.0000	1.0000
T13	23	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 20.00	1.0000	1.0000
T13	24	LDF4-50A (1/2 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	25	LDF5-50A (7/8 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	26	LDF4-50A (1/2 FOAM)	0.00 - 20.00	1.0000	1.0000
T13	27	LDF4-50A (1/2 FOAM)	0.00 - 20.00	1.0000	1.0000

Discrete Tower Loads

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *lb*
* *** VWZ Antennas 20200615									
Pirod 15' T-Frame Sector Mount (1) (Verizon)	A	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	500.00 650.00 800.00
Pirod 15' T-Frame Sector Mount (1) (Verizon)	B	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	500.00 650.00 800.00
Pirod 15' T-Frame Sector Mount (1) (Verizon)	C	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice	15.00 20.60 26.20	15.00 20.60 26.20	500.00 650.00 800.00
JAHH-65B-R3B Panel Antenna (Verizon)	A	From Leg	3.00 6.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	9.66 10.22 10.79	7.71 8.53 9.37	130.00 204.15 289.72
JAHH-65B-R3B Panel Antenna (Verizon)	A	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	9.66 10.22 10.79	7.71 8.53 9.37	130.00 204.15 289.72
BXA-70080-4CF-EDIN Panel (Verizon)	A	From Leg	3.00 -6.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	3.75 4.12 4.51	5.42 6.05 6.70	50.00 93.77 144.71
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	A	From Leg	3.00 -3.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.40 2.60 2.81	20.00 59.31 102.70
BSAMNT-SBS-2-2 (JAHH Bracket (for 2))	A	From Leg	3.00 3.00	0.0000	160.00	No Ice 1/2" Ice	3.78 4.84	3.56 4.62	120.00 175.06

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft²	C_AA_A *Side* ft²	*Weight* lb
(Verizon)			0.00			1" Ice	5.64	5.41	240.44
4x40 B2_B66 Dual Band	A	From Leg	3.00	0.0000	160.00	No Ice	2.19	1.46	100.00
RRH Unit			0.00			1/2" Ice	2.39	1.62	115.84
(Verizon)			0.00			1" Ice	2.59	1.80	136.97
DB-T1-6Z-8AB-0Z	A	From Leg	3.00	0.0000	160.00	No Ice	5.60	2.33	50.00
Distribution Box			0.00			1/2" Ice	5.92	2.56	81.13
(Verizon)			0.00			1" Ice	6.24	2.79	121.22
CBC78T-DS-43-2X Diplexer	A	From Leg	3.00	0.0000	160.00	No Ice	0.37	0.51	22.00
(Verizon - Proposed)			0.00			1/2" Ice	0.45	0.60	28.34
			0.00			1" Ice	0.53	0.70	36.37
RFV01U-D2A RRH Unit	A	From Leg	3.00	0.0000	160.00	No Ice	1.88	1.01	82.00
(Verizon - Proposed)			0.00			1/2" Ice	2.05	1.14	98.43
			0.00			1" Ice	2.22	1.28	117.53
CBRS RRH (RT 4401-48A)	A	From Leg	3.00	0.0000	160.00	No Ice	0.52	1.53	20.00
(Verizon - Proposed)			0.00			1/2" Ice	0.61	1.69	31.93
			0.00			1" Ice	0.72	1.85	46.20
JAHH-65B-R3B Panel	B	From Leg	3.00	0.0000	160.00	No Ice	9.66	7.71	130.00
Antenna			6.00			1/2" Ice	10.22	8.53	204.15
(Verizon)			0.00			1" Ice	10.79	9.37	289.72
JAHH-65B-R3B Panel	B	From Leg	3.00	0.0000	160.00	No Ice	9.66	7.71	130.00
Antenna			4.00			1/2" Ice	10.22	8.53	204.15
(Verizon)			0.00			1" Ice	10.79	9.37	289.72
BXA-70063-4CF Panel	B	From Leg	3.00	0.0000	160.00	No Ice	7.82	6.34	60.00
Antenna			-6.00			1/2" Ice	8.37	7.15	128.37
(Verizon)			0.00			1" Ice	8.92	7.97	200.39
XXDWMM-12.5-65-8T-CBR	B	From Leg	3.00	0.0000	160.00	No Ice	4.80	2.40	20.00
S Panel			-3.00			1/2" Ice	5.07	2.60	59.31
(Verizon - Proposed)			0.00			1" Ice	5.35	2.81	102.70
BSAMNT-SBS-2-2 (JAHH	B	From Leg	3.00	0.0000	160.00	No Ice	3.78	3.56	120.00
Bracket (for 2))			3.00			1/2" Ice	4.84	4.62	175.06
(Verizon)			0.00			1" Ice	5.64	5.41	240.44
4x40 B2_B66 Dual Band	B	From Leg	3.00	0.0000	160.00	No Ice	2.19	1.46	100.00
RRH Unit			0.00			1/2" Ice	2.39	1.62	115.84
(Verizon)			0.00			1" Ice	2.59	1.80	136.97
CBC78T-DS-43-2X Diplexer	B	From Leg	3.00	0.0000	160.00	No Ice	0.37	0.51	22.00
(Verizon - Proposed)			0.00			1/2" Ice	0.45	0.60	28.34
			0.00			1" Ice	0.53	0.70	36.37
RFV01U-D2A RRH Unit	B	From Leg	3.00	0.0000	160.00	No Ice	1.88	1.01	82.00
(Verizon - Proposed)			0.00			1/2" Ice	2.05	1.14	98.43
			0.00			1" Ice	2.22	1.28	117.53
CBRS RRH (RT 4401-48A)	B	From Leg	3.00	0.0000	160.00	No Ice	0.52	1.53	20.00
(Verizon - Proposed)			0.00			1/2" Ice	0.61	1.69	31.93
			0.00			1" Ice	0.72	1.85	46.20
JAHH-65B-R3B Panel	C	From Leg	3.00	0.0000	160.00	No Ice	9.66	7.71	130.00
Antenna			6.00			1/2" Ice	10.22	8.53	204.15
(Verizon)			0.00			1" Ice	10.79	9.37	289.72
JAHH-65B-R3B Panel	C	From Leg	3.00	0.0000	160.00	No Ice	9.66	7.71	130.00
Antenna			4.00			1/2" Ice	10.22	8.53	204.15
(Verizon)			0.00			1" Ice	10.79	9.37	289.72
BXA-70063-4CF Panel	C	From Leg	3.00	0.0000	160.00	No Ice	7.82	6.34	60.00
Antenna			-6.00			1/2" Ice	8.37	7.15	128.37
(Verizon)			0.00			1" Ice	8.92	7.97	200.39
XXDWMM-12.5-65-8T-CBR	C	From Leg	3.00	0.0000	160.00	No Ice	4.80	2.40	20.00
S Panel			-3.00			1/2" Ice	5.07	2.60	59.31
(Verizon - Proposed)			0.00			1" Ice	5.35	2.81	102.70
BSAMNT-SBS-2-2 (JAHH	C	From Leg	3.00	0.0000	160.00	No Ice	3.78	3.56	120.00
Bracket (for 2))			3.00			1/2" Ice	4.84	4.62	175.06

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft²	C_AA_A *Side* ft²	*Weight* lb
(Verizon)			0.00			1" Ice	5.64	5.41	240.44
4x40 B2_B66 Dual Band	C	From Leg	3.00	0.0000	160.00	No Ice	2.19	1.46	100.00
RRH Unit			0.00			1/2" Ice	2.39	1.62	115.84
(Verizon)			0.00			1" Ice	2.59	1.80	136.97
CBC78T-DS-43-2X Diplexer	C	From Leg	3.00	0.0000	160.00	No Ice	0.37	0.51	22.00
(Verizon - Proposed)			0.00			1/2" Ice	0.45	0.60	28.34
			0.00			1" Ice	0.53	0.70	36.37
RFV01U-D2A RRH Unit	C	From Leg	3.00	0.0000	160.00	No Ice	1.88	1.01	82.00
(Verizon - Proposed)			0.00			1/2" Ice	2.05	1.14	98.43
			0.00			1" Ice	2.22	1.28	117.53
CBRS RRH (RT 4401-48A)	C	From Leg	3.00	0.0000	160.00	No Ice	0.52	1.53	20.00
(Verizon - Proposed)			0.00			1/2" Ice	0.61	1.69	31.93
			0.00			1" Ice	0.72	1.85	46.20
*									
*** T-Mobile TWM-020									
Updates 05/29/2019									
LTF12=372 Sector Mount (1)	A	None		0.0000	125.00	No Ice	13.60	13.60	465.00
(T-Mobile)						1/2" Ice	18.40	18.40	600.00
						1" Ice	23.20	23.20	735.00
LTF12=372 Sector Mount (1)	B	None		0.0000	125.00	No Ice	13.60	13.60	465.00
(T-Mobile)						1/2" Ice	18.40	18.40	600.00
						1" Ice	23.20	23.20	735.00
LTF12=372 Sector Mount (1)	C	None		0.0000	125.00	No Ice	13.60	13.60	465.00
(T-Mobile)						1/2" Ice	18.40	18.40	600.00
						1" Ice	23.20	23.20	735.00
Ericsson AIR32 B66A/B2A	A	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	132.20
Panel Antenna			-4.00			1/2" Ice	6.89	5.07	178.02
(T-Mobile)			0.00			1" Ice	7.27	5.43	229.11
Ericsson AIR32 B66A/B2A	B	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	132.20
Panel Antenna			-4.00			1/2" Ice	6.89	5.07	178.02
(T-Mobile)			0.00			1" Ice	7.27	5.43	229.11
Ericsson AIR32 B66A/B2A	C	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	132.20
Panel Antenna			-4.00			1/2" Ice	6.89	5.07	178.02
(T-Mobile)			0.00			1" Ice	7.27	5.43	229.11
Generic Twin TMA unit	A	From Face	3.00	0.0000	125.00	No Ice	0.37	0.96	25.00
(T-Mobile)			0.00			1/2" Ice	0.46	1.09	32.19
			0.00			1" Ice	0.55	1.22	41.21
Generic Twin TMA unit	B	From Face	3.00	0.0000	125.00	No Ice	0.37	0.96	25.00
(T-Mobile)			0.00			1/2" Ice	0.46	1.09	32.19
			0.00			1" Ice	0.55	1.22	41.21
Generic Twin TMA unit	C	From Face	3.00	0.0000	125.00	No Ice	0.37	0.96	25.00
(T-Mobile)			0.00			1/2" Ice	0.46	1.09	32.19
			0.00			1" Ice	0.55	1.22	41.21
Ericsson AIR21 B2A|B4P	A	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	105.80
Panel			0.00			1/2" Ice	6.89	5.07	151.62
(T-Mobile)			0.00			1" Ice	7.27	5.43	202.71
Ericsson AIR21 B2A|B4P	B	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	105.80
Panel			0.00			1/2" Ice	6.89	5.07	151.62
(T-Mobile)			0.00			1" Ice	7.27	5.43	202.71
Ericsson AIR21 B2A|B4P	C	From Face	3.00	0.0000	125.00	No Ice	6.51	4.71	105.80
Panel			0.00			1/2" Ice	6.89	5.07	151.62
(T-Mobile)			0.00			1" Ice	7.27	5.43	202.71
APXVARR24_43-C-NA20	A	From Face	3.00	0.0000	125.00	No Ice	17.15	11.04	179.72
Panel Antenna w/ 96" Pipe			4.00			1/2" Ice	17.77	12.47	301.81
(T-Mobile)			0.00			1" Ice	18.40	13.57	435.25
APXVARR24_43-C-NA20	B	From Face	3.00	0.0000	125.00	No Ice	17.15	11.04	179.72
Panel Antenna w/ 96" Pipe			4.00			1/2" Ice	17.77	12.47	301.81

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 lb
(T-Mobile)			0.00			1" Ice	18.40	13.57	435.25
APXVARR24_43-C-NA20	C	From Face	3.00	0.0000	125.00	No Ice	17.15	11.04	179.72
Panel Antenna w/ 96" Pipe			4.00			1/2" Ice	17.77	12.47	301.81
(T-Mobile)			0.00			1" Ice	18.40	13.57	435.25
Ericsson 4449 B71 + B12	A	From Face	3.00	0.0000	125.00	No Ice	1.66	1.16	80.00
Radio Unit			0.00			1/2" Ice	1.82	1.29	96.16
(T-Mobile)			0.00			1" Ice	1.98	1.44	114.94
Ericsson 4449 B71 + B12	B	From Face	3.00	0.0000	125.00	No Ice	1.66	1.16	80.00
Radio Unit			0.00			1/2" Ice	1.82	1.29	96.16
(T-Mobile)			0.00			1" Ice	1.98	1.44	114.94
Ericsson 4449 B71 + B12	C	From Face	3.00	0.0000	125.00	No Ice	1.66	1.16	80.00
Radio Unit			0.00			1/2" Ice	1.82	1.29	96.16
(T-Mobile)			0.00			1" Ice	1.98	1.44	114.94
*** T-Mobile TWM-020 Updates 05/29/2019									
*** AT&T Antennas from SMK-004 MODification Analysis									
800-10798 Kathrein Panel	A	From Face	3.00	0.0000	133.00	No Ice	11.31	7.25	110.00
(AT&T)			6.00			1/2" Ice	11.92	8.37	188.92
			0.00			1" Ice	12.54	9.27	275.98
RRUS-32 B66	A	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			6.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
RRUS-32	A	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
DBC0061F1V51-2 Combiner	A	From Face	3.00	0.0000	133.00	No Ice	0.48	0.51	30.00
Units			6.00			1/2" Ice	0.58	0.60	30.80
(AT&T)			0.00			1" Ice	0.68	0.71	37.64
800-10798 Kathrein Panel	B	From Face	3.00	0.0000	133.00	No Ice	11.31	7.25	110.00
(AT&T)			6.00			1/2" Ice	11.92	8.37	188.92
			0.00			1" Ice	12.54	9.27	275.98
RRUS-32 B66	B	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			6.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
RRUS-32	B	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
DBC0061F1V51-2 Combiner	B	From Face	3.00	0.0000	133.00	No Ice	0.48	0.51	30.00
Units			6.00			1/2" Ice	0.58	0.60	30.80
(AT&T)			0.00			1" Ice	0.68	0.71	37.64
800-10798 Kathrein Panel	C	From Face	3.00	0.0000	133.00	No Ice	11.31	7.25	110.00
(AT&T)			6.00			1/2" Ice	11.92	8.37	188.92
			0.00			1" Ice	12.54	9.27	275.98
RRUS-32 B66	C	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
RRUS-32	C	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			6.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
DBC0061F1V51-2 Combiner	C	From Face	3.00	0.0000	133.00	No Ice	0.48	0.51	30.00
Units			6.00			1/2" Ice	0.58	0.60	30.80
(AT&T)			0.00			1" Ice	0.68	0.71	37.64
DC6-48-60-18-8F (Squid)	C	From Face	3.00	0.0000	133.00	No Ice	1.27	1.27	20.00
Suppressor			0.00			1/2" Ice	1.46	1.46	35.12
(AT&T)			0.00			1" Ice	1.66	1.66	52.57

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* *lb*
Pirod 15' T-Frame Sector	A	None		0.0000	133.00	No Ice	15.00	15.00	500.00
Mount (1)						1/2" Ice	20.60	20.60	650.00
(AT&T)						1" Ice	26.20	26.20	800.00
Pirod 15' T-Frame Sector	B	None		0.0000	133.00	No Ice	15.00	15.00	500.00
Mount (1)						1/2" Ice	20.60	20.60	650.00
(AT&T)						1" Ice	26.20	26.20	800.00
Pirod 15' T-Frame Sector	C	None		0.0000	133.00	No Ice	15.00	15.00	500.00
Mount (1)						1/2" Ice	20.60	20.60	650.00
(AT&T)						1" Ice	26.20	26.20	800.00
P65-16-XLH-RR	A	From Face	3.00	0.0000	133.00	No Ice	8.40	4.70	60.00
(AT&T)			-6.00			1/2" Ice	8.95	5.15	111.28
			0.00			1" Ice	9.51	5.60	164.59
RRUS-11	A	From Face	3.00	0.0000	133.00	No Ice	2.99	1.25	50.00
(AT&T)			-6.00			1/2" Ice	3.23	1.41	69.57
			0.00			1" Ice	3.47	1.59	92.08
HPA-65R-BUU-H6 Panel	A	From Face	3.00	0.0000	133.00	No Ice	10.12	5.49	50.00
(AT&T)			-2.00			1/2" Ice	10.69	5.94	105.33
			0.00			1" Ice	11.26	6.41	168.95
RRUS-32	A	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
DC6-48-60-18-8F (Squid)	A	From Face	3.00	0.0000	133.00	No Ice	1.27	1.27	20.00
Suppressor			0.00			1/2" Ice	1.46	1.46	35.12
(AT&T)			0.00			1" Ice	1.66	1.66	52.57
DC6-48-60-18-8F (Squid)	B	From Leg	3.00	0.0000	133.00	No Ice	1.27	1.27	20.00
Suppressor			-2.00			1/2" Ice	1.46	1.46	35.12
(AT&T)			0.00			1" Ice	1.66	1.66	52.57
P65-16-XLH-RR	B	From Face	3.00	0.0000	133.00	No Ice	8.40	4.70	60.00
(AT&T)			-6.00			1/2" Ice	8.95	5.15	111.28
			0.00			1" Ice	9.51	5.60	164.59
RRUS-11	B	From Face	3.00	0.0000	133.00	No Ice	2.99	1.25	50.00
(AT&T)			-6.00			1/2" Ice	3.23	1.41	69.57
			0.00			1" Ice	3.47	1.59	92.08
HPA-65R-BUU-H6 Panel	B	From Face	3.00	0.0000	133.00	No Ice	10.12	5.49	50.00
(AT&T)			-2.00			1/2" Ice	10.69	5.94	105.33
			0.00			1" Ice	11.26	6.41	168.95
RRUS-32	B	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
P65-16-XLH-RR	C	From Face	3.00	0.0000	133.00	No Ice	8.40	4.70	60.00
(AT&T)			-6.00			1/2" Ice	8.95	5.15	111.28
			0.00			1" Ice	9.51	5.60	164.59
RRUS-11	C	From Face	3.00	0.0000	133.00	No Ice	2.99	1.25	50.00
(AT&T)			-6.00			1/2" Ice	3.23	1.41	69.57
			0.00			1" Ice	3.47	1.59	92.08
HPA-65R-BUU-H6 Panel	C	From Face	3.00	0.0000	133.00	No Ice	10.12	5.49	50.00
(AT&T)			-2.00			1/2" Ice	10.69	5.94	105.33
			0.00			1" Ice	11.26	6.41	168.95
RRUS-32	C	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00
(AT&T)			-2.00			1/2" Ice	3.46	2.08	81.11
			0.00			1" Ice	3.73	2.31	105.42
*** AT&T Antennas from SMK-004 MODification Analysis									
* CSP									
ANT940Y10-WR	A	From Leg	0.00	0.0000	187.00	No Ice	0.19	0.19	2.50
(CSP)			0.00			1/2" Ice	0.34	0.34	3.25

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* *lb*
			0.00			1" Ice	0.49	0.49	4.00
ANT940Y10-WR (CSP - Yagi Antenna)	C	From Leg	0.50 0.00 0.00	0.0000	181.00	No Ice 1/2" Ice 1" Ice	0.19 0.34 0.49	0.19 0.34 0.49	2.50 3.25 4.00
RFI BPS7496-180-14 Panel Antenna (CSP-80)	A	From Face	4.00 -6.00 0.00	0.0000	170.00	No Ice 1/2" Ice 1" Ice	5.83 6.21 6.60	3.75 4.13 4.51	20.00 56.42 97.99
RFI BPS7496-180-14 Panel Antenna (CSP-81)	A	From Face	4.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice 1" Ice	5.83 6.21 6.60	3.75 4.13 4.51	20.00 56.42 97.99
RFI BPS7496-180-14 Panel Antenna (CSP-82)	A	From Face	4.00 6.00 0.00	0.0000	170.00	No Ice 1/2" Ice 1" Ice	5.83 6.21 6.60	3.75 4.13 4.51	20.00 56.42 97.99
SitePro1 USF12-396-U Mount Assembly w/ (3) 96" Mount Pipes (CSP 47, 80, 81, 82)	A	From Leg	0.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice 1" Ice	16.23 22.18 28.15	9.80 13.27 16.68	491.09 630.09 815.09
432E-83I-01T TTA Unit (Re-Located TMA (CSP))	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice 1" Ice	2.85 3.06 3.28	0.97 1.11 1.26	25.00 44.70 67.39
3' Yagi (CSP)	C	From Leg	0.50 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice	2.08 3.79 5.52	2.08 3.79 5.52	30.95 52.87 85.27
ANT150D (CSP - 1-Bay Dipole)	A	From Leg	0.00 0.00 0.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice	0.80 1.44 2.08	0.80 1.44 2.08	5.50 7.15 8.80
GPS (DNK-1 / GPS)	C	From Leg	4.00 0.00 2.00	0.0000	60.00	No Ice 1/2" Ice 1" Ice	1.00 1.50 2.00	1.00 1.50 2.00	10.00 15.00 20.00
4' Standoff (DNK-1 / GPS)	C	From Leg	0.00 0.00 0.00	0.0000	60.00	No Ice 1/2" Ice 1" Ice	3.42 3.67 3.92	3.42 3.67 3.92	110.00 147.19 187.07

Dishes

Description	*Face or Leg*	*Dish Type*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft*	*Azimuth Adjustment* *°*	*3 dB Beam Width* *°*	*Elevation* *ft*	*Outside Diameter* *ft*		*Aperture Area* *ft^2*	*Weight* *lb*
PA6-65AC (DNK-52 / CSP-42)	C	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	-55.0000		177.00	6.00	No Ice 1/2" Ice 1" Ice	28.27 29.05 29.83	90.00 240.00 390.00

222-H Verification Constants

Constant	*Value*
K_d	0.85

Constant	Value
Ice Thickness Importance Factor	1.25
Z_g	900
α	9.5
K_{zmin}	0.85
K_c	n/a
K_t	1
f	1
K_e	1

222-H Section Verification ArRr By Element

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
T1 180.00-160.00	1	ROHN 3 STD	45.107	31.948	C	0.139	0.285	5.833	10.742	3.165	6.384
	1	ROHN 3 STD	45.107	31.948	A	0.139	0.285	5.833	10.742	3.165	6.384
	2	ROHN 3 STD	45.107	31.948	C	0.139	0.285	5.833	10.742	3.165	6.384
	2	ROHN 3 STD	45.107	31.948	B	0.139	0.285	5.833	10.742	3.165	6.384
	3	ROHN 3 STD	45.107	31.948	B	0.139	0.285	5.833	10.742	3.165	6.384
	3	ROHN 3 STD	45.107	31.948	A	0.139	0.285	5.833	10.742	3.165	6.384
	4	ROHN 1.5 STD	24.486	24.017	C	0.139	0.285	1.306	3.331	0.740	1.980
	5	ROHN 1.5 STD	24.486	24.017	B	0.139	0.285	1.306	3.331	0.740	1.980
	6	ROHN 1.5 STD	24.486	24.017	A	0.139	0.285	1.306	3.331	0.740	1.980
	7	ROHN 1.5 STD	24.486	24.017	C	0.139	0.285	1.315	3.354	0.745	1.993
	8	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.518	3.401	0.860	2.021
	9	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.518	3.401	0.860	2.021
	10	ROHN 1.5 STD	24.486	24.017	B	0.139	0.285	1.315	3.354	0.745	1.993
	11	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.518	3.401	0.860	2.021
	12	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.518	3.401	0.860	2.021
	13	ROHN 1.5 STD	24.486	24.017	A	0.139	0.285	1.315	3.354	0.745	1.993
	14	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.518	3.401	0.860	2.021
	15	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.518	3.401	0.860	2.021
	19	ROHN 1.5 STD	24.486	24.017	C	0.139	0.285	1.311	3.342	0.743	1.986
	20	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.517	3.398	0.859	2.019
	21	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.517	3.398	0.859	2.019
	22	ROHN 1.5 STD	24.486	24.017	B	0.139	0.285	1.311	3.342	0.743	1.986
	23	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.517	3.398	0.859	2.019
	24	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.517	3.398	0.859	2.019
	25	ROHN 1.5 STD	24.486	24.017	A	0.139	0.285	1.311	3.342	0.743	1.986
	26	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.517	3.398	0.859	2.019
	27	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.517	3.398	0.859	2.019
	31	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.515	3.394	0.858	2.017
	32	ROHN 2 STD	30.608	26.372	C	0.139	0.285	1.515	3.394	0.858	2.017
	33	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.515	3.394	0.858	2.017
	34	ROHN 2 STD	30.608	26.372	B	0.139	0.285	1.515	3.394	0.858	2.017
	35	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.515	3.394	0.858	2.017
	36	ROHN 2 STD	30.608	26.372	A	0.139	0.285	1.515	3.394	0.858	2.017
					A		Sum:	24.699	51.898	13.713	30.840
					B			24.699	51.898	13.713	30.840
					C			24.699	51.898	13.713	30.840
T2 160.00-140.00	40	ROHN 4 STD	57.235	36.242	C	0.144	0.276	7.514	12.370	3.727	7.320
	40	ROHN 4 STD	57.235	36.242	A	0.144	0.276	7.514	12.370	3.727	7.320
	41	ROHN 4 STD	57.235	36.242	C	0.144	0.276	7.514	12.370	3.727	7.320
	41	ROHN 4 STD	57.235	36.242	B	0.144	0.276	7.514	12.370	3.727	7.320
	42	ROHN 4 STD	57.235	36.242	B	0.144	0.276	7.514	12.370	3.727	7.320
	42	ROHN 4 STD	57.235	36.242	A	0.144	0.276	7.514	12.370	3.727	7.320
	43	ROHN 1.5 STD	24.166	23.524	C	0.144	0.276	1.526	3.863	0.865	2.286

Section Elevation *ft*	*Elem. Num.*	*Size*	*C*	*C w/Ice*	*Face*	*e*	*e w/Ice*	A_r ft^2	A_r *w/Ice* ft^2	A_rR_r ft^2	A_rR_r *w/Ice* ft^2
	44	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.634	3.634	0.926	2.151
	45	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.634	3.634	0.926	2.151
	46	ROHN 1.5 STD	24.166	23.524	B	0.144	0.276	1.526	3.863	0.865	2.286
	47	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.634	3.634	0.926	2.151
	48	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.634	3.634	0.926	2.151
	49	ROHN 1.5 STD	24.166	23.524	A	0.144	0.276	1.526	3.863	0.865	2.286
	50	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.634	3.634	0.926	2.151
	51	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.634	3.634	0.926	2.151
	55	ROHN 1.5 STD	24.166	23.524	C	0.144	0.276	1.416	3.584	0.803	2.121
	56	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.589	3.535	0.901	2.092
	57	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.589	3.535	0.901	2.092
	58	ROHN 1.5 STD	24.166	23.524	B	0.144	0.276	1.416	3.584	0.803	2.121
	59	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.589	3.535	0.901	2.092
	60	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.589	3.535	0.901	2.092
	61	ROHN 1.5 STD	24.166	23.524	A	0.144	0.276	1.416	3.584	0.803	2.121
	62	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.589	3.535	0.901	2.092
	63	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.589	3.535	0.901	2.092
	67	ROHN 1.5 STD	24.166	23.524	C	0.144	0.276	1.319	3.339	0.748	1.976
	68	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.546	3.438	0.876	2.035
	69	ROHN 2 STD	30.207	25.847	C	0.144	0.276	1.546	3.438	0.876	2.035
	70	ROHN 1.5 STD	24.166	23.524	B	0.144	0.276	1.319	3.339	0.748	1.976
	71	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.546	3.438	0.876	2.035
	72	ROHN 2 STD	30.207	25.847	B	0.144	0.276	1.546	3.438	0.876	2.035
	73	ROHN 1.5 STD	24.166	23.524	A	0.144	0.276	1.319	3.339	0.748	1.976
	74	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.546	3.438	0.876	2.035
	75	ROHN 2 STD	30.207	25.847	A	0.144	0.276	1.546	3.438	0.876	2.035
					A		Sum:	28.825	56.742	15.277	33.579
					B			28.825	56.742	15.277	33.579
					C			28.825	56.742	15.277	33.579
T3 140.00-133.33	79	ROHN 5 EH	70.065	40.908	C	0.151	0.272	3.096	4.700	1.391	2.776
	79	ROHN 5 EH	70.065	40.908	A	0.151	0.272	3.096	4.700	1.391	2.776
	80	ROHN 5 EH	70.065	40.908	C	0.151	0.272	3.096	4.700	1.391	2.776
	80	ROHN 5 EH	70.065	40.908	B	0.151	0.272	3.096	4.700	1.391	2.776
	81	ROHN 5 EH	70.065	40.908	B	0.151	0.272	3.096	4.700	1.391	2.776
	81	ROHN 5 EH	70.065	40.908	A	0.151	0.272	3.096	4.700	1.391	2.776
	82	ROHN 2 STD	29.913	25.465	C	0.151	0.272	2.045	4.527	1.161	2.674
	83	ROHN 2 EH	29.976	25.489	C	0.151	0.272	1.670	3.691	0.948	2.180
	84	ROHN 2 EH	29.976	25.489	C	0.151	0.272	1.670	3.691	0.948	2.180
	85	ROHN 2 STD	29.913	25.465	B	0.151	0.272	2.045	4.527	1.161	2.674
	86	ROHN 2 EH	29.976	25.489	B	0.151	0.272	1.670	3.691	0.948	2.180
	87	ROHN 2 EH	29.976	25.489	B	0.151	0.272	1.670	3.691	0.948	2.180
	88	ROHN 2 STD	29.913	25.465	A	0.151	0.272	2.045	4.527	1.161	2.674
	89	ROHN 2 EH	29.976	25.489	A	0.151	0.272	1.670	3.691	0.948	2.180
	90	ROHN 2 EH	29.976	25.489	A	0.151	0.272	1.670	3.691	0.948	2.180
					A		Sum:	11.577	21.309	5.838	12.586
					B			11.577	21.309	5.838	12.586
					C			11.577	21.309	5.838	12.586
T4 133.33-126.67	94	ROHN 5 EH	69.697	40.624	C	0.145	0.262	3.096	4.692	1.388	2.759
	94	ROHN 5 EH	69.697	40.624	A	0.145	0.262	3.096	4.692	1.388	2.759
	95	ROHN 5 EH	69.697	40.624	C	0.145	0.262	3.096	4.692	1.388	2.759
	95	ROHN 5 EH	69.697	40.624	B	0.145	0.262	3.096	4.692	1.388	2.759
	96	ROHN 5 EH	69.697	40.624	B	0.145	0.262	3.096	4.692	1.388	2.759
	96	ROHN 5 EH	69.697	40.624	A	0.145	0.262	3.096	4.692	1.388	2.759
	97	ROHN 2 STD	29.756	25.262	C	0.145	0.262	2.165	4.779	1.228	2.810
	98	ROHN 2 STD	29.756	25.262	B	0.145	0.262	2.165	4.779	1.228	2.810
	99	ROHN 2 STD	29.756	25.262	A	0.145	0.262	2.165	4.779	1.228	2.810
	100	ROHN 2 EH	29.818	25.286	C	0.145	0.262	1.717	3.787	0.974	2.226
	101	ROHN 2 EH	29.818	25.286	C	0.145	0.262	1.717	3.787	0.974	2.226

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
	102	ROHN 2 EH	29.818	25.286	B	0.145	0.262	1.717	3.787	0.974	2.226
	103	ROHN 2 EH	29.818	25.286	B	0.145	0.262	1.717	3.787	0.974	2.226
	104	ROHN 2 EH	29.818	25.286	A	0.145	0.262	1.717	3.787	0.974	2.226
	105	ROHN 2 EH	29.818	25.286	A	0.145	0.262	1.717	3.787	0.974	2.226
					A		Sum:	11.792	21.736	5.951	12.781
					B			11.792	21.736	5.951	12.781
					C			11.792	21.736	5.951	12.781
T5 126.67-120.00	109	ROHN 5 EH	69.312	40.327	C	0.14	0.253	3.096	4.684	1.386	2.744
	109	ROHN 5 EH	69.312	40.327	A	0.14	0.253	3.096	4.684	1.386	2.744
	110	ROHN 5 EH	69.312	40.327	C	0.14	0.253	3.096	4.684	1.386	2.744
	110	ROHN 5 EH	69.312	40.327	B	0.14	0.253	3.096	4.684	1.386	2.744
	111	ROHN 5 EH	69.312	40.327	B	0.14	0.253	3.096	4.684	1.386	2.744
	111	ROHN 5 EH	69.312	40.327	A	0.14	0.253	3.096	4.684	1.386	2.744
	112	ROHN 2 STD	29.591	25.05	C	0.14	0.253	2.303	5.068	1.305	2.969
	113	ROHN 2 STD	29.591	25.05	B	0.14	0.253	2.303	5.068	1.305	2.969
	114	ROHN 2 STD	29.591	25.05	A	0.14	0.253	2.303	5.068	1.305	2.969
	115	ROHN 2 XXS	29.591	25.05	C	0.14	0.253	1.763	3.880	0.999	2.273
	116	ROHN 2 XXS	29.591	25.05	C	0.14	0.253	1.763	3.880	0.999	2.273
	117	ROHN 2 XXS	29.591	25.05	B	0.14	0.253	1.763	3.880	0.999	2.273
	118	ROHN 2 XXS	29.591	25.05	B	0.14	0.253	1.763	3.880	0.999	2.273
	119	ROHN 2 XXS	29.591	25.05	A	0.14	0.253	1.763	3.880	0.999	2.273
	120	ROHN 2 XXS	29.591	25.05	A	0.14	0.253	1.763	3.880	0.999	2.273
					A		Sum:	12.020	22.194	6.074	13.001
					B			12.020	22.194	6.074	13.001
					C			12.020	22.194	6.074	13.001
T6 120.00-100.00	124	ROHN 6 EHS	81.556	44.719	C	0.133	0.222	11.065	15.775	4.542	9.128
	124	ROHN 6 EHS	81.556	44.719	A	0.133	0.222	11.065	15.775	4.542	9.128
	125	ROHN 6 EHS	81.556	44.719	C	0.133	0.222	11.065	15.775	4.542	9.128
	125	ROHN 6 EHS	81.556	44.719	B	0.133	0.222	11.065	15.775	4.542	9.128
	126	ROHN 6 EHS	81.556	44.719	B	0.133	0.222	11.065	15.775	4.542	9.128
	126	ROHN 6 EHS	81.556	44.719	A	0.133	0.222	11.065	15.775	4.542	9.128
	127	ROHN 2 STD	29.237	24.596	C	0.133	0.222	2.645	5.786	1.497	3.348
	128	Pipe 2.5 XXS	35.392	26.964	C	0.133	0.222	2.889	5.722	1.635	3.311
	129	Pipe 2.5 XXS	35.392	26.964	C	0.133	0.222	2.889	5.722	1.635	3.311
	130	ROHN 2 STD	29.237	24.596	B	0.133	0.222	2.645	5.786	1.497	3.348
	131	Pipe 2.5 XXS	35.392	26.964	B	0.133	0.222	2.889	5.722	1.635	3.311
	132	Pipe 2.5 XXS	35.392	26.964	B	0.133	0.222	2.889	5.722	1.635	3.311
	133	ROHN 2 STD	29.237	24.596	A	0.133	0.222	2.645	5.786	1.497	3.348
	134	Pipe 2.5 XXS	35.392	26.964	A	0.133	0.222	2.889	5.722	1.635	3.311
	135	Pipe 2.5 XXS	35.392	26.964	A	0.133	0.222	2.889	5.722	1.635	3.311
	139	ROHN 2 STD	29.237	24.596	C	0.133	0.222	2.440	5.337	1.381	3.088
	140	Pipe 2.5 XXS	35.392	26.964	C	0.133	0.222	2.804	5.554	1.587	3.214
	141	Pipe 2.5 XXS	35.392	26.964	C	0.133	0.222	2.804	5.554	1.587	3.214
	142	ROHN 2 STD	29.237	24.596	B	0.133	0.222	2.440	5.337	1.381	3.088
	143	Pipe 2.5 XXS	35.392	26.964	B	0.133	0.222	2.804	5.554	1.587	3.214
	144	Pipe 2.5 XXS	35.392	26.964	B	0.133	0.222	2.804	5.554	1.587	3.214
	145	ROHN 2 STD	29.237	24.596	A	0.133	0.222	2.440	5.337	1.381	3.088
	146	Pipe 2.5 XXS	35.392	26.964	A	0.133	0.222	2.804	5.554	1.587	3.214
	147	Pipe 2.5 XXS	35.392	26.964	A	0.133	0.222	2.804	5.554	1.587	3.214
					A		Sum:	38.601	65.226	18.407	37.742
					B			38.601	65.226	18.407	37.742
					C			38.601	65.226	18.407	37.742
T7 100.00-90.00	151	ROHN 6 EH	80.307	43.843	C	0.131	0.212	5.537	7.859	2.265	4.533
	151	ROHN 6 EH	80.307	43.843	A	0.131	0.212	5.537	7.859	2.265	4.533
	152	ROHN 6 EH	80.307	43.843	C	0.131	0.212	5.537	7.859	2.265	4.533
	152	ROHN 6 EH	80.307	43.843	B	0.131	0.212	5.537	7.859	2.265	4.533
	153	ROHN 6 EH	80.307	43.843	B	0.131	0.212	5.537	7.859	2.265	4.533
	153	ROHN 6 EH	80.307	43.843	A	0.131	0.212	5.537	7.859	2.265	4.533

Section Elevation *ft*	*Elem. Num.*	*Size*	*C*	*C w/Ice*	*Face*	*e*	*e w/Ice*	A_r *ft²*	A_r *w/Ice* *ft²*	A_rR_r *ft²*	A_rR_r *w/Ice* *ft²*
	154	ROHN 2 STD	28.789	24.028	C	0.131	0.212	2.868	6.223	1.623	3.589
	155	ROHN 3 STD	42.426	29.273	C	0.131	0.212	3.643	6.535	2.011	3.769
	156	ROHN 3 STD	42.426	29.273	C	0.131	0.212	3.643	6.535	2.011	3.769
	157	ROHN 2 STD	28.789	24.028	B	0.131	0.212	2.868	6.223	1.623	3.589
	158	ROHN 3 STD	42.426	29.273	B	0.131	0.212	3.643	6.535	2.011	3.769
	159	ROHN 3 STD	42.426	29.273	B	0.131	0.212	3.643	6.535	2.011	3.769
	160	ROHN 2 STD	28.789	24.028	A	0.131	0.212	2.868	6.223	1.623	3.589
	161	ROHN 3 STD	42.426	29.273	A	0.131	0.212	3.643	6.535	2.011	3.769
	162	ROHN 3 STD	42.426	29.273	A	0.131	0.212	3.643	6.535	2.011	3.769
					A		Sum:	21.227	35.011	10.175	20.193
					B			21.227	35.011	10.175	20.193
					C			21.227	35.011	10.175	20.193
T8 90.00-80.00	166	ROHN 6 EH	79.372	43.191	C	0.124	0.202	5.537	7.833	2.247	4.502
	166	ROHN 6 EH	79.372	43.191	A	0.124	0.202	5.537	7.833	2.247	4.502
	167	ROHN 6 EH	79.372	43.191	C	0.124	0.202	5.537	7.833	2.247	4.502
	167	ROHN 6 EH	79.372	43.191	B	0.124	0.202	5.537	7.833	2.247	4.502
	168	ROHN 6 EH	79.372	43.191	B	0.124	0.202	5.537	7.833	2.247	4.502
	168	ROHN 6 EH	79.372	43.191	A	0.124	0.202	5.537	7.833	2.247	4.502
	169	ROHN 2 STD	28.454	23.607	C	0.124	0.202	3.129	6.749	1.769	3.879
	170	ROHN 2 STD	28.454	23.607	B	0.124	0.202	3.129	6.749	1.769	3.879
	171	ROHN 2 STD	28.454	23.607	A	0.124	0.202	3.129	6.749	1.769	3.879
	172	ROHN 3 STD	41.933	28.791	C	0.124	0.202	3.773	6.735	2.088	3.871
	173	ROHN 3 STD	41.933	28.791	C	0.124	0.202	3.773	6.735	2.088	3.871
	174	ROHN 3 STD	41.933	28.791	B	0.124	0.202	3.773	6.735	2.088	3.871
	175	ROHN 3 STD	41.933	28.791	B	0.124	0.202	3.773	6.735	2.088	3.871
	176	ROHN 3 STD	41.933	28.791	A	0.124	0.202	3.773	6.735	2.088	3.871
	177	ROHN 3 STD	41.933	28.791	A	0.124	0.202	3.773	6.735	2.088	3.871
					A		Sum:	21.747	35.885	10.439	20.625
					B			21.747	35.885	10.439	20.625
					C			21.747	35.885	10.439	20.625
T9 80.00-60.00	184	ROHN 2.5 STD	33.748	25.148	C	0.14	0.204	4.360	8.447	2.470	4.859
	185	ROHN 3 STD	41.084	27.97	C	0.14	0.204	3.995	7.071	2.231	4.067
	186	ROHN 3 STD	41.084	27.97	C	0.14	0.204	3.995	7.071	2.231	4.067
	187	ROHN 2.5 STD	33.748	25.148	B	0.14	0.204	4.360	8.447	2.470	4.859
	188	ROHN 3 STD	41.084	27.97	B	0.14	0.204	3.995	7.071	2.231	4.067
	189	ROHN 3 STD	41.084	27.97	B	0.14	0.204	3.995	7.071	2.231	4.067
	190	ROHN 2.5 STD	33.748	25.148	A	0.14	0.204	4.360	8.447	2.470	4.859
	191	ROHN 3 STD	41.084	27.97	A	0.14	0.204	3.995	7.071	2.231	4.067
	192	ROHN 3 STD	41.084	27.97	A	0.14	0.204	3.995	7.071	2.231	4.067
	196	ROHN 2.5 STD	33.748	25.148	C	0.14	0.204	4.103	7.949	2.325	4.572
	197	ROHN 3 STD	41.084	27.97	C	0.14	0.204	3.862	6.837	2.157	3.933
	198	ROHN 3 STD	41.084	27.97	C	0.14	0.204	3.862	6.837	2.157	3.933
	199	ROHN 2.5 STD	33.748	25.148	B	0.14	0.204	4.103	7.949	2.325	4.572
	200	ROHN 3 STD	41.084	27.97	B	0.14	0.204	3.862	6.837	2.157	3.933
	201	ROHN 3 STD	41.084	27.97	B	0.14	0.204	3.862	6.837	2.157	3.933
	202	ROHN 2.5 STD	33.748	25.148	A	0.14	0.204	4.103	7.949	2.325	4.572
	203	ROHN 3 STD	41.084	27.97	A	0.14	0.204	3.862	6.837	2.157	3.933
	204	ROHN 3 STD	41.084	27.97	A	0.14	0.204	3.862	6.837	2.157	3.933
					A		Sum:	24.177	44.212	13.570	25.431
					B			24.177	44.212	13.570	25.431
					C			24.177	44.212	13.570	25.431
T10 60.00-40.00	211	ROHN 2.5 STD	32.573	23.885	C	0.129	0.189	4.959	9.454	2.805	5.413
	212	ROHN 3 EH	39.655	26.608	C	0.129	0.189	4.269	7.448	2.404	4.264
	213	ROHN 3 EH	39.655	26.608	C	0.129	0.189	4.269	7.448	2.404	4.264
	214	ROHN 2.5 STD	32.573	23.885	B	0.129	0.189	4.959	9.454	2.805	5.413
	215	ROHN 3 EH	39.655	26.608	B	0.129	0.189	4.269	7.448	2.404	4.264
	216	ROHN 3 EH	39.655	26.608	B	0.129	0.189	4.269	7.448	2.404	4.264
	217	ROHN 2.5 STD	32.573	23.885	A	0.129	0.189	4.959	9.454	2.805	5.413
	218	ROHN 3 EH	39.655	26.608	A	0.129	0.189	4.269	7.448	2.404	4.264
	219	ROHN 3 EH	39.655	26.608	A	0.129	0.189	4.269	7.448	2.404	4.264

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
	223	ROHN 2.5 STD	32.573	23.885	C	0.129	0.189	4.659	8.883	2.636	5.086
	224	ROHN 3 EH	39.655	26.608	C	0.129	0.189	4.130	7.206	2.326	4.126
	225	ROHN 3 EH	39.655	26.608	C	0.129	0.189	4.130	7.206	2.326	4.126
	226	ROHN 2.5 STD	32.573	23.885	B	0.129	0.189	4.659	8.883	2.636	5.086
	227	ROHN 3 EH	39.655	26.608	B	0.129	0.189	4.130	7.206	2.326	4.126
	228	ROHN 3 EH	39.655	26.608	B	0.129	0.189	4.130	7.206	2.326	4.126
	229	ROHN 2.5 STD	32.573	23.885	A	0.129	0.189	4.659	8.883	2.636	5.086
	230	ROHN 3 EH	39.655	26.608	A	0.129	0.189	4.130	7.206	2.326	4.126
	231	ROHN 3 EH	39.655	26.608	A	0.129	0.189	4.130	7.206	2.326	4.126
					A		Sum:	26.417	47.644	14.901	27.279
					B			26.417	47.644	14.901	27.279
					C			26.417	47.644	14.901	27.279
T11 40.00-30.00	238	ROHN 2.5 STD	31.373	22.621	C	0.123	0.178	5.258	9.858	2.973	5.629
	239	ROHN 3 EH	38.193	25.244	C	0.123	0.178	4.410	7.579	2.493	4.328
	240	ROHN 3 EH	38.193	25.244	C	0.123	0.178	4.410	7.579	2.493	4.328
	241	ROHN 2.5 STD	31.373	22.621	B	0.123	0.178	5.258	9.858	2.973	5.629
	242	ROHN 3 EH	38.193	25.244	B	0.123	0.178	4.410	7.579	2.493	4.328
	243	ROHN 3 EH	38.193	25.244	B	0.123	0.178	4.410	7.579	2.493	4.328
	244	ROHN 2.5 STD	31.373	22.621	A	0.123	0.178	5.258	9.858	2.973	5.629
	245	ROHN 3 EH	38.193	25.244	A	0.123	0.178	4.410	7.579	2.493	4.328
	246	ROHN 3 EH	38.193	25.244	A	0.123	0.178	4.410	7.579	2.493	4.328
					A		Sum:	14.079	25.017	7.959	14.285
					B			14.079	25.017	7.959	14.285
					C			14.079	25.017	7.959	14.285
T12 30.00-20.00	253	ROHN 2.5 EH	30.281	21.497	C	0.119	0.172	5.558	10.258	3.141	5.849
	254	ROHN 2.5 EH	30.281	21.497	B	0.119	0.172	5.558	10.258	3.141	5.849
	255	ROHN 2.5 EH	30.281	21.497	A	0.119	0.172	5.558	10.258	3.141	5.849
	256	ROHN 3 EH	36.864	24.029	C	0.119	0.172	4.555	7.719	2.574	4.401
	257	ROHN 3 EH	36.864	24.029	C	0.119	0.172	4.555	7.719	2.574	4.401
	258	ROHN 3 EH	36.864	24.029	B	0.119	0.172	4.555	7.719	2.574	4.401
	259	ROHN 3 EH	36.864	24.029	B	0.119	0.172	4.555	7.719	2.574	4.401
	260	ROHN 3 EH	36.864	24.029	A	0.119	0.172	4.555	7.719	2.574	4.401
	261	ROHN 3 EH	36.864	24.029	A	0.119	0.172	4.555	7.719	2.574	4.401
					A		Sum:	14.667	25.696	8.288	14.650
					B			14.667	25.696	8.288	14.650
					C			14.667	25.696	8.288	14.650
T13 20.00-0.00	268	P3.5x.226	39.951	23.889	C	0.107	0.152	8.149	12.669	4.568	7.192
	269	ROHN 3 EH	34.957	21.968	C	0.107	0.152	6.913	11.295	3.903	6.412
	270	ROHN 1.5 STD	18.977	15.822	C	0.107	0.152	0.940	2.037	0.531	1.156
	271	ROHN 2 STD	23.721	17.646	C	0.107	0.152	2.130	4.120	1.203	2.339
	272	ROHN 3 EH	34.957	21.968	C	0.107	0.152	6.913	11.295	3.903	6.412
	273	ROHN 1.5 STD	18.977	15.822	C	0.107	0.152	0.940	2.037	0.531	1.156
	274	ROHN 2 STD	23.721	17.646	C	0.107	0.152	2.130	4.120	1.203	2.339
	275	P3.5x.226	39.951	23.889	B	0.107	0.152	8.149	12.669	4.568	7.192
	276	ROHN 3 EH	34.957	21.968	B	0.107	0.152	6.913	11.295	3.903	6.412
	277	ROHN 1.5 STD	18.977	15.822	B	0.107	0.152	0.940	2.037	0.531	1.156
	278	ROHN 2 STD	23.721	17.646	B	0.107	0.152	2.130	4.120	1.203	2.339
	279	ROHN 3 EH	34.957	21.968	B	0.107	0.152	6.913	11.295	3.903	6.412
	280	ROHN 1.5 STD	18.977	15.822	B	0.107	0.152	0.940	2.037	0.531	1.156
	281	ROHN 2 STD	23.721	17.646	B	0.107	0.152	2.130	4.120	1.203	2.339
	283	P3.5x.226	39.951	23.889	A	0.107	0.152	8.149	12.669	4.568	7.192
	284	ROHN 3 EH	34.957	21.968	A	0.107	0.152	6.913	11.295	3.903	6.412
	285	ROHN 1.5 STD	18.977	15.822	A	0.107	0.152	0.940	2.037	0.531	1.156
	286	ROHN 2 STD	23.721	17.646	A	0.107	0.152	2.130	4.120	1.203	2.339
	287	ROHN 3 EH	34.957	21.968	A	0.107	0.152	6.913	11.295	3.903	6.412
	288	ROHN 1.5 STD	18.977	15.822	A	0.107	0.152	0.940	2.037	0.531	1.156
	289	ROHN 2 STD	23.721	17.646	A	0.107	0.152	2.130	4.120	1.203	2.339
					A		Sum:	28.114	47.573	15.840	27.007
					B			28.114	47.573	15.840	27.007
					C			28.114	47.573	15.840	27.007

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2

222-H Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T1 180.00-160.00	170.00		1.415	1	1		52	A	0.139	13.713
								B	0.139	13.713
								C	0.139	13.713
T2 160.00-140.00	150.00		1.378	1	1		51	A	0.144	15.277
								B	0.144	15.277
								C	0.144	15.277
T3 140.00-133.33	136.67		1.352	1	1		50	A	0.151	5.838
								B	0.151	5.838
								C	0.151	5.838
T4 133.33-126.67	130.00		1.337	1	1		49	A	0.145	5.951
								B	0.145	5.951
								C	0.145	5.951
T5 126.67-120.00	123.33		1.323	1	1		49	A	0.14	6.074
								B	0.14	6.074
								C	0.14	6.074
T6 120.00-100.00	110.00		1.291	1	1		47	A	0.133	18.407
								B	0.133	18.407
								C	0.133	18.407
T7 100.00-90.00	95.00		1.252	1	1		46	A	0.131	10.175
								B	0.131	10.175
								C	0.131	10.175
T8 90.00-80.00	85.00		1.223	1	1		45	A	0.124	10.439
								B	0.124	10.439
								C	0.124	10.439
T9 80.00-60.00	70.00		1.174	1	1		43	A	0.14	13.570
								B	0.14	13.570
								C	0.14	13.570
T10 60.00-40.00	50.00		1.094	1	1		40	A	0.129	14.901
								B	0.129	14.901
								C	0.129	14.901
T11 40.00-30.00	35.00		1.015	1	1		37	A	0.123	7.959
								B	0.123	7.959
								C	0.123	7.959
T12 30.00-20.00	25.00		0.945	1	1		35	A	0.119	8.288
								B	0.119	8.288
								C	0.119	8.288
T13 20.00-0.00	10.00		0.85	1	1		31	A	0.107	15.840
								B	0.107	15.840
								C	0.107	15.840

222-H Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T1 180.00-160.00	170.00	170.00	1.415	1	1	1.4727	8	A	0.285	30.840
								B	0.285	30.840
								C	0.285	30.840
T2 160.00-140.00	150.00	150.00	1.378	1	1	1.4543	7	A	0.276	33.579
								B	0.276	33.579
								C	0.276	33.579
T3 140.00-133.33	136.67	136.67	1.352	1	1	1.4409	7	A	0.272	12.586
								B	0.272	12.586
								C	0.272	12.586
T4 133.33-126.67	130.00	130.00	1.337	1	1	1.4337	7	A	0.262	12.781
								B	0.262	12.781
								C	0.262	12.781
T5 126.67-120.00	123.33	123.33	1.323	1	1	1.4262	7	A	0.253	13.001
								B	0.253	13.001
								C	0.253	13.001
T6 120.00-100.00	110.00	110.00	1.291	1	1	1.4099	7	A	0.222	37.742
								B	0.222	37.742
								C	0.222	37.742
T7 100.00-90.00	95.00	95.00	1.252	1	1	1.3894	7	A	0.212	20.193
								B	0.212	20.193
								C	0.212	20.193
T8 90.00-80.00	85.00	85.00	1.223	1	1	1.3740	7	A	0.202	20.625
								B	0.202	20.625
								C	0.202	20.625
T9 80.00-60.00	70.00	70.00	1.174	1	1	1.3476	6	A	0.204	25.431
								B	0.204	25.431
								C	0.204	25.431
T10 60.00-40.00	50.00	50.00	1.094	1	1	1.3030	6	A	0.189	27.279
								B	0.189	27.279
								C	0.189	27.279
T11 40.00-30.00	35.00	35.00	1.015	1	1	1.2574	6	A	0.178	14.285
								B	0.178	14.285
								C	0.178	14.285
T12 30.00-20.00	25.00	25.00	0.945	1	1	1.2158	5	A	0.172	14.650
								B	0.172	14.650
								C	0.172	14.650
T13 20.00-0.00	10.00	10.00	0.85	1	1	1.1093	5	A	0.152	27.007
								B	0.152	27.007
								C	0.152	27.007

222-H Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T1 180.00-160.00	170.00		1.415	1	1		11	A	0.139	13.713
								B	0.139	13.713
								C	0.139	13.713
T2 160.00-140.00	150.00		1.378	1	1		11	A	0.144	15.277
								B	0.144	15.277
								C	0.144	15.277
T3 140.00-133.33	136.67		1.352	1	1		11	A	0.151	5.838
								B	0.151	5.838
								C	0.151	5.838
T4 133.33-126.67	130.00		1.337	1	1		10	A	0.145	5.951
								B	0.145	5.951

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
								C	0.145	5.951
T5 126.67-120.00	123.33		1.323	1	1		10	A	0.14	6.074
								B	0.14	6.074
								C	0.14	6.074
T6 120.00-100.00	110.00		1.291	1	1		10	A	0.133	18.407
								B	0.133	18.407
								C	0.133	18.407
T7 100.00-90.00	95.00		1.252	1	1		10	A	0.131	10.175
								B	0.131	10.175
								C	0.131	10.175
T8 90.00-80.00	85.00		1.223	1	1		10	A	0.124	10.439
								B	0.124	10.439
								C	0.124	10.439
T9 80.00-60.00	70.00		1.174	1	1		9	A	0.14	13.570
								B	0.14	13.570
								C	0.14	13.570
T10 60.00-40.00	50.00		1.094	1	1		9	A	0.129	14.901
								B	0.129	14.901
								C	0.129	14.901
T11 40.00-30.00	35.00		1.015	1	1		8	A	0.123	7.959
								B	0.123	7.959
								C	0.123	7.959
T12 30.00-20.00	25.00		0.945	1	1		7	A	0.119	8.288
								B	0.119	8.288
								C	0.119	8.288
T13 20.00-0.00	10.00		0.85	1	1		7	A	0.107	15.840
								B	0.107	15.840
								C	0.107	15.840

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	170.00	1.415	52	177.503	A	0.000	24.699	11.667	47.24	15.281	0.000
180.00-160.00					B	0.000	24.699		47.24	0.000	0.000
					C	0.000	24.699		47.24	0.000	0.000
T2	150.00	1.378	51	200.850	A	0.000	28.825	15.027	52.13	64.658	0.000
160.00-140.00					B	0.000	28.825		52.13	0.000	0.000
					C	0.000	28.825		52.13	0.000	0.000
T3	136.67	1.352	50	76.803	A	0.000	11.577	6.192	53.49	21.553	0.000
140.00-133.33					B	0.000	11.577		53.49	0.000	0.000
					C	0.000	11.577		53.49	0.000	0.000
T4	130.00	1.337	49	81.431	A	0.000	11.792	6.192	52.51	21.553	0.000
133.33-126.67					B	0.000	11.792		52.51	14.852	0.000
					C	0.000	11.792		52.51	0.000	0.000
T5	123.33	1.323	49	86.060	A	0.000	12.020	6.192	51.52	21.553	0.000
126.67-120.00					B	0.000	12.020		51.52	24.913	0.000
					C	0.000	12.020		51.52	0.000	0.000
T6	110.00	1.291	47	289.399	A	0.000	38.601	22.130	57.33	65.477	0.000
120.00-100.00					B	0.000	38.601		57.33	84.017	0.000
					C	0.000	38.601		57.33	0.000	0.000
T7	95.00	1.252	46	162.540	A	0.000	21.227	11.074	52.17	32.959	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
100.00-90.00					B	0.000	21.227		52.17	42.009	0.000
					C	0.000	21.227		52.17	0.000	0.000
T8 90.00-80.00	85.00	1.223	45	175.715	A	0.000	21.747	11.074	50.92	32.959	0.000
					B	0.000	21.747		50.92	42.009	0.000
					C	0.000	21.747		50.92	0.000	0.000
T9 80.00-60.00	70.00	1.174	43	390.971	A	30.496	24.177	30.496	55.78	65.981	0.000
					B	30.496	24.177		55.78	84.017	0.000
					C	30.496	24.177		55.78	0.000	0.000
T10 60.00-40.00	50.00	1.094	40	440.971	A	30.496	26.417	30.496	53.58	67.178	0.000
					B	30.496	26.417		53.58	84.017	0.000
					C	30.496	26.417		53.58	0.000	0.000
T11 40.00-30.00	35.00	1.015	37	239.236	A	15.248	14.079	15.248	51.99	33.589	0.000
					B	15.248	14.079		51.99	42.009	0.000
					C	15.248	14.079		51.99	0.000	0.000
T12 30.00-20.00	25.00	0.945	35	251.736	A	15.248	14.667	15.248	50.97	33.589	0.000
					B	15.248	14.667		50.97	42.009	0.000
					C	15.248	14.667		50.97	0.000	0.000
T13 20.00-0.00	10.00	0.85	31	541.368	A	30.078	28.114	30.078	51.69	67.178	0.000
					B	30.078	28.114		51.69	84.017	0.000
					C	30.078	28.114		51.69	0.000	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.415	8	1.4727	182.412	A	0.000	51.898	21.484	41.40	43.556	0.000
						B	0.000	51.898		41.40	0.000	0.000
						C	0.000	51.898		41.40	0.000	0.000
T2 160.00-140.00	150.00	1.378	7	1.4543	205.705	A	0.000	56.742	24.740	43.60	179.426	0.000
						B	0.000	56.742		43.60	0.000	0.000
						C	0.000	56.742		43.60	0.000	0.000
T3 140.00-133.33	136.67	1.352	7	1.4409	78.406	A	0.000	21.309	9.400	44.11	59.609	0.000
						B	0.000	21.309		44.11	0.000	0.000
						C	0.000	21.309		44.11	0.000	0.000
T4 133.33-126.67	130.00	1.337	7	1.4337	83.027	A	0.000	21.736	9.384	43.17	59.502	0.000
						B	0.000	21.736		43.17	32.201	0.000
						C	0.000	21.736		43.17	0.000	0.000
T5 126.67-120.00	123.33	1.323	7	1.4262	87.647	A	0.000	22.194	9.367	42.21	59.391	0.000
						B	0.000	22.194		42.21	53.843	0.000
						C	0.000	22.194		42.21	0.000	0.000
T6 120.00-100.00	110.00	1.291	7	1.4099	294.106	A	0.000	65.226	31.549	48.37	181.936	0.000
						B	0.000	65.226		48.37	180.819	0.000
						C	0.000	65.226		48.37	0.000	0.000
T7 100.00-90.00	95.00	1.252	7	1.3894	164.861	A	0.000	35.011	15.718	44.90	91.678	0.000
						B	0.000	35.011		44.90	89.951	0.000
						C	0.000	35.011		44.90	0.000	0.000
T8 90.00-80.00	85.00	1.223	7	1.3740	178.010	A	0.000	35.885	15.667	43.66	91.306	0.000
						B	0.000	35.885		43.66	89.607	0.000
						C	0.000	35.885		43.66	0.000	0.000
T9 80.00-60.00	70.00	1.174	6	1.3476	395.472	A	36.501	44.212	36.501	45.22	181.664	0.000
						B	36.501	44.212		45.22	178.034	0.000
						C	36.501	44.212		45.22	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T10 60.00-40.00	50.00	1.094	6	1.3030	445.323	A	36.302	47.644	36.302	43.24	185.645	0.000
						B	36.302	47.644		43.24	176.043	0.000
						C	36.302	47.644		43.24	0.000	0.000
T11 40.00-30.00	35.00	1.015	6	1.2574	241.335	A	18.049	25.017	18.049	41.91	91.626	0.000
						B	18.049	25.017		41.91	87.003	0.000
						C	18.049	25.017		41.91	0.000	0.000
T12 30.00-20.00	25.00	0.945	5	1.2158	253.766	A	17.957	25.696	17.957	41.14	90.536	0.000
						B	17.957	25.696		41.14	86.075	0.000
						C	17.957	25.696		41.14	0.000	0.000
T13 20.00-0.00	10.00	0.85	5	1.1093	545.073	A	35.021	47.573	35.021	42.40	175.498	0.000
						B	35.021	47.573		42.40	167.410	0.000
						C	35.021	47.573		42.40	0.000	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 180.00-160.00	170.00	1.415	11	177.503	A	0.000	24.699	11.667	47.24	15.281	0.000
					B	0.000	24.699		47.24	0.000	0.000
					C	0.000	24.699		47.24	0.000	0.000
T2 160.00-140.00	150.00	1.378	11	200.850	A	0.000	28.825	15.027	52.13	64.658	0.000
					B	0.000	28.825		52.13	0.000	0.000
					C	0.000	28.825		52.13	0.000	0.000
T3 140.00-133.33	136.67	1.352	11	76.803	A	0.000	11.577	6.192	53.49	21.553	0.000
					B	0.000	11.577		53.49	0.000	0.000
					C	0.000	11.577		53.49	0.000	0.000
T4 133.33-126.67	130.00	1.337	10	81.431	A	0.000	11.792	6.192	52.51	21.553	0.000
					B	0.000	11.792		52.51	14.852	0.000
					C	0.000	11.792		52.51	0.000	0.000
T5 126.67-120.00	123.33	1.323	10	86.060	A	0.000	12.020	6.192	51.52	21.553	0.000
					B	0.000	12.020		51.52	24.913	0.000
					C	0.000	12.020		51.52	0.000	0.000
T6 120.00-100.00	110.00	1.291	10	289.399	A	0.000	38.601	22.130	57.33	65.477	0.000
					B	0.000	38.601		57.33	84.017	0.000
					C	0.000	38.601		57.33	0.000	0.000
T7 100.00-90.00	95.00	1.252	10	162.540	A	0.000	21.227	11.074	52.17	32.959	0.000
					B	0.000	21.227		52.17	42.009	0.000
					C	0.000	21.227		52.17	0.000	0.000
T8 90.00-80.00	85.00	1.223	10	175.715	A	0.000	21.747	11.074	50.92	32.959	0.000
					B	0.000	21.747		50.92	42.009	0.000
					C	0.000	21.747		50.92	0.000	0.000
T9 80.00-60.00	70.00	1.174	9	390.971	A	30.496	24.177	30.496	55.78	65.981	0.000
					B	30.496	24.177		55.78	84.017	0.000
					C	30.496	24.177		55.78	0.000	0.000
T10 60.00-40.00	50.00	1.094	9	440.971	A	30.496	26.417	30.496	53.58	67.178	0.000
					B	30.496	26.417		53.58	84.017	0.000
					C	30.496	26.417		53.58	0.000	0.000
T11 40.00-30.00	35.00	1.015	8	239.236	A	15.248	14.079	15.248	51.99	33.589	0.000
					B	15.248	14.079		51.99	42.009	0.000
					C	15.248	14.079		51.99	0.000	0.000
T12	25.00	0.945	7	251.736	A	15.248	14.667	15.248	50.97	33.589	0.000

Section Elevation *ft*	*z* *ft*	K_Z	q_z *psf*	A_G *ft²*	*Face*	A_F *ft²*	A_R *ft²*	A_{leg} *ft²*	*Leg %*	C_AA_A *In Face* *ft²*	C_AA_A *Out Face* *ft²*
30.00-20.00					B	15.248	14.667		50.97	42.009	0.000
					C	15.248	14.667		50.97	0.000	0.000
T13 20.00-0.00	10.00	0.85	7	541.368	A	30.078	28.114	30.078	51.69	67.178	0.000
					B	30.078	28.114		51.69	84.017	0.000
					C	30.078	28.114		51.69	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	q_z *psf*	D_F	D_R	A_E *ft²*	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1	44.64	1250.43	A	0.139	2.812	52	1	1	13.713	2381.65	119.08	C
180.00-160.00			B	0.139	2.812		1	1	13.713			
			C	0.139	2.812		1	1	13.713			
T2	329.00	1495.62	A	0.144	2.796	51	1	1	15.277	4625.94	231.30	C
160.00-140.00			B	0.144	2.796		1	1	15.277			
			C	0.144	2.796		1	1	15.277			
T3	109.67	825.91	A	0.151	2.769	50	1	1	5.838	1593.59	239.04	C
140.00-133.33			B	0.151	2.769		1	1	5.838			
			C	0.151	2.769		1	1	5.838			
T4	180.47	842.18	A	0.145	2.791	49	1	1	5.951	2216.27	332.44	C
133.33-126.67			B	0.145	2.791		1	1	5.951			
			C	0.145	2.791		1	1	5.951			
T5	239.71	1080.40	A	0.14	2.81	49	1	1	6.074	2626.83	394.02	C
126.67-120.00			B	0.14	2.81		1	1	6.074			
			C	0.14	2.81		1	1	6.074			
T6	776.57	3821.31	A	0.133	2.834	47	1	1	18.407	8139.20	406.96	C
120.00-100.00			B	0.133	2.834		1	1	18.407			
			C	0.133	2.834		1	1	18.407			
T7	388.81	1682.80	A	0.131	2.844	46	1	1	10.175	4066.52	406.65	C
100.00-90.00			B	0.131	2.844		1	1	10.175			
			C	0.131	2.844		1	1	10.175			
T8	388.81	1722.73	A	0.124	2.87	45	1	1	10.439	4011.52	401.15	C
90.00-80.00			B	0.124	2.87		1	1	10.439			
			C	0.124	2.87		1	1	10.439			
T9	777.77	4897.54	A	0.14	2.809	43	1	1	44.066	10047.84	502.39	C
80.00-60.00			B	0.14	2.809		1	1	44.066			
			C	0.14	2.809		1	1	44.066			
T10	780.62	5700.46	A	0.129	2.85	40	1	1	45.397	9592.79	479.64	C
60.00-40.00			B	0.129	2.85		1	1	45.397			
			C	0.129	2.85		1	1	45.397			
T11	390.31	2942.46	A	0.123	2.875	37	1	1	23.207	4513.75	451.38	C
40.00-30.00			B	0.123	2.875		1	1	23.207			
			C	0.123	2.875		1	1	23.207			
T12	390.31	3139.03	A	0.119	2.889	35	1	1	23.536	4243.15	424.32	C
30.00-20.00			B	0.119	2.889		1	1	23.536			
			C	0.119	2.889		1	1	23.536			
T13	780.62	6187.56	A	0.107	2.934	31	1	1	45.918	7596.81	379.84	C
20.00-0.00			B	0.107	2.934		1	1	45.918			
			C	0.107	2.934		1	1	45.918			
Sum Weight:	5577.31	35588.43						OTM	5074.28 kip-ft	65655.87		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	44.64	1250.43	A	0.139	2.812	52	0.825	1	13.713	2381.65	119.08	C
180.00-160.00			B	0.139	2.812		0.825	1	13.713			
			C	0.139	2.812		0.825	1	13.713			
T2	329.00	1495.62	A	0.144	2.796	51	0.825	1	15.277	4625.94	231.30	C
160.00-140.00			B	0.144	2.796		0.825	1	15.277			
			C	0.144	2.796		0.825	1	15.277			
T3	109.67	825.91	A	0.151	2.769	50	0.825	1	5.838	1593.59	239.04	C
140.00-133.33			B	0.151	2.769		0.825	1	5.838			
			C	0.151	2.769		0.825	1	5.838			
T4	180.47	842.18	A	0.145	2.791	49	0.825	1	5.951	2216.27	332.44	C
133.33-126.67			B	0.145	2.791		0.825	1	5.951			
			C	0.145	2.791		0.825	1	5.951			
T5	239.71	1080.40	A	0.14	2.81	49	0.825	1	6.074	2626.83	394.02	C
126.67-120.00			B	0.14	2.81		0.825	1	6.074			
			C	0.14	2.81		0.825	1	6.074			
T6	776.57	3821.31	A	0.133	2.834	47	0.825	1	18.407	8139.20	406.96	C
120.00-100.00			B	0.133	2.834		0.825	1	18.407			
			C	0.133	2.834		0.825	1	18.407			
T7	388.81	1682.80	A	0.131	2.844	46	0.825	1	10.175	4066.52	406.65	C
100.00-90.00			B	0.131	2.844		0.825	1	10.175			
			C	0.131	2.844		0.825	1	10.175			
T8	388.81	1722.73	A	0.124	2.87	45	0.825	1	10.439	4011.52	401.15	C
90.00-80.00			B	0.124	2.87		0.825	1	10.439			
			C	0.124	2.87		0.825	1	10.439			
T9	777.77	4897.54	A	0.14	2.809	43	0.825	1	38.729	9497.64	474.88	C
80.00-60.00			B	0.14	2.809		0.825	1	38.729			
			C	0.14	2.809		0.825	1	38.729			
T10	780.62	5700.46	A	0.129	2.85	40	0.825	1	40.060	9072.77	453.64	C
60.00-40.00			B	0.129	2.85		0.825	1	40.060			
			C	0.129	2.85		0.825	1	40.060			
T11	390.31	2942.46	A	0.123	2.875	37	0.825	1	20.539	4270.44	427.04	C
40.00-30.00			B	0.123	2.875		0.825	1	20.539			
			C	0.123	2.875		0.825	1	20.539			
T12	390.31	3139.03	A	0.119	2.889	35	0.825	1	20.868	4015.33	401.53	C
30.00-20.00			B	0.119	2.889		0.825	1	20.868			
			C	0.119	2.889		0.825	1	20.868			
T13	780.62	6187.56	A	0.107	2.934	31	0.825	1	40.654	7186.47	359.32	C
20.00-0.00			B	0.107	2.934		0.825	1	40.654			
			C	0.107	2.934		0.825	1	40.654			
Sum Weight:	5577.31	35588.43						OTM	4991.45 kip-ft	63704.18		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	44.64	1250.43	A	0.139	2.812	52	0.8	1	13.713	2381.65	119.08	C
180.00-160.00			B	0.139	2.812		0.8	1	13.713			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
			C	0.139	2.812		0.8	1	13.713			
T2 160.00-140.00	329.00	1495.62	A	0.144	2.796	51	0.8	1	15.277	4625.94	231.30	C
			B	0.144	2.796		0.8	1	15.277			
			C	0.144	2.796		0.8	1	15.277			
T3 140.00-133.33	109.67	825.91	A	0.151	2.769	50	0.8	1	5.838	1593.59	239.04	C
			B	0.151	2.769		0.8	1	5.838			
			C	0.151	2.769		0.8	1	5.838			
T4 133.33-126.67	180.47	842.18	A	0.145	2.791	49	0.8	1	5.951	2216.27	332.44	C
			B	0.145	2.791		0.8	1	5.951			
			C	0.145	2.791		0.8	1	5.951			
T5 126.67-120.00	239.71	1080.40	A	0.14	2.81	49	0.8	1	6.074	2626.83	394.02	C
			B	0.14	2.81		0.8	1	6.074			
			C	0.14	2.81		0.8	1	6.074			
T6 120.00-100.00	776.57	3821.31	A	0.133	2.834	47	0.8	1	18.407	8139.20	406.96	C
			B	0.133	2.834		0.8	1	18.407			
			C	0.133	2.834		0.8	1	18.407			
T7 100.00-90.00	388.81	1682.80	A	0.131	2.844	46	0.8	1	10.175	4066.52	406.65	C
			B	0.131	2.844		0.8	1	10.175			
			C	0.131	2.844		0.8	1	10.175			
T8 90.00-80.00	388.81	1722.73	A	0.124	2.87	45	0.8	1	10.439	4011.52	401.15	C
			B	0.124	2.87		0.8	1	10.439			
			C	0.124	2.87		0.8	1	10.439			
T9 80.00-60.00	777.77	4897.54	A	0.14	2.809	43	0.8	1	37.966	9419.04	470.95	C
			B	0.14	2.809		0.8	1	37.966			
			C	0.14	2.809		0.8	1	37.966			
T10 60.00-40.00	780.62	5700.46	A	0.129	2.85	40	0.8	1	39.297	8998.48	449.92	C
			B	0.129	2.85		0.8	1	39.297			
			C	0.129	2.85		0.8	1	39.297			
T11 40.00-30.00	390.31	2942.46	A	0.123	2.875	37	0.8	1	20.158	4235.68	423.57	C
			B	0.123	2.875		0.8	1	20.158			
			C	0.123	2.875		0.8	1	20.158			
T12 30.00-20.00	390.31	3139.03	A	0.119	2.889	35	0.8	1	20.487	3982.79	398.28	C
			B	0.119	2.889		0.8	1	20.487			
			C	0.119	2.889		0.8	1	20.487			
T13 20.00-0.00	780.62	6187.56	A	0.107	2.934	31	0.8	1	39.902	7127.85	356.39	C
			B	0.107	2.934		0.8	1	39.902			
			C	0.107	2.934		0.8	1	39.902			
Sum Weight:	5577.31	35588.43						OTM	4979.62 kip-ft	63425.37		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	44.64	1250.43	A	0.139	2.812	52	0.85	1	13.713	2381.65	119.08	C
			B	0.139	2.812		0.85	1	13.713			
			C	0.139	2.812		0.85	1	13.713			
T2 160.00-140.00	329.00	1495.62	A	0.144	2.796	51	0.85	1	15.277	4625.94	231.30	C
			B	0.144	2.796		0.85	1	15.277			
			C	0.144	2.796		0.85	1	15.277			
T3 140.00-133.33	109.67	825.91	A	0.151	2.769	50	0.85	1	5.838	1593.59	239.04	C
			B	0.151	2.769		0.85	1	5.838			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.151	2.769		0.85	1	5.838			
T4 133.33-126.67	180.47	842.18	A	0.145	2.791	49	0.85	1	5.951	2216.27	332.44	C
			B	0.145	2.791		0.85	1	5.951			
			C	0.145	2.791		0.85	1	5.951			
T5 126.67-120.00	239.71	1080.40	A	0.14	2.81	49	0.85	1	6.074	2626.83	394.02	C
			B	0.14	2.81		0.85	1	6.074			
			C	0.14	2.81		0.85	1	6.074			
T6 120.00-100.00	776.57	3821.31	A	0.133	2.834	47	0.85	1	18.407	8139.20	406.96	C
			B	0.133	2.834		0.85	1	18.407			
			C	0.133	2.834		0.85	1	18.407			
T7 100.00-90.00	388.81	1682.80	A	0.131	2.844	46	0.85	1	10.175	4066.52	406.65	C
			B	0.131	2.844		0.85	1	10.175			
			C	0.131	2.844		0.85	1	10.175			
T8 90.00-80.00	388.81	1722.73	A	0.124	2.87	45	0.85	1	10.439	4011.52	401.15	C
			B	0.124	2.87		0.85	1	10.439			
			C	0.124	2.87		0.85	1	10.439			
T9 80.00-60.00	777.77	4897.54	A	0.14	2.809	43	0.85	1	39.491	9576.24	478.81	C
			B	0.14	2.809		0.85	1	39.491			
			C	0.14	2.809		0.85	1	39.491			
T10 60.00-40.00	780.62	5700.46	A	0.129	2.85	40	0.85	1	40.822	9147.06	457.35	C
			B	0.129	2.85		0.85	1	40.822			
			C	0.129	2.85		0.85	1	40.822			
T11 40.00-30.00	390.31	2942.46	A	0.123	2.875	37	0.85	1	20.920	4305.20	430.52	C
			B	0.123	2.875		0.85	1	20.920			
			C	0.123	2.875		0.85	1	20.920			
T12 30.00-20.00	390.31	3139.03	A	0.119	2.889	35	0.85	1	21.249	4047.88	404.79	C
			B	0.119	2.889		0.85	1	21.249			
			C	0.119	2.889		0.85	1	21.249			
T13 20.00-0.00	780.62	6187.56	A	0.107	2.934	31	0.85	1	41.406	7245.09	362.25	C
			B	0.107	2.934		0.85	1	41.406			
			C	0.107	2.934		0.85	1	41.406			
Sum Weight:	5577.31	35588.43						OTM	5003.28 kip-ft	63982.99		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	552.25	3542.13	A	0.285	2.338	8	1	1	30.840	756.88	37.84	C
			B	0.285	2.338		1	1	30.840			
			C	0.285	2.338		1	1	30.840			
T2 160.00-140.00	2420.98	3972.41	A	0.276	2.362	7	1	1	33.579	1649.18	82.46	C
			B	0.276	2.362		1	1	33.579			
			C	0.276	2.362		1	1	33.579			
T3 140.00-133.33	799.84	1763.59	A	0.272	2.374	7	1	1	12.586	559.29	83.89	C
			B	0.272	2.374		1	1	12.586			
			C	0.272	2.374		1	1	12.586			
T4 133.33-126.67	1290.33	1804.53	A	0.262	2.403	7	1	1	12.781	757.05	113.56	C
			B	0.262	2.403		1	1	12.781			
			C	0.262	2.403		1	1	12.781			
T5 126.67-120.00	1649.43	2066.51	A	0.253	2.428	7	1	1	13.001	885.65	132.85	C
			B	0.253	2.428		1	1	13.001			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.253	2.428		1	1	13.001			
T6 120.00-100.00	5286.19	6611.25	A	0.222	2.525	7	1	1	37.742	2734.93	136.75	C
			B	0.222	2.525		1	1	37.742			
			C	0.222	2.525		1	1	37.742			
T7 100.00-90.00	2624.38	3212.73	A	0.212	2.555	7	1	1	20.193	1350.23	135.02	C
			B	0.212	2.555		1	1	20.193			
			C	0.212	2.555		1	1	20.193			
T8 90.00-80.00	2600.89	3293.32	A	0.202	2.591	7	1	1	20.625	1325.32	132.53	C
			B	0.202	2.591		1	1	20.625			
			C	0.202	2.591		1	1	20.625			
T9 80.00-60.00	5124.92	9216.41	A	0.204	2.582	6	1	1	61.932	2821.01	141.05	C
			B	0.204	2.582		1	1	61.932			
			C	0.204	2.582		1	1	61.932			
T10 60.00-40.00	5052.09	10171.64	A	0.189	2.635	6	1	1	63.581	2676.56	133.83	C
			B	0.189	2.635		1	1	63.581			
			C	0.189	2.635		1	1	63.581			
T11 40.00-30.00	2456.64	5180.35	A	0.178	2.67	6	1	1	32.335	1243.07	124.31	C
			B	0.178	2.67		1	1	32.335			
			C	0.178	2.67		1	1	32.335			
T12 30.00-20.00	2394.30	5351.10	A	0.172	2.692	5	1	1	32.607	1155.64	115.56	C
			B	0.172	2.692		1	1	32.607			
			C	0.172	2.692		1	1	32.607			
T13 20.00-0.00	4477.36	9751.96	A	0.152	2.766	5	1	1	62.028	2022.07	101.10	C
			B	0.152	2.766		1	1	62.028			
			C	0.152	2.766		1	1	62.028			
Sum Weight:	36729.59	65937.92						OTM	1625.81 kip-ft	19936.88		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	552.25	3542.13	A	0.285	2.338	8	0.825	1	30.840	756.88	37.84	C
			B	0.285	2.338		0.825	1	30.840			
			C	0.285	2.338		0.825	1	30.840			
T2 160.00-140.00	2420.98	3972.41	A	0.276	2.362	7	0.825	1	33.579	1649.18	82.46	C
			B	0.276	2.362		0.825	1	33.579			
			C	0.276	2.362		0.825	1	33.579			
T3 140.00-133.33	799.84	1763.59	A	0.272	2.374	7	0.825	1	12.586	559.29	83.89	C
			B	0.272	2.374		0.825	1	12.586			
			C	0.272	2.374		0.825	1	12.586			
T4 133.33-126.67	1290.33	1804.53	A	0.262	2.403	7	0.825	1	12.781	757.05	113.56	C
			B	0.262	2.403		0.825	1	12.781			
			C	0.262	2.403		0.825	1	12.781			
T5 126.67-120.00	1649.43	2066.51	A	0.253	2.428	7	0.825	1	13.001	885.65	132.85	C
			B	0.253	2.428		0.825	1	13.001			
			C	0.253	2.428		0.825	1	13.001			
T6 120.00-100.00	5286.19	6611.25	A	0.222	2.525	7	0.825	1	37.742	2734.93	136.75	C
			B	0.222	2.525		0.825	1	37.742			
			C	0.222	2.525		0.825	1	37.742			
T7 100.00-90.00	2624.38	3212.73	A	0.212	2.555	7	0.825	1	20.193	1350.23	135.02	C
			B	0.212	2.555		0.825	1	20.193			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.212	2.555		0.825	1	20.193			
T8 90.00-80.00	2600.89	3293.32	A	0.202	2.591	7	0.825	1	20.625	1325.32	132.53	C
			B	0.202	2.591		0.825	1	20.625			
			C	0.202	2.591		0.825	1	20.625			
T9 80.00-60.00	5124.92	9216.41	A	0.204	2.582	6	0.825	1	55.544	2731.46	136.57	C
			B	0.204	2.582		0.825	1	55.544			
			C	0.204	2.582		0.825	1	55.544			
T10 60.00-40.00	5052.09	10171.64	A	0.189	2.635	6	0.825	1	57.228	2591.90	129.59	C
			B	0.189	2.635		0.825	1	57.228			
			C	0.189	2.635		0.825	1	57.228			
T11 40.00-30.00	2456.64	5180.35	A	0.178	2.67	6	0.825	1	29.176	1203.51	120.35	C
			B	0.178	2.67		0.825	1	29.176			
			C	0.178	2.67		0.825	1	29.176			
T12 30.00-20.00	2394.30	5351.10	A	0.172	2.692	5	0.825	1	29.464	1118.66	111.87	C
			B	0.172	2.692		0.825	1	29.464			
			C	0.172	2.692		0.825	1	29.464			
T13 20.00-0.00	4477.36	9751.96	A	0.152	2.766	5	0.825	1	55.899	1955.45	97.77	C
			B	0.152	2.766		0.825	1	55.899			
			C	0.152	2.766		0.825	1	55.899			
Sum Weight:	36729.59	65937.92						OTM	1612.34 kip-ft	19619.50		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	552.25	3542.13	A	0.285	2.338	8	0.8	1	30.840	756.88	37.84	C
			B	0.285	2.338		0.8	1	30.840			
			C	0.285	2.338		0.8	1	30.840			
T2 160.00-140.00	2420.98	3972.41	A	0.276	2.362	7	0.8	1	33.579	1649.18	82.46	C
			B	0.276	2.362		0.8	1	33.579			
			C	0.276	2.362		0.8	1	33.579			
T3 140.00-133.33	799.84	1763.59	A	0.272	2.374	7	0.8	1	12.586	559.29	83.89	C
			B	0.272	2.374		0.8	1	12.586			
			C	0.272	2.374		0.8	1	12.586			
T4 133.33-126.67	1290.33	1804.53	A	0.262	2.403	7	0.8	1	12.781	757.05	113.56	C
			B	0.262	2.403		0.8	1	12.781			
			C	0.262	2.403		0.8	1	12.781			
T5 126.67-120.00	1649.43	2066.51	A	0.253	2.428	7	0.8	1	13.001	885.65	132.85	C
			B	0.253	2.428		0.8	1	13.001			
			C	0.253	2.428		0.8	1	13.001			
T6 120.00-100.00	5286.19	6611.25	A	0.222	2.525	7	0.8	1	37.742	2734.93	136.75	C
			B	0.222	2.525		0.8	1	37.742			
			C	0.222	2.525		0.8	1	37.742			
T7 100.00-90.00	2624.38	3212.73	A	0.212	2.555	7	0.8	1	20.193	1350.23	135.02	C
			B	0.212	2.555		0.8	1	20.193			
			C	0.212	2.555		0.8	1	20.193			
T8 90.00-80.00	2600.89	3293.32	A	0.202	2.591	7	0.8	1	20.625	1325.32	132.53	C
			B	0.202	2.591		0.8	1	20.625			
			C	0.202	2.591		0.8	1	20.625			
T9 80.00-60.00	5124.92	9216.41	A	0.204	2.582	6	0.8	1	54.632	2718.67	135.93	C
			B	0.204	2.582		0.8	1	54.632			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.204	2.582		0.8	1	54.632			
T10 60.00-40.00	5052.09	10171.64	A	0.189	2.635	6	0.8	1	56.321	2579.81	128.99	C
			B	0.189	2.635		0.8	1	56.321			
			C	0.189	2.635		0.8	1	56.321			
T11 40.00-30.00	2456.64	5180.35	A	0.178	2.67	6	0.8	1	28.725	1197.86	119.79	C
			B	0.178	2.67		0.8	1	28.725			
			C	0.178	2.67		0.8	1	28.725			
T12 30.00-20.00	2394.30	5351.10	A	0.172	2.692	5	0.8	1	29.016	1113.38	111.34	C
			B	0.172	2.692		0.8	1	29.016			
			C	0.172	2.692		0.8	1	29.016			
T13 20.00-0.00	4477.36	9751.96	A	0.152	2.766	5	0.8	1	55.024	1945.93	97.30	C
			B	0.152	2.766		0.8	1	55.024			
			C	0.152	2.766		0.8	1	55.024			
Sum Weight:	36729.59	65937.92						OTM	1610.41 kip-ft	19574.16		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	552.25	3542.13	A	0.285	2.338	8	0.85	1	30.840	756.88	37.84	C
			B	0.285	2.338		0.85	1	30.840			
			C	0.285	2.338		0.85	1	30.840			
T2 160.00-140.00	2420.98	3972.41	A	0.276	2.362	7	0.85	1	33.579	1649.18	82.46	C
			B	0.276	2.362		0.85	1	33.579			
			C	0.276	2.362		0.85	1	33.579			
T3 140.00-133.33	799.84	1763.59	A	0.272	2.374	7	0.85	1	12.586	559.29	83.89	C
			B	0.272	2.374		0.85	1	12.586			
			C	0.272	2.374		0.85	1	12.586			
T4 133.33-126.67	1290.33	1804.53	A	0.262	2.403	7	0.85	1	12.781	757.05	113.56	C
			B	0.262	2.403		0.85	1	12.781			
			C	0.262	2.403		0.85	1	12.781			
T5 126.67-120.00	1649.43	2066.51	A	0.253	2.428	7	0.85	1	13.001	885.65	132.85	C
			B	0.253	2.428		0.85	1	13.001			
			C	0.253	2.428		0.85	1	13.001			
T6 120.00-100.00	5286.19	6611.25	A	0.222	2.525	7	0.85	1	37.742	2734.93	136.75	C
			B	0.222	2.525		0.85	1	37.742			
			C	0.222	2.525		0.85	1	37.742			
T7 100.00-90.00	2624.38	3212.73	A	0.212	2.555	7	0.85	1	20.193	1350.23	135.02	C
			B	0.212	2.555		0.85	1	20.193			
			C	0.212	2.555		0.85	1	20.193			
T8 90.00-80.00	2600.89	3293.32	A	0.202	2.591	7	0.85	1	20.625	1325.32	132.53	C
			B	0.202	2.591		0.85	1	20.625			
			C	0.202	2.591		0.85	1	20.625			
T9 80.00-60.00	5124.92	9216.41	A	0.204	2.582	6	0.85	1	56.457	2744.25	137.21	C
			B	0.204	2.582		0.85	1	56.457			
			C	0.204	2.582		0.85	1	56.457			
T10 60.00-40.00	5052.09	10171.64	A	0.189	2.635	6	0.85	1	58.136	2603.99	130.20	C
			B	0.189	2.635		0.85	1	58.136			
			C	0.189	2.635		0.85	1	58.136			
T11 40.00-30.00	2456.64	5180.35	A	0.178	2.67	6	0.85	1	29.627	1209.16	120.92	C
			B	0.178	2.67		0.85	1	29.627			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
			C	0.178	2.67		0.85	1	29.627			
T12 30.00-20.00	2394.30	5351.10	A	0.172	2.692	5	0.85	1	29.913	1123.94	112.39	C
			B	0.172	2.692		0.85	1	29.913			
			C	0.172	2.692		0.85	1	29.913			
T13 20.00-0.00	4477.36	9751.96	A	0.152	2.766	5	0.85	1	56.775	1964.97	98.25	C
			B	0.152	2.766		0.85	1	56.775			
			C	0.152	2.766		0.85	1	56.775			
Sum Weight:	36729.59	65937.92						OTM	1614.26 kip-ft	19664.84		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	44.64	1250.43	A	0.139	2.812	11	1	1	13.713	507.33	25.37	C
			B	0.139	2.812		1	1	13.713			
			C	0.139	2.812		1	1	13.713			
T2 160.00-140.00	329.00	1495.62	A	0.144	2.796	11	1	1	15.277	985.41	49.27	C
			B	0.144	2.796		1	1	15.277			
			C	0.144	2.796		1	1	15.277			
T3 140.00-133.33	109.67	825.91	A	0.151	2.769	11	1	1	5.838	339.46	50.92	C
			B	0.151	2.769		1	1	5.838			
			C	0.151	2.769		1	1	5.838			
T4 133.33-126.67	180.47	842.18	A	0.145	2.791	10	1	1	5.951	472.11	70.82	C
			B	0.145	2.791		1	1	5.951			
			C	0.145	2.791		1	1	5.951			
T5 126.67-120.00	239.71	1080.40	A	0.14	2.81	10	1	1	6.074	559.56	83.93	C
			B	0.14	2.81		1	1	6.074			
			C	0.14	2.81		1	1	6.074			
T6 120.00-100.00	776.57	3821.31	A	0.133	2.834	10	1	1	18.407	1733.80	86.69	C
			B	0.133	2.834		1	1	18.407			
			C	0.133	2.834		1	1	18.407			
T7 100.00-90.00	388.81	1682.80	A	0.131	2.844	10	1	1	10.175	866.24	86.62	C
			B	0.131	2.844		1	1	10.175			
			C	0.131	2.844		1	1	10.175			
T8 90.00-80.00	388.81	1722.73	A	0.124	2.87	10	1	1	10.439	854.52	85.45	C
			B	0.124	2.87		1	1	10.439			
			C	0.124	2.87		1	1	10.439			
T9 80.00-60.00	777.77	4897.54	A	0.14	2.809	9	1	1	44.066	2140.37	107.02	C
			B	0.14	2.809		1	1	44.066			
			C	0.14	2.809		1	1	44.066			
T10 60.00-40.00	780.62	5700.46	A	0.129	2.85	9	1	1	45.397	2043.43	102.17	C
			B	0.129	2.85		1	1	45.397			
			C	0.129	2.85		1	1	45.397			
T11 40.00-30.00	390.31	2942.46	A	0.123	2.875	8	1	1	23.207	961.51	96.15	C
			B	0.123	2.875		1	1	23.207			
			C	0.123	2.875		1	1	23.207			
T12 30.00-20.00	390.31	3139.03	A	0.119	2.889	7	1	1	23.536	903.87	90.39	C
			B	0.119	2.889		1	1	23.536			
			C	0.119	2.889		1	1	23.536			
T13 20.00-0.00	780.62	6187.56	A	0.107	2.934	7	1	1	45.918	1618.25	80.91	C
			B	0.107	2.934		1	1	45.918			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.107	2.934		1	1	45.918			
Sum Weight:	5577.31	35588.43						OTM	1080.91 kip-ft	13985.87		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	44.64	1250.43	A	0.139	2.812	11	0.825	1	13.713	507.33	25.37	C
180.00-160.00			B	0.139	2.812		0.825	1	13.713			
			C	0.139	2.812		0.825	1	13.713			
T2	329.00	1495.62	A	0.144	2.796	11	0.825	1	15.277	985.41	49.27	C
160.00-140.00			B	0.144	2.796		0.825	1	15.277			
			C	0.144	2.796		0.825	1	15.277			
T3	109.67	825.91	A	0.151	2.769	11	0.825	1	5.838	339.46	50.92	C
140.00-133.33			B	0.151	2.769		0.825	1	5.838			
			C	0.151	2.769		0.825	1	5.838			
T4	180.47	842.18	A	0.145	2.791	10	0.825	1	5.951	472.11	70.82	C
133.33-126.67			B	0.145	2.791		0.825	1	5.951			
			C	0.145	2.791		0.825	1	5.951			
T5	239.71	1080.40	A	0.14	2.81	10	0.825	1	6.074	559.56	83.93	C
126.67-120.00			B	0.14	2.81		0.825	1	6.074			
			C	0.14	2.81		0.825	1	6.074			
T6	776.57	3821.31	A	0.133	2.834	10	0.825	1	18.407	1733.80	86.69	C
120.00-100.00			B	0.133	2.834		0.825	1	18.407			
			C	0.133	2.834		0.825	1	18.407			
T7	388.81	1682.80	A	0.131	2.844	10	0.825	1	10.175	866.24	86.62	C
100.00-90.00			B	0.131	2.844		0.825	1	10.175			
			C	0.131	2.844		0.825	1	10.175			
T8	388.81	1722.73	A	0.124	2.87	10	0.825	1	10.439	854.52	85.45	C
90.00-80.00			B	0.124	2.87		0.825	1	10.439			
			C	0.124	2.87		0.825	1	10.439			
T9	777.77	4897.54	A	0.14	2.809	9	0.825	1	38.729	2023.17	101.16	C
80.00-60.00			B	0.14	2.809		0.825	1	38.729			
			C	0.14	2.809		0.825	1	38.729			
T10	780.62	5700.46	A	0.129	2.85	9	0.825	1	40.060	1932.66	96.63	C
60.00-40.00			B	0.129	2.85		0.825	1	40.060			
			C	0.129	2.85		0.825	1	40.060			
T11	390.31	2942.46	A	0.123	2.875	8	0.825	1	20.539	909.68	90.97	C
40.00-30.00			B	0.123	2.875		0.825	1	20.539			
			C	0.123	2.875		0.825	1	20.539			
T12	390.31	3139.03	A	0.119	2.889	7	0.825	1	20.868	855.34	85.53	C
30.00-20.00			B	0.119	2.889		0.825	1	20.868			
			C	0.119	2.889		0.825	1	20.868			
T13	780.62	6187.56	A	0.107	2.934	7	0.825	1	40.654	1530.85	76.54	C
20.00-0.00			B	0.107	2.934		0.825	1	40.654			
			C	0.107	2.934		0.825	1	40.654			
Sum Weight:	5577.31	35588.43						OTM	1063.27 kip-ft	13570.12		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	44.64	1250.43	A	0.139	2.812	11	0.8	1	13.713	507.33	25.37	C
			B	0.139	2.812		0.8	1	13.713			
			C	0.139	2.812		0.8	1	13.713			
T2 160.00-140.00	329.00	1495.62	A	0.144	2.796	11	0.8	1	15.277	985.41	49.27	C
			B	0.144	2.796		0.8	1	15.277			
			C	0.144	2.796		0.8	1	15.277			
T3 140.00-133.33	109.67	825.91	A	0.151	2.769	11	0.8	1	5.838	339.46	50.92	C
			B	0.151	2.769		0.8	1	5.838			
			C	0.151	2.769		0.8	1	5.838			
T4 133.33-126.67	180.47	842.18	A	0.145	2.791	10	0.8	1	5.951	472.11	70.82	C
			B	0.145	2.791		0.8	1	5.951			
			C	0.145	2.791		0.8	1	5.951			
T5 126.67-120.00	239.71	1080.40	A	0.14	2.81	10	0.8	1	6.074	559.56	83.93	C
			B	0.14	2.81		0.8	1	6.074			
			C	0.14	2.81		0.8	1	6.074			
T6 120.00-100.00	776.57	3821.31	A	0.133	2.834	10	0.8	1	18.407	1733.80	86.69	C
			B	0.133	2.834		0.8	1	18.407			
			C	0.133	2.834		0.8	1	18.407			
T7 100.00-90.00	388.81	1682.80	A	0.131	2.844	10	0.8	1	10.175	866.24	86.62	C
			B	0.131	2.844		0.8	1	10.175			
			C	0.131	2.844		0.8	1	10.175			
T8 90.00-80.00	388.81	1722.73	A	0.124	2.87	10	0.8	1	10.439	854.52	85.45	C
			B	0.124	2.87		0.8	1	10.439			
			C	0.124	2.87		0.8	1	10.439			
T9 80.00-60.00	777.77	4897.54	A	0.14	2.809	9	0.8	1	37.966	2006.42	100.32	C
			B	0.14	2.809		0.8	1	37.966			
			C	0.14	2.809		0.8	1	37.966			
T10 60.00-40.00	780.62	5700.46	A	0.129	2.85	9	0.8	1	39.297	1916.84	95.84	C
			B	0.129	2.85		0.8	1	39.297			
			C	0.129	2.85		0.8	1	39.297			
T11 40.00-30.00	390.31	2942.46	A	0.123	2.875	8	0.8	1	20.158	902.28	90.23	C
			B	0.123	2.875		0.8	1	20.158			
			C	0.123	2.875		0.8	1	20.158			
T12 30.00-20.00	390.31	3139.03	A	0.119	2.889	7	0.8	1	20.487	848.40	84.84	C
			B	0.119	2.889		0.8	1	20.487			
			C	0.119	2.889		0.8	1	20.487			
T13 20.00-0.00	780.62	6187.56	A	0.107	2.934	7	0.8	1	39.902	1518.36	75.92	C
			B	0.107	2.934		0.8	1	39.902			
			C	0.107	2.934		0.8	1	39.902			
Sum Weight:	5577.31	35588.43						OTM	1060.75 kip-ft	13510.73		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	44.64	1250.43	A	0.139	2.812	11	0.85	1	13.713	507.33	25.37	C

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
180.00-160.00			B	0.139	2.812		0.85	1	13.713			
			C	0.139	2.812		0.85	1	13.713			
T2	329.00	1495.62	A	0.144	2.796	11	0.85	1	15.277	985.41	49.27	C
160.00-140.00			B	0.144	2.796		0.85	1	15.277			
			C	0.144	2.796		0.85	1	15.277			
T3	109.67	825.91	A	0.151	2.769	11	0.85	1	5.838	339.46	50.92	C
140.00-133.33			B	0.151	2.769		0.85	1	5.838			
			C	0.151	2.769		0.85	1	5.838			
T4	180.47	842.18	A	0.145	2.791	10	0.85	1	5.951	472.11	70.82	C
133.33-126.67			B	0.145	2.791		0.85	1	5.951			
			C	0.145	2.791		0.85	1	5.951			
T5	239.71	1080.40	A	0.14	2.81	10	0.85	1	6.074	559.56	83.93	C
126.67-120.00			B	0.14	2.81		0.85	1	6.074			
			C	0.14	2.81		0.85	1	6.074			
T6	776.57	3821.31	A	0.133	2.834	10	0.85	1	18.407	1733.80	86.69	C
120.00-100.00			B	0.133	2.834		0.85	1	18.407			
			C	0.133	2.834		0.85	1	18.407			
T7	388.81	1682.80	A	0.131	2.844	10	0.85	1	10.175	866.24	86.62	C
100.00-90.00			B	0.131	2.844		0.85	1	10.175			
			C	0.131	2.844		0.85	1	10.175			
T8	388.81	1722.73	A	0.124	2.87	10	0.85	1	10.439	854.52	85.45	C
90.00-80.00			B	0.124	2.87		0.85	1	10.439			
			C	0.124	2.87		0.85	1	10.439			
T9	777.77	4897.54	A	0.14	2.809	9	0.85	1	39.491	2039.91	102.00	C
80.00-60.00			B	0.14	2.809		0.85	1	39.491			
			C	0.14	2.809		0.85	1	39.491			
T10	780.62	5700.46	A	0.129	2.85	9	0.85	1	40.822	1948.49	97.42	C
60.00-40.00			B	0.129	2.85		0.85	1	40.822			
			C	0.129	2.85		0.85	1	40.822			
T11	390.31	2942.46	A	0.123	2.875	8	0.85	1	20.920	917.08	91.71	C
40.00-30.00			B	0.123	2.875		0.85	1	20.920			
			C	0.123	2.875		0.85	1	20.920			
T12	390.31	3139.03	A	0.119	2.889	7	0.85	1	21.249	862.27	86.23	C
30.00-20.00			B	0.119	2.889		0.85	1	21.249			
			C	0.119	2.889		0.85	1	21.249			
T13	780.62	6187.56	A	0.107	2.934	7	0.85	1	41.406	1543.33	77.17	C
20.00-0.00			B	0.107	2.934		0.85	1	41.406			
			C	0.107	2.934		0.85	1	41.406			
Sum Weight:	5577.31	35588.43						OTM	1065.79 kip-ft	13629.51		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	17198.81					
Bracing Weight	18389.62					
Total Member Self-Weight	35588.43			-5.45	4.35	
Total Weight	51548.43			-5.45	4.35	
Wind 0 deg - No Ice		-153.93	-92655.08	-8962.19	30.51	-1.73
Wind 30 deg - No Ice		45190.09	-78725.94	-7689.42	-4387.28	-27.49
Wind 45 deg - No Ice		63727.08	-64036.80	-6263.29	-6200.22	-37.41

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 60 deg - No Ice		77724.93	-45082.02	-4414.37	-7569.32	-44.88
Wind 90 deg - No Ice		90136.84	-24.03	-10.79	-8733.96	-51.15
Wind 120 deg - No Ice		79549.94	46101.19	4431.92	-7631.34	-44.07
Wind 135 deg - No Ice		64419.15	64667.74	6256.42	-6215.06	-35.66
Wind 150 deg - No Ice		45240.15	78542.12	7644.90	-4394.26	-24.88
Wind 180 deg - No Ice		174.54	90188.99	8814.93	-25.45	0.91
Wind 210 deg - No Ice		-45034.70	78447.75	7629.28	4368.48	25.40
Wind 225 deg - No Ice		-63468.50	63737.97	6199.50	6163.16	35.35
Wind 240 deg - No Ice		-79400.47	45898.22	4397.87	7614.68	42.81
Wind 270 deg - No Ice		-90078.62	-302.22	-57.85	8732.36	49.40
Wind 300 deg - No Ice		-77742.93	-45313.36	-4453.43	7580.13	43.05
Wind 315 deg - No Ice		-63867.67	-64221.35	-6294.41	6232.27	34.59
Wind 330 deg - No Ice		-45414.11	-78871.38	-7714.07	4433.76	23.92
Member Ice	30349.49					
Total Weight Ice	127156.76			-51.92	9.56	
Wind 0 deg - Ice		-22.88	-25968.33	-2546.13	13.45	-8.92
Wind 30 deg - Ice		12769.63	-22243.78	-2200.30	-1218.42	-17.30
Wind 45 deg - Ice		18028.70	-18123.15	-1803.55	-1725.94	-19.76
Wind 60 deg - Ice		22027.71	-12783.47	-1288.04	-2111.86	-20.89
Wind 90 deg - Ice		25498.53	-5.16	-52.99	-2438.92	-19.02
Wind 120 deg - Ice		22323.65	12947.30	1188.53	-2121.81	-12.11
Wind 135 deg - Ice		18139.79	18224.60	1700.20	-1728.12	-7.26
Wind 150 deg - Ice		12775.14	22213.43	2090.93	-1219.12	-1.91
Wind 180 deg - Ice		26.13	25568.49	2420.32	5.10	8.79
Wind 210 deg - Ice		-12745.14	22199.94	2088.71	1233.21	16.97
Wind 225 deg - Ice		-17987.95	18076.05	1691.39	1737.85	19.43
Wind 240 deg - Ice		-22301.46	12917.70	1183.57	2137.17	20.56
Wind 270 deg - Ice		-25489.36	-46.25	-59.94	2456.41	18.74
Wind 300 deg - Ice		-22029.17	-12817.54	-1293.79	2131.07	11.95
Wind 315 deg - Ice		-18048.91	-18150.29	-1808.13	1748.41	7.09
Wind 330 deg - Ice		-12802.55	-22265.32	-2203.95	1243.09	1.76
Total Weight	51548.43			-5.45	4.35	
Wind 0 deg - Service		-32.79	-19737.18	-1909.97	7.64	-0.37
Wind 30 deg - Service		9626.29	-16770.02	-1638.85	-933.43	-5.85
Wind 45 deg - Service		13575.00	-13640.98	-1335.06	-1319.62	-7.97
Wind 60 deg - Service		16556.79	-9603.27	-941.20	-1611.26	-9.56
Wind 90 deg - Service		19200.75	-5.12	-3.16	-1859.35	-10.90
Wind 120 deg - Service		16945.55	9820.37	943.21	-1624.47	-9.39
Wind 135 deg - Service		13722.42	13775.38	1331.86	-1322.78	-7.60
Wind 150 deg - Service		9636.96	16730.87	1627.63	-934.92	-5.30
Wind 180 deg - Service		37.18	19211.86	1876.87	-4.28	0.19
Wind 210 deg - Service		-9593.19	16710.76	1624.31	931.70	5.41
Wind 225 deg - Service		-13519.92	13577.32	1319.74	1314.00	7.53
Wind 240 deg - Service		-16913.71	9777.13	935.96	1623.20	9.12
Wind 270 deg - Service		-19188.35	-64.38	-13.19	1861.29	10.52
Wind 300 deg - Service		-16560.63	-9652.55	-949.52	1615.84	9.17
Wind 315 deg - Service		-13604.95	-13680.29	-1341.69	1328.72	7.37
Wind 330 deg - Service		-9674.01	-16801.00	-1644.10	945.61	5.10

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice

Comb. No.	*Description*
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 45 deg - No Ice
7	0.9 Dead+1.0 Wind 45 deg - No Ice
8	1.2 Dead+1.0 Wind 60 deg - No Ice
9	0.9 Dead+1.0 Wind 60 deg - No Ice
10	1.2 Dead+1.0 Wind 90 deg - No Ice
11	0.9 Dead+1.0 Wind 90 deg - No Ice
12	1.2 Dead+1.0 Wind 120 deg - No Ice
13	0.9 Dead+1.0 Wind 120 deg - No Ice
14	1.2 Dead+1.0 Wind 135 deg - No Ice
15	0.9 Dead+1.0 Wind 135 deg - No Ice
16	1.2 Dead+1.0 Wind 150 deg - No Ice
17	0.9 Dead+1.0 Wind 150 deg - No Ice
18	1.2 Dead+1.0 Wind 180 deg - No Ice
19	0.9 Dead+1.0 Wind 180 deg - No Ice
20	1.2 Dead+1.0 Wind 210 deg - No Ice
21	0.9 Dead+1.0 Wind 210 deg - No Ice
22	1.2 Dead+1.0 Wind 225 deg - No Ice
23	0.9 Dead+1.0 Wind 225 deg - No Ice
24	1.2 Dead+1.0 Wind 240 deg - No Ice
25	0.9 Dead+1.0 Wind 240 deg - No Ice
26	1.2 Dead+1.0 Wind 270 deg - No Ice
27	0.9 Dead+1.0 Wind 270 deg - No Ice
28	1.2 Dead+1.0 Wind 300 deg - No Ice
29	0.9 Dead+1.0 Wind 300 deg - No Ice
30	1.2 Dead+1.0 Wind 315 deg - No Ice
31	0.9 Dead+1.0 Wind 315 deg - No Ice
32	1.2 Dead+1.0 Wind 330 deg - No Ice
33	0.9 Dead+1.0 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service

Comb. No.	Description
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	31	2667.72	-0.35	-0.23
			Max. Compression	2	-4355.41	-0.12	0.03
			Max. Mx	18	169.27	0.69	-0.29
			Max. My	27	-762.18	0.02	1.07
			Max. Vy	3	398.41	0.59	0.33
			Max. Vx	26	547.14	0.02	-0.61
		Diagonal	Max Tension	5	4425.45	0.00	0.00
			Max. Compression	4	-4492.77	0.00	0.00
			Max. Mx	34	-74.16	0.05	0.00
			Max. Vy	34	-24.39	0.00	0.00
		Horizontal	Max Tension	4	2406.72	-0.01	-0.00
			Max. Compression	5	-2421.26	-0.01	-0.00
			Max. Mx	48	-28.18	-0.02	-0.00
			Max. My	3	1117.49	-0.00	0.00
			Max. Vy	48	25.82	-0.02	-0.00
			Max. Vx	3	-0.92	0.00	0.00
		Top Girt	Max Tension	33	315.17	-0.01	0.00
			Max. Compression	2	-341.08	-0.01	-0.00
			Max. Mx	49	14.18	-0.02	-0.00
			Max. My	3	-50.80	-0.00	0.00
			Max. Vy	49	-24.91	-0.02	-0.00
			Max. Vx	3	-0.12	0.00	0.00
		Inner Bracing	Max Tension	2	5.91	0.00	0.00
			Max. Compression	2	-5.95	0.00	0.00
			Max. Mx	34	-0.11	-0.02	0.00
			Max. Vy	34	20.88	0.00	0.00
T2	160 - 140	Leg	Max Tension	19	26838.05	-0.10	-0.07
			Max. Compression	2	-33224.64	0.21	0.12
			Max. Mx	18	25986.00	-0.21	-0.12
			Max. My	32	-2558.69	-0.01	0.37
			Max. Vy	18	-3046.44	0.14	-0.03
			Max. Vx	10	2997.93	0.02	-0.19
		Diagonal	Max Tension	5	9385.56	0.00	0.00
			Max. Compression	4	-9457.72	0.00	0.00
			Max. Mx	34	-171.23	0.06	0.00
			Max. Vy	34	-29.98	0.00	0.00
		Horizontal	Max Tension	4	5893.65	-0.01	-0.00
			Max. Compression	5	-5865.73	-0.01	-0.00
			Max. Mx	48	-46.21	-0.03	-0.00
			Max. My	2	2524.59	-0.01	0.01
			Max. Vy	48	-30.03	-0.03	-0.00
			Max. Vx	2	-2.93	0.00	0.00
		Inner Bracing	Max Tension	3	5.85	0.00	0.00
			Max. Compression	18	-7.72	0.00	0.00
			Max. Mx	34	-3.47	-0.03	0.00
			Max. Vy	34	24.00	0.00	0.00
T3	140 - 133.333	Leg	Max Tension	19	37192.10	-0.21	-0.12
			Max. Compression	2	-44157.54	0.09	0.01
			Max. Mx	18	36354.69	-0.21	-0.12
			Max. My	32	-2669.23	-0.01	0.37
			Max. Vy	8	-85.36	-0.21	0.10
			Max. Vx	18	-185.36	0.10	-0.36

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial lb*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
		Diagonal	Max Tension	5	9598.69	0.00	0.00
			Max. Compression	4	-9709.79	0.00	0.00
			Max. Mx	34	-196.60	0.08	0.00
			Max. Vy	34	-36.43	0.00	0.00
		Horizontal	Max Tension	4	6270.99	-0.02	-0.00
			Max. Compression	5	-6242.09	-0.01	-0.00
			Max. Mx	48	-100.38	-0.05	-0.00
			Max. My	3	-679.18	0.00	0.01
			Max. Vy	48	-38.54	-0.05	-0.00
			Max. Vx	3	2.50	0.00	0.00
		Inner Bracing	Max Tension	3	4.38	0.00	0.00
			Max. Compression	18	-7.19	0.00	0.00
			Max. Mx	34	-4.06	-0.03	0.00
			Max. Vy	34	25.42	0.00	0.00
T4	133.333 - 126.667	Leg	Max Tension	19	47194.44	-0.09	-0.01
			Max. Compression	2	-56191.74	1.57	0.03
			Max. Mx	18	45126.68	-1.65	-0.03
			Max. My	32	-4440.46	-0.05	1.61
			Max. Vy	28	-2497.04	-0.10	0.02
			Max. Vx	4	-2472.11	-0.01	-0.01
		Diagonal	Max Tension	5	13006.50	0.00	0.00
			Max. Compression	4	-13126.00	0.00	0.00
			Max. Mx	34	-197.48	0.09	0.00
			Max. Vy	34	-38.51	0.00	0.00
		Top Girt	Max Tension	7	8797.11	-0.01	0.01
			Max. Compression	4	-8765.19	-0.02	-0.00
			Max. Mx	48	-467.47	-0.05	-0.01
			Max. My	3	2645.12	0.00	0.02
			Max. Vy	48	40.93	-0.05	-0.01
			Max. Vx	3	3.81	0.00	0.00
		Inner Bracing	Max Tension	4	152.06	0.00	0.00
			Max. Compression	4	-153.42	0.00	0.00
			Max. Mx	34	0.99	-0.04	0.00
			Max. Vy	34	26.92	0.00	0.00
T5	126.667 - 120	Leg	Max Tension	19	60771.78	-1.64	-0.03
			Max. Compression	2	-72571.02	1.12	-0.03
			Max. Mx	18	59461.06	-1.65	-0.03
			Max. My	32	-4638.93	-0.05	1.61
			Max. Vy	8	-1844.88	-1.64	0.02
			Max. Vx	10	1789.31	-0.04	1.56
		Diagonal	Max Tension	5	15939.33	0.00	0.00
			Max. Compression	4	-16124.87	0.00	0.00
			Max. Mx	34	-217.83	0.13	0.00
			Max. Vy	34	55.89	0.00	0.00
		Top Girt	Max Tension	5	11057.49	-0.02	-0.00
			Max. Compression	4	-11067.50	-0.02	-0.00
			Max. Mx	48	-463.65	-0.06	-0.01
			Max. My	3	2563.53	-0.00	0.03
			Max. Vy	48	43.21	-0.06	-0.01
			Max. Vx	3	-4.22	-0.00	0.03
		Inner Bracing	Max Tension	4	191.93	0.00	0.00
			Max. Compression	4	-194.17	0.00	0.00
			Max. Mx	34	0.80	-0.04	0.00
			Max. Vy	34	-28.40	0.00	0.00
T6	120 - 100	Leg	Max Tension	19	104067.77	-0.55	0.05
			Max. Compression	2	-119458.65	0.33	-0.08
			Max. Mx	18	76093.72	-1.17	0.02
			Max. My	26	-8405.15	-0.02	-1.24
			Max. Vy	18	-176.36	-1.17	0.02
			Max. Vx	26	-228.70	-0.02	-1.24

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max Tension	5	20496.01	0.00	0.00
			Max. Compression	4	-20792.89	0.00	0.00
			Max. Mx	34	-268.84	0.28	0.00
			Max. Vy	34	-89.70	0.00	0.00
		Horizontal	Max Tension	4	12191.30	-0.03	-0.00
			Max. Compression	5	-12088.10	-0.02	-0.00
			Max. Mx	48	-142.25	-0.08	-0.01
			Max. My	18	-1761.71	-0.05	-0.02
			Max. Vy	48	-49.49	-0.08	-0.01
			Max. Vx	18	-3.76	-0.05	-0.02
		Inner Bracing	Max Tension	3	4.78	0.00	0.00
			Max. Compression	18	-13.29	0.00	0.00
			Max. Mx	34	-8.95	-0.07	0.00
			Max. Vy	34	-42.45	0.00	0.00
T7	100 - 90	Leg	Max Tension	19	129435.58	-0.35	0.07
			Max. Compression	2	-146630.20	0.71	-0.04
			Max. Mx	18	126882.76	-0.76	0.04
			Max. My	11	-7108.12	-0.02	0.77
			Max. Vy	18	151.92	-0.76	0.04
			Max. Vx	10	-201.05	-0.02	0.77
		Diagonal	Max Tension	5	18533.90	0.00	0.00
			Max. Compression	4	-18755.40	0.00	0.00
			Max. Mx	34	-283.71	0.23	0.00
			Max. Vy	34	71.24	0.00	0.00
		Horizontal	Max Tension	4	11769.06	-0.03	-0.00
			Max. Compression	5	-11758.00	-0.03	-0.00
			Max. Mx	48	-479.41	-0.09	-0.01
			Max. My	18	-1733.54	-0.05	-0.02
			Max. Vy	48	52.12	-0.09	-0.01
			Max. Vx	18	2.81	-0.05	-0.02
		Inner Bracing	Max Tension	3	3.17	0.00	0.00
			Max. Compression	43	-10.99	0.00	0.00
			Max. Mx	34	-9.16	-0.09	0.00
			Max. Vy	34	-45.29	0.00	0.00
T8	90 - 80	Leg	Max Tension	19	152053.56	-0.75	0.04
			Max. Compression	2	-170761.50	0.66	-0.02
			Max. Mx	18	149642.40	-0.76	0.04
			Max. My	11	-7731.90	-0.02	0.86
			Max. Vy	18	-116.58	-0.76	0.04
			Max. Vx	10	-164.88	-0.03	0.86
		Diagonal	Max Tension	5	18404.03	0.00	0.00
			Max. Compression	4	-18643.93	0.00	0.00
			Max. Mx	34	-304.67	0.26	0.00
			Max. Vy	34	-76.44	0.00	0.00
		Top Girt	Max Tension	4	12263.90	-0.04	-0.00
			Max. Compression	5	-12192.57	-0.03	-0.00
			Max. Mx	48	-303.13	-0.10	-0.01
			Max. My	18	-1229.75	-0.06	-0.02
			Max. Vy	48	-55.87	-0.10	-0.01
			Max. Vx	18	-2.39	-0.06	-0.02
		Inner Bracing	Max Tension	5	208.54	0.00	0.00
			Max. Compression	4	-216.10	0.00	0.00
			Max. Mx	34	-4.08	-0.10	0.00
			Max. Vy	34	48.77	0.00	0.00
T9	80 - 60	Leg	Max Tension	19	195652.92	-1.30	0.03
			Max. Compression	2	-218224.80	1.93	-0.04
			Max. Mx	18	192190.96	-1.94	0.04
			Max. My	11	-9390.13	-0.02	1.79
			Max. Vy	18	265.40	-1.94	0.04
			Max. Vx	10	-312.76	-0.03	1.79
		Diagonal	Max Tension	5	19323.33	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	4	-19649.19	0.00	0.00
			Max. Mx	34	-388.23	0.31	0.00
			Max. Vy	34	-86.22	0.00	0.00
		Horizontal	Max Tension	4	13855.98	-0.08	-0.00
			Max. Compression	5	-13736.92	-0.06	-0.00
			Max. Mx	48	-297.26	-0.17	-0.01
			Max. My	3	666.27	-0.03	0.03
			Max. Vy	48	-83.69	-0.17	-0.01
			Max. Vx	18	-3.13	-0.10	-0.03
		Inner Bracing	Max Tension	3	3.19	0.00	0.00
			Max. Compression	43	-13.11	0.00	0.00
			Max. Mx	34	-11.15	-0.15	0.00
			Max. Vy	34	64.61	0.00	0.00
T10	60 - 40	Leg	Max Tension	19	239027.62	-1.31	0.03
			Max. Compression	2	-266561.88	1.16	-0.03
			Max. Mx	18	214079.79	-1.94	0.04
			Max. My	11	-9824.46	-0.02	1.79
			Max. Vy	8	-330.04	-1.93	0.12
			Max. Vx	10	323.16	-0.03	1.79
		Diagonal	Max Tension	5	20365.25	0.00	0.00
			Max. Compression	4	-20847.90	0.00	0.00
			Max. Mx	34	-497.08	0.43	0.00
			Max. Vy	34	-113.22	0.00	0.00
		Horizontal	Max Tension	4	15514.41	-0.10	-0.00
			Max. Compression	5	-15283.34	-0.08	-0.00
			Max. Mx	48	-225.97	-0.21	-0.01
			Max. My	3	1429.58	-0.04	0.03
			Max. Vy	48	-92.30	-0.21	-0.01
			Max. Vx	3	-2.83	0.00	0.00
		Inner Bracing	Max Tension	3	1.05	0.00	0.00
			Max. Compression	43	-15.50	0.00	0.00
			Max. Mx	34	-13.82	-0.24	0.00
			Max. Vy	34	-90.29	0.00	0.00
T11	40 - 30	Leg	Max Tension	19	260462.85	-1.22	0.03
			Max. Compression	2	-290823.79	2.71	-0.02
			Max. Mx	2	-290823.79	2.71	-0.02
			Max. My	26	-17481.28	-0.05	-1.28
			Max. Vy	3	-318.02	2.69	-0.02
			Max. Vx	26	-239.15	-0.05	-1.28
		Diagonal	Max Tension	5	20693.12	0.00	0.00
			Max. Compression	4	-21211.48	0.00	0.00
			Max. Mx	34	-529.12	0.46	0.00
			Max. Vy	34	-117.43	0.00	0.00
		Horizontal	Max Tension	4	16139.57	-0.11	-0.00
			Max. Compression	5	-15896.09	-0.09	-0.00
			Max. Mx	48	-270.22	-0.23	-0.01
			Max. My	3	1280.65	-0.06	0.03
			Max. Vy	48	-95.33	-0.23	-0.01
			Max. Vx	3	-2.43	-0.06	0.03
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	43	-15.74	0.00	0.00
			Max. Mx	34	-14.16	-0.26	0.00
			Max. Vy	34	-93.18	0.00	0.00
T12	30 - 20	Leg	Max Tension	19	281544.30	-2.53	0.02
			Max. Compression	2	-314886.08	-2.36	-0.03
			Max. Mx	2	-314284.32	2.71	-0.02
			Max. My	11	-13247.30	-0.38	4.49
			Max. Vy	2	655.04	2.71	-0.02
			Max. Vx	11	-544.77	-0.38	4.49
		Diagonal	Max Tension	5	21144.81	0.00	0.00
			Max. Compression	4	-21748.21	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	34	-584.63	0.49	0.00
			Max. Vy	34	-121.65	0.00	0.00
		Top Girt	Max Tension	4	16921.82	-0.17	-0.00
			Max. Compression	5	-16553.52	-0.13	-0.00
			Max. Mx	48	22.00	-0.29	-0.01
			Max. My	3	387.18	-0.09	0.02
			Max. Vy	48	-115.51	-0.29	-0.01
			Max. Vx	3	2.09	0.00	0.00
		Inner Bracing	Max Tension	5	282.94	0.00	0.00
			Max. Compression	4	-298.18	0.00	0.00
			Max. Mx	34	-15.21	-0.29	0.00
			Max. Vy	34	96.06	0.00	0.00
T13	20 - 0	Leg	Max Tension	19	300651.02	1.54	0.04
			Max. Compression	2	-338227.24	0.00	-0.00
			Max. Mx	2	-337505.48	7.91	-0.02
			Max. My	11	-14057.81	-0.38	4.49
			Max. Vy	2	-1153.47	7.91	-0.02
			Max. Vx	11	961.48	-0.38	4.49
		Diagonal	Max Tension	5	30853.68	-0.15	-0.04
			Max. Compression	4	-31573.09	0.00	0.00
			Max. Mx	30	20374.81	-0.24	-0.04
			Max. My	2	-26599.33	-0.01	-0.05
			Max. Vy	36	-81.05	-0.20	-0.00
			Max. Vx	2	-4.12	-0.01	-0.05
		Horizontal	Max Tension	4	17445.10	-0.23	-0.00
			Max. Compression	15	-17467.02	-0.20	-0.01
			Max. Mx	48	-2.56	-0.41	-0.02
			Max. My	3	1469.91	-0.05	0.06
			Max. Vy	48	145.41	-0.41	-0.02
			Max. Vx	3	4.44	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	2	5871.73	0.00	0.00
			Max. Compression	2	-5871.73	0.00	0.00
			Max. Mx	34	787.69	0.04	0.00
			Max. Vy	34	23.11	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	2	5364.43	0.00	0.00
			Max. Compression	2	-5364.43	0.00	0.00
			Max. Mx	34	719.63	0.07	0.00
			Max. Vy	34	-25.88	0.00	0.00
		Redund Hip 1 Bracing	Max Tension	3	3.01	0.00	0.00
			Max. Compression	18	-18.97	0.00	0.00
			Max. Mx	34	-14.25	0.06	0.00
			Max. Vy	34	-38.89	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	43	-14.46	0.00	0.00
			Max. Mx	34	-12.96	0.18	0.00
			Max. Vy	34	-57.34	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	24	376282.03	45521.50	-27322.06
	Max. H_x	24	376282.03	45521.50	-27322.06

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
	Max. H_z	7	-328606.58	-39660.46	26639.90
	Min. Vert	9	-339163.70	-42102.05	25390.04
	Min. H_x	9	-339163.70	-42102.05	25390.04
	Min. H_z	22	362025.17	42102.69	-28008.08
Leg B	Max. Vert	12	377531.22	-45628.53	-27414.15
	Max. H_x	29	-340337.64	42192.00	25408.90
	Max. H_z	31	-330382.56	39807.98	26664.16
	Min. Vert	29	-340337.64	42192.00	25408.90
	Min. H_x	12	377531.22	-45628.53	-27414.15
	Min. H_z	14	364897.18	-42657.65	-28387.07
Leg A	Max. Vert	2	383358.89	-34.59	53686.09
	Max. H_x	27	17855.45	10551.88	1495.83
	Max. H_z	2	383358.89	-34.59	53686.09
	Min. Vert	19	-341373.28	9.99	-49365.94
	Min. H_x	10	21114.91	-10597.08	1755.14
	Min. H_z	19	-341373.28	9.99	-49365.94

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	51548.43	-0.00	0.00	-5.45	4.35	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	61858.12	-153.93	-92655.08	-8694.50	31.38	-1.73
0.9 Dead+1.0 Wind 0 deg - No Ice	46393.59	-153.93	-92655.08	-8692.86	30.08	-1.73
1.2 Dead+1.0 Wind 30 deg - No Ice	61858.12	45190.09	-78725.94	-7461.86	-4254.40	-27.49
0.9 Dead+1.0 Wind 30 deg - No Ice	46393.59	45190.09	-78725.94	-7460.22	-4255.70	-27.49
1.2 Dead+1.0 Wind 45 deg - No Ice	61858.12	63727.08	-64036.80	-6078.24	-6013.22	-37.41
0.9 Dead+1.0 Wind 45 deg - No Ice	46393.59	63727.08	-64036.80	-6076.61	-6014.52	-37.41
1.2 Dead+1.0 Wind 60 deg - No Ice	61858.12	77724.93	-45082.02	-4284.24	-7341.18	-44.88
0.9 Dead+1.0 Wind 60 deg - No Ice	46393.59	77724.93	-45082.02	-4282.61	-7342.48	-44.88
1.2 Dead+1.0 Wind 90 deg - No Ice	61858.12	90136.84	-24.03	-11.88	-8469.07	-51.15
0.9 Dead+1.0 Wind 90 deg - No Ice	46393.59	90136.84	-24.03	-10.24	-8470.37	-51.15
1.2 Dead+1.0 Wind 120 deg - No Ice	61858.12	79549.94	46101.19	4296.44	-7397.70	-44.07
0.9 Dead+1.0 Wind 120 deg - No Ice	46393.59	79549.94	46101.19	4298.07	-7399.00	-44.07
1.2 Dead+1.0 Wind 135 deg - No Ice	61858.12	64419.15	64667.74	6066.95	-6025.82	-35.66
0.9 Dead+1.0 Wind 135 deg - No Ice	46393.59	64419.15	64667.74	6068.59	-6027.13	-35.66
1.2 Dead+1.0 Wind 150 deg - No Ice	61858.12	45240.15	78542.12	7415.16	-4261.37	-24.88
0.9 Dead+1.0 Wind 150 deg - No Ice	46393.59	45240.15	78542.12	7416.80	-4262.68	-24.88
1.2 Dead+1.0 Wind 180 deg - No Ice	61858.12	174.54	90188.99	8551.41	-24.58	0.91

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
0.9 Dead+1.0 Wind 180 deg - No Ice	46393.59	174.54	90188.99	8553.04	-25.89	0.91
1.2 Dead+1.0 Wind 210 deg - No Ice	61858.12	-45034.70	78447.75	7399.55	4237.34	25.40
0.9 Dead+1.0 Wind 210 deg - No Ice	46393.59	-45034.70	78447.75	7401.18	4236.04	25.40
1.2 Dead+1.0 Wind 225 deg - No Ice	61858.12	-63468.50	63737.97	6012.28	5977.90	35.35
0.9 Dead+1.0 Wind 225 deg - No Ice	46393.59	-63468.50	63737.97	6013.91	5976.59	35.35
1.2 Dead+1.0 Wind 240 deg - No Ice	61858.12	-79400.47	45898.22	4262.40	7382.78	42.81
0.9 Dead+1.0 Wind 240 deg - No Ice	46393.59	-79400.47	45898.22	4264.03	7381.47	42.81
1.2 Dead+1.0 Wind 270 deg - No Ice	61858.12	-90078.62	-302.22	-58.94	8469.21	49.40
0.9 Dead+1.0 Wind 270 deg - No Ice	46393.59	-90078.62	-302.22	-57.31	8467.91	49.40
1.2 Dead+1.0 Wind 300 deg - No Ice	61858.12	-77742.93	-45313.36	-4323.30	7353.73	43.05
0.9 Dead+1.0 Wind 300 deg - No Ice	46393.59	-77742.93	-45313.36	-4321.67	7352.42	43.05
1.2 Dead+1.0 Wind 315 deg - No Ice	61858.12	-63867.67	-64221.35	-6109.37	6047.01	34.59
0.9 Dead+1.0 Wind 315 deg - No Ice	46393.59	-63867.67	-64221.35	-6107.74	6045.71	34.59
1.2 Dead+1.0 Wind 330 deg - No Ice	61858.12	-45414.11	-78871.38	-7486.51	4302.62	23.92
0.9 Dead+1.0 Wind 330 deg - No Ice	46393.59	-45414.11	-78871.38	-7484.88	4301.31	23.92
1.2 Dead+1.0 Ice	137466.44	-0.00	-0.00	-53.00	10.43	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice	137466.44	-22.88	-25968.33	-2458.31	14.32	-8.92
1.2 Dead+1.0 Wind 30 deg+1.0 Ice	137466.44	12769.63	-22243.78	-2125.20	-1173.57	-17.30
1.2 Dead+1.0 Wind 45 deg+1.0 Ice	137466.44	18028.70	-18123.15	-1742.54	-1662.98	-19.76
1.2 Dead+1.0 Wind 60 deg+1.0 Ice	137466.44	22027.71	-12783.47	-1245.30	-2035.07	-20.89
1.2 Dead+1.0 Wind 90 deg+1.0 Ice	137466.44	25498.53	-5.16	-54.08	-2350.08	-19.02
1.2 Dead+1.0 Wind 120 deg+1.0 Ice	137466.44	22323.65	12947.30	1142.98	-2043.94	-12.11
1.2 Dead+1.0 Wind 135 deg+1.0 Ice	137466.44	18139.79	18224.60	1636.57	-1664.71	-7.26
1.2 Dead+1.0 Wind 150 deg+1.0 Ice	137466.44	12775.14	22213.43	2013.66	-1174.26	-1.91
1.2 Dead+1.0 Wind 180 deg+1.0 Ice	137466.44	26.13	25568.49	2331.57	5.97	8.79
1.2 Dead+1.0 Wind 210 deg+1.0 Ice	137466.44	-12745.14	22199.94	2011.43	1190.09	16.97
1.2 Dead+1.0 Wind 225 deg+1.0 Ice	137466.44	-17987.95	18076.05	1628.20	1676.62	19.43
1.2 Dead+1.0 Wind 240 deg+1.0 Ice	137466.44	-22301.46	12917.70	1138.02	2061.04	20.56
1.2 Dead+1.0 Wind 270 deg+1.0 Ice	137466.44	-25489.36	-46.25	-61.03	2369.31	18.74
1.2 Dead+1.0 Wind 300 deg+1.0 Ice	137466.44	-22029.17	-12817.54	-1251.05	2056.02	11.95
1.2 Dead+1.0 Wind 315 deg+1.0 Ice	137466.44	-18048.91	-18150.29	-1747.12	1687.18	7.09

Load Combination	*Vertical* *lb*	*Shear$_x$* *lb*	*Shear$_z$* *lb*	*Overturning Moment, M_x* *kip-ft*	*Overturning Moment, M_z* *kip-ft*	*Torque* *kip-ft*
1.2 Dead+1.0 Wind 330 deg+1.0 Ice	137466.44	-12802.55	-22265.32	-2128.85	1199.97	1.76
Dead+Wind 0 deg - Service	51548.43	-32.79	-19737.18	-1856.14	9.93	-0.37
Dead+Wind 30 deg - Service	51548.43	9626.29	-16770.02	-1593.56	-903.02	-5.85
Dead+Wind 45 deg - Service	51548.43	13575.00	-13640.98	-1298.83	-1277.68	-7.97
Dead+Wind 60 deg - Service	51548.43	16556.79	-9603.27	-916.67	-1560.56	-9.56
Dead+Wind 90 deg - Service	51548.43	19200.75	-5.12	-6.58	-1800.82	-10.90
Dead+Wind 120 deg - Service	51548.43	16945.55	9820.37	911.16	-1572.60	-9.39
Dead+Wind 135 deg - Service	51548.43	13722.42	13775.38	1288.31	-1280.37	-7.60
Dead+Wind 150 deg - Service	51548.43	9636.96	16730.87	1575.51	-904.51	-5.30
Dead+Wind 180 deg - Service	51548.43	37.18	19211.86	1817.55	-2.00	0.19
Dead+Wind 210 deg - Service	51548.43	-9593.19	16710.76	1572.18	905.87	5.41
Dead+Wind 225 deg - Service	51548.43	-13519.92	13577.32	1276.67	1276.64	7.53
Dead+Wind 240 deg - Service	51548.43	-16913.71	9777.13	903.91	1575.90	9.12
Dead+Wind 270 deg - Service	51548.43	-19188.35	-64.38	-16.61	1807.33	10.52
Dead+Wind 300 deg - Service	51548.43	-16560.63	-9652.55	-924.99	1569.72	9.17
Dead+Wind 315 deg - Service	51548.43	-13604.95	-13680.29	-1305.46	1291.36	7.37
Dead+Wind 330 deg - Service	51548.43	-9674.01	-16801.00	-1598.81	919.77	5.10

Solution Summary

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*% Error*
1	0.00	-51548.43	0.00	0.00	51548.43	-0.00	0.000%
2	-153.93	-61858.12	-92655.08	153.93	61858.12	92655.08	0.000%
3	-153.93	-46393.59	-92655.08	153.93	46393.59	92655.08	0.000%
4	45190.09	-61858.12	-78725.94	-45190.09	61858.12	78725.94	0.000%
5	45190.09	-46393.59	-78725.94	-45190.09	46393.59	78725.94	0.000%
6	63727.08	-61858.12	-64036.80	-63727.08	61858.12	64036.80	0.000%
7	63727.08	-46393.59	-64036.80	-63727.08	46393.59	64036.80	0.000%
8	77724.93	-61858.12	-45082.02	-77724.93	61858.12	45082.02	0.000%
9	77724.93	-46393.59	-45082.02	-77724.93	46393.59	45082.02	0.000%
10	90136.84	-61858.12	-24.03	-90136.84	61858.12	24.03	0.000%
11	90136.84	-46393.59	-24.03	-90136.84	46393.59	24.03	0.000%
12	79549.94	-61858.12	46101.19	-79549.94	61858.12	-46101.19	0.000%
13	79549.94	-46393.59	46101.19	-79549.94	46393.59	-46101.19	0.000%
14	64419.15	-61858.12	64667.74	-64419.15	61858.12	-64667.74	0.000%
15	64419.15	-46393.59	64667.74	-64419.15	46393.59	-64667.74	0.000%
16	45240.15	-61858.12	78542.12	-45240.15	61858.12	-78542.12	0.000%
17	45240.15	-46393.59	78542.12	-45240.15	46393.59	-78542.12	0.000%
18	174.54	-61858.12	90188.99	-174.54	61858.12	-90188.99	0.000%
19	174.54	-46393.59	90188.99	-174.54	46393.59	-90188.99	0.000%
20	-45034.70	-61858.12	78447.75	45034.70	61858.12	-78447.75	0.000%
21	-45034.70	-46393.59	78447.75	45034.70	46393.59	-78447.75	0.000%
22	-63468.50	-61858.12	63737.97	63468.50	61858.12	-63737.97	0.000%
23	-63468.50	-46393.59	63737.97	63468.50	46393.59	-63737.97	0.000%
24	-79400.47	-61858.12	45898.22	79400.47	61858.12	-45898.22	0.000%
25	-79400.47	-46393.59	45898.22	79400.47	46393.59	-45898.22	0.000%
26	-90078.62	-61858.12	-302.22	90078.62	61858.12	302.22	0.000%
27	-90078.62	-46393.59	-302.22	90078.62	46393.59	302.22	0.000%
28	-77742.93	-61858.12	-45313.36	77742.93	61858.12	45313.36	0.000%
29	-77742.93	-46393.59	-45313.36	77742.93	46393.59	45313.36	0.000%
30	-63867.67	-61858.12	-64221.35	63867.67	61858.12	64221.35	0.000%
31	-63867.67	-46393.59	-64221.35	63867.67	46393.59	64221.35	0.000%
32	-45414.11	-61858.12	-78871.38	45414.11	61858.12	78871.38	0.000%
33	-45414.11	-46393.59	-78871.38	45414.11	46393.59	78871.38	0.000%
34	0.00	-137466.44	0.00	0.00	137466.44	0.00	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
35	-22.88	-137466.44	-25968.33	22.88	137466.44	25968.33	0.000%
36	12769.63	-137466.44	-22243.78	-12769.63	137466.44	22243.78	0.000%
37	18028.70	-137466.44	-18123.15	-18028.70	137466.44	18123.15	0.000%
38	22027.71	-137466.44	-12783.47	-22027.71	137466.44	12783.47	0.000%
39	25498.53	-137466.44	-5.16	-25498.53	137466.44	5.16	0.000%
40	22323.65	-137466.44	12947.30	-22323.65	137466.44	-12947.30	0.000%
41	18139.79	-137466.44	18224.60	-18139.79	137466.44	-18224.60	0.000%
42	12775.14	-137466.44	22213.43	-12775.14	137466.44	-22213.43	0.000%
43	26.13	-137466.44	25568.49	-26.13	137466.44	-25568.49	0.000%
44	-12745.14	-137466.44	22199.94	12745.14	137466.44	-22199.94	0.000%
45	-17987.95	-137466.44	18076.05	17987.95	137466.44	-18076.05	0.000%
46	-22301.46	-137466.44	12917.70	22301.46	137466.44	-12917.70	0.000%
47	-25489.36	-137466.44	-46.25	25489.36	137466.44	46.25	0.000%
48	-22029.17	-137466.44	-12817.54	22029.17	137466.44	12817.54	0.000%
49	-18048.91	-137466.44	-18150.29	18048.91	137466.44	18150.29	0.000%
50	-12802.55	-137466.44	-22265.32	12802.55	137466.44	22265.32	0.000%
51	-32.79	-51548.43	-19737.18	32.79	51548.43	19737.18	0.000%
52	9626.29	-51548.43	-16770.02	-9626.29	51548.43	16770.02	0.000%
53	13575.00	-51548.43	-13640.98	-13575.00	51548.43	13640.98	0.000%
54	16556.79	-51548.43	-9603.27	-16556.79	51548.43	9603.27	0.000%
55	19200.75	-51548.43	-5.12	-19200.75	51548.43	5.12	0.000%
56	16945.55	-51548.43	9820.37	-16945.55	51548.43	-9820.37	0.000%
57	13722.42	-51548.43	13775.38	-13722.42	51548.43	-13775.38	0.000%
58	9636.95	-51548.43	16730.87	-9636.96	51548.43	-16730.87	0.000%
59	37.18	-51548.43	19211.86	-37.18	51548.43	-19211.86	0.000%
60	-9593.19	-51548.43	16710.76	9593.19	51548.43	-16710.76	0.000%
61	-13519.92	-51548.43	13577.32	13519.92	51548.43	-13577.32	0.000%
62	-16913.71	-51548.43	9777.13	16913.71	51548.43	-9777.13	0.000%
63	-19188.35	-51548.43	-64.38	19188.35	51548.43	64.38	0.000%
64	-16560.63	-51548.43	-9652.55	16560.63	51548.43	9652.55	0.000%
65	-13604.95	-51548.43	-13680.29	13604.95	51548.43	13680.29	0.000%
66	-9674.01	-51548.43	-16801.00	9674.01	51548.43	16801.00	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	2.170	66	0.0937	0.0387
T2	160 - 140	1.773	66	0.0921	0.0309
T3	140 - 133.333	1.373	51	0.0838	0.0197
T4	133.333 - 126.667	1.252	51	0.0811	0.0169
T5	126.667 - 120	1.130	51	0.0779	0.0147
T6	120 - 100	1.016	51	0.0739	0.0135
T7	100 - 90	0.723	51	0.0590	0.0109
T8	90 - 80	0.594	51	0.0518	0.0093
T9	80 - 60	0.480	51	0.0439	0.0078
T10	60 - 40	0.287	51	0.0337	0.0055
T11	40 - 30	0.143	51	0.0223	0.0037
T12	30 - 20	0.087	51	0.0164	0.0027
T13	20 - 0	0.046	56	0.0101	0.0019

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
187.00	ANT940Y10-WR	66	2.170	0.0937	0.0387	390340
181.00	ANT940Y10-WR	66	2.170	0.0937	0.0387	390340
177.00	PA6-65AC	66	2.111	0.0937	0.0378	390340
170.00	RFI BPS7496-180-14 Panel Antenna	66	1.974	0.0936	0.0353	195170
169.00	3' Yagi	66	1.954	0.0935	0.0350	177427
160.00	Pirod 15' T-Frame Sector Mount (1)	66	1.773	0.0921	0.0309	116864
133.00	800-10798 Kathrein Panel	51	1.246	0.0809	0.0168	273108
125.00	LTF12=372 Sector Mount (1)	51	1.101	0.0770	0.0144	61551
113.00	ANT150D	51	0.906	0.0689	0.0127	67634
60.00	GPS	51	0.287	0.0337	0.0055	90213

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	10.117	2	0.4305	0.1818
T2	160 - 140	8.291	2	0.4254	0.1451
T3	140 - 133.333	6.425	2	0.3899	0.0923
T4	133.333 - 126.667	5.860	2	0.3775	0.0795
T5	126.667 - 120	5.293	2	0.3631	0.0691
T6	120 - 100	4.758	2	0.3447	0.0636
T7	100 - 90	3.387	2	0.2753	0.0514
T8	90 - 80	2.783	2	0.2418	0.0434
T9	80 - 60	2.251	2	0.2053	0.0365
T10	60 - 40	1.347	2	0.1578	0.0258
T11	40 - 30	0.669	2	0.1046	0.0172
T12	30 - 20	0.408	3	0.0765	0.0127
T13	20 - 0	0.214	3	0.0475	0.0088

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
187.00	ANT940Y10-WR	2	10.117	0.4305	0.1818	91393
181.00	ANT940Y10-WR	2	10.117	0.4305	0.1818	91393
177.00	PA6-65AC	2	9.847	0.4309	0.1773	91393
170.00	RFI BPS7496-180-14 Panel Antenna	2	9.215	0.4310	0.1659	45696
169.00	3' Yagi	2	9.124	0.4309	0.1641	41542
160.00	Pirod 15' T-Frame Sector Mount (1)	2	8.291	0.4254	0.1451	27624
133.00	800-10798 Kathrein Panel	2	5.832	0.3768	0.0789	60982
125.00	LTF12=372 Sector Mount (1)	2	5.155	0.3589	0.0674	13235
113.00	ANT150D	2	4.244	0.3215	0.0594	14575
60.00	GPS	2	1.347	0.1578	0.0258	19295

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load per Bolt lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Diagonal	A325N	0.6250	3	1497.59	13805.80	0.108 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	1210.63	13805.80	0.088 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	170.54	13805.80	0.012 ✔	1	Bolt Shear
T2	160	Leg	A325N	0.8750	4	1410.61	41556.00	0.034 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	3152.57	13805.80	0.228 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	2946.83	13805.80	0.213 ✔	1	Bolt Shear
T3	140	Leg	A325N	1.0000	4	9298.02	54517.00	0.171 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	3236.60	13805.80	0.234 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	3135.49	13805.80	0.227 ✔	1	Bolt Shear
T4	133.333	Diagonal	A325N	0.6250	3	4375.33	13805.80	0.317 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	4398.56	13805.80	0.319 ✔	1	Bolt Shear
T5	126.667	Diagonal	A325N	0.6250	3	5374.96	13805.80	0.389 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	5533.75	13805.80	0.401 ✔	1	Bolt Shear
T6	120	Leg	A325N	1.0000	6	12971.80	54517.00	0.238 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6930.96	13805.80	0.502 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	6095.65	13805.80	0.442 ✔	1	Bolt Shear
T7	100	Leg	A325N	1.0000	6	21572.60	54517.00	0.396 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6251.80	13805.80	0.453 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	5884.53	13805.80	0.426 ✔	1	Bolt Shear
T8	90	Diagonal	A325N	0.6250	3	6214.64	13805.80	0.450 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	6131.95	13805.80	0.444 ✔	1	Bolt Shear
T9	80	Leg	A325N	1.0000	8	21733.90	54517.00	0.399 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6549.73	13805.80	0.474 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	6927.99	13805.80	0.502 ✔	1	Bolt Shear
T10	60	Leg	A325N	1.0000	8	27160.00	54517.00	0.498 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	6949.30	13805.80	0.503 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	7757.21	13805.80	0.562 ✔	1	Bolt Shear
T11	40	Leg	A325N	1.0000	8	32557.90	54517.00	0.597 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	7070.49	13805.80	0.512 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	8069.79	13805.80	0.585 ✔	1	Bolt Shear
T12	30	Diagonal	A325N	0.6250	3	7249.40	13805.80	0.525 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	8460.91	13805.80	0.613 ✔	1	Bolt Shear
T13	20	Leg	A325N	1.0000	8	37581.40	54517.00	0.689 ✔	1	Bolt Tension
		Diagonal	A325X	0.6250	3	10524.40	17257.30	0.610 ✔	1	Bolt Shear
		Horizontal	A325N	0.7500	2	8733.51	19880.40	0.439 ✔	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8 K=1.00	2.2285	-4355.41	70976.40	0.061 [1] ✔
T2	160 - 140	ROHN 4 STD	20.04	6.68	53.1 K=1.00	3.1741	-33224.60	116229.00	0.286 [1] ✔
T3	140 - 133.333	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-44157.50	239378.00	0.184 [1] ✔
T4	133.333 - 126.667	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-56191.70	239378.00	0.235 [1] ✔
T5	126.667 - 120	ROHN 5 EH	6.68	6.68	43.6 K=1.00	6.1120	-72571.00	239378.00	0.303 [1] ✔
T6	120 - 100	ROHN 6 EHS	20.04	10.02	54.0 K=1.00	6.7133	-119459.00	244017.00	0.490 [1] ✔
T7	100 - 90	ROHN 6 EH	10.03	10.03	54.8 K=1.00	8.4049	-146630.00	303585.00	0.483 [1] ✔
T8	90 - 80	ROHN 6 EH	10.03	10.03	54.8 K=1.00	8.4049	-170762.00	303585.00	0.562 [1] ✔
T9	80 - 60	120deg_9.6250x0.375 BU on ROHN 8 EHS	20.05	10.03	42.2 K=1.00	13.6005	-218225.00	537270.00	0.406 [1] ✔
T10	60 - 40	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	20.05	10.03	42.2 K=1.00	13.6005	-266562.00	460811.00	0.578 [1] ✔
T11	40 - 30	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	10.03	10.03	42.2 K=1.00	13.6005	-290824.00	460811.00	0.631 [1] ✔
T12	30 - 20	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	10.03	10.03	42.2 K=1.00	13.6005	-314886.00	460811.00	0.683 [1] ✔
T13	20 - 0	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	20.05	10.03	42.9 K=1.00	16.6002	-338227.00	560408.00	0.604 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0 K=1.00	1.0745	-4492.77	17747.50	0.253 [1] ✔
T2	160 - 140	ROHN 2 STD	8.55	8.25	125.8 K=1.00	1.0745	-9448.69	15331.30	0.616 [1] ✔
T3	140 - 133.333	ROHN 2 EH	8.77	8.42	131.5 K=1.00	1.4807	-9709.79	19347.50	0.502 [1] ✔
T4	133.333 - 126.667	ROHN 2 EH	9.00	8.66	135.3 K=1.00	1.4807	-13126.00	18285.10	0.718 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T5	126.667 - 120	ROHN 2 XXS	9.24	8.91	152.1 K=1.00	2.6559	-16124.90	25935.80	0.622 [1] ✔
T6	120 - 100	Pipe 2.5 XXS	12.52	12.06	171.4 K=1.00	4.0285	-20447.30	30977.00	0.660 [1] ✔
T7	100 - 90	ROHN 3 STD	12.92	12.49	128.8 K=1.00	2.2285	-18755.40	30346.40	0.618 [1] ✔
T8	90 - 80	ROHN 3 STD	13.35	12.93	133.4 K=1.00	2.2285	-18643.90	28290.90	0.659 [1] ✔
T9	80 - 60	ROHN 3 STD	14.21	13.70	141.3 K=1.00	2.2285	-19649.20	25233.20	0.779 [1] ✔
T10	60 - 40	ROHN 3 EH	15.12	14.64	154.6 K=1.00	3.0159	-20847.90	28518.80	0.731 [1] ✔
T11	40 - 30	ROHN 3 EH	15.60	15.12	159.7 K=1.00	3.0159	-21211.50	26718.70	0.794 [1] ✔
T12	30 - 20	ROHN 3 EH	16.08	15.62	164.9 K=1.00	3.0159	-21748.20	25055.10	0.868 [1] ✔
T13	20 - 0	ROHN 3 EH	24.33	23.70	125.1 K=0.50	3.0159	-31573.10	43506.30	0.726 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.0 K=1.00	0.7995	-2421.26	22519.90	0.108 [1] ✔
T2	160 - 140	ROHN 1.5 STD	10.01	4.82	92.9 K=1.00	0.7995	-5865.73	19142.00	0.306 [1] ✔
T3	140 - 133.333	ROHN 2 STD	10.71	5.17	78.8 K=1.00	1.0745	-6242.09	30717.90	0.203 [1] ✔
T6	120 - 100	ROHN 2 STD	13.92	6.68	101.9 K=1.00	1.0745	-12088.10	22639.20	0.534 [1] ✔
T7	100 - 90	ROHN 2 STD	15.04	7.24	110.5 K=1.00	1.0745	-11758.00	19817.20	0.593 [1] ✔
T9	80 - 60	ROHN 2.5 STD	18.93	9.10	115.2 K=1.00	1.7040	-13736.90	28984.30	0.474 [1] ✔
T10	60 - 40	ROHN 2.5 STD	21.43	10.35	131.1 K=1.00	1.7040	-15283.30	22405.40	0.682 [1] ✔
T11	40 - 30	ROHN 2.5 STD	22.68	10.97	139.0 K=1.00	1.7040	-15896.10	19925.90	0.798 [1] ✔
T13	20 - 0	P3.5x.226	25.18	12.22	109.7 K=1.00	2.6795	-17467.00	49988.70	0.349 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 1.5 STD	8.54	4.13	79.5 K=1.00	0.7995	-341.08	22660.50	0.015 [1] ✔
T4	133.333 - 126.667	ROHN 2 STD	11.40	5.47	83.4 K=1.00	1.0745	-8765.19	29081.40	0.301 [1] ✔
T5	126.667 - 120	ROHN 2 STD	12.10	5.82	88.7 K=1.00	1.0745	-11067.50	27207.90	0.407 [1] ✔
T8	90 - 80	ROHN 2 STD	16.36	7.90	120.5 K=1.00	1.0745	-12192.60	16719.60	0.729 [1] ✔
T12	30 - 20	ROHN 2.5 EH	23.93	11.60	150.6 K=1.00	2.2535	-16553.50	22438.80	0.738 [1] ✔

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 1.5 STD	6.29	5.93	114.4 K=1.00	0.7995	-5871.73	13802.80	0.425 [1] ✔

[1] P_u / ϕP_n controls

Redundant Diagonal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 2 STD	11.50	10.76	164.1 K=1.00	1.0745	-5364.43	9016.50	0.595 [1] ✔

[1] P_u / ϕP_n controls

Redundant Hip (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 2.5 STD	6.29	6.29	79.7 K=1.00	1.7040	-18.97	48180.50	0.000 [1] ✔

[1] P_u / ϕP_n controls

Inner Bracing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	4.27	4.27	128.9 K=1.00	0.4844	-5.95	8341.12	0.001 [1] ✔
T2	160 - 140	L2x2x1/8	4.31	4.31	130.2 K=1.00	0.4844	-7.72	8181.36	0.001 [1] ✔
T3	140 - 133.333	L2x2x1/8	5.35	5.35	161.6 K=1.00	0.4844	-7.19	5306.96	0.001 [1] ✔
T4	133.333 - 126.667	L2x2x1/8	5.70	5.70	172.1 K=1.00	0.4844	-153.42	4680.37	0.033 [1] ✔
T5	126.667 - 120	L2x2x1/8	6.05	6.05	182.6 K=1.00	0.4844	-194.17	4158.54	0.047 [1] ✔
T6	120 - 100	L2 1/2x2 1/2x3/16	6.96	6.96	168.7 K=1.00	0.9020	-12.26	9072.37	0.001 [1] ✔
T7	100 - 90	L2 1/2x2 1/2x3/16	7.52	7.52	182.3 K=1.00	0.9020	-10.99	7766.06	0.001 [1] ✔
T8	90 - 80	L2 1/2x2 1/2x3/16	8.18	8.18	198.3 K=1.00	0.9020	-216.10	6565.57	0.033 [1] ✔
T9	80 - 60	L3x3x3/16	9.46	9.46	190.5 K=1.00	1.0900	-13.11	8593.12	0.002 [1] ✔
T10	60 - 40	L3 1/2x3 1/2x1/4	10.71	10.71	185.2 K=1.00	1.6900	-15.50	14095.40	0.001 [1] ✔
T11	40 - 30	L3 1/2x3 1/2x1/4	11.34	11.34	196.1 K=1.00	1.6900	-15.74	12584.30	0.001 [1] ✔
T12	30 - 20	L3 1/2x3 1/2x1/4	11.96	11.96	206.9 K=1.00	1.6900	-298.18	11303.80	0.026 [1] ✔
T13	20 - 0	ROHN 2 STD	12.59	12.59	191.9 K=1.00	1.0745	-14.46	6590.81	0.002 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8	2.2285	2667.72	100281.00	0.027 [1] ✔
T2	160 - 140	ROHN 4 STD	20.04	6.68	53.1	3.1741	26838.10	142832.00	0.188 [1] ✔
T3	140 - 133.333	ROHN 5 EH	6.68	6.68	43.6	6.1120	37192.10	275039.00	0.135 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T4	133.333 - 126.667	ROHN 5 EH	6.68	6.68	43.6	6.1120	47194.40	275039.00	0.172 [1] ✔
T5	126.667 - 120	ROHN 5 EH	6.68	6.68	43.6	6.1120	60771.80	275039.00	0.221 [1] ✔
T6	120 - 100	ROHN 6 EHS	20.04	10.02	54.0	6.7133	104068.00	302097.00	0.344 [1] ✔
T7	100 - 90	ROHN 6 EH	10.03	10.03	54.8	8.4049	129436.00	378222.00	0.342 [1] ✔
T8	90 - 80	ROHN 6 EH	10.03	10.03	54.8	8.4049	152054.00	378222.00	0.402 [1] ✔
T9	80 - 60	120deg_9.6250x0.375 BU on ROHN 8 EHS	20.05	10.03	42.2	13.6005	195653.00	612023.00	0.320 [1] ✔
T10	60 - 40	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	20.05	10.03	42.2	13.6005	239028.00	514099.00	0.465 [1] ✔
T11	40 - 30	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	10.03	10.03	42.2	13.6005	260463.00	514099.00	0.507 [1] ✔
T12	30 - 20	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	10.03	10.03	42.2	13.6005	281544.00	514099.00	0.548 [1] ✔
T13	20 - 0	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	20.05	10.03	42.9	16.6002	300651.00	627488.00	0.479 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0	1.0745	4425.45	48353.90	0.092 [1] ✔
T2	160 - 140	ROHN 2 STD	8.34	8.04	122.6	1.0745	9385.56	48353.90	0.194 [1] ✔
T3	140 - 133.333	ROHN 2 EH	8.77	8.42	131.5	1.4807	9598.69	66630.70	0.144 [1] ✔
T4	133.333 - 126.667	ROHN 2 EH	9.00	8.66	135.3	1.4807	13006.50	66630.70	0.195 [1] ✔
T5	126.667 - 120	ROHN 2 XXS	9.24	8.91	152.1	2.6559	15939.30	119516.00	0.133 [1] ✔
T6	120 - 100	Pipe 2.5 XXS	12.19	11.73	166.7	4.0285	20496.00	181280.00	0.113 [1] ✔
T7	100 - 90	ROHN 3 STD	12.92	12.49	128.8	2.2285	18533.90	100281.00	0.185 [1] ✔
T8	90 - 80	ROHN 3 STD	13.35	12.93	133.4	2.2285	18404.00	100281.00	0.184 [1] ✔
T9	80 - 60	ROHN 3 STD	14.21	13.70	141.3	2.2285	19323.30	100281.00	0.193 [1] ✔
T10	60 - 40	ROHN 3 EH	15.12	14.64	154.6	3.0159	20365.30	135717.00	0.150 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $P_u / \phi P_n$
T11	40 - 30	ROHN 3 EH	15.60	15.12	159.7	3.0159	20693.10	135717.00	0.152 [1] ✔
T12	30 - 20	ROHN 3 EH	16.08	15.62	164.9	3.0159	21144.80	135717.00	0.156 [1] ✔
T13	20 - 0	ROHN 3 EH	24.33	23.70	250.3	3.0159	30853.70	135717.00	0.227 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $P_u / \phi P_n$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.0	0.7995	2406.72	35975.60	0.067 [1] ✔
T2	160 - 140	ROHN 1.5 STD	10.01	4.82	92.9	0.7995	5893.65	35975.60	0.164 [1] ✔
T3	140 - 133.333	ROHN 2 STD	10.71	5.17	78.8	1.0745	6270.99	48353.90	0.130 [1] ✔
T6	120 - 100	ROHN 2 STD	13.92	6.68	101.9	1.0745	12191.30	48353.90	0.252 [1] ✔
T7	100 - 90	ROHN 2 STD	15.04	7.24	110.5	1.0745	11769.10	48353.90	0.243 [1] ✔
T9	80 - 60	ROHN 2.5 STD	18.93	9.10	115.2	1.7040	13856.00	76682.30	0.181 [1] ✔
T10	60 - 40	ROHN 2.5 STD	21.43	10.35	131.1	1.7040	15514.40	76682.30	0.202 [1] ✔
T11	40 - 30	ROHN 2.5 STD	22.68	10.97	139.0	1.7040	16139.60	76682.30	0.210 [1] ✔
T13	20 - 0	P3.5x.226	25.18	12.22	109.7	2.6795	17445.10	120579.00	0.145 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $P_u / \phi P_n$
T1	180 - 160	ROHN 1.5 STD	8.54	4.13	79.5	0.7995	315.17	35975.60	0.009 [1] ✔
T4	133.333 - 126.667	ROHN 2 STD	11.40	5.47	83.4	1.0745	8797.11	48353.90	0.182 [1] ✔
T5	126.667 - 120	ROHN 2 STD	12.10	5.82	88.7	1.0745	11057.50	48353.90	0.229 [1] ✔
T8	90 - 80	ROHN 2 STD	16.36	7.90	120.5	1.0745	12263.90	48353.90	0.254 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T12	30 - 20	ROHN 2.5 EH	23.93	11.60	150.6	2.2535	16921.80	101409.00	0.167 [1] ✔

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 1.5 STD	6.29	5.93	114.4	0.7995	5871.73	35975.60	0.163 [1] ✔

[1] P_u / ϕP_n controls

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 2 STD	11.50	10.76	164.1	1.0745	5364.43	48353.90	0.111 [1] ✔

[1] P_u / ϕP_n controls

Redundant Hip (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T13	20 - 0	ROHN 2.5 STD	6.29	6.29	79.7	1.7040	3.01	76682.30	0.000 [1] ✔

[1] P_u / ϕP_n controls

Inner Bracing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	4.27	4.27	81.8	0.4844	5.91	15693.80	0.000 [1] ✔
T2	160 - 140	L2x2x1/8	4.31	4.31	82.6	0.4844	5.85	15693.80	0.000 [1] ✔
T3	140 - 133.333	L2x2x1/8	5.35	5.35	102.6	0.4844	4.38	15693.80	0.000 [1] ✔
T4	133.333 - 126.667	L2x2x1/8	5.70	5.70	109.3	0.4844	152.06	15693.80	0.010 [1] ✔
T5	126.667 - 120	L2x2x1/8	6.05	6.05	115.9	0.4844	191.93	15693.80	0.012 [1] ✔
T6	120 - 100	L2 1/2x2 1/2x3/16	6.40	6.40	98.7	0.9020	4.78	29224.80	0.000 [1] ✔
T7	100 - 90	L2 1/2x2 1/2x3/16	7.52	7.52	116.0	0.9020	3.17	29224.80	0.000 [1] ✔
T8	90 - 80	L2 1/2x2 1/2x3/16	8.18	8.18	126.2	0.9020	208.54	29224.80	0.007 [1] ✔
T9	80 - 60	L3x3x3/16	8.84	8.84	113.0	1.0900	3.19	35316.00	0.000 [1] ✔
T10	60 - 40	L3 1/2x3 1/2x1/4	10.09	10.09	111.1	1.6900	1.05	76050.00	0.000 [1] ✔
T12	30 - 20	L3 1/2x3 1/2x1/4	11.96	11.96	131.7	1.6900	282.94	76050.00	0.004 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 3 STD	1	-2983.21	70976.40	4.2	Pass
		Leg	ROHN 3 STD	2	-2697.32	70976.40	3.8	Pass
		Leg	ROHN 3 STD	3	-4355.41	70976.40	6.1	Pass
T2	160 - 140	Leg	ROHN 4 STD	40	-29897.30	116229.00	25.7	Pass
		Leg	ROHN 4 STD	41	-29978.80	116229.00	25.8	Pass
		Leg	ROHN 4 STD	42	-33224.60	116229.00	28.6	Pass
T3	140 - 133.333	Leg	ROHN 5 EH	79	-40436.30	239378.00	16.9	Pass
		Leg	ROHN 5 EH	80	-40573.30	239378.00	16.9 17.0 (b)	Pass
		Leg	ROHN 5 EH	81	-44157.50	239378.00	18.4	Pass
T4	133.333 - 126.667	Leg	ROHN 5 EH	94	-52137.60	239378.00	21.8	Pass
		Leg	ROHN 5 EH	95	-52418.40	239378.00	21.9	Pass
		Leg	ROHN 5 EH	96	-56191.70	239378.00	23.5	Pass
T5	126.667 - 120	Leg	ROHN 5 EH	109	-68149.80	239378.00	28.5	Pass
		Leg	ROHN 5 EH	110	-68556.00	239378.00	28.6	Pass
		Leg	ROHN 5 EH	111	-72571.00	239378.00	30.3	Pass
T6	120 - 100	Leg	ROHN 6 EHS	124	-114241.00	244017.00	46.8	Pass
		Leg	ROHN 6 EHS	125	-114907.00	244017.00	47.1	Pass
		Leg	ROHN 6 EHS	126	-119459.00	244017.00	49.0	Pass
T7	100 - 90	Leg	ROHN 6 EH	151	-141039.00	303585.00	46.5	Pass
		Leg	ROHN 6 EH	152	-141830.00	303585.00	46.7	Pass
		Leg	ROHN 6 EH	153	-146630.00	303585.00	48.3	Pass

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Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
T8	90 - 80	Leg	ROHN 6 EH	166	-164922.00	303585.00	54.3	Pass
		Leg	ROHN 6 EH	167	-165809.00	303585.00	54.6	Pass
		Leg	ROHN 6 EH	168	-170762.00	303585.00	56.2	Pass
T9	80 - 60	Leg	120deg_9.6250x0.375 BU on ROHN 8 EHS	181	-211968.00	537270.00	39.5	Pass
		Leg	120deg_9.6250x0.375 BU on ROHN 8 EHS	182	-213007.00	537270.00	39.6 39.7 (b)	Pass
		Leg	120deg_9.6250x0.375 BU on ROHN 8 EHS	183	-218225.00	537270.00	40.6	Pass
T10	60 - 40	Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	208	-260093.00	460811.00	56.4	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	209	-261111.00	460811.00	56.7	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	210	-266562.00	460811.00	57.8	Pass
T11	40 - 30	Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	235	-284198.00	460811.00	61.7	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	236	-285273.00	460811.00	61.9	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	237	-290824.00	460811.00	63.1	Pass
T12	30 - 20	Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	250	-308122.00	460811.00	66.9	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	251	-309246.00	460811.00	67.1	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	252	-314886.00	460811.00	68.3	Pass
T13	20 - 0	Leg	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	265	-331345.00	560408.00	59.1 68.4 (b)	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	266	-332502.00	560408.00	59.3 68.7 (b)	Pass
		Leg	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	267	-338227.00	560408.00	60.4 68.9 (b)	Pass
T1	180 - 160	Diagonal	ROHN 2 STD	8	-2412.10	17747.50	13.6	Pass
		Diagonal	ROHN 2 STD	9	-2148.34	17747.50	12.1	Pass
		Diagonal	ROHN 2 STD	11	-2546.53	17747.50	14.3	Pass
		Diagonal	ROHN 2 STD	12	-2636.10	17747.50	14.9	Pass
		Diagonal	ROHN 2 STD	14	-4492.77	17747.50	25.3	Pass
		Diagonal	ROHN 2 STD	15	-4057.81	17747.50	22.9	Pass
		Diagonal	ROHN 2 STD	20	-1825.46	17782.20	10.3	Pass
		Diagonal	ROHN 2 STD	21	-1514.73	17782.20	8.5	Pass
		Diagonal	ROHN 2 STD	23	-1137.10	17782.20	6.4	Pass
		Diagonal	ROHN 2 STD	24	-1257.44	17782.20	7.1	Pass
		Diagonal	ROHN 2 STD	26	-2958.41	17782.20	16.6	Pass
		Diagonal	ROHN 2 STD	27	-2450.39	17782.20	13.8	Pass
		Diagonal	ROHN 2 STD	31	-505.36	17817.00	2.8	Pass
		Diagonal	ROHN 2 STD	32	-378.59	17817.00	2.1	Pass
		Diagonal	ROHN 2 STD	33	-161.60	17817.00	0.9	Pass
		Diagonal	ROHN 2 STD	34	-151.49	17817.00	0.9	Pass
		Diagonal	ROHN 2 STD	35	-596.66	17817.00	3.3	Pass
		Diagonal	ROHN 2 STD	36	-489.35	17817.00	2.7	Pass
T2	160 - 140	Diagonal	ROHN 2 STD	44	-6992.10	15331.30	45.6	Pass
		Diagonal	ROHN 2 STD	45	-6878.45	15331.30	44.9	Pass
		Diagonal	ROHN 2 STD	47	-7103.07	15331.30	46.3	Pass
		Diagonal	ROHN 2 STD	48	-7110.82	15331.30	46.4	Pass
		Diagonal	ROHN 2 STD	50	-9448.69	15331.30	61.6	Pass
		Diagonal	ROHN 2 STD	51	-9160.98	15331.30	59.8	Pass
		Diagonal	ROHN 2 STD	56	-7006.53	16154.50	43.4	Pass
		Diagonal	ROHN 2 STD	57	-6872.56	16154.50	42.5	Pass
		Diagonal	ROHN 2 STD	59	-7292.01	16154.50	45.1	Pass
		Diagonal	ROHN 2 STD	60	-7301.15	16154.50	45.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Diagonal	ROHN 2 STD	62	-9457.72	16154.50	58.5	Pass
		Diagonal	ROHN 2 STD	63	-9139.29	16154.50	56.6	Pass
		Diagonal	ROHN 2 STD	68	-6921.80	17005.60	40.7	Pass
		Diagonal	ROHN 2 STD	69	-6760.11	17005.60	39.8	Pass
		Diagonal	ROHN 2 STD	71	-7392.96	17005.60	43.5	Pass
		Diagonal	ROHN 2 STD	72	-7407.23	17005.60	43.6	Pass
		Diagonal	ROHN 2 STD	74	-9286.67	17005.60	54.6	Pass
		Diagonal	ROHN 2 STD	75	-8924.70	17005.60	52.5	Pass
T3	140 - 133.333	Diagonal	ROHN 2 EH	83	-7150.63	19347.50	37.0	Pass
		Diagonal	ROHN 2 EH	84	-7052.35	19347.50	36.5	Pass
		Diagonal	ROHN 2 EH	86	-7119.85	19347.50	36.8	Pass
		Diagonal	ROHN 2 EH	87	-7120.62	19347.50	36.8	Pass
		Diagonal	ROHN 2 EH	89	-9709.79	19347.50	50.2	Pass
		Diagonal	ROHN 2 EH	90	-9445.30	19347.50	48.8	Pass
T4	133.333 - 126.667	Diagonal	ROHN 2 EH	100	-10847.00	18285.10	59.3	Pass
		Diagonal	ROHN 2 EH	101	-10761.90	18285.10	58.9	Pass
		Diagonal	ROHN 2 EH	102	-10591.30	18285.10	57.9	Pass
		Diagonal	ROHN 2 EH	103	-10594.20	18285.10	57.9	Pass
		Diagonal	ROHN 2 EH	104	-13126.00	18285.10	71.8	Pass
		Diagonal	ROHN 2 EH	105	-12884.30	18285.10	70.5	Pass
T5	126.667 - 120	Diagonal	ROHN 2 XXS	115	-14092.80	25935.80	54.3	Pass
		Diagonal	ROHN 2 XXS	116	-14013.60	25935.80	54.0	Pass
		Diagonal	ROHN 2 XXS	117	-13839.70	25935.80	53.4	Pass
		Diagonal	ROHN 2 XXS	118	-13841.20	25935.80	53.4	Pass
		Diagonal	ROHN 2 XXS	119	-16124.90	25935.80	62.2	Pass
		Diagonal	ROHN 2 XXS	120	-15899.70	25935.80	61.3	Pass
T6	120 - 100	Diagonal	Pipe 2.5 XXS	128	-18001.00	30977.00	58.1	Pass
		Diagonal	Pipe 2.5 XXS	129	-17923.10	30977.00	57.9	Pass
		Diagonal	Pipe 2.5 XXS	131	-18477.20	30977.00	59.6	Pass
		Diagonal	Pipe 2.5 XXS	132	-18466.70	30977.00	59.6	Pass
		Diagonal	Pipe 2.5 XXS	134	-20447.30	30977.00	66.0	Pass
		Diagonal	Pipe 2.5 XXS	135	-20231.20	30977.00	65.3	Pass
		Diagonal	Pipe 2.5 XXS	140	-18302.60	32743.10	55.9	Pass
		Diagonal	Pipe 2.5 XXS	141	-18213.90	32743.10	55.6	Pass
		Diagonal	Pipe 2.5 XXS	143	-18343.30	32743.10	56.0	Pass
		Diagonal	Pipe 2.5 XXS	144	-18334.10	32743.10	56.0	Pass
		Diagonal	Pipe 2.5 XXS	146	-20792.90	32743.10	63.5	Pass
		Diagonal	Pipe 2.5 XXS	147	-20544.40	32743.10	62.7	Pass
T7	100 - 90	Diagonal	ROHN 3 STD	155	-16456.60	30346.40	54.2	Pass
		Diagonal	ROHN 3 STD	156	-16390.90	30346.40	54.0	Pass
		Diagonal	ROHN 3 STD	158	-17214.00	30346.40	56.7	Pass
		Diagonal	ROHN 3 STD	159	-17177.00	30346.40	56.6	Pass
		Diagonal	ROHN 3 STD	161	-18755.40	30346.40	61.8	Pass
		Diagonal	ROHN 3 STD	162	-18588.40	30346.40	61.3	Pass
T8	90 - 80	Diagonal	ROHN 3 STD	172	-16419.20	28290.90	58.0	Pass
		Diagonal	ROHN 3 STD	173	-16361.40	28290.90	57.8	Pass
		Diagonal	ROHN 3 STD	174	-17427.20	28290.90	61.6	Pass
		Diagonal	ROHN 3 STD	175	-17393.40	28290.90	61.5	Pass
		Diagonal	ROHN 3 STD	176	-18643.90	28290.90	65.9	Pass
		Diagonal	ROHN 3 STD	177	-18497.80	28290.90	65.4	Pass
T9	80 - 60	Diagonal	ROHN 3 STD	185	-17521.40	25233.20	69.4	Pass
		Diagonal	ROHN 3 STD	186	-17475.80	25233.20	69.3	Pass
		Diagonal	ROHN 3 STD	188	-18908.60	25233.20	74.9	Pass
		Diagonal	ROHN 3 STD	189	-18885.30	25233.20	74.8	Pass
		Diagonal	ROHN 3 STD	191	-19649.20	25233.20	77.9	Pass
		Diagonal	ROHN 3 STD	192	-19529.50	25233.20	77.4	Pass
		Diagonal	ROHN 3 STD	197	-17034.30	26922.60	63.3	Pass
		Diagonal	ROHN 3 STD	198	-16982.20	26922.60	63.1	Pass
		Diagonal	ROHN 3 STD	200	-18271.00	26922.60	67.9	Pass
		Diagonal	ROHN 3 STD	201	-18244.20	26922.60	67.8	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
		Diagonal	ROHN 3 STD	203	-19229.40	26922.60	71.4	Pass
		Diagonal	ROHN 3 STD	204	-19095.70	26922.60	70.9	Pass
T10	60 - 40	Diagonal	ROHN 3 EH	212	-18726.60	28518.80	65.7	Pass
		Diagonal	ROHN 3 EH	213	-18696.10	28518.80	65.6	Pass
		Diagonal	ROHN 3 EH	215	-20300.80	28518.80	71.2	Pass
		Diagonal	ROHN 3 EH	216	-20277.20	28518.80	71.1	Pass
		Diagonal	ROHN 3 EH	218	-20847.90	28518.80	73.1	Pass
		Diagonal	ROHN 3 EH	219	-20743.00	28518.80	72.7	Pass
		Diagonal	ROHN 3 EH	224	-18360.50	30411.50	60.4	Pass
		Diagonal	ROHN 3 EH	225	-18326.10	30411.50	60.3	Pass
		Diagonal	ROHN 3 EH	227	-19804.50	30411.50	65.1	Pass
		Diagonal	ROHN 3 EH	228	-19780.00	30411.50	65.0	Pass
		Diagonal	ROHN 3 EH	230	-20516.10	30411.50	67.5	Pass
		Diagonal	ROHN 3 EH	231	-20399.40	30411.50	67.1	Pass
T11	40 - 30	Diagonal	ROHN 3 EH	239	-19094.20	26718.70	71.5	Pass
		Diagonal	ROHN 3 EH	240	-19066.20	26718.70	71.4	Pass
		Diagonal	ROHN 3 EH	242	-20809.60	26718.70	77.9	Pass
		Diagonal	ROHN 3 EH	243	-20784.60	26718.70	77.8	Pass
		Diagonal	ROHN 3 EH	245	-21211.50	26718.70	79.4	Pass
		Diagonal	ROHN 3 EH	246	-21117.10	26718.70	79.0	Pass
T12	30 - 20	Diagonal	ROHN 3 EH	256	-19677.20	25055.10	78.5	Pass
		Diagonal	ROHN 3 EH	257	-19652.00	25055.10	78.4	Pass
		Diagonal	ROHN 3 EH	258	-21461.70	25055.10	85.7	Pass
		Diagonal	ROHN 3 EH	259	-21441.20	25055.10	85.6	Pass
		Diagonal	ROHN 3 EH	260	-21748.20	25055.10	86.8	Pass
		Diagonal	ROHN 3 EH	261	-21660.10	25055.10	86.4	Pass
T13	20 - 0	Diagonal	ROHN 3 EH	269	-28544.80	43506.30	65.6	Pass
		Diagonal	ROHN 3 EH	272	-28519.90	43506.30	65.6	Pass
		Diagonal	ROHN 3 EH	276	-31444.90	43506.30	72.3	Pass
		Diagonal	ROHN 3 EH	279	-31403.10	43506.30	72.2	Pass
		Diagonal	ROHN 3 EH	284	-31573.10	43506.30	72.6	Pass
		Diagonal	ROHN 3 EH	287	-31448.90	43506.30	72.3	Pass
T1	180 - 160	Horizontal	ROHN 1.5 STD	7	-1414.21	22519.90	6.3	Pass
		Horizontal	ROHN 1.5 STD	10	-1510.80	22519.90	6.7	Pass
		Horizontal	ROHN 1.5 STD	13	-2421.26	22519.90	10.8	Pass
		Horizontal	ROHN 1.5 STD	19	-1147.74	22590.20	5.1	Pass
		Horizontal	ROHN 1.5 STD	22	-831.79	22590.20	3.7	Pass
		Horizontal	ROHN 1.5 STD	25	-1674.45	22590.20	7.4	Pass
T2	160 - 140	Horizontal	ROHN 1.5 STD	43	-4328.75	19142.00	22.6	Pass
		Horizontal	ROHN 1.5 STD	46	-4458.67	19142.00	23.3	Pass
		Horizontal	ROHN 1.5 STD	49	-5865.73	19142.00	30.6	Pass
		Horizontal	ROHN 1.5 STD	55	-4162.30	20895.80	19.9	Pass
		Horizontal	ROHN 1.5 STD	58	-4416.25	20895.80	21.1	Pass
		Horizontal	ROHN 1.5 STD	61	-5637.05	20895.80	27.0	Pass
		Horizontal	ROHN 1.5 STD	67	-4596.06	22661.30	20.3	Pass
		Horizontal	ROHN 1.5 STD	70	-4929.62	22661.30	21.8	Pass
		Horizontal	ROHN 1.5 STD	73	-5549.12	22661.30	24.5	Pass
T3	140 - 133.333	Horizontal	ROHN 2 STD	82	-4580.33	30717.90	14.9 16.9 (b)	Pass
		Horizontal	ROHN 2 STD	85	-4642.63	30717.90	15.1 17.0 (b)	Pass
		Horizontal	ROHN 2 STD	88	-6242.09	30717.90	20.3 22.7 (b)	Pass
T6	120 - 100	Horizontal	ROHN 2 STD	127	-10618.80	22639.20	46.9	Pass
		Horizontal	ROHN 2 STD	130	-10911.20	22639.20	48.2	Pass
		Horizontal	ROHN 2 STD	133	-12088.10	22639.20	53.4	Pass
		Horizontal	ROHN 2 STD	139	-10292.50	25586.40	40.2	Pass
		Horizontal	ROHN 2 STD	142	-10384.30	25586.40	40.6	Pass
		Horizontal	ROHN 2 STD	145	-11717.20	25586.40	45.8	Pass
T7	100 - 90	Horizontal	ROHN 2 STD	154	-10293.80	19817.20	51.9	Pass
		Horizontal	ROHN 2 STD	157	-10899.70	19817.20	55.0	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Horizontal	ROHN 2 STD	160	-11758.00	19817.20	59.3	Pass
T9	80 - 60	Horizontal	ROHN 2.5 STD	184	-12225.90	28984.30	42.2 44.7 (b)	Pass
		Horizontal	ROHN 2.5 STD	187	-13244.70	28984.30	45.7 48.3 (b)	Pass
		Horizontal	ROHN 2.5 STD	190	-13736.90	28984.30	47.4 50.2 (b)	Pass
		Horizontal	ROHN 2.5 STD	196	-11507.30	33028.40	34.8 42.1 (b)	Pass
		Horizontal	ROHN 2.5 STD	199	-12350.60	33028.40	37.4 45.2 (b)	Pass
		Horizontal	ROHN 2.5 STD	202	-13010.40	33028.40	39.4 47.6 (b)	Pass
T10	60 - 40	Horizontal	ROHN 2.5 STD	211	-13694.40	22405.40	61.1	Pass
		Horizontal	ROHN 2.5 STD	214	-14913.90	22405.40	66.6	Pass
		Horizontal	ROHN 2.5 STD	217	-15283.30	22405.40	68.2	Pass
		Horizontal	ROHN 2.5 STD	223	-13130.90	25378.10	51.7	Pass
		Horizontal	ROHN 2.5 STD	226	-14256.60	25378.10	56.2	Pass
		Horizontal	ROHN 2.5 STD	229	-14704.90	25378.10	57.9	Pass
T11	40 - 30	Horizontal	ROHN 2.5 STD	238	-14271.90	19925.90	71.6	Pass
		Horizontal	ROHN 2.5 STD	241	-15663.30	19925.90	78.6	Pass
		Horizontal	ROHN 2.5 STD	244	-15896.10	19925.90	79.8	Pass
T13	20 - 0	Horizontal	P3.5x.226	268	-15614.20	49988.70	31.2 39.5 (b)	Pass
		Horizontal	P3.5x.226	275	-17467.00	49988.70	34.9 43.9 (b)	Pass
		Horizontal	P3.5x.226	283	-17354.30	49988.70	34.7 43.9 (b)	Pass
T1	180 - 160	Top Girt	ROHN 1.5 STD	4	-230.44	22660.50	1.0 1.1 (b)	Pass
		Top Girt	ROHN 1.5 STD	5	-122.44	22660.50	0.5	Pass
		Top Girt	ROHN 1.5 STD	6	-341.08	22660.50	1.5	Pass
T4	133.333 - 126.667	Top Girt	ROHN 2 STD	97	-7508.86	29081.40	25.8 27.4 (b)	Pass
		Top Girt	ROHN 2 STD	98	-7428.78	29081.40	25.5 26.9 (b)	Pass
		Top Girt	ROHN 2 STD	99	-8765.19	29081.40	30.1 31.9 (b)	Pass
T5	126.667 - 120	Top Girt	ROHN 2 STD	112	-9662.62	27207.90	35.5	Pass
		Top Girt	ROHN 2 STD	113	-9751.70	27207.90	35.8	Pass
		Top Girt	ROHN 2 STD	114	-11067.50	27207.90	40.7	Pass
T8	90 - 80	Top Girt	ROHN 2 STD	169	-10719.90	16719.60	64.1	Pass
		Top Girt	ROHN 2 STD	170	-11396.80	16719.60	68.2	Pass
		Top Girt	ROHN 2 STD	171	-12192.60	16719.60	72.9	Pass
T12	30 - 20	Top Girt	ROHN 2.5 EH	253	-14938.80	22438.80	66.6	Pass
		Top Girt	ROHN 2.5 EH	254	-16328.70	22438.80	72.8	Pass
		Top Girt	ROHN 2.5 EH	255	-16553.50	22438.80	73.8	Pass
T13	20 - 0	Redund Horz 1 Bracing	ROHN 1.5 STD	270	-5752.23	13802.80	41.7	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	273	-5772.33	13802.80	41.8	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	277	-5772.33	13802.80	41.8	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	280	-5871.73	13802.80	42.5	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	285	-5871.73	13802.80	42.5	Pass
		Redund Horz 1 Bracing	ROHN 1.5 STD	288	-5752.23	13802.80	41.7	Pass
T13	20 - 0	Redund Diag 1 Bracing	ROHN 2 STD	271	-5255.26	9016.50	58.3	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Redund Diag 1 Bracing	ROHN 2 STD	274	-5273.62	9016.50	58.5	Pass
		Redund Diag 1 Bracing	ROHN 2 STD	278	-5273.62	9016.50	58.5	Pass
		Redund Diag 1 Bracing	ROHN 2 STD	281	-5364.43	9016.50	59.5	Pass
		Redund Diag 1 Bracing	ROHN 2 STD	286	-5364.43	9016.50	59.5	Pass
		Redund Diag 1 Bracing	ROHN 2 STD	289	-5255.26	9016.50	58.3	Pass
T13	20 - 0	Redund Hip 1 Bracing	ROHN 2.5 STD	282	-18.94	48180.50	0.2	Pass
		Redund Hip 1 Bracing	ROHN 2.5 STD	290	-18.97	48180.50	0.2	Pass
		Redund Hip 1 Bracing	ROHN 2.5 STD	291	-18.87	48180.50	0.2	Pass
T1	180 - 160	Inner Bracing	L2x2x1/8	16	-2.02	8234.10	0.4	Pass
		Inner Bracing	L2x2x1/8	17	-2.09	8234.10	0.4	Pass
		Inner Bracing	L2x2x1/8	18	-1.92	8234.10	0.4	Pass
		Inner Bracing	L2x2x1/8	28	-1.51	8287.35	0.4	Pass
		Inner Bracing	L2x2x1/8	29	-1.54	8287.35	0.4	Pass
		Inner Bracing	L2x2x1/8	30	-1.47	8287.35	0.4	Pass
		Inner Bracing	L2x2x1/8	37	-4.03	8341.12	0.4	Pass
		Inner Bracing	L2x2x1/8	38	-5.95	8341.12	0.4	Pass
		Inner Bracing	L2x2x1/8	39	-5.95	8341.12	0.4	Pass
T2	160 - 140	Inner Bracing	L2x2x1/8	52	-4.87	6068.75	0.5	Pass
		Inner Bracing	L2x2x1/8	53	-4.92	6068.75	0.5	Pass
		Inner Bracing	L2x2x1/8	54	-4.85	6068.75	0.5	Pass
		Inner Bracing	L2x2x1/8	64	-5.38	7007.17	0.5	Pass
		Inner Bracing	L2x2x1/8	65	-5.44	7007.17	0.5	Pass
		Inner Bracing	L2x2x1/8	66	-5.35	7007.17	0.5	Pass
		Inner Bracing	L2x2x1/8	76	-7.65	8181.36	0.4	Pass
		Inner Bracing	L2x2x1/8	77	-7.72	8181.36	0.4	Pass
		Inner Bracing	L2x2x1/8	78	-7.62	8181.36	0.4	Pass
T3	140 - 133.333	Inner Bracing	L2x2x1/8	91	-7.11	5306.96	0.5	Pass
		Inner Bracing	L2x2x1/8	92	-7.19	5306.96	0.5	Pass
		Inner Bracing	L2x2x1/8	93	-7.09	5306.96	0.5	Pass
T4	133.333 - 126.667	Inner Bracing	L2x2x1/8	106	-131.42	4680.37	2.8	Pass
		Inner Bracing	L2x2x1/8	107	-153.42	4680.37	3.3	Pass
		Inner Bracing	L2x2x1/8	108	-153.41	4680.37	3.3	Pass
T5	126.667 - 120	Inner Bracing	L2x2x1/8	121	-171.12	4158.54	4.1	Pass
		Inner Bracing	L2x2x1/8	122	-194.17	4158.54	4.7	Pass
		Inner Bracing	L2x2x1/8	123	-194.17	4158.54	4.7	Pass
T6	120 - 100	Inner Bracing	L2 1/2x2 1/2x3/16	136	-12.23	9072.37	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	137	-12.26	9072.37	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	138	-12.23	9072.37	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	148	-13.25	10738.30	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	149	-13.29	10738.30	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	150	-13.24	10738.30	0.4	Pass
T7	100 - 90	Inner Bracing	L2 1/2x2 1/2x3/16	163	-10.93	7766.06	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	164	-10.99	7766.06	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	165	-10.97	7766.06	0.5	Pass
T8	90 - 80	Inner Bracing	L2 1/2x2 1/2x3/16	178	-202.08	6565.57	3.1	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	179	-216.10	6565.57	3.3	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	180	-216.10	6565.57	3.3	Pass
T9	80 - 60	Inner Bracing	L3x3x3/16	193	-13.05	8593.12	0.6	Pass
		Inner Bracing	L3x3x3/16	194	-13.11	8593.12	0.6	Pass
		Inner Bracing	L3x3x3/16	195	-13.07	8593.12	0.6	Pass
		Inner Bracing	L3x3x3/16	205	-12.62	9851.38	0.6	Pass
		Inner Bracing	L3x3x3/16	206	-12.69	9851.38	0.6	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Inner Bracing	L3x3x3/16	207	-12.65	9851.38	0.6	Pass
T10	60 - 40	Inner Bracing	L3 1/2x3 1/2x1/4	220	-15.46	14095.40	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	221	-15.50	14095.40	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	222	-15.47	14095.40	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	232	-14.99	15896.00	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	233	-15.04	15896.00	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	234	-15.01	15896.00	0.4	Pass
T11	40 - 30	Inner Bracing	L3 1/2x3 1/2x1/4	247	-15.69	12584.30	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	248	-15.74	12584.30	0.4	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	249	-15.71	12584.30	0.4	Pass
T12	30 - 20	Inner Bracing	L3 1/2x3 1/2x1/4	262	-294.17	11303.80	2.6	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	263	-298.18	11303.80	2.6	Pass
		Inner Bracing	L3 1/2x3 1/2x1/4	264	-298.17	11303.80	2.6	Pass
T13	20 - 0	Inner Bracing	ROHN 2 STD	292	-14.25	6590.81	0.4	Pass
		Inner Bracing	ROHN 2 STD	293	-14.46	6590.81	0.4	Pass
		Inner Bracing	ROHN 2 STD	294	-14.31	6590.81	0.4	Pass
							Summary	
						Leg (T13)	68.9	Pass
						Diagonal (T12)	86.8	Pass
						Horizontal (T11)	79.8	Pass
						Top Girt (T12)	73.8	Pass
						Redund Horz 1 Bracing (T13)	42.5	Pass
						Redund Diag 1 Bracing (T13)	59.5	Pass
						Redund Hip 1 Bracing (T13)	0.2	Pass
						Inner Bracing (T5)	4.7	Pass
						Bolt Checks	68.9	Pass
						RATING =	**86.8**	**Pass**

ANCHOR BOLT EVALUATION

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift:	$Uplift := 345.245 kips$	*user input*
Shear:	$Shear := 54.627 \cdot kips$	*user input*
Compression:	$Compression := 389.545 kips$	*user input*

Anchor Bolt Data:

Use ASTM A354 Gr. BC Material reference located from original construction drawings (Drawing No. C880790 R3 (dated 12/19/1995 - ROHN Inc.)

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

Anchor Bolt Section Properties:

Gross Area of Bolt:

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

Net Area of Bolt:

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

Net Diameter:

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

Radius of Gyration of Bolt:

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

Plastic Section Modulus of Bolt:

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

Forces:

Tension Force:

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

$T_u = 34.52 \cdot kip$ $\quad T_{ub} := T_u$

Compression Force:

$P_{uc} := \frac{Compression}{N}$

$P_{uc} = 38.95 \cdot kip$ $\quad P_{ucb} := P_{uc}$

Shear Force:

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

$V_u = 5.46 \cdot kip$ $\quad V_{ub} := V_u$

Resistance Factor for Flexure (TIA-222-H 4.9.9):

$\phi_f := 0.9$

Resistance Factor for Anchor Bolt (Compression) (TIA-222-H 4.9.9 Addendum 1):

$\phi_c := 0.90$

Resistance Factor for Tension (TIA-222-H 4.9.9):

$\phi_t := 0.75$

Resistance Factor for Shear (TIA-222-H 4.9.9):

$\phi_v := 0.75$

TIA-222-H 4.9.9 Calculate Equation Variables Strength Design:

Design Tensile Strength, Rnt:

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

$R_{nt} = 75.72 \cdot kip$

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

Design Compression Strength, Rnc:

$R_{nc} := Fy \cdot A_g$

$R_{nc} = 85.61 \cdot ft \cdot kip$

$\phi_c \cdot R_{nc} = 77.05 \cdot ft \cdot kip$

Design Shear Strength (Tension), Rnv:

$R_{nv} := 0.5 \cdot F_u \cdot A_g$

$R_{nv} = 49.09 \cdot ft \cdot kip$

$\phi_v \cdot R_{nv} = 36.82 \cdot ft \cdot kip$

Design Shear Strength (Compression), Rnvc:

$R_{nvc} := 0.6 \cdot Fy \cdot A_g \cdot 0.75$

$R_{nvc} = 38.52 \cdot ft \cdot kip$

$\phi_c \cdot R_{nvc} = 34.67 \cdot ft \cdot kip$

NOTE: Per TIA-222-H The determination of capacity formulas are based on the exising constructed condition of exposed anchor rod from the top of the foundation to the bottom of the (base) leveling nut., Therefore the following equations next page), reflects for this tower site, the first formula shall be applied:

lar = 3" - 1.75" (nut height) = 1.25" < 1.75" Bolt Diameter

TIA-222-H 4.9.9 Combined Shear and Tension:

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

$$\left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 + \left(\frac{V_{ub}}{\phi_v \cdot R_{nv}}\right)^2 = 0.3916$$

TIA-222-H 4.9.9 Combined Shear and Compression:

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 \le 1$$

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 = 0.530$$

NOTE: Larger ratio number shown above Governs design Capacity.

Combined Shear and Tension/Compression Check:

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

ShearAndTensionCheck = "OK"

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

DR. CLARENCE WELTI, P.E., P.C.
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Glastonbury, CT 06033
(860) 633-4623 / FAX (860) 657-2514

STATE OF CONNECTICUT DR. CLARENCE WELTI, P.E., P.C. NO. EL 0037 CORPORATE PRACTICE OF ENGINEERING

October 10, 2002

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

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

Dear Mohsen:

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

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

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

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

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

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

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

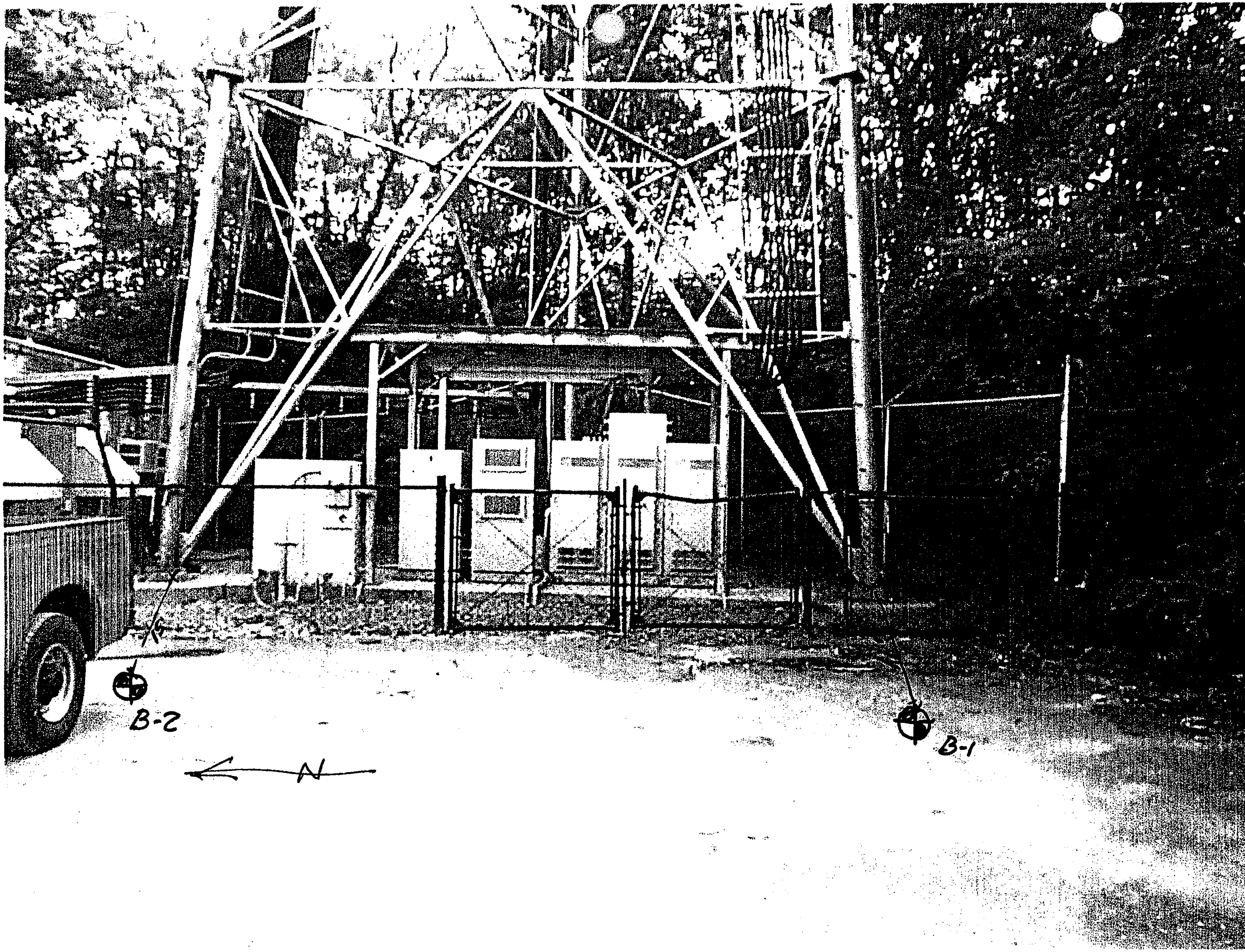
4.0 In summary it is believed that the shafts are in rock. The rock is a Schist with steep foliation and may have been drilled with only moderate effort. If the actual shaft are in earth there would have to have been a deep depression between the rock outcrop (which was cut down about 5 feet at the east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

If you have any questions, please call me.

Very truly yours.

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

A:\urstoweranalysis9/04/02


B-2
B-1
N

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT URS CORPORATION	PROJECT NAME CELL TOWER SITE LOCATION 880 POST ROAD WESTPORT, CT

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

OFFSET
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.

HOLE NO. B-1

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

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

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

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

DRILLER: BROMLEY
INSPECTOR:

SHEET 1 OF 1 HOLE NO. **B-1**

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

CLIENT	URS CORPORATION
PROJECT NAME	CELL TOWER SITE
LOCATION	880 POST ROAD WESTPORT, CT
SURFACE ELEV.	
HOLE NO.	**B-2**

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

OFFSET	
LINE & STA.	
N. COORDINATE	
E. COORDINATE	

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

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

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

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

DRILLER: BROMLEY
INSPECTOR:

SHEET 1 OF 1 HOLE NO. **B-2**

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

CLIENT: URS.
PROJECT: Communication Tower Westport
SUBJECT: Assessment of Capacity
BY: CW DATE: 10/ /02 SHEET NO.

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

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

(1) $f_{max_i} = \sigma_{vi}' K_{oi} \tan \phi_i'$

σ_{vi}: vertical effective stress at middle of layer i ≈ 1.8 ksf ±

K_{oi}: design value of earth pressure coefficient at rest

ϕ_i: design value of angle of friction for the layer i

(2) $\phi_i' = \tan^{-1}\left\{\left[\frac{N_{60}\ (\text{LAYER } i)}{12.3 + 20.3\left(\frac{\sigma_{vi}}{p_a}\right)}\right]^{0.34}\right\}$

p_a = 2 ksf = 14.7 psi

N_{60} (LAYER i) = 60

$= \tan^{-1}\left\{\left[\frac{60}{12.3 + 20.3 \times 0.9}\right]^{.34}\right\} = \tan^{-1}(1.96)^{.34} = 51.5°$

(3) $K_{oi} = (1 - \sin\phi_i')\left[\frac{0.2\, p_a\, N_{60}\ (\text{layer})}{\sigma_{vi}}\right]^{\sin\phi}$

$= (1 - .78)\left[\frac{0.2 \times 2 \times 60}{1.8}\right]^{.78} = 1.65$

f_a = (from (1)) = 3.73 ksf × 0.75 (uplift) = 2.8 ksf

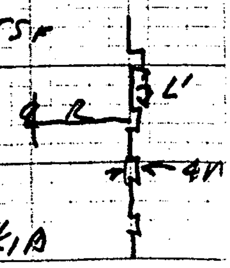
21' × 4.5 × π × 2.8 = 831 KIPS ULTIMATE UPLIFT CAPACITY

FOR SHAFT IN ROCK

q_u = 5200 psi × 333 TSF

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

L = 27'
4R = 0.5' L' = 0.2'



f_{max}: 5.37 TSF = 10.78 ksf

21' × π × 4.5 = 296 SF
Assume 1/3 for f_{all} ≈ 3 ksf. Q = 888 KIPS

AECOM Imagine it. Delivered.

TWM-020 DESIGN REFERENCE COPIED FOR THIS ANALYSIS

JOB TITLE Westport, CT (CSP tower) / Evaluating foundation capacity
PROJECT/JOB NO. NSS-020/60607321 CALCULATION NO. 1
COMPUTED BY MCD DATE 5/30/2019
VERIFIED BY DATE
SCALE N/A SHEET NO. 1 OF 3

- Evaluation of Foundation capacity (Soil) from 2002 Assessment from Dr. Clarence Welti, P.E., P.C.

- From original Welti Calculation - Given values:

$N_{60} = 60$
$\sigma'_v = 1.8$ ksf
$P_a = 2000$ psf (atmospheric Pressure)
$D_{pier} = 4.5$ feet
Ht Pier = 21.0 feet

FHWA-IF-99-025 (Reference for Design for cohesionless IGM - Compression)

[EQ (B.61)] $\phi' = \tan^{-1}\left[\left[\frac{N_{60}}{12.2+20.3\times\left(\frac{\sigma'_v}{P_a}\right)}\right]^{0.34}\right] = \tan^{-1}\left[\left[\frac{60}{12.2+20.3\left(\frac{1.8}{2}\right)}\right]^{0.34}\right] = 51.5° = \phi'$

[EQ (B.60)] "OCR" $= \frac{\sigma'_p}{\sigma'_v} = \frac{(0.2)(N_{60})(P_a)}{\sigma'_v} = \frac{(0.2)(60)(2\,ksf)}{(1.8\,ksf)} = 13.\bar{3} = OCR$

[EQ B.51] $k_0 = (1-\sin\phi')(OCR)^{\sin\phi'} = (1-\sin 51.5°)(13.\bar{3})^{\sin 51.5°} = 1.65 = k_0$

[EQ (B.62)] $f_{max} = (\sigma'_v)(k_0)(\tan\phi') = (1.8\,ksf)(1.65)(\tan 51.5°) = 3.7338\,ksf = f_{max}$

- $3.734\,ksf \times 21\,ft \times 4.5\,ft \times \pi = R_n = 1108.5$ kip $\times$ ($\phi = 0.60$ LRFD ~~FHWA~~) = 665 kips (comp.) ↓ (LRFD)

- Page 50 Table $L/B = \Psi$ factor
L = 21 feet $\frac{L}{B} = 4.\bar{6}$ say 5 → $\Psi = 0.74$
B = 4.5 ft

[EQ B.46] • Uplift = (Ψ)(compression) = 0.75×665 kip = 492 kips (uplift capacity) (LRFD) ↑

4x4 = 1 in

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

[13.3.5.1] – Cohesionless Soil - Side Resistance:

$\beta = k \cdot \tan\delta$

[E.Q.] (13-5) $R_n = \pi \cdot B \cdot \Delta z (\sigma'_v \cdot k \cdot \tan\delta) = \pi \cdot B \cdot \Delta z (\sigma'_v \cdot \beta)$

– Determine values for above variables:

- Given by Welti Calculation:
  - $N_{60} = 60$
  - $P_a = 2.116$ ksf
  - $\sigma'_v = 1.8$ ksf
  - $z = 27$ ft
  - $B = 4.5$ ft

[E.Q.] (13-12) § – Gravely Soils

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

- $\sigma'_p = 0.15 \times N_{60} \times P_a = (0.15)(60)(2.116\text{ ksf}) = 19.0440\text{ ksf} = \sigma'_p$

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

[E.Q.] (13-8) $\phi' = 27.5 + 9.2\log[(N_1)_{60}] = 27.5 + 9.2\log(60) = 43.85 = \phi'$

Implement ϕ' into [E.Q.] (13-13) → $\beta \approx (1-\sin 43.85)\left(\frac{19.044}{1.8}\right)^{\sin 43.85°} \times \tan 43.85° = 1.513$

- $K_p \tan\phi' = \tan^2\left(45+\frac{\phi}{2}\right) \times \tan\phi = \tan^2\left(45+\frac{43.85}{2}\right) \times \tan 43.85° = 5.29$

$1.513 \leq 5.29 \therefore \beta_{applied} \rightarrow \beta = 1.513$

[EQ] (13-7) $f_{sn} = \sigma'_{v} \cdot \beta = 1.8\ ksf \times 1.513 = 2.7234\ ksf$

[EQ] (13-5) $R_{sn} = (\pi)(B)(\Delta z)(f_{sn}) = \pi \times 4.5\ ft \times 27\ ft \times 2.7234\ ksf$
$= 1039.5$ kips (Side/uplift Resistance (nominal))

Reduction factors to consider:

- TIA-222-G Section 9 Reduction factor 0.75 for uplift in Rock/Soil
- FHWA Page 13-13 "Casing reduction factors of 0.6–0.75 are commonly used" (for "permanent casing").

∴ Check LRFD uplift capacity w/ $\phi = 0.60$:

1039.5 kip × 0.60 = 623.7 kip uplift (Ultimate capacity-LRFD)

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

* Uplift (LRFD) = 492 kips (See page 1)

Compression/Bearing on Rock (LRFD) = 665 kips

- Dr Welti's 2002 Assessment calculations is Included with this Analysis Report.

4x4 = 1 in

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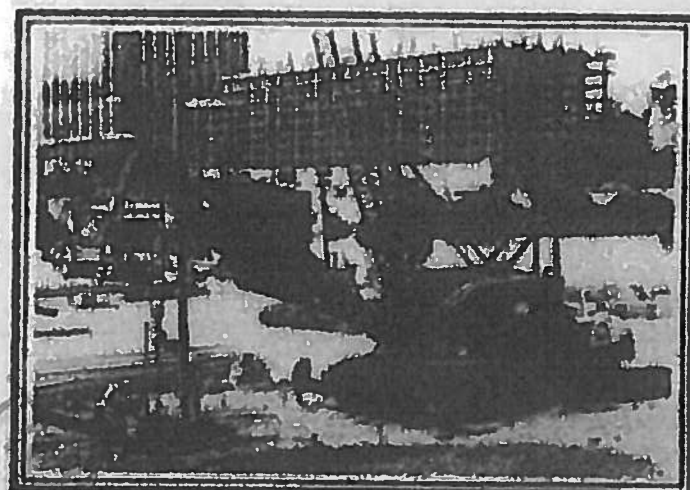
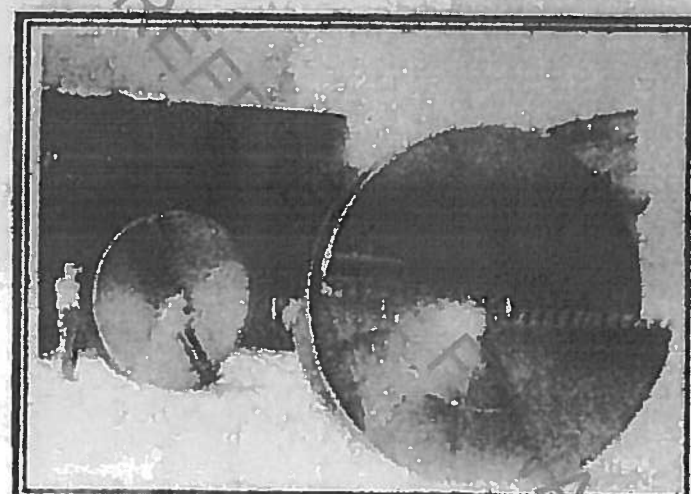
US Department
of Transportation
Federal Highway
Administration

DRILLED SHAFTS:

CONSTRUCTION PROCEDURES AND DESIGN METHODS





Office Of Infrastructure

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Little specific experimental information is available on side resistance in uplift for drilled shafts in gravel. Until such information becomes available, f_{max} can be estimated in a gravel layer in the same manner as it is estimated in a sand layer.

While the above method is theoretically correct and is accurate for simulated deep foundations in a geotechnical centrifuge, it has not been tested against full-scale drilled shaft foundations. Therefore, site-specific loading tests should be conducted where they are warranted economically.

Cohesionless Intermediate Geomaterials - Compression

A cohesionless intermediate geomaterial is a sand-like or gravel-like material (transported or residual) that exhibits $N > 50$ blows/0.3 m. f_{max} can be estimated in such soils using Equation (B.50). O'Neill et al. (1996) recommend the following procedure using the SPT N value, based on the original work of Mayne and Harris (1993). This method has been used and verified by load testing of full-scale drilled shafts in residual micaceous sands in the Piedmont province of the United States and has been verified for granular glacial till in the northeastern United States (O'Neill et al., 1996).

Within any one layer, the preconsolidation pressure of the IGM, σ'_p, is estimated from the correlation given in Equation (B.59). Then, after estimating the vertical effective stress at the middle of the layer, σ'_v (Figure 2.4), the overconsolidation ratio, OCR, is then estimated from Equation (B.60).

$$\sigma'_p = 0.2\, N_{60}\, p_a \qquad \text{(B.59)}$$

$$OCR = \sigma'_p / \sigma'_v \qquad \text{(B.60)}$$

N_{60} is the uncorrected SPT blow count in blows/0.3 m for the condition in which 60 per cent of the potential energy of the SPT hammer is transferred into the drive string, and p_a is atmospheric pressure in the units being used in the calculations. ϕ' is then computed from:

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

Then,

$$K_o = (1-\sin\phi')OCR^{\sin\phi'} \quad \text{and} \tag{B.51}$$

$$f_{max} = \sigma'_v K_o \tan\phi' \tag{B.62}$$

The method assumes that $K = K_o$ and that $\delta = \phi'$ in granular IGM's. Obviously, if the contractor were to leave the borehole open for an extended period of time or otherwise deviate from good practice, f_{max} would be overestimated with this procedure.

It is recommended by O'Neill et al. (1996) that N_{60} not be taken to be > 100 with this method, regardless of the actual value of N_{60} measured. Otherwise, the method will overpredict f_{max}. While the method is sound, the various coefficients and exponents are based empirically on residual soils in the Piedmont province. Local correlations are therefore recommended.

Cohesionless Intermediate Geomaterials - Uplift Loading

It can reasonably be assumed that Equations (B.46), (B.57) and (B.58) apply both to granular soils and cohesionless IGM's.

Intermediate Geomaterials -- Considerations for Desert Regions

Some "cohesionless" IGM's exhibit cementation due to the presence of carbonates and other weak cementing agents. Such geomaterials are often found in desert regions. While more research is needed in this subject area, various empirical means have been suggested to estimate unit side resistance values. For example, Ismael et al. (1994) found from uplift loading tests on 0.3-m-diameter drilled shafts in dry cemented sand with N from 60 to 90 that β was 1.47 in the depth range of 3 to 5 m (10 to 16 ft). From uplift tests on 0.5-m-diameter drilled shafts in calcareous sands below the water table in the depth range of 5 to 15 m (16 to 49 ft), Ismael and Al-Sanad (1986) proposed f_{max} (kPa) = 0.96 N (blows/0.3 m), or f_{max} (tsf) = 0.01 N (blows/ft). These relations correspond to $\beta \approx 1$ in that depth range, suggesting relatively high values of f_{max}. The authors caution, however, that they were careful to prevent the intrusion of groundwater into the boreholes by casing off sources of water at shallow depths.

On the other hand, Walsh et al. (1995) reported uplift tests on three small-scale drilled shafts (102 mm $\leq B \leq$ 254 mm; 0.915 m $\leq L \leq$ 1.53 m) in cemented, fine-grained geomaterials above the water table having carbonate contents ranging from 4 per cent to 50 per cent. These geomaterials exhibited s_u between 250 and 670 kPa (2.6 and 7.0 tsf) based on UU triaxial compression tests with cell pressures equal to the total overburden pressures at the depths from which the samples were recovered. From these tests, and treating the geomaterial as if it were a cohesive soil [Equation (B.32)], it was found that $\alpha = 0.45$ (average over the entire length of the small test shaft). This value is higher than would be expected if the geomaterial is classified as a

Let w (corresponding to failure) = 25 mm = 0.025 m.

H_f = [(50) (1.937) (0.025)]/[π (5) (0.442)(0.688)] = 0.507

(Note that pressure units are all in expressed in MPa, and all length units are expressed in m, so the units are consistent, leading to a value for H_f that is nondimensional.)

K_f = 0.04 + [(0.507 - 0.04) (1 - 0.04)] / [0.507 - 2 (0.04) +1] = 0.354.

<u>d. Compute f_{max}</u> from Equation (B.40):

f_{max} = 0.354 (0.688) = 0.243 MPa = 2.53 tons/ft².

Note that this value is about twice the value for the smooth interface. A cost analysis should be performed, perhaps by discussing the issue with drilled shaft contractors, relating to the increased costs incurred in cutting off infiltration of the perched water and roughening and cleaning the sides of the borehole before concreting plus careful inspection versus the benefit achieved in increasing the side resistance (reduced size of the drilled shaft).

Cohesive Intermediate Geomaterials - Uplift Loading

Cohesive IGM's that are loaded in uplift will develop values of f_{max} that are essentially identical to those developed in compression, provided the shaft borehole is classified as "rough." When the borehole is "smooth" the Poisson's effect influences shaft resistance. The shaft expands laterally when it is loaded in compression, increasing the lateral effective stresses against the interface and consequently the shearing resistance of the IGM at the interface, since the interface is drained and frictional. However, when the drilled shaft is loaded in uplift, the shaft contracts laterally, reducing the lateral effective stresses against the interface and the shearing resistance of the IGM at the interface. This effect is illustrated in exaggerated form in Figure B.14. For this reason values of f_{max} for uplift loading should be reduced slightly below the values shown above for compression loading if the shaft is long and flexible. It is recommended that

$$f_{max}\,(uplift) = \Psi f_{max}\,(compression) \qquad (B.46)$$

in which Ψ is taken to be 1.0 if $(E_c/E_m)(B/D)^2 \geq 4$, or 0.7 if $(E_c/E_m)(B/D)^2 < 4$, unless loading tests in uplift are performed. E_c and E_m are the composite Young's modulus of the shaft's cross section and IGM mass, respectively, B is the socket diameter and D is the socket length. This recommendation is based upon a study by Carter and Kulhawy (1988) for sockets in rock.

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May 2010

NHI Course No. 132014

Drilled Shafts: Construction Procedures and LRFD Design Methods

Developed following:

AASHTO LRFD Bridge Design Specifications, 4th Edition, 2007, with 2008 and 2009 Interims.

NATIONAL HIGHWAY INSTITUTE

TABLE 3-3 RELATIONSHIP BETWEEN RELATIVE DENSITY, SPT N-VALUE,AND DRAINED FRICTION ANGLE OF COHESIONLESS SOILS (SABATINI ET AL., 2002, AFTER MEYERHOF, 1956)

State of Packing	Relative Density (%)	Standard Penetration Resistance, N (blows per ft)	Friction Angle, ϕ' (degrees)
Very Loose	< 20	< 4	< 30
Loose	20 – 40	4 – 10	30 – 35
Compact	40 – 60	10 – 30	35 – 40
Dense	60 – 80	30 – 50	40 – 45
Very Dense	> 80	> 50	> 45

Note: N = 15 + (N' – 15) / 2 for N' > 15 in saturated or very fine silty sand, where N' = measured blow count and N = blow count corrected for dynamic pore pressure effects during the SPT

$$\phi' = \tan^{-1}\left[\frac{N_{60}}{12.2+20.3\left(\frac{\sigma'_{vo}}{p_a}\right)}\right]^{0.34} \qquad 3\text{-}7$$

In which: ϕ' = effective stress friction angle, σ'_{vo} = vertical effective stress at the depth of N-value measurement, and p_a = atmospheric pressure in the same units as σ'_{vo} (*e.g.*, 2,116 psf). Equation 3-6 is a derived correlation between ϕ' and normalized SPT resistance, $(N_1)_{60}$, where high quality undisturbed frozen samples of natural sands were obtained that permitted direct measurements of ϕ' in triaxial cells (Hatanaka and Uchida, 1996). Equation 3-7 is a well-known correlation between N_{60} and ϕ′ developed by Schmertmann (1975). Results from Equation 3-7 tend to be somewhat conservative, especially for shallow depths (*i.e.*, less than 6 ft).

Kulhawy and Chen (2007) evaluated data compiled from the literature on the strength properties of very coarse-grained soils, including both sands and gravels. The database was used to develop the following correlation, based on regression analysis, between ϕ' and N-value. This equation provides a first-order estimate of ϕ' for a wide range of cohesionless soils and over a wide range of N-values, including values up to 100. Equation 3-8 is the recommended correlation for estimating ϕ' for the purpose of evaluating unit side resistance of drilled shafts in cohesionless soils by the methods described in Chapter 13.

$$\phi' = 27.5 + 9.2\log\left[(N_1)_{60}\right] \qquad \left(r^2 = 0.356, n = 57\right) \qquad 3\text{-}8$$

Where r^2 = coefficient of determination and n = number of data pairs used in the regression analysis. AASHTO (2007) states that other in-situ tests, including CPT, may be used to determine ϕ' and refers to GEC No. 5 (Sabatini et al., 2002) for details. The correlation given in GEC No. 5, based on CPT cone resistance, q_c, is given by:

$$\phi' = \tan^{-1}\left[0.1 + 0.38\log\left(\frac{q_c}{\sigma'_{vo}}\right)\right] \qquad 3\text{-}9$$

In which σ'_{vo} = vertical effective stress at the depth of the q_c measurement.

13.3.5.1 Cohesionless Soils

Side Resistance

The nominal side resistance of a drilled shaft in cohesionless soil can be expressed as the frictional resistance that develops over a cylindrical shear surface defined by the soil-shaft interface. As illustrated in Figure 13-4, the unit side resistance is directly proportional to the normal stress acting on the interface. By Equation 13-3, nominal side resistance is then given by:

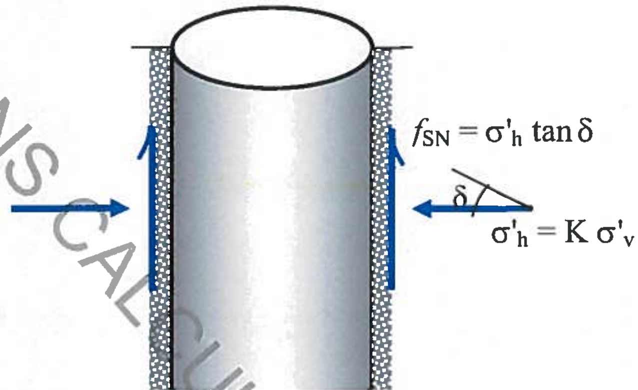


Figure 13-4 Frictional Model of Unit Side Resistance, Drilled Shaft in Cohesionless Soil

$$R_{SN} = \pi B \Delta z\, f_{SN} = \pi B \Delta z \left(\sigma'_v\, K \tan\delta\right) \qquad 13\text{-}5$$

where:

R_{SN} = nominal side resistance
B = shaft diameter
Δz = thickness of the soil layer over which resistance is calculated
σ'_v = average vertical effective stress over the depth interval Δz
K = coefficient of horizontal soil stress ($K = \sigma'_h / \sigma'_v$)
σ'_h = horizontal effective stress
δ = effective stress angle of friction for the soil-shaft interface

For convenience, the following terms may be combined:

$$\beta = K \tan\delta \qquad 13\text{-}6$$

and

$$f_{SN} = \sigma'_v\, \beta \qquad 13\text{-}7$$

in which β = side resistance coefficient (hence the term "beta method") and f_{SN} = nominal unit side resistance. Several design models have been proposed for evaluating the β term in Equation 13-7. The approach currently recommended in AASHTO (2007) is the "O'Neill and Reese (1999)" method, in reference to equations presented in the previous version of this manual. In this approach, β is calculated solely as a function of depth below the ground surface, without explicit consideration of soil strength or the in-situ state of stress. This approach is based on fitting a design curve to values of β back-calculated from field load tests. A more rational approach, as presented for example by Chen and Kulhawy (2002), is to evaluate separately values of K and δ which are then combined to determine β. Results of research published over the past 15 years demonstrate that this approach can provide reliable estimates of side resistance and represents a rational method to incorporate soil strength and state of stress into design equations. It is recommended that designers employ this model, which is presented below. Additional commentary, including a comparison between the Reese and O'Neill method and the procedure presented herein, is given in Appendix C. It is noted further that this approach is applicable to all cohesionless soils, including those identified previously as cohesionless intermediate geomaterials.

The operative value of K, coefficient of horizontal soil stress, is a function of the in-situ (at-rest) value, K_o, and changes in horizontal stress that occur in response to drilled shaft construction, given by the ratio K/K_o. A rational first-order approximation is that $K/K_o = 1$, assuming there is no stress change induced by construction. For simple virgin loading-unloading of "normal soils" that are not cemented, the K_o value increases with overconsolidation ratio (OCR) and can be approximated according to (Mayne and Kulhawy, 1982):

$$K_o = (1 - \sin\phi')\, OCR^{\sin\phi'} \leq K_p \qquad \text{13-8}$$

$$OCR = \frac{\sigma'_p}{\sigma'_v} \qquad \text{13-9}$$

where σ'_p = effective vertical preconsolidation stress. Note that the value of K_o as given by Equation 13-8 is limited to an upper-bound value corresponding to the coefficient of passive earth pressure, which, for a cohesionless soil, is given by:

$$K_p = \tan^2\left(45^\circ + \frac{\phi'}{2}\right) \qquad \text{13-10}$$

A variety of methods have been proposed for evaluation of either K_o or σ'_p by correlations with in-situ test results. For a practical estimate based on the most commonly used in-situ test (SPT) the following correlation is suggested by Mayne (2007):

$$\frac{\sigma'_p}{p_a} \approx 0.47\left(N_{60}\right)^m \qquad \text{13-11}$$

where m = 0.6 for clean quartzitic sands and m = 0.8 for silty sands to sandy silts (*e.g.*, Piedmont residual soils), and p_a = atmospheric pressure in the same units as σ'_p (for example, 2,116 psf). Kulhawy and Chen (2007) suggest the following correlation provides a good fit for gravelly soils:

$$\frac{\sigma'_p}{p_a} = 0.15\, N_{60} \qquad \text{13-12}$$

Substituting Equations 13-9 through 13-12 into Equation 13-6 leads to the following approximation of β for cohesionless soils:

$$\beta \approx (1-\sin\phi')\left(\frac{\sigma'_p}{\sigma'_v}\right)^{\sin\phi'}\tan\phi' \qquad \le K_p \tan\phi' \qquad \text{13-13}$$

where σ'_p is estimated by Equation 13-11 for sandy soils and Equation 13-12 for gravelly soils. The value of β at shallow depths should be limited to the value corresponding to a depth of 7.5 ft, which corresponds to a vertical effective stress of approximately 900 psf. At lower confining stress, the correlations for effective stress friction angle and preconsolidation stress have not been validated and it would be prudent to limit β to the values corresponding to this depth. The value of β evaluated by Equation 13-13 is substituted into Equation 13-7 for determination of unit side resistance and this value is substituted into Equation 13-5 for determination of nominal side resistance R_{SN} for each layer of cohesionless soil. This model accounts for site-specific variations in horizontal stress and soil strength in a rational manner. The approach is also adaptable to other in-situ methods that allow measurement of horizontal soil stress and its variation with depth, such as pressuremeter test (PMT) and flat plate dilatometer test (DMT). The principal limitation of this approach relates to its reliance on N-values and the correlations employed between N-values, friction angle, and preconsolidation stress. Furthermore, resistance factors have not been established for this method through a probability-based calibration study with AASHTO LRFD load factors. Calibration to allowable stress design (ASD) using a factor of safety of FS = 2.5 yields a resistance factor for side resistance in cohesionless soils of $\varphi_S = 0.55$ as discussed in Chapter 10. Until the proper reliability-based calibration study is conducted, this value is recommended. Agencies are also encouraged to establish resistance factors based on local calibrations.

In the approach described above, it is assumed that no change in horizontal stress, and therefore no change in K, occurs as a result of construction. Experience demonstrates this assumption is valid for dry, slurry (wet-hole), and casing methods of construction with minimal sidewall disturbance, proper handling of slurry and casing, and prompt placement of concrete (Chen and Kulhawy, 2002). However, when these aspects of construction quality are not controlled properly, the coefficient K can be reduced to 2/3 of its initial in-situ value (K_o), or lower in extreme cases of soil caving. Judgment and accurate knowledge of field realities are therefore needed to assess the applicability of the design equations to individual projects. The recommended approach is to take the necessary measures that will assure quality of construction, thereby justifying the use of the design equations presented above.

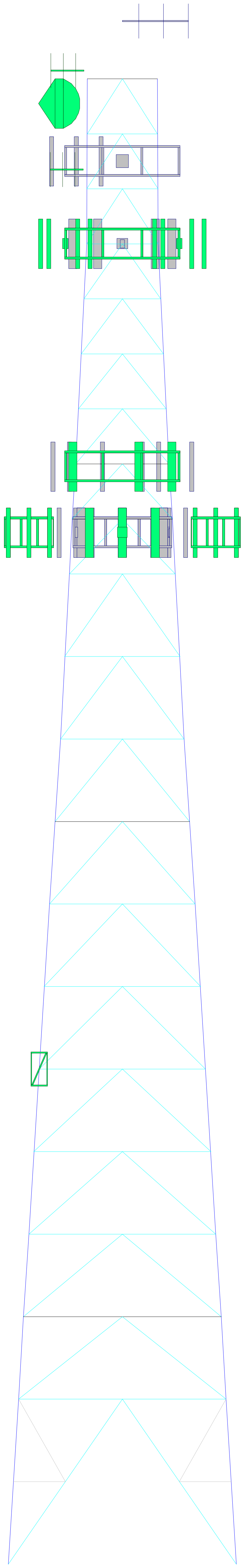
When permanent casing is used and extends through layers of cohesionless soil, the basic concepts presented above are valid, with proper consideration of differences in the interface shear strength. AASHTO (2007) states that no specific data are available, but that casing reduction factors of 0.60 to 0.75 are commonly used. A common practice is to specify permanent casing in subsurface zones where scour is expected, in which case side resistance may be neglected over this depth.

For each strength or service limit state considered, side resistance in cohesionless soils must account for scour resulting from the design flood. The most significant effect is that all material above the total scour line is assumed to be removed and unavailable for axial support. Changes in subsurface stress also occur in response to removal of soil, and these changes will affect side resistance calculated by the β-method. This issue is considered in Section 13.5.

Illustrative Example 13-1 on the following page demonstrates evaluation of unit side resistance by the β-method as presented above.

ANALYSIS UNDER TIA-222-F DESIGN CRITERIA (DESPP / CSP)

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	
Legs	ROHN 3 STD	ROHN 4 STD	ROHN 5 EH			ROHN 6 EHS	ROHN 6 EH		A	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe			B	
Leg Grade	A572-50													
Diagonals	ROHN 2 STD		ROHN 2 EH		C	ROHN 2.5 XXS (Pipe 2.5-XXS)	ROHN 3 STD			ROHN 3 EH				
Diagonal Grade	A572-50													
Top Girts	ROHN 1.5 STD	N.A.		ROHN 2 STD		N.A.		ROHN 2 STD	N.A.			ROHN 2.5 EH	N.A.	
Horizontals	ROHN 1.5 STD		ROHN 2 STD	N.A.		ROHN 2 STD		N.A.	ROHN 2.5 STD			N.A.	P3.5x.226	
Red. Horizontals	N.A.												ROHN 1.5 STD	
Red. Diagonals	N.A.												ROHN 2 STD	
Red. Hips	N.A.												ROHN 2.5 STD	
Inner Bracing	L2x2x1/8					L2 1/2x2 1/2x3/16			L3x3x3/16	L3 1/2x3 1/2x1/4			ROHN 2 STD	
Face Width (ft)	8.542	8.625	10.709	11.4033	12.0977	12.792	15.042	16.3595	17.677	20.177	22.677	23.927	25.177	27.677
# Panels @ (ft)	9 @ 6.66667					10 @ 10							1 @ 20	
Weight (lb)	1250.4	1495.6	825.9	842.2	1080.4	3821.3	1682.8	1722.7	4897.5	5700.5	2942.5	3139.0	6187.6	35588.5



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
ANT940Y10-WR (CSP)	187	RRUS-32 B66 (ATT)	133
ANT940Y10-WR (CSP - Yagi Antenna)	181	RRUS-32 (ATT)	133
PA6-65AC (DNK-52 / CSP-42)	177	DBC0061F1V51-2 Combiner Units (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-80)	170	800-10798 Kathrein Panel (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-81)	170	RRUS-32 B66 (ATT)	133
RFI BPS7496-180-14 Panel Antenna (CSP-82)	170	RRUS-32 (ATT)	133
SitePro1 USF12-396-U Mount Assembly w/ (3) 96" Mount Pipes (CSP 47, 80, 81, 82)	170	DBC0061F1V51-2 Combiner Units (ATT)	133
432E-83I-01T TTA Unit (Re-Located TMA (CSP))	170	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
3' Yagi (CSP)	169	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
DB-T1-6Z-8AB-0Z Distribution Box (Verizon)	160	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	Pirod 15' T-Frame Sector Mount (1) (ATT)	133
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	P65-16-XLH-RR (ATT)	133
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	RRUS-11 (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	HPA-65R-BUU-H6 Panel (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	RRUS-32 (ATT)	133
BXA-70063-4CF Panel Antenna (Verizon)	160	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	DC6-48-60-18-8F (Squid) Suppressor (ATT)	133
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	P65-16-XLH-RR (ATT)	133
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	RRUS-11 (ATT)	133
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	HPA-65R-BUU-H6 Panel (ATT)	133
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	RRUS-32 (ATT)	133
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	P65-16-XLH-RR (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	RRUS-11 (ATT)	133
JAHH-65B-R3B Panel Antenna (Verizon)	160	HPA-65R-BUU-H6 Panel (ATT)	133
BXA-70063-4CF Panel Antenna (Verizon)	160	RRUS-32 (ATT)	133
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	125
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
RFV01U-D2A RRH Unit (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	160	Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
JAHH-65B-R3B Panel Antenna (Verizon)	160	Ericsson AIR21 B2A|B4P Panel (T-Mobile)	125
JAHH-65B-R3B Panel Antenna (Verizon)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
BXA-70080-4CF-EDIN Panel (Verizon)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	160	LTF12=372 Sector Mount (1) (T-Mobile)	125
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
4x40 B2_B66 Dual Band RRH Unit (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
Pirod 15' T-Frame Sector Mount (1) (Verizon)	160	Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	125
800-10798 Kathrein Panel (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
RRUS-32 B66 (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
RRUS-32 (ATT)	133	Generic Twin TMA unit (T-Mobile)	125
DBC0061F1V51-2 Combiner Units (ATT)	133	ANT150D (CSP - 1-Bay Dipole)	113
800-10798 Kathrein Panel (ATT)	133	4' Standoff (DNK-1 / GPS)	60
		GPS (DNK-1 / GPS)	60

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	120deg_9.6250x0.375 BU on ROHN 8 EHS	C	ROHN 2XXS (Pipe 2XXS)
B	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 90 mph wind.
4. NOTE: Application of Azimuth of Dish is implemented via direct information from the DESPP / CSP. (06/15/2020)

MAX. CORNER REACTIONS AT BASE:
DOWN: 323138 lb
SHEAR: 41996 lb

UPLIFT: -266489 lb
SHEAR: 37122 lb

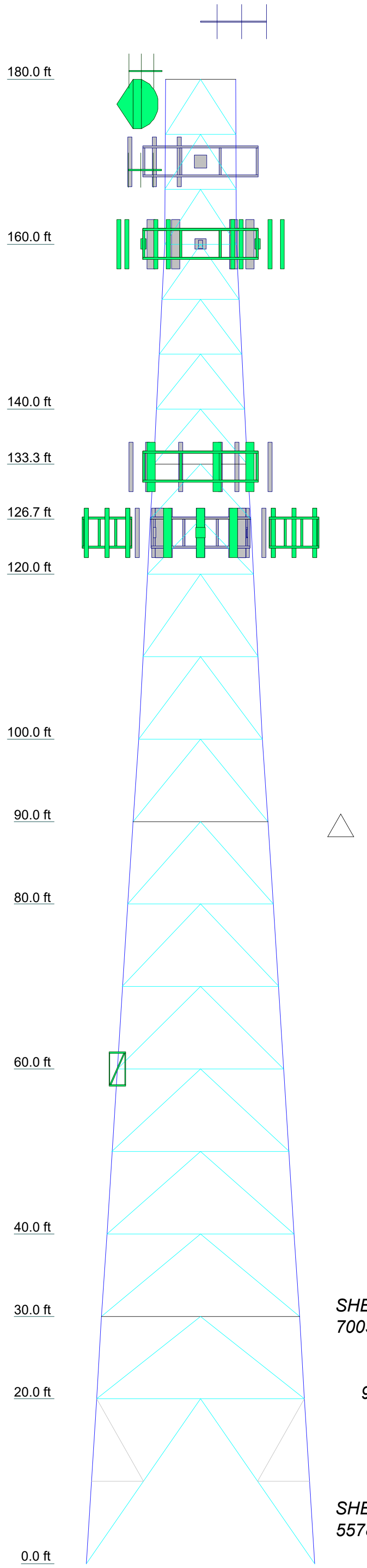
AXIAL 74327 lb
SHEAR 70035 lb
MOMENT 7151 kip-ft
TORQUE 117 kip-ft
90 mph WIND - 0.5000 in ICE

AXIAL 51548 lb
SHEAR 55786 lb
MOMENT 5670 kip-ft
TORQUE 67 kip-ft
REACTIONS - 90 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: **180' CSP Lattice Tower - Evaluation**			
Project: **Westport, Connecticut / DESPP/CSP Design Loading**			
Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/10/20	Scale: NTS	
Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-F\MOD_20200706_WestportCT_F...eri		Dwg No. E-1	

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Red. Horizontals	Red. Diagonals	Red. Hips	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (lb)
T1	ROHN 3 STD	A572-50	ROHN 2 STD	A572-50	ROHN 1.5 STD	ROHN 1.5 STD	N.A.	N.A.	N.A.	L2x2x1/8	8.542	9 @ 6.66667	1250.4
T2	ROHN 4 STD				N.A.						8.625		1495.6
T3	ROHN 5 EH		ROHN 2 EH		ROHN 2 STD	E					10.709		825.9
T4						N.A.					11.4033		842.2
T5			C								12.0977		1080.4
T6	ROHN 6 EHS		D		N.A.	ROHN 2 STD				L2 1/2x2 1/2x3/16	12.792		3821.3
T7	ROHN 6 EH		ROHN 3 STD								15.042		1682.8
T8					E	N.A.					16.3595		1722.7
T9	A				N.A.	ROHN 2.5 STD				L3x3x3/16	17.677	10 @ 10	4897.5
T10	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe		ROHN 3 EH							L3 1/2x3 1/2x1/4	20.177		5700.5
T11											22.677		2942.5
T12					F	N.A.					23.927		3139.0
T13	B				N.A.	P3.5x.226	ROHN 1.5 STD	ROHN 2 STD	ROHN 2.5 STD	ROHN 2 STD	25.177	1 @ 20	6187.6
											27.677		35588.5



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	120deg_9.6250x0.375 BU on ROHN 8 EHS	D	ROHN 2.5 XXS (Pipe 2.5-XXS)
B	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	E	ROHN 2 STD
C	ROHN 2XXS (Pipe 2XXS)	F	ROHN 2.5 EH

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 90 mph wind.
4. NOTE: Application of Azimuth of Dish is implemented via direct information from the DESPP / CSP. (06/15/2020)

MAX. CORNER REACTIONS AT BASE:

DOWN: 323138 lb
SHEAR: 41996 lb

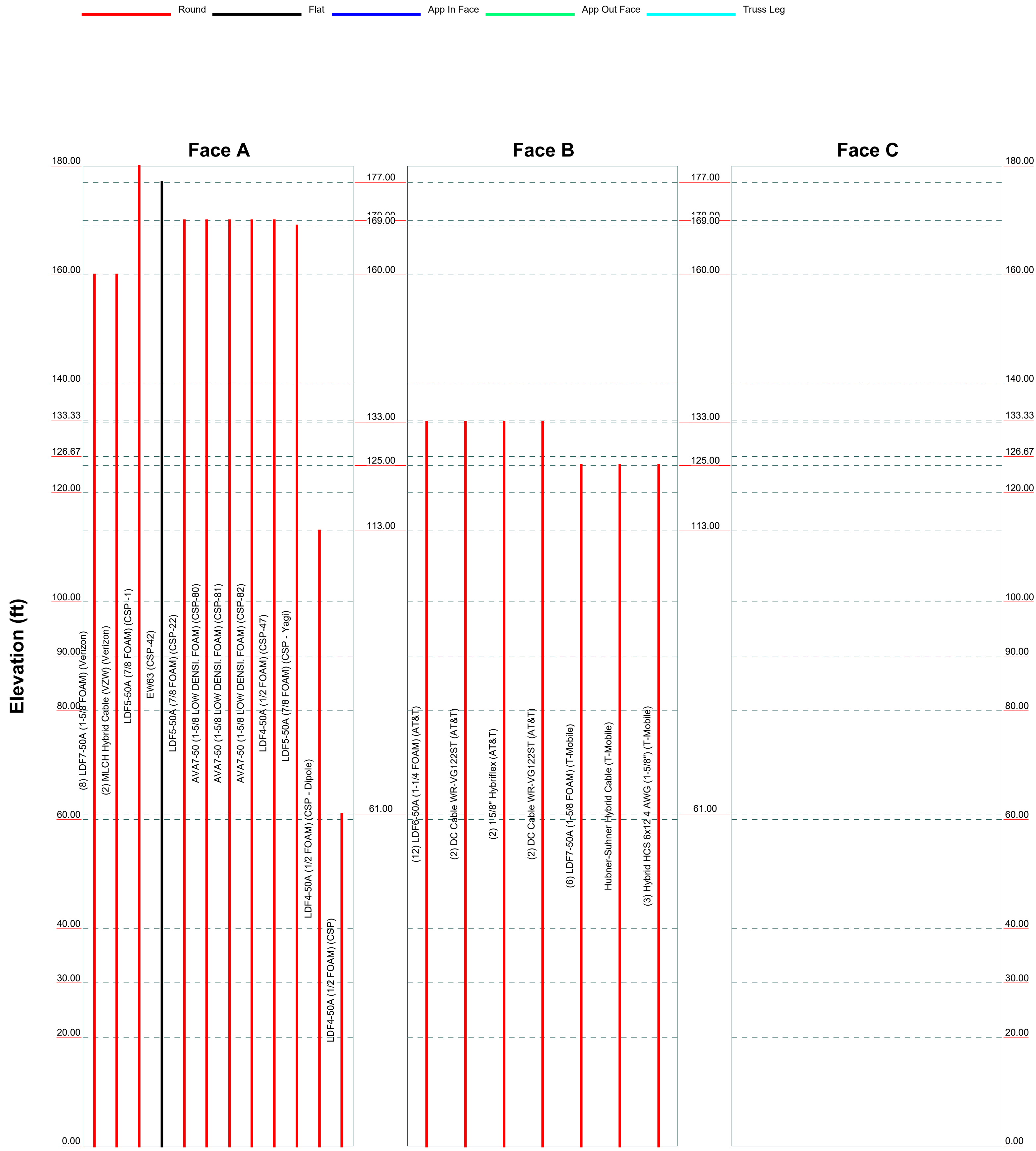
UPLIFT: -266489 lb
SHEAR: 37122 lb

AXIAL 74327 lb
SHEAR 70035 lb
MOMENT 7151 kip-ft
TORQUE 117 kip-ft
90 mph WIND - 0.5000 in ICE

AXIAL 51548 lb
SHEAR 55786 lb
MOMENT 5670 kip-ft
TORQUE 67 kip-ft
REACTIONS - 90 mph WIND

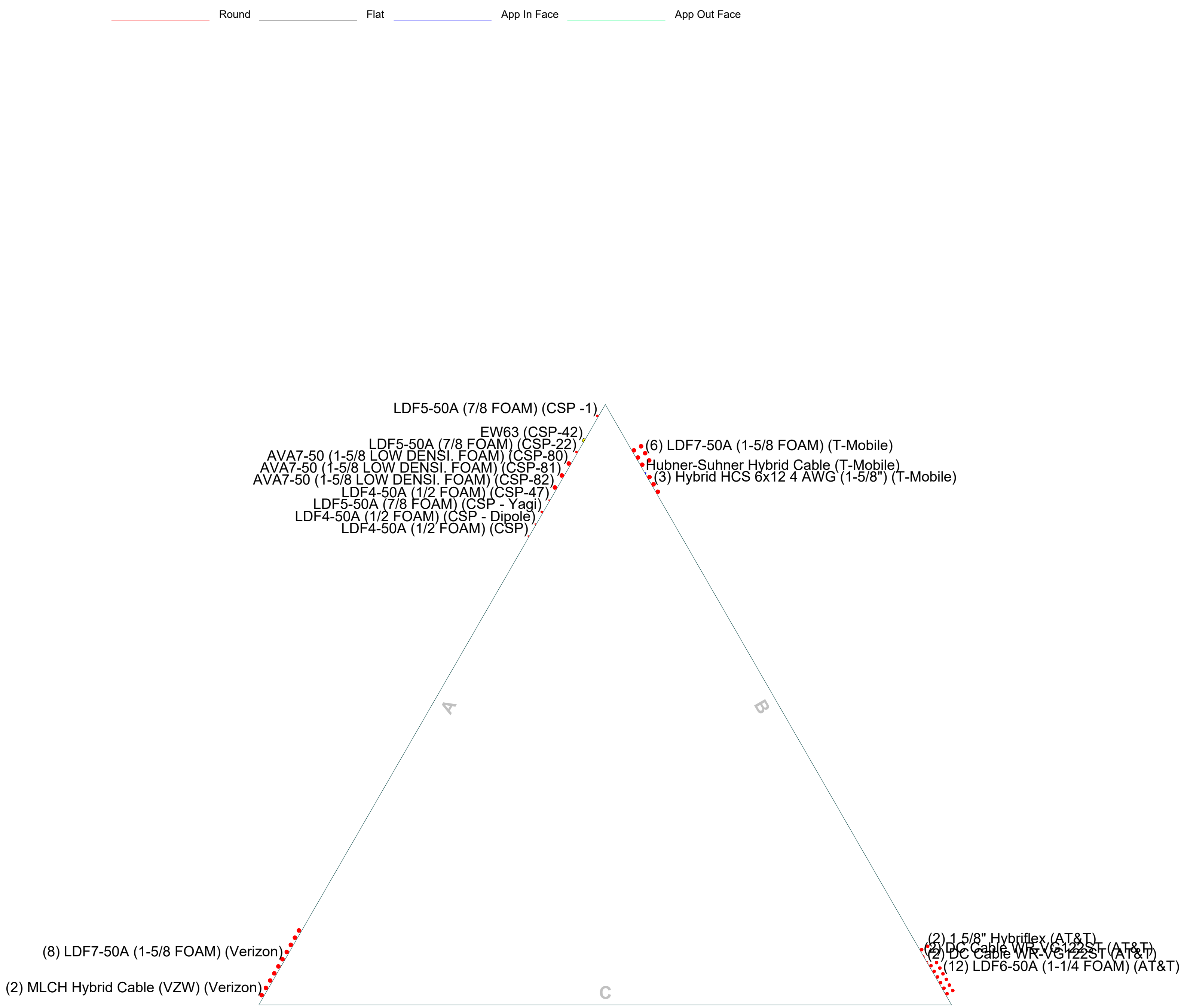
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***180' CSP Lattice Tower - Evaluation*** Project: ***Westport, Connecticut / DESPP/CSP Design Loading*** Client: Verizon Wireless / VZ5-224 / Modification — Drawn by: MCD — App'd: Code: TIA/EIA-222-F — Date: 07/10/20 — Scale: NTS Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-F\MOD_20200708_WestportCT_F_.eri — Dwg No. E-1

Feed Line Distribution Chart
0' - 180'



AECOM	Job: ***180' CSP Lattice Tower - Evaluation***			
500 Enterprise Drive, Suite 3B	Project: ***Westport, Connecticut / DESPP/CSP Design Loading***			
Rocky Hill, CT	Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD	App'd:	
Phone: 860-263-5800	Code: TIA/EIA-222-F	Date: 07/10/20	Scale: NTS	
FAX: 860-812-2094	Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-F\MOD_20200708_WestportCT_F_.eri		Dwg No. E-7	

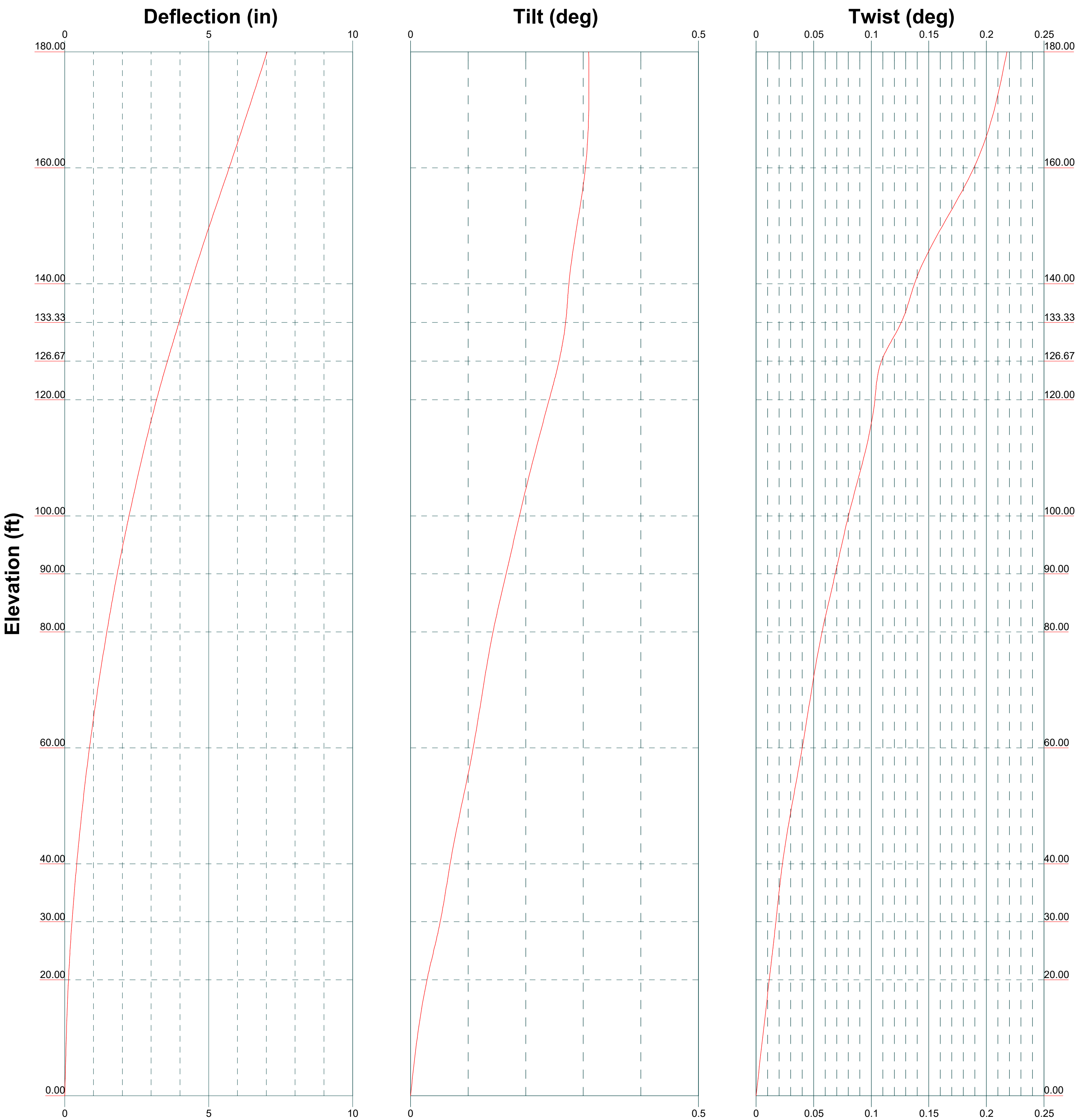
Feed Line Plan



AECOM	Job: ***180' CSP Lattice Tower - Evaluation***			
500 Enterprise Drive, Suite 3B	Project: ***Westport, Connecticut / DESPP/CSP Design Loading***			
Rocky Hill, CT	Client: Verizon Wireless / VZ5-224 / Modification	Drawn by: MCD	App'd:	
Phone: 860-263-5800	Code: TIA/EIA-222-F	Date: 07/10/20	Scale: NTS	
FAX: 860-812-2094	Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-F\MOD_20200708_WestportCT_F_.eri		Dwg No. E-7	

TIA/EIA-222-F - Service - 90 mph

Maximum Values



AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***180' CSP Lattice Tower - Evaluation*** Project: ***Westport, Connecticut / DESPP/CSP Design Loading*** Client: Verizon Wireless / VZ5-224 / Modification · Drawn by: MCD · App'd: Code: TIA/EIA-222-F · Date: 07/10/20 · Scale: NTS Path: C:\Users\michael.dalickas\Desktop\20200706_WestportMOD\TIA-222-F\MOD_20200708_WestportCT_F_.eri · Dwg No. E-5

Tower Input Data

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

- Basic wind speed of 90 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 90 mph is used in combination with ice.
- Deflections calculated using a wind speed of 90 mph.
- NOTE: Application of Azimuth of Dish is implemented via direct information from the DESPP / CSP. (06/15/2020).
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

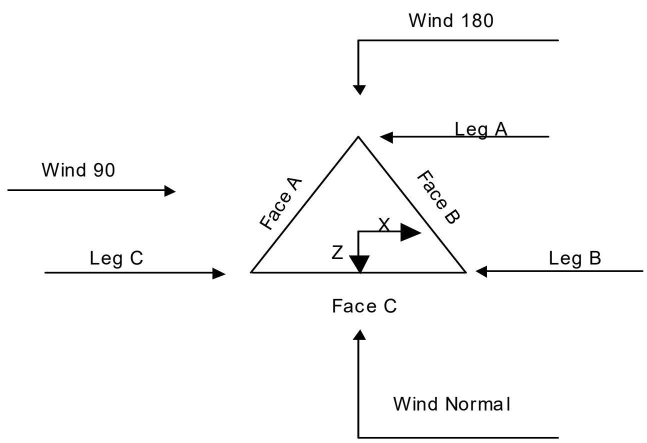
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
√ SR Members Have Cut Ends
SR Members Are Concentric

√ Distribute Leg Loads As Uniform
Assume Legs Pinned
Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
√ Retension Guys To Initial Tension
Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
Add IBC .6D+W Combination
√ Sort Capacity Reports By Component
√ Triangulate Diamond Inner Bracing
Treat Feed Line Bundles As Cylinder
Ignore KL/ry For 60 Deg. Angle Legs

Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
√ SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feed Line Torque
√ Include Angle Block Shear Check
Use TIA-222-G Bracing Resist. Exemption
Use TIA-222-G Tension Splice Exemption

Poles

√ Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets
Pole Without Linear Attachments
Pole With Shroud Or No Appurtenances
Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T2 160.00-140.00	Pipe	ROHN 4 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T3 140.00-133.33	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T4 133.33-126.67	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2 EH	A572-50 (50 ksi)
T5 126.67-120.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2XXS (Pipe 2XXS)	A572-50 (50 ksi)
T6 120.00-100.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Pipe	ROHN 2.5 XXS (Pipe 2.5-XXS)	A572-50 (50 ksi)
T7 100.00-90.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T8 90.00-80.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T9 80.00-60.00	Arbitrary Shape	120deg_9.6250x0.375 BU on ROHN 8 EHS	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T10 60.00-40.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T11 40.00-30.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T12 30.00-20.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EHS Leg Pipe	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)
T13 20.00-0.00	Arbitrary Shape	1/3 9.6250x0.375 on ROHN 8 EH Leg Pipe	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Connection Type*	*Leg*		*Diagonal*		*Top Girt*		*Bottom Girt*		*Mid Girt*		*Long Horizontal*		*Short Horizontal*	
		Bolt Size in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*
T1 180.00-160.00	Flange	0.8750 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T2 160.00-140.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T3 140.00-133.33	Flange	1.0000 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T4 133.33-126.67	Flange	0.7500 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T5 126.67-120.00	Flange	0.7500 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T6 120.00-100.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T7 100.00-90.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T8 90.00-80.00	Flange	1.0000 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T9 80.00-60.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T10 60.00-40.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T11 40.00-30.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T12 30.00-20.00	Flange	1.0000 A325N	0	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T13 20.00-0.00	Flange	1.0000 A325N	8	0.6250 A325X	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	*Face or Leg*	*Allow Shield*	*Exclude From Torque Calculation*	*Component Type*	*Placement* ft	*Face Offset* in	*Lateral Offset* (Frac FW)	*#*	*# Per Row*	*Clear Spacing* in	*Width or Diameter* in	*Perimeter* in	*Weight* plf
*													
*													

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF6-50A (1-1/4 FOAM) (AT&T)	B	Yes	No	Ar (CfAe)	133.00 - 0.00	0.0000	0.46	12	6	1.5500	1.5500		0.66
DC Cable WR-VG122S T (AT&T)	B	Yes	No	Ar (CfAe)	133.00 - 0.00	0.0000	0.43	2	2	0.4000	0.4000		0.25
1 5/8" Hybriflex (AT&T)	B	Yes	No	Ar (CfAe)	133.00 - 0.00	0.0000	0.41	2	1	1.6250	1.6250		1.13
DC Cable WR-VG122S T (AT&T)	B	Yes	No	Ar (CfAe)	133.00 - 0.00	0.0000	0.42	2	2	0.4000	0.4000		0.25
*													
LDF7-50A (1-5/8 FOAM) (T-Mobile)	B	Yes	No	Ar (CfAe)	125.00 - 0.00	0.0000	-0.41	6	3	1.9800	1.9800		0.82
Hubner-Suhne r Hybrid Cable (T-Mobile)	B	Yes	No	Ar (CaAa)	125.00 - 0.00	0.0000	-0.385	1	1	0.7087	0.7087		0.48
Hybrid HCS 6x12 4 AWG (1-5/8") (T-Mobile)	B	Yes	No	Ar (CfAe)	125.00 - 0.00	0.0000	-0.365	3	3	1.9900	1.9900		1.90
*													
LDF7-50A (1-5/8 FOAM) (Verizon)	A	Yes	No	Ar (CfAe)	160.00 - 0.00	0.0000	-0.42	8	8	1.9800	1.9800		0.82
MLCH Hybrid Cable (VZW) (Verizon)	A	Yes	No	Ar (CfAe)	160.00 - 0.00	0.0000	-0.48	2	2	2.0126	2.0126		3.04
*													
LDF5-50A (7/8 FOAM) (CSP -1)	A	Yes	No	Ar (CfAe)	180.00 - 0.00	0.0000	0.48	1	1	1.0900	1.0900		0.33
EW63 (CSP-42)	A	Yes	No	Af (CfAe)	177.00 - 0.00	0.0000	0.44	1	1	1.5742	1.5742	5.0668	0.51
LDF5-50A (7/8 FOAM) (CSP-22)	A	Yes	No	Ar (CfAe)	170.00 - 0.00	0.0000	0.42	1	1	1.0900	1.0900		0.33
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-80)	A	Yes	No	Ar (CfAe)	170.00 - 0.00	0.0000	0.4	1	1	1.9800	1.9800		0.72
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-81)	A	Yes	No	Ar (CfAe)	170.00 - 0.00	0.0000	0.38	1	1	1.9800	1.9800		0.72
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP-82)	A	Yes	No	Ar (CfAe)	170.00 - 0.00	0.0000	0.36	1	1	1.9800	1.9800		0.72
LDF4-50A (1/2 FOAM) (CSP-47)	A	Yes	No	Ar (CfAe)	170.00 - 0.00	0.0000	0.34	1	1	0.6300	0.6300		0.15
LDF5-50A	A	Yes	No	Ar (CfAe)	169.00 -	0.0000	0.32	1	1	1.0900	1.0900		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
(7/8 FOAM) (CSP - Yagi)					0.00								
LDF4-50A (1/2 FOAM) (CSP - Dipole)	A	Yes	No	Ar (CfAe)	113.00 - 0.00	0.0000	0.3	1	1	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM) (CSP)	A	Yes	No	Ar (CfAe)	61.00 - 0.00	0.0000	0.28	1	1	0.6300	0.6300		0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	180.00-160.00	A	9.018	2.230	0.000	0.000	44.64
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	49.509	2.624	0.000	0.000	329.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	16.503	0.875	0.000	0.000	109.67
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	16.503	0.875	0.000	0.000	109.67
		B	6.610	0.000	0.000	0.000	70.81
		C	0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	16.503	0.875	0.000	0.000	109.67
		B	11.921	0.000	0.354	0.000	130.04
		C	0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	50.191	2.624	0.000	0.000	330.95
		B	40.725	0.000	1.417	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T7	100.00-90.00	A	25.279	1.312	0.000	0.000	166.00
		B	20.363	0.000	0.709	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	25.279	1.312	0.000	0.000	166.00
		B	20.363	0.000	0.709	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	50.611	2.624	0.000	0.000	332.15
		B	40.725	0.000	1.417	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	51.609	2.624	0.000	0.000	335.00
		B	40.725	0.000	1.417	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	25.804	1.312	0.000	0.000	167.50
		B	20.363	0.000	0.709	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	25.804	1.312	0.000	0.000	167.50
		B	20.363	0.000	0.709	0.000	222.81
		C	0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	51.609	2.624	0.000	0.000	335.00
		B	40.725	0.000	1.417	0.000	445.62
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	180.00-160.00	A	0.500	15.601	3.175	0.000	0.000	157.88
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.500	77.842	3.735	0.000	0.000	822.83
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-133.33	A	0.500	25.947	1.245	0.000	0.000	274.28
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T4	133.33-126.67	A	0.500	25.947	1.245	0.000	0.000	274.28
		B		10.938	0.844	0.000	0.000	194.28
		C		0.000	0.000	0.000	0.000	0.00
T5	126.67-120.00	A	0.500	25.947	1.245	0.000	0.000	274.28
		B		18.976	0.889	0.854	0.000	331.97
		C		0.000	0.000	0.000	0.000	0.00
T6	120.00-100.00	A	0.500	79.608	3.735	0.000	0.000	833.75
		B		64.392	2.667	3.417	0.000	1123.37
		C		0.000	0.000	0.000	0.000	0.00
T7	100.00-90.00	A	0.500	40.279	1.867	0.000	0.000	419.82
		B		32.196	1.333	1.709	0.000	561.69
		C		0.000	0.000	0.000	0.000	0.00
T8	90.00-80.00	A	0.500	40.279	1.867	0.000	0.000	419.82
		B		32.196	1.333	1.709	0.000	561.69
		C		0.000	0.000	0.000	0.000	0.00
T9	80.00-60.00	A	0.500	80.695	3.735	0.000	0.000	840.47
		B		64.392	2.667	3.417	0.000	1123.37
		C		0.000	0.000	0.000	0.000	0.00
T10	60.00-40.00	A	0.500	83.275	3.735	0.000	0.000	856.44
		B		64.392	2.667	3.417	0.000	1123.37
		C		0.000	0.000	0.000	0.000	0.00
T11	40.00-30.00	A	0.500	41.638	1.867	0.000	0.000	428.22
		B		32.196	1.333	1.709	0.000	561.69
		C		0.000	0.000	0.000	0.000	0.00
T12	30.00-20.00	A	0.500	41.638	1.867	0.000	0.000	428.22
		B		32.196	1.333	1.709	0.000	561.69
		C		0.000	0.000	0.000	0.000	0.00
T13	20.00-0.00	A	0.500	83.275	3.735	0.000	0.000	856.44
		B		64.392	2.667	3.417	0.000	1123.37
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	180.00-160.00	A	0.883	2.196	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	160.00-140.00	A	3.820	8.758	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	140.00-133.33	A	1.311	2.934	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000

Section	*Elevation* *ft*	*Face*	A_R ft^2	A_R *Ice* ft^2	A_F ft^2	A_F *Ice* ft^2
T4	133.33-126.67	A	1.285	2.876	0.000	0.000
		B	0.489	1.238	0.000	0.000
		C	0.000	0.000	0.000	0.000
T5	126.67-120.00	A	1.261	2.823	0.000	0.000
		B	0.886	2.122	0.000	0.000
		C	0.000	0.000	0.000	0.000
T6	120.00-100.00	A	3.204	6.982	0.000	0.000
		B	2.542	5.817	0.000	0.000
		C	0.000	0.000	0.000	0.000
T7	100.00-90.00	A	1.750	3.704	0.000	0.000
		B	1.379	3.052	0.000	0.000
		C	0.000	0.000	0.000	0.000
T8	90.00-80.00	A	1.697	3.594	0.000	0.000
		B	1.337	2.961	0.000	0.000
		C	0.000	0.000	0.000	0.000
T9	80.00-60.00	A	3.497	7.305	0.000	0.000
		B	2.753	6.009	0.000	0.000
		C	0.000	0.000	0.000	0.000
T10	60.00-40.00	A	3.435	7.262	0.000	0.000
		B	2.654	5.797	0.000	0.000
		C	0.000	0.000	0.000	0.000
T11	40.00-30.00	A	1.680	3.553	0.000	0.000
		B	1.298	2.837	0.000	0.000
		C	0.000	0.000	0.000	0.000
T12	30.00-20.00	A	1.660	3.510	0.000	0.000
		B	1.282	2.802	0.000	0.000
		C	0.000	0.000	0.000	0.000
T13	20.00-0.00	A	3.808	8.258	0.000	0.000
		B	2.943	6.593	0.000	0.000
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	*Elevation* *ft*	CP_X *in*	CP_Z *in*	CP_X *Ice* *in*	CP_Z *Ice* *in*
T1	180.00-160.00	-1.4210	-13.2386	-1.7471	-16.2105
T2	160.00-140.00	-38.5982	-4.1905	-44.3469	-7.3756
T3	140.00-133.33	-36.7399	-3.9432	-43.4470	-7.1778
T4	133.33-126.67	-16.0722	6.6601	-18.5817	5.4600
T5	126.67-120.00	-12.6890	-10.7178	-14.2045	-15.4949
T6	120.00-100.00	-12.6531	-17.9242	-14.6947	-25.6736
T7	100.00-90.00	-13.0335	-18.5068	-15.3899	-27.0134
T8	90.00-80.00	-13.7550	-19.4143	-16.2052	-28.3001
T9	80.00-60.00	-8.9145	-13.9296	-11.4022	-21.8579
T10	60.00-40.00	-9.9330	-15.8267	-12.8427	-25.2593
T11	40.00-30.00	-10.5205	-16.6513	-13.5588	-26.5080
T12	30.00-20.00	-10.8964	-17.1767	-14.0145	-27.2987
T13	20.00-0.00	-11.7400	-18.4687	-15.0460	-29.1574

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
*									
*** VWZ Antennas 20200615									
Pirod 15' T-Frame Sector Mount (1) (Verizon)	A	None		0.0000	160.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (Verizon)	B	None		0.0000	160.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (Verizon)	C	None		0.0000	160.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
JAHH-65B-R3B Panel Antenna (Verizon)	A	From Leg	3.00 6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
JAHH-65B-R3B Panel Antenna (Verizon)	A	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
BXA-70080-4CF-EDIN Panel (Verizon)	A	From Leg	3.00 -6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	3.75 4.12	5.42 6.05	50.00 93.77
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	A	From Leg	3.00 -3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.80 5.07	2.40 2.60	20.00 59.31
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	A	From Leg	3.00 3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	3.78 4.84	3.56 4.62	120.00 175.06
4x40 B2_B66 Dual Band RRH Unit (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.46 1.62	100.00 115.84
DB-T1-6Z-8AB-0Z Distribution Box (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	5.60 5.92	2.33 2.56	50.00 81.13
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.43 0.52	0.60 0.71	22.00 28.34
RFV01U-D2A RRH Unit (Verizon - Proposed)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.18 1.34	82.00 98.43
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.60 0.72	1.79 1.97	20.00 31.93
JAHH-65B-R3B Panel Antenna (Verizon)	B	From Leg	3.00 6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
JAHH-65B-R3B Panel Antenna (Verizon)	B	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
BXA-70063-4CF Panel Antenna (Verizon)	B	From Leg	3.00 -6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	7.82 8.37	6.34 7.15	60.00 128.37
XXDWMM-12.5-65-8T-CBRS Panel (Verizon - Proposed)	B	From Leg	3.00 -3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.80 5.07	2.40 2.60	20.00 59.31
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	B	From Leg	3.00 3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	3.78 4.84	3.56 4.62	120.00 175.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
4x40 B2_B66 Dual Band RRH Unit (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.46 1.62	100.00 115.84
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.43 0.52	0.60 0.71	22.00 28.34
RFV01U-D2A RRH Unit (Verizon - Proposed)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.18 1.34	82.00 98.43
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.60 0.72	1.79 1.97	20.00 31.93
JAHH-65B-R3B Panel Antenna (Verizon)	C	From Leg	3.00 6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
JAHH-65B-R3B Panel Antenna (Verizon)	C	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice	9.66 10.22	7.71 8.53	130.00 204.15
BXA-70063-4CF Panel Antenna (Verizon)	C	From Leg	3.00 -6.00 0.00	0.0000	160.00	No Ice 1/2" Ice	7.82 8.37	6.34 7.15	60.00 128.37
XXDWMM-12.5-65-8T-CBR S Panel (Verizon - Proposed)	C	From Leg	3.00 -3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.80 5.07	2.40 2.60	20.00 59.31
BSAMNT-SBS-2-2 (JAHH Bracket (for 2)) (Verizon)	C	From Leg	3.00 3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	3.78 4.84	3.56 4.62	120.00 175.06
4x40 B2_B66 Dual Band RRH Unit (Verizon)	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.46 1.62	100.00 115.84
CBC78T-DS-43-2X Diplexer (Verizon - Proposed)	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.43 0.52	0.60 0.71	22.00 28.34
RFV01U-D2A RRH Unit (Verizon - Proposed)	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.19 2.39	1.18 1.34	82.00 98.43
CBRS RRH (RT 4401-48A) (Verizon - Proposed)	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	0.60 0.72	1.79 1.97	20.00 31.93
*									
*** T-Mobile TWM-020 Updates 05/29/2019									
LTF12=372 Sector Mount (1) (T-Mobile)	A	None		0.0000	125.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	465.00 600.00
LTF12=372 Sector Mount (1) (T-Mobile)	B	None		0.0000	125.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	465.00 600.00
LTF12=372 Sector Mount (1) (T-Mobile)	C	None		0.0000	125.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	465.00 600.00
Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	A	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	132.20 178.02
Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	B	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	132.20 178.02
Ericsson AIR32 B66A/B2A Panel Antenna (T-Mobile)	C	From Face	3.00 -4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	132.20 178.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
Generic Twin TMA unit (T-Mobile)	A	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	0.42 0.53	1.12 1.27	25.00 32.19
Generic Twin TMA unit (T-Mobile)	B	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	0.42 0.53	1.12 1.27	25.00 32.19
Generic Twin TMA unit (T-Mobile)	C	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	0.42 0.53	1.12 1.27	25.00 32.19
Ericsson AIR21 B2A|B4P Panel (T-Mobile)	A	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	105.80 151.62
Ericsson AIR21 B2A|B4P Panel (T-Mobile)	B	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	105.80 151.62
Ericsson AIR21 B2A|B4P Panel (T-Mobile)	C	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	7.10 7.55	4.79 5.21	105.80 151.62
APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	A	From Face	3.00 4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	18.39 19.14	11.04 12.47	179.72 301.81
APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	B	From Face	3.00 4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	18.39 19.14	11.04 12.47	179.72 301.81
APXVARR24_43-C-NA20 Panel Antenna w/ 96" Pipe (T-Mobile)	C	From Face	3.00 4.00 0.00	0.0000	125.00	No Ice 1/2" Ice	18.39 19.14	11.04 12.47	179.72 301.81
Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	A	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	1.93 2.12	1.35 1.51	80.00 96.16
Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	B	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	1.93 2.12	1.35 1.51	80.00 96.16
Ericsson 4449 B71 + B12 Radio Unit (T-Mobile)	C	From Face	3.00 0.00 0.00	0.0000	125.00	No Ice 1/2" Ice	1.93 2.12	1.35 1.51	80.00 96.16
*** T-Mobile TWM-020 Updates 05/29/2019									
*** AT&T Antennas from SMK-004 MODification Analysis									
800-10798 Kathrein Panel (AT&T)	A	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	11.31 11.92	7.25 8.37	110.00 188.92
RRUS-32 B66 (AT&T)	A	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
RRUS-32 (AT&T)	A	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
DBC0061F1V51-2 Combiner Units (AT&T)	A	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	0.48 0.58	0.51 0.60	30.00 30.80
800-10798 Kathrein Panel (AT&T)	B	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	11.31 11.92	7.25 8.37	110.00 188.92
RRUS-32 B66	B	From Face	3.00	0.0000	133.00	No Ice	3.20	1.85	60.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
(AT&T)			6.00 0.00			1/2" Ice	3.46	2.08	81.11
RRUS-32 (AT&T)	B	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
DBC0061F1V51-2 Combiner Units (AT&T)	B	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	0.48 0.58	0.51 0.60	30.00 30.80
800-10798 Kathrein Panel (AT&T)	C	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	11.31 11.92	7.25 8.37	110.00 188.92
RRUS-32 B66 (AT&T)	C	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
RRUS-32 (AT&T)	C	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
DBC0061F1V51-2 Combiner Units (AT&T)	C	From Face	3.00 6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	0.48 0.58	0.51 0.60	30.00 30.80
DC6-48-60-18-8F (Squid) Suppressor (AT&T)	C	From Face	3.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice	1.27 1.46	1.27 1.46	20.00 35.12
Pirod 15' T-Frame Sector Mount (1) (AT&T)	A	None		0.0000	133.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (AT&T)	B	None		0.0000	133.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (AT&T)	C	None		0.0000	133.00	No Ice 1/2" Ice	15.00 20.60	15.00 20.60	500.00 650.00
P65-16-XLH-RR (AT&T)	A	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	60.00 111.28
RRUS-11 (AT&T)	A	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	50.00 69.57
HPA-65R-BUU-H6 Panel (AT&T)	A	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	10.12 10.69	5.49 5.94	50.00 105.33
RRUS-32 (AT&T)	A	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
DC6-48-60-18-8F (Squid) Suppressor (AT&T)	A	From Face	3.00 0.00 0.00	0.0000	133.00	No Ice 1/2" Ice	1.27 1.46	1.27 1.46	20.00 35.12
DC6-48-60-18-8F (Squid) Suppressor (AT&T)	B	From Leg	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	1.27 1.46	1.27 1.46	20.00 35.12
P65-16-XLH-RR (AT&T)	B	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	60.00 111.28
RRUS-11 (AT&T)	B	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	50.00 69.57
HPA-65R-BUU-H6 Panel	B	From Face	3.00	0.0000	133.00	No Ice	10.12	5.49	50.00

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* lb
(AT&T)			-2.00 0.00			1/2" Ice	10.69	5.94	105.33
RRUS-32 (AT&T)	B	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
P65-16-XLH-RR (AT&T)	C	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	8.40 8.95	4.70 5.15	60.00 111.28
RRUS-11 (AT&T)	C	From Face	3.00 -6.00 0.00	0.0000	133.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	50.00 69.57
HPA-65R-BUU-H6 Panel (AT&T)	C	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	10.12 10.69	5.49 5.94	50.00 105.33
RRUS-32 (AT&T)	C	From Face	3.00 -2.00 0.00	0.0000	133.00	No Ice 1/2" Ice	3.20 3.46	1.85 2.08	60.00 81.11
*** AT&T Antennas from SMK-004 MODification Analysis									
* CSP									
ANT940Y10-WR (CSP)	A	From Leg	0.00 0.00 0.00	0.0000	187.00	No Ice 1/2" Ice	0.19 0.34	0.19 0.34	2.50 3.25
ANT940Y10-WR (CSP - Yagi Antenna)	C	From Leg	0.50 0.00 0.00	0.0000	181.00	No Ice 1/2" Ice	0.19 0.34	0.19 0.34	2.50 3.25
RFI BPS7496-180-14 Panel Antenna (CSP-80)	A	From Face	4.00 -6.00 0.00	0.0000	170.00	No Ice 1/2" Ice	6.07 6.53	3.75 4.13	20.00 56.42
RFI BPS7496-180-14 Panel Antenna (CSP-81)	A	From Face	4.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	6.07 6.53	3.75 4.13	20.00 56.42
RFI BPS7496-180-14 Panel Antenna (CSP-82)	A	From Face	4.00 6.00 0.00	0.0000	170.00	No Ice 1/2" Ice	6.07 6.53	3.75 4.13	20.00 56.42
SitePro1 USF12-396-U Mount Assembly w/ (3) 96" Mount Pipes (CSP 47, 80, 81, 82)	A	From Leg	0.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	16.23 22.18	9.80 13.27	491.09 630.09
432E-83I-01T TTA Unit (Re-Located TMA (CSP))	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	3.33 3.57	1.11 1.27	25.00 44.70
3' Yagi (CSP)	C	From Leg	0.50 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice	2.08 3.79	2.08 3.79	30.95 52.87
ANT150D (CSP - 1-Bay Dipole)	A	From Leg	0.00 0.00 0.00	0.0000	113.00	No Ice 1/2" Ice	0.80 1.44	0.80 1.44	5.50 7.15
GPS (DNK-1 / GPS)	C	From Leg	4.00 0.00 2.00	0.0000	60.00	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	10.00 15.00
4' Standoff (DNK-1 / GPS)	C	From Leg	0.00 0.00 0.00	0.0000	60.00	No Ice 1/2" Ice	3.42 3.67	3.42 3.67	110.00 147.19

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter		Aperture Area	Weight
				ft	°	°	ft	ft		ft^2	lb
PA6-65AC (DNK-52 / CSP-42)	C	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	-55.0000		177.00	6.00	No Ice 1/2" Ice	28.27 29.05	90.00 240.00

Load Combinations

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

Comb. No.	Description
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	7.029	35	0.3103	0.2157
T2	160 - 140	5.708	35	0.3055	0.1880
T3	140 - 133.333	4.370	35	0.2772	0.1380
T4	133.333 - 126.667	3.967	35	0.2677	0.1237
T5	126.667 - 120	3.565	35	0.2566	0.1104
T6	120 - 100	3.188	35	0.2426	0.1016
T7	100 - 90	2.233	35	0.1912	0.0818
T8	90 - 80	1.821	35	0.1668	0.0688
T9	80 - 60	1.462	35	0.1405	0.0567
T10	60 - 40	0.858	35	0.1069	0.0380
T11	40 - 30	0.416	35	0.0701	0.0240
T12	30 - 20	0.250	35	0.0510	0.0174
T13	20 - 0	0.130	35	0.0315	0.0118

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
187.00	ANT940Y10-WR	35	7.029	0.3103	0.2157	140440
181.00	ANT940Y10-WR	35	7.029	0.3103	0.2157	140440
177.00	PA6-65AC	35	6.833	0.3105	0.2126	140440
170.00	RFI BPS7496-180-14 Panel Antenna	35	6.375	0.3103	0.2045	70220
169.00	3' Yagi	35	6.309	0.3102	0.2032	63837
160.00	Pirod 15' T-Frame Sector Mount (1)	35	5.708	0.3055	0.1880	42936
133.00	800-10798 Kathrein Panel	35	3.947	0.2672	0.1230	131485
125.00	LTF12=372 Sector Mount (1)	35	3.467	0.2534	0.1077	16977
113.00	ANT150D	35	2.828	0.2252	0.0948	19475
60.00	GPS	35	0.858	0.1069	0.0380	27481

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	8.846	19	0.3892	0.3201
T2	160 - 140	7.189	19	0.3834	0.2879
T3	140 - 133.333	5.510	19	0.3486	0.2186
T4	133.333 - 126.667	5.001	19	0.3367	0.1973
T5	126.667 - 120	4.496	19	0.3229	0.1769
T6	120 - 100	4.022	19	0.3054	0.1636
T7	100 - 90	2.820	19	0.2409	0.1327
T8	90 - 80	2.299	19	0.2103	0.1127
T9	80 - 60	1.845	19	0.1774	0.0938
T10	60 - 40	1.082	19	0.1350	0.0638
T11	40 - 30	0.524	19	0.0886	0.0408
T12	30 - 20	0.314	19	0.0645	0.0298
T13	20 - 0	0.163	19	0.0398	0.0204

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
187.00	ANT940Y10-WR	19	8.846	0.3892	0.3201	111736
181.00	ANT940Y10-WR	19	8.846	0.3892	0.3201	111736
177.00	PA6-65AC	19	8.601	0.3896	0.3169	111736
170.00	RFI BPS7496-180-14 Panel Antenna	19	8.026	0.3894	0.3081	55868
169.00	3' Yagi	19	7.943	0.3891	0.3066	50789
160.00	Pirod 15' T-Frame Sector Mount (1)	19	7.189	0.3834	0.2879	34008
133.00	800-10798 Kathrein Panel	19	4.976	0.3361	0.1962	124514
125.00	LTF12=372 Sector Mount (1)	19	4.373	0.3189	0.1729	13415
113.00	ANT150D	19	3.569	0.2836	0.1531	15661
60.00	GPS	19	1.082	0.1350	0.0638	21706

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.

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ATTACHMENT 5

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July 6, 2020

Mr. Phil Cotto
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Reference: **Analysis of Antenna Mount:**
Verizon Site ID: Westport CT
880 Post Road East, Westport, Connecticut
AECOM Project Number: VZ5-224

Dear Mr. Cotto,

AECOM has been authorized by Verizon Wireless to conduct a structural evaluation of the proposed antenna modification to the existing antenna mount frame attached to an existing transmission tower structure located at 880 Post Road East in Westport, Connecticut. The results of our independent structural analysis has determined that the proposed antenna upgrades to the existing antenna frame mounts are in compliance with the Codes and Standards stated herein.

The proposed antenna modification will consist of the removal of three (3) Amphenol BXA-171063-12CF Panel Antennas, three (3) Nokia AHCA AirScale RRH 4T4R B5 RRHs and three (3) Nokia UHBA B13 RRH 4x30 RRHs, with the installation of three (3) Samsung XXDWMM-12.5-65-8T-CBRS antennas, three (3) Samsung CBRS RRH-RT4401-48A RRH Units, three (3) Samsung B5/B13 RRH-BR04C (RFV01U-D2A) RRH Units, three (3) CBC78T-DS-43-2X Diplexer and six (6) Fiber Optic Cables (Considered as 1-5/8” Fiber Cable) on three (3) existing antenna mounts with one (1) support/tie-back arm connected to tower structure at 160 feet above the tower base. The existing mount applied for analysis was considered as three (3) MTS Wireless Components Tower Stand-off Pipe Frame assemblies, with four (4) antenna mount pipes (assumed as 126” length pipes), part number SF-SP-4-126.

An independent structural analysis was conducted considering the antenna pipe mounted frame mounted to the existing tower structure for its strength design. This analysis did not consider the loading of the proposed antenna mounting frame attached to the tower structure. A previous tower structure analysis has been designed (by AECOM, project # VZ5-202 Rev. 1) addressing the antenna modifications associated for this mount assembly stated above and herein.

Two load conditions were evaluated as shown below which were compared to ultimate stresses according to AISC and TIA-222-H.

Load Condition 1 = 130 mph (3-second gust) Wind Load (without ice) + (Antenna + Mount) Dead Load
Load Condition 2 = 50 mph (3-second gust) Wind Load (with ice) + 0.75” Ice Load + (Antenna + Mount) Dead Load

> NOTE: The 0.75” Ice load thickness obtained from the TIA-222-G and the ASCE 7-10 Standard are considered to increase in thickness with the height of the Antenna and Mount assembly.
>
> NOTE: Due to the location of the Tower and Risk Category for the structure, the wind speed shall be increased to the TIAA-222-G maximum listed speed (indicated above) to address additional wind effects within the “Special Wind Region” designated by ASCE and indicated within the “Wind-Borne Debris Region” per the CT State Building Code.

The independent structural analysis also considered the following site conditions (following the TIA-222-H Standard):

- Structure Class 3 – Essential Communications (ASCE7-16/CT B.C. Risk Category 4; State Police Structure)
- Topographic Category 1 – (No Abrupt Changes in General Topography)
- Exposure Class C – Open Terrain with scattered obstructions

The independent structural analysis was conducted using the STAAD.Pro V8i software design program to assess the strength design of the antenna mount frame. The analysis was conducted in compliance with the Codes and Standards of the TIA-222-Revision H with Addendum 1, the ASCE 7-2016 Minimum Design Loads Standard, the 2018 International Building Code, and the 2018 State of Connecticut Building code. The results of our independent structural analysis has determined that the proposed antenna upgrades to the existing antenna pipe mounts are in compliance with the Codes and Standards previously mentioned.

Per the included mount analysis, the controlling stress for the design mount is noted ***at 53.9%*** structural capacity rating.

Should there be any questions, please contact Michael Egan at (860) 263-5817.

Sincerely,

AECOM

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

Richard Sambor, P.E.
Senior Structural Engineer

Westport, CT - 180' Self-SupportingTower - Antenna Strength Design Analysis Calculations (Antenna Mount)

- **Design Criteria used for Proposed Antenna Assessment**
  - 2018 International Building Code (IBC) with 2018 State of Connecticut Building Code
  - Telecommunications Industry Association Design Standard TIA-222-H (Structural Standard for Antenna Supporting Structures and Antennas) with Addendum 2 (December 2009)
  - Verizon Antenna Mounting System Classification Standard (NSTD-445) (version Jan. 3 2017)

- **Design Calculation Applied for Antenna Assessment of Stress and of the Mount Classification listing required for Bare and Iced Mounts.**
  - Topographical Category of Structure = "Category 1" - Structure located on upper half of hill - wind speed-up considered
  - Exposure Category of Structure = "Exposure C" - Open Terrain with scttered obstructions
  - Antenna supporting stresses checked through STAAD design program considering forces obtained from TIA-222-H Standard (V.asd)
  - Antenna supporting stresses checked through STAAD design program considering forces obtained from ASCE 7 2010 (V.ultimate)
  - Antenna mount classification for iced considerations following design criteria (design thickness per ASCE 7 2010 and TIA-222-H Standards).

    - *NOTE:* Calculation referenced to the use Serviceable Loads in the STAAD design program (not currently approved deisgn Standard) applied as a design and loading guidance for Serviceability/Maintenance work on mount not specifially identified per the TIA-222-H design Standard. Maintenance loads consist of a 500 lbf vertical load @ antenna mount pipes and 250lbf vertical load @ end of horizontal cantilevered member (Load Combination #5 & 6 within analysis herein).

- **Antennas located in the Alpha/Beta Sector with an Antenna Centerline Elevation of 160'-0" Above Ground:**
  - 3 panel antennas per Sector on tower structure:
    - Antennas to remain (per Sector):
      - (2) Antel BXA-70063-4CF (Beta & Gamma Sector)
      - (1) Antel BXA-70080-4CF (Alpha Sector)
      - (6) Commscope JAHH-65B-R3B Panel Antennas (2 per Sector)
      - (3) Samsung 4x40_B2/B66 RRH Units
    - Removed existing antennas (to be removed and/or swapped for Proposed Antennas):
      - (3) Amphenol BXA-171063-12CF Panel Antennas (indicated as "inactive" in RFDS)
      - (3) Nokia AHCA AirScale RRH 4T4R B5 RRHs
      - (3) Nokia UHBA B13 RRH 4x30 RRHs
    - Proposed antennas (to be installed):
      - (3) Samsung XXDWMM-12.5-65-8T-CBRS (1 per Sector)
      - (3) Samsung CBRS RRH-RT4401-48A RRH Units
      - (3) Samsung B5/B13 RRH-BR04C (RFV01U-D2A) RRH Units
      - (3) CBC78T-DS-43-2X Diplexer

- **Antenna Mount Design consideration/conditions used for structural analysis and assessment of proposed antenna:**
  - For the purposes of design, the MTS Wireless Components Sector Frame SF-SP16-4-126 was considered for strength design for the antenna mount
  - The following image is a graphical representation of the Antenna Mount Frame with antenna pipe mounts on the existing tower leg as a reference for the STAAD Design Model used for Strength Design cases.
    - Wind loading considered the worst case surface are of contact considering Bare and Iced Antenna conditions
    - Load Combinations are in reference to the TIA-222-H Section 2.3.2 & 16.4.1 for Strength Design Load Combinations.

- **Calculated Load Combinations for Consideration (LRFD):**
  - **LC#1: 1.2 * Dead Load + 1.0 * Wind w/o ice load**
  - **LC#2: 0.9 * Dead Load + 1.0 * Wind w/o ice load**
  - **LC#3: 1.2 * Dead Load + 1.0 Dead Load (ice) + 1.0 * Wind with ice load**
  - **LC#4: 1.4 * Dead Load**
  - **LC#5: 1.2 * Dead Load + 1.5 Maintenance Load (500 lbf) on Antenna Mounting Pipe + 1.0 * Wind w/o ice load**
  - **LC#6: 1.2 Dead Load + 1.5 Maintance Load (250 lbf) Cantilever end of Mount Pipe Assembly**

- **Determine Bare (no ice) Force Applied to Antenna (TIA-222-H Standard):**
  - TIA-222-H Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-H Section 2.6.5.2]

,where $z := 160ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$\alpha := 9.5$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.397$$

$K_{zt} := \left(1 + \frac{K_c \cdot K_t}{K_h}\right)^2$ [TIA-222-H Section 2.6.6.2.1] ,where

$K_c := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-H Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 1 [TIA-222-H Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-H; Table 2-5] Topographic Category 1

$H_t := 100ft$ Height of Crest above Surrounding Terrain

Because Topographic Category is 1, K.zt = 1.0

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h = ▪$

$K_{zt} := 1.0$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.000$

$K_d := 0.85$ [TIA-222-H Table 2-2]

$V :=$ Connecticut State Building Code 2018 - Appendix N

$V_{ult.1} := 130mph$

$I_{Cat} := 3$

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{ult.1}^{\ 2}$$

$q_z = 51.4 \cdot psf$

- Distributed Wind to Antenna Frame (design for lb / inch)

Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

$F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 0.8$ Round Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

$Antenna_{frame.OD} := 2.8750in$ $Antenna_{frame.Length} := 168in$

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 9.84844607 \cdot \frac{lbf}{ft}$ $\omega_{frame.width} = 0.82070384 \cdot \frac{lbf}{in}$ Pounds (force) per foot - distributed load for STAAD input

- Distributed Wind to Antenna on Mount Frame (design for lb / inch)

$C_a := 1.4$ Flat Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.1} := 72.0in$ $Antenna_{Width.1} := 13.8in$

$Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.1} = 47.27254114 \cdot \frac{lbf}{ft}$$

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.2} := 72in$ $Antenna_{Width.2} := 13.8in$

$Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.2} = 47.27254114 \cdot \frac{lbf}{ft}$$

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm$ $Antenna_{Width.3} := 131mm$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

$$\omega_{frame.width.3} := \frac{2Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.3} = 14.41351987 \cdot \frac{lbf}{ft}$$

Antenna #1rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.4} := 25.8in$ $Antenna_{Width.4} := 11.8in$

$Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.4} = 14.48435228 \cdot \frac{lbf}{ft}$$

Antenna #2antenna/rrh - CBRS XXDWMM-12.5-65-88T w/ RRH-RT4401-48A (Height = 16.16in x Width 11.39in)

$Antenna_{Height.5} := 16.16in$ $Antenna_{Width.5} := 11.39in$

$Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.5} = 8.75714309 \cdot \frac{lbf}{ft}$$

Antenna #3rrh - B5/B13 RRH-BR04C Unit (RFV01U-D2A) (Height = 14.96in x Width 14.96 in)

$Antenna_{Height.6} := 14.96in$ $Antenna_{Width.6} := 14.96in$

$Antenna_{No.6} := C_a \cdot (Antenna_{Height.6} \cdot Antenna_{Width.6})$

$$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.6} = 10.64781637 \cdot \frac{lbf}{ft}$$

Antenna #4- BXA-70063-4CF - Antenna (Height = 47.4 in x Width 11.2 in)

$Antenna_{Height.7} := 47.4in$ $Antenna_{Width.7} := 11.2in$

$Antenna_{No.7} := C_a \cdot (Antenna_{Height.7} \cdot Antenna_{Width.7})$

$$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.7} = 25.25769589 \cdot \frac{lbf}{ft}$$

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 108.958602 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 8.757143 \cdot \frac{lbf}{ft}$

Distribution on Truss Member: $\omega_{frame.width.4} = 14.484352 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 10.647816 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 25.257696 \cdot \frac{lbf}{ft}$

- Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight) $Antenna_{Weight.1} := 92.6lbf$

Antenna #2 - JAHH-65B-R3B - Antenna (Weight) $Antenna_{Weight.2} := 92.6lbf$

Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight) $Antenna_{Weight.3} := 67.4lbf$

RRH Unit #4 - B66 Unit (Weight) $Antenna_{Weight.4} := 57.0lbf$

Antenna/RRH #5 - CBRS equipment (Weight) $Antenna_{Weight.5} := 13lbf$

RRH Unit #6 - B5/B13 Unit (Weight) $Antenna_{Weight.6} := 70lbf$

Antenna #7 - BXA-70080-4CF - Antenna (Weight) $Antenna_{Weight.7} := 10lbf$

Distribution on Pipe Mount #1: $Antenna_{Weight.1} + Antenna_{Weight.2} + Antenna_{Weight.3} = 252.60 \cdot lbf$

Distribution on Truss Member: $Antenna_{Weight.4} = 57.00 \cdot lbf$

Distribution on Pipe Mount #2: $Antenna_{Weight.5} = 13.00 \cdot lbf$

Distribution on Pipe Mount #3: $Antenna_{Weight.6} = 70.00 \cdot lbf$

Distribution on Pipe Mount #4: $Antenna_{Weight.7} = 10.00 \cdot lbf$

- **Determine Iced Forces Applied to Antenna (TIA-222-H Standard):**
  - TIA-222-H Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-H Section 2.6.5.2]

,where

$z := 160ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$\alpha := 9.5$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$K_{t.min} := 0.53$ [TIA-222-H Table 2-5 - Topographic Category 3]

$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} =$ $K_z = 1.397$

$K_{zt} := \left(1 + \frac{K_c \cdot K_t}{K_h}\right)^2$ [TIA-222-H Section 2.6.6.2.1] ,where

$K_c := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-H Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 3 [TIA-222-H Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-H; Table 2-5] Topographic Category 3

$H_t := 100ft$ Height of Crest above Surrounding Terrain

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h =$ *NOTE: Values Manually input because of formula calculation inaccuracy*

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.000$

$K_d := 0.85$ [TIA-222-H Table 2-2]

$V_{asd.2} := 50mph$ mph Ice - TIA-222-H Appendix #

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{asd.2}^{\ 2}$$

$q_z = 7.6 \cdot psf$

- Design Ice Thickness (TIA-222-H / ASCE 7):

$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{\ 0.35}$,where $t_i := 1.0in$ inch

$I_{ice} := 1.25($ [TIA-222-H Table 2-3]

$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{\ 0.35}$ $K_{iz} := \left(\frac{z}{33ft}\right)^{0.10} = 1.2$

$t_{iz} = 2.928 \cdot in$ inch

- Area of Design Ice Thickness - for Weight:

Horizontal / Vertical Pipes (2-7/8" O.D.) $D_c := 2.875in$ inch

$A_{iz} := \pi \cdot t_{iz} \cdot (D_c + t_{iz})$ $A_{iz} = 53.4 \cdot in^2$ $inch^2$

- Design Ice Thickness - Weight:

$WT_{ice} := A_{iz} \cdot 56pcf \cdot (Antenna_{frame.Length} + 2 \cdot t_{iz}) = 300.7 \cdot lbf$ Lbf NOTE: "56" is in reference to the unit weight of ice at 56 pcf

- Distributed Wind to Antenna Frame (design for lb / inch)

Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

$F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 0.8$ Round Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

$Antenna_{frame.OD} := 2.8750in + 2 \cdot t_{iz}$ (inch) $Antenna_{frame.Length} := 168in + 2 \cdot t_{iz}$ (inch)

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$ Pounds (force) per foot - distributed load for STAAD input

- Distributed Wind to Antenna on Mount Frame (design for lb / inch)

$C_a := 1.4$ Flat Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0 in x Width 13.8 in)

$Antenna_{Height.1} := 72in + 2 \cdot t_{iz}$ $Antenna_{Width.1} := 13.8in + 2 \cdot t_{iz}$ $Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$$

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0 in x Width 13.8 in)

$Antenna_{Height.2} := 72in + 2 \cdot t_{iz}$ $Antenna_{Width.2} := 13.8in + 2 \cdot t_{iz}$ $Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$$

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm + 2 \cdot t_{iz}$ $Antenna_{Width.3} := 131mm + 2 \cdot t_{iz}$

$$\omega_{frame.width.3} := \frac{2 Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$$

Antenna #1rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.4} := 25.8in + 2 \cdot t_i$ $Antenna_{Width.4} := 11.8in + 2 \cdot t_{iz}$ $Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$$

Antenna #2antenna/rrh -CBRS XXDWMM-12.5-65-88T w/ RRH-RT4401-48A (Height = 16.16in x Width 11.39in)

$Antenna_{Height.5} := 16.16in + 2 \cdot$ $Antenna_{Width.5} := 11.39in + 2 \cdot t_{iz}$ $Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width} = 4.42384495 \cdot \frac{lbf}{ft}$$

Antenna #3rrh - B5/B13 RRH-BR04C Unit (RFV01U-D2A) (Height = 14.96in x Width 14.96in)

$Antenna_{Height.6} := 14.96in + 2 \cdot t_{iz}$ $Antenna_{Width.6} := 14.96in + 2 \cdot t_{iz}$

$$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$$

$$Antenna_{No.6} := C_a \cdot \left(Antenna_{Height.6} \cdot Antenna_{Width.6}\right)$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.6} = 3.04933815 \cdot \frac{lbf}{ft}$$

Antenna #4- BXA-70063 - Antenna (Height = 47.4 in x Width 11.2 in)

$Antenna_{Height.7} := 47.4in + 2 \cdot t_{iz}$ $Antenna_{Width.7} := 11.2in + t_{iz}$

$$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$$

$$Antenna_{No.7} := C_a \cdot \left(Antenna_{Height.7} \cdot Antenna_{Width.7}\right)$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.7} = 5.29514127 \cdot \frac{lbf}{ft}$$

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 27.000146 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 2.671990 \cdot \frac{lbf}{ft}$

Distribution on Truss Member: $\omega_{frame.width.4} = 3.933350 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 3.049338 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 5.295141 \cdot \frac{lbf}{ft}$

NOTE; Above Distributions are considering wind applied to "design" ice thicknesses acting on exterior of appurtenances

- Design Ice Thickness - Weight: (Copied for Reference) (Antenna.frame.Length considering Ice build-up)

$WT_{ice} := A_{iz} \cdot 56pcf \cdot Antenna_{frame.Length}$ $\quad WT_{ice} = 300.7 \cdot lbf$ Lbf

NOTE: "56" is in reference to the unit weight of ice at 56 pcf

"Point Load"

$\omega_{WT.ice.frame.width} := \dfrac{WT_{ice}}{Antenna_{frame.Length}} = 20.753581 \cdot \dfrac{lbf}{ft}$

Lbf / in Distributed load of Ice on Antenna Frame

- Design Ice Thickness - Weight: (Volume Comparison from Ice to Antenna):

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in x Thickness 8.2in) (no ice)
Antenna (Height = 77.0in x Width 18.8in x Thickness 13.2in) (w/ ice)

$Antenna_{Ice.Volume.1} := 77in \cdot 18.8in \cdot 13.2in$ $\quad Antenna_{No.Ice.Volume.1} := 72in \cdot 13.8in \cdot 8.2in$

$Weight_{Antenna.1} := (Antenna_{Ice.Volume.1} - Antenna_{No.Ice.Volume.1}) \cdot 56pcf = 355.2 \cdot lbf$ Lbf - "Point Load"

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in x Thickness 8.2in) (no ice)
Antenna (Height = 77.0in x Width 18.8in x Thickness 13.2in) (w/ ice)

$Antenna_{Ice.Volume.2} := 77in \cdot 18.8in \cdot 13.2in$ $\quad Antenna_{No.Ice.Volume.2} := 72in \cdot 13.8in \cdot 8.2in$

$Weight_{Antenna.2} := (Antenna_{Ice.Volume.2} - Antenna_{No.Ice.Volume.2}) \cdot 56pcf = 355.2 \cdot lbf$ Lbf - "Point Load"

Antenna #1mnt - BSAMNT-SBS-2-2 - Antenna (Height = 746mm x Width 131mm x Thickness 80mm) (no ice)
Antenna (Height = 873mm x Width 258mm x Thickness 207mm)(w/ ice)

$Antenna_{Ice.Volume.3} := 873mm \cdot 258mm \cdot 207mm$ $\quad Antenna_{No.Ice.Volume.3} := 746mm \cdot 131mm \cdot 80mm$

$Weight_{Antenna.3} := 2(Antenna_{Ice.Volume.3} - Antenna_{No.Ice.Volume.3}) \cdot 56pcf = 153.5 \cdot lbf$ Lbf - "Point Load"

Antenna #1rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in x Thickness 7.2in) (no ice)
Unit (Height = 30.8in x Width 16.8in x Thickness 12.2in) (w/ ice)

$Antenna_{Ice.Volume.4} := 30.8in \cdot 16.8in \cdot 12.2in$ $\quad Antenna_{No.Ice.Volume.4} := 25.8in \cdot 11.8in \cdot 7.2in$

$Weight_{Antenna.4} := (Antenna_{Ice.Volume.4} - Antenna_{No.Ice.Volume.4}) \cdot 56pcf = 133.5 \cdot lbf$ Lbf - "Point Load"

Antenna #2antenna/rrh - CBRS equipment(Height = 16.16in x Width 11.39in x Thickness 5.45in) (no ice)
equipment(Height = 21.16in x Width 16.39in x Thickness 10.45in) (w/ ice)

$Antenna_{Ice.Volume.5} := 21.16in \cdot 16.39in \cdot 10.45in$ $\quad Antenna_{No.Ice.Volume.5} := 16.16in \cdot 11.39in \cdot 5.45in$

$Weight_{Antenna.5} := (Antenna_{Ice.Volume.5} - Antenna_{No.Ice.Volume.5}) \cdot 56pcf = 84.9 \cdot lbf$ Lbf - "Point Load"

- Design Ice Thickness - Weight: (Volume Comparison from Ice to Antenna Equipment - Applied to largest [point load - Conservative approach):

Antenna #3rrh -B5/B13 RRH-BR04C Unit (Height = 14.96in x Width 14.96in x Thickness 8.14in) (no ice)
Unit (Height = 20.96in x Width 19.96in x Thickness 13.14in) (w/ ice)

$Equipment_{Ice.Volume.6} := 20.96in \cdot 19.96in \cdot 13.14in$ $Equipemnt_{No.Ice.Volume.6} := 14.96in \cdot 14.96in \cdot 8.14in$

$Weight_{Equipment.6} := \left(Equipment_{Ice.Volume.6} - Equipemnt_{No.Ice.Volume.6}\right) \cdot 56pcf = 119.1 \cdot lbf$ Lbf - "Point Load"

Antenna #4 - BXA-70063-4CF - Antenna (Height = 47.4in x Width 11.2in x Thickness 5.0in) (no ice)
Antenna (Height = 53.4in x Width 16.2in x Thickness 10.0in) (w/ ice)

$Equipment_{Ice.Volume.7} := 53.4in \cdot 16.2in \cdot 10.0in$ $Equipemnt_{No.Ice.Volume.7} := 47.7in \cdot 11.2in \cdot 5.0in$

$Weight_{Equipment.7} := \left(Equipment_{Ice.Volume.7} - Equipemnt_{No.Ice.Volume.7}\right) \cdot 56pcf = 193.8 \cdot lbf$ Lbf - "Point Load"

- Ice Induced Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight)	$Weight_{Antenna.1} = 355.2 \cdot lbf$
Antenna #2 - JAHH-65B-R3B - Antenna (Weight)	$Weight_{Antenna.2} = 355.2 \cdot lbf$
Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight)	$Weight_{Antenna.3} = 153.5 \cdot lbf$
RRH Unit #4 - B66 Unit (Weight)	$Weight_{Antenna.4} = 133.5 \cdot lbf$
RRH Unit #5 - CBRS equipment (Weight)	$Weight_{Antenna.5} = 84.9 \cdot lbf$
RRH Unit #6 - B5/B13 Unit (Weight)	$Weight_{Equipment.6} = 119.1 \cdot lbf$
Antenna #7 - BXA-70080-4CF - Antenna (Weight)	$Weight_{Equipment.7} = 193.8 \cdot lbf$

- Ice Induced Dead Load of Antennas, Connection Frame and Mount Pipe - on Mounting Pipe

Distribution on Pipe Mount #1:	$Weight_{Antenna.1} + Weight_{Antenna.2} + Weight_{Antenna.3} = 863.907 \cdot lbf$
Distribution on Truss Member:	$Weight_{Antenna.4} = 133.544444 \cdot lbf$
Distribution on Pipe Mount #2:	$Weight_{Antenna.5} = 84.941419 \cdot lbf$
Distribution on Pipe Mount #3:	$Weight_{Equipment.6} = 119.114281 \cdot lbf$
Distribution on Pipe Mount #4:	$Weight_{Equipment.7} = 193.783333 \cdot lbf$

- **Determine Service/Maintenance .Force Applied to Antenna (TIA-222-H Standard):**
  - TIA-222-H Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-H Section 2.6.5.2]

,where $z := 160ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$\alpha = 9.5$ [TIA-222-H Table 2-4 - Exposure Category "C"]

$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.397$

$K_{zt} := \left(1 + \frac{K_c \cdot K_t}{K_h}\right)^2$ [TIA-222-H Section 2.6.6.2.1] ,where

$K_c := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-H Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 3 [TIA-222-H Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-H; Table 2-5] Topographic Category 3

$H_t := 100ft$ Height of Crest above Surrounding Terrain

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h =$ ▪

NOTE: Values Manually input because of formula calculation inaccuracy

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.000$

$K_d := 0.85$ [TIA-222-H Table 2-2]

$V_{asd} := 60mph$ mph - Service Loading (TIA-222-H Section 2.8.3)

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{asd}^{\;2}$$

$q_z = 10.9 \cdot psf$ (psf)

- Distributed Wind to Antenna Frame (design for lb / inch)

  Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

  $F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 0.8$ Round Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

$Antenna_{frame.OD} := 2.8750in$ (inch) $Antenna_{frame.Length} := 168in$ (inch)

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 2.09789384 \cdot \frac{lbf}{ft}$ Pounds (force) per inch - distributed load for STAAD input

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.1} := 72.0in$ $Antenna_{Width.1} := 13.8in$

$Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.1} = 5.75422310 \cdot \frac{lbf}{ft}$$

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.2} := 72in$ $Antenna_{Width.2} := 13.8in$

$Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.2} = 5.75422310 \cdot \frac{lbf}{ft}$$

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm$ $Antenna_{Width.3} := 131mm$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

$$\omega_{frame.width.3} := \frac{2 Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.3} = 1.75447748 \cdot \frac{lbf}{ft}$$

Antenna #1rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.4} := 25.8in$ $Antenna_{Width.4} := 11.8in$

$Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.4} = 1.76309952 \cdot \frac{lbf}{ft}$$

Antenna #2rrh - CBRS XXDWMM-12.5-65-88T w/ RRH-RT4401-48A (Height = 16.16in x Width 11.39in)

$Antenna_{Height.5} := 16.16in$ $Antenna_{Width.5} := 11.39in$

$Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.5} = 1.06595825 \cdot \frac{lbf}{ft}$$

Antenna #3rrh - B5/B13 RRH-BR04C Unit (Height = 14.96in x Width 14.96in)

$Antenna_{Height.6} := 14.96in$ $Antenna_{Width.6} := 14.96in$

$Antenna_{No.6} := C_a \cdot (Antenna_{Height.6} \cdot Antenna_{Width.6})$

$$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.6} = 1.29609937 \cdot \frac{lbf}{ft}$$

Antenna #4- BXA-70063-4CF - Antenna (Height = 47.4 in x Width 11.2 in)

$Antenna_{Height.7} := 47.4in$ $Antenna_{Width.7} := 11.2in$

$Antenna_{No.7} := C_a \cdot (Antenna_{Height.7} \cdot Antenna_{Width.7})$

$$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$$\omega_{frame.width.7} = 3.07447862 \cdot \frac{lbf}{ft}$$

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 13.262924 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 1.065958 \cdot \frac{lbf}{ft}$

Distribution on Truss Member: $\omega_{frame.width.4} = 1.763100 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 1.296099 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 3.074479 \cdot \frac{lbf}{ft}$

- Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.1} := 92.6lbf$
Antenna #2 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.2} := 92.6lbf$
Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight)	$Antenna_{Weight.3} := 67.4lbf$
RRH Unit #4 - B66 Unit (Weight)	$Antenna_{Weight.4} := 57lbf$
Antenna/RRH Unit #5 - CBRS equipment (Weight)	$Antenna_{Weight.5} := 13lbf$
RRH Unit #6 - B5/B13 Unit (Weight)	$Antenna_{Weight.6} := 70lbf$
Antenna #7 - BXA-70080-4CF - Antenna (Weight)	$Antenna_{Weight.7} := 10lbf$

Distribution on Pipe Mount #1: $Antenna_{Weight.1} + Antenna_{Weight.2} + Antenna_{Weight.3} = 252.60 \cdot lbf$

Distribution on Truss Member: $Antenna_{Weight.4} = 57.00 \cdot lbf$

Distribution on Pipe Mount #2: $Antenna_{Weight.5} = 13.00 \cdot lbf$

Distribution on Pipe Mount #3: $Antenna_{Weight.6} = 70.00 \cdot lbf$

Distribution on Pipe Mount #4: $Antenna_{Weight.7} = 10.00 \cdot lbf$

Job Information

	Engineer	Checked	Approved
Name:	CMC		
Date:	30-Jun-20		

Project ID	
Project Name	

Structure Type	SPACE FRAME

Number of Nodes	40	Highest Node	41
Number of Elements	54	Highest Beam	54

Number of Basic Load Cases	12
Number of Combination Load Cases	6

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SELFWEIGHT FRAME
Primary	2	ANTENNA WEIGHT (DL)
Primary	3	ICE WEIGHT - FRAME (IL)
Primary	4	ICE WEIGHT - ANTENNA (IL)
Primary	5	WIND LOAD - FRAME (WL)
Primary	6	WIND LOAD - ANTENNA (WL)
Primary	7	WIND ON ICE - FRAME (WLI)
Primary	8	WIND ON ICE - ANTENNA (WLI)
Primary	9	MAINTENANCE LOAD - ANTENNA PIPE (
Primary	10	MAINTENANCE - FRAME PIPE (LM)
Primary	11	SERVICE LOAD - FRAME (WM)
Primary	12	SERVICE LOAD - ANTENNA (WM)
Combination	13	COMBINATION LOAD CASE 13
Combination	14	COMBINATION LOAD CASE 14
Combination	15	COMBINATION LOAD CASE 15
Combination	16	COMBINATION LOAD CASE 16
Combination	17	COMBINATION LOAD CASE 17
Combination	18	COMBINATION LOAD CASE 18

Nodes

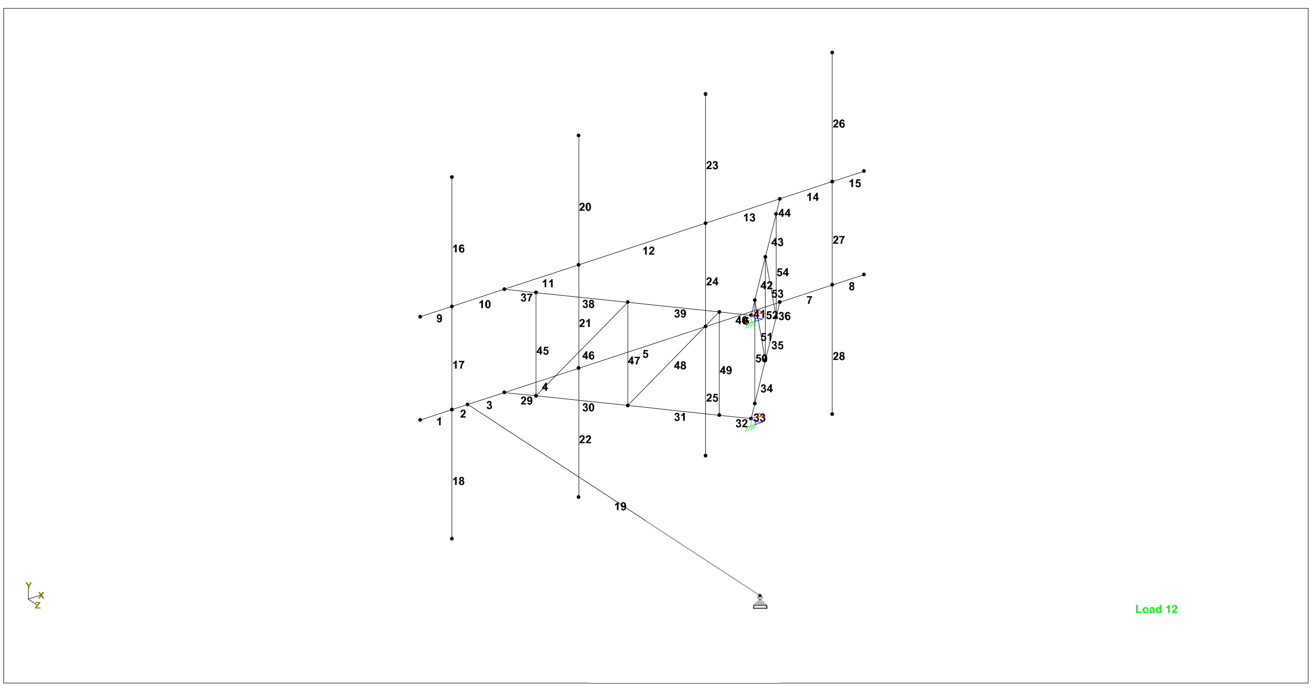
Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	1.000	0.000	0.000
3	2.656	0.000	0.000
4	5.000	0.000	0.000
5	9.000	0.000	0.000
6	11.344	0.000	0.000
7	13.000	0.000	0.000
8	14.000	0.000	0.000
9	0.000	3.000	0.000
10	1.000	3.000	0.000
11	2.656	3.000	0.000
12	5.000	3.000	0.000
13	9.000	3.000	0.000
14	11.344	3.000	0.000
15	13.000	3.000	0.000
16	14.000	3.000	0.000
17	1.500	0.000	0.000
18	3.213	0.000	0.626
19	4.828	0.000	2.427
20	6.440	0.000	4.228
21	7.000	0.000	4.854
22	7.560	0.000	4.228
23	9.172	0.000	2.427
24	10.783	0.000	0.626
25	3.213	3.000	0.626
26	4.828	3.000	2.427
27	6.440	3.000	4.228
28	7.000	3.000	4.854
29	7.560	3.000	4.228
30	9.172	3.000	2.427
31	10.783	3.000	0.626
33	1.500	0.000	13.000
34	1.000	-3.750	0.000
35	1.000	6.750	0.000
36	5.000	-3.750	0.000
37	5.000	6.750	0.000
38	9.000	-3.750	0.000
39	9.000	6.750	0.000
40	13.000	-3.750	0.000
41	13.000	6.750	0.000

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
1	1	2	1.000	1	0
2	2	17	0.500	1	0
3	17	3	1.156	1	0
4	3	4	2.344	1	0
5	4	5	4.000	1	0
6	5	6	2.344	1	0
7	6	7	1.656	1	0
8	7	8	1.000	1	0
9	9	10	1.000	1	0
10	10	11	1.656	1	0
11	11	12	2.344	1	0
12	12	13	4.000	1	0
13	13	14	2.344	1	0
14	14	15	1.656	1	0
15	15	16	1.000	1	0
16	35	10	3.750	2	0
17	10	2	3.000	2	0
18	2	34	3.750	2	0
19	17	33	13.000	2	0
20	37	12	3.750	2	0
21	12	4	3.000	2	0
22	4	36	3.750	2	0
23	39	13	3.750	2	0
24	13	5	3.000	2	0
25	5	38	3.750	2	0
26	41	15	3.750	2	0
27	15	7	3.000	2	0
28	7	40	3.750	2	0
29	3	18	0.838	2	0
30	18	19	2.419	2	0
31	19	20	2.417	2	0
32	20	21	0.840	2	0
33	21	22	0.840	2	0
34	22	23	2.417	2	0
35	23	24	2.417	2	0
36	24	6	0.840	2	0
37	11	25	0.838	2	0
38	25	26	2.419	2	0
39	26	27	2.417	2	0
40	27	28	0.840	2	0
41	28	29	0.840	2	0
42	29	30	2.417	2	0
43	30	31	2.417	2	0
44	31	14	0.840	2	0
45	18	25	3.000	3	0

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
46	18	26	3.854	3	0
47	19	26	3.000	3	0
48	19	27	3.852	3	0
49	20	27	3.000	3	0
50	22	29	3.000	3	0
51	29	23	3.852	3	0
52	23	30	3.000	3	0
53	30	24	3.852	3	0
54	24	31	3.000	3	0



Beam Layout

Section Properties

Prop	Section	Area (in^2)	I_{yy} (in^4)	I_{zz} (in^4)	J (in^4)	Material
1	PIPS25	1.610	1.450	1.450	2.907	STEEL
2	PIPS20	1.020	0.627	0.627	1.262	STEEL
3	PIPS10	0.469	0.083	0.083	0.168	STEEL

Materials

Mat	Name	E (kip/in^2)	ν	Density (kip/in^3)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E -6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E -6
3	ALUMINUM	10E+3	0.330	0.000	13E -6
4	CONCRETE	3.15E+3	0.170	0.000	5E -6

Supports

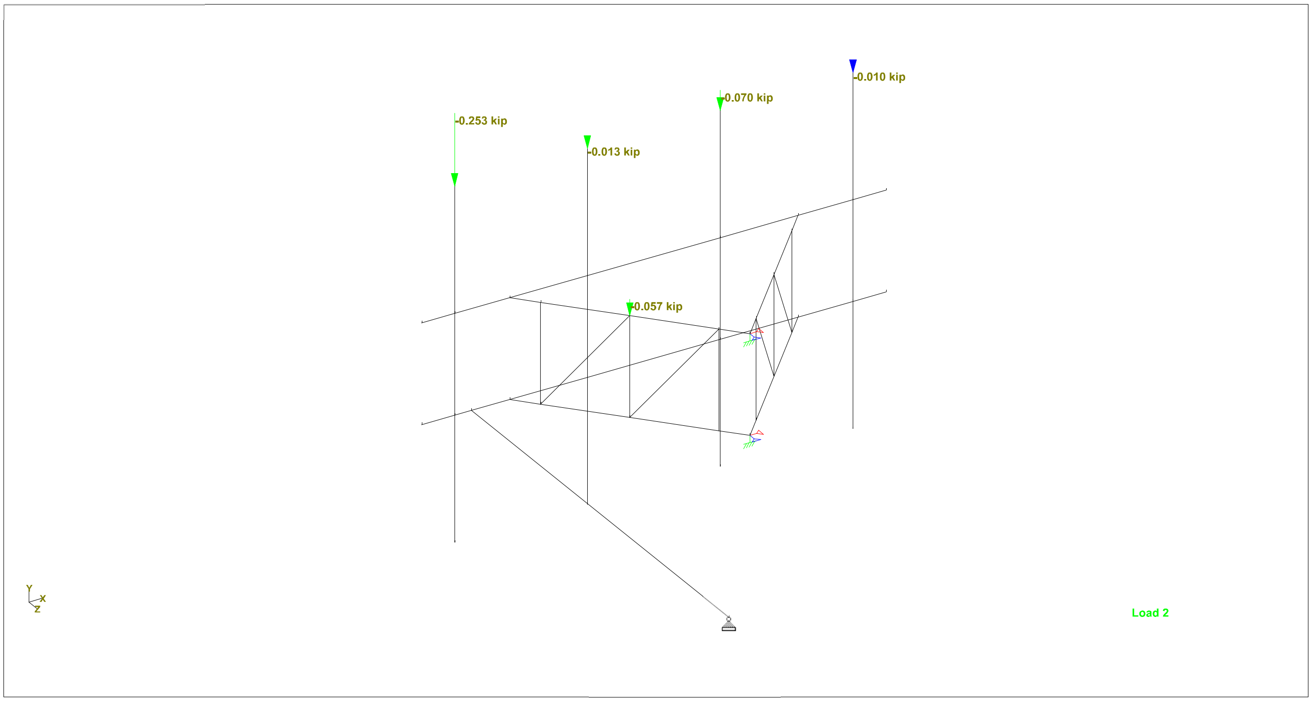
Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip˙ft/deg)	rY (kip˙ft/deg)	rZ (kip˙ft/deg)
21	Fixed	Fixed	Fixed	-	Fixed	-
28	Fixed	Fixed	Fixed	-	Fixed	-
33	Fixed	Fixed	Fixed	-	-	-

Primary Load Cases

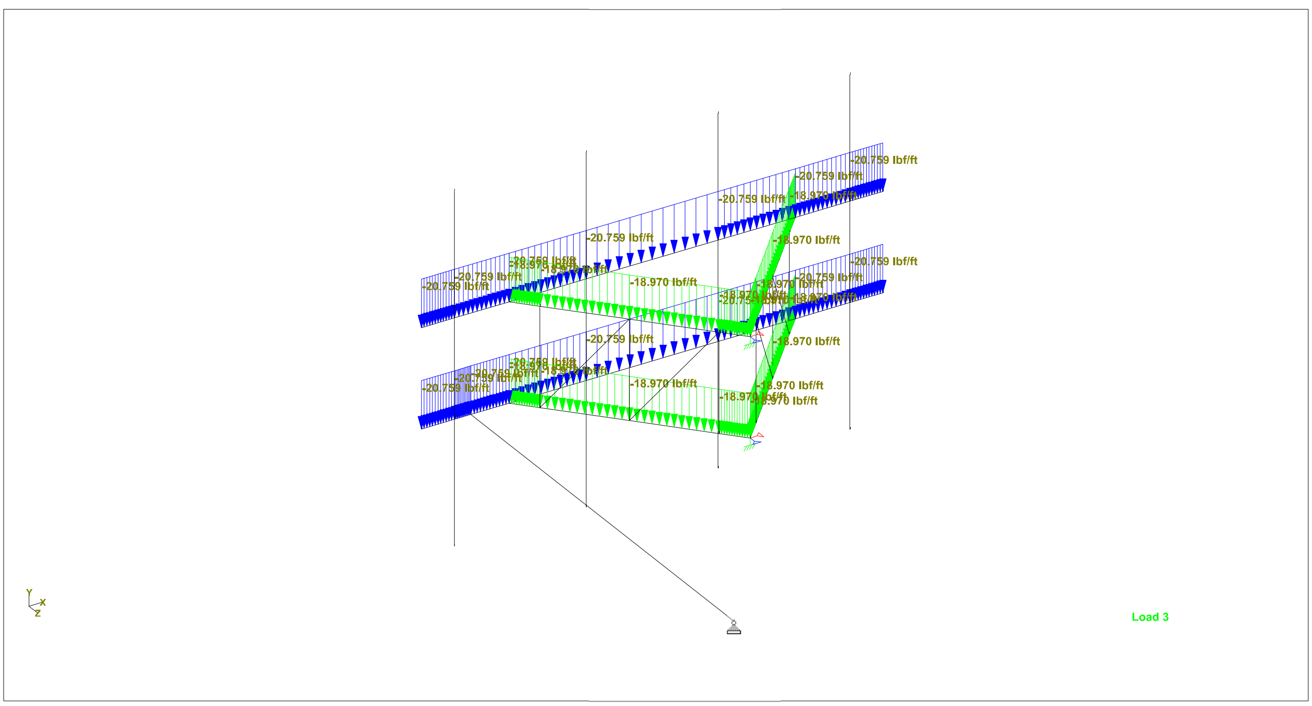
Number	Name	Type
1	SELFWEIGHT FRAME	None
2	ANTENNA WEIGHT (DL)	None
3	ICE WEIGHT - FRAME (IL)	None
4	ICE WEIGHT - ANTENNA (IL)	None
5	WIND LOAD - FRAME (WL)	None
6	WIND LOAD - ANTENNA (WL)	None
7	WIND ON ICE - FRAME (WLI)	None
8	WIND ON ICE - ANTENNA (WLI)	None
9	MAINTENANCE LOAD - ANTENNA PIPE	None
10	MAINTENANCE - FRAME PIPE (LM)	None
11	SERVICE LOAD - FRAME (WM)	None
12	SERVICE LOAD - ANTENNA (WM)	None

Combination Load Cases

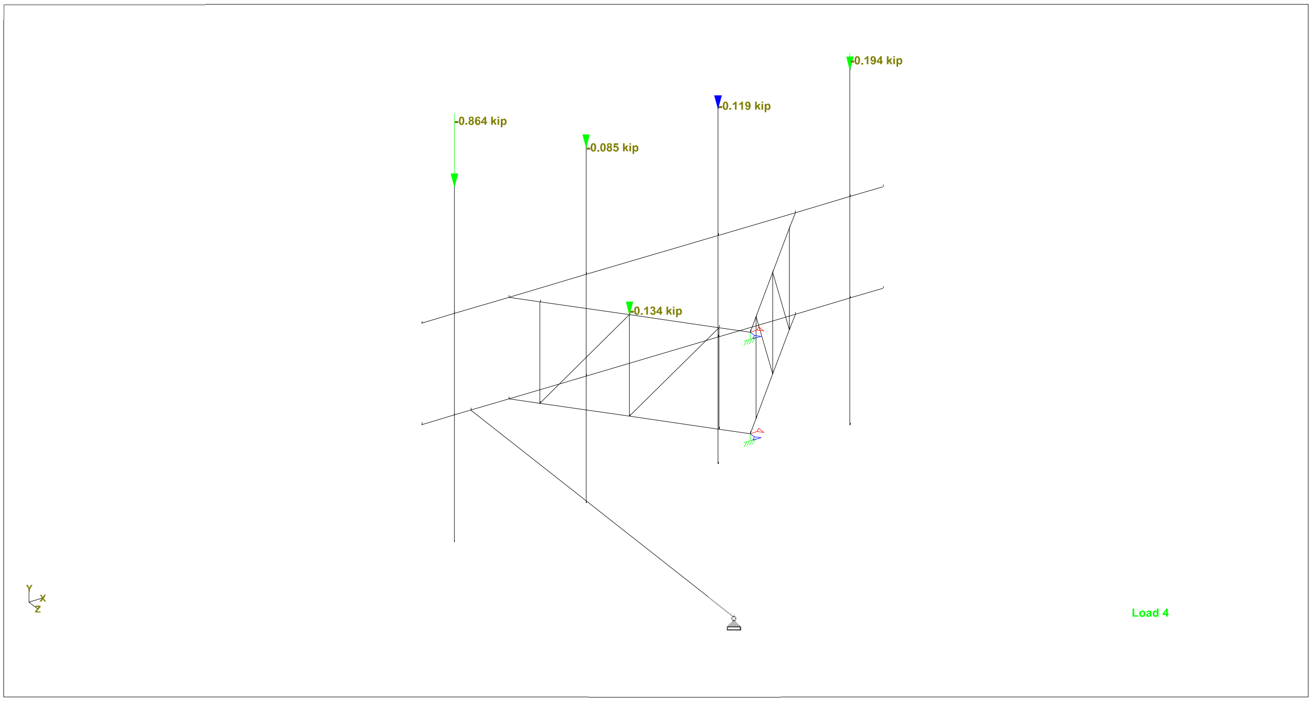
Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
13	COMBINATION LOAD CASE 13	1	SELFWEIGHT FRAME	1.20
		2	ANTENNA WEIGHT (DL)	1.20
		5	WIND LOAD - FRAME (WL)	1.00
		6	WIND LOAD - ANTENNA (WL)	1.00
14	COMBINATION LOAD CASE 14	1	SELFWEIGHT FRAME	0.90
		2	ANTENNA WEIGHT (DL)	0.90
		5	WIND LOAD - FRAME (WL)	1.00
		6	WIND LOAD - ANTENNA (WL)	1.00
15	COMBINATION LOAD CASE 15	1	SELFWEIGHT FRAME	1.20
		2	ANTENNA WEIGHT (DL)	1.20
		3	ICE WEIGHT - FRAME (IL)	1.00
		4	ICE WEIGHT - ANTENNA (IL)	1.00
		7	WIND ON ICE - FRAME (WLI)	1.00
		8	WIND ON ICE - ANTENNA (WLI)	1.00
16	COMBINATION LOAD CASE 16	1	SELFWEIGHT FRAME	1.40
		2	ANTENNA WEIGHT (DL)	1.40
17	COMBINATION LOAD CASE 17	1	SELFWEIGHT FRAME	1.20
		2	ANTENNA WEIGHT (DL)	1.20
		9	MAINTENANCE LOAD - ANTENNA PIPE (	1.50
		11	SERVICE LOAD - FRAME (WM)	1.00
18	COMBINATION LOAD CASE 18	1	SELFWEIGHT FRAME	1.20
		2	ANTENNA WEIGHT (DL)	1.20
		10	MAINTENANCE - FRAME PIPE (LM)	1.50



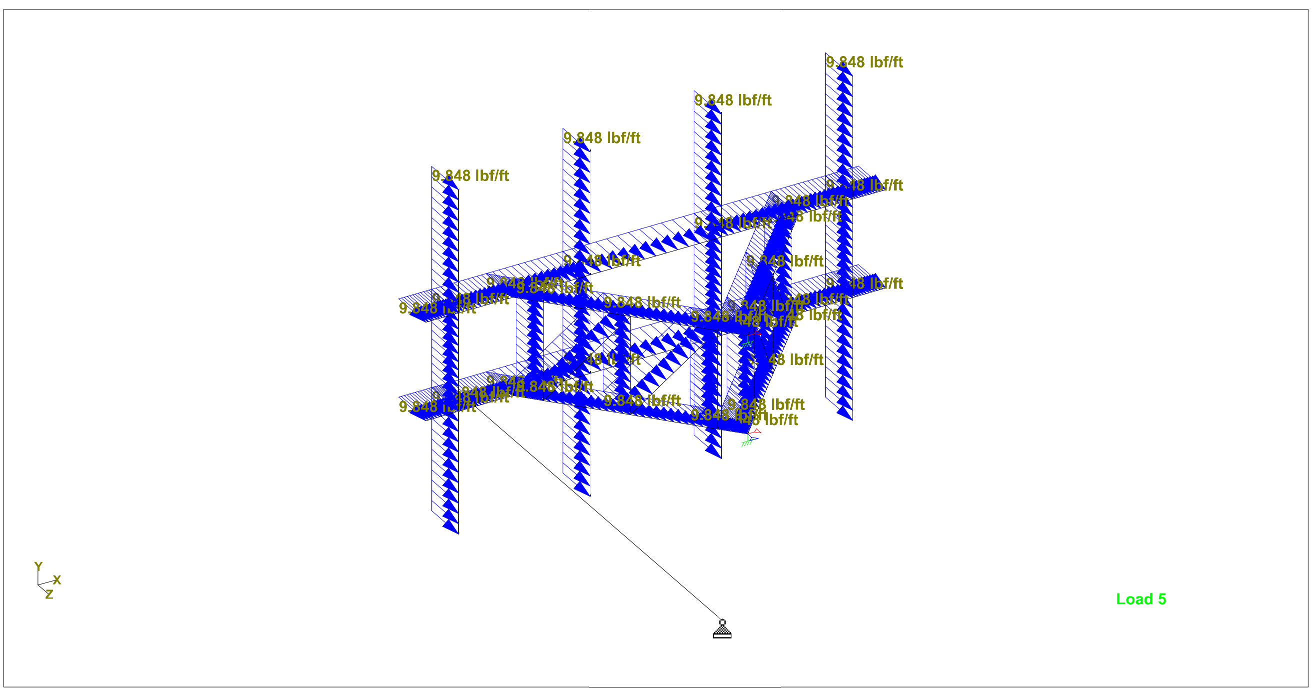
Antenna Weight



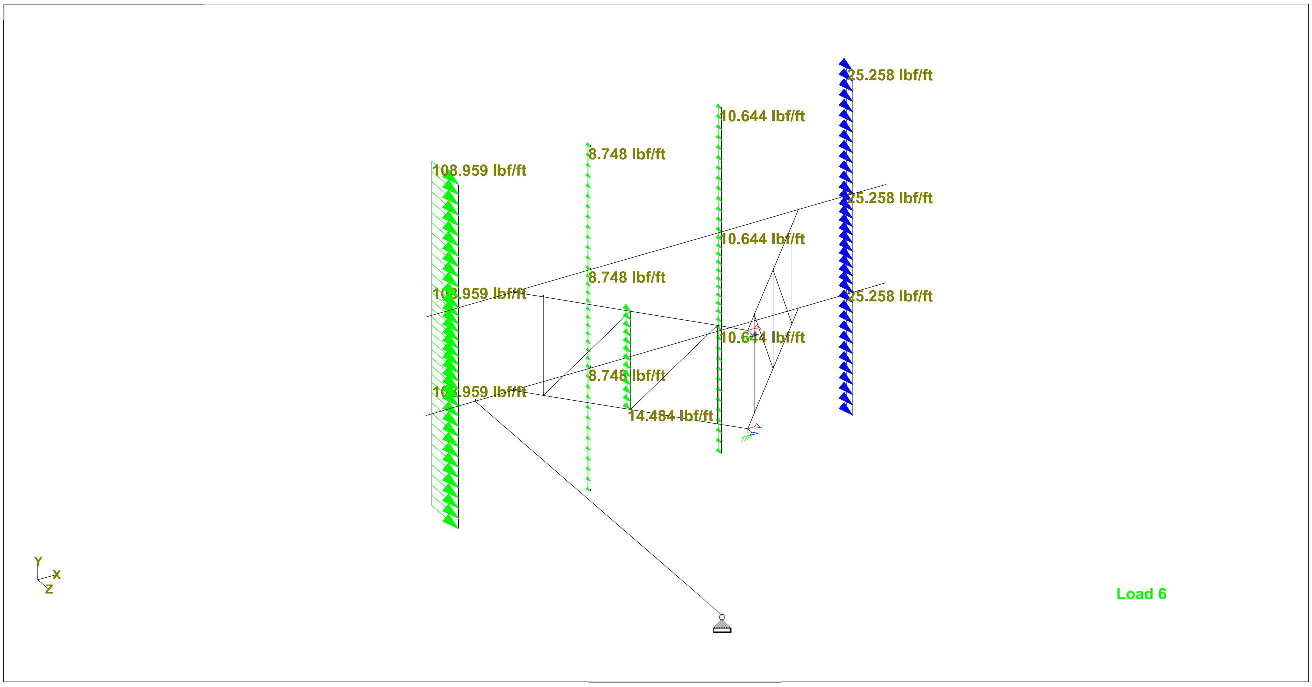
Ice Weight



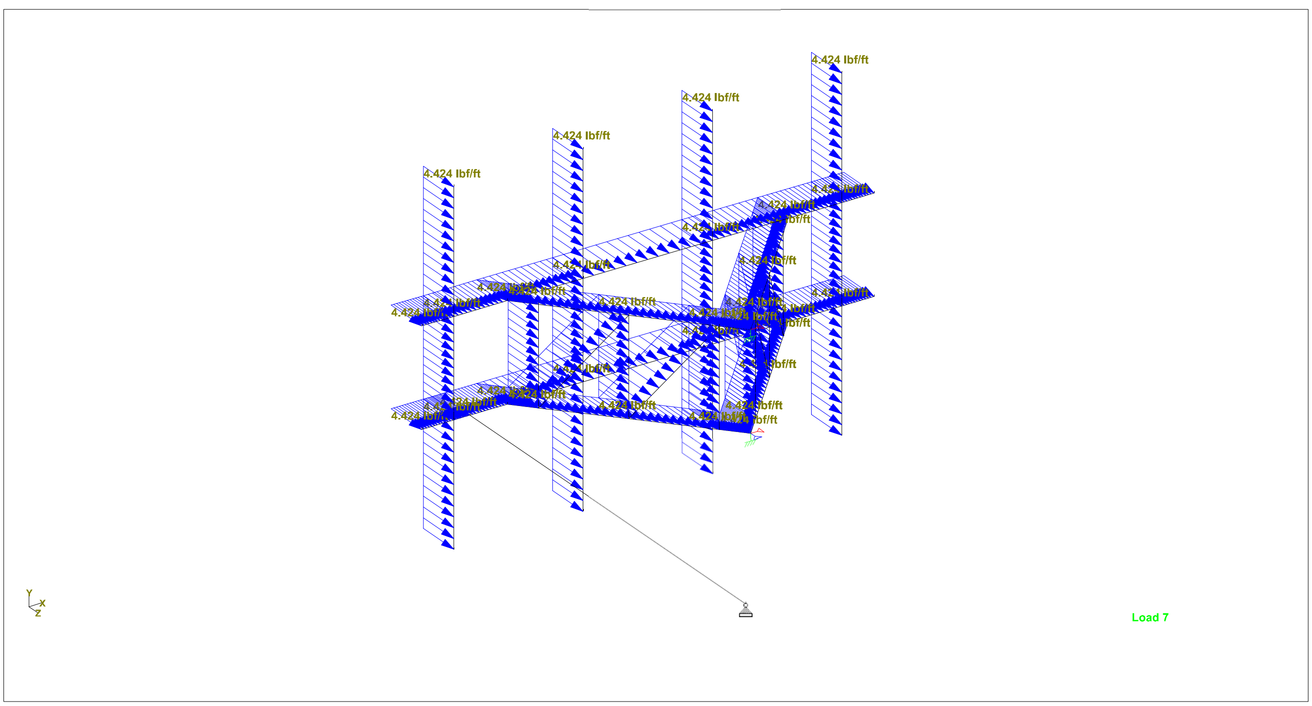
Antenna Ice Weight



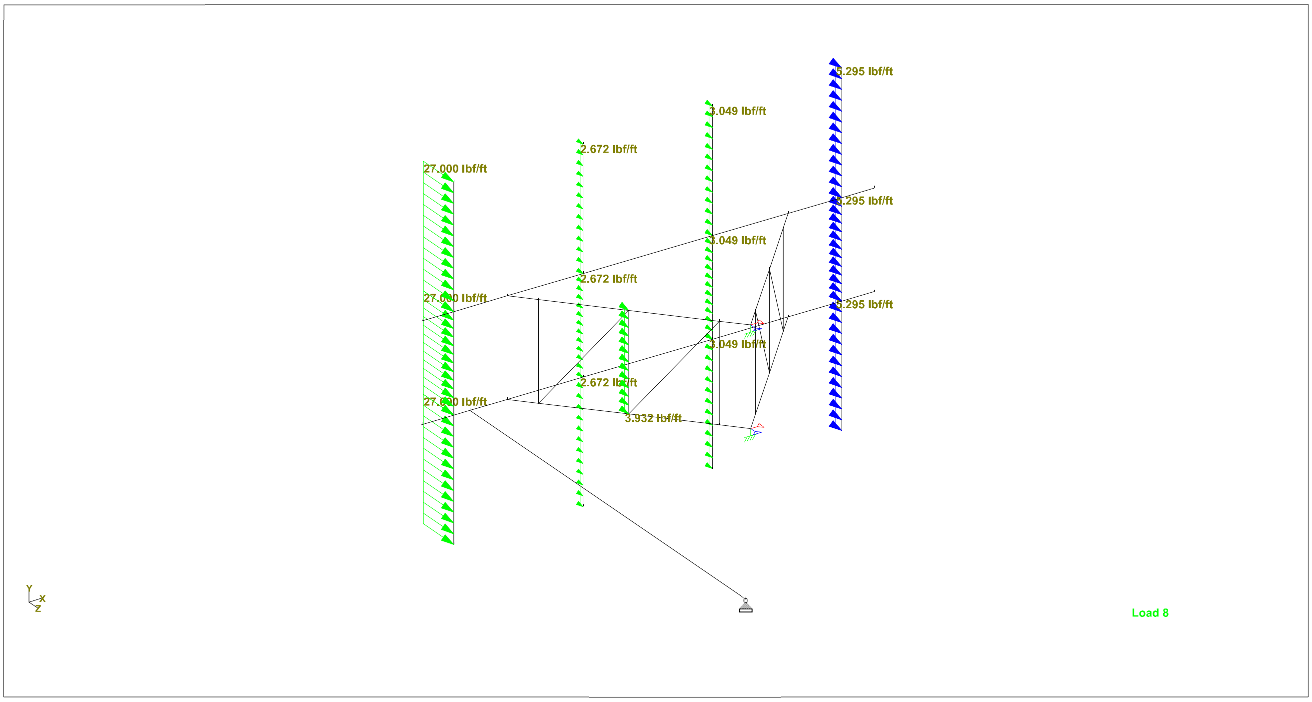
Wind Load



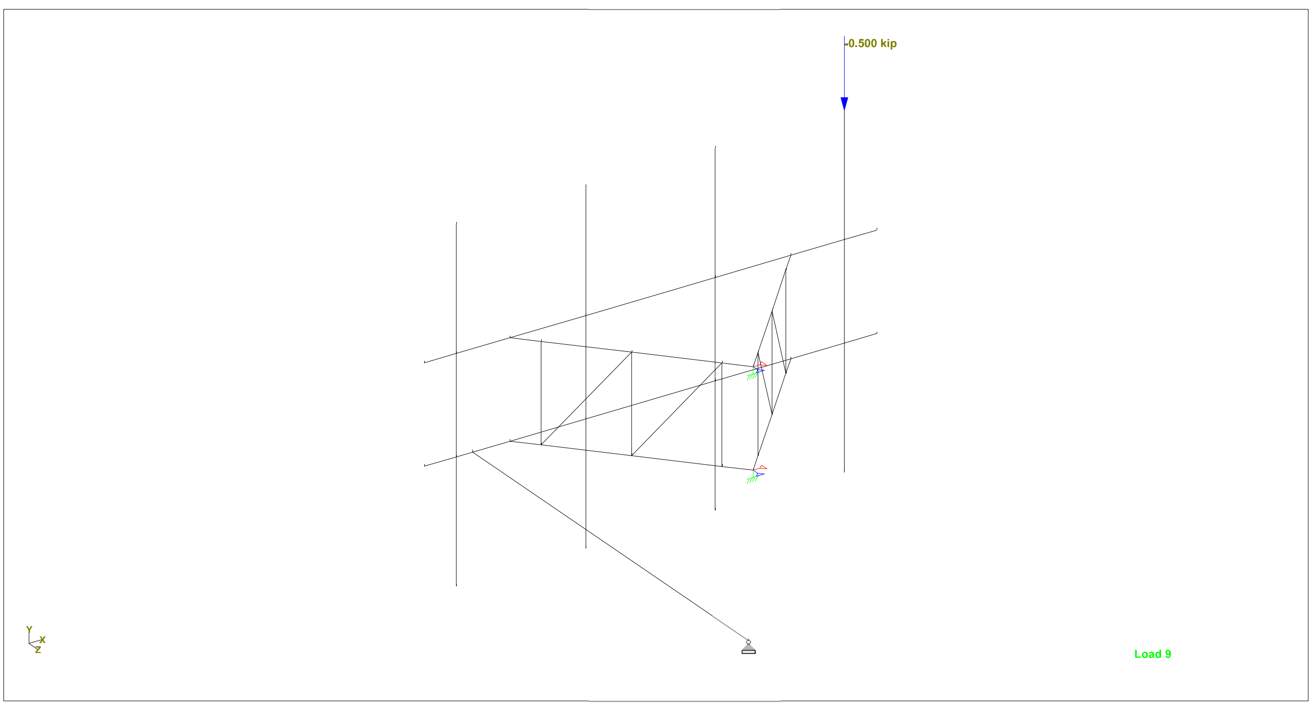
Antenna Wind Load



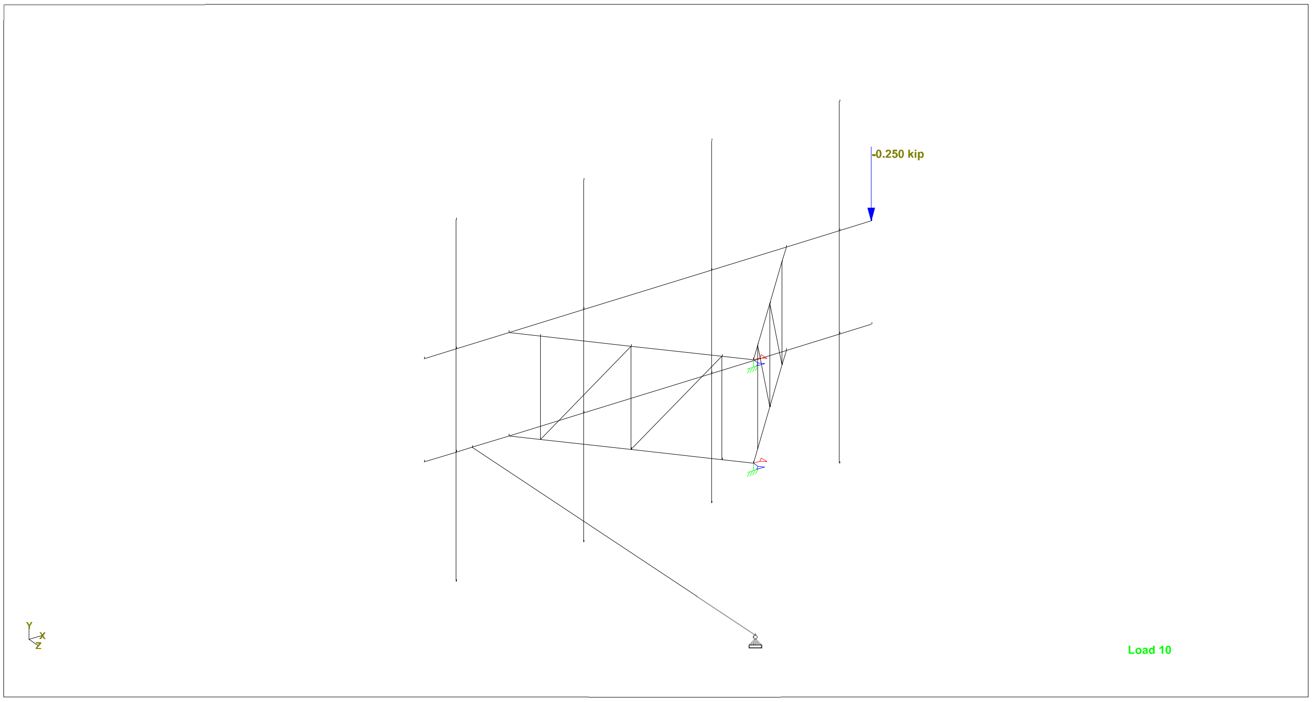
Wind on Ice



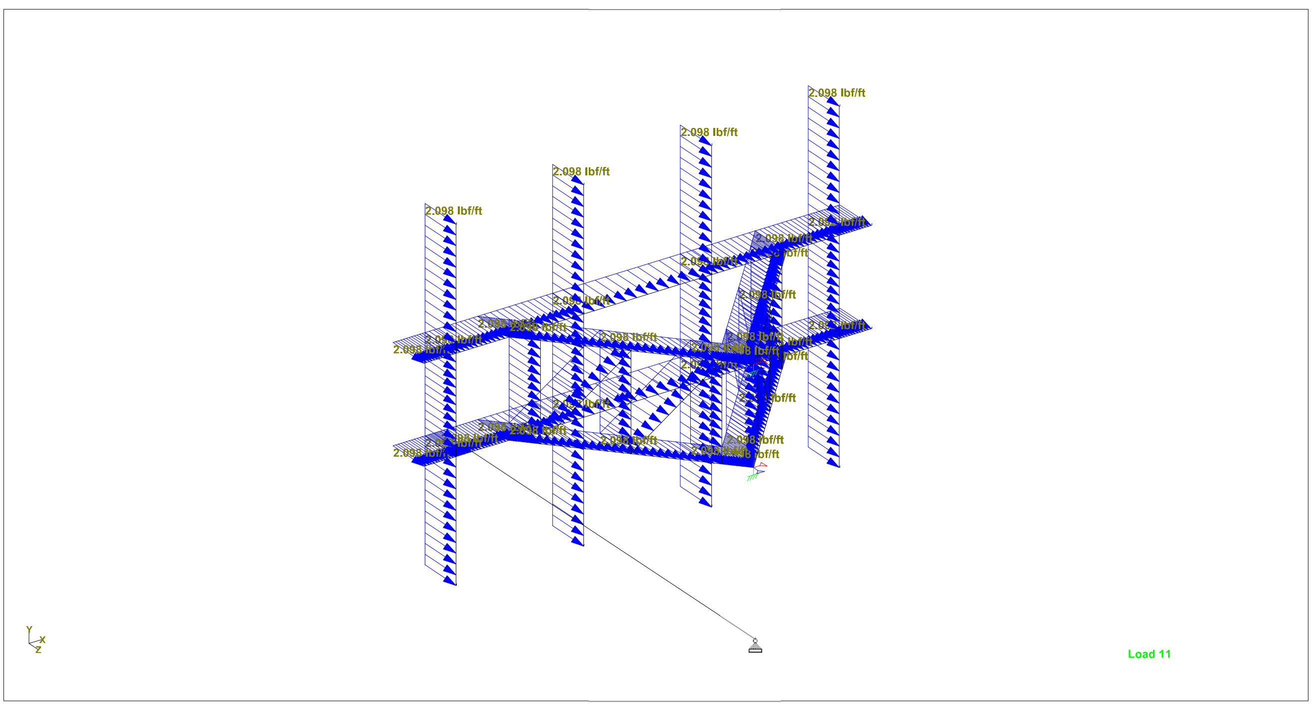
Antenna Wind on Ice



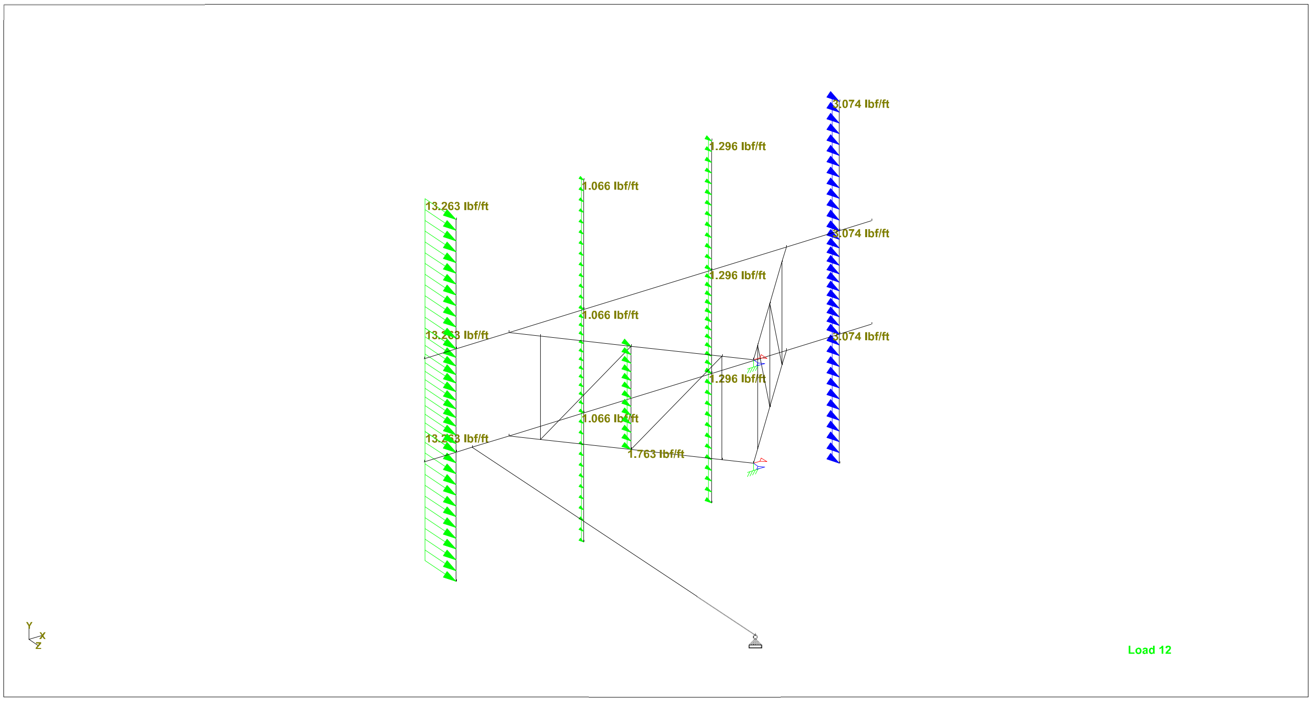
Maintenance Load 1



Maintenance Load 2



Service Load 1



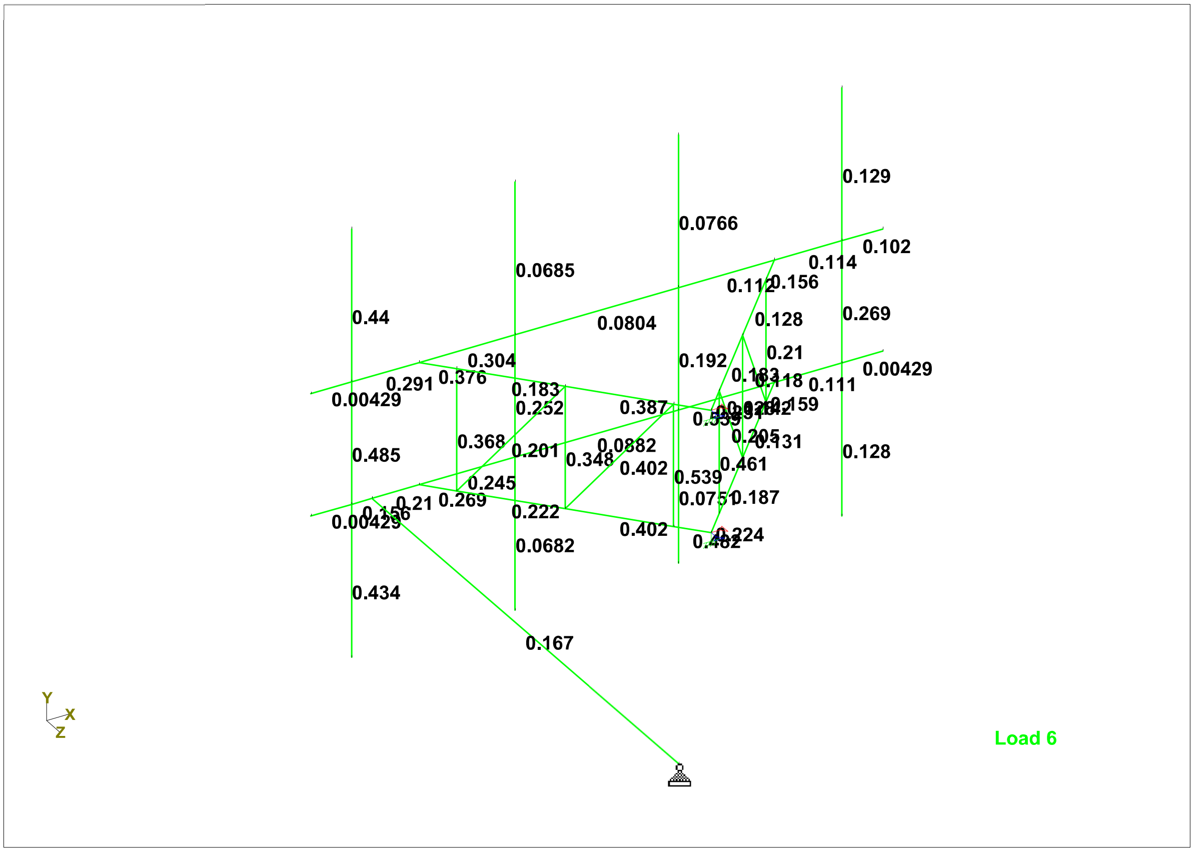
Service Load 2

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (in^2)	Iz (in^4)	Iy (in^4)	Ix (in^4)
1	PIPS25	PIPS25	0.004	1.000	0.004	Eq. H1-1b	15	1.610	1.450	1.450	2.900
2	PIPS25	PIPS25	0.156	1.000	0.156	Eq. H1-1b	15	1.610	1.450	1.450	2.900
3	PIPS25	PIPS25	0.210	1.000	0.210	Eq. H1-1b	15	1.610	1.450	1.450	2.900
4	PIPS25	PIPS25	0.245	1.000	0.245	Eq. H1-1b	15	1.610	1.450	1.450	2.900
5	PIPS25	PIPS25	0.088	1.000	0.088	Eq. H1-1b	13	1.610	1.450	1.450	2.900
6	PIPS25	PIPS25	0.128	1.000	0.128	Eq. H1-1b	17	1.610	1.450	1.450	2.900
7	PIPS25	PIPS25	0.111	1.000	0.111	Eq. H1-1b	17	1.610	1.450	1.450	2.900
8	PIPS25	PIPS25	0.004	1.000	0.004	Eq. H1-1b	15	1.610	1.450	1.450	2.900
9	PIPS25	PIPS25	0.004	1.000	0.004	Eq. H1-1b	15	1.610	1.450	1.450	2.900
10	PIPS25	PIPS25	0.291	1.000	0.291	Eq. H1-1b	13	1.610	1.450	1.450	2.900
11	PIPS25	PIPS25	0.304	1.000	0.304	Eq. H1-1b	13	1.610	1.450	1.450	2.900
12	PIPS25	PIPS25	0.080	1.000	0.080	Eq. H1-1b	13	1.610	1.450	1.450	2.900
13	PIPS25	PIPS25	0.112	1.000	0.112	Eq. H1-1b	17	1.610	1.450	1.450	2.900
14	PIPS25	PIPS25	0.114	1.000	0.114	Eq. H1-1b	17	1.610	1.450	1.450	2.900
15	PIPS25	PIPS25	0.102	1.000	0.102	Eq. H1-1b	18	1.610	1.450	1.450	2.900
16	PIPS20	PIPS20	0.440	1.000	0.440	Eq. H1-1b	13	1.020	0.627	0.627	1.254
17	PIPS20	PIPS20	0.485	1.000	0.485	Eq. H1-1b	15	1.020	0.627	0.627	1.254
18	PIPS20	PIPS20	0.434	1.000	0.434	Eq. H1-1b	13	1.020	0.627	0.627	1.254
19	PIPS20	PIPS20	0.167	1.000	0.167	Eq. H1-1b	13	1.020	0.627	0.627	1.254
20	PIPS20	PIPS20	0.068	1.000	0.068	Eq. H1-1b	13	1.020	0.627	0.627	1.254
21	PIPS20	PIPS20	0.252	1.000	0.252	Eq. H1-1b	13	1.020	0.627	0.627	1.254

Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (in^2)	Iz (in^4)	Iy (in^4)	Ix (in^4)
22	PIPS20	PIPS20	0.068	1.000	0.068	Eq. H1-1b	13	1.020	0.627	0.627	1.254
23	PIPS20	PIPS20	0.077	1.000	0.077	Eq. H1-1b	13	1.020	0.627	0.627	1.254
24	PIPS20	PIPS20	0.192	1.000	0.192	Eq. H1-1b	13	1.020	0.627	0.627	1.254
25	PIPS20	PIPS20	0.075	1.000	0.075	Eq. H1-1b	13	1.020	0.627	0.627	1.254
26	PIPS20	PIPS20	0.129	1.000	0.129	Eq. H1-1b	13	1.020	0.627	0.627	1.254
27	PIPS20	PIPS20	0.269	1.000	0.269	Eq. H1-1b	17	1.020	0.627	0.627	1.254
28	PIPS20	PIPS20	0.128	1.000	0.128	Eq. H1-1b	13	1.020	0.627	0.627	1.254
29	PIPS20	PIPS20	0.269	1.000	0.269	Eq. H1-1b	15	1.020	0.627	0.627	1.254
30	PIPS20	PIPS20	0.222	1.000	0.222	Eq. H1-1b	15	1.020	0.627	0.627	1.254
31	PIPS20	PIPS20	0.402	1.000	0.402	Eq. H1-1b	15	1.020	0.627	0.627	1.254
32	PIPS20	PIPS20	0.482	1.000	0.482	Eq. H1-1b	15	1.020	0.627	0.627	1.254
33	PIPS20	PIPS20	0.224	1.000	0.224	Eq. H1-1b	17	1.020	0.627	0.627	1.254
34	PIPS20	PIPS20	0.187	1.000	0.187	Eq. H1-1b	17	1.020	0.627	0.627	1.254
35	PIPS20	PIPS20	0.131	1.000	0.131	Eq. H1-1b	17	1.020	0.627	0.627	1.254
36	PIPS20	PIPS20	0.159	1.000	0.159	Eq. H1-1b	17	1.020	0.627	0.627	1.254
37	PIPS20	PIPS20	0.376	1.000	0.376	Eq. H1-1b	13	1.020	0.627	0.627	1.254
38	PIPS20	PIPS20	0.183	1.000	0.183	Eq. H1-1b	15	1.020	0.627	0.627	1.254
39	PIPS20	PIPS20	0.387	1.000	0.387	Eq. H1-1b	15	1.020	0.627	0.627	1.254
40	PIPS20	PIPS20	0.539	1.000	0.539	Eq. H1-1b	15	1.020	0.627	0.627	1.254
41	PIPS20	PIPS20	0.251	1.000	0.251	Eq. H1-1b	17	1.020	0.627	0.627	1.254
42	PIPS20	PIPS20	0.183	1.000	0.183	Eq. H1-1b	17	1.020	0.627	0.627	1.254
43	PIPS20	PIPS20	0.128	1.000	0.128	Eq. H1-1b	17	1.020	0.627	0.627	1.254
44	PIPS20	PIPS20	0.156	1.000	0.156	Eq. H1-1b	17	1.020	0.627	0.627	1.254
45	PIPS10	PIPS10	0.368	1.000	0.368	Eq. H1-1b	15	0.469	0.083	0.083	0.166
46	PIPS10	PIPS10	0.201	1.000	0.201	Eq. H1-1b	15	0.469	0.083	0.083	0.166
47	PIPS10	PIPS10	0.348	1.000	0.348	Eq. H1-1a	15	0.469	0.083	0.083	0.166
48	PIPS10	PIPS10	0.402	1.000	0.402	Eq. H1-1a	15	0.469	0.083	0.083	0.166
49	PIPS10	PIPS10	0.539	1.000	0.539	Eq. H1-1b	15	0.469	0.083	0.083	0.166
50	PIPS10	PIPS10	0.461	1.000	0.461	Eq. H1-1b	15	0.469	0.083	0.083	0.166
51	PIPS10	PIPS10	0.205	1.000	0.205	Eq. H1-1b	15	0.469	0.083	0.083	0.166
52	PIPS10	PIPS10	0.142	1.000	0.142	Eq. H1-2	15	0.469	0.083	0.083	0.166
53	PIPS10	PIPS10	0.118	1.000	0.118	Eq. H1-1b	17	0.469	0.083	0.083	0.166
54	PIPS10	PIPS10	0.210	1.000	0.210	Eq. H1-1b	17	0.469	0.083	0.083	0.166



Utility Ratio

Failed Members

There is no data of this type.

BSAMNT-SBS-2-2

Side-By-Side Mounting Kit to mount two antennas on a pipe with 2.375 - 4.5 inch (60 – 115 mm) diameter

- 4x4 MIMO capability at both UMTS and LTE band for faster data throughput
- Ensures consistent distance between the antennas for each site (2 inches / 50mm)
- Forces both antennas to point to the same boresight direction

General Specifications

Application	Outdoor
Includes	Brackets | Hardware
Package Quantity	1

Mechanical Specifications

Color	Silver
Material Type	Galvanized steel

Dimensions

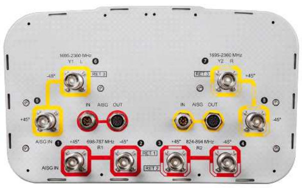
Compatible Diameter, maximum	115.0 mm | 4.5 in
Compatible Diameter, minimum	60.0 mm | 2.4 in
Net Weight	30.6 kg | 67.4 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

COMMSCOPE®

JAHH-65B-R3B



8-port sector antenna, 2x 698–787, 2x 824-894 and 4x 1695–2360 MHz, 65° HPBW, 3x RET and low bands have diplexers. Internal SBT's on first LB (Port 1) and first HB(Port 5).

- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- One RET for 700MHz, one RET for 850MHz, and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO
- Internal filter on low band and interleaved dipole technology providing for attractive, low wind load mechanical package
- Separate RS-485 RET input/output for low and high band

Electrical Specifications

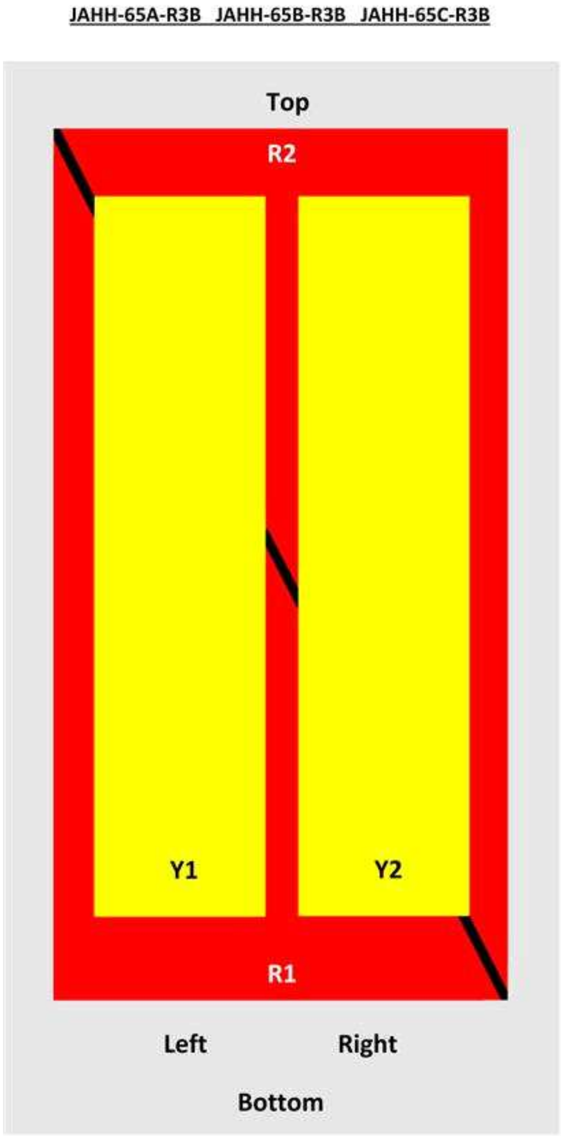
Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	14.5	15.8	18.0	18.4	18.5	18.8
Beamwidth, Horizontal, degrees	67	65	63	63	65	68
Beamwidth, Vertical, degrees	12.4	10.5	5.7	5.2	4.9	4.4
Beam Tilt, degrees	2–14	2–14	0–10	0–10	0–10	0–10
USLS (First Lobe), dB	18	18	20	20	21	23
Front-to-Back Ratio at 180°, dB	32	34	31	35	36	38
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port at 50°C, maximum, watts	200	200	300	300	300	250
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.3	14.9	17.6	18.1	18.2	18.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.5	±0.6	±0.4	±0.5	±0.6
Gain by Beam Tilt, average, dBi	2 ° | 14.3 8 ° | 14.3 14 ° | 14.3	2 ° | 15.0 8 ° | 14.9 14 ° | 15.4	0 ° | 17.2 5 ° | 17.6 10 ° | 17.6	0 ° | 17.6 5 ° | 18.2 10 ° | 18.2	0 ° | 17.7 5 ° | 18.3 10 ° | 18.3	0 ° | 17.9 5 ° | 18.7 10 ° | 18.7
Beamwidth, Horizontal Tolerance, degrees	±1.2	±1.4	±4	±2.4	±2.9	±2.7
Beamwidth, Vertical Tolerance, degrees	±0.9	±0.5	±0.3	±0.2	±0.3	±0.1
USLS, beampeak to 20° above beampeak, dB	18	17	17	18	19	18
Front-to-Back Total Power at 180° ± 30°, dB	25	24	26	29	27	29
CPR at Boresight, dB	22	23	20	21	21	24
CPR at Sector, dB	11	12	11	11	11	8

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Array Layout



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-798	1-2	1	ANxxxxxxxxxxxxxxxx1
R2	824-894	3-4	2	ANxxxxxxxxxxxxxxxx2
Y1	1695-2360	5-6	3	ANxxxxxxxxxxxxxxxx3
Y2	1695-2360	7-8		

View from the front of the antenna

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

General Specifications

Operating Frequency Band 1695 – 2360 MHz | 698 – 787 MHz | 824 – 894 MHz

Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4
RF Connector Interface	4.3-10 Female
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	301.0 N @ 150 km/h 67.7 lbf @ 150 km/h
Wind Loading, lateral	254.0 N @ 150 km/h 57.1 lbf @ 150 km/h
Wind Loading, maximum	638.0 N @ 150 km/h 143.4 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1828.0 mm | 72.0 in
Width	350.0 mm | 13.8 in
Depth	208.0 mm | 8.2 in
Net Weight, without mounting kit	28.7 kg | 63.3 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 5
Internal RET	High band (1) | Low band (2)
Power Consumption, idle state, maximum	2 W
Power Consumption, normal conditions, maximum	13 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

Packed Dimensions

Length	1975.0 mm | 77.8 in
Width	456.0 mm | 18.0 in
Depth	357.0 mm | 14.1 in
Shipping Weight	42.0 kg | 92.6 lb

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

Included Products

BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

SAMSUNG

Dual-Band Radio Unit 700/850MHz (B13/B5)

RFV01U-D2A

Samsung's RFV01U-D2A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.

The RFV01U-D2A RU targets dual-band support across Band 13 (700MHz) and Band 5 (850MHz), making it an ideal product for broad coverage footprints across multiple common low-end, long-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B13: DL(746-756MHz)/UL(777-787MHz)
B5: DL(869-894MHz)/UL(824-849MHz)
Instantaneous Bandwidth: 10MHz(B13) + 25MHz(B5)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 207mm (29.9L) 14.96" x 14.96" x 8.14"
Weight: 31.9kg
Input Power: -48V DC
Operating Temp.: -40 - 55°(w/o solar load)
Cooling: Natural convection

SAMSUNG

Dual-Band Radio Unit
AWS/PCS (B66/B2)

RFV01U-D1A

Samsung's RFV01U-D1A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.

The RFV01U-D1A RU targets dual-band support across Band 66 (AWS) and Band 2 (PCS), making it an ideal product for broad coverage footprints across multiple common mid-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation
- Built-in Broadcast Auxiliary Services (BAS) filter ensures compliant AWS operation without impacting footprint

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B66: DL(2,110-2,180MHz)/UL(1,710-1,780MHz)
B2: DL(1,930-1,990MHz)/UL(1,850-1,910MHz)
Instantaneous Bandwidth:
70MHz(B66) + 60MHz(B2)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 255mm (36.8L)
Weight: 38.3kg
Input Power: -48V DC
Operating Temp.: -40 - 55°(w/o solar load)
Cooling: Natural convection

Specifications

The table below outlines the main specifications of the RRH.

Table 1. Specifications

Item	RT4401-48A
Air Technology	LTE
Band	Band 48 (3.5 GHz)
Operating Frequency (MHz)	3550 to 3700
RF Chain	4TX/4RX
Input Power	-48 V DC (-38 to -57 V DC, 1 SKU), with clip-on AC-DC converter (Option)
Dimension (W × D × H) (mm)	8.55 in. (217.4) × 4.15 in. (105.5) × 13.91 in. (353.5) * RRH only 11.39 in. (289.4) × 5.45 in. (138.5) × 16.16 in. (410.5) * with Clip-on antenna, AC-DC power unit
Cooling	Natural convection
Unwanted Emission	3GPP 36.104 Category A
	[B48]: FCC 47 CFR 96.41 e)
Spectrum Analyzer	TX/RX Support
Antenna Type	Integrated (Clip-on) antenna (Option), External antenna (Option)
Operating Humidity	5 to 100 [%] (RH), condensing, not to exceed 30 g/m^3 absolute humidity
Altitude	-60 to 1,800 m
Earthquake	Telcordia Earthquake Risk Zone4 (Telcordia GR-63-CORE)
Vibration in Use Transportation Vibration	Office Vibration Transportation Vibration
Noise	Fanless (natural convection cooling)
Wind Resistance	Telcordia GR-487-CORE, Section 3.34
EMC	FCC Title 47, CFR Part 96
Safety	UL 60950-1 2nd ED

Item	RT4401-48A
	UL 62368-1 UL 60950-22
RF	FCC Title 47, CFR Part 96

The table below outlines the AC/DC power unit specifications of the RRH system.

[CBRS] Clip-on Antenna Specifications

VzW accepted IP45 in FLD, but IP55 is Samsung Spec.

Items	Clip-on Antenna, BASTA**
Antenna Gain	12.5 ± 0.5 dBi (Max 13 dBi)
Horizontal BW (-3dB)	65° ± 5°
Vertical BW (-3dB)	17° ±3°
Electrical Tilt	8° (fixed) ±2°
Front-to-Back Ratio	> 25 dB
Port-to-Port Tracking	< 3 dB
VSWR	< 1.5
Isolation	> 25 dB
Ingress Protection	**IP55**
Size	220(W)×313(H)×34.3(D) mm (*) (8.7 x 12.3 x 1.4 inch.)
Weight	< **2.0** kg [Typ. 1.3 kg]
It is required that the radio should be weatherproofed properly with JMA WPS Boot with external antenna or with Weatherproof Boot for clip-on antennas.	

Antenna includes integrated cable with connector
* Design is subject to minor change

** Ant. spec. follows NGMN recommendations on Base Station Antenna Standards (BASTA). For example, 'mean ± tolerance of 86.6%' is applied to double-sided specification of statistical RF parameters.

ATTACHMENT 6


345.26
880
64
1.77 Ac
TC 9550
STATE OF CT
STATE OF CT
62
63
41.50
234.49
245.34
SHERWOOD ISLAND CONNECTOR
STATE OF CT
STATE OF CT
61
10.73 Ac
TC 9245

Property Location POST RD E | Map ID F09/ / 063/000 / | Bldg Name | State Use 435
Vision ID 100302 | Account # 29409 | Bldg # 1 | Sec # 1 of 1 | Card # 1 of 1 | Print Date 8/2/2020 1:34:58 PM

CURRENT OWNER

CONNECTICUT STATE OF
CELL TOWER/WALGREENS
30 TRINITY ST

HARTFORD CT 06106

1

TOPO	UTILITIES	STRT / ROAD	LOCATION

SUPPLEMENTAL DATA

Alt Prcl ID	53184	Lift Hse
Historic ID		
Census		
WestportC		
Survey Ma		
Survey Ma		
GIS ID	F09063000	Assoc Pid#

CURRENT ASSESSMENT

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

6158

WESTPORT, CT

VISION

RECORD OF OWNERSHIP

RECORD OF OWNERSHIP	BK-VOL/PAGE		SALE DATE	Q/U	V/I	SALE PRICE	VC
CONNECTICUT STATE OF	0000	0000	10-01-2005	U	I	0	

PREVIOUS ASSESSMENTS (HISTORY)

Year	Code	Assessed	Year	Code	Assessed V	Year	Code	Assessed
2019	4-2	700	2018	4-2	700	2017	4-2	700
	4-3	688,800		4-3	688,800		4-3	688,800
	Total	689500		Total	689500		Total	689500

EXEMPTIONS

Year	Code	Description	Amount
		Total	0.00

OTHER ASSESSMENTS

Code	Description	Number	Amount	Comm Int

This signature acknowledges a visit by a Data Collector or Assessor

APPRAISED VALUE SUMMARY

Appraised Bldg. Value (Card)	1,000
Appraised Xf (B) Value (Bldg)	0
Appraised Ob (B) Value (Bldg)	984,000
Appraised Land Value (Bldg)	0
Special Land Value	0
Total Appraised Parcel Value	985,000
Valuation Method	I
Total Appraised Parcel Value	985,000

ASSESSING NEIGHBORHOOD

Nbhd	Sub	Nbhd Name	B	Tracing	Batch
0001	A				

NOTES

CELL TOWER BEHIND THE WALGREENS AT
880 POST RD E
3 CELL SITES
TOWER VALUE= 2000 X 12=24000 X .75=18000
FKA LIST #14621
18000/.11=163,600 X 3=490,800

BUILDING PERMIT RECORD

Permit Id	Issue Date	Type	Description	Amount	Insp Date	% Comp	Date Comp	Comments

VISIT / CHANGE HISTORY

Date	Id	Type	Is	Cd	Purpost/Result
05-13-2010	J			11	QC - Check/Field Review

LAND LINE VALUATION SECTION

B	Use Code	Description	Zone	Land Type	Land Units		Unit Price	Size Adj	Site Index	Cond.	Nbhd.	Nbhd. Adj	Notes	Location Adjustment		Adj Unit P	Land Value
1	435	Cell Site Vac Lnd	GBD		0	SF	0	1.00000	C	1.00		1.000			0.0000		0
		Total Card Land Units			0	SF	Parcel Total Land Area			0.0000				Total Land Value			0

Property Location POST RD E | Map ID F09/ / 063/000 / | Bldg Name | State Use 435
Vision ID 100302 | Account # 29409 | Bldg # 1 | Sec # 1 of 1 | Card # 1 of 1 | Print Date 8/2/2020 1:34:59 PM

CONSTRUCTION DETAIL

Element	Cd	Description
Style:	99	Vacant Land
Model	00	Vacant
Grade:		
Stories:		
Occupancy		
Exterior Wall 1		
Exterior Wall 2		
Roof Structure:		
Roof Cover		
Interior Wall 1		
Interior Wall 2		
Interior Flr 1		
Interior Flr 2		
Heat Fuel		
Heat Type:		
AC Type:		
Total Bedrooms		
Total Bthrms:		
Total Half Baths		
Total Xtra Fixtrs		
Total Rooms:		
Bath Style:		
Kitchen Style:		
Kitchens		
Whirlpool Tubs		
Hot Tubs		
Sauna (SF Area		
Fin Basement		
Fin Bsmt Qual		
Bsmt. Garages		
Interior Cond		
Fireplaces		
Ceiling Height		

CONSTRUCTION DETAIL (CONTINUED)

Element	Cd	Description
Fireplaces		
Ceiling Height		
Elevator		

CONDO DATA

Parcel Id		C		Owne	
		B		S	

Adjust Type	Code	Description	Factor%
Condo Flr			
Condo Unit			

COST / MARKET VALUATION

Building Value New	0
Year Built	0
Effective Year Built	
Depreciation Code	
Remodel Rating	
Year Remodeled	
Depreciation %	0
Functional Obsol	0
External Obsol	0
Trend Factor	1
Condition	
Condition %	100
Percent Good	
Cns Sect Rcnld	0
Dep % Ovr	
Dep Ovr Comment	
Misc Imp Ovr	
Misc Imp Ovr Comment	
Cost to Cure Ovr	
Cost to Cure Ovr Comment	

No Sketch

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

Code	Descript	Sub	Sub Ty	L/B	Units	Unit Pric	Yr Blt	Cond. C	% Gd	Grade	Grade A	Appr. V
CELL	Cell on	TW		L	3	328000.	2010		100	00	1.00	984,00

BUILDING SUB-AREA SUMMARY SECTION

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

ATTACHMENT 7

UNITED STATES POSTAL SERVICE ®

WESTPORT CT

Certificate of Mailing — Firm

Name and Address of Sender	TOTAL NO. of Pieces Listed by Sender	TOTAL NO. of Pieces Received at Post Office™	Affix Stamp Here *Postmark with Date of Receipt.*
Kenneth C. Baldwin, Esquire Robinson & Cole, LLP 280 Trumbull Street Hartford, CT 06103	2	2	neopost 08/12/2020 US POSTAGE $002.84º ZIP 06103 041L12203937
	Postmaster, per *(name of receiving employee)* V.P.		

USPS® Tracking Number Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)	Postage	Fee	Special Handling	Parcel Airlift
1.	James Marpe, First Selectman Town of Westport 110 Myrtle Avenue Westport, CT 06880				
2.	Mary Young, Planning & Zoning Director Town of Westport 110 Myrtle Avenue Westport, CT 06880				
3.					
4.					
5.					
6.					

OLD STATE HOUSE STATION
AUG 12 2020
06103 USPS

See Reverse for Instructions