Robinson+Cole

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Also admitted in Massachusetts

December 18, 2019

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**
366 Old Long Ridge Road, Stamford, Connecticut

Dear Attorney Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 98-foot level on the existing 152-foot tower at 366 Old Long Ridge Road in Stamford, Connecticut (the "Property"). The tower and Property are owned by the Long Ridge Fire Company ("LRFC"). The Siting Council approved Cellco's use of the LRFC tower in 2015 (TS-VER-135-150112). A copy of the Council's tower share approval is included in Attachment 1.

Cellco now intends to modify its facility by replacing all of its existing antennas with twelve (12) new antennas, remove three (3) existing remote radio heads ("RRHs"), and install nine (9) new RRHs and install six (6) HYBRIFLEX™ fiber optic antenna cables. A set of project plans showing the proposed facility modifications and specifications for Cellco's antennas, RRHs and antenna cables 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 Stamford's Mayor, David Martin; Ralph Blessing, Stamford's Land Use Bureau Chief/Director of Planning and Zoning; and LRFC, the owner of the Property and tower.

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 tower. Cellco's replacement antennas and RRHs will be installed at a centerline height of 98 feet on the 152-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 antennas 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. Far Field Approximation tables for each of Cellco's operating frequencies, for the modified facility are included in Attachment 3. These tables demonstrate that Cellco's modified facility will comply with RF emissions standards established by the FCC.

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 the antenna mounting brackets can support Cellco's proposed equipment modifications. (*See* Structural Opinion Letter and Structural Analysis Report included in Attachment 4).

A copy of the parcel map and Property owner information is included in Attachment 5. A Certificate of Mailing verifying that this filing was sent to municipal officials and the Property owner is included in Attachment 6.

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:
David Martin, Stamford Mayor
Ralph Blessing, Land Use Bureau Chief/Director of Planning and Zoning
Long Ridge Fire Company
Tim Parks

ATTACHMENT 1

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

February 20, 2015

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

RE: **TS-VER-135-150112** - Cellco Partnership d/b/a Verizon Wireless request for an order to approve tower sharing at an existing telecommunications facility located at 366 Old Long Ridge Road, Stamford, Connecticut.

Dear Attorney Baldwin:

At a public meeting held on February 19, 2015, the Connecticut Siting Council (Council) ruled that the shared use of this existing tower site is technically, legally, environmentally, and economically feasible and meets public safety concerns, and therefore, in compliance with General Statutes § 16-50aa, the Council has ordered the shared use of this facility to avoid the unnecessary proliferation of tower structures with the following conditions:

- The tower shall be reinforced per the URS Corporation report dated June 13, 2013, and Nextel's equipment at 118-foot level of the tower shall be removed as referenced in the structural analysis report prepared by URS Corporation dated October 31, 2014 and stamped by Richard Sambor, prior to the installation of Cellco's equipment;
- Within 45 days following completion of the equipment installation, Cellco shall provide documentation certified by a professional engineer that its installation complied with the recommendations included in the Structural Analysis Report prepared by URS Corp. dated October 31, 2014 and stamped by Richard Sambor;
- Any deviation from the proposed installation as specified in the original tower share request and supporting materials with the Council shall render this decision invalid;
- Any material changes to the proposed installation as specified in the original tower share request and supporting materials filed with the Council shall require an explicit request for modification to the Council pursuant to Connecticut General Statutes § 16-50aa, including all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65;
- Not less than 45 days after completion of the proposed installation, the Council shall be notified in writing that the installation has been completed;
- Any nonfunctioning antenna and associated antenna mounting equipment on this facility owned and operated by Cellco shall be removed within 60 days of the date the antenna ceased to function;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration.

This decision is under the exclusive jurisdiction of the Council and applies only to this request for tower sharing dated January 12, 2015. This facility has been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower. Any deviation from the approved tower sharing request is enforceable under the provisions of Connecticut General Statutes § 16-50u.

The proposed shared use is to be implemented as specified in your letter dated January 12, 2015, including the placement of all necessary equipment and shelters within the tower compound.

Please be advised that the validity of this action shall expire one year from the date of this letter.

Thank you for your attention and cooperation.

Very truly yours,

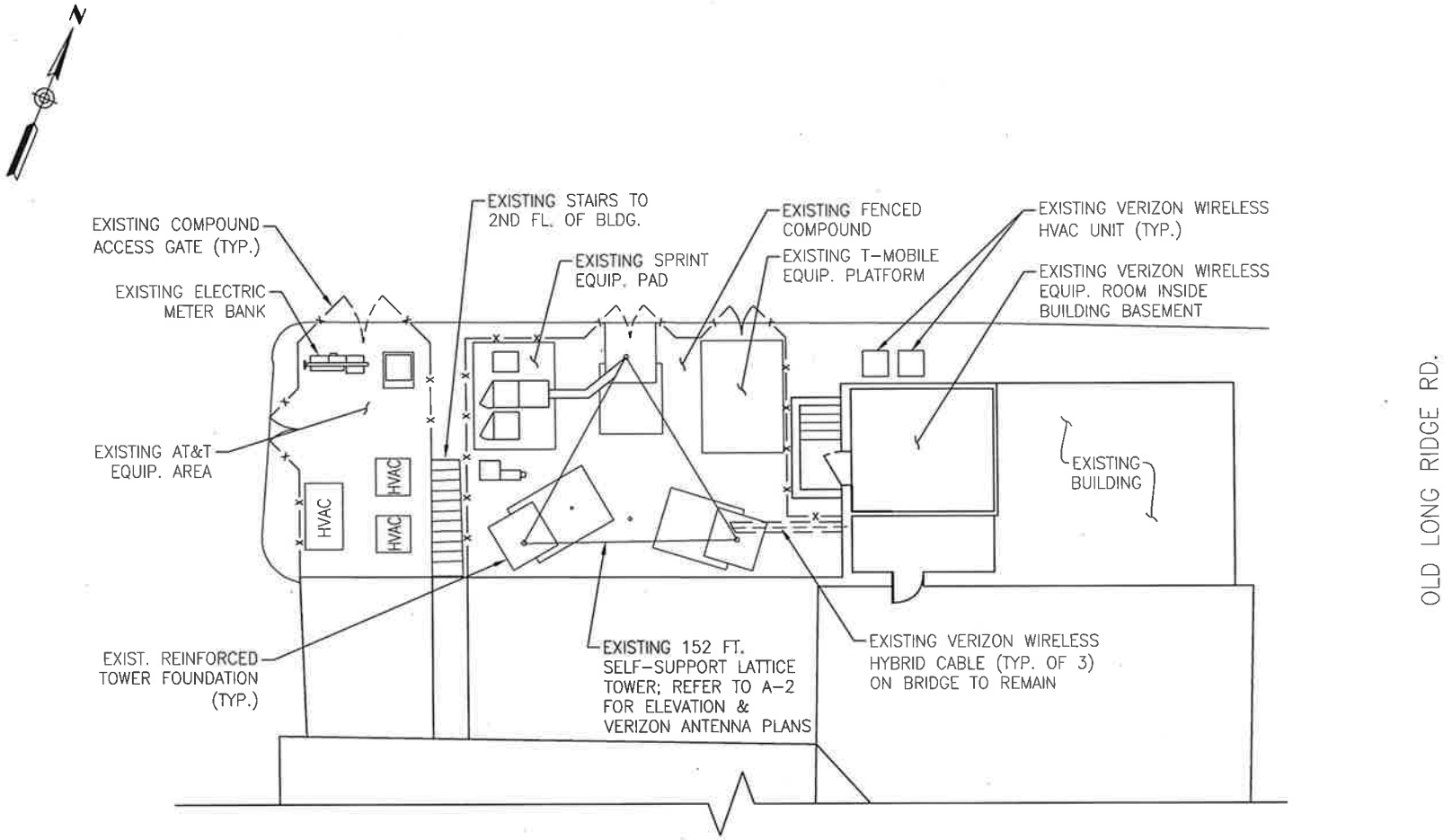
Robert Stein

Robert Stein
Chairman

RS/MP/lm

c: The Honorable David Martin, Mayor, City of Stamford
Norman Cole, AICP, Land Use Bureau Chief, City of Stamford
Stuart Teitelbaum, Chief, Long Ridge Fire Company

ATTACHMENT 2



NOTES:
1. SITE LAYOUT IS BASED EXISTING DRAWINGS ON FILE WITH THE CT SITING COUNCIL AND A LIMITED DESIGN VISIT ON 7-31-19 FOR A PROPOSED ANTENNA MODIFICATION. A SITE SURVEY WAS NOT PERFORMED.
2. PLANS ARE DIAGRAMMATIC ONLY AND NOT TO BE SCALED.
3. REFER TO STRUCTURAL ANALYSIS UNDER SEPARATE COVER.

1 **SITE LAYOUT**
Scale: 1/16" = 1'-0"

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. WEIMPHIL · NO. 22144 · LICENSED PROFESSIONAL ENGINEER

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

SUBMITTALS

NO.	DATE	DESCRIPTION
0	08/23/19	REVIEW

DRAWN BY:	MF
CHECKED BY:	DW

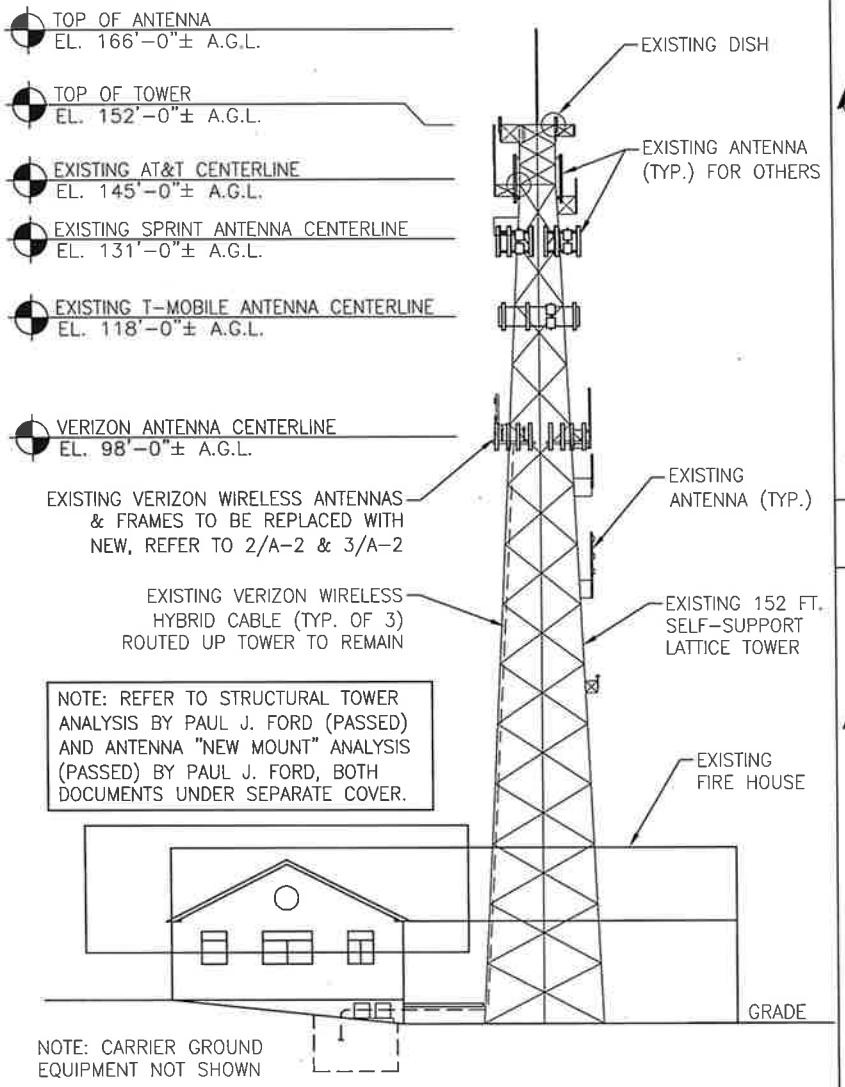
PROJECT NAME:
PCS-850 LTE-CBRS CARRIER ADD/ANTMO CABLE DRAWINGS

SITE NAME:
STAMFORD NW CT

SITE ADDRESS:
LONG RIDGE FIRE DEPT.
366 OLD LONG RIDGE RD.
STAMFORD, CT 06903

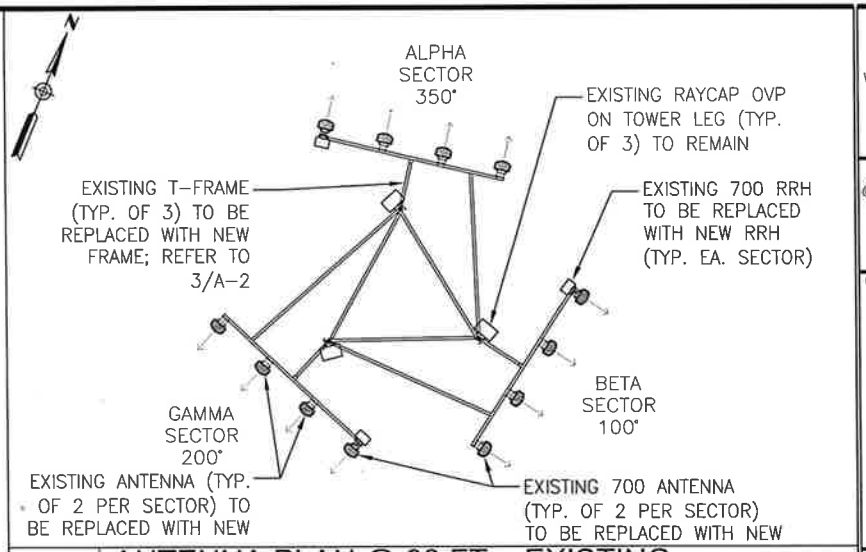
SHEET TITLE
SITE LAYOUT

SHEET NUMBER:
A-1



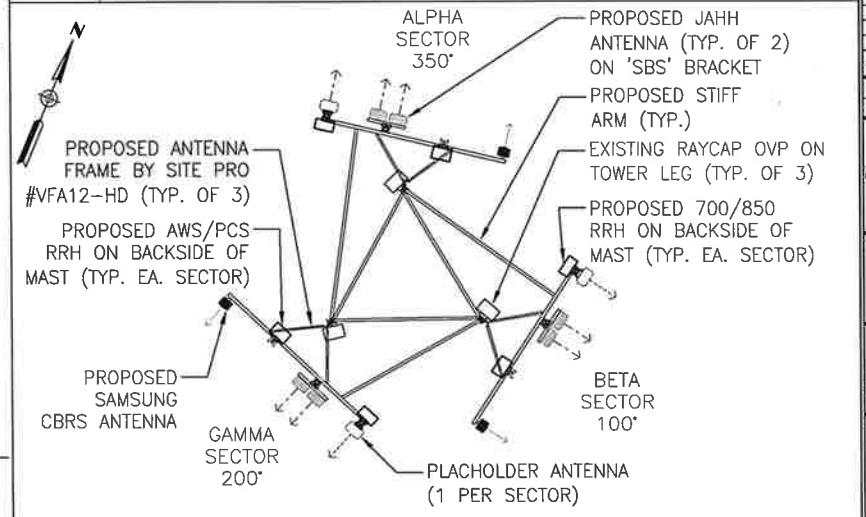
1 NORTH ELEVATION

Scale: NTS



2 ANTENNA PLAN @ 98 FT. - EXISTING

SCALE: 1/8" = 1'-0"



3 ANTENNA PLAN @ 98 FT. - PROPOSED

SCALE: 1/8" = 1'-0"

verizon

WIRELESS COMMUNICATIONS FACILITY

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WALLINGFORD, CT 06492

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

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

SUBMITTALS

#	10.25.19	REVIEW

NO	DATE	DESCRIPTION

DRAWN BY:	MF
CHECKED BY:	DW

PROJECT NAME:
PCS-850 LTE-CBRS CARRIER ADD/ANTMO CABLE DRAWINGS

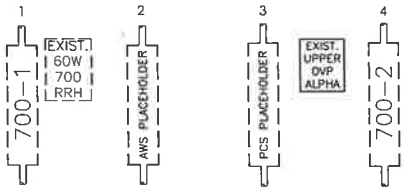
SITE NAME:
STAMFORD NW CT

SITE ADDRESS:
LONG RIDGE FIRE DEPT.
366 OLD LONG RIDGE RD.
STAMFORD, CT 06903

SHEET TITLE:
NORTH ELEVATION & ANTENNA PLANS

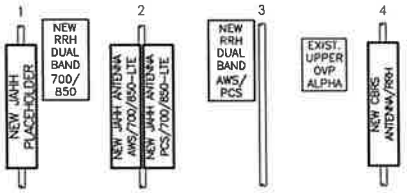
SHEET NUMBER:
A-2

EXISTING - ALPHA



(VIEWED FROM REAR)

PROPOSED - ALPHA



(VIEWED FROM REAR)

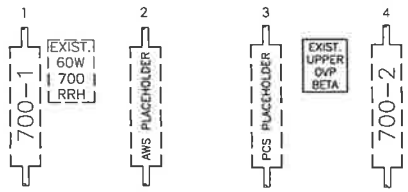
SECTOR: ALPHA				
POSITION	EXISTING ANTENNA	PROPOSED - SEE NOTE 6		
		ANTENNA	RRH	OVP
1	700-1	JAHH PLACEHOLDER SEE NOTE 1	700/850 DUAL BAND; SEE NOTE 4	-
2	AWS PLACEHOLDER	NEW JAHH SEE NOTE 2	-	EXIST. UPPER OVP TO REMAIN
3	PCS PLACEHOLDER	NEW JAHH SEE NOTE 3	AWS/PCS DUAL BAND; SEE NOTE 5	-
4	700-2	NEW CBRS INTEGRATED	RRH INTEGRATED WITH ANTENNA	-

NOTES:
1. NEW JAHH PLACEHOLDER ANTENNA; VERIFY WITH VERIZON WIRELESS
2. NEW JAHH ON 'SBS' BRACKET AT POS. 2; DO NOT INSTALL ANY RRH's ON POS. 2 MAST
3. NEW JAHH LOCATE AT POS. 2 WITH OTHER JAHH ANTENNA; USE POS. 3 MAST FOR RRH SUPPORT
4. NEW DUAL BAND 700/850 RRH TO REPLACE EXIST. 700 RRH ON BACKSIDE OF POS. 1 MAST; SEE 3/A-2
5. NEW DUAL BAND AWS/PCS RRH TO BE MOUNTED ON BACKSIDE OF POS. 3 MAST; SEE 3/A-2
6. EXISTING SECTOR FRAME TO BE REPLACED WITH NEW; REFER TO 3/A-2

1 ANTENNA SECTOR CONFIGURATIONS - ALPHA

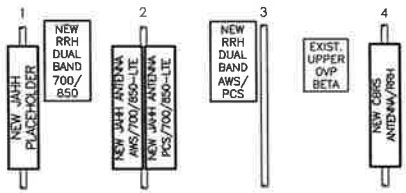
Scale: N.T.S.

EXISTING - BETA



(VIEWED FROM REAR)

PROPOSED - BETA



(VIEWED FROM REAR)

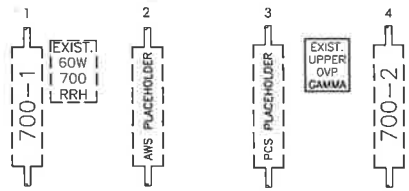
SECTOR: BETA				
POSITION	EXISTING ANTENNA	PROPOSED - SEE NOTE 6		
		ANTENNA	RRH	OVP
1	700-1	JAHH PLACEHOLDER SEE NOTE 1	700/850 DUAL BAND; SEE NOTE 4	-
2	AWS PLACEHOLDER	NEW JAHH SEE NOTE 2	-	EXIST. UPPER OVP TO REMAIN
3	PCS PLACEHOLDER	NEW JAHH SEE NOTE 3	AWS/PCS DUAL BAND; SEE NOTE 5	-
4	700-2	NEW CBRS INTEGRATED	RRH INTEGRATED WITH ANTENNA	-

NOTES:
1. NEW JAHH PLACEHOLDER ANTENNA; VERIFY WITH VERIZON WIRELESS
2. NEW JAHH ON 'SBS' BRACKET AT POS. 2; DO NOT INSTALL ANY RRH's ON POS. 2 MAST
3. NEW JAHH LOCATE AT POS. 2 WITH OTHER JAHH ANTENNA; USE POS. 3 MAST FOR RRH SUPPORT
4. NEW DUAL BAND 700/850 RRH TO REPLACE EXIST. 700 RRH ON BACKSIDE OF POS. 1 MAST; SEE 3/A-2
5. NEW DUAL BAND AWS/PCS RRH TO BE MOUNTED ON BACKSIDE OF POS. 3 MAST; SEE 3/A-2
6. EXISTING SECTOR FRAME TO BE REPLACED WITH NEW; REFER TO 3/A-2

2 ANTENNA SECTOR CONFIGURATIONS - BETA

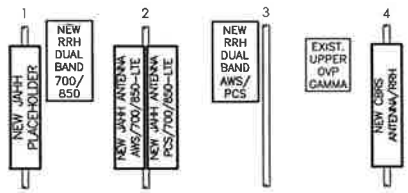
Scale: N.T.S.

EXISTING - GAMMA



(VIEWED FROM REAR)

PROPOSED - GAMMA



(VIEWED FROM REAR)

SECTOR: GAMMA				
POSITION	EXISTING ANTENNA	PROPOSED - SEE NOTE 6		
		ANTENNA	RRH	OVP
1	700-1	JAHH PLACEHOLDER SEE NOTE 1	700/850 DUAL BAND; SEE NOTE 4	-
2	AWS PLACEHOLDER	NEW JAHH SEE NOTE 2	-	EXIST. UPPER OVP TO REMAIN
3	PCS PLACEHOLDER	NEW JAHH SEE NOTE 3	AWS/PCS DUAL BAND; SEE NOTE 5	-
4	700-2	NEW CBRS INTEGRATED	RRH INTEGRATED WITH ANTENNA	-

NOTES:
1. NEW JAHH PLACEHOLDER ANTENNA; VERIFY WITH VERIZON WIRELESS
2. NEW JAHH ON 'SBS' BRACKET AT POS. 2; DO NOT INSTALL ANY RRH's ON POS. 2 MAST
3. NEW JAHH LOCATE AT POS. 2 WITH OTHER JAHH ANTENNA; USE POS. 3 MAST FOR RRH SUPPORT
4. NEW DUAL BAND 700/850 RRH TO REPLACE EXIST. 700 RRH ON BACKSIDE OF POS. 1 MAST; SEE 3/A-2
5. NEW DUAL BAND AWS/PCS RRH TO BE MOUNTED ON BACKSIDE OF POS. 3 MAST; SEE 3/A-2
6. EXISTING SECTOR FRAME TO BE REPLACED WITH NEW; REFER TO 3/A-2

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
Cold Spring, NY 10516
201-456-4624
onair@optonline.net

LICENSURE

STATE OF CONNECTICUT
DAVID A. WEINHAUL
NO. 22144
LICENSED
LICENSED PROFESSIONAL ENGINEER

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

SUBMITTALS

#	DATE	DESCRIPTION

NO	DATE	DESCRIPTION

DRAWN BY: MF
CHECKED BY: DW

PROJECT NAME:
PCS-850 LTE-CBRS CARRIER ADD/ANTMO CABLE DRAWINGS

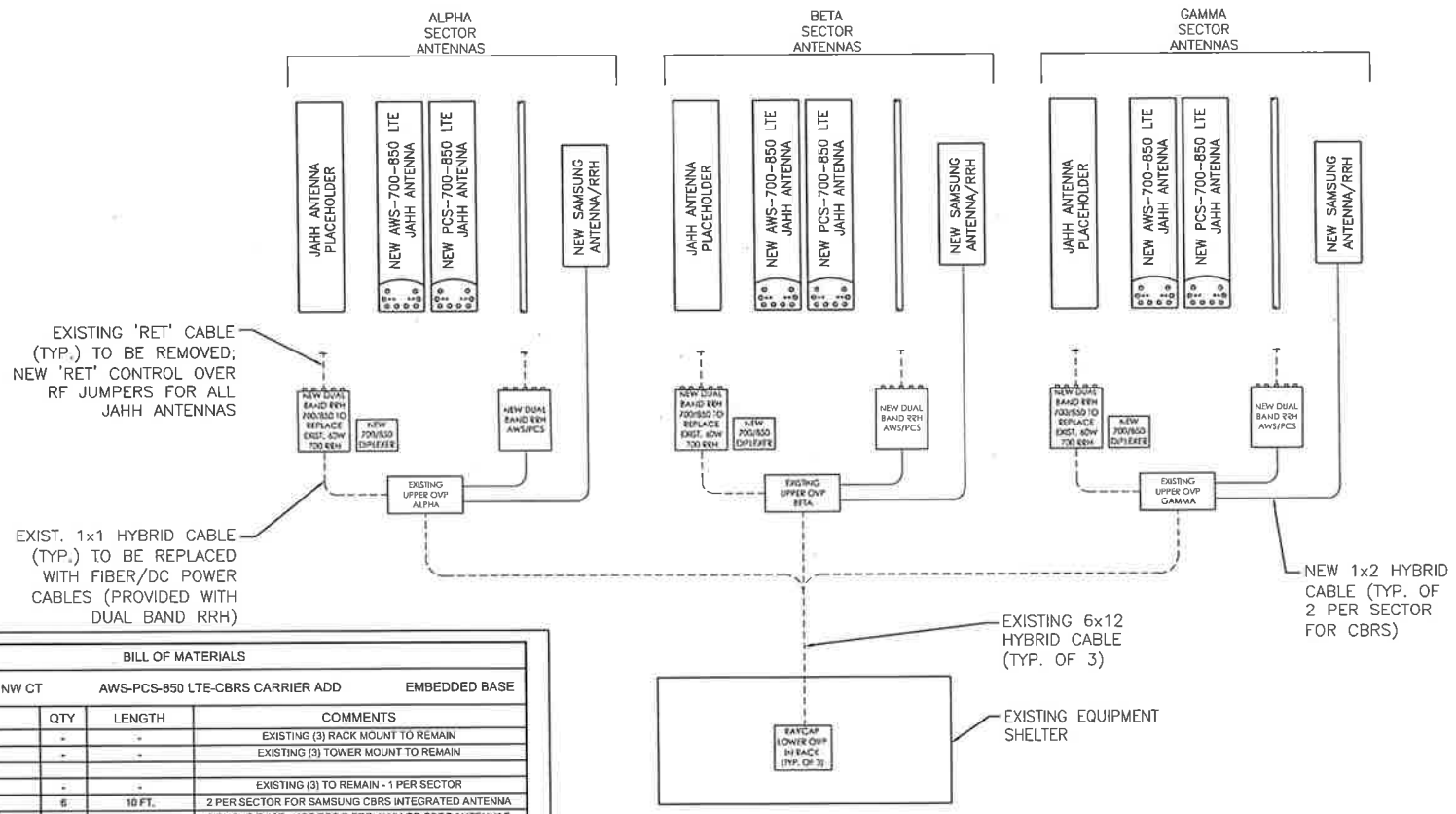
SITE NAME:
STAMFORD NW CT

SITE ADDRESS:
LONG RIDGE FIRE DEPT.
366 OLD LONG RIDGE RD.
STAMFORD, CT 06903

SHEET TITLE:
ANTENNA SECTOR CONFIGURATIONS

SHEET NUMBER:
A-3

NOTE: ALL ANTENNAS VIEWED FROM REAR



BILL OF MATERIALS

SITE NAME: STAMFORD NW CT — AWS-PCS-850 LTE-CBRS CARRIER ADD — EMBEDDED BASE

DESCRIPTION	QTY	LENGTH	COMMENTS
LOWER OVP	-	-	EXISTING (3) RACK MOUNT TO REMAIN
UPPER OVP	-	-	EXISTING (3) TOWER MOUNT TO REMAIN
6x12 HYBRID CABLE	-	-	EXISTING (3) TO REMAIN - 1 PER SECTOR
1x2 HYBRID CABLE	6	10 FT.	2 PER SECTOR FOR SAMSUNG CBRS INTEGRATED ANTENNA
RET CONTROL CABLE	-	-	REMOVE EXIST. NOT REQ'D FOR JAHH OR CBRS ANTENNAS
1/2" JUMPERS	60	6 FT.	(20) PER SECTOR; SEE NOTE 2
700/850 DIPLEXER	3	-	COMMSCOPE CBC78T-DS-43-2x
AWS/PCS DUAL BAND RRH	3	-	SAMSUNG B2/B66A
700/850 DUAL BAND RRH	3	-	SAMSUNG B5/B13; REMOVE EXIST. 700 RRH
CBRS ANTENNA/RRH	3	-	SAMSUNG INTEGRATED
AWS ANTENNA	3	-	NEW JAHH TO REPLACE HBXX PLACEHOLDER
700 ANTENNA	-	-	SHARED WITH JAHH ANTENNAS; EXIST. (6) TO BE REMOVED
1900 ANTENNA	3	-	NEW JAHH TO REPLACE HBXX PLACEHOLDER
PLACEHOLDER ANTENNA	3	-	JAHH - VERIFY WITH RF & CONSTRUCTION
850-LTE ANTENNA	-	-	SHARED WITH JAHH ANTENNAS
SIDE-BY-SIDE MTG. BRACKET	3	-	COMMSCOPE BSAMNT-SBS-2-2

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 700 JUMPERS TO BE REPLACED; LENGTH SHOWN IS AVERAGE; CONTRACTOR TO FIELD FABRICATE JUMPERS TO MINIMUM LENGTHS REQUIRED OR AS DIRECTED BY VERIZON WIRELESS.

1 BILL OF MATERIALS
Scale: N.T.S.

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. RET CABLES SHALL BE ROUTED AND SECURED ON STRUCTURAL MEMBERS ONLY - DO NOT "LOOP" THE CABLES IN MID-AIR BETWEEN ANTENNAS
4. EXISTING JUMPER & 'RET' CABLES NOT SHOWN; NEW DIPLEXER WIRING NOT SHOWN; REFER TO MANUFACTURER SPECIFICATIONS AND RFDS.

2 RF PLUMBING DIAGRAM
Scale: N.T.S.

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

LICENSOR

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

DAVID WEINPAHL, P.E.
CT LIC NO 22144

SUBMITTALS

NO	DATE	DESCRIPTION
0	10.25.19	REVIEW

DRAWN BY:	MF
CHECKED BY:	DW

PROJECT NAME:
PCS-850 LTE-CBRS CARRIER ADD/ANTMO CABLE DRAWINGS

SITE NAME:
STAMFORD NW CT

SITE ADDRESS:
LONG RIDGE FIRE DEPT.
366 OLD LONG RIDGE RD.
STAMFORD, CT 06903

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

SHEET NUMBER:
A-4

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

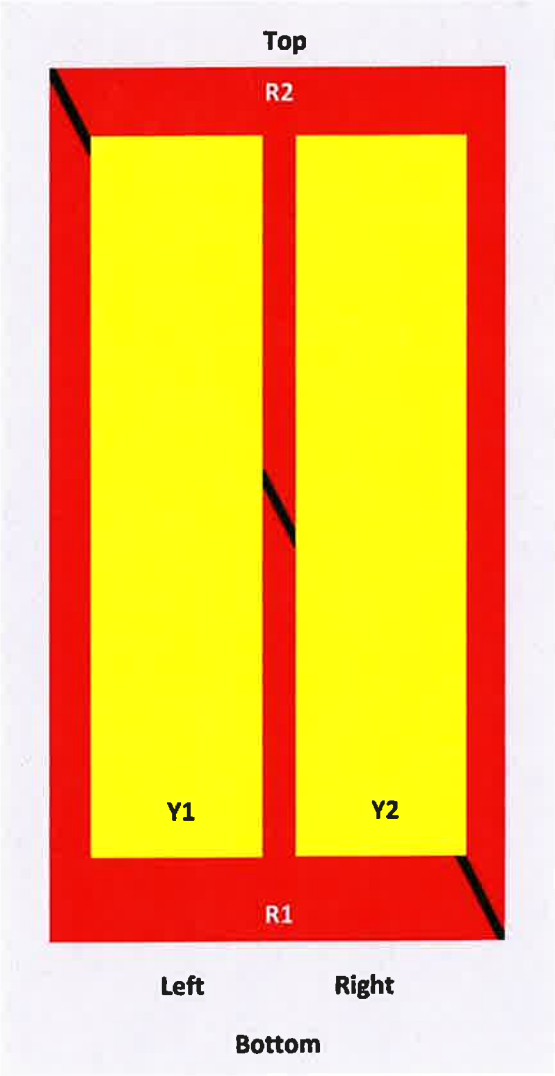
Electrical Specifications, BASTA*

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

JAHH-65A-R3B JAHH-65B-R3B JAHH-65C-R3B



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-798	1-2	1	ANxxxxxxxxxxxxxxx1
R2	824-894	3-4	2	ANxxxxxxxxxxxxxxx2
Y1	1695-2360	5-6	3	ANxxxxxxxxxxxxxxx3
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

JAHH-65B-R3B

Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN

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	143.4 lbf @ 150 km/h | 638.0 N @ 150 km/h
Effective Projected Area (EPA), frontal	0.28 m^2 | 3.01 ft^2
Effective Projected Area (EPA), lateral	0.24 m^2 | 2.58 ft^2
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	29.2 kg | 64.4 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

JAHH-65B-R3B

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	42.5 kg | 93.7 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

[CBRS] Clip-on Antenna Specifications

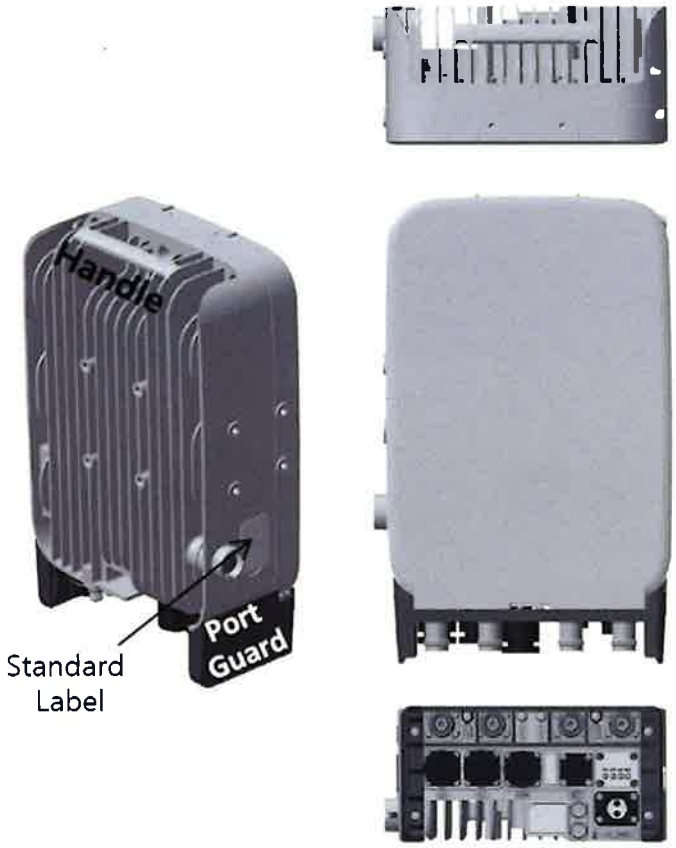
VzW accepted IP45 in FLD, but IP55 is Samsung Spec.

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

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

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

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

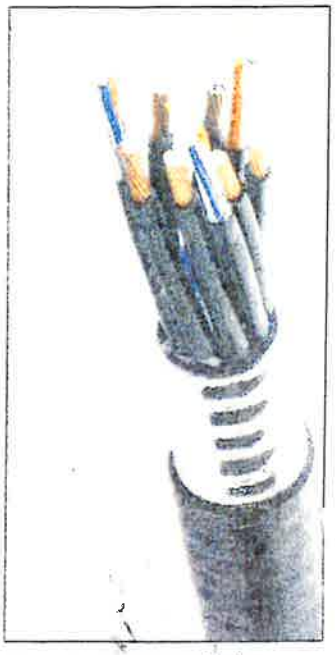


Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environmental			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

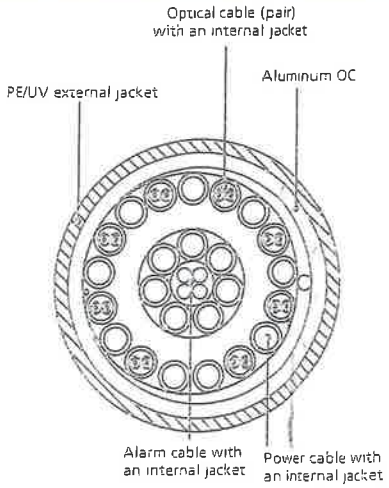


Figure 2: Construction Detail

- This data is provisional and subject to change

ATTACHMENT 3

Far Field Approximation
with downtilt variation

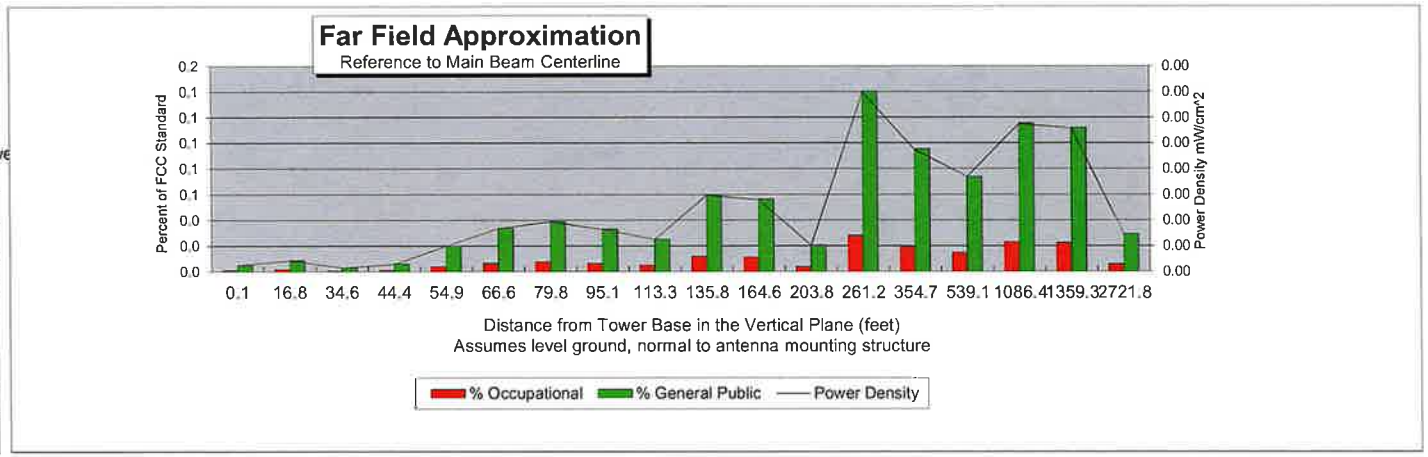
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STAMFORD NW CT
Site #:	
Date:	12/12/19
Name:	Shiva Gadasu
File Name:	STAMFORD NW CT - FF Powe

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**98.0**
Antenna Gain (dBi):	**14.9**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**160.0**
Number of channels:	



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	95.0	96.5	101.1	104.8	109.7	116.0	124.1	134.4	147.9	165.7	190.1	224.9	277.9	367.2	547.4	1090.6	1362.6	2723.5
Distance from Antenna Structure Base in Horizontal plane	0.1	16.8	34.6	44.4	54.9	66.6	79.8	95.1	113.3	135.8	164.6	203.8	261.2	354.7	539.1	1086.4	1359.3	2721.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0

Antenna Type JAHH-65B-R3B
Max% 0.14%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

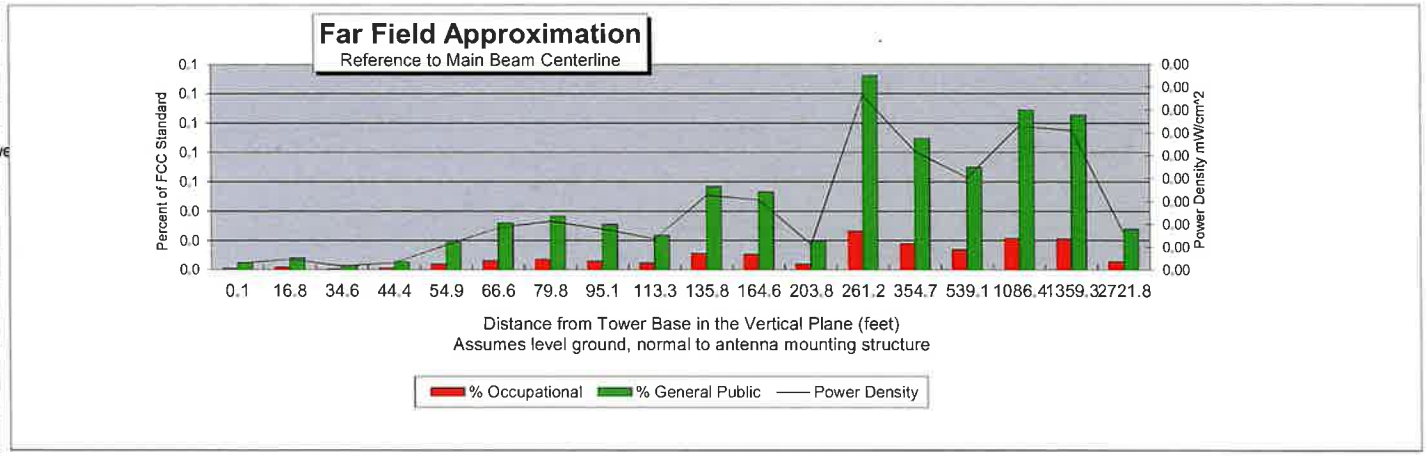
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STAMFORD NW CT
Site #:	
Date:	12/12/19
Name:	Shiva Gadasu
File Name:	STAMFORD NW CT - FF Powe

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**98.0**
Antenna Gain (dBi):	**15.3**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**160.0**
Number of channels:	



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	95.0	96.5	101.1	104.8	109.7	116.0	124.1	134.4	147.9	165.7	190.1	224.9	277.9	367.2	547.4	1090.6	1362.6	2723.5
Distance from Antenna Structure Base in Horizontal plane	0.1	16.8	34.6	44.4	54.9	66.6	79.8	95.1	113.3	135.8	164.6	203.8	261.2	354.7	539.1	1086.4	1359.3	2721.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0

Antenna Type JAHH-65B-R3B
Max% 0.13%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

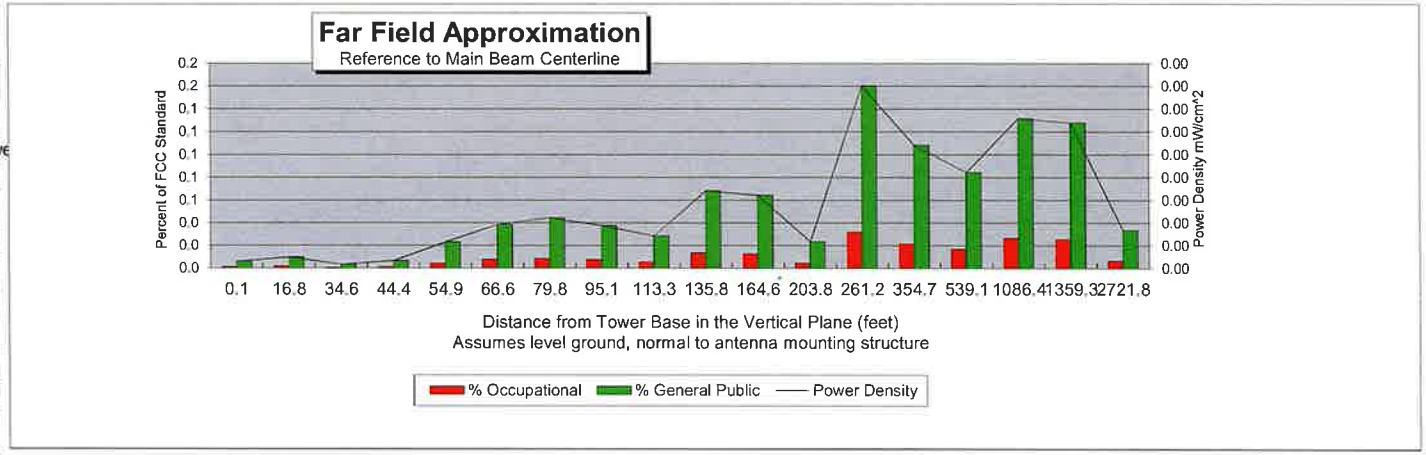
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STAMFORD NW CT
Site #:	
Date:	12/12/19
Name:	Shiva Gadasu
File Name:	STAMFORD NW CT - FF Powe

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**98.0**
Antenna Gain (dBi):	**18.5**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**160.0**
Number of channels:	**4**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	95.0	96.5	101.1	104.8	109.7	116.0	124.1	134.4	147.9	165.7	190.1	224.9	277.9	367.2	547.4	1090.6	1362.6	2723.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.8	34.6	44.4	54.9	66.6	79.8	95.1	113.3	135.8	164.6	203.8	261.2	354.7	539.1	1086.4	1359.3	2721.8	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.0	

Antenna Type JAHH-65B-R3B
Max% 0.16%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

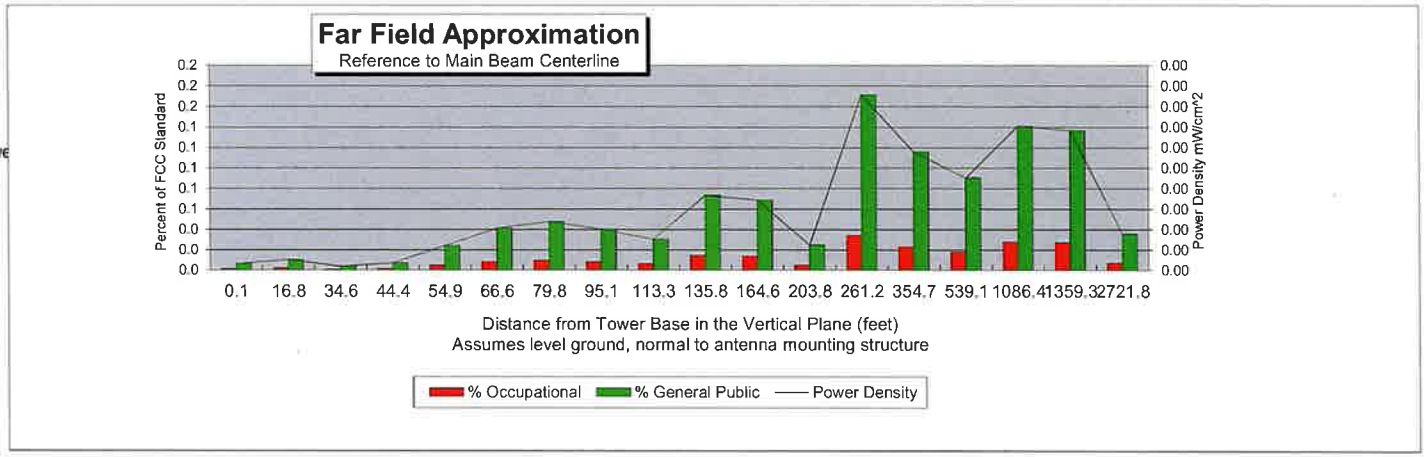
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STAMFORD NW CT
Site #:	
Date:	12/12/19
Name:	Shiva Gadasu
File Name:	STAMFORD NW CT - FF Powe

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**98.0**
Antenna Gain (dBi):	**18.8**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**160.0**
Number of channels:	



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	95.0	96.5	101.1	104.8	109.7	116.0	124.1	134.4	147.9	165.7	190.1	224.9	277.9	367.2	547.4	1090.6	1362.6	2723.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.8	34.6	44.4	54.9	66.6	79.8	95.1	113.3	135.8	164.6	203.8	261.2	354.7	539.1	1086.4	1359.3	2721.8	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.0	

Antenna Type JAHH-65B-R3B
Max% 0.17%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

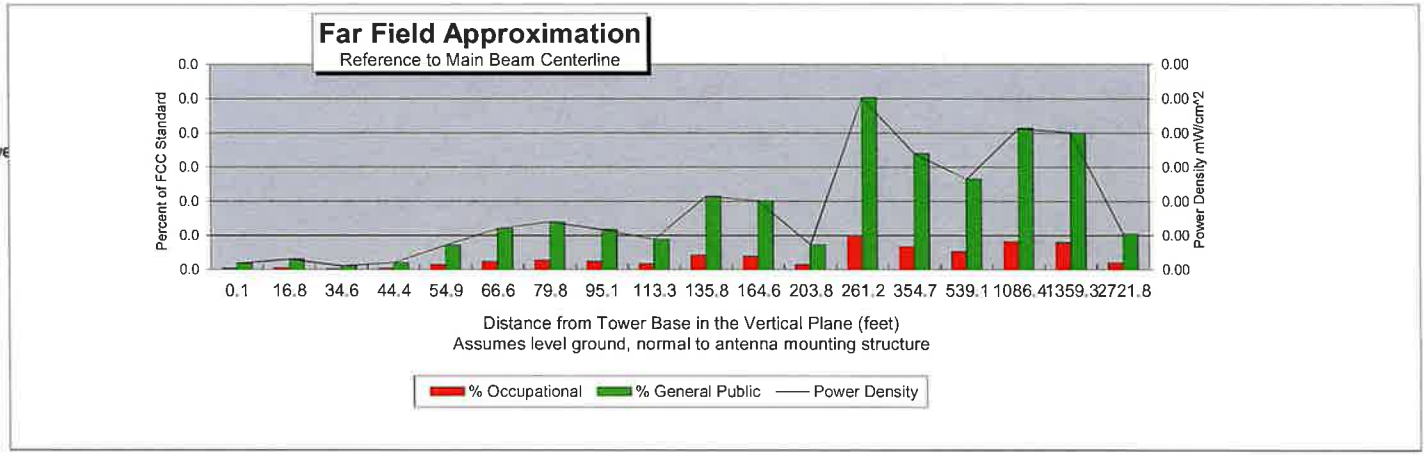
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STAMFORD NW CT
Site #:	
Date:	12/12/19
Name:	Shiva Gadasu
File Name:	STAMFORD NW CT - FF Powe

Operating Freq. (MHz)	**3550.0**
Antenna Height (ft):	**98.0**
Antenna Gain (dBi):	**12.5**
Antenna Size (in.):	**12.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**20.0**
Number of channels:	**4**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	95.0	96.5	101.1	104.8	109.7	116.0	124.1	134.4	147.9	165.7	190.1	224.9	277.9	367.2	547.4	1090.6	1362.6	2723.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.8	34.6	44.4	54.9	66.6	79.8	95.1	113.3	135.8	164.6	203.8	261.2	354.7	539.1	1086.4	1359.3	2721.8	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Antenna Type XXDWMM-12.5-65-8T
Max% 0.01%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 4

PAUL J. FORD & COMPANY

Report Date: October 24, 2019

Client: On Air Engineering, LLC
88 Foundry Pond Road
Cold Spring, NY 10516
Attn: David Weinpahl, P.E.
(201) 456-4624

Structure: Existing 152-ft Self Support
Carrier Site Name: Stamford NW CT - Long Ridge Fire Company
Mount Type: (3) SitePro1 VFA12 HD mounts
Site Address: 366 Old Long Ridge Road
City, County, State: Stamford, Fairfield County, CT 06027
Latitude, Longitude: 41.153047, -73.592567

PJF Project: A42919-0011.002.8300

Paul J. Ford and Company is pleased to submit this "**Opinion Letter**" regarding the adequacy of the new SitePro1 VFA12HD frames on the above referenced tower to replace existing overstressed mounting frames for a proposed Verizon antenna modification.

Opinion Criteria:

Reference Standard:	2018 Connecticut State Building Code with the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1.
Ultimate Wind Speed:	125 mph 3-second gust wind speed without ice
Nominal Wind Speed:	97 mph 3-second gust wind speed without ice
Ice Wind Speed:	50 mph 3-second gust wind speed with 0.75" ice
IBC Site Criteria:	Risk Category II, Topographic Category 1, Exposure Category B

Recommendations:

Based on the load comparison and the above listed parameters, it is our opinion that SitePro1 VFA12 HD mount with one tieback will be adequate for supporting the proposed loading listed in Table 1 of this report.

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and On Air Engineering, LLC. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully Submitted by:
Paul J. Ford and Company

Angela Sage, E.I.
Structural Designer
asage@pauljford.com D.S.

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30301
LICENSED PROFESSIONAL ENGINEER
2019.10.24 16:05:45-04'00'

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250 E Broad St, Suite 600
Columbus, OH 43215
Phone 614.221.6679

Founded in 1965

50 Years 1965 - 2015

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Orlando
1801 Lee Rd, Suite 230
Winter Park, FL 32789
Phone 407.898.9039

100% Employee Owned

Table 1 – Equipment Information

Mounting Level (feet)	Center Line Elevation (feet)	Quantity	Manufacturer	Model	Status	Mount Type
98	98	6	Commscope	JAHH-65B-R3B	Proposed	(3) VFA12-HD
		3	Commscope	BSAMNT-SBS-2-2		
		3	Commscope	JAHH-65B-R3B (lease only/reserved)		
		3	Samsung	XXDWMM-12.5-65-8T-CBRS		
		3	Samsung	CBRS RRH		
		3	Samsung	B2/B66A RRH		
		3	Samsung	B5/B13 RRH		
		3	Commscope	CBC78T-DS-43-2X		
		3	rfs celwave	DB-T1-6Z-8AB-0Z	Existing to remain	Tower Mounted
		6	Andrew	HBXX-6517DS-A2M	To be removed	(3) Existing Mounts
		6	Andrew	LNX-6514DS-A1M		
		3	ALU	RRH 4X30 700		

PAUL J. FORD & COMPANY

Report Date:	October 25, 2019
Client:	On Air Engineering, LLC 88 Foundry Pond Road Cold Spring, NY 10516 Attn: David Weinpahl, P.E. (201) 456-4624 dweinpahl@onaireng.com
Structure:	Existing 152-ft Self Support
Site Name:	Stamford NW CT - Long Ridge Fire Company
Site Address:	366 Old Long Ridge Road
City, County, State:	Stamford, Fairfield County, CT
Latitude, Longitude:	41.153047, -73.592567
PJF Project:	A42919-0011.001.8700

Paul J. Ford and Company is pleased to submit this "**Structural Analysis Report**" to determine the tower stress level.

Analysis Criteria:

Reference Standard:	2018 Connecticut State Building Code and Appendix N. and the 2015 International Building Code with the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1.
Ultimate Wind Speed:	125 mph 3-second gust wind speed without ice
Nominal Wind Speed:	97 mph 3-second gust wind speed without ice
Ice Wind Speed:	50 mph 3-second gust wind speed with 0.75" ice
Service Wind Speed:	60 mph (Serviceability) without ice
IBC Site Criteria:	Risk Category II, Topographic Category 1, Exposure Category B

Proposed Appurtenance Loads:
The structure was analyzed for the equipment configuration shown in Table 1 of this report.

Summary of Analysis Results:

Existing Structure:	Pass – 73.9%
Existing Foundation:	Pass – 84.1%

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and On Air Engineering, LLC. If you have any questions or need further assistance on this or any other projects, please give us a call.

Respectfully Submitted by:
Paul J. Ford and Company

Rebekah Dorris

Rebekah M. Dorris, PE
Project Engineer
RDorris@pauljford.com

JPJ

STATE OF CONNECTICUT
JOSEPH PACHICARAH JACOBS
No. PEN 22731
LICENSED PROFESSIONAL ENGINEER

10/25/2019

Columbus
250 E Broad St, Suite 600
Columbus, OH 43215
Phone 614.221.6679

Orlando
1801 Lee Rd, Suite 230
Winter Park, FL 32789
Phone 407.898.9039

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 152-ft Self Support tower designed by Rohn in May of 1989.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-G
Risk Category:	II
Wind Speed (Nominal):	97 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	0.75 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 – Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
152.0	162.0	1	antennae	20' 4-Bay Dipole	1 1	7/8 EW180	1
	152.0	1	miscl	TMA			
		1	tower mounts	6' x 4" Sch 40 Pipe Mount			
		1	microwave dishes	4 ft w/ HP			
		1	tower mounts	4' x 4.5" Pipe Mount			
150.0	156.7	1	decibel	DB563K w/Mount Pipe	1	1/2	1
	150.0	1	tower mounts	Generic 2' x 3' sidearm			
145.0	145.0	3	quintel technology	QS66512-2_TIA w/ Mount Pipe	12	1-5/8	1
		6	kaelus	TMA2117F00V1-1			
		3	tower mounts	Side Arm Mount			
140.0	140.0	1	microwave dishes	4 ft w/ HP	1	EW180	1
		1	tower mounts	4' x 4.5" Pipe Mount			
135.0	138.0	1	generic	6 ft x 3" omni whip	2	1-5/8	1
	135.0	1	decibel	DB254			
		2	tower mounts	Generic 2' x 3' sidearm			
131.0	131.0	3	rfs celwave	APXVSPP18-C-A20_TIA w/ Mount Pipe	3 1	1-1/4 7/8	1
		3	alcatel lucent	RRH2x50			
		3	alcatel lucent	RRH4X45			
		3	rfs celwave	APXVTM14-ALU-I20_TIA w/ Mount Pipe			
		3	alcatel lucent	TD-RRH8x20			
		3	tower mounts	Sector Mount			
118.0	118.0	3	ericsson	AIR 32 w/ Mount Pipe	1 1	1-5/8 1-1/4	1
		3	andrew	LNX-6515DS-A1M_TIA w/ Mount Pipe			
		3	rfs celwave	APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe			
		3	ericsson	RRUS 11			
		3	ericsson	RRUS 32			
		3	tower mounts	Sector Mount			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
98.0	98.0	3	commscope	JAHH-65B-R3B	-	-	3
		6	commscope	JAHH-65B-R3B	-	-	2
		3	commscope	BSAMNT-SBS-2-2			
		3	samsung	XXDWMM-12.5-65-8T-CBRS			
		3	samsung	CBRS-RRH			
		3	samsung	B2/B66A RRH			
		3	samsung	B5/B13 RRH			
		3	commscope	CBC78T-DS-43-2x			
		3	tower mounts	SitePro1 VFA12-HD			
		1	miscl	GPS	3	1-5/8	1
		3	rfs celwave	DB-T1-6Z-8AB-0Z	1	1/2	
		6	Andrew	HBXX-6517DS-A2M	-	-	4
		6	Andrew	LNX-6514DS-A1M			
		3	ALU	RRH 4X30 700			
		3	tower mounts	Sector Mounts			
74.0	78.0	1	antennae	8' 4-Bay Dipole	1	7/8	1
	74.0	1	tower mounts	Generic 2' x 3' sidearm			
58.0	58.0	1	miscl	GPS	1	1/2	1
		1	tower mounts	Generic 2' x 3' sidearm			

Notes:
1) Existing Equipment
2) Proposed Equipment
3) Reserved Equipment
4) Equipment to be removed

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Remarks
Previous Structural Analysis	Ramaker, 8/29/2017
Geotechnical Report	GZA, 12/14/1988
Geotechnical Report	Dr Clarence Welti, 12/12/2012
Loading Confirmation	Email From David Weinpahl, 10/26/2019

3.1) Analysis Method

tnxTower (version 8.0.5.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures have been built and maintained in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
3) The existing base plate grout was considered in this analysis. Grout must be maintained and inspected periodically and must be replaced if damaged or cracked.
4) All geometry, foundation, and modification information was obtained from the previous structural analysis referenced in Table 2 of this report.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 3 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	152 - 140	Leg	Pipe 2.375" x 0.154" (2 STD)	3	-4.9619	36.8422	13.5	Pass
T2	140 - 135	Leg	P2.875"x0.203" (2.5 STD)	27	-7.5436	57.1341	13.2	Pass
T3	135 - 130	Leg	P2.875"x0.203" (2.5 STD)	39	-11.1827	57.1341	19.6	Pass
T4	130 - 125	Leg	P2.875"x0.203" (2.5 STD)	48	-15.4077	57.1341	27.0	Pass
T5	125 - 120	Leg	P2.875"x0.203" (2.5 STD)	57	-20.2832	57.1364	35.5	Pass
T6	120 - 100	Leg	Pipe 2.875" x 0.276" (2.5 XS)	64	-43.2374	58.5119	73.9	Pass
T7	100 - 80	Leg	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	85	-71.2614	124.4500	57.3	Pass
T8	80 - 73.333	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	115	-80.5593	160.2660	50.3	Pass
T9	73.333 - 66.667	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	127	-89.2692	160.3010	55.7	Pass
T10	66.667 - 60	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	139	-98.1071	160.3360	61.2	Pass
T11	60 - 50	Leg	Pipe 4.5" x 0.337" (4 XS)	151	-108.8130	174.2770	62.4	Pass
T12	50 - 40	Leg	Pipe 4.5" x 0.337" (4 XS)	163	-121.3150	174.3530	69.6	Pass
T13	40 - 30	Leg	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60" Lu)	175	-133.9290	218.7270	61.2	Pass
T14	30 - 20	Leg	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30" Lu)	187	-145.6900	244.7280	59.5	Pass
T15	20 - 15	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ 6 x 0.25 half sleeve	229	-157.6500	254.3080	62.0	Pass
T16	15 - 10	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (60" Lu)	253	-158.7980	276.0700	57.5	Pass
T17	10 - 0	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120" Lu)	262	-170.2020	230.6190	73.8	Pass
T1	152 - 140	Diagonal	L 1.5 x 1.5 x 1/8	11	-1.3182	3.7688	35.0 41.7 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T2	140 - 135	Diagonal	L 1.5 x 1.5 x 3/16	35	-1.2282	4.1693	29.5	Pass
T3	135 - 130	Diagonal	L 1.5 x 1.5 x 3/16	40	-1.7874	3.8068	47.0	Pass
T4	130 - 125	Diagonal	L 1.5 x 1.5 x 1/4	49	-2.7285	4.4676	61.1	Pass
T5	125 - 120	Diagonal	L 1.5 x 1.5 x 1/4	59	-2.4191	4.0783	59.3	Pass
T6	120 - 100	Diagonal	L 2 x 2 x 1/4	67	-3.9438	6.1034	64.6	Pass
T7	100 - 80	Diagonal	L 2.5 x 2.5 x 1/4	88	-5.1551	9.1018	56.6	Pass
T8	80 - 73.333	Diagonal	L 2.5 x 2.5 x 1/4	118	-5.2645	8.4358	62.4	Pass
T9	73.333 - 66.667	Diagonal	L 2.5 x 2.5 x 5/16	131	-5.4942	9.4608	58.1	Pass
T10	66.667 - 60	Diagonal	L 2.5 x 2.5 x 5/16	142	-5.5257	8.7408	63.2	Pass
T11	60 - 50	Diagonal	L 3 x 3 x 1/4	155	-6.2934	9.4069	66.9	Pass
T12	50 - 40	Diagonal	L 3 x 3 x 5/16	167	-6.4489	10.5040	61.4	Pass
T13	40 - 30	Diagonal	L 3 x 3 x 3/8	179	-6.6285	11.3814	58.2	Pass
T14	30 - 20	Diagonal	L 3 x 3 x 5/16	191	-7.5289	23.0113	32.7 60.6 (b)	Pass
T15	20 - 15	Diagonal	L 3.5 x 3.5 x 1/4	233	-6.2988	27.0057	23.3 61.2 (b)	Pass
T16	15 - 10	Diagonal	L 3.5 x 3.5 x 1/4	257	-6.4328	11.6188	55.4 59.6 (b)	Pass
T17	10 - 0	Diagonal	L 3.5 x 3.5 x 5/16	265	-7.4646	12.6397	59.1	Pass
T14	30 - 20	Horizontal	L 3 x 3 x 1/4	190	-2.5267	12.1434	20.8	Pass
T16	15 - 10	Horizontal	L 2.5 x 2.5 x 3/16	232	-2.7540	4.0435	68.1	Pass
T7	100 - 80	Secondary Horizontal	L 2.5 x 2.5 x 1/4	94	-1.2359	12.4591	9.9	Pass
T8	80 - 73.333	Secondary Horizontal	L 2.5 x 2.5 x 1/4	124	-1.3971	11.2450	12.4	Pass
T9	73.333 - 66.667	Secondary Horizontal	L 2.5 x 2.5 x 1/4	136	-1.5482	10.1345	15.3	Pass
T10	66.667 - 60	Secondary Horizontal	L 2.5 x 2.5 x 1/4	150	-1.7015	9.1740	18.5	Pass
T11	60 - 50	Secondary Horizontal	L 2.5 x 2.5 x 1/4	160	-1.8871	8.2155	23.0	Pass
T12	50 - 40	Secondary Horizontal	L 3 x 3 x 1/4	172	-2.1040	12.6557	16.6	Pass
T13	40 - 30	Secondary Horizontal	L 3 x 3 x 1/4	184	-2.3227	11.2295	20.7	Pass
T1	152 - 140	Top Girt	L 2 x 2 x 1/8	5	-0.1185	3.2130	3.7	Pass
T2	140 - 135	Top Girt	L 2 x 2 x 1/8	30	-0.1540	3.1714	4.9	Pass
T14	30 - 20	Redund Horz 1 Bracing	L 2 x 2 x 1/4	209	-2.5267	11.8833	21.3	Pass
T15	20 - 15	Redund Horz 1 Bracing	L 2 x 2 x 1/4	234	-2.7341	10.7957	25.3	Pass
T14	30 - 20	Redund Diag 1 Bracing	L 2 x 2 x 1/4	213	-1.4720	8.7390	16.8	Pass
T15	20 - 15	Redund Diag 1 Bracing	L 2 x 2 x 1/4	252	-1.5842	8.1340	19.5	Pass
							Summary	
						Leg (T6)	73.9	Pass
						Diagonal (T11)	66.9	Pass
						Horizontal (T16)	68.1	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
						Secondary Horizontal (T11)	23.0	Pass
						Top Girt (T2)	4.9	Pass
						Redund Horz 1 Bracing (T15)	25.3	Pass
						Redund Diag 1 Bracing (T15)	19.5	Pass
						Bolt Checks	61.6	Pass
						RATING =	**73.9**	**Pass**

Table 4 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	-	73.8	Pass
1	Base Foundation Structural	-	14.7	Pass
1	Base Foundation Soil Interaction	-	84.1	Pass

Structure Rating (max from all components) =	84.1%

Notes:
1) See additional documentation in "Appendix C -- Additional Calculations" for calculations supporting the % capacity consumed.

The results of the tilt and twist values for a 60 mph 3-second gust service wind speed per the TIA-222-G Standard are given below:

Table 6 - Microwave Dish Tilt (Sway) Results for 60 mph Rev G Service

Dish Elevation ft	Dish	Dish Diameter ft	Analysis Results Tilt at Service Wind deg	Analysis Results Twist at Service Wind deg
152.0	4 ft w/ HP	4.0	0.152	0.009
140.0	4 ft w/ HP	4.0	0.149	0.009

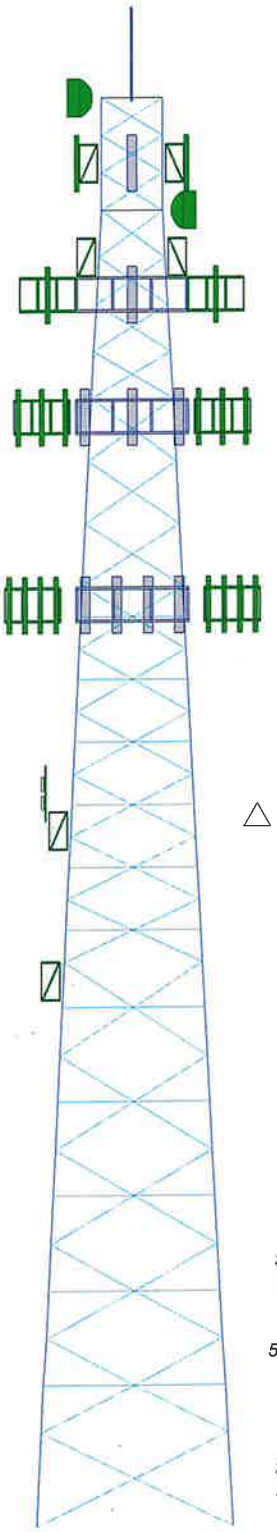
4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section		T17	T18	T15	T14	T13	T12	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1	
Legs		H	G	F	E	D	Pipe 4.5" x 0.337" (4 XS)			C		B	Pipe 2.875" x 0.276" (2.5 XS)	P2.875"x0.203" (2.5 STD)				A	
Leg Grade		A500-50																	
Diagonals		L	K		L 3 x 3 x 5/16	L 3 x 3 x 3/8	L 3 x 3 x 5/16	L 3 x 3 x 1/4	L 2.5 x 2.5 x 5/16			L 2.5 x 2.5 x 1/4	L 2 x 2 x 1/4		J		I	L 1.5 x 1.5 x 1/8	
Diagonal Grade		A36																	
Top Girts		N.A.																L 2 x 2 x 1/8	
Horizontals		N.A.	M	N.A.	L 3 x 3 x 1/4														
Sec. Horizontals		N.A.					L 3 x 3 x 1/4			L 2.5 x 2.5 x 1/4		N.A.			N.A.				
Red. Horizontals		N.A.			L 2 x 2 x 1/4							N.A.							
Red. Diagonals		N.A.			L 2 x 2 x 1/4							N.A.							
Face Width (ft)	20.7813	19.77	19.26	18.75	17.73	16.72	15.7	14.69	14.01	13.33	12.66	10.63	8.59	8.09	7.58	7.07	6.56	6.52	
# Panels @ (ft)		1 @ 10		4 @ 5			3 @ 10		1 @ 6.667	1 @ 6.666	@ 6.667	6 @ 6.66667			4 @ 5			3 @ 4	
Weight (K)	17.4	17	09	09	21	18	15	12	10	09	08	12	22	02	02	02	02	03	



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Pipe 2.375" x 0.154" (2 STD)	H	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120° Lu)
B	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	I	L 1.5 x 1.5 x 3/16
C	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	J	L 1.5 x 1.5 x 1/4
D	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60° Lu)	K	L 3.5 x 3.5 x 1/4
E	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30° Lu)	L	L 3.5 x 3.5 x 5/16
		M	L 2.5 x 2.5 x 3/16

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A36	36 ksi	58 ksi

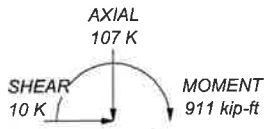
TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 73.9%

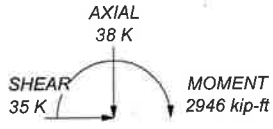
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 176 K
SHEAR: 21 K

UPLIFT: -146 K
SHEAR: 18 K



TORQUE 4 kip-ft
50 mph WIND - 0.750 in ICE



TORQUE 14 kip-ft
REACTIONS - 97 mph WIND

Paul J. Ford and Company
250 E. Broad St., Ste 600
Columbus, OH 43215
Phone: 614-221-6679
FAX:

Job: 152' SST / Stamford, UT			
Project: PJF 42919-0011			
Client: On Air Engineering, LLC	Drawn by: Rebekah Dorris	App'd:	
Code: TIA-222-G	Date: 10/25/19	Scale: NTS	
Path:		Dwg No. E-1	

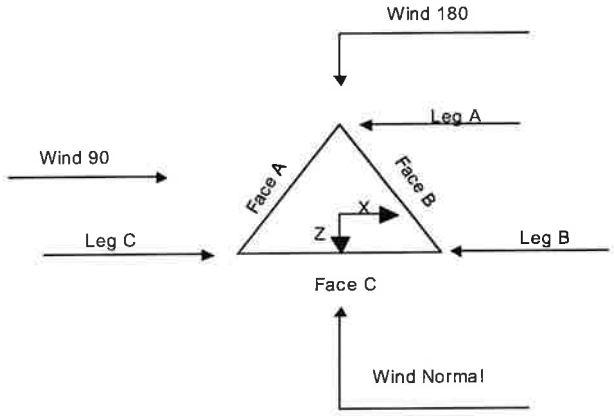
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 152.00 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 6.52 ft at the top and 20.78 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

1) Tower is located in Fairfield County, Connecticut.
2) ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
3) Basic wind speed of 97 mph.
4) Structure Class II.
5) Exposure Category B.
6) Topographic Category 1.
7) Crest Height 0.00 ft.
8) Nominal ice thickness of 0.750 in.
9) Ice thickness is considered to increase with height.
10) Ice density of 56 pcf.
11) A wind speed of 50 mph is used in combination with ice.
12) Deflections calculated using a wind speed of 60 mph.
13) A non-linear (P-delta) analysis was used.
14) Pressures are calculated at each section.
15) Stress ratio used in tower member design is 1.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	152.00-140.00			6.52	1	12.00
T2	140.00-135.00			6.56	1	5.00
T3	135.00-130.00			7.07	1	5.00
T4	130.00-125.00			7.58	1	5.00
T5	125.00-120.00			8.09	1	5.00
T6	120.00-100.00			8.59	1	20.00
T7	100.00-80.00			10.63	1	20.00
T8	80.00-73.33			12.66	1	6.67
T9	73.33-66.67			13.33	1	6.67
T10	66.67-60.00			14.01	1	6.67
T11	60.00-50.00			14.69	1	10.00
T12	50.00-40.00			15.70	1	10.00
T13	40.00-30.00			16.72	1	10.00
T14	30.00-20.00			17.73	1	10.00
T15	20.00-15.00			18.75	1	5.00
T16	15.00-10.00			19.26	1	5.00
T17	10.00-0.00			19.77	1	10.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	152.00-140.00	4.00	X Brace	No	Yes	0.000	0.000
T2	140.00-135.00	5.00	X Brace	No	Yes	0.000	0.000
T3	135.00-130.00	5.00	X Brace	No	No	0.000	0.000
T4	130.00-125.00	5.00	X Brace	No	No	0.000	0.000
T5	125.00-120.00	5.00	X Brace	No	No	0.000	0.000
T6	120.00-100.00	6.67	X Brace	No	No	0.000	0.000
T7	100.00-80.00	6.67	X Brace	No	Yes	0.000	0.000
T8	80.00-73.33	6.67	X Brace	No	Yes	0.000	0.000
T9	73.33-66.67	6.67	X Brace	No	Yes	0.000	0.000
T10	66.67-60.00	6.67	X Brace	No	Yes	0.000	0.000
T11	60.00-50.00	10.00	X Brace	No	Yes	0.000	0.000
T12	50.00-40.00	10.00	X Brace	No	Yes	0.000	0.000

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
T13	40.00-30.00	10.00	X Brace	No	Yes	0.000	0.000
T14	30.00-20.00	5.00	Double K1	No	Yes	0.000	0.000
T15	20.00-15.00	5.00	K1 Up	No	Yes	0.000	0.000
T16	15.00-10.00	5.00	K Brace Down	No	Yes	0.000	0.000
T17	10.00-0.00	10.00	X Brace	No	No	0.000	0.000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 152.00-140.00	Pipe	Pipe 2.375" x 0.154" (2 STD)	A500-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T2 140.00-135.00	Pipe	P2.875"x0.203" (2.5 STD)	A500-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 3/16	A36 (36 ksi)
T3 135.00-130.00	Pipe	P2.875"x0.203" (2.5 STD)	A500-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 3/16	A36 (36 ksi)
T4 130.00-125.00	Pipe	P2.875"x0.203" (2.5 STD)	A500-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/4	A36 (36 ksi)
T5 125.00-120.00	Pipe	P2.875"x0.203" (2.5 STD)	A500-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/4	A36 (36 ksi)
T6 120.00-100.00	Pipe	Pipe 2.875" x 0.276" (2.5 XS)	A500-50 (50 ksi)	Equal Angle	L 2 x 2 x 1/4	A36 (36 ksi)
T7 100.00-80.00	Arbitrary Shape	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	A500-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)
T8 80.00-73.33	Arbitrary Shape	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	A500-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)
T9 73.33-66.67	Arbitrary Shape	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	A500-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 5/16	A36 (36 ksi)
T10 66.67-60.00	Arbitrary Shape	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	A500-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 5/16	A36 (36 ksi)
T11 60.00-50.00	Pipe	Pipe 4.5" x 0.337" (4 XS)	A500-50 (50 ksi)	Equal Angle	L 3 x 3 x 1/4	A36 (36 ksi)
T12 50.00-40.00	Pipe	Pipe 4.5" x 0.337" (4 XS)	A500-50 (50 ksi)	Equal Angle	L 3 x 3 x 5/16	A36 (36 ksi)
T13 40.00-30.00	Arbitrary Shape	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60" Lu)	A500-50 (50 ksi)	Equal Angle	L 3 x 3 x 3/8	A36 (36 ksi)
T14 30.00-20.00	Arbitrary Shape	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30" Lu)	A500-50 (50 ksi)	Equal Angle	L 3 x 3 x 5/16	A36 (36 ksi)
T15 20.00-15.00	Arbitrary Shape	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ 6 x 0.25 half sleeve	A500-50 (50 ksi)	Equal Angle	L 3.5 x 3.5 x 1/4	A36 (36 ksi)
T16 15.00-10.00	Arbitrary Shape	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (60" Lu)	A500-50 (50 ksi)	Equal Angle	L 3.5 x 3.5 x 1/4	A36 (36 ksi)
T17 10.00-0.00	Arbitrary Shape	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120" Lu)	A500-50 (50 ksi)	Equal Angle	L 3.5 x 3.5 x 5/16	A36 (36 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
T1 152.00-140.00	Equal Angle	L 2 x 2 x 1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 140.00-135.00	Equal Angle	L 2 x 2 x 1/8	A36 (36 ksi)	Solid Round		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
T14 30.00-20.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L 3 x 3 x 1/4	A36 (36 ksi)
T15 20.00-15.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L 2.5 x 2.5 x 3/16	A36 (36 ksi)
T16 15.00-10.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L 2.5 x 2.5 x 3/16	A36 (36 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
T7 100.00-80.00	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T8 80.00-73.33	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T9 73.33-66.67	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T10 66.67-60.00	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T11 60.00-50.00	Equal Angle	L 2.5 x 2.5 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T12 50.00-40.00	Equal Angle	L 3 x 3 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T13 40.00-30.00	Equal Angle	L 3 x 3 x 1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T14 30.00-20.00	A36 (36 ksi)	Horizontal (1)	Equal Angle	L 2 x 2 x 1/4	1
		Diagonal (1)	Equal Angle	L 2 x 2 x 1/4	1
T15 20.00-15.00	A36 (36 ksi)	Horizontal (1)	Equal Angle	L 2 x 2 x 1/4	1
		Diagonal (1)	Equal Angle	L 2 x 2 x 1/4	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 152.00-140.00	0.00	0.188	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T2 140.00-135.00	0.00	0.188	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T3 135.00-130.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T4 130.00-125.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T5 125.00-120.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T6 120.00-100.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T7 100.00-80.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

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 80.00-73.33	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T9 73.33-66.67	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T10 66.67-60.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T11 60.00-50.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T12 50.00-40.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T13 40.00-30.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T14 30.00-20.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T15 20.00-15.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T16 15.00-10.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T17 10.00-0.00	0.00	0.250	A36 (36 ksi)	1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 152.00-140.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T2 140.00-135.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T3 135.00-130.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T4 130.00-125.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T5 125.00-120.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T6 120.00-100.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T7 100.00-80.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T8 80.00-73.33	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T9 73.33-66.67	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T10 66.67-60.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T11 60.00-50.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T12 50.00-40.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T13 40.00-30.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T14 30.00-20.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T15 20.00-15.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T16 15.00-10.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T17 10.00-0.00	Yes	No	1	1	1	1	1	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 152.00-140.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T2 140.00-135.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T3 135.00-130.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T4 130.00-125.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T5 125.00-120.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T6 120.00-100.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T7 100.00-80.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T8 80.00-73.33	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T9 73.33-66.67	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T10 66.67-60.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T11 60.00-50.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T12 50.00-40.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T13 40.00-30.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T14 30.00-20.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T15 20.00-15.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T16 15.00-10.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T17 10.00-0.00	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75

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 152.00-140.00	Flange	0.625 A325N	0	0.500 A325N	1	0.500 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T2 140.00-135.00	Flange	0.625 A325N	4	0.500 A325N	1	0.500 A325N	1	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T3 135.00-130.00	Flange	0.625 A325N	0	0.625 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T4 130.00-125.00	Flange	0.625 A325N	0	0.625 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T5 125.00-120.00	Flange	0.625 A325N	0	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T6 120.00-100.00	Flange	0.625 A325N	4	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	0
T7 100.00-80.00	Flange	0.750 A325N	4	0.625 A325X	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T8 80.00-73.33	Flange	0.875 A325N	4	0.625 A325X	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T9 73.33-66.67	Flange	0.875 A325N	0	0.625 A325X	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2

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.
T10 66.67-60.00	Flange	0.875 A325N	0	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T11 60.00-50.00	Flange	0.875 A325N	4	0.625 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T12 50.00-40.00	Flange	0.875 A325N	0	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T13 40.00-30.00	Flange	1.000 A325N	4	0.625 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2
T14 30.00-20.00	Flange	1.000 A325N	0	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 A325N	2	0.500 A325N	0
T15 20.00-15.00	Flange	1.000 A325N	4	0.625 A325X	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	1	0.500 A325N	0
T16 15.00-10.00	Flange	1.000 A325N	0	0.625 A325X	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	1	0.500 A325N	0
T17 10.00-0.00	Flange	1.000 A325N	0	0.625 A325X	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.500 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
Face A													
LDF5-50A(7/8")	A	No	No	Ar (CaAa)	152.00 - 0.00	0.000	-0.05	1	1	1.090 0.500	1.090		0.33
LDF4-50A(1/2")	A	No	No	Ar (CaAa)	150.00 - 0.00	0.000	-0.03	1	1	0.630 0.500	0.630		0.15
1.5" flat Cable Ladder Rail	A	No	No	Af (CaAa)	0.00 - 0.00	0.000	0	2	2	36.000 0.500	1.500		1.80
Face B													
LDF7-50A(1-5/8")	B	No	No	Ar (CaAa)	145.00 - 0.00	0.000	0	12	12	1.000 0.500	1.980		0.82
1.5" flat Cable Ladder Rail	B	No	No	Af (CaAa)	0.00 - 0.00	0.000	0	2	2	36.000 0.500	1.500		1.80
******													
EW180(ELLIPTICAL)	B	No	No	Ar (CaAa)	152.00 - 0.00	0.000	0.25	1	1	0.780 0.500	0.780		0.15
EW180(ELLIPTICAL)	B	No	No	Ar (CaAa)	140.00 - 0.00	0.000	0.22	1	1	0.780 0.500	0.780		0.15
LDF7-50A(1-5/8")	B	No	No	Ar (CaAa)	135.00 - 0.00	0.000	0.2	2	2	1.000 0.500	1.980		0.82
LDF7-50A(1-5/8")	B	No	No	Ar (CaAa)	98.00 - 0.00	0.000	0.18	1	1	1.000 0.500	1.980		0.82
LDF4-50A(1/2")	B	No	No	Ar (CaAa)	98.00 - 0.00	0.000	0.17	1	1	0.630 0.500	0.630		0.15
LDF5-50A(7/8")	B	No	No	Ar (CaAa)	78.00 - 0.00	0.000	0.15	1	1	1.090 0.500	1.090		0.33
1.5" flat Cable Ladder Rail	B	No	No	Af (CaAa)	0.00 - 0.00	0.000	0.2	2	2	36.000 0.500	1.500		1.80
Face C													
LDF6-50A(1-1/4")	C	No	No	Ar (CaAa)	131.00 - 0.00	0.000	0.25	3	3	1.550 0.500	1.550		0.66
LDF5-50A(7/8")	C	No	No	Ar (CaAa)	131.00 - 0.00	0.000	0.23	1	1	1.090 0.500	1.090		0.33
LDF4-50A(1/2")	C	No	No	Ar (CaAa)	58.00 - 0.00	0.000	0.27	1	1	0.630 0.500	0.630		0.15
LDF7-50A(1-5/8")	C	No	No	Ar (CaAa)	118.00 - 0.00	0.000	0.15	1	1	1.000 0.500	1.980		0.82
LDF6-50A(1-1/4")	C	No	No	Ar (CaAa)	118.00 - 0.00	0.000	0.17	1	1	1.550 0.500	1.550		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
1.5" flat Cable Ladder Rail	C	No	No	Af (CaAa)	0.00 - 0.00	0.000	0.2	2	2	36.000 0.500	1.500		1.80
*****													

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
20' 4-Bay Dipole	C	From Face	1.00 0 10	0.000	152.00	No Ice 1/2" Ice 1" Ice	4.00 6.00 8.00	4.00 6.00 8.00	0.0550 0.1000 0.1450
TMA	C	From Leg	0.50 0 0	0.000	152.00	No Ice 1/2" Ice 1" Ice	1.50 2.00 3.00	1.50 2.00 3.00	0.0500 0.0650 0.0700
6' x 4" Sch 40 Pipe Mount	C	From Leg	0.50 0 0	0.000	152.00	No Ice 1/2" Ice 1" Ice	1.96 2.62 3.00	1.96 2.62 3.00	0.0648 0.0839 0.1073
*****									
DB563K-TT w/Mount Pipe	A	From Leg	3.00 0 7	0.000	150.00	No Ice 1/2" Ice 1" Ice	19.19 20.22 21.27	4.03 6.95 9.91	0.1311 0.2320 0.3493
Generic 2' x 3' sidearm	A	From Leg	1.50 0 0	0.000	150.00	No Ice 1/2" Ice 1" Ice	1.50 2.50 3.50	3.00 4.00 5.00	0.1875 0.2750 0.3625
*****									
4' x 4.5" Pipe Mount	C	From Leg	0.50 0 0	0.000	152.00	No Ice 1/2" Ice 1" Ice	1.19 1.58 1.84	1.19 1.58 1.84	0.0430 0.0560 0.0720
*****									
QS66512-2_TIA w/ Mount Pipe	A	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	8.37 8.93 9.46	8.46 9.66 10.55	0.1366 0.2122 0.2961
QS66512-2_TIA w/ Mount Pipe	B	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	8.37 8.93 9.46	8.46 9.66 10.55	0.1366 0.2122 0.2961
QS66512-2_TIA w/ Mount Pipe	C	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	8.37 8.93 9.46	8.46 9.66 10.55	0.1366 0.2122 0.2961
(2) TMA2117F00V1-1	A	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	0.30 0.37 0.45	0.83 0.95 1.07	0.0176 0.0244 0.0330
(2) TMA2117F00V1-1	B	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	0.30 0.37 0.45	0.83 0.95 1.07	0.0176 0.0244 0.0330
(2) TMA2117F00V1-1	C	From Leg	3.00 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	0.30 0.37 0.45	0.83 0.95 1.07	0.0176 0.0244 0.0330
Side Arm Mount [SO 202-1]	A	From Leg	1.50 0	0.000	145.00	No Ice	1.78 2.24	2.97 3.57	0.1100 0.1328

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0			1/2" Ice	2.75	4.19	0.1632
						1" Ice			
Side Arm Mount [SO 202-1]	B	From Leg	1.50 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	1.78 2.24 2.75	2.97 3.57 4.19	0.1100 0.1328 0.1632
Side Arm Mount [SO 202-1]	C	From Leg	1.50 0 0	0.000	145.00	No Ice 1/2" Ice 1" Ice	1.78 2.24 2.75	2.97 3.57 4.19	0.1100 0.1328 0.1632
*****									
4' x 4.5" Pipe Mount	B	From Leg	0.50 0 0	0.000	140.00	No Ice 1/2" Ice 1" Ice	1.20 1.58 1.84	1.20 1.58 1.84	0.0430 0.0560 0.0720
*****									
6 ft x 3" omni whip	B	From Leg	3.00 0 3	0.000	135.00	No Ice 1/2" Ice 1" Ice	1.77 2.13 2.50	1.77 2.13 2.50	0.0240 0.0372 0.0546
Generic 2' x 3' sidearm	B	From Leg	1.50 0 0	0.000	135.00	No Ice 1/2" Ice 1" Ice	1.50 2.50 3.50	3.00 4.00 5.00	0.1875 0.2750 0.3625
*****									
DB254-A	C	From Leg	3.00 0 0	0.000	135.00	No Ice 1/2" Ice 1" Ice	1.10 1.98 2.86	1.10 1.98 2.86	0.0100 0.0130 0.0160
Generic 2' x 3' sidearm	C	From Leg	1.50 0 0	0.000	135.00	No Ice 1/2" Ice 1" Ice	1.50 2.50 3.50	3.00 4.00 5.00	0.1875 0.2750 0.3625
*****									
APXVSPP18-C-A20_TIA w/ Mount Pipe	A	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	8.26 8.82 9.35	7.47 8.66 9.56	0.0951 0.1655 0.2440
APXVSPP18-C-A20_TIA w/ Mount Pipe	B	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	8.26 8.82 9.35	7.47 8.66 9.56	0.0951 0.1655 0.2440
APXVSPP18-C-A20_TIA w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	8.26 8.82 9.35	7.47 8.66 9.56	0.0951 0.1655 0.2440
RRH2x50-WCS	A	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	4.91 5.23 5.55	2.70 3.00 3.30	0.0774 0.1087 0.1444
RRH2x50-WCS	B	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	4.91 5.23 5.55	2.70 3.00 3.30	0.0774 0.1087 0.1444
RRH2x50-WCS	C	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	4.91 5.23 5.55	2.70 3.00 3.30	0.0774 0.1087 0.1444
RRH4X45-19	A	From Leg	4.00 0 0	0.000	131.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.0595 0.0834 0.1106
RRH4X45-19	B	From Leg	4.00 0	0.000	131.00	No Ice	2.31 2.52	2.38 2.58	0.0595 0.0834

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0				1/2" Ice	2.73	2.79	0.1106
							1" Ice			
RRH4X45-19	C	From Leg	4.00	0.000		131.00	No Ice	2.31	2.38	0.0595
			0				1/2" Ice	2.52	2.58	0.0834
			0				1" Ice	2.73	2.79	0.1106
APXVTM14-ALU-I20_TIA w/ Mount Pipe	A	From Leg	4.00	0.000		131.00	No Ice	6.58	4.96	0.0770
			0				1/2" Ice	7.03	5.75	0.1316
			0				1" Ice	7.47	6.47	0.1929
APXVTM14-ALU-I20_TIA w/ Mount Pipe	B	From Leg	4.00	0.000		131.00	No Ice	6.58	4.96	0.0770
			0				1/2" Ice	7.03	5.75	0.1316
			0				1" Ice	7.47	6.47	0.1929
APXVTM14-ALU-I20_TIA w/ Mount Pipe	C	From Leg	4.00	0.000		131.00	No Ice	6.58	4.96	0.0770
			0				1/2" Ice	7.03	5.75	0.1316
			0				1" Ice	7.47	6.47	0.1929
TD-RRH8x20	C	From Leg	4.00	0.000		131.00	No Ice	3.70	1.29	0.0661
			0				1/2" Ice	3.95	1.46	0.0901
			0				1" Ice	4.20	1.64	0.1174
TD-RRH8x20	B	From Leg	4.00	0.000		131.00	No Ice	3.70	1.29	0.0661
			0				1/2" Ice	3.95	1.46	0.0901
			0				1" Ice	4.20	1.64	0.1174
TD-RRH8x20	C	From Leg	4.00	0.000		131.00	No Ice	3.70	1.29	0.0661
			0				1/2" Ice	3.95	1.46	0.0901
			0				1" Ice	4.20	1.64	0.1174
Sector Mount [SM 502-1]	A	From Leg	2.00	0.000		131.00	No Ice	15.40	11.11	0.5577
			0				1/2" Ice	21.17	16.35	0.7554
			0				1" Ice	26.86	21.52	1.0172
Sector Mount [SM 502-1]	B	From Leg	2.00	0.000		131.00	No Ice	15.40	11.11	0.5577
			0				1/2" Ice	21.17	16.35	0.7554
			0				1" Ice	26.86	21.52	1.0172
Sector Mount [SM 502-1]	C	From Leg	2.00	0.000		131.00	No Ice	15.40	11.11	0.5577
			0				1/2" Ice	21.17	16.35	0.7554
			0				1" Ice	26.86	21.52	1.0172
*****										
AIR 32 w/ Mount Pipe	A	From Leg	4.00	0.000		118.00	No Ice	6.71	6.03	0.1259
			0				1/2" Ice	7.14	6.78	0.1864
			0				1" Ice	7.57	7.49	0.2537
AIR 32 w/ Mount Pipe	B	From Leg	4.00	0.000		118.00	No Ice	6.71	6.03	0.1259
			0				1/2" Ice	7.14	6.78	0.1864
			0				1" Ice	7.57	7.49	0.2537
AIR 32 w/ Mount Pipe	C	From Leg	4.00	0.000		118.00	No Ice	6.71	6.03	0.1259
			0				1/2" Ice	7.14	6.78	0.1864
			0				1" Ice	7.57	7.49	0.2537
LNX-6515DS-A1M_TIA w/ Mount Pipe	A	From Leg	4.00	0.000		118.00	No Ice	11.71	9.87	0.0833
			0				1/2" Ice	12.43	11.39	0.1732
			0				1" Ice	13.17	12.94	0.2730
LNX-6515DS-A1M_TIA w/ Mount Pipe	B	From Leg	4.00	0.000		118.00	No Ice	11.71	9.87	0.0833
			0				1/2" Ice	12.43	11.39	0.1732
			0				1" Ice	13.17	12.94	0.2730

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LNX-6515DS-A1M_TIA w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	11.71 12.43 13.17	9.87 11.39 12.94	0.0833 0.1732 0.2730
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	A	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	6.82 7.28 7.72	3.49 4.26 4.96	0.0614 0.1099 0.1649
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	B	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	6.82 7.28 7.72	3.49 4.26 4.96	0.0614 0.1099 0.1649
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	6.82 7.28 7.72	3.49 4.26 4.96	0.0614 0.1099 0.1649
RRUS 11	A	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.0507 0.0716 0.0955
RRUS 11	B	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.0507 0.0716 0.0955
RRUS 11	C	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.0507 0.0716 0.0955
RRUS 32	A	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.32	1.78 1.97 2.17	0.0551 0.0774 0.1029
RRUS 32	B	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.32	1.78 1.97 2.17	0.0551 0.0774 0.1029
RRUS 32	C	From Leg	4.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.32	1.78 1.97 2.17	0.0551 0.0774 0.1029
Sector Mount [SM 502-1]	A	From Leg	2.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	15.40 21.17 26.86	11.11 16.35 21.52	0.5577 0.7554 1.0172
Sector Mount [SM 502-1]	B	From Leg	2.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	15.40 21.17 26.86	11.11 16.35 21.52	0.5577 0.7554 1.0172
Sector Mount [SM 502-1]	C	From Leg	2.00 0 0	0.000	118.00	No Ice 1/2" Ice 1" Ice	15.40 21.17 26.86	11.11 16.35 21.52	0.5577 0.7554 1.0172
*****									
GPS	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.14 0.24 0.31	0.14 0.24 0.31	0.0150 0.0182 0.0225
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.0440 0.0801 0.1202
DB-T1-6Z-8AB-0Z	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.0440 0.0801 0.1202

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DB-T1-6Z-8AB-0Z	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.0440 0.0801 0.1202
JAHH-65B-R3B w/ Mount Pipe	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
JAHH-65B-R3B w/ Mount Pipe	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
JAHH-65B-R3B w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
(2) JAHH-65B-R3B w/ Mount Pipe	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
(2) JAHH-65B-R3B w/ Mount Pipe	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
(2) JAHH-65B-R3B w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	5.50 5.97 6.45	4.38 4.84 5.30	0.0961 0.1693 0.2536
BSAMNT-SBS-2-2 (Mount Bracket)	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.00 0.00 0.00	0.0674 0.0876 0.1078
BSAMNT-SBS-2-2 (Mount Bracket)	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.00 0.00 0.00	0.0674 0.0876 0.1078
BSAMNT-SBS-2-2 (Mount Bracket)	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.00 0.00 0.00	0.0674 0.0876 0.1078
CBRS w/ 8' Mount Pipe	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.11 3.96 4.68	2.65 3.59 4.39	0.0523 0.0854 0.1228
CBRS w/ 8' Mount Pipe	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.11 3.96 4.68	2.65 3.59 4.39	0.0523 0.0854 0.1228
CBRS w/ 8' Mount Pipe	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.11 3.96 4.68	2.65 3.59 4.39	0.0523 0.0854 0.1228
CBRS	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.53 1.69 1.85	0.75 0.87 0.99	0.0231 0.0351 0.0493
CBRS	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.53 1.69 1.85	0.75 0.87 0.99	0.0231 0.0351 0.0493
CBRS	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.53 1.69 1.85	0.75 0.87 0.99	0.0231 0.0351 0.0493
B2/B66A RRH-BR049	A	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
B2/B66A RRH-BR049	B	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
B2/B66A RRH-BR049	C	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
B5/B13 RRH-BR04C	A	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
B5/B13 RRH-BR04C	B	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
B5/B13 RRH-BR04C	C	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.0703
			0			1/2"	2.05	1.14	0.0867
			0			Ice	2.22	1.28	0.1058
						1" Ice			
CBC78T-DS-43-2X	A	From Leg	4.00	0.000	98.00	No Ice	0.37	0.51	0.0207
			0			1/2"	0.45	0.60	0.0270
			0			Ice	0.53	0.70	0.0351
						1" Ice			
CBC78T-DS-43-2X	B	From Leg	4.00	0.000	98.00	No Ice	0.37	0.51	0.0207
			0			1/2"	0.45	0.60	0.0270
			0			Ice	0.53	0.70	0.0351
						1" Ice			
CBC78T-DS-43-2X	C	From Leg	4.00	0.000	98.00	No Ice	0.37	0.51	0.0207
			0			1/2"	0.45	0.60	0.0270
			0			Ice	0.53	0.70	0.0351
						1" Ice			
Site Pro 1 VFA12-HD	A	From Leg	4.00	0.000	98.00	No Ice	13.20	9.20	0.6580
			0			1/2"	19.50	14.60	0.8040
			0			Ice	25.80	19.50	1.0150
						1" Ice			
Site Pro 1 VFA12-HD	B	From Leg	4.00	0.000	98.00	No Ice	13.20	9.20	0.6580
			0			1/2"	19.50	14.60	0.8040
			0			Ice	25.80	19.50	1.0150
						1" Ice			
Site Pro 1 VFA12-HD	C	From Leg	4.00	0.000	98.00	No Ice	13.20	9.20	0.6580
			0			1/2"	19.50	14.60	0.8040
			0			Ice	25.80	19.50	1.0150
						1" Ice			
*****									
*****									
8' 4-Bay Dipole	C	From Leg	3.00	0.000	74.00	No Ice	4.00	4.00	0.0550
			0			1/2"	6.00	6.00	0.1000
			4			Ice	8.00	8.00	0.1450
						1" Ice			
Generic 2' x 3' sidearm	C	From Leg	1.50	0.000	74.00	No Ice	1.50	3.00	0.1875
			0			1/2"	2.50	4.00	0.2750
			0			Ice	3.50	5.00	0.3625
						1" Ice			
*****									
GPS	C	From Leg	3.00	0.000	58.00	No Ice	0.15	0.15	0.0150
			0			1/2"	0.24	0.24	0.0182
			0			Ice	0.31	0.31	0.0225
						1" Ice			
Generic 2' x 3' sidearm	C	From Leg	1.50	0.000	58.00	No Ice	1.50	3.00	0.1875
			0			1/2"	2.50	4.00	0.2750
			0			Ice	3.50	5.00	0.3625

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
*****					1" Ice			

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 K
4 ft w/ HP	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0 0	0.000		152.00	4.00	No Ice 1/2" Ice 1" Ice	12.57 13.10 13.62	0.1200 0.1900 0.2600
4 ft w/ HP	B	Paraboloid w/Shroud (HP)	From Leg	1.00 0 0	0.000		140.00	4.00	No Ice 1/2" Ice 1" Ice	12.57 13.10 13.62	0.1200 0.1900 0.2600
*****											

Load Combinations

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

Comb. No.	Description
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	152 - 140	2.77	47	0.152	0.009
T2	140 - 135	2.38	47	0.149	0.009
T3	135 - 130	2.22	47	0.147	0.009
T4	130 - 125	2.07	47	0.144	0.008
T5	125 - 120	1.91	47	0.140	0.008
T6	120 - 100	1.77	47	0.135	0.007
T7	100 - 80	1.23	47	0.112	0.005
T8	80 - 73.333	0.78	47	0.089	0.004
T9	73.333 - 66.667	0.66	47	0.082	0.003
T10	66.667 - 60	0.54	47	0.074	0.003
T11	60 - 50	0.44	47	0.065	0.003
T12	50 - 40	0.30	47	0.053	0.002
T13	40 - 30	0.20	47	0.040	0.002
T14	30 - 20	0.12	47	0.030	0.001
T15	20 - 15	0.06	47	0.020	0.001
T16	15 - 10	0.03	47	0.014	0.001
T17	10 - 0	0.02	47	0.010	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152.00	4 ft w/ HP	47	2.77	0.152	0.009	352029
150.00	DB563K-TT w/Mount Pipe	47	2.70	0.151	0.008	352029
145.00	QS66512-2_TIA w/ Mount Pipe	47	2.54	0.150	0.009	251449
140.00	4 ft w/ HP	47	2.38	0.149	0.009	114846
135.00	6 ft x 3" omni whip	47	2.22	0.147	0.009	83144
131.00	APXVSPP18-C-A20_TIA w/ Mount Pipe	47	2.10	0.145	0.008	278148
118.00	AIR 32 w/ Mount Pipe	47	1.71	0.133	0.007	81192
98.00	GPS	47	1.18	0.110	0.005	43689
74.00	8' 4-Bay Dipole	47	0.67	0.082	0.004	45742
58.00	GPS	47	0.41	0.063	0.003	49928

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	152 - 140	11.53	18	0.630	0.037
T2	140 - 135	9.93	18	0.619	0.037
T3	135 - 130	9.28	18	0.611	0.036
T4	130 - 125	8.63	18	0.600	0.034
T5	125 - 120	7.99	18	0.584	0.032
T6	120 - 100	7.38	18	0.564	0.030
T7	100 - 80	5.12	18	0.469	0.023
T8	80 - 73.333	3.27	18	0.372	0.017

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T9	73.333 - 66.667	2.74	18	0.341	0.015
T10	66.667 - 60	2.26	18	0.307	0.013
T11	60 - 50	1.83	18	0.272	0.011
T12	50 - 40	1.27	18	0.221	0.009
T13	40 - 30	0.83	18	0.169	0.007
T14	30 - 20	0.49	18	0.126	0.006
T15	20 - 15	0.24	18	0.082	0.004
T16	15 - 10	0.14	18	0.060	0.003
T17	10 - 0	0.07	19	0.040	0.002

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152.00	4 ft w/ HP	18	11.53	0.630	0.037	104392
150.00	DB563K-TT w/Mount Pipe	18	11.26	0.629	0.034	104392
145.00	QS66512-2_TIA w/ Mount Pipe	18	10.60	0.624	0.035	74566
140.00	4 ft w/ HP	18	9.93	0.619	0.037	31285
135.00	6 ft x 3" omni whip	18	9.28	0.611	0.036	20288
131.00	APXVSPP18-C-A20_TIA w/ Mount Pipe	18	8.76	0.603	0.034	68068
118.00	AIR 32 w/ Mount Pipe	18	7.14	0.556	0.029	19767
98.00	GPS	18	4.91	0.459	0.022	10392
74.00	8' 4-Bay Dipole	18	2.79	0.344	0.015	10863
58.00	GPS	18	1.71	0.262	0.011	11835

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	152	Diagonal	A325N	0.500	1	1.3038	3.1266	0.417 ✔	1	Member Block Shear
		Top Girt	A325N	0.500	1	0.1067	4.1325	0.026 ✔	1	Member Bearing
T2	140	Leg	A325N	0.625	4	1.3686	20.7087	0.066 ✔	1	Bolt Tension
		Diagonal	A325N	0.500	1	1.1967	4.6898	0.255 ✔	1	Member Block Shear
		Top Girt	A325N	0.500	1	0.1207	4.1325	0.029 ✔	1	Member Bearing
T3	135	Diagonal	A325N	0.625	1	1.7092	4.7918	0.357 ✔	1	Member Block Shear
T4	130	Diagonal	A325N	0.625	1	2.6640	6.3891	0.417 ✔	1	Member Block Shear
T5	125	Diagonal	A325N	0.625	1	2.4766	6.3891	0.388 ✔	1	Member Block Shear
T6	120	Leg	A325N	0.625	4	8.7722	20.7087	0.424 ✔	1	Bolt Tension
		Diagonal	A325N	0.625	1	4.0592	9.1078	0.446 ✔	1	Member Block Shear
T7	100	Leg	A325N	0.750	4	14.4681	29.8206	0.485 ✔	1	Bolt Tension
		Diagonal	A325X	0.625	1	4.9585	10.4400	0.475 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.500	2	0.6179	7.9522	0.078 ✔	1	Bolt Shear
T8	80	Leg	A325N	0.875	4	16.4451	40.5891	0.405 ✔	1	Bolt Tension
		Diagonal	A325X	0.625	1	5.0936	10.4400	0.488 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.500	2	0.6985	7.9522	0.088 ✔	1	Bolt Shear
T9	73.333	Diagonal	A325X	0.625	1	5.1948	13.0500	0.398 ✔	1	Member Bearing

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
		Secondary Horizontal	A325N	0.500	2	0.7741	7.9522	0.097 ✔	1	Bolt Shear
T10	66.667	Diagonal	A325N	0.625	1	5.5257	12.4252	0.445 ✔	1	Bolt Shear
		Secondary Horizontal	A325N	0.500	2	0.8507	7.9522	0.107 ✔	1	Bolt Shear
T11	60	Leg	A325N	0.875	4	22.4455	40.5891	0.553 ✔	1	Bolt Tension
		Diagonal	A325N	0.625	1	6.0152	10.4400	0.576 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.500	2	0.9436	7.9522	0.119 ✔	1	Bolt Shear
T12	50	Diagonal	A325N	0.625	1	6.4489	12.4252	0.519 ✔	1	Bolt Shear
		Secondary Horizontal	A325N	0.500	2	1.0520	7.9522	0.132 ✔	1	Bolt Shear
T13	40	Leg	A325N	1.000	4	27.7936	53.0144	0.524 ✔	1	Bolt Tension
		Diagonal	A325N	0.625	1	6.6285	12.4252	0.533 ✔	1	Bolt Shear
		Secondary Horizontal	A325N	0.500	2	1.1613	7.9522	0.146 ✔	1	Bolt Shear
T14	30	Diagonal	A325N	0.625	1	7.5289	12.4252	0.606 ✔	1	Bolt Shear
		Horizontal	A325N	0.500	2	1.2633	7.9522	0.159 ✔	1	Bolt Shear
T15	20	Leg	A325N	1.000	4	32.6802	53.0144	0.616 ✔	1	Bolt Tension
		Diagonal	A325X	0.625	1	6.3867	10.4400	0.612 ✔	1	Member Bearing
T16	15	Diagonal	A325X	0.625	1	6.2174	10.4400	0.596 ✔	1	Member Bearing
		Horizontal	A325N	0.625	1	2.7540	7.8300	0.352 ✔	1	Member Bearing
T17	10	Diagonal	A325X	0.625	1	6.9376	13.0500	0.532 ✔	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	152 - 140	Pipe 2.375" x 0.154" (2 STD)	12.00	4.00	61.0 K=1.00	1.075	-4.9619	36.8422	0.135 [1] ✔
T2	140 - 135	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4 K=1.00	1.704	-7.5436	57.1341	0.132 [1] ✔
T3	135 - 130	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4 K=1.00	1.704	-11.1827	57.1341	0.196 [1] ✔
T4	130 - 125	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4 K=1.00	1.704	-15.4077	57.1341	0.270 [1] ✔
T5	125 - 120	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4 K=1.00	1.704	-20.2832	57.1364	0.355 [1] ✔
T6	120 - 100	Pipe 2.875" x 0.276" (2.5 XS)	20.03	6.68	86.7 K=1.00	2.254	-43.2374	58.5119	0.739 [1] ✔
T7	100 - 80	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	20.03	3.43	47.4 K=1.00	3.259	-71.2614	124.4500	0.573 [1] ✔
T8	80 - 73.333	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.43	39.0 K=1.00	3.980	-80.5593	160.2660	0.503 [1] ✔
T9	73.333 - 66.667	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.42	38.9 K=1.00	3.980	-89.2692	160.3010	0.557 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T10	66.667 - 60	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.42	38.9 K=1.00	3.980	-98.1071	160.3360	0.612 [1] ✔
T11	60 - 50	Pipe 4.5" x 0.337" (4 XS)	10.02	5.17	42.1 K=1.00	4.407	-108.8130	174.2770	0.624 [1] ✔
T12	50 - 40	Pipe 4.5" x 0.337" (4 XS)	10.02	5.17	42.0 K=1.00	4.407	-121.3150	174.3530	0.696 [1] ✔
T13	40 - 30	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60" Lu)	10.02	5.16	45.4 K=1.00	5.651	-133.9290	218.7270	0.612 [1] ✔
T14	30 - 20	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30" Lu)	10.02	2.50	22.9 K=1.00	5.651	-145.6900	244.7280	0.595 [1] ✔
T15	20 - 15	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ 6 x 0.25 half sleeve	5.01	2.50	16.9 K=1.00	5.770	-157.6500	254.3080	0.620 [1] ✔
T16	15 - 10	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (60" Lu)	5.01	5.01	28.6 K=1.00	6.514	-158.7980	276.0700	0.575 [1] ✔
T17	10 - 0	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120" Lu)	10.02	10.02	57.3 K=1.00	6.514	-170.2020	230.6190	0.738 [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 K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	152 - 140	L 1.5 x 1.5 x 1/8	7.68	3.62	146.8 K=1.00	0.359	-1.3182	3.7688	0.350 [1] ✔
T2	140 - 135	L 1.5 x 1.5 x 3/16	8.45	4.13	169.0 K=1.00	0.527	-1.2282	4.1693	0.295 [1] ✔
T3	135 - 130	L 1.5 x 1.5 x 3/16	8.87	4.32	176.9 K=1.00	0.527	-1.7874	3.8068	0.470 [1] ✔
T4	130 - 125	L 1.5 x 1.5 x 1/4	9.30	4.54	186.5 K=1.00	0.688	-2.7285	4.4676	0.611 [1] ✔
T5	125 - 120	L 1.5 x 1.5 x 1/4	9.73	4.75	195.1 K=1.00	0.688	-2.4191	4.0783	0.593 [1] ✔
T6	120 - 100	L 2 x 2 x 1/4	12.26	6.07	186.3 K=1.00	0.938	-3.9438	6.1034	0.646 [1] ✔
T7	100 - 80	L 2.5 x 2.5 x 1/4	14.01	7.03	171.9 K=1.00	1.190	-5.1551	9.1018	0.566 [1] ✔
T8	80 - 73.333	L 2.5 x 2.5 x 1/4	14.61	7.30	178.5 K=1.00	1.190	-5.2645	8.4358	0.624 [1] ✔
T9	73.333 - 66.667	L 2.5 x 2.5 x 5/16	15.21	7.61	186.7 K=1.00	1.460	-5.4942	9.4608	0.581 [1] ✔
T10	66.667 - 60	L 2.5 x 2.5 x 5/16	15.82	7.92	194.3 K=1.00	1.460	-5.5257	8.7408	0.632 [1] ✔
T11	60 - 50	L 3 x 3 x 1/4	18.19	9.17	186.0 K=1.00	1.440	-6.2934	9.4069	0.669 [1] ✔
T12	50 - 40	L 3 x 3 x 5/16	19.05	9.60	195.7 K=1.00	1.780	-6.4489	10.5040	0.614 [1] ✔
T13	40 - 30	L 3 x 3 x 3/8	19.92	10.01	204.7 K=1.00	2.110	-6.6285	11.3814	0.582 [1] ✔
T14	30 - 20	KL/R > 200 (C) - 179 L 3 x 3 x 5/16	10.63	10.15	132.1 K=1.00	1.780	-7.5289	23.0113	0.327 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T15	20 - 15	L 3.5 x 3.5 x 1/4	10.63	10.15	115.9 K=1.04	1.690	-6.2988	27.0057	0.233 [1] ✔
T16	15 - 10	L 3.5 x 3.5 x 1/4	11.08	10.48	181.3 K=1.00	1.690	-6.4328	11.6188	0.554 [1] ✔
T17	10 - 0	L 3.5 x 3.5 x 5/16	22.61	11.11	193.3 K=1.00	2.090	-7.4646	12.6397	0.591 [1] ✔

[1] $P_u / \phi P_n$ controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T14	30 - 20	L 3 x 3 x 1/4	18.24	8.75	163.7 K=0.92	1.440	-2.5267	12.1434	0.208 [1] ✔
T16	15 - 10	L 2.5 x 2.5 x 3/16	19.26	9.26	224.5 K=1.00	0.902	-2.7540	4.0435	0.681 [1] ✔
		KL/R > 200 (C) - 232							

[1] $P_u / \phi P_n$ controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	100 - 80	L 2.5 x 2.5 x 1/4	12.31	6.01	146.9 K=1.00	1.190	-1.2359	12.4591	0.099 [1] ✔
T8	80 - 73.333	L 2.5 x 2.5 x 1/4	12.99	6.33	154.6 K=1.00	1.190	-1.3971	11.2450	0.124 [1] ✔
T9	73.333 - 66.667	L 2.5 x 2.5 x 1/4	13.66	6.66	162.9 K=1.00	1.190	-1.5482	10.1345	0.153 [1] ✔
T10	66.667 - 60	L 2.5 x 2.5 x 1/4	14.34	7.00	171.2 K=1.00	1.190	-1.7015	9.1740	0.185 [1] ✔
T11	60 - 50	L 2.5 x 2.5 x 1/4	15.18	7.40	180.9 K=1.00	1.190	-1.8871	8.2155	0.230 [1] ✔
T12	50 - 40	L 3 x 3 x 1/4	16.19	7.91	160.3 K=1.00	1.440	-2.1040	12.6557	0.166 [1] ✔
T13	40 - 30	L 3 x 3 x 1/4	17.21	8.40	170.2 K=1.00	1.440	-2.3227	11.2295	0.207 [1] ✔

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	152 - 140	L 2 x 2 x 1/8	6.52	6.11	184.5 K=1.00	0.484	-0.1185	3.2130	0.037 [1] ✔
T2	140 - 135	L 2 x 2 x 1/8	6.56	6.15	185.8 K=1.00	0.484	-0.1540	3.1714	0.049 [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 K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T14	30 - 20	L 2 x 2 x 1/4	4.56	4.35	133.6 K=1.00	0.938	-2.5267	11.8833	0.213 [1] ✔
T15	20 - 15	L 2 x 2 x 1/4	4.81	4.56	140.1 K=1.00	0.938	-2.7341	10.7957	0.253 [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 K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T14	30 - 20	L 2 x 2 x 1/4	5.31	5.07	155.7 K=1.00	0.938	-1.4720	8.7390	0.168 [1] ✔
T15	20 - 15	L 2 x 2 x 1/4	5.54	5.26	161.4 K=1.00	0.938	-1.5842	8.1340	0.195 [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 K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	152 - 140	Pipe 2.375" x 0.154" (2 STD)	12.00	4.00	61.0	1.075	3.1732	48.3539	0.066 [1] ✔
T2	140 - 135	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4	1.704	5.4743	76.6823	0.071 [1] ✔
T3	135 - 130	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4	1.704	7.8360	76.6823	0.102 [1] ✔
T4	130 - 125	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4	1.704	11.1117	76.6823	0.145 [1] ✔
T5	125 - 120	P2.875"x0.203" (2.5 STD)	5.01	5.01	63.4	1.704	15.4471	76.6823	0.201 [1] ✔
T6	120 - 100	Pipe 2.875" x 0.276" (2.5 XS)	20.03	6.68	86.7	2.254	35.0888	101.4090	0.346 [1] ✔
T7	100 - 80	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	20.03	3.25	44.9	3.259	57.9325	146.6550	0.395 [1] ✔
T8	80 - 73.333	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.25	37.0	3.980	65.8536	179.1000	0.368 [1] ✔
T9	73.333 - 66.667	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.26	37.1	3.980	73.3610	179.1000	0.410 [1] ✔
T10	66.667 - 60	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	6.68	3.26	37.1	3.980	80.9643	179.1000	0.452 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T11	60 - 50	Pipe 4.5" x 0.337" (4 XS)	10.02	4.84	39.3	4.407	90.0965	198.3350	0.454 [1] ✔
T12	50 - 40	Pipe 4.5" x 0.337" (4 XS)	10.02	4.85	39.4	4.407	100.7650	198.3350	0.508 [1] ✔
T13	40 - 30	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60" Lu)	10.02	4.86	42.8	5.651	111.3280	254.2950	0.438 [1] ✔
T14	30 - 20	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30" Lu)	10.02	2.50	22.9	5.651	120.9830	254.2950	0.476 [1] ✔
T15	20 - 15	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ 6 x 0.25 half sleeve	5.01	2.50	16.9	5.770	130.9290	259.6500	0.504 [1] ✔
T16	15 - 10	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (60" Lu)	5.01	5.01	28.6	6.514	131.4760	293.1300	0.449 [1] ✔
T17	10 - 0	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120" Lu)	10.02	10.02	57.3	6.514	141.0870	293.1300	0.481 [1] ✔

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	152 - 140	L 1.5 x 1.5 x 1/8	7.68	3.62	96.1	0.211	1.3038	9.1758	0.142 [1] ✔
T2	140 - 135	L 1.5 x 1.5 x 3/16	8.45	4.13	111.3	0.308	1.1967	13.3814	0.089 [1] ✔
T3	135 - 130	L 1.5 x 1.5 x 3/16	8.87	4.32	116.8	0.290	1.7092	12.6167	0.135 [1] ✔
T4	130 - 125	L 1.5 x 1.5 x 1/4	9.30	4.54	124.5	0.375	2.6640	16.3125	0.163 [1] ✔
T5	125 - 120	L 1.5 x 1.5 x 1/4	9.73	4.75	130.2	0.375	2.4766	16.3125	0.152 [1] ✔
T6	120 - 100	L 2 x 2 x 1/4	11.70	5.79	116.5	0.563	4.0592	24.4851	0.166 [1] ✔
T7	100 - 80	L 2.5 x 2.5 x 1/4	14.01	7.03	109.7	0.752	4.9585	32.7066	0.152 [1] ✔
T8	80 - 73.333	L 2.5 x 2.5 x 1/4	14.61	7.30	114.0	0.752	5.0936	32.7066	0.156 [1] ✔
T9	73.333 - 66.667	L 2.5 x 2.5 x 5/16	15.21	7.61	120.0	0.919	5.1948	39.9860	0.130 [1] ✔
T10	66.667 - 60	L 2.5 x 2.5 x 5/16	15.82	7.92	124.8	0.919	5.3601	39.9860	0.134 [1] ✔
T11	60 - 50	L 3 x 3 x 1/4	18.19	9.17	118.4	0.939	6.0152	40.8628	0.147 [1] ✔
T12	50 - 40	L 3 x 3 x 5/16	19.05	9.60	125.0	1.159	6.0688	50.4260	0.120 [1] ✔
T13	40 - 30	L 3 x 3 x 3/8	19.92	10.01	131.6	1.372	6.3120	59.6630	0.106 [1] ✔
T14	30 - 20	L 3 x 3 x 5/16	10.63	10.15	135.2	1.159	6.7130	50.4260	0.133 [1] ✔
T15	20 - 15	L 3.5 x 3.5 x 1/4	10.63	10.15	114.4	1.127	6.3867	49.0191	0.130 [1] ✔
T16	15 - 10	L 3.5 x 3.5 x 1/4	11.08	10.48	118.1	1.127	6.2174	49.0191	0.127 [1] ✔

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T17	10 - 0	L 3.5 x 3.5 x 5/16	22.61	11.11	124.8	1.392	6.9376	60.5398	0.115 [1] ✔

[1] $P_u / \phi P_n$ controls

Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T14	30 - 20	L 3 x 3 x 1/4	18.24	8.75	172.5	0.963	2.5267	41.8823	0.060 [1] ✔
T16	15 - 10	L 2.5 x 2.5 x 3/16	19.26	9.26	217.0	0.571	2.7540	24.8399	0.111 [1] ✔

[1] $P_u / \phi P_n$ controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T7	100 - 80	L 2.5 x 2.5 x 1/4	12.31	6.01	187.6	0.775	1.2359	33.7261	0.037 [1] ✔
T8	80 - 73.333	L 2.5 x 2.5 x 1/4	12.99	6.33	197.4	0.775	1.3971	33.7261	0.041 [1] ✔
T9	73.333 - 66.667	L 2.5 x 2.5 x 1/4	13.66	6.66	208.0	0.775	1.5482	33.7261	0.046 [1] ✔
T10	66.667 - 60	L 2.5 x 2.5 x 1/4	14.34	7.00	218.6	0.775	1.7015	33.7261	0.050 [1] ✔
T11	60 - 50	L 2.5 x 2.5 x 1/4	15.18	7.40	231.0	0.775	1.8871	33.7261	0.056 [1] ✔
T12	50 - 40	L 3 x 3 x 1/4	16.19	7.91	204.1	0.963	2.1040	41.8823	0.050 [1] ✔
T13	40 - 30	L 3 x 3 x 1/4	17.21	8.40	216.7	0.963	2.3227	41.8823	0.055 [1] ✔

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T1	152 - 140	L 2 x 2 x 1/8	6.52	6.11	121.1	0.305	0.1067	13.2539	0.008 [1] ✔
T2	140 - 135	L 2 x 2 x 1/8	6.56	6.15	121.9	0.305	0.1207	13.2539	0.009 [1] ✔

[1] $P_u / \phi P_n$ controls

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T14	30 - 20	L 2 x 2 x 1/4	4.56	4.35	85.7	0.938	2.5267	30.3912	0.083 [1] ✔
T15	20 - 15	L 2 x 2 x 1/4	4.81	4.56	90.0	0.938	2.7341	30.3912	0.090 [1] ✔

[1] $P_u / \phi P_n$ controls

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T14	30 - 20	L 2 x 2 x 1/4	5.31	5.07	100.0	0.938	1.4720	30.3912	0.048 [1] ✔
T15	20 - 15	L 2 x 2 x 1/4	5.54	5.26	103.6	0.938	1.5842	30.3912	0.052 [1] ✔

[1] $P_u / \phi P_n$ controls

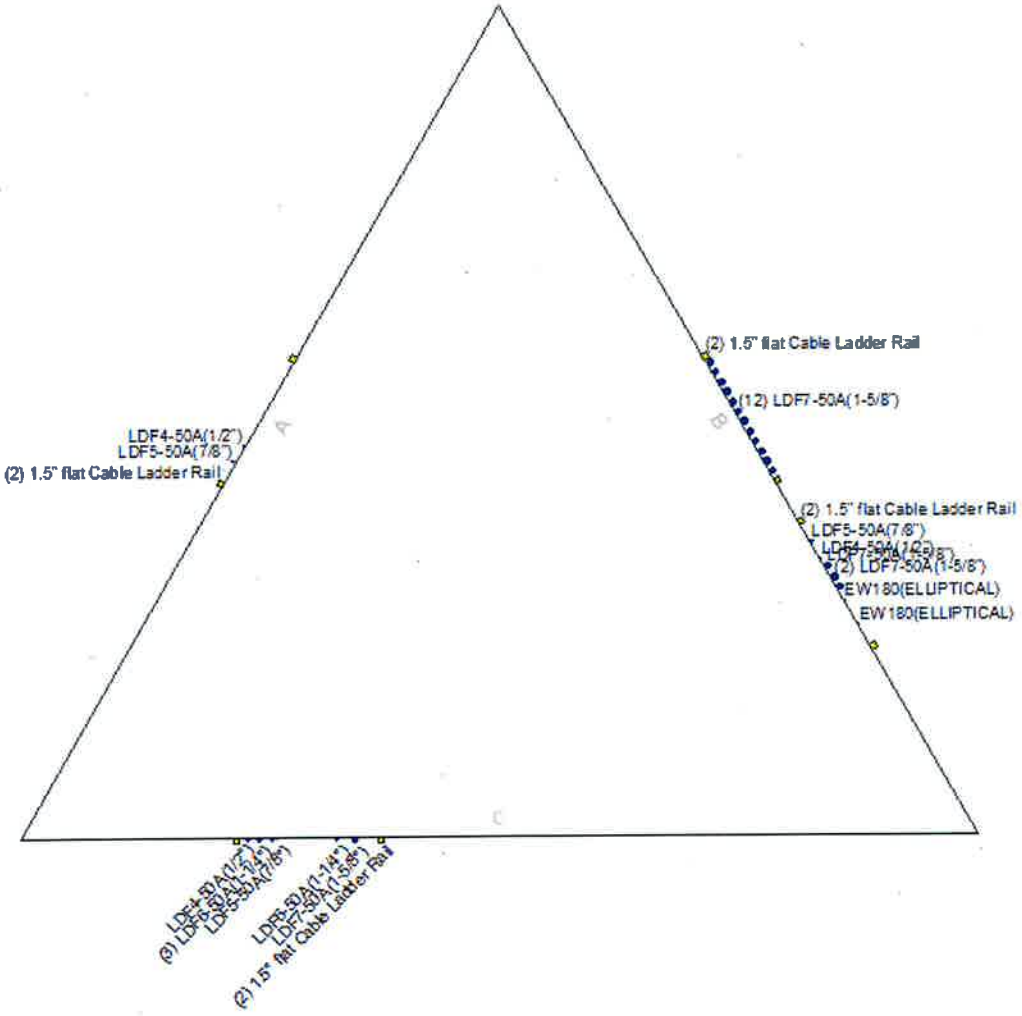
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	152 - 140	Leg	Pipe 2.375" x 0.154" (2 STD)	3	-4.9619	36.8422	13.5	Pass
T2	140 - 135	Leg	P2.875"x0.203" (2.5 STD)	27	-7.5436	57.1341	13.2	Pass
T3	135 - 130	Leg	P2.875"x0.203" (2.5 STD)	39	-11.1827	57.1341	19.6	Pass
T4	130 - 125	Leg	P2.875"x0.203" (2.5 STD)	48	-15.4077	57.1341	27.0	Pass
T5	125 - 120	Leg	P2.875"x0.203" (2.5 STD)	57	-20.2832	57.1364	35.5	Pass
T6	120 - 100	Leg	Pipe 2.875" x 0.276" (2.5 XS)	64	-43.2374	58.5119	73.9	Pass
T7	100 - 80	Leg	PJF 42919-0011 - Pipe 2.875 x 0.276 w/ 3.5x.3 half sleeve	85	-71.2614	124.4500	57.3	Pass
T8	80 - 73.333	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	115	-80.5593	160.2660	50.3	Pass
T9	73.333 - 66.667	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	127	-89.2692	160.3010	55.7	Pass
T10	66.667 - 60	Leg	PJF 42919-0011 - Pipe 3.5 x 0.3 w/ 4 x 0.25 half sleeve	139	-98.1071	160.3360	61.2	Pass
T11	60 - 50	Leg	Pipe 4.5" x 0.337" (4 XS)	151	-108.8130	174.2770	62.4	Pass
T12	50 - 40	Leg	Pipe 4.5" x 0.337" (4 XS)	163	-121.3150	174.3530	69.6	Pass
T13	40 - 30	Leg	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (60" Lu)	175	-133.9290	218.7270	61.2	Pass
T14	30 - 20	Leg	PJF 42919-0011 - Pipe 4.5 x .337 w/ 5 x 0.25 half sleeve (30" Lu)	187	-145.6900	244.7280	59.5	Pass
T15	20 - 15	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ 6 x 0.25 half sleeve	229	-157.6500	254.3080	62.0	Pass
T16	15 - 10	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (60" Lu)	253	-158.7980	276.0700	57.5	Pass
T17	10 - 0	Leg	PJF 42919-0011 - Pipe 5.5 x 0.259 w/ (3) 1.5 x 0.5 bar (120" Lu)	262	-170.2020	230.6190	73.8	Pass
T1	152 - 140	Diagonal	L 1.5 x 1.5 x 1/8	11	-1.3182	3.7688	35.0 41.7 (b)	Pass
T2	140 - 135	Diagonal	L 1.5 x 1.5 x 3/16	35	-1.2282	4.1693	29.5	Pass
T3	135 - 130	Diagonal	L 1.5 x 1.5 x 3/16	40	-1.7874	3.8068	47.0	Pass
T4	130 - 125	Diagonal	L 1.5 x 1.5 x 1/4	49	-2.7285	4.4676	61.1	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T5	125 - 120	Diagonal	L 1.5 x 1.5 x 1/4	59	-2.4191	4.0783	59.3	Pass
T6	120 - 100	Diagonal	L 2 x 2 x 1/4	67	-3.9438	6.1034	64.6	Pass
T7	100 - 80	Diagonal	L 2.5 x 2.5 x 1/4	88	-5.1551	9.1018	56.6	Pass
T8	80 - 73.333	Diagonal	L 2.5 x 2.5 x 1/4	118	-5.2645	8.4358	62.4	Pass
T9	73.333 - 66.667	Diagonal	L 2.5 x 2.5 x 5/16	131	-5.4942	9.4608	58.1	Pass
T10	66.667 - 60	Diagonal	L 2.5 x 2.5 x 5/16	142	-5.5257	8.7408	63.2	Pass
T11	60 - 50	Diagonal	L 3 x 3 x 1/4	155	-6.2934	9.4069	66.9	Pass
T12	50 - 40	Diagonal	L 3 x 3 x 5/16	167	-6.4489	10.5040	61.4	Pass
T13	40 - 30	Diagonal	L 3 x 3 x 3/8	179	-6.6285	11.3814	58.2	Pass
T14	30 - 20	Diagonal	L 3 x 3 x 5/16	191	-7.5289	23.0113	32.7 60.6 (b)	Pass
T15	20 - 15	Diagonal	L 3.5 x 3.5 x 1/4	233	-6.2988	27.0057	23.3 61.2 (b)	Pass
T16	15 - 10	Diagonal	L 3.5 x 3.5 x 1/4	257	-6.4328	11.6188	55.4 59.6 (b)	Pass
T17	10 - 0	Diagonal	L 3.5 x 3.5 x 5/16	265	-7.4646	12.6397	59.1	Pass
T14	30 - 20	Horizontal	L 3 x 3 x 1/4	190	-2.5267	12.1434	20.8	Pass
T16	15 - 10	Horizontal	L 2.5 x 2.5 x 3/16	232	-2.7540	4.0435	68.1	Pass
T7	100 - 80	Secondary Horizontal	L 2.5 x 2.5 x 1/4	94	-1.2359	12.4591	9.9	Pass
T8	80 - 73.333	Secondary Horizontal	L 2.5 x 2.5 x 1/4	124	-1.3971	11.2450	12.4	Pass
T9	73.333 - 66.667	Secondary Horizontal	L 2.5 x 2.5 x 1/4	136	-1.5482	10.1345	15.3	Pass
T10	66.667 - 60	Secondary Horizontal	L 2.5 x 2.5 x 1/4	150	-1.7015	9.1740	18.5	Pass
T11	60 - 50	Secondary Horizontal	L 2.5 x 2.5 x 1/4	160	-1.8871	8.2155	23.0	Pass
T12	50 - 40	Secondary Horizontal	L 3 x 3 x 1/4	172	-2.1040	12.6557	16.6	Pass
T13	40 - 30	Secondary Horizontal	L 3 x 3 x 1/4	184	-2.3227	11.2295	20.7	Pass
T1	152 - 140	Top Girt	L 2 x 2 x 1/8	5	-0.1185	3.2130	3.7	Pass
T2	140 - 135	Top Girt	L 2 x 2 x 1/8	30	-0.1540	3.1714	4.9	Pass
T14	30 - 20	Redund Horz 1 Bracing	L 2 x 2 x 1/4	209	-2.5267	11.8833	21.3	Pass
T15	20 - 15	Redund Horz 1 Bracing	L 2 x 2 x 1/4	234	-2.7341	10.7957	25.3	Pass
T14	30 - 20	Redund Diag 1 Bracing	L 2 x 2 x 1/4	213	-1.4720	8.7390	16.8	Pass
T15	20 - 15	Redund Diag 1 Bracing	L 2 x 2 x 1/4	252	-1.5842	8.1340	19.5	Pass
							Summary	
						Leg (T6)	73.9	Pass
						Diagonal (T11)	66.9	Pass
						Horizontal (T16)	68.1	Pass
						Secondary Horizontal (T11)	23.0	Pass
						Top Girt (T2)	4.9	Pass
						Redund Horz 1 Bracing (T15)	25.3	Pass
						Redund Diag 1 Bracing (T15)	19.5	Pass
						Bolt Checks	61.6	Pass
						RATING =	**73.9**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


(2) 1.5" flat Cable Ladder Rail
(12) LDF7-50A(1-5/8")
LDF4-50A(1/2")
LDF5-50A(7/8")
(2) 1.5" flat Cable Ladder Rail
(2) 1.5" flat Cable Ladder Rail
LDF5-50A(7/8")
(2) LDF7-50A(1-5/8")
EW180(ELLIPTICAL)
EW180(ELLIPTICAL)
A
B
C

APPENDIX C

ADDITIONAL CALCULATIONS

PAUL J. FORD & COMPANY
250 E Broad St, Ste 600 • Columbus, OH 43215
Phone 614.221.6679 www.pauljford.com

Self-Support Tower Anchor Rod Capacity - TIA-G

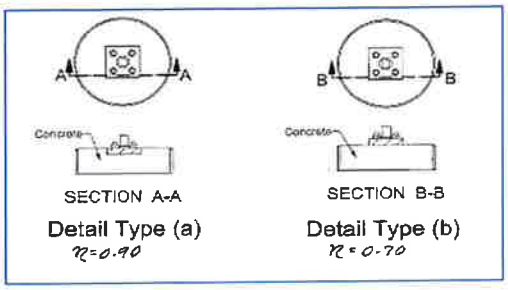
Loads

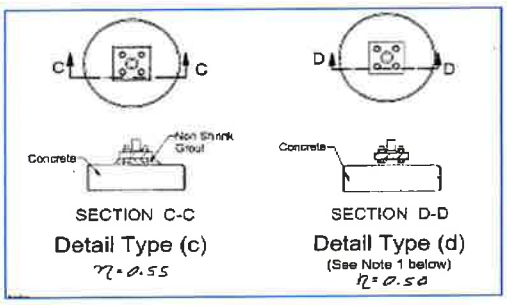
Compression :	176	kips	Tension :	146	kips
Comp. Shear :	21	kips	Ten.Shear :	18	kips

Code: TIA-G
Maximum Ratio: 1.00

Existing Anchor Rods

Anchor Rod Condition (n) :	0.55	
Anchor Rod ø :	1	in
Anchor Rod Quantity :	4	
Anchor Rod Grade :	F1554 Gr. 105	
F_y :	105	ksi
F_u :	125	ksi
Threads per Inch	8	
Net Tensile Area	0.61	in^2
ϕ_t :	0.80	
$\phi_t R_{nt}$:	242.30	kip
Anchor Rod Ratio :	0.738	





PAUL J. FORD & COMPANY
250 E Broad St, Ste 600 • Columbus, OH 43215
Phone 614.221.6679 www.pauljford.com

Job Number: 42919-0011
Site Number: -
Site Name: Stamford NW CT

By: RMD
Date: 10/25/2019

DRILLED PIER SOIL AND STEEL ANALYSIS - TIA-222-G

Factored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, Mu =			k-ft
Shear, Vu =	21.0	18.0	kips
Axial Load, Pu =	176.0	-146.0	kips
OTMu =	10.5	9.0	k-ft @ Ground

Safety Factors / Load Factors / Φ Factors

Tower Type =	Self-Supported
ACI Code =	ACI 318-08
Seismic Design Category =	B
Reference Standard =	TIA-222-G
Use 1.3 Load Factor?	No
Load Factor =	1.00

Drilled Pier Parameters

Diameter =	4.5	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	21	ft
fc' =	4	ksi
εc =	0.003	in/in
L / D Ratio =	4.78	
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

	Safety Factor	Φ Factor
Soil Lateral Resistance =	2.00	0.75
Skin Friction =	2.00	0.75
End Bearing =	2.00	0.75
Concrete Wt. Resist Uplift =	1.25	

Load Combinations Checked per TIA-222-G

1. (0.75) Ult. Skin Friction + (0.75) Ult. End Bearing + (1.2) Effective Soil Wt. - (1.2) Buoyant Conc. Wt. ≥ Comp.
2. (0.75) Ult. Skin Friction + (0.9) Buoyant Conc. Wt. ≥ Uplift

Steel Parameters

Number of Bars =	15	
Rebar Size =	#8	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#4	
Side Clear Cover to Ties =	3	in

Soil Parameters

Water Table Depth =	8.00	ft
Depth to Ignore Soil =	5.00	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?*	Ground	

Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)
Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)

Direct Embed Pole Shaft Parameters

Dia @ Grade =		in
Dia @ Depth Below Grade =		in
Number of Sides =		
Thickness =		in
Fy =		ksi
Backfill Condition =		

Maximum Capacity Ratios

Maximum Soil Ratio =	110.0%
Maximum Steel Ratio =	105.0%

*Note: The drilled pier foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the drilled pier is based the recommendations of the site specific geotechnical report. In the absence of any recommendations, the frost depth at the site or one half of the drilled pier diameter (whichever is greater) shall be ignored.

Define Soil Layers

Note: Cohesion = Undrained Shear Strength = Unconfined Compressive Strength / 2

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	5	120	0	0	Sand	0	0	0	5
2	3	120	0	30	Sand	0	820	820	8
3	5.5	120	0	30	Sand	0	820	820	13.5
4	7.5	130	0	36	Sand	10000	820	820	21
5									
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	16.70	ft, from Grade
Bending Moment, Mu =	361.19	k-ft, from COR
Resisting Moment, ΦMn =	2681.72	k-ft, from COR

MOMENT RATIO = 13.5% OK

Shear, Vu =	21.00	kips
Resisting Shear, ΦVn =	155.92	kips

SHEAR RATIO = 13.5% OK

Soil Results: Uplift

Uplift, Tu =	146.00	kips
Uplift Capacity, ΦTn =	173.66	kips

UPLIFT RATIO = 84.1% OK

Soil Results: Compression

Compression, Cu =	176.00	kips
Comp. Capacity, ΦCn =	246.37	kips

COMPRESSION RATIO = 71.4% OK

Steel Results (ACI 318-08):

Minimum Steel Area =	7.63	sq in
Actual Steel Area =	11.85	sq in
Axial, ΦPn (min) =	-639.90	kips, Where ΦMn = 0 k-ft
Axial, ΦPn (max) =	4397.88	kips, Where ΦMn = 0 k-ft

Axial Load, Pu =	-88.36	kips @ 10.25 ft Below Grade
Moment, Mu =	154.77	k-ft @ 10.25 ft Below Grade
Moment, ΦMn =	1055.20	k-ft

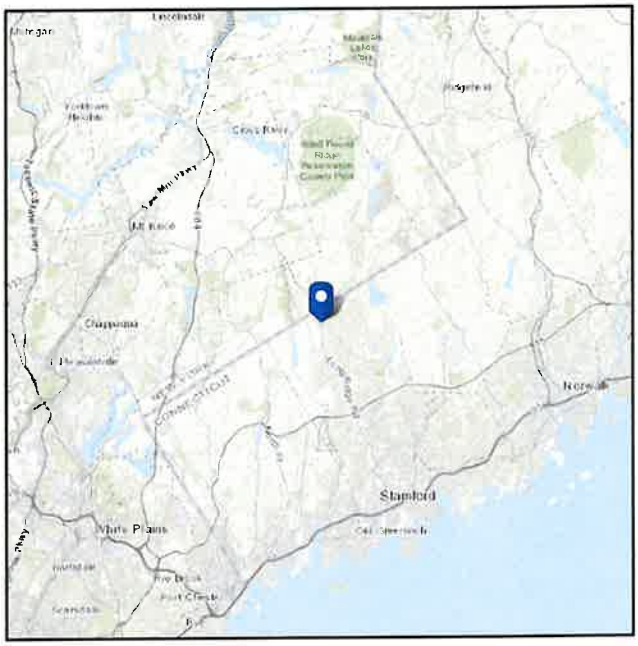
MOMENT RATIO = 14.7% OK

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 447.38 ft (NAVD 88)
Latitude: 41.1543
Longitude: -73.5925



Wind

Results:

Wind Speed:	117 Vmph
10-year MRI	76 Vmph
25-year MRI	85 Vmph
50-year MRI	90 Vmph
100-year MRI	96 Vmph

125 mph per jurisdiction

Data Source: ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, incorporating errata of March 12, 2014

Date Accessed: Fri Sep 20 2019

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

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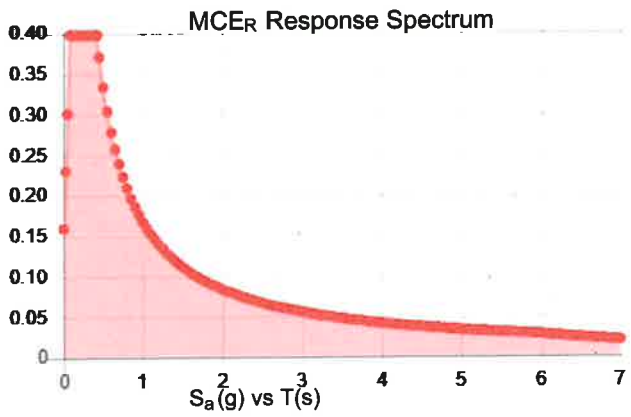
Seismic

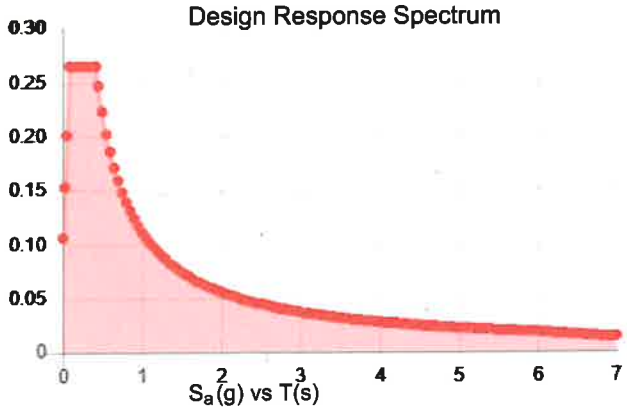
Site Soil Class: D - Stiff Soil

Results:

S_S :	0.249	S_{DS} :	0.265
S_1 :	0.07	S_{D1} :	0.111
F_a :	1.6	T_L :	6
F_v :	2.4	PGA :	0.144
S_{MS} :	0.398	PGA_M :	0.218
S_{M1} :	0.167	F_{PGA} :	1.511
		I_e :	1

Seismic Design Category B





Data Accessed: Fri Sep 20 2019

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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Ice

Results:

Ice Thickness:	0.75 in.
Concurrent Temperature:	15 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
Date Accessed:	Fri Sep 20 2019

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES BY PAUL J. FORD AND COMPANY

1) Paul J. Ford and Company has not made a field inspection to verify the tower member sizes or the antenna/coax loading. If the existing conditions are not as represented on these drawings, we should be contacted immediately to evaluate the significance of the deviation.

2) No allowance was made for any damaged, missing, or rusted members. The analysis of this tower assumes that no physical deterioration has occurred in any of the structural components of the tower and that all the tower members have the same load carrying capacity as the day the tower was erected.

3) It is not possible to have all the detailed information to perform a thorough analysis of every structural sub-component of an existing tower. The structural analysis by Paul J. Ford and Company verifies the adequacy of the main structural members of the tower. Paul J. Ford and Company provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc.

4) This tower has been analyzed according to the minimum design wind loads recommended by the Telecommunications Industry Association Standard ANSI/TIA-222-G. If the owner or local or state agencies require a higher design wind load, Paul J. Ford and Company should be made aware of this requirement.

5) The enclosed sketches are a schematic representation of the tower that we have analyzed. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions and for the proper fit and clearance in the field.

6) Miscellaneous items such as antenna mounts etc. have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

ATTACHMENT 5

Map: 14

0 100 200 300 400 500 Feet

City of Stamford, Connecticut

Assessment Parcel Map

Parcel data current as of October 2015.
Assessment Data displayed on this map as of October 2015 grand list.
Building and Paved Roads based on aerial flight from Spring 2013.
Map Coordinates based on NAD 83 Connecticut State Plane Feet.

Map Block Lot
Address
Parcel Id
Parcels
City Boundaries
Water Bodies
Streams and Rivers
Paved Roads
Buildings
Pools
Railroad

Map: 14

366 OLD LONG RIDGE ROAD

Location 366 OLD LONG RIDGE ROAD
Mblu 002/ 6549/ / /

Acct# 002-6549
Owner LONG RIDGE FIRE CO INC

Assessment $1,496,530
Appraisal $2,137,900

PID 24275
Building Count 1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$1,817,440	$320,460	$2,137,900
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$1,272,210	$224,320	$1,496,530

Owner of Record

Owner LONG RIDGE FIRE CO INC
Co-Owner
Address 366 OLD LONG RIDGE RD
STAMFORD, CT 06903-1133

Sale Price $0
Book & Page 0686/ 581
Sale Date 01/14/1953
Instrument 25

Ownership History

Ownership History				
Owner	**Sale Price**	**Book & Page**	**Instrument**	**Sale Date**
LONG RIDGE FIRE CO INC	$0	0686/ 581	25	01/14/1953

Building Information

Building 1 : Section 1

Year Built: 1956
Living Area: 8,569

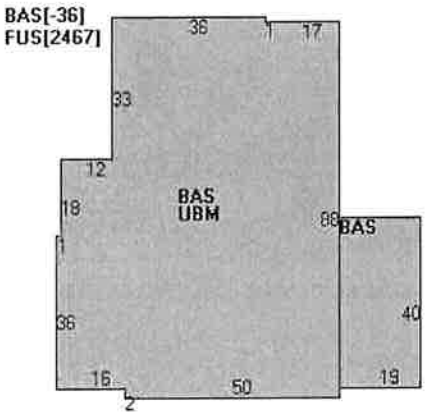
Building Attributes	
Field	**Description**
STYLE	Fire Station
MODEL	Ind/Comm
Grade	B
Stories:	1

Occupancy	1
Exterior Wall 1	Brick/Masonry
Exterior Wall 2	
Roof Structure	Gable/Hip
Roof Cover	Asph/F Gls/Cmp
Interior Wall 1	Minimum
Interior Wall 2	Drywall/Plaste
Interior Floor 1	Concrete Slab
Interior Floor 2	Vinyl/Asphalt
Heating Fuel	Oil
Heating Type	Forced Air-Duc
AC Type	Partial A/C
Bldg Use	Exmpt Comm MDL-94
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	902C
Heat/AC	Heat/AC Pkgs
Frame Type	FireProofSteel
Baths/Plumbing	Average
Ceiling/Wall	Ceil & Mn Wall
Rooms/Prtns	Average
Wall Height	11
% Comn Wall	

Building Photo

(http://images.vgsi.com/photos/StamfordCTPhotos//\00\07\72/7

Building Layout



(http://images.vgsi.com/photos/StamfordCTPhotos//Sketches/24

Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	6,102	6,102
FUS	Upper Story, Finished	2,467	2,467
UBM	Basement, Unfinished	5,378	0
		13,947	8,569

Extra Features

Extra Features				Legend
Code	Description	Size	Value	Bldg #
OH1	Door Overhd Co	4 UNITS	$11,100	1
H04	Air Con/Sfla	9620 S.F	$18,040	1

Land

Land Use

Land Line Valuation

Use Code	902C	**Size (Acres)**	0.49
Description	Exmpt Comm MDL-94	**Depth**	
Zone	RA2	**Assessed Value**	$224,320
Neighborhood	0100	**Appraised Value**	$320,460
Alt Land Appr	No		
Category			

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
LP6	Patio Asphlt			480 S.F.	$1,310	1
FC1	Shed Wood			108 S.F.	$1,300	1
FC1	Shed Wood			560 S.F.	$6,720	1
RG4	Gar 1.0 Det			1008 S.F.	$39,690	1
CEL1	Cell Tower			3 SITES	$438,750	1
CSHD	Cell Equipment			56 S.F.	$2,020	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$1,817,440	$320,460	$2,137,900
2017	$1,817,440	$320,460	$2,137,900
2016	$1,682,510	$291,330	$1,973,840

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$1,272,210	$224,320	$1,496,530
2017	$1,272,210	$224,320	$1,496,530
2016	$1,177,750	$203,930	$1,381,680

ATTACHMENT 6

UNITED STATES POSTAL SERVICE®

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, Esq. Robinson & Cole LLP 280 Trumbull Street Hartford, CT 06103	3	3	neopost 12/18/2019 US POSTAGE $002.79⁰ ZIP 06103 041L12203937
	Postmaster, per *(name of receiving employee)*		

USPS® Tracking Number / Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)	Postage	Fee	Special Handling	Parcel Airlift
1.	David Martin, Mayor City of Stamford 888 Washington Boulevard Stamford, CT 06901				
2.	Ralph Blessing, Land Use Bureau Chief/Director of Planning and Zoning City of Stamford 888 Washington Boulevard Stamford, CT 06901				
3.	Daniel Dauplaise, Chief Long Ridge Fire Company 366 Old Long Ridge Road Stamford, CT 06903				
4.					
5.					
6.					

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