Robinson+Cole

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Also admitted in Massachusetts

April 16, 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**
630 James Farm Road, Stratford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 98-foot level of the existing 110-foot tower at 630 James Farm Road in Stratford, Connecticut (the "Property"). The tower and Property are owned by Dana and Darcy Shoop. The Council approved Cellco's shared use of the tower in 2009. Cellco now intends to modify its facility by replacing six (6) of its existing antennas with six (6) model JAHH-65B-R3B antennas, all at the same level on the tower. Cellco also now intends to remove three (3) remote radio heads ("RRHs") and install six (6) new RRHs behind its antennas and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

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 Stratford Mayor, Laura R. Hoydick; Susmitha Attota, Stratford's Town Planner; and Dana and Darcy Shoop, the owners 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 located at the 98-foot level on the 110-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 operation of the facility with the new antennas and RRHs will not increase radio frequency (RF) emissions to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included behind Attachment 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Opinion Letter and Structural Analysis Report included in Attachment 3). The Structural Opinion Letter was issued to correct the model numbers for the proposed remote radio heads and mounting brackets that were not included in the Structural Analysis Report.

A copy of the parcel map and owner information for the Property is included in Attachment 4. A Certificate of Mailing verifying that this filing was sent to municipal officials and the owner of the Property is included in Attachment 5.

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:
Laura R. Hoydick, Mayor
Susmitha Attota, Town Planner
Dana and Darcy Shoop
Tim Parks

ATTACHMENT 1

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, dB	25	25	25	25	25	25
Isolation, Intersystem, 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

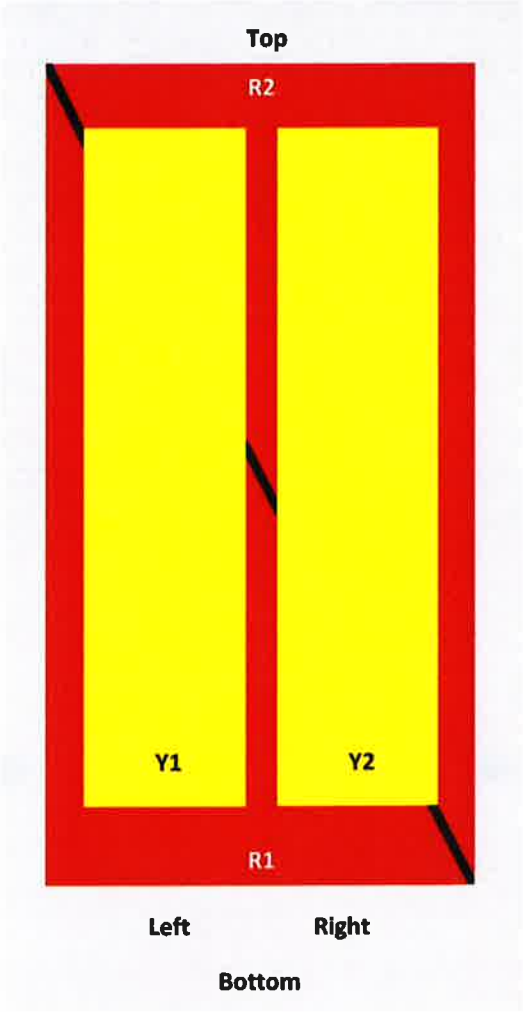
Electrical Specifications, BASTA*

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

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4
RF Connector Interface	4.3-10 Female
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	301.0 N @ 150 km/h 67.7 lbf @ 150 km/h
Wind Loading, lateral	254.0 N @ 150 km/h 57.1 lbf @ 150 km/h
Wind Loading, maximum	638.0 N @ 150 km/h 143.4 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1828.0 mm | 72.0 in
Width	350.0 mm | 13.8 in
Depth	208.0 mm | 8.2 in
Net Weight, without mounting kit	28.7 kg | 63.3 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 5
Internal RET	High band (1) | Low band (2)
Power Consumption, idle state, maximum	2 W
Power Consumption, normal conditions, maximum	13 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

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	42.0 kg | 92.6 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

Included Products

BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

SAMSUNG

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

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

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

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

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

Features and Benefits

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

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B13: DL(746-756MHz)/UL(777-787MHz)
B5: DL(869-894MHz)/UL(824-849MHz)
Instantaneous Bandwidth: 10MHz(B13) + 25MHz(B5)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 207mm (29.9L)
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.

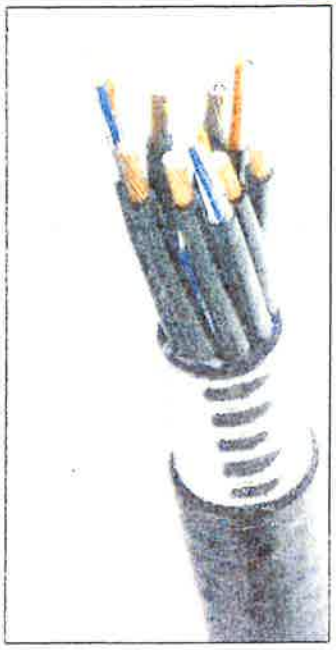


Figure 1: HYBRIFLEX Series

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)

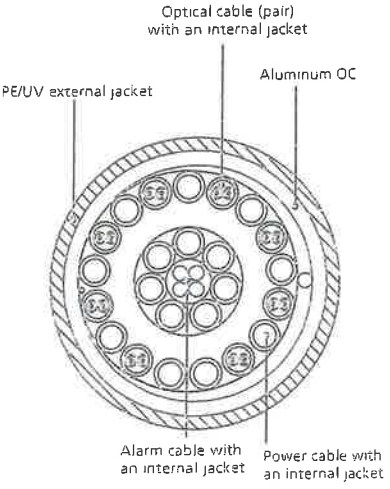


Figure 2: Construction Detail

- This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Stratford N								
Tower Height: 110'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Clearwire	2	153	110	2496	0.0102	1.0000	0.10%	
*Clearwire	1	211	110	11000	0.0070	1.0000	0.07%	
*Nextel	11	197	110	851	0.0721	0.5673	1.27%	
*Sprint	3	140	110	2657	0.0140	1.0000	0.14%	
*Sprint	2	289	109	22500	0.0196	1.0000	0.20%	
*Sprint	2	347	109	19500	0.0235	1.0000	0.24%	
Verizon	**1**	**6906.78**	**98**	**0.2586**	**1970**	**1.0000**	**25.86%**	
Verizon	**9**	**1854.58**	**98**	**0.0694**	**869**	**0.5793**	**11.98%**	
Verizon	**1**	**6906.78**	**98**	**0.2586**	**2145**	**1.0000**	**25.86%**	
Verizon	**1**	**2749.6**	**98**	**0.1029**	**746**	**0.4973**	**20.70%**	
								86.4%
* Source: Siting Council								

ATTACHMENT 3

PJF PAUL J. FORD & COMPANY

Report Date:	April 11, 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 110-ft Self Support
Site Name:	Stratford N CT
Site Address:	630 James Farm Rd.
City, County, State:	Stratford, Fairfield County, CT
Latitude, Longitude:	41.25333, -73.12
PJF Project:	A42918-0023.003.8300

Paul J. Ford and Company is pleased to submit this **"Structural Opinion Letter"** for the structural integrity of the aforementioned tower.

The purpose of the opinion letter is to determine the suitability of the tower with the proposed and existing loading as specified in Tables 1 & 2 on the next page. This opinion is in accordance with the requirements of the 2018 Connecticut State Building Code and 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 using a 3-second gust wind speed of 97 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category B with topographic category 1 and crest height of 0 feet.

Based on a comparison of the previous analysis loads (including wind speeds) from the PJF job number 42918-0023.002.8700, dated 12/10/2018, the current loads, and the proposed loads, we have determined the tower structure and foundation ***ARE*** sufficient for the proposed loading.

We at *Paul J. Ford and Company* appreciate the opportunity of providing our continuing professional services to you. 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

Michael T Bange

Michael Bange, EI
Structural Designer
mbange@pauljford.com

STATE OF CONNECTICUT
JOSEPH PACHICARAH JACOBS
No. PEN 22717
LICENSED PROFESSIONAL ENGINEER

APR 11 2019

PAUL J. FORD & COMPANY

Table 1 - Proposed 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
98.0	98.0	3	commscope	CBC78T-DS-43-2X	1	Hybrid	-
		6	commscope	JAHH-65B-R3B w/ Mount Pipe			
		1	rfs celwave	DB-C1-12C-24AB-0Z			
		3	samsung telecommunications	B2/B66A RRH-BR049			
		3	samsung telecommunications	B5/B13 RRH-BR04C			
		3	commscope	BSAMNT-SBS-2-2 Mount Bracket			
		3	tower mounts	Site Pro 1 VFA12-HD			

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
110.0	110.0	1	andrew	VHLP25 11-DW2	2 2	2 1/2	1
		3	alcatel lucent	RRH2WB0			
		3	argus technologies	LLPX310R-V1 w/ Mount Pipe			
		1	andrew	VHLP2-18-DW1			
		1	miscl	Junction Box			
		3	tower mounts	Pirod 12' V Frame			
98.0	98.0	6	rfs celwave	APL868013 w/ Mount Pipe	12	1-5/8	1
		2	amphenol	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	1 3	Hybrid 1-5/8	2
		1	amphenol	BXA-171063-8BF-EDIN-4 w/ Mount Pipe			
		1	andrew	LNX-6514DS-A1M_10DT_750MHZ w/ Mount Pipe			
		1	andrew	LNX-6514DS-T4M-750_4 w/ Mount Pipe			
		3	nokia	B66A_RRH			
		1	powerwave technologies	P65-16-XL-2_2_790_-2 w/ Mount Pipe			
		1	raycap	RxxDC-3315-PF-48			
		3	tower mounts	Pirod 15' T-Frame Sector Mount			

Notes:
1) Existing Equipment
2) Equipment to be Removed

PJF PAUL J. FORD & COMPANY

Report Date:	December 10, 2018
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 110-ft Self Support
Site Name:	Stratford N CT
Site Address:	630 James Farm Rd.
City, County, State:	Stratford, Fairfield County, CT
Latitude, Longitude:	41.25333, -73.12
PJF Project:	A42918-0023.002.8700

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 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 with the addition of the proposed appurtenance loads shown in Table 1 combined with the existing loads shown in Table 2 of this report.

Summary of Analysis Results:

Existing Structure:	Pass
Existing Foundation:	Pass

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

Michael T Bange

Michael Bange, EI
Structural Designer
mbange@pauljford.com

JPJ

for Jacobs

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

DEC 13 2018

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 110 ft Self Support tower designed by Rohn.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-G
Risk Category:	II
Wind Speed:	96.1 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 - Proposed Antenna and Cable Information

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	6	commscope	JAHH-65B-R3B w/ Mount Pipe	1	1-5/8	-
		3	nokia	AHCA AIRSCALE RRH 4T4R B5 160W			
		3	samsung telecommunications	B2/B66A RRH-BR049			
		3	alcatel lucent	RRH 4X30-B13			
		1	raycap	RVZDC-6627-PF-48			
		3	tower mounts	Site Pro 1 VFA12-RRU			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
110.0	110.0	1	andrew	VHLP25 11-DW2	2 2	1/2 2	1
		3	alcatel lucent	RRH2WB0			
		3	argus technologies	LLPX310VR-V1 w/ Mount Pipe			
		1	andrew	VHLP2-18-DW1			
		1	miscl	Junction Box			
		3	tower mounts	Pirod 12' V Frame			

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	6	rfs celwave	APL868013 w/ Mount Pipe	13	1-5/8	1
		1	raycap	RxxDC-3315-PF-48			
		2	amphenol	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	3	1-5/8	2
		1	amphenol	BXA-171063-8BF-EDIN-4 w/ Mount Pipe			
		1	andrew	LNX-6514DS-A1M_10DT_750MHZ w/ Mount Pipe			
		1	andrew	LNX-6514DS-T4M-750_4 w/ Mount Pipe			
		3	nokia	B66_RRH			
		1	powerwave technologies	P65-16-XL-2_2_790_-2 w/ Mount Pipe			
		3	tower mounts	Pirod 15' T-Frame Sector Mount (1)			

Notes:
1) Existing Equipment
2) Equipment to be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Previous Structural Analysis	Centek, 15001.096, 11/7/2016	-	On Air Engineering
Previous Structural Analysis	Westchester, 11/15/2017	-	On Air Engineering
Previous Structural Analysis	CHA, 20621.1047.1203 R1, 3/1/2010	-	On Air Engineering
Photos	On Air Engineering	-	On Air Engineering
RFDS	Verizon, 1385857, 9/27/2018	-	On Air Engineering

3.1) Analysis Method

tnxTower (version 8.0.4.0), 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 were 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.

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 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	110 - 100	Leg	Pipe 3.5" x 0.300" (3 XS)	3	-6.91	129.06	5.4	Pass
T2	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	31	-30.20	119.32	25.3	Pass
T3	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	67	-48.40	119.32	40.6	Pass
T4	60 - 40	Leg	Pipe 3.5" x 0.300" (3 XS)	103	-64.00	128.67	49.7	Pass
T5	40 - 20	Leg	Pipe 4.0" x 0.318" (3.5 XS)	145	-79.27	126.30	62.8	Pass
T6	20 - 0	Leg	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	169	-94.73	139.49	67.9	Pass
T1	110 - 100	Diagonal	L 1.5 x 1.5 x 1/8	30	-1.81	9.04	20.0 55.2 (b)	Pass
T2	100 - 80	Diagonal	L 1.5 x 1.5 x 1/8	60	-2.50	6.67	37.4 78.4 (b)	Pass
T3	80 - 60	Diagonal	L 1.5 x 1.5 x 1/8	75	-1.78	3.82	46.5 56.7 (b)	Pass
T4	60 - 40	Diagonal	L 2.5 x 2.5 x 3/16	109	-2.47	14.20	17.4 35.7 (b)	Pass
T5	40 - 20	Diagonal	L 2 x 2 x 1/8	151	-2.82	7.55	37.3 61.5 (b)	Pass
T6	20 - 0	Diagonal	L 2.5 x 2.5 x 3/16	175	-3.13	7.47	41.9 46.1 (b)	Pass
T4	60 - 40	Secondary Horizontal	L 2 x 2 x 1/8	115	-1.11	7.16	15.5	Pass
T1	110 - 100	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.23	8.22	2.8 7.1 (b)	Pass
T2	100 - 80	Top Girt	L 1.5 x 1.5 x 1/8	34	-0.12	6.75	1.8 4.3 (b)	Pass
T3	80 - 60	Top Girt	L 1.5 x 1.5 x 1/8	71	-0.30	2.97	10.2 11.9 (b)	Pass
T4	60 - 40	Top Girt	L 2.5 x 2.5 x 3/16	107	-0.50	8.73	5.7 8.7 (b)	Pass
T5	40 - 20	Top Girt	L 2.5 x 2.5 x 3/16	149	-0.62	5.06	12.3	Pass
T6	20 - 0	Top Girt	L 3.5 x 3.5 x 1/4	173	-0.79	12.88	6.2 11.6 (b)	Pass
							Summary	
						Leg (T6)	67.9	Pass
						Diagonal (T2)	78.4	Pass
						Secondary Horizontal (T4)	15.5	Pass
						Top Girt (T5)	12.3	Pass
						Bolt Checks	78.4	Pass
						Rating =	78.4	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	63.3	Pass
1	Base Foundation Structural	0	Unknown	Unknown
1	Base Foundation Soil Interaction	0	62.8	Pass

Structure Rating (max from all components) =	78.4%

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

4.1) Recommendations

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

APPENDIX A

TNXTOWER OUTPUT

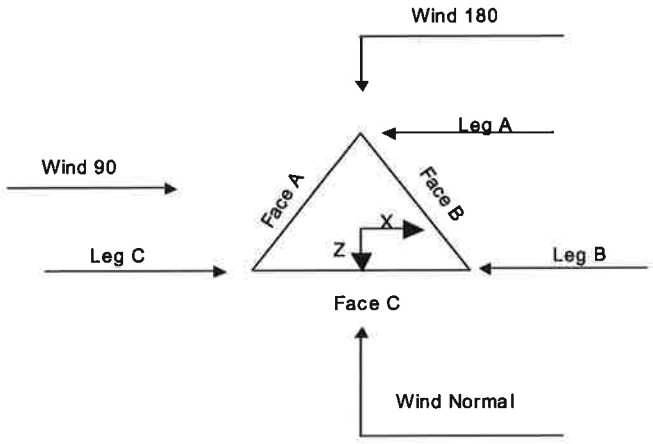
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 110.00 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 1.55 ft at the top and 12.64 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 0.75 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.
16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	110.00-100.00			1.55	1	10.00
T2	100.00-80.00			2.56	1	20.00
T3	80.00-60.00			4.57	1	20.00
T4	60.00-40.00			6.59	1	20.00
T5	40.00-20.00			8.60	1	20.00
T6	20.00-0.00			10.62	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	110.00-100.00	2.48	X Brace	No	No	1.00	0.00
T2	100.00-80.00	3.97	X Brace	No	No	1.00	1.00
T3	80.00-60.00	3.97	X Brace	No	No	1.00	1.00
T4	60.00-40.00	4.96	X Brace	No	Yes	1.00	1.00
T5	40.00-20.00	6.61	X Brace	No	No	1.00	1.00
T6	20.00-0.00	6.64	X Brace	No	No	1.00	0.00

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 110.00-100.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A572-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T2 100.00-80.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A572-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T3 80.00-60.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A572-50 (50 ksi)	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T4 60.00-40.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A572-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 3/16	A36 (36 ksi)
T5 40.00-20.00	Pipe	Pipe 4.0" x 0.318" (3.5 XS)	A572-50 (50 ksi)	Equal Angle	L 2 x 2 x 1/8	A36 (36 ksi)
T6 20.00-0.00	Arbitrary Shape	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	A572-50 (50 ksi)	Equal Angle	L 2.5 x 2.5 x 3/16	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 110.00-100.00	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T2 100.00-80.00	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 80.00-60.00	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T4 60.00-40.00	Equal Angle	L 2.5 x 2.5 x 3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T5 40.00-20.00	Equal Angle	L 2.5 x 2.5 x 3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T6 20.00-0.00	Equal Angle	L 3.5 x 3.5 x 1/4	A36 (36 ksi)	Solid Round		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
T4 60.00-40.00	Equal Angle	L 2 x 2 x 1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

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 110.00-100.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00
T2 100.00-80.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00
T3 80.00-60.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00
T4 60.00-40.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00
T5 40.00-20.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00

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
T6 20.00-0.00	0.00	0.00	A36 (36 ksi)	1	1	1.05	36.00	36.00	36.00

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 110.00-100.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T2 100.00-80.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T3 80.00-60.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T4 60.00-40.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	0.5	1
T5 40.00-20.00	No	No	1	0.5	1	1	1	1	1	1
				1	1	1	1	1	1	1
T6 20.00-0.00	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 Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 110.00-100.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T2 100.00-80.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T3 80.00-60.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T4 60.00-40.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T5 40.00-20.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T6 20.00-0.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T1 110.00-100.00	Flange	0.88 A325N	4	0.50 A325N	1	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0

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.
T2 100.00-80.00	Flange	0.88 A325N	4	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0
T3 80.00-60.00	Flange	0.88 A325N	4	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0
T4 60.00-40.00	Flange	0.88 A325N	4	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0
T5 40.00-20.00	Flange	0.88 A325N	4	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0
T6 20.00-0.00	Flange	0.75 A325N	0	0.50 A325N	1	0.50 A325N	1	0.63 A325N	0	0.63 A325N	0	0.63 A325N	0	0.63 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
LDF7-50A (1 5/8" foam)	B	No	No	Ar (CaAa)	98.00 - 10.00	0.00	0.35	14	7	1.00	1.98		0.92
1.5" flat Cable Ladder Rail	B	No	No	Af (CaAa)	98.00 - 10.00	0.00	0.35	2	2	24.00 1.50	1.50		1.80
LDF4-50A (1/2" foam)	A	No	No	Ar (CaAa)	60.00 - 10.00	0.00	0.49	1	1	0.50	0.63		0.15
LDF4-50A (1/2" foam)	A	No	No	Ar (CaAa)	110.00 - 10.00	0.00	0.48	2	1	0.50	0.63		0.15
1.5" Conduit (1 1/4" EMT)	A	No	No	Ar (CaAa)	98.00 - 10.00	0.00	0.5	2	2	0.50	1.51		1.00
2" Conduit (1 1/2" EMT) ***	A	No	No	Ar (CaAa)	110.00 - 10.00	0.00	0.5	2	2	1.74	1.74		1.16

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
(2) APL868013 w/ Mount Pipe	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.10 3.48 3.85	4.80 5.42 6.04	0.02 0.06 0.11
(2) APL868013 w/ Mount Pipe	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.10 3.48 3.85	4.80 5.42 6.04	0.02 0.06 0.11
(2) APL868013 w/ Mount Pipe	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	3.10 3.48 3.85	4.80 5.42 6.04	0.02 0.06 0.11
TME-B13 RRH 4X30	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.32 1.48 1.64	0.06 0.07 0.09
TME-B13 RRH 4X30	B	From Leg	4.00 0	0.000	98.00	No Ice	2.06 2.24	1.32 1.48	0.06 0.07

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	2.43	1.64	0.09
						1" Ice			
TME-B13 RRH 4X30	C	From Leg	4.00	0.000	98.00	No Ice	2.06	1.32	0.06
			0			1/2"	2.24	1.48	0.07
			0			Ice	2.43	1.64	0.09
						1" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	A	From Leg	4.00	0.000	98.00	No Ice	9.47	7.76	0.09
			0			1/2"	10.09	9.00	0.17
			0			Ice	10.67	10.02	0.25
						1" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	B	From Leg	4.00	0.000	98.00	No Ice	9.47	7.76	0.09
			0			1/2"	10.09	9.00	0.17
			0			Ice	10.67	10.02	0.25
						1" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	C	From Leg	4.00	0.000	98.00	No Ice	9.47	7.76	0.09
			0			1/2"	10.09	9.00	0.17
			0			Ice	10.67	10.02	0.25
						1" Ice			
AIRSCALE RRH 4T4R B5 160W	A	From Leg	4.00	0.000	98.00	No Ice	1.29	0.72	0.04
			0			1/2"	1.43	0.83	0.05
			0			Ice	1.58	0.96	0.06
						1" Ice			
AIRSCALE RRH 4T4R B5 160W	B	From Leg	4.00	0.000	98.00	No Ice	1.29	0.72	0.04
			0			1/2"	1.43	0.83	0.05
			0			Ice	1.58	0.96	0.06
						1" Ice			
AIRSCALE RRH 4T4R B5 160W	C	From Leg	4.00	0.000	98.00	No Ice	1.29	0.72	0.04
			0			1/2"	1.43	0.83	0.05
			0			Ice	1.58	0.96	0.06
						1" Ice			
B2/B66A RRH-BR049	A	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.07
			0			1/2"	2.05	1.14	0.09
			0			Ice	2.22	1.28	0.11
						1" Ice			
B2/B66A RRH-BR049	B	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.07
			0			1/2"	2.05	1.14	0.09
			0			Ice	2.22	1.28	0.11
						1" Ice			
B2/B66A RRH-BR049	C	From Leg	4.00	0.000	98.00	No Ice	1.88	1.01	0.07
			0			1/2"	2.05	1.14	0.09
			0			Ice	2.22	1.28	0.11
						1" Ice			
Site Pro 1 VFA12-HD	A	From Leg	0.00	0.000	98.00	No Ice	13.20	9.20	0.66
			0			1/2"	19.50	14.60	0.80
			0			Ice	25.80	19.50	1.01
						1" Ice			
Site Pro 1 VFA12-HD	B	From Leg	0.00	0.000	98.00	No Ice	13.20	9.20	0.66
			0			1/2"	19.50	14.60	0.80
			0			Ice	25.80	19.50	1.01
						1" Ice			
Site Pro 1 VFA12-HD	C	From Leg	0.00	0.000	98.00	No Ice	13.20	9.20	0.66
			0			1/2"	19.50	14.60	0.80
			0			Ice	25.80	19.50	1.01
						1" Ice			
RVZDC-6627-PF-48	C	From Leg	0.00	0.000	98.00	No Ice	3.79	2.51	0.03
			0			1/2"	4.04	2.73	0.06
			0			Ice	4.30	2.95	0.10
						1" Ice			
RxxDC-3315-PF-48	C	From Leg	0.00	0.000	98.00	No Ice	3.01	1.96	0.02
			0			1/2"	3.23	2.15	0.05
			0			Ice	3.46	2.35	0.08
						1" Ice			
***									
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	22.20	No Ice	1.31	1.31	0.01

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"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	22.20	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	22.20	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	24.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	24.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	24.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	28.81	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	28.81	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	28.81	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	31.00	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	31.00	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	31.00	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	35.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	35.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	35.40	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	A	From Face	0.00	0.000	37.60	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	B	From Face	0.00	0.000	37.60	No Ice	1.31	1.31	0.01
			0				1.60	1.60	0.02

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	1.90	1.90	0.03
						1" Ice			
L 2" x 2" x 1/4" x 4'-0"	C	From Face	0.00	0.000	37.60	No Ice	1.31	1.31	0.01
			0			1/2"	1.60	1.60	0.02
			0			Ice	1.90	1.90	0.03
						1" Ice			
***									
Junction Box	A	From Leg	4.00	0.000	110.00	No Ice	0.53	0.53	0.01
			0			1/2"	0.63	0.63	0.02
			0			Ice	0.73	0.73	0.03
						1" Ice			
RRH2WB0	A	From Leg	4.00	0.000	110.00	No Ice	2.16	1.85	0.04
			0			1/2"	2.35	2.04	0.06
			0			Ice	2.56	2.23	0.09
						1" Ice			
RRH2WB0	B	From Leg	4.00	0.000	110.00	No Ice	2.16	1.85	0.04
			0			1/2"	2.35	2.04	0.06
			0			Ice	2.56	2.23	0.09
						1" Ice			
RRH2WB0	C	From Leg	4.00	0.000	110.00	No Ice	2.16	1.85	0.04
			0			1/2"	2.35	2.04	0.06
			0			Ice	2.56	2.23	0.09
						1" Ice			
LLPX310R-V1 w/ Mount Pipe	A	From Leg	4.00	0.000	110.00	No Ice	4.54	2.98	0.05
			0			1/2"	4.89	3.53	0.08
			0			Ice	5.25	4.09	0.13
						1" Ice			
LLPX310R-V1 w/ Mount Pipe	B	From Leg	4.00	0.000	110.00	No Ice	4.54	2.98	0.05
			0			1/2"	4.89	3.53	0.08
			0			Ice	5.25	4.09	0.13
						1" Ice			
LLPX310R-V1 w/ Mount Pipe	C	From Leg	4.00	0.000	110.00	No Ice	4.54	2.98	0.05
			0			1/2"	4.89	3.53	0.08
			0			Ice	5.25	4.09	0.13
						1" Ice			
Pirod 12' V Frame	A	From Leg	0.00	0.000	110.00	No Ice	9.22	3.08	0.30
			0			1/2"	12.97	6.17	0.39
			0			Ice	16.72	9.26	0.48
						1" Ice			
Pirod 12' V Frame	B	From Leg	0.00	0.000	110.00	No Ice	9.22	3.08	0.30
			0			1/2"	12.97	6.17	0.39
			0			Ice	16.72	9.26	0.48
						1" Ice			
Pirod 12' V Frame	C	From Leg	0.00	0.000	110.00	No Ice	9.22	3.08	0.30
			0			1/2"	12.97	6.17	0.39
			0			Ice	16.72	9.26	0.48
						1" Ice			
***									
GPS	B	From Leg	0.50	0.000	60.00	No Ice	0.15	0.15	0.02
			0			1/2"	0.24	0.24	0.02
			0			Ice	0.31	0.31	0.02
						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
3 ft standard	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0 0	Worst		110.00	3.00	No Ice 1/2" Ice 1" Ice	7.06 7.47 7.88	0.10 0.18 0.25
2 ft standard	A	Paraboloid w/o Radome	From Leg	4.00 0 0	Worst		110.00	2.00	No Ice 1/2" Ice 1" Ice	3.14 3.41 3.68	0.01 0.06 0.10
***											

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
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	110 - 100	2.00	41	0.159	0.094
T2	100 - 80	1.67	41	0.155	0.051
T3	80 - 60	1.04	41	0.129	0.024
T4	60 - 40	0.56	41	0.093	0.011
T5	40 - 20	0.24	47	0.054	0.008
T6	20 - 0	0.06	47	0.023	0.003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.00	3 ft standard	41	2.00	0.159	0.094	214793
98.00	(2) APL868013 w/ Mount Pipe	41	1.60	0.153	0.046	87130
60.00	GPS	41	0.56	0.093	0.011	26488
37.60	L 2" x 2" x 1/4" x 4'-0"	47	0.21	0.050	0.007	38638
35.40	L 2" x 2" x 1/4" x 4'-0"	47	0.19	0.046	0.007	37766
31.00	L 2" x 2" x 1/4" x 4'-0"	47	0.14	0.039	0.006	35830
28.81	L 2" x 2" x 1/4" x 4'-0"	47	0.12	0.035	0.005	34938
24.40	L 2" x 2" x 1/4" x 4'-0"	47	0.09	0.029	0.004	33274
22.20	L 2" x 2" x 1/4" x 4'-0"	47	0.07	0.026	0.003	32793

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	110 - 100	8.35	18	0.655	0.395
T2	100 - 80	6.98	18	0.641	0.215
T3	80 - 60	4.39	18	0.539	0.099
T4	60 - 40	2.36	18	0.388	0.048
T5	40 - 20	1.03	18	0.227	0.033
T6	20 - 0	0.26	18	0.096	0.011

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.00	3 ft standard	18	8.35	0.655	0.395	64263
98.00	(2) APL868013 w/ Mount Pipe	18	6.70	0.635	0.191	24439
60.00	GPS	18	2.36	0.388	0.048	6358
37.60	L 2" x 2" x 1/4" x 4'-0"	18	0.90	0.209	0.031	9406
35.40	L 2" x 2" x 1/4" x 4'-0"	18	0.80	0.193	0.029	9152
31.00	L 2" x 2" x 1/4" x 4'-0"	18	0.61	0.163	0.024	8605
28.81	L 2" x 2" x 1/4" x 4'-0"	18	0.53	0.149	0.022	8356
24.40	L 2" x 2" x 1/4" x 4'-0"	18	0.38	0.121	0.016	7897
22.20	L 2" x 2" x 1/4" x 4'-0"	18	0.31	0.108	0.014	7758

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	110	Leg	A325N	0.88	4	1.36	40.59	0.034 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	1.73	3.13	0.552 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.22	3.13	0.071 ✔	1	Member Block Shear
T2	100	Leg	A325N	0.88	4	7.03	40.59	0.173 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.45	3.13	0.784 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.14	3.13	0.043 ✔	1	Member Block Shear
T3	80	Leg	A325N	0.88	4	11.13	40.59	0.274 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	1.77	3.13	0.567 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.37	3.13	0.119 ✔	1	Member Block Shear
T4	60	Leg	A325N	0.88	4	14.71	40.59	0.363 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.21	6.20	0.357 ✔	1	Member Bearing
		Top Girt	A325N	0.50	1	0.54	6.20	0.087 ✔	1	Member Bearing
T5	40	Leg	A325N	0.88	4	18.14	40.59	0.447 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.54	4.13	0.615 ✔	1	Member Bearing
		Top Girt	A325N	0.50	1	0.71	6.20	0.114 ✔	1	Member Bearing
T6	20	Diagonal	A325N	0.50	1	2.86	6.20	0.461 ✔	1	Member Bearing
		Top Girt	A325N	0.50	1	0.92	7.95	0.116 ✔	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	110 - 100	Pipe 3.5" x 0.300" (3 XS)	10.02	2.48	26.2 K=1.00	3.02	-6.91	129.06	0.054 [1] ✔
T2	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	3.97	42.0 K=1.00	3.02	-30.20	119.32	0.253 [1] ✔
T3	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	3.97	42.0 K=1.00	3.02	-48.40	119.32	0.406 [1] ✔
T4	60 - 40	Pipe 3.5" x 0.300" (3 XS)	20.03	2.56	27.0 K=1.00	3.02	-64.00	128.67	0.497 [1] ✔
T5	40 - 20	Pipe 4.0" x 0.318" (3.5 XS)	20.03	6.62	60.8 K=1.00	3.68	-79.27	126.30	0.628 [1] ✔
T6	20 - 0	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	20.03	6.65	82.5 K=1.00	5.10	-94.73	139.49	0.679 [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	110 - 100	L 1.5 x 1.5 x 1/8	3.00	1.30	69.4 K=1.32	0.36	-1.81	9.04	0.200 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	5.07	2.40	102.8 K=1.06	0.36	-2.50	6.67	0.374 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	7.51	3.60	145.8 K=1.00	0.36	-1.78	3.82	0.465 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	9.71	4.83	117.1 K=1.00	0.90	-2.47	14.20	0.174 [1] ✔
T5	40 - 20	L 2 x 2 x 1/8	12.22	6.11	117.1 K=1.00	0.48	-2.82	7.55	0.373 [1] ✔
T6	20 - 0	L 2.5 x 2.5 x 3/16	13.98	6.81	165.1 K=1.00	0.90	-3.13	7.47	0.419 [1] ✔

[1] P_u / ϕP_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 $\frac{P_u}{\phi P_n}$
T4	60 - 40	L 2 x 2 x 1/8	8.34	4.02	121.4 K=1.00	0.48	-1.11	7.16	0.155 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	110 - 100	L 1.5 x 1.5 x 1/8	1.56	1.06	81.4 K=1.90	0.36	-0.23	8.22	0.028 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	2.56	2.06	101.8 K=1.22	0.36	-0.12	6.75	0.018 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	4.58	4.08	165.3 K=1.00	0.36	-0.30	2.97	0.102 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	6.60	6.30	152.8 K=1.00	0.90	-0.50	8.73	0.057 [1] ✔
T5	40 - 20	L 2.5 x 2.5 x 3/16	8.61	8.28	200.7 K=1.00	0.90	-0.62	5.06	0.123 [1] ✔
T6	20 - 0	KL/R > 200 (C) - 149 L 3.5 x 3.5 x 1/4	10.63	9.96	172.1 K=1.00	1.69	-0.79	12.88	0.062 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg 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	110 - 100	Pipe 3.5" x 0.300" (3 XS)	10.02	2.48	26.2	3.02	5.44	135.72	0.040 [1] ✔
T2	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	28.13	135.72	0.207 [1] ✔
T3	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	44.54	135.72	0.328 [1] ✔
T4	60 - 40	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	58.86	135.72	0.434 [1] ✔
T5	40 - 20	Pipe 4.0" x 0.318" (3.5 XS)	20.03	0.08	0.8	3.68	72.57	165.53	0.438 [1] ✔
T6	20 - 0	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	20.03	6.65	82.5	5.10	82.94	229.32	0.362 [1] ✔

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
T1	110 - 100	L 1.5 x 1.5 x 1/8	3.00	1.30	36.1	0.21	1.73	9.18	0.188 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	5.07	2.40	64.5	0.21	2.45	9.18	0.267 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	6.21	2.96	79.0	0.21	1.77	9.18	0.193 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	9.71	4.83	74.5	0.59	2.21	25.60	0.086 [1] ✔
T5	40 - 20	L 2 x 2 x 1/8	11.67	5.84	111.9	0.30	2.54	13.25	0.192 [1] ✔
T6	20 - 0	L 2.5 x 2.5 x 3/16	13.39	6.52	102.2	0.59	2.86	25.60	0.112 [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	
T4	60 - 40	L 2 x 2 x 1/8	8.34	4.02	154.2	0.48	1.11	15.69	0.071 [1] ✔

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	110 - 100	L 1.5 x 1.5 x 1/8	1.56	1.06	32.6	0.21	0.22	9.18	0.024 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	2.56	2.06	58.6	0.21	0.14	9.18	0.015 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	4.58	4.08	110.6	0.21	0.37	9.18	0.041 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	6.60	6.30	97.2	0.59	0.54	25.60	0.021 [1] ✔
T5	40 - 20	L 2.5 x 2.5 x 3/16	8.61	8.28	127.7	0.59	0.71	25.60	0.028 [1] ✔
T6	20 - 0	L 3.5 x 3.5 x 1/4	10.63	9.96	111.9	1.15	0.92	50.04	0.018 [1] ✔

[1] $P_u / \phi P_n$ controls

Section Capacity Table

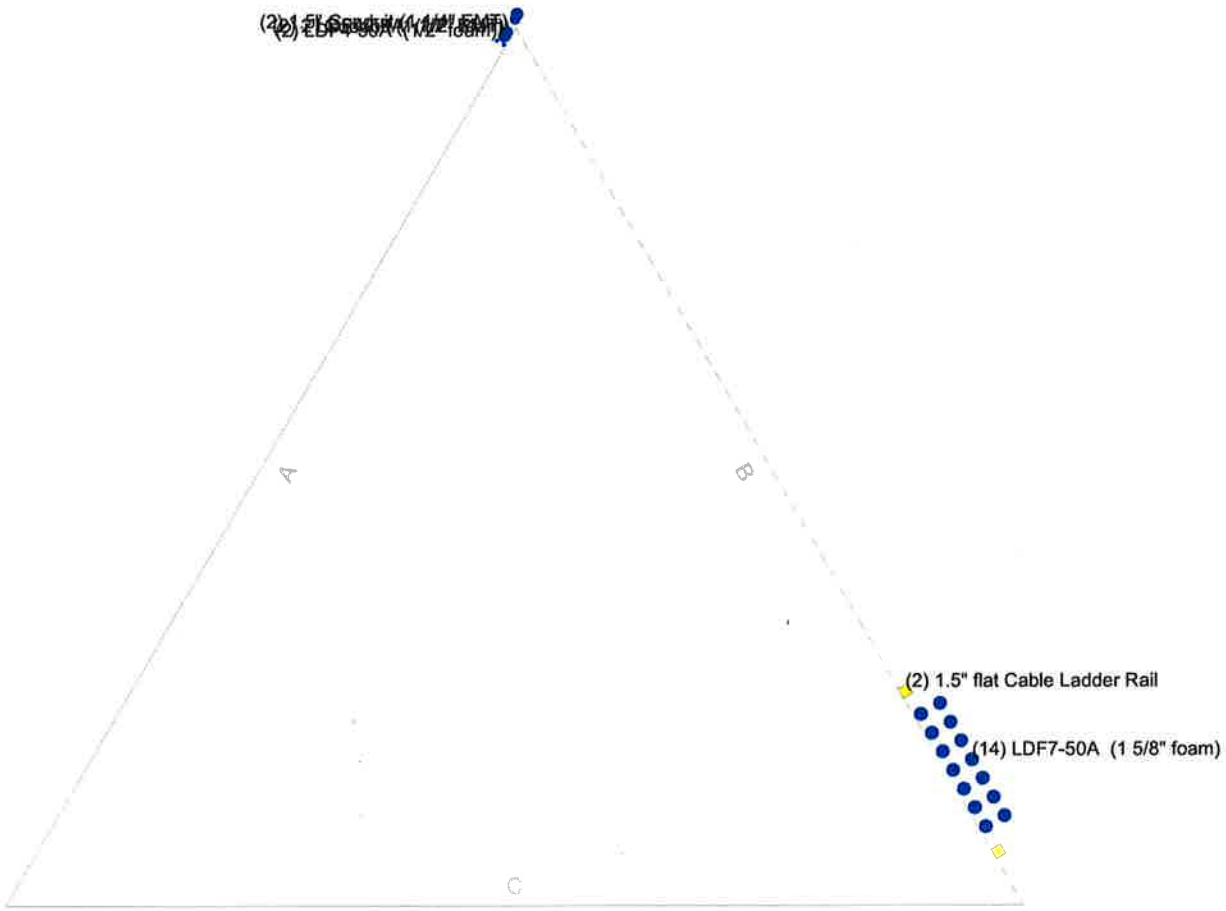
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	110 - 100	Leg	Pipe 3.5" x 0.300" (3 XS)	3	-6.91	129.06	5.4	Pass
T2	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	31	-30.20	119.32	25.3	Pass
T3	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	67	-48.40	119.32	40.6	Pass
T4	60 - 40	Leg	Pipe 3.5" x 0.300" (3 XS)	103	-64.00	128.67	49.7	Pass
T5	40 - 20	Leg	Pipe 4.0" x 0.318" (3.5 XS)	145	-79.27	126.30	62.8	Pass
T6	20 - 0	Leg	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	169	-94.73	139.49	67.9	Pass
T1	110 - 100	Diagonal	L 1.5 x 1.5 x 1/8	30	-1.81	9.04	20.0 55.2 (b)	Pass
T2	100 - 80	Diagonal	L 1.5 x 1.5 x 1/8	60	-2.50	6.67	37.4 78.4 (b)	Pass
T3	80 - 60	Diagonal	L 1.5 x 1.5 x 1/8	75	-1.78	3.82	46.5 56.7 (b)	Pass
T4	60 - 40	Diagonal	L 2.5 x 2.5 x 3/16	109	-2.47	14.20	17.4 35.7 (b)	Pass
T5	40 - 20	Diagonal	L 2 x 2 x 1/8	151	-2.82	7.55	37.3 61.5 (b)	Pass
T6	20 - 0	Diagonal	L 2.5 x 2.5 x 3/16	175	-3.13	7.47	41.9 46.1 (b)	Pass
T4	60 - 40	Secondary Horizontal	L 2 x 2 x 1/8	115	-1.11	7.16	15.5	Pass
T1	110 - 100	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.23	8.22	2.8 7.1 (b)	Pass
T2	100 - 80	Top Girt	L 1.5 x 1.5 x 1/8	34	-0.12	6.75	1.8 4.3 (b)	Pass
T3	80 - 60	Top Girt	L 1.5 x 1.5 x 1/8	71	-0.30	2.97	10.2 11.9 (b)	Pass
T4	60 - 40	Top Girt	L 2.5 x 2.5 x 3/16	107	-0.50	8.73	5.7 8.7 (b)	Pass
T5	40 - 20	Top Girt	L 2.5 x 2.5 x 3/16	149	-0.62	5.06	12.3	Pass
T6	20 - 0	Top Girt	L 3.5 x 3.5 x 1/4	173	-0.79	12.88	6.2 11.6 (b)	Pass
							Summary	
						Leg (T6)	67.9	Pass
						Diagonal (T2)	78.4	Pass
						Secondary Horizontal (T4)	15.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						Top Girt (T5)	12.3	Pass
						Bolt Checks	78.4	Pass
						RATING =	**78.4**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

Round Flat App In Face App Out Face

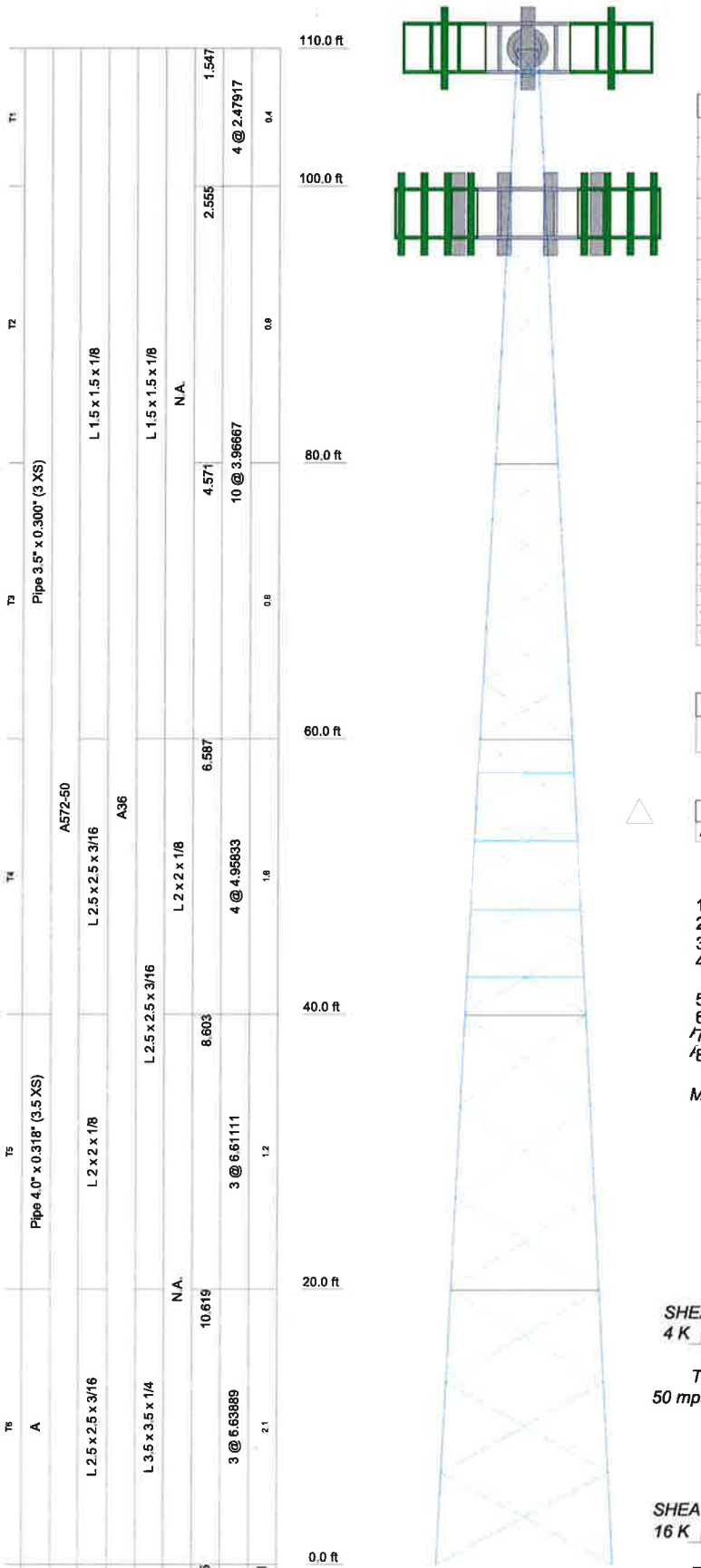


Paul J. Ford and Company
250 East Broad st., Suite 600
Columbus, OH 43215
Phone: (614) 221-6679
FAX:

Job:	Existing 110' SST, Stratford CT		
Project:	42918-0023		
Client:	On Air Engineering	Drawn by: mbange	App'd:
Code:	TIA-222-G	Date: 12/12/18	Scale: N
Path:			Dwg No.

APPENDIX C

ADDITIONAL CALCULATIONS



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Junction Box	110	(2) JAHH-65B-R3B w/ Mount Pipe	98
RRH2WB0	110	(2) JAHH-65B-R3B w/ Mount Pipe	98
RRH2WB0	110	(2) JAHH-65B-R3B w/ Mount Pipe	98
RRH2WB0	110	AIRSCALE RRH 4T4R B5 160W	98
LLPX310R-V1 w/ Mount Pipe	110	AIRSCALE RRH 4T4R B5 160W	98
LLPX310R-V1 w/ Mount Pipe	110	AIRSCALE RRH 4T4R B5 160W	98
LLPX310R-V1 w/ Mount Pipe	110	GPS	60
Pirod 12' V Frame	110	L 2" x 2" x 1/4" x 4'-0"	37.6
Pirod 12' V Frame	110	L 2" x 2" x 1/4" x 4'-0"	37.6
Pirod 12' V Frame	110	L 2" x 2" x 1/4" x 4'-0"	37.6
3 ft standard	110	L 2" x 2" x 1/4" x 4'-0"	35.4
2 ft standard	110	L 2" x 2" x 1/4" x 4'-0"	35.4
B2/B66A RRH-BR049	98	L 2" x 2" x 1/4" x 4'-0"	35.4
B2/B66A RRH-BR049	98	L 2" x 2" x 1/4" x 4'-0"	31
B2/B66A RRH-BR049	98	L 2" x 2" x 1/4" x 4'-0"	31
Site Pro 1 VFA12-HD	98	L 2" x 2" x 1/4" x 4'-0"	31
Site Pro 1 VFA12-HD	98	L 2" x 2" x 1/4" x 4'-0"	28.81
Site Pro 1 VFA12-HD	98	L 2" x 2" x 1/4" x 4'-0"	28.81
RVZDC-6627-PF-48	98	L 2" x 2" x 1/4" x 4'-0"	28.81
RxxDC-3315-PF-48	98	L 2" x 2" x 1/4" x 4'-0"	24.4
(2) APL868013 w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	24.4
(2) APL868013 w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	24.4
(2) APL868013 w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	22.2
TME-B13 RRH 4X30	98	L 2" x 2" x 1/4" x 4'-0"	22.2
TME-B13 RRH 4X30	98	L 2" x 2" x 1/4" x 4'-0"	22.2
TME-B13 RRH 4X30	98		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

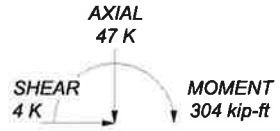
TOWER DESIGN NOTES

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: 78.4%

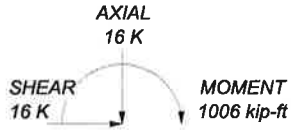
MAX. CORNER REACTIONS AT BASE:

DOWN: 97 K
SHEAR: 10 K

UPLIFT: -85 K
SHEAR: 9 K



TORQUE 2 kip-ft
50 mph WIND - 0.75 in ICE



TORQUE 7 kip-ft
REACTIONS - 97 mph WIND

Paul J. Ford and Company
250 East Broad st., Suite 600
Columbus, OH 43215
Phone: (614) 221-6679
FAX:

Job:	Existing 110' SST, Stratford CT		
Project:	42918-0023		
Client:	On Air Engineering	Drawn by: mbange	App'd:
Code:	TIA-222-G	Date: 12/12/18	Scale: N
Path:			Dwg No.

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

By MTB Date 12/12/2018
Project # 42918-0023

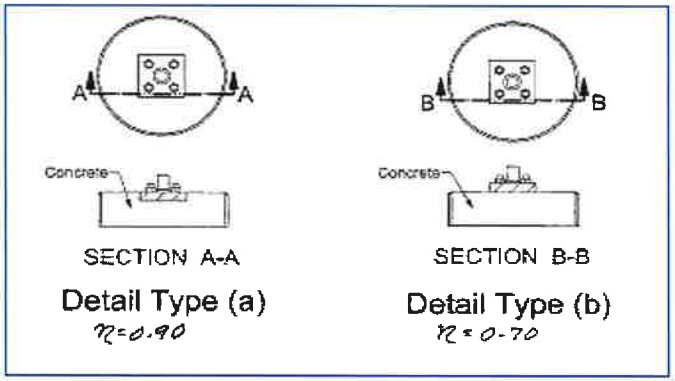
Self-Support Tower Anchor Rod Capacity - TIA-G

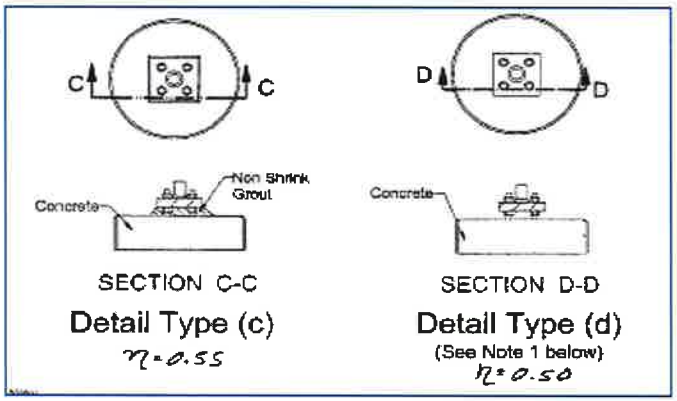
Loads

Compression :	97	kips	Tension :	85	kips	Code:	TIA-G
Comp. Shear :	10	kips	Ten.Shear :	9	kips	Maximum Ratio:	1.00

Existing Anchor Rods

Anchor Rod Condition (n) :	0.5				
Anchor Rod ø :	7/8	in	l_{ar} :		inches
Anchor Rod Quantity :	4		Comp. M_u :	0.00	k-in
Anchor Rod Grade :	A354 Gr. BC (1/4 to 2-1/2 incl.)				
F_y :	109	ksi			
F_u :	125	ksi			
Threads per Inch	9				
Net Tensile Area	0.46	in^2			
ϕ_t :	0.80				
$\phi_t R_{nt}$:	184.69	kip			
Anchor Rod Ratio :	0.633				





Factored Foundation Loads:

	Comp	Uplift	
Factored Axial Load (+Comp, -Ten) =	**115.62**	**-66.38**	kips
Factored Horiz. Load at Top of Pier =	**10**	**9**	kips
Factored OTM at Top of Pier =	**0**	**0**	k-ft

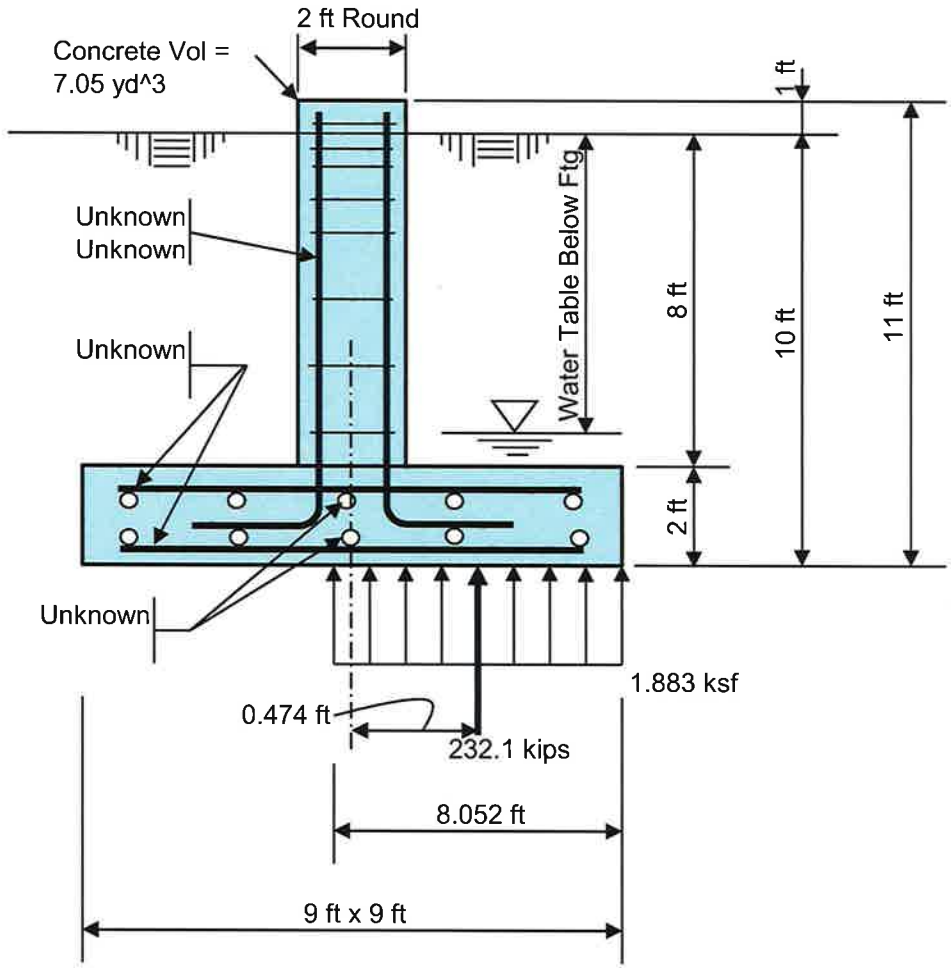
LRFD Resistance and Load Factors:

	Φ	Dead Load Factors	
Soil Bearing =	**0.75**		
Soil Weight =	**0.75**	1.2	0.9
Concrete Weight =	**0.75**	1.2	0.9

Soil Properties:

Depth to Water Table = **99** ft
Uplift Cone from **Top** of footing
Depth to Ignore for Uplift and PP = **0** ft

Layer Thk ft	Soil Density pcf	Cohesion ksf	Friction Angle degrees	Ult Bearing ksf	Depth ft
10	**110**	**0**	**30**	**4**	**10.00**



Dimensions:

Pier Shape = **Round**
Pier Width = **2** ft Diameter
Pier Height above Grade = **1** ft
Depth to Bottom of Footing = **10** ft
Footing Thickness = **2** ft
Footing Width, B = **9** ft
Footing Length, L = **9** ft

Concrete:

Concrete Strength = **3** ksi
Rebar Strength = **60** ksi

Total Pad Reinf Stl =
Total Pier Reinf Stl =
Footing Thickness = **2.00** ft >= 0.75 ft = Min Ftg Thk, OK

Summary Results:

	Required		Available			
Maximum Net Soil Bearing =	**1.883**	ksf	**3.000**	ksf	Stress Ratio =	**62.8%** in Soil Bearing
Uplift =	**66.4**	kips	**146.4**	kips	Stress Ratio =	**45.3%** in Uplift
Punching Shear Stress =	**0.036**	ksi	**0.164**	ksi	Stress Ratio =	**21.9%** in Punching Shear
Bending Shear Stress =	**34.3**	kips	**186.3**	kips	Stress Ratio =	**18.4%** in Bending Shear
Bending Moment =				Rebar Unknown	Stress Ratio =	in Bending Moment
Conc Pier Reinforcing Steel =				Rebar Unknown	Stress Ratio =	in Pier Rebar

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) The structural integrity of the existing tower foundation can only be verified if exact foundation sizes and soil conditions are known. Paul J. Ford and Company will not accept any responsibility for the adequacy of the existing foundations unless the foundation sizes and a soils report are provided.

5) 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.

6) 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.

7) 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 4


SOUTH
BAN
CHE LN
BAYFIELD LN
BOXELDER LN
KEATING DR
CANDLEWOOD RD
JUDITH TER
ANDRA DR
JAMES FARM RD
K RD

TOWN OF STRATFORD

Recent Sales in Neighborhood | Previous Parcel | Next Parcel | Field Definitions | Return to Main Search | Stratford Home

Owner and Parcel Information

Owner Name	SHOOP DARCY (50%) & SHOOP DANA (50%)	**Today's Date**	February 13, 2019
Mailing Address	67 ELM ST	**Account #**	0857800
	HANOVER, MA 02339		
Location Address	630 JAMES FARM RD	**Census Tract**	0813
Map / Block / Lot	50 /19 / 3 / 28/ Dev Lot: 11.8 ACRES E/S	**Acreage**	9.61
Use Class / Description	101 Single Family	**Parcel Map**	Show Parcel Map / Owner List By Radius

Current Appraised Value Information

Building Value	OB Value	Land Value	Special Land Value	Total Appraised Value	Net Appraised Value	Current Assessment
No Apprasial Information available for this parcel						

Assessment History

Year	Building	OB/Misc	Land	Total Assessment
2017	$ 89,390	$ 182,910	$ 272,090	$ 544,390
2016	$ 89,390	$ 182,910	$ 272,090	$ 544,390

Land Information

Use	Class	Zoning	Area	Value
Single Family	R	RS-1	1 AC	$ 109,300
Single Family	R	RS-1	8.61 AC	$ 108,900
Cell Site	I	RS-1	1 SF	$ 170,500

Residential Building Information

Style	Year Built	Living Area	Stories	Grade	Exterior Wall	Interior Wall	Fireplaces
Modern/Contemp	1947	2,312	2.00	C+	Stone	Plastered and Plastered	1
Roof Cover	**Roof Structure**	**Floor Type**	**Heat Type**	**Heat Fuel**	**AC**	**Bedrooms/Full Baths/Half Baths/Total Rooms**	**Basement Sq Ft**
T&G/Rubber	Flat	Vinyl/Asphalt and Ceram Clay Til	Oil	Radiant	None	3 / 2 / 1 / 6	1,428

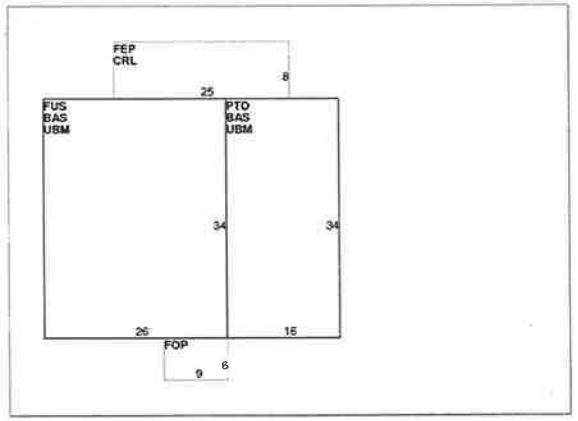
Building Sub Areas

Code	Description	Living Area	Gross Area	Effective Area
BAS	First Floor	1,428	1,428	
CRL	Crawl Space	0	200	
FEP	Finished Enclosed Porch	0	200	
FOP	Finished Open Porch	0	54	
FUS	Finished Upper	884	884	

Building Sketch Enlarge

Building Photo Enlarge

	Story			
PTO	Patio	0	544	
UBM	Unfinished Basement	0	1,428	
	Totals	**2,312**	**4,738**	**2,803**



Out Buildings / Extra Features

Description	Sub Description	Area	Year Built	Value
Garage	Frame	1,050 S.F.	1947	$ 14,300
Shed	Frame	240 S.F.	1953	$ 1,300
Shed	Metal	60 S.F.	2000	$ 0
Shed	Cell	360 S.F.	2006	$ 113,400
Shed	Cell	420 S.F.	2008	$ 132,300
ELEVATOR-NON FUNCTIONAL		1		$ 0

Sale Information

Sale Date	Sale Price	Deed Book/Page	Sale Qualification	Reason	Vacant or Improved	Owner
07/19/2012		3594/0229	Unqualified	Judicial Sale	Improved	SHOOP DARCY (50%) & SHOOP DANA (50%)
10/27/2011		3517/0310	Unqualified	Judicial Sale	Improved	FEDORKO WILHELMINA EST & SHOOP RANDY CO- SHOOP WILHELMINA J
02/24/2005		2587/ 348	Unqualified	Other	Improved	FEDORKO WILHELMINA & SHOOP RANDY CO-TRUSTEES
06/27/2003		2181/0244	Unqualified	NT		FEDORKO PETRO EST & WILMA B
05/11/1945		0208/0309	Unqualified		Improved	FEDORKO PETRO & WILMA B

Permit Information

Permit ID	Issue Date	Type	Description	Amount	Inspection Date	% Complete	Date Complete	Comments
39588	07/23/2018	BP	Building Permi	$ 25,000		0		SWAP 3 EXISTING ANTENNAS
23305	12/20/2016	BP	Building Permi	$ 15,000	08/04/2017	100		REPLACE ANTENNA TOWERS
21237	03/06/2014	BP	Building Permi	$ 9,000		100		ADD 3 ANTEENNAS; BELL ATLANTIC
18415	06/04/2010	EL	Electrical Per	$ 1,500	08/09/2010	100		WIRE NEW CABINET
18583	05/17/2010	BP	Building Permi	$ 20,000	07/13/2010	100		REPL ANTENNAS/DISHES & CAB.
18375	02/16/2010	BP	Building Permi	$ 39,000	05/24/2010	100		REPL ANTENNAE
11668	09/29/2005	EL	Electrical Per	$ 14,000	06/27/2006	100		WIRE CELL SITE
14848	06/20/2005	BP	Building Permi	$ 100,000	06/27/2006	100		TELE/COM ANTENNA
11207	06/16/2000					100		COMMUNICATION FACILITY;

Recent Sales in Neighborhood	Previous Parcel	Next Parcel	Field Definitions	Return to Main Search Page	Stratford Home

The Town of Stratford Assessor's Office makes every effort to produce the most accurate information possible. No warranties, expressed or implied, are provided for the data herein, its use or interpretation. Website Updated: September 9, 2018

ATTACHMENT 5

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 04/16/2019 US POSTAGE $002.79 ZIP 06103 041L12203987
	Postmaster, per *(name of receiving employee)* SMC		

USPS® Tracking Number / Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)	Postage	Fee	Special Handling	Parcel Airlift
1.	Laura R. Hoydick, Mayor Town of Stratford 2757 Main Street Stratford, CT 06615				
2.	Susmitha Attota, Town Planner Town of Stratford 2757 Main Street Stratford, CT 06615				
3.	Dana and Darcy Shoop 11 Birchwood Lane Westport, CT 06880				
4.					
5.					
6.					

USPS APR 16 2019 ONE STATE HOUSE SQUARE CT 06103

Stratford North

See Reverse for Instructions