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

VIA ELECTRONIC MAIL

May 21, 2019

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

RE: **EM-VER-138-190418** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 630 James Farm Road, Stratford, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) is in receipt of your correspondence of May 14, 2019 submitted in response to the Council's April 22, 2019 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/IN/emr

Robidoux, Evan

From: Mayo, Rachel <rmayo@RC.com>
Sent: Tuesday, May 14, 2019 8:09 AM
To: Bachman, Melanie; CSC-DL Siting Council
Cc: Robidoux, Evan; Baldwin, Kenneth; Mayo, Rachel
Subject: EM-VER-138-190418- Stratford
Attachments: Stratford N CT ANTMO AWS-700-PCS SA 05-07-19 Revised.pdf

Please see the attached revised Structural Report submitted in response to the Council's April 22, 2019 letter.

Please let me know if this electronic copy is sufficient or a hard copy is required.

Thank you, Rachel

Rachel A. Mayo
Land Use Analyst

Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103
Direct 860.275.8213 | Fax 860.275.8299
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KENNETH C. BALDWIN

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Also admitted in Massachusetts

May 16, 2019

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

Re: **EM-VER-138-190418 – Cellco Partnership d/b/a Verizon Wireless**
Notice of Intent to Modify an Existing Telecommunications Facility Located at 630 James Farm Road, Stratford, Connecticut

Dear Ms. Bachman:

Pursuant to your request, enclosed is one hard copy of the updated Structural Analysis regarding the above-referenced facility modifications. An electronic copy of this filing has also been provided to your office.

Please do not hesitate to contact me if you have any questions or need any additional information.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Enclosure

19376641-v1

PJF PAUL J. FORD & COMPANY

Report Date:	May 7, 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
Verizon 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 for a proposed Verizon antenna/equipment modification.

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

STATE OF CONNECTICUT
JOSEPH PACHICARAH JABORS
No. 00 22731
REGISTERED PROFESSIONAL ENGINEER

Joseph for Jaime

MAY 07 2019

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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 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 (Verizon)	98.0 (Verizon)	3	commscope	BSAMNT-SBS-2-2 (Mount Bracket)	1	Hybrid	-
		3	commscope	CBC78T-DS-43-2X			
		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	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 (Sprint)	110.0 (Sprint)	1	microwave dishes	3 ft standard	2 1 3	Cat5 1-1/2 1-1/4	4
		1	microwave dishes	2 ft standard			
		3	tower mounts	Pirod 12' V Frame			
		3	alcatel lucent	2500MHz RRH			
		3	alcatel lucent	1900MHz RRH			
		6	alcatel lucent	800MHz RRH			
		3	kmw communications	ETCR-654L12H6 w/ Mount Pipe			

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 (Verizon)	98.0 (Verizon)	6	rfs celwave	APL868013 w/ Mount Pipe	12	1-5/8	1
		3	amphenol	BXA-171063-8BF w/ Mount Pipe	1 3	Hybrid 1-5/8	3
		2	andrew	LNX-6514DS w/ Mount Pipe			
		3	nokia	B66A RRH4X45 (UHIE)			
		1	powerwave technologies	P65-16-XL-2 w/ Mount Pipe			
		1	raycap	RxxDC-3315-PF-48			
		3	tower mounts	Pirod 15' T-Frame Sector Mount (1)			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be Removed
4) Sprint loading taken from Structural Analysis by Westchester Services LLC dated 11-15-17.

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, 5/2/2019	-	On Air Engineering

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 were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) 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	-9.59	129.06	7.4	Pass
T2	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	31	-34.92	119.32	29.3	Pass
T3	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	67	-54.22	119.32	45.4	Pass
T4	60 - 40	Leg	Pipe 3.5" x 0.300" (3 XS)	103	-70.62	128.67	54.9	Pass
T5	40 - 20	Leg	Pipe 4.0" x 0.318" (3.5 XS)	145	-86.59	126.30	68.6	Pass
T6	20 - 0	Leg	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	169	-102.65	139.49	73.6	Pass
T1	110 - 100	Diagonal	L 1.5 x 1.5 x 1/8	27	-2.07	9.04	23.0 63.5 (b)	Pass
T2	100 - 80	Diagonal	L 1.5 x 1.5 x 1/8	60	-2.62	6.67	39.3 82.6 (b)	Pass
T3	80 - 60	Diagonal	L 1.5 x 1.5 x 1/8	75	-1.98	3.82	51.9 62.2 (b)	Pass
T4	60 - 40	Diagonal	L 2.5 x 2.5 x 3/16	111	-2.69	14.20	19.0 39.5 (b)	Pass
T5	40 - 20	Diagonal	L 2 x 2 x 1/8	153	-2.95	7.55	39.0 65.4 (b)	Pass
T6	20 - 0	Diagonal	L 2.5 x 2.5 x 3/16	177	-3.21	7.47	42.9 47.6 (b)	Pass
T4	60 - 40	Secondary Horizontal	L 2 x 2 x 1/8	117	-1.23	7.16	17.1	Pass
T1	110 - 100	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.34	8.22	4.1 10.3 (b)	Pass
T2	100 - 80	Top Girt	L 1.5 x 1.5 x 1/8	35	0.08	9.18	0.8 2.4 (b)	Pass
T3	80 - 60	Top Girt	L 1.5 x 1.5 x 1/8	71	-0.35	2.97	11.8 13.7 (b)	Pass
T4	60 - 40	Top Girt	L 2.5 x 2.5 x 3/16	107	-0.56	8.73	6.5 9.8 (b)	Pass
T5	40 - 20	Top Girt	L 2.5 x 2.5 x 3/16	149	-0.69	5.06	13.7	Pass
T6	20 - 0	Top Girt	L 3.5 x 3.5 x 1/4	173	-0.87	12.88	6.8 12.7 (b)	Pass
							Summary	
						Leg (T6)	73.6	Pass
						Diagonal (T2)	82.6	Pass
						Secondary Horizontal (T4)	17.1	Pass
						Top Girt (T3)	13.7	Pass
						Bolt Checks	82.6	Pass
						Rating =	82.6	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	68.8	Pass
1	Base Foundation Structural	0	Unknown	Unknown
1	Base Foundation Soil Interaction	0	67.3	Pass

Structure Rating (max from all components) =	**82.6%**

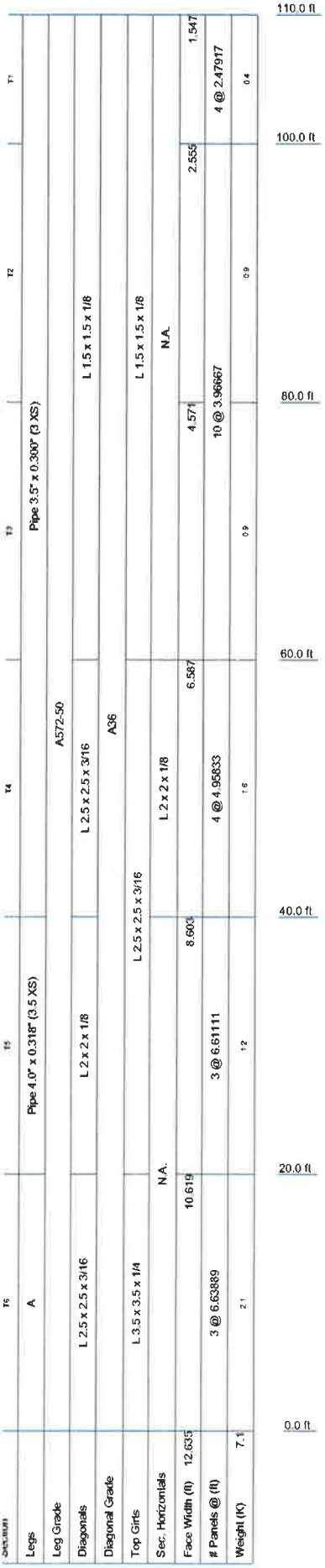
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

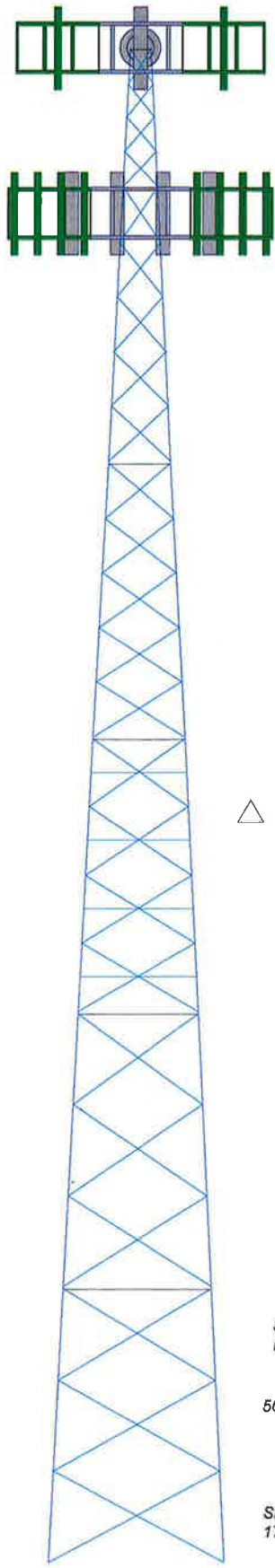
4.1) Recommendations

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





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Pirod 12' V Frame	110	B2/B66A RRH-BR049	98
Pirod 12' V Frame	110	B2/B66A RRH-BR049	98
Pirod 12' V Frame	110	B5/B13 RRH-BR04C	98
ETCR-654L12H6 w/ Mount Pipe	110	B5/B13 RRH-BR04C	98
ETCR-654L12H6 w/ Mount Pipe	110	B5/B13 RRH-BR04C	98
ETCR-654L12H6 w/ Mount Pipe	110	DB-C1-12C-24AB-0Z	98
TD-RRH8x20-25	110	CBC78T-DS-43-2X	98
TD-RRH8x20-25	110	CBC78T-DS-43-2X	98
TD-RRH8x20-25	110	CBC78T-DS-43-2X	98
PCS 1900MHz 4x45W-65MHz	110	BSAMNT-SBS-2-2 (Mount Bracket)	98
PCS 1900MHz 4x45W-65MHz	110	GPS	60
PCS 1900MHz 4x45W-65MHz	110	L 2" x 2" x 1/4" x 4'-0"	37.6
FD-RRH-2x50-800	110	L 2" x 2" x 1/4" x 4'-0"	37.6
FD-RRH-2x50-800	110	L 2" x 2" x 1/4" x 4'-0"	37.6
FD-RRH-2x50-800	110	L 2" x 2" x 1/4" x 4'-0"	35.4
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
BSAMNT-SBS-2-2 (Mount Bracket)	98	L 2" x 2" x 1/4" x 4'-0"	31
BSAMNT-SBS-2-2 (Mount Bracket)	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
(2) APL868013 w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	28.81
(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) JAHH-65B-R3B w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	24.4
(2) JAHH-65B-R3B w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	22.2
(2) JAHH-65B-R3B w/ Mount Pipe	98	L 2" x 2" x 1/4" x 4'-0"	22.2
B2/B66A RRH-BR049	98	L 2" x 2" x 1/4" x 4'-0"	22.2

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

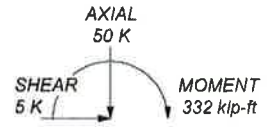
TOWER DESIGN NOTES

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: 82.6%

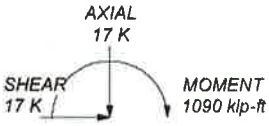
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 105 K
SHEAR: 11 K

UPLIFT: -93 K
SHEAR: 9 K



TORQUE 3 kip-ft
50 mph WIND - 0.75 in ICE



TORQUE 8 kip-ft
REACTIONS - 97 mph WIND

PJF
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: 05/13/19 | Scale: N
Path: | Dwg No.

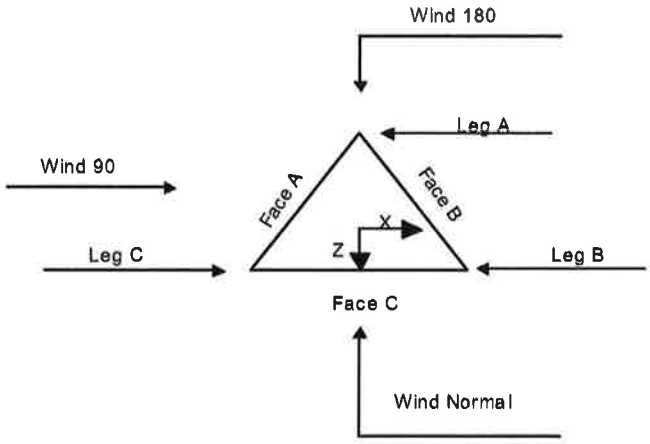
Tower Input Data

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
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
1.5" Conduit (1 1/4" EMT)	A	No	No	Ar (CaAa)	110.00 - 10.00	0.00	0.5	1	1	0.50	1.51		1.00
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
LDF6-50 (1 1/4" foam) ***	A	No	No	Ar (CaAa)	110.00 - 10.00	0.00	0.47	3	3	0.50	1.55		0.66

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
***									
(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
(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	9.47 10.09 10.67	7.76 9.00 10.02	0.09 0.17 0.25

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(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	9.47 10.09 10.67	7.76 9.00 10.02	0.09 0.17 0.25
(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	9.47 10.09 10.67	7.76 9.00 10.02	0.09 0.17 0.25
B2/B66A RRH-BR049	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B2/B66A RRH-BR049	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B2/B66A RRH-BR049	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B5/B13 RRH-BR04C	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B5/B13 RRH-BR04C	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B5/B13 RRH-BR04C	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
DB-C1-12C-24AB-0Z	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	4.06 4.32 4.58	3.10 3.34 3.58	0.03 0.07 0.11
CBC78T-DS-43-2X	A	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
CBC78T-DS-43-2X	B	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
CBC78T-DS-43-2X	C	From Leg	4.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
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	0.07 0.09 0.11
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	0.07 0.09 0.11
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	0.07 0.09 0.11
Site Pro 1 VFA12-HD	A	From Leg	0.00 0 0	0.000	98.00	No Ice 1/2" Ice 1" Ice	13.20 19.50 25.80	9.20 14.60 19.50	0.66 0.80 1.01
Site Pro 1 VFA12-HD	B	From Leg	0.00	0.000	98.00	No Ice	13.20	9.20	0.66

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"	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			
***									
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
			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

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"	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			1/2"	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	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			
***									
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			
ETCR-654L12H6 w/ Mount Pipe	A	From Leg	4.00	0.000	110.00	No Ice	10.90	4.61	0.10
			0			1/2"	11.57	5.18	0.19
			0			Ice	12.24	5.77	0.28
						1" Ice			
ETCR-654L12H6 w/ Mount Pipe	B	From Leg	4.00	0.000	110.00	No Ice	10.90	4.61	0.10
			0			1/2"	11.57	5.18	0.19
			0			Ice	12.24	5.77	0.28
						1" Ice			
ETCR-654L12H6 w/ Mount Pipe	C	From Leg	4.00	0.000	110.00	No Ice	10.90	4.61	0.10
			0			1/2"	11.57	5.18	0.19
			0			Ice	12.24	5.77	0.28
						1" Ice			
TD-RRH8x20-25	A	From Leg	4.00	0.000	110.00	No Ice	4.05	1.53	0.07
			0			1/2"	4.30	1.71	0.10
			0			Ice	4.56	1.90	0.13
						1" Ice			
TD-RRH8x20-25	B	From Leg	4.00	0.000	110.00	No Ice	4.05	1.53	0.07
			0			1/2"	4.30	1.71	0.10
			0			Ice	4.56	1.90	0.13
						1" Ice			
TD-RRH8x20-25	C	From Leg	4.00	0.000	110.00	No Ice	4.05	1.53	0.07
			0			1/2"	4.30	1.71	0.10
			0			Ice	4.56	1.90	0.13
						1" Ice			
PCS 1900MHz 4x45W-65MHz	A	From Leg	4.00	0.000	110.00	No Ice	2.32	2.24	0.06
			0			1/2"	2.53	2.44	0.08
			0			Ice	2.74	2.65	0.11
						1" Ice			
PCS 1900MHz 4x45W-65MHz	B	From Leg	4.00	0.000	110.00	No Ice	2.32	2.24	0.06
			0			1/2"	2.53	2.44	0.08
			0			Ice	2.74	2.65	0.11
						1" Ice			
PCS 1900MHz 4x45W-65MHz	C	From Leg	4.00	0.000	110.00	No Ice	2.32	2.24	0.06
			0			1/2"	2.53	2.44	0.08
			0			Ice	2.74	2.65	0.11
						1" Ice			
FD-RRH-2x50-800	A	From Leg	4.00	0.000	110.00	No Ice	1.36	3.01	0.05

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	1.52	3.22	0.08
			0			1" Ice	1.68	3.45	0.10
FD-RRH-2x50-800	B	From Leg	4.00	0.000	110.00	No Ice	1.36	3.01	0.05
			0			1/2" Ice	1.52	3.22	0.08
			0			1" Ice	1.68	3.45	0.10
FD-RRH-2x50-800	C	From Leg	4.00	0.000	110.00	No Ice	1.36	3.01	0.05
			0			1/2" Ice	1.52	3.22	0.08
			0			1" Ice	1.68	3.45	0.10
***									
GPS	B	From Leg	0.50	0.000	60.00	No Ice	0.15	0.15	0.02
			0			1/2" Ice	0.24	0.24	0.02
			0			1" Ice	0.31	0.31	0.02
****									

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	Worst		110.00	3.00	No Ice	7.06	0.10
				0					1/2" Ice	7.47	0.18
				0					1" Ice	7.88	0.25
2 ft standard	A	Paraboloid w/o Radome	From Leg	4.00	Worst		110.00	2.00	No Ice	3.14	0.01
				0					1/2" Ice	3.41	0.06
				0					1" Ice	3.68	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

Comb. No.	Description
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	2.22	42	0.180	0.101
T2	100 - 80	1.84	42	0.174	0.056
T3	80 - 60	1.15	42	0.144	0.028
T4	60 - 40	0.61	42	0.102	0.015
T5	40 - 20	0.26	47	0.059	0.010
T6	20 - 0	0.07	47	0.025	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	42	2.22	0.180	0.101	134701
98.00	(2) APL868013 w/ Mount Pipe	42	1.77	0.172	0.050	59522
60.00	GPS	42	0.61	0.102	0.015	23797
37.60	L 2" x 2" x 1/4" x 4'-0"	47	0.23	0.055	0.010	34741
35.40	L 2" x 2" x 1/4" x 4'-0"	47	0.21	0.050	0.009	34061
31.00	L 2" x 2" x 1/4" x 4'-0"	47	0.16	0.042	0.007	32510
28.81	L 2" x 2" x 1/4" x 4'-0"	47	0.13	0.039	0.006	31790
24.40	L 2" x 2" x 1/4" x 4'-0"	47	0.10	0.031	0.005	30434
22.20	L 2" x 2" x 1/4" x 4'-0"	47	0.08	0.028	0.004	30063

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	110 - 100	9.28	18	0.745	0.424
T2	100 - 80	7.71	18	0.724	0.233
T3	80 - 60	4.81	18	0.599	0.118
T4	60 - 40	2.57	18	0.428	0.061
T5	40 - 20	1.11	18	0.249	0.043
T6	20 - 0	0.28	18	0.104	0.014

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	9.28	0.745	0.424	36072
98.00	(2) APL868013 w/ Mount Pipe	18	7.40	0.717	0.210	15551
60.00	GPS	18	2.57	0.428	0.061	5702
37.60	L 2" x 2" x 1/4" x 4'-0"	18	0.98	0.229	0.040	8450
35.40	L 2" x 2" x 1/4" x 4'-0"	18	0.87	0.211	0.037	8250
31.00	L 2" x 2" x 1/4" x 4'-0"	18	0.66	0.178	0.030	7810
28.81	L 2" x 2" x 1/4" x 4'-0"	18	0.57	0.162	0.027	7607
24.40	L 2" x 2" x 1/4" x 4'-0"	18	0.41	0.132	0.020	7231
22.20	L 2" x 2" x 1/4" x 4'-0"	18	0.34	0.118	0.017	7120

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	1.94	40.59	0.048 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	1.98	3.13	0.635 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.32	3.13	0.103 ✔	1	Member Block Shear
T2	100	Leg	A325N	0.88	4	8.11	40.59	0.200 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.58	3.13	0.826 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.08	3.13	0.024 ✔	1	Member Block Shear
T3	80	Leg	A325N	0.88	4	12.47	40.59	0.307 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	1.94	3.13	0.622 ✔	1	Member Block Shear
		Top Girt	A325N	0.50	1	0.43	3.13	0.137 ✔	1	Member Block Shear
T4	60	Leg	A325N	0.88	4	16.26	40.59	0.401 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.45	6.20	0.395 ✔	1	Member Bearing
		Top Girt	A325N	0.50	1	0.61	6.20	0.098 ✔	1	Member Bearing
T5	40	Leg	A325N	0.88	4	19.86	40.59	0.489 ✔	1	Bolt Tension
		Diagonal	A325N	0.50	1	2.70	4.13	0.654 ✔	1	Member Bearing
		Top Girt	A325N	0.50	1	0.77	6.20	0.125 ✔	1	Member Bearing
T6	20	Diagonal	A325N	0.50	1	2.95	6.20	0.476 ✔	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
		Top Girt	A325N	0.50	1	1.01	7.95	0.127 ✔	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	-9.59	129.06	0.074 [1] ✔
T2	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	3.97	42.0 K=1.00	3.02	-34.92	119.32	0.293 [1] ✔
T3	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	3.97	42.0 K=1.00	3.02	-54.22	119.32	0.454 [1] ✔
T4	60 - 40	Pipe 3.5" x 0.300" (3 XS)	20.03	2.56	27.0 K=1.00	3.02	-70.62	128.67	0.549 [1] ✔
T5	40 - 20	Pipe 4.0" x 0.318" (3.5 XS)	20.03	6.62	60.8 K=1.00	3.68	-86.59	126.30	0.686 [1] ✔
T6	20 - 0	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	20.03	6.65	82.5 K=1.00	5.10	-102.65	139.49	0.736 [1] ✔

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	110 - 100	L 1.5 x 1.5 x 1/8	3.00	1.30	69.4 K=1.32	0.36	-2.07	9.04	0.230 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	5.07	2.40	102.8 K=1.06	0.36	-2.62	6.67	0.393 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	7.51	3.60	145.8 K=1.00	0.36	-1.98	3.82	0.519 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	9.71	4.83	117.1 K=1.00	0.90	-2.69	14.20	0.190 [1] ✔
T5	40 - 20	L 2 x 2 x 1/8	12.22	6.11	117.1 K=1.00	0.48	-2.95	7.55	0.390 [1] ✔
T6	20 - 0	L 2.5 x 2.5 x 3/16	13.98	6.81	165.1 K=1.00	0.90	-3.21	7.47	0.429 [1] ✔

[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 $\frac{P_u}{\phi P_n}$
T4	60 - 40	L 2 x 2 x 1/8	8.34	4.02	121.4 K=1.00	0.48	-1.23	7.16	0.171 [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	110 - 100	L 1.5 x 1.5 x 1/8	1.56	1.06	81.4 K=1.90	0.36	-0.34	8.22	0.041 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	2.56	2.06	101.8 K=1.22	0.36	-0.05	6.75	0.008 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	4.58	4.08	165.3 K=1.00	0.36	-0.35	2.97	0.118 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	6.60	6.30	152.8 K=1.00	0.90	-0.56	8.73	0.065 [1] ✔
T5	40 - 20	L 2.5 x 2.5 x 3/16	8.61	8.28	200.7 K=1.00	0.90	-0.69	5.06	0.137 [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	-0.87	12.88	0.068 [1] ✔

[1] $P_u / \phi P_n$ controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	110 - 100	Pipe 3.5" x 0.300" (3 XS)	10.02	2.48	26.2	3.02	7.78	135.72	0.057 [1] ✔
T2	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	32.43	135.72	0.239 [1] ✔
T3	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	49.89	135.72	0.368 [1] ✔
T4	60 - 40	Pipe 3.5" x 0.300" (3 XS)	20.03	0.08	0.9	3.02	65.04	135.72	0.479 [1] ✔
T5	40 - 20	Pipe 4.0" x 0.318" (3.5 XS)	20.03	0.08	0.8	3.68	79.44	165.53	0.480 [1] ✔
T6	20 - 0	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	20.03	6.65	82.5	5.10	90.28	229.32	0.394 [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	110 - 100	L 1.5 x 1.5 x 1/8	3.00	1.30	36.1	0.21	1.98	9.18	0.216 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	5.07	2.40	64.5	0.21	2.58	9.18	0.281 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	6.21	2.96	79.0	0.21	1.94	9.18	0.212 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	9.71	4.83	74.5	0.59	2.45	25.60	0.096 [1] ✔
T5	40 - 20	L 2 x 2 x 1/8	11.67	5.84	111.9	0.30	2.70	13.25	0.204 [1] ✔
T6	20 - 0	L 2.5 x 2.5 x 3/16	13.39	6.52	102.2	0.59	2.95	25.60	0.115 [1] ✔

[1] $P_u / \phi P_n$ controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	60 - 40	L 2 x 2 x 1/8	8.34	4.02	154.2	0.48	1.23	15.69	0.078 [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	0.32	9.18	0.035 [1] ✔
T2	100 - 80	L 1.5 x 1.5 x 1/8	2.56	2.06	58.6	0.21	0.08	9.18	0.008 [1] ✔
T3	80 - 60	L 1.5 x 1.5 x 1/8	4.58	4.08	110.6	0.21	0.43	9.18	0.047 [1] ✔
T4	60 - 40	L 2.5 x 2.5 x 3/16	6.60	6.30	97.2	0.59	0.61	25.60	0.024 [1] ✔
T5	40 - 20	L 2.5 x 2.5 x 3/16	8.61	8.28	127.7	0.59	0.77	25.60	0.030 [1] ✔
T6	20 - 0	L 3.5 x 3.5 x 1/4	10.63	9.96	111.9	1.15	1.01	50.04	0.020 [1] ✔

[1] $P_u / \phi P_n$ controls

Section Capacity Table

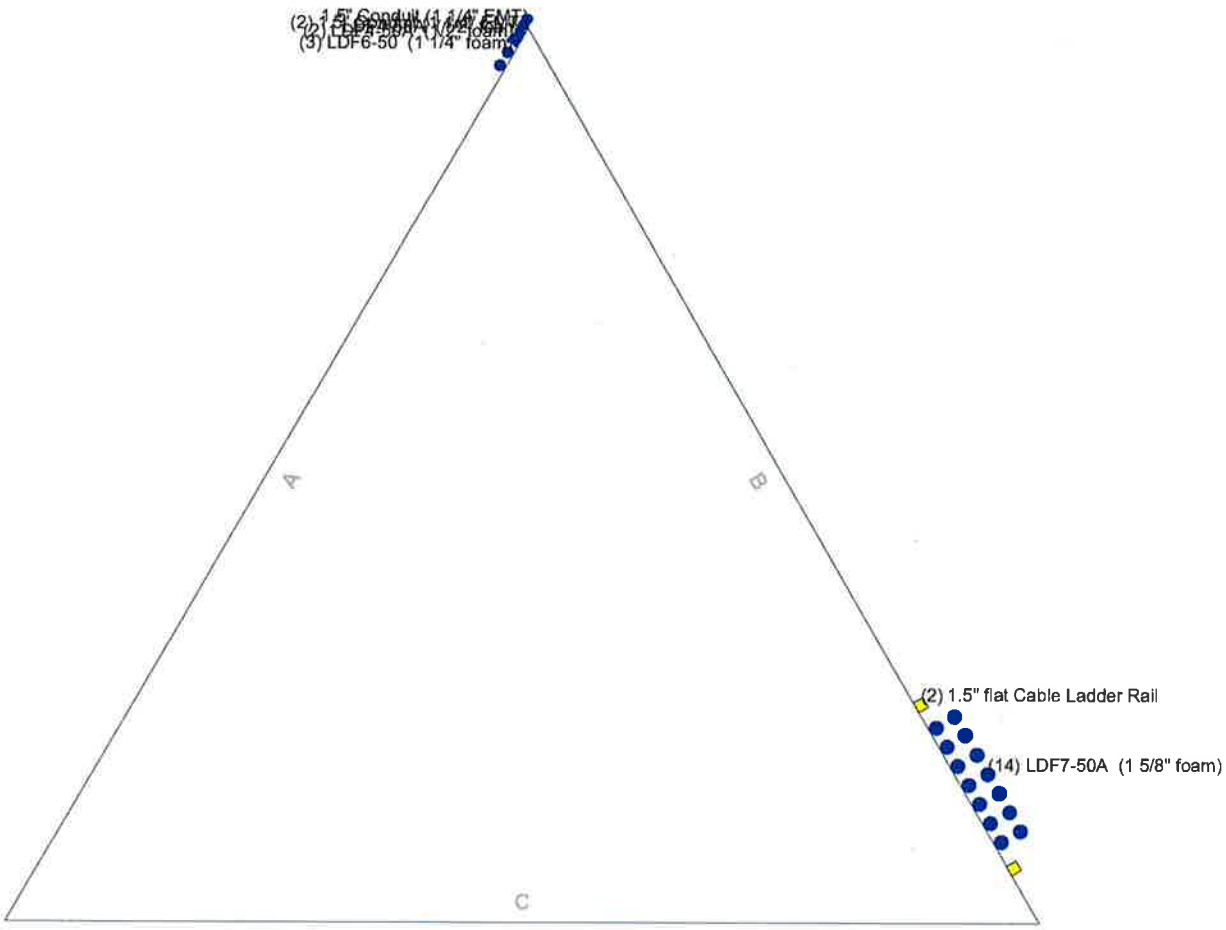
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	110 - 100	Leg	Pipe 3.5" x 0.300" (3 XS)	3	-9.59	129.06	7.4	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T2	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	31	-34.92	119.32	29.3	Pass
T3	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	67	-54.22	119.32	45.4	Pass
T4	60 - 40	Leg	Pipe 3.5" x 0.300" (3 XS)	103	-70.62	128.67	54.9	Pass
T5	40 - 20	Leg	Pipe 4.0" x 0.318" (3.5 XS)	145	-86.59	126.30	68.6	Pass
T6	20 - 0	Leg	(42918-0023) P3.5XS w/ P5XXS Sleeve Reinforcing	169	-102.65	139.49	73.6	Pass
T1	110 - 100	Diagonal	L 1.5 x 1.5 x 1/8	27	-2.07	9.04	23.0 63.5 (b)	Pass
T2	100 - 80	Diagonal	L 1.5 x 1.5 x 1/8	60	-2.62	6.67	39.3 82.6 (b)	Pass
T3	80 - 60	Diagonal	L 1.5 x 1.5 x 1/8	75	-1.98	3.82	51.9 62.2 (b)	Pass
T4	60 - 40	Diagonal	L 2.5 x 2.5 x 3/16	111	-2.69	14.20	19.0 39.5 (b)	Pass
T5	40 - 20	Diagonal	L 2 x 2 x 1/8	153	-2.95	7.55	39.0 65.4 (b)	Pass
T6	20 - 0	Diagonal	L 2.5 x 2.5 x 3/16	177	-3.21	7.47	42.9 47.6 (b)	Pass
T4	60 - 40	Secondary Horizontal	L 2 x 2 x 1/8	117	-1.23	7.16	17.1	Pass
T1	110 - 100	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.34	8.22	4.1 10.3 (b)	Pass
T2	100 - 80	Top Girt	L 1.5 x 1.5 x 1/8	35	0.08	9.18	0.8 2.4 (b)	Pass
T3	80 - 60	Top Girt	L 1.5 x 1.5 x 1/8	71	-0.35	2.97	11.8 13.7 (b)	Pass
T4	60 - 40	Top Girt	L 2.5 x 2.5 x 3/16	107	-0.56	8.73	6.5 9.8 (b)	Pass
T5	40 - 20	Top Girt	L 2.5 x 2.5 x 3/16	149	-0.69	5.06	13.7	Pass
T6	20 - 0	Top Girt	L 3.5 x 3.5 x 1/4	173	-0.87	12.88	6.8 12.7 (b)	Pass
							Summary	
						Leg (T6)	73.6	Pass
						Diagonal (T2)	82.6	Pass
						Secondary Horizontal (T4)	17.1	Pass
						Top Girt (T3)	13.7	Pass
						Bolt Checks	82.6	Pass
						RATING =	**82.6**	**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: 05/03/19	Scale: N	
Path:		Dwg No.	

APPENDIX C

ADDITIONAL CALCULATIONS

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

By MTB Date 5/13/2019
Project # 42918-0023

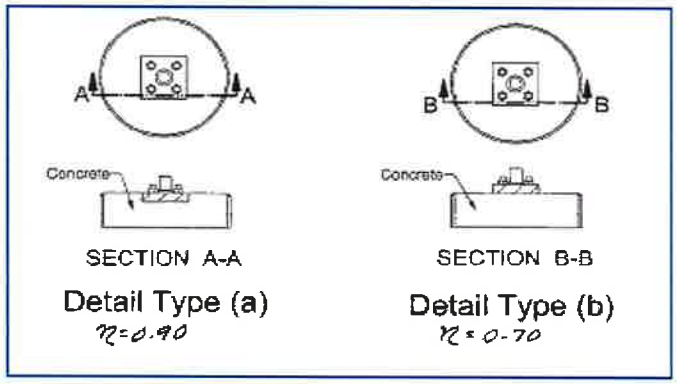
Self-Support Tower Anchor Rod Capacity - TIA-G

Loads

Compression :	105	kips	Tension :	93	kips	Code:	TIA-G
Comp. Shear :	11	kips	Ten.Shear :	10	kips	Maximum Ratio:	1.00

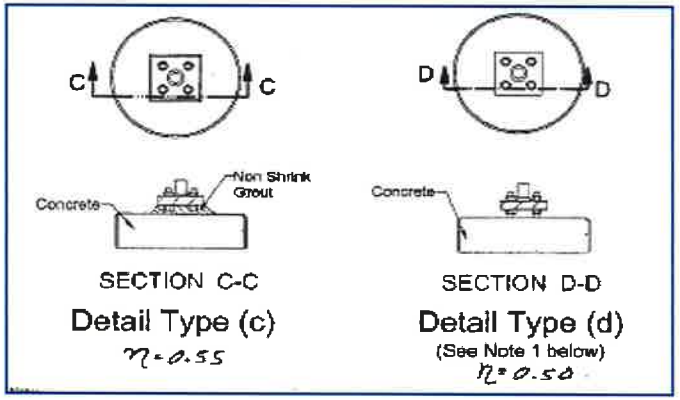
Existing Anchor Rods

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 :	0.688				



SECTION A-A
Detail Type (a)
η=0.90

SECTION B-B
Detail Type (b)
η=0.70



SECTION C-C
Detail Type (c)
η=0.55

SECTION D-D
Detail Type (d)
(See Note 1 below)
η=0.50

PJF Job No. **42918-0023** Project Name: **Stratford** Engineer: MTB

Factored Foundation Loads:

	Comp	Uplift	
Factored Axial Load (+Comp, -Ten) =	123.62	-74.38	kips
Factored Horiz. Load at Top of Pier =	11	10	kips
Factored OTM at Top of Pier =	0	0	k-ft

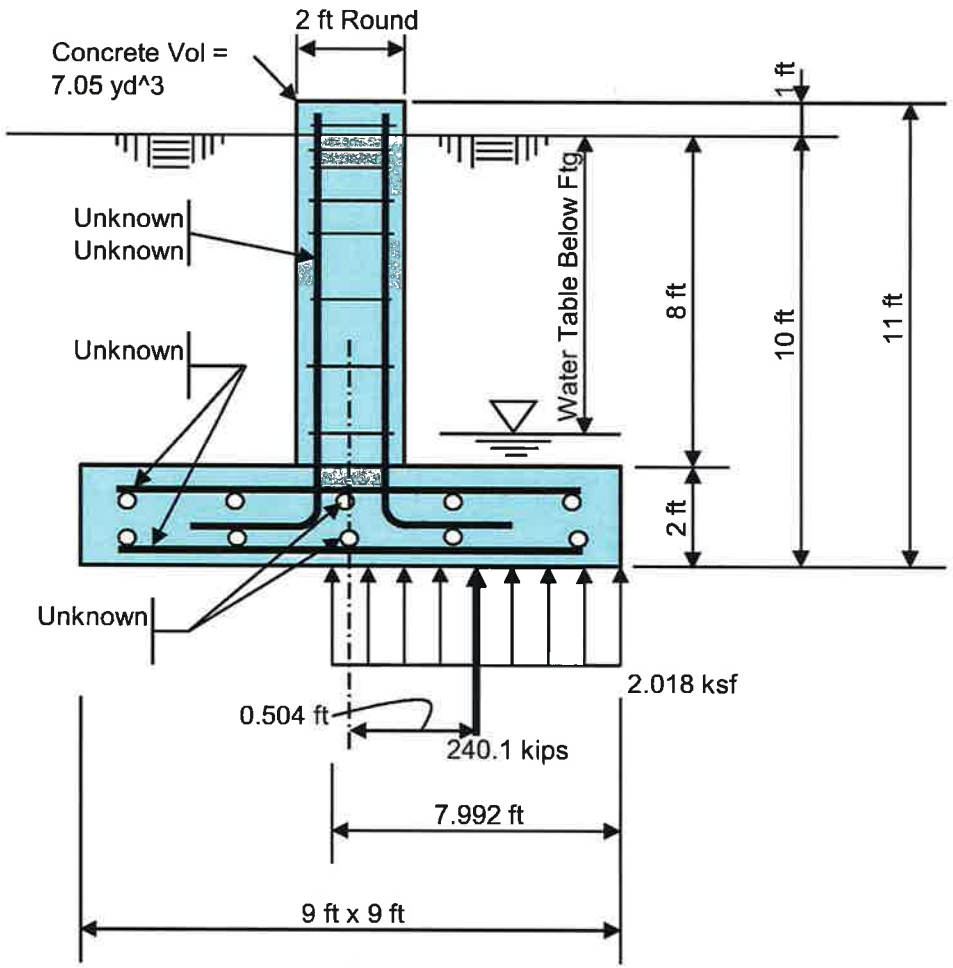
LRFD Resistance and Load Factors:

	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 =	2.018	ksf	3.000	ksf	Stress Ratio =	67.3% in Soil Bearing
Uplift =	74.4	kips	146.4	kips	Stress Ratio =	50.8% in Uplift
Punching Shear Stress =	0.039	ksi	0.164	ksi	Stress Ratio =	23.6% in Punching Shear
Bending Shear Stress =	37.0	kips	186.3	kips	Stress Ratio =	19.9% 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.