Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

March 23, 2015

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
370 West Main Street, Stamford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at a height of 80 feet above ground level ("AGL") on the existing roof-top tower at 370 West Main Street in Stamford (the "Property"). The top of the tower extends to a height of 90 feet AGL. The tower and Property are owned by Storage Works LLC. The Council approved Cellco's shared use of this tower in 1995. On August 18, 2014, the Council acknowledged Cellco's request to replace nine (9) of its existing antennas with newer model antennas, at the same level on the tower (EM-VER-135-140723B). Cellco now intends to add three (3) Remote Radio Heads ("RRHs") behind its 1900 MHz antennas. Included in Attachment 1 are the specifications for the new RRHs.

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 David Martin, Mayor for the City of Stamford.

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 proposed RRHs will be located at the same level (80 feet AGL) on the 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 modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A General Power Density table for Cellco's modified facility is included in Attachment 2.

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

6. The existing tower can support Cellco's proposed modifications. (*See* Structural Analysis Report is included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
David Martin, Mayor
Tim Parks

ATTACHMENT 1

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version 1900A HW version	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

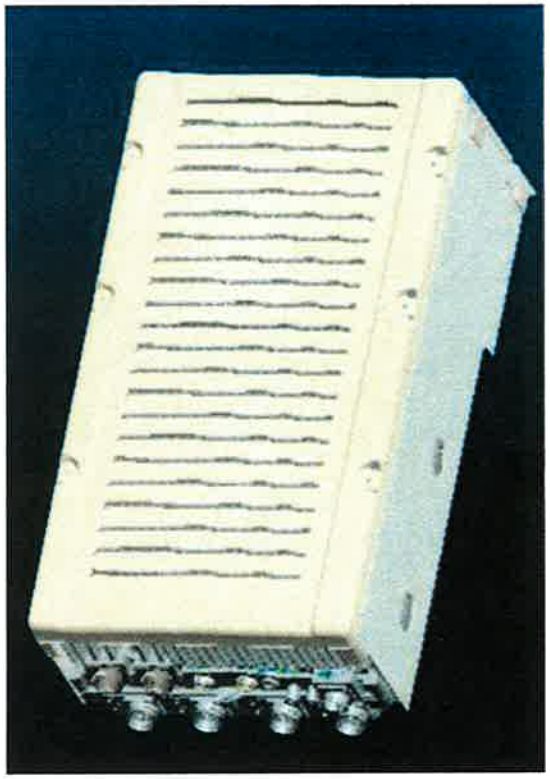
** Not a Verizon Wireless deployed product

Alcatel·Lucent

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

Alcatel·Lucent

ATTACHMENT 2

Site Name: STAMFORD W, CT
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW PCS	1970	1	1243	1243	80	0.0698	1.0	6.98%
VZW Cellular	869	9	340	3060	80	0.1719	0.579333333	29.68%
VZW AWS	2145	1	1750	1750	80	0.0983	1.0	9.83%
VZW 700	746	1	718	718	80	0.0403	0.497333333	8.11%
Total Percentage of Maximum Permissible Exposure								54.61%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used.

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

40-ft Existing Roof Mounted Lattice Tower

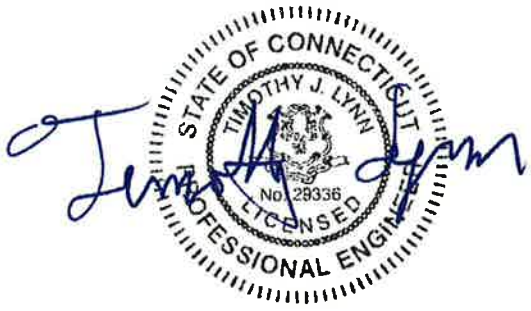
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Stamford West

370 West Main Street
Stamford, CT

Centek Project No. 14067.006

Date: March 17, 2015



Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

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

Table of Contents

CENTEK Engineering, Inc.
Structural Analysis – 40' Roof Mounted Lattice Tower
Verizon Wireless Antenna Upgrade – Stamford West
Stamford, CT
March 17, 2015

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing roof mounted lattice tower located in Stamford, CT.

The host tower is a 40-ft tall, three-legged, tapered self-support lattice tower mounted on a structural steel support frame to the roof of the host building. The tower geometry, structure member sizes and existing steel support frame information were a previous structural analysis prepared by Centek job no. 12124.CO53 dated April 2, 2013.

Antenna and appurtenance information were obtained from the aforementioned structural report, visual verification from grade conducted by Centek personnel on March 10, 2015 and a Verizon Wireless RF data sheet.

The tower consists of two (2) tapered steel sections consisting of ASTM A572-50 pipe legs. Horizontal and diagonal lateral support bracing consists of ASTM A36 steel angle construction. The vertical tower sections are connected by bolted flange plates while the bracing is connected by bolted and welded connections. The tower face width is 8.5625-ft at the top and 12.064-ft at the bottom.

Verizon proposes the removal of nine (9) existing panel antennas and the installation of nine (9) panel antennas, three (3) remote radio heads and one (1) main distribution box mounted to the three (3) existing boom gates. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- UNKNOWN (EXISTING)
  Antennas: One (1) 16-ft Omni-directional whip antenna pipe mounted to a leg of the tower an elevation of 95.5-ft +/- above grade level (41.5-ft +/- above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.
- UNKNOWN (EXISTING)
  Antennas: One (1) 3-ft Yagi antenna pipe mounted to a leg of the tower with an elevation of 96-ft +/- above grade level (42-ft +/-, above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.
- UNKNOWN (EXISTING)
  Antennas: One (1) 3-ft Yagi antenna pipe mounted to a leg of the tower with an elevation of 93-ft +/- above grade level (39-ft +/-, above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.
- UNKNOWN (EXISTING)
  Antennas: One (1) 3-ft Yagi antenna pipe mounted to a leg of the tower with an elevation of 87.5-ft +/- above grade level (33.5-ft +/-, above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.

- UNKNOWN (EXISTING)
  Antennas: One (1) Kathrein PR-850 paraflector and one (1) GPS antenna mounted on a 4-ft side arm to a leg of the tower with an elevation of 85.5-ft +/- above grade level (31.5-ft +/-, above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.
- UNKNOWN (EXISTING)
  Antennas: One (1) 3-ft Yagi antenna pipe mounted to a leg of the tower with an elevation of 67-ft +/- above grade level (13-ft +/-, above the tower base).
  Coax Cables: One (1) 1/2" ∅ coax cables running on a face of the existing tower.
- VERIZON (EXISTING TO REMAIN)
  Antennas: Six (6) Decibel DB844G65ZAXY panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on three (3) existing boom gates with a RAD center elevation of 80-ft +/- above grade level (26-ft +/- above the tower base)
  Coax Cables: Eighteen (18) 7/8" ∅ coax cables and one (1) 1-1/4" ∅ fiber cable running on a face of the existing tower.
- VERIZON (EXISTING TO REMOVE)
  Antennas: Three (3) Antel BXA-171063-8BF, three (3) BXA-70063-6CF and three (3) RYMSA MG D3-800T0 panel antennas mounted on three (3) existing boom gates with a RAD center elevation of 80-ft +/- above grade level (26-ft +/- above the tower base)
- **VERIZON (PROPOSED):**
  Antennas: Six (6) Andrew HBXX-6516DS panel antennas, three (3) Andrew LNX-6514DS panel antennas, three (3) Alcatel-Lucent RRH-2x60-PCS remote radio heads and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on three (3) existing boom gates with a RAD center elevation of 80-ft +/- above grade level (26-ft +/- above the tower base)
  Cables: One (1) 1-1/4" ∅ fiber cable running on a face of the existing tower.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables should be routed as specified in section 3 of this report.

Analysis

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

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation of the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Stamford; v = 105 mph (3 second gust) equivalent to v = 85 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA and Appendix-K wind speeds are equal.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **80.1%** of its total capacity.

Tower Section	Elevation (AGL)	Stress Ratio (percentage of capacity)	Result
Leg (T2)	54'-0"-74'-0"	53.9%	**PASS**
Diagonal (T1)	74'-0"-94'-0"	80.1%	**PASS**
Top Girt (T1)	74'-0"-94'-0"	4.3%	**PASS**

Steel Support Frame and Anchors

The existing steel support frame consists of W14 horizontal beams and W10 vertical columns positively attached to the reinforced concrete structure below Tower legs are connected to the steel support frame by means of four (4) 3/4"Ø, ASTM A325 bolts per leg.

- The tower reactions developed from the governing Load Case 1 were used in the verification of the foundation:

Reactions	Vector	Proposed Base Reactions
Base	Shear	**10 kips**
	Compression	**6 kips**
	Moment	**238 kip-ft**
Leg	Shear	**5 kips**
	Uplift	**20 kips**
	Compression	**25 kips**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	17.1%	**PASS**

Conclusion and Recommendations

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

- **All coax cables routed as specified in Section 3 of this report.**

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

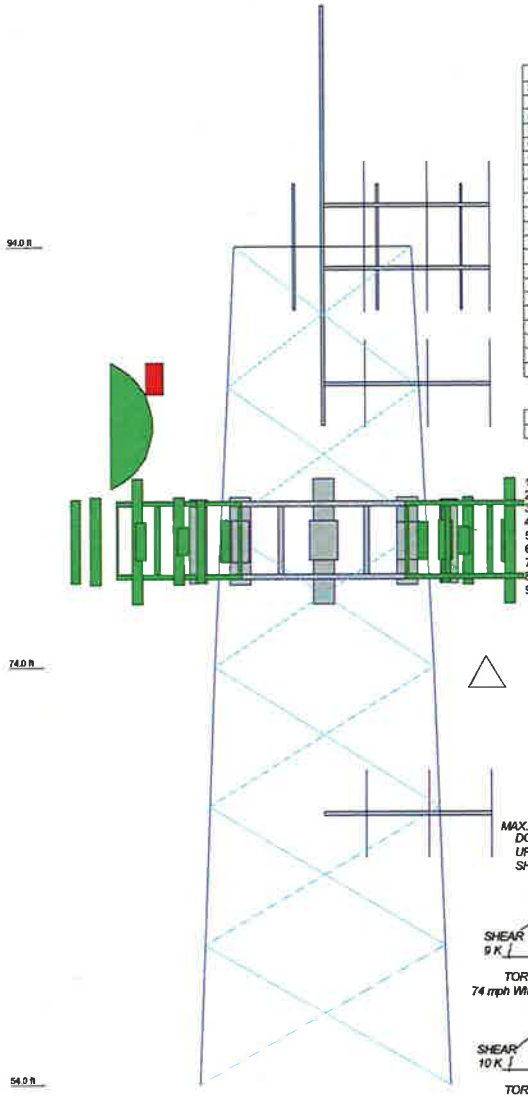
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

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

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1			L1 3/4x1 3/4x1/4		L3x3x1/4	8.5625		T1
T2	ROHN 25 STD	A572-50	L2x2x1/4	A36	N.A.	10.9625	8 @ 8.69687	T1
						12.064		2.2



MAX. CORNER REACTIONS AT BASE:
DOWN: 25 K
UPLIFT: -20 K
SHEAR: 5 K

AXIAL
7 K
SHEAR 9 K
MOMENT 228 kip-ft

TORQUE 2 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL
6 K
SHEAR 10 K
MOMENT 238 kip-ft

TORQUE 2 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
3' Yagi	96	LNX-6514DS-T4M (Verizon - Proposed)	80
16' x 2.5" Dia Omni	95.5	HBXX-6516DS (Verizon - Proposed)	80
3' Yagi	93	DB844G65ZAXY (Verizon - Existing)	80
13-ft Wireless Frame	91	DB844G65ZAXY (Verizon - Existing)	80
6'x2" Pipe Mount	91	HBXX-6516DS (Verizon - Proposed)	80
6'x2" Pipe Mount	91	LNX-6514DS-T4M (Verizon - Proposed)	80
6'x2" Pipe Mount	91	HBXX-6516DS (Verizon - Proposed)	80
3' Yagi	87.5	DB844G65ZAXY (Verizon - Existing)	80
GPS	87	RRH2x40-AWS (Verizon - Existing)	80
ROHN 4-ft Side Arm	85.5	RRH2x40-AWS (Verizon - Existing)	80
PR-650	85.5	RRH2x40-AWS (Verizon - Existing)	80
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	80	RRH2x40-07-U (Verizon - Existing)	80
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	80	RRH2x40-07-U (Verizon - Existing)	80
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	80	RRH2x40-07-U (Verizon - Existing)	80
DB844G65ZAXY (Verizon - Existing)	80	RC2DC-3315-PF-48 (Verizon - Existing)	80
HBXX-6516DS (Verizon - Proposed)	80	RRH2x60-PCS (Verizon - Proposed)	80
LNX-6514DS-T4M (Verizon - Proposed)	80	RRH2x60-PCS (Verizon - Proposed)	80
HBXX-6516DS (Verizon - Proposed)	80	RRH2x60-PCS (Verizon - Proposed)	80
DB844G65ZAXY (Verizon - Existing)	80	RC2DC-3315-PF-48 (Verizon - Proposed)	80
DB844G65ZAXY (Verizon - Existing)	80	6'x2" Pipe Mount	67
HBXX-6516DS (Verizon - Proposed)	80	3' Yagi	67

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

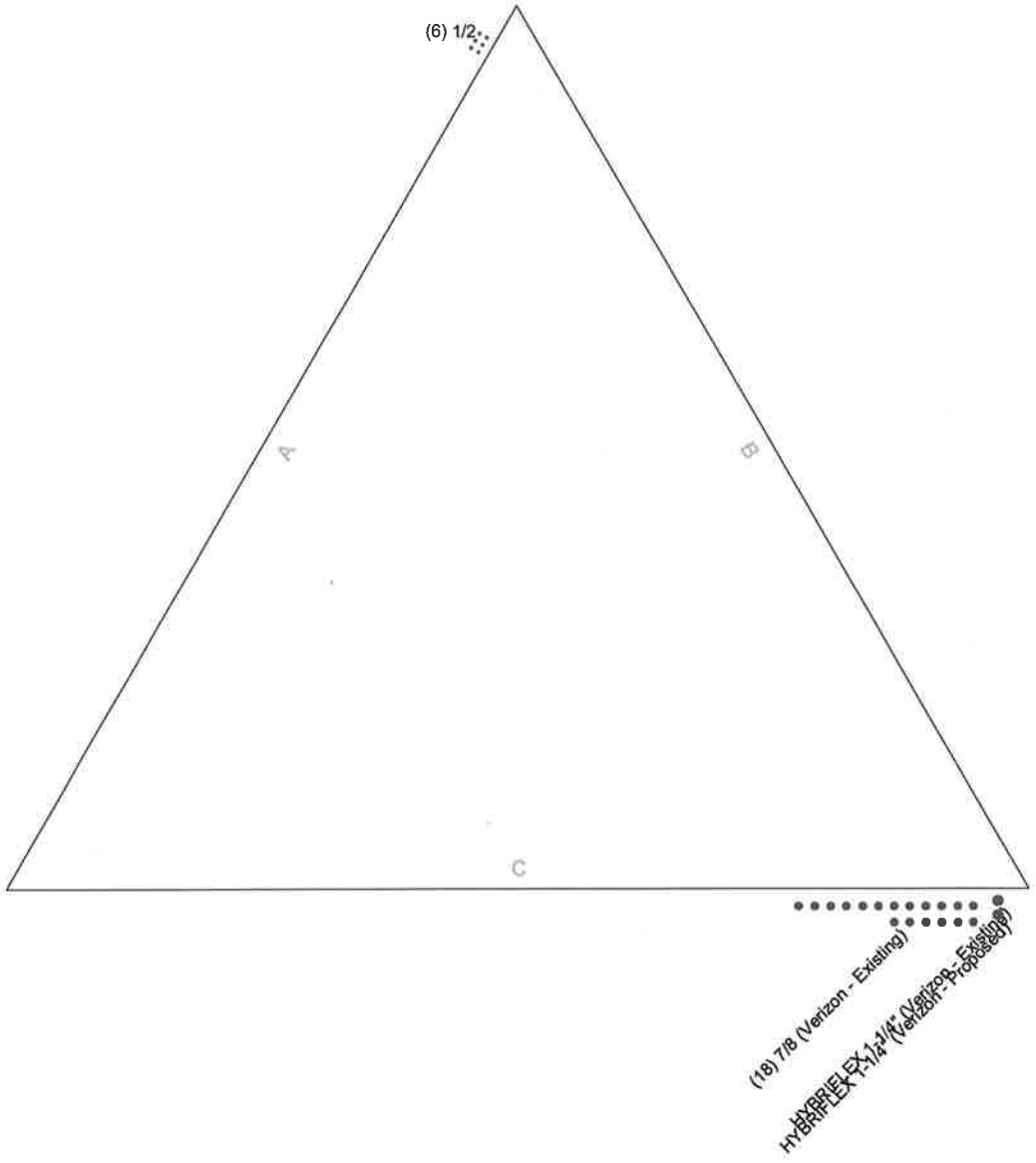
1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 80.1%

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

Job:	14067.006 - Stamford West
Project:	40-ft Lattice Tower - 370 West Main St., Stamford, CT
Client: Verizon Wireless	Drawn by: TJL / App'd:
Code: TIA/EIA-222-F	Date: 03/17/15 / Scale: NTS
Path:	Dwg No: E-1

Feedline Plan

_____ Round _____ Flat _____ App In Face _____ App Out Face

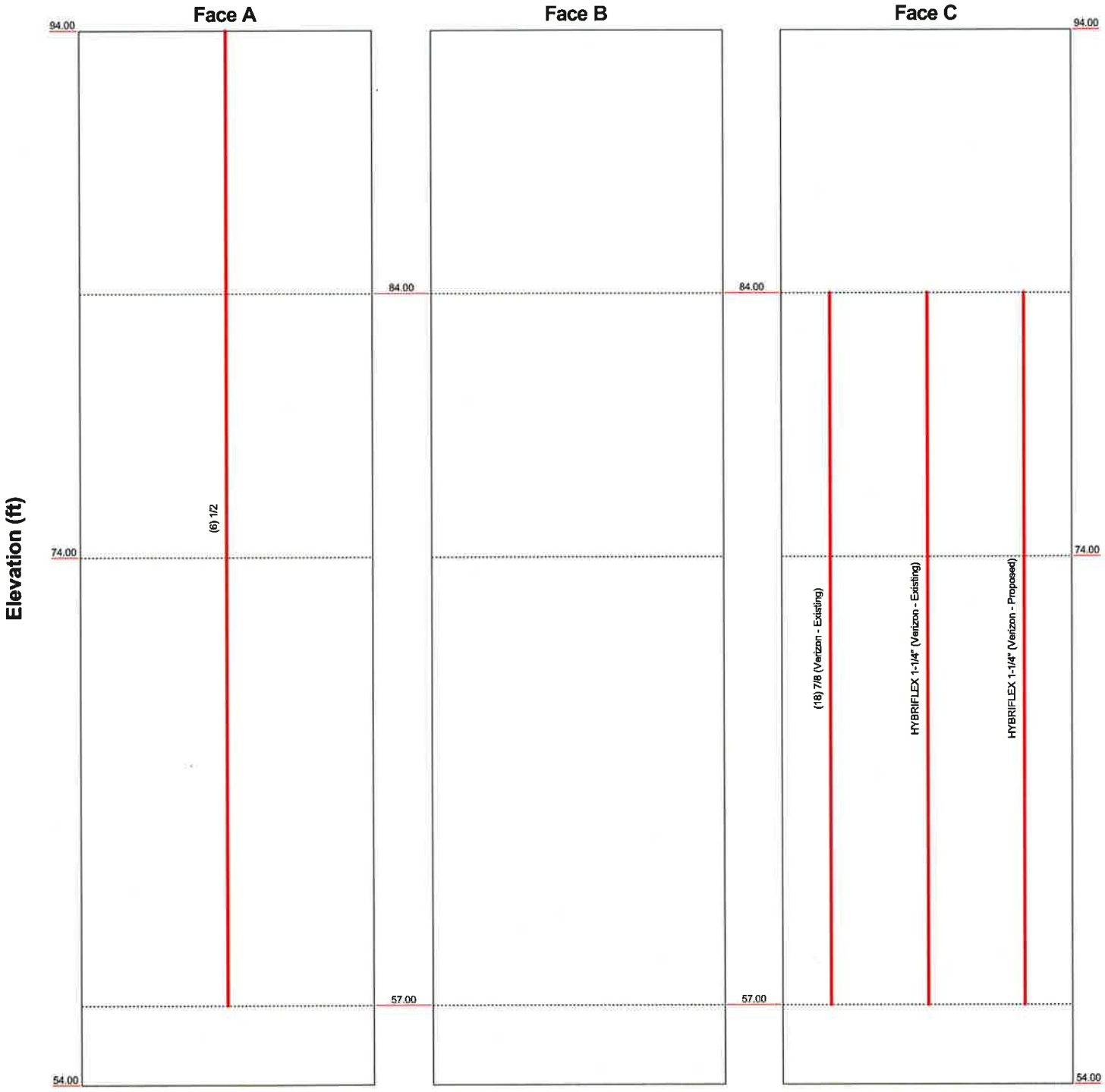


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **14067.006 - Stamford West**			
Project: **40-ft Lattice Tower - 370 West Main St., Stamford, CT**			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 03/17/15	Scale: NTS	
Path:		Dwg No. E-7	

Feedline Distribution Chart
54' - 94'

Round | Flat | App In Face | App Out Face | Truss Leg



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **14067.006 - Stamford West**		
	Project: ***40-ft Lattice Tower - 370 West Main St., Stamford, CT***		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 03/17/15	Scale: NTS
	Path:		Dwg No. E-7

tnxTower	Job	Page
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	14067.006 - Stamford West	1 of 21
	Project 40-ft Lattice Tower - 370 West Main St., Stamford, CT	Date 07:50:50 03/17/15
	Client Verizon Wireless	Designed by TJL

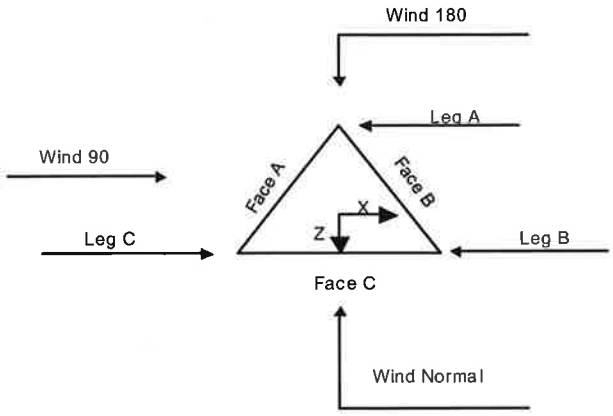
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 94.00 ft above the ground line.
The base of the tower is set at an elevation of 54.00 ft above the ground line.
The face width of the tower is 8.56 ft at the top and 12.06 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	√ Calculate Redundant Bracing Forces
Use Moment Magnification	√ Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	√ SR Leg Bolts Resist Compression
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	√ All Leg Panels Have Same Allowable
Escalate Ice	Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	Use Azimuth Dish Coefficients	√ Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	Include Angle Block Shear Check
√ Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Poles
Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	Include Shear-Torsion Interaction
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination		



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	94.00-74.00			8.56	1	20.00
T2	74.00-54.00			10.56	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	94.00-74.00	6.67	X Brace	No	No	0.0000	0.0000
T2	74.00-54.00	6.67	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 94.00-74.00	Pipe	ROHN 2.5 STD	A572-50	Single Angle	L1 3/4x1 3/4x1/4	A36

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T2 74.00-54.00	Pipe	ROHN 2.5 STD	(50 ksi) A572-50 (50 ksi)	Single Angle	L2x2x1/4	(36 ksi) A36 (36 ksi)

Tower Section Geometry *(cont'd)*

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
T1 94.00-74.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	30.0000	30.0000
T2 74.00-54.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	30.0000	30.0000

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 94.00-74.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 74.00-54.00	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 94.00-74.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 74.00-54.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation 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 94.00-74.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 74.00-54.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
7/8 (Verizon - Existing)	C	Yes	Ar (CfAe)	84.00 - 57.00	2.0000	-0.36	18	12	1.1100	1.1100		0.54
HYBRIFLEX 1-1/4" (Verizon - Existing)	C	Yes	Ar (CfAe)	84.00 - 57.00	1.0000	-0.47	1	1	1.5400	1.5400		1.30
HYBRIFLEX 1-1/4" (Verizon - Proposed)	C	Yes	Ar (CfAe)	84.00 - 57.00	3.0000	-0.47	1	1	1.5400	1.5400		1.30
1/2	A	Yes	Ar (CfAe)	94.00 - 57.00	1.0000	0.45	6	3	0.5800	0.5800		0.25

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	94.00-74.00	A	2.900	0.000	0.000	0.000	0.03
		B	0.000	0.000	0.000	0.000	0.00
		C	13.667	0.000	0.000	0.000	0.12
T2	74.00-54.00	A	2.465	0.000	0.000	0.000	0.03
		B	0.000	0.000	0.000	0.000	0.00
		C	23.233	0.000	0.000	0.000	0.21

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	94.00-74.00	A	0.500	2.633	3.867	0.000	0.000	0.10
		B		0.000	0.000	0.000	0.000	0.00
		C		25.333	0.000	0.000	0.000	0.33
T2	74.00-54.00	A	0.500	2.238	3.287	0.000	0.000	0.08
		B		0.000	0.000	0.000	0.000	0.00
		C		43.067	0.000	0.000	0.000	0.55

Feed Line Shielding

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
T1	94.00-74.00	A	0.000	0.225	0.191	0.428
		B	0.000	0.000	0.000	0.000
		C	0.000	0.879	0.901	1.670
T2	74.00-54.00	A	0.000	0.160	0.143	0.321
		B	0.000	0.000	0.000	0.000
		C	0.000	1.250	1.349	2.501

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	94.00-74.00	7.0868	3.9600	8.3199	5.4658
T2	74.00-54.00	12.0028	8.1975	14.0055	10.2962

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
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	A	From Leg	2.25 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	17.75 21.10	17.75 21.10	0.60 0.07
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	B	From Leg	2.25 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	17.75 21.10	17.75 21.10	0.60 0.07
ROHN 6'x15' Boom Gate (1) (Verizon - Existing)	C	From Leg	2.25 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	17.75 21.10	17.75 21.10	0.60 0.07
PR-850	C	From Leg	4.00 0.00 0.00	0.0000	85.50	No Ice 1/2" Ice	6.35 11.43	6.35 11.43	0.04 0.05
ROHN 4-ft Side Arm	C	From Leg	2.00 0.00 0.00	0.0000	85.50	No Ice 1/2" Ice	5.28 7.88	5.28 7.88	0.07 0.08
13-ft Wireless Frame	B	From Face	0.00 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	9.00 11.50	9.00 11.50	0.28 0.35
6'x2" Pipe Mount	B	From Face	0.50 -8.00 3.00	0.0000	91.00	No Ice 1/2" Ice	1.20 1.80	1.20 1.80	0.02 0.03
6'x2" Pipe Mount	B	From Face	0.50 0.00	0.0000	91.00	No Ice 1/2" Ice	1.20 1.80	1.20 1.80	0.02 0.03

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
			3.00						
6'x2" Pipe Mount	B	From Face	0.50	0.0000	91.00	No Ice	1.20	1.20	0.02
			8.00			1/2" Ice	1.80	1.80	0.03
			3.00						
3' Yagi	A	From Leg	6.00	0.0000	67.00	No Ice	2.08	2.08	0.03
			0.00			1/2" Ice	3.79	3.79	0.05
			0.00						
6'x2" Pipe Mount	A	From Leg	3.00	0.0000	67.00	No Ice	1.20	1.20	0.02
			0.00			1/2" Ice	1.80	1.80	0.03
			0.00						
GPS	C	From Leg	4.00	0.0000	87.00	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00						
3' Yagi	A	From Leg	3.00	0.0000	87.50	No Ice	2.08	2.08	0.03
			0.00			1/2" Ice	3.79	3.79	0.05
			0.00						
3' Yagi	A	From Leg	3.00	0.0000	93.00	No Ice	2.08	2.08	0.03
			0.00			1/2" Ice	3.79	3.79	0.05
			0.00						
3' Yagi	A	From Leg	3.00	0.0000	96.00	No Ice	2.08	2.08	0.03
			0.00			1/2" Ice	3.79	3.79	0.05
			0.00						
16' x 2.5" Dia Omni	A	From Leg	0.00	0.0000	95.50	No Ice	4.08	4.08	0.05
			0.00			1/2" Ice	5.75	5.75	0.08
			0.00						
DB844G65ZAXY	A	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			-6.00			1/2" Ice	5.05	4.10	0.05
			0.00						
HBXX-6516DS	A	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-T4M	A	From Leg	4.50	0.0000	80.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6516DS	A	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
DB844G65ZAXY	A	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			6.00			1/2" Ice	5.05	4.10	0.05
			0.00						
DB844G65ZAXY	B	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			-6.00			1/2" Ice	5.05	4.10	0.05
			0.00						
HBXX-6516DS	B	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-T4M	B	From Leg	4.50	0.0000	80.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6516DS	B	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
DB844G65ZAXY	B	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			6.00			1/2" Ice	5.05	4.10	0.05
			0.00						
DB844G65ZAXY	C	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			-6.00			1/2" Ice	5.05	4.10	0.05

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
			0.00						
HBXX-6516DS	C	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-T4M	C	From Leg	4.50	0.0000	80.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6516DS	C	From Leg	4.50	0.0000	80.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
DB844G65ZAXY	C	From Leg	4.50	0.0000	80.00	No Ice	4.67	3.73	0.02
(Verizon - Existing)			6.00			1/2" Ice	5.05	4.10	0.05
			0.00						
RRH2x40-AWS	A	From Leg	2.00	0.0000	80.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Leg	2.00	0.0000	80.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Leg	2.00	0.0000	80.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-07-U	A	From Leg	2.00	0.0000	80.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	B	From Leg	2.00	0.0000	80.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	C	From Leg	2.00	0.0000	80.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RC2DC-3315-PF-48	A	From Leg	1.00	0.0000	80.00	No Ice	3.52	2.29	0.03
(Verizon - Existing)			0.00			1/2" Ice	3.77	2.51	0.05
			0.00						
RRH2x60-PCS	A	From Leg	2.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	B	From Leg	2.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	C	From Leg	2.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RC2DC-3315-PF-48	B	From Leg	1.00	0.0000	80.00	No Ice	3.52	2.29	0.03
(Verizon - Proposed)			0.00			1/2" Ice	3.77	2.51	0.05
			0.00						

Tower Pressures - No Ice

$G_H = 1.234$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 94.00-74.00	84.00	1.306	24	196.048	A	12.079	12.499	9.599	39.06	0.000	0.000
					B	12.270	9.599		43.89	0.000	0.000
					C	11.370	23.266		27.72	0.000	0.000
T2 74.00-54.00	64.00	1.208	22	231.060	A	12.970	12.057	9.592	38.33	0.000	0.000
					B	13.113	9.592		42.25	0.000	0.000
					C	11.764	32.826		21.51	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.234$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 94.00-74.00	84.00	1.306	18	0.5000	197.716	A	15.709	21.725	12.938	34.56	0.000	0.000
						B	12.270	19.317		40.96	0.000	0.000
						C	10.601	43.772		23.80	0.000	0.000
T2 74.00-54.00	64.00	1.208	17	0.5000	232.728	A	16.079	21.435	12.929	34.46	0.000	0.000
						B	13.113	19.357		39.82	0.000	0.000
						C	10.612	61.173		18.01	0.000	0.000

Tower Pressure - Service

$G_H = 1.234$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 94.00-74.00	84.00	1.306	8	196.048	A	12.079	12.499	9.599	39.06	0.000	0.000
					B	12.270	9.599		43.89	0.000	0.000
					C	11.370	23.266		27.72	0.000	0.000
T2 74.00-54.00	64.00	1.208	8	231.060	A	12.970	12.057	9.592	38.33	0.000	0.000
					B	13.113	9.592		42.25	0.000	0.000
					C	11.764	32.826		21.51	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	1	1	19.304	1.99	99.68	C
94.00-74.00			B	0.112	2.918	0.576	1	1	17.803			
			C	0.177	2.676	0.586	1	1	25.002			
T2	0.23	1.12	A	0.108	2.931	0.576	1	1	19.914	2.25	112.31	C
74.00-54.00			B	0.098	2.971	0.575	1	1	18.628			
			C	0.193	2.62	0.589	1	1	31.098			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	0.39	2.20						OTM	82.27 kip-ft	4.24		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.825	1	17.190	1.83	91.75	C
94.00-74.00			B	0.112	2.918	0.576	0.825	1	15.656			
			C	0.177	2.676	0.586	0.825	1	23.012			
T2	0.23	1.12	A	0.108	2.931	0.576	0.825	1	17.645	2.10	104.88	C
74.00-54.00			B	0.098	2.971	0.575	0.825	1	16.333			
			C	0.193	2.62	0.589	0.825	1	29.039			
Sum Weight:	0.39	2.20						OTM	76.03 kip-ft	3.93		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.8	1	16.888	1.81	90.62	C
94.00-74.00			B	0.112	2.918	0.576	0.8	1	15.349			
			C	0.177	2.676	0.586	0.8	1	22.728			
T2	0.23	1.12	A	0.108	2.931	0.576	0.8	1	17.321	2.08	103.82	C
74.00-54.00			B	0.098	2.971	0.575	0.8	1	16.005			
			C	0.193	2.62	0.589	0.8	1	28.745			
Sum Weight:	0.39	2.20						OTM	75.13 kip-ft	3.89		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.85	1	17.492	1.86	92.88	C
94.00-74.00			B	0.112	2.918	0.576	0.85	1	15.962			
			C	0.177	2.676	0.586	0.85	1	23.296			
T2	0.23	1.12	A	0.108	2.931	0.576	0.85	1	17.969	2.12	105.94	C
74.00-54.00			B	0.098	2.971	0.575	0.85	1	16.661			
			C	0.193	2.62	0.589	0.85	1	29.333			
Sum Weight:	0.39	2.20						OTM	76.92 kip-ft	3.98		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.42	1.64	A	0.189	2.632	0.588	1	1	28.489	1.97	98.41	C
94.00-74.00			B	0.16	2.736	0.583	1	1	23.532			
			C	0.275	2.365	0.609	1	1	37.239			
T2	0.63	1.71	A	0.161	2.731	0.583	1	1	28.580	2.28	113.91	C
74.00-54.00			B	0.14	2.81	0.58	1	1	24.338			
			C	0.308	2.274	0.619	1	1	48.449			
Sum Weight:	1.06	3.34						OTM	81.83 kip-ft	4.25		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.42	1.64	A	0.189	2.632	0.588	0.825	1	25.740	1.87	93.50	C
94.00-74.00			B	0.16	2.736	0.583	0.825	1	21.385			
			C	0.275	2.365	0.609	0.825	1	35.384			
T2	0.63	1.71	A	0.161	2.731	0.583	0.825	1	25.767	2.19	109.54	C
74.00-54.00			B	0.14	2.81	0.58	0.825	1	22.043			
			C	0.308	2.274	0.619	0.825	1	46.592			
Sum Weight:	1.06	3.34						OTM	78.01 kip-ft	4.06		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.42	1.64	A	0.189	2.632	0.588	0.8	1	25.347	1.86	92.80	C
94.00-74.00			B	0.16	2.736	0.583	0.8	1	21.078			
			C	0.275	2.365	0.609	0.8	1	35.119			
T2	0.63	1.71	A	0.161	2.731	0.583	0.8	1	25.365	2.18	108.92	C
74.00-54.00			B	0.14	2.81	0.58	0.8	1	21.716			
			C	0.308	2.274	0.619	0.8	1	46.327			
Sum Weight:	1.06	3.34						OTM	77.47 kip-ft	4.03		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.42	1.64	A	0.189	2.632	0.588	0.85	1	26.133	1.88	94.20	C
94.00-74.00			B	0.16	2.736	0.583	0.85	1	21.692			
			C	0.275	2.365	0.609	0.85	1	35.649			
T2	0.63	1.71	A	0.161	2.731	0.583	0.85	1	26.169	2.20	110.17	C
74.00-54.00			B	0.14	2.81	0.58	0.85	1	22.371			
			C	0.308	2.274	0.619	0.85	1	46.857			
Sum Weight:	1.06	3.34						OTM	78.56 kip-ft	4.09		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	1	1	19.304	0.69	34.49	C
94.00-74.00			B	0.112	2.918	0.576	1	1	17.803			
			C	0.177	2.676	0.586	1	1	25.002			
T2	0.23	1.12	A	0.108	2.931	0.576	1	1	19.914	0.78	38.86	C
74.00-54.00			B	0.098	2.971	0.575	1	1	18.628			
			C	0.193	2.62	0.589	1	1	31.098			
Sum Weight:	0.39	2.20						OTM	28.47 kip-ft	1.47		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.825	1	17.190	0.63	31.75	C
94.00-74.00			B	0.112	2.918	0.576	0.825	1	15.656			
			C	0.177	2.676	0.586	0.825	1	23.012			
T2	0.23	1.12	A	0.108	2.931	0.576	0.825	1	17.645	0.73	36.29	C
74.00-54.00			B	0.098	2.971	0.575	0.825	1	16.333			
			C	0.193	2.62	0.589	0.825	1	29.039			
Sum Weight:	0.39	2.20						OTM	26.31 kip-ft	1.36		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.8	1	16.888	0.63	31.36	C
94.00-74.00			B	0.112	2.918	0.576	0.8	1	15.349			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.177	2.676	0.586	0.8	1	22.728			
T2	0.23	1.12	A	0.108	2.931	0.576	0.8	1	17.321	0.72	35.92	C
74.00-54.00			B	0.098	2.971	0.575	0.8	1	16.005			
			C	0.193	2.62	0.589	0.8	1	28.745			
Sum Weight:	0.39	2.20						OTM	26.00 kip-ft	1.35		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.08	A	0.125	2.864	0.578	0.85	1	17.492	0.64	32.14	C
94.00-74.00			B	0.112	2.918	0.576	0.85	1	15.962			
			C	0.177	2.676	0.586	0.85	1	23.296			
T2	0.23	1.12	A	0.108	2.931	0.576	0.85	1	17.969	0.73	36.66	C
74.00-54.00			B	0.098	2.971	0.575	0.85	1	16.661			
			C	0.193	2.62	0.589	0.85	1	29.333			
Sum Weight:	0.39	2.20						OTM	26.62 kip-ft	1.38		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	0.71					
Bracing Weight	1.49					
Total Member Self-Weight	2.20			-0.80	-1.50	
Total Weight	6.02			-0.80	-1.50	
Wind 0 deg - No Ice		-0.02	-9.83	-238.28	-1.09	1.90
Wind 30 deg - No Ice		4.76	-8.28	-201.62	-116.98	1.33
Wind 45 deg - No Ice		6.71	-6.72	-164.02	-164.39	0.97
Wind 60 deg - No Ice		8.19	-4.73	-115.62	-200.37	0.54
Wind 90 deg - No Ice		9.55	0.02	-0.39	-233.16	-0.27
Wind 120 deg - No Ice		8.51	4.93	118.30	-206.96	-1.07
Wind 135 deg - No Ice		6.73	6.75	163.00	-164.96	-1.38
Wind 150 deg - No Ice		4.79	8.30	200.43	-117.68	-1.60
Wind 180 deg - No Ice		0.02	9.48	229.55	-1.90	-1.63
Wind 210 deg - No Ice		-4.76	8.28	200.03	113.98	-1.33
Wind 225 deg - No Ice		-6.71	6.72	162.42	161.39	-0.97
Wind 240 deg - No Ice		-8.49	4.90	117.59	203.56	-0.83
Wind 270 deg - No Ice		-9.55	-0.02	-1.20	230.16	0.27
Wind 300 deg - No Ice		-8.20	-4.75	-116.32	197.78	1.08
Wind 315 deg - No Ice		-6.73	-6.75	-164.59	161.97	1.38
Wind 330 deg - No Ice		-4.79	-8.30	-202.03	114.68	1.60
Member Ice	1.14					
Total Weight Ice	7.22			-0.74	-3.75	
Wind 0 deg - Ice		-0.01	-9.33	-225.78	-3.44	1.75

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 30 deg - Ice		4.57	-7.94	-192.64	-114.19	1.37
Wind 45 deg - Ice		6.45	-6.46	-156.95	-159.71	1.07
Wind 60 deg - Ice		7.88	-4.55	-110.81	-194.40	0.71
Wind 90 deg - Ice		9.16	0.01	-0.43	-225.16	-0.04
Wind 120 deg - Ice		8.08	4.68	112.05	-198.49	-0.82
Wind 135 deg - Ice		6.47	6.48	155.91	-160.15	-1.16
Wind 150 deg - Ice		4.59	7.95	191.47	-114.73	-1.41
Wind 180 deg - Ice		0.01	9.12	219.94	-4.07	-1.55
Wind 210 deg - Ice		-4.57	7.94	191.16	106.68	-1.37
Wind 225 deg - Ice		-6.45	6.46	155.47	152.20	-1.07
Wind 240 deg - Ice		-8.06	4.66	111.51	190.67	-0.93
Wind 270 deg - Ice		-9.16	-0.01	-1.05	217.65	0.04
Wind 300 deg - Ice		-7.89	-4.57	-111.35	187.20	0.84
Wind 315 deg - Ice		-6.47	-6.48	-157.39	152.64	1.16
Wind 330 deg - Ice		-4.59	-7.95	-192.95	107.22	1.41
Total Weight	6.02			-0.80	-1.50	
Wind 0 deg - Service		-0.01	-3.40	-83.79	-0.00	0.66
Wind 30 deg - Service		1.65	-2.86	-71.11	-40.10	0.46
Wind 45 deg - Service		2.32	-2.33	-58.10	-56.51	0.34
Wind 60 deg - Service		2.83	-1.64	-41.35	-68.96	0.19
Wind 90 deg - Service		3.30	0.01	-1.48	-80.30	-0.09
Wind 120 deg - Service		2.94	1.71	39.59	-71.24	-0.37
Wind 135 deg - Service		2.33	2.33	55.06	-56.71	-0.48
Wind 150 deg - Service		1.66	2.87	68.01	-40.35	-0.55
Wind 180 deg - Service		0.01	3.28	78.09	-0.29	-0.56
Wind 210 deg - Service		-1.65	2.86	67.87	39.81	-0.46
Wind 225 deg - Service		-2.32	2.33	54.86	56.22	-0.34
Wind 240 deg - Service		-2.94	1.70	39.35	70.81	-0.29
Wind 270 deg - Service		-3.30	-0.01	-1.76	80.01	0.09
Wind 300 deg - Service		-2.84	-1.65	-41.59	68.81	0.37
Wind 315 deg - Service		-2.33	-2.33	-58.30	56.42	0.48
Wind 330 deg - Service		-1.66	-2.87	-71.25	40.06	0.55

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp

Comb. No.	Description
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	94 - 74	Leg	Max Tension	22	3.87	-0.47	-0.02
			Max. Compression	2	-5.85	0.15	-0.04
			Max. Mx	10	3.44	0.49	-0.04
			Max. My	6	-0.60	-0.01	-0.59
			Max. Vy	15	-1.45	-0.48	0.06
			Max. Vx	11	1.38	-0.01	0.34
		Diagonal	Max Tension	4	2.61	0.00	0.00
			Max. Compression	29	-2.87	0.00	0.00
			Max. Mx	24	-0.07	0.03	-0.00
			Max. My	20	-2.84	0.02	0.01
			Max. Vy	24	0.02	0.03	-0.00
			Max. Vx	20	-0.00	0.00	0.00
		Top Girt	Max Tension	19	0.72	0.00	0.00
			Max. Compression	15	-0.55	0.00	0.00
			Max. Mx	18	0.29	-0.07	0.00
			Max. My	23	0.29	0.00	0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	23	-0.00	0.00	0.00
T2	74 - 54	Leg	Max Tension	5	17.69	-0.06	-0.02
			Max. Compression	7	-22.13	0.00	0.00
			Max. Mx	30	-11.09	0.21	0.02
			Max. My	3	-1.60	-0.02	-0.30

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	27	-0.09	-0.13	0.02
			Max. Vx	3	-0.10	-0.02	-0.30
		Diagonal	Max Tension	34	3.45	0.00	0.00
			Max. Compression	26	-3.28	0.00	0.00
			Max. Mx	23	1.14	0.05	-0.00
			Max. My	33	-3.05	0.03	-0.01
			Max. Vy	23	0.02	0.05	-0.00
			Max. Vx	33	0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	13	24.52	4.53	-2.57
	Max. H_x	13	24.52	4.53	-2.57
	Max. H_z	20	-16.28	-3.70	2.84
	Min. Vert	5	-20.15	-4.15	2.37
	Min. H_x	22	-19.01	-4.55	2.59
	Min. H_z	11	21.04	3.49	-2.76
Leg B	Max. Vert	7	24.83	-4.50	-2.66
	Max. H_x	32	-18.44	4.51	2.65
	Max. H_z	34	-15.72	3.64	2.95
	Min. Vert	15	-19.96	4.12	2.44
	Min. H_x	7	24.83	-4.50	-2.66
	Min. H_z	9	21.36	-3.43	-2.90
Leg A	Max. Vert	2	24.83	0.10	5.22
	Max. H_x	14	2.12	1.43	0.12
	Max. H_z	2	24.83	0.10	5.22
	Min. Vert	10	-19.97	-0.08	-4.79
	Min. H_x	6	2.04	-1.43	0.11
	Min. H_z	27	-18.65	-0.07	-5.24

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	6.02	0.00	0.00	-0.80	-1.50	-0.00
Dead+Wind 0 deg - No Ice	6.02	-0.02	-9.83	-238.40	-1.09	1.91
Dead+Wind 30 deg - No Ice	6.02	4.76	-8.28	-201.72	-117.03	1.33
Dead+Wind 45 deg - No Ice	6.02	6.71	-6.72	-164.10	-164.47	0.97
Dead+Wind 60 deg - No Ice	6.02	8.19	-4.73	-115.67	-200.47	0.54
Dead+Wind 90 deg - No Ice	6.02	9.55	0.02	-0.39	-233.27	-0.27
Dead+Wind 120 deg - No Ice	6.02	8.51	4.93	118.35	-207.06	-1.07
Dead+Wind 135 deg - No Ice	6.02	6.73	6.75	163.08	-165.04	-1.38
Dead+Wind 150 deg - No Ice	6.02	4.79	8.30	200.53	-117.74	-1.61
Dead+Wind 180 deg - No Ice	6.02	0.02	9.48	229.66	-1.90	-1.63
Dead+Wind 210 deg - No Ice	6.02	-4.76	8.28	200.13	114.04	-1.33
Dead+Wind 225 deg - No Ice	6.02	-6.71	6.72	162.50	161.47	-0.97
Dead+Wind 240 deg - No Ice	6.02	-8.49	4.90	117.65	203.66	-0.83
Dead+Wind 270 deg - No Ice	6.02	-9.55	-0.02	-1.20	230.28	0.27
Dead+Wind 300 deg - No Ice	6.02	-8.20	-4.75	-116.38	197.88	1.08

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 315 deg - No Ice	6.02	-6.73	-6.75	-164.67	162.05	1.38
Dead+Wind 330 deg - No Ice	6.02	-4.79	-8.30	-202.13	114.74	1.61
Dead+Ice+Temp	7.22	0.00	0.00	-0.74	-3.75	-0.00
Dead+Wind 0 deg+Ice+Temp	7.22	-0.01	-9.33	-225.83	-3.44	1.75
Dead+Wind 30 deg+Ice+Temp	7.22	4.57	-7.94	-192.68	-114.21	1.37
Dead+Wind 45 deg+Ice+Temp	7.22	6.45	-6.46	-156.98	-159.74	1.07
Dead+Wind 60 deg+Ice+Temp	7.22	7.88	-4.55	-110.83	-194.44	0.71
Dead+Wind 90 deg+Ice+Temp	7.22	9.16	0.01	-0.43	-225.21	-0.05
Dead+Wind 120 deg+Ice+Temp	7.22	8.08	4.68	112.07	-198.53	-0.83
Dead+Wind 135 deg+Ice+Temp	7.22	6.47	6.48	155.94	-160.18	-1.16
Dead+Wind 150 deg+Ice+Temp	7.22	4.59	7.95	191.52	-114.75	-1.41
Dead+Wind 180 deg+Ice+Temp	7.22	0.01	9.12	219.99	-4.07	-1.56
Dead+Wind 210 deg+Ice+Temp	7.22	-4.57	7.94	191.20	106.70	-1.37
Dead+Wind 225 deg+Ice+Temp	7.22	-6.45	6.46	155.50	152.23	-1.08
Dead+Wind 240 deg+Ice+Temp	7.22	-8.06	4.66	111.53	190.71	-0.93
Dead+Wind 270 deg+Ice+Temp	7.22	-9.16	-0.01	-1.05	217.70	0.05
Dead+Wind 300 deg+Ice+Temp	7.22	-7.89	-4.57	-111.38	187.25	0.85
Dead+Wind 315 deg+Ice+Temp	7.22	-6.47	-6.48	-157.42	152.67	1.16
Dead+Wind 330 deg+Ice+Temp	7.22	-4.59	-7.95	-193.00	107.24	1.41
Dead+Wind 0 deg - Service	6.02	-0.01	-3.40	-83.01	-1.36	0.66
Dead+Wind 30 deg - Service	6.02	1.65	-2.86	-70.32	-41.47	0.46
Dead+Wind 45 deg - Service	6.02	2.32	-2.33	-57.30	-57.89	0.34
Dead+Wind 60 deg - Service	6.02	2.83	-1.64	-40.55	-70.35	0.19
Dead+Wind 90 deg - Service	6.02	3.30	0.01	-0.66	-81.69	-0.09
Dead+Wind 120 deg - Service	6.02	2.94	1.71	40.43	-72.63	-0.37
Dead+Wind 135 deg - Service	6.02	2.33	2.33	55.91	-58.09	-0.48
Dead+Wind 150 deg - Service	6.02	1.66	2.87	68.87	-41.72	-0.56
Dead+Wind 180 deg - Service	6.02	0.01	3.28	78.95	-1.64	-0.56
Dead+Wind 210 deg - Service	6.02	-1.65	2.86	68.73	38.48	-0.46
Dead+Wind 225 deg - Service	6.02	-2.32	2.33	55.71	54.89	-0.34
Dead+Wind 240 deg - Service	6.02	-2.94	1.70	40.19	69.49	-0.29
Dead+Wind 270 deg - Service	6.02	-3.30	-0.01	-0.94	78.70	0.09
Dead+Wind 300 deg - Service	6.02	-2.84	-1.65	-40.79	67.49	0.38
Dead+Wind 315 deg - Service	6.02	-2.33	-2.33	-57.50	55.09	0.48
Dead+Wind 330 deg - Service	6.02	-1.66	-2.87	-70.46	38.72	0.56

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-6.02	0.00	0.00	6.02	0.00	0.000%
2	-0.02	-6.02	-9.83	0.02	6.02	9.83	0.000%
3	4.76	-6.02	-8.28	-4.76	6.02	8.28	0.000%
4	6.71	-6.02	-6.72	-6.71	6.02	6.72	0.000%
5	8.19	-6.02	-4.73	-8.19	6.02	4.73	0.000%
6	9.55	-6.02	0.02	-9.55	6.02	-0.02	0.000%
7	8.51	-6.02	4.93	-8.51	6.02	-4.93	0.000%
8	6.73	-6.02	6.75	-6.73	6.02	-6.75	0.000%
9	4.79	-6.02	8.30	-4.79	6.02	-8.30	0.000%
10	0.02	-6.02	9.48	-0.02	6.02	-9.48	0.000%
11	-4.76	-6.02	8.28	4.76	6.02	-8.28	0.000%
12	-6.71	-6.02	6.72	6.71	6.02	-6.72	0.000%
13	-8.49	-6.02	4.90	8.49	6.02	-4.90	0.000%
14	-9.55	-6.02	-0.02	9.55	6.02	0.02	0.000%
15	-8.20	-6.02	-4.75	8.20	6.02	4.75	0.000%
16	-6.73	-6.02	-6.75	6.73	6.02	6.75	0.000%
17	-4.79	-6.02	-8.30	4.79	6.02	8.30	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
18	0.00	-7.22	0.00	0.00	7.22	0.00	0.000%
19	-0.01	-7.22	-9.33	0.01	7.22	9.33	0.000%
20	4.57	-7.22	-7.94	-4.57	7.22	7.94	0.000%
21	6.45	-7.22	-6.46	-6.45	7.22	6.46	0.000%
22	7.88	-7.22	-4.55	-7.88	7.22	4.55	0.000%
23	9.16	-7.22	0.01	-9.16	7.22	-0.01	0.000%
24	8.08	-7.22	4.68	-8.08	7.22	-4.68	0.000%
25	6.47	-7.22	6.48	-6.47	7.22	-6.48	0.000%
26	4.59	-7.22	7.95	-4.59	7.22	-7.95	0.000%
27	0.01	-7.22	9.12	-0.01	7.22	-9.12	0.000%
28	-4.57	-7.22	7.94	4.57	7.22	-7.94	0.000%
29	-6.45	-7.22	6.46	6.45	7.22	-6.46	0.000%
30	-8.06	-7.22	4.66	8.06	7.22	-4.66	0.000%
31	-9.16	-7.22	-0.01	9.16	7.22	0.01	0.000%
32	-7.89	-7.22	-4.57	7.89	7.22	4.57	0.000%
33	-6.47	-7.22	-6.48	6.47	7.22	6.48	0.000%
34	-4.59	-7.22	-7.95	4.59	7.22	7.95	0.000%
35	-0.01	-6.02	-3.40	0.01	6.02	3.40	0.000%
36	1.65	-6.02	-2.86	-1.65	6.02	2.86	0.000%
37	2.32	-6.02	-2.33	-2.32	6.02	2.33	0.000%
38	2.83	-6.02	-1.64	-2.83	6.02	1.64	0.000%
39	3.30	-6.02	0.01	-3.30	6.02	-0.01	0.000%
40	2.94	-6.02	1.71	-2.94	6.02	-1.71	0.000%
41	2.33	-6.02	2.33	-2.33	6.02	-2.33	0.000%
42	1.66	-6.02	2.87	-1.66	6.02	-2.87	0.000%
43	0.01	-6.02	3.28	-0.01	6.02	-3.28	0.000%
44	-1.65	-6.02	2.86	1.65	6.02	-2.86	0.000%
45	-2.32	-6.02	2.33	2.32	6.02	-2.33	0.000%
46	-2.94	-6.02	1.70	2.94	6.02	-1.70	0.000%
47	-3.30	-6.02	-0.01	3.30	6.02	0.01	0.000%
48	-2.84	-6.02	-1.65	2.84	6.02	1.65	0.000%
49	-2.33	-6.02	-2.33	2.33	6.02	2.33	0.000%
50	-1.66	-6.02	-2.87	1.66	6.02	2.87	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001

19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000001
24	Yes	4	0.00000001	0.00000001
25	Yes	4	0.00000001	0.00000001
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	94 - 74	0.154	35	0.0206	0.0016
T2	74 - 54	0.061	35	0.0177	0.0005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
96.00	3' Yagi	35	0.154	0.0206	0.0016	405165
95.50	16' x 2.5" Dia Omni	35	0.154	0.0206	0.0016	405165
93.00	3' Yagi	35	0.149	0.0206	0.0016	405165
91.00	13-ft Wireless Frame	35	0.139	0.0207	0.0014	405165
87.50	3' Yagi	35	0.122	0.0207	0.0012	311665
87.00	GPS	35	0.119	0.0207	0.0011	289403
85.50	PR-850	35	0.112	0.0206	0.0011	238332
80.00	ROHN 6'x15' Boom Gate (1)	35	0.086	0.0198	0.0008	144702
67.00	3' Yagi	35	0.037	0.0129	0.0004	155832

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	94 - 74	0.440	2	0.0579	0.0051
T2	74 - 54	0.176	2	0.0504	0.0015

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
96.00	3' Yagi	2	0.440	0.0579	0.0051	145191
95.50	16' x 2.5" Dia Omni	2	0.440	0.0579	0.0051	145191
93.00	3' Yagi	2	0.425	0.0580	0.0049	145191
91.00	13-ft Wireless Frame	2	0.397	0.0583	0.0044	145191
87.50	3' Yagi	2	0.347	0.0586	0.0035	111686
87.00	GPS	2	0.340	0.0586	0.0034	103708
85.50	PR-850	2	0.320	0.0584	0.0031	85407
80.00	ROHN 6'x15' Boom Gate (1)	2	0.247	0.0565	0.0023	51854
67.00	3' Yagi	2	0.106	0.0368	0.0010	55843

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	94	Leg	A325N	0.7500	4	0.97	19.43	0.050 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.87	4.12	0.696 ✔	1.333	Bolt Shear
T2	74	Leg	A325N	0.7500	4	4.42	19.44	0.228 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.45	4.12	0.838 ✔	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	18.081	1.7040	-5.85	30.81	0.190 ✔
T2	74 - 54	ROHN 2.5 STD	20.02	6.67	84.5 K=1.00	18.094	1.7040	-22.13	30.83	0.718 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	L1 3/4x1 3/4x1/4 KL/R > 200 (C) - 12	12.21	6.05	212.6 K=1.00	3.305	0.8125	-2.87	2.68	1.068 ✔
T2	74 - 54	L2x2x1/4 KL/R > 200 (C) - 30	13.57	6.67	204.8 K=1.00	3.559	0.9380	-3.18	3.34	0.952 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	L3x3x1/4	8.56	8.32	150.0 K=0.89	6.641	1.4400	-0.55	9.56	0.057 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	ROHN 2.5 STD	20.03	6.68	84.6	30.000	1.7040	3.87	51.12	0.076 ✔
T2	74 - 54	ROHN 2.5 STD	20.02	6.67	84.5	30.000	1.7040	17.69	51.12	0.346 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	L1 3/4x1 3/4x1/4	12.21	6.05	139.8	29.000	0.4922	2.61	14.27	0.183 ✔
T2	74 - 54	L2x2x1/4	13.57	6.67	133.8	29.000	0.5863	3.45	17.00	0.203 ✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	94 - 74	L3x3x1/4	8.56	8.32	107.4	21.600	1.4400	0.72	31.10	0.023 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	94 - 74	Leg	ROHN 2.5 STD	3	-5.85	41.07	14.3	Pass
T2	74 - 54	Leg	ROHN 2.5 STD	26	-22.13	41.10	53.9	Pass
T1	94 - 74	Diagonal	L1 3/4x1 3/4x1/4	12	-2.87	3.58	80.1	Pass
T2	74 - 54	Diagonal	L2x2x1/4	30	-3.18	4.45	71.4	Pass
T1	94 - 74	Top Girt	L3x3x1/4	6	-0.55	12.75	4.3	Pass
							Summary	
						Leg (T2)	53.9	Pass
						Diagonal (T1)	80.1	Pass
						Top Girt (T1)	4.3	Pass
						Bolt Checks	62.8	Pass
						RATING =	**80.1**	**Pass**

SITE NAME	STAMFORD W, CT	ECP - CELL #	AWS1	5	81
LATITUDE	41-02-52.07 N	LONGITUDE	73-33-13.15 W		
Additional Comments: Please Order Appropriate RET Cables. Install PCS LTE - 60W RRH's. On-going construction for the previous ANTMO (swapping 700 and AWS antennas).		SAVE BUTTON	PCS1		
		STRUCTURE TYPE	ROOF TOP		

1900 PCS - Current Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 4.0B	
ANTENNA TYPE	HBXX-6516DS-A2M		HBXX-6516DS-A2M		HBXX-6516DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC° + MECH°)	0 Elec + 0 Mech		0 Elec + 0 Mech		0 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

1900 PCS LTE - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 1900 RRH		ALU 1900 RRH		ALU 1900 RRH	
ANTENNA TYPE	HBXX-6516DS-A2M		HBXX-6516DS-A2M		HBXX-6516DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC° + MECH°)	0 Elec + 0 Mech		0 Elec + 0 Mech		0 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS
SECTOR DISTRIBUTION BOX	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

700 LTE - Current Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700 eNodeB + RRH		ALU 700 eNodeB + RRH		ALU 700 eNodeB + RRH	
ANTENNA TYPE	LNX-6514DS-A1M		LNX-6514DS-A1M		LNX-6514DS-A1M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	10		180		260	
DOWN TILT (ELEC° + MECH°)	2 Elec + 0 Mech		2 Elec + 0 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700	1	ALU RH_2X40-700	1	ALU RH_2X40-700
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

700 LTE - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700 eNodeB + RRH		ALU 700 eNodeB + RRH		ALU 700 eNodeB + RRH	
ANTENNA TYPE	LNX-6514DS-A1M		LNX-6514DS-A1M		LNX-6514DS-A1M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	10		180		260	
DOWN TILT (ELEC° + MECH°)	5 Elec + 0 Mech		4 Elec + 0 Mech		7 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700	1	ALU RH_2X40-700	1	ALU RH_2X40-700
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

850 Cellular - No Change	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	DB844G65ZAXY_H		DB844G65ZAXY_H		DB844G65ZAXY_H	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC° + MECH°)	0 Elec + 0 Mech		0 Elec + 0 Mech		0 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

2100 AWS LTE - No Change	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz eNodeB + RRH		2100 MHz eNodeB + RRH		2100 MHz eNodeB + RRH	
ANTENNA TYPE	HBXX-6516DS-A2M		HBXX-6516DS-A2M		HBXX-6516DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	10		180		260	
DOWN TILT (ELEC° + MECH°)	0 Elec + 0 Mech		0 Elec + 0 Mech		0 Elec + 0 Mech	
RAD CTR (FT AGL)	80		80		80	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

NUMBER OF CABLE'S NEEDED						Fiber Lines Model number			
TOTAL # FIBER LINES	1	TOTAL # OF MAINLINES			12	FIBER LINE MODEL #			HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	12	TOTAL # OF TOP JUMPERS			12	FIBER TOP JUMPER MODEL #			HB114-1-08U4-S4J18
Equipment Cable Ordering		MAIN CABLE #	18	+		TOP JUMPER #	18	+	

TX / RX FREQUENCIES								TX POWER OUTPUT			
Cellular A-Band				PCS F / AWS-Band			700 Mhz C - Blo	Cellular (Watts)			20
TX - 869-880,890-891.5 MHz				TX - 1970-1975 / 2145-2155			TX - 746-757	PCS (Watts)			16
RX - 824-835,845-846.5 MHz				RX - 1890-1895 / 1745-1755			RX - 776-787	LTE/ AWS (Watts)			40
ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Ryan Ulanday	Robert Hesselbach		11/24/2014

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity, total	2
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Product Specifications

LNX-6514DS-VTM

Dimensions

Depth	181.0 mm | 7.1 in
Length	1847.0 mm | 72.7 in
Width	301.0 mm | 11.9 in
Net Weight	17.6 kg | 38.8 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6514DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	22	22	21
CPR at Sector, dB	8	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0 5 ° | 17.3 10 ° | 17.0	0 ° | 17.1 5 ° | 17.4 10 ° | 17.0	0 ° | 17.4 5 ° | 17.7 10 ° | 17.2
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9

* 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.

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6516DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

600899A-2 — 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.

RRH SUMMARY TABLE

RF Module	Available	Output Power	BW Coverage	4RX ready	4TX Ready	Dimensions (H x W x D)	Weight
AWS 2x40 RRH	Now	2x40W	20 Mhz	No	No	24.4" x 12" x 7.7"	40 lbs
AWS 2x40 RRH w RDEM	Now	2x40W	20 Mhz	Yes- 10 Mhz Max	No	24.4" x 12" x 7.7"	48 lbs
AWS 2x60 RRH*	Now- July 2014	2x60W	45 Mhz	Yes- 14.1 SW	No	36.7" x 10.6" x 5.8"	55 lbs
PCS 2x60 RRH**	Target March 2015	2x60W	60 Mhz	Yes	Yes	21.5" x 12" x 7.4"	55 lbs
700 2x40 RRH	Now	2x40W	10 Mhz	No	No	20" x 17" x 10"	51 lbs
700 2x60 RRH	Target June 2015	2x60W	10 Mhz	Yes	Yes	21" x 12" x 8"	57 lbs

* Bandwidth varies by release- see AWS slide

** Bandwidth for PCS will vary by release- Still TBD

Alcatel·Lucent

DATA SHEET

DC Surge Protection for RRH/Integrated Antenna Radio Head

RxxDC-4750-PF-48 • RxxDC-3103-PF-48 • RxxDC-3315-PF-48

Tower / Base / Rooftop / Rooftop Distribution Models

Raycap's flexible Tower, Base Stations and Rooftop protection and Distribution products provide protection for up to 6 Remote Radio Heads/Integrated Antennas. The solutions mitigate the risk of damage due to lightning and provide high levels of availability and reliability to radio equipment.

Shown with optional 90° elbow for side entry. Can be installed on left or right side of unit.

Mounting Bracket Included

Features

- Employs the Strikesorb® 30-V1-HV Surge Protective Device (SPD) specifically designed for the Remote Radio Head (RRH) installation environment and certified for use in DC applications and at low DC operating voltages (48V).
- The Strikesorb 30-V1-HV is a Class I SPD, certified by VDE per the IEC 61643-1 standard as suitable for installation in areas where direct lightning exposure is expected. Strikesorb 30-V1-HV is able to withstand direct lightning currents of up to 5kA (10/350) and induced surge currents of up to 60kA (8/20).
- Provides very low let through / clamping voltage - unique for a Class I product - as it does not employ spark gaps or other switching elements. Strikesorb offers unique protection levels to the RRH equipment as well as the Base Band Units.
- Alarms for SPD sacrifice, Moisture detection and Intrusion.
- Fully recognized to the UL 1449 3rd Edition Safety Standard.
- Patent pending design

Benefits

- Offers unique maintenance-free protection against direct lightning currents.
- Protects up to 6 Remote Radio Heads and connects up to 12 fiber pairs.
- Utilizes an IP 67 rated enclosure, allowing for indoor or outdoor installation on a roof or tower top.
- Configurable cable ports are designed to accommodate varying diameters of hybrid (combined power and fiber optic) or standard cables with diameters up to 2" (will fit most standard 1⅝" coax class cables) depending upon port configuration.
- Lightweight aerodynamic design provides maximum flexibility for tower top installation.
- Companion to the RxxDC-4291-PF-48 / RxxDC-1064-PF-48 (Sector) models.

Tower / Base / Rooftop / Rooftop Distribution Models
RxxDC-4750-PF-48
RxxDC-3103-PF-48
RxxDC-3315-PF-48

Companion Sector Models:
RxxDC-4291-PF-48
RxxDC-1064-PF-48

G02-00-236 121003

Raycap

www.raycapsurgeprotection.com

SPECIFICATIONS

DC Surge Protection for RRH/Integrated Antenna Radio Head

RxxDC-4750-PF-48 • RxxDC-3103-PF-48 • RxxDC-3315-PF-48

Tower / Base / Rooftop / Rooftop Distribution Models

Electrical

Model Numbers	RxxDC-4750-PF-48	RxxDC-3103-PF-48	RxxDC-3315-PF-48
Nominal Operating Voltage	48 VDC	48 VDC	48 VDC
Nominal Discharge Current [I_n]	20 kA 8/20 µs	20 kA 8/20 µs	20 kA 8/20 µs
Maximum Surge Current [I_{max}]	60 kA 8/20 µs	60 kA 8/20 µs	60 kA 8/20 µs
Maximum Impulse (Lightning) Current per IEC 61643-1	5 kA 10/350 µs	5 kA 10/350 µs	5 kA 10/350 µs
Maximum Continuous Operating Voltage [U_c]	75 VDC	75 VDC	75 VDC
Voltage Protection Rating (VPR) per UL 1449 3rd Edition	400V	400V	400V
Protection Class as per IEC 61643-1	Class I	Class I	Class I
SPD Alarm	upon sacrifice	upon sacrifice	upon sacrifice
Intrusion Sensor	microswitch	microswitch	microswitch
Moisture Sensor	infrared moisture detector	infrared moisture detector	infrared moisture detector
Strikesorb Module Type	**No Strikesorb modules installed**	30-V1-HV **Strikesorb modules installed to protect 3 Remote Radio Heads**	30-V1-HV **Strikesorb modules installed to protect 6 Remote Radio Heads**

Mechanical

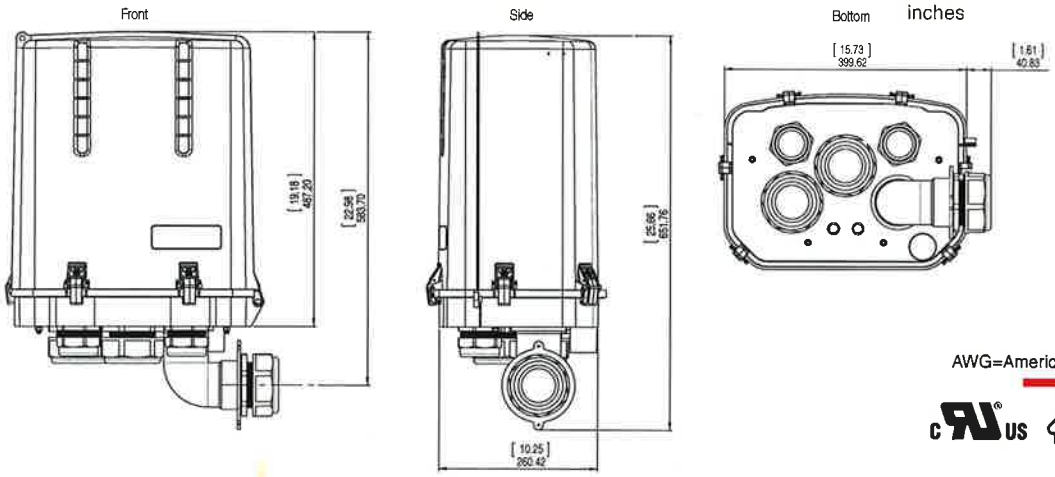
Suppression Connection Method	Compression lug, #14 - #2/0 AWG (2.5 mm² - 70 mm²) Copper; #12 - #2/0 AWG (4 mm² - 70 mm²) Aluminum		
Fiber Connection Method	LC-LC Single mode		
Pressure Equalizing Vent	Gore™ Vent		
Environmental Rating	IP 67		
Operating Temperature	-40° C to +80° C		
UV Resistant	Yes		
Weight	System: 16.0 lbs (7.25 kg) Mount: 5.5 lbs (2.49 kg) Total: 21.5 lbs (9.75 kg)	System: 18.7 lbs (8.48 kg) Mount: 5.5 lbs (2.49 kg) Total: 24.2 lbs (10.98 kg)	System: 21.4 lbs (9.70 kg) Mount: 5.5 lbs (2.49 kg) Total: 26.9 lbs (12.20 kg)
Combined Wind Loading	150mph (sustained): 200 lbs (889.6 N)		

Standards Compliance

Strikesorb modules are compliant to the following Surge Protective Device (SPD) Standards	
Standards	ANSI/UL 1449 3rd Edition
	IEEE C62.41
	NEMA LS-1, IEC 61643-1:2005 2nd Edition (Class I Protection)
	IEC 61643-12
	EN 61643-11:2002 (including A11:2007)

Product Diagram

[mm]
inches



AWG=American Wire Gauge

Raycap

www.raycapsurgeprotection.com