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
Internet: ct.gov/csc

Daniel F. Caruso
Chairman

March 14, 2011

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

RE: **EM-VER-166-110203B** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 1192 Wolcott Road, Wolcott, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated February 3, 2011. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Linda Roberts

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable Thomas G. Dunn, Mayor, Town of Wolcott
David Kalinowski, Zoning Enforcement Officer, Town of Wolcott
Graziano Tower

ROBINSON & COLE

KENNETH C. BALDWIN

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EM-VER-166-110203B

ORIGINAL

February 3, 2011

Via Hand Delivery

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
1192 Wolcott Road, Wolcott, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 135-foot level on the existing 180-foot tower at the above-referenced address. The tower is owned by Graziano Tower, LLC. The Connecticut Siting Council ("Council") approved Cellco's use of this tower in 1997. Cellco intends to remove all if its existing antennas and replace them with twelve (12) new antennas (four (4) model APL868013-42T0 cellular antennas; two (2) model APL866513-42T0 cellular antennas; two (2) APX18-206516L-T0 PCS antennas; one (1) model MG D3-800T0 PCS antenna; and three (3) model BXA 70063/6CF LTE antennas). All new antennas will be installed at the same 135-foot level on the tower. Cellco will also install six (6) coax cable diplexers on its existing antenna platform. Attached behind Tab 1 of this filing are the specifications for each of the proposed replacement antennas and cable diplexers.

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 Thomas Dunn, Mayor for the Town of Wolcott. A copy of this letter is also being sent to Graziano Tower, LLC, the owner of the property on which the tower is located.

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 any increase in the overall height of the existing tower. Cellco's replacement antennas and diplexers will be located at the 135-foot level on the 180-foot tower.

2. The proposed modifications will not involve any modifications to ground-mounted equipment and, therefore, will not require the extension of the site boundaries.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table for the modified facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower and foundation can support Cellco's proposed modifications. (See Tab 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

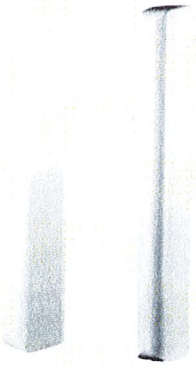
Enclosures
Copy to:
Thomas Dunn, Wolcott Mayor
Graziano Tower, LLC
Sandy M. Carter

Product Data Sheet **APL868013-42T0**

Maximizer® Log Periodic Antenna, 806-894, 80deg, 14.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



Features/Benefits

• 45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.

Technical Specifications

Electrical Specifications

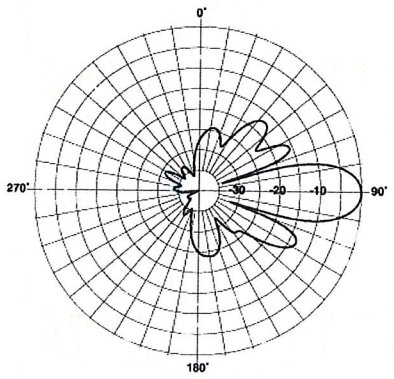
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

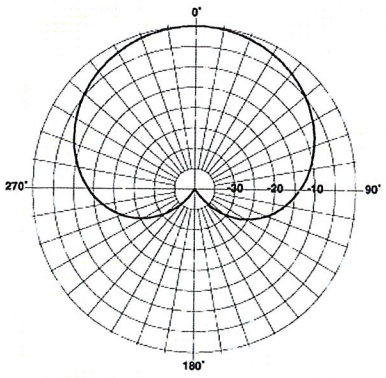
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Wind Load - Side @ Rated Wind, N (lbf)	743 (167)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	7.9 (17.5)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

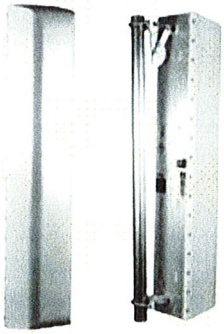
Other Documentation

Product Data Sheet **APL866513-42T0**

Maximizer® Log Periodic Antenna, 806-894, 65deg, 15.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



FRONT BACK

Features/Benefits

• 45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.

Technical Specifications

Electrical Specifications

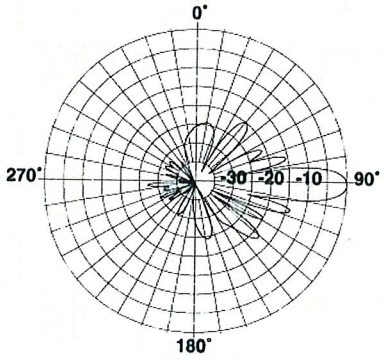
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	15.1 (13)
1st Upper Sidelobe Suppression, dB	>20
Upper Sidelobe Suppression, dB	>20
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

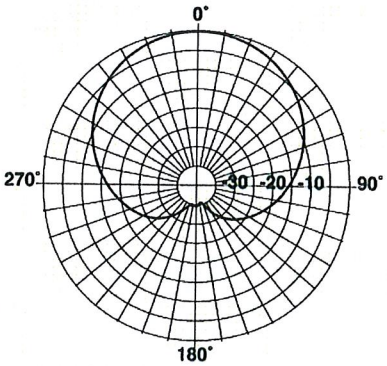
Dimensions - HxWxD, mm (in)	1219 x 234 x 203 (48 x 9.2 x 8)
Weight w/o Mtg Hardware, kg (lb)	7 (15.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	180 (112)
Max Wind Loading Area, m² (ft²)	0.376 (4.05)
Maximum Thrust @ Rated Wind, N (lbf)	903 (203)
Wind Load - Side @ Rated Wind, N (lbf)	594 (133.5)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	9.1 (20)
Packing Dimensions, HxWxD, mm (in)	1594 x 343 x 349 (62.75 x 13.5 x 13.75)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

Other Documentation

Product Data Sheet **APX18-206516L-CT0**

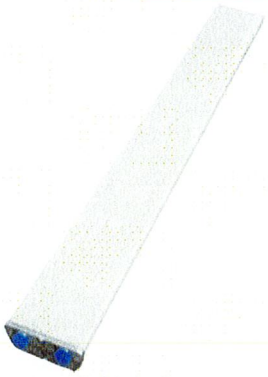
Optimizer® Dual Polarized Antenna, 1710-2170, 65deg, 17.6/18.6dBi, 1.3m, FET, 0deg

Product Description

Dense urban networks where site aspect is essential.

Features/Benefits

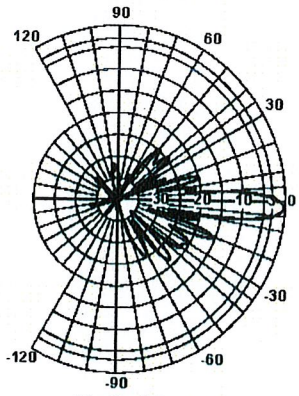
- **Very broadband design operating from GSM1800 up to 3G-UMTS.**
- **Reduction of visual impact by gathering 3 antennas in a cylindrical volume.**
- **Reduction of site dimensions will ease site acceptance.**
- **Possible camouflage solution on demand.**
- **Wind load thrust highly reduced.**
- **Compatible with usual base stations with 35 dB typical isolation between ports.**
- **Effective polarization diversity ensured by high cross polar discrimination.**
- **Optimized suppression of side lobes allows strong mechanical tilt.**



Technical Specifications

Electrical Specifications

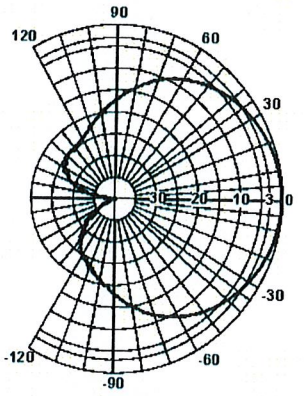
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	69	64
Vertical Beamwidth, deg	6.9	6
Electrical Downtilt, deg	0	
Gain, dBi (dBd)	17.6 (15.5)	18.6 (16.5)
1st Upper Sidelobe Suppression, dB	>20	
Front-To-Back Ratio, dB	>29	30
Polarization	Dual pol +/-45°	
VSWR	< 1.4:1	
Isolation between Ports, dB	>30 (typ 35)	
3rd Order IMP @ 2 x 43 dBm, dBc	>150, N/A	
7th Order IMP @ 2 x 46 dBm, dBc	N/A, >170	
Impedance, Ohms	50	
Maximum Power Input, W	300	
Lightning Protection	Direct Ground	
Connector Type	(2) 7-16 Long Neck Female	



Vertical Pattern

Mechanical Specifications

Dimensions - HxWxD, mm (in)	1349 x 169 x 80 (53.0 x 6.65 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	8.5 (18.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.23 (2.46)
Front Thrust @ Rated Wind, N (lbf)	406 (91)
Maximum Thrust @ Rated Wind, N (lbf)	406 (91)
Wind Load - Side @ Rated Wind, N (lbf)	236 (53)
Wind Load - Rear @ Rated Wind, N (lbf)	196 (44)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	13.5 (30)
Packing Dimensions, HxWxD, mm (in)	1464 x 251 x 203 (57.64 x 9.88 x 7.99)



Horizontal Pattern

Ordering Information

Mounting Hardware	APM40-2
Mounting Pipe Diameter, mm (in)	60-120 (2.36-4.72)
Mounting Hardware Weight, kg (lb)	3.4 (7.5)

Other Documentation

APM40 Series Datasheet
APM40 Series Installation Instructions

SINGLE-BAND PANEL ANTENNA
BROADBAND 1710-2170 MHz

1710 - 2170		
1710-1880	1850-1990	1920-2170
H66º V7.2º	H64º V6.6º	H63º V6.3º
Fixed Tilt 0º,2º,4º,6º	Fixed Tilt 0º,2º,4º,6º	Fixed Tilt 0º,2º,4º,6º

MGD3-800TX

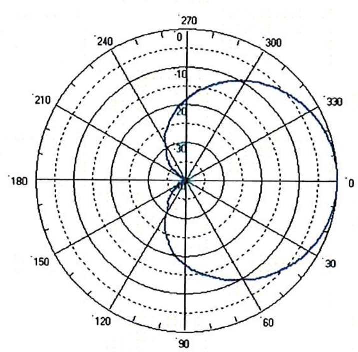
ELECTRICAL SPECIFICATIONS

***BROADBAND** 1710-2170 MHz*

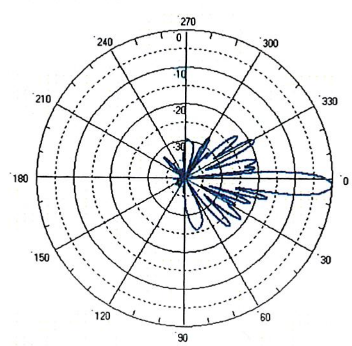
Antenna Model	MGD3-800TX		
Polarization	± 45º		
Frequency	***1710-2170***		
	1710 - 1880	1850 - 1990	1920 - 2170
Horizontal Beamwidth	66º	64º	63º
Vertical Beamwidth	7.2º	6.6º	6.3º
Gain (dBi)	18	18	18.5
Vertical Electrical Tilt	FIXED 0º,2º,4º,6º	FIXED 0º,2º,4º,6º	FIXED 0º,2º,4º,6º
Upper Sidelobe Suppression for the 1st lobe above main beam (dB)	20	20	20
Front-to-Back Ratio @ 180º ± 20º (dB)	> 30	> 30	> 30
VSWR	< 1.4 : 1	< 1.4 : 1	< 1.4 : 1
Cross Polar Ratio @ ± 60º (dB)	> 10	> 10	> 10
Isolation between Ports (dB)	> 30	> 30	> 30
Maximum Power Per Input (W)	250		
Intermodulation (dBc)	< - 150		
Impedance (Ω)	50		

MECHANICAL SPECIFICATIONS

Connectors	2 X 7/16 Female
Connector Position	Bottom
Survival Wind Speed km/h (mph)	200 (125)
Front Windload N @ 160 km/h (lbs @ 100 mph)	370 (85)
Lateral Windload N @ 160 km/h (lbs @ 100 mph)	170 (40)
Radome Color	Grey, paintable
Humidity	100%
Antenna Weight kg (lbs)	7 (15)
Antenna Dimension mm (in) H X W X D	1340 X 170 X 100 (53 X 7 X 4)



H&V Pattern



RYMSA Telecom Group (Headquarters)
[illegible]

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Phone +1 888 622 6095
www.rymsawireless.com

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

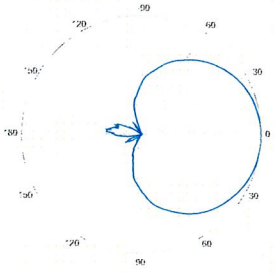
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

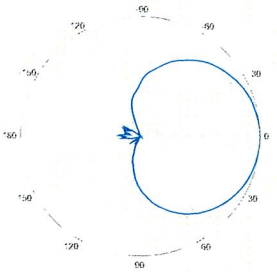
Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power	500 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting Bracket Kit	36210003	50-160 mm 2.0-6.3 in	6.3 kg 14 lbs
3-Point Downtilt Bracket Kit (0-14°)	36210004	50-160 mm 2.0-6.3 in	7.3 kg 16 lbs
Downtilt Mounting Applications	A mounting bracket and downtilt bracket kit must be ordered for downtilt applications		
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X

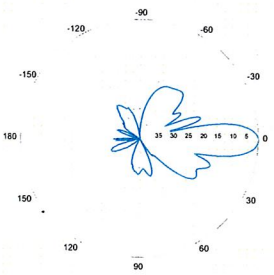


Horizontal | 750 MHz

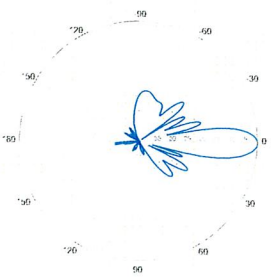


Horizontal | 850 MHz

BXA-70063-6CF-EDIN-0

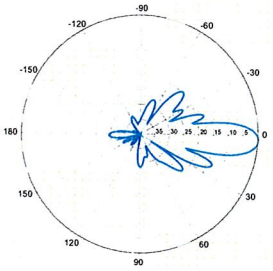


0° | Vertical | 750 MHz

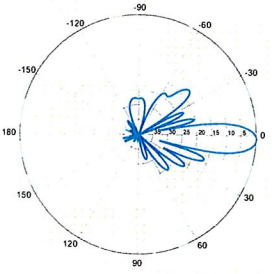


0° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-2



2° | Vertical | 750 MHz

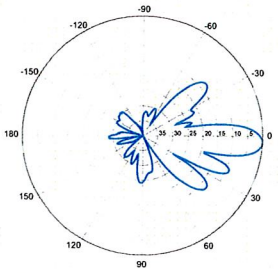


2° | Vertical | 850 MHz

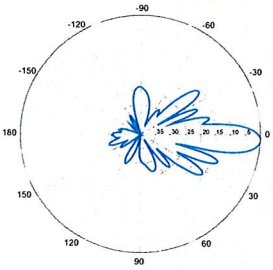
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

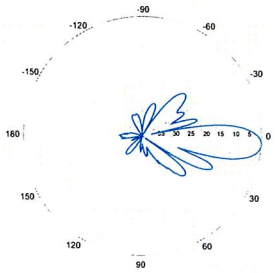


3° | Vertical | 750 MHz

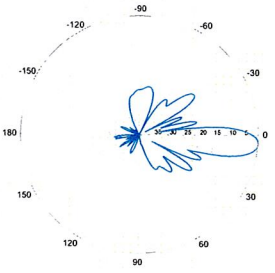


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

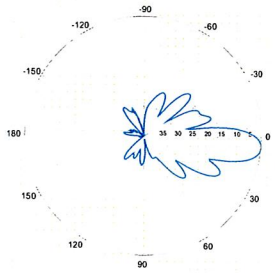


4° | Vertical | 750 MHz

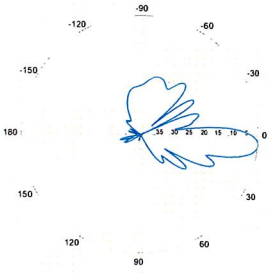


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

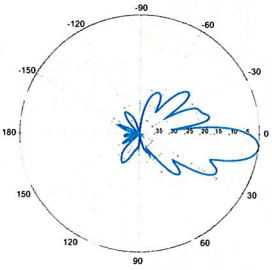


5° | Vertical | 750 MHz

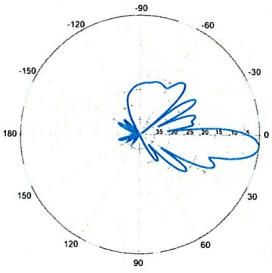


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

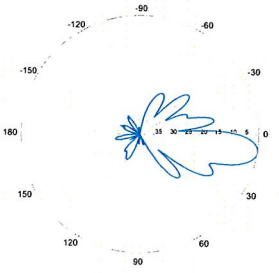


6° | Vertical | 750 MHz

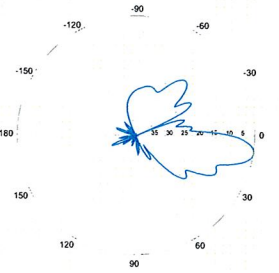


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

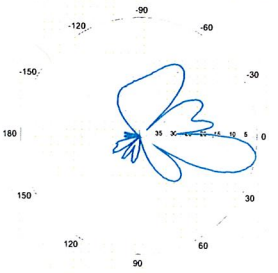


8° | Vertical | 750 MHz

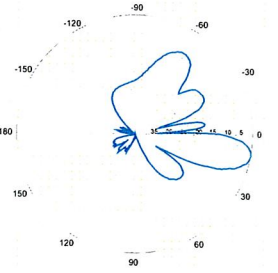


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

Product Data Sheet **FD9R6004/2C-3L**

ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Product Description

The ShareLite FD9R6004 Series of diplexers are designed to enable feeder sharing between systems in the 698-960 MHz range and in the 1710-2200 MHz range. The diplexer is equipped with in-line connector placement so it can be installed in the BTS cabinet or at the tower top. This is especially valuable in crowded sites or when the feeders are not easily accessible. Due to its wideband design, the FD9R6004 Series can accommodate many combining solutions between 698-960 MHz and 1710-2200 MHz systems such as LTE 700 MHz, Cellular 800 MHz with PCS, GSM900 with GSM1800, or GSM900 with UMTS. This diplexer features a highly selective filter. It provides a high level of isolation between ports, while keeping the insertion loss on both paths at an extremely low level. The FD9R6004 diplexers are available with various DC pass options, helpful in configurations with or without the Tower Mount Amplifiers installed.

Features/Benefits

- **LTE ready design**
- **Extremely Low Insertion Loss**
- **High level of Rejection between bands – Protection against interferences**
- **Extremely High Power Handling Capability**
- **Integrated DC block/bypass versions available**
- **Very compact & small size design – Easy installation and reduced tower load**
- **In-line long-neck connectors for easy connection & waterproofing**
- **Exceptional reliability & environmental protection (IP 67)**
- **Equipped with 1 * Breathable Vent – Prevent any humidity inside the product**
- **Mounting hardware for Wall and Pole mount provided (P/N SEM2-1A)**
- **Grounding already provided through the mounting bracket**
- **Kit available for easy dual mount**

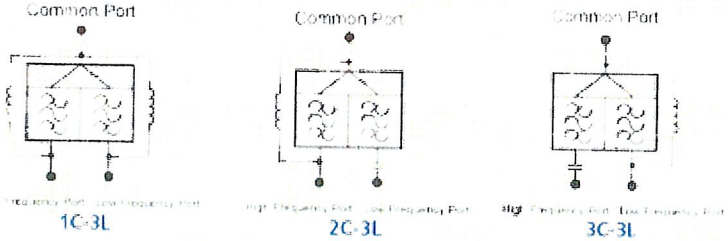
Technical Specifications

Product Type	Diplexer/Cross Band Coupler
Frequency Band, MHz	698-2200
Configuration	Sharelite Single diplexer, outdoor, DC pass in the 1710-2170MHz path, with mounting hardware SEM2-1A
Mounting	Wall Mounting: With 4 screws (maximum 6mm diameter); Pole Mounting: With included clamp set 40-110mm (1.57-4.33)
Frequency Range Low Frequency Path, MHz	698-960
Frequency Range High Frequency Path, MHz	1710-2200
Return Loss All Ports Min/Typ, dB	19/23
Power Handling Continuous, Max, W	1250 at common port; 750 in low frequency path & 500 in high frequency path
Power Handling Peak, Max, W	15000 in low frequency path & 8000 in high frequency path
Impedance, Ohms	50
Insertion Loss 698-960 MHz Path, Typ, dB	0.07
Insertion Loss 1710-2200MHz path, Typ, dB	0.13
Rejection Between Bands Min/Typ, dB	58/64@698-960MHz; 60/70@1710-2200MHz
IMP Level at the COM Port, Typ, dBm	-112 @ 2x43
DC Pass in Low Frequency Path	No
DC Pass in High Frequency Path	Yes
Temperature Range, °C (°F)	-40 to +60 (-40 to +140)
Environmental	ETSI 300-019-2-4 Class 4.1E
Ingress Protection	IP 67
Lightning Protection	EN/IEC61000-4-5 Level 4
Connectors	In-line long-neck 7-16-Female
Weight, kg (lb)	1.2 (2.6)
Shipping Weight, kg (lb)	3.2 (7) for 2 * single units in 1 * box, 9.8 (21.6) for 6 * units = 3 * Boxes in 1 * overwrap
Application	LTE 700MHz, GSM900/3G/UMTS, GSM900/GSM1800, Cellular 800/PCS
Dimensions, H x W x D, mm (in)	147 x 164 x 37 (5.8 x 6.5 x 1.5)
Shipping Dimensions, H x W x D, mm (in)	254 x 406 x 82 (10 x 16 x 3.2) for 2 * Single Units in 1 * box, 280 x 406 x 241 (11 x 16 x 9.5) for 6 * units = 3 * Boxes in 1 * overwrap
Volume, L	0.43
Housing	Aluminum

Notes

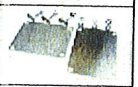
ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Selection Guide Diplexer 698-960 / 1710-2200MHz					
	Model Number	Full DC Pass	DC Pass High Band	DC Pass Low Band	Mounting Hardware Included
Single	FD9R6004/1C-3L				X
	FD9R6004/2C-3L				X
	FD9R6004/3C-3L				X
Dual	KIT-FD9R6004/1C-DL				X
	KIT-FD9R6004/2C-DL				X
	KIT-FD9R6004/3C-DL				X



1C-3L 2C-3L 3C-3L

The FD9R6004 Series is upgradeable to a Dual Diplexer kit by means of 2 diplexers and mounting hardware kits SEM2-1A and SEM2-3

Mounting Hardware and Ground Cable Ordering Information		
Model Number	**Description**	
SEM2-1A	Mounting Hardware, Pole mount ø40-110mm (Included with the Single and Dual Diplexer) Wall Screws M6 (Not included with the product)	
SEM2-3	Assembly kit for 2 pcs of FT9DW/xC-3L (Can be ordered separately but included with the Dual Diplexer Kit)	
CA020-2	Ground Cable, 2m, includes lugs (Optional)	
CA030-2	Ground Cable, 2m, includes lugs (Optional)	
SEM6	Mounting Hardware for 6 Diplexers, Tower Base (Optional)	

	General	Power	Density					
Site Name: Wolcott N								
Tower Height: Verizon @ 135Ft.								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*T-Mobile	8	120	160	0.0135	1935	1.0000	1.35%	
*2-way radio			180				0.40%	
Verizon	**3**	**370**	**135**	**0.0219**	**1970**	**1.0000**	**2.19%**	
Verizon	**9**	**276**	**135**	**0.0490**	**869**	**0.5793**	**8.46%**	
Verizon	**1**	**722**	**135**	**0.01424456**	**757**	**0.497333**	**2.86%**	**15.26%**
* Source: Siting Council								

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180' Existing ROHN Lattice Tower

Proposed Verizon Wireless
LTE Antenna Installation

Verizon Site Ref: Wolcott North

1192 Wolcott Rd.
Wolcott, CT

Centek Project No. 11001.CO1

Date: January 24, 2011

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

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by Verizon Wireless on the existing self supporting lattice tower located in Wolcott, Connecticut.

The host tower is a 180-ft, three legged, tapered lattice tower originally designed and manufactured by ROHN, eng. file no. 23963DB dated November 28 1988. The tower geometry, structure member sizes and foundation information were taken from a previous structural analysis report prepared by URS Corp., job no. 36931099 (VZ4-023); dated November 5, 2007.

Antenna and appurtenance inventory were taken from the aforementioned URS structural report and a visual verification from grade by Centek Engineering personal on January 17, 2011.

The tower is made of nine (9) tapered vertical sections consisting of ROHN steel pipe legs. Diagonal and horizontal lateral support bracing consists of steel angle shapes. All connections were bolted connections. The width of the tower face is 6.52-ft at the top and 20.78-ft at the base.

Verizon Wireless proposes the removal of twelve (12) panel antennas and the installation of twelve (12) panel antennas and six (6) diplexers. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna configuration.

Antenna and Appurtenance Summary

The existing tower supports several communication antennas. The existing and proposed loads considered in the analysis consist of the following:

- UNKNOWN (Existing):
  Antenna: One (1) 2-Bay Dipole and two (2) 10' Omni-Directional whips mounted on three (3) 3' stand-offs and one (1) 10' Omni-Directional whip flush mounted to a leg of the existing tower with a RAD center elevation of ±185-ft above grade level.
  Coax Cable: Three (3) 7/8" ∅ and one (1) 1-1/4" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 10' Omni-Directional whip mounted on one (1) 3' stand-off with a RAD center elevation of ±155-ft above grade level.
  Coax Cable: One (1) 7/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: Two (2) empty 3' stand-offs with an elevation of ±150-ft above grade level.
- UNKNOWN (Existing):
  Antenna: One (1) 8' Omni-Directional whip mounted on one (1) 2' stand-off with a RAD center elevation of ±144-ft above grade level.
  Coax Cable: One (1) 7/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.

- UNKNOWN (Existing):
  Antenna: One (1) 8' Omni-Directional whip mounted on one (1) 2' stand-off with a RAD center elevation of ±104-ft above grade level.
  Coax Cable: One (1) 1/2" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (Existing to Remain):
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- **VERIZON (Existing to Remove):**
  Antennas: Six (6) Antel WPA-70063/6CF and six (6) Andrew 950F65T2ZE-M panel antennas mounted on three (3) PiROD 13' KD T-Frames with a RAD center elevation of ±135-ft above grade level.
- **VERIZON (Proposed):**
  Antennas: Three (3) Antel BXA-70063/6CF, four (4) RFS APL868013-42T0, two (2) RFS APL866513-42T0, two (2) RFS APX18-206516L-T0 and one (1) RYMSA MG D3-800T0 panel antennas and six (6) FD9R6004/2C-3L Diplexers mounted on three (3) existing PiROD 13' KD T-Frames with a RAD center elevation of ±135-ft above grade level.

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 routed as specified in Section 3 of this report.**

Analysis

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

The existing tower was analyzed for 85 mph basic wind speed (fastest mile) with no ice and 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).

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 tower structure and its components.

Basic Wind Speed:	New Haven; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Wolcott; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed Controls	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design.	*[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*

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISATower. 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 RISATower "Section Capacity Table", this tower was found to be at **98.2%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Diagonal (T10)	20'-0"-40'-0"	87.2%	**PASS**
Leg (T10)	20'-0"-40'-0"	98.2%	**PASS**

Foundation and Anchors

The existing foundation consists of a 28.5-ft wide by 4.0-ft deep reinforced concrete mat footing. The sub grade conditions used in the analysis of the existing foundation were derived from the aforementioned URS structural report.

Tower legs are connected to the concrete mat by means of (4) 1.00"∅, ASTM A354 Gr. BC anchor bolts per leg, embedded into the concrete mat.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

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

Reactions	Vector	Proposed Load (kips, kip-ft)
Base	Shear	**23**
	Compression	**16**
	Moment	**2170**
Leg	Shear	**14**
	Compression	**126**
	Uplift	**106**

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

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	50.3%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Mat	OM[2]	2.0	3.1	**PASS**

Note 1: FS denotes Factor of Safety
Note 2: OM denotes Overturning Moment

Conclusion

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

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:

Checked by:

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 18894
LICENSED
PROFESSIONAL ENGINEER

1/25/2011

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Timothy J. Lynn, EIT
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:

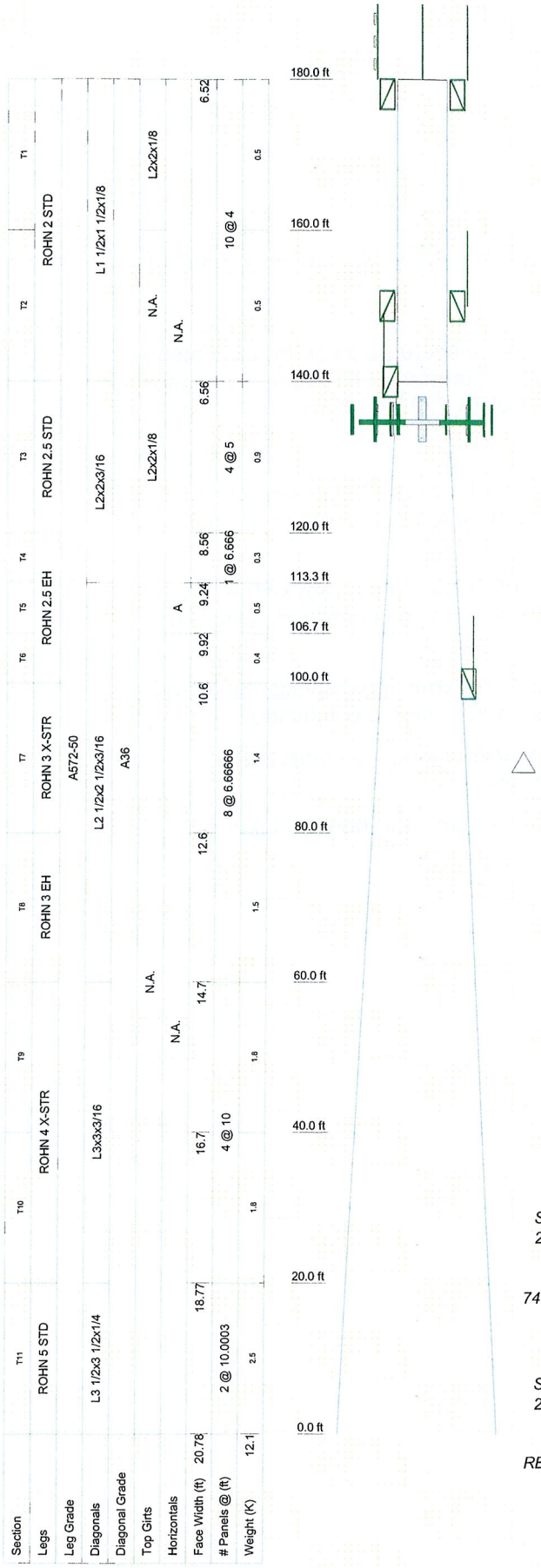
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or 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

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

RISATower Features:

- RISATower 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.
- RISATower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2 Bay Dipole	185	BXA-70063/6CF (Verizon - Proposed)	135
2" Dia 10' Omni	185	APX18-206516L-T0 (Verizon - Proposed)	135
2" Dia 10' Omni	185		
2" Dia 10' Omni	185	APL868013-42T0 (Verizon - Proposed)	135
3' Side Mount Standoff	178	APL866513-42T0 (Verizon - Proposed)	135
3' Side Mount Standoff	178	BXA-70063/6CF (Verizon - Proposed)	135
3' Side Mount Standoff	178	APX18-206516L-T0 (Verizon - Proposed)	135
2" Dia 10' Omni	155		
3' Side Mount Standoff	150	APL868013-42T0 (Verizon - Proposed)	135
3' Side Mount Standoff	150	APL868013-42T0 (Verizon - Proposed)	135
3' Side Mount Standoff	150	APL866513-42T0 (Verizon - Proposed)	135
2" Dia 8' Omni	144	Pirod 13' KD T-Frame	135
2' Side Mount Standoff	140	Pirod 13' KD T-Frame	135
BXA-70063/6CF (Verizon - Proposed)	135	Pirod 13' KD T-Frame	135
MG D3-800T0 (Verizon - Proposed)	135	2" Dia 8' Omni	104
APL868013-42T0 (Verizon - Proposed)	135	2' Side Mount Standoff	100

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L3x3x3/16		

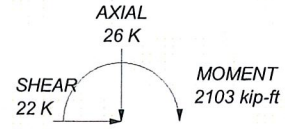
MATERIAL STRENGTH

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

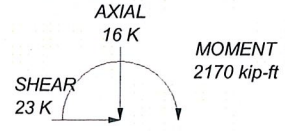
TOWER DESIGN NOTES

1. Tower is located in New Haven 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. TOWER RATING: 98.2%

MAX. CORNER REACTIONS AT BASE:
DOWN: 126 K
UPLIFT: -106 K
SHEAR: 14 K



TORQUE 15 kip-ft
74 mph WIND - 0.5000 in ICE



TORQUE 17 kip-ft
REACTIONS - 85 mph WIND

Centek Engineering Inc.
63-2 North Branford Road
Branford, CT 06405
Phone: 203.488.0580
FAX: 203.488.8587

Job: *11001.CO4 ~ Wolcott North*		
Project: *180' Self-Support Lattice 1192 Wolcott Road., Wolcott, CT*		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 01/24/11	Scale: NTS
Path: J:\Jobs\1100100 WICO1 - Wolcott North - 1192 Wolcott Road, Wolcott, CT\Calcs\ERI Files\180-ft ROHN Lattice Tower.eri		Dwg No. E-1

Feedline Plan

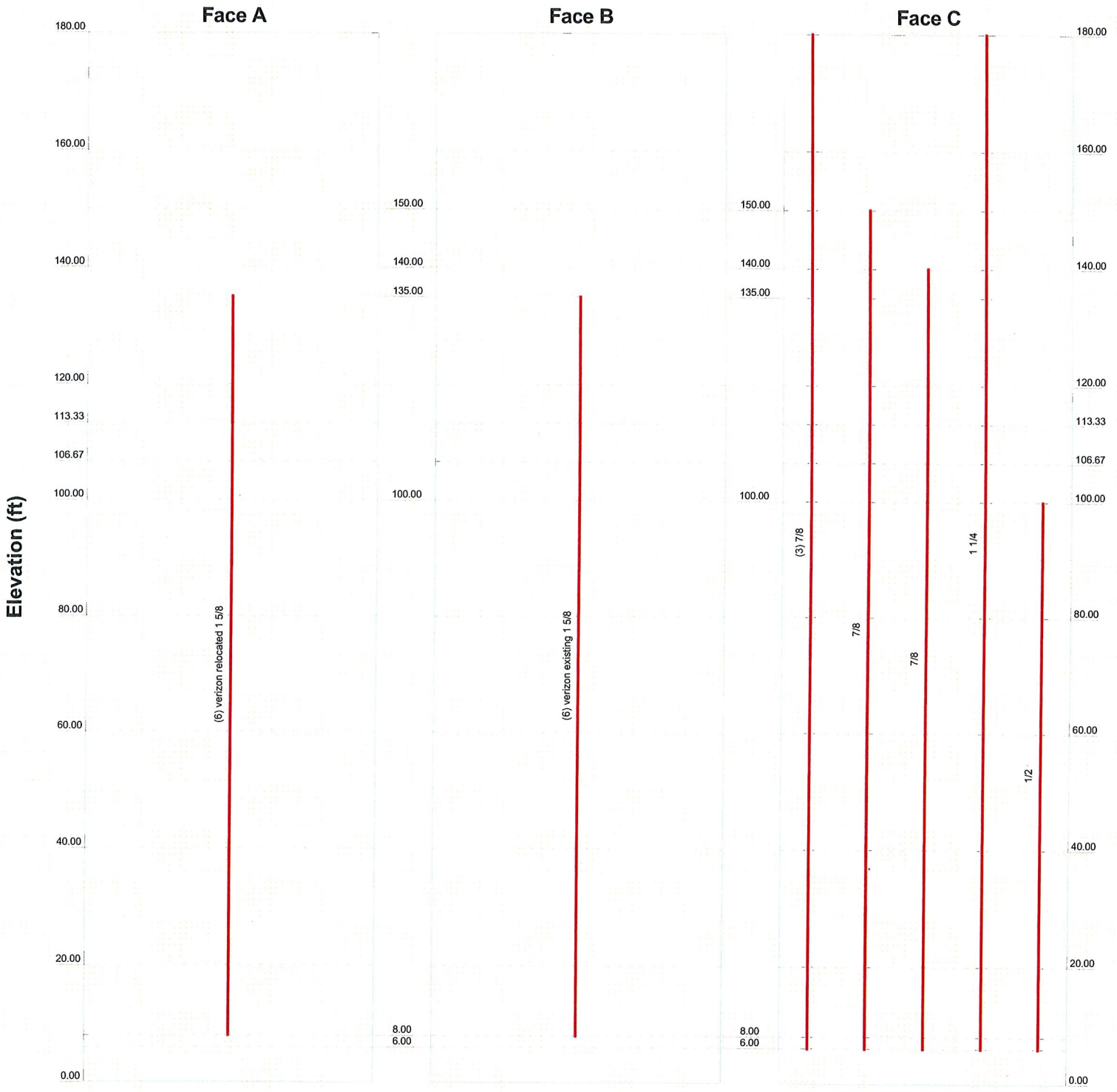
Round _____ Flat _____ App In Face App Out Face

Centek Engineering Inc.
63-2 North Branford Road
Branford, CT 06405
Phone: 203.488.0580
FAX: 203.488.8587

Job: ***11001.CO4 ~ Wolcott North***		
Project: ***180' Self-Support Lattice 1192 Wolcott Road., Wolcott, CT***		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 01/24/11	Scale: NTS
Path: J:\Jobs\1100100 W\CO1 - Wolcott North - 1192 Wolcott Road, Wolcott, CT\Calcs\ER Files\180-ft ROHN Lattice Tower.er		Dwg No. E-7

Feedline Distribution Chart
0' - 180'

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



Centek Engineering Inc.
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Job: ***11001.CO4 ~ Wolcott North***		
Project: ***180' Self-Support Lattice 1192 Wolcott Road., Wolcott, CT***		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 01/24/11	Scale: NTS
Path: J:\Jobs\11001\00 WIP\CO1 - Wolcott North - 1192 Wolcott Road, Wolcott, CT\Calcs\ERI Files\180-ft ROHN Lattice Tower.eri		Dwg No. E-7

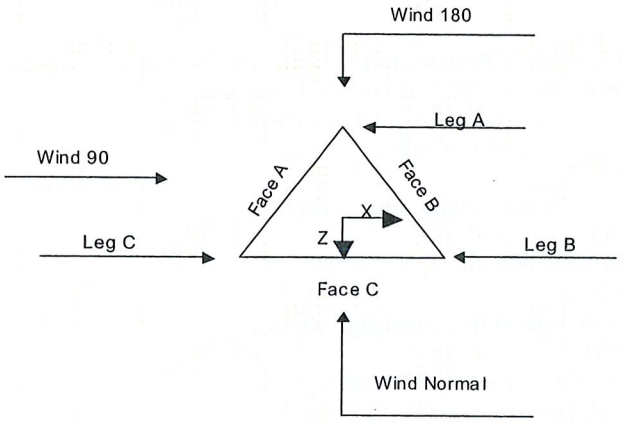
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.52 ft at the top and 20.78 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven 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.
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	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	180.00-160.00			6.52	1	20.00
T2	160.00-140.00			6.52	1	20.00
T3	140.00-120.00			6.56	1	20.00
T4	120.00-113.33			8.56	1	6.67
T5	113.33-106.67			9.24	1	6.67
T6	106.67-100.00			9.92	1	6.67
T7	100.00-80.00			10.60	1	20.00
T8	80.00-60.00			12.60	1	20.00
T9	60.00-40.00			14.70	1	20.00
T10	40.00-20.00			16.70	1	20.00
T11	20.00-0.00			18.77	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	180.00-160.00	4.00	X Brace	No	No	0.0000	0.0000
T2	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T4	120.00-113.33	6.67	X Brace	No	No	0.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T5	113.33-106.67	6.67	X Brace	No	Yes	0.0000	0.0000
T6	106.67-100.00	6.67	X Brace	No	No	0.0000	0.0000
T7	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T8	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T9	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T10	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T11	20.00-0.00	10.00	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 180.00-160.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T2 160.00-140.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T3 140.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Single Angle	L2x2x3/16	A36 (36 ksi)
T4 120.00-113.33	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L2x2x3/16	A36 (36 ksi)
T5 113.33-106.67	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 106.67-100.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 100.00-80.00	Pipe	ROHN 3 X-STR	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 80.00-60.00	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 60.00-40.00	Pipe	ROHN 4 X-STR	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T10 40.00-20.00	Pipe	ROHN 4 X-STR	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T11 20.00-0.00	Pipe	ROHN 5 STD	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	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 180.00-160.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T3 140.00-120.00	Single Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T5 113.33-106.67	None	Single Angle		A36 (36 ksi)	Single Angle	L3x3x3/16	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 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T4 120.00-113.33	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T5 113.33-106.67	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T6 106.67-100.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T7 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T8 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T9 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T10 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000
T11 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1.02	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors[1] X Brace Diags X / Y	K Brace Diags X / Y	Single Diags X / Y	Girts X / Y	Horiz. X / Y	Sec. Horiz. X / Y	Inner Brace X / Y
T1 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 120.00-113.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 113.33-106.67	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors[1] X Brace Diags X	K Factors[1] X Brace Diags Y	K Factors[1] Single Diags X	K Factors[1] Single Diags Y	K Factors[1] Girts X	K Factors[1] Girts Y	K Factors[1] Horiz. X	K Factors[1] Horiz. Y	K Factors[1] Sec. Horiz. X	K Factors[1] Sec. Horiz. Y	K Factors[1] Inner Brace X	K Factors[1] Inner Brace Y
T6 106.67-100.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T7 100.00-80.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T8 80.00-60.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T9 60.00-40.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T10 40.00-20.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T11 20.00-0.00	Yes	Yes	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 180.00-160.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 160.00-140.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 140.00-120.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 120.00-113.33	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 113.33-106.67	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 106.67-100.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T7 100.00-80.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T8 80.00-60.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T9 60.00-40.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T10 40.00-20.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T11 20.00-0.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

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 180.00-160.00	Flange	0.6250 A325N	0	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T2 160.00-140.00	Flange	0.6250 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	0.6250 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T4 120.00-113.33	Flange	0.6250 A325N	4	0.6250 A325N	1	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T5 113.33-106.67	Flange	0.7500 A325N	0	0.6250 A325N	1	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T6 106.67-100.00	Flange	0.7500 A325N	0	0.6250 A325N	1	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T7 100.00-80.00	Flange	0.7500 A325N	4	0.6250 A325N	1	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T8 80.00-60.00	Flange	0.8750 A325N	4	0.6250 A325N	1	1.2500 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.5000 A325N	0	0.6250 A325X	0
T9 60.00-40.00	Flange	0.8750 A325N	4	0.6250 A325N	1	1.2500 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.5000 A325N	0	0.6250 A325X	0
T10 40.00-20.00	Flange	0.8750 A325N	4	0.6250 A325N	1	1.2500 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.5000 A325N	0	0.6250 A325X	0
T11 20.00-0.00	Flange	1.0000 A325N	4	0.6250 A325N	1	1.2500 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.5000 A325N	0	0.6250 A325X	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	C	Yes	Ar (CfAe)	180.00 - 6.00	2.5000	0.41	3	3	1.1100 1.0000	1.1100		0.54
7/8	C	Yes	Ar (CfAe)	150.00 - 6.00	2.5000	0.43	1	1	1.1100	1.1100		0.54
7/8	C	Yes	Ar (CfAe)	140.00 - 6.00	2.5000	0.44	1	1	1.1100 1.0000	1.1100		0.54
1 1/4	C	Yes	Ar (CfAe)	180.00 - 6.00	2.5000	0.39	1	1	1.5500	1.5500		0.66
1/2	C	Yes	Ar (CfAe)	100.00 - 6.00	2.5000	0.35	1	1	0.5800	0.5800		0.58
verizon existing 1 5/8	B	Yes	Ar (CfAe)	135.00 - 8.00	2.5000	-0.38	6	6	1.9800	1.9800		1.04
verizon relocated 1 5/8	A	Yes	Ar (CfAe)	135.00 - 8.00	2.5000	0.38	6	6	1.9800	1.9800		1.04

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	8.133	0.000	0.000	0.000	0.05
T2	160.00-140.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	9.058	0.000	0.000	0.000	0.05
T3	140.00-120.00	A	14.850	0.000	0.000	0.000	0.09
		B	14.850	0.000	0.000	0.000	0.09
		C	11.833	0.000	0.000	0.000	0.07
T4	120.00-113.33	A	6.599	0.000	0.000	0.000	0.04
		B	6.599	0.000	0.000	0.000	0.04
		C	3.944	0.000	0.000	0.000	0.02
T5	113.33-106.67	A	6.600	0.000	0.000	0.000	0.04
		B	6.600	0.000	0.000	0.000	0.04
		C	3.944	0.000	0.000	0.000	0.02
T6	106.67-100.00	A	6.600	0.000	0.000	0.000	0.04
		B	6.600	0.000	0.000	0.000	0.04
		C	3.944	0.000	0.000	0.000	0.02
T7	100.00-80.00	A	19.800	0.000	0.000	0.000	0.12
		B	19.800	0.000	0.000	0.000	0.12
		C	12.800	0.000	0.000	0.000	0.08
T8	80.00-60.00	A	19.800	0.000	0.000	0.000	0.12
		B	19.800	0.000	0.000	0.000	0.12
		C	12.800	0.000	0.000	0.000	0.08
T9	60.00-40.00	A	19.800	0.000	0.000	0.000	0.12
		B	19.800	0.000	0.000	0.000	0.12
		C	12.800	0.000	0.000	0.000	0.08
T10	40.00-20.00	A	19.800	0.000	0.000	0.000	0.12
		B	19.800	0.000	0.000	0.000	0.12
		C	12.800	0.000	0.000	0.000	0.08
T11	20.00-0.00	A	11.881	0.000	0.000	0.000	0.07
		B	11.881	0.000	0.000	0.000	0.07
		C	8.960	0.000	0.000	0.000	0.06

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		14.800	0.000	0.000	0.000	0.13
T2	160.00-140.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		16.558	0.000	0.000	0.000	0.14
T3	140.00-120.00	A	0.500	22.350	0.000	0.000	0.000	0.23
		B		22.350	0.000	0.000	0.000	0.23
		C		21.833	0.000	0.000	0.000	0.19
T4	120.00-113.33	A	0.500	9.932	0.000	0.000	0.000	0.10
		B		9.932	0.000	0.000	0.000	0.10
		C		7.277	0.000	0.000	0.000	0.06
T5	113.33-106.67	A	0.500	9.933	0.000	0.000	0.000	0.10
		B		9.933	0.000	0.000	0.000	0.10
		C		7.278	0.000	0.000	0.000	0.06
T6	106.67-100.00	A	0.500	9.933	0.000	0.000	0.000	0.10
		B		9.933	0.000	0.000	0.000	0.10
		C		7.278	0.000	0.000	0.000	0.06
T7	100.00-80.00	A	0.500	29.800	0.000	0.000	0.000	0.31
		B		29.800	0.000	0.000	0.000	0.31
		C		24.467	0.000	0.000	0.000	0.22
T8	80.00-60.00	A	0.500	29.800	0.000	0.000	0.000	0.31
		B		29.800	0.000	0.000	0.000	0.31
		C		24.467	0.000	0.000	0.000	0.22

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T9	60.00-40.00	A	0.500	29.800	0.000	0.000	0.000	0.31
		B		29.800	0.000	0.000	0.000	0.31
		C		24.467	0.000	0.000	0.000	0.22
T10	40.00-20.00	A	0.500	29.800	0.000	0.000	0.000	0.31
		B		29.800	0.000	0.000	0.000	0.31
		C		24.467	0.000	0.000	0.000	0.22
T11	20.00-0.00	A	0.500	17.881	0.000	0.000	0.000	0.18
		B		17.881	0.000	0.000	0.000	0.18
		C		17.127	0.000	0.000	0.000	0.15

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	180.00-160.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.785	0.664	1.209
T2	160.00-140.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.809	0.664	1.213
T3	140.00-120.00	A	0.000	0.988	1.313	1.977
		B	0.000	0.988	1.313	1.977
		C	0.000	0.965	1.047	1.931
T4	120.00-113.33	A	0.000	0.310	0.412	0.620
		B	0.000	0.310	0.412	0.620
		C	0.000	0.227	0.246	0.455
T5	113.33-106.67	A	0.000	0.427	0.750	1.129
		B	0.000	0.427	0.750	1.129
		C	0.000	0.313	0.448	0.827
T6	106.67-100.00	A	0.000	0.296	0.492	0.740
		B	0.000	0.296	0.492	0.740
		C	0.000	0.217	0.294	0.542
T7	100.00-80.00	A	0.000	0.860	1.428	2.150
		B	0.000	0.860	1.428	2.150
		C	0.000	0.706	0.923	1.765
T8	80.00-60.00	A	0.000	0.829	1.378	2.074
		B	0.000	0.829	1.378	2.074
		C	0.000	0.681	0.891	1.703
T9	60.00-40.00	A	0.000	0.589	1.174	1.767
		B	0.000	0.589	1.174	1.767
		C	0.000	0.484	0.759	1.451
T10	40.00-20.00	A	0.000	0.570	1.137	1.711
		B	0.000	0.570	1.137	1.711
		C	0.000	0.468	0.735	1.405
T11	20.00-0.00	A	0.000	0.334	0.777	1.169
		B	0.000	0.334	0.777	1.169
		C	0.000	0.320	0.586	1.120

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	180.00-160.00	-3.7554	3.0573	-4.1217	3.3496
T2	160.00-140.00	-4.4197	3.5719	-4.8724	3.9305
T3	140.00-120.00	-3.8255	-8.8172	-4.5965	-7.9673
T4	120.00-113.33	-4.4478	-14.2139	-5.4036	-13.2986
T5	113.33-106.67	-3.5975	-11.4806	-4.4844	-11.0243
T6	106.67-100.00	-4.5651	-14.5513	-5.6851	-13.9630
T7	100.00-80.00	-5.0561	-14.7561	-6.5566	-14.0565
T8	80.00-60.00	-5.6661	-16.5015	-7.3605	-15.7567
T9	60.00-40.00	-6.1780	-17.9645	-8.3762	-17.9116
T10	40.00-20.00	-6.7494	-19.6026	-9.1653	-19.5828
T11	20.00-0.00	-4.8865	-11.5618	-7.0024	-11.9879

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft ft ft	°	ft		ft^2	ft^2	K
APL868013-42T0	A	From Leg	3.00	0.0000	135.00	No Ice	2.87	3.73	0.02
(Verizon - Proposed)			6.00			1/2" Ice	3.18	4.10	0.04
			0.00						
BXA-70063/6CF	A	From Leg	3.00	0.0000	135.00	No Ice	7.73	3.76	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.19	0.06
			0.00						
APX18-206516L-T0	A	From Leg	3.00	0.0000	135.00	No Ice	3.51	2.00	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	3.85	2.33	0.04
			0.00						
APL868013-42T0	A	From Leg	3.00	0.0000	135.00	No Ice	2.87	3.73	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	3.18	4.10	0.04
			0.00						
APL868013-42T0	B	From Leg	3.00	0.0000	135.00	No Ice	2.87	3.73	0.02
(Verizon - Proposed)			6.00			1/2" Ice	3.18	4.10	0.04
			0.00						
BXA-70063/6CF	B	From Leg	3.00	0.0000	135.00	No Ice	7.73	3.76	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.19	0.06
			0.00						
MG D3-800T0	B	From Leg	3.00	0.0000	135.00	No Ice	3.45	2.22	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	3.80	2.55	0.04
			0.00						
APL868013-42T0	B	From Leg	3.00	0.0000	135.00	No Ice	2.87	3.73	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	3.18	4.10	0.04
			0.00						
APL866513-42T0	C	From Leg	3.00	0.0000	135.00	No Ice	4.29	3.73	0.02
(Verizon - Proposed)			6.00			1/2" Ice	4.67	4.10	0.05
			0.00						
BXA-70063/6CF	C	From Leg	3.00	0.0000	135.00	No Ice	7.73	3.76	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.19	0.06
			0.00						
APX18-206516L-T0	C	From Leg	3.00	0.0000	135.00	No Ice	3.51	2.00	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	3.85	2.33	0.04
			0.00						
APL866513-42T0	C	From Leg	3.00	0.0000	135.00	No Ice	4.29	3.73	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	4.67	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						
3' Side Mount Standoff	A	From Leg	1.50	0.0000	178.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
3' Side Mount Standoff	B	From Leg	1.50	0.0000	178.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
3' Side Mount Standoff	C	From Leg	1.50	0.0000	178.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
2 Bay Dipole	C	From Leg	3.00	0.0000	185.00	No Ice	2.66	2.66	0.05
			0.00			1/2" Ice	4.44	4.44	0.07
			0.00						
2" Dia 10' Omni	A	From Leg	3.00	0.0000	185.00	No Ice	2.00	2.00	0.01
			0.00			1/2" Ice	3.03	3.03	0.03
			0.00						
2" Dia 10' Omni	B	From Leg	3.00	0.0000	185.00	No Ice	2.00	2.00	0.01
			0.00			1/2" Ice	3.03	3.03	0.03
			0.00						
2" Dia 10' Omni	C	None		0.0000	185.00	No Ice	2.00	2.00	0.01
						1/2" Ice	3.03	3.03	0.03
3' Side Mount Standoff	A	From Leg	1.50	0.0000	150.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
3' Side Mount Standoff	B	From Leg	1.50	0.0000	150.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
3' Side Mount Standoff	C	From Leg	1.50	0.0000	150.00	No Ice	2.64	2.64	0.04
			0.00			1/2" Ice	3.69	3.69	0.05
			0.00						
2" Dia 10' Omni	B	From Leg	3.00	0.0000	155.00	No Ice	2.00	2.00	0.01
			0.00			1/2" Ice	3.03	3.03	0.03
			0.00						
2' Side Mount Standoff	C	From Leg	1.00	0.0000	140.00	No Ice	2.10	2.10	0.05
			0.00			1/2" Ice	4.30	4.30	0.09
			0.00						
2" Dia 8' Omni	C	From Leg	2.00	0.0000	144.00	No Ice	2.00	2.00	0.01
			0.00			1/2" Ice	3.03	3.03	0.02
			0.00						
2" Dia 8' Omni	B	From Leg	2.00	0.0000	104.00	No Ice	2.00	2.00	0.01
			0.00			1/2" Ice	3.03	3.03	0.02
			0.00						
2' Side Mount Standoff	B	From Leg	1.00	0.0000	100.00	No Ice	2.10	2.10	0.05
			0.00			1/2" Ice	4.30	4.30	0.09
			0.00						
Pirod 13' KD T-Frame	A	From Leg	2.00	0.0000	135.00	No Ice	11.07	11.07	0.24
			0.00			1/2" Ice	15.53	15.53	0.35
			0.00						
Pirod 13' KD T-Frame	B	From Leg	2.00	0.0000	135.00	No Ice	11.07	11.07	0.24
			0.00			1/2" Ice	15.53	15.53	0.35
			0.00						
Pirod 13' KD T-Frame	C	From Leg	2.00	0.0000	135.00	No Ice	11.07	11.07	0.24
			0.00			1/2" Ice	15.53	15.53	0.35
			0.00						

Tower Pressures - No Ice

$G_H = 1.121$

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 180.00-160.00	170.00	1.597	30	134.358	A	10.531	7.917	7.917	42.91	0.000	0.000
					B	10.531	7.917		42.91	0.000	0.000
					C	9.867	16.050		30.55	0.000	0.000
T2 160.00-140.00	150.00	1.541	29	134.758	A	9.479	7.917	7.917	45.51	0.000	0.000
					B	9.479	7.917		45.51	0.000	0.000
					C	8.815	16.975		30.70	0.000	0.000
T3 140.00-120.00	130.00	1.48	27	155.998	A	11.721	24.449	9.599	26.54	0.000	0.000
					B	11.721	24.449		26.54	0.000	0.000
					C	11.988	21.433		28.72	0.000	0.000
T4 120.00-113.33	116.67	1.434	27	60.927	A	3.267	9.799	3.200	24.49	0.000	0.000
					B	3.267	9.799		24.49	0.000	0.000
					C	3.433	7.144		30.25	0.000	0.000
T5 113.33-106.67	110.00	1.411	26	65.466	A	6.382	9.800	3.200	19.77	0.000	0.000
					B	6.382	9.800		19.77	0.000	0.000
					C	6.684	7.144		23.14	0.000	0.000
T6 106.67-100.00	103.33	1.386	26	69.999	A	4.588	9.800	3.200	22.24	0.000	0.000
					B	4.588	9.800		22.24	0.000	0.000
					C	4.785	7.144		26.82	0.000	0.000
T7 100.00-80.00	90.00	1.332	25	237.841	A	15.219	31.486	11.686	25.02	0.000	0.000
					B	15.219	31.486		25.02	0.000	0.000
					C	15.724	24.486		29.06	0.000	0.000
T8 80.00-60.00	70.00	1.24	23	278.841	A	17.581	31.488	11.688	23.82	0.000	0.000
					B	17.581	31.488		23.82	0.000	0.000
					C	18.068	24.488		27.47	0.000	0.000
T9 60.00-40.00	50.00	1.126	21	321.509	A	17.388	34.825	15.025	28.78	0.000	0.000
					B	17.388	34.825		28.78	0.000	0.000
					C	17.804	27.825		32.93	0.000	0.000
T10 40.00-20.00	30.00	1	18	362.210	A	19.195	34.827	15.027	27.82	0.000	0.000
					B	19.195	34.827		27.82	0.000	0.000
					C	19.597	27.827		31.69	0.000	0.000
T11 20.00-0.00	10.00	1	18	404.797	A	25.008	30.456	18.575	33.49	0.000	0.000
					B	25.008	30.456		33.49	0.000	0.000
					C	25.199	27.536		35.22	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.597	22	0.5000	136.025	A	10.531	17.958	11.250	39.49	0.000	0.000
						B	10.531	17.958		39.49	0.000	0.000
						C	9.323	31.973		27.24	0.000	0.000
T2 160.00-140.00	150.00	1.541	22	0.5000	136.425	A	9.479	17.445	11.250	41.78	0.000	0.000
						B	9.479	17.445		41.78	0.000	0.000
						C	8.266	33.195		27.13	0.000	0.000

Section Elevation	z	K_Z	q_z	t_Z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft^2	e	ft^2	ft^2	ft^2		ft^2	ft^2
T3 140.00-120.00	130.00	1.48	21	0.5000	157.666	A	11.058	40.689	12.938	25.00	0.000	0.000
						B	11.058	40.689		25.00	0.000	0.000
						C	11.104	40.195		25.22	0.000	0.000
T4 120.00-113.33	116.67	1.434	20	0.5000	61.483	A	3.059	15.738	4.313	22.94	0.000	0.000
						B	3.059	15.738		22.94	0.000	0.000
						C	3.225	13.166		26.31	0.000	0.000
T5 113.33-106.67	110.00	1.411	20	0.5000	66.022	A	6.003	16.467	4.313	19.19	0.000	0.000
						B	6.003	16.467		19.19	0.000	0.000
						C	6.305	13.925		21.32	0.000	0.000
T6 106.67-100.00	103.33	1.386	19	0.5000	70.556	A	4.339	15.942	4.313	21.27	0.000	0.000
						B	4.339	15.942		21.27	0.000	0.000
						C	4.537	13.366		24.09	0.000	0.000
T7 100.00-80.00	90.00	1.332	19	0.5000	239.509	A	14.498	50.494	15.025	23.12	0.000	0.000
						B	14.498	50.494		23.12	0.000	0.000
						C	14.883	45.314		24.96	0.000	0.000
T8 80.00-60.00	70.00	1.24	17	0.5000	280.510	A	16.885	51.433	15.028	22.00	0.000	0.000
						B	16.885	51.433		22.00	0.000	0.000
						C	17.256	46.248		23.66	0.000	0.000
T9 60.00-40.00	50.00	1.126	16	0.5000	323.178	A	16.795	53.641	18.364	26.07	0.000	0.000
						B	16.795	53.641		26.07	0.000	0.000
						C	17.112	48.413		28.03	0.000	0.000
T10 40.00-20.00	30.00	1	14	0.5000	363.879	A	18.621	54.240	18.366	25.21	0.000	0.000
						B	18.621	54.240		25.21	0.000	0.000
						C	18.927	49.009		27.03	0.000	0.000
T11 20.00-0.00	10.00	1	14	0.5000	406.466	A	24.616	46.684	21.914	30.74	0.000	0.000
						B	24.616	46.684		30.74	0.000	0.000
						C	24.665	45.945		31.04	0.000	0.000

Tower Pressure - Service

$G_H = 1.121$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2	e	ft^2	ft^2	ft^2		ft^2	ft^2
T1 180.00-160.00	170.00	1.597	10	134.358	A	10.531	7.917	7.917	42.91	0.000	0.000
					B	10.531	7.917		42.91	0.000	0.000
					C	9.867	16.050		30.55	0.000	0.000
T2 160.00-140.00	150.00	1.541	10	134.758	A	9.479	7.917	7.917	45.51	0.000	0.000
					B	9.479	7.917		45.51	0.000	0.000
					C	8.815	16.975		30.70	0.000	0.000
T3 140.00-120.00	130.00	1.48	9	155.998	A	11.721	24.449	9.599	26.54	0.000	0.000
					B	11.721	24.449		26.54	0.000	0.000
					C	11.988	21.433		28.72	0.000	0.000
T4 120.00-113.33	116.67	1.434	9	60.927	A	3.267	9.799	3.200	24.49	0.000	0.000
					B	3.267	9.799		24.49	0.000	0.000
					C	3.433	7.144		30.25	0.000	0.000
T5 113.33-106.67	110.00	1.411	9	65.466	A	6.382	9.800	3.200	19.77	0.000	0.000
					B	6.382	9.800		19.77	0.000	0.000
					C	6.684	7.144		23.14	0.000	0.000
T6 106.67-100.00	103.33	1.386	9	69.999	A	4.588	9.800	3.200	22.24	0.000	0.000
					B	4.588	9.800		22.24	0.000	0.000
					C	4.785	7.144		26.82	0.000	0.000
T7 100.00-	90.00	1.332	9	237.841	A	15.219	31.486	11.686	25.02	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
80.00					B	15.219	31.486		25.02	0.000	0.000
					C	15.724	24.486		29.06	0.000	0.000
T8 80.00-60.00	70.00	1.24	8	278.841	A	17.581	31.488	11.688	23.82	0.000	0.000
					B	17.581	31.488		23.82	0.000	0.000
					C	18.068	24.488		27.47	0.000	0.000
T9 60.00-40.00	50.00	1.126	7	321.509	A	17.388	34.825	15.025	28.78	0.000	0.000
					B	17.388	34.825		28.78	0.000	0.000
					C	17.804	27.825		32.93	0.000	0.000
T10 40.00-20.00	30.00	1	6	362.210	A	19.195	34.827	15.027	27.82	0.000	0.000
					B	19.195	34.827		27.82	0.000	0.000
					C	19.597	27.827		31.69	0.000	0.000
T11 20.00-0.00	10.00	1	6	404.797	A	25.008	30.456	18.575	33.49	0.000	0.000
					B	25.008	30.456		33.49	0.000	0.000
					C	25.199	27.536		35.22	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 180.00-160.00	0.05	0.54	A	0.137	2.819	0.58	1	1	15.120	1.68	83.81	C
			B	0.137	2.819	0.58	1	1	15.120			
			C	0.193	2.62	0.589	1	1	19.320			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	1	1	14.058	1.58	78.88	C
			B	0.129	2.85	0.578	1	1	14.058			
			C	0.191	2.625	0.589	1	1	18.808			
T3 140.00-120.00	0.25	0.93	A	0.232	2.493	0.597	1	1	26.328	2.01	100.66	B
			B	0.232	2.493	0.597	1	1	26.328			
			C	0.214	2.549	0.593	1	1	24.706			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	1	1	9.083	0.69	103.26	B
			B	0.214	2.548	0.593	1	1	9.083			
			C	0.174	2.687	0.585	1	1	7.615			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	1	1	12.273	0.88	131.69	B
			B	0.247	2.446	0.601	1	1	12.273			
			C	0.211	2.559	0.593	1	1	10.919			
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	1	1	10.385	0.77	115.34	B
			B	0.206	2.578	0.592	1	1	10.385			
			C	0.17	2.698	0.585	1	1	8.964			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	1	1	33.786	2.43	121.66	B
			B	0.196	2.608	0.59	1	1	33.786			
			C	0.169	2.703	0.585	1	1	30.038			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	1	1	36.027	2.48	123.99	B
			B	0.176	2.678	0.586	1	1	36.027			
			C	0.153	2.762	0.582	1	1	32.317			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	1	1	37.707	2.40	120.00	B
			B	0.162	2.726	0.583	1	1	37.707			
			C	0.142	2.801	0.58	1	1	33.950			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	1	1	39.441	2.27	113.44	B
			B	0.149	2.775	0.581	1	1	39.441			
			C	0.131	2.843	0.579	1	1	35.701			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	1	1	42.660	2.49	124.69	B
			B	0.137	2.82	0.58	1	1	42.660			
			C	0.13	2.845	0.579	1	1	41.133			
Sum Weight:	2.19	12.11						OTM	1645.24 kip-ft	19.68		

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 ft²	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.05	0.54	A	0.137	2.819	0.58	0.8	1	13.014	1.51	75.25	C
			B	0.137	2.819	0.58	0.8	1	13.014			
			C	0.193	2.62	0.589	0.8	1	17.347			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	0.8	1	12.163	1.43	71.48	C
			B	0.129	2.85	0.578	0.8	1	12.163			
			C	0.191	2.625	0.589	0.8	1	17.045			
T3 140.00-120.00	0.25	0.93	A	0.232	2.493	0.597	0.8	1	23.983	1.83	91.70	B
			B	0.232	2.493	0.597	0.8	1	23.983			
			C	0.214	2.549	0.593	0.8	1	22.309			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	0.8	1	8.429	0.64	95.83	B
			B	0.214	2.548	0.593	0.8	1	8.429			
			C	0.174	2.687	0.585	0.8	1	6.928			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	0.8	1	10.997	0.79	117.99	B
			B	0.247	2.446	0.601	0.8	1	10.997			
			C	0.211	2.559	0.593	0.8	1	9.582			
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	0.8	1	9.467	0.70	105.15	B
			B	0.206	2.578	0.592	0.8	1	9.467			
			C	0.17	2.698	0.585	0.8	1	8.006			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	0.8	1	30.742	2.21	110.70	B
			B	0.196	2.608	0.59	0.8	1	30.742			
			C	0.169	2.703	0.585	0.8	1	26.893			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	0.8	1	32.510	2.24	111.89	B
			B	0.176	2.678	0.586	0.8	1	32.510			
			C	0.153	2.762	0.582	0.8	1	28.704			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	0.8	1	34.229	2.18	108.93	B
			B	0.162	2.726	0.583	0.8	1	34.229			
			C	0.142	2.801	0.58	0.8	1	30.389			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	0.8	1	35.602	2.05	102.40	B
			B	0.149	2.775	0.581	0.8	1	35.602			
			C	0.131	2.843	0.579	0.8	1	31.782			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	0.8	1	37.658	2.20	110.07	B
			B	0.137	2.82	0.58	0.8	1	37.658			
			C	0.13	2.845	0.579	0.8	1	36.093			
Sum Weight:	2.19	12.11						OTM	1490.52 kip-ft	17.77		

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 ft²	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.05	0.54	A	0.137	2.819	0.58	0.85	1	13.540	1.55	77.39	C
			B	0.137	2.819	0.58	0.85	1	13.540			
			C	0.193	2.62	0.589	0.85	1	17.840			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	0.85	1	12.637	1.47	73.33	C
			B	0.129	2.85	0.578	0.85	1	12.637			
			C	0.191	2.625	0.589	0.85	1	17.486			
T3 140.00-	0.25	0.93	A	0.232	2.493	0.597	0.85	1	24.569	1.88	93.94	B

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
120.00			B	0.232	2.493	0.597	0.85	1	24.569			
			C	0.214	2.549	0.593	0.85	1	22.908			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	0.85	1	8.592	0.65	97.69	B
			B	0.214	2.548	0.593	0.85	1	8.592			
			C	0.174	2.687	0.585	0.85	1	7.100			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	0.85	1	11.316	0.81	121.41	B
			B	0.247	2.446	0.601	0.85	1	11.316			
			C	0.211	2.559	0.593	0.85	1	9.916			
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	0.85	1	9.697	0.72	107.69	B
			B	0.206	2.578	0.592	0.85	1	9.697			
			C	0.17	2.698	0.585	0.85	1	8.246			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	0.85	1	31.503	2.27	113.44	B
			B	0.196	2.608	0.59	0.85	1	31.503			
			C	0.169	2.703	0.585	0.85	1	27.680			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	0.85	1	33.389	2.30	114.91	B
			B	0.176	2.678	0.586	0.85	1	33.389			
			C	0.153	2.762	0.582	0.85	1	29.607			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	0.85	1	35.099	2.23	111.70	B
			B	0.162	2.726	0.583	0.85	1	35.099			
			C	0.142	2.801	0.58	0.85	1	31.279			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	0.85	1	36.562	2.10	105.16	B
			B	0.149	2.775	0.581	0.85	1	36.562			
			C	0.131	2.843	0.579	0.85	1	32.762			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	0.85	1	38.909	2.27	113.73	B
			B	0.137	2.82	0.58	0.85	1	38.909			
			C	0.13	2.845	0.579	0.85	1	37.353			
Sum Weight:	2.19	12.11						OTM	1529.20 kip-ft	18.25		

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 ft²	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.13	1.04	A	0.209	2.565	0.592	1	1	21.169	1.67	83.36	C
			B	0.209	2.565	0.592	1	1	21.169			
			C	0.304	2.287	0.617	1	1	29.050			
T2 160.00-140.00	0.14	0.97	A	0.197	2.605	0.59	1	1	19.769	1.59	79.57	C
			B	0.197	2.605	0.59	1	1	19.769			
			C	0.304	2.286	0.617	1	1	28.750			
T3 140.00-120.00	0.65	1.51	A	0.328	2.224	0.625	1	1	36.486	1.89	94.31	B
			B	0.328	2.224	0.625	1	1	36.486			
			C	0.325	2.231	0.624	1	1	36.185			
T4 120.00-113.33	0.27	0.49	A	0.306	2.281	0.618	1	1	12.780	0.66	98.56	B
			B	0.306	2.281	0.618	1	1	12.780			
			C	0.267	2.389	0.606	1	1	11.207			
T5 113.33-106.67	0.27	0.76	A	0.34	2.194	0.629	1	1	16.362	0.80	119.36	B
			B	0.34	2.194	0.629	1	1	16.362			
			C	0.306	2.279	0.618	1	1	14.909			
T6 106.67-100.00	0.27	0.60	A	0.287	2.33	0.612	1	1	14.098	0.72	107.27	B
			B	0.287	2.33	0.612	1	1	14.098			
			C	0.254	2.426	0.603	1	1	12.594			
T7 100.00-80.00	0.83	2.09	A	0.271	2.375	0.608	1	1	45.175	2.25	112.28	B
			B	0.271	2.375	0.608	1	1	45.175			
			C	0.251	2.434	0.602	1	1	42.171			

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
T8 80.00-60.00	0.83	2.27	A	0.244	2.457	0.6	1	1	47.758	2.29	114.28	B
			B	0.244	2.457	0.6	1	1	47.758			
			C	0.226	2.51	0.596	1	1	44.827			
T9 60.00-40.00	0.83	2.55	A	0.218	2.537	0.594	1	1	48.670	2.18	109.24	B
			B	0.218	2.537	0.594	1	1	48.670			
			C	0.203	2.587	0.591	1	1	45.722			
T10 40.00-20.00	0.83	2.69	A	0.2	2.595	0.59	1	1	50.647	2.07	103.27	B
			B	0.2	2.595	0.59	1	1	50.647			
			C	0.187	2.641	0.588	1	1	47.733			
T11 20.00-0.00	0.52	3.51	A	0.175	2.68	0.586	1	1	51.959	2.19	109.40	B
			B	0.175	2.68	0.586	1	1	51.959			
			C	0.174	2.686	0.585	1	1	51.561			
Sum Weight:	5.56	18.49						OTM	1560.61 kip-ft	18.28		

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 ft²	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.13	1.04	A	0.209	2.565	0.592	0.8	1	19.063	1.56	78.01	C
			B	0.209	2.565	0.592	0.8	1	19.063			
			C	0.304	2.287	0.617	0.8	1	27.186			
T2 160.00-140.00	0.14	0.97	A	0.197	2.605	0.59	0.8	1	17.873	1.50	75.00	C
			B	0.197	2.605	0.59	0.8	1	17.873			
			C	0.304	2.286	0.617	0.8	1	27.097			
T3 140.00-120.00	0.65	1.51	A	0.328	2.224	0.625	0.8	1	34.274	1.77	88.59	B
			B	0.328	2.224	0.625	0.8	1	34.274			
			C	0.325	2.231	0.624	0.8	1	33.964			
T4 120.00-113.33	0.27	0.49	A	0.306	2.281	0.618	0.8	1	12.168	0.63	93.85	B
			B	0.306	2.281	0.618	0.8	1	12.168			
			C	0.267	2.389	0.606	0.8	1	10.562			
T5 113.33-106.67	0.27	0.76	A	0.34	2.194	0.629	0.8	1	15.161	0.74	110.60	B
			B	0.34	2.194	0.629	0.8	1	15.161			
			C	0.306	2.279	0.618	0.8	1	13.648			
T6 106.67-100.00	0.27	0.60	A	0.287	2.33	0.612	0.8	1	13.230	0.67	100.67	B
			B	0.287	2.33	0.612	0.8	1	13.230			
			C	0.254	2.426	0.603	0.8	1	11.687			
T7 100.00-80.00	0.83	2.09	A	0.271	2.375	0.608	0.8	1	42.276	2.10	105.07	B
			B	0.271	2.375	0.608	0.8	1	42.276			
			C	0.251	2.434	0.602	0.8	1	39.195			
T8 80.00-60.00	0.83	2.27	A	0.244	2.457	0.6	0.8	1	44.381	2.12	106.20	B
			B	0.244	2.457	0.6	0.8	1	44.381			
			C	0.226	2.51	0.596	0.8	1	41.375			
T9 60.00-40.00	0.83	2.55	A	0.218	2.537	0.594	0.8	1	45.311	2.03	101.70	B
			B	0.218	2.537	0.594	0.8	1	45.311			
			C	0.203	2.587	0.591	0.8	1	42.300			
T10 40.00-20.00	0.83	2.69	A	0.2	2.595	0.59	0.8	1	46.923	1.91	95.67	B
			B	0.2	2.595	0.59	0.8	1	46.923			
			C	0.187	2.641	0.588	0.8	1	43.948			
T11 20.00-0.00	0.52	3.51	A	0.175	2.68	0.586	0.8	1	47.035	1.98	99.04	B
			B	0.175	2.68	0.586	0.8	1	47.035			
			C	0.174	2.686	0.585	0.8	1	46.628			
Sum Weight:	5.56	18.49						OTM	1460.74	17.02		

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
									kip-ft			

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 180.00-160.00	0.13	1.04	A	0.209	2.565	0.592	0.85	1	19.589	1.59	79.35	C
			B	0.209	2.565	0.592	0.85	1	19.589			
			C	0.304	2.287	0.617	0.85	1	27.652			
T2 160.00-140.00	0.14	0.97	A	0.197	2.605	0.59	0.85	1	18.347	1.52	76.14	C
			B	0.197	2.605	0.59	0.85	1	18.347			
			C	0.304	2.286	0.617	0.85	1	27.510			
T3 140.00-120.00	0.65	1.51	A	0.328	2.224	0.625	0.85	1	34.827	1.80	90.02	B
			B	0.328	2.224	0.625	0.85	1	34.827			
			C	0.325	2.231	0.624	0.85	1	34.520			
T4 120.00-113.33	0.27	0.49	A	0.306	2.281	0.618	0.85	1	12.321	0.63	95.03	B
			B	0.306	2.281	0.618	0.85	1	12.321			
			C	0.267	2.389	0.606	0.85	1	10.723			
T5 113.33-106.67	0.27	0.76	A	0.34	2.194	0.629	0.85	1	15.461	0.75	112.79	B
			B	0.34	2.194	0.629	0.85	1	15.461			
			C	0.306	2.279	0.618	0.85	1	13.963			
T6 106.67-100.00	0.27	0.60	A	0.287	2.33	0.612	0.85	1	13.447	0.68	102.32	B
			B	0.287	2.33	0.612	0.85	1	13.447			
			C	0.254	2.426	0.603	0.85	1	11.914			
T7 100.00-80.00	0.83	2.09	A	0.271	2.375	0.608	0.85	1	43.001	2.14	106.87	B
			B	0.271	2.375	0.608	0.85	1	43.001			
			C	0.251	2.434	0.602	0.85	1	39.939			
T8 80.00-60.00	0.83	2.27	A	0.244	2.457	0.6	0.85	1	45.225	2.16	108.22	B
			B	0.244	2.457	0.6	0.85	1	45.225			
			C	0.226	2.51	0.596	0.85	1	42.238			
T9 60.00-40.00	0.83	2.55	A	0.218	2.537	0.594	0.85	1	46.151	2.07	103.59	B
			B	0.218	2.537	0.594	0.85	1	46.151			
			C	0.203	2.587	0.591	0.85	1	43.155			
T10 40.00-20.00	0.83	2.69	A	0.2	2.595	0.59	0.85	1	47.854	1.95	97.57	B
			B	0.2	2.595	0.59	0.85	1	47.854			
			C	0.187	2.641	0.588	0.85	1	44.894			
T11 20.00-0.00	0.52	3.51	A	0.175	2.68	0.586	0.85	1	48.266	2.03	101.63	B
			B	0.175	2.68	0.586	0.85	1	48.266			
			C	0.174	2.686	0.585	0.85	1	47.861			
Sum Weight:	5.56	18.49						OTM	1485.70 kip-ft	17.34		

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 180.00-	0.05	0.54	A	0.137	2.819	0.58	1	1	15.120	0.58	29.00	C

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
160.00			B	0.137	2.819	0.58	1	1	15.120			
			C	0.193	2.62	0.589	1	1	19.320			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	1	1	14.058	0.55	27.29	C
			B	0.129	2.85	0.578	1	1	14.058			
			C	0.191	2.625	0.589	1	1	18.808			
T3 140.00-120.00	0.25	0.93	A	0.232	2.493	0.597	1	1	26.328	0.70	34.83	B
			B	0.232	2.493	0.597	1	1	26.328			
			C	0.214	2.549	0.593	1	1	24.706			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	1	1	9.083	0.24	35.73	B
			B	0.214	2.548	0.593	1	1	9.083			
			C	0.174	2.687	0.585	1	1	7.615			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	1	1	12.273	0.30	45.57	B
			B	0.247	2.446	0.601	1	1	12.273			
			C	0.211	2.559	0.593	1	1	10.919			
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	1	1	10.385	0.27	39.91	B
			B	0.206	2.578	0.592	1	1	10.385			
			C	0.17	2.698	0.585	1	1	8.964			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	1	1	33.786	0.84	42.10	B
			B	0.196	2.608	0.59	1	1	33.786			
			C	0.169	2.703	0.585	1	1	30.038			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	1	1	36.027	0.86	42.90	B
			B	0.176	2.678	0.586	1	1	36.027			
			C	0.153	2.762	0.582	1	1	32.317			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	1	1	37.707	0.83	41.52	B
			B	0.162	2.726	0.583	1	1	37.707			
			C	0.142	2.801	0.58	1	1	33.950			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	1	1	39.441	0.79	39.25	B
			B	0.149	2.775	0.581	1	1	39.441			
			C	0.131	2.843	0.579	1	1	35.701			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	1	1	42.660	0.86	43.15	B
			B	0.137	2.82	0.58	1	1	42.660			
			C	0.13	2.845	0.579	1	1	41.133			
Sum Weight:	2.19	12.11						OTM	569.29 kip-ft	6.81		

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 180.00-160.00	0.05	0.54	A	0.137	2.819	0.58	0.8	1	13.014	0.52	26.04	C
			B	0.137	2.819	0.58	0.8	1	13.014			
			C	0.193	2.62	0.589	0.8	1	17.347			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	0.8	1	12.163	0.49	24.74	C
			B	0.129	2.85	0.578	0.8	1	12.163			
			C	0.191	2.625	0.589	0.8	1	17.045			
T3 140.00-120.00	0.25	0.93	A	0.232	2.493	0.597	0.8	1	23.983	0.63	31.73	B
			B	0.232	2.493	0.597	0.8	1	23.983			
			C	0.214	2.549	0.593	0.8	1	22.309			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	0.8	1	8.429	0.22	33.16	B
			B	0.214	2.548	0.593	0.8	1	8.429			
			C	0.174	2.687	0.585	0.8	1	6.928			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	0.8	1	10.997	0.27	40.83	B
			B	0.247	2.446	0.601	0.8	1	10.997			
			C	0.211	2.559	0.593	0.8	1	9.582			

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
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	0.8	1	9.467	0.24	36.38	B
			B	0.206	2.578	0.592	0.8	1	9.467			
			C	0.17	2.698	0.585	0.8	1	8.006			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	0.8	1	30.742	0.77	38.31	B
			B	0.196	2.608	0.59	0.8	1	30.742			
			C	0.169	2.703	0.585	0.8	1	26.893			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	0.8	1	32.510	0.77	38.72	B
			B	0.176	2.678	0.586	0.8	1	32.510			
			C	0.153	2.762	0.582	0.8	1	28.704			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	0.8	1	34.229	0.75	37.69	B
			B	0.162	2.726	0.583	0.8	1	34.229			
			C	0.142	2.801	0.58	0.8	1	30.389			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	0.8	1	35.602	0.71	35.43	B
			B	0.149	2.775	0.581	0.8	1	35.602			
			C	0.131	2.843	0.579	0.8	1	31.782			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	0.8	1	37.658	0.76	38.09	B
			B	0.137	2.82	0.58	0.8	1	37.658			
			C	0.13	2.845	0.579	0.8	1	36.093			
Sum Weight:	2.19	12.11						OTM	515.75 kip-ft	6.15		

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 180.00-160.00	0.05	0.54	A	0.137	2.819	0.58	0.85	1	13.540	0.54	26.78	C
			B	0.137	2.819	0.58	0.85	1	13.540			
			C	0.193	2.62	0.589	0.85	1	17.840			
T2 160.00-140.00	0.05	0.51	A	0.129	2.85	0.578	0.85	1	12.637	0.51	25.37	C
			B	0.129	2.85	0.578	0.85	1	12.637			
			C	0.191	2.625	0.589	0.85	1	17.486			
T3 140.00-120.00	0.25	0.93	A	0.232	2.493	0.597	0.85	1	24.569	0.65	32.50	B
			B	0.232	2.493	0.597	0.85	1	24.569			
			C	0.214	2.549	0.593	0.85	1	22.908			
T4 120.00-113.33	0.11	0.32	A	0.214	2.548	0.593	0.85	1	8.592	0.23	33.80	B
			B	0.214	2.548	0.593	0.85	1	8.592			
			C	0.174	2.687	0.585	0.85	1	7.100			
T5 113.33-106.67	0.11	0.48	A	0.247	2.446	0.601	0.85	1	11.316	0.28	42.01	B
			B	0.247	2.446	0.601	0.85	1	11.316			
			C	0.211	2.559	0.593	0.85	1	9.916			
T6 106.67-100.00	0.11	0.39	A	0.206	2.578	0.592	0.85	1	9.697	0.25	37.26	B
			B	0.206	2.578	0.592	0.85	1	9.697			
			C	0.17	2.698	0.585	0.85	1	8.246			
T7 100.00-80.00	0.33	1.38	A	0.196	2.608	0.59	0.85	1	31.503	0.79	39.25	B
			B	0.196	2.608	0.59	0.85	1	31.503			
			C	0.169	2.703	0.585	0.85	1	27.680			
T8 80.00-60.00	0.33	1.49	A	0.176	2.678	0.586	0.85	1	33.389	0.80	39.76	B
			B	0.176	2.678	0.586	0.85	1	33.389			
			C	0.153	2.762	0.582	0.85	1	29.607			
T9 60.00-40.00	0.33	1.76	A	0.162	2.726	0.583	0.85	1	35.099	0.77	38.65	B
			B	0.162	2.726	0.583	0.85	1	35.099			
			C	0.142	2.801	0.58	0.85	1	31.279			
T10 40.00-20.00	0.33	1.84	A	0.149	2.775	0.581	0.85	1	36.562	0.73	36.39	B
			B	0.149	2.775	0.581	0.85	1	36.562			

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	0.131	2.843	0.579	0.85	1	32.762			
T11 20.00-0.00	0.20	2.46	A	0.137	2.82	0.58	0.85	1	38.909	0.79	39.35	B
			B	0.137	2.82	0.58	0.85	1	38.909			
			C	0.13	2.845	0.579	0.85	1	37.353			
Sum Weight:	2.19	12.11						OTM	529.13 kip-ft	6.32		

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	5.27					
Bracing Weight	6.84					
Total Member Self-Weight	12.11			-7.55	3.10	
Total Weight	15.69			-7.55	3.10	
Wind 0 deg - No Ice		0.04	-23.26	-2164.88	-2.56	-7.82
Wind 90 deg - No Ice		21.87	-0.04	-13.21	-2043.59	-16.78
Wind 180 deg - No Ice		-0.04	21.36	1995.06	8.77	7.02
Member Ice	6.38					
Total Weight Ice	26.34			-18.15	8.40	
Wind 0 deg - Ice		0.03	-21.87	-2094.42	3.92	-9.39
Wind 90 deg - Ice		20.96	-0.03	-22.62	-1997.26	-14.65
Wind 180 deg - Ice		-0.03	20.61	1958.25	12.87	8.70
Total Weight	15.69			-7.55	3.10	
Wind 0 deg - Service		0.01	-8.05	-745.98	-1.89	-2.71
Wind 90 deg - Service		7.57	-0.01	-1.46	-708.13	-5.81
Wind 180 deg - Service		-0.01	7.39	693.45	2.03	2.43

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 90 deg - No Ice
4	Dead+Wind 180 deg - No Ice
5	Dead+Ice+Temp
6	Dead+Wind 0 deg+Ice+Temp
7	Dead+Wind 90 deg+Ice+Temp
8	Dead+Wind 180 deg+Ice+Temp
9	Dead+Wind 0 deg - Service
10	Dead+Wind 90 deg - Service
11	Dead+Wind 180 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	180 - 160	Leg	Max Tension	8	4.13	0.00	-0.01
			Max. Compression	6	-5.03	-0.01	0.01
			Max. Mx	7	-0.55	0.09	0.00
			Max. My	6	0.01	-0.00	-0.09
			Max. Vy	7	-0.18	0.00	0.00
			Max. Vx	8	-0.19	0.00	0.00
		Diagonal	Max Tension	7	0.88	0.00	0.00
			Max. Compression	7	-0.88	0.00	0.00
			Max. Mx	7	0.36	0.01	-0.00
			Max. My	6	-0.06	0.01	0.00
			Max. Vy	7	0.01	0.01	-0.00
			Max. Vx	6	0.00	0.00	0.00
		Top Girt	Max Tension	6	0.04	0.00	0.00
			Max. Compression	8	-0.07	0.00	0.00
			Max. Mx	5	-0.01	-0.02	0.00
			Max. My	6	-0.04	0.00	-0.00
			Max. Vy	5	0.01	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	8	14.19	-0.00	-0.00
			Max. Compression	6	-16.28	0.06	0.01
			Max. Mx	6	-16.28	0.06	0.01
			Max. My	7	-0.55	-0.00	-0.06
			Max. Vy	6	-0.06	0.06	0.01
			Max. Vx	6	0.07	-0.00	0.03
		Diagonal	Max Tension	7	1.71	0.00	0.00
			Max. Compression	7	-1.74	0.00	0.00
			Max. Mx	6	1.47	0.01	0.00
			Max. My	6	-1.32	0.00	0.00
			Max. Vy	6	-0.01	0.01	0.00
			Max. Vx	6	-0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	8	27.17	-0.07	-0.00
			Max. Compression	6	-32.58	0.02	0.01
			Max. Mx	2	-26.56	0.08	0.00
			Max. My	3	-1.28	-0.01	0.16
			Max. Vy	4	-0.86	-0.04	-0.00
			Max. Vx	3	0.85	-0.00	0.02
		Diagonal	Max Tension	7	2.38	0.00	0.00
			Max. Compression	7	-2.38	0.00	0.00
			Max. Mx	7	0.90	0.03	-0.00
			Max. My	8	-2.15	0.01	-0.01
			Max. Vy	7	0.01	0.03	-0.00
			Max. Vx	8	0.00	0.00	0.00
		Top Girt	Max Tension	4	0.38	0.00	0.00
			Max. Compression	2	-0.36	0.00	0.00
			Max. Mx	5	0.01	-0.02	0.00
			Max. My	8	-0.17	0.00	0.00
			Max. Vy	5	0.01	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
T4	120 - 113.334	Leg	Max Tension	8	31.08	-0.04	-0.01
			Max. Compression	6	-37.07	0.10	0.02
			Max. Mx	2	-35.62	0.11	0.01
			Max. My	3	-1.36	-0.01	0.16
			Max. Vy	4	0.04	-0.10	-0.01
			Max. Vx	3	0.07	-0.01	0.16
		Diagonal	Max Tension	8	2.43	0.00	0.00
			Max. Compression	6	-2.64	0.00	0.00
			Max. Mx	6	1.69	0.03	0.00
			Max. My	8	1.99	0.02	-0.00
			Max. Vy	6	-0.01	0.03	0.00
			Max. Vx	8	0.00	0.00	0.00
T5	113.334 -	Leg	Max Tension	4	35.65	-0.10	-0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
	106.667						
			Max. Compression	6	-42.44	0.05	-0.00
			Max. Mx	2	-40.95	0.11	0.01
			Max. My	3	-1.70	-0.01	0.17
			Max. Vy	2	0.04	0.11	0.01
			Max. Vx	3	-0.07	-0.01	0.17
		Diagonal	Max Tension	4	2.46	0.00	0.00
			Max. Compression	6	-2.75	0.00	0.00
			Max. Mx	7	1.46	0.05	-0.00
			Max. My	8	-2.27	0.01	-0.01
			Max. Vy	7	0.02	0.05	-0.00
			Max. Vx	8	0.00	0.00	0.00
		Horizontal	Max Tension	8	0.61	0.00	0.00
			Max. Compression	2	-0.53	0.00	0.00
			Max. Mx	5	0.10	-0.07	0.00
			Max. My	7	0.11	0.00	0.00
			Max. Vy	5	0.03	0.00	0.00
			Max. Vx	7	-0.00	0.00	0.00
T6	106.667 - 100.001	Leg	Max Tension	4	40.51	-0.06	0.00
			Max. Compression	6	-48.26	0.10	-0.00
			Max. Mx	8	39.90	-0.13	0.00
			Max. My	3	-1.86	-0.01	0.17
			Max. Vy	8	0.05	-0.13	0.00
			Max. Vx	3	0.07	-0.01	0.17
		Diagonal	Max Tension	6	2.65	0.00	0.00
			Max. Compression	3	-2.52	0.00	0.00
			Max. Mx	6	2.63	0.05	-0.00
			Max. My	8	1.97	0.04	-0.01
			Max. Vy	6	-0.02	0.05	-0.00
			Max. Vx	8	0.00	0.00	0.00
T7	100.001 - 80.0007	Leg	Max Tension	4	54.07	-0.11	-0.01
			Max. Compression	6	-63.82	0.18	0.01
			Max. Mx	6	-63.82	0.18	0.01
			Max. My	3	-2.16	-0.01	0.16
			Max. Vy	8	-0.07	-0.13	0.00
			Max. Vx	3	-0.07	-0.01	0.16
		Diagonal	Max Tension	6	2.78	0.00	0.00
			Max. Compression	6	-3.00	0.00	0.00
			Max. Mx	6	2.14	0.05	0.00
			Max. My	8	-2.46	0.02	-0.01
			Max. Vy	8	0.02	0.05	-0.00
			Max. Vx	8	0.00	0.00	0.00
T8	80.0007 - 60.0007	Leg	Max Tension	4	67.00	-0.10	-0.01
			Max. Compression	6	-79.31	-0.03	0.02
			Max. Mx	8	64.65	-0.35	-0.02
			Max. My	7	-6.02	-0.19	0.18
			Max. Vy	8	0.09	-0.35	-0.02
			Max. Vx	3	-0.07	0.00	0.18
		Diagonal	Max Tension	6	3.12	0.00	0.00
			Max. Compression	6	-3.14	0.00	0.00
			Max. Mx	6	2.18	0.06	0.00
			Max. My	8	-2.59	0.02	-0.01
			Max. Vy	8	0.03	0.06	-0.01
			Max. Vx	8	0.00	0.00	0.00
T9	60.0007 - 40.0007	Leg	Max Tension	4	78.68	-0.21	-0.02
			Max. Compression	6	-93.30	-0.11	0.02
			Max. Mx	8	75.16	-0.61	-0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	3	-3.76	-0.03	0.38
			Max. Vy	8	0.12	-0.61	-0.02
			Max. Vx	3	0.11	-0.03	0.38
		Diagonal	Max Tension	8	3.82	0.00	0.00
			Max. Compression	2	-3.93	0.00	0.00
			Max. Mx	8	2.49	0.09	-0.01
			Max. My	8	-3.56	0.06	-0.01
			Max. Vy	8	0.04	0.09	-0.01
			Max. Vx	8	0.00	0.00	0.00
T10	40.0007 - 20.0007	Leg	Max Tension	4	90.98	-0.16	-0.02
			Max. Compression	6	-108.11	-0.29	0.02
			Max. Mx	8	86.25	-0.99	-0.02
			Max. My	3	-4.56	-0.04	0.43
			Max. Vy	8	0.18	-0.99	-0.02
			Max. Vx	3	0.11	-0.04	0.43
		Diagonal	Max Tension	8	4.15	0.00	0.00
			Max. Compression	2	-4.13	0.00	0.00
			Max. Mx	8	2.40	0.11	-0.01
			Max. My	8	-3.88	0.08	-0.02
			Max. Vy	8	0.04	0.11	-0.01
			Max. Vx	8	0.00	0.00	0.00
T11	20.0007 - 0	Leg	Max Tension	4	102.92	-0.34	-0.01
			Max. Compression	6	-122.68	-0.00	-0.00
			Max. Mx	6	-114.45	1.02	0.01
			Max. My	3	-5.35	-0.04	0.77
			Max. Vy	8	-0.20	-0.99	-0.02
			Max. Vx	3	0.16	-0.04	0.77
		Diagonal	Max Tension	8	4.94	0.00	0.00
			Max. Compression	2	-4.78	0.00	0.00
			Max. Mx	8	2.20	0.23	-0.01
			Max. My	8	-4.61	0.16	-0.03
			Max. Vy	8	0.06	0.23	-0.01
			Max. Vx	8	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	8	64.04	4.12	-4.10
	Max. H_x	4	61.23	5.07	-4.76
	Max. H_z	7	-88.37	-10.04	5.45
	Min. Vert	3	-93.73	-9.51	5.12
	Min. H_x	7	-88.37	-10.04	5.45
	Min. H_z	4	61.23	5.07	-4.76
Leg B	Max. Vert	7	104.67	-9.07	-4.87
	Max. H_x	6	-49.85	5.65	4.43
	Max. H_z	6	-49.85	5.65	4.43
	Min. Vert	2	-54.95	4.96	4.32
	Min. H_x	3	103.45	-10.27	-5.51
	Min. H_z	3	103.45	-10.27	-5.51
Leg A	Max. Vert	2	125.83	-0.22	14.23
	Max. H_x	8	-100.49	0.24	-12.85
	Max. H_z	2	125.83	-0.22	14.23
	Min. Vert	4	-105.91	0.20	-12.20
	Min. H_x	3	5.97	-2.09	0.43

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. H_z	8	-100.49	0.24	-12.85

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	15.69	0.00	0.00	-7.55	3.10	-0.00
Dead+Wind 0 deg - No Ice	15.69	0.04	-23.26	-2170.29	-2.54	-7.84
Dead+Wind 90 deg - No Ice	15.69	21.87	-0.04	-13.28	-2048.72	-16.81
Dead+Wind 180 deg - No Ice	15.69	-0.04	21.36	2000.08	8.81	7.04
Dead+Ice+Temp	26.34	0.00	0.00	-18.19	8.43	-0.00
Dead+Wind 0 deg+Ice+Temp	26.34	0.03	-21.87	-2103.22	4.00	-9.44
Dead+Wind 90 deg+Ice+Temp	26.34	20.96	-0.03	-22.74	-2005.66	-14.73
Dead+Wind 180 deg+Ice+Temp	26.34	-0.03	20.61	1966.51	12.96	8.74
Dead+Wind 0 deg - Service	15.69	0.01	-8.05	-755.93	1.15	-2.71
Dead+Wind 90 deg - Service	15.69	7.57	-0.01	-9.53	-706.87	-5.82
Dead+Wind 180 deg - Service	15.69	-0.01	7.39	687.13	5.08	2.44

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-15.69	0.00	0.00	15.69	0.00	0.000%
2	0.04	-15.69	-23.26	-0.04	15.69	23.26	0.000%
3	21.87	-15.69	-0.04	-21.87	15.69	0.04	0.000%
4	-0.04	-15.69	21.36	0.04	15.69	-21.36	0.000%
5	0.00	-26.34	0.00	0.00	26.34	0.00	0.000%
6	0.03	-26.34	-21.87	-0.03	26.34	21.87	0.000%
7	20.96	-26.34	-0.03	-20.96	26.34	0.03	0.000%
8	-0.03	-26.34	20.61	0.03	26.34	-20.61	0.000%
9	0.01	-15.69	-8.05	-0.01	15.69	8.05	0.000%
10	7.57	-15.69	-0.01	-7.57	15.69	0.01	0.000%
11	-0.01	-15.69	7.39	0.01	15.69	-7.39	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	0.00000197
3	Yes	4	0.00000001	0.00000267
4	Yes	4	0.00000001	0.00000302
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000488
7	Yes	4	0.00000001	0.00000365
8	Yes	4	0.00000001	0.00000228
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001

11	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	5.941	9	0.2915	0.0173
T2	160 - 140	4.719	9	0.2845	0.0155
T3	140 - 120	3.563	9	0.2508	0.0120
T4	120 - 113.334	2.574	9	0.2090	0.0127
T5	113.334 - 106.667	2.287	9	0.1959	0.0126
T6	106.667 - 100.001	2.015	9	0.1815	0.0123
T7	100.001 - 80.0007	1.768	9	0.1664	0.0118
T8	80.0007 - 60.0007	1.125	9	0.1296	0.0099
T9	60.0007 - 40.0007	0.640	9	0.0898	0.0071
T10	40.0007 - 20.0007	0.301	9	0.0612	0.0046
T11	20.0007 - 0	0.083	9	0.0315	0.0018

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	2 Bay Dipole	9	5.941	0.2915	0.0173	357791
178.00	3' Side Mount Standoff	9	5.818	0.2914	0.0172	357791
155.00	2" Dia 10' Omni	9	4.420	0.2784	0.0147	56139
150.00	3' Side Mount Standoff	9	4.126	0.2704	0.0138	40226
144.00	2" Dia 8' Omni	9	3.784	0.2590	0.0127	30023
140.00	2' Side Mount Standoff	9	3.563	0.2508	0.0120	26371
135.00	APL868013-42T0	9	3.298	0.2402	0.0118	25125
104.00	2" Dia 8' Omni	9	1.914	0.1754	0.0121	22645
100.00	2' Side Mount Standoff	9	1.768	0.1664	0.0118	33049

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	17.090	2	0.8435	0.0601
T2	160 - 140	13.567	2	0.8213	0.0532
T3	140 - 120	10.237	2	0.7216	0.0416
T4	120 - 113.334	7.393	2	0.6005	0.0367
T5	113.334 - 106.667	6.568	2	0.5627	0.0364
T6	106.667 - 100.001	5.787	2	0.5212	0.0355
T7	100.001 - 80.0007	5.078	2	0.4778	0.0342
T8	80.0007 - 60.0007	3.232	2	0.3721	0.0287
T9	60.0007 - 40.0007	1.838	2	0.2576	0.0205
T10	40.0007 - 20.0007	0.866	2	0.1755	0.0132
T11	20.0007 - 0	0.239	2	0.0903	0.0053

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	2 Bay Dipole	2	17.090	0.8435	0.0601	115239
178.00	3' Side Mount Standoff	2	16.735	0.8432	0.0595	115239
155.00	2" Dia 10' Omni	2	12.705	0.8026	0.0506	18178
150.00	3' Side Mount Standoff	2	11.858	0.7787	0.0477	13138
144.00	2" Dia 8' Omni	2	10.872	0.7456	0.0440	9861
140.00	2' Side Mount Standoff	2	10.237	0.7216	0.0416	8693
135.00	APL868013-42T0	2	9.473	0.6910	0.0387	8354
104.00	2" Dia 8' Omni	2	5.496	0.5036	0.0350	7828
100.00	2' Side Mount Standoff	2	5.078	0.4777	0.0342	11427

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	180	Diagonal	A325N	0.6250	1	0.88	4.08	0.216 ✓	1.333	Member Bearing
T2	160	Leg	A325N	0.6250	4	1.40	13.50	0.104 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	1.71	4.08	0.420 ✓	1.333	Member Bearing
T3	140	Leg	A325N	0.6250	4	4.10	13.50	0.304 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	2.38	6.12	0.389 ✓	1.333	Member Bearing
T4	120	Leg	A325N	0.6250	4	7.77	13.50	0.576 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	2.64	6.44	0.409 ✓	1.333	Bolt Shear
T5	113.334	Diagonal	A325N	0.6250	1	2.75	6.44	0.427 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.5000	1	0.61	4.12	0.147 ✓	1.333	Bolt Shear
T6	106.667	Diagonal	A325N	0.6250	1	2.65	6.12	0.433 ✓	1.333	Member Bearing
T7	100.001	Leg	A325N	0.7500	4	11.24	19.44	0.578 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	3.00	6.44	0.466 ✓	1.333	Bolt Shear
T8	80.0007	Leg	A325N	0.8750	4	14.63	26.46	0.553 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	3.12	6.12	0.510 ✓	1.333	Member Bearing
T9	60.0007	Leg	A325N	0.8750	4	18.08	26.46	0.683 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	3.82	6.12	0.625 ✓	1.333	Member Bearing
T10	40.0007	Leg	A325N	0.8750	4	21.25	26.46	0.803 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	4.15	6.12	0.678 ✓	1.333	Member Bearing
T11	20.0007	Leg	A325N	1.0000	4	24.29	34.56	0.703 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	4.94	6.44	0.767 ✓	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 $\frac{P}{P_a}$
T1	180 - 160	ROHN 2 STD	20.00	4.00	61.0 K=1.00	22.549	1.0745	-5.03	24.23	0.208 ✓
T2	160 - 140	ROHN 2 STD	20.00	4.00	61.0 K=1.00	22.549	1.0745	-16.28	24.23	0.672 ✓
T3	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4 K=1.00	22.122	1.7040	-32.58	37.70	0.864 ✓
T4	120 - 113.334	ROHN 2.5 EH	6.68	6.68	86.7 K=1.00	17.636	2.2535	-37.07	39.74	0.933 ✓
T5	113.334 - 106.667	ROHN 2.5 EH	6.68	6.68	86.7 K=1.00	17.634	2.2535	-42.44	39.74	1.068 ✓
T6	106.667 - 100.001	ROHN 2.5 EH	6.68	6.68	86.7 K=1.00	17.634	2.2535	-48.26	39.74	1.215 ✓
T7	100.001 - 80.0007	ROHN 3 X-STR	20.03	6.68	70.5 K=1.00	20.841	3.0159	-63.82	62.86	1.015 ✓
T8	80.0007 - 60.0007	ROHN 3 EH	20.04	6.68	70.5 K=1.00	20.839	3.0159	-79.31	62.85	1.262 ✓
T9	60.0007 - 40.0007	ROHN 4 X-STR	20.03	10.02	81.4 K=1.00	18.731	4.4074	-93.30	82.56	1.130 ✓
T10	40.0007 - 20.0007	ROHN 4 X-STR	20.04	10.02	81.4 K=1.00	18.729	4.4074	-108.11	82.55	1.310 ✓
T11	20.0007 - 0	ROHN 5 STD	20.03	10.02	64.0 K=1.00	22.021	4.2999	-122.68	94.69	1.296 ✓

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	180 - 160	L1 1/2x1 1/2x1/8	7.65	3.57	144.8 K=1.00	7.126	0.3594	-0.88	2.56	0.344 ✓
T2	160 - 140	L1 1/2x1 1/2x1/8	7.68	3.59	145.5 K=1.00	7.055	0.3594	-1.74	2.54	0.687 ✓
T3	140 - 120	L2x2x3/16	9.70	4.72	143.8 K=1.00	7.225	0.7150	-2.28	5.17	0.441 ✓
T4	120 - 113.334	L2x2x3/16	11.12	5.49	167.1 K=1.00	5.345	0.7150	-2.64	3.82	0.690 ✓
T5	113.334 - 106.667	L2 1/2x2 1/2x3/16	11.67	5.76	139.7 K=1.00	7.653	0.9020	-2.75	6.90	0.399 ✓
T6	106.667 - 100.001	L2 1/2x2 1/2x3/16	12.24	6.04	146.5 K=1.00	6.958	0.9020	-2.52	6.28	0.401 ✓
T7	100.001 - 80.0007	L2 1/2x2 1/2x3/16	13.96	6.87	166.5 K=1.00	5.384	0.9020	-3.00	4.86	0.618 ✓
T8	80.0007 - 60.0007	L2 1/2x2 1/2x3/16	15.82	7.81	189.3 K=1.00	4.167	0.9020	-3.10	3.76	0.824 ✓

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 $\frac{P}{P_a}$
T9	60.0007 - 40.0007	L3x3x3/16	19.04	9.46	190.4 K=1.00	4.118	1.0900	-3.93	4.49	0.875 ✓
T10	40.0007 - 20.0007	L3x3x3/16	20.81	10.35	208.5 K=1.00	3.437	1.0900	-4.13	3.75	1.103 ✓
T11	20.0007 - 0	KL/R > 200 (C) - 194 L3 1/2x3 1/2x1/4	22.61	11.19	193.5 K=1.00	3.987	1.6900	-4.78	6.74	0.709 ✓

Horizontal 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 $\frac{P}{P_a}$
T5	113.334 - 106.667	L3x3x3/16	9.24	8.77	176.6 K=1.00	4.788	1.0900	-0.53	5.22	0.102 ✓

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	180 - 160	L2x2x1/8	6.52	6.32	163.6 K=0.86	5.582	0.4844	-0.07	2.70	0.025 ✓
T3	140 - 120	L2x2x1/8	6.56	6.36	164.3 K=0.86	5.532	0.4844	-0.36	2.68	0.136 ✓

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	180 - 160	ROHN 2 STD	20.00	4.00	61.0	30.000	1.0745	4.13	32.24	0.128 ✓
T2	160 - 140	ROHN 2 STD	20.00	4.00	61.0	30.000	1.0745	14.20	32.24	0.440 ✓
T3	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4	30.000	1.7040	27.17	51.12	0.531 ✓
T4	120 - 113.334	ROHN 2.5 EH	6.68	6.68	86.7	30.000	2.2535	31.08	67.61	0.460 ✓
T5	113.334 -	ROHN 2.5 EH	6.68	6.68	86.7	30.000	2.2535	35.65	67.61	0.527

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 $\frac{P}{P_a}$
	106.667									✓
T6	106.667 - 100.001	ROHN 2.5 EH	6.68	6.68	86.7	30.000	2.2535	40.51	67.61	0.599 ✓
T7	100.001 - 80.0007	ROHN 3 X-STR	20.03	6.68	70.5	30.000	3.0159	54.07	90.48	0.598 ✓
T8	80.0007 - 60.0007	ROHN 3 EH	20.04	6.68	70.5	30.000	3.0159	67.00	90.48	0.740 ✓
T9	60.0007 - 40.0007	ROHN 4 X-STR	20.03	10.02	81.4	30.000	4.4074	78.68	132.22	0.595 ✓
T10	40.0007 - 20.0007	ROHN 4 X-STR	20.04	10.02	81.4	30.000	4.4074	90.98	132.22	0.688 ✓
T11	20.0007 - 0	ROHN 5 STD	20.03	10.02	64.0	30.000	4.2999	102.92	129.00	0.798 ✓

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	180 - 160	L1 1/2x1 1/2x1/8	7.65	3.57	95.7	29.000	0.2656	0.88	7.70	0.115 ✓
T2	160 - 140	L1 1/2x1 1/2x1/8	7.68	3.59	96.1	29.000	0.2656	1.71	7.70	0.222 ✓
T3	140 - 120	L2x2x3/16	8.86	4.31	86.4	21.600	0.7150	2.38	15.44	0.154 ✓
T4	120 - 113.334	L2x2x3/16	11.12	5.49	109.4	21.600	0.7150	2.43	15.44	0.158 ✓
T5	113.334 - 106.667	L2 1/2x2 1/2x3/16	11.67	5.76	91.0	21.600	0.9020	2.46	19.48	0.126 ✓
T6	106.667 - 100.001	L2 1/2x2 1/2x3/16	12.24	6.04	95.3	21.600	0.9020	2.65	19.48	0.136 ✓
T7	100.001 - 80.0007	L2 1/2x2 1/2x3/16	13.38	6.58	103.6	21.600	0.9020	2.78	19.48	0.142 ✓
T8	80.0007 - 60.0007	L2 1/2x2 1/2x3/16	15.82	7.81	122.5	21.600	0.9020	3.12	19.48	0.160 ✓
T9	60.0007 - 40.0007	L3x3x3/16	19.04	9.46	122.6	21.600	1.0900	3.82	23.54	0.162 ✓
T10	40.0007 - 20.0007	L3x3x3/16	20.81	10.35	134.0	21.600	1.0900	4.15	23.54	0.176 ✓
T11	20.0007 - 0	L3 1/2x3 1/2x1/4	22.61	11.19	124.7	21.600	1.6900	4.94	36.50	0.135 ✓

Horizontal 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 $\frac{P}{P_a}$

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 $\frac{P}{P_a}$
T5	113.334 - 106.667	L3x3x3/16	9.24	8.77	115.0	21.600	1.0900	0.61	23.54	0.026 ✓

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	180 - 160	L2x2x1/8	6.52	6.32	121.1	21.600	0.4844	0.04	10.46	0.004 ✓
T3	140 - 120	L2x2x1/8	6.56	6.36	121.9	21.600	0.4844	0.38	10.46	0.036 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 2 STD	3	-5.03	32.30	15.6	Pass
T2	160 - 140	Leg	ROHN 2 STD	39	-16.28	32.30	50.4	Pass
T3	140 - 120	Leg	ROHN 2.5 STD	72	-32.58	50.25	64.8	Pass
T4	120 - 113.334	Leg	ROHN 2.5 EH	102	-37.07	52.98	70.0	Pass
T5	113.334 - 106.667	Leg	ROHN 2.5 EH	111	-42.44	52.97	80.1	Pass
T6	106.667 - 100.001	Leg	ROHN 2.5 EH	123	-48.26	52.97	91.1	Pass
T7	100.001 - 80.0007	Leg	ROHN 3 X-STR	132	-63.82	83.79	76.2	Pass
T8	80.0007 - 60.0007	Leg	ROHN 3 EH	153	-79.31	83.78	94.7	Pass
T9	60.0007 - 40.0007	Leg	ROHN 4 X-STR	174	-93.30	110.05	84.8	Pass
T10	40.0007 - 20.0007	Leg	ROHN 4 X-STR	189	-108.11	110.04	98.2	Pass
T11	20.0007 - 0	Leg	ROHN 5 STD	204	-122.68	126.22	97.2	Pass
T1	180 - 160	Diagonal	L1 1/2x1 1/2x1/8	8	-0.88	3.41	25.8	Pass
T2	160 - 140	Diagonal	L1 1/2x1 1/2x1/8	41	-1.74	3.38	51.5	Pass
T3	140 - 120	Diagonal	L2x2x3/16	77	-2.28	6.89	33.1	Pass
T4	120 - 113.334	Diagonal	L2x2x3/16	107	-2.64	5.09	51.8	Pass
T5	113.334 - 106.667	Diagonal	L2 1/2x2 1/2x3/16	119	-2.75	9.20	29.9 32.0 (b)	Pass
T6	106.667 - 100.001	Diagonal	L2 1/2x2 1/2x3/16	125	-2.52	8.37	30.1 32.5 (b)	Pass
T7	100.001 - 80.0007	Diagonal	L2 1/2x2 1/2x3/16	137	-3.00	6.47	46.4	Pass
T8	80.0007 - 60.0007	Diagonal	L2 1/2x2 1/2x3/16	158	-3.10	5.01	61.8	Pass
T9	60.0007 - 40.0007	Diagonal	L3x3x3/16	179	-3.93	5.98	65.7	Pass
T10	40.0007 - 20.0007	Diagonal	L3x3x3/16	194	-4.13	4.99	82.7	Pass
T11	20.0007 - 0	Diagonal	L3 1/2x3 1/2x1/4	209	-4.78	8.98	53.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T5	113.334 - 106.667	Horizontal	L3x3x3/16	112	-0.53	6.96	57.5 (b) 7.7	Pass
T1	180 - 160	Top Girt	L2x2x1/8	4	-0.07	3.60	11.0 (b) 1.8	Pass
T3	140 - 120	Top Girt	L2x2x1/8	73	-0.36	3.57	10.2	Pass
							Summary	
						Leg (T10)	98.2	Pass
						Diagonal (T10)	82.7	Pass
						Horizontal (T5)	11.0	Pass
						Top Girt (T3)	10.2	Pass
						Bolt Checks	60.3	Pass
						RATING =	**98.2**	**Pass**

Element Map

Section No.	Section Elevation ft	Component Type	Element List
T1	180.00-160.00	Leg	1-3
		Diagonal	7-36
		Top Girt	4-6
T2	160.00-140.00	Leg	37-39
		Diagonal	40-69
T3	140.00-120.00	Leg	70-72
		Diagonal	76-99
		Top Girt	73-75
T4	120.00-113.33	Leg	100-102
		Diagonal	103-108
T5	113.33-106.67	Leg	109-111
		Diagonal	115-120
		Horizontal	112-114
T6	106.67-100.00	Leg	121-123
		Diagonal	124-129
T7	100.00-80.00	Leg	130-132
		Diagonal	133-150
T8	80.00-60.00	Leg	151-153
		Diagonal	154-171
T9	60.00-40.00	Leg	172-174
		Diagonal	175-186
T10	40.00-20.00	Leg	187-189
		Diagonal	190-201
T11	20.00-0.00	Leg	202-204
		Diagonal	205-216
			Total number of elements: 216

CENTEK engineering
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Subject:	Anchor Bolt Analysis
Location:	Wolcott, CT
Rev. 0: 1/24/11	Prepared by: T.J.L. Checked by: C.F.C. Job No. 11001.CO.1

Tower Anchor Bolt Analysis

Max Leg Reactions:

Uplift = Uplift := 106·kips (User Input)

Shear = Shear := 14·kips (User Input)

Compression = Compression := 126·kips (User Input)

Anchor Bolt Data:

Use ASTM A354 Gr. BC

Number of Anchor Bolts = $N := 4$ (User Input)

Bolt Ultimate Strength = $F_u := 125ksi$ (User Input)

Bolt Yield Strength = $F_y := 109ksi$ (User Input)

Diameter of Bolts = $D := 1.0in$ (User Input)

Threads per Inch = $n := 8$ (User Input)

Coefficient of Friction = $\mu := 0.55$ (User Input)

Anchor Bolt Area:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.606 \cdot in^2$ (AISC 13th Ed. pg. 7-83)

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Subject: Anchor Bolt Analysis

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Job No. 11001.CO.1

Check Tensile Force:

Maximum Tensile Force (Gross Area) =

$$F_{gross.area} := 1.33 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 43.1 \cdot kips$$

Maximum Tensile Force (Net Area) =

$$F_{net.area} := 1.33 \cdot \left(0.60 \cdot A_n \cdot F_y\right) = 52.7 \cdot kips$$

Allowable Tension =

$$AllowableTension := \begin{cases} F_{gross.area} & \text{if } F_{gross.area} < F_{net.area} \\ F_{net.area} & \text{if } F_{net.area} < F_{gross.area} \end{cases}$$

$$AllowableTension = 43.1 \cdot kips$$

Applied Tension =

$$MaxTension := \frac{Uplift}{N} = 26.5 \cdot kips$$

$$\frac{MaxTension}{F_{net.area}} = 50.3 \cdot \%$$

$$Condition1 := if\left(\frac{MaxTension}{F_{net.area}} \le 1.00, "OK", "Overstressed"\right)$$

Condition1 = "OK"

Check Anchor Bolt Area:

Based on the ASCE 10-97 Design of Latticed Steel Transmission Structures

Required Area =

$$A_{s1} := \frac{Uplift}{F_y} + \frac{Shear}{\mu \cdot .85 \cdot F_y} = 1.2 \cdot in^2$$

$$A_{s2} := \left|\frac{Shear - (0.3 \cdot Compression)}{\mu \cdot .85 \cdot F_y}\right| = 0.467 \cdot in^2$$

Provided Area =

$$A_{sprovided} := A_n \cdot N = 2.4 \cdot in^2$$

$$Condition2 := if\left(\frac{A_{s1}}{A_{sprovided}} \le 1.00, "OK", "Overstressed"\right)$$

Condition2 = "OK"

$$Condition3 := if\left(\frac{A_{s2}}{A_{sprovided}} \le 1.00, "OK", "Overstressed"\right)$$

Condition3 = "OK"

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Subject:	FOUNDATION ANALYSIS
Location:	Wolcott, CT
Rev. 0: 1/24/11	Prepared by: T.J.L. Checked by: C.F.C. Job No. 11001.CO1

Pier and Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 2170 \cdot ft \cdot kips$	(User Input from RISATower)	
Shear Force =	$S_t := 23 \cdot kip$	(User Input from RISATower)	
Axial Force =	$WT_t := 16 \cdot kip$	(User Input from RISATower)	
Max Compression Force =	$C_t := 126 \cdot kip$	(User Input from RISATower)	
Max Uplift Force =	$U_t := 106 \cdot kip$	(User Input from RISATower)	
Tower Height =	$H_t := 180 \cdot ft$	(User Input)	
Tower Width =	$W_t := 20.78 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 4.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 0 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 4.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 28.5 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 34 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 3000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 60 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 0$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.0 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 0$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 4 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 0$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 0 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 0$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 7$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 0.875 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 29$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^{2}}{4} = 0.785 \cdot in^{2}$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^{2}}{4} = 0 \cdot in^{2}$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^{2}}{4} = 0.601 \cdot in^{2}$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.537$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft} \right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}\left(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}\right) = 150\cdot\text{pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 60\cdot\text{pcf}$$

Passive Pressure =

$$P_{pn} := K_p\cdot\gamma_s\cdot n + c\cdot 2\cdot\sqrt{K_p} = 0\cdot\text{ksf}$$

$$P_{pt} := K_p\cdot\gamma_s\cdot\left(D_f - T_f\right) + c\cdot 2\cdot\sqrt{K_p} = 0\cdot\text{ksf}$$

$$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0\cdot\text{ksf}$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 0.849\cdot\text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.424\cdot\text{ksf}$$

$$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 4$$

$$A_p := W_f\cdot T_p = 114$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 48.388\cdot\text{kip}$$

Weight of Concrete =

$$WT_c := \left[\left(W_f^{\,2}\cdot T_f\right) + (3)\cdot\left(\frac{d_p^{\,2}\cdot\pi}{4}L_p\right)\right]\cdot\gamma_c = 487.35\cdot\text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left[W_f^{\,2} - (3)\cdot\left(\frac{d_p^{\,2}\cdot\pi}{4}\right)\right]\cdot\left(\left|L_p - L_{pag} - n\right|\right)\right]\cdot\gamma_s = 0\cdot\text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left[\frac{\left(L_p - L_{pag}\right)^2\cdot\tan\left(\Phi_s\right)}{2}\cdot W_f\right]\cdot\gamma_s = 0\cdot\text{kip}$$

Tower Offset =

$$X_{t1} := \left[\frac{W_f}{2} - \frac{\left(W_t\cdot\cos(30\cdot\text{deg})\right)}{2}\right] \qquad X_{t2} := \frac{W_f}{2} - \frac{\left(W_t\cdot\cos(30\cdot\text{deg})\right)}{3}$$

$$X_t := \text{if}\left(\text{Pos}_t = 1, X_{t1}, X_{t2}\right) = 8.251$$

$$X_{off1} := \frac{W_f}{2} - \left[\frac{\left(W_t\cdot\cos(30\cdot\text{deg})\right)}{3} + X_t\right] = 0 \qquad X_{off2} := 0$$

$$X_{off} := \text{if}\left(\text{Pos}_t = 1, X_{off1}, X_{off2}\right) = 0$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} = 487.3\cdot\text{kip}$$

Resisting Moment =

$$M_r := \left(WT_{tot}\right)\cdot\frac{W_f}{2} + S_u\cdot\frac{T_f}{3} + WT_{s2}\cdot\left[W_f + \frac{\left(L_p - L_{pag}\right)\cdot\tan\left(\Phi_s\right)}{3}\right] = 7009\cdot\text{kip}\cdot\text{ft}$$

Overturning Moment =

$$M_{ot} := OM + S_t\cdot\left(L_p + T_f\right) = 2262\cdot\text{kip}\cdot\text{ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 3.1$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning\_Moment\_Check} := \text{if}\left(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$$

OverTurning_Moment_Check = "Okay"

Bearing Pressure Caused by Footing:

Total Load =

$Load_{tot} := WT_c + WT_{s1} + WT_t = 503 \cdot kip$

Area of the Mat =

$A_{mat} := W_f^{\,2} = 812.25$

Section Modulus of Mat =

$S := \frac{W_f^{\,3}}{6} = 3858.19 \cdot ft^3$

Maximum Pressure in Mat =

$P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.206 \cdot ksf$

$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No\ Good"\right)$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat =

$P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.033 \cdot ksf$

$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), "Okay", "No\ Good"\right]$

Min_Pressure_Check = "Okay"

Distance to Resultant of Pressure Distribution =

$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 9.771$

Distance to Kern =

$X_k := \frac{W_f}{6} = 4.75$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity =

$e := \frac{M_{ot}}{WT_{tot}} = 4.641$

Adjusted Soil Pressure =

$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 1.186 \cdot ksf$

$q_{adj} := if\left(P_{min} < 0, P_a, P_{max}\right) = 1.206 \cdot ksf$

$Pressure\_Check := if\left(q_{adj} < q_s, "Okay", "No\ Good"\right)$

Pressure_Check = "Okay"

Shear Strength of Concrete:

Beam Shear:

(Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 44.125 \cdot in$

$FL := LF \cdot \frac{C_t}{W_f^2} = 0.207 \cdot ksf$

$V_{req} := FL \cdot \left(X_t - .5 \cdot d_p - d\right) \cdot W_f = 26.957 \cdot kips$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d = 1405 \cdot kip$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if\left(V_{req} < V_{Avail}, "Okay", "No Good"\right)$

Beam_Shear_Check = "Okay"

Punching Shear:

(Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 11.6$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 10.6$

Required Shear Strength = $V_{req} := FL \cdot \left(W_f^2 - A_{bo}\right) = 166 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1139.1 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if\left(V_{req} < V_{Avail}, "Okay", "No Good"\right)$

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$$M_{nT} := LF\cdot\left[U_t\cdot\left(W_t\cdot\sin(60\cdot deg) - \frac{d_p}{2}\right) + S_t\cdot\left(D_f + L_{pag}\right)\right] - WT_t\cdot X_{off} = 3\times 10^6\,lbf$$

$$M_{nS} := -1\cdot\left[\frac{1}{2}\cdot\left(\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2}\right)^2\cdot W_t\cdot\left[\gamma_s\cdot\left(T_f - T_f\right)\right] + WT_{s2}\cdot\left[\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2} + \left(D_f - n\right)\cdot\tan\left(\Phi_s\right)\right]\right]$$

$$M_{nC} := -1\cdot\left[\frac{1}{2}\cdot\left(\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2}\right)^2\cdot W_t\cdot\left(\gamma_c\cdot T_f\right)\right]$$

Design Moment = $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m} = 121.603\cdot kips\cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500\cdot psi \le f_c \le 4000\cdot psi \\ 0.65 & \text{if } f_c > 8000\cdot psi \\ \left[\left[0.85 - \left[\dfrac{\left(\dfrac{f_c}{psi} - 4000\right)}{1000}\right]\cdot 0.5\right]\right] & \text{otherwise} \end{cases} = 0.85 \quad \text{(ACI-200810.2.7.3)}$$

$b_{eff} := W_t\cdot\cos(30\cdot deg) + d_p = 215.952\cdot in$

$A_s := \dfrac{M_n}{\left(f_y\cdot d\right)} = 0.551\cdot in^2$

$a := \dfrac{A_s\cdot f_y}{\beta\cdot f_c\cdot b_{eff}} = 0.06\cdot in$

$A_s := \dfrac{M_n}{f_y\cdot\left(d - \dfrac{a}{2}\right)} = 0.552\cdot in^2$

$\rho := \dfrac{A_s}{b_{eff}\,d} = 0.00069\cdot in$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018 \qquad \text{(ACI -2008 7.12.2.1)}$$

Check Bottom Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 8.6 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 17.4 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if\left(As_{prov} > As, \text{"Okay"}, \text{"No Good"}\right)$$

Pad_Reinforcement_Bot = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 11.09 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0 \qquad \text{(ACI-2008 12.2.3)}$$

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 21 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in \qquad \text{(ACI-2008 12.2.1)}$$

$$L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, \text{"Use L.dbt"}, \text{"Use L.dbmin"}\right) = \text{"Use L.dbt"}$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 43.32 \cdot in$$

$$Lpad\_Check := if\left(L_{Pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"}\right)$$

Lpad_Check = "Okay"

SITE NAME	WOLCOTT N CT	ECP - CELL #	2	343
LATITUDE	41-37-05.37 N	LONGITUDE	72-58-14.38 W	
Additional Comments:		SAVE BUTTON		
		STRUCTURE TYPE	LATTICE	

700 Mhz - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70063-6CF 4°	BXA-70063-6CF 4°	BXA-70063-6CF 4°
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	20	180	280
DOWN TILT (MECH/DEG)	0°	3°	0°
RAD CTR (FT AGL)	135	135	135
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
MCPA BRICKS (QTY)			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	WPA-80063-4CF	WPA-80080/4CF	WPA-80063-4CF
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	20	195	290
DOWN TILT (MECH/DEG)	10	4	2
RAD CTR (FT AGL)	135	135	135
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEXER KIT - QTY / MODEL			
MCPA BRICKS (QTY)			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	APL868013-42T0	APL868013-42T0	APL866513-42T0
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	20	180	280
DOWN TILT (MECH/DEG)	4°	6°	4°
RAD CTR (FT AGL)	135	135	135
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	2 FD9R6004/2C-3L	2 FD9R6004/2C-3L	2 FD9R6004/2C-3L
DIPLEXER KIT - QTY / MODEL			
MCPA BRICKS (QTY)			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	950F65T2ZE-M_2	948F85T2E-M_2	948F85T2E-M_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	20	195	290
DOWN TILT (MECH/DEG)	0	2	0
RAD CTR (FT AGL)	135	135	135
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEXER KIT - QTY / MODEL			
MCPA BRICKS (QTY)			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	APX18-206516L-T0	MG D3-800T0	APX18-206516L-T0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	20	180	280
DOWN TILT (MECH/DEG)	2°	3°	3°
RAD CTR (FT AGL)	135	135	135
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable
MCPA BRICKS (QTY)			

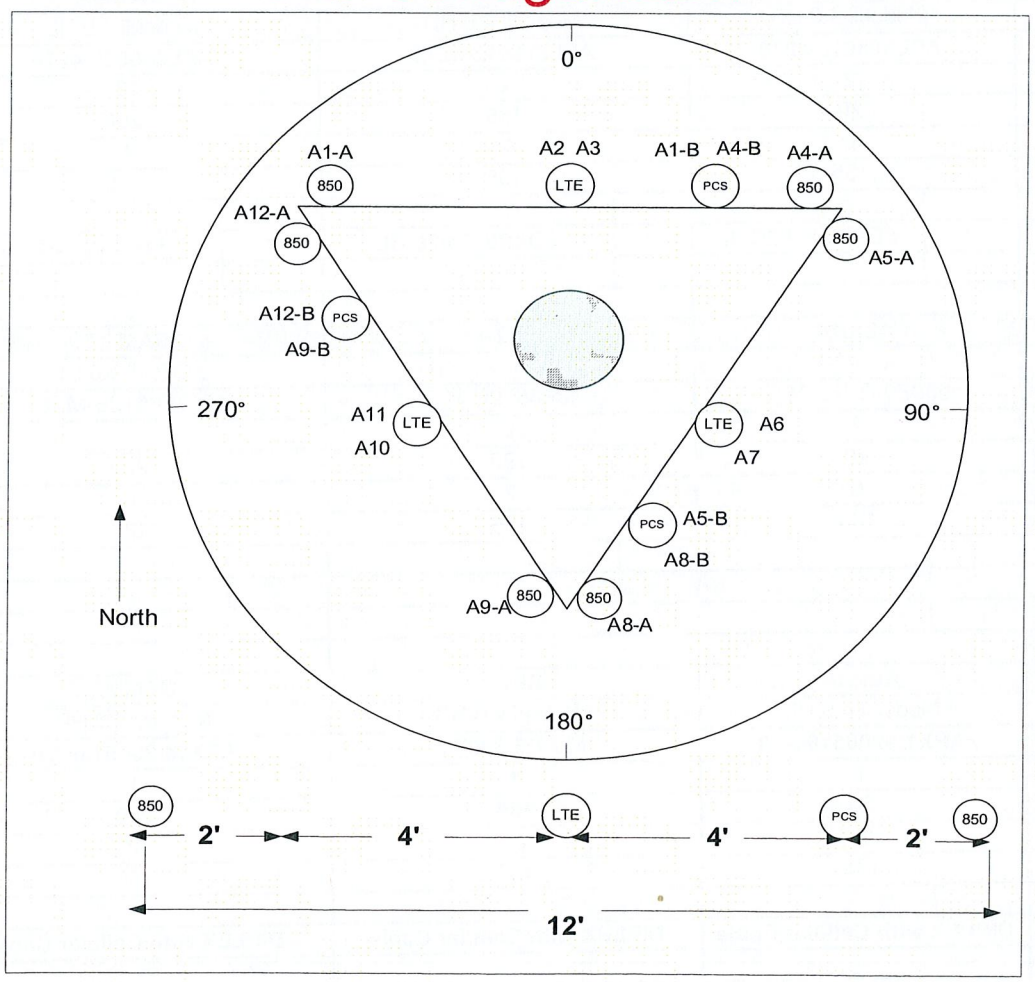
NUMBER OF CABLE'S NEEDED				ESTIMATED CABLE LENGTH	
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES	12	MAINLINE (FT)	
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	18	TOP JUMPER (FT)	
Equipment Cable Ordering		MAIN CABLE	12 +	TOP JUMPER #	12 + 6

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F-Band	700 Mhz C - B	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895	RX - 776-787	LTE (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/ WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By : Dany Bustamante	Steve Weatherbee	DB	1/25/2011

Site Configuration

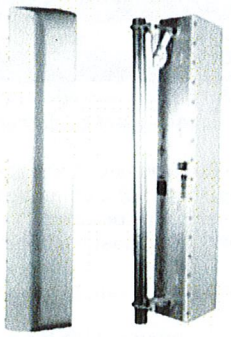


Product Data Sheet **APL866513-42T0**

Maximizer® Log Periodic Antenna, 806-894, 65deg, 15.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



FRONT BACK

Features/Benefits

• 45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.

Technical Specifications

Electrical Specifications

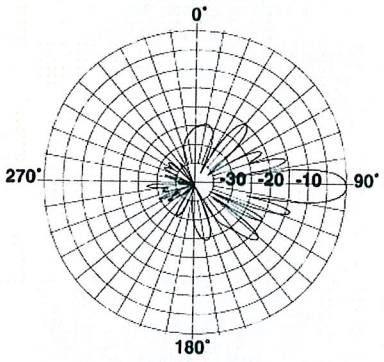
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	15.1 (13)
1st Upper Sidelobe Suppression, dB	>20
Upper Sidelobe Suppression, dB	>20
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

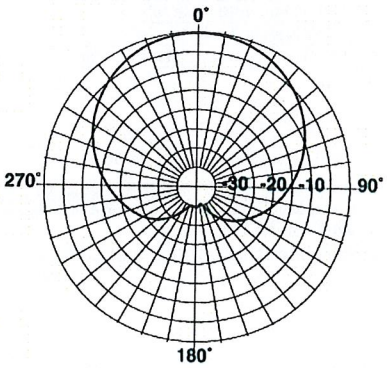
Dimensions - HxWxD, mm (in)	1219 x 234 x 203 (48 x 9.2 x 8)
Weight w/o Mtg Hardware, kg (lb)	7 (15.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	180 (112)
Max Wind Loading Area, m² (ft²)	0.376 (4.05)
Maximum Thrust @ Rated Wind, N (lbf)	903 (203)
Wind Load - Side @ Rated Wind, N (lbf)	594 (133.5)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	9.1 (20)
Packing Dimensions, HxWxD, mm (in)	1594 x 343 x 349 (62.75 x 13.5 x 13.75)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

Other Documentation

Product Data Sheet **APX18-206516L-CT0**

Optimizer® Dual Polarized Antenna, 1710-2170, 65deg, 17.6/18.6dBi, 1.3m, FET, 0deg

Product Description

Dense urban networks where site aspect is essential.

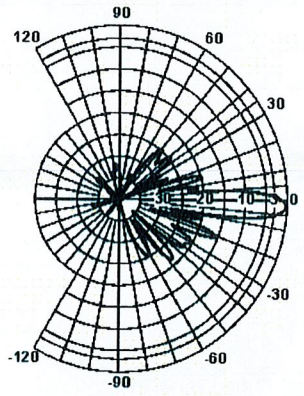
Features/Benefits

- **Very broadband design operating from GSM1800 up to 3G-UMTS.**
- **Reduction of visual impact by gathering 3 antennas in a cylindrical volume.**
- **Reduction of site dimensions will ease site acceptance.**
- **Possible camouflage solution on demand.**
- **Wind load thrust highly reduced.**
- **Compatible with usual base stations with 35 dB typical isolation between ports.**
- **Effective polarization diversity ensured by high cross polar discrimination.**
- **Optimized suppression of side lobes allows strong mechanical tilt.**

Technical Specifications

Electrical Specifications

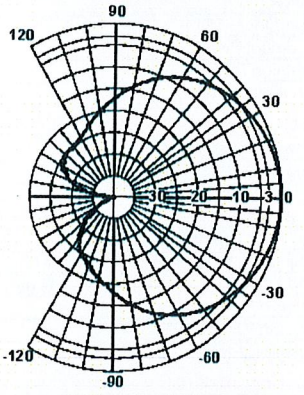
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	69	64
Vertical Beamwidth, deg	6.9	6
Electrical Downtilt, deg	0	
Gain, dBi (dBd)	17.6 (15.5)	18.6 (16.5)
1st Upper Sidelobe Suppression, dB	>20	
Front-To-Back Ratio, dB	>29	30
Polarization	Dual pol +/-45°	
VSWR	< 1.4:1	
Isolation between Ports, dB	>30 (typ 35)	
3rd Order IMP @ 2 x 43 dBm, dBc	>150, N/A	
7th Order IMP @ 2 x 46 dBm, dBc	N/A, >170	
Impedance, Ohms	50	
Maximum Power Input, W	300	
Lightning Protection	Direct Ground	
Connector Type	(2) 7-16 Long Neck Female	



Vertical Pattern

Mechanical Specifications

Dimensions - HxWxD, mm (in)	1349 x 169 x 80 (53.0 x 6.65 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	8.5 (18.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.23 (2.46)
Front Thrust @ Rated Wind, N (lbf)	406 (91)
Maximum Thrust @ Rated Wind, N (lbf)	406 (91)
Wind Load - Side @ Rated Wind, N (lbf)	236 (53)
Wind Load - Rear @ Rated Wind, N (lbf)	196 (44)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	13.5 (30)
Packing Dimensions, HxWxD, mm (in)	1464 x 251 x 203 (57.64 x 9.88 x 7.99)



Horizontal Pattern

Ordering Information

Mounting Hardware	APM40-2
Mounting Pipe Diameter, mm (in)	60-120 (2.36-4.72)
Mounting Hardware Weight, kg (lb)	3.4 (7.5)

Other Documentation

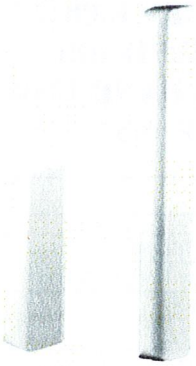
APM40 Series Datasheet
APM40 Series Installation Instructions

Product Data Sheet **APL868013-42T0**

Maximizer® Log Periodic Antenna, 806-894, 80deg, 14.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



Features/Benefits

• 45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.

Technical Specifications

Electrical Specifications

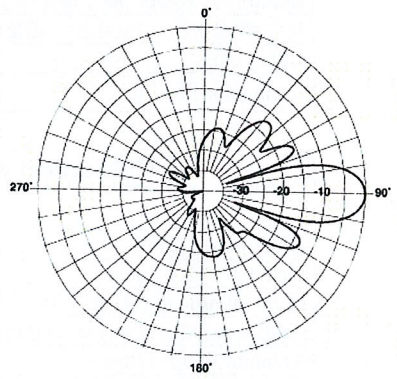
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

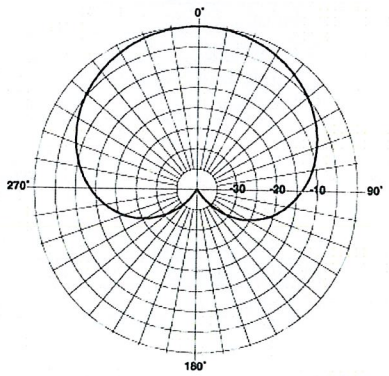
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Wind Load - Side @ Rated Wind, N (lbf)	743 (167)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	7.9 (17.5)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

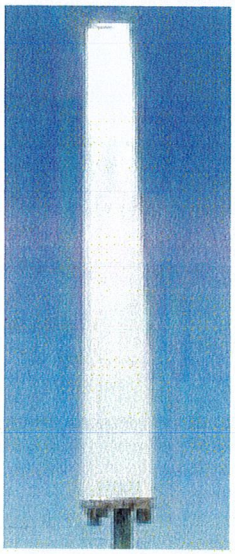
Other Documentation

MG D3-800Tx

Xpol GSM1800+PCS & UMTS Panel Antenna
15.9 dBd/18 dBi
WIDE BAND 1710-2170 MHz
H 65º V 6.5º

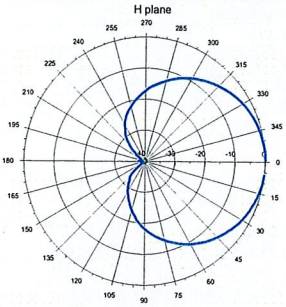
Electrical Specifications

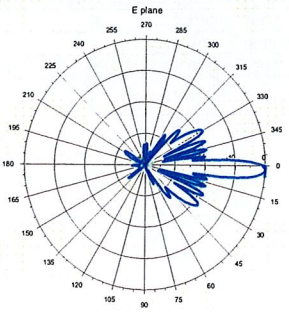
Antenna Model	MG D3-800Tx		
Frequency Range (MHz)	1710-1880	1850-1990	1920-2170
Impedance	50 Ohms		
VSWR	1.40:1		
Polarization	±45º		
Isolation between Ports (dB)	30		
Average Gain (dBd/dBi)	15.7/17.8	15.9/18	16.15/18.25
Horizontal Beamwidth (deg)	65º±5º		
Vertical Beamwidth (deg)	6.5º±0.5º	6.3º±0.5º	6.3º±0.5º
Electrical Tilt (deg)	Fixed 0º-14º		
Sidelobe Suppression (dB)	18	18	18
Front to Back Ratio (dB) @180º±20º	30		
Polarization Isolation (dB) @3 dB Beamwidth	20		
Maximum Power per Input (w)	250		
Intermodulation Products (dBc)	-150		
Connectors	2 x 7/16 Female		
Connector Position	Antenna Bottom		



Mechanical & Environmental Specifications

Dimensions (mm)	1380 x 160 x 90
Survival Wind Speed	200 km/h
Front Windload (N) @ 160 km/h	335
Lateral Windload (N) @ 160 km/h	188
Antenna Weight (kg)	7
Clamps Weight (kg)	2
Mast Mounting	50 to 135 mm
Radome Color	Grey
Grounding	All metallic parts are DC grounded
Temperature Range	-55 to +60ºC
Humidity	100 %





Shipping Specifications

Dimensions (mm)	1580 x 340 x 210
Weight (kg)	12
Material	Cardboard and Foam

Ctra. Campo Real, Km 2,100
28500 Arganda del Rey
Madrid-Spain

RYMSA

Phone: 34 91 876 06 81
Fax: 34 91 876 07 09
E-mail: telecom.commercial@rymsa.com
Web: www.rymsa.com

Slant ±45° Dual Polarized FET Panel 63° / 14.5 dBd
696-900 MHz

Mechanical specifications

Length	1804	mm	71.0	in
Width	285	mm	11.2	in
Depth	114	mm	4.5	in
Depth with z-bracket	154	mm	6.1	in
Weight [4]	7.9	kg	17.0	lbs
Wind Area Fore/Aft	0.51	m^2	5.5	ft^2
Wind Area Side	0.21	m^2	2.2	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	753	N	169	lbf
Side	351	N	79	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in

Mounting Bracket Kit	36210002
Downtilt Bracket Kit	36114003

Electrical specifications

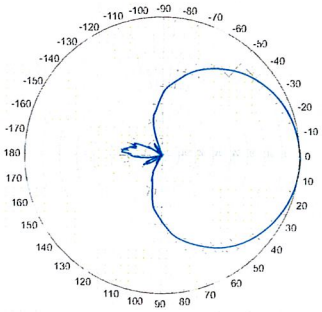
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -25 dB
Gain [1]	14.5 dBd 16.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	11°
Electrical downtilt [5]	0°
Null fill [1]	5%
Lightning protection	Direct ground

Patented Dipole Design: U.S. Patent No. 6,608,600 B2

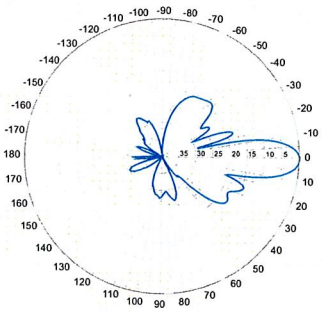
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

Radiation-pattern[1]
750 MHz

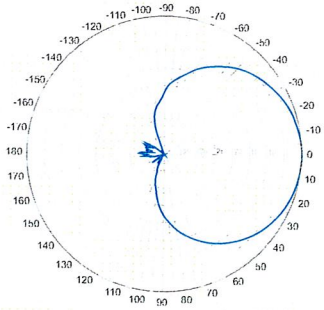


Horizontal

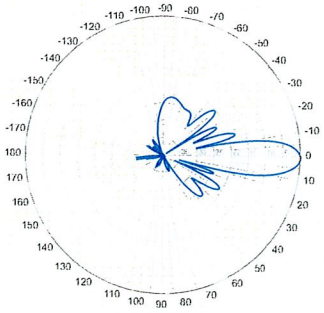


Vertical

850 MHz



Horizontal

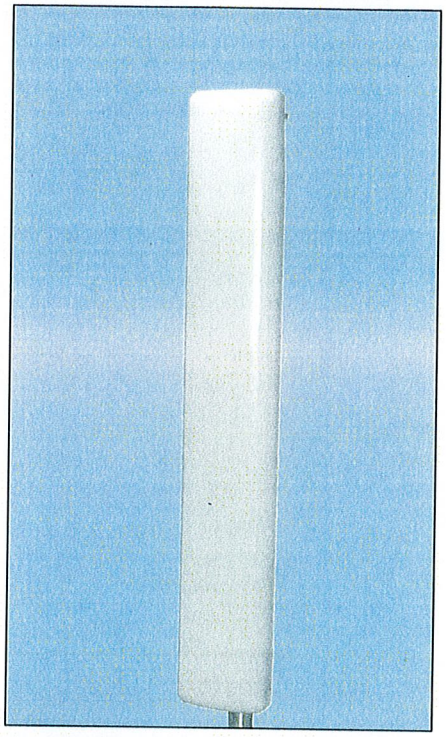


Vertical

696-900 MHz

BXA-70063/6CF __

When ordering replace "__" with connector type.



Featuring our Exclusive 3T Technology™ Antenna Design:

- Watercut brass feedline assembly for consistent performance.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date: 01/08/09

815.399.0001 • antel@antelinc.com • www.antelinc.com