ROBINSON & COLE LLP

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
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Also admitted in Massachusetts

August 10, 2012

David Martin
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-034-111121 – Cellco Partnership d/b/a Verizon Wireless**
144 Old Boston Post Road, Danbury, Connecticut

Dear Mr. Martin:

On December 9, 2011, the Siting Council acknowledged receipt of Cellco's notice of intent to modify its telecommunications facility at 144 Old Boston Post Road in Danbury. The modification involved the replacement of certain antennas and the installation of additional coax cables.

As a condition of the acknowledgement, Cellco was required to provide the Council with a letter stating that the recommendations specified in the structural report were implemented. Attached is a Tower Modification Certification Letter verifying that these conditions have been satisfied. All construction associated with these modifications has now been completed.

If you have any questions please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Sandy M. Carter
Brian Ragozzine
Mark Gauger

CENTEK engineering

Centered on Solutions℠

August 10, 2012

Mr. Mark Gauger
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re: Existing Telecommunications Facility Tower Modification Certification Letter

Project:	**Verizon ~ Danbury South** 144 Old Boston Post Road Danbury, CT
Tower Owner:	**SBA Communications Corporation** 5900 Broken Sound Parkway NW Boca Raton, Florida 33487
Engineer:	**FDH Engineering** 2730 Rowland Ave Raleigh, NC 27615

Centek Project No.: 12005.CO20

Dear Mr. Gauger,

We are providing this "Existing Telecommunications Facility Tower Modification Certification Letter" with regard to the antenna upgrade by Verizon Wireless at the above referenced project.

The following are the basis for substantiating compliance with the design documents prepared by FDH Engineering:

- Review of the FDH structural analysis dated 9/6/2011.
- Field observations by Centek personnel of coax installation on 8/9/2012 which determined all coax lines were installed in general compliance with the recommendations of the structural analysis report prepared by FDH on 9/6/2011.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,

Carlo F. Centore, PE
Principal ~Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No.16694
LICENSED
PROFESSIONAL ENGINEER

CC: Rachel Mayo, Tim Parks, Tom Nolan

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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

December 9, 2011

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

RE: **EM-VER-034-111121** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 144 Old Boston Post Road (a/k/a Moses Mountain), Danbury, 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:

- The coax lines be installed in accordance with recommendations made in Figure 1 of the Structural Analysis Report prepared by FDH Engineering dated September 6, 2011 and stamped by Christopher Murphy; and
- Following the installation of the proposed equipment, Verizon shall provide documentation certifying that the installation complied with the engineer's recommendations
- 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 November 18, 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,

LRoberts

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable Mark D. Boughton, Mayor, City of Danbury
Dennis Elpern, City Planner, City of Danbury
Christopher B. Fisher, Esq., Cuddy & Feder LLP

ROBINSON & COL

EM-VER-034-111121

KENNETH C. BALDWIN

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November 18, 2011

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

Re: **Notice of Exempt Modification**
144 Old Boston Post Road (a/k/a Moses Mountain)
Danbury, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains wireless telecommunications antennas at the top of the existing 65-foot tower at the above-referenced address. The tower and underlying property are owned by AT&T. The Council approved Cellco's use of this facility in 2000. Cellco now intends to modify its installation by replacing all of its existing antennas with four (4) model DB846F65ZAXY cellular antennas; four (4) LPA-185063/12CF PCS antennas; and two (2) BXA-70063/6CF LTE antennas, at the same level on the tower. Cellco also intends to install four (4) additional coax cables. Attached behind Tab 1 are the specifications for the proposed antennas.

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 Mark D. Boughton, Mayor for the City of Danbury.

The planned modifications to the facility falls squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing structure. Cellco's replacement antennas will be located at the same height as the existing antennas.

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

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

4. The installation of 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 Calculated Radio Frequency Emissions Report for the modified facility is included behind Tab 2.

Also attached is a Structural Analysis confirming that the tower and foundation can support the 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:
Mark D. Boughton, Danbury Mayor
Sandy M. Carter

ANDREW®

Vertically Polarized Directed Dipole® Panel Antennas

806 - 960 MHz

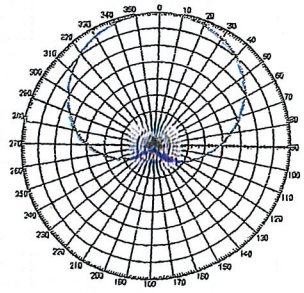
65° HORIZONTAL BEAMWIDTH

HORIZONTAL BEAMWIDTH	65°		65°	65°
FREQUENCY RANGE	806-960 MHz		806-896 MHz	806-896 MHz
	14.5 & 14.8 dBd / 0° Tilt		14.5 dBd / 0° Tilt	14.3 dBd / 5° Tilt
MODEL	DB846F65ZAXY		DB846H65E-SX	846H65T5E-SX
TYPE	Directed Dipole®, No Screen		Directed Dipole®	Directed Dipole®
ELECTRICAL SPECIFICATIONS				
Frequency Range (MHz)	806-896	870-960	806-896	806-896
Gain (dBd/dBi)	14.5 / 16.6	14.8 / 16.9	14.5 / 16.6	14.3 / 16.4
Horizontal Beamwidth (Deg.)	65	60	65	65
Elevation Beamwidth (Deg.)	11	10.5	11	10.5
USLS (dB)	>15	>15	N/A	N/A
Null Fill (dB) – Below Peak	N/A	N/A	N/A	N/A
Beam Tilt (Deg.)	0	0	0	5
VSWR	<1.33:1	<1.33:1	<1.5:1	<1.5:1
Front-To-Back Ratio (dB)	40	40	30	40
Isolation (dB)	N/A	N/A	N/A	N/A
Max. Input Power (Watts)	500	500	500	500
Polarization	Vertical	Vertical	Vertical	Vertical
Connector Location	Back	Back	Back	Back
Connector Type	7-16 DIN - Female	7-16 DIN - Female	7-16 DIN - Female	7-16 DIN - Female
Optional Connectors	N/A	N/A	N/A	N/A
MECHANICAL SPECIFICATIONS				
Length (inch/mm)	72 / 1,829	72 / 1,829	72 / 1,829	72 / 1,829
Width (inch/mm)	10 / 254	10 / 254	20.5 / 521	20.5 / 521
Depth (inch/mm)	8.5 / 216	8.5 / 216	9 / 229	9 / 229
Net Weight (lbs/kg)	21 / 9.5	21 / 9.5	24 / 10.9	24 / 10.9
Max. Flat Plate Area (ft^2/m^2)	1.61 / 0.15	1.61 / 0.15	4.95 / 0.46	4.95 / 0.46
Max. Wind Load at 100 mph (lbf/N)	87 / 386	87 / 386	273 / 1,214	273 / 1,214
Max. Wind Speed (mph/kmh)	125 / 201	125 / 201	125 / 201	125 / 201
Radome Material	ABS, UV Resistant	ABS, UV Resistant	ABS, UV Resistant	ABS, UV Resistant
Reflector Material	Pass. Aluminum	Pass. Aluminum	Pass. Aluminum	Pass. Aluminum
Radiator Material	Aluminum	Aluminum	Brass	Brass
Hardware Material	Galvanized Steel	Galvanized Steel	Galvanized Steel	Galvanized Steel
Color	Light Gray	Light Gray	Light Gray	Light Gray
Std. Mounting Hardware	DB380	DB380	DB380	DB380
Optional Downtilt Kit	DB5083	DB5083	DB5083	DB5083
Optional Special Mounting	DB5084-AZ	DB5084-AZ	DB5084-AZ	DB5084-AZ

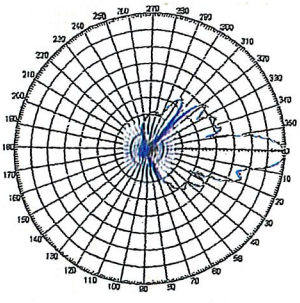
Specifications are subject to change. Please see our website for the latest information.

DB846F65ZAXY

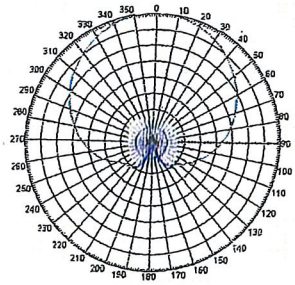
Azimuth Pattern

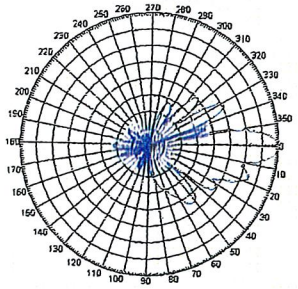


Elevation Pattern

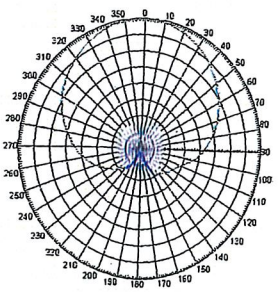


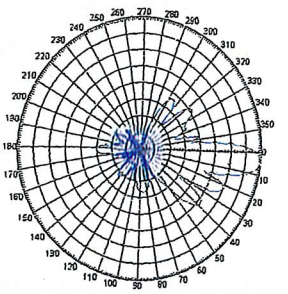
DB846H65E-SX





846H65T5E-SX





Scale: 10° radials, 5 dB per division

Amphenol ANTENNA SOLUTIONS

LPA-185063-12CF-EDIN-X

V-Pol | Log Periodic | 63° | 19.0 dBi

Replace "X" with desired electrical downtilt.

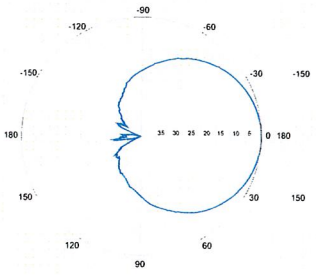
Antenna is available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	
Frequency bands	1850-1990 MHz
Polarization	Vertical
Horizontal beamwidth	63°
Vertical beamwidth	5°
Gain	16.9 dBd (19.0 dBi)
Electrical downtilt (X)	0, 2, 4
Impedance	50Ω
VSWR	≤ 1.4:1
Upper sidelobe suppression (0°)	-18.6 dB
Front-to-Back ratio (+/- 30°)	-37.4 dB
Null fill	10% (-20.0 dB)
Input power	250 W
Lightning protection	Direct Ground
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)

Mechanical Characteristics		
Dimensions Length x Width x Depth	1806 x 167 x 148 mm	71.1 x 6.6 x 5.8 in
Weight without mounting brackets	6.1 kg	13.5 lbs
Survival wind speed	>201 km/hr	>125 mph
Wind area	Front: 0.30 m² Side: 0.27 m²	Front: 3.3 ft² Side: 9.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 479 N Side: 434 N	Front: 108 lbf Side: 98 lbf

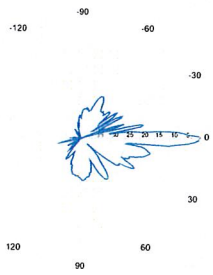
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5.0 lbs
2-Point Mounting and Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	2.3 kg 5.0 lbs

LPA-185063-12CF-EDIN-X



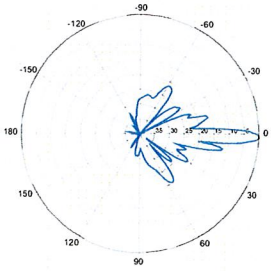
Horizontal

LPA-185063-12CF-EDIN-0



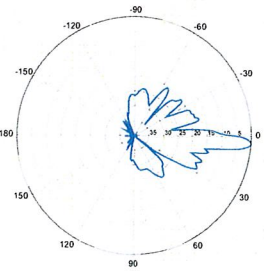
0° | Vertical

LPA-185063-12CF-EDIN-2



2° | Vertical

LPA-185063-12CF-EDIN-4



4° | Vertical

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

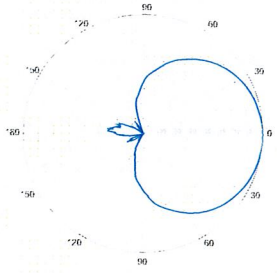
Replace "X" with desired electrical downtilt.

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

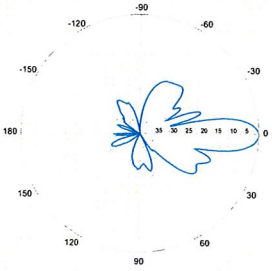
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting Bracket Kit	36210003	50-160 mm 2.0-6.3 in	6.3 kg 14 lbs
3-Point Downtilt Bracket Kit (0-14°)	36210004	50-160 mm 2.0-6.3 in	7.3 kg 16 lbs
Downtilt Mounting Applications	A mounting bracket and downtilt bracket kit must be ordered for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

BXA-70063-6CF-EDIN-X



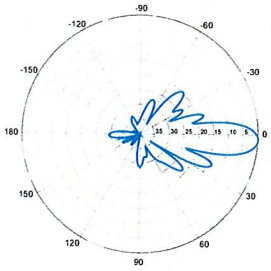
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

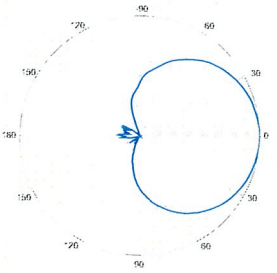


0° | Vertical | 750 MHz

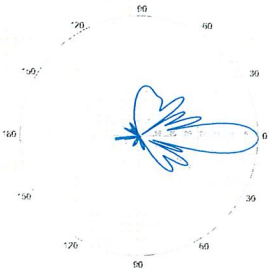
BXA-70063-6CF-EDIN-2



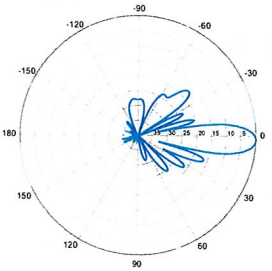
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



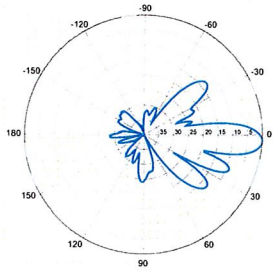
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

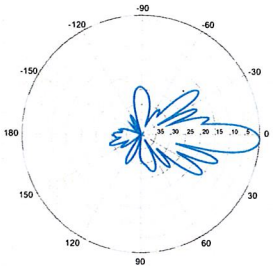
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

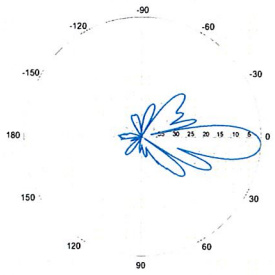


3° | Vertical | 750 MHz

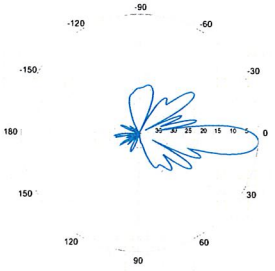


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

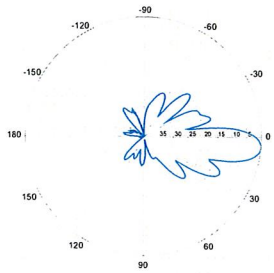


4° | Vertical | 750 MHz

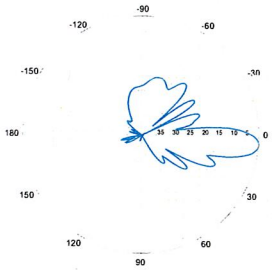


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

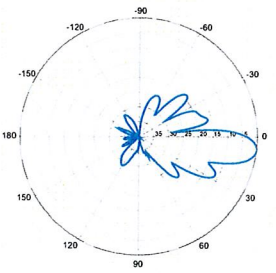


5° | Vertical | 750 MHz

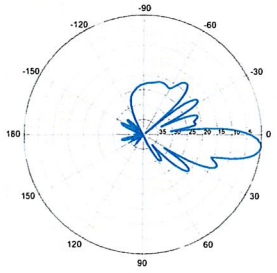


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

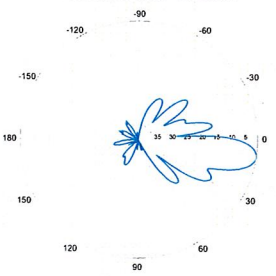


6° | Vertical | 750 MHz

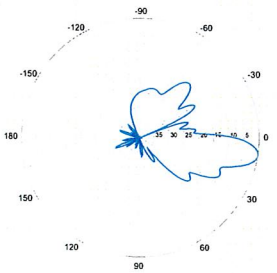


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

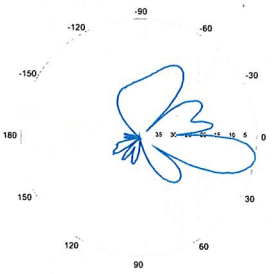


8° | Vertical | 750 MHz

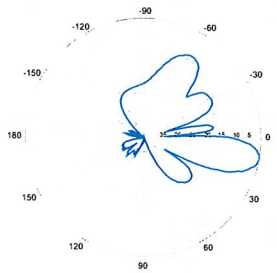


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

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Calculated Radio Frequency Emissions

verizonwireless

Danbury S CT

Old Boston Post Road, Danbury, CT 06810

(aka: Moses Mountain)

September 23, 2011

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the Verizon Wireless antenna arrays on the existing lattice tower located at the summit of Moses Mountain, off Old Boston Post Road in Danbury, CT. Verizon Wireless, AT&T, PageNet & Marcus Communications are all collocated on the tower. The coordinates of the lattice tower are 41-21-34.42 N, 73-27-55.54 W.

Verizon Wireless is proposing the following modifications:

1) Install two 750 MHz LTE antennas (one per sector);
2) Remove four existing 850 MHz Cellular antennas (two per sector);
3) Install four replacement 850 MHz Cellular antennas (two per sector);
4) Remove four existing 1900 MHz PCS antennas (two per sector);
5) Install four replacement 1900 MHz PCS antennas (two per sector);
6) Modify the azimuth of the gamma sector antennas.

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \times OffBeamLoss$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss determined by selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

4. Calculation Results

Table 1 below outlines the power density information for the site. All information for carriers other than Verizon Wireless comes directly from the current CSC database. Because the Verizon antennas are directional in nature, the majority of the RF power is focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the tower. Please refer to Attachment C for the vertical patterns of the Verizon antennas. The calculated results for Verizon in Table 1 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
Marcus - Antenna #1	50	460	N/A	100	0.0256	0.3067	8.35%
Marcus - Antenna #2	50	460	N/A	100	0.0256	0.3067	8.35%
Marcus - Antenna #4	49	5800	N/A	0.1	0.0021	1.0000	0.21%
PageNet	58	940.3	N/A	N/A	0.1136	0.6269	18.12%
AT&T GSM	65	880	2	296	0.0504	0.5867	8.59%
AT&T GSM	65	1930	2	427	0.0727	1.0000	7.27%
Verizon LTE	69	750	1	1005	0.0759	0.5000	1.52%
Verizon Cellular	69	850	9	564	0.3834	0.5667	6.77%
Verizon PCS	69	1900	3	784	0.1776	1.0000	1.78%
						Total	**60.94%**

Table 1: Carrier Information[1]

[1] %MPE calculations for Verizon include a nominal -10 dB antenna off-beam loss factor

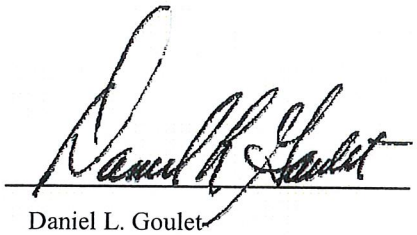
5. Conclusion

The above analysis verifies that emissions from the existing site will be below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the power density from the proposed antenna configuration is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at the base of the lattice tower is 60.94% of the FCC limit.

As noted in the introduction, obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished modifications.

6. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.



Daniel L. Goulet
C Squared Systems, LLC

September 23, 2011
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[2]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[3]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 2: FCC Limits for Maximum Permissible Exposure (MPE)

[2] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

[3] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

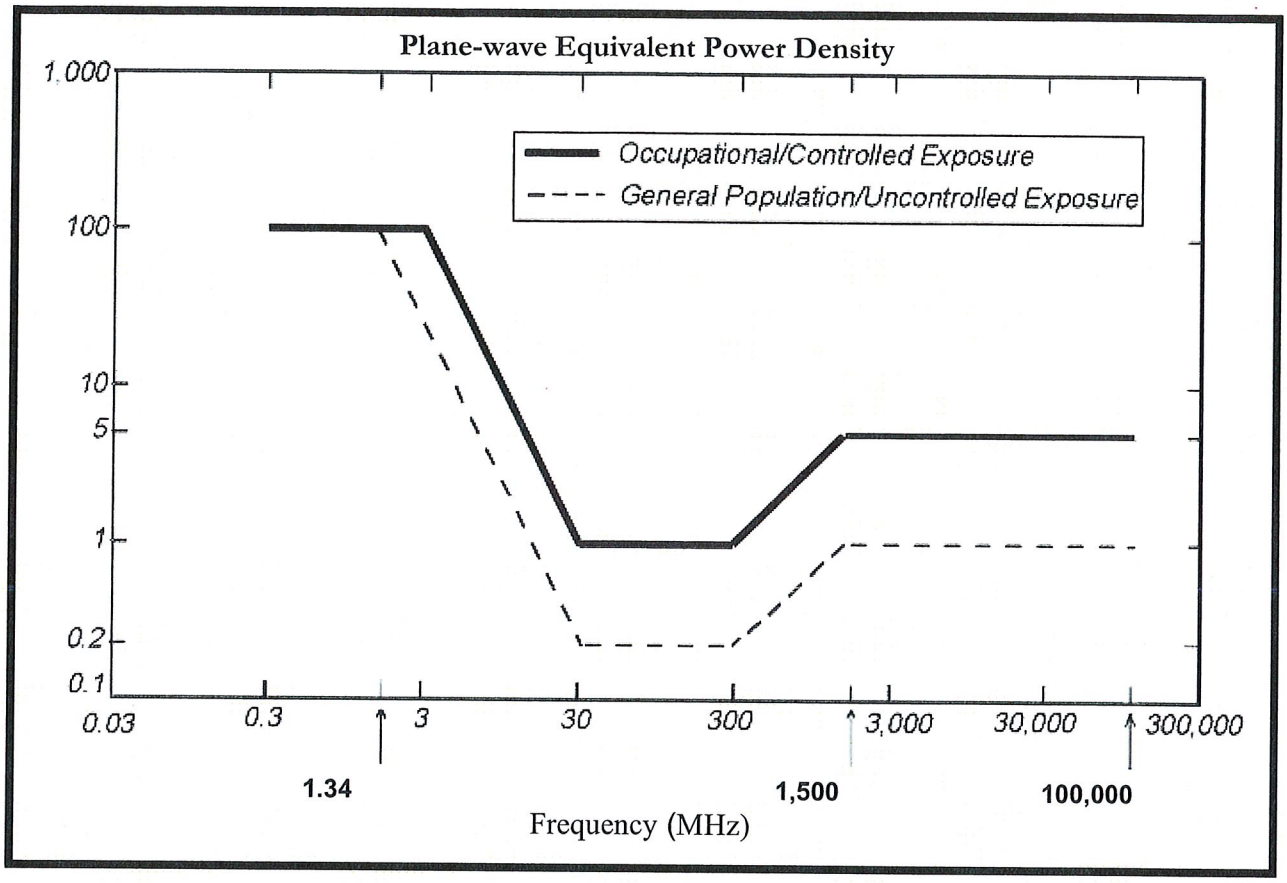
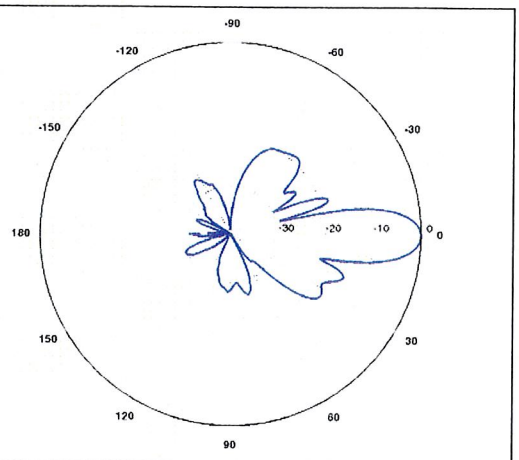


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Verizon Wireless' Antenna Model Data Sheets and Electrical Patterns

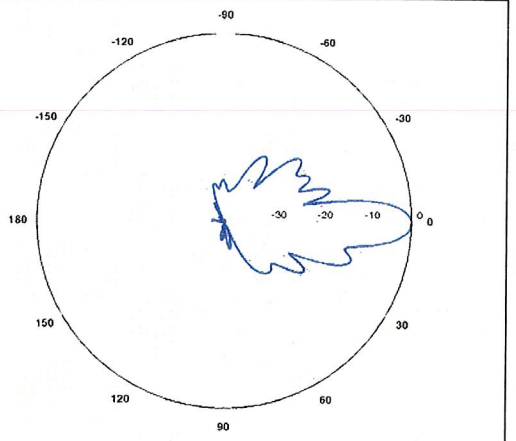
750 MHz

Manufacturer:	Amphenol
Model #:	BXA-70063/6CF
Frequency Band:	696-806 MHz
Gain:	14.0 dBd
Vertical Beamwidth:	13°
Horizontal Beamwidth:	65°
Polarization:	±45°
Size L x W x D:	71.0" x 11.2" x 5.2"



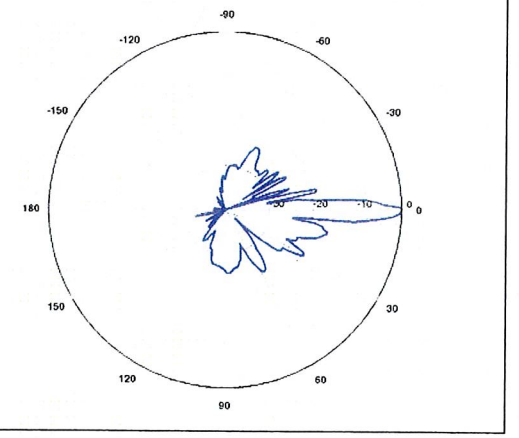
850 MHz

Manufacturer:	Andrew
Model #:	DB846F65ZAXY
Frequency Band:	806-896 MHz
Gain:	14.5 dBd
Vertical Beamwidth:	11°
Horizontal Beamwidth:	65°
Polarization:	Vertical
Size L x W x D:	72.0" x 10.0" x 8.5"



1900 MHz

Manufacturer:	Amphenol
Model #:	LPA-185063/12CF
Frequency Band:	1850-1990 MHz
Gain:	16.9 dBd
Vertical Beamwidth:	5°
Horizontal Beamwidth:	63°
Polarization:	Vertical
Size L x W x D:	71.1" x 6.6" x 5.8"



FDH Engineering, Inc., 2730 Rowland Rd. Raleigh, NC 27615, Ph. 919.755.1012, Fax 919.755.1031

Structural Analysis for AT&T Towers

65' Self-Support Tower

AT&T Towers Site Name: Danbury
AT&T Towers Site USID: SNET005-A
Verizon Site Name: Danbury South

FDH Project Number 11-07110E S1

Analysis Results

Tower Components	80.5%	Sufficient
Foundation	96.1%	Sufficient

Prepared By:

David Chickering, EI
Project Engineer

Reviewed By:

Christopher M Murphy, PE
President
CT PE License No. 25842

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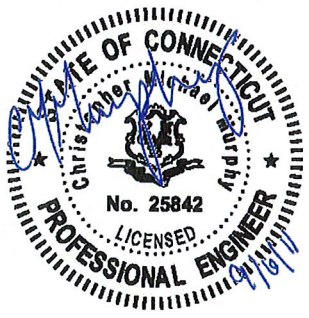

September 6, 2011

Prepared pursuant to TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

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EXECUTIVE SUMMARY

At the request of AT&T Towers, FDH Engineering, Inc. performed a structural analysis of the existing self-supported tower located in Danbury, CT to determine whether the tower is structurally adequate to support both the existing and proposed loads pursuant to the *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, TIA/EIA-222-F*. Information pertaining to the existing/proposed antenna loading, current tower geometry, the member sizes, soil parameters and foundation dimensions was obtained from:

- FDH, Inc. (Job No. 11-07130T T1) Self-Support Tower Mapping Report dated August 23, 2011
- FDH Engineering, Inc. (Project No. 11-07110E N1) Dispersive Wave Propagation Testing of an Existing Tower Foundation dated August 23, 2011
- FDH Engineering, Inc. (Project No. 11-07110E G1) Geotechnical Evaluation of Subsurface Conditions dated August 24, 2011
- AT&T Towers

The *basic design wind speed* per the *TIA/EIA-222-F* standards is 85 mph without ice and 74 mph with 1/2" radial ice.

Conclusions

With the existing and proposed antennas from Verizon in place at 69 ft, the tower meets the requirements of the *TIA/EIA-222-F* standards provided the **Recommendation** listed below is satisfied. Furthermore, given the existing foundation dimensions (see FDH Project No. 11-07110E N1), and given soil parameters (see FDH Project No. 11-07110E G1), the foundation should have the necessary capacity to support the existing and proposed loading. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

Our structural analysis has been performed assuming all information provided to FDH Engineering, Inc. is accurate (i.e., the steel data, tower layout, existing antenna loading, and proposed antenna loading) and that the tower has been properly erected and maintained per the original design drawings.

Recommendation

To ensure the requirements of the *TIA/EIA-222-F* standards are met with the existing and proposed loading in place, we have the following recommendation:

1. Coax lines must be installed as show in Figure 1.

APPURTENANCE LISTING

The proposed and existing antennas with their corresponding cables/coax lines are shown in **Table 1**. *If the actual layout determined in the field deviates from the layout, FDH Engineering, Inc. should be contacted to perform a revised analysis.*

Table 1 - Appurtenance Loading

Existing Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Coax No.	Carrier	Mount Elevation (ft)	Mount Type
73.5	(1) GPS	(1) 1/2"	19	Verizon	72	(1) 28" x 1.6" Pipe Mount
72.6	(1) Antenex 5 Element (38" x 13.5") Yagi	(1) 3/8"	38	---	68	(1) 5.25' x 2.4" Pipe Mount
70	(4) Decibel DB948F65T2E-M w/Mount Pipe (4) Swedcom ALP-E-6014 w/Pipe Mount	(8) 1 5/8"	11-18	Verizon	66.5	(2) 14.5' I-Beam Mounts
64	(3) Powerwave P65-16-XLH-RR w/ Mount Pipe (6) Powerwave 7770.00 W/Mount Pipe (6) Ericsson RRUs (6) Powerwave LGP13519 (6) Powerwave 14.5"x9.25"x2.5" TMAs	(12) 1 5/8" (3) 1/2"	22-33, 45-47	AT&T	62.5	(3) 8.3' Face Mount T-Frames
60.5	(1) RFS 6' Dish	(1) WE65	2	State Police	61.5	5.7'x4.5" Pipe Mount
57	(1) RFS 6' Dish	(1) WE65	1		58	(1) 6.6'x4.5" Pipe Mount
---	---	---	---	---	58	(1) 14.7'x3.5" Pipe Mount
65	(1) TX/RX Systems 15.5'x3.5" Omni	(1) 1 1/4"	42	---	57.5	(1) 2' Standoff
55	(1) 9.5'x1.75" 4-Element Dipole	(1) 1/2"	21	---	56.5	(1) 14.5'x1.9" Pipe Mount
59	(1) Adtran 13"x10.5"x3.5" TMA	(1) 1/2"	34	---		(1) 16'x3.5" Pipe Mount
57.5	(1) Radiowaves SPD2-5.8 Dish					
---	---	---	---	---	56	(1) 7.7'x1.6" Pipe Mount
65	(1) Telewave 21'x2.5" Omni	(1) 1/2"	37	---	54.5	(1) 8' Standoff
57.5	(1) 7.25'x0.95" Omni	---	---	---	52.5	(1) 5'x2.4" Pipe Mount
---	---	---	---	---		(1) 5'x2.4" Pipe Mount
58.5	(1) Telewave 4-Element (10'x1.6") Dipole	(1) 1/2"	40	---		(1) 5'x2.4" Pipe Mount
55	(1) 5-Element (80.5"x3.7") Yagi	(1) 1/2"	36	---		(1) 5'x2.4" Pipe Mount
59.5	(1) TX/RX Systems 9.25'x3.5" Omni	(2) 1 5/8"	5-6	State Police	51.5	(1) 6.5' I-Beam Standoff
46.5	(1) Telewave 4-Element (10'x1.6") Dipole	(2) 7/8"	3-4			
59.5	(1) Decibel 10'x3" Omni	(1) 1 5/8"	8			(1) 9.5' I-Beam Standoff
57.5	(1) Antel 11.5'x2.5" Omni	(1) 1 1/4"	35			
51.5	(1) 20"x16"x7.25" TMA	(2) 3/8"	9-10			
45.5	(1) Decibel 10'x3" Omni	(1) 1 5/8"	7			
51.5	(1) 4'x2.4" Pipe Mount	---	---	---		(1) 10.5' I-Beam Standoff
45.5	(1) Decibel 10'x3" Omni	(1) 1 1/4"	44	---	50.5	(1) 6.5' Standoff
---	---	---	---	---		(2) 15" Standoffs
46	(1) Decibel DB636NS-C Omni	(1) 1 1/4"	43	---		(1) 6.5' Standoff
52.5	(1) 20.5"x6.75"x4.5" TMA	(1) 1/2"	39	Skytel		(1) 15" Standoff
43.5	(1) Scala 11'x2" Omni					
46.5	(1) Scala PRFTV-48/75 Grid Dish	(1) 1/2"	20	---	46.5	(1) 5' Standoff

Proposed Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Coax No.	Carrier	Mount Elevation (ft)	Mount Type
69	(2) Antel BXA-70063/6CF W/Mount Pipe (4) Decibel DB846F65ZAXY w/Mount Pipe (4) Antel LPA-185063/12CF W/Mount Pipe	(12) 1 5/8"	11-18; 48-51	Verizon	66.5	(2) I-Beam Mounts

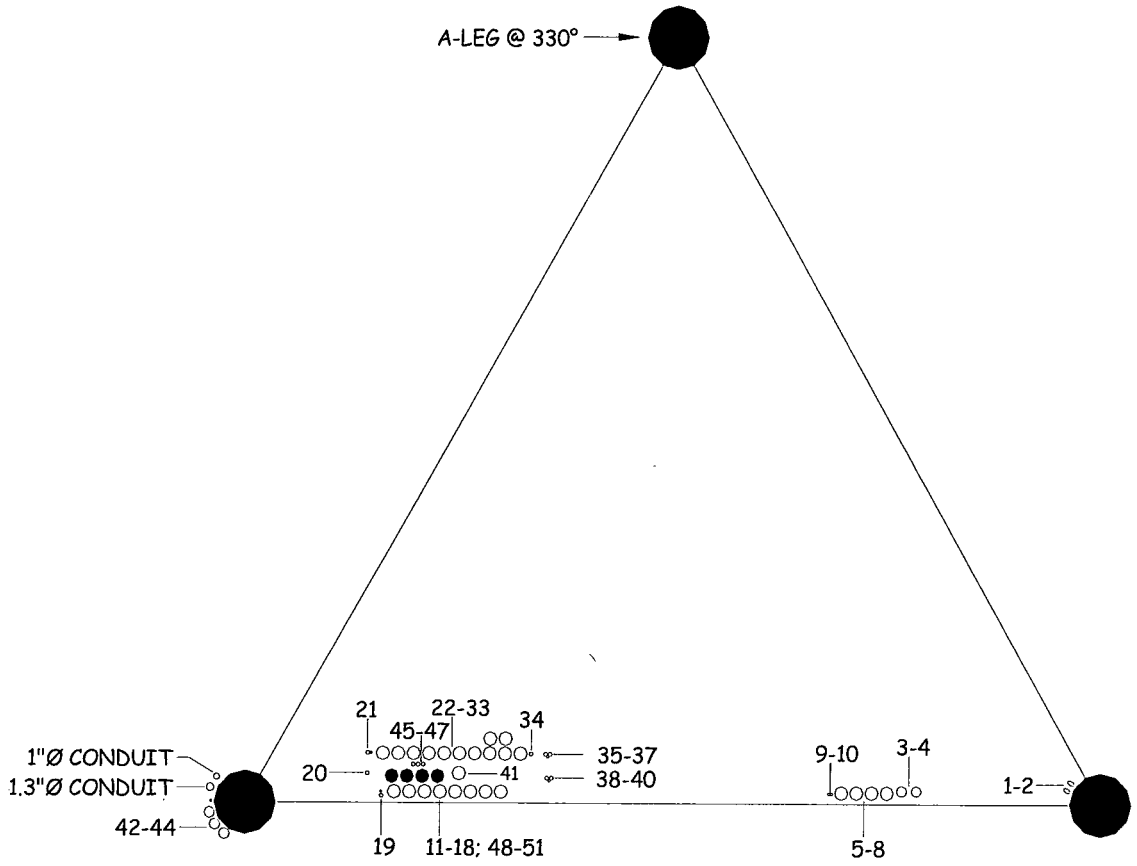


Figure 1 – Coax Layout

RESULTS

The following yield strength of steel for individual members was used for analysis:

Table 2 - Material Strength

Member Type	Yield Strength
Legs	50 ksi (Assumed)
Bracing	36 ksi & 50 ksi (Assumed)

Table 3 displays the summary of the ratio (as a percentage) of force in the member to their capacities. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. **Table 4** displays the maximum foundation reactions.

If the assumptions outlined in this report differ from actual field conditions, FDH Engineering, Inc. should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the existing or proposed appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information

Table 3 - Summary of Working Percentage of Structural Components

Section No.	Elevation ft	Component Type	Size	% Capacity	Pass Fail
T1	65 - 50.1042	Leg	15.5"Ø x 0.260 8-Sided Polygon	32.7	Pass
		Top Girt	12.45"Ø x 0.265 8-Sided Polygon	36.0	Pass
T2	50.1042 - 25.1667	Leg	15.5"Ø x 0.260 8-Sided Polygon	68.7	Pass
		Horizontal	12.45"Ø x 0.265 8-Sided Polygon	80.5	Pass
T3	25.1667 - 0	Leg	15.5"Ø x 0.260 8-Sided Polygon	15.5	Pass
		Diagonal	W6x25	23.2 37.4 (b)	Pass
		Horizontal	12.45"Ø x 0.265 8-Sided Polygon	0.6 1.4 (b)	Pass

Table 4 - Maximum Base Reactions

Load Type	Direction	Current Analysis *(TIA/EIA-222-F)*	Original Design
Individual Foundation	Horizontal	20 k	---
	Uplift	74 k	---
	Compression	99 k	---
Overturning Moment	---	1,126 k	---

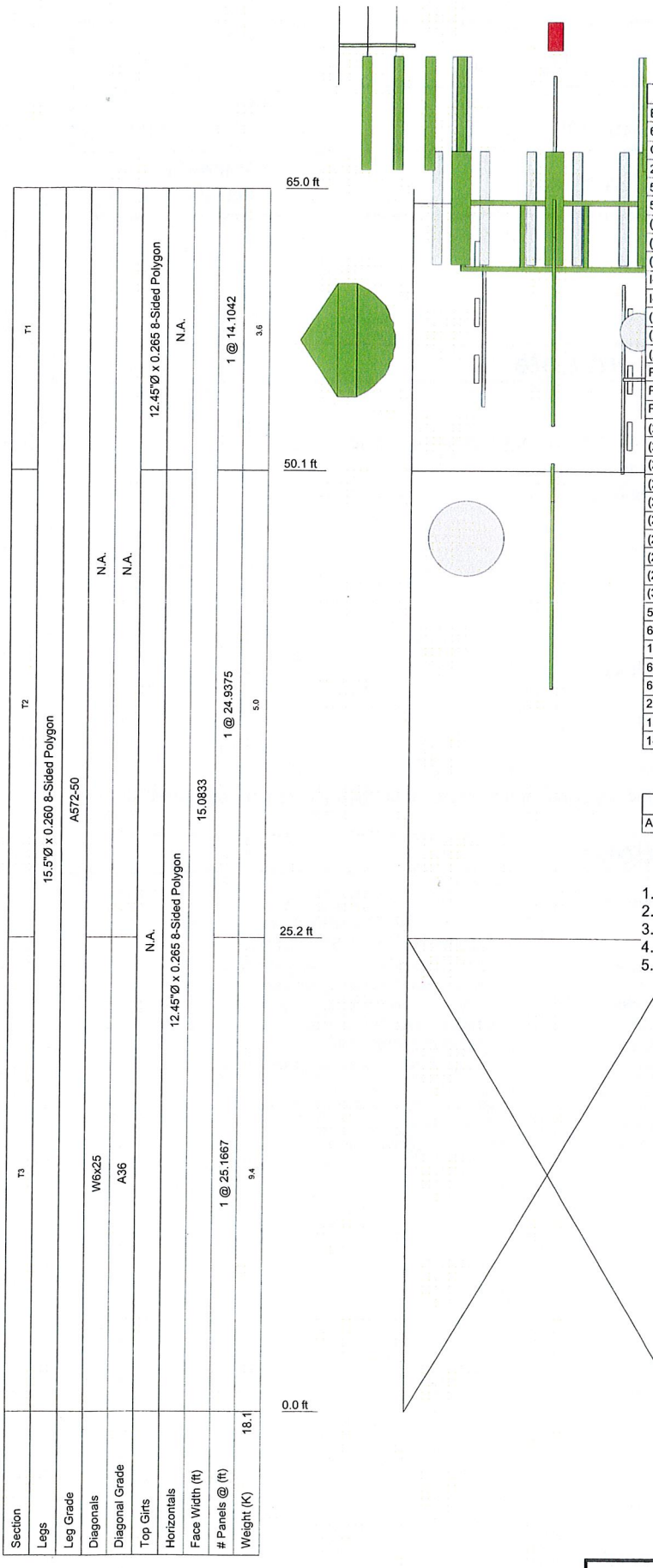
GENERAL COMMENTS

This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of AT&T Towers to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading information) modeled. If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, FDH Engineering, Inc. should be notified immediately to perform a revised analysis.

LIMITATIONS

All opinions and conclusions are considered accurate to a reasonable degree of engineering certainty based upon the evidence available at the time of this report. All opinions and conclusions are subject to revision based upon receipt of new or additional/updated information. All services are provided exercising a level of care and diligence equivalent to the standard and care of our profession. No other warranty or guarantee, expressed or implied, is offered. Our services are confidential in nature and we will not release this report to any other party without the client's consent. The use of this engineering work is limited to the express purpose for which it was commissioned and it may not be reused, copied, or distributed for any other purpose without the written consent of FDH Engineering, Inc.

APPENDIX



Section		Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	65.0 ft	15.5"Ø x 0.260 8-Sided Polygon	A572-50	N.A.	N.A.	12.45"Ø x 0.265 8-Sided Polygon	N.A.		1 @ 14.1042	3.6
T2	50.1 ft						12.45"Ø x 0.265 8-Sided Polygon	15.0833	1 @ 24.9375	5.0
T3	25.2 ft			W6x25	A36	N.A.			1 @ 25.1667	9.4
	0.0 ft									18.1

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Beacon	65	16'x3.5" Pipe Mount Mnt	56.5
6.5' x 4.5" Pipe Mount	65	13"x10.5"x3.5" TMA	56.5
GPS	65	9.5'x1.75" 4-Element Dipole	56.5
28" x 1.6" Pipe Mount Mnt	65	SPD2-5.8	56.5
5 Element (38" x 13.5") Yagi	65	7.7'x1.6" Pipe Mount Mnt	56
5.25' x 2.4" Pipe Mount	65	21'x2.5" Omni	54.5
(2) BXA-70063/6CF W/Mount Pipe	65	8' Standoff Mnt	54.5
(4) DB846F65ZAXY w/Mount Pipe	65	5'x2.4" Pipe Mount	52.5
(4) LPA-185063/12CF W/Mount Pipe	65	10'x1.6" Omni	52.5
I-Beam Mnt	65	5-Element (80.5"x3.7") Yagi	52.5
I-Beam Mnt	65	4-Element (10'x1.6") Dipole	52.5
(2) 7770.00 W/Mount Pipe	62.5	7.25'x0.95" Omni	52.5
(2) 7770.00 W/Mount Pipe	62.5	(2) 5'x2.4" Pipe Mount	52.5
(2) 7770.00 W/Mount Pipe	62.5	5'x2.4" Pipe Mount	52.5
P65-16-XLH-RR w/ Mount Pipe	62.5	10.5' I-Beam Standoff	51.5
P65-16-XLH-RR w/ Mount Pipe	62.5	4'x2.4" Pipe Mount Mnt	51.5
P65-16-XLH-RR w/ Mount Pipe	62.5	11.5'x2.5" Omni	51.5
(2) RRUS-11 RRU	62.5	10'x3" Omni	51.5
(2) RRUS-11 RRU	62.5	20"x16"x7.25" TMA	51.5
(2) RRUS-11 RRU	62.5	10'x3" Omni	51.5
(2) LGP13519	62.5	9.5' I-Beam Standoff Mnt	51.5
(2) LGP13519	62.5	9.25'x3.5" Omni	51.5
(2) LGP13519	62.5	4-Element (10'x1.6") Dipole	51.5
(2) 14.5"x9.25"x2.5" TMA	62.5	6.5' I-Beam Standoff Mnt	51.5
(2) 14.5"x9.25"x2.5" TMA	62.5	(1) 15" Standoff Mnt	50.5
(2) 14.5"x9.25"x2.5" TMA	62.5	DB636NS-C	50.5
(3) 8.3' Face Mounted T-Frames Mnt	62.5	6.5' Standoff	50.5
5.7'x4.5" Pipe Mount Mnt	61.5	11'x2" Omni	50.5
6' Dish	61.5	(1) 15" Standoff Mnt	50.5
14.7'x3.5" Pipe Mount Mnt	58	20.5"x6.75"x4.5" TMA	50.5
6.6'x4.5" Pipe Mount Mnt	58	10'x3" Omni	50.5
6' Dish	58	6.5' Standoff Mnt	50.5
2' Standoff Mnt	57.5	(1) 15" Standoff Mnt	50.5
15.5'x3.5" Omni	57.5	5' Standoff Mnt	46.5
14.5x1.9" Pipe Mount Mnt	56.5	PRFTV-48/75 Grid Dish	46.5

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 80.5%

MAX. CORNER REACTIONS AT BASE:
DOWN: 99 K
UPLIFT: -74 K
SHEAR: 20 K

AXIAL
40 K
SHEAR 28 K *MOMENT 1126 kip-ft*

TORQUE 42 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL
28 K
SHEAR 26 K *MOMENT 1089 kip-ft*

TORQUE 44 kip-ft
REACTIONS - 85 mph WIND

FDH ENGINEERING
FDH Engineering, Inc.
2730 Rowland Road
Raleigh, North Carolina
Phone: (919) 755-1012
FAX: (919) 755-1031
Tower Analysis

Job: *Danbury, CT (SNET005-A)*			
Project: *11-07110E S1*			
Client: AT&T Towers	Drawn by: David Chickering		App'd:
Code: TIA/EIA-222-F	Date: 09/06/11		Scale: NTS
Path:			Dwg No. E-1

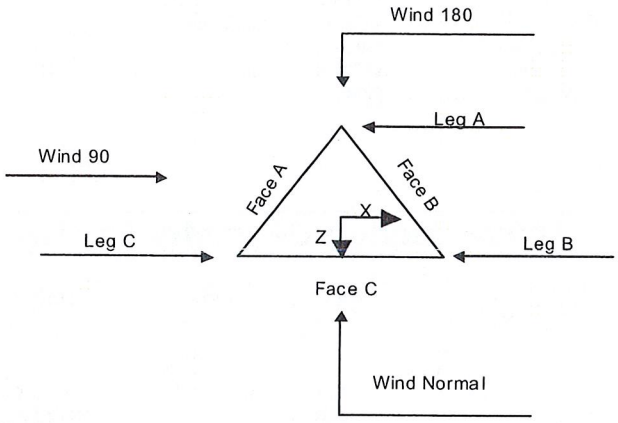
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 65.00 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 15.08 ft at the top and 15.08 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
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	65.00-50.10			15.08	1	14.90
T2	50.10-25.17			15.08	1	24.94
T3	25.17-0.00			15.08	1	25.17

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	65.00-50.10	14.10	X Brace	No	Yes	9.5000	0.0000
T2	50.10-25.17	24.94	X Brace	No	Yes	0.0000	0.0000
T3	25.17-0.00	25.17	X Brace	No	Yes	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 65.00-50.10	Arbitrary Shape	15.5"Ø x 0.260 8-Sided Polygon	A572-50 (50 ksi)	Equal Angle		A36 (36 ksi)
T2 50.10-25.17	Arbitrary Shape	15.5"Ø x 0.260 8-Sided Polygon	A572-50 (50 ksi)	Equal Angle		A36 (36 ksi)
T3 25.17-0.00	Arbitrary Shape	15.5"Ø x 0.260 8-Sided Polygon	A572-50 (50 ksi)	Wide Flange	W6x25	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 65.00-50.10	None	Flat Bar		A36 (36 ksi)	Arbitrary Shape	12.45"Ø x 0.265 8-Sided Polygon	A572-50 (50 ksi)
T2 50.10-25.17	None	Flat Bar		A36 (36 ksi)	Arbitrary Shape	12.45"Ø x 0.265 8-Sided Polygon	A572-50 (50 ksi)
T3 25.17-0.00	None	Flat Bar		A36 (36 ksi)	Arbitrary Shape	12.45"Ø x 0.265 8-Sided Polygon	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 65.00-50.10	Solid Round		A572-50 (50 ksi)	Wide Flange	W5x16	A36 (36 ksi)
T2 50.10-25.17	Solid Round		A572-50 (50 ksi)	Wide Flange	W6x20	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 65.00-50.10	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 50.10-25.17	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 25.17-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	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	K Factors[1] K Brace Diags X	K Factors[1] Single Diags X	K Factors[1] Girts X	K Factors[1] Horiz. X	K Factors[1] Sec. Horiz. X	K Factors[1] Inner Brace X
				Y	Y	Y	Y	Y	Y	Y
T1 65.00-50.10	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T2 50.10-25.17	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T3 25.17-0.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 65.00-50.10	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 50.10-25.17	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 25.17-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T1 65.00-50.10	Flange	1.0000 A325N	0	0.6250 A325N	0	1.2500 A325N	4	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 50.10-25.17	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	1.2500 A325N	4	0.6250 A325N	0
T3 25.17-0.00	Flange	2.2500 A572-50	4	0.7500 A325N	6	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	1.2500 A325N	4	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
***												
WE65	C	Yes	Ar (CfAe)	58.00 - 0.00	-2.0000	-0.5	2	2	0.5000	1.5836		0.53

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
WE65 ***	C	Yes	Ar (CfAe)	61.50 - 58.00	-2.0000	-0.5	1	1	0.5000	1.5836		0.53
7/8	C	Yes	Ar (CfAe)	51.50 - 0.00	-1.0000	-0.3	2	2	0.5000	1.1100		0.54
1 5/8	C	Yes	Ar (CfAe)	51.50 - 0.00	-1.0000	-0.25	4	4	0.5000	1.9800		1.04
LDF2-50A(3/8") ***	C	Yes	Ar (CfAe)	51.50 - 0.00	-1.0000	-0.18	2	2	0.4400	0.4400		0.08
1 1/4	C	Yes	Ar (CfAe)	51.50 - 0.00	-3.0000	0.1	1	1	1.0000	1.5500		0.66
1/2	C	Yes	Ar (CfAe)	52.50 - 0.00	-2.0000	0.1	2	2	0.5000	0.5800		0.25
1/2	C	Yes	Ar (CfAe)	54.50 - 52.50	-2.0000	0.1	1	1	0.5000	0.5800		0.25
1/2	C	Yes	Ar (CfAe)	50.50 - 0.00	-0.5000	0.1	2	2	0.5000	0.5800		0.25
1/2	C	Yes	Ar (CfAe)	52.50 - 50.50	-0.5000	0.1	1	1	0.5000	0.5800		0.25
LDF2-50A(3/8") ***	C	Yes	Ar (CfAe)	65.00 - 0.00	-1.0000	0.1	1	1	0.4400	0.4400		0.08
1/2	C	Yes	Ar (CfAe)	54.50 - 0.00	-4.0000	0.12	1	1	0.5800	0.5800		0.25
1 5/8	C	Yes	Ar (CfAe)	62.50 - 0.00	-4.0000	0.2	12	10	0.5000	1.9800		1.04
1/2	C	Yes	Ar (CfAe)	62.50 - 0.00	-3.0000	0.15	3	2	0.5800	0.5800		0.25
1 5/8	C	Yes	Ar (CfAe)	51.50 - 0.00	-3.0000	0.2	1	1	0.5000	1.9800		1.04
1 5/8	C	Yes	Ar (CfAe)	65.00 - 0.00	-1.0000	0.2	12	8	0.5000	1.9800		1.04
1/2	C	Yes	Ar (CfAe)	65.00 - 0.00	-1.0000	0.35	1	1	0.5800	0.5800		0.25
1/2	C	Yes	Ar (CfAe)	46.50 - 0.00	-3.0000	0.38	1	1	0.5800	0.5800		0.25
1/2	C	Yes	Ar (CfAe)	56.50 - 0.00	-4.0000	0.35	1	1	0.5800	0.5800		0.25
1 1/4	C	Yes	Ar (CfAe)	50.50 - 0.00	0.0000	0.5	3	3	0.5000	1.5500		0.66
1 1/4 ***	C	Yes	Ar (CfAe)	57.50 - 50.50	0.0000	0.5	1	1	0.5000	1.5500		0.66
1" conduit & 1.3" conduit ***	A	Yes	Ar (CfAe)	65.00 - 0.00	0.0000	-0.49	2	2	1.0000	1.0900		0.33
Feedline Ladder (Af)	C	Yes	Af (CfAe)	65.00 - 0.00	-2.0000	0.25	1	1	3.0000	3.0000	9.0000	8.40
Feedline Ladder (Af) ***	C	Yes	Af (CfAe)	51.50 - 0.00	-2.0000	-0.25	1	1	3.0000	3.0000	9.0000	8.40

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
***							

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	65.00-50.10	A	2.706	0.000	0.000	0.000	0.01
		B	0.000	0.000	0.000	0.000	0.00
		C	48.861	4.073	0.000	0.000	0.52
T2	50.10-25.17	A	4.530	0.000	0.000	0.000	0.02
		B	0.000	0.000	0.000	0.000	0.00
		C	133.339	12.469	0.000	0.000	1.36
T3	25.17-0.00	A	4.572	0.000	0.000	0.000	0.02

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
		B	0.000	0.000	0.000	0.000	0.00
		C	134.741	12.583	0.000	0.000	1.38

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	65.00-50.10	A	0.500	2.594	2.594	0.000	0.000	0.04
		B		0.000	0.000	0.000	0.000	0.00
		C		19.901	53.694	0.000	0.000	1.18
T2	50.10-25.17	A	0.500	4.343	4.343	0.000	0.000	0.07
		B		0.000	0.000	0.000	0.000	0.00
		C		73.618	138.085	0.000	0.000	3.06
T3	25.17-0.00	A	0.500	4.383	4.383	0.000	0.000	0.07
		B		0.000	0.000	0.000	0.000	0.00
		C		74.773	139.354	0.000	0.000	3.09

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	65.00-50.10	A	0.188	0.390	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	3.687	5.572	0.000	0.000
T2	50.10-25.17	A	0.188	0.390	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	6.066	9.577	0.000	0.000
T3	25.17-0.00	A	0.188	0.503	0.376	0.721
		B	0.000	0.000	0.000	0.000
		C	6.073	12.375	12.108	17.714

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	65.00-50.10	-7.9123	12.3143	-8.3818	12.1669
T2	50.10-25.17	-7.4084	18.9565	-8.2512	17.2169
T3	25.17-0.00	-5.7172	14.5861	-6.3454	12.8477

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
Beacon	A	From Leg	0.00 0.00 7.30	0.0000	65.00	No Ice 1/2" Ice	2.00 2.50	2.00 2.50	0.02 0.03
6.5' x 4.5" Pipe Mount	A	From Leg	0.00 0.00 3.00	0.0000	65.00	No Ice 1/2" Ice	2.60 3.01	2.60 3.01	0.07 0.09
***									
GPS	C	From Leg	0.00 11.00 1.50	0.0000	65.00	No Ice 1/2" Ice	0.62 0.75	0.62 0.75	0.01 0.02
28" x 1.6" Pipe Mount Mnt	C	From Leg	0.00 7.00 0.00	0.0000	65.00	No Ice 1/2" Ice	0.36 0.49	0.36 0.49	0.03 0.03
***									
5 Element (38" x 13.5") Yagi	C	From Leg	0.00 0.00 7.60	0.0000	65.00	No Ice 1/2" Ice	1.50 1.90	1.50 1.90	0.02 0.02
5.25' x 2.4" Pipe Mount	C	From Leg	0.00 0.00 3.00	0.0000	65.00	No Ice 1/2" Ice	1.33 1.63	1.33 1.63	0.03 0.04
***									
(2) BXA-70063/6CF W/Mount Pipe	A	From Leg	0.00 0.00 4.00	-40.0000	65.00	No Ice 1/2" Ice	7.75 8.29	5.18 6.11	0.04 0.09
(4) DB846F65ZAXY w/Mount Pipe	B	From Leg	0.00 0.00 4.00	75.0000	65.00	No Ice 1/2" Ice	7.27 7.88	7.82 9.01	0.05 0.11
(4) LPA-185063/12CF W/Mount Pipe	C	From Leg	0.00 0.00 4.00	40.0000	65.00	No Ice 1/2" Ice	4.99 5.44	5.94 6.88	0.04 0.08
I-Beam Mnt	A	From Leg	0.00 0.00 1.50	0.0000	65.00	No Ice 1/2" Ice	8.76 12.74	0.78 0.95	0.34 0.50
I-Beam Mnt	C	From Leg	0.00 0.00 1.50	0.0000	65.00	No Ice 1/2" Ice	8.76 12.74	0.78 0.95	0.34 0.50
***									
(2) 7770.00 W/Mount Pipe	A	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	5.90 6.34	4.01 4.64	0.05 0.10
(2) 7770.00 W/Mount Pipe	B	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	5.90 6.34	4.01 4.64	0.05 0.10
(2) 7770.00 W/Mount Pipe	C	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	5.90 6.34	4.01 4.64	0.05 0.10
P65-16-XLH-RR w/ Mount Pipe	A	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	8.64 9.29	6.36 7.54	0.08 0.14
P65-16-XLH-RR w/ Mount Pipe	B	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	8.64 9.29	6.36 7.54	0.08 0.14
P65-16-XLH-RR w/ Mount Pipe	C	From Face	0.00 0.00 1.50	20.0000	62.50	No Ice 1/2" Ice	8.64 9.29	6.36 7.54	0.08 0.14
(2) RRUS-11 RRU	A	From Face	0.00	20.0000	62.50	No Ice	2.55	0.92	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			1/2" Ice	2.77	1.07	0.06
			1.50						
(2) RRUS-11 RRU	B	From Face	0.00	20.0000	62.50	No Ice	2.55	0.92	0.05
			0.00			1/2" Ice	2.77	1.07	0.06
			1.50						
(2) RRUS-11 RRU	C	From Face	0.00	20.0000	62.50	No Ice	2.55	0.92	0.05
			0.00			1/2" Ice	2.77	1.07	0.06
			1.50						
(2) LGP13519	A	From Face	0.00	20.0000	62.50	No Ice	0.00	0.21	0.01
			0.00			1/2" Ice	0.00	0.28	0.01
			0.00						
(2) LGP13519	B	From Face	0.00	20.0000	62.50	No Ice	0.00	0.21	0.01
			0.00			1/2" Ice	0.00	0.28	0.01
			0.00						
(2) LGP13519	C	From Face	0.00	20.0000	62.50	No Ice	0.00	0.21	0.01
			0.00			1/2" Ice	0.00	0.28	0.01
			0.00						
(2) 14.5"x9.25"x2.5" TMA	A	From Leg	0.00	20.0000	62.50	No Ice	0.00	0.35	0.02
			0.00			1/2" Ice	0.00	0.47	0.02
			0.00						
(2) 14.5"x9.25"x2.5" TMA	B	From Leg	0.00	20.0000	62.50	No Ice	0.00	0.35	0.02
			0.00			1/2" Ice	0.00	0.47	0.02
			0.00						
(2) 14.5"x9.25"x2.5" TMA	C	From Leg	0.00	20.0000	62.50	No Ice	0.00	0.35	0.02
			0.00			1/2" Ice	0.00	0.47	0.02
			0.00						
(3) 8.3' Face Mounted T-Frames Mnt	C	None		0.0000	62.50	No Ice	19.73	19.73	0.82
						1/2" Ice	27.41	27.41	1.17
***									
5.7'x4.5" Pipe Mount Mnt	B	From Leg	0.00	0.0000	61.50	No Ice	2.60	2.60	0.07
			0.00			1/2" Ice	3.01	3.01	0.09
			0.00						
***									
6.6'x4.5" Pipe Mount Mnt	C	From Leg	0.00	0.0000	58.00	No Ice	2.60	2.60	0.07
			0.00			1/2" Ice	3.01	3.01	0.09
			0.00						
***									
15.5'x3.5" Omni	B	From Leg	2.00	0.0000	57.50	No Ice	5.25	5.25	0.02
			0.00			1/2" Ice	6.79	6.79	0.06
			7.50						
2' Standoff Mnt	B	From Leg	1.00	0.0000	57.50	No Ice	1.00	0.90	0.02
			0.00			1/2" Ice	1.39	1.42	0.03
			0.00						
***									
14.7'x3.5" Pipe Mount Mnt	A	From Face	0.00	0.0000	58.00	No Ice	5.87	5.87	0.26
			0.00			1/2" Ice	7.40	7.40	0.33
			0.00						
7.7'x1.6" Pipe Mount Mnt	A	From Face	0.00	0.0000	56.00	No Ice	2.30	2.30	0.04
			0.00			1/2" Ice	3.13	3.13	0.06
			0.00						
***									
9.5'x1.75" 4-Element Dipole	B	From Face	0.00	0.0000	56.50	No Ice	1.75	1.75	0.03
			0.00			1/2" Ice	2.77	2.77	0.04
			-1.50						
14.5x1.9" Pipe Mount Mnt	B	From Face	0.00	0.0000	56.50	No Ice	3.45	3.45	0.10
			0.00			1/2" Ice	4.94	4.94	0.14
			0.00						

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
***									
16'x3.5" Pipe Mount Mnt	C	From Face	0.00 0.00 0.00	0.0000	56.50	No Ice 1/2" Ice	6.40 8.05	6.40 8.05	0.30 0.37
13"x10.5"x3.5" TMA	C	From Face	0.00 0.00 2.50	0.0000	56.50	No Ice 1/2" Ice	1.52 1.69	0.36 0.47	0.02 0.03
***									
21'x2.5" Omni	B	From Leg	8.00 0.00 10.50	0.0000	54.50	No Ice 1/2" Ice	5.25 7.38	5.25 7.38	0.03 0.07
8' Standoff Mnt	B	From Leg	4.00 0.00 0.00	0.0000	54.50	No Ice 1/2" Ice	5.00 10.00	5.00 10.00	0.25 0.30
***									
7.25'x0.95" Omni	B	From Leg	0.00 0.00 5.00	0.0000	52.50	No Ice 1/2" Ice	0.69 1.43	0.69 1.43	0.02 0.02
(2) 5'x2.4" Pipe Mount	B	From Face	0.00 0.00 0.00	0.0000	52.50	No Ice 1/2" Ice	1.33 1.63	1.33 1.63	0.03 0.04
5'x2.4" Pipe Mount	C	From Face	0.00 0.00 0.00	0.0000	52.50	No Ice 1/2" Ice	1.33 1.63	1.33 1.63	0.03 0.04
5'x2.4" Pipe Mount	A	From Face	0.00 0.00 0.00	0.0000	52.50	No Ice 1/2" Ice	1.33 1.63	1.33 1.63	0.03 0.04
10'x1.6" Omni	A	From Face	0.00 0.00 6.00	0.0000	52.50	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.04
5-Element (80.5"x3.7") Yagi	B	From Face	0.00 0.00 2.50	0.0000	52.50	No Ice 1/2" Ice	2.40 3.19	2.40 3.19	0.04 0.06
4-Element (10'x1.6") Dipole	A	From Face	0.00 0.00 6.00	0.0000	52.50	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.04
*** ***									
9.25'x3.5" Omni	B	From Face	6.50 5.00 8.00	0.0000	51.50	No Ice 1/2" Ice	2.85 3.83	2.85 3.83	0.03 0.05
4-Element (10'x1.6") Dipole	B	From Face	6.50 5.00 -5.00	0.0000	51.50	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.04
6.5' I-Beam Standoff Mnt	B	From Face	3.25 5.00 0.00	0.0000	51.50	No Ice 1/2" Ice	0.37 0.46	4.82 5.37	0.16 0.20
***									
10.5' I-Beam Standoff	B	From Leg	5.75 -5.00 0.00	0.0000	51.50	No Ice 1/2" Ice	0.37 0.46	7.79 8.65	0.26 0.32
4'x2.4" Pipe Mount Mnt	B	From Leg	10.50 -5.00 0.00	0.0000	51.50	No Ice 1/2" Ice	1.00 1.39	1.00 1.39	0.03 0.04
***									
11.5'x2.5" Omni	C	From Face	3.00 0.00	0.0000	51.50	No Ice 1/2" Ice	2.75 3.88	2.75 3.88	0.03 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
			6.00						
10'x3" Omni	C	From Face	9.50	0.0000	51.50	No Ice	3.00	3.00	0.03
			0.00			1/2" Ice	4.03	4.03	0.05
			8.00						
20"x16"x7.25" TMA	C	From Face	0.00	0.0000	51.50	No Ice	3.11	1.41	0.04
			0.00			1/2" Ice	3.35	1.59	0.06
			0.00						
10'x3" Omni	C	From Face	9.50	0.0000	51.50	No Ice	3.00	3.00	0.03
			0.00			1/2" Ice	4.03	4.03	0.05
			6.00						
9.5' I-Beam Standoff Mnt	C	From Face	4.75	0.0000	51.50	No Ice	0.37	7.05	0.24
			0.00			1/2" Ice	0.46	7.83	0.29
			0.00						
***									
10'x3" Omni	C	From Face	6.50	0.0000	50.50	No Ice	3.00	3.00	0.03
			0.00			1/2" Ice	4.03	4.03	0.05
			-5.00						
6.5' Standoff Mnt	C	From Leg	3.25	0.0000	50.50	No Ice	2.72	12.93	0.15
			0.00			1/2" Ice	4.11	17.82	0.22
			0.00						
***									
(1) 15" Standoff Mnt	B	From Leg	0.00	0.0000	50.50	No Ice	0.63	0.94	0.02
			0.00			1/2" Ice	1.00	1.45	0.03
			0.00						
(1) 15" Standoff Mnt	C	From Leg	0.00	0.0000	50.50	No Ice	0.63	0.94	0.02
			0.00			1/2" Ice	1.00	1.45	0.03
			0.00						
***									
DB636NS-C	B	From Leg	0.00	0.0000	50.50	No Ice	2.51	2.51	0.03
			0.00			1/2" Ice	3.59	3.59	0.05
			-4.50						
6.5' Standoff	B	From Leg	6.50	0.0000	50.50	No Ice	2.72	12.93	0.15
			0.00			1/2" Ice	4.11	17.82	0.22
			0.00						
***									
11'x2" Omni	C	From Face	1.25	0.0000	50.50	No Ice	2.75	2.75	0.03
			0.00			1/2" Ice	3.88	3.88	0.05
			-7.00						
(1) 15" Standoff Mnt	C	From Face	0.00	0.0000	50.50	No Ice	0.63	0.94	0.02
			0.00			1/2" Ice	1.00	1.45	0.03
			0.00						
20.5"x6.75"x4.5" TMA	C	From Face	1.25	0.0000	50.50	No Ice	1.35	0.90	0.04
			0.00			1/2" Ice	1.53	1.06	0.05
			2.00						
***									
5' Standoff Mnt	A	From Face	5.00	0.0000	46.50	No Ice	0.98	2.60	0.05
			0.00			1/2" Ice	1.70	4.50	0.07
			0.00						
***									
***									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
6' Dish	B	Paraboloid w/Radome	From Leg	1.00 0.00 -1.00	0.0000		61.50	6.00	No Ice 1/2" Ice	28.27 29.07	0.38 0.45
6' Dish	C	Paraboloid w/Radome	From Leg	1.00 0.00 -1.00	0.0000		58.00	6.00	No Ice 1/2" Ice	28.27 29.07	0.38 0.45
SPD2-5.8	B	Paraboloid w/o Radome	From Face	1.00 0.00 1.00	0.0000		56.50	2.00	No Ice 1/2" Ice	3.14 3.41	0.02 0.04
PRFTV-48/75 Grid Dish	A	Grid	From Face	1.00 0.00 0.00	0.0000		46.50	4.00	No Ice 1/2" Ice	12.57 13.10	0.07 0.14

Load Combinations

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

Comb. No.	Description
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	65 - 50.1042	Leg	Max Tension	12	6.87	43.41	-3.88
			Max. Compression	19	-14.07	25.10	0.95
			Max. Mx	2	-9.13	-46.46	1.62
			Max. My	3	-0.70	-0.12	23.72
			Max. Vy	2	-6.45	27.63	0.06
			Max. Vx	10	-1.86	-12.37	-16.73
		Top Girt	Max Tension	2	2.98	-3.34	0.03
			Max. Compression	4	-3.04	6.58	0.00
			Max. Mx	11	-0.09	-37.25	-0.13
			Max. My	10	-1.60	-32.54	-0.14
			Max. Vy	11	5.14	-37.25	-0.13
			Max. Vx	11	0.02	36.18	0.13
T2	50.1042 - 25.1667	Leg	Max Tension	8	21.11	75.51	-2.93
			Max. Compression	23	-33.19	64.75	12.55
			Max. Mx	15	-29.05	-79.06	2.75
			Max. My	3	-6.09	-1.05	-68.68
			Max. Vy	15	-6.12	65.43	-1.98
			Max. Vx	3	5.80	-1.05	-68.68
		Horizontal	Max Tension	4	2.48	-9.28	0.04
			Max. Compression	2	-2.41	-1.27	-0.04
			Max. Mx	11	0.08	-83.53	0.07
			Max. My	2	1.31	-64.39	0.08
			Max. Vy	11	11.28	-83.53	0.07
			Max. Vx	13	0.01	-69.32	0.07
T3	25.1667 - 0	Leg	Max Tension	8	41.88	-63.01	2.37
			Max. Compression	23	-63.97	0.00	0.00
			Max. Mx	15	-58.97	65.43	-1.98
			Max. My	3	-4.24	-1.05	-68.68
			Max. Vy	2	2.91	64.89	-2.79
			Max. Vx	3	-3.08	-1.05	-68.68
		Diagonal	Max Tension	17	26.67	0.00	0.00
			Max. Compression	10	-27.74	0.00	0.00
			Max. Mx	22	19.89	-0.81	-0.02
			Max. My	11	-25.54	0.04	-0.05
			Max. Vy	22	0.18	-0.81	-0.02
			Max. Vx	11	0.00	0.01	-0.05
		Horizontal	Max Tension	2	1.24	0.00	0.00
			Max. Compression	17	-1.97	0.00	0.00
			Max. Mx	14	-1.63	1.25	0.00
			Max. Vy	14	-0.33	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	23	99.30	15.14	-6.90
	Max. H_x	10	92.74	17.91	-8.50
	Max. H_z	17	-63.45	-17.21	8.62
	Min. Vert	4	-70.85	-14.16	6.63
	Min. H_x	17	-63.45	-17.21	8.62
	Min. H_z	10	92.74	17.91	-8.50
Leg B	Max. Vert	19	98.36	-15.12	-6.82
	Max. H_x	25	-63.43	17.10	8.58
	Max. H_z	25	-63.43	17.10	8.58
	Min. Vert	12	-70.53	14.08	6.65
	Min. H_x	6	92.21	-17.79	-8.50
	Min. H_z	6	92.21	-17.79	-8.50
Leg A	Max. Vert	15	94.29	-0.07	16.35
	Max. H_x	5	7.69	1.98	1.81
	Max. H_z	2	90.74	0.06	19.74
	Min. Vert	8	-73.65	-0.06	-15.74
	Min. H_x	11	6.88	-1.98	1.66
	Min. H_z	21	-69.30	-0.02	-19.59

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	28.18	0.00	0.00	26.14	-1.16	0.00
Dead+Wind 0 deg - No Ice	28.18	0.06	-26.48	-1062.56	-4.28	1.22
Dead+Wind 30 deg - No Ice	28.18	12.81	-22.74	-913.52	-525.11	22.01
Dead+Wind 60 deg - No Ice	28.18	22.19	-13.12	-517.16	-911.73	37.53
Dead+Wind 90 deg - No Ice	28.18	25.87	-0.07	22.30	-1063.45	43.42
Dead+Wind 120 deg - No Ice	28.18	22.57	13.14	564.56	-923.28	37.03
Dead+Wind 150 deg - No Ice	28.18	12.79	22.42	947.29	-524.17	19.91
Dead+Wind 180 deg - No Ice	28.18	-0.16	25.75	1084.76	8.19	-1.28
Dead+Wind 210 deg - No Ice	28.18	-12.98	22.45	949.25	532.66	-22.07
Dead+Wind 240 deg - No Ice	28.18	-22.68	13.27	571.67	927.03	-38.26
Dead+Wind 270 deg - No Ice	28.18	-25.91	0.12	32.83	1064.23	-43.68
Dead+Wind 300 deg - No Ice	28.18	-22.23	-12.95	-508.00	912.23	-36.25
Dead+Wind 330 deg - No Ice	28.18	-12.73	-22.69	-911.13	518.93	-19.59
Dead+Ice+Temp	39.65	0.00	0.00	47.85	5.07	0.00
Dead+Wind 0 deg+Ice+Temp	39.65	0.08	-27.94	-1058.97	0.53	-1.63
Dead+Wind 30 deg+Ice+Temp	39.65	12.93	-22.85	-870.17	-510.13	19.39
Dead+Wind 60 deg+Ice+Temp	39.65	22.21	-12.80	-468.51	-885.89	34.74
Dead+Wind 90 deg+Ice+Temp	39.65	26.13	0.08	50.55	-1038.55	41.55
Dead+Wind 120 deg+Ice+Temp	39.65	23.97	13.94	598.38	-938.72	37.73
Dead+Wind 150 deg+Ice+Temp	39.65	13.07	22.61	951.40	-515.33	19.97
Dead+Wind 180 deg+Ice+Temp	39.65	0.12	25.65	1077.91	1.62	-0.07
Dead+Wind 210 deg+Ice+Temp	39.65	-13.05	22.64	953.55	527.30	-19.43
Dead+Wind 240 deg+Ice+Temp	39.65	-23.95	14.02	604.09	949.66	-36.10
Dead+Wind 270 deg+Ice+Temp	39.65	-26.05	0.15	56.27	1045.98	-41.04
Dead+Wind 300 deg+Ice+Temp	39.65	-22.00	-12.81	-466.95	886.42	-34.66
Dead+Wind 330 deg+Ice+Temp	39.65	-12.81	-22.82	-868.02	513.02	-20.44
Dead+Wind 0 deg - Service	28.18	0.02	-9.16	-350.58	-2.24	0.42
Dead+Wind 30 deg - Service	28.18	4.43	-7.87	-299.00	-182.46	7.61
Dead+Wind 60 deg - Service	28.18	7.68	-4.54	-161.86	-316.23	12.99
Dead+Wind 90 deg - Service	28.18	8.95	-0.02	24.81	-368.73	15.03
Dead+Wind 120 deg - Service	28.18	7.81	4.55	212.44	-320.23	12.81
Dead+Wind 150 deg - Service	28.18	4.42	7.76	344.87	-182.13	6.89
Dead+Wind 180 deg - Service	28.18	-0.06	8.91	392.44	2.08	-0.44

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 210 deg - Service	28.18	-4.49	7.77	345.55	183.55	-7.64
Dead+Wind 240 deg - Service	28.18	-7.85	4.59	214.90	320.02	-13.24
Dead+Wind 270 deg - Service	28.18	-8.96	0.04	28.45	367.49	-15.11
Dead+Wind 300 deg - Service	28.18	-7.69	-4.48	-158.69	314.89	-12.54
Dead+Wind 330 deg - Service	28.18	-4.40	-7.85	-298.18	178.80	-6.78

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-28.18	0.00	0.00	28.18	-0.00	0.000%
2	0.06	-28.18	-26.48	-0.06	28.18	26.48	0.000%
3	12.81	-28.18	-22.74	-12.81	28.18	22.74	0.000%
4	22.19	-28.18	-13.12	-22.19	28.18	13.12	0.000%
5	25.87	-28.18	-0.07	-25.87	28.18	0.07	0.000%
6	22.57	-28.18	13.14	-22.57	28.18	-13.14	0.000%
7	12.79	-28.18	22.42	-12.79	28.18	-22.42	0.000%
8	-0.16	-28.18	25.75	0.16	28.18	-25.75	0.000%
9	-12.98	-28.18	22.45	12.98	28.18	-22.45	0.000%
10	-22.68	-28.18	13.27	22.68	28.18	-13.27	0.000%
11	-25.91	-28.18	0.12	25.91	28.18	-0.12	0.000%
12	-22.23	-28.18	-12.95	22.23	28.18	12.95	0.000%
13	-12.73	-28.18	-22.69	12.73	28.18	22.69	0.000%
14	0.00	-39.65	0.00	0.00	39.65	-0.00	0.000%
15	0.08	-39.65	-27.94	-0.08	39.65	27.94	0.000%
16	12.93	-39.65	-22.85	-12.93	39.65	22.85	0.000%
17	22.21	-39.65	-12.80	-22.21	39.65	12.80	0.000%
18	26.13	-39.65	0.08	-26.13	39.65	-0.08	0.000%
19	23.97	-39.65	13.94	-23.97	39.65	-13.94	0.000%
20	13.07	-39.65	22.61	-13.07	39.65	-22.61	0.000%
21	0.12	-39.65	25.65	-0.12	39.65	-25.65	0.000%
22	-13.05	-39.65	22.64	13.05	39.65	-22.64	0.000%
23	-23.95	-39.65	14.02	23.95	39.65	-14.02	0.000%
24	-26.05	-39.65	0.15	26.05	39.65	-0.15	0.000%
25	-22.00	-39.65	-12.81	22.00	39.65	12.81	0.000%
26	-12.81	-39.65	-22.82	12.81	39.65	22.82	0.000%
27	0.02	-28.18	-9.16	-0.02	28.18	9.16	0.000%
28	4.43	-28.18	-7.87	-4.43	28.18	7.87	0.000%
29	7.68	-28.18	-4.54	-7.68	28.18	4.54	0.000%
30	8.95	-28.18	-0.02	-8.95	28.18	0.02	0.000%
31	7.81	-28.18	4.55	-7.81	28.18	-4.55	0.000%
32	4.42	-28.18	7.76	-4.42	28.18	-7.76	0.000%
33	-0.06	-28.18	8.91	0.06	28.18	-8.91	0.000%
34	-4.49	-28.18	7.77	4.49	28.18	-7.77	0.000%
35	-7.85	-28.18	4.59	7.85	28.18	-4.59	0.000%
36	-8.96	-28.18	0.04	8.96	28.18	-0.04	0.000%
37	-7.69	-28.18	-4.48	7.69	28.18	4.48	0.000%
38	-4.40	-28.18	-7.85	4.40	28.18	7.85	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	65 - 50.1042	1.260	27	0.0123	0.1658
T2	50.1042 - 25.1667	0.996	27	0.0116	0.1286
T3	25.1667 - 0	0.041	33	0.0074	0.0049

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
65.00	Beacon	27	1.260	0.0123	0.1658	14671
62.50	(2) 7770.00 W/Mount Pipe	27	1.231	0.0123	0.1614	14671
61.50	5.7'x4.5" Pipe Mount Mnt	27	1.218	0.0122	0.1595	14671
60.50	6' Dish	27	1.205	0.0122	0.1576	14671
58.00	6.6'x4.5" Pipe Mount Mnt	27	1.169	0.0121	0.1524	10479
57.50	SPD2-5.8	27	1.161	0.0121	0.1512	9781
57.00	6' Dish	27	1.153	0.0120	0.1500	9169
56.50	9.5'x1.75" 4-Element Dipole	27	1.144	0.0120	0.1488	8630
56.00	7.7'x1.6" Pipe Mount Mnt	27	1.135	0.0120	0.1475	8151
54.50	21'x2.5" Omni	27	1.106	0.0119	0.1435	6988
52.50	7.25'x0.95" Omni	27	1.061	0.0118	0.1373	5998
51.50	9.25'x3.5" Omni	27	1.035	0.0117	0.1339	5737
50.50	10'x3" Omni	27	1.008	0.0116	0.1301	5638
46.50	PRFTV-48/75 Grid Dish	27	0.874	0.0112	0.1125	7181

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	65 - 50.1042	3.661	2	0.0335	0.4792
T2	50.1042 - 25.1667	2.890	2	0.0315	0.3716
T3	25.1667 - 0	0.119	23	0.0206	0.0142

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
65.00	Beacon	2	3.661	0.0335	0.4792	5015
62.50	(2) 7770.00 W/Mount Pipe	2	3.574	0.0332	0.4663	5015
61.50	5.7'x4.5" Pipe Mount Mnt	2	3.538	0.0331	0.4610	5015
60.50	6' Dish	2	3.500	0.0330	0.4554	5015
58.00	6.6'x4.5" Pipe Mount Mnt	2	3.394	0.0328	0.4403	3582
57.50	SPD2-5.8	2	3.371	0.0327	0.4370	3343
57.00	6' Dish	2	3.346	0.0326	0.4336	3134
56.50	9.5'x1.75" 4-Element Dipole	2	3.321	0.0326	0.4301	2950
56.00	7.7'x1.6" Pipe Mount Mnt	2	3.295	0.0325	0.4264	2786
54.50	21'x2.5" Omni	2	3.210	0.0323	0.4147	2389
52.50	7.25'x0.95" Omni	2	3.079	0.0319	0.3968	2050

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
51.50	9.25'x3.5" Omni	2	3.004	0.0318	0.3869	1961
50.50	10'x3" Omni	2	2.924	0.0316	0.3761	1926
46.50	PRFTV-48/75 Grid Dish	2	2.537	0.0306	0.3252	2449

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	65	Top Girt	A325N	1.2500	4	0.76	25.77	0.029 ✓	1.333	Bolt Shear
T2	50.1042	Horizontal	A325N	1.2500	4	0.62	25.77	0.024 ✓	1.333	Bolt Shear
T3	25.1667	Leg	A572-50	2.2500	4	10.47	85.29	0.123 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	6	4.62	9.28	0.498 ✓	1.333	Bolt Shear
		Horizontal	A325N	1.2500	4	0.49	25.77	0.019 ✓	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	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	14.90	14.10	30.5 K=1.00	27.085	13.1302	-9.46	355.63	0.027
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	24.94	24.94	54.0 K=1.00	23.714	13.1302	-26.71	311.37	0.086
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	25.17	25.17	54.5 K=1.00	23.634	13.1302	-63.97	310.31	0.206

Leg Bending Design Data (Compression)

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	-39.76	-9.172	30.000	0.306	-13.47	-3.107	30.000	0.104
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	-66.45	-15.331	30.000	0.511	-41.45	-9.563	30.000	0.319
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	0.00	0.000	30.000	0.000	0.00	0.000	30.000	0.000

Leg Interaction Design Data (Compression)

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	0.027	0.306	0.104	0.436 ✓	1.333	H1-3 ✓
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	0.086	0.511	0.319	0.916 ✓	1.333	H1-3 ✓
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	0.206	0.000	0.000	0.206 ✓	1.333	H1-3 ✓

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 $\frac{P}{P_a}$
T3	25.1667 - 0	W6x25	29.34	13.41	105.9 K=1.00	12.217	7.3400	-27.74	89.67	0.309 ✓

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 $\frac{P}{P_a}$
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4 K=1.00	30.000	10.7000	0.00	280.32	0.000
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4 K=1.00	26.198	10.7000	-1.63	280.32	0.006*

* DL controls

Horizontal Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	-83.53	-32.155	30.000	1.072	0.07	-0.025	30.000	0.001
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	0.00	0.000	30.000	0.000	0.00	0.000	30.000	0.000

Horizontal Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	0.000	1.072	0.001	1.073 ✔	1.333	H1-3 ✔
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	0.006	0.000	0.000	0.006* ✔	1.000	H1-3 ✔

* DL controls

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	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4 K=1.00	26.198	10.7000	-0.09	280.32	0.000

Top Girt Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	-37.25	-14.340	30.000	0.478	-0.13	-0.051	30.000	0.002

Top Girt Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	0.000	0.478	0.002	0.480 ✔	1.333	H1-3 ✔

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	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	14.90	14.10	30.5	30.000	13.1302	5.84	393.91	0.015

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 $\frac{P}{P_a}$
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	24.94	24.94	54.0	30.000	13.1302	15.82	393.91	0.040
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	25.17	25.17	54.5	30.000	13.1302	41.88	393.91	0.106

Leg Bending Design Data (Tension)

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	37.57	8.667	30.000	0.289	-13.66	3.151	30.000	0.105
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	65.46	15.103	30.000	0.503	-42.18	9.730	30.000	0.324
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	0.00	0.000	30.000	0.000	0.00	0.000	30.000	0.000

Leg Interaction Design Data (Tension)

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	65 - 50.1042	15.5"Ø x 0.260 8-Sided Polygon	0.015	0.289	0.105	0.409 ✓	1.333	H2-1 ✓
T2	50.1042 - 25.1667	15.5"Ø x 0.260 8-Sided Polygon	0.040	0.503	0.324	0.868 ✓	1.333	H2-1 ✓
T3	25.1667 - 0	15.5"Ø x 0.260 8-Sided Polygon	0.106	0.000	0.000	0.106 ✓	1.333	H2-1 ✓

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 $\frac{P}{P_a}$
T3	25.1667 - 0	W6x25	29.34	13.41	105.9	29.000	5.2950	26.67	153.56	0.174 ✓

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 $\frac{P}{P_a}$
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4	30.000	10.7000	0.08	321.00	0.000

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 $\frac{P}{P_a}$
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4	30.000	10.7000	0.97	321.00	0.003*

* DL controls

Horizontal Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	-83.53	32.155	30.000	1.072	0.07	0.025	30.000	0.001
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	0.00	0.000	30.000	0.000	0.00	0.000	30.000	0.000

Horizontal Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T2	50.1042 - 25.1667	12.45"Ø x 0.265 8-Sided Polygon	0.000	1.072	0.001	1.073 ✓	1.333	H2-1 ✓
T3	25.1667 - 0	12.45"Ø x 0.265 8-Sided Polygon	0.003	0.000	0.000	0.003* ✓	1.000	H2-1 ✓

* DL controls

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	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	15.08	13.79	37.4	30.000	10.7000	1.46	321.00	0.005

Top Girt Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	-32.95	12.682	30.000	0.423	-0.09	0.036	30.000	0.001

Top Girt Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	65 - 50.1042	12.45"Ø x 0.265 8-Sided Polygon	0.005	0.423	0.001	0.428 ✓	1.333	H2-1 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	65 - 50.1042	Leg	15.5"Ø x 0.260 8-Sided Polygon	1	-9.46	474.06	32.7	Pass
		Top Girt	12.45"Ø x 0.265 8-Sided Polygon	4	1.46	427.89	36.0	Pass
T2	50.1042 - 25.1667	Leg	15.5"Ø x 0.260 8-Sided Polygon	7	-26.71	415.05	68.7	Pass
		Horizontal	12.45"Ø x 0.265 8-Sided Polygon	10	0.08	427.89	80.5	Pass
T3	25.1667 - 0	Leg	15.5"Ø x 0.260 8-Sided Polygon	13	-63.97	413.65	15.5	Pass
		Diagonal	W6x25	19	-27.74	119.53	23.2 37.4 (b)	Pass
		Horizontal	12.45"Ø x 0.265 8-Sided Polygon	17	-1.63	280.32	0.6 1.4 (b)	Pass
						Summary		
						Leg (T2)	68.7	Pass
						Diagonal (T3)	37.4	Pass
						Horizontal (T2)	80.5	Pass
						Top Girt (T1)	36.0	Pass
						Bolt Checks	37.4	Pass
						RATING =	**80.5**	**Pass**

Foundation Analysis (Ice Load Controls)

Overturning:

$$FS = \frac{(P + W_c + W_a)\left(\frac{21.6'}{2}\right)}{M + V(d)} \; ; \; W_c = V_c \gamma_c$$

$$W_c = (357.2\,ft^2)(2.5\,ft)(.150\,kcf)$$

$$W_c = 133.9K$$

$$W_a = 0$$

$$FS = \frac{(39k + 133.9 + 0)\left(\frac{21.6'}{2}\right)}{1126\,k\text{-}ft + 28(2.5')}$$

$FS = 1.56 \geq 1.5$ ✓ OK ; $\% = \frac{1.5}{1.56} = \boxed{96.1\%}$

Toe Pressure:

Ult. Bearing Pressure = 25ksf

Actual Bearing Pressure = $\frac{M}{S} + \frac{P}{A}$; $S = \frac{I}{\bar{y}} = \frac{11197.4\,ft^4}{13\,ft} = 861.3\,ft^3$

$A = 357.2\,ft^2$

$$\sigma_B = \frac{1126\,k\text{-}ft}{861.3\,ft^3} + \frac{39K}{357.2\,ft^2}$$

$\sigma_B = 1.42\,ksf$

$$\% = \frac{1.42\,ksf}{(.50)(25\,ksf)} = \boxed{11.4\%}$$