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

April 13, 2009

Mark R. Richard
UMTS Project Manager
T-Mobile USA, Inc.
35 Griffin Road South
Bloomfield, CT 06002

RE: **EM-T-MOBILE-152-090305** - Omnipoint Communications, as subsidiary of T-Mobile USA, Inc., notice of intent to modify an existing telecommunications facility located at 41 Manitock Hill Road a/k/a Rock Ridge Road, Waterford, Connecticut.

Dear Mr. Richard:

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.

The proposed modifications are to be implemented as specified here and in your notice dated March 3, 2009, including the placement of all necessary equipment and shelters within the tower compound. 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. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP/laf

c: The Honorable Daniel M. Steward, First Selectman, Town of Waterford
Thomas V. Wagner, Planning Director, Town of Waterford
Carrie L. Larson, Esq., Pullman & Comley, LLC
Crown Castle USA, Inc.

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
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www.ct.gov/csc

March 10, 2009

The Honorable Daniel M. Steward
First Selectman
Town of Waterford
Town Hall
15 Rope Ferry Road
Waterford, CT 06385

RE: **EM-T-MOBILE-152-090305** - Omnipoint Communications, as subsidiary of T-Mobile USA, Inc., notice of intent to modify an existing telecommunications facility located at 41 Manitock Hill Road a/k/a Rock Ridge Road, Waterford, Connecticut.

Dear Mr. Steward:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by March 24, 2009.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/jb

Enclosure: Notice of Intent

c: Thomas V. Wagner, Planning Director, Town of Waterford

T-Mobile

March 3, 2009

EM-T-MOBILE-152-090305

Via Federal Express

S. Derek Phelps, Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Notice of Exempt Modification
Crown Castle USA, Inc. Telecommunications Facility
41 Manitock Hill Road aka Rock Ridge Road, Waterford, Connecticut
T-Mobile Site CT11381C

Dear Mr. Phelps:

Omnipoint Communications, a subsidiary of T-Mobile USA, Inc. ("T-Mobile"), intends to replace existing antennas, install additional antennas and replace existing ground equipment at the existing 136-foot PiRod Self-Supporting Tower facility owned by Crown Castle USA, Inc. and located at 41 Manitock Hill Road a/k/a Rock Ridge Road, Waterford, Connecticut ("Facility"). T-Mobile is licensed by the Federal Communications Commission (FCC) to provide PCS wireless telecommunications service in the State of Connecticut, which includes the area to be served by the proposed installation. This installation constitutes an exempt modification pursuant to the Public Utility Environmental Standards Act, Connecticut General Statutes Section 16-50g *et. seq.* (PUESA), and Section 16-50j-72(b)(2) of the Regulations of the Connecticut State Agencies adopted pursuant to PUESA. In accordance with R.C.S.A. Section 16-50j-73, a copy of this notice has been sent to, Daniel Stewart, First Selectman, Town of Waterford.

The existing Facility consists of a 136-foot PiRod Self-Supporting Tower capable of supporting multiple carriers within a fenced compound and was previously approved by the Town of Waterford. The coordinates for the Facility are approximately **Lat: 41°-21'-14" and Long: 72°-09-03".** The tower is located in the southern portion of Waterford, approximately 300 feet north of a water tower, approximately 2000 feet north of Boston Post Road (Route 1) and roughly 5000 feet south of Interstate 95 (see Site Map, attached as Exhibit A). The tower currently supports AT&T antennas at the ninety seven foot (97') level centerline AGL (above ground level), Verizon antennas at the one hundred seven foot level (107') AGL, Nextel antennas at the one hundred twenty seven foot level (127') AGL and Sprint antennas at the one hundred thirty seven foot (137') AGL.. T-Mobile currently has antennas on the tower at the one hundred seventeen foot (117') AGL. The current T-Mobile antenna configuration is two per sector, for a total of six antennas. T-Mobile proposes to swap one T-Mobile antenna per sector with T-Mobile UMTS Quad Pole Antenna. (one per sector), for a total of six antennas at their current elevation on the tower. T-Mobile proposes to install three RFS APX16DWW-16DWV-S-E-ACU antennas on existing pipe mounts at the same elevation, one hundred seventeen foot (117') level centerline AGL. T-Mobile also intends to replace one of it's existing S-8000 equipment cabinets with a UMTS 3106 equipment cabinet. One existing S-8000 equipment cabinets will remain. The two cabinets will be mounted on T-Mobile's existing equipment pad

T-Mobile USA, Inc.
Office: (860) 692-7100
Fax: (860) 692-7159
35 Griffin Rd S
Bloomfield, CT 06002

contained within T-Mobile's existing lease area. (See Design Drawings and Equipment Specifications, attached as Exhibits B and C respectively).

For the following reasons, the proposed modifications to the Manitock Hill Road Facility meet the exempt modification criteria set forth in R.C.S.A. Section 16-50j-72(b)(2):

1. The proposed modification will not increase the height of the tower as T-Mobile seeks to add to its existing antenna configuration and install additional antennas at a center line height of approximately 117 feet.

2. The installation and replacement of T-Mobile's antennas and ground equipment will not require an extension of the site boundaries.

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

4. The operation of the additional antennas will not increase the total radio frequency (RF) power density, measured at the site boundary, to a level at or above the standard adopted by the Connecticut Department of Environmental Protection as set forth in Section 22a-162 of the Connecticut General Statutes and MPE limits established by the Federal Communications Commission. The worst-case RF power density calculations for the proposed T-Mobile antennas would be 10.381% of the FCC standard (see general power density calculations table, attached as Exhibit D).

Also attached, Exhibit E, is a structural assessment confirming that the tower can support the existing and proposed antennas and associated equipment. Of note, because all antennas are internally mounted in the flagpole, the additional three antennas will not increase the ice and winding loading for the tower.

For the foregoing reasons, T-Mobile respectfully submits that the proposed antenna installation and equipment at the Bridgeport Facility constitutes an exempt modification under R.C.S.A. Section 16-50j-72(b)(2).

Respectfully Submitted,

Mark R. Richard
UMTS Project Manager
Agent for T-Mobile

cc: Martin Berliner, City Manager, City of New London, underlying property owner
Daniel Stewart, First Selectman, Town of Waterford

Hartford/72800.2/JTP/354242v1

Exhibit A

Site Map

T-Mobile Site CT11381C

41 Manitock Hill Road

aka Rock Ridge Road

Waterford, Connecticut

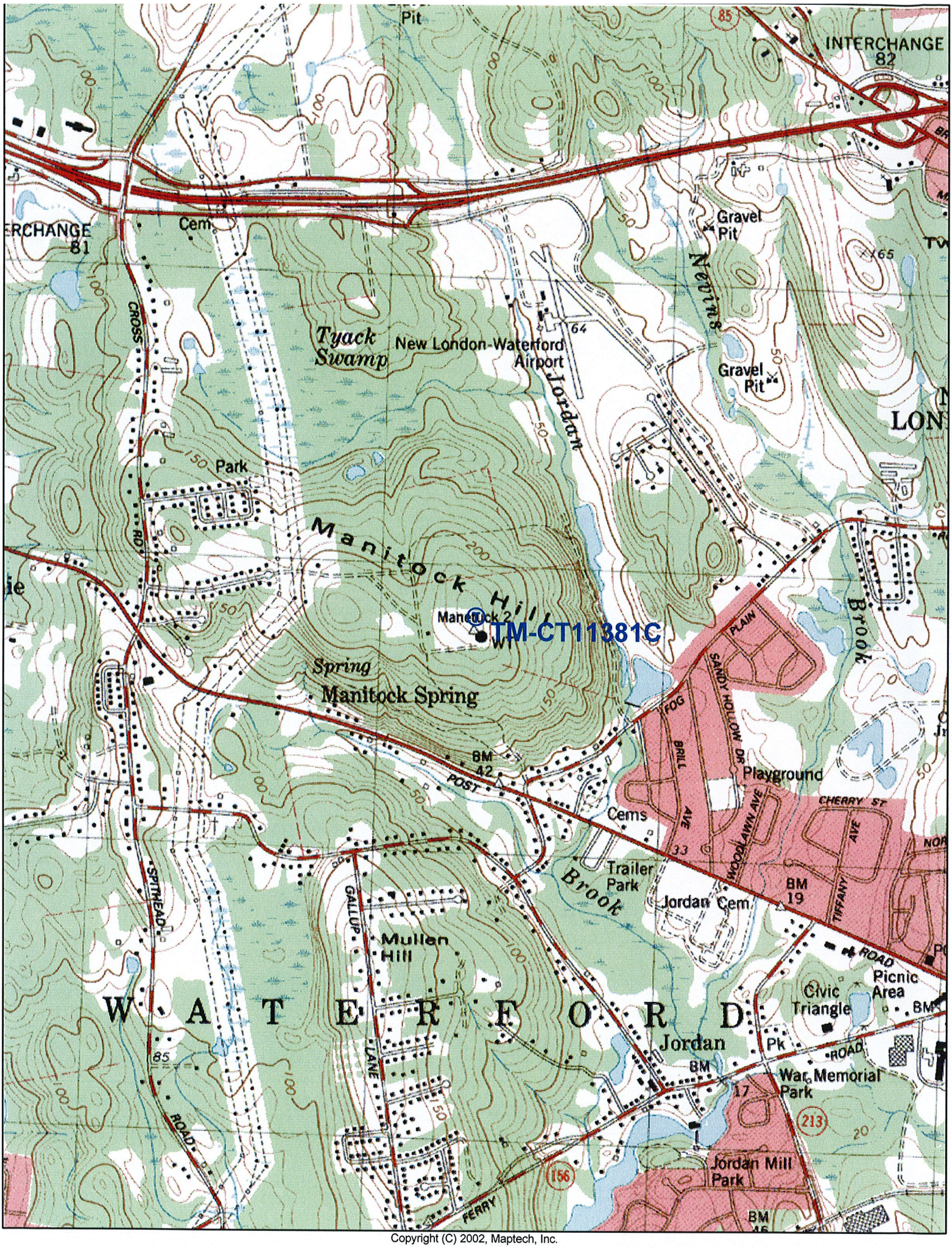


Exhibit B

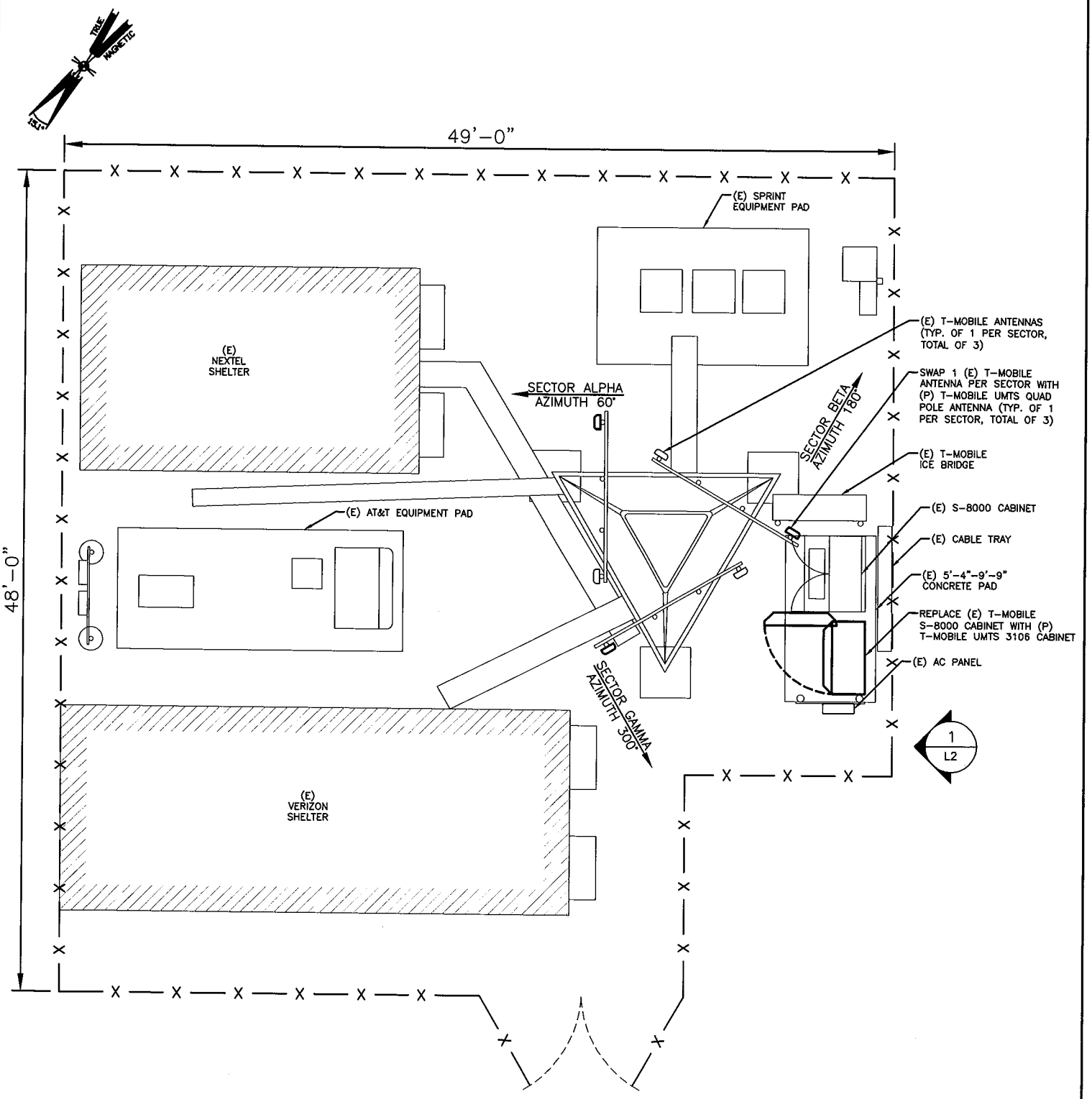
Design Drawings

T-Mobile Site CT11381C

41 Manitock Hill Road

aka Rock Ridge Road

Waterford, Connecticut



COMPOUND LAYOUT PLAN 1

SCALE: NTS

T··Mobile·
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

MAXTON
50 Eastman St.
South Easton, MA 02375
Phone: (508) 936-6393
Fax: (508) 936-6396

PROJECT LOCATION:
WATERFORD SOUTH/RT 1
CT11381C
41 ROCKRIDGE ROAD
WATERFORD, CT 06385

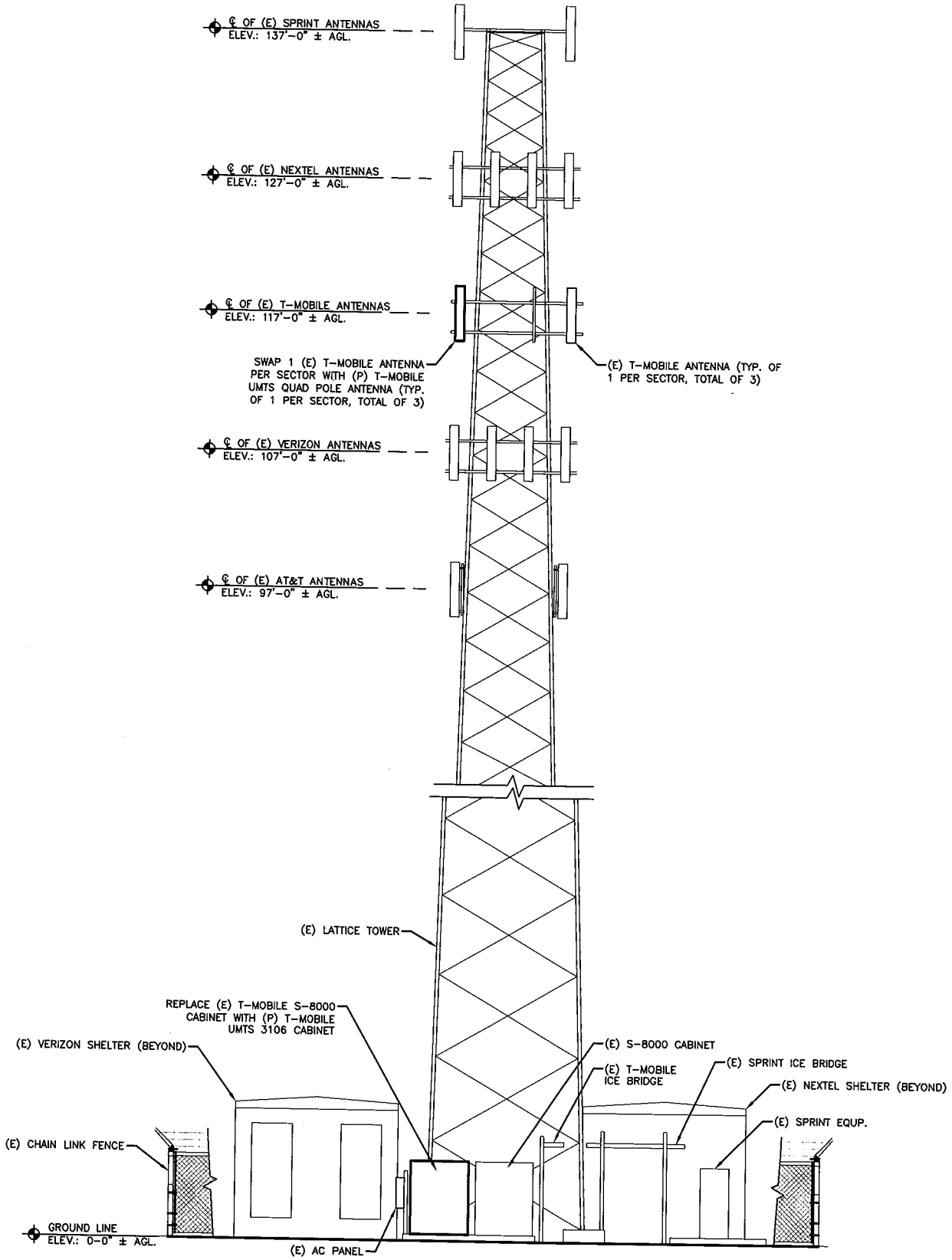
APPROVED BY:

PROJECT MANAGER:	DRAWN BY:	BSDA PROJ. #:
KB	JRK	2898.266

REV. 3
REV. 2
REV. 1
01/16/09

COMPOUND LAYOUT PLAN

SHEET: L1



ELEVATION

SCALE: N.T.S.

1

T··Mobile·
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

MAXTON
50 Eastman St.
South Easton, MA 02375
Phone: (508) 936-8393
Fax: (508) 936-8395

PROJECT LOCATION:
WATERFORD SOUTH/RT 1
CT11381C
41 ROCKRIDGE ROAD
WATERFORD, CT 06385

APPROVED BY:

PROJECT MANAGER:	DRAWN BY:	BSDA PROJ. #:
KB	JRK	2898.266

REV. 3
REV. 2
REV. 1
01/16/09

ELEVATION

SHEET: L2

Exhibit C

Equipment Specifications

T-Mobile Site CT11381C

41 Manitock Hill Road

aka Rock Ridge Road

Waterford, Connecticut

Technical Data Sheet APX16DWV-16DWV-S-E-ACU

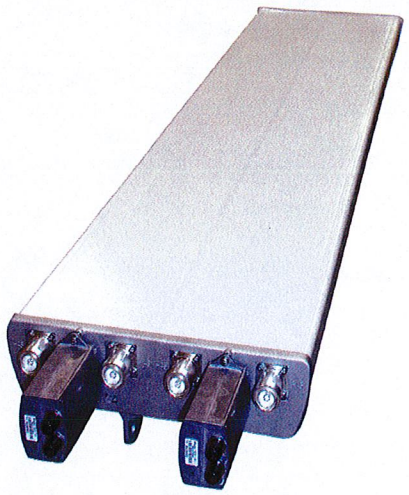
Optimizer® Panel Dual Polarized Antenna equipped with (2) ACU motors

RFS

Product Description

Gathering two X-Polarized antennas in a single radome this pair of variable tilt antenna provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features a wide downtilt range with optional remote tilt.

This antenna is optimized for performance across the entire AWS frequency band (1710-2170 MHz). The antenna comes pre-connected with the antenna control unit (ACU).



Features/Benefits

- **Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.**
- **High Suppression of all Upper Sidelobes (Typically <-20dB).**
- **Gain difference between UL and DL <1dB.**
- **Two X-Polarised panels in a single radome.**
- **Azimuth horizontal beamwidth difference <7deg between UL and DL (1710-1755 & 2110-2155).**
- **Low profile for low visual impact.**
- **Dual polarization; Broadband design.**

Technical Features

Frequency Band	3G/UMTS
Horizontal Pattern	Directional
Antenna Type	Panel Dual Polarized
Electrical Down Tilt Option	Variable
Gain, dBi (dBd)	18.0 (16.0) Avg. across band
Frequency Range, MHz	1710-2170

Optimizer® Panel Dual Polarized Antenna equipped with (2) ACU motors

Connector Type	(4) 7-16 DIN Female
Connector Location	Bottom
Mount Type	Downtilt Kit w/Scissor Kit
Electrical Downtilt, deg	0-10 , 0-10
Horizontal Beamwidth, deg	65 ±5 (65.9 average across band)
Mounting Hardware	APM40-2 + APM40-E2
Rated Wind Speed, km/h (mph)	160 (100)
VSWR	< 1.4:1
Vertical Beamwidth, deg	5.8 to 7.8 across band
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)
Polarization	Dual pol +/-45°
Front-To-Back Ratio, dB	>28
Maximum Power Input, W	300
Isolation between Ports, dB	> 30
Lightning protection	Direct Ground
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
Overall Length, m (ft)	1.35 (4.42)
Dimensions - HxWxD, mm (in)	1349 x 330 x 80 (53 x 13 x 3.15)
Radiating Element Material	Brass
Radome Material	Fiberglass
Reflector Material	Aluminum
Max Wind Loading Area, m² (ft²)	0.64 (6.6)
Survival Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	787 (177)
Front Thrust @ Rated Wind, N (lbf)	787 (177)
Shipping Weight, kg (lb)	24.1 (52.7)
Packing Dimensions, HxWxD, mm (in)	1550 x 420 x 210 (61 x 16.5 x 8.3)
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)

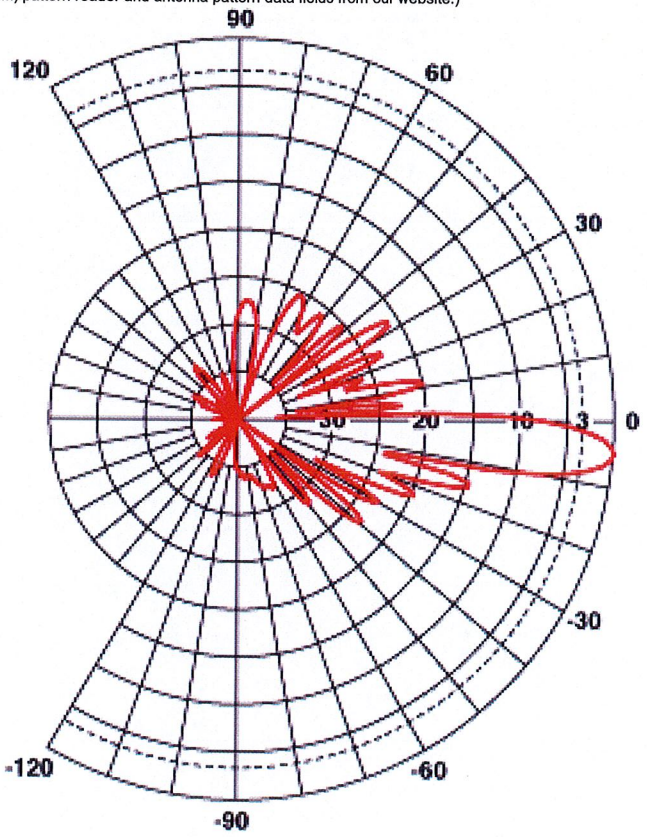
Note

This data is provisional and subject to change.

Optimizer® Panel Dual Polarized Antenna equipped with (2) ACU motors

Vertical Pattern

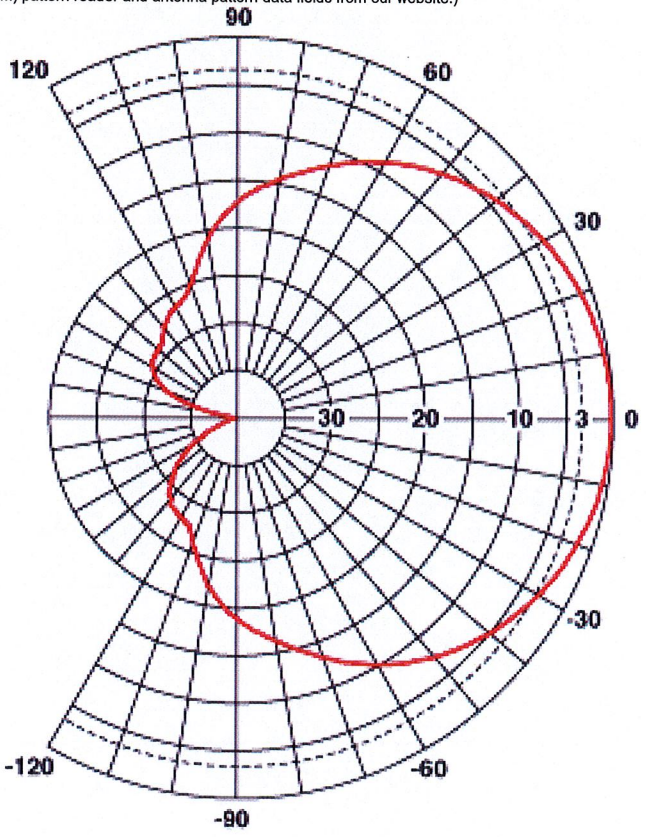
(This is a general representation of the antenna family pattern. For the latest detailed pattern contact Applications Engineering. You may also download the CELplot(TM) pattern reader and antenna pattern data fields from our website.)



Optimizer® Panel Dual Polarized Antenna equipped with (2) ACU motors

Horizontal Pattern

(This is a general representation of the antenna family pattern. For the latest detailed pattern contact Applications Engineering. You may also download the CELplot(TM) pattern reader and antenna pattern data fields from our website.)



The Indoor Cabinets (Two Variants Available)

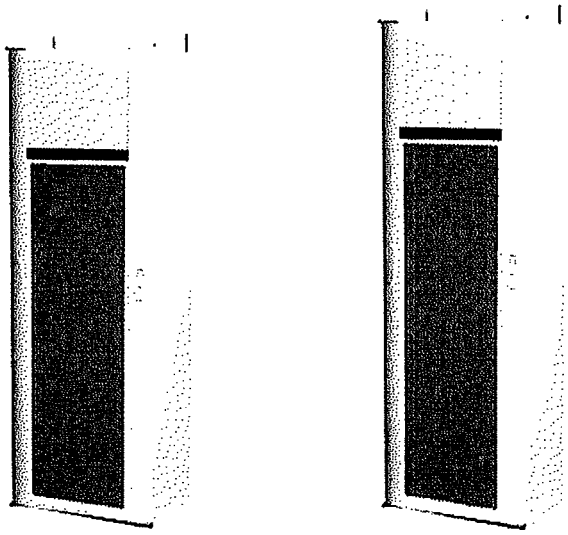


Figure 1 RBS 3206 F and E Cabinet

- Indoor specified
- RBS 3206F cabinet with slots for 6 radio units (single and dual band configurations)
- RBS 3206E cabinet with slots for 9 radio units (dual-band configurations only)
- The cabinets fulfil seismic requirements
- Minimal footprint
- Hot-spot heat management and fan control

The RBS 3206 cabinet footprint is the same as for the GSM RBS 2206 and WCDMA RBS 3202 cabinet. The RBS 3206 cabinet is intended for indoor sites with primarily high capacity and high coverage requirements. The RBS 3206 can be equipped with an optional integrated power supply voltages other than -48 VDC or a space for auxiliary transport network equipment.

The Outdoor Cabinet

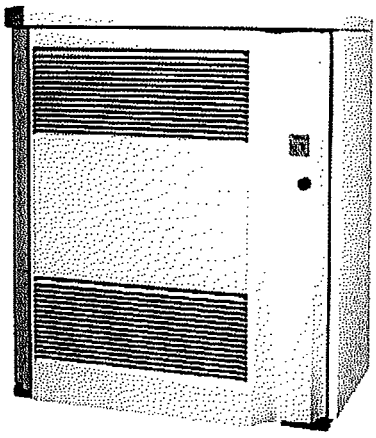


Figure 2 RBS 3106 Cabinet

- Specified for outdoor environment
- Can be configured for both 6 and 9 radio units.
- The cabinet fulfils seismic requirements
- Vandal protected
- Forced convection and heat exchanger (Eco-Cooling)

The RBS 3106 cabinet has the same footprint as the GSM RBS 2106 and the WCDMA RBS 3101.

The RBS 3106 cabinet is a weatherproof outdoor cabinet for outdoor sites with primarily high capacity and high coverage requirements. The RBS 3106 houses integrated power supply with optional backup batteries, space for transmission equipment and a climate package for ensuring an indoor climate for all units inside, including the batteries.

2 Descriptions

The RBS HW is modularly structured into several subsystems for easy expansion and evolution purposes. From a physical viewpoint the subsystem are located together on shelves in the cabinet. The shelves are basically identical between the cabinets.

3.3. GENERAL VIEW

3.3.1 BTS 18000 INDOOR SPECIFIC

The BTS 18000 indoor cabinet consists of the following specific elements:

- Indoor enclosure
- DC breaker panel
- BTS 18000 Integrated Cooling System (SICS)

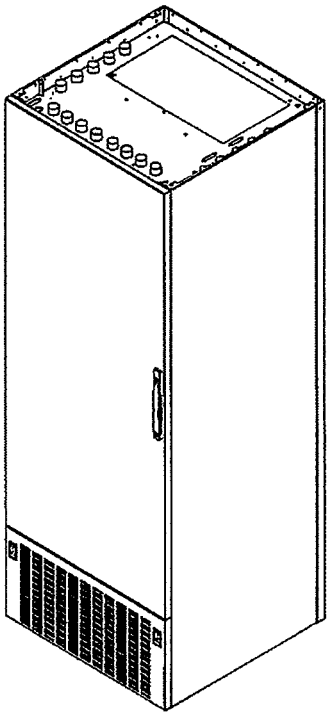


Figure 3.1: BTS 18000 indoor cabinet overview (door closed)

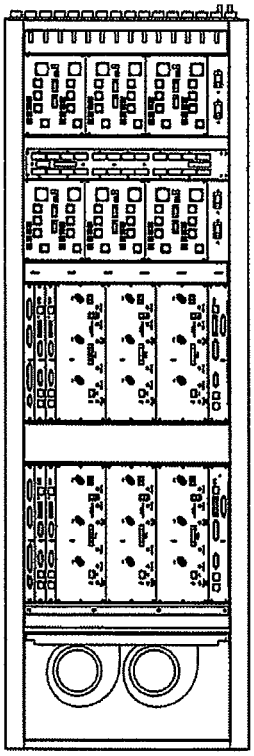


Figure 3.2: BTS 18000 indoor cabinet fully populated overview (door open)

3.3.2 BTS 18000 OUTDOOR SPECIFIC

The BTS 18000 outdoor cabinet consists of the following specific elements:

- Outdoor enclosure including AC Distribution Unit (ADU)
- AC/DC power supply: Universal Compact Power System (UCPS)
- Environmental Control Unit (ECU)
- Rack user and its associated User ICO

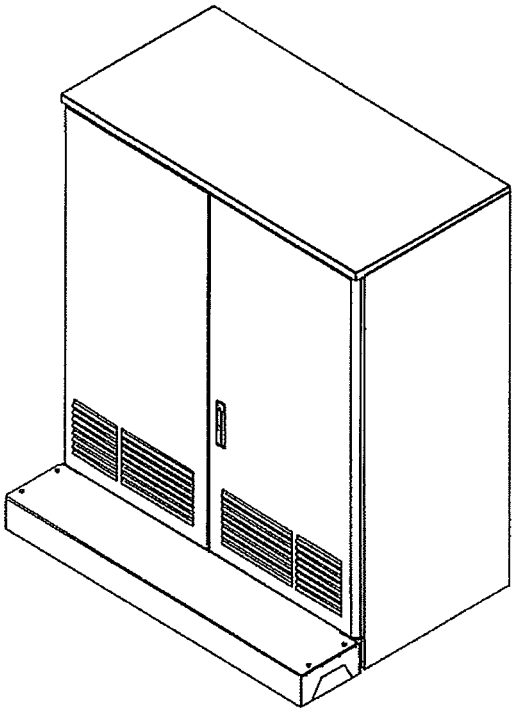


Figure 3.3 : BTS 18000 outdoor cabinet overview (door closed)

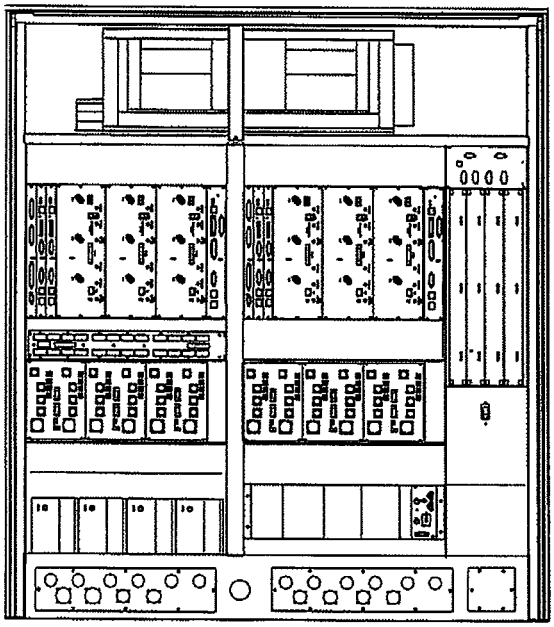


Figure 3.4 : BTS 18000 outdoor cabinet fully populated overview (door open)

3.3.3 BTS 18000 INDOOR/OUTDOOR SHARING ELEMENTS

The Indoor and Outdoor BTS 18000 variant share the following modules :

- Back-planes and ICO: Interface Back Plane (IBP), Digital Back-plane (DBP), Radio ICO (RICO)
- up to two Quad Interface module (IFM)
- One Interface Control Module (ICM) or two .
- Up to two spare module (SPM)
- Up to two Alarm collector and Bridge Module (ABM)
- Up to six Radio Module (RM)
- Up to six Dual diplexer module (DDM)

For the two variants, DDM are physically grouped into 2 combiner racks. The digital rack consists of the association of IFM, ICM, ABM, SPM and RM modules. There are two digital racks per cabinet. The association of one combiner rack and one digital rack will be further named "shelf"

Exhibit D

Power Density Calculations

T-Mobile Site CT11381C

41 Manitock Hill Road

aka Rock Ridge Road

Waterford, Connecticut

T-Mobile USA Inc.
35 Griffin Rd South, Bloomfield, CT 06002-1853
Phone: (860) 692-7100
Fax: (860) 692-7159

Technical Memo

To: Maxton
From: Farid Marbouh - Radio Frequency Engineer
cc: Jason Overbey
Subject: Power Density Report for CT11381C
Date: February 13, 2009

1. Introduction:

This report is the result of an Electromagnetic Field Intensities (EMF - Power Densities) study for the T-Mobile PCS antenna installation on a Self Support Tower at 41 Rockridge Road, Waterford, CT. This study incorporates the most conservative consideration for determining the practical combined worst case power density levels that would be theoretically encountered from locations surrounding the transmitting location.

2. Discussion:

The following assumptions were used in the calculations:

1) The emissions from T-Mobile transmitters are in the (1935-1944.8), (1983-1984), (2140-2145)MHz frequency Band.
2) The antenna array consists of three sectors, with 2 antennas per sector.
3) The model number for GSM antenna is RR90-17-02DP.
3) The model number for UMTS antenna is APX16DWV-16DWV.
4) GSM antenna center line height is 117 ft.
4) UMTS antenna center line height is 117 ft.
5) The maximum transmit power from any GSM sector is 1820.87 Watts Effective Radiated Power (EiRP) assuming 8 channels per sector.
5) The maximum transmit power from any UMTS sector is 2565.96 Watts Effective Radiated Power (EiRP) assuming 2 channels per sector.
6) All the antennas are simultaneously transmitting and receiving, 24 hours a day.
7) Power levels emitting from the antennas are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
8) The average ground level of the studied area does not change significantly with respect to the transmitting location

Equations given in "FCC OET Bulletin 65, Edition 97-01" were then used with the above information to perform the calculations.

3. Conclusion:

Based on the above worst case assumptions, the power density calculation from the T-Mobile PCS antenna installation on a Self Support Tower at 41 Rockridge Road, Waterford, CT, is 0.07811 mW/cm^2. This value represents 7.811% of the Maximum Permissible Exposure (MPE) standard of 1 milliwatt per square centimeter (mW/cm^2) set forth in the FCC/ANSI/IEEE C95.1-1991. Furthermore, the proposed antenna location for T-Mobile will not interfere with existing public safety communications, AM or FM radio broadcasts, TV, Police Communications, HAM Radio communications or any other signals in the area.
The combined Power Density from other carriers is 2.57%. The combined Power Density for the site is 10.381% of the M.P.E. standard.

Connecticut Market

T-Mobile

Worst Case Power Density

Site:	**CT11381C**
Site Address:	**41 Rockridge Road**
Town:	**Waterford**
Tower Height:	**120 ft.**
Tower Style:	**Self Support Tower**

GSM Data		**UMTS Data**	
Base Station TX output	20 W	**Base Station TX output**	40 W
Number of channels	8	**Number of channels**	2
Antenna Model	RR90-17-02DP	**Antenna Model**	APX16DWV-16DWV
Cable Size	1 5/8 in.	**Cable Size**	1 5/8 in.
Cable Length	124 ft.	**Cable Length**	124 ft.
Antenna Height	117.0 ft.	**Antenna Height**	117.0 ft.
Ground Reflection	1.6	**Ground Reflection**	1.6
Frequency	1945.0 MHz	**Frequency**	2.1 GHz
Jumper & Connector loss	4.50 dB	**Jumper & Connector loss**	1.50 dB
Antenna Gain	16.5 dBi	**Antenna Gain**	18.0 dBi
Cable Loss per foot	0.0116 dB	**Cable Loss per foot**	0.0116 dB
Total Cable Loss	1.4384 dB	**Total Cable Loss**	1.4384 dB
Total Attenuation	5.9384 dB	**Total Attenuation**	2.9384 dB
Total EIRP per Channel	53.57 dBm	**Total EIRP per Channel**	61.08 dBm
(In Watts)	227.61 W	**(In Watts)**	1282.98 W
Total EIRP per Sector	62.60 dBm	**Total EIRP per Sector**	64.09 dBm
(In Watts)	1820.87 W	**(In Watts)**	2565.96 W
nsg	10.5616	**nsg**	15.0616
Power Density (S) =	**0.032423 mW/cm^2**	**Power Density (S) =**	**0.045690 mW/cm^2**
T-Mobile Worst Case % MPE =		**7.8113%**	

Equation Used :

$$S = \frac{(1000)(grf)^2 (Power) * 10^{(nsg/10)}}{4\pi (R)^2}$$

Office of Engineering and Technology (OET) Bulletin 65, Edition 97-01, August 1997

Co-Location Total

Carrier	**% of Standard**
Verizon	
Cingular	
Sprint	2.5700 %
AT&T Wireless	
Nextel	
Pocket	
Other Antenna Systems	
Total Excluding T-Mobile	**2.5700 %**
T-Mobile	7.8113
Total % MPE for Site	**10.3813%**

Exhibit E

Structural Analysis

T-Mobile Site CT11381C

41 Manitock Hill Road

aka Rock Ridge Road

Waterford, Connecticut

February 11, 2009

Benjamin Goodhart
Crown Castle USA
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
(704) 405-6545

Vertical Structures, Inc.
309 Spangler Drive, Suite E
Richmond, KY 40475
(859) 624-8360
kmeehan@verticalstructures.com

Subject: **Structural Analysis Report**

Carrier Designation	**T-Mobile Change-Out** **Carrier Site Number: CT11381** **Carrier Site Name: N/A**
Crown Castle Designation	**Crown Castle BU Number: 876338** **Crown Castle Site Name: Waterford** **Crown Castle JDE Job Number: 114260**
Engineering Firm Designation	**Vertical Structures Project Number: 2009-004-026**
Site Data	**41 Manitock Hill Road, Waterford, CT, New London County** **Latitude 41°-21'-16.42", Longitude -72°-9'-3.38".** **136' PiRod Self-Supporting Tower**

Dear Mr. Goodhart,

Vertical Structures is pleased to submit this structural analysis report to determine the structural integrity of the aforementioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 319153, and Application Number 73363, Revision 1. The purpose of the analysis is to determine the suitability of the tower for the following load case:

Load Case 1 (LC1): Proposed Equipment (Table 1) + Existing/Reserved Equipment (Table 2)

Based on our analysis we have determined the tower superstructure and foundation are sufficient for LC1. This analysis has been performed in accordance with the TIA/EIA-222-F standard and local code requirements based upon an 85 MPH basic "fastest mile" wind speed, equivalent to a 100 MPH basic "3-second gust" wind speed per 2006 IBC Equation 16-34.

Vertical Structures appreciates the opportunity of providing our continuing professional services to you and Crown Castle USA. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Kyle Meehan, P.E.
Project Engineer

February 11, 2009

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Subject: **Structural Analysis Report**

Carrier Designation	**T-Mobile Change-Out** **Carrier Site Number: CT11381** **Carrier Site Name: N/A**
Crown Castle Designation	**Crown Castle BU Number: 876338** **Crown Castle Site Name: Waterford** **Crown Castle JDE Job Number: 114260**
Engineering Firm Designation	**Vertical Structures Project Number: 2009-004-026**
Site Data	**41 Manitock Hill Road, Waterford, CT, New London County** **Latitude 41°-21'-16.42", Longitude -72°-9'-3.38".** **136' PiRod Self-Supporting Tower**

Dear Mr. Goodhart,

Vertical Structures is pleased to submit this structural analysis report to determine the structural integrity of the aforementioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 319153, and Application Number 73363, Revision 1. The purpose of the analysis is to determine the suitability of the tower for the following load case:

Load Case 1 (LC1): Proposed Equipment (Table 1) + Existing/Reserved Equipment (Table 2)

Based on our analysis we have determined the tower superstructure and foundation are sufficient for LC1. This analysis has been performed in accordance with the TIA/EIA-222-F standard and local code requirements based upon an 85 MPH basic "fastest mile" wind speed, equivalent to a 100 MPH basic "3-second gust" wind speed per 2006 IBC Equation 16-34.

Vertical Structures appreciates the opportunity of providing our continuing professional services to you and Crown Castle USA. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Kyle Meehan, P.E.
Project Engineer

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1.) INTRODUCTION

The 136' self-supporting tower was designed and manufactured by PiRod in 1999 for Sprint PCS. The three (3) sided tower is constructed of truss legs with angle x-bracing from 0' to 90' and solid rod legs with solid rod x-bracing from 90' up to 136'. The tower is founded on 23' square by 3'-3" thick mat foundation bearing 6' below grade. The tower was reworked in 2008 to accommodate additional loading.

2.) ANALYSIS CRITERIA

The Waterford tower was analyzed in accordance with the current EIA-222-F publication, "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures." The proposed, existing, and reserved antennas, cables and mounts considered in this analysis are listed in Tables 1 and 2. Applied forces in this study were derived from an 85 MPH basic "fastest mile" wind speed with no ice and a reduced 74 MPH basic "fastest mile" wind speed with a 1/2" of radial ice accumulation. The tower was originally designed for a 90 MPH basic "fastest mile" wind speed with no ice and a reduced 78 MPH basic "fastest mile" wind speed with 1/2" of radial ice accumulation. The original design loads are listed in Table 3. All cables are assumed to be routed in accordance with the drawing in Appendix B.

Table 1 – Proposed Antenna and Cable Information

Mount Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount Manufacturer	Mount Model	Number Of Feed Lines	Feed Line Size (inches)
117	3	RFS/Celwave	APX16DWV-16DWV-S-E-A20				
	6	RFS/Celwave	ATMAA1412D-1A20 TMA				

Table 2 – Existing and Reserved Antenna and Cable Information

Mount Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount Manufacturer	Mount Model	Number Of Feed Lines	Feed Line Size (inches)
137	6	Allgon	7184.05	PiRod	16'-6" L.P. Platform	6	1 5/8
	9*	EMS Wireless	FV65-14-00NA2			9*	1 5/8
127	12	Decibel	DB844H90E-XY	PiRod	(3) 15' T-Frames	12	1 1/4
117	3 + 3**	EMS Wireless	RR90-17-02DP	PiRod	(3) 15' T-Frames	14	1 5/8
	6**		TMA				
107	6	Antel	LPA-185063/8CF		(3) 12' Knockdown T-Frames	12	1 5/8
	6	Antel	LPA-80063/4CF				
	12***	Decibel	DB844H90E-XY			12***	1 5/8
97	3	Powerwave Technologies	7770.00		(3) Mount Pipes	6	1 1/4
	6		LGP21401 TMA				
80	1		GPS Antenna		(1) 4' Sidearm	1	1/2
72	1		GPS Antenna		(1) 4' Sidearm	1	1/2

*Indicates MLA loading. MLA loading controls and is used in the analysis.
**Indicates equipment to be removed.
***Indicates SLA loading. Existing loading controls and is used in the analysis.

Table 3 – Design Antenna and Cable Information

Mount Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount Manufacturer	Mount Model	Number Of Feed Lines	Feed Line Size (inches)
136	12	Allgon	7184	PiRod	16' Low Profile Platform	12	1 5/8
127	12	Swedcom	ALP9212	PiRod	(3) T-Frames	12	1 5/8
117	12	Swedcom	ALP9212	PiRod	(3) T-Frames	12	1 5/8
102	2	Decibel	DB810	PiRod	(2) 6'-8" Rigid Sidearms	2	1 5/8
80	2		GPS Antenna			2	1/2

3.) ANALYSIS PROCEDURE

Table 4 – Documents Provided

Document	Remarks	Reference	Source
Online Application	T-Mobile Change-Out Revision #1	73363	CCI iSite
Tower Drawing	PiRod Drawing No. 204676-B	1441523	CCI iSite
Foundation Drawing	PiRod Drawing No. 204676-B	1610804	CCI iSite
Geotechnical Report	SEA Consultants Project No. 99034.01-A	2035622	CCI iSite
Rework Drawings	Vertical Structures Job No. 2007-004-139	2125417	CCI iSite

3.1) Analysis Methods

RISA Tower (Version 5.3), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. All loads were computed in accordance with the ANSI/TIA/EIA-222-F or the local building code requirements. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1. Tower and structures were built in accordance with the manufacturer's specifications.
2. The tower and structures have been maintained in accordance with manufacturer's specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and any referenced drawings.
4. When applicable, transmission cables are considered to be structural components for calculating wind loads, as allowed by TIA/EIA-222-F.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and Vertical Structures should be allowed to review any new information to determine its effect on the structural integrity of the tower.

4.) ANALYSIS RESULTS

Table 5 – Tower Component Stresses vs. Capacity (LC1)

Section Capacity Table

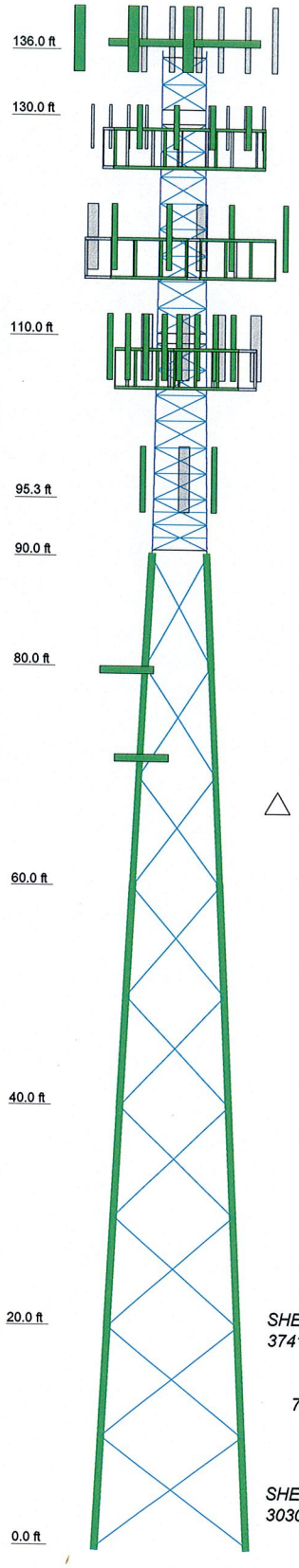
Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	136 - 130	Leg	1 1/2	2	-7000.43	46641.40	15.0	Pass
		Diagonal	3/4	17	-1600.46	5220.53	30.7	Pass
		Horizontal	3/4	16	-119.38	2918.06	4.1	Pass
		Top Girt	7/8	5	-725.74	5406.06	13.4	Pass
		Bottom Girt	7/8	7	-572.54	5406.06	10.6	Pass
T2	130 - 110	Leg	2	24	-54000.00	97247.68	55.5	Pass
		Diagonal	7/8	35	-4994.16	8173.18	61.1	Pass
		Horizontal	7/8	45	-564.76	4581.31	12.3	Pass
		Top Girt	1	28	-725.35	9327.52	7.8	Pass
		Bottom Girt	1	31	-2232.78	7392.52	30.2	Pass
T3	110 - 95.2708	Leg	2 1/4	89	89074.90	105068.92	84.8	Pass
		Diagonal	1	95	-5921.54	12388.28	47.8	Pass
		Horizontal	7/8	127	-1042.78	4216.39	24.7	Pass
		Top Girt	1	92	-1633.51	7388.98	22.1	Pass
T4	95.2708 - 90	Leg	2 1/4	135	-127755.00	146979.24	86.9	Pass
		Diagonal	1	145	-7056.88	11896.05	59.3	Pass
		Horizontal	7/8	137	-1169.14	3705.13	31.6	Pass
		Secondary Horizontal	1 1/2	152	-2212.96	15107.82	14.6	Pass
		Bottom Girt	1	140	-2361.17	6015.72	39.2	Pass
T5	90 - 80	Leg	Pirod 105244 w/ 1 1/4" Reinforcement	165	-128614.00	204902.09	62.8	Pass
		Diagonal	L3x3x3/16	170	-8244.70	16986.69	48.5	Pass
T6	80 - 60	Leg	Pirod 105217	174	-175312.00	184672.48	58.7 (b) 94.9	Pass
		Diagonal	L2 1/2x2 1/2x3/16	176	-6690.68	9204.66	72.7	Pass
T7	60 - 40	Leg	Pirod 105218	189	-212071.00	258238.08	82.1	Pass
		Diagonal	L3x3x3/16	191	-5997.90	13457.03	44.6	Pass
T8	40 - 20	Leg	Pirod 105218	204	-245132.00	258238.08	47.0 (b) 94.9	Pass
		Diagonal	L3x3x3/16	212	-6047.79	12196.52	49.6	Pass
T9	20 - 3e-005	Leg	Pirod 105219	219	-274664.00	343622.06	50.3 (b) 79.9	Pass
		Diagonal	L3x3x5/16	222	-6452.73	14740.05	43.8	Pass
							Summary	
							Leg (T6) 94.9	Pass
							Diagonal (T6) 72.7	Pass
							Horizontal (T4) 31.6	Pass
							Secondary Horizontal (T4) 14.6	Pass
							Top Girt (T3) 22.1	Pass
							Bottom Girt (T4) 39.2	Pass
							Bolt Checks 79.2	Pass
							RATING = 94.9	**Pass**

Notes	Component	% Capacity	Pass/Fail
Additional Component Analysis Summary:			
1	Anchor Bolts (Tension)	47.8	Pass
1	Tower Foundation (Compared to Allowable Loads)	93.6	Pass
	Structure Rating =	**94.9**	Pass

1) Indicates calculations supporting % capacity are included in Appendix C.

APPENDIX A

Section	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	Pirod 105219	Pirod 105218		Pirod 105217	A		SR 2 1/4	SR 2	SR 1 1/2
Leg Grade				A572-50					
Diagonals	L3x3x5/16	L3x3x3/16		L2 1/2x2 1/2x3/16	L3x3x3/16		SR 1	SR 7/8	SR 3/4
Diagonal Grade		A36						A572-50	A36
Top Girts			N.A.					SR 1	SR 7/8
Bottom Girts			N.A.			SR 1	N.A.	SR 1	SR 7/8
Horizontals			N.A.				SR 7/8		SR 3/4
Sec. Horizontals			N.A.			SR 1 1/2	N.A.		
Face Width (ft)	14	12	10	8	6	5	4.5	4	
# Panels @ (ft)		9 @ 10				4.8682	8 @ 2.34376	11 @ 2.375	
Weight (lb)	16308.6	3829.5	2826.2	2767.0	2249.5	1286.0	666.8	1166.8	1249.6	247.3



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PiRod 16'-6" Low Profile Platform (VSI)	137	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	117
(3) FV65-14-00NA2 w/Mount Pipe	137	(2) ATMAA1412D-1A20 TMA (T-Mobile)	117
(3) FV65-14-00NA2 w/Mount Pipe	137	(2) ATMAA1412D-1A20 TMA (T-Mobile)	117
(3) FV65-14-00NA2 w/Mount Pipe	137	(2) ATMAA1412D-1A20 TMA (T-Mobile)	117
Pirod 15' T-Frame Sector Mount (1) (VSI)	127	Pirod 12' Knockdown T-Frame (1) (VSI)	107
Pirod 15' T-Frame Sector Mount (1) (VSI)	127	Pirod 12' Knockdown T-Frame (1) (VSI)	107
Pirod 15' T-Frame Sector Mount (1) (VSI)	127	Pirod 12' Knockdown T-Frame (1) (VSI)	107
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	127	(2) LPA-80063/4CF w/ Mount Pipe (VSI)	107
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	127	(2) LPA-80063/4CF w/ Mount Pipe (VSI)	107
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	127	(2) LPA-80063/4CF w/ Mount Pipe (VSI)	107
(4) DB844H90E-XY w/Mount Pipe	127	(2) LPA-185063/8CF w/ Mount Pipe	107
(4) DB844H90E-XY w/Mount Pipe	127	(2) LPA-185063/8CF w/ Mount Pipe	107
(4) DB844H90E-XY w/Mount Pipe	127	(2) LPA-185063/8CF w/ Mount Pipe	107
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	117	7770.00 w/ Mount Pipe	97
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	117	7770.00 w/ Mount Pipe	97
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	117	7770.00 w/ Mount Pipe	97
RR90-17-02DP w/Mount Pipe (T-Mobile)	117	(2) LGP21401 TMA	97
RR90-17-02DP w/Mount Pipe (T-Mobile)	117	(2) LGP21401 TMA	97
RR90-17-02DP w/Mount Pipe (T-Mobile)	117	(2) LGP21401 TMA	97
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	117	4' Sidearm (2" pipe) (VSI)	80
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	117	Generic GPS (VSI)	80
		4' Sidearm (2" pipe) (VSI)	72
		Generic GPS (VSI)	72

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Pirod 105244 w/ 1 1/4" Reinforcement		

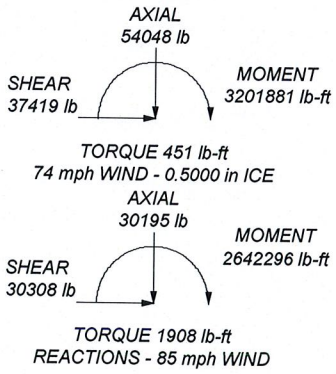
MATERIAL STRENGTH

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 London 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: 94.9%

MAX. CORNER REACTIONS AT BASE:
DOWN: 282102 lb
UPLIFT: -232345 lb
SHEAR: 25145 lb



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Job: *Waterford, CT BU#876338*		
Project: *Vertical Structures Job No. 2009-004-026*		
Client: Crown Castle	Drawn by: Kyle Meehan	App'd:
Code: TIA/EIA-222-F	Date: 02/11/09	Scale: NTS
Path: \\Nas1\kmeehan\2009-004-026\RISA\876338.eri		Dwg No. E-1

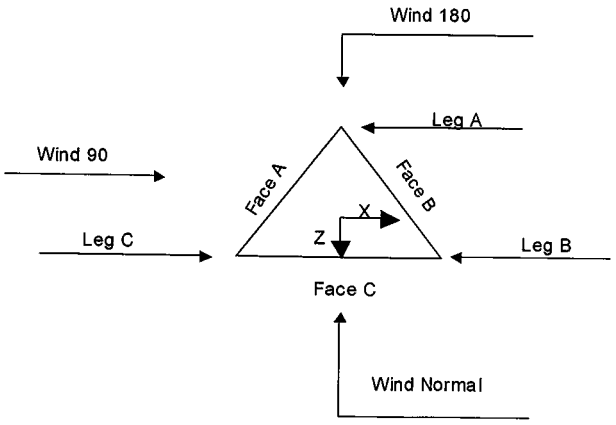
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 136.00 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 4.00 ft at the top and 14.00 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 London 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	136.00-130.00			4.00	1	6.00
T2	130.00-110.00			4.00	1	20.00
T3	110.00-95.27			4.50	1	14.73
T4	95.27-90.00			4.87	1	5.27
T5	90.00-80.00			5.00	1	10.00
T6	80.00-60.00			6.00	1	20.00
T7	60.00-40.00			8.00	1	20.00
T8	40.00-20.00			10.00	1	20.00
T9	20.00-0.00			12.00	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	136.00-130.00	2.38	X Brace	No	Steps	8.5000	6.5000
T2	130.00-110.00	2.38	X Brace	No	Steps	9.5000	2.5000
T3	110.00-95.27	2.34	X Brace	No	Steps	8.0000	0.0000
T4	95.27-90.00	2.34	X Brace	No	Yes	0.0000	7.0000
T5	90.00-80.00	10.00	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	10.00	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
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	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 136.00-130.00	Solid Round	1 1/2	A572-50 (50 ksi)	Solid Round	3/4	A36 (36 ksi)
T2 130.00-110.00	Solid Round	2	A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T3 110.00-95.27	Solid Round	2 1/4	A572-50 (50 ksi)	Solid Round	1	A572-50 (50 ksi)
T4 95.27-90.00	Solid Round	2 1/4	A572-50 (50 ksi)	Solid Round	1	A572-50 (50 ksi)
T5 90.00-80.00	Truss Leg	Pirod 105244 w/ 1 1/4" Reinforcement	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T6 80.00-60.00	Truss Leg	Pirod 105217	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 60.00-40.00	Truss Leg	Pirod 105218	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T8 40.00-20.00	Truss Leg	Pirod 105218	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T9 20.00-0.00	Truss Leg	Pirod 105219	A572-50 (50 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 136.00-130.00	Solid Round	7/8	A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T2 130.00-110.00	Solid Round	1	A572-50 (50 ksi)	Solid Round	1	A572-50 (50 ksi)
T3 110.00-95.27	Solid Round	1	A572-50 (50 ksi)	Solid Round		A572-50 (50 ksi)
T4 95.27-90.00	Solid Round		A572-50 (50 ksi)	Solid Round	1	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
T1 136.00-130.00	None	Solid Round		A572-50 (50 ksi)	Solid Round	3/4	A572-50 (50 ksi)
T2 130.00-110.00	None	Solid Round		A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T3 110.00-95.27	None	Solid Round		A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)
T4 95.27-90.00	None	Solid Round		A572-50 (50 ksi)	Solid Round	7/8	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
T4 95.27-90.00	Solid Round	1 1/2	A572-50 (50 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 136.00-130.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 130.00-110.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 110.00-95.27	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 95.27-90.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 90.00-80.00	0.67	0.5000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 80.00-60.00	1.44	0.5000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 60.00-40.00	1.44	0.5000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 40.00-20.00	1.44	0.5000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T9 20.00-0.00	1.44	0.5000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

K Factors[1]

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 136.00-130.00	No	No	1	0.9	1	1	0.7	0.7	1	1
T2 130.00-110.00	No	No	1	0.9	1	1	0.7	0.7	1	1
T3 110.00-95.27	No	No	1	0.9	1	1	0.7	0.7	1	1
T4 95.27-90.00	No	No	1	0.9	1	1	0.7	0.7	1	1
T5 90.00-80.00	No	No	1	0.9	1	1	0.7	0.7	1	1
T6 80.00-60.00	No	No	1	1	1	1	1	1	1	1
T7 60.00-40.00	No	No	1	1	1	1	1	1	1	1
T8 40.00-20.00	No	No	1	1	1	1	1	1	1	1
T9 20.00-0.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			Truss-Legs Used As Inner Members		
Tower Elevation ft	Leg Panels	X Brace Diagonals	Z Brace Diagonals	Leg Panels	X Brace Diagonals	Z Brace Diagonals
T5 90.00-80.00	1	1	0.5	1	0.5	0.85
T6 80.00-60.00	1	1	0.5	1	0.5	0.85
T7 60.00-40.00	1	1	0.5	1	0.5	0.85
T8 40.00-20.00	1	1	0.5	1	0.5	0.85
T9 20.00-0.00	1	1	0.5	1	0.5	0.85

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 136.00-130.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 130.00-110.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T3 110.00-95.27	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 95.27-90.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 90.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T9 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1

Tower Section Geometry *(cont'd)*

Tower Elevation	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T1 136.00-130.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T2 130.00-110.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T3 110.00-95.27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T4 95.27-90.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T5 90.00-80.00	5.0000	10.7500	5.0000	10.7500	0.0000	0.0000	0.0000	0.0000
T6 80.00-60.00	5.0000	10.7500	5.0000	10.7500	0.0000	0.0000	0.0000	0.0000
T7 60.00-40.00	5.0000	10.7500	5.0000	10.7500	0.0000	0.0000	0.0000	0.0000
T8 40.00-20.00	5.0000	10.7500	5.0000	10.7500	0.0000	0.0000	0.0000	0.0000
T9 20.00-0.00	5.0000	12.2500	5.0000	12.2500	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 136.00-130.00	Sleeve DS	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	0
T2 130.00-110.00	Sleeve DS	0.6250 A325N	5	0.0000 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 110.00-95.27	Sleeve DS	0.7500 A325N	5	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 95.27-90.00	Flange	0.7500 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 90.00-80.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T6 80.00-60.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-0.00	Flange	1.0000 A325N	6	1.2500 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
T-brackets (Af) (T-Mobile)	C	No	Af (Leg)	119.00 - 8.00	0.0000	0.15	1	1	0.7500	0.5000	4.0000	4.00
LDF7-50A (1-5/8 FOAM) (T-Mobile)	C	No	Ar (Leg)	119.00 - 8.00	0.0000	0.15	14	7	1.0000	1.9800		0.82
LDF7-50A (1-5/8 FOAM)	B	No	Ar (Leg)	97.00 - 8.00	0.0000	0.15	27	8	1.0000	1.9800		0.82
LDF7-50A (1-5/8 FOAM)	B	No	Ar (Leg)	109.00 - 97.00	0.0000	0.2	21	6	1.0000	1.9800		0.82
LDF7-50A (1-5/8 FOAM)	B	No	Ar (Leg)	136.00 - 109.00	0.0000	0.25	9	6	1.0000	1.9800		0.82
T-brackets (Af)	B	No	Af (Leg)	136.00 - 8.00	0.0000	0.15	1	1	0.7500	0.5000	4.0000	4.00
LDF6-50A (1-1/4 FOAM)	A	No	Ar (Leg)	129.00 - 8.00	0.0000	0.15	12	7	1.2500	1.5500		0.66
LDF4RN-50A (1/2 FOAM)	A	No	Ar (Leg)	50.00 - 8.00	0.0000	0.1	2	2	2.0000	0.6300		0.15
LDF4RN-50A (1/2 FOAM)	A	No	Ar (Leg)	72.00 - 50.00	0.0000	0.1	1	1	0.6300	0.6300		0.15
T-brackets (Af)	A	No	Af (Leg)	129.00 - 8.00	0.0000	0.15	1	1	0.7500	0.5000	4.0000	4.00

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 lb
T1	136.00-130.00	A	0.000	0.000	0.000	0.000	0.00
		B	5.940	0.250	0.000	0.000	68.28
		C	5.940	0.250	0.000	0.000	0.00
T2	130.00-110.00	A	27.574	1.167	0.000	0.000	226.48
		B	36.979	1.625	0.000	0.000	227.60
		C	30.195	1.208	0.000	0.000	139.32
T3	110.00-95.27	A	30.330	1.227	0.000	0.000	175.57
		B	28.470	1.227	0.000	0.000	311.22

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 lb
		C	32.165	1.227	0.000	0.000	228.01
T4	95.27-90.00	A	10.854	0.439	0.000	0.000	62.83
		B	11.723	0.439	0.000	0.000	137.78
		C	13.045	0.439	0.000	0.000	81.59
T5	90.00-80.00	A	20.592	0.833	0.000	0.000	119.20
		B	22.242	0.833	0.000	0.000	261.40
		C	24.750	0.833	0.000	0.000	154.80
T6	80.00-60.00	A	41.813	1.667	0.000	0.000	240.20
		B	45.113	1.667	0.000	0.000	522.80
		C	49.500	1.667	0.000	0.000	309.60
T7	60.00-40.00	A	42.758	1.667	0.000	0.000	242.90
		B	46.058	1.667	0.000	0.000	522.80
		C	49.500	1.667	0.000	0.000	309.60
T8	40.00-20.00	A	43.283	1.667	0.000	0.000	244.40
		B	46.583	1.667	0.000	0.000	522.80
		C	49.500	1.667	0.000	0.000	309.60
T9	20.00-0.00	A	25.970	1.000	0.000	0.000	146.64
		B	27.950	1.000	0.000	0.000	313.68
		C	29.700	1.000	0.000	0.000	185.76

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 lb
T1	136.00-130.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		1.490	8.033	0.000	0.000	174.18
		C		1.490	8.033	0.000	0.000	0.00
T2	130.00-110.00	A	0.500	30.497	16.132	0.000	0.000	533.77
		B		33.229	28.625	0.000	0.000	580.61
		C		7.202	41.063	0.000	0.000	420.56
T3	110.00-95.27	A	0.500	25.567	24.811	0.000	0.000	413.79
		B		25.567	22.012	0.000	0.000	945.94
		C		7.316	43.958	0.000	0.000	688.27
T4	95.27-90.00	A	0.500	9.149	8.878	0.000	0.000	148.07
		B		9.149	10.187	0.000	0.000	437.04
		C		2.618	18.041	0.000	0.000	246.30
T5	90.00-80.00	A	0.500	17.358	16.844	0.000	0.000	280.93
		B		17.358	19.328	0.000	0.000	829.17
		C		4.967	34.228	0.000	0.000	467.29
T6	80.00-60.00	A	0.500	36.347	33.689	0.000	0.000	571.95
		B		36.347	38.656	0.000	0.000	1658.35
		C		9.933	68.456	0.000	0.000	934.57
T7	60.00-40.00	A	0.500	38.792	33.689	0.000	0.000	587.07
		B		38.792	38.656	0.000	0.000	1658.35
		C		9.933	68.456	0.000	0.000	934.57
T8	40.00-20.00	A	0.500	40.150	33.689	0.000	0.000	595.47
		B		40.150	38.656	0.000	0.000	1658.35
		C		9.933	68.456	0.000	0.000	934.57
T9	20.00-0.00	A	0.500	24.090	20.213	0.000	0.000	357.28
		B		24.090	23.193	0.000	0.000	995.01
		C		5.960	41.073	0.000	0.000	560.74

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	136.00-130.00	3.8415	2.2179	2.8925	1.6700
T2	130.00-110.00	0.6616	-0.6986	0.5094	-1.1672
T3	110.00-95.27	-0.5562	0.3666	-0.4765	-0.2709
T4	95.27-90.00	0.3469	0.8093	0.3193	0.1881
T5	90.00-80.00	0.3191	0.7445	0.3069	0.1807
T6	80.00-60.00	0.4142	0.8584	0.3965	0.0561
T7	60.00-40.00	0.5019	0.8561	0.4843	-0.2367
T8	40.00-20.00	0.6019	0.9100	0.5805	-0.4772
T9	20.00-0.00	0.5032	0.7608	0.4912	-0.4038

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
PiRod 16'-6" Low Profile Platform (VSI)	C	None		0.0000	137.00	No Ice 1/2" Ice	21.50 24.90	21.50 24.90	1847.00 2077.00
(3) FV65-14-00NA2 w/Mount Pipe	A	From Centroid-Face	4.06 4.69 0.00	50.0000	137.00	No Ice 1/2" Ice	8.64 9.29	6.95 8.13	55.55 121.25
(3) FV65-14-00NA2 w/Mount Pipe	B	From Centroid-Face	4.06 4.69 0.00	50.0000	137.00	No Ice 1/2" Ice	8.64 9.29	6.95 8.13	55.55 121.25
(3) FV65-14-00NA2 w/Mount Pipe **	C	From Centroid-Face	4.06 4.69 0.00	50.0000	137.00	No Ice 1/2" Ice	8.64 9.29	6.95 8.13	55.55 121.25
Pirod 15' T-Frame Sector Mount (1) (VSI)	A	From Face	3.00 -0.60 0.00	-10.0000	127.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (VSI)	B	From Face	3.00 -0.60 0.00	-10.0000	127.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (VSI)	C	From Face	3.00 -0.60 0.00	-10.0000	127.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	A	From Face	0.17 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice	4.00 6.83	0.50 0.75	50.00 75.00
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	B	From Face	0.17 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice	4.00 6.83	0.50 0.75	50.00 75.00
PiRod 4' Face Mount Support (2"x1" Channels) (VSI)	C	From Face	0.17 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice	4.00 6.83	0.50 0.75	50.00 75.00
(4) DB844H90E-XY w/Mount Pipe	A	From Face	5.00 -1.00 2.00	-10.0000	127.00	No Ice 1/2" Ice	3.58 4.20	5.40 6.49	35.55 76.59
(4) DB844H90E-XY w/Mount Pipe	B	From Face	5.00 -1.00 2.00	-10.0000	127.00	No Ice 1/2" Ice	3.58 4.20	5.40 6.49	35.55 76.59

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
(4) DB844H90E-XY w/Mount Pipe	C	From Face	5.00 -1.00 2.00	-10.0000	127.00	No Ice 1/2" Ice	3.58 4.20	5.40 6.49	35.55 76.59
**									
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	A	From Leg	2.25 -2.00 0.00	-40.0000	117.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	B	From Leg	2.25 -2.00 0.00	-40.0000	117.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
Pirod 15' T-Frame Sector Mount (1) (VSI) (T-Mobile)	C	From Leg	2.25 -2.00 0.00	-40.0000	117.00	No Ice 1/2" Ice	16.20 22.70	10.50 13.80	500.00 650.00
RR90-17-02DP w/Mount Pipe (T-Mobile)	A	From Leg	3.75 -3.25 2.00	-40.0000	117.00	No Ice 1/2" Ice	4.91 5.57	3.64 4.70	43.55 81.64
RR90-17-02DP w/Mount Pipe (T-Mobile)	B	From Leg	3.75 -3.25 2.00	-40.0000	117.00	No Ice 1/2" Ice	4.91 5.57	3.64 4.70	43.55 81.64
RR90-17-02DP w/Mount Pipe (T-Mobile)	C	From Leg	3.75 -3.25 2.00	-40.0000	117.00	No Ice 1/2" Ice	4.91 5.57	3.64 4.70	43.55 81.64
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	A	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	7.55 8.11	3.57 4.41	62.60 109.60
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	B	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	7.55 8.11	3.57 4.41	62.60 109.60
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (VSI) (T-Mobile)	C	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	7.55 8.11	3.57 4.41	62.60 109.60
(2) ATMAA1412D-1A20 TMA (T-Mobile)	A	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	1.17 1.31	0.47 0.57	13.00 20.62
(2) ATMAA1412D-1A20 TMA (T-Mobile)	B	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	1.17 1.31	0.47 0.57	13.00 20.62
(2) ATMAA1412D-1A20 TMA (T-Mobile)	C	From Leg	3.75 -3.25 0.00	-40.0000	117.00	No Ice 1/2" Ice	1.17 1.31	0.47 0.57	13.00 20.62
**									
Pirod 12' Knockdown T-Frame (1) (VSI)	A	From Leg	0.50 0.90 0.00	60.0000	107.00	No Ice 1/2" Ice	8.90 12.60	6.00 8.70	235.00 340.00
Pirod 12' Knockdown T-Frame (1) (VSI)	B	From Leg	0.50 0.90 0.00	60.0000	107.00	No Ice 1/2" Ice	8.90 12.60	6.00 8.70	235.00 340.00
Pirod 12' Knockdown T-Frame (1) (VSI)	C	From Leg	0.50 0.90 0.00	60.0000	107.00	No Ice 1/2" Ice	8.90 12.60	6.00 8.70	235.00 340.00
(2) LPA-80063/4CF w/ Mount Pipe (VSI)	A	From Leg	1.00 1.80 2.00	60.0000	107.00	No Ice 1/2" Ice	7.02 7.43	6.95 7.59	34.60 96.28
(2) LPA-80063/4CF w/ Mount Pipe (VSI)	B	From Leg	1.00 1.80 2.00	60.0000	107.00	No Ice 1/2" Ice	7.02 7.43	6.95 7.59	34.60 96.28
(2) LPA-80063/4CF w/	C	From Leg	1.00	60.0000	107.00	No Ice	7.02	6.95	34.60

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 lb
Mount Pipe (VSI)			1.80 2.00			1/2" Ice	7.43	7.59	96.28
(2) LPA-185063/8CF w/ Mount Pipe	A	From Leg	1.00 1.80 2.00	60.0000	107.00	No Ice 1/2" Ice	3.29 3.70	3.92 4.53	27.25 60.68
(2) LPA-185063/8CF w/ Mount Pipe	B	From Leg	1.00 1.80 2.00	60.0000	107.00	No Ice 1/2" Ice	3.29 3.70	3.92 4.53	27.25 60.68
(2) LPA-185063/8CF w/ Mount Pipe	C	From Leg	1.00 1.80 2.00	60.0000	107.00	No Ice 1/2" Ice	3.29 3.70	3.92 4.53	27.25 60.68
**									
7770.00 w/ Mount Pipe	A	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	6.22 6.77	4.35 5.20	56.90 102.99
7770.00 w/ Mount Pipe	B	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	6.22 6.77	4.35 5.20	56.90 102.99
7770.00 w/ Mount Pipe	C	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	6.22 6.77	4.35 5.20	56.90 102.99
(2) LGP21401 TMA	A	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.31	14.10 21.26
(2) LGP21401 TMA	B	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.31	14.10 21.26
(2) LGP21401 TMA	C	From Leg	0.95 0.35 0.00	20.0000	97.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.31	14.10 21.26
**									
4' Sidearm (2" pipe) (VSI)	C	From Leg	2.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	0.80 1.12	3.20 4.48	60.00 90.00
Generic GPS (VSI)	C	From Leg	4.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	1.40 1.70	1.40 1.70	25.00 30.00
4' Sidearm (2" pipe) (VSI)	C	From Leg	1.00 -1.80 0.00	-60.0000	72.00	No Ice 1/2" Ice	0.80 1.12	3.20 4.48	60.00 90.00
Generic GPS (VSI)	C	From Leg	2.00 -3.60 0.00	-60.0000	72.00	No Ice 1/2" Ice	1.40 1.70	1.40 1.70	25.00 30.00

Truss-Leg Properties

Section Designation	Area in^2	Area Ice in^2	Self Weight lb	Ice Weight lb	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in^2
Pirod 105244 w/ 1	1112.2340	1856.9124	682.09	223.92	7.7238	12.8952	5.8293

Section Designation	Area in^2	Area Ice in^2	Self Weight lb	Ice Weight lb	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in^2
1/4" Reinforcement							
Pirod 105217	2130.7479	3520.4599	589.86	443.34	7.3984	12.2238	5.3014
Pirod 105218	2263.4687	3690.8612	718.59	458.46	7.8593	12.8155	7.2158
Pirod 105218	2263.4687	3690.8612	718.59	458.46	7.8593	12.8155	7.2158
Pirod 105219	2441.8688	3942.2854	899.30	485.72	8.4787	13.6885	9.4248

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T2	130	Leg	A325N	0.6250	5	1405.41	12885.40	0.109 ✓	1.333	Bolt DS
T3	110	Leg	A325N	0.7500	5	10803.30	18555.00	0.582 ✓	1.333	Bolt DS
T5	90	Leg	A325N	1.0000	6	19054.60	34552.30	0.551 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	6810.66	8700.00	0.783 ✓	1.333	Member Bearing
T6	80	Leg	A325N	1.0000	6	22453.30	34554.80	0.650 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	6191.48	8019.77	0.772 ✓	1.333	Member Bearing
T7	60	Leg	A325N	1.0000	6	27911.40	34556.30	0.808 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	5446.63	8700.00	0.626 ✓	1.333	Member Bearing
T8	40	Leg	A325N	1.0000	6	32319.00	34557.20	0.935 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	5829.64	8700.00	0.670 ✓	1.333	Member Bearing
T9	20	Leg	A325N	1.0000	6	36465.70	34557.30	1.055 ✓	1.333	Bolt Tension
		Diagonal	A325N	1.2500	1	8553.75	17671.90	0.484 ✓	1.333	Member Bearing

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	1 1/2	6.00	2.38	76.0 K=1.00	19.800	1.7672	-7000.43	34989.80	0.200 ✓
T2	130 - 110	2	20.00	2.38	57.0 K=1.00	23.222	3.1416	-54000.00	72954.00	0.740 ✓
T3	110 - 95.2708	2 1/4	14.73	2.34	50.0 K=1.00	24.350	3.9761	-103088.00	96816.70	1.065 ✓
T4	95.2708 - 90	2 1/4	5.27	1.18	25.2 K=1.00	27.731	3.9761	-127755.00	110262.00	1.159 ✓
T5	90 - 80	Pirod 105244 w/ 1 1/4" Reinforcement	10.02	10.02	36.1 K=1.00	26.370	5.8293	-128614.00	153715.00	0.837 ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T6	80 - 60	Pirod 105217	20.03	10.02	37.8 K=1.00	26.132	5.3014	-175312.00	138539.00	1.265 ✓
T7	60 - 40	Pirod 105218	20.03	10.02	32.4 K=1.00	26.848	7.2158	-212071.00	193727.00	1.095 ✓
T8	40 - 20	Pirod 105218	20.03	10.02	32.4 K=1.00	26.848	7.2158	-245132.00	193727.00	1.265 ✓
T9	20 - 3e-005	Pirod 105219	20.03	10.02	28.4 K=1.00	27.351	9.4248	-274664.00	257781.00	1.065 ✓

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T5	90 - 80	0.5	1.47	70.4	16.386	0.1963	1924.04	3600.97	0.534 ✓
T6	80 - 60	0.5	1.47	70.6	16.368	0.1963	1491.70	3597.01	0.415 ✓
T7	60 - 40	0.5	1.46	70.0	16.429	0.1963	893.32	3610.50	0.247 ✓
T8	40 - 20	0.5	1.46	70.0	16.429	0.1963	1052.66	3610.50	0.292 ✓
T9	20 - 3e-005	0.625	1.45	55.5	17.850	0.3068	1161.87	6129.18	0.190 ✓

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	3/4	4.65	2.25	129.8 K=0.90	8.865	0.4418	-1600.46	3916.38	0.409 ✓
T2	130 - 110	7/8	5.06	2.45	121.0 K=0.90	10.197	0.6013	-4994.16	6131.42	0.815 ✓
T3	110 - 95.2708	1	5.38	2.60	112.3 K=0.90	11.833	0.7854	-5921.54	9293.53	0.637 ✓
T4	95.2708 - 90	1	5.48	2.65	114.6 K=0.90	11.363	0.7854	-7056.88	8924.27	0.791 ✓
T5	90 - 80	L3x3x3/16	9.89	5.40	108.6 K=1.00	11.691	1.0900	-8244.70	12743.20	0.647 ✓
T6	80 - 60	L2 1/2x2 1/2x3/16	10.80	5.76	139.7 K=1.00	7.655	0.9020	-6690.68	6905.22	0.969 ✓
T7	60 - 40	L3x3x3/16	11.98	6.31	127.0 K=1.00	9.262	1.0900	-5997.90	10095.30	0.594 ✓
T8	40 - 20	L3x3x3/16	12.65	6.62	133.4 K=1.00	8.394	1.0900	-6047.79	9149.68	0.661 ✓
T9	20 - 3e-005	L3x3x5/16	14.68	7.61	155.0	6.212	1.7800	-6452.73	11057.80	0.584

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
					K=1.00					✓

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	3/4	4.00	3.88	173.6 K=0.70	4.955	0.4418	-119.38	2189.09	0.055 ✓
T2	130 - 110	7/8	4.38	4.21	161.6 K=0.70	5.715	0.6013	-564.76	3436.84	0.164 ✓
T3	110 - 95.2708	7/8	4.58	4.39	168.5 K=0.70	5.260	0.6013	-1042.78	3163.08	0.330 ✓
T4	95.2708 - 90	7/8	4.87	4.68	179.7 K=0.70	4.622	0.6013	-1169.14	2779.54	0.421 ✓

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T4	95.2708 - 90	1 1/2	4.96	4.77	152.6 K=1.00	6.414	1.7672	-2212.96	11333.70	0.195 ✓

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	7/8	4.00	3.88	148.8 K=0.70	6.744	0.6013	-725.74	4055.56	0.179 ✓
T2	130 - 110	1	4.02	3.85	129.5 K=0.70	8.909	0.7854	-725.35	6997.39	0.104 ✓
T3	110 - 95.2708	1	4.52	4.33	145.5 K=0.70	7.058	0.7854	-1633.51	5543.12	0.295 ✓

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	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 lb	Allow. P_a lb	Ratio P / P_a
T1	136 - 130	7/8	4.00	3.88	148.8 K=0.70	6.744	0.6013	-572.54	4055.56	0.141 ✓
T2	130 - 110	1	4.49	4.33	145.4 K=0.70	7.061	0.7854	-2232.78	5545.78	0.403 ✓
T4	95.2708 - 90	1	4.99	4.80	161.2 K=0.70	5.746	0.7854	-2361.17	4512.92	0.523 ✓

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 lb	Allow. P_a lb	Ratio P / P_a
T1	136 - 130	1 1/2	6.00	2.38	76.0	30.000	1.7672	5273.31	53014.40	0.099 ✓
T2	130 - 110	2	20.00	2.38	57.0	32.500	1.9959	44939.10	64867.60	0.693 ✓
T3	110 - 95.2708	2 1/4	14.73	2.34	50.0	32.500	2.4253	89074.90	78821.40	1.130 ✓
T4	95.2708 - 90	2 1/4	5.27	1.18	25.2	30.000	3.9761	111520.00	119282.00	0.935 ✓
T5	90 - 80	Pirod 105244 w/ 1 1/4" Reinforcement	10.02	10.02	36.1	30.000	5.8293	114328.00	174878.00	0.654 ✓
T6	80 - 60	Pirod 105217	20.03	10.02	37.8	30.000	5.3014	152448.00	159043.00	0.959 ✓
T7	60 - 40	Pirod 105218	20.03	10.02	32.4	30.000	7.2158	180829.00	216475.00	0.835 ✓
T8	40 - 20	Pirod 105218	20.03	10.02	32.4	30.000	7.2158	204537.00	216475.00	0.945 ✓
T9	20 - 3e-005	Pirod 105219	20.03	10.02	28.4	30.000	9.4248	223099.00	282743.00	0.789 ✓

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T5	90 - 80	0.5	1.47	70.4	16.386	0.1963	1924.04	3600.97	0.534 ✓
T6	80 - 60	0.5	1.47	70.6	16.368	0.1963	1491.70	3597.01	0.415 ✓
T7	60 - 40	0.5	1.46	70.0	16.429	0.1963	893.32	3610.50	0.247 ✓
T8	40 - 20	0.5	1.46	70.0	16.429	0.1963	1052.66	3610.50	0.292 ✓

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T9	20 - 3e-005	0.625	1.45	55.5	17.850	0.3068	1161.87	6129.18	0.190

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	3/4	4.65	2.25	144.2	21.600	0.4418	1566.06	9542.59	0.164
T2	130 - 110	7/8	5.06	2.45	134.5	30.000	0.6013	4995.98	18039.60	0.277
T3	110 - 95.2708	1	5.38	2.60	124.8	30.000	0.7854	5853.63	23561.90	0.248
T4	95.2708 - 90	1	5.48	2.65	127.4	30.000	0.7854	7019.67	23561.90	0.298
T5	90 - 80	L3x3x3/16	9.89	5.40	69.0	29.000	0.6593	6810.66	19119.60	0.356
T6	80 - 60	L2 1/2x2 1/2x3/16	10.31	5.55	85.6	29.000	0.5183	6191.48	15030.60	0.412
T7	60 - 40	L3x3x3/16	11.36	6.02	76.9	29.000	0.6593	5446.63	19119.60	0.285
T8	40 - 20	L3x3x3/16	13.35	6.97	89.0	29.000	0.6593	5829.64	19119.60	0.305
T9	20 - 3e-005	L3x3x5/16	14.68	7.61	99.0	29.000	1.0127	8553.75	29369.30	0.291

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	3/4	4.00	3.88	248.0	30.000	0.4418	227.91	13253.60	0.017
T2	130 - 110	7/8	4.38	4.21	230.9	30.000	0.6013	771.55	18039.60	0.043
T3	110 - 95.2708	7/8	4.58	4.39	240.7	30.000	0.6013	1280.22	18039.60	0.071
T4	95.2708 - 90	7/8	4.87	4.68	256.8	30.000	0.6013	1407.52	18039.60	0.078

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T4	95.2708 - 90	1 1/2	4.96	4.77	152.6	30.000	1.7672	2212.96	53014.40	0.042

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	7/8	4.00	3.88	212.6	30.000	0.6013	698.17	18039.60	0.039
T2	130 - 110	1	4.02	3.85	184.9	30.000	0.7854	747.16	23561.90	0.032
T3	110 - 95.2708	1	4.52	4.33	207.8	30.000	0.7854	1798.97	23561.90	0.076

Bottom Girt Design Data (Tension)

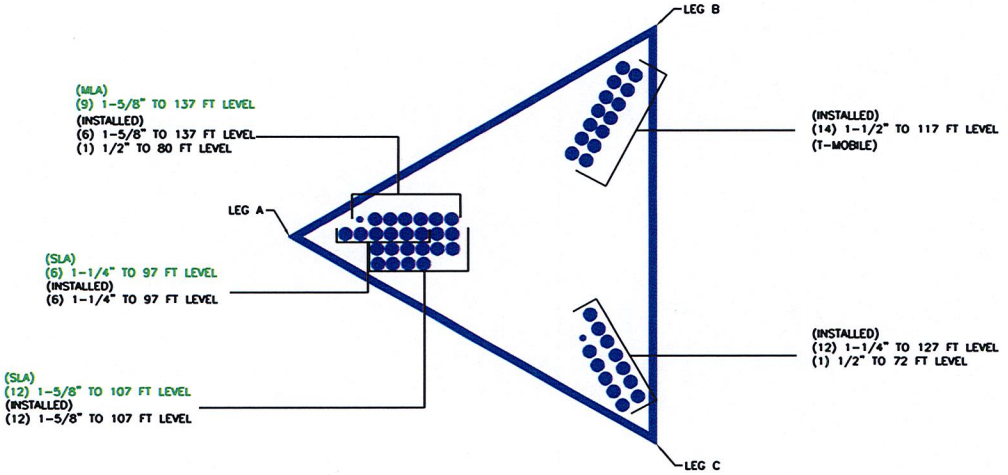
Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	136 - 130	7/8	4.00	3.88	212.6	30.000	0.6013	597.87	18039.60	0.033
T2	130 - 110	1	4.49	4.33	207.8	30.000	0.7854	2187.53	23561.90	0.093
T4	95.2708 - 90	1	4.99	4.80	230.3	30.000	0.7854	2668.85	23561.90	0.113

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	136 - 130	Leg	1 1/2	2	-7000.43	46641.40	15.0	Pass
		Diagonal	3/4	17	-1600.46	5220.53	30.7	Pass
		Horizontal	3/4	16	-119.38	2918.06	4.1	Pass
		Top Girt	7/8	5	-725.74	5406.06	13.4	Pass
		Bottom Girt	7/8	7	-572.54	5406.06	10.6	Pass
T2	130 - 110	Leg	2	24	-54000.00	97247.68	55.5	Pass
		Diagonal	7/8	35	-4994.16	8173.18	61.1	Pass
		Horizontal	7/8	45	-564.76	4581.31	12.3	Pass
		Top Girt	1	28	-725.35	9327.52	7.8	Pass
		Bottom Girt	1	31	-2232.78	7392.52	30.2	Pass
T3	110 - 95.2708	Leg	2 1/4	89	89074.90	105068.92	84.8	Pass
		Diagonal	1	95	-5921.54	12388.28	47.8	Pass
		Horizontal	7/8	127	-1042.78	4216.39	24.7	Pass
		Top Girt	1	92	-1633.51	7388.98	22.1	Pass
T4	95.2708 - 90	Leg	2 1/4	135	-127755.00	146979.24	86.9	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
		Diagonal	1	145	-7056.88	11896.05	59.3	Pass
		Horizontal	7/8	137	-1169.14	3705.13	31.6	Pass
		Secondary Horizontal	1 1/2	152	-2212.96	15107.82	14.6	Pass
		Bottom Girt	1	140	-2361.17	6015.72	39.2	Pass
T5	90 - 80	Leg	Pirod 105244 w/ 1 1/4" Reinforcement	165	-128614.00	204902.09	62.8	Pass
		Diagonal	L3x3x3/16	170	-8244.70	16986.69	48.5	Pass
							58.7 (b)	
T6	80 - 60	Leg	Pirod 105217	174	-175312.00	184672.48	94.9	Pass
		Diagonal	L2 1/2x2 1/2x3/16	176	-6690.68	9204.66	72.7	Pass
T7	60 - 40	Leg	Pirod 105218	189	-212071.00	258238.08	82.1	Pass
		Diagonal	L3x3x3/16	191	-5997.90	13457.03	44.6	Pass
							47.0 (b)	
T8	40 - 20	Leg	Pirod 105218	204	-245132.00	258238.08	94.9	Pass
		Diagonal	L3x3x3/16	212	-6047.79	12196.52	49.6	Pass
							50.3 (b)	
T9	20 - 3e-005	Leg	Pirod 105219	219	-274664.00	343622.06	79.9	Pass
		Diagonal	L3x3x5/16	222	-6452.73	14740.05	43.8	Pass
							Summary	
						Leg (T6)	94.9	Pass
						Diagonal (T6)	72.7	Pass
						Horizontal (T4)	31.6	Pass
						Secondary Horizontal (T4)	14.6	Pass
						Top Girt (T3)	22.1	Pass
						Bottom Girt (T4)	39.2	Pass
						Bolt Checks	79.2	Pass
						RATING =	**94.9**	**Pass**

APPENDIX B



BUSINESS UNIT: 876338 TOWER ID: C_BASELEVEL

LEGEND: FEEDLINES

- SOLID BLUE CIRCLE DENOTES EXISTING FEEDLINE
- OPEN RED CIRCLE DENOTES PROPOSED FEEDLINE
- OPEN BLUE CIRCLE DENOTES RESERVED FEEDLINE
- X BLUE "X" DENOTES LOCATION NOT GIVEN

NOTE: ASSUME FEEDLINE ATTACHMENT HEIGHT TO TOWER STEEL AT 8-FEET ABOVE FINISHED GRADE UNLESS OTHERWISE SPECIFIED

17/12/07	NEW BASD PER WORK ORDER # 149282	DVA
02/02/09	APPLICATION ADDED PER WORK ORDER # 251637	ADC

DRAWN BY: DVA
CHECKED BY: KDI/DK
DRAWING DATE: 17/12/07

SITE NUMBER:
SITE NAME:

SITE NAME

WATERFORD

BUSINESS UNIT NUMBER

876338

SITE ADDRESS

41 MANITOCK HILL ROAD
WATERFORD, CT 06385-2000
NEW LONDON COUNTY
USA

SHEET TITLE

BASE LEVEL

SHEET NUMBER

A1-0

BASE LEVEL DRAWING

SCALE: N.T.S.

1

PLOT DATE: 2/3/2009 FILE NAME: 876338_BASELEVEL.DWG

Xref: R:\TEMPLATES\TYPICAL BLOCKS FOR TEMPLATES\RFLE BLOCK SHD-HDR S.T.dwg

APPENDIX C

ANCHOR BOLT CALCULATIONS

Customer:	Crown Castle
Site Name:	Waterford, CT BU#876338
Job Number:	2009-004-027
Tower Model:	136' PiRod Self-Supporting Tower
Date:	2/11/2009

Input Information:

# bolts	6	
bolt diameter	1.25	in
Allowable Tension, F_u	150	ksi
Steel Grade	A687	
Applied Shear	25.145	kips
Uplift per Leg	232.345	kips

Bolt Cross-Sectional Area, **A**	1.227	in^2
Applied Shear, f_v	3.41	ksi
Maximum Allowable Tensile Stress, F_t	49.5	ksi
Allowable tension force	364.47	kips
Maximum Allowable	485.84	kips
% Capacity	**47.8%**	

The Bolt Group is sufficient for the applied Uplift Force

Maximum Allowable Tensile Stress, F_t

$$0.43F_u - 1.8f_v \leq 0.33F_u$$

This equation is for threaded parts, A449 bolts over 1 1/2" dia. (threads included in shear plane) Manual of Steel Construction ASD, 9th Edition, pg. 5-74, Table J3.3

Overturning Calculation for Square Mat Foundations

Customer:	Crown Castle
Site Name:	Waterford, CT BU#876338
Job Number:	2009-004-026
Tower Model:	136' PiRod Self-Supporting Tower
Date:	2/11/2009

Soil Ultimate Bearing	8	ksf
Unit wt soil	0.125	kcf
Soil skin friction (Ultimate)	0.27813	ksf
Unit wt concrete	0.15	kcf
Mat Width	23	ft
Mat Thickness	3.25	ft
Depth of Soil Over Mat	2.75	ft
Has Pedestals? (Y or N)	y	
Pedestal Round or Square? (R or S)	R	
Number of Pedestals	3	
Pedestal Height	3.25	ft
Pedestal Diameter or Width	3	ft
Applied Shear	37.419	kip
Applied Axial Force	54.048	kip
Applied Moment	3201.881	k-ft
wt. Concrete =	268.225	kip
wt. Soil =	174.554	kip
x =	2.700	ft
Shear Moment =	243.2235	k-ft
Allowable Bearing =	4	ksf
L/6 =	3.83	ft
e =	6.93	ft
I =	13.70	ft
Bearing =	3.15	ksf
Resisting Moment =	5520.93767	k-ft
SF =	1.603	

BEARING ADEQUATE

OVERTURNING ADEQUATE