T-Mobile

March 17, 2009

EM-T-MOBILE-062-090316

Via Federal Express

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

ORIGINAL

RECEIVED
MAR 16 2009
CONNECTICUT
SITING COUNCIL

Re: Notice of Exempt Modification
TowerCo LLC Telecommunications Facility
2895 State Street, Hamden, Connecticut
T-Mobile Site CT11611B

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 138-foot monopole facility owned by FNS Associates LLC and located at 2895 State Street, Hamden, 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, Craig Henrici, Mayor, Town of Hamden.

The existing Facility consists of a 138-foot self-supporting monopole tower capable of supporting multiple carriers within a fenced compound. The coordinates for the Facility are **Lat: 41°-21'-36" and Long: 72°–53'-8".** The tower is located in the southeastern portion of Hamden, close to it's Quinnipiac River border with North Haven. The Facility is approximately 950 feet east of State Street (Route 5) and roughly 4,600 feet west of Interstate 91 (see Site Map, attached as Exhibit A). The tower currently supports Sprint Nextel antennas at the one hundred thirty eight foot level (138') centerline AGL (above ground level). T-Mobile currently has antennas on the tower at the one hundred twenty eight foot (128') level AGL. The current T-Mobile antenna configuration is two per sector, for a total of six antennas. T-Mobile proposes to replace the existing antennas with six new ones. T-Mobile proposes to install six RFS APXV16DWV antennas on existing mounts at the same elevation, (128') level centerline AGL. T-Mobile also intends to add a UMTS 3106 BTS equipment cabinet to its current configuration of one existing S12000 equipment cabinet. The two cabinets will both be mounted on the existing raised concrete platform underneath the tower. T-Mobile's equipment will be contained within it's existing lease area. T-Mobile intends to run new coaxial cable on its existing ice bridge from its current equipment pad to the existing tower. Utilities will be run via a proposed underground conduit from existing utility sources at the Facility (See Design Drawings and Equipment Specifications, attached as Exhibits B and C respectively).

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

For the following reasons, the proposed modifications to the State Street 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 replace its existing antennas and install new antennas at a center line height of approximately 128 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 9.2688% 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.

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

Respectfully Submitted,

Mark Richard
UMTS Project Manager
Agent for T-Mobile

cc: Craig Henrici, Mayor
State 5 Industrial Park, Inc., underlying property owner
Carrie L. Larson

35 Griffin Rd S
Bloomfield, CT 06002

Exhibit A

Site Map

T-Mobile Site CT11611B

2895 State Street

Hamden, Connecticut

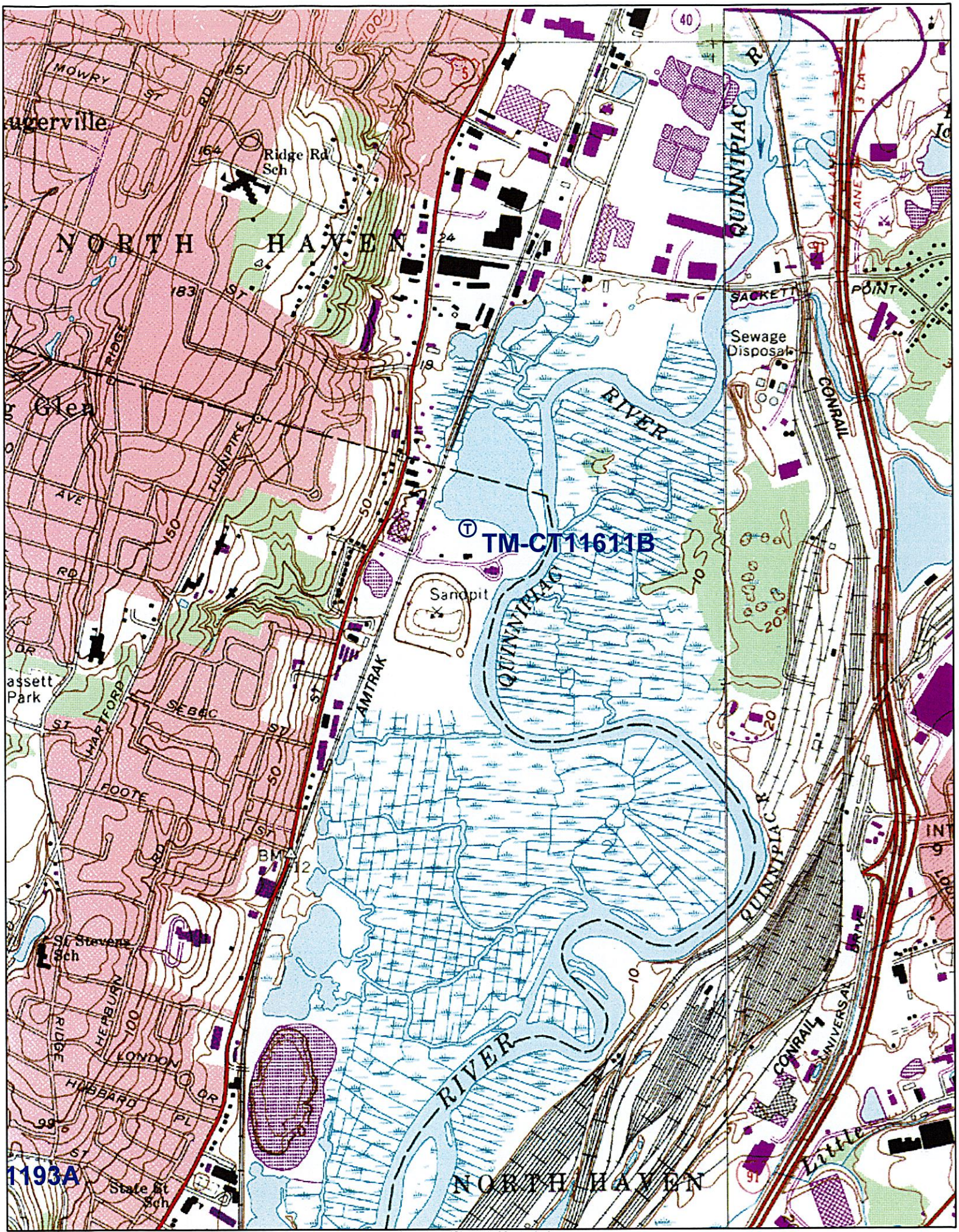


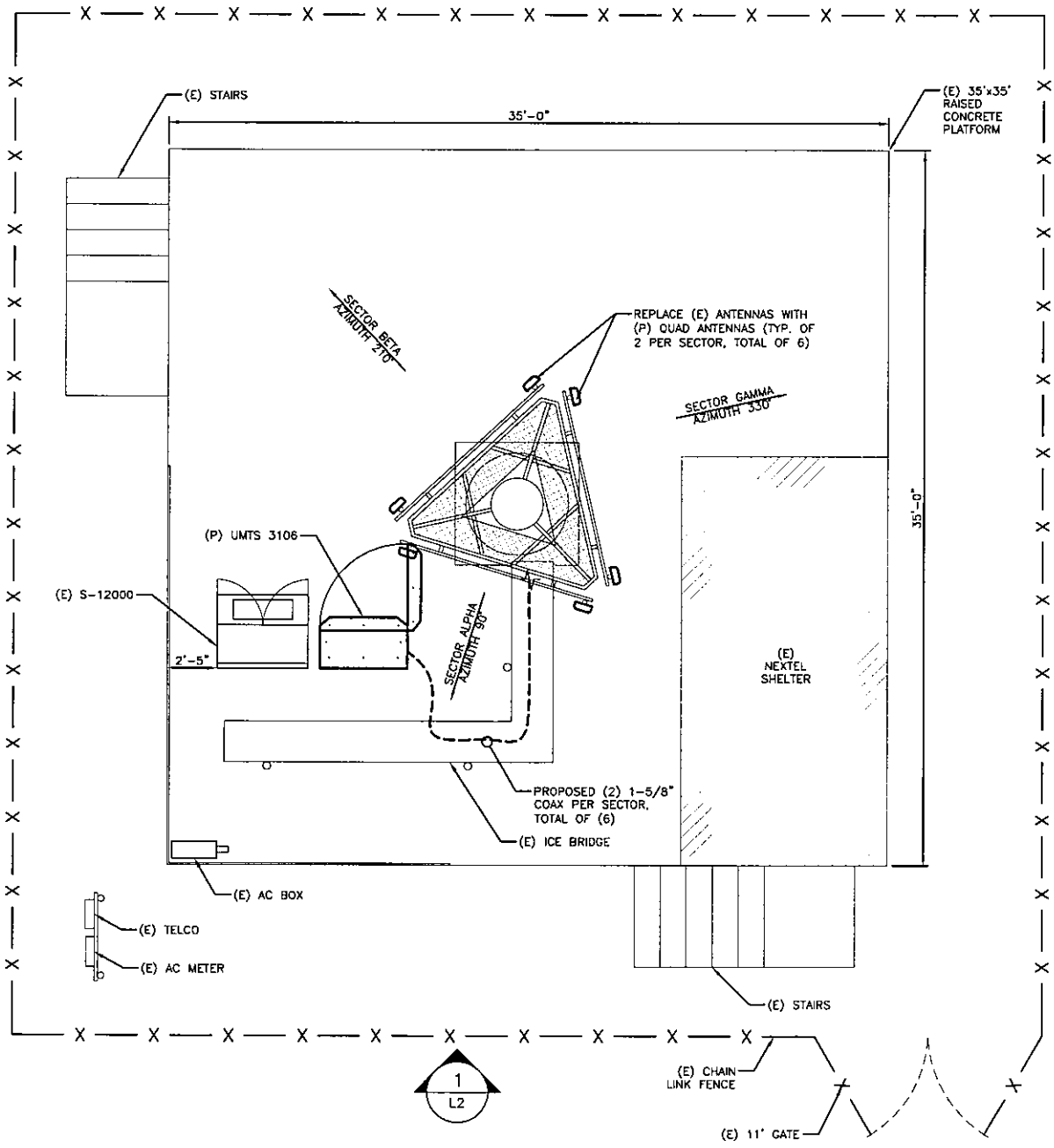
Exhibit B

Design Drawings

T-Mobile Site CT11611B

2895 State Street

Hamden, Connecticut



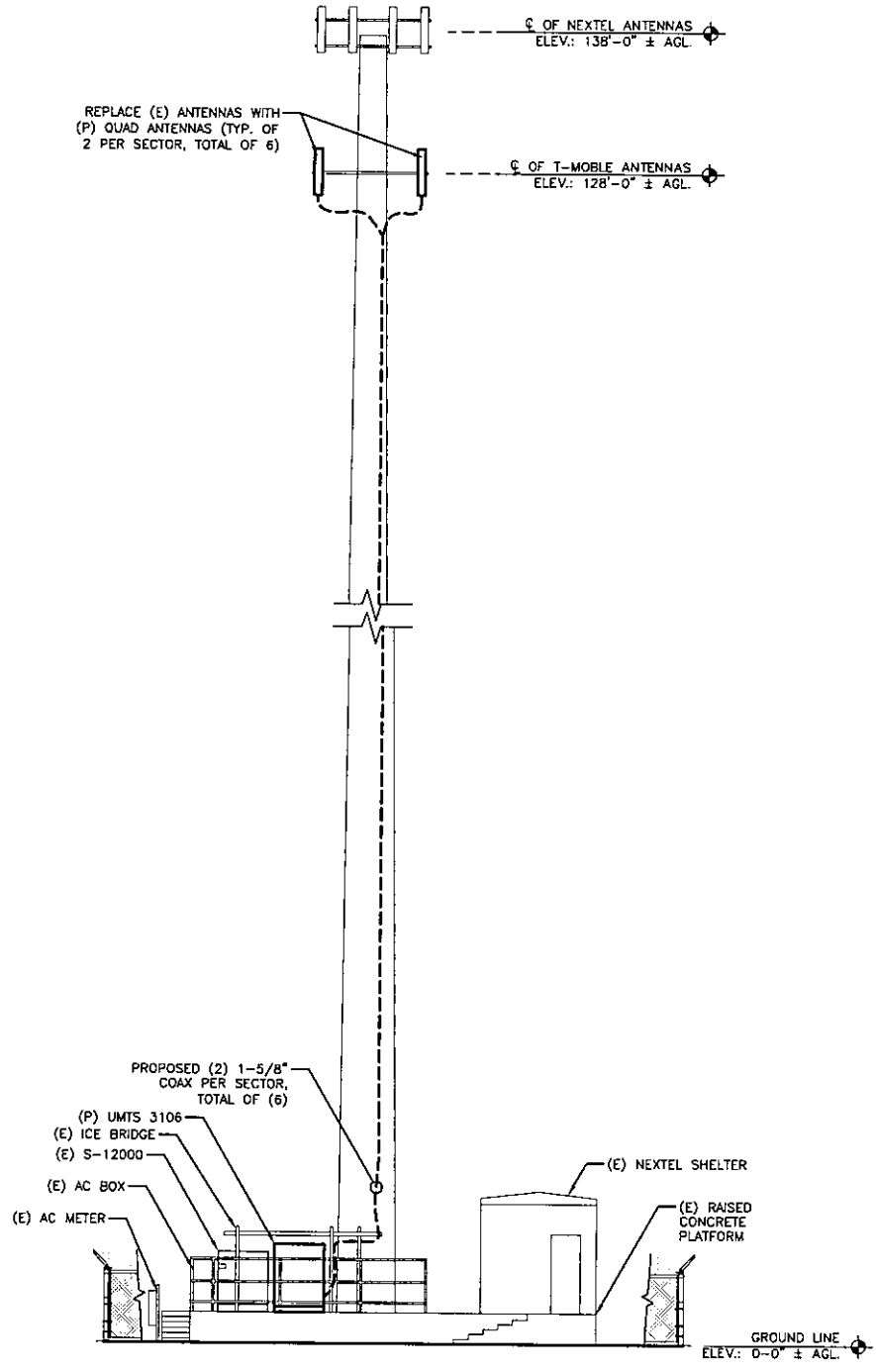
COMPOUND LAYOUT PLAN 1

SCALE: NTS

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

MAXTON
50 Eastman St.
South Easton, MA 02375
Phone: (508) 936-6383
Fax: (508) 936-6385

PROJECT LOCATION: NEXTEL MONOPOLE HAMDEN CT11611B 2895 STATE ROAD HAMDEN, CT 06517	PROJECT MANAGER: KB	DRAWN BY: JRK	BSDA PROJ. #: 2898.277
APPROVED BY:	REV. 2 REV. 1 01/09/09	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) 936-6393
Fax: (508) 936-6395

PROJECT LOCATION: NEXTEL MONOPOLE HAMDEN CT11611B 2895 STATE ROAD HAMDEN, CT 06517	PROJECT MANAGER: KB	DRAWN BY: JRK	BSQA PROJ. #: 2898.277
APPROVED BY:	REV. 2 REV. 1 01/09/09	ELEVATION	SHEET: L2

Exhibit C

Equipment Specifications

T-Mobile Site CT11611B

2895 State Street

Hamden, Connecticut

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

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

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

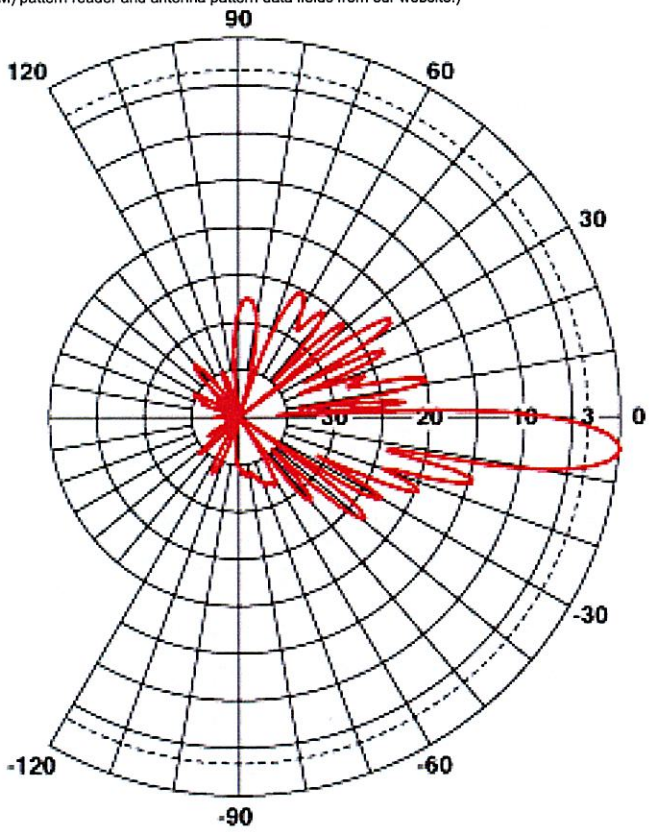
Connector Type	(4) 7-16 DIN Female
Connector Location	Bottom
Mount Type	Downtilt Kit w/Scissor Kit
Electrical Downtilt, deg	0-10 , 0-10
Horizontal Beamwidth, deg	65 ±5 (65.9 average across band)
Mounting Hardware	APM40-2 + APM40-E2
Rated Wind Speed, km/h (mph)	160 (100)
VSWR	< 1.4:1
Vertical Beamwidth, 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.

Vertical Pattern

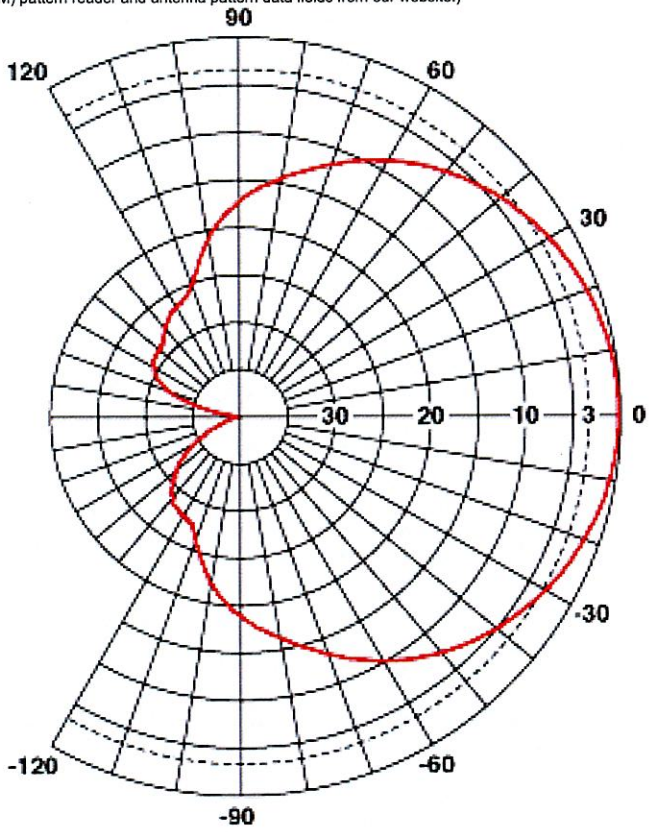
(This is a general representation of the antenna family pattern. For the latest detailed pattern contact Applications Engineering. You may also download the CELplot(TM) pattern reader and antenna pattern data fields from our website.)



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.)



3 Dimensions

This section describes the physical characteristics of the RBS, that is, dimensions, weight, and color.

Table 1 RBS 3106 Dimensions

Unit	Dimensions (mm)
Height (including installation frame)	1626
Width	1300
Depth	710
Depth including door	926

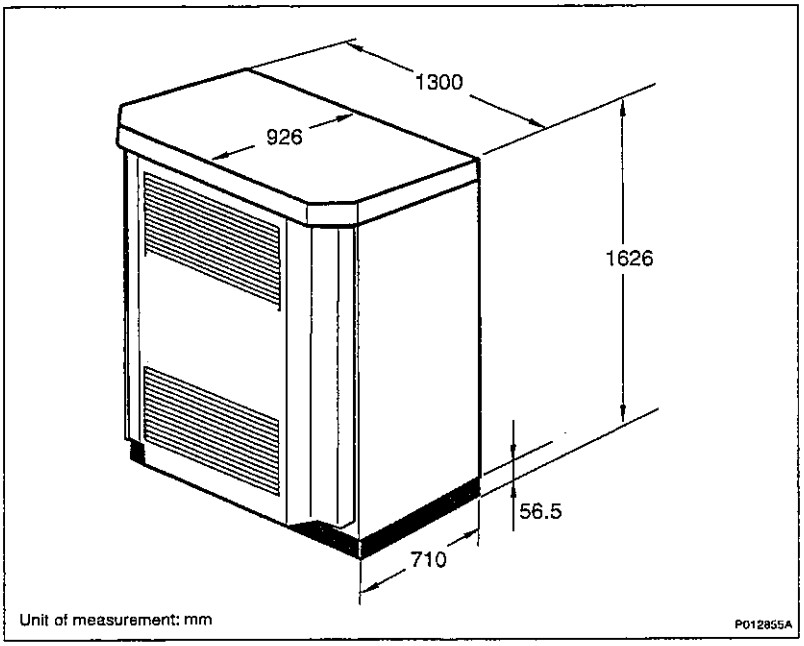


Figure 2 RBS 3106 Dimensions

The various weights of the RBS 3106 are shown in the table below.

Table 2 RBS 3106 Weights

Unit	Type	Weight (kg)
RBS fully equipped excluding batteries	AC-powered	560
RBS fully equipped including batteries	AC-powered	850

Unit	Type	Weight (kg)
RBS fully equipped including batteries and future expansion of hardware (not yet available)	AC-powered	875
RBS fully equipped	DC-powered	510
Installation frame	AC- and DC-powered	12

The color of RBS 3106 is shown in the table below.

Table 3 RBS 3106 Color

Color	Color Standard
Gray	RAL 7035
Green	NCS 8010–G 10 Y

Exhibit D

Power Density Calculations

T-Mobile Site CT11611B

2895 State Street

Hamden, 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 CT11611B
Date: February 27, 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 Monopole at 2895 State Road, Hamden, 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), (1980.2-1984.8), (2140-2145), (2110-2120)MHz frequency Band.
2) The antenna array consists of three sectors, with 2 antennas per sector.
3) The model number for GSM antenna is APX16DWV-16DWV.
3) The model number for UMTS antenna is APX16DWV-16DWV.
4) GSM antenna center line height is 128 ft.
4) UMTS antenna center line height is 128 ft.
5) The maximum transmit power from any GSM sector is 2220.65 Watts Effective Radiated Power (EiRP) assuming 8 channels per sector.
5) The maximum transmit power from any UMTS sector is 2215.39 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 Monopole at 2895 State Road, Hamden, CT, is 0.06539 mW/cm^2. This value represents 6.539% 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 2.73%. The combined Power Density for the site is 9.269% of the M.P.E. standard.

Connecticut Market

T-Mobile

Worst Case Power Density

Site:	**CT11611B**
Site Address:	**2895 State Road**
Town:	**Hamden**
Tower Height:	**140 ft.**
Tower Style:	**Monopole**

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	APX16DWV-16DWV	**Antenna Model**	APX16DWV-16DWV
Cable Size	1 5/8 in.	**Cable Size**	1 5/8 in.
Cable Length	179 ft.	**Cable Length**	179 ft.
Antenna Height	128.0 ft.	**Antenna Height**	128.0 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	18.0 dBi	**Antenna Gain**	18.0 dBi
Cable Loss per foot	0.0116 dB	**Cable Loss per foot**	0.0116 dB
Total Cable Loss	2.0764 dB	**Total Cable Loss**	2.0764 dB
Total Attenuation	6.5764 dB	**Total Attenuation**	3.5764 dB
Total EIRP per Channel	54.43 dBm	**Total EIRP per Channel**	60.44 dBm
(In Watts)	277.58 W	**(In Watts)**	1107.69 W
Total EIRP per Sector	63.46 dBm	**Total EIRP per Sector**	63.45 dBm
(In Watts)	2220.65 W	**(In Watts)**	2215.39 W
nsg	11.4236	**nsg**	14.4236
Power Density (S) =	**0.032733 mW/cm^2**	**Power Density (S) =**	**0.032655 mW/cm^2**
T-Mobile Worst Case % MPE =		**6.5388%**	

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	
AT&T Wireless	
Nextel	2.7300 %
Pocket	
Other Antenna Systems	
Total Excluding T-Mobile	**2.7300 %**
T-Mobile	6.5388
Total % MPE for Site	**9.2688%**

Exhibit E

Structural Analysis

T-Mobile Site CT11611B

2895 State Street

Hamden, Connecticut

Date: **February 18, 2009**

Mr. Stephen Rambeau
Engineering Manager
TowerCo LLC
5000 Valleystone Drive
Cary, NC 27519
(919) 653-5722

Tower Engineering Professionals, Inc.
3703 Junction Blvd.
Raleigh, NC 27603
(919) 661-6351
mnichols@tepgroup.net

Subject: **Structural Analysis Report**

	T-Mobile Co-Locate	
Carrier Designation:	**Site Number:**	CT11611
	Site Name:	N/A
TowerCo Designation:	**Site Number:**	CT2013
	Site Name:	Hamden-State St
Engineering Firm Designation:	**TEP Project Number:**	090512
Site Data:	**Hamden, New Haven County, CT 06517** **Latitude *41° 21' 36"*, Longitude *-72° 53' 9"*** **136 Foot – Monopole Tower**	

Dear Mr. Rambeau,

Tower Engineering Professionals, Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC1: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and 2006 International Building Code based upon a wind speed of 105 mph 3-second gust.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in table 1 and 2 for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals, Inc.* appreciate the opportunity of providing our continuing professional services to you and TowerCo. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

J. Russell Hill, P.E.

STATE OF CONNECTICUT
J. RUSSELL HILL
#13532
LICENSED
PROFESSIONAL ENGINEER

2/18/2009

Date: **February 18, 2009**

Mr. Stephen Rambeau
Engineering Manager
TowerCo LLC
5000 Valleystone Drive
Cary, NC 27519
(919) 653-5722

Tower Engineering Professionals, Inc.
3703 Junction Blvd.
Raleigh, NC 27603
(919) 661-6351
mnichols@tepgroup.net

Subject: **Structural Analysis Report**

	T-Mobile Co-Locate	
Carrier Designation:	**Site Number:**	CT11611
	Site Name:	N/A
TowerCo Designation:	**Site Number:**	CT2013
	Site Name:	Hamden-State St
Engineering Firm Designation:	**TEP Project Number:**	090512
Site Data:	**Hamden, New Haven County, CT 06517** **Latitude *41° 21' 36"*, Longitude *-72° 53' 9"*** **136 Foot – Monopole Tower**	

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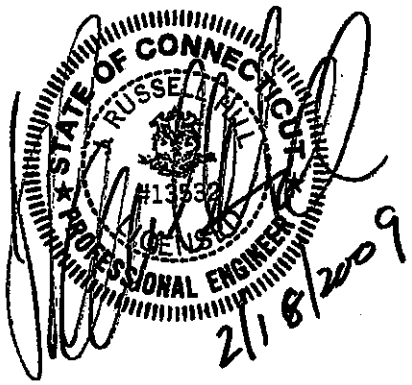


J. Russell Hill, P.E.

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 136 ft monopole tower designed by Engineered Endeavors Inc. in October of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 73.6 mph with 0.5 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Coax Location
128 T-Mobile Final Configuration	128	6	RFS	APX16DWV-16DWVS-A20	18	1 5/8	Inside Pole
		3	RFS	ATMPP1412D-1CWA			
		3	RFS	ATMAA1412D-1A20			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
136' 10" Sprint/Nextel Existing Loading	136' 10"	12	Decibel	DB844H90E-XY	12	1 1/4	1
128 T-Mobile Existing Configuration	128	6	EMS Wireless	RR65-18-02DP	12	1 5/8	1

Notes:
1) Existing equipment

Table 3 - Design Antenna and Cable Information

Unknown

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Manufacturer Drawings	Engineered Endeavors, Inc. dated August 20, 1999, Drawing # GS51580	-	TowerCo
Geotechnical Report	Dr. Clarence Welti, P.E. dated May 27, 1999	-	TowerCo
Correspondence	Correspondence from TowerCo in reference to the proposed loading	-	TowerCo

3.1) Analysis Method

RISATower (version 5.3.1.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) This report is not a construction document.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals, Inc. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
L1	136 - 88.125	Pole	TP27.996x19x0.25	1	-6833.010	1113548.164	39.8	Pass
L2	88.125 - 43.6432	Pole	TP35.728x26.744x0.375	2	-13548.100	2130613.792	41.7	Pass
L3	43.6432 - 0	Pole	TP43x34.058x0.438	3	-24304.900	3072604.863	44.6	Pass
							Summary	
						Pole (L3)	44.6	Pass
						Base Plate	83.7	Pass
						Rating =	83.7	Pass

Structure Rating (max from all components) =	83.7%

4.1) Recommendations

1) TEP did not have sufficient information to perform a foundation analysis. However, since the tower superstructure has reserve capacity, it is reasonable to assume that the foundation is adequate.

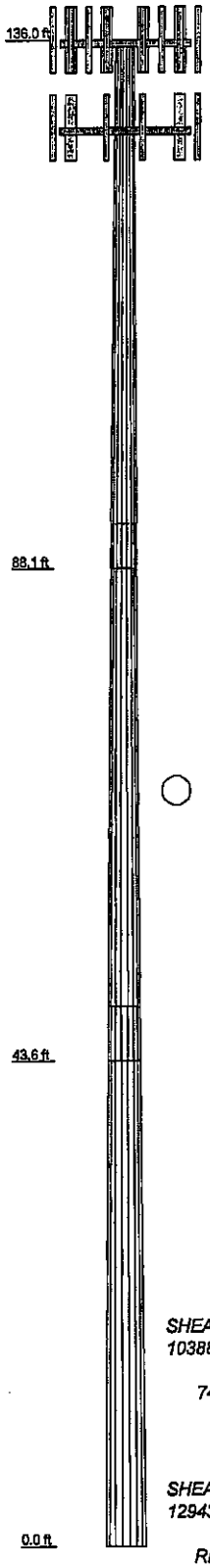
2) If the load differs from that described in table 1 & 2 of this report, or the provisions of this analysis are found to be invalid, another structural analysis should be performed.

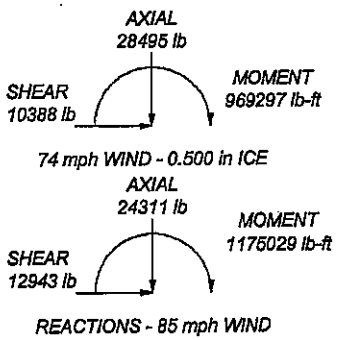
APPENDIX A

RISA TOWER OUTPUT

Section	1	2	3
Length (ft)	47.875	48.482	48.609
Number of Sides	18	18	18
Thickness (in)	0.250	0.375	0.438
Lap Splice (ft)	4.000	4.986	
Top Dia (in)	19.000	26.744	34.058
Bot Dia (in)	27.996	35.728	43.000
Grade	A572-65		
Weight (lb)	3005.2	6059.9	8749.2

17814.2





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(4) DB844H90E-XY	136	RFS/Celwave ATMAA1412D-1A20	128
(4) DB844H90E-XY	136	RFS/Celwave ATMAA1412D-1A20	128
(4) DB844H90E-XY	136	RFS/Celwave ATMAA1412D-1A20	128
12-ft Low Profile Platform	136	RFS ATMPP1412D-1CWA	128
(2) APX16DWV-16DWV-S-A20	128	RFS ATMPP1412D-1CWA	128
(2) APX16DWV-16DWV-S-A20	128	RFS ATMPP1412D-1CWA	128
(2) APX16DWV-16DWV-S-A20	128	12-ft Low Profile Platform	128

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 83.7%

Tower Engineering Professionals, Inc.
3703 Junction Blvd.
Raleigh, NC 27603
Phone: (919) 661-6351
FAX: (919) 661-6350

Job: Hamden			
Project: 090512			
Client: TowerCo	Drawn by: Matt Nichols, E	App'd:	
Code: TIA/EIA-222-F	Date: 02/18/09	Scale: NTS	
Path: H:\2009\090512_Hamden\Structural\RISA\LC1\Hamden.eri		Dwg No. E-1	

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:
Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
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 pole 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		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	136.000-88.125	47.875	4.000	18	19.000	27.996	0.250	1.000	A572-65 (65 ksi)
L2	88.125-43.643	48.482	4.966	18	26.744	35.728	0.375	1.500	A572-65 (65 ksi)
L3	43.643-0.000	48.609		18	34.058	43.000	0.438	1.750	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in²	I in⁴	r in	C in	I/C in³	J in⁴	J/Q in³	w in	w/t
L1	19.293	14.878	660.828	6.656	9.652	68.465	1323.525	7.440	2.904	11.616
	28.427	22.016	2141.247	9.850	14.222	150.561	4285.311	11.010	4.487	17.949
L2	27.909	31.386	2757.129	9.361	13.586	202.940	5517.886	15.696	4.047	10.792
	36.279	42.079	6644.380	12.550	18.150	366.085	13297.503	21.043	5.628	15.008
L3	35.511	46.686	6666.914	11.935	17.301	385.341	13342.601	23.347	5.224	11.941
	43.663	59.103	13527.073	15.110	21.844	619.258	27071.944	29.557	6.798	15.538

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 136.000-88.125				1	1	1		
L2 88.125-43.643				1	1	1		
L3 43.643-0.000				1	1	1		

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.250 in
Number of bolts	16
Embedment length	60.000 in
F_u	3,000 ksi
Grout space	3.000 in
Base plate grade	A572-60
Base plate thickness	2.000 in
Bolt circle diameter	51.000 in
Outer diameter	57.000 in
Inner diameter	33.000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft²/ft	Weight lb/f
LDF6-50A (1-1/4 FOAM)	A	No	Inside Pole	136.000 - 0.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	128.000 - 0.000	18	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
L1	136.000-88.125	A	0.000	0.000	0.000	0.000	967.725
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.000
L2	88.125-43.643	A	0.000	0.000	0.000	0.000	1008.847
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.000
L3	43.643-0.000	A	0.000	0.000	0.000	0.000	989.828
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.000

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
L1	136.000-88.125	A	0.500	0.000	0.000	0.000	0.000	967.725
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.000
L2	88.125-43.643	A	0.500	0.000	0.000	0.000	0.000	1008.847
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.000
L3	43.643-0.000	A	0.500	0.000	0.000	0.000	0.000	989.828
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
(4) DB844H90E-XY	A	From Leg	4.000	0.000	0.000	136.000	No Ice	2.867	3.733	10.000
			0.000				1/2" Ice	3.177	4.101	35.375
			0.000							
(4) DB844H90E-XY	B	From Leg	4.000	0.000	0.000	136.000	No Ice	2.867	3.733	10.000
			0.000				1/2" Ice	3.177	4.101	35.375
			0.000							
(4) DB844H90E-XY	C	From Leg	4.000	0.000	0.000	136.000	No Ice	2.867	3.733	10.000
			0.000				1/2" Ice	3.177	4.101	35.375
			0.000							
12-ft Low Profile Platform	C	None			0.000	136.000	No Ice	12.080	12.080	1545.000
							1/2" Ice	15.240	15.240	2035.000
(2) APX16DWV-16DWV-S-A20	A	From Leg	4.000	0.000	0.000	128.000	No Ice	7.228	2.150	40.700
			0.000				1/2" Ice	7.681	2.490	74.235
			0.000							
(2) APX16DWV-16DWV-S-A20	B	From Leg	4.000	0.000	0.000	128.000	No Ice	7.228	2.150	40.700
			0.000				1/2" Ice	7.681	2.490	74.235
			0.000							
(2) APX16DWV-16DWV-S-A20	C	From Leg	4.000	0.000	0.000	128.000	No Ice	7.228	2.150	40.700
			0.000				1/2" Ice	7.681	2.490	74.235
			0.000							

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
RFS/Celwave ATMAA1412D-1A20	A	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.467	13.000
			0.000				1/2" Ice	1.314	0.575	20.616
			0.000							
RFS/Celwave ATMAA1412D-1A20	B	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.467	13.000
			0.000				1/2" Ice	1.314	0.575	20.616
			0.000							
RFS/Celwave ATMAA1412D-1A20	C	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.467	13.000
			0.000				1/2" Ice	1.314	0.575	20.616
			0.000							
RFS ATMPP1412D-1CWA	A	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.416	12.500
			0.000				1/2" Ice	1.317	0.530	19.513
			0.000							
RFS ATMPP1412D-1CWA	B	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.416	12.500
			0.000				1/2" Ice	1.317	0.530	19.513
			0.000							
RFS ATMPP1412D-1CWA	C	From Leg	4.000	0.000	0.000	128.000	No Ice	1.167	0.416	12.500
			0.000				1/2" Ice	1.317	0.530	19.513
			0.000							
12-ft Low Profile Platform	C	None			0.000	128.000	No Ice	12.080	12.080	1545.000
							1/2" Ice	15.240	15.240	2035.000

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
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice

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

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	136 - 88.125	17.170	33	1.129	0.000
L2	92.125 - 43.6432	7.833	33	0.811	0.000
L3	48.6093 - 0	2.166	33	0.411	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
136.000	(4) DB844H90E-XY	33	17.170	1.129	0.000	46345
128.000	(2) APX16DWV-16DWV-S-A20	33	15.339	1.079	0.000	28965

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	136 - 88.125	49.571	8	3.259	0.000
L2	92.125 - 43.6432	22.622	2	2.342	0.000
L3	48.6093 - 0	6.257	2	1.186	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
136.000	(4) DB844H90E-XY	8	49.571	3.259	0.000	16135
128.000	(2) APX16DWV-16DWV-S-A20	8	44.286	3.109	0.000	10084

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension lb	Actual Allowable Ratio Bolt Compression lb	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.000	16	2.250	67690.313 131210.581 0.52	70638.421 217809.564 0.32	50.199 45.000 1.12		Plate	1.12 ✓

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in²	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
L1	136 - 88.125 (1)	TP27.996x19x0.25	47.875	0.000	0.0	39.000	21.420	-6833.010	835370.000	0.008
L2	88.125 - 43.6432 (2)	TP35.728x26.744x0.375	48.482	0.000	0.0	39.000	40.984	-13548.100	1598360.00 0	0.008
L3	43.6432 - 0 (3)	TP43x34.058x0.438	48.609	0.000	0.0	39.000	59.103	-24304.900	2305030.00 0	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_z lb-ft	Actual f_{bc} ksi	Allow. F_{bc} ksi	Ratio $\frac{f_{bc}}{F_{bc}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	136 - 88.125 (1)	TP27.996x19x0.25	242006.667	-20.383	39.000	0.523	0.000	0.000	39.000	0.000
L2	88.125 - 43.6432 (2)	TP35.728x26.744x0.375	616984.167	-21.326	39.000	0.547	0.000	0.000	39.000	0.000
L3	43.6432 - 0 (3)	TP43x34.058x0.438	1175033.333	-22.770	39.000	0.584	0.000	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bc}}{F_{bc}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	136 - 88.125 (1)	TP27.996x19x0.25	0.008	0.523	0.000	0.531 ✓	1.333	HI-3 ✓

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bw}}{F_{bw}}$	Ratio $\frac{f_v}{F_v}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	88.125 - 43.6432 (2)	TP35.728x26.744x0.375	0.008	0.547	0.000	0.555 ✓	1.333	H1-3 ✓
L3	43.6432 - 0 (3)	TP43x34.058x0.438	0.011	0.584	0.000	0.594 ✓	1.333	H1-3 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	136 - 88.125	Pole	TP27.996x19x0.25	1	-6833.010	1113548.164	39.8	Pass
L2	88.125 - 43.6432	Pole	TP35.728x26.744x0.375	2	-13548.100	2130613.792	41.7	Pass
L3	43.6432 - 0	Pole	TP43x34.058x0.438	3	-24304.900	3072604.863	44.6	Pass
							Summary	
						Pole (L3)	44.6	Pass
						Base Plate	83.7	Pass
						RATING =	83.7	Pass