smartlink

Via Overnight Delivery

December 12, 2012

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

Re:	**Tower Sharing Application**
Property Address:	**111 Upper Fish Rock Road, Southbury, CT 06488 (the "Property")**
Applicant:	**New Cingular Wireless PCS, LLC ("AT&T")**

Dear Ms. Bachman:

On behalf of AT&T, enclosed in connection with the shared use of a tower located on the Property, please find an original and fifteen (15) copies of a tower sharing application package along with a check in the amount of six hundred and twenty five ($625.00) dollars.

Please date stamp a copy of this letter and a copy of the check (both attached) and email them back to me. If you have any questions, please contact me.

Sincerely,

Adam F. Braillard

Enclosures

cc w/enclosures:
Ed Edelson, First Selectman, Town of Southbury
Carl M. Ferencek and Marilyn T. Ferencek, Property Owners

33 Boston Post Road West, Marlborough, Massachusetts 01752
p: 508.954.7702 • adam.braillard@smartlinkllc.com
www.smartlinkllc.com

SMARTLINK, LLC
1997 Annapolis Exchange Pkwy Suite 200
Annapolis, MD 21401

BRANCH BANKING AND TRUST COMPANY
65-330/550

0157

11/25/13

PAY TO THE ORDER OF Connecticut Siting Council $ 625.00

six hundred twenty five —————— 00/100 DOLLARS

MEMO Tower Share App Fee CT2426

MP

⑈000157⑈ ⑆055003308⑆0005158694044⑈

SMARTLINK, LLC

0157

SMARTLINK, LLC

0157

APPLICATION TO THE CONNECTICUT SITING COUNCIL
FOR AN ORDER TO APPROVE THE SHARED USE OF AN EXISTING TOWER
PURSUANT TO CONNECTICUT GENERAL STATUTE §16-50aa

APPLICANT

New Cingular Wireless PCS, LLC (AT&T)
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067

TOWER/PROPERTY ADDRESS

111 Upper Fish Rock Road
Southbury, Connecticut 06488

PREPARED BY: Adam F. Braillard
Regional Land Use Manager
Smartlink, LLC
33 Boston Post Road West
Marlborough, Massachusetts 01752
508-954-7702
adam.braillard@smartlinkllc.com

Date Submitted: December 12, 2013

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APPLICANT

New Cingular Wireless PCS, LLC (AT&T)
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067

TOWER/PROPERTY ADDRESS

111 Upper Fish Rock Road
Southbury, Connecticut 06488

TAB 1

smartlink

December 11, 2013

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

Re:	**Request for an Order to Approve the Shared Use of an Existing Tower**
Property Address:	**111 Upper Fish Rock Road, Southbury, CT 06488 (the "Property")**
Applicant:	**New Cingular Wireless PCS, LLC ("AT&T")**

Dear Ms. Bachman:

On behalf of AT&T, please accept this application pursuant to Connecticut General Statute §16-50aa, as amended (the "Statute"), requesting the finding from the Connecticut Siting Council (the "Council") that the shared use of the tower and facility located on the Property (the "Facility") is technically, legally, economically and environmentally feasible, will meet public safety concerns, will avoid the unnecessary proliferation of towers and is in the public interest. AT&T further requests an order from the Council approving the shared use of the Facility.

I. The Facility

The Facility is owned by Cellco Partnership dba Verizon Wireless, ("Verizon") and consists of a 100' monopole style tower (the "Tower") located on the Property. The Tower is currently shared by Verizon with an antenna centerline height of 100'. The Facility also consists of a 60'x50' fenced compound at the base of the Tower with Verizon's radio equipment therein.

II. The Tower Share

AT&T proposes to install a total of twelve (12) panel antennas (4 per sector) and fifteen (15) remote radio head ("RRHs") on the tower (see attached plans). The antennas and RRHs will be mounted on the Tower at an antenna centerline of 90'. Further, AT&T proposes to install an 11'.5" x 16' equipment shelter and a generator at the base of the Tower within the existing fenced compound. The Tower will not be increased in height and the existing compound will not be expanded. Moreover, no upgrades to the access road or parking area will be necessary.

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p 508 954 7702 • adam.braillard@smartlinkllc.com
www.smartlinkllc.com

Please refer to Tab 3 (Engineering Drawings) of this application package for further specifications of AT&T's proposed installation.

III. Technical Feasibility

It is technically feasible for AT&T to install its equipment on the Tower. To determine the structural integrity of the Tower, AT&T has performed a structural analysis of the Tower with AT&T proposed modifications. The structural analysis, dated December 4, 2013 and attached herewith (see Tab 4) concludes that the "subject tower is adequate to support the proposed modified antenna configuration". Consequently, the shared use of the Tower is technically feasible.

IV. Legal Feasibility

Pursuant to the Statute, the Council has the authority to issue an order approving the shared use of the Facility. By issuing an order approving AT&T's use of the Facility, AT&T will be able to proceed with obtaining a building permit from the Town of Windsor for the proposed installation on the Facility. Therefore, the shared use of the Facility is legally feasible.

V. Economic Feasibility

AT&T is a federally licensed telecommunications company providing service in areas of Connecticut, including the Town of Southbury. AT&T is entering into an agreement with Verizon for the purpose of locating AT&T equipment at the Facility. Consequently, the shared use of the Facility is economically feasible.

VI. Environmental Feasibility

Pursuant to the Statute, AT&T's proposed sharing of the Facility will be environmentally feasible for the following reasons:

a. The proposal will neither increase the height of the Tower nor expand the existing fenced compound. Therefore, the proposed sharing of the Facility will have an insignificant incremental visual impact on the area surrounding the Tower and will no significant change or alter the physical or environmental characteristics of the Facility.

b. The addition of AT&T equipment will not increase the noise levels by six (6) decibels or more.

c. The addition of the AT&T antennas will not exceed the RF emissions standard adopted by the Federal Communications Commission ("FCC"). The cumulative "worst-case" RF emissions for the operation of the existing Verizon antennas and the proposed AT&T antennas will be 47.38% of the FCC standards (see attached Tab 6, Power Density Table).

d. The proposed installation will have no impact on the local wetlands or water resources.

e. After installation, AT&T equipment will be unmanned and will only require monthly visits by maintenance personnel who will inspect the Facility to ensure it remains in good working order.

f. AT&T's proposal will have no impact on water, sanitary or sewer systems or other municipal utilities. Additionally, the proposal complies with all applicable local, state and federal safety rules and regulations.

VII. Public Safety and Benefits

As referenced in Section III above, AT&T has performed a structural analysis of the Tower confirming that the Tower is structurally feasible to hold AT&T's additional equipment. Further, as referenced in Section VI.c above, AT&T has performed an analysis of the radio frequency emanating from its proposed antennas to ensure compliance with FCC standards. The analysis indicates that the maximum level of radio frequency energy emitting from the Facility after the installation of AT&T's antennas will be well below the FCC's exposure limits. Moreover, AT&T proposal is expected to enhance safety by improving wireless communications in the area of the Facility

VII. Conclusion

For the aforementioned reasons, AT&T's proposed shared use of the Facility meets all of the requirements set forth in the Statute, and the proposal advances the Council's goal of preventing the unnecessary proliferation of towers in Connecticut. Moreover, the proposal is technically, legally, economically and environmentally feasible and meets all public safety concerns. Consequently, AT&T respectfully requests that the Council issue an order approving the proposed sharing use of the Facility.

Sincerely,

Adam F. Braillard

TAB 2

CERTIFICATE OF SERVICE

This is to certify that on the 12rd day of December, 2013, the foregoing application by AT&T for an Order to Approve the Shared Use of an Existing Tower was sent, via UPS, to the following:

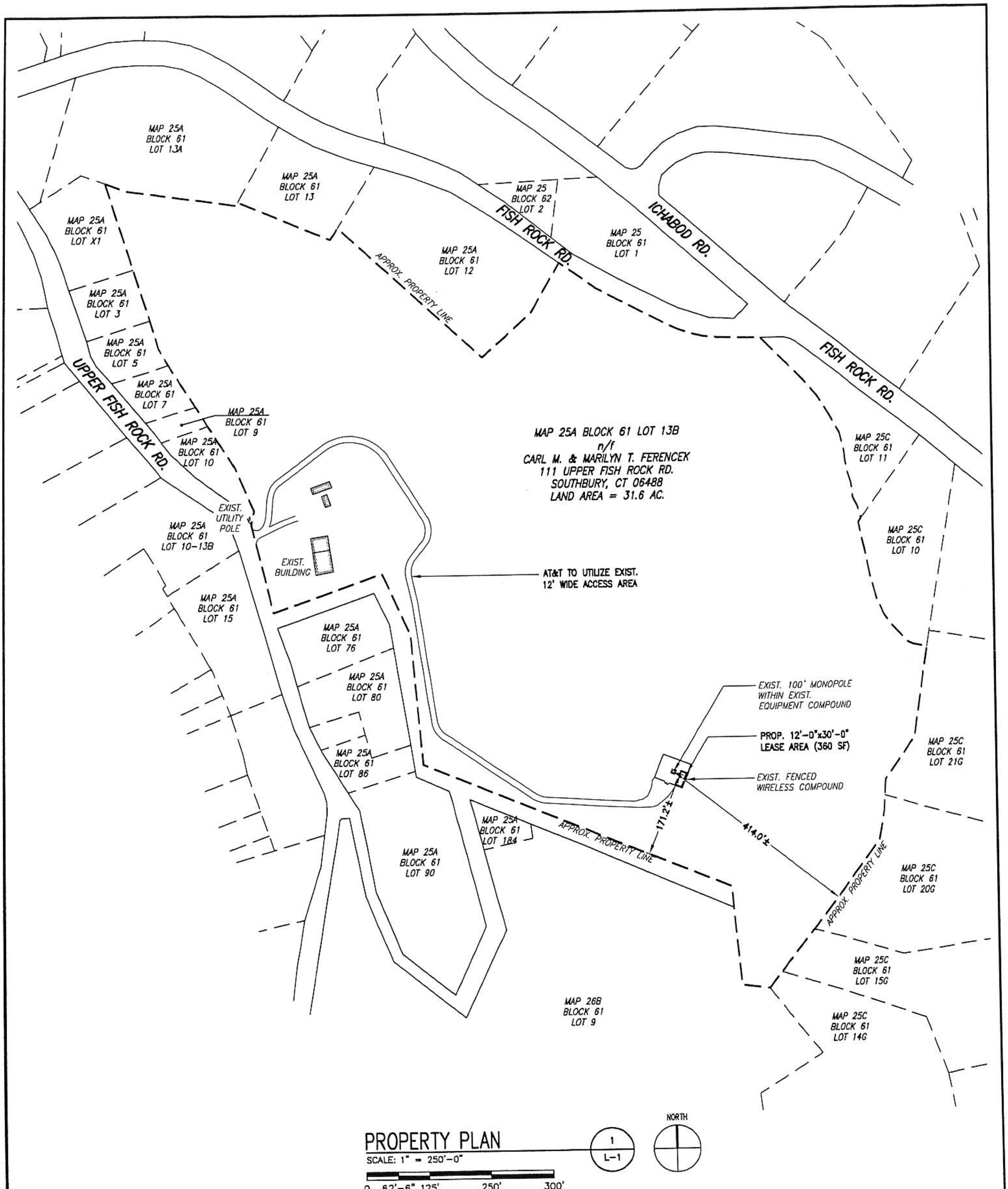
Carl M. Ferencek and Marilyn T. Ferencek
111 Upper Fish Rock Rd.
Southbury, CT 06488

and

First Selectman, Ed Edelson
501 Main Street
South Southbury, CT 06488
203-262-0647

By:__________________________
Adam F. Braillard

TAB 3



CHAPPELL ENGINEERING ASSOCIATES, LLC

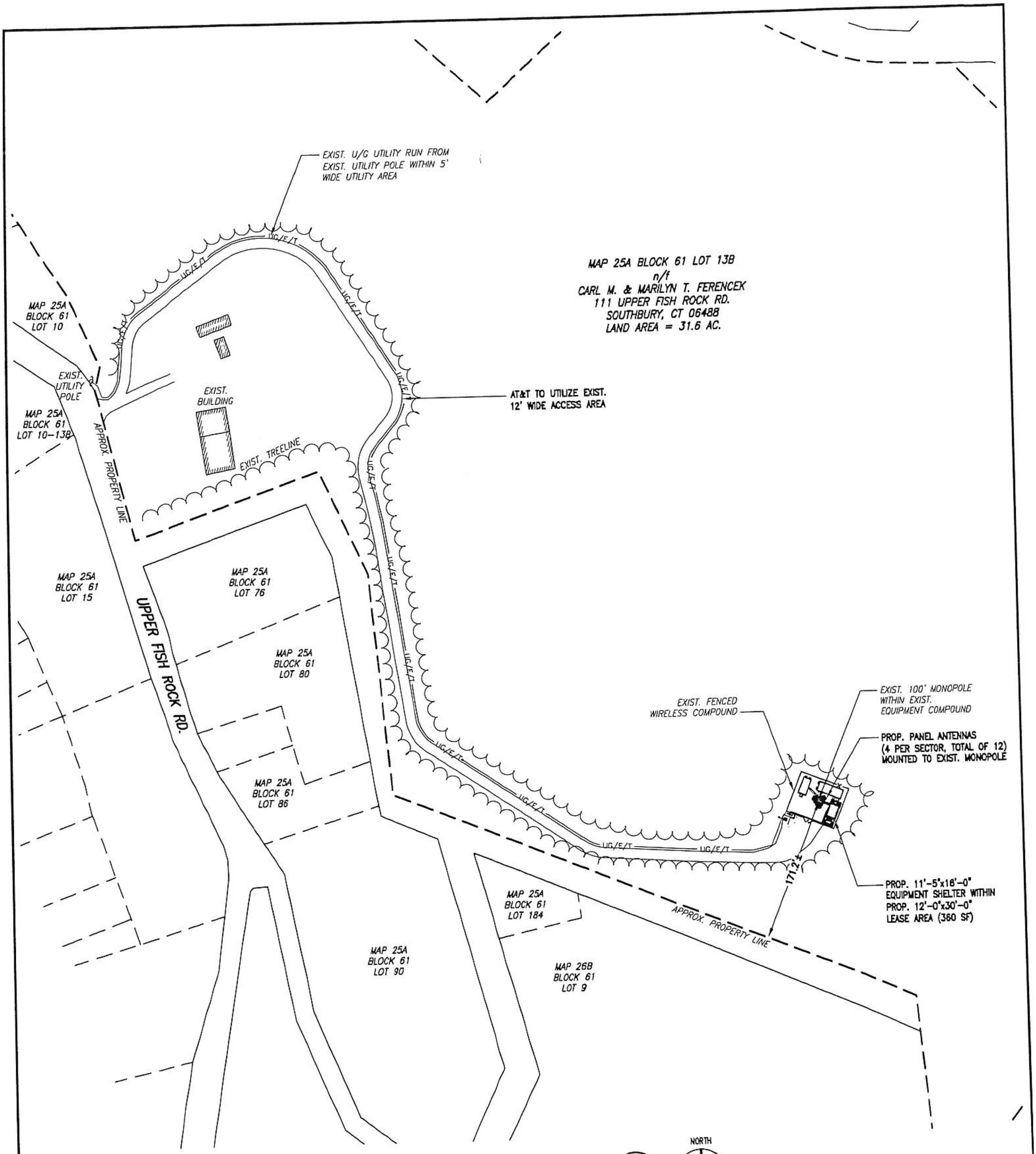
R.K. EXECUTIVE CENTRE
201 BOSTON POST ROAD WEST
SUITE 101
MARLBOROUGH, MA 01752
TEL: 508.481.7400
FAX: 508.481.7406

at&t
500 COCHITUATE ROAD, SUITE 13
FRAMINGHAM, MA 01701-4681

smartlink
1997 ANNAPOLIS EXCHANGE PKWY, SUITE 200
ANNAPOLIS, MD 21401

TITLE:	LEASE EXHIBIT
SITE NO:	CT2426S-A
SITE NAME:	SOUTHBURY COOPER HILL ROAD
ADDRESS:	111 UPPER FISH ROCK ROAD SOUTHBURY, CT 06488

DATE: 10/25/2013
DRAWN BY: NWC
REVISION: 1
CEA #: 1325.007
SHEET: 1 OF 4



SITE PLAN

SCALE: 1" = 150'-0"

0 37'-6" 75' 150' 300'

1 / L-2

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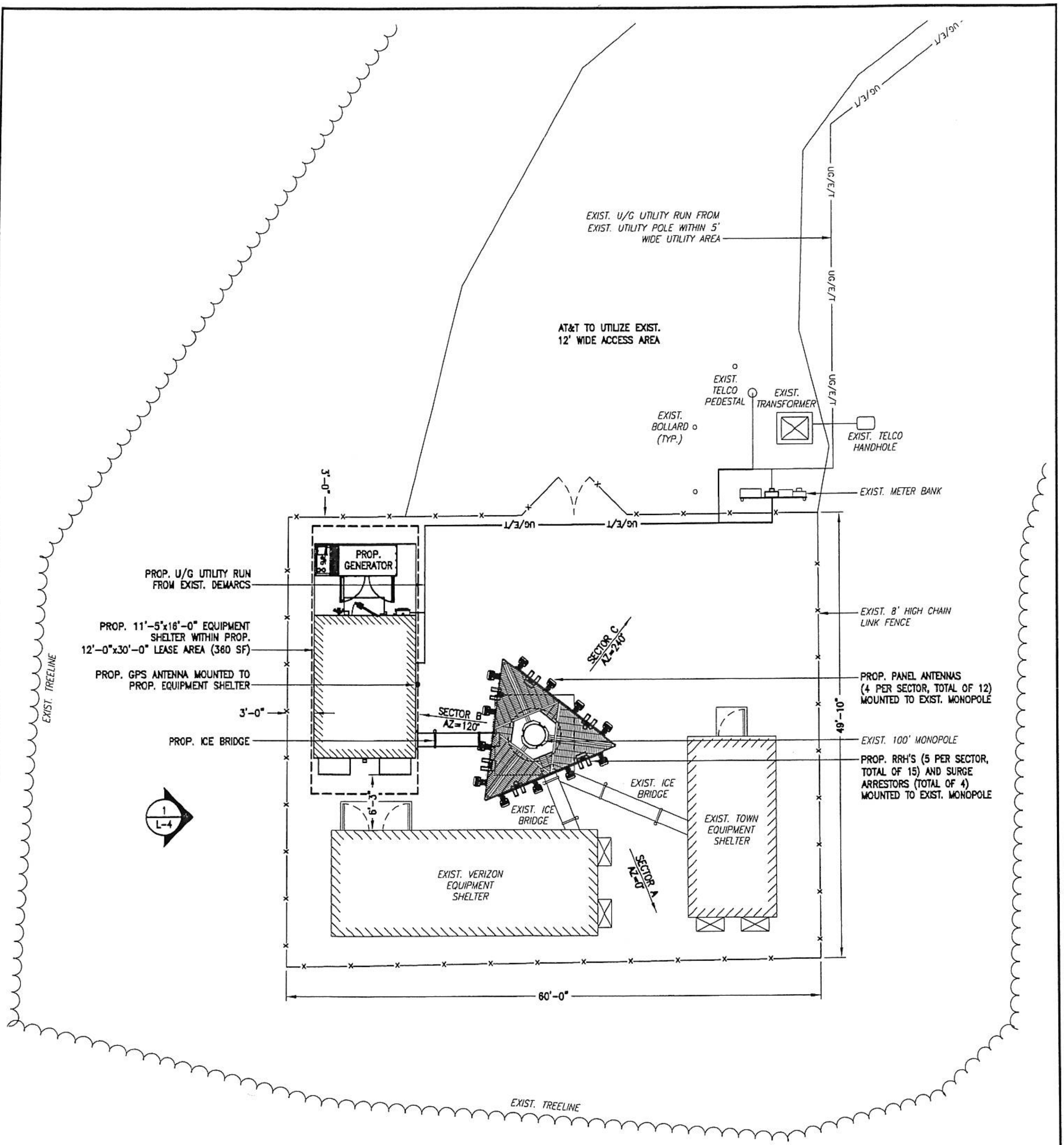
TITLE:	LEASE EXHIBIT
SITE NO:	CT2426S-A
SITE NAME:	SOUTHBURY COOPER HILL ROAD
ADDRESS:	111 UPPER FISH ROCK ROAD SOUTHBURY, CT 06488

DATE: 10/25/2013
DRAWN BY: NWC
REVISION: 1
CEA #: 1325.007
SHEET: 2 OF 4



COMPOUND PLAN

SCALE: 1" = 15'-0"

0 7.5' 15' 30' 45'

1 / L-3

NORTH

CHAPPELL ENGINEERING ASSOCIATES, LLC

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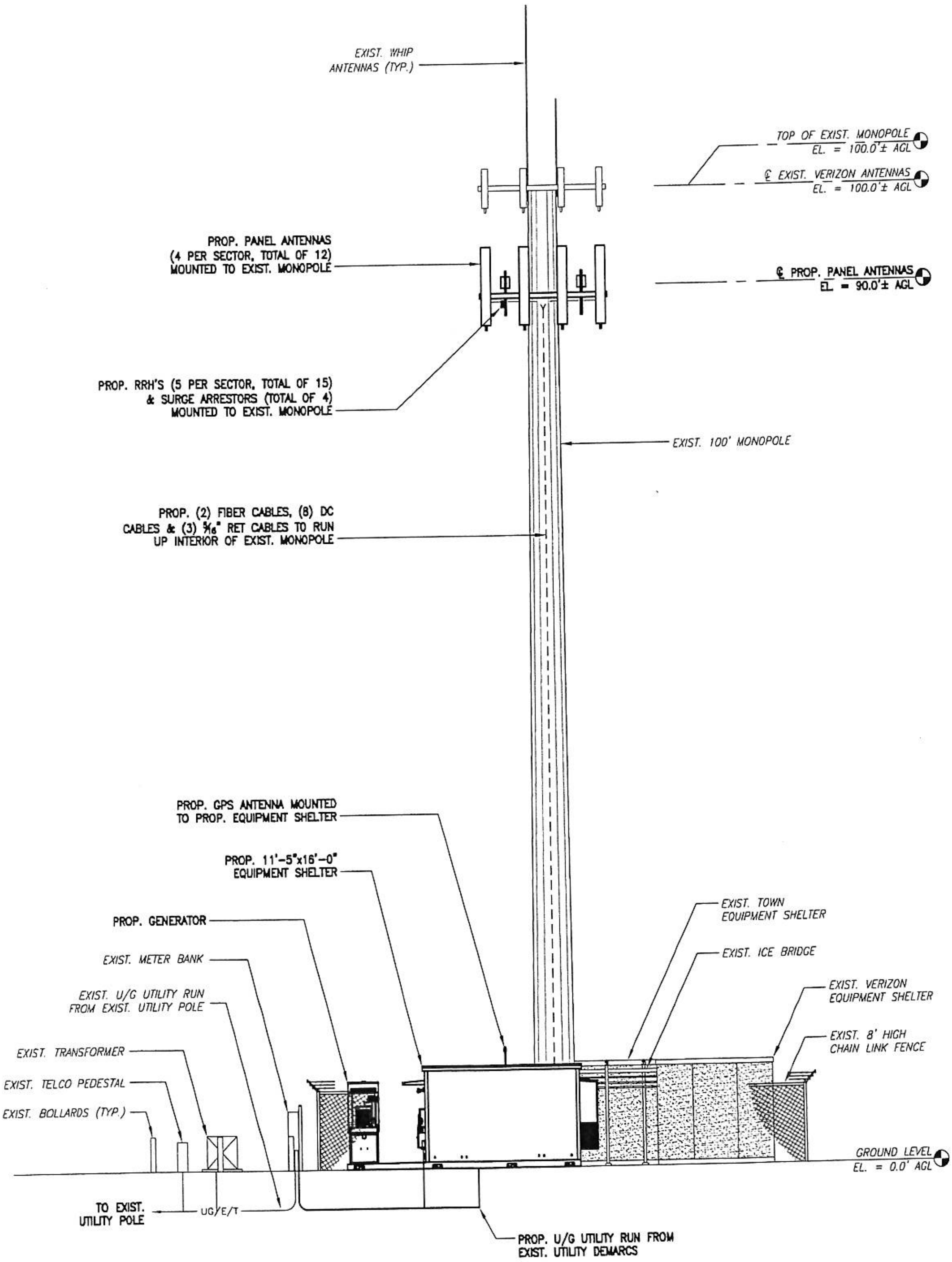
ANNAPOLIS, MD 21401

TITLE:	LEASE EXHIBIT
SITE NO:	CT2426S-A
SITE NAME:	SOUTHBURY COOPER HILL ROAD
ADDRESS:	111 UPPER FISH ROCK ROAD SOUTHBURY, CT 06488

DATE: 10/25/2013
DRAWN BY: NWC
REVISION: 1
CEA #: 1325.007
SHEET: 3 OF 4



ELEVATION
SCALE: 1" = 16'-0"
1 / L-4
0 4' 8' 16' 32'

CHAPPELL ENGINEERING ASSOCIATES, LLC	R.K. EXECUTIVE CENTRE 201 BOSTON POST ROAD WEST SUITE 101 MARLBOROUGH, MA 01752 TEL: 508.481.7400 FAX: 508.481.7406	at&t 500 COCHITUATE ROAD, SUITE 13 FRAMINGHAM, MA 01701-4681 smartlink 1997 ANNAPOLIS EXCHANGE PKWY, SUITE 200 ANNAPOLIS, MD 21401	TITLE: LEASE EXHIBIT SITE NO: CT2426S-A SITE NAME: SOUTHBURY COOPER HILL ROAD ADDRESS: 111 UPPER FISH ROCK ROAD SOUTHBURY, CT 06488	DATE: 10/25/2013 DRAWN BY: NWC REVISION: 1 CEA #: 1325.007 SHEET: 4 OF 4

TAB 4

CENTEK engineering

Centered on Solutions

Structural Analysis Report

100-ft Existing EEI Monopole

Proposed AT&T Mobility
Antenna Upgrade

AT&T Site Ref: CT2426s

Verizon Site Ref: Newtown NE

111 Upper Fish Rock Road
Southbury, CT

CENTEK Project No. 13338.000

Date: December 4, 2013

Prepared for:

AT&T Mobility
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by AT&T Mobility on the existing monopole (tower) owned and operated by Verizon Wireless located in Southbury, Connecticut.

The host tower is a 100-ft tall, three-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 14859-E01 dated April 20, 2007. The tower geometry, structure member sizes and foundation system information were obtained from the original manufacturers design documents.

Antenna and appurtenance information were obtained from a visual verification conducted from grade by Centek personnel on November 11, 2013 and a AT&T RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected The diameter of the pole (flat-flat) is 41.34-in at the top and 70.00-in at the base.

AT&T proposes the installation of twelve (12) panel antennas, fifteen (15) RRU's and four (4) surge arrestors mounted on a low profile mount. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- TOWN (EXISTING):
  Antennas: One (1) 20-ft Omni-directional whip antenna mounted on the existing Verizon Wireless low profile platform with an elevation of 97-ft above grade level.
  Coax Cables: One (1) 1-1/4" ∅ coax cable running on the inside of the existing tower.

- VERIZON WIRELESS (RESERVED):
  Antennas: Six (6) Antel LPA-80063-6CF panel antennas, six (6) Antel BXA-70063-6CF panel antennas, six (6) LPA-171063-12CF panel antennas, six (6) RFS FD9R6004/2C-3L diplexers, six (6) RRH's and one (1) main distribution box mounted on a low profile platform with a RAD center elevation of 100-ft above grade level.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables and two (2) 1-5/8" ∅ fiber cables running on the inside of the existing tower.

- **AT&T (PROPOSED):**
  Antennas: **Three (3) Andrew SBNH-1D6565C panel antennas, nine (9) Ericsson KRY 118 054/1 panel antennas, fifteen (15) Ericsson RRUS-11 and four (4) Raycap DC6-48-60-18-8F surge arrestors mounted on a Site Pro Ultra-Low Profile Monopole Mount p/n UPL12-496 with a RAD center elevation of 90-ft above existing grade.**
  Coax Cables: **Two (2) fiber cable, eight (8) dc control cables and three (3) RET cables running on the inside of the existing tower.**

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	New Haven; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Southbury; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **24.4%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L3)	1.00'-46.16'	24.4%	**PASS**

Foundation and Anchors

The existing foundation consists of a 9-ft square x 3.0-ft long reinforced concrete pier on a 32.0-ft square x 3.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned original design documents prepared by EEI job no. 14859-E01 dated April 20, 2007. The base of the tower is connected to the foundation by means of (36) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 5-ft into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	25 kips
	Compression	39 kips
	Moment	1928 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)(1)	Proposed Loading (FS)(1)	Result
Reinforced Concrete Pad and Pier	OTM(2)	2.0	6.46	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Bending	17.5%	PASS
Base Plate	Bending	10.4%	PASS

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

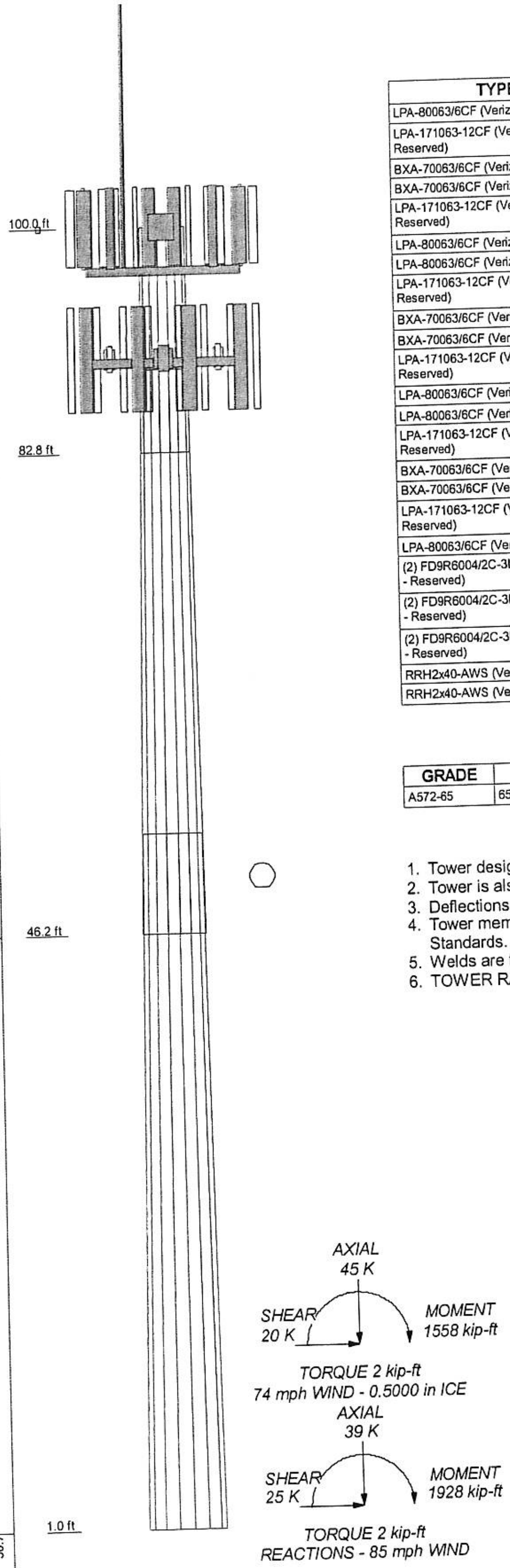
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

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

Section	1	2	3
Length (ft)	17.17	43.00	52.83
Number of Sides	18	18	18
Thickness (in)	0.3750	0.4375	0.5000
Socket Length (ft)	6.33	7.67	
Top Dia (in)	41.3400	43.9288	53.8519
Bot Dia (in)	46.6300	57.0700	70.0000
Grade	A572-65	A572-65	A572-65
Weight (K) 30.7	3.0	10.2	17.5



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80063/6CF (Verizon - Reserved)	100	RRH2x40-AWS (Verizon - Reserved)	100
LPA-171063-12CF (Verizon - Reserved)	100	RRH2x40-07-U (Verizon - Reserved)	100
		RRH2x40-07-U (Verizon - Reserved)	100
BXA-70063/6CF (Verizon - Reserved)	100	RRH2x40-07-U (Verizon - Reserved)	100
BXA-70063/6CF (Verizon - Reserved)	100	DB-T1-6Z-8AB-0Z (Verizon - Reserved)	100
LPA-171063-12CF (Verizon - Reserved)	100	20' x 3" Dia Omni (Town - Existing)	97
		EEI 12-ft Low Profile Platform (Verizon - Existing)	97
LPA-80063/6CF (Verizon - Reserved)	100	SBNH-1D6565C (ATI - Proposed)	90
LPA-80063/6CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
LPA-171063-12CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
		KRC 118 054/1 (ATI - Proposed)	90
BXA-70063/6CF (Verizon - Reserved)	100	SBNH-1D6565C (ATI - Proposed)	90
BXA-70063/6CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
LPA-171063-12CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
		KRC 118 054/1 (ATI - Proposed)	90
LPA-80063/6CF (Verizon - Reserved)	100	SBNH-1D6565C (ATI - Proposed)	90
LPA-80063/6CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
LPA-171063-12CF (Verizon - Reserved)	100	KRC 118 054/1 (ATI - Proposed)	90
		KRC 118 054/1 (ATI - Proposed)	90
BXA-70063/6CF (Verizon - Reserved)	100	(5) RRUS-11 (ATI - Proposed)	90
BXA-70063/6CF (Verizon - Reserved)	100	(5) RRUS-11 (ATI - Proposed)	90
LPA-171063-12CF (Verizon - Reserved)	100	(5) RRUS-11 (ATI - Proposed)	90
LPA-80063/6CF (Verizon - Reserved)	100	DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	90
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	100	DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	90
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	100	DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	90
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	100	DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	90
RRH2x40-AWS (Verizon - Reserved)	100	Site Pro ULP12-496 (ATI - Proposed)	90
RRH2x40-AWS (Verizon - Reserved)	100		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 24.4%

Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **13338.000 - CT2426s**		
	Project: **100' EEI Monopole - 111 Upper Fish Rock Rd., Southb**		
	Client: AT&T Mobility	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 12/03/13	Scale: NT
	Path: J:\Jobs\1333800 .WI\Backup Documentation\Calcs\ERI Files\100' EEI Monopole Southbury CT.eri		Dwg No. E

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- 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.
- Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
- Welds are fabricated with ER-70S-6 electrodes..
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.333.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

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	100.00-82.83	17.17	6.33	18	41.3400	46.6300	0.3750	1.5000	A572-65 (65 ksi)
L2	82.83-46.16	43.00	7.67	18	43.9288	57.0700	0.4375	1.7500	A572-65 (65 ksi)
L3	46.16-1.00	52.83		18	53.8519	70.0000	0.5000	2.0000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	41.9777	48.7586	10337.4761	14.5426	21.0007	492.2439	20688.5545	24.3839	6.6158	17.642
	47.3493	55.0550	14881.6709	16.4205	23.6880	628.2356	29782.9235	27.5327	7.5469	20.125
L2	46.5718	60.3931	14432.1331	15.4394	22.3158	646.7213	28883.2565	30.2023	6.9615	15.912
	57.9504	78.6413	31865.4188	20.1045	28.9916	1099.1274	63772.7670	39.3281	9.2743	21.198
L3	57.0623	84.6695	30448.3683	18.9399	27.3568	1113.0106	60936.8013	42.3428	8.5979	17.196
	71.0799	110.2965	67308.3262	24.6725	35.5600	1892.8101	134705.218 4	55.1587	11.4400	22.88

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
L1 100.00-82.83				1	1	1		
L2 82.83-46.16				1	1	1		
L3 46.16-1.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (Verizon - Reserved)	C	No	Inside Pole	100.00 - 1.00	18	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (Verizon - Reserved)	C	No	Inside Pole	100.00 - 1.00	2	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
1 1/4 (Town - Existing)	C	No	Inside Pole	100.00 - 1.00	1	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
Fiber Trunk (AT&T - Proposed)	C	No	Inside Pole	90.00 - 1.00	2	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
DC Trunk (AT&T - Proposed)	C	No	Inside Pole	90.00 - 1.00	8	No Ice	0.00	0.11
						1/2" Ice	0.00	0.11
0.3" dia RET (AT&T - Proposed)	C	No	Inside Pole	90.00 - 1.00	3	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00

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 K
L1	100.00-82.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.42
L2	82.83-46.16	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.96
L3	46.16-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.18

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	100.00-82.83	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.42
L2	82.83-46.16	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.96
L3	46.16-1.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.18

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	100.00-82.83	0.0000	0.0000	0.0000	0.0000
L2	82.83-46.16	0.0000	0.0000	0.0000	0.0000
L3	46.16-1.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
20' x 3" Dia Omni (Town - Existing)	C	From Face	2.50 3.00 10.00	0.0000	97.00	No Ice 1/2" Ice	6.00 8.03	6.00 8.03	0.05 0.09
LPA-80063/6CF (Verizon - Reserved)	A	From Face	3.00 6.00 0.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10
LPA-171063-12CF (Verizon - Reserved)	A	From Face	3.00 4.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
BXA-70063/6CF (Verizon - Reserved)	A	From Face	3.00 1.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (Verizon - Reserved)	A	From Face	3.00 -1.00 0.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-171063-12CF (Verizon - Reserved)	A	From Face	3.00 -4.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
LPA-80063/6CF (Verizon - Reserved)	A	From Face	3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
LPA-80063/6CF (Verizon - Reserved)	B	From Face	0.00 3.00 6.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10
LPA-171063-12CF (Verizon - Reserved)	B	From Face	0.00 3.00 4.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
BXA-70063/6CF (Verizon - Reserved)	B	From Face	0.00 3.00 1.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (Verizon - Reserved)	B	From Face	0.00 3.00 -1.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-171063-12CF (Verizon - Reserved)	B	From Face	0.00 3.00 -4.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
LPA-80063/6CF (Verizon - Reserved)	B	From Face	0.00 3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10
LPA-80063/6CF (Verizon - Reserved)	C	From Face	0.00 3.00 6.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10
LPA-171063-12CF (Verizon - Reserved)	C	From Face	0.00 3.00 4.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
BXA-70063/6CF (Verizon - Reserved)	C	From Face	0.00 3.00 1.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (Verizon - Reserved)	C	From Face	0.00 3.00 -1.00	0.0000	100.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
LPA-171063-12CF (Verizon - Reserved)	C	From Face	0.00 3.00 -4.00	0.0000	100.00	No Ice 1/2" Ice	5.99 6.46	6.05 6.52	0.01 0.06
LPA-80063/6CF (Verizon - Reserved)	C	From Face	0.00 3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	0.03 0.10
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	A	From Face	0.00 3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	0.37 0.45	0.08 0.14	0.00 0.01
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	A	From Face	0.00 3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	0.37 0.45	0.08 0.14	0.00 0.01
(2) FD9R6004/2C-3L Diplexer (Verizon - Reserved)	A	From Face	0.00 3.00 -6.00	0.0000	100.00	No Ice 1/2" Ice	0.37 0.45	0.08 0.14	0.00 0.01
RRH2x40-AWS (Verizon - Reserved)	A	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RRH2x40-AWS (Verizon - Reserved)	B	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RRH2x40-AWS (Verizon - Reserved)	C	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.52 2.75	1.59 1.80	0.04 0.06
RRH2x40-07-U (Verizon - Reserved)	A	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.25 2.45	1.23 1.39	0.05 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert (ft ft ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft^2)	C_AA_A Side (ft^2)	Weight (K)
RRH2x40-07-U (Verizon - Reserved)	B	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.25 2.45	1.23 1.39	0.05 0.07
RRH2x40-07-U (Verizon - Reserved)	C	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.25 2.45	1.23 1.39	0.05 0.07
DB-T1-6Z-8AB-0Z (Verizon - Reserved)	C	From Face	0.00 3.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.60 5.92	2.33 2.56	0.04 0.08
EEI 12-ft Low Profile Platform (Verizon - Existing)	C	None	0.00	0.0000	97.00	No Ice 1/2" Ice	15.00 18.40	15.00 18.40	1.50 1.75
SBNH-1D6565C (AT&T - Proposed)	A	From Face	3.00 -6.00	0.0000	90.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
KRC 118 054/1 (AT&T - Proposed)	A	From Face	0.00 3.00 -2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	A	From Face	0.00 3.00 2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	A	From Face	0.00 3.00 6.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
SBNH-1D6565C (AT&T - Proposed)	B	From Face	0.00 3.00 -6.00	0.0000	90.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
KRC 118 054/1 (AT&T - Proposed)	B	From Face	0.00 3.00 -2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	B	From Face	0.00 3.00 2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	B	From Face	0.00 3.00 6.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
SBNH-1D6565C (AT&T - Proposed)	C	From Face	0.00 3.00 -6.00	0.0000	90.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
KRC 118 054/1 (AT&T - Proposed)	C	From Face	0.00 3.00 -2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	C	From Face	0.00 3.00 2.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
KRC 118 054/1 (AT&T - Proposed)	C	From Face	0.00 3.00 6.00	0.0000	90.00	No Ice 1/2" Ice	11.54 12.16	8.90 9.50	0.12 0.19
(5) RRUS-11 (AT&T - Proposed)	A	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
(5) RRUS-11 (AT&T - Proposed)	B	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
(5) RRUS-11 (AT&T - Proposed)	C	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert (ft ft ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft^2)	C_AA_A Side (ft^2)	Weight (K)
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	A	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	A	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	B	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	C	From Face	0.00 3.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
Site Pro ULP12-496 (AT&T - Proposed)	C	None		0.0000	90.00	No Ice 1/2" Ice	27.00 33.80	27.00 33.80	1.41 1.76

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation (ft)	z (ft)	K_Z	q_z (psf)	A_G (ft^2)	Face	A_F (ft^2)	A_R (ft^2)	A_{leg} (ft^2)	Leg %	C_AA_A In Face (ft^2)	C_AA_A Out Face (ft^2)
L1 100.00-82.83	91.24	1.337	25	62.935	A	0.000	62.935	62.935	100.00	0.000	0.000
					B	0.000	62.935		100.00	0.000	0.000
					C	0.000	62.935		100.00	0.000	0.000
L2 82.83-46.16	64.21	1.209	22	157.262	A	0.000	157.262	157.262	100.00	0.000	0.000
					B	0.000	157.262		100.00	0.000	0.000
					C	0.000	157.262		100.00	0.000	0.000
L3 46.16-1.00	22.84	1	19	237.473	A	0.000	237.473	237.473	100.00	0.000	0.000
					B	0.000	237.473		100.00	0.000	0.000
					C	0.000	237.473		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation (ft)	z (ft)	K_Z	q_z (psf)	t_Z (in)	A_G (ft^2)	Face	A_F (ft^2)	A_R (ft^2)	A_{leg} (ft^2)	Leg %	C_AA_A In Face (ft^2)	C_AA_A Out Face (ft^2)
L1 100.00-82.83	91.24	1.337	19	0.5000	64.366	A	0.000	64.366	64.366	100.00	0.000	0.000
						B	0.000	64.366		100.00	0.000	0.000
						C	0.000	64.366		100.00	0.000	0.000
L2 82.83-46.16	64.21	1.209	17	0.5000	160.318	A	0.000	160.318	160.318	100.00	0.000	0.000
						B	0.000	160.318		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
						C	0.000	160.318		100.00	0.000	0.000
L3 46.16-1.00	22.84	1	14	0.5000	241.237	A	0.000	241.237	241.237	100.00	0.000	0.000
						B	0.000	241.237		100.00	0.000	0.000
						C	0.000	241.237		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 100.00-82.83	91.24	1.337	9	62.935	A	0.000	62.935	62.935	100.00	0.000	0.000
					B	0.000	62.935		100.00	0.000	0.000
					C	0.000	62.935		100.00	0.000	0.000
L2 82.83-46.16	64.21	1.209	8	157.262	A	0.000	157.262	157.262	100.00	0.000	0.000
					B	0.000	157.262		100.00	0.000	0.000
					C	0.000	157.262		100.00	0.000	0.000
L3 46.16-1.00	22.84	1	6	237.473	A	0.000	237.473	237.473	100.00	0.000	0.000
					B	0.000	237.473		100.00	0.000	0.000
					C	0.000	237.473		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.03	A	1	0.65	1	1	1	62.935	1.71	99.59	C
			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	3.85	105.00	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	4.86	107.54	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	503.71 kip-ft	10.42		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.42	3.03	A	1	0.65	1	1	1	62.935	1.71	99.59	C

Section Elevation *ft*	*Add Weight* *K*	*Self Weight* *K*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *K*	*w* *plf*	*Ctrl. Face*
100.00-82.83			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	3.85	105.00	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	4.86	107.54	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	503.71 kip-ft	10.42		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation *ft*	*Add Weight* *K*	*Self Weight* *K*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *K*	*w* *plf*	*Ctrl. Face*
L1 100.00-82.83	0.42	3.03	A	1	0.65	1	1	1	62.935	1.71	99.59	C
			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	3.85	105.00	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	4.86	107.54	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	503.71 kip-ft	10.42		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation *ft*	*Add Weight* *K*	*Self Weight* *K*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *K*	*w* *plf*	*Ctrl. Face*
L1 100.00-82.83	0.42	3.50	A	1	0.65	1	1	1	64.366	1.31	76.39	C
			B	1	0.65	1	1	1	64.366			
			C	1	0.65	1	1	1	64.366			
L2 82.83-46.16	0.96	11.35	A	1	0.65	1	1	1	160.318	2.94	80.28	C
			B	1	0.65	1	1	1	160.318			
			C	1	0.65	1	1	1	160.318			
L3 46.16-1.00	1.18	19.30	A	1	0.65	1	1	1	241.237	3.70	81.94	C
			B	1	0.65	1	1	1	241.237			
			C	1	0.65	1	1	1	241.237			
Sum Weight:	2.55	34.15						OTM	385.22 kip-ft	7.96		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.50	A	1	0.65	1	1	1	64.366	1.31	76.39	C
			B	1	0.65	1	1	1	64.366			
			C	1	0.65	1	1	1	64.366			
L2 82.83-46.16	0.96	11.35	A	1	0.65	1	1	1	160.318	2.94	80.28	C
			B	1	0.65	1	1	1	160.318			
			C	1	0.65	1	1	1	160.318			
L3 46.16-1.00	1.18	19.30	A	1	0.65	1	1	1	241.237	3.70	81.94	C
			B	1	0.65	1	1	1	241.237			
			C	1	0.65	1	1	1	241.237			
Sum Weight:	2.55	34.15						OTM	385.22 kip-ft	7.96		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.50	A	1	0.65	1	1	1	64.366	1.31	76.39	C
			B	1	0.65	1	1	1	64.366			
			C	1	0.65	1	1	1	64.366			
L2 82.83-46.16	0.96	11.35	A	1	0.65	1	1	1	160.318	2.94	80.28	C
			B	1	0.65	1	1	1	160.318			
			C	1	0.65	1	1	1	160.318			
L3 46.16-1.00	1.18	19.30	A	1	0.65	1	1	1	241.237	3.70	81.94	C
			B	1	0.65	1	1	1	241.237			
			C	1	0.65	1	1	1	241.237			
Sum Weight:	2.55	34.15						OTM	385.22 kip-ft	7.96		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.03	A	1	0.65	1	1	1	62.935	0.59	34.46	C
			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	1.33	36.33	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	1.68	37.21	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	174.29 kip-ft	3.60		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.03	A	1	0.65	1	1	1	62.935	0.59	34.46	C
			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	1.33	36.33	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	1.68	37.21	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	174.29 kip-ft	3.60		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 100.00-82.83	0.42	3.03	A	1	0.65	1	1	1	62.935	0.59	34.46	C
			B	1	0.65	1	1	1	62.935			
			C	1	0.65	1	1	1	62.935			
L2 82.83-46.16	0.96	10.17	A	1	0.65	1	1	1	157.262	1.33	36.33	C
			B	1	0.65	1	1	1	157.262			
			C	1	0.65	1	1	1	157.262			
L3 46.16-1.00	1.18	17.52	A	1	0.65	1	1	1	237.473	1.68	37.21	C
			B	1	0.65	1	1	1	237.473			
			C	1	0.65	1	1	1	237.473			
Sum Weight:	2.55	30.73						OTM	174.29 kip-ft	3.60		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	30.73					
Bracing Weight	0.00					
Total Member Self-Weight	30.73			0.40	0.36	
Total Weight	39.01			0.40	0.36	
Wind 0 deg - No Ice		-0.03	-25.50	-1917.61	3.47	-1.55
Wind 30 deg - No Ice		12.67	-22.06	-1659.09	-950.81	-0.44
Wind 60 deg - No Ice		21.97	-12.72	-955.91	-1650.23	0.79
Wind 90 deg - No Ice		25.39	0.03	3.52	-1907.37	1.81
Wind 120 deg - No Ice		22.01	12.78	962.11	-1653.34	2.34
Wind 150 deg - No Ice		12.72	22.10	1663.01	-956.20	2.24
Wind 180 deg - No Ice		0.03	25.50	1918.42	-2.75	1.55
Wind 210 deg - No Ice		-12.67	22.06	1659.90	951.53	0.44

Load Case	*Vertical Forces* *K*	*Sum of Forces X* *K*	*Sum of Forces Z* *K*	*Sum of Overturning Moments, M_x* *kip-ft*	*Sum of Overturning Moments, M_z* *kip-ft*	*Sum of Torques* *kip-ft*
Wind 240 deg - No Ice		-21.97	12.72	956.72	1650.95	-0.79
Wind 270 deg - No Ice		-25.39	-0.03	-2.71	1908.10	-1.81
Wind 300 deg - No Ice		-22.01	-12.78	-961.30	1654.06	-2.34
Wind 330 deg - No Ice		-12.72	-22.10	-1662.20	956.92	-2.24
Member Ice	3.42					
Total Weight Ice	45.41			0.77	0.67	
Wind 0 deg - Ice		-0.03	-20.35	-1547.38	3.27	-1.48
Wind 30 deg - Ice		10.11	-17.61	-1338.67	-767.31	-0.42
Wind 60 deg - Ice		17.55	-10.15	-771.05	-1332.11	0.75
Wind 90 deg - Ice		20.27	0.03	3.37	-1539.79	1.72
Wind 120 deg - Ice		17.57	10.20	777.10	-1334.71	2.23
Wind 150 deg - Ice		10.16	17.64	1342.81	-771.81	2.14
Wind 180 deg - Ice		0.03	20.35	1548.92	-1.93	1.48
Wind 210 deg - Ice		-10.11	17.61	1340.21	768.65	0.42
Wind 240 deg - Ice		-17.55	10.15	772.59	1333.45	-0.75
Wind 270 deg - Ice		-20.27	-0.03	-1.83	1541.13	-1.72
Wind 300 deg - Ice		-17.57	-10.20	-775.56	1336.05	-2.23
Wind 330 deg - Ice		-10.16	-17.64	-1341.27	773.15	-2.14
Total Weight	39.01			0.40	0.36	
Wind 0 deg - Service		-0.01	-8.82	-663.27	1.44	-0.54
Wind 30 deg - Service		4.38	-7.63	-573.82	-328.76	-0.15
Wind 60 deg - Service		7.60	-4.40	-330.50	-570.78	0.27
Wind 90 deg - Service		8.79	0.01	1.48	-659.75	0.62
Wind 120 deg - Service		7.61	4.42	333.17	-571.85	0.81
Wind 150 deg - Service		4.40	7.65	575.70	-330.63	0.78
Wind 180 deg - Service		0.01	8.82	664.08	-0.72	0.54
Wind 210 deg - Service		-4.38	7.63	574.62	329.49	0.15
Wind 240 deg - Service		-7.60	4.40	331.31	571.50	-0.27
Wind 270 deg - Service		-8.79	-0.01	-0.67	660.48	-0.62
Wind 300 deg - Service		-7.61	-4.42	-332.36	572.58	-0.81
Wind 330 deg - Service		-4.40	-7.65	-574.89	331.35	-0.78

Load Combinations

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

Comb. No.	*Description*
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Force K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
L1	100 - 82.83	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-11.14	0.67	-0.77
			Max. Mx	11	-4.87	92.49	0.07
			Max. My	8	-4.86	-0.09	-93.36
			Max. Vy	11	-16.11	90.11	-0.05
			Max. Vx	8	16.21	0.01	-91.28
			Max. Torque	6			-2.34
L2	82.83 - 46.163	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.46	0.67	-0.77
			Max. Mx	11	-17.97	724.61	1.06
			Max. My	8	-17.97	-1.10	-729.48
			Max. Vy	11	-19.82	724.61	1.06
			Max. Vx	8	19.93	-1.10	-729.48
			Max. Torque	6			-2.34
L3	46.163 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.41	0.67	-0.77
			Max. Mx	11	-39.01	1917.27	2.72
			Max. My	8	-39.01	-2.76	-1927.65
			Max. Vy	11	-25.40	1917.27	2.72
			Max. Vx	8	25.50	-2.76	-1927.65
			Max. Torque	6			-2.34

Maximum Reactions

Location	*Condition*	*Gov. Load Comb.*	*Vertical K*	*Horizontal, X K*	*Horizontal, Z K*
Pole	Max. Vert	21	45.41	-0.03	-20.35
	Max. H_x	11	39.01	25.39	0.03
	Max. H_z	2	39.01	0.03	25.50
	Max. M_x	2	1926.83	0.03	25.50

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. M_z	5	1916.54	-25.39	-0.03
	Max. Torsion	12	2.34	22.01	12.78
	Min. Vert	33	39.01	-0.01	-8.82
	Min. H_x	5	39.01	-25.39	-0.03
	Min. H_z	8	39.01	-0.03	-25.50
	Min. M_x	8	-1927.65	-0.03	-25.50
	Min. M_z	11	-1917.27	25.39	0.03
	Min. Torsion	6	-2.34	-22.01	-12.78

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	39.01	0.00	0.00	0.40	0.36	0.00
Dead+Wind 0 deg - No Ice	39.01	-0.03	-25.50	-1926.83	3.49	-1.55
Dead+Wind 30 deg - No Ice	39.01	12.67	-22.06	-1667.07	-955.38	-0.44
Dead+Wind 60 deg - No Ice	39.01	21.97	-12.72	-960.50	-1658.16	0.79
Dead+Wind 90 deg - No Ice	39.01	25.39	0.03	3.54	-1916.54	1.81
Dead+Wind 120 deg - No Ice	39.01	22.01	12.78	966.74	-1661.29	2.34
Dead+Wind 150 deg - No Ice	39.01	12.72	22.10	1671.01	-960.80	2.25
Dead+Wind 180 deg - No Ice	39.01	0.03	25.50	1927.65	-2.76	1.55
Dead+Wind 210 deg - No Ice	39.01	-12.67	22.06	1667.88	956.11	0.44
Dead+Wind 240 deg - No Ice	39.01	-21.97	12.72	961.32	1658.89	-0.79
Dead+Wind 270 deg - No Ice	39.01	-25.39	-0.03	-2.72	1917.27	-1.81
Dead+Wind 300 deg - No Ice	39.01	-22.01	-12.78	-965.92	1662.01	-2.34
Dead+Wind 330 deg - No Ice	39.01	-12.72	-22.10	-1670.20	961.52	-2.25
Dead+Ice+Temp	45.41	0.00	0.00	0.77	0.67	0.00
Dead+Wind 0 deg+Ice+Temp	45.41	-0.03	-20.35	-1556.71	3.30	-1.48
Dead+Wind 30 deg+Ice+Temp	45.41	10.11	-17.61	-1346.74	-771.93	-0.42
Dead+Wind 60 deg+Ice+Temp	45.41	17.55	-10.15	-775.70	-1340.14	0.75
Dead+Wind 90 deg+Ice+Temp	45.41	20.27	0.03	3.40	-1549.07	1.72
Dead+Wind 120 deg+Ice+Temp	45.41	17.57	10.20	781.79	-1342.75	2.23
Dead+Wind 150 deg+Ice+Temp	45.41	10.16	17.64	1350.91	-776.47	2.14
Dead+Wind 180 deg+Ice+Temp	45.41	0.03	20.35	1558.27	-1.94	1.48
Dead+Wind 210 deg+Ice+Temp	45.41	-10.11	17.61	1348.30	773.28	0.42
Dead+Wind 240 deg+Ice+Temp	45.41	-17.55	10.15	777.26	1341.49	-0.75
Dead+Wind 270 deg+Ice+Temp	45.41	-20.27	-0.03	-1.84	1550.43	-1.72
Dead+Wind 300 deg+Ice+Temp	45.41	-17.57	-10.20	-780.24	1344.11	-2.23
Dead+Wind 330 deg+Ice+Temp	45.41	-10.16	-17.64	-1349.36	777.82	-2.14
Dead+Wind 0 deg - Service	39.01	-0.01	-8.82	-666.46	1.45	-0.54
Dead+Wind 30 deg - Service	39.01	4.38	-7.63	-576.58	-330.35	-0.15
Dead+Wind 60 deg - Service	39.01	7.60	-4.40	-332.09	-573.52	0.27
Dead+Wind 90 deg - Service	39.01	8.79	0.01	1.49	-662.93	0.63
Dead+Wind 120 deg - Service	39.01	7.61	4.42	334.78	-574.61	0.81
Dead+Wind 150 deg - Service	39.01	4.40	7.65	578.48	-332.22	0.78
Dead+Wind 180 deg - Service	39.01	0.01	8.82	667.28	-0.72	0.54
Dead+Wind 210 deg - Service	39.01	-4.38	7.63	577.39	331.07	0.15
Dead+Wind 240 deg - Service	39.01	-7.60	4.40	332.91	574.25	-0.27
Dead+Wind 270 deg - Service	39.01	-8.79	-0.01	-0.67	663.66	-0.63
Dead+Wind 300 deg - Service	39.01	-7.61	-4.42	-333.97	575.34	-0.81
Dead+Wind 330 deg - Service	39.01	-4.40	-7.65	-577.66	332.95	-0.78

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-39.01	0.00	0.00	39.01	0.00	0.000%
2	-0.03	-39.01	-25.50	0.03	39.01	25.50	0.000%
3	12.67	-39.01	-22.06	-12.67	39.01	22.06	0.000%
4	21.97	-39.01	-12.72	-21.97	39.01	12.72	0.000%
5	25.39	-39.01	0.03	-25.39	39.01	-0.03	0.000%
6	22.01	-39.01	12.78	-22.01	39.01	-12.78	0.000%
7	12.72	-39.01	22.10	-12.72	39.01	-22.10	0.000%
8	0.03	-39.01	25.50	-0.03	39.01	-25.50	0.000%
9	-12.67	-39.01	22.06	12.67	39.01	-22.06	0.000%
10	-21.97	-39.01	12.72	21.97	39.01	-12.72	0.000%
11	-25.39	-39.01	-0.03	25.39	39.01	0.03	0.000%
12	-22.01	-39.01	-12.78	22.01	39.01	12.78	0.000%
13	-12.72	-39.01	-22.10	12.72	39.01	22.10	0.000%
14	0.00	-45.41	0.00	0.00	45.41	0.00	0.000%
15	-0.03	-45.41	-20.35	0.03	45.41	20.35	0.000%
16	10.11	-45.41	-17.61	-10.11	45.41	17.61	0.000%
17	17.55	-45.41	-10.15	-17.55	45.41	10.15	0.000%
18	20.27	-45.41	0.03	-20.27	45.41	-0.03	0.000%
19	17.57	-45.41	10.20	-17.57	45.41	-10.20	0.000%
20	10.16	-45.41	17.64	-10.16	45.41	-17.64	0.000%
21	0.03	-45.41	20.35	-0.03	45.41	-20.35	0.000%
22	-10.11	-45.41	17.61	10.11	45.41	-17.61	0.000%
23	-17.55	-45.41	10.15	17.55	45.41	-10.15	0.000%
24	-20.27	-45.41	-0.03	20.27	45.41	0.03	0.000%
25	-17.57	-45.41	-10.20	17.57	45.41	10.20	0.000%
26	-10.16	-45.41	-17.64	10.16	45.41	17.64	0.000%
27	-0.01	-39.01	-8.82	0.01	39.01	8.82	0.000%
28	4.38	-39.01	-7.63	-4.38	39.01	7.63	0.000%
29	7.60	-39.01	-4.40	-7.60	39.01	4.40	0.000%
30	8.79	-39.01	0.01	-8.79	39.01	-0.01	0.000%
31	7.61	-39.01	4.42	-7.61	39.01	-4.42	0.000%
32	4.40	-39.01	7.65	-4.40	39.01	-7.65	0.000%
33	0.01	-39.01	8.82	-0.01	39.01	-8.82	0.000%
34	-4.38	-39.01	7.63	4.38	39.01	-7.63	0.000%
35	-7.60	-39.01	4.40	7.60	39.01	-4.40	0.000%
36	-8.79	-39.01	-0.01	8.79	39.01	0.01	0.000%
37	-7.61	-39.01	-4.42	7.61	39.01	4.42	0.000%
38	-4.40	-39.01	-7.65	4.40	39.01	7.65	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000405
3	Yes	4	0.00000001	0.00000604
4	Yes	4	0.00000001	0.00000581
5	Yes	4	0.00000001	0.00000483
6	Yes	4	0.00000001	0.00001074
7	Yes	4	0.00000001	0.00000647
8	Yes	4	0.00000001	0.00000400
9	Yes	4	0.00000001	0.00000702
10	Yes	4	0.00000001	0.00000767
11	Yes	4	0.00000001	0.00000479
12	Yes	4	0.00000001	0.00000665

13	Yes	4	0.00000001	0.00001054
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00006453
16	Yes	4	0.00000001	0.00006776
17	Yes	4	0.00000001	0.00006763
18	Yes	4	0.00000001	0.00006433
19	Yes	4	0.00000001	0.00006848
20	Yes	4	0.00000001	0.00006822
21	Yes	4	0.00000001	0.00006464
22	Yes	4	0.00000001	0.00006802
23	Yes	4	0.00000001	0.00006795
24	Yes	4	0.00000001	0.00006443
25	Yes	4	0.00000001	0.00006811
26	Yes	4	0.00000001	0.00006856
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	100 - 82.83	2.506	33	0.1977	0.0010
L2	89.163 - 46.163	2.060	33	0.1939	0.0008
L3	53.83 - 1	0.800	33	0.1332	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.00	LPA-80063/6CF	33	2.506	0.1977	0.0010	268601
97.00	20' x 3" Dia Omni	33	2.382	0.1971	0.0009	268601
90.00	SBNH-1D6565C	33	2.094	0.1945	0.0008	129076

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	100 - 82.83	7.235	8	0.5704	0.0029

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	89.163 - 46.163	5.949	8	0.5599	0.0023
L3	53.83 - 1	2.311	8	0.3846	0.0009

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.00	LPA-80063/6CF	8	7.235	0.5704	0.0029	94056
97.00	20' x 3" Dia Omni	8	6.878	0.5688	0.0027	94056
90.00	SBNH-1D6565C	8	6.047	0.5614	0.0023	45149

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in²	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	100 - 82.83 (1)	TP46.63x41.34x0.375	17.17	99.00	75.5	23.088	52.7326	-7.71	1217.51	0.006
L2	82.83 - 46.163 (2)	TP57.07x43.9288x0.4375	43.00	99.00	61.6	27.151	75.3876	-17.97	2046.86	0.009
L3	46.163 - 1 (3)	TP70x53.8519x0.5	52.83	99.00	48.2	30.640	110.2970	-39.01	3379.43	0.012

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	100 - 82.83 (1)	TP46.63x41.34x0.375	91.28	-1.901	39.000	0.049	0.00	0.000	39.000	0.000
L2	82.83 - 46.163 (2)	TP57.07x43.9288x0.4375	729.48	-8.669	39.000	0.222	0.00	0.000	39.000	0.000
L3	46.163 - 1 (3)	TP70x53.8519x0.5	1927.65	-12.221	39.000	0.313	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	100 - 82.83 (1)	TP46.63x41.34x0.375	0.006	0.049	0.000	0.055 ✓	1.333	H1-3 ✓

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	82.83 - 46.163 (2)	TP57.07x43.9288x0.4375	0.009	0.222	0.000	0.231 ✓	1.333	H1-3 ✓
L3	46.163 - 1 (3)	TP70x53.8519x0.5	0.012	0.313	0.000	0.325 ✓	1.333	H1-3 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	100 - 82.83	Pole	TP46.63x41.34x0.375	1	-7.71	1622.94	4.1	Pass
L2	82.83 - 46.163	Pole	TP57.07x43.9288x0.4375	2	-17.97	2728.46	17.3	Pass
L3	46.163 - 1	Pole	TP70x53.8519x0.5	3	-39.01	4504.78	24.4	Pass
							Summary	
						Pole (L3)	24.4	Pass
						RATING =	**24.4**	**Pass**

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 1928 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$Shear := 25 \cdot kips$	(Input From RisaTower)
Axial Force =	$Axial := 39 \cdot kips$	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 36$	(User Input)
Diameter of Bolt Circle =	$D_{bc} := 78.0 \cdot in$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Base Plate Data:

Use ASTM A572 60

Plate Yield Strength =	$Fy_{bp} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.5 \cdot in$	(User Input)
Base Plate Diameter =	$D_{bp} := 84 \cdot in$	(User Input)
Outer Pole Diameter =	$D_{pole} := 70 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 39 \cdot in$

Distance to Bolts = $i := 1..N$

$$d_i := \begin{vmatrix} \theta \leftarrow 2\cdot\pi\cdot\left(\frac{i}{N}\right) \\ d \leftarrow R_{bc}\cdot\sin(\theta) \end{vmatrix}$$

$d_1 = 6.77 \cdot in$	$d_7 = 36.65 \cdot in$
$d_2 = 13.34 \cdot in$	$d_8 = 38.41 \cdot in$
$d_3 = 19.50 \cdot in$	$d_9 = 39.00 \cdot in$
$d_4 = 25.07 \cdot in$	$d_{10} = 38.41 \cdot in$
$d_5 = 29.88 \cdot in$	$d_{11} = 36.65 \cdot in$
$d_6 = 33.77 \cdot in$	etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 35 \cdot in$

Moment Arms of Bolts about Neutral Axis = $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00 \cdot in$	$MA_7 = 1.65 \cdot in$
$MA_2 = 0.00 \cdot in$	$MA_8 = 3.41 \cdot in$
$MA_3 = 0.00 \cdot in$	$MA_9 = 4.00 \cdot in$
$MA_4 = 0.00 \cdot in$	$MA_{10} = 3.41 \cdot in$
$MA_5 = 0.00 \cdot in$	$MA_{11} = 1.65 \cdot in$
$MA_6 = 0.00 \cdot in$	etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 37.1 \cdot in$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i (d_i)^2 = 2.738 \times 10^4 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 31.9 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

$T_{ALL.Net} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 194.812 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 16$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.174 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 2.5 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force = $C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 34 \cdot kips$

Maximum Compressive Stress = $f_a := \frac{C_{Max}}{A_n} = 10.5 \cdot ksi$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^2}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases} = 45 \cdot ksi$$

Allowable Compressive Stress = $F_a := 1.333 \cdot F_a = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity = $\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 17.5$

Condition 2 = $Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$

$C_1 = 6.8 \cdot kips$

$C_2 = 12.4 \cdot kips$

$C_3 = 17.6 \cdot kips$

$C_4 = 22.3 \cdot kips$

$C_5 = 26.3 \cdot kips$

$C_6 = 29.6 \cdot kips$

$C_7 = 32.1 \cdot kips$

$C_8 = 33.5 \cdot kips$

$C_9 = 34.0 \cdot kips$

$C_{10} = 33.5 \cdot kips$

$C_{11} = 32.1 \cdot kips$

etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} t_{bp}^2\right)} = 6.2 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 10.4$

Condition3 = Condition3 := if$\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition3 = "Ok"

Standard Monopole Foundation:

Input Data:

<u>Tower Data</u>

Overturning Moment =	$OM := 1928 \cdot ft \cdot kips$	(User Input from RISATower)
Shear Force =	$Shear := 25 \cdot kip$	(User Input from RISATower)
Axial Force =	$Axial := 39 \cdot kip$	(User Input from RISATower)
Tower Height =	$H_t := 100 \cdot ft$	(User Input)

<u>Footing Data:</u>

Overall Depth of Footing =	$D_f := 5.0 \cdot ft$	(User Input)
Length of Pier =	$L_p := 3.0 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 1.0 \cdot ft$	(User Input)
Diameter of Pier =	$d_p := 9.0 \cdot ft$	(User Input)
Thickness of Footing =	$T_f := 3.0 \cdot ft$	(User Input)
Width of Footing =	$W_f := 32.0 \cdot ft$	(User Input)

<u>Anchor Bolt Data:</u>

Length of Anchor Bolts =	$L_{st} := 72 \cdot in$	(User Input)
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)
Base Plate Bolt Circle =	$MP := 78 \cdot in$	(User Input)

<u>Material Properties:</u>

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 11$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.41 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 30$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 11$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.41 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 19$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 11$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.41 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 37$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 1.561 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 1.561 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Load Factor =

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

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}) = 150 \cdot \text{pcf}$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 120 \cdot \text{pcf}$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 0.72 \cdot \text{ksf}$

$P_{top} := \text{if}\left[n < (D_f - T_f), P_{pt}, P_{pn}\right] = 0.72 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 1.8 \cdot \text{ksf}$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.26 \cdot \text{ksf}$$

$T_p := \text{if}\left[n < (D_f - T_f), T_f, (D_f - n)\right] = 3$

$A_p := W_f \cdot T_p = 96$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 120.96 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + d_p^2 \cdot L_p\right] \cdot \gamma_c = 497.25 \cdot \text{kip}$

Weight of Soil Above Footing =
$$WT_{s1} := \left[\left(W_f^2 - d_p^2\right) \cdot \begin{vmatrix} (L_p - L_{pag} - n) \text{ if } (L_p - L_{pag} - n) \ge 0 \\ 0 \text{ if } (L_p - L_{pag} - n) \le 0 \end{vmatrix}\right] \cdot \gamma_s = 226.32 \cdot \text{kip}$$

Weight of Soil Wedge at Back Face =
$$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right) \cdot \gamma_s = 27.713 \cdot \text{kip}$$

Weight of Soil Wedge at back face Corners =
$$WT_{s3} := 2 \cdot \left[(D_f)^3 \cdot \frac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 5.774 \cdot \text{kips}$$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 762.57 \cdot \text{kip}$

Resisting Moment =
$$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \frac{D_f \tan(\Phi_s)}{3}\right)\right] = 13426 \cdot \text{kip} \cdot \text{ft}$$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 2078 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $$FS := \frac{M_r}{M_{ot}} = 6.46$$

Factor of Safety Required = $FS_{req} := 2$

OverTurning_Moment_Check := if(FS ≥ FS_{req}, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{\mu \cdot WT_{tot}}{FS_{req}} = 171.578 \cdot kips$

Shear_Check := if(S_p > Shear, "Okay", "No Good")

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 1.024 \times 10^3$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 5461.33 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{(WT_c + Axial)}{A_{mat}} + \frac{M_{ot}}{S} = 0.904 \cdot ksf$

Max_Pressure_Check := if($P_{max} < q_s$, "Okay", "No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{(WT_c + Axial)}{A_{mat}} - \frac{M_{ot}}{S} = 0.143 \cdot ksf$

Min_Pressure_Check := if[$(P_{min} \geq 0) \cdot (P_{min} < q_s)$, "Okay", "No Good"]

Min_Pressure_Check = "Okay"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 12.674$

Distance to Kern = $X_k := \frac{W_f}{6} = 5.333$

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

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 2.725$

Adjusted Soil Pressure = $P_a := \frac{2(WT_c + Axial)}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 0.842 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 0.904 \cdot ksf$

Pressure_Check := if($q_{adj} < q_s$, "Okay", "No Good")

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^{\,2}}{4} = 2.025 \times 10^4 \cdot kips$ (ACI-2008 10.14)

Bearing_Check := if(P_b > LF·Axial, "Okay", "No Good")

Bearing_Check = "Okay"

Shear Strength of Concrete:

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

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 31.59 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f d_1$

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

Beam_Shear_Check := if($V_{req} < V_{Avail}$, "Okay", "No Good")

Beam_Shear_Check = "Okay"

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

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 36.5$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 106.3$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 917.7$

Guess Value = $v_u := 1\text{ksf}$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := \text{Find}(v_u) = 7.9 \cdot \text{ksf}$

$V_u := v_u \cdot d \cdot W_f = 667.7 \cdot \text{kips}$

Required Shear Strength = $V_{req} := LF \cdot V_u = 890.1 \cdot \text{kips}$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot \text{psi}} \cdot b_o \cdot d = 2978.9 \cdot \text{kip}$ (ACI-2008 11.11.2.1)

Punching_Shear_Check := if(V_req < V_Avail, "Okay", "No Good")

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

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

$q_b := q_{adj} - d_1 \cdot \text{Slope} = 0.631 \cdot \text{ksf}$

Maximum Bending at Face of Pier = $M_u := LF \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 2293.2 \cdot \text{kip} \cdot \text{ft}$

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

(ACI-200810.2.7.3)

$R_n := \frac{M_u}{\phi_m \cdot W_f \cdot d^2} = 79.8 \cdot \text{psi}$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0013$

$\rho_{min} := \rho = 0.00135$

Required Reinforcement for Temperature and Shrinkage:

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

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 16.326 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 57.8 \cdot in^2$$

Pad_Reinforcement_Bot := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2} \right) = 10.9 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 29.7 \cdot in^2$$

Pad_Reinforcement_Top := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =
$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 9.05 \cdot in$$

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

Transverse Reinforcement Index =
$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 47.2 \cdot in$$

Minimum Development Length =
$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

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

Available Length in Pad =
$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 135 \cdot in$$

Lpad_Check := if($L_{Pad} > L_{dbt}$, "Okay", "No Good")

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 9160.88 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.05 \cdot A_p = 4.58 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 46.84 \cdot in^2$

Steel_Area_Check := if(A_sprov > A_smin, "Okay" , "No Good")

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 9.9 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 102 \cdot in$

Maximum Moment in Pier = $M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF = 32239.9 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$$\left(D\ N\ n\ P_u\ M_{xu}\right) := \left(d_p \cdot 12\ \ NB_{pier}\ \ BS_{pier}\ \ \frac{Axial \cdot 1.333}{kips}\ \ \frac{M_p}{in \cdot kips}\right)$$

$$\left(D\ N\ n\ P_u\ M_{xu}\right) = \left(108\ \ 30\ \ 11\ \ 51.987\ \ 3.224 \times 10^4\right)$$

$$\left(\phi P_n\ \phi M_{xn}\ f_{sp}\ \rho\right) := (0\ \ 0\ \ 0\ \ 0)$$

$$\left(\phi P_n\ \phi M_{xn}\ f_{sp}\ \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$$

$$\left(\phi P_n\ \phi M_{xn}\ f_{sp}\ \rho\right) = \left(197.743\ \ 1.226 \times 10^5\ \ -60\ \ 5.109 \times 10^{-3}\right)$$

Axial_Load_Check := if(ϕP_n ≥ P_u, "Okay" , "No Good")

Axial_Load_Check = "Okay"

Bending_Check := if(ϕM_xn ≥ M_xu, "Okay" , "No Good")

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 33 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 33 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension = $c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 47.15 \cdot in$$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 18.727 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := max(L_{dbt}, L_{dbmin})$

$L_{tension\_Check} := if(L_{pier} + L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$

$L_{tension\_Check} = \text{"Okay"}$

Compression: (ACI-2008 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 26.753 \cdot in$$

$$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot (d_{bpier} \cdot f_y) = 25.38 \cdot in$$

$L_{dbc} := if(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}) = 26.753 \cdot in$

$L_{compression\_Check} := if(L_{pier} + L_{pad} > L_{dbc}, \text{"Okay"}, \text{"No Good"})$

$L_{compression\_Check} = \text{"Okay"}$

Tie Size and Spacing in Column:

Minimum Tie Size = $Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 4$

Used #4 Ties

Seismic Factor = $z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \cdot in$

$s_{lim2} := 48 \cdot d_{Tie} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 60 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing = $s_{tie} := min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 2.667$

Check Anchor Steel Embedment:

Depth Available = $D_{ab} := L_{st} - A_{BP} = 5 \cdot ft$

Length of Anchor Bolt = $L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 10.87 \cdot ft$

Depth_Check := if($D_{ab} \ge L_{anchor}$, "Okay" , "No Good")

Depth_Check = "No Good"

Note: Anchor plate is provided

Section 1 - RFDS GENERAL INFORMATION

RFDS NAME:	CT2426S	DATE:	8/7/2013	RF DESIGN ENG:	Atu Kwamina	RF PERF ENG:	
ISSUE:	Pre-construction	Approved? (Y/N)	Y	RF DESIGN PHONE:	[illegible]	RF PERF PHONE:	
REVISION:	V02	RF MANAGER:	Cameron Syme	RF DESIGN EMAIL:	860-513-7691	RF PERF EMAIL:	
						TRIDENT:	
						GSM FREQUENCY:	
						UMTS FREQUENCY:	
						LTE FREQUENCY:	
INITIATIVE / PROJECT:	Pre-construction RFDS for leasing and zoning purposes, general design. It is not the finalized location, CL and azimuths. RRU positioning may be different based on the structural analysis.					I-PLAN JOB NUMBER:	

Section 2 - LOCATION INFORMATION

USID:		FA LOCATION CODE:		LOCATION NAME:	Washington Depot	ORACLE PROJECT #:	
REGION:	NE	MARKET CLUSTER:	CT	MARKET:	NER	SEARCH RING NAME:	Danbury Pinnacle Way
ADDRESS:	111 Upper Fish Road	CITY:	Southbury	STATE:	CT	SEARCH RING ID:	CT2426S
ZIP CODE:		COUNTY:		MSA/RSA:		BTA:	
LATITUDE (D-M-S):	41 26' 17.8"	LONGITUDE (D-M-S):	72 14' 15.87"	LAT (DEC. DEG.):	41.438278 N	LONG (DEC. DEG.):	-72.237742
DIRECTIONS, ACCESS AND EQUIPMENT LOCATION:						BORDER CELL WITH CONTOUR COORD:	
						AM STUDY REQ'D (Y/N):	
						FREQ COORD:	

Section 3 - LICENSE COVERAGE/FILING INFORMATION

CGSA - NO FILING TRIGGERED:		CGSA LOSS:		PCS REDUCED - UPS ZIP:	
CGSA - MINOR FILING NEEDED:		CGSA EXT AGMT NEEDED:		PCS POPS REDUCED:	
CGSA - MAJOR FILING NEEDED:		CGSA SCORECARD UPDATED:			

Section 4 - TOWER/REGULATORY INFORMATION

STRUCTURE AT&T OWNED?:		GROUND ELEVATION:		STRUCTURE TYPE:		MARKET LOCATION 850 MHZ CALL SIGN(S):	
ADDTIONAL REGULATORY?:		HEIGHT OVERALL:		FCC ASR NUMBER:		MARKET LOCATION 1900 MHZ CALL SIGN(S):	
SUB-LEASE RIGHTS?:		STRUCTURE HEIGHT:				MARKET LOCATION 700 MHZ CALL SIGN(S):	
LIGHTING TYPE:						MARKET LOCATION AWS MHZ CALL SIGN(S):	

Section 5 - E-911 INFORMATION

	PSAP NAME:	PSAP ID:	E911 PHASE:	MPC SVC PROVIDER:	LMU REQUIRED:	ESRN:	DATE LIVE PH1:	DATE LIVE PH2:
ALPHA								
BETA								
GAMMA								
DELTA								
EPSILON								
PSI								

Section 6 - RBS GENERAL INFORMATION

4-DIGIT SITE ID:	CT2426S	COW OR TOY?:	No	CELLULAR NETWORK:		DISASTER PRIORITY:	
CELL SITE TYPE:	Sectorized	SITE TYPE:		OPS DISTRICT:		OPS ZONE:	
BTS LOCATION ID:		ORIGINATING CO:		RF DISTRICT:		RF ZONE:	

Section 7 - RBS SPECIFIC INFORMATION

	GSM RBSs	UMTS 1ST CARRIER RBSs	UMTS 2ND CARRIER RBSs	UMTS 3RD CARRIER RBSs	UMTS 4TH CARRIER RBSs	LTE RBSs
MSC						
BSC/RNC						
LAC						
RAC						
EQUIPMENT VENDOR						
EQUIPMENT TYPE						
LOCATION						
CABINET LOCATION						

Section 8 - RBS INDIVIDUAL INFORMATION

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
CELL ID/BCF												
CTS COMMON ID												

Section 9 - SOFT SECTOR ID

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 10 - CID/SAC

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 11 - CURRENT RADIO COUNTS (Existing)

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 12 - CURRENT T1 COUNTS (Existing)

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

Section 13 - NEW/PROPOSED RADIO COUNTS

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 14 - NEW/PROPOSED T1 COUNTS

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

Section 15A - CURRENT SECTOR/CELL INFORMATION - ALPHA (OR OMNI)

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15B - CURRENT SECTOR/CELL INFORMATION - BETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15C - CURRENT SECTOR/CELL INFORMATION - GAMMA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15D - CURRENT SECTOR/CELL INFORMATION - DELTA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15E - CURRENT SECTOR/CELL INFORMATION - EPSILON

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15F - CURRENT SECTOR/CELL INFORMATION - ZETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 16A - NEW/PROPOSED SECTOR/CELL INFORMATION - ALPHA (OR OMNI)					
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD	TBD TBD	TBD TBD	
TECHNOLOGY	UMTS-DB	LTE-DB	LTE-DB	LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	SBNH-1D6565C	KRC 118 054/1	KRC 118 054/1	KRC 118 054/1	
ANTENNA VENDOR	Andrew	Ericsson	Ericsson	Ericsson	
ANTENNA SIZE H"xW"xD"	96 x 12 x 7	96"x14"x12"	96"x14"x12"	96"x14"x12"	
ANTENNA WEIGHT	61	200	200	200	
ANTENNA GAIN	16.4dBi @ 850MHz	17.6 dBi (high band)	17.6 dBi (high band)	17.6 dBi (high band)	
AZIMUTH	50°	3 0	30°	30°	
RADIATION CENTER	110	110'	110'	110'	
ANTENNA TIP HEIGHT	114'	114'	114'	114'	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0°	2°	2°	2°	
MECHANICAL DOWNTILT	0°	0°	0°	0°	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)	UMTS-RRUS (too) x 2	Ericsson RRUS	Ericsson RRUS	Ericsson RRUS	
CURRENT INJECTORS FOR TMA	n/a	n/a	n/a	n/a	
CURRENT INJCTR POWER CABLE	n/a	n/a	n/a	n/a	
ANTENNA SHARING KIT?	n/a	n/a	n/a	n/a	
BAS Filter	n/a	n/a	n/a	n/a	
DIPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
DUPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a	n/a	n/a	n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a	n/a	n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a	n/a	n/a	

Section 16B - NEW/PROPOSED SECTOR/CELL INFORMATION - BETA					
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD	TBD TBD	TBD TBD	
TECHNOLOGY	UMTS-DB	LTE-DB	LTE-DB	LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	SBNH-1D6565C	KRC 118 054/1	KRC 118 054/1	KRC 118 054/1	
ANTENNA VENDOR	Andrew	Ericsson	Ericsson	Ericsson	
ANTENNA SIZE H"xW"xD"	96 x 12 x 7	96"x14"x12"	96"x14"x12"	96"x14"x12"	
ANTENNA WEIGHT	61	200	200	200	
ANTENNA GAIN	16.4dBi @ 850MHz	17.6 dBi (high band)	17.6 dBi (high band)	17.6 dBi (high band)	
AZIMUTH	1 80	150°	150°	150°	
RADIATION CENTER	110'	110'	110'	110'	
ANTENNA TIP HEIGHT	114'	114'	114'	114'	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0°	2°	2°	2°	
MECHANICAL DOWNTILT	0°	0°	0°	0°	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)	UMTS-RRUS (too) x 2	Ericsson RRUS	Ericsson RRUS	Ericsson RRUS	
CURRENT INJECTORS FOR TMA	n/a	n/a	n/a	n/a	
CURRENT INJCTR POWER CABLE	n/a	n/a	n/a	n/a	
ANTENNA SHARING KIT?	n/a	n/a	n/a	n/a	
BAS Filter	n/a	n/a	n/a	n/a	
DIPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
DUPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a	n/a	n/a	n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a	n/a	n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a	n/a	n/a	

Section 16C - NEW/PROPOSED SECTOR/CELL INFORMATION - GAMMA					
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD	TBD TBD	TBD TBD	
TECHNOLOGY	UMTS-DB	LTE-DB	LTE-DB	LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	SBNH-1D6565C	KRC 118 054/1	KRC 118 054/1	KRC 118 054/1	
ANTENNA VENDOR	Andrew	Ericsson	Ericsson	Ericsson	
ANTENNA SIZE H"xW"xD"	96 x 12 x 7	96"x14"x12"	96"x14"x12"	96"x14"x12"	
ANTENNA WEIGHT	61	200	200	200	
ANTENNA GAIN	16.4dBi @ 850MHz	17.6 dBi (high band)	17.6 dBi (high band)	17.6 dBi (high band)	
AZIMUTH	300°	270°	270°	270°	
RADIATION CENTER	110'	110'	110'	110'	
ANTENNA TIP HEIGHT	114'	114'	114'	114'	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0°	2°	2°	2°	
MECHANICAL DOWNTILT	0°	0°	0°	0°	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)	UMTS-RRUS (too) x 2	Ericsson RRUS	Ericsson RRUS	Ericsson RRUS	
CURRENT INJECTORS FOR TMA	n/a	n/a	n/a	n/a	
CURRENT INJCTR POWER CABLE	n/a	n/a	n/a	n/a	
ANTENNA SHARING KIT?	n/a	n/a	n/a	n/a	
BAS Filter	n/a	n/a	n/a	n/a	
DIPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
DUPLEXER (QTY/MODEL)	n/a	n/a	n/a	n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a	n/a	n/a	n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a	n/a	n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a	n/a	n/a	

Product Specifications

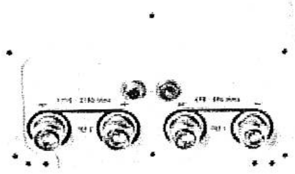
COMMSCOPE®

on the go

Andrew Solutions

SBNH-1D6565C

Andrew® DualPol® Dual Band Teletilt® Antenna, 698–896 MHz and 1710–2180 MHz, 65° horizontal beamwidth, RET compatible



- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Internal next generation actuator eliminates field installation and defines new standards for reliability

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	15.7	16.4	18.0	18.0	18.0
Beamwidth, Horizontal, degrees	71	67	58	57	59
Beamwidth, Vertical, degrees	8.6	7.8	5.5	5.1	4.8
Beam Tilt, degrees	0–11	0–11	0–7	0–7	0–7
USLS, typical, dB	15	15	16	16	16
Front-to-Back Ratio at 180°, dB	25	28	34	31	31
Front-to-Back Total Power at 180° ± 20°, dB	21	22	30	27	26
CPR at Boresight, dB	24	21	17	17	17
CPR at Sector, dB	11	8	9	8	9
Isolation, dB	30	30	30	30	30
Isolation, Intersystem, dB	35	35	35	35	35
VSWR | Return Loss, dB	1.5:1 | 14.0	1.5:1 | 14.0	1.5:1 | 14.0	1.5:1 | 14.0	1.5:1 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150	-150	-150
Input Power per Port, maximum, watts	400	400	300	300	300
Polarization	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm
Lightning Protection	dc Ground	dc Ground	dc Ground	dc Ground	dc Ground

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	879.0 N @ 150 km/h 197.6 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	2449.00 mm | 96.42 in
Width	301.00 mm | 11.85 in
Net Weight	27.60 kg | 60.85 lb

Remote Electrical Tilt (RET) Information

Adjustment Time, full range, maximum	30 s
Annual Failure Rate, maximum	0.01%
Power Consumption, during motor movements, maximum	11.0 W
Power Consumption, idle state, maximum	2.0 W

Frequency (AT&T)
✓ Band 12 (Lower 700 MHz)
✓ Band 4 (AWS, 17/2100 MHz) — 2Q2011

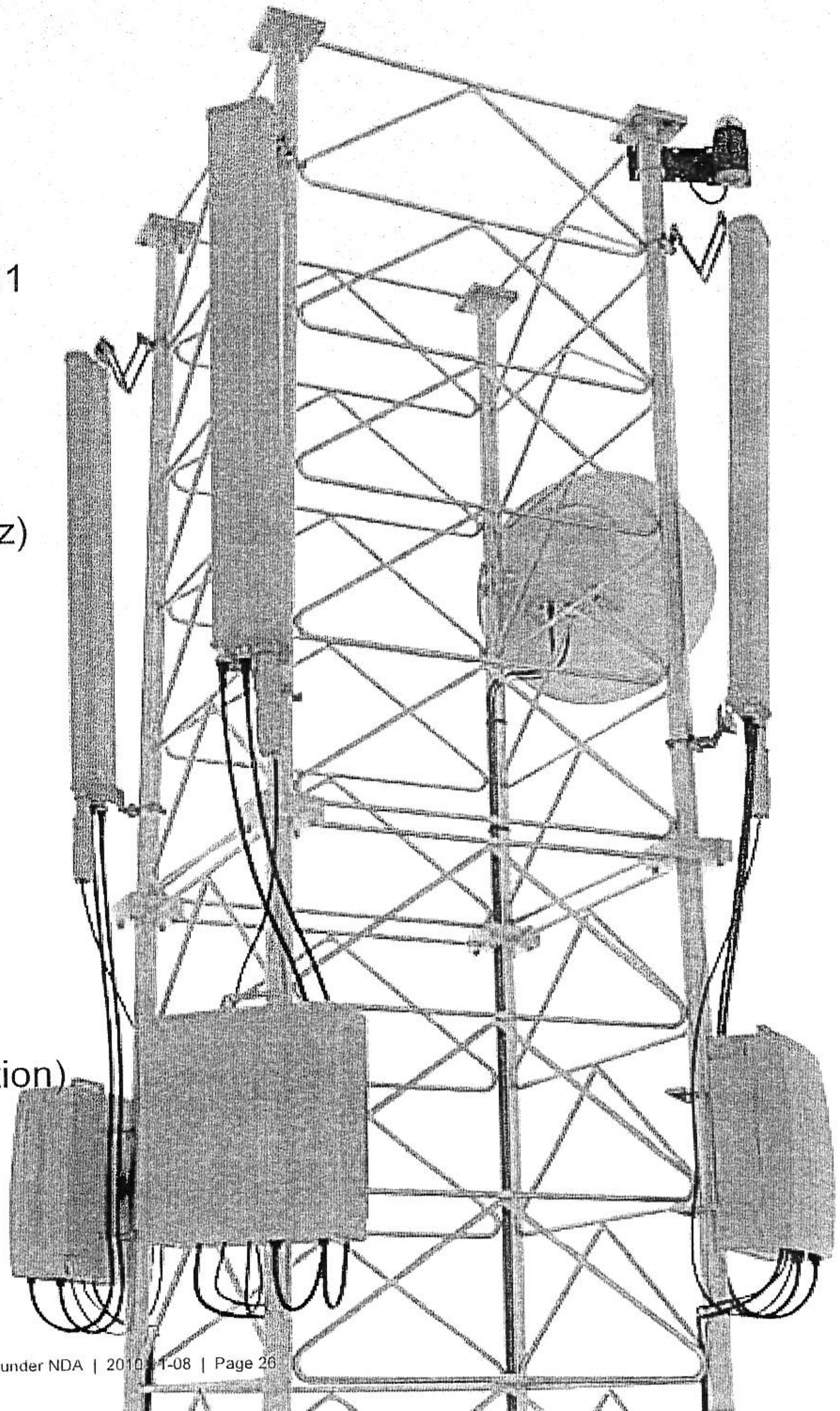
RF Characteristics
✓ Output power: 2x30 Watts
✓ 2x2 MIMO Capable
✓ IBW of 20 MHz
✓ Rx Sens.: Better than -105 dBm (5 MHz)

RET/TMA Support
✓ AISG 2.0 Compatible
✓ Via RET Port and Centre Conductor
✓ Cascading
✓ 30 VDC Bias

Environmental
✓ Self Convection
✓ Temperature -40 to 131 F

Power
✓ Input voltage: -48 VDC or AC (exemption)
✓ Fuse size: 13 – 32 A
- Recommended: 25 A

✓ Power Consumption:
- Typical 200 Watts
- Max 310 Watts
- Excl. RET and TMA load



RRUS 11 Mechanics

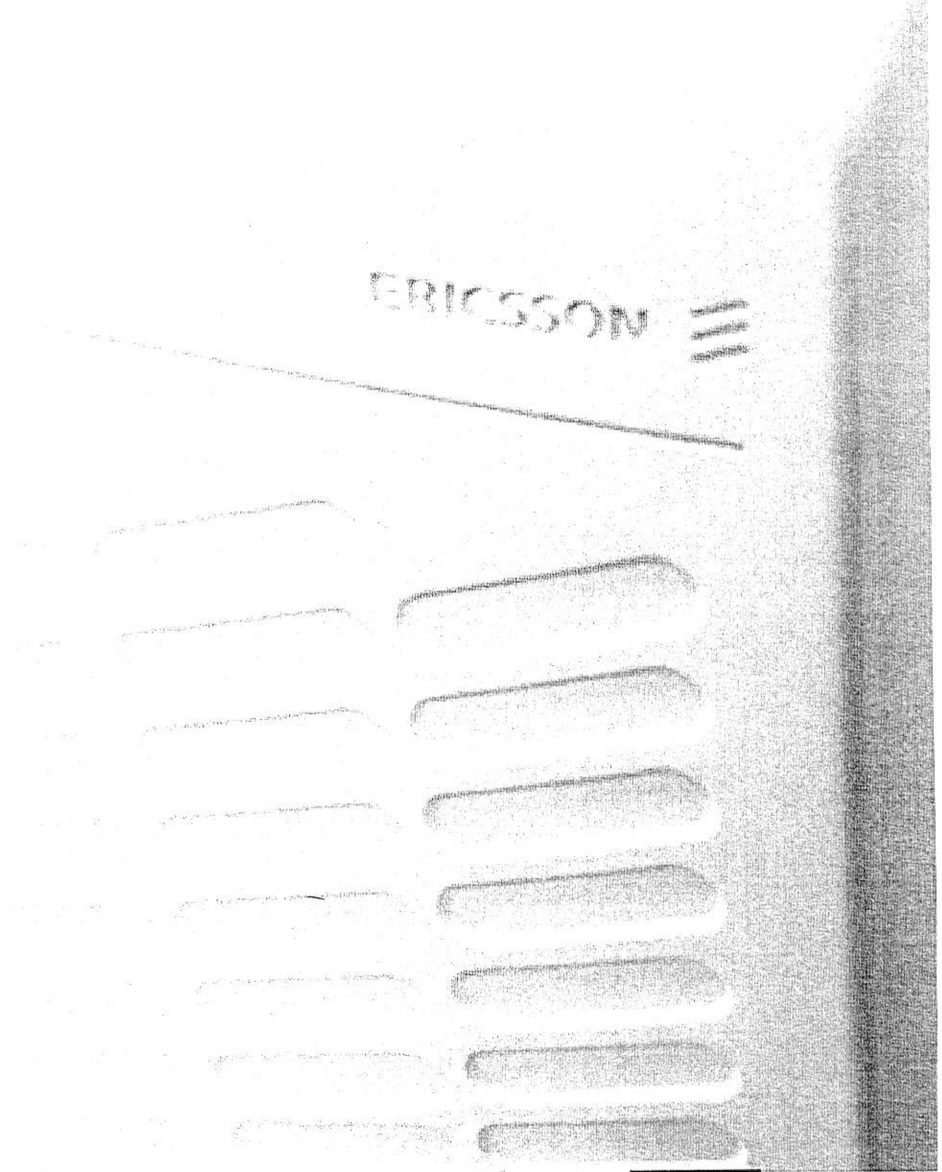
Wall and pole mounting brackets
- Reused from RRUW and RRU22
- Vertical Mount Only

Clearing distances:
- Above >= 16 in.
- Below >= 12 in.
- Side >= 0 mm

DC connector
- Bayonet
- Screw terminals in connector plug
- Supported outer cable diameter: 6-18 mm

CPRI connector
- LCD with proprietary cover
- Separate cover available from 1Q2011

Size & Weight
- Band 4: 44 lbs
- Band 12: 50 lbs
- 17.8″ x 17.3″ x 7.2″ incl. sun shield



ERICSSON

POWER

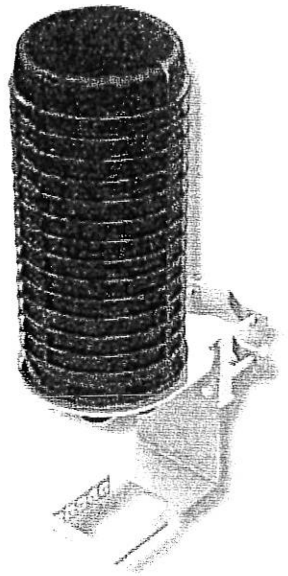
DC6-48-60-18-8F

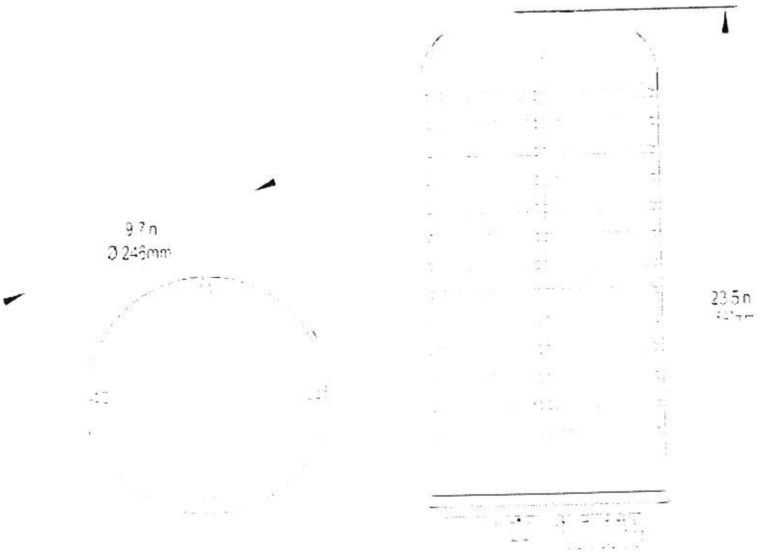
DC Surge Suppression Solution

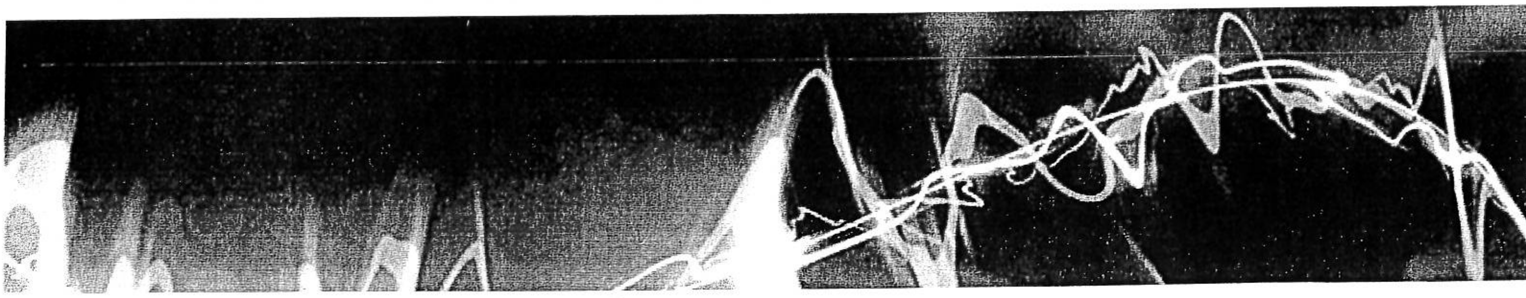
The DC6-48-60-18 is a dual chambered, DC surge suppression system for use in multi-circuit, Distributed Antenna Systems. The system will protect up to 6 Remote Radio Heads from voltage surges and lightning, and connect up to 18 fiber pairs. The system is enclosed in a NEMA 4 rated, waterproof enclosure.

FEATURES

- Protects up to 6 Remote Radio Heads, each with its own protection circuit.
- Flexible design allows for installation at the top of a tower for Remote Radio Head protection.
- Includes fiber connections for up to 18 pairs of fiber.
- LED indicators on individual circuits provide visual indication of suppressor status.
- Form 'C' relays allow for remote monitoring of the suppressor status.
- Patented Strikesorb technology provides over 60 kA of surge current capacity per circuit.
- Strikesorb suppression modules are fully recognized to UL 1449-3rd Edition Safety Standard, meeting all intermediate and high current fault requirements to facilitate use in OEM applications.
- Raycap recommends that DC protection system be installed within 2 meters or 6 feet of the radio.
- Dome design is lightweight and aerodynamic providing maximum flexibility for installation on top of towers.







DC6-48-60-18-8F

DC Power Surge Protection

Electrical Specifications	
Model Number	DC6-48-60-18-8F
Nominal Operating Voltage	48 VDC
Nominal Discharge Current (I_n)	20 kA 8/20 µs
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs
Maximum Continuous Operating Voltage (U_c)	75 VDC
Voltage Protection Rating	400 V

Mechanical Specifications	
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum
Fiber Connection Method	LC-LC Single mode duplex
Environmental Rating	IP 68, 7m 72hrs
Operating Temperature	-40° C to + 80° C
Storage Temperature	-70° C to + 80° C
Cold Temperature Cycling	IEC 61300-2-22e -30° C to + 60° C 200 hrs @ 5 psi
Resistance to Aggressive Materials	CEI IEC 61073-2 including acids and bases
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs
Weight	20 lbs without Mounting Bracket

STANDARDS

Strikesorb modules are compliant to the following Surge Protection Device (SPD) Standards:

- ANSI/UL 1449 – 3rd Edition
- IEEE C62.41
- NEMA LS-1, IEC 61643-1:2005 2nd Edition:2005
- IEC 61643-12
- EN 61643-11:2002 (including A11:2007)

GSA
GS-07F-0435V

ANAB
Certified to ISO 9001:2000

TÜV
TÜV Rheinland of North America

806 W. Clearwater Loop • Post Falls • Idaho • 83854 • USA
208.777.1166 • 800.890.2569 • 208.777.4466 • www.raycapsurgeprotection.com

TAB 5

verizonwireless

December 10, 2013

To Whom It May Concern:

Re: Cellco Partnership d/b/a Verizon Wireless
Facility at 111 Upper Fish Rock Rd, Southbury, CT

Dear Sir/Madam:

Cellco Partnership d/b/a Verizon Wireless, the owner of the above referenced facility, do hereby authorizes Mr. Kevin Woodley or any other AT&T's authorized agent to file all necessary applications with the CT Siting Council, Town of Southbury or any other governmental entity for the proposed AT&T's co-location at the above-referenced location.

Sincerely,

A. Trofimov

Signature

Its: Real Estate Representative

12190706-v1

TAB 6

Power Density Calculations

Applicant:	New Cingular Wireless PCS, LLC ("AT&T")
Site ID:	CT2426
Site Type:	Existing 100' Monopole Tower
Address:	111 Upper Fish Rock Road, CT 06488
Date:	December 10, 2013

1. **Existing Power Density** [1]

Carrier	# Channels	ERP/Ch	Ant Ht	Power Density (mW/cm2)	Frequency MHz	Limit	%MPE
Verizon cellular	9	268	100	0.0867	869	0.5793	14.97%
Verizon PCS	11	268	100	0.1060	1970	1.0000	10.60%
Verizon AWS	1	651	100	0.0234	2145	1.0000	2.34%
Verizon LTE	1	875	100	0.0315	698	0.4653	6.76%
						TOTAL	**34.67%**

2. **Proposed AT&T Power Density** [2]

Carrier	#Channels	ERP/Ch	Ant Ht	Power Density (mW/cm2)	Frequency MHz	Limit	%MPE
AT&T UMTS	2	500	90	0.0297	800 Band	0.5867	5.06
AT&T UMTS	1	500	90	0.0149	1900 Band	1.0000	1.49
AT&T LTE	1	500	90	0.0149	700 Band	0.4667	3.18
AT&T LTE	1	500	90	0.0149	1900 Band	1.0000	1.49
AT&T LTE	1	500	90	0.0149	2300 Band	1.0000	1.49
						TOTAL	**12.71%**

3. **Cumulative Power Density Calculation Results**

Carrier	#Channels	ERP/Ch	Ant Ht	Power Density (mW/cm2)	Frequency MHz	Limit	%MPE
Verizon cellular	9	268	100	0.0867	869	0.5793	14.97%
Verizon PCS	11	268	100	0.1060	1970	1.0000	10.60%
Verizon AWS	1	651	100	0.0234	2145	1.0000	2.34%
Verizon LTE	1	875	100	0.0315	698	0.4653	6.76%
AT&T UMTS	2	500	90	0.0297	800 Band	0.5867	5.06
AT&T UMTS	1	500	90	0.0149	1900 Band	1.0000	1.49
AT&T LTE	1	500	90	0.0149	700 Band	0.4667	3.18
AT&T LTE	1	500	90	0.0149	1900 Band	1.0000	1.49
AT&T LTE	1	500	90	0.0149	2300 Band	1.0000	1.49
						TOTAL	**47.38%**

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[1] This Power Density information was taken from the Connecticut Siting Council database dated October 1, 2013.
[2] This Power Density information is based on worse case assumptions from AT&T's radio frequency engineers.

4. Conclusion:

The addition of AT&T's antennas on the existing tower will result in the cumulative maximum permissible exposure (MPE) level of 47.38%. The proposal complies with the National Council on Radiation Protection and Measurements standard for MPE adopted by the Federal Communications Commission ("FCC"). Moreover, the maximum level of radio-frequency energy emitted from AT&T's installation will be well below the FCC's mandated radio frequency exposure limits.