



# STATE OF CONNECTICUT

## CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: [siting.council@ct.gov](mailto:siting.council@ct.gov)

[www.ct.gov/csc](http://www.ct.gov/csc)

VIA ELECTRONIC MAIL

May 3, 2018

Jennifer Iliades  
Site Acquisition Specialist  
Empire Telecom USA  
16 Esquire Road  
Billerica, MA 01862

RE: **EM-AT&T-080-180328** - AT&T notice of intent to modify an existing telecommunications facility located at 119 Empire Avenue, Meriden, Connecticut.

Dear Ms. Iliades:

The Connecticut Siting Council (Council) is in receipt of your email correspondence of May 3, 2018 submitted in response to the Council's April 5, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman  
Executive Director

MB/CMW/mr

**From:** Jennifer Iliades [mailto:jiliades@empiretelecomm.com]  
**Sent:** Thursday, May 03, 2018 1:42 PM  
**To:** Galligan, Coleen <Coleen.Galligan@ct.gov>; CSC-DL Siting Council <Siting.Council@ct.gov>  
**Cc:** David Cooper <dcooper@empiretelecomm.com>; Danielle Beaulieu <dbeaulieu@empiretelecomm.com>  
**Subject:** RE: Incomplete - EM-ATT-080-180328 - Empire Ave.

Ms. Galligan,

Pursuant to Ms. Bachman's request, attached please find our letter and Structural Analysis addressing her concerns in her letter dated April 5, 2018.

Please do not hesitate to contact us should you have any questions or require any additional information. The original is being sent via UPS Overnight Delivery to your office to Ms. Bachman's attention.

Thank you,

Jennifer Iliades  
Site Acquisition Specialist  
Empire Telecom USA, LLC  
16 Esquire Road  
Billerica, MA 01862

**Mobile:** 978.284.0701

**Desk:** 978.608.8556

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**Website:** [www.empiretelecomm.com](http://www.empiretelecomm.com)



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May 3, 2017

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

**RE: EM-AT&T-080-180328** – AT&T notice of intent to modify an existing telecommunications facility located at 119 Empire Avenue, Meriden Connecticut (AT&T Site CT1015)

Dear Ms. Bachman:

In accordance with your letter dated April 5, 2018 concerning the above-referenced matter, enclosed please find a Structural Analysis Report completed by Centek Engineering dated May 2, 2018 to supplement our original exempt modification request.

Please do not hesitate to contact us should you require any additional documentation or information. Thank you for your time and attention to this matter.

Sincerely,

A handwritten signature in blue ink, appearing to read "J. Iliades".

Jennifer Iliades  
Site Acquisition Specialist

Enclosure

cc: Kevin Scarpati, Mayor, City of Meriden  
Ken Morgan, Interim City Manager, City of Meriden  
Robert Seale, Director of Development and Enforcement, City of Meriden  
119 Empire Avenue, LLC  
Crown Castle



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Jennifer Iliades  
Site Acquisition Specialist  
Empire Telecom USA  
16 Esquire Road  
Billerica, MA 01862

RE: **EM-AT&T-080-180328** - AT&T notice of intent to modify an existing telecommunications facility located at 119 Empire Avenue, Meriden, Connecticut.

Dear Ms. Iliades:

The Connecticut Siting Council (Council) received a notice of intent to modify the above-referenced facility on March 28, 2018.

According to Section 16-50j-71 of the Regulations of Connecticut State Agencies, "...any modification, as defined in Section 16-50j-2a of the Regulations of Connecticut State Agencies, to an existing tower site, except as specified in Sections 16-50j-72 and 16-50j-88 of the Regulations of Connecticut State Agencies, may have a substantial adverse environmental effect."

Staff has reviewed this exempt modification request for completeness and has identified a deficiency in the filing. The Structural Analysis Report provided in the exempt modification filing only assesses the capacity of the existing antenna mounts to support the proposed equipment and not the capacity of the water tank structure supporting that equipment as well as other carrier equipment.

Therefore, the exempt modification request is incomplete at this time. The Council recommends that Empire Telecom provide a Structural Analysis Report including the total proposed and existing loading, including that of other carriers, on the water tank structure on or before May 4, 2018. If additional time is needed to gather the requested information, please submit a written request for an extension of time prior to May 4, 2018.

This notice of incompleteness shall have the effect of tolling the Federal Communications Commission (FCC) 60-day timeframe in accordance with Paragraph 217 of the FCC Wireless Infrastructure Report and Order issued on October 21, 2014 (FCC 14-153).

Thank you for your attention to this matter. Should you have any questions, please feel free to contact me at 860-827-2951.

Sincerely,

Melanie Bachman  
Executive Director

MAB/CW

c: The Honorable Kevin M. Scarpati, Mayor, City of Meriden  
Ken Morgan, Interim City Manager, City of Meriden  
Robert Seale, Director of Development and Enforcement, City of Meriden



**Structural Analysis Report**

*105-ft Existing Watertank*

*AT&T Site #: CT1015*

*AT&T Site Name: Meriden North*

*Project: LTE Extended Carrier RRH Add*

*PACE #: MRCTB018760*

*PT #: NA*

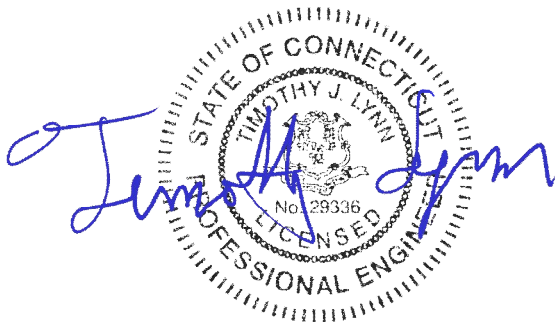
*FA #: 10035234*

*119 Empire Avenue  
Meriden, CT 06450*

*Centek Project No. 18000.64*

*Date: May 2, 2018*

*Max Stress Ratio = 70.5%*



**Prepared for:**

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

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## Introduction

The purpose of this report is to summarize the results of the non-linear, P- $\Delta$  structural analysis of the antenna upgrade proposed by AT&T Mobility on the existing water tank located in Meriden, Connecticut.

The host water tank is a 105-ft, 4-leg steel lattice water tank. Originally designed information was unavailable for use in this report. The tank geometry and structure member sizes were all obtained from a previous structural analysis report prepared by URS Corp. dated February 7, 2005. Foundation information was taken from foundation analysis conducted by Gibble Norden Champion Brown Consulting Engineers Inc., project no. 05060; dated May 31, 2005.

Additionally there is a 125-ft tall, four-section, eighteen sided, tapered monopole that runs vertically up through the center of the water tank. The monopole utilizes the same foundation as the water tank.

Antenna and appurtenance information were taken from an AT&T RF data sheet and visual verification conducted by Centek personnel from grade on May 2, 2018.

The water tank consists of four (4) steel pipe legs. Diagonal bracing consists of tension-only solid rounds. The tank tapers from a base width of 28.0-ft to 18-ft at its attachment to the tank wall.

## Antenna and Appurtenance Summary

- VERIZON (EXISTING – ON MONOPOLE):  
Antennas: Six (6) Antel LPA-80080-4CF panel antennas, nine (9) Andrew SBNHH-1D65B panel antennas, three (3) Alcatel-Lucent RRH4x30-B13 remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads, three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads and two (2) RFS DB-T1-6Z-8AB-0Z main distribution boxes mounted on a 13-ft low profile platform with a RAD center elevation of 125-ft above grade level  
Coax Cables: Twelve (12) 1-5/8"  $\varnothing$  coax cables and two (2) 1-5/8"  $\varnothing$  fiber cables running inside the monopole.
- T-MOBILE (EXISTING – ON MONOPOLE):  
Antennas: Six (6) Ericsson AIR21 panel antennas, three (3) Andrew LNX-6515DS panel antennas, three (3) TMA's and three (3) Ericsson RRUS-11 remote radio heads mounted on a low profile platform with a RAD center elevation of 115-ft above grade level.  
Coax Cables: Twelve (12) 1-5/8"  $\varnothing$  coax cables and one (1) 1-5/8"  $\varnothing$  fiber cable inside the monopole.
- SPRINT (EXISTING – ON WATER TANK):  
Antennas: Six (6) 6' panel antennas and nine (9) remote radio heads mounted to the water tank roof with a RAD center elevation of 105-ft above grade level.  
Coax Cables: Four (4) 1-1/4"  $\varnothing$  fiber cables running on a leg of the water tank.

- AT&T (EXISTING TO REMAIN – ON WATER TANK):  
Antennas: Six (6) KMW AM-X-CD-16-65-00T panel antennas, three (3) Kathrein 800-10121 panel antennas, two (2) 2-ft microwave dishes, three (3) Powerwave TT19-08BP111-001 TMAs, three (3) CCI DTMABP7819VG12A TMAs, three (3) Ericson RRUS-11 remote radio heads and one (1) surge arrester mounted on pipe masts to the water tank façade with a RAD center elevation of 97-ft above grade level.  
Coax Cables: Twelve (12) 7/8"  $\varnothing$  coax cables, (1) fiber cable and two (2) DC trunks running on a leg of the water tank.
- AT&T (EXISTING TO REMOVE – ON WATER TANK):  
Antennas: Three (3) Ericson RRUS-11 remote radio heads mounted on pipe masts to the water tank façade with a RAD center elevation of 97-ft above grade level.
- **AT&T (PROPOSED – ON WATER TANK):**  
**Antennas: Three (3) Ericson RRUS-12 remote radio heads mounted on pipe masts to the water tank façade with a RAD center elevation of 97-ft above grade level.**

### Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents 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, and the model assumes that the tower members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-G-2005 entitled “Structural Standard for Antenna Support Structures and Antennas”, the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix N of the CSBC<sup>1</sup> and the wind speed data available in the TIA-222-G-2005 Standard.

## Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 0.75” radial ice on the tower structure and its components.

|                   |  |   |
|-------------------|--|---|
| Basic Wind Speed: | New Haven; $v = 95-115$ mph (3-second gust)  | [Annex B of TIA-222-G-2005]               |
|                   | Meriden; $v = 97$ mph (3 second gust)  | [Appendix N of the 2016 CT Building Code] |
| Load Cases:       | <u>Load Case 1</u> ; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. | [Appendix N of the 2016 CT Building Code] |
|                   | <u>Load Case 2</u> ; 50 mph wind speed w/ 0.75” radial ice plus gravity load – used in calculation of tower stresses.    | [Annex B of TIA-222-G-2005]               |

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<sup>1</sup> The 2012 International Building Code as amended by the 2016 Connecticut State Building Code (CSBC).

## Capacity

Stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 4-8 of the TIA code.

- Calculated stresses were found to be within allowable limits. This tank was found to be at **70.5%** of its total capacity.

| Tower Section      | Elevation     | Stress Ratio<br>(percentage of capacity) | Result      |
|--------------------|---------------|--|-------------|
| Tank Leg (T1)      | 40.00'-85.00' | 23.3%                                    | <b>PASS</b> |
| Tank Diagonal (T1) | 40.00'-85.00' | 70.5%                                    | <b>PASS</b> |

## Foundation

The existing foundation consists of a four (4) 7-ft x 4-ft x 4-ft and one (1) 7-ft x 10-ft x 10-ft concrete piers bearing on a 50.0 square x 2.5-ft thick reinforced concrete mat. The existing foundation properties were obtained from the aforementioned GNCR design report; project no. 05060; dated May 31, 2005.

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

| Location | Vector      | Proposed Reactions |
|----------|-------------|--------------------|
| Base     | Shear       | 41 kips            |
|          | Compression | 133 kips           |
|          | Moment      | 2835 kip-ft        |

- The foundation was found to be within allowable limits.

| Foundation                       | Design Limit       | TIA-222-G Section<br>9.4 FS <sup>(1)</sup> | Proposed Loading<br>(FS) <sup>(1)</sup> | Result      |
|----------------------------------|--------------------|--|---|-------------|
| Reinforced Concrete Pad and Pier | OTM <sup>(2)</sup> | 1.0  | 8.6                                     | <b>PASS</b> |

Note 1: FS denotes Factor of Safety.

Note 2: OTM denotes Overturning Moment

**CEN TEK** Engineering, Inc.  
Structural Analysis – 105-ft Watertank  
AT&T Antenna Upgrade – CT1015  
Meriden, CT  
May 2, 2018

## Conclusion

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

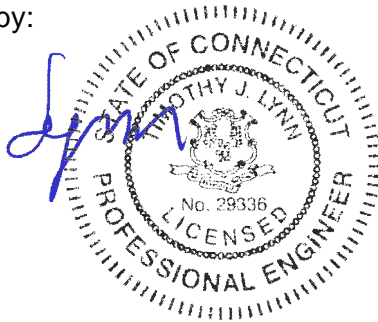
The analysis is based, in part, on the information provided to this office by AT&T. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE  
Structural Engineer



*CENTEK Engineering, Inc.*  
*Structural Analysis – 105-ft Watertank*  
*AT&T Antenna Upgrade – CT1015*  
*Meriden, CT*  
*May 2, 2018*

*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 uncorroded 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.

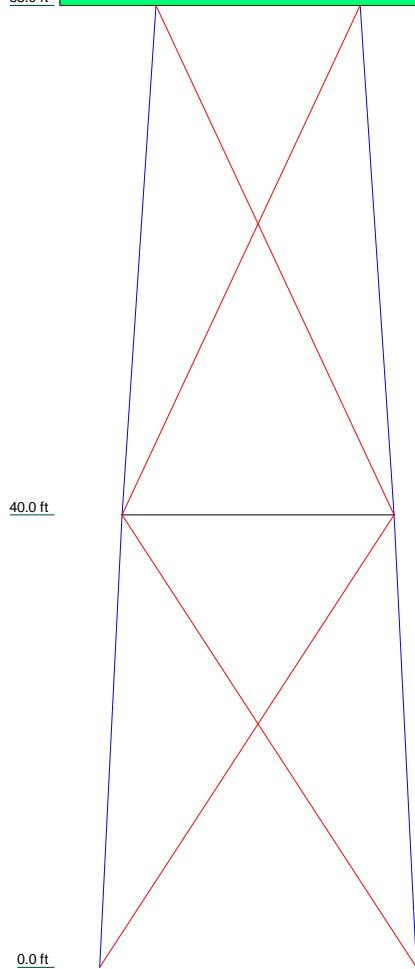
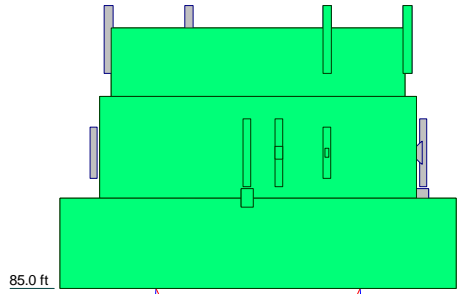
## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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         | T1 |         |          |  |  |  |  |  | 18 |  |  |      |
| Legs            |    | P22X1/4 |          |  |  |  |  |  |    |  |  |      |
| Leg Grade       |    | A36     |          |  |  |  |  |  |    |  |  |      |
| Diagonals       |    |         | SR 1 1/8 |  |  |  |  |  |    |  |  |      |
| Diagonal Grade  |    | A36     |          |  |  |  |  |  |    |  |  |      |
| Top Girts       |    | W8x24   |          |  |  |  |  |  |    |  |  |      |
| Face Width (ft) |    | 24      |          |  |  |  |  |  |    |  |  |      |
| # Panels @ (ft) |    |         | 1 @ 45   |  |  |  |  |  |    |  |  |      |
| Weight (K)      |    |         |          |  |  |  |  |  |    |  |  | 13.6 |



### DESIGNED APPURTENANCE LOADING

| TYPE                             | ELEVATION | TYPE                             | ELEVATION |
|----------------------------------|-----------|----------------------------------|-----------|
| (2) 6'x1' Panel Antenna (Sprint) | 107       | TT19-08BP111-001 TMA (ATI)       | 97        |
| (2) 6'x1' Panel Antenna (Sprint) | 107       | DTMABP7819VG12A TMA (ATI)        | 97        |
| (2) 6'x1' Panel Antenna (Sprint) | 107       | RRUS-11 (ATI)                    | 97        |
| (3) RRH2x40-07-L (Sprint)        | 107       | RRUS-12 (ATI - Proposed)         | 97        |
| (3) RRH2x40-07-L (Sprint)        | 107       | TT19-08BP111-001 TMA (ATI)       | 97        |
| (3) RRH2x40-07-L (Sprint)        | 107       | DTMABP7819VG12A TMA (ATI)        | 97        |
| Meriden Top Screening (ATI)      | 105       | RRUS-11 (ATI)                    | 97        |
| Meriden Tank (ATI)               | 97.5      | RRUS-12 (ATI - Proposed)         | 97        |
| AM-X-CD-16-65-00T-RET(72") (ATI) | 97        | 800-10121 (ATI)                  | 97        |
| 800-10121 (ATI)                  | 97        | AM-X-CD-16-65-00T-RET(72") (ATI) | 97        |
| AM-X-CD-16-65-00T-RET(72") (ATI) | 97        | 800-10121 (ATI)                  | 97        |
| AM-X-CD-16-65-00T-RET(72") (ATI) | 97        | AM-X-CD-16-65-00T-RET(72") (ATI) | 97        |
| TT19-08BP111-001 TMA (ATI)       | 97        | AM-X-CD-16-65-00T-RET(72") (ATI) | 97        |
| DTMABP7819VG12A TMA (ATI)        | 97        | 2-ft dish                        | 97        |
| RRUS-11 (ATI)                    | 97        | 2-ft dish                        | 97        |
| RRUS-12 (ATI - Proposed)         | 97        | Meriden Bot Screening (ATI)      | 89        |

### MATERIAL STRENGTH

| GRADE | Fy     | Fu     | GRADE | Fy | Fu |
|-------|--------|--------|-------|----|----|
| A36   | 36 ksi | 58 ksi |       |    |    |

### TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.

ALL #5. Tower Structure Class II.

ARE #6. Topographic Category 1 with Crest Height of 0.00 ft

7. TOWER RATING: 70.5%

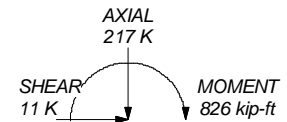
MAX. CORNER REACTIONS AT BASE:

DOWN: 105 K

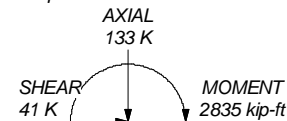
SHEAR: 8 K

UPLIFT: -46 K

SHEAR: 18 K



TORQUE 11 kip-ft  
50 mph WIND - 0.7500 in ICE



TORQUE 30 kip-ft  
REACTIONS - 97 mph WIND

|                                |  |   |                |
|--------------------------------|--|---|----------------|
| <b>Centek Engineering Inc.</b> |  | Job: <b>18000.64 - CT1015</b>                                 |                |
| 63-2 North Branford Rd.        |  | Project: <b>105' Watertank - 119 Empire Ave., Meriden, CT</b> |                |
| Branford, CT 06405             |  | Client: AT&T  | Drawn by: TJL  |
| Phone: (203) 488-0580          |  | Code: TIA-222-G   | Date: 05/02/18 |
| FAX: (203) 488-8587            |  | Path:   | Scale: NTS     |
|                                |  |   | Dwg No. E-1    |

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>1 of 21           |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

## Tower Input Data

The main tower is a 4x free standing tower with an overall height of 85.00 ft above the ground line.

The base of the tower is set at an elevation of 0.00 ft above the ground line.

The face width of the tower is 18.00 ft at the top and 28.00 ft at the base.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Basic wind speed of 97 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Tension only take-up is 0.0313 in.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

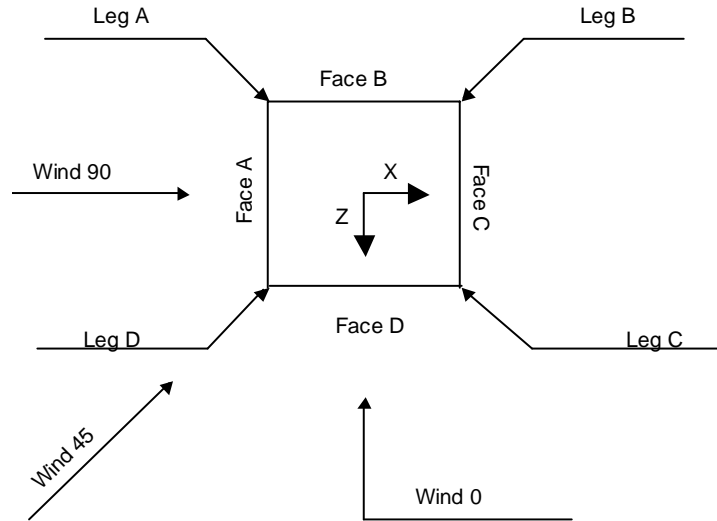
Stress ratio used in tower member design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

|                                     |                                      |   |
|-------------------------------------|--------------------------------------|---|
| Consider Moments - Legs             | Distribute Leg Loads As Uniform      | Use ASCE 10 X-Brace Ly Rules            |
| Consider Moments - Horizontals      | Assume Legs Pinned                   | Calculate Redundant Bracing Forces      |
| Consider Moments - Diagonals        | √ Assume Rigid Index Plate           | Ignore Redundant Members in FEA         |
| Use Moment Magnification            | Use Clear Spans For Wind Area        | SR Leg Bolts Resist Compression         |
| √ Use Code Stress Ratios            | Use Clear Spans For KL/r             | All Leg Panels Have Same Allowable      |
| √ Use Code Safety Factors - Guys    | Retension Guys To Initial Tension    | Offset Girt At Foundation               |
| Escalate Ice                        | Bypass Mast Stability Checks         | √ Consider Feed Line Torque             |
| Always Use Max Kz                   | Use Azimuth Dish Coefficients        | Include Angle Block Shear Check         |
| Use Special Wind Profile            | √ Project Wind Area of Appurt.       | Use TIA-222-G Bracing Resist. Exemption |
| Include Bolts In Member Capacity    | Autocalc Torque Arm Areas            | Use TIA-222-G Tension Splice Exemption  |
| Leg Bolts Are At Top Of Section     | Add IBC .6D+W Combination            | Poles                                   |
| Secondary Horizontal Braces Leg     | √ Sort Capacity Reports By Component | Include Shear-Torsion Interaction       |
| Use Diamond Inner Bracing (4 Sided) | Triangulate Diamond Inner Bracing    | Always Use Sub-Critical Flow            |
| SR Members Have Cut Ends            | Treat Feed Line Bundles As Cylinder  | Use Top Mounted Sockets                 |
| SR Members Are Concentric           |                                      |   |

|  |   |                                  |
|--|---|----------------------------------|
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|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJJ        |



**Square Tower**

**Tower Section Geometry**

| Tower Section | Tower Elevation | Assembly Database | Description | Section Width | Number of Sections | Section Length |
|---------------|-----------------|-------------------|-------------|---------------|--------------------|----------------|
|               | <i>ft</i>       |                   |             | <i>ft</i>     |                    | <i>ft</i>      |
| T1            | 85.00-40.00     |                   |             | 18.00         | 1                  | 45.00          |
| T2            | 40.00-0.00      |                   |             | 24.00         | 1                  | 40.00          |

**Tower Section Geometry (cont'd)**

| Tower Section | Tower Elevation | Diagonal Spacing | Bracing Type | Has K Brace End Panels | Has Horizontals | Top Girt Offset | Bottom Girt Offset |
|---------------|-----------------|------------------|--------------|------------------------|-----------------|-----------------|--------------------|
|               | <i>ft</i>       | <i>ft</i>        |              |                        |                 | <i>in</i>       | <i>in</i>          |
| T1            | 85.00-40.00     | 45.00            | TX Brace     | No                     | Yes             | 0.0000          | 0.0000             |
| T2            | 40.00-0.00      | 40.00            | TX Brace     | No                     | Yes             | 0.0000          | 0.0000             |

**Tower Section Geometry (cont'd)**

| Tower Elevation | Leg Type | Leg Size | Leg Grade       | Diagonal Type | Diagonal Size | Diagonal Grade  |
|-----------------|----------|----------|-----------------|---------------|---------------|-----------------|
| <i>ft</i>       |          |          |                 |               |               |                 |
| T1 85.00-40.00  | Pipe     | P22x1/4  | A36<br>(36 ksi) | Solid Round   | 1 1/8         | A36<br>(36 ksi) |
| T2 40.00-0.00   | Pipe     | P22x1/4  | A36<br>(36 ksi) | Solid Round   | 1 1/4         | A36<br>(36 ksi) |



|  |   |                                  |
|--|---|----------------------------------|
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### Tower Section Geometry (cont'd)

| Tower Elevation<br>ft | Top Girt Type | Top Girt Size | Top Girt Grade  | Bottom Girt Type | Bottom Girt Size | Bottom Girt Grade |
|-----------------------|---------------|---------------|-----------------|------------------|------------------|-------------------|
| T1 85.00-40.00        | Wide Flange   | W8x24         | A36<br>(36 ksi) | Flat Bar         |                  | A36<br>(36 ksi)   |
| T2 40.00-0.00         | Wide Flange   | W8x24         | A36<br>(36 ksi) | Flat Bar         |                  | A36<br>(36 ksi)   |

### Tower Section Geometry (cont'd)

| Tower Elevation<br>ft | No. of Mid Girts | Mid Girt Type | Mid Girt Size | Mid Girt Grade  | Horizontal Type | Horizontal Size | Horizontal Grade    |
|-----------------------|------------------|---------------|---------------|-----------------|-----------------|-----------------|---------------------|
| T1 85.00-40.00        | None             | Flat Bar      |               | A36<br>(36 ksi) | Solid Round     | 5/16            | A572-50<br>(50 ksi) |
| T2 40.00-0.00         | None             | Flat Bar      |               | A36<br>(36 ksi) | Solid Round     | 5/16            | A572-50<br>(50 ksi) |

### Tower Section Geometry (cont'd)

| Tower Elevation<br>ft | Gusset Area<br>(per face)<br>ft <sup>2</sup> | Gusset Thickness<br>in | Gusset Grade    | Adjust. Factor<br>A <sub>f</sub> | Adjust. Factor<br>A <sub>r</sub> | Weight Mult. | Double Angle<br>Stitch Bolt<br>Spacing<br>Diagonals<br>in | Double Angle<br>Stitch Bolt<br>Spacing<br>Horizontals<br>in | Double Angle<br>Stitch Bolt<br>Spacing<br>Redundants<br>in |
|-----------------------|--|------------------------|-----------------|----------------------------------|----------------------------------|--------------|---|---|--|
| T1 85.00-40.00        | 0.00   | 0.0000                 | A36<br>(36 ksi) | 1                                | 1                                | 1            | 36.0000   | 36.0000   | 36.0000  |
| T2 40.00-0.00         | 0.00   | 0.0000                 | A36<br>(36 ksi) | 1                                | 1                                | 1            | 36.0000   | 36.0000   | 36.0000  |

### Tower Section Geometry (cont'd)

| Tower Elevation<br>ft | Calc K<br>Single Angles | Calc K<br>Solid Rounds | Legs | K Factors <sup>1</sup>        |                               |                           |                 |                  |                          |                          |   |   |
|-----------------------|-------------------------|------------------------|------|-------------------------------|-------------------------------|---------------------------|-----------------|------------------|--------------------------|--------------------------|---|---|
|                       |                         |                        |      | X<br>Brace<br>Diags<br>X<br>Y | K<br>Brace<br>Diags<br>X<br>Y | Single<br>Diags<br>X<br>Y | Girts<br>X<br>Y | Horiz.<br>X<br>Y | Sec.<br>Horiz.<br>X<br>Y | Inner<br>Brace<br>X<br>Y |   |   |
|                       |                         |                        |      |                               |                               |                           |                 |                  |                          |                          | X | Y |
| T1 85.00-40.00        | No                      | No                     | 1    | 1                             | 1                             | 1                         | 1               | 1                | 1                        | 1                        | 1 | 1 |
| T2 40.00-0.00         | No                      | No                     | 1    | 1                             | 1                             | 1                         | 1               | 1                | 1                        | 1                        | 1 | 1 |

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

|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
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### Tower Section Geometry (cont'd)

| Tower Elevation<br>ft | Leg                       |   | Diagonal                  |      | Top Girt                  |      | Bottom Girt                  |      | Mid Girt                     |      | Long Horizontal              |      | Short Horizontal             |      |
|-----------------------|---------------------------|---|---------------------------|------|---------------------------|------|------------------------------|------|------------------------------|------|------------------------------|------|------------------------------|------|
|                       | Net Width<br>Deduct<br>in | U | Net Width<br>Deduct<br>in | U    | Net Width<br>Deduct<br>in | U    | Net<br>Width<br>Deduct<br>in | U    | Net<br>Width<br>Deduct<br>in | U    | Net<br>Width<br>Deduct<br>in | U    | Net<br>Width<br>Deduct<br>in | U    |
| T1 85.00-40.00        | 0.0000                    | 1 | 0.0000                    | 0.75 | 0.0000                    | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 |
| T2 40.00-0.00         | 0.0000                    | 1 | 0.0000                    | 0.75 | 0.0000                    | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 | 0.0000                       | 0.75 |

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

| Description                     | Face<br>or<br>Leg | Allow<br>Shield | Component<br>Type | Placement<br>ft | Face<br>Offset<br>in | Lateral<br>Offset<br>(Frac FW) | #  | #<br>Per<br>Row | Clear<br>Spacing<br>in | Width or<br>Diameter<br>in | Perimeter<br>in | Weight<br>plf |
|---------------------------------|-------------------|-----------------|-------------------|-----------------|----------------------|--------------------------------|----|-----------------|------------------------|----------------------------|-----------------|---------------|
| HYBRIFLEX<br>1-1/4"<br>(Sprint) | A                 | No              | Ar (CaAa)         | 85.00 - 0.00    | 0.0000               | 0.45                           | 4  | 4               | 1.5400                 | 1.5400                     |                 | 1.30          |
| 7/8<br>(AT&T)                   | B                 | No              | Ar (CaAa)         | 85.00 - 0.00    | 0.0000               | 0.45                           | 12 | 12              | 1.1100                 | 1.1100                     |                 | 0.54          |
| DC Trunk<br>(AT&T)              | B                 | No              | Ar (CaAa)         | 85.00 - 0.00    | 0.0000               | 0.45                           | 2  | 2               | 0.4000                 | 0.4000                     |                 | 0.11          |
| Fiber Trunk<br>(AT&T)           | B                 | No              | Ar (CaAa)         | 85.00 - 0.00    | 0.0000               | 0.45                           | 1  | 1               | 0.4000                 | 0.4000                     |                 | 1.00          |

### Feed Line/Linear Appurtenances Section Areas

| Tower<br>Section | Tower<br>Elevation<br>ft | Face | A <sub>R</sub><br>ft <sup>2</sup> | A <sub>F</sub><br>ft <sup>2</sup> | C <sub>A</sub> A <sub>A</sub><br>In Face<br>ft <sup>2</sup> | C <sub>A</sub> A <sub>A</sub><br>Out Face<br>ft <sup>2</sup> | Weight<br>K |
|------------------|--------------------------|------|-----------------------------------|-----------------------------------|---|--|-------------|
| T1               | 85.00-40.00              | A    | 0.000                             | 0.000                             | 27.720  | 0.000  | 0.23        |
|                  |                          | B    | 0.000                             | 0.000                             | 65.340  | 0.000  | 0.35        |
|                  |                          | C    | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
|                  |                          | D    | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
| T2               | 40.00-0.00               | A    | 0.000                             | 0.000                             | 24.640  | 0.000  | 0.21        |
|                  |                          | B    | 0.000                             | 0.000                             | 58.080  | 0.000  | 0.31        |
|                  |                          | C    | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
|                  |                          | D    | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |

### Feed Line/Linear Appurtenances Section Areas - With Ice

| Tower<br>Section | Tower<br>Elevation<br>ft | Face<br>or<br>Leg | Ice<br>Thickness<br>in | A <sub>R</sub><br>ft <sup>2</sup> | A <sub>F</sub><br>ft <sup>2</sup> | C <sub>A</sub> A <sub>A</sub><br>In Face<br>ft <sup>2</sup> | C <sub>A</sub> A <sub>A</sub><br>Out Face<br>ft <sup>2</sup> | Weight<br>K |
|------------------|--------------------------|-------------------|------------------------|-----------------------------------|-----------------------------------|---|--|-------------|
| T1               | 85.00-40.00              | A                 | 1.599                  | 0.000                             | 0.000                             | 83.019  | 0.000  | 1.18        |
|                  |                          | B                 |                        | 0.000                             | 0.000                             | 211.553   | 0.000  | 2.64        |

|  |   |                                  |
|--|---|----------------------------------|
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| Tower Section | Tower Elevation<br>ft | Face or Leg | Ice Thickness<br>in | A <sub>R</sub><br>ft <sup>2</sup> | A <sub>F</sub><br>ft <sup>2</sup> | C <sub>AA</sub><br>In Face<br>ft <sup>2</sup> | C <sub>AA</sub><br>Out Face<br>ft <sup>2</sup> | Weight<br>K |
|---------------|-----------------------|-------------|---------------------|-----------------------------------|-----------------------------------|---|--|-------------|
|               |                       | C           |                     | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
|               |                       | D           |                     | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
| T2            | 40.00-0.00            | A           | 1.427               | 0.000                             | 0.000                             | 71.619  | 0.000  | 0.96        |
|               |                       | B           |                     | 0.000                             | 0.000                             | 182.296                                       | 0.000  | 2.12        |
|               |                       | C           |                     | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |
|               |                       | D           |                     | 0.000                             | 0.000                             | 0.000   | 0.000  | 0.00        |

### Feed Line Center of Pressure

| Section | Elevation<br>ft | CP <sub>X</sub><br>in | CP <sub>Z</sub><br>in | CP <sub>X</sub><br>Ice<br>in | CP <sub>Z</sub><br>Ice<br>in |
|---------|-----------------|-----------------------|-----------------------|------------------------------|------------------------------|
| T1      | 85.00-40.00     | 3.4779                | -10.1875              | 5.4127                       | -12.3633                     |
| T2      | 40.00-0.00      | 4.1982                | -12.2774              | 6.6255                       | -15.2361                     |

### Shielding Factor Ka

| Tower Section | Feed Line Record No. | Description      | Feed Line Segment Elev. | K <sub>a</sub><br>No Ice | K <sub>a</sub><br>Ice |
|---------------|----------------------|------------------|-------------------------|--------------------------|-----------------------|
| T1            | 1                    | HYBRIFLEX 1-1/4" | 40.00 - 85.00           | 1.0000                   | 1.0000                |
| T1            | 2                    | 7/8              | 40.00 - 85.00           | 1.0000                   | 1.0000                |
| T1            | 3                    | DC Trunk         | 40.00 - 85.00           | 1.0000                   | 1.0000                |
| T1            | 4                    | Fiber Trunk      | 40.00 - 85.00           | 1.0000                   | 1.0000                |
| T2            | 1                    | HYBRIFLEX 1-1/4" | 0.00 - 40.00            | 1.0000                   | 1.0000                |
| T2            | 2                    | 7/8              | 0.00 - 40.00            | 1.0000                   | 1.0000                |
| T2            | 3                    | DC Trunk         | 0.00 - 40.00            | 1.0000                   | 1.0000                |
| T2            | 4                    | Fiber Trunk      | 0.00 - 40.00            | 1.0000                   | 1.0000                |

### Discrete Tower Loads

| Description                     | Face or Leg | Offset Type | Offsets:<br>Horz<br>Lateral<br>Vert<br>ft<br>ft<br>ft | Azimuth Adjustment<br>° | Placement<br>ft | C <sub>AA</sub><br>Front<br>ft <sup>2</sup> | C <sub>AA</sub><br>Side<br>ft <sup>2</sup> | Weight<br>K |       |
|---------------------------------|-------------|-------------|---|-------------------------|-----------------|---|--|-------------|-------|
| Meriden Top Screening<br>(AT&T) | C           | None        |   | 0.0000                  | 105.00          | No Ice                                      | 78.00                                      | 78.00       | 2.50  |
|                                 |             |             |   |                         |                 | 1/2" Ice                                    | 111.07                                     | 111.07      | 6.14  |
|                                 |             |             |   |                         |                 | 1" Ice                                      | 112.95                                     | 112.95      | 9.81  |
| Meriden Tank<br>(AT&T)          | C           | None        |   | 0.0000                  | 97.50           | No Ice                                      | 126.00                                     | 126.00      | 75.00 |
|                                 |             |             |   |                         |                 | 1/2" Ice                                    | 178.56                                     | 178.56      | 79.74 |
|                                 |             |             |   |                         |                 | 1" Ice                                      | 180.74                                     | 180.74      | 84.52 |
| Meriden Bot Screening           | C           | None        |   | 0.0000                  | 89.00           | No Ice                                      | 140.00                                     | 140.00      | 4.00  |

|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
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| Description                 | Face or Leg | Offset Type | Offsets: |      | Azimuth Adjustment | Placement | C <sub>AA</sub> Front | C <sub>AA</sub> Side | Weight |
|-----------------------------|-------------|-------------|----------|------|--------------------|-----------|-----------------------|----------------------|--------|
|                             |             |             | Horz     | Vert |                    |           |                       |                      |        |
|                             |             |             | ft       | ft   | °                  | ft        | ft <sup>2</sup>       | ft <sup>2</sup>      | K      |
| (AT&T)                      |             |             |          |      |                    | 1/2" Ice  | 198.51                | 198.51               | 10.57  |
|                             |             |             |          |      |                    | 1" Ice    | 201.04                | 201.04               | 17.18  |
| 800-10121                   | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 5.16                  | 3.29                 | 0.05   |
| (AT&T)                      |             |             | -6.00    |      |                    | 1/2" Ice  | 5.51                  | 3.64                 | 0.08   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 5.87                  | 3.99                 | 0.12   |
| AM-X-CD-16-65-00T-RET(7 2") | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 2.00     |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| AM-X-CD-16-65-00T-RET(7 2") | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| 800-10121                   | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 5.16                  | 3.29                 | 0.05   |
| (AT&T)                      |             |             | -6.00    |      |                    | 1/2" Ice  | 5.51                  | 3.64                 | 0.08   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 5.87                  | 3.99                 | 0.12   |
| AM-X-CD-16-65-00T-RET(7 2") | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 2.00     |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| AM-X-CD-16-65-00T-RET(7 2") | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| 800-10121                   | C           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 5.16                  | 3.29                 | 0.05   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 5.51                  | 3.64                 | 0.08   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 5.87                  | 3.99                 | 0.12   |
| AM-X-CD-16-65-00T-RET(7 2") | C           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 12.00    |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| AM-X-CD-16-65-00T-RET(7 2") | C           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 8.02                  | 4.64                 | 0.05   |
| (AT&T)                      |             |             | 16.00    |      |                    | 1/2" Ice  | 8.48                  | 5.09                 | 0.10   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 8.94                  | 5.54                 | 0.15   |
| TT19-08BP111-001 TMA        | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 0.55                  | 0.45                 | 0.02   |
| (AT&T)                      |             |             | -6.00    |      |                    | 1/2" Ice  | 0.65                  | 0.53                 | 0.02   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 0.75                  | 0.63                 | 0.03   |
| DTMABP7819VG12A TMA         | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 1.36                  | 0.51                 | 0.02   |
| (AT&T)                      |             |             | 2.00     |      |                    | 1/2" Ice  | 1.51                  | 0.61                 | 0.03   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 1.66                  | 0.72                 | 0.04   |
| RRUS-11                     | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 2.57                  | 1.07                 | 0.05   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 2.76                  | 1.21                 | 0.07   |
|                             |             |             | -4.00    |      |                    | 1" Ice    | 2.97                  | 1.36                 | 0.09   |
| RRUS-12                     | A           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 3.15                  | 1.29                 | 0.06   |
| (AT&T - Proposed)           |             |             | 6.00     |      |                    | 1/2" Ice  | 3.36                  | 1.44                 | 0.08   |
|                             |             |             | -4.00    |      |                    | 1" Ice    | 3.59                  | 1.60                 | 0.11   |
| TT19-08BP111-001 TMA        | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 0.55                  | 0.45                 | 0.02   |
| (AT&T)                      |             |             | -6.00    |      |                    | 1/2" Ice  | 0.65                  | 0.53                 | 0.02   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 0.75                  | 0.63                 | 0.03   |
| DTMABP7819VG12A TMA         | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 1.36                  | 0.51                 | 0.02   |
| (AT&T)                      |             |             | 2.00     |      |                    | 1/2" Ice  | 1.51                  | 0.61                 | 0.03   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 1.66                  | 0.72                 | 0.04   |
| RRUS-11                     | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 2.57                  | 1.07                 | 0.05   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 2.76                  | 1.21                 | 0.07   |
|                             |             |             | -4.00    |      |                    | 1" Ice    | 2.97                  | 1.36                 | 0.09   |
| RRUS-12                     | B           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 3.15                  | 1.29                 | 0.06   |
| (AT&T - Proposed)           |             |             | 6.00     |      |                    | 1/2" Ice  | 3.36                  | 1.44                 | 0.08   |
|                             |             |             | -4.00    |      |                    | 1" Ice    | 3.59                  | 1.60                 | 0.11   |
| TT19-08BP111-001 TMA        | C           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 0.55                  | 0.45                 | 0.02   |
| (AT&T)                      |             |             | 6.00     |      |                    | 1/2" Ice  | 0.65                  | 0.53                 | 0.02   |
|                             |             |             | 0.00     |      |                    | 1" Ice    | 0.75                  | 0.63                 | 0.03   |
| DTMABP7819VG12A TMA         | C           | From Leg    | 3.00     |      | 0.0000             | No Ice    | 1.36                  | 0.51                 | 0.02   |

|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b>        | 7 of 21           |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  | <b>Designed by</b> | TJL               |

| Description             | Face or Leg | Offset Type | Offsets:     |      | Azimuth Adjustment | Placement | C <sub>AA</sub> Front | C <sub>AA</sub> Side | Weight |
|-------------------------|-------------|-------------|--------------|------|--------------------|-----------|-----------------------|----------------------|--------|
|                         |             |             | Horz Lateral | Vert |                    |           |                       |                      |        |
|                         |             |             | ft           | ft   | °                  | ft        | ft <sup>2</sup>       | ft <sup>2</sup>      | K      |
| (AT&T)                  |             |             | 12.00        |      |                    | 1/2" Ice  | 1.51                  | 0.61                 | 0.03   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 1.66                  | 0.72                 | 0.04   |
| RRUS-11                 | C           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 2.57                  | 1.07                 | 0.05   |
| (AT&T)                  |             |             | 16.00        |      |                    | 1/2" Ice  | 2.76                  | 1.21                 | 0.07   |
|                         |             |             | -4.00        |      |                    | 1" Ice    | 2.97                  | 1.36                 | 0.09   |
| RRUS-12                 | C           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 3.15                  | 1.29                 | 0.06   |
| (AT&T - Proposed)       |             |             | 16.00        |      |                    | 1/2" Ice  | 3.36                  | 1.44                 | 0.08   |
|                         |             |             | -4.00        |      |                    | 1" Ice    | 3.59                  | 1.60                 | 0.11   |
| (2) 6'x1' Panel Antenna | A           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |
| (2) 6'x1' Panel Antenna | B           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |
| (2) 6'x1' Panel Antenna | C           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |
| (3) RRH2x40-07-L        | A           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |
| (3) RRH2x40-07-L        | B           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |
| (3) RRH2x40-07-L        | C           | From Leg    | 3.00         |      | 0.0000             | No Ice    | 8.13                  | 3.53                 | 0.04   |
| (Sprint)                |             |             | 0.00         |      |                    | 1/2" Ice  | 8.59                  | 3.97                 | 0.08   |
|                         |             |             | 0.00         |      |                    | 1" Ice    | 9.05                  | 4.41                 | 0.13   |

### Dishes

| Description | Face or Leg | Dish Type             | Offset Type | Offsets:     |      | Azimuth Adjustment | 3 dB Beam Width | Elevation | Outside Diameter | Aperture Area | Weight |      |
|-------------|-------------|-----------------------|-------------|--------------|------|--------------------|-----------------|-----------|------------------|---------------|--------|------|
|             |             |                       |             | Horz Lateral | Vert |                    |                 |           |                  |               |        |      |
|             |             |                       | ft          | ft           | °    | °                  | ft              | ft        | ft <sup>2</sup>  | K             |        |      |
| 2-ft dish   | A           | Paraboloid w/o Radome | From Face   | 3.00         |      | Worst              |                 | 97.00     | 2.00             | No Ice        | 3.14   | 0.05 |
|             |             |                       |             | 0.00         |      |                    |                 |           |                  | 1/2" Ice      | 3.41   | 0.08 |
|             |             |                       |             | 0.00         |      |                    |                 |           |                  | 1" Ice        | 3.68   | 0.10 |
| 2-ft dish   | B           | Paraboloid w/o Radome | From Leg    | 3.00         |      | Worst              |                 | 97.00     | 2.00             | No Ice        | 3.14   | 0.05 |
|             |             |                       |             | 5.00         |      |                    |                 |           |                  | 1/2" Ice      | 3.41   | 0.08 |
|             |             |                       |             | 0.00         |      |                    |                 |           |                  | 1" Ice        | 3.68   | 0.10 |

### Tower Pressures - No Ice

$$G_H = 0.850$$



|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b>        | 9 of 21           |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  | <b>Designed by</b> | TJL               |

| Section Elevation<br>ft | Add Weight<br>K | Self Weight<br>K | F a c e | e     | C <sub>F</sub> | q <sub>z</sub><br>psf | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub><br>ft <sup>2</sup> | F<br>K | w<br>plf | Ctrl. Face |
|-------------------------|-----------------|------------------|---------|-------|----------------|-----------------------|----------------|----------------|-----------------------------------|--------|----------|------------|
| T1<br>85.00-40.00       | 0.58            | 13.59            | A       | 0.182 | 3.059          | 23                    | 1              | 1              | 89.420                            | 7.31   | 162.53   | D          |
|                         |                 |                  | B       | 0.182 | 3.059          |                       | 1              | 1              | 89.420                            |        |          |            |
|                         |                 |                  | C       | 0.182 | 3.059          |                       | 1              | 1              | 89.420                            |        |          |            |
|                         |                 |                  | D       | 0.182 | 3.059          |                       | 1              | 1              | 89.420                            |        |          |            |
| T2 40.00-0.00           | 0.52            | 13.23            | A       | 0.155 | 3.181          | 18                    | 1              | 1              | 83.468                            | 5.46   | 136.62   | D          |
|                         |                 |                  | B       | 0.155 | 3.181          |                       | 1              | 1              | 83.468                            |        |          |            |
|                         |                 |                  | C       | 0.155 | 3.181          |                       | 1              | 1              | 83.468                            |        |          |            |
|                         |                 |                  | D       | 0.155 | 3.181          |                       | 1              | 1              | 83.468                            |        |          |            |
| Sum Weight:             | 1.10            | 26.82            |         |       |                |                       |                | OTM            | 566.42<br>kip-ft                  | 12.78  |          |            |

**Tower Forces - No Ice - Wind 45 To Face**

| Section Elevation<br>ft | Add Weight<br>K | Self Weight<br>K | F a c e | e     | C <sub>F</sub> | q <sub>z</sub><br>psf | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub><br>ft <sup>2</sup> | F<br>K | w<br>plf | Ctrl. Face |
|-------------------------|-----------------|------------------|---------|-------|----------------|-----------------------|----------------|----------------|-----------------------------------|--------|----------|------------|
| T1<br>85.00-40.00       | 0.58            | 13.59            | A       | 0.182 | 3.059          | 23                    | 1.136          | 1.136          | 101.621                           | 8.06   | 179.08   | D          |
|                         |                 |                  | B       | 0.182 | 3.059          |                       | 1.136          | 1.136          | 101.621                           |        |          |            |
|                         |                 |                  | C       | 0.182 | 3.059          |                       | 1.136          | 1.136          | 101.621                           |        |          |            |
|                         |                 |                  | D       | 0.182 | 3.059          |                       | 1.136          | 1.136          | 101.621                           |        |          |            |
| T2 40.00-0.00           | 0.52            | 13.23            | A       | 0.155 | 3.181          | 18                    | 1.116          | 1.116          | 93.185                            | 5.95   | 148.75   | D          |
|                         |                 |                  | B       | 0.155 | 3.181          |                       | 1.116          | 1.116          | 93.185                            |        |          |            |
|                         |                 |                  | C       | 0.155 | 3.181          |                       | 1.116          | 1.116          | 93.185                            |        |          |            |
|                         |                 |                  | D       | 0.155 | 3.181          |                       | 1.116          | 1.116          | 93.185                            |        |          |            |
| Sum Weight:             | 1.10            | 26.82            |         |       |                |                       |                | OTM            | 622.65<br>kip-ft                  | 14.01  |          |            |

**Tower Forces - With Ice - Wind Normal To Face**

| Section Elevation<br>ft | Add Weight<br>K | Self Weight<br>K | F a c e | e     | C <sub>F</sub> | q <sub>z</sub><br>psf | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub><br>ft <sup>2</sup> | F<br>K | w<br>plf | Ctrl. Face |
|-------------------------|-----------------|------------------|---------|-------|----------------|-----------------------|----------------|----------------|-----------------------------------|--------|----------|------------|
| T1<br>85.00-40.00       | 3.82            | 25.71            | A       | 0.233 | 2.842          | 6                     | 1              | 1              | 145.806                           | 3.76   | 83.51    | D          |
|                         |                 |                  | B       | 0.233 | 2.842          |                       | 1              | 1              | 145.806                           |        |          |            |
|                         |                 |                  | C       | 0.233 | 2.842          |                       | 1              | 1              | 145.806                           |        |          |            |
|                         |                 |                  | D       | 0.233 | 2.842          |                       | 1              | 1              | 145.806                           |        |          |            |
| T2 40.00-0.00           | 3.08            | 23.52            | A       | 0.196 | 2.996          | 5                     | 1              | 1              | 133.188                           | 2.72   | 68.08    | D          |
|                         |                 |                  | B       | 0.196 | 2.996          |                       | 1              | 1              | 133.188                           |        |          |            |
|                         |                 |                  | C       | 0.196 | 2.996          |                       | 1              | 1              | 133.188                           |        |          |            |
|                         |                 |                  | D       | 0.196 | 2.996          |                       | 1              | 1              | 133.188                           |        |          |            |
| Sum Weight:             | 6.89            | 49.23            |         |       |                |                       |                | OTM            | 289.35<br>kip-ft                  | 6.48   |          |            |

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>10 of 21          |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

**Tower Forces - With Ice - Wind 45 To Face**

| Section Elevation | Add Weight | Self Weight | F a c e | e     | C <sub>F</sub> | q <sub>z</sub> | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub>   | F    | w     | Ctrl. Face |
|-------------------|------------|-------------|---------|-------|----------------|----------------|----------------|----------------|------------------|------|-------|------------|
| ft                | K          | K           |         |       |                | psf            |                |                | ft <sup>2</sup>  | K    | plf   |            |
| T1<br>85.00-40.00 | 3.82       | 25.71       | A       | 0.233 | 2.842          | 6              | 1.175          | 1.175          | 171.297          | 4.14 | 92.05 | D          |
|                   |            |             | B       | 0.233 | 2.842          |                | 1.175          | 1.175          | 171.297          |      |       |            |
|                   |            |             | C       | 0.233 | 2.842          |                | 1.175          | 1.175          | 171.297          |      |       |            |
|                   |            |             | D       | 0.233 | 2.842          |                | 1.175          | 1.175          | 171.297          |      |       |            |
| T2 40.00-0.00     | 3.08       | 23.52       | A       | 0.196 | 2.996          | 5              | 1.147          | 1.147          | 152.787          | 2.97 | 74.20 | D          |
|                   |            |             | B       | 0.196 | 2.996          |                | 1.147          | 1.147          | 152.787          |      |       |            |
|                   |            |             | C       | 0.196 | 2.996          |                | 1.147          | 1.147          | 152.787          |      |       |            |
|                   |            |             | D       | 0.196 | 2.996          |                | 1.147          | 1.147          | 152.787          |      |       |            |
| Sum Weight:       | 6.89       | 49.23       |         |       |                |                |                | OTM            | 318.25<br>kip-ft | 7.11 |       |            |

**Tower Forces - Service - Wind Normal To Face**

| Section Elevation | Add Weight | Self Weight | F a c e | e     | C <sub>F</sub> | q <sub>z</sub> | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub>   | F    | w     | Ctrl. Face |
|-------------------|------------|-------------|---------|-------|----------------|----------------|----------------|----------------|------------------|------|-------|------------|
| ft                | K          | K           |         |       |                | psf            |                |                | ft <sup>2</sup>  | K    | plf   |            |
| T1<br>85.00-40.00 | 0.58       | 13.59       | A       | 0.182 | 3.059          | 9              | 1              | 1              | 89.420           | 2.80 | 62.19 | D          |
|                   |            |             | B       | 0.182 | 3.059          |                | 1              | 1              | 89.420           |      |       |            |
|                   |            |             | C       | 0.182 | 3.059          |                | 1              | 1              | 89.420           |      |       |            |
|                   |            |             | D       | 0.182 | 3.059          |                | 1              | 1              | 89.420           |      |       |            |
| T2 40.00-0.00     | 0.52       | 13.23       | A       | 0.155 | 3.181          | 7              | 1              | 1              | 83.468           | 2.09 | 52.27 | D          |
|                   |            |             | B       | 0.155 | 3.181          |                | 1              | 1              | 83.468           |      |       |            |
|                   |            |             | C       | 0.155 | 3.181          |                | 1              | 1              | 83.468           |      |       |            |
|                   |            |             | D       | 0.155 | 3.181          |                | 1              | 1              | 83.468           |      |       |            |
| Sum Weight:       | 1.10       | 26.82       |         |       |                |                |                | OTM            | 216.72<br>kip-ft | 4.89 |       |            |

**Tower Forces - Service - Wind 45 To Face**

| Section Elevation | Add Weight | Self Weight | F a c e | e     | C <sub>F</sub> | q <sub>z</sub> | D <sub>F</sub> | D <sub>R</sub> | A <sub>E</sub>   | F    | w     | Ctrl. Face |
|-------------------|------------|-------------|---------|-------|----------------|----------------|----------------|----------------|------------------|------|-------|------------|
| ft                | K          | K           |         |       |                | psf            |                |                | ft <sup>2</sup>  | K    | plf   |            |
| T1<br>85.00-40.00 | 0.58       | 13.59       | A       | 0.182 | 3.059          | 9              | 1.136          | 1.136          | 101.621          | 3.08 | 68.52 | D          |
|                   |            |             | B       | 0.182 | 3.059          |                | 1.136          | 1.136          | 101.621          |      |       |            |
|                   |            |             | C       | 0.182 | 3.059          |                | 1.136          | 1.136          | 101.621          |      |       |            |
|                   |            |             | D       | 0.182 | 3.059          |                | 1.136          | 1.136          | 101.621          |      |       |            |
| T2 40.00-0.00     | 0.52       | 13.23       | A       | 0.155 | 3.181          | 7              | 1.116          | 1.116          | 93.185           | 2.28 | 56.91 | D          |
|                   |            |             | B       | 0.155 | 3.181          |                | 1.116          | 1.116          | 93.185           |      |       |            |
|                   |            |             | C       | 0.155 | 3.181          |                | 1.116          | 1.116          | 93.185           |      |       |            |
|                   |            |             | D       | 0.155 | 3.181          |                | 1.116          | 1.116          | 93.185           |      |       |            |
| Sum Weight:       | 1.10       | 26.82       |         |       |                |                |                | OTM            | 238.24<br>kip-ft | 5.36 |       |            |



|  |   |                                  |
|--|---|----------------------------------|
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|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

### Force Totals

| Load Case                | Vertical Forces | Sum of Forces | Sum of Forces | Sum of Overturning Moments, $M_x$ | Sum of Overturning Moments, $M_z$ | Sum of Torques |
|--------------------------|-----------------|---------------|---------------|-----------------------------------|-----------------------------------|----------------|
|                          | K               | X<br>K        | Z<br>K        | kip-ft                            | kip-ft                            | kip-ft         |
| Leg Weight               | 19.83           |               |               |                                   |                                   |                |
| Bracing Weight           | 6.99            |               |               |                                   |                                   |                |
| Total Member Self-Weight | 26.82           |               |               | -15.51                            | -5.64                             |                |
| Total Weight             | 111.02          |               |               | -15.51                            | -5.64                             |                |
| Wind 0 deg - No Ice      |                 | -0.40         | -23.93        | -1673.59                          | 35.41                             | 8.99           |
| Wind 30 deg - No Ice     |                 | 12.24         | -21.59        | -1479.63                          | -827.25                           | -0.03          |
| Wind 45 deg - No Ice     |                 | 17.51         | -17.51        | -1198.69                          | -1188.82                          | -4.90          |
| Wind 60 deg - No Ice     |                 | 21.59         | -12.24        | -837.12                           | -1469.76                          | -9.43          |
| Wind 90 deg - No Ice     |                 | 23.93         | 0.40          | 25.54                             | -1663.72                          | -15.17         |
| Wind 120 deg - No Ice    |                 | 21.99         | 12.93         | 877.20                            | -1510.81                          | -18.80         |
| Wind 135 deg - No Ice    |                 | 18.07         | 18.07         | 1225.73                           | -1246.88                          | -18.15         |
| Wind 150 deg - No Ice    |                 | 12.93         | 21.99         | 1489.66                           | -898.36                           | -16.26         |
| Wind 180 deg - No Ice    |                 | 0.40          | 23.93         | 1642.57                           | -46.70                            | -8.99          |
| Wind 210 deg - No Ice    |                 | -12.24        | 21.59         | 1448.60                           | 815.96                            | 0.03           |
| Wind 225 deg - No Ice    |                 | -17.51        | 17.51         | 1167.66                           | 1177.53                           | 4.90           |
| Wind 240 deg - No Ice    |                 | -21.59        | 12.24         | 806.09                            | 1458.47                           | 9.43           |
| Wind 270 deg - No Ice    |                 | -23.93        | -0.40         | -56.57                            | 1652.44                           | 15.17          |
| Wind 300 deg - No Ice    |                 | -21.99        | -12.93        | -908.23                           | 1499.53                           | 18.80          |
| Wind 315 deg - No Ice    |                 | -18.07        | -18.07        | -1256.75                          | 1235.60                           | 18.15          |
| Wind 330 deg - No Ice    |                 | -12.93        | -21.99        | -1520.69                          | 887.07                            | 16.26          |
| Member Ice               | 22.41           |               |               |                                   |                                   |                |
| Total Weight Ice         | 194.48          |               |               | -92.45                            | -42.13                            |                |
| Wind 0 deg - Ice         |                 | -0.11         | -10.63        | -787.54                           | -30.94                            | 5.19           |
| Wind 30 deg - Ice        |                 | 5.54          | -9.70         | -713.85                           | -394.44                           | -0.01          |
| Wind 45 deg - Ice        |                 | 7.89          | -7.89         | -596.48                           | -546.16                           | -2.85          |
| Wind 60 deg - Ice        |                 | 9.70          | -5.54         | -444.75                           | -663.53                           | -5.51          |
| Wind 90 deg - Ice        |                 | 10.63         | 0.11          | -81.26                            | -737.23                           | -8.83          |
| Wind 120 deg - Ice       |                 | 9.81          | 5.73          | 279.24                            | -674.73                           | -11.01         |
| Wind 135 deg - Ice       |                 | 8.04          | 8.04          | 427.41                            | -561.99                           | -10.63         |
| Wind 150 deg - Ice       |                 | 5.73          | 9.81          | 540.15                            | -413.82                           | -9.53          |
| Wind 180 deg - Ice       |                 | 0.11          | 10.63         | 602.65                            | -53.33                            | -5.19          |
| Wind 210 deg - Ice       |                 | -5.54         | 9.70          | 528.95                            | 310.17                            | 0.01           |
| Wind 225 deg - Ice       |                 | -7.89         | 7.89          | 411.58                            | 461.89                            | 2.85           |
| Wind 240 deg - Ice       |                 | -9.70         | 5.54          | 259.85                            | 579.27                            | 5.51           |
| Wind 270 deg - Ice       |                 | -10.63        | -0.11         | -103.64                           | 652.96                            | 8.83           |
| Wind 300 deg - Ice       |                 | -9.81         | -5.73         | -464.14                           | 590.46                            | 11.01          |
| Wind 315 deg - Ice       |                 | -8.04         | -8.04         | -612.31                           | 477.73                            | 10.63          |
| Wind 330 deg - Ice       |                 | -5.73         | -9.81         | -725.04                           | 329.56                            | 9.53           |
| Total Weight             | 111.02          |               |               | -15.51                            | -5.64                             |                |
| Wind 0 deg - Service     |                 | -0.15         | -9.16         | -637.60                           | 11.76                             | 3.44           |
| Wind 30 deg - Service    |                 | 4.68          | -8.26         | -563.39                           | -318.31                           | -0.01          |
| Wind 45 deg - Service    |                 | 6.70          | -6.70         | -455.90                           | -456.65                           | -1.87          |
| Wind 60 deg - Service    |                 | 8.26          | -4.68         | -317.55                           | -564.14                           | -3.61          |
| Wind 90 deg - Service    |                 | 9.16          | 0.15          | 12.51                             | -638.36                           | -5.80          |
| Wind 120 deg - Service   |                 | 8.41          | 4.95          | 338.37                            | -579.85                           | -7.19          |
| Wind 135 deg - Service   |                 | 6.92          | 6.92          | 471.71                            | -478.87                           | -6.94          |
| Wind 150 deg - Service   |                 | 4.95          | 8.41          | 572.70                            | -345.52                           | -6.22          |
| Wind 180 deg - Service   |                 | 0.15          | 9.16          | 631.20                            | -19.66                            | -3.44          |
| Wind 210 deg - Service   |                 | -4.68         | 8.26          | 556.99                            | 310.40                            | 0.01           |
| Wind 225 deg - Service   |                 | -6.70         | 6.70          | 449.50                            | 448.74                            | 1.87           |
| Wind 240 deg - Service   |                 | -8.26         | 4.68          | 311.16                            | 556.23                            | 3.61           |
| Wind 270 deg - Service   |                 | -9.16         | -0.15         | -18.91                            | 630.45                            | 5.80           |
| Wind 300 deg - Service   |                 | -8.41         | -4.95         | -344.76                           | 571.94                            | 7.19           |

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>12 of 21          |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

| Load Case              | Vertical Forces<br>K | Sum of Forces<br>X<br>K | Sum of Forces<br>Z<br>K | Sum of Overturning Moments, $M_x$<br>kip-ft | Sum of Overturning Moments, $M_z$<br>kip-ft | Sum of Torques<br>kip-ft |
|------------------------|----------------------|-------------------------|-------------------------|---|---|--------------------------|
| Wind 315 deg - Service |                      | -6.92                   | -6.92                   | -478.11                                     | 470.96                                      | 6.94                     |
| Wind 330 deg - Service |                      | -4.95                   | -8.41                   | -579.10                                     | 337.61                                      | 6.22                     |

## Load Combinations

| Comb. No. | Description                                |
|-----------|--|
| 1         | Dead Only                                  |
| 2         | 1.2 Dead+1.6 Wind 0 deg - No Ice           |
| 3         | 0.9 Dead+1.6 Wind 0 deg - No Ice           |
| 4         | 1.2 Dead+1.6 Wind 30 deg - No Ice          |
| 5         | 0.9 Dead+1.6 Wind 30 deg - No Ice          |
| 6         | 1.2 Dead+1.6 Wind 45 deg - No Ice          |
| 7         | 0.9 Dead+1.6 Wind 45 deg - No Ice          |
| 8         | 1.2 Dead+1.6 Wind 60 deg - No Ice          |
| 9         | 0.9 Dead+1.6 Wind 60 deg - No Ice          |
| 10        | 1.2 Dead+1.6 Wind 90 deg - No Ice          |
| 11        | 0.9 Dead+1.6 Wind 90 deg - No Ice          |
| 12        | 1.2 Dead+1.6 Wind 120 deg - No Ice         |
| 13        | 0.9 Dead+1.6 Wind 120 deg - No Ice         |
| 14        | 1.2 Dead+1.6 Wind 135 deg - No Ice         |
| 15        | 0.9 Dead+1.6 Wind 135 deg - No Ice         |
| 16        | 1.2 Dead+1.6 Wind 150 deg - No Ice         |
| 17        | 0.9 Dead+1.6 Wind 150 deg - No Ice         |
| 18        | 1.2 Dead+1.6 Wind 180 deg - No Ice         |
| 19        | 0.9 Dead+1.6 Wind 180 deg - No Ice         |
| 20        | 1.2 Dead+1.6 Wind 210 deg - No Ice         |
| 21        | 0.9 Dead+1.6 Wind 210 deg - No Ice         |
| 22        | 1.2 Dead+1.6 Wind 225 deg - No Ice         |
| 23        | 0.9 Dead+1.6 Wind 225 deg - No Ice         |
| 24        | 1.2 Dead+1.6 Wind 240 deg - No Ice         |
| 25        | 0.9 Dead+1.6 Wind 240 deg - No Ice         |
| 26        | 1.2 Dead+1.6 Wind 270 deg - No Ice         |
| 27        | 0.9 Dead+1.6 Wind 270 deg - No Ice         |
| 28        | 1.2 Dead+1.6 Wind 300 deg - No Ice         |
| 29        | 0.9 Dead+1.6 Wind 300 deg - No Ice         |
| 30        | 1.2 Dead+1.6 Wind 315 deg - No Ice         |
| 31        | 0.9 Dead+1.6 Wind 315 deg - No Ice         |
| 32        | 1.2 Dead+1.6 Wind 330 deg - No Ice         |
| 33        | 0.9 Dead+1.6 Wind 330 deg - No Ice         |
| 34        | 1.2 Dead+1.0 Ice+1.0 Temp                  |
| 35        | 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp   |
| 36        | 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp  |
| 37        | 1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp  |
| 38        | 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp  |
| 39        | 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp  |
| 40        | 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp |
| 41        | 1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp |
| 42        | 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp |
| 43        | 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp |
| 44        | 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp |
| 45        | 1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp |
| 46        | 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp |
| 47        | 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp |
| 48        | 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp |
| 49        | 1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp |

|  |                |   |             |                    |                   |
|--|----------------|---|-------------|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b> | 13 of 21           |                   |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT |             | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  |             | <b>Designed by</b> | TJL               |

| <i>Comb. No.</i> | <i>Description</i>                         |
|------------------|--|
| 50               | 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp |
| 51               | Dead+Wind 0 deg - Service                  |
| 52               | Dead+Wind 30 deg - Service                 |
| 53               | Dead+Wind 45 deg - Service                 |
| 54               | Dead+Wind 60 deg - Service                 |
| 55               | Dead+Wind 90 deg - Service                 |
| 56               | Dead+Wind 120 deg - Service                |
| 57               | Dead+Wind 135 deg - Service                |
| 58               | Dead+Wind 150 deg - Service                |
| 59               | Dead+Wind 180 deg - Service                |
| 60               | Dead+Wind 210 deg - Service                |
| 61               | Dead+Wind 225 deg - Service                |
| 62               | Dead+Wind 240 deg - Service                |
| 63               | Dead+Wind 270 deg - Service                |
| 64               | Dead+Wind 300 deg - Service                |
| 65               | Dead+Wind 315 deg - Service                |
| 66               | Dead+Wind 330 deg - Service                |

### Maximum Member Forces

| <i>Section No.</i> | <i>Elevation ft</i> | <i>Component Type</i> | <i>Condition</i> | <i>Gov. Load Comb.</i> | <i>Axial K</i> | <i>Major Axis Moment kip-ft</i> | <i>Minor Axis Moment kip-ft</i> |
|--------------------|---------------------|-----------------------|------------------|------------------------|----------------|---------------------------------|---------------------------------|
| T1                 | 85 - 40             | Leg                   | Max Tension      | 1                      | 0.00           | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Compression | 30                     | -68.55         | 10.31                           | -0.76                           |
|                    |                     |                       | Max. Mx          | 14                     | -19.48         | -13.51                          | 0.80                            |
|                    |                     |                       | Max. My          | 30                     | -44.87         | -0.85                           | -12.72                          |
|                    |                     |                       | Max. Vy          | 14                     | 1.55           | -13.51                          | 0.80                            |
|                    |                     |                       | Max. Vx          | 30                     | 1.47           | -0.85                           | -12.72                          |
|                    |                     | Diagonal Top Girt     | Max Tension      | 18                     | 22.70          | 0.00                            | 0.00                            |
|                    |                     |                       | Max Tension      | 1                      | 0.00           | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Compression | 18                     | -7.27          | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Mx          | 34                     | -2.85          | 2.10                            | 0.00                            |
|                    |                     |                       | Max. My          | 47                     | -4.37          | 0.00                            | -0.14                           |
|                    |                     |                       | Max. Vy          | 34                     | 0.47           | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Vx          | 47                     | 0.03           | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Vx          | 47                     | 0.03           | 0.00                            | 0.00                            |
| T2                 | 40 - 0              | Leg                   | Max Tension      | 31                     | 16.25          | -13.04                          | -0.80                           |
|                    |                     |                       | Max. Compression | 30                     | -104.98        | 0.00                            | -0.00                           |
|                    |                     |                       | Max. Mx          | 14                     | 8.55           | -13.51                          | 0.80                            |
|                    |                     |                       | Max. My          | 30                     | -47.45         | -0.85                           | -12.72                          |
|                    |                     |                       | Max. Vy          | 14                     | -1.23          | -13.51                          | 0.80                            |
|                    |                     |                       | Max. Vx          | 30                     | -1.17          | -0.85                           | -12.72                          |
|                    |                     | Diagonal Top Girt     | Max Tension      | 26                     | 26.42          | 0.00                            | 0.00                            |
|                    |                     |                       | Max Tension      | 18                     | 0.61           | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Compression | 11                     | -11.62         | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Mx          | 46                     | -2.75          | 3.54                            | 0.00                            |
|                    |                     |                       | Max. My          | 48                     | -1.01          | 0.00                            | -0.18                           |
|                    |                     |                       | Max. Vy          | 46                     | -0.59          | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Vx          | 48                     | -0.03          | 0.00                            | 0.00                            |
|                    |                     |                       | Max. Vx          | 48                     | -0.03          | 0.00                            | 0.00                            |

### Maximum Reactions

| <i>Location</i> | <i>Condition</i> | <i>Gov. Load Comb.</i> | <i>Vertical K</i> | <i>Horizontal, X K</i> | <i>Horizontal, Z K</i> |
|-----------------|------------------|------------------------|-------------------|------------------------|------------------------|
|-----------------|------------------|------------------------|-------------------|------------------------|------------------------|

|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b>        | 14 of 21          |
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|  | <b>Client</b>  | AT&T  | <b>Designed by</b> | TJL               |

| Location | Condition           | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| Leg D    | Max. Vert           | 22              | 101.00     | 5.49            | -5.53           |
|          | Max. H <sub>x</sub> | 22              | 101.00     | 5.49            | -5.53           |
|          | Max. H <sub>z</sub> | 3               | -21.81     | -2.05           | 14.54           |
|          | Min. Vert           | 7               | -43.20     | -12.15          | 12.39           |
|          | Min. H <sub>x</sub> | 11              | -21.80     | -14.39          | 2.13            |
|          | Min. H <sub>z</sub> | 22              | 101.00     | 5.49            | -5.53           |
| Leg C    | Max. Vert           | 14              | 104.60     | -5.65           | -5.70           |
|          | Max. H <sub>x</sub> | 27              | -23.96     | 14.52           | 2.43            |
|          | Max. H <sub>z</sub> | 33              | -43.92     | 9.22            | 15.29           |
|          | Min. Vert           | 31              | -46.34     | 12.25           | 13.21           |
|          | Min. H <sub>x</sub> | 14              | 104.60     | -5.65           | -5.70           |
|          | Min. H <sub>z</sub> | 14              | 104.60     | -5.65           | -5.70           |
| Leg B    | Max. Vert           | 6               | 101.92     | -5.57           | 5.53            |
|          | Max. H <sub>x</sub> | 27              | -21.10     | 15.20           | -1.68           |
|          | Max. H <sub>z</sub> | 4               | 99.59      | -5.29           | 5.54            |
|          | Min. Vert           | 23              | -42.52     | 12.39           | -12.15          |
|          | Min. H <sub>x</sub> | 8               | 99.59      | -5.57           | 5.26            |
|          | Min. H <sub>z</sub> | 19              | -21.10     | 1.76            | -15.05          |
| Leg A    | Max. Vert           | 30              | 105.02     | 5.72            | 5.67            |
|          | Max. H <sub>x</sub> | 28              | 102.58     | 5.72            | 5.39            |
|          | Max. H <sub>z</sub> | 32              | 102.58     | 5.44            | 5.67            |
|          | Min. Vert           | 15              | -46.02     | -13.21          | -12.25          |
|          | Min. H <sub>x</sub> | 13              | -43.60     | -15.36          | -9.15           |
|          | Min. H <sub>z</sub> | 19              | -23.64     | -2.33           | -14.68          |

### Tower Mast Reaction Summary

| Load Combination                   | Vertical K | Shear <sub>x</sub> K | Shear <sub>z</sub> K | Overturning Moment, M <sub>x</sub> kip-ft | Overturning Moment, M <sub>z</sub> kip-ft | Torque kip-ft |
|------------------------------------|------------|----------------------|----------------------|---|---|---------------|
| Dead Only                          | 111.02     | 0.00                 | 0.00                 | -15.54                                    | -5.65                                     | 0.00          |
| 1.2 Dead+1.6 Wind 0 deg - No Ice   | 133.22     | -0.64                | -38.29               | -2688.33                                  | 59.81                                     | 14.32         |
| 0.9 Dead+1.6 Wind 0 deg - No Ice   | 99.92      | -0.64                | -38.29               | -2679.53                                  | 61.35                                     | 14.31         |
| 1.2 Dead+1.6 Wind 30 deg - No Ice  | 133.22     | 19.58                | -34.55               | -2376.22                                  | -1329.91                                  | -0.07         |
| 0.9 Dead+1.6 Wind 30 deg - No Ice  | 99.92      | 19.58                | -34.55               | -2367.88                                  | -1326.16                                  | -0.06         |
| 1.2 Dead+1.6 Wind 45 deg - No Ice  | 133.22     | 28.02                | -28.02               | -1923.93                                  | -1912.07                                  | -7.89         |
| 0.9 Dead+1.6 Wind 45 deg - No Ice  | 99.92      | 28.02                | -28.02               | -1916.29                                  | -1907.40                                  | -7.89         |
| 1.2 Dead+1.6 Wind 60 deg - No Ice  | 133.22     | 34.55                | -19.58               | -1341.76                                  | -2364.36                                  | -15.17        |
| 0.9 Dead+1.6 Wind 60 deg - No Ice  | 99.92      | 34.55                | -19.58               | -1335.05                                  | -2358.99                                  | -15.18        |
| 1.2 Dead+1.6 Wind 90 deg - No Ice  | 133.22     | 38.29                | 0.64                 | 47.96                                     | -2676.47                                  | -24.28        |
| 0.9 Dead+1.6 Wind 90 deg - No Ice  | 99.92      | 38.29                | 0.64                 | 52.47                                     | -2670.64                                  | -24.27        |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 133.22     | 35.19                | 20.68                | 1419.04                                   | -2430.39                                  | -30.19        |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 99.92      | 35.19                | 20.68                | 1421.48                                   | -2424.91                                  | -30.18        |
| 1.2 Dead+1.6 Wind 135 deg - No Ice | 133.22     | 28.92                | 28.92                | 1980.18                                   | -2005.44                                  | -29.18        |

|   |                |   |             |                    |                   |
|---|----------------|---|-------------|--------------------|-------------------|
| <p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b><br/>63-2 North Branford Rd.<br/>Branford, CT 06405<br/>Phone: (203) 488-0580<br/>FAX: (203) 488-8587</p> | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b> | 15 of 21           |                   |
|   | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT |             | <b>Date</b>        | 14:22:44 05/02/18 |
|   | <b>Client</b>  | AT&T  |             | <b>Designed by</b> | TJL               |

| Load Combination                              | Vertical<br>K | Shear <sub>x</sub><br>K | Shear <sub>z</sub><br>K | Overturning<br>Moment, M <sub>x</sub><br>kip-ft | Overturning<br>Moment, M <sub>z</sub><br>kip-ft | Torque<br>kip-ft |
|---|---------------|-------------------------|-------------------------|---|---|------------------|
| 0.9 Dead+1.6 Wind 135 deg -<br>No Ice         | 99.92         | 28.92                   | 28.92                   | 1981.73   | -2000.63  | -29.18           |
| 1.2 Dead+1.6 Wind 150 deg -<br>No Ice         | 133.22        | 20.68                   | 35.19                   | 2405.08   | -1444.27  | -26.12           |
| 0.9 Dead+1.6 Wind 150 deg -<br>No Ice         | 99.92         | 20.68                   | 35.19                   | 2405.94   | -1440.35  | -26.12           |
| 1.2 Dead+1.6 Wind 180 deg -<br>No Ice         | 133.22        | 0.64                    | 38.29                   | 2651.06   | -72.20  | -14.28           |
| 0.9 Dead+1.6 Wind 180 deg -<br>No Ice         | 99.92         | 0.64                    | 38.29                   | 2651.57   | -70.50  | -14.27           |
| 1.2 Dead+1.6 Wind 210 deg -<br>No Ice         | 133.22        | -19.58                  | 34.55                   | 2338.94   | 1316.39   | 0.08             |
| 0.9 Dead+1.6 Wind 210 deg -<br>No Ice         | 99.92         | -19.58                  | 34.55                   | 2339.91   | 1316.03   | 0.09             |
| 1.2 Dead+1.6 Wind 225 deg -<br>No Ice         | 133.22        | -28.02                  | 28.02                   | 1886.66   | 1898.52   | 7.89             |
| 0.9 Dead+1.6 Wind 225 deg -<br>No Ice         | 99.92         | -28.02                  | 28.02                   | 1888.34   | 1897.23   | 7.89             |
| 1.2 Dead+1.6 Wind 240 deg -<br>No Ice         | 133.22        | -34.55                  | 19.58                   | 1304.54   | 2350.81   | 15.18            |
| 0.9 Dead+1.6 Wind 240 deg -<br>No Ice         | 99.92         | -34.55                  | 19.58                   | 1307.15   | 2348.80   | 15.17            |
| 1.2 Dead+1.6 Wind 270 deg -<br>No Ice         | 133.22        | -38.29                  | -0.64                   | -84.04  | 2662.93   | 24.24            |
| 0.9 Dead+1.6 Wind 270 deg -<br>No Ice         | 99.92         | -38.29                  | -0.64                   | -79.38  | 2660.48   | 24.23            |
| 1.2 Dead+1.6 Wind 300 deg -<br>No Ice         | 133.22        | -35.19                  | -20.68                  | -1456.14  | 2416.95   | 30.20            |
| 0.9 Dead+1.6 Wind 300 deg -<br>No Ice         | 99.92         | -35.19                  | -20.68                  | -1449.25  | 2414.85   | 30.21            |
| 1.2 Dead+1.6 Wind 315 deg -<br>No Ice         | 133.22        | -28.92                  | -28.92                  | -2017.31  | 1992.05   | 29.18            |
| 0.9 Dead+1.6 Wind 315 deg -<br>No Ice         | 99.92         | -28.92                  | -28.92                  | -2009.53  | 1990.63   | 29.18            |
| 1.2 Dead+1.6 Wind 330 deg -<br>No Ice         | 133.22        | -20.68                  | -35.19                  | -2442.26  | 1430.91   | 26.11            |
| 0.9 Dead+1.6 Wind 330 deg -<br>No Ice         | 99.92         | -20.68                  | -35.19                  | -2433.81  | 1430.38   | 26.10            |
| 1.2 Dead+1.0 Ice+1.0 Temp                     | 216.68        | -0.00                   | 0.00                    | -95.56  | -43.24  | -0.00            |
| 1.2 Dead+1.0 Wind 0 deg+1.0<br>Ice+1.0 Temp   | 216.68        | -0.11                   | -10.63                  | -797.20   | -31.64  | 5.18             |
| 1.2 Dead+1.0 Wind 30 deg+1.0<br>Ice+1.0 Temp  | 216.68        | 5.54                    | -9.70                   | -722.85   | -398.79   | -0.01            |
| 1.2 Dead+1.0 Wind 45 deg+1.0<br>Ice+1.0 Temp  | 216.68        | 7.89                    | -7.89                   | -604.32   | -552.02   | -2.86            |
| 1.2 Dead+1.0 Wind 60 deg+1.0<br>Ice+1.0 Temp  | 216.68        | 9.70                    | -5.54                   | -451.09   | -670.55   | -5.52            |
| 1.2 Dead+1.0 Wind 90 deg+1.0<br>Ice+1.0 Temp  | 216.68        | 10.63                   | 0.11                    | -83.98  | -744.91   | -8.83            |
| 1.2 Dead+1.0 Wind 120<br>deg+1.0 Ice+1.0 Temp | 216.68        | 9.81                    | 5.73                    | 279.72  | -681.86   | -11.02           |
| 1.2 Dead+1.0 Wind 135<br>deg+1.0 Ice+1.0 Temp | 216.68        | 8.04                    | 8.04                    | 429.37  | -568.00   | -10.64           |
| 1.2 Dead+1.0 Wind 150<br>deg+1.0 Ice+1.0 Temp | 216.68        | 5.73                    | 9.81                    | 543.22  | -418.35   | -9.53            |
| 1.2 Dead+1.0 Wind 180<br>deg+1.0 Ice+1.0 Temp | 216.68        | 0.11                    | 10.63                   | 606.28  | -54.38  | -5.18            |
| 1.2 Dead+1.0 Wind 210<br>deg+1.0 Ice+1.0 Temp | 216.68        | -5.54                   | 9.70                    | 531.93  | 312.46  | 0.01             |
| 1.2 Dead+1.0 Wind 225<br>deg+1.0 Ice+1.0 Temp | 216.68        | -7.89                   | 7.89                    | 413.39  | 465.70  | 2.86             |

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>16 of 21          |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

| Load Combination                           | Vertical<br>K | Shear <sub>x</sub><br>K | Shear <sub>z</sub><br>K | Overturning<br>Moment, M <sub>x</sub><br>kip-ft | Overturning<br>Moment, M <sub>z</sub><br>kip-ft | Torque<br>kip-ft |
|--|---------------|-------------------------|-------------------------|---|---|------------------|
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp | 216.68        | -9.70                   | 5.54                    | 260.16  | 584.24  | 5.53             |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp | 216.68        | -10.63                  | -0.11                   | -106.71   | 658.59  | 8.84             |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp | 216.68        | -9.81                   | -5.73                   | -470.66   | 595.53  | 11.02            |
| 1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp | 216.68        | -8.04                   | -8.04                   | -620.30   | 481.68  | 10.64            |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp | 216.68        | -5.73                   | -9.81                   | -734.16   | 332.04  | 9.54             |
| Dead+Wind 0 deg - Service                  | 111.02        | -0.15                   | -9.16                   | -653.09   | 10.12   | 3.44             |
| Dead+Wind 30 deg - Service                 | 111.02        | 4.68                    | -8.26                   | -578.53   | -321.51   | -0.02            |
| Dead+Wind 45 deg - Service                 | 111.02        | 6.70                    | -6.70                   | -470.48   | -460.59   | -1.88            |
| Dead+Wind 60 deg - Service                 | 111.02        | 8.26                    | -4.68                   | -331.40   | -568.64   | -3.62            |
| Dead+Wind 90 deg - Service                 | 111.02        | 9.16                    | 0.15                    | 0.23  | -643.21   | -5.82            |
| Dead+Wind 120 deg - Service                | 111.02        | 8.41                    | 4.95                    | 327.69  | -584.43   | -7.22            |
| Dead+Wind 135 deg - Service                | 111.02        | 6.92                    | 6.92                    | 461.75  | -482.91   | -6.97            |
| Dead+Wind 150 deg - Service                | 111.02        | 4.95                    | 8.41                    | 563.26  | -348.85   | -6.24            |
| Dead+Wind 180 deg - Service                | 111.02        | 0.15                    | 9.16                    | 622.03  | -21.40  | -3.44            |
| Dead+Wind 210 deg - Service                | 111.02        | -4.68                   | 8.26                    | 547.47  | 310.24  | 0.01             |
| Dead+Wind 225 deg - Service                | 111.02        | -6.70                   | 6.70                    | 439.42  | 449.31  | 1.88             |
| Dead+Wind 240 deg - Service                | 111.02        | -8.26                   | 4.68                    | 300.35  | 557.36  | 3.62             |
| Dead+Wind 270 deg - Service                | 111.02        | -9.16                   | -0.15                   | -31.29  | 631.92  | 5.82             |
| Dead+Wind 300 deg - Service                | 111.02        | -8.41                   | -4.95                   | -358.74   | 573.15  | 7.21             |
| Dead+Wind 315 deg - Service                | 111.02        | -6.92                   | -6.92                   | -492.80   | 471.64  | 6.97             |
| Dead+Wind 330 deg - Service                | 111.02        | -4.95                   | -8.41                   | -594.31   | 337.58  | 6.25             |

## Solution Summary

| Load Comb. | Sum of Applied Forces |         |         | Sum of Reactions |         |         | % Error |
|------------|-----------------------|---------|---------|------------------|---------|---------|---------|
|            | PX<br>K               | PY<br>K | PZ<br>K | PX<br>K          | PY<br>K | PZ<br>K |         |
| 1          | 0.00                  | -111.02 | 0.00    | 0.00             | 111.02  | 0.00    | 0.000%  |
| 2          | -0.64                 | -133.22 | -38.29  | 0.64             | 133.22  | 38.29   | 0.000%  |
| 3          | -0.64                 | -99.92  | -38.29  | 0.64             | 99.92   | 38.29   | 0.000%  |
| 4          | 19.58                 | -133.22 | -34.55  | -19.58           | 133.22  | 34.55   | 0.000%  |
| 5          | 19.58                 | -99.92  | -34.55  | -19.58           | 99.92   | 34.55   | 0.000%  |
| 6          | 28.02                 | -133.22 | -28.02  | -28.02           | 133.22  | 28.02   | 0.000%  |
| 7          | 28.02                 | -99.92  | -28.02  | -28.02           | 99.92   | 28.02   | 0.000%  |
| 8          | 34.55                 | -133.22 | -19.58  | -34.55           | 133.22  | 19.58   | 0.000%  |
| 9          | 34.55                 | -99.92  | -19.58  | -34.55           | 99.92   | 19.58   | 0.000%  |
| 10         | 38.29                 | -133.22 | 0.64    | -38.29           | 133.22  | -0.64   | 0.000%  |
| 11         | 38.29                 | -99.92  | 0.64    | -38.29           | 99.92   | -0.64   | 0.000%  |
| 12         | 35.19                 | -133.22 | 20.68   | -35.19           | 133.22  | -20.68  | 0.000%  |
| 13         | 35.19                 | -99.92  | 20.68   | -35.19           | 99.92   | -20.68  | 0.000%  |
| 14         | 28.92                 | -133.22 | 28.92   | -28.92           | 133.22  | -28.92  | 0.000%  |
| 15         | 28.92                 | -99.92  | 28.92   | -28.92           | 99.92   | -28.92  | 0.000%  |
| 16         | 20.68                 | -133.22 | 35.19   | -20.68           | 133.22  | -35.19  | 0.000%  |
| 17         | 20.68                 | -99.92  | 35.19   | -20.68           | 99.92   | -35.19  | 0.000%  |
| 18         | 0.64                  | -133.22 | 38.29   | -0.64            | 133.22  | -38.29  | 0.000%  |
| 19         | 0.64                  | -99.92  | 38.29   | -0.64            | 99.92   | -38.29  | 0.000%  |
| 20         | -19.58                | -133.22 | 34.55   | 19.58            | 133.22  | -34.55  | 0.000%  |
| 21         | -19.58                | -99.92  | 34.55   | 19.58            | 99.92   | -34.55  | 0.000%  |
| 22         | -28.02                | -133.22 | 28.02   | 28.02            | 133.22  | -28.02  | 0.000%  |
| 23         | -28.02                | -99.92  | 28.02   | 28.02            | 99.92   | -28.02  | 0.000%  |
| 24         | -34.55                | -133.22 | 19.58   | 34.55            | 133.22  | -19.58  | 0.000%  |
| 25         | -34.55                | -99.92  | 19.58   | 34.55            | 99.92   | -19.58  | 0.000%  |
| 26         | -38.29                | -133.22 | -0.64   | 38.29            | 133.22  | 0.64    | 0.000%  |

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>17 of 21          |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

| Load Comb. | Sum of Applied Forces |         |         | Sum of Reactions |         |         | % Error |
|------------|-----------------------|---------|---------|------------------|---------|---------|---------|
|            | PX<br>K               | PY<br>K | PZ<br>K | PX<br>K          | PY<br>K | PZ<br>K |         |
| 27         | -38.29                | -99.92  | -0.64   | 38.29            | 99.92   | 0.64    | 0.000%  |
| 28         | -35.19                | -133.22 | -20.68  | 35.19            | 133.22  | 20.68   | 0.000%  |
| 29         | -35.19                | -99.92  | -20.68  | 35.19            | 99.92   | 20.68   | 0.000%  |
| 30         | -28.92                | -133.22 | -28.92  | 28.92            | 133.22  | 28.92   | 0.000%  |
| 31         | -28.92                | -99.92  | -28.92  | 28.92            | 99.92   | 28.92   | 0.000%  |
| 32         | -20.68                | -133.22 | -35.19  | 20.68            | 133.22  | 35.19   | 0.000%  |
| 33         | -20.68                | -99.92  | -35.19  | 20.68            | 99.92   | 35.19   | 0.000%  |
| 34         | 0.00                  | -216.68 | 0.00    | 0.00             | 216.68  | -0.00   | 0.000%  |
| 35         | -0.11                 | -216.68 | -10.63  | 0.11             | 216.68  | 10.63   | 0.000%  |
| 36         | 5.54                  | -216.68 | -9.70   | -5.54            | 216.68  | 9.70    | 0.000%  |
| 37         | 7.89                  | -216.68 | -7.89   | -7.89            | 216.68  | 7.89    | 0.000%  |
| 38         | 9.70                  | -216.68 | -5.54   | -9.70            | 216.68  | 5.54    | 0.000%  |
| 39         | 10.63                 | -216.68 | 0.11    | -10.63           | 216.68  | -0.11   | 0.000%  |
| 40         | 9.81                  | -216.68 | 5.73    | -9.81            | 216.68  | -5.73   | 0.000%  |
| 41         | 8.04                  | -216.68 | 8.04    | -8.04            | 216.68  | -8.04   | 0.000%  |
| 42         | 5.73                  | -216.68 | 9.81    | -5.73            | 216.68  | -9.81   | 0.000%  |
| 43         | 0.11                  | -216.68 | 10.63   | -0.11            | 216.68  | -10.63  | 0.000%  |
| 44         | -5.54                 | -216.68 | 9.70    | 5.54             | 216.68  | -9.70   | 0.000%  |
| 45         | -7.89                 | -216.68 | 7.89    | 7.89             | 216.68  | -7.89   | 0.000%  |
| 46         | -9.70                 | -216.68 | 5.54    | 9.70             | 216.68  | -5.54   | 0.000%  |
| 47         | -10.63                | -216.68 | -0.11   | 10.63            | 216.68  | 0.11    | 0.000%  |
| 48         | -9.81                 | -216.68 | -5.73   | 9.81             | 216.68  | 5.73    | 0.000%  |
| 49         | -8.04                 | -216.68 | -8.04   | 8.04             | 216.68  | 8.04    | 0.000%  |
| 50         | -5.73                 | -216.68 | -9.81   | 5.73             | 216.68  | 9.81    | 0.000%  |
| 51         | -0.15                 | -111.02 | -9.16   | 0.15             | 111.02  | 9.16    | 0.000%  |
| 52         | 4.68                  | -111.02 | -8.26   | -4.68            | 111.02  | 8.26    | 0.000%  |
| 53         | 6.70                  | -111.02 | -6.70   | -6.70            | 111.02  | 6.70    | 0.000%  |
| 54         | 8.26                  | -111.02 | -4.68   | -8.26            | 111.02  | 4.68    | 0.000%  |
| 55         | 9.16                  | -111.02 | 0.15    | -9.16            | 111.02  | -0.15   | 0.000%  |
| 56         | 8.41                  | -111.02 | 4.95    | -8.41            | 111.02  | -4.95   | 0.000%  |
| 57         | 6.92                  | -111.02 | 6.92    | -6.92            | 111.02  | -6.92   | 0.000%  |
| 58         | 4.95                  | -111.02 | 8.41    | -4.95            | 111.02  | -8.41   | 0.000%  |
| 59         | 0.15                  | -111.02 | 9.16    | -0.15            | 111.02  | -9.16   | 0.000%  |
| 60         | -4.68                 | -111.02 | 8.26    | 4.68             | 111.02  | -8.26   | 0.000%  |
| 61         | -6.70                 | -111.02 | 6.70    | 6.70             | 111.02  | -6.70   | 0.000%  |
| 62         | -8.26                 | -111.02 | 4.68    | 8.26             | 111.02  | -4.68   | 0.000%  |
| 63         | -9.16                 | -111.02 | -0.15   | 9.16             | 111.02  | 0.15    | 0.000%  |
| 64         | -8.41                 | -111.02 | -4.95   | 8.41             | 111.02  | 4.95    | 0.000%  |
| 65         | -6.92                 | -111.02 | -6.92   | 6.92             | 111.02  | 6.92    | 0.000%  |
| 66         | -4.95                 | -111.02 | -8.41   | 4.95             | 111.02  | 8.41    | 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        | 5                | 0.00000001             | 0.00007572      |
| 3                | Yes        | 5                | 0.00000001             | 0.00006870      |
| 4                | Yes        | 4                | 0.00000001             | 0.00009095      |
| 5                | Yes        | 4                | 0.00000001             | 0.00007978      |
| 6                | Yes        | 4                | 0.00000001             | 0.00009289      |
| 7                | Yes        | 4                | 0.00000001             | 0.00008167      |
| 8                | Yes        | 4                | 0.00000001             | 0.00009044      |
| 9                | Yes        | 4                | 0.00000001             | 0.00007927      |
| 10               | Yes        | 5                | 0.00000001             | 0.00010106      |
| 11               | Yes        | 5                | 0.00000001             | 0.00009126      |

|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b>        | 18 of 21          |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  | <b>Designed by</b> | TJL               |

|    |     |   |            |            |
|----|-----|---|------------|------------|
| 12 | Yes | 4 | 0.00000001 | 0.00009533 |
| 13 | Yes | 4 | 0.00000001 | 0.00008368 |
| 14 | Yes | 4 | 0.00000001 | 0.00009514 |
| 15 | Yes | 4 | 0.00000001 | 0.00008335 |
| 16 | Yes | 4 | 0.00000001 | 0.00009352 |
| 17 | Yes | 4 | 0.00000001 | 0.00008190 |
| 18 | Yes | 5 | 0.00000001 | 0.00005197 |
| 19 | Yes | 5 | 0.00000001 | 0.00003456 |
| 20 | Yes | 4 | 0.00000001 | 0.00009120 |
| 21 | Yes | 4 | 0.00000001 | 0.00008018 |
| 22 | Yes | 4 | 0.00000001 | 0.00009198 |
| 23 | Yes | 4 | 0.00000001 | 0.00008099 |
| 24 | Yes | 4 | 0.00000001 | 0.00009134 |
| 25 | Yes | 4 | 0.00000001 | 0.00008029 |
| 26 | Yes | 5 | 0.00000001 | 0.00026457 |
| 27 | Yes | 6 | 0.00000001 | 0.00001463 |
| 28 | Yes | 4 | 0.00000001 | 0.00009340 |
| 29 | Yes | 4 | 0.00000001 | 0.00008174 |
| 30 | Yes | 4 | 0.00000001 | 0.00009528 |
| 31 | Yes | 4 | 0.00000001 | 0.00008345 |
| 32 | Yes | 4 | 0.00000001 | 0.00009524 |
| 33 | Yes | 4 | 0.00000001 | 0.00008347 |
| 34 | Yes | 5 | 0.00000001 | 0.00001336 |
| 35 | Yes | 5 | 0.00000001 | 0.00005223 |
| 36 | Yes | 4 | 0.00000001 | 0.00003791 |
| 37 | Yes | 4 | 0.00000001 | 0.00003875 |
| 38 | Yes | 4 | 0.00000001 | 0.00003818 |
| 39 | Yes | 5 | 0.00000001 | 0.00006067 |
| 40 | Yes | 4 | 0.00000001 | 0.00003991 |
| 41 | Yes | 4 | 0.00000001 | 0.00004052 |
| 42 | Yes | 4 | 0.00000001 | 0.00003825 |
| 43 | Yes | 5 | 0.00000001 | 0.00003565 |
| 44 | Yes | 4 | 0.00000001 | 0.00003839 |
| 45 | Yes | 4 | 0.00000001 | 0.00003898 |
| 46 | Yes | 4 | 0.00000001 | 0.00003867 |
| 47 | Yes | 5 | 0.00000001 | 0.00004273 |
| 48 | Yes | 4 | 0.00000001 | 0.00003828 |
| 49 | Yes | 4 | 0.00000001 | 0.00004055 |
| 50 | Yes | 4 | 0.00000001 | 0.00003982 |
| 51 | Yes | 4 | 0.00000001 | 0.00005963 |
| 52 | Yes | 4 | 0.00000001 | 0.00002569 |
| 53 | Yes | 4 | 0.00000001 | 0.00002592 |
| 54 | Yes | 4 | 0.00000001 | 0.00002567 |
| 55 | Yes | 4 | 0.00000001 | 0.00003948 |
| 56 | Yes | 4 | 0.00000001 | 0.00002736 |
| 57 | Yes | 4 | 0.00000001 | 0.00002711 |
| 58 | Yes | 4 | 0.00000001 | 0.00002652 |
| 59 | Yes | 4 | 0.00000001 | 0.00002194 |
| 60 | Yes | 4 | 0.00000001 | 0.00002550 |
| 61 | Yes | 4 | 0.00000001 | 0.00002596 |
| 62 | Yes | 4 | 0.00000001 | 0.00002562 |
| 63 | Yes | 4 | 0.00000001 | 0.00002501 |
| 64 | Yes | 4 | 0.00000001 | 0.00002651 |
| 65 | Yes | 4 | 0.00000001 | 0.00002709 |
| 66 | Yes | 4 | 0.00000001 | 0.00002728 |

### Maximum Tower Deflections - Service Wind



|  |                |   |                    |                   |
|--|----------------|---|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b>        | 19 of 21          |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  | <b>Designed by</b> | TJL               |

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load<br>Comb. | Tilt<br>° | Twist<br>° |
|-------------|-----------------|------------------------|--------------------|-----------|------------|
| T1          | 85 - 40         | 0.413                  | 57                 | 0.0061    | 0.0086     |
| T2          | 40 - 0          | 0.179                  | 58                 | 0.0005    | 0.0035     |

### Critical Deflections and Radius of Curvature - Service Wind

| Elevation<br>ft | Appurtenance            | Gov. Load<br>Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|-----------------|-------------------------|--------------------|------------------|-----------|------------|---------------------------|
| 107.00          | (2) 6'x1' Panel Antenna | 57                 | 0.413            | 0.0061    | 0.0086     | Inf                       |
| 105.00          | Meriden Top Screening   | 57                 | 0.413            | 0.0061    | 0.0086     | Inf                       |
| 97.50           | Meriden Tank            | 57                 | 0.413            | 0.0061    | 0.0086     | Inf                       |
| 97.00           | 2-ft dish               | 57                 | 0.413            | 0.0061    | 0.0086     | Inf                       |
| 89.00           | Meriden Bot Screening   | 57                 | 0.413            | 0.0061    | 0.0086     | Inf                       |

### Maximum Tower Deflections - Design Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load<br>Comb. | Tilt<br>° | Twist<br>° |
|-------------|-----------------|------------------------|--------------------|-----------|------------|
| T1          | 85 - 40         | 1.868                  | 15                 | 0.0290    | 0.0357     |
| T2          | 40 - 0          | 0.823                  | 15                 | 0.0024    | 0.0145     |

### Critical Deflections and Radius of Curvature - Design Wind

| Elevation<br>ft | Appurtenance            | Gov. Load<br>Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|-----------------|-------------------------|--------------------|------------------|-----------|------------|---------------------------|
| 107.00          | (2) 6'x1' Panel Antenna | 15                 | 1.868            | 0.0290    | 0.0357     | Inf                       |
| 105.00          | Meriden Top Screening   | 15                 | 1.868            | 0.0290    | 0.0357     | Inf                       |
| 97.50           | Meriden Tank            | 15                 | 1.868            | 0.0290    | 0.0357     | Inf                       |
| 97.00           | 2-ft dish               | 15                 | 1.868            | 0.0290    | 0.0357     | Inf                       |
| 89.00           | Meriden Bot Screening   | 15                 | 1.868            | 0.0290    | 0.0357     | Inf                       |

### Compression Checks

### Leg Design Data (Compression)

| Section No. | Elevation<br>ft | Size    | L<br>ft | L <sub>u</sub><br>ft | Kl/r           | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|---------|---------|----------------------|----------------|----------------------|---------------------|----------------------|---------------------------------|
| T1          | 85 - 40         | P22x1/4 | 45.20   | 45.20                | 70.5<br>K=1.00 | 17.0824              | -68.55              | 425.95               | 0.161 <sup>1</sup>              |

|  |                |   |             |                    |                   |
|--|----------------|---|-------------|--------------------|-------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b>     | 18000.64 - CT1015                             | <b>Page</b> | 20 of 21           |                   |
|  | <b>Project</b> | 105' Watertank - 119 Empire Ave., Meriden, CT |             | <b>Date</b>        | 14:22:44 05/02/18 |
|  | <b>Client</b>  | AT&T  |             | <b>Designed by</b> | TJL               |

| Section No. | Elevation<br>ft | Size    | L<br>ft | L <sub>u</sub><br>ft | Kl/r           | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|---------|---------|----------------------|----------------|----------------------|---------------------|----------------------|---------------------------------|
| T2          | 40 - 0          | P22x1/4 | 40.10   | 40.10                | 62.6<br>K=1.00 | 17.0824              | -104.98             | 450.38               | 0.233 <sup>1</sup><br>✓<br>✓    |

<sup>1</sup> P<sub>u</sub> / φP<sub>n</sub> controls

### Top Girt Design Data (Compression)

| Section No. | Elevation<br>ft | Size  | L<br>ft | L <sub>u</sub><br>ft | Kl/r            | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|-------|---------|----------------------|-----------------|----------------------|---------------------|----------------------|---------------------------------|
| T1          | 85 - 40         | W8x24 | 18.00   | 18.00                | 134.2<br>K=1.00 | 7.0800               | -7.27               | 88.86                | 0.082 <sup>1</sup><br>✓         |
| T2          | 40 - 0          | W8x24 | 24.00   | 24.00                | 178.9<br>K=1.00 | 7.0800               | -11.62              | 49.98                | 0.232 <sup>1</sup><br>✓         |

<sup>1</sup> P<sub>u</sub> / φP<sub>n</sub> controls

### Tension Checks

### Leg Design Data (Tension)

| Section No. | Elevation<br>ft | Size    | L<br>ft | L <sub>u</sub><br>ft | Kl/r | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|---------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| T2          | 40 - 0          | P22x1/4 | 40.10   | 40.10                | 62.6 | 17.0824              | 16.25               | 553.47               | 0.029 <sup>1</sup><br>✓         |

<sup>1</sup> P<sub>u</sub> / φP<sub>n</sub> controls

### Diagonal Design Data (Tension)

| Section No. | Elevation<br>ft | Size  | L<br>ft | L <sub>u</sub><br>ft | Kl/r   | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|-------|---------|----------------------|--------|----------------------|---------------------|----------------------|---------------------------------|
| T1          | 85 - 40         | 1 1/8 | 49.75   | 49.75                | 2122.6 | 0.9940               | 22.70               | 32.21                | 0.705 <sup>1</sup><br>✓         |
| T2          | 40 - 0          | 1 1/4 | 47.75   | 47.75                | 1833.6 | 1.2272               | 26.42               | 39.76                | 0.664 <sup>1</sup><br>✓         |

<sup>1</sup> P<sub>u</sub> / φP<sub>n</sub> controls

|  |   |                                  |
|--|---|----------------------------------|
| <b>tnxTower</b><br><br><b>Centek Engineering Inc.</b><br>63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 | <b>Job</b><br>18000.64 - CT1015                                 | <b>Page</b><br>21 of 21          |
|  | <b>Project</b><br>105' Watertank - 119 Empire Ave., Meriden, CT | <b>Date</b><br>14:22:44 05/02/18 |
|  | <b>Client</b><br>AT&T   | <b>Designed by</b><br>TJL        |

### Top Girt Design Data (Tension)

| Section No. | Elevation<br>ft | Size  | L<br>ft | L <sub>u</sub><br>ft | Kl/r  | A<br>in <sup>2</sup> | P <sub>u</sub><br>K | φP <sub>n</sub><br>K | Ratio<br>$\frac{P_u}{\phi P_n}$ <sup>1</sup> |
|-------------|-----------------|-------|---------|----------------------|-------|----------------------|---------------------|----------------------|--|
| T2          | 40 - 0          | W8x24 | 24.00   | 24.00                | 178.9 | 7.0800               | 0.61                | 229.39               | 0.003 <sup>1</sup>                           |

<sup>1</sup> P<sub>u</sub> / φP<sub>n</sub> controls

### Section Capacity Table

| Section No.     | Elevation<br>ft | Component Type | Size    | Critical Element | P<br>K  | φP <sub>allow</sub><br>K | %<br>Capacity | Pass<br>Fail |
|-----------------|-----------------|----------------|---------|------------------|---------|--------------------------|---------------|--------------|
| T1              | 85 - 40         | Leg            | P22x1/4 | 4                | -68.55  | 425.95                   | 16.1          | Pass         |
| T2              | 40 - 0          | Leg            | P22x1/4 | 20               | -104.98 | 450.38                   | 23.3          | Pass         |
| T1              | 85 - 40         | Diagonal       | 1 1/8   | 12               | 22.70   | 32.21                    | 70.5          | Pass         |
| T2              | 40 - 0          | Diagonal       | 1 1/4   | 29               | 26.42   | 39.76                    | 66.4          | Pass         |
| T1              | 85 - 40         | Top Girt       | W8x24   | 6                | -7.27   | 88.86                    | 8.2           | Pass         |
| T2              | 40 - 0          | Top Girt       | W8x24   | 23               | -11.62  | 49.98                    | 23.2          | Pass         |
| Summary         |                 |                |         |                  |         |                          |               |              |
| Leg (T2)        |                 |                |         |                  |         |                          | 23.3          | Pass         |
| Diagonal (T1)   |                 |                |         |                  |         |                          | 70.5          | Pass         |
| Top Girt (T2)   |                 |                |         |                  |         |                          | 23.2          | Pass         |
| <b>RATING =</b> |                 |                |         |                  |         |                          | <b>70.5</b>   | <b>Pass</b>  |

**Mat Foundation Analysis:**

**Input Data:**

Monopole Base Reactions

Overturing Moment =  $OM_t := 2080 \text{ ft-kips}$  (User Input from *tnxTower*)

Shear Force =  $S_t := 25 \text{ kip}$  (User Input from *tnxTower*)

Axial Force =  $WT_t := 46 \text{ kip}$  (User Input from *tnxTower*)

Water Tank Base Reactions

Overturing Moment =  $OM_{wt} := 2837 \text{ ft-kips}$

Shear Force =  $S_{wt} := 41 \text{ kip}$

Axial Force =  $WT_{wt} := 133 \text{ kip}$

Footing Data:

Overall Depth of Footing =  $D_f := 8 \text{ ft}$  (User Input)

Thickness of Footing =  $T_f := 2.5 \text{ ft}$  (User Input)

Length of Footing Side =  $a := 20.708 \text{ ft}$  (User Input)

Width of Footing =  $W_f := 50 \text{ ft}$  (User Input)

Extension of Pier Above Grade =  $L_{pag} := 1.5 \text{ ft}$  (User Input)

Height of Monopole Pier =  $H_{mp} := 7 \text{ ft}$  (User Input)

Width of Monopole Pier =  $W_{mp} := 10 \text{ ft}$  (User Input)

Height of Water Tank Pier =  $H_{wtp} := 7 \text{ ft}$  (User Input)

Width of Water Tank Pier Top =  $W_{wtpt} := 3.67 \text{ ft}$  (User Input)

Length of Water Tank Pier Bot =  $L_{wtp} := 5 \text{ ft}$  (User Input)

Width of Water Tank Pier Bot =  $W_{wtp} := 6 \text{ ft}$  (User Input)

Material Properties:

Concrete Compressive Strength =  $f_c := 4000 \text{ psi}$  (User Input)

Steel Reinforcement Yield Strength =  $f_y := 60000 \text{ psi}$  (User Input)

Internal Friction Angle of Soil =  $\Phi_s := 30 \text{ deg}$  (User Input)

Allowable Soil Bearing Capacity =  $q_s := 5000 \text{ psf}$  (User Input)

Unit Weight of Soil =  $\gamma_{soil} := 120 \text{ pcf}$  (User Input)

Unit Weight of Concrete =  $\gamma_{conc} := 150 \text{ pcf}$  (User Input)

Foundation Bouyancy = Bouyancy := 0 (User Input) (Yes=1 / No=0)

Depth to Neglect =  $n := 1 \text{ ft}$  (User Input)

Cohesion of Clay Type Soil =  $c := 0 \text{ ksf}$  (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)

**Stability of Footing:**

Area of Concrete Pad =  $A_{pad} := 2 \cdot (1 + \sqrt{2}) \cdot a^2 = 2071 \cdot ft^3$

Weight of Concrete Pad =  $WT_{pad} := 2 \cdot (1 + \sqrt{2}) \cdot a^2 \cdot T_f \cdot \gamma_{conc} = 776.45 \cdot kip$

Weight of Water Tank Piers =  $WT_{pier.wt} := 4 \cdot \left[ \frac{1}{3} \cdot H_{wtp} \left[ W_{wtp}^2 + L_{wtp} \cdot W_{wtp} + \sqrt{W_{wtp}^2 \cdot (L_{wtp} \cdot W_{wtp})} \right] \cdot \gamma_{conc} \right] = 88.998 \cdot kip$

Weight of Monopole Pier =  $WT_{pier.m} := H_{mp} \cdot W_{mp}^2 \cdot \gamma_{conc} = 105 \cdot kip$

Total Weight of Concrete =  $WT_c := WT_{pad} + WT_{pier.wt} + WT_{pier.m} = 970 \cdot kip$

Weight of Soil Above Footing =  $WT_{s1} := \left[ A_{pad} \cdot (D_f - T_f) - \frac{(WT_{pier.wt} + WT_{pier.m})}{\gamma_{conc}} \right] \cdot \gamma_{soil} = 1211 \cdot kip$

Resisting Moment =  $M_r := (0.9WT_c + 0.75WT_{s1} + 0.75WT_t + 0.75 \cdot WT_{wt}) \cdot \frac{W_f}{2} = 47904 \cdot kip \cdot ft$

Overturning Moment =  $M_{ot} := OM_t + OM_{wt} + (S_t + S_{wt}) \cdot (H_{mp} + T_f) = 5544 \cdot kip \cdot ft$

Factor of Safety Actual =  $FS := \frac{M_r}{M_{ot}} = 8.6$

Factor of Safety Required =  $FS_{req} := 1$

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

OverTurning\_Moment\_Check = "Okay"



Section 6 - RBS GENERAL INFORMATION - existing

|                    | GSM 1ST RBS        | GSM 2ND RBS         | UMTS 1ST RBS  | UMTS 2ND RBS  | LTE 1ST RBS   |  |  |  |  |  |  |  |
|--------------------|--------------------|---------------------|---------------|---------------|---------------|--|--|--|--|--|--|--|
| RBS ID:            | 130342             | 130343              | 210579        | 336050        | 367770        |  |  |  |  |  |  |  |
| CTS COMMON ID:     | 049D1015           | 318D1015            | CTV1015       | CTU1015       | CTL01015      |  |  |  |  |  |  |  |
| CELL ID / BCF:     | 049D1015           | 049D1015            | CTV1015       | CTV1015       | CTL01015      |  |  |  |  |  |  |  |
| BTA/TID:           | 049G               | 049P                | 318U          | 318W          | 318L          |  |  |  |  |  |  |  |
| 4-DIGIT SITE ID:   | 1015               | 1015                | 1015          | 1015          | 1015          |  |  |  |  |  |  |  |
| COW OR TOY?:       | No                 | No                  | No            | No            | No            |  |  |  |  |  |  |  |
| CELL SITE TYPE:    |                    |                     |               |               |               |  |  |  |  |  |  |  |
| SITE TYPE:         |                    |                     |               |               |               |  |  |  |  |  |  |  |
| BTS LOCATION ID:   |                    |                     |               |               |               |  |  |  |  |  |  |  |
| ORIGINATING CO:    |                    |                     |               |               |               |  |  |  |  |  |  |  |
| CELLULAR NETWORK:  |                    |                     |               |               |               |  |  |  |  |  |  |  |
| OPS DISTRICT:      | SOUTH              | CT SOUTH-WEST       |               |               |               |  |  |  |  |  |  |  |
| RF DISTRICT:       | SOUTH              |                     |               | NPO TRIAGE    |               |  |  |  |  |  |  |  |
| OPS ZONE:          | NE_CT_S_NHVN_NE_CS | NE_CT_S_NHVN_NE_CS  |               |               |               |  |  |  |  |  |  |  |
| RF ZONE:           | BCT02 - MIDDLESEX  |                     |               | CT SOUTH-WEST |               |  |  |  |  |  |  |  |
| BASE STATION TYPE: |                    |                     |               |               |               |  |  |  |  |  |  |  |
| EQUIPMENT NAME:    | MERIDEN NORTH      | MERIDEN WEYERHAUSER | MERIDEN NORTH | MERIDEN NORTH | MERIDEN NORTH |  |  |  |  |  |  |  |
| DISASTER PRIORITY: |                    |                     |               |               |               |  |  |  |  |  |  |  |

Section 6 - RBS GENERAL INFORMATION - final

|                    | GSM 1ST RBS        | GSM 2ND RBS         | UMTS 1ST RBS       | UMTS 2ND RBS       | LTE 1ST RBS        |  |  |  |  |  |  |  |
|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--|--|--|--|--|--|--|
| RBS ID:            | 130342             | 130343              | 210579             | 336050             | 367770             |  |  |  |  |  |  |  |
| CTS COMMON ID:     | 049D1015           | 318D1015            | CTV1015            | CTU1015            | CTL01015           |  |  |  |  |  |  |  |
| CELL ID / BCF:     | 049D1015           | 318D1015            | CTV1015            | CTV1015            | CTL01015           |  |  |  |  |  |  |  |
| BTA/TID:           | 049G               | 049P                | 318U               | 318W               | 318L               |  |  |  |  |  |  |  |
| 4-DIGIT SITE ID:   | 1015               | 1015                | 1015               | 1015               | 1015               |  |  |  |  |  |  |  |
| COW OR TOY?:       | No                 | No                  | No                 | No                 | No                 |  |  |  |  |  |  |  |
| CELL SITE TYPE:    | SECTORIZED         | SECTORIZED          | SECTORIZED         | SECTORIZED         | SECTORIZED         |  |  |  |  |  |  |  |
| SITE TYPE:         | BTS-CONVENTIONAL   | BTS-CONVENTIONAL    | MACRO-CONVENTIONAL | MACRO-CONVENTIONAL | MACRO-CONVENTIONAL |  |  |  |  |  |  |  |
| BTS LOCATION ID:   |                    |                     |                    |                    |                    |  |  |  |  |  |  |  |
| ORIGINATING CO:    | CINGULAR           | CINGULAR            | CINGULAR           | CINGULAR           | CINGULAR           |  |  |  |  |  |  |  |
| CELLULAR NETWORK:  | GOLD               | GOLD                | GOLD               | GOLD               | GOLD               |  |  |  |  |  |  |  |
| OPS DISTRICT:      | CT-South           | CT-South            | CT-South           | CT-South           | CT-South           |  |  |  |  |  |  |  |
| RF DISTRICT:       | Middletown         | Middletown          | Middletown         | Middletown         | Middletown         |  |  |  |  |  |  |  |
| OPS ZONE:          | NE_CT_S_NHVN_NE_CS | NE_CT_S_NHVN_NE_CS  | NE_CT_S_NHVN_NE_CS | NE_CT_S_NHVN_NE_CS | NE_CT_S_NHVN_NE_CS |  |  |  |  |  |  |  |
| RF ZONE:           | BCT08              | BCT08               | BCT08              | BCT08              | BCT08              |  |  |  |  |  |  |  |
| BASE STATION TYPE: | BASE               | BASE                | BASE               | OVERLAY            | BASE               |  |  |  |  |  |  |  |
| EQUIPMENT NAME:    | MERIDEN NORTH      | MERIDEN WEYERHAUSER | MERIDEN NORTH      | MERIDEN NORTH      | MERIDEN NORTH      |  |  |  |  |  |  |  |
| DISASTER PRIORITY: | 0                  | 1                   | 1                  | 3                  | 3                  |  |  |  |  |  |  |  |



























Section 17A - FINAL SECTOR/CELL INFORMATION - SECTOR A (OR OMNI)

| ANTENNA COMMON FIELDS  | ANTENNA POSITION 1  |  | ANTENNA POSITION 2 |   | ANTENNA POSITION 3    |                       | ANTENNA POSITION 4    |                | ANTENNA POSITION 5 |         | ANTENNA POSITION 6 |  | ANTENNA POSITION 7 |  |  |
|--|---|--|--------------------|---|-----------------------|-----------------------|-----------------------|----------------|--------------------|---------|--------------------|--|--------------------|--|--|
| ANTENNA MAKE - MODEL   | 800 10121   |  |                    |   | AM-X-CD-16-65-00T-RET |                       | AM-X-CD-16-65-00T-RET |                |                    |         |                    |  |                    |  |  |
| ANTENNA VENDOR   | KATHREIN  |  |                    |   | KMW                   |                       | KMW                   |                |                    |         |                    |  |                    |  |  |
| ANTENNA SIZE (H x W x D)   | 54.5X10.3X5.9   |  |                    |   | 72X11.8X5.9           |                       | 72X11.8X5.9           |                |                    |         |                    |  |                    |  |  |
| ANTENNA WEIGHT   | 50.7  |  |                    |   | 48.5                  |                       | 48.5                  |                |                    |         |                    |  |                    |  |  |
| AZIMUTH  | 143   |  |                    |   | 143                   |                       | 50                    |                |                    |         |                    |  |                    |  |  |
| MAGNETIC DECLINATION   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RADIATION CENTER (feet)  | 97.02   |  |                    |   | 97.02                 |                       | 95.02                 |                |                    |         |                    |  |                    |  |  |
| ANTENNA TIP HEIGHT   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| MECHANICAL DOWNTILT  | 0   |  |                    |   | 0                     |                       | 0                     |                |                    |         |                    |  |                    |  |  |
| FEEDER AMOUNT  | 2   |  |                    |   | 2                     |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE) |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)     |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET Motor (QTY/MODEL)  | 2   | Kathrein / 860-10025                           |                    |   |                       | Built in              |                       | Built in       |                    |         |                    |  |                    |  |  |
| SURGE ARRESTOR (QTY/MODEL)   |   |  |                    |   |                       | 1                     |                       | DC Fiber Squid |                    |         |                    |  |                    |  |  |
| DIPLEXER (QTY/MODEL)   | 2   | Kathrein / 782-10250                           |                    | 2 |                       | Powerwave / LGP 21901 |                       |                |                    |         |                    |  |                    |  |  |
| DUPLEXER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET CONTROL UNIT (QTY/MODEL)   |   |  |                    | 1 |                       | Kathrein / 860-10006  |                       | LTE RRH        |                    |         |                    |  |                    |  |  |
| DC BLOCK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| TMA/LNA (QTY/MODEL)  | 1   | Pwav TT19-08BP111-001 Twin 1900 w/ 850BP (850) |                    | 1 |                       | CCI DTMAPB7819VG12A   |                       |                |                    |         |                    |  |                    |  |  |
| CURRENT INJECTORS FOR TMA (QTY/MODEL)  | 2   | Polyphaser/ 1000860                            |                    | 1 |                       | Kathrein 782-10253BTS |                       |                |                    |         |                    |  |                    |  |  |
| PDU FOR TMA (QTY/MODEL)  | 1   | Powerwave LGP12104                             |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FILTER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| SQUID (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FIBER TRUNK (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| DC TRUNK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 700 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-11 |                    |  |                    |  |  |
| RRH - 850 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 1900 band (QTY/MODEL)  |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-12 |                    |  |                    |  |  |
| RRH - AWS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - WCS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #1 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #2 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 1 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 2 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 3 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 1  | LTE BWE 1900 A3-A4 & E, Replace existing LTE 1900 - RRUS-11 to RRUS-12 // DUL to DUS Upgrade to DUS41, Add XMU. |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 2  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 3  | Baseband Config - 1 DUS + XMU DUS-1 - 7A:7B:7C:X1P1:X1P2:_XMU-1 - PA:PA2A:_PB:PA2B:PC:PC2A:_D1E:D1D             |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |

| PORT SPECIFIC FIELDS | PORT NUMBER | USEID (CSSng)     | USEID (Atoll)     | ATOLL TXID    | ATOLL CELL ID | TX/RX ? | TECHNOLOGY/FREQUENCY | ANTENNA ATOLL                      | ANTENNA GAIN | ELECTRICAL AZIMUTH | ELECTRICAL TILT | RRH LOCATION (Top/Bottom/Integrated/None) | FEEDERS TYPE  | FEEDER LENGTH (feet) | RXAIT KIT MODULE? | TRIPLEXER or LLC (QTY) | TRIPLEXER or LLC (MODEL) | SCPA/MCPA MODULE? | HATCHPLATE POWER (Watts) | ERP (Watts) | Antenna RET Name | CABLE NUMBER | CABLE ID (CSSNG) |
|----------------------|-------------|-------------------|-------------------|---------------|---------------|---------|----------------------|------------------------------------|--------------|--------------------|-----------------|---|---------------|----------------------|-------------------|------------------------|--------------------------|-------------------|--------------------------|-------------|------------------|--------------|------------------|
| ANTENNA POSITION 1   | PORT 1      | 25991.A.850.3G.1  | 25991.A.850.3G.1  | CTV10151      | CTV10151      |         | UMTS 850             | 800 10121 @850_Xpol_4dt            | 13.41        | 143                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 1            |                  |
|                      | PORT 3      | 25991.A.1900.3G.2 | 25991.A.1900.3G.2 | CTV10151      | CTU10157      |         | UMTS 1900            | 800 10121 @1920_Xpol_4dt           | 16.43        | 143                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 1            |                  |
| ANTENNA POSITION 3   | PORT 1      | 25991.A.850.25G.1 | 25991.A.850.25G.1 | 318G10151     | 318G10151     |         | GSM 850              | AM-X-CD-16-65-00T-RET_850MHz_04DT  | 16.1         | 143                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   | 11.22                    | 234.42      |                  | 5            |                  |
| ANTENNA POSITION 4   | PORT 1      | 25991.A.700.4G.1  | 25991.A.700.4G.1  | CTL01015_7A_1 | CTL01015_7A_1 |         | LTE 700              | AM-X-CD-16-65-00T-RET_725MHz_02DT  | 15.6         | 50                 | 2               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 1475.7065   |                  | 7            |                  |
|                      | PORT 3      | 25991.A.1900.4G.1 | 25991.A.1900.4G.1 | CTL01015_9A_1 | CTL01015_9A_1 |         | LTE 1900             | AM-X-CD-16-65-00T-RET_1930MHz_02DT | 17.3         | 50                 | 2               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 2421.029    |                  | 7            |                  |

Section 17B - FINAL SECTOR/CELL INFORMATION - SECTOR B

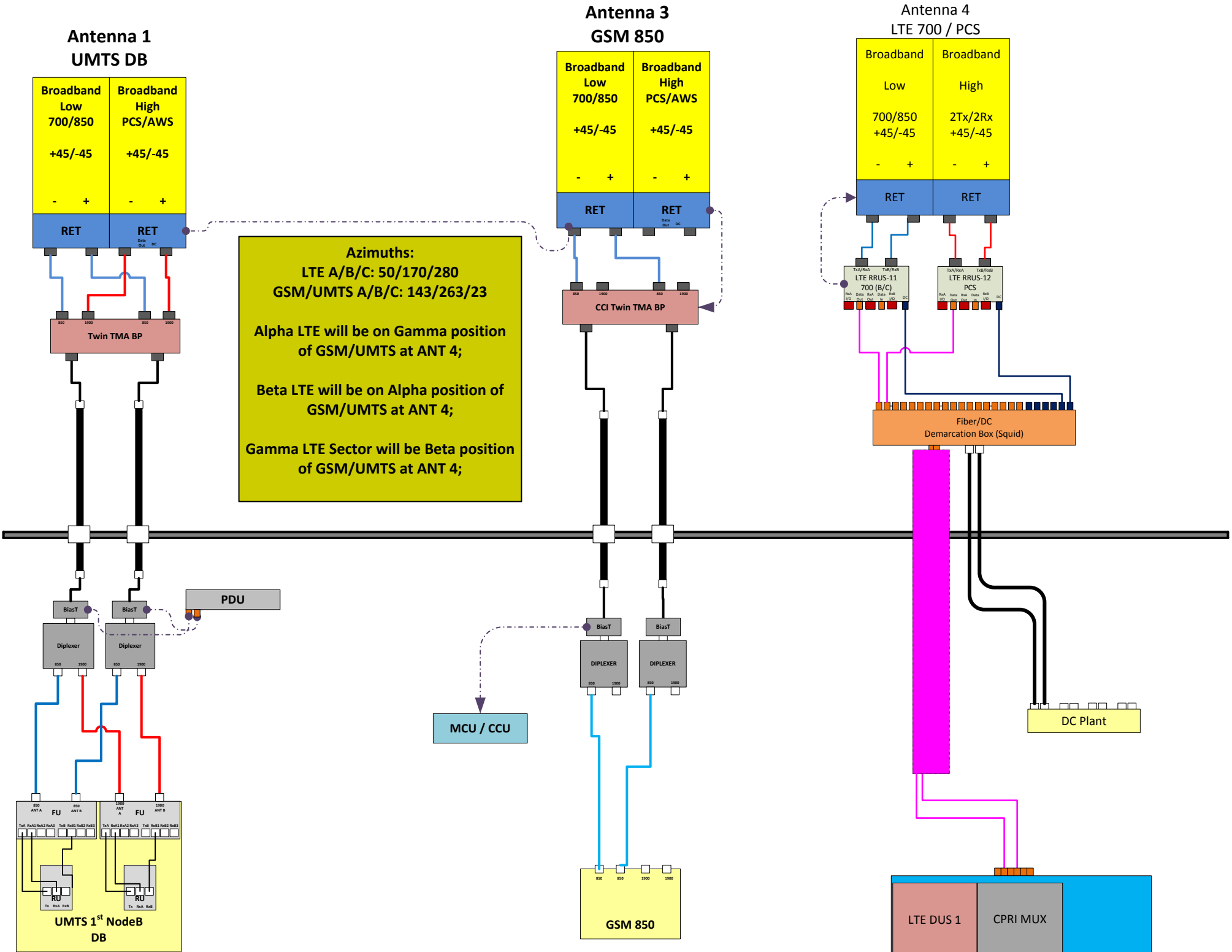
| ANTENNA COMMON FIELDS  | ANTENNA POSITION 1  |  | ANTENNA POSITION 2 |   | ANTENNA POSITION 3    |                       | ANTENNA POSITION 4    |                | ANTENNA POSITION 5 |         | ANTENNA POSITION 6 |  | ANTENNA POSITION 7 |  |  |
|--|---|--|--------------------|---|-----------------------|-----------------------|-----------------------|----------------|--------------------|---------|--------------------|--|--------------------|--|--|
| ANTENNA MAKE - MODEL   | 800 10121   |  |                    |   | AM-X-CD-16-65-00T-RET |                       | AM-X-CD-16-65-00T-RET |                |                    |         |                    |  |                    |  |  |
| ANTENNA VENDOR   | KATHREIN  |  |                    |   | KMW                   |                       | KMW                   |                |                    |         |                    |  |                    |  |  |
| ANTENNA SIZE (H x W x D)   | 54.5X10.3X5.9   |  |                    |   | 72X11.8X5.9           |                       | 72X11.8X5.9           |                |                    |         |                    |  |                    |  |  |
| ANTENNA WEIGHT   | 50.7  |  |                    |   | 48.5                  |                       | 48.5                  |                |                    |         |                    |  |                    |  |  |
| AZIMUTH  | 263   |  |                    |   | 263                   |                       | 170                   |                |                    |         |                    |  |                    |  |  |
| MAGNETIC DECLINATION   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RADIATION CENTER (feet)  | 97.02   |  |                    |   | 97.02                 |                       | 95.02                 |                |                    |         |                    |  |                    |  |  |
| ANTENNA TIP HEIGHT   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| MECHANICAL DOWNTILT  | 0   |  |                    |   | 1                     |                       | 0                     |                |                    |         |                    |  |                    |  |  |
| FEEDER AMOUNT  | 2   |  |                    |   | 2                     |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE) |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)     |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET Motor (QTY/MODEL)  | 2   | Kathrein / 860-10025                           |                    |   |                       | Built in              |                       | Built in       |                    |         |                    |  |                    |  |  |
| SURGE ARRESTOR (QTY/MODEL)   |   |  |                    |   |                       | 1                     |                       | DC Fiber Squid |                    |         |                    |  |                    |  |  |
| DIPLEXER (QTY/MODEL)   | 2   | Kathrein / 782-10250                           |                    | 2 |                       | Powerwave / LGP 21901 |                       |                |                    |         |                    |  |                    |  |  |
| DUPLEXER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET CONTROL UNIT (QTY/MODEL)   |   |  |                    |   |                       |                       |                       | LTE RRH        |                    |         |                    |  |                    |  |  |
| DC BLOCK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| TMA/LNA (QTY/MODEL)  | 1   | Pwav TT19-08BP111-001 Twin 1900 w/ 850BP (850) |                    | 1 |                       | CCI DTMAPB7819VG12A   |                       |                |                    |         |                    |  |                    |  |  |
| CURRENT INJECTORS FOR TMA (QTY/MODEL)  | 2   | Polyphaser/ 1000860                            |                    | 1 |                       | Kathrein 782-10253BTS |                       |                |                    |         |                    |  |                    |  |  |
| PDU FOR TMAS (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FILTER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| SQUID (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FIBER TRUNK (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| DC TRUNK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 700 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-11 |                    |  |                    |  |  |
| RRH - 850 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 1900 band (QTY/MODEL)  |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-12 |                    |  |                    |  |  |
| RRH - AWS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - WCS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #1 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #2 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 1 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 2 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 3 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 1  | LTE BWE 1900 A3-A4 & E, Replace existing LTE 1900 - RRUS-11 to RRUS-12 // DUL to DUS Upgrade to DUS41, Add XMU. |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 2  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 3  | Baseband Config - 1 DUS + XMU DUS-1 - 7A-7B-7C:X1P1:X1P2:_XMU-1 - PA:PA2A:_PB:PA2B:PC:PC2A:_D1E:D1D             |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |

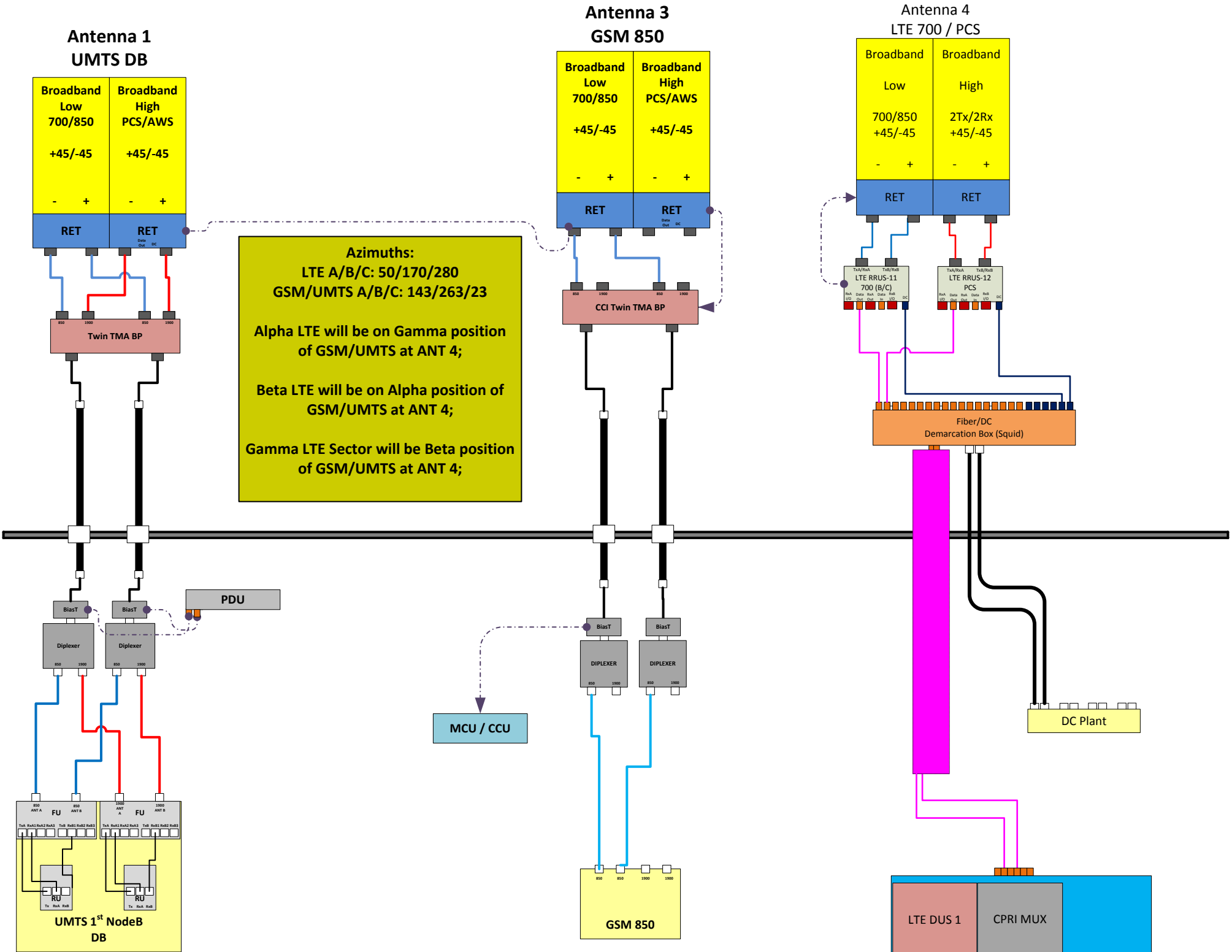
| PORT SPECIFIC FIELDS | PORT NUMBER | USEID (CSSng)     | USEID (Atoll)     | ATOLL TXID    | ATOLL CELL ID | TX/RX ? | TECHNOLOGY/FREQUENCY | ANTENNA ATOLL                      | ANTENNA GAIN | ELECTRICAL AZIMUTH | ELECTRICAL TILT | RRH LOCATION (Top/Bottom/Integrated/None) | FEEDERS TYPE  | FEEDER LENGTH (feet) | RXAIT KIT MODULE? | TRIPLEXER or LLC (QTY) | TRIPLEXER or LLC (MODEL) | SCPA/MCPA MODULE? | HATCHPLATE POWER (Watts) | ERP (Watts) | Antenna RET Name | CABLE NUMBER | CABLE ID (CSSNG) |
|----------------------|-------------|-------------------|-------------------|---------------|---------------|---------|----------------------|------------------------------------|--------------|--------------------|-----------------|---|---------------|----------------------|-------------------|------------------------|--------------------------|-------------------|--------------------------|-------------|------------------|--------------|------------------|
| ANTENNA POSITION 1   | PORT 1      | 25991.B.850.3G.1  | 25991.B.850.3G.1  | CTV10152      | CTV10152      |         | UMTS 850             | 800 10121 @850_Xpol_4dt            | 13.41        | 263                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 9            |                  |
|                      | PORT 3      | 25991.B.1900.3G.2 | 25991.B.1900.3G.2 | CTV10152      | CTU10158      |         | UMTS 1900            | 800 10121 @1920_Xpol_4dt           | 16.43        | 263                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 9            |                  |
| ANTENNA POSITION 3   | PORT 1      | 25991.B.850.25G.1 | 25991.B.850.25G.1 | 318G10152     | 318G10152     |         | GSM 850              | AM-X-CD-16-65-00T-RET_850MHz_04DT  | 16.1         | 263                | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   | 11.22                    | 234.42      |                  | 13           |                  |
| ANTENNA POSITION 4   | PORT 1      | 25991.B.700.4G.1  | 25991.B.700.4G.1  | CTL01015_7B_1 | CTL01015_7B_1 |         | LTE 700              | AM-X-CD-16-65-00T-RET_725MHz_02DT  | 15.6         | 170                | 2               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 1475.7065   |                  | 15           |                  |
|                      | PORT 3      | 25991.B.1900.4G.1 | 25991.B.1900.4G.1 | CTL01015_9B_1 | CTL01015_9B_1 |         | LTE 1900             | AM-X-CD-16-65-00T-RET_1930MHz_02DT | 17.3         | 170                | 2               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 2421.029    |                  | 15           |                  |

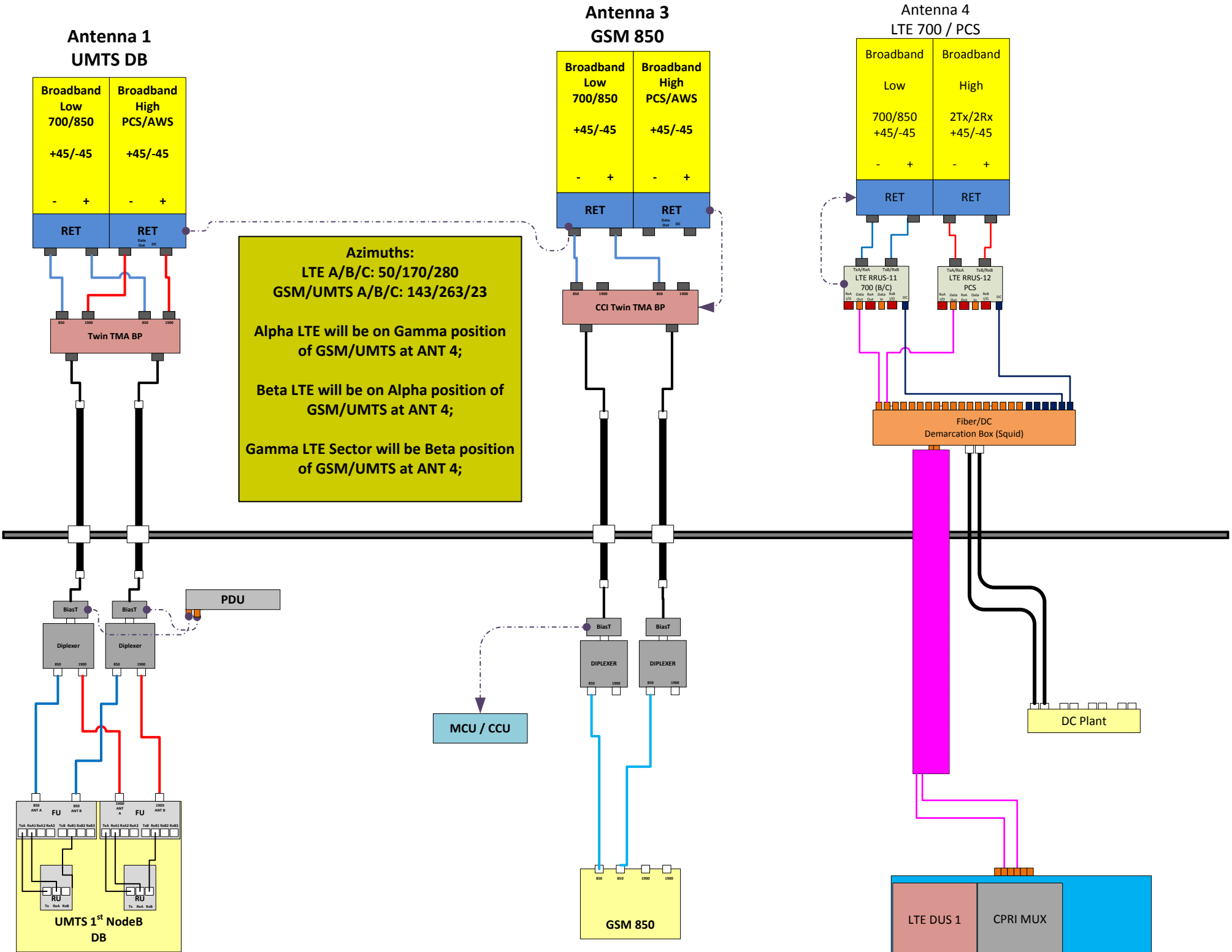
Section 17C - FINAL SECTOR/CELL INFORMATION - SECTOR C

| ANTENNA COMMON FIELDS  | ANTENNA POSITION 1  |  | ANTENNA POSITION 2 |   | ANTENNA POSITION 3    |                       | ANTENNA POSITION 4    |                | ANTENNA POSITION 5 |         | ANTENNA POSITION 6 |  | ANTENNA POSITION 7 |  |  |
|--|---|--|--------------------|---|-----------------------|-----------------------|-----------------------|----------------|--------------------|---------|--------------------|--|--------------------|--|--|
| ANTENNA MAKE - MODEL   | 800 10121   |  |                    |   | AM-X-CD-16-65-00T-RET |                       | AM-X-CD-16-65-00T-RET |                |                    |         |                    |  |                    |  |  |
| ANTENNA VENDOR   | KATHREIN  |  |                    |   | KMW                   |                       | KMW                   |                |                    |         |                    |  |                    |  |  |
| ANTENNA SIZE (H x W x D)   | 54.5X10.3X5.9   |  |                    |   | 72X11.8X5.9           |                       | 72X11.8X5.9           |                |                    |         |                    |  |                    |  |  |
| ANTENNA WEIGHT   | 50.7  |  |                    |   | 48.5                  |                       | 48.5                  |                |                    |         |                    |  |                    |  |  |
| AZIMUTH  | 23  |  |                    |   | 23                    |                       | 280                   |                |                    |         |                    |  |                    |  |  |
| MAGNETIC DECLINATION   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RADIATION CENTER (feet)  | 97.02   |  |                    |   | 97.02                 |                       | 95.02                 |                |                    |         |                    |  |                    |  |  |
| ANTENNA TIP HEIGHT   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| MECHANICAL DOWNTILT  | 0   |  |                    |   | 0                     |                       | 0                     |                |                    |         |                    |  |                    |  |  |
| FEEDER AMOUNT  | 2   |  |                    |   | 2                     |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)                            |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE) |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)     |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET Motor (QTY/MODEL)  | 2   | Kathrein / 860-10025                           |                    |   |                       | Built in              |                       | Built in       |                    |         |                    |  |                    |  |  |
| SURGE ARRESTOR (QTY/MODEL)   |   |  |                    |   |                       | 1                     |                       | DC Fiber Squid |                    |         |                    |  |                    |  |  |
| DIPLEXER (QTY/MODEL)   | 2   | Kathrein / 782-10250                           |                    | 2 |                       | Powerwave / LGP 21901 |                       |                |                    |         |                    |  |                    |  |  |
| DUPLEXER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Antenna RET CONTROL UNIT (QTY/MODEL)   |   |  |                    |   |                       |                       |                       | LTE RRH        |                    |         |                    |  |                    |  |  |
| DC BLOCK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| TMA/LNA (QTY/MODEL)  | 1   | Pwav TT19-08BP111-001 Twin 1900 w/ 850BP (850) |                    | 1 |                       | CCI DTMAPB7819VG12A   |                       |                |                    |         |                    |  |                    |  |  |
| CURRENT INJECTORS FOR TMA (QTY/MODEL)  | 2   | Polyphaser/ 1000860                            |                    | 1 |                       | Kathrein 782-10253BTS |                       |                |                    |         |                    |  |                    |  |  |
| PDU FOR TMAS (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FILTER (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| SQUID (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| FIBER TRUNK (QTY/MODEL)  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| DC TRUNK (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 700 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-11 |                    |  |                    |  |  |
| RRH - 850 band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - 1900 band (QTY/MODEL)  |   |  |                    |   |                       |                       |                       | 1              |                    | RRUS-12 |                    |  |                    |  |  |
| RRH - AWS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| RRH - WCS band (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #1 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional RRH #2 - any band (QTY/MODEL)                                       |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 1 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 2 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Additional Component 3 (QTY/MODEL)   |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 1  | LTE BWE 1900 A3-A4 & E, Replace existing LTE 1900 - RRUS-11 to RRUS-12 // DUL to DUS Upgrade to DUS41, Add XMU. |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 2  |   |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |
| Local Market Note 3  | Baseband Config - 1 DUS + XMU DUS-1 - 7A-7B-7C:X1P1:X1P2:_XMU-1 - PA:PA2A:_PB:PA2B:PC:PC2A:_D1E:D1D             |  |                    |   |                       |                       |                       |                |                    |         |                    |  |                    |  |  |

| PORT SPECIFIC FIELDS | PORT NUMBER | USEID (CSSng)     | USEID (Atoll)     | ATOLL TXID    | ATOLL CELL ID | TX/RX ? | TECHNOLOGY/FREQUENCY | ANTENNA ATOLL                      | ANTENNA GAIN | ELECTRICAL AZIMUTH | ELECTRICAL TILT | RRH LOCATION (Top/Bottom/Integrated/None) | FEEDERS TYPE  | FEEDER LENGTH (feet) | RXAIT KIT MODULE? | TRIPLEXER or LLC (QTY) | TRIPLEXER or LLC (MODEL) | SCPA/MCPA MODULE? | HATCHPLATE POWER (Watts) | ERP (Watts) | Antenna RET Name | CABLE NUMBER | CABLE ID (CSSNG) |
|----------------------|-------------|-------------------|-------------------|---------------|---------------|---------|----------------------|------------------------------------|--------------|--------------------|-----------------|---|---------------|----------------------|-------------------|------------------------|--------------------------|-------------------|--------------------------|-------------|------------------|--------------|------------------|
| ANTENNA POSITION 1   | PORT 1      | 25991.C.850.3G.1  | 25991.C.850.3G.1  | CTV10153      | CTV10153      |         | UMTS 850             | 800 10121 @850_Xpol_4dt            | 13.41        | 23                 | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 17           |                  |
|                      | PORT 3      | 25991.C.1900.3G.2 | 25991.C.1900.3G.2 | CTV10153      | CTU10159      |         | UMTS 1900            | 800 10121 @1920_Xpol_4dt           | 16.43        | 23                 | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   |                          | 249.46      |                  | 17           |                  |
| ANTENNA POSITION 3   | PORT 1      | 25991.C.850.25G.1 | 25991.C.850.25G.1 | 318G10153     | 318G10153     |         | GSM 850              | AM-X-CD-16-65-00T-RET_850MHz_04DT  | 16.1         | 23                 | 4               | None                                      | RFS 7/8 (850) | 135.03               |                   |                        |                          |                   | 11.22                    | 234.42      |                  | 21           |                  |
| ANTENNA POSITION 4   | PORT 1      | 25991.C.700.4G.1  | 25991.C.700.4G.1  | CTL01015_7C_1 | CTL01015_7C_1 |         | LTE 700              | AM-X-CD-16-65-00T-RET_725MHz_07DT  | 15.6         | 280                | 7               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 1475.7065   |                  | 23           |                  |
|                      | PORT 3      | 25991.C.1900.4G.1 | 25991.C.1900.4G.1 | CTL01015_9C_1 | CTL01015_9C_1 |         | LTE 1900             | AM-X-CD-16-65-00T-RET_1930MHz_07DT | 17.3         | 280                | 7               | Top                                       | FIBER         | 0                    |                   |                        |                          |                   |                          | 2421.029    |                  | 23           |                  |









WORKFLOW SUMMARY

| Date       | FROM<br>State / Status               | FROM<br>ATTUID | TO<br>State / Status                 | TO<br>ATTUID | Operation | Comments                      |
|------------|--------------------------------------|----------------|--------------------------------------|--------------|-----------|-------------------------------|
| 05/13/2016 | Preliminary / In Progress            | mm093q         | Preliminary / Submitted for Approval | AB014M       | Promote   | LTE 1900 BWE Preliminary RFDS |
| 06/06/2016 | Preliminary / Submitted for Approval | AB014M         | Preliminary / Approved               | BG144B       | Promote   |                               |
| 08/15/2016 | Preliminary / Approved               | BG144B         | Final / RF Approval                  | OM636A       | Promote   | Needs Final                   |
| 08/17/2016 | Final / RF Approval                  | OM636A         | Final / Approved                     | BG144B       | Promote   | Final LTE RFDS                |

## AM-X-CD-16-65-00T-RET(6' 65° Dual Broadband Antenna)

Dual Band Electrical DownTilt Antenna

698 ~ 894MHz, X-pol., H65° / V12°

1710 ~ 2170MHz, X-pol., H65° / V6.0°

### Electrical Specification

| Frequency Range   | 698~894MHz  | 1710~2170MHz  |
|---|---|---|
| Impedance   | 50Ω   |   |
| Polarization  | Dual, Slant ±45°  |   |
| Gain  | 15.5dBi / 13.35dBd @ 698-806MHz<br>16.0dBi / 13.85dBd @ 824-894MHz  | 17.3dBi / 15.15dBd @ 1710-1755MHz<br>17.4dBi / 15.25dBd @ 1850-1900MHz<br>17.1dBi / 14.95dBd @ 2110-2155MHz |
| Beamwidth   | Horizontal  | 65° @ 1710-1755MHz<br>67° @ 1850-1900MHz<br>69° @ 2110-2155MHz  |
|   | Vertical  | 6.5° @ 1710-1755MHz<br>6.0° @ 1850-1900MHz<br>5.7° @ 2110-2155MHz   |
| VSWR  | ≤1.5:1  |   |
| Front-to-Back Ratio                                     | ≥27 dB  |   |
| Electrical Downtilt Range                               | 2° ~ 16°  | 0° ~ 10°  |
| Isolation Between Ports                                 | ≥30 dB  |   |
| Isolation Between Ports of Different Frequency Elements | ≥35 dB  |   |
| Cross Pole Discrimination                               | 10.0 dB @ ±60°<br>15.0 dBi @ 0°   |   |
| First Upper Side Lobe Suppression                       | 16dB  |   |
| Side Lobe Suppression                                   | > 16 dB @ 0-6° Tilt<br>> 18 dB @ 7-12° Tilt<br>(Up to 10° from Boresight)                                     | > 16 dB @ 0-6° Tilt<br>> 18 dB @ 7-10° Tilt<br>(Up to 10° from Boresight)                                   |
| Passive Intermodulation                                 | ≤ -150 dBc @ 2x20w  |   |
| Input Maximum CW Power                                  | 500 W   | 300 W   |
| Environmental Compliance                                | IP65 for Radome<br>IP67 for Connectors  |   |
| RET Motor Configuration                                 | Field Replaceable RET Electronic Control Module /<br>RET Motor is internal to antenna & not field replaceable |   |
| Compliant with AISG 1.1 and 2.0                         | AISG 1.1 and 2.0  |   |

### Mechanical Specification

|                        |  |
|------------------------|--|
| Dimension (W×D×H)      | 11.8×5.9×72 inches<br>(300×150×1829mm) |
| Weight (Without clamp) | 48.5 lbs (22.0 kg)                     |
| Connector              | 4 x 7/16 DIN(F), Long Neck             |
| Max Wind Speed         | 150 mph                                |
| Wind Load (@150 mph)   | 1891 N                                 |

300

Kathrein's dual band antennas are ready for 3G applications, covering all existing wireless bands as well as all spectrum under consideration for future systems, AMPS, PCS and 3G/UMTS. These cross-polarized antennas offer diversity operation in the same space as a conventional 800 MHz antenna, and are mountable on our compact sector brackets.

- Wide band operation.
- Exceptional intermodulation characteristics.
- Remote control ready.
- Various gain, beamwidth and downtilt ranges.
- AISG compatible.
- High strength pultruded fiberglass radome.

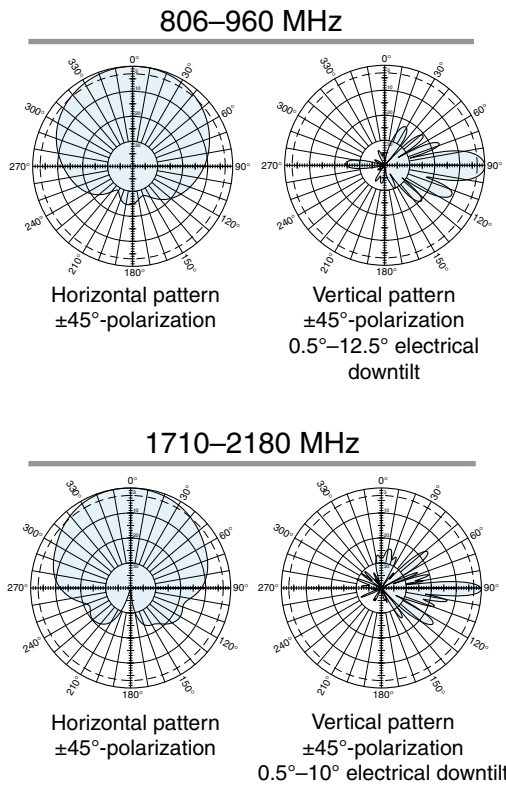
**General specifications:**

|                            |  |
|----------------------------|--|
| Frequency range            | 806–960 MHz<br>1710–2180 MHz   |
| VSWR                       | <1.5:1   |
| Impedance                  | 50 ohms  |
| Intermodulation (2x20w)    | IM3: < -150 dBc  |
| Polarization               | +45° and -45°  |
| Connector                  | 4 x 7/16 DIN female  |
| Isolation intrasystem      | >30 dB   |
| intersystem                | >45 dB (806–960 // 1710–2180 MHz)  |
| Weight                     | 46.3 lb (21 kg)  |
| Dimensions                 | 54.5 x 10.3 x 5.9 inches<br>(1384 x 262 x 149 mm)                            |
| Equivalent flat plate area | 5.58 ft <sup>2</sup> (0.518 m <sup>2</sup> )                                 |
| Wind survival rating*      | 120 mph (200 kph) sustained<br>150 mph (240 kph) in a 3 second burst         |
| Shipping dimensions        | 67.6 x 12 x 8 inches<br>(1716 x 304 x 204 mm)                                |
| Shipping weight            | 50.7 lb (23 kg)  |
| Mounting                   | Fixed mount options are available for 2 to 4.6 inch (50 to 115 mm) OD masts. |

See reverse for order information.

| Specifications:  | 806–866 MHz       |      |       | 824–896 MHz        |      |       | 880–960 MHz        |      |       | 1710–1880 MHz     |      |       | 1850–1990 MHz     |      |       | 1920–2180 MHz     |      |       |
|--|-------------------|------|-------|--------------------|------|-------|--------------------|------|-------|-------------------|------|-------|-------------------|------|-------|-------------------|------|-------|
| Average gain (dBi)   | 13.4              | 13.4 | 13.1  | 13.6               | 13.6 | 13.4  | 13.9               | 13.8 | 13.5  | 16.4              | 16.4 | 16.2  | 16.4              | 16.5 | 16    | 16.4              | 15.9 | 15.3  |
| Tilt   | 0°                | 6°   | 12°   | 0°                 | 6°   | 12°   | 0°                 | 6°   | 12°   | 0°                | 5°   | 10°   | 0°                | 5°   | 10°   | 0°                | 5°   | 10°   |
| Front-to-back ratio  | >23 dB (co-polar) |      |       | >23 dB (co-polar)  |      |       | >23 dB (co-polar)  |      |       | >23 dB (co-polar) |      |       | >23 dB (co-polar) |      |       | >23 dB (co-polar) |      |       |
| Maximum input power per input (at 50°C)  | 400 watts         |      |       | 400 watts          |      |       | 400 watts          |      |       | 250 watts         |      |       | 250 watts         |      |       | 250 watts         |      |       |
| +45° and -45° polarization horizontal beamwidth  | 88° (half-power)  |      |       | 86° (half-power)   |      |       | 88° (half-power)   |      |       | 82° (half-power)  |      |       | 85° (half-power)  |      |       | 90° (half-power)  |      |       |
| +45° and -45° polarization vertical beamwidth  | 15° (half-power)  |      |       | 14.5° (half-power) |      |       | 13.5° (half-power) |      |       | 7.1° (half-power) |      |       | 6.8° (half-power) |      |       | 6.5° (half-power) |      |       |
| Electrical downtilt continuously adjustable (manual or optional remote control)        | 0.5°–12.5°        |      |       | 0.5°–12.5°         |      |       | 0.5°–12.5°         |      |       | 0.5°–10°          |      |       | 0.5°–10°          |      |       | 0.5°–10°          |      |       |
| Vertical Pattern—min. side-lobe suppression for first sidelobe above main beam average | 0°                | 6°   | 12° T | 0°                 | 6°   | 12° T | 0°                 | 6°   | 12° T | 0°                | 5°   | 10° T | 0°                | 5°   | 10° T | 0°                | 5°   | 10° T |
|  | 16                | 16   | 16 dB | 16                 | 16   | 16 dB | 14                 | 14   | 13 dB | 17                | 17   | 16 dB | 17                | 18   | 16 dB | 18                | 16   | 16 dB |
|  | 17                | 17   | 19 dB | 17                 | 17   | 19 dB | 17                 | 16   | 16 dB | 20                | 20   | 18 dB | 21                | 22   | 17 dB | 20                | 20   | 16 dB |
| Front-to-back ratio (copolar)  | >23 dB            |      |       | >23 dB             |      |       | >23 dB             |      |       | >23 dB            |      |       | >23 dB            |      |       | >23 dB            |      |       |
| Cross polar ratio (typical)  |                   |      |       |                    |      |       |                    |      |       |                   |      |       |                   |      |       |                   |      |       |
| Main direction   | 0° 18 dB          |      |       | 18 dB              |      |       | 20 dB              |      |       | 17 dB             |      |       | 16 dB             |      |       | 15 dB             |      |       |
| Sector ±60°  | >10 dB            |      |       | >10 dB             |      |       | >13 dB             |      |       | >10 dB            |      |       | >12 dB            |      |       | >10 dB            |      |       |
| average ±60°   | 16 dB             |      |       | 16 dB              |      |       | 19 dB              |      |       | 17 dB             |      |       | 19 dB             |      |       | 19 dB             |      |       |

\* Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.



# RRUS 11

## 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  $\geq 16$  in.
- Below  $\geq 12$  in.
- Side  $\geq 0$  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



# RRUS 12



- › 2x60 Watts
- › GSM, WCDMA & LTE
- › Frequencies:
  - Band 2 (PCS, KRC 161 299/2)
  - Band 4 (AWS, KRC 161 349/2)
  - Band 5 (850MHz, KRC 161 321/2)
- › IBW: 40 MHz (B2, B4), 25 MHz (B5)
- › Up to 4 carriers WCDMA or LTE
- › 2.5 Gbps CPRI
- › 6 external alarms
- › DC supply (AC as an option)
- › Dimensions (HxWxD): 20.4"x18.5"x7.5"  
(including sun shield and handle)
- › Weight: 50 lbs, excluding mounting hardware
  - 58 lbs in Extranet description, applicable to heaviest (non-AT&T) frequency model



### DESIGNED APPURTENANCE LOADING

| TYPE                                | ELEVATION | TYPE                                | ELEVATION |
|-------------------------------------|-----------|-------------------------------------|-----------|
| Lightning Rod 1"x10'                | 130       | RRH4x30-B13 (Verizon Proposed)      | 125       |
| LPA-80080-4CF (Verizon Existing)    | 125       | RRH2x60-PCS (Verizon Proposed)      | 125       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | RRH2x60-PCS (Verizon Proposed)      | 125       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | RRH2x60-PCS (Verizon Proposed)      | 125       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | DB-T1-6Z-8AB-0Z (Verizon Proposed)  | 125       |
| LPA-80080-4CF (Verizon Existing)    | 125       | DB-T1-6Z-8AB-0Z (Verizon Proposed)  | 125       |
| LPA-80080-4CF (Verizon Existing)    | 125       | EEL Low Profile Platform (Verizon)  | 125       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | AIR21 B2A/B4P (T-Mobile Existing)   | 115       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | LNX-6515DS (T-Mobile Existing)      | 115       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | AIR21 B4A/B2P (T-Mobile Existing)   | 115       |
| LPA-80080-4CF (Verizon Existing)    | 125       | AIR21 B2A/B4P (T-Mobile Existing)   | 115       |
| LPA-80080-4CF (Verizon Existing)    | 125       | LNX-6515DS (T-Mobile Existing)      | 115       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | AIR21 B4A/B2P (T-Mobile Existing)   | 115       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | AIR21 B2A/B4P (T-Mobile Existing)   | 115       |
| SBNHH-1D65B (Verizon Proposed)      | 125       | LNX-6515DS (T-Mobile Existing)      | 115       |
| LPA-80080-4CF (Verizon Existing)    | 125       | AIR21 B4A/B2P (T-Mobile Existing)   | 115       |
| RRH4x45/2x90-AWS (Verizon Proposed) | 125       | TMA 10"x8"x3" (T-Mobile Existing)   | 115       |
| RRH4x45/2x90-AWS (Verizon Proposed) | 125       | TMA 10"x8"x3" (T-Mobile Existing)   | 115       |
| RRH4x45/2x90-AWS (Verizon Proposed) | 125       | RRUS-11 (T-Mobile Existing)         | 115       |
| RRH4x45/2x90-AWS (Verizon Proposed) | 125       | RRUS-11 (T-Mobile Existing)         | 115       |
| RRH4x30-B13 (Verizon Proposed)      | 125       | RRUS-11 (T-Mobile Existing)         | 115       |
| RRH4x30-B13 (Verizon Proposed)      | 125       | EEL Low Profile Platform (T-Mobile) | 115       |

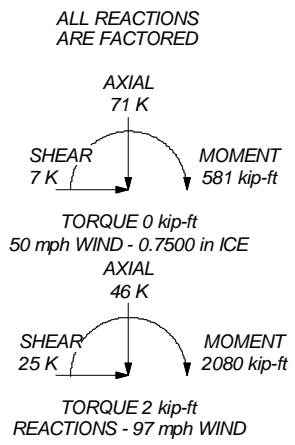
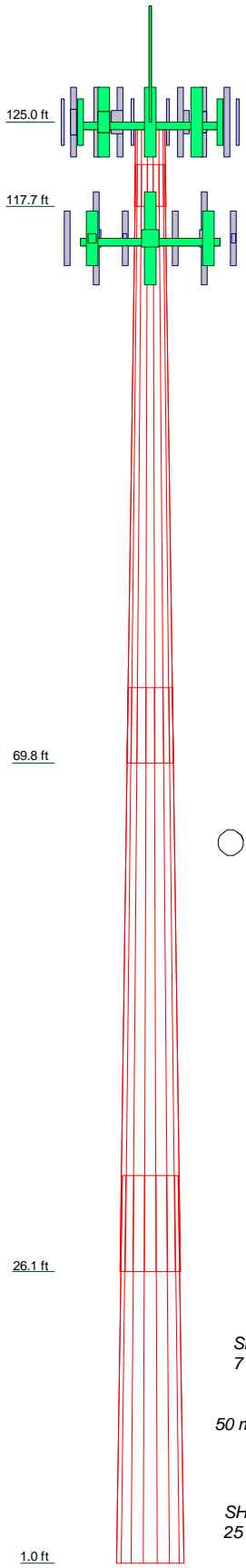
### MATERIAL STRENGTH

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

### TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 25.6%

|                    |         |         |         |         |         |      |
|--------------------|---------|---------|---------|---------|---------|------|
| Section            | 1       | 2       | 3       | 4       | A572-65 | 29.6 |
| Length (ft)        | 7.28    | 51.52   | 50.28   | 33.31   |         |      |
| Number of Sides    | 18      | 18      | 18      | 18      |         |      |
| Thickness (in)     | 0.2500  | 0.3750  | 0.3750  | 0.4375  |         |      |
| Socket Length (ft) | 3.64    | 6.50    | 8.25    | 58.5277 |         |      |
| Top Dia (in)       | 30.0000 | 30.7300 | 45.0012 | 70.0000 |         |      |
| Bot Dia (in)       | 32.4600 | 47.9200 | 62.0800 | 70.0000 |         |      |
| Grade              |         |         |         |         |         |      |
| Weight (K)         | 0.6     | 8.1     | 10.8    | 10.0    |         |      |



|   |  |            |
|---|--|------------|
| <b>Centek Engineering Inc.</b>  |  |            |
| 63-2 North Branford Rd.<br>Branford, CT 06405<br>Phone: (203) 488-0580<br>FAX: (203) 488-8587 |  |            |
| Job: <b>15001.146 - Meriden North</b>   | Project: <b>125' EEI Monopole - 119 Empire Ave., Meriden, CT</b> |            |
| Client: Verizon Wireless  | Drawn by: T.JL   | App'd:     |
| Code: TIA-222-G   | Date: 05/03/18   | Scale: NTS |
| Path:   | Dwg No. E-1  |            |