

**Structural Analysis Report**

*180-ft Existing EEL Monopole*

*Proposed T-Mobile  
Antenna Upgrade*

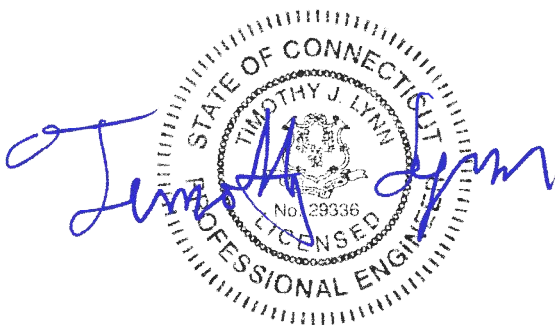
*T-Mobile Site Ref: CTHA539A*

*719 George Washington Turnpike  
Burlington, CT*

*CEN TEK Project No. 16118.00*

~~*Date: August 24, 2016*~~

*Rev 1: October 18, 2016*



**Prepared for:**  
T-Mobile USA  
35 Griffin Road  
Bloomfield, CT 06002

## **Table of Contents**

### **SECTION 1 - REPORT**

- INTRODUCTION
- ANTENNA AND APPURTENANCE SUMMARY
- PRIMARY ASSUMPTIONS USED IN THE ANALYSIS
- ANALYSIS
- TOWER LOADING
- TOWER CAPACITY
- FOUNDATION AND ANCHORS
- CONCLUSION

### **SECTION 2 – CONDITIONS & SOFTWARE**

- STANDARD ENGINEERING CONDITIONS
- GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

### **SECTION 3 – CALCULATIONS**

- tnxTower INPUT/OUTPUT SUMMARY
- tnxTower DETAILED OUTPUT
- ANCHOR BOLT AND BASE PLATE ANALYSIS
- MathCAD CAISSON FOUNDATION ANALYSIS
- L-PILE CAISSON ANALYSIS
- L-PILE LATERAL DEFLECTION vs. DEPTH
- L-PILE BENDING MOMENT vs. DEPTH
- L-PILE SHEAR FORCE vs. DEPTH

### **SECTION 4 – REFERENCE MATERIAL**

- RF DATA SHEET
- ANTENNA DATA SHEETS

## *I n t r o d u c t i o n*

The purpose of this report is to summarize the results of the non-linear, P- $\Delta$  structural analysis of the antenna upgrade proposed by T-Mobile on the existing monopole (tower) located in Burlington, Connecticut.

The host tower is a 180-ft tall, four-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 13628 dated September 15, 2005. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by URS Corporation job no; 36922256.00000 (VZ5-098), dated November 7, 2011. The tower was previously reinforced per the structural analysis and reinforcement design prepared by Atlantis Group dated October 8, 2014.

Antenna and appurtenance information were obtained from a previous structural report prepared by Centek job no. 16001.09 dated February 16, 2016, visual verification from grade conducted by Centek personnel on July 29, 2016 and a T-Mobile RF data sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The tower sections are slip joint connected. The diameter of the pole (flat-flat) is 19.50-in at the top and 56.25-in at the base.

T-Mobile proposes the installation of three (3) panel antennas mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

## *A n t e n n a   a n d   A p p u r t e n a n c e   S u m m a r y*

The existing, proposed and future loads considered in this analysis consist of the following:

- **TOWN (EXISTING):**  
Antennas: Three (3) 20-ft Omni-directional whip antennas mounted to the T-Mobile low profile platform with an elevation of 191-ft above grade level.  
Coax Cables: Three (3) 1-5/8"  $\varnothing$  coax cables running on the inside of the existing monopole.
- **AT&T (EXISTING):**  
Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrester mounted to one (1) universal ring mount with a RAD center elevation of 170-ft above grade level.  
Coax Cables: One (1) fiber cable and two (2) dc control cables running on the inside of the existing monopole.
- **AT&T (EXISTING):**  
Antennas: Six (6) Powerwave 7770.00 panel antennas, three (3) Powerwave P65-17-XLH-RR panel antennas, six (6) LGP21401 TMA's and six (6) LGP13519 diplexers mounted on a low profile platform with a RAD center elevation of 170-ft above grade level.  
Coax Cables: Twelve (12) 1-5/8"  $\varnothing$  coax cables running on the inside of the existing monopole

- **VERIZON (EXISTING TO REMAIN):**  
Antennas: Six (6) RFS APL866513 panel antennas, six (6) Andrew SBNHH-1D65B panel antennas, three (3) Alcatel-Lucent RRH2x60-700 remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads, three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads, two (2) Raycap RC2DC-3315-PF-48 main distribution boxes and six (6) RFS FD9R6004/2C-3L Diplexers mounted on a low profile platform with a RAD center elevation of 160-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.
- **TOWN (EXISTING):**  
Antennas: One (1) 20-ft dipole antenna mounted on a 3-ft standoff with an elevation of 138.5-ft above grade level.  
Coax Cables: One (1) 1-5/8"  $\varnothing$  coax cable running on the inside of the existing monopole.
- **TOWN (EXISTING):**  
Antennas: One (1) 8-ft Omni-directional whip antenna and one (1) 3-ft yagi mounted on a 3-ft standoff with an elevation of 132.5-ft above grade level.  
Coax Cables: One (1) 1-5/8"  $\varnothing$  and one (1) 1/2"  $\varnothing$  coax cables running on the inside of the existing monopole.
- **TOWN (EXISTING):**  
Antennas: One (1) 10-ft dipole antenna mounted on a 3-ft standoff with an elevation of 112.5-ft above grade level.  
Coax Cables: One (1) 1-5/8"  $\varnothing$  coax cable running on the inside of the existing monopole.
- **T-MOBILE (EXISTING TO REMAIN):**  
Antennas: Six (6) Ericsson AIR21 panel antennas mounted on a low profile platform with a RAD center elevation of 179-ft above grade level.  
Coax Cables: Six (6) 1-5/8"  $\varnothing$  coax cables and one (1) 1-1/4" fiber cable running inside the monopole.
- **T-MOBILE (PROPOSED):**  
Antennas: **Three (3) Andrew LNX-6515DS panel antennas mounted on a low profile platform with a RAD center elevation of 179-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.

## A n a l y s i s

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.

## T o w e r L o a d i n g

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 1.00” radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford; v = 90-105 mph (3-second gust)	[Annex B of TIA-222-G-2005]
	Burlington; v = 93 mph (3 second gust)	[Appendix N of the 2016 CT Building Code]
Load Cases:	<u>Load Case 1</u> ; 93 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/ 1.00” radial ice plus gravity load – used in calculation of tower stresses.	[Annex B of TIA-222-G-2005]

---

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

## Tower Capacity

Tower 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. In Load Case 1, per tnxTower “Section Capacity Table”, this tower was found to be at **85.5%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	139.50'-179.00'	85.5%	<b>PASS</b>

(1) Wall thickness increased in tower section 2 to account for reinforcement design prepared by Atlantis Group for T-Mobile dated 10.8.14.

## Foundation and Anchors

The existing foundation consists of a 7.5 Ø x 28.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the the aforementioned URS structural report dated November 7, 2011. The base of the tower is connected to the foundation by means of (18) 2.25”Ø, ASTM A615-75 anchor bolts embedded into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	29 kips
	Compression	52 kips
	Moment	3810 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	58.8%	<b>PASS</b>
	Lateral Deflection	0.21 in. <sup>(1)</sup>	<b>PASS</b>

(2) Lateral deflection limited to 0.75” under service load condition per section 9.5 of TIA-222-G.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Shear	62.5%	PASS
Base Plate	Bending	65.4%	PASS

### Conclusion

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

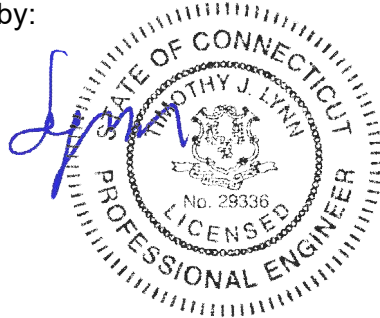
The analysis is based, in part, on the information provided to this office by T-Mobile. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE  
Structural Engineer





*Standard Conditions for Furnishing of  
Professional Engineering Services on  
Existing Structures*

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

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

## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

### tnxTower Features:

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

### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
20' x 3" Dia Omni (Town Existing)	191	SBNHH-1D65B (Verizon Existing)	160
20' x 3" Dia Omni (Town Existing)	191	SBNHH-1D65B (Verizon Existing)	160
20' x 3" Dia Omni (Town Existing)	191	APL866513-42T0 (Verizon Existing)	160
AIR21 B2A/B4P (T-Mobile Existing)	179	APL866513-42T0 (Verizon Existing)	160
AIR21 B4A/B2P (T-Mobile Existing)	179	SBNHH-1D65B (Verizon Existing)	160
AIR21 B2A/B4P (T-Mobile Existing)	179	SBNHH-1D65B (Verizon Existing)	160
AIR21 B4A/B2P (T-Mobile Existing)	179	APL866513-42T0 (Verizon Existing)	160
AIR21 B2A/B4P (T-Mobile Existing)	179	APL866513-42T0 (Verizon Existing)	160
AIR21 B4A/B2P (T-Mobile Existing)	179	SBNHH-1D65B (Verizon Existing)	160
LNX-6515DS (T-Mobile Proposed)	179	SBNHH-1D65B (Verizon Existing)	160
LNX-6515DS (T-Mobile Proposed)	179	APL866513-42T0 (Verizon Existing)	160
LNX-6515DS (T-Mobile Proposed)	179	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	160
EEL 14-ft Low Profile Platform (T-Mobile Existing)	179	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	160
(2) RRUS-11 (ATI Existing)	170	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	160
(2) RRUS-11 (ATI Existing)	170	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	160
(2) RRUS-11 (ATI Existing)	170	RRH4x45/2x90-AWS (Verizon Existing)	160
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	170	RRH4x45/2x90-AWS (Verizon Existing)	160
Valmont Uni-Tri Bracket (ATI Existing)	170	RRH4x45/2x90-AWS (Verizon Existing)	160
7770.00 (ATI Existing)	170	RRH4x30-B13 (Verizon Existing)	160
P65-17-XLH-RR (ATI Existing)	170	RRH4x30-B13 (Verizon Existing)	160
7770.00 (ATI Existing)	170	RRH2x60-PCS (Verizon Existing)	160
7770.00 (ATI Existing)	170	RRH2x60-PCS (Verizon Existing)	160
P65-17-XLH-RR (ATI Existing)	170	RRH2x60-PCS (Verizon Existing)	160
7770.00 (ATI Existing)	170	RC2DC-3315-PF-48 (Verizon Existing)	160
7770.00 (ATI Existing)	170	RC2DC-3315-PF-48 (Verizon Existing)	160
P65-17-XLH-RR (ATI Existing)	170	EEL 14-ft Low Profile Platform (Verizon Existing)	158
7770.00 (ATI Existing)	170	(2) LGP21401 TMA (ATI Existing)	170
(2) LGP21401 TMA (ATI Existing)	170	20' 4-Bay Dipole (Town Existing)	138.5
(2) LGP21401 TMA (ATI Existing)	170	3' Pipe Mount Side Arm (Town Existing)	138.5
(2) LPG13519 Diplexer (ATI Existing)	170	3' Pipe Mount Side Arm (Town Existing)	132.5
(2) LPG13519 Diplexer (ATI Existing)	170	8' x 3" Dia Omni (Town Existing)	132.5
(2) LPG13519 Diplexer (ATI Existing)	170	3' Yagi (Town Existing)	132.5
EEL 14-ft Low Profile Platform (ATI Existing)	168	10' Dipole (Town Existing)	112.5
APL866513-42T0 (Verizon Existing)	160	3' Pipe Mount Side Arm (Town Existing)	112.5

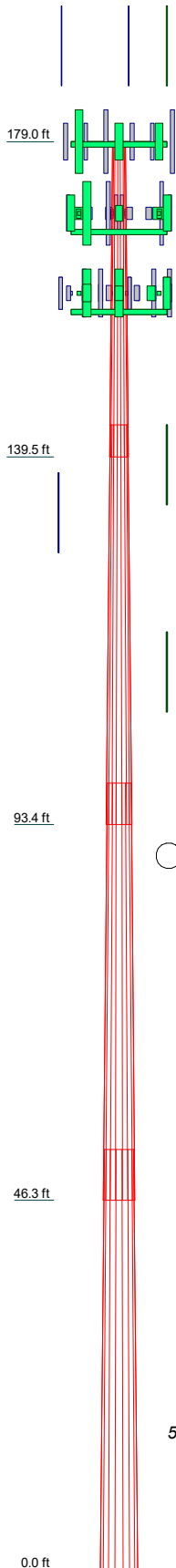
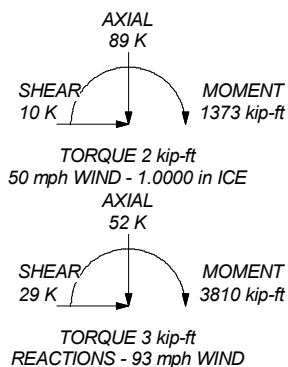
### MATERIAL STRENGTH

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 93 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 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. Wall thickness increased in tower section 2 to account for reinforcement design per Atlantis Group drawings dated 10.8.14
10. TOWER RATING: 85.5%

ALL REACTIONS ARE FACTORED



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	39.50	18	0.1875	4.00	19.5000	28.0455	1.9	
2	50.10	18	0.4000	5.20	26.8651	37.5377	6.9	
3	52.29	18	0.3750	6.39	35.6237	47.1230	8.7	A572-65
4	52.70	18	0.3750	44.9678	56.2500		10.7	28.2

<b>Centek Engineering Inc.</b>		
63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587		
Job: <b>16118.00 - CTHA539A</b>	Project: <b>180' EEI Monopole - 719 George Washington Tpk., Burlington, CT</b>	
Client: T-Mobile	Drawn by: TJL	App'd:
Code: TIA-222-G	Date: 10/18/16	Scale: NTS
Path:		Dwg No. E-1

<p><b>tnxTower</b></p> <p><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p>Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<p><b>Job</b></p> <p>16118.00 - CTHA539A</p>	<p><b>Page</b></p> <p>1 of 22</p>
	<p><b>Project</b></p> <p>180' EEI Monopole - 719 George Washington Tpk., Burlington, CT</p>	<p><b>Date</b></p> <p>10:38:58 10/18/16</p>
	<p><b>Client</b></p> <p>T-Mobile</p>	<p><b>Designed by</b></p> <p>TJL</p>

## Tower Input Data

There is a pole section.

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

The following design criteria apply:

- Basic wind speed of 93 mph.
- Structure Class II.
- Exposure Category C.
- Topographic Category 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 1.0000 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.
- Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
- Welds are fabricated with ER-70S-6 electrodes..
- Wall thickness increased in tower section 2 to account for reinforcement design per Atlantis Group drawings dated 10.8.14.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

- |  |  |   |
|--|--|---|
| <ul style="list-style-type: none"> <li>Consider Moments - Legs</li> <li>Consider Moments - Horizontals</li> <li>Consider Moments - Diagonals</li> <li>Use Moment Magnification</li> <li>√ Use Code Stress Ratios</li> <li>√ Use Code Safety Factors - Guys</li> <li>Escalate Ice</li> <li>Always Use Max Kz</li> <li>Use Special Wind Profile</li> <li>Include Bolts In Member Capacity</li> <li>Leg Bolts Are At Top Of Section</li> <li>Secondary Horizontal Braces Leg</li> <li>Use Diamond Inner Bracing (4 Sided)</li> <li>SR Members Have Cut Ends</li> <li>SR Members Are Concentric</li> </ul> | <ul style="list-style-type: none"> <li>Distribute Leg Loads As Uniform</li> <li>Assume Legs Pinned</li> <li>√ Assume Rigid Index Plate</li> <li>Use Clear Spans For Wind Area</li> <li>Use Clear Spans For KL/r</li> <li>Retension Guys To Initial Tension</li> <li>Bypass Mast Stability Checks</li> <li>Use Azimuth Dish Coefficients</li> <li>√ Project Wind Area of Appurt.</li> <li>Autocalc Torque Arm Areas</li> <li>Add IBC .6D+W Combination</li> <li>√ Sort Capacity Reports By Component</li> <li>Triangulate Diamond Inner Bracing</li> <li>Treat Feed Line Bundles As Cylinder</li> </ul> | <ul style="list-style-type: none"> <li>Use ASCE 10 X-Brace Ly Rules</li> <li>Calculate Redundant Bracing Forces</li> <li>Ignore Redundant Members in FEA</li> <li>SR Leg Bolts Resist Compression</li> <li>All Leg Panels Have Same Allowable</li> <li>Offset Girt At Foundation</li> <li>√ Consider Feed Line Torque</li> <li>Include Angle Block Shear Check</li> <li>Use TIA-222-G Bracing Resist. Exemption</li> <li>Use TIA-222-G Tension Splice Exemption</li> <li style="text-align: center;">Poles</li> <li>Include Shear-Torsion Interaction</li> <li>Always Use Sub-Critical Flow</li> <li>Use Top Mounted Sockets</li> </ul> |
|--|--|---|

## Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 2 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	179.00-139.50	39.50	4.00	18	19.5000	28.0455	0.1875	0.7500	A572-65 (65 ksi)
L2	139.50-93.40	50.10	5.20	18	26.8051	37.5377	0.4000	1.6000	A572-65 (65 ksi)
L3	93.40-46.31	52.29	6.39	18	35.6237	47.1230	0.3750	1.5000	A572-65 (65 ksi)
L4	46.31-0.00	52.70		18	44.9678	56.2500	0.3750	1.5000	A572-65 (65 ksi)

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
L1	19.8008	11.4934	541.5782	6.8559	9.9060	54.6717	1083.8689	5.7478	3.1020	16.544
	28.4781	16.5790	1625.5317	9.8896	14.2471	114.0955	3253.2023	8.2911	4.6060	24.565
L2	28.0888	33.5240	2953.0408	9.3738	13.6170	216.8641	5909.9672	16.7652	4.0137	10.034
	38.1168	47.1500	8215.7909	13.1839	19.0692	430.8420	16442.3923	23.5795	5.9026	14.757
L3	37.3345	41.9548	6585.7686	12.5133	18.0969	363.9177	13180.2030	20.9814	5.6098	14.959
	47.8499	55.6418	15362.6008	16.5955	23.9385	641.7533	30745.4162	27.8262	7.6336	20.356
L4	47.0506	53.0765	13334.2488	15.8304	22.8436	583.7187	26686.0431	26.5433	7.2543	19.345
	57.1177	66.5052	26231.8094	19.8356	28.5750	917.9986	52498.1354	33.2589	9.2400	24.64

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>f</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 179.00-139.50				1	1	1			
L2 139.50-93.40				1	1	1			
L3 93.40-46.31				1	1	1			
L4 46.31-0.00				1	1	1			

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
1 5/8 (Town Existing)	A	No	Inside Pole	179.00 - 3.00	3	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
1 5/8 (Town Existing)	A	No	Inside Pole	138.50 - 3.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
1 5/8 (Town Existing)	A	No	Inside Pole	132.50 - 3.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
1/2 (Town Existing)	A	No	Inside Pole	128.50 - 3.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
1 5/8	A	No	Inside Pole	113.00 - 3.00	1	No Ice	0.00

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 3 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		$C_{AA}$ ft <sup>2</sup> /ft	Weight plf
(Town Existing)						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
1 5/8 (T-Mobile Existing)	B	No	Inside Pole	179.00 - 3.00	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
HYBRIFLEX 1-1/4" (T-Mobile Existing)	B	No	Inside Pole	179.00 - 3.00	1	No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30
1 5/8 (AT&T Existing)	A	No	Inside Pole	170.00 - 3.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
RG6-Fiber (AT&T Existing)	A	No	Inside Pole	170.00 - 3.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
#8 AWG Copper Wire (AT&T Existing)	A	No	Inside Pole	170.00 - 3.00	2	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
1 5/8 (Verizon Existing)	C	No	Inside Pole	160.00 - 3.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (Verizon Existing)	C	No	Inside Pole	160.00 - 3.00	2	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
						1" Ice	0.00	1.90

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L1	179.00-139.50	A	0.000	0.000	0.000	0.000	0.50
		B	0.000	0.000	0.000	0.000	0.30
		C	0.000	0.000	0.000	0.000	0.33
L2	139.50-93.40	A	0.000	0.000	0.000	0.000	0.84
		B	0.000	0.000	0.000	0.000	0.35
		C	0.000	0.000	0.000	0.000	0.75
L3	93.40-46.31	A	0.000	0.000	0.000	0.000	0.89
		B	0.000	0.000	0.000	0.000	0.36
		C	0.000	0.000	0.000	0.000	0.77
L4	46.31-0.00	A	0.000	0.000	0.000	0.000	0.82
		B	0.000	0.000	0.000	0.000	0.33
		C	0.000	0.000	0.000	0.000	0.71

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L1	179.00-139.50	A	2.339	0.000	0.000	0.000	0.000	0.50
		B		0.000	0.000	0.000	0.000	0.30
		C		0.000	0.000	0.000	0.000	0.33
L2	139.50-93.40	A	2.267	0.000	0.000	0.000	0.000	0.84
		B		0.000	0.000	0.000	0.000	0.35
		C		0.000	0.000	0.000	0.000	0.75
L3	93.40-46.31	A	2.154	0.000	0.000	0.000	0.000	0.89
		B		0.000	0.000	0.000	0.000	0.36

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 4 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L4	46.31-0.00	C	1.933	0.000	0.000	0.000	0.000	0.77
		A		0.000	0.000	0.000	0.000	0.82
		B		0.000	0.000	0.000	0.000	0.33
		C		0.000	0.000	0.000	0.000	0.71

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	179.00-139.50	0.0000	0.0000	0.0000	0.0000
L2	139.50-93.40	0.0000	0.0000	0.0000	0.0000
L3	93.40-46.31	0.0000	0.0000	0.0000	0.0000
L4	46.31-0.00	0.0000	0.0000	0.0000	0.0000

### Shielding Factor $K_a$

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	$K_a$ No Ice	$K_a$ Ice
---------------	----------------------	-------------	-------------------------	-----------------	--------------

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	$C_{AA}$ Front ft <sup>2</sup>	$C_{AA}$ Side ft <sup>2</sup>	Weight K	
20' x 3" Dia Omni (Town Existing)	A	From Face	4.00	0.0000	191.00	No Ice	6.00	6.00	0.05
			-6.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
20' x 3" Dia Omni (Town Existing)	B	From Face	4.00	0.0000	191.00	No Ice	6.00	6.00	0.05
			-6.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
20' x 3" Dia Omni (Town Existing)	C	From Face	4.00	0.0000	191.00	No Ice	6.00	6.00	0.05
			-6.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
20' 4-Bay Dipole (Town Existing)	C	From Face	4.00	0.0000	138.50	No Ice	4.00	4.00	0.06
			-6.00			1/2" Ice	6.00	6.00	0.10
			0.00			1" Ice	8.00	8.00	0.14
3' Pipe Mount Side Arm (Town Existing)	C	From Face	4.00	0.0000	138.50	No Ice	0.30	0.30	0.01
			-6.00			1/2" Ice	0.61	0.61	0.05
			0.00			1" Ice	0.81	0.81	0.09
8' x 3" Dia Omni (Town Existing)	A	From Face	4.00	0.0000	132.50	No Ice	2.40	2.40	0.03
			-6.00			1/2" Ice	3.19	3.19	0.04
			0.00			1" Ice	3.67	3.67	0.07
3' Yagi (Town Existing)	A	From Face	4.00	0.0000	132.50	No Ice	2.08	2.08	0.03
			-6.00			1/2" Ice	3.79	3.79	0.05

<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<b>Job</b>						<b>Page</b>	
	16118.00 - CTHA539A						5 of 22	
	<b>Project</b>						<b>Date</b>	
180' EEI Monopole - 719 George Washington Tpk., Burlington, CT						10:38:58 10/18/16		
<b>Client</b>						<b>Designed by</b>		
T-Mobile						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						
3' Pipe Mount Side Arm (Town Existing)	A	From Face	0.00			0.0000	132.50	1" Ice	5.52	5.52	0.09
			4.00					No Ice	0.30	0.30	0.01
			-6.00					1/2" Ice	0.61	0.61	0.05
			0.00					1" Ice	0.81	0.81	0.09
10' Dipole (Town Existing)	C	From Face	4.00			0.0000	112.50	No Ice	4.00	4.00	0.05
			-6.00					1/2" Ice	6.00	6.00	0.07
			0.00					1" Ice	8.00	8.00	0.10
			4.00					No Ice	0.30	0.30	0.01
3' Pipe Mount Side Arm (Town Existing)	C	From Face	-6.00			0.0000	112.50	1/2" Ice	0.61	0.61	0.05
			0.00					1" Ice	0.81	0.81	0.09
			4.00					No Ice	6.05	4.36	0.08
			-5.00					1/2" Ice	6.42	4.70	0.12
AIR21 B2A/B4P (T-Mobile Existing)	A	From Face	0.00			0.0000	179.00	1" Ice	6.80	5.06	0.17
			4.00					No Ice	6.05	4.36	0.08
			-5.00					1/2" Ice	6.42	4.70	0.12
			0.00					1" Ice	6.80	5.06	0.17
AIR21 B4A/B2P (T-Mobile Existing)	A	From Face	4.00			0.0000	179.00	No Ice	6.05	4.36	0.08
			0.00					1/2" Ice	6.42	4.70	0.12
			0.00					1" Ice	6.80	5.06	0.17
			4.00					No Ice	6.05	4.36	0.08
AIR21 B2A/B4P (T-Mobile Existing)	B	From Face	0.00			0.0000	179.00	1/2" Ice	6.42	4.70	0.12
			-5.00					1" Ice	6.80	5.06	0.17
			0.00					No Ice	6.05	4.36	0.08
			4.00					1/2" Ice	6.42	4.70	0.12
AIR21 B4A/B2P (T-Mobile Existing)	B	From Face	0.00			0.0000	179.00	1" Ice	6.80	5.06	0.17
			4.00					No Ice	6.05	4.36	0.08
			0.00					1/2" Ice	6.42	4.70	0.12
			0.00					1" Ice	6.80	5.06	0.17
AIR21 B2A/B4P (T-Mobile Existing)	C	From Face	4.00			0.0000	179.00	No Ice	6.05	4.36	0.08
			-5.00					1/2" Ice	6.42	4.70	0.12
			0.00					1" Ice	6.80	5.06	0.17
			4.00					No Ice	6.05	4.36	0.08
AIR21 B4A/B2P (T-Mobile Existing)	C	From Face	0.00			0.0000	179.00	1/2" Ice	6.42	4.70	0.12
			0.00					1" Ice	6.80	5.06	0.17
			4.00					No Ice	11.45	7.70	0.06
			-5.00					1/2" Ice	12.06	8.29	0.12
LNx-6515DS (T-Mobile Proposed)	A	From Face	0.00			0.0000	179.00	1" Ice	12.69	8.89	0.19
			4.00					No Ice	11.45	7.70	0.06
			5.00					1/2" Ice	12.06	8.29	0.12
			0.00					1" Ice	12.69	8.89	0.19
LNx-6515DS (T-Mobile Proposed)	B	From Face	4.00			0.0000	179.00	No Ice	11.45	7.70	0.06
			5.00					1/2" Ice	12.06	8.29	0.12
			0.00					1" Ice	12.69	8.89	0.19
			4.00					No Ice	11.45	7.70	0.06
LNx-6515DS (T-Mobile Proposed)	C	From Face	5.00			0.0000	179.00	1/2" Ice	12.06	8.29	0.12
			0.00					1" Ice	12.69	8.89	0.19
			4.00					No Ice	16.50	16.50	1.55
			0.00					1/2" Ice	20.00	20.00	1.80
EEI 14-ft Low Profile Platform (T-Mobile Existing)	C	None				0.0000	179.00	1" Ice	23.50	23.50	2.05
								No Ice	2.57	1.07	0.05
								1/2" Ice	2.76	1.21	0.07
								1" Ice	2.97	1.36	0.09
(2) RRUS-11 (AT&T Existing)	A	From Face	0.50			0.0000	170.00	No Ice	2.57	1.07	0.05
			0.00					1/2" Ice	2.76	1.21	0.07
			0.00					1" Ice	2.97	1.36	0.09
			0.50					No Ice	2.57	1.07	0.05
(2) RRUS-11 (AT&T Existing)	B	From Face	0.00			0.0000	170.00	1/2" Ice	2.76	1.21	0.07
			0.00					1" Ice	2.97	1.36	0.09
			0.00					No Ice	2.57	1.07	0.05
			0.00					1/2" Ice	2.76	1.21	0.07
(2) RRUS-11 (AT&T Existing)	C	From Face	0.50			0.0000	170.00	1" Ice	2.97	1.36	0.09
			0.00					No Ice	2.57	1.07	0.05
			0.00					1/2" Ice	2.76	1.21	0.07
			0.00					1" Ice	2.97	1.36	0.09
DC6-48-60-18-8F Surge Arrestor (AT&T Existing)	C	From Face	0.50			0.0000	170.00	No Ice	1.91	1.91	0.02
			0.00					1/2" Ice	2.10	2.10	0.04
			0.00					1" Ice	2.29	2.29	0.06
			0.00					No Ice	1.75	1.75	0.29
Valmont Uni-Tri Bracket (AT&T Existing)	C	None				0.0000	170.00	1/2" Ice	1.94	1.94	0.31
								1" Ice	2.13	2.13	0.32
								No Ice	5.51	2.93	0.04
								1/2" Ice	5.87	3.27	0.07
7770.00 (AT&T Existing)	A	From Face	3.00			0.0000	170.00	No Ice	5.51	2.93	0.04
			6.00					1/2" Ice	5.87	3.27	0.07



<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<b>Job</b>		16118.00 - CTHA539A		<b>Page</b>		6 of 22	
	<b>Project</b>		180' EEI Monopole - 719 George Washington Tpk., Burlington, CT		<b>Date</b>		10:38:58 10/18/16	
	<b>Client</b>		T-Mobile		<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	Vert						ft
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
P65-17-XLH-RR (AT&T Existing)	A	From Face	0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			4.00	3.00	0.0000	170.00	No Ice	11.47	6.80	0.06
			4.00	3.00	0.0000	170.00	1/2" Ice	12.08	7.38	0.12
			0.00	3.00	0.0000	170.00	1" Ice	12.71	7.98	0.19
7770.00 (AT&T Existing)	A	From Face	3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
			-6.00	3.00	0.0000	170.00	1/2" Ice	5.87	3.27	0.07
			0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
7770.00 (AT&T Existing)	B	From Face	6.00	3.00	0.0000	170.00	1/2" Ice	5.87	3.27	0.07
			0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
			4.00	3.00	0.0000	170.00	1/2" Ice	12.08	7.38	0.12
P65-17-XLH-RR (AT&T Existing)	B	From Face	0.00	3.00	0.0000	170.00	1" Ice	12.71	7.98	0.19
			4.00	3.00	0.0000	170.00	No Ice	11.47	6.80	0.06
			4.00	3.00	0.0000	170.00	1/2" Ice	12.08	7.38	0.12
			0.00	3.00	0.0000	170.00	1" Ice	12.71	7.98	0.19
7770.00 (AT&T Existing)	B	From Face	3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
			-6.00	3.00	0.0000	170.00	1/2" Ice	5.87	3.27	0.07
			0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
7770.00 (AT&T Existing)	C	From Face	6.00	3.00	0.0000	170.00	1/2" Ice	5.87	3.27	0.07
			0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
			4.00	3.00	0.0000	170.00	1/2" Ice	12.08	7.38	0.12
P65-17-XLH-RR (AT&T Existing)	C	From Face	0.00	3.00	0.0000	170.00	1" Ice	12.71	7.98	0.19
			4.00	3.00	0.0000	170.00	No Ice	11.47	6.80	0.06
			4.00	3.00	0.0000	170.00	1/2" Ice	12.08	7.38	0.12
			0.00	3.00	0.0000	170.00	1" Ice	12.71	7.98	0.19
7770.00 (AT&T Existing)	C	From Face	3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
			-6.00	3.00	0.0000	170.00	1/2" Ice	5.87	3.27	0.07
			0.00	3.00	0.0000	170.00	1" Ice	6.23	3.63	0.11
			3.00	3.00	0.0000	170.00	No Ice	5.51	2.93	0.04
(2) LGP21401 TMA (AT&T Existing)	A	From Face	0.00	3.00	0.0000	170.00	1/2" Ice	0.94	0.44	0.02
			0.00	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
			0.00	3.00	0.0000	170.00	1" Ice	1.06	0.54	0.03
			0.00	3.00	0.0000	170.00	1/2" Ice	0.94	0.44	0.02
(2) LGP21401 TMA (AT&T Existing)	B	From Face	0.00	3.00	0.0000	170.00	1" Ice	1.06	0.54	0.03
			0.00	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
			0.00	3.00	0.0000	170.00	1/2" Ice	0.94	0.44	0.02
			0.00	3.00	0.0000	170.00	1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA (AT&T Existing)	C	From Face	0.00	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
			0.00	3.00	0.0000	170.00	1/2" Ice	0.94	0.44	0.02
			0.00	3.00	0.0000	170.00	1" Ice	1.06	0.54	0.03
			0.00	3.00	0.0000	170.00	No Ice	0.82	0.35	0.02
(2) LPG13519 Diplexer (AT&T Existing)	A	From Face	0.00	3.00	0.0000	170.00	1/2" Ice	0.29	0.21	0.01
			0.00	3.00	0.0000	170.00	1" Ice	0.36	0.28	0.01
			0.00	3.00	0.0000	170.00	No Ice	0.23	0.16	0.01
			0.00	3.00	0.0000	170.00	1/2" Ice	0.29	0.21	0.01
(2) LPG13519 Diplexer (AT&T Existing)	B	From Face	0.00	3.00	0.0000	170.00	1" Ice	0.36	0.28	0.01
			0.00	3.00	0.0000	170.00	No Ice	0.23	0.16	0.01
			0.00	3.00	0.0000	170.00	1/2" Ice	0.29	0.21	0.01
			0.00	3.00	0.0000	170.00	1" Ice	0.36	0.28	0.01
(2) LPG13519 Diplexer (AT&T Existing)	C	From Face	0.00	3.00	0.0000	170.00	No Ice	0.23	0.16	0.01
			0.00	3.00	0.0000	170.00	1/2" Ice	0.29	0.21	0.01
			0.00	3.00	0.0000	170.00	1" Ice	0.36	0.28	0.01
			0.00	3.00	0.0000	170.00	No Ice	0.23	0.16	0.01
EEI 14-ft Low Profile Platform (AT&T Existing)	C	None	0.00	3.00	0.0000	168.00	1/2" Ice	20.00	20.00	1.80
			0.00	3.00	0.0000	168.00	1" Ice	23.50	23.50	2.05
			0.00	3.00	0.0000	168.00	No Ice	16.50	16.50	1.55
			0.00	3.00	0.0000	168.00	1/2" Ice	20.00	20.00	1.80
APL866513-42T0 (Verizon Existing)	A	From Face	4.00	4.00	0.0000	160.00	1" Ice	4.05	3.61	0.02
			-6.00	4.00	0.0000	160.00	1/2" Ice	4.36	3.92	0.05
			0.00	4.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			0.00	4.00	0.0000	160.00	No Ice	8.08	5.34	0.04
SBNHH-1D65B (Verizon Existing)	A	From Face	0.00	4.00	0.0000	160.00	1/2" Ice	8.53	5.79	0.09
			0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			0.00	4.00	0.0000	160.00	No Ice	8.08	5.34	0.04
			0.00	4.00	0.0000	160.00	1/2" Ice	8.53	5.79	0.09
SBNHH-1D65B (Verizon Existing)	A	From Face	0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			0.00	4.00	0.0000	160.00	No Ice	8.08	5.34	0.04
			0.00	4.00	0.0000	160.00	1/2" Ice	8.53	5.79	0.09
			0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
APL866513-42T0 (Verizon Existing)	A	From Face	4.00	4.00	0.0000	160.00	No Ice	4.05	3.61	0.02
			-6.00	4.00	0.0000	160.00	1/2" Ice	4.36	3.92	0.05

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b>	16118.00 - CTHA539A	<b>Page</b>	7 of 22
	<b>Project</b>	180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b>	10:38:58 10/18/16
	<b>Client</b>	T-Mobile	<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	Vert						
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
APL866513-42T0 (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			-6.00	0.00			No Ice	4.05	3.61	0.02
			0.00	0.00			1/2" Ice	4.36	3.92	0.05
SBNHH-1D65B (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			0.00	0.00			No Ice	8.08	5.34	0.04
			0.00	0.00			1/2" Ice	8.53	5.79	0.09
SBNHH-1D65B (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			0.00	0.00			No Ice	8.08	5.34	0.04
			0.00	0.00			1/2" Ice	8.53	5.79	0.09
APL866513-42T0 (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			-6.00	0.00			No Ice	4.05	3.61	0.02
			0.00	0.00			1/2" Ice	4.36	3.92	0.05
APL866513-42T0 (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			-6.00	0.00			No Ice	4.05	3.61	0.02
			0.00	0.00			1/2" Ice	4.36	3.92	0.05
SBNHH-1D65B (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			0.00	0.00			No Ice	8.08	5.34	0.04
			0.00	0.00			1/2" Ice	8.53	5.79	0.09
SBNHH-1D65B (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			0.00	0.00			No Ice	8.08	5.34	0.04
			0.00	0.00			1/2" Ice	8.53	5.79	0.09
APL866513-42T0 (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	9.00	6.26	0.15
			-6.00	0.00			No Ice	4.05	3.61	0.02
			0.00	0.00			1/2" Ice	4.36	3.92	0.05
(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	A	From Face	0.00	3.00	0.0000	160.00	1" Ice	4.68	4.23	0.08
			0.00	0.00			No Ice	0.31	0.08	0.00
			0.00	0.00			1/2" Ice	0.39	0.12	0.01
(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	B	From Face	0.00	3.00	0.0000	160.00	1" Ice	0.47	0.17	0.01
			0.00	0.00			No Ice	0.31	0.08	0.00
			0.00	0.00			1/2" Ice	0.39	0.12	0.01
(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	C	From Face	0.00	3.00	0.0000	160.00	1" Ice	0.47	0.17	0.01
			0.00	0.00			No Ice	0.31	0.08	0.00
			0.00	0.00			1/2" Ice	0.39	0.12	0.01
RRH4x45/2x90-AWS (Verizon Existing)	A	From Face	0.00	4.00	0.0000	160.00	1" Ice	0.47	0.17	0.01
			0.00	0.00			No Ice	2.58	1.69	0.08
			0.00	0.00			1/2" Ice	2.79	1.87	0.10
RRH4x45/2x90-AWS (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	3.01	2.06	0.12
			0.00	0.00			No Ice	2.58	1.69	0.08
			0.00	0.00			1/2" Ice	2.79	1.87	0.10
RRH4x45/2x90-AWS (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	3.01	2.06	0.12
			0.00	0.00			No Ice	2.58	1.69	0.08
			0.00	0.00			1/2" Ice	2.79	1.87	0.10
RRH4x30-B13 (Verizon Existing)	A	From Face	0.00	4.00	0.0000	160.00	1" Ice	3.01	2.06	0.12
			0.00	0.00			No Ice	2.16	1.62	0.06
			0.00	0.00			1/2" Ice	2.35	1.79	0.08
RRH4x30-B13 (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	2.55	1.97	0.10
			0.00	0.00			No Ice	2.16	1.62	0.06
			0.00	0.00			1/2" Ice	2.35	1.79	0.08
RRH4x30-B13 (Verizon Existing)	C	From Face	0.00	4.00	0.0000	160.00	1" Ice	2.55	1.97	0.10
			0.00	0.00			No Ice	2.16	1.62	0.06
			0.00	0.00			1/2" Ice	2.35	1.79	0.08
RRH2x60-PCS (Verizon Existing)	A	From Face	0.00	4.00	0.0000	160.00	1" Ice	2.55	1.97	0.10
			-4.00	0.00			No Ice	2.15	1.35	0.06
			0.00	0.00			1/2" Ice	2.34	1.50	0.07
RRH2x60-PCS (Verizon Existing)	B	From Face	0.00	4.00	0.0000	160.00	1" Ice	2.54	1.67	0.09
			-4.00	0.00			No Ice	2.15	1.35	0.06
			0.00	0.00			1/2" Ice	2.34	1.50	0.07

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 8 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<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						
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
RRH2x60-PCS (Verizon Existing)	C	From Face	0.00		0.0000	160.00	1" Ice	2.54	1.67	0.09
			4.00				No Ice	2.15	1.35	0.06
			-4.00				1/2" Ice	2.34	1.50	0.07
RC2DC-3315-PF-48 (Verizon Existing)	A	From Face	0.00		0.0000	160.00	1" Ice	2.54	1.67	0.09
			1.00				No Ice	3.01	1.96	0.03
			1.00				1/2" Ice	3.23	2.15	0.05
RC2DC-3315-PF-48 (Verizon Existing)	B	From Face	0.00		0.0000	160.00	1" Ice	3.46	2.35	0.08
			1.00				No Ice	3.01	1.96	0.03
			1.00				1/2" Ice	3.23	2.15	0.05
EEI 14-ft Low Profile Platform (Verizon Existing)	C	None	0.00		0.0000	158.00	1" Ice	3.46	2.35	0.08
							No Ice	16.50	16.50	1.55
							1/2" Ice	20.00	20.00	1.80
						1" Ice	23.50	23.50	2.05	

### Tower Pressures - No Ice

$$G_H = 1.100$$

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>AA</sub> In Face	C <sub>AA</sub> Out Face
ft	ft		psf	ft <sup>2</sup>	e	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 179.00-139.50	158.19	1.394	29	79.459	A	0.000	79.459	79.459	100.00	0.000	0.000
					B	0.000	79.459	100.00	0.000	0.000	
					C	0.000	79.459	100.00	0.000	0.000	
L2 139.50-93.40	115.53	1.305	27	127.170	A	0.000	127.170	127.170	100.00	0.000	0.000
					B	0.000	127.170	100.00	0.000	0.000	
					C	0.000	127.170	100.00	0.000	0.000	
L3 93.40-46.31	69.31	1.172	25	167.139	A	0.000	167.139	167.139	100.00	0.000	0.000
					B	0.000	167.139	100.00	0.000	0.000	
					C	0.000	167.139	100.00	0.000	0.000	
L4 46.31-0.00	23.42	0.932	19	201.001	A	0.000	201.001	201.001	100.00	0.000	0.000
					B	0.000	201.001	100.00	0.000	0.000	
					C	0.000	201.001	100.00	0.000	0.000	

### Tower Pressure - With Ice

$$G_H = 1.100$$

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	t <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>AA</sub> In Face	C <sub>AA</sub> Out Face
ft	ft		psf	in	ft <sup>2</sup>	e	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 179.00-139.50	158.19	1.394	8	2.3394	94.860	A	0.000	94.860	94.860	100.00	0.000	0.000
						B	0.000	94.860	100.00	0.000	0.000	
						C	0.000	94.860	100.00	0.000	0.000	
L2 139.50-93.40	115.53	1.305	8	2.2670	145.144	A	0.000	145.144	145.144	100.00	0.000	0.000

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 9 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	t <sub>z</sub> in	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L3 93.40-46.31	69.31	1.172	7	2.1541	184.931	B	0.000	145.144	184.931	100.00	0.000	0.000
						C	0.000	145.144				
						A	0.000	184.931				
L4 46.31-0.00	23.42	0.932	6	1.9325	217.627	B	0.000	184.931	217.627	100.00	0.000	0.000
						C	0.000	184.931				
						A	0.000	217.627				
						B	0.000	217.627		100.00	0.000	0.000
						C	0.000	217.627		100.00	0.000	0.000

### Tower Pressure - Service

$$G_H = 1.100$$

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 179.00-139.50	158.19	1.394	11	79.459	A	0.000	79.459	79.459	100.00	0.000	0.000
					B	0.000	79.459				
					C	0.000	79.459				
L2 139.50-93.40	115.53	1.305	10	127.170	A	0.000	127.170	127.170	100.00	0.000	0.000
					B	0.000	127.170				
					C	0.000	127.170				
L3 93.40-46.31	69.31	1.172	9	167.139	A	0.000	167.139	167.139	100.00	0.000	0.000
					B	0.000	167.139				
					C	0.000	167.139				
L4 46.31-0.00	23.42	0.932	7	201.001	A	0.000	201.001	201.001	100.00	0.000	0.000
					B	0.000	201.001				
					C	0.000	201.001				

### Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	29	1	1	79.459	1.66	42.15	C
			B	1	0.65							
			C	1	0.65							
L2 139.50-93.40	1.93	6.88	A	1	0.65	27	1	1	127.170	2.49	54.06	C
			B	1	0.65							
			C	1	0.65							
L3 93.40-46.31	2.02	8.68	A	1	0.65	25	1	1	167.139	2.93	62.31	C
			B	1	0.65							
			C	1	0.65							
L4 46.31-0.00	1.85	10.72	A	1	0.65	19	1	1	201.001	2.80	60.51	C
			B	1	0.65							
			C	1	0.65							
Sum Weight:	6.94	28.17						OTM	820.28 kip-ft	9.89		

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 10 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

**Tower Forces - No Ice - Wind 60 To Face**

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	29	1	1	79.459	1.66	42.15	C
			B	1	0.65		1	1	79.459			
			C	1	0.65		1	1	79.459			
L2 139.50-93.40	1.93	6.88	A	1	0.65	27	1	1	127.170	2.49	54.06	C
			B	1	0.65		1	1	127.170			
			C	1	0.65		1	1	127.170			
L3 93.40-46.31	2.02	8.68	A	1	0.65	25	1	1	167.139	2.93	62.31	C
			B	1	0.65		1	1	167.139			
			C	1	0.65		1	1	167.139			
L4 46.31-0.00	1.85	10.72	A	1	0.65	19	1	1	201.001	2.80	60.51	C
			B	1	0.65		1	1	201.001			
			C	1	0.65		1	1	201.001			
Sum Weight:	6.94	28.17						OTM	820.28 kip-ft	9.89		

**Tower Forces - No Ice - Wind 90 To Face**

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	29	1	1	79.459	1.66	42.15	C
			B	1	0.65		1	1	79.459			
			C	1	0.65		1	1	79.459			
L2 139.50-93.40	1.93	6.88	A	1	0.65	27	1	1	127.170	2.49	54.06	C
			B	1	0.65		1	1	127.170			
			C	1	0.65		1	1	127.170			
L3 93.40-46.31	2.02	8.68	A	1	0.65	25	1	1	167.139	2.93	62.31	C
			B	1	0.65		1	1	167.139			
			C	1	0.65		1	1	167.139			
L4 46.31-0.00	1.85	10.72	A	1	0.65	19	1	1	201.001	2.80	60.51	C
			B	1	0.65		1	1	201.001			
			C	1	0.65		1	1	201.001			
Sum Weight:	6.94	28.17						OTM	820.28 kip-ft	9.89		

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

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1	1.14	4.86	A	1	1.2	8	1	1	94.860	1.06	26.85	C

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 11 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
179.00-139.50			B	1	1.2		1	1	94.860			
			C	1	1.2		1	1	94.860			
L2	1.93	11.37	A	1	1.2	8	1	1	145.144	1.52	32.93	C
139.50-93.40			B	1	1.2		1	1	145.144			
			C	1	1.2		1	1	145.144			
L3	2.02	14.20	A	1	1.2	7	1	1	184.931	1.73	36.79	C
93.40-46.31			B	1	1.2		1	1	184.931			
			C	1	1.2		1	1	184.931			
L4	1.85	16.60	A	1	1.2	6	1	1	217.627	1.62	34.96	C
46.31-0.00			B	1	1.2		1	1	217.627			
			C	1	1.2		1	1	217.627			
Sum Weight:	6.94	47.05						OTM	501.13 kip-ft	5.93		

### Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1	1.14	4.86	A	1	1.2	8	1	1	94.860	1.06	26.85	C
179.00-139.50			B	1	1.2		1	1	94.860			
			C	1	1.2		1	1	94.860			
L2	1.93	11.37	A	1	1.2	8	1	1	145.144	1.52	32.93	C
139.50-93.40			B	1	1.2		1	1	145.144			
			C	1	1.2		1	1	145.144			
L3	2.02	14.20	A	1	1.2	7	1	1	184.931	1.73	36.79	C
93.40-46.31			B	1	1.2		1	1	184.931			
			C	1	1.2		1	1	184.931			
L4	1.85	16.60	A	1	1.2	6	1	1	217.627	1.62	34.96	C
46.31-0.00			B	1	1.2		1	1	217.627			
			C	1	1.2		1	1	217.627			
Sum Weight:	6.94	47.05						OTM	501.13 kip-ft	5.93		

### Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1	1.14	4.86	A	1	1.2	8	1	1	94.860	1.06	26.85	C
179.00-139.50			B	1	1.2		1	1	94.860			
			C	1	1.2		1	1	94.860			
L2	1.93	11.37	A	1	1.2	8	1	1	145.144	1.52	32.93	C
139.50-93.40			B	1	1.2		1	1	145.144			
			C	1	1.2		1	1	145.144			
L3	2.02	14.20	A	1	1.2	7	1	1	184.931	1.73	36.79	C
93.40-46.31			B	1	1.2		1	1	184.931			
			A	1	1.2		1	1	184.931			

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 12 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L4 46.31-0.00	1.85	16.60	C	1	1.2	6	1	1	184.931	1.62	34.96	C
			A	1	1.2		1	1	217.627			
			B	1	1.2		1	1	217.627			
			C	1	1.2		1	1	217.627			
Sum Weight:	6.94	47.05						OTM	501.13 kip-ft	5.93		

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

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	11	1	1	79.459	0.62	15.70	C
			B	1	0.65		1	1	79.459			
			C	1	0.65		1	1	79.459			
L2 139.50-93.40	1.93	6.88	A	1	0.65	10	1	1	127.170	0.93	20.13	C
			B	1	0.65		1	1	127.170			
			C	1	0.65		1	1	127.170			
L3 93.40-46.31	2.02	8.68	A	1	0.65	9	1	1	167.139	1.09	23.21	C
			B	1	0.65		1	1	167.139			
			C	1	0.65		1	1	167.139			
L4 46.31-0.00	1.85	10.72	A	1	0.65	7	1	1	201.001	1.04	22.54	C
			B	1	0.65		1	1	201.001			
			C	1	0.65		1	1	201.001			
Sum Weight:	6.94	28.17						OTM	305.49 kip-ft			

### Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C <sub>F</sub>	q <sub>z</sub> psf	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	11	1	1	79.459	0.62	15.70	C
			B	1	0.65		1	1	79.459			
			C	1	0.65		1	1	79.459			
L2 139.50-93.40	1.93	6.88	A	1	0.65	10	1	1	127.170	0.93	20.13	C
			B	1	0.65		1	1	127.170			
			C	1	0.65		1	1	127.170			
L3 93.40-46.31	2.02	8.68	A	1	0.65	9	1	1	167.139	1.09	23.21	C
			B	1	0.65		1	1	167.139			
			C	1	0.65		1	1	167.139			
L4 46.31-0.00	1.85	10.72	A	1	0.65	7	1	1	201.001	1.04	22.54	C
			B	1	0.65		1	1	201.001			
			C	1	0.65		1	1	201.001			
Sum Weight:	6.94	28.17						OTM	305.49 kip-ft			

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 13 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

**Tower Forces - Service - Wind 90 To Face**

Section Elevation <i>ft</i>	Add Weight <i>K</i>	Self Weight <i>K</i>	F a c e	e	C <sub>F</sub>	q <sub>z</sub> <i>psf</i>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> <i>ft<sup>2</sup></i>	F <i>K</i>	w <i>plf</i>	Ctrl. Face
L1 179.00-139.50	1.14	1.89	A	1	0.65	11	1	1	79.459	0.62	15.70	C
			B	1	0.65		1	1	79.459			
			C	1	0.65		1	1	79.459			
L2 139.50-93.40	1.93	6.88	A	1	0.65	10	1	1	127.170	0.93	20.13	C
			B	1	0.65		1	1	127.170			
			C	1	0.65		1	1	127.170			
L3 93.40-46.31	2.02	8.68	A	1	0.65	9	1	1	167.139	1.09	23.21	C
			B	1	0.65		1	1	167.139			
			C	1	0.65		1	1	167.139			
L4 46.31-0.00	1.85	10.72	A	1	0.65	7	1	1	201.001	1.04	22.54	C
			B	1	0.65		1	1	201.001			
			C	1	0.65		1	1	201.001			
Sum Weight:	6.94	28.17						OTM	305.49 kip-ft	3.68		

**Force Totals**

Load Case	Vertical Forces <i>K</i>	Sum of Forces X <i>K</i>	Sum of Forces Z <i>K</i>	Sum of Overturning Moments, M <sub>x</sub> <i>kip-ft</i>	Sum of Overturning Moments, M <sub>z</sub> <i>kip-ft</i>	Sum of Torques <i>kip-ft</i>
Leg Weight	28.17					
Bracing Weight	0.00					
Total Member Self-Weight	28.17			0.81	-0.25	
Total Weight	42.98			0.81	-0.25	
Wind 0 deg - No Ice		0.00	-18.32	-2237.35	-0.25	0.54
Wind 30 deg - No Ice		9.18	-15.87	-1937.50	-1121.51	1.35
Wind 60 deg - No Ice		15.89	-9.16	-1118.27	-1942.32	1.80
Wind 90 deg - No Ice		18.35	0.00	0.81	-2242.76	1.76
Wind 120 deg - No Ice		15.89	9.16	1119.89	-1942.32	1.25
Wind 150 deg - No Ice		9.18	15.87	1939.11	-1121.51	0.41
Wind 180 deg - No Ice		0.00	18.32	2238.97	-0.25	-0.54
Wind 210 deg - No Ice		-9.18	15.87	1939.11	1121.00	-1.35
Wind 240 deg - No Ice		-15.89	9.16	1119.89	1941.82	-1.80
Wind 270 deg - No Ice		-18.35	0.00	0.81	2242.25	-1.76
Wind 300 deg - No Ice		-15.89	-9.16	-1118.27	1941.82	-1.25
Wind 330 deg - No Ice		-9.18	-15.87	-1937.50	1121.00	-0.41
Member Ice	18.88					
Total Weight Ice	78.58			6.35	-1.07	
Wind 0 deg - Ice		0.00	-10.04	-1182.21	-1.07	0.33
Wind 30 deg - Ice		5.02	-8.69	-1022.97	-596.07	1.08
Wind 60 deg - Ice		8.70	-5.02	-587.93	-1031.63	1.55
Wind 90 deg - Ice		10.05	0.00	6.35	-1191.06	1.60
Wind 120 deg - Ice		8.70	5.02	600.63	-1031.63	1.23
Wind 150 deg - Ice		5.02	8.69	1035.67	-596.07	0.52
Wind 180 deg - Ice		0.00	10.04	1194.91	-1.07	-0.33
Wind 210 deg - Ice		-5.02	8.69	1035.67	593.92	-1.08
Wind 240 deg - Ice		-8.70	5.02	600.63	1029.48	-1.55



<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 14 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, $M_x$ kip-ft	Sum of Overturning Moments, $M_z$ kip-ft	Sum of Torques kip-ft
Wind 270 deg - Ice		-10.05	0.00	6.35	1188.91	-1.60
Wind 300 deg - Ice		-8.70	-5.02	-587.93	1029.48	-1.23
Wind 330 deg - Ice		-5.02	-8.69	-1022.97	593.92	-0.52
Total Weight	42.98			0.81	-0.25	
Wind 0 deg - Service		0.00	-6.82	-832.73	-0.25	0.20
Wind 30 deg - Service		3.42	-5.91	-721.05	-417.83	0.50
Wind 60 deg - Service		5.92	-3.41	-415.96	-723.52	0.67
Wind 90 deg - Service		6.83	0.00	0.81	-835.41	0.66
Wind 120 deg - Service		5.92	3.41	417.58	-723.52	0.47
Wind 150 deg - Service		3.42	5.91	722.67	-417.83	0.15
Wind 180 deg - Service		0.00	6.82	834.34	-0.25	-0.20
Wind 210 deg - Service		-3.42	5.91	722.67	417.32	-0.50
Wind 240 deg - Service		-5.92	3.41	417.58	723.01	-0.67
Wind 270 deg - Service		-6.83	0.00	0.81	834.90	-0.66
Wind 300 deg - Service		-5.92	-3.41	-415.96	723.01	-0.47
Wind 330 deg - Service		-3.42	-5.91	-721.05	417.32	-0.15

## 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 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 15 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Comb. No.	Description
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	179 - 139.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-30.48	-0.24	-0.18
			Max. Mx	8	-10.61	-417.32	-0.06
			Max. My	2	-10.62	-0.05	416.53
			Max. Vy	8	16.55	-417.32	-0.06
			Max. Vx	14	16.50	-0.05	-416.49
			Max. Torque	21			0.14
L2	139.5 - 93.4	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-46.48	-1.25	-7.52
			Max. Mx	8	-20.78	-1272.98	-0.94
			Max. My	14	-20.79	-0.29	-1270.83
			Max. Vy	8	21.39	-1272.98	-0.94
			Max. Vx	14	21.34	-0.29	-1270.83
			Max. Torque	19			2.84
L3	93.4 - 46.31	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-64.70	-1.33	-7.98
			Max. Mx	8	-33.73	-2352.82	-1.01
			Max. My	14	-33.73	-0.32	-2348.54
			Max. Vy	8	25.57	-2352.82	-1.01
			Max. Vx	14	25.53	-0.32	-2348.54
			Max. Torque	19			2.84
L4	46.31 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-88.99	-1.33	-7.98
			Max. Mx	8	-51.55	-3809.67	-1.03
			Max. My	14	-51.55	-0.32	-3803.03
			Max. Vy	8	29.41	-3809.67	-1.03
			Max. Vx	14	29.36	-0.32	-3803.03
			Max. Torque	19			2.82

### Maximum Reactions

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

<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<p><b>Job</b></p> <p style="text-align: center;">16118.00 - CTHA539A</p>	<p><b>Page</b></p> <p style="text-align: center;">16 of 22</p>
	<p><b>Project</b></p> <p style="text-align: center;">180' EEI Monopole - 719 George Washington Tpk., Burlington, CT</p>	<p><b>Date</b></p> <p style="text-align: center;">10:38:58 10/18/16</p>
	<p><b>Client</b></p> <p style="text-align: center;">T-Mobile</p>	<p><b>Designed by</b></p> <p style="text-align: center;">TJL</p>

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	33	88.99	-0.00	-10.04
	Max. H <sub>x</sub>	20	51.58	29.36	-0.00
	Max. H <sub>z</sub>	3	38.68	-0.00	29.32
	Max. M <sub>x</sub>	2	3800.91	-0.00	29.32
	Max. M <sub>z</sub>	8	3809.67	-29.36	-0.00
	Max. Torsion	19	2.82	25.43	-14.66
	Min. Vert	13	38.68	-14.68	-25.39
	Min. H <sub>x</sub>	8	51.58	-29.36	-0.00
	Min. H <sub>z</sub>	15	38.68	-0.00	-29.32
	Min. M <sub>x</sub>	14	-3803.03	-0.00	-29.32
	Min. M <sub>z</sub>	20	-3809.01	29.36	-0.00
	Min. Torsion	7	-2.82	-25.43	14.66

### 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	42.98	0.00	0.00	0.81	-0.25	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	51.58	0.00	-29.32	-3800.91	-0.32	0.81
0.9 Dead+1.6 Wind 0 deg - No Ice	38.68	0.00	-29.32	-3740.68	-0.23	0.82
1.2 Dead+1.6 Wind 30 deg - No Ice	51.58	14.68	-25.39	-3291.55	-1905.00	2.09
0.9 Dead+1.6 Wind 30 deg - No Ice	38.68	14.68	-25.39	-3239.44	-1874.60	2.10
1.2 Dead+1.6 Wind 60 deg - No Ice	51.58	25.43	-14.66	-1899.94	-3299.31	2.81
0.9 Dead+1.6 Wind 60 deg - No Ice	38.68	25.43	-14.66	-1869.97	-3246.73	2.82
1.2 Dead+1.6 Wind 90 deg - No Ice	51.58	29.36	0.00	1.02	-3809.67	2.78
0.9 Dead+1.6 Wind 90 deg - No Ice	38.68	29.36	0.00	0.75	-3748.96	2.78
1.2 Dead+1.6 Wind 120 deg - No Ice	51.58	25.43	14.66	1902.01	-3299.34	2.00
0.9 Dead+1.6 Wind 120 deg - No Ice	38.68	25.43	14.66	1871.48	-3246.75	2.00
1.2 Dead+1.6 Wind 150 deg - No Ice	51.58	14.68	25.39	3293.65	-1905.03	0.69
0.9 Dead+1.6 Wind 150 deg - No Ice	38.68	14.68	25.39	3240.97	-1874.62	0.68
1.2 Dead+1.6 Wind 180 deg - No Ice	51.58	0.00	29.32	3803.03	-0.32	-0.81
0.9 Dead+1.6 Wind 180 deg - No Ice	38.68	0.00	29.32	3742.23	-0.23	-0.82
1.2 Dead+1.6 Wind 210 deg - No Ice	51.58	-14.68	25.39	3293.64	1904.38	-2.09
0.9 Dead+1.6 Wind 210 deg - No Ice	38.68	-14.68	25.39	3240.97	1874.15	-2.11
1.2 Dead+1.6 Wind 240 deg - No Ice	51.58	-25.43	14.66	1902.00	3298.69	-2.81
0.9 Dead+1.6 Wind 240 deg - No Ice	38.68	-25.43	14.66	1871.47	3246.27	-2.82
1.2 Dead+1.6 Wind 270 deg - No Ice	51.58	-29.36	0.00	1.02	3809.01	-2.78

<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<p><b>Job</b></p> <p style="text-align: center;">16118.00 - CTHA539A</p>	<p><b>Page</b></p> <p style="text-align: center;">17 of 22</p>
	<p><b>Project</b></p> <p style="text-align: center;">180' EEI Monopole - 719 George Washington Tpk., Burlington, CT</p>	<p><b>Date</b></p> <p style="text-align: center;">10:38:58 10/18/16</p>
	<p><b>Client</b></p> <p style="text-align: center;">T-Mobile</p>	<p><b>Designed by</b></p> <p style="text-align: center;">TJL</p>

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
0.9 Dead+1.6 Wind 270 deg - No Ice	38.68	-29.36	0.00	0.75	3748.48	-2.78
1.2 Dead+1.6 Wind 300 deg - No Ice	51.58	-25.43	-14.66	-1899.93	3298.66	-2.00
0.9 Dead+1.6 Wind 300 deg - No Ice	38.68	-25.43	-14.66	-1869.96	3246.25	-1.99
1.2 Dead+1.6 Wind 330 deg - No Ice	51.58	-14.68	-25.39	-3291.54	1904.35	-0.68
0.9 Dead+1.6 Wind 330 deg - No Ice	38.68	-14.68	-25.39	-3239.43	1874.13	-0.67
1.2 Dead+1.0 Ice+1.0 Temp	88.99	0.00	0.00	7.98	-1.33	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	88.99	0.00	-10.04	-1356.64	-1.36	0.20
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	88.99	5.02	-8.69	-1173.79	-684.59	0.98
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	88.99	8.70	-5.02	-674.24	-1184.76	1.49
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	88.99	10.05	0.00	8.16	-1367.84	1.61
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	88.99	8.70	5.02	690.58	-1184.77	1.30
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	88.99	5.02	8.69	1190.14	-684.60	0.64
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	88.99	0.00	10.04	1372.99	-1.36	-0.20
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	88.99	-5.02	8.69	1190.14	681.88	-0.97
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	88.99	-8.70	5.02	690.58	1182.05	-1.49
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	88.99	-10.05	0.00	8.16	1365.11	-1.61
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	88.99	-8.70	-5.02	-674.24	1182.04	-1.29
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	88.99	-5.02	-8.69	-1173.79	681.87	-0.63
Dead+Wind 0 deg - Service	42.98	0.00	-6.82	-876.71	-0.27	0.19
Dead+Wind 30 deg - Service	42.98	3.42	-5.91	-759.15	-439.93	0.50
Dead+Wind 60 deg - Service	42.98	5.92	-3.41	-437.92	-761.78	0.66
Dead+Wind 90 deg - Service	42.98	6.83	0.00	0.88	-879.57	0.66
Dead+Wind 120 deg - Service	42.98	5.92	3.41	439.68	-761.78	0.47
Dead+Wind 150 deg - Service	42.98	3.42	5.91	760.90	-439.93	0.16
Dead+Wind 180 deg - Service	42.98	0.00	6.82	878.47	-0.27	-0.19
Dead+Wind 210 deg - Service	42.98	-3.42	5.91	760.90	439.38	-0.50
Dead+Wind 240 deg - Service	42.98	-5.92	3.41	439.68	761.23	-0.67
Dead+Wind 270 deg - Service	42.98	-6.83	0.00	0.88	879.03	-0.66
Dead+Wind 300 deg - Service	42.98	-5.92	-3.41	-437.92	761.23	-0.47
Dead+Wind 330 deg - Service	42.98	-3.42	-5.91	-759.15	439.38	-0.16

## Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-42.98	0.00	0.00	42.98	0.00	0.000%
2	0.00	-51.58	-29.32	-0.00	51.58	29.32	0.000%
3	0.00	-38.68	-29.32	-0.00	38.68	29.32	0.000%
4	14.68	-51.58	-25.39	-14.68	51.58	25.39	0.000%
5	14.68	-38.68	-25.39	-14.68	38.68	25.39	0.000%

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 18 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
6	25.43	-51.58	-14.66	-25.43	51.58	14.66	0.000%
7	25.43	-38.68	-14.66	-25.43	38.68	14.66	0.000%
8	29.36	-51.58	0.00	-29.36	51.58	-0.00	0.000%
9	29.36	-38.68	0.00	-29.36	38.68	-0.00	0.000%
10	25.43	-51.58	14.66	-25.43	51.58	-14.66	0.000%
11	25.43	-38.68	14.66	-25.43	38.68	-14.66	0.000%
12	14.68	-51.58	25.39	-14.68	51.58	-25.39	0.000%
13	14.68	-38.68	25.39	-14.68	38.68	-25.39	0.000%
14	0.00	-51.58	29.32	-0.00	51.58	-29.32	0.000%
15	0.00	-38.68	29.32	-0.00	38.68	-29.32	0.000%
16	-14.68	-51.58	25.39	14.68	51.58	-25.39	0.000%
17	-14.68	-38.68	25.39	14.68	38.68	-25.39	0.000%
18	-25.43	-51.58	14.66	25.43	51.58	-14.66	0.000%
19	-25.43	-38.68	14.66	25.43	38.68	-14.66	0.000%
20	-29.36	-51.58	0.00	29.36	51.58	-0.00	0.000%
21	-29.36	-38.68	0.00	29.36	38.68	-0.00	0.000%
22	-25.43	-51.58	-14.66	25.43	51.58	14.66	0.000%
23	-25.43	-38.68	-14.66	25.43	38.68	14.66	0.000%
24	-14.68	-51.58	-25.39	14.68	51.58	25.39	0.000%
25	-14.68	-38.68	-25.39	14.68	38.68	25.39	0.000%
26	0.00	-88.99	0.00	-0.00	88.99	-0.00	0.000%
27	0.00	-88.99	-10.04	-0.00	88.99	10.04	0.000%
28	5.02	-88.99	-8.69	-5.02	88.99	8.69	0.000%
29	8.70	-88.99	-5.02	-8.70	88.99	5.02	0.000%
30	10.05	-88.99	0.00	-10.05	88.99	-0.00	0.000%
31	8.70	-88.99	5.02	-8.70	88.99	-5.02	0.000%
32	5.02	-88.99	8.69	-5.02	88.99	-8.69	0.000%
33	0.00	-88.99	10.04	-0.00	88.99	-10.04	0.000%
34	-5.02	-88.99	8.69	5.02	88.99	-8.69	0.000%
35	-8.70	-88.99	5.02	8.70	88.99	-5.02	0.000%
36	-10.05	-88.99	0.00	10.05	88.99	-0.00	0.000%
37	-8.70	-88.99	-5.02	8.70	88.99	5.02	0.000%
38	-5.02	-88.99	-8.69	5.02	88.99	8.69	0.000%
39	0.00	-42.98	-6.82	-0.00	42.98	6.82	0.000%
40	3.42	-42.98	-5.91	-3.42	42.98	5.91	0.000%
41	5.92	-42.98	-3.41	-5.92	42.98	3.41	0.000%
42	6.83	-42.98	0.00	-6.83	42.98	-0.00	0.000%
43	5.92	-42.98	3.41	-5.92	42.98	-3.41	0.000%
44	3.42	-42.98	5.91	-3.42	42.98	-5.91	0.000%
45	0.00	-42.98	6.82	-0.00	42.98	-6.82	0.000%
46	-3.42	-42.98	5.91	3.42	42.98	-5.91	0.000%
47	-5.92	-42.98	3.41	5.92	42.98	-3.41	0.000%
48	-6.83	-42.98	0.00	6.83	42.98	-0.00	0.000%
49	-5.92	-42.98	-3.41	5.92	42.98	3.41	0.000%
50	-3.42	-42.98	-5.91	3.42	42.98	5.91	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	0.00006247
3	Yes	4	0.00000001	0.00094857
4	Yes	6	0.00000001	0.00032260
5	Yes	6	0.00000001	0.00010120
6	Yes	6	0.00000001	0.00030746

<p style="text-align: center;"><b>tnxTower</b></p> <p style="text-align: center;"><b>Centek Engineering Inc.</b> 63-2 North Branford Rd.</p> <p style="text-align: center;">Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587</p>	<b>Job</b>	16118.00 - CTHA539A	<b>Page</b>	19 of 22
	<b>Project</b>	180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b>	10:38:58 10/18/16
	<b>Client</b>	T-Mobile	<b>Designed by</b>	TJL

7	Yes	6	0.0000001	0.00009562
8	Yes	5	0.0000001	0.00022646
9	Yes	5	0.0000001	0.00010645
10	Yes	6	0.0000001	0.00032333
11	Yes	6	0.0000001	0.00010134
12	Yes	6	0.0000001	0.00031391
13	Yes	6	0.0000001	0.00009794
14	Yes	5	0.0000001	0.00006249
15	Yes	4	0.0000001	0.00094913
16	Yes	6	0.0000001	0.00031001
17	Yes	6	0.0000001	0.00009651
18	Yes	6	0.0000001	0.00032575
19	Yes	6	0.0000001	0.00010226
20	Yes	5	0.0000001	0.00022647
21	Yes	5	0.0000001	0.00010647
22	Yes	6	0.0000001	0.00030957
23	Yes	6	0.0000001	0.00009642
24	Yes	6	0.0000001	0.00031839
25	Yes	6	0.0000001	0.00009965
26	Yes	4	0.0000001	0.00009232
27	Yes	6	0.0000001	0.00026265
28	Yes	6	0.0000001	0.00055092
29	Yes	6	0.0000001	0.00052430
30	Yes	6	0.0000001	0.00027433
31	Yes	6	0.0000001	0.00057437
32	Yes	6	0.0000001	0.00054875
33	Yes	6	0.0000001	0.00026787
34	Yes	6	0.0000001	0.00054400
35	Yes	6	0.0000001	0.00057399
36	Yes	6	0.0000001	0.00027364
37	Yes	6	0.0000001	0.00052352
38	Yes	6	0.0000001	0.00054558
39	Yes	4	0.0000001	0.00013859
40	Yes	5	0.0000001	0.00007549
41	Yes	5	0.0000001	0.00006550
42	Yes	4	0.0000001	0.00023970
43	Yes	5	0.0000001	0.00007622
44	Yes	5	0.0000001	0.00006954
45	Yes	4	0.0000001	0.00013933
46	Yes	5	0.0000001	0.00006706
47	Yes	5	0.0000001	0.00007802
48	Yes	4	0.0000001	0.00023943
49	Yes	5	0.0000001	0.00006652
50	Yes	5	0.0000001	0.00007223

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	179 - 139.5	35.347	43	1.8615	0.0031
L2	143.5 - 93.4	22.457	43	1.4992	0.0030
L3	98.6 - 46.31	10.459	43	1.0289	0.0017
L4	52.7 - 0	2.940	43	0.5175	0.0006

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

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 20 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
191.00	20' x 3" Dia Omni	43	35.347	1.8615	0.0031	28123
179.00	AIR21 B2A/B4P	43	35.347	1.8615	0.0031	28123
170.00	(2) RRUS-11	43	31.928	1.7696	0.0031	15624
168.00	EEI 14-ft Low Profile Platform	43	31.175	1.7492	0.0031	12783
160.00	APL866513-42T0	43	28.205	1.6676	0.0031	7400
158.00	EEI 14-ft Low Profile Platform	43	27.477	1.6472	0.0031	6695
138.50	20' 4-Bay Dipole	43	20.859	1.4481	0.0029	4123
132.50	8' x 3" Dia Omni	43	19.036	1.3866	0.0027	4339
112.50	10' Dipole	43	13.651	1.1787	0.0021	5253

### Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	179 - 139.5	153.004	8	8.0668	0.0132
L2	143.5 - 93.4	97.281	8	6.4991	0.0126
L3	98.6 - 46.31	45.334	8	4.4622	0.0073
L4	52.7 - 0	12.744	8	2.2440	0.0027

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

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
191.00	20' x 3" Dia Omni	8	153.004	8.0668	0.0132	6716
179.00	AIR21 B2A/B4P	8	153.004	8.0668	0.0132	6716
170.00	(2) RRUS-11	8	138.227	7.6695	0.0132	3730
168.00	EEI 14-ft Low Profile Platform	8	134.971	7.5812	0.0132	3051
160.00	APL866513-42T0	8	122.135	7.2280	0.0132	1764
158.00	EEI 14-ft Low Profile Platform	8	118.988	7.1397	0.0131	1595
138.50	20' 4-Bay Dipole	8	90.366	6.2780	0.0122	976
132.50	8' x 3" Dia Omni	8	82.479	6.0120	0.0116	1024
112.50	10' Dipole	8	59.164	5.1113	0.0091	1231

### Compression Checks

### Pole Design Data

Section No.	Elevation	Size	L	L <sub>u</sub>	Kl/r	A	P <sub>u</sub>	φP <sub>n</sub>	Ratio
	ft		ft	ft		in <sup>2</sup>	K	K	φP <sub>n</sub>
L1	179 - 139.5 (1)	TP28.0455x19.5x0.1875	39.50	179.00	224.2	16.0640	-10.61	72.22	0.147
L2	139.5 - 93.4 (2)	TP37.5377x26.8051x0.4	50.10	179.00	168.0	45.7357	-20.78	366.24	0.057
L3	93.4 - 46.31 (3)	TP47.123x35.6237x0.375	52.29	179.00	133.4	53.9692	-33.73	684.68	0.049

<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 21 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJL

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio $\frac{P_u}{\phi P_n}$
L4	46.31 - 0 (4)	TP56.25x44.9678x0.375	52.70	179.00	108.3	66.5052	-51.55	1281.21	0.040

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> kip-ft	φM <sub>ux</sub> kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M <sub>uy</sub> kip-ft	φM <sub>uy</sub> kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	179 - 139.5 (1)	TP28.0455x19.5x0.1875	417.32	590.06	0.707	0.00	590.06	0.000
L2	139.5 - 93.4 (2)	TP37.5377x26.8051x0.4	1272.98	2509.00	0.507	0.00	2509.00	0.000
L3	93.4 - 46.31 (3)	TP47.123x35.6237x0.375	2352.82	3541.65	0.664	0.00	3541.65	0.000
L4	46.31 - 0 (4)	TP56.25x44.9678x0.375	3809.67	4986.09	0.764	0.00	4986.09	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V <sub>u</sub> K	φV <sub>n</sub> K	Ratio $\frac{V_u}{\phi V_n}$	Actual T <sub>u</sub> kip-ft	φT <sub>n</sub> kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	179 - 139.5 (1)	TP28.0455x19.5x0.1875	16.55	531.05	0.031	0.02	1181.56	0.000
L2	139.5 - 93.4 (2)	TP37.5377x26.8051x0.4	21.39	1698.97	0.013	2.79	5024.14	0.001
L3	93.4 - 46.31 (3)	TP47.123x35.6237x0.375	25.57	1899.99	0.013	2.78	7091.96	0.000
L4	46.31 - 0 (4)	TP56.25x44.9678x0.375	29.41	2167.33	0.014	2.78	9984.42	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	Ratio $\frac{M_{uy}}{\phi M_{uy}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	179 - 139.5 (1)	0.147	0.707	0.000	0.031	0.000	0.855	1.000	4.8.2 ✓
L2	139.5 - 93.4 (2)	0.057	0.507	0.000	0.013	0.001	0.564	1.000	4.8.2 ✓
L3	93.4 - 46.31 (3)	0.049	0.664	0.000	0.013	0.000	0.714	1.000	4.8.2 ✓
L4	46.31 - 0 (4)	0.040	0.764	0.000	0.014	0.000	0.804	1.000	4.8.2 ✓

### Section Capacity Table



<b>tnxTower</b>  <b>Centek Engineering Inc.</b> 63-2 North Branford Rd.  Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	<b>Job</b> 16118.00 - CTHA539A	<b>Page</b> 22 of 22
	<b>Project</b> 180' EEI Monopole - 719 George Washington Tpk., Burlington, CT	<b>Date</b> 10:38:58 10/18/16
	<b>Client</b> T-Mobile	<b>Designed by</b> TJJ

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\emptyset P_{allow}$ K	% Capacity	Pass Fail	
L1	179 - 139.5	Pole	TP28.0455x19.5x0.1875	1	-10.61	72.22	85.5	Pass	
L2	139.5 - 93.4	Pole	TP37.5377x26.8051x0.4	2	-20.78	366.24	56.4	Pass	
L3	93.4 - 46.31	Pole	TP47.123x35.6237x0.375	3	-33.73	684.68	71.4	Pass	
L4	46.31 - 0	Pole	TP56.25x44.9678x0.375	4	-51.55	1281.21	80.4	Pass	
							Summary		
							Pole (L1)	85.5	Pass
							<b>RATING =</b>	<b>85.5</b>	<b>Pass</b>

Program Version 7.0.5.1 - 2/1/2016 File:J:/Jobs/1611800.WI/04\_Structural/Backup Documentation/Calcs/Rev (1)/ERI Files/180' EEI Monopole Burlington, CT.eri

**Anchor Bolt and Base Plate Analysis:**

**Input Data:**

Tower Reactions:

Overturing Moment = OM := 3810-ft-kips (Input From tnxTower)  
 Shear Force = Shear := 29-kips (Input From tnxTower)  
 Axial Force = Axial := 52-kips (Input From tnxTower)

Anchor Bolt Data:

ASTMA615 Grade 75  
 Number of Anchor Bolts = N := 18 (User Input)  
 Diameter of Bolt Circle =  $D_{bc}$  := 65-in (User Input)  
 Bolt "Column" Distance = l := 3.0-in (User Input)  
 Bolt Ultimate Strength =  $F_u$  := 100-ksi (User Input)  
 Bolt Yield Strength =  $F_y$  := 75-ksi (User Input)  
 Bolt Modulus = E := 29000-ksi (User Input)  
 Diameter of Anchor Bolts = D := 2.25-in (User Input)  
 Threads per Inch = n := 4.5 (User Input)  
 Top of Concrete to Bot Leveling Nut =  $l_{ar}$  := 2-in (User Input)

Base Plate Data:

Use ASTM A572 Grade 60  
 Plate Yield Strength =  $F_{y_{bp}}$  := 60-ksi (User Input)  
 Base Plate Thickness =  $t_{bp}$  := 2-in (User Input)  
 Base Plate Diameter =  $D_{bp}$  := 71-in (User Input)  
 Outer Pole Diameter =  $D_{pole}$  := 56.25-in (User Input)  
 $\eta$  := 0.5 For UngROUTED Base Plate per TIA-222-G Section 4.9.9

**Geometric Layout Data:**

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =:  $R_{bc} := \frac{D_{bc}}{2} = 32.5\text{-in}$

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

$$d_i := \begin{cases} \theta \leftarrow 2\pi \cdot \left(\frac{i}{N}\right) & d_1 = 11.12\text{-in} \\ d \leftarrow R_{bc} \cdot \sin(\theta) & d_2 = 20.89\text{-in} \end{cases}$$

$d_3 = 28.15\text{-in}$

$d_4 = 32.01\text{-in}$

$d_5 = 32.01\text{-in}$

$d_6 = 28.15\text{-in}$

$d_7 = 20.89\text{-in}$

$d_8 = 11.12\text{-in}$

Critical Distances For Bending in Plate:

Outer Pole Radius =  $R_{pole} := \frac{D_{pole}}{2} = 28.1\text{-in}$

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

$MA_1 = 0.00\text{-in}$

$MA_2 = 0.00\text{-in}$

$MA_3 = 0.02\text{-in}$

$MA_4 = 3.88\text{-in}$

$MA_5 = 3.88\text{-in}$

$MA_6 = 0.02\text{-in}$

$MA_7 = 0.00\text{-in}$

$MA_8 = 0.00\text{-in}$

Effective Width of Baseplate for Bending =  $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 34.7\text{-in}$

**Anchor Bolt Analysis:**

Calculated Anchor Bolt Properties:

Polar Moment of Inertia =  $I_p := \sum_i (d_i)^2 = 9.506 \times 10^3 \cdot \text{in}^2$

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

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

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

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

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

Tensile Root Diameter =  $d_{rt} := D - \frac{0.9743 \cdot \text{in}}{n} = 2.033 \cdot \text{in}$

Plastic Section Modulus =  $Z := \frac{d_{rt}^3}{6} = 1.401 \cdot \text{in}^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =  $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 153.4 \cdot \text{kips}$

Maximum Compressive Force =  $P_u := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 159.2 \cdot \text{kips}$

Maximum Shear Force =  $V_u := \frac{Shear}{N} = 1.6 \cdot \text{kips}$

Design Tensile Strength =  $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot \text{k}$

Bolt % of Capacity =  $\frac{\left( P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 62.5$

Condition1 =  $\text{Condition1} := \text{if} \left[ \frac{\left( P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right]$

Condition1 = "OK"

Design Shear Strength =  $\Phi R_{nv} := 0.75 \cdot 0.45 \cdot F_u \cdot A_g = 134.193 \cdot k$

Design Flexural Strength =  $\Phi R_{nm} := 0.9 \cdot F_y \cdot Z = 94.597 \cdot \text{in} \cdot k$

$$M_u := \begin{cases} 0 & \text{if } I_{ar} < D \\ 0.65 \cdot I_{ar} \cdot V_u & \text{otherwise} \end{cases} = 0 \cdot \text{in} \cdot k$$

Bolt % of Capacity =  $\left[ \left( \frac{V_u}{\Phi R_{nv}} \right)^2 + \left( \frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \right] \cdot 100 = 37.6$

Condition2 =  $\text{Condition2} := \text{if} \left[ \left( \frac{V_u}{\Phi R_{nv}} \right)^2 + \left( \frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right]$

Condition2 = "OK"

**Base Plate Analysis:**

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

$C_1 = 56.3$ -kips  
 $C_2 = 103.4$ -kips  
 $C_3 = 138.3$ -kips  
 $C_4 = 156.8$ -kips  
 $C_5 = 156.8$ -kips  
 $C_6 = 138.3$ -kips  
 $C_7 = 103.4$ -kips  
 $C_8 = 56.3$ -kips

Maximum Bending Stress in Plate =  $f_{bp} := \sum_i \frac{4 \cdot C_i \cdot MA_i}{(B_{eff} \cdot t_{bp}^2)} = 35.3$ -ksi

Allowable Bending Stress in Plate =  $F_{bp} := 0.9 \cdot F_y = 54$ -ksi

Plate Bending Stress % of Capacity =  $\frac{f_{bp}}{F_{bp}} = 65.4$ %

Condition2 =  $Condition2 := \text{if} \left( \frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$

Condition2 = "Ok"

**Caisson Foundation:**

Input Data:

Shear Force =	S := 29k	<i>USER INPUT-FROM tnxTower</i>
Overturing Moment =	M := 3810ft-k	<i>USER INPUT-FROM tnxTower</i>
Applied Axial Load =	A1 := 52k	<i>USER INPUT-FROM tnxTower</i>
Bending Moment =	Mu := 3902ft-k	<i>USER INPUT-FROM LPILE</i>
Moment Capacity =	Mn := 7495ft-k	<i>USER INPUT-FROM LPILE</i>
Foundation Diameter =	d := 7.5ft	<i>USER INPUT</i>
Overall Length of Caisson =	Lc := 28.0ft	<i>USER INPUT</i>
Depth From Top of Caisson to Grade =	Lpag := 1.0ft	<i>USER INPUT</i>
Number of Rebar =	n := 24	<i>USER INPUT</i>
Area of Rebar =	Ar := 1.560in <sup>2</sup>	<i>USER INPUT</i>
Rebar Yield Strength =	fy := 60ksi	<i>USER INPUT</i>
Concrete Comp Strength =	fc := 4ksi	<i>USER INPUT</i>

Check Moment Capacity:

Factor of Safety =	$FS := \frac{0.9 \cdot Mn}{Mu} = 1.7$
Factor of Safety Required =	FS <sub>reqd</sub> := 1.0
	FOSCheck := if(FS ≥ FS <sub>reqd</sub> , "OK", "NO GOOD")
	<b>FOSCheck = "OK"</b>

Caisson Analysis.lpo

=====  
LPILE Plus for Windows, Version 5.0 (5.0.47)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method

(c) 1985-2010 by Ensoft, Inc.  
All Rights Reserved

=====  
This program is licensed to:

TJL  
Centek Engineering

-----  
Files Used for Analysis  
-----

Path to file locations: J:\Jobs\1611800.WI\04\_Structural\Backup  
Documentation\Calcs\Rev (1)\Foundation\  
Name of input data file: Caisson Analysis.lpd  
Name of output file: Caisson Analysis.lpo  
Name of plot output file: Caisson Analysis.lpp  
Name of runtime file: Caisson Analysis.lpr

-----  
Time and Date of Analysis  
-----

Date: October 18, 2016 Time: 11:29:12

-----  
Problem Title  
-----

16001.09 - Burlington

-----  
Program Options  
-----

Units Used in Computations - US Customary Units: Inches, Pounds



Caisson Analysis.lpo

Basic Program Options:

Analysis Type 3:

- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- Analysis includes computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-04 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:

- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 8

-----  
Pile Structural Properties and Geometry  
-----

- Pile Length = 336.00 in
- Depth of ground surface below top of pile = 12.00 in
- Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	90.00000000	3220623.	6361.7000	3600000.
2	336.0000	90.00000000	3220623.	6361.7000	3600000.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness

Caisson Analysis.lpo

that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

-----  
Soil and Rock Layering Information  
-----

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 12.000 in  
Distance from top of pile to bottom of layer = 336.000 in  
p-y subgrade modulus k for top of soil layer = 90.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 90.000 lbs/in\*\*3

(Depth of lowest layer extends 0.00 in below pile tip)

-----  
Effective Unit Weight of Soil vs. Depth  
-----

Effective unit weight of soil with depth defined using 2 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.07500
2	336.00	0.07500

-----  
Shear Strength of Soils  
-----

Shear strength parameters with depth defined using 2 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	0.00000	34.00	-----	-----
2	336.000	0.00000	34.00	-----	-----

Notes:

Caisson Analysis.lpo

- (1) Cohesion = uniaxial compressive strength for rock materials.
- (2) Values of E50 are reported for clay strata.
- (3) Default values will be generated for E50 when input values are 0.
- (4) RQD and k<sub>rm</sub> are reported only for weak rock strata.

-----  
Loading Type  
-----

Static loading criteria was used for computation of p-y curves.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)

Shear force at pile head = 29000.000 lbs

Bending moment at pile head = 45720000.000 in-lbs

Axial load at pile head = 52000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head may rotate under the applied pile-head loading, but is not a free-head (zero moment) condition.

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)

Shear force at pile head = 12000.000 lbs

Bending moment at pile head = 19068000.000 in-lbs

Axial load at pile head = 52000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head may rotate under the applied pile-head loading, but is not a free-head (zero moment) condition.

-----  
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness  
-----

Caisson Analysis.lpo

Number of sections = 1

Pile Section No. 1

The sectional shape is a circular drilled shaft (bored pile).

Outside Diameter = 90.0000 in

Material Properties:

Compressive Strength of Concrete = 4.000 kip/in\*\*2  
Yield Stress of Reinforcement = 60. kip/in\*\*2  
Modulus of Elasticity of Reinforcement = 29000. kip/in\*\*2  
Number of Reinforcing Bars = 24  
Area of Single Bar = 1.56000 in\*\*2  
Number of Rows of Reinforcing Bars = 13  
Area of Steel = 37.440 in\*\*2  
Area of Shaft = 6361.725 in\*\*2  
Percentage of Steel Reinforcement = 0.589 percent  
Cover Thickness (edge to bar center) = 4.000 in

Unfactored Axial Squash Load Capacity = 23748.97 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	41.000
2	3.120	39.603
3	3.120	35.507
4	3.120	28.991
5	3.120	20.500
6	3.120	10.612
7	3.120	0.000
8	3.120	-10.612
9	3.120	-20.500
10	3.120	-28.991
11	3.120	-35.507
12	3.120	-39.603
13	1.560	-41.000

Axial Thrust Force = 52000.00 lbs

Caisson Analysis.lpo					
Bending Max. Steel Moment Stress in-lbs psi	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi
7871340.	1.259414E+13	6.250000E-07	0.00003039	48.62751737	107.94947
808.87375					
15667973.	1.253438E+13	0.00000125	0.00005862	46.89990386	206.55097
1555.12152					
23390765.	1.247507E+13	0.00000188	0.00008690	46.34505674	303.79011
2302.51246					
31037498.	1.241500E+13	0.00000250	0.00011513	46.05179742	399.39057
3048.75531					
31037498.	9.931999E+12	0.00000313	0.00007118	22.77626887	245.70889
5729.65063					
31037498.	8.276666E+12	0.00000375	0.00008373	22.32779816	287.89641
6924.35195					
31037498.	7.094285E+12	0.00000438	0.00009603	21.94932237	328.92084
8126.42972					
31037498.	6.207500E+12	0.00000500	0.00010834	21.66807666	369.71789
9328.12888					
31037498.	5.517777E+12	0.00000563	0.00012067	21.45166531	410.28695
10529.44710					
31037498.	4.966000E+12	0.00000625	0.00013300	21.28065035	450.62736
11730.38212					
31037498.	4.514545E+12	0.00000688	0.00014536	21.14266142	490.73845
12930.93188					
31037498.	4.138333E+12	0.00000750	0.00015772	21.02945074	530.61952
14131.09446					
31037498.	3.820000E+12	0.00000813	0.00017060	20.99694774	571.93117
15316.34419					
31037498.	3.547143E+12	0.00000875	0.00018297	20.91080323	611.26384
16516.38368					
31037498.	3.310666E+12	0.00000938	0.00019535	20.83771840	650.36932
17715.99531					
31037498.	3.103750E+12	0.00001000	0.00020775	20.77524707	689.24668
18915.17835					
31037498.	2.921176E+12	0.00001063	0.00022017	20.72153315	727.89545
20113.92760					
31037498.	2.758889E+12	0.00001125	0.00023260	20.67512020	766.31471
21312.24203					
31037498.	2.613684E+12	0.00001188	0.00024504	20.63486561	804.50380
22510.11815					
31037498.	2.483000E+12	0.00001250	0.00025750	20.59985206	842.46191
23707.55363					
31037498.	2.364762E+12	0.00001313	0.00026997	20.56934193	880.18844

Caisson Analysis.lpo

24904.54423						
31037498.	2.257273E+12	0.00001375	0.00028246	20.54272637	917.68254	
26101.08786						
31037498.	2.159130E+12	0.00001438	0.00029497	20.51950380	954.94340	
27297.18185						
31037498.	2.069167E+12	0.00001500	0.00030749	20.49925849	991.97033	
28492.82256						
32181783.	2.059634E+12	0.00001563	0.00032003	20.48163906	1028.76251	
29688.00730						
33399656.	2.055363E+12	0.00001625	0.00033258	20.46634778	1065.31909	
30882.73361						
34616360.	2.051340E+12	0.00001688	0.00034515	20.45313522	1101.63942	
32076.99695						
35831888.	2.047536E+12	0.00001750	0.00035773	20.44178411	1137.72265	
33270.79456						
37046230.	2.043930E+12	0.00001813	0.00037033	20.43210670	1173.56791	
34464.12391						
38259382.	2.040500E+12	0.00001875	0.00038295	20.42394206	1209.17440	
35656.98151						
39471338.	2.037230E+12	0.00001938	0.00039558	20.41715071	1244.54137	
36849.36345						
40682085.	2.034104E+12	0.00002000	0.00040823	20.41160658	1279.66779	
38041.26818						
41891630.	2.031109E+12	0.00002063	0.00042090	20.40720776	1314.55319	
39232.68886						
43099952.	2.028233E+12	0.00002125	0.00043358	20.40385231	1349.19630	
40423.62601						
44307051.	2.025465E+12	0.00002188	0.00044628	20.40145978	1383.59651	
41614.07395						
45512921.	2.022796E+12	0.00002250	0.00045900	20.39995506	1417.75292	
42804.02932						
46717553.	2.020219E+12	0.00002313	0.00047173	20.39927110	1451.66463	
43993.48882						
47920943.	2.017724E+12	0.00002375	0.00048448	20.39934888	1485.33079	
45182.44846						
49123081.	2.015306E+12	0.00002438	0.00049725	20.40013477	1518.75051	
46370.90473						
51523569.	2.010676E+12	0.00002563	0.00052284	20.40364042	1584.84673	
48746.29471						
53918957.	2.006287E+12	0.00002688	0.00054850	20.40945813	1649.94597	
51119.62857						
56309193.	2.002105E+12	0.00002813	0.00057424	20.41731969	1714.04088	
53490.87363						
58694209.	1.998101E+12	0.00002938	0.00060004	20.42699978	1777.12366	
55859.99956						
61073945.	1.994251E+12	0.00003063	0.00062592	20.43831334	1839.18656	
58226.97297						
63386900.	1.988609E+12	0.00003188	0.00065165	20.44407204	1899.68011	
60000.00000						

Caisson Analysis.lpo

65169216. 60000.00000	1.967373E+12	0.00003313	0.00067551	20.39261654	1954.52175
66803933. 60000.00000	1.943387E+12	0.00003438	0.00069887	20.33085063	2007.21820
67991564. 60000.00000	1.908535E+12	0.00003563	0.00072051	20.22476926	2054.97485
69174215. 60000.00000	1.875911E+12	0.00003688	0.00074218	20.12678012	2101.97300
70354213. 60000.00000	1.845356E+12	0.00003813	0.00076389	20.03634408	2148.23023
71219963. 60000.00000	1.808761E+12	0.00003938	0.00078422	19.91680607	2190.67443
72020489. 60000.00000	1.772812E+12	0.00004063	0.00080431	19.79841605	2231.84902
72819046. 60000.00000	1.738962E+12	0.00004188	0.00082443	19.68791708	2272.38266
73615610. 60000.00000	1.707029E+12	0.00004313	0.00084459	19.58462790	2312.27190
74123403. 60000.00000	1.670387E+12	0.00004438	0.00086531	19.49999884	2352.59332
75098986. 60000.00000	1.646005E+12	0.00004563	0.00088766	19.45559219	2395.36525
75595279. 60000.00000	1.612699E+12	0.00004688	0.00090581	19.32388768	2429.09472
76090209. 60000.00000	1.581095E+12	0.00004813	0.00092398	19.19960484	2462.30156
76583778. 60000.00000	1.551064E+12	0.00004938	0.00094218	19.08218578	2494.98350
77075976. 60000.00000	1.522488E+12	0.00005063	0.00096041	18.97112623	2527.13810
77566792. 60000.00000	1.495263E+12	0.00005188	0.00097867	18.86597022	2558.76283
78056202. 60000.00000	1.469293E+12	0.00005313	0.00099696	18.76630202	2589.85491
78544235. 60000.00000	1.444492E+12	0.00005438	0.00101528	18.67175415	2620.41246
79030838. 60000.00000	1.420779E+12	0.00005563	0.00103362	18.58197793	2650.43220
79353965. 60000.00000	1.395235E+12	0.00005688	0.00105076	18.47485587	2677.83435
79640512. 60000.00000	1.370159E+12	0.00005813	0.00106764	18.36808249	2704.31911
79926004. 60000.00000	1.346122E+12	0.00005938	0.00108456	18.26620415	2730.34738
80210467. 60000.00000	1.323059E+12	0.00006063	0.00110149	18.16892579	2755.91767
80493865. 60000.00000	1.300911E+12	0.00006188	0.00111845	18.07596579	2781.02747
80855231. 60000.00000	1.280875E+12	0.00006313	0.00113625	18.00000027	2806.91513

Caisson Analysis.lpo

60000.00000						
81133786.	1.260331E+12	0.00006438	0.00115851	17.99626395	2838.85806	
60000.00000						
81405403.	1.240463E+12	0.00006563	0.00117491	17.90334150	2861.46578	
60000.00000						
81676066.	1.221324E+12	0.00006688	0.00119133	17.81424657	2883.64219	
60000.00000						
81945781.	1.202874E+12	0.00006813	0.00120777	17.72877261	2905.38555	
60000.00000						
82214527.	1.185074E+12	0.00006938	0.00122424	17.64672384	2926.69370	
60000.00000						
82482315.	1.167891E+12	0.00007063	0.00124073	17.56792322	2947.56492	
60000.00000						
82749110.	1.151292E+12	0.00007188	0.00125725	17.49219909	2967.99679	
60000.00000						
83014940.	1.135247E+12	0.00007313	0.00127379	17.41940126	2987.98783	
60000.00000						
83279784.	1.119728E+12	0.00007438	0.00129036	17.34938219	3007.53580	
60000.00000						
83604707.	1.087541E+12	0.00007688	0.00132114	17.18555823	3042.43615	
60000.00000						
83889082.	1.056870E+12	0.00007938	0.00135155	17.02739373	3075.29607	
60000.00000						
84170530.	1.028037E+12	0.00008188	0.00138204	16.87988296	3106.65945	
60000.00000						
84449045.	1.000878E+12	0.00008438	0.00141261	16.74209252	3136.51386	
60000.00000						
84724561.	9.752467E+11	0.00008688	0.00144327	16.61318824	3164.84589	
60000.00000						
84724561.	9.479671E+11	0.00008938	0.00147469	16.49999902	3192.25060	
60000.00000						
85360394.	9.290927E+11	0.00009188	0.00151508	16.49061665	3225.42893	
60000.00000						
85612067.	9.071477E+11	0.00009438	0.00154455	16.36607632	3247.42998	
60000.00000						
85861043.	8.863075E+11	0.00009688	0.00157410	16.24881282	3268.00867	
60000.00000						
86107289.	8.664884E+11	0.00009938	0.00160374	16.13828704	3287.15237	
60000.00000						
86350774.	8.476150E+11	0.00010188	0.00163347	16.03401348	3304.84825	
60000.00000						
86591492.	8.296191E+11	0.00010438	0.00166327	15.93555763	3321.08347	
60000.00000						
86829358.	8.124384E+11	0.00010688	0.00169317	15.84251449	3335.84421	
60000.00000						
87064384.	7.960172E+11	0.00010938	0.00172315	15.75452998	3349.11720	
60000.00000						
87243054.	7.798262E+11	0.00011188	0.00175204	15.66065803	3360.42379	
60000.00000						



Caisson Analysis.lpo

87353391.	7.637455E+11	0.00011438	0.00177953	15.55875555	3369.83810
60000.00000					
87461586.	7.483344E+11	0.00011688	0.00180710	15.46184465	3377.99729
60000.00000					
87567611.	7.335507E+11	0.00011938	0.00183475	15.36961690	3384.89046
60000.00000					
87671444.	7.193554E+11	0.00012188	0.00186247	15.28179064	3390.50655
60000.00000					
87773053.	7.057130E+11	0.00012438	0.00189026	15.19810572	3394.83429
60000.00000					
87872391.	6.925903E+11	0.00012688	0.00191814	15.11832073	3397.86224
60000.00000					
87969474.	6.799573E+11	0.00012938	0.00194609	15.04222110	3399.57888
60000.00000					
88312438.	6.696678E+11	0.00013188	0.00197813	15.00000045	3397.52958
60000.00000					
88976509.	6.621508E+11	0.00013438	0.00201563	15.00000045	3388.11636
60000.00000					
88976509.	6.500567E+11	0.00013688	0.00204926	14.97174338	3383.92316
60000.00000					
88976509.	6.383965E+11	0.00013938	0.00207591	14.89445016	3388.75238
60000.00000					
88976509.	6.271472E+11	0.00014188	0.00210265	14.82043460	3392.73456
60000.00000					
88976509.	6.162875E+11	0.00014438	0.00212946	14.74953577	3395.86017
60000.00000					
88976509.	6.057975E+11	0.00014688	0.00215636	14.68160078	3398.11943
60000.00000					
88976509.	5.956586E+11	0.00014938	0.00218334	14.61648747	3399.50234
60000.00000					
88976509.	5.858536E+11	0.00015188	0.00221040	14.55406442	3399.99872
60000.00000					
88976509.	5.763661E+11	0.00015438	0.00223769	14.49516848	3394.58894
60000.00000					
88976509.	5.671809E+11	0.00015688	0.00226505	14.43859264	3388.84520
60000.00000					
88976509.	5.582840E+11	0.00015938	0.00229248	14.38417867	3383.08516
60000.00000					
89035664.	5.500273E+11	0.00016188	0.00231996	14.33182731	3377.30880
60000.00000					
89101776.	5.420640E+11	0.00016438	0.00234751	14.28145006	3381.27627
60000.00000					
89167388.	5.343364E+11	0.00016688	0.00237513	14.23296377	3385.87459
60000.00000					
89232480.	5.268338E+11	0.00016938	0.00240280	14.18628797	3389.83882
60000.00000					
89297059.	5.195465E+11	0.00017188	0.00243054	14.14135024	3393.16228
60000.00000					
89361118.	5.124652E+11	0.00017438	0.00245835	14.09808084	3395.83808

Caisson Analysis.lpo

60000.00000						
89487593.	4.988855E+11	0.00017938	0.00251417	14.01628152	3399.21830	
60000.00000						
89610937.	4.860254E+11	0.00018438	0.00257036	13.94091949	3397.60040	
60000.00000						
89729627.	4.738198E+11	0.00018938	0.00262706	13.87224421	3387.57305	
60000.00000						
89835462.	4.621760E+11	0.00019438	0.00268325	13.80452111	3377.67826	
60000.00000						
89870008.	4.507587E+11	0.00019938	0.00273546	13.72017637	3368.83806	
60000.00000						
89903896.	4.398967E+11	0.00020438	0.00278781	13.64067033	3376.62991	
60000.00000						
89937150.	4.295506E+11	0.00020938	0.00284031	13.56567040	3383.87432	
60000.00000						
89937150.	4.195319E+11	0.00021438	0.00289406	13.49999920	3390.02628	
60000.00000						
89937150.	4.099699E+11	0.00021938	0.00296156	13.49999920	3396.49644	
60000.00000						
89937150.	4.008341E+11	0.00022438	0.00302906	13.49999920	3399.65731	
60000.00000						
89937150.	3.920966E+11	0.00022938	0.00309656	13.49999920	3394.06162	
60000.00000						
90141407.	3.846033E+11	0.00023438	0.00316057	13.48510489	3384.08449	
60000.00000						
90150458.	3.766077E+11	0.00023938	0.00321249	13.42033222	3377.30154	
60000.00000						
90159278.	3.689382E+11	0.00024438	0.00326450	13.35857704	3370.49489	
60000.00000						
90167872.	3.615754E+11	0.00024938	0.00331660	13.29966500	3363.66408	
60000.00000						
90176224.	3.545011E+11	0.00025438	0.00336880	13.24343249	3356.80883	
60000.00000						
90184340.	3.476987E+11	0.00025938	0.00342109	13.18973199	3361.27279	
60000.00000						
90192204.	3.411525E+11	0.00026438	0.00347347	13.13842401	3368.16743	
60000.00000						
90198036.	3.348419E+11	0.00026938	0.00352640	13.09103206	3374.55748	
60000.00000						
90198036.	3.287400E+11	0.00027438	0.00358261	13.05734351	3381.13304	
60000.00000						
90198036.	3.228565E+11	0.00027938	0.00363900	13.02549765	3386.76775	
60000.00000						
90198036.	3.171799E+11	0.00028438	0.00369557	12.99542472	3391.43953	
60000.00000						
90198036.	3.116995E+11	0.00028938	0.00375234	12.96704695	3395.12421	
60000.00000						
90198036.	3.064052E+11	0.00029438	0.00380930	12.94030532	3397.79705	
60000.00000						

Caisson Analysis.lpo

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 89937.15017 in-kip

Axial Thrust Force = 52000.00 lbs

Bending Max. Steel Moment Stress in-lbs psi	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi
7871340.	1.259414E+13	6.250000E-07	0.00003039	48.62751737	107.94947
808.87375					
15667973.	1.253438E+13	0.00000125	0.00005862	46.89990386	206.55097
1555.12152					
23390765.	1.247507E+13	0.00000188	0.00008690	46.34505674	303.79011
2302.51246					
31037498.	1.241500E+13	0.00000250	0.00011513	46.05179742	399.39057
3048.75531					
31037498.	9.931999E+12	0.00000313	0.00007118	22.77626887	245.70889
5729.65063					
31037498.	8.276666E+12	0.00000375	0.00008373	22.32779816	287.89641
6924.35195					
31037498.	7.094285E+12	0.00000438	0.00009603	21.94932237	328.92084
8126.42972					
31037498.	6.207500E+12	0.00000500	0.00010834	21.66807666	369.71789
9328.12888					
31037498.	5.517777E+12	0.00000563	0.00012067	21.45166531	410.28695
10529.44710					
31037498.	4.966000E+12	0.00000625	0.00013300	21.28065035	450.62736
11730.38212					
31037498.	4.514545E+12	0.00000688	0.00014536	21.14266142	490.73845
12930.93188					
31037498.	4.138333E+12	0.00000750	0.00015772	21.02945074	530.61952
14131.09446					
31037498.	3.820000E+12	0.00000813	0.00017060	20.99694774	571.93117
15316.34419					
31037498.	3.547143E+12	0.00000875	0.00018297	20.91080323	611.26384
16516.38368					
31037498.	3.310666E+12	0.00000938	0.00019535	20.83771840	650.36932
17715.99531					
31037498.	3.103750E+12	0.00001000	0.00020775	20.77524707	689.24668
18915.17835					

Caisson Analysis.lpo

31037498.	2.921176E+12	0.00001063	0.00022017	20.72153315	727.89545
20113.92760					
31037498.	2.758889E+12	0.00001125	0.00023260	20.67512020	766.31471
21312.24203					
31037498.	2.613684E+12	0.00001188	0.00024504	20.63486561	804.50380
22510.11815					
31037498.	2.483000E+12	0.00001250	0.00025750	20.59985206	842.46191
23707.55363					
31037498.	2.364762E+12	0.00001313	0.00026997	20.56934193	880.18844
24904.54423					
31037498.	2.257273E+12	0.00001375	0.00028246	20.54272637	917.68254
26101.08786					
31037498.	2.159130E+12	0.00001438	0.00029497	20.51950380	954.94340
27297.18185					
31037498.	2.069167E+12	0.00001500	0.00030749	20.49925849	991.97033
28492.82256					
32181783.	2.059634E+12	0.00001563	0.00032003	20.48163906	1028.76251
29688.00730					
33399656.	2.055363E+12	0.00001625	0.00033258	20.46634778	1065.31909
30882.73361					
34616360.	2.051340E+12	0.00001688	0.00034515	20.45313522	1101.63942
32076.99695					
35831888.	2.047536E+12	0.00001750	0.00035773	20.44178411	1137.72265
33270.79456					
37046230.	2.043930E+12	0.00001813	0.00037033	20.43210670	1173.56791
34464.12391					
38259382.	2.040500E+12	0.00001875	0.00038295	20.42394206	1209.17440
35656.98151					
39471338.	2.037230E+12	0.00001938	0.00039558	20.41715071	1244.54137
36849.36345					
40682085.	2.034104E+12	0.00002000	0.00040823	20.41160658	1279.66779
38041.26818					
41891630.	2.031109E+12	0.00002063	0.00042090	20.40720776	1314.55319
39232.68886					
43099952.	2.028233E+12	0.00002125	0.00043358	20.40385231	1349.19630
40423.62601					
44307051.	2.025465E+12	0.00002188	0.00044628	20.40145978	1383.59651
41614.07395					
45512921.	2.022796E+12	0.00002250	0.00045900	20.39995506	1417.75292
42804.02932					
46717553.	2.020219E+12	0.00002313	0.00047173	20.39927110	1451.66463
43993.48882					
47920943.	2.017724E+12	0.00002375	0.00048448	20.39934888	1485.33079
45182.44846					
49123081.	2.015306E+12	0.00002438	0.00049725	20.40013477	1518.75051
46370.90473					
51523569.	2.010676E+12	0.00002563	0.00052284	20.40364042	1584.84673
48746.29471					
53918957.	2.006287E+12	0.00002688	0.00054850	20.40945813	1649.94597

Caisson Analysis.lpo

51119.62857						
56309193.	2.002105E+12	0.00002813	0.00057424	20.41731969	1714.04088	
53490.87363						
58694209.	1.998101E+12	0.00002938	0.00060004	20.42699978	1777.12366	
55859.99956						
61073945.	1.994251E+12	0.00003063	0.00062592	20.43831334	1839.18656	
58226.97297						
63386900.	1.988609E+12	0.00003188	0.00065165	20.44407204	1899.68011	
60000.00000						
65169216.	1.967373E+12	0.00003313	0.00067551	20.39261654	1954.52175	
60000.00000						
66803933.	1.943387E+12	0.00003438	0.00069887	20.33085063	2007.21820	
60000.00000						
67991564.	1.908535E+12	0.00003563	0.00072051	20.22476926	2054.97485	
60000.00000						
69174215.	1.875911E+12	0.00003688	0.00074218	20.12678012	2101.97300	
60000.00000						
70354213.	1.845356E+12	0.00003813	0.00076389	20.03634408	2148.23023	
60000.00000						
71219963.	1.808761E+12	0.00003938	0.00078422	19.91680607	2190.67443	
60000.00000						
72020489.	1.772812E+12	0.00004063	0.00080431	19.79841605	2231.84902	
60000.00000						
72819046.	1.738962E+12	0.00004188	0.00082443	19.68791708	2272.38266	
60000.00000						
73615610.	1.707029E+12	0.00004313	0.00084459	19.58462790	2312.27190	
60000.00000						
74123403.	1.670387E+12	0.00004438	0.00086531	19.49999884	2352.59332	
60000.00000						
75098986.	1.646005E+12	0.00004563	0.00088766	19.45559219	2395.36525	
60000.00000						
75595279.	1.612699E+12	0.00004688	0.00090581	19.32388768	2429.09472	
60000.00000						
76090209.	1.581095E+12	0.00004813	0.00092398	19.19960484	2462.30156	
60000.00000						
76583778.	1.551064E+12	0.00004938	0.00094218	19.08218578	2494.98350	
60000.00000						
77075976.	1.522488E+12	0.00005063	0.00096041	18.97112623	2527.13810	
60000.00000						
77566792.	1.495263E+12	0.00005188	0.00097867	18.86597022	2558.76283	
60000.00000						
78056202.	1.469293E+12	0.00005313	0.00099696	18.76630202	2589.85491	
60000.00000						
78544235.	1.444492E+12	0.00005438	0.00101528	18.67175415	2620.41246	
60000.00000						
79030838.	1.420779E+12	0.00005563	0.00103362	18.58197793	2650.43220	
60000.00000						
79353965.	1.395235E+12	0.00005688	0.00105076	18.47485587	2677.83435	
60000.00000						

Caisson Analysis.lpo

79640512. 60000.00000	1.370159E+12	0.00005813	0.00106764	18.36808249	2704.31911
79926004. 60000.00000	1.346122E+12	0.00005938	0.00108456	18.26620415	2730.34738
80210467. 60000.00000	1.323059E+12	0.00006063	0.00110149	18.16892579	2755.91767
80493865. 60000.00000	1.300911E+12	0.00006188	0.00111845	18.07596579	2781.02747
80855231. 60000.00000	1.280875E+12	0.00006313	0.00113625	18.00000027	2806.91513
81133786. 60000.00000	1.260331E+12	0.00006438	0.00115851	17.99626395	2838.85806
81405403. 60000.00000	1.240463E+12	0.00006563	0.00117491	17.90334150	2861.46578
81676066. 60000.00000	1.221324E+12	0.00006688	0.00119133	17.81424657	2883.64219
81945781. 60000.00000	1.202874E+12	0.00006813	0.00120777	17.72877261	2905.38555
82214527. 60000.00000	1.185074E+12	0.00006938	0.00122424	17.64672384	2926.69370
82482315. 60000.00000	1.167891E+12	0.00007063	0.00124073	17.56792322	2947.56492
82749110. 60000.00000	1.151292E+12	0.00007188	0.00125725	17.49219909	2967.99679
83014940. 60000.00000	1.135247E+12	0.00007313	0.00127379	17.41940126	2987.98783
83279784. 60000.00000	1.119728E+12	0.00007438	0.00129036	17.34938219	3007.53580
83604707. 60000.00000	1.087541E+12	0.00007688	0.00132114	17.18555823	3042.43615
83889082. 60000.00000	1.056870E+12	0.00007938	0.00135155	17.02739373	3075.29607
84170530. 60000.00000	1.028037E+12	0.00008188	0.00138204	16.87988296	3106.65945
84449045. 60000.00000	1.000878E+12	0.00008438	0.00141261	16.74209252	3136.51386
84724561. 60000.00000	9.752467E+11	0.00008688	0.00144327	16.61318824	3164.84589
84724561. 60000.00000	9.479671E+11	0.00008938	0.00147469	16.49999902	3192.25060
85360394. 60000.00000	9.290927E+11	0.00009188	0.00151508	16.49061665	3225.42893
85612067. 60000.00000	9.071477E+11	0.00009438	0.00154455	16.36607632	3247.42998
85861043. 60000.00000	8.863075E+11	0.00009688	0.00157410	16.24881282	3268.00867
86107289. 60000.00000	8.664884E+11	0.00009938	0.00160374	16.13828704	3287.15237
86350774. 60000.00000	8.476150E+11	0.00010188	0.00163347	16.03401348	3304.84825

Caisson Analysis.lpo

60000.00000						
86591492.	8.296191E+11	0.00010438	0.00166327	15.93555763	3321.08347	
60000.00000						
86829358.	8.124384E+11	0.00010688	0.00169317	15.84251449	3335.84421	
60000.00000						
87064384.	7.960172E+11	0.00010938	0.00172315	15.75452998	3349.11720	
60000.00000						
87243054.	7.798262E+11	0.00011188	0.00175204	15.66065803	3360.42379	
60000.00000						
87353391.	7.637455E+11	0.00011438	0.00177953	15.55875555	3369.83810	
60000.00000						
87461586.	7.483344E+11	0.00011688	0.00180710	15.46184465	3377.99729	
60000.00000						
87567611.	7.335507E+11	0.00011938	0.00183475	15.36961690	3384.89046	
60000.00000						
87671444.	7.193554E+11	0.00012188	0.00186247	15.28179064	3390.50655	
60000.00000						
87773053.	7.057130E+11	0.00012438	0.00189026	15.19810572	3394.83429	
60000.00000						
87872391.	6.925903E+11	0.00012688	0.00191814	15.11832073	3397.86224	
60000.00000						
87969474.	6.799573E+11	0.00012938	0.00194609	15.04222110	3399.57888	
60000.00000						
88312438.	6.696678E+11	0.00013188	0.00197813	15.00000045	3397.52958	
60000.00000						
88976509.	6.621508E+11	0.00013438	0.00201563	15.00000045	3388.11636	
60000.00000						
88976509.	6.500567E+11	0.00013688	0.00204926	14.97174338	3383.92316	
60000.00000						
88976509.	6.383965E+11	0.00013938	0.00207591	14.89445016	3388.75238	
60000.00000						
88976509.	6.271472E+11	0.00014188	0.00210265	14.82043460	3392.73456	
60000.00000						
88976509.	6.162875E+11	0.00014438	0.00212946	14.74953577	3395.86017	
60000.00000						
88976509.	6.057975E+11	0.00014688	0.00215636	14.68160078	3398.11943	
60000.00000						
88976509.	5.956586E+11	0.00014938	0.00218334	14.61648747	3399.50234	
60000.00000						
88976509.	5.858536E+11	0.00015188	0.00221040	14.55406442	3399.99872	
60000.00000						
88976509.	5.763661E+11	0.00015438	0.00223769	14.49516848	3394.58894	
60000.00000						
88976509.	5.671809E+11	0.00015688	0.00226505	14.43859264	3388.84520	
60000.00000						
88976509.	5.582840E+11	0.00015938	0.00229248	14.38417867	3383.08516	
60000.00000						
89035664.	5.500273E+11	0.00016188	0.00231996	14.33182731	3377.30880	
60000.00000						

Caisson Analysis.lpo

89101776. 60000.00000	5.420640E+11	0.00016438	0.00234751	14.28145006	3381.27627
89167388. 60000.00000	5.343364E+11	0.00016688	0.00237513	14.23296377	3385.87459
89232480. 60000.00000	5.268338E+11	0.00016938	0.00240280	14.18628797	3389.83882
89297059. 60000.00000	5.195465E+11	0.00017188	0.00243054	14.14135024	3393.16228
89361118. 60000.00000	5.124652E+11	0.00017438	0.00245835	14.09808084	3395.83808
89487593. 60000.00000	4.988855E+11	0.00017938	0.00251417	14.01628152	3399.21830
89610937. 60000.00000	4.860254E+11	0.00018438	0.00257036	13.94091949	3397.60040
89729627. 60000.00000	4.738198E+11	0.00018938	0.00262706	13.87224421	3387.57305
89835462. 60000.00000	4.621760E+11	0.00019438	0.00268325	13.80452111	3377.67826
89870008. 60000.00000	4.507587E+11	0.00019938	0.00273546	13.72017637	3368.83806
89903896. 60000.00000	4.398967E+11	0.00020438	0.00278781	13.64067033	3376.62991
89937150. 60000.00000	4.295506E+11	0.00020938	0.00284031	13.56567040	3383.87432
89937150. 60000.00000	4.195319E+11	0.00021438	0.00289406	13.49999920	3390.02628
89937150. 60000.00000	4.099699E+11	0.00021938	0.00296156	13.49999920	3396.49644
89937150. 60000.00000	4.008341E+11	0.00022438	0.00302906	13.49999920	3399.65731
89937150. 60000.00000	3.920966E+11	0.00022938	0.00309656	13.49999920	3394.06162
90141407. 60000.00000	3.846033E+11	0.00023438	0.00316057	13.48510489	3384.08449
90150458. 60000.00000	3.766077E+11	0.00023938	0.00321249	13.42033222	3377.30154
90159278. 60000.00000	3.689382E+11	0.00024438	0.00326450	13.35857704	3370.49489
90167872. 60000.00000	3.615754E+11	0.00024938	0.00331660	13.29966500	3363.66408
90176224. 60000.00000	3.545011E+11	0.00025438	0.00336880	13.24343249	3356.80883
90184340. 60000.00000	3.476987E+11	0.00025938	0.00342109	13.18973199	3361.27279
90192204. 60000.00000	3.411525E+11	0.00026438	0.00347347	13.13842401	3368.16743
90198036. 60000.00000	3.348419E+11	0.00026938	0.00352640	13.09103206	3374.55748
90198036. 60000.00000	3.287400E+11	0.00027438	0.00358261	13.05734351	3381.13304



Caisson Analysis.lpo

60000.00000	90198036.	3.228565E+11	0.00027938	0.00363900	13.02549765	3386.76775
60000.00000	90198036.	3.171799E+11	0.00028438	0.00369557	12.99542472	3391.43953
60000.00000	90198036.	3.116995E+11	0.00028938	0.00375234	12.96704695	3395.12421
60000.00000	90198036.	3.064052E+11	0.00029438	0.00380930	12.94030532	3397.79705

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 89937.15017 in-kip

-----  
 Computed Values of Load Distribution and Deflection  
 for Lateral Loading for Load Case Number 1  
 -----

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)  
 Specified shear force at pile head = 29000.000 lbs  
 Specified moment at pile head = 45720000.000 in-lbs  
 Specified axial load at pile head = 52000.000 lbs

Depth Es*h X F/L in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in
0.000	0.697445	4.57E+07	29000.	-0.005482	646.994	2.02E+12	0.000
0.000	26.880	4.65E+07	24657.	-0.004869	657.696	2.02E+12	-582.978
3508.528	53.760	4.68E+07	-5587.794	-0.004247	662.299	2.02E+12	-1637.765
12628.	80.640	4.60E+07	-55939.	-0.003629	651.167	2.02E+12	-2038.196
20757.	107.520	4.38E+07	-1.12E+05	-0.003031	619.754	2.03E+12	-2067.589
28885.	134.400	4.00E+07	-1.65E+05	-0.002474	567.672	2.04E+12	-1835.703
37014.	161.280	3.50E+07	-2.09E+05	-0.001979	497.184	2.05E+12	-1436.825
45142.	188.160	2.89E+07	-2.41E+05	-0.001697	412.260	1.24E+13	-932.168
53271.							

Caisson Analysis.lpo

215.040 0.013966 2.22E+07 -2.57E+05 -0.001641 318.078 1.25E+13 -255.204  
 61399.  
 241.920 -0.029581 1.53E+07 -2.53E+05 -0.001601 221.476 1.25E+13 612.106  
 69528.  
 268.800 -0.072244 8.81E+06 -2.23E+05 -0.001576 131.211 1.26E+13 1669.714  
 77656.  
 295.680 -0.114397 3.56E+06 -1.62E+05 -0.001563 57.961 1.26E+13 2920.680  
 85785.  
 322.560 -0.156334 4.43E+05 -64050. -0.001559 14.362 1.26E+13 4369.604  
 93913.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.69744521 in  
 Computed slope at pile head = -0.00548221  
 Maximum bending moment = 46824096. lbs-in  
 Maximum shear force = -258543.17109 lbs  
 Depth of maximum bending moment = 50.40000000 in  
 Depth of maximum shear force = 225.12000 in  
 Number of iterations = 50  
 Number of zero deflection points = 1

-----  
 Computed Values of Load Distribution and Deflection  
 for Lateral Loading for Load Case Number 2  
 -----

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)  
 Specified shear force at pile head = 12000.000 lbs  
 Specified moment at pile head = 19068000.000 in-lbs  
 Specified axial load at pile head = 52000.000 lbs

Depth Es*h	Deflect. y	Moment M	Shear V	Slope S	Total Stress	Flx. Rig. EI	Soil Res. p
---------------	---------------	-------------	------------	------------	-----------------	-----------------	----------------

Caisson Analysis.lpo

F/L	in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in
0.000	0.204028	1.91E+07	12000.	-0.001061	274.601	1.25E+13	0.000	
0.000	26.880	0.176072	1.94E+07	10174.	-0.001019	279.002	1.25E+13	-235.796
4499.712	53.760	0.149236	1.95E+07	-813.641	-0.000977	281.062	1.25E+13	-560.888
12628.	80.640	0.123526	1.93E+07	-18870.	-0.000936	277.559	1.25E+13	-763.097
20757.	107.520	0.098929	1.85E+07	-40801.	-0.000895	266.447	1.25E+13	-850.472
28885.	134.400	0.075396	1.71E+07	-63623.	-0.000857	246.837	1.25E+13	-830.564
37014.	161.280	0.052846	1.51E+07	-84544.	-0.000822	218.925	1.25E+13	-710.002
45142.	188.160	0.031164	1.26E+07	-1.01E+05	-0.000792	183.923	1.25E+13	-494.080
53271.	215.040	0.010203	9.72E+06	-1.10E+05	-0.000768	144.008	1.26E+13	-186.451
61399.	241.920	-0.010199	6.74E+06	-1.10E+05	-0.000751	102.285	1.26E+13	211.043
69528.	268.800	-0.030214	3.91E+06	-98122.	-0.000739	62.767	1.26E+13	698.301
77656.	295.680	-0.050002	1.59E+06	-71782.	-0.000734	30.373	1.26E+13	1276.616
85785.	322.560	-0.069695	1.98E+05	-28650.	-0.000732	10.945	1.26E+13	1948.006
93913.								

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.20402829 in  
 Computed slope at pile head = -0.00106064  
 Maximum bending moment = 19530414. lbs-in  
 Maximum shear force = -111546.74744 lbs  
 Depth of maximum bending moment = 53.76000000 in

Caisson Analysis.lpo

Depth of maximum shear force = 228.48000 in  
 Number of iterations = 5  
 Number of zero deflection points = 1

-----  
 Summary of Pile Response(s)  
 -----

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacement in  
 Type 2 = Shear and Slope, M = Pile-head Moment lbs-in  
 Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs  
 Type 4 = Deflection and Moment, S = Pile-head Slope, radians  
 Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 29000.	M= 4.57E+07	52000.0000	0.6974452	4.6824E+07	-258543.
1	V= 12000.	M= 1.91E+07	52000.0000	0.2040283	1.9530E+07	-111547.

-----  
 Computed Pile-head Stiffness Matrix Members  
 K22, K23, K32, K33 for Superstructure  
 -----

Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00133005	2900.00004	543355.24397	2180370.	4.085225E+08
0.00400385	8729.86987	1635662.	2180370.	4.085225E+08
0.00634595	13836.51639	2592463.	2180370.	4.085225E+08
0.00800770	17459.73975	3271324.	2180370.	4.085225E+08
0.00929665	20270.13013	3797890.	2180370.	4.085225E+08
0.01034980	22566.38626	4228126.	2180370.	4.085225E+08
0.01124022	24507.84316	4591884.	2180370.	4.085225E+08
0.01201155	26189.60962	4906987.	2180370.	4.085225E+08
0.01269190	27673.03277	5184927.	2180370.	4.085225E+08
0.01330050	29000.00000	5433552.	2180370.	4.085225E+08

Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad

Caisson Analysis.lpo

0.00004729	19320.63415	4572000.	4.085225E+08	9.667202E+10
0.00014256	58164.26516	13763091.	4.079856E+08	9.653940E+10
0.00022643	92201.24053	21813984.	4.071932E+08	9.633825E+10
0.00028617	116357.93881	27526183.	4.066020E+08	9.618769E+10
0.00033359	135101.24292	31956909.	4.049867E+08	9.579573E+10
0.00039521	150517.89026	35577075.	3.808583E+08	9.002135E+10
0.00091361	168043.67795	38637882.	1.839345E+08	4.229163E+10
0.00111412	182897.08319	41289274.	1.641626E+08	3.705995E+10
0.00125784	195739.75672	43627968.	1.556152E+08	3.468471E+10
0.00140204	208151.16952	45720000.	1.484632E+08	3.260965E+10

K22 = abs(Shear Reaction/Top y)

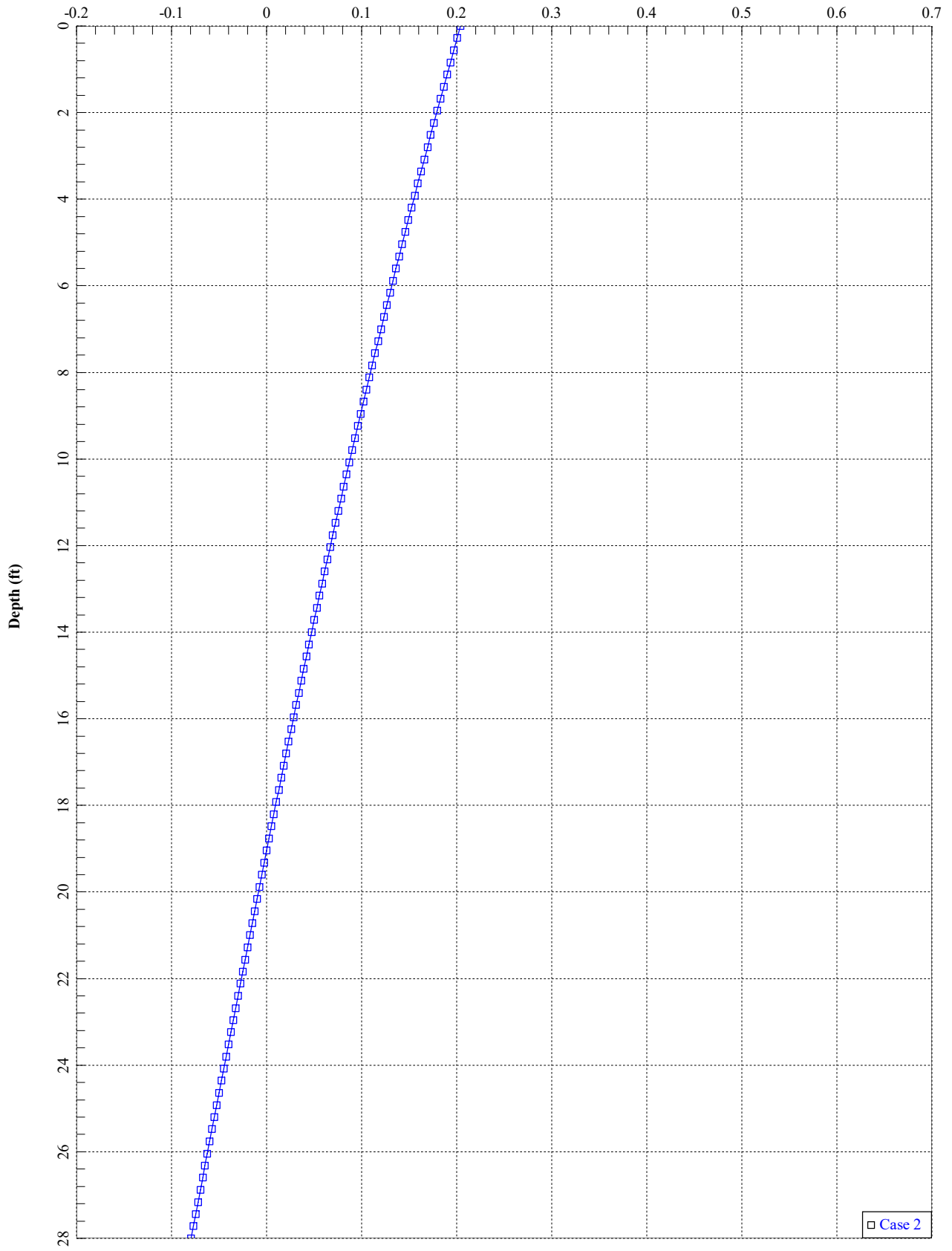
K23 = abs(Shear Reaction/Top Rotation)

K32 = abs(Moment Reaction/Top y)

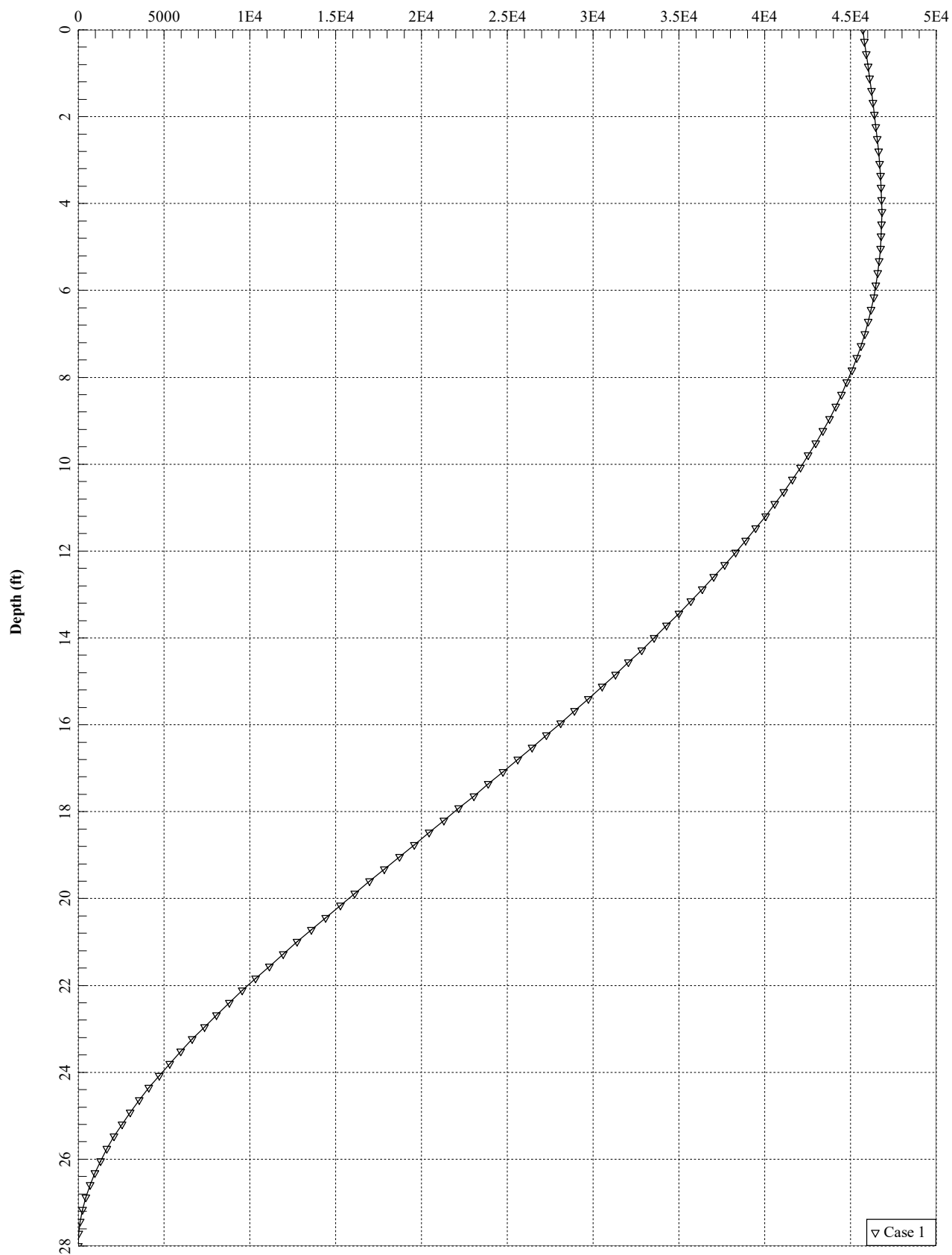
K33 = abs(Moment Reaction/Top Rotation)

The analysis ended normally.

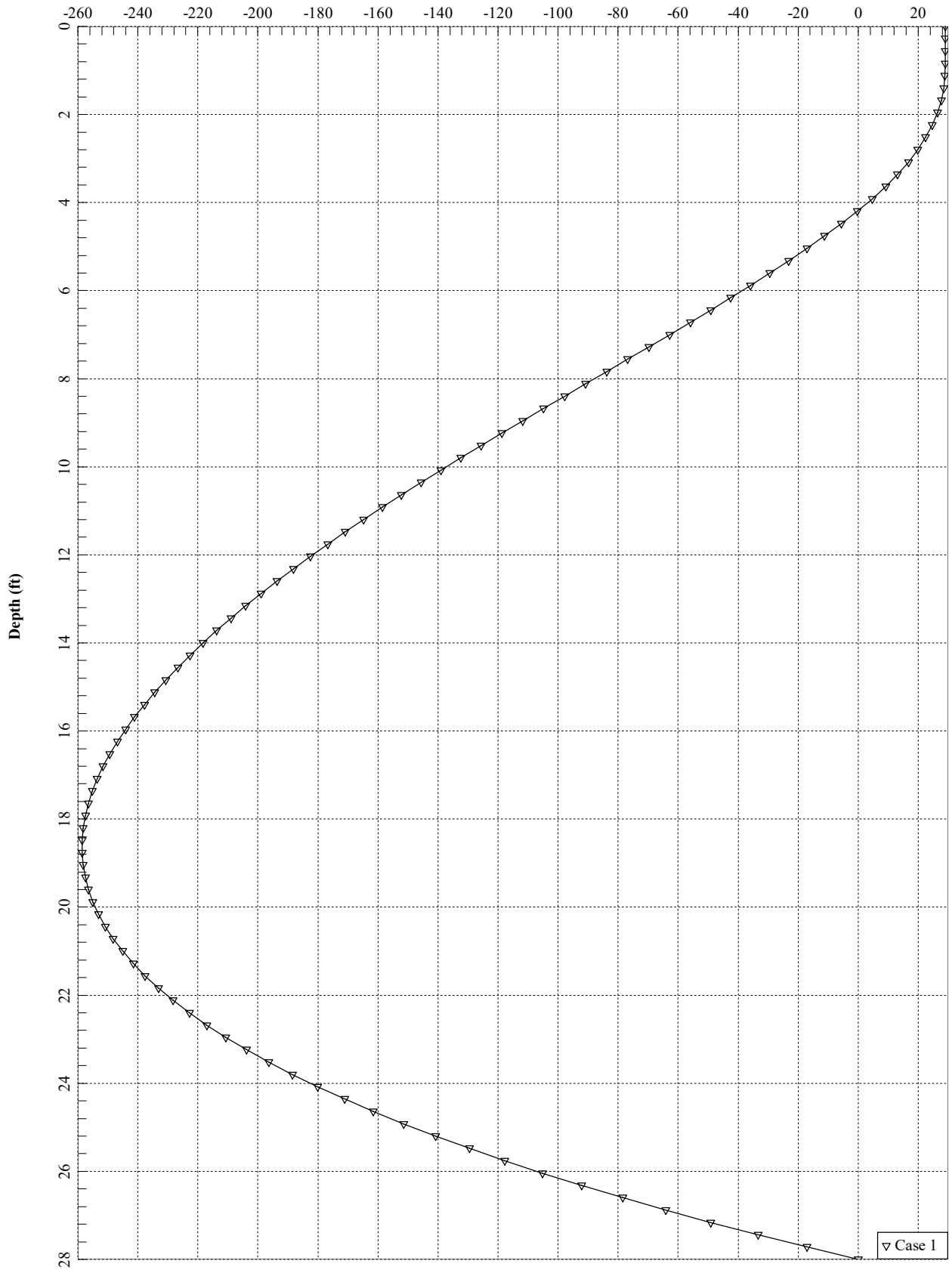
Lateral Deflection (in)



Bending Moment (in-kips)



### Shear Force (kips)





<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

### Section 1 - Site Information

<b>Site ID:</b> CTHA539A	<b>Site Name:</b> Burlington Fire Department Flagpole	<b>Latitude:</b> 41.7664000
<b>Status:</b> Draft	<b>Site Class:</b> Monopole	<b>Longitude:</b> -72.96170000
<b>Version:</b> 1.1	<b>Site Type:</b> Structure Non Building	<b>Address:</b> 719 George Washington Tpke
<b>Project Type:</b> L700	<b>Solution Type:</b>	<b>City, State:</b> Burlington, CT
<b>Approved:</b> Not Approved	<b>Plan Year:</b>	<b>Region:</b> NORTHEAST
<b>Approved By:</b> Not Approved	<b>Market:</b> CONNECTICUT	
<b>Last Modified:</b> 7/19/2016 11:39:29 AM	<b>Vendor:</b> Ericsson	
<b>Last Modified By:</b> GSM1900MLucey	<b>Landlord:</b> <undefined>	

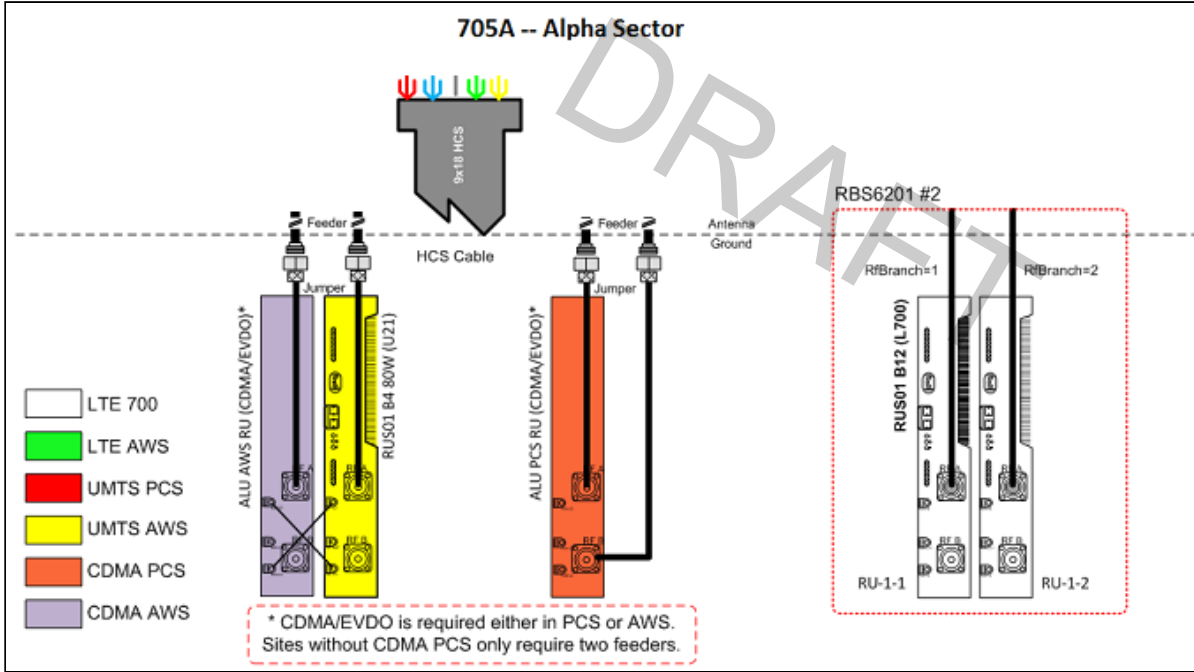
<b>RAN Template:</b> 705A-V2		<b>AL Template:</b> 1DP_2xAIR_705A		
<b>Sector Count:</b> 3	<b>Antenna Count:</b> 9	<b>Coax Line Count:</b> 6	<b>TMA Count:</b> 0	<b>RRU Count:</b> 0

### Section 2 - Existing Template Images

----- This section is intentionally blank. -----

### Section 3 - Proposed Template Images

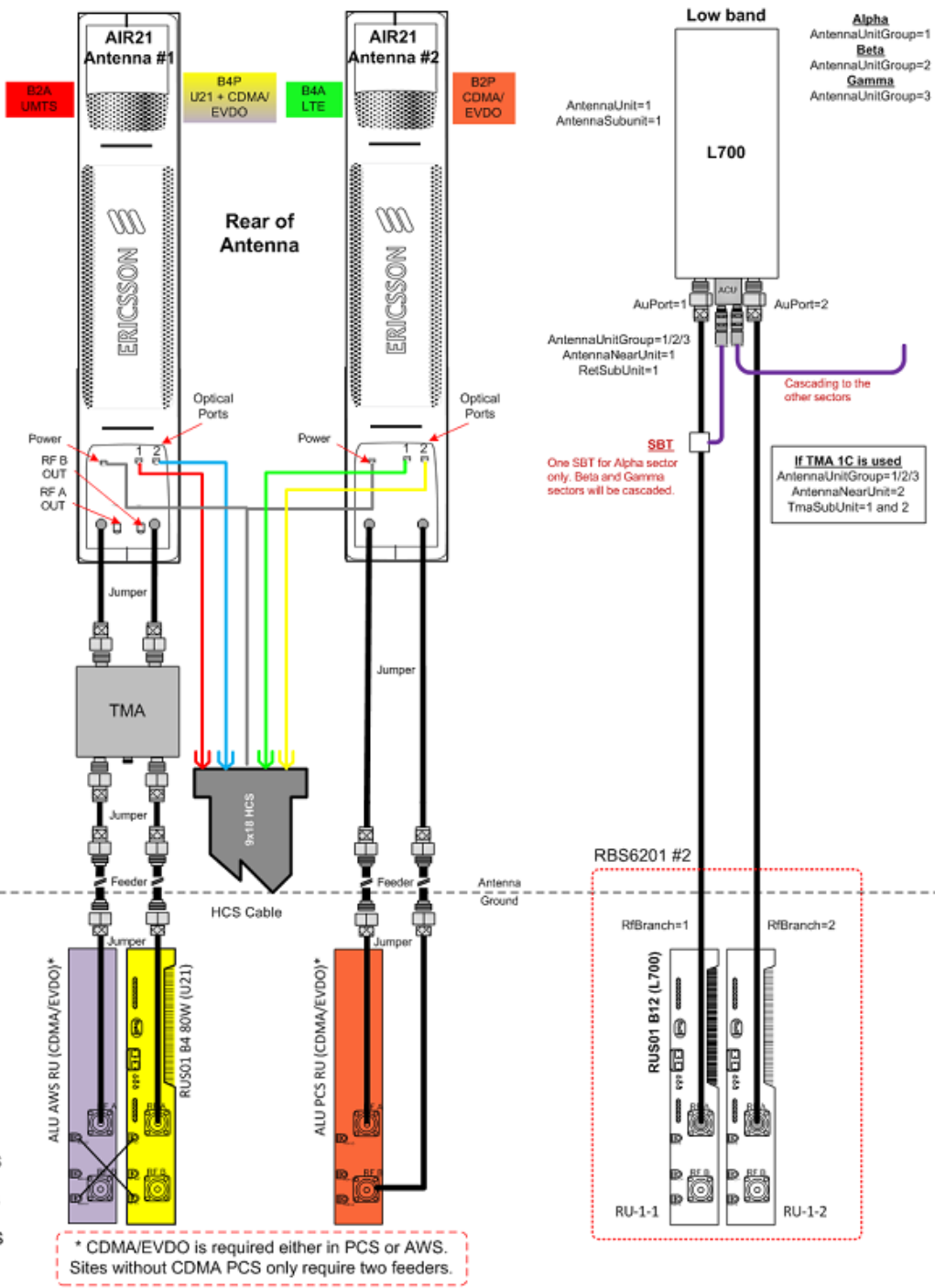
RAN\_705A.png



Notes:

AL\_705A.png

### 705A -- Alpha Sector



Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

DRAFT

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 5A

<b>Enclosure</b>	1	
<b>Enclosure Type</b>	RBS 6201 ODE	
<b>Baseband</b>	DUW30	DUS31
<b>Radio</b>	RUS01 B4 (x3)	

Proposed RAN Equipment

Template: 705A-V2

Enclosure	1	2
<b>Enclosure Type</b>	RBS 6201 ODE	Battery Cabinet
<b>Baseband</b>	DUW30 U1900	DUS41 L2100 L700
<b>Multiplexer</b>	XMU	
<b>Radio</b>	RUS01 B12 (x6) L700	

RAN Scope of Work:

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Section 6 - A&L Equipment

Existing Template: 5A  
Proposed Template: 1DP\_2xAIR\_705A

Sector 1 (Existing) view from behind

<b>Coverage Type</b>	A - Outdoor Macro			
<b>Antenna</b>	1		2	
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)		AIR21 B4A/B2P (Quad)	
<b>Azimuth</b>	60		60	
<b>M. Tilt</b>	0		0	
<b>Height</b>	175		175	
<b>Ports</b>	P1	P2	P3	P4
<b>Active Tech.</b>	U1900		L2100	
<b>Dark Tech.</b>				
<b>Restricted Tech.</b>				
<b>Decomm. Tech.</b>				
<b>E. Tilt</b>	2		2	
<b>Cables</b>	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.	
<b>TMA's</b>				
<b>Diplexers / Combiners</b>				
<b>Radio</b>				
<b>Sector Equipment</b>				

Unconnected Equipment:

Scope of Work:

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Sector 1 (Proposed) view from behind					
<b>Coverage Type</b>	A - Outdoor Macro				
<b>Antenna</b>	1		2		3
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)		AIR21 B4A/B2P (Quad)		LNx-6515DS-A1M (Dual)
<b>Azimuth</b>	60		60		60
<b>M. Tilt</b>					
<b>Height</b>	175		175		175
<b>Ports</b>	P1	P2	P3	P4	P5
<b>Active Tech.</b>	U1900		L2100		L700
<b>Dark Tech.</b>					
<b>Restricted Tech.</b>					
<b>Decomm. Tech.</b>					
<b>E. Tilt</b>	2		2		2
<b>Cables</b>	1-5/8" Coax 1-5/8" Coax				
<b>TMA's</b>					
<b>Diplexers / Combiners</b>					
<b>Radio</b>					
<b>Sector Equipment</b>					
<b>Unconnected Equipment:</b>					
<b>Scope of Work:</b>					
Add L7 antenna on new mount. Re-use existing coax if swept clean and not aluminum otherwise replace 2 per sector.					

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Sector 2 (Existing) view from behind			
<b>Coverage Type</b>	A - Outdoor Macro		
<b>Antenna</b>	1		2
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)		AIR21 B4A/B2P (Quad)
<b>Azimuth</b>	180		180
<b>M. Tilt</b>	0		0
<b>Height</b>	175		175
<b>Ports</b>	P1	P2	P3
<b>Active Tech.</b>	U1900		L2100
<b>Dark Tech.</b>			
<b>Restricted Tech.</b>			
<b>Decomm. Tech.</b>			
<b>E. Tilt</b>	2		2
<b>Cables</b>	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.
<b>TMA's</b>			
<b>Diplexers / Combiners</b>			
<b>Radio</b>			
<b>Sector Equipment</b>			
<b>Unconnected Equipment:</b>			
<b>Scope of Work:</b>			



<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Sector 2 (Proposed) view from behind				
<b>Coverage Type</b>	A - Outdoor Macro			
<b>Antenna</b>	1	2		3
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)	AIR21 B4A/B2P (Quad)	LNX-6515DS-A1M (Dual)	
<b>Azimuth</b>	180	180	180	
<b>M. Tilt</b>				
<b>Height</b>	175	175	175	
<b>Ports</b>	P1	P2	P3	P4
<b>Active Tech.</b>	U1900		L2100	L700
<b>Dark Tech.</b>				
<b>Restricted Tech.</b>				
<b>Decomm. Tech.</b>				
<b>E. Tilt</b>	2		2	2
<b>Cables</b>				1-5/8" Coax 1-5/8" Coax
<b>TMA's</b>				
<b>Diplexers / Combiners</b>				
<b>Radio</b>				
<b>Sector Equipment</b>				
<b>Unconnected Equipment:</b>				
<b>Scope of Work:</b>				
Add L7 antenna on new mount. Re-use existing coax if swept clean and not aluminum otherwise replace 2 per sector.				

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Sector 3 (Existing) view from behind			
<b>Coverage Type</b>	A - Outdoor Macro		
<b>Antenna</b>	1		2
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)	AIR21 B4A/B2P (Quad)	
<b>Azimuth</b>	300	300	
<b>M. Tilt</b>	0	0	
<b>Height</b>	175	175	
<b>Ports</b>	P1	P2	P3
<b>Active Tech.</b>	U1900		L2100
<b>Dark Tech.</b>			
<b>Restricted Tech.</b>			
<b>Decomm. Tech.</b>			
<b>E. Tilt</b>	2		2
<b>Cables</b>	Fiber Jumper - 15 ft.		Fiber Jumper - 15 ft.
<b>TMA's</b>			
<b>Diplexers / Combiners</b>			
<b>Radio</b>			
<b>Sector Equipment</b>			
<b>Unconnected Equipment:</b>			
<b>Scope of Work:</b>			

<b>RAN Template:</b> 705A-V2	<b>A&amp;L Template:</b> 1DP_2xAIR_705A
---------------------------------	--

Sector 3 (Proposed) view from behind					
<b>Coverage Type</b>	A - Outdoor Macro				
<b>Antenna</b>	1		2		3
<b>Antenna Model</b>	AIR21 B2A/B4P (Quad)		AIR21 B4A/B2P (Quad)		LNx-6515DS-A1M (Dual)
<b>Azimuth</b>	300		300		300
<b>M. Tilt</b>					
<b>Height</b>	175		175		175
<b>Ports</b>	P1	P2	P3	P4	P5
<b>Active Tech.</b>	U1900		L2100		L700
<b>Dark Tech.</b>					
<b>Restricted Tech.</b>					
<b>Decomm. Tech.</b>					
<b>E. Tilt</b>	2		2		2
<b>Cables</b>	1-5/8" Coax 1-5/8" Coax				
<b>TMA's</b>					
<b>Diplexers / Combiners</b>					
<b>Radio</b>					
<b>Sector Equipment</b>					
<b>Unconnected Equipment:</b>					
<b>Scope of Work:</b>					
Add L7 antenna on new mount. Re-use existing coax if swept clean and not aluminum otherwise replace 2 per sector.					



## LNX-6515DS-VTM | LNX-6515DS-A1M

**Single Band Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible**

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- Exceptional horizontal pattern roll-off and strong front-to-back ratio
- Extended bandwidth allows one antenna to serve multiple frequency allocations
- Great solution to maximize network coverage and capacity
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

### Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	16.7	17.6
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	9.7	8.6
Beam Tilt, degrees	0–8	0–8
USLS (First Lobe), dB	17	17
Front-to-Back Ratio at 180°, dB	32	27
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13
Isolation, dB	30	30
VSWR   Return Loss, dB	1.4   15.6	1.4   15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

### Electrical Specifications, BASTA\*

Frequency Band, MHz	698–806	806–896
Gain by all Beam Tilts, average, dBi	16.6	16.9
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3
	0 °   16.6	0 °   17.0
Gain by Beam Tilt, average, dBi	4 °   16.6	4 °   17.0
	8 °   16.4	8 °   16.8
Beamwidth, Horizontal Tolerance, degrees	±1	±0.9
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.4
USLS, beampeak to 20° above beampeak, dB	18	18
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13

\* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

### General Specifications

Antenna Type	Sector
Band	Single band
Brand	DualPol®
Operating Frequency Band	698 – 896 MHz

LNx-6515DS-VTM | LNx-6515DS-A1M

Performance Note

Outdoor usage

## Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, frontal	878.0 N @ 150 km/h 197.4 lbf @ 150 km/h
Wind Loading, lateral	273.0 N @ 150 km/h 61.4 lbf @ 150 km/h
Wind Loading, rear	1033.0 N @ 150 km/h 232.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h   150 mph

## Dimensions

Depth	180.5 mm   7.1 in
Length	2453.0 mm   96.6 in
Width	301.0 mm   11.9 in
Net Weight, without mounting kit	19.8 kg   43.7 lb

## Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator LNx-6515DS-A1M

## Packed Dimensions

Depth	295.0 mm   11.6 in
Length	2718.0 mm   107.0 in
Width	392.0 mm   15.4 in
Shipping Weight	36.9 kg   81.4 lb

## Regulatory Compliance/Certifications

### Agency

RoHS 2011/65/EU

China RoHS SJ/T 11364-2006

ISO 9001:2008

### Classification

Compliant by Exemption

Above Maximum Concentration Value (MCV)

Designed, manufactured and/or distributed under this quality management system



## Included Products

DB380-3 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Used for wide panel antennas. Includes

LNx-6515DS-VTM | LNx-6515DS-A1M

---

three clamp sets.

**DB5083D** — Downtilt Mounting Kit for 2.4"-4.5" (60-115 mm) OD round members. Consists of two DB5083 heavy-duty, galvanized steel downtilt mounting brackets. This kit is compatible with the DB380-3 pipe mount for panel antennas with three mounting points.

## \* **Footnotes**

---

Performance Note      Severe environmental conditions may degrade optimum performance