Robinson+Cole

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October 18, 2016

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

Re: **EM-VER-138-160921 – Cellco Partnership d/b/a Verizon Wireless**
623 Honeyspot Road, Stratford, Connecticut

Dear Ms. Bachman:

On October 11, 2016, the Siting Council acknowledged receipt of Cellco's notice of intent to modify its existing telecommunications facility at 623 Honeyspot Road in Stratford, Connecticut. The modifications involved the replacement of antennas and the installation of remote radio heads at the above-referenced facility.

As a condition of the acknowledgement, Cellco was required to provide the Council with a copy of the Structural Analysis Report referencing the Rev. G of the Structural Standards. The updated Structural Analysis Report referencing Rev. G is attached.

If you have any questions please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Tim Parks

15369772-v1

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

102-ft Existing EEI Monopole

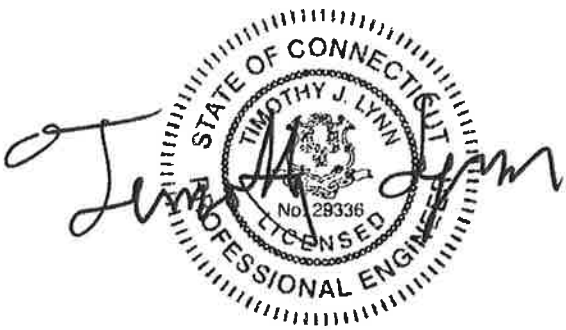
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Stratford

627 Honeyspot Road
Stratford, CT

CENTEK Project No. 16001.32

~~Date: September 7, 2016~~
Rev 1: October 12, 2016



Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing monopole (tower) located in Stratford, Connecticut.

The host tower is a 102-ft tall, three-section, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 5553 dated September 9, 1999. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by URS Corporation job no; 36931189.00000 (VZ5-042), dated April 12, 2010. Tower reinforced was obtained from a previous structural analysis prepared by Destek dated March 8, 2016.

Antenna and appurtenance information were obtained from the aforementioned Destek structural report, visual verification from grade conducted by Centek personnel on August 25, 2016 and a Verizon RF data sheet.

The tower is made up of two (2) tapered vertical sections consisting of A572-65 pole sections slip joint connected and one (1) 13" diameter pipe flange connected to the top of the tower. The diameter of the pole (flat-flat) is 13.00-in at the top and 40.00-in at the base.

Verizon proposes the removal of six (6) panel antennas and six (6) remote radio heads and the installation of six (6) panel antennas, nine (9) remote radio heads and one (1) main distribution box mounted to the existing platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- METROPCS (EXISTING):
  Antennas: Six (6) Kathrein 800-10504 panel antennas mounted on three (3) T-Arms with a RAD center elevation of 101-ft above grade level.
  Coax Cables: Twelve (12) 7/8" ∅ coax cables running inside the monopole.
- AT&T (EXISTING):
  Antennas: Three (3) Powerwave 7770.00 panel antennas, three (3) KMW AM-X-CD-16-65-00T panel antennas, three (3) Quintel QS66512-3 panel antennas, twelve (12) LGP21401 TMA's, six (6) TPX-070821 diplexers, six (6) Ericsson RRUS-11, three (3) Ericsson RRUS-32 and two (2) Raycap DC6-48-60-18-8F surge arrestors mounted on a platform with a RAD center elevation of 90-ft above grade level.
  Coax Cables: Twelve (12) 1-1/4" ∅ coax cables, one (1) fiber cable and two (2) dc control cables running on the inside of the existing monopole
- SPRINT (EXISTING):
  Appurtenances: Six (6) 1900 remote radio heads, three (3) 800 remote radio heads and three (3) TD-RRH8x20 remote radio heads flush mounted with an elevation of 74-ft above grade level.
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas and two (2) 2-ft microwave dishes mounted on three (3) T-arms with a RAD center elevation of 72-ft above grade level.
  Coax Cables: Six (6) 1-1/4" ∅ cables on the exterior of the existing monopole

- TOWN (EXISTING):
  Antennas: One (1) 20-ft Omni-directional whip antenna, two (2) 12-ft Omni-directional whip antennas and three (3) 10-ft Omni-directional whip antennas mounted on a T-Arm with an elevation of 28-ft above grade level.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Six (6) Antel BXA-70063-6CF panel antennas and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on a platform with a RAD center elevation of 82-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running inside the monopole running inside the monopole.
- VERIZON (EXISTING TO REMOVE):
  Antennas: Three (3) RYMSA MG D3-800T0 panel antennas, three (3) Antel BXA-171063-8BF panel antennas, three (3) Alcatel-Lucent RRH2x40-700 remote radio heads and three (3) Alcatel-Lucent RRH2x40-AWS remote radio heads mounted on a platform with a RAD center elevation of 82-ft above grade level.
- **VERIZON (PROPOSED):**
  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 and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on a platform with a RAD center elevation of 82-ft above grade level.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running inside the monopole.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Fairfield; v = 90-110 mph (3-second gust)	*[Annex B of TIA-222-G-2005]*
	Stratford; v = 97 mph (3 second gust)	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2016 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

[1] 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 **75.4%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	65.00'-89.73'	75.4%	**PASS**

(1) Wall thickness increased in bottom 65-ft of tower to account for previous reinforcement.

Foundation and Anchors

The existing foundation consists of a 6.0 ∅ x 16.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned URS structural report. The base of the tower is connected to the foundation by means of (10) 2.25"∅, 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	23 kips
	Compression	31 kips
	Moment	1685 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	55.6%	**PASS**
	Lateral Deflection	0.08 in.(1)	**PASS**

(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	Tension	43.6%	**PASS**
Base Plate	Bending	70.1%	**PASS**

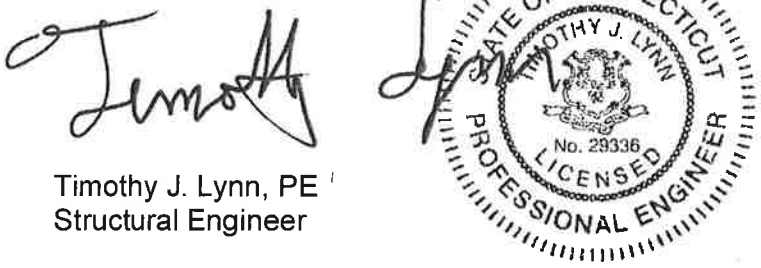
Conclusion

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 Verizon Wireless. 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:

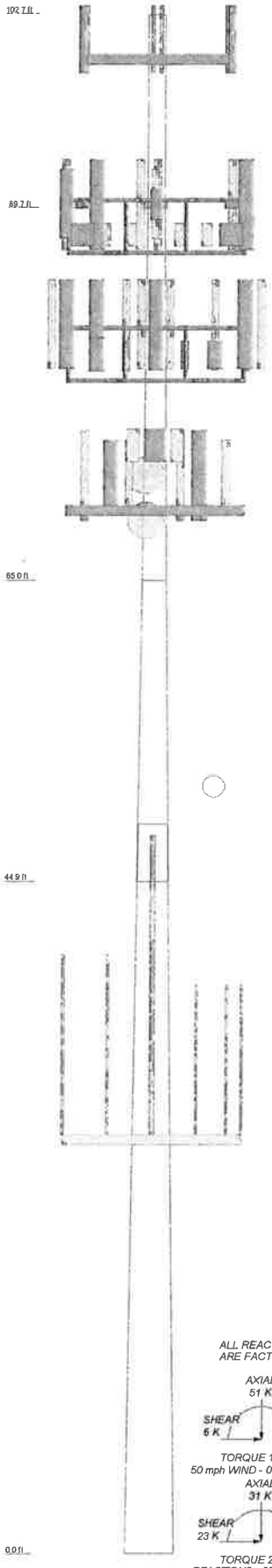
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or 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.

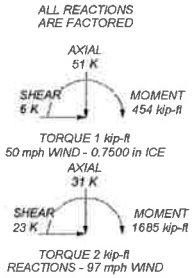
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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
(2) 800-10504 (MetroPCS)	101	SBNHH-1D65B (Verizon Proposed)	82
(2) 800-10504 (MetroPCS)	101	BXA-70063/6CF (Verizon Existing)	82
(2) 800-10504 (MetroPCS)	101	RC2DC-3315-PF-48 (Verizon Existing)	82
4-ft x 4ft T-Arm (MetroPCS)	100	RC2DC-3315-PF-48 (Verizon Proposed)	82
4-ft x 4ft T-Arm (MetroPCS)	100	RRH4x45/2x90-AWS (Verizon Proposed)	80
4-ft x 4ft T-Arm (MetroPCS)	100	RRH4x30-B13 (Verizon Proposed)	80
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	90	RRH4x30-B13 (Verizon Proposed)	80
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	90	RRH4x30-B13 (Verizon Proposed)	80
Valmont Uni-Tri Bracket (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
7770.00 (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
QS66512-3 (ATI Existing)	90	RRH4x45/2x90-AWS (Verizon Proposed)	80
7770.00 (ATI Existing)	90	RRH4x45/2x90-AWS (Verizon Proposed)	80
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	10' Platform w/rails (Verizon Existing)	80
QS66512-3 (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
7770.00 (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
QS66512-3 (ATI Existing)	90	FD-RRH 2x50 800 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	FD-RRH 2x50 800 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	FD-RRH 2x50 800 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	TD-RRHBx20-25 (Sprint)	74
(2) TPX-070821 (ATI Existing)	90	TD-RRHBx20-25 (Sprint)	74
(2) TPX-070821 (ATI Existing)	90	TD-RRHBx20-25 (Sprint)	74
(2) TPX-070821 (ATI Existing)	90	APXVTM14 (Sprint)	72
Platform w/rails (ATI Existing)	88.5	APXVSPP18-C-A20 (Sprint)	72
(2) RRUS-11 (ATI Existing)	88	APXVTM14 (Sprint)	72
(2) RRUS-11 (ATI Existing)	88	APXVSPP18-C-A20 (Sprint)	72
RRUS-32 (ATI Existing)	88	APXVTM14 (Sprint)	72
RRUS-32 (ATI Existing)	88	APXVSPP18-C-A20 (Sprint)	72
RRUS-32 (ATI Existing)	88	A-ANT-23G-2	72
(2) RRUS-11 (ATI Existing)	88	A-ANT-23G-2	72
BXA-70063/6CF (Verizon Existing)	82	Rohn T-Arm (1) (Sprint)	70
SBNHH-1D65B (Verizon Proposed)	82	Rohn T-Arm (1) (Sprint)	70
SBNHH-1D65B (Verizon Proposed)	82	Rohn T-Arm (1) (Sprint)	70
BXA-70063/6CF (Verizon Existing)	82	12' x 2" Dia Omni	28
BXA-70063/6CF (Verizon Existing)	82	10' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82	10' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82	10' x 2" Dia Omni	28
BXA-70063/6CF (Verizon Existing)	82	Rohn T-Arm (1)	28
BXA-70063/6CF (Verizon Existing)	82	20' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82	12' x 2" Dia Omni	28

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. Wall thickness increased in tower section 2 to account for reinforcement design per Atlantis Group drawings dated 10.8.14
10. TOWER RATING: 75.4%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	16001.32 - Stratford
Project:	102' EEI Monopole - 627 Honeyspot Road Stratford, CT
Client: Verizon Wireless	Drawn by: TJL / Appd:
Code: TIA-222-G	Date: 10/11/16 / Scale: NTS
Path:	Dwg No: E-1

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 97 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
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

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

Tapered Pole Section Geometry

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

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	102.65-89.73	12.92	0.00	Round	13.0000	13.0000	0.2500		A53-B-35 (35 ksi)
L2	89.73-65.00	24.73	0.00	18	13.0000	20.6140	0.2500	1.0000	A572-65 (65 ksi)
L3	65.00-44.93	20.07	3.85	18	20.6140	26.7925	0.6000	2.4000	A572-65 (65 ksi)
L4	44.93-0.00	48.78		18	24.4073	40.0000	0.6000	2.4000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	13.0000	10.0138	203.5623	4.5087	6.5000	31.3173	407.1246	5.0039	0.0000	0
	13.0000	10.0138	203.5623	4.5087	6.5000	31.3173	407.1246	5.0039	0.0000	0
L2	13.2005	10.1171	207.7854	4.5263	6.6040	31.4636	415.8441	5.0595	1.8480	7.392
	20.9320	16.1588	846.5910	7.2292	10.4719	80.8440	1694.2960	8.0810	3.1881	12.752
L3	20.9320	38.1147	1928.8449	7.1050	10.4719	184.1922	3860.2278	19.0610	2.5721	4.287
	27.2058	49.8810	4323.4106	9.2983	13.6106	317.6505	8652.5100	24.9452	3.6595	6.099
L4	26.0335	45.3386	3246.5743	8.4516	12.3989	261.8437	6497.4205	22.6736	3.2397	5.399
	40.6171	75.0334	14715.8140	13.9870	20.3200	724.2034	29450.9913	37.5238	5.9840	9.973

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 102.65-89.73				1	1	1			
L2 89.73-65.00				1	1	1			
L3 65.00-44.93				1	1	1			
L4 44.93-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
7/8 (MetroPCS)	C	No	Inside Pole	102.00 - 20.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
						1" Ice	0.00	0.54
1 1/4 (AT&T)	C	No	Inside Pole	90.00 - 20.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
Fiber Trunk (AT&T)	C	No	Inside Pole	90.00 - 20.00	1	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
						1" Ice	0.00	1.00
DC Trunk (AT&T)	C	No	Inside Pole	90.00 - 20.00	2	No Ice	0.00	0.11
						1/2" Ice	0.00	0.11
						1" Ice	0.00	0.11
1 5/8 (Verizon)	C	No	Inside Pole	82.00 - 20.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (Verizon)	C	No	Inside Pole	82.00 - 20.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
						1" Ice	0.00	1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	No	Inside Pole	82.00 - 20.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
						1" Ice	0.00	1.90
1 1/4 (Sprint)	C	No	CaAa (Out Of Face)	66.00 - 20.00	2	No Ice	0.16	0.66
						1/2" Ice	0.25	1.91
						1" Ice	0.35	3.78
1 1/4 (Sprint)	C	No	CaAa (Out Of Face)	66.00 - 20.00	4	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
						1" Ice	0.00	3.78

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	102.65-89.73	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.08
L2	89.73-65.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.310	0.67
L3	65.00-44.93	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.222	0.72
L4	44.93-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	7.728	0.89

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	102.65-89.73	A	1.669	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.08
L2	89.73-65.00	A	1.631	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.963	0.71
L3	65.00-44.93	A	1.577	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	18.884	1.48
L4	44.93-0.00	A	1.439	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	23.457	1.84

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	102.65-89.73	0.0000	0.0000	0.0000	0.0000
L2	89.73-65.00	-0.0194	0.0112	-0.0497	0.0287
L3	65.00-44.93	-0.3435	0.1983	-0.7522	0.4343
L4	44.93-0.00	-0.1870	0.1080	-0.4700	0.2713

Shielding Factor Ka

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 ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) 800-10504 (MetroPCS)	A	From Face	2.00		0.0000	101.00	No Ice	3.35	1.86	0.02
			0.00				1/2" Ice	3.70	2.19	0.04
			0.00				1" Ice	4.05	2.52	0.06
(2) 800-10504 (MetroPCS)	B	From Face	2.00		0.0000	101.00	No Ice	3.35	1.86	0.02
			0.00				1/2" Ice	3.70	2.19	0.04
			0.00				1" Ice	4.05	2.52	0.06
(2) 800-10504 (MetroPCS)	C	From Face	2.00		0.0000	101.00	No Ice	3.35	1.86	0.02
			0.00				1/2" Ice	3.70	2.19	0.04
			0.00				1" Ice	4.05	2.52	0.06
4-ft x 4-ft T-Arm (MetroPCS)	A	From Face	2.00		0.0000	100.00	No Ice	3.27	3.27	0.20
			0.00				1/2" Ice	4.20	4.20	0.26
			0.00				1" Ice	5.13	5.13	0.32
4-ft x 4-ft T-Arm (MetroPCS)	B	From Face	2.00		0.0000	100.00	No Ice	3.27	3.27	0.20
			0.00				1/2" Ice	4.20	4.20	0.26
			0.00				1" Ice	5.13	5.13	0.32
4-ft x 4-ft T-Arm (MetroPCS)	C	From Face	2.00		0.0000	100.00	No Ice	3.27	3.27	0.20
			0.00				1/2" Ice	4.20	4.20	0.26
			0.00				1" Ice	5.13	5.13	0.32
(2) RRUS-11 (AT&T Existing)	A	From Face	0.50		0.0000	88.00	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
(2) RRUS-11 (AT&T Existing)	B	From Face	0.50		0.0000	88.00	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
(2) RRUS-11 (AT&T Existing)	C	From Face	0.50		0.0000	88.00	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
RRUS-32 (AT&T Existing)	A	From Face	0.50		0.0000	88.00	No Ice	0.00	2.76	0.08
			0.00				1/2" Ice	0.00	3.02	0.10
			0.00				1" Ice	0.00	3.29	0.14
RRUS-32 (AT&T Existing)	B	From Face	0.50		0.0000	88.00	No Ice	0.00	2.76	0.08
			0.00				1/2" Ice	0.00	3.02	0.10
			0.00				1" Ice	0.00	3.29	0.14
RRUS-32	C	From Face	0.50		0.0000	88.00	No Ice	0.00	2.76	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T Existing)			0.00			1/2" Ice	0.00	3.02	0.10
			0.00			1" Ice	0.00	3.29	0.14
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	90.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T Existing)			0.00			1" Ice	2.29	2.29	0.06
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	90.00	No Ice	1.91	1.91	0.02
Arrestor			0.00			1/2" Ice	2.10	2.10	0.04
(AT&T Existing)			0.00			1" Ice	2.29	2.29	0.06
Valmont Uni-Tri Bracket	C	None		0.0000	90.00	No Ice	1.75	1.75	0.29
(AT&T Existing)						1/2" Ice	1.94	1.94	0.31
						1" Ice	2.13	2.13	0.32
7770.00	A	From Face	3.00	0.0000	90.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
AM-X-CD-16-65-00T-RET(72")	A	From Face	3.00	0.0000	90.00	No Ice	8.02	4.64	0.05
			4.00			1/2" Ice	8.48	5.09	0.10
(AT&T Existing)			0.00			1" Ice	8.94	5.54	0.15
QS66512-3	A	From Face	3.00	0.0000	90.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-6.00			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
7770.00	B	From Face	3.00	0.0000	90.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
AM-X-CD-16-65-00T-RET(72")	B	From Face	3.00	0.0000	90.00	No Ice	8.02	4.64	0.05
			4.00			1/2" Ice	8.48	5.09	0.10
(AT&T Existing)			0.00			1" Ice	8.94	5.54	0.15
QS66512-3	B	From Face	3.00	0.0000	90.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-6.00			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
7770.00	C	From Face	3.00	0.0000	90.00	No Ice	5.51	2.93	0.04
(AT&T Existing)			6.00			1/2" Ice	5.87	3.27	0.07
			0.00			1" Ice	6.23	3.63	0.11
AM-X-CD-16-65-00T-RET(72")	C	From Face	3.00	0.0000	90.00	No Ice	8.02	4.64	0.05
			4.00			1/2" Ice	8.48	5.09	0.10
(AT&T Existing)			0.00			1" Ice	8.94	5.54	0.15
QS66512-3	C	From Face	3.00	0.0000	90.00	No Ice	8.13	6.80	0.11
(AT&T Existing)			-6.00			1/2" Ice	8.59	7.27	0.17
			0.00			1" Ice	9.05	7.72	0.23
(4) LGP21401 TMA	A	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00			1" Ice	0.00	0.60	0.03
(4) LGP21401 TMA	B	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00			1" Ice	0.00	0.60	0.03
(4) LGP21401 TMA	C	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00			1" Ice	0.00	0.60	0.03
(2) TPX-070821	A	From Face	3.00	0.0000	90.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	B	From Face	3.00	0.0000	90.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
(2) TPX-070821	C	From Face	3.00	0.0000	90.00	No Ice	0.47	0.10	0.01
(AT&T Existing)			0.00			1/2" Ice	0.56	0.15	0.01
			0.00			1" Ice	0.66	0.20	0.02
Platform w/rails	C	None		0.0000	88.50	No Ice	21.00	21.00	1.50

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T Existing)							1/2" Ice	26.00	26.00	1.75
							1" Ice	31.00	31.00	2.00
BXA-70063/6CF	A	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
SBNHH-1D65B	A	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			0.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
SBNHH-1D65B	A	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			4.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
BXA-70063/6CF	A	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
BXA-70063/6CF	B	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
SBNHH-1D65B	B	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			0.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
SBNHH-1D65B	B	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			4.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
BXA-70063/6CF	B	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
BXA-70063/6CF	C	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			-6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
SBNHH-1D65B	C	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			0.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
SBNHH-1D65B	C	From Face	4.00		0.0000	82.00	No Ice	8.08	5.34	0.04
(Verizon Proposed)			4.00				1/2" Ice	8.53	5.79	0.09
			0.00				1" Ice	9.00	6.26	0.15
BXA-70063/6CF	C	From Face	4.00		0.0000	82.00	No Ice	7.57	4.16	0.01
(Verizon Existing)			6.00				1/2" Ice	8.02	4.60	0.05
			0.00				1" Ice	8.47	5.04	0.10
RRH4x45/2x90-AWS	A	From Face	4.00		0.0000	80.00	No Ice	2.58	1.69	0.08
(Verizon Proposed)			4.00				1/2" Ice	2.79	1.87	0.10
			0.00				1" Ice	3.01	2.06	0.12
RRH4x45/2x90-AWS	B	From Face	4.00		0.0000	80.00	No Ice	2.58	1.69	0.08
(Verizon Proposed)			4.00				1/2" Ice	2.79	1.87	0.10
			0.00				1" Ice	3.01	2.06	0.12
RRH4x45/2x90-AWS	C	From Face	4.00		0.0000	80.00	No Ice	2.58	1.69	0.08
(Verizon Proposed)			4.00				1/2" Ice	2.79	1.87	0.10
			0.00				1" Ice	3.01	2.06	0.12
RRH4x30-B13	A	From Face	4.00		0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00				1/2" Ice	0.00	2.09	0.08
			0.00				1" Ice	0.00	2.30	0.10
RRH4x30-B13	B	From Face	4.00		0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00				1/2" Ice	0.00	2.09	0.08
			0.00				1" Ice	0.00	2.30	0.10
RRH4x30-B13	C	From Face	4.00		0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00				1/2" Ice	0.00	2.09	0.08
			0.00				1" Ice	0.00	2.30	0.10
RRH2x60-PCS	A	From Face	4.00		0.0000	80.00	No Ice	2.15	1.35	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon Proposed)			-4.00			1/2" Ice	2.34	1.50	0.07
			0.00			1" Ice	2.54	1.67	0.09
RRH2x60-PCS	B	From Face	4.00	0.0000	80.00	No Ice	2.15	1.35	0.06
(Verizon Proposed)			-4.00			1/2" Ice	2.34	1.50	0.07
			0.00			1" Ice	2.54	1.67	0.09
RRH2x60-PCS	C	From Face	4.00	0.0000	80.00	No Ice	2.15	1.35	0.06
(Verizon Proposed)			-4.00			1/2" Ice	2.34	1.50	0.07
			0.00			1" Ice	2.54	1.67	0.09
RC2DC-3315-PF-48	A	From Face	1.00	0.0000	82.00	No Ice	0.00	2.29	0.03
(Verizon Existing)			1.00			1/2" Ice	0.00	2.51	0.05
			0.00			1" Ice	0.00	2.74	0.08
RC2DC-3315-PF-48	B	From Face	1.00	0.0000	82.00	No Ice	0.00	2.29	0.03
(Verizon Proposed)			1.00			1/2" Ice	0.00	2.51	0.05
			0.00			1" Ice	0.00	2.74	0.08
10' Platform w/rails	C	None		0.0000	80.00	No Ice	21.00	21.00	1.50
(Verizon Existing)						1/2" Ice	26.00	26.00	1.75
						1" Ice	31.00	31.00	2.00
APXVSPP18-C-A20	A	From Face	3.00	0.0000	72.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	A	From Face	3.00	0.0000	72.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVSPP18-C-A20	B	From Face	3.00	0.0000	72.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	B	From Face	3.00	0.0000	72.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
APXVSPP18-C-A20	C	From Face	3.00	0.0000	72.00	No Ice	8.02	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.48	5.74	0.11
			0.00			1" Ice	8.94	6.20	0.16
APXVTM14	C	From Face	3.00	0.0000	72.00	No Ice	6.34	3.61	0.06
(Sprint)			3.00			1/2" Ice	6.72	3.97	0.10
			0.00			1" Ice	7.10	4.33	0.14
(2) FD-RRH 4x40 1900	A	From Face	1.00	0.0000	74.00	No Ice	0.00	2.71	0.06
(Sprint)			0.00			1/2" Ice	0.00	2.95	0.08
			0.00			1" Ice	0.00	3.20	0.11
(2) FD-RRH 4x40 1900	B	From Face	1.00	0.0000	74.00	No Ice	0.00	2.71	0.06
(Sprint)			0.00			1/2" Ice	0.00	2.95	0.08
			0.00			1" Ice	0.00	3.20	0.11
(2) FD-RRH 4x40 1900	C	From Face	1.00	0.0000	74.00	No Ice	0.00	2.71	0.06
(Sprint)			0.00			1/2" Ice	0.00	2.95	0.08
			0.00			1" Ice	0.00	3.20	0.11
FD-RRH 2x50 800	A	From Face	1.00	0.0000	74.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	B	From Face	1.00	0.0000	74.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	C	From Face	1.00	0.0000	74.00	No Ice	2.06	1.93	0.06
(Sprint)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
TD-RRH8x20-25	A	From Face	1.00	0.0000	74.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	1.00	0.0000	74.00	No Ice	4.05	1.53	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	1.00	0.0000	74.00	No Ice	4.05	1.53	0.07
(Sprint)			0.00			1/2" Ice	4.30	1.71	0.10
			0.00			1" Ice	4.56	1.90	0.13
Rohn T-Arm (1)	A	None		0.0000	70.00	No Ice	7.33	7.33	0.38
(Sprint)						1/2" Ice	10.00	10.00	0.49
						1" Ice	12.67	12.67	0.60
Rohn T-Arm (1)	B	None		0.0000	70.00	No Ice	7.33	7.33	0.38
(Sprint)						1/2" Ice	10.00	10.00	0.49
						1" Ice	12.67	12.67	0.60
Rohn T-Arm (1)	C	None		0.0000	70.00	No Ice	7.33	7.33	0.38
(Sprint)						1/2" Ice	10.00	10.00	0.49
						1" Ice	12.67	12.67	0.60
20' x 3" Dia Omni	A	From Leg	0.00	0.0000	28.00	No Ice	6.00	6.00	0.05
			0.00			1/2" Ice	8.03	8.03	0.09
			10.00			1" Ice	10.08	10.08	0.15
12' x 2" Dia Omni	A	From Leg	3.00	0.0000	28.00	No Ice	2.40	2.40	0.03
			-3.00			1/2" Ice	3.63	3.63	0.05
			6.00			1" Ice	4.87	4.87	0.07
12' x 2" Dia Omni	A	From Leg	3.00	0.0000	28.00	No Ice	2.40	2.40	0.03
			-6.00			1/2" Ice	3.63	3.63	0.05
			6.00			1" Ice	4.87	4.87	0.07
10' x 2" Dia Omni	A	From Leg	3.00	0.0000	28.00	No Ice	2.00	2.00	0.02
			3.00			1/2" Ice	3.02	3.02	0.03
			5.00			1" Ice	4.07	4.07	0.05
10' x 2" Dia Omni	A	From Leg	3.00	0.0000	28.00	No Ice	2.00	2.00	0.02
			5.00			1/2" Ice	3.02	3.02	0.03
			5.00			1" Ice	4.07	4.07	0.05
10' x 2" Dia Omni	A	From Leg	3.00	0.0000	28.00	No Ice	2.00	2.00	0.02
			6.00			1/2" Ice	3.02	3.02	0.03
			5.00			1" Ice	4.07	4.07	0.05
Rohn T-Arm (1)	A	From Leg	0.00	0.0000	28.00	No Ice	7.33	7.33	0.38
			0.00			1/2" Ice	10.00	10.00	0.49
			0.00			1" Ice	12.67	12.67	0.60

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
A-ANT-23G-2	A	Paraboloid w/Radome	From Face	0.00	Worst		72.00	2.50	No Ice	4.91	0.04
				0.00					1/2" Ice	5.24	0.07
				0.00					1" Ice	5.57	0.10
A-ANT-23G-2	A	Paraboloid w/Radome	From Face	0.00	Worst		72.00	2.50	No Ice	4.91	0.04
				0.00					1/2" Ice	5.24	0.07
				-3.00					1" Ice	5.57	0.10

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 102.65-89.73	96.19	1.255	29	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
					B	0.000	13.997		100.00	0.000	0.000
					C	0.000	13.997		100.00	0.000	0.000
L2 89.73-65.00	76.43	1.196	27	35.171	A	0.000	35.171	35.171	100.00	0.000	0.000
					B	0.000	35.171		100.00	0.000	0.000
					C	0.000	35.171		100.00	0.000	0.310
L3 65.00-44.93	54.53	1.114	25	40.255	A	0.000	40.255	40.255	100.00	0.000	0.000
					B	0.000	40.255		100.00	0.000	0.000
					C	0.000	40.255		100.00	0.000	6.222
L4 44.93-0.00	21.75	0.918	21	124.775	A	0.000	124.775	124.775	100.00	0.000	0.000
					B	0.000	124.775		100.00	0.000	0.000
					C	0.000	124.775		100.00	0.000	7.728

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 102.65-89.73	96.19	1.255	8	1.6694	17.591	A	0.000	17.591	17.591	100.00	0.000	0.000
						B	0.000	17.591		100.00	0.000	0.000
						C	0.000	17.591		100.00	0.000	0.000
L2 89.73-65.00	76.43	1.196	7	1.6314	41.895	A	0.000	41.895	41.895	100.00	0.000	0.000
						B	0.000	41.895		100.00	0.000	0.000
						C	0.000	41.895		100.00	0.000	0.963
L3 65.00-44.93	54.53	1.114	7	1.5773	45.531	A	0.000	45.531	45.531	100.00	0.000	0.000
						B	0.000	45.531		100.00	0.000	0.000
						C	0.000	45.531		100.00	0.000	18.884
L4 44.93-0.00	21.75	0.918	6	1.4388	136.586	A	0.000	136.586	136.586	100.00	0.000	0.000
						B	0.000	136.586		100.00	0.000	0.000
						C	0.000	136.586		100.00	0.000	23.457

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 102.65-89.73	96.19	1.255	10	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
					B	0.000	13.997		100.00	0.000	0.000
					C	0.000	13.997		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L2 89.73-65.00	76.43	1.196	9	35.171	A	0.000	35.171	35.171	100.00	0.000	0.000
					B	0.000	35.171		100.00	0.000	0.000
					C	0.000	35.171		100.00	0.000	0.310
L3 65.00-44.93	54.53	1.114	9	40.255	A	0.000	40.255	40.255	100.00	0.000	0.000
					B	0.000	40.255		100.00	0.000	0.000
					C	0.000	40.255		100.00	0.000	6.222
L4 44.93-0.00	21.75	0.918	7	124.775	A	0.000	124.775	124.775	100.00	0.000	0.000
					B	0.000	124.775		100.00	0.000	0.000
					C	0.000	124.775		100.00	0.000	7.728

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	29	1	1	13.997	0.27	20.54	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	27	1	1	35.171	0.70	28.21	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	25	1	1	40.255	0.97	48.41	C
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	21	1	1	124.775	2.05	45.71	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	176.48 kip-ft	3.99		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	29	1	1	13.997	0.27	20.54	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	27	1	1	35.171	0.70	28.21	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	25	1	1	40.255	0.97	48.41	C
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	21	1	1	124.775	2.05	45.71	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	176.48 kip-ft	3.99		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	29	1	1	13.997	0.27	20.54	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	27	1	1	35.171	0.70	28.21	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	25	1	1	40.255	0.97	48.41	C
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	21	1	1	124.775	2.05	45.71	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	176.48 kip-ft	3.99		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.83	A	1	1.2	8	1	1	17.591	0.18	13.72	C
102.65-89.73			B	1	1.2		1	1	17.591			
			C	1	1.2		1	1	17.591			
L2	0.71	2.02	A	1	1.2	7	1	1	41.895	0.41	16.57	C
89.73-65.00			B	1	1.2		1	1	41.895			
			C	1	1.2		1	1	41.895			
L3	1.48	3.99	A	1	1.2	7	1	1	45.531	0.55	27.29	C
65.00-44.93			B	1	1.2		1	1	45.531			
			C	1	1.2		1	1	45.531			
L4 44.93-0.00	1.84	12.72	A	1	1.2	6	1	1	136.586	1.15	25.61	C
			B	1	1.2		1	1	136.586			
			C	1	1.2		1	1	136.586			
Sum Weight:	4.11	19.57						OTM	103.27 kip-ft	2.29		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.83	A	1	1.2	8	1	1	17.591	0.18	13.72	C
102.65-89.73			B	1	1.2		1	1	17.591			
			C	1	1.2		1	1	17.591			
L2	0.71	2.02	A	1	1.2	7	1	1	41.895	0.41	16.57	C
89.73-65.00			B	1	1.2		1	1	41.895			
			C	1	1.2		1	1	41.895			
L3	1.48	3.99	A	1	1.2	7	1	1	45.531	0.55	27.29	C
65.00-44.93			B	1	1.2		1	1	45.531			
			C	1	1.2		1	1	45.531			
L4 44.93-0.00	1.84	12.72	A	1	1.2	6	1	1	136.586	1.15	25.61	C
			B	1	1.2		1	1	136.586			
			C	1	1.2		1	1	136.586			
Sum Weight:	4.11	19.57						OTM	103.27 kip-ft	2.29		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.83	A	1	1.2	8	1	1	17.591	0.18	13.72	C
102.65-89.73			B	1	1.2		1	1	17.591			
			C	1	1.2		1	1	17.591			
L2	0.71	2.02	A	1	1.2	7	1	1	41.895	0.41	16.57	C
89.73-65.00			B	1	1.2		1	1	41.895			
			C	1	1.2		1	1	41.895			
L3	1.48	3.99	A	1	1.2	7	1	1	45.531	0.55	27.29	C
65.00-44.93			B	1	1.2		1	1	45.531			
			C	1	1.2		1	1	45.531			
L4 44.93-0.00	1.84	12.72	A	1	1.2	6	1	1	136.586	1.15	25.61	C
			B	1	1.2		1	1	136.586			
			C	1	1.2		1	1	136.586			
Sum Weight:	4.11	19.57						OTM	103.27 kip-ft	2.29		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	10	1	1	13.997	0.09	7.03	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	9	1	1	35.171	0.24	9.66	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	9	1	1	40.255	0.33	16.57	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	7	1	1	124.775	0.70	15.65	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	60.42 kip-ft	1.37		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	10	1	1	13.997	0.09	7.03	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	9	1	1	35.171	0.24	9.66	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	9	1	1	40.255	0.33	16.57	C
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	7	1	1	124.775	0.70	15.65	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	60.42 kip-ft	1.37		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.6	10	1	1	13.997	0.09	7.03	C
102.65-89.73			B	1	0.6		1	1	13.997			
			C	1	0.6		1	1	13.997			
L2	0.67	1.11	A	1	0.65	9	1	1	35.171	0.24	9.66	C
89.73-65.00			B	1	0.65		1	1	35.171			
			C	1	0.65		1	1	35.171			
L3	0.72	3.00	A	1	0.706	9	1	1	40.255	0.33	16.57	C
65.00-44.93			B	1	0.706		1	1	40.255			
			C	1	0.706		1	1	40.255			
L4 44.93-0.00	0.89	9.99	A	1	0.65	7	1	1	124.775	0.70	15.65	C
			B	1	0.65		1	1	124.775			
			C	1	0.65		1	1	124.775			
Sum Weight:	2.36	14.54						OTM	60.42 kip-ft	1.37		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	14.54					
Bracing Weight	0.00					
Total Member Self-Weight	14.54			-1.00	0.19	
Total Weight	26.20			-1.00	0.19	
Wind 0 deg - No Ice		0.00	-14.60	-1027.63	0.19	-0.36
Wind 30 deg - No Ice		7.27	-12.65	-890.09	-510.25	-1.06
Wind 60 deg - No Ice		12.59	-7.30	-514.32	-883.93	-1.48
Wind 90 deg - No Ice		14.53	0.00	-1.00	-1020.70	-1.50
Wind 120 deg - No Ice		12.59	7.30	512.31	-883.93	-1.11
Wind 150 deg - No Ice		7.27	12.65	888.09	-510.25	-0.44
Wind 180 deg - No Ice		0.00	14.60	1025.63	0.19	0.36
Wind 210 deg - No Ice		-7.27	12.65	888.09	510.64	1.06
Wind 240 deg - No Ice		-12.59	7.30	512.31	884.31	1.48
Wind 270 deg - No Ice		-14.53	0.00	-1.00	1021.08	1.50
Wind 300 deg - No Ice		-12.59	-7.30	-514.32	884.31	1.11
Wind 330 deg - No Ice		-7.27	-12.65	-890.09	510.64	0.44
Member Ice	5.03					
Total Weight Ice	45.93			-2.26	1.77	
Wind 0 deg - Ice		0.00	-6.44	-431.73	1.77	-0.25
Wind 30 deg - Ice		3.21	-5.58	-374.19	-211.95	-0.65
Wind 60 deg - Ice		5.55	-3.22	-216.99	-368.40	-0.88
Wind 90 deg - Ice		6.41	0.00	-2.26	-425.66	-0.87
Wind 120 deg - Ice		5.55	3.22	212.47	-368.40	-0.63
Wind 150 deg - Ice		3.21	5.58	369.66	-211.95	-0.22
Wind 180 deg - Ice		0.00	6.44	427.20	1.77	0.25
Wind 210 deg - Ice		-3.21	5.58	369.66	215.48	0.65
Wind 240 deg - Ice		-5.55	3.22	212.47	371.94	0.88
Wind 270 deg - Ice		-6.41	0.00	-2.26	429.20	0.87
Wind 300 deg - Ice		-5.55	-3.22	-216.99	371.94	0.63
Wind 330 deg - Ice		-3.21	-5.58	-374.19	215.48	0.22
Total Weight	26.20			-1.00	0.19	
Wind 0 deg - Service		0.00	-5.00	-352.56	0.01	-0.00
Wind 30 deg - Service		2.49	-4.33	-305.47	-174.73	-0.29
Wind 60 deg - Service		4.31	-2.50	-176.83	-302.65	-0.50
Wind 90 deg - Service		4.98	0.00	-1.10	-349.47	-0.58
Wind 120 deg - Service		4.31	2.50	174.62	-302.65	-0.50
Wind 150 deg - Service		2.49	4.33	303.26	-174.73	-0.29
Wind 180 deg - Service		0.00	5.00	350.35	0.01	0.00
Wind 210 deg - Service		-2.49	4.33	303.26	174.76	0.29
Wind 240 deg - Service		-4.31	2.50	174.62	302.68	0.50
Wind 270 deg - Service		-4.98	0.00	-1.10	349.50	0.58
Wind 300 deg - Service		-4.31	-2.50	-176.83	302.68	0.50
Wind 330 deg - Service		-2.49	-4.33	-305.47	174.76	0.29

Load Combinations

Comb. No.	Description

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
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	102.65 - 89.73	Pole	Max Tension	2	0.00	-0.00	-0.00
			Max. Compression	26	-6.60	0.00	-0.21
			Max. Mx	20	-2.55	18.78	-0.03

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	14	-2.54	0.00	-18.84
			Max. Vy	20	-5.11	18.78	-0.03
			Max. Vx	2	-5.11	0.00	18.74
			Max. Torque	9			-0.20
L2	89.73 - 65	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-26.70	0.10	0.10
			Max. Mx	20	-12.38	325.89	0.06
			Max. My	2	-12.37	0.03	327.89
			Max. Vy	20	-18.08	325.89	0.06
			Max. Vx	2	-18.19	0.03	327.89
			Max. Torque	17			-0.31
L3	65 - 44.93	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-31.65	0.69	-0.24
			Max. Mx	20	-16.13	628.15	0.04
			Max. My	2	-16.13	0.10	631.92
			Max. Vy	20	-19.24	628.15	0.04
			Max. Vx	2	-19.36	0.10	631.92
			Max. Torque	15			-0.47
L4	44.93 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-51.41	1.81	2.46
			Max. Mx	20	-31.43	1674.96	1.22
			Max. My	2	-31.43	0.23	1685.36
			Max. Vy	20	-23.28	1674.96	1.22
			Max. Vx	2	-23.39	0.23	1685.36
			Max. Torque	20			-2.50

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	51.41	0.00	6.44
	Max. H_x	20	31.44	23.25	0.00
	Max. H_z	2	31.44	0.00	23.37
	Max. M_x	2	1685.36	0.00	23.37
	Max. M_z	8	1674.49	-23.25	0.00
	Max. Torsion	8	2.39	-23.25	0.00
	Min. Vert	11	23.58	-20.14	-11.68
	Min. H_x	8	31.44	-23.25	0.00
	Min. H_z	14	31.44	0.00	-23.37
	Min. M_x	14	-1682.92	0.00	-23.37
	Min. M_z	20	-1674.96	23.25	0.00
	Min. Torsion	20	-2.39	23.25	0.00

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	26.20	0.00	0.00	-1.00	0.19	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	31.44	-0.00	-23.37	-1685.36	0.23	-0.57
0.9 Dead+1.6 Wind 0 deg - No	23.58	-0.00	-23.37	-1674.12	0.17	-0.57

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
1.2 Dead+1.6 Wind 30 deg - No Ice	31.44	11.63	-20.24	-1459.74	-837.13	-1.69
0.9 Dead+1.6 Wind 30 deg - No Ice	23.58	11.63	-20.24	-1449.96	-831.75	-1.69
1.2 Dead+1.6 Wind 60 deg - No Ice	31.44	20.14	-11.68	-843.30	-1450.12	-2.36
0.9 Dead+1.6 Wind 60 deg - No Ice	23.58	20.14	-11.68	-837.52	-1440.77	-2.36
1.2 Dead+1.6 Wind 90 deg - No Ice	31.44	23.25	-0.00	-1.22	-1674.49	-2.39
0.9 Dead+1.6 Wind 90 deg - No Ice	23.58	23.25	-0.00	-0.91	-1663.68	-2.39
1.2 Dead+1.6 Wind 120 deg - No Ice	31.44	20.14	11.68	840.85	-1450.12	-1.79
0.9 Dead+1.6 Wind 120 deg - No Ice	23.58	20.14	11.68	835.70	-1440.77	-1.79
1.2 Dead+1.6 Wind 150 deg - No Ice	31.44	11.63	20.24	1457.29	-837.12	-0.70
0.9 Dead+1.6 Wind 150 deg - No Ice	23.58	11.63	20.24	1448.13	-831.75	-0.70
1.2 Dead+1.6 Wind 180 deg - No Ice	31.44	-0.00	23.37	1682.92	0.23	0.57
0.9 Dead+1.6 Wind 180 deg - No Ice	23.58	-0.00	23.37	1672.30	0.17	0.57
1.2 Dead+1.6 Wind 210 deg - No Ice	31.44	-11.63	20.24	1457.29	837.59	1.69
0.9 Dead+1.6 Wind 210 deg - No Ice	23.58	-11.63	20.24	1448.13	832.10	1.69
1.2 Dead+1.6 Wind 240 deg - No Ice	31.44	-20.14	11.68	840.86	1450.59	2.36
0.9 Dead+1.6 Wind 240 deg - No Ice	23.58	-20.14	11.68	835.70	1441.12	2.36
1.2 Dead+1.6 Wind 270 deg - No Ice	31.44	-23.25	-0.00	-1.22	1674.96	2.39
0.9 Dead+1.6 Wind 270 deg - No Ice	23.58	-23.25	-0.00	-0.91	1664.03	2.39
1.2 Dead+1.6 Wind 300 deg - No Ice	31.44	-20.14	-11.68	-843.30	1450.59	1.79
0.9 Dead+1.6 Wind 300 deg - No Ice	23.58	-20.14	-11.68	-837.52	1441.12	1.78
1.2 Dead+1.6 Wind 330 deg - No Ice	31.44	-11.63	-20.24	-1459.74	837.59	0.70
0.9 Dead+1.6 Wind 330 deg - No Ice	23.58	-11.63	-20.24	-1449.96	832.10	0.70
1.2 Dead+1.0 Ice+1.0 Temp	51.41	0.00	0.00	-2.46	1.81	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	51.41	-0.00	-6.44	-453.56	1.89	-0.25
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	51.41	3.21	-5.58	-393.13	-222.55	-0.65
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	51.41	5.55	-3.22	-228.05	-386.85	-0.88
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	51.41	6.41	-0.00	-2.54	-446.99	-0.87
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	51.41	5.55	3.22	222.97	-386.85	-0.63
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	51.41	3.21	5.58	388.06	-222.55	-0.22
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	51.41	-0.00	6.44	448.48	1.89	0.25
1.2 Dead+1.0 Wind 210	51.41	-3.21	5.58	388.06	226.33	0.65

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	51.41	-5.55	3.22	222.97	390.63	0.88
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	51.41	-6.41	-0.00	-2.54	450.77	0.87
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	51.41	-5.55	-3.22	-228.05	390.63	0.63
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	51.41	-3.21	-5.58	-393.13	226.33	0.22
Dead+Wind 0 deg - Service	26.20	0.00	-5.00	-360.03	0.19	-0.00
Dead+Wind 30 deg - Service	26.20	2.49	-4.33	-311.93	-178.31	-0.29
Dead+Wind 60 deg - Service	26.20	4.31	-2.50	-180.53	-308.98	-0.51
Dead+Wind 90 deg - Service	26.20	4.98	0.00	-1.02	-356.81	-0.58
Dead+Wind 120 deg - Service	26.20	4.31	2.50	178.49	-308.98	-0.50
Dead+Wind 150 deg - Service	26.20	2.49	4.33	309.90	-178.31	-0.29
Dead+Wind 180 deg - Service	26.20	0.00	5.00	358.00	0.19	0.00
Dead+Wind 210 deg - Service	26.20	-2.49	4.33	309.90	178.70	0.29
Dead+Wind 240 deg - Service	26.20	-4.31	2.50	178.49	309.37	0.51
Dead+Wind 270 deg - Service	26.20	-4.98	0.00	-1.02	357.20	0.58
Dead+Wind 300 deg - Service	26.20	-4.31	-2.50	-180.53	309.37	0.50
Dead+Wind 330 deg - Service	26.20	-2.49	-4.33	-311.93	178.70	0.29

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-26.20	0.00	0.00	26.20	0.00	0.000%
2	0.00	-31.44	-23.37	0.00	31.44	23.37	0.000%
3	0.00	-23.58	-23.37	0.00	23.58	23.37	0.000%
4	11.63	-31.44	-20.24	-11.63	31.44	20.24	0.000%
5	11.63	-23.58	-20.24	-11.63	23.58	20.24	0.000%
6	20.14	-31.44	-11.68	-20.14	31.44	11.68	0.000%
7	20.14	-23.58	-11.68	-20.14	23.58	11.68	0.000%
8	23.25	-31.44	0.00	-23.25	31.44	0.00	0.000%
9	23.25	-23.58	0.00	-23.25	23.58	0.00	0.000%
10	20.14	-31.44	11.68	-20.14	31.44	-11.68	0.000%
11	20.14	-23.58	11.68	-20.14	23.58	-11.68	0.000%
12	11.63	-31.44	20.24	-11.63	31.44	-20.24	0.000%
13	11.63	-23.58	20.24	-11.63	23.58	-20.24	0.000%
14	0.00	-31.44	23.37	0.00	31.44	-23.37	0.000%
15	0.00	-23.58	23.37	0.00	23.58	-23.37	0.000%
16	-11.63	-31.44	20.24	11.63	31.44	-20.24	0.000%
17	-11.63	-23.58	20.24	11.63	23.58	-20.24	0.000%
18	-20.14	-31.44	11.68	20.14	31.44	-11.68	0.000%
19	-20.14	-23.58	11.68	20.14	23.58	-11.68	0.000%
20	-23.25	-31.44	0.00	23.25	31.44	0.00	0.000%
21	-23.25	-23.58	0.00	23.25	23.58	0.00	0.000%
22	-20.14	-31.44	-11.68	20.14	31.44	11.68	0.000%
23	-20.14	-23.58	-11.68	20.14	23.58	11.68	0.000%
24	-11.63	-31.44	-20.24	11.63	31.44	20.24	0.000%
25	-11.63	-23.58	-20.24	11.63	23.58	20.24	0.000%
26	0.00	-51.41	0.00	0.00	51.41	0.00	0.000%
27	0.00	-51.41	-6.44	0.00	51.41	6.44	0.000%
28	3.21	-51.41	-5.58	-3.21	51.41	5.58	0.000%
29	5.55	-51.41	-3.22	-5.55	51.41	3.22	0.000%
30	6.41	-51.41	0.00	-6.41	51.41	0.00	0.000%
31	5.55	-51.41	3.22	-5.55	51.41	-3.22	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
32	3.21	-51.41	5.58	-3.21	51.41	-5.58	0.000%
33	0.00	-51.41	6.44	0.00	51.41	-6.44	0.000%
34	-3.21	-51.41	5.58	3.21	51.41	-5.58	0.000%
35	-5.55	-51.41	3.22	5.55	51.41	-3.22	0.000%
36	-6.41	-51.41	0.00	6.41	51.41	0.00	0.000%
37	-5.55	-51.41	-3.22	5.55	51.41	3.22	0.000%
38	-3.21	-51.41	-5.58	3.21	51.41	5.58	0.000%
39	0.00	-26.20	-5.00	0.00	26.20	5.00	0.000%
40	2.49	-26.20	-4.33	-2.49	26.20	4.33	0.000%
41	4.31	-26.20	-2.50	-4.31	26.20	2.50	0.000%
42	4.98	-26.20	0.00	-4.98	26.20	0.00	0.000%
43	4.31	-26.20	2.50	-4.31	26.20	-2.50	0.000%
44	2.49	-26.20	4.33	-2.49	26.20	-4.33	0.000%
45	0.00	-26.20	5.00	0.00	26.20	-5.00	0.000%
46	-2.49	-26.20	4.33	2.49	26.20	-4.33	0.000%
47	-4.31	-26.20	2.50	4.31	26.20	-2.50	0.000%
48	-4.98	-26.20	0.00	4.98	26.20	0.00	0.000%
49	-4.31	-26.20	-2.50	4.31	26.20	2.50	0.000%
50	-2.49	-26.20	-4.33	2.49	26.20	4.33	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00021687
3	Yes	4	0.00000001	0.00013066
4	Yes	5	0.00000001	0.00019522
5	Yes	5	0.00000001	0.00008462
6	Yes	5	0.00000001	0.00020653
7	Yes	5	0.00000001	0.00009002
8	Yes	4	0.00000001	0.00031117
9	Yes	4	0.00000001	0.00019040
10	Yes	5	0.00000001	0.00019784
11	Yes	5	0.00000001	0.00008596
12	Yes	5	0.00000001	0.00019946
13	Yes	5	0.00000001	0.00008667
14	Yes	4	0.00000001	0.00021670
15	Yes	4	0.00000001	0.00013059
16	Yes	5	0.00000001	0.00020614
17	Yes	5	0.00000001	0.00008981
18	Yes	5	0.00000001	0.00019461
19	Yes	5	0.00000001	0.00008442
20	Yes	4	0.00000001	0.00031124
21	Yes	4	0.00000001	0.00019043
22	Yes	5	0.00000001	0.00020278
23	Yes	5	0.00000001	0.00008823
24	Yes	5	0.00000001	0.00020138
25	Yes	5	0.00000001	0.00008752
26	Yes	4	0.00000001	0.00000001
27	Yes	5	0.00000001	0.00013295
28	Yes	5	0.00000001	0.00015213
29	Yes	5	0.00000001	0.00015280
30	Yes	5	0.00000001	0.00013161
31	Yes	5	0.00000001	0.00015135
32	Yes	5	0.00000001	0.00015171

33	Yes	5	0.00000001	0.00013232
34	Yes	5	0.00000001	0.00015336
35	Yes	5	0.00000001	0.00015215
36	Yes	5	0.00000001	0.00013249
37	Yes	5	0.00000001	0.00015336
38	Yes	5	0.00000001	0.00015351
39	Yes	4	0.00000001	0.00001519
40	Yes	4	0.00000001	0.00008008
41	Yes	4	0.00000001	0.00009437
42	Yes	4	0.00000001	0.00002508
43	Yes	4	0.00000001	0.00008001
44	Yes	4	0.00000001	0.00008662
45	Yes	4	0.00000001	0.00001514
46	Yes	4	0.00000001	0.00009145
47	Yes	4	0.00000001	0.00007882
48	Yes	4	0.00000001	0.00002510
49	Yes	4	0.00000001	0.00009161
50	Yes	4	0.00000001	0.00008333

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	102.65 - 89.73	10.830	39	1.0190	0.0005
L2	89.73 - 65	8.093	39	0.9911	0.0005
L3	65 - 44.93	3.797	39	0.5922	0.0007
L4	48.78 - 0	2.074	39	0.4229	0.0007

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	(2) 800-10504	39	10.474	1.0203	0.0005	17709
100.00	4-ft x 4-ft T-Arm	39	10.259	1.0209	0.0005	17709
90.00	DC6-48-60-18-8F Surge Arrestor	39	8.149	0.9932	0.0005	7139
88.50	Platform w/rails	39	7.843	0.9800	0.0005	6514
88.00	(2) RRUS-11	39	7.743	0.9750	0.0005	6342
82.00	BXA-70063/6CF	39	6.573	0.8935	0.0006	4936
80.00	RRH4x45/2x90-AWS	39	6.202	0.8599	0.0006	4603
74.00	(2) FD-RRH 4x40 1900	39	5.153	0.7496	0.0007	3828
72.00	A-ANT-23G-2	39	4.827	0.7121	0.0007	3624
70.00	Rohn T-Arm (1)	39	4.515	0.6754	0.0007	3440
69.00	A-ANT-23G-2	39	4.364	0.6576	0.0007	3356
28.00	20' x 3" Dia Omni	39	0.816	0.2464	0.0004	8528

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	102.65 - 89.73	50.792	2	4.7872	0.0029
L2	89.73 - 65	37.951	2	4.6557	0.0029
L3	65 - 44.93	17.795	2	2.7785	0.0034
L4	48.78 - 0	9.714	2	1.9832	0.0028

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	(2) 800-10504	2	49.123	4.7932	0.0031	3821
100.00	4-ft x 4-ft T-Arm	2	48.113	4.7959	0.0031	3821
90.00	DC6-48-60-18-8F Surge Arrestor	2	38.210	4.6658	0.0031	1539
88.50	Platform w/rails	2	36.778	4.6037	0.0031	1403
88.00	(2) RRUS-11	2	36.305	4.5799	0.0031	1366
82.00	BXA-70063/6CF	2	30.818	4.1966	0.0032	1061
80.00	RRH4x45/2x90-AWS	2	29.075	4.0383	0.0032	988
74.00	(2) FD-RRH 4x40 1900	2	24.155	3.5190	0.0033	820
72.00	A-ANT-23G-2	2	22.628	3.3426	0.0033	776
70.00	Rohn T-Arm (1)	2	21.163	3.1701	0.0033	737
69.00	A-ANT-23G-2	2	20.455	3.0864	0.0033	718
28.00	20' x 3" Dia Omni	2	3.820	1.1548	0.0016	1818

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	12.92	102.65	273.2	10.0138	-6.57	30.31	0.217
L2	89.73 - 65 (2)	TP20.614x13x0.25	24.73	102.65	170.4	16.1588	-12.37	125.73	0.098
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	20.07	102.65	138.8	47.6239	-16.13	558.82	0.029
L4	44.93 - 0 (4)	TP40x24.4073x0.6	48.78	102.65	138.6	47.6823	-17.84	560.88	0.032

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	5.98	106.69	0.056	0.00	106.69	0.000
L2	89.73 - 65 (2)	TP20.614x13x0.25	327.89	500.52	0.655	0.00	500.52	0.000
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	631.92	1790.80	0.353	0.00	1790.80	0.000
L4	44.93 - 0 (4)	TP40x24.4073x0.6	707.09	1795.24	0.394	0.00	1795.24	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	1.36	157.72	0.009	0.00	164.42	0.000
L2	89.73 - 65 (2)	TP20.614x13x0.25	18.19	600.26	0.030	0.28	1002.28	0.000
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	19.36	1769.11	0.011	0.47	3585.97	0.000
L4	44.93 - 0 (4)	TP40x24.4073x0.6	19.86	1824.75	0.011	0.54	3594.88	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	102.65 - 89.73 (1)	0.217	0.056	0.000	0.009	0.000	0.273 ✔	1.000	4.8.2 ✔
L2	89.73 - 65 (2)	0.098	0.655	0.000	0.030	0.000	0.754 ✔	1.000	4.8.2 ✔
L3	65 - 44.93 (3)	0.029	0.353	0.000	0.011	0.000	0.382 ✔	1.000	4.8.2 ✔
L4	44.93 - 0 (4)	0.032	0.394	0.000	0.011	0.000	0.426 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	102.65 - 89.73	Pole	TP13x13x0.25	1	-6.57	30.31	27.3	Pass
L2	89.73 - 65	Pole	TP20.614x13x0.25	2	-12.37	125.73	75.4	Pass
L3	65 - 44.93	Pole	TP26.7925x20.614x0.6	3	-16.13	558.82	38.2	Pass
L4	44.93 - 0	Pole	TP40x24.4073x0.6	4	-17.84	560.88	42.6	Pass
							Summary	
						Pole (L2)	75.4	Pass
						RATING =	**75.4**	**Pass**

tnxTower	**Job** 16001.32 - Stratford	**Page** 23 of 23
Centek Engineering Inc. *63-2 North Branford Rd. Branford, CT 06405* *Phone: (203) 488-0580* *FAX: (203) 488-8587*	**Project** 102' EEI Monopole - 627 Honeyspot Road Stratford, CT	**Date** 08:59:57 10/11/16
Program Version 7.0.5.1 - 2/1/2016 File:J:\Jobs\16000100.WI\32_Stratford CT\Backup Documentation\Calcs\Rev (1)\ERI Files\102' EEI Monopole Stratford, CT.eri	**Client** Verizon Wireless	**Designed by** TJL

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		Stratford, CT
Rev. 1: 10/11/16		Prepared by: T.J.L. Checked by: C.F.C. Job No. 16001.32

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M := 1685 \cdot ft \cdot kips$	(Input From tnxTower)
Shear Force =	$V := 23 \cdot kips$	(Input From tnxTower)
Axial Force =	$P := 31 \cdot kips$	(Input From tnxTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 10$	(User Input)
Diameter of Bolt Circle =	$d_{bc} := 48 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n_t := 4.5$	(User Input)

Base Plate Data:

Plate Yield Strength =	$Fy_{bp} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 1.75 \cdot in$	(User Input)
Base Plate Diameter =	$d_{bp} := 54 \cdot in$	(User Input)
Outer Pole Diameter =	$d_{pole} := 40 \cdot in$	(User Input)
Inner Plate Diameter =	$d_i := 32 \cdot in$	(User Input)
Stiffener Height =	$H_{stiff} := 6 \cdot in$	(User Input)
Stiffener Thickness =	$Thk_{stiff} := 0.5 \cdot in$	(User Input)
Number of Stiffeners per Bolt =	$n_{stiff} := 2$	(User Input)
Grout Strength =	$F_c := 3000 \quad psi$	(User Input)
Effective Width of Baseplate for Bending =	$b_{eff} := \frac{\pi \cdot d_{pole}}{N} = 12.566 \cdot in$	(User Input)
Axial Load Eccentricity from Center of Base Plate =	$e := \frac{M}{P} = 54.355\,ft$	
Distance to Axial Load from Nuetral Axis =	$q := 641.42 \cdot in$	(User Input) (Computed Based Complete Circular Base Plate Method)

$$n := \frac{29000}{57 \cdot \sqrt{F_c}} = 9.289$$

$$A_{bolt} := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n_t} \right)^2 = 3.248 \cdot in^2$$

Distance to Bolts =

Radius of Bolt Circle = $R_{bc} := \frac{d_{bc}}{2} = 24 \cdot in$

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

$$y_i := \left| \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N} \right) \right.$$
$$\left. d \leftarrow R_{bc} \cdot \sin(\theta) \right|$$

Transformed Bolt Area =

$na_1 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$

$na_2 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$

$na_3 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$

$na_4 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$

$na_5 := A_{bolt} \cdot n = 30.167 \cdot in^2$

$na_6 := A_{bolt} \cdot n = 30.167 \cdot in^2$

$na_7 := A_{bolt} \cdot n = 30.167 \cdot in^2$

$na_8 := A_{bolt} \cdot n = 30.167 \cdot in^2$

$na_9 := A_{bolt} \cdot n = 30.167 \cdot in^2$

$na_{10} := A_{bolt} \cdot n = 30.167 \cdot in^2$

Bolt Moment Area:

$Q_{b1} := na_1 \cdot (e - y_1) = 17178.8 \cdot in^3$

$Q_{b2} := na_2 \cdot (e - y_2) = 16944.1 \cdot in^3$

$Q_{b3} := na_3 \cdot (e - y_3) = 16944.1 \cdot in^3$

$Q_{b4} := na_4 \cdot (e - y_4) = 17178.8 \cdot in^3$

$Q_{b5} := na_5 \cdot (e - y_5) = 19676.8 \cdot in^3$

$Q_{b6} := na_6 \cdot (e - y_6) = 20102.4 \cdot in^3$

$Q_{b7} := na_7 \cdot (e - y_7) = 20365.4 \cdot in^3$

$Q_{b8} := na_8 \cdot (e - y_8) = 20365.4 \cdot in^3$

$Q_{b9} := na_9 \cdot (e - y_9) = 20102.4 \cdot in^3$

$Q_{b10} := na_{10} \cdot (e - y_{10}) = 19676.8 \cdot in^3$

Bolt Moments of Inertia:

$I_{b1} := \left[na_1 \cdot (e - y_1)^2 \right] + \frac{(na_1)^2}{4 \cdot \pi} = 10962709.2 \cdot in^4$

$I_{b2} := \left[na_2 \cdot (e - y_2)^2 \right] + \frac{(na_2)^2}{4 \cdot \pi} = 10665208.9 \cdot in^4$

$I_{b3} := \left[na_3 \cdot (e - y_3)^2 \right] + \frac{(na_3)^2}{4 \cdot \pi} = 10665208.9 \cdot in^4$

$I_{b4} := \left[na_4 \cdot (e - y_4)^2 \right] + \frac{(na_4)^2}{4 \cdot \pi} = 10962709.2 \cdot in^4$

$I_{b5} := \left[na_5 \cdot (e - y_5)^2 \right] + \frac{(na_5)^2}{4 \cdot \pi} = 12834453.2 \cdot in^4$

$I_{b6} := \left[na_6 \cdot (e - y_6)^2 \right] + \frac{(na_6)^2}{4 \cdot \pi} = 13395613 \cdot in^4$

$I_{b7} := \left[na_7 \cdot (e - y_7)^2 \right] + \frac{(na_7)^2}{4 \cdot \pi} = 13748432.2 \cdot in^4$

$I_{b8} := \left[na_8 \cdot (e - y_8)^2 \right] + \frac{(na_8)^2}{4 \cdot \pi} = 13748432.2 \cdot in^4$

$I_{b9} := \left[na_9 \cdot (e - y_9)^2 \right] + \frac{(na_9)^2}{4 \cdot \pi} = 13395613 \cdot in^4$

$I_{b10} := \left[na_{10} \cdot (e - y_{10})^2 \right] + \frac{(na_{10})^2}{4 \cdot \pi} = 12834453.2 \cdot in^4$

$na_{tot} := na_1 + na_2 + na_3 + na_4 + na_5 + na_6 + na_7 + na_8 + na_9 + na_{10} = 288.682 \cdot in^2$

$Qb_{tot} := Q_{b1} + Q_{b2} + Q_{b3} + Q_{b4} + Q_{b5} + Q_{b6} + Q_{b7} + Q_{b8} + Q_{b9} + Q_{b10} = 188535.03 \cdot in^3$

$Ib_{tot} := I_{b1} + I_{b2} + I_{b3} + I_{b4} + I_{b5} + I_{b6} + I_{b7} + I_{b8} + I_{b9} + I_{b10} = 123212832.72 \cdot in^4$

Outer Cicle Area:

$r := \frac{d_{bp}}{2} = 27 \cdot in$

$l_0 := r - e + q = 16.162 \cdot in$

$y_0 := r - l_0 = 10.838 \cdot in$

$A_1 := \frac{r^2 \cdot \pi}{2} - y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)} - r^2 \cdot \operatorname{asin}\left(\frac{y_0}{r}\right) = 576 \cdot in^2$

Inner Circle Area:

$r_i := \frac{d_i}{2} = 16 \cdot in$

$l := r_i - e + q = 5.162 \cdot in$

$y_c := \max\left(r_i - l, -r_i\right) = 10.838 \cdot in$

$A_c := -\left[\frac{r_i^2 \cdot \pi}{2} - y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)} - r_i^2 \cdot \operatorname{asin}\left(\frac{y_c}{r_i}\right)\right] = -84 \cdot in^2$

$A_T := A_1 + A_c + na_{tot} = 780.613 \cdot in^2$

Moment Area:

$Y_1 := \frac{\left[2 \cdot \left(r^2 - y_0^2\right)^{1.5}\right]}{3 \cdot A_1} = 17.504 \cdot in$

$Q_1 := A_1 \cdot \left(e - Y_1\right) = 365602.9 \cdot in^3$

$Y_{1c} := \frac{\left[-2 \cdot \left(r_i^2 - y_c^2\right)^{1.5}\right]}{3 \cdot A_c} = 12.934 \cdot in$

$Q_c := A_c \cdot \left(e - Y_{1c}\right) = -53731.7 \cdot in^3$

$Q_T := Q_1 + Q_c + Qb_{tot} = 500406.2 \cdot in^3$

Moments of Inertia:

$$I_1 := \left[\frac{\pi \cdot r^4}{8} + \frac{y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)^3}}{2} - \frac{r^2 \cdot y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)}}{4} - \frac{r^4 \cdot \operatorname{asin}\left(\frac{y_0}{r}\right)}{4}\right] - A_1 \cdot Y_1^2 + A_1 \cdot \left(e - Y_1\right)^2 = 11192.05\,ft^4$$

$$I_c := \left[\frac{\pi \cdot r_i^4}{8} + \frac{y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)^3}}{2} - \frac{r_i^2 \cdot y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)}}{4} - \frac{r_i^4 \cdot \operatorname{asin}\left(\frac{y_c}{r_i}\right)}{4}\right] - A_c \cdot Y_{1c}^2 + A_c \cdot \left(e - Y_{1c}\right)^2 = -1655.27\,ft^4$$

$$I_T := I_1 + I_c + Ib_{tot} = 15478.757\,ft^4$$

$$q_{calc} := \frac{I_T}{Q_T} = 641.414 \cdot in$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_1 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -9 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_2 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -34 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_3 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -34 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_4 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -9 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_5 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 35 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_6 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 80 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_7 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 109 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_8 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 109 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_9 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 80 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_{10} - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 35 \cdot kips$$

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Subject: Anchor Bolt and Baseplate Analysis

Location: Stratford, CT

Rev. 1: 10/11/16

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 16001.32

Anchor Bolt Check:

Maximum Bolt Force in Compression = $C_{max} := 34 \cdot kips$

Maximum Bolt Force in Tension = $T_{max} := 109 \cdot kips$

Check Anchor Bolt Tension Force:

Maximum Shear Force = $V_u := \frac{V}{N} = 2.3 \cdot kips$

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

$\eta := 0.55$ For Grouted Base Plate per TIA-222-G Section 4.9.9

Bolt % of Capacity = $\frac{\left(T_{max} + \frac{V_u}{\eta}\right)}{\Phi R_{nt}} \cdot 100 = 43.6$

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

Condition1 = "OK"

Grout Check:

$y := .5 \cdot d_{bp} - e + q_{calc} = 16.156 \cdot in$

Grout Stress at Edge of Plate = $f_{cmax} := \frac{P \cdot y}{q_{calc} \cdot A_T - Q_T} = 1.73 \cdot ksi$

$y_{bc} := .5 \cdot d_{bc} - e + q_{calc} = 13.156 \cdot in$

Grout Stress at Bolt = $f_c := \frac{P \cdot y_{bc}}{q \cdot A_T - Q_T} = 1384.3\,psi$

Plate Bending Stress % of Capacity = $\frac{f_{cmax}}{F_c \cdot psi} = 57.6 \cdot \%$

Condition2 = $Condition2 := \left(\text{if} \left(\frac{f_{cmax}}{F_c \cdot psi} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right) \right)$

Condition2 = "Ok"

Base Plate Check:

Effective Area of Stiffener = $A_{stiff} := H_{stiff} Thk_{stiff} n_{stiff} = 6 \cdot in^2$

Effective Area of Base Plate = $A_{bp} := b_{eff} t_{bp} = 21.991 \cdot in^2$

Distance to Stiffener Centroid = $y_{stiff} := t_{bp} + \frac{H_{stiff}}{2} = 4.75 \cdot in$

Distance to Base Plate Centroid = $y_{bp} := \frac{t_{bp}}{2} = 0.875 \cdot in$

Moment Area of Stiffener = $Ay_{stiff} := A_{stiff} y_{stiff} = 28.5 \cdot in^3$

Moment Area of Base Plate = $Ay_{bp} := A_{bp} \cdot y_{bp} = 19.242 \cdot in^3$

Distance to Built up Section Centroid = $\Upsilon := \frac{(Ay_{stiff} + Ay_{bp})}{(A_{stiff} + A_{bp})} = 1.706 \cdot in$

Distance to Stiffener Centroid from Centroid = $d_{stiff} := |\Upsilon - y_{stiff}| = 3.044 \cdot in$

Distance to Base Plate Centroid from Centroid = $D_{bp} := |\Upsilon - y_{bp}| = 0.831 \cdot in$

Moment of Inertia of Stiffener = $I_{stiff} := \frac{Thk_{stiff} H_{stiff}^3}{12} \cdot n_{stiff} + A_{stiff} d_{stiff}^2 = 73.61 \cdot in^4$

Moment of Inertia of Base Plate = $I_{bp} := \frac{b_{eff} t_{bp}^3}{12} + A_{bp} \cdot D_{bp}^2 = 20.785 \cdot in^4$

Total Moment of Inertia = $I_{tot} := I_{stiff} + I_{bp} = 94.394 \cdot in^4$

Distance to Extreme Fiber = $c_{bp} := \begin{cases} (H_{stiff} + t_{bp} - \Upsilon) & \text{if } (H_{stiff} + t_{bp} - \Upsilon) \geq \Upsilon \\ \Upsilon & \text{otherwise} \end{cases} = 6.044 \cdot in$

Built up Section Modulus = $S_x := \frac{I_{tot}}{c_{bp}} = 15.617 \cdot in^3$

$$y_{pole} := .5 \cdot d_{pole} - e + q_{calc} = 9.2 \cdot in$$

Allowable Bending Stress in Plate =

$$F_{bp} := 0.9 \cdot Fy_{bp} = 54 \cdot ksi$$

Check Bending on Compression Side:

Grout Stress at the Pole Face =

$$f_{pole} := \frac{P \cdot y_{pole}}{q_{calc} \cdot A_T - Q_T} = 0.979 \cdot ksi$$

Maximum Moment in Plate =

$$M_{max} := \frac{b_{eff} f_{pole} \cdot \left(\frac{d_{bp} - d_{pole}}{2}\right)^2}{2} + \frac{b_{eff} \left(f_{cmax} - f_{pole}\right) \cdot \left(\frac{d_{bp} - d_{pole}}{2}\right)^2}{3} + C_{max} \cdot \left(\frac{d_{bc} - d_{pole}}{2}\right) = 591 \cdot k \cdot in$$

Maximum Bending Stress in Plate =

$$f_b := \frac{M_{max}}{S_x} = 37.9 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_b}{F_{bp}} = 70.1 \cdot \%$$

Condition3 =

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

Condition3 = "Ok"

Check Bending on Tension Side:

Maximum Moment in Plate =

$$M_{max} := T_{max} \cdot \left(\frac{d_{bc} - d_{pole}}{2}\right) = 436 \cdot k \cdot in$$

Maximum Bending Stress in Plate =

$$f_b := \frac{M_{max}}{S_x} = 27.9 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_b}{F_{bp}} = 51.7 \cdot \%$$

Condition4 =

$$Condition4 := if\left(\frac{f_b}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$$

Condition4 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	102-ft EEI Monopole Stratford, CT
Rev. 1: 10/12/16	Prepared by: TJL Checked by: C.F.C. Job No. 16001.32

Caisson Foundation:

Input Data:

Shear Force =	$S := 22k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 1587ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 26k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 1785ft \cdot k$	*USER INPUT–FROM LPILE*
Moment Capacity =	$Mn := 3502ft \cdot k$	*USER INPUT–FROM LPILE*
Foundation Diameter =	$d := 6ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 16ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 14$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 4ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9 \cdot Mn}{Mu} = 1.8$

Factor of Safety Required = $FS_{reqd} := 1.0$

$FOSCheck := if(FS \geq FS_{reqd}, "OK", "NO GOOD")$

FOSCheck = "OK"

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

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\1600100.WI\32_Stratford CT\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 12, 2016 Time: 14:55:58

Problem Title

16001.32 - Stratford

Program Options

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

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 = 192.00 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	72.00000000	1319167.	4071.5000	3600000.
2	192.0000	72.00000000	1319167.	4071.5000	3600000.

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

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 2 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 = 48.000 in
p-y subgrade modulus k for top of soil layer = 10.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 10.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 48.000 in
Distance from top of pile to bottom of layer = 252.000 in
p-y subgrade modulus k for top of soil layer = 1000.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 1000.000 lbs/in**3

(Depth of lowest layer extends 60.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 4 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.05800
2	48.00	0.05800
3	48.00	0.09800
4	252.00	0.09800

**** WARNING - POSSIBLE INPUT DATA ERROR ****

Values entered for effective unit weights of soil were outside the limits of 0.011574 pci (20 pcf) or 0.0810019 pci (140 pcf) This data may be erroneous. Please check your data.

Shear Strength of Soils

Shear strength parameters with depth defined using 4 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	30.00	------	------
2	48.000	0.00000	30.00	------	------
3	48.000	0.00000	42.00	------	------
4	252.000	0.00000	42.00	------	------

Notes:

(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_rm 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 = 23000.000 lbs
Bending moment at pile head = 20220000.000 in-lbs
Axial load at pile head = 31000.000 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 = 9000.000 lbs
Bending moment at pile head = 7752000.000 in-lbs
Axial load at pile head = 31000.000 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

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Number of sections = 1

Pile Section No. 1

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

Outside Diameter	=	72.0000 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	=	14
Area of Single Bar	=	1.56000 in**2
Number of Rows of Reinforcing Bars	=	7
Area of Steel	=	21.840 in**2
Area of Shaft	=	4071.504 in**2
Percentage of Steel Reinforcement	=	0.536 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 15079.26 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in

1	3.120	31.198
2	3.120	25.019
3	3.120	13.884
4	3.120	0.000
5	3.120	-13.884
6	3.120	-25.019
7	3.120	-31.198

Axial Thrust Force = 31000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
4255959.	5.107151E+12	8.333333E-07	0.00003213	38.55467641	114.04945	815.68227
8468711.	5.081227E+12	0.00000167	0.00006224	37.34593356	219.07097	1572.94196
12638405.	5.055362E+12	0.00000250	0.00009240	36.95992291	322.53305	2331.42717
16763718.	5.029115E+12	0.00000333	0.00012251	36.75418031	424.14016	3088.68111
16763718.	4.023292E+12	0.00000417	0.00007337	17.60812604	252.83332	5992.07270
16763718.	3.352744E+12	0.00000500	0.00008614	17.22876513	295.64016	7245.49457
16763718.	2.873780E+12	0.00000583	0.00009893	16.96015370	338.20140	8498.51710
16763718.	2.514558E+12	0.00000667	0.00011200	16.80000007	381.41250	9743.55400
16763718.	2.235162E+12	0.00000750	0.00012484	16.64468729	423.53188	10995.27878
16763718.	2.011646E+12	0.00000833	0.00013761	16.51283634	465.14133	12248.84041
16763718.	1.828769E+12	0.00000917	0.00015039	16.40660369	506.50849	13501.96462
16763718.	1.676372E+12	0.00001000	0.00016320	16.31959498	547.63262	14754.64848
16763718.	1.547420E+12	0.00001083	0.00017601	16.24738348	588.51297	16006.88897
16763718.	1.436890E+12	0.00001167	0.00018885	16.18680847	629.14883	17258.68266
16763718.	1.341097E+12	0.00001250	0.00020169	16.13554609	669.53924	18510.02832

16763718.	1.257279E+12	0.00001333	0.00021456	16.09186256	709.68360
19760.92118					
16763718.	1.183321E+12	0.00001417	0.00022744	16.05442536	749.58103
21011.35920					
16763718.	1.117581E+12	0.00001500	0.00024033	16.02220023	789.23071
22261.33944					
16763718.	1.058761E+12	0.00001583	0.00025324	15.99437392	828.63198
23510.85743					
16763718.	1.005823E+12	0.00001667	0.00026617	15.97028768	867.78375
24759.91266					
16763718.	9.579267E+11	0.00001750	0.00027911	15.94941795	906.68544
26008.49968					
16763718.	9.143846E+11	0.00001833	0.00029207	15.93132913	945.33606
27256.61689					
16763718.	8.746288E+11	0.00001917	0.00030505	15.91566503	983.73481
28504.26065					
16763718.	8.381859E+11	0.00002000	0.00031804	15.90212953	1021.88092
29751.42692					
16763718.	8.046585E+11	0.00002083	0.00033105	15.89047158	1059.77348
30998.11306					
16763718.	7.737101E+11	0.00002167	0.00034408	15.88047874	1097.41154
32244.31641					
17112459.	7.605537E+11	0.00002250	0.00035712	15.87197292	1134.79435
33490.03248					
17713304.	7.591416E+11	0.00002333	0.00037018	15.86479962	1171.92102
34735.25798					
18313529.	7.578012E+11	0.00002417	0.00038325	15.85882366	1208.79049
35979.99106					
18913135.	7.565254E+11	0.00002500	0.00039635	15.85393345	1245.40210
37224.22581					
19512116.	7.553077E+11	0.00002583	0.00040946	15.85002601	1281.75475
38467.96066					
20110470.	7.541426E+11	0.00002667	0.00042259	15.84701550	1317.84764
39711.19075					
20708193.	7.530252E+11	0.00002750	0.00043573	15.84482467	1353.67983
40953.91264					
21305281.	7.519511E+11	0.00002833	0.00044890	15.84338486	1389.25032
42196.12334					
21901730.	7.509165E+11	0.00002917	0.00046208	15.84263599	1424.55815
43437.81922					
22497539.	7.499180E+11	0.00003000	0.00047528	15.84252656	1459.60250
44678.99497					
23092701.	7.489525E+11	0.00003083	0.00048849	15.84300721	1494.38226
45919.64838					
23687212.	7.480172E+11	0.00003167	0.00050173	15.84403503	1528.89640
47159.77608					
24281070.	7.471098E+11	0.00003250	0.00051498	15.84557354	1563.14407
48399.37277					
25466814.	7.453702E+11	0.00003417	0.00054154	15.85004961	1630.83601

50876.95684					
26649897.	7.437181E+11	0.00003583	0.00056818	15.85619724	1697.44966
53352.37121					
27830289.	7.421410E+11	0.00003750	0.00059489	15.86382544	1762.97686
55825.58118					
29007958.	7.406287E+11	0.00003917	0.00062168	15.87277544	1827.40914
58296.55242					
30055339.	7.360491E+11	0.00004083	0.00064761	15.85978496	1888.44854
60000.00000					
30816868.	7.251028E+11	0.00004250	0.00067149	15.79983652	1943.43042
60000.00000					
31576646.	7.149429E+11	0.00004417	0.00069543	15.74563873	1997.52023
60000.00000					
32297973.	7.046831E+11	0.00004583	0.00071911	15.68978012	2049.99827
60000.00000					
32603190.	6.863829E+11	0.00004750	0.00074100	15.59999907	2097.43280
60000.00000					
33141943.	6.740734E+11	0.00004917	0.00076422	15.54351604	2146.97438
60000.00000					
33549616.	6.599924E+11	0.00005083	0.00078498	15.44218647	2190.20769
60000.00000					
33956270.	6.467861E+11	0.00005250	0.00080577	15.34802806	2232.76452
60000.00000					
34361897.	6.343735E+11	0.00005417	0.00082660	15.26038635	2274.64124
60000.00000					
34766483.	6.226833E+11	0.00005583	0.00084748	15.17868197	2315.83380
60000.00000					
35170029.	6.116527E+11	0.00005750	0.00086839	15.10240853	2356.33880
60000.00000					
35572517.	6.012256E+11	0.00005917	0.00088934	15.03111112	2396.15205
60000.00000					
35776186.	5.881017E+11	0.00006083	0.00090783	14.92327130	2430.41836
60000.00000					
35954850.	5.752776E+11	0.00006250	0.00092604	14.81670177	2463.55517
60000.00000					
36132874.	5.631097E+11	0.00006417	0.00094428	14.71609104	2496.16671
60000.00000					
36310274.	5.515485E+11	0.00006583	0.00096255	14.62099493	2528.25126
60000.00000					
36487040.	5.405487E+11	0.00006750	0.00098084	14.53100574	2559.80613
60000.00000					
36663159.	5.300698E+11	0.00006917	0.00099916	14.44575441	2590.82853
60000.00000					
36963767.	5.218414E+11	0.00007083	0.00102000	14.40000021	2625.63586
60000.00000					
37045518.	5.109727E+11	0.00007250	0.00104091	14.35736167	2659.80250
60000.00000					
37215369.	5.017803E+11	0.00007417	0.00105868	14.27435267	2687.98851
60000.00000					

37384637.	4.929842E+11	0.00007583	0.00107648	14.19535840	2715.67269
60000.00000					
37553322.	4.845590E+11	0.00007750	0.00109431	14.12012351	2742.85277
60000.00000					
37721415.	4.764810E+11	0.00007917	0.00111217	14.04841197	2769.52616
60000.00000					
37888908.	4.687288E+11	0.00008083	0.00113005	13.98000705	2795.69026
60000.00000					
38055798.	4.612824E+11	0.00008250	0.00114796	13.91471136	2821.34266
60000.00000					
38222095.	4.541239E+11	0.00008417	0.00116591	13.85234678	2846.48134
60000.00000					
38387776.	4.472362E+11	0.00008583	0.00118388	13.79273951	2871.10307
60000.00000					
38552852.	4.406040E+11	0.00008750	0.00120188	13.73573935	2895.20590
60000.00000					
38717304.	4.342128E+11	0.00008917	0.00121991	13.68119824	2918.78668
60000.00000					
38881143.	4.280493E+11	0.00009083	0.00123797	13.62898743	2941.84331
60000.00000					
39032178.	4.219695E+11	0.00009250	0.00125577	13.57590544	2964.00241
60000.00000					
39092439.	4.151409E+11	0.00009417	0.00127149	13.50256741	2982.96175
60000.00000					
39152322.	4.085460E+11	0.00009583	0.00128723	13.43200600	3001.52658
60000.00000					
39211823.	4.021725E+11	0.00009750	0.00130300	13.36407959	3019.69514
60000.00000					
39270945.	3.960095E+11	0.00009917	0.00131878	13.29865730	3037.46578
60000.00000					
39270945.	3.831312E+11	0.00010250	0.00135300	13.19999921	3074.71342
60000.00000					
39549975.	3.737006E+11	0.00010583	0.00139078	13.14120734	3113.71310
60000.00000					
39653921.	3.632420E+11	0.00010917	0.00142083	13.01527441	3142.55437
60000.00000					
39756530.	3.533914E+11	0.00011250	0.00145097	12.89753401	3169.94240
60000.00000					
39857793.	3.440961E+11	0.00011583	0.00148119	12.78728878	3195.86475
60000.00000					
39957692.	3.353093E+11	0.00011917	0.00151150	12.68391645	3220.30837
60000.00000					
40056200.	3.269894E+11	0.00012250	0.00154189	12.58686125	3243.25988
60000.00000					
40153323.	3.190993E+11	0.00012583	0.00157237	12.49563396	3264.70643
60000.00000					
40249031.	3.116054E+11	0.00012917	0.00160293	12.40978825	3284.63409
60000.00000					
40343303.	3.044778E+11	0.00013250	0.00163358	12.32892501	3303.02894

60000.00000					
40436126.	2.976893E+11	0.00013583	0.00166432	12.25268590	3319.87695
60000.00000					
40527493.	2.912155E+11	0.00013917	0.00169515	12.18074906	3335.16391
60000.00000					
40617377.	2.850342E+11	0.00014250	0.00172608	12.11281836	3348.87496
60000.00000					
40705751.	2.791251E+11	0.00014583	0.00175709	12.04862559	3360.99508
60000.00000					
40853264.	2.738766E+11	0.00014917	0.00179000	12.00000036	3372.10536
60000.00000					
41231450.	2.703702E+11	0.00015250	0.00183000	12.00000036	3383.21826
60000.00000					
41231450.	2.645868E+11	0.00015583	0.00186706	11.98110688	3390.97972
60000.00000					
41231450.	2.590458E+11	0.00015917	0.00189712	11.91905344	3395.47013
60000.00000					
41231450.	2.537320E+11	0.00016250	0.00192728	11.86016285	3398.43704
60000.00000					
41232370.	2.486374E+11	0.00016583	0.00195754	11.80425274	3399.86401
60000.00000					
41303453.	2.441583E+11	0.00016917	0.00198790	11.75116003	3395.63088
60000.00000					
41372129.	2.398384E+11	0.00017250	0.00201838	11.70073020	3388.10786
60000.00000					
41440205.	2.356789E+11	0.00017583	0.00204895	11.65282381	3381.63822
60000.00000					
41507675.	2.316707E+11	0.00017917	0.00207964	11.60731208	3387.64351
60000.00000					
41574516.	2.278056E+11	0.00018250	0.00211044	11.56407273	3392.48240
60000.00000					
41640722.	2.240756E+11	0.00018583	0.00214136	11.52299631	3396.13909
60000.00000					
41706289.	2.204738E+11	0.00018917	0.00217239	11.48398197	3398.59724
60000.00000					
41771197.	2.169932E+11	0.00019250	0.00220353	11.44693315	3399.83993
60000.00000					
41800768.	2.134507E+11	0.00019583	0.00223199	11.39738739	3397.45836
60000.00000					
41810453.	2.099270E+11	0.00019917	0.00225899	11.34221113	3391.90898
60000.00000					
41819966.	2.065183E+11	0.00020250	0.00228605	11.28913987	3386.34416
60000.00000					
41829299.	2.032193E+11	0.00020583	0.00231317	11.23807275	3380.76383
60000.00000					
41838466.	2.000245E+11	0.00020917	0.00234035	11.18891966	3376.02479
60000.00000					
41847451.	1.969292E+11	0.00021250	0.00236759	11.14159048	3381.00023
60000.00000					

41856252.	1.939286E+11	0.00021583	0.00239489	11.09600365	3385.41212
60000.00000					
41864866.	1.910184E+11	0.00021917	0.00242225	11.05208194	3389.25445
60000.00000					
41873297.	1.881946E+11	0.00022250	0.00244967	11.00975454	3392.52119
60000.00000					
41881537.	1.854533E+11	0.00022583	0.00247716	10.96895278	3395.20611
60000.00000					
41889582.	1.827909E+11	0.00022917	0.00250470	10.92961228	3397.30289
60000.00000					
41897428.	1.802040E+11	0.00023250	0.00253231	10.89167297	3398.80515
60000.00000					
41912505.	1.752439E+11	0.00023917	0.00258773	10.81979406	3399.90362
60000.00000					
41912505.	1.704915E+11	0.00024583	0.00265500	10.79999936	3387.41455
60000.00000					
41912505.	1.659901E+11	0.00025250	0.00272700	10.79999936	3373.67456
60000.00000					
41998985.	1.620540E+11	0.00025917	0.00279801	10.79618847	3374.99495
60000.00000					
42005003.	1.580126E+11	0.00026583	0.00285072	10.72372377	3382.10778
60000.00000					
42010758.	1.541679E+11	0.00027250	0.00290359	10.65537250	3388.06637
60000.00000					
42016236.	1.505059E+11	0.00027917	0.00295661	10.59084928	3392.84870
60000.00000					
42021429.	1.470137E+11	0.00028583	0.00300980	10.52989662	3396.43216
60000.00000					
42026333.	1.436798E+11	0.00029250	0.00306314	10.47228277	3398.79345
60000.00000					
42030938.	1.404934E+11	0.00029917	0.00311666	10.41779530	3399.90838
60000.00000					
42034564.	1.374427E+11	0.00030583	0.00317065	10.36723673	3395.69905
60000.00000					
42037636.	1.345204E+11	0.00031250	0.00322492	10.31974876	3388.75641
60000.00000					
42040591.	1.317199E+11	0.00031917	0.00327928	10.27450526	3381.79179
60000.00000					
42043445.	1.290336E+11	0.00032583	0.00333372	10.23137534	3374.80460
60000.00000					
42046194.	1.264547E+11	0.00033250	0.00338825	10.19023454	3367.79459
60000.00000					
42048814.	1.239768E+11	0.00033917	0.00344287	10.15096486	3360.76185
60000.00000					
42051334.	1.215942E+11	0.00034583	0.00349757	10.11346757	3353.70549
60000.00000					
42053732.	1.193014E+11	0.00035250	0.00355237	10.07764184	3352.50589
60000.00000					
42056005.	1.170933E+11	0.00035917	0.00360725	10.04339755	3360.27603

60000.00000					
42058166.	1.149654E+11	0.00036583	0.00366223	10.01065528	3367.38566
60000.00000					
42060203.	1.129133E+11	0.00037250	0.00371730	9.97933567	3373.82464
60000.00000					
42062114.	1.109330E+11	0.00037917	0.00377247	9.94936788	3379.58304
60000.00000					
42063897.	1.090209E+11	0.00038583	0.00382773	9.92068541	3384.65057
60000.00000					

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 42020.47235 in-kip

Axial Thrust Force = 31000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
4255959.	5.107151E+12	8.333333E-07	0.00003213	38.55467641	114.04945	815.68227
8468711.	5.081227E+12	0.00000167	0.00006224	37.34593356	219.07097	1572.94196
12638405.	5.055362E+12	0.00000250	0.00009240	36.95992291	322.53305	2331.42717
16763718.	5.029115E+12	0.00000333	0.00012251	36.75418031	424.14016	3088.68111
16763718.	4.023292E+12	0.00000417	0.00007337	17.60812604	252.83332	5992.07270
16763718.	3.352744E+12	0.00000500	0.00008614	17.22876513	295.64016	7245.49457
16763718.	2.873780E+12	0.00000583	0.00009893	16.96015370	338.20140	8498.51710
16763718.	2.514558E+12	0.00000667	0.00011200	16.80000007	381.41250	9743.55400
16763718.	2.235162E+12	0.00000750	0.00012484	16.64468729	423.53188	10995.27878
16763718.	2.011646E+12	0.00000833	0.00013761	16.51283634	465.14133	12248.84041
16763718.	1.828769E+12	0.00000917	0.00015039	16.40660369	506.50849	13501.96462
16763718.	1.676372E+12	0.00001000	0.00016320	16.31959498	547.63262	

14754.64848					
16763718.	1.547420E+12	0.00001083	0.00017601	16.24738348	588.51297
16006.88897					
16763718.	1.436890E+12	0.00001167	0.00018885	16.18680847	629.14883
17258.68266					
16763718.	1.341097E+12	0.00001250	0.00020169	16.13554609	669.53924
18510.02832					
16763718.	1.257279E+12	0.00001333	0.00021456	16.09186256	709.68360
19760.92118					
16763718.	1.183321E+12	0.00001417	0.00022744	16.05442536	749.58103
21011.35920					
16763718.	1.117581E+12	0.00001500	0.00024033	16.02220023	789.23071
22261.33944					
16763718.	1.058761E+12	0.00001583	0.00025324	15.99437392	828.63198
23510.85743					
16763718.	1.005823E+12	0.00001667	0.00026617	15.97028768	867.78375
24759.91266					
16763718.	9.579267E+11	0.00001750	0.00027911	15.94941795	906.68544
26008.49968					
16763718.	9.143846E+11	0.00001833	0.00029207	15.93132913	945.33606
27256.61689					
16763718.	8.746288E+11	0.00001917	0.00030505	15.91566503	983.73481
28504.26065					
16763718.	8.381859E+11	0.00002000	0.00031804	15.90212953	1021.88092
29751.42692					
16763718.	8.046585E+11	0.00002083	0.00033105	15.89047158	1059.77348
30998.11306					
16763718.	7.737101E+11	0.00002167	0.00034408	15.88047874	1097.41154
32244.31641					
17112459.	7.605537E+11	0.00002250	0.00035712	15.87197292	1134.79435
33490.03248					
17713304.	7.591416E+11	0.00002333	0.00037018	15.86479962	1171.92102
34735.25798					
18313529.	7.578012E+11	0.00002417	0.00038325	15.85882366	1208.79049
35979.99106					
18913135.	7.565254E+11	0.00002500	0.00039635	15.85393345	1245.40210
37224.22581					
19512116.	7.553077E+11	0.00002583	0.00040946	15.85002601	1281.75475
38467.96066					
20110470.	7.541426E+11	0.00002667	0.00042259	15.84701550	1317.84764
39711.19075					
20708193.	7.530252E+11	0.00002750	0.00043573	15.84482467	1353.67983
40953.91264					
21305281.	7.519511E+11	0.00002833	0.00044890	15.84338486	1389.25032
42196.12334					
21901730.	7.509165E+11	0.00002917	0.00046208	15.84263599	1424.55815
43437.81922					
22497539.	7.499180E+11	0.00003000	0.00047528	15.84252656	1459.60250
44678.99497					

23092701.	7.489525E+11	0.00003083	0.00048849	15.84300721	1494.38226
45919.64838					
23687212.	7.480172E+11	0.00003167	0.00050173	15.84403503	1528.89640
47159.77608					
24281070.	7.471098E+11	0.00003250	0.00051498	15.84557354	1563.14407
48399.37277					
25466814.	7.453702E+11	0.00003417	0.00054154	15.85004961	1630.83601
50876.95684					
26649897.	7.437181E+11	0.00003583	0.00056818	15.85619724	1697.44966
53352.37121					
27830289.	7.421410E+11	0.00003750	0.00059489	15.86382544	1762.97686
55825.58118					
29007958.	7.406287E+11	0.00003917	0.00062168	15.87277544	1827.40914
58296.55242					
30055339.	7.360491E+11	0.00004083	0.00064761	15.85978496	1888.44854
60000.00000					
30816868.	7.251028E+11	0.00004250	0.00067149	15.79983652	1943.43042
60000.00000					
31576646.	7.149429E+11	0.00004417	0.00069543	15.74563873	1997.52023
60000.00000					
32297973.	7.046831E+11	0.00004583	0.00071911	15.68978012	2049.99827
60000.00000					
32603190.	6.863829E+11	0.00004750	0.00074100	15.59999907	2097.43280
60000.00000					
33141943.	6.740734E+11	0.00004917	0.00076422	15.54351604	2146.97438
60000.00000					
33549616.	6.599924E+11	0.00005083	0.00078498	15.44218647	2190.20769
60000.00000					
33956270.	6.467861E+11	0.00005250	0.00080577	15.34802806	2232.76452
60000.00000					
34361897.	6.343735E+11	0.00005417	0.00082660	15.26038635	2274.64124
60000.00000					
34766483.	6.226833E+11	0.00005583	0.00084748	15.17868197	2315.83380
60000.00000					
35170029.	6.116527E+11	0.00005750	0.00086839	15.10240853	2356.33880
60000.00000					
35572517.	6.012256E+11	0.00005917	0.00088934	15.03111112	2396.15205
60000.00000					
35776186.	5.881017E+11	0.00006083	0.00090783	14.92327130	2430.41836
60000.00000					
35954850.	5.752776E+11	0.00006250	0.00092604	14.81670177	2463.55517
60000.00000					
36132874.	5.631097E+11	0.00006417	0.00094428	14.71609104	2496.16671
60000.00000					
36310274.	5.515485E+11	0.00006583	0.00096255	14.62099493	2528.25126
60000.00000					
36487040.	5.405487E+11	0.00006750	0.00098084	14.53100574	2559.80613
60000.00000					
36663159.	5.300698E+11	0.00006917	0.00099916	14.44575441	2590.82853

60000.00000					
36963767.	5.218414E+11	0.00007083	0.00102000	14.40000021	2625.63586
60000.00000					
37045518.	5.109727E+11	0.00007250	0.00104091	14.35736167	2659.80250
60000.00000					
37215369.	5.017803E+11	0.00007417	0.00105868	14.27435267	2687.98851
60000.00000					
37384637.	4.929842E+11	0.00007583	0.00107648	14.19535840	2715.67269
60000.00000					
37553322.	4.845590E+11	0.00007750	0.00109431	14.12012351	2742.85277
60000.00000					
37721415.	4.764810E+11	0.00007917	0.00111217	14.04841197	2769.52616
60000.00000					
37888908.	4.687288E+11	0.00008083	0.00113005	13.98000705	2795.69026
60000.00000					
38055798.	4.612824E+11	0.00008250	0.00114796	13.91471136	2821.34266
60000.00000					
38222095.	4.541239E+11	0.00008417	0.00116591	13.85234678	2846.48134
60000.00000					
38387776.	4.472362E+11	0.00008583	0.00118388	13.79273951	2871.10307
60000.00000					
38552852.	4.406040E+11	0.00008750	0.00120188	13.73573935	2895.20590
60000.00000					
38717304.	4.342128E+11	0.00008917	0.00121991	13.68119824	2918.78668
60000.00000					
38881143.	4.280493E+11	0.00009083	0.00123797	13.62898743	2941.84331
60000.00000					
39032178.	4.219695E+11	0.00009250	0.00125577	13.57590544	2964.00241
60000.00000					
39092439.	4.151409E+11	0.00009417	0.00127149	13.50256741	2982.96175
60000.00000					
39152322.	4.085460E+11	0.00009583	0.00128723	13.43200600	3001.52658
60000.00000					
39211823.	4.021725E+11	0.00009750	0.00130300	13.36407959	3019.69514
60000.00000					
39270945.	3.960095E+11	0.00009917	0.00131878	13.29865730	3037.46578
60000.00000					
39270945.	3.831312E+11	0.00010250	0.00135300	13.19999921	3074.71342
60000.00000					
39549975.	3.737006E+11	0.00010583	0.00139078	13.14120734	3113.71310
60000.00000					
39653921.	3.632420E+11	0.00010917	0.00142083	13.01527441	3142.55437
60000.00000					
39756530.	3.533914E+11	0.00011250	0.00145097	12.89753401	3169.94240
60000.00000					
39857793.	3.440961E+11	0.00011583	0.00148119	12.78728878	3195.86475
60000.00000					
39957692.	3.353093E+11	0.00011917	0.00151150	12.68391645	3220.30837
60000.00000					

40056200.	3.269894E+11	0.00012250	0.00154189	12.58686125	3243.25988 60000.00000
40153323.	3.190993E+11	0.00012583	0.00157237	12.49563396	3264.70643 60000.00000
40249031.	3.116054E+11	0.00012917	0.00160293	12.40978825	3284.63409 60000.00000
40343303.	3.044778E+11	0.00013250	0.00163358	12.32892501	3303.02894 60000.00000
40436126.	2.976893E+11	0.00013583	0.00166432	12.25268590	3319.87695 60000.00000
40527493.	2.912155E+11	0.00013917	0.00169515	12.18074906	3335.16391 60000.00000
40617377.	2.850342E+11	0.00014250	0.00172608	12.11281836	3348.87496 60000.00000
40705751.	2.791251E+11	0.00014583	0.00175709	12.04862559	3360.99508 60000.00000
40853264.	2.738766E+11	0.00014917	0.00179000	12.00000036	3372.10536 60000.00000
41231450.	2.703702E+11	0.00015250	0.00183000	12.00000036	3383.21826 60000.00000
41231450.	2.645868E+11	0.00015583	0.00186706	11.98110688	3390.97972 60000.00000
41231450.	2.590458E+11	0.00015917	0.00189712	11.91905344	3395.47013 60000.00000
41231450.	2.537320E+11	0.00016250	0.00192728	11.86016285	3398.43704 60000.00000
41232370.	2.486374E+11	0.00016583	0.00195754	11.80425274	3399.86401 60000.00000
41303453.	2.441583E+11	0.00016917	0.00198790	11.75116003	3395.63088 60000.00000
41372129.	2.398384E+11	0.00017250	0.00201838	11.70073020	3388.10786 60000.00000
41440205.	2.356789E+11	0.00017583	0.00204895	11.65282381	3381.63822 60000.00000
41507675.	2.316707E+11	0.00017917	0.00207964	11.60731208	3387.64351 60000.00000
41574516.	2.278056E+11	0.00018250	0.00211044	11.56407273	3392.48240 60000.00000
41640722.	2.240756E+11	0.00018583	0.00214136	11.52299631	3396.13909 60000.00000
41706289.	2.204738E+11	0.00018917	0.00217239	11.48398197	3398.59724 60000.00000
41771197.	2.169932E+11	0.00019250	0.00220353	11.44693315	3399.83993 60000.00000
41800768.	2.134507E+11	0.00019583	0.00223199	11.39738739	3397.45836 60000.00000
41810453.	2.099270E+11	0.00019917	0.00225899	11.34221113	3391.90898 60000.00000
41819966.	2.065183E+11	0.00020250	0.00228605	11.28913987	3386.34416

60000.00000					
41829299.	2.032193E+11	0.00020583	0.00231317	11.23807275	3380.76383
60000.00000					
41838466.	2.000245E+11	0.00020917	0.00234035	11.18891966	3376.02479
60000.00000					
41847451.	1.969292E+11	0.00021250	0.00236759	11.14159048	3381.00023
60000.00000					
41856252.	1.939286E+11	0.00021583	0.00239489	11.09600365	3385.41212
60000.00000					
41864866.	1.910184E+11	0.00021917	0.00242225	11.05208194	3389.25445
60000.00000					
41873297.	1.881946E+11	0.00022250	0.00244967	11.00975454	3392.52119
60000.00000					
41881537.	1.854533E+11	0.00022583	0.00247716	10.96895278	3395.20611
60000.00000					
41889582.	1.827909E+11	0.00022917	0.00250470	10.92961228	3397.30289
60000.00000					
41897428.	1.802040E+11	0.00023250	0.00253231	10.89167297	3398.80515
60000.00000					
41912505.	1.752439E+11	0.00023917	0.00258773	10.81979406	3399.90362
60000.00000					
41912505.	1.704915E+11	0.00024583	0.00265500	10.79999936	3387.41455
60000.00000					
41912505.	1.659901E+11	0.00025250	0.00272700	10.79999936	3373.67456
60000.00000					
41998985.	1.620540E+11	0.00025917	0.00279801	10.79618847	3374.99495
60000.00000					
42005003.	1.580126E+11	0.00026583	0.00285072	10.72372377	3382.10778
60000.00000					
42010758.	1.541679E+11	0.00027250	0.00290359	10.65537250	3388.06637
60000.00000					
42016236.	1.505059E+11	0.00027917	0.00295661	10.59084928	3392.84870
60000.00000					
42021429.	1.470137E+11	0.00028583	0.00300980	10.52989662	3396.43216
60000.00000					
42026333.	1.436798E+11	0.00029250	0.00306314	10.47228277	3398.79345
60000.00000					
42030938.	1.404934E+11	0.00029917	0.00311666	10.41779530	3399.90838
60000.00000					
42034564.	1.374427E+11	0.00030583	0.00317065	10.36723673	3395.69905
60000.00000					
42037636.	1.345204E+11	0.00031250	0.00322492	10.31974876	3388.75641
60000.00000					
42040591.	1.317199E+11	0.00031917	0.00327928	10.27450526	3381.79179
60000.00000					
42043445.	1.290336E+11	0.00032583	0.00333372	10.23137534	3374.80460
60000.00000					
42046194.	1.264547E+11	0.00033250	0.00338825	10.19023454	3367.79459
60000.00000					

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   42048814.  1.239768E+11    0.00033917    0.00344287   10.15096486    3360.76185
60000.00000
   42051334.  1.215942E+11    0.00034583    0.00349757   10.11346757    3353.70549
60000.00000
   42053732.  1.193014E+11    0.00035250    0.00355237   10.07764184    3352.50589
60000.00000
   42056005.  1.170933E+11    0.00035917    0.00360725   10.04339755    3360.27603
60000.00000
   42058166.  1.149654E+11    0.00036583    0.00366223   10.01065528    3367.38566
60000.00000
   42060203.  1.129133E+11    0.00037250    0.00371730    9.97933567    3373.82464
60000.00000
   42062114.  1.109330E+11    0.00037917    0.00377247    9.94936788    3379.58304
60000.00000
   42063897.  1.090209E+11    0.00038583    0.00382773    9.92068541    3384.65057
60000.00000
```

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 42020.47235 in-kip

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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 = 23000.000 lbs
Specified moment at pile head = 20220000.000 in-lbs
Specified axial load at pile head = 31000.000 lbs

Depth X	Deflect. y	Moment M	Shear V	Slope S	Total Stress	Flx. Rig. EI	Soil Res. Es*h p
in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in F/L
0.000	0.700864	2.02E+07	23000.	-0.006772	559.417	7.54E+11	0.000 0.000
15.360	0.600026	2.06E+07	22964.	-0.006356	569.142	7.53E+11	-20.161 64.512
30.720	0.505633	2.09E+07	22046.	-0.005933	578.697	7.53E+11	-94.654 359.424
46.080	0.417799	2.13E+07	20194.	-0.005502	587.650	7.52E+11	-142.386 654.336
61.440	0.336629	2.14E+07	-3679.046	-0.005066	592.085	7.52E+11	-2197.407

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12533.
  76.800  0.262167  2.11E+07   -45339. -0.004631   582.434  7.52E+11 -3206.459
23483.
  92.160  0.194289  2.00E+07 -1.01E+05 -0.004211   552.234  7.54E+11 -4030.556
39831.
 107.520  0.132627  1.79E+07 -1.68E+05 -0.003825   496.220  7.59E+11 -4568.895
66142.
 122.880  0.075243  1.48E+07 -2.39E+05 -0.003703   411.046  5.04E+12 -4593.987
1.17E+05
 138.240  0.018681  1.06E+07 -3.01E+05 -0.003664   296.921  5.07E+12 -2255.024
2.32E+05
 153.600 -0.037389  5.99E+06 -2.81E+05 -0.003639   170.998  5.09E+12  4722.140
2.42E+05
 168.960 -0.093178  2.32E+06 -1.91E+05 -0.003627    70.812  5.11E+12  6935.009
1.43E+05
 184.320 -0.148853  2.73E+05   -70286. -0.003624    15.077  5.11E+12  8745.902
1.13E+05
```

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	=	0.70086445 in
Computed slope at pile head	=	-0.00677221
Maximum bending moment	=	21419814. lbs-in
Maximum shear force	=	-306375.43159 lbs
Depth of maximum bending moment	=	59.52000000 in
Depth of maximum shear force	=	144.00000 in
Number of iterations	=	44
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 = 9000.000 lbs
Specified moment at pile head = 7752000.000 in-lbs
Specified axial load at pile head = 31000.000 lbs

Depth X 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. Es*h F/L p lbs/in
0.000	0.074856	7.75E+06	9000.000	-0.000646	219.166	5.08E+12	0.000
0.000							
15.360	0.065115	7.89E+06	8996.066	-0.000622	222.946	5.08E+12	-2.188
64.512							
30.720	0.055740	8.03E+06	8895.549	-0.000598	226.709	5.08E+12	-10.435
359.424							
46.080	0.046738	8.16E+06	8689.724	-0.000574	230.405	5.08E+12	-15.928
654.336							
61.440	0.038114	8.22E+06	-4105.522	-0.000549	231.868	5.08E+12	-1178.569
59370.							
76.800	0.029871	7.99E+06	-26351.	-0.000524	225.783	5.08E+12	-1704.578
1.10E+05							
92.160	0.021998	7.39E+06	-52762.	-0.000501	209.151	5.09E+12	-1641.694
1.43E+05							
107.520	0.014465	6.39E+06	-75626.	-0.000480	182.061	5.09E+12	-1301.734
1.73E+05							
122.880	0.007228	5.10E+06	-91719.	-0.000463	146.695	5.10E+12	-761.473
2.02E+05							
138.240	0.000226	3.62E+06	-98019.	-0.000450	106.528	5.11E+12	-27.270
2.32E+05							
153.600	-0.006609	2.15E+06	-91565.	-0.000441	66.287	5.11E+12	899.251
2.61E+05							
168.960	-0.013343	8.91E+05	-69389.	-0.000437	31.939	5.11E+12	2020.570
2.91E+05							
184.320	-0.020035	1.13E+05	-28462.	-0.000435	10.705	5.11E+12	3341.602
3.20E+05							

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	=	0.07485610 in
Computed slope at pile head	=	-0.00064597
Maximum bending moment	=	8224730. lbs-in
Maximum shear force	=	-98018.69844 lbs
Depth of maximum bending moment	=	57.60000000 in
Depth of maximum shear force	=	138.24000 in
Number of iterations	=	6
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 displacment 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= 23000.	M= 2.02E+07	31000.0000	0.7008645	2.1420E+07	-306375.
1	V= 9000.000	M= 7.75E+06	31000.0000	0.0748561	8224730.	-98018.6984

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

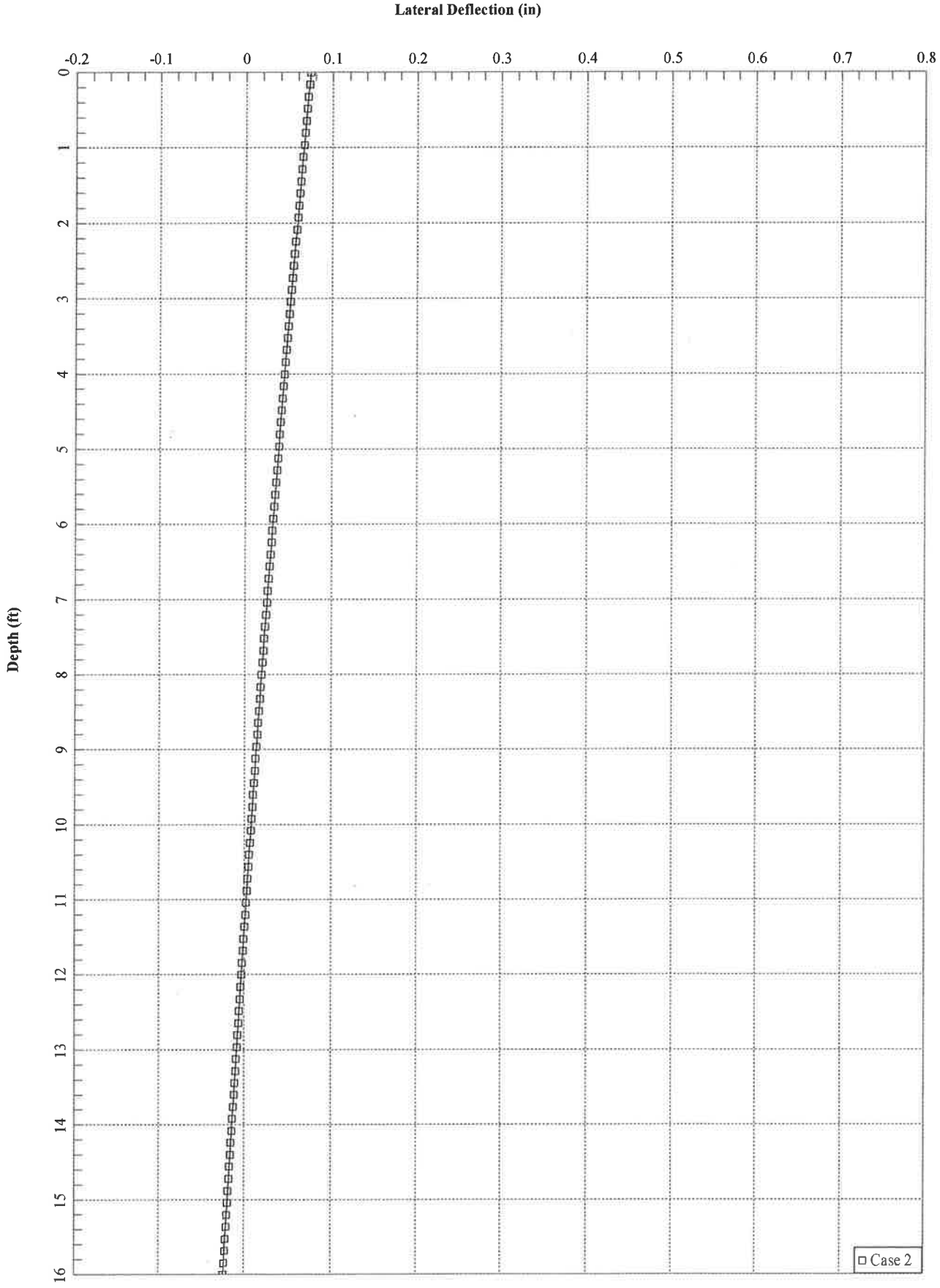
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00043729	2300.00003	252673.57419	5259620.	5.778117E+08
0.00131639	6923.68990	760623.23809	5259620.	5.778117E+08
0.00208642	10973.78886	1205559.	5259620.	5.778117E+08
0.00263277	13847.37980	1521246.	5259620.	5.778117E+08
0.00305655	16076.31010	1766112.	5259620.	5.778117E+08
0.00340281	17897.47876	1966183.	5259620.	5.778117E+08

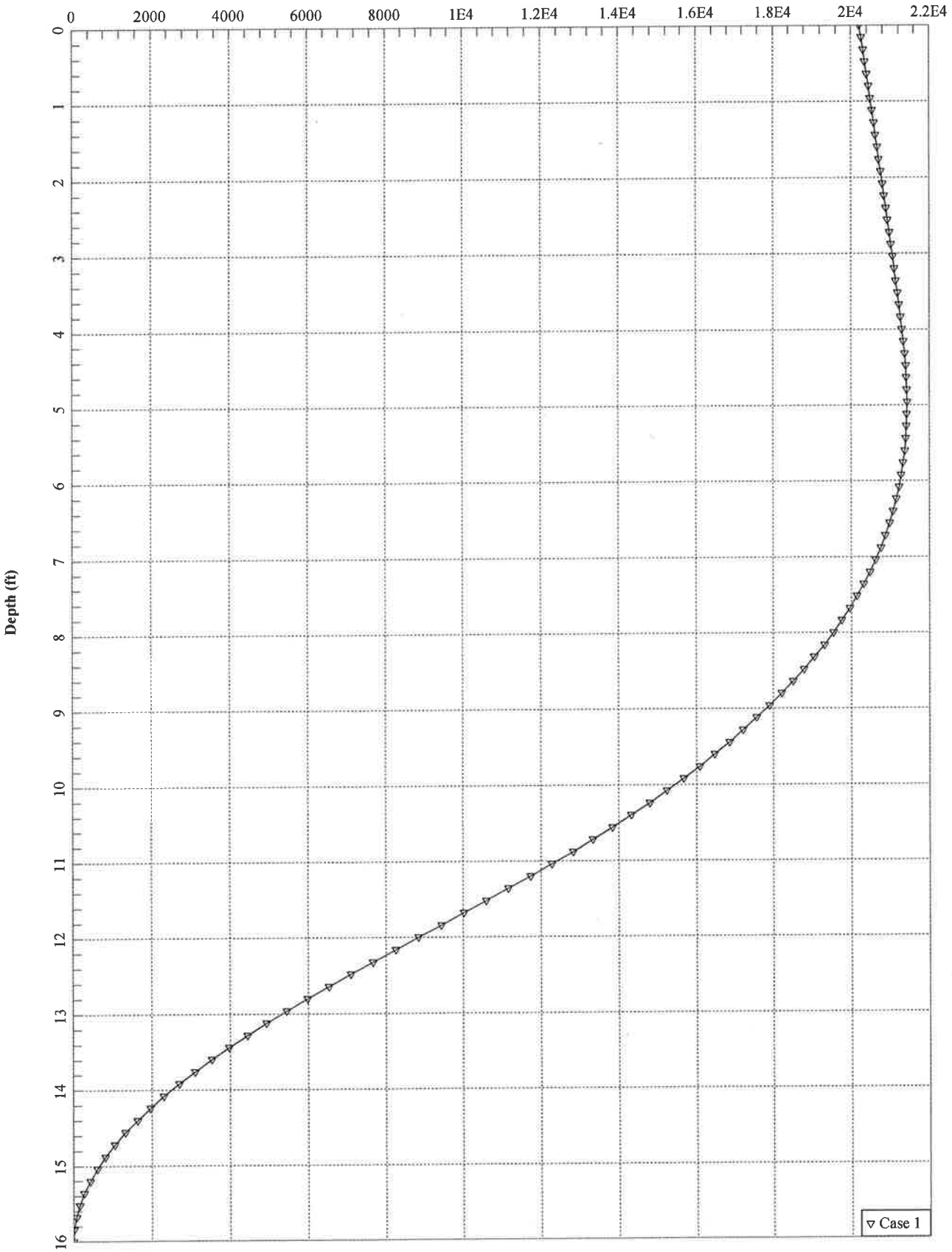
0.00369556	19437.25492	2135339.	5259620.	5.778117E+08
0.00394916	20771.06970	2281870.	5259620.	5.778117E+08
0.00417284	21947.57772	2411119.	5259620.	5.778117E+08
0.00437294	23000.00000	2526736.	5259620.	5.778117E+08

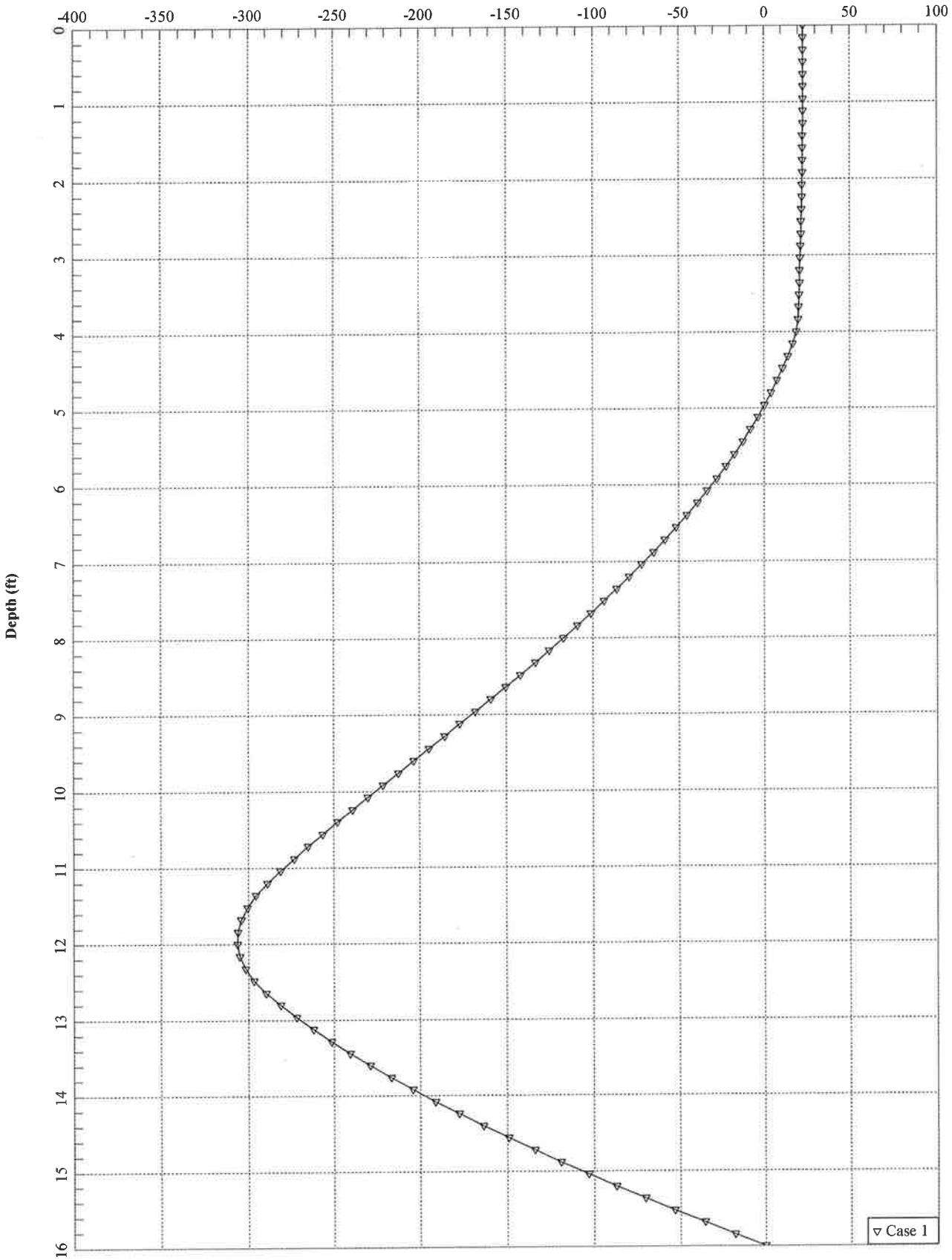
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00002584	14931.01193	2022000.	5.778117E+08	7.824891E+10
0.00007786	44947.83346	6086827.	5.773235E+08	7.818104E+10
0.00012364	71249.38857	9647392.	5.762428E+08	7.802510E+10
0.00015627	89916.06597	12173653.	5.753972E+08	7.790249E+10
0.00018164	104398.13815	14133173.	5.747579E+08	7.780937E+10
0.00020242	116232.94340	15734218.	5.742034E+08	7.772875E+10
0.00022025	126241.12210	17087882.	5.731631E+08	7.758283E+10
0.00024221	134935.17364	18260480.	5.571079E+08	7.539218E+10
0.00026931	142672.10264	19294784.	5.297703E+08	7.164542E+10
0.00030052	149683.00084	20220000.	4.980742E+08	6.728260E+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)
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Case 2


Bending Moment (in-kips)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
2E4
2.2E4
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Case 1


Shear Force (kips)
-400
-350
-300
-250
-200
-150
-100
-50
0
50
100
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Case 1

SITE NAME	STRATFORD, CT			ECP - CELL #	5	0021		
LATITUDE	41-10-36.79 N			LONGITUDE	73-08-46.18 W			
NOTE: **Please Order Appropriate RET Cables.** Install PCS LTE antennas and RRH's. Replace 700 and AWS antennas and RRH's. (ant rec updated 9/21/15)				SAVE BUTTON	PCS1			
				STRUCTURE TYPE	ROOFTOP			
700 Mhz - LTE Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH			
ANTENNA TYPE	BXA-70063-6CF-4-750MHZ		BXA-70063-6CF-2-750MHZ		BXA-70063-6CF-4-750MHZ			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech			
RAD CTR (FT AGL)	82		82		82			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z			
700 Mhz - LTE Future Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH			
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	4 Elec + 0 Mech		4 Elec + 0 Mech		7 Elec + 0 Mech			
RAD CTR (FT AGL)	82		82		82			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z			
1900 PCS - Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	PCS Modcell 4.0		PCS Modcell 4.0		PCS Modcell 4.0			
ANTENNA TYPE	MG D3-800T0		MG D3-800T0		MG D3-800T0			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech			
RAD CTR (FT AGL)	82		82		82			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
1900 PCS - Future Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 1900 MHz RRH		ALU 1900 MHz RRH		ALU 1900 MHz RRH			
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B			
QTY OF ANTENNAS PER FACE	0 (shared w/ LTE 700)		0 (shared w/ LTE 700)		0 (shared w/ LTE 700)			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	3 Elec + 0 Mech		3 Elec + 0 Mech		3 Elec + 0 Mech			
RAD CTR (FT AGL)	82		82		82			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX								
2100 AWS - Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH			
ANTENNA TYPE	BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech			
RAD CTR (FT AGL)	82		82		82			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX								

2100 AWS - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	3 Elec + 0 Mech		3 Elec + 0 Mech		3 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_4x45-AWS	1	ALU RRH_4x45-AWS	1	ALU RRH_4x45-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

850 Cellular - No Change	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	Cellular Modcell 4.0HD		Cellular Modcell 4.0HD		Cellular Modcell 4.0HD	
ANTENNA TYPE	BXA-70063-6CF-2-850MHZ		BXA-70063-6CF-2-850MHZ		BXA-70063-6CF-2-850MHZ	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

NUMBER OF CABLES NEEDED						ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES			12	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS			24	TOP JUMPER (FT)			12
Equipment Cable Ordering		**MAIN CABLE #**	12	+	0	**TOP JUMPER #**		+	0
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES			**2**	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS			**9**	TOP JUMPER MODEL #			HB058-1-08U1-S1J18
Fiber Cable Ordering		**FIBER CABLE #**	1	+	**1**	**TOP JUMPER #**	6	+	**3**

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	**PCS F-Band**	**700 Mhz C - Block**	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975	TX - 746-757	700 LTE RRH (Watts)	60
RX - 824-835,845-846.5 MHz	RX - 1890-1895	RX - 776-787	PCS/AWS LTE RRH (Watts)	60

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By : Ryan Ulanday	Alex Restrepo	RU	7/20/2015

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2 x 1710–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
Gain by Beam Tilt, average, dBi	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

* 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 Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2360 MHz | 698 – 896 MHz

Mechanical Specifications

Product Specifications

COMMSCOPE®

SBNHH-1D65B

POWERED BY ANDREW.

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h | 150.0 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1828.0 mm | 72.0 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

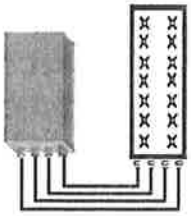
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

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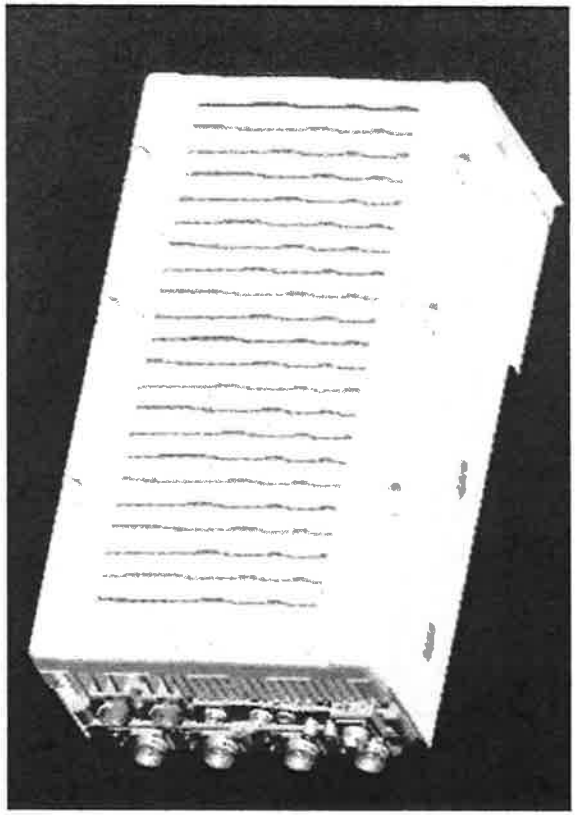
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.) Volume in L Weight in kg (lb) (w/o mounting HW)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield) 38 (with solar shield) 26 (57.2) (with solar shield)
DC voltage range DC power consumption	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions Wind load (@150km/h or 93mph)	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

NEW PCS RF MODULES FOR VZW

RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

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VZW Network Equipment Reporting Form (NERF)

Vendor	Alcatel-Lucent	Model	B66a RRH 4Tx/4Rx 4x45W or 2x 90W (SW selectable)	Function	RRH for distributed architecture with a CPRI interface between digital and RF processing components. The RRH has 4 Tx ports and 4 Rx ports. Can be SW configured for 2 Tx with 90W rf per port or 4 Tx with 45W rf per port. The RRH has passive cooling only.

*1)Equipment Configuration	*2)Heat Release @50°F Intake Temp [W]		*3)Airflow Rate @ 100% Activity Rate [cfm]		*4)Dimensions [in]		Non-Thermal Data		
	100% Activity	50% Activity	Nominal (70°F)	Max (95°F)	External (WxDxH)	Clear (F/R/S)	Installed Weight [lb]	*5)Sound @ Nominal [L_{WAd}]	*6)Name Plate [W]
Minimum			N/A Convection cooled	N/A Convection cooled	w/o Solar Shield W = 11.4in D = 6.7in H = 25.2in (W=290mm) (D=170mm) (H=640mm)	Front: 12" Rear: 7.5" Right: 12" Left: 12" Top: 12" Bottom: 24"			
Typical			N/A Convection cooled	N/A Convection cooled	with Solar Shield W = 12in D = 7.6in H = 25.8in (W=304mm) (D=193mm) (H=655mm)		62lb 72 lb(w mounting brackets)	N/A Convection cooled	
Full	825W (add 60W for AISG)	TBD	N/A Convection cooled	N/A Convection cooled	N/A			N/A Convection cooled	

*7)Equipment EC-Class	N/A Convection cooled	*10)Fan Speed	N/A Convection cooled	*13)Fan Hot-Swap	N/A Convection cooled	*16)Environ. Tests	N/A Convection cooled	*18)Temp. Rise [°F]	N/A Convection cooled
*8)Non-Optimal EC-Class	N/A Convection cooled	*11)Fan Logic	N/A Convection cooled	*14)Shut-Down	N/A Convection cooled	*17)Allow. Max [°F]	N/A Convection cooled	*19)Rec. Max [°F]	N/A Convection cooled
*9)Exhaust Openings	N/A Convection cooled	*12)Fan Alarm	N/A Convection cooled	*15)Temp. Access	N/A Convection cooled	*17)Allow. Min [°F]	N/A Convection cooled	*19)Rec. Min [°F]	N/A Convection cooled

Power Reporting					
Power Input	-48V	No. Power Supplies	N/A (Customer provided power plant)	Number of Inputs per Power Supply	1
*24)Maximum Demand (total system in Watts)	825W (add 60W for AISG)	Maximum Input (each power supply in Watts)	N/A (Customer provided power plant)	Maximum Output (each power supply in Watts)	58W (to AISG port, 29V/2A)
Power Supply Connection Type	DC entry via Conduit Box	Power Supply Make & Model	N/A (Customer provided power plant)		
Input Protection	no input fuse	Input Protection Make & Model	N/A (Customer provided power plant)		
Redundancy Scheme	N/A				
Nominal Voltage	-48VDC	Maximum Voltage	-57V	Minimum Voltage	-38V
*25)Max Current at Nominal Voltage	17.2A (add 1.2A if AISG port loaded 2A*29V)	*25)Max Current at Maximum Voltage	14.5A (add 1A if AISG port loaded 2A*29V)	*25)Max Current at Minimum Voltage	21.7A (add 1.5A if AISG port loaded 2A*29V)

Return completed forms to Engineering and Operations Support (EOS)

Richard.damiano@verizonwireless.com

Product Data Sheet | DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage	48 VDC	
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs	N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs	N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs	N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC	N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V	N/A
Protection Class as per IEC 61643-1	Class 1	N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed	N/A
	IEEE C62.41	N/A
	NEMA LS-1	N/A
	IEC 61643-1	N/A
	IEC 61643-12	N/A
	EN 61643-11	N/A

* This data is provisional and subject to change.