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KENNETH C. BALDWIN

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Also admitted in Massachusetts

January 22, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
123 Costello Road, Newington, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 114-foot level on the existing 145-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 2003. Cellco now intends to replace one (1) of its existing antennas with one (1) model 80010735V01, 750 MHz antenna at the 114-foot level on the tower. Included in Attachment 1 are specifications for the replacement antenna.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Newington's Mayor Stephen Woods. A copy of this letter is being sent to Costello Industries, Inc., the owner of the property where the tower is located.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antenna will be located at the 114-foot level on the 145-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative worst-case RF emissions calculation for Cellco's modified facility is included in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Stephen Woods, Newington Mayor
Costello Industries Inc.
Sandy M. Carter

ATTACHMENT 1

KATHREIN
SCALA DIVISION

800 10735V01

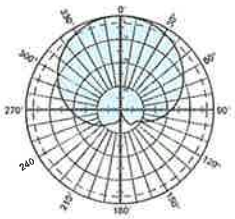
65° Single Band Panel Antenna, 6'

	Antenna
Single Band (MHz)	**698–894**
Dual Polarization	**X**
HPBW	**65°**
Adj. Electrical Downtilt Manual or optional remote control	**0°–10°**

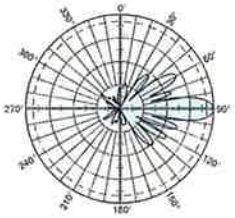
General specifications:

Frequency range	698–894 MHz
VSWR	<1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Maximum input power	500 watts per input (at 50°C)
Connector	2 x 7-16 DIN female (long neck) (bottom mounted)
Isolation	>30 dB
Electrical downtilt	0–10 degrees (continuously adjustable)
See reverse for order information.	

698–894 MHz



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–10° electrical downtilt

Specifications:

	698–806 MHz	824–894 MHz
Gain	15.5 dBi	16 dBi
Front-to-back ratio	>30 dB (co-polar) 35 dB (average)	>30 dB (co-polar) 35 dB (average)
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)
+45° and -45° polarization vertical beamwidth	11.3° (half-power)	10° (half-power)
Min. sidelobe suppression for first sidelobe above main beam average	0° 5° 10° T 16 17 17 dB 16 19 20 dB	0° 5° 10° T 18 17 16 dB 20 20 20 dB
Cross polar ratio Main direction 0° Sector ±60°	25 dB (typical) >11 dB, Average: 15 dB	25 dB (typical) >11 dB, Average: 15 dB

IRT specifications:

Logical interface ex factory[1]	3GPP/AISG 2.0
Protocols	AISG 1.1 and 3GPP/AISG 2.0 compliant
Hardware interface[2]	2 x 8 pin connector acc. IEC 60130-9; according to AISG: – IRT in (male): Control / Daisy chain in – IRT in (female): Daisy chain out
Power supply	10–30 V
Power consumption	<1 watt (standby) <8.5 watts (motor activated)
Adjustment time (full range)	40 sec.
Adjustment cycles	>50,000
Certification	FCC 15.107 Class B Computing Devices

[1] The protocol of the logical interface can be switched from 3GPP/AISG 2.0 to AISG 1.1 and vice versa with a vendor specific command. Start-up operation of the RCU 86010149 is possible in an RET system supporting AISG 1.1 or supporting 3GPP/AISG 2.0 after performing a layer 2 reset before address assignment. The protocol can also be changed as follows: AISG 1.1 to 3GPP: Enter "3GPP" into the additional data filed "Installer's ID" and perform a layer 7 reset or a power reset. 3GPP to AISG 1.1: Enter "AISG 1" into the additional datafield "Installer's ID" and perform a layer 2 reset or a power reset. After switching the protocol any other information can be entered into the "Installer's ID" field.

[2] The tightning torque for fixing the connector must be 0.5 – 1.0 Nm ('hand-tightened'). The connector should be tightened by hand only!

TÜV 11387-D
936.4273/a

RoHS Lead-Free Oct 19, 2012

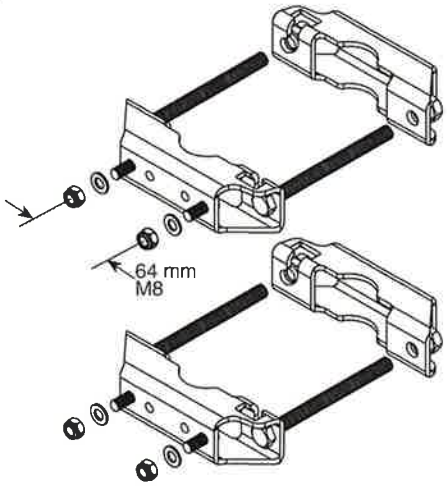
AISG Antenna Interface Standards Group

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

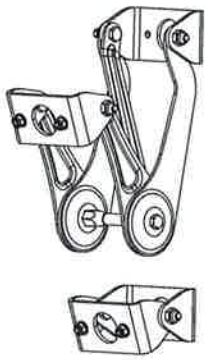
KATHREIN
SCALA DIVISION

800 10735V01

65° Single Band Panel Antenna, 6'



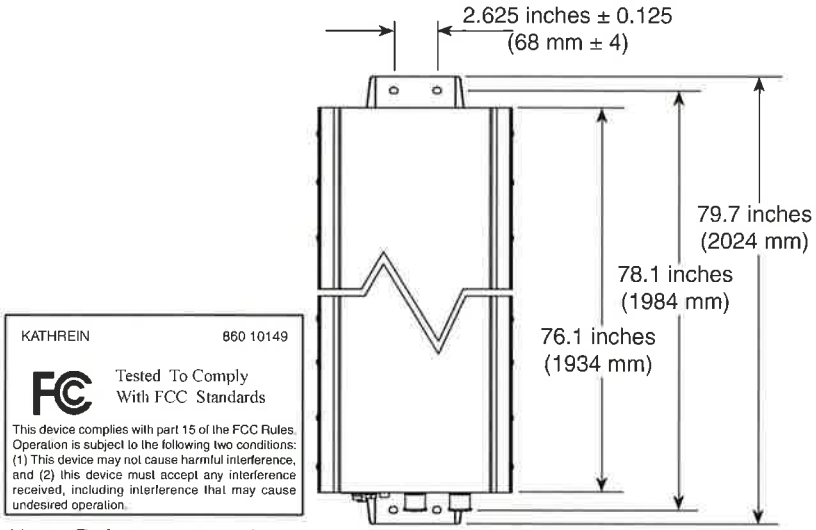
Mounting Brackets
for use with 2-point mount antennas
Mast dia. 2–4.5 inches (50–115 mm)
Weight: 4.4 lb (2 kg)



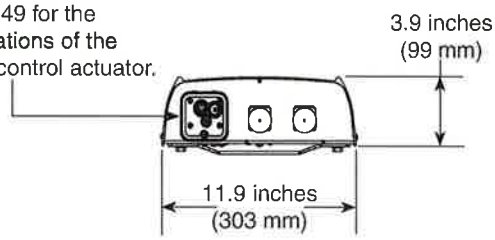
Mechanical Tilt Brackets
for use with 2-point mount antennas
Weight: 9.5 lb (4.3 kg)
(Model 850 10008)

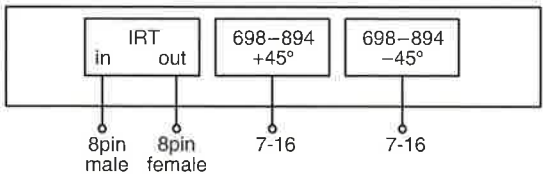
Mechanical specifications:

Weight	30.9 lb (14 kg) 35.3 lb (16 kg) clamps included
Dimensions H x W x D	76.1 x 11.9 x 3.9 inches (1934 x 303 x 99 mm)
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 203 lbf / 70 lbf / 232 lbf (900 N / 310 N / 1030 N) H (Heavy)
Wind survival rating*	150 mph (240 kph)
Shipping dimensions	81.1 x 12.4 x 4.5 inches (2060 x 315 x 115 mm)
Shipping weight	39.7 lb (18 kg)
Mounting bracket	2-point hot-dip galvanized with stainless steel hardware for 2 to 4.5 inch (50 to 115 mm) OD masts.



Note: Refer to part number 860 10149 for the specifications of the remote control actuator.





Order Information:

Model	Description
800 10735V01	Antenna with mounting bracket 0°–10° electrical downtilt
800 10735V01K	Antenna with mounting bracket and mechanical tilt bracket 0°–10° electrical downtilt

*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

All specifications are subject to change without notice. The latest specifications are available at www.kathrein-scala.com.

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

ATTACHMENT 2

	General	Power	Density					
Site Name: Newington 2								
Tower Height: Verizon @ 114'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*MetroPCS CDMA	3	727	87	0.1036	2135	1.0000	10.36%	
*MetroPCS LTE	1	1200	87	0.0570	2130	1.0000	5.70%	
*Clearwire	2	153	133	0.0062	2496	1.0000	0.62%	
*Clearwire	1	211	133	0.0043	11 GHz	1.0000	0.43%	
*Sprint CDMA/LTE	5	693	124	0.0810	1900	1.0000	8.10%	
*Sprint CDMA/LTE	1	390	124	0.0091	850	0.5667	1.61%	
*Nextel	9	100	135	0.0178	851	0.5673	3.13%	
*AT&T UMTS	2	565	105	0.0369	880	0.5867	6.28%	
*AT&T UMTS	2	875	105	0.0571	1900	1.0000	5.71%	
*AT&T GSM	1	283	105	0.0092	880	0.5867	1.57%	
*AT&T GSM	4	525	105	0.0685	1900	1.0000	6.85%	
*AT&T LTE	1	1313	105	0.0428	734	0.4893	8.75%	
*T-Mobile GSM/UMTS	2	12	95	0.0010	1950	1.0000	0.10%	
*T-Mobile UMTS	2	12	95	0.0010	2100	1.0000	0.10%	
*T-Mobile LTE	2	24	95	0.0019	2100	1.0000	0.19%	
Verizon cellular	**9**	**406**	**114**	**0.1011**	**869**	**0.5793**	**17.45%**	
Verizon PCS	**9**	**443**	**114**	**0.1103**	**1970**	**1.0000**	**11.03%**	
Verizon LTE	**1**	**1050**	**114**	**0.0291**	**698**	**0.4653**	**6.24%**	
Verizon AWS	**1**	**1750**	**114**	**0.0484**	**2145**	**1.0000**	**4.84%**	
								99.1%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

145-ft Existing Summit Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Newington 2

123 Costello Road
Newington, CT

Centek Project No. 14001.013

Date: January 17, 2014

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

Table of Contents

Introduction

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

The host tower is a 145-ft, four-section, eighteen sided, tapered monopole, originally designed and manufactured by PennSummit Tubular in October of 1997. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural report prepared by Paul J. Ford and Company; job no. 37513-2220 dated October 3, 2013.

Antenna and appurtenance information were obtained from the aforementioned PJF structural analysis report, visual verification from grade conducted by Centek personnel on January 17, 2014 and a Verizon RF data sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The bottom three vertical tower sections are slip joint connected and the top section is flange connected. The diameter of the pole (flat-flat) is 24.00-in at the top and 49.83-in at the base.

Verizon proposes the replacement of one (1) existing panel antenna with one (1) proposed panel antenna mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- CLEARWIRE (Existing):
  Antennas: Two (2) Andrew VHLP2.5 dishes and two (2) Dragonwave Horizon ODU's mounted with a RAD center elevation of ±139-ft above grade level.
- CLEARWIRE (Existing):
  Antennas: Three (3) Argus LLPX310R panel antennas, three (3) Samsung WiMAX DAP Heads and one (1) GPS mounted on one (1) low profile platform with a RAD center elevation of 135-ft above grade level
  Coax Cables: Three (3) 1/2" ∅ cables and six (6) 5/16" ∅ cables running within two (2) 2" flex conduits running on the inside of monopole
- SPRINT (Existing):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) Celwave IBC1900BB filters and three (3) Celwave 1900HG filters mounted on one (1) low profile platform with a RAD center elevation of 124-ft above grade level.
  Coax Cables: Three (3) 1-1/4" ∅ fiber cables running on the inside of monopole.
- SPRINT (Existing):
  Antennas: Six (6) ALU 1900 MHz RRH's and three (3) ALU 800 MHz RRH's flush mounted with a RAD center elevation of 122-ft above grade level.

- AT&T (Existing):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor flush mounted with a RAD center elevation of 105-ft above grade level.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running on the inside of monopole.
- AT&T (Existing):
  Antennas: Three (3) KMW AM-X-CD-16-65-00T panel antennas, six (6) Powerwave 7770 panel antennas, twelve (12) Powerwave LGP21401 TMA's mounted on one (1) low profile platform with a RAD center elevation of 105-ft above grade level.
  Coax Cables: Twelve (12) 1 5/8" ∅ coax cables running on the inside of monopole.
- T-MOBILE (Existing/Reserved):
  Antennas: Six (6) Ericsson AIR 21 panel antennas and three (3) Ericsson KRY 112 TMA's mounted on one (1) low profile platform with a RAD center elevation of 95-ft above grade level.
  Coax Cables: Twelve (12) 1 5/8" ∅ coax cables running on the inside of monopole and one (1) 1-5/8" ∅ fiber cable running on the exterior of monopole.
- METROPCS (Existing):
  Antennas: Three (3) Kathrein 742-213 panel antennas flush mounted with a RAD center elevation of 87-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the exterior of monopole.
- Unknown (Existing):
  Mount: Two (2) empty 3-ft standoff arms with an elevation of 80-ft above grade level.
- Unknown (Existing):
  GPS: One (1) GPS antenna mounted on a 3-ft standoff arm with a RAD center elevation of 77-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the exterior of monopole.
- Verizon (Existing to Remain):
  Antennas: Three (3) Antel BXA-171063-8CF panel antennas, two (2) Andrew LNX-6514DS-T4M panel antennas, three (3) Antel BXA-80063-4CF panel antennas, three (3) Antel BXA-185063-8CF panel antennas, six (6) RFS FD9R6004/2C-3L diplexers three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted to one (1) low profile platform with a RAD center elevation of 114-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables, one (1) 1-5/8" ∅ fiber cable and one (1) 1/2" ∅ coax cables running on the inside of the monopole.
- Verizon (Existing to Remove):
  Antennas: One (1) Andrew LNX-6514DS-T4M panel antenna mounted to one (1) low profile platform with a RAD center elevation of 114-ft above existing grade.
- **VERIZON (Proposed):**
  Antennas: One (1) Kathrein 800-10735 panel antenna mounted to one (1) low profile platform with a RAD center elevation of 114-ft above existing grade.

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 existing coax cables to be installed as indicated in this report.

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Newington; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F and Appendix K wind speeds are equal.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **81.0%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	0.00'-44.25'	81.0%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.0 ∅ x 25.5-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned structural report prepared by PJF. The base of the tower is connected to the foundation by means of (16) 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	26 kips
	Compression	37 kips
	Moment	2482 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	43.8%	**PASS**
	Lateral Deflection	0.48 in.[1]	**PASS**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Tension	5.0%	**PASS**
Flange Plate	Bending	2.0%	**PASS**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Bending	67.8%	**PASS**
Base Plate	Bending	69.2%	**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:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16694
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

General Description of Structural Analysis Program

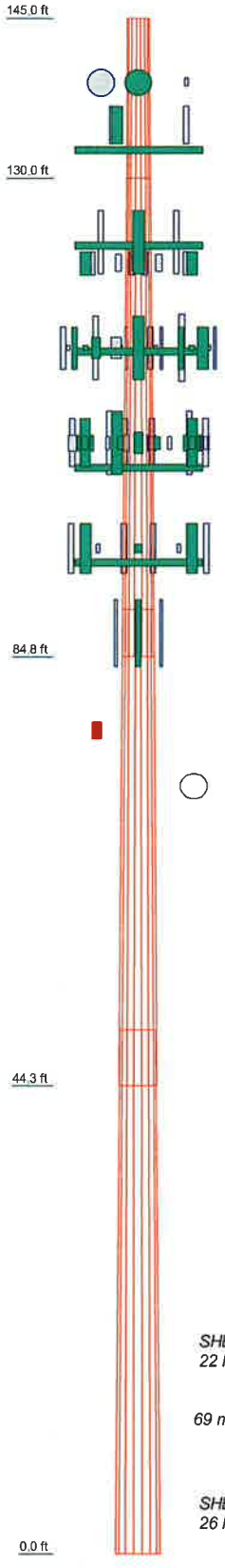
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

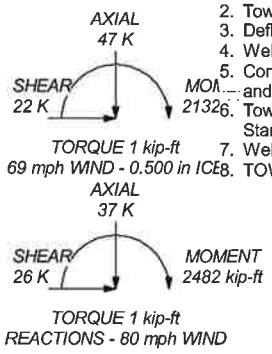
tnxTower Features:

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

Section	1	2	3	4
Length (ft)	15.000	45.250	45.000	49.500
Number of Sides	18	18	18	18
Thickness (in)	0.188	0.250	0.313	0.375
Socket Length (ft)		4.500	5.250	
Top Dia (in)	24.000	26.770	33.925	40.663
Bot Dia (in)	26.770	35.270	42.260	49.830
Grade	A572-65			
Weight (K)	0.8	3.8	5.7	9.0

Total Weight (K) 19.3





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Horizon ODU (Clearwire - Existing)	139	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	114
Horizon ODU (Clearwire - Existing)	139	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	114
VHLP2.5-10W (Clearwire - Existing)	139	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	114
VHLP2.5-10W (Clearwire - Existing)	139	RRH2x40-AWS (Verizon - Existing)	114
LLPX310R (Clearwire - Existing)	135	RRH2x40-AWS (Verizon - Existing)	114
TIMING 2000 (Clearwire - Existing)	135	RRH2x40-AWS (Verizon - Existing)	114
WiMAX DAP Head (Clearwire - Existing)	135	DB-T1-6Z-8AB-0Z (Verizon - Existing)	114
WiMAX DAP Head (Clearwire - Existing)	135	EEI Low Profile Platform (Verizon - Existing)	114
WiMAX DAP Head (Clearwire - Existing)	135	BXA-80063-4CF (Verizon - Existing)	114
LLPX310R (Clearwire - Existing)	135	BXA-171063-8CF (Verizon - Existing)	114
LLPX310R (Clearwire - Existing)	135	(2) RRUS-11 (ATT - Existing)	105
EEI Low Profile Platform (Clearwire - Existing)	133	Valmont Uni-Tri Bracket (ATT - Existing)	105
APXVSPP18-C-A20 w/ Mount (Sprint - Existing)	124	DC6-48-60-18-8F Surge Arrestor (ATT - Existing)	105
IBC1900BB-1 (Sprint - Existing)	124	(2) 7770.00 (ATT - Existing)	105
IBC1900BB-1 (Sprint - Existing)	124	AM-X-CD-16-65-00T-RET(72") (ATT - Existing)	105
IBC1900BB-1 (Sprint - Existing)	124	(2) 7770.00 (ATT - Existing)	105
IBC1900HG-2A (Sprint - Existing)	124	AM-X-CD-16-65-00T-RET(72") (ATT - Existing)	105
IBC1900HG-2A (Sprint - Existing)	124	(2) 7770.00 (ATT - Existing)	105
IBC1900HG-2A (Sprint - Existing)	124	AM-X-CD-16-65-00T-RET(72") (ATT - Existing)	105
EEI Low Profile Platform (Sprint - Existing)	124	(4) LGP21401 TMA (ATT - Existing)	105
APXVSPP18-C-A20 w/ Mount (Sprint - Existing)	124	(4) LGP21401 TMA (ATT - Existing)	105
APXVSPP18-C-A20 w/ Mount (Sprint - Existing)	124	(4) LGP21401 TMA (ATT - Existing)	105
(2) FD-RRH 4x45 1900 (Sprint - Existing)	122	(2) RRUS-11 (ATT - Existing)	105
FD-RRH 2x50 800 (Sprint - Existing)	122	(2) RRUS-11 (ATT - Existing)	105
FD-RRH 2x50 800 (Sprint - Existing)	122	EEI Low Profile Platform (ATT - Existing)	103
FD-RRH 2x50 800 (Sprint - Existing)	122	(2) AIR21 (T-Mobile - Existing)	95
Valmont Uni-Tri Bracket (Sprint - Existing)	122	KRY 112 TMA (T-Mobile - Existing)	95
(2) FD-RRH 4x45 1900 (Sprint - Existing)	122	KRY 112 TMA (T-Mobile - Existing)	95
(2) FD-RRH 4x45 1900 (Sprint - Existing)	122	KRY 112 TMA (T-Mobile - Existing)	95
LNX-6514DS-T4M (Verizon - Existing)	114	(2) AIR21 (T-Mobile - Existing)	95
BXA-185063-8CF (Verizon - Existing)	114	(2) AIR21 (T-Mobile - Existing)	95
BXA-80063-4CF (Verizon - Existing)	114	EEI Low Profile Platform (T-Mobile - Existing)	94
BXA-171063-8CF (Verizon - Existing)	114	742-213 (MetroPCS - Existing)	87
800-10735 (Verizon - Proposed)	114	Valmont Uni-Tri Bracket (MetroPCS - Existing)	87
BXA-185063-8CF (Verizon - Existing)	114	742-213 (MetroPCS - Existing)	87
BXA-80063-4CF (Verizon - Existing)	114	742-213 (MetroPCS - Existing)	87
BXA-171063-8CF (Verizon - Existing)	114	3' GPS Stand-off Mount (Empty)	80
LNX-6514DS-T4M (Verizon - Existing)	114	3' GPS Stand-off Mount (Empty)	80
BXA-185063-8CF (Verizon - Existing)	114	3' GPS Stand-off Mount	77
		GPS	77

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 81%

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

Job: 14001.013 - Newington 2		
Project: 145' Summit Monopole - 123 Costello Rd., Newington, CT		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 01/17/14	Scale: NTS
Path:		Dwg No. E-1

Tower Input Data

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

Basic wind speed of 80 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	145.000-130.000	15.000	0.000	18	24.000	26.770	0.188	0.750	A572-65 (65 ksi)
L2	130.000-84.750	45.250	4.500	18	26.770	35.270	0.250	1.000	A572-65 (65 ksi)
L3	84.750-44.250	45.000	5.250	18	33.925	42.260	0.313	1.250	A572-65 (65 ksi)

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
L4	44.250-0.000	49.500		18	40.663	49.830	0.375	1.500	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	24.370	14.171	1015.221	8.453	12.192	83.269	2031.778	7.087	3.894	20.768
	27.183	15.820	1412.320	9.437	13.599	103.853	2826.498	7.911	4.382	23.368
L2	27.183	21.044	1869.842	9.415	13.599	137.497	3742.145	10.524	4.272	17.086
	35.814	27.788	4305.591	12.432	17.917	240.305	8616.848	13.897	5.768	23.07
L3	35.294	33.339	4758.664	11.932	17.234	276.125	9523.590	16.673	5.421	17.346
	42.912	41.607	9249.380	14.891	21.468	430.843	18510.931	20.807	6.888	22.041
L4	42.277	47.952	9833.048	14.302	20.657	476.025	19679.034	23.981	6.497	17.324
	50.599	58.864	18188.893	17.557	25.314	718.541	36401.719	29.438	8.110	21.627

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 145.000-130.000				1	1	1		
L2 130.000-84.750				1	1	1		
L3 84.750-44.250				1	1	1		
L4 44.250-0.000				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 klf
LDF4-50A (1/2 FOAM) (Clearwire - Existing)	C	No	Inside Pole	133.000 - 0.000	3	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
9207 (5/16 FOEM) (Clearwire - Existing)	C	No	Inside Pole	133.000 - 0.000	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
2" Rigid Conduit (Clearwire - Existing)	C	No	Inside Pole	133.000 - 0.000	2	No Ice	0.000	0.003
						1/2" Ice	0.000	0.003
HYBRIFLEX 1-1/4" (Sprint - Existing)	C	No	Inside Pole	124.000 - 0.000	3	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
LDF7-50A (1-5/8 FOAM) (Verizon - Existing)	C	No	Inside Pole	114.000 - 0.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
LDF4-50A (1/2 FOAM) (Verizon - Existing)	C	No	Inside Pole	114.000 - 0.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	Inside Pole	114.000 - 0.000	1	No Ice	0.000	0.002
						1/2" Ice	0.000	0.002

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
LDF7-50A (1-5/8 FOAM) (AT&T - Existing)	C	No	Inside Pole	105.000 - 0.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
Fiber Trunk (AT&T - Existing)	C	No	Inside Pole	105.000 - 0.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
DC Trunk (AT&T - Existing)	C	No	Inside Pole	105.000 - 0.000	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
LDF7-50A (1-5/8 FOAM) (T-Mobile - Existing)	C	No	Inside Pole	94.000 - 0.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
LDF7-50A (1-5/8 FOAM) (T-Mobile - Existing)	C	No	CaAa (Out Of Face)	94.000 - 0.000	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.002
1 5/8 (MetroPCS - Existing)	C	No	CaAa (Out Of Face)	87.000 - 0.000	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (MetroPCS - Existing)	C	No	CaAa (Out Of Face)	87.000 - 0.000	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
LDF4-50A (1/2 FOAM)	C	No	CaAa (Out Of Face)	77.000 - 0.000	1	No Ice	0.063	0.000
						1/2" Ice	0.163	0.001

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	145.000-130.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.036
L2	130.000-84.750	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	2.277	1.383
L3	84.750-44.250	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	18.101	2.265
L4	44.250-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	20.311	2.476

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	145.000-130.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.036
L2	130.000-84.750	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	3.427	1.417
L3	84.750-44.250	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	29.476	2.716
L4	44.250-0.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	33.586	2.974

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LLPX310R	A	From Face	3.000	0.000	135.000	No Ice	4.830	1.945	0.029
(Clearwire - Existing)			2.000			1/2" Ice	5.183	2.214	0.055
			0.000						
LLPX310R	B	From Face	3.000	0.000	135.000	No Ice	4.830	1.945	0.029
(Clearwire - Existing)			2.000			1/2" Ice	5.183	2.214	0.055
			0.000						
LLPX310R	C	From Face	3.000	0.000	135.000	No Ice	4.830	1.945	0.029
(Clearwire - Existing)			2.000			1/2" Ice	5.183	2.214	0.055
			0.000						
Horizon ODU	A	From Face	3.000	0.000	139.000	No Ice	0.787	0.175	0.000
(Clearwire - Existing)			2.000			1/2" Ice	0.908	0.251	0.004
			0.000						
Horizon ODU	B	From Face	3.000	0.000	139.000	No Ice	0.787	0.175	0.000
(Clearwire - Existing)			2.000			1/2" Ice	0.908	0.251	0.004
			0.000						
TIMING 2000	A	From Face	3.000	0.000	135.000	No Ice	0.126	0.126	0.001
(Clearwire - Existing)			0.000			1/2" Ice	0.177	0.177	0.002
			0.000						
WiMAX DAP Head	A	From Face	3.000	0.000	135.000	No Ice	1.804	0.778	0.033
(Clearwire - Existing)			0.000			1/2" Ice	1.988	0.918	0.045
			0.000						
WiMAX DAP Head	B	From Face	3.000	0.000	135.000	No Ice	1.804	0.778	0.033
(Clearwire - Existing)			0.000			1/2" Ice	1.988	0.918	0.045
			0.000						
WiMAX DAP Head	C	From Face	3.000	0.000	135.000	No Ice	1.804	0.778	0.033
(Clearwire - Existing)			0.000			1/2" Ice	1.988	0.918	0.045
			0.000						
EEI Low Profile Platform	C	None		0.000	133.000	No Ice	22.500	22.500	1.500
(Clearwire - Existing)						1/2" Ice	28.200	28.200	2.250
APXVSPP18-C-A20 w/	A	From Face	3.000	0.000	124.000	No Ice	8.960	8.083	0.118
Mount			0.000			1/2" Ice	9.659	9.141	0.198
(Sprint - Existing)			0.000						
APXVSPP18-C-A20 w/	B	From Face	3.000	0.000	124.000	No Ice	8.960	8.083	0.118
Mount			0.000			1/2" Ice	9.659	9.141	0.198
(Sprint - Existing)			0.000						
APXVSPP18-C-A20 w/	C	From Face	3.000	0.000	124.000	No Ice	8.960	8.083	0.118
Mount			0.000			1/2" Ice	9.659	9.141	0.198
(Sprint - Existing)			0.000						
IBC1900BB-1	A	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000			1/2" Ice	1.273	0.647	0.030
			0.000						
IBC1900BB-1	B	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000			1/2" Ice	1.273	0.647	0.030
			0.000						
IBC1900BB-1	C	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000			1/2" Ice	1.273	0.647	0.030
			0.000						
IBC1900HG-2A	A	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000			1/2" Ice	1.273	0.647	0.030
			0.000						

tnxTower	Job: 14001.013 - Newington 2	Page: 5 of 23
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 145' Summit Monopole - 123 Costello Rd., Newington, CT	Date: 11:35:53 01/17/14
	Client: Verizon Wireless	Designed by: TJL

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
IBC1900HG-2A	B	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000 0.000			1/2" Ice	1.273	0.647	0.030
IBC1900HG-2A	C	From Face	3.000	0.000	124.000	No Ice	1.127	0.533	0.022
(Sprint - Existing)			0.000 0.000			1/2" Ice	1.273	0.647	0.030
EEI Low Profile Platform	C	None		0.000	124.000	No Ice	22.500	22.500	1.500
(Sprint - Existing)						1/2" Ice	28.200	28.200	2.250
(2) FD-RRH 4x45 1900	A	From Face	1.000	0.000	122.000	No Ice	2.705	2.781	0.060
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.944	3.022	0.084
(2) FD-RRH 4x45 1900	B	From Face	1.000	0.000	122.000	No Ice	2.705	2.781	0.060
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.944	3.022	0.084
(2) FD-RRH 4x45 1900	C	From Face	1.000	0.000	122.000	No Ice	2.705	2.781	0.060
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.944	3.022	0.084
FD-RRH 2x50 800	A	From Face	1.000	0.000	122.000	No Ice	2.401	2.254	0.064
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.613	2.460	0.086
FD-RRH 2x50 800	B	From Face	1.000	0.000	122.000	No Ice	2.401	2.254	0.064
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.613	2.460	0.086
FD-RRH 2x50 800	C	From Face	1.000	0.000	122.000	No Ice	2.401	2.254	0.064
(Sprint - Existing)			0.000 0.000			1/2" Ice	2.613	2.460	0.086
Valmont Uni-Tri Bracket	C	None		0.000	122.000	No Ice	1.750	1.750	0.290
(Sprint - Existing)						1/2" Ice	1.940	1.940	0.306
BXA-80063-4CF	A	From Face	3.500	0.000	114.000	No Ice	5.161	2.517	0.010
(Verizon - Existing)			-6.000 0.000			1/2" Ice	5.545	2.819	0.039
BXA-171063-8CF	A	From Face	3.500	0.000	114.000	No Ice	2.941	2.156	0.011
(Verizon - Existing)			-4.000 0.000			1/2" Ice	3.255	2.458	0.030
LNX-6514DS-T4M	A	From Face	3.500	0.000	114.000	No Ice	8.411	5.405	0.038
(Verizon - Existing)			0.000 0.000			1/2" Ice	8.964	5.863	0.089
BXA-185063-8CF	A	From Face	3.500	0.000	114.000	No Ice	2.944	1.794	0.010
(Verizon - Existing)			6.000 0.000			1/2" Ice	3.258	2.093	0.027
BXA-80063-4CF	B	From Face	3.500	0.000	114.000	No Ice	5.161	2.517	0.010
(Verizon - Existing)			-6.000 0.000			1/2" Ice	5.545	2.819	0.039
BXA-171063-8CF	B	From Face	3.500	0.000	114.000	No Ice	2.941	2.156	0.011
(Verizon - Existing)			-4.000 0.000			1/2" Ice	3.255	2.458	0.030
800-10735	B	From Face	3.500	0.000	114.000	No Ice	8.804	3.745	0.029
(Verizon - Proposed)			0.000 0.000			1/2" Ice	9.379	4.204	0.072
BXA-185063-8CF	B	From Face	3.500	0.000	114.000	No Ice	2.944	1.794	0.010
(Verizon - Existing)			6.000 0.000			1/2" Ice	3.258	2.093	0.027
BXA-80063-4CF	C	From Face	3.500	0.000	114.000	No Ice	5.161	2.517	0.010
(Verizon - Existing)			-6.000 0.000			1/2" Ice	5.545	2.819	0.039
BXA-171063-8CF	C	From Face	3.500	0.000	114.000	No Ice	2.941	2.156	0.011
(Verizon - Existing)			-4.000			1/2" Ice	3.255	2.458	0.030

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
			0.000						
LNX-6514DS-T4M	C	From Face	3.500	0.000	114.000	No Ice	8.411	5.405	0.038
(Verizon - Existing)			0.000			1/2" Ice	8.964	5.863	0.089
			0.000						
BXA-185063-8CF	C	From Face	3.500	0.000	114.000	No Ice	2.944	1.794	0.010
(Verizon - Existing)			6.000			1/2" Ice	3.258	2.093	0.027
			0.000						
(2) FD9R6004/2C-3L	A	From Face	3.500	0.000	114.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
(2) FD9R6004/2C-3L	B	From Face	3.500	0.000	114.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
(2) FD9R6004/2C-3L	C	From Face	3.500	0.000	114.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
RRH2x40-AWS	A	From Face	3.500	0.000	114.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	B	From Face	3.500	0.000	114.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	C	From Face	3.500	0.000	114.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
DB-T1-6Z-8AB-0Z	A	From Face	3.500	0.000	114.000	No Ice	5.600	2.333	0.044
(Verizon - Existing)			4.000			1/2" Ice	5.915	2.558	0.080
			0.000						
EEI Low Profile Platform	C	None		0.000	114.000	No Ice	22.500	22.500	1.500
(Verizon - Existing)						1/2" Ice	28.200	28.200	2.250
(2) RRUS-11	A	From Face	3.000	0.000	105.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-11	B	From Face	3.000	0.000	105.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-11	C	From Face	3.000	0.000	105.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
Valmont Uni-Tri Bracket	C	None		0.000	105.000	No Ice	1.750	1.750	0.290
(AT&T - Existing)						1/2" Ice	1.940	1.940	0.306
DC6-48-60-18-8F Surge	C	From Face	3.000	0.000	105.000	No Ice	2.228	2.228	0.020
Arrestor			0.000			1/2" Ice	2.447	2.447	0.039
(AT&T - Existing)			0.000						
(2) 7770.00	A	From Face	3.000	0.000	105.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
AM-X-CD-16-65-00T-RET(7	A	From Face	3.000	0.000	105.000	No Ice	8.260	4.642	0.050
2")			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Existing)			0.000						
(2) 7770.00	B	From Face	3.000	0.000	105.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
AM-X-CD-16-65-00T-RET(7	B	From Face	3.000	0.000	105.000	No Ice	8.260	4.642	0.050
2")			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Existing)			0.000						
(2) 7770.00	C	From Face	3.000	0.000	105.000	No Ice	5.882	2.928	0.035

tnxTower	Job: 14001.013 - Newington 2	Page: 7 of 23
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 145' Summit Monopole - 123 Costello Rd., Newington, CT	Date: 11:35:53 01/17/14
	Client: Verizon Wireless	Designed by: TJL

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
(AT&T - Existing)			0.000 0.000			1/2" Ice	6.314	3.273	0.068
AM-X-CD-16-65-00T-RET(72")	C	From Face	3.000 2.000	0.000	105.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096
(AT&T - Existing)			0.000						
(4) LGP21401 TMA	A	From Face	3.000	0.000	105.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
(4) LGP21401 TMA	B	From Face	3.000	0.000	105.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
(4) LGP21401 TMA	C	From Face	3.000	0.000	105.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
EEI Low Profile Platform	C	None		0.000	103.000	No Ice	22.500	22.500	1.500
(AT&T - Existing)						1/2" Ice	28.200	28.200	2.250
(2) AIR21	A	From Face	3.000	0.000	95.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	6.978	4.775	0.125
(2) AIR21	B	From Face	3.000	0.000	95.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	6.978	4.775	0.125
(2) AIR21	C	From Face	3.000	0.000	95.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	6.978	4.775	0.125
KRY 112 TMA	A	From Face	3.000	0.000	95.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	0.899	0.588	0.031
KRY 112 TMA	B	From Face	3.000	0.000	95.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	0.899	0.588	0.031
KRY 112 TMA	C	From Face	3.000	0.000	95.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	0.899	0.588	0.031
EEI Low Profile Platform	C	None		0.000	94.000	No Ice	22.500	22.500	1.500
(T-Mobile - Existing)						1/2" Ice	28.200	28.200	2.250
742-213	A	From Face	1.000	0.000	87.000	No Ice	5.169	2.991	0.020
(MetroPCS - Existing)			0.000 0.000			1/2" Ice	5.645	3.571	0.046
742-213	B	From Face	1.000	0.000	87.000	No Ice	5.169	2.991	0.020
(MetroPCS - Existing)			0.000 0.000			1/2" Ice	5.645	3.571	0.046
742-213	C	From Face	1.000	0.000	87.000	No Ice	5.169	2.991	0.020
(MetroPCS - Existing)			0.000 0.000			1/2" Ice	5.645	3.571	0.046
Valmont Uni-Tri Bracket	C	None		0.000	87.000	No Ice	1.750	1.750	0.290
(MetroPCS - Existing)						1/2" Ice	1.940	1.940	0.306
3' GPS Stand-off Mount	C	None		0.000	77.000	No Ice	2.450	2.450	0.051
						1/2" Ice	3.980	3.980	0.075
GPS	C	From Leg	3.000	0.000	77.000	No Ice	1.000	1.000	0.010
			0.000 0.000			1/2" Ice	1.500	1.500	0.015
3' GPS Stand-off Mount	A	None		0.000	80.000	No Ice	2.450	2.450	0.051
(Empty)						1/2" Ice	3.980	3.980	0.075
3' GPS Stand-off Mount	B	None		0.000	80.000	No Ice	2.450	2.450	0.051
(Empty)						1/2" Ice	3.980	3.980	0.075

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft °	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
VHLP2.5-10W (Clearwire - Existing)	C	Paraboloid w/Radome	From Face	3.000 0.000 0.000	Worst		139.000	2.500	No Ice 1/2" Ice	4.910 5.240	0.049 0.076
VHLP2.5-10W (Clearwire - Existing)	A	Paraboloid w/Radome	From Face	3.000 0.000 0.000	Worst		139.000	2.500	No Ice 1/2" Ice	4.910 5.240	0.049 0.076

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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	137.364	1.503	0.025	31.731	A	0.000	31.731	31.731	100.00	0.000	0.000
145.000-130.000					B	0.000	31.731		100.00	0.000	0.000
					C	0.000	31.731		100.00	0.000	0.000
L2	106.682	1.398	0.023	116.971	A	0.000	116.971	116.971	100.00	0.000	0.000
130.000-84.750					B	0.000	116.971		100.00	0.000	0.000
					C	0.000	116.971		100.00	0.000	2.277
L3	64.300	1.21	0.020	129.968	A	0.000	129.968	129.968	100.00	0.000	0.000
84.750-44.250					B	0.000	129.968		100.00	0.000	0.000
					C	0.000	129.968		100.00	0.000	18.101
L4	21.465	1	0.016	168.638	A	0.000	168.638	168.638	100.00	0.000	0.000
44.250-0.000					B	0.000	168.638		100.00	0.000	0.000
					C	0.000	168.638		100.00	0.000	20.311

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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	137.364	1.503	0.018	0.500	32.981	A	0.000	32.981	32.981	100.00	0.000	0.000
145.000-130.000						B	0.000	32.981		100.00	0.000	0.000
						C	0.000	32.981		100.00	0.000	0.000
L2	106.682	1.398	0.017	0.500	120.742	A	0.000	120.742	120.742	100.00	0.000	0.000
130.000-84.750						B	0.000	120.742		100.00	0.000	0.000
						C	0.000	120.742		100.00	0.000	3.427
L3	64.300	1.21	0.015	0.500	133.343	A	0.000	133.343	133.343	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	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
84.750-44.250						B	0.000	133.343		100.00	0.000	0.000
						C	0.000	133.343		100.00	0.000	29.476
L4 44.250-0.000	21.465	1	0.012	0.500	172.326	A	0.000	172.326	172.326	100.00	0.000	0.000
						B	0.000	172.326		100.00	0.000	0.000
						C	0.000	172.326		100.00	0.000	33.586

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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	137.364	1.503	0.010	31.731	A	0.000	31.731	31.731	100.00	0.000	0.000
145.000-130.0					B	0.000	31.731		100.00	0.000	0.000
00					C	0.000	31.731		100.00	0.000	0.000
L2	106.682	1.398	0.009	116.971	A	0.000	116.971	116.971	100.00	0.000	0.000
130.000-84.75					B	0.000	116.971		100.00	0.000	0.000
0					C	0.000	116.971		100.00	0.000	2.277
L3	64.300	1.21	0.008	129.968	A	0.000	129.968	129.968	100.00	0.000	0.000
84.750-44.250					B	0.000	129.968		100.00	0.000	0.000
					C	0.000	129.968		100.00	0.000	18.101
L4	21.465	1	0.006	168.638	A	0.000	168.638	168.638	100.00	0.000	0.000
44.250-0.000					B	0.000	168.638		100.00	0.000	0.000
					C	0.000	168.638		100.00	0.000	20.311

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.858	0.057	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	3.026	0.067	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	3.421	0.084	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	3.598	0.081	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	737.880 kip-ft	10.903		

tnxTower	Job: 14001.013 - Newington 2	Page: 10 of 23
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 145' Summit Monopole - 123 Costello Rd., Newington, CT	Date: 11:35:53 01/17/14
	Client: Verizon Wireless	Designed by: TJL

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.858	0.057	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	3.026	0.067	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	3.421	0.084	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	3.598	0.081	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	737.880 kip-ft	10.903		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.858	0.057	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	3.026	0.067	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	3.421	0.084	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	3.598	0.081	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	737.880 kip-ft	10.903		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.858	0.057	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	3.026	0.067	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	3.421	0.084	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	3.598	0.081	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	737.880 kip-ft	10.903		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.036	1.005	A	1	0.65	1	1	1	32.981	0.669	0.045	C
145.000-130.0			B	1	0.65	1	1	1	32.981			
00			C	1	0.65	1	1	1	32.981			
L2	1.417	4.640	A	1	0.65	1	1	1	120.742	2.374	0.052	C
130.000-84.75			B	1	0.65	1	1	1	120.742			
0			C	1	0.65	1	1	1	120.742			
L3	2.716	6.713	A	1	0.65	1	1	1	133.343	2.905	0.072	C
84.750-44.250			B	1	0.65	1	1	1	133.343			
			C	1	0.65	1	1	1	133.343			
L4	2.974	10.259	A	1	0.65	1	1	1	172.326	3.024	0.068	C
44.250-0.000			B	1	0.65	1	1	1	172.326			
			C	1	0.65	1	1	1	172.326			
Sum Weight:	7.143	22.616						OTM	596.833 kip-ft	8.972		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.036	1.005	A	1	0.65	1	1	1	32.981	0.669	0.045	C
145.000-130.0			B	1	0.65	1	1	1	32.981			
00			C	1	0.65	1	1	1	32.981			
L2	1.417	4.640	A	1	0.65	1	1	1	120.742	2.374	0.052	C
130.000-84.75			B	1	0.65	1	1	1	120.742			
0			C	1	0.65	1	1	1	120.742			
L3	2.716	6.713	A	1	0.65	1	1	1	133.343	2.905	0.072	C
84.750-44.250			B	1	0.65	1	1	1	133.343			
			C	1	0.65	1	1	1	133.343			
L4	2.974	10.259	A	1	0.65	1	1	1	172.326	3.024	0.068	C
44.250-0.000			B	1	0.65	1	1	1	172.326			
			C	1	0.65	1	1	1	172.326			
Sum Weight:	7.143	22.616						OTM	596.833 kip-ft	8.972		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	1.005	A	1	0.65	1	1	1	32.981	0.669	0.045	C
145.000-130.0			B	1	0.65	1	1	1	32.981			
00			C	1	0.65	1	1	1	32.981			
L2	1.417	4.640	A	1	0.65	1	1	1	120.742	2.374	0.052	C
130.000-84.75			B	1	0.65	1	1	1	120.742			
0			C	1	0.65	1	1	1	120.742			
L3	2.716	6.713	A	1	0.65	1	1	1	133.343	2.905	0.072	C
84.750-44.250			B	1	0.65	1	1	1	133.343			
			C	1	0.65	1	1	1	133.343			
L4	2.974	10.259	A	1	0.65	1	1	1	172.326	3.024	0.068	C
44.250-0.000			B	1	0.65	1	1	1	172.326			
			C	1	0.65	1	1	1	172.326			
Sum Weight:	7.143	22.616						OTM	596.833 kip-ft	8.972		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	1.005	A	1	0.65	1	1	1	32.981	0.669	0.045	C
145.000-130.0			B	1	0.65	1	1	1	32.981			
00			C	1	0.65	1	1	1	32.981			
L2	1.417	4.640	A	1	0.65	1	1	1	120.742	2.374	0.052	C
130.000-84.75			B	1	0.65	1	1	1	120.742			
0			C	1	0.65	1	1	1	120.742			
L3	2.716	6.713	A	1	0.65	1	1	1	133.343	2.905	0.072	C
84.750-44.250			B	1	0.65	1	1	1	133.343			
			C	1	0.65	1	1	1	133.343			
L4	2.974	10.259	A	1	0.65	1	1	1	172.326	3.024	0.068	C
44.250-0.000			B	1	0.65	1	1	1	172.326			
			C	1	0.65	1	1	1	172.326			
Sum Weight:	7.143	22.616						OTM	596.833 kip-ft	8.972		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.335	0.022	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	1.182	0.026	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	1.336	0.033	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	1.405	0.032	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	288.234 kip-ft	4.259		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.335	0.022	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	1.182	0.026	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	1.336	0.033	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	1.405	0.032	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	288.234 kip-ft	4.259		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.335	0.022	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	1.182	0.026	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	1.336	0.033	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	1.405	0.032	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	288.234	4.259		

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2 kip-ft	F K	w klf	Ctrl. Face

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.036	0.765	A	1	0.65	1	1	1	31.731	0.335	0.022	C
145.000-130.0			B	1	0.65	1	1	1	31.731			
00			C	1	0.65	1	1	1	31.731			
L2	1.383	3.759	A	1	0.65	1	1	1	116.971	1.182	0.026	C
130.000-84.75			B	1	0.65	1	1	1	116.971			
0			C	1	0.65	1	1	1	116.971			
L3	2.265	5.738	A	1	0.65	1	1	1	129.968	1.336	0.033	C
84.750-44.250			B	1	0.65	1	1	1	129.968			
			C	1	0.65	1	1	1	129.968			
L4	2.476	8.996	A	1	0.65	1	1	1	168.638	1.405	0.032	C
44.250-0.000			B	1	0.65	1	1	1	168.638			
			C	1	0.65	1	1	1	168.638			
Sum Weight:	6.159	19.259						OTM	288.234 kip-ft	4.259		

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	19.259					
Bracing Weight	0.000					
Total Member Self-Weight	19.259			-0.030	0.344	
Total Weight	37.195			-0.030	0.344	
Wind 0 deg - No Ice		-0.021	-25.591	-2381.914	2.707	-0.916
Wind 30 deg - No Ice		12.843	-22.152	-2061.620	-1196.312	-0.823
Wind 45 deg - No Ice		18.174	-18.081	-1682.605	-1693.207	-0.690
Wind 60 deg - No Ice		22.266	-12.778	-1188.925	-2074.688	-0.511
Wind 90 deg - No Ice		25.722	0.021	2.333	-2397.061	-0.061
Wind 120 deg - No Ice		22.286	12.814	1192.959	-2077.051	0.405
Wind 135 deg - No Ice		18.203	18.111	1685.887	-1696.548	0.604
Wind 150 deg - No Ice		12.879	22.173	2063.924	-1200.405	0.762
Wind 180 deg - No Ice		0.021	25.591	2381.854	-2.019	0.916
Wind 210 deg - No Ice		-12.843	22.152	2061.561	1197.000	0.823
Wind 225 deg - No Ice		-18.174	18.081	1682.546	1693.894	0.690
Wind 240 deg - No Ice		-22.266	12.778	1188.866	2075.376	0.511
Wind 270 deg - No Ice		-25.722	-0.021	-2.392	2397.749	0.061
Wind 300 deg - No Ice		-22.286	-12.814	-1193.018	2077.739	-0.405
Wind 315 deg - No Ice		-18.203	-18.111	-1685.947	1697.236	-0.604
Wind 330 deg - No Ice		-12.879	-22.173	-2063.983	1201.092	-0.762
Member Ice	3.358					
Total Weight Ice	47.411			-0.095	0.557	

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 0 deg - Ice		-0.016	-21.706	-2019.509	2.433	-0.776
Wind 30 deg - Ice		10.889	-18.790	-1748.021	-1013.538	-0.688
Wind 45 deg - Ice		15.408	-15.337	-1426.710	-1434.561	-0.571
Wind 60 deg - Ice		18.877	-10.839	-1008.178	-1757.783	-0.415
Wind 90 deg - Ice		21.807	0.016	1.781	-2030.882	-0.031
Wind 120 deg - Ice		18.894	10.867	1011.237	-1759.658	0.361
Wind 135 deg - Ice		15.431	15.360	1429.173	-1437.213	0.526
Wind 150 deg - Ice		10.918	18.806	1749.707	-1016.786	0.656
Wind 180 deg - Ice		0.016	21.706	2019.320	-1.318	0.776
Wind 210 deg - Ice		-10.889	18.790	1747.832	1014.653	0.688
Wind 225 deg - Ice		-15.408	15.337	1426.521	1435.676	0.571
Wind 240 deg - Ice		-18.877	10.839	1007.988	1758.898	0.415
Wind 270 deg - Ice		-21.807	-0.016	-1.970	2031.997	0.031
Wind 300 deg - Ice		-18.894	-10.867	-1011.426	1760.773	-0.361
Wind 315 deg - Ice		-15.431	-15.360	-1429.362	1438.328	-0.526
Wind 330 deg - Ice		-10.918	-18.806	-1749.897	1017.901	-0.656
Total Weight	37.195			-0.030	0.344	
Wind 0 deg - Service		-0.008	-9.997	-930.453	1.267	-0.358
Wind 30 deg - Service		5.017	-8.653	-805.338	-467.100	-0.322
Wind 45 deg - Service		7.099	-7.063	-657.286	-661.199	-0.270
Wind 60 deg - Service		8.697	-4.991	-464.442	-810.216	-0.199
Wind 90 deg - Service		10.048	0.008	0.893	-936.142	-0.024
Wind 120 deg - Service		8.706	5.005	465.981	-811.139	0.158
Wind 135 deg - Service		7.110	7.074	658.532	-662.505	0.236
Wind 150 deg - Service		5.031	8.661	806.202	-468.699	0.298
Wind 180 deg - Service		0.008	9.997	930.394	-0.579	0.358
Wind 210 deg - Service		-5.017	8.653	805.279	467.788	0.322
Wind 225 deg - Service		-7.099	7.063	657.227	661.887	0.270
Wind 240 deg - Service		-8.697	4.991	464.383	810.903	0.199
Wind 270 deg - Service		-10.048	-0.008	-0.953	936.830	0.024
Wind 300 deg - Service		-8.706	-5.005	-466.041	811.826	-0.158
Wind 315 deg - Service		-7.110	-7.074	-658.591	663.192	-0.236
Wind 330 deg - Service		-5.031	-8.661	-806.261	469.386	-0.298

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp

Comb. No.	Description
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	145 - 130	Pole	Max Tension	14	0.000	-0.000	0.000
			Max. Compression	18	-3.753	0.264	-0.132
			Max. Mx	14	-2.393	16.650	-0.074
			Max. My	10	-2.396	0.140	-16.344
			Max. Vy	14	-2.946	16.650	-0.074
			Max. Vx	10	2.921	0.140	-16.344
			Max. Torque	17			0.667
L2	130 - 84.75	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-23.407	0.499	0.128
			Max. Mx	14	-15.626	460.327	0.586
			Max. My	2	-15.641	0.832	456.107
			Max. Vy	14	-18.484	460.327	0.586
			Max. Vx	2	-18.349	0.832	456.107
			Max. Torque	3			0.927
L3	84.75 - 44.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-32.954	0.558	0.095
			Max. Mx	14	-23.977	1286.729	1.431
			Max. My	2	-23.986	1.756	1277.097
			Max. Vy	14	-22.459	1286.729	1.431
			Max. Vx	2	-22.325	1.756	1277.097
			Max. Torque	10			-0.922

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L4	44.25 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-47.411	0.558	0.095
			Max. Mx	14	-37.175	2481.645	2.482
			Max. My	2	-37.175	2.813	2465.508
			Max. Vy	14	-25.747	2481.645	2.482
			Max. Vx	2	-25.619	2.813	2465.508
			Max. Torque	10			-0.921

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	47.411	0.000	0.000
	Max. H_x	14	37.195	25.718	0.021
	Max. H_z	2	37.195	0.021	25.590
	Max. M_x	2	2465.508	0.021	25.590
	Max. M_z	6	2480.916	-25.718	-0.021
	Max. Torsion	2	0.919	0.021	25.590
	Min. Vert	14	37.195	25.718	0.021
	Min. H_x	6	37.195	-25.718	-0.021
	Min. H_z	10	37.195	-0.021	-25.590
	Min. M_x	10	-2465.446	-0.021	-25.590
	Min. M_z	14	-2481.645	25.718	0.021
	Min. Torsion	10	-0.920	-0.021	-25.590

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	37.195	-0.000	0.000	-0.030	0.344	0.000
Dead+Wind 0 deg - No Ice	37.195	-0.021	-25.590	-2465.508	2.812	-0.919
Dead+Wind 30 deg - No Ice	37.195	12.843	-22.152	-2134.155	-1238.422	-0.820
Dead+Wind 45 deg - No Ice	37.195	18.173	-18.081	-1741.798	-1752.806	-0.684
Dead+Wind 60 deg - No Ice	37.195	22.265	-12.778	-1230.745	-2147.711	-0.501
Dead+Wind 90 deg - No Ice	37.195	25.718	0.021	2.420	-2480.916	-0.047
Dead+Wind 120 deg - No Ice	37.195	22.286	12.814	1234.925	-2150.156	0.419
Dead+Wind 135 deg - No Ice	37.195	18.203	18.110	1745.197	-1756.266	0.617
Dead+Wind 150 deg - No Ice	37.195	12.879	22.173	2136.538	-1242.664	0.773
Dead+Wind 180 deg - No Ice	37.195	0.021	25.590	2465.446	-2.090	0.920
Dead+Wind 210 deg - No Ice	37.195	-12.843	22.152	2134.096	1239.146	0.820
Dead+Wind 225 deg - No Ice	37.195	-18.173	18.081	1741.740	1753.532	0.683
Dead+Wind 240 deg - No Ice	37.195	-22.265	12.778	1230.687	2148.439	0.500
Dead+Wind 270 deg - No Ice	37.195	-25.718	-0.021	-2.482	2481.645	0.047
Dead+Wind 300 deg - No Ice	37.195	-22.286	-12.814	-1234.991	2150.884	-0.418
Dead+Wind 315 deg - No Ice	37.195	-18.203	-18.110	-1745.263	1756.993	-0.616
Dead+Wind 330 deg - No Ice	37.195	-12.879	-22.173	-2136.604	1243.388	-0.772
Dead+Ice+Temp	47.411	-0.000	-0.000	-0.095	0.558	0.000
Dead+Wind 0 deg+Ice+Temp	47.411	-0.016	-21.705	-2118.778	2.578	-0.783
Dead+Wind 30 deg+Ice+Temp	47.411	10.889	-18.789	-1834.043	-1063.422	-0.686
Dead+Wind 45 deg+Ice+Temp	47.411	15.408	-15.337	-1496.927	-1505.185	-0.564
Dead+Wind 60 deg+Ice+Temp	47.411	18.877	-10.839	-1057.784	-1844.307	-0.404

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 90 deg+Ice+Temp	47.411	21.806	0.016	1.871	-2130.728	-0.014
Dead+Wind 120 deg+Ice+Temp	47.411	18.893	10.867	1060.995	-1846.277	0.380
Dead+Wind 135 deg+Ice+Temp	47.411	15.431	15.360	1499.509	-1507.973	0.544
Dead+Wind 150 deg+Ice+Temp	47.411	10.918	18.806	1835.806	-1066.839	0.672
Dead+Wind 180 deg+Ice+Temp	47.411	0.016	21.705	2118.572	-1.370	0.784
Dead+Wind 210 deg+Ice+Temp	47.411	-10.889	18.789	1833.839	1064.630	0.685
Dead+Wind 225 deg+Ice+Temp	47.411	-15.408	15.337	1496.724	1506.396	0.564
Dead+Wind 240 deg+Ice+Temp	47.411	-18.877	10.839	1057.581	1845.520	0.403
Dead+Wind 270 deg+Ice+Temp	47.411	-21.806	-0.016	-2.077	2131.942	0.014
Dead+Wind 300 deg+Ice+Temp	47.411	-18.893	-10.867	-1061.204	1847.490	-0.380
Dead+Wind 315 deg+Ice+Temp	47.411	-15.431	-15.360	-1499.719	1509.184	-0.544
Dead+Wind 330 deg+Ice+Temp	47.411	-10.918	-18.806	-1836.016	1068.047	-0.671
Dead+Wind 0 deg - Service	37.195	-0.008	-9.995	-963.644	1.324	-0.361
Dead+Wind 30 deg - Service	37.195	5.016	-8.653	-834.164	-483.818	-0.322
Dead+Wind 45 deg - Service	37.195	7.099	-7.062	-680.811	-684.870	-0.268
Dead+Wind 60 deg - Service	37.195	8.697	-4.991	-481.065	-839.223	-0.197
Dead+Wind 90 deg - Service	37.195	10.046	0.008	0.926	-969.545	-0.019
Dead+Wind 120 deg - Service	37.195	8.705	5.005	482.660	-840.181	0.164
Dead+Wind 135 deg - Service	37.195	7.110	7.074	682.102	-686.224	0.242
Dead+Wind 150 deg - Service	37.195	5.030	8.661	835.058	-485.478	0.303
Dead+Wind 180 deg - Service	37.195	0.008	9.995	963.580	-0.592	0.361
Dead+Wind 210 deg - Service	37.195	-5.016	8.653	834.101	484.550	0.322
Dead+Wind 225 deg - Service	37.195	-7.099	7.062	680.748	685.602	0.268
Dead+Wind 240 deg - Service	37.195	-8.697	4.991	481.001	839.955	0.197
Dead+Wind 270 deg - Service	37.195	-10.046	-0.008	-0.990	970.278	0.019
Dead+Wind 300 deg - Service	37.195	-8.705	-5.005	-482.724	840.913	-0.164
Dead+Wind 315 deg - Service	37.195	-7.110	-7.074	-682.166	686.956	-0.242
Dead+Wind 330 deg - Service	37.195	-5.030	-8.661	-835.122	486.210	-0.303

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-37.195	0.000	0.000	37.195	0.000	0.000%
2	-0.021	-37.195	-25.591	0.021	37.195	25.590	0.004%
3	12.843	-37.195	-22.152	-12.843	37.195	22.152	0.000%
4	18.174	-37.195	-18.081	-18.173	37.195	18.081	0.000%
5	22.266	-37.195	-12.778	-22.265	37.195	12.778	0.000%
6	25.722	-37.195	0.021	-25.718	37.195	-0.021	0.009%
7	22.286	-37.195	12.814	-22.286	37.195	-12.814	0.000%
8	18.203	-37.195	18.111	-18.203	37.195	-18.110	0.000%
9	12.879	-37.195	22.173	-12.879	37.195	-22.173	0.000%
10	0.021	-37.195	25.591	-0.021	37.195	-25.590	0.004%
11	-12.843	-37.195	22.152	12.843	37.195	-22.152	0.000%
12	-18.174	-37.195	18.081	18.173	37.195	-18.081	0.000%
13	-22.266	-37.195	12.778	22.265	37.195	-12.778	0.000%
14	-25.722	-37.195	-0.021	25.718	37.195	0.021	0.009%
15	-22.286	-37.195	-12.814	22.286	37.195	12.814	0.000%
16	-18.203	-37.195	-18.111	18.203	37.195	18.110	0.000%
17	-12.879	-37.195	-22.173	12.879	37.195	22.173	0.000%
18	0.000	-47.411	0.000	0.000	47.411	0.000	0.000%
19	-0.016	-47.411	-21.706	0.016	47.411	21.705	0.002%
20	10.889	-47.411	-18.790	-10.889	47.411	18.789	0.000%
21	15.408	-47.411	-15.337	-15.408	47.411	15.337	0.000%
22	18.877	-47.411	-10.839	-18.877	47.411	10.839	0.000%
23	21.807	-47.411	0.016	-21.806	47.411	-0.016	0.002%
24	18.894	-47.411	10.867	-18.893	47.411	-10.867	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
25	15.431	-47.411	15.360	-15.431	47.411	-15.360	0.000%
26	10.918	-47.411	18.806	-10.918	47.411	-18.806	0.000%
27	0.016	-47.411	21.706	-0.016	47.411	-21.705	0.002%
28	-10.889	-47.411	18.790	10.889	47.411	-18.789	0.000%
29	-15.408	-47.411	15.337	15.408	47.411	-15.337	0.000%
30	-18.877	-47.411	10.839	18.877	47.411	-10.839	0.000%
31	-21.807	-47.411	-0.016	21.806	47.411	0.016	0.002%
32	-18.894	-47.411	-10.867	18.893	47.411	10.867	0.000%
33	-15.431	-47.411	-15.360	15.431	47.411	15.360	0.000%
34	-10.918	-47.411	-18.806	10.918	47.411	18.806	0.000%
35	-0.008	-37.195	-9.997	0.008	37.195	9.995	0.004%
36	5.017	-37.195	-8.653	-5.016	37.195	8.653	0.002%
37	7.099	-37.195	-7.063	-7.099	37.195	7.062	0.002%
38	8.697	-37.195	-4.991	-8.697	37.195	4.991	0.002%
39	10.048	-37.195	0.008	-10.046	37.195	-0.008	0.004%
40	8.706	-37.195	5.005	-8.705	37.195	-5.005	0.002%
41	7.110	-37.195	7.074	-7.110	37.195	-7.074	0.002%
42	5.031	-37.195	8.661	-5.030	37.195	-8.661	0.002%
43	0.008	-37.195	9.997	-0.008	37.195	-9.995	0.004%
44	-5.017	-37.195	8.653	5.016	37.195	-8.653	0.002%
45	-7.099	-37.195	7.063	7.099	37.195	-7.062	0.002%
46	-8.697	-37.195	4.991	8.697	37.195	-4.991	0.002%
47	-10.048	-37.195	-0.008	10.046	37.195	0.008	0.004%
48	-8.706	-37.195	-5.005	8.705	37.195	5.005	0.002%
49	-7.110	-37.195	-7.074	7.110	37.195	7.074	0.002%
50	-5.031	-37.195	-8.661	5.030	37.195	8.661	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	15	0.00006105	0.00010614
3	Yes	18	0.00000001	0.00012577
4	Yes	18	0.00000001	0.00014878
5	Yes	18	0.00000001	0.00013180
6	Yes	14	0.00013224	0.00013518
7	Yes	18	0.00000001	0.00013274
8	Yes	18	0.00000001	0.00014959
9	Yes	18	0.00000001	0.00012644
10	Yes	15	0.00006106	0.00010127
11	Yes	18	0.00000001	0.00013334
12	Yes	18	0.00000001	0.00014895
13	Yes	18	0.00000001	0.00012782
14	Yes	14	0.00013223	0.00013491
15	Yes	18	0.00000001	0.00012842
16	Yes	18	0.00000001	0.00014976
17	Yes	18	0.00000001	0.00013420
18	Yes	6	0.00000001	0.00000001
19	Yes	16	0.00004441	0.00013204
20	Yes	18	0.00000001	0.00013808
21	Yes	19	0.00000001	0.00007426
22	Yes	18	0.00000001	0.00014278
23	Yes	16	0.00004440	0.00012683
24	Yes	18	0.00000001	0.00014364
25	Yes	19	0.00000001	0.00007460

26	Yes	18	0.00000001	0.00013868
27	Yes	16	0.00004441	0.00013134
28	Yes	18	0.00000001	0.00014421
29	Yes	19	0.00000001	0.00007443
30	Yes	18	0.00000001	0.00013987
31	Yes	16	0.00004439	0.00012695
32	Yes	18	0.00000001	0.00014049
33	Yes	19	0.00000001	0.00007481
34	Yes	18	0.00000001	0.00014509
35	Yes	14	0.00013532	0.00007283
36	Yes	15	0.00000001	0.00008085
37	Yes	15	0.00000001	0.00010007
38	Yes	15	0.00000001	0.00009209
39	Yes	14	0.00013532	0.00006596
40	Yes	15	0.00000001	0.00009306
41	Yes	15	0.00000001	0.00010078
42	Yes	15	0.00000001	0.00008130
43	Yes	14	0.00013532	0.00007243
44	Yes	15	0.00000001	0.00009560
45	Yes	15	0.00000001	0.00010039
46	Yes	15	0.00000001	0.00008426
47	Yes	14	0.00013531	0.00006605
48	Yes	15	0.00000001	0.00008456
49	Yes	15	0.00000001	0.00010112
50	Yes	15	0.00000001	0.00009643

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 130	29.334	47	1.522	0.003
L2	130 - 84.75	24.556	47	1.517	0.003
L3	89.25 - 44.25	12.348	47	1.260	0.001
L4	49.5 - 0	3.889	47	0.713	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.000	VHLP2.5-10W	47	27.420	1.523	0.003	137325
135.000	LLPX310R	47	26.146	1.522	0.003	82395
133.000	EEI Low Profile Platform	47	25.509	1.520	0.003	67969
124.000	APXVSPP18-C-A20 w/ Mount	47	22.658	1.503	0.002	23651
122.000	(2) FD-RRH 4x45 1900	47	22.028	1.497	0.002	19874
114.000	BXA-80063-4CF	47	19.539	1.462	0.002	12126
105.000	(2) RRUS-11	47	16.815	1.405	0.002	8429
103.000	EEI Low Profile Platform	47	16.224.	1.389	0.002	7894
95.000	(2) AIR21	47	13.926	1.319	0.001	6296
94.000	EEI Low Profile Platform	47	13.647	1.310	0.001	6140
87.000	742-213	47	11.750	1.235	0.001	5246
80.000	3' GPS Stand-off Mount	47	9.964	1.150	0.001	4594
77.000	3' GPS Stand-off Mount	47	9.238	1.111	0.001	4362

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 130	74.937	14	3.888	0.008
L2	130 - 84.75	62.741	14	3.874	0.007
L3	89.25 - 44.25	31.562	14	3.221	0.003
L4	49.5 - 0	9.944	14	1.824	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.000	VHLP2.5-10W	14	70.051	3.890	0.008	55378
135.000	LLPX310R	14	66.798	3.887	0.007	33226
133.000	EEI Low Profile Platform	14	65.174	3.884	0.007	27397
124.000	APXVSPP18-C-A20 w/ Mount	14	57.893	3.840	0.006	9401
122.000	(2) FD-RRH 4x45 1900	14	56.286	3.824	0.006	7888
114.000	BXA-80063-4CF	14	49.929	3.735	0.005	4797
105.000	(2) RRUS-11	14	42.973	3.589	0.004	3328
103.000	EEI Low Profile Platform	14	41.464	3.551	0.004	3116
95.000	(2) AIR21	14	35.593	3.372	0.003	2482
94.000	EEI Low Profile Platform	14	34.880	3.347	0.003	2421
87.000	742-213	14	30.033	3.157	0.003	2066
80.000	3' GPS Stand-off Mount	14	25.472	2.940	0.002	1807
77.000	3' GPS Stand-off Mount	14	23.615	2.840	0.002	1715

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	145 - 130 (1)	TP26.77x24x0.188	15.000	0.000	0.0	39.000	15.820	-2.393	616.977	0.004
L2	130 - 84.75 (2)	TP35.27x26.77x0.25	45.250	0.000	0.0	39.000	27.118	-15.626	1057.590	0.015
L3	84.75 - 44.25 (3)	TP42.26x33.925x0.313	45.000	0.000	0.0	39.000	40.642	-23.977	1585.040	0.015
L4	44.25 - 0 (4)	TP49.83x40.663x0.375	49.500	0.000	0.0	39.000	58.864	-37.175	2295.690	0.016

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	145 - 130 (1)	TP26.77x24x0.188	16.650	1.924	39.000	0.049	0.000	0.000	39.000	0.000
L2	130 - 84.75 (2)	TP35.27x26.77x0.25	460.327	24.143	39.000	0.619	0.000	0.000	39.000	0.000
L3	84.75 - 44.25 (3)	TP42.26x33.925x0.313	1286.733	37.566	39.000	0.963	0.000	0.000	39.000	0.000
L4	44.25 - 0 (4)	TP49.83x40.663x0.375	2481.650	41.445	39.000	1.063	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	145 - 130 (1)	TP26.77x24x0.188	2.946	0.186	26.000	0.014	0.324	0.018	26.000	0.001
L2	130 - 84.75 (2)	TP35.27x26.77x0.25	18.484	0.682	26.000	0.052	0.128	0.003	26.000	0.000
L3	84.75 - 44.25 (3)	TP42.26x33.925x0.313	22.459	0.553	26.000	0.042	0.047	0.001	26.000	0.000
L4	44.25 - 0 (4)	TP49.83x40.663x0.375	25.747	0.437	26.000	0.034	0.047	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	145 - 130 (1)	0.004	0.049	0.000	0.014	0.001	0.053 ✔	1.333	H1-3+VT ✔
L2	130 - 84.75 (2)	0.015	0.619	0.000	0.052	0.000	0.635 ✔	1.333	H1-3+VT ✔
L3	84.75 - 44.25 (3)	0.015	0.963	0.000	0.042	0.000	0.979 ✔	1.333	H1-3+VT ✔
L4	44.25 - 0 (4)	0.016	1.063	0.000	0.034	0.000	1.079 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	145 - 130	Pole	TP26.77x24x0.188	1	-2.393	822.430	4.0	Pass
L2	130 - 84.75	Pole	TP35.27x26.77x0.25	2	-15.626	1409.767	47.6	Pass
L3	84.75 - 44.25	Pole	TP42.26x33.925x0.313	3	-23.977	2112.858	73.4	Pass
L4	44.25 - 0	Pole	TP49.83x40.663x0.375	4	-37.175	3060.155	81.0	Pass
						Summary		
						Pole (L4)	81.0	Pass
						RATING =	**81.0**	**Pass**

Program Version 6.0.0.8 - 9/7/2011 File:J:/Jobs/1400100.WI/013 - Newington 2/Backup Documentation/Calcs/ERI Files/145' Summit Monopole Newington, CT.eri

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Subject:	Flange Bolts and Flangeplate Analysis
Location:	145-ft Summit Monopole Newington, CT
Rev. 0: 1/17/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14001.013

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 16.3·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 2.9·kips	(Input From RisaTower)
Axial Force =	Axial := 3.8·kips	(Input From RisaTower)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	N := 18	(User Input)
Diameter of Bolt Circle =	D_{bc} := 30.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 120·ksi	(User Input)
Bolt Yield Strength =	F_y := 92·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 0.75·in	(User Input)
Threads per Inch =	n := 10	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	Fy_{bp} := 36·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.5·in	(User Input)
Flange Plate Diameter =	D_{bp} := 34.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 26.77·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 15 \cdot in$

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

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

$d_1 = 5.13 \cdot in$ $d_7 = 9.64 \cdot in$

$d_2 = 9.64 \cdot in$ $d_8 = 5.13 \cdot in$

$d_3 = 12.99 \cdot in$ $d_9 = 0.00 \cdot in$

$d_4 = 14.77 \cdot in$ $d_{10} = -5.13 \cdot in$

$d_5 = 14.77 \cdot in$ $d_{11} = -9.64 \cdot in$

$d_6 = 12.99 \cdot in$ $d_{12} = -12.99 \cdot in$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 13.4 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 1.39 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 1.39 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 0.00 \cdot in$ $MA_{12} = 0.00 \cdot in$

Effective Width of Flangeplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 16.8 \cdot in$

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 2.025 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.442 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.334 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.653 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.163 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.027 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 1.2 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 23.3 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} = 5 \%$

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

Condition1 = "OK"

Flange Plate Analysis:

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

$C_1 = 0.7 \cdot kips$ $C_7 = 1.1 \cdot kips$

$C_2 = 1.1 \cdot kips$ $C_8 = 0.7 \cdot kips$

$C_3 = 1.5 \cdot kips$ $C_9 = 0.2 \cdot kips$

$C_4 = 1.6 \cdot kips$ $C_{10} = -0.3 \cdot kips$

$C_5 = 1.6 \cdot kips$ $C_{11} = -0.7 \cdot kips$

$C_6 = 1.5 \cdot kips$ $C_{12} = -1.0 \cdot kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 0.7 \cdot ksi$$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 35.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 2.0 \cdot \%$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

CENTEK engineering
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Subject:		Anchor Bolt and Baseplate Analysis
Location:		145-ft Summit Monopole Newington, CT
Rev. 1: 1/17/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14001.013

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2482·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 26·kips	(Input From RisaTower)
Axial Force =	Axial := 37·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 16	(User Input)
Diameter of Bolt Circle =	D_{bc} := 57.00·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strenght =	F_u := 100·ksi	(User Input)
Bolt Yeild Strenght =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Grade 50

Plate Yield Strength =	Fy_{bp} := 50·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 3.0·in	(User Input)
Base Plate Diameter =	D_{bp} := 56·in	(User Input)
Outer Pole Diameter =	D_{pole} := 49.83·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 28.375in$ (User Input)

$d_2 := 27.125in$ (User Input)

$d_3 := 8.875in$ (User Input)

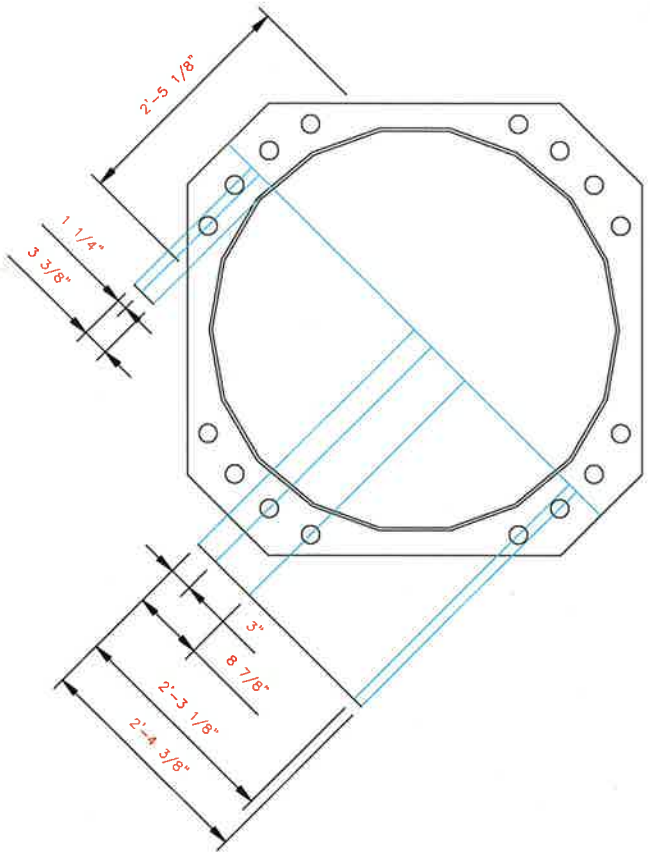
$d_4 := 3in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3.375in$ (User Input)

$ma_2 := 1.25in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 0.8 \cdot 29.125in = 23.3 \cdot in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		145-ft Summit Monopole Newington, CT
Rev. 1: 1/17/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14001.013

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 \right] = 6515 \cdot in^2$

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

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

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

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

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

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 127.4 \cdot kips$

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

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 65.4 \cdot \%$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N} \right) \cdot l = 0.406 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 5.9 \cdot ksi$

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

Check Combined Stress Requirement:

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

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{d_1}{I_p} + \frac{Axial}{N} = 132 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 40.7 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 67.8 \%$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts =

$$C_1 := OM \cdot \frac{d_1}{I_p} + \frac{Axial}{N} = 132 \cdot kips$$

$$C_2 := OM \cdot \frac{d_2}{I_p} + \frac{Axial}{N} = 126.3 \cdot kips$$

Maximum Bending Stress in Plate =

$$f_{bp} := \frac{6 \cdot \left(2 \cdot C_1 \cdot ma_1 + 2 \cdot C_2 \cdot ma_2\right)}{\left(B_{eff} \cdot t_{bp}^{\,2}\right)} = 34.5 \cdot ksi$$

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 49.9 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} = 69.2 \cdot \%$$

Condition3 =

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

Condition3 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	145-ft Summit Monopole Newington, CT
Rev. 0: 1/17/14	Prepared by: J.R.M. Checked by: C.F.C. Job No. 14001.001

Caisson Foundation:

Input Data:

Shear Force =	S := 26k	*USER INPUT-FROM tnxTower*
Overturning Moment =	M := 2482ft·k	*USER INPUT-FROM tnxTower*
Applied Axial Load =	A1 := 37k	*USER INPUT-FROM tnxTower*
Bending Moment =	Mu := 2553ft·k	*USER INPUT–FROM LPILE*
Moment Capacity =	Mn := 7571ft·k	*USER INPUT–FROM LPILE*
Foundation Diameter =	d := 7.0ft	*USER INPUT*
Overall Length of Caisson =	L_c := 25.5ft	*USER INPUT*
Depth From Top of Caisson to Grade =	L_{pag} := 0.5ft	*USER INPUT*
Number of Rebar =	n := 28	*USER INPUT*
Area of Rebar =	Ar := 1.56in^2	*USER INPUT*
Rebar Yield Strength =	fy := 60ksi	*USER INPUT*
Concrete Comp Strength =	f'c := 3ksi	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 3$

Factor of Safety Required = $FS_{reqd} := 1.3$

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

FOSCheck = "OK"

Check Axial Capacity:

Concrete Weight = $A2 := .150\frac{k}{ft^3} \cdot LD \cdot \pi \frac{d^2}{4} = 144.3 \cdot kips$

Total Axial Load = AT := A1 + A2 = 181.3·kips

Area of Concrete = $Ag := \pi \cdot \frac{d^2}{4} = 38.48ft^2$

Axial Capacity = Po := n·Ar·fy + (Ag – n·Ar)·0.85·f'c = 16640.9·kips

AxialCheck := if(AT ≤ Po, "OK", "NO GOOD")

AxialCheck = "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\1400100.WI\013 - Newington 2\Backup Documentation\Calcs\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: January 17, 2014 Time: 11:42:43

Problem Title

14001.013 - Newington 2

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 = 306.00 in

Depth of ground surface below top of pile = 6.00 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	84.00000000	2443920.	5541.8000	3122018.
2	306.0000	84.00000000	2443920.	5541.8000	3122018.

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 = 6.000 in
Distance from top of pile to bottom of layer = 150.000 in
p-y subgrade modulus k for top of soil layer = 90.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 90.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 150.000 in
Distance from top of pile to bottom of layer = 342.000 in
p-y subgrade modulus k for top of soil layer = 90.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 90.000 lbs/in**3

(Depth of lowest layer extends 36.00 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	6.00	0.07200
2	150.00	0.07200
3	150.00	0.07200
4	342.00	0.07200

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	6.000	0.00000	34.00	------	------
2	150.000	0.00000	34.00	------	------
3	150.000	0.00000	30.00	------	------
4	342.000	0.00000	30.00	------	------

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 = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 26000.000 lbs
Bending moment at pile head = 29784000.000 in-lbs
Axial load at pile head = 37000.000 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

---

Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 84.0000 in

Material Properties:

Compressive Strength of Concrete	=	3.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Number of Reinforcing Bars	=	28
Area of Single Bar	=	1.56000 in**2
Number of Rows of Reinforcing Bars	=	15
Area of Steel	=	43.680 in**2
Area of Shaft	=	5541.769 in**2
Percentage of Steel Reinforcement	=	0.788 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 16640.93 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	38.000
2	3.120	37.047
3	3.120	34.237
4	3.120	29.710
5	3.120	23.693
6	3.120	16.488
7	3.120	8.456
8	3.120	0.000
9	3.120	-8.456
10	3.120	-16.488
11	3.120	-23.693
12	3.120	-29.710
13	3.120	-34.237
14	3.120	-37.047
15	1.560	-38.000

Axial Thrust Force = 37000.00 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
5367616.	8.588185E+12	6.250000E-07	0.00002834	45.33781797	87.10722375	749.24795
10682374.	8.545899E+12	0.00000125	0.00005468	43.74790925	166.65345	1440.86171
15944773.	8.503879E+12	0.00000188	0.00008107	43.23707896	245.00136	2133.51617
21153339.	8.461336E+12	0.00000250	0.00010742	42.96722299	321.93362	2825.12367
26308749.	8.418800E+12	0.00000313	0.00013377	42.80523330	397.55945	3516.72427
26308749.	7.015666E+12	0.00000375	0.00008563	22.83340269	254.70232	6216.86746
26308749.	6.013428E+12	0.00000438	0.00009870	22.56050259	292.31338	7287.63623
26308749.	5.261750E+12	0.00000500	0.00011200	22.39999992	330.26276	8352.00001
26308749.	4.677111E+12	0.00000563	0.00012511	22.24171525	367.34230	9421.82020
26308749.	4.209400E+12	0.00000625	0.00013821	22.11280543	404.06832	10492.05402
26308749.	3.826727E+12	0.00000688	0.00015132	22.00991088	440.53348	11561.77402
26308749.	3.507833E+12	0.00000750	0.00016445	21.92654532	476.73685	12630.97639
26308749.	3.238000E+12	0.00000813	0.00017760	21.85821766	512.67746	13699.65746
26308749.	3.006714E+12	0.00000875	0.00019077	21.80172104	548.35436	14767.81329
26308749.	2.806267E+12	0.00000938	0.00020395	21.75470477	583.76660	15835.43964

26308749.	2.630875E+12	0.00001000	0.00021715	21.71540397	618.91318	16902.53285
26308749.	2.476118E+12	0.00001063	0.00023038	21.68246931	653.79308	17969.08914
26308749.	2.338555E+12	0.00001125	0.00024362	21.65485185	688.40528	19035.10458
26308749.	2.215474E+12	0.00001188	0.00025688	21.63172799	722.74890	20100.57367
26308749.	2.104700E+12	0.00001250	0.00027016	21.61242932	756.82270	21165.49437
26308749.	2.004476E+12	0.00001313	0.00028345	21.59642261	790.62574	22229.86164
26308749.	1.913364E+12	0.00001375	0.00029677	21.58327228	824.15705	23293.67018
27182924.	1.890986E+12	0.00001438	0.00031011	21.57261282	857.41544	24356.91703
28313186.	1.887546E+12	0.00001500	0.00032346	21.56414634	890.39998	25419.59634
29442012.	1.884289E+12	0.00001563	0.00033684	21.55761498	923.10938	26481.70571
30569400.	1.881194E+12	0.00001625	0.00035023	21.55280846	955.54270	27543.23901
31695338.	1.878242E+12	0.00001688	0.00036365	21.54954404	987.69881	28604.19189
32819815.	1.875418E+12	0.00001750	0.00037708	21.54766399	1019.57651	29664.56053
33942824.	1.872708E+12	0.00001813	0.00039054	21.54703563	1051.17473	30724.33939
35064358.	1.870099E+12	0.00001875	0.00040402	21.54754382	1082.49237	31783.52305
36184399.	1.867582E+12	0.00001938	0.00041751	21.54908341	1113.52810	32842.10876
37302945.	1.865147E+12	0.00002000	0.00043103	21.55156928	1144.28089	33900.08982
38419984.	1.862787E+12	0.00002063	0.00044457	21.55492383	1174.74955	34957.46118
39535504.	1.860494E+12	0.00002125	0.00045813	21.55907696	1204.93278	36014.21882
40649495.	1.858263E+12	0.00002188	0.00047171	21.56396860	1234.82939	37070.35742
41761949.	1.856087E+12	0.00002250	0.00048531	21.56954616	1264.43819	38125.87113
42872854.	1.853961E+12	0.00002313	0.00049894	21.57576209	1293.75793	39180.75455
43982196.	1.851882E+12	0.00002375	0.00051259	21.58257133	1322.78721	40235.00400
45089969.	1.849845E+12	0.00002438	0.00052625	21.58993882	1351.52492	41288.61200
47300762.	1.845883E+12	0.00002563	0.00055366	21.60621339	1408.12029	43393.88267
49505135.	1.842052E+12	0.00002688	0.00058115	21.62434798	1463.53326	45496.52379
51703002.	1.838329E+12	0.00002813	0.00060874	21.64415485	1517.75314	47596.48620
53894260.	1.834698E+12	0.00002938	0.00063642	21.66547376	1570.76858	49693.72454
56078818.	1.831145E+12	0.00003063	0.00066420	21.68817955	1622.56840	51788.18553
58256569.	1.827657E+12	0.00003188	0.00069208	21.71216208	1673.14067	53879.82018
60427420.	1.824224E+12	0.00003313	0.00072005	21.73733622	1722.47357	55968.57140
62591246.	1.820836E+12	0.00003438	0.00074812	21.76362187	1770.55437	58054.38945
64735438.	1.817135E+12	0.00003563	0.00077625	21.78941935	1817.27784	60000.00000
66470946.	1.802602E+12	0.00003688	0.00080268	21.76766735	1859.79281	60000.00000
67999185.	1.783585E+12	0.00003813	0.00082828	21.72537249	1899.70578	60000.00000
69210039.	1.757715E+12	0.00003938	0.00085246	21.64978498	1936.24321	60000.00000
70417037.	1.733342E+12	0.00004063	0.00087671	21.58046848	1971.82297	60000.00000
71459804.	1.706503E+12	0.00004188	0.00090018	21.49676746	2005.21190	60000.00000
72340986.	1.677472E+12	0.00004313	0.00092287	21.39995366	2036.51353	60000.00000
73219174.	1.650010E+12	0.00004438	0.00094562	21.30982894	2066.96424	60000.00000
74094354.	1.623986E+12	0.00004563	0.00096843	21.22586256	2096.55817	60000.00000
74881900.	1.597481E+12	0.00004688	0.00099078	21.13667911	2124.63228	60000.00000
75488919.	1.568601E+12	0.00004813	0.00101211	21.03083557	2150.53300	60000.00000
76131304.	1.541900E+12	0.00004938	0.00103670	20.99641639	2179.54622	60000.00000
76728482.	1.515624E+12	0.00005063	0.00105773	20.89334911	2203.34260	60000.00000
77323445.	1.490572E+12	0.00005188	0.00107880	20.79618233	2226.40344	60000.00000
77916163.	1.466657E+12	0.00005313	0.00109993	20.70450801	2248.72352	60000.00000
78506634.	1.443800E+12	0.00005438	0.00112110	20.61796314	2270.29795	60000.00000
78930747.	1.418980E+12	0.00005563	0.00114101	20.51254517	2289.79869	60000.00000
79314895.	1.394548E+12	0.00005688	0.00116065	20.40709466	2308.33761	60000.00000
79697349.	1.371137E+12	0.00005813	0.00118034	20.30688125	2326.22952	60000.00000
80078099.	1.348684E+12	0.00005938	0.00120006	20.21158201	2343.47035	60000.00000
80457104.	1.327127E+12	0.00006063	0.00121983	20.12089401	2360.05562	60000.00000
80834383.	1.306414E+12	0.00006188	0.00123964	20.03455192	2375.98150	60000.00000
81209890.	1.286493E+12	0.00006313	0.00125949	19.95229787	2391.24335	60000.00000
81583614.	1.267318E+12	0.00006438	0.00127938	19.87390155	2405.83687	60000.00000
81955556.	1.248847E+12	0.00006563	0.00129932	19.79915267	2419.75779	60000.00000
82325686.	1.231038E+12	0.00006688	0.00131930	19.72785097	2433.00148	60000.00000
82600067.	1.212478E+12	0.00006813	0.00133836	19.64558691	2444.94474	60000.00000
83031533.	1.196851E+12	0.00006938	0.00135975	19.60000008	2457.65223	60000.00000
83111816.	1.176804E+12	0.00007063	0.00138086	19.55204755	2469.38355	60000.00000
83329183.	1.159363E+12	0.00007188	0.00139896	19.46373528	2478.73675	60000.00000
83545291.	1.142500E+12	0.00007313	0.00141709	19.37894529	2487.53154	60000.00000
83760144.	1.126187E+12	0.00007438	0.00143525	19.29750735	2495.76447	60000.00000
84185987.	1.095102E+12	0.00007688	0.00147170	19.14404172	2510.52991	60000.00000
84606633.	1.065910E+12	0.00007938	0.00150830	19.00217181	2523.00374	60000.00000
85021980.	1.038436E+12	0.00008188	0.00154505	18.87087125	2533.15556	60000.00000
85431936.	1.012527E+12	0.00008438	0.00158197	18.74923879	2540.95413	60000.00000
85836402.	9.880449E+11	0.00008688	0.00161904	18.63647836	2546.36717	60000.00000
86162509.	9.640560E+11	0.00008938	0.00165510	18.51863855	2549.30096	60000.00000
86382983.	9.402229E+11	0.00009188	0.00168968	18.39110059	2548.94487	60000.00000
86596212.	9.175758E+11	0.00009438	0.00172440	18.27182132	2543.16158	60000.00000
86596212.	8.938964E+11	0.00009688	0.00176312	18.19999892	2546.53817	60000.00000
87079060.	8.762673E+11	0.00009938	0.00180319	18.14530975	2549.39953	60000.00000
87273686.	8.566742E+11	0.00010188	0.00183706	18.03245670	2549.33968	60000.00000
87464596.	8.379841E+11	0.00010438	0.00187114	17.92711884	2544.28157	60000.00000
87653859.	8.201531E+11	0.00010688	0.00190535	17.82785171	2542.45855	60000.00000
87841455.	8.031219E+11	0.00010938	0.00193968	17.73426229	2546.20381	60000.00000
88027330.	7.868365E+11	0.00011188	0.00197414	17.64598757	2548.68522	60000.00000
88211456.	7.712477E+11	0.00011438	0.00200873	17.56270212	2549.88386	60000.00000
88392597.	7.563003E+11	0.00011688	0.00204352	17.48466879	2547.35072	60000.00000
88571550.	7.419606E+11	0.00011938	0.00207846	17.41120666	2542.75645	60000.00000
88749276.	7.281992E+11	0.00012188	0.00211351	17.34159476	2539.67672	60000.00000
88925785.	7.149812E+11	0.00012438	0.00214866	17.27562028	2543.75538	60000.00000
89095404.	7.022298E+11	0.00012688	0.00218374	17.21172363	2546.80689	60000.00000
89179914.	6.893133E+11	0.00012938	0.00221635	17.13116938	2548.67269	60000.00000
89263662.	6.768809E+11	0.00013188	0.00224904	17.05432516	2549.73526	60000.00000
89346308.	6.649028E+11	0.00013438	0.00228184	16.98117095	2549.28911	60000.00000

89427058.	6.533484E+11	0.00013688	0.00231482	16.91193956	2545.65348	60000.00000
89507359.	6.422053E+11	0.00013938	0.00234786	16.84563214	2542.00708	60000.00000
89700469.	6.322500E+11	0.00014188	0.00238350	16.80000025	2537.90430	60000.00000
90169962.	6.245538E+11	0.00014438	0.00242550	16.80000025	2539.60007	60000.00000
90169962.	6.139231E+11	0.00014688	0.00246596	16.78954858	2543.97697	60000.00000
90169962.	6.036483E+11	0.00014938	0.00249780	16.72169656	2546.18781	60000.00000
90169962.	5.937117E+11	0.00015188	0.00252970	16.65646559	2547.90056	60000.00000
90169962.	5.840969E+11	0.00015438	0.00256166	16.59374052	2549.10980	60000.00000
90169962.	5.747886E+11	0.00015688	0.00259368	16.53340119	2549.80978	60000.00000
90176393.	5.658127E+11	0.00015938	0.00262578	16.47547013	2549.58586	60000.00000
90245059.	5.574984E+11	0.00016188	0.00265805	16.42039043	2546.68768	60000.00000
90313536.	5.494360E+11	0.00016438	0.00269036	16.36721331	2543.78295	60000.00000
90381841.	5.416140E+11	0.00016688	0.00272271	16.31585866	2540.87150	60000.00000
90446260.	5.340001E+11	0.00016938	0.00275543	16.26823658	2537.89421	60000.00000
90504582.	5.265721E+11	0.00017188	0.00278874	16.22539097	2534.81468	60000.00000
90562651.	5.193557E+11	0.00017438	0.00282209	16.18403989	2531.72702	60000.00000
90678061.	5.055223E+11	0.00017938	0.00288894	16.10559100	2537.88875	60000.00000
90792452.	4.924336E+11	0.00018438	0.00295598	16.03244430	2543.29145	60000.00000
90891889.	4.799572E+11	0.00018938	0.00302466	15.97179204	2547.28056	60000.00000
90967500.	4.680000E+11	0.00019438	0.00309591	15.92752701	2549.60610	60000.00000
91040385.	4.566289E+11	0.00019938	0.00316763	15.88778812	2547.70468	60000.00000
91110588.	4.458010E+11	0.00020438	0.00323980	15.85222989	2541.79843	60000.00000
91179906.	4.354861E+11	0.00020938	0.00331217	15.81930774	2535.85774	60000.00000
91231553.	4.255699E+11	0.00021438	0.00338313	15.78135628	2530.16392	60000.00000
91240049.	4.159091E+11	0.00021938	0.00345016	15.72722536	2525.15925	60000.00000
91248132.	4.066769E+11	0.00022438	0.00351732	15.67609602	2529.88002	60000.00000
91255817.	3.978455E+11	0.00022938	0.00358462	15.62778801	2535.51643	60000.00000
91263061.	3.893891E+11	0.00023438	0.00365206	15.58212608	2540.25530	60000.00000
91269875.	3.812841E+11	0.00023938	0.00371964	15.53896004	2544.07964	60000.00000
91276239.	3.735089E+11	0.00024438	0.00378736	15.49814719	2546.97158	60000.00000
91282137.	3.660437E+11	0.00024938	0.00385523	15.45955735	2548.91273	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 90856.18615 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 = 26000.000 lbs
Specified moment at pile head = 29784000.000 in-lbs
Specified axial load at pile head = 37000.000 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. p lbs/in	Es*h F/L
0.000	0.476829	2.98E+07	26000.	-0.003714	518.530	1.88E+12	0.000	0.000
24.480	0.390688	3.04E+07	20408.	-0.003322	528.950	1.88E+12	-612.550	4797.697
48.960	0.314216	3.06E+07	-2918.767	-0.002925	533.199	1.88E+12	-1214.885	11831.
73.440	0.247485	3.02E+07	-36669.	-0.002528	525.167	1.88E+12	-1502.136	18573.
97.920	0.190335	2.88E+07	-74698.	-0.002144	501.841	1.89E+12	-1574.606	25315.
122.400	0.142263	2.65E+07	-1.12E+05	-0.001815	462.424	5.32E+12	-1490.351	32057.
146.880	0.098807	2.33E+07	-1.46E+05	-0.001740	407.786	8.44E+12	-1252.797	38798.
171.360	0.057004	1.94E+07	-1.75E+05	-0.001678	339.891	8.47E+12	-953.472	51183.
195.840	0.016568	1.49E+07	-1.91E+05	-0.001628	262.337	8.51E+12	-313.627	57925.
220.320	-0.022821	1.02E+07	-1.89E+05	-0.001592	181.684	8.55E+12	482.271	64667.
244.800	-0.061494	5.79E+06	-1.66E+05	-0.001570	106.129	8.58E+12	1435.024	71409.
269.280	-0.099757	2.26E+06	-1.18E+05	-0.001558	45.488	8.59E+12	2547.729	78150.
293.760	-0.137854	2.58E+05	-42103.	-0.001555	11.114	8.59E+12	3391.782	75289.

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 = 0.47682890 in
Computed slope at pile head = -0.00371380
Maximum bending moment = 30640483. lbs-in
Maximum shear force = -192580.11788 lbs
Depth of maximum bending moment = 45.90000000 in
Depth of maximum shear force = 205.02000 in
Number of iterations = 46
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= 26000.	M= 2.98E+07	37000.0000	0.4768289	3.0640E+07	-192580.

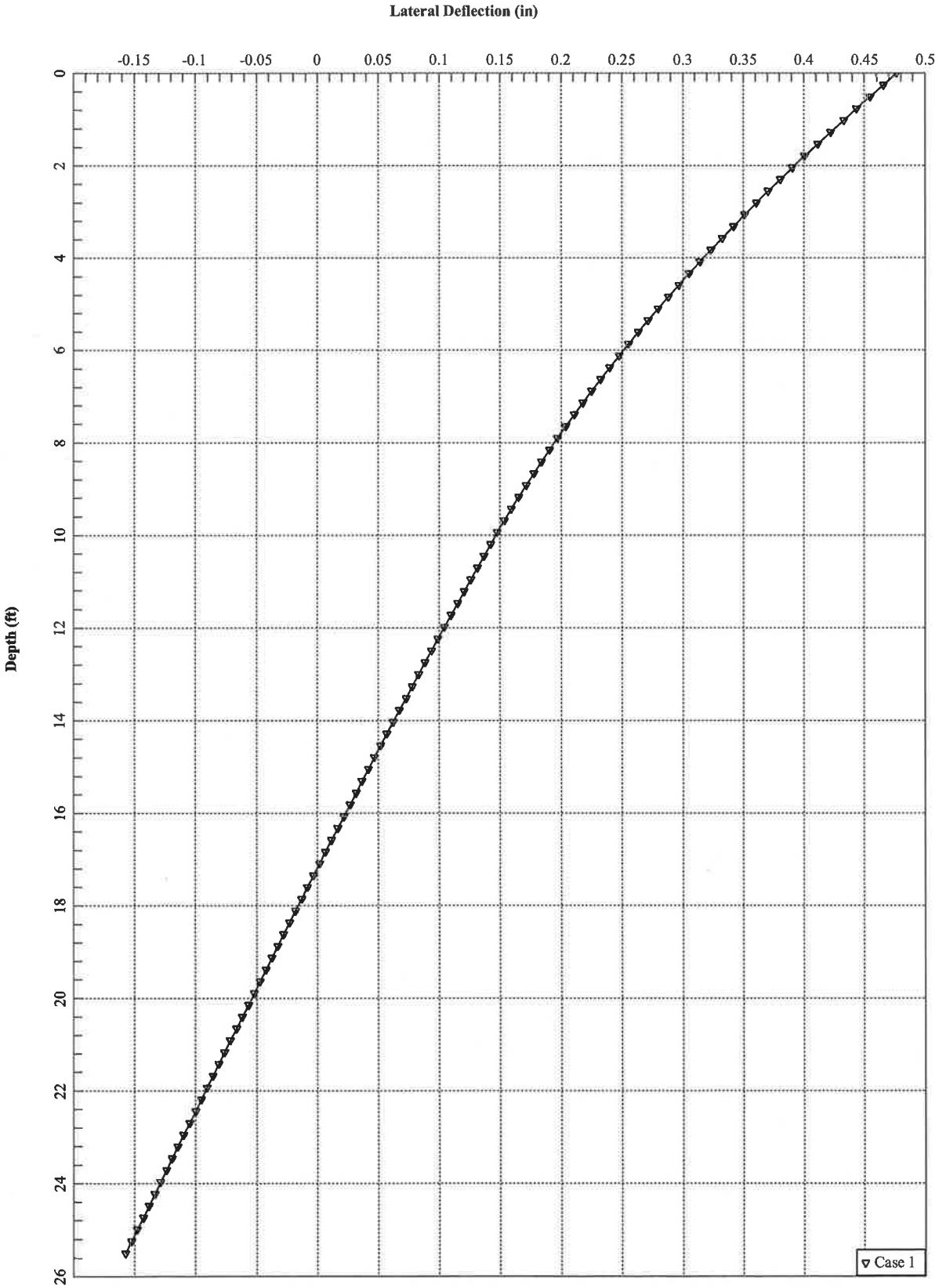
Computed Pile-head Stiffness Matrix Members K22, K23, K32, K33 for Superstructure

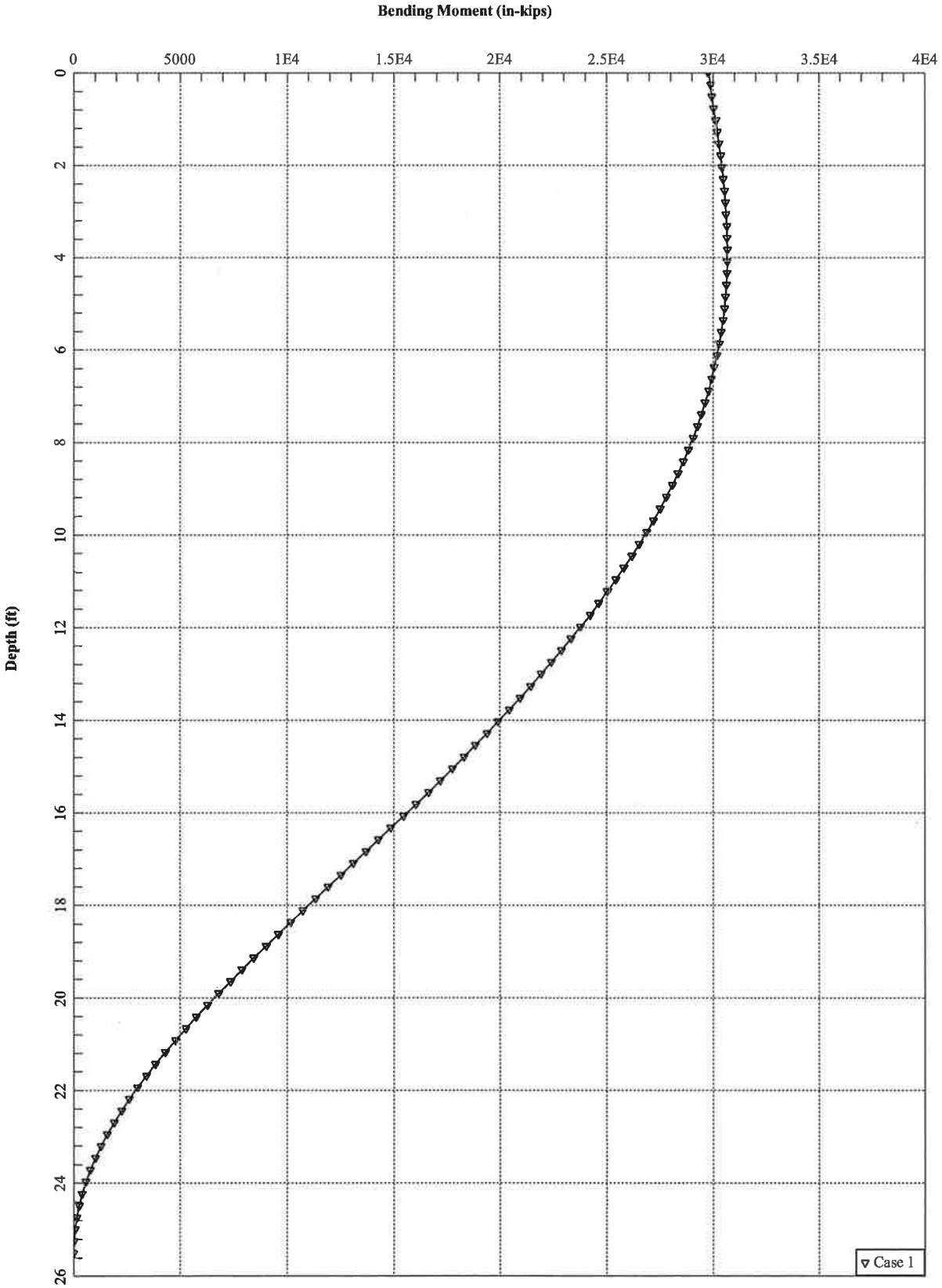
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00130855	2600.00004	442414.08471	1986939.	3.380962E+08
0.00393911	7826.77989	1331799.	1986939.	3.380962E+08
0.00624335	12405.15262	2110852.	1986939.	3.380962E+08
0.00787823	15653.55977	2663598.	1986939.	3.380962E+08
0.00914634	18173.22011	3092342.	1986939.	3.380962E+08
0.01018246	20231.93251	3442651.	1986939.	3.380962E+08
0.01105849	21972.54904	3738833.	1986939.	3.380962E+08
0.01181734	23480.33966	3995397.	1986939.	3.380962E+08
0.01248669	24810.30525	4221703.	1986939.	3.380962E+08
0.01308545	26000.00000	4424141.	1986939.	3.380962E+08

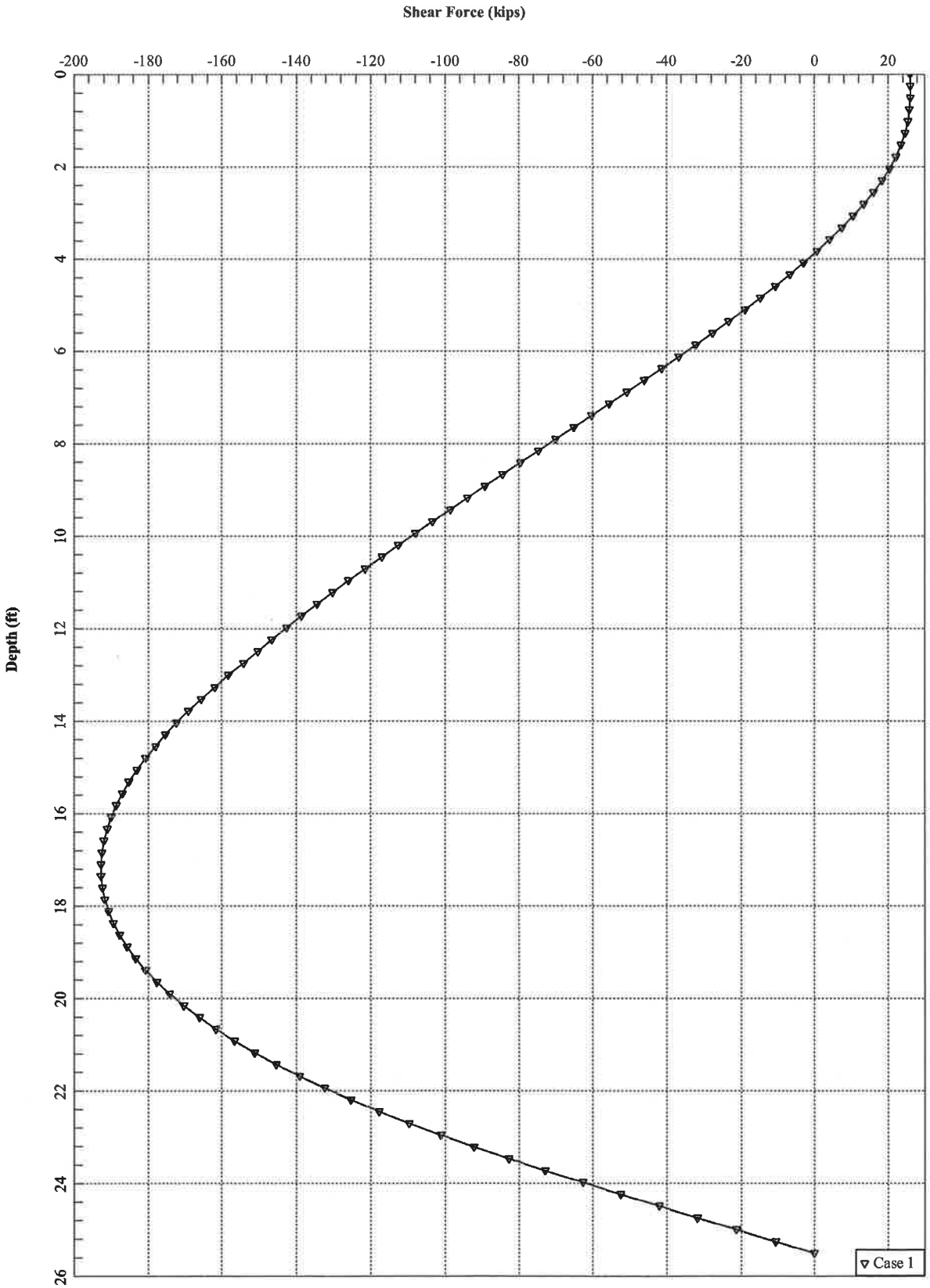
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00004090	13828.89629	2978400.	3.380962E+08	7.281750E+10
0.00012328	41631.20682	8965877.	3.376832E+08	7.272493E+10
0.00019581	65993.02741	14210579.	3.370339E+08	7.257505E+10
0.00024746	83283.03968	17931755.	3.365513E+08	7.246320E+10
0.00028765	96697.16110	20818123.	3.361580E+08	7.237211E+10
0.00032057	107659.19700	23176457.	3.358378E+08	7.229786E+10
0.00034846	116928.85095	25170400.	3.355592E+08	7.223331E+10
0.00037320	124960.45163	26897632.	3.348341E+08	7.207275E+10
0.00040194	132061.15776	28421159.	3.285593E+08	7.070995E+10
0.00043528	138453.14155	29784000.	3.180803E+08	6.842535E+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)
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1


Shear Force (kips)
-200
-180
-160
-140
-120
-100
-80
-60
-40
-20
0
20
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1

SITE NAME	NEWINGTON 2 CT	ECP - CELL #	8	145
LATITUDE	41-39-18.71 N	LONGITUDE	72-43-18.85 W	
Additional Comments: **2013 ANTMO** Swap beta LTE antenna for Kathrein model w/RET		SAVE BUTTON		
		STRUCTURE TYPE	MONOPOLE	

AWS - LTE ANTENNA ADD	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	2100 MHz eNodeB		2100 MHz eNodeB		2100 MHz eNodeB	
ANTENNA TYPE	BXA-171063-8CF-EDIN-0		BXA-171063-8CF-EDIN-2		BXA-171063-8CF-EDIN-2	
QTY OF ANTENNAS PER FACE	#N/A		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z			
700 Mhz - LTE Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	700 eNodeB		700 eNodeB		700 eNodeB	
ANTENNA TYPE	LNX-6514DS-T4M-750_4		LNX-6514DS-T4M-750_4		LNX-6514DS-T4M-750_4	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	4		4		4	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
700 Mhz - LTE Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	700 eNodeB		700 eNodeB		700 eNodeB	
ANTENNA TYPE	LNX-6514DS-T4M-750_4		**80010735V01_0704_M45_08**		LNX-6514DS-T4M-750_4	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	4		**0**		4	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
850 Celluar - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	DB844H65-XY		DB844H65-XY		DB844H65-XY	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	10		8		8	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L
850 Celluar - Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	BXA-80063/4CF 5		BXA-80063/4CF 5		BXA-80063/4CF 5	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	5		3		3	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L
DIPLEX WITH LTE CABLE						
1900 PCS - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 4.0B	
ANTENNA TYPE	BXA-185063/8CF		BXA-185063/8CF		BXA-185063/8CF	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	2		2		3	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
1900 PCS - Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 4.0B	
ANTENNA TYPE	BXA-185063/8CF		BXA-185063/8CF		BXA-185063/8CF	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	90		210		330	
DOWN TILT (MECH/DEG)	2		2		3	
RAD CTR (FT AGL)	115		115		115	
TMA - QTY / MODEL						
DIPLEX WITH CELLULAR CABLE	diplexed with cellular		diplexed with cellular		diplexed with cellular	

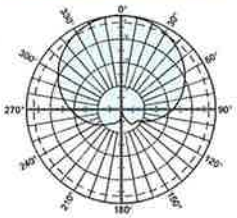
NUMBER OF CABLE'S NEEDED								Fiber Lines Model number			
TOTAL # FIBER LINES	1	TOTAL # OF MAINLINES			12			FIBER LINE MODEL #			HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	6	TOTAL # OF TOP JUMPERS			12			FIBER TOP JUMPER MODEL #			HB114-1-08U4-S4J18
Equipment Cable Ordering		**MAIN CABLE**	12	+	0			**TOP JUMPER #**	12	+	0
TX / RX FREQUENCIES								**TX POWER OUTPUT**			
Cellular A-Band		**PCS F / AWS-Band**		**700 Mhz C - E**				Cellular (Watts)			20
TX - 869-880,890-891.5 MHz		TX - 1970-1975 / 2145-2155		TX - 746-757				PCS (Watts)			16
RX - 824-835,845-846.5 MHz		RX - 1890-1895 / 1745-1755		RX - 776-787				LTE/ AWS (Watts)			40
ALPHA				**BETA**				**GAMMA**			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/OR ANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/ WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/WH ITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	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/BR OWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN
RF ENGINEER				**RF MANAGER**				**INITIALS**			**DATE**
Prepared By: Maria Montrose				Robert Hesselbach							9/12/2013

KATHREIN
SCALA DIVISION

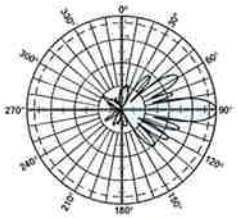
800 10735
Single Band Broadband 6', 65 Degree Antenna RET

- X-polarized (+45° and -45°).
- UV resistant fiberglass radomes.
- Wideband vector dipole technology.
- DC Grounded metallic parts for impulse suppression.
- RET motor housed inside the radome and field replaceable.

698–894 MHz



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–10° electrical downtilt

General specifications:

Frequency range	698–894 MHz
VSWR	<1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Maximum input power	500 watts per input (at 50°C)
Connector	2 x 7-16 DIN female (long neck) (bottom mounted)
Isolation	>30 dB
Electrical downtilt	0–10 degrees (continuously adjustable)
See reverse for order information.	

Specifications:	**698–806 MHz**	**824–894 MHz**
Gain	15.5 dBi	16 dBi
Front-to-back ratio	>30 dB (co-polar) 35 dB (average)	>30 dB (co-polar) 35 dB (average)
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)
+45° and -45° polarization vertical beamwidth	11.3° (half-power)	10° (half-power)
Min. sidelobe suppression for first sidelobe above main beam average	0° 5° 10° T 16 17 17 dB 16 19 20 dB	0° 5° 10° T 18 17 16 dB 20 20 20 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >11 dB, Average: 15 dB	 25 dB (typical) >11 dB, Average: 15 dB

IRT specifications:

Logical interface ex factory[1]	AISG 1.1
Protocols	AISG 1.1 and 3GPP/AISG 2.0 compliant
Hardware interface[2]	2 x 8 pin connector acc. IEC 60130-9; according to AISG: – IRT in (male): Control / Daisy chain in – IRT in (female): Daisy chain out
Power supply	10–30 V
Power consumption	<1 watt (standby) <8.5 watts (motor activated)
Adjustment time (full range)	40 sec.
Adjustment cycles	>50,000
Certification	FCC 15.107 Class B Computing Devices

[1] The protocol of the logical interface can be switched from AISG 1.1 to 3GPP/AISG 2.0 and vice versa with a vendor specific command. Start-up operation of the RCU 86010149 is possible in an RET system supporting AISG 1.1 or supporting 3GPP/AISG 2.0 after performing a layer 2 reset before address assignment. The protocol can also be changed as follows: AISG 1.1 to 3GPP: Enter "3GPP" into the additional data filed "Installer's ID" and perform a layer 7 reset or a power reset. 3GPP to AISG 1.1: Enter "AISG 1" into the additional datafield "Installer's ID" and perform a layer 2 reset or a power reset. After switching the protocol any other information can be entered into the "Installer's ID" field.

[2] The tightning torque for fixing the connector must be 0.5 – 1.0 Nm ('hand-tightened'). The connector should be tightened by hand only!

11220-B
936.4131
Mar 15, 2011

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
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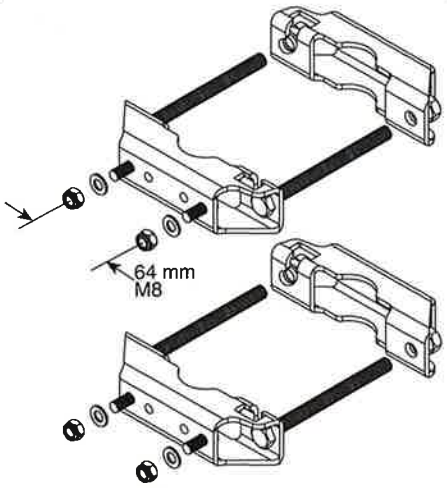
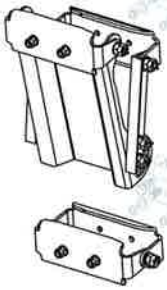
KATHREIN
SCALA DIVISION

800 10735
Single Band Broadband 6', 65 Degree Antenna RET



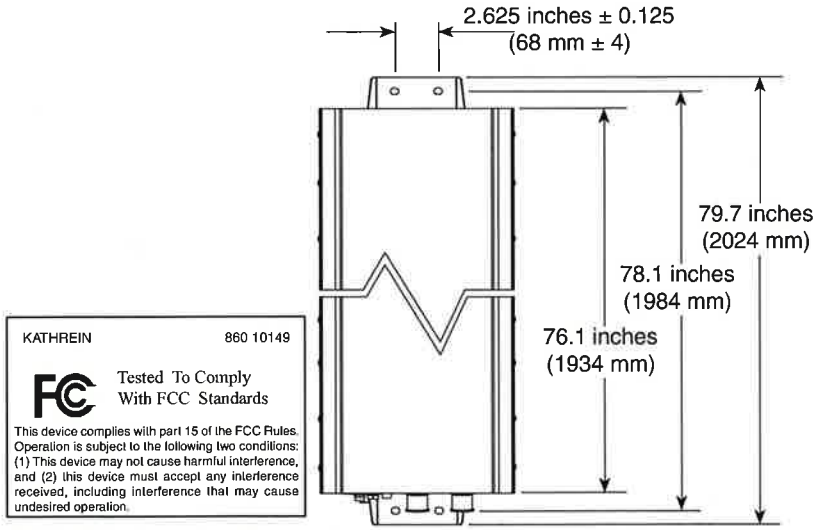
Mounting Brackets
for use with 2-point mount antennas
Mast dia. 2–4.5 inches (50–115 mm)
Weight: 4.4 lb (2 kg)



Mechanical Tilt Brackets
for use with 2-point mount antennas
Weight: 13 lb (5.9 kg)
(Model 850 10007)

Mechanical specifications:

Weight	28.7 lb (13 kg)	33.1 lb (15 kg) clamps included
Dimensions H x W x D	76.1 x 11.9 x 3.9 inches (1934 x 303 x 99 mm)	
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 203 lbf / 70 lbf / 239 lbf (900 N / 310 N / 1060 N) H (Heavy)	
Wind survival rating*	150 mph (240 kph)	
Shipping dimensions	81.1 x 12.4 x 4.5 inches (2060 x 315 x 115 mm)	
Shipping weight	37.5 lb (17 kg)	
Mounting bracket	2-point hot-dip galvanized with stainless steel hardware for 2 to 4.5 inch (50 to 115 mm) OD masts.	

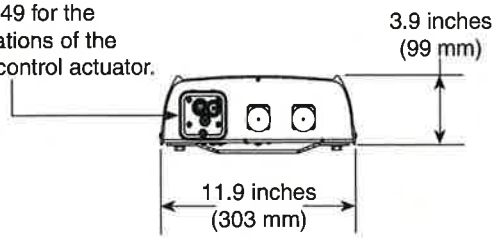


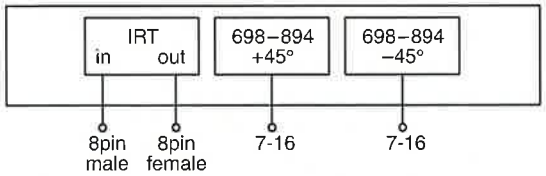
KATHREIN 860 10149

FC Tested To Comply With FCC Standards

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Refer to part number 860 10149 for the specifications of the remote control actuator.





Order Information:

Model	Description
800 10735	Antenna with mounting bracket 0°–10° electrical downtilt
800 10735K	Antenna with mounting bracket and mechanical tilt bracket 0°–10° electrical downtilt

*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

All specifications are subject to change without notice. The latest specifications are available at www.kathrein-scala.com.

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