Robinson+Cole

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March 16, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
48 Newtown Road, Danbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 90-foot level on the existing 110-foot roof-top tower at 48 Newtown Road in Danbury, Connecticut (the "Property"). The tower is owned by Wireless Capital Partners. The Council approved Cellco's shared use of this tower in 1999. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model X7C-FRO-660-V, 700 MHz antennas; three (3) model HBXX-6516DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6516DS-VTM, 2100 MHz antennas, all at the same 90-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 1900 MHz antennas and one (1) HYBRIFLEX™ antenna cable attached to the outside of the monopole tower. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

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 Mark D. Boughton, Mayor for the City of Danbury. A copy of this letter is also being sent to 48 Newtown Road Corporation, the owner of the Property.

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

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on its existing antenna platform at the 90-foot level on the 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 replacement antennas 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 General Power Density table 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:
Mark D. Boughton, Danbury Mayor
48 Newtown Road Corporation
Timothy Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	22	22	21
CPR at Sector, dB	8	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0 5 ° | 17.3 10 ° | 17.0	0 ° | 17.1 5 ° | 17.4 10 ° | 17.0	0 ° | 17.4 5 ° | 17.7 10 ° | 17.2
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6516DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam
RET/MET

- Designed to improve SNR
- Greatly increases LTE data rates
- Broadband radiator
- Macro Cell, high gain antenna
- Suitable for LTE/CDMA/UMTS/GSM
- AISG 2.0 RET or manual MET tilt control

Electrical Specifications

Frequency Band, MHz	**698-824**	**824-896**
Horizontal Beamwidth, 3dB points	62	58
Gain, dBi	15.9	16.0
Vertical Beamwidth, 3dB points	12.0	10.5
Front-to-Back at 180°, dB	>28	
Upper Sidelobe Suppression, Typical, dB	<-18	
Polarization	+/-45°	
Electrical Downtilt	0-10° or 4-14°	
VSWR/Return Loss, dB, Maximum	1.5:1/14.0	
Isolation Between Ports, dB, Mimimum	-28	
Intermodulation (2x20w), IM3, dBc, Maximum	-150	
Impedance, ohms	50	
Maximum Power Per Connector, CW	500	

X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam

RET/MET

Mechanical Specifications

Dimensions, Length/Width/Depth	72.0/14.6/8.0 in (1829/372/204 mm)
Connector (Quantity) Type	(2) 7-16 DIN Female
Connector Torque	220-265 lbf-in (25-30 N-m)
Connector Location	Back
Antenna Weight	35.0 lbs
Bracket Weight	13.2 lbs (6.0 kg)
Standard Bracket Kit	CSS P/N 919011
Mechanical Downtilt Range	0-12°
Radome Material	Ultra High Strength Luran, UV Stabilized, ASTM D1925
Wind Survival	150 mph (241 km/h)
Front Wind Load	205.39 lbf (913.65 N) @100mph
Equivalent Flat Plate	4.09 sq-ft (c=2) @ 100mph

RET Information

Model	CSS-RET-200
Mounting Location	Rear of Antenna
Weight	1.2 lb (0.54 kg)
Communication Standard	AISG 2.0
Control System	CSS-PCU-220

Order Information

Model	*Description*
X7C-FRO-660-VR0	Antenna with manual RET adjust electrical downtilt 0-10°
X7C-FRO-660-VR4	Antenna with manual RET adjust electrical downtilt 4-14°
X7C-FRO-660-VM0	Antenna with remote MET adjust electrical downtilt 0-10°
X7C-FRO-660-VM4	Antenna with remote MET adjust electrical downtilt 4-14°

Optional Bracket Kit

919036	Bracket Kit, 2-Point, 12 deg D-tilt, For 4.5" OD Pole

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

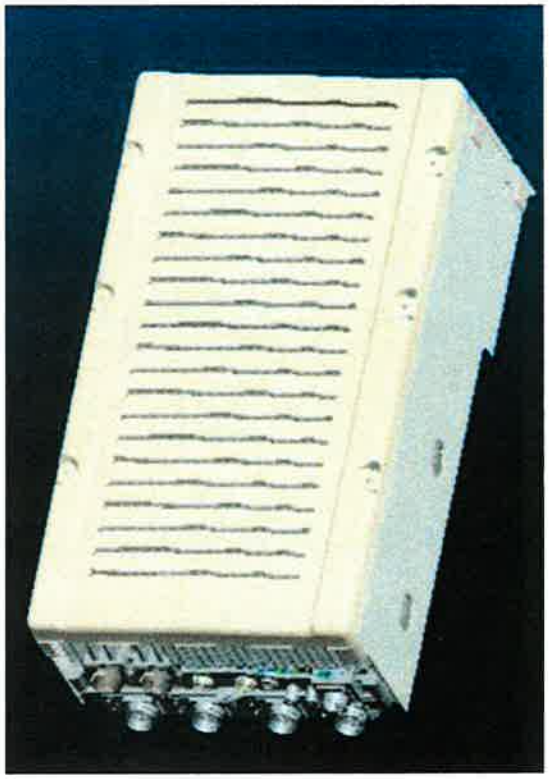
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – **minimizes installation time and enables mechanical protection and shielding**
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – **Eliminates typical grounding requirements and saves on installation costs**
- Lightweight solution and compact design – **Decreases tower loading**
- Robust cabling – **Eliminates need for expensive cable trays and ducts**
- Installation of tight bundled fiber optic cable pairs directly to the RRH – **Reduces CAPEX and wind load by eliminating need for interconnection**
- Optical fiber and power cables housed in single corrugated cable – **Saves CAPEX by standardizing RRH cable installation and reducing installation requirements**
- Outdoor polyethylene jacket – **Ensures long-lasting cable protection**

Technical Specifications

Structure			
Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environment			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change.

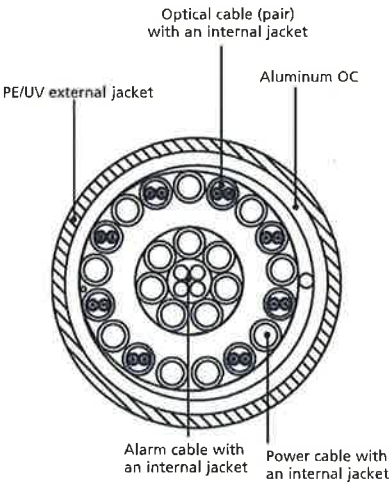


Figure 2: Construction Detail

ATTACHMENT 2

	General	Power	Density					
Site Name: Germantown (Danbury)								
Tower Height: 96Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	1	500	100	0.0180	880	0.5867	3.06%	
*AT&T GSM	6	296	100	0.0639	880	0.5867	10.89%	
*AT&T GSM	1	427	100	0.0154	1900	1.0000	1.54%	
*AT&T LTE	1	500	100	0.0180	740	0.4933	3.64%	
*MetroPCS	3	443.61	108	0.0410	2140	1.0000	4.10%	
*Clearwire	2	153	78	0.0181	2496	1.0000	1.81%	
*Clearwire	1	211	78	0.0125	11 GHz	1.0000	1.25%	
*Nextel iDEN	12	100	78	0.0709	851	0.5673	12.50%	
*Sprint/Nextel WiMAX	3	562	78	0.0996	2657	1.0000	9.96%	
*Sprint/Nextel Microwave	2	4.42	78	0.0005	22500	1.0000	0.05%	
Verizon PCS	**1**	**1194**	**90**	**0.0530**	**1970**	**1.0000**	**5.30%**	
Verizon Cellular	**9**	**330**	**90**	**0.1318**	**869**	**0.5793**	**22.76%**	
Verizon AWS	**1**	**1750**	**90**	**0.0777**	**2145**	**1.0000**	**7.77%**	
Verizon 700	**1**	**818**	**90**	**0.0363**	**746**	**0.4973**	**7.30%**	
								91.93%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

96-ft EEI Monopole with 14-ft Extension

Proposed Verizon Wireless
Antenna Upgrade

Verizon Wireless Site Ref: Germantown

48 Newtown Road
Danbury, CT

CENTEK Project No. 14309.017

Date: December 18, 2014

Prepared for:

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

Table of Contents

CENTEK Engineering, Inc.
Structural Analysis - 96' EEI Monopole w/ 14-ft Extension
Verizon Wireless Antenna Upgrade – Germantown
Danbury, CT
December 18, 2014

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 Danbury, Connecticut.

The host tower is a 96-ft tall two-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 5246 dated July 6, 1999. The original tower geometry, structure member sizes and foundation system information were obtained from the aforementioned EEI design documents. A 14-ft extension along with tower reinforcement information were obtained from a structural analysis and reinforcement design prepared by Structural Components job no. 090239 dated October 6, 2009.

Antenna and appurtenance information were obtained from a previous structural analysis report prepared by Centek job no; 14001.001 dated January 16, 2014 and a Verizon RF data sheet.

The tower consists of two (2) tapered vertical sections conforming to ASTM A572-65 (65ksi).The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 17.50-in at the top and 37.0-in at the base. The 14-ft extension consists of 16in. diameter pipe conforming to ASTM A36 and is flanged connected to the top of the tapered steel portion of the monopole.

Verizon proposes the removal of nine (9) panel antennas and the installation of nine (9) panel antennas, three (3) Remote Radio Heads (RRHs) and one (1) distribution box mounted on an existing EEI platform with handrails. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- METRO PCS (EXISTING/RESERVED):
  Antennas: Three (3) Kathrein 800-10504 and three (3) Kathrein 742-351 panel antenna mounted on three (3) 10-ft T-Arms with a RAD center elevation of 108-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables (6 existing/6 reserved) running on the exterior of the existing tower in a 2x6 cable configuration.
- AT&T (EXISTING):
  Antennas: Six (6) Powerwave 7770.00 panel antennas, two (2) KMW AM-X-CD-14-65-00T panel antennas, one (1) KMW AM-X-CD-16-65-00T panel antennas, six (6) Powerwave LGP21401 TMA's, three (3) Powerwave TT19-08BP111-001 TMA's mounted on an EEI standard platform with a RAD center elevation of 100-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the exterior of the existing tower in a 2x6 cable configuration.

- AT&T (EXISTING):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted to one (1) universal ring mount with a RAD center elevation of 100-ft above existing grade level.
  Coax Cables: One (1) 5/8" ∅ fiber cable and two (2) #8 DC control cables running within one (1) 3" ∅ inner-duct running on the exterior of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Two (2) Antel BXA-80080-6CF and one (1) Antel BXA-80063-6CF panel antennas mounted on an existing EEI platform w/ handrails with a RAD center elevation of 90-ft above grade level.
  Misc. Equipment: Three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on an existing EEI platform w/ handrails with a RAD center elevation of 90-ft above grade level.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower. One (1) 1-5/8" ∅ Hybriflex fiber line running on the exterior of the monopole.
- VERIZON (EXISTING TO REMOVE):
  Antennas: Three (3) Antel BXA-171063-8BF panel antennas, three (3) Antel BXA-70063-6CF panel antennas, three (3) RYMSA MG D3-800T0 panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on an existing EEI standard platform with a RAD center elevation of 90-ft above grade level.
- **VERIZON (PROPOSED):**
  Antennas: Six (6) Andrew HBXX-6516DS panel antennas, three (3) CSS X7C-FRO-660 panel antenna mounted on an existing EEI platform w/ handrails with a RAD center elevation of 90-ft above grade level.
  Misc. Equipment: Three (3) Alcatel-Lucent RRH2x60-PCS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on an existing EEI platform w/ handrails with a RAD center elevation of 90-ft above grade level.
  Cables: One (1) 1-5/8" ∅ Hybriflex fiber line running on the exterior of the monopole.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables are installed as indicated within Section 3 of this report.
- All aforementioned reinforcements designed by Structural Components are installed.

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

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **99.7%** of its total capacity.

Tower Section	Elevation (AGL)	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L3)	47.00'-97.00'	99.7%	**PASS**

Note: The wall thickness of the bottom 20-ft of the monopole was increased in the tnxTower analysis to reflect the reinforcements designed in the aforementioned structural analysis report prepared by Structural Components, job no. 090239, dated October 6, 2009.

Foundation and Anchors

The existing foundation consists of a 5.5-ft ∅ x 21.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; project no. 5246 dated July 6, 1999. The base of the tower is connected to the foundation by means of (8) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 5-ft into the concrete foundation structure. Three (3) additional 2-3/4" "∅ ASTM A193 Gr. B7 anchor rods were installed per the structural analysis and reinforcement design report prepared by Structural Components.

- 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	18 kips
	Compression	19 kips
	Moment	1437 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	76.5%	**PASS**
	Lateral Deflection	0.74 in.(1)	**PASS**

(1) Lateral deflection typically limited to 1.0 in. for monopole tower structures.

- 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 (ASTM-A615)	Combined Compression/Bending	61.0%	**PASS**
Anchor Bolts (ASTM-A193)	Combined Compression/Bending	53.7%	**PASS**
Flange Plate	Bending	72.8%	**PASS**

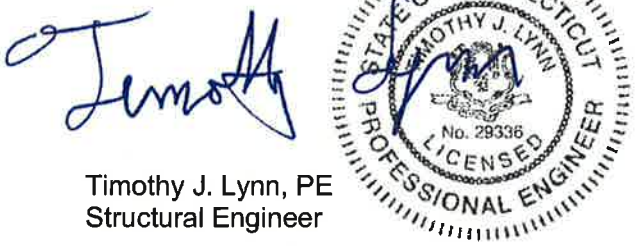
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

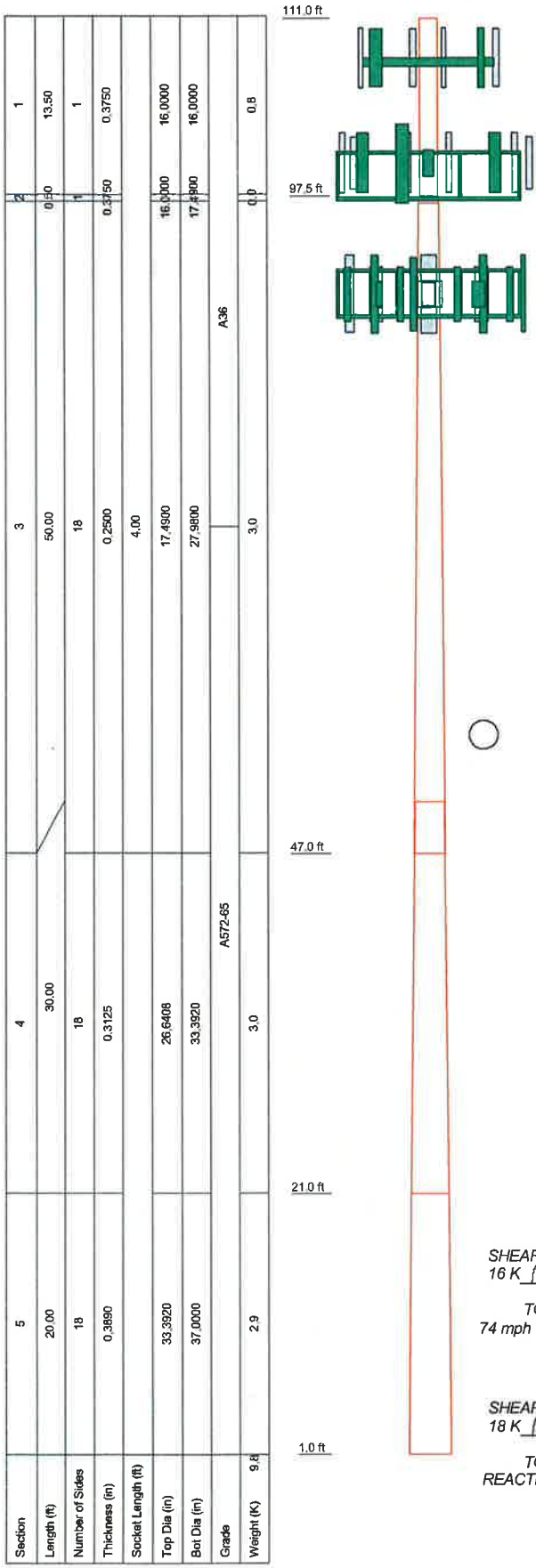
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

TnxTower Features:

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



Section	1	2	3	4	5
Length (ft)	13.50	50.00	50.00	30.00	20.00
Number of Sides	1	18	18	18	18
Thickness (in)	0.3750	0.3750	0.2500	0.3125	0.3890
Socket Length (ft)			4.00		
Top Dia (in)	16.0000	16.0000	17.4900	26.6408	33.3920
Bot Dia (in)	16.0000	17.4900	27.9800	33.3920	37.0000
Grade			A36	A572-65	
Weight (K)	0.8	0.0	3.0	3.0	2.9

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
800-10504 (MetroPCS)	108	TT19-08BP111-001 TMA (ATI - Existing)	100
800-10504 (MetroPCS)	108	TT19-08BP111-001 TMA (ATI - Existing)	100
800-10504 (MetroPCS)	108	EEI Standard Platform (ATI - Existing)	99
742-351 (MetroPCS)	108	BXA-80080-6CF (Verizon - Existing)	90
742-351 (MetroPCS)	108	HBXX-6516DS (Verizon - Proposed)	90
742-351 (MetroPCS)	108	X7C-FRO-660 (Verizon - Proposed)	90
2-ft Standoff T-Arm (10-ft Face Width) (MetroPCS)	108	HBXX-6516DS (Verizon - Proposed)	90
2-ft Standoff T-Arm (10-ft Face Width) (MetroPCS)	108	BXA-80080-6CF (Verizon - Existing)	90
2-ft Standoff T-Arm (10-ft Face Width) (MetroPCS)	108	HBXX-6516DS (Verizon - Proposed)	90
(2) 7770.00 (ATI - Existing)	100	X7C-FRO-660 (Verizon - Proposed)	90
(2) 7770.00 (ATI - Existing)	100	HBXX-6516DS (Verizon - Proposed)	90
(2) 7770.00 (ATI - Existing)	100	BXA-80063-6BF (Verizon - Existing)	90
AM-X-CD-14-65-00T-RET (ATI - Existing)	100	HBXX-6516DS (Verizon - Proposed)	90
AM-X-CD-14-65-00T-RET (ATI - Existing)	100	X7C-FRO-660 (Verizon - Proposed)	90
AM-X-CD-16-65-00T-RET(72") (ATI - Existing)	100	HBXX-6516DS (Verizon - Proposed)	90
(2) RRUS-11 (ATI - Existing)	100	RRH2x40-07-U (Verizon - Existing)	90
(2) RRUS-11 (ATI - Existing)	100	RRH2x40-07-U (Verizon - Existing)	90
(2) RRUS-11 (ATI - Existing)	100	RRH2x40-07-U (Verizon - Existing)	90
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	100	RRH2x40-AWS (Verizon - Existing)	90
(2) LGP21401 TMA (ATI - Existing)	100	RRH2x40-AWS (Verizon - Existing)	90
(2) LGP21401 TMA (ATI - Existing)	100	RRH2x40-AWS (Verizon - Existing)	90
(2) LGP21401 TMA (ATI - Existing)	100	DB-T1-6Z-8AB-0Z (Verizon - Existing)	90
TT19-08BP111-001 TMA (ATI - Existing)	100	RRH2x60-PCS (Verizon - Proposed)	90
		RRH2x60-PCS (Verizon - Proposed)	90
		RRH2x60-PCS (Verizon - Proposed)	90
		DB-T1-6Z-8AB-0Z (Verizon - Proposed)	90
		EEI Standard Platform (Verizon - Existing)	90

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
6. Welds are fabricated with ER-70S-6 electrodes.
7. Analysis considers all reinforcements proposed and designed by Structural Components, LLC dated October 6, 2009.
8. TOWER RATING: 99.7%

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

Job:	14309.017 - Germantown		
Project:	110-ft EEI Monopole - 48 Newton Rd., Danbury, CT		
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 12/18/14	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	14309.017 - Germantown	1 of 28
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 110-ft EEI Monopole - 48 Newton Rd., Danbury, CT	**Date** 08:30:29 12/18/14
	Client Verizon Wireless	**Designed by** TJL

Tower Input Data

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

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
Analysis considers all reinforcements proposed and designed by Structural Components, LLC dated October 6, 2009..
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*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	
L1	111.00-97.50	13.50	0.00	Round	16.0000	16.0000	0.3750		A36 (36 ksi)
L2	97.50-97.00	0.50	0.00	Round	16.0000	17.4900	0.3750		A36 (36 ksi)
L3	97.00-47.00	50.00	4.00	18	17.4900	27.9800	0.2500	1.0000	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	47.00-21.00	30.00	0.00	18	26.6408	33.3920	0.3125	1.2500	A572-65 (65 ksi)
L5	21.00-1.00	20.00		18	33.3920	37.0000	0.3890	1.5560	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	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
L2	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
	17.4900	20.1631	738.8470	6.0587	8.7450	84.4879	1475.6812	10.0755	0.0000	0
L3	17.7598	13.6799	513.6842	6.1202	8.8849	57.8153	1028.0442	6.8413	2.6382	10.553
	28.4116	22.0038	2137.6372	9.8442	14.2138	150.3912	4278.0871	11.0040	4.4845	17.938
L4	27.9658	26.1144	2286.9825	9.3465	13.5335	168.9864	4576.9743	13.0597	4.1388	13.244
	33.9071	32.8107	4535.9808	11.7432	16.9631	267.4023	9077.9301	16.4085	5.3270	17.046
L5	33.9071	40.7483	5607.3057	11.7161	16.9631	330.5583	11221.9896	20.3780	5.1924	13.348
	37.5708	45.2031	7654.7101	12.9969	18.7960	407.2521	15319.4925	22.6058	5.8274	14.98

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 111.00-97.50				1	1	1		
L2 97.50-97.00				1	1	1		
L3 97.00-47.00				1	1	1		
L4 47.00-21.00				1	1	1		
L5 21.00-1.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (AT&T - Existing)	B	No	CaAa (Out Of Face)	99.00 - 16.00	2	No Ice	0.20	1.04
						1/2" Ice	0.30	2.55
1 5/8 (AT&T - Existing)	B	No	CaAa (Out Of Face)	99.00 - 16.00	10	No Ice	0.00	1.04
						1/2" Ice	0.00	2.55
1 5/8 (Verizon - Existing)	C	No	Inside Pole	89.00 - 16.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (MetroPCS - Existing)	C	No	CaAa (Out Of Face)	109.00 - 16.00	2	No Ice	0.20	1.04
						1/2" Ice	0.30	2.55
1 5/8 (MetroPCS - Existing)	C	No	CaAa (Out Of Face)	109.00 - 16.00	10	No Ice	0.00	1.04
						1/2" Ice	0.00	2.55
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	CaAa (Out Of Face)	95.00 - 16.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	3.41
3" dia Flex Conduit (AT&T - Existing)	B	No	Inside Pole	101.00 - 16.00	1	No Ice	0.00	5.00
						1/2" Ice	0.00	5.00
HYBRIFLEX 1-5/8"	C	No	CaAa (Out Of	95.00 - 16.00	1	No Ice	0.00	1.90

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
(Verizon - Proposed)			Face)		1/2" Ice	0.00	3.41

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	111.00-97.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.594	0.04
		C	0.000	0.000	0.000	4.554	0.14
L2	97.50-97.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.198	0.01
		C	0.000	0.000	0.000	0.198	0.01
L3	97.00-47.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	19.800	0.87
		C	0.000	0.000	0.000	19.800	1.33
L4	47.00-21.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	10.296	0.45
		C	0.000	0.000	0.000	10.296	0.75
L5	21.00-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	1.980	0.09
		C	0.000	0.000	0.000	1.980	0.14

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	111.00-97.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.894	0.06
		C		0.000	0.000	0.000	6.854	0.35
L2	97.50-97.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.298	0.02
		C		0.000	0.000	0.000	0.298	0.02
L3	97.00-47.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	29.800	1.78
		C		0.000	0.000	0.000	29.800	2.38
L4	47.00-21.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	15.496	0.93
		C		0.000	0.000	0.000	15.496	1.30
L5	21.00-1.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	2.980	0.18
		C		0.000	0.000	0.000	2.980	0.25

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	111.00-97.50	-0.2963	0.2224	-0.3841	0.2883
L2	97.50-97.00	0.0000	0.3789	0.0000	0.4671

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L3	97.00-47.00	0.0000	0.4189	0.0000	0.5343
L4	47.00-21.00	0.0000	0.4528	0.0000	0.5951
L5	21.00-1.00	0.0000	0.1338	0.0000	0.1902

Discrete Tower Loads

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
800-10504	A	From Face	3.00	0.0000	108.00	No Ice	3.66	2.26	0.02
(MetroPCS)			-4.00			1/2" Ice	4.01	2.59	0.04
			0.00						
800-10504	B	From Face	3.00	0.0000	108.00	No Ice	3.66	2.26	0.02
(MetroPCS)			-4.00			1/2" Ice	4.01	2.59	0.04
			0.00						
800-10504	C	From Face	3.00	0.0000	108.00	No Ice	3.66	2.26	0.02
(MetroPCS)			-4.00			1/2" Ice	4.01	2.59	0.04
			0.00						
742-351	A	From Face	3.00	0.0000	108.00	No Ice	5.89	1.73	0.03
(MetroPCS)			4.00			1/2" Ice	6.30	2.04	0.06
			0.00						
742-351	B	From Face	3.00	0.0000	108.00	No Ice	5.89	1.73	0.03
(MetroPCS)			4.00			1/2" Ice	6.30	2.04	0.06
			0.00						
742-351	C	From Face	3.00	0.0000	108.00	No Ice	5.89	1.73	0.03
(MetroPCS)			4.00			1/2" Ice	6.30	2.04	0.06
			0.00						
2-ft Standoff T-Arm (10-ft	A	From Face	1.50	0.0000	108.00	No Ice	5.50	5.50	0.13
Face Width)			0.00			1/2" Ice	6.90	6.90	0.17
(MetroPCS)			0.00						
2-ft Standoff T-Arm (10-ft	B	From Face	1.50	0.0000	108.00	No Ice	5.50	5.50	0.13
Face Width)			0.00			1/2" Ice	6.90	6.90	0.17
(MetroPCS)			0.00						
2-ft Standoff T-Arm (10-ft	C	From Face	1.50	0.0000	108.00	No Ice	5.50	5.50	0.13
Face Width)			0.00			1/2" Ice	6.90	6.90	0.17
(MetroPCS)			0.00						
(2) 7770.00	A	From Face	4.00	0.0000	100.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	B	From Face	4.00	0.0000	100.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	C	From Face	4.00	0.0000	100.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
AM-X-CD-14-65-00T-RET	A	From Face	7.00	0.0000	100.00	No Ice	5.51	2.83	0.04
(AT&T - Existing)			2.00			1/2" Ice	5.90	3.14	0.07
			0.00						
AM-X-CD-14-65-00T-RET	B	From Face	7.00	0.0000	100.00	No Ice	5.51	2.83	0.04
(AT&T - Existing)			2.00			1/2" Ice	5.90	3.14	0.07
			0.00						
AM-X-CD-16-65-00T-RET(7	C	From Face	7.00	0.0000	100.00	No Ice	8.26	4.64	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2")				2.00			1/2" Ice	8.81	5.09	0.10
(AT&T - Existing)				0.00						
(2) RRUS-11	A	From Face		1.00	0.0000	100.00	No Ice	0.00	1.25	0.05
(AT&T - Existing)				2.00			1/2" Ice	0.00	1.41	0.07
				0.00						
(2) RRUS-11	B	From Face		1.00	0.0000	100.00	No Ice	0.00	1.25	0.05
(AT&T - Existing)				2.00			1/2" Ice	0.00	1.41	0.07
				0.00						
(2) RRUS-11	C	From Face		1.00	0.0000	100.00	No Ice	0.00	1.25	0.05
(AT&T - Existing)				2.00			1/2" Ice	0.00	1.41	0.07
				0.00						
DC6-48-60-18-8F Surge	C	From Face		0.50	0.0000	100.00	No Ice	2.23	2.23	0.02
Arrestor				0.00			1/2" Ice	2.45	2.45	0.04
(AT&T - Existing)				0.00						
(2) LGP21401 TMA	A	From Face		3.50	0.0000	100.00	No Ice	0.00	0.37	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.00	0.48	0.02
				0.00						
(2) LGP21401 TMA	B	From Face		3.50	0.0000	100.00	No Ice	0.00	0.37	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.00	0.48	0.02
				0.00						
(2) LGP21401 TMA	C	From Face		3.50	0.0000	100.00	No Ice	0.00	0.37	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.00	0.48	0.02
				0.00						
TT19-08BP111-001 TMA	A	From Face		3.50	0.0000	100.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.76	0.62	0.02
				0.00						
TT19-08BP111-001 TMA	B	From Face		3.50	0.0000	100.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.76	0.62	0.02
				0.00						
TT19-08BP111-001 TMA	C	From Face		3.50	0.0000	100.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)				0.00			1/2" Ice	0.76	0.62	0.02
				0.00						
EEI Standard Platform	C	None			0.0000	99.00	No Ice	30.00	30.00	1.60
(AT&T - Existing)							1/2" Ice	35.00	35.00	2.00
BXA-80080-6CF	A	From Leg		4.00	0.0000	90.00	No Ice	5.77	4.56	0.02
(Verizon - Existing)				-6.00			1/2" Ice	6.22	5.00	0.05
				0.00						
HBXX-6516DS	A	From Leg		4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)				-4.00			1/2" Ice	6.35	3.61	0.07
				0.00						
X7C-FRO-660	A	From Leg		4.00	0.0000	90.00	No Ice	10.22	5.87	0.04
(Verizon - Proposed)				0.00			1/2" Ice	10.79	6.32	0.10
				0.00						
HBXX-6516DS	A	From Leg		4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)				4.00			1/2" Ice	6.35	3.61	0.07
				0.00						
BXA-80080-6CF	B	From Leg		4.00	0.0000	90.00	No Ice	5.77	4.56	0.02
(Verizon - Existing)				-6.00			1/2" Ice	6.22	5.00	0.05
				0.00						
HBXX-6516DS	B	From Leg		4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)				-4.00			1/2" Ice	6.35	3.61	0.07
				0.00						
X7C-FRO-660	B	From Leg		4.00	0.0000	90.00	No Ice	10.22	5.87	0.04
(Verizon - Proposed)				0.00			1/2" Ice	10.79	6.32	0.10
				0.00						
HBXX-6516DS	B	From Leg		4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)				4.00			1/2" Ice	6.35	3.61	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
BXA-80063-6BF	C	From Leg	4.00	0.0000	90.00	No Ice	7.47	4.04	0.02
(Verizon - Existing)			-6.00			1/2" Ice	7.99	4.46	0.06
			0.00						
HBXX-6516DS	C	From Leg	4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
X7C-FRO-660	C	From Leg	4.00	0.0000	90.00	No Ice	10.22	5.87	0.04
(Verizon - Proposed)			0.00			1/2" Ice	10.79	6.32	0.10
			0.00						
HBXX-6516DS	C	From Leg	4.00	0.0000	90.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
RRH2x40-07-U	A	From Leg	3.50	0.0000	90.00	No Ice	0.00	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	0.00	1.39	0.07
			0.00						
RRH2x40-07-U	B	From Leg	3.50	0.0000	90.00	No Ice	0.00	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	0.00	1.39	0.07
			0.00						
RRH2x40-07-U	C	From Leg	3.50	0.0000	90.00	No Ice	0.00	1.23	0.05
(Verizon - Existing)			0.00			1/2" Ice	0.00	1.39	0.07
			0.00						
RRH2x40-AWS	A	From Leg	3.50	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Leg	3.50	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Leg	3.50	0.0000	90.00	No Ice	2.52	1.59	0.04
(Verizon - Existing)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
DB-T1-6Z-8AB-0Z	A	From Leg	3.50	0.0000	90.00	No Ice	5.60	2.33	0.04
(Verizon - Existing)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
RRH2x60-PCS	A	From Leg	3.50	0.0000	90.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			0.00			1/2" Ice	2.80	2.24	0.08
			0.00						
RRH2x60-PCS	B	From Leg	3.50	0.0000	90.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			0.00			1/2" Ice	2.80	2.24	0.08
			0.00						
RRH2x60-PCS	C	From Leg	3.50	0.0000	90.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			0.00			1/2" Ice	2.80	2.24	0.08
			0.00						
DB-T1-6Z-8AB-0Z	B	From Leg	3.50	0.0000	90.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
EEI Standard Platform	C	None		0.0000	90.00	No Ice	30.00	30.00	1.60
(Verizon - Existing)						1/2" Ice	35.00	35.00	2.00

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 111.00-97.50	104.25	1.389	26	18.000	A	0.000	18.000	18.000	100.00	0.000	0.000
					B	0.000	18.000		100.00	0.000	0.594
					C	0.000	18.000		100.00	0.000	4.554
L2 97.50-97.00	97.25	1.362	25	0.698	A	0.000	0.698	0.698	100.00	0.000	0.000
					B	0.000	0.698		100.00	0.000	0.198
					C	0.000	0.698		100.00	0.000	0.198
L3 97.00-47.00	70.70	1.243	23	94.729	A	0.000	94.729	94.729	100.00	0.000	0.000
					B	0.000	94.729		100.00	0.000	19.800
					C	0.000	94.729		100.00	0.000	19.800
L4 47.00-21.00	33.58	1.005	19	66.011	A	0.000	66.011	66.011	100.00	0.000	0.000
					B	0.000	66.011		100.00	0.000	10.296
					C	0.000	66.011		100.00	0.000	10.296
L5 21.00-1.00	10.83	1	18	58.660	A	0.000	58.660	58.660	100.00	0.000	0.000
					B	0.000	58.660		100.00	0.000	1.980
					C	0.000	58.660		100.00	0.000	1.980

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 111.00-97.50	104.25	1.389	19	0.5000	19.125	A	0.000	19.125	19.125	100.00	0.000	0.000
						B	0.000	19.125		100.00	0.000	0.894
						C	0.000	19.125		100.00	0.000	6.854
L2 97.50-97.00	97.25	1.362	19	0.5000	0.739	A	0.000	0.739	0.739	100.00	0.000	0.000
						B	0.000	0.739		100.00	0.000	0.298
						C	0.000	0.739		100.00	0.000	0.298
L3 97.00-47.00	70.70	1.243	17	0.5000	98.896	A	0.000	98.896	98.896	100.00	0.000	0.000
						B	0.000	98.896		100.00	0.000	29.800
						C	0.000	98.896		100.00	0.000	29.800
L4 47.00-21.00	33.58	1.005	14	0.5000	68.177	A	0.000	68.177	68.177	100.00	0.000	0.000
						B	0.000	68.177		100.00	0.000	15.496
						C	0.000	68.177		100.00	0.000	15.496
L5 21.00-1.00	10.83	1	14	0.5000	60.327	A	0.000	60.327	60.327	100.00	0.000	0.000
						B	0.000	60.327		100.00	0.000	2.980
						C	0.000	60.327		100.00	0.000	2.980

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	104.25	1.389	9	18.000	A	0.000	18.000	18.000	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
111.00-97.50					B	0.000	18.000		100.00	0.000	0.594
					C	0.000	18.000		100.00	0.000	4.554
L2 97.50-97.00	97.25	1.362	9	0.698	A	0.000	0.698	0.698	100.00	0.000	0.000
					B	0.000	0.698		100.00	0.000	0.198
					C	0.000	0.698		100.00	0.000	0.198
L3 97.00-47.00	70.70	1.243	8	94.729	A	0.000	94.729	94.729	100.00	0.000	0.000
					B	0.000	94.729		100.00	0.000	19.800
					C	0.000	94.729		100.00	0.000	19.800
L4 47.00-21.00	33.58	1.005	6	66.011	A	0.000	66.011	66.011	100.00	0.000	0.000
					B	0.000	66.011		100.00	0.000	10.296
					C	0.000	66.011		100.00	0.000	10.296
L5 21.00-1.00	10.83	1	6	58.660	A	0.000	58.660	58.660	100.00	0.000	0.000
					B	0.000	58.660		100.00	0.000	1.980
					C	0.000	58.660		100.00	0.000	1.980

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 plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.68	50.72	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.03	68.76	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	3.91	78.19	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	1.99	76.72	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	1.32	65.78	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	424.41 kip-ft	7.94		

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 ft²	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.68	50.72	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.03	68.76	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	3.91	78.19	C
97.00-47.00			B	1	0.65	1	1	1	94.729			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	1.99	76.72	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	1.32	65.78	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	424.41 kip-ft	7.94		

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 ft²	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.68	50.72	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.03	68.76	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	3.91	78.19	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	1.99	76.72	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	1.32	65.78	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	424.41 kip-ft	7.94		

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 ft²	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.68	50.72	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.03	68.76	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	3.91	78.19	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	1.99	76.72	C
47.00-21.00			B	1	0.65	1	1	1	66.011			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	1.32	65.78	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	424.41 kip-ft	7.94		

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 plf	Ctrl. Face
L1	0.42	0.98	A	1	0.59	1	1	1	19.125	0.62	45.91	C
111.00-97.50			B	1	0.59	1	1	1	19.125			
			C	1	0.59	1	1	1	19.125			
L2	0.03	0.04	A	1	0.59	1	1	1	0.739	0.03	65.91	C
97.50-97.00			B	1	0.59	1	1	1	0.739			
			C	1	0.59	1	1	1	0.739			
L3	4.16	3.75	A	1	0.65	1	1	1	98.896	3.59	71.80	C
97.00-47.00			B	1	0.65	1	1	1	98.896			
			C	1	0.65	1	1	1	98.896			
L4	2.22	3.50	A	1	0.65	1	1	1	68.177	1.77	68.24	C
47.00-21.00			B	1	0.65	1	1	1	68.177			
			C	1	0.65	1	1	1	68.177			
L5 21.00-1.00	0.43	3.37	A	1	0.65	1	1	1	60.327	1.06	52.95	C
			B	1	0.65	1	1	1	60.327			
			C	1	0.65	1	1	1	60.327			
Sum Weight:	7.26	11.64						OTM	385.61 kip-ft	7.08		

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 plf	Ctrl. Face
L1	0.42	0.98	A	1	0.59	1	1	1	19.125	0.62	45.91	C
111.00-97.50			B	1	0.59	1	1	1	19.125			
			C	1	0.59	1	1	1	19.125			
L2	0.03	0.04	A	1	0.59	1	1	1	0.739	0.03	65.91	C
97.50-97.00			B	1	0.59	1	1	1	0.739			
			C	1	0.59	1	1	1	0.739			
L3	4.16	3.75	A	1	0.65	1	1	1	98.896	3.59	71.80	C
97.00-47.00			B	1	0.65	1	1	1	98.896			
			C	1	0.65	1	1	1	98.896			
L4	2.22	3.50	A	1	0.65	1	1	1	68.177	1.77	68.24	C
47.00-21.00			B	1	0.65	1	1	1	68.177			
			C	1	0.65	1	1	1	68.177			
L5 21.00-1.00	0.43	3.37	A	1	0.65	1	1	1	60.327	1.06	52.95	C
			B	1	0.65	1	1	1	60.327			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
Sum Weight:	7.26	11.64	C	1	0.65	1	1	1 OTM	60.327 385.61 kip-ft	7.08		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.42	0.98	A	1	0.59	1	1	1	19.125	0.62	45.91	C
111.00-97.50			B	1	0.59	1	1	1	19.125			
			C	1	0.59	1	1	1	19.125			
L2	0.03	0.04	A	1	0.59	1	1	1	0.739	0.03	65.91	C
97.50-97.00			B	1	0.59	1	1	1	0.739			
			C	1	0.59	1	1	1	0.739			
L3	4.16	3.75	A	1	0.65	1	1	1	98.896	3.59	71.80	C
97.00-47.00			B	1	0.65	1	1	1	98.896			
			C	1	0.65	1	1	1	98.896			
L4	2.22	3.50	A	1	0.65	1	1	1	68.177	1.77	68.24	C
47.00-21.00			B	1	0.65	1	1	1	68.177			
			C	1	0.65	1	1	1	68.177			
L5 21.00-1.00	0.43	3.37	A	1	0.65	1	1	1	60.327	1.06	52.95	C
			B	1	0.65	1	1	1	60.327			
			C	1	0.65	1	1	1	60.327			
Sum Weight:	7.26	11.64						OTM	385.61 kip-ft	7.08		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.42	0.98	A	1	0.59	1	1	1	19.125	0.62	45.91	C
111.00-97.50			B	1	0.59	1	1	1	19.125			
			C	1	0.59	1	1	1	19.125			
L2	0.03	0.04	A	1	0.59	1	1	1	0.739	0.03	65.91	C
97.50-97.00			B	1	0.59	1	1	1	0.739			
			C	1	0.59	1	1	1	0.739			
L3	4.16	3.75	A	1	0.65	1	1	1	98.896	3.59	71.80	C
97.00-47.00			B	1	0.65	1	1	1	98.896			
			C	1	0.65	1	1	1	98.896			
L4	2.22	3.50	A	1	0.65	1	1	1	68.177	1.77	68.24	C
47.00-21.00			B	1	0.65	1	1	1	68.177			
			C	1	0.65	1	1	1	68.177			
L5 21.00-1.00	0.43	3.37	A	1	0.65	1	1	1	60.327	1.06	52.95	C
			B	1	0.65	1	1	1	60.327			
			C	1	0.65	1	1	1	60.327			
Sum Weight:	7.26	11.64						OTM	385.61 kip-ft	7.08		

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 plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.24	17.55	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.01	23.79	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	1.35	27.05	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	0.69	26.55	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	0.46	22.76	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	146.85 kip-ft	2.75		

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 ft^2	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.24	17.55	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.01	23.79	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	1.35	27.05	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	0.69	26.55	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	0.46	22.76	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	146.85 kip-ft	2.75		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.24	17.55	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.01	23.79	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	1.35	27.05	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	0.69	26.55	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	0.46	22.76	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	146.85 kip-ft	2.75		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.18	0.85	A	1	0.59	1	1	1	18.000	0.24	17.55	C
111.00-97.50			B	1	0.59	1	1	1	18.000			
			C	1	0.59	1	1	1	18.000			
L2	0.01	0.03	A	1	0.59	1	1	1	0.698	0.01	23.79	C
97.50-97.00			B	1	0.59	1	1	1	0.698			
			C	1	0.59	1	1	1	0.698			
L3	2.20	3.04	A	1	0.65	1	1	1	94.729	1.35	27.05	C
97.00-47.00			B	1	0.65	1	1	1	94.729			
			C	1	0.65	1	1	1	94.729			
L4	1.20	3.01	A	1	0.65	1	1	1	66.011	0.69	26.55	C
47.00-21.00			B	1	0.65	1	1	1	66.011			
			C	1	0.65	1	1	1	66.011			
L5 21.00-1.00	0.23	2.92	A	1	0.65	1	1	1	58.660	0.46	22.76	C
			B	1	0.65	1	1	1	58.660			
			C	1	0.65	1	1	1	58.660			
Sum Weight:	3.83	9.85						OTM	146.85 kip-ft	2.75		

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	9.85					
Bracing Weight	0.00					
Total Member Self-Weight	9.85			1.33	0.23	

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
Total Weight	19.24			1.33	0.23	
Wind 0 deg - No Ice		-0.02	-18.04	-1384.37	1.89	0.41
Wind 30 deg - No Ice		8.97	-15.61	-1197.89	-688.22	0.88
Wind 45 deg - No Ice		12.70	-12.74	-977.33	-974.25	1.04
Wind 60 deg - No Ice		15.56	-9.00	-690.08	-1193.87	1.12
Wind 90 deg - No Ice		17.98	0.02	3.00	-1379.56	1.06
Wind 120 deg - No Ice		15.58	9.04	695.62	-1195.53	0.71
Wind 135 deg - No Ice		12.73	12.77	982.34	-976.61	0.46
Wind 150 deg - No Ice		9.01	15.63	1202.21	-691.11	0.17
Wind 180 deg - No Ice		0.02	18.04	1387.03	-1.44	-0.41
Wind 210 deg - No Ice		-8.97	15.61	1200.54	688.67	-0.88
Wind 225 deg - No Ice		-12.70	12.74	979.98	974.70	-1.04
Wind 240 deg - No Ice		-15.56	9.00	692.73	1194.32	-1.12
Wind 270 deg - No Ice		-17.98	-0.02	-0.34	1380.01	-1.06
Wind 300 deg - No Ice		-15.58	-9.04	-692.97	1195.99	-0.71
Wind 315 deg - No Ice		-12.73	-12.77	-979.69	977.06	-0.46
Wind 330 deg - No Ice		-9.01	-15.63	-1199.56	691.56	-0.17
Member Ice	1.80					
Total Weight Ice	26.69			3.25	0.45	
Wind 0 deg - Ice		-0.01	-15.56	-1190.86	1.71	0.33
Wind 30 deg - Ice		7.74	-13.47	-1030.25	-593.27	0.75
Wind 45 deg - Ice		10.96	-10.99	-840.23	-839.84	0.89
Wind 60 deg - Ice		13.43	-7.77	-592.72	-1029.15	0.97
Wind 90 deg - Ice		15.51	0.01	4.51	-1189.16	0.93
Wind 120 deg - Ice		13.44	7.79	601.40	-1030.41	0.64
Wind 135 deg - Ice		10.98	11.01	848.50	-841.62	0.43
Wind 150 deg - Ice		7.77	13.48	1038.01	-595.44	0.18
Wind 180 deg - Ice		0.01	15.56	1197.36	-0.81	-0.33
Wind 210 deg - Ice		-7.74	13.47	1036.75	594.17	-0.75
Wind 225 deg - Ice		-10.96	10.99	846.73	840.74	-0.89
Wind 240 deg - Ice		-13.43	7.77	599.22	1030.05	-0.97
Wind 270 deg - Ice		-15.51	-0.01	1.99	1190.06	-0.93
Wind 300 deg - Ice		-13.44	-7.79	-594.89	1031.31	-0.64
Wind 315 deg - Ice		-10.98	-11.01	-842.00	842.52	-0.43
Wind 330 deg - Ice		-7.77	-13.48	-1031.51	596.34	-0.18
Total Weight	19.24			1.33	0.23	
Wind 0 deg - Service		-0.01	-6.24	-479.47	0.45	0.14
Wind 30 deg - Service		3.10	-5.40	-414.94	-238.35	0.31
Wind 45 deg - Service		4.39	-4.41	-338.62	-337.32	0.36
Wind 60 deg - Service		5.38	-3.12	-239.23	-413.31	0.39
Wind 90 deg - Service		6.22	0.01	0.59	-477.56	0.37
Wind 120 deg - Service		5.39	3.13	240.25	-413.89	0.25
Wind 135 deg - Service		4.40	4.42	339.47	-338.13	0.16
Wind 150 deg - Service		3.12	5.41	415.55	-239.35	0.06
Wind 180 deg - Service		0.01	6.24	479.49	-0.71	-0.14
Wind 210 deg - Service		-3.10	5.40	414.97	238.09	-0.31
Wind 225 deg - Service		-4.39	4.41	338.65	337.06	-0.36
Wind 240 deg - Service		-5.38	3.12	239.25	413.05	-0.39
Wind 270 deg - Service		-6.22	-0.01	-0.56	477.30	-0.37
Wind 300 deg - Service		-5.39	-3.13	-240.23	413.63	-0.25
Wind 315 deg - Service		-4.40	-4.42	-339.44	337.88	-0.16
Wind 330 deg - Service		-3.12	-5.41	-415.52	239.09	-0.06

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
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	111 - 97.5	Pole	Max Tension	43	0.00	0.00	0.00
			Max. Compression	18	-5.50	0.23	-0.40
			Max. Mx	14	-3.40	30.57	-0.09

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	10	-3.39	0.06	-30.74
			Max. Vy	14	-6.11	30.57	-0.09
			Max. Vx	10	6.15	0.06	-30.74
			Max. Torque	7			-0.74
L2	97.5 - 97	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-5.57	0.23	-0.41
			Max. Mx	14	-3.44	33.64	-0.09
			Max. My	10	-3.44	0.06	-33.83
			Max. Vy	14	-6.15	33.64	-0.09
			Max. Vx	10	6.19	0.06	-33.83
			Max. Torque	7			-0.74
L3	97 - 47	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-16.47	0.21	-1.91
			Max. Mx	14	-10.58	601.25	0.05
			Max. My	10	-10.57	-0.68	-604.84
			Max. Vy	14	-14.93	601.25	0.05
			Max. Vx	10	14.99	-0.68	-604.84
			Max. Torque	5			-1.02
L4	47 - 21	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-22.90	0.43	-3.20
			Max. Mx	14	-15.75	1080.46	0.08
			Max. My	10	-15.75	-1.14	-1086.39
			Max. Vy	14	-16.98	1080.46	0.08
			Max. Vx	10	17.04	-1.14	-1086.39
			Max. Torque	5			-1.09
L5	21 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-26.69	0.47	-3.44
			Max. Mx	14	-19.23	1429.86	0.35
			Max. My	10	-19.23	-1.49	-1437.13
			Max. Vy	14	-17.99	1429.86	0.35
			Max. Vx	10	18.05	-1.49	-1437.13
			Max. Torque	5			-1.10

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	26.69	-0.01	-15.56
	Max. H_x	14	19.24	17.98	0.02
	Max. H_z	2	19.24	0.02	18.04
	Max. M_x	2	1434.37	0.02	18.04
	Max. M_z	6	1429.39	-17.98	-0.02
	Max. Torsion	13	1.10	15.56	-9.00
	Min. Vert	1	19.24	0.00	0.00
	Min. H_x	6	19.24	-17.98	-0.02
	Min. H_z	10	19.24	-0.02	-18.04
	Min. M_x	10	-1437.13	-0.02	-18.04
	Min. M_z	14	-1429.86	17.98	0.02
	Min. Torsion	5	-1.10	-15.56	9.00

Tower Mast Reaction Summary

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 Only	19.24	0.00	0.00	1.35	0.23	-0.00
Dead+Wind 0 deg - No Ice	19.24	-0.02	-18.04	-1434.37	1.97	0.41
Dead+Wind 30 deg - No Ice	19.24	8.97	-15.61	-1241.17	-713.07	0.87
Dead+Wind 45 deg - No Ice	19.24	12.70	-12.74	-1012.65	-1009.43	1.02
Dead+Wind 60 deg - No Ice	19.24	15.56	-9.00	-715.02	-1236.99	1.10
Dead+Wind 90 deg - No Ice	19.24	17.98	0.02	3.11	-1429.39	1.03
Dead+Wind 120 deg - No Ice	19.24	15.58	9.04	720.76	-1238.72	0.69
Dead+Wind 135 deg - No Ice	19.24	12.73	12.77	1017.84	-1011.88	0.44
Dead+Wind 150 deg - No Ice	19.24	9.01	15.63	1245.64	-716.06	0.16
Dead+Wind 180 deg - No Ice	19.24	0.02	18.04	1437.13	-1.49	-0.41
Dead+Wind 210 deg - No Ice	19.24	-8.97	15.61	1243.92	713.55	-0.87
Dead+Wind 225 deg - No Ice	19.24	-12.70	12.74	1015.40	1009.91	-1.02
Dead+Wind 240 deg - No Ice	19.24	-15.56	9.00	717.76	1237.46	-1.10
Dead+Wind 270 deg - No Ice	19.24	-17.98	-0.02	-0.35	1429.86	-1.03
Dead+Wind 300 deg - No Ice	19.24	-15.58	-9.04	-718.00	1239.18	-0.69
Dead+Wind 315 deg - No Ice	19.24	-12.73	-12.77	-1015.08	1012.34	-0.44
Dead+Wind 330 deg - No Ice	19.24	-9.01	-15.63	-1242.88	716.54	-0.16
Dead+Ice+Temp	26.69	-0.00	0.00	3.44	0.47	-0.00
Dead+Wind 0 deg+Ice+Temp	26.69	-0.01	-15.56	-1254.85	1.81	0.34
Dead+Wind 30 deg+Ice+Temp	26.69	7.74	-13.47	-1085.62	-625.15	0.74
Dead+Wind 45 deg+Ice+Temp	26.69	10.96	-10.99	-885.38	-884.98	0.88
Dead+Wind 60 deg+Ice+Temp	26.69	13.43	-7.77	-624.56	-1084.48	0.95
Dead+Wind 90 deg+Ice+Temp	26.69	15.51	0.01	4.79	-1253.08	0.90
Dead+Wind 120 deg+Ice+Temp	26.69	13.44	7.79	633.77	-1085.79	0.62
Dead+Wind 135 deg+Ice+Temp	26.69	10.98	11.01	894.17	-886.85	0.40
Dead+Wind 150 deg+Ice+Temp	26.69	7.77	13.48	1093.86	-627.44	0.16
Dead+Wind 180 deg+Ice+Temp	26.69	0.01	15.56	1261.77	-0.85	-0.34
Dead+Wind 210 deg+Ice+Temp	26.69	-7.74	13.47	1092.53	626.11	-0.74
Dead+Wind 225 deg+Ice+Temp	26.69	-10.96	10.99	892.29	885.94	-0.88
Dead+Wind 240 deg+Ice+Temp	26.69	-13.43	7.77	631.47	1085.43	-0.95
Dead+Wind 270 deg+Ice+Temp	26.69	-15.51	-0.01	2.13	1254.03	-0.90
Dead+Wind 300 deg+Ice+Temp	26.69	-13.44	-7.79	-626.85	1086.75	-0.62
Dead+Wind 315 deg+Ice+Temp	26.69	-10.98	-11.01	-887.24	887.81	-0.40
Dead+Wind 330 deg+Ice+Temp	26.69	-7.77	-13.48	-1086.93	628.40	-0.16
Dead+Wind 0 deg - Service	19.24	-0.01	-6.24	-496.22	0.83	0.14
Dead+Wind 30 deg - Service	19.24	3.10	-5.40	-429.26	-246.99	0.31
Dead+Wind 45 deg - Service	19.24	4.39	-4.41	-350.05	-349.70	0.36
Dead+Wind 60 deg - Service	19.24	5.38	-3.12	-246.90	-428.56	0.39
Dead+Wind 90 deg - Service	19.24	6.22	0.01	1.99	-495.24	0.36
Dead+Wind 120 deg - Service	19.24	5.39	3.13	250.71	-429.16	0.24
Dead+Wind 135 deg - Service	19.24	4.40	4.42	353.68	-350.55	0.15
Dead+Wind 150 deg - Service	19.24	3.12	5.41	432.63	-248.02	0.06
Dead+Wind 180 deg - Service	19.24	0.01	6.24	499.00	-0.36	-0.14
Dead+Wind 210 deg - Service	19.24	-3.10	5.40	432.03	247.46	-0.31
Dead+Wind 225 deg - Service	19.24	-4.39	4.41	352.83	350.17	-0.36
Dead+Wind 240 deg - Service	19.24	-5.38	3.12	249.67	429.03	-0.39
Dead+Wind 270 deg - Service	19.24	-6.22	-0.01	0.79	495.71	-0.36
Dead+Wind 300 deg - Service	19.24	-5.39	-3.13	-247.94	429.63	-0.24
Dead+Wind 315 deg - Service	19.24	-4.40	-4.42	-350.90	351.02	-0.15
Dead+Wind 330 deg - Service	19.24	-3.12	-5.41	-429.86	248.49	-0.06

Solution Summary

Load Comb.	Sum of Applied Forces PX	PY	PZ	Sum of Reactions PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-19.24	0.00	0.00	19.24	0.00	0.000%
2	-0.02	-19.24	-18.04	0.02	19.24	18.04	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
3	8.97	-19.24	-15.61	-8.97	19.24	15.61	0.000%
4	12.70	-19.24	-12.74	-12.70	19.24	12.74	0.000%
5	15.56	-19.24	-9.00	-15.56	19.24	9.00	0.000%
6	17.98	-19.24	0.02	-17.98	19.24	-0.02	0.000%
7	15.58	-19.24	9.04	-15.58	19.24	-9.04	0.000%
8	12.73	-19.24	12.77	-12.73	19.24	-12.77	0.000%
9	9.01	-19.24	15.63	-9.01	19.24	-15.63	0.000%
10	0.02	-19.24	18.04	-0.02	19.24	-18.04	0.000%
11	-8.97	-19.24	15.61	8.97	19.24	-15.61	0.000%
12	-12.70	-19.24	12.74	12.70	19.24	-12.74	0.000%
13	-15.56	-19.24	9.00	15.56	19.24	-9.00	0.000%
14	-17.98	-19.24	-0.02	17.98	19.24	0.02	0.000%
15	-15.58	-19.24	-9.04	15.58	19.24	9.04	0.000%
16	-12.73	-19.24	-12.77	12.73	19.24	12.77	0.000%
17	-9.01	-19.24	-15.63	9.01	19.24	15.63	0.000%
18	0.00	-26.69	0.00	0.00	26.69	-0.00	0.000%
19	-0.01	-26.69	-15.56	0.01	26.69	15.56	0.000%
20	7.74	-26.69	-13.47	-7.74	26.69	13.47	0.000%
21	10.96	-26.69	-10.99	-10.96	26.69	10.99	0.000%
22	13.43	-26.69	-7.77	-13.43	26.69	7.77	0.000%
23	15.51	-26.69	0.01	-15.51	26.69	-0.01	0.000%
24	13.44	-26.69	7.79	-13.44	26.69	-7.79	0.000%
25	10.98	-26.69	11.01	-10.98	26.69	-11.01	0.000%
26	7.77	-26.69	13.48	-7.77	26.69	-13.48	0.000%
27	0.01	-26.69	15.56	-0.01	26.69	-15.56	0.000%
28	-7.74	-26.69	13.47	7.74	26.69	-13.47	0.000%
29	-10.96	-26.69	10.99	10.96	26.69	-10.99	0.000%
30	-13.43	-26.69	7.77	13.43	26.69	-7.77	0.000%
31	-15.51	-26.69	-0.01	15.51	26.69	0.01	0.000%
32	-13.44	-26.69	-7.79	13.44	26.69	7.79	0.000%
33	-10.98	-26.69	-11.01	10.98	26.69	11.01	0.000%
34	-7.77	-26.69	-13.48	7.77	26.69	13.48	0.000%
35	-0.01	-19.24	-6.24	0.01	19.24	6.24	0.000%
36	3.10	-19.24	-5.40	-3.10	19.24	5.40	0.000%
37	4.39	-19.24	-4.41	-4.39	19.24	4.41	0.000%
38	5.38	-19.24	-3.12	-5.38	19.24	3.12	0.000%
39	6.22	-19.24	0.01	-6.22	19.24	-0.01	0.000%
40	5.39	-19.24	3.13	-5.39	19.24	-3.13	0.000%
41	4.40	-19.24	4.42	-4.40	19.24	-4.42	0.000%
42	3.12	-19.24	5.41	-3.12	19.24	-5.41	0.000%
43	0.01	-19.24	6.24	-0.01	19.24	-6.24	0.000%
44	-3.10	-19.24	5.40	3.10	19.24	-5.40	0.000%
45	-4.39	-19.24	4.41	4.39	19.24	-4.41	0.000%
46	-5.38	-19.24	3.12	5.38	19.24	-3.12	0.000%
47	-6.22	-19.24	-0.01	6.22	19.24	0.01	0.000%
48	-5.39	-19.24	-3.13	5.39	19.24	3.13	0.000%
49	-4.40	-19.24	-4.42	4.40	19.24	4.42	0.000%
50	-3.12	-19.24	-5.41	3.12	19.24	5.41	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00005040
3	Yes	6	0.00000001	0.00011051

4	Yes	6	0.00000001	0.00011159
5	Yes	6	0.00000001	0.00010064
6	Yes	5	0.00000001	0.00020888
7	Yes	6	0.00000001	0.00011062
8	Yes	6	0.00000001	0.00011169
9	Yes	6	0.00000001	0.00010542
10	Yes	5	0.00000001	0.00006695
11	Yes	6	0.00000001	0.00010227
12	Yes	6	0.00000001	0.00011176
13	Yes	6	0.00000001	0.00011223
14	Yes	5	0.00000001	0.00019231
15	Yes	6	0.00000001	0.00010255
16	Yes	6	0.00000001	0.00011151
17	Yes	6	0.00000001	0.00010768
18	Yes	4	0.00000001	0.00004057
19	Yes	5	0.00000001	0.00059563
20	Yes	6	0.00000001	0.00035593
21	Yes	6	0.00000001	0.00038512
22	Yes	6	0.00000001	0.00033238
23	Yes	5	0.00000001	0.00072900
24	Yes	6	0.00000001	0.00036058
25	Yes	6	0.00000001	0.00039002
26	Yes	6	0.00000001	0.00034771
27	Yes	5	0.00000001	0.00060311
28	Yes	6	0.00000001	0.00034025
29	Yes	6	0.00000001	0.00038968
30	Yes	6	0.00000001	0.00036394
31	Yes	5	0.00000001	0.00071393
32	Yes	6	0.00000001	0.00033782
33	Yes	6	0.00000001	0.00038636
34	Yes	6	0.00000001	0.00035065
35	Yes	4	0.00000001	0.00026427
36	Yes	5	0.00000001	0.00022668
37	Yes	5	0.00000001	0.00024281
38	Yes	5	0.00000001	0.00019066
39	Yes	4	0.00000001	0.00086276
40	Yes	5	0.00000001	0.00022948
41	Yes	5	0.00000001	0.00024559
42	Yes	5	0.00000001	0.00020888
43	Yes	4	0.00000001	0.00028786
44	Yes	5	0.00000001	0.00019838
45	Yes	5	0.00000001	0.00024663
46	Yes	5	0.00000001	0.00023629
47	Yes	4	0.00000001	0.00083985
48	Yes	5	0.00000001	0.00019703
49	Yes	5	0.00000001	0.00024254
50	Yes	5	0.00000001	0.00021592

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	111 - 97.5	28.253	43	2.1662	0.0070
L2	97.5 - 97	22.145	43	2.1439	0.0067
L3	97 - 47	21.920	43	2.1418	0.0067
L4	51 - 21	5.471	43	1.0843	0.0016
L5	21 - 1	0.787	43	0.3779	0.0004

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	800-10504	43	26.891	2.1648	0.0070	43115
100.00	(2) 7770.00	43	23.270	2.1527	0.0069	14545
99.00	EEI Standard Platform	43	22.819	2.1496	0.0068	10792
90.00	BXA-80080-6CF	43	18.858	2.0777	0.0060	3576

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	111 - 97.5	81.136	10	6.2233	0.0201
L2	97.5 - 97	63.618	10	6.1601	0.0193
L3	97 - 47	62.974	10	6.1538	0.0191
L4	51 - 21	15.742	10	3.1193	0.0046
L5	21 - 1	2.267	10	1.0879	0.0012

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	800-10504	10	77.229	6.2195	0.0201	15501
100.00	(2) 7770.00	10	66.844	6.1850	0.0197	5210
99.00	EEI Standard Platform	10	65.552	6.1761	0.0196	3858
90.00	BXA-80080-6CF	10	54.188	5.9706	0.0172	1272

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	111 - 109.962	TP16x16x0.375	13.50	0.00	0.0	21.600	18.4078	-0.10	397.61	0.000
	109.962 - 108.923					21.600	18.4078	-0.20	397.61	0.001
	108.923 - 107.885					21.600	18.4078	-0.97	397.61	0.002
	107.885 - 106.846					21.600	18.4078	-0.65	397.61	0.002

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 $\frac{P}{P_a}$
	106.846 - 105.808					21.600	18.4078	-0.72	397.61	0.002
	105.808 - 104.769					21.600	18.4078	-0.80	397.61	0.002
	104.769 - 103.731					21.600	18.4078	-0.87	397.61	0.002
	103.731 - 102.692					21.600	18.4078	-0.94	397.61	0.002
	102.692 - 101.654					21.600	18.4078	-1.01	397.61	0.003
	101.654 - 100.615					21.600	18.4078	-1.09	397.61	0.003
	100.615 - 99.5769					21.600	18.4078	-1.79	397.61	0.005
	99.5769 - 98.5385					21.600	18.4078	-3.32	397.61	0.008
	98.5385 - 97.5					21.600	18.4078	-3.39	397.61	0.009
L2	97.5 - 97 (2)	TP17.49x16x0.375	0.50	0.00	0.0	21.600	18.4078	-3.41	397.61	0.009
L3	97 - 94.5789	TP27.98x17.49x0.25	50.00	0.00	0.0	39.000	14.0830	-3.64	549.24	0.007
	94.5789 - 92.1579					39.000	14.4860	-3.85	564.96	0.007
	92.1579 - 89.7368					39.000	14.8891	-6.08	580.67	0.010
	89.7368 - 87.3158					39.000	15.2921	-6.31	596.39	0.011
	87.3158 - 84.8947					39.000	15.6952	-6.55	612.11	0.011
	84.8947 - 82.4737					39.000	16.0982	-6.80	627.83	0.011
	82.4737 - 80.0526					39.000	16.5013	-7.05	643.55	0.011
	80.0526 - 77.6316					39.000	16.9043	-7.31	659.27	0.011
	77.6316 - 75.2105					39.000	17.3074	-7.58	674.99	0.011
	75.2105 - 72.7895					39.000	17.7104	-7.85	690.71	0.011
	72.7895 - 70.3684					39.000	18.1135	-8.13	706.42	0.012
	70.3684 - 67.9474					39.000	18.5165	-8.42	722.14	0.012
	67.9474 - 65.5263					39.000	18.9196	-8.71	737.86	0.012
	65.5263 - 63.1053					39.000	19.3226	-9.01	753.58	0.012
	63.1053 - 60.6842					39.000	19.7257	-9.31	769.30	0.012
	60.6842 - 58.2632					39.000	20.1287	-9.62	785.02	0.012
	58.2632 - 55.8421					39.000	20.5318	-9.93	800.74	0.012
	55.8421 - 53.4211					39.000	20.9348	-10.25	816.46	0.013
	53.4211 - 51					39.000	21.3379	-10.57	832.18	0.013
	51 - 47					39.000	22.0038	-5.18	858.15	0.006
L4	51 - 47	TP33.392x26.6408x0.3125	30.00	0.00	0.0	39.000	27.0072	-6.25	1053.28	0.006
	47 - 45.6316					39.000	27.3127	-11.65	1065.19	0.011
	45.6316 - 44.2632					39.000	27.6181	-11.87	1077.11	0.011
	44.2632 -					39.000	27.9236	-12.08	1089.02	0.011

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 $\frac{P}{P_a}$
	42.8947									
	42.8947 - 41.5263					39.000	28.2290	-12.30	1100.93	0.011
	41.5263 - 40.1579					39.000	28.5345	-12.52	1112.84	0.011
	40.1579 - 38.7895					39.000	28.8399	-12.74	1124.76	0.011
	38.7895 - 37.4211					39.000	29.1454	-12.96	1136.67	0.011
	37.4211 - 36.0526					39.000	29.4508	-13.18	1148.58	0.011
	36.0526 - 34.6842					39.000	29.7563	-13.41	1160.49	0.012
	34.6842 - 33.3158					39.000	30.0617	-13.64	1172.41	0.012
	33.3158 - 31.9474					39.000	30.3671	-13.86	1184.32	0.012
	31.9474 - 30.5789					39.000	30.6726	-14.09	1196.23	0.012
	30.5789 - 29.2105					39.000	30.9780	-14.32	1208.14	0.012
	29.2105 - 27.8421					39.000	31.2835	-14.56	1220.06	0.012
	27.8421 - 26.4737					39.000	31.5889	-14.79	1231.97	0.012
	26.4737 - 25.1053					39.000	31.8944	-15.03	1243.88	0.012
	25.1053 - 23.7368					39.000	32.1998	-15.27	1255.79	0.012
	23.7368 - 22.3684					39.000	32.5053	-15.51	1267.71	0.012
	22.3684 - 21					39.000	32.8107	-15.75	1279.62	0.012
L5	21 - 20	TP37x33.392x0.389	20.00	0.00	0.0	39.000	40.9711	-15.92	1597.87	0.010
	20 - 19					39.000	41.1938	-16.08	1606.56	0.010
	19 - 18					39.000	41.4166	-16.25	1615.25	0.010
	18 - 17					39.000	41.6393	-16.42	1623.93	0.010
	17 - 16					39.000	41.8620	-16.59	1632.62	0.010
	16 - 15					39.000	42.0848	-16.76	1641.31	0.010
	15 - 14					39.000	42.3075	-16.93	1649.99	0.010
	14 - 13					39.000	42.5302	-17.10	1658.68	0.010
	13 - 12					39.000	42.7530	-17.27	1667.37	0.010
	12 - 11					39.000	42.9757	-17.45	1676.05	0.010
	11 - 10					39.000	43.1985	-17.62	1684.74	0.010
	10 - 9					39.000	43.4212	-17.80	1693.43	0.011
	9 - 8					39.000	43.6439	-17.97	1702.11	0.011
	8 - 7					39.000	43.8667	-18.15	1710.80	0.011
	7 - 6					39.000	44.0894	-18.33	1719.49	0.011
	6 - 5					39.000	44.3121	-18.51	1728.17	0.011
	5 - 4					39.000	44.5349	-18.68	1736.86	0.011
	4 - 3					39.000	44.7576	-18.86	1745.55	0.011
	3 - 2					39.000	44.9804	-19.05	1754.23	0.011
	2 - 1					39.000	45.2031	-19.23	1762.92	0.011

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	111 - 109.962	TP16x16x0.375	0.05	-0.008	23.760	0.000	0.00	0.000	23.760	0.000
	109.962 - 108.923		0.15	-0.026	23.760	0.001	0.00	0.000	23.760	0.000
	108.923 - 107.885		0.49	-0.084	23.760	0.004	0.00	0.000	23.760	0.000
	107.885 - 106.846		2.45	-0.419	23.760	0.018	0.00	0.000	23.760	0.000
	106.846 - 105.808		4.47	-0.763	23.760	0.032	0.00	0.000	23.760	0.000
	105.808 - 104.769		6.55	-1.119	23.760	0.047	0.00	0.000	23.760	0.000
	104.769 - 103.731		8.69	-1.485	23.760	0.062	0.00	0.000	23.760	0.000
	103.731 - 102.692		10.90	-1.862	23.760	0.078	0.00	0.000	23.760	0.000
	102.692 - 101.654		13.17	-2.249	23.760	0.095	0.00	0.000	23.760	0.000
	101.654 - 100.615		15.51	-2.648	23.760	0.111	0.00	0.000	23.760	0.000
	100.615 - 99.5769		18.94	-3.234	23.760	0.136	0.00	0.000	23.760	0.000
	99.5769 - 98.5385		24.39	-4.165	23.760	0.175	0.00	0.000	23.760	0.000
	98.5385 - 97.5		30.74	-5.250	23.760	0.221	0.00	0.000	23.760	0.000
L2	97.5 - 97 (2)	TP17.49x16x0.375	30.74	-5.250	23.760	0.221	0.00	0.000	23.760	0.000
L3	97 - 94.5789	TP27.98x17.49x0.25	49.06	-9.605	39.000	0.246	0.00	0.000	39.000	0.000
	94.5789 - 92.1579		64.73	-11.973	39.000	0.307	0.00	0.000	39.000	0.000
	92.1579 - 89.7368		82.16	-14.378	39.000	0.369	0.00	0.000	39.000	0.000
	89.7368 - 87.3158		111.48	-18.490	39.000	0.474	0.00	0.000	39.000	0.000
	87.3158 - 84.8947		141.25	-22.232	39.000	0.570	0.00	0.000	39.000	0.000
	84.8947 - 82.4737		171.46	-25.644	39.000	0.658	0.00	0.000	39.000	0.000
	82.4737 - 80.0526		202.12	-28.761	39.000	0.737	0.00	0.000	39.000	0.000
	80.0526 - 77.6316		233.21	-31.614	39.000	0.811	0.00	0.000	39.000	0.000
	77.6316 - 75.2105		264.75	-34.228	39.000	0.878	0.00	0.000	39.000	0.000
	75.2105 - 72.7895		296.74	-36.627	39.000	0.939	0.00	0.000	39.000	0.000
	72.7895 - 70.3684		329.17	-38.833	39.000	0.996	0.00	0.000	39.000	0.000
	70.3684 - 67.9474		362.05	-40.863	39.000	1.048	0.00	0.000	39.000	0.000
	67.9474 - 65.5263		395.38	-42.734	39.000	1.096	0.00	0.000	39.000	0.000
	65.5263 - 63.1053		429.15	-44.460	39.000	1.140	0.00	0.000	39.000	0.000
	63.1053 - 60.6842		463.38	-46.055	39.000	1.181	0.00	0.000	39.000	0.000
	60.6842 - 58.2632		498.06	-47.530	39.000	1.219	0.00	0.000	39.000	0.000
	58.2632 - 55.8421		533.20	-48.895	39.000	1.254	0.00	0.000	39.000	0.000
	55.8421 - 53.4211		568.79	-50.161	39.000	1.286	0.00	0.000	39.000	0.000

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 $\frac{f_{by}}{F_{by}}$
	53.4211 - 51		604.84	-51.335	39.000	1.316	0.00	0.000	39.000	0.000
	51 - 47		305.56	-24.381	39.000	0.625	0.00	0.000	39.000	0.000
L4	51 - 47	TP33.392x26.6408x0.3125	359.97	-23.890	39.000	0.613	0.00	0.000	39.000	0.000
	47 - 45.6316		686.60	-44.549	39.000	1.142	0.00	0.000	39.000	0.000
	45.6316 - 44.2632		707.79	-44.908	39.000	1.151	0.00	0.000	39.000	0.000
	44.2632 - 42.8947		729.10	-45.248	39.000	1.160	0.00	0.000	39.000	0.000
	42.8947 - 41.5263		750.52	-45.570	39.000	1.168	0.00	0.000	39.000	0.000
	41.5263 - 40.1579		772.07	-45.874	39.000	1.176	0.00	0.000	39.000	0.000
	40.1579 - 38.7895		793.73	-46.163	39.000	1.184	0.00	0.000	39.000	0.000
	38.7895 - 37.4211		815.51	-46.435	39.000	1.191	0.00	0.000	39.000	0.000
	37.4211 - 36.0526		837.41	-46.693	39.000	1.197	0.00	0.000	39.000	0.000
	36.0526 - 34.6842		859.42	-46.937	39.000	1.204	0.00	0.000	39.000	0.000
	34.6842 - 33.3158		881.57	-47.168	39.000	1.209	0.00	0.000	39.000	0.000
	33.3158 - 31.9474		903.83	-47.386	39.000	1.215	0.00	0.000	39.000	0.000
	31.9474 - 30.5789		926.22	-47.593	39.000	1.220	0.00	0.000	39.000	0.000
	30.5789 - 29.2105		948.73	-47.788	39.000	1.225	0.00	0.000	39.000	0.000
	29.2105 - 27.8421		971.36	-47.973	39.000	1.230	0.00	0.000	39.000	0.000
	27.8421 - 26.4737		994.11	-48.147	39.000	1.235	0.00	0.000	39.000	0.000
	26.4737 - 25.1053		1016.99	-48.312	39.000	1.239	0.00	0.000	39.000	0.000
	25.1053 - 23.7368		1040.00	-48.468	39.000	1.243	0.00	0.000	39.000	0.000
	23.7368 - 22.3684		1063.13	-48.615	39.000	1.247	0.00	0.000	39.000	0.000
	22.3684 - 21		1086.39	-48.753	39.000	1.250	0.00	0.000	39.000	0.000
L5	21 - 20	TP37x33.392x0.389	1103.45	-39.621	39.000	1.016	0.00	0.000	39.000	0.000
	20 - 19		1120.56	-39.799	39.000	1.020	0.00	0.000	39.000	0.000
	19 - 18		1137.72	-39.972	39.000	1.025	0.00	0.000	39.000	0.000
	18 - 17		1154.93	-40.141	39.000	1.029	0.00	0.000	39.000	0.000
	17 - 16		1172.18	-40.306	39.000	1.033	0.00	0.000	39.000	0.000
	16 - 15		1189.49	-40.467	39.000	1.038	0.00	0.000	39.000	0.000
	15 - 14		1206.85	-40.624	39.000	1.042	0.00	0.000	39.000	0.000
	14 - 13		1224.26	-40.777	39.000	1.046	0.00	0.000	39.000	0.000
	13 - 12		1241.72	-40.927	39.000	1.049	0.00	0.000	39.000	0.000
	12 - 11		1259.23	-41.072	39.000	1.053	0.00	0.000	39.000	0.000
	11 - 10		1276.79	-41.215	39.000	1.057	0.00	0.000	39.000	0.000
	10 - 9		1294.40	-41.353	39.000	1.060	0.00	0.000	39.000	0.000
	9 - 8		1312.07	-41.488	39.000	1.064	0.00	0.000	39.000	0.000
	8 - 7		1329.78	-41.620	39.000	1.067	0.00	0.000	39.000	0.000
	7 - 6		1347.54	-41.749	39.000	1.070	0.00	0.000	39.000	0.000
	6 - 5		1365.36	-41.874	39.000	1.074	0.00	0.000	39.000	0.000
	5 - 4		1383.22	-41.997	39.000	1.077	0.00	0.000	39.000	0.000
	4 - 3		1401.14	-42.116	39.000	1.080	0.00	0.000	39.000	0.000
	3 - 2		1419.12	-42.233	39.000	1.083	0.00	0.000	39.000	0.000
	2 - 1		1437.13	-42.346	39.000	1.086	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	111 - 109.962	TP16x16x0.375	0.000	0.000	0.000	0.001 ✔	1.333	H1-3 ✔
	109.962 - 108.923		0.001	0.001	0.000	0.002 ✔	1.333	H1-3 ✔
	108.923 - 107.885		0.002	0.004	0.000	0.006 ✔	1.333	H1-3 ✔
	107.885 - 106.846		0.002	0.018	0.000	0.019 ✔	1.333	H1-3 ✔
	106.846 - 105.808		0.002	0.032	0.000	0.034 ✔	1.333	H1-3 ✔
	105.808 - 104.769		0.002	0.047	0.000	0.049 ✔	1.333	H1-3 ✔
	104.769 - 103.731		0.002	0.062	0.000	0.065 ✔	1.333	H1-3 ✔
	103.731 - 102.692		0.002	0.078	0.000	0.081 ✔	1.333	H1-3 ✔
	102.692 - 101.654		0.003	0.095	0.000	0.097 ✔	1.333	H1-3 ✔
	101.654 - 100.615		0.003	0.111	0.000	0.114 ✔	1.333	H1-3 ✔
	100.615 - 99.5769		0.005	0.136	0.000	0.141 ✔	1.333	H1-3 ✔
	99.5769 - 98.5385		0.008	0.175	0.000	0.184 ✔	1.333	H1-3 ✔
	98.5385 - 97.5		0.009	0.221	0.000	0.229 ✔	1.333	H1-3 ✔
L2	97.5 - 97 (2)	TP17.49x16x0.375	0.009	0.221	0.000	0.230 ✔	1.333	H1-3 ✔
L3	97 - 94.5789	TP27.98x17.49x0.25	0.007	0.246	0.000	0.253 ✔	1.333	H1-3 ✔
	94.5789 - 92.1579		0.007	0.307	0.000	0.314 ✔	1.333	H1-3 ✔
	92.1579 - 89.7368		0.010	0.369	0.000	0.379 ✔	1.333	H1-3 ✔
	89.7368 - 87.3158		0.011	0.474	0.000	0.485 ✔	1.333	H1-3 ✔
	87.3158 - 84.8947		0.011	0.570	0.000	0.581 ✔	1.333	H1-3 ✔
	84.8947 - 82.4737		0.011	0.658	0.000	0.668 ✔	1.333	H1-3 ✔
	82.4737 - 80.0526		0.011	0.737	0.000	0.748 ✔	1.333	H1-3 ✔
	80.0526 - 77.6316		0.011	0.811	0.000	0.822 ✔	1.333	H1-3 ✔
	77.6316 - 75.2105		0.011	0.878	0.000	0.889 ✔	1.333	H1-3 ✔
	75.2105 - 72.7895		0.011	0.939	0.000	0.951 ✔	1.333	H1-3 ✔

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	72.7895 - 70.3684		0.012	0.996	0.000	1.007 ✔	1.333	H1-3 ✔
	70.3684 - 67.9474		0.012	1.048	0.000	1.059 ✔	1.333	H1-3 ✔
	67.9474 - 65.5263		0.012	1.096	0.000	1.108 ✔	1.333	H1-3 ✔
	65.5263 - 63.1053		0.012	1.140	0.000	1.152 ✔	1.333	H1-3 ✔
	63.1053 - 60.6842		0.012	1.181	0.000	1.193 ✔	1.333	H1-3 ✔
	60.6842 - 58.2632		0.012	1.219	0.000	1.231 ✔	1.333	H1-3 ✔
	58.2632 - 55.8421		0.012	1.254	0.000	1.266 ✔	1.333	H1-3 ✔
	55.8421 - 53.4211		0.013	1.286	0.000	1.299 ✔	1.333	H1-3 ✔
	53.4211 - 51		0.013	1.316	0.000	1.329 ✔	1.333	H1-3 ✔
	51 - 47		0.006	0.625	0.000	0.631 ✔	1.333	H1-3 ✔
L4	51 - 47	TP33.392x26.6408x0.3125	0.006	0.613	0.000	0.619 ✔	1.333	H1-3 ✔
	47 - 45.6316		0.011	1.142	0.000	1.153 ✔	1.333	H1-3 ✔
	45.6316 - 44.2632		0.011	1.151	0.000	1.163 ✔	1.333	H1-3 ✔
	44.2632 - 42.8947		0.011	1.160	0.000	1.171 ✔	1.333	H1-3 ✔
	42.8947 - 41.5263		0.011	1.168	0.000	1.180 ✔	1.333	H1-3 ✔
	41.5263 - 40.1579		0.011	1.176	0.000	1.188 ✔	1.333	H1-3 ✔
	40.1579 - 38.7895		0.011	1.184	0.000	1.195 ✔	1.333	H1-3 ✔
	38.7895 - 37.4211		0.011	1.191	0.000	1.202 ✔	1.333	H1-3 ✔
	37.4211 - 36.0526		0.011	1.197	0.000	1.209 ✔	1.333	H1-3 ✔
	36.0526 - 34.6842		0.012	1.204	0.000	1.215 ✔	1.333	H1-3 ✔
	34.6842 - 33.3158		0.012	1.209	0.000	1.221 ✔	1.333	H1-3 ✔
	33.3158 - 31.9474		0.012	1.215	0.000	1.227 ✔	1.333	H1-3 ✔
	31.9474 - 30.5789		0.012	1.220	0.000	1.232 ✔	1.333	H1-3 ✔
	30.5789 - 29.2105		0.012	1.225	0.000	1.237 ✔	1.333	H1-3 ✔
	29.2105 - 27.8421		0.012	1.230	0.000	1.242 ✔	1.333	H1-3 ✔
	27.8421 - 26.4737		0.012	1.235	0.000	1.247 ✔	1.333	H1-3 ✔

tnxTower	Job: 14309.017 - Germantown	Page: 27 of 28
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 110-ft EEI Monopole - 48 Newton Rd., Danbury, CT	Date: 08:30:29 12/18/14
	Client: Verizon Wireless	Designed by: TJL

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	26.4737 - 25.1053		0.012	1.239	0.000	1.251 ✔	1.333	H1-3 ✔
	25.1053 - 23.7368		0.012	1.243	0.000	1.255 ✔	1.333	H1-3 ✔
	23.7368 - 22.3684		0.012	1.247	0.000	1.259 ✔	1.333	H1-3 ✔
	22.3684 - 21		0.012	1.250	0.000	1.262 ✔	1.333	H1-3 ✔
L5	21 - 20	TP37x33.392x0.389	0.010	1.016	0.000	1.026 ✔	1.333	H1-3 ✔
	20 - 19		0.010	1.020	0.000	1.030 ✔	1.333	H1-3 ✔
	19 - 18		0.010	1.025	0.000	1.035 ✔	1.333	H1-3 ✔
	18 - 17		0.010	1.029	0.000	1.039 ✔	1.333	H1-3 ✔
	17 - 16		0.010	1.033	0.000	1.044 ✔	1.333	H1-3 ✔
	16 - 15		0.010	1.038	0.000	1.048 ✔	1.333	H1-3 ✔
	15 - 14		0.010	1.042	0.000	1.052 ✔	1.333	H1-3 ✔
	14 - 13		0.010	1.046	0.000	1.056 ✔	1.333	H1-3 ✔
	13 - 12		0.010	1.049	0.000	1.060 ✔	1.333	H1-3 ✔
	12 - 11		0.010	1.053	0.000	1.064 ✔	1.333	H1-3 ✔
	11 - 10		0.010	1.057	0.000	1.067 ✔	1.333	H1-3 ✔
	10 - 9		0.011	1.060	0.000	1.071 ✔	1.333	H1-3 ✔
	9 - 8		0.011	1.064	0.000	1.074 ✔	1.333	H1-3 ✔
	8 - 7		0.011	1.067	0.000	1.078 ✔	1.333	H1-3 ✔
	7 - 6		0.011	1.070	0.000	1.081 ✔	1.333	H1-3 ✔
	6 - 5		0.011	1.074	0.000	1.084 ✔	1.333	H1-3 ✔
	5 - 4		0.011	1.077	0.000	1.088 ✔	1.333	H1-3 ✔
	4 - 3		0.011	1.080	0.000	1.091 ✔	1.333	H1-3 ✔
	3 - 2		0.011	1.083	0.000	1.094 ✔	1.333	H1-3 ✔
	2 - 1		0.011	1.086	0.000	1.097 ✔	1.333	H1-3 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P_{allow} K	% Capacity	Pass Fail
L1	111 - 97.5	Pole	TP16x16x0.375	1	-3.39	530.01	17.2	Pass
L2	97.5 - 97	Pole	TP17.49x16x0.375	2	-3.41	530.01	17.2	Pass
L3	97 - 47	Pole	TP27.98x17.49x0.25	3	-10.57	1109.29	99.7	Pass
L4	47 - 21	Pole	TP33.392x26.6408x0.3125	4	-15.75	1705.73	94.7	Pass
L5	21 - 1	Pole	TP37x33.392x0.389	5	-19.23	2349.97	82.3	Pass
							Summary	
						Pole (L3)	99.7	Pass
						RATING =	**99.7**	**Pass**

CENTEK engineering
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P: (203) 488-0580
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Subject:	Anchor Bolt and Baseplate Analysis
Location:	96-ft EEI Monopole w/ 14-ft Extension Danbury, CT
Rev. 0: 12/18/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14309.017

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 1437·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 18·kips	(Input From tnxTower)
Axial Force =	Axial := 19·kips	(Input From tnxTower)

Existing Anchor Bolt Data 1:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 8	(User Input)
Diameter of Bolt Circle =	D_{bc} := 45.00·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Existing Anchor Bolt Data 2:

Use ASTM A193 GR.B7

Number of Anchor Bolts =	N2 := 3	(User Input)
Diameter of Bolt Circle =	D_{bc2} := 59.00·in	(User Input)
Bolt "Column" Distance =	l2 := 8.0·in	(User Input)
Bolt Ultimate Strength =	F_{u2} := 115·ksi	(User Input)
Bolt Yield Strength =	F_{y2} := 95·ksi	(User Input)
Bolt Modulus =	E2 := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D2 := 2.75·in	(User Input)
Threads per Inch =	n2 := 4.0	(User Input)

Base Plate Data:

Use ASTM A572 GR 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 1.5·in	(User Input)
Base Plate Diameter =	D_{bp} := 51.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 37·in	(User Input)

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		96-ft EEI Monopole w/ 14-ft Extension Danbury, CT
Rev. 0: 12/18/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14309.017

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Distance to Bolts =

$d_1 := 14.75 \cdot in$ (User Input)

$d_2 := 15.9375 \cdot in$ (User Input)

$d_3 := 22.5 \cdot in$ (User Input)

$d_4 := 29.5 \cdot in$ (User Input)

Number of Bolts per Group =

$N_1 := 2$ (User Input)

$N_2 := 4$ (User Input)

$N_3 := 2$ (User Input)

$N_4 := 1$ (User Input)

Critical Distances For Bending in Plate:

Outer Pole Radius =

$$R_{pole} := \frac{D_{pole}}{2} = 18.5 \cdot in$$

Moment Arms of Bolts about Neutral Axis =

$MA_1 := 0 \cdot in$ (User Input)

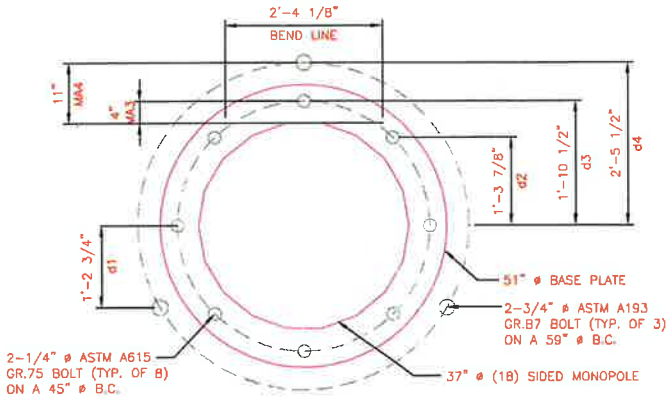
$MA_2 := 0 \cdot in$ (User Input)

$MA_3 := 4 \cdot in$ (User Input)

$MA_4 := 11 \cdot in$ (User Input)

Effective Width of Baseplate for Bending =

$$B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 28.1 \cdot in$$



Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Existing Anchor Bolts:

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

Proposed Anchor Bolts:

Gross Area of Bolt = $A_{g2} := \frac{\pi}{4} \cdot D2^2 = 5.94 \cdot in^2$

Net Area of Bolt = $A_{n2} := \frac{\pi}{4} \cdot \left(D2 - \frac{0.9743 \cdot in}{n2}\right)^2 = 4.934 \cdot in^2$

Net Diameter = $D_{n2} := \frac{2 \cdot \sqrt{A_{n2}}}{\sqrt{\pi}} = 2.506 \cdot in$

Radius of Gyration of Bolt = $r2 := \frac{D_{n2}}{4} = 0.627 \cdot in$

Section Modulus of Bolt = $S_{x2} := \frac{\pi \cdot D_{n2}^3}{32} = 1.546 \cdot in^3$

Total Polar Moment of Inertia = $I_p := d_1^2 \cdot N_1 + d_2^2 \cdot N_2 + d_3^2 \cdot N_3 + d_4^2 \cdot N_4 = 3333.9 \cdot in^2$

ASTM A615 GR. 65 Bolts:

Check Inner Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N + N2} = 114.7 \cdot kips$

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 = $\frac{T_{Max}}{T_{ALL.Net}} = 58.9 \cdot \%$ 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 = $M_x := \left(\frac{Shear}{N + N2}\right) \cdot l = 0.409 \cdot ft \cdot kips$

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.

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force = $C_{Max} := OM \cdot \frac{d_3}{I_p} + \frac{Axial}{N} = 118.8 \cdot kips$

Note: Calculation assumes that the total axial load is taken up in the original inner anchor bolts with no contribution from the external anchor bolts added as reinforcements.

Maximum Compressive Stress = $f_a := \frac{C_{Max}}{A_n} = 36.6 \cdot ksi$

$K := 0.65$

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

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

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

Combined Stress % of Capacity = $\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 61 \cdot \%$

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

Condition2 = "OK"

ASTM A193 Gr.B7 Bolts:

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max2} := OM \cdot \frac{d_4}{I_p} - \frac{Axial}{N + N2} = 150.9 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross2} := 1.333 \cdot (0.33 \cdot A_{g2} \cdot F_{u2}) = 300.5 \cdot kips$ (1.333 increase allowed per TIA/EIA)

$T_{ALL.Net2} := 1.333 \cdot (0.60 \cdot A_{n2} \cdot F_{y2}) = 374.89 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max2}}{T_{ALL.Net2}} = 40.2 \cdot \%$ Bolts are "upset bolts". Use net area per AISC

Condition 3 = $Condition3 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition3 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_{x2} := \left(\frac{Shear}{N + N2}\right) \cdot l2 = 1.091 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx2} := \frac{M_{x2}}{S_{x2}} = 8.5 \cdot ksi$

Allowable Bending Stress = $F_{bx2} := 1.333 \cdot 0.6 \cdot F_{y2} = 76 \cdot ksi$ (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.

$l2 := \begin{cases} l2 & \text{if } l2 > 2 \cdot D_{n2} \\ 0 & \text{otherwise} \end{cases} = 8 \cdot in$

$f_{bx2} := \begin{cases} f_{bx2} & \text{if } l2 > 2 \cdot D_{n2} \\ 0 & \text{otherwise} \end{cases} = 8.5 \cdot ksi$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force = $C_{Max2} := OM \cdot \frac{d_4}{I_p} + \frac{Axial}{N} = 155 \cdot kips$

Note: Calculation assumes that the total axial load is taken up in the original inner anchor bolts with no contribution from the external anchor bolts added as reinforcements.

Maximum Compressive Stress = $f_{a2} := \frac{C_{Max2}}{A_{n2}} = 31.4 \cdot ksi$

$K := 0.65$

$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E2}{F_{y2}}} = 77.625$

$$F_{a2} := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l2}{r2}\right)^2}{2 \cdot C_c^2}\right] \cdot F_{y2}}{\frac{5}{3} + \frac{3 \cdot \left(\frac{K \cdot l2}{r2}\right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l2}{r2}\right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l2}{r2} \le C_c \\ \frac{12 \cdot \pi^2 \cdot E2}{23 \cdot \left(\frac{K \cdot l2}{r2}\right)^2} & \text{if } \frac{K \cdot l2}{r2} > C_c \end{cases} = 55.348 \cdot ksi$$

Allowable Compressive Stress = $F_{a2} := 1.333 \cdot F_{a2} = 73.8 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity = $\left(\frac{f_{a2}}{F_{a2}} + \frac{f_{bx2}}{F_{bx2}}\right) = 53.7 \cdot \%$

Condition 4 = $Condition4 := if\left(\frac{f_{a2}}{F_{a2}} + \frac{f_{bx2}}{F_{bx2}} \le 1.00, "OK", "Overstressed"\right)$

Condition4 = "OK"

Base Plate Analysis:

Note: Only the force from the original anchor bolts attribuites to the baseplate bending. The anchor bolts located outside the edge of the baseplate provide addtional anchor bolt capacity only. .

Force from Bolts = $C_1 := T_{Max} = 114.65 \cdot kips$

Maximum Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (C_1 \cdot MA_3)}{(B_{eff} \cdot t_{bp}^2)} = 43.6 \cdot ksi$

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

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 72.8 \cdot \%$

Condition5 = $Condition5 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition5 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	96-ft EEI Monopole w/ 14-ft Extension Danbury, CT
Rev. 0: 12/18/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14309.017

Caisson Foundation:

Input Data:

Shear Force =	$S := 18k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 1437ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 19k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 1523ft \cdot k$	*USER INPUT–FROM LPILE*
Moment Capacity =	$Mn := 2662ft \cdot k$	*USER INPUT–FROM LPILE*
Foundation Diameter =	$d := 5.5ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 21.0ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 24$	*USER INPUT*
Area of Rebar =	$Ar := 0.79in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 3ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 1.7$

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

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

FOSCheck = "OK"

LPILE Plus for Windows, Version 5.0 (5.0.47)

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

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\1430900.WI\017 - Germantown CT\Backup Documentation\Calcs\Foundation\
Name of input data file: Germantown Caisson Analysis.lpd
Name of output file: Germantown Caisson Analysis.lpo
Name of plot output file: Germantown Caisson Analysis.lpp
Name of runtime file: Germantown Caisson Analysis.lpr

Time and Date of Analysis

Date: December 18, 2014 Time: 8:51:34

Problem Title

14309.017 - Germantown

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 = 252.00 in

Depth of ground surface below top of pile = 12.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	66.00000000	931420.0000	3421.2000	3600000.
2	252.0000	66.00000000	931420.0000	3421.2000	3600000.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 12.000 in
Distance from top of pile to bottom of layer = 48.000 in
p-y subgrade modulus k for top of soil layer = 1.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 1.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 48.000 in
Distance from top of pile to bottom of layer = 168.000 in
p-y subgrade modulus k for top of soil layer = 122.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 122.000 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 168.000 in
Distance from top of pile to bottom of layer = 360.000 in
p-y subgrade modulus k for top of soil layer = 100.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 100.000 lbs/in**3

(Depth of lowest layer extends 108.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.05800
2	48.00	0.05800
3	48.00	0.07800
4	168.00	0.07800
5	168.00	0.04300
6	360.00	0.04300

Shear Strength of Soils

Shear strength parameters with depth defined using 6 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	0.00000	28.00	------	------
2	48.000	0.00000	28.00	------	------
3	48.000	0.00000	38.00	------	------
4	168.000	0.00000	38.00	------	------
5	168.000	0.00000	38.00	------	------
6	360.000	0.00000	38.00	------	------

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 = 18000.000 lbs
Bending moment at pile head = 17244000.000 in-lbs
Axial load at pile head = 19000.000 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 = 66.0000 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 = 24
Area of Single Bar = 0.79000 in**2
Number of Rows of Reinforcing Bars = 13
Area of Steel = 18.960 in**2
Area of Shaft = 3421.194 in**2
Percentage of Steel Reinforcement = 0.554 percent
Cover Thickness (edge to bar center) = 4.000 in

Unfactored Axial Squash Load Capacity = 9813.30 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	0.790	29.000
2	1.580	28.012
3	1.580	25.115
4	1.580	20.506
5	1.580	14.500
6	1.580	7.506
7	1.580	0.000
8	1.580	-7.506
9	1.580	-14.500
10	1.580	-20.506
11	1.580	-25.115
12	1.580	-28.012
13	0.790	-29.000

Axial Thrust Force = 19000.00 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
2629441.	3.155329E+12	8.333333E-07	0.00002930	35.16311556	90.03320698	753.10863
5230073.	3.138044E+12	0.00000167	0.00005689	34.13221174	173.22699	1456.39023
7803291.	3.121316E+12	0.00000250	0.00008453	33.81156296	255.16139	2161.33831
10347765.	3.104330E+12	0.00000333	0.00011213	33.63963944	335.54518	2865.16515
12863941.	3.087346E+12	0.00000417	0.00013974	33.53642553	414.49520	3568.98475
12863941.	2.572788E+12	0.00000500	0.00008149	16.29820043	241.95810	6626.76094
12863941.	2.205247E+12	0.00000583	0.00009382	16.08280724	277.37795	7767.65844

12863941.	1.929591E+12	0.00000667	0.00010616	15.92358631	312.56962	8908.10665
12863941.	1.715192E+12	0.00000750	0.00011851	15.80182403	347.53227	10048.10327
12863941.	1.543673E+12	0.00000833	0.00013089	15.70630091	382.26525	11187.64395
12863941.	1.403339E+12	0.00000917	0.00014327	15.62986904	416.76769	12326.72648
12863941.	1.286394E+12	0.00001000	0.00015568	15.56776839	451.03884	13465.34717
12863941.	1.187441E+12	0.00001083	0.00016810	15.51669842	485.07782	14603.50391
12863941.	1.102624E+12	0.00001167	0.00018053	15.47431058	518.88399	15741.19159
12863941.	1.029115E+12	0.00001250	0.00019299	15.43887395	552.45642	16878.40819
12863941.	9.647956E+11	0.00001333	0.00020545	15.40909034	585.79416	18015.15174
12863941.	9.080429E+11	0.00001417	0.00021817	15.39999908	619.51868	19144.83371
12863941.	8.575961E+11	0.00001500	0.00023100	15.39999908	653.28043	20271.00040
12863941.	8.124594E+11	0.00001583	0.00024366	15.38928312	686.28755	21402.08750
12863941.	7.718365E+11	0.00001667	0.00025622	15.37291414	718.70583	22536.42483
12863941.	7.350824E+11	0.00001750	0.00026879	15.35916120	750.88861	23670.22569
12863941.	7.016695E+11	0.00001833	0.00028137	15.34768206	782.83530	24803.48237
12863941.	6.711621E+11	0.00001917	0.00029398	15.33818561	814.54483	25936.19183
12863941.	6.431971E+11	0.00002000	0.00030661	15.33043188	846.01627	27068.34951
12863941.	6.174692E+11	0.00002083	0.00031925	15.32422024	877.24872	28199.95027
12863941.	5.937204E+11	0.00002167	0.00033192	15.31937760	908.24108	29330.99107
12863941.	5.717307E+11	0.00002250	0.00034460	15.31576234	938.99256	30461.46507
12863941.	5.513118E+11	0.00002333	0.00035731	15.31324464	969.50188	31591.37113
12863941.	5.323010E+11	0.00002417	0.00037003	15.31172222	999.76829	32720.70134
13094962.	5.237985E+11	0.00002500	0.00038278	15.31110066	1029.79069	33849.45202
13511928.	5.230424E+11	0.00002583	0.00039554	15.31130129	1059.56818	34977.61678
13928373.	5.223140E+11	0.00002667	0.00040833	15.31224936	1089.09944	36105.19383
14344300.	5.216109E+11	0.00002750	0.00042113	15.31388980	1118.38387	37232.17288
14759696.	5.209304E+11	0.00002833	0.00043396	15.31615967	1147.41985	38358.55547
15174562.	5.202707E+11	0.00002917	0.00044680	15.31901568	1176.20662	39484.33257
15588895.	5.196298E+11	0.00003000	0.00045967	15.32241458	1204.74305	40609.49932
16002689.	5.190061E+11	0.00003083	0.00047256	15.32631701	1233.02794	41734.05154
16415943.	5.183982E+11	0.00003167	0.00048547	15.33069152	1261.06034	42857.98162
16828653.	5.178047E+11	0.00003250	0.00049840	15.33550662	1288.83905	43981.28501
17652417.	5.166561E+11	0.00003417	0.00052433	15.34634846	1343.63048	46225.99306
18473956.	5.155523E+11	0.00003583	0.00055035	15.35866159	1397.39328	48468.12416
19293236.	5.144863E+11	0.00003750	0.00057646	15.37229258	1450.11775	50707.63182
20110218.	5.134524E+11	0.00003917	0.00060266	15.38711160	1501.79362	52944.47240
20920643.	5.123423E+11	0.00004083	0.00062883	15.39999908	1552.16810	55182.16775
21708410.	5.107861E+11	0.00004250	0.00065450	15.39999908	1600.33227	57434.50113
22490990.	5.092300E+11	0.00004417	0.00068017	15.39999908	1647.30509	59686.83451
23196262.	5.061003E+11	0.00004583	0.00070583	15.39999908	1693.08657	60000.00000
23801384.	5.010818E+11	0.00004750	0.00073099	15.38920051	1736.76469	60000.00000
24289199.	4.940176E+11	0.00004917	0.00075403	15.33628553	1775.64841	60000.00000
24693777.	4.857792E+11	0.00005083	0.00077612	15.26796144	1811.95451	60000.00000
25097173.	4.780414E+11	0.00005250	0.00079826	15.20504647	1847.48188	60000.00000
25482558.	4.704472E+11	0.00005417	0.00082023	15.14268619	1881.84333	60000.00000
25755968.	4.613009E+11	0.00005583	0.00084068	15.05695456	1912.96416	60000.00000
26028509.	4.526697E+11	0.00005750	0.00086118	14.97697431	1943.41187	60000.00000
26300161.	4.445098E+11	0.00005917	0.00088172	14.90226156	1973.18151	60000.00000
26570922.	4.367823E+11	0.00006083	0.00090230	14.83239537	2002.26899	60000.00000
26840789.	4.294526E+11	0.00006250	0.00092294	14.76699811	2030.66995	60000.00000
27050745.	4.215701E+11	0.00006417	0.00094262	14.69015712	2056.99701	60000.00000
27221360.	4.134890E+11	0.00006583	0.00096168	14.60786766	2081.80994	60000.00000
27391289.	4.057969E+11	0.00006750	0.00098079	14.53018874	2106.03074	60000.00000
27560548.	3.984658E+11	0.00006917	0.00099993	14.45680171	2129.65678	60000.00000
27729131.	3.914701E+11	0.00007083	0.00101911	14.38740760	2152.68438	60000.00000
27897019.	3.847865E+11	0.00007250	0.00103833	14.32173103	2175.10947	60000.00000
28168009.	3.797934E+11	0.00007417	0.00106058	14.30000013	2200.43745	60000.00000
28248173.	3.725034E+11	0.00007583	0.00108135	14.25960284	2223.20420	60000.00000
28411956.	3.666059E+11	0.00007750	0.00110024	14.19662887	2243.14918	60000.00000
28549147.	3.606208E+11	0.00007917	0.00111853	14.12882406	2261.83941	60000.00000
28643939.	3.543580E+11	0.00008083	0.00113584	14.05160147	2278.92959	60000.00000
28738264.	3.483426E+11	0.00008250	0.00115318	13.97788793	2295.52929	60000.00000
28832109.	3.425597E+11	0.00008417	0.00117055	13.90747494	2311.63543	60000.00000
28925473.	3.369958E+11	0.00008583	0.00118795	13.84017366	2327.24522	60000.00000
29018356.	3.316383E+11	0.00008750	0.00120538	13.77581102	2342.35591	60000.00000
29110743.	3.264756E+11	0.00008917	0.00122285	13.71422178	2356.96430	60000.00000
29202652.	3.214971E+11	0.00009083	0.00124035	13.65526432	2371.06807	60000.00000
29294051.	3.166924E+11	0.00009250	0.00125789	13.59878916	2384.66341	60000.00000
29384966.	3.120527E+11	0.00009417	0.00127546	13.54467827	2397.74812	60000.00000
29475365.	3.075690E+11	0.00009583	0.00129306	13.49280185	2410.31840	60000.00000
29565259.	3.032334E+11	0.00009750	0.00131070	13.44305366	2422.37154	60000.00000
29654648.	2.990385E+11	0.00009917	0.00132837	13.39533144	2433.90449	60000.00000
29831866.	2.910426E+11	0.00010250	0.00136382	13.30557150	2455.39624	60000.00000
29981222.	2.832871E+11	0.00010583	0.00139852	13.21437961	2474.28362	60000.00000
30105396.	2.757746E+11	0.00010917	0.00143999	13.19070929	2494.26355	60000.00000
30191918.	2.683726E+11	0.00011250	0.00147161	13.08100051	2507.27270	60000.00000
30277032.	2.613844E+11	0.00011583	0.00150336	12.97862452	2518.59675	60000.00000
30360717.	2.547752E+11	0.00011917	0.00153522	12.88298339	2528.21572	60000.00000
30442956.	2.485139E+11	0.00012250	0.00156721	12.79354602	2536.10909	60000.00000
30523725.	2.425726E+11	0.00012583	0.00159932	12.70983642	2542.25572	60000.00000
30602990.	2.369264E+11	0.00012917	0.00163156	12.63142580	2546.63383	60000.00000
30680742.	2.315528E+11	0.00013250	0.00166393	12.55793649	2549.22115	60000.00000
30756773.	2.264302E+11	0.00013583	0.00169643	12.48902231	2549.58557	60000.00000
30829548.	2.215297E+11	0.00013917	0.00172906	12.42437249	2544.18311	60000.00000
30901501.	2.168526E+11	0.00014250	0.00176183	12.36370379	2541.65258	60000.00000
30972634.	2.123838E+11	0.00014583	0.00179474	12.30676836	2545.86097	60000.00000
31042926.	2.081090E+11	0.00014917	0.00182779	12.25333411	2548.61873	60000.00000
31112346.	2.040154E+11	0.00015250	0.00186099	12.20318860	2549.90298	60000.00000

31173314.	2.000427E+11	0.00015583	0.00189392	12.15350729	2546.94055	60000.00000
31173314.	1.958533E+11	0.00015917	0.00192592	12.09999830	2542.29318	60000.00000
31173314.	1.918358E+11	0.00016250	0.00196625	12.09999830	2540.27990	60000.00000
31290664.	1.886874E+11	0.00016583	0.00200389	12.08375126	2545.02787	60000.00000
31315126.	1.851140E+11	0.00016917	0.00203360	12.02125329	2547.47409	60000.00000
31339258.	1.816769E+11	0.00017250	0.00206340	11.96173328	2549.10555	60000.00000
31363047.	1.783680E+11	0.00017583	0.00209330	11.90502995	2549.91056	60000.00000
31386166.	1.751786E+11	0.00017917	0.00212338	11.85143048	2548.01467	60000.00000
31408749.	1.721027E+11	0.00018250	0.00215360	11.80056506	2544.32145	60000.00000
31431145.	1.691362E+11	0.00018583	0.00218390	11.75190657	2540.61578	60000.00000
31453342.	1.662732E+11	0.00018917	0.00221426	11.70534092	2536.89756	60000.00000
31475317.	1.635081E+11	0.00019250	0.00224470	11.66075796	2536.96406	60000.00000
31497095.	1.608362E+11	0.00019583	0.00227521	11.61807114	2540.64059	60000.00000
31518670.	1.582527E+11	0.00019917	0.00230579	11.57718998	2543.72118	60000.00000
31540016.	1.557532E+11	0.00020250	0.00233645	11.53802401	2546.19803	60000.00000
31561152.	1.533335E+11	0.00020583	0.00236719	11.50050241	2548.06357	60000.00000
31582067.	1.509900E+11	0.00020917	0.00239800	11.46455044	2549.30977	60000.00000
31602747.	1.487188E+11	0.00021250	0.00242890	11.43009728	2549.92843	60000.00000
31622904.	1.465154E+11	0.00021583	0.00245995	11.39746553	2548.30906	60000.00000
31642639.	1.443771E+11	0.00021917	0.00249114	11.36642700	2545.08936	60000.00000
31662245.	1.423022E+11	0.00022250	0.00252238	11.33654505	2541.86082	60000.00000
31681738.	1.402881E+11	0.00022583	0.00255367	11.30777639	2538.62313	60000.00000
31701111.	1.383321E+11	0.00022917	0.00258502	11.28007382	2535.37622	60000.00000
31720362.	1.364317E+11	0.00023250	0.00261641	11.25339407	2532.11999	60000.00000
31758485.	1.327881E+11	0.00023917	0.00267937	11.20294172	2535.08216	60000.00000
31796099.	1.293401E+11	0.00024583	0.00274255	11.15612429	2541.46584	60000.00000
31833177.	1.260720E+11	0.00025250	0.00280595	11.11267430	2546.10632	60000.00000
31869717.	1.229700E+11	0.00025917	0.00286959	11.07235962	2548.96394	60000.00000
31905696.	1.200214E+11	0.00026583	0.00293346	11.03496784	2549.99704	60000.00000
31940290.	1.172121E+11	0.00027250	0.00299786	11.00130934	2544.80318	60000.00000
31940290.	1.144130E+11	0.00027917	0.00307083	10.99999934	2537.79106	60000.00000
31940290.	1.117445E+11	0.00028583	0.00314417	10.99999934	2530.71632	60000.00000
31940290.	1.091976E+11	0.00029250	0.00321750	10.99999934	2523.64158	60000.00000
32016813.	1.070200E+11	0.00029917	0.00328796	10.99040061	2530.57102	60000.00000
32018976.	1.046942E+11	0.00030583	0.00334645	10.94206864	2535.24130	60000.00000
32021042.	1.024673E+11	0.00031250	0.00340505	10.89616388	2539.29387	60000.00000
32023009.	1.003332E+11	0.00031917	0.00346377	10.85254079	2542.71694	60000.00000
32024869.	9.828604E+10	0.00032583	0.00352261	10.81106561	2545.49830	60000.00000
32026620.	9.632066E+10	0.00033250	0.00358156	10.77161640	2547.62544	60000.00000
32028272.	9.443225E+10	0.00033917	0.00364064	10.73408693	2549.08551	60000.00000
32029802.	9.261630E+10	0.00034583	0.00369985	10.69836706	2549.86482	60000.00000
32031069.	9.086828E+10	0.00035250	0.00375935	10.66481084	2548.70790	60000.00000
32032011.	8.918425E+10	0.00035917	0.00381917	10.63341433	2545.28943	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 31940.28960 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 = 18000.000 lbs
Specified moment at pile head = 17244000.000 in-lbs
Specified axial load at pile head = 19000.000 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	0.738193	1.72E+07	18000.	-0.007103	616.505	5.17E+11	0.000	0.000
20.160	0.601826	1.76E+07	17979.	-0.006423	629.451	5.17E+11	-4.911	20.563
40.320	0.479309	1.80E+07	17785.	-0.005729	642.317	5.16E+11	-13.574	71.366
60.480	0.370942	1.83E+07	5006.928	-0.005020	652.690	5.16E+11	-1343.894	9129.776
80.640	0.276929	1.80E+07	-29886.	-0.004308	644.768	5.16E+11	-2016.028	18345.
100.800	0.197068	1.70E+07	-70009.	-0.003621	609.024	5.18E+11	-1919.343	24543.
120.960	0.130533	1.53E+07	-1.06E+05	-0.002992	545.906	5.20E+11	-1592.371	30741.
141.120	0.075783	1.28E+07	-1.33E+05	-0.002509	460.029	3.01E+12	-1110.861	36939.
161.280	0.025992	9.96E+06	-1.49E+05	-0.002434	358.382	3.11E+12	-444.937	43137.
181.440	-0.022497	6.92E+06	-1.50E+05	-0.002380	250.580	3.13E+12	354.090	39664.
201.600	-0.070084	4.02E+06	-1.34E+05	-0.002345	148.050	3.14E+12	1244.398	44744.
221.760	-0.117146	1.64E+06	-98553.	-0.002327	63.653	3.16E+12	2316.187	49825.
241.920	-0.163987	2.05E+05	-39499.	-0.002322	12.827	3.16E+12	3572.909	54905.

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	=	0.73819322 in
Computed slope at pile head	=	-0.00710276
Maximum bending moment	=	18273929. lbs-in
Maximum shear force	=	-151585.30717 lbs
Depth of maximum bending moment	=	63.00000000 in
Depth of maximum shear force	=	171.36000 in
Number of iterations	=	39
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= 18000.	M= 1.72E+07	19000.0000	0.7381932	1.8274E+07	-151585.

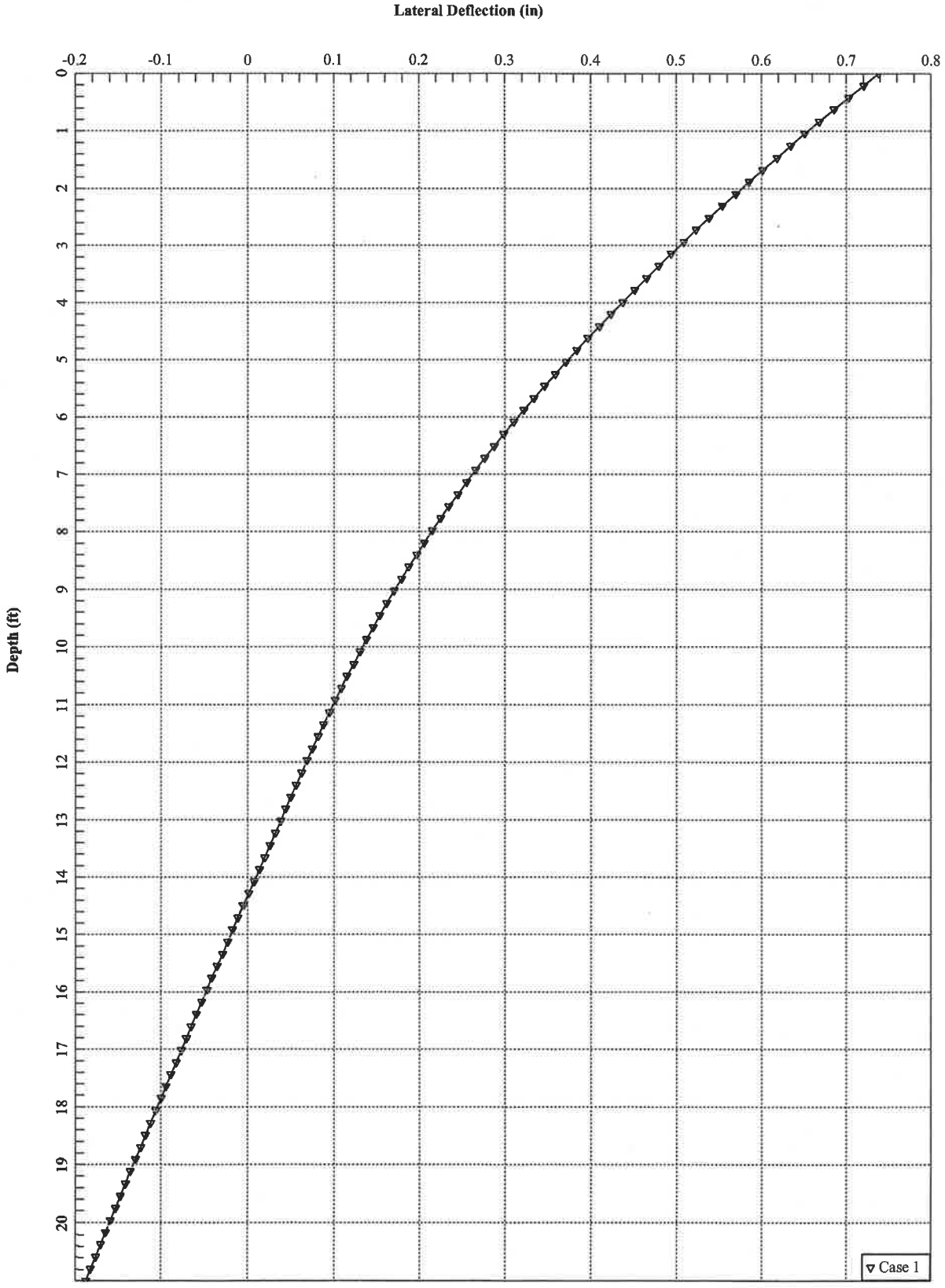
Computed Pile-head Stiffness Matrix Members K22, K23, K32, K33 for Superstructure

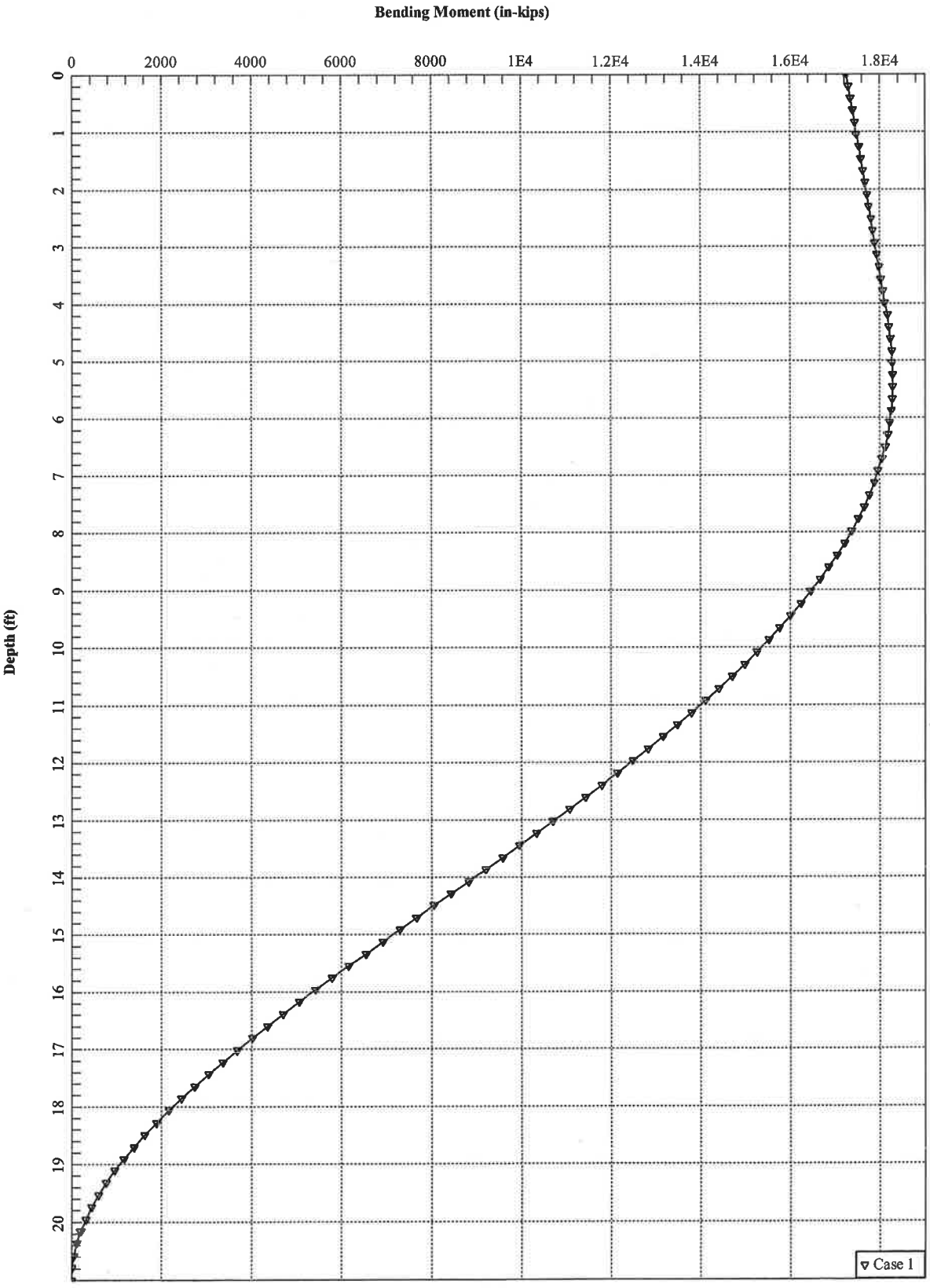
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00140750	1800.00003	259985.77652	1278865.	1.847149E+08
0.00423699	5418.53992	782635.16012	1278865.	1.847149E+08
0.00671547	8588.18258	1240447.	1278865.	1.847149E+08
0.00847398	10837.07984	1565270.	1278865.	1.847149E+08
0.00983799	12581.46008	1817223.	1278865.	1.847149E+08
0.01095246	14006.72251	2023083.	1278865.	1.847149E+08
0.01189474	15211.76472	2197135.	1278865.	1.847149E+08
0.01271097	16255.61977	2347905.	1278865.	1.847149E+08
0.01343094	17176.36517	2480895.	1278865.	1.847149E+08
0.01407498	18000.00000	2599858.	1278865.	1.847149E+08

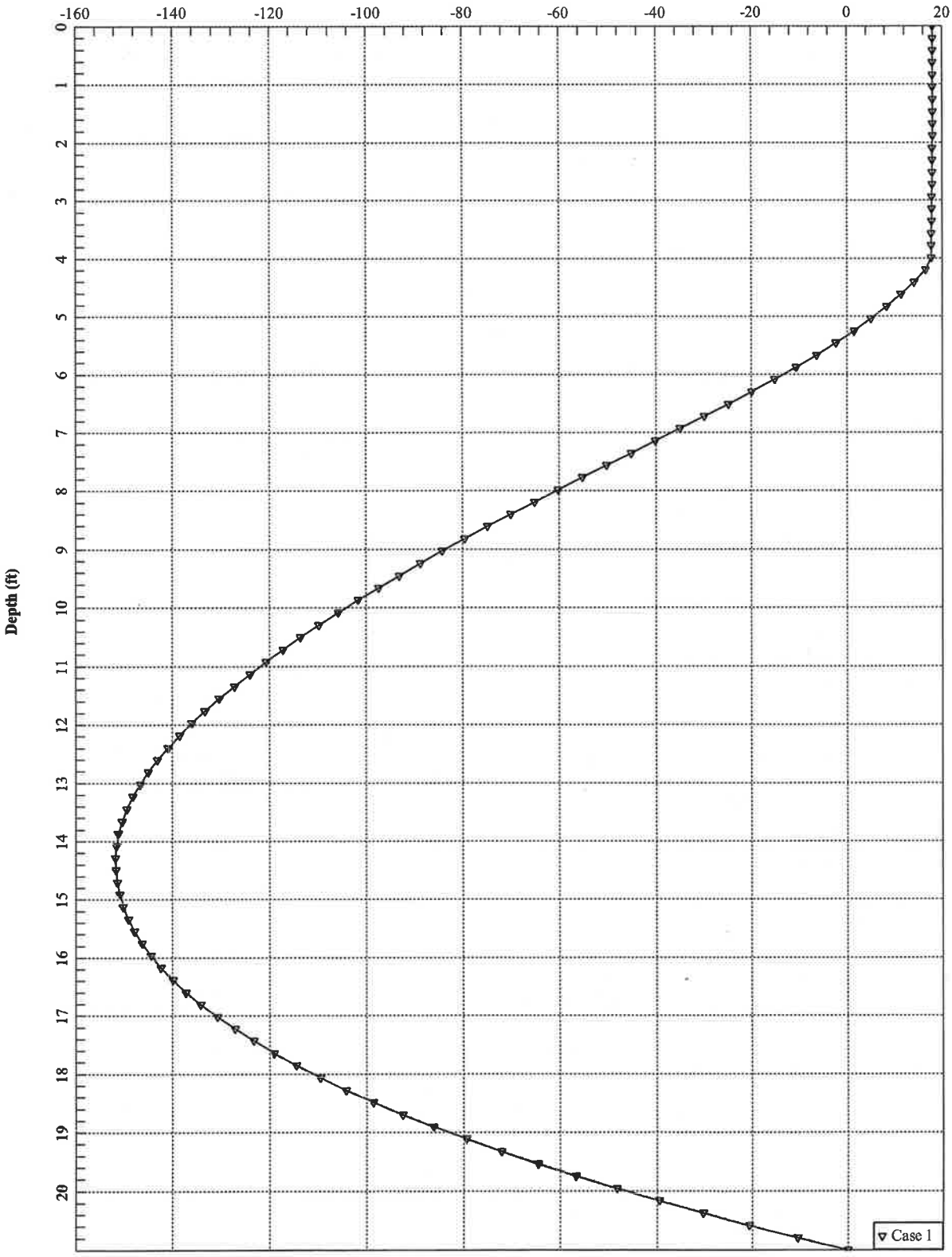
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00005287	9765.61882	1724400.	1.847149E+08	3.261671E+10
0.00015948	29400.08064	5190961.	1.843513E+08	3.254958E+10
0.00025347	46606.22846	8227479.	1.838760E+08	3.245995E+10
0.00032050	58818.48697	10381922.	1.835209E+08	3.239288E+10
0.00037270	68293.55306	12053039.	1.832399E+08	3.233977E+10
0.00041777	76038.53674	13418440.	1.820114E+08	3.211935E+10
0.00047589	82620.72774	14572871.	1.736129E+08	3.062232E+10
0.00100330	89796.48884	15572884.	89501147.	1.552166E+10
0.00120114	95965.05522	16454958.	79895223.	1.369949E+10
0.00137857	101776.10669	17244000.	73827251.	1.250861E+10

K22 = abs(Shear Reaction/Top y)
K23 = abs(Shear Reaction/Top Rotation)
K32 = abs(Moment Reaction/Top y)
K33 = abs(Moment Reaction/Top Rotation)

The analysis ended normally.


Lateral Deflection (in)
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Case 1


Bending Moment (in-kips)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Case 1


Shear Force (kips)
-160
-140
-120
-100
-80
-60
-40
-20
0
20
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Case 1

SITE NAME	GERMANTOWN CT	ECP - CELL #	AWS1	5	293
LATITUDE	41-24-12.34 N	LONGITUDE	73-25-26.44 W		
Additional Comments: Install PCS LTE (60W RRH). Swap for RET antennas. Adjust alpha azimuths except CDMA 850. Remove 850/PCS diplexers.		SAVE BUTTON	PCS1		
		STRUCTURE TYPE	MONOPOLE		

1900 PCS - Existing Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 4.0B	
ANTENNA TYPE	MG D3-800T0		MG D3-800T0		MG D3-800T0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC + MECH)	0		0		0	
RAD CTR (FT AGL)	90		90		90	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	DIPLEX with Cellular Cable		DIPLEX with Cellular Cable		DIPLEX with Cellular Cable	
RRH - QTY/MODEL						
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

1900 PCS - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 1900 MHz RRH		ALU 1900 MHz RRH		ALU 1900 MHz RRH	
ANTENNA TYPE	HBXX-6516DS-A2M		HBXX-6516DS-A2M		HBXX-6516DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	20		150		270	
DOWN TILT (ELEC + MECH)	0		0		0	
RAD CTR (FT AGL)	90		90		90	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	N/A		N/A		N/A	
RRH - QTY/MODEL	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

2100 MHz AWS - Existing Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC + MECH)	0		0		0	
RAD CTR (FT AGL)	90		90		90	
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	

2100 MHz AWS - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	HBXX-6516DS-A2M		HBXX-6516DS-A2M		HBXX-6516DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	20		150		270	
DOWN TILT (ELEC + MECH)	0		0		0	
RAD CTR (FT AGL)	90		90		90	
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 - Existing Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	BXA-70063-6CF-2-750MHZ		BXA-70063-6CF-2-750MHZ		BXA-70063-6CF-750MHZ	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC + MECH)	2 Elec + 0 Mech		2 Elec + 0 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	90		90		90	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700	1	ALU RH_2X40-700	1	ALU RH_2X40-700
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

700 MHz - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	X7C-FRO-660-VR0		X7C-FRO-660-VR0		X7C-FRO-660-VR0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	20		150		270	
DOWN TILT (ELEC + MECH)	2 Elec + 0 Mech		2 Elec + 0 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	90		90		90	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700	1	ALU RH_2X40-700	1	ALU RH_2X40-700
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

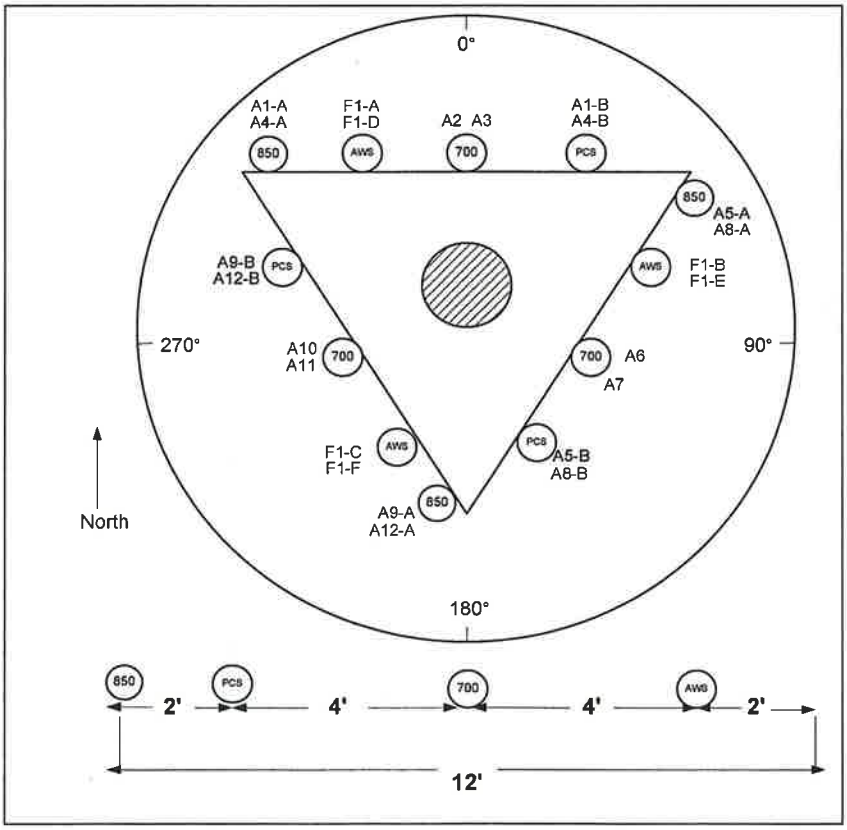
850 Cellular - No Change	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	BXA-80080-6CF		BXA-80080-6CF		BXA-80063--6CF	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC + MECH)	0		0		0	
RAD CTR (FT AGL)	90		90		90	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL		REMOVE		REMOVE		REMOVE
DIPLEX WITH LTE CABLE						

NUMBER OF CABLE'S NEEDED				Fiber Lines Model number	
TOTAL # FIBER LINES	2	TOTAL # OF MAINLINES	12	FIBER LINE MODEL #	HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	30	TOTAL # OF TOP JUMPERS	30	FIBER TOP JUMPER MODEL #	HB114-1-08U4-S4J18
Equipment Cable Ordering		MAIN CABLE #	12 +	TOP JUMPER #	18 +

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 / 2145-215	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-175	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: Ryan Ulanday	Robert Hesselbach	RU	10/16/2014



Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	22	22	21
CPR at Sector, dB	8	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0 5 ° | 17.3 10 ° | 17.0	0 ° | 17.1 5 ° | 17.4 10 ° | 17.0	0 ° | 17.4 5 ° | 17.7 10 ° | 17.2
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6516DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

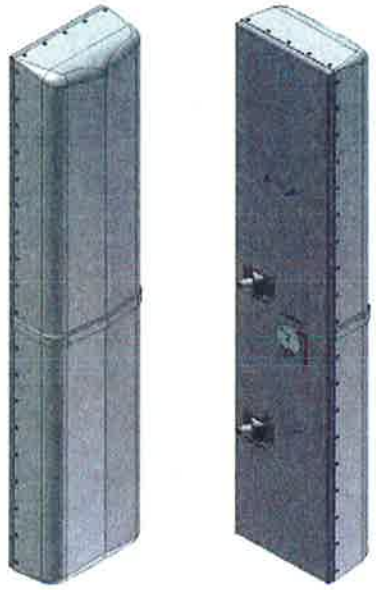
Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam
RET/MET



- Designed to improve SNR
- Greatly increases LTE data rates
- Broadband radiator
- Macro Cell, high gain antenna
- Suitable for LTE/CDMA/UMTS/GSM
- AISG 2.0 RET or manual MET tilt control

Electrical Specifications

Frequency Band, MHz	**698-824**	**824-896**
Horizontal Beamwidth, 3dB points	62	58
Gain, dBi	15.9	16.0
Vertical Beamwidth, 3dB points	12.0	10.5
Front-to-Back at 180°, dB	>28	
Upper Sidelobe Suppression, Typical, dB	<-18	
Polarization	+/-45°	
Electrical Downtilt	0-10° or 4-14°	
VSWR/Return Loss, dB, Maximum	1.5:1/14.0	
Isolation Between Ports, dB, Mimimum	-28	
Intermodulation (2x20w), IM3, dBc, Maximum	-150	
Impedance, ohms	50	
Maximum Power Per Connector, CW	500	

X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam

RET/MET

Mechanical Specifications

Dimensions, Length/Width/Depth	72.0/14.6/8.0 in (1829/372/204 mm)
Connector (Quantity) Type	(2) 7-16 DIN Female
Connector Torque	220-265 lbf-in (25-30 N-m)
Connector Location	Back
Antenna Weight	35.0 lbs
Bracket Weight	13.2 lbs (6.0 kg)
Standard Bracket Kit	CSS P/N 919011
Mechanical Downtilt Range	0-12°
Radome Material	Ultra High Strength Luran, UV Stabilized, ASTM D1925
Wind Survival	150 mph (241 km/h)
Front Wind Load	205.39 lbf (913.65 N) @100mph
Equivalent Flat Plate	4.09 sq-ft (c=2) @ 100mph

RET Information

Model	CSS-RET-200
Mounting Location	Rear of Antenna
Weight	1.2 lb (0.54 kg)
Communication Standard	AISG 2.0
Control System	CSS-PCU-220

Order Information

Model	*Description*
X7C-FRO-660-VR0	Antenna with manual RET adjust electrical downtilt 0-10°
X7C-FRO-660-VR4	Antenna with manual RET adjust electrical downtilt 4-14°
X7C-FRO-660-VM0	Antenna with remote MET adjust electrical downtilt 0-10°
X7C-FRO-660-VM4	Antenna with remote MET adjust electrical downtilt 4-14°

Optional Bracket Kit

919036	Bracket Kit, 2-Point, 12 deg D-tilt, For 4.5" OD Pole

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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

Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

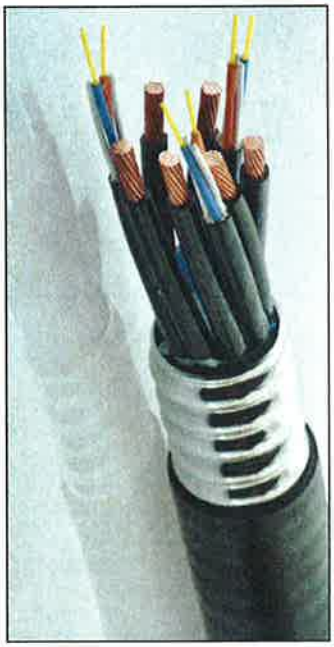


Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – **minimizes installation time and enables mechanical protection and shielding**
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – **Eliminates typical grounding requirements and saves on installation costs**
- Lightweight solution and compact design – **Decreases tower loading**
- Robust cabling – **Eliminates need for expensive cable trays and ducts**
- Installation of tight bundled fiber optic cable pairs directly to the RRH – **Reduces CAPEX and wind load by eliminating need for interconnection**
- Optical fiber and power cables housed in single corrugated cable – **Saves CAPEX by standardizing RRH cable installation and reducing installation requirements**
- Outdoor polyethylene jacket – **Ensures long-lasting cable protection**

Technical Specifications

Structure			
Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0,307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environment			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change.

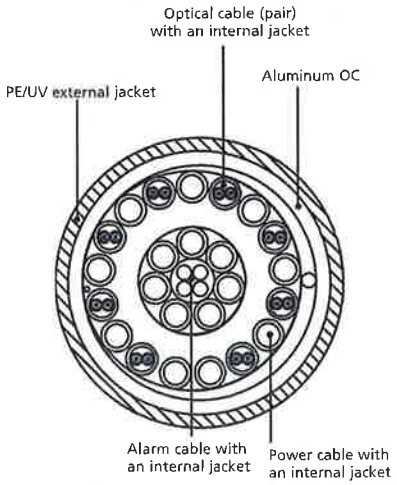


Figure 2: Construction Detail