

May 1, 2013

BY EMAIL & OVERNIGHT DELIVERY

Ms. Melanie Bachman
Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, Connecticut 06051

RECEIVED
MAY - 2 2013

ORIGINAL

CONNECTICUT
SITING COUNCIL

Re: Docket 422
North Atlantic Towers, LLC and New Cingular Wireless PCS, LLC ("AT&T")
Development and Management Plan Revision
655 Bassett Road, Watertown, Connecticut

Dear Ms. Bachman:

On behalf of North Atlantic Towers, LLC and New Cingular Wireless PCS LLC ("AT&T"), please accept for review and Council approval this *revised* Development and Management Plan ("D&M Plan") filing for the captioned Facility as approved in Docket No. 422. This D&M revision includes the provision of AT&T's LTE (Long Term Evolution) services.

Antennas & Other Equipment

Enclosed are fifteen (15) sets of 11"x 17" sized revised construction drawings and two (2) sets of full sized revised construction drawings being filed in accordance with the Siting Council's ("Council") Decision and Order dated May 10, 2012 ("Decision and Order"). The revised D&M Plan incorporates revised specifications for AT&T's antennas. AT&T will install (9) LTE and (3) UMTS antennas for a total of (12) panel antennas. AT&T will also install (15) Remote Radiohead Units ("RRU's") with (5) RRU's mounted behind the antennas at each of the three antenna sectors. Product specifications for AT&T's antennas are enclosed.

Also attached is a structural analysis prepared by Vector Engineers dated April 26, 2013 which confirms that the tower facility can structurally accommodate AT&T's antenna configuration.

Required Notifications

As noted in the approved D&M Plan submission, the General Contractor/Supervisor for all construction related matters on this project is Keith Coppins. Mr. Coppins is located at Phoenix Partnership, LLC, 110 Washington Avenue, North Haven, Connecticut and can be reached by telephone at (203)-623-3287.

We respectfully request that this matter be included on the Council's next available agenda for review.

Thank you for your consideration of the enclosed.

Very truly yours,


Lucia Chiochio

Enclosures

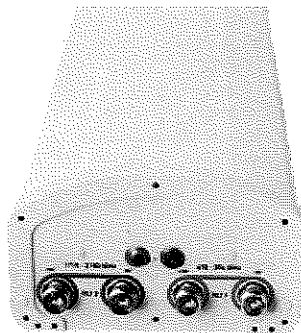
cc: Charles Frigon, Town Manager, Town of Watertown
Paul R. Jessel, Esq.
Robert and Cathleen Alex
Frank E. Gustafson Revocable Trust, the Edward Gustafson Revocable Trust, Frank E.
Gustafson, Jr. Trustee, and Thomas W. Calkins, Independent Trustee
Dan Shriver, North Atlantic Towers
John Stevens, Infinigy Engineering
Michele Briggs, AT&T

Product Specifications



SBNH-1D6565C

DualPol® Dual Band Antenna, 698–896 MHz and 1710–2170 MHz, 65° horizontal beamwidth, RET compatible variable electrical tilt



- Two DualPol® antennas under one radome
- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Each antenna is independently capable of field adjustable electrical tilt
- Internal next generation actuator eliminates field installation and defines new standards for reliability
- Fully compatible with Andrew Teletilt® remote control system

CHARACTERISTICS

General Specifications

Antenna Type SmartBeam®
 Brand DualPol® | SmartBeam® | Teletilt®
 Operating Frequency Band 1710 – 2170 MHz | 698 – 896 MHz

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2170
Beamwidth, Horizontal, degrees	71	67	58	57	59
Beamwidth, Horizontal Tolerance, degrees	±3	±6	±3	±3	±3
Gain, dBd	13.6	14.3	15.9	15.9	15.9
Gain, dBi	15.7	16.4	18.0	18.0	18.0
Beamwidth, Vertical, degrees	8.6	7.8	5.5	5.1	4.8
Beam Tilt, degrees	0–11	0–11	0–7	0–7	0–7
Upper Sidelobe Suppression (USLS), typical, dB	15	15	16	16	16
Front-to-Back Ratio at 180°, dB	25	28	34	31	31
Front-to-Back Total Power at 180° ± 20°, dB	21	22	30	27	26
Cross Polarization Ratio (CPR) at Boresight, dB	24	21	17	17	17
Cross Polarization Ratio (CPR) at Sector, dB	11	8	9	8	9
Isolation, dB	30	30	30	30	30
Isolation, Intersystem, dB	35	35	35	35	35
VSWR Return Loss, db	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0
Intermodulation Products, 3rd Order, 2 x 20 W, dBc	-150	-150	-150	-150	-150
Input Power, maximum, watts	400	400	300	300	300
Polarization	±45°	±45°	±45°	±45°	±45°
Impedance, ohms	50	50	50	50	50
Lightning Protection	dc Ground	dc Ground	dc Ground	dc Ground	dc Ground

www.commscope.com/andrew

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Product Specifications

SBNH-1D6565C



Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity	4
Radome Material	Fiberglass, UV resistant
Wind Loading, maximum	879.0 N @ 150 km/h 197.6 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

Depth	181.0 mm 7.1 in
Length	2449.0 mm 96.4 in
Width	301.0 mm 11.9 in
Net Weight	27.6 kg 60.8 lb

Remote Electrical Tilt (RET) Information

Adjustment Time, full range, maximum	30 s
Annual Failure Rate, maximum	0.01%
Power Consumption, during motor movements, maximum	11.0 W
Power Consumption, idle state, maximum	2.0 W
Power Input	10-30 V
Protocol	3GPP/AISG 2.0 Multi-RET
RET Interface	RS-485 Male (input port, 1) RS-485 Female (daisy chain port, 1)
RET System	Teletilt®

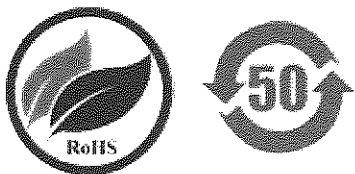
Regulatory Compliance/Certifications

Agency

RoHS 2002/95/EC
China RoHS SJ/T 11364-2006

Classification

Compliant by Exemption
Above Maximum Concentration Value (MCV)



INCLUDED PRODUCTS

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Product Specifications

SBNH-1D6565C



DB380

Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members



DB5083

Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members

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4/27/2011

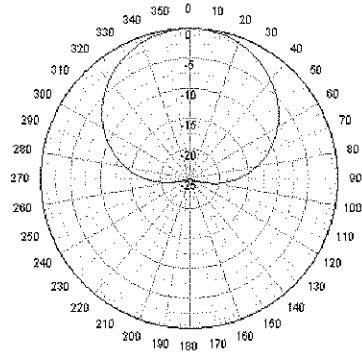
Product Specifications

SBNH-1D6565C

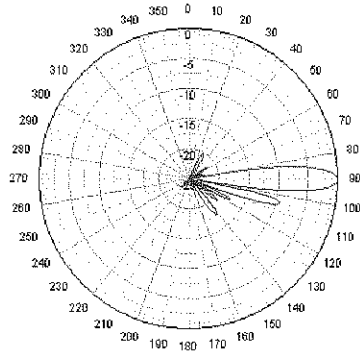


Horizontal Pattern

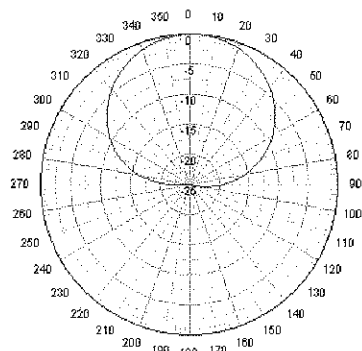
Vertical Pattern



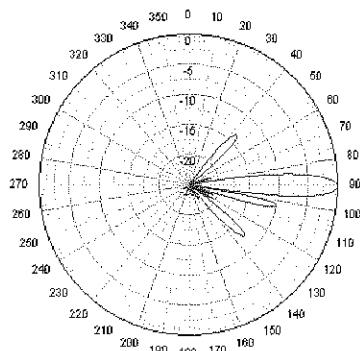
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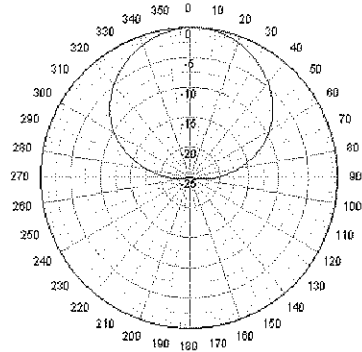
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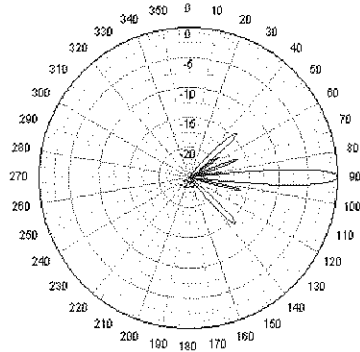
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Freq: 850 MHz, Tilt: 0°



Freq: 1730 MHz, Tilt: 0°



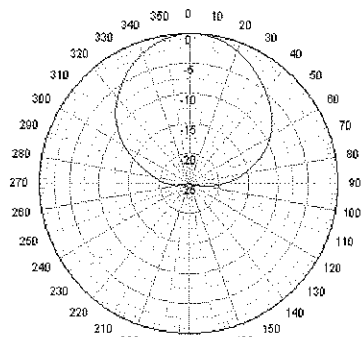
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www.commscope.com/andrew

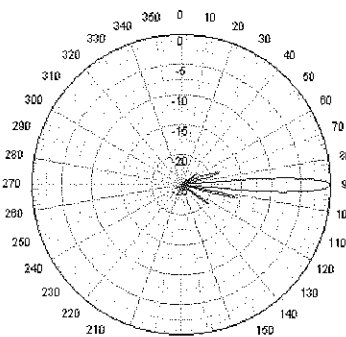
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Product Specifications

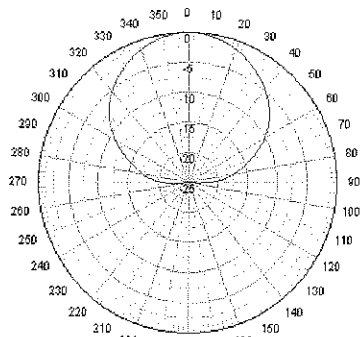
SBNH-1D6565C



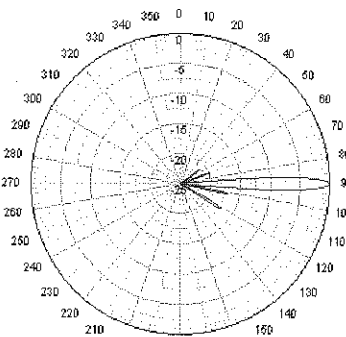
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Freq: 1920 MHz, Tilt: 0°



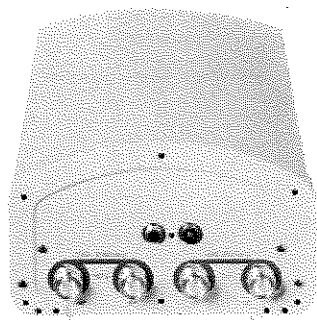
Freq: 2130 MHz, Tilt: 0°



Freq: 2130 MHz, Tilt: 0°

Product Specifications

COMMSCOPE®



Andrew Solutions SBNH-1D8585C

Andrew® DualPol® Dual Band Antenna, 698–896 MHz and 1710–2180 MHz, 85° horizontal beamwidth, RET compatible

- Two DualPol® antennas under one radome
- Patented dipole technology
- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Each antenna is independently capable of field adjustable electrical tilt
- Internal next generation actuator eliminates field installation and defines new standards for reliability
- Fully compatible with Andrew Teletilt® remote control system

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2180
Gain, dBi	15.1	15.4	16.9	17.0	17.3
Beamwidth, Horizontal, degrees	88	84	85	84	86
Beamwidth, Vertical, degrees	9.1	8.1	5.2	4.7	4.5
Beam Tilt, degrees	0–9	0–9	0–6	0–6	0–6
USLS, typical, dB	16	16	17	18	19
Front-to-Back Ratio at 180°, dB	22	21	26	26	27
Front-to-Back Total Power at 180° ± 20°, dB	16	16	22	23	21
CPR at Boresight, dB	25	21	20	22	22
CPR at Sector, dB	10	10	8	8	11
Isolation, dB	30	30	30	30	30
Isolation, Intersystem, dB	30	30	30	30	30
VSWR Return Loss, dB	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0	1.5:1 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150	-150	-150
Input Power per Port, maximum, watts	400	400	300	300	300
Polarization	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm
Lightning Protection	dc Ground	dc Ground	dc Ground	dc Ground	dc Ground

Mechanical Specifications

Color Radome Material	Light gray Fiberglass, UV resistant
Connector Interface Location Quantity	7-16 DIN Female Bottom 4
Wind Loading, maximum	879.0 N @ 150 km/h 197.6 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

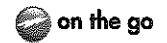
Depth	181.0 mm 7.1 in
Length	2449.00 mm 96.42 in
Width	301.00 mm 11.85 in
Net Weight	25.10 kg 55.34 lb

Remote Electrical Tilt (RET) Information

Adjustment Time, full range, maximum	30 s
Annual Failure Rate, maximum	0.01%

Product Specifications

COMMSCOPE®



SBNH-ID8585C

Power Consumption, during motor movements, maximum	11.0 W
Power Consumption, idle state, maximum	2.0 W
Power Input	10–30 V
Protocol	3GPP/AISG 2.0 Multi-RET
RET Interface	RS-485 Female (daisy chain port ,1) RS-485 Male (input port, 1)

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.5 - 4.5 in (64 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

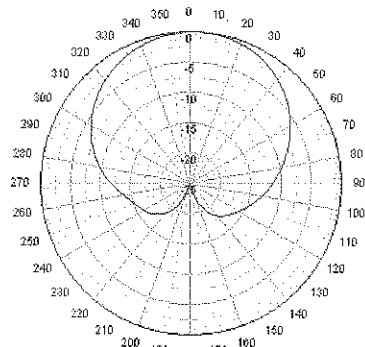
Product Specifications

SBNH-1D8585C

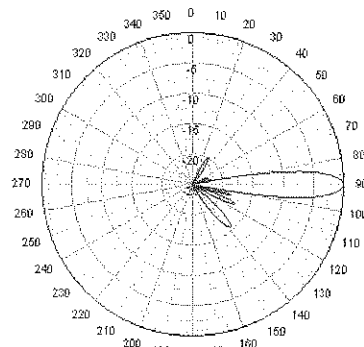


Horizontal Pattern

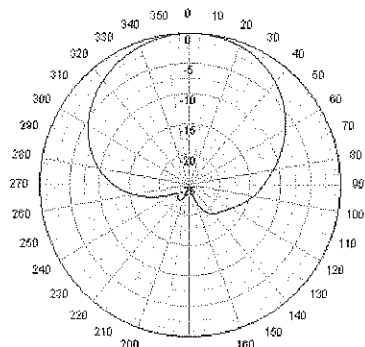
Vertical Pattern



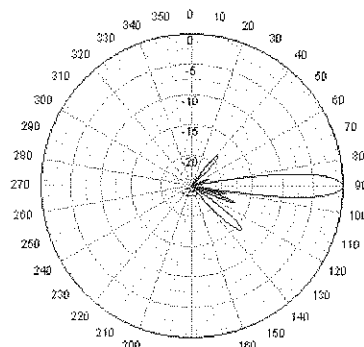
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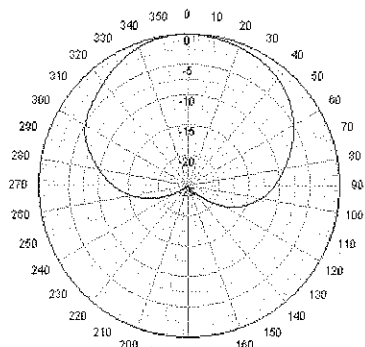
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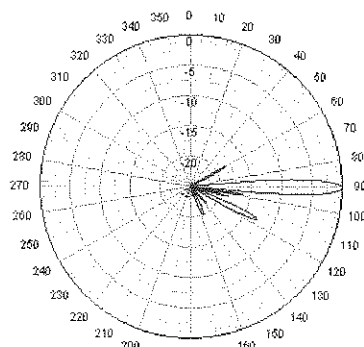
Freq: 850 MHz, Tilt: 0°



Freq: 850 MHz, Tilt: 0°



Freq: 1730 MHz, Tilt: 0°

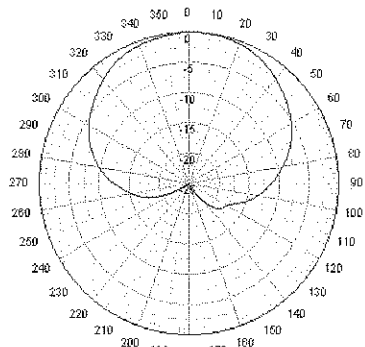
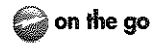


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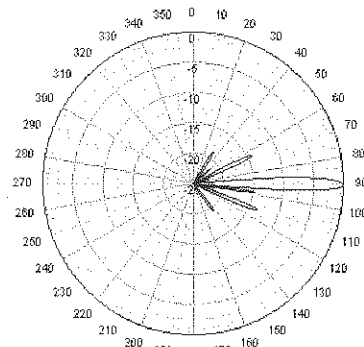
Product Specifications

COMMScope®

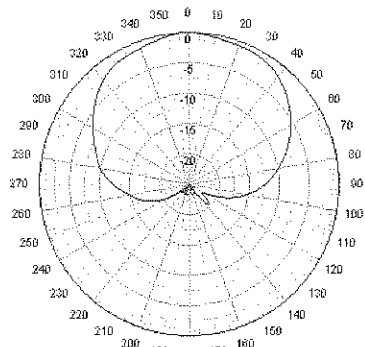
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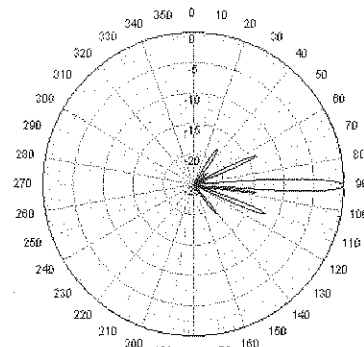
Freq: 1920 MHz, Tilt: 0°



Freq: 1920 MHz, Tilt: 0°



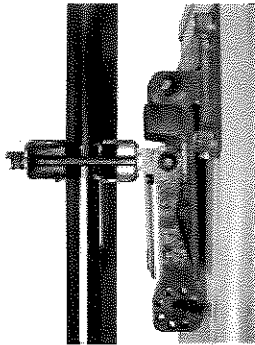
Freq: 2130 MHz, Tilt: 0°



Freq: 2130 MHz, Tilt: 0°

Product Specifications

COMMSCOPE®



Andrew Solutions
BSAMNT-1

Wide Profile Antenna Downtilt Mounting Kit for 2.5 - 4.5 in (64 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

General Specifications

Mount Type	Pipe mounts
Includes	Brackets Hardware
Package Quantity	1

Mechanical Specifications

Color	Silver
Material Type	Galvanized steel

Dimensions

Compatible Diameter, maximum	114.3 mm 4.5 in
Compatible Diameter, minimum	63.5 mm 2.5 in
Net Weight	5.60 kg 12.35 lb

Packed Dimensions

Height	82.00 mm 3.23 in
Length	385.00 mm 15.16 in
Shipping Weight	5.60 kg 12.35 lb
Width	252.00 mm 9.92 in

Regulatory Compliance/Certifications

Agency

RoHS 2011/65/EU
China RoHS SJ/T 11364-2006

Classification

Compliant
Below Maximum Concentration Value (MCV)





Project Number: U1223-226-132

April 26, 2013

Larson Camouflage, LLC
1501 S. Euclid Ave.
Tucson, AZ 85713

ATTENTION: Tom Feddersen

REFERENCE: **WATERTOWN**
Structural Analysis with Revised Loading

Dear Mr. Feddersen:

Per your request, we have analyzed the 130'-0" tall monopine for the proposed antenna modifications. It is our understanding that the proposed antenna configuration consists of (12) panel antennas, (15) RRHs, and (3) surge suppressors at 127'-0" A.G.L. supported by 12'-0" T-arms, and (9) panel antennas at 102'-0" A.G.L. supported by 4'-0" T-arms.

DOCUMENTATION:

The following documentation was provided by the client for this analysis:

- Original structural drawings and calculations prepared by our office (Dated: 07/30/12)
- Various emailed communication from your office received in April, 2013

DESIGN CRITERIA:

Our analysis uses the following codes, parameters and appurtenances:

- Code: 2003 International Building Code w/ Connecticut supplements and the TIA-222-G design standard for antenna supporting structures
- Wind Parameters:
 - Basic Wind Speed: 97 mph (3-second gust), Wind Exposure C
 - Ice: 1" radial ice at 40 mph basic wind speed (3-second gust)
- Appurtenances:
 - Antennas and related equipment per attached tnxTower documents
 - Branch loading per attached branch loading summary

MATERIALS:

We understand the existing monopole, base plate, and foundation consist of materials, member sizes, dimensions, etc. as shown in the attached calculations.

CONCLUSIONS:

As shown on the attached tnxTower analysis and calculations, the monopole tower rating for the proposed loading configuration is 97.1% of capacity. Attached calculations also indicate that the base plate, anchorage, and foundation are adequate to support the proposed loading. Therefore, we conclude that the existing monopole, base plate, anchor bolts, and foundation are adequate to support the proposed antenna configuration.

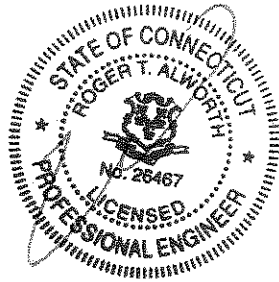
U1223-226-132
Watertown
April 26, 2013

LIMITATIONS:

The recommendations above are provided based upon calculations prepared by our office. These calculations are based upon original design drawings, calculations, and other information prepared by others. A representative from Vector has not visited the site and thus no observations were made of the structural integrity, materials used or quality of work of any portions of the structure. The analysis and conclusions described above are also based on the assumption that the monopole and its foundation were properly designed and installed in accordance with the above referenced documents. Vector Structural Engineering makes no claim as to the correctness of the original design or the current condition of the structure. The monopole and foundation are assumed to be in good condition, free of damage or deterioration. The contractor shall notify Vector Structural Engineering immediately should any damage, deterioration, or discrepancies between the as-built condition of the existing monopole and the assumed condition described in this report be found.

We hope this meets your needs. If you have any further questions regarding this matter, please call this office at your convenience.

Very truly yours,
VECTOR STRUCTURAL ENGINEERS



04/26/2013

Roger T. Alworth, S.E.
Principal

RTA/tph

Enclosures

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Top Hat with (3) 4 ft, and (1) 6 ft branches	132.5	DC Surge Suppressor (CaAa = 1.2 sq. ft.)	127
(4) Andrew SBNH-1D6565C w/ Mount Pipe	127	(4) Andrew SBNH-1D6565C w/ Mount Pipe	127
(4) Andrew SBNH-1D6565C w/ Mount Pipe	127	(26) 4 ft branches	125.5
12'-0" T-Arm	127	(24) 6 ft branches	116.9
12'-0" T-Arm	127	(24) 6 ft branches	108.6
12'-0" T-Arm	127	(3) Powerwave 7770.00 w/ Mount Pipe	102
(5) Ericsson RRUS-11	127	(3) Powerwave 7770.00 w/ Mount Pipe	102
(5) Ericsson RRUS-11	127	4'-0" T-Arm	102
(5) Ericsson RRUS-11	127	4'-0" T-Arm	102
DC Surge Suppressor (CaAa = 1.2 sq. ft.)	127	4'-0" T-Arm	102
DC Surge Suppressor (CaAa = 1.2 sq. ft.)	127	(15) 8 ft branches	101.9
		(15) 8 ft branches	96.7
		(12) 10 ft branches	92.1

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 97.1%

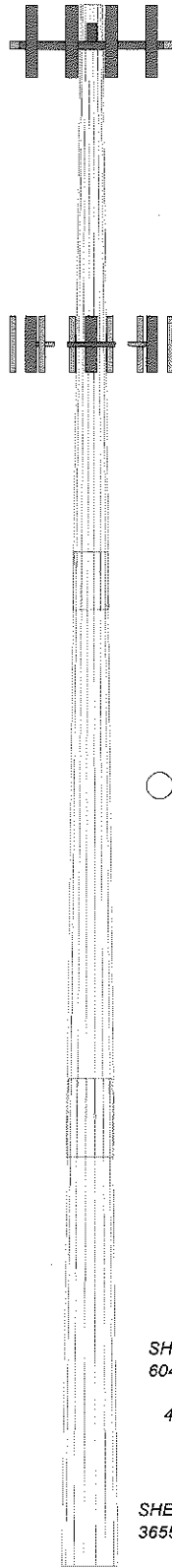
Section	1	2	3
Length (ft)	50.00	50.00	40.33
Number of Sides	18	18	18
Thickness (in)	0.1875	0.3125	0.3125
Socket Length (ft)	4.83	6.50	
Top Dia (in)	21.0000	33.2726	44.8276
Bot Dia (in)	35.0000	47.2726	56.1200
Grade		A572-65	
Weight (lb)	2816.1	6743.6	6827.9

130.0 ft

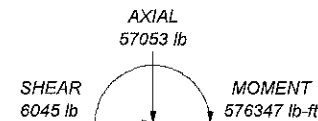
80.0 ft

34.8 ft

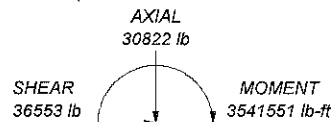
1.0 ft



ALL REACTIONS ARE FACTORED



40 mph WIND - 1.0000 in ICE



REACTIONS - 97 mph WIND

Vector Structural Engineering		Job: Watertown	
9138 S. State St., Suite 101		Project: U1223-226-132	
Sandy, Utah 84070		Client: Larson Camouflage LLC	Drawn by: Trevor Hawkes
Phone: (801) 990-1775		Code: TIA-222-G	Date: 04/26/13
FAX: (801) 990-1776		Path:	Scale: NTS
www.vectorse.com		Dwg No. E-1	



JOB NO.: U1223-226-121
DATE: 04/26/13

DESIGNED: TPH
CHECKED: RTA

PROJECT: WATERTOWN

Monopine Branch Layout

Eff. Area Factor:	0.84
Top Crown Radius:	5 ft
C _A Factor:	0.6
Bott. Branch Elev. (ft):	90.0 ft
Top Branch Elev. (ft):	130.0 ft

Branch Layout Along Pole:

Branch Length (ft)	Qty	Elevation		Branch Wt. (lbs)	Total Wt. (lbs)	Wind Area		
		Start (ft)	Stop (ft)			Gross (ft ²)	Eff. (ft ²)	C _A A _E (ft ²)
4	26	121.0	130.0	26.0	676	88.4	74.2	44.5
6	24	112.8	121.0	40.0	960	115.5	97.0	58.2
6	24	104.5	112.8	40.0	960	116.3	97.7	58.6
8	15	99.3	104.5	50.0	750	93.7	78.7	47.2
8	15	94.1	99.3	50.0	750	94.0	78.9	47.4
10	12	90.0	94.1	66.0	792	91.9	77.2	46.3
Total (lbs):					4888			

Top Crown:

Branch Length (ft)	Qty	Total Wt.	Total Wt.
4	3	78	118
6	1	40	
Gross Area (ft²):		39.3	
Eff. Area (ft²):		33.0	
C_AA_E (ft²):		19.8	

Random Branch Distribution:

Total C_AA_E (ft²):	302.2
C_AA_E per ft (ft²/ft):	7.56
Wt. per ft (lbs/ft):	122.2

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Tower Input Data

There is a pole section.
 This tower is designed using the TIA-222-G standard.
 The following design criteria apply:
 Tower is located in Litchfield County, Connecticut.
 Basic wind speed of 97 mph.
 Structure Class II.
 Exposure Category C.
 Topographic Category 1.
 Crest Height 0.00 ft.
 Nominal ice thickness of 1.0000 in.
 Ice thickness is considered to increase with height.
 Ice density of 56 pcf.
 A wind speed of 40 mph is used in combination with ice.
 Temperature drop of 50 °F.
 Deflections calculated using a wind speed of 60 mph.
 A non-linear (P-delta) analysis was used.
 Pressures are calculated at each section.
 Stress ratio used in pole design is 1.
 Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	130.00-80.00	50.00	4.83	18	21.0000	35.0000	0.1875	0.7500	A572-65 (65 ksi)
L2	80.00-34.83	50.00	6.50	18	33.2726	47.2726	0.3125	1.2500	A572-65 (65 ksi)
L3	34.83-1.00	40.33		18	44.8276	56.1200	0.3125	1.2500	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	I/Q in ²	w in	w/t
L1	21.3240	12.3860	677.8263	7.3884	10.6680	63.5383	1356.5444	6.1942	3.3660	17.952

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Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	Iv/O in ²	w in	w/t
L2	35.5399	20.7178	3172.1322	12.3584	17.7800	178.4101	6348.4384	10.3609	5.8300	31.093
	35.1591	32.6923	4487.0402	11.7008	16.9025	265.4664	8979.9845	16.3493	5.3060	16.979
L3	48.0019	46.5785	12977.2130	16.6708	24.0145	540.3912	25971.5018	23.2937	7.7700	24.864
	47.3672	44.1534	11053.9235	15.8029	22.7724	485.4084	22122.3920	22.0809	7.3397	23.487
	56.9857	55.3541	21780.7133	19.8117	28.5090	763.9954	43590.0862	27.6823	9.3271	29.847

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 130.00-80.00				1	1	1		
L2 80.00-34.83				1	1	1		
L3 34.83-1.00				1	1	1		

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	14
Embedment length	72.0000 in
f _c	6 ksi
Grout space	3.0000 in
Base plate grade	A572-50
Base plate thickness	2.5000 in
Bolt circle diameter	63.5000 in
Outer diameter	69.5000 in
Inner diameter	50.0000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight plf
Fiber (7/16")	C	No	Inside Pole	127.00 - 1.00	3	No Ice	0.00	0.12
						1/2" Ice	0.00	0.12
						1" Ice	0.00	0.12
DC Cable (3/4")	C	No	Inside Pole	127.00 - 1.00	6	No Ice	0.00	0.30
						1/2" Ice	0.00	0.30
						1" Ice	0.00	0.30
RET Cable (1/2")	C	No	Inside Pole	127.00 - 1.00	3	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
AVA7-50 (1-5/8 LOW DENSI FOAM)	C	No	Inside Pole	102.00 - 1.00	12	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
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Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
L1	130.00-80.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	312.75
L2	80.00-34.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	508.16
L3	34.83-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	380.59

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 _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
L1	130.00-80.00	A	2.242	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	312.75
L2	80.00-34.83	A	2.111	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	508.16
L3	34.83-1.00	A	1.881	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	380.59

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice

User Defined Loads

Description	Elevation ft	Offset From Centroid ft	Azimuth Angle °	Weight lb	F _x lb	F _z lb	Wind Force lb	C _A A _C ft ²	
(12) 10 ft branches	92.10	0.00	0.0000	No Ice	792.00	0.00	0.00	1449.64	46.30
				Ice	871.20	0.00	0.00	271.53	51.00
				Service	792.00	0.00	0.00	496.27	46.30
(15) 8 ft branches	96.70	0.00	0.0000	No Ice	750.00	0.00	0.00	1499.38	47.40
				Ice	825.00	0.00	0.00	280.25	52.10
				Service	750.00	0.00	0.00	513.30	47.40
(15) 8 ft branches	101.90	0.00	0.0000	No Ice	750.00	0.00	0.00	1509.61	47.20
				Ice	825.00	0.00	0.00	282.27	51.90
				Service	750.00	0.00	0.00	516.80	47.20
(24) 6 ft branches	108.60	0.00	0.0000	No Ice	960.00	0.00	0.00	1899.52	58.60
				Ice	1056.00	0.00	0.00	355.53	64.50
				Service	960.00	0.00	0.00	650.28	58.60
(24) 6 ft branches	116.90	0.00	0.0000	No Ice	960.00	0.00	0.00	1916.03	58.20
				Ice	1056.00	0.00	0.00	358.29	64.00
				Service	960.00	0.00	0.00	655.93	58.20
(26) 4 ft branches	125.50	0.00	0.0000	No Ice	676.00	0.00	0.00	1487.06	44.50
				Ice	743.60	0.00	0.00	278.45	49.00
				Service	676.00	0.00	0.00	509.08	44.50
Top Hat with (3) 4 ft, and (1) 6 ft branches	132.50	0.00	0.0000	No Ice	118.00	0.00	0.00	669.26	19.80
				Ice	129.80	0.00	0.00	125.30	21.80

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Description	Elevation ft	Offset From Centroid ft	Azimuth Angle °	Weight lb	F _x lb	F _y lb	Wind Force lb	C _{MAc} ft ²
Service				118.00	0.00	0.00	229.11	19.80

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{MA} Front ft ²	C _{MA} Side ft ²	Weight lb	
(4) Andrew SBNH-1D6565C w/ Mount Pipe	A	From Face	3.50	0.0000	127.00	No Ice	8.58	7.20	69.30
			0.00			1/2" Ice	10.30	8.64	133.27
			0.00			1" Ice	12.02	10.08	208.50
(4) Andrew SBNH-1D6565C w/ Mount Pipe	B	From Face	3.50	0.0000	127.00	No Ice	8.58	7.20	69.30
			0.00			1/2" Ice	10.30	8.64	133.27
			0.00			1" Ice	12.02	10.08	208.50
(4) Andrew SBNH-1D6565C w/ Mount Pipe	C	From Face	3.50	0.0000	127.00	No Ice	8.58	7.20	69.30
			0.00			1/2" Ice	10.30	8.64	133.27
			0.00			1" Ice	12.02	10.08	208.50
12'-0" T-Arm	A	From Face	3.50	0.0000	127.00	No Ice	4.20	4.20	220.00
			0.00			1/2" Ice	5.44	5.44	249.84
			0.00			1" Ice	6.69	6.69	287.51
12'-0" T-Arm	B	From Face	3.50	0.0000	127.00	No Ice	4.20	4.20	220.00
			0.00			1/2" Ice	5.44	5.44	249.84
			0.00			1" Ice	6.69	6.69	287.51
12'-0" T-Arm	C	From Face	3.50	0.0000	127.00	No Ice	4.20	4.20	220.00
			0.00			1/2" Ice	5.44	5.44	249.84
			0.00			1" Ice	6.69	6.69	287.51
(5) Ericsson RRUS-11	A	From Face	3.50	0.0000	127.00	No Ice	2.21	0.93	55.00
			0.00			1/2" Ice	2.65	1.12	74.57
			0.00			1" Ice	3.09	1.31	97.08
(5) Ericsson RRUS-11	B	From Face	3.50	0.0000	127.00	No Ice	2.21	0.93	55.00
			0.00			1/2" Ice	2.65	1.12	74.57
			0.00			1" Ice	3.09	1.31	97.08
(5) Ericsson RRUS-11	C	From Face	3.50	0.0000	127.00	No Ice	2.21	0.93	55.00
			0.00			1/2" Ice	2.65	1.12	74.57
			0.00			1" Ice	3.09	1.31	97.08
(3) Powerwave 7770.00 w/ Mount Pipe	A	From Face	3.50	0.0000	102.00	No Ice	6.25	4.38	60.90
			0.00			1/2" Ice	6.80	5.23	107.22
			0.00			1" Ice	7.33	5.95	163.48
(3) Powerwave 7770.00 w/ Mount Pipe	B	From Face	3.50	0.0000	102.00	No Ice	6.25	4.38	60.90
			0.00			1/2" Ice	6.80	5.23	107.22
			0.00			1" Ice	7.33	5.95	163.48
(3) Powerwave 7770.00 w/ Mount Pipe	C	From Face	3.50	0.0000	102.00	No Ice	6.25	4.38	60.90
			0.00			1/2" Ice	6.80	5.23	107.22
			0.00			1" Ice	7.33	5.95	163.48
4'-0" T-Arm	A	From Face	3.50	0.0000	102.00	No Ice	0.93	0.93	45.00
			0.00			1/2" Ice	1.23	1.23	114.75
			0.00			1" Ice	1.53	1.53	189.72
4'-0" T-Arm	B	From Face	3.50	0.0000	102.00	No Ice	0.93	0.93	45.00
			0.00			1/2" Ice	1.23	1.23	114.75
			0.00			1" Ice	1.53	1.53	189.72
4'-0" T-Arm	C	From Face	3.50	0.0000	102.00	No Ice	0.93	0.93	45.00
			0.00			1/2" Ice	1.23	1.23	114.75
			0.00			1" Ice	1.53	1.53	189.72
DC Surge Suppressor (CaAa = 1.2 sq. ft.)	A	From Face	3.50	0.0000	127.00	No Ice	1.20	1.20	30.00
			0.00			1/2" Ice	1.44	1.44	50.00

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment °	Placement ft		C _A A ₁ Front ft ²	C _A A ₁ Side ft ²	Weight lb
			0.00						
DC Surge Suppressor (CaAa = 1.2 sq. ft.)	B	From Face	3.50	0.0000	127.00	1" Ice	1.68	1.68	70.00
			0.00			No Ice	1.20	1.20	30.00
			0.00			1/2" Ice	1.44	1.44	50.00
DC Surge Suppressor (CaAa = 1.2 sq. ft.)	C	From Face	3.50	0.0000	127.00	1" Ice	1.68	1.68	70.00
			0.00			No Ice	1.20	1.20	30.00
			0.00			1/2" Ice	1.44	1.44	50.00
			0.00			1" Ice	1.68	1.68	70.00

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _V ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A ₁ In Face ft ²	C _A A ₁ Out Face ft ²
L1 130.00-80.00	103.23	1.274	29	118.466	A	0.000	118.466	118.466	100.00	0.000	0.000
					B	0.000	118.466	100.00	0.000	0.000	
					C	0.000	118.466	100.00	0.000	0.000	
L2 80.00-34.83	56.73	1.123	26	156.516	A	0.000	156.516	156.516	100.00	0.000	0.000
					B	0.000	156.516	100.00	0.000	0.000	
					C	0.000	156.516	100.00	0.000	0.000	
L3 34.83-1.00	17.89	0.881	21	147.094	A	0.000	147.094	147.094	100.00	0.000	0.000
					B	0.000	147.094	100.00	0.000	0.000	
					C	0.000	147.094	100.00	0.000	0.000	

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e	A _V ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A ₁ In Face ft ²	C _A A ₁ Out Face ft ²
L1 130.00-80.00	103.23	1.274	5	2.2416	137.146	A	0.000	137.146	137.146	100.00	0.000	0.000
						B	0.000	137.146	100.00	0.000	0.000	
						C	0.000	137.146	100.00	0.000	0.000	
L2 80.00-34.83	56.73	1.123	4	2.1113	173.391	A	0.000	173.391	173.391	100.00	0.000	0.000
						B	0.000	173.391	100.00	0.000	0.000	
						C	0.000	173.391	100.00	0.000	0.000	
L3 34.83-1.00	17.89	0.881	4	1.8812	158.999	A	0.000	158.999	158.999	100.00	0.000	0.000
						B	0.000	158.999	100.00	0.000	0.000	
						C	0.000	158.999	100.00	0.000	0.000	

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _V ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A ₁ In Face ft ²	C _A A ₁ Out Face ft ²
L1 130.00-80.00	103.23	1.274	10	118.466	A	0.000	118.466	118.466	100.00	0.000	0.000
					B	0.000	118.466	100.00	0.000	0.000	

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Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F _a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L2 80.00-34.83	56.73	1.123	9	156.516	C	0.000	118.466		100.00	0.000	0.000
					A	0.000	156.516	156.516	100.00	0.000	0.000
					B	0.000	156.516		100.00	0.000	0.000
					C	0.000	156.516		100.00	0.000	0.000
L3 34.83-1.00	17.89	0.881	7	147.094	A	0.000	147.094	147.094	100.00	0.000	0.000
					B	0.000	147.094		100.00	0.000	0.000
					C	0.000	147.094		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F _a c e	e	C _F	q _z psf	D _F	D _R	A _F ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	29	1	1	118.466	2465.06	49.30	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	26	1	1	156.516	2861.76	63.36	C
			B	1	0.65		1	1	156.516			
			C	1	0.65		1	1	156.516			
L3 34.83-1.00	380.59	6827.93	A	1	0.65	21	1	1	147.094	2166.06	64.03	C
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	448042.19 lb-ft	7492.88		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F _a c e	e	C _F	q _z psf	D _F	D _R	A _F ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	29	1	1	118.466	2465.06	49.30	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	26	1	1	156.516	2861.76	63.36	C
			B	1	0.65		1	1	156.516			
			C	1	0.65		1	1	156.516			
L3 34.83-1.00	380.59	6827.93	A	1	0.65	21	1	1	147.094	2166.06	64.03	C
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	448042.19 lb-ft	7492.88		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F _a c e	e	C _F	q _z psf	D _F	D _R	A _F ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	29	1	1	118.466	2465.06	49.30	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	26	1	1	156.516	2861.76	63.36	C
			B	1	0.65		1	1	156.516			

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Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L3 34.83-1.00	380.59	6827.93	C	1	0.65		1	1	156.516			
			A	1	0.65	21	1	1	147.094	2166.06	64.03	C
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	448042.19 lb-ft	7492.88		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	6999.87	A	1	1.2	5	1	1	137.146	895.90	17.92	C
			B	1	1.2		1	1	137.146			
			C	1	1.2		1	1	137.146			
L2 80.00-34.83	508.16	11812.46	A	1	1.2	4	1	1	173.391	995.28	22.03	C
			B	1	1.2		1	1	173.391			
			C	1	1.2		1	1	173.391			
L3 34.83-1.00	380.59	11012.09	A	1	1.2	4	1	1	158.999	735.04	21.73	C
			B	1	1.2		1	1	158.999			
			C	1	1.2		1	1	158.999			
Sum Weight:	1201.50	29824.43						OTM	159459.09 lb-ft	2626.23		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	6999.87	A	1	1.2	5	1	1	137.146	895.90	17.92	C
			B	1	1.2		1	1	137.146			
			C	1	1.2		1	1	137.146			
L2 80.00-34.83	508.16	11812.46	A	1	1.2	4	1	1	173.391	995.28	22.03	C
			B	1	1.2		1	1	173.391			
			C	1	1.2		1	1	173.391			
L3 34.83-1.00	380.59	11012.09	A	1	1.2	4	1	1	158.999	735.04	21.73	C
			B	1	1.2		1	1	158.999			
			C	1	1.2		1	1	158.999			
Sum Weight:	1201.50	29824.43						OTM	159459.09 lb-ft	2626.23		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	6999.87	A	1	1.2	5	1	1	137.146	895.90	17.92	C
			B	1	1.2		1	1	137.146			
			C	1	1.2		1	1	137.146			
L2 80.00-34.83	508.16	11812.46	A	1	1.2	4	1	1	173.391	995.28	22.03	C
			B	1	1.2		1	1	173.391			
			C	1	1.2		1	1	173.391			

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Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L3 34.83-1.00	380.59	11012.09	A	1	1.2	4	1	1	158.999	735.04	21.73	C
			B	1	1.2		1	1	158.999			
			C	1	1.2		1	1	158.999			
Sum Weight:	1201.50	29824.43						OTM	159459.09 lb-ft	2626.23		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	10	1	1	118.466	843.88	16.88	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	9	1	1	156.516	979.69	21.69	C
			B	1	0.65		1	1	156.516			
			C	1	0.65		1	1	156.516			
L3 34.83-1.00	380.59	6827.93	A	1	0.65	7	1	1	147.094	741.52	21.92	C
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	153381.60 lb-ft	2565.09		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	10	1	1	118.466	843.88	16.88	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	9	1	1	156.516	979.69	21.69	C
			B	1	0.65		1	1	156.516			
			C	1	0.65		1	1	156.516			
L3 34.83-1.00	380.59	6827.93	A	1	0.65	7	1	1	147.094	741.52	21.92	C
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	153381.60 lb-ft	2565.09		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 130.00-80.00	312.75	2816.14	A	1	0.65	10	1	1	118.466	843.88	16.88	C
			B	1	0.65		1	1	118.466			
			C	1	0.65		1	1	118.466			
L2 80.00-34.83	508.16	6743.56	A	1	0.65	9	1	1	156.516	979.69	21.69	C
			B	1	0.65		1	1	156.516			
			C	1	0.65		1	1	156.516			
L3 34.83-1.00	380.59	6827.93	A	1	0.65	7	1	1	147.094	741.52	21.92	C

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Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _P	q _s psf	D _F	D _R	A _F ft ²	F lb	w plf	Ctrl. Face
			B	1	0.65		1	1	147.094			
			C	1	0.65		1	1	147.094			
Sum Weight:	1201.50	16387.63						OTM	153381.60 lb-ft	2565.09		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M _x lb-ft	Sum of Overturning Moments, M _z lb-ft	Sum of Torques lb-ft
Leg Weight	16387.63					
Bracing Weight	0.00					
Total Member Self-Weight	16387.63			0.00	0.00	
Total Weight	25684.83			0.00	0.00	
Wind 0 deg - No Ice		0.00	-22846.51	-2163427.69	0.00	0.00
Wind 90 deg - No Ice		22846.51	0.00	0.00	-2163427.69	0.00
Wind 180 deg - No Ice		0.00	22846.51	2163427.69	0.00	0.00
Member Ice	13436.80					
Total Weight Ice	50569.67			0.00	0.00	
Wind 0 deg - Ice		0.00	-6045.22	-546447.22	0.00	0.00
Wind 90 deg - Ice		6045.22	0.00	0.00	-546447.22	0.00
Wind 180 deg - Ice		0.00	6045.22	546447.22	0.00	0.00
Total Weight	25684.83			0.00	0.00	
Wind 0 deg - Service		0.00	-7821.22	-740622.22	0.00	0.00
Wind 90 deg - Service		7821.22	0.00	0.00	-740622.22	0.00
Wind 180 deg - Service		0.00	7821.22	740622.22	0.00	0.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	130 - 80	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-28260.21	0.00	-0.00
			Max. Mx	4	-10943.58	-786411.41	-0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L2	80 - 34.83	Pole	Max. My	2	-10943.58	0.00	786411.41
			Max. Vy	4	28933.55	-786411.41	-0.00
			Max. Vx	2	-28933.55	0.00	786411.41
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-41384.78	0.00	-0.00
			Max. Mx	4	-19774.38	-2134217.0	-0.00
			Max. My	6	-19774.38	0.00	-2134217.0
			Max. Vy	4	33058.44	-2134217.0	-0.00
L3	34.83 - 1	Pole	Max. Vx	6	33058.44	0.00	-2134217.0
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-57052.59	0.00	0.00
			Max. Mx	4	-30795.23	-3541550.5	0.00
			Max. My	6	-30795.23	0.00	-3541550.5
			Max. Vy	4	36575.21	-3541550.5	0.00
			Max. Vx	6	36575.21	0.00	-3541550.5

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	8	57052.59	0.00	0.00
	Max. H _x	14	25684.81	0.00	-7820.18
	Max. H _z	3	23116.29	0.00	36553.37
	Max. M _x	2	3541550.57	0.00	36552.90
	Max. M _z	4	3541550.57	-36552.90	0.00
	Max. Torsion	5	0.00	-36553.37	0.00
	Min. Vert	5	23116.29	-36553.37	0.00
	Min. H _x	5	23116.29	-36553.37	0.00
	Min. H _z	7	23116.29	0.00	-36553.37
	Min. M _x	6	-3541550.57	0.00	-36552.90
	Min. M _z	1	0.00	0.00	0.00
	Min. Torsion	13	0.00	-7820.18	0.00

Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear _x lb	Shear _z lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _z lb-ft	Torque lb-ft
Dead Only	25684.83	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	30821.71	0.00	-36552.90	-3541550.57	0.00	0.00
0.9 Dead+1.6 Wind 0 deg - No Ice	23116.29	0.00	-36553.37	-3519817.49	0.00	0.00
1.2 Dead+1.6 Wind 90 deg - No Ice	30821.71	36552.90	0.00	0.00	-3541550.57	0.00
0.9 Dead+1.6 Wind 90 deg - No Ice	23116.29	36553.37	0.00	0.00	-3519817.49	0.00

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Load Combination	Vertical lb	Shear _x lb	Shear _y lb	Overtuning Moment, M _x lb-ft	Overtuning Moment, M _y lb-ft	Torque lb-ft
1.2 Dead+1.6 Wind 180 deg - No Ice	30821.71	0.00	36552.90	3541550.57	0.00	0.00
0.9 Dead+1.6 Wind 180 deg - No Ice	23116.29	0.00	36553.37	3519817.49	0.00	0.00
1.2 Dead+1.0 Ice+1.0 Temp	57052.59	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	57052.58	0.00	-6044.67	-576346.88	0.00	0.00
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	57052.58	6044.67	0.00	0.00	-576346.88	0.00
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	57052.58	0.00	6044.67	576346.88	0.00	0.00
Dead+Wind 0 deg - Service	25684.81	0.00	-7820.18	-755665.33	0.00	0.00
Dead+Wind 90 deg - Service	25684.81	7820.18	0.00	0.00	-755665.33	0.00
Dead+Wind 180 deg - Service	25684.81	0.00	7820.18	755665.33	0.00	0.00

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-25684.83	0.00	0.00	25684.83	0.00	0.000%
2	0.00	-30821.79	-36554.42	0.00	30821.71	36552.90	0.003%
3	0.00	-23116.34	-36554.42	0.00	23116.29	36553.37	0.002%
4	36554.42	-30821.79	0.00	-36552.90	30821.71	0.00	0.003%
5	36554.42	-23116.34	0.00	-36553.37	23116.29	0.00	0.002%
6	0.00	-30821.79	36554.42	0.00	30821.71	-36552.90	0.003%
7	0.00	-23116.34	36554.42	0.00	23116.29	-36553.37	0.002%
8	0.00	-57052.59	0.00	0.00	57052.59	0.00	0.000%
9	0.00	-57052.59	-6045.22	0.00	57052.58	6044.67	0.001%
10	6045.22	-57052.59	0.00	-6044.67	57052.58	0.00	0.001%
11	0.00	-57052.59	6045.22	0.00	57052.58	-6044.67	0.001%
12	0.00	-25684.83	-7821.22	0.00	25684.81	7820.18	0.004%
13	7821.22	-25684.83	0.00	-7820.18	25684.81	0.00	0.004%
14	0.00	-25684.83	7821.22	0.00	25684.81	-7820.18	0.004%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.0000001	0.0000001
2	Yes	11	0.0000001	0.00008624
3	Yes	11	0.0000001	0.00006828
4	Yes	11	0.0000001	0.00008624
5	Yes	11	0.0000001	0.00006828
6	Yes	11	0.0000001	0.00008624
7	Yes	11	0.0000001	0.00006828
8	Yes	6	0.0000001	0.0000001
9	Yes	11	0.0000001	0.00014028
10	Yes	11	0.0000001	0.00014028
11	Yes	11	0.0000001	0.00014028
12	Yes	10	0.0000001	0.00010848
13	Yes	10	0.0000001	0.00010848
14	Yes	10	0.0000001	0.00010848

Maximum Tower Deflections - Service Wind

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 80	18.550	12	1.2944	0.0000
L2	84.83 - 34.83	7.658	12	0.8755	0.0000
L3	41.33 - 1	1.764	12	0.3976	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
132.50	Top Hat with (3) 4 ft, and (1) 6 ft branches	12	18.550	1.2944	0.0000	36698
127.00	(4) Andrew SBNH-1D6565C w/ Mount Pipe	12	17.760	1.2682	0.0000	36698
125.50	(26) 4 ft branches	12	17.366	1.2551	0.0000	36698
116.90	(24) 6 ft branches	12	15.124	1.1795	0.0000	14006
108.60	(24) 6 ft branches	12	13.020	1.1050	0.0000	8574
102.00	(3) Powerwave 7770.00 w/ Mount Pipe	12	11.415	1.0442	0.0000	6552
101.90	(15) 8 ft branches	12	11.391	1.0432	0.0000	6529
96.70	(15) 8 ft branches	12	10.182	0.9939	0.0000	5509
92.10	(12) 10 ft branches	12	9.161	0.9491	0.0000	4840

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 80	86.870	2	6.0675	0.0000
L2	84.83 - 34.83	35.886	6	4.1047	0.0000
L3	41.33 - 1	8.266	6	1.8642	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
132.50	Top Hat with (3) 4 ft, and (1) 6 ft branches	2	86.870	6.0675	0.0000	7974
127.00	(4) Andrew SBNH-1D6565C w/ Mount Pipe	2	83.173	5.9448	0.0000	7974
125.50	(26) 4 ft branches	2	81.328	5.8834	0.0000	7974
116.90	(24) 6 ft branches	2	70.837	5.5290	0.0000	3042
108.60	(24) 6 ft branches	6	60.990	5.1801	0.0000	1860
102.00	(3) Powerwave 7770.00 w/ Mount Pipe	6	53.474	4.8950	0.0000	1420
101.90	(15) 8 ft branches	6	53.363	4.8906	0.0000	1415
96.70	(15) 8 ft branches	6	47.704	4.6595	0.0000	1193
92.10	(12) 10 ft branches	6	42.926	4.4494	0.0000	1047

Base Plate Design Data

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Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual	Actual	Actual	Actual	Controlling Condition	Ratio
			Allowable Ratio Bolt Tension lb	Allowable Ratio Bolt Compression lb	Allowable Ratio Plate Stress ksi	Allowable Ratio Stiffener Stress ksi		
2.5000	14	2.2500	184225.89	188625.21	35.373		Bolt T	0.82
			223654.40	371266.30	45.000			✓
			0.82	0.51	0.79			

Compression Checks Pole Design Data

Section No.	Elevation ft	Size	L ft	L _n ft	Kl/r	A in ²	P _u lb	φP _u lb	Ratio P _u / φP _u	
L1	130 - 127.623	TP35x21x0.1875	50.00	0.00	0.0	12.7822	-151.07	915151.00	0.000	
	127.623 - 125.245					13.1783	-3092.79	934798.00	0.003	
	125.245 - 122.868						13.5745	-3226.10	953921.00	0.003
	122.868 - 120.491						13.9706	-3365.77	972519.00	0.003
	120.491 - 118.113						14.3668	-3511.66	990594.00	0.004
	118.113 - 115.736						14.7630	-4494.09	1008140.00	0.004
	115.736 - 113.358						15.1591	-4656.06	1025170.00	0.005
	113.358 - 110.981						15.5553	-4824.98	1041670.00	0.005
	110.981 - 108.604						15.9514	-5000.57	1057650.00	0.005
	108.604 - 106.226						16.3476	-6035.37	1073110.00	0.006
	106.226 - 103.849						16.7437	-6230.53	1088040.00	0.006
	103.849 - 101.472						17.1399	-7729.54	1102440.00	0.007
	101.472 - 99.0942						17.5360	-7949.77	1116320.00	0.007
	99.0942 - 96.7168						17.9322	-8178.39	1129680.00	0.007
	96.7168 - 94.3395						18.3283	-9107.62	1142520.00	0.008
	94.3395 - 91.9621						18.7245	-10115.60	1154830.00	0.009
	91.9621 - 89.5847						19.1206	-10383.00	1166610.00	0.009
	89.5847 - 87.2074						19.5168	-10659.20	1177870.00	0.009
	87.2074 - 84.83						19.9129	-10943.60	1188610.00	0.009
	84.83 - 80						20.7178	-4576.37	1208810.00	0.004
L2	84.83 - 80	TP47.2726x33.2726x0.3125	50.00	0.00	0.0	34.0337	-7512.31	2466790.00	0.003	
	80 - 77.8517					34.6304	-12473.20	2497620.00	0.005	
	77.8517 - 75.7033					35.2270	-12853.30	2528020.00	0.005	
	75.7033 - 73.555					35.8236	-13240.00	2557990.00	0.005	
	73.555 -					36.4203	-13633.20	2587530.00	0.005	

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Section No.	Elevation ft	Size	L ft	L _n ft	Kl/r	A in ²	P _u lb	ΦP _n lb	Ratio P _u /ΦP _n
	71.4067								
	71.4067 -					37.0169	-14032.70	2616640.00	0.005
	69.2583								
	69.2583 -					37.6136	-14438.60	2645330.00	0.005
	67.11								
	67.11 -					38.2102	-14850.60	2673590.00	0.006
	64.9617								
	64.9617 -					38.8069	-15268.80	2701420.00	0.006
	62.8133								
	62.8133 -					39.4035	-15693.00	2728820.00	0.006
	60.665								
	60.665 -					40.0002	-16123.10	2755800.00	0.006
	58.5167								
	58.5167 -					40.5968	-16559.30	2782340.00	0.006
	56.3683								
	56.3683 -					41.1935	-17001.30	2808460.00	0.006
	54.22								
	54.22 -					41.7901	-17449.10	2834160.00	0.006
	52.0717								
	52.0717 -					42.3868	-17902.70	2859420.00	0.006
	49.9233								
	49.9233 -					42.9834	-18362.10	2884250.00	0.006
	47.775								
	47.775 -					43.5800	-18827.20	2908660.00	0.006
	45.6267								
	45.6267 -					44.1767	-19297.90	2932640.00	0.007
	43.4783								
	43.4783 -					44.7733	-19774.40	2956190.00	0.007
	41.33								
	41.33 - 34.83					46.5785	-11257.00	3024840.00	0.004
L3	41.33 - 34.83	TP56.12x44.8276x0.3125	40.33	0.00	0.0	45.9586	-11071.90	3001710.00	0.004
	34.83 -					46.4531	-22763.20	3020200.00	0.008
	33.0495								
	33.0495 -					46.9476	-23177.90	3038400.00	0.008
	31.2689								
	31.2689 -					47.4421	-23596.40	3056300.00	0.008
	29.4884								
	29.4884 -					47.9366	-24018.60	3073910.00	0.008
	27.7079								
	27.7079 -					48.4311	-24444.60	3091220.00	0.008
	25.9274								
	25.9274 -					48.9256	-24874.30	3108250.00	0.008
	24.1468								
	24.1468 -					49.4201	-25307.70	3124970.00	0.008
	22.3663								
	22.3663 -					49.9146	-25744.80	3141410.00	0.008
	20.5858								
	20.5858 -					50.4091	-26185.60	3157540.00	0.008
	18.8053								
	18.8053 -					50.9036	-26630.10	3173390.00	0.008
	17.0247								
	17.0247 -					51.3981	-27078.30	3188940.00	0.008
	15.2442								
	15.2442 -					51.8926	-27530.10	3204200.00	0.009
	13.4637								
	13.4637 -					52.3871	-27985.60	3219160.00	0.009
	11.6832								
	11.6832 -					52.8816	-28444.80	3233830.00	0.009
	9.90263								
	9.90263 -					53.3761	-28907.60	3248210.00	0.009

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u lb	φP _n lb	Ratio P _u / φP _n
	8.1221								
	8.1221 - 6.34158					53.8706	-29374.10	3262290.00	0.009
	6.34158 - 4.56105					54.3651	-29844.20	3276070.00	0.009
	4.56105 - 2.78053					54.8596	-30317.90	3289570.00	0.009
	2.78053 - 1					55.3541	-30795.20	3302770.00	0.009

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} lb-ft	φM _{ux} lb-ft	Ratio M _{ux} / φM _{ux}	M _{uy} lb-ft	φM _{uy} lb-ft	Ratio M _{uy} / φM _{uy}
L1	130 - 127.623	TP35x21x0.1875	5437.38	403838.33	0.013	0.00	403838.33	0.000
	127.623 - 125.245		19871.83	425403.33	0.047	0.00	425403.33	0.000
	125.245 - 122.868		43698.75	447265.00	0.098	0.00	447265.00	0.000
	122.868 - 120.491		67934.33	469400.83	0.145	0.00	469400.83	0.000
	120.491 - 118.113		92585.83	491790.00	0.188	0.00	491790.00	0.000
	118.113 - 115.736		121350.00	514410.83	0.236	0.00	514410.83	0.000
	115.736 - 113.358		154385.00	537240.83	0.287	0.00	537240.83	0.000
	113.358 - 110.981		187855.83	560259.17	0.335	0.00	560259.17	0.000
	110.981 - 108.604		221768.33	583443.33	0.380	0.00	583443.33	0.000
	108.604 - 106.226		263573.33	606771.67	0.434	0.00	606771.67	0.000
	106.226 - 103.849		305840.83	630223.33	0.485	0.00	630223.33	0.000
	103.849 - 101.472		350766.67	653776.67	0.537	0.00	653776.67	0.000
	101.472 - 99.0942		404950.83	677409.17	0.598	0.00	677409.17	0.000
	99.0942 - 96.7168		459593.33	701099.17	0.656	0.00	701099.17	0.000
	96.7168 - 94.3395		520522.50	724825.83	0.718	0.00	724825.83	0.000
	94.3395 - 91.9621		582286.67	748566.67	0.778	0.00	748566.67	0.000
	91.9621 - 89.5847		649863.33	772300.00	0.841	0.00	772300.00	0.000
	89.5847 - 87.2074		717903.33	796005.00	0.902	0.00	796005.00	0.000
	87.2074 - 84.83		786411.67	819659.17	0.959	0.00	819659.17	0.000
	84.83 - 80		357505.83	867466.67	0.412	0.00	867466.67	0.000
L2	84.83 - 80	TP47.2726x33.2726x0.3125	569770.00	1738358.33	0.328	0.00	1738358.33	0.000
	80 - 77.8517		990683.33	1791216.67	0.553	0.00	1791216.67	0.000
	77.8517 - 75.7033		1054508.33	1844533.33	0.572	0.00	1844533.33	0.000
	75.7033 - 73.555		1118758.33	1898283.33	0.589	0.00	1898283.33	0.000

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Section No.	Elevation ft	Size	M_{ux}	ϕM_{ux}	Ratio	M_{uy}	ϕM_{uy}	Ratio
			lb-ft	lb-ft	$\frac{M_{ux}}{\phi M_{ux}}$	lb-ft	lb-ft	$\frac{M_{uy}}{\phi M_{uy}}$
	73.555 - 71.4067		1183433.33	1952466.67	0.606	0.00	1952466.67	0.000
	71.4067 - 69.2583		1248533.33	2007058.33	0.622	0.00	2007058.33	0.000
	69.2583 - 67.11		1314066.67	2062033.33	0.637	0.00	2062033.33	0.000
	67.11 - 64.9617		1380025.00	2117391.67	0.652	0.00	2117391.67	0.000
	64.9617 - 62.8133		1446408.33	2173108.33	0.666	0.00	2173108.33	0.000
	62.8133 - 60.665		1513233.33	2229166.67	0.679	0.00	2229166.67	0.000
	60.665 - 58.5167		1580483.33	2285558.33	0.692	0.00	2285558.33	0.000
	58.5167 - 56.3683		1648166.67	2342258.33	0.704	0.00	2342258.33	0.000
	56.3683 - 54.22		1716291.67	2399258.33	0.715	0.00	2399258.33	0.000
	54.22 - 52.0717		1784850.00	2456533.33	0.727	0.00	2456533.33	0.000
	52.0717 - 49.9233		1853841.67	2514083.33	0.737	0.00	2514083.33	0.000
	49.9233 - 47.775		1923275.00	2571875.00	0.748	0.00	2571875.00	0.000
	47.775 - 45.6267		1993150.00	2629891.67	0.758	0.00	2629891.67	0.000
	45.6267 - 43.4783		2063458.33	2688133.33	0.768	0.00	2688133.33	0.000
	43.4783 - 41.33		2134216.67	2746575.00	0.777	0.00	2746575.00	0.000
	41.33 - 34.83		1199925.00	2924450.00	0.410	0.00	2924450.00	0.000
L3	41.33 - 34.83	TP56.12x44.8276x0.3125	1151400.00	2863200.00	0.402	0.00	2863200.00	0.000
	34.83 - 33.0495		2411575.00	2912041.67	0.828	0.00	2912041.67	0.000
	33.0495 - 31.2689		2472100.00	2960983.33	0.835	0.00	2960983.33	0.000
	31.2689 - 29.4884		2532900.00	3010008.33	0.841	0.00	3010008.33	0.000
	29.4884 - 27.7079		2593975.00	3059108.33	0.848	0.00	3059108.33	0.000
	27.7079 - 25.9274		2655308.33	3108275.00	0.854	0.00	3108275.00	0.000
	25.9274 - 24.1468		2716916.67	3157508.33	0.860	0.00	3157508.33	0.000
	24.1468 - 22.3663		2778791.67	3206783.33	0.867	0.00	3206783.33	0.000
	22.3663 - 20.5858		2840933.33	3256108.33	0.872	0.00	3256108.33	0.000
	20.5858 - 18.8053		2903333.33	3305458.33	0.878	0.00	3305458.33	0.000
	18.8053 - 17.0247		2966000.00	3354833.33	0.884	0.00	3354833.33	0.000
	17.0247 - 15.2442		3028925.00	3404216.67	0.890	0.00	3404216.67	0.000
	15.2442 - 13.4637		3092116.67	3453616.67	0.895	0.00	3453616.67	0.000
	13.4637 - 11.6832		3155558.33	3503000.00	0.901	0.00	3503000.00	0.000
	11.6832 - 9.90263		3219258.33	3552375.00	0.906	0.00	3552375.00	0.000

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Section No.	Elevation ft	Size	M_{ux} lb-ft	ϕM_{ux} lb-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M_{uy} lb-ft	ϕM_{uy} lb-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
	9.90263 - 8.1221		3283208.33	3601725.00	0.912	0.00	3601725.00	0.000
	8.1221 - 6.34158		3347416.67	3651050.00	0.917	0.00	3651050.00	0.000
	6.34158 - 4.56105		3411883.33	3700325.00	0.922	0.00	3700325.00	0.000
	4.56105 - 2.78053		3476591.67	3749558.33	0.927	0.00	3749558.33	0.000
	2.78053 - 1		3541550.00	3798725.00	0.932	0.00	3798725.00	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_u lb	Ratio $\frac{V_u}{\phi V_u}$	Actual T_u lb-ft	ϕT_u lb-ft	Ratio $\frac{T_u}{\phi T_u}$		
L1	130 - 127.623	TP35x21x0.1875	1243.17	457576.00	0.003	0.00	808665.00	0.000		
	127.623 - 125.245		9937.88	467399.00	0.021	0.00	851850.00	0.000		
	125.245 - 122.868		10108.70	476960.00	0.021	0.00	895625.00	0.000		
	122.868 - 120.491		10282.60	486260.00	0.021	0.00	939950.00	0.000		
	120.491 - 118.113		10459.70	495297.00	0.021	0.00	984783.33	0.000		
	118.113 - 115.736		13807.90	504072.00	0.027	0.00	1030083.33	0.000		
	115.736 - 113.358		13990.20	512585.00	0.027	0.00	1075791.67	0.000		
	113.358 - 110.981		14175.20	520836.00	0.027	0.00	1121891.67	0.000		
	110.981 - 108.604		14363.00	528826.00	0.027	0.00	1168316.67	0.000		
	108.604 - 106.226		17689.90	536553.00	0.033	0.00	1215025.00	0.000		
	106.226 - 103.849		17881.30	544018.00	0.033	0.00	1261991.67	0.000		
	103.849 - 101.472		22704.40	551221.00	0.041	0.00	1309150.00	0.000		
	101.472 - 99.0942		22897.50	558162.00	0.041	0.00	1356475.00	0.000		
	99.0942 - 96.7168		23092.40	564841.00	0.041	0.00	1403916.67	0.000		
	96.7168 - 94.3395		25756.10	571258.00	0.045	0.00	1451425.00	0.000		
	94.3395 - 91.9621		28342.40	577413.00	0.049	0.00	1498966.67	0.000		
	91.9621 - 89.5847		28538.20	583306.00	0.049	0.00	1546491.67	0.000		
	89.5847 - 87.2074		28735.20	588937.00	0.049	0.00	1593958.33	0.000		
	87.2074 - 84.83		28933.50	594306.00	0.049	0.00	1641325.00	0.000		
	84.83 - 80		11484.20	604407.00	0.019	0.00	1737058.33	0.000		
	L2		84.83 - 80	TP47.2726x33.2726x0.3125	17947.10	1233400.00	0.015	0.00	3480975.00	0.000
			80 - 77.8517		29623.90	1248810.00	0.024	0.00	3586816.67	0.000
			77.8517 - 75.7033		29821.50	1264010.00	0.024	0.00	3693575.00	0.000
75.7033 -		30019.60	1278990.00		0.023	0.00	3801216.67	0.000		

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Section No.	Elevation ft	Size	Actual V_n lb	ϕV_n lb	Ratio $\frac{V_n}{\phi V_n}$	Actual T_n lb-ft	ϕT_n lb-ft	Ratio $\frac{T_n}{\phi T_n}$
	73.555							
	73.555 - 71.4067		30218.30	1293760.00	0.023	0.00	3909708.33	0.000
	71.4067 - 69.2583		30417.50	1308320.00	0.023	0.00	4019016.67	0.000
	69.2583 - 67.11		30617.30	1322660.00	0.023	0.00	4129108.33	0.000
	67.11 - 64.9617		30817.60	1336790.00	0.023	0.00	4239958.33	0.000
	64.9617 - 62.8133		31018.50	1350710.00	0.023	0.00	4351533.33	0.000
	62.8133 - 60.665		31220.00	1364410.00	0.023	0.00	4463791.67	0.000
	60.665 - 58.5167		31422.00	1377900.00	0.023	0.00	4576708.33	0.000
	58.5167 - 56.3683		31624.60	1391170.00	0.023	0.00	4690250.00	0.000
	56.3683 - 54.22		31827.70	1404230.00	0.023	0.00	4804383.33	0.000
	54.22 - 52.0717		32031.40	1417080.00	0.023	0.00	4919083.33	0.000
	52.0717 - 49.9233		32235.70	1429710.00	0.023	0.00	5034308.33	0.000
	49.9233 - 47.775		32440.60	1442130.00	0.022	0.00	5150033.33	0.000
	47.775 - 45.6267		32646.00	1454330.00	0.022	0.00	5266225.00	0.000
	45.6267 - 43.4783		32851.90	1466320.00	0.022	0.00	5382841.67	0.000
	43.4783 - 41.33		33058.40	1478100.00	0.022	0.00	5499866.67	0.000
L3	41.33 - 34.83	TP56.12x44.8276x0.3125	17419.60	1512420.00	0.012	0.00	5856050.00	0.000
	41.33 - 34.83		16377.10	1500860.00	0.011	0.00	5733408.00	0.000
	34.83 - 33.0495		33936.30	1510100.00	0.022	0.00	5831216.67	0.000
	33.0495 - 31.2689		34089.90	1519200.00	0.022	0.00	5929208.00	0.000
	31.2689 - 29.4884		34242.70	1528150.00	0.022	0.00	6027374.67	0.000
	29.4884 - 27.7079		34394.70	1536950.00	0.022	0.00	6125700.00	0.000
	27.7079 - 25.9274		34545.90	1545610.00	0.022	0.00	6224158.00	0.000
	25.9274 - 24.1468		34696.20	1554120.00	0.022	0.00	6322733.33	0.000
	24.1468 - 22.3663		34845.70	1562490.00	0.022	0.00	6421416.67	0.000
	22.3663 - 20.5858		34994.40	1570700.00	0.022	0.00	6520174.67	0.000
	20.5858 - 18.8053		35142.30	1578770.00	0.022	0.00	6619000.00	0.000
	18.8053 - 17.0247		35289.30	1586690.00	0.022	0.00	6717866.67	0.000
	17.0247 - 15.2442		35435.50	1594470.00	0.022	0.00	6816766.67	0.000
	15.2442 - 13.4637		35580.90	1602100.00	0.022	0.00	6915674.67	0.000
	13.4637 - 11.6832		35725.40	1609580.00	0.022	0.00	7014574.67	0.000
	11.6832 -		35869.20	1616910.00	0.022	0.00	7113441.33	0.000

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Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-ft	ϕT_n lb-ft	Ratio $\frac{T_u}{\phi T_n}$
	9.90263							
	9.90263 - 8.1221		36012.00	1624100.00	0.022	0.00	7212266.67	0.000
	8.1221 - 6.34158		36154.10	1631140.00	0.022	0.00	7311024.67	0.000
	6.34158 - 4.56105		36295.30	1638040.00	0.022	0.00	7409708.00	0.000
	4.56105 - 2.78053		36435.70	1644780.00	0.022	0.00	7508283.33	0.000
	2.78053 - 1		36575.20	1651380.00	0.022	0.00	7606741.33	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		ϕP_n	ϕM_{ux}	ϕM_{uy}	ϕV_n	ϕT_n			
L1	130 - 127.623	0.000	0.013	0.000	0.003	0.000	0.014	1.000	4.8.2 ✓
	127.623 - 125.245	0.003	0.047	0.000	0.021	0.000	0.050	1.000	4.8.2 ✓
	125.245 - 122.868	0.003	0.098	0.000	0.021	0.000	0.102	1.000	4.8.2 ✓
	122.868 - 120.491	0.003	0.145	0.000	0.021	0.000	0.149	1.000	4.8.2 ✓
	120.491 - 118.113	0.004	0.188	0.000	0.021	0.000	0.192	1.000	4.8.2 ✓
	118.113 - 115.736	0.004	0.236	0.000	0.027	0.000	0.241	1.000	4.8.2 ✓
	115.736 - 113.358	0.005	0.287	0.000	0.027	0.000	0.293	1.000	4.8.2 ✓
	113.358 - 110.981	0.005	0.335	0.000	0.027	0.000	0.341	1.000	4.8.2 ✓
	110.981 - 108.604	0.005	0.380	0.000	0.027	0.000	0.386	1.000	4.8.2 ✓
	108.604 - 106.226	0.006	0.434	0.000	0.033	0.000	0.441	1.000	4.8.2 ✓
	106.226 - 103.849	0.006	0.485	0.000	0.033	0.000	0.492	1.000	4.8.2 ✓
	103.849 - 101.472	0.007	0.537	0.000	0.041	0.000	0.545	1.000	4.8.2 ✓
	101.472 - 99.0942	0.007	0.598	0.000	0.041	0.000	0.607	1.000	4.8.2 ✓
	99.0942 - 96.7168	0.007	0.656	0.000	0.041	0.000	0.664	1.000	4.8.2 ✓
	96.7168 - 94.3395	0.008	0.718	0.000	0.045	0.000	0.728	1.000	4.8.2 ✓
	94.3395 - 91.9621	0.009	0.778	0.000	0.049	0.000	0.789	1.000	4.8.2 ✓
	91.9621 - 89.5847	0.009	0.841	0.000	0.049	0.000	0.853	1.000	4.8.2 ✓
	89.5847 - 87.2074	0.009	0.902	0.000	0.049	0.000	0.913	1.000	4.8.2 ✓

tnxTower Vector Structural Engineering 9138 S. State St., Suite 101 Sandy, Utah 84070 Phone: (801) 990-1775 FAX: (801) 990-1776	Job Watertown	Page 24 of 28
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Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P_u	M_{ux}	M_{uy}	V_u	T_u			
	87.2074 - 84.83	0.009	0.959	0.000	0.049	0.000	0.971	1.000	4.8.2 ✓
	84.83 - 80	0.004	0.412	0.000	0.019	0.000	0.416	1.000	4.8.2 ✓
L2	84.83 - 80	0.003	0.328	0.000	0.015	0.000	0.331	1.000	4.8.2 ✓
	80 - 77.8517	0.005	0.553	0.000	0.024	0.000	0.559	1.000	4.8.2 ✓
	77.8517 - 75.7033	0.005	0.572	0.000	0.024	0.000	0.577	1.000	4.8.2 ✓
	75.7033 - 73.555	0.005	0.589	0.000	0.023	0.000	0.595	1.000	4.8.2 ✓
	73.555 - 71.4067	0.005	0.606	0.000	0.023	0.000	0.612	1.000	4.8.2 ✓
	71.4067 - 69.2583	0.005	0.622	0.000	0.023	0.000	0.628	1.000	4.8.2 ✓
	69.2583 - 67.11	0.005	0.637	0.000	0.023	0.000	0.643	1.000	4.8.2 ✓
	67.11 - 64.9617	0.006	0.652	0.000	0.023	0.000	0.658	1.000	4.8.2 ✓
	64.9617 - 62.8133	0.006	0.666	0.000	0.023	0.000	0.672	1.000	4.8.2 ✓
	62.8133 - 60.665	0.006	0.679	0.000	0.023	0.000	0.685	1.000	4.8.2 ✓
	60.665 - 58.5167	0.006	0.692	0.000	0.023	0.000	0.698	1.000	4.8.2 ✓
	58.5167 - 56.3683	0.006	0.704	0.000	0.023	0.000	0.710	1.000	4.8.2 ✓
	56.3683 - 54.22	0.006	0.715	0.000	0.023	0.000	0.722	1.000	4.8.2 ✓
	54.22 - 52.0717	0.006	0.727	0.000	0.023	0.000	0.733	1.000	4.8.2 ✓
	52.0717 - 49.9233	0.006	0.737	0.000	0.023	0.000	0.744	1.000	4.8.2 ✓
	49.9233 - 47.775	0.006	0.748	0.000	0.022	0.000	0.755	1.000	4.8.2 ✓
	47.775 - 45.6267	0.006	0.758	0.000	0.022	0.000	0.765	1.000	4.8.2 ✓
	45.6267 - 43.4783	0.007	0.768	0.000	0.022	0.000	0.775	1.000	4.8.2 ✓
	43.4783 - 41.33	0.007	0.777	0.000	0.022	0.000	0.784	1.000	4.8.2 ✓
	41.33 - 34.83	0.004	0.410	0.000	0.012	0.000	0.414	1.000	4.8.2 ✓
L3	41.33 - 34.83	0.004	0.402	0.000	0.011	0.000	0.406	1.000	4.8.2 ✓
	34.83 - 33.0495	0.008	0.828	0.000	0.022	0.000	0.836	1.000	4.8.2 ✓
	33.0495 - 31.2689	0.008	0.835	0.000	0.022	0.000	0.843	1.000	4.8.2 ✓
	31.2689 - 29.4884	0.008	0.841	0.000	0.022	0.000	0.850	1.000	4.8.2 ✓

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Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	29.4884 - 27.7079	0.008	0.848	0.000	0.022	0.000	0.856	1.000	4.8.2 ✓
	27.7079 - 25.9274	0.008	0.854	0.000	0.022	0.000	0.863	1.000	4.8.2 ✓
	25.9274 - 24.1468	0.008	0.860	0.000	0.022	0.000	0.869	1.000	4.8.2 ✓
	24.1468 - 22.3663	0.008	0.867	0.000	0.022	0.000	0.875	1.000	4.8.2 ✓
	22.3663 - 20.5858	0.008	0.872	0.000	0.022	0.000	0.881	1.000	4.8.2 ✓
	20.5858 - 18.8053	0.008	0.878	0.000	0.022	0.000	0.887	1.000	4.8.2 ✓
	18.8053 - 17.0247	0.008	0.884	0.000	0.022	0.000	0.893	1.000	4.8.2 ✓
	17.0247 - 15.2442	0.008	0.890	0.000	0.022	0.000	0.899	1.000	4.8.2 ✓
	15.2442 - 13.4637	0.009	0.895	0.000	0.022	0.000	0.904	1.000	4.8.2 ✓
	13.4637 - 11.6832	0.009	0.901	0.000	0.022	0.000	0.910	1.000	4.8.2 ✓
	11.6832 - 9.90263	0.009	0.906	0.000	0.022	0.000	0.916	1.000	4.8.2 ✓
	9.90263 - 8.1221	0.009	0.912	0.000	0.022	0.000	0.921	1.000	4.8.2 ✓
	8.1221 - 6.34158	0.009	0.917	0.000	0.022	0.000	0.926	1.000	4.8.2 ✓
	6.34158 - 4.56105	0.009	0.922	0.000	0.022	0.000	0.932	1.000	4.8.2 ✓
	4.56105 - 2.78053	0.009	0.927	0.000	0.022	0.000	0.937	1.000	4.8.2 ✓
	2.78053 - 1	0.009	0.932	0.000	0.022	0.000	0.942	1.000	4.8.2 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail	
L1	130 - 80	Pole	TP35x21x0.1875	1	-10943.60	1188610.00	97.1	Pass	
L2	80 - 34.83	Pole	TP47.2726x33.2726x0.3125	2	-19774.40	2956190.00	78.4	Pass	
L3	34.83 - 1	Pole	TP56.12x44.8276x0.3125	3	-30795.20	3302770.00	94.2	Pass	
							Summary		
							Pole (L1)	97.1	Pass
							Base Plate	82.4	Pass
							RATING =	97.1	Pass

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev G

Site Data

Project #:	U1223-226-121
Site Name:	WATERTOWN
Date:	04/26/13
Pole Manufacturer:	Other

Reactions		
Mu:	3542	ft-kips
Axial, Pu:	57.1	kips
Shear, Vu:	36.6	kips

Anchor Rod Data

Qty:	14	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	63.5	in

If No stiffeners, Criteria: AISC LRFD <-Only Applicable to Unstiffened Cases

Anchor Rod Results

Max Rod (Cu+ Vu/φ): 200.5 Kips
 Allowable Axial, φ*Fu*Anet: 260.0 Kips
 Anchor Rod Stress Ratio: 77.1% Pass

Rigid
AISC LRFD
φ*Tn

Plate Data

Diam:	69.5	in
Thick:	2.5	in
Grade:	50	ksi
Single-Rod B-eff:	12.72	in

Base Plate Results

Base Plate Stress: 23.8 ksi
 Allowable Plate Stress: 45.0 ksi
 Base Plate Stress Ratio: 52.8% Pass

Flexural Check

Rigid
AISC LRFD
φ*Fy
Y.L. Length: 29.71

Stiffener Data (Welding at both sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.25	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

n/a

Stiffener Results

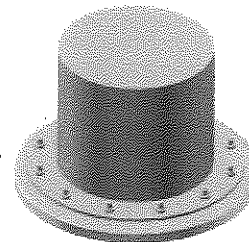
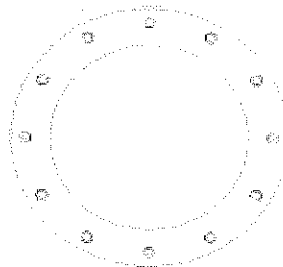
Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: n/a
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data

Diam:	56.12	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes



JOB NO.: U1223-226-121
DATE: 04/26/13

DESIGNED: TPH
CHECKED: RTA

PROJECT: WATERTOWN

Square Mat Foundation Design (Resultant Lies Outside Footing Kern)

Design Loads (Factored / ϕ_s):

Max. Base Shear, $V_u / 0.75$:	48.7	k
Max. Overturning Moment, $M_u / 0.75$:	4,722.1	k-ft
Max. Down, $P_{u-down} / 0.75$:	76.1	k
Structure Weight:	25.7	k
Moment Components, $M_y = M_x$:	3339.0	k-ft

Mat Properties:

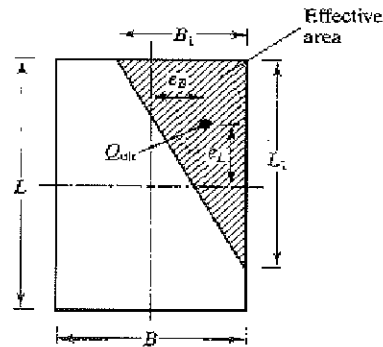
Mat Width, $L = B$:	21.0	ft
Mat Thickness, t :	3.0	ft
Pier Diameter, b :	7.0	ft
Height of Pier:	4.5	ft
Depth of Soil Above Mat:	4.0	ft
Unit Weight of Soil:	120.0	pcf
Number of Legs:	1	

Soil Properties:

Allow. Bearing Pressure:	12,000	psf
Factor of Safety:	1	
1/3 increase for short term loads?	No	
Passive Pressure:	1200	pcf
Factor of Safety:	1	
Max. Passive Pressure (opt'l):		pcf
1/3 increase for short term loads?	No	
Top Depth to Ignore:	0.0	ft

Check Bearing:

Total Moment, $M_y = M_x$:	3,597.5	k-ft
Total Axial Load, Q :	744.3	k
Load eccentricity, $e_L = e_B$:	4.83	ft
Effective Mat Brg Width, $B_1 = L_1$:	17.00	ft
Effective Area, $A' = 1/2(B_1)(L_1)$:	144.49	ft ²
Allowable axial load:	1734	k



Volume of Concrete:	1496	ft ³
Volume of Concrete:	55.4	yd ³
Weight of Concrete:	224.4	k
Weight of Soil:	193.2	k

Eff. Bearing Pressure:	12000	psf
Coefficient of Friction:	0.70	
Factor of Safety:	1.5	
% Passive for Sliding:	100.00	
% Friction for Sliding:	0.00	

Bearing Capacity OK.



JOB NO.: U1223-226-121
 DATE: 04/26/13

DESIGNED: TPH
 CHECKED: RTA

PROJECT: WATERTOWN

Square Mat Foundation Design (cont.)

Check Overturning:

Base Shear (1.6W), V_u :	36.6	k
Overturning Moment (1.6W), M_u :	3,541.6	k-ft
Down (0.9 D), P_u :	23.1	k
OTM about point P (1.6W):	3815.6985	k-ft
Resisting Moment (0.9D):	4189.4	k-ft

Overturning OK.

Check Sliding:

Sliding Resistance from Friction:	0.0	k
Sliding Resistance from Passive:	113.4	k
Total Sliding Resistance:	113.4	k

Sliding resistance OK.

