



STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

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E-Mail: siting.council@ct.gov

Web Site: www.ct.gov/csc

VIA ELECTRONIC MAIL

April 16, 2020

Alex Murshteyn
Site Acquisition Consultant
Centerline Communications, LLC
750 West Center Street, Suite 301
West Bridgewater, MA 02379

RE: **EM-VER-096-200316** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located off of Canterbury Road (a/k/a 4 Elkington Farm), New Milford, Connecticut.

Dear Mr. Murshteyn:

The Connecticut Siting Council (Council) is in receipt of your correspondence of April 16, 2020 submitted in response to the Council's March 25, 2020 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

s/ Melanie A. Bachman

Melanie A. Bachman
Executive Director

MAB/IN/emr

From: Alex Murshteyn <amurshteyn@clinellc.com>

Sent: Thursday, April 16, 2020 11:31 AM

To: Robidoux, Evan <Evan.Robidoux@ct.gov>

Cc: mayor@newmilford.org; zoning@newmilford.org; CSC-DL Siting Council <Siting.Council@ct.gov>; Peter Fales <pfales@clinellc.com>; Blake Paynter <Blake.Paynter@AmericanTower.com>

Subject: RE: Council Incomplete Letter for EM-VER-096-200316 (Canterbury Road a/k/a 4 Elkington Farm, New Milford) // New Milford CT aka 302523 / 12995763

All,

In response to the correspondence below and attached, please find additionally attached an updated Structural Analysis in order to complete this filing. This SA remains under capacity and now accounts for the mount modifications proposed in the Mount Analysis as well.

Thanks,

Alex Murshteyn
508-821-0159



AMERICAN TOWER®
CORPORATION

Structural Analysis Report

Structure : 150 ft Monopole
ATC Site Name : New Milford CT 2, CT
ATC Asset Number : 302523
Engineering Number : 12995763_C3_06
Proposed Carrier : Verizon Wireless
Carrier Site Name : New Milford CT
Carrier Site Number : 467154
Site Location : 4 Elkington Farm Rd
New Milford, CT 06776-2909
41.590900,-73.408600
County : Litchfield
Date : April 9, 2020
Max Usage : 93%
Result : Pass

Prepared By:
Tyler Ferguson, E.I.
Structural Engineer II

Reviewed By:



COA: PEC.0001553



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Introduction

The purpose of this report is to summarize results of a structural analysis performed on the 150 ft monopole to reflect the change in loading by Verizon Wireless.

Supporting Documents

Tower Drawings	ITT Meyer per AT&T Design Spec. AT-8935, dated April 13, 1984
Foundation Drawing	SNET Job #3C239, dated April 20, 1990
Geotechnical Report	JSEC Job #14974-NM, dated January 28, 2002
Modifications	Scientel CMS Modification Drawings, dated March 7, 2002 ATC Project #41658239, dated December 22, 2008 ATC Project #50496632, dated October 22, 2012 ATC Project #OAA682215_C6_04, dated September 19, 2016 ATC Project #OAA707682_C6_05, dated December 28, 2017

Analysis

The tower was analyzed using tnxTower 8.0.5.0 tower analysis software. This program considers an elastic three-dimensional model and second-order effects per ANSI/TIA-222.

Basic Wind Speed:	90 mph (3-Second Gust, V_{asd}) / 115 mph (3-second Gust, V_{ult})
Basic Wind Speed w/ Ice:	40 mph (3-Second Gust) w/ 3/4" radial ice concurrent
Code:	ANSI/TIA-222-G / 2015 IBC / 2018 Connecticut State Building Code
Structure Class:	II
Exposure Category:	B
Topographic Category:	1
Crest Height:	0 ft
Spectral Response:	$S_s = 0.20$, $S_1 = 0.07$
Site Class:	D - Stiff Soil

Conclusion

Based on the analysis results, the structure meets the requirements per the applicable codes listed above. The tower and foundation can support the equipment as described in this report.

If you have any questions or require additional information, please contact American Tower via email at Engineering@americantower.com. Please include the American Tower site name, site number, and engineering number in the subject line for any questions.



Existing and Reserved Equipment

Elev. ¹ (ft)	Qty	Antenna	Mount Type	Lines	Carrier
154.0	1	Andrew ABT-DFDM-ADB	Low Profile Platform	(2) 0.39" (10mm) Fiber Trunk (4) 0.78" (19.7mm) 8 AWG 6 (12) 1 1/4" Coax (1) 2" conduit (1) 3" conduit	AT&T MOBILITY
	3	Powerwave Allgon TT19-08BP111-001			
	2	Kathrein Scala 80010768			
	2	KMW AM-X-CD-16-65-00T-RET			
	1	Kathrein Scala 80010767			
	1	Kathrein Scala 800 10764			
	3	Powerwave Allgon 7770.00A			
	3	Ericsson RRUS-12 B2			
	3	Ericsson RRUS 32 B2			
	3	Ericsson RRUS 11 (Band 12)			
	3	Kaelus DBCT108F1V92-1			
	2	Raycap DC6-48-60-18-8F			
140.0	3	RFS APXV9TM14-ALU-I20*	Platform with Handrails	(4) 1 1/4" Hybriflex Cable	SPRINT NEXTEL
	3	Alcatel-Lucent TD-RRH8x20-25 w/ Solar Shield			
	3	RFS APXVSP18-C-A20			
132.0	2	Antel LPA-80063/6CF	Platform with Handrails w/ Mods	(6) 1 5/8" Coax (2) 1.58" (40.1mm) Hybrid	VERIZON WIRELESS
	6	Commscope JAHH-65B-R3B			
	3	Nokia B5 RRH4x40 w/ Solar Shield			
	2	RFS DB-T1-6Z-8AB-OZ			
	4	Antel LPA-80080/6CF ____			
75.0	1	PCTEL GPS-TMG-HR-26N	Flush	(1) 1/2" Coax	SPRINT NEXTEL

Equipment to be Removed

Elev. ¹ (ft)	Qty	Antenna	Mount Type	Lines	Carrier
132.0	3	Nokia B5 RRH4x40-850	-	-	VERIZON WIRELESS
	3	Alcatel-Lucent B66A RRH 4x45			
	3	Alcatel-Lucent B13 RRH4x30-4R 700U			
	3	Alcatel-Lucent B25 RRH4x30			

Proposed Equipment

Elev. ¹ (ft)	Qty	Antenna	Mount Type	Lines	Carrier
132.0	3	Commscope CBC78T-DS-43-2X	Platform with Handrails w/ Mods	-	VERIZON WIRELESS
	3	Samsung Outdoor LAA 1W RRH -Clip-on Antenna			
	3	Samsung Outdoor CBRS 20W RRH			
	3	Samsung B5/B13 RRH-BR04C			
	3	Samsung B2/B66A RRH-BR049			

¹ Contracted elevations are shown for appurtenances within contracted installation tolerances. Appurtenances outside of contract limits are shown at installed elevations.



Structure Usages

Structural Component	Controlling Usage	Pass/Fail
Anchor Bolts	60%	Pass
Shaft	82%	Pass
Base Plate	30%	Pass
Flanges	93%	Pass
Reinforcement	47%	Pass

Foundations

Reaction Component	Analysis Reactions	% of Usage
Moment (Kip-Ft)	2257.0	77%
Axial (Kips)	45.0	33%
Shear (Kips)	21.0	15%

The structure base reactions resulting from this analysis were found to be acceptable through analysis based on geotechnical and foundation information, therefore no modification or reinforcement of the foundation will be required.

Deflection and Sway*

Antenna Elevation (ft)	Antenna	Carrier	Deflection (ft)	Sway (Rotation) (°)
132.0	Commscope CBC78T-DS-43-2X	Verizon Wireless	1.372	0.008
	Samsung Outdoor LAA 1W RRH – Clip-on Antenna			
	Samsung Outdoor CBRS 20W RRH			
	Samsung B5/B13 RRH-BR04C			
	Samsung B2/B66A RRH-BR049			

*Deflection and Sway was evaluated considering a design wind speed of 60 mph (3-Second Gust) per ANSI/TIA-222-G



Standard Conditions

All engineering services performed by A.T. Engineering Service, PLLC are prepared on the basis that the information used is current and correct. This information may consist of, but is not limited to the following:

- Information supplied by the client regarding antenna, mounts and feed line loading
- Information from drawings, design and analysis documents, and field notes in the possession of A.T. Engineering Service, PLLC

It is the responsibility of the client to ensure that the information provided to A.T. Engineering Service, PLLC and used in the performance of our engineering services is correct and complete.

All assets of American Tower Corporation, its affiliates and subsidiaries (collectively "American Tower") are inspected at regular intervals. Based upon these inspections and in the absence of information to the contrary, American Tower assumes that all structures were constructed in accordance with the drawings and specifications.

Unless explicitly agreed by both the client and A.T. Engineering Service, PLLC, all services will be performed in accordance with the current revision of ANSI/TIA-222.

All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. A.T. Engineering Service, PLLC is not responsible for the conclusions, opinions and recommendations made by others based on the information supplied herein.

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
ABT-DFDM-ADB	150	APXV9TM14-ALU-I20*	143
TT19-08BP111-001	150	APXV9TM14-ALU-I20*	143
TT19-08BP111-001	150	APXV9TM14-ALU-I20*	143
TT19-08BP111-001	150	APXVSP18-C-A20	143
DBCT108F1V92-1	150	APXVSP18-C-A20	143
DBCT108F1V92-1	150	APXVSP18-C-A20	143
DBCT108F1V92-1	150	Round Platform w/ Handrails	143
(2) DC6-48-60-18-8F	150	B5 RRH4x40 w/ Solar Shield	132
RRUS 11 (Band 12)	150	B5 RRH4x40 w/ Solar Shield	132
RRUS 11 (Band 12)	150	B5 RRH4x40 w/ Solar Shield	132
RRUS 11 (Band 12)	150	B25 RRH4x30	132
RRUS 32 B2	150	B25 RRH4x30	132
RRUS 32 B2	150	B25 RRH4x30	132
RRUS 32 B2	150	B13 RRH4x30-4R 700U	132
RRUS-12 B2	150	B13 RRH4x30-4R 700U	132
RRUS-12 B2	150	B13 RRH4x30-4R 700U	132
RRUS-12 B2	150	B66A RRH 4x45	132
7770.00A	150	B66A RRH 4x45	132
7770.00A	150	B66A RRH 4x45	132
7770.00A	150	DB-T1-6Z-8AB-OZ	132
800 10764	150	DB-T1-6Z-8AB-OZ	132
80010767	150	(2) LPA-80080/6CF	132
80010767	150	(2) LPA-80080/6CF	132
AM-X-CD-16-65-00T-RET	150	(2) JAHH-65B-R3B	132
AM-X-CD-16-65-00T-RET	150	(2) JAHH-65B-R3B	132
80010768	150	(2) JAHH-65B-R3B	132
80010768	150	(2) JAHH-65B-R3B	132
Round Low Profile Platform	150	(2) LPA-80063/6CF	132
TD-RRH8x20-25 w/ Solar Shield	143	Round Platform w/ Handrails	132
TD-RRH8x20-25 w/ Solar Shield	143	GPS-TMG-HR-26N	75
TD-RRH8x20-25 w/ Solar Shield	143		

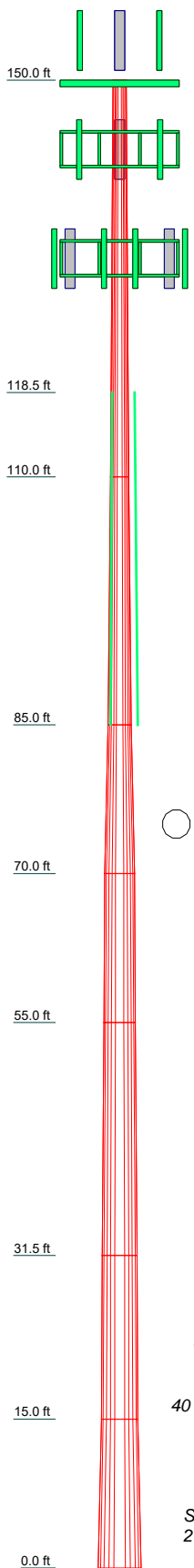
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	A615-75	75 ksi	100 ksi

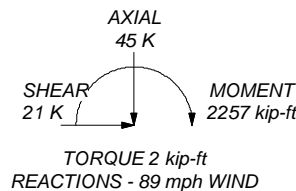
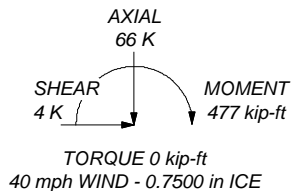
TOWER DESIGN NOTES


1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 89 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 0.75 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 wrap from 0° to 85°. This model considers an equivalent Moment of Inertia for tower Sections 3 through 7.
9. TOWER RATING: 82%

Section	Length (ft)	Number of Sides	Thickness (in)	Top Dia (in)	Bot Dia (in)	Grade	Tube Length (ft)	Reinf Size	Reinf Grade	Weight (K)
1	40.00	12	0.1875	15.0000	21.2500	A572-65	33.50	2 1/2	A615-75	1.5
2	25.00	12	0.2500	21.2500	27.6100	A572-65	33.50	2 1/2	A615-75	1.7
3	15.00	12	0.3722	27.6100	35.6910	A572-65	33.50	2 1/2	A615-75	1.9
4	15.00	12	0.3918	35.6910	38.0580	A572-65	33.50	2 1/2	A615-75	2.3
5	23.50	12	0.4720	38.0580	41.5760	A572-65	33.50	2 1/2	A615-75	4.8
6	16.50	12	0.4977	41.5760	44.0460	A572-65	33.50	2 1/2	A615-75	3.8
7	15.00	12	0.5362	44.0460	52.0640	A572-65	33.50	2 1/2	A615-75	4.2
										20.2



ALL REACTIONS ARE FACTORED



 <p>American Tower Engineering 3500 Regency Parkway, Suite 100 Cary, NC 27518 Phone: (919) 468-0112 FAX: (919) 466-5414</p>	Job: 302523 - New Milford CT 2, CT
	Project: 12995763 C3 04
	Client: Verizon Wireless Drawn by: Tyler.Ferguson App'd:
	Code: TIA-222-G Date: 11/21/19 Scale: NTS
	Path: C:\Users\tyler.ferguson\Desktop\302523\302523 - New Milford CT 2, CT.eri Dwg No. E-1

tnxTower American Tower Engineering 3500 Regency Parkway, Suite 100 Cary, NC 27518 Phone: (919) 468-0112 FAX: (919) 466-5414	Job	302523 - New Milford CT 2, CT	Page	1 of 25
	Project	12995763_C3_04	Date	11:57:07 11/21/19
	Client	Verizon Wireless	Designed by	Tyler.Ferguson

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Tower Input Data

The tower is a monopole.

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

The following design criteria apply:

Tower is located in Litchfield County, Connecticut.

ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).

Basic wind speed of 89 mph.

Structure Class II.

Exposure Category B.

Topographic Category I.

Crest Height 0.00 ft.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Tower wrap from 0' to 85'. This model considers an equivalent Moment of Inertia for tower Sections 3 through 7..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> 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) SR Members Have Cut Ends SR Members Are Concentric | <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 Retention Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs | <ul style="list-style-type: none"> 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 Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption <li style="text-align: center;">Poles √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known |
|--|---|---|

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	150.00-110.00	40.00	0.00	12	15.0000	21.2500	0.1875	0.7500	A572-65 (65 ksi)
L2	110.00-85.00	25.00	0.00	12	21.2500	27.6100	0.2500	1.0000	A572-65 (65 ksi)
L3	85.00-70.00	15.00	0.00	12	27.6100	35.6910	0.3722	1.4888	A572-65 (65 ksi)
L4	70.00-55.00	15.00	0.00	12	35.6910	38.0580	0.3918	1.5673	A572-65 (65 ksi)
L5	55.00-31.50	23.50	0.00	12	38.0580	41.5760	0.4720	1.8882	A572-65 (65 ksi)
L6	31.50-15.00	16.50	0.00	12	41.5760	44.0460	0.4977	1.9908	A572-65 (65 ksi)
L7	15.00-0.00	15.00		12	44.0460	52.0640	0.5362	2.1449	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 ⁶	I ² /Q in ²	w in	w/t
L1	15.4630	8.9430	250.4541	5.3029	7.7700	32.2335	507.4880	4.4015	3.5175	18.76
	21.9335	12.7165	720.0669	7.5404	11.0075	65.4160	1459.0508	6.2587	5.1925	27.693
L2	21.9114	16.9050	951.5678	7.5180	11.0075	86.4472	1928.1342	8.3201	5.0250	20.1
	28.4958	22.0248	2104.4088	9.7949	14.3020	147.1411	4264.1028	10.8399	6.7295	26.918
L3	28.4527	32.6449	3091.3307	9.7511	14.3020	216.1470	6263.8740	16.0668	6.4020	17.2
	36.8187	42.3301	6739.8046	12.6441	18.4879	364.5515	13656.6715	20.8336	8.5677	23.018
L4	36.8118	44.5367	7083.2568	12.6371	18.4879	383.1285	14352.5987	21.9196	8.5151	21.732
	39.2623	47.5231	8605.8524	13.4845	19.7140	436.5341	17437.7901	23.3894	9.1494	23.351
L5	39.2340	57.1295	10301.4312	13.4558	19.7140	522.5428	20873.4924	28.1174	8.9345	18.927
	42.8761	62.4767	13473.2267	14.7152	21.5364	625.6035	27300.4100	30.7491	9.8773	20.925
L6	42.8671	65.8318	14179.0407	14.7060	21.5364	658.3766	28730.5806	32.4004	9.8085	19.708
	45.4242	69.7902	16893.6340	15.5903	22.8158	740.4348	34231.0826	34.3486	10.4705	21.038
L7	45.4106	75.1266	18153.2042	15.5765	22.8158	795.6408	36783.3132	36.9750	10.3672	19.334
	53.7115	88.9710	30152.0589	18.4469	26.9692	1118.0203	61096.2459	43.7888	12.5161	23.341

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A ₁	Adjust. Factor A ₂	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1				1	1	1			
150.00-110.00									
L2				1	1	1			
110.00-85.00									
L3				1	1	1			
85.00-70.00									
L4				1	1	1			
70.00-55.00									
L5				1	1	1			
55.00-31.50									
L6				1	1	1			
31.50-15.00									
L7				1	1	1			
15.00-0.00									

Pole Reinforcing Data

tnxTower American Tower Engineering 3500 Regency Parkway, Suite 100 Cary, NC 27518 Phone: (919) 468-0112 FAX: (919) 466-5414	Job	302523 - New Milford CT 2, CT	Page	3 of 25
	Project	12995763_C3_04	Date	11:57:07 11/21/19
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Height Above Base ft	Segment Length ft	No. of Segments	Offset in	Grade	Type	Size	Unbraced Length ft	K	Bolt Hole Dia. in	Bolts per Row	Shear Lag Factor U
85.00	33.50	3	8.1100	A615-75 (75 ksi)	Solid Round	2 1/2	2.50	0.80	0.0000	0	1.000

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C _v A _s ft ² /ft	Weight plf
1.58" (40.1mm) Hybrid	B	No	No	Inside Pole	85.00 - 10.00	2	1" Ice 0.00	0.82
						No Ice 0.00	1.61	
						1/2" Ice 0.00	1.61	
***	C	No	No	Inside Pole	75.00 - 10.00	1	No Ice 0.00	0.15
1/2" Ice 0.00						0.15		
1" Ice 0.00						0.15		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf

Wrap Seams	A	No	Surface Ar (CaAa)	85.00 - 0.00	1	1	0.000	0.1875		2.00
Wrap Seams	B	No	Surface Ar (CaAa)	85.00 - 0.00	1	1	0.000	0.0000		2.00
Wrap Seams	C	No	Surface Ar (CaAa)	85.00 - 0.00	1	1	0.000	0.0000		2.00

#20 Dywidag	A	No	Surface Ar (CaAa)	131.00 - 80.00	1	1	0.000	2.5000		16.70
#20 Dywidag	B	No	Surface Ar (CaAa)	131.00 - 80.00	1	1	0.000	0.0000		16.70
#20 Dywidag	C	No	Surface Ar (CaAa)	131.00 - 80.00	1	1	0.000	0.0000		16.70

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C _v A _s ft ² /ft	Weight plf
1 1/4" Coax	A	No	No	Inside Pole	150.00 - 10.00	12	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	0.63 0.63 0.63
0.39" (10mm) Fiber Trunk	A	No	No	Inside Pole	150.00 - 0.00	2	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	0.07 0.07 0.07
0.78" (19.7 mm) 8 AWG 6	A	No	No	Inside Pole	150.00 - 10.00	4	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	0.59 0.59 0.59
2" conduit	C	No	No	Inside Pole	150.00 - 0.00	1	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	3.65 3.65 3.65
3" Conduit	A	No	No	Inside Pole	150.00 - 10.00	1	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	7.58 7.58 7.58

1 1/4" Hybriflex Cable	A	No	No	Inside Pole	143.00 - 10.00	4	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00	1.00 1.00 1.00

1 5/8" Coax	B	No	No	Inside Pole	85.00 - 10.00	6	No Ice 0.00 1/2" Ice 0.00	0.82 0.82

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _v A _s In Face ft ²	C _v A _s Out Face ft ²	Weight K
L1	150.00-110.00	A	0.000	0.000	5.250	0.000	1.19
		B	0.000	0.000	0.000	0.000	0.35
		C	0.000	0.000	0.000	0.000	0.50
L2	110.00-85.00	A	0.000	0.000	6.250	0.000	0.96
		B	0.000	0.000	0.000	0.000	0.42
		C	0.000	0.000	0.000	0.000	0.51
L3	85.00-70.00	A	0.000	0.000	1.531	0.000	0.44
		B	0.000	0.000	0.000	0.000	0.24
		C	0.000	0.000	0.000	0.000	0.17
L4	70.00-55.00	A	0.000	0.000	0.281	0.000	0.35
		B	0.000	0.000	0.000	0.000	0.15
		C	0.000	0.000	0.000	0.000	0.09
L5	55.00-31.50	A	0.000	0.000	0.441	0.000	0.56
		B	0.000	0.000	0.000	0.000	0.24
		C	0.000	0.000	0.000	0.000	0.14
L6	31.50-15.00	A	0.000	0.000	0.309	0.000	0.39
		B	0.000	0.000	0.000	0.000	0.17
		C	0.000	0.000	0.000	0.000	0.10
L7	15.00-0.00	A	0.000	0.000	0.281	0.000	0.14
		B	0.000	0.000	0.000	0.000	0.07
		C	0.000	0.000	0.000	0.000	0.09

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 _v A _s In Face ft ²	C _v A _s Out Face ft ²	Weight K
L1	150.00-110.00	A	1.719	0.000	0.000	12.471	0.000	1.37
		B		0.000	0.000	7.221	0.000	0.43
		C		0.000	0.000	7.221	0.000	0.57
L2	110.00-85.00	A	1.671	0.000	0.000	14.603	0.000	1.17
		B		0.000	0.000	8.353	0.000	0.50
		C		0.000	0.000	8.353	0.000	0.59
L3	85.00-70.00	A	1.633	0.000	0.000	8.063	0.000	0.53
		B		0.000	0.000	6.532	0.000	0.30
		C		0.000	0.000	6.532	0.000	0.23
L4	70.00-55.00	A	1.599	0.000	0.000	5.077	0.000	0.41

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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 K
L5	55.00-31.50	B	0.000	0.000	4.796	0.000	0.000	0.20
		C	0.000	0.000	4.796	0.000	0.13	
		A	1.541	0.000	7.681	0.000	0.63	
L6	31.50-15.00	B	0.000	0.000	7.240	0.000	0.31	
		C	0.000	0.000	7.240	0.000	0.20	
		A	1.448	0.000	5.087	0.000	0.44	
L7	15.00-0.00	B	0.000	0.000	4.778	0.000	0.21	
		C	0.000	0.000	4.778	0.000	0.14	
		A	1.290	0.000	4.151	0.000	0.17	
		B	0.000	0.000	3.869	0.000	0.10	
		C	0.000	0.000	3.869	0.000	0.12	

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _{No Ice}	K _{Ice}
L5	14	Wrap Seams	31.50 - 55.00	1.0000	1.0000
L5	15	Wrap Seams	31.50 - 55.00	1.0000	1.0000
L5	16	Wrap Seams	31.50 - 55.00	1.0000	1.0000
L6	14	Wrap Seams	15.00 - 31.50	1.0000	1.0000
L6	15	Wrap Seams	15.00 - 31.50	1.0000	1.0000
L6	16	Wrap Seams	15.00 - 31.50	1.0000	1.0000
L7	14	Wrap Seams	0.00 - 15.00	1.0000	1.0000
L7	15	Wrap Seams	0.00 - 15.00	1.0000	1.0000
L7	16	Wrap Seams	0.00 - 15.00	1.0000	1.0000

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
L1	150.00-110.00	-0.7438	-0.4294	-0.5030	-0.2904
L2	110.00-85.00	-1.2404	-0.7161	-0.7979	-0.4607
L3	85.00-70.00	-0.4939	-0.2851	-0.3077	-0.1776
L4	70.00-55.00	-0.0944	-0.0545	-0.0641	-0.0370
L5	55.00-31.50	-0.0944	-0.0545	-0.0653	-0.0377
L6	31.50-15.00	-0.0944	-0.0545	-0.0666	-0.0385
L7	15.00-0.00	-0.0944	-0.0545	-0.0687	-0.0397

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Vert ft ft	Azimuth Adjustment °	Placement ft	C _A A _{Front} ft ²	C _A A _{Side} ft ²	Weight K
ABT-DFDM-ADB	C	From Leg	4.00	0.0000	150.00	No Ice	0.05	0.00
			0.00			1/2" Ice	0.11	0.10
			4.00			1" Ice	0.17	0.15
TT19-08BP111-001	A	From Leg	4.00	0.0000	150.00	No Ice	0.64	0.52
			0.00			1/2" Ice	0.82	0.66
			4.00			1" Ice	1.00	0.80
TT19-08BP111-001	B	From Leg	4.00	0.0000	150.00	No Ice	0.64	0.52
			0.00			1/2" Ice	0.82	0.66
			4.00			1" Ice	1.00	0.80
TT19-08BP111-001	C	From Leg	4.00	0.0000	150.00	No Ice	0.64	0.52
			0.00			1/2" Ice	0.82	0.66
			4.00			1" Ice	1.00	0.80
DBCT108F1V92-1	A	From Leg	4.00	0.0000	150.00	No Ice	0.74	0.71
			0.00			1/2" Ice	0.92	0.88
			4.00			1" Ice	1.10	1.05
DBCT108F1V92-1	B	From Leg	4.00	0.0000	150.00	No Ice	0.74	0.71
			0.00			1/2" Ice	0.92	0.88
			4.00			1" Ice	1.10	1.05
DBCT108F1V92-1	C	From Leg	4.00	0.0000	150.00	No Ice	0.74	0.71
			0.00			1/2" Ice	0.92	0.88
			4.00			1" Ice	1.10	1.05
(2) DC6-48-60-18-8F	A	From Leg	4.00	0.0000	150.00	No Ice	1.11	1.11
			0.00			1/2" Ice	1.46	1.46
			4.00			1" Ice	1.81	1.81
RRUS 11 (Band 12)	A	From Leg	4.00	0.0000	150.00	No Ice	2.57	1.07
			0.00			1/2" Ice	3.34	1.39
			4.00			1" Ice	4.11	1.71
RRUS 11 (Band 12)	B	From Leg	4.00	0.0000	150.00	No Ice	2.57	1.07
			0.00			1/2" Ice	3.34	1.39
			4.00			1" Ice	4.11	1.71
RRUS 11 (Band 12)	C	From Leg	4.00	0.0000	150.00	No Ice	2.57	1.07
			0.00			1/2" Ice	3.34	1.39
			4.00			1" Ice	4.11	1.71
RRUS 32 B2	A	From Leg	4.00	0.0000	150.00	No Ice	2.74	1.67
			0.00			1/2" Ice	3.59	2.18
			4.00			1" Ice	4.44	2.69

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _{No Ice}	K _{Ice}
L1	18	#20 Dywidag	110.00 - 131.00	1.0000	1.0000
			110.00 - 131.00	1.0000	1.0000
L1	19	#20 Dywidag	110.00 - 131.00	1.0000	1.0000
			110.00 - 131.00	1.0000	1.0000
L2	18	#20 Dywidag	85.00 - 110.00	1.0000	1.0000
			85.00 - 110.00	1.0000	1.0000
L2	19	#20 Dywidag	85.00 - 110.00	1.0000	1.0000
			85.00 - 110.00	1.0000	1.0000
L3	14	Wrap Seams	70.00 - 85.00	1.0000	1.0000
			70.00 - 85.00	1.0000	1.0000
L3	15	Wrap Seams	70.00 - 85.00	1.0000	1.0000
			70.00 - 85.00	1.0000	1.0000
L3	16	Wrap Seams	70.00 - 85.00	1.0000	1.0000
			70.00 - 85.00	1.0000	1.0000
L3	18	#20 Dywidag	80.00 - 85.00	1.0000	1.0000
			80.00 - 85.00	1.0000	1.0000
L3	19	#20 Dywidag	80.00 - 85.00	1.0000	1.0000
			80.00 - 85.00	1.0000	1.0000
L3	20	#20 Dywidag	80.00 - 85.00	1.0000	1.0000
			80.00 - 85.00	1.0000	1.0000
L4	14	Wrap Seams	55.00 - 70.00	1.0000	1.0000
			55.00 - 70.00	1.0000	1.0000
L4	15	Wrap Seams	55.00 - 70.00	1.0000	1.0000
			55.00 - 70.00	1.0000	1.0000
L4	16	Wrap Seams	55.00 - 70.00	1.0000	1.0000
			55.00 - 70.00	1.0000	1.0000

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
RRUS 32 B2	B	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 2.74 1/2" Ice 3.59 1" Ice 4.44	1.67 2.18 2.69	0.05 0.07 0.10
RRUS 32 B2	C	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 2.74 1/2" Ice 3.59 1" Ice 4.44	1.67 2.18 2.69	0.05 0.07 0.10
RRUS-12 B2	A	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 3.15 1/2" Ice 4.06 1" Ice 4.97	1.29 1.66 2.03	0.06 0.08 0.10
RRUS-12 B2	B	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 3.15 1/2" Ice 4.06 1" Ice 4.97	1.29 1.66 2.03	0.06 0.08 0.10
RRUS-12 B2	C	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 3.15 1/2" Ice 4.06 1" Ice 4.97	1.29 1.66 2.03	0.06 0.08 0.10
7770.00A	A	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 5.56 1/2" Ice 6.60 1" Ice 7.64	1.69 2.01 2.33	0.03 0.06 0.09
7770.00A	B	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 5.56 1/2" Ice 6.60 1" Ice 7.64	1.69 2.01 2.33	0.03 0.06 0.09
7770.00A	C	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 5.56 1/2" Ice 6.60 1" Ice 7.64	1.69 2.01 2.33	0.03 0.06 0.09
800 10764	C	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 5.87 1/2" Ice 6.99 1" Ice 8.11	1.95 2.33 2.71	0.04 0.08 0.11
80010767	C	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 7.38 1/2" Ice 8.91 1" Ice 10.44	2.21 2.67 3.13	0.06 0.11 0.15
AM-X-CD-16-65-00T-RET	A	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 8.02 1/2" Ice 9.08 1" Ice 10.14	2.70 3.06 3.42	0.05 0.10 0.14
AM-X-CD-16-65-00T-RET	B	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 8.02 1/2" Ice 9.08 1" Ice 10.14	2.70 3.06 3.42	0.05 0.10 0.14
80010768	A	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 10.16 1/2" Ice 11.71 1" Ice 13.26	3.13 3.60 4.07	0.08 0.14 0.19
80010768	B	From Leg	4.00 0.00 4.00	0.0000	150.00	No Ice 10.16 1/2" Ice 11.71 1" Ice 13.26	3.13 3.60 4.07	0.08 0.14 0.19
Round Low Profile Platform	C	None	4.00	0.0000	150.00	No Ice 21.70 1/2" Ice 27.20 1" Ice 32.70	21.70 27.20 32.70	1.50 1.70 1.90

TD-RRH8x20-25 w/ Solar Shield	A	From Leg	4.00 0.00 4.00	0.0000	143.00	No Ice 4.05 1/2" Ice 5.16 1" Ice 6.27	1.53 1.95 2.37	0.07 0.10 0.12
TD-RRH8x20-25 w/ Solar Shield	B	From Leg	4.00 0.00 4.00	0.0000	143.00	No Ice 4.05 1/2" Ice 5.16 1" Ice 6.27	1.53 1.95 2.37	0.07 0.10 0.12
TD-RRH8x20-25 w/ Solar Shield	C	From Leg	4.00 0.00 4.00	0.0000	143.00	No Ice 4.05 1/2" Ice 5.16 1" Ice 6.27	1.53 1.95 2.37	0.07 0.10 0.12
APXV9TM14-ALU-I20*	A	From Leg	4.00 0.00 4.00	0.0000	143.00	No Ice 6.34 1/2" Ice 7.57	2.08 2.48	0.06 0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
APXV9TM14-ALU-I20*	B	From Leg	0.00 4.00 0.00	0.0000	143.00	1" Ice 8.80 No Ice 6.34 1/2" Ice 7.57	2.88 2.08 2.48	0.13 0.06 0.09
APXV9TM14-ALU-I20*	C	From Leg	0.00 4.00 0.00	0.0000	143.00	1" Ice 8.80 No Ice 6.34 1/2" Ice 7.57	2.88 2.08 2.48	0.13 0.06 0.09
APXVSPP18-C-A20	A	From Leg	0.00 4.00 0.00	0.0000	143.00	No Ice 8.02 1/2" Ice 9.08 1" Ice 10.14	3.05 3.46 3.87	0.06 0.11 0.16
APXVSPP18-C-A20	B	From Leg	0.00 4.00 0.00	0.0000	143.00	No Ice 8.02 1/2" Ice 9.08 1" Ice 10.14	3.05 3.46 3.87	0.06 0.11 0.16
APXVSPP18-C-A20	C	From Leg	0.00 4.00 0.00	0.0000	143.00	No Ice 8.02 1/2" Ice 9.08 1" Ice 10.14	3.05 3.46 3.87	0.06 0.11 0.16
Round Platform w/ Handrails	C	None	0.00	0.0000	143.00	No Ice 27.20 1/2" Ice 34.20 1" Ice 41.20	27.20 34.20 41.20	2.00 2.40 2.80

B5 RRH4x40 w/ Solar Shield	A	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 1.74 1/2" Ice 2.33 1" Ice 2.92	1.01 1.35 1.69	0.04 0.06 0.07
B5 RRH4x40 w/ Solar Shield	B	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 1.74 1/2" Ice 2.33 1" Ice 2.92	1.01 1.35 1.69	0.04 0.06 0.07
B5 RRH4x40 w/ Solar Shield	C	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 1.74 1/2" Ice 2.33 1" Ice 2.92	1.01 1.35 1.69	0.04 0.06 0.07
B25 RRH4x30	A	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.12 1/2" Ice 2.81 1" Ice 3.50	1.29 1.71 2.13	0.05 0.07 0.09
B25 RRH4x30	B	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.12 1/2" Ice 2.81 1" Ice 3.50	1.29 1.71 2.13	0.05 0.07 0.09
B25 RRH4x30	C	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.12 1/2" Ice 2.81 1" Ice 3.50	1.29 1.71 2.13	0.05 0.07 0.09
B13 RRH4x30-4R 700U	A	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.17 1/2" Ice 2.87 1" Ice 3.57	1.63 2.15 2.67	0.06 0.08 0.10
B13 RRH4x30-4R 700U	B	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.17 1/2" Ice 2.87 1" Ice 3.57	1.63 2.15 2.67	0.06 0.08 0.10
B13 RRH4x30-4R 700U	C	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.17 1/2" Ice 2.87 1" Ice 3.57	1.63 2.15 2.67	0.06 0.08 0.10
B66A RRH 4x45	A	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.58 1/2" Ice 3.38 1" Ice 4.18	1.63 2.13 2.63	0.07 0.09 0.11
B66A RRH 4x45	B	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.58 1/2" Ice 3.38 1" Ice 4.18	1.63 2.13 2.63	0.07 0.09 0.11
B66A RRH 4x45	C	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 2.58 1/2" Ice 3.38 1" Ice 4.18	1.63 2.13 2.63	0.07 0.09 0.11
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 4.00	0.0000	132.00	No Ice 4.80	2.00	0.04

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral	Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			ft	°	ft	ft ²	ft ²	K
			0.00		1/2" Ice	6.08	2.53	0.08
			0.00		1" Ice	7.36	3.06	0.12
DB-T1-6Z-8AB-OZ	B	From Leg	4.00	0.0000	132.00	4.80	2.00	0.04
			0.00		1/2" Ice	6.08	2.53	0.08
			0.00		1" Ice	7.36	3.06	0.12
(2) LPA-80080/6CF	B	From Leg	4.00	0.0000	132.00	No Ice	8.63	14.52
			0.00		1/2" Ice	9.93	16.71	0.00
			0.00		1" Ice	11.23	18.90	0.00
(2) LPA-80080/6CF	C	From Leg	4.00	0.0000	132.00	No Ice	8.63	14.52
			0.00		1/2" Ice	9.93	16.71	0.00
			0.00		1" Ice	11.23	18.90	0.00
(2) JAHH-65B-R3B	A	From Leg	4.00	0.0000	132.00	No Ice	9.11	3.44
			0.00		1/2" Ice	10.50	3.97	0.12
			0.00		1" Ice	11.89	4.50	0.18
(2) JAHH-65B-R3B	B	From Leg	4.00	0.0000	132.00	No Ice	9.11	3.44
			0.00		1/2" Ice	10.50	3.97	0.12
			0.00		1" Ice	11.89	4.50	0.18
(2) JAHH-65B-R3B	C	From Leg	4.00	0.0000	132.00	No Ice	9.11	3.44
			0.00		1/2" Ice	10.50	3.97	0.12
			0.00		1" Ice	11.89	4.50	0.18
(2) LPA-80063/6CF	A	From Leg	4.00	0.0000	132.00	No Ice	9.59	4.93
			0.00		1/2" Ice	11.18	5.75	0.00
			0.00		1" Ice	12.77	6.57	0.00
Round Platform w/ Handrails	C	None		0.0000	132.00	No Ice	27.20	27.20
						1/2" Ice	34.20	34.20
						1" Ice	41.20	41.20

GPS-TMG-HR-26N	C	From Leg	4.00	0.0000	75.00	No Ice	0.09	0.09
			0.00			1/2" Ice	0.14	0.14
			0.00			1" Ice	0.19	0.19

Comb. No.	Description
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice

Maximum Tower Deflections - Service Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	150 - 110	21.681	39	1.5566	0.0100
L2	110 - 85	10.789	39	1.0143	0.0046
L3	85 - 70	6.033	39	0.7725	0.0016
L4	70 - 55	3.936	39	0.5787	0.0010
L5	55 - 31.5	2.348	39	0.4319	0.0006
L6	31.5 - 15	0.710	39	0.2322	0.0003
L7	15 - 0	0.142	39	0.0963	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
150.00	ABT-DFDM-ADB	39	21.681	1.5566	0.0101	28716
143.00	TD-RRH8x20-25 w/ Solar Shield	39	19.624	1.4501	0.0091	20511

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Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
132.00	B5 RRH4x40 w/ Solar Shield	39	16.460	1.2880	0.0076	7976
75.00	GPS-TMG-HR-26N	39	4.577	0.6421	0.0011	5143

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	150 - 110	86.030	2	6.1724	0.0381
L2	110 - 85	42.842	2	4.0308	0.0182
L3	85 - 70	23.953	2	3.0694	0.0061
L4	70 - 55	15.625	2	2.2985	0.0038
L5	55 - 31.5	9.316	2	1.7148	0.0025
L6	31.5 - 15	2.818	2	0.9215	0.0012
L7	15 - 0	0.564	2	0.3820	0.0004

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
150.00	ABT-DFDM-ADB	2	86.030	6.1724	0.0401	7374
143.00	TD-RRH8x20-25 w/ Solar Shield	2	77.875	5.7523	0.0362	5266
132.00	B5 RRH4x40 w/ Solar Shield	2	65.332	5.1128	0.0300	2046
75.00	GPS-TMG-HR-26N	2	18.169	2.5507	0.0043	1297

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L _w	K/U _r	A	P _u	φP _n	Ratio P _n /φP _n
	ft		ft	ft		in ²	K	K	φP _n
L1	150 - 148	TP21.25x15x0.1875	40.00	0.00	0.0	9.1317	-2.91	673.10	0.004
	148 - 146					9.3204	-3.10	687.01	0.005
	146 - 144					9.5091	-3.29	700.91	0.005
	144 - 142					9.6977	-6.31	714.82	0.009
	142 - 140					9.8864	-6.50	728.00	0.009
	140 - 138					10.0751	-6.71	737.48	0.009
	138 - 136					10.2638	-6.91	746.79	0.009
	136 - 134					10.4524	-7.12	755.93	0.009
	134 - 132					10.6411	-7.33	764.91	0.010
	132 - 130					10.8298	-10.99	773.73	0.014
	130 - 128					11.0184	-11.21	782.37	0.014
	128 - 126					11.2071	-11.45	790.86	0.014
	126 - 124					11.3958	-11.70	799.17	0.015

Section No.	Elevation	Size	L	L _w	K/U _r	A	P _u	φP _n	Ratio P _n /φP _n
	ft		ft	ft		in ²	K	K	φP _n
L2	124 - 122	TP27.61x21.25x0.25	25.00	0.00	0.0	11.5845	-11.95	807.33	0.015
	122 - 120					11.7731	-12.21	815.31	0.015
	120 - 118.5					11.9146	-12.41	821.20	0.015
	118.5 - 118					11.9146	-2.66	821.20	0.003
	118 - 116					11.9618	-2.79	823.13	0.003
	116 - 114					12.3391	-3.15	838.28	0.004
	114 - 112					12.5278	-3.36	845.61	0.004
	112 - 110					12.7165	-3.53	852.77	0.004
	110 - 108.75					17.1610	-3.73	1264.94	0.003
	108.75 - 107.5					17.4170	-3.93	1283.81	0.003
	107.5 - 106.25					17.6730	-4.13	1299.13	0.003
	106.25 - 105					17.9290	-4.34	1311.95	0.003
	105 - 103.75					18.1849	-4.54	1324.60	0.003
	103.75 - 102.5					18.4409	-4.75	1337.07	0.004
	102.5 - 101.25					18.6969	-4.96	1349.38	0.004
	101.25 - 100					18.9529	-5.18	1361.51	0.004
	100 - 98.75					19.2089	-5.39	1373.47	0.004
	98.75 - 97.5					19.4649	-5.61	1385.26	0.004
	97.5 - 96.25					19.7209	-5.82	1396.88	0.004
	96.25 - 95					19.9769	-6.04	1408.33	0.004
	L3					95 - 93.75	TP35.691x27.61x0.3722	15.00	0.00
93.75 - 92.5		20.4889	-6.49	1430.71	0.005				
92.5 - 91.25		20.7449	-6.71	1441.65	0.005				
91.25 - 90		21.0008	-6.94	1452.41	0.005				
90 - 88.75		21.2568	-7.17	1463.00	0.005				
88.75 - 87.5		21.5128	-7.40	1473.42	0.005				
87.5 - 86.25		21.7688	-7.63	1483.67	0.005				
86.25 - 85		22.0248	-7.86	1493.74	0.005				
85 - 84		32.6449	-19.73	2406.26	0.008				
84 - 83		33.2906	-19.95	2453.85	0.008				
83 - 82		33.9363	-20.16	2501.44	0.008				
82 - 81		34.5820	-20.38	2549.04	0.008				
81 - 80		35.2277	-20.60	2596.63	0.008				
80 - 79		35.8733	-20.83	2644.22	0.008				
79 - 78		36.5190	-21.05	2691.82	0.008				
78 - 77		37.1647	-21.28	2739.41	0.008				
77 - 76		37.8104	-21.51	2787.00	0.008				
76 - 75		38.4561	-21.74	2834.60	0.008				
75 - 74		39.1017	-21.98	2876.04	0.008				
74 - 73		39.7474	-22.21	2908.39	0.008				
L4		73 - 72	TP38.058x35.691x0.3918	15.00	0.00	0.0			
	72 - 71	41.0388					-22.69	2971.63	0.008
	71 - 70	41.6845					-22.94	3002.51	0.008
	70 - 69	44.7358					-23.41	3257.03	0.007
	69 - 68	44.9349					-23.65	3266.77	0.007
	68 - 67	45.1340					-23.88	3276.46	0.007
	67 - 66	45.3331					-24.12	3286.11	0.007
	66 - 65	45.5322					-24.36	3295.72	0.007
	65 - 64	45.7313					-24.61	3305.29	0.007
	64 - 63	45.9304					-24.85	3314.81	0.007
	63 - 62	46.1295					-25.09	3324.29	0.008
	62 - 61	46.3286					-25.33	3333.73	0.008
	61 - 60	46.5277					-25.58	3343.13	0.008
	60 - 59	46.7267					-25.83	3352.48	0.008
	59 - 58	46.9258					-26.07	3361.80	0.008
	58 - 57	47.1249					-26.32	3371.07	0.008
	57 - 56	47.3240					-26.57	3380.29	0.008
	56 - 55	47.5231					-26.82	3389.48	0.008
	L5	55 - 53.825					TP41.576x38.058x0.472	23.50	0.00
53.825 - 52.65		57.6642	-27.50	4250.43	0.006				

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Section No.	Elevation	Size	L	L _w	KI/r	A	P _u	φP _n	Ratio P _u /φP _n
	ft		ft	ft		in ²	K	K	φP _n
	52.65 - 51.475					57.9316	-27.84	4270.14	0.007
	51.475 - 50.3					58.1989	-28.18	4289.84	0.007
	50.3 - 49.125					58.4663	-28.53	4309.55	0.007
	49.125 - 47.95					58.7337	-28.88	4329.26	0.007
	47.95 - 46.775					59.0010	-29.22	4348.97	0.007
	46.775 - 45.6					59.2684	-29.57	4368.67	0.007
	45.6 - 44.425					59.5357	-29.92	4388.38	0.007
	44.425 - 43.25					59.8031	-30.28	4408.09	0.007
	43.25 - 42.075					60.0705	-30.63	4427.79	0.007
	42.075 - 40.9					60.3378	-30.98	4447.50	0.007
	40.9 - 39.725					60.6052	-31.34	4467.21	0.007
	39.725 - 38.55					60.8726	-31.70	4486.92	0.007
	38.55 - 37.375					61.1399	-32.06	4506.62	0.007
	37.375 - 36.2					61.4073	-32.42	4526.33	0.007
	36.2 - 35.025					61.6746	-32.78	4546.04	0.007
	35.025 - 33.85					61.9420	-33.14	4565.75	0.007
	33.85 - 32.675					62.2094	-33.51	4585.45	0.007
	32.675 - 31.5					62.4767	-33.87	4605.16	0.007
L6	31.5 - 30.4688	TP44.046x41.576x0.4977	16.50	0.00	0.0	66.0792	-34.21	4870.70	0.007
	30.4688 - 29.4375					66.3266	-34.55	4888.94	0.007
	29.4375 - 28.4063					66.5740	-34.89	4907.17	0.007
	28.4063 - 27.375					66.8214	-35.23	4925.41	0.007
	27.375 - 26.3438					67.0688	-35.57	4943.64	0.007
	26.3438 - 25.3125					67.3162	-35.91	4961.88	0.007
	25.3125 - 24.2813					67.5636	-36.25	4980.12	0.007
	24.2813 - 23.25					67.8110	-36.60	4998.35	0.007
	23.25 - 22.2188					68.0584	-36.94	5016.59	0.007
	22.2188 - 21.1875					68.3058	-37.29	5034.82	0.007
	21.1875 - 20.1563					68.5532	-37.64	5053.06	0.007
	20.1563 - 19.125					68.8006	-37.99	5071.30	0.007
	19.125 - 18.0938					69.0480	-38.34	5089.53	0.008
	18.0938 - 17.0625					69.2954	-38.69	5107.77	0.008
	17.0625 - 16.0313					69.5428	-39.04	5126.01	0.008
L7	16.0313 - 15	TP52.064x44.046x0.5362	15.00	0.00	0.0	69.7902	-39.40	5136.07	0.008
	15 - 14					75.1266	-39.41	5537.58	0.007
	14 - 13					76.0496	-39.75	5605.61	0.007
	13 - 12					76.9725	-40.09	5673.64	0.007
	12 - 11					77.8955	-40.44	5741.68	0.007
	11 - 10					78.8184	-40.80	5809.71	0.007
	10 - 9					79.7414	-41.15	5877.74	0.007
	9 - 8					80.6644	-41.51	5945.77	0.007
	8 - 7					81.5873	-41.88	5990.97	0.007
	7 - 6					82.5103	-42.25	6037.11	0.007
	6 - 5					83.4332	-42.62	6082.76	0.007
	5 - 4					84.3562	-42.99	6127.92	0.007
	4 - 3					85.2791	-43.37	6172.61	0.007

Section No.	Elevation	Size	L	L _w	KI/r	A	P _u	φP _n	Ratio P _u /φP _n
	ft		ft	ft		in ²	K	K	φP _n
	3 - 2					86.2021	-43.75	6216.81	0.007
	2 - 1					87.1251	-44.14	6260.52	0.007
	1 - 0					88.0480	-44.53	6303.76	0.007

Pole Bending Design Data

Section No.	Elevation	Size	M _{xx}	φM _{xx}	Ratio M _{xx} /φM _{xx}	M _{yy}	φM _{yy}	Ratio M _{yy} /φM _{yy}		
			kip-ft	kip-ft		kip-ft	kip-ft			
L1	150 - 148	TP21.25x15x0.1875	15.33	206.49	0.074	0.00	206.49	0.000		
	148 - 146		22.19	215.16	0.103	0.00	215.16	0.000		
	146 - 144		29.28	224.02	0.131	0.00	224.02	0.000		
	144 - 142		38.98	233.05	0.167	0.00	233.05	0.000		
	142 - 140		51.27	242.02	0.212	0.00	242.02	0.000		
	140 - 138		63.79	249.90	0.255	0.00	249.90	0.000		
	138 - 136		76.54	257.84	0.297	0.00	257.84	0.000		
	136 - 134		89.52	265.85	0.337	0.00	265.85	0.000		
	134 - 132		102.72	273.92	0.375	0.00	273.92	0.000		
	132 - 130		126.12	282.04	0.447	0.00	282.04	0.000		
	130 - 128		149.78	290.21	0.516	0.00	290.21	0.000		
	128 - 126		173.72	298.43	0.582	0.00	298.43	0.000		
	126 - 124		197.84	306.70	0.645	0.00	306.70	0.000		
	124 - 122		222.15	315.01	0.705	0.00	315.01	0.000		
	122 - 120		246.62	323.35	0.763	0.00	323.35	0.000		
	120 - 118.5		265.09	329.64	0.804	0.00	329.64	0.000		
	118.5 - 118		28.21	329.64	0.086	0.00	329.64	0.000		
	118 - 116		22.97	331.74	0.069	0.00	331.74	0.000		
	116 - 114		20.03	348.60	0.057	0.00	348.60	0.000		
	114 - 112		41.53	357.07	0.116	0.00	357.07	0.000		
	112 - 110		63.48	365.57	0.174	0.00	365.57	0.000		
	L2		110 - 108.75	TP27.61x21.25x0.25	77.34	547.30	0.141	0.00	547.30	0.000
			108.75 - 107.5		91.32	563.85	0.162	0.00	563.85	0.000
			107.5 - 106.25		105.40	579.06	0.182	0.00	579.06	0.000
			106.25 - 105		119.61	593.34	0.202	0.00	593.34	0.000
105 - 103.75		133.92	607.71		0.220	0.00	607.71	0.000		
103.75 - 102.5		148.35	622.16		0.238	0.00	622.16	0.000		
102.5 - 101.25		162.89	636.70		0.256	0.00	636.70	0.000		
101.25 - 100		177.56	651.31		0.273	0.00	651.31	0.000		
100 - 98.75		192.34	666.00		0.289	0.00	666.00	0.000		
98.75 - 97.5		207.23	680.76		0.304	0.00	680.76	0.000		
97.5 - 96.25		222.25	695.59		0.320	0.00	695.59	0.000		
96.25 - 95		237.39	710.49		0.334	0.00	710.49	0.000		
95 - 93.75		252.65	725.45		0.348	0.00	725.45	0.000		
93.75 - 92.5		268.03	740.46		0.362	0.00	740.46	0.000		
92.5 - 91.25		283.53	755.54		0.375	0.00	755.54	0.000		
91.25 - 90		299.16	770.66		0.388	0.00	770.66	0.000		
90 - 88.75		314.91	785.83		0.401	0.00	785.83	0.000		
88.75 - 87.5		330.79	801.05		0.413	0.00	801.05	0.000		
87.5 - 86.25		346.79	816.31		0.425	0.00	816.31	0.000		
86.25 - 85		362.92	831.61		0.436	0.00	831.61	0.000		
L3		85 - 84	TP35.691x27.61x0.3722		719.30	1327.68	0.542	0.00	1327.68	0.000
		84 - 83			734.11	1381.08	0.532	0.00	1381.08	0.000
		83 - 82			748.97	1435.54	0.522	0.00	1435.54	0.000
		82 - 81			763.91	1491.04	0.512	0.00	1491.04	0.000
		81 - 80			778.91	1547.60	0.503	0.00	1547.60	0.000
	80 - 79	793.98		1605.22	0.495	0.00	1605.22	0.000		

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Section No.	Elevation	Size	M_{xx}	ϕM_{xx}	$\frac{Ratio}{M_{xx}}$	M_{yy}	ϕM_{yy}	$\frac{Ratio}{M_{yy}}$
			kip-ft	kip-ft	$\frac{\phi M_{xx}}{M_{xx}}$	kip-ft	kip-ft	$\frac{\phi M_{yy}}{M_{yy}}$
	ft							
	79 - 78		809.13	1663.88	0.486	0.00	1663.88	0.000
	78 - 77		824.34	1723.60	0.478	0.00	1723.60	0.000
	77 - 76		839.63	1784.38	0.471	0.00	1784.38	0.000
	76 - 75		855.00	1846.20	0.463	0.00	1846.20	0.000
	75 - 74		870.45	1905.00	0.457	0.00	1905.00	0.000
	74 - 73		885.98	1958.60	0.452	0.00	1958.60	0.000
	73 - 72		901.59	2012.58	0.448	0.00	2012.58	0.000
	72 - 71		917.28	2066.93	0.444	0.00	2066.93	0.000
	71 - 70		933.07	2121.62	0.440	0.00	2121.62	0.000
L4	70 - 69	TP38.058x35.691x0.3918	964.88	2345.45	0.411	0.00	2345.45	0.000
	69 - 68		980.92	2363.04	0.415	0.00	2363.04	0.000
	68 - 67		997.04	2380.67	0.419	0.00	2380.67	0.000
	67 - 66		1013.25	2398.32	0.422	0.00	2398.32	0.000
	66 - 65		1029.53	2416.02	0.426	0.00	2416.02	0.000
	65 - 64		1045.91	2433.74	0.430	0.00	2433.74	0.000
	64 - 63		1062.37	2451.49	0.433	0.00	2451.49	0.000
	63 - 62		1078.90	2469.28	0.437	0.00	2469.28	0.000
	62 - 61		1095.53	2487.08	0.440	0.00	2487.08	0.000
	61 - 60		1112.23	2504.93	0.444	0.00	2504.93	0.000
	60 - 59		1129.03	2522.80	0.448	0.00	2522.80	0.000
	59 - 58		1145.91	2540.70	0.451	0.00	2540.70	0.000
	58 - 57		1162.87	2558.63	0.454	0.00	2558.63	0.000
	57 - 56		1179.91	2576.58	0.458	0.00	2576.58	0.000
	56 - 55		1197.04	2594.57	0.461	0.00	2594.57	0.000
L5	55 - 53.825	TP41.576x38.058x0.472	1217.28	3240.02	0.376	0.00	3240.02	0.000
	53.825 - 52.665		1237.62	3270.46	0.378	0.00	3270.46	0.000
	52.665 - 51.475		1258.07	3301.05	0.381	0.00	3301.05	0.000
	51.475 - 50.3		1278.63	3331.78	0.384	0.00	3331.78	0.000
	50.3 - 49.125		1299.29	3362.64	0.386	0.00	3362.64	0.000
	49.125 - 47.95		1320.07	3393.66	0.389	0.00	3393.66	0.000
	47.95 - 46.775		1340.95	3424.81	0.392	0.00	3424.81	0.000
	46.775 - 45.6		1361.95	3456.11	0.394	0.00	3456.11	0.000
	45.6 - 44.425		1383.05	3487.54	0.397	0.00	3487.54	0.000
	44.425 - 43.25		1404.27	3519.13	0.399	0.00	3519.13	0.000
	43.25 - 42.075		1425.58	3550.85	0.401	0.00	3550.85	0.000
	42.075 - 40.9		1447.02	3582.72	0.404	0.00	3582.72	0.000
	40.9 - 39.725		1468.56	3614.72	0.406	0.00	3614.72	0.000
	39.725 - 38.55		1490.21	3646.88	0.409	0.00	3646.88	0.000
	38.55 - 37.375		1511.97	3679.17	0.411	0.00	3679.17	0.000
	37.375 - 36.2		1533.83	3711.60	0.413	0.00	3711.60	0.000
	36.2 - 35.025		1555.81	3744.18	0.416	0.00	3744.18	0.000
	35.025 - 33.85		1577.89	3776.90	0.418	0.00	3776.90	0.000
	33.85 - 32.675		1600.08	3809.77	0.420	0.00	3809.77	0.000
	32.675 - 31.5		1622.38	3842.77	0.422	0.00	3842.77	0.000
L6	31.5 - 30.4688	TP44.046x41.576x0.4977	1642.04	4074.72	0.403	0.00	4074.72	0.000
	30.4688 - 29.4375		1661.78	4105.47	0.405	0.00	4105.47	0.000
	29.4375 - 28.4063		1681.59	4136.33	0.407	0.00	4136.33	0.000
	28.4063 - 27.375		1701.47	4167.32	0.408	0.00	4167.32	0.000
	27.375 - 26.3438		1721.43	4198.41	0.410	0.00	4198.41	0.000
	26.3438 - 25.3125		1741.46	4229.63	0.412	0.00	4229.63	0.000
	25.3125 - 24.2813		1761.57	4260.96	0.413	0.00	4260.96	0.000
	24.2813 - 23.25		1781.75	4292.40	0.415	0.00	4292.40	0.000
	23.25 - 22.25		1802.01	4323.96	0.417	0.00	4323.96	0.000

Section No.	Elevation	Size	M_{xx}	ϕM_{xx}	$\frac{Ratio}{M_{xx}}$	M_{yy}	ϕM_{yy}	$\frac{Ratio}{M_{yy}}$
			kip-ft	kip-ft	$\frac{\phi M_{xx}}{M_{xx}}$	kip-ft	kip-ft	$\frac{\phi M_{yy}}{M_{yy}}$
	ft							
	22.2188							
	22.2188 - 21.1875		1822.34	4355.63	0.418	0.00	4355.63	0.000
	21.1875 - 20.1563		1842.75	4387.43	0.420	0.00	4387.43	0.000
	20.1563 - 19.125		1863.22	4419.33	0.422	0.00	4419.33	0.000
	19.125 - 18.0938		1883.78	4451.36	0.423	0.00	4451.36	0.000
	18.0938 - 17.0625		1904.41	4483.50	0.425	0.00	4483.50	0.000
	17.0625 - 16.0313		1925.11	4515.58	0.427	0.00	4515.58	0.000
L7	16.0313 - 15	TP52.064x44.046x0.5362	1945.89	4540.90	0.429	0.00	4540.90	0.000
	15 - 14		1945.89	4887.23	0.398	0.00	4887.23	0.000
	14 - 13		1966.11	5008.78	0.393	0.00	5008.78	0.000
	13 - 12		1986.40	5131.84	0.387	0.00	5131.84	0.000
	12 - 11		2006.77	5256.38	0.382	0.00	5256.38	0.000
	11 - 10		2027.20	5382.43	0.377	0.00	5382.43	0.000
	10 - 9		2047.72	5509.96	0.372	0.00	5509.96	0.000
	9 - 8		2068.31	5638.98	0.367	0.00	5638.98	0.000
	8 - 7		2088.98	5747.61	0.363	0.00	5747.61	0.000
	7 - 6		2109.73	5858.12	0.360	0.00	5858.12	0.000
	6 - 5		2130.57	5969.17	0.357	0.00	5969.17	0.000
	5 - 4		2151.48	6080.76	0.354	0.00	6080.76	0.000
	4 - 3		2172.48	6192.84	0.351	0.00	6192.84	0.000
	3 - 2		2193.57	6305.41	0.348	0.00	6305.41	0.000
	2 - 1		2214.74	6418.46	0.345	0.00	6418.46	0.000
	1 - 0		2235.99	6531.97	0.342	0.00	6531.97	0.000

Pole Shear Design Data

Section No.	Elevation	Size	V_u	ϕV_u	$\frac{Ratio}{V_u}$	T_u	ϕT_u	$\frac{Ratio}{T_u}$
			K	K	$\frac{\phi V_u}{V_u}$	kip-ft	kip-ft	$\frac{\phi T_u}{T_u}$
L1	150 - 148	TP21.25x15x0.1875	3.37	336.55	0.010	0.39	420.45	0.001
	148 - 146		3.49	343.50	0.010	0.39	438.08	0.001
	146 - 144		3.61	350.46	0.010	0.39	456.06	0.001
	144 - 142		6.09	357.41	0.017	0.39	474.41	0.001
	142 - 140		6.21	364.00	0.017	0.39	492.63	0.001
	140 - 138		6.32	368.74	0.017	0.39	508.64	0.001
	138 - 136		6.44	373.39	0.017	0.39	524.78	0.001
	136 - 134		6.55	377.97	0.017	0.39	541.04	0.001
	134 - 132		6.67	382.46	0.017	0.39	557.42	0.001
	132 - 130		11.73	386.86	0.030	0.56	573.91	0.001
	130 - 128		11.94	391.19	0.031	0.44	590.50	0.001
	128 - 126		12.03	395.43	0.030	0.44	607.20	0.001
	126 - 124		12.13	399.59	0.030	0.44	623.98	0.001
	124 - 122		12.22	403.66	0.030	0.44	640.85	0.001
	122 - 120		12.31	407.66	0.030	0.44	657.80	0.001
	120 - 118.5		12.36	410.60	0.030	0.44	670.55	0.001
	118.5 - 118		10.49	411.57	0.025	0.46	670.55	0.001
	118 - 116		10.63	415.40	0.026	0.46	674.82	0.001
	116 - 114		10.68	419.14	0.025	0.57	709.05	0.001
	114 - 112		10.82	422.80	0.026	0.57	726.25	0.001
	112 - 110		11.05	426.38	0.026	0.43	743.49	0.001

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Section No.	Elevation	Size	Actual V _e K	φV _n K	Ratio V _e φV _n	Actual T _n kip-ft	φT _n kip-ft	Ratio T _n φT _n		
ft										
L2	110 - 108.75	TP27.61x21.25x0.25	11.14	632.47	0.018	0.43	1114.16	0.000		
	108.75 - 107.5		11.22	641.90	0.017	0.43	1147.78	0.000		
	107.5 - 106.25		11.31	649.57	0.017	0.43	1178.68	0.000		
	106.25 - 105		11.41	655.98	0.017	0.43	1207.68	0.000		
	105 - 103.75		11.50	662.30	0.017	0.43	1236.86	0.000		
	103.75 - 102.5		11.59	668.54	0.017	0.43	1266.21	0.000		
	102.5 - 101.25		11.68	674.69	0.017	0.43	1295.72	0.000		
	101.25 - 100		11.78	680.76	0.017	0.43	1325.40	0.000		
	100 - 98.75		11.87	686.74	0.017	0.43	1355.23	0.000		
	98.75 - 97.5		11.97	692.63	0.017	0.43	1385.21	0.000		
	97.5 - 96.25		12.06	698.44	0.017	0.43	1415.32	0.000		
	96.25 - 95		12.16	704.16	0.017	0.43	1445.57	0.000		
	95 - 93.75		12.26	709.80	0.017	0.43	1475.93	0.000		
	93.75 - 92.5		12.36	715.36	0.017	0.43	1506.43	0.000		
	92.5 - 91.25		12.45	720.82	0.017	0.43	1537.03	0.000		
	91.25 - 90		12.55	726.20	0.017	0.43	1567.72	0.000		
	90 - 88.75		12.65	731.50	0.017	0.43	1598.53	0.000		
	88.75 - 87.5		12.75	736.71	0.017	0.43	1629.43	0.000		
	87.5 - 86.25		12.86	741.83	0.017	0.43	1660.40	0.000		
	86.25 - 85		12.96	746.87	0.017	0.43	1691.46	0.000		
	L3		85 - 84	TP35.691x27.61x0.3722	14.85	1226.93	0.012	0.43	2704.55	0.000
			84 - 83		14.91	1250.72	0.012	0.43	2813.08	0.000
			83 - 82		14.98	1274.52	0.012	0.43	2923.75	0.000
82 - 81		15.05	1298.32		0.012	0.43	3036.55	0.000		
81 - 80		15.12	1322.11		0.011	0.43	3151.48	0.000		
80 - 79		15.19	1345.91		0.011	0.43	3268.56	0.000		
79 - 78		15.26	1369.70		0.011	0.43	3387.77	0.000		
78 - 77		15.34	1393.50		0.011	0.43	3509.11	0.000		
77 - 76		15.42	1417.30		0.011	0.43	3632.58	0.000		
76 - 75		15.50	1438.02		0.011	0.43	3758.20	0.000		
75 - 74		15.58	1454.20		0.011	0.42	3877.65	0.000		
74 - 73		15.66	1470.13		0.011	0.42	3986.51	0.000		
73 - 72		15.75	1485.82		0.011	0.42	4096.13	0.000		
72 - 71		15.83	1501.26		0.011	0.42	4206.49	0.000		
71 - 70		15.92	1516.45		0.010	0.42	4317.56	0.000		
L4		70 - 69	TP38.058x35.691x0.3918		16.00	1628.52	0.010	0.42	4773.62	0.000
	69 - 68	16.09		1633.38	0.010	0.42	4809.34	0.000		
	68 - 67	16.17		1638.23	0.010	0.42	4845.14	0.000		
	67 - 66	16.25		1643.06	0.010	0.42	4881.00	0.000		
	66 - 65	16.34		1647.86	0.010	0.42	4916.93	0.000		
	65 - 64	16.42		1652.64	0.010	0.42	4952.91	0.000		
	64 - 63	16.51		1657.40	0.010	0.42	4988.96	0.000		
	63 - 62	16.59		1662.15	0.010	0.42	5025.07	0.000		
	62 - 61	16.68		1666.87	0.010	0.42	5061.24	0.000		
	61 - 60	16.76		1671.56	0.010	0.42	5097.48	0.000		
	60 - 59	16.84		1676.24	0.010	0.42	5133.77	0.000		
	59 - 58	16.93		1680.90	0.010	0.42	5170.11	0.000		
	58 - 57	17.01		1685.53	0.010	0.42	5206.52	0.000		
	57 - 56	17.10		1690.15	0.010	0.42	5242.98	0.000		
L5	56 - 55	TP41.576x38.058x0.472	17.18	1694.74	0.010	0.42	5279.49	0.000		
	55 - 53.825		17.27	2115.36	0.008	0.42	6597.50	0.000		
	53.825 - 52.65		17.37	2125.21	0.008	0.42	6659.36	0.000		
	52.65 - 51.475		17.46	2135.07	0.008	0.42	6721.51	0.000		
	51.475 - 50.3		17.55	2144.92	0.008	0.42	6783.95	0.000		
	50.3 - 49.125		17.65	2154.78	0.008	0.42	6846.67	0.000		
	49.125 - 47.95		17.74	2164.63	0.008	0.42	6909.68	0.000		
	47.95 - 46.775		17.83	2174.48	0.008	0.42	6972.99	0.000		
	46.775 - 45.6		17.92	2184.34	0.008	0.42	7036.58	0.000		
	45.6 - 44.425		18.02	2194.19	0.008	0.42	7100.46	0.000		
	44.425 - 43.25		18.11	2204.04	0.008	0.42	7164.63	0.000		

Section No.	Elevation	Size	Actual V _e K	φV _n K	Ratio V _e φV _n	Actual T _n kip-ft	φT _n kip-ft	Ratio T _n φT _n
ft								
L6	43.25 - 42.075	TP44.046x41.576x0.4977	18.20	2213.90	0.008	0.42	7229.09	0.000
	42.075 - 40.9		18.30	2223.75	0.008	0.42	7293.83	0.000
	40.9 - 39.725		18.39	2233.60	0.008	0.42	7358.87	0.000
	39.725 - 38.55		18.48	2243.46	0.008	0.42	7424.19	0.000
	38.55 - 37.375		18.57	2253.31	0.008	0.42	7489.81	0.000
	37.375 - 36.2		18.67	2263.17	0.008	0.42	7555.71	0.000
	36.2 - 35.025		18.76	2273.02	0.008	0.42	7621.90	0.000
	35.025 - 33.85		18.85	2282.87	0.008	0.42	7688.37	0.000
	33.85 - 32.675		18.95	2292.73	0.008	0.42	7755.14	0.000
	32.675 - 31.5		19.04	2302.58	0.008	0.42	7822.20	0.000
	31.5 - 30.4688		19.11	2435.35	0.008	0.42	8295.96	0.000
	30.4688 - 29.4375		19.18	2444.47	0.008	0.42	8358.42	0.000
	29.4375 - 28.4063		19.25	2453.59	0.008	0.42	8421.17	0.000
	28.4063 - 27.375		19.33	2462.70	0.008	0.42	8484.08	0.000
	27.375 - 26.3438		19.40	2471.82	0.008	0.42	8547.33	0.000
	26.3438 - 25.3125		19.47	2480.94	0.008	0.42	8610.75	0.000
	25.3125 - 24.2813		19.55	2490.06	0.008	0.42	8674.33	0.000
	24.2813 - 23.25		19.62	2499.18	0.008	0.42	8738.25	0.000
	L7		23.25 - 22.2188	TP52.064x44.046x0.5362	19.69	2508.29	0.008	0.42
22.2188 - 21.1875		19.76	2517.41		0.008	0.42	8866.75	0.000
21.1875 - 20.1563		19.83	2526.53		0.008	0.42	8931.33	0.000
20.1563 - 19.125		19.91	2535.65		0.008	0.42	8996.17	0.000
19.125 - 18.0938		19.98	2544.77		0.008	0.42	9061.25	0.000
18.0938 - 17.0625		20.05	2553.88		0.008	0.42	9126.50	0.000
17.0625 - 16.0313		20.12	2561.77		0.008	0.42	9187.67	0.000
16.0313 - 15		20.19	2568.04		0.008	0.42	9243.08	0.000
15 - 14		20.27	2802.81		0.007	0.42	9951.08	0.000
14 - 13		20.34	2836.82		0.007	0.42	10198.08	0.000
13 - 12		20.41	2870.84		0.007	0.42	10448.08	0.000
12 - 11		20.49	2904.85		0.007	0.42	10701.17	0.000
11 - 10		20.56	2938.87		0.007	0.42	10957.25	0.000
L8	10 - 9	TP52.064x44.046x0.5362	20.64	2972.88	0.007	0.42	11216.33	0.000
	9 - 8		20.72	2995.48	0.007	0.42	11478.50	0.000
	8 - 7		20.80	3018.55	0.007	0.42	11699.08	0.000
	7 - 6		20.88	3041.38	0.007	0.42	11923.50	0.000
	6 - 5		20.97	3063.96	0.007	0.42	12149.08	0.000
	5 - 4		21.05	3086.30	0.007	0.42	12375.67	0.000
	4 - 3		21.14	3108.40	0.007	0.42	12603.25	0.000
	3 - 2		21.22	3130.26	0.007	0.42	12831.83	0.000
	2 - 1		21.31	3151.88	0.007	0.42	13061.42	0.000
	1 - 0		21.40	3173.25	0.007	0.42	13291.92	0.000

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Pole Interaction Design Data

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			
		ϕP_u	ϕM_{ux}	ϕM_{uy}	ϕV_u	ϕT_u			
L1	150 - 148	0.004	0.074	0.000	0.010	0.001	0.079	1.000	4.8.2 ✓
	148 - 146	0.005	0.103	0.000	0.010	0.001	0.108	1.000	4.8.2 ✓
	146 - 144	0.005	0.131	0.000	0.010	0.001	0.136	1.000	4.8.2 ✓
	144 - 142	0.009	0.167	0.000	0.017	0.001	0.176	1.000	4.8.2 ✓
	142 - 140	0.009	0.212	0.000	0.017	0.001	0.221	1.000	4.8.2 ✓
	140 - 138	0.009	0.255	0.000	0.017	0.001	0.265	1.000	4.8.2 ✓
	138 - 136	0.009	0.297	0.000	0.017	0.001	0.306	1.000	4.8.2 ✓
	136 - 134	0.009	0.337	0.000	0.017	0.001	0.346	1.000	4.8.2 ✓
	134 - 132	0.010	0.375	0.000	0.017	0.001	0.385	1.000	4.8.2 ✓
	132 - 130	0.014	0.447	0.000	0.030	0.001	0.462	1.000	4.8.2 ✓
	130 - 128	0.014	0.516	0.000	0.031	0.001	0.531	1.000	4.8.2 ✓
	128 - 126	0.014	0.582	0.000	0.030	0.001	0.598	1.000	4.8.2 ✓
	126 - 124	0.015	0.645	0.000	0.030	0.001	0.661	1.000	4.8.2 ✓
	124 - 122	0.015	0.705	0.000	0.030	0.001	0.721	1.000	4.8.2 ✓
	122 - 120	0.015	0.763	0.000	0.030	0.001	0.779	1.000	4.8.2 ✓
	120 - 118.5	0.015	0.804	0.000	0.030	0.001	0.820	1.000	4.8.2 ✓
	118.5 - 118	0.003	0.086	0.000	0.025	0.001	0.089	1.000	4.8.2 ✓
	118 - 116	0.003	0.069	0.000	0.026	0.001	0.073	1.000	4.8.2 ✓
	116 - 114	0.004	0.057	0.000	0.025	0.001	0.062	1.000	4.8.2 ✓
	114 - 112	0.004	0.116	0.000	0.026	0.001	0.121	1.000	4.8.2 ✓
	112 - 110	0.004	0.174	0.000	0.026	0.001	0.178	1.000	4.8.2 ✓
L2	110 - 108.75	0.003	0.141	0.000	0.018	0.000	0.145	1.000	4.8.2 ✓
	108.75 - 107.5	0.003	0.162	0.000	0.017	0.000	0.165	1.000	4.8.2 ✓
	107.5 - 106.25	0.003	0.182	0.000	0.017	0.000	0.186	1.000	4.8.2 ✓
	106.25 - 105	0.003	0.202	0.000	0.017	0.000	0.205	1.000	4.8.2 ✓

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			
		ϕP_u	ϕM_{ux}	ϕM_{uy}	ϕV_u	ϕT_u			
	105 - 103.75	0.003	0.220	0.000	0.017	0.000	0.224	1.000	4.8.2 ✓
	103.75 - 102.5	0.004	0.238	0.000	0.017	0.000	0.242	1.000	4.8.2 ✓
	102.5 - 101.25	0.004	0.256	0.000	0.017	0.000	0.260	1.000	4.8.2 ✓
	101.25 - 100	0.004	0.273	0.000	0.017	0.000	0.277	1.000	4.8.2 ✓
	100 - 98.75	0.004	0.289	0.000	0.017	0.000	0.293	1.000	4.8.2 ✓
	98.75 - 97.5	0.004	0.304	0.000	0.017	0.000	0.309	1.000	4.8.2 ✓
	97.5 - 96.25	0.004	0.320	0.000	0.017	0.000	0.324	1.000	4.8.2 ✓
	96.25 - 95	0.004	0.334	0.000	0.017	0.000	0.339	1.000	4.8.2 ✓
	95 - 93.75	0.004	0.348	0.000	0.017	0.000	0.353	1.000	4.8.2 ✓
	93.75 - 92.5	0.005	0.362	0.000	0.017	0.000	0.367	1.000	4.8.2 ✓
	92.5 - 91.25	0.005	0.375	0.000	0.017	0.000	0.380	1.000	4.8.2 ✓
	91.25 - 90	0.005	0.388	0.000	0.017	0.000	0.393	1.000	4.8.2 ✓
	90 - 88.75	0.005	0.401	0.000	0.017	0.000	0.406	1.000	4.8.2 ✓
	88.75 - 87.5	0.005	0.413	0.000	0.017	0.000	0.418	1.000	4.8.2 ✓
	87.5 - 86.25	0.005	0.425	0.000	0.017	0.000	0.430	1.000	4.8.2 ✓
	86.25 - 85	0.005	0.436	0.000	0.017	0.000	0.442	1.000	4.8.2 ✓
L3	85 - 84	0.008	0.542	0.000	0.012	0.000	0.550	1.000	4.8.2 ✓
	84 - 83	0.008	0.532	0.000	0.012	0.000	0.540	1.000	4.8.2 ✓
	83 - 82	0.008	0.522	0.000	0.012	0.000	0.530	1.000	4.8.2 ✓
	82 - 81	0.008	0.512	0.000	0.012	0.000	0.520	1.000	4.8.2 ✓
	81 - 80	0.008	0.503	0.000	0.011	0.000	0.511	1.000	4.8.2 ✓
	80 - 79	0.008	0.495	0.000	0.011	0.000	0.503	1.000	4.8.2 ✓
	79 - 78	0.008	0.486	0.000	0.011	0.000	0.494	1.000	4.8.2 ✓
	78 - 77	0.008	0.478	0.000	0.011	0.000	0.486	1.000	4.8.2 ✓
	77 - 76	0.008	0.471	0.000	0.011	0.000	0.478	1.000	4.8.2 ✓
	76 - 75	0.008	0.463	0.000	0.011	0.000	0.471	1.000	4.8.2 ✓

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Section No.	Elevation	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft	ϕP_u	ϕM_{ux}	ϕM_{uy}	ϕV_u	ϕT_u			
	75 - 74	0.008	0.457	0.000	0.011	0.000	0.465	1.000	4.8.2 ✓
	74 - 73	0.008	0.452	0.000	0.011	0.000	0.460	1.000	4.8.2 ✓
	73 - 72	0.008	0.448	0.000	0.011	0.000	0.456	1.000	4.8.2 ✓
	72 - 71	0.008	0.444	0.000	0.011	0.000	0.452	1.000	4.8.2 ✓
	71 - 70	0.008	0.440	0.000	0.010	0.000	0.448	1.000	4.8.2 ✓
L4	70 - 69	0.007	0.411	0.000	0.010	0.000	0.419	1.000	4.8.2 ✓
	69 - 68	0.007	0.415	0.000	0.010	0.000	0.422	1.000	4.8.2 ✓
	68 - 67	0.007	0.419	0.000	0.010	0.000	0.426	1.000	4.8.2 ✓
	67 - 66	0.007	0.422	0.000	0.010	0.000	0.430	1.000	4.8.2 ✓
	66 - 65	0.007	0.426	0.000	0.010	0.000	0.434	1.000	4.8.2 ✓
	65 - 64	0.007	0.430	0.000	0.010	0.000	0.437	1.000	4.8.2 ✓
	64 - 63	0.007	0.433	0.000	0.010	0.000	0.441	1.000	4.8.2 ✓
	63 - 62	0.008	0.437	0.000	0.010	0.000	0.445	1.000	4.8.2 ✓
	62 - 61	0.008	0.440	0.000	0.010	0.000	0.448	1.000	4.8.2 ✓
	61 - 60	0.008	0.444	0.000	0.010	0.000	0.452	1.000	4.8.2 ✓
	60 - 59	0.008	0.448	0.000	0.010	0.000	0.455	1.000	4.8.2 ✓
	59 - 58	0.008	0.451	0.000	0.010	0.000	0.459	1.000	4.8.2 ✓
	58 - 57	0.008	0.454	0.000	0.010	0.000	0.462	1.000	4.8.2 ✓
	57 - 56	0.008	0.458	0.000	0.010	0.000	0.466	1.000	4.8.2 ✓
	56 - 55	0.008	0.461	0.000	0.010	0.000	0.469	1.000	4.8.2 ✓
L5	55 - 53.825	0.006	0.376	0.000	0.008	0.000	0.382	1.000	4.8.2 ✓
	53.825 - 52.65	0.006	0.378	0.000	0.008	0.000	0.385	1.000	4.8.2 ✓
	52.65 - 51.475	0.007	0.381	0.000	0.008	0.000	0.388	1.000	4.8.2 ✓
	51.475 - 50.3	0.007	0.384	0.000	0.008	0.000	0.390	1.000	4.8.2 ✓
	50.3 - 49.125	0.007	0.386	0.000	0.008	0.000	0.393	1.000	4.8.2 ✓
	49.125 - 47.95	0.007	0.389	0.000	0.008	0.000	0.396	1.000	4.8.2 ✓

Section No.	Elevation	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft	ϕP_u	ϕM_{ux}	ϕM_{uy}	ϕV_u	ϕT_u			
	47.95 - 46.775	0.007	0.392	0.000	0.008	0.000	0.398	1.000	4.8.2 ✓
	46.775 - 45.6	0.007	0.394	0.000	0.008	0.000	0.401	1.000	4.8.2 ✓
	45.6 - 44.425	0.007	0.397	0.000	0.008	0.000	0.403	1.000	4.8.2 ✓
	44.425 - 43.25	0.007	0.399	0.000	0.008	0.000	0.406	1.000	4.8.2 ✓
	43.25 - 42.075	0.007	0.401	0.000	0.008	0.000	0.408	1.000	4.8.2 ✓
	42.075 - 40.9	0.007	0.404	0.000	0.008	0.000	0.411	1.000	4.8.2 ✓
	40.9 - 39.725	0.007	0.406	0.000	0.008	0.000	0.413	1.000	4.8.2 ✓
	39.725 - 38.55	0.007	0.409	0.000	0.008	0.000	0.416	1.000	4.8.2 ✓
	38.55 - 37.375	0.007	0.411	0.000	0.008	0.000	0.418	1.000	4.8.2 ✓
	37.375 - 36.2	0.007	0.413	0.000	0.008	0.000	0.420	1.000	4.8.2 ✓
	36.2 - 35.025	0.007	0.416	0.000	0.008	0.000	0.423	1.000	4.8.2 ✓
	35.025 - 33.85	0.007	0.418	0.000	0.008	0.000	0.425	1.000	4.8.2 ✓
	33.85 - 32.675	0.007	0.420	0.000	0.008	0.000	0.427	1.000	4.8.2 ✓
	32.675 - 31.5	0.007	0.422	0.000	0.008	0.000	0.430	1.000	4.8.2 ✓
L6	31.5 - 30.4688	0.007	0.403	0.000	0.008	0.000	0.410	1.000	4.8.2 ✓
	30.4688 - 29.4375	0.007	0.405	0.000	0.008	0.000	0.412	1.000	4.8.2 ✓
	29.4375 - 28.4063	0.007	0.407	0.000	0.008	0.000	0.414	1.000	4.8.2 ✓
	28.4063 - 27.375	0.007	0.408	0.000	0.008	0.000	0.416	1.000	4.8.2 ✓
	27.375 - 26.3438	0.007	0.410	0.000	0.008	0.000	0.417	1.000	4.8.2 ✓
	26.3438 - 25.3125	0.007	0.412	0.000	0.008	0.000	0.419	1.000	4.8.2 ✓
	25.3125 - 24.2813	0.007	0.413	0.000	0.008	0.000	0.421	1.000	4.8.2 ✓
	24.2813 - 23.25	0.007	0.415	0.000	0.008	0.000	0.422	1.000	4.8.2 ✓
	23.25 - 22.2188	0.007	0.417	0.000	0.008	0.000	0.424	1.000	4.8.2 ✓
	22.2188 - 21.1875	0.007	0.418	0.000	0.008	0.000	0.426	1.000	4.8.2 ✓
	21.1875 - 20.1563	0.007	0.420	0.000	0.008	0.000	0.428	1.000	4.8.2 ✓
	20.1563 - 19.125	0.007	0.422	0.000	0.008	0.000	0.429	1.000	4.8.2 ✓

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Section No.	Elevation	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft	ϕP_u	ϕM_{ux}	ϕM_{uy}	ϕV_u	ϕT_u			
	19.125 - 18.0938	0.008	0.423	0.000	0.008	0.000	0.431	1.000	4.8.2 ✓
	18.0938 - 17.0625	0.008	0.425	0.000	0.008	0.000	0.432	1.000	4.8.2 ✓
	17.0625 - 16.0313	0.008	0.427	0.000	0.008	0.000	0.434	1.000	4.8.2 ✓
	16.0313 - 15	0.008	0.429	0.000	0.008	0.000	0.436	1.000	4.8.2 ✓
L7	15 - 14	0.007	0.398	0.000	0.007	0.000	0.405	1.000	4.8.2 ✓
	14 - 13	0.007	0.393	0.000	0.007	0.000	0.400	1.000	4.8.2 ✓
	13 - 12	0.007	0.387	0.000	0.007	0.000	0.394	1.000	4.8.2 ✓
	12 - 11	0.007	0.382	0.000	0.007	0.000	0.389	1.000	4.8.2 ✓
	11 - 10	0.007	0.377	0.000	0.007	0.000	0.384	1.000	4.8.2 ✓
	10 - 9	0.007	0.372	0.000	0.007	0.000	0.379	1.000	4.8.2 ✓
	9 - 8	0.007	0.367	0.000	0.007	0.000	0.374	1.000	4.8.2 ✓
	8 - 7	0.007	0.363	0.000	0.007	0.000	0.370	1.000	4.8.2 ✓
	7 - 6	0.007	0.360	0.000	0.007	0.000	0.367	1.000	4.8.2 ✓
	6 - 5	0.007	0.357	0.000	0.007	0.000	0.364	1.000	4.8.2 ✓
	5 - 4	0.007	0.354	0.000	0.007	0.000	0.361	1.000	4.8.2 ✓
	4 - 3	0.007	0.351	0.000	0.007	0.000	0.358	1.000	4.8.2 ✓
	3 - 2	0.007	0.348	0.000	0.007	0.000	0.355	1.000	4.8.2 ✓
	2 - 1	0.007	0.345	0.000	0.007	0.000	0.352	1.000	4.8.2 ✓
	1 - 0	0.007	0.342	0.000	0.007	0.000	0.349	1.000	4.8.2 ✓

Reinforcing Design Data (Compression)

Section No.	Elevation	Size	L	L_u	KL/r	A	P_u	ϕP_n	Ratio P_u
	ft		ft	ft		in^2	K	K	$\frac{P_u}{\phi P_n}$
L2	118.5 - 85	2 1/2	33.50	2.50	38.4	4.9087	-132.85	281.86	0.471 ¹

¹ $P_u / \phi P_n$ controls

Reinforcing Bending Design Data

Section No.	Elevation	Size	M_{ux}	ϕM_{ux}	Ratio M_{ux}	M_{uy}	ϕM_{uy}	Ratio M_{uy}
	ft		kip-ft	kip-ft	$\frac{M_{ux}}{\phi M_{ux}}$	kip-ft	kip-ft	$\frac{M_{uy}}{\phi M_{uy}}$
L2	118.5 - 85	2 1/2	0.37	14.65	0.025	0.00	14.65	0.000

Reinforcing Interaction Design Data

Section No.	Elevation	Size	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft		ϕP_u	ϕM_{ux}	ϕM_{uy}			
L2	118.5 - 85	2 1/2	0.471	0.025	0.000	0.471 ¹	1.000	4.8.1 ✓

¹ $P_u / \phi P_n$ controls

Tension Checks

Reinforcing Design Data (Tension)

Section No.	Elevation	Size	L	L_u	KL/r	A	P_u	ϕP_n	Ratio P_u
	ft		ft	ft		in^2	K	K	$\frac{P_u}{\phi P_n}$
L2	118.5 - 85	2 1/2	33.50	2.50	48.0	4.9087	125.45	331.34	0.379 ¹

¹ $P_u / \phi P_n$ controls

Reinforcing Bending Design Data

Section No.	Elevation	Size	M_{ux}	ϕM_{ux}	Ratio M_{ux}	M_{uy}	ϕM_{uy}	Ratio M_{uy}
	ft		kip-ft	kip-ft	$\frac{M_{ux}}{\phi M_{ux}}$	kip-ft	kip-ft	$\frac{M_{uy}}{\phi M_{uy}}$
L2	118.5 - 85	2 1/2	0.04	14.65	0.003	0.00	14.65	0.000

Reinforcing Interaction Design Data

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Section No.	Elevation	Size	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
			ϕP_u	ϕM_{ux}	ϕM_{uy}			
			ft					
L2	118.5 - 85	2 1/2	0.379	0.003	0.000	0.379 ¹	1.000	4.8.1 ✓

¹ P_u / ϕP_u controls

Section Capacity Table

Section No.	Elevation	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	150 - 110	Pole	TP21.25x15x0.1875	1	-12.41	821.20	82.0	Pass
L2	110 - 85	Pole	TP27.61x21.25x0.25	2	54.99	1288.45	44.2	Pass
	118.5 - 85	Reinforcing	2 1/2	9	-132.85	281.86	47.1	Pass
L3	85 - 70	Pole	TP35.691x27.61x0.3722	3	-19.73	2406.26	55.0	Pass
L4	70 - 55	Pole	TP38.058x35.691x0.3918	4	-26.82	3389.48	46.9	Pass
L5	55 - 31.5	Pole	TP41.576x38.058x0.472	5	-33.87	4605.16	43.0	Pass
L6	31.5 - 15	Pole	TP44.046x41.576x0.4977	6	-39.40	5136.07	43.6	Pass
L7	15 - 0	Pole	TP52.064x44.046x0.5362	7	-39.41	5537.58	40.5	Pass
Summary								
Pole (L1)							82.0	Pass
Reinforcing (L2)							47.1	Pass
RATING =							82.0	Pass

Flange Plate Analysis

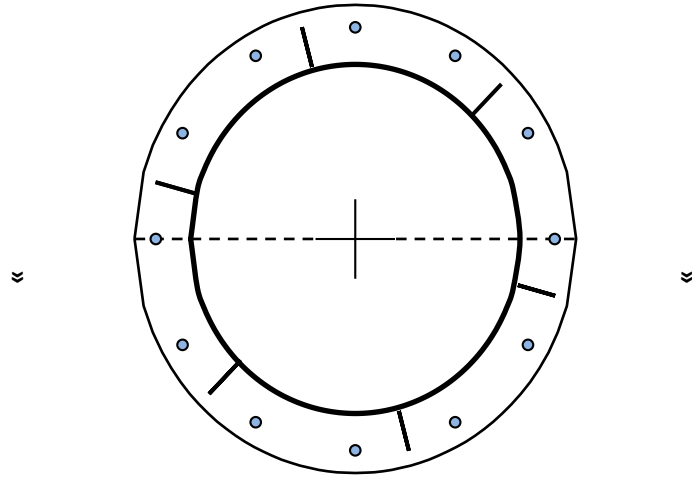
Flange Plate	Plate Type	Flange	@ 110 ft
	Pole Diameter	21.3	in
	Pole Thickness	3/16	in
	Plate Diameter	28.5	in
	Plate Thickness	1	in
	Plate Fy	60	ksi
	Weld Length	1/4	in
	f _s Resistance	201.01	k-in
	Applied	13.74	k-in

Code Rev.	G
Moment	63.5 k-ft
Axial	3.5 k

Date	11/21/2019
Engineer	
Site #	302523
Carrier	

Stiffeners	#	6	Show
	Thickness	0.5	in
	Length	3.5	in
	Height	6	in
	Chamfer	0.5	in
	Offset Angle	0	°
	Fy	50	ksi

Bolts	#	12	
	Bolt Circle	25.8	in
	(R)adial / (S)quare	R	
	Diameter	1	in
	Hole Diameter	1 1/8	in
	Type	A325	
	Fy	92	ksi
	Fu	120	ksi
	f _s Resistance	54.52	k
	Applied	9.56	k



Reinforcement	#		
---------------	---	--	--

Extra Bolts	O	#	
-------------	---	---	--

Plate Stress Ratio:
7% Pass

Bolt Stress Ratio:
18% Pass

Flange Plate Analysis

Flange Plate	Plate Type	Flange	@ 55 ft
	Pole Diameter	34.5	in
	Pole Thickness	1/4	in
	Plate Diameter	48.5	in
	Plate Thickness	2	in
	Plate Fy	60	ksi
	Weld Length	1/4	in
	f _s Resistance	585.28	k-in
	Applied	295.95	k-in

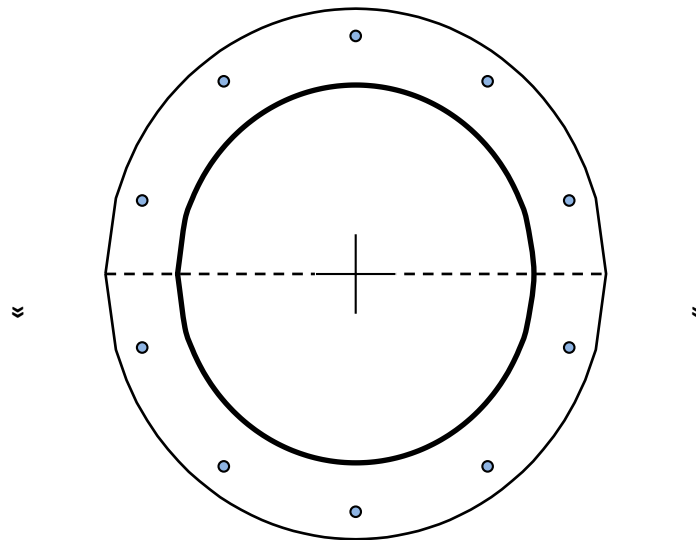
Code Rev.	G
Moment	1197.0 k-ft
Act. Moment	809.1 k-ft
Axial	26.8 k

Date	11/21/2019
Engineer	
Site #	302523
Carrier	

Required Flange Thickness:
1.42 in OK

Stiffeners	#	
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Bolts	#	10	
	Bolt Circle	43.5	in
	(R)adial / (S)quare	R	
	Diameter	1 1/2	in
	Hole Diameter	1 5/8	in
	Type	A325	
	Fy	81	ksi
	Fu	105	ksi
	f _s Resistance	110.66	k
	Applied	86.65	k



Reinforcement	#	
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Plate Stress Ratio:
51% Pass

Bolt Stress Ratio:
78% Pass

Extra Bolts	O	
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Flange Plate Analysis

Flange Plate	Plate Type	Flange	@ 15 ft
	Pole Diameter	39.1	in
	Pole Thickness	5/16	in
	Plate Diameter	54.7	in
	Plate Thickness	2	in
	Plate Fy	60	ksi
	Weld Length	1/4	in
	f _s Resistance	552.76	k-in
	Applied	432.48	k-in

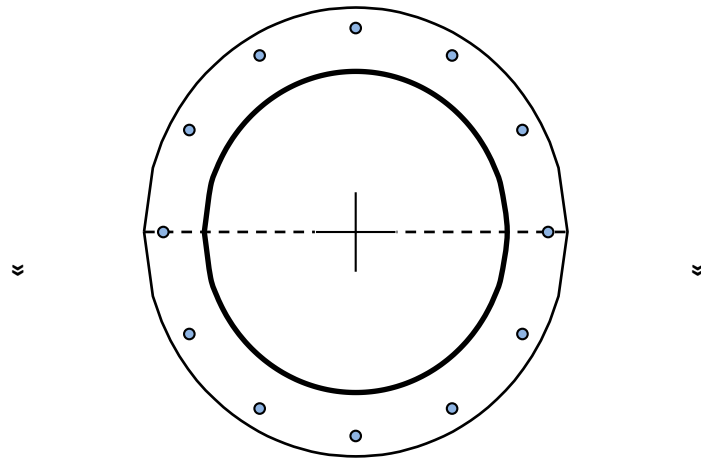
Code Rev.	G
Moment	1945.9 k-ft
Act. Moment	1315.3 k-ft
Axial	39.4 k

Date	11/21/2019
Engineer	
Site #	302523
Carrier	

Required Flange Thickness:
1.77 in OK

Stiffeners	#	
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Bolts	#	12	
	Bolt Circle	49.7	in
	(R)adial / (S)quare	R	
	Diameter	1 1/2	in
	Hole Diameter	1 5/8	in
	Type	A325	
	Fy	81	ksi
	Fu	105	ksi
	f _s Resistance	110.66	k
	Applied	102.64	k



Reinforcement	#	
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Plate Stress Ratio:
78% Pass

Bolt Stress Ratio:
93% Pass

Extra Bolts	O	
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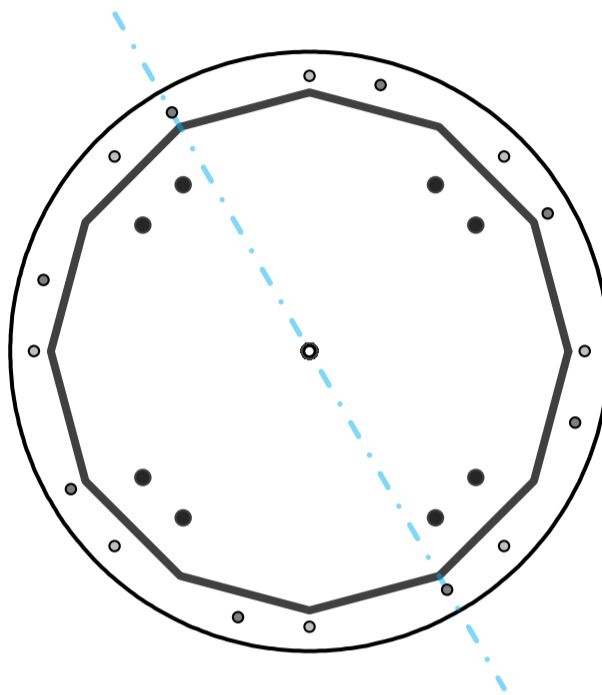
Base Plate & Anchor Rod Analysis

Pole Dimensions		
Number of Sides	12	-
Diameter	52.4	in
Thickness	3/8	in
Orientation Offset		°

Base Reactions		
Moment, Mu	2257	k-ft
Axial, Pu	45	k
Shear, Vu	21	k
Neutral Axis	120	°

Report Capacities		
Component	Capacity	Result
Base Plate	30%	Pass
Anchor Rods	60%	Pass
Dwyidag	-	-

Base Plate		
Shape	Round	-
Diameter, ϕ	63.1	in
Thickness	2	in
Grade	A572-60	
Yield Strength, Fy	60	ksi
Tensile Strength, Fu	75	ksi
Clip	N/A	in
Orientation Offset		°
Anchor Rod Detail	c	$\eta=0.55$
Clear Distance	N/A	in
Applied Moment, Mu	324.9	k
Bending Stress, ϕMn	1095.8	k



Original Anchor Rods		
Arrangement	Cluster	-
Quantity	8	-
Diameter, ϕ	2 1/4	in
Bolt Circle	44	in
Grade	A615-75	
Yield Strength, Fy	75	ksi
Tensile Strength, Fu	100	ksi
Spacing	6	in
Orientation Offset		°
Applied Force, Pu	122.6	k
Anchor Rods, ϕPn	259.8	k

Additional Anchor Rods		
Quantity	8	-
Diameter, ϕ	1 1/2	in
Bolt Circle	58	in
Grade	A325 (>1")	
Yield Strength, Fy	81	ksi
Tensile Strength, Fu	105	ksi
Bypass Base?	No	
Orientation Offset		°
Applied Force, Pu	68.2	k
Additional Rod, ϕPn	118.0	k

Additional Anchor Rods		
Quantity	8	-
Diameter, ϕ	1 1/2	in
Bolt Circle	58	in
Grade	A325 (>1")	
Yield Strength, Fy	81	ksi
Tensile Strength, Fu	105	ksi
Bypass Base?	No	
Orientation Offset	30	°
Applied Force, Pu	70.6	k
Additional Rod, ϕPn	118.0	k

Calculations for Monopole Base Plate & Anchor Rod Analysis

Reaction Distribution

Reaction	Shear Vu	Moment Mu	Factor
-	k	k-ft	-
Base Forces	21.0	2257.0	1.00
Anchor Rod Forces	15.5	901.9	0.40
Additional Bolt (Grp1) Forces	2.7	677.5	0.30
Additional Bolt (Grp2) Forces	2.7	677.5	0.30
Dywidag Forces	0.0	0.0	0.00
Stiffener Forces	0.0	0.0	0.00

Geometric Properties

Section	Gross Area	Net Area	Individual Inertia	Threads per Inch	Moment of Inertia
-	in ²	in ²	in ⁴	#	in ⁴
Pole	60.6200	5.0517	0.2377		20530.58
Bolt	3.9761	3.2477	0.8393	4.5	6294.24
Bolt1	1.7671	1.4053	0.1571	6	4728.53
Bolt2	1.7671	1.4053	0.1571	6	4728.53
Dywidag	0.0000	0.0000	0.0000		0.00
Stiffener	0.0000	0.0000	0.0000		0.00

Base Plate

Shape	Round	-
Diameter, D	63.084	in
Thickness, t	2	in
Yield Strength, Fy	60	ksi
Tensile Strength, Fu	75	ksi
Base Plate Chord	0.000	in
Detail Type	c	-
Detail Factor	0.55	-
Clear Distance	N/A	-

Anchor Rods

Anchor Rod Quantity, N	8	-
Rod Diameter, d	2.25	in
Bolt Circle, BC	44	in
Yield Strength, Fy	75	ksi
Tensile Strength, Fu	100	ksi
Applied Axial, Pu	122.6	k
Applied Shear, Vu	0.4	k
Compressive Capacity, φPn	259.8	k
Tensile Capacity, φRnt	0.472	OK
Interaction Capacity	0.475	OK

External Base Plate

Chord Length AA	0.000	in
Additional AA	4.000	in
Section Modulus, Z	4.000	in ³
Applied Moment, Mu	302.4	k-ft
Bending Capacity, φMn	216.0	k-ft
Capacity, Mu/φMn		
Chord Length AB	0.000	in
Additional AB	4.000	in
Section Modulus, Z	4.000	in ³
Applied Moment, Mu	173.4	k-ft
Bending Capacity, φMn	216.0	k-ft
Capacity, Mu/φMn		
Bend Line Length	0.000	in
Additional Bend Line	0.000	in
Section Modulus, Z	0.000	in ³
Applied Moment, Mu	#N/A	k-ft
Bending Capacity, φMn	0.0	k-ft
Capacity, Mu/φMn		

Additional Bolt Group 1

Bolt Quantity, N	8	-
Bolt Diameter, d	1.5	in
Bolt Circle, BC	58	in
Yield Strength, Fy	81	ksi
Tensile Strength, Fu	105	ksi
Applied Axial, Pu	68.2	k
Applied Shear, Vu	0.5	k
Compressive Capacity, φPn	118.0	k
Compressive Capacity, φPn	0.578	OK
Interaction Capacity	0.585	OK

Additional Bolt Group 2

Bolt Quantity, N	8	-
Bolt Diameter, d	1.5	in
Bolt Circle, BC	58	in
Yield Strength, Fy	81	ksi
Tensile Strength, Fu	105	ksi
Applied Axial, Pu	70.6	k
Applied Shear, Vu	0.4	k
Compressive Capacity, φPn	118.0	k
Compressive Capacity, φPn	0.598	OK
Interaction Capacity	0.605	OK

Internal Base Plate

Arc Length	20.292	in
Section Modulus, Z	20.292	in ³
Moment Arm	2.649	in
Applied Moment, Mu	324.9	k-ft
Bending Capacity, φMn	1095.8	k-ft
Capacity, Mu/φMn	0.296	OK

Site Name: New Milford CT2, CT
Site Number: 302523
Tower Type: MP
Design Loads (Factored) - Analysis per TIA-222-G Standards

Monolithic Mat & Pier Foundation Analysis

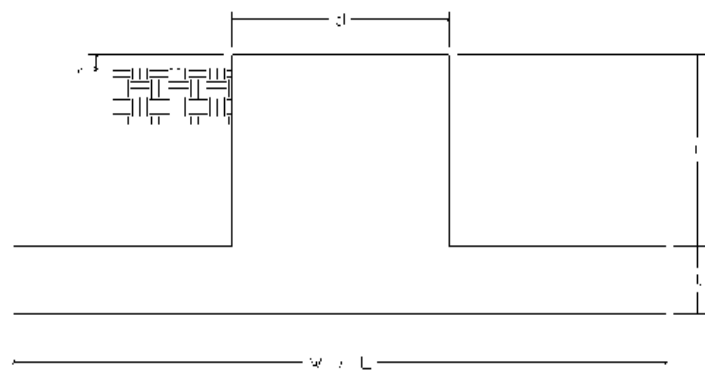
Foundation Analysis Parameters		
Design / Analysis / Mapping:	Analysis	-
Compression/Leg:	45	k
Uplift/Leg:	0	k
Total Shear:	21	k
Moment:	2257	k-ft
Tower + Appurtenance Weight:	45	k
Depth to Base of Foundation (l + t - h):	8	ft
Diameter of Pier (d):	6	ft
Length of Pier (l):	5.5	ft
Height of Pier above Ground (h):	0.5	ft
Width of Pad (W):	24	ft
Length of Pad (L):	18	ft
Thickness of Pad (t):	3	ft
Tower Leg Center to Center:	0	ft
Number of Tower Legs:	1	-
Tower Center from Mat Center:	3	ft
Depth Below Ground Surface to Water Table:	99	ft
Unit Weight of Concrete:	150	pcf
Unit Weight of Soil Above Water Table:	115	pcf
Unit Weight of Water:	62.4	pcf
Unit Weight of Soil Below Water Table:	52.6	pcf
Friction Angle of Uplift:	15	°
Coefficient of Shear Friction:	0.2	-
Ultimate Compressive Bearing Pressure:	9,162	psf
Ultimate Passive Pressure on Pad Face:	1,354	psf
$f_{\text{Soil and Concrete Weight}}$:	0.9	-
f_{Soil} :	0.75	-

Foundation Steel Parameters		
Concrete Strength (f_c):	3,000	psi
Pad Tension Steel Depth:	32.0	in
Dead Load Factor:	0.9	-
f_{Shear} :	0.75	-
$f_{\text{Flexure / Tension}}$:	0.9	-
$f_{\text{Compression}}$:	0.65	-
b:	0.85	-
Bottom Pad Rebar Size #:	10	-
# of Bottom Pad Rebar:	36	-
Pad Bottom Steel Area:	45.72	in ²
Pad Steel F_y :	60,000	psi
Top Pad Rebar Size #:	5	-
# of Top Pad Rebar:	36	-
Pad Top Steel Area:	11.16	in ²
Pier Rebar Size #:	11	-
Pier Steel Area (Single Bar):	1.56	in ²
# of Pier Rebar:	14	-
Pier Steel F_y :	60,000	psi
Pier Cage Diameter:	64.0	in
Rebar Strain Limit:	0.008	-
Steel Elastic Modulus:	29,000	ksi
Tie Rebar Size #:	4	-
Tie Steel Area (Single Bar):	0.20	in ²
Tie Spacing:	12	in
Tie Steel F_y :	60,000	psi

Overturning Moment Usage		
Design OTM:	2570.5	k-ft
OTM Resistance:	4363.5	k-ft
Design OTM / OTM Resistance:	59%	Pass

Soil Bearing Pressure Usage		
Net Bearing Pressure:	2292	psf
Factored Nominal Bearing Pressure:	6872	psf
Factored Nominal (Net) Bearing Pressure:	33%	Pass
Load Direction Controlling Design Bearing Pressure:	Diagonal to Pad Edge	

Sliding Factor of Safety		
Ultimate Friction Resistance:	97.5	k
Ultimate Passive Pressure Resistance:	87.7	k
Total Factored Sliding Resistance:	138.9	k
Sliding Design / Sliding Resistance:	15%	Pass



Pad Strength Capacity			
Factored One Way Shear (V_u):	154.3	k	
One Way Shear Capacity (fV_c):	757.2	k	ACI11.3.1.1
V_u / fV_c :	20%	Pass	
Load Direction Controlling Shear Capacity:	Parallel to Pad Edge		
Lower Steel Pad Factored Moment (M_u):	801.7	k-ft	
Lower Steel Pad Moment Capacity (fM_n):	6257.1	k-ft	ACI10.3
M_u / fM_n :	13%	Pass	
Load Direction Controlling Flexural Capacity:	Parallel to Pad Edge		
Upper Steel Pad Factored Moment (M_u):	581.2	k-ft	
Upper Steel Pad Moment Capacity (fM_n):	1587.6	k-ft	
M_u / fM_n :	37%	Pass	
Lower Pad Flexural Reinforcement Ratio:	0.0050		OK - Minimum Reinforcement Ratio Met - ACI10.5.1
Upper Pad Flexural Reinforcement Ratio:	0.0012		OK - Minimum Reinforcement Ratio Met - ACI10.5.1
Pad Shrinkage Reinforcement Ratio:	0.0062		OK - Shrinkage Reinforcement Ratio Met - ACI7.12.2.1
Lower Pad Reinforcement Spacing:	6	in	Pad Reinforcing Spacing OK - ACI7.12.2.2 & 10.5.4
Upper Pad Reinforcement Spacing:	6	in	Pad Reinforcing Spacing OK - ACI7.12.2.2 & 10.5.4
Factored Punching Shear (V_u):	0.0	k	
Nominal Punching Shear Capacity (f_cV_n):	1718.0	k	ACI11.12.2.1
V_u / fV_c :	0%	Pass	

Pier Strength Capacity			
Factored Moment in Pier (M_u):	2372.5	k-ft	
Pier Moment Capacity (fM_n):	3087.5	k-ft	
M_u / fM_n :	77%	Pass	
Factored Shear in Pier (V_u):	21.0	k	
Pier Shear Capacity (fV_n):	422.8	k	
V_u / fV_c :	5%	Pass	
Pier Shear Reinforcement Ratio:	0.0005		OK - No Ties Necessary for Shear - ACI11.5.6.1
Factored Tension in Pier (T_u):	0.0	k	
Pier Tension Capacity (fT_n):	1179.4	k	
T_u / fT_n :	0%	Pass	
Factored Compression in Pier (P_u):	45.0	k	
Pier Compression Capacity (fP_n):	5369.9	k	ACI10.3.6.2
P_u / fP_n :	1%	Pass	
Pier Compression Reinforcement Ratio:	0.005		OK - Reinforcement Ratio Met - ACI10.9.1 & 10.8.4
Minimum Depth to Develop Vertical Rebar:	31	in	ACI12.2.3
Minimum Hook Development Length:	22	in	ACI12.5
Minimum Mat Thickness / Edge Distance from Pier:	25.0	in	
Minimum Foundation Depth:	4.93	ft	
$M_u/f_B M_n + T_u/f_T T_n$:	77%	Pass	