



AMERICAN TOWER®
CORPORATION

Structural Analysis Report

Structure : 65 ft Monopine
ATC Asset Name : Monument CO
ATC Asset Number : 302418
Engineering Number : 14193528_C3_03
Proposed Carrier : AT&T MOBILITY
Carrier Site Name : Monument Hill
Carrier Site Number : COL02014
Site Location : 20017 Beacon Lite Road
Monument, CO 80132-9619
39.1226, -104.8663
County : El Paso
Date : March 2, 2023
Max Usage : 94%
Analysis Result : Pass

Prepared By:

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Structural Engineer I

Reviewed By:



Introduction

The purpose of this report is to summarize results of a structural analysis performed on the 65 ft Monopine tower to reflect the change in loading by AT&T MOBILITY.

Supporting Documents

Tower Drawing:	Valmont Drawing #DC20032, dated June 22, 1994
Foundation Drawing:	Foundation Design for 65' Valmont Pole, Monument, CO
Geotechnical Report:	E.O. Church, Inc. Job #5417, dated June 23, 1994

Analysis

The tower was analyzed using American Tower Corporation's tower analysis software. This program considers an elastic three-dimensional model and second-order effects per ANSI/TIA-222.

Basic Wind Speed:	130 mph (3-second gust)
Basic Wind Speed w/ Ice:	50 mph (3-second gust) w/ 0.25" radial ice concurrent
Code(s):	ANSI/TIA-222-H / 2015 IBC
Exposure Category:	C
Risk Category:	II
Topographic Factor Procedure:	Method 1
Topographic Category:	1
Spectral Response:	$S_s = 0.18$, $S_1 = 0.06$
Site Class:	D - Stiff Soil - Default

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.

Proposed Carrier Final Loading

Elev.*	Qty	Equipment	Lines	Carrier
50.0'	2	Powerwave Allgon 7770.00	(4) 7/8" Coax	AT&T MOBILITY
	3	T-Arm		
49.0'	1	KMW AM-X-CD-16-65-00T-RET	(2) 7/8" Coax	
48.0'	1	Raycap DC9-48-60-24-8C-EV (Enclosure)	(3) 0.39" (10mm) Fiber Trunk (4) 0.78" (19.7mm) 8 AWG 6 (1) 0.96" (24.3mm) Cable (4) 2" conduit	
	2	Raycap DC6-48-60-18-8F(32.8 lbs)		
	3	Alcatel-Lucent B25 RRH4x30-4R		
	3	Alcatel-Lucent B66A RRH4x45-4R w/ Solar Shield		
	3	Alcatel-Lucent RRH2x40-07-L		
	3	KMW ET-X-UW-70-16-70-18-iR-AT-RA		
	3	Nokia AirScale Dual RRH 4T4R B25/66 320W AHFIB (66.1lbs)		
	3	Nokia AirScale RRH 4T4R B5 160W AHCA		
	3	Nokia B14/12/29 Triband RRH AHLBBA		
	3	Nokia Flexi RRH 4T4R B14 160W FRBI		
	6	Kathrein Scala 80010992		

(If table breaks across pages, please see previous page for data in merged cells)

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

Install proposed lines inside the pole shaft.

Other Existing/Reserved Loading

Elev.*	Qty	Equipment	Lines	Carrier
65.0'	15	Vector 4' Branches	-	BRANCHES
62.0'	1	Raycap RDIDC-9181-PF-48 (19")	(1) 1.41" (35.8mm) Hybrid	DISH WIRELESS L.L.C.
	3	Fujitsu TA08025-B604		
	3	Fujitsu TA08025-B605		
	3	Light Sector Frame		
	3	JMA Wireless MX08FRO665-21		
60.6'	17	Vector 4' Branches	-	BRANCHES
56.3'	19	Vector 6' Branches		
51.9'	21	Vector 6' Branches		
47.5'	23	Vector 8' Branches		
43.1'	25	Vector 8' Branches		
38.8'	27	Vector 10' Branches		
34.4'	29	Vector 10' Branches		
30.0'	31	Vector 10' Branches		

(If table breaks across pages, please see previous page for data in merged cells)

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

Structure Usages

Structural Component	Usage	Pass/Fail
Anchor Rods	66%	Pass
Base Plate	23%	Pass
Shaft	88%	Pass

Foundation Reactions & Usages

Reaction Component	Analysis Reactions	Usage
Moment (k-ft)	1608.1	94%
Axial (k)	20.5	60%
Shear (k)	36.4	63%

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.

Standard Conditions

All engineering services performed by ATC Tower Services LLC 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 ATC Tower Services LLC

It is the responsibility of the client to ensure that the information provided to ATC Tower Services LLC 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 ATC Tower Services LLC, 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. ATC Tower Services LLC is not responsible for the conclusions, opinions and recommendations made by others based on the information supplied herein.

ANALYSIS PARAMETERS

Nominal Wind: 130 mph	Ice Wind: 50 mph w/ 0.25" ice	Service Wind: 60 mph
Risk Category: II	Exposure: C	S _z : 0.185 S _t : 0.059
Topo Category: 1	Topo Factor: Method 1	Topo Feature:
Structure Height: 65 ft	Base Elevation: 0.00 ft	Structure Type: Taper
Base Diameter: 30 in	Base Rotation: 0°	Taper: 0.2250 (in/ft)

POLE SECTION PROPERTIES

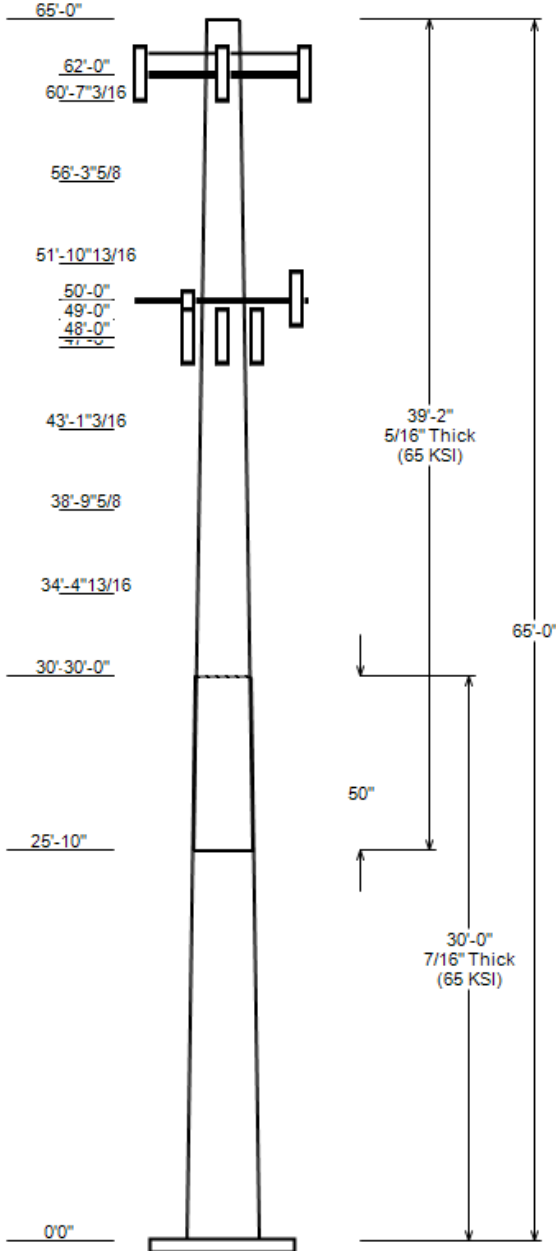
Section	Length (ft)	Flat Diameter (in)		Thick (in)	Joint Type	Joint Length (in)	Pole Shape	Yield Strength (ksi)
		Top	Bottom					
1	30.000	23.25	30.00	0.438		0.000	12 Sides	65
2	39.167	16.00	24.81	0.312	Slip Joint	50.000	12 Sides	65

DISCRETE APPURTENANCE

Elev (ft)	Description
65.0	(15) Vector 4' Branches
62.0	(3) Fujitsu TA08025-B605
62.0	(3) Fujitsu TA08025-B604
62.0	(1) Raycap RDIDC-9181-PF-48 (19")
62.0	(3) JMA Wireless MX08FRO665-21
62.0	(3) Generic Flat Light Sector Fram
60.6	(17) Vector 4' Branches
56.3	(19) Vector 6' Branches
51.9	(21) Vector 6' Branches
50.0	(2) Powerwave Allgon 7770.00
50.0	(3) Generic Round T-Arm
49.0	(1) KMW AM-X-CD-16-65-00T-RET
48.0	(3) Nokia AirScale RRH 4T4R B5 160
48.0	(2) Raycap DC6-48-60-18-8F(32.8 lb
48.0	(3) Alcatel-Lucent RRH2x40-07-L
48.0	(3) Alcatel-Lucent B25 RRH4x30-4R
48.0	(3) Nokia AirScale Dual RRH 4T4R B
48.0	(3) Nokia Flexi RRH 4T4R B14 160W
48.0	(3) Alcatel-Lucent B66A RRH4x45-4R
48.0	(1) Raycap DC9-48-60-24-8C-EV (Enc
48.0	(3) Nokia B14/12/29 Triband RRH AH
48.0	(3) KMW ET-X-UW-70-16-70-18-iR-AT-
48.0	(6) Kathrein Scala 80010992
47.5	(23) Vector 8' Branches
43.1	(25) Vector 8' Branches
38.8	(27) Vector 10' Branches
34.4	(29) Vector 10' Branches
30.0	(31) Vector 10' Branches

LINEAR APPURTENANCE

Elev To (ft)	Description
62.0	(1) 1.41" (35.8mm) Hybrid
50.0	(4) 7/8" Coax
49.0	(2) 7/8" Coax
48.0	(4) 2" conduit
48.0	(1) 0.96" (24.3mm) Cable
48.0	(4) 0.78" (19.7mm) 8 AWG 6
48.0	(3) 0.39" (10mm) Fiber Trunk



GLOBAL BASE REACTIONS

Load Case	Moment (kip-ft)	Axial (kip)	Shear (kip)
1.2D + 1.0W	1608.11	20.45	36.42
0.9D + 1.0W	1601.24	15.30	36.39
1.2D + 1.0Di + 1.0Wi	264.40	21.12	6.01
1.2D + 1.0Ev + 1.0Eh	53.71	20.29	1.13
0.9D + 1.0Ev + 1.0Eh	53.42	14.08	1.12
1.0D + 1.0W	305.81	17.16	6.94

ANALYSIS PARAMETERS

Location:	El Paso County,CO	Height:	65 ft
Type and Shape:	Taper, 12 Sides	Base Diameter:	30.00 in
Manufacturer:	Valmont	Top Diameter:	16.00 in
K_d (non-service):	0.95	Taper:	0.2250 in/ft
K_e:	0.77	Rotation:	0.000°

ICE & WIND PARAMETERS

Risk Category:	II	Design Wind Speed:	130 mph
Exposure Category:	C	Design Wind Speed w/ Ice:	50 mph
Topo Factor Procedure:	Method 1	Design Ice Thickness:	0.25 in
Topographic Category:	1	Service Wind Speed:	60 mph
Crest Height:	0 ft	HMSL:	7382.00 ft

SEISMIC PARAMETERS

Analysis Method:	Equivalent Lateral Force Method		
Site Class:	D - Stiff Soil	Period Based on Rayleigh Method (sec):	0.96
T_L (sec):	4	P:	1
S_s:	0.185	S₁:	0.059
F_a:	1.600	F_v:	2.400
S_{ds}:	0.197	S_{d1}:	0.094
		C_s:	0.066
		C_s Max:	0.066
		C_s Min:	0.030

LOAD CASES

1.2D + 1.0W	130 mph Wind with No Ice
0.9D + 1.0W	130 mph Wind with No Ice (Reduced DL)
1.2D + 1.0Di + 1.0Wi	50 mph Wind with 0.25" Radial Ice
1.2D + 1.0Ev + 1.0Eh	Seismic
0.9D - 1.0Ev + 1.0Eh	Seismic (Reduced DL)
1.0D + 1.0W	60 mph Wind with No Ice

SHAFT SECTION PROPERTIES

Section	Length (ft)	Thick (in)	Fy (ksi)	Joint Type	Joint Len (in)	Weight (lb)	Bottom						Top											
							Dia (in)	Elev (ft)	Area (in ²)	Ix (in ⁴)	W/t Ratio	D/t Ratio	Dia (in)	Elev (ft)	Area (in ²)	Ix (in ⁴)	W/t Ratio	D/t Ratio	Taper (in/ft)					
1-12	30.00	0.4375	65		0.00	3,766	30.00	0.000	41.65	4,645.6	15.69	68.57	23.25	30.00	32.14	2,134.9	11.56	53.15	0.2250					
2-12	39.17	0.3125	65	Slip	50.00	2,695	24.81	25.833	24.65	1,888.9	18.60	79.40	16.00	65.00	15.79	496.0	11.04	51.20	0.2250					
Total Shaft Weight						6,461																		

DISCRETE APPURTENANCE PROPERTIES

Attach Elev (ft)	Description	Qty	Vert Ecc (ft)	No Ice			Ice			
				Weight (lb)	EPAA (sf)	Orientation Factor	Weight (lb)	EPAA (sf)	Orientation Factor	
65.00	Vector 4' Branches	15	1.00	0.000	11.00	1.850	1.00	12.17	2.048	1.00
62.00	JMA Wireless MX08FRO665-21	3	0.80	0.000	64.50	12.489	0.64	103.75	12.918	0.64
62.00	Raycap RDIDC-9181-PF-48 (19")	1	0.80	0.000	21.90	2.565	1.00	33.81	2.725	1.00
62.00	Fujitsu TA08025-B604	3	0.80	0.000	63.90	1.962	0.50	72.81	2.102	0.50
62.00	Fujitsu TA08025-B605	3	0.80	0.000	75.00	1.962	0.50	84.57	2.102	0.50
62.00	Generic Flat Light Sector Fram	3	0.75	0.000	400.00	17.900	0.75	445.96	20.204	0.75
60.60	Vector 4' Branches	17	1.00	0.000	11.00	1.850	1.00	12.17	2.046	1.00
56.30	Vector 6' Branches	19	1.00	0.000	16.00	2.620	1.00	17.69	2.896	1.00
51.90	Vector 6' Branches	21	1.00	0.000	16.00	2.620	1.00	17.67	2.894	1.00
50.00	Powerwave Allgon 7770.00	2	0.80	0.000	35.00	5.508	0.66	51.99	5.826	0.66
50.00	Generic Round T-Arm	3	0.75	0.000	312.50	9.700	0.67	351.55	10.932	0.67
49.00	KMW AM-X-CD-16-65-00T-RET	1	0.80	0.000	48.50	8.024	1.00	72.66	8.440	1.00
48.00	Kathrein Scala 80010992	6	0.80	0.000	133.40	19.326	0.63	185.54	19.928	0.63
48.00	KMW ET-X-UW-70-16-70-18-iR-AT-	3	0.80	0.000	48.50	10.860	0.68	79.85	11.322	0.68
48.00	Raycap DC9-48-60-24-8C-EV (Enc	1	0.80	0.000	18.50	2.676	1.00	30.98	2.846	1.00
48.00	Alcatel-Lucent B66A RRH4x45-4R	3	0.80	0.000	56.80	2.537	0.67	67.24	2.704	0.67
48.00	Nokia Flexi RRH 4T4R B14 160W	3	0.80	0.000	50.70	2.415	0.67	60.06	2.573	0.67
48.00	Nokia AirScale Dual RRH 4T4R B	3	0.80	0.000	66.10	2.218	0.67	74.72	2.369	0.67
48.00	Alcatel-Lucent B25 RRH4x30-4R	3	0.80	0.000	51.00	2.140	0.67	60.06	2.289	0.67
48.00	Alcatel-Lucent RRH2x40-07-L	3	0.80	0.000	52.40	1.705	0.50	61.41	1.838	0.50
48.00	Raycap DC6-48-60-18-8F(32.8 lb	2	0.80	0.000	32.80	1.470	1.00	41.99	1.574	1.00
48.00	Nokia AirScale RRH 4T4R B5 160	3	0.80	0.000	35.30	1.286	0.50	41.16	1.398	0.50
48.00	Nokia B14/12/29 Triband RRH AH	3	0.80	0.000	101.40	2.980	0.67	116.60	3.153	0.67
47.50	Vector 8' Branches	23	1.00	0.000	22.00	3.420	1.00	24.28	3.774	1.00
43.10	Vector 8' Branches	25	1.00	0.000	22.00	3.420	1.00	24.25	3.770	1.00
38.80	Vector 10' Branches	27	1.00	0.000	28.00	4.210	1.00	30.83	4.636	1.00
34.40	Vector 10' Branches	29	1.00	0.000	28.00	4.210	1.00	30.79	4.630	1.00
30.00	Vector 10' Branches	31	1.00	0.000	28.00	4.210	1.00	30.75	4.624	1.00
Totals	Row Count: 28	259			9,643.20			11,237.75		

LINEAR APPURTENANCE PROPERTIES

Elev From (ft)	Elev To (ft)	Qty	Description	Diameter (in)	Weight (lb/ft)	Flat	Max/Row	Distance Between Rows(in)	Distance Between Cols(in)	Azimuth (deg)	Distance From Face (in)	Exposed To Wind	Carrier
0.00	62.00	1	1.41" (35.8mm) Hybrid	1.41	1.66	N	0	0	0	0	0	N	DISH WIRELESS L.L.C.
0.00	50.00	4	7/8" Coax	1.09	0.33	N	0	0	0	0	0	N	AT&T MOBILITY
0.00	49.00	2	7/8" Coax	1.09	0.33	N	0	0	0	0	0	N	AT&T MOBILITY
0.00	48.00	4	0.78" (19.7mm) 8 AWG	0.78	0.59	N	0	0	0	0	0	N	AT&T MOBILITY
0.00	48.00	4	2" conduit	2.38	3.65	N	0	0	0	0	0	N	AT&T MOBILITY
0.00	48.00	3	0.39" (10mm) Fiber Tr	0.39	0.06	N	0	0	0	0	0	N	AT&T MOBILITY
0.00	48.00	1	0.96" (24.3mm) Cable	0.96	0.88	N	0	0	0	0	0	N	AT&T MOBILITY

SEGMENT PROPERTIES

Seg Top Elev (ft)	Description	Thick (in)	Flat Dia (in)	Area (in ²)	Ix (in ⁴)	W/t Ratio	D/t Ratio	F'y (ksi)	S (in ³)	Z (in ³)	Weight (lb)
0.00		0.4375	30.000	41.646	4,645.60	15.69	68.57	81.9	299.2	0.0	0.0
5.00		0.4375	28.875	40.061	4,135.20	15.01	66.00	81.9	276.7	0.0	695.1
10.00		0.4375	27.750	38.477	3,663.60	14.32	63.43	81.9	255.0	0.0	668.1
15.00		0.4375	26.625	36.892	3,229.40	13.63	60.86	81.9	234.3	0.0	641.2

SEGMENT PROPERTIES

Seg Top Elev (ft)	Description	(Max Length: 5 ft)	Thick (in)	Flat Dia (in)	Area (in ²)	Ix (in ⁴)	W/t Ratio	D/t Ratio	Fy (ksi)	S (in ³)	Z (in ³)	Weight (lb)
20.00			0.4375	25.500	35.307	2,830.80	12.94	58.29	81.9	214.5	0.0	614.2
25.00			0.4375	24.376	33.723	2,466.50	12.25	55.72	81.9	195.5	0.0	587.2
25.83	Bot - Section 2		0.4375	24.188	33.459	2,409.00	12.13	55.29	81.9	192.4	0.0	95.3
30.00	Top - Section 1		0.3125	23.876	23.710	1,680.30	17.79	76.40	81.9	136.0	0.0	807.9
34.40			0.3125	22.886	22.714	1,477.30	16.94	73.23	81.9	124.7	0.0	347.5
35.00			0.3125	22.751	22.578	1,451.00	16.83	72.80	81.9	123.2	0.0	46.2
38.80			0.3125	21.896	21.718	1,291.30	16.09	70.07	81.9	113.9	0.0	286.4
40.00			0.3125	21.626	21.447	1,243.50	15.86	69.20	81.9	111.1	0.0	88.1
43.10			0.3125	20.928	20.745	1,125.40	15.27	66.97	81.9	103.9	0.0	222.5
45.00			0.3125	20.501	20.315	1,056.80	14.90	65.60	81.9	99.6	0.0	132.7
47.50			0.3125	19.938	19.749	970.90	14.42	63.80	81.9	94.1	0.0	170.4
48.00			0.3125	19.826	19.635	954.30	14.32	63.44	81.9	93.0	0.0	33.5
49.00			0.3125	19.601	19.409	921.70	14.13	62.72	81.9	90.8	0.0	66.4
50.00			0.3125	19.376	19.183	889.80	13.93	62.00	81.9	88.7	0.0	65.7
51.90			0.3125	18.949	18.753	831.30	13.57	60.64	81.9	84.8	0.0	122.6
55.00			0.3125	18.251	18.051	741.40	12.97	58.40	81.9	78.5	0.0	194.1
56.30			0.3125	17.959	17.756	705.70	12.72	57.47	81.9	75.9	0.0	79.2
60.00			0.3125	17.126	16.919	610.50	12.01	54.80	81.9	68.9	0.0	218.3
60.60			0.3125	16.991	16.783	595.90	11.89	54.37	81.9	67.8	0.0	34.4
62.00			0.3125	16.676	16.466	562.80	11.62	53.36	81.9	65.2	0.0	79.2
65.00			0.3125	16.001	15.787	496.00	11.04	51.20	81.9	59.9	0.0	164.6
Total:											6,460.8	

CALCULATED FORCES

Load Case: 1.2D + 1.0W 130 mph Wind with No Ice 18 Iterations

Gust Response Factor: 1.10
 Dead load Factor: 1.20
 Wind Load Factor: 1.00

Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (ft-kips)	Mu MX (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (ft-kips)	Phi Mn (ft-kips)	Total Deflect (in)	Rotation (deg)	Ratio
0.00	-20.45	-36.42	0.00	-1,608.1	0.00	1,608.11	3,069.74	730.89	2,039.12	1,837.56	0	0	0.884
5.00	-19.20	-36.22	0.00	-1,426.0	0.00	1,426.04	2,952.93	703.08	1,886.97	1,699.39	0.25	-0.46	0.848
10.00	-17.98	-36.02	0.00	-1,244.9	0.00	1,244.94	2,836.12	675.27	1,740.71	1,566.63	0.99	-0.92	0.804
15.00	-16.82	-35.80	0.00	-1,064.9	0.00	1,064.86	2,719.31	647.46	1,600.35	1,439.27	2.2	-1.37	0.749
20.00	-15.70	-35.57	0.00	-885.8	0.00	885.84	2,602.51	619.64	1,465.89	1,317.30	3.87	-1.8	0.682
25.00	-14.74	-35.41	0.00	-708.0	0.00	708.00	2,485.70	591.83	1,337.33	1,200.74	5.98	-2.21	0.599
25.83	-14.49	-35.28	0.00	-678.5	0.00	678.49	2,466.23	587.20	1,316.48	1,181.84	6.37	-2.27	0.584
30.00	-12.42	-30.54	0.00	-531.5	0.00	531.48	1,747.69	416.12	925.24	835.13	8.49	-2.57	0.649
34.40	-11.06	-26.07	0.00	-397.1	0.00	397.11	1,674.27	398.64	849.16	765.99	10.99	-2.84	0.529
35.00	-10.92	-25.95	0.00	-381.5	0.00	381.47	1,664.26	396.25	839.04	756.80	11.35	-2.88	0.515
38.80	-9.74	-21.67	0.00	-282.9	0.00	282.87	1,600.85	381.15	776.35	699.85	13.75	-3.13	0.414
40.00	-9.57	-21.54	0.00	-256.9	0.00	256.86	1,580.82	376.39	757.06	682.32	14.55	-3.2	0.386
43.10	-8.71	-18.21	0.00	-190.1	0.00	190.08	1,529.09	364.07	708.35	638.09	16.68	-3.36	0.306
45.00	-8.49	-18.08	0.00	-155.5	0.00	155.47	1,497.39	356.52	679.29	611.71	18.04	-3.44	0.262
47.50	-7.78	-15.00	0.00	-110.3	0.00	110.28	1,455.67	346.59	641.99	577.85	19.87	-3.53	0.198
48.00	-5.25	-10.89	0.00	-102.8	0.00	102.78	1,447.33	344.60	634.66	571.19	20.24	-3.55	0.185
49.00	-5.12	-10.58	0.00	-91.9	0.00	91.89	1,430.64	340.63	620.11	557.99	20.98	-3.58	0.169
50.00	-3.88	-9.64	0.00	-81.3	0.00	81.31	1,413.95	336.66	605.74	544.95	21.74	-3.61	0.153
51.90	-3.46	-7.37	0.00	-63.0	0.00	62.99	1,382.25	329.11	578.89	520.59	23.18	-3.65	0.124
55.00	-3.23	-7.23	0.00	-40.1	0.00	40.14	1,330.52	316.79	536.40	482.04	25.57	-3.7	0.086
56.30	-2.90	-5.13	0.00	-30.8	0.00	30.75	1,308.83	311.63	519.06	466.32	26.58	-3.72	0.068
60.00	-2.64	-4.99	0.00	-11.8	0.00	11.77	1,247.08	296.92	471.27	423.00	29.47	-3.75	0.030
60.60	-2.46	-3.68	0.00	-8.8	0.00	8.77	1,237.07	294.54	463.74	416.17	29.95	-3.76	0.023
62.00	-0.32	-1.20	0.00	-3.6	0.00	3.61	1,213.71	288.98	446.40	400.46	31.05	-3.76	0.009
65.00	0.00	-1.18	0.00	0.0	0.00	0.00	1,163.65	277.06	410.36	367.81	33.41	-3.76	0.000

CALCULATED FORCES

Load Case: 0.9D + 1.0W												130 mph Wind with No Ice (Reduced DL)		18 Iterations
Gust Response Factor:		1.10												
Dead load Factor:		0.90												
Wind Load Factor:		1.00												
Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (ft-kips)	Mu MX (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (ft-kips)	Phi Mn (ft-kips)	Total Deflect (in)	Rotation (deg)	Ratio	
0.00	-15.30	-36.39	0.00	-1,601.2	0.00	1,601.24	3,069.74	730.89	2,039.12	1,837.56	0	0	0.879	
5.00	-14.29	-36.16	0.00	-1,419.3	0.00	1,419.28	2,952.93	703.08	1,886.97	1,699.39	0.25	-0.46	0.843	
10.00	-13.31	-35.92	0.00	-1,238.5	0.00	1,238.49	2,836.12	675.27	1,740.71	1,566.63	0.98	-0.92	0.798	
15.00	-12.37	-35.68	0.00	-1,058.9	0.00	1,058.88	2,719.31	647.46	1,600.35	1,439.27	2.19	-1.37	0.743	
20.00	-11.48	-35.42	0.00	-880.5	0.00	880.49	2,602.51	619.64	1,465.89	1,317.30	3.85	-1.79	0.676	
25.00	-10.72	-35.25	0.00	-703.4	0.00	703.40	2,485.70	591.83	1,337.33	1,200.74	5.95	-2.19	0.594	
25.83	-10.51	-35.11	0.00	-674.0	0.00	674.03	2,466.23	587.20	1,316.48	1,181.84	6.34	-2.26	0.578	
30.00	-8.97	-30.37	0.00	-527.7	0.00	527.73	1,747.69	416.12	925.24	835.13	8.45	-2.55	0.642	
34.40	-7.98	-25.91	0.00	-394.1	0.00	394.09	1,674.27	398.64	849.16	765.99	10.93	-2.82	0.523	
35.00	-7.87	-25.78	0.00	-378.6	0.00	378.55	1,664.26	396.25	839.04	756.80	11.29	-2.87	0.509	
38.80	-7.02	-21.51	0.00	-280.6	0.00	280.57	1,600.85	381.15	776.35	699.85	13.68	-3.11	0.408	
40.00	-6.88	-21.39	0.00	-254.8	0.00	254.75	1,580.82	376.39	757.06	682.32	14.47	-3.18	0.381	
43.10	-6.28	-18.07	0.00	-188.4	0.00	188.45	1,529.09	364.07	708.35	638.09	16.59	-3.34	0.302	
45.00	-6.10	-17.93	0.00	-154.1	0.00	154.12	1,497.39	356.52	679.29	611.71	17.94	-3.42	0.259	
47.50	-5.62	-14.86	0.00	-109.3	0.00	109.30	1,455.67	346.59	641.99	577.85	19.76	-3.51	0.195	
48.00	-3.78	-10.79	0.00	-101.9	0.00	101.87	1,447.33	344.60	634.66	571.19	20.12	-3.53	0.182	
49.00	-3.69	-10.49	0.00	-91.1	0.00	91.07	1,430.64	340.63	620.11	557.99	20.87	-3.56	0.167	
50.00	-2.77	-9.57	0.00	-80.6	0.00	80.58	1,413.95	336.66	605.74	544.95	21.61	-3.58	0.151	
51.90	-2.49	-7.30	0.00	-62.4	0.00	62.40	1,382.25	329.11	578.89	520.59	23.05	-3.63	0.122	
55.00	-2.31	-7.17	0.00	-39.8	0.00	39.76	1,330.52	316.79	536.40	482.04	25.42	-3.68	0.085	
56.30	-2.10	-5.08	0.00	-30.4	0.00	30.44	1,308.83	311.63	519.06	466.32	26.43	-3.7	0.067	
60.00	-1.90	-4.94	0.00	-11.7	0.00	11.66	1,247.08	296.92	471.27	423.00	29.3	-3.73	0.029	
60.60	-1.79	-3.64	0.00	-8.7	0.00	8.69	1,237.07	294.54	463.74	416.17	29.77	-3.73	0.022	
62.00	-0.22	-1.20	0.00	-3.6	0.00	3.60	1,213.71	288.98	446.40	400.46	30.87	-3.74	0.009	
65.00	0.00	-1.18	0.00	0.0	0.00	0.00	1,163.65	277.06	410.36	367.81	33.21	-3.74	0.000	

CALCULATED FORCES

Load Case: 1.2D + 1.0Di + 1.0Wi			50 mph Wind with 0.25" Radial Ice								17 Iterations		
Gust Response Factor:		1.10	Ice Dead Load Factor		1.00			Ice Importance Factor			1.00		
Dead Load Factor:		1.20											
Wind Load Factor:		1.00											
Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (ft-kips)	Mu MX (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (ft-kips)	Phi Mn (ft-kips)	Total Deflect (in)	Rotation (deg)	Ratio
0.00	-21.12	-6.01	0.00	-264.4	0.00	264.40	3,069.74	730.89	2,039.12	1,837.56	0	0	0.151
5.00	-20.11	-5.97	0.00	-234.4	0.00	234.36	2,952.93	703.08	1,886.97	1,699.39	0.04	-0.08	0.145
10.00	-19.13	-5.93	0.00	-204.5	0.00	204.51	2,836.12	675.27	1,740.71	1,566.63	0.16	-0.15	0.137
15.00	-18.19	-5.89	0.00	-174.9	0.00	174.87	2,719.31	647.46	1,600.35	1,439.27	0.36	-0.23	0.128
20.00	-17.28	-5.84	0.00	-145.4	0.00	145.43	2,602.51	619.64	1,465.89	1,317.30	0.64	-0.3	0.117
25.00	-16.40	-5.81	0.00	-116.2	0.00	116.23	2,485.70	591.83	1,337.33	1,200.74	0.98	-0.36	0.103
25.83	-16.25	-5.79	0.00	-111.4	0.00	111.39	2,466.23	587.20	1,316.48	1,181.84	1.05	-0.37	0.101
30.00	-14.11	-5.01	0.00	-87.3	0.00	87.28	1,747.69	416.12	925.24	835.13	1.4	-0.42	0.113
34.40	-12.57	-4.28	0.00	-65.2	0.00	65.24	1,674.27	398.64	849.16	765.99	1.81	-0.47	0.093
35.00	-12.49	-4.25	0.00	-62.7	0.00	62.67	1,664.26	396.25	839.04	756.80	1.86	-0.47	0.090
38.80	-11.12	-3.55	0.00	-46.5	0.00	46.51	1,600.85	381.15	776.35	699.85	2.26	-0.51	0.073
40.00	-10.97	-3.53	0.00	-42.2	0.00	42.25	1,580.82	376.39	757.06	682.32	2.39	-0.53	0.069
43.10	-9.95	-2.98	0.00	-31.3	0.00	31.32	1,529.09	364.07	708.35	638.09	2.74	-0.55	0.056
45.00	-9.72	-2.95	0.00	-25.7	0.00	25.66	1,497.39	356.52	679.29	611.71	2.96	-0.57	0.049
47.50	-8.83	-2.45	0.00	-18.3	0.00	18.28	1,455.67	346.59	641.99	577.85	3.26	-0.58	0.038
48.00	-6.03	-1.81	0.00	-17.1	0.00	17.06	1,447.33	344.60	634.66	571.19	3.33	-0.58	0.034
49.00	-5.89	-1.76	0.00	-15.2	0.00	15.25	1,430.64	340.63	620.11	557.99	3.45	-0.59	0.031
50.00	-4.58	-1.60	0.00	-13.5	0.00	13.49	1,413.95	336.66	605.74	544.95	3.57	-0.59	0.028
51.90	-4.02	-1.22	0.00	-10.4	0.00	10.45	1,382.25	329.11	578.89	520.59	3.81	-0.6	0.023
55.00	-3.76	-1.20	0.00	-6.6	0.00	6.65	1,330.52	316.79	536.40	482.04	4.2	-0.61	0.017
56.30	-3.29	-0.85	0.00	-5.1	0.00	5.09	1,308.83	311.63	519.06	466.32	4.37	-0.61	0.013
60.00	-3.00	-0.82	0.00	-2.0	0.00	1.95	1,247.08	296.92	471.27	423.00	4.85	-0.62	0.007
60.60	-2.73	-0.61	0.00	-1.5	0.00	1.46	1,237.07	294.54	463.74	416.17	4.92	-0.62	0.006
62.00	-0.41	-0.20	0.00	-0.6	0.00	0.60	1,213.71	288.98	446.40	400.46	5.1	-0.62	0.002
65.00	0.00	-0.20	0.00	0.0	0.00	0.00	1,163.65	277.06	410.36	367.81	5.49	-0.62	0.000

CALCULATED FORCES

Load Case: 1.0D + 1.0W		60 mph Wind with No Ice										17 Iterations	
Gust Response Factor: 1.10													
Dead load Factor: 1.00													
Wind Load Factor: 1.00													
Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (ft-kips)	Mu MX (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (ft-kips)	Phi Mn (ft-kips)	Total Deflect (in)	Rotation (deg)	Ratio
0.00	-17.16	-6.94	0.00	-305.8	0.00	305.81	3,069.74	730.89	2,039.12	1,837.56	0	0	0.172
5.00	-16.35	-6.90	0.00	-271.1	0.00	271.13	2,952.93	703.08	1,886.97	1,699.39	0.05	-0.09	0.165
10.00	-15.56	-6.85	0.00	-236.6	0.00	236.65	2,836.12	675.27	1,740.71	1,566.63	0.19	-0.18	0.157
15.00	-14.81	-6.81	0.00	-202.4	0.00	202.38	2,719.31	647.46	1,600.35	1,439.27	0.42	-0.26	0.146
20.00	-14.07	-6.76	0.00	-168.3	0.00	168.34	2,602.51	619.64	1,465.89	1,317.30	0.74	-0.34	0.133
25.00	-13.37	-6.73	0.00	-134.5	0.00	134.52	2,485.70	591.83	1,337.33	1,200.74	1.14	-0.42	0.118
25.83	-13.26	-6.71	0.00	-128.9	0.00	128.91	2,466.23	587.20	1,316.48	1,181.84	1.21	-0.43	0.115
30.00	-11.49	-5.81	0.00	-101.0	0.00	100.96	1,747.69	416.12	925.24	835.13	1.61	-0.49	0.128
34.40	-10.24	-4.95	0.00	-75.4	0.00	75.41	1,674.27	398.64	849.16	765.99	2.09	-0.54	0.105
35.00	-10.18	-4.93	0.00	-72.4	0.00	72.44	1,664.26	396.25	839.04	756.80	2.16	-0.55	0.102
38.80	-9.06	-4.12	0.00	-53.7	0.00	53.71	1,600.85	381.15	776.35	699.85	2.61	-0.6	0.083
40.00	-8.95	-4.09	0.00	-48.8	0.00	48.77	1,580.82	376.39	757.06	682.32	2.77	-0.61	0.077
43.10	-8.11	-3.46	0.00	-36.1	0.00	36.08	1,529.09	364.07	708.35	638.09	3.17	-0.64	0.062
45.00	-7.94	-3.43	0.00	-29.5	0.00	29.51	1,497.39	356.52	679.29	611.71	3.43	-0.65	0.054
47.50	-7.21	-2.85	0.00	-20.9	0.00	20.93	1,455.67	346.59	641.99	577.85	3.78	-0.67	0.041
48.00	-4.91	-2.07	0.00	-19.5	0.00	19.51	1,447.33	344.60	634.66	571.19	3.85	-0.67	0.038
49.00	-4.79	-2.01	0.00	-17.4	0.00	17.44	1,430.64	340.63	620.11	557.99	3.99	-0.68	0.035
50.00	-3.71	-1.83	0.00	-15.4	0.00	15.43	1,413.95	336.66	605.74	544.95	4.13	-0.69	0.031
51.90	-3.26	-1.40	0.00	-12.0	0.00	11.95	1,382.25	329.11	578.89	520.59	4.41	-0.69	0.025
55.00	-3.06	-1.37	0.00	-7.6	0.00	7.62	1,330.52	316.79	536.40	482.04	4.86	-0.7	0.018
56.30	-2.68	-0.97	0.00	-5.8	0.00	5.83	1,308.83	311.63	519.06	466.32	5.05	-0.71	0.015
60.00	-2.45	-0.95	0.00	-2.2	0.00	2.23	1,247.08	296.92	471.27	423.00	5.6	-0.71	0.007
60.60	-2.23	-0.70	0.00	-1.7	0.00	1.66	1,237.07	294.54	463.74	416.17	5.69	-0.71	0.006
62.00	-0.33	-0.23	0.00	-0.7	0.00	0.69	1,213.71	288.98	446.40	400.46	5.9	-0.71	0.002
65.00	0.00	-0.23	0.00	0.0	0.00	0.00	1,163.65	277.06	410.36	367.81	6.35	-0.71	0.000

EQUIVALENT LATERAL FORCES METHOD ANALYSIS

(Based on ASCE7-16 Chapters 11, 12 and 15)

Spectral Response Acceleration for Short Period (S_s):	0.185
Spectral Response Acceleration at 1.0 Second Period (S_1):	0.059
Long-Period Transition Period (T_L – Seconds):	4
Importance Factor (I_e):	1.000
Site Coefficient F_a :	1.600
Site Coefficient F_v :	2.400
Response Modification Coefficient (R):	1.500
Design Spectral Response Acceleration at Short Period (S_{ds}):	0.197
Design Spectral Response Acceleration at 1.0 Second Period (S_{d1}):	0.094
Seismic Response Coefficient (C_s):	0.066
Upper Limit C_s :	0.066
Lower Limit C_s :	0.030
Period based on Rayleigh Method (sec):	0.960
Redundancy Factor (ρ):	1.000
Seismic Force Distribution Exponent (k):	1.230
Total Unfactored Dead Load:	17.170 k
Seismic Base Shear (E):	1.120 k

SEISMIC FORCES

Segment	Seismic	Height Above Base (ft)	Weight (lb)	W_z (lb-ft)	C_{vx}	Horizontal Force (lb)	Vertical Force (lb)
24		63.5	165	27	0.017	19	204
23		61.3	82	13	0.008	9	101
22		60.3	35	5	0.004	4	44
21		58.15	224	33	0.021	24	278
20		55.65	81	11	0.007	8	101
19		53.45	199	27	0.017	19	247
18		50.95	126	16	0.010	11	156
17		49.5	69	8	0.005	6	85
16		48.5	70	8	0.005	6	87
15		47.75	44	5	0.003	4	55
14		46.25	225	25	0.016	18	278
13		44.05	174	18	0.012	13	216
12		41.55	290	28	0.018	20	359
11		39.4	114	10	0.007	7	141
10		36.9	369	31	0.020	22	457
9		34.7	59	5	0.003	3	73
8		32.2	443	32	0.020	23	549
7		27.9167	898	54	0.034	38	1,113
6		25.4167	113	6	0.004	4	140
5		22.5	696	32	0.020	23	862
4		17.5	722	24	0.015	17	896
3		12.5	749	17	0.011	12	929
2		7.5	776	9	0.006	7	962
1		2.5	803	2	0.002	2	996
Vector 4' Branches		65	165	28	0.018	20	205
Vector 4' Branches		60.6	187	29	0.018	21	232
Fujitsu TA08025-B605		62	225	36	0.023	26	279
Fujitsu TA08025-B604		62	192	31	0.019	22	238
Raycap RDIDC-9181-PF-48 (19")		62	22	4	0.002	2	27
JMA Wireless MX08FRO665-21		62	194	31	0.020	22	240
Generic Flat Light Sector Frame		62	1,200	192	0.121	137	1,487
Vector 6' Branches		56.3	304	43	0.027	31	377
Vector 6' Branches		51.9	336	43	0.027	31	416
Powerwave Allgon 7770.00		50	70	9	0.005	6	87
Generic Round T-Arm		50	938	115	0.073	82	1,162
KMW AM-X-CD-16-65-00T-RET		49	48	6	0.004	4	60
Nokia AirScale RRH 4T4R B5 160W AHCA		48	106	12	0.008	9	131
Raycap DC6-48-60-18-8F(32.8 lbs)		48	66	8	0.005	5	81

SEISMIC FORCES

1.2D + 1.0Ev + 1.0Eh

Seismic

Segment	Height Above Base (ft)	Weight (lb)	W _z (lb-ft)	C _{vx}	Horizontal Force (lb)	Vertical Force (lb)
Alcatel-Lucent RRH2x40-07-L	48	157	18	0.012	13	195
Alcatel-Lucent B25 RRH4x30-4R	48	153	18	0.011	13	190
Nokia AirScale Dual RRH 4T4R B25/66 320W AHFIB (66.1lbs)	48	198	23	0.015	16	246
Nokia Flexi RRH 4T4R B14 160W FRBI	48	152	18	0.011	13	189
Alcatel-Lucent B66A RRH4x45-4R w/ Solar Shield	48	170	20	0.013	14	211
Raycap DC9-48-60-24-8C-EV (Enclosure)	48	18	2	0.001	2	23
Nokia B14/12/29 Triband RRH AHLBBA	48	304	36	0.022	25	377
KMW ET-X-UW-70-16-70-18-iR-AT-RA	48	146	17	0.011	12	180
Kathrein Scala 80010992	48	800	94	0.059	66	992
Vector 8' Branches	47.5	506	58	0.037	41	627
Vector 8' Branches	43.1	550	56	0.036	40	682
Vector 10' Branches	38.8	756	68	0.043	48	937
Vector 10' Branches	34.4	812	63	0.040	45	1,006
Vector 10' Branches	30	868	57	0.036	40	1,076
Totals:		17,170	1,586	1.000	1,125	21,282

SEISMIC FORCES

0.9D - 1.0Ev + 1.0Eh

Seismic (Reduced DL)

Segment	Height Above Base (ft)	Weight (lb)	W _z (lb-ft)	C _{vx}	Horizontal Force (lb)	Vertical Force (lb)
24	63.5	165	27	0.017	19	142
23	61.3	82	13	0.008	9	70
22	60.3	35	5	0.004	4	30
21	58.15	224	33	0.021	24	193
20	55.65	81	11	0.007	8	70
19	53.45	199	27	0.017	19	171
18	50.95	126	16	0.010	11	108
17	49.5	69	8	0.005	6	59
16	48.5	70	8	0.005	6	60
15	47.75	44	5	0.003	4	38
14	46.25	225	25	0.016	18	193
13	44.05	174	18	0.012	13	150
12	41.55	290	28	0.018	20	249
11	39.4	114	10	0.007	7	98
10	36.9	369	31	0.020	22	317
9	34.7	59	5	0.003	3	51
8	32.2	443	32	0.020	23	381
7	27.9167	898	54	0.034	38	773
6	25.4167	113	6	0.004	4	97
5	22.5	696	32	0.020	23	599
4	17.5	722	24	0.015	17	622
3	12.5	749	17	0.011	12	645
2	7.5	776	9	0.006	7	668
1	2.5	803	2	0.002	2	691
Vector 4' Branches	65	165	28	0.018	20	142
Vector 4' Branches	60.6	187	29	0.018	21	161
Fujitsu TA08025-B605	62	225	36	0.023	26	194
Fujitsu TA08025-B604	62	192	31	0.019	22	165
Raycap RDIDC-9181-PF-48 (19")	62	22	4	0.002	2	19
JMA Wireless MX08FRO665-21	62	194	31	0.020	22	167
Generic Flat Light Sector Frame	62	1,200	192	0.121	137	1,033
Vector 6' Branches	56.3	304	43	0.027	31	262
Vector 6' Branches	51.9	336	43	0.027	31	289
Powerwave Allgon 7770.00	50	70	9	0.005	6	60
Generic Round T-Arm	50	938	115	0.073	82	807
KMW AM-X-CD-16-65-00T-RET	49	48	6	0.004	4	42
Nokia AirScale RRH 4T4R B5 160W AHCA	48	106	12	0.008	9	91
Raycap DC6-48-60-18-8F(32.8 lbs)	48	66	8	0.005	5	56
Alcatel-Lucent RRH2x40-07-L	48	157	18	0.012	13	135
Alcatel-Lucent B25 RRH4x30-4R	48	153	18	0.011	13	132

SEISMIC FORCES

0.9D - 1.0Ev + 1.0Eh

Seismic (Reduced DL)

Segment	Height Above Base (ft)	Weight (lb)	W _z (lb-ft)	C _{vx}	Horizontal Force (lb)	Vertical Force (lb)
Nokia AirScale Dual RRH 4T4R B25/66 320W AHFIB (66.1lbs)	48	198	23	0.015	16	171
Nokia Flexi RRH 4T4R B14 160W FRBI	48	152	18	0.011	13	131
Alcatel-Lucent B66A RRH4x45-4R w/ Solar Shield	48	170	20	0.013	14	147
Raycap DC9-48-60-24-8C-EV (Enclosure)	48	18	2	0.001	2	16
Nokia B14/12/29 Triband RRH AHLBBA	48	304	36	0.022	25	262
KMW ET-X-UW-70-16-70-18-iR-AT-RA	48	146	17	0.011	12	125
Kathrein Scala 80010992	48	800	94	0.059	66	689
Vector 8' Branches	47.5	506	58	0.037	41	435
Vector 8' Branches	43.1	550	56	0.036	40	473
Vector 10' Branches	38.8	756	68	0.043	48	651
Vector 10' Branches	34.4	812	63	0.040	45	699
Vector 10' Branches	30	868	57	0.036	40	747
Totals:		17,170	1,586	1.000	1,125	14,776

1.2D + 1.0Ev + 1.0Eh

Seismic

CALCULATED FORCES

Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (fr-kips)	Mu Mx (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (kips)	Phi Mn (kips)	Total Deflect (in)	Rotation (deg)	Ratio
0.00	-20.29	-1.13	0.00	-53.71	0.00	53.71	3,069.74	730.89	2,039	1,837.56	0.00	0.00	0.04
5.00	-19.32	-1.12	0.00	-48.08	0.00	48.08	2,952.93	703.08	1,887	1,699.39	0.01	-0.02	0.04
10.00	-18.39	-1.12	0.00	-42.46	0.00	42.46	2,836.12	675.27	1,741	1,566.63	0.03	-0.03	0.03
15.00	-17.50	-1.10	0.00	-36.88	0.00	36.88	2,719.31	647.46	1,600	1,439.27	0.07	-0.05	0.03
20.00	-16.64	-1.08	0.00	-31.37	0.00	31.37	2,602.51	619.64	1,466	1,317.30	0.13	-0.06	0.03
25.00	-16.50	-1.08	0.00	-25.94	0.00	25.94	2,485.70	591.83	1,337	1,200.74	0.20	-0.08	0.03
25.83	-15.38	-1.04	0.00	-25.04	0.00	25.04	2,466.23	587.20	1,316	1,181.84	0.22	-0.08	0.03
30.00	-13.76	-0.98	0.00	-20.69	0.00	20.69	1,747.69	416.12	925	835.13	0.29	-0.09	0.03
34.40	-12.68	-0.93	0.00	-16.37	0.00	16.37	1,674.27	398.64	849	765.99	0.38	-0.10	0.03
35.00	-12.22	-0.91	0.00	-15.81	0.00	15.81	1,664.26	396.25	839	756.80	0.39	-0.10	0.03
38.80	-11.14	-0.85	0.00	-12.35	0.00	12.35	1,600.85	381.15	776	699.85	0.48	-0.11	0.03
40.00	-10.78	-0.84	0.00	-11.33	0.00	11.33	1,580.82	376.39	757	682.32	0.51	-0.12	0.02
43.10	-9.89	-0.78	0.00	-8.74	0.00	8.74	1,529.09	364.07	708	638.09	0.58	-0.12	0.02
45.00	-9.61	-0.76	0.00	-7.25	0.00	7.25	1,497.39	356.52	679	611.71	0.63	-0.13	0.02
47.50	-8.93	-0.72	0.00	-5.34	0.00	5.34	1,455.67	346.59	642	577.85	0.70	-0.13	0.02
48.00	-6.02	-0.52	0.00	-4.99	0.00	4.99	1,447.33	344.60	635	571.19	0.72	-0.13	0.01
49.00	-5.88	-0.51	0.00	-4.47	0.00	4.47	1,430.64	340.63	620	557.99	0.74	-0.13	0.01
50.00	-4.47	-0.40	0.00	-3.96	0.00	3.96	1,413.95	336.66	606	544.95	0.77	-0.13	0.01
51.90	-3.81	-0.35	0.00	-3.20	0.00	3.20	1,382.25	329.11	579	520.59	0.83	-0.14	0.01
55.00	-3.71	-0.34	0.00	-2.10	0.00	2.10	1,330.52	316.79	536	482.04	0.92	-0.14	0.01
56.30	-3.06	-0.29	0.00	-1.66	0.00	1.66	1,308.83	311.63	519	466.32	0.95	-0.14	0.01
60.00	-3.01	-0.28	0.00	-0.59	0.00	0.59	1,247.08	296.92	471	423.00	1.06	-0.14	0.00
60.60	-2.68	-0.25	0.00	-0.42	0.00	0.42	1,237.07	294.54	464	416.17	1.08	-0.14	0.00
62.00	-0.20	-0.02	0.00	-0.06	0.00	0.06	1,213.71	288.98	446	400.46	1.12	-0.14	0.00
65.00	0.00	-0.02	0.00	0.00	0.00	0.00	1,163.65	277.06	410	367.81	1.21	-0.14	0.00

0.9D - 1.0Ev + 1.0Eh

Seismic (Reduced DL)

CALCULATED FORCES

Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (fr-kips)	Mu Mx (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (kips)	Phi Mn (kips)	Total Deflect (in)	Rotation (deg)	Ratio
0.00	-14.08	-1.12	0.00	-53.42	0.00	53.42	3,069.74	730.89	2,039	1,837.56	0.00	0.00	0.03
5.00	-13.42	-1.12	0.00	-47.80	0.00	47.80	2,952.93	703.08	1,887	1,699.39	0.01	-0.02	0.03
10.00	-12.77	-1.11	0.00	-42.19	0.00	42.19	2,836.12	675.27	1,741	1,566.63	0.03	-0.03	0.03
15.00	-12.15	-1.10	0.00	-36.62	0.00	36.62	2,719.31	647.46	1,600	1,439.27	0.07	-0.05	0.03
20.00	-11.55	-1.08	0.00	-31.13	0.00	31.13	2,602.51	619.64	1,466	1,317.30	0.13	-0.06	0.03
25.00	-11.45	-1.08	0.00	-25.74	0.00	25.74	2,485.70	591.83	1,337	1,200.74	0.20	-0.08	0.03
25.83	-10.68	-1.04	0.00	-24.85	0.00	24.85	2,466.23	587.20	1,316	1,181.84	0.22	-0.08	0.03
30.00	-9.55	-0.97	0.00	-20.53	0.00	20.53	1,747.69	416.12	925	835.13	0.29	-0.09	0.03
34.40	-8.80	-0.93	0.00	-16.24	0.00	16.24	1,674.27	398.64	849	765.99	0.38	-0.10	0.03

CALCULATED FORCES

Seg Elev (ft)	Pu FY (-) (kips)	Vu FX (-) (kips)	Tu MY (ft-kips)	Mu MZ (fr-kips)	Mu Mx (ft-kips)	Resultant Moment (ft-kips)	Phi Pn (kips)	Phi Vn (kips)	Phi Tn (kips)	Phi Mn (kips)	Total Deflect (in)	Rotation (deg)	Ratio
35.00	-8.48	-0.90	0.00	-15.68	0.00	15.68	1,664.26	396.25	839	756.80	0.39	-0.10	0.03
38.80	-7.74	-0.85	0.00	-12.25	0.00	12.25	1,600.85	381.15	776	699.85	0.47	-0.11	0.02
40.00	-7.49	-0.83	0.00	-11.23	0.00	11.23	1,580.82	376.39	757	682.32	0.50	-0.12	0.02
43.10	-6.86	-0.77	0.00	-8.66	0.00	8.66	1,529.09	364.07	708	638.09	0.58	-0.12	0.02
45.00	-6.67	-0.76	0.00	-7.19	0.00	7.19	1,497.39	356.52	679	611.71	0.63	-0.13	0.02
47.50	-6.20	-0.71	0.00	-5.30	0.00	5.30	1,455.67	346.59	642	577.85	0.70	-0.13	0.01
48.00	-4.18	-0.51	0.00	-4.95	0.00	4.95	1,447.33	344.60	635	571.19	0.71	-0.13	0.01
49.00	-4.08	-0.50	0.00	-4.43	0.00	4.43	1,430.64	340.63	620	557.99	0.74	-0.13	0.01
50.00	-3.11	-0.40	0.00	-3.93	0.00	3.93	1,413.95	336.66	606	544.95	0.77	-0.13	0.01
51.90	-2.65	-0.35	0.00	-3.17	0.00	3.17	1,382.25	329.11	579	520.59	0.82	-0.14	0.01
55.00	-2.58	-0.34	0.00	-2.09	0.00	2.09	1,330.52	316.79	536	482.04	0.91	-0.14	0.01
56.30	-2.12	-0.29	0.00	-1.64	0.00	1.64	1,308.83	311.63	519	466.32	0.95	-0.14	0.01
60.00	-2.09	-0.28	0.00	-0.58	0.00	0.58	1,247.08	296.92	471	423.00	1.06	-0.14	0.00
60.60	-1.86	-0.25	0.00	-0.41	0.00	0.41	1,237.07	294.54	464	416.17	1.07	-0.14	0.00
62.00	-0.14	-0.02	0.00	-0.06	0.00	0.06	1,213.71	288.98	446	400.46	1.12	-0.14	0.00
65.00	0.00	-0.02	0.00	0.00	0.00	0.00	1,163.65	277.06	410	367.81	1.20	-0.14	0.00

ANALYSIS SUMMARY

Load Case	Base Reactions						Max Usage	
	Shear FX (kips)	Shear FZ (kips)	Axial FY (kips)	Moment MX (ft-kips)	Moment MY (ft-kips)	Moment MZ (ft-kips)	Elev (ft)	Interaction Ratio
1.2D + 1.0W	36.42	0.00	20.45	0.00	0.00	1608.11	0.00	0.88
0.9D + 1.0W	36.39	0.00	15.30	0.00	0.00	1601.24	0.00	0.88
1.2D + 1.0Di + 1.0Wi	6.01	0.00	21.12	0.00	0.00	264.40	0.00	0.15
1.2D + 1.0Ev + 1.0Eh	1.13	0.00	20.29	0.00	0.00	53.71	0.00	0.04
0.9D - 1.0Ev + 1.0Eh	1.12	0.00	14.08	0.00	0.00	53.42	0.00	0.03
1.0D + 1.0W	6.94	0.00	17.16	0.00	0.00	305.81	0.00	0.17

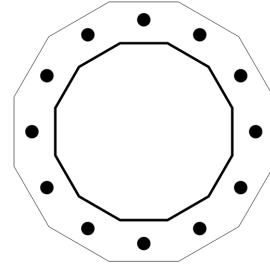
BASE PLATE ANALYSIS @ 0 FT

APPLIED REACTIONS

Moment (k-ft)	Axial (k)	Shear (k)
1608.11	20.45	36.42

PLATE PARAMETERS (ID# 20853)

Width:	43.56	in
Shape:	12	
Thickness:	2.75	in
Grade:	A633 Gr. E	
Yield Strength:	60	ksi
Tensile Strength:	80	ksi
Rod Detail Type:	d	
Clear Distance	2.375	in
Base Weld Size:	0.125	in
Orientation Offset:	15	°
Analysis Type:	Plastic	
Neutral Axis:	60	°



ANCHOR ROD PARAMETERS

Class	Arrangement	Quantity	Diameter (in)	Circle (in)	Grade	F _y (ksi)	F _u (ksi)	Spacing (in)	Offset (°)
Original [ID#21403]	Radial	12	2.25	37.56	A615-75	75	100	-	-

COMPONENT PROPERTIES

Component	ID	Gross Area (in ²)	Net Area (in ²)	Individual Inertia (in ⁴)	Moment of Inertia (in ⁴)	Threads/in
Pole	30"ø x 0.4375" (12 Sides)	40.1695	-	-	4390.81	-
Bolt Group	Original (12) 2.25"ø	3.9761	3.2477	0.8393	5955.56	4.5

REACTION DISTRIBUTION

Component	ID	Moment M _u (k-ft)	Axial Load P _u (k)	Shear V _u (k)	Moment Factor
Pole	30"ø x 0.4375" (12 Sides)	1608.1	20.45	36.42	1.000
Bolt Group	Original (12) 2.25"ø	1608.1	-	36.42	1.000

BASE PLATE BEND LINE ANALYSIS @ 0 FT

POLE PROPERTIES

Flat-to-Flat Diameter:	30.12	in
Point-to-Point Diameter:	31.19	in
Orientation Offset:	15	°

Flat Width:	8.072	in
Flat Radians:	0.524	rad

PLATE PROPERTIES

Neutral Axis:	60	°
Bend Line Limits:	1.828 to 3.408	rad

Bend Line	Chord Length (in)	Additional Length (in)	Section Modulus (in ³)	Applied Moment M _u (k-in)	Moment Capacity ΦM _n (k-in)	Flexure Result M _u /ΦM _n
Flats	27.738	0.00	52.442	467.0	2831.9	16.5%
Corners	26.537	0.00	50.172	347.6	2709.3	12.8%
Circumferential	39.835	0.00	75.313	950.5	4066.9	23.4%

PLASTIC ANCHOR ROD ANALYSIS

Class	Group Quantity	Rod Diameter (in)	Applied Axial Load P _u (k)	Applied Shear Load V _u (k)	Compressive Capacity ΦP _n (k)	Interaction Result
Original	12	2.25	151.5	4.9	243.6	66.2%

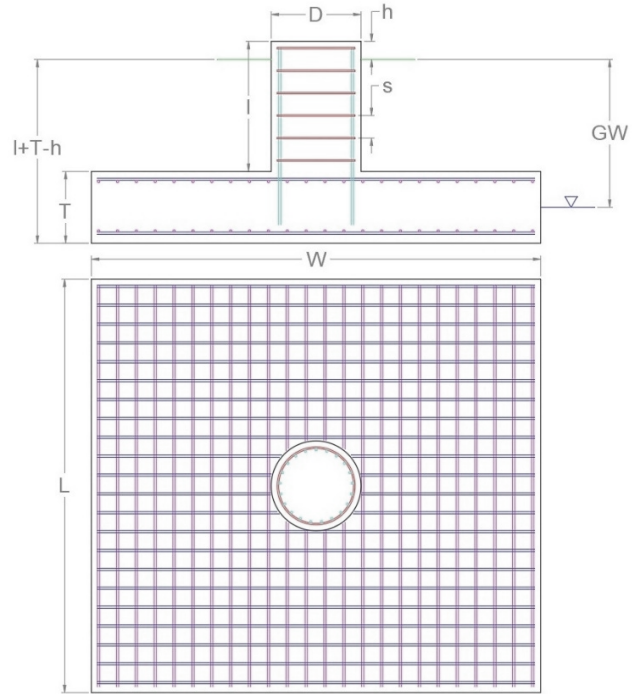
MONOLITHIC MAT & PIER FOUNDATION ANALYSIS

APPLIED GLOBAL REACTIONS

Moment (k-ft)	Axial (k)	Shear (k)
1,608.11	20.45	36.42

FOUNDATION PARAMETERS

Mat Length:	L	19	ft
Mat Width:	W	19	ft
Mat Thickness:	T	3	ft
Base Depth:	L+T-h	5	ft
Pier Shape:		Square	
Pier Width:	D	5	ft
Pier Height above Grade:	h	1.5	ft
Concrete Compressive Strength:		3,000	psi
Mat Top Rebar:		(18) #6 bars [60 ksi]	
Mat Bottom Rebar:		(18) #8 bars [60 ksi]	
Pier Vertical Rebar:		(16) #9 bars [60 ksi]	
Pier Rebar Ties:	s	#3 bars @ 16.0" c/c [40 ksi]	
Rebar Clear Cover:		3.0	in
Tower Eccentricity:	ecc	0	ft
Tower Leg Count		1	



SOIL PARAMETERS

Water Table Depth [BGL]:	GW	ft
Soil Unit Weight:	117	pcf
Ultimate Skin Friction:	0	psf
Ultimate Bearing Pressure:	6,000	psf
Bearing Pressure Type:	Gross	
Coefficient of Shear Friction:	0.2	

SOIL STRENGTH ANALYSIS

Soil Strength Reduction Factor, Φ_s	Uplift Strength Reduction Factor, Φ_s	Asset Dead Load Factor	Dead Load Factor
0.75	0.75	0.9	1.2

SOIL OVERTURNING ANALYSIS

Design Moment, $M_{u,Design}$ (k-ft)	Nominal Overturning Capacity, $\Phi_m M_n$ (k-ft)	Soil Overturning Usage, $M_{u,Design} / \Phi_m M_n$
1,844.84	2,453.96	75.2% ✔

SOIL BEARING ANALYSIS

Net Bearing Pressure, $P_{u,Net}$ (psf)	Nominal Bearing Capacity, $\Phi_b P_n$ (psf)	Bearing Pressure Controlling Load Direction	Soil Bearing Usage, $P_{u,net} / \Phi_b P_n$
2,698.00	4,500.00	Diagonal to Pad Edge	60.0% ✔

SOIL SLIDING SHEAR ANALYSIS

Applied Shear Force, V_u (k)	Friction Resistance (k)	Passive Pressure (psf)	Passive Pressure Resistance (k)	Nominal Shear Capacity, $\Phi_s V_n$ (k)	Soil Sliding Shear Usage, $V_u / \Phi_s V_n$
36.42	54.25	409.5	23.34	58.19	63.0% ✔

MAT REINFORCING STEEL STRENGTH ANALYSIS

Steel Elastic Modulus, E (ksi)	Strength Bending/Tension Reduction Factor, Φ_b	Strength Shear Reduction Factor, Φ_v	Strength Compression Reduction Factor, Φ_c
29,000	0.9	0.75	0.65

MAT REINFORCING ONE WAY SHEAR ANALYSIS

One Way Design Shear, V_u (k)	Nominal One Way Shear Capacity, $\Phi_c V_n$ (k)	One Way Shear Controlling Load Direction	Mat One Way Shear Usage, $V_u / \Phi_c V_n$
144.48	521.71	Diagonal to Pad Edge	27.7%

MAT REINFORCING PUNCHING SHEAR ANALYSIS

Punching Shear Design Stress, v_u (psi)	Nominal Punching Shear Capacity, $\Phi_c v_n$ (psi)	Mat Punching Shear Usage, $v_u / \Phi_c v_n$
25.5	164.3	15.5%

MAT REINFORCING MOMENT TRANSFER ANALYSIS

Moment Transfer Effective Flexural Width, w_t (in)	Neutral Axis Depth (in)	Pier Moment at Joint, M_{ut} (k-in)	Nominal Moment Transfer Capacity, $\Phi M_{sc,f}$ (k-in)	Mat Moment Transfer Usage, $0.6 M_{ut} / \Phi M_{sc,f}$
14.00	1.54	0.00	18,579.6	0.0%

MAT REINFORCING FLEXURE ANALYSIS – UPPER STEEL

Factored Moment, M_u (k-ft)	Nominal Flexural Capacity, ΦM_n (k-ft)	Flexural Steel Controlling Load Direction	Mat Upper Rebar Flexure Usage, $M_u / \Phi M_n$
318.40	1,128.10	Parallel to Pad Edge	28.2%

MAT REINFORCING FLEXURE ANALYSIS – LOWER STEEL

Factored Moment, M_u (k-ft)	Nominal Flexural Capacity, ΦM_n (k-ft)	Flexural Steel Controlling Load Direction	Mat Lower Rebar Flexure Usage, $M_u / \Phi M_n$
914.00	2,007.77	Parallel to Pad Edge	45.5%

PIER REINFORCING STEEL STRENGTH ANALYSIS

Rebar Cage Diameter (in)	Steel Elastic Modulus, E (ksi)	Strength Bending/Tension Reduction Factor, Φ_b	Strength Shear Reduction Factor, Φ_v	Strength Compression Reduction Factor, Φ_c
52.12	29,000	0.9	0.75	0.65

PIER REINFORCING MOMENT ANALYSIS

Design Moment, M_u (k-ft)	Nominal Moment Capacity, $\Phi_b M_n$ (k-ft)	Bending Reinforcement Ratio	Pier Rebar Flexure Usage, $M_u / \Phi_b M_n$
1,735.58	1,842.29	0.004	94.2%

PIER REINFORCING COMPRESSION ANALYSIS

Design Compression, P_u (k)	Nominal Compressive Capacity, $\Phi_p P_n$ (k)	Pier Rebar Compressive Usage, $P_u / \Phi_p P_n$
20.45	4,783.58	0.4%

PIER REINFORCING SHEAR ANALYSIS

Design Shear, V_u (k)	Nominal Shear Capacity, $\Phi_v V_n$ (k)	Pier Rebar Shear Usage, $V_u / \Phi_v V_n$
36.42	316.41	11.5%