TECHNICAL ASSIGNMENT THREE

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Structural Option
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Executive Summary

The purpose of this technical assignment is to analyze the lateral system of the Borgata Hotel Tower. In this analysis, design loads will be determined and applied to the lateral force resisting members. ETABS and PCA Column will be used as aides in this analysis.

The Borgata Hotel Tower is a 43 story tower that sits atop a low rise casino. The hotel serves guest rooms for the casino and spa. The tower rises 453 feet above the base level of the building to the top of the parapet.

The structural system is made of a grid of concrete columns and walls supporting post-tensioned slabs. The walls are also the lateral force resisting system.

Lateral loads from wind and seismic were calculated using procedures outlined in ASCE 7-05. Wind load is the controlling force in the North-South direction, and seismic load is the controlling force in the East-West direction. The different loadings controlling in each direction is a result of the long narrow plan of the building. The total base shear due to wind load is calculated as 9,592 kips and the base shear due to seismic loads is calculated as 2,142kips.

Though seismic load creates a larger base shear in the East-West direction, different load cases for wind were considered since substantial torsion is produced due to different wind load cases and asymmetry in stiffness distribution. The maximum torsion at the base of the building was found to be 2,209,300 k-ft creating by the application of full wind force in the North-South direction.

The maximum allowable drift in the building is base on an H/400 limitation. The maximum drift in the North-South direction was found to be 11.42in. This drift is a result of the application of full wind load in the North-South direction. The maximum drift in the East-West direction was found to be 7.10 inches. The drift is a result of the application of seismic load in the East-West direction.

After the analysis of lateral loads, shear walls were modeled using PCA Column. Using these models and some hand calculation, nominal strength for axial, flexural and shear forces were obtained. According to these hand calculations the shear walls hand adequate strength for all forces.

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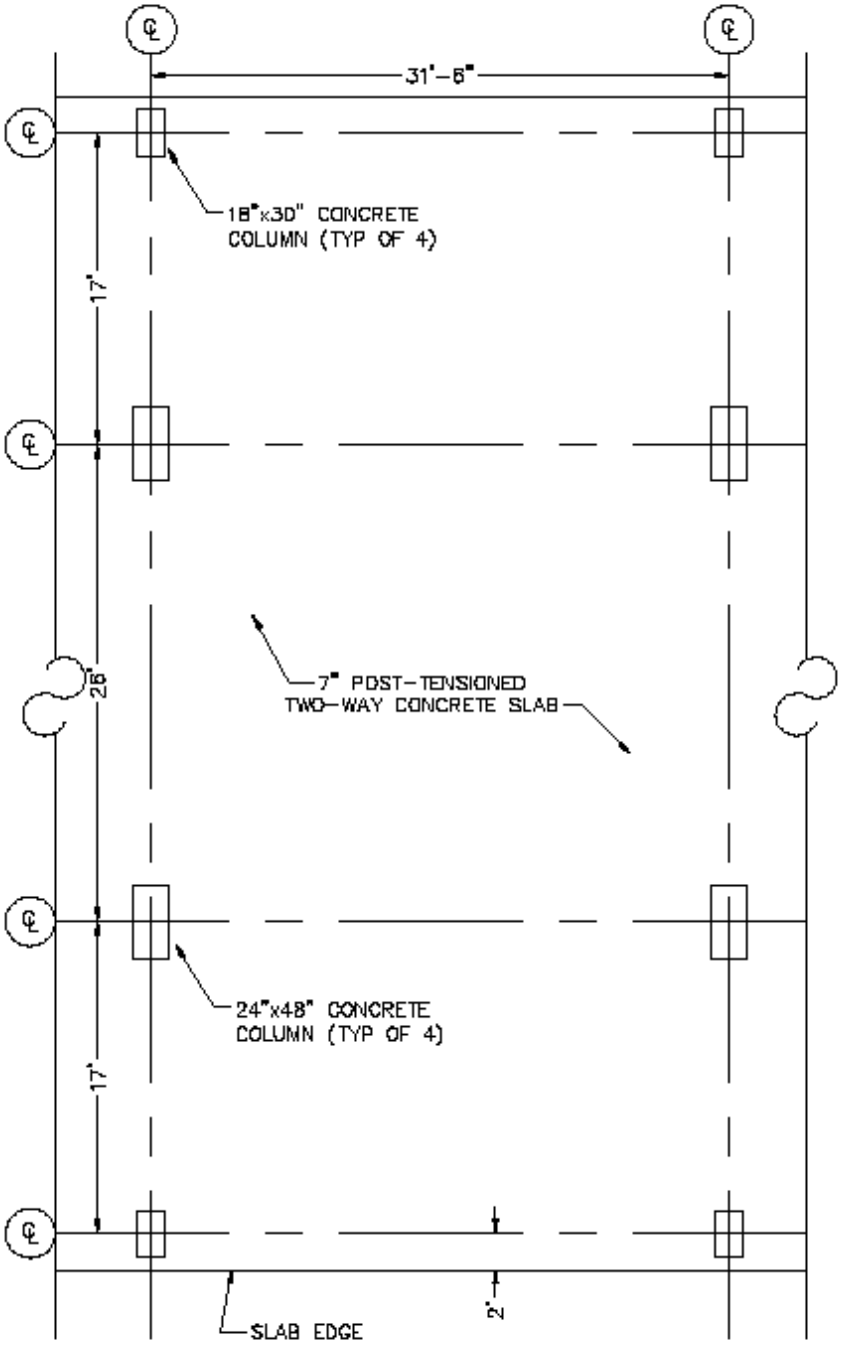
Existing Structural System

Floor System

The typical floor is supported by a post-tensioned concrete slab system. The concrete is normal weight (145 pcf dry unit weight) and has a minimum 28 day strength of 5000 psi. The slab is 7” thick at the center of the building, and 8 ½” thick at each end where the floor plan is circular in shape. The typical bay sizes are 30’-0” X 26’-0” and 30’-0” X 17’-0”. There is variation in span sizes at the ends of the building. Post-tensioned cables are to conform to ASTM A-416 and shall be Grade A or Grade B and are loaded with varying forces from 50 to 900 kips. The non typical floors are a mix of post-tensioned systems with a thicker slab, and two way flat slabs with drop panels. The figure to the right shows the typical bay sizes along the building. A full typical floor plan can be found in the appendix.



TWO-WAY POST TENSIONED SLAB

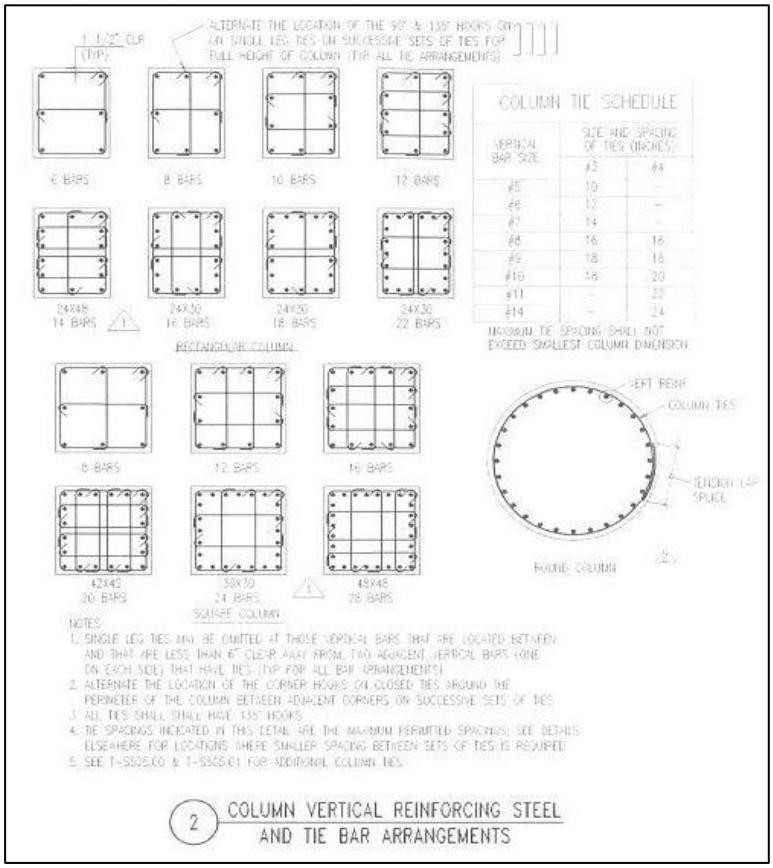
Roof System: The flat roof slab is similar to the typical floor slab. It is a post-tensioned system, but the slab is 8 ½" thick for the entire slab. The roof slab supports most of the buildings mechanical equipment as well as catwalks used to access the mechanical equipment.

Foundation: The Borgata Hotel is located on the site of a former landfill. The dump was not excavated and the soil below the dump is a combination of marine tidal marsh and clay/sand seams. A deep foundation system was chosen for the building. The transfers gravity and lateral loads to the earth through concrete filled steel tube piles. The piles are 16" in diameter and contain reinforced concrete. Piles are driven to various depths until reaching very dense sand. Columns bear directly on pile caps which vary in size. In some cases at shear walls, the walls and columns bear on 9'-0" concrete pile mats. The slab on grade is a 1'-6" thick structural two-way slab. This slab spans between piles caps since the soil below (landfill) has no bearing capacity.

Lateral System: The structure is laterally supported by reinforced high strength concrete shear walls. There are a total of 11 shear walls. There are 9 walls in the North-South direction and 2 walls in the East-West direction. The shear walls also assume gravity load from the floors. The concrete is normal weight and has a minimum strength of 9000psi. Most of the shear walls extend to the top of the roof, but some stop at lower levels. The layout of the shear walls can be seen on the typical floor plan in the appendix.

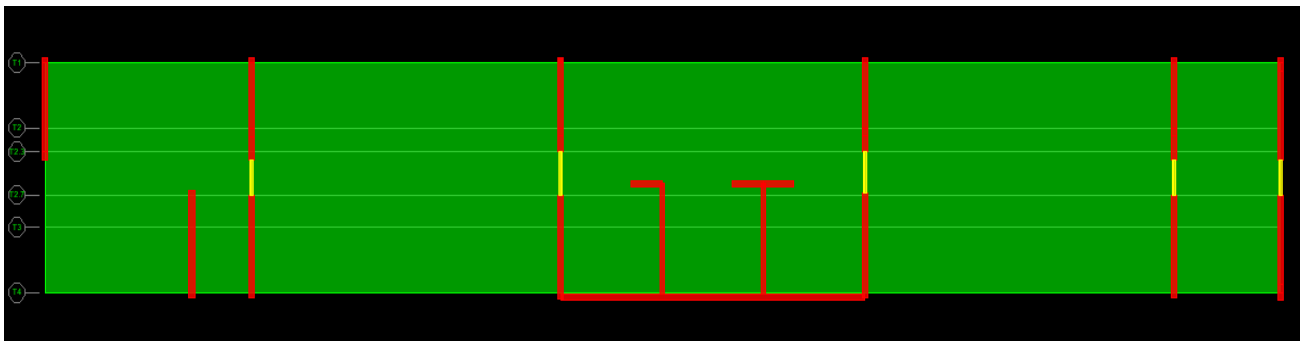
Columns: Columns are cast-in-place concrete with strengths that vary depending on stories. Below, table one contains the column concrete strengths for the various stories. The figure to the right shows the typical column sizes and common reinforcing arrangements.

Concrete Compressive Strengths		
Stories	f'c	Time
Level B -12	9000 psi	@56 days
Level 12 – 23	7000 psi	@56 days
Level 23 and up	5000 psi	@28 days



Lateral System

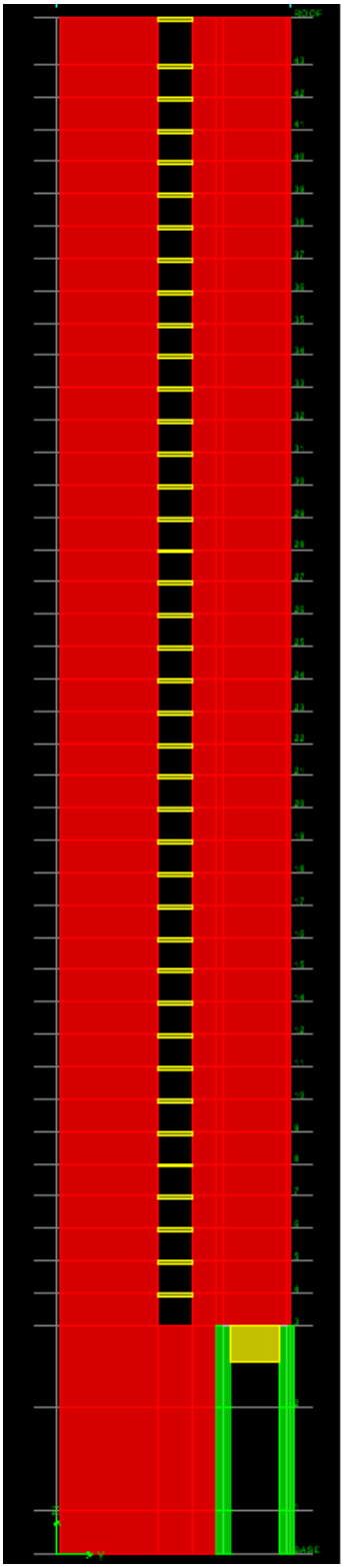
The lateral force resisting system is composed of nine shear walls in the North-South direction and two shear walls in the East-West direction. The shear walls in the north south direction vary in size and design. Five of the shear walls are solid walls from bottom to top. The other shear walls sit on top of a hybrid of wall and columns. The typical columns supporting these shear walls are 48”x48” and 54” diameter. Above floor 3, these walls are composed of two projections coupled together at each story with wide flange beams. The East-West direction only contains two shear walls. The main wall changes length, getting smaller as you go down the building. From the top, the wall starts at about thirty feet long. At floor 34, the wall steps up to a length of about sixty feet. At floor 21 there is another step, where the wall reaches its max length of about 90ft. This wall is so large because it assumes almost the entire lateral load in the East-West direction. The secondary shear wall in the East-West direction is the same size as the primary shear wall from the base up to floor 3. Above floor 3, this wall is composed of two small concrete projections that go up the tower. The shorter of the projections is eighteen feet long, but steps down to 9’-1” at floor 21, then stops completely at floor 36. The second projection is 9’-8” long and rises to a few feet past the roof level. The purpose of these shear walls is assumed to act as flange members for the shear walls in the North-South direction that are poured continuous with it. The pictures on the next pages are elevations of each of the shear walls.



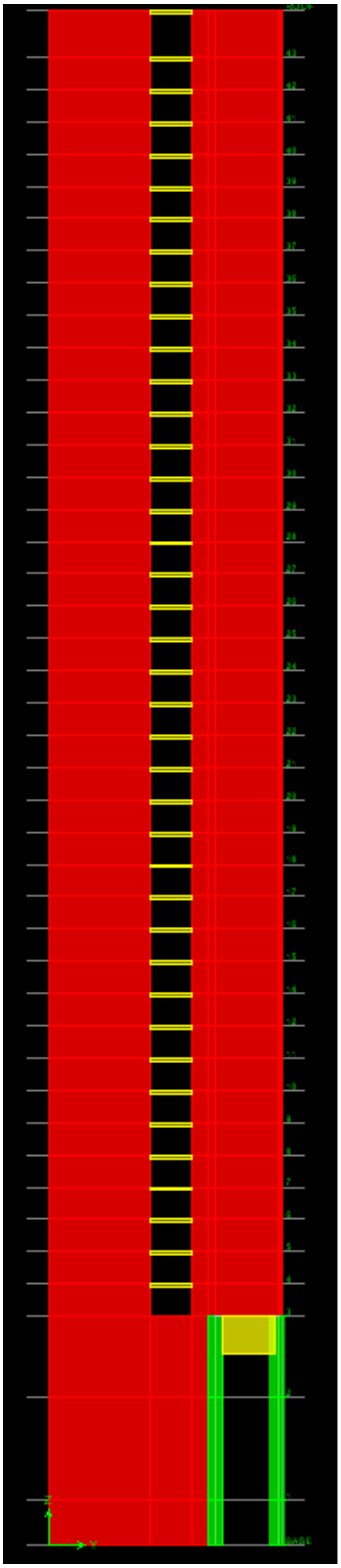
Shear Wall Plan

Shear Wall Elevations

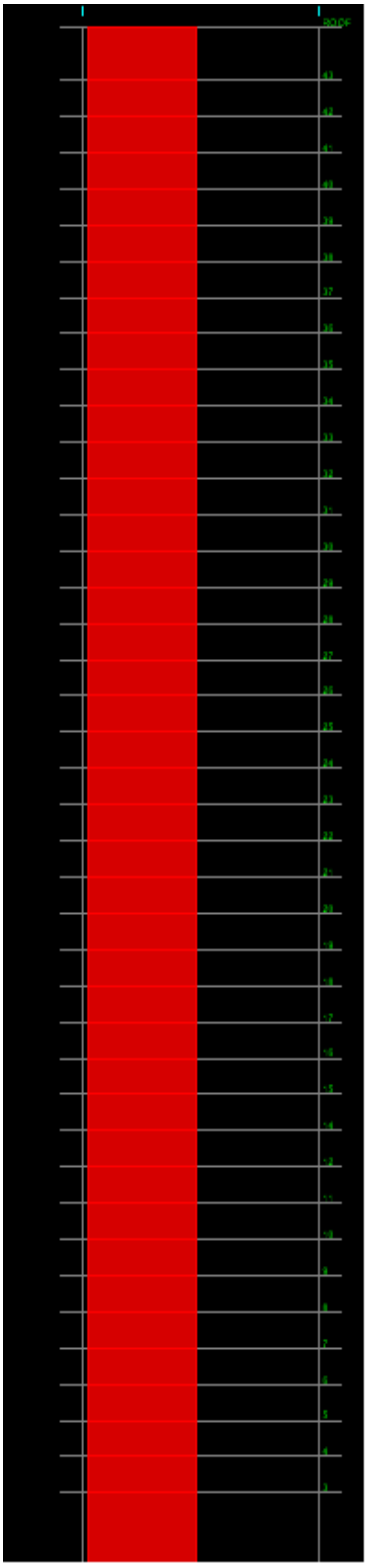
Shear Wall 1
North South



Shear Wall 2
North-South

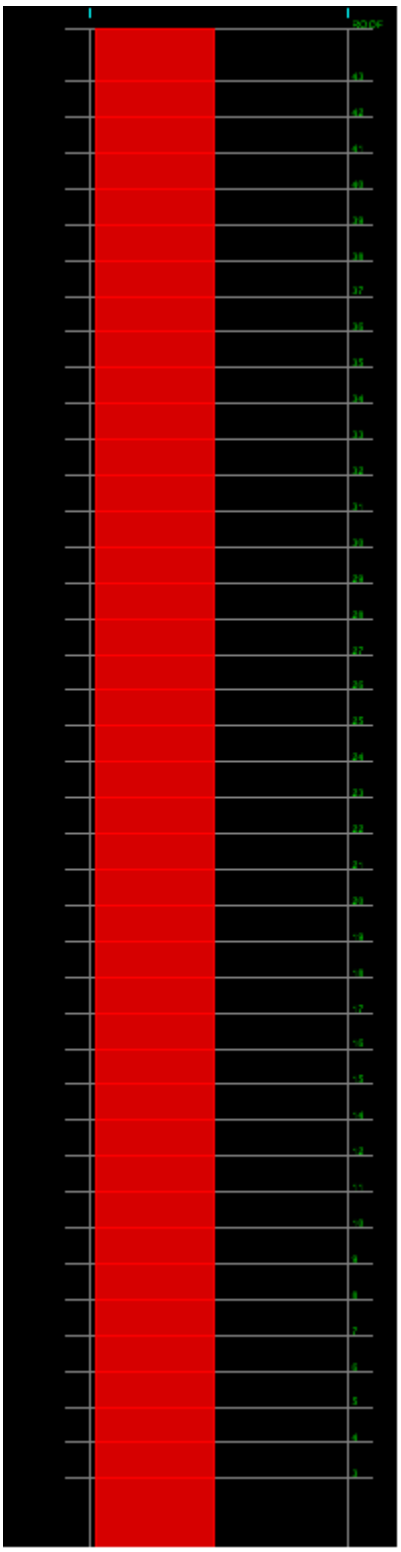


Shear Wall 3
North-South

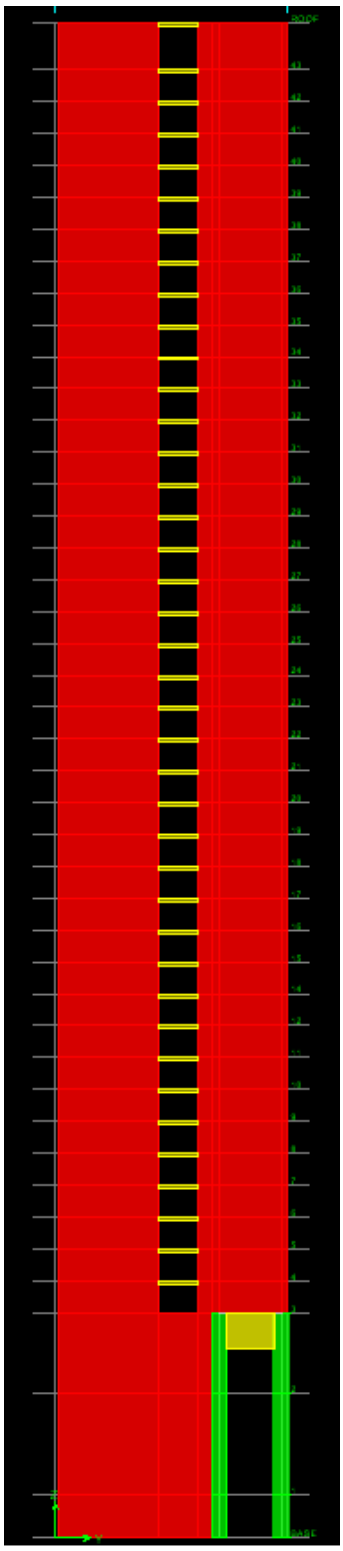


Shear Wall Elevations

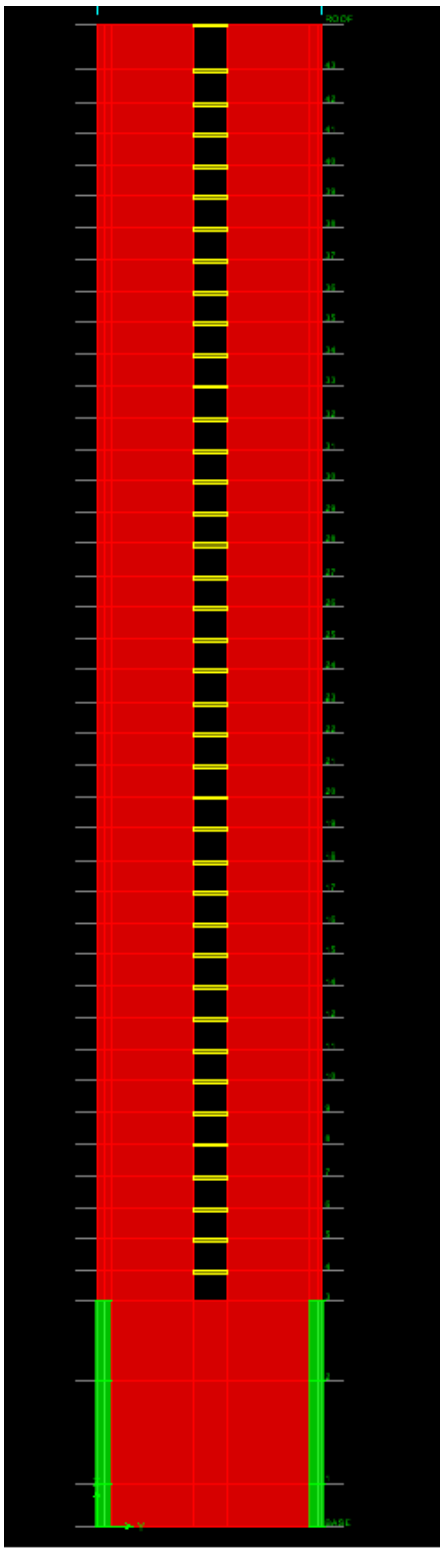
Shear Wall 4
North-South



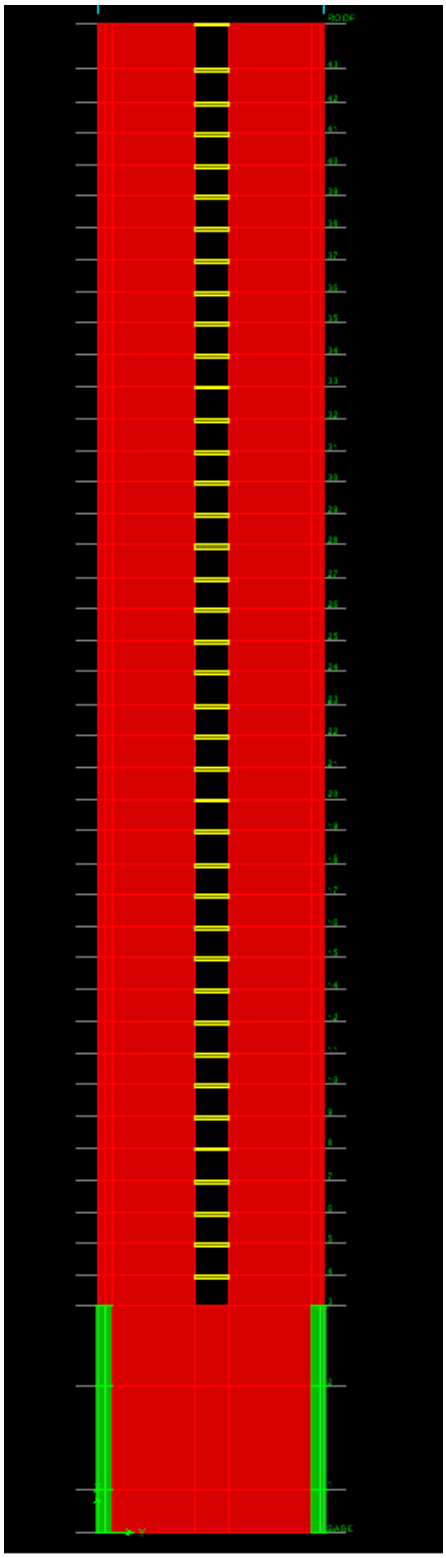
Shear Wall 5
North-South



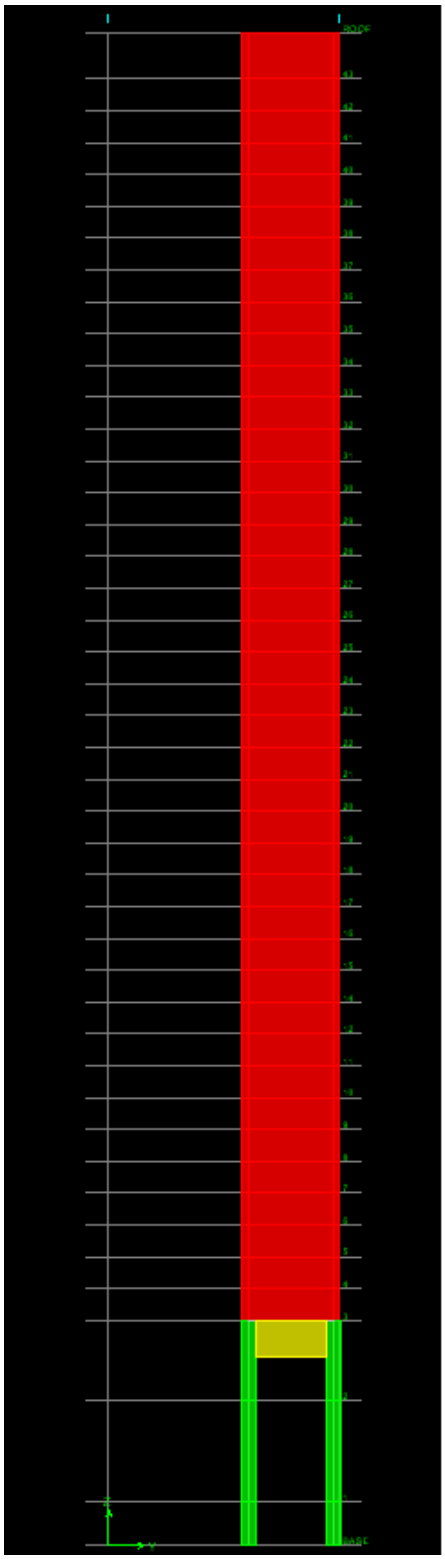
Shear Wall 6
North-South



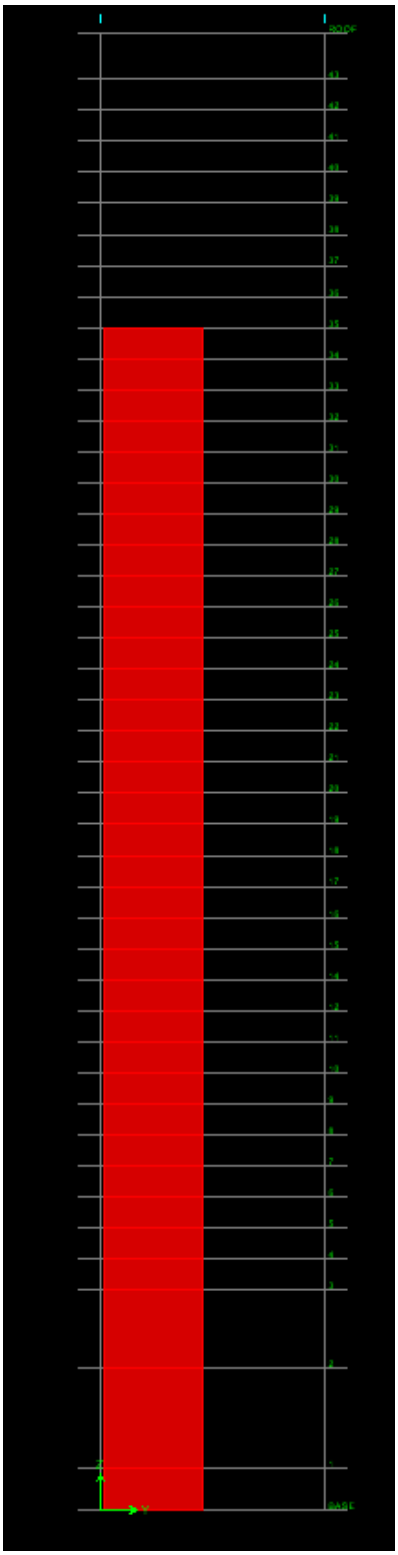
Shear Wall 7
North-South



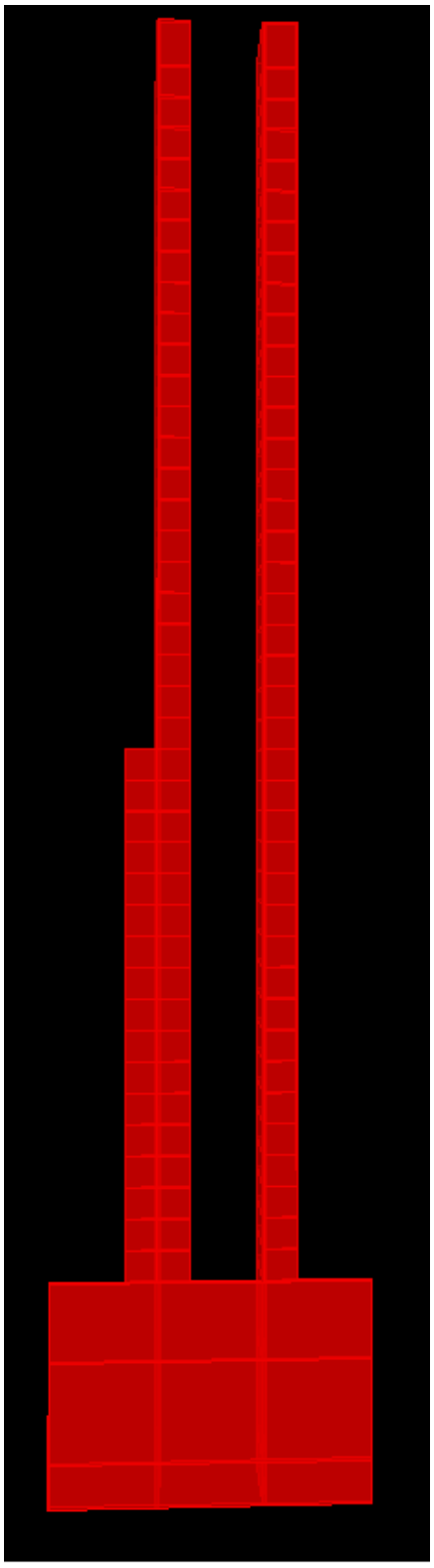
Shear Wall 10
North-South



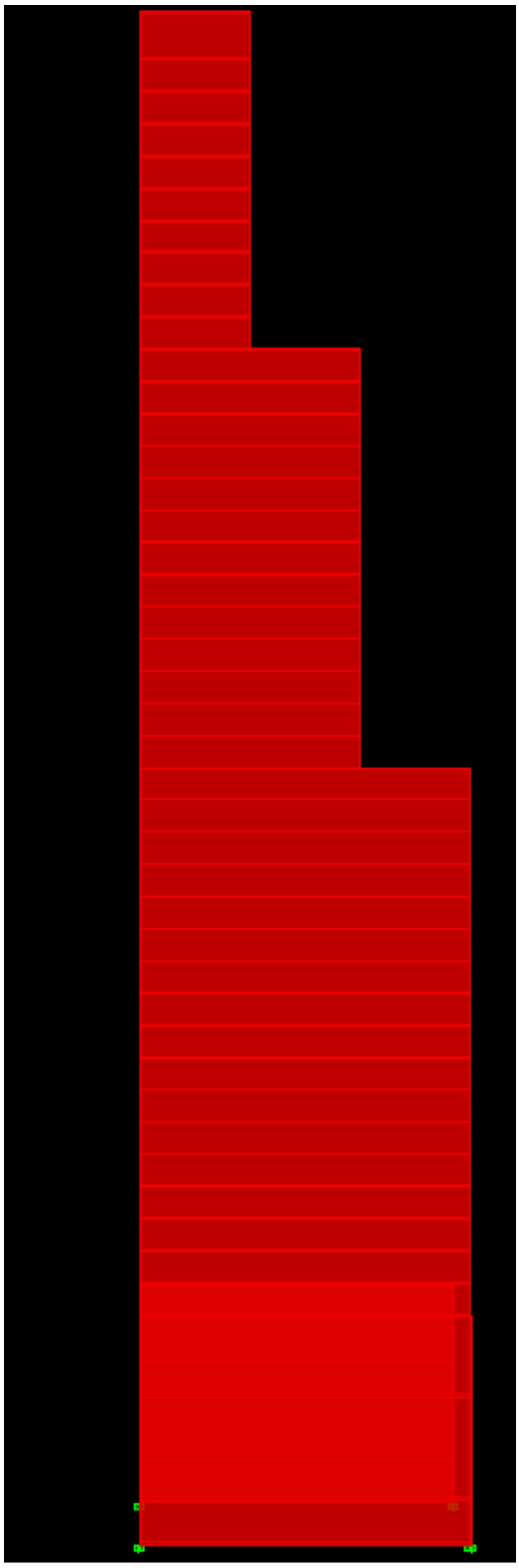
Shear Wall 11
North-South



Shear Wall 8
East-West



Shear Wall 9
East-West



Dead Loads

Slab	85, 103 psf
Partitions	15 psf

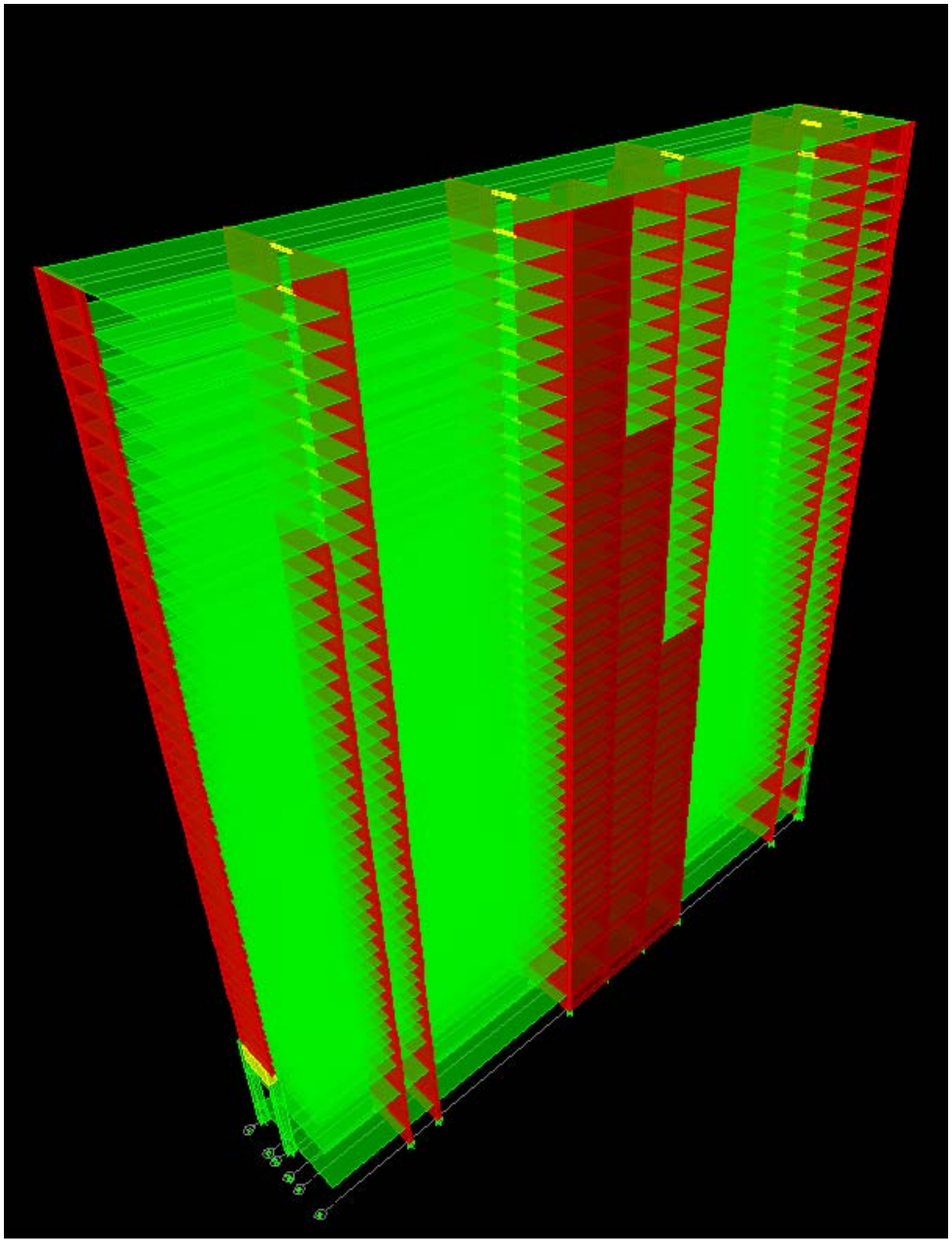
Live Loads

Guest Rooms	40 psf
Guest Hallways	40 psf
Elevators/Stairs/Exits	100 psf
Casino Floor	100 psf
Casino Corridor	100 psf
Mechanical – Basement	150 psf
Mechanical – Roof	150 psf

Lateral Analysis

To analyze the lateral loads of the building, a model was created using ETABS. In the ETABS model, only shear walls and diaphragms were modeled. Columns were neglected for ease of creating the model and running the analysis. Wind and Seismic loads were calculated and entered into the model for analysis and distribution. After loads were distributed to each shear wall, a shear wall was spot checked for strength. Axial and flexural strengths were checked using PCA Column and shear strength was checked with hand calculation.

ETABS Model



Wind Loads

Wind load analysis was performed using Method 2 – Analytical Procedure, outlined in Chapter 6 of ASCE 7-05.The table to the right lists the design criteria summary. The building was assumed to act as a cantilever and the base shear was the summation of the forces at each story. For ease of calculation, the building was assumed to be a rectangle with dimensions 510'-0" x 107'-0". The building is classified as a "dynamically sensitive structure" because calculation of the approximate period, using equation 12.8-7 of ASCE 7-05, shows the period is larger than 1 second. The period was calculated as 1.94 seconds. Since the building is classified as "dynamically sensitive", the Gust Effect Factor was calculated according to section 6.5.8.2. During calculation of the Resonant Response Factor (ASCE 7-05 Equation 6-10), the critical damping ratio, β, was assumed as 0.05, or 5 percent of critical. Below is a table with design values and story shears.

Design Criteria Summary	
V =	120mph
Kd =	0.85
I =	1.0
Occupancy	2
Exposure	B
Kzt =	1.0
Gf =	0.82
GCpi	±0.18
Cp, windward	0.8
Cp, Leeward	-0.47

Wind Load Distribution per Story

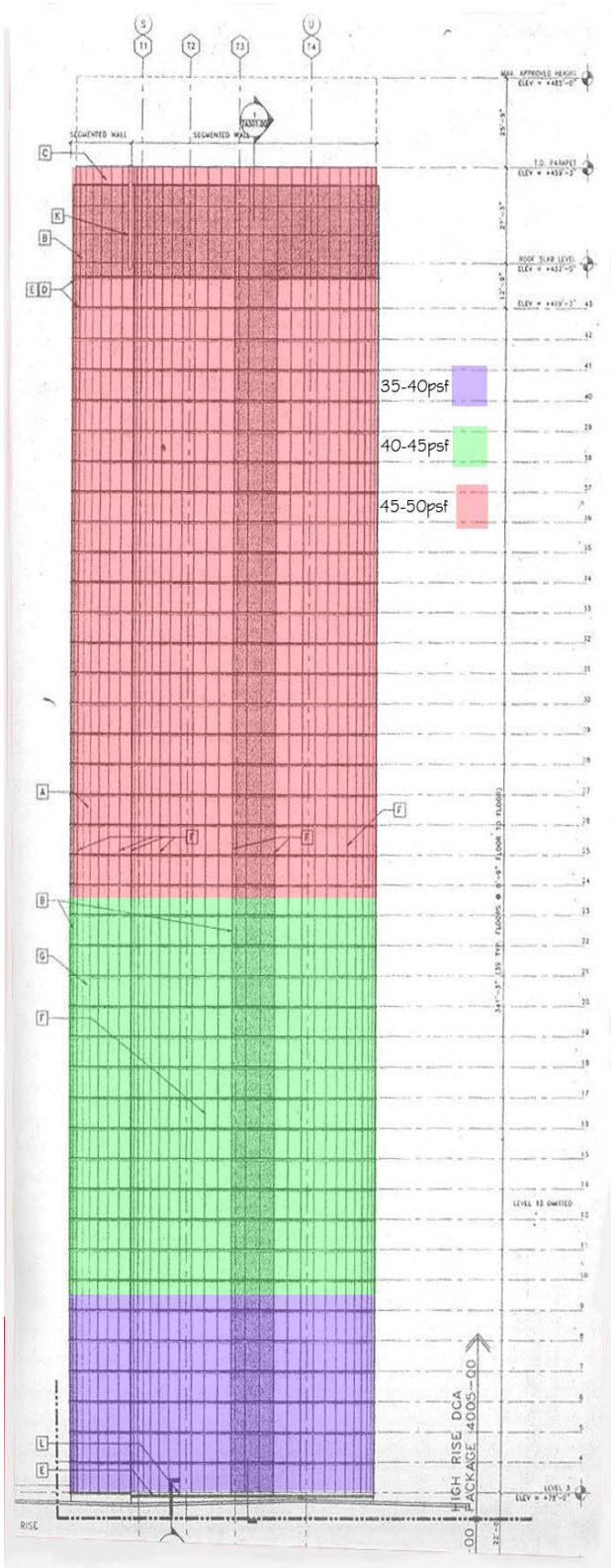
Story	Height	Kz	qz	p, windward	p, leeward	Area(long)	Force(long)	Area(short)	Force(short)
B	0.0	0.57	18.01		-18.44	0	0	0	0
1	14.0	0.57	18.01	11.91	-18.44	10710	325	2247	68
2	42.0	0.77	24.17	15.99	-18.44	12750	439	2675	92
3	64.0	0.87	27.26	18.03	-18.44	7854	286	1648	60
4	72.8	0.90	28.28	18.71	-18.44	4463	166	936	35
5	81.5	0.93	29.21	19.32	-18.44	4463	169	936	35
6	90.3	0.96	30.07	19.90	-18.44	4463	171	936	36
7	99.0	0.99	30.88	20.43	-18.44	4463	173	936	36
8	107.8	1.01	31.63	20.93	-18.44	4463	176	936	37
9	116.5	1.03	32.35	21.40	-18.44	4463	178	936	37
10	125.3	1.05	33.02	21.85	-18.44	4463	180	936	38
11	134.0	1.07	33.67	22.27	-18.44	4463	182	936	38
12	142.8	1.09	34.28	22.68	-18.44	4463	184	936	39
14	151.5	1.11	34.87	23.07	-18.44	4463	185	936	39
15	160.3	1.13	35.43	23.44	-18.44	4463	187	936	39
16	169.0	1.15	35.97	23.80	-18.44	4463	189	936	40
17	177.8	1.16	36.50	24.15	-18.44	4463	190	936	40
18	186.5	1.18	37.00	24.48	-18.44	4463	192	936	40
19	195.3	1.20	37.49	24.80	-18.44	4463	193	936	40
20	204.0	1.21	37.96	25.12	-18.44	4463	194	936	41
21	212.8	1.23	38.42	25.42	-18.44	4463	196	936	41
22	221.5	1.24	38.86	25.71	-18.44	4463	197	936	41

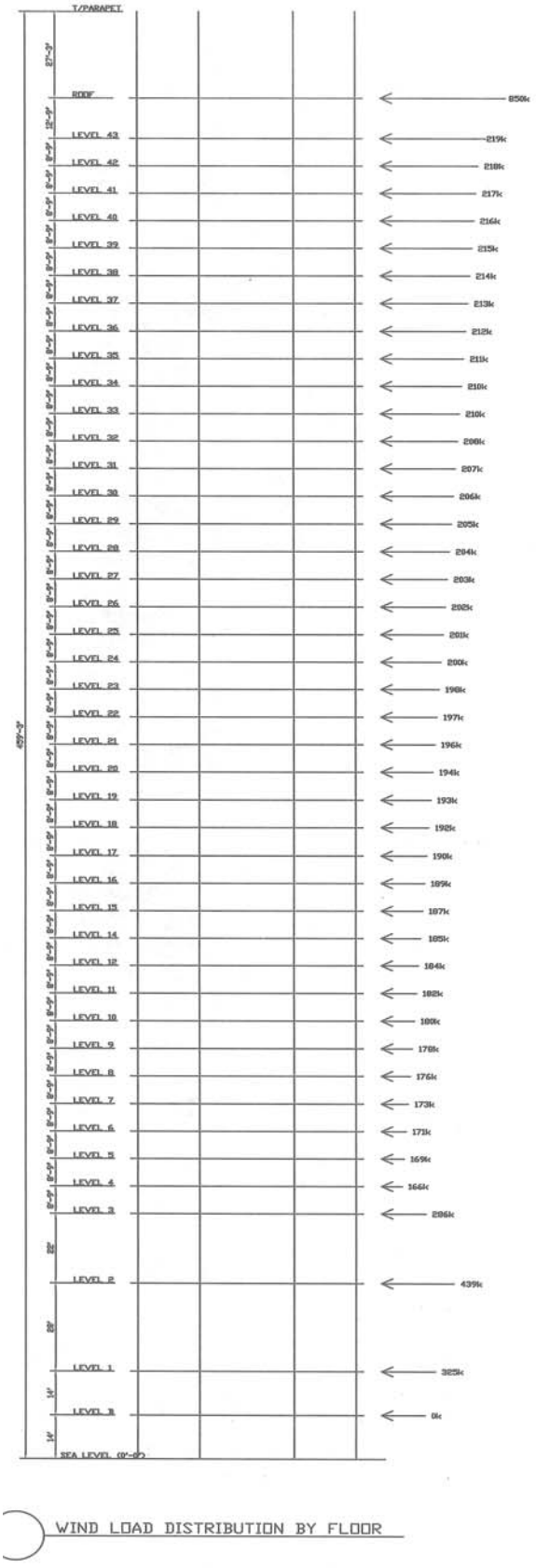
23	230.3	1.25	39.30	26.00	-18.44	4463	198	936	42
24	239.0	1.27	39.72	26.28	-18.44	4463	200	936	42
25	247.8	1.28	40.13	26.55	-18.44	4463	201	936	42
26	256.5	1.29	40.53	26.81	-18.44	4463	202	936	42
29	282.8	1.33	41.67	27.57	-18.44	4463	205	936	43
30	291.5	1.34	42.04	27.81	-18.44	4463	206	936	43
31	300.3	1.35	42.39	28.05	-18.44	4463	207	936	44
32	309.0	1.36	42.74	28.28	-18.44	4463	208	936	44
33	317.8	1.38	43.09	28.51	-18.44	4463	210	936	44
34	326.5	1.39	43.42	28.73	-18.44	4463	210	936	44
35	335.3	1.40	43.75	28.95	-18.44	4463	211	936	44
36	344.0	1.41	44.07	29.16	-18.44	4463	212	936	45
37	352.8	1.42	44.39	29.37	-18.44	4463	213	936	45
38	361.5	1.43	44.70	29.58	-18.44	4463	214	936	45
39	370.3	1.44	45.01	29.78	-18.44	4463	215	936	45
40	379.0	1.45	45.31	29.98	-18.44	4463	216	936	45
41	387.8	1.46	45.61	30.17	-18.44	4463	217	936	46
42	396.5	1.46	45.90	30.37	-18.44	4463	218	936	46
43	405.3	1.47	46.19	30.56	-18.44	4463	219	936	46
Roof	418.0	1.49	46.60	30.83	-18.44	10200	503	2140	105
T/Parapet	445.3	1.51	47.45	31.39	-18.44	6961	347	1460	73
						Base Shear(k)	9592	Base Shear(l)	2012

Base Shear (North-South) = 9592 k
Overturning Moment = 2,301,258 k-ft

Base Shear (East-West) = 2012 k
Overturning Moment = 482,832 k-ft

Wind Pressure Diagram

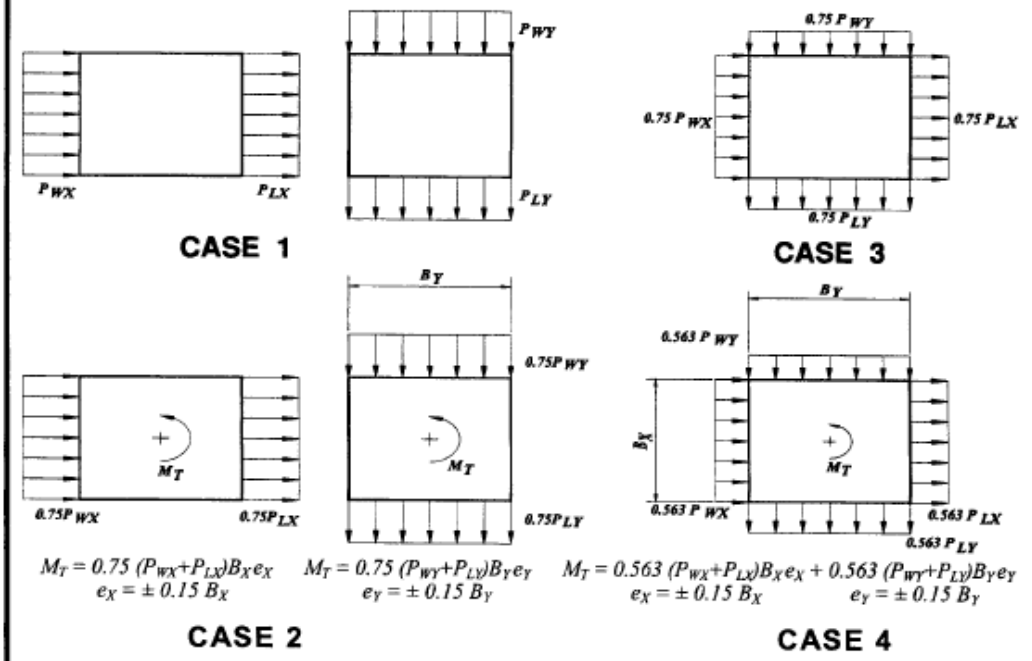




WIND LOAD DISTRIBUTION BY FLOOR

Using the calculated base shears, several load cases were entered into ETABS for analysis. Using these four different load cases, a total of five different load cases for wind were created (Two different cases for Load Case 2).

Main Wind Force Resisting System– Method 2		All Heights
Figure 6-9	Design Wind Load Cases	



$M_T = 0.75\,(P_{WX}+P_{LX})B_X e_X$ $e_X = \pm 0.15\,B_X$ $M_T = 0.75\,(P_{WY}+P_{LY})B_Y e_Y$ $e_Y = \pm 0.15\,B_Y$

CASE 2

$M_T = 0.563\,(P_{WX}+P_{LX})B_X e_X + 0.563\,(P_{WY}+P_{LY})B_Y e_Y$ $e_X = \pm 0.15\,B_X$ $e_Y = \pm 0.15\,B_Y$

CASE 4

Case 1. Full design wind pressure acting on the projected area perpendicular to each principal axis of the structure, considered separately along each principal axis.

Case 2. Three quarters of the design wind pressure acting on the projected area perpendicular to each principal axis of the structure in conjunction with a torsional moment as shown, considered separately for each principal axis.

Case 3. Wind loading as defined in Case 1, but considered to act simultaneously at 75% of the specified value.

Case 4. Wind loading as defined in Case 2, but considered to act simultaneously at 75% of the specified value.

Notes:

1. Design wind pressures for windward and leeward faces shall be determined in accordance with the provisions of 6.5.12.2.1 and 6.5.12.2.3 as applicable for building of all heights.
2. Diagrams show plan views of building.
3. Notation:
   P_{WX}, P_{WY}: Windward face design pressure acting in the x, y principal axis, respectively.
   P_{LX}, P_{LY}: Leeward face design pressure acting in the x, y principal axis, respectively.
   e (e_X, e_Y) : Eccentricity for the x, y principal axis of the structure, respectively.
   M_T: Torsional moment per unit height acting about a vertical axis of the building.

Seismic Loads

Seismic loads were calculated using the Equivalent Lateral Force Procedure outlined in Chapter 12 of ASCE 7-05. The first table below lists the design criteria used in the calculations. The effective seismic weight of the building was calculated according to Section 12.7.2 ASCE 7-05. Only dead load of the building was included in the calculation because no live load satisfied the criteria specified in the code to be included in the effective seismic weight. The dead loads used were the summation of the slabs, columns, shear walls, the exterior cladding and the estimated superimposed dead loads. The design base shear was distributed vertically through the building using Equations 12.8-11 and 12.8-12 from ASCE 7-05. The second table below shows the weight per floor and the seismic shear distributed to each floor.

Seismic Design Summary															
Ss	S1	Site Class	Fa	Fv	To	Ts	Sa	I	SDC	R	R/I	$T=C_T h_n^x$	C_T	x	Cs
0.166	0.048	D	1.600	2.400	0.460	2.300	0.166	1.000	III	4.0	4.0	1.939	0.020	0.750	0.010

Seismic Load Distribution by Floor

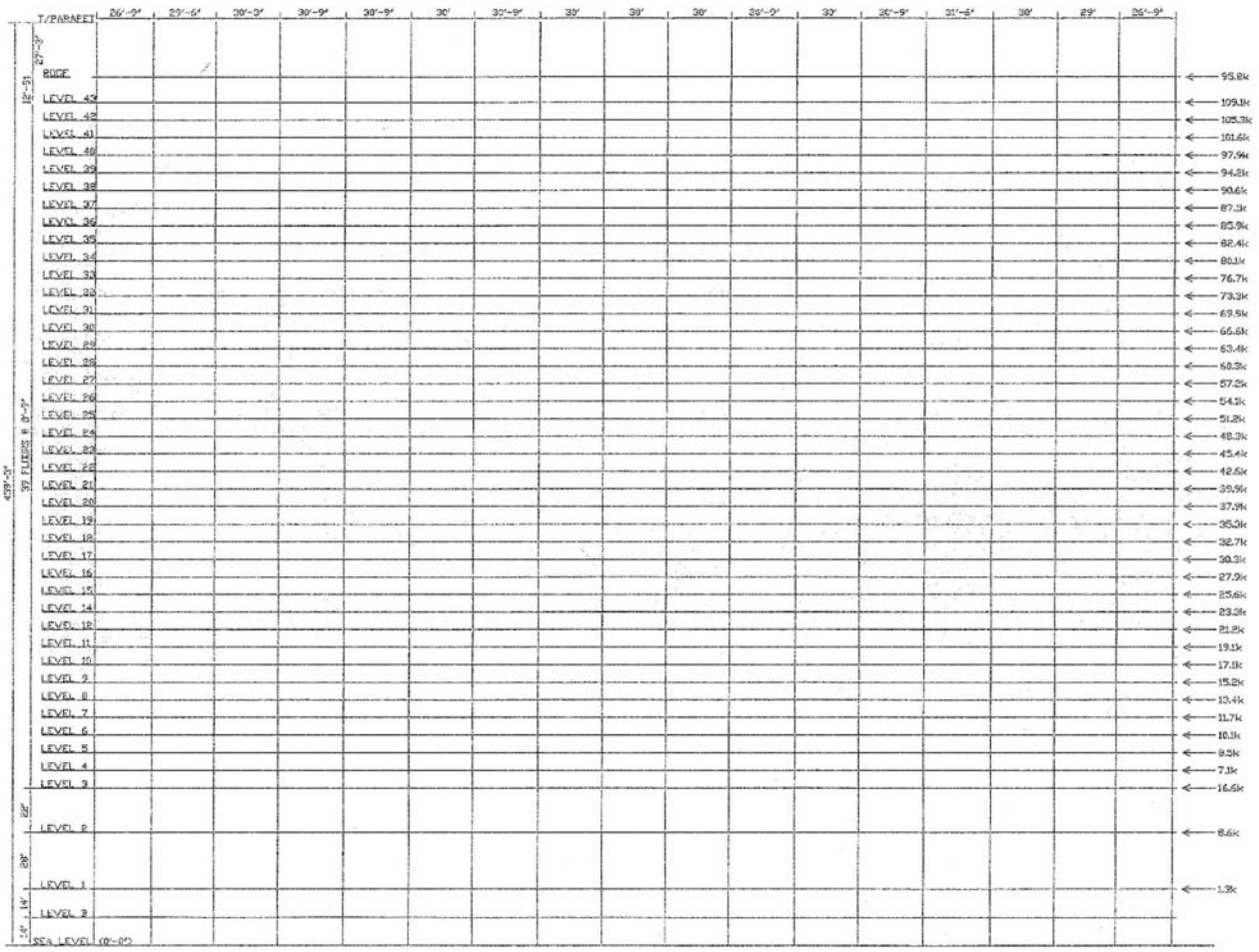
Story	Elevation	MidH-MidH	FLR-FLR (ft)	Weight Floor (k)	Wx*hx^k	Cvx	Fx
B		0	0.00	9885			
1	14.0	21	14.00	11224	819883	0.001	1.3
2	42.0	25	28.00	12738	5552705	0.004	8.6
3	64.0	15.375	22.00	12405	10726188	0.008	16.6
4	72.8	8.75	8.75	4291	4569819	0.003	7.1
5	81.5	8.75	8.75	4291	5496684	0.004	8.5
6	90.3	8.75	8.75	4291	6488072	0.005	10.1
7	99.0	8.75	8.75	4291	7541563	0.005	11.7
8	107.8	8.75	8.75	4291	8655039	0.006	13.4
9	116.5	8.75	8.75	4291	9826627	0.007	15.2
10	125.3	8.75	8.75	4291	11054653	0.008	17.1
11	134.0	8.75	8.75	4291	12337607	0.009	19.1
12	142.8	8.75	8.75	4291	13674117	0.010	21.2
14	151.5	8.75	8.75	4291	15062930	0.011	23.3
15	160.3	8.75	8.75	4291	16502895	0.012	25.6
16	169.0	8.75	8.75	4291	17992947	0.013	27.9
17	177.8	8.75	8.75	4291	19532100	0.014	30.3
18	186.5	8.75	8.75	4291	21119435	0.015	32.7
19	195.3	8.75	8.75	4291	22754094	0.016	35.3
20	204.0	8.75	8.75	4291	24435271	0.018	37.9
21	212.8	8.75	8.75	4228	25778100	0.019	39.9
22	221.5	8.75	8.75	4228	27524071	0.020	42.6
23	230.3	8.75	8.75	4228	29313764	0.021	45.4
24	239.0	8.75	8.75	4228	31146551	0.023	48.3
25	247.8	8.75	8.75	4228	33021834	0.024	51.2
26	256.5	8.75	8.75	4228	34939046	0.025	54.1

27	265.3	8.75	8.75	4228	36897645	0.027	57.2
28	274.0	8.75	8.75	4228	38897115	0.028	60.3
29	282.8	8.75	8.75	4228	40936964	0.030	63.4
30	291.5	8.75	8.75	4228	43016718	0.031	66.6
31	300.3	8.75	8.75	4228	45135927	0.033	69.9
32	309.0	8.75	8.75	4228	47294155	0.034	73.3
33	317.8	8.75	8.75	4228	49490985	0.036	76.7
34	326.5	8.75	8.75	4228	51726017	0.037	80.1
35	335.3	8.75	8.75	4165	53194245	0.038	82.4
36	344.0	8.75	8.75	4165	55470111	0.040	85.9
37	352.8	8.75	8.75	4051	56200945	0.041	87.1
38	361.5	8.75	8.75	4051	58485249	0.042	90.6
39	370.3	8.75	8.75	4051	60804430	0.044	94.2
40	379.0	8.75	8.75	4051	63158179	0.046	97.9
41	387.8	8.75	8.75	4051	65546194	0.047	101.6
42	396.5	8.75	8.75	4051	67968185	0.049	105.3
43	405.3	10.75	8.75	4051	70423869	0.051	109.1
Roof	418.0	20	12.75	3381	61812713	0.045	95.8
T/Parapet	445.3	13.65	27.25	0	0	0.000	0.0
			Total Weight =	214168	1382325639	1.000	

Base Shear = Cs*W Cs = 0.01
= 0.01*214,168 = 2142 kips

Compared to the wind load in the North-South Direction, seismic loads are relatively small. The seismic loads do however have almost the same base shear as wind loads in the East-West direction. Seismic loading in the East-West is slightly larger than wind loading, therefore it controls. The picture on the next page illustrates the distribution of seismic forces by story.

Seismic Load Distribution



SEISMIC LOAD DISTRIBUTION BY FLOOR

Lateral Load Comparison

Wind load in the North-South direction far exceeds the magnitude of the seismic loading in the North-South direction, and wind and seismic loading in the East-West direction. This is true due to the long, narrow and tall geometry of the building. Since this wind load is so much larger than the seismic, no seismic loads were used during analysis in the north south direction.

For wind loading, there are many different load cases that combine wind force and moments created by wind force, from both directions, into a single case. These load cases were applied to the North-South and East-West directions. Though seismic loading creates a larger base shear in the East-West direction than wind loading does, wind loads were considered. These special load cases described earlier were used the North-South and East-West direction since the magnitude of the wind in the North-South direction was so large. Wind loading occurring in the North-South direction can have substantial implication on the design of members in the East-West direction. It is possible for this wind loading to create produce axial, flexural and shear forces larger than that produced by seismic load in the East-West direction.

Torsion

In addition to lateral forces on the building, torsion can be a contributing and controlling factor in design. On each floor, the maximum torsion is created by applying a full wind load in the North-South direction. This load controls because wind in the direction has the largest magnitude and the shear walls resisting this force do not have a symmetric distribution throughout the building. This dissymmetry, along with the large eccentricities from the center of rigidity creates large amounts of torsion. The total torsion at the base of the building is 2,210,000 kip feet. This large amount of torsion is resisted by the shear walls that run in the East-West direction.

Center of Mass/Rigidity and Torsion per Floor

Story	XCM	YCM	XCCM	YCCM	XCR	YCR	Torsion
ROOF	2874.77	361.36	2874.77	361.36	3257.87	-170.13	120217
43	2879.35	362.56	2877.07	361.97	3256.78	-170.82	172558
42	2878.93	362.45	2877.69	362.13	3255.90	-170.85	224660
41	2878.93	362.45	2878.00	362.21	3254.89	-170.60	276523
40	2878.93	362.45	2878.19	362.26	3253.76	-170.13	328147
39	2878.93	362.45	2878.31	362.29	3252.53	-169.49	379532
38	2878.93	362.45	2878.40	362.31	3251.21	-168.73	430678
37	2878.93	362.45	2878.47	362.33	3249.79	-167.88	481585
36	2878.93	362.45	2878.52	362.34	3248.30	-166.95	532253
35	2878.30	362.43	2878.50	362.35	3246.72	-165.96	582682
34	2877.68	362.42	2878.42	362.36	3244.98	-164.92	632872
33	2877.68	362.42	2878.36	362.36	3243.09	-163.77	683062
32	2877.68	362.42	2878.31	362.37	3241.11	-162.50	732774
31	2877.68	362.42	2878.26	362.37	3239.10	-161.13	782247
30	2877.68	362.42	2878.22	362.37	3237.07	-159.65	831481
29	2877.68	362.42	2878.19	362.38	3235.05	-158.08	880476
28	2877.68	362.42	2878.16	362.38	3233.06	-156.39	929232
27	2877.68	362.42	2878.13	362.38	3231.12	-154.56	977749
26	2877.68	362.42	2878.11	362.38	3229.25	-152.54	1026027
25	2877.68	362.42	2878.09	362.39	3227.48	-150.25	1074066
24	2877.68	362.42	2878.07	362.39	3225.85	-147.61	1121866
23	2877.68	362.42	2878.05	362.39	3224.39	-144.50	1169188
22	2877.68	362.42	2878.03	362.39	3223.15	-140.76	1216271

21	2877.90	362.41	2878.03	362.39	3222.21	-136.22	1263115
20	2878.12	362.40	2878.03	362.39	3221.62	-130.73	1309481
19	2878.12	362.40	2878.03	362.39	3221.47	-123.78	1355608
18	2878.12	362.40	2878.04	362.39	3221.85	-115.12	1401496
17	2878.12	362.40	2878.04	362.39	3222.87	-104.37	1446906
16	2878.12	362.40	2878.04	362.39	3224.66	-91.11	1492077
15	2878.12	362.40	2878.04	362.39	3227.41	-74.81	1536770
14	2878.12	362.40	2878.05	362.39	3231.34	-54.86	1580985
12	2878.12	362.40	2878.05	362.39	3236.71	-30.54	1624961
11	2878.12	362.40	2878.05	362.39	3243.85	-1.02	1668459
10	2878.12	362.40	2878.05	362.39	3253.11	34.58	1711479
9	2878.12	362.40	2878.06	362.39	3264.84	77.07	1754021
8	2878.12	362.40	2878.06	362.39	3279.26	126.91	1796085
7	2878.12	362.40	2878.06	362.39	3296.17	183.58	1837432
6	2878.12	362.40	2878.06	362.39	3314.60	244.61	1878301
5	2878.12	362.40	2878.06	362.39	3332.72	304.24	1918692
4	2878.12	362.40	2878.06	362.39	3349.82	353.02	1958366
3	2867.52	472.37	2877.60	367.20	3361.02	379.24	2026720
2	2909.29	416.20	2878.60	368.75	3345.02	369.96	2131641
1	2905.50	407.52	2879.39	369.88	3327.48	371.47	2209316

Lateral Displacement

Lateral displacements were found using the output from the ETABS model. Lateral displacement in the Y direction is at its maximum when using the full wind load in the North-South direction. The maximum drift at roof level was 11.42 inches. Lateral displacement in the East-West direction was controlled by seismic loading. The maximum drift at roof level was 7.10 inches. The maximum allowable story drift in either direction is limited to H/400. Both the drift in the N-S and E-W direction are within this limit.

North-South

Drift = 11.42in < H/400 = (418ft x 12in/ft) / 400 = 12.54 in

East-West

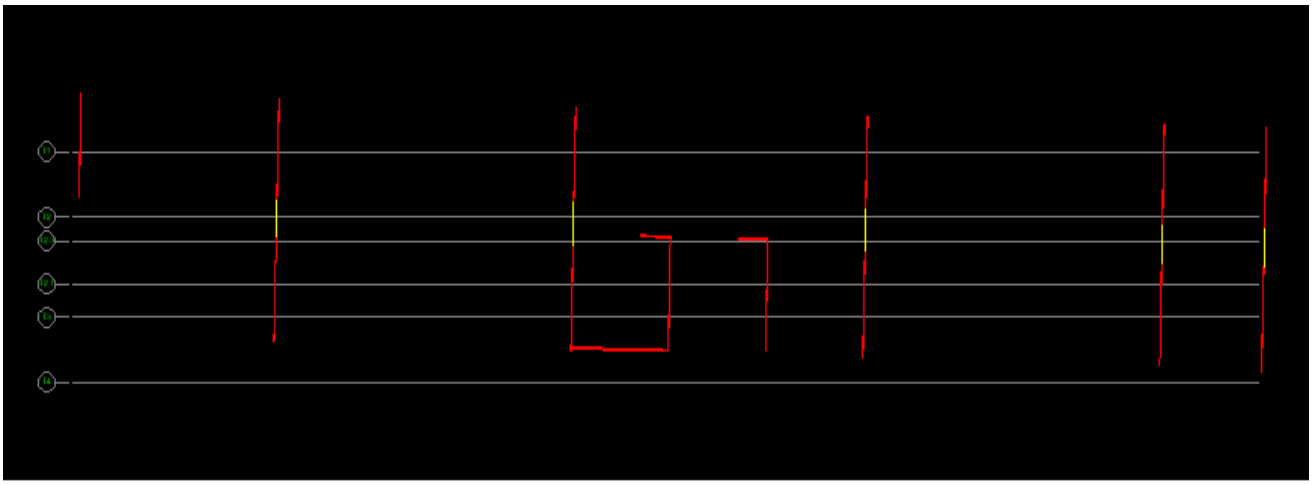
Drift = 7.1in < H/400 = (418ft x 12in/ft) / 400 = 12.54 in

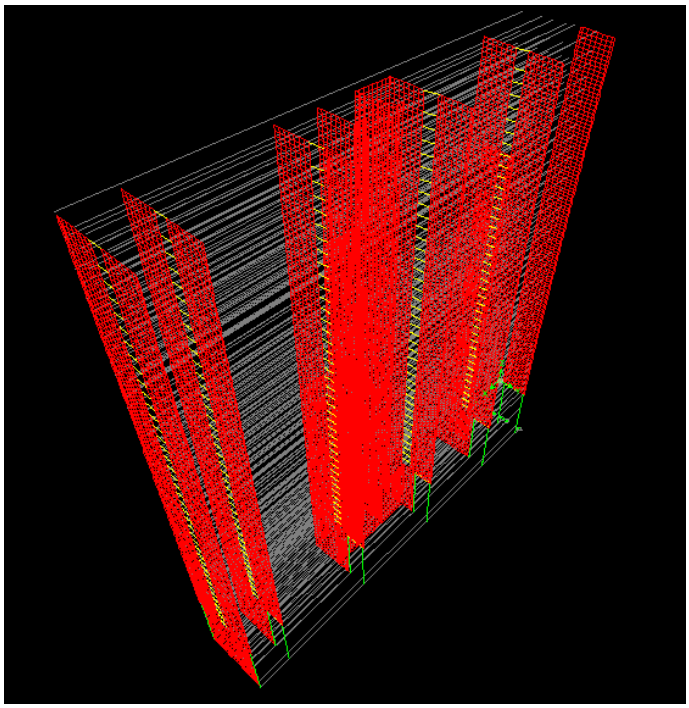
The following table has each story with its respective drifts per the controlling load case.

Story	Load	UX	UY	Story	Load	UX	UY	Story	Load	UX	UY
ROOF	WINDY	1.85	11.42	29	QUAKE	3.0641	0.1281	12	WINDY	0.19	1.79
ROOF	QUAKE	7.10	0.40	28	WINDY	0.8816	6.1341	12	QUAKE	0.45	0.02
43	WINDY	1.78	10.95	28	QUAKE	2.8219	0.1142	11	WINDY	0.16	1.56
43	QUAKE	6.71	0.37	27	WINDY	0.8159	5.8123	11	QUAKE	0.37	0.01
42	WINDY	1.73	10.63	27	QUAKE	2.5854	0.101	10	WINDY	0.13	1.34
42	QUAKE	6.44	0.36	26	WINDY	0.7514	5.4925	10	QUAKE	0.30	0.01
41	WINDY	1.68	10.32	26	QUAKE	2.356	0.0885	9	WINDY	0.10	1.14
41	QUAKE	6.18	0.34	25	WINDY	0.689	5.1751	9	QUAKE	0.24	0.01
40	WINDY	1.63	10.00	25	QUAKE	2.1352	0.077	8	WINDY	0.07	0.95
40	QUAKE	5.91	0.32	24	WINDY	0.6292	4.8607	8	QUAKE	0.18	0.01
39	WINDY	1.57	9.68	24	QUAKE	1.9246	0.0664	7	WINDY	0.05	0.78
39	QUAKE	5.64	0.30	23	WINDY	0.5731	4.5501	7	QUAKE	0.14	0.01
38	WINDY	1.52	9.36	23	QUAKE	1.7262	0.0569	6	WINDY	0.03	0.63
38	QUAKE	5.38	0.28	22	WINDY	0.5216	4.2438	6	QUAKE	0.09	0.01
37	WINDY	1.46	9.04	22	QUAKE	1.542	0.0486	5	WINDY	0.02	0.49
37	QUAKE	5.12	0.26	21	WINDY	0.476	3.9425	5	QUAKE	0.06	0.01
36	WINDY	1.40	8.72	21	QUAKE	1.3745	0.0415	4	WINDY	0.00	0.38
36	QUAKE	4.85	0.24	20	WINDY	0.4378	3.6469	4	QUAKE	0.04	0.01
35	WINDY	1.34	8.40	20	QUAKE	1.2255	0.0357	3	WINDY	0.01	0.28
35	QUAKE	4.59	0.22	19	WINDY	0.401	3.3576	3	QUAKE	0.02	0.01
34	WINDY	1.28	8.08	19	QUAKE	1.0876	0.0309	2	WINDY	0.00	0.14
34	QUAKE	4.33	0.21	18	WINDY	0.3645	3.0751	2	QUAKE	0.01	0.00
33	WINDY	1.21	7.75	18	QUAKE	0.9593	0.027	1	WINDY	0.00	0.02
33	QUAKE	4.07	0.19	17	WINDY	0.3284	2.7998	1	QUAKE	0.00	0.00
32	WINDY	1.15	7.43	17	QUAKE	0.8403	0.0238				
32	QUAKE	3.82	0.17	16	WINDY	0.2928	2.5324				
31	WINDY	1.08	7.11	16	QUAKE	0.7303	0.0211				
31	QUAKE	3.56	0.16	15	WINDY	0.2578	2.2737				
30	WINDY	1.01	6.78	15	QUAKE	0.6289	0.0189				
30	QUAKE	3.31	0.14	14	WINDY	0.2236	2.0244				
29	WINDY	0.95	6.46	14	QUAKE	0.5357	0.0171				

Lateral Displacement

The images below are a plan and perspective of the deflected shape (amplified) of the shear walls at the roof level under full wind loading in the North-South Direction. Wind loading in the North-South direction was chosen for illustration because it produces the most lateral displacement.





Conclusion

From analysis of the structural system using ETABS, it is shown that both wind and seismic loading have substantial effects on the shear walls in both directions. For shear walls in the North-South direction, wind load was the controlling factor. Wind cases applying forces only in the North-South direction, and those applying a combination of loads from both directions controlled different aspects of the design. In the East-West direction, seismic loading was the main contributor to critical load cases, but in certain cases, combinations of wind load from both directions will control portions of the design.

Using the analysis output from ETABS, a shear wall was spot checked for strength. PCA Column and hand calculations were used for this strength check. From these calculations, we see that the shear wall is more than adequate to resist the applied ultimate loads. In some cases, the wall had as much as 3 times the capacity to carry the ultimate load.

According to the ETABS model, the maximum deflection at the roof is 11.42 inches which is less than the limiting 12.54 inches.

After reviewing the conclusions from this report, it can be seen that the design is more than adequate to resist the design loads and service limitations.

Shear Wall Spot Checks - Shear Wall 9

Shear wall nine is the main lateral force resisting member for the East-West direction. The shear wall changes length twice as you go down the building due to larger shear and torsion forces at the lower levels. Load combinations containing dead, wind and seismic loads were considered. Live load was neglected in this calculation because this particular wall supports a negligible area of the slab.

U1 = 1.200*Dead + 0.800*Wind

U2 = 1.200*Dead + 1.600*Wind

U3 = 0.900*Dead + 1.600*Wind

U4 = 1.200*Dead - 0.800*Wind

U5 = 1.200*Dead - 1.600*Wind

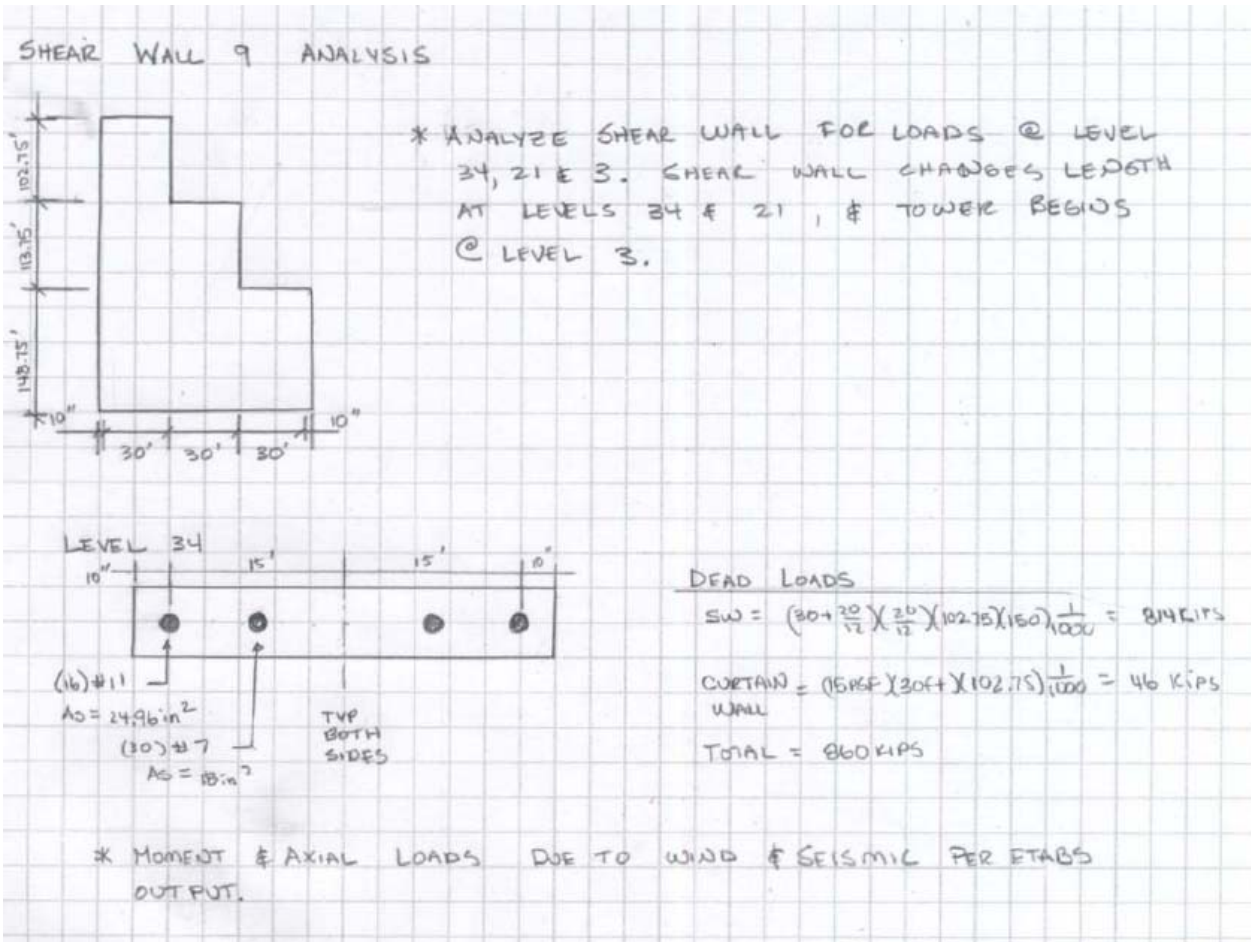
U6 = 0.900*Dead - 1.600*Wind

U7 = 1.200*Dead + 1.000*EarthQuake

U8 = 0.900*Dead + 1.000*EarthQuake

U9 = 1.200*Dead - 1.000*EarthQuake

U10 = 0.900*Dead - 1.000*EarthQuake



Shear Wall 9 - ETABS Output

Story	Pier	Combo	Loc	P	V2	M2	M3
34	SW9P2	SEISMIC-1	Top	1541	971	1790	18869
34	SW9P2	SEISMIC-1	Bottom	1576	1022	1884	111018
34	SW9P2	WINDX-1	Top	861	549	1117	13554
34	SW9P2	WINDX-1	Bottom	881	579	1297	65881
34	SW9P2	WINDY-1	Top	212	15	151	79357
34	SW9P2	WINDY-1	Bottom	267	18	338	100798
34	SW9P2	WINDXY-1	Top	487	423	951	69683
34	SW9P2	WINDXY-1	Bottom	460	448	1226	125009
34	SW9P2	WINDXNMOM-1	Top	649	412	834	9054
34	SW9P2	WINDXNMOM-1	Bottom	664	434	967	48038
34	SW9P2	WINDYNMOM-1	Top	101	9	15	34242
34	SW9P2	WINDYNMOM-1	Bottom	127	11	116	44385
34	SW9P2	WINDXYNMOM-1	Top	409	316	641	33336
34	SW9P2	WINDXYNMOM-1	Bottom	401	334	817	70410

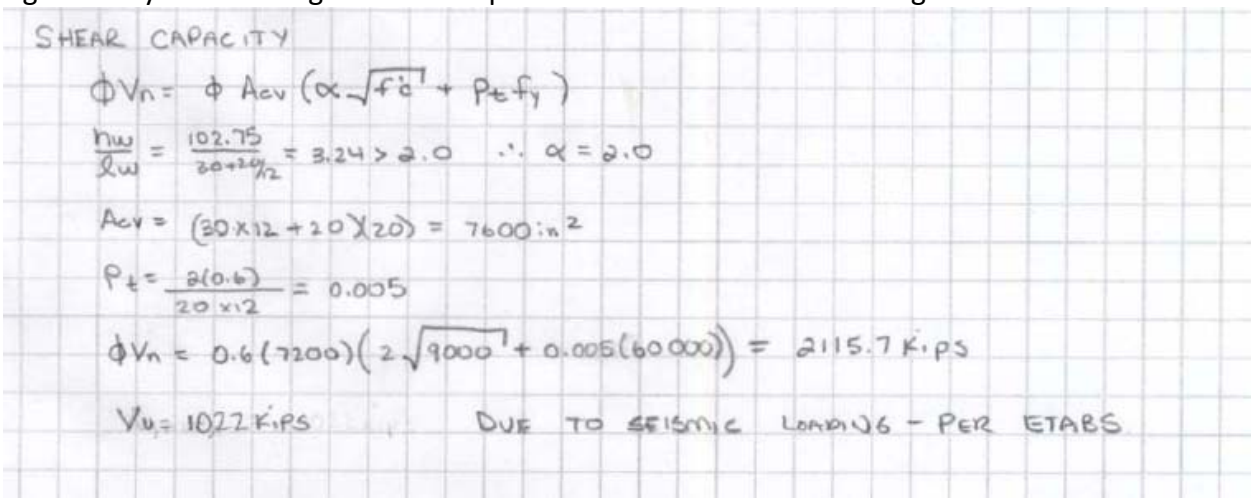
Once the ETABS outputs and hand calculated dead loads were inputted into PCA Column, the analysis shows that the load combination, U9 controls the strength design for axial and flexural strength of the wall at level 34. Combination U9 is 1.2Dead + 1.0 Earthquake. Application of this load combination results in the following ultimate loads:

P_u = 38 kips

$M_{u,weak}$ = 163.2 k-ft

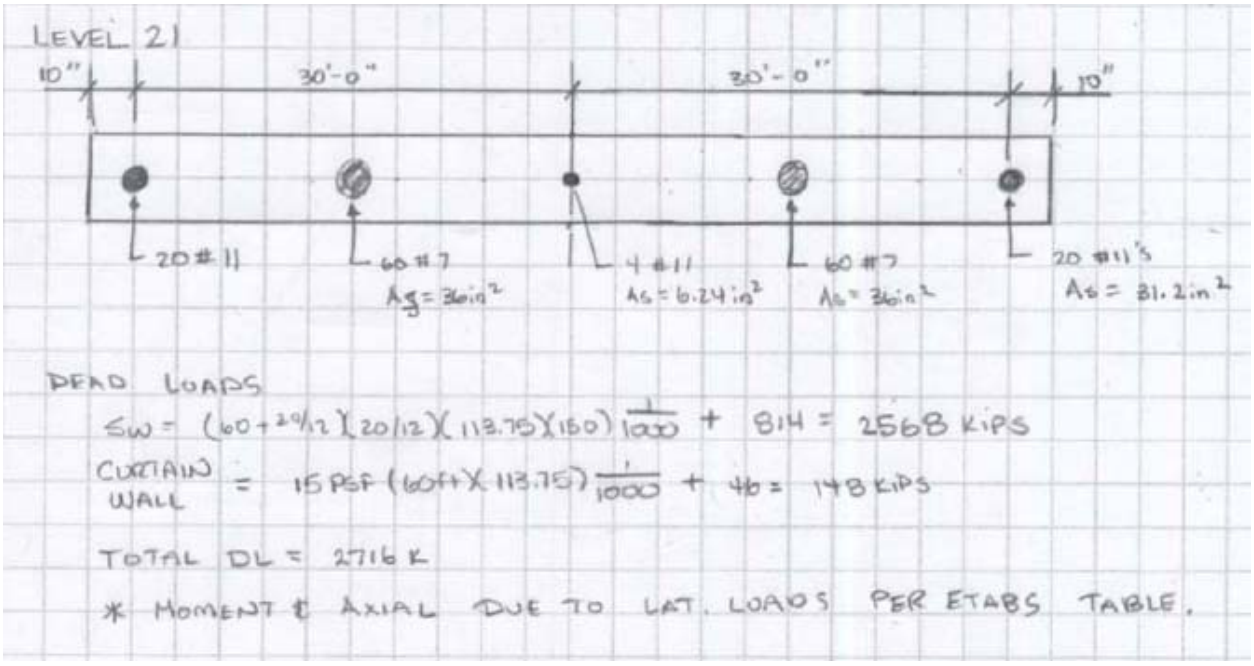
$M_{u,strong}$ = 16,667 k-ft

The ratio of nominal strength versus ultimate loads is 4.183. This shows the wall has significantly more strength than is required for axial and flexural strength.



The shear capacity of the wall was calculated by hand. The hand calculation shows that the wall has more than twice the capacity needed to resist the ultimate load. The maximum shear load on the wall is 1022 kips, due to seismic load in the East-West direction.

Level 21



Shear Wall 9 - ETABS Output

21	SW9P1	SEISMIC-1	Top	2504	1788	10704	869628
21	SW9P1	SEISMIC-1	Bottom	2402	1793	10469	983643
21	SW9P1	WINDX-1	Top	1405	1120	6221	525776
21	SW9P1	WINDX-1	Bottom	1346	1133	6459	601446
21	SW9P1	WINDY-1	Top	2529	81	815	1038257
21	SW9P1	WINDY-1	Bottom	3162	32	2284	923978
21	SW9P1	WINDXY-1	Top	843	901	4054	1173025
21	SW9P1	WINDXY-1	Bottom	1362	874	3131	1144068
21	SW9P1	WINDXNMOM-1	Top	1075	840	4706	381339
21	SW9P1	WINDXNMOM-1	Bottom	1031	850	4873	436497
21	SW9P1	WINDYNMOM-1	Top	1412	73	307	483786
21	SW9P1	WINDYNMOM-1	Bottom	1883	33	1069	361886
21	SW9P1	WINDXYNMOM-1	Top	269	685	3733	659171
21	SW9P1	WINDXYNMOM-1	Bottom	656	663	2834	610266

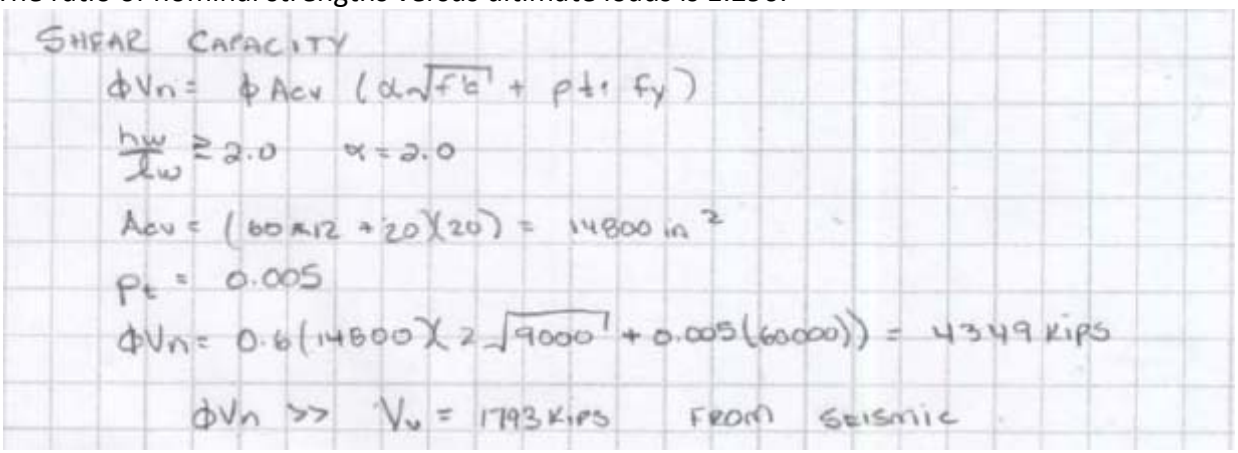
For level 21, the controlling load combination is U9. Load combination U9 is 1.2 Dead + 1.0 Earthquake. The ultimate loads produced by this load combination are:

P_u = 1609kips

$M_{u,\ weak}$ = 108.8k-ft

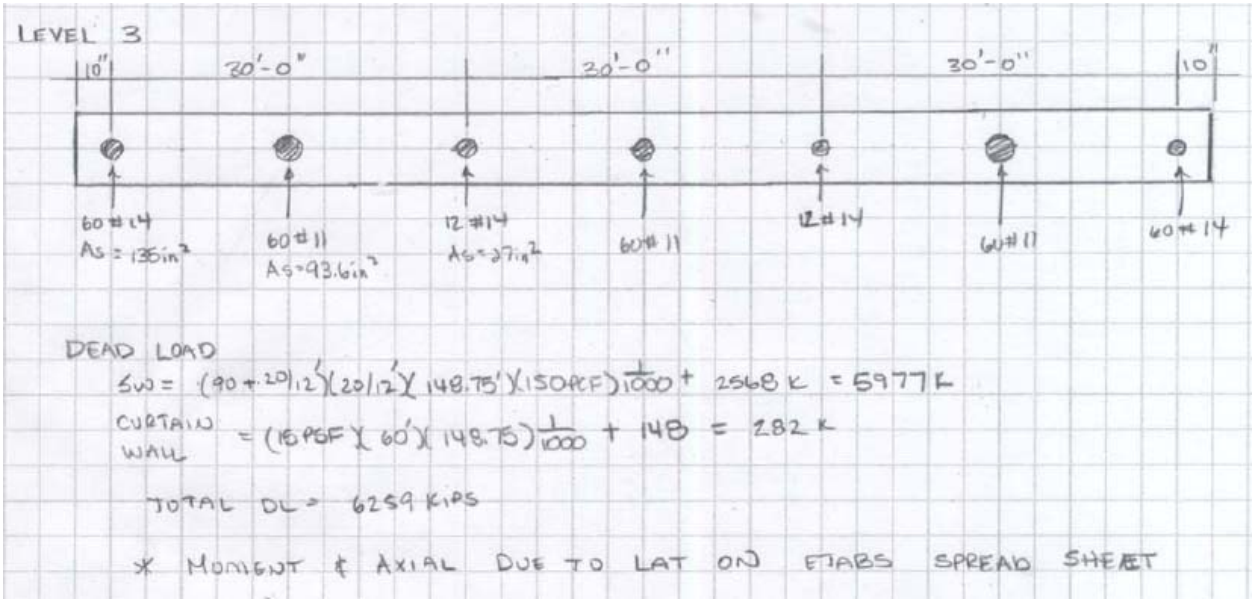
$M_{u,\ strong}$ = 138,433.6k-ft

The ratio of nominal strengths versus ultimate loads is 1.296.



The shear strength of the wall was calculated by hand. Hand calculation shows the shear wall has more than twice the capacity to resist the loads. The maximum ultimate shear load applied to the shear wall is 1793 kips due to the application of seismic load in the East-West direction.

Level 3



Shear Wall 9 - ETABS Output

Story	Pier	Combo	Loc	P(kips)	V2	M2 (k-in)	M3 (k-in)
3	SW9P1	SEISMIC-1	Top	39	1991	13	1755259
3	SW9P1	SEISMIC-1	Bottom	89	1973	51	1903094
3	SW9P1	WINDX-1	Top	193	1410	56	1257775
3	SW9P1	WINDX-1	Bottom	240	1395	98	1371056
3	SW9P1	WINDY-1	Top	17443	19	7692	547817
3	SW9P1	WINDY-1	Bottom	17909	32	5563	603424
3	SW9P1	WINDXY-1	Top	13227	1043	5811	1354194
3	SW9P1	WINDXY-1	Bottom	13612	1022	4246	1480860
3	SW9P1	WINDXNMOM-1	Top	84	1063	22	895230
3	SW9P1	WINDXNMOM-1	Bottom	110	1053	47	981440
3	SW9P1	WINDYNMOM-1	Top	11710	120	5324	679649
3	SW9P1	WINDYNMOM-1	Bottom	11827	129	3564	612052
3	SW9P1	WINDXYNMOM-1	Top	8899	884	4028	197885
3	SW9P1	WINDXYNMOM-1	Bottom	9013	882	2731	312484

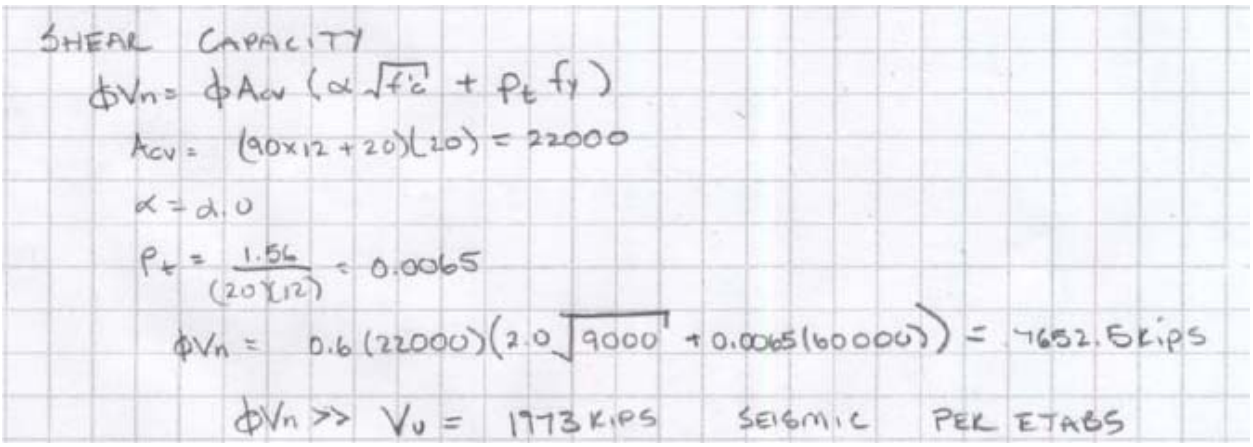
For floor 3 of shear wall 9, the controlling load combination is U6. Load combination U6 is 0.9Dead +1.6 Wind. The ultimate loads produced by this combination are:

Pu = -16,126kips

Mu, weak = 566.5k-ft

Mu, strong = 197,448k-ft

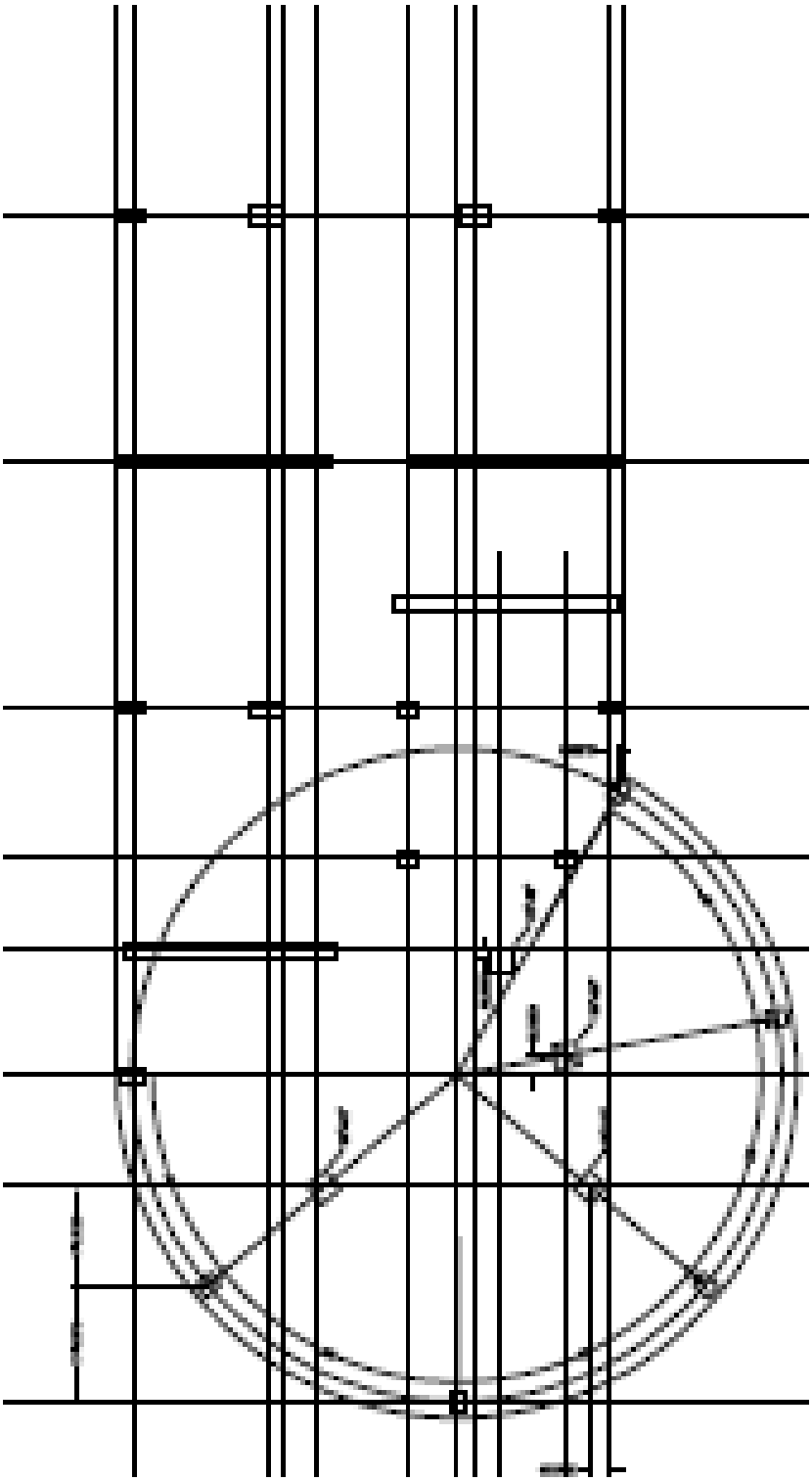
The ratio of nominal axial and flexural strengths versus ultimate loads is 3.741.

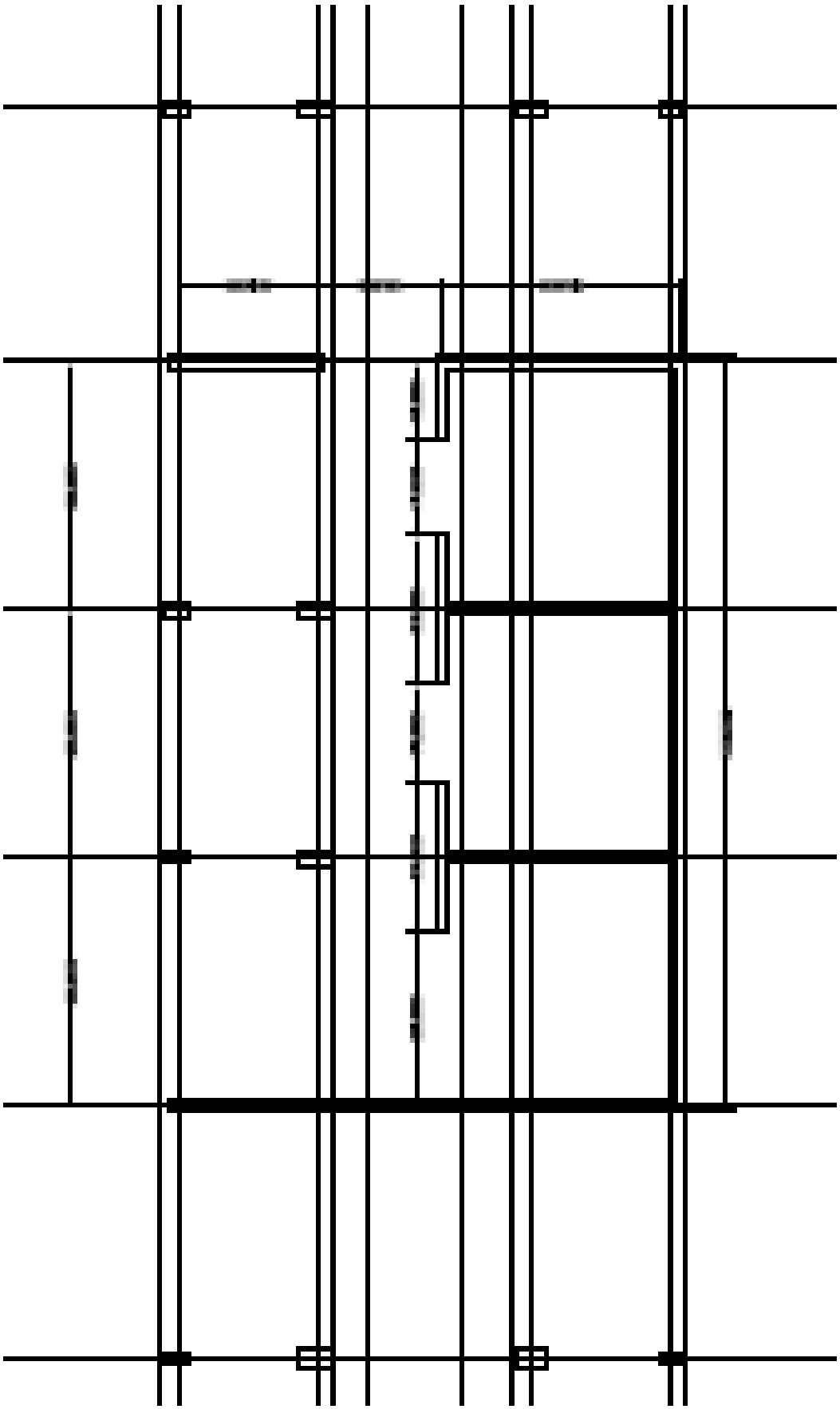


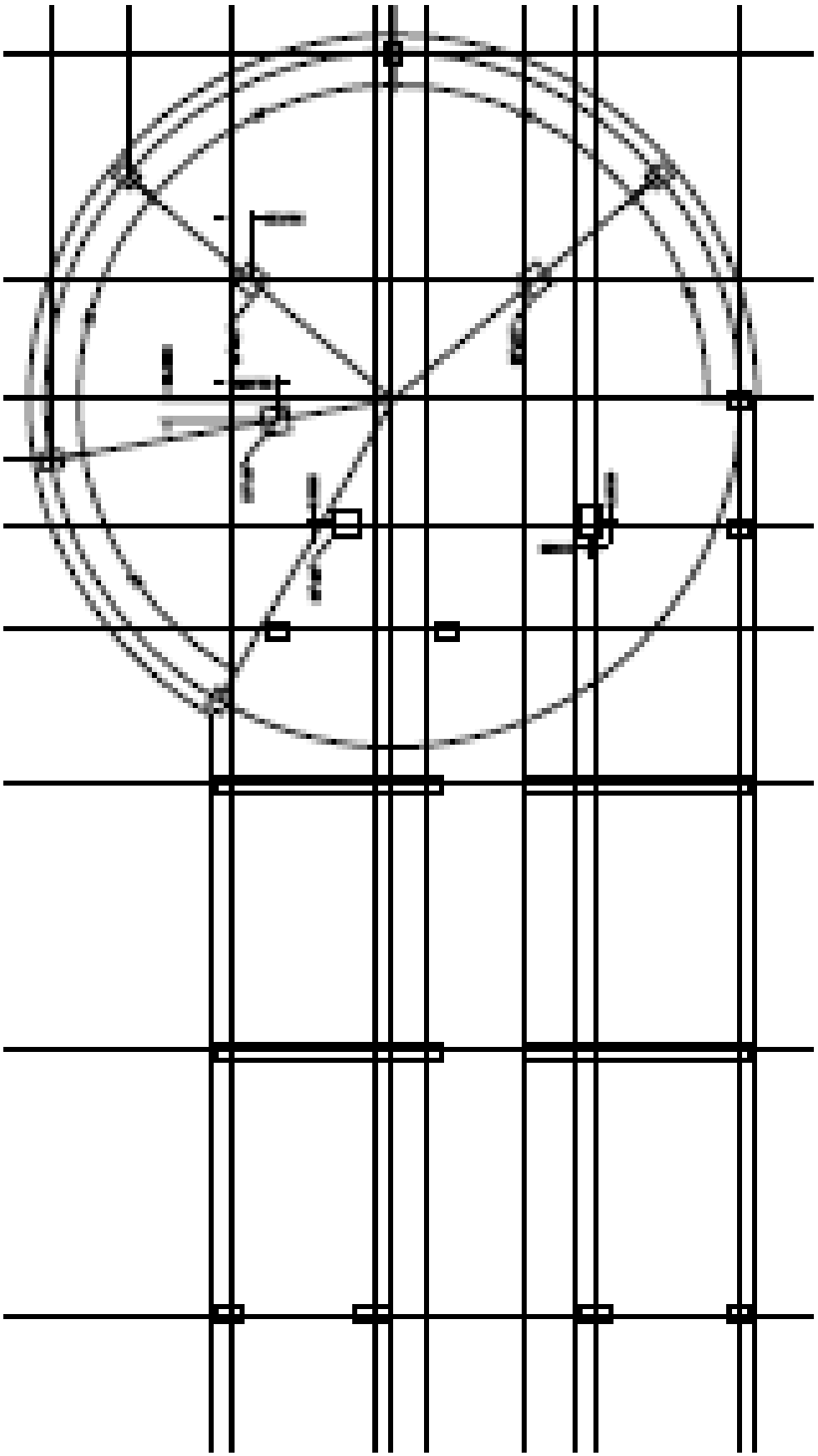
The shear capacity at floor 3 was calculated by hand. The hand calculation shows that the wall has a more than 3 times the capacity to carry the load. The ultimate shear load is 1973 kips produced by applying seismic load in the East-West direction.

Appendix A

Building Floor Plan







ETABS Output File

ETABS v9.1.1 File:SHEAR WALLS2 Units:Kip-in November 27, 2007 16:32 PAGE 1

PROJECT INFORMATION

Company Name = PSUAE

ETABS v9.1.1 File:SHEAR WALLS2 Units:Kip-in November 27, 2007 16:32 PAGE 2

S T O R Y D A T A

STORY	SIMILAR TO	HEIGHT	ELEVATION
ROOF	None	153.000	5097.000
43	None	105.000	4944.000
42	None	105.000	4839.000
41	None	105.000	4734.000
40	None	105.000	4629.000
39	None	105.000	4524.000
38	None	105.000	4419.000
37	None	105.000	4314.000
36	None	105.000	4209.000
35	None	105.000	4104.000
34	None	105.000	3999.000
33	None	105.000	3894.000
32	None	105.000	3789.000
31	None	105.000	3684.000
30	None	105.000	3579.000
29	None	105.000	3474.000
28	None	105.000	3369.000
27	None	105.000	3264.000
26	None	105.000	3159.000
25	None	105.000	3054.000
24	None	105.000	2949.000
23	None	105.000	2844.000
22	None	105.000	2739.000
21	None	105.000	2634.000
20	None	105.000	2529.000
19	None	105.000	2424.000
18	None	105.000	2319.000
17	None	105.000	2214.000
16	None	105.000	2109.000
15	None	105.000	2004.000
14	None	105.000	1899.000
13	None	105.000	1794.000
12	None	105.000	1689.000
11	None	105.000	1584.000
10	None	105.000	1479.000

9	None	105.000	1374.000
8	None	105.000	1269.000
7	None	105.000	1164.000
6	None	105.000	1059.000
5	None	105.000	954.000
4	None	105.000	849.000
3	None	264.000	744.000
2	None	336.000	480.000
1	None	144.000	144.000
BASE	None		0.000

S T A T I C L O A D C A S E S

STATIC CASE	AUTO LAT LOAD	SELF WT MULTIPLIER
WIND	WIND	USER 0.0000
QUAKE	QUAKE	USER_LOADS 0.0000

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A U T O W I N D U S E R

Case: WIND

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M A S S S O U R C E D A T A

MASS FROM	LATERAL LUMP MASS	
Masses	Yes	Yes

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D I A P H R A G M M A S S D A T A

STORY	DIAPHRAGM	MASS-X	MASS-Y	MMI	X-M	Y-M
ROOF	D1	5.013E+00	5.013E+00	8.313E+06	2874.770	361.363
43	D1	5.079E+00	5.079E+00	8.471E+06	2879.347	362.559
42	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
41	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
40	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
39	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
38	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
37	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
36	D1	5.073E+00	5.073E+00	8.456E+06	2878.927	362.449
35	D1	5.075E+00	5.075E+00	8.461E+06	2878.301	362.434
34	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
33	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
32	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
31	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
30	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418

29	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
28	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
27	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
26	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
25	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
24	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
23	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
22	D1	5.077E+00	5.077E+00	8.467E+06	2877.676	362.418
21	D1	5.080E+00	5.080E+00	8.467E+06	2877.897	362.407
20	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
19	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
18	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
17	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
16	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
15	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
14	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
13	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
12	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
11	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
10	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
9	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
8	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
7	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
6	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
5	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
4	D1	5.083E+00	5.083E+00	8.468E+06	2878.118	362.396
3	D1	9.283E+00	9.283E+00	1.681E+07	2867.519	472.374
2	D1	6.929E+00	6.929E+00	1.339E+07	2909.291	416.195
1	D1	6.564E+00	6.564E+00	1.241E+07	2905.504	407.517

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A S S E M B L E D P O I N T M A S S E S

STORY	UX	UY	UZ	RX	RY	RZ
ROOF	7.721E+00	7.721E+00	-2.794E+00	0.000E+00	0.000E+00	8.313E+06
43	7.155E+00	7.155E+00	-2.229E+00	0.000E+00	0.000E+00	8.471E+06
42	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
41	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
40	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
39	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
38	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
37	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
36	7.121E+00	7.121E+00	-2.195E+00	0.000E+00	0.000E+00	8.456E+06
35	7.253E+00	7.253E+00	-2.327E+00	0.000E+00	0.000E+00	8.461E+06

34	7.421E+00	7.421E+00	-2.495E+00	0.000E+00	0.000E+00	8.467E+06
33	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
32	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
31	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
30	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
29	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
28	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
27	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
26	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
25	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
24	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
23	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
22	7.450E+00	7.450E+00	-2.523E+00	0.000E+00	0.000E+00	8.467E+06
21	7.633E+00	7.633E+00	-2.707E+00	0.000E+00	0.000E+00	8.467E+06
20	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
19	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
18	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
17	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
16	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
15	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
14	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
13	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
12	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
11	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
10	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
9	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
8	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
7	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
6	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
5	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
4	7.670E+00	7.670E+00	-2.743E+00	0.000E+00	0.000E+00	8.468E+06
3	1.675E+01	1.675E+01	-1.183E+01	0.000E+00	0.000E+00	1.681E+07
2	1.666E+01	1.666E+01	-1.173E+01	0.000E+00	0.000E+00	1.339E+07
1	1.067E+01	1.067E+01	-5.744E+00	0.000E+00	0.000E+00	1.241E+07
BASE	1.156E+00	1.156E+00	-1.156E+00	0.000E+00	0.000E+00	0.000E+00
Totals	3.521E+02	3.521E+02	1.353E+02	0.000E+00	0.000E+00	3.895E+08

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C E N T E R S O F C U M U L A T I V E M A S S & C E N T E R S O F R I G I D I T Y

STORY LEVEL	DIAPHRAGM NAME	MASS	/----------CENTER OF MASS----------//--CENTER OF RIGIDITY--/ ORDINATE-X	ORDINATE-Y	ORDINATE-X	ORDINATE-Y
ROOF	D1	5.013E+00	2874.770	361.363	3259.449	-170.974
43	D1	1.009E+01	2877.073	361.965	3258.375	-171.689
42	D1	1.517E+01	2877.693	362.127	3257.501	-171.766
41	D1	2.024E+01	2878.002	362.208	3256.499	-171.572
40	D1	2.531E+01	2878.188	362.256	3255.381	-171.169
39	D1	3.038E+01	2878.311	362.288	3254.159	-170.609
38	D1	3.546E+01	2878.399	362.311	3252.842	-169.933
37	D1	4.053E+01	2878.465	362.329	3251.436	-169.174
36	D1	4.560E+01	2878.516	362.342	3249.943	-168.350
35	D1	5.068E+01	2878.495	362.351	3248.363	-167.467
34	D1	5.576E+01	2878.420	362.357	3246.620	-166.546
33	D1	6.083E+01	2878.358	362.362	3244.726	-165.533
32	D1	6.591E+01	2878.306	362.367	3242.745	-164.418
31	D1	7.099E+01	2878.260	362.370	3240.717	-163.215
30	D1	7.606E+01	2878.221	362.374	3238.667	-161.935
29	D1	8.114E+01	2878.187	362.376	3236.616	-160.581
28	D1	8.622E+01	2878.157	362.379	3234.580	-159.145
27	D1	9.129E+01	2878.130	362.381	3232.578	-157.604
26	D1	9.637E+01	2878.106	362.383	3230.631	-155.917
25	D1	1.014E+02	2878.085	362.385	3228.761	-154.028
24	D1	1.065E+02	2878.065	362.386	3226.999	-151.857
23	D1	1.116E+02	2878.048	362.388	3225.378	-149.304
22	D1	1.167E+02	2878.032	362.389	3223.941	-146.245
21	D1	1.218E+02	2878.026	362.390	3222.743	-142.527
20	D1	1.268E+02	2878.030	362.390	3221.845	-138.025
19	D1	1.319E+02	2878.033	362.390	3221.304	-132.315
18	D1	1.370E+02	2878.036	362.391	3221.198	-125.188
17	D1	1.421E+02	2878.039	362.391	3221.614	-116.341
16	D1	1.472E+02	2878.042	362.391	3222.665	-105.417
15	D1	1.523E+02	2878.044	362.391	3224.491	-91.991
14	D1	1.573E+02	2878.047	362.391	3227.268	-75.551
13	D1	1.624E+02	2878.049	362.391	3231.215	-55.482
12	D1	1.675E+02	2878.051	362.392	3236.604	-31.059
11	D1	1.726E+02	2878.053	362.392	3243.755	-1.453
10	D1	1.777E+02	2878.055	362.392	3253.031	34.222
9	D1	1.827E+02	2878.057	362.392	3264.780	76.782
8	D1	1.878E+02	2878.058	362.392	3279.210	126.679
7	D1	1.929E+02	2878.060	362.392	3296.131	183.405
6	D1	1.980E+02	2878.061	362.392	3314.572	244.487

5	D1	2.031E+02	2878.063	362.392	3332.704	304.157
4	D1	2.082E+02	2878.064	362.392	3349.811	352.981
3	D1	2.174E+02	2877.614	367.088	3361.017	379.222
2	D1	2.244E+02	2878.592	368.604	3345.018	369.950
1	D1	2.309E+02	2879.357	369.710	3327.479	371.465

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M O D A L P E R I O D S A N D F R E Q U E N C I E S

MODE NUMBER	PERIOD (TIME)	FREQUENCY (CYCLES/TIME)	CIRCULAR FREQ (RADIANS/TIME)
Mode 1	4.38974	0.22780	1.43133
Mode 2	3.29950	0.30308	1.90429
Mode 3	2.68253	0.37278	2.34226
Mode 4	2.07643	0.48159	3.02595
Mode 5	1.26049	0.79334	4.98472
Mode 6	0.90981	1.09913	6.90604
Mode 7	0.78224	1.27838	8.03231
Mode 8	0.72218	1.38469	8.70029
Mode 9	0.60321	1.65779	10.41621
Mode 10	0.51332	1.94812	12.24037
Mode 11	0.47924	2.08664	13.11072
Mode 12	0.43222	2.31362	14.53689

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M O D A L P A R T I C I P A T I N G M A S S R A T I O S

MODE NUMBER	X-TRANS %MASS <SUM>	Y-TRANS %MASS <SUM>	Z-TRANS %MASS <SUM>	RX-ROTN %MASS <SUM>	RY-ROTN %MASS <SUM>	RZ-ROTN %MASS <SUM>
Mode 1	37.04 < 37>	2.75 < 3>	0.00 < 0>	4.45 < 4>	66.93 < 67>	11.32 < 11>
Mode 2	5.93 < 43>	39.39 < 42>	0.00 < 0>	61.85 < 66>	12.16 < 79>	11.86 < 23>
Mode 3	0.62 < 44>	18.22 < 60>	0.00 < 0>	29.48 < 96>	2.53 < 82>	36.93 < 60>
Mode 4	18.96 < 63>	0.20 < 61>	0.00 < 0>	0.26 < 96>	10.50 < 92>	1.26 < 61>
Mode 5	11.70 < 74>	0.01 < 61>	0.00 < 0>	0.00 < 96>	3.82 < 96>	0.02 < 61>
Mode 6	0.42 < 75>	0.03 < 61>	0.00 < 0>	0.00 < 96>	1.11 < 97>	0.12 < 62>
Mode 7	3.69 < 78>	0.01 < 61>	0.00 < 0>	0.00 < 96>	0.41 < 97>	0.02 < 62>
Mode 8	0.07 < 78>	12.01 < 73>	0.00 < 0>	1.98 < 98>	0.05 < 98>	5.98 < 68>
Mode 9	0.02 < 78>	4.98 < 78>	0.00 < 0>	0.82 < 99>	0.00 < 98>	11.03 < 79>
Mode 10	2.09 < 81>	0.03 < 78>	0.00 < 0>	0.00 < 99>	0.27 < 98>	0.00 < 79>
Mode 11	0.02 < 81>	0.79 < 78>	0.00 < 0>	0.10 < 99>	0.12 < 98>	0.06 < 79>
Mode 12	0.18 < 81>	0.67 < 79>	0.00 < 0>	0.04 < 99>	0.40 < 98>	0.00 < 79>

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M O D A L L O A D P A R T I C I P A T I O N R A T I O S

(STATIC AND DYNAMIC RATIOS ARE IN PERCENT)

TYPE	NAME	STATIC	DYNAMIC
Load	DEAD	0.4482	0.0000
Load	LIVE	0.0000	0.0000
Load	WIND	99.8714	55.3632
Load	QUAKE	99.9492	71.5925
Accel	UX	99.9222	80.7424
Accel	UY	99.8671	79.0851
Accel	UZ	0.0000	0.0000
Accel	RX	99.9938	98.9859
Accel	RY	99.9912	98.3010
Accel	RZ	185.6133	78.5958

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TOTAL REACTIVE FORCES (RECOVERED LOADS) AT ORIGIN

LOAD	FX	FY	FZ	MX	MY	MZ
DEAD	-9.919E-07	-2.109E-06	5.261E+04	1.549E+07	-1.607E+08	-5.690E-03
LIVE	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
WIND	6.258E-06	-9.244E+03	1.650E-05	2.665E+07	-4.117E-02	-2.651E+07
QUAKE	-2.142E+03	1.120E-05	-1.034E-05	-1.022E-02	-7.877E+06	2.450E-02

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S T O R Y F O R C E S

STORY	LOAD	P	VX	VY	T	MX	MY
ROOF	WIND	-2.728E-08	3.836E-08	-5.030E+02	-1.443E+06	7.696E+04	6.259E-05
43	WIND	-5.854E-08	9.512E-08	-7.220E+02	-2.071E+06	1.528E+05	1.480E-04
42	WIND	-8.178E-08	1.761E-07	-9.400E+02	-2.696E+06	2.515E+05	2.236E-04
41	WIND	-6.836E-08	2.772E-07	-1.157E+03	-3.318E+06	3.730E+05	2.155E-04
40	WIND	-1.061E-07	3.545E-07	-1.373E+03	-3.938E+06	5.171E+05	3.438E-04
39	WIND	-1.261E-07	4.767E-07	-1.588E+03	-4.554E+06	6.839E+05	4.411E-04
38	WIND	-1.443E-07	5.640E-07	-1.802E+03	-5.168E+06	8.731E+05	5.481E-04
37	WIND	-1.487E-07	6.407E-07	-2.015E+03	-5.779E+06	1.085E+06	6.197E-04
36	WIND	-1.521E-07	7.441E-07	-2.227E+03	-6.387E+06	1.318E+06	7.053E-04
35	WIND	-1.652E-07	8.869E-07	-2.438E+03	-6.992E+06	1.574E+06	8.269E-04
34	WIND	-1.195E-07	1.038E-06	-2.648E+03	-7.594E+06	1.853E+06	8.215E-04
33	WIND	-1.378E-07	1.251E-06	-2.858E+03	-8.197E+06	2.153E+06	9.957E-04
32	WIND	-1.404E-07	1.501E-06	-3.066E+03	-8.793E+06	2.475E+06	1.157E-03
31	WIND	-1.433E-07	1.719E-06	-3.273E+03	-9.387E+06	2.818E+06	1.347E-03
30	WIND	-1.603E-07	1.903E-06	-3.479E+03	-9.978E+06	3.183E+06	1.588E-03
29	WIND	-1.952E-07	2.102E-06	-3.684E+03	-1.057E+07	3.570E+06	1.895E-03
28	WIND	-2.157E-07	2.316E-06	-3.888E+03	-1.115E+07	3.979E+06	2.188E-03
27	WIND	-2.610E-07	2.527E-06	-4.091E+03	-1.173E+07	4.408E+06	2.565E-03
26	WIND	-3.010E-07	2.762E-06	-4.293E+03	-1.231E+07	4.859E+06	2.957E-03

25	WIND	-3.261E-07	2.963E-06	-4.494E+03	-1.289E+07	5.331E+06	3.326E-03
24	WIND	-3.358E-07	3.176E-06	-4.694E+03	-1.346E+07	5.824E+06	3.683E-03
23	WIND	-3.295E-07	3.332E-06	-4.892E+03	-1.403E+07	6.337E+06	4.016E-03
22	WIND	-3.546E-07	3.441E-06	-5.089E+03	-1.460E+07	6.872E+06	4.440E-03
21	WIND	4.445E-06	4.025E-06	-5.285E+03	-1.516E+07	7.427E+06	-1.121E-02
20	WIND	6.249E-06	4.258E-06	-5.479E+03	-1.571E+07	8.002E+06	-1.727E-02
19	WIND	8.430E-06	4.278E-06	-5.672E+03	-1.627E+07	8.597E+06	-2.465E-02
18	WIND	7.617E-06	4.948E-06	-5.864E+03	-1.682E+07	9.213E+06	-2.124E-02
17	WIND	1.053E-05	5.038E-06	-6.054E+03	-1.736E+07	9.849E+06	-3.122E-02
16	WIND	1.034E-05	5.038E-06	-6.243E+03	-1.790E+07	1.050E+07	-3.003E-02
15	WIND	8.102E-06	5.532E-06	-6.430E+03	-1.844E+07	1.118E+07	-2.144E-02
14	WIND	8.404E-06	5.725E-06	-6.615E+03	-1.897E+07	1.187E+07	-2.192E-02
13	WIND	8.986E-06	5.562E-06	-6.799E+03	-1.950E+07	1.259E+07	-2.343E-02
12	WIND	7.995E-06	5.470E-06	-6.981E+03	-2.002E+07	1.332E+07	-1.930E-02
11	WIND	4.969E-06	5.502E-06	-7.161E+03	-2.054E+07	1.407E+07	-7.898E-03
10	WIND	4.944E-06	5.728E-06	-7.339E+03	-2.105E+07	1.484E+07	-7.238E-03
9	WIND	7.923E-06	5.889E-06	-7.515E+03	-2.155E+07	1.563E+07	-1.732E-02
8	WIND	8.531E-06	5.913E-06	-7.688E+03	-2.205E+07	1.644E+07	-1.891E-02
7	WIND	1.504E-05	6.015E-06	-7.859E+03	-2.254E+07	1.726E+07	-4.162E-02
6	WIND	1.740E-05	6.033E-06	-8.028E+03	-2.302E+07	1.811E+07	-4.947E-02
5	WIND	1.756E-05	6.074E-06	-8.194E+03	-2.350E+07	1.897E+07	-4.939E-02
4	WIND	1.766E-05	6.080E-06	-8.480E+03	-2.432E+07	1.986E+07	-4.913E-02
3	WIND	1.888E-05	6.073E-06	-8.919E+03	-2.558E+07	2.221E+07	-5.271E-02
2	WIND	1.676E-05	6.271E-06	-9.244E+03	-2.651E+07	2.532E+07	-4.301E-02
1	WIND	1.650E-05	6.258E-06	-9.244E+03	-2.651E+07	2.665E+07	-4.117E-02
ROOF	QUAKE	-1.341E-08	-9.580E+01	5.252E-09	-4.852E-05	-4.821E-07	-1.466E+04
43	QUAKE	-3.113E-08	-2.049E+02	2.704E-08	-1.003E-04	-2.956E-06	-3.617E+04
42	QUAKE	-4.585E-08	-3.102E+02	8.805E-08	-9.871E-05	-1.183E-05	-6.874E+04
41	QUAKE	-3.316E-08	-4.118E+02	1.469E-07	-1.080E-04	-2.754E-05	-1.120E+05
40	QUAKE	-5.521E-08	-5.097E+02	1.968E-07	-1.243E-04	-4.763E-05	-1.655E+05
39	QUAKE	-6.707E-08	-6.039E+02	2.203E-07	-2.389E-04	-7.056E-05	-2.289E+05
38	QUAKE	-7.616E-08	-6.945E+02	2.573E-07	-3.070E-04	-9.734E-05	-3.018E+05
37	QUAKE	-7.829E-08	-7.816E+02	2.883E-07	-3.466E-04	-1.276E-04	-3.839E+05
36	QUAKE	-7.700E-08	-8.675E+02	3.235E-07	-4.318E-04	-1.616E-04	-4.750E+05
35	QUAKE	-8.437E-08	-9.499E+02	3.551E-07	-5.604E-04	-1.987E-04	-5.747E+05
34	QUAKE	-5.439E-08	-1.030E+03	3.883E-07	-6.702E-04	-2.399E-04	-6.829E+05
33	QUAKE	-6.399E-08	-1.107E+03	4.123E-07	-9.005E-04	-2.831E-04	-7.991E+05
32	QUAKE	-6.642E-08	-1.180E+03	4.420E-07	-1.152E-03	-3.294E-04	-9.230E+05
31	QUAKE	-6.571E-08	-1.250E+03	4.610E-07	-1.390E-03	-3.779E-04	-1.054E+06
30	QUAKE	-7.518E-08	-1.316E+03	4.763E-07	-1.575E-03	-4.277E-04	-1.192E+06
29	QUAKE	-9.454E-08	-1.380E+03	4.924E-07	-1.784E-03	-4.791E-04	-1.337E+06
28	QUAKE	-1.052E-07	-1.440E+03	5.039E-07	-2.013E-03	-5.318E-04	-1.489E+06
27	QUAKE	-1.299E-07	-1.497E+03	5.161E-07	-2.237E-03	-5.855E-04	-1.646E+06

26	QUAKE	-1.511E-07	-1.551E+03	5.282E-07	-2.491E-03	-6.405E-04	-1.809E+06
25	QUAKE	-1.667E-07	-1.603E+03	5.379E-07	-2.711E-03	-6.968E-04	-1.977E+06
24	QUAKE	-1.726E-07	-1.651E+03	5.522E-07	-2.933E-03	-7.548E-04	-2.150E+06
23	QUAKE	-1.685E-07	-1.696E+03	5.646E-07	-3.088E-03	-8.142E-04	-2.328E+06
22	QUAKE	-1.820E-07	-1.739E+03	5.735E-07	-3.206E-03	-8.742E-04	-2.511E+06
21	QUAKE	-1.633E-06	-1.779E+03	6.116E-07	-3.229E-03	-9.163E-04	-2.698E+06
20	QUAKE	-2.727E-06	-1.817E+03	6.161E-07	-3.375E-03	-9.650E-04	-2.889E+06
19	QUAKE	-4.099E-06	-1.852E+03	6.214E-07	-3.491E-03	-1.010E-03	-3.083E+06
18	QUAKE	-3.580E-06	-1.885E+03	6.273E-07	-3.564E-03	-1.084E-03	-3.281E+06
17	QUAKE	-5.576E-06	-1.915E+03	6.318E-07	-3.663E-03	-1.120E-03	-3.482E+06
16	QUAKE	-5.484E-06	-1.943E+03	6.348E-07	-3.757E-03	-1.189E-03	-3.686E+06
15	QUAKE	-3.978E-06	-1.969E+03	6.390E-07	-3.837E-03	-1.279E-03	-3.893E+06
14	QUAKE	-4.189E-06	-1.992E+03	6.422E-07	-3.903E-03	-1.344E-03	-4.102E+06
13	QUAKE	-4.586E-06	-2.013E+03	6.456E-07	-3.990E-03	-1.407E-03	-4.313E+06
12	QUAKE	-3.929E-06	-2.032E+03	6.481E-07	-4.050E-03	-1.485E-03	-4.527E+06
11	QUAKE	-1.961E-06	-2.049E+03	6.506E-07	-4.112E-03	-1.583E-03	-4.742E+06
10	QUAKE	-1.972E-06	-2.064E+03	6.525E-07	-4.149E-03	-1.651E-03	-4.959E+06
9	QUAKE	-3.903E-06	-2.078E+03	6.550E-07	-4.179E-03	-1.691E-03	-5.177E+06
8	QUAKE	-4.320E-06	-2.090E+03	6.562E-07	-4.209E-03	-1.754E-03	-5.396E+06
7	QUAKE	-8.410E-06	-2.100E+03	6.567E-07	-4.221E-03	-1.762E-03	-5.617E+06
6	QUAKE	-9.899E-06	-2.108E+03	6.578E-07	-4.233E-03	-1.809E-03	-5.838E+06
5	QUAKE	-9.998E-06	-2.115E+03	6.581E-07	-4.240E-03	-1.877E-03	-6.060E+06
4	QUAKE	-1.005E-05	-2.132E+03	6.585E-07	-4.244E-03	-1.945E-03	-6.284E+06
3	QUAKE	-1.180E-05	-2.140E+03	1.120E-05	2.452E-02	-4.826E-03	-6.849E+06
2	QUAKE	-1.048E-05	-2.142E+03	1.120E-05	2.450E-02	-8.607E-03	-7.569E+06
1	QUAKE	-1.034E-05	-2.142E+03	1.120E-05	2.450E-02	-1.022E-02	-7.877E+06

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STORY DRIFTS

STORY	DIRECTION	LOAD	MAX DRIFT
ROOF	Y	WIND	1/214
43	Y	WIND	1/213
42	Y	WIND	1/213
41	Y	WIND	1/212
40	Y	WIND	1/212
39	Y	WIND	1/211
38	Y	WIND	1/211
37	Y	WIND	1/210
36	Y	WIND	1/210
35	Y	WIND	1/209
34	Y	WIND	1/209
33	Y	WIND	1/209

32	Y	WIND	1/209
31	Y	WIND	1/209
30	Y	WIND	1/210
29	Y	WIND	1/211
28	Y	WIND	1/212
27	Y	WIND	1/213
26	Y	WIND	1/215
25	Y	WIND	1/216
24	Y	WIND	1/219
23	Y	WIND	1/222
22	Y	WIND	1/225
21	Y	WIND	1/229
20	Y	WIND	1/233
19	Y	WIND	1/238
18	Y	WIND	1/244
17	Y	WIND	1/250
16	Y	WIND	1/258
15	Y	WIND	1/267
14	Y	WIND	1/277
13	Y	WIND	1/289
12	Y	WIND	1/304
11	Y	WIND	1/321
10	Y	WIND	1/343
9	Y	WIND	1/369
8	Y	WIND	1/402
7	Y	WIND	1/444
6	Y	WIND	1/501
5	Y	WIND	1/578
4	Y	WIND	1/691
3	Y	WIND	1/1070
2	Y	WIND	1/1674
1	Y	WIND	1/3715
ROOF	X	QUAKE	1/381
43	X	QUAKE	1/383
42	X	QUAKE	1/385
41	X	QUAKE	1/386
41	Y	QUAKE	1/769
40	X	QUAKE	1/387
40	Y	QUAKE	1/644
39	X	QUAKE	1/388
39	Y	QUAKE	1/558
38	X	QUAKE	1/389
38	Y	QUAKE	1/494

37	X	QUAKE	1/390
37	Y	QUAKE	1/443
36	X	QUAKE	1/392
36	Y	QUAKE	1/400
35	X	QUAKE	1/394
35	Y	QUAKE	1/364
34	X	QUAKE	1/396
34	Y	QUAKE	1/284
33	X	QUAKE	1/399
33	Y	QUAKE	1/271
32	X	QUAKE	1/397
32	Y	QUAKE	1/256
31	X	QUAKE	1/394
31	Y	QUAKE	1/242
30	X	QUAKE	1/388
30	Y	QUAKE	1/230
29	X	QUAKE	1/379
29	Y	QUAKE	1/220
28	X	QUAKE	1/366
28	Y	QUAKE	1/211
27	X	QUAKE	1/349
27	Y	QUAKE	1/205
26	X	QUAKE	1/330
26	Y	QUAKE	1/202
25	X	QUAKE	1/312
25	Y	QUAKE	1/202
24	X	QUAKE	1/302
24	Y	QUAKE	1/207
23	X	QUAKE	1/318
23	Y	QUAKE	1/225
22	X	QUAKE	1/490
22	Y	QUAKE	1/281
21	X	QUAKE	1/683
20	X	QUAKE	1/737
19	X	QUAKE	1/790
18	X	QUAKE	1/850
17	X	QUAKE	1/916
16	X	QUAKE	1/991
15	X	QUAKE	1/1073
14	X	QUAKE	1/1165
13	X	QUAKE	1/1269
12	X	QUAKE	1/1388
11	X	QUAKE	1/1527

10	X	QUAKE	1/1695
9	X	QUAKE	1/1904
8	X	QUAKE	1/2179
7	X	QUAKE	1/2563
6	X	QUAKE	1/3154
5	X	QUAKE	1/4194
4	X	QUAKE	1/6305
3	X	QUAKE	1/8103
3	Y	QUAKE	1/15429
2	X	QUAKE	1/12260
1	X	QUAKE	1/16341

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DISPLACEMENTS AT DIAPHRAGM CENTER OF MASS

STORY	DIAPHRAGM	LOAD	UX	UY	RZ
ROOF	D1	WIND	1.9298	12.2605	-0.00265
43	D1	WIND	1.8616	11.7703	-0.00255
42	D1	WIND	1.8112	11.4420	-0.00247
41	D1	WIND	1.7600	11.1116	-0.00240
40	D1	WIND	1.7072	10.7802	-0.00232
39	D1	WIND	1.6528	10.4476	-0.00225
38	D1	WIND	1.5966	10.1137	-0.00218
37	D1	WIND	1.5384	9.7786	-0.00210
36	D1	WIND	1.4785	9.4423	-0.00203
35	D1	WIND	1.4167	9.1060	-0.00195
34	D1	WIND	1.3533	8.7686	-0.00188
33	D1	WIND	1.2885	8.4292	-0.00180
32	D1	WIND	1.2225	8.0893	-0.00173
31	D1	WIND	1.1556	7.7490	-0.00166
30	D1	WIND	1.0880	7.4088	-0.00158
29	D1	WIND	1.0203	7.0689	-0.00151
28	D1	WIND	0.9527	6.7297	-0.00144
27	D1	WIND	0.8858	6.3917	-0.00137
26	D1	WIND	0.8201	6.0554	-0.00130
25	D1	WIND	0.7563	5.7213	-0.00123
24	D1	WIND	0.6951	5.3900	-0.00116
23	D1	WIND	0.6374	5.0621	-0.00109
22	D1	WIND	0.5841	4.7383	-0.00102
21	D1	WIND	0.5366	4.4192	-0.00095
20	D1	WIND	0.4961	4.1054	-0.00089
19	D1	WIND	0.4571	3.7977	-0.00082
18	D1	WIND	0.4183	3.4964	-0.00076
17	D1	WIND	0.3800	3.2020	-0.00070

16	D1	WIND	0.3422	2.9151	-0.00064
15	D1	WIND	0.3049	2.6365	-0.00058
14	D1	WIND	0.2683	2.3669	-0.00052
13	D1	WIND	0.2326	2.1073	-0.00047
12	D1	WIND	0.1980	1.8585	-0.00042
11	D1	WIND	0.1648	1.6215	-0.00037
10	D1	WIND	0.1333	1.3974	-0.00032
9	D1	WIND	0.1038	1.1874	-0.00028
8	D1	WIND	0.0769	0.9927	-0.00024
7	D1	WIND	0.0531	0.8144	-0.00020
6	D1	WIND	0.0327	0.6539	-0.00016
5	D1	WIND	0.0165	0.5126	-0.00013
4	D1	WIND	0.0048	0.3916	-0.00010
3	D1	WIND	0.0073	0.2932	-0.00008
2	D1	WIND	0.0011	0.1430	-0.00004
1	D1	WIND	0.0002	0.0192	0.00000
ROOF	D1	QUAKE	7.2191	0.4118	-0.00038
43	D1	QUAKE	6.8239	0.3815	-0.00037
42	D1	QUAKE	6.5540	0.3621	-0.00036
41	D1	QUAKE	6.2852	0.3425	-0.00034
40	D1	QUAKE	6.0172	0.3230	-0.00033
39	D1	QUAKE	5.7499	0.3036	-0.00032
38	D1	QUAKE	5.4833	0.2844	-0.00031
37	D1	QUAKE	5.2174	0.2655	-0.00030
36	D1	QUAKE	4.9524	0.2470	-0.00029
35	D1	QUAKE	4.6885	0.2290	-0.00028
34	D1	QUAKE	4.4259	0.2117	-0.00027
33	D1	QUAKE	4.1651	0.1947	-0.00026
32	D1	QUAKE	3.9064	0.1783	-0.00024
31	D1	QUAKE	3.6502	0.1625	-0.00023
30	D1	QUAKE	3.3972	0.1472	-0.00022
29	D1	QUAKE	3.1482	0.1325	-0.00021
28	D1	QUAKE	2.9040	0.1184	-0.00020
27	D1	QUAKE	2.6657	0.1050	-0.00019
26	D1	QUAKE	2.4346	0.0924	-0.00018
25	D1	QUAKE	2.2121	0.0807	-0.00017
24	D1	QUAKE	1.9999	0.0699	-0.00016
23	D1	QUAKE	1.8000	0.0603	-0.00015
22	D1	QUAKE	1.6144	0.0518	-0.00014
21	D1	QUAKE	1.4455	0.0446	-0.00014
20	D1	QUAKE	1.2953	0.0386	-0.00013
19	D1	QUAKE	1.1562	0.0337	-0.00012
18	D1	QUAKE	1.0266	0.0297	-0.00011

17	D1	QUAKE	0.9063	0.0264	-0.00010
16	D1	QUAKE	0.7950	0.0236	-0.00009
15	D1	QUAKE	0.6921	0.0213	-0.00008
14	D1	QUAKE	0.5973	0.0194	-0.00007
13	D1	QUAKE	0.5101	0.0176	-0.00007
12	D1	QUAKE	0.4301	0.0161	-0.00006
11	D1	QUAKE	0.3571	0.0146	-0.00005
10	D1	QUAKE	0.2909	0.0133	-0.00004
9	D1	QUAKE	0.2313	0.0120	-0.00004
8	D1	QUAKE	0.1783	0.0107	-0.00003
7	D1	QUAKE	0.1321	0.0095	-0.00003
6	D1	QUAKE	0.0930	0.0084	-0.00002
5	D1	QUAKE	0.0613	0.0073	-0.00002
4	D1	QUAKE	0.0377	0.0062	-0.00001
3	D1	QUAKE	0.0244	0.0054	-0.00001
2	D1	QUAKE	0.0106	0.0020	0.00000
1	D1	QUAKE	0.0013	0.0001	0.00000

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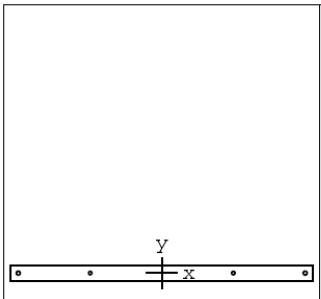
STORY MAXIMUM AND AVERAGE LATERAL DISPLACEMENTS

STORY	LOAD	DIR	MAXIMUM	AVERAGE	RATIO
ROOF	WIND	Y	18.0974	12.2785	1.474
43	WIND	Y	17.3820	11.7992	1.473
42	WIND	Y	16.8896	11.4690	1.473
41	WIND	Y	16.3961	11.1378	1.472
40	WIND	Y	15.9013	10.8056	1.472
39	WIND	Y	15.4052	10.4722	1.471
38	WIND	Y	14.9077	10.1375	1.471
37	WIND	Y	14.4089	9.8016	1.470
36	WIND	Y	13.9089	9.4644	1.470
35	WIND	Y	13.4079	9.1261	1.469
34	WIND	Y	12.9060	8.7868	1.469
33	WIND	Y	12.4038	8.4467	1.468
32	WIND	Y	11.9016	8.1060	1.468
31	WIND	Y	11.3996	7.7651	1.468
30	WIND	Y	10.8984	7.4241	1.468
29	WIND	Y	10.3984	7.0835	1.468
28	WIND	Y	9.9001	6.7436	1.468
27	WIND	Y	9.4041	6.4049	1.468
26	WIND	Y	8.9111	6.0679	1.469
25	WIND	Y	8.4217	5.7331	1.469
24	WIND	Y	7.9367	5.4011	1.469
23	WIND	Y	7.4569	5.0726	1.470

22	WIND	Y	6.9831	4.7482	1.471
21	WIND	Y	6.5163	4.4286	1.471
20	WIND	Y	6.0573	4.1144	1.472
19	WIND	Y	5.6069	3.8060	1.473
18	WIND	Y	5.1659	3.5041	1.474
17	WIND	Y	4.7353	3.2090	1.476
16	WIND	Y	4.3160	2.9215	1.477
15	WIND	Y	3.9090	2.6423	1.479
14	WIND	Y	3.5156	2.3722	1.482
13	WIND	Y	3.1368	2.1120	1.485
12	WIND	Y	2.7741	1.8627	1.489
11	WIND	Y	2.4286	1.6252	1.494
10	WIND	Y	2.1019	1.4007	1.501
9	WIND	Y	1.7954	1.1902	1.508
8	WIND	Y	1.5107	0.9951	1.518
7	WIND	Y	1.2493	0.8164	1.530
6	WIND	Y	1.0130	0.6556	1.545
5	WIND	Y	0.8032	0.5139	1.563
4	WIND	Y	0.6216	0.3926	1.583
3	WIND	Y	0.4700	0.2932	1.603
2	WIND	Y	0.2308	0.1447	1.595
1	WIND	Y	0.0301	0.0194	1.550
ROOF	QUAKE	X	7.3571	7.2186	1.019
43	QUAKE	X	6.9554	6.8230	1.019
42	QUAKE	X	6.6814	6.5531	1.020
41	QUAKE	X	6.4085	6.2844	1.020
40	QUAKE	X	6.1364	6.0164	1.020
39	QUAKE	X	5.8650	5.7491	1.020
38	QUAKE	X	5.5943	5.4825	1.020
37	QUAKE	X	5.3244	5.2167	1.021
36	QUAKE	X	5.0553	4.9517	1.021
35	QUAKE	X	4.7875	4.6878	1.021
34	QUAKE	X	4.5211	4.4253	1.022
33	QUAKE	X	4.2564	4.1645	1.022
32	QUAKE	X	3.9939	3.9058	1.023
31	QUAKE	X	3.7340	3.6496	1.023
30	QUAKE	X	3.4773	3.3967	1.024
29	QUAKE	X	3.2246	3.1477	1.024
28	QUAKE	X	2.9768	2.9035	1.025
27	QUAKE	X	2.7349	2.6653	1.026
26	QUAKE	X	2.5002	2.4342	1.027
25	QUAKE	X	2.2742	2.2117	1.028
24	QUAKE	X	2.0585	1.9995	1.030

23	QUAKE	X	1.8552	1.7996	1.031
22	QUAKE	X	1.6662	1.6141	1.032
21	QUAKE	X	1.4939	1.4452	1.034
20	QUAKE	X	1.3403	1.2950	1.035
19	QUAKE	X	1.1979	1.1559	1.036
18	QUAKE	X	1.0651	1.0264	1.038
17	QUAKE	X	0.9417	0.9061	1.039
16	QUAKE	X	0.8272	0.7948	1.041
15	QUAKE	X	0.7214	0.6919	1.043
14	QUAKE	X	0.6236	0.5971	1.044
13	QUAKE	X	0.5336	0.5099	1.047
12	QUAKE	X	0.4510	0.4300	1.049
11	QUAKE	X	0.3755	0.3570	1.052
10	QUAKE	X	0.3069	0.2908	1.055
9	QUAKE	X	0.2450	0.2312	1.060
8	QUAKE	X	0.1900	0.1782	1.066
7	QUAKE	X	0.1418	0.1321	1.074
6	QUAKE	X	0.1010	0.0929	1.087
5	QUAKE	X	0.0677	0.0613	1.106
4	QUAKE	X	0.0428	0.0377	1.136
3	QUAKE	X	0.0272	0.0232	1.172
2	QUAKE	X	0.0120	0.0103	1.166
1	QUAKE	X	0.0014	0.0013	1.102

PCA Column Interaction Diagram – Shear Wall 9, Floor 34



380 x 20 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

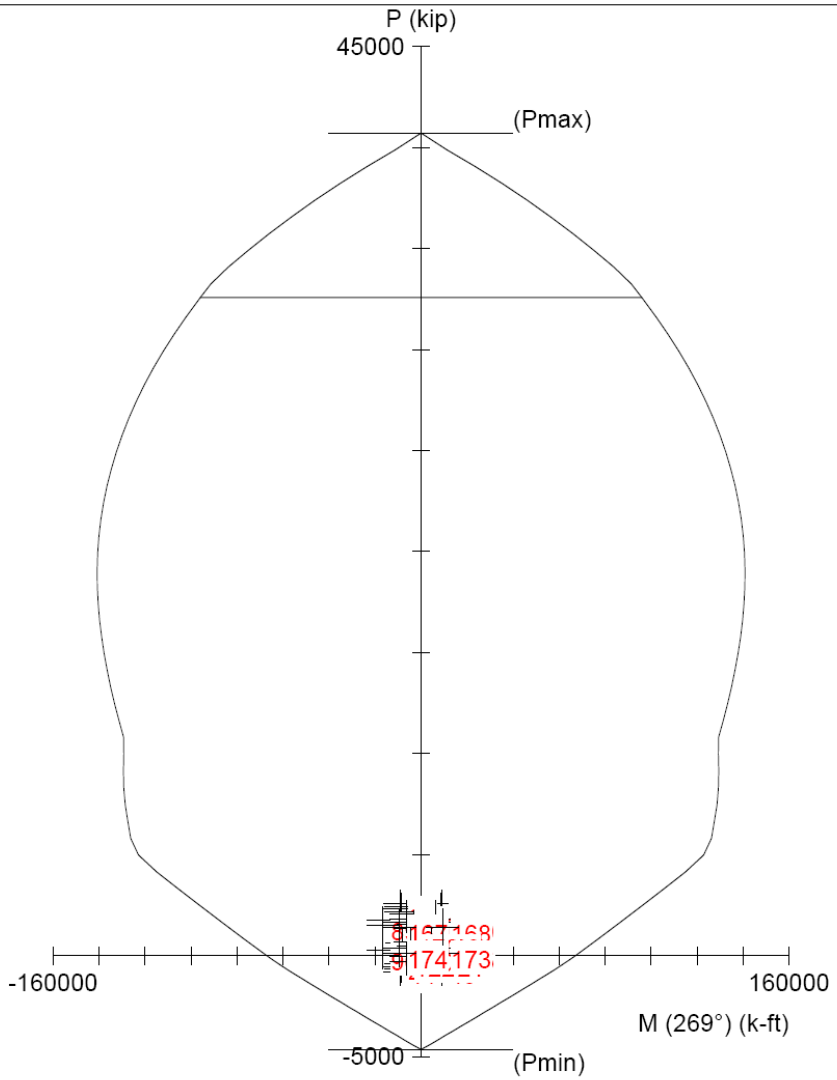
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 12/03/07

Time: 11:08:20



pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: F:\Thesis\Tech3\PCA FILES\SW9_FLR34.col

Project:

Column:		Engineer:	
f'c = 9 ksi	fy = 60 ksi	Ag = 7600 in^2	4 bars
Ec = 5408 ksi	Es = 29000 ksi	As = 85.92 in^2	Rho = 1.13%
fc = 7.65 ksi	fc = 7.65 ksi	Xo = 0.00 in	Ix = 253333 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 9.14533e+007 in^4
Beta1 = 0.65		Clear spacing = 84.79 in	Clear cover = 7.18 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

PCA Output File – Shear Wall 9, Floor 34

```
                                    PCA SW9 FLR 34
 General Information:
   ====================
      File Name: F:\Thesis\Tech3\PCA FILES\SW9_FLR3.col
      Project:
      Column:                                   Engineer:
      Code:     ACI 318-02                      Units: English

      Run Option: Investigation                 Slenderness: Not considered
      Run Axis:   Biaxial                       Column Type: Structural

   Material Properties:
   ====================
      f'c   = 9 ksi                             fy   = 60 ksi
      Ec    = 5407.5 ksi                        Es   = 29000 ksi
      Ultimate strain = 0.003 in/in
      Beta1 = 0.65

   Section:
   ========
      Rectangular: Width = 1100 in              Depth = 20 in

      Gross section area, Ag =  22000 in^2
      Ix =  733333 in^4                         Iy =  2.21833e+009 in^4
      Xo =  0 in                                Yo =  0 in

   Reinforcement:
   ==============
      Rebar Database: ASTM A615
      Size Diam (in) Area (in^2)   Size Diam (in) Area (in^2)   Size Diam (in) Area
(in^2)
      ---- --------- -----------   ---- --------- -----------   ---- ---------
-----------
      #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63
 0.31
      #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00
 0.79
      #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41
 1.56
      # 14      1.69        2.25   # 18      2.26        4.00

      Confinement: Tied; #3 ties with #10 bars,  #4 with larger bars.
      phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

      Pattern: Irregular

      Total steel area, As = 604.80 in^2 at 2.75%

      Area in^2   X (in)   Y (in)  Area in^2   X (in)   Y (in)  Area in^2   X (in)
Y (in)
      --------- -------- --------  --------- -------- --------  --------- --------
--------
          67.50    540.0      5.0      67.50    540.0     -5.0      67.50   -540.0
  -5.0
          67.50   -540.0      5.0      93.60    360.0      0.0      93.60   -360.0
   0.0
          93.60      0.0      0.0      27.00    180.0      0.0      27.00   -180.0
   0.0

   Load Combinations:
   ==================
      U1  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
      U2  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
      U3  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
                                       Page 1
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U4 = 1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
U5 = 1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
U6 = 0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
U7 = 1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
U8 = 0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
U9 = 1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
U10 = 0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake

Service Loads:
==============

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	0.0	0.0	0.0	0.0	0.0
	E.Q.	89.0	4.0	4.0	158591.0	158591.0
2	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	240.0	8.0	8.0	114255.0	114255.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
3	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	17909.0	464.0	464.0	50285.0	50285.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
4	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	13612.0	354.0	354.0	123405.0	123405.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
5	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	110.0	4.0	4.0	81787.0	81787.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
6	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	11827.0	297.0	297.0	51004.0	51004.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
7	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	9013.0	228.0	228.0	26040.0	26040.0
	E.Q.	0.0	0.0	0.0	0.0	0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

NOTE: Each loading combination includes the following cases:
First line - at column top
Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	1 U1	7537.2	0.0	0.0	22485.4	0.0	999.999
2		7537.2	0.0	0.0	22485.4	0.0	999.999
3	1 U2	7537.2	0.0	0.0	22485.4	0.0	999.999
4		7537.2	0.0	0.0	22485.4	0.0	999.999
5	1 U3	5652.9	0.0	0.0	22459.7	0.0	999.999

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6		5652.9	0.0	0.0	22459.7	0.0	999.999
7	1 U4	7537.2	0.0	0.0	22485.4	0.0	999.999
8		7537.2	0.0	0.0	22485.4	0.0	999.999
9	1 U5	7537.2	0.0	0.0	22485.4	0.0	999.999
10		7537.2	0.0	0.0	22485.4	0.0	999.999
11	1 U6	5652.9	0.0	0.0	22459.7	0.0	999.999
12		5652.9	0.0	0.0	22459.7	0.0	999.999
13	1 U7	7626.2	4.0	158591.0	40.4	1607930.4	10.139
14		7626.2	-4.0	-158591.0	-39.9	-1607933.1	10.139
15	1 U8	5741.9	4.0	158591.0	38.9	1548107.5	9.762
16		5741.9	-4.0	-158591.0	-38.4	-1548108.0	9.762
17	1 U9	7448.2	-4.0	-158591.0	-39.7	-1602465.3	10.104
18		7448.2	4.0	158591.0	40.2	1602462.4	10.104
19	1 U10	5563.9	-4.0	-158591.0	-38.2	-1542185.3	9.724
20		5563.9	4.0	158591.0	38.7	1542184.6	9.724
21	2 U1	7729.2	6.4	91404.0	112.8	1610657.8	17.621
22		7729.2	-6.4	-91404.0	-112.1	-1610662.9	17.621
23	2 U2	7921.2	12.8	182808.0	113.2	1616554.9	8.843
24		7921.2	-12.8	-182808.0	-112.5	-1616559.8	8.843
25	2 U3	6036.9	12.8	182808.0	109.1	1557818.6	8.522
26		6036.9	-12.8	-182808.0	-108.4	-1557819.5	8.522
27	2 U4	7345.2	-6.4	-91404.0	-111.3	-1598854.0	17.492
28		7345.2	6.4	91404.0	112.0	1598849.5	17.492
29	2 U5	7153.2	-12.8	-182808.0	-110.9	-1592939.4	8.714
30		7153.2	12.8	182808.0	111.6	1592935.6	8.714
31	2 U6	5268.9	-12.8	-182808.0	-106.7	-1532251.9	8.382
32		5268.9	12.8	182808.0	107.3	1532251.1	8.382
33	2 U7	7537.2	0.0	0.0	22485.4	0.0	999.999
34		7537.2	0.0	0.0	22485.4	0.0	999.999
35	2 U8	5652.9	0.0	0.0	22459.7	0.0	999.999
36		5652.9	0.0	0.0	22459.7	0.0	999.999
37	2 U9	7537.2	0.0	0.0	22485.4	0.0	

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999.999							
	38		7537.2	0.0	0.0	22485.4	0.0
999.999							
	39	2 U10	5652.9	0.0	0.0	22459.7	0.0
999.999							
	40		5652.9	0.0	0.0	22459.7	0.0
999.999							
	41	3 U1	21864.4	371.2	40228.0	10521.8	1140282.5
28.345							
	42		21864.4	-371.2	-40228.0	-10521.9	-1140277.6
28.345							
	43	3 U2	36191.6	742.4	80456.0	10230.1	1108672.9
13.780							
	44		36191.6	-742.4	-80456.0	-10230.3	-1108669.4
13.780							
	45	3 U3	34307.3	742.4	80456.0	10320.0	1118411.4
13.901							
	46		34307.3	-742.4	-80456.0	-10320.2	-1118410.1
13.901							
	47	3 U4	-6790.0	-371.2	-40228.0	-6972.2	-755584.8
18.783							
	48		-6790.0	371.2	40228.0	6972.1	755586.8
18.783							
	49	3 U5	-21117.2	-742.4	-80456.0	-3745.2	-405874.8
5.045							
	50		-21117.2	742.4	80456.0	3745.2	405876.2
5.045							
	51	3 U6	-23001.5	-742.4	-80456.0	-3273.6	-354769.1
4.409							
	52		-23001.5	742.4	80456.0	3273.6	354770.8
4.410							
	53	3 U7	7537.2	0.0	0.0	22485.4	0.0
999.999							
	54		7537.2	0.0	0.0	22485.4	0.0
999.999							
	55	3 U8	5652.9	0.0	0.0	22459.7	0.0
999.999							
	56		5652.9	0.0	0.0	22459.7	0.0
999.999							
	57	3 U9	7537.2	0.0	0.0	22485.4	0.0
999.999							
	58		7537.2	0.0	0.0	22485.4	0.0
999.999							
	59	3 U10	5652.9	0.0	0.0	22459.7	0.0
999.999							
	60		5652.9	0.0	0.0	22459.7	0.0
999.999							
	61	4 U1	18426.8	283.2	98724.0	4722.2	1646169.8
16.674							
	62		18426.8	-283.2	-98724.0	-4722.3	-1646174.1
16.675							
	63	4 U2	29316.4	566.4	197448.0	4816.4	1679002.5
8.504							
	64		29316.4	-566.4	-197448.0	-4816.5	-1679006.4
8.504							
	65	4 U3	27432.1	566.4	197448.0	4865.1	1695978.0
8.589							
	66		27432.1	-566.4	-197448.0	-4865.2	-1695974.5
8.589							
	67	4 U4	-3352.4	-283.2	-98724.0	-3301.2	-1150795.8
11.657							
	68		-3352.4	283.2	98724.0	3301.2	1150790.6
11.657							

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69	4	U5	-14242.0	-566.4	-197448.0	-2334.9	-813953.3	4.122
70			-14242.0	566.4	197448.0	2334.9	813953.0	4.122
71	4	U6	-16126.3	-566.4	-197448.0	-2118.8	-738600.4	3.741
72			-16126.3	566.4	197448.0	2118.8	738600.5	3.741
73	4	U7	7537.2	0.0	0.0	22485.4	0.0	999.999
74			7537.2	0.0	0.0	22485.4	0.0	999.999
75	4	U8	5652.9	0.0	0.0	22459.7	0.0	999.999
76			5652.9	0.0	0.0	22459.7	0.0	999.999
77	4	U9	7537.2	0.0	0.0	22485.4	0.0	999.999
78			7537.2	0.0	0.0	22485.4	0.0	999.999
79	4	U10	5652.9	0.0	0.0	22459.7	0.0	999.999
80			5652.9	0.0	0.0	22459.7	0.0	999.999
81	5	U1	7625.2	3.2	65429.6	78.5	1607669.8	24.571
82			7625.2	-3.2	-65429.6	-78.9	-1607667.0	24.571
83	5	U2	7713.2	6.4	130859.2	78.6	1610372.9	12.306
84			7713.2	-6.4	-130859.2	-79.1	-1610370.3	12.306
85	5	U3	5828.9	6.4	130859.2	75.7	1550953.3	11.852
86			5828.9	-6.4	-130859.2	-76.2	-1550952.8	11.852
87	5	U4	7449.2	-3.2	-65429.6	-78.7	-1602257.3	24.488
88			7449.2	3.2	65429.6	78.2	1602259.9	24.488
89	5	U5	7361.2	-6.4	-130859.2	-78.5	-1599551.9	12.223
90			7361.2	6.4	130859.2	78.1	1599553.1	12.223
91	5	U6	5476.9	-6.4	-130859.2	-75.6	-1539239.1	11.763
92			5476.9	6.4	130859.2	75.2	1539239.8	11.763
93	5	U7	7537.2	0.0	0.0	22485.4	0.0	999.999
94			7537.2	0.0	0.0	22485.4	0.0	999.999
95	5	U8	5652.9	0.0	0.0	22459.7	0.0	999.999
96			5652.9	0.0	0.0	22459.7	0.0	999.999
97	5	U9	7537.2	0.0	0.0	22485.4	0.0	999.999
98			7537.2	0.0	0.0	22485.4	0.0	999.999
99	5	U10	5652.9	0.0	0.0	22459.7	0.0	999.999
100			5652.9	0.0	0.0	22459.7	0.0	

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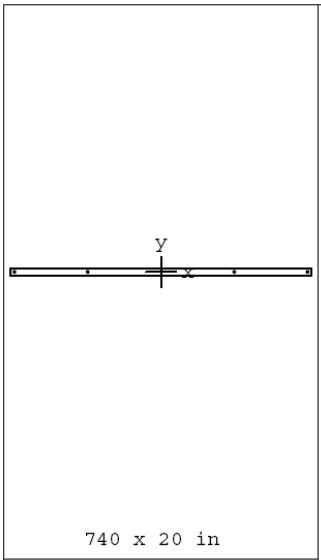
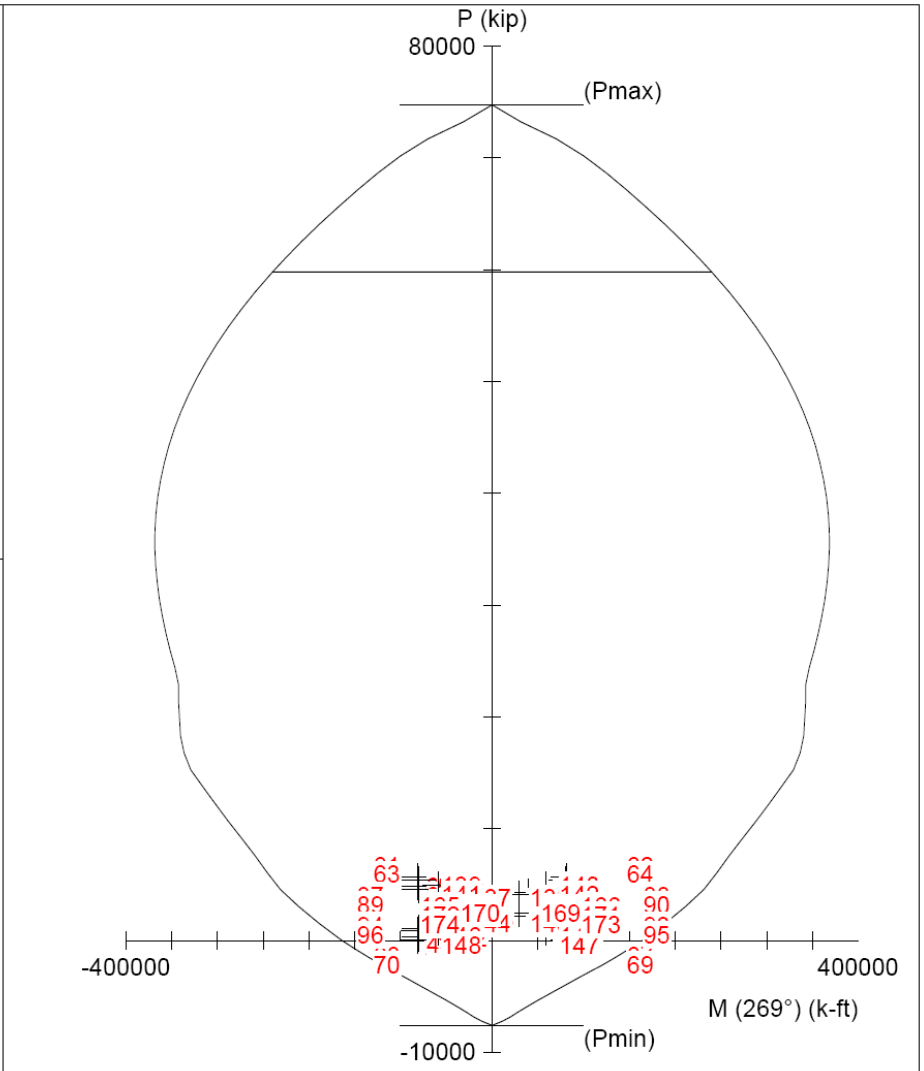
999.999							
	101	6 U1	16998.8	237.6	40803.2	7796.2	1338860.4
32.813							
	102		16998.8	-237.6	-40803.2	-7796.4	-1338853.1
32.812							
	103	6 U2	26460.4	475.2	81606.4	8077.6	1387184.5
16.998							
	104		26460.4	-475.2	-81606.4	-8077.8	-1387178.0
16.998							
	105	6 U3	24576.1	475.2	81606.4	8151.4	1399856.5
17.154							
	106		24576.1	-475.2	-81606.4	-8151.6	-1399849.6
17.154							
	107	6 U4	-1924.4	-237.6	-40803.2	-5882.6	-1010196.4
24.758							
	108		-1924.4	237.6	40803.2	5882.5	1010203.6
24.758							
	109	6 U5	-11386.0	-475.2	-81606.4	-4523.1	-776732.6
9.518							
	110		-11386.0	475.2	81606.4	4523.0	776736.6
9.518							
	111	6 U6	-13270.3	-475.2	-81606.4	-4246.6	-729254.1
8.936							
	112		-13270.3	475.2	81606.4	4246.5	729254.4
8.936							
	113	6 U7	7537.2	0.0	0.0	22485.4	0.0
999.999							
	114		7537.2	0.0	0.0	22485.4	0.0
999.999							
	115	6 U8	5652.9	0.0	0.0	22459.7	0.0
999.999							
	116		5652.9	0.0	0.0	22459.7	0.0
999.999							
	117	6 U9	7537.2	0.0	0.0	22485.4	0.0
999.999							
	118		7537.2	0.0	0.0	22485.4	0.0
999.999							
	119	6 U10	5652.9	0.0	0.0	22459.7	0.0
999.999							
	120		5652.9	0.0	0.0	22459.7	0.0
999.999							
	121	7 U1	14747.6	182.4	20832.0	9842.8	1124151.8
53.963							
	122		14747.6	-182.4	-20832.0	-9842.6	-1124174.8
53.964							
	123	7 U2	21958.0	364.8	41664.0	10237.8	1169270.3
28.064							
	124		21958.0	-364.8	-41664.0	-10237.7	-1169294.9
28.065							
	125	7 U3	20073.7	364.8	41664.0	10182.3	1162922.3
27.912							
	126		20073.7	-364.8	-41664.0	-10182.1	-1162946.5
27.913							
	127	7 U4	326.8	-182.4	-20832.0	-8108.3	-926088.8
44.455							
	128		326.8	182.4	20832.0	8108.4	926070.4
44.454							
	129	7 U5	-6883.6	-364.8	-41664.0	-6739.1	-769707.9
18.474							
	130		-6883.6	364.8	41664.0	6739.2	769690.4
18.474							
	131	7 U6	-8767.9	-364.8	-41664.0	-6379.6	-728644.1
17.489							

```
                                    PCA SW9 FLR 34
      132              -8767.9       364.8     41664.0      6379.7    728631.1
17.488
      133  7 U7         7537.2         0.0         0.0     22485.4         0.0
999.999
      134               7537.2         0.0         0.0     22485.4         0.0
999.999
      135  7 U8         5652.9         0.0         0.0     22459.7         0.0
999.999
      136               5652.9         0.0         0.0     22459.7         0.0
999.999
      137  7 U9         7537.2         0.0         0.0     22485.4         0.0
999.999
      138               7537.2         0.0         0.0     22485.4         0.0
999.999
      139  7 U10        5652.9         0.0         0.0     22459.7         0.0
999.999
      140               5652.9         0.0         0.0     22459.7         0.0
999.999

      *** Program completed as requested! ***
```

PCA Column Interaction Diagram – Shear Wall 9, Floor 21





Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 12/03/07

Time: 11:26:23

pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: F:\Thesis\Tech3\PCA FILES\SW9_FLR21.col

Project:

Column:		Engineer:	
f'c = 9 ksi	fy = 60 ksi	Ag = 14800 in^2	5 bars
Ec = 5408 ksi	Es = 29000 ksi	As = 140.64 in^2	Rho = 0.95%
fc = 7.65 ksi	fc = 7.65 ksi	Xo = 0.00 in	Ix = 493333 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 6.75373e+008 in^4
Beta1 = 0.65		Clear spacing = 173.46 in	Clear cover = 6.61 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

PCA Column Output File – Shear Wall 9, Floor 21

```
                                    PCA SW9 FLR 21
General Information:
   ====================
      File Name: F:\Thesis\Tech3\PCA FILES\SW9_FLR21.col
      Project:
      Column:                                   Engineer:
      Code:     ACI 318-02                      Units: English

      Run Option: Investigation                 Slenderness: Not considered
      Run Axis:   Biaxial                       Column Type: Architectural

   Material Properties:
   ====================
      f'c   = 9 ksi                             fy   = 60 ksi
      Ec    = 5407.5 ksi                        Es   = 29000 ksi
      Ultimate strain = 0.003 in/in
      Beta1 = 0.65

   Section:
   ========
      Rectangular: Width = 740 in               Depth = 20 in

      Gross section area, Ag =  14800 in^2
      Ix =  493333 in^4                         Iy =  6.75373e+008 in^4
      Xo =  0 in                                Yo =  0 in

   Reinforcement:
   ==============
      Rebar Database: ASTM A615
      Size Diam (in) Area (in^2)   Size Diam (in) Area (in^2)   Size Diam (in) Area
(in^2)
      ---- --------- -----------   ---- --------- -----------   ---- ---------
-----------
      #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63
 0.31
      #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00
 0.79
      #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41
 1.56
      # 14      1.69        2.25   # 18      2.26        4.00

      Confinement: Tied; #3 ties with #10 bars,  #4 with larger bars.
      phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

      Pattern: Irregular

      Total steel area, As = 140.64 in^2 at 0.95%

      Area in^2   X (in)   Y (in)  Area in^2   X (in)   Y (in)  Area in^2   X (in)
Y (in)
      --------- -------- --------  --------- -------- --------  --------- --------
--------
           31.20    360.0      0.0      31.20   -360.0      0.0       6.24      0.0
   0.0
           36.00   -180.0      0.0      36.00    180.0      0.0

   Load Combinations:
   ==================
      U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
      U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
      U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
      U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
      U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
      U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
                                       Page 1
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U7 = 1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
U8 = 1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
U9 = 0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
U10 = 1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
U11 = 0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
U12 = 1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
U13 = 0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake

Service Loads:

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	0.0	0.0	0.0	0.0	0.0
	E.Q.	2402.0	872.0	872.0	81970.0	81970.0
2	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	1346.0	538.0	538.0	50120.0	50120.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
3	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	2529.0	68.0	68.0	86521.0	86521.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
4	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	843.0	338.0	338.0	97752.0	97752.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
5	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	1031.0	406.0	406.0	36375.0	36375.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
6	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	1412.0	26.0	26.0	40315.0	40315.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
7	Dead	2716.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	269.0	311.0	311.0	54931.0	54931.0
	E.Q.	0.0	0.0	0.0	0.0	0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

NOTE: Each loading combination includes the following cases:
First line - at column top
Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	1 U1	3802.4	0.0	0.0	8379.6	0.0	999.999
2		3802.4	0.0	0.0	8379.6	0.0	999.999
3	1 U2	3259.2	0.0	0.0	8030.9	0.0	999.999
4		3259.2	0.0	0.0	8030.9	0.0	999.999

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5	1 U3	3259.2	0.0	0.0	8030.9	0.0	999.999
6		3259.2	0.0	0.0	8030.9	0.0	999.999
7	1 U4	3259.2	0.0	0.0	8030.9	0.0	999.999
8		3259.2	0.0	0.0	8030.9	0.0	999.999
9	1 U5	3259.2	0.0	0.0	8030.9	0.0	999.999
10		3259.2	0.0	0.0	8030.9	0.0	999.999
11	1 U6	2444.4	0.0	0.0	7498.4	0.0	999.999
12		2444.4	0.0	0.0	7498.4	0.0	999.999
13	1 U7	3259.2	0.0	0.0	8030.9	0.0	999.999
14		3259.2	0.0	0.0	8030.9	0.0	999.999
15	1 U8	3259.2	0.0	0.0	8030.9	0.0	999.999
16		3259.2	0.0	0.0	8030.9	0.0	999.999
17	1 U9	2444.4	0.0	0.0	7498.4	0.0	999.999
18		2444.4	0.0	0.0	7498.4	0.0	999.999
19	1 U10	5661.2	872.0	81970.0	3166.0	297610.3	3.631
20		5661.2	-872.0	-81970.0	-3166.0	-297609.0	3.631
21	1 U11	4846.4	872.0	81970.0	3049.4	286653.6	3.497
22		4846.4	-872.0	-81970.0	-3049.5	-286652.8	3.497
23	1 U12	857.2	-872.0	-81970.0	-2342.9	-220233.5	2.687
24		857.2	872.0	81970.0	2342.9	220234.2	2.687
25	1 U13	42.4	-872.0	-81970.0	-2169.8	-203967.7	2.488
26		42.4	872.0	81970.0	2169.8	203968.0	2.488
27	2 U1	3802.4	0.0	0.0	8379.6	0.0	999.999
28		3802.4	0.0	0.0	8379.6	0.0	999.999
29	2 U2	3259.2	0.0	0.0	8030.9	0.0	999.999
30		3259.2	0.0	0.0	8030.9	0.0	999.999
31	2 U3	3259.2	0.0	0.0	8030.9	0.0	999.999
32		3259.2	0.0	0.0	8030.9	0.0	999.999
33	2 U4	4336.0	430.4	40096.0	2992.0	278732.9	6.952
34		4336.0	-430.4	-40096.0	-2991.9	-278734.9	6.952
35	2 U5	5412.8	860.8	80192.0	3149.0	293361.2	3.658
36		5412.8	-860.8	-80192.0	-3149.0	-293363.5	

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3.658							
	37	2 U6	4598.0	860.8	80192.0	3030.8	282354.0
3.521							
	38		4598.0	-860.8	-80192.0	-3030.8	-282356.9
3.521							
	39	2 U7	2182.4	-430.4	-40096.0	-2609.4	-243097.5
6.063							
	40		2182.4	430.4	40096.0	2609.4	243095.5
6.063							
	41	2 U8	1105.6	-860.8	-80192.0	-2404.5	-224010.3
2.793							
	42		1105.6	860.8	80192.0	2404.6	224009.1
2.793							
	43	2 U9	290.8	-860.8	-80192.0	-2240.8	-208759.1
2.603							
	44		290.8	860.8	80192.0	2240.8	208756.6
2.603							
	45	2 U10	3259.2	0.0	0.0	8030.9	0.0
999.999							
	46		3259.2	0.0	0.0	8030.9	0.0
999.999							
	47	2 U11	2444.4	0.0	0.0	7498.4	0.0
999.999							
	48		2444.4	0.0	0.0	7498.4	0.0
999.999							
	49	2 U12	3259.2	0.0	0.0	8030.9	0.0
999.999							
	50		3259.2	0.0	0.0	8030.9	0.0
999.999							
	51	2 U13	2444.4	0.0	0.0	7498.4	0.0
999.999							
	52		2444.4	0.0	0.0	7498.4	0.0
999.999							
	53	3 U1	3802.4	0.0	0.0	8379.6	0.0
999.999							
	54		3802.4	0.0	0.0	8379.6	0.0
999.999							
	55	3 U2	3259.2	0.0	0.0	8030.9	0.0
999.999							
	56		3259.2	0.0	0.0	8030.9	0.0
999.999							
	57	3 U3	3259.2	0.0	0.0	8030.9	0.0
999.999							
	58		3259.2	0.0	0.0	8030.9	0.0
999.999							
	59	3 U4	5282.4	54.4	69216.8	284.4	361897.6
5.228							
	60		5282.4	-54.4	-69216.8	-284.4	-361898.9
5.228							
	61	3 U5	7305.6	108.8	138433.6	318.9	405778.8
2.931							
	62		7305.6	-108.8	-138433.6	-318.9	-405779.5
2.931							
	63	3 U6	6490.8	108.8	138433.6	305.0	388142.6
2.804							
	64		6490.8	-108.8	-138433.6	-305.0	-388143.0
2.804							
	65	3 U7	1236.0	-54.4	-69216.8	-203.8	-259360.5
3.747							
	66		1236.0	54.4	69216.8	203.8	259360.6
3.747							
	67	3 U8	-787.2	-108.8	-138433.6	-159.5	-202997.1
1.466							

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68		-787.2	108.8	138433.6	159.5	202997.1	1.466
69	3 U9	-1602.0	-108.8	-138433.6	-141.0	-179476.4	1.296
70		-1602.0	108.8	138433.6	141.1	179476.3	1.296
71	3 U10	3259.2	0.0	0.0	8030.9	0.0	999.999
72		3259.2	0.0	0.0	8030.9	0.0	999.999
73	3 U11	2444.4	0.0	0.0	7498.4	0.0	999.999
74		2444.4	0.0	0.0	7498.4	0.0	999.999
75	3 U12	3259.2	0.0	0.0	8030.9	0.0	999.999
76		3259.2	0.0	0.0	8030.9	0.0	999.999
77	3 U13	2444.4	0.0	0.0	7498.4	0.0	999.999
78		2444.4	0.0	0.0	7498.4	0.0	999.999
79	4 U1	3802.4	0.0	0.0	8379.6	0.0	999.999
80		3802.4	0.0	0.0	8379.6	0.0	999.999
81	4 U2	3259.2	0.0	0.0	8030.9	0.0	999.999
82		3259.2	0.0	0.0	8030.9	0.0	999.999
83	4 U3	3259.2	0.0	0.0	8030.9	0.0	999.999
84		3259.2	0.0	0.0	8030.9	0.0	999.999
85	4 U4	3933.6	270.4	78201.6	1122.9	324767.3	4.153
86		3933.6	-270.4	-78201.6	-1122.9	-324768.0	4.153
87	4 U5	4608.0	540.8	156403.2	1174.5	339674.0	2.172
88		4608.0	-540.8	-156403.2	-1174.4	-339674.7	2.172
89	4 U6	3793.2	540.8	156403.2	1112.2	321668.6	2.057
90		3793.2	-540.8	-156403.2	-1112.2	-321669.1	2.057
91	4 U7	2584.8	-270.4	-78201.6	-1016.5	-293989.7	3.759
92		2584.8	270.4	78201.6	1016.5	293989.1	3.759
93	4 U8	1910.4	-540.8	-156403.2	-955.3	-276292.6	1.767
94		1910.4	540.8	156403.2	955.3	276292.5	1.767
95	4 U9	1095.6	-540.8	-156403.2	-879.3	-254325.8	1.626
96		1095.6	540.8	156403.2	879.4	254325.7	1.626
97	4 U10	3259.2	0.0	0.0	8030.9	0.0	999.999
98		3259.2	0.0	0.0	8030.9	0.0	999.999
99	4 U11	2444.4	0.0	0.0	7498.4	0.0	

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999.999							
	100		2444.4	0.0	0.0	7498.4	0.0
999.999							
	101	4 U12	3259.2	0.0	0.0	8030.9	0.0
999.999							
	102		3259.2	0.0	0.0	8030.9	0.0
999.999							
	103	4 U13	2444.4	0.0	0.0	7498.4	0.0
999.999							
	104		2444.4	0.0	0.0	7498.4	0.0
999.999							
	105	5 U1	3802.4	0.0	0.0	8379.6	0.0
999.999							
	106		3802.4	0.0	0.0	8379.6	0.0
999.999							
	107	5 U2	3259.2	0.0	0.0	8030.9	0.0
999.999							
	108		3259.2	0.0	0.0	8030.9	0.0
999.999							
	109	5 U3	3259.2	0.0	0.0	8030.9	0.0
999.999							
	110		3259.2	0.0	0.0	8030.9	0.0
999.999							
	111	5 U4	4084.0	324.8	29100.0	3027.1	271207.1
9.320							
	112		4084.0	-324.8	-29100.0	-3027.1	-271204.7
9.320							
	113	5 U5	4908.8	649.6	58200.0	3154.5	282622.4
4.856							
	114		4908.8	-649.6	-58200.0	-3154.5	-282619.9
4.856							
	115	5 U6	4094.0	649.6	58200.0	3028.9	271368.2
4.663							
	116		4094.0	-649.6	-58200.0	-3028.9	-271366.7
4.663							
	117	5 U7	2434.4	-324.8	-29100.0	-2723.6	-244009.1
8.385							
	118		2434.4	324.8	29100.0	2723.5	244011.1
8.385							
	119	5 U8	1609.6	-649.6	-58200.0	-2564.2	-229731.2
3.947							
	120		1609.6	649.6	58200.0	2564.2	229732.7
3.947							
	121	5 U9	794.8	-649.6	-58200.0	-2402.3	-215229.3
3.698							
	122		794.8	649.6	58200.0	2402.3	215231.0
3.698							
	123	5 U10	3259.2	0.0	0.0	8030.9	0.0
999.999							
	124		3259.2	0.0	0.0	8030.9	0.0
999.999							
	125	5 U11	2444.4	0.0	0.0	7498.4	0.0
999.999							
	126		2444.4	0.0	0.0	7498.4	0.0
999.999							
	127	5 U12	3259.2	0.0	0.0	8030.9	0.0
999.999							
	128		3259.2	0.0	0.0	8030.9	0.0
999.999							
	129	5 U13	2444.4	0.0	0.0	7498.4	0.0
999.999							
	130		2444.4	0.0	0.0	7498.4	0.0
999.999							

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PCA SW9 FLR 21

131	6 U1	3802.4	0.0	0.0	8379.6	0.0	999.999
132		3802.4	0.0	0.0	8379.6	0.0	999.999
133	6 U2	3259.2	0.0	0.0	8030.9	0.0	999.999
134		3259.2	0.0	0.0	8030.9	0.0	999.999
135	6 U3	3259.2	0.0	0.0	8030.9	0.0	999.999
136		3259.2	0.0	0.0	8030.9	0.0	999.999
137	6 U4	4388.8	20.8	32252.0	220.6	342020.9	10.605
138		4388.8	-20.8	-32252.0	-220.5	-342021.0	10.605
139	6 U5	5518.4	41.6	64504.0	236.9	367378.1	5.695
140		5518.4	-41.6	-64504.0	-236.8	-367378.4	5.695
141	6 U6	4703.6	41.6	64504.0	225.5	349705.5	5.421
142		4703.6	-41.6	-64504.0	-225.4	-349706.3	5.421
143	6 U7	2129.6	-20.8	-32252.0	-182.7	-283445.1	8.788
144		2129.6	20.8	32252.0	182.8	283445.0	8.788
145	6 U8	1000.0	-41.6	-64504.0	-163.1	-252937.0	3.921
146		1000.0	41.6	64504.0	163.1	252936.9	3.921
147	6 U9	185.2	-41.6	-64504.0	-148.5	-230426.5	3.572
148		185.2	41.6	64504.0	148.6	230426.5	3.572
149	6 U10	3259.2	0.0	0.0	8030.9	0.0	999.999
150		3259.2	0.0	0.0	8030.9	0.0	999.999
151	6 U11	2444.4	0.0	0.0	7498.4	0.0	999.999
152		2444.4	0.0	0.0	7498.4	0.0	999.999
153	6 U12	3259.2	0.0	0.0	8030.9	0.0	999.999
154		3259.2	0.0	0.0	8030.9	0.0	999.999
155	6 U13	2444.4	0.0	0.0	7498.4	0.0	999.999
156		2444.4	0.0	0.0	7498.4	0.0	999.999
157	7 U1	3802.4	0.0	0.0	8379.6	0.0	999.999
158		3802.4	0.0	0.0	8379.6	0.0	999.999
159	7 U2	3259.2	0.0	0.0	8030.9	0.0	999.999
160		3259.2	0.0	0.0	8030.9	0.0	999.999
161	7 U3	3259.2	0.0	0.0	8030.9	0.0	999.999
162		3259.2	0.0	0.0	8030.9	0.0	

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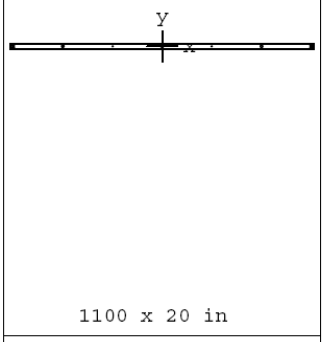
999.999							
	163	7 U4	3474.4	248.8	43944.8	1740.7	307449.0
6.996							
	164		3474.4	-248.8	-43944.8	-1740.5	-307451.1
6.996							
	165	7 U5	3689.6	497.6	87889.6	1767.8	312249.4
3.553							
	166		3689.6	-497.6	-87889.6	-1767.7	-312251.2
3.553							
	167	7 U6	2874.8	497.6	87889.6	1664.8	294042.8
3.346							
	168		2874.8	-497.6	-87889.6	-1664.6	-294044.9
3.346							
	169	7 U7	3044.0	-248.8	-43944.8	-1686.2	-297865.0
6.778							
	170		3044.0	248.8	43944.8	1686.4	297862.9
6.778							
	171	7 U8	2828.8	-497.6	-87889.6	-1658.5	-292967.0
3.333							
	172		2828.8	497.6	87889.6	1658.7	292964.9
3.333							
	173	7 U9	2014.0	-497.6	-87889.6	-1548.7	-273566.7
3.113							
	174		2014.0	497.6	87889.6	1548.8	273565.3
3.113							
	175	7 U10	3259.2	0.0	0.0	8030.9	0.0
999.999							
	176		3259.2	0.0	0.0	8030.9	0.0
999.999							
	177	7 U11	2444.4	0.0	0.0	7498.4	0.0
999.999							
	178		2444.4	0.0	0.0	7498.4	0.0
999.999							
	179	7 U12	3259.2	0.0	0.0	8030.9	0.0
999.999							
	180		3259.2	0.0	0.0	8030.9	0.0
999.999							
	181	7 U13	2444.4	0.0	0.0	7498.4	0.0
999.999							
	182		2444.4	0.0	0.0	7498.4	0.0
999.999							

*** Program completed as requested! ***

PCA Column Interaction Diagram - Shear Wall 9, Floor 3



1100 x 20 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

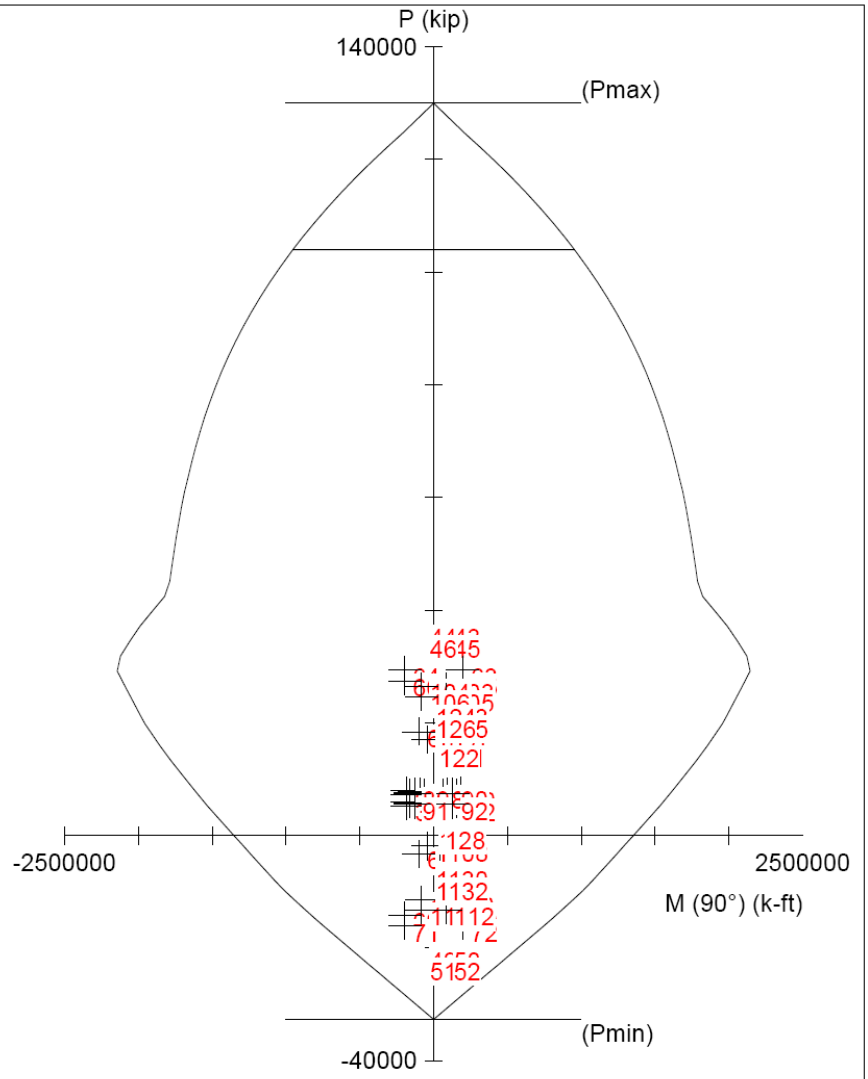
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 12/03/07

Time: 11:28:00



pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: F:\Thesis\Tech3\PCA FILES\SW9_FLR3.col

Project:

Column:		Engineer:	
f'c = 9 ksi	fy = 60 ksi	Ag = 22000 in^2	9 bars
Ec = 5408 ksi	Es = 29000 ksi	As = 604.80 in^2	Rho = 2.75%
fc = 7.65 ksi	fc = 7.65 ksi	Xo = 0.00 in	Ix = 733333 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 2.21833e+009 in^4
Beta1 = 0.65		Clear spacing = 0.73 in	Clear cover = 0.36 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

PCA Column Output File – Shear Wall 9, Floor 3

```
                                    PCA SW9 FLR 3
General Information:
   ====================
      File Name: F:\Thesis\Tech3\PCA FILES\SW9_FLR3.col
      Project:
      Column:                                   Engineer:
      Code:     ACI 318-02                      Units: English

      Run Option: Investigation                 Slenderness: Not considered
      Run Axis:   Biaxial                       Column Type: Architectural

   Material Properties:
   ====================
      f'c   = 9 ksi                             fy   = 60 ksi
      Ec    = 5407.5 ksi                        Es   = 29000 ksi
      Ultimate strain = 0.003 in/in
      Beta1 = 0.65

   Section:
   ========
      Rectangular: Width = 1100 in              Depth = 20 in

      Gross section area, Ag =  22000 in^2
      Ix =  733333 in^4                         Iy =  2.21833e+009 in^4
      Xo =  0 in                                Yo =  0 in

   Reinforcement:
   ==============
      Rebar Database: ASTM A615
      Size Diam (in) Area (in^2)   Size Diam (in) Area (in^2)   Size Diam (in) Area
(in^2)
      ---- --------- -----------   ---- --------- -----------   ---- ---------
-----------
      #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63
 0.31
      #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00
 0.79
      #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41
 1.56
      # 14      1.69        2.25   # 18      2.26        4.00

      Confinement: Tied; #3 ties with #10 bars,  #4 with larger bars.
      phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

      Pattern: Irregular

      Total steel area, As = 604.80 in^2 at 2.75%

      Area in^2   X (in)   Y (in)  Area in^2   X (in)   Y (in)  Area in^2   X (in)
Y (in)
      --------- -------- --------  --------- -------- --------  --------- --------
--------
           67.50    540.0      5.0      67.50    540.0     -5.0      67.50   -540.0
  -5.0
           67.50   -540.0      5.0      93.60    360.0      0.0      93.60   -360.0
   0.0
           93.60      0.0      0.0      27.00    180.0      0.0      27.00   -180.0
   0.0

   Load Combinations:
   ==================
      U1  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
      U2  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
      U3  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
                                       Page 1
```

PCA SW9 FLR 3

U4 = 1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
U5 = 1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
U6 = 0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
U7 = 1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
U8 = 0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
U9 = 1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
U10 = 0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake

pcaColumn v3.64 © Portland Cement Association
Page 3
Licensed to: Penn State University. License ID: 52411-1010265-4-22545-21B66
12/03/07
F:\Thesis\Tech3\PCA FILES\SW9_FLR3.col
01:23 AM

Service Loads:

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	0.0	0.0	0.0	0.0	0.0
	E.Q.	89.0	4.0	4.0	158591.0	158591.0
2	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	240.0	8.0	8.0	114255.0	114255.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
3	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	17909.0	464.0	464.0	50285.0	50285.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
4	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	13612.0	354.0	354.0	123405.0	123405.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
5	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	110.0	4.0	4.0	81787.0	81787.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
6	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	11827.0	297.0	297.0	51004.0	51004.0
	E.Q.	0.0	0.0	0.0	0.0	0.0
7	Dead	6281.0	0.0	0.0	0.0	0.0
	Live	0.0	0.0	0.0	0.0	0.0
	Wind	9013.0	228.0	228.0	26040.0	26040.0
	E.Q.	0.0	0.0	0.0	0.0	0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

NOTE: Each loading combination includes the following cases:
First line - at column top
Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu

PCA SW9 FLR 3

1	1	U1	7537.2	0.0	0.0	22485.4	0.0	999.999
2			7537.2	0.0	0.0	22485.4	0.0	999.999
3	1	U2	7537.2	0.0	0.0	22485.4	0.0	999.999
4			7537.2	0.0	0.0	22485.4	0.0	999.999
5	1	U3	5652.9	0.0	0.0	22459.7	0.0	999.999
6			5652.9	0.0	0.0	22459.7	0.0	999.999
7	1	U4	7537.2	0.0	0.0	22485.4	0.0	999.999
8			7537.2	0.0	0.0	22485.4	0.0	999.999
9	1	U5	7537.2	0.0	0.0	22485.4	0.0	999.999
10			7537.2	0.0	0.0	22485.4	0.0	999.999
11	1	U6	5652.9	0.0	0.0	22459.7	0.0	999.999
12			5652.9	0.0	0.0	22459.7	0.0	999.999
13	1	U7	7626.2	4.0	158591.0	40.4	1607930.4	10.139
14			7626.2	-4.0	-158591.0	-39.9	-1607933.1	10.139
15	1	U8	5741.9	4.0	158591.0	38.9	1548107.5	9.762
16			5741.9	-4.0	-158591.0	-38.4	-1548108.0	9.762
17	1	U9	7448.2	-4.0	-158591.0	-39.7	-1602465.3	10.104
18			7448.2	4.0	158591.0	40.2	1602462.4	10.104
19	1	U10	5563.9	-4.0	-158591.0	-38.2	-1542185.3	9.724
20			5563.9	4.0	158591.0	38.7	1542184.6	9.724
21	2	U1	7729.2	6.4	91404.0	112.8	1610657.8	17.621
22			7729.2	-6.4	-91404.0	-112.1	-1610662.9	17.621

23	2	U2	7921.2	12.8	182808.0	113.2	1616554.9	8.843
24			7921.2	-12.8	-182808.0	-112.5	-1616559.8	8.843
25	2	U3	6036.9	12.8	182808.0	109.1	1557818.6	8.522
26			6036.9	-12.8	-182808.0	-108.4	-1557819.5	8.522
27	2	U4	7345.2	-6.4	-91404.0	-111.3	-1598854.0	

PCA SW9 FLR 3

17.492							
	28		7345.2	6.4	91404.0	112.0	1598849.5
17.492							
	29	2 U5	7153.2	-12.8	-182808.0	-110.9	-1592939.4
8.714							
	30		7153.2	12.8	182808.0	111.6	1592935.6
8.714							
	31	2 U6	5268.9	-12.8	-182808.0	-106.7	-1532251.9
8.382							
	32		5268.9	12.8	182808.0	107.3	1532251.1
8.382							
	33	2 U7	7537.2	0.0	0.0	22485.4	0.0
999.999							
	34		7537.2	0.0	0.0	22485.4	0.0
999.999							
	35	2 U8	5652.9	0.0	0.0	22459.7	0.0
999.999							
	36		5652.9	0.0	0.0	22459.7	0.0
999.999							
	37	2 U9	7537.2	0.0	0.0	22485.4	0.0
999.999							
	38		7537.2	0.0	0.0	22485.4	0.0
999.999							
	39	2 U10	5652.9	0.0	0.0	22459.7	0.0
999.999							
	40		5652.9	0.0	0.0	22459.7	0.0
999.999							
	41	3 U1	21864.4	371.2	40228.0	10521.8	1140282.5
28.345							
	42		21864.4	-371.2	-40228.0	-10521.9	-1140277.6
28.345							
	43	3 U2	36191.6	742.4	80456.0	10230.1	1108672.9
13.780							
	44		36191.6	-742.4	-80456.0	-10230.3	-1108669.4
13.780							
	45	3 U3	34307.3	742.4	80456.0	10320.0	1118411.4
13.901							
	46		34307.3	-742.4	-80456.0	-10320.2	-1118410.1
13.901							
	47	3 U4	-6790.0	-371.2	-40228.0	-6972.2	-755584.8
18.783							
	48		-6790.0	371.2	40228.0	6972.1	755586.8
18.783							
	49	3 U5	-21117.2	-742.4	-80456.0	-3745.2	-405874.8
5.045							
	50		-21117.2	742.4	80456.0	3745.2	405876.2
5.045							
	51	3 U6	-23001.5	-742.4	-80456.0	-3273.6	-354769.1
4.409							
	52		-23001.5	742.4	80456.0	3273.6	354770.8
4.410							
	53	3 U7	7537.2	0.0	0.0	22485.4	0.0
999.999							
	54		7537.2	0.0	0.0	22485.4	0.0
999.999							
	55	3 U8	5652.9	0.0	0.0	22459.7	0.0
999.999							
	56		5652.9	0.0	0.0	22459.7	0.0
999.999							
	57	3 U9	7537.2	0.0	0.0	22485.4	0.0
999.999							
	58		7537.2	0.0	0.0	22485.4	0.0
999.999							

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PCA SW9 FLR 3

59	3	U10	5652.9	0.0	0.0	22459.7	0.0	999.999
60			5652.9	0.0	0.0	22459.7	0.0	999.999
61	4	U1	18426.8	283.2	98724.0	4722.2	1646169.8	16.674
62			18426.8	-283.2	-98724.0	-4722.3	-1646174.1	16.675
63	4	U2	29316.4	566.4	197448.0	4816.4	1679002.5	8.504
64			29316.4	-566.4	-197448.0	-4816.5	-1679006.4	8.504
65	4	U3	27432.1	566.4	197448.0	4865.1	1695978.0	8.589
66			27432.1	-566.4	-197448.0	-4865.2	-1695974.5	8.589
67	4	U4	-3352.4	-283.2	-98724.0	-3301.2	-1150795.8	11.657
68			-3352.4	283.2	98724.0	3301.2	1150790.6	11.657
69	4	U5	-14242.0	-566.4	-197448.0	-2334.9	-813953.3	4.122
70			-14242.0	566.4	197448.0	2334.9	813953.0	4.122
71	4	U6	-16126.3	-566.4	-197448.0	-2118.8	-738600.4	3.741
72			-16126.3	566.4	197448.0	2118.8	738600.5	3.741
73	4	U7	7537.2	0.0	0.0	22485.4	0.0	999.999
74			7537.2	0.0	0.0	22485.4	0.0	999.999
75	4	U8	5652.9	0.0	0.0	22459.7	0.0	999.999
76			5652.9	0.0	0.0	22459.7	0.0	999.999
77	4	U9	7537.2	0.0	0.0	22485.4	0.0	999.999
78			7537.2	0.0	0.0	22485.4	0.0	999.999
79	4	U10	5652.9	0.0	0.0	22459.7	0.0	999.999
80			5652.9	0.0	0.0	22459.7	0.0	999.999
81	5	U1	7625.2	3.2	65429.6	78.5	1607669.8	24.571
82			7625.2	-3.2	-65429.6	-78.9	-1607667.0	24.571
83	5	U2	7713.2	6.4	130859.2	78.6	1610372.9	12.306
84			7713.2	-6.4	-130859.2	-79.1	-1610370.3	12.306
85	5	U3	5828.9	6.4	130859.2	75.7	1550953.3	11.852
86			5828.9	-6.4	-130859.2	-76.2	-1550952.8	11.852
87	5	U4	7449.2	-3.2	-65429.6	-78.7	-1602257.3	24.488
88			7449.2	3.2	65429.6	78.2	1602259.9	24.488

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89	5	U5	7361.2	-6.4	-130859.2	-78.5	-1599551.9	12.223
90			7361.2	6.4	130859.2	78.1	1599553.1	12.223
91	5	U6	5476.9	-6.4	-130859.2	-75.6	-1539239.1	11.763
92			5476.9	6.4	130859.2	75.2	1539239.8	11.763
93	5	U7	7537.2	0.0	0.0	22485.4	0.0	999.999
94			7537.2	0.0	0.0	22485.4	0.0	999.999
95	5	U8	5652.9	0.0	0.0	22459.7	0.0	999.999
96			5652.9	0.0	0.0	22459.7	0.0	999.999
97	5	U9	7537.2	0.0	0.0	22485.4	0.0	999.999
98			7537.2	0.0	0.0	22485.4	0.0	999.999
99	5	U10	5652.9	0.0	0.0	22459.7	0.0	999.999
100			5652.9	0.0	0.0	22459.7	0.0	999.999
101	6	U1	16998.8	237.6	40803.2	7796.2	1338860.4	32.813
102			16998.8	-237.6	-40803.2	-7796.4	-1338853.1	32.812
103	6	U2	26460.4	475.2	81606.4	8077.6	1387184.5	16.998
104			26460.4	-475.2	-81606.4	-8077.8	-1387178.0	16.998
105	6	U3	24576.1	475.2	81606.4	8151.4	1399856.5	17.154
106			24576.1	-475.2	-81606.4	-8151.6	-1399849.6	17.154
107	6	U4	-1924.4	-237.6	-40803.2	-5882.6	-1010196.4	24.758
108			-1924.4	237.6	40803.2	5882.5	1010203.6	24.758
109	6	U5	-11386.0	-475.2	-81606.4	-4523.1	-776732.6	9.518
110			-11386.0	475.2	81606.4	4523.0	776736.6	9.518
111	6	U6	-13270.3	-475.2	-81606.4	-4246.6	-729254.1	8.936
112			-13270.3	475.2	81606.4	4246.5	729254.4	8.936
113	6	U7	7537.2	0.0	0.0	22485.4	0.0	999.999
114			7537.2	0.0	0.0	22485.4	0.0	999.999
115	6	U8	5652.9	0.0	0.0	22459.7	0.0	999.999
116			5652.9	0.0	0.0	22459.7	0.0	999.999

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117	6 U9	7537.2	0.0	0.0	22485.4	0.0	999.999
118		7537.2	0.0	0.0	22485.4	0.0	999.999
119	6 U10	5652.9	0.0	0.0	22459.7	0.0	999.999
120		5652.9	0.0	0.0	22459.7	0.0	999.999
121	7 U1	14747.6	182.4	20832.0	9842.8	1124151.8	53.963
122		14747.6	-182.4	-20832.0	-9842.6	-1124174.8	53.964
123	7 U2	21958.0	364.8	41664.0	10237.8	1169270.3	28.064
124		21958.0	-364.8	-41664.0	-10237.7	-1169294.9	28.065
125	7 U3	20073.7	364.8	41664.0	10182.3	1162922.3	27.912
126		20073.7	-364.8	-41664.0	-10182.1	-1162946.5	27.913
127	7 U4	326.8	-182.4	-20832.0	-8108.3	-926088.8	44.455
128		326.8	182.4	20832.0	8108.4	926070.4	44.454
129	7 U5	-6883.6	-364.8	-41664.0	-6739.1	-769707.9	18.474
130		-6883.6	364.8	41664.0	6739.2	769690.4	18.474
131	7 U6	-8767.9	-364.8	-41664.0	-6379.6	-728644.1	17.489
132		-8767.9	364.8	41664.0	6379.7	728631.1	17.488
133	7 U7	7537.2	0.0	0.0	22485.4	0.0	999.999
134		7537.2	0.0	0.0	22485.4	0.0	999.999
135	7 U8	5652.9	0.0	0.0	22459.7	0.0	999.999
136		5652.9	0.0	0.0	22459.7	0.0	999.999
137	7 U9	7537.2	0.0	0.0	22485.4	0.0	999.999
138		7537.2	0.0	0.0	22485.4	0.0	999.999
139	7 U10	5652.9	0.0	0.0	22459.7	0.0	999.999
140		5652.9	0.0	0.0	22459.7	0.0	999.999

*** Program completed as requested! ***