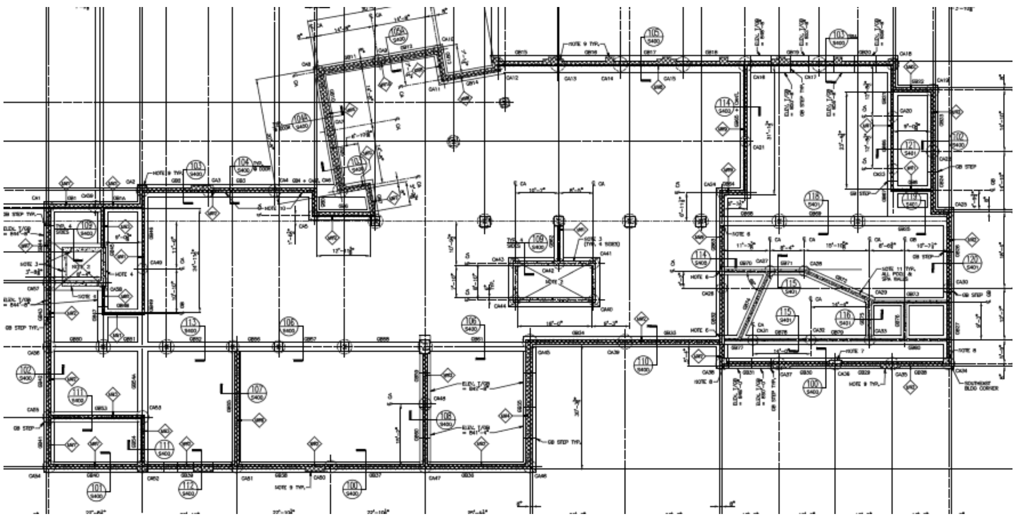
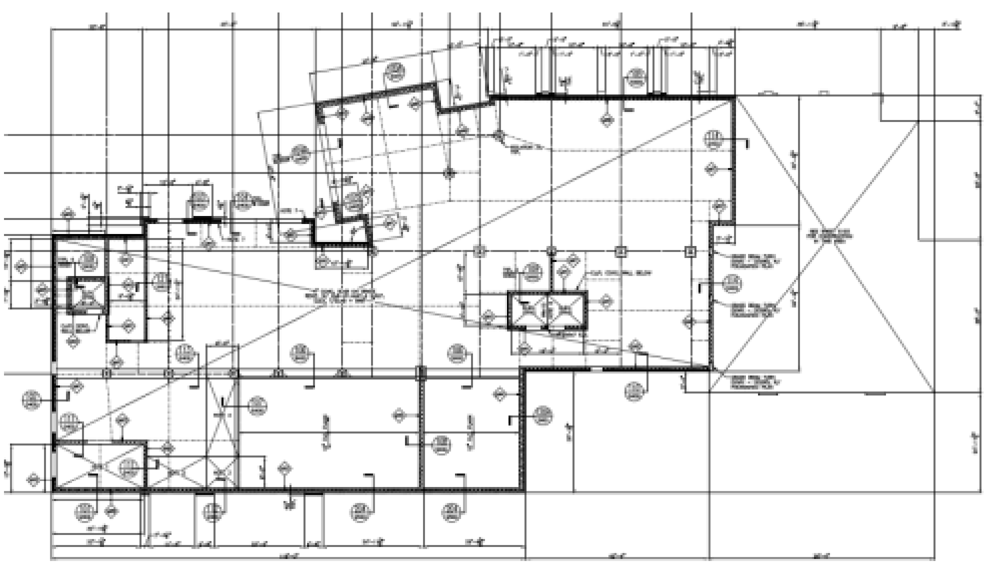
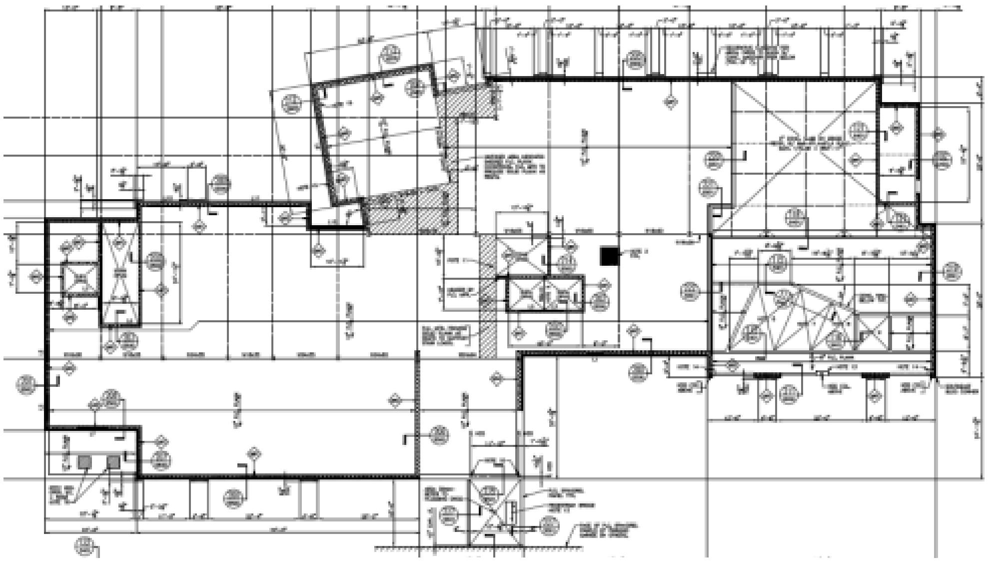
Appendix A: Existing Floor Plans



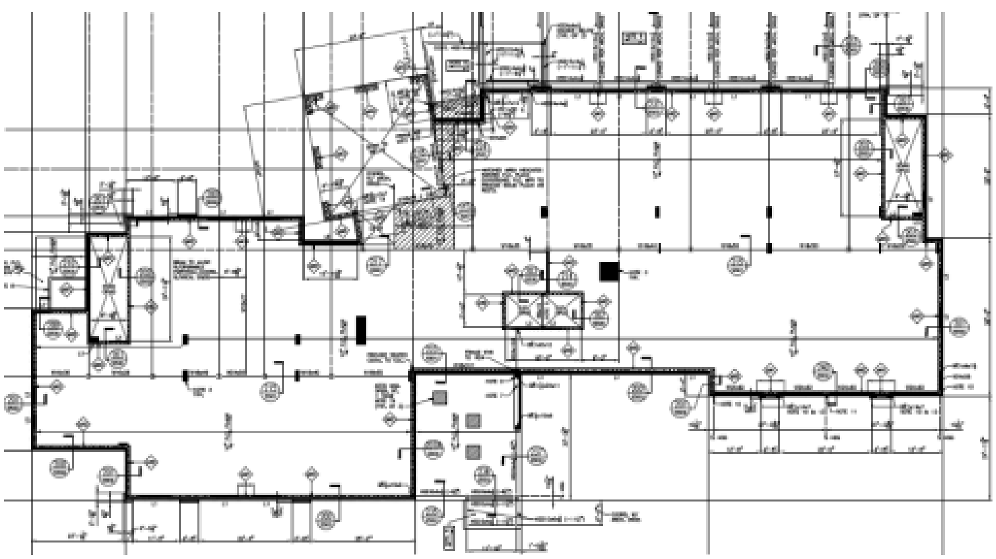
Foundation Plan



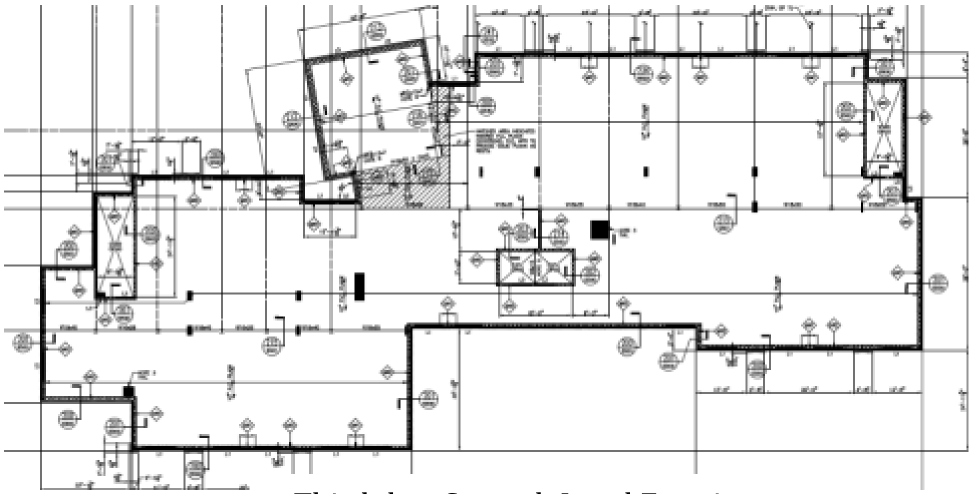
Plaza Level Framing Plan



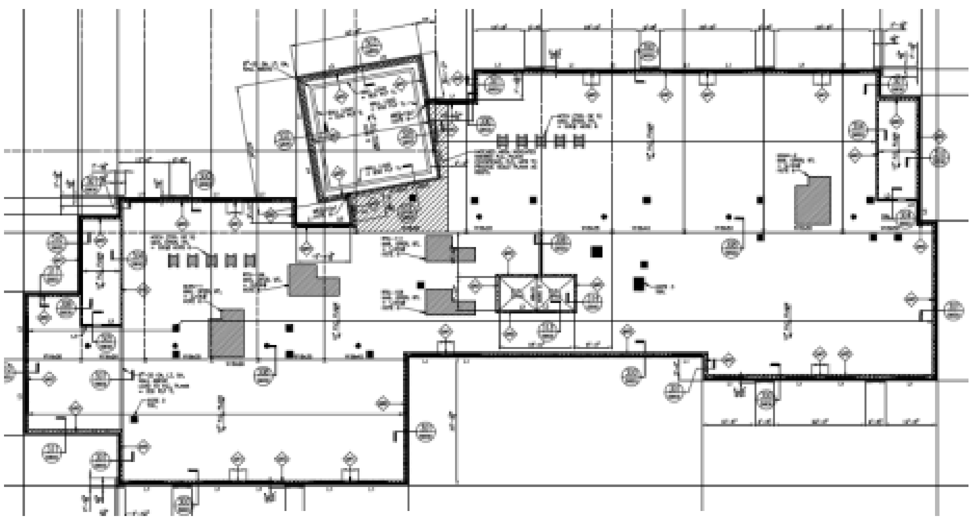
Hotel Level Framing Plan



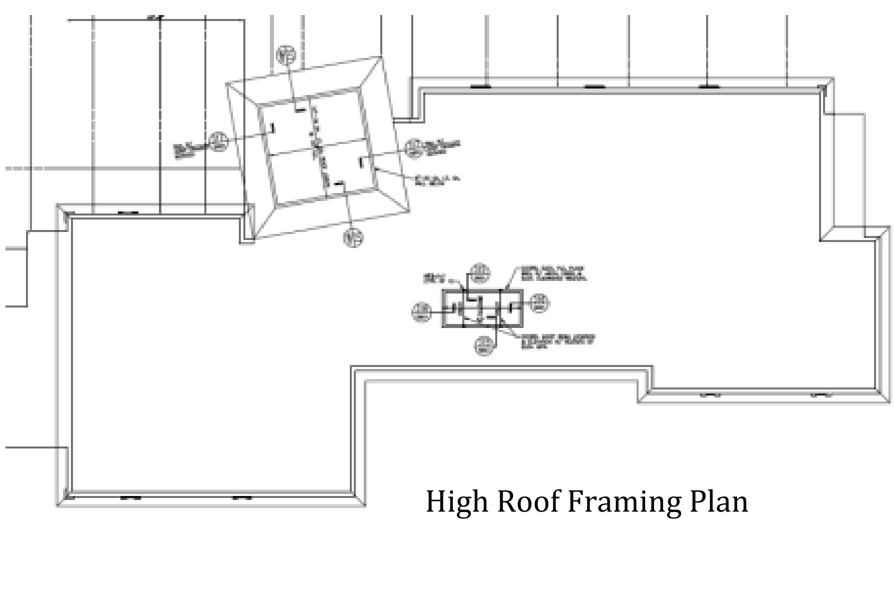
Second Level Framing Plan



Third thru Seventh Level Framing



Roof Framing Plan



High Roof Framing Plan

Appendix B: Gravity System Redesign

PRECAST HOLLOW-CORE CONCRETE PLANK
ON STEEL FRAMING

- LOADS

  LL = 40 PSF (HOTEL ROOMS)
  SDL = 25 PSF (MEP, PART., FINISHES)
  DL = 15 PSF (W/ TOPPING ⇒ PCI HANDBOOK)

  TOTAL LOAD = 80 PSF

  f'_c = 5000 PSI
  f_{pu} = 270,000 PSI
  SPAN = 27'-6"

- DESIGNED FOR 8" W/ TOPPING
  4'-0" × 8" NWC (4HCB + 2)

- FROM PCI HANDBOOK
  76-S carrying 88 PSF capacity @ 28' span
  0.2" estimated camber @ erection
  -0.4" estimated long term camber
  7 strands @ 6/16" ϕ - straight
  Self weight of slab = 81 PSF

- GIRDERS (where applicable)

  $w_u = 1.2(25+81) + 1.6(40) = 191.2$ PSF

  $M_u = \dfrac{191.2(18')(27.5)^2}{8} = \underline{\underline{325.3 \text{ ft.k}}}$

- USE W14 × 61 (less economical, but decreases system depth)

$\phi M_n = 383 \text{ ft.k} > 325.3 \text{ ft.k} = M_u \quad \therefore \text{OK}$

$\Delta_{LL} = \ell/360 = \dfrac{18'(12)}{360} = 0.267''$

$0.267'' = \dfrac{5\,(40)(27.5)(18)^4(1728)}{384(29000)\,I_x\,(1000)} \Rightarrow I_x = 335.6 \text{ in}^4 < 640 \text{ in}^4$ for W14 × 62 $\therefore$ OK

$\Delta_{TL} = \dfrac{5(40+25+81)(27.5)(18)^4(1728)}{384(29000)(640)(1000)} = 0.511''$

$\Delta_{TL} = 0.511'' < \ell/240 = \dfrac{18(12)}{240} = 0.9'' \quad \therefore \text{OK}$

BEAM / GIRDER DESIGN

• DESIGN LOADS

DL = 81 PSF (PLANK)
SDL = 25 PSF (PART., MEP, FINISHES)
LL = 40 PSF (HOTEL ROOMS)

• INTERIOR BEAM

Factored Load : $1.2(81+25) + 1.6(40) = 191.2$ PSF

Trib. Width : 27.5'

$w_u = 191.2 \text{ PSF } (27.5')/1000 = 5.26 \text{ k/ft.}$

$M_u = \frac{w_u l^2}{8} = \frac{5.26(18)^2}{8} = 213.03 \text{ ft-k}$

W14×61 $\phi M_n = 383 \text{ ft-k} > M_u = 213.03 \text{ ft-k}$ ∴ OK

Uniform Dist. Load :

$191.2(27.5)(18)/1000 = 94.64^k$ w/ KL = 18'

W14×61 total capacity $= 170^k > 94.64^k$ ∴ OK

• DEFLECTION CHECK

$\Delta_{LL} = l/360 = \frac{18'(12)}{360} = 0.267''$

$0.267 = \frac{5\left(\frac{1.74 \text{ k/ft}}{12}\right)(18 \times 12)^4}{384(29000) I_x} \Rightarrow I_x = 536.8 \text{ in}^4 < 640 \text{ in}^4$ for W14×61 ∴ OK

$\Delta_{TL} = l/240 = \frac{18(12)}{240} = 0.9''$

$0.9 = \frac{5\left(\frac{5.26}{12}\right)(18 \times 12)^4}{384(29000) I_x} \Rightarrow I_x = 476 \text{ in}^4 < 640 \text{ in}^4$ for W14×61 ∴ OK

• EXTERIOR GIRDER

$w_u = 1.2(81 + 25) + 1.6(40) = 191.2$ PSF

Trib. Width $= \frac{27.5'}{2} = 13.75'$

Beam Length $= 18'$

$w_u = 191.2(13.75)/1000 = 2.63$ k/ft.

$M_u = \frac{2.63 \text{ k/ft} (18')^2}{8} = 106.5$ ft·k

W14×61 $\phi M_n = 383$ ft·k > 106.5 ft·k $= M_u$ ∴ OK

Uniform Dist. Load:

191.2 PSF $(18')(13.75')/1000 = 47.32^k$ w/ KL = 18'

W14×61 total capacity $= 170^k > 47.32^k$ ∴ OK

• DEFLECTION CHECK

$\Delta_{LL} = \ell/360 = \frac{18'(12)}{360} = 0.267''$

$0.267'' = \frac{5\left(\frac{0.88}{12}\right)(18' \times 12)^4}{384(29000) I_x} \Rightarrow I_x = 268.4 \text{ in}^4 < 640 \text{ in}^4$ for W14×61 ∴ OK

$\Delta_{TL} = \ell/240 = \frac{18(12)}{240} = 0.9''$

$0.9'' = \frac{5\left(\frac{2.63}{12}\right)(18 \times 12)^4}{384(29000) I_x} \Rightarrow I_x = 238 \text{ in}^4 < 640 \text{ in}^4$ for W14×61 ∴ OK

GIRDER-SLAB D-BEAM DESIGN (where applicable)

- LOADS

Plank DL, untopped = 56 PSF
Partition load = 15 PSF
Live Load = 40 PSF
Topping = 25 PSF
Plank f'_c = 5000 ksi
Grout f'_c = 5000 ksi
Plank Span = 27.5'
DB Span = 18'

$$\text{Allowable } \Delta_{LL} = \ell/360 = \frac{18(12)}{360} = 0.6''$$

- DB 9x46 Properties

Steel Section	Transformed Section
I_s = 195 in^4	I_t = 356 in^4
S_t = 33.7 in^3	S_t = 68.6 in^3
S_b = 50.8 in^3	S_b = 80.6 in^3
M_{ALL} = 84 k.ft.	b = 5.75 in
t_w = 0.375 in.	

- INITIAL LOAD - PRECOMPOSITE

$$M_{DL} = (27.5')(0.056\text{ ksf})(18')^2 / 8 = 62.37\text{ kft} < 84\text{ kft} = M_{ALL}$$
$\therefore$ OK

$$\Delta_{DL} = \frac{5(27.5')(0.056\text{ ksf})(18)^4(1728)}{384(195\text{ in}^4)(29000)} = 0.64\text{ in.}$$

- TOTAL LOAD - COMPOSITE

$$M_{SDP} = (27.5')(0.015 + 0.04 + 0.025)(18')^2 / 8 = 89.1\text{ kft.}$$

$$M_{TL} = 62.37 + 89.1 = 151.5\text{ kft}$$

$S_{req.} = 151.5\ kft\ (12in/ft) \ / \ (0.6)(50ksi) = 60.6\ in^3 < 68.6 in^3$ ∴ OK

$$\Delta_{SUP} = \frac{5(27.5)(0.015+0.04+0.025)(18)^4(1728)}{384(356)(29000)}$$

$= 0.50\ in. < 0.6\ in$

- CHECK COMPRESSIVE STRESS ON CONCRETE

$$N\ Value = \frac{E_{steel}}{E_{conc.}} = \frac{29000\ ksi}{57000\ (5000\ psi)^{1/2}} = \frac{29000\ ksi}{4030} = 7.20$$

$S_{tc} = 7.20\ (68.6) = 494\ in^3$

$f_c = 89.1\ kft\ (12in/ft) \ / \ 494\ in^3 = 2.16\ ksi$

$F_c = 0.45\ (5\ ksi) = 2.25\ ksi > 2.16\ ksi$ ∴ OK

- CHECK BOTTOM FLANGE TENSION STRESS (TOTAL LOAD)

$$f_b = \frac{(62.37\ kft)(12in/ft)}{50.8\ in^3} + \frac{(89.1\ kft)(12in/ft)}{80.6\ in^3}$$

$= 14.7 + 13.3$
$= 28\ ksi$

$F_b = 0.9(50ksi) = 45\ ksi > 28\ ksi$ ∴ OK

- CHECK SHEAR

Total Load $= 56 + 15 + 40 + 25 = 136$ PSF
$w = 0.136\ ksf\ (27.5') = 3.74\ k/ft.$

$R = 3.74\ k/ft\ (18') / 2 = 33.7^k$

$f_v = 33.7^k \ / \ (0.375in)(5.75) = 15.6\ ksi$

$F_v = 0.4(50ksi) = 20\ ksi > 15.6\ ksi$ ∴ OK

COLUMN SPOT CHECKS

- SUMMARY OF LOADS

ROOF : LL = 20 PSF
DL = 81 PSF

FLOOR : LL = 100 PSF or 40 PSF
DL = 106 PSF

EXTERIOR WALL : DL = 45 PSF (assumed)

- AXIAL LOAD ON INTERIOR COLUMNS (PLAZA LEVEL : ROOF + 7 FLOORS)

$A_T = (27.5' \times 18') = 495 \text{ ft}^2$

$LL_{red} = 0.25 + \dfrac{15}{\sqrt{4(7)(495)}} = 0.377 > 0.4 \quad \therefore \text{use } 0.4$

$P_{LL} = 0.4\left[(100)(1)(495) + (40)(6)(495)\right] = 67.32^k$

$P_{SL} = 20(495) = 9.9^k$

$P_{DL} = 81(495) + 106(7)(495) = 367.9^k$

$P_u = 1.2(367.9) + 1.6(67.32) + 0.5(9.9) = 554.1^k$

$@ KL = 14'$ $\underline{\underline{W10 \times 60}}$ w/ $\phi P_n = 581^k > 554.1^k = P_u$

$\therefore$ OK

- AXIAL LOAD ON EXTERIOR COLUMNS FOR INTERIOR FRAMES (PLAZA LEVEL: ROOF + 7 FLOORS)

$A_T = (27.5' \times 9') = 247.5 \text{ ft}^2$

$LL_{red} = 0.25 + \frac{15}{\sqrt{4(7)(247.5)}} = 0.43$

$P_{LL} = 0.43\left[(100)(1)(247.5) + (40)(6)(247.5)\right] = 36.2^k$

$P_{SL} = 20(247.5) = 4.95^k$

$P_{DL} = 81(247.5) + 106(7)(247.5) + 450(7)(27.5) = 290.3^k$

$P_u = 1.2(290.3) + 1.6(36.2) + 0.5(4.95) = 408.8^k$

@ $KL = 14'$ $\underline{\underline{W10 \times 49}}$ w/ $\phi P_n = 471^k > 408.8^k = P_u$

$\therefore$ OK

- AXIAL LOAD ON EXTERIOR CORNER COLUMNS (PLAZA LEVEL: ROOF + 7 FLOORS)

$A_T = (13.75' \times 9') = 123.75 \text{ ft}^2$

$LL_{red} = 0.25 + \frac{15}{\sqrt{4(7)(123.75)}} = 0.51$

$P_{LL} = 0.51\left[(100)(1)(123.75) + (40)(6)(123.75)\right] = 21.6^k$

$P_{SL} = 20(123.75) = 2.48^k$

$P_{DL} = 81(123.75) + 106(7)(123.75) + 450(7)(22.75) = 173.5^k$

$P_u = 1.2(173.5) + 1.6(21.6) + 0.5(2.48) = 244^k$

@ $KL = 14'$ $\underline{\underline{W10 \times 33}}$ w/ $\phi P_n = 253^k > 244^k = P_u$

$\therefore$ OK

Appendix C: Wind & Seismic Load Analysis

Wind Loads

WIND LOADS

METHOD 2 : ANALYTICAL PROCEDURE

- WIND VARIABLES
  - $V = 90$ mph
  - $K_d = 0.85$
  - $I = 1.0$
  - EXPOSURE : B
  - $K_{zt} = 1.0$

(TABLE 6-3)
CASE 2

NOTE : INTERPOLATE K_z VALUES

LEVEL	HEIGHT	K_z
B	0'	0'
1	14'-10"	0.56
2	26'-10"	0.63
3	36'-10"	0.74
4	46'-10"	0.79
5	56'-10"	0.84
6	66'-10"	0.88
7	76'-10"	0.92
ROOF	86'-10"	0.95
HIGH ROOF	102'-2"	1.00

$$q_z = 0.00256 \boxed{K_z} K_{zt} K_d V^2 I \qquad \text{(Eq. 6-15)}$$

VARIES BY LEVEL

$$q_z = 0.00256 K_z (1.0)(0.85)(90^2)(1.0)$$

* THIS IS COMPLETED FOR ALL LEVELS AND PUT IN TABLE

EXAMPLE @ LEVEL 1 : $q_z = 0.00256(0.56)(1.0)(0.85)(90^2)(1.0)$
$= \underline{\underline{9.87}}$ PSF

WIND LOADS (CONT.)

q_h @ MEAN ROOF HEIGHT : $\bar{z} = \frac{86.833' + 102.167'}{2} = 94.5'$

$\Downarrow$

$K_{zt} = 0.97$

$\bar{z}' = 0.6h = 0.6(94.5') = 56.7' > \bar{z}_{min} = 30'$

$q_h = 0.00256(0.97)(1.0)(0.85)(90^2)(1.0) = \underline{\underline{17.10 \text{ PSF}}}$

- C_p - EXTERNAL PRESSURE COEFFICIETS

NORTH / SOUTH	EAST / WEST
WINDWARD = 0.8	WINDWARD = 0.8
LEEWARD = -0.5	LEEWARD = -0.2
$L/B = 0.45$	$L/B = 2.22$
$L = 98.92'$ $B = 219.67'$	$L = 219.67'$ $B = 98.92'$

- WIND PRESSURE

$p_z = q_z G C_p - q_h G C_{pi}$ (WINDWARD)

$p_h = q_h G C_p - q_h G C_{pi}$ (LEEWARD)

$GC_{pi} = \pm 0.18$
FOR ENCLOSED BUILDINGS

NORTH / SOUTH EXAMPLE : @ LEVEL 1

$p_z = 9.87(0.85)(0.8)$
$= \underline{\underline{6.71 \text{ PSF}}}$

$p_h = 17.10(0.85)(-0.5)$
$= \underline{\underline{-7.27 \text{ PSF}}}$

WIND LOADS (CONT.)

EAST/WEST EXAMPLE : @ LEVEL 1

$$P_z = 9.87(0.85)(0.8) = \underline{\underline{6.71 \text{ PSF}}}$$

$$P_h = 17.10(0.85)(-0.2) = \underline{\underline{-2.91 \text{ PSF}}}$$

* WIND PRESSURES CALCULATED FOR EACH STORY AND PUT IN TABLE

- FORCE OF WINDWARD ONLY

$$F_w = B(\text{story height})\,p_z$$

N/S EXAMPLE : @ LEVEL 1 $\quad F_w = (219.67')(12')(6.71) = \underline{\underline{17.69 \text{ k}}}$

- FORCE OF TOTAL PRESSURE

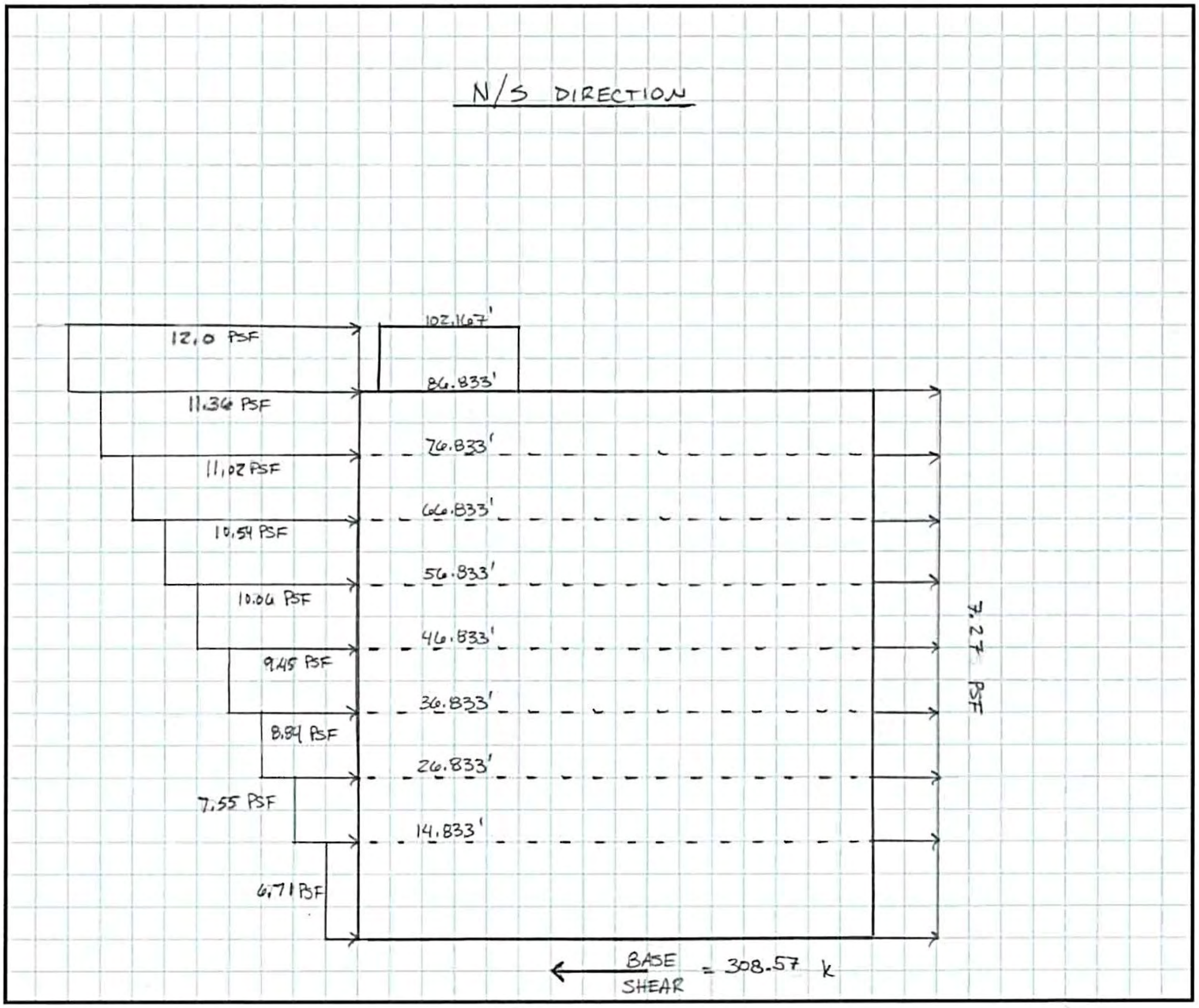
N/S EXAMPLE : @ LEVEL 1 $\quad F_T = (219.67')(12')(14.0 \text{ PSF}) = \underline{\underline{36.85 \text{ k}}}$

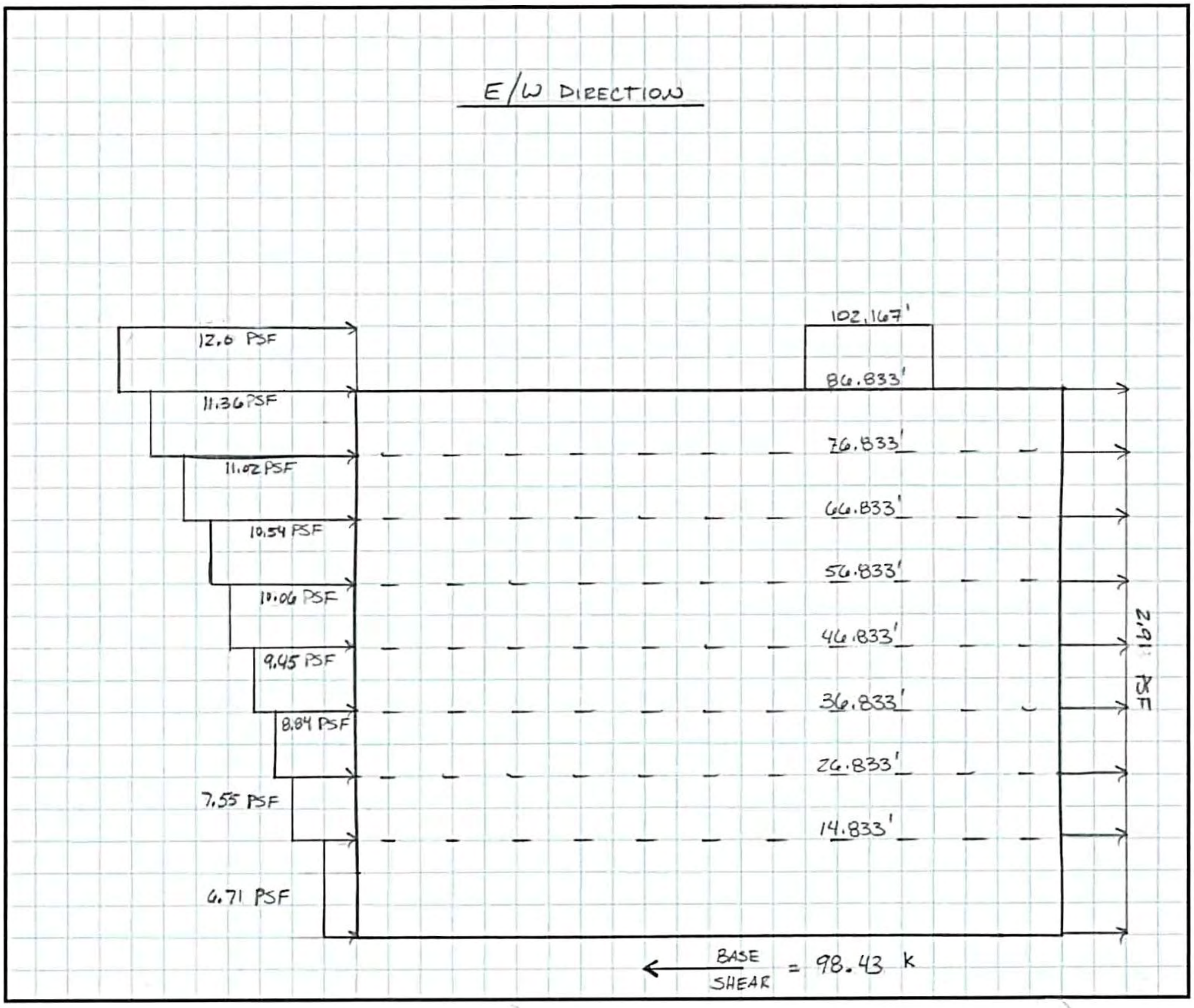
- WINDWARD SHEAR STORY

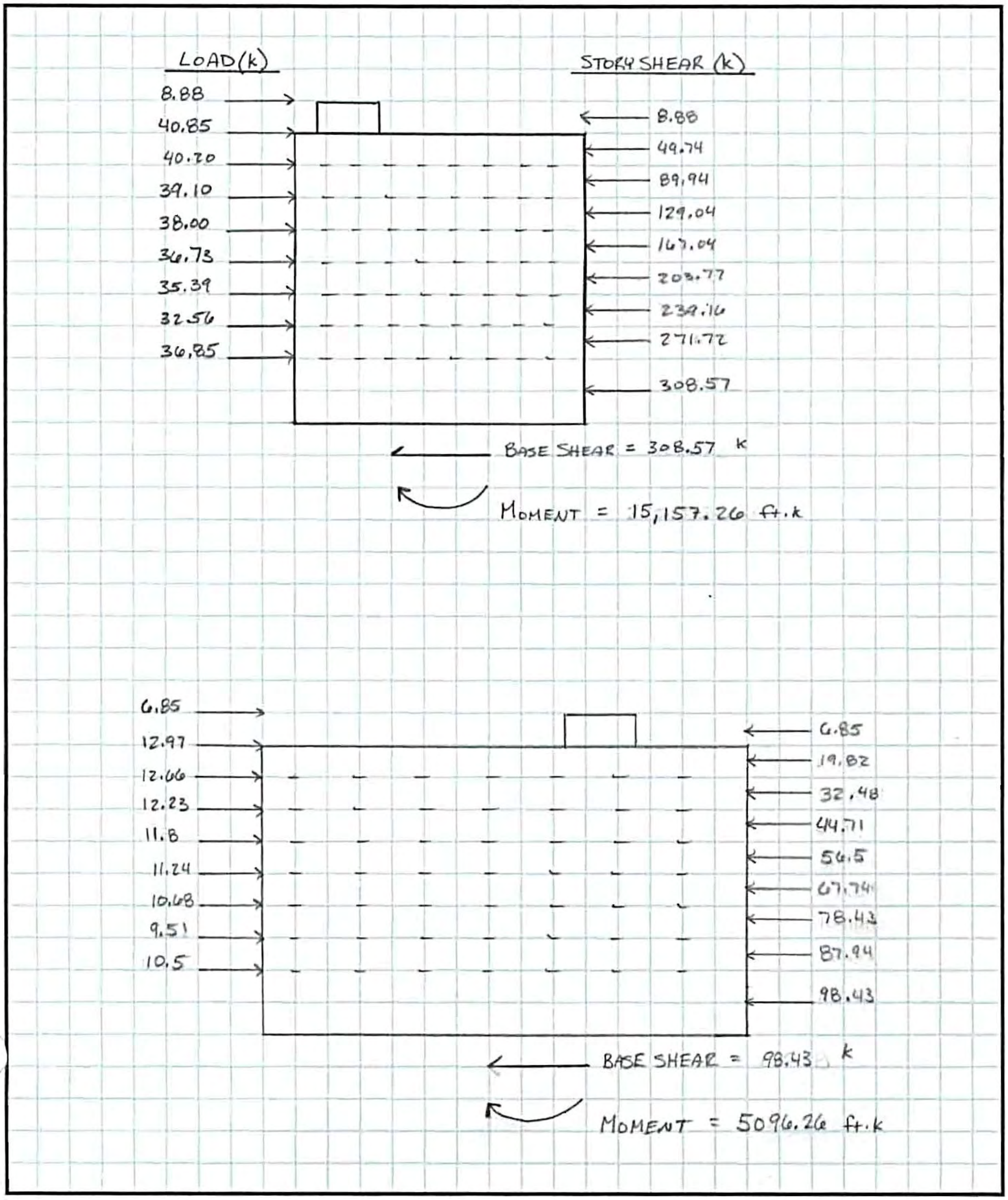
N/S EXAMPLE : @ LEVEL 7 $\quad F = F_w \text{ @ (HIGH ROOF + ROOF + 7)}$
$= 5.52 + 24.95 + 24.21 = \underline{\underline{54.68 \text{ k}}}$

- TOTAL STORY SHEAR

N/S EXAMPLE : @ LEVEL 7 $\quad F = F_T \text{ @ (HIGH ROOF + ROOF + 7)}$
$= 8.88 + 40.86 + 40.20 = \underline{\underline{89.94 \text{ k}}}$


N/S DIRECTION
12.0 PSF
102.167'
86.833'
11.36 PSF
76.833'
11.02 PSF
66.833'
10.54 PSF
56.833'
10.06 PSF
46.833'
9.45 PSF
36.833'
8.84 PSF
26.833'
7.55 PSF
14.833'
6.71 PSF
7.27 PSF
BASE SHEAR = 308.57 k


E/W DIRECTION
12.6 PSF
11.36 PSF
11.02 PSF
10.54 PSF
10.06 PSF
9.45 PSF
8.84 PSF
7.55 PSF
6.71 PSF
102.167'
86.833'
76.833'
66.833'
56.833'
46.833'
36.833'
26.833'
14.833'
2.91 PSF
BASE SHEAR = 98.43 k


LOAD(k)
STORY SHEAR (k)
8.88
40.85
40.20
39.10
38.00
36.73
35.39
32.56
36.85
8.88
49.74
89.94
129.04
167.04
203.77
239.16
271.72
308.57
BASE SHEAR = 308.57 k
MOMENT = 15,157.26 ft.k
6.85
12.97
12.66
12.23
11.8
11.24
10.68
9.51
10.5
6.85
19.82
32.48
44.71
56.5
67.74
78.43
87.94
98.43
BASE SHEAR = 98.43 k
MOMENT = 5096.26 ft.k

Wind Loads (East/West Direction)

B = 98'-11"   L = 219'-8"

Level	Height Above Ground, z (ft.)	Story Height (ft.)	K_z	q_z	Wind Pressure (PSF)		Total Pressure (PSF)	Force of Windward Pressure Only (k)	Force of Total Pressure (k)	Windward Shear Story (k)	Total Story Shear (k)	Windward Moment (ft.-k)	Total Moment (ft.-k)
					Windward	Leeward							
High Roof	102.167	15.333	1.00	17.6	12.0	-2.91	14.9	5.52	6.850	5.52	6.850	521.64	647.33
Roof	86.833	10	0.95	16.7	11.36	-2.91	14.3	10.32	12.97	15.84	19.820	844.89	1061.39
7	76.833	10	0.92	16.2	11.02	-2.91	13.9	10.02	12.66	25.86	32.481	719.44	909.48
6	66.833	10	0.88	15.5	10.54	-2.91	13.5	9.58	12.23	35.44	44.710	592.52	756.11
5	56.833	10	0.84	14.8	10.06	-2.91	13.0	9.15	11.80	44.59	56.5	474.27	611.40
4	46.833	10	0.79	13.9	9.45	-2.91	12.4	8.59	11.24	53.19	67.744	359.49	470.17
3	36.833	10	0.74	13.0	8.84	-2.91	11.8	8.04	10.68	61.22	78.427	255.84	340.06
2	26.833	10	0.63	11.1	7.55	-2.91	10.5	6.86	9.51	68.09	87.935	149.83	207.59
1	14.833	12	0.56	9.87	6.71	-2.91	9.6	7.32	10.50	75.41	98.432	64.68	92.72
B	0	14.833	0	0	0	0	0	0	0	75.41	98.43	0	0

Σ Windward Story Shear =	75.41	kips
Σ Total Story Shear =	98.43	kips
Σ Windward Moment =	3982.60	ft-k
Σ Total Moment =	5096.26	ft-k

Wind Loads (North/South Direction)

B = 219'-8"   L = 98'-11"

Level	Height Above Ground, z (ft.)	Story Height (ft.)	K_z	q_z	Wind Pressure (PSF)		Total Pressure (PSF)	Force of Windward Pressure Only (k)	Force of Total Pressure (k)	Windward Shear Story (k)	Total Story Shear (k)	Windward Moment (ft.-k)	Total Moment (ft.-k)
					Windward	Leeward							
High Roof	102.167	15.333	1.00	17.6	12.0	-7.27	19.3	5.52	8.88	5.52	8.88	521.64	839.16
Roof	86.833	10	0.95	16.7	11.36	-7.27	18.6	24.95	40.86	30.47	49.74	2042.10	3343.58
7	76.833	10	0.92	16.2	11.02	-7.27	18.3	24.21	40.20	54.68	89.94	1738.91	2887.66
6	66.833	10	0.88	15.5	10.54	-7.27	17.8	23.15	39.10	77.84	129.04	1431.63	2417.75
5	56.833	10	0.84	14.8	10.06	-7.27	17.3	22.10	38.00	99.93	167.04	1145.45	1969.80
4	46.833	10	0.79	13.9	9.45	-7.27	16.7	20.76	36.73	155.62	203.77	868.40	1536.48
3	36.833	10	0.74	13.0	8.84	-7.27	16.1	19.42	35.39	140.11	239.16	618.16	1126.53
2	26.833	10	0.63	11.1	7.55	-7.27	14.8	16.59	32.56	156.70	271.72	362.10	710.78
1	14.833	12	0.56	9.87	6.71	-7.27	14.0	17.69	36.85	174.38	308.57	156.24	325.51
B	0	14.833	0	0	0	0	0	0	0	174.38	308.57	0	0

Σ Windward Story Shear =	174.38	kips
Σ Total Story Shear =	308.57	kips
Σ Windward Moment =	8884.63	ft-k
Σ Total Moment =	15157.26	ft-k

Seismic Loads

Seismic Force Resisting System: Floor Weights					
Plaza Level					
Approximate Area:		15,113	SF		
Floor to Floor Height:		14	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.	Partitions:	15	PSF
Height:	0	ft.	MEP:	10	PSF
Unit Weight:	0	PSF	Finishes:	5	PSF
Weight =	**0.00**	**k**	**Weight =**	**453.39**	**k**
Slab:					
Thickness:	0	in.			
Unit Weight:	0	PSF			
Weight =	**0**	**k**			
Columns:					
Shape	Quantity	Weight (PLF)	Column Height (ft)	Total Weight (k)	
W10x33	28	33	14	12.94	
W10x45	8	45	14	5.04	
W10x49	6	49	14	4.12	
W10x39	4	39	14	2.18	
W10x68	4	68	14	3.81	
W10x77	5	77	14	5.39	
W12x65	2	65	14	1.82	
W10x60	4	60	14	3.36	
W12x87	1	87	14	1.22	
W10x54	1	54	14	0.76	
			Weight =	**40.63**	**k**
Beams:					
Shape	Quantity	Weight (PLF)	Total Beam Length (ft)	Total Weight (k)	
W10x12	34	12	546.96	6.56	
W12x14	3	14	52.5	0.74	
W12x16	1	16	12.5	0.20	
W14x22	7	22	80.5	1.77	
W16x26	2	26	33	0.86	
W14x26	1	26	14	0.36	
W14x30	7	30	95	2.85	
W16x31	2	31	36	1.12	
W18x35	2	35	41.5	1.45	
W14x38	1	38	10	0.38	
W14x43	1	43	18	0.77	
W14x48	6	48	91.5	4.39	
W14x53	1	53	18	0.95	
W14x61	13	61	228.5	13.94	
			Weight =	**36.35**	**k**
		Total Weight of Floor =	**530.37**	**k**	
			35.09	PSF	

Seismic Force Resisting System: Floor Weights					
Hotel Level					
Approximate Area:		15,113	SF		
Floor to Floor Height:		12	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.	Partitions:	15	PSF
Height:	0	ft.	MEP:	10	PSF
Unit Weight:	0	PSF	Finishes:	5	PSF
Weight =	**0**	**k**	**Weight =**	**453.39**	**k**
Slab:					
Thickness:	8	in.			
Unit Weight:	81	PSF			
Weight =	**1224.153**	**k**			
Columns:					
Shape	Quantity	Weight (PLF)	Column Height (ft)	Total Weight (k)	
W10x33	26	33	12	10.30	
W10x45	8	45	12	4.32	
W10x49	5	49	12	2.94	
W10x39	5	39	12	2.34	
W10x68	4	68	12	3.26	
W10x77	5	77	12	4.62	
W12x65	1	65	12	0.78	
W10x60	4	60	12	2.88	
W12x87	1	87	12	1.04	
W10x54	1	54	12	0.65	
			Weight =	**33.13**	**k**
Beams:					
Shape	Quantity	Weight (PLF)	Total Beam Length (ft)	Total Weight (k)	
W8x10	3	10	73	0.73	
W10x12	25	12	410.3	4.92	
W12x14	1	14	28.5	0.40	
W16x26	1	26	18.5	0.48	
W18x35	1	35	23	0.81	
DB 9x46	45	46	647	29.76	
W40x183	1	183	24	4.39	
			Weight =	**41.49**	**k**
Total Weight of Floor =			**1752.17**	**k**	
			115.94	PSF	

Seismic Force Resisting System: Floor Weights					
Floor Levels 2-4					
Approximate Area:		15,113	SF		
Floor to Floor Height:		10	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.			
Height:	0	ft.	Partitions:	15	PSF
			MEP:	10	
Unit Weight:	0	PSF	Finishes:	5	PSF
Weight =	**0**	**k**	**Weight =**	**453.39**	**k**
Slab:					
Thickness:	8	in.			
Unit Weight:	81	PCF			
Weight =	**1224.153**	**k**			
Columns:					
Shape	Quantity	Weight (PLF)	Column Height (ft)	Total Weight (k)	
W10x33	39	33	10	12.87	
W10x45	7	45	10	3.15	
W10x49	2	49	10	0.98	
W12x50	2	50	10	1	
W10x39	5	39	10	1.95	
			Weight =	**19.95**	**k**
Beams:					
Shape	Quantity	Weight (PLF)	Total Beam Length (ft)	Total Weight (k)	
W10x12	28	12	506.7	6.08	
W16x26	1	26	18.5	0.48	
W18x35	1	35	23	0.81	
DB 9x46	41	46	602.5	27.72	
			Weight =	**35.08**	**k**
Total Weight of Floor =			**1732.57**	**k**	
			114.64	PSF	

Seismic Force Resisting System: Floor Weights					
Floor Levels 5-7					
Approximate Area:		15,113	SF		
Floor to Floor Height:		10	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.			
Height:	0	ft.	Partitions:	15	PSF
			MEP:	10	
Unit Weight:	0	PSF	Finishes:	5	PSF
Weight =	**0**	**k**	**Weight =**	**453.39**	**k**
Slab:					
Thickness:	8	in.			
Unit Weight:	81	PCF			
Weight =	**1224.153**	**k**			
Columns:					
Shape	Quantity	Weight (PLF)	Column Height (ft)	Total Weight (k)	
W10x33	55	33	10	18.15	
W12x40	2	40	10	0.8	
			Weight =	**18.95**	**k**
Beams:					
Shape	Quantity	Weight (PLF)	Total Beam Length (ft)	Total Weight (k)	
W10x12	28	12	506.7	6.08	
W16x26	1	26	18.5	0.48	
W18x35	1	35	23	0.81	
DB 9x46	41	46	602.5	27.72	
			Weight =	**35.08**	**k**
Total Weight of Floor =			**1731.57**	**k**	
			114.58	PSF	

Seismic Force Resisting System: Floor Weights					
Roof Level					
Approximate Area:		15,113	SF		
Floor to Floor Height:		10	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.		0	PSF
Height:	0	ft.	MEP:	10	PSF
Unit Weight:	0	PSF	Roof Mat:	10	PSF
Weight =	**0.00**	**k**	**Weight =**	**302.26**	**k**
Slab:					
Thickness:	8	in.			
Unit Weight:	81	PCF			
Weight =	**1224.153**	**k**			
Columns:					
			Weight =		**k**
Beams:					
Shape	Quantity	Weight (PLF)	Total Beam Length (ft)	Total Weight (k)	
W10x12	4	12	52	0.62	
			Weight =	**0.62**	**k**
Total Weight of Floor =			**1527.04**	**k**	
			101.04	PSF	

Seismic Force Resisting System: Floor Weights					
High Roof Level					
Approximate Area:		576	SF		
Floor to Floor Height:		10	ft.		
Walls:			**Superimposed:**		
Perimeter:	0	ft.		0	PSF
Height:	0	ft.	MEP:	10	PSF
Unit Weight:	0	PSF	Roof Mat:	10	PSF
Weight =	**0.00**	**k**	**Weight =**	**11.52**	**k**
Slab:					
Thickness:	8	in.			
Unit Weight:	81	PCF			
Weight =	**46.656**	**k**			
Total Weight of Floor =			**58.18**	**k**	
			101.00	PSF	

SEISMIC LOADS

- SITE CLASS C – Very Dense Soil & Soft Rock (TABLE 20.3-1)
- OCCUPANCY CATEGORY II (TABLE 1-1)
- IMPORTANCE FACTOR = 1.0 (TABLE 11.5-1)
- SPECTRAL RESPONSE ACCELERATION, SHORT (S_S) (FIG. 22-1 thru 22-14)
&
SPECTRAL RESPONSE ACCELERATION, 1s (S_1)

$S_S = 0.125$
$S_1 = 0.049$

- SITE COEFFICIENTS (F_a & F_v) (TABLE 11.4-1 & 11.4-2)

$F_a = 1.2$
$F_v = 1.7$

- $S_{MS} = F_a S_s$
$= 1.2(0.125)$ $\boxed{S_{MS} = 0.15}$ (Eq 11.4-1)

- $S_{DS} = 2/3 (S_{MS})$
$= 2/3 (0.15)$ $\boxed{S_{DS} = 0.10}$

- $S_{M1} = F_v S_1$
$= 1.7(0.049)$ $\boxed{S_{M1} = 0.0833}$ (Eq. 11.4-2)

- $S_{D1} = 2/3 S_{M1}$
$= 2/3(0.0833)$ $\boxed{S_{D1} = 0.055}$ (Eq. 11.4-4)

- $T_a = C_t h_n^x$ (Eq. 12.8-7)
  $= 0.02(102.167)^{0.75}$ $\boxed{T_a = 0.643\ s}$

- $C_u = 1.7$ (TABLE 12.8-1)

- $T = T_a C_u$
  $= 0.643(1.7)$ $\boxed{T = 1.09\ s}$ (SEC. 12.8.2)

- $C_s = \text{MIN.}\left[\begin{array}{l} \dfrac{S_{D1}}{T(R/I)} = \dfrac{0.055}{1.09(3.25/1.0)} = \boxed{0.016} \geq 0.01 \\[2ex] \dfrac{S_{DS}}{(R/I)} = \dfrac{0.10}{(3.25/1.0)} = 0.031 \geq 0.01 \\[2ex] \dfrac{S_{D1}T_L}{T^2(R/I)} = \dfrac{0.055(12)}{(1.09)^2(3.25/1.0)} = 0.171 \geq 0.01 \end{array}\right.$

WHERE : $R = 3.25$ (TABLE 12.2-1)
$I = 1.0$ (TABLE 11.5-1)
$T_L = 12$ (FIG. 22-15)

- $k = 0.75 + 0.5(T)$
  $= 0.75 + 0.5(1.09)$ $\boxed{k = 1.295}$ (SEC. 12.8.3)

- SEE EXCEL SPREADSHEETS FOR FLOOR WEIGHTS

FLOOR	APPROX. FLOOR AREA	TOTAL WEIGHT
B	15,113 SF	35.09 PSF
1	15,113 SF	115.94 PSF
2-4	15,113 SF	114.64 PSF
5-7	15,113 SF	114.58 PSF
ROOF	15,113 SF	101.04 PSF
HIGH ROOF	576 SF	101 PSF

- TOTAL BUILDING WEIGHT (W_T)

$$\boxed{W_T = 14,260 \text{ k}}$$

- BASE SHEAR (V)

$$V = C_s W_T = 0.016(14260)$$

$$\boxed{V = 228.16^{k}}$$

- $w_x h_x^k$ (varies @ height)

Example @ Level 1 : $w_x = 1752.17^{k}$, $h_x = 14.833'$, $k = 1.295$

$$w_x h_x^k = 1752.17(14.833)^{1.295} = \boxed{57,586 \text{ ft}\cdot\text{k}}$$

- $\Sigma w_i h_i^k = \boxed{2338382 \text{ ft k}}$

- $C_{vx} = \dfrac{w_x h_x^k}{\Sigma w_i h_i^k}$ (varies @ height) (Eq. 12.8-12)

  Example @ Level 1 : $C_{vx} = \dfrac{57586}{2338382} = \boxed{0.025}$

- $F_x = C_{vx}(V)$

  Example @ Level 1 : $F_x = 0.025(228.16) = \boxed{5.62^k}$

- STORY SHEAR (V_x)

  $V_x = F_x(\text{@ Level}) + F_x(\text{@ all levels above})$

  Example @ Level 7 : $V_x = F_x(HR) + F_x(\text{Roof}) + F_x(7)$
  $= 2.27 + 48.28 + 46.72$
  $= \boxed{97.28^k}$

- MOMENTS

  $M_x = (\text{Trib. Floor Area Height})(F_x)$

  Example @ Level 7 : $M_x = ((76.833 + 66.833)/2)(46.72)$
  $= \boxed{3356.39 \text{ ft.k}}$

Redesign Base Shear and Overturning Moment Distribution							
Story	h_x (ft)	Story Weight (k)	$w_x h_x^k$	C_{vx}	Lateral Force F_x (k)	Story Shear V_x (k)	M_x (ft-k)
High Roof	102.167	58.18	23272	0.010	2.27	2.27	214.58
Roof	86.833	1527.04	494820	0.212	48.28	50.55	3950.93
7	76.833	1731.57	478878	0.205	46.72	97.28	3356.39
6	66.833	1731.57	399764	0.171	39.01	136.28	2411.84
5	56.833	1731.57	324077	0.139	31.62	167.90	1639.00
4	46.833	1732.57	252380	0.108	24.63	192.53	1030.15
3	36.833	1732.57	184913	0.079	18.04	208.30	574.34
2	26.833	1732.57	122692	0.052	11.97	222.54	249.40
1	14.833	1752.17	57586	0.025	5.62	228.16	41.67
B	0	530.37	0	0	0	228.16	0
			2338382				

Total Building Weight =	14260	k
Base Shear =	228.16	k
Total Moment =	13468.29	ft-k

Existing Base Shear and Overturning Moment Distribution							
Story	h_x (ft)	Story Weight (k)	$w_x h_x^k$	C_{vx}	Lateral Force F_x (k)	Story Shear V_x (k)	M_x (ft-k)
High Roof	102.167	7.92	3168	0.001	0.52	0.52	48.89
Roof	86.833	1864.55	604186	0.194	98.67	99.18	8074.14
7	76.833	2372.19	656045	0.211	107.13	206.32	7695.82
6	66.833	2372.19	547662	0.176	89.44	295.75	5530.06
5	56.833	2372.19	443974	0.143	72.50	368.26	3758.03
4	46.833	2372.19	345553	0.111	56.43	424.69	2360.64
3	36.833	2372.19	253178	0.081	41.35	465.51	1316.14
2	26.833	2372.19	167987	0.054	27.43	493.46	571.51
1	14.833	2712.91	89161	0.029	14.56	508.03	107.99
B	0	1404.82	0	0	0	508.03	0
			3110915				

Total Building Weight =	20223	k
Base Shear =	508.03	k
Total Moment =	29463.22	ft-k

COR and COM Calculations

The following equations were used to calculate the Center of Rigidity for both the X and Y direction for each level.

$$XCR = \frac{\sum kiyxi}{\sum Kiy,total} \qquad YCR=\frac{\sum kixyi}{\sum Kix,total}$$

Center of Rigidity (XCR)										
Level	K_{iy}				x_i (ft)				K_{iy},total	XCR (ft)
	Frame C	Frame M	Frame M.2	Frame O	Frame C	Frame M	Frame M.2	Frame O		
Roof	13.60	0.92	1.18	11.12	22.6	118.5	136.5	205	26.81	106.53
7	15.65	1.09	1.40	12.82	22.6	118.5	136.5	205	30.96	106.64
6	18.44	1.33	1.73	15.11	22.6	118.5	136.5	205	36.61	106.76
5	22.51	1.69	2.23	18.46	22.6	118.5	136.5	205	44.90	106.88
4	28.82	2.29	3.08	23.65	22.6	118.5	136.5	205	57.84	107.05
3	39.26	3.41	4.66	32.40	22.6	118.5	136.5	205	79.73	107.48
2	58.31	5.87	8.08	49.00	22.6	118.5	136.5	205	121.26	108.54
Hotel Level	115.47	16.78	22.57	100.70	22.6	118.5	136.5	205	255.53	110.84

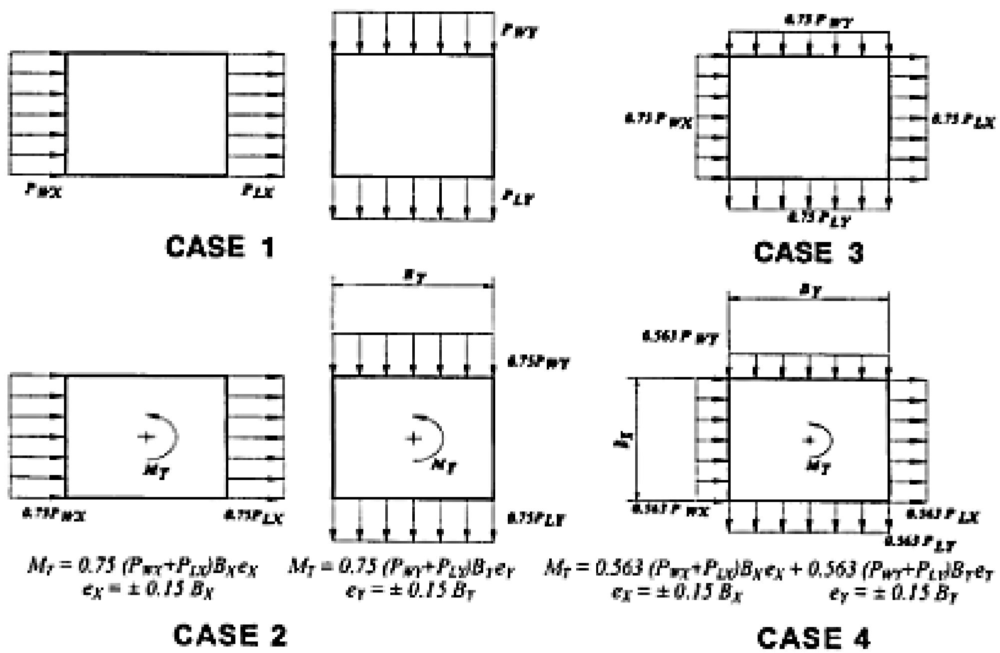
Center of Rigidity (YCR)						
Level	K_{ix}		y_i (ft)		K_{ix},total	YCR (ft)
	Frame 2	Frame 8	Frame 2	Frame 8		
Roof	6.70	4.37	12.5	51	11.07	37.70
7	7.67	5.08	12.5	51	12.75	37.84
6	9.02	6.06	12.5	51	15.08	37.97
5	11.00	7.53	12.5	51	18.53	38.15
4	14.08	9.87	12.5	51	23.95	38.37
3	19.35	13.95	12.5	51	33.30	38.63
2	29.64	22.11	12.5	51	51.75	38.95
Hotel Level	61.69	49.88	12.5	51	111.57	39.71

Center of Rigidity & Center of Mass								
Level	ETABS COR		Calculated COR		Difference in COR		ETABS COM	
	XCR (ft)	YCR (ft)	XCR (ft)	YCR (ft)	XCR (ft)	YCR (ft)	XCM (ft)	YCM (ft)
Roof	107.1	40.2	106.46	37.70	0.6	2.5	112.4	52.1
7	106.7	39.9	106.56	37.84	0.1	2.1	112.4	52.1
6	106.3	39.6	106.66	37.97	-0.4	1.6	112.4	52.1
5	106.1	39.1	106.76	38.15	-0.7	1.0	112.4	52.1
4	106.4	38.4	106.90	38.37	-0.5	0.0	112.4	52.1
3	107.5	37.2	107.28	38.63	0.2	-1.4	112.4	52.1
2	110.0	35.5	108.23	38.95	1.8	-3.4	112.4	52.1
Hotel Level	114.3	32.9	110.25	39.71	4.1	-6.8	112.4	52.1

Design Wind Load Cases

Figure 6-9: Design Wind Load Cases from ASCE 7-05

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



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.

The following tables summarize the design wind load cases analyzed in ETABS when considering ASCE 7-05 load combinations. Data is based on the wind load cases defined in Figure 6-9 of ASCE 7-05 (pictured above).

Case 1X		
Level	Factored P_x (k)	P_Y (k)
Roof	20.75	0
7	20.26	0
6	12.23	0
5	18.87	0
4	17.98	0
3	17.09	0
2	15.21	0
Hotel Level	16.80	0

Case 1Y		
Level	P_X (k)	Factored P_X (k)
Roof	0	65.37
7	0	64.32
6	0	62.56
5	0	60.80
4	0	58.77
3	0	56.62
2	0	52.09
Hotel Level	0	58.96

Case 2X					
Level	Factored P_X (k)	$0.75P_X$ (k)	B_x (ft)	e_x (ft)	M_T (ft-k)
Roof	20.75	15.56	98.92	14.84	230.94
7	20.26	15.19	98.92	14.84	225.44
6	12.23	9.17	98.92	14.84	136.08
5	18.87	14.15	98.92	14.84	210.03
4	17.98	13.49	98.92	14.84	200.12
3	17.09	12.82	98.92	14.84	190.21
2	15.21	11.41	98.92	14.84	169.30
Hotel Level	16.80	12.60	98.92	14.84	186.91

Case 2Y					
Level	Factored P_Y (k)	$0.75P_Y$ (k)	B_y (ft)	e_y (ft)	M_T (ft-k)
Roof	65.37	49.03	219.67	32.95	1615.57
7	64.32	48.24	219.67	32.95	1589.52
6	62.56	46.92	219.67	32.95	1546.09
5	60.80	45.60	219.67	32.95	1502.66
4	58.77	44.07	219.67	32.95	1452.28
3	56.62	42.47	219.67	32.95	1399.30
2	52.09	39.07	219.67	32.95	1287.25
Hotel Level	58.96	44.22	219.67	32.95	1457.14

Case 3				
Level	Factored P_X (k)	Factored P_Y (k)	$0.75P_X$ (k)	$0.75P_Y$ (k)
Roof	20.75	65.37	15.56	49.03
7	20.26	64.32	15.19	48.24
6	12.23	62.56	9.17	46.92
5	18.87	60.80	14.15	45.60
4	17.98	58.77	13.49	44.07
3	17.09	56.62	12.82	42.47
2	15.21	52.09	11.41	39.07
Hotel Level	16.80	58.96	12.60	44.22

Case 4									
Level	Factored P_X (k)	$0.563P_X$ (k)	Factored P_Y (k)	$0.563P_Y$ (k)	B_x (ft)	e_x (ft)	B_y (ft)	e_y (ft)	M_T (ft-k)
Roof	20.75	11.68	65.37	36.81	98.92	14.84	219.67	32.95	1386.12
7	20.26	11.41	64.32	36.21	98.92	14.84	219.67	32.95	1362.43
6	12.23	6.88	62.56	35.22	98.92	14.84	219.67	32.95	1262.75
5	18.87	10.63	60.80	34.23	98.92	14.84	219.67	32.95	1285.66
4	17.98	10.12	58.77	33.09	98.92	14.84	219.67	32.95	1240.40
3	17.09	9.62	56.62	31.88	98.92	14.84	219.67	32.95	1193.19
2	15.21	8.56	52.09	29.33	98.92	14.84	219.67	32.95	1093.38
Hotel Level	16.80	9.46	58.96	33.20	98.92	14.84	219.67	32.95	1234.14

The following tables are summaries of the seismic data considering ASCE 7-05 wind load combinations. All data considers inherent and accidental torsion, as defined in Section 12.8.4.1 and 12.8.4.2 of ASCE 7-05.

Accidental Torsion, M_{ta} (X-Direction)				
Level	Structural Width (ft)	5% of Width (ft)	Story Force	Moment, M_{ta} (ft-k)
Roof	219.67	11.0	48.28	530.3
7	219.67	11.0	46.72	513.2
6	219.67	11.0	39.01	428.4
5	219.67	11.0	31.62	347.3
4	219.67	11.0	24.63	270.5
3	219.67	11.0	18.04	198.2
2	219.67	11.0	11.97	131.5
Plaza	219.67	11.0	5.62	61.7

Accidental Torsion, M_{ta} (Y-Direction)				
Level	Structural Width (ft)	5% of Width (ft)	Story Force	Moment, M_{ta} (ft-k)
Roof	98.92	4.9	48.28	238.8
7	98.92	4.9	46.72	231.1
6	98.92	4.9	39.01	192.9
5	98.92	4.9	31.62	156.4
4	98.92	4.9	24.63	121.8
3	98.92	4.9	18.04	89.2
2	98.92	4.9	11.97	59.2
Plaza	98.92	4.9	5.62	27.8

Seismic Torsional Effects										
Level	East-West (X-Direction)					North-South (Y-Direction)				
	Factored Story Force (k)	COR-COM (ft)	M_t (ft-k)	M_{ta} (ft-k)	M_{total} (ft-k)	Factored Story Force (k)	COR-COM (ft)	M_t (ft-k)	M_{ta} (ft-k)	M_{total} (ft-k)
Roof	48.28	-5.3	-255.89	530.29	274.40	48.28	-11.9	-574.54	238.80	-335.74
7	46.72	-5.7	-266.33	513.20	246.87	46.72	-12.2	-570.04	231.10	-338.94
6	39.01	-6.1	-237.93	428.42	190.48	39.01	-12.5	-487.57	192.92	-294.65
5	31.62	-6.3	-199.21	347.31	148.10	31.62	-13.0	-411.07	156.40	-254.67
4	24.63	-6.0	-147.75	270.47	122.72	24.63	-13.7	-337.37	121.80	-215.57
3	18.04	-4.9	-88.41	198.17	109.76	18.04	-14.9	-268.83	89.24	-179.59
2	11.97	-2.4	-28.73	131.49	102.76	11.97	-16.6	-198.72	59.21	-139.51
Plaza	5.62	1.9	10.68	61.71	72.39	5.62	-19.2	-107.88	27.79	-80.09
				Total:	1267.48				**Total:**	-1838.77

The following table is a summation of the base shears and overturning moments produced by ETABS in the analysis of the ASCE 7-05 design wind load cases. It is confirmed that wind loads control in the North/South direction (Case 1Y) and seismic loads control in the East/West direction (Case EX).

Design Wind Load Cases: Controlling Base Shears and Overturning Moments								
Story	Point	Load	FX	FY	FZ	MX	MY	MZ
Summartion	0,0,Base	Case 1X	-139.20	0.00	0.00	0.00	-7377.10	7034.70
Summartion	0,0,Base	Case 1Y	0.00	-479.50	0.00	25364.80	0.00	-52504.20
Summartion	0,0,Base	Case 2X	-104.39	0.00	0.00	0.00	-5532.30	3726.84
Summartion	0,0,Base	Case 2Y	0.00	-359.62	0.00	19023.74	0.00	-51228.20
Summartion	0,0,Base	Case 3	-104.39	-359.62	0.00	19023.74	-5532.30	-34102.52
Summartion	0,0,Base	Case 4	-78.36	-269.97	0.00	14281.11	-4153.11	-35659.47
Summartion	0,0,Base	Case EX	-225.89	0.00	0.00	0.00	-14408.67	11764.63
Summartion	0,0,Base	Case EY	0.00	-225.89	0.00	14408.67	0.00	-25392.93

Appendix D: Lateral System Design

The following tables summarize the results of an analysis performed in determining the adequacy of the lateral brace designs for the proposed braced frame lateral system.

Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
C	7	HSS8x8x5/8	13.35	0.03
			20.39	0.046
			23.88	0.044
			11.54	0.021
	6	HSS8x8x5/8	31.98	0.072
			43.9	0.098
			52.34	0.096
			32.33	0.059
	5	HSS8x8x5/8	54.24	0.121
			69.25	0.155
			80.88	0.148
			58.85	0.108
	4	HSS8x8x5/8	68.58	0.153
			96.16	0.215
			107.64	0.197
			76.58	0.14
	3	HSS8x8x5/8	80.24	0.18
			132.15	0.296
			144.98	0.266
			94.06	0.173
	2	HSS8x8x5/8	86.69	0.201
			139.41	0.312
			184.16	0.338
			120.04	0.22
	Hotel	HSS8x8x5/8	115.99	0.224
			212	0.41
			180.93	0.426
			94.91	0.224
	Plaza	HSS8x8x5/8	141.74	0.291
			250.1	0.514
			200.2	0.502
			107.08	0.268

Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
O	7	HSS8x8x5/8	9.12	0.02
			17.93	0.04
			18.05	0.033
			4.52	0.008
	6	HSS8x8x5/8	21.36	0.048
			35.22	0.079
			38.9	0.071
			16.95	0.031
	5	HSS8x8x5/8	35.17	0.079
			55.87	0.125
			62.68	0.115
			29.29	0.054
	4	HSS8x8x5/8	48.34	0.108
			78.91	0.177
			89.66	0.165
			43.66	0.08
	3	HSS8x8x5/8	59.36	0.133
			102.9	0.23
			117.31	0.215
			61.22	0.112
	2	HSS8x8x5/8	71.88	0.161
			127.92	0.286
			142.61	0.262
			83.41	0.153
	Hotel	HSS8x8x5/8	73.63	0.174
			147.29	0.347
			194.26	0.375
			96.01	0.186
	Plaza	HSS8x8x5/8	170.69	0.428
			220.72	0.454
			108.27	0.223
			73.02	0.183

Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
M	7	HSS8x8x5/8	23.17	0.038
			14.62	0.024
	6	HSS8x8x5/8	42.03	0.069
			7.81	0.013
	5	HSS8x8x5/8	68.64	0.113
			21.07	0.035
	4	HSS8x8x5/8	102.17	0.168
			40.9	0.067
	3	HSS8x8x5/8	140.37	0.231
			67.52	0.111
	2	HSS8x8x5/8	181.58	0.299
			98.74	0.162
	Hotel	HSS8x8x5/8	224.88	0.39
			150.83	0.261
	Plaza	HSS8x8x5/8	210.86	0.389
			241.25	0.445

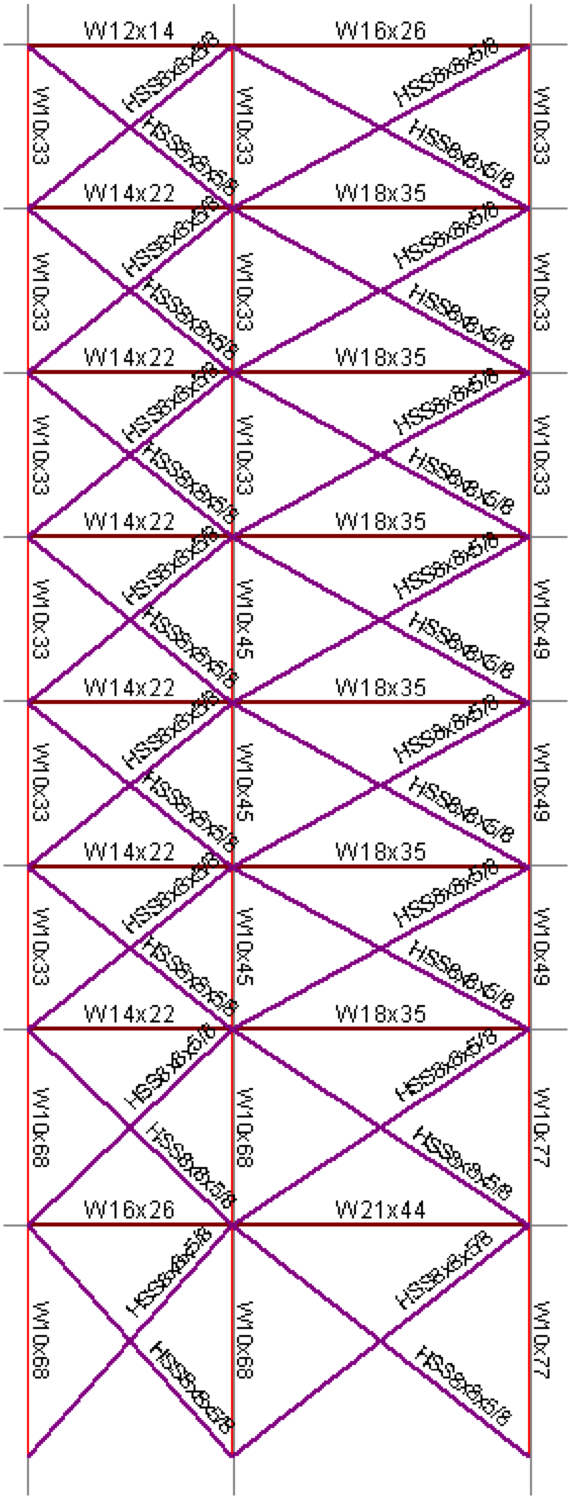
Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
M.2	7	HSS8x8x5/8	36.2	0.06
			28.53	0.047
	6	HSS8x8x5/8	72.24	0.119
			47.97	0.079
	5	HSS8x8x5/8	115.17	0.189
			73.45	0.121
	4	HSS8x8x5/8	163.95	0.27
			109.43	0.18
	3	HSS8x8x5/8	216.63	0.356
			151.72	0.25
	2	HSS8x8x5/8	275.06	0.452
			194.62	0.32
	Hotel	HSS8x8x5/8	277.84	0.481
			222.54	0.386
	Plaza	HSS8x8x5/8	276.98	0.51
			292.14	0.538

Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
2	7	HSS8x8x5/8	21.69	0.061
			16.39	0.046
	6	HSS8x8x5/8	38.93	0.109
			36.06	0.101
	5	HSS8x8x5/8	62.13	0.174
			64.25	0.18
	4	HSS8x8x5/8	86.05	0.241
			92.4	0.259
	3	HSS8x8x5/8	111.64	0.313
			121.78	0.341
	2	HSS8x8x5/8	140.38	0.393
			129.65	0.363
	Hotel	HSS8x8x5/8	167.75	0.495
			154.33	0.455
	Plaza	HSS8x8x5/8	179.07	0.562
			207.31	0.65

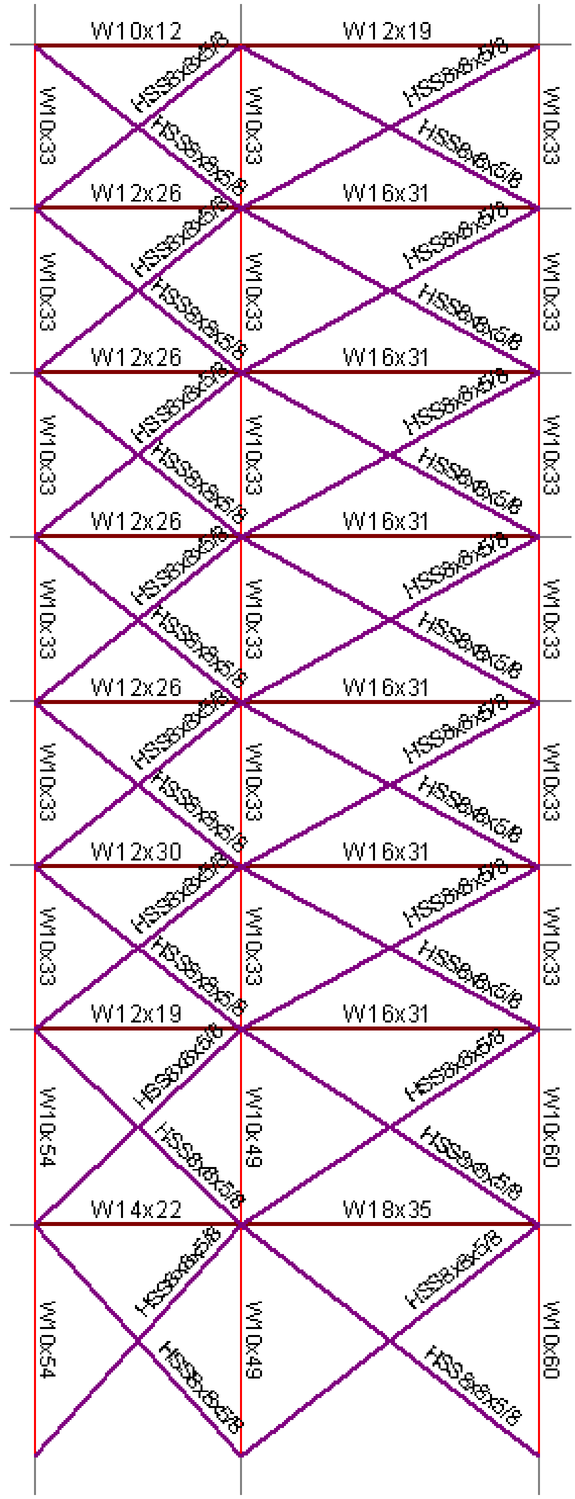
Frame	Level	Brace	Factored Axial Load (k)	Pu/ϕPn < 1.0
8	7	HSS8x8x5/8	45.55	0.102
			52.14	0.117
	6	HSS8x8x5/8	64.09	0.143
			68.12	0.152
	5	HSS8x8x5/8	91.48	0.205
			90.31	0.202
	4	HSS8x8x5/8	119.27	0.267
			115.59	0.259
	3	HSS8x8x5/8	140.72	0.315
			130.49	0.292
	2	HSS8x8x5/8	154.61	0.346
			144.63	0.324
	Hotel	HSS8x8x5/8	177.79	0.419
			163.6	0.386
	Plaza	HSS8x8x5/8	184.28	0.462
			208.52	0.523

The following table summarizes the results of a braced frame column check for Frame 2. This spreadsheet was developed thoroughly to determine the adequacy of the member designs for the braced frame lateral force resisting system.

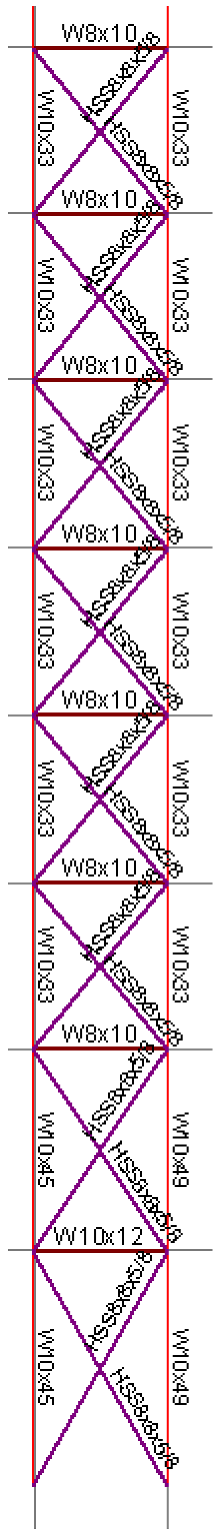
Column	Level	Factored Axial Load, P_u	Moment, M_{ux}	Moment, M_{uy}	Designed Member	pPr	Equation H1-1a or H1-1b?	< 1.0
A.2	7	18.3	0.26	0	W10x33	0.055	H1-1b	0.03
	6	50.66	0.32	0.01		0.153	H1-1b	0.079
	5	93.51	0.31	0.01		0.283	H1-1a	0.285
	4	155.6	-0.24	-0.1	W10x49	0.282	H1-1a	0.284
	3	229.63	-0.66	-0.14		0.417	H1-1a	0.421
	2	319.51	-1.77	-0.16		0.58	H1-1a	0.588
	Hotel	438.94	-7.01	-0.46	W12x96	0.405	H1-1a	0.418
	Plaza	601.85	-7.01	-0.46		0.588	H1-1a	0.601
C.2	7	48.61	0.18	0	W10x33	0.147	H1-1b	0.075
	6	105.29	0.31	0.01		0.319	H1-1a	0.321
	5	182.68	0.7	0		0.553	H1-1a	0.557
	4	287.16	2.17	0.01	W10x68	0.373	H1-1a	0.379
	3	403.75	3.15	0.07		0.525	H1-1a	0.534
	2	533.53	5.31	0.13		0.694	H1-1a	0.709
	Hotel	687.89	16.2	0.44	W12x120	0.506	H1-1a	0.528
	Plaza	897.33	16.2	0.44		0.698	H1-1a	0.72



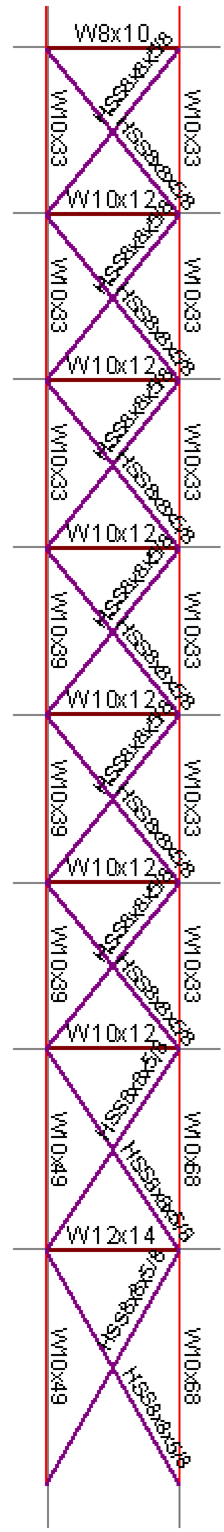
Braced Frame C



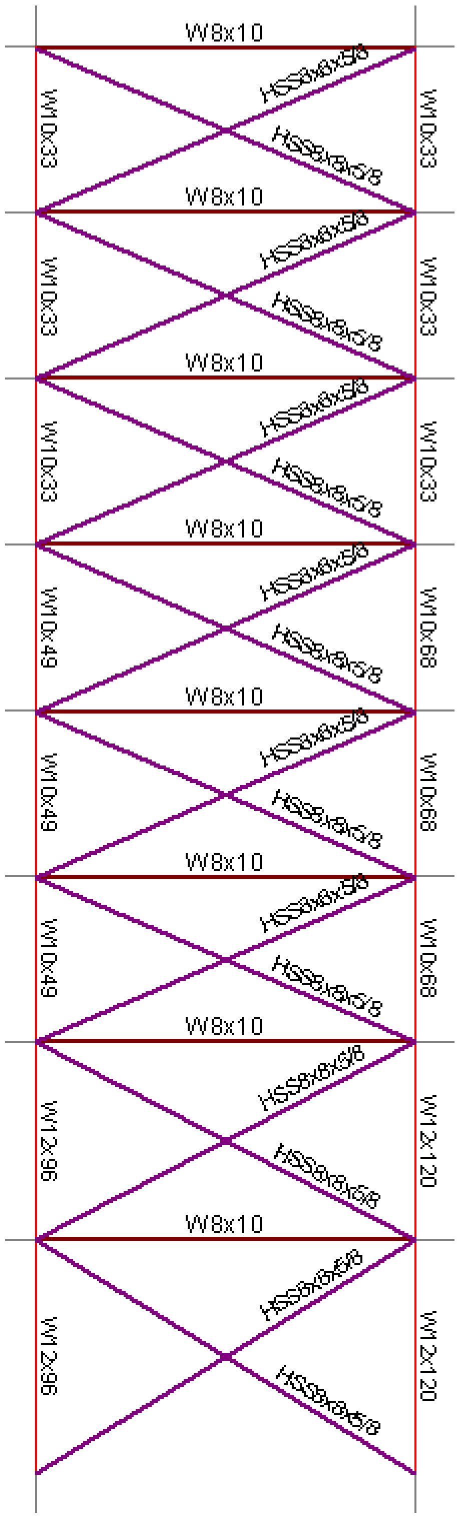
Braced Frame O



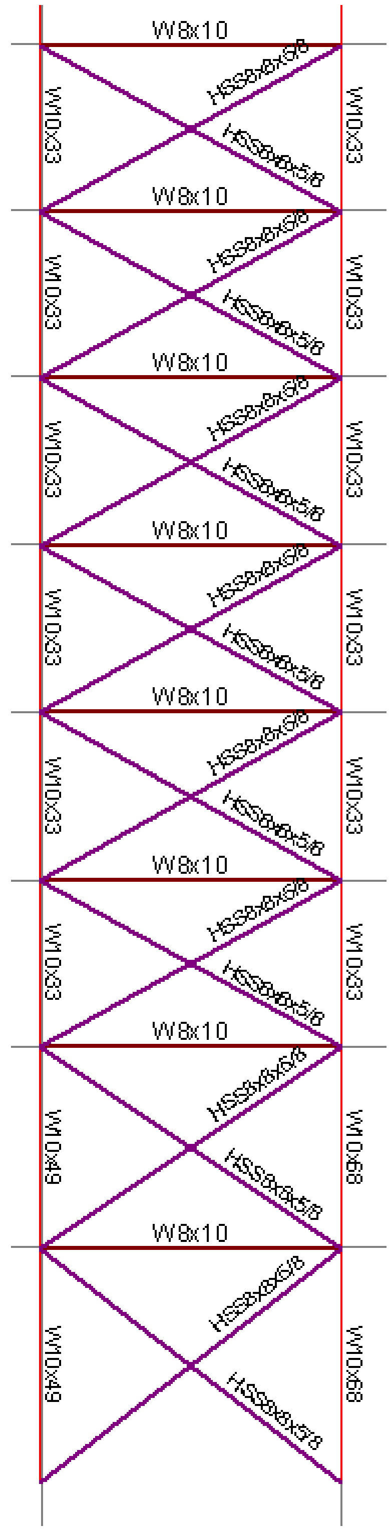
Braced Frame M



Braced Frame M.2



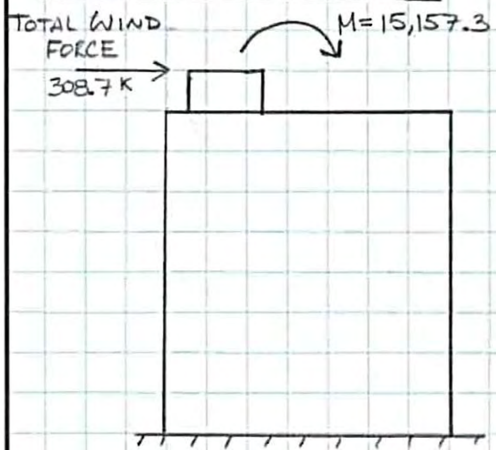
Braced Frame 2



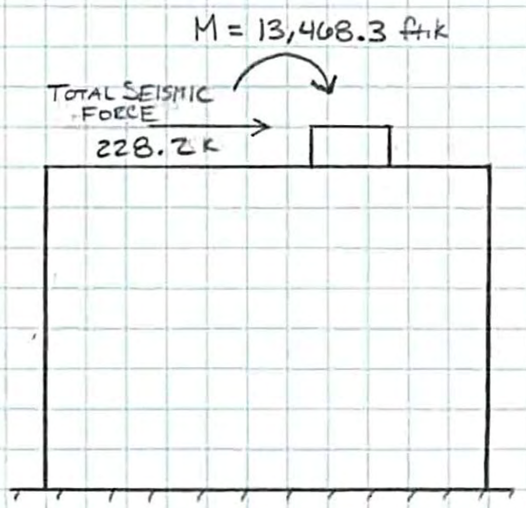
Braced Frame 8

Appendix E: Foundation Check

OVERTURNING MOMENT



(N/S DIRECTION)



(E/W DIRECTION)

- Lateral loads will create overturning moment, while the gravity loads will try to resist the overturning moment.
- To determine if the gravity loads will exceed the lateral loads, the stress due to seismic and lateral loads will be calculated.

STRESS DUE TO DEAD LOADS

$$\Rightarrow \frac{\text{Weight of building}}{\text{Square Footage of Foundation}} = \frac{14,260^{K}}{12,808 \text{ SF}} \times 1000 \text{ lb.} = 1113.4 \text{ PSF}$$

STRESS DUE TO E/W SEISMIC LOADS

$$\Rightarrow \frac{228.2^{k}\ (1000\ \text{lb})}{12{,}808\ \text{SF}} = 17.82\ \text{PSF}$$

$$\Rightarrow \frac{17.82}{1113.4} \times 100\% = 1.6\%\ \text{of Dead Load}$$

STRESS DUE TO N/S LATERAL LOADS

$$\Rightarrow \frac{308.7^{k}\ (1000\ \text{lb})}{12{,}808\ \text{SF}} = 24.1\ \text{PSF}$$

$$\Rightarrow \frac{24.1}{1586.6} \times 100\% = 1.5\%\ \text{of Dead Load}$$

- Since the stresses of the lateral and seismic loads are a much smaller percentage of the gravity loads, overturning is not a concern for the design of Cambria Suites Hotel.

Appendix F: Architectural/Façade Study Calculations

THERMAL GRADIENT CALCULATIONS

EXISTING CMU / BRICK SYSTEM :
1. Brick (TTW), 4"
2. Cavity, 1"
3. Rigid Ins., 2"
4. CMU Block, 8"
5. Steel Furrings, 1"
6. GWB, 5/8"

	Winter		Summer	
	Int.	Ext.	Int.	Ext.
Temp (°F)	70	2	75	88
RH (%)	25	80	50	59
DPT (°F)	33	-3	56	72

$R_o = 0.17$
$R_1 = 0.64$
$R_2 = 0.98$
$R_3 = 10.27$
$R_4 = 1.03$
$R_5 = 0.46$
$R_6 = 0.46$
$R_i = 0.64$

$\Sigma R_{o-i} = 14.66$
$U = 0.0682$

$$T_x = T_o + (T_i - T_o)\left(\frac{\Sigma R_{o-x}}{\Sigma R_{o-i}}\right)$$

$$T_1 = 2 + (70-2)\left(\frac{0.81}{14.66}\right) = 5.75\,°F$$

$$T_2 = 2 + (70-2)\left(\frac{1.79}{14.66}\right) = 10.3\,°F$$

$$T_3 = 2 + (70-2)\left(\frac{12.06}{14.66}\right) = 57.9\,°F$$

$$T_4 = 2 + (70-2)\left(\frac{13.09}{14.66}\right) = 62.7\,°F$$

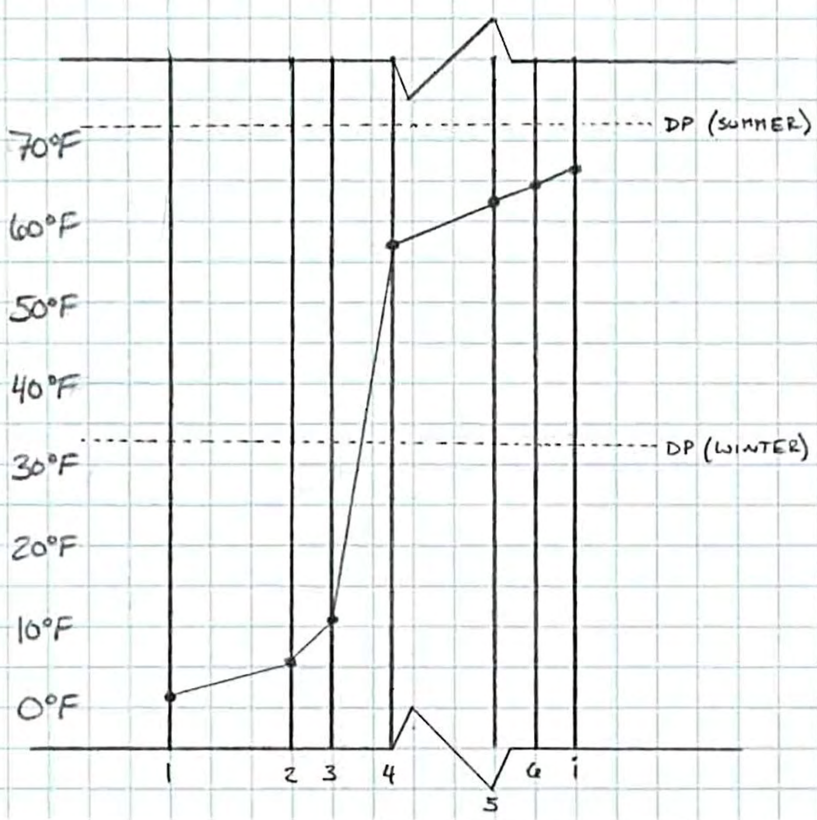
$$T_5 = 2 + (70-2)\left(\frac{13.55}{14.66}\right) = 64.9\,°F$$

$$T_6 = 2 + (70-2)\left(\frac{14.01}{14.66}\right) = 66.98\,°F$$

$$T_i = 2 + (70-2)\left(\frac{14.66}{14.66}\right) = 70\,°F$$

THERMAL GRADIENT

BTW	ΣR_{o-x}	Temp. (°F)
0 - 1	0.17	2
1 - 2	0.81	5.75
2 - 3	1.79	10.3
3 - 4	12.06	57.9
4 - 5	13.09	62.7
5 - 6	13.55	64.9
6 - i	14.01	66.98
	14.66	70° F



OPTION 1 - BRICK VENEER SYSTEM :
① Brick (TTW), 4"
② Cavity, 1"
③ Poly Film, 4 MIL
④ Batt. Ins., 4"
⑤ GWB, 5/8"

	Winter		Summer	
	Int.	Ext.	Int.	Ex.
Temp. (°F)	70	2	75	88
RH (%)	25	80	50	59
DPT (°F)	33	-3	56	72

$R_o = 0.17$
$R_1 = 0.64$
$R_2 = 0.98$
$R_3 = 0.12$
$R_4 = 12.19$
$R_5 = 0.46$
$R_i = 0.64$

$\Sigma R_{o-i} = 15.2$
$U = 0.0658$

$$T_x = T_o + (T_i - T_o)\left(\frac{\Sigma R_{o-x}}{\Sigma R_{o-i}}\right)$$

$$T_1 = 2 + (70-2)\left(\frac{0.81}{15.2}\right) = 5.62\ °F$$

$$T_2 = 2 + (70-2)\left(\frac{1.79}{15.2}\right) = 10\ °F$$

$$T_3 = 2 + (70-2)\left(\frac{1.91}{15.2}\right) = 10.54\ °F$$

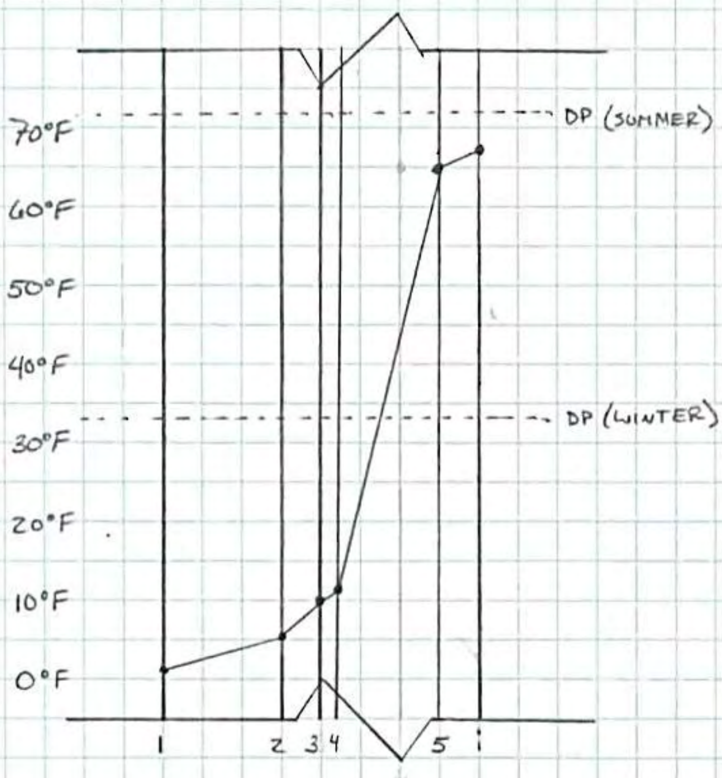
$$T_4 = 2 + (70-2)\left(\frac{14.1}{15.2}\right) = 65.08\ °F$$

$$T_5 = 2 + (70-2)\left(\frac{14.56}{15.2}\right) = 67.14\ °F$$

$$T_i = 2 + (70-2)\left(\frac{15.2}{15.2}\right) = 70\ °F$$

THERMAL GRADIENT

BTW	ΣR_{o-x}	Temp. (°F)
0 - 1	0.17	2
1 - 2	0.81	5.62
2 - 3	1.79	.10
3 - 4	1.91	10.54
4 - 5	14.1	65.08
5 - i	14.56	67.14
	15.2	70°F



OPTION 2 - CURTAIN WALL SYSTEM :
① Glass
② Cavity, ½"
③ Glass

	Winter		Summer	
	Int.	Ext.	Int.	Ext.
Temp. (°F)	70	2	75	88
RH (%)	25	80	50	59
DPT (°F)	33	-3	56	72

$R_o = 0.17$
$R_1 = 2.045$
$R_2 = 0.98$
$R_3 = 2.045$
$R_i = 0.64$

$\Sigma R_{o-i} = 5.88$
$U = 0.17$

$$T_x = T_o + (T_i - T_o)\left(\frac{\Sigma R_{o-x}}{\Sigma R_{o-i}}\right)$$

$$T_1 = 2 + (70-2)\left(\frac{2.215}{5.88}\right) = 27.62\,°F$$

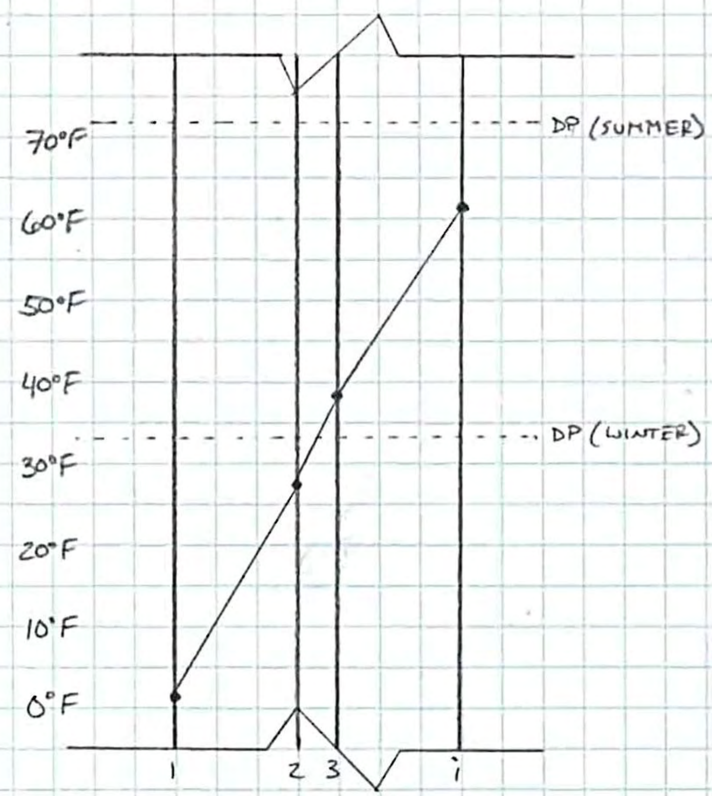
$$T_2 = 2 + (70-2)\left(\frac{3.195}{5.88}\right) = 38.95\,°F$$

$$T_3 = 2 + (70-2)\left(\frac{5.24}{5.88}\right) = 62.6\,°F$$

$$T_i = 2 + (70-2)\left(\frac{5.88}{5.88}\right) = 70°\,F$$

THERMAL GRADIENT

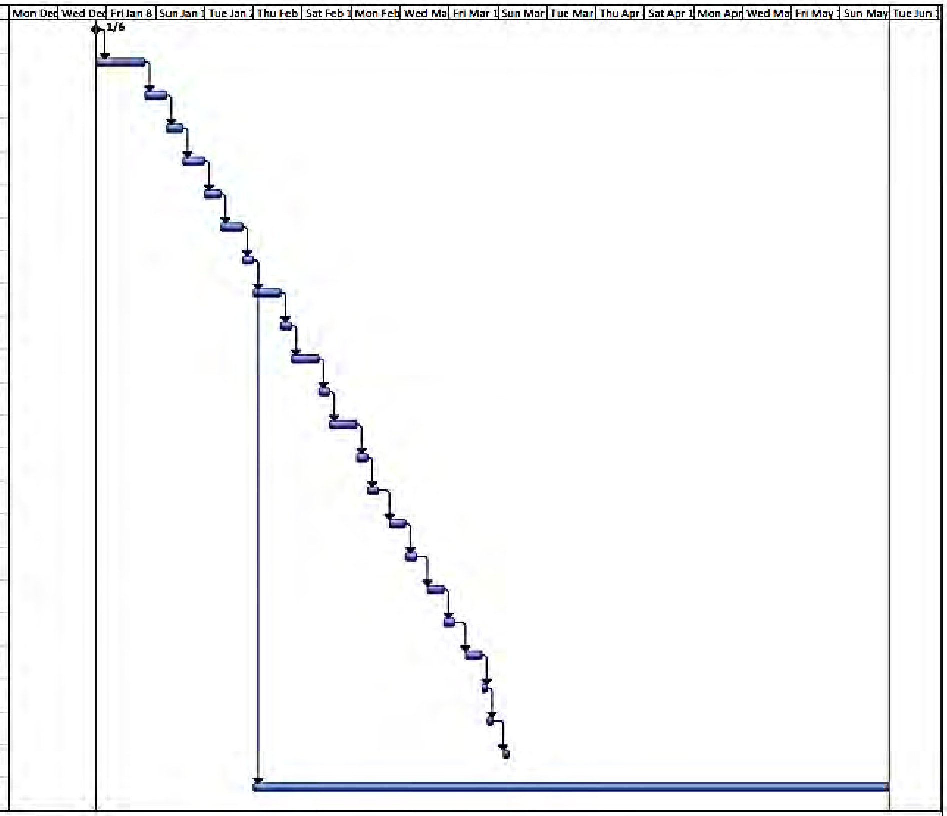
BTW	ΣR_{0-x}	Temp. (°F)
0 - 1	0.17	2
1 - 2	2.215	27.62
2 - 3	3.195	38.95
3 - i	5.24	62.6
	5.88	70°F



Appendix G: Construction Schedule & Cost Calculations

Redesigned Construction Schedule

ID		Task	Task Name	Duration	Start	Finish
1			Start Date	0 days	Wed 1/6/10	Wed 1/6/10
2			Erect Steel Columns: Levels Plaza-Hotel	7 days	Wed 1/6/10	Thu 1/14/10
3			Erect Steel Girders & Lateral Bracing: Hotel Level	2 days	Fri 1/15/10	Mon 1/18/10
4			Pre-Cast Concrete Plank: Hotel Level	3 days	Tue 1/19/10	Thu 1/21/10
5			Erect Steel Girders & Lateral Bracing: 2nd Level	2 days	Fri 1/22/10	Mon 1/25/10
6			Pre-Cast Concrete Plank: 2nd Level	3 days	Tue 1/26/10	Thu 1/28/10
7			Erect Steel Columns: Levels 2nd-4th	2 days	Fri 1/29/10	Mon 2/1/10
8			Erect Steel Girders & Lateral Bracing: 3rd Level	2 days	Tue 2/2/10	Wed 2/3/10
9			Pre-Cast Concrete Plank: 3rd Level	3 days	Thu 2/4/10	Mon 2/8/10
10			Erect Steel Girders & Lateral Bracing: 4th Level	2 days	Tue 2/9/10	Wed 2/10/10
11			Pre-Cast Concrete Plank: 4th Level	3 days	Thu 2/11/10	Mon 2/15/10
12			Erect Steel Girders & Lateral Bracing: 5th Level	2 days	Tue 2/16/10	Wed 2/17/10
13			Pre-Cast Concrete Plank: 5th Level	3 days	Thu 2/18/10	Mon 2/22/10
14			Erect Steel Columns: Levels 5th-7th	2 days	Tue 2/23/10	Wed 2/24/10
15			Erect Steel Girders & Lateral Bracing: 6th Level	2 days	Thu 2/25/10	Fri 2/26/10
16			Pre-Cast Concrete Plank: 6th Level	3 days	Mon 3/1/10	Wed 3/3/10
17			Erect Steel Girders & Lateral Bracing: 7th Level	2 days	Thu 3/4/10	Fri 3/5/10
18			Pre-Cast Concrete Plank: 7th Level	3 days	Mon 3/8/10	Wed 3/10/10
19			Erect Steel Girders & Lateral Bracing: Roof Level	2 days	Thu 3/11/10	Fri 3/12/10
20			Pre-Cast Concrete Plank: Roof Level	3 days	Mon 3/15/10	Wed 3/17/10
21			Erect Steel Columns: Roof Level	1 day	Thu 3/18/10	Thu 3/18/10
22			Erect Steel Girders: High Roof level	1 day	Fri 3/19/10	Fri 3/19/10
23			Pre-Cast Concrete Plank: High Roof level	1 day	Mon 3/22/10	Mon 3/22/10
24			Masonry Veneer	83 days	Thu 2/4/10	Mon 5/31/10

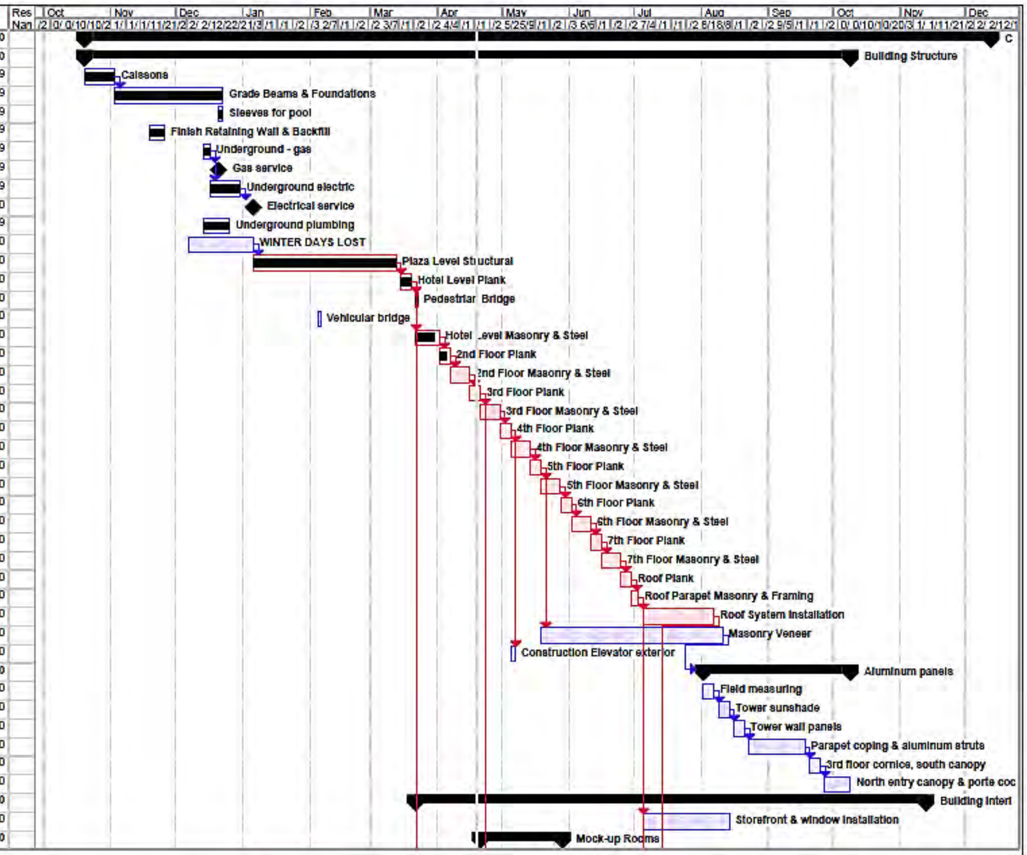


Project: Cambria Suites Schedule_
Date: Mon 3/21/11

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

Existing Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**CAMBRIA SUITES - NEW ARENA HOTEL**	**298 days**	**Tue 10/20/09**	**Mon 12/13/10**
2	**Building Structure**	**253 days**	**Tue 10/20/09**	**Fri 10/8/10**
3	Caissons	10 days	Tue 10/20/09	Mon 11/2/09
4	Grade Beams & Foundations	7 wks	Tue 11/3/09	Tue 12/22/09
5	Sleeves for pool	2 days	Mon 12/21/09	Tue 12/22/09
6	Finish Retaining Wall & Backfill	5 days	Thu 11/19/09	Wed 11/25/09
7	Underground - gas	3 days	Mon 12/14/09	Wed 12/16/09
8	Gas service	0 days	Mon 12/21/09	Mon 12/21/09
9	Underground electric	10 days	Thu 12/17/09	Wed 12/30/09
10	Electrical service	0 days	Wed 1/6/10	Wed 1/6/10
11	Underground plumbing	10 days	Mon 12/14/09	Fri 12/25/09
12	WINTER DAYS LOST	22 days	Mon 12/7/09	Tue 1/5/10
13	Plaza Level Structural	48 days	Wed 1/6/10	Fri 3/12/10
14	Hotel Level Plank	1 wk	Mon 3/15/10	Fri 3/19/10
15	Pedestrian Bridge	1 day	Mon 3/22/10	Mon 3/22/10
16	Vehicular bridge	1 day	Fri 2/5/10	Fri 2/5/10
17	Hotel Level Masonry & Steel	9 days	Mon 3/22/10	Thu 4/1/10
18	2nd Floor Plank	3 days	Fri 4/2/10	Tue 4/6/10
19	2nd Floor Masonry & Steel	7 days	Wed 4/7/10	Thu 4/15/10
20	3rd Floor Plank	3 days	Fri 4/16/10	Tue 4/20/10
21	3rd Floor Masonry & Steel	7 days	Wed 4/21/10	Thu 4/29/10
22	4th Floor Plank	3 days	Fri 4/30/10	Tue 5/4/10
23	4th Floor Masonry & Steel	7 days	Wed 5/5/10	Thu 5/13/10
24	5th Floor Plank	3 days	Fri 5/14/10	Tue 5/18/10
25	5th Floor Masonry & Steel	7 days	Wed 5/19/10	Thu 5/27/10
26	6th Floor Plank	3 days	Fri 5/28/10	Tue 6/1/10
27	6th Floor Masonry & Steel	7 days	Wed 6/2/10	Thu 6/10/10
28	7th Floor Plank	3 days	Fri 6/11/10	Tue 6/15/10
29	7th Floor Masonry & Steel	7 days	Wed 6/16/10	Thu 6/24/10
30	Roof Plank	3 days	Fri 6/25/10	Tue 6/29/10
31	Roof Parapet Masonry & Framing	3 days	Wed 6/30/10	Fri 7/2/10
32	Roof System Installation	5 wks	Mon 7/5/10	Fri 8/6/10
33	Masonry Veneer	12 wks	Wed 5/19/10	Tue 8/10/10
34	Construction Elevator exterior	2 days	Wed 5/5/10	Thu 5/6/10
35	**Aluminum panels**	**50 days**	**Mon 8/2/10**	**Fri 10/8/10**
36	Field measuring	5 days	Mon 8/2/10	Fri 8/6/10
37	Tower sunshade	5 days	Mon 8/9/10	Fri 8/13/10
38	Tower wall panels	5 days	Mon 8/16/10	Fri 8/20/10
39	Parapet coping & aluminum struts	20 days	Mon 8/23/10	Fri 9/17/10
40	3rd floor cornice, south canopy	5 days	Mon 9/20/10	Fri 9/24/10
41	North entry canopy & porte cochere	10 days	Mon 9/27/10	Fri 10/8/10
42	**Building Interior**	**170 days**	**Mon 3/22/10**	**Fri 11/12/10**
43	Storefront & window installation	30 days	Mon 7/5/10	Fri 8/13/10
44	**Mock-up Rooms**	**28 days**	**Wed 4/21/10**	**Fri 5/28/10**



Project: Cambria suites (update 2)
Date: Mon 4/19/10

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

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Cost Estimate of Redesigned System												
Steel	Amount	Unit	Crew	Daily Output	Labor Hours/Unit	Labor Hours	Material Cost/Unit	Labor Cost/Unit	Equipment Cost/Unit	Total Cost/Unit	Total Cost w/ O&P	Total Cost
Columns	4986	LF	E-2	984	0.057	284	84	2.7	1.65	88.35	99	493614.00
Baseplates	119.2	SF	E-2	60	0.061	7	46	0	0	46	n/a	5483.20
Beams	9435	LF	E-5	912	0.088	830	62	3.99	1.8	55.29	63.5	599122.50
Braces	2368	LF	E-5	n/a	n/a	n/a	47.14	3.79	2.32	53.25	n/a	126096.00
Fireproofing	95400	SF	G-2	3000	0.008	763	1.31	0.29	0.04	1.64	1.95	186030.00
Concrete	Amount	Unit	Crew	Daily Output	Labor Hours/Unit	Labor Hours	Material Cost/Unit	Labor Cost/Unit	Equipment Cost/Unit	Total Cost/Unit	Total Cost w/ O&P	Total Cost
8" P.C. Plank	120000	SF	C-11	3200	0.023	2760	7.2	1.07	0.6	8.87	10.45	1254000.00
											Total Cost of Redesigned System:	2664345.70

Cost Estimate of Existing System												
Shearwalls	Amount	Unit	Crew	Daily Output	Labor Hours/Unit	Labor Hours	Material Cost/Unit	Labor Cost/Unit	Equipment Cost/Unit	Total Cost/Unit	Total Cost w/ O&P	Total Cost
8" CMU, reinforced	59904	SF	D-8	395	0.101	6050	2.62	4.03	0	6.65	9.35	560102.40
12" CMU, reinforced	12339	SF	D-9	300	0.16	1974	3.65	6.25	0	9.9	14	172746.00
Steel	Amount	Unit					Material Cost/Unit	Labor Cost/Unit	Equipment Cost/Unit	Total Cost/Unit	Total Cost w/ O&P	Total Cost
Columns	1224	LF	E-2	984	0.057	70	84	2.7	1.65	88.35	99	121176.00
Baseplates	52.2	SF	E-2	60	0.061	3	46	0	0	46	0	2401.20
Beams	2888	LF	E-5	1110	0.072	208	68	3.45	1.56	73.01	83	239704.00
Fireproofing	27180	SF	G-2	3000	0.008	217	1.31	0.29	0.04	1.64	1.95	53001.00
Concrete	Amount	Unit	Crew	Daily Output	Labor Hours/Unit	Labor Hours	Material Cost/Unit	Labor Cost/Unit	Equipment Cost/Unit	Total Cost/Unit	Total Cost w/ O&P	Total Cost
10" P.C. Plank	120000	SF	C-11	3600	0.02	2400	7.5	0.95	0.53	8.98	10.55	1266000.00
											Total Cost of Existing System:	2415130.60