APPENDIX D

PROJ: HYATT REGENCY

PG. 1 OF 6

COLUMN LINE 3, 7, 11

1 - ROOF
2 (11)
3 (10)
4 (9)
5 (8)
6 (7)
7 (6)
8 (5)
9 (4)
10 (3)
11 (2)
12 (MAIN)
13 (GRAD)

FRAME 7

LOOK AT COLUMNS UNDER 2, 8, 12

INTERIOR COLUMNS

$$A_T = \left(\frac{18.5' + 24''}{2}\right) 27' = 573.75 \, ft^2$$

10 EQ SPACES @ 11'-0"

144'

20'

14'

* WITH ADJUSTMENTS DUE TO RE-FRAMING DEPTH

PG. 2 OF 6

INTERIOR

LIVE LOAD REDUCTION   (≤ 100 psf   & NONROOF)

$$A_I = 4A_T = 2295 \, ft^2$$

BELOW 2
$$L = L_o \left(0.25 + \frac{15}{\sqrt{A_I}}\right) = 0.563 L_o \quad \geq 0.5 L_o$$

BELOW 8
$$L = L_o \left(0.25 + \frac{15}{\sqrt{7(2295)}}\right) = 0.368 \quad \geq 0.4 L_o$$

BELOW 12

USE $0.4 L_o$

COLUMN BELOW	A_I	LLR(%)	A_T	LL	DL	ROOF LL	ROOF DL
2	2295	0.563	573.75	32.3	57.4	14.3	57.4
8	16065	0.4	4016.25	160.7	401.6	14.3	57.4
12	25245	0.4	6311.25	252.5	631.1	14.3	57.4

ROOF   LL $= 25$ psf $(573.75 ft^2) = 14.3^k$
ROOF   DL $= 100$ psf $(573.75) = 57.4^k$

BELOW 2 LL $= 0.563 (100)(573.75) = 32.3^k$
BELOW 2 DL $= 100 (573.75) = 57.4^k$

BELOW 8 LL $= 0.4 (100)(4016.25) = 160.7^k$
BELOW 8 DL $= 100 (4016.25) = 401.6^k$

BELOW 12 LL $= 0.4 (100)(6311.25) = 252.5^k$
BELOW 12 DL $= (100)(6311.25) = 631.1^k$

BEAM LL RED

$A_T = (24')(27) = 648 ft^2$ $A_I = 2A_T = 1296 ft^2$
$\quad (18.5)(27) = 499.5 = 500 ft^2$ $= 1000 ft^2$

$L = L_o \left(0.25 + \frac{15}{\sqrt{1296}}\right) = 0.67 L_o$ $L = L_o \left(0.25 + \frac{15}{\sqrt{1000}}\right) = 0.72 L_o$

$\quad$ (MIDDLE)   (ENDS)

BEAMS

END $W_u = 1.2(100) + 0.72(1.6)(40) = 166.1$ psf
MIDDLE $W_u = 1.2(100) + 0.67(1.6)(100) = 227.2$ psf
$W_D = 1.2(100) = 120$ psf

END SPANS
$W_u = 166.1(18.5) = 3.1$ klf $W_D = 120(18.5) = 2.2^k$
MIDDLE SPAN
$W_u = 227.2(24) = 5.5$ klf $W_D = 120(24) = 2.9^k$

A   B   C   D
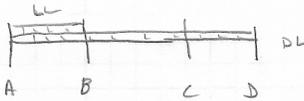
$FEM_{BA} = \frac{3.1(18.5)^2}{12} = 88.4^{'k}$

$FEM_{BC} = \frac{2.9(24)^2}{12} = 139.2^{'k}$

$P_u = 1.2(57.4 + 57.4) + 1.6(32.3) + 0.5(14.3) = 196.6^k$

JOINT B2

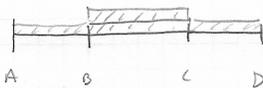$88.4 \left(+ \right) 139.2$ $\Delta FEM = 139.2 - 88.4 = 50.8^{'k}$

for DESIGN $P_u = 196.6^{'k}$
$M_u = \frac{\Delta FEM}{2} = \frac{50.8}{2} = 25.4^{'k}$

A   B   C   D

$FEM_{AB} = \frac{2.2(18.5)^2}{12} = 62.7^{'k}$

$FEM_{BC} = \frac{5.5(24)^2}{12} = 264^{'k}$ $62.7 \left(+ \right) 264$

$P_u = 196.6^k$

$\Delta FEM = 264^{'k} - 62.7^{'k} = 201.3^{'k}$

for DESIGN $P_u = 196.6^{'k}$
$M_u = 100.7^{'k}$

TRY   W 14 $P_u = 196.6^k$
                          $M_u = 100.7^{'k}$

$\ell = 11'$

$P_{eff} = P_u + \alpha M_u = 196.6 + \frac{24}{14}(100.7) = 369.2^k$
                                      (1.71)

     WITH $k\ell = 11'$ $P_{u\,eff} = 369.2^k$

     USE   W14×48   , $\phi P_n = 423^k$

EXTERIOR

$ROOF\ LL = 25\left(\frac{18.5}{2}\right)(27) = 6.2^k$

$ROOF\ DL = 100\left(\frac{18.5}{2}\right)(27) = 25.0$

$L = L_o\left(0.25 + \frac{15}{\sqrt{4\left(\frac{18.5}{2}\right)(27)}}\right) = 0.72 L_o$

$LL = 0.72(40)\left(\frac{18.5}{2}\right)(27) = 7.2^k$

$DL = 100\left(\frac{18.5}{2}\right)(27) = 25.0^k$

$WALL = \left(110 pcf\right)\left(\frac{4''}{12}\right)(11')(27') = 10.9^k$

$FEM_{AB} = \frac{3.1(18.5)^2}{12} = 88.4^{'k}$

     ASSUME $\frac{1}{3}$ INTO COL

$M_u = \frac{88.4}{3} = 29.5^{'k}$

$P_u = 1.2(25 + 25 + 10.9) + 1.6(7.2) + 0.5(6.2) = 87.7^k$

$P_{eff} = 87.7 + 1.71(29.5) = 138.1^k$

USE W14×48   FOR   SYMMETRY & STACKING PURPOSES

BELOW 8

INTERIOR

$$P_u = 1.2(401.6 + 57.4) + 1.6(160.7) + 0.5(14.3) = 815.1^k$$

$$M_{u\,DESIGN} = 100.7^k$$

$$P_{eff} = 815.1 + 1.71(100.7) = 987.3^k$$

USE W14 × 109 $\phi P_n = 1240$

EXTERIOR

$$P_u = 1.2(7(25) + 25 + 7(10.4)) + 1.6(7(7.2)) + 0.5(6.2) = 415.3^k$$

$$M_{u\,DESIGN} = 29.5^{1k}$$

$$P_{eff} = 415.3 + 1.71(29.5) = 465.7^k$$

USE   W14 × 53 $\phi P_n = 469^k$
OR   W14 × 61 $\phi P_n = 615^k$

BELOW 12

INTERIOR

$$P_u = 1.2(631.1 + 57.4) + 1.6(252.5) + 0.5(14.3) = 1237.4^k$$

$$M_{u\,DESIGN} = 100.7^k$$

$$P_{eff} = 1237.4 + 1.71(100.7) = 1409.6^k$$

USE   W14×145 $\phi P_r = 1530^k$

EXTERIOR

$$P_u = 1.2(11(25) + 25 + 110pcf(\tfrac{1}{12})(27)(130')) + 1.6(11(7.2)) + 0.5(6.2) = 644.3^k$$

$$M_{u\,DESIGN} = 29.5^{1k}$$

$$P_{eff} = 644.3 + 1.71(29.5) = 694.7^k$$

USE   W14 × 74 $\phi P_u = 753^k$

SUMMARY OF COLUMNS BELOW 2, 8, 12

2)
W14x48   W14x48   W14x48   W14x48

8)
W14x53   W14x109   W14x109   W14x53

12)
W14x74   W14x145   W14x145   W14x74
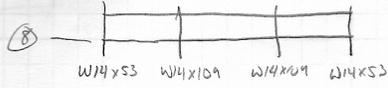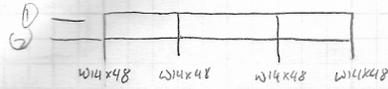
22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD