

2 CLASS ROOM

# CLASSROOM & OFFICE FLOOR

## 2-1 LOAD

### DL DEAD LOAD

ROOF	LIME CONCRETE	10 mm	200	} 460 kg/m <sup>2</sup>
	RC SLAB	10	240	
	CEILING		20	

FLOOR	TERAZZO TILE	5	100	} 360
	RC SLAB	10	240	
	CEILING		20	

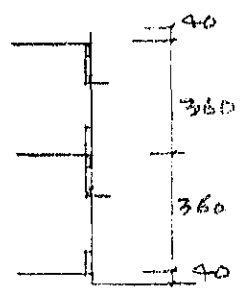
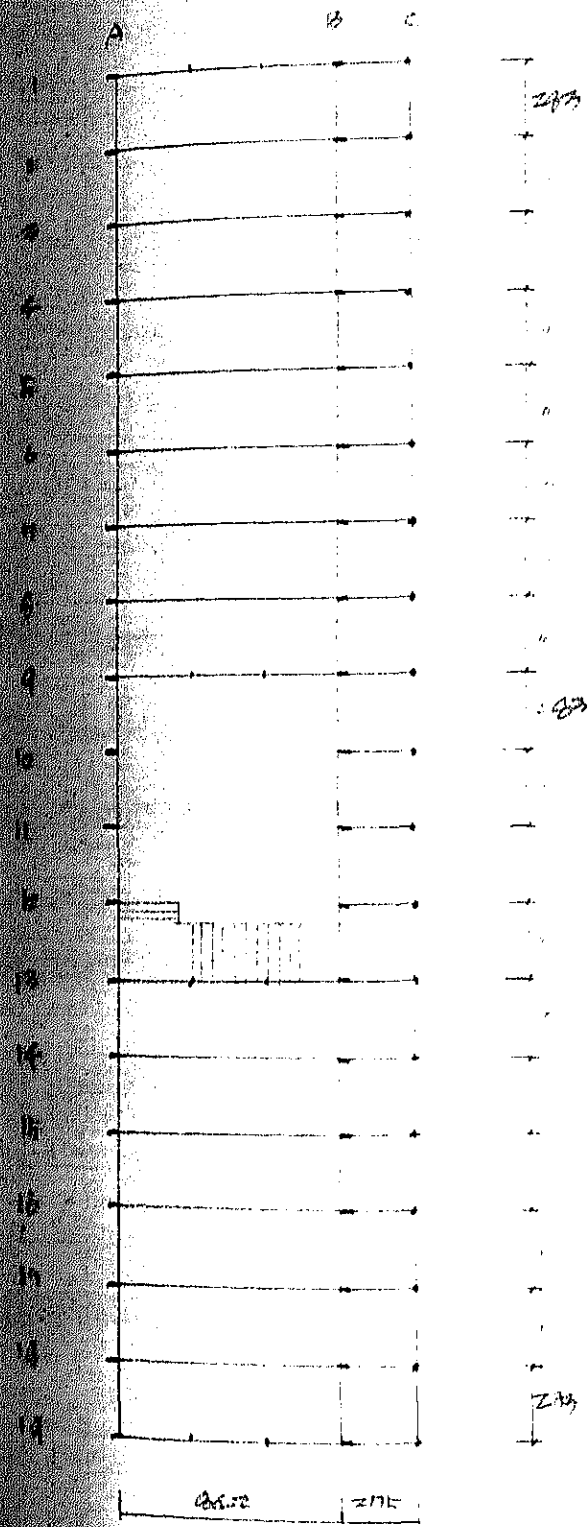
WALL	BRICK	25.4	490	} 1540
	CEMENT MORTAR	2.5	50	

BEAM	28x50	340	kg/m
	28x75	410	"

COLUMN	28x75	410
	28x45	300
	28x30	190

### LL LIVE LOAD

	SLAB	FRAME	EARTHQUAKE
FLOOR	300	210	110
ROOF	100	50	0
LIBRARY	500	450	400



CITRO OF HEAT

Q. 12



$l_x = 2.5$   $l_y = 1.0$

$w'_R = 0.54$

$w_2 = 0.57$

(0.81)

$C = 0.62W + 0.67W'$

0.7

1.0 0.5

1.1

$M_0 = 1.10W + 1.00W'$

1.1

1.5 0.4

1.9

$Q = 1.05W + 1.42W'$

1.4

2.0 1.2

2.2

Q. 13



$l_x = 2.2$   $l_y = 1.0$

$w'_R = 0.28$

$w'_2 = 1.64$

$C = 1.2W + 0.67W'$

0.8

1.2 0.6

1.5

$M_0 = 2.0W + 1.0W'$

1.4

2.3 0.9

2.4

$Q = 2.1W + 1.42W'$

1.6

2.5 1.1

2.7

Q. 14



$l_x = 2.75$   $l_y = 1.0$

$w'_R = 0.66$

$w'_2 = 0.62$

$C = 0.6W + 0.67W'$

0.6

0.7

$M_0 = 1.0W + 1.0W'$

1.0

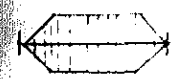
1.1

$Q = 1.06W + 1.42W'$

1.2

1.3

Q. 15



$l_x = 2.9$   $l_y = 1.5$   $l_z = 2.9$

$w_2 = 0.11$

$w'_1 = 0.51$  (19.20)

$C = 2.11 \times 2W + 2.41W'$

11.2

12.4 (20.7) 16.1

$M_0 = 2.3 \times 2W + 2.5W'$

10.0

18.3 (20.0) 24.5

$Q = 2.11 \times 2W + 2.21W'$

7.4

9.1 (17.6) 10.4

Q. 16



$l_x = 2.0$   $l_y = 1.0$

$w'_R = 0.28$

$C = 0.55 \times 2W + 0.67W'$

0.9

0.9

$M_0 = 0.9 \times 2W + 0.67W'$

1.2

1.4

$Q = 0.96 \times 2W + 1.42W'$

1.4

1.6

2-2 AXIAL FORCE OF COLUMN

	ROOF & FLOOR		WALL		PISTON	COLUMN	W	P
C1	0.51 x 1.42 x 1.41	1.02	0.10 x 2.95 0.77 x 1.27	0.20 0.96	0.97	0.92	4.07	4.1
C2	0.51 x " "	1.14	0.43 x 1.27 1.67 x 1.17 0.10 x 2.95	0.96 1.05 0.20	0.97	2.96	0.95	13.0
C3	0.51 x 2.43 x 4.21	6.08	0.77 x 2.55	1.96	2.43	0.92	11.67	11.7
C4	0.51 x " "	6.74	0.93 x 2.55 1.1 x 1.4	2.12 0.20	2.43	2.96	16.26	27.9
C5	0.51 x 2.43 x 4.21	6.08	0.77 x 2.55 1.71 x 4.07	1.96 5.33	2.43	0.92	12.54	12.5
C6	0.51 x " "	3.74	0.43 x 2.55	2.12	2.43	2.96	21.5A	34.1
C7	0.51 x 2.43 x 4.21	6.08	0.10 x 2.95 0.77 x 2.55 1.71 x 4.07	0.20 1.96 5.33	2.43	0.92	11.45	11.4
C8	0.51 x 1.42 x 4.21	3.41	0.83 x 2.55	2.12	2.43	2.96	14.21	29.7
C9	0.51 x 2.43 x 4.21	6.08	0.10 x 2.95	0.20	2.43	0.92	9.71	9.7
C10	0.51 x 2.43 x 1.50	1.53	0.47 x 2.55	1.20	0.97	2.96	6.56	16.3
C11	0.51 x 2.43 x 4.21	6.08	0.10 x 2.95 0.77 x 2.55	0.20 1.96	2.43	0.92	11.65	11.5
C12	0.51 x " "	4.65	0.43 x 2.55 0.10 x 2.95	2.12 0.20	2.43	2.96	1A.12	30.6
C13	0.51 x 1.42 x 2.91	2.06	1.63 x 2.55	4.25	0.95	0.34	3.51	3.5
C14	0.51 x " "	2.27			0.95	1.10	8.07	12.0
C15	0.51 x 1.42 x 2.91	2.06	0.10 x 2.95	0.20	1.24	0.42	3.99	4.0
C16	0.51 x " "	2.25	0.47 x 1.23 1.67 x 1.27	0.54 2.13	1.23	1.10	7.34	11.3
C17	0.51 x 2.43 x 5.59	8.02	1.63 x 2.55	4.25	2.92	0.54	11.34	11.4
C18	0.51 x " "	8.97			2.92	1.74	17.81	29.2
C19	0.51 x 2.43 x 5.59	8.02			2.92	0.54	11.34	11.4
C20	0.51 x " "	8.97	1.68 x 1.0 1.71 x 5.15	1.64 6.74	2.92	1.74	21.95	32.3
C21	0.51 x 2.43 x 5.59	8.02			2.92	0.54	11.34	11.4
C22	0.51 x (1.42 x 5.59 + 1.95) 5.64		1.68 x 0.5 1.71 x 5.15	0.84 6.74	2.92	1.74	17.76	29.2

	ROOF & FLOOR	WALL	BEAM	COLUMN	W	P
C <sub>1</sub>	0.51 x 2.87 x 5.59 0.72		2.87	0.51	11.30	11.4
C <sub>2</sub>	0.87 x 2.87 x 1.39 2.24		1.47	1.10	5.41	16.8
C <sub>3</sub>	0.51 x 1.42 x 1.39 1.05	0.10 x 2.87 0.72	0.98	0.42	2.58	2.6
C <sub>4</sub>	0.87 x " 1.12	0.17 x 1.39 0.32	0.57	0.44	1.10	3.90
C <sub>5</sub>	0.51 x 2.87 x 1.39 2.01	0.10 x 2.87 0.32	1.29	0.42	4.00	4.0
C <sub>6</sub>	0.87 x " 2.24	0.17 x 2.55 0.43	1.29	1.10	5.06	9.1
C <sub>7</sub>	0.51 x 2.87 x 1.39 2.01	0.10 x 2.87 0.32	1.29	0.42	4.00	4.0
C <sub>8</sub>	0.87 x " 2.24	0.17 x 2.55 0.43	1.29	1.10	6.26	10.3

## Z-4 SEISMIC FORCE

ROOF	$0.46 \times 569.0$	261.7	
PARAPET	$0.12 \times 124$	14.9	
WALL	$0.77 \times 255 \times 14$	275	
	$0.54 \times 155 \times 42.1$	352	} 693
ORNAMENTS	$0.15 \times 155 \times 26.3$	59	
PARTITION	$0.46 \times 143 \times 43.0$	292	
BEAM	$0.24 \times 199.8$	67.9	
	$0.51 \times 121.4$	61.9	
COLUMN	$0.51 \times 22 \times 19$	21.3	
	$0.30 \times 160 \times 17$	92	
	$0.19 \times 2.2 \times 25$	10.6	$541.7 \times 0.1 = 54.2$
FLOOR	$0.47 \times 378.4$	177.8	
	$0.76 \times 95.3$	72.4	
	$0.36 \times 45$	16.2	
WALL	FROM UPPER STAIRS	$69.3 + 22.0$	
	$0.84 \times 255 \times 14$	30.0	
	$0.18 \times 255 \times 14$	75.7	
	$0.54 \times 15 \times 36.7$	29.7	
	$0.15 \times 15 \times 7.6$	1.7	
	$0.46 \times 132 \times 57.0$	35.0	
BEAM	$0.24 \times 199.8$	67.9	
	$0.41 \times 100.0$	41.0	
COLUMN	$0.47 \times 3.4 \times 19$	30.9	
	$0.30 \times 3.4 \times 17$	17.4	
	$0.19 \times 3.4 \times 25$	16.1	$669.5 - 2.5 = 670$
			$\Sigma 121.2$



2.5 STIFFNESS RATIO

$E_0 = 10^3$

	$b \times h$	$J_{10^4}$	$L$	$K_{10^3}$	$\frac{K}{E_0}$	
2C	200 x 75	20.6	300	27.7		2.73
	175 x 200	13.7		3.6		0.36
	200 x 450	21.3		5.9		0.59
	450 x 200	4.2		2.3		0.23
	200 x 200	5.1		1.4		0.14
1C	200 x 75	99.4	400	24.6		2.46
	75 x 200	17.1		3.4		0.34
	200 x 450	21.3		5.3		0.53
	450 x 200	4.2		2.1		0.21
	200 x 200	5.1		1.3		0.13
G	200 x 50	29.2	283	10.3	1.37 1.47	1.37 1.62
			275	10.6	1.37 1.57	1.66
	200 x 150	98.4	642	11.7	1.5 2.0	1.75 2.36
FG	35 x 90	212.6	283	75.1		7.51
			275	77.3		7.73
			642	25.3		2.53



1.377	1.377	1.377	1.377				
0.14	0.14	0.14	0.14				
1.377	1.377	1.377					
0.13	0.13	0.13					
7.51	7.51						

1.62	1.62	1.62	
0.23	0.23	0.23	
1.62	1.62	1.62	
0.21	0.21	0.21	
7.51	7.51		

1.62	1.62	1.62	
0.23	0.23	0.23	
1.62	1.62	1.62	
0.21	0.21	0.21	
7.51	7.51		

1.377	1.377	1.377	
0.30	0.30	0.30	
1.377	1.377		
0.34	0.34		
7.51	7.51		

1.377	1.377	1.377
0.30	0.30	0.30
1.377	1.073	1.073
0.34	0.34	0.34
7.51	7.51	

2.07	2.07		
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1.377	1.377	1.377	1.41	0.14
0.14	0.14	0.14	0.14	0.14
1.377	1.377	1.377	1.41	0.13
0.13	0.13	0.13	0.13	0.13
7.51	7.51	7.51	7.73	
2.01	2.01	2.01	2.05	

(8)

2.34	1.66	
2.43	0.69	0.14
2.36 (1.75) (9)	1.66	
2.46	0.57	0.13
2.53	0.77	

(9)

2.34	1.66	
	0.69	0.14
1.29	1.66	
	0.67	0.13
2.53	0.77	
0.67	0.75	

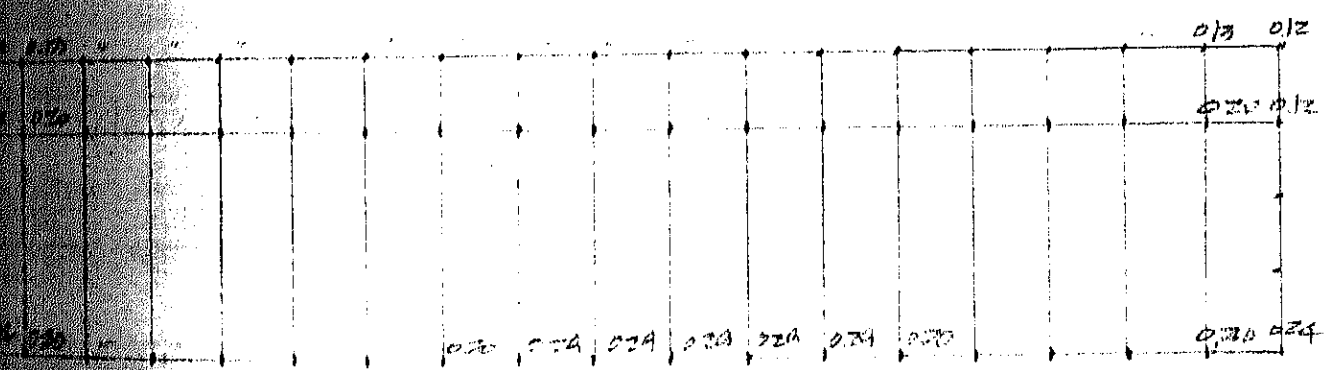
# CALCULATION OF STRESS

1. P 2 y

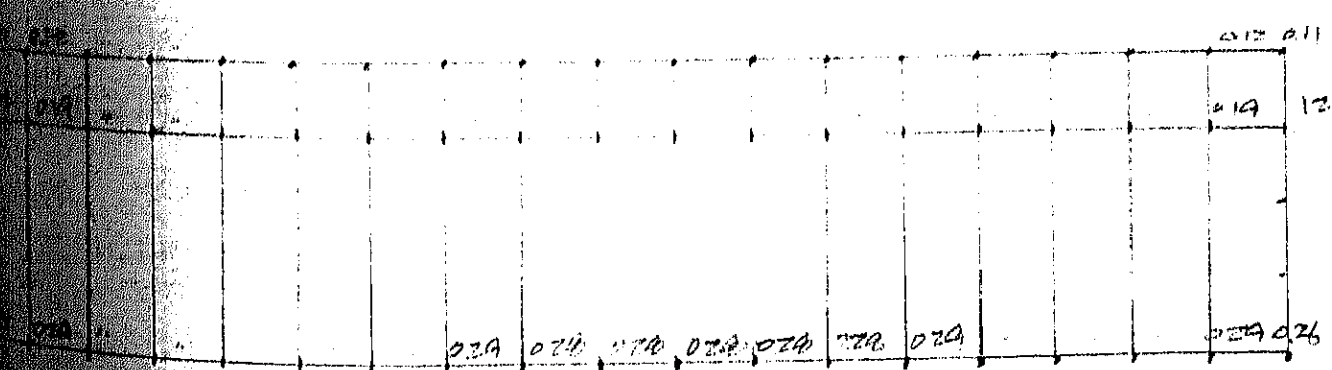
14.57	0.13
0.6	0.6
0.46	0.46
12.46	0.12
1.3	1.3
0.50	0.50

11.57	14.04	13.64	13.00
0.12	0.20	0.20	0.20
0.6	0.9	0.9	0.9
0.6	0.6	0.6	0.6
12.46	14.11	14.24	13.04
0.12	0.19	0.19	0.19
1.3	2.0	2.0	2.0
0.50	0.50	0.50	0.50

2.60	7.21	6.76	6.22
0.24	0.24	0.24	0.24
1.1	1.4	1.3	1.3
0.40	0.40	0.40	0.40
4.03	8.06	7.06	6.06
0.26	0.29	0.26	0.26
2.0	3.1	3.0	3.0
0.45	0.45	0.45	0.45



ID = 11.02      Q = 5.04 - 2



ID = 11.17      Q = 12.12

0.15	0.15	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.12
0.15	0.13	0.13	0.13	1.9	1.0	0.3	1.4	1.0	0.3
0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
0.15	2.173	2.173	2.173	0.15	0.15	12.07	3.13	12.07	12.07
0.15	0.12	0.12	0.12	1.21	0.15	0.15	0.15	0.15	0.15
0.15	0.15	0.15	0.15	4.95	1.2	0.15	1.5	0.15	0.15
0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

0.15	"	"	"	"	"	"	"	"	"	"	"	0.12	0.12
0.15	"	"	"	0.15	0.15	0.15	"	0.12	0.12	0.15	"	"	0.15
0.15	"	"	"	"	"	"	"	"	"	"	"	"	0.15
0.15	"	"	"	0.15	0.15	0.15	"	1.2	0.12	0.15	"	"	0.15

$\Sigma D = 27.1$        $\Sigma Q = 150.2$

0.15	"	"	"	"	"	"	"	"	"	"	"	0.12	0.11
0.15	"	"	"	0.15	0.15	0.15	"	0.12	0.12	0.15	"	"	0.15
0.15	"	"	"	"	"	"	"	"	"	"	"	"	0.15
0.15	"	"	"	1.21	1.0	"	"	1.1	1.21	"	"	1.21	1.02

$\Sigma D = 29.16$        $\Sigma Q = 121.2 - 1.2 \times 3 = 118.8$

# AREA DIAGRAM OF SEISMIC FORCE

①

	0.4	0.4	
0.6	0.6	0.6	0.6
0	0	0	0
1.2	1.2	1.2	1.2
1.0	1.0	1.0	1.0
1.3	1.3	1.3	1.3
1.0	1.0	1.0	1.0
2.6	2.6	2.6	2.6
1.7	1.7	1.7	1.7
0.9	0.9	0.9	0.9
1.3	1.3	1.3	1.3
0	0	0	0

②

	0.6	0.6	
0.9	0.9	0.9	0.9
0	0	0	0
1.5	1.5	1.5	1.5
1.5	1.5	1.5	1.5
1.9	1.9	1.9	1.9
2.0	2.0	2.0	2.0
4.0	4.0	4.0	4.0
1.9	1.9	1.9	1.9
2.0	2.0	2.0	2.0
0	0	0	0

③

	1.0	1.0	
1.2	1.2	1.2	1.2
0	0	0	0
2.3	2.3	2.3	2.3
3.0	3.0	3.0	3.0
4.2	4.2	4.2	4.2
6.2	6.2	6.2	6.2
3.2	3.2	3.2	3.2
3.1	3.1	3.1	3.1
0	0	0	0

④

	0.2	0.2	
0.3	0.3	0.3	0.3
0	0	0	0
0.5	0.5	0.5	0.5
0.5	0.5	0.5	0.5
0.7	0.7	0.7	0.7
1.5	1.5	1.5	1.5
0.1	0.1	0.1	0.1
0.4	0.4	0.4	0.4
1.0	1.0	1.0	1.0
1.0	1.0	1.0	1.0
0.4	0.4	0.4	0.4
0.5	0.5	0.5	0.5
1.0	1.0	1.0	1.0
0	0	0	0

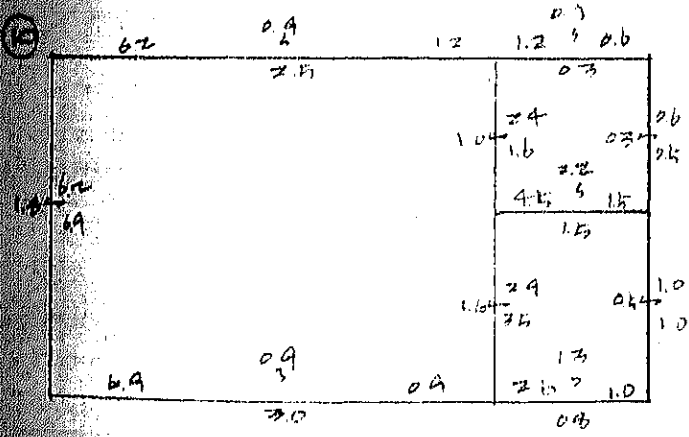
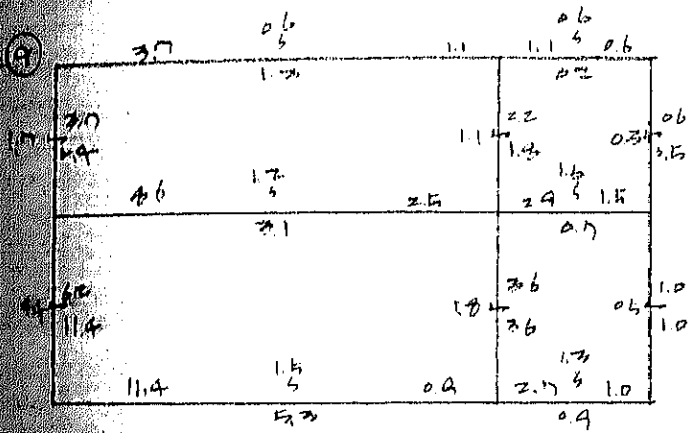
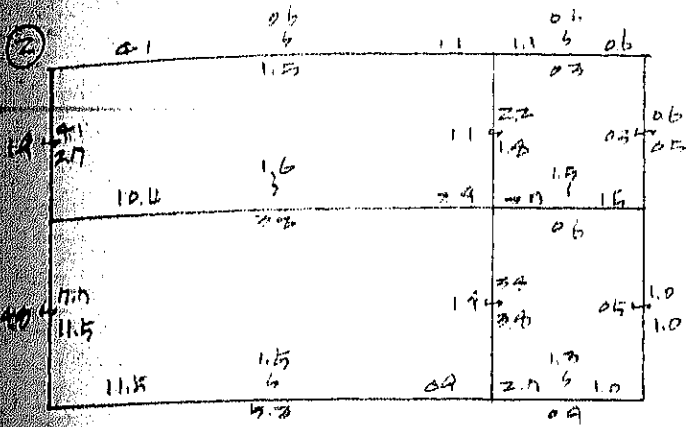
⑤

	0.6	0.6	
0.9	0.9	0.9	0.9
0	0	0	0
1.5	1.5	1.5	1.5
1.5	1.5	1.5	1.5
1.9	1.9	1.9	1.9
2.0	2.0	2.0	2.0
4.0	4.0	4.0	4.0
1.9	1.9	1.9	1.9
2.0	2.0	2.0	2.0
0	0	0	0

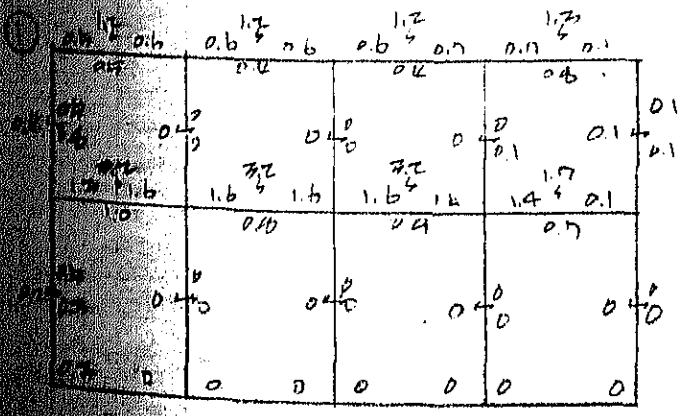
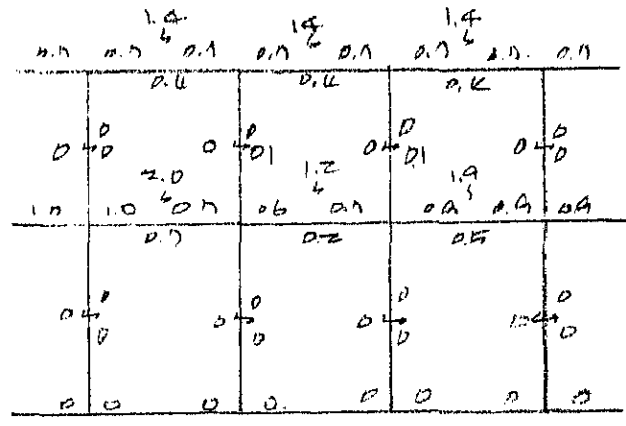
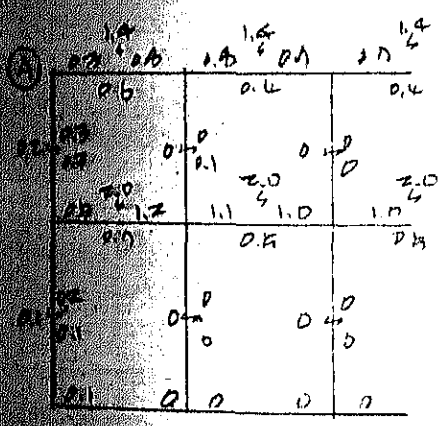
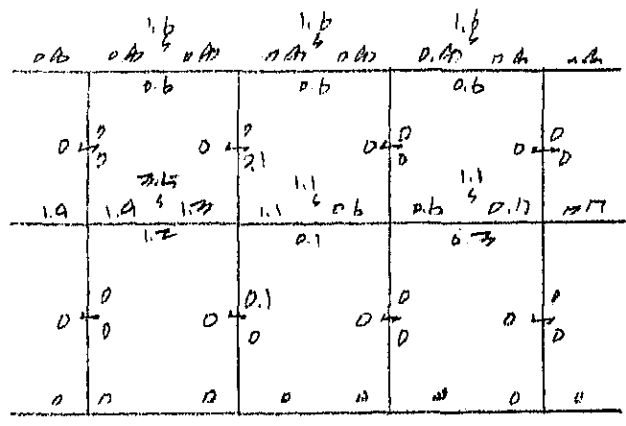
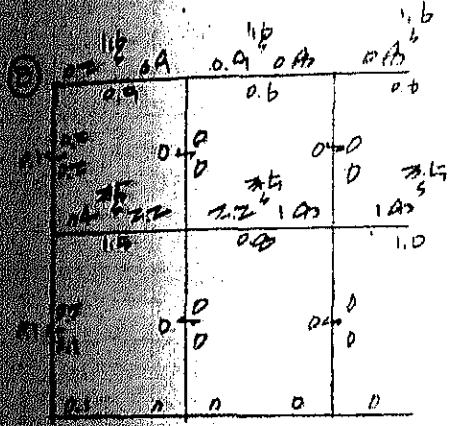
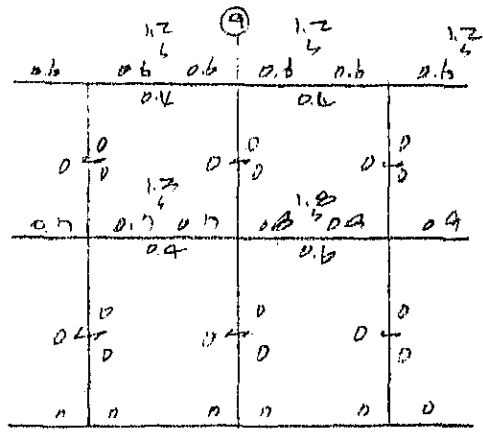
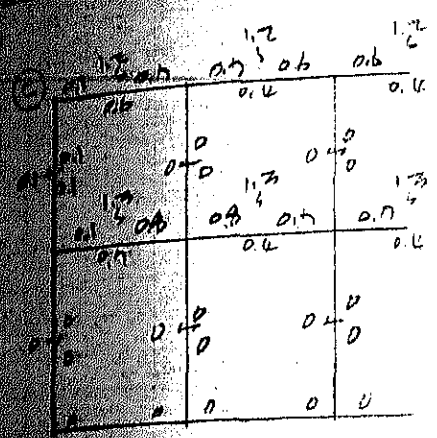
⑥

	1.0	1.0	
1.2	1.2	1.2	1.2
0	0	0	0
2.3	2.3	2.3	2.3
3.0	3.0	3.0	3.0
4.2	4.2	4.2	4.2
6.2	6.2	6.2	6.2
3.2	3.2	3.2	3.2
3.1	3.1	3.1	3.1
0	0	0	0

⑦



# STRESS DIAGRAM OF VERTICAL LOAD



⑦



①

	7.2 4	8.1	5.4 1.9	0.2
AA	2.4		1.6	
AA 10.0	9.1 5	A.D	4.9 1.6	0.1 0.2
AA 11.9	4.4		1.1	
AA 10.0		0.6 1.5	0	0
AA 11.1		0.2 0.6	0	0

②

	7.2 4	8.0	5.1 1.4	0.2
AA	2.1		1.4	
AA 10.0		1.8 2.9	1.6 2.7	0.1 0.2
AA 12.9	13.6 5	1.5	7.7 0.4	
AA 14.0			3.6	
AA 10.0		1.0 2.6	1.7	0.1 0
AA		0.7	1.0	0

2.1

③

	7.2 4	8.1	5.3 1.4	0.7
AA	2.3		1.6	
AA 10.0		1.6 2.1	1.6 2.1	0.1 0.2
AA 10.6	10.6 5	11.2	6.0 0.3	
AA 12.3			1.2	
AA 10.0		0.7 1.0		0.1 0
AA		0.2	0.9	0

④

	7.2 4	8.6	6.4 1.4	0.1
AA	9.7		3.0	
AA 10.0		0.7 0.4	1.6 0.4	0.1 0.1
AA 10.0			1.6 0.4	
AA 10.0		0.2 0.2		0.1 0
AA		0	0.2	0