รายการคำนวณโครงสร้าง

อาคารพักอาศัยคนงาน 4 ชั้น

บริษัท วู้ดเวอร์ค ครีเอชั่น จำกัด

ต.ห้วยน้ำขาว อ.ครองท่อม

จ.กระบี่

วิศวกรโครงสร้าง

นายประสาน จึงสงวนพรสุข สย. 5499

DESIGN NOTES

Design Code of Practice

E.I.T. Standard 1007-34 (Working Stress Design)
AISC ; Manual of Steel Construction Allowable Stress Design

Properties of Materials

Concrete :

fc'	Ultimate compressive strength		:	173	173	ksc
Factor			:	0.375	0.375	
fc	=	Factor x fc'	:	65	65	ksc
Ec	=	$4,270w^{1.5}$ Sqrt[f'c]	:	2.1E+05	2.1E+05	ksc

Reinforcemment :

			Rounded	Deformed	
	Steel Grade	:	SR-24	SD-40	
fy	Yield strength	:	2,400	4,000	ksc
fs	Allowable strength	:	1,200	1,700	ksc
Es	Modulus of elasticity	:	2.04E+06	2.04E+06	ksc

Steel Structure :

fy	Yield strength	:	2,400	ksc

PC Pile :

Squ. 0.22 x 0.22 x 8.00 m. Safe Load		:	12	ton

Design Parameter

n		= Es/Ec	10	10	
k		= 1/[1+fs/(n*fc)]	0.346	0.272	
j		= 1 - k/3	0.885	0.909	
R		= fc * j * k/2	9.92	8.01	ksc
vc	Beam Shear	= 0.29 * Sqrt(fc')		3.81	ksc
vp	Punching Shear	= 0.53 * Sqrt(fc')		6.97	ksc

Design Loading

Dead Load :

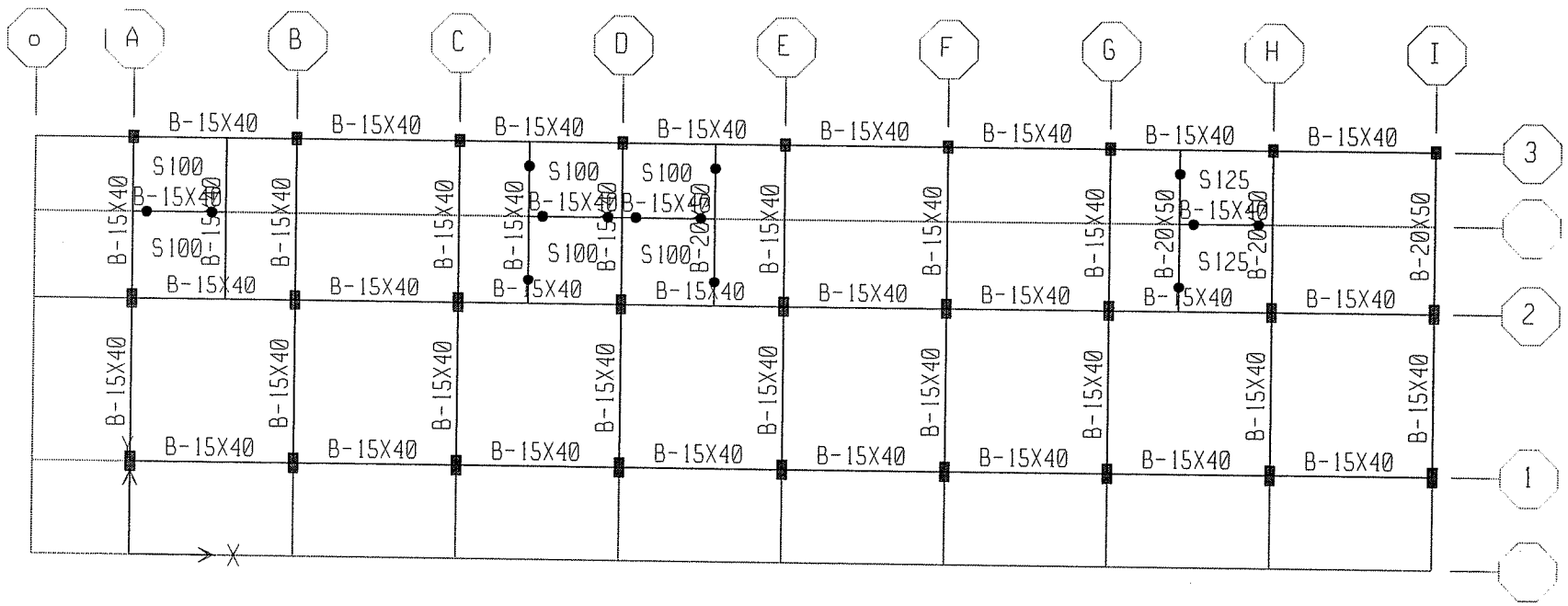
Steel	:	7,850	Kg/m^3	
Concrete	:	2,400	Kg/m^3	
Compact Sand	:	2,000	Kg/m^3	
Water	:	1,000	Kg/m^3	
Block partition	:	120	Kg/m^3	
Roof Sheet	:	15	Kg/m^2	

Live Load :

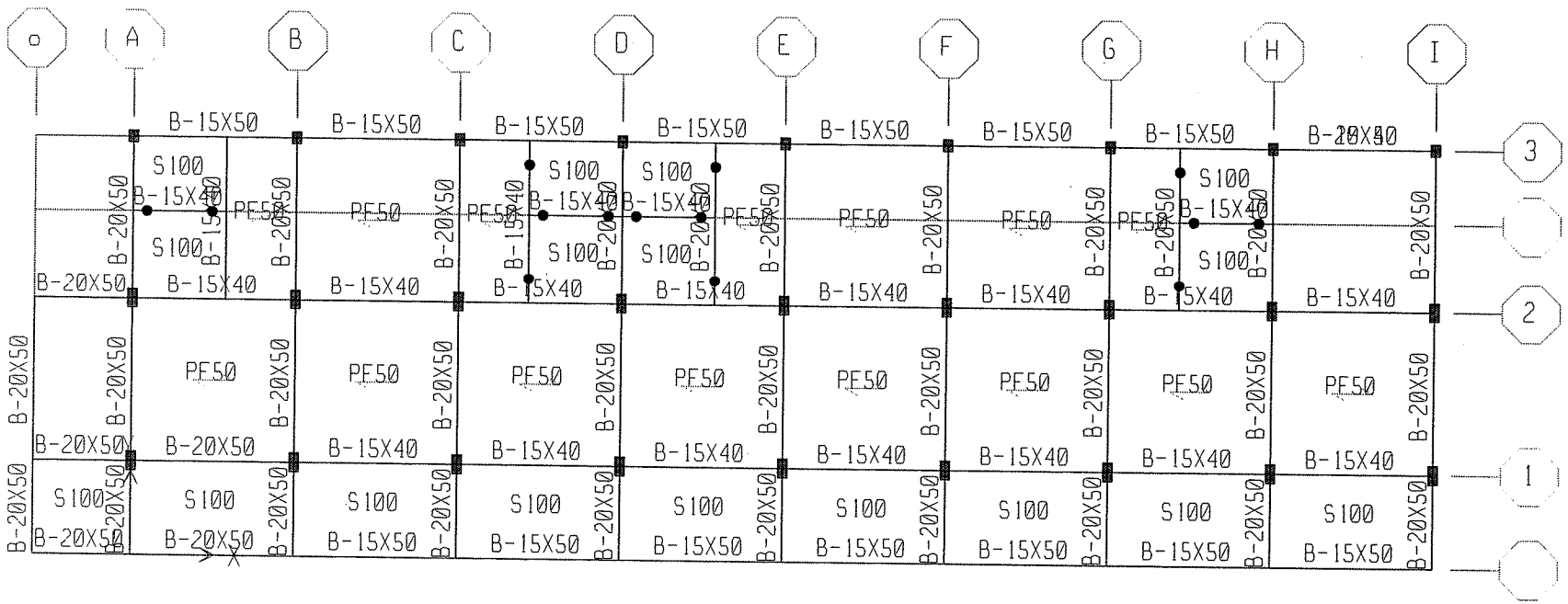
LL	:	150	Kg/m^2	
Roof	:	50	Kg/m^2	

Wind Load :

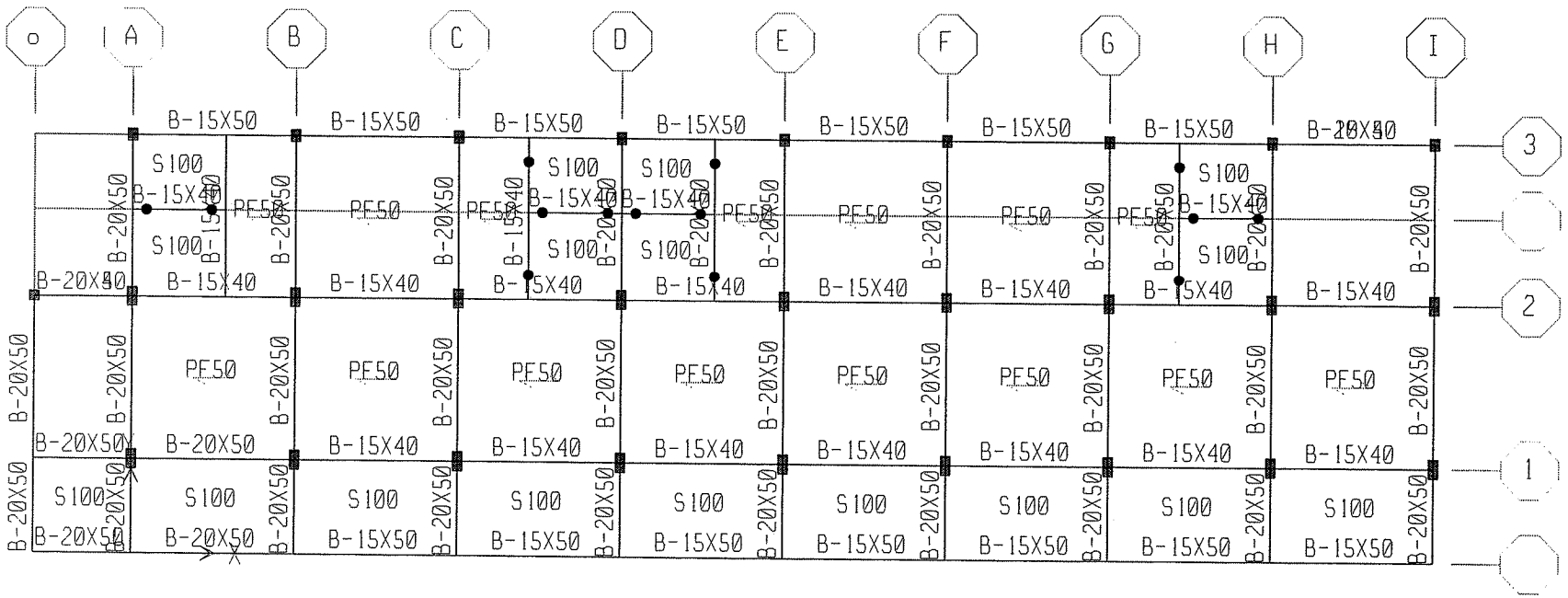
	:	50 Kg/m^2	(H< 10 m.)
	:	80 Kg/m^2	(10 < H< 20 m.)



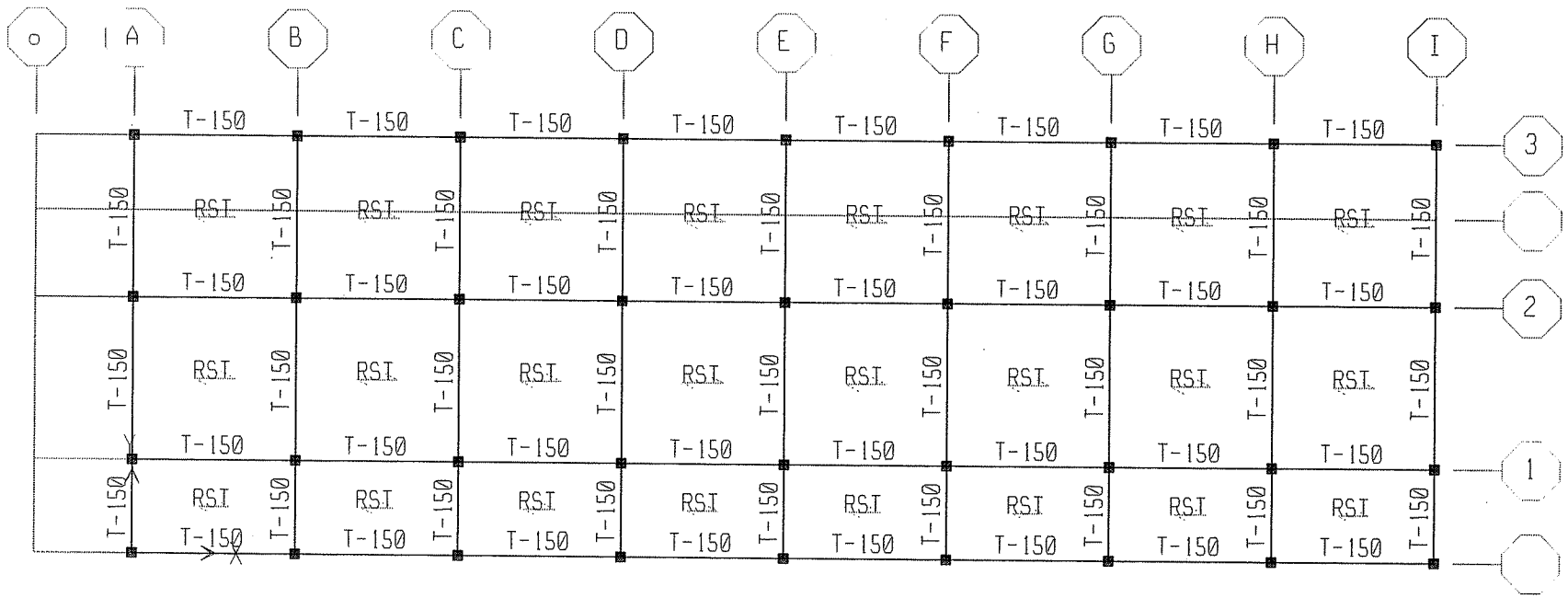
GROUND FL PLAN



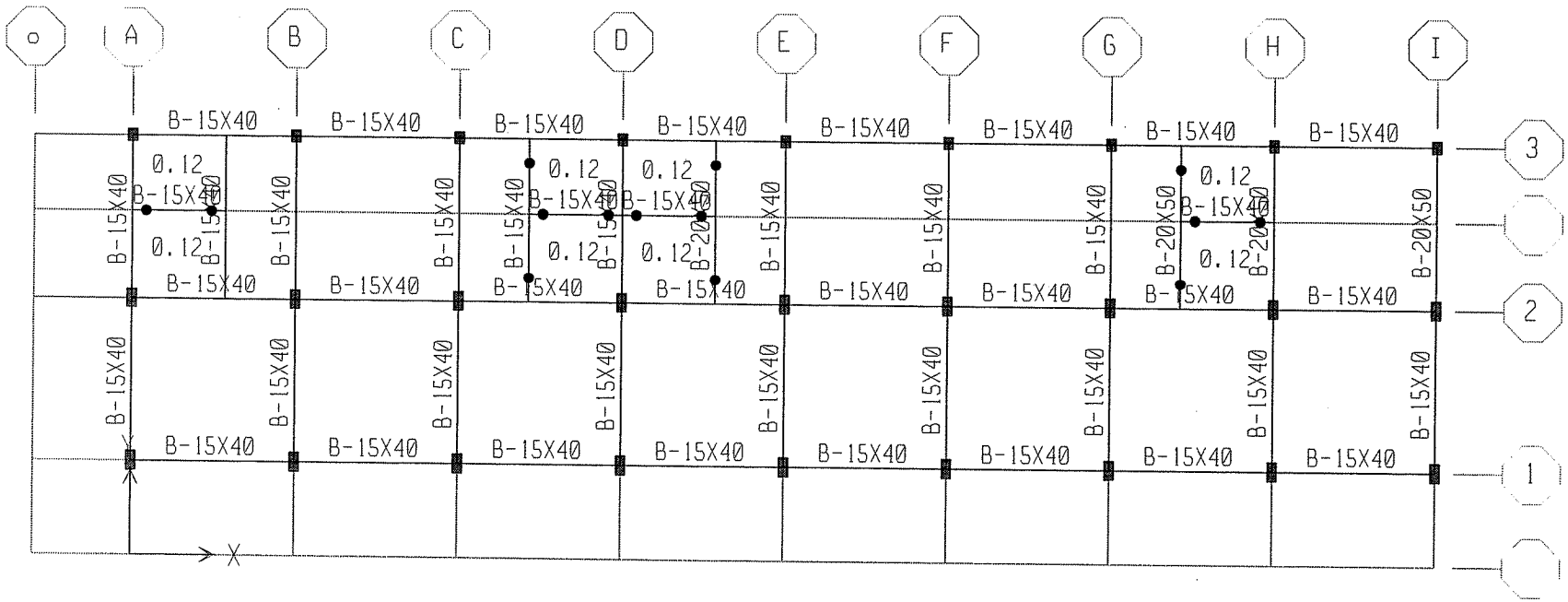
2nd FL PLAN



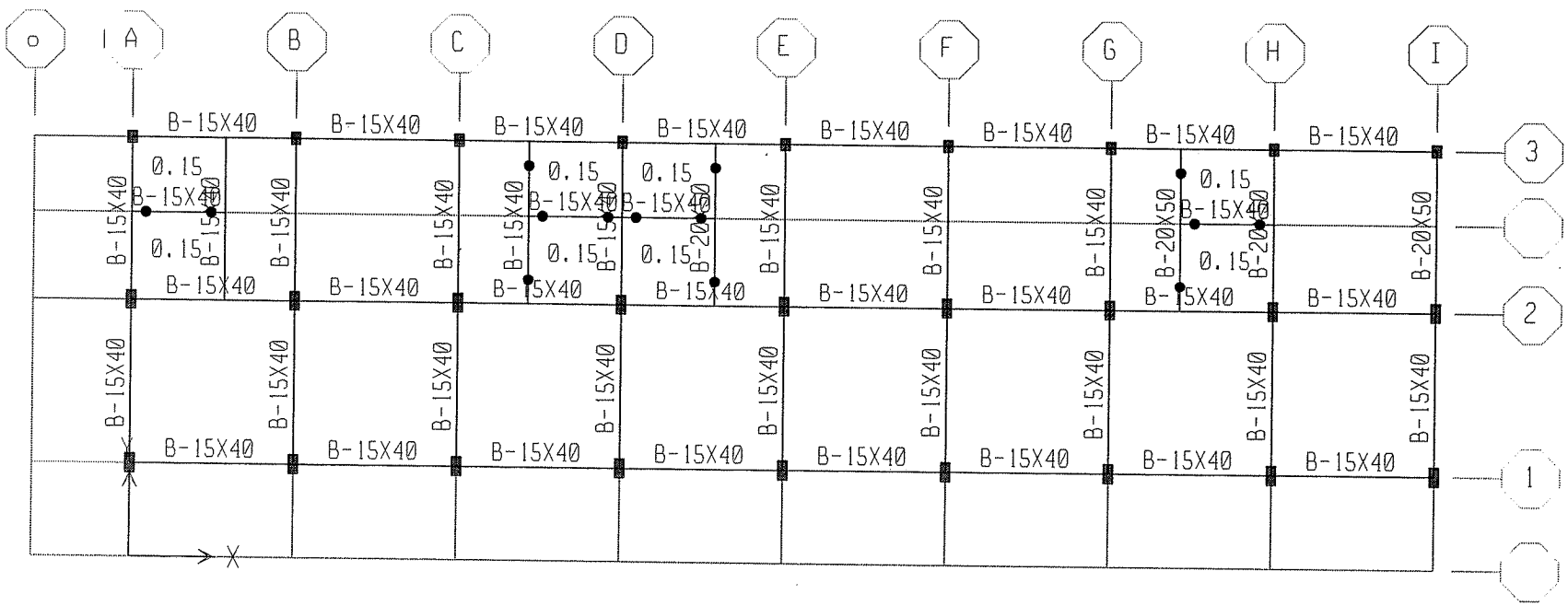
3rd - 4th FL PLAN



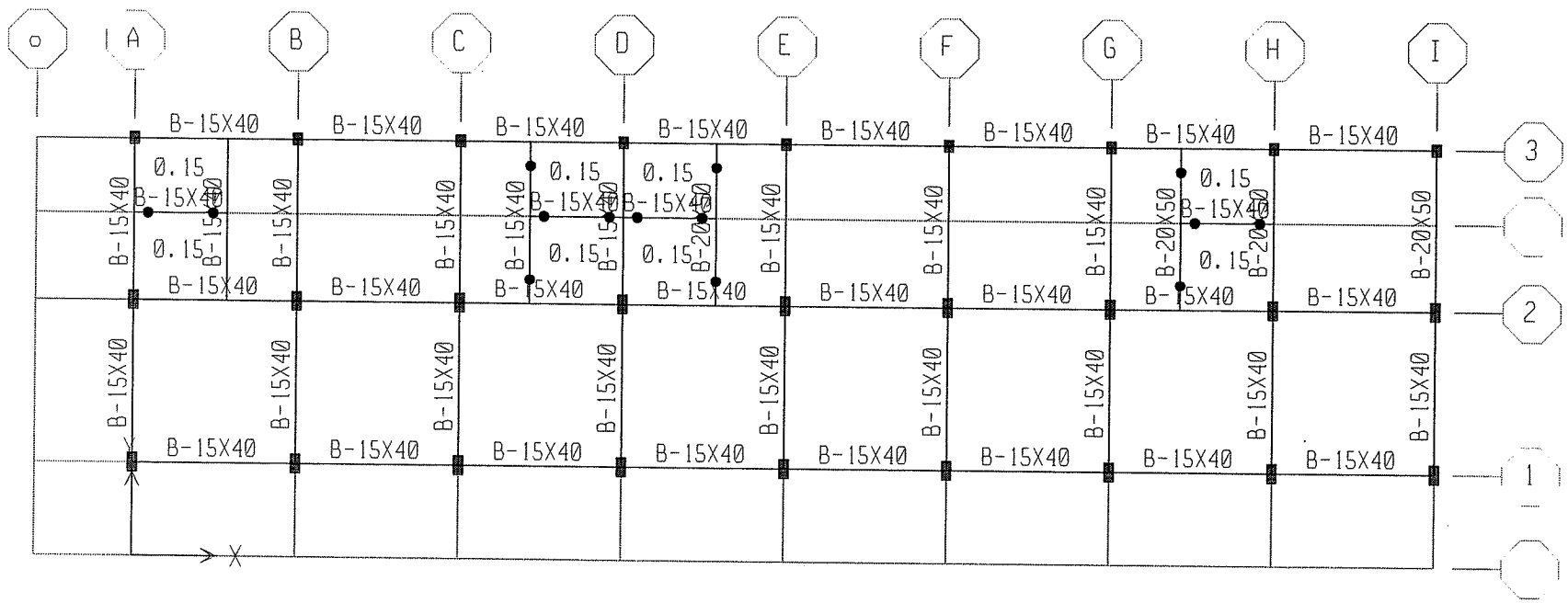
Roof PLAN



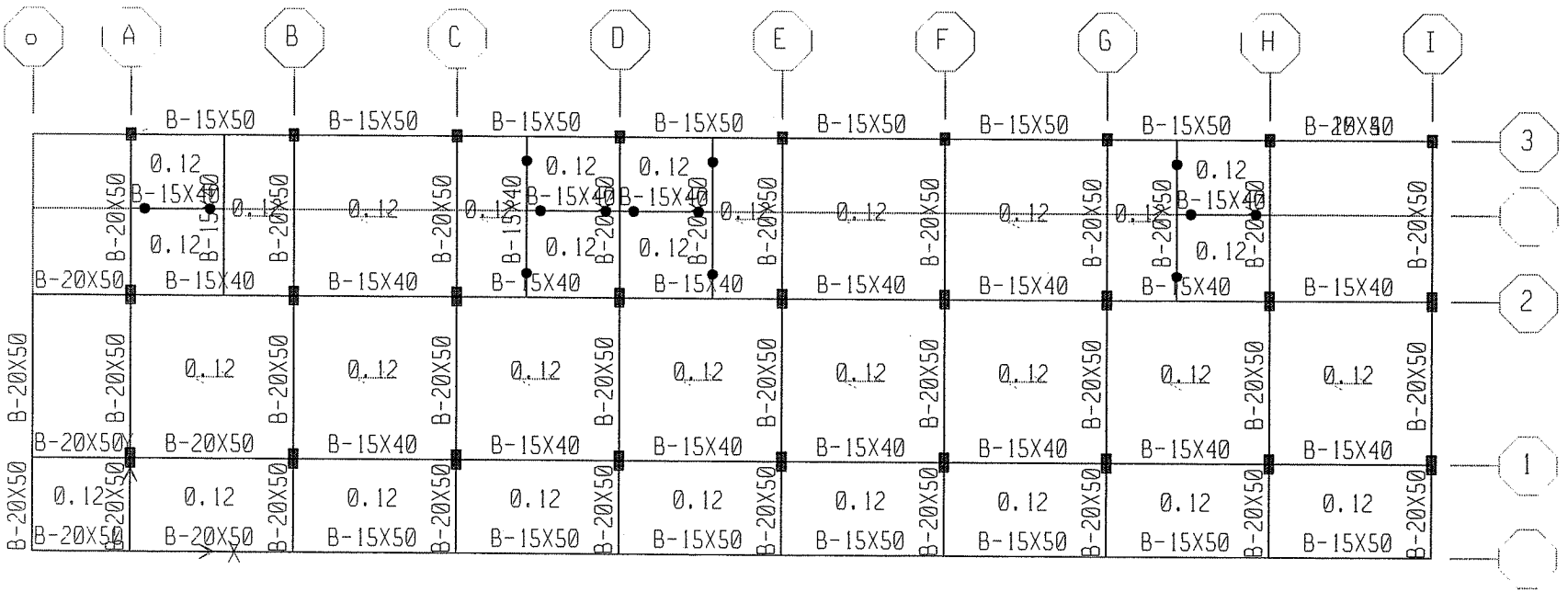
GROUND FL PLAN
(Superimposed DL)



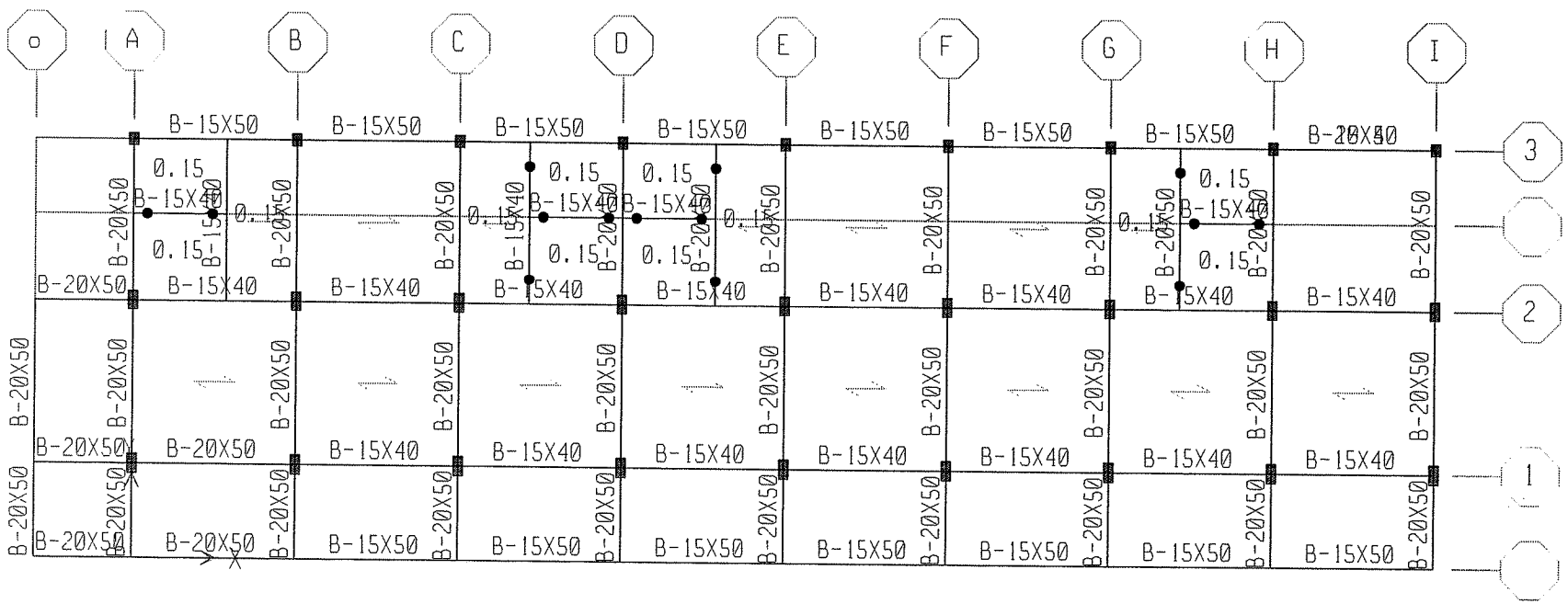
GROUND FL PLAN
(Partition load)



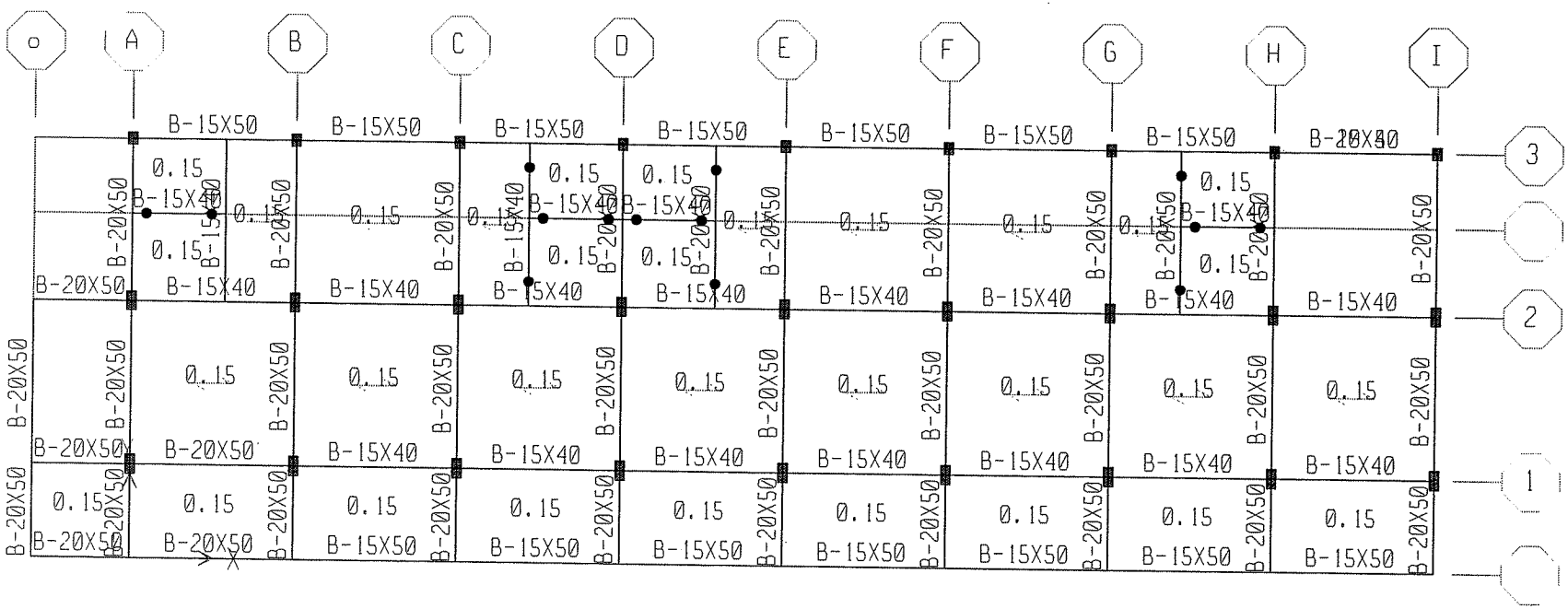
GROUND FL PLAN
(LL)



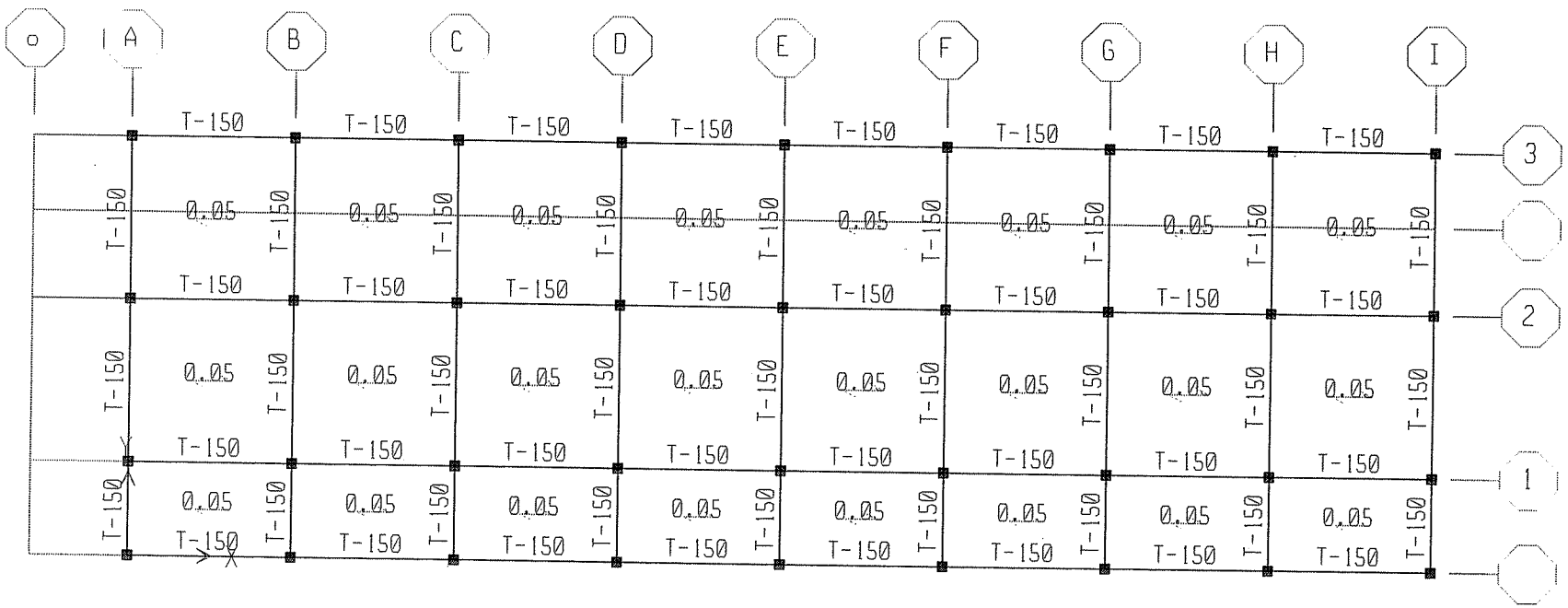
2nd - 4th FL PLAN
(Superimpose DL)



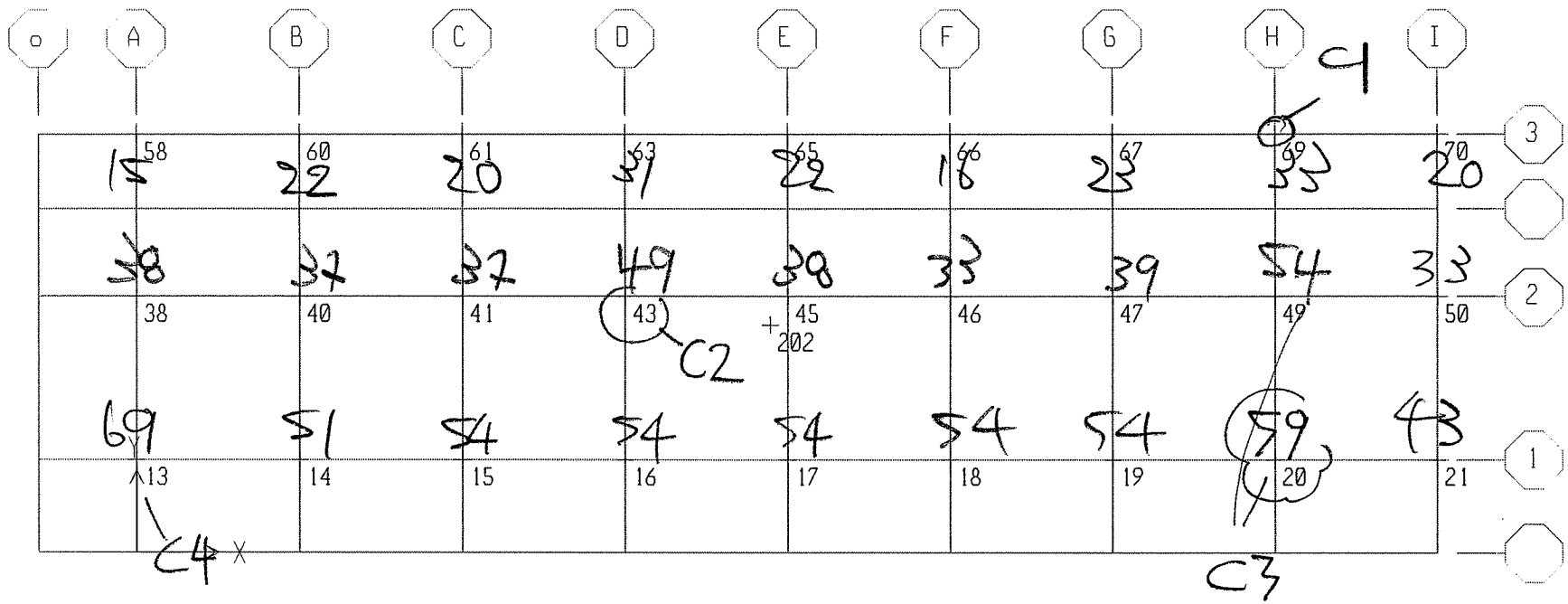
2nd - 4th FL PLAN
(Partition Load)



2nd-4th FL
(LL)



Roof PLAN
(LL)



Reaction Plan

Job Title : อาคารพักอาศัย 4 ชั้น		Subject : Reaction F01	
Designed : PSJ	Date : Feb-12		
Checked :	Date : Feb-12	Sheet :	Page :

Pile Capacity = 12 ton

Story	Point	Load	FX [ton]	FY [ton]	FZ [ton]	MX [ton.m]	MY [ton.m]	MZ [ton.m]	No. of Piles-Req.	Provide Piles	R
BASE	13	S2DL	0.29	0.22	68.92	-0.14	0.14	0.00	5.74	6	0.96
BASE	14	S2DL	-0.12	0.22	50.58	-0.13	-0.06	0.00	4.22	5	0.84
BASE	15	S2DL	0.02	0.20	53.44	-0.12	0.01	0.00	4.45	5	0.89
BASE	16	S2DL	-0.02	0.12	53.71	-0.07	-0.01	0.00	4.48	5	0.90
BASE	17	S2DL	-0.03	0.21	53.70	-0.11	-0.01	0.00	4.48	5	0.90
BASE	18	S2DL	-0.02	0.19	53.18	-0.09	-0.01	0.00	4.43	5	0.89
BASE	19	S2DL	-0.01	0.21	53.85	-0.09	-0.01	0.00	4.49	5	0.90
BASE	20	S2DL	0.03	0.37	58.60	-0.16	0.01	0.00	4.88	5	0.98
BASE	21	S2DL	-0.25	0.32	42.34	-0.13	-0.13	0.00	3.53	4	0.88
BASE	38	S2DL	0.64	0.13	37.39	-0.10	0.31	0.00	3.12	4	0.78
BASE	40	S2DL	-0.37	-0.11	36.88	0.01	-0.18	0.00	3.07	4	0.77
BASE	41	S2DL	0.24	-0.14	36.68	0.04	0.12	0.00	3.06	4	0.76
BASE	43	S2DL	-0.01	0.72	48.11	-0.34	0.00	0.00	4.01	5	0.80
BASE	45	S2DL	-0.24	-0.18	37.67	0.07	-0.12	0.00	3.14	4	0.78
BASE	46	S2DL	-0.02	-0.27	32.50	0.11	-0.01	0.00	2.71	3	0.90
BASE	47	S2DL	0.25	-0.19	38.65	0.09	0.12	0.00	3.22	4	0.81
BASE	49	S2DL	0.05	0.26	53.93	-0.11	0.03	0.00	4.49	5	0.90
BASE	50	S2DL	-0.61	-0.13	32.58	0.07	-0.30	0.00	2.72	3	0.91
BASE	58	S2DL	0.47	-0.35	14.73	0.16	0.23	0.00	1.23	2	0.61
BASE	60	S2DL	-0.26	-0.12	21.35	0.05	-0.13	0.00	1.78	2	0.89
BASE	61	S2DL	0.20	-0.12	19.87	0.05	0.10	0.00	1.66	2	0.83
BASE	63	S2DL	0.00	-0.61	30.23	0.29	0.00	0.00	2.52	3	0.84
BASE	65	S2DL	-0.18	-0.11	21.23	0.05	-0.09	0.00	1.77	2	0.88
BASE	66	S2DL	-0.01	-0.11	15.60	0.05	0.00	0.00	1.30	2	0.65
BASE	67	S2DL	0.25	-0.12	23.22	0.06	0.12	0.00	1.94	2	0.97
BASE	69	S2DL	-0.24	-0.47	32.60	0.23	-0.11	0.00	2.72	3	0.91
BASE	70	S2DL	-0.05	-0.14	19.53	0.00	0.00	0.00	1.63	2	0.81

FOOTING ULTIMATE DESIGN **F3**
Number of Pile 3

Design Data

Column Data	X-Dimension	0.20	m.	Material Data	Concrete	173	ksc.
	Y-Dimension	0.20	m.		Steel	4000	ksc.
Pile Data	Dimension	0.20	m.	Service Load	P	34	t.
	Safe Load	12	t.		Mx	0	t-m.
Footing	Edge Distance	0.20	m.		My	0	t.-m.
	Thickness	0.50	m.	Weight of Footing		1	t.
	Covering	0.08	m.	Average Load Factor		1.50	

Pile Coordinate and Loading

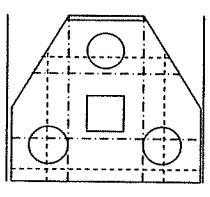
Pile	X-Coordinate				Y-Coordinate				Pile Service Loading				
No.	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-0.30		-0.30	0.09	-0.17		-0.17	0.03	11	0	0	0	12
2	0.30		0.30	0.09	-0.17		-0.17	0.03	11	0	0	0	12
3	0.00		0.00	0.00	0.35		0.35	0.12	11	0	0	0	12
cg.	0.00	0.00	0.00		0.00	0.00	0.00						
Total				0.18				0.18	34	1	0	0	35

Column Coordinate

Corner	X	Y
1	-0.1	-0.1
2	0.1	-0.1
3	0.1	0.1
4	-0.1	0.1

Footing Coordinate

Corner	X	Y
1	-0.50	-0.37
2	0.50	-0.37
3	0.50	-0.37
4	0.50	0.03
5	0.20	0.55
6	-0.20	0.55
7	-0.50	0.03
8	-0.50	-0.37



Critical Section Line Coordinate

Beam Shear	X1	Y1	X2	Y2	Length	Deep Beam	X1	Y1	X2	Y2	Length
X-Negative	-0.52	-0.37	-0.52	0.55	0.92	X-Negative	-0.20	-0.37	-0.20	0.55	0.92
X-Possitive	0.52	-0.37	0.52	0.55	0.92	X-Possitive	0.20	-0.37	0.20	0.55	0.92
Y-Negative	-0.50	-0.52	0.50	-0.52	1.00	Y-Negative	-0.50	-0.14	0.50	-0.14	1.00
Y-Possitive	-0.22	0.52	0.22	0.52	0.43	Y-Possitive	-0.39	0.22	0.39	0.22	0.77
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.31	-0.37	-0.31	0.36	0.73	X-Negative	-0.10	-0.37	-0.10	0.55	0.92
X-Possitive	0.31	-0.37	0.31	0.36	0.73	X-Possitive	0.10	-0.37	0.10	0.55	0.92
Y-Negative	-0.50	-0.31	0.50	-0.31	1.00	Y-Negative	-0.50	-0.10	0.50	-0.10	1.00
Y-Possitive	-0.34	0.31	0.34	0.31	0.67	Y-Possitive	-0.46	0.10	0.46	0.10	0.92

FOOTING ULTIMATE DESIGN **F3**
Number of Pile 3

Ultimate Shear and Shear Stress at Critical Section

Pile	Beam Shear				Deep Beam Shear				Punching Shear				
No.	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Peri
1	0	0	0	0	17	0	12	0	8	0	0	0	8
2	0	0	0	0	0	17	12	0	0	8	0	0	8
3	0	0	0	0	0	0	0	17	0	0	0	12	12
Shear	0	0	0	0	17	17	24	17	8	8	0	12	28
Moment					2	2	1	2					
Factor					2.50	2.50	2.50	2.50					
Length	0.92	0.92	1.00	0.43	0.92	0.92	1.00	0.77	0.73	0.73	1.00	0.67	2.48
Depth	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Stress	0.00	0.00	0.00	0.00	4.52	4.52	5.68	5.37	2.57	2.57	0.00	4.22	2.65
Allow		5.93			14.81	14.81	14.81	14.81		11.85			

Ultimate Moment and Reinforcement at Critical Section

Pile	X-Negative			X-Possitive			Y-Negative			Y-Possitive		
Number	a	V	M	a	V	M	a	V	M	a	V	M
1	0.20	17	3	-0.40	0	0	0.07	17	1	-0.27	0	0
2	-0.40	0	0	0.20	17	3	0.07	17	1	-0.27	0	0
3	-0.10	0	0	-0.10	0	0	-0.45	0	0	0.25	17	4
Moment			3			3			3			4
Length		0.92			0.92			1.00			0.92	
Depth		0.42			0.42			0.42			0.42	
As(Req.)			2.3			2.3			1.7			2.9
MinAs(Beam)			13.5			13.5			14.7			13.5
MinAs(Slab)			11.5			11.5			12.5			11.44
Conc. Moment			67			67			73			66

FOOTING ULTIMATE DESIGN **F4**
Number of Pile **4**

Design Data

Column Data	X-Dimension	0.20	m.	Material Data	Concrete	173	ksc.
	Y-Dimension	0.20	m.		Steel	4000	ksc.
Pile Data	Dimension	0.20	m.	Service Load	P	46	t.
	Safe Load	12	t.		Mx	0	t-m.
Footing	Edge Distance	0.20	m.		My	0	t.-m.
	Thickness	0.50	m.	Weight of Footing		1	t.
	Covering	0.08	m.	Average Load Factor		1.50	

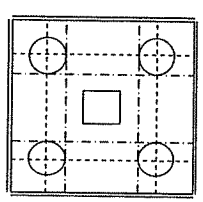
Pile Coordinate and Loading

Pile	X-Coordinate				Y-Coordinate				Pile Service Loading				
No.	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-0.30		0.30	0.09	-0.30		-0.30	0.09	12	0	0	0	12
2	0.30		0.30	0.09	-0.30		-0.30	0.09	12	0	0	0	12
3	0.30		0.30	0.09	0.30		0.30	0.09	12	0	0	0	12
4	-0.30		-0.30	0.09	0.30		0.30	0.09	12	0	0	0	12
cg	0.00	0.00	0.00		0.00	0.00	0.00						
Total				0.36				0.36	46	1	0	0	47

Column Coordinate / Footing Coordinate

Corner	X	Y
1	-0.1	-0.1
2	0.1	-0.1
3	0.1	0.1
4	-0.1	0.1

Corner	X	Y
1	-0.50	-0.50
2	0.50	-0.50
3	0.50	-0.50
4	0.50	0.50
5	0.50	0.50
6	-0.50	0.50
7	-0.50	0.50
8	-0.50	-0.50



Critical Section Line Coordinate

Beam Shear	X1	Y1	X2	Y2	Length	Deep Beam	X1	Y1	X2	Y2	Length
X-Negative	-0.52	-0.50	-0.52	0.50	1.00	X-Negative	-0.20	-0.50	-0.20	0.50	1.00
X-Possitive	0.52	-0.50	0.52	0.50	1.00	X-Possitive	0.20	-0.50	0.20	0.50	1.00
Y-Negative	-0.50	-0.52	0.50	-0.52	1.00	Y-Negative	-0.50	-0.20	0.50	-0.20	1.00
Y-Possitive	-0.50	0.52	0.50	0.52	1.00	Y-Possitive	-0.50	0.20	0.50	0.20	1.00
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.31	-0.50	-0.31	0.50	1.00	X-Negative	-0.10	-0.50	-0.10	0.50	1.00
X-Possitive	0.31	-0.50	0.31	0.50	1.00	X-Possitive	0.10	-0.50	0.10	0.50	1.00
Y-Negative	-0.50	-0.31	0.50	-0.31	1.00	Y-Negative	-0.50	-0.10	0.50	-0.10	1.00
Y-Possitive	-0.50	0.31	0.50	0.31	1.00	Y-Possitive	-0.50	0.10	0.50	0.10	1.00

FOOTING ULTIMATE DESIGN **F4**
Number of Pile **4**

Ultimate Shear and Shear Stress at Critical Section

Pile	Beam Shear				Deep Beam Shear				Punching Shear				
No.	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Peri
1	0	0	0	0	18	0	18	0	8	0	8	0	8
2	0	0	0	0	0	18	18	0	0	8	8	0	8
3	0	0	0	0	0	18	0	18	0	8	0	8	8
4	0	0	0	0	18	0	0	18	8	0	0	8	8
Shear	0	0	0	0	35	35	35	35	16	16	16	16	32
Moment					4	4	4	4					
Factor					2.50	2.50	2.50	2.50					
Length	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.48
Depth	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Stress	0.00	0.00	0.00	0.00	8.43	8.43	8.43	8.43	3.79	3.79	3.79	3.79	3.06
Allow	5.93				14.81	14.81	14.81	14.81	11.85				

Ultimate Moment and Reinforcement at Critical Section

Pile	X-Negative			X-Possitive			Y-Negative			Y-Possitive		
Number	a	V	M	a	V	M	a	V	M	a	V	M
1	0.20	18	4	-0.40	0	0	0.20	18	4	-0.40	0	0
2	-0.40	0	0	0.20	18	4	0.20	18	4	-0.40	0	0
3	-0.40	0	0	0.20	18	4	-0.40	0	0	0.20	18	4
4	0.20	18	4	-0.40	0	0	-0.40	0	0	0.20	18	4
Moment			7			7			7			7
Length	1.00			1.00			1.00			1.00		
Depth	0.42			0.42			0.42			0.42		
As(Req.)			4.8			4.8			4.8			4.8
MinAs(Beam)			14.7			14.7			14.7			14.7
MinAs(Slab)			12.5			12.5			12.5			12.5
Conc. Moment			73			73			73			73

FOOTING ULTIMATE DESIGN **F5**
Number of Pile **5**

Design Data

Column Data	X-Dimension	0.20	m.	Material Data	Concrete	173	ksc.
	Y-Dimension	0.30	m.		Steel	4000	ksc.
Pile Data	Dimension	0.20	m.	Service Load	P	56	t.
	Safe Load	12	t.		Mx	0	t-m.
Footing	Edge Distance	0.20	m.		My	0	t.-m.
	Thickness	0.50	m.	Weight of Footing		2	t.
	Covering	0.08	m.	Average Load Factor		1.50	

Pile Coordinate and Loading

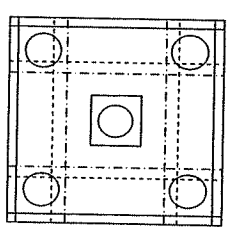
Pile	X-Coordinate				Y-Coordinate				Pile Service Loading				
No.	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-0.42		-0.42	0.18	-0.42		-0.42	0.18	11	0	0	0	12
2	0.42		0.42	0.18	-0.42		-0.42	0.18	11	0	0	0	12
3	0.00		0.00	0.00	0.00		0.00	0.00	11	0	0	0	12
4	-0.42		-0.42	0.18	0.42		0.42	0.18	11	0	0	0	12
5	0.42		0.42	0.18	0.42		0.42	0.18	11	0	0	0	12
cg.	0.00	0.00	0.00		0.00	0.00	0.00						
Total				0.72				0.72	56	2	0	0	58

Column Coordinate

Corner	X	Y
1	-0.1	-0.15
2	0.1	-0.15
3	0.1	0.15
4	-0.1	0.15

Footing Coordinate

Corner	X	Y
1	-0.62	-0.62
2	0.62	-0.62
3	0.62	-0.62
4	0.62	0.62
5	0.62	0.62
6	-0.62	0.62
7	-0.62	0.62
8	-0.62	-0.62



Critical Section Line Coordinate

Beam Shear	X1	Y1	X2	Y2	Length	Deep Beam	X1	Y1	X2	Y2	Length
X-Negative	-0.52	-0.62	-0.52	0.62	1.25	X-Negative	-0.29	-0.62	-0.29	0.62	1.25
X-Possitive	0.52	-0.62	0.52	0.62	1.25	X-Possitive	0.29	-0.62	0.29	0.62	1.25
Y-Negative	-0.62	-0.57	0.62	-0.57	1.25	Y-Negative	-0.62	-0.29	0.62	-0.29	1.25
Y-Possitive	-0.62	0.57	0.62	0.57	1.25	Y-Possitive	-0.62	0.29	0.62	0.29	1.25
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.31	-0.62	-0.31	0.62	1.25	X-Negative	-0.10	-0.62	-0.10	0.62	1.25
X-Possitive	0.31	-0.62	0.31	0.62	1.25	X-Possitive	0.10	-0.62	0.10	0.62	1.25
Y-Negative	-0.62	-0.36	0.62	-0.36	1.25	Y-Negative	-0.62	-0.15	0.62	-0.15	1.25
Y-Possitive	-0.62	0.36	0.62	0.36	1.25	Y-Possitive	-0.62	0.15	0.62	0.15	1.25

FOOTING ULTIMATE DESIGN **F5**
Number of Pile **5**

Ultimate Shear and Shear Stress at Critical Section

Pile	Beam Shear				Deep Beam Shear				Punching Shear				
No.	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Peri
1	0	0	0	0	17	0	17	0	17	0	14	0	17
2	0	0	0	0	0	17	17	0	0	17	14	0	17
3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	17	0	0	17	17	0	0	14	17
5	0	0	0	0	0	17	0	17	0	17	0	14	17
Shear	1	1	0	0	35	35	35	35	35	35	29	29	69
Moment					5	5	5	5					
Factor					2.50	2.50	2.50	2.50					
Length	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	2.68
Depth	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Stress	0.14	0.14	0.00	0.00	6.62	6.62	6.62	6.62	6.62	6.62	5.44	5.44	6.17
Allow	5.93				14.81	14.81	14.81	14.81	11.85				

Ultimate Moment and Reinforcement at Critical Section

Pile	X-Negative			X-Possitive			Y-Negative			Y-Possitive		
Number	a	V	M	a	V	M	a	V	M	a	V	M
1	0.32	17	6	-0.52	0	0	0.27	17	5	-0.57	0	0
2	-0.52	0	0	0.32	17	6	0.27	17	5	-0.57	0	0
3	-0.10	0	0	-0.10	0	0	-0.15	0	0	-0.15	0	0
4	0.32	17	6	-0.52	0	0	-0.57	0	0	0.27	17	5
5	-0.52	0	0	0.32	17	6	-0.57	0	0	0.27	17	5
Moment			11			11			10			10
Length	1.25			1.25			1.25			1.25		
Depth	0.42			0.42			0.42			0.42		
As(Req.)			7.6			7.6			6.4			6.4
MinAs(Beam)			18.4			18.4			18.4			18.4
MinAs(Slab)			15.61			15.61			15.61			15.61
Conc. Moment			91			91			91			91

FOOTING ULTIMATE DESIGN F6
Number of Pile 6

Design Data

Column Data	X-Dimension	0.30	m.	Material Data	Concrete	173	ksc.
	Y-Dimension	0.20	m.		Steel	4000	ksc.
Pile Data	Dimension	0.20	m.	Service Load	P	68	t.
	Safe Load	12	t.		Mx	0	t-m.
Footing	Edge Distance	0.20	m.		My	0	t.-m.
	Thickness	0.60	m.	Weight of Footing		2	t.
	Covering	0.08	m.	Average Load Factor		1.50	

Pile Coordinate and Loading

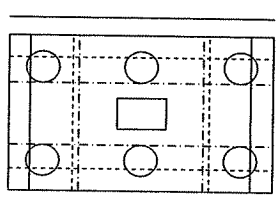
Pile	X-Coordinate				Y-Coordinate				Pile Service Loading				
No.	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-0.60		-0.60	0.36	-0.30		-0.30	0.09	11	0	0	0	12
2	0.00		0.00	0.00	-0.30		-0.30	0.09	11	0	0	0	12
3	0.60		0.60	0.36	-0.30		-0.30	0.09	11	0	0	0	12
4	-0.60		-0.60	0.36	0.30		0.30	0.09	11	0	0	0	12
5	0.00		0.00	0.00	0.30		0.30	0.09	11	0	0	0	12
6	0.60		0.60	0.36	0.30		0.30	0.09	11	0	0	0	12
cg.	0.00	0.00	0.00		0.00	0.00	0.00						
Total				1.44				0.54	68	2	0	0	70

Column Coordinate

Corner	X	Y
1	-0.15	-0.1
2	0.15	-0.1
3	0.15	0.1
4	-0.15	0.1

Footing Coordinate

Corner	X	Y
1	-0.80	-0.50
2	0.80	-0.50
3	0.80	-0.50
4	0.80	0.50
5	0.80	0.50
6	-0.80	0.50
7	-0.80	0.50
8	-0.80	-0.50



Critical Section Line Coordinate

Beam Shear	X1	Y1	X2	Y2	Length	Deep Beam	X1	Y1	X2	Y2	Length
X-Negative	-0.67	-0.50	-0.67	0.50	1.00	X-Negative	-0.38	-0.50	-0.38	0.50	1.00
X-Possitive	0.67	-0.50	0.67	0.50	1.00	X-Possitive	0.38	-0.50	0.38	0.50	1.00
Y-Negative	-0.80	-0.62	0.80	-0.62	1.60	Y-Negative	-0.80	-0.20	0.80	-0.20	1.60
Y-Possitive	-0.80	0.62	0.80	0.62	1.60	Y-Possitive	-0.80	0.20	0.80	0.20	1.60
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.41	-0.50	-0.41	0.50	1.00	X-Negative	-0.15	-0.50	-0.15	0.50	1.00
X-Possitive	0.41	-0.50	0.41	0.50	1.00	X-Possitive	0.15	-0.50	0.15	0.50	1.00
Y-Negative	-0.80	-0.36	0.80	-0.36	1.60	Y-Negative	-0.80	-0.10	0.80	-0.10	1.60
Y-Possitive	-0.80	0.36	0.80	0.36	1.60	Y-Possitive	-0.80	0.10	0.80	0.10	1.60

FOOTING ULTIMATE DESIGN F6
Number of Pile 6

Ultimate Shear and Shear Stress at Critical Section

Pile	Beam Shear				Deep Beam Shear				Punching Shear				
No.	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Peri
1	3	0	0	0	18	0	18	0	18	0	4	0	18
2	0	0	0	0	0	0	18	0	0	0	4	0	4
3	0	3	0	0	0	18	18	0	0	18	4	0	18
4	3	0	0	0	18	0	0	18	18	0	0	4	18
5	0	0	0	0	0	0	0	18	0	0	0	4	4
6	0	3	0	0	0	18	0	18	0	18	0	4	18
Shear	5	5	0	0	35	35	53	53	35	35	11	11	77
Moment					8	8	5	5					
Factor					2.42	2.42	2.50	2.50					
Length	1.00	1.00	1.60	1.60	1.00	1.00	1.60	1.60	1.00	1.00	1.60	1.60	3.08
Depth	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Stress	1.01	1.01	0.00	0.00	6.76	6.76	6.34	6.34	6.76	6.76	1.27	1.27	4.83
Allow	5.93				14.33	14.33	14.81	14.81	11.85				

Ultimate Moment and Reinforcement at Critical Section

Pile	X-Negative			X-Possitive			Y-Negative			Y-Possitive		
Number	a	V	M	a	V	M	a	V	M	a	V	M
1	0.45	18	8	-0.75	0	0	0.20	18	4	-0.40	0	0
2	-0.15	0	0	-0.15	0	0	0.20	18	4	-0.40	0	0
3	-0.75	0	0	0.45	18	8	0.20	18	4	-0.40	0	0
4	0.45	18	8	-0.75	0	0	-0.40	0	0	0.20	18	4
5	-0.15	0	0	-0.15	0	0	-0.40	0	0	0.20	18	4
6	-0.75	0	0	0.45	18	8	-0.40	0	0	0.20	18	4
Moment			16			16			11			11
Length	1.00			1.00			1.60			1.60		
Depth	0.52			0.52			0.52			0.52		
As(Req.)			8.6			8.6			5.7			5.7
MinAs(Beam)			18.2			18.2			29.1			29.1
MinAs(Slab)			15			15			24			24
Conc. Moment			111			111			178			178

Job Title	:	Saint John Mary		Subject : Column Force & Reinforcement	
Designed	:	PSJ	Date : Feb-12		
Checked	:		Date : Feb-12	Sheet :	Page :

C1 : 20x20

Story	Column	Load	Loc	P	V2	V3	T	M2	M3	Section of Column B	Section of Column D	fc'	Pc	Ps	Ast
ROOF	C36	S2DL	0.00	0.73	0.03	0.04	0.00	-0.04	0.08	0.20	0.25	240	25.50	0.00	Ast = 1%
ROOF	C36	S2DL	1.43	0.87	0.03	0.04	0.00	-0.10	0.04	0.20	0.25	240	25.50	0.00	Ast = 1%
ROOF	C36	S2DL	2.85	1.01	0.03	0.04	0.00	-0.16	0.01	0.20	0.25	240	25.50	0.00	Ast = 1%
L1	C36	S2DL	0.00	-32.60	0.24	0.47	0.00	0.23	0.11	0.20	0.25	240	25.50	7.10	5.22
L1	C36	S2DL	0.50	-32.54	0.24	0.47	0.00	-0.01	0.00	0.20	0.25	240	25.50	7.04	5.18
L1	C36	S2DL	1.00	-32.48	0.24	0.47	0.00	-0.24	-0.12	0.20	0.25	240	25.50	6.98	5.13
L4	C36-1	S2DL	0.40	-5.08	-0.43	0.02	0.00	-0.01	-0.36	0.20	0.25	240	25.50	0.00	Ast = 1%
L4	C36-1	S2DL	0.70	-5.05	-0.43	0.02	0.00	-0.02	-0.23	0.20	0.25	240	25.50	0.00	Ast = 1%
L4	C36-1	S2DL	1.00	-5.01	-0.43	0.02	0.00	-0.03	-0.10	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-1	S2DL	0.40	-13.86	-0.43	0.06	0.00	-0.02	-0.39	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-1	S2DL	0.70	-13.82	-0.43	0.06	0.00	-0.04	-0.26	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-1	S2DL	1.00	-13.79	-0.43	0.06	0.00	-0.06	-0.13	0.20	0.25	240	25.50	0.00	Ast = 1%
L2	C36-1	S2DL	0.40	-22.95	-0.28	0.16	0.00	-0.07	-0.35	0.20	0.25	240	25.50	0.00	Ast = 1%
L2	C36-1	S2DL	0.70	-22.92	-0.28	0.16	0.00	-0.11	-0.27	0.20	0.25	240	25.50	0.00	Ast = 1%
L2	C36-1	S2DL	1.00	-22.88	-0.28	0.16	0.00	-0.16	-0.18	0.20	0.25	240	25.50	0.00	Ast = 1%
L4	C36-2	S2DL	0.00	-8.55	-0.33	0.02	0.00	0.02	-0.02	0.20	0.25	240	25.50	0.00	Ast = 1%
L4	C36-2	S2DL	0.55	-8.49	-0.33	0.02	0.00	0.00	0.17	0.20	0.25	240	25.50	0.00	Ast = 1%
L4	C36-2	S2DL	1.10	-8.42	-0.33	0.02	0.00	-0.01	0.35	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-2	S2DL	0.00	-17.39	-0.41	0.06	0.00	0.08	-0.07	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-2	S2DL	0.55	-17.32	-0.41	0.06	0.00	0.05	0.15	0.20	0.25	240	25.50	0.00	Ast = 1%
L3	C36-2	S2DL	1.10	-17.26	-0.41	0.06	0.00	0.02	0.38	0.20	0.25	240	25.50	0.00	Ast = 1%
L2	C36-2	S2DL	0.00	-26.39	-0.39	0.16	0.00	0.23	-0.09	0.20	0.25	240	25.50	0.89	0.65
L2	C36-2	S2DL	0.55	-26.33	-0.39	0.16	0.00	0.14	0.12	0.20	0.25	240	25.50	0.83	0.61
L2	C36-2	S2DL	1.10	-26.26	-0.39	0.16	0.00	0.05	0.34	0.20	0.25	240	25.50	0.76	0.56

C2 : 20x40

Story	Column	Load	Loc	P	V2	V3	T	M2	M3	Section of Column B	Section of Column D	fc'	Pc	Ps	Ast
ROOF	C23	S2DL	0.00	2.34	-0.02	-0.22	0.00	-0.41	-0.03	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C23	S2DL	1.43	2.48	-0.02	-0.22	0.00	-0.10	0.00	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C23	S2DL	2.85	2.61	-0.02	-0.22	0.00	0.22	0.02	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C23	S2DL	0.00	-11.12	-0.10	-1.33	0.01	-1.89	-0.15	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C23	S2DL	1.25	-10.88	-0.10	-1.33	0.01	-0.24	-0.02	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C23	S2DL	2.50	-10.64	-0.10	-1.33	0.01	1.42	0.11	0.20	0.40	240	40.80	0.00	Ast = 1%
L3	C23	S2DL	0.00	-24.73	-0.13	-1.01	0.00	-1.61	-0.19	0.20	0.40	240	40.80	0.00	Ast = 1%
L3	C23	S2DL	1.25	-24.49	-0.13	-1.01	0.00	-0.34	-0.03	0.20	0.40	240	40.80	0.00	Ast = 1%
L3	C23	S2DL	2.50	-24.25	-0.13	-1.01	0.00	0.92	0.12	0.20	0.40	240	40.80	0.00	Ast = 1%
L2	C23	S2DL	0.00	-38.17	-0.04	-0.74	0.00	-1.20	-0.06	0.20	0.40	240	40.80	0.00	Ast = 1%
L2	C23	S2DL	1.25	-37.93	-0.04	-0.74	0.00	-0.27	-0.01	0.20	0.40	240	40.80	0.00	Ast = 1%
L2	C23	S2DL	2.50	-37.69	-0.04	-0.74	0.00	0.66	0.03	0.20	0.40	240	40.80	0.00	Ast = 1%
L1	C23	S2DL	0.00	-48.11	0.01	-0.72	0.00	-0.34	0.00	0.20	0.40	240	40.80	7.31	5.38
L1	C23	S2DL	0.50	-48.02	0.01	-0.72	0.00	0.02	0.00	0.20	0.40	240	40.80	7.22	5.31
L1	C23	S2DL	1.00	-47.92	0.01	-0.72	0.00	0.38	0.00	0.20	0.40	240	40.80	7.12	5.24

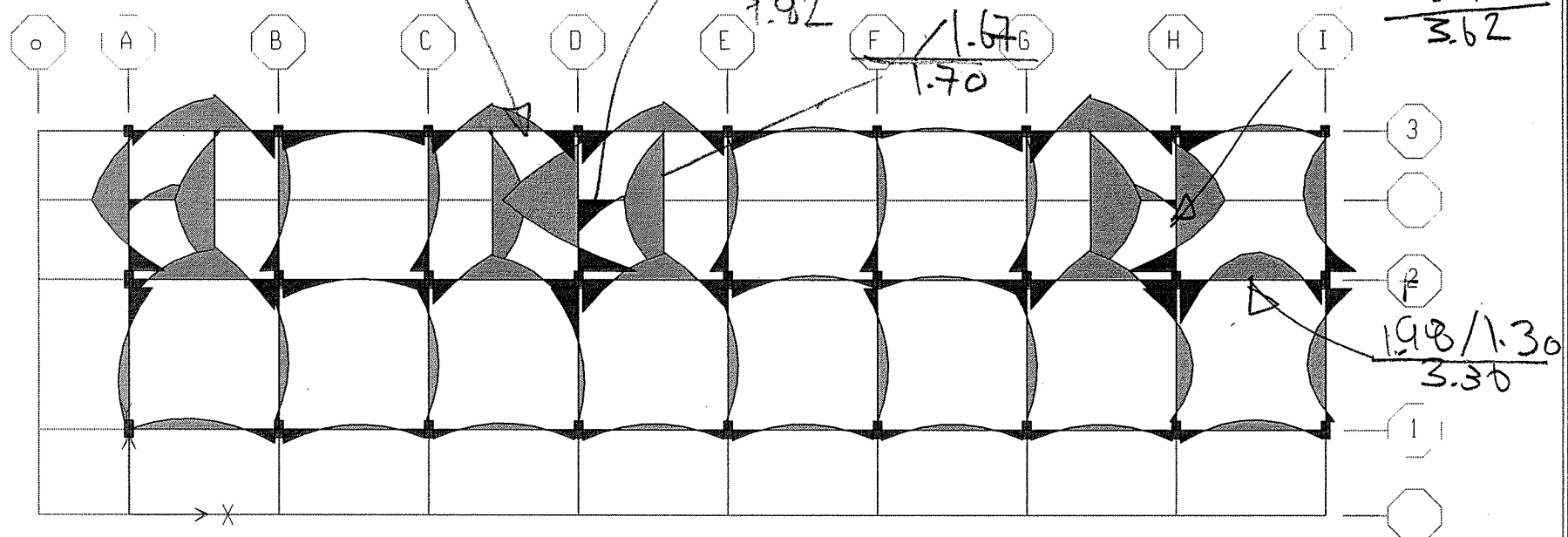
C3 : 20x40

Story	Column	Load	Loc	P	V2	V3	T	M2	M3	Section of Column B	Section of Column D	fc'	Pc	Ps	Ast
ROOF	C17	S2DL	0.00	-13.55	0.00	-0.04	0.00	-0.06	-0.01	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C17	S2DL	1.43	-13.42	0.00	-0.04	0.00	0.00	-0.01	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C17	S2DL	2.85	-13.28	0.00	-0.04	0.00	0.06	-0.01	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C17	S2DL	0.00	-27.64	-0.10	0.68	0.01	0.80	-0.14	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C17	S2DL	1.25	-27.40	-0.10	0.68	0.01	-0.05	-0.02	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C17	S2DL	2.50	-27.16	-0.10	0.68	0.01	-0.90	0.10	0.20	0.40	240	40.80	0.00	Ast = 1%
L3	C17	S2DL	0.00	-41.11	-0.12	0.49	0.00	0.72	-0.19	0.20	0.40	240	40.80	0.31	0.23
L3	C17	S2DL	1.25	-40.87	-0.12	0.49	0.00	0.11	-0.04	0.20	0.40	240	40.80	0.07	0.05
L3	C17	S2DL	2.50	-40.63	-0.12	0.49	0.00	-0.50	0.12	0.20	0.40	240	40.80	0.00	Ast = 1%
L2	C17	S2DL	0.00	-54.76	-0.05	0.17	0.00	-0.16	-0.08	0.20	0.40	240	40.80	13.96	10.26
L2	C17	S2DL	1.25	-54.52	-0.05	0.17	0.00	-0.37	-0.02	0.20	0.40	240	40.80	13.72	10.09
L2	C17	S2DL	2.50	-54.28	-0.05	0.17	0.00	-0.58	0.04	0.20	0.40	240	40.80	13.48	9.91
L1	C17	S2DL	0.00	-58.60	-0.03	-0.37	0.00	-0.16	-0.01	0.20	0.40	240	40.80	17.80	13.09
L1	C17	S2DL	0.50	-58.51	-0.03	-0.37	0.00	0.03	0.00	0.20	0.40	240	40.80	17.71	13.02
L1	C17	S2DL	1.00	-58.41	-0.03	-0.37	0.00	0.21	0.02	0.20	0.40	240	40.80	17.61	12.95

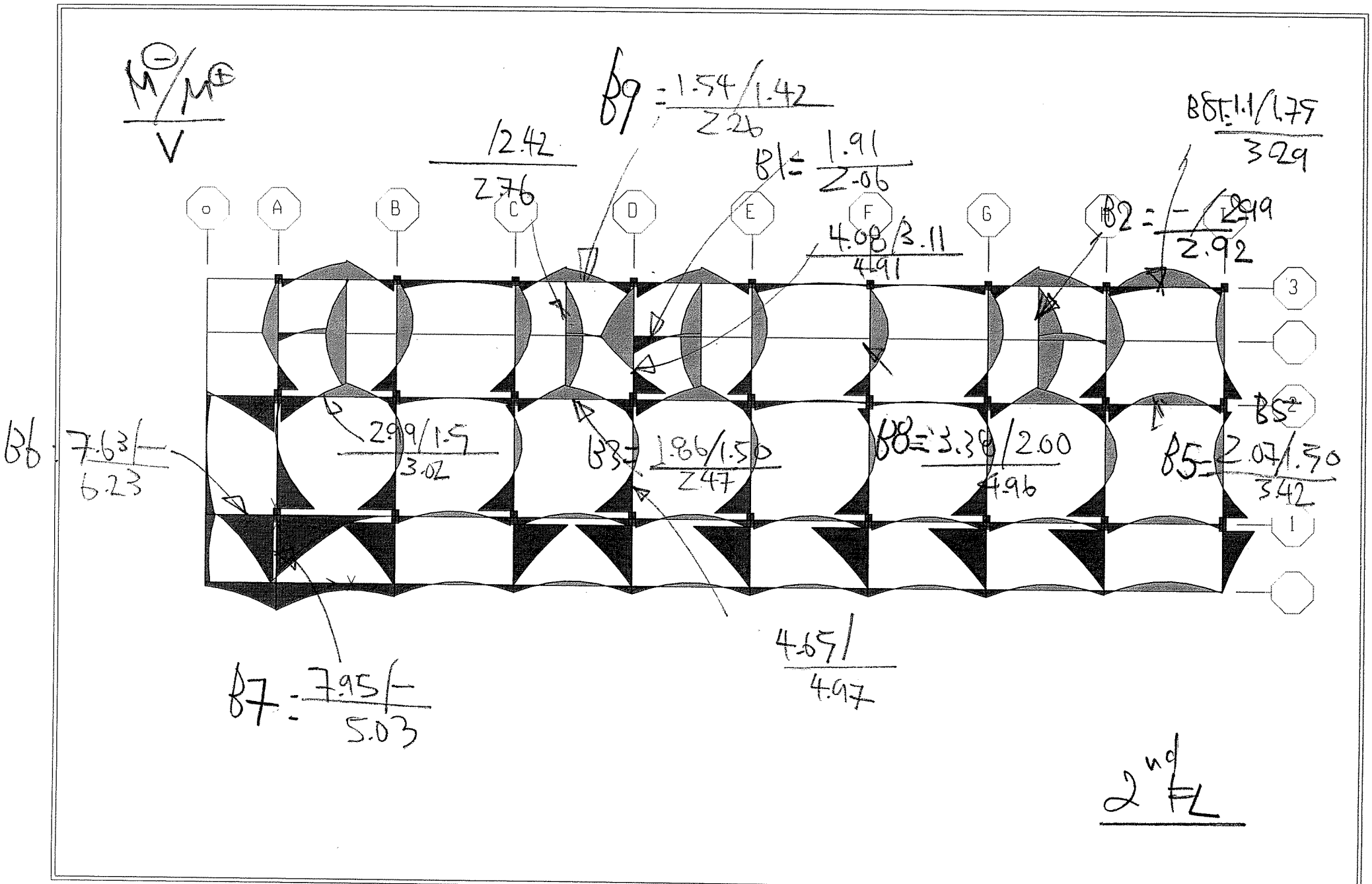
C4 : 20x40

Story	Column	Load	Loc	P	V2	V3	T	M2	M3	Section of Column B	Section of Column D	fc'	Pc	Ps	Ast
ROOF	C10	S2DL	0.00	-13.17	0.12	0.09	0.00	0.15	0.30	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C10	S2DL	1.43	-13.03	0.12	0.09	0.00	0.02	0.13	0.20	0.40	240	40.80	0.00	Ast = 1%
ROOF	C10	S2DL	2.85	-12.89	0.12	0.09	0.00	-0.10	-0.03	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C10	S2DL	0.00	-30.57	0.71	1.73	0.01	2.22	1.10	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C10	S2DL	1.25	-30.33	0.71	1.73	0.01	0.05	0.21	0.20	0.40	240	40.80	0.00	Ast = 1%
L4	C10	S2DL	2.50	-30.09	0.71	1.73	0.01	-2.11	-0.68	0.20	0.40	240	40.80	0.00	Ast = 1%
L3	C10	S2DL	0.00	-48.80	0.76	1.31	0.00	1.96	1.14	0.20	0.40	240	40.80	8.00	5.88
L3	C10	S2DL	1.25	-48.56	0.76	1.31	0.00	0.31	0.19	0.20	0.40	240	40.80	7.76	5.71
L3	C10	S2DL	2.50	-48.32	0.76	1.31	0.00	-1.33	-0.76	0.20	0.40	240	40.80	7.52	5.53
L2	C10	S2DL	0.00	-67.40	0.33	0.65	0.00	0.27	0.23	0.20	0.40	240	40.80	26.60	19.56
L2	C10	S2DL	1.25	-67.16	0.33	0.65	0.00	-0.54	-0.18	0.20	0.40	240	40.80	26.36	19.38
L2	C10	S2DL	2.50	-66.92	0.33	0.65	0.00	-1.34	-0.60	0.20	0.40	240	40.80	26.12	19.21
L1	C10	S2DL	0.00	-68.92	-0.29	-0.22	0.00	-0.14	-0.14	0.40	0.40	240	81.60	0.00	Ast = 1%
L1	C10	S2DL	0.50	-68.82	-0.29	-0.22	0.00	-0.03	0.01	0.40	0.40	240	81.60	0.00	Ast = 1%
L1	C10	S2DL	1.00	-68.72	-0.29	-0.22	0.00	0.08	0.15	0.40	0.40	240	81.60	0.00	Ast = 1%

$\frac{M^{E}/M^{D}}{V}$

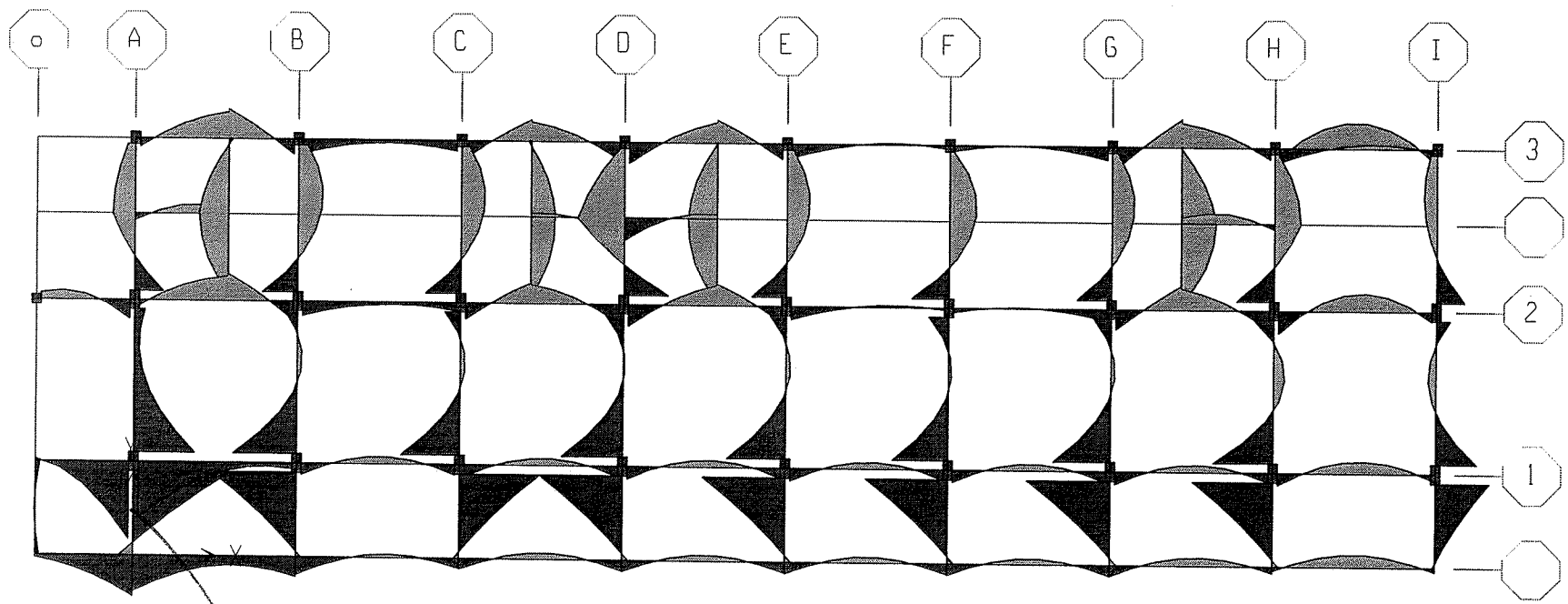


Ground FL.


M⊖/M⊕
V
B9 = 1.54/1.42
2.26
12.42
2.76
B1 = 1.91
2.06
B8: 1.1/1.79
3.29
B2 = 2.19
2.92
4.08/3.11
4.91
o
A
B
C
D
E
F
G
H
I
3
2
1
B6 = 7.63/—
6.23
2.99/1.5
3.02
B3 = 1.86/1.50
2.47
B8 = 3.38/2.00
4.96
B5 = 2.07/1.50
3.42
B7 = 7.95/—
5.03
4.05/
4.97
2nd FL

$M^{\ominus}/M^{+}$

V



7.97/-

5.25

3rd & 4th FL

Job Title : Resident 4		Subject : Design of RC. Beam	
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Beam No. : **B-1**

A) Properties of Materials

fc'	=	240 ksc	
fy	=	4,000 ksc :	Grade : SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,	
Width , b	=	**0.15** m.	
Depth , D	=	**0.40** m.	
Concrete Cover , d'	=	0.035 m.	

C) Bending Reinforcement

Neg. Bending , M-	=	1,069 kg.m	
Effective Depth , d	=	0.36 m.	
MR=Rbd^2	=	2,519 kg.m	
As'	=	0.00 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	1.96 cm^2	(As = 2.26 cm^2)
			2 DB 12 mm (B)
			(As = 2.26 cm^2)
Pos. Bending , M+	=	650 kg.m	
Effective Depth , d	=	0.36 m.	
MR=Rbd^2	=	2,519 kg.m	
As'	=	0.00 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	1.19 cm^2	(As = 2.26 cm^2)
			2 DB 12 mm (B)
			(As = 2.26 cm^2)

D) Shear Reinforcement

V	=	1,100 kg	< V(max) = 11,043 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	2,426 kg	
Provided Shear Reinf. :	RB	6 mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	0 kg	
Spacing , S	=	Av*fv*d/Vs	
	=	- cm	
d/2	=	18.00 cm	
S(min) = Av*fy/(3.5*b)	=	25.85 cm	Provided : RB - 6 mm @ 20 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	1	
Span Length , L	=	3.50 m	
Span/Depth ratio , L/D	=	8.75	
Allowable L/D	=	1.00 * 16.00	
	=	16.00 > Actual L/D ratio OK.	

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

Beam No. : **B-2**

A) Properties of Materials

fc'	=	240 ksc	
fy	=	4,000 ksc :	Grade : 0.00

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,	
Width , b	=	**0.15** m.	
Depth , D	=	**0.40** m.	
Concrete Cover , d'	=	0.035 m.	

C) Bending Reinforcement

Neg. Bending , M-	=	0 kg.m	
Effective Depth , d	=	0.36 m.	
MR=Rbd^2	=	2,519 kg.m	
As'	=	0.00 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	0.00 cm^2	(As = 2.26 cm^2)
			2 DB 12 mm (B)
			(As = 2.26 cm^2)
Pos. Bending , M+	=	2,980 kg.m	
Effective Depth , d	=	0.36 m.	
MR=Rbd^2	=	2,519 kg.m	
As'	=	1.40 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	5.55 cm^2	(As = 2.26 cm^2)
			4 DB 16 mm (B)
			(As = 8.04 cm^2)

D) Shear Reinforcement

V	=	2,992 kg	< V(max) = 11,043 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	2,426 kg	
Provided Shear Reinf. :	RB	6 mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	566 kg	
Spacing , S	=	Av*fv*d/Vs	
	=	43.16 cm	
d/2	=	18.00 cm	
S(min) = Av*fy/(3.5*b)	=	25.85 cm	Provided : RB - 6 mm. @ 20 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	1	
Span Length , L	=	3.50 m	
Span/Depth ratio , L/D	=	8.75	
Allowable L/D	=	1.00 * 16.00	
	=	16.00 > Actual L/D ratio OK.	

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

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Beam No. : **B3**

A) Properties of Materials

fc'	=	240	ksc	
fy	=	4,000	ksc :	Grade : SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50	m,
Width , b	=	**0.15**	m.
Depth , D	=	**0.40**	m.
Concrete Cover , d'	=	0.035	m.

C) Bending Reinforcement

Neg. Bending , M-	=	1,720	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	2,519	kg.m	
As'	=	0.00	cm^2	Provided : 4 DB 12 mm (T)
Ast	=	3.15	cm^2	(As = 4.52 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	1,270	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	2,519	kg.m	
As'	=	0.00	cm^2	Provided : 2 DB 12 mm (T)
Ast	=	2.33	cm^2	(As = 2.26 cm^2)
				4 DB 12 mm (B)
				(As = 4.52 cm^2)

D) Shear Reinforcement

V	=	2,310	kg	< V(max) = 11,043 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	2,426	kg	
Provided Shear Reinf. :	RB	6	mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	0	kg	
Spacing , S	=	Av*fv*d/Vs		
	=	-	cm	
d/2	=	18.00	cm	
S(min) = Av*fy/(3.5*b)	=	25.85	cm	Provided : RB - 6 mm. @ 20 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	2		
Span Length , L	=	3.50	m	
Span/Depth ratio , L/D	=	8.75		
Allowable L/D	=	1.00	* 18.50	
	=	18.50	> Actual L/D ratio OK.	

Beam Type : 1. Simple Beam 2. One End Continuous Beam 3. Both End Continuous Beam 4. Cantilever Beam

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Beam No. : **B4**

A) Properties of Materials

fc'	=	240	ksc	
fy	=	4,000	ksc :	Grade : 0.00

B) Beam Configulation & Loading

Span Length , L	=	3.50	m,
Width , b	=	**0.15**	m.
Depth , D	=	**0.40**	m.
Concrete Cover , d'	=	0.035	m.

C) Bending Reinforcement

Neg. Bending , M-	=	3,130	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	2,519	kg.m	
As'	=	1.24	cm^2	Provided : 4 DB 16 mm (T)
Ast	=	5.85	cm^2	(As = 8.04 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	2,880	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	2,519	kg.m	
As'	=	1.10	cm^2	Provided : 2 DB 12 mm (T)
Ast	=	5.34	cm^2	(As = 2.26 cm^2)
				4 DB 16 mm (B)
				(As = 8.04 cm^2)

D) Shear Reinforcement

V	=	4,290	kg	< V(max) = 11,043 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	2,426	kg	
Provided Shear Reinf. :	RB	6	mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	1,864	kg	
Spacing , S	=	Av*fv*d/Vs		
	=	13.11	cm	
d/2	=	18.00	cm	
S(min) = Av*fy/(3.5*b)	=	25.85	cm	Provided : RB - 6 mm. @ 12.50 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	2		
Span Length , L	=	3.50	m	
Span/Depth ratio , L/D	=	8.75		
Allowable L/D	=	1.00	* 18.50	
	=	18.50	> Actual L/D ratio OK.	

Beam Type : 1. Simple Beam 2. One End Continuous Beam 3. Both End Continuous Beam 4. Cantilever Beam

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Beam No. : **B4a**

A) Properties of Materials

fc'	=	240	ksc	
fy	=	4,000	ksc :	Grade : SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50	m,
Width , b	=	**0.20**	m.
Depth , D	=	**0.40**	m.
Concrete Cover , d'	=	0.035	m.

C) Bending Reinforcement

Neg. Bending , M-	=	3,800	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	3,359	kg.m	
As'	=	0.80	cm^2	Provided : **4 DB 16 mm (T)**
Ast	=	7.04	cm^2	(As = 8.04 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	1,600	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	3,359	kg.m	
As'	=	0.00	cm^2	Provided : **2 DB 12 mm (T)**
Ast	=	2.93	cm^2	(As = 2.26 cm^2)
				4 DB 12 mm (B)
				(As = 4.52 cm^2)

D) Shear Reinforcement

V	=	3,800	kg	< V(max) = 14,724 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	3,235	kg	
Provided Shear Reinf. :	RB	6	mm , Av =	0.283 cm^2 2 Legs
Vs = Vu-Vc	=	565	kg	
Spacing , S	=	Av*fv*d/Vs		
	=	43.22	cm	
d/2	=	18.00	cm	
S(min) = Av*fy/(3.5*b)	=	19.39	cm	Provided : **RB - 6 mm @ 12.50 cm (2 Legs)**

E) Section (W/O Checking of Deflection)

Beam Type	:	2		
Span Length , L	=	3.50	m	
Span/Depth ratio , L/D	=	8.75		
Allowable L/D	=	1.00	* 18.50	
	=	18.50	> Actual L/D ratio OK.	

Beam Type : 1. Simple Beam 2. One End Continuous Beam 3. Both End Continuous Beam 4. Cantilever Beam

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Beam No. : **B5**

A) Properties of Materials

fc'	=	240	ksc	
fy	=	4,000	ksc :	Grade : 0.00

B) Beam Configulation & Loading

Span Length , L	=	3.50	m,
Width , b	=	**0.15**	m.
Depth , D	=	**0.36**	m.
Concrete Cover , d'	=	0.035	m.

C) Bending Reinforcement

Neg. Bending , M-	=	2,070	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	3,359	kg.m	
As'	=	0.00	cm^2	Provided : **4 DB 12 mm (T)**
Ast	=	3.79	cm^2	(As = 4.52 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	1,500	kg.m	
Effective Depth , d	=	0.36	m.	
MR=Rbd^2	=	3,359	kg.m	
As'	=	0.00	cm^2	Provided : **2 DB 12 mm (T)**
Ast	=	2.75	cm^2	(As = 2.26 cm^2)
				4 DB 12 mm (B)
				(As = 4.52 cm^2)

D) Shear Reinforcement

V	=	3,420	kg	< V(max) = 11,043 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	2,426	kg	
Provided Shear Reinf. :	RB	6	mm , Av =	0.283 cm^2 2 Legs
Vs = Vu-Vc	=	994	kg	
Spacing , S	=	Av*fv*d/Vs		
	=	24.58	cm	
d/2	=	18.00	cm	
S(min) = Av*fy/(3.5*b)	=	25.85	cm	Provided : **RB - 6 mm @ 20 cm (2 Legs)**

E) Section (W/O Checking of Deflection)

Beam Type	:	2		
Span Length , L	=	3.50	m	
Span/Depth ratio , L/D	=	9.72		
Allowable L/D	=	1.00	* 18.50	
	=	18.50	> Actual L/D ratio OK.	

Beam Type : 1. Simple Beam 2. One End Continuous Beam 3. Both End Continuous Beam 4. Cantilever Beam

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Beam No. : **B6**

A) Properties of Materials

fc'	=	240 ksc	
fy	=	4,000 ksc :	Grade : SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,	
Width , b	=	**0.20** m.	
Depth , D	=	**0.50** m.	
Concrete Cover , d'	=	0.035 m.	

C) Bending Reinforcement

Neg. Bending , M-	=	7,630 kg.m	
Effective Depth , d	=	0.46 m.	
MR=Rbd^2	=	5,485 kg.m	
As'	=	3.05 cm^2	Provided : 5 DB 20 mm (T)
Ast	=	11.19 cm^2	(As = 15.71 cm^2)
			3 DB 20 mm (B)
			(As = 9.42 cm^2)
Pos. Bending , M+	=	650 kg.m	
Effective Depth , d	=	0.46 m.	
MR=Rbd^2	=	5,485 kg.m	
As'	=	0.00 cm^2	Provided : 2 DB 20 mm (T)
Ast	=	0.93 cm^2	(As = 6.28 cm^2)
			2 DB 20 mm (B)
			(As = 6.28 cm^2)

D) Shear Reinforcement

V	=	6,230 kg	< V(max) = 18,813 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	4,133 kg	
Provided Shear Reinf. :	RB	6 mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	2,097 kg	
Spacing , S	=	Av*fv*d/Vs	
	=	14.89 cm	
d/2	=	23.00 cm	
S(min) = Av*fy/(3.5*b)	=	19.39 cm	Provided : RB - 6 mm. @ 12.5 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	2	
Span Length , L	=	3.50 m	
Span/Depth ratio , L/D	=	7.00	
Allowable L/D	=	1.00 * 18.50	
	=	18.50 > Actual L/D ratio OK.	

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

Beam No. : **B7**

A) Properties of Materials

fc'	=	240 ksc	
fy	=	4,000 ksc :	Grade : 0.00

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,	
Width , b	=	**0.20** m.	
Depth , D	=	**0.50** m.	
Concrete Cover , d'	=	0.035 m.	

C) Bending Reinforcement

Neg. Bending , M-	=	7,950 kg.m	
Effective Depth , d	=	0.46 m.	
MR=Rbd^2	=	5,485 kg.m	
As'	=	3.82 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	11.68 cm^2	(As = 2.26 cm^2) *Increase Rebars !*
			2 DB 12 mm (B)
			(As = 2.26 cm^2) *Increase Rebars !*
Pos. Bending , M+	=	1,500 kg.m	
Effective Depth , d	=	0.46 m.	
MR=Rbd^2	=	5,485 kg.m	
As'	=	0.00 cm^2	Provided : 2 DB 12 mm (T)
Ast	=	2.15 cm^2	(As = 2.26 cm^2)
			4 DB 16 mm (B)
			(As = 8.04 cm^2)

D) Shear Reinforcement

V	=	5,030 kg	< V(max) = 18,813 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	4,133 kg	
Provided Shear Reinf. :	RB	6 mm , Av = 0.283 cm^2	2 Legs
Vs = Vu-Vc	=	897 kg	
Spacing , S	=	Av*fv*d/Vs	
	=	34.81 cm	
d/2	=	23.00 cm	
S(min) = Av*fy/(3.5*b)	=	19.39 cm	Provided : RB - 6 mm. @ 12.5 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	2	
Span Length , L	=	3.50 m	
Span/Depth ratio , L/D	=	7.00	
Allowable L/D	=	1.00 * 18.50	
	=	18.50 > Actual L/D ratio OK.	

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

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Beam No. : **B8**

A) Properties of Materials

fc'	=	240 ksc		
fy	=	4,000 ksc :	Grade :	SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,		
Width , b	=	**0.20** m.		
Depth , D	=	**0.50** m.		
Concrete Cover , d'	=	0.035 m.		

C) Bending Reinforcement

Neg. Bending , M-	=	3,380 kg.m		
Effective Depth , d	=	0.46 m.		
MR=Rbd^2	=	5,485 kg.m		
As'	=	0.00 cm^2	Provided :	2 DB 20 mm (T)
Ast	=	4.84 cm^2		(As = 6.28 cm^2)
				2 DB 16 mm (B)
				(As = 4.02 cm^2)
Pos. Bending , M+	=	2,000 kg.m		
Effective Depth , d	=	0.46 m.		
MR=Rbd^2	=	5,485 kg.m		
As'	=	0.00 cm^2	Provided :	2 DB 16 mm (T)
Ast	=	2.87 cm^2		(As = 4.02 cm^2)
				2 DB 16 mm (B)
				(As = 4.02 cm^2)

D) Shear Reinforcement

V	=	4,960 kg	< V(max) =	18,813 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	4,133 kg		
Provided Shear Reinf. :	RB	6 mm , Av =	0.283 cm^2	2 Legs
Vs = Vu-Vc	=	827 kg		
Spacing , S	=	Av*fv*d/Vs		
	=	37.76 cm		
d/2	=	23.00 cm		
S(min) = Av*fy/(3.5*b)	=	19.39 cm	Provided :	RB - 6 mm. @ 20 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	1		
Span Length , L	=	3.50 m		
Span/Depth ratio , L/D	=	7.00		
Allowable L/D	=	1.00 *	16.00	
	=	16.00 > Actual L/D ratio OK.		

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

Beam No. : **B9**

A) Properties of Materials

fc'	=	240 ksc		
fy	=	4,000 ksc :	Grade :	0.00

B) Beam Configulation & Loading

Span Length , L	=	3.50 m,		
Width , b	=	**0.15** m.		
Depth , D	=	**0.50** m.		
Concrete Cover , d'	=	0.035 m.		

C) Bending Reinforcement

Neg. Bending , M-	=	1,540 kg.m		
Effective Depth , d	=	0.46 m.		
MR=Rbd^2	=	5,485 kg.m		
As'	=	0.00 cm^2	Provided :	2 DB 12 mm (T)
Ast	=	2.21 cm^2		(As = 2.26 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	1,750 kg.m		
Effective Depth , d	=	0.46 m.		
MR=Rbd^2	=	5,485 kg.m		
As'	=	0.00 cm^2	Provided :	2 DB 12 mm (T)
Ast	=	2.51 cm^2		(As = 2.26 cm^2)
				4 DB 12 mm (B)
				(As = 4.52 cm^2)

D) Shear Reinforcement

V	=	3,290 kg	< V(max) =	14,110 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	3,100 kg		
Provided Shear Reinf. :	RB	6 mm , Av =	0.283 cm^2	2 Legs
Vs = Vu-Vc	=	190 kg		
Spacing , S	=	Av*fv*d/Vs		
	=	164.23 cm		
d/2	=	23.00 cm		
S(min) = Av*fy/(3.5*b)	=	25.85 cm	Provided :	RB - 6 mm. @ 20 cm (2 Legs)

E) Section (W/O Checking of Deflection)

Beam Type	:	1		
Span Length , L	=	3.50 m		
Span/Depth ratio , L/D	=	7.00		
Allowable L/D	=	1.00 *	16.00	
	=	16.00 > Actual L/D ratio OK.		

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

Job Title : Resident 4		Subject : Design of RC. Beam	
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Beam No. : **bst**

A) Properties of Materials

fc'	=	240	ksc	
fy	=	4,000	ksc :	Grade : SD-40

B) Beam Configulation & Loading

Span Length , L	=	3.50	m,
Width , b	=	**0.20**	m.
Depth , D	=	**0.40**	m.
Concrete Cover , d'	=	0.035	m.

C) Bending Reinforcement

Neg. Bending , M-	=	1,100	kg.m	
Effective Depth , d	=	0.36	m.	
$MR=Rbd^2$	=	3,359	kg.m	
As'	=	0.00	cm^2	Provided : **2 DB 12 mm (T)**
Ast	=	2.01	cm^2	(As = 2.26 cm^2)
				2 DB 12 mm (B)
				(As = 2.26 cm^2)
Pos. Bending , M+	=	1,750	kg.m	
Effective Depth , d	=	0.36	m.	
$MR=Rbd^2$	=	3,359	kg.m	
As'	=	0.00	cm^2	Provided : **2 DB 12 mm (T)**
Ast	=	3.20	cm^2	(As = 2.26 cm^2)
				4 DB 12 mm (B)
				(As = 4.52 cm^2)

D) Shear Reinforcement

V	=	3,290	kg	< V(max) = 14,724 kg ; Section OK.
Vc=0.29*Sqrt(fc')*b*d	=	3,235	kg	
Provided Shear Reinf. :	RB	6	mm , Av =	0.283 cm^2 2 Legs
Vs = Vu-Vc	=	55	kg	
Spacing , S	=	Av*fv*d/Vs		
	=	441.88	cm	
d/2	=	18.00	cm	
S(min) = Av*fy/(3.5*b)	=	19.39	cm	Provided : **RB - 6 mm @ 20 cm (2 Legs)**

E) Section (W/O Checking of Deflection)

Beam Type	:	1		
Span Length , L	=	3.50	m	
Span/Depth ratio , L/D	=	8.75		
Allowable L/D	=	1.00	* 16.00	
	=	16.00	> Actual L/D ratio OK.	

Beam Type : 1. Simple Beam
2. One End Continuous Beam
3. Both End Continuous Beam
4. Cantilever Beam

Job Title	:	Resident 4		Subject :	Design of RC. Slab
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Slab No. : S-1

Type : Two-way slab (Method 2)

A) Properties of Materials & Design Parmeter

fy	Yield strength of steel	=	2,400	ksc
fs	Allowable strength of steel	=	1,200	ksc
fc'	Ult. compressive strength of concrete	=	240	ksc
	Factor	=	0.375	
fc	Allowable strength of concrete , fc = Factor*fc'	=	90	ksc
k	k = 1/(1+(fs/(n*fc)))	=	0.379	
j	j = 1-k/3	=	0.874	
R	R = 0.50*fc*j*k	=	14.89	ksc

B) Slab Configuration

	Slab case	:	4	
S	Short span	=	1.90	m
L	Long span	=	2.00	m
t	Thickness , t(min) = 0.043 m.	=	**0.100**	m
m	S/L ratio	=	0.95	
dc	Concrete covering	=	0.020	m

Slab case
1 Interoir
2 Discont. 1 side
3 Discont. 2 side
4 Discont. 3 side
5 Discont. 4 side

C) Loading

SW	Self weight , SW = t*2400	=	240	kg/m^2
DL	Superimposed dead load	=	150	kg/m^2
LL	Live load	=	150	kg/m^2
wt	Total load , wt = SW+DL+LL	=	540	kg/m^2

D) Bending Reinforcement

D.1) Short Span :

d	Effective depth		=	0.077	m	
MR	Resisting Moment , Mr = R*(d*100)^2		=	883	kg-m/m	
	Coefficient C	Moment C*wt*S^2 [kg-m/m]	As(req) M/(fs*j*d) [cm^2/m]	**Provided reinfocement**		
M- sup (cont.)	0.064	125	**1.55**	RB	6 mm. @	0.175 m
				(As =	**1.62** cm^2/m)	
M- sup (discont.)	0.032	62	**0.77**	RB	6 mm. @	0.20 m
				(As =	**1.41** cm^2/m)	
M+ mid. Span	0.049	95	**1.17**	RB	6 mm. @	0.20 m
				(As =	**1.41** cm^2/m)	

D.2) Long Span :

d	Effective depth		=	0.071	m	
MR	Resisting Moment , Mr = R*(d*100)^2		=	751	kg-m/m	
	Coefficient C	Moment C*wt*S^2 [kg-m/m]	As(req) M/(fs*j*d) [cm^2/m]	**Provided reinfocement**		
M- sup (cont.)	0.058	113	**1.52**	RB	6 mm. @	0.175 m
				(As =	**1.62** cm^2/m)	
M- sup (discont.)	0.029	57	**0.76**	RB	6 mm. @	0.20 m
				(As =	**1.41** cm^2/m)	
M+ mid. Span	0.044	86	**1.15**	RB	6 mm. @	0.20 m
				(As =	**1.41** cm^2/m)	
Ast(min)	Temp. steel , Ast(min) =0.0025 *b*t		=	**2.50**	cm^2/m	

E) Transfer shear to support

V-S	Shear short span	=	1	kg/m
V-L	Shear long span	=	1	kg/m

Job Title	:	Resident 4		Subject :	Design of RC. Slab
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Slab No. : S-2

Type : Two-way slab (Method 2)

A) Properties of Materials & Design Parmeter

fy	Yield strength of steel	=	2,400	ksc
fs	Allowable strength of steel	=	1,200	ksc
fc'	Ult. compressive strength of concrete	=	240	ksc
	Factor	=	0.375	
fc	Allowable strength of concrete , fc = Factor*fc'	=	90	ksc
k	k = 1/(1+(fs/(n*fc)))	=	0.379	
j	j = 1-k/3	=	0.874	
R	R = 0.50*fc*j*k	=	14.89	ksc

B) Slab Configuration

	Slab case	:	3	
S	Short span	=	2.00	m
L	Long span	=	3.50	m
t	Thickness , t(min) = 0.061 m.	=	**0.125**	m
m	S/L ratio	=	0.57	
dc	Concrete covering	=	0.025	m

Slab case
1 Interoir
2 Discont. 1 side
3 Discont. 2 side
4 Discont. 3 side
5 Discont. 4 side

C) Loading

SW	Self weight , SW = t*2400	=	300	kg/m^2
DL	Superimposed dead load	=	150	kg/m^2
LL	Live load	=	150	kg/m^2
wt	Total load , wt = SW+DL+LL	=	600	kg/m^2

D) Bending Reinforcement

D.1) Short Span :

d	Effective depth			=	0.096	m	
MR	Resisting Moment , Mr = R*(d*100)^2			=	1,358	kg-m/m	
	Coefficient C	Moment C*wt*S^2 [kg-m/m]	As(req) M/(fs*j*d) [cm^2/m]	**Provided reinfocement**			
M- sup (cont.)	0.084	202	**2.01**	**RB**	**9 mm. @**	**0.200 m**	
				(As =	**3.18**	cm^2/m)	
M- sup (discont.)	0.042	101	**1.01**	**RB**	**9 mm. @**	**0.20 m**	
				(As =	**3.18**	cm^2/m)	
M+ mid. Span	0.064	152	**1.52**	**RB**	**9 mm. @**	**0.20 m**	
				(As =	**3.18**	cm^2/m)	

D.2) Long Span :

d	Effective depth			=	0.087	m	
MR	Resisting Moment , Mr = R*(d*100)^2			=	1,114	kg-m/m	
	Coefficient C	Moment C*wt*S^2 [kg-m/m]	As(req) M/(fs*j*d) [cm^2/m]	**Provided reinfocement**			
M- sup (cont.)	0.049	118	**1.30**	**RB**	**9 mm. @**	**0.200 m**	
				(As =	**3.18**	cm^2/m)	
M- sup (discont.)	0.025	60	**0.66**	**RB**	**9 mm. @**	**0.20 m**	
				(As =	**3.18**	cm^2/m)	
M+ mid. Span	0.037	89	**0.98**	**RB**	**9 mm. @**	**0.20 m**	
				(As =	**3.18**	cm^2/m)	
Ast(min)	Temp. steel , Ast(min) =0.0025 *b*t			=	**3.13**	cm^2/m	

E) Transfer shear to support

V-S	Shear short span	=	1	kg/m
V-L	Shear long span	=	1	kg/m

Job Title : Resident 4		Subject : Design of RC. Stair	
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Stair No. : ST-1

A) Properties of Materials and Design Parameter

fy (Main Reinf.)	=	4,000	ksc
fs	=	1,700	ksc
fy (Temp. Reinf.)	=	2,400	ksc
fc' (Cyl.)	=	173	ksc
Factor	=	0.375	
fc	=	65	ksc
Es	=	2.04E+06	ksc
Ec	=	2.09E+05	ksc
n	=	10	
k	=	0.27	
j	=	0.91	
R	=	8.01	ksc
vc	=	3.81	ksc

B) Stair Configuration

Span Length , L	=	3.50	m
Thickness , t	=	0.150	m
Horizontal size of step , b	=	0.300	m
Vertical size of step , h	=	0.175	m
Concrete Cover	=	0.025	m

C) Loading

Superimpose Deadload , FL	=	50	kg/m^2	
Landing+FL, DL1	=	710	kg/m^2	
Stair+FL , DL2	=	994	kg/m^2	
LL	=	300	kg/m^2	
wt-1	=	1,060	kg/m^2	(Landind+FL+LL)
wt-2	=	1,344	kg/m^2	(Step + FL+LL)

D) Bending Reinforcement

d	=	0.119	m	
MR	=	1,135	kg-m/m	
Asr	=	6.17	cm^2/m	
M	=	1,367	kg-m/m	
As'	=	1.60	cm^2/m	12 mm. @ 0.20 m. (T)
				(Ast = 5.65 cm^2/m)
Ast	=	7.76	cm^2/m	12 mm. @ 0.13 m. (B)
				(Ast = 9.05 cm^2/m)
As-temp.	=	0.0025	*b*t	9 mm. @ 0.20 m. (T&B)
	=	3.75	cm^2/m	(Ast = 6.36 cm^2/m)

E) Load Transfer to Support

Serviced Load :	R1	=	1,648	kg/m
	R2	=	1,405	kg/m

Vc = 4,539 kg/m ; > Vu OK.

F) Deflection

Es	=	2.04E+06	ksc
Ec	=	2.09E+05	ksc
n = Es/Ec	=	10	
ρ'	=	0.0048	
ρ	=	0.0076	
B = b/(n.As)	=	1.13	/cm
r = (n-1)As'/(n.As)	=	0.56	
Kd	=	$[Sqrt(2dB(1+rd'/d)+(1+r)^2)]-(1+r)]/B$	
	=	3.66	cm
Ig	=	28,125	cm^4/m
Icr	=	$b(Kd)^3/3+nAs(d-kd)^2+(n-1)As'(kd-d')^2$	
	=	7,702 cm^4/m	< Ig OK.
Mcr = fr*Ig/(t/2)	=	986	kg-m/m
M(service), Ms	=	1,367	kg-m/m
$(Mcr/Ms)^3$	=	0.376	
Ie	=	$(Mcr/Ms)^3.Ig+[1-(Mcr/Ms)^3].Icr$	
		15,385 cm^4/m	< Ig OK.
Ec*Ie	=	3.21E+09	ksc
$\Delta = 5*wL^4/(384*Ec*Ie)$	=	0.43	cm
Δ-allowable = L/240	=	1.46	cm OK.

Job Title	:	Resident 4		Subject :	Steel Purlin
Designed	:	PSJ	Date : Mar-12		
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A) Properties of Materials

Fy	Yield Strength	=	2,400	ksc
Es	Modulus of Elasticity	=	2.10E+06	ksc

Section Properties

Section	:	**C-100x50x20x2.3**
Jnit Weight	=	4.06 kg/m
Ix	=	80.70 cm^4
Iy	=	19.00 cm^4
SX	=	16.10 cm^3
SY	=	6.06 cm^3

B) Roof Configuration & Loading

Asbestos Cement Roofing Tile or Steel Roof Sheet ;

L	Span , L	=	3.50	m
@	Spacing of Purlin	=	1.00	m
θ	Angle of Roof	=	20	° (Slope ≧ 10 °)
SW	Purlin DL	=	4.06	kg/m
DL	Deal load of Roof Sheet	=	8	kg/m^2
LL	Live Load	=	30	kg/m^2
WL	Wind Pressure	=	80	kg/m^2

C) Check Bending Stresses

SW	Self weight of Purlin	=	4.06	kg/m
dl	Roof Sheet = DL*@	=	7.50	kg/m
ll	Live Load = LL*@	=	30.00	kg/m
wt	Total load			
	wt = SW+dl+ll	=	41.56	kg/m
wl	Wind Load Perpen. to Purlin			
	wl = WL*@*Sin θ	=	27.36	kg/m
wy	Wy = wt*Cos θ +wl	=	66.42	kg/m
wx	Wx = wt*Sin θ	=	14.21	kg/m
cmx	Moment coefficient for X-axis	=	0.125	
cmy	Moment coefficient for Y-axis	=	0.125	
Mx	Mx = cmx*wy*L^2	=	102	kg.m
My	My = cmy*wx*L^2	=	22	kg.m
fb	fb =(Mx/SX)+(My/(SY/2))	=	1,350	ksc
Fb	Alloable Stress			
	Fb = 0.6*Fy	=	1,440	ksc fb < Fb OK.

D) Check Deflection

cd	Deflection coefficient	=	0.013	
Δy	Deflection			
	Δy = (cd*wy*L^3)/(Es*Ix)	=	0.77	cm
Δ-all	Allowable Deflection			
	Δ-allowable = L/240	=	1.46	cm dy < d-all OK.

Job Title	:	Resident 4		Subject :	จันทันเหล็ก
Designed	:	PSJ	Date : Mar-12		
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A) Properties of Materials

Fy	Yield Strength	=	2,400 ksc
Es	Modulus of Elasticity	=	2.10E+06 ksc

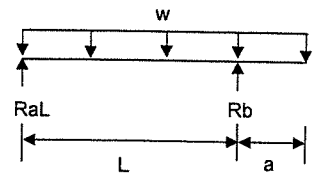
Section Properties

Section	:	**Rec-150x50x2.3**
Jnit Weight	=	6.95 kg/m
Ix	=	235.28 cm^4
Iy	=	42.00 cm^4
SX	=	31.37 cm^3
SY	=	16.80 cm^3

B) Roof Configuration & Loading

Asbestos Cement Roofing Tile or Steel Roof Sheet ;

L	Span , L	=	2.25 m
a	Cantilever Span, a	=	1.30 m
@	Spacing of Rafter	=	3.50 m
θ	Angle of Roof	=	20 °
SW	Rafter DL	=	6.95 kg/m
DL	Deal load of Roof Sheet+Purlin	=	15 kg/m^2
LL	Live Load	=	30 kg/m^2
WL	Wind Pressure	=	80 kg/m^2



C) Check Bending Stresses

SW	Self weight of Purlin	=	6.95 kg/m
dl	Roof Sheet = DL*@	=	52.50 kg/m
ll	Live Load = LL*@	=	105.00 kg/m
wl	Wind Load = WL*@	=	280.00 kg/m
wt	Total load		
	$wt = (SW+dl+ll+wl)/\cos\theta$	=	472.97 kg/m
Mc	$Mc = -0.50*wt*a^2$	=	-400 kg.m
M+max	$M+max = Ra*Xo-wt*Xo^2/2$		
	$Xo = (L^2-a^2)/(2*L)$	=	0.13 m
	M+max	=	41 kg.m
fb max	fb =Max(abs(Mc,M+max))/SX	=	1,274 ksc
Fb	Alloable Stress		
	Fb = 0.6*Fy	=	1,440 ksc

fb < Fb OK.

D) Check Deflection

Δo	Deflection in span			
	$\Delta o = (5*wt*L*L^3)/(384*Es*Ix)-Mc*L^2/(16*Es*Ix)$	=	0.06 cm	
Δ-all	Allowable Deflection			
	Δ-allowable = L/240	=	0.94 cm	dy < d-all OK.
Δc	Deflection			
	$\Delta c = (wt*a*a^3)/(8*Es*Ix)+wt*L*a*(4a^2-L^2)/(24*Es*Ix)$	=	0.34 cm	Recheck Formuls
Δ-all	Allowable Deflection			
	Δ-allowable = a/120	=	1.08 cm	dy < d-all OK.

D) Reaction

1.02

Ra		=	354 kg
Rb		=	1,325 kg

Job Title	:	Resident 4		Subject :	อะเสเหล็ก
Designed	:	PSJ	Date : Mar-12		
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A) Properties of Materials

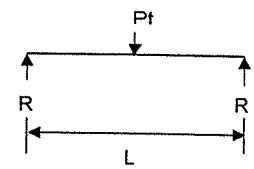
Fy	Yield Strength	=	2,400	ksc
Es	Modulus of Elasticity	=	2.10E+06	ksc

Section Properties

Section	:	**Rec-150x100x3.2**
Unit Weight	=	15.33 kg/m
Ix	=	487.20 cm^4
SX	=	64.96 cm^3

B) Roof Configuration & Loading

L	Span , L	=	3.50	m
θ	Angle of Roof	=	20	°
SW	Rafter DL	=	15.33	kg/m
Pt	Pt from Steel Post	=	1,040	kg
wt	Total load	=		
	wt = (SW+W)	=	15.33	kg/m



C) Check Bending Stresses

M+max	$M+max = 0.125*wt*L^2$		933.47	kg.m	
fb	fb =M+max/SX	=	1,437	ksc	
Fb	Alloable Stress				
	Fb = 0.6*Fy	=	1,440	ksc	**fb < Fb OK.**

D) Check Deflection

Δo	Deflection in span				
	$Δo = (Pt*L^3)/(48*Es*Ix)$	=	0.91	cm	
Δ-all	Allowable Deflection				
	Δ-allowable = L/240	=	1.46	cm	**dy < d-all OK.**

D) Reaction

R		=	547	kg

Job Title	:	Resident 4		Subject :	อะเสเหล็ก
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A) Properties of Materials

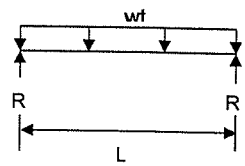
Fy	Yield Strength	=	2,400	ksc
Es	Modulus of Elasticity	=	2.10E+06	ksc

Section Properties

Section	:	**Rec-150x100x3.2**
Jnit Weight	=	15.33 kg/m
Ix	=	487.20 cm^4
SX	=	64.96 cm^3

B) Roof Configuration & Loading

L	Span , L	=	3.50	m
θ	Angle of Roof	=	20	°
SW	Rafter DL	=	15.33	kg/m
W	Total Load from Rafter	=	550	kg/m
wt	Total load	=		
	wt = (SW+W)	=	15.33	kg/m



C) Check Bending Stresses

M+max	M+max = 0.125*wt*L^2		23.47	kg.m	
fb	fb =M+max/SX	=	36	ksc	
Fb	Alloable Stress				
	Fb = 0.6*Fy	=	1,440	ksc	**fb < Fb OK.**

D) Check Deflection

Δo	Deflection in span				
	Δo = (5*wt*L*L^3)/(384*Es*Ix)	=	0.03	cm	
Δ-all	Allowable Deflection				
	Δ-allowable = L/240	=	1.46	cm	**dy < d-all OK.**

D) Reaction

R		=	27	kg

Job Title	:	Resident 4		Subject : ดั้งเหล็ก, เสาเหล็ก	
Designed	:	PSJ	Date : Mar-12		
Checked	:		Date :	Sheet :	Page :

Steel Post

A) Properties of Materials

Fy	=	2,400	ksc
Es	=	2.10E+06	ksc

C) Loading

Axial Force	=	1,040	kg

D) Check Allowable Compression Force

Length of Member , L	=	250	cm
K	=	1.00	
KL/r	=	63.78	
Cc = Sqrt($2\pi^2$*Es/Fy)	=	131.42	

KL/r < Cc ;

Fa = (1-(KL/r)^2/(2*Cc^2))Fy/(5/3+3(KL/r)/(8*Cc)-(KL/r)^3/(8*Cc^3))

= 1,154 ksc

Pa = Fa*A = 14,002 kg P < Pa OK.

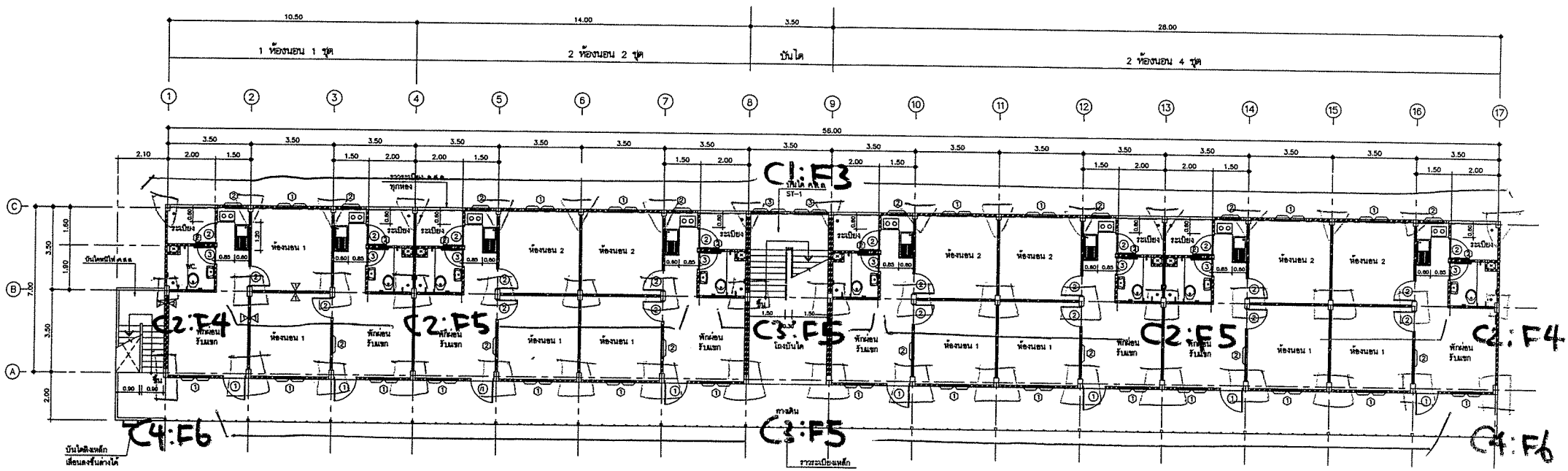
B) Properties of Section

USE Section	:	**Squ. 100x100x3.2 mm.**
Section Area , A	=	12.13 cm^2
rx	=	3.92 cm
ry	=	3.92 cm

Notes : Effective Length Coefficient

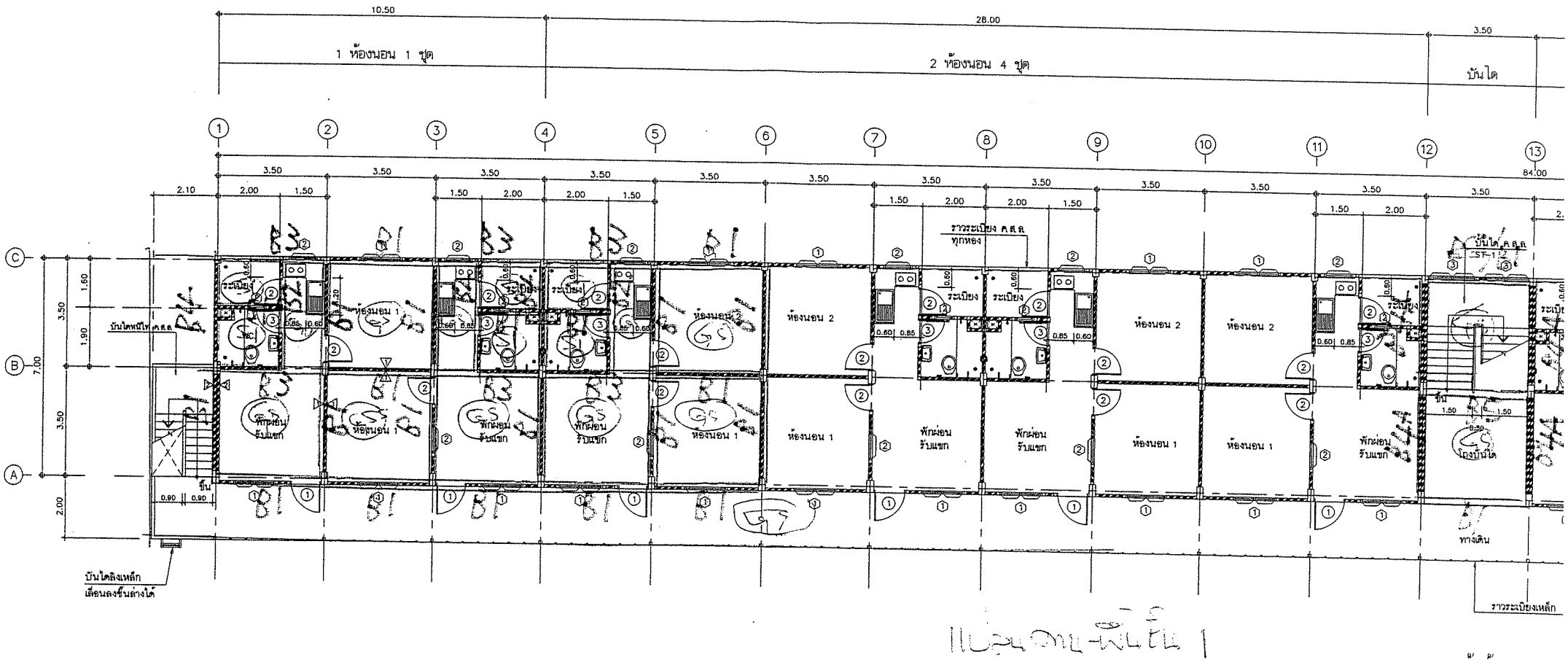
K	Condition
1.00	Pined with Pined Base
2.00	Guided with Pined Base
0.65	Fixed with Fixed Base
0.80	Pined with Fixed Base
1.20	Guided with Fixed Base
2.10	Free with Fixed Base

56.00

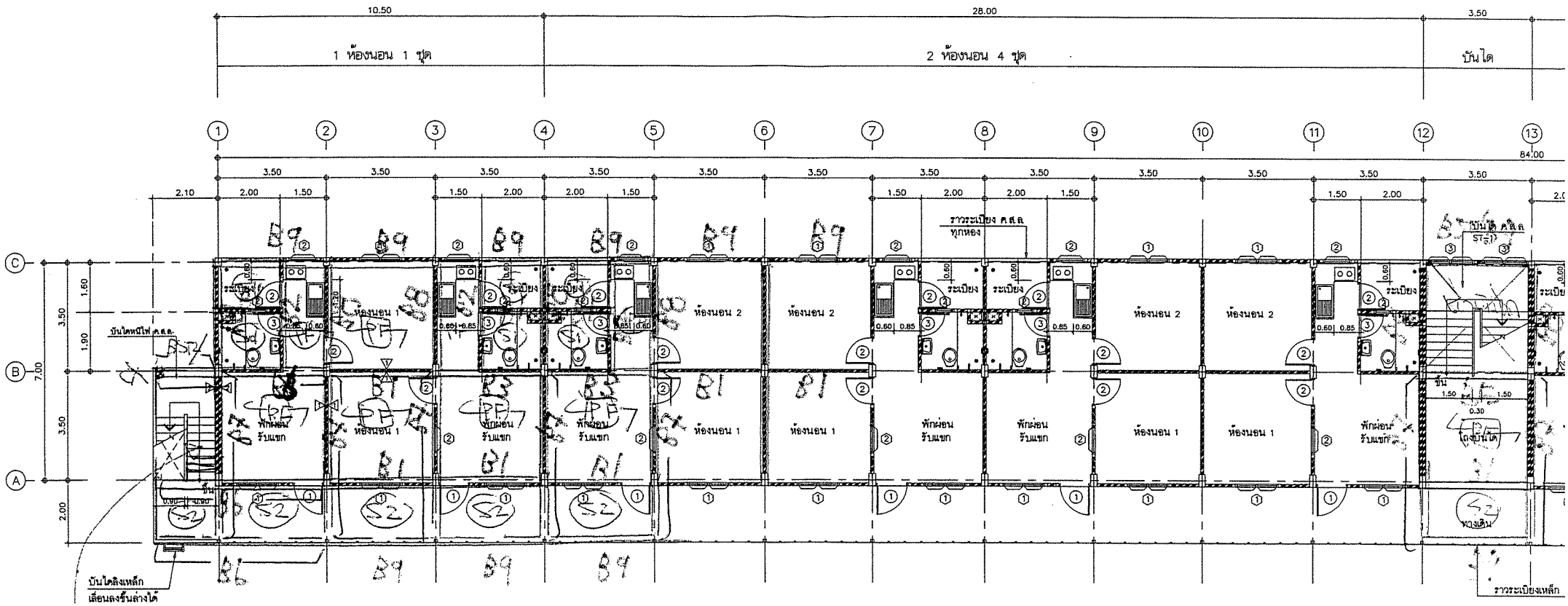


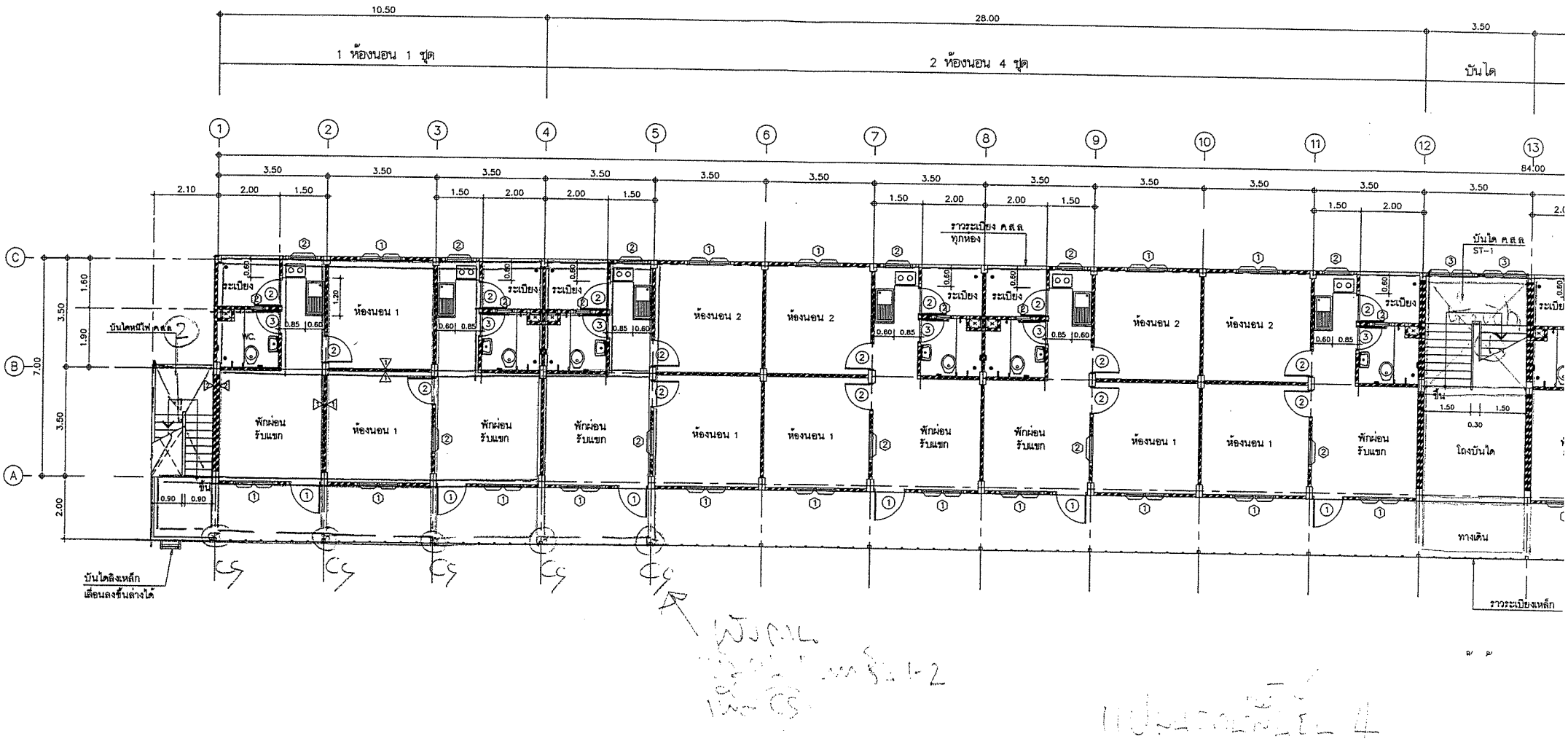
แปลนพื้นชั้น 1–4
มาตราส่วน 1 : 100

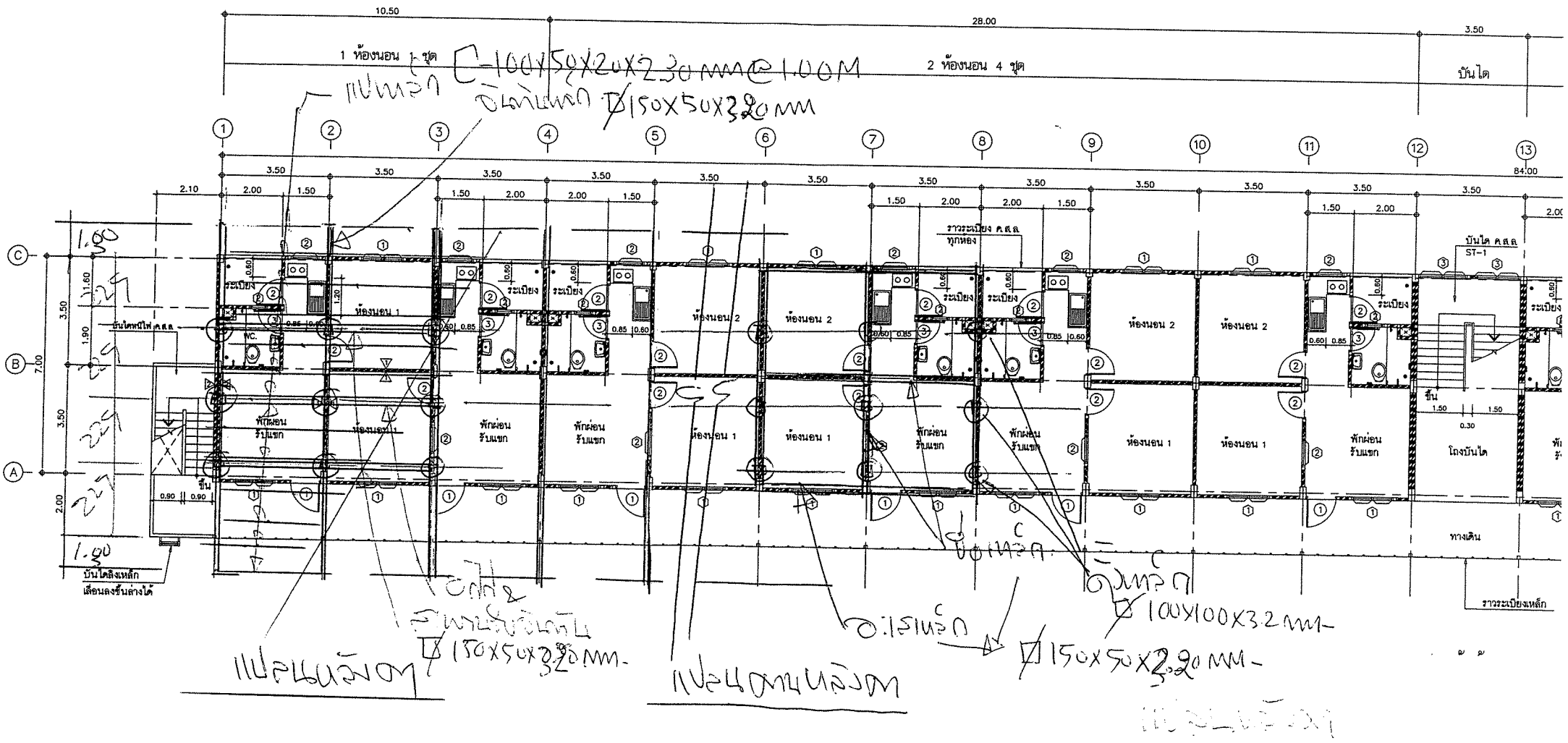
Creation
แปลนหน้า

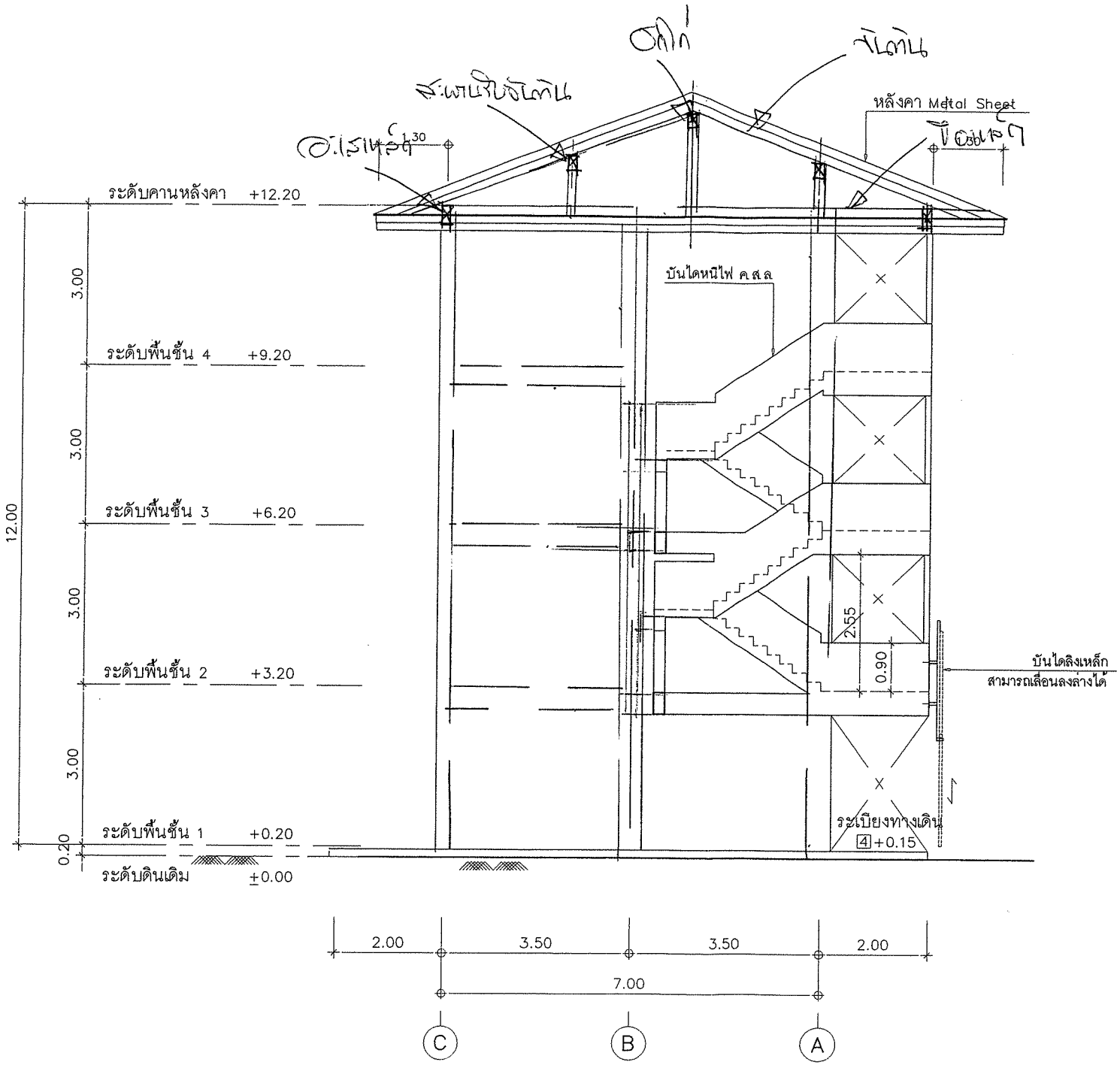

1 ห้องนอน 1 ชุด
2 ห้องนอน 4 ชุด
บันได
ห้องนอน 1
ห้องนอน 2
พักผ่อน รับแขก
ระเบียง
ราวระเบียง คสล. ทุกห้อง
บันไดหนีไฟ คสล.
บันไดลิงเหล็ก เลื่อนลงขึ้นล่างได้
ทางเดิน
ราวระเบียงเหล็ก
โถงบันได
ชั้น

แบบผังพื้นชั้น 1


10.50
28.00
3.50
1 ห้องนอน 1 ชุด
2 ห้องนอน 4 ชุด
บันได
84.00
ห้องนอน 1
ห้องนอน 2
พักผ่อน รับแขก
ระเบียง
ราวระเบียง ค.ส.ล. ทุกห้อง
บันไดหนีไฟ ค.ส.ล.
บันไดลิงเหล็ก เลื่อนลงขึ้นล่างได้
ราวระเบียงเหล็ก


10.50
28.00
3.50
1 ห้องนอน 1 ชุด
2 ห้องนอน 4 ชุด
บันได
84.00
ห้องนอน 1
ห้องนอน 2
พักผ่อน รับแขก
ระเบียง
WC.
ราวระเบียง คสล. ทุกห้อง
บันได คสล. ST-1
โถงบันได
ทางเดิน
ขึ้น
บันไดหนีไฟ คสล.
บันไดลิงเหล็ก เลื่อนลงขึ้นด่างได้
ราวระเบียงเหล็ก

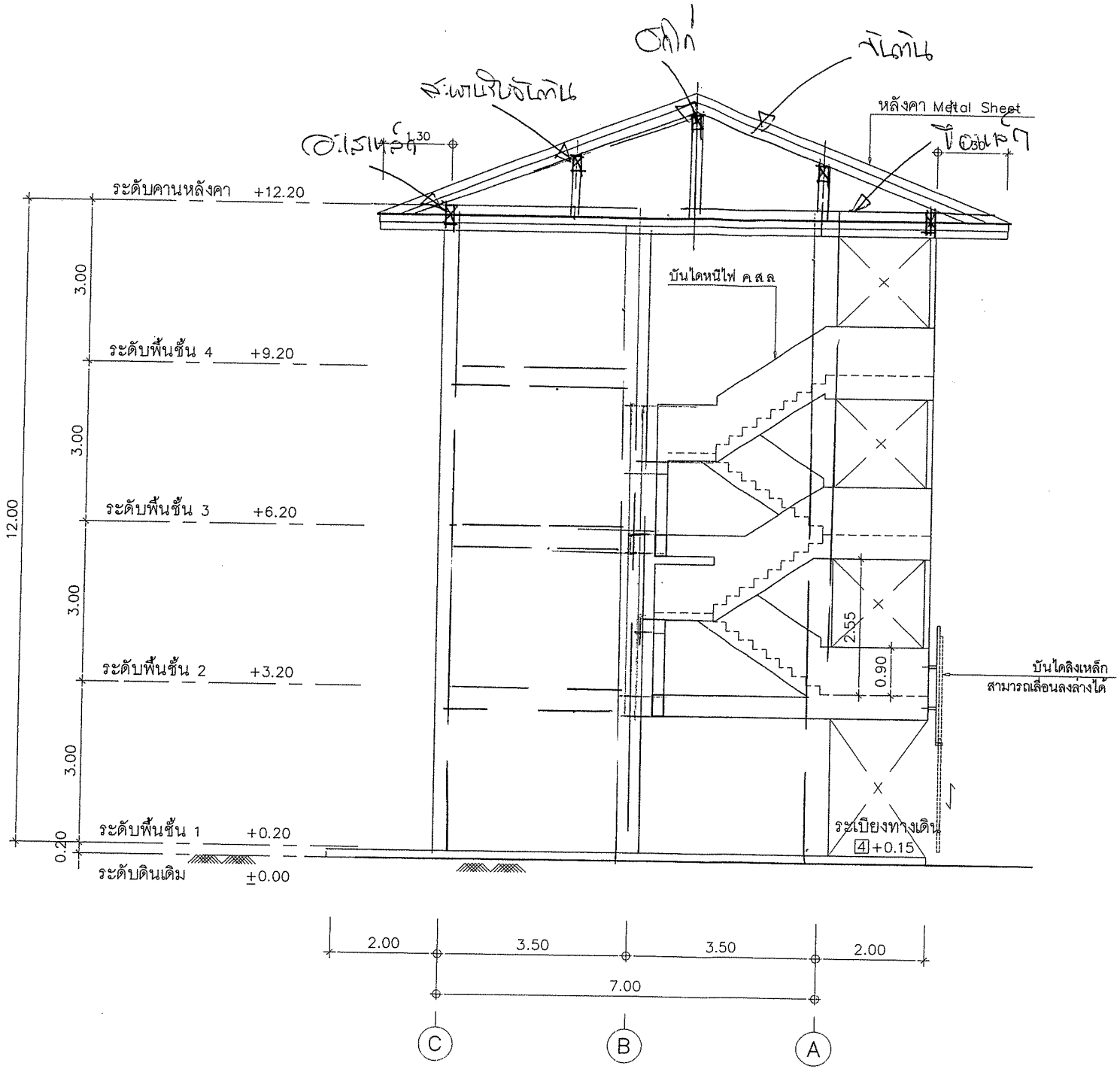

1 ห้องนอน 1 ชุด
2 ห้องนอน 4 ชุด
บันได
ห้องนอน 1
ห้องนอน 2
พักผ่อนรับแขก
ระเบียง
ราวระเบียง คสล ทุกห้อง
บันได คสล ST-1
ขึ้น
โถงบันได
ทางเดิน
บันไดลิงเหล็กเลื่อนลงชั้นล่างได้
ราวระเบียงเหล็ก
C-100X50X20X2.30mm@1.00M
150X50X3.20mm
100X100X3.2mm
150X50X3.20mm
150X50X3.20mm



รูปด้าน 4

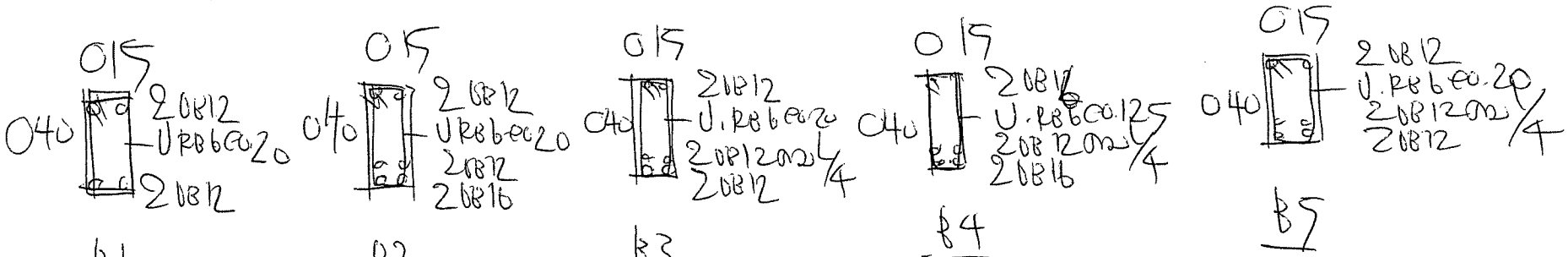
มาตราส่วน 1 : 75

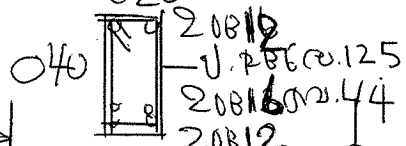
তলা / কলাম	C1	C2	C3	C4
ছাদ ↑ সিঁড়ি ৪				
সিঁড়ি ৪ – সিঁড়ি ৩				020 040 8–08 12 2URB 6@0.20
সিঁড়ি ৩ – সিঁড়ি ২			020 040 8–08 12 2URB 6@0.20	020 040 8–08 16 2URB 6@0.20
সিঁড়ি ২ – সিঁড়ি ১				
সিঁড়ি ১ ↓ ভূমিতল	020 025 6–08 12 1.RB 6@0.20	020 040 8–08 12 2URB 6@0.20	020 040 8–08 16 2URB 6@0.20	020 040 10–08 20 2URB 6@0.20

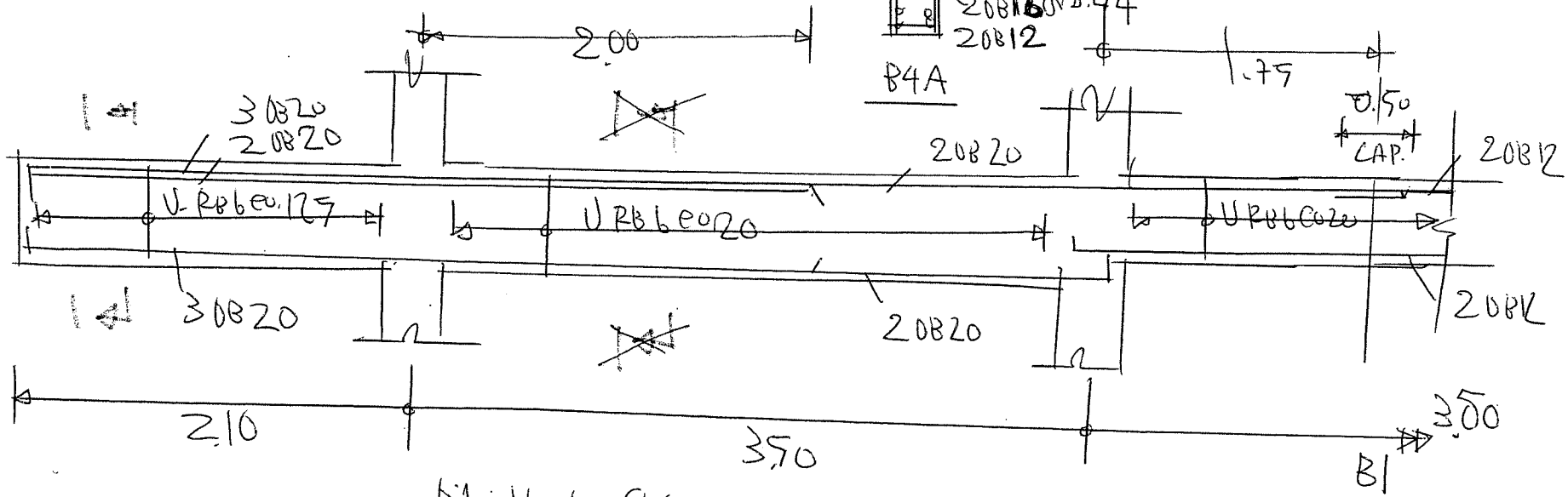


รูปด้าน 4

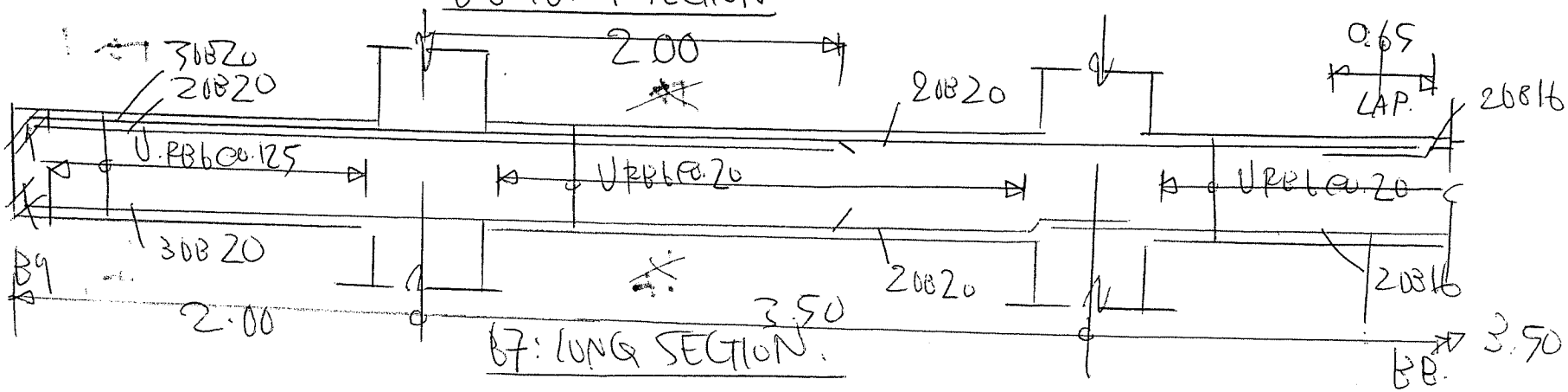
มาตราส่วน 1 : 75



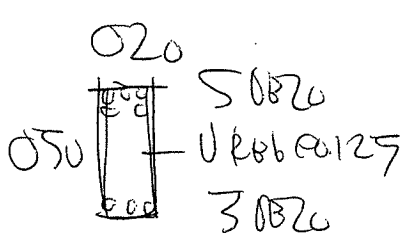




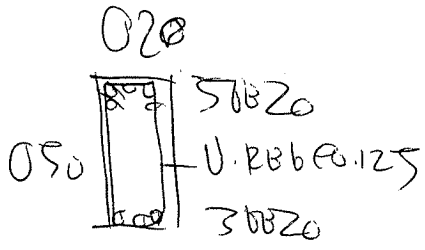
B1: LONG SECTION.



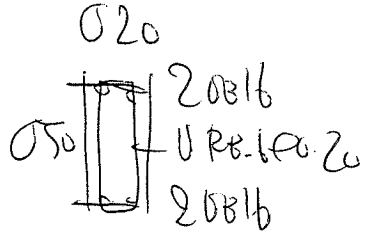
B7: LONG SECTION.



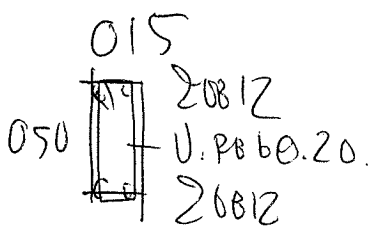
B6: 1-1



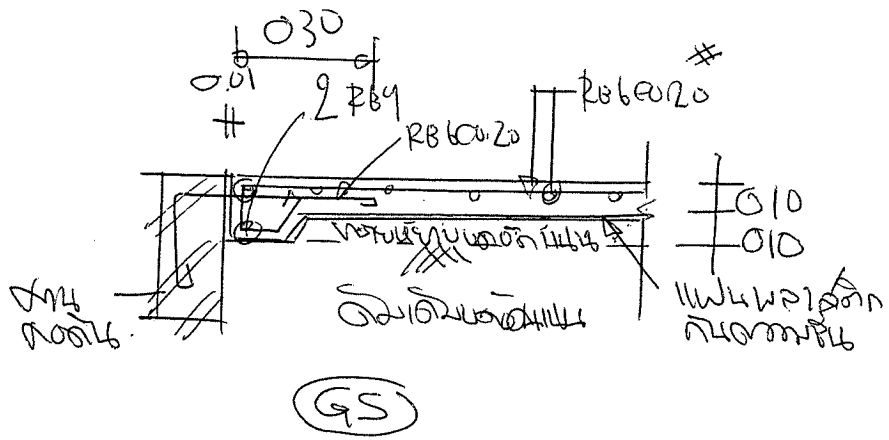
B7: 1-1



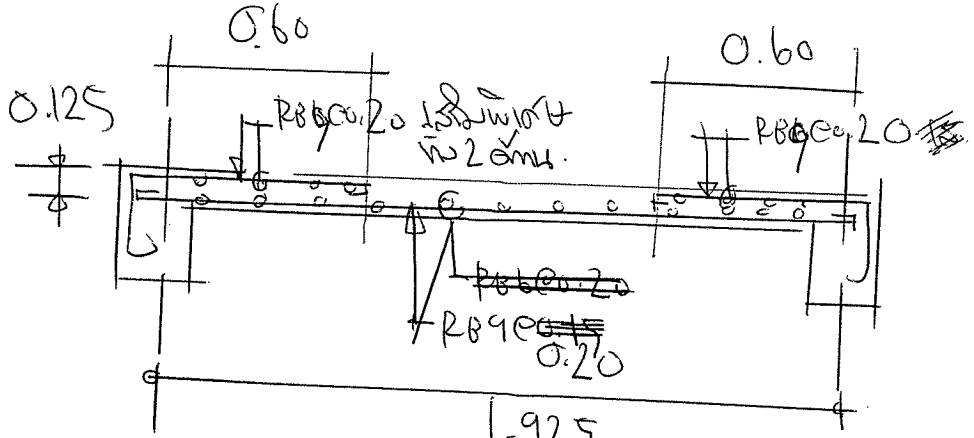
B8



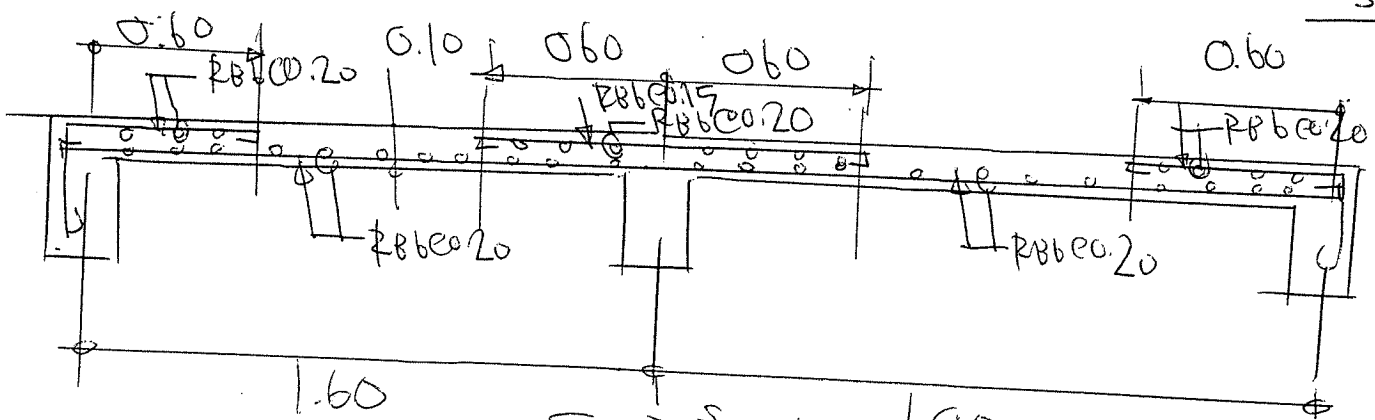
B9



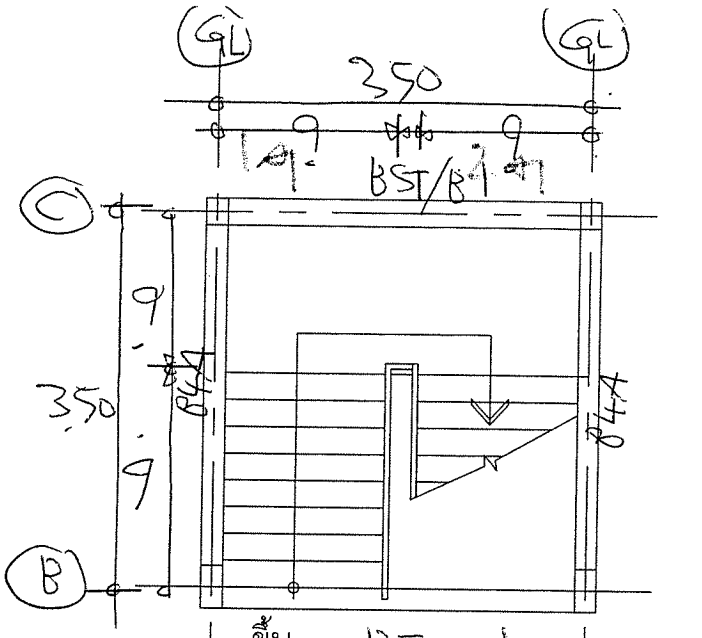
G5



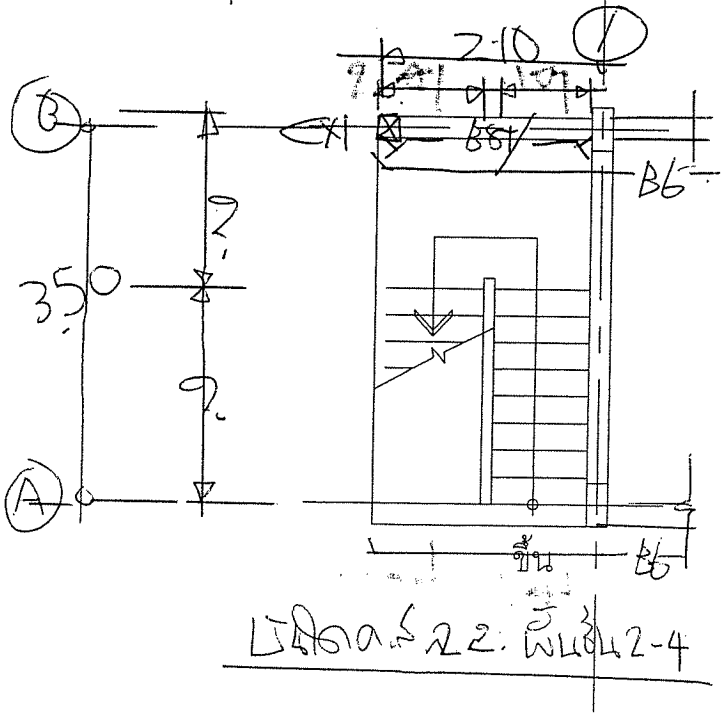
S2: อิเหล็ก



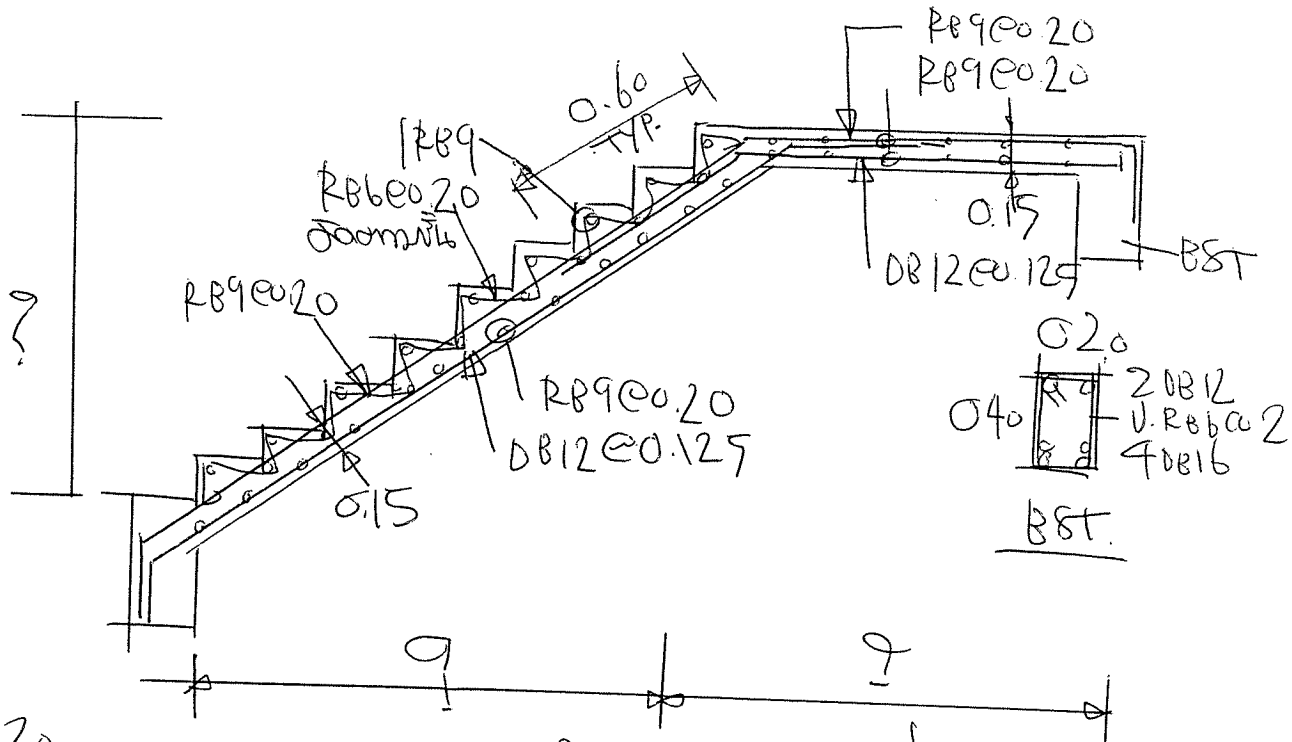
S1: อิเหล็ก



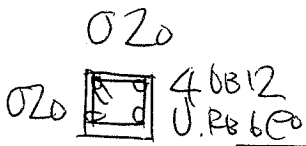
แปลนรอบ 1: พื้นชั้น 1-4



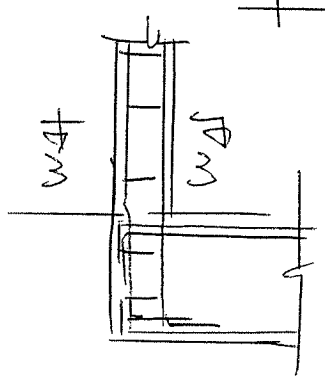
แปลนรอบ 2: พื้นชั้น 2-4



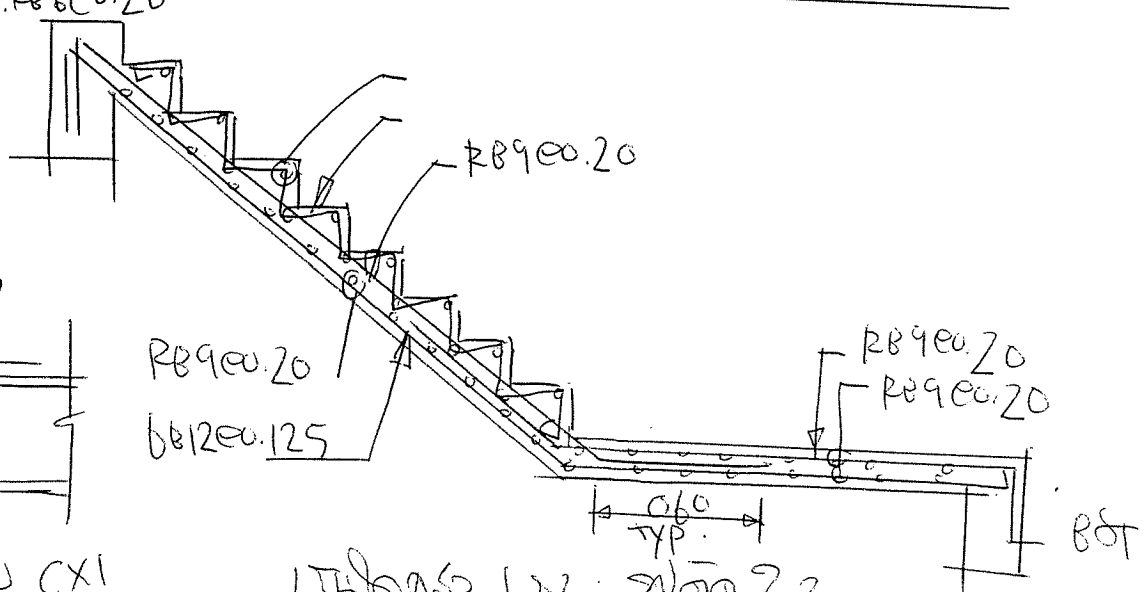
แปลนรอบ 1x2: รูปตัด 1-1



CX:3-3



แปลนรอบ CX1



แปลนรอบ 1x2: รูปตัด 2-2