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バングラディシュ国
テレビジョンスタジオ建設計画
実施設計報告書
第 5 編

昭和53年3月

国際協力事業団

78

バングラディシュ国
テレビジョンスタジオ建設計画
実施設計報告書
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計　算　書　目　次

1. 構 造 計 算 書

STRUCTURAL ANALYSIS ON CONSTRUCTION PROJECT OF B.T.V. HALL IN DACCA

バングラデシュ国 テレビジョン・スタジオ
建設計画 構造計算書

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1－ 一般事項

建物名称 ： B.T.V. ホール

所在地 ： バングラデシュ国 ダッカ市

用途 ： オーディトリウム

規模 ： 4階建
延床面積 3,920 m²
（既存部分 2,360 m²）

構造 ： 鉄筋コンクリート造

プロセニアム骨組＝鉄骨鉄筋コンクリート造

スポット室
スノコ
ポーチ庇 等 ］ 一鉄骨造

使用材料 ： コンクリート
くい Fc-210
一般 Fc-180

鉄筋
Ms-Bar (¼～1")
SD 30 (D10.13)
SD 35 (D16～25)

鋼材
Ms-Steel
SM 50A
SS 41

高力ボルト F10T

基礎 ： 独立基礎
くい打 (現場造成くい)

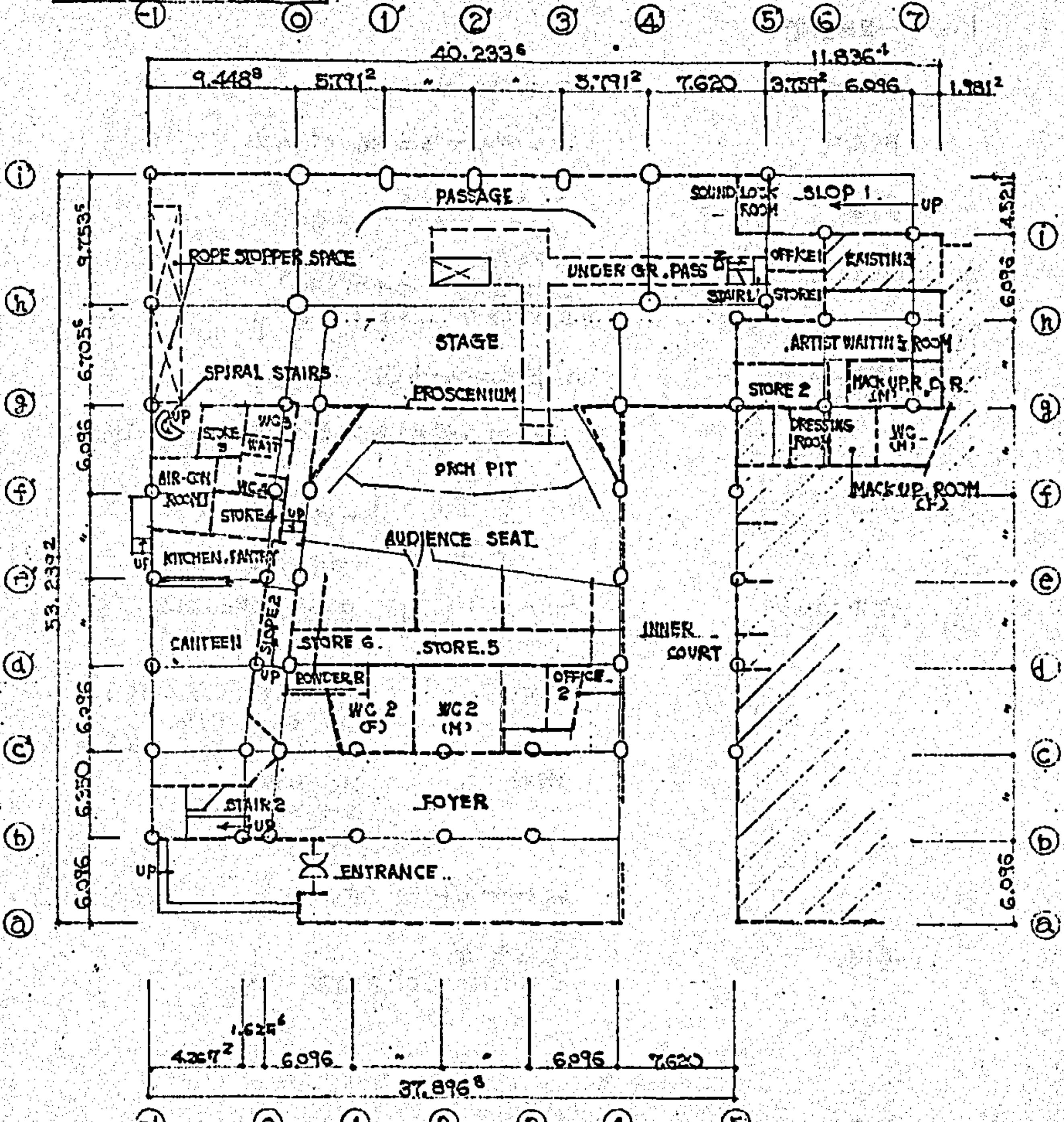
＊

基礎については M/S 材により、大ばり小ばり片持ばりおよび地下構造体のにつりては SD 材により設計する。

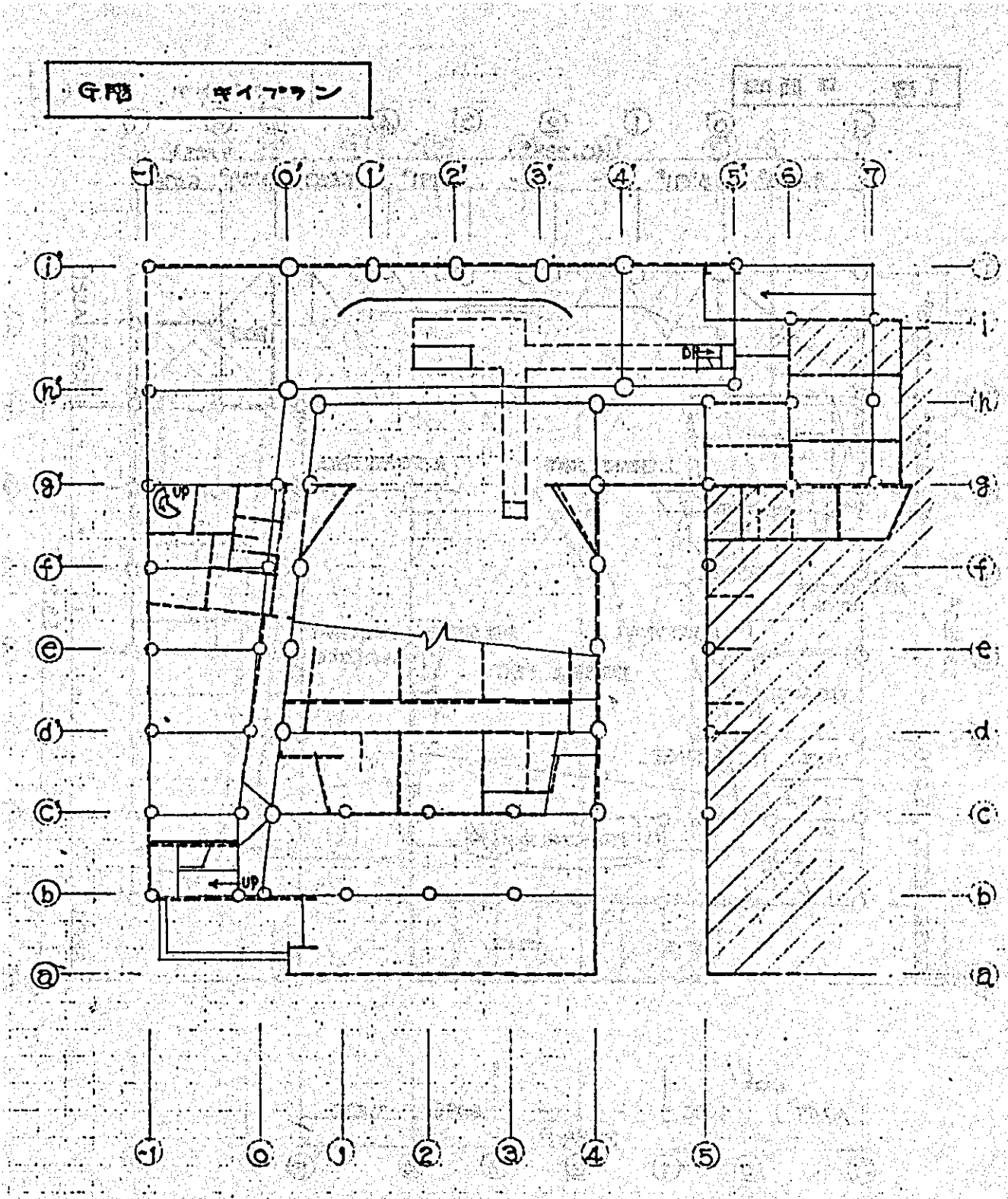
基礎ばり、柱、床スラブ、壁および プロセニアムフレームについては両方の場合を設計する。

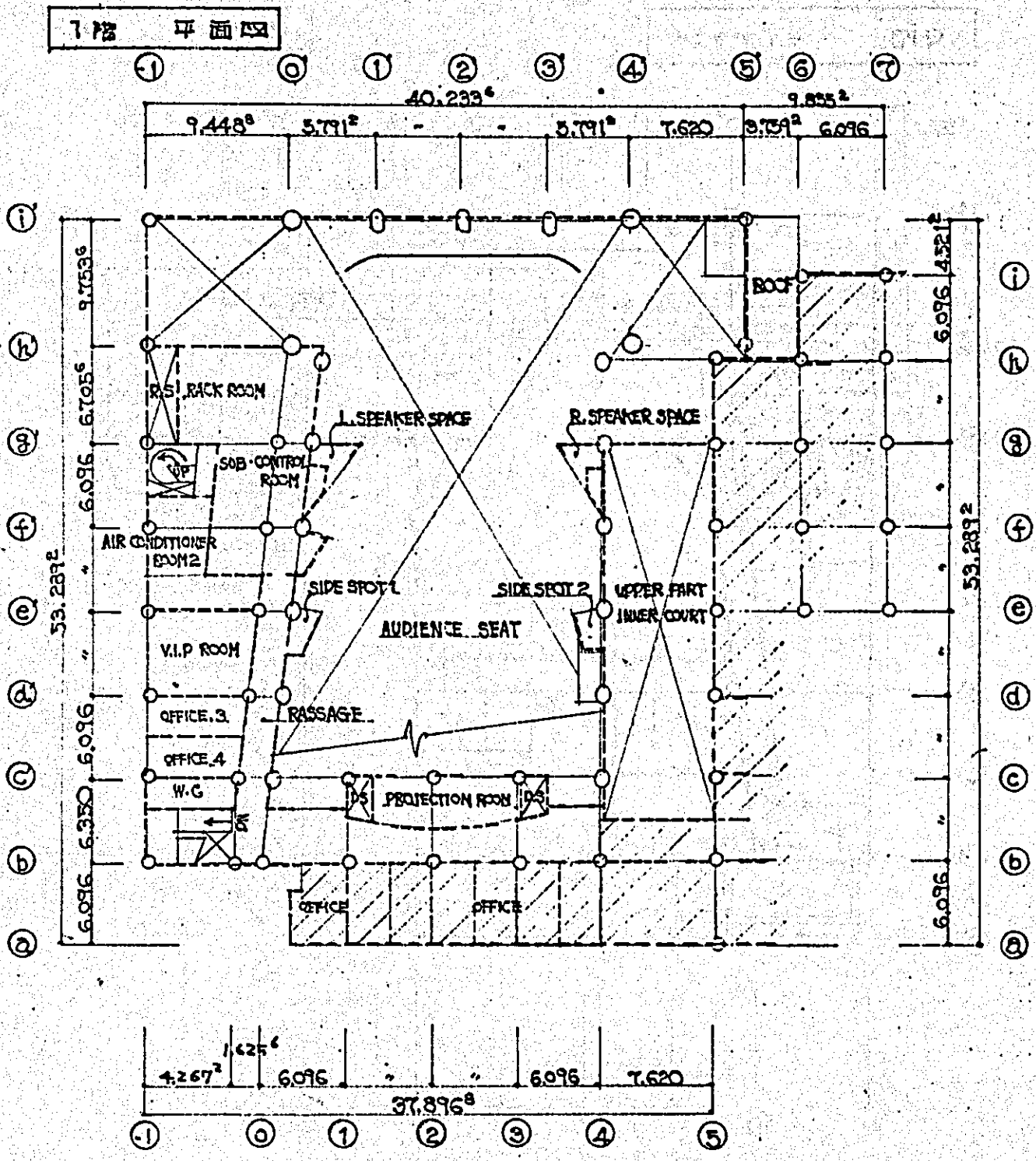
なお ラーメン材の $Q_T = Q_L + 1.5Q_E$ とした。

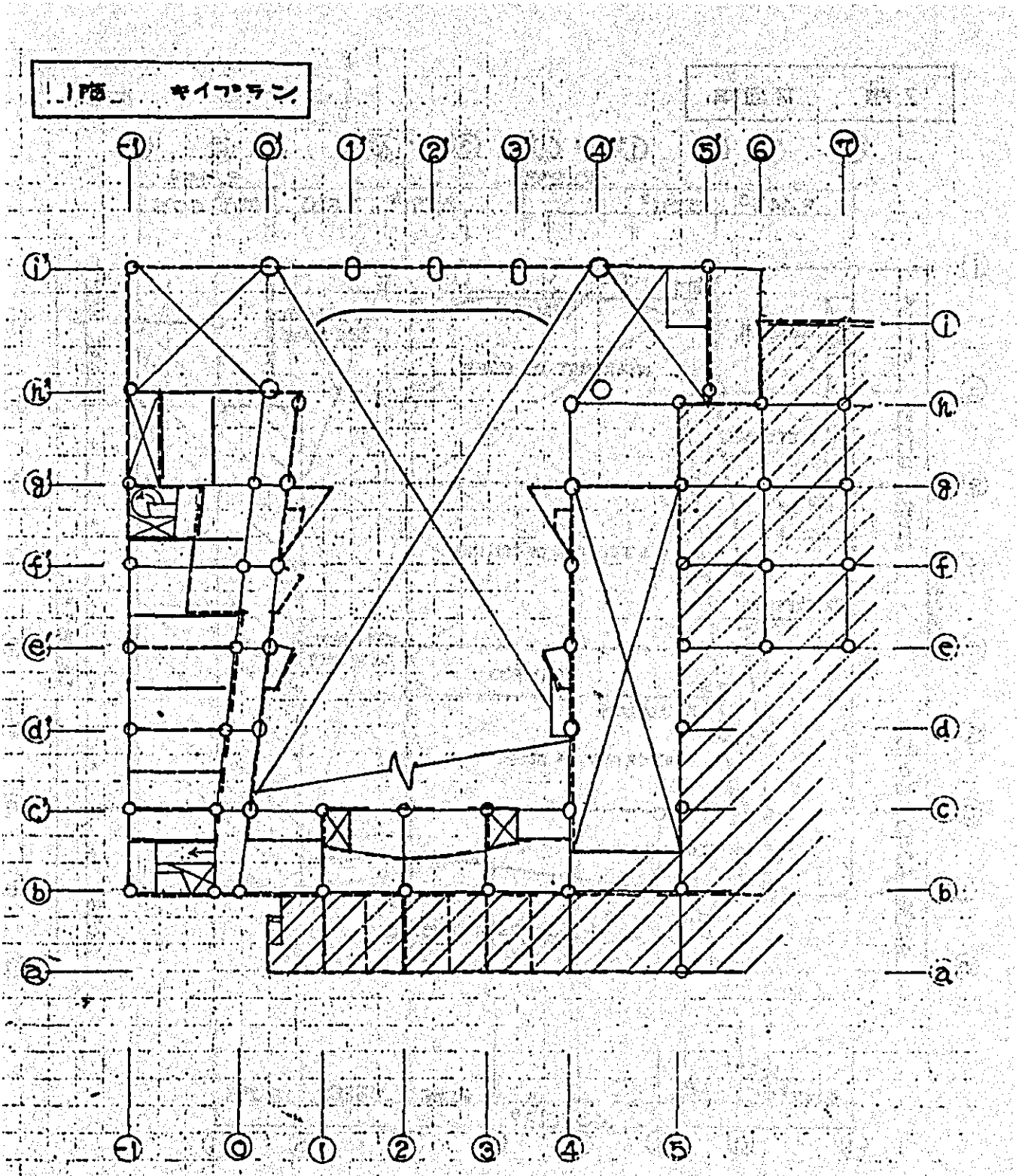
G階 平面図



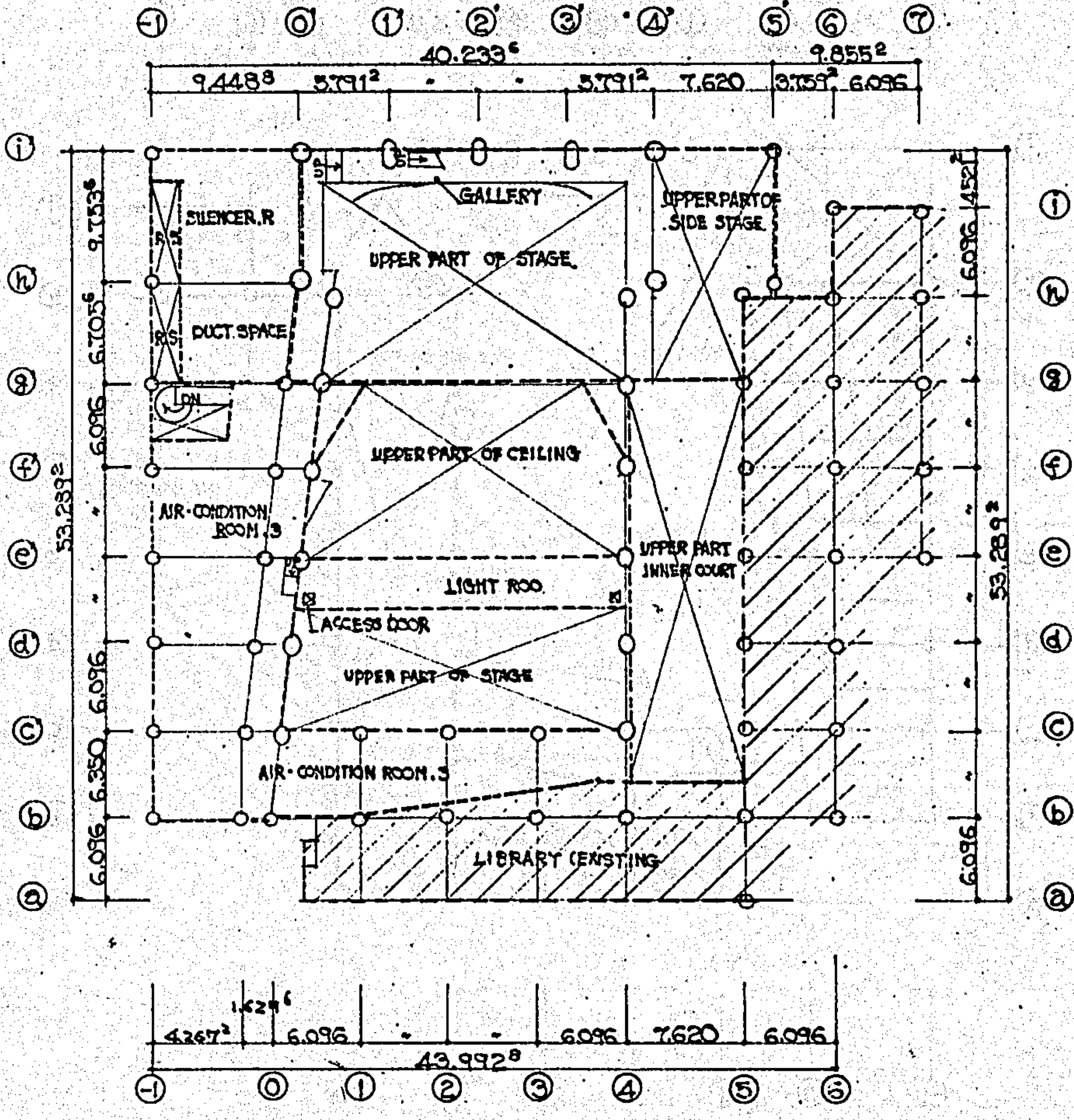
40.233⁶
11.836⁴
9.448⁸
5.791²
5.791²
7.620
3.759²
6.096
1.981²
PASSAGE
SOUND LOCK ROOM
SLOP 1
UP
ROPE STOPPER SPACE
UNDER GR. PASS
OFFICE 1
EXISTING
STAIR 1
STORE 1
STAGE
ARTIST WAITING ROOM
SPIRAL STAIRS
PROSCENIUM
STORE 2
MAKE UP R. C R.
DRESSING ROOM
WC
ORCH PIT
MAKE UP ROOM
AIR-CON ROOM
STORE 4
AUDIENCE SEAT
KITCHEN, PANTRY
CANTEEN
SLOPE 2
STORE 6
STORE 5
INNER COURT
OFFICE 2
WC 2 (F)
WC 2 (M)
FOYER
STAIR 2
ENTRANCE
53.233²
6.096
4.267²
1.625⁶
6.096
6.096
7.620
37.896⁸


1階 ガイアラン
UP
UP
DN


7階 平面図
40,233
9,855
9,448
5,791
5,791
7,620
3,759
6,096
9,753
6,705
6,096
6,096
6,350
6,096
53,289
4,521
6,096
6,096
53,289
R.S
RACK ROOM
L.SPEAKER SPACE
R.SPEAKER SPACE
SOB CONTROL ROOM
AIR CONDITIONER ROOM 2
SIDE SPOT 1
SIDE SPOT 2
UPPER PART INNER COURT
AUDIENCE SEAT
V.I.P ROOM
OFFICE.3
PASSAGE
OFFICE.4
W.G
PROJECTION ROOM
OFFICE
OFFICE
ROOF
1,625
4,267
6,096
6,096
7,620
37,896

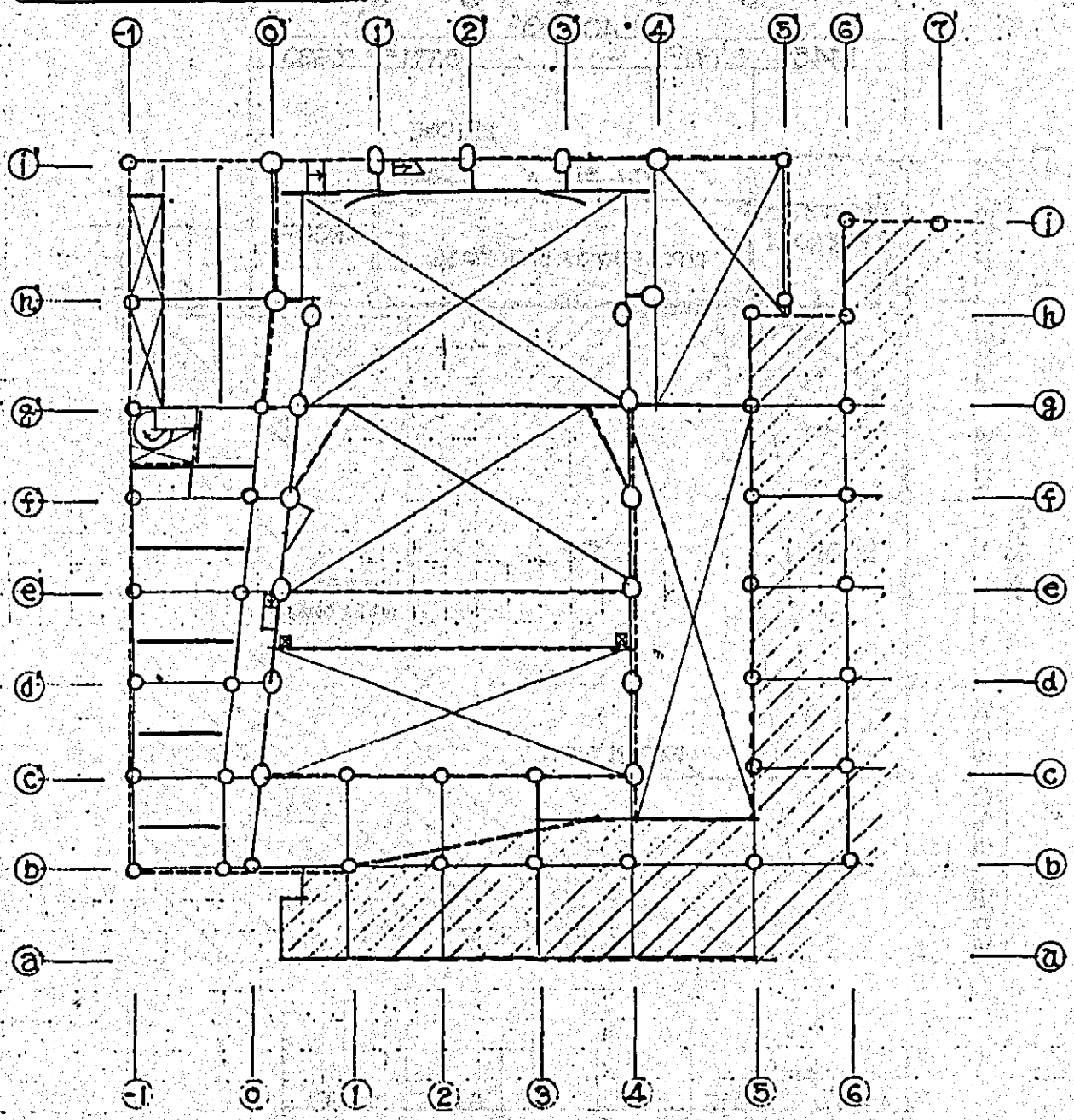

1階 ゼイマラン
-1
0
1
2
3
4
5
6
7
i'
h'
g'
f'
e'
d'
c'
b'
a'
i
h
g
f
e
d
c
b
a

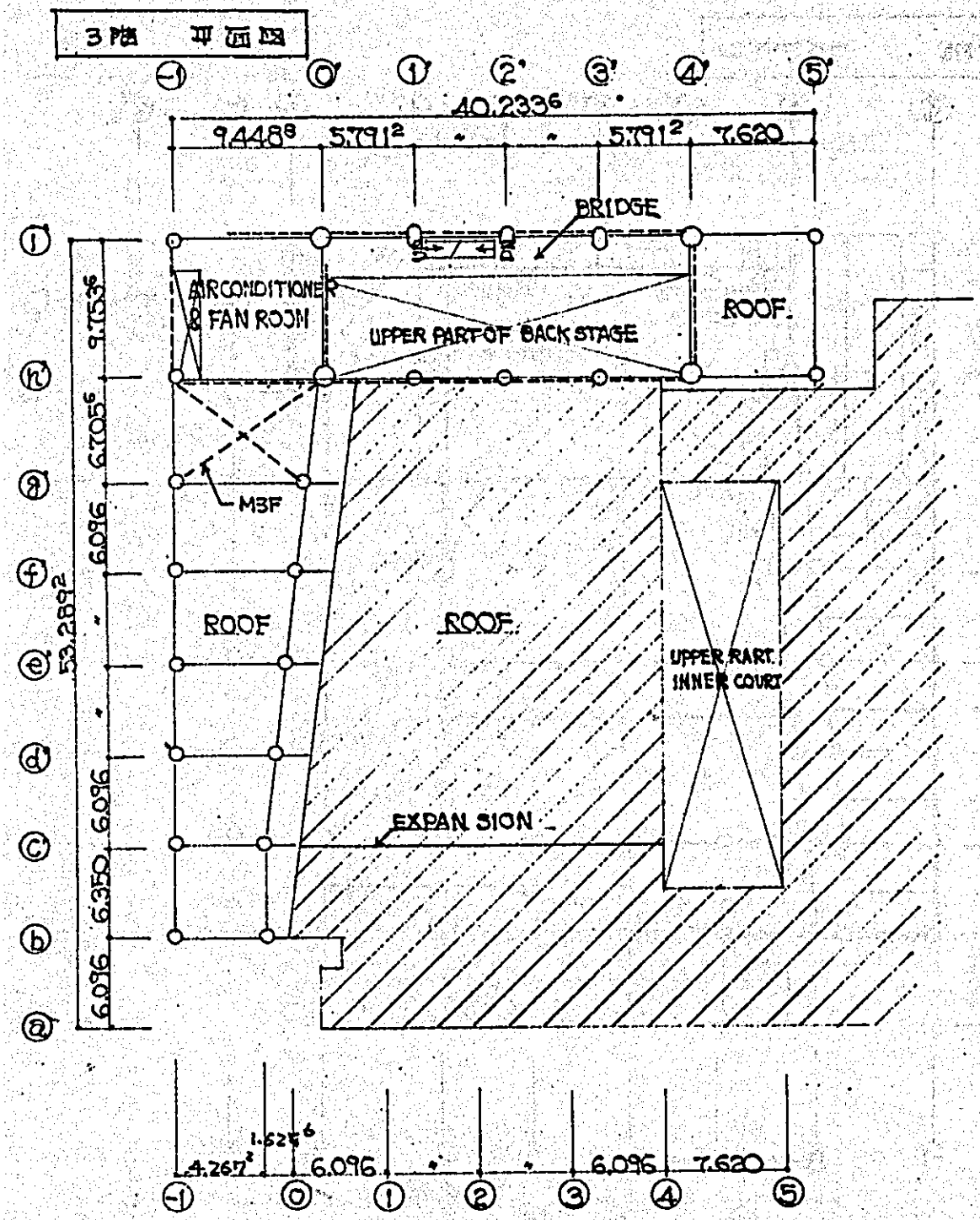
2階 平面図

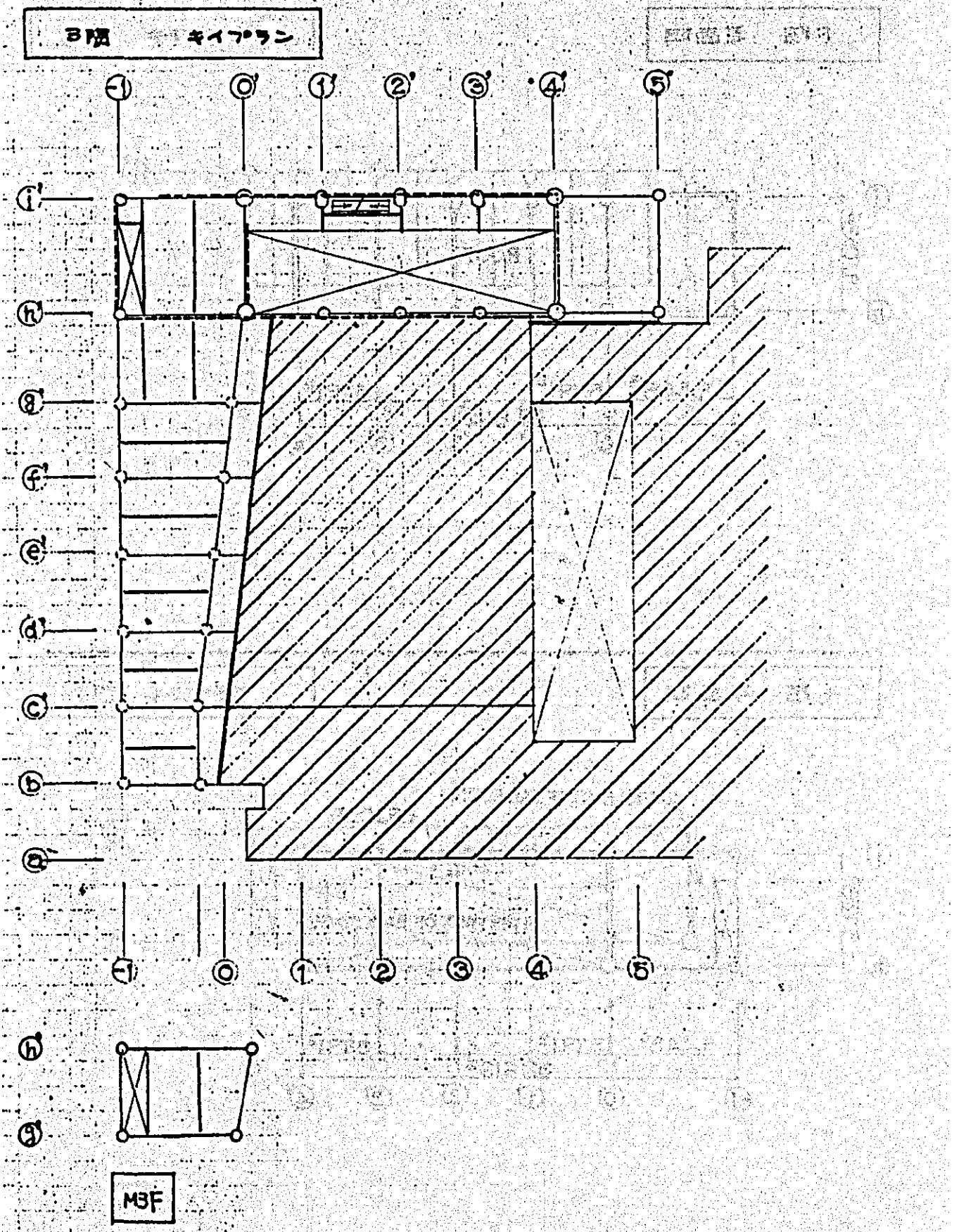


40.233⁶
9.855²
9.448⁸
5.791²
7.620
3.759²
6.096
GALLERY
SILENCER.R
R.S
DUCT SPACE
UPPER PART OF STAGE
UPPER PART OF SIDE STAGE
DN
UP
UPPER PART OF CEILING
AIR·CONDITION ROOM.3
LIGHT ROO.
ACCESS DOOR
UPPER PART INNER COURT
UPPER PART OF STAGE
AIR·CONDITION ROOM.3
LIBRARY (EXISTING)
53.239²
9.753⁶
6.705⁶
6.350
1.452
4.267²
1.829⁶
43.992⁸

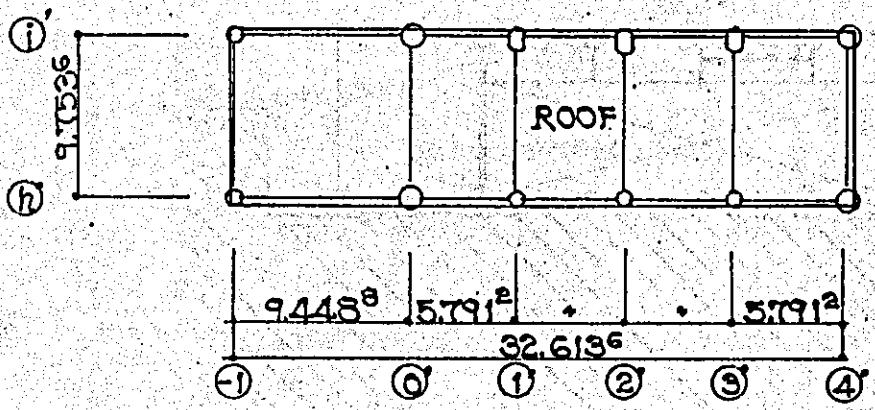
2階　　ギイブラン



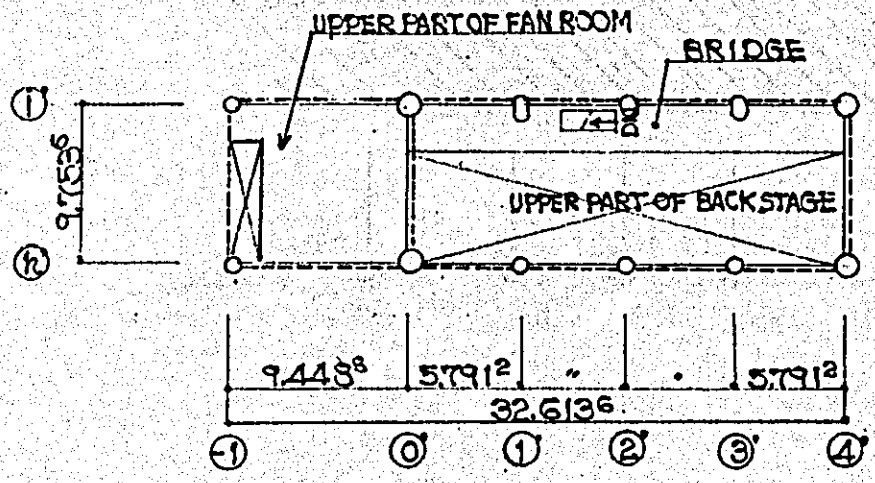

3階 平面図
-1
0
1
2
3
4
5
40.233⁶
9.448⁸
5.791²
5.791²
7.620
BRIDGE
AIRCONDITIONER & FAN ROOM
UPPER PART OF BACK STAGE
ROOF
ROOF
M3F
ROOF
ROOF
UPPER PART INNER COURT
EXPANSION
h
g
f
e
d
c
b
a
9.753⁶
6.705⁶
6.096
6.096
6.350
6.096
53.289²
1.625⁶
4.267²
6.096
6.096
7.620


B階 ｷｲﾌﾟﾗﾝ
-1
0
1
2
3
4
5
i'
h'
g'
f'
e'
d'
c'
b'
a'
M3F

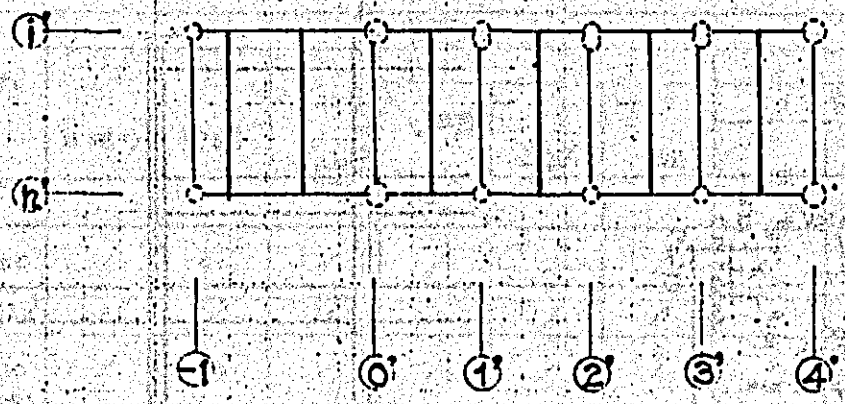
R階 平面図


ROOF
9.448⁸
5.791²
5.791²
32.613⁶
-1
0
1
2
3
4

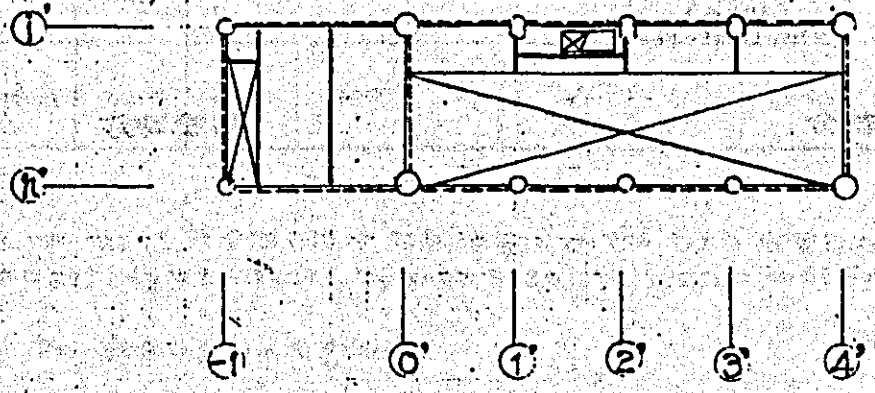
4階 平面図.

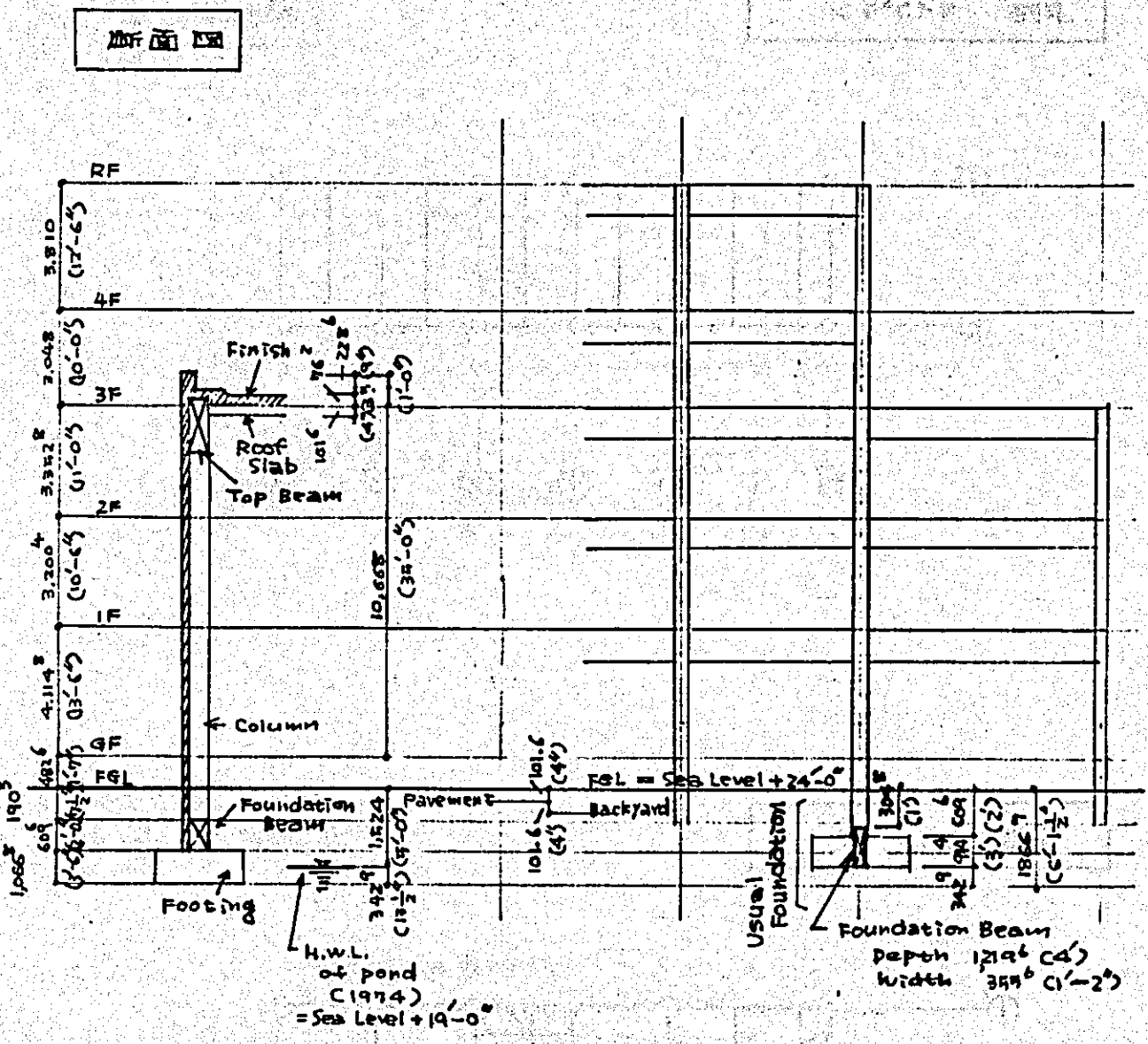

UPPER PART OF FAN ROOM
BRIDGE
UPPER PART OF BACK STAGE
9.448⁸
5.791²
5.791²
32.613⁶
-1
0
1
2
3
4

RFB キイプラン



4FB キイプラン




RF
4F
3F
2F
1F
GF
FGL
Finish
Roof Slab
Top Beam
Column
Foundation Beam
Footing
Pavement
Backyard
FGL = Sea Level + 24'-0"
H.W.L. of pond (1974) = Sea Level + 19'-0"
Usual Foundation
Foundation Beam
depth 1219 (4')
width 359 (1'-2")

駐車部分　　増築部分

材料の許容応力度

[kg/cm²]

材料	応力	長期						溶接			短期
		引張り	圧縮	せん断 せん断補強	位置 / Fc	上筋	一般筋	つき合せ 一般	つき合せ せん断	すみ肉	
コンクリート	Fc 180 (2,500 PSi)	/	60	/	/	/	/	/	/	/	× 2.0
		/	/	6	/	/	/	/	/	/	× 1.5
	Fc 210 (3,000 PSi)	/	70	/	/	/	/	/	/	/	× 2.0
		/	/	7	/	/	/	/	/	/	× 1.5
鉄筋	M/S *	1,265 (18 kip/in²)	1,125 (16 〃)	1,265 (18 〃)	/	/	/	/	/	/	× 1.33
	BAR	/	/	/	Fc 180	7.2	10.8	/	/	/	× 1.5
					φ 210	8.4	12.6				
	SD30	2,000	2,000	2,000	/	/	/	/	/	/	
		/	/	/	Fc 180	12.0	18.0	/	/	/	× 1.5
					φ 210	14.0	21.0				
	SD35	2,200	2,200	(2,000)	/	/	/	/	/	/	3,300 (3,000)
		/	/	/	Fc 180	12.0	18.0	/	/	/	× 1.5
					φ 210	14.0	21.0				
鉄骨	M/S ** STEEL	1,265 (18 kip/in²)	1,125 (16 〃)	844 (12 〃)	/	/	/	/	/	800 (11.4 kip/in²)	× 1.33
	SS41	1,600	1,600	900	/	/	/	1,400	900	800	× 1.5
	SM50A	2,200	2,200	1,300	/	/	/	2,200	1,300	1,300	× 1.5

(M/S 材に対する許容応力度は 付着・溶接については 日本の規準によった方が不利なので、日本における値をとった。但し M/S BAR = SR24, M/S STEEL = SS41 とみなした。)

* Reinforcing No 1 grade

** 注 = "SANJUKTA" 注 (Weldable Quality)

[1 PSi = 0.001 kip/in² = 0.0703 kg/cm²]

M/S BAR の断面積 および周長

Dia	φ cm	at cm²	cp cm	MAX LENGTH m (′)	UNIT WEIGHT kg/m
1/4"	0.635	0.317	1.995		0.249
(5/16")	(0.794)	(0.495)	(2.494)		
3/8"	0.953	0.713	2.992	12.192 (40′)	0.559
1/2"	1.270	1.267	3.990	〃	0.994
5/8"	1.588	1.979	4.987	10.668 (35′)	1.554
3/4"	1.905	2.850	5.985	〃	2.237
7/8"	2.223	3.879	6.982	8.839 (29′)	3.045
1"	2.540	5.067	7.980	〃	3.978
1 1/4"	3.175	7.917	9.975	〃	6.215

M/S STEEL の標準サイズ

L　MAX LENGTH 26′ = 7924.8

M/S 板　UNIT 8′×4′ = 2438.4×1219.2

"	M/M	A cm²	W kg/m
3/4"×3/4"×1/8"	19×19×3		≒0.80
1"×1"×1/8"	25×25×3	1.545	1.22
1 1/2"×1 1/2"×1/8"	38×38×3		≒1.80
×3/16"	×5	3.419	2.68
×1/4"	×6	4.442	3.49
2"×2"×1/4"	51×51×6	6.065	4.76
2 1/2"×2 1/2"×1/4"	64×64×6	7.613	5.98
3"×3"×3/8"	76×76×10	13.484	10.58

"	M/M	W kg/m²
1/8	3.18	24.9
3/16	4.76	37.4
1/4	6.35	49.8
3/8	9.53	74.8
1/2	12.70	99.7
3/4	19.05	149.5
1	25.4	199.3

FB (FLAT IRON BAR)　MAX LENGTH 30′ = 9144.0

"	M/M	A cm²	W kg/m
3/4"×1/8"	19×3	0.60	0.47
×3/16"	×5	0.91	0.71
×1/4"	×6	1.21	0.95
1"×1/8"	25×3	0.81	0.63
×3/16"	×5	1.21	0.95
×1/4"	×6	1.61	1.27
1 1/2"×3/16"	38×5	1.81	1.42
×1/4"	×6	2.42	1.90
2"×1/4"	51×6	3.23	2.53

2. —応力解析

剛比

(最終報告書において、一部の部材はCM単位のラウンド・ナムバーのサイズに変更された。)

柱

	J ×10⁴	k Story	4'	3	2	1	9
		Height	289.56	393.24	338.28	320.04	512.70
2' □ 2'	115.08		0.40	0.29	0.34	0.36 0.14	0.22
3' ▯ 2'	388.39		1.34	0.99	1.15	1.21 0.46	0.75
2' ▭ 3'	172.62		0.60	0.44	0.51	0.54	0.33
3' □ 3'	582.59		2.01	1.52	1.72	1.82 0.70	1.13

はり.

	J ×10⁴	φ	φJ	k span 426.72	528.32	629.92	731.52	833.12	944.88	[716.91] 579.12	762.00	635.00	609.60	690.86	975.36
1'-6" ⊤ 1'-2"	28.3	1.53 1.85	43.37 52.39	0.10 0.12	0.10	0.08						0.07 0.08	0.07 0.09	0.07 0.08	
2' ⊤ 1'-2"	64.13	(1.0) 1.5 1.8	(67.13) 100.69 120.83	0.24 0.26	0.19 0.23	0.16 0.19	0.14 0.17	0.12 0.13	(0.09) 0.11 0.13	[0.12] 0.17 0.21	(0.09) 0.13 0.16	0.16 0.19	0.17 0.20	0.15 0.18	(0.07) 0.10 0.12
2'-6" ⊤ 1'-2"	131.11	1.5 1.8	196.67 236.00	0.46 0.55	0.37 0.45	0.31 0.37	0.27 0.32	0.24 0.28	0.21 0.25	0.34 0.41	0.26 0.31	0.31 0.37	0.32 0.39	0.29 0.35	0.20 0.24
3' ⊤ 1'-2"	226.56	(1.0) 1.4 1.7	226.56 317.19 385.16	0.74 0.90	0.60 0.73	0.50 0.61	0.43 0.53	0.38 0.46	0.34 0.41	[0.14] 0.55 0.67	(0.30) 0.42 0.51	0.50 0.61	0.52 0.63	0.47 0.57	(0.24) 0.33 0.39
2' ▯ 1'-2"	67.13	1.0	67.13						0.07	[0.03] 0.12	0.09				0.07
5' ▯ 1'-2"	1048.90	1.0	1048.90							[0.45] 1.81					
4' ▯ 1'-2"	537.04	1.0	537.04	1.26	1.02	0.85	0.73	0.64	0.57	0.93	0.70	0.85	0.88	0.80	0.55

等価断面二次モーメント 下表

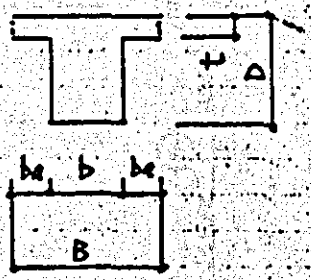
b	D	Type	t	t/b	ba =a1.2	B	B/b	φ								
38.96 (1'-2⅝")	45.72 (1'-6")	⊓	12.7 (½")	0.28	60.96	96.52	2.71	1.95								
		⊓̄	〃	〃	〃	152.48	4.43	1.35								
37.56	60.96 (2'-0")	⊓	〃	0.21	〃	96.52	2.71	1.5								
(1'-2½")		⊓̄	〃	〃	〃	152.48	4.43	1.3								
〃	76.20 (2'-6")	⊓	〃	0.17	〃	96.52	2.71	1.5								
		⊓̄	〃	〃	〃	152.48	4.43	1.3								
〃	91.44 (3'-0")	⊓	〃	0.14	〃	96.52	2.71	1.4								
		⊓̄	〃	〃	〃	152.48	4.43	1.47								

J：(T型断面の断面二次モーメント……(⊓̄)

J_0：□ 〃 〃 (□)

$$J = \phi I_0 = \phi \frac{bD^3}{12}$$

$$\phi = 4\alpha - 3\frac{\beta^2}{\gamma}$$



$$\alpha = 1 + (b_1 - 1)t_1^3$$

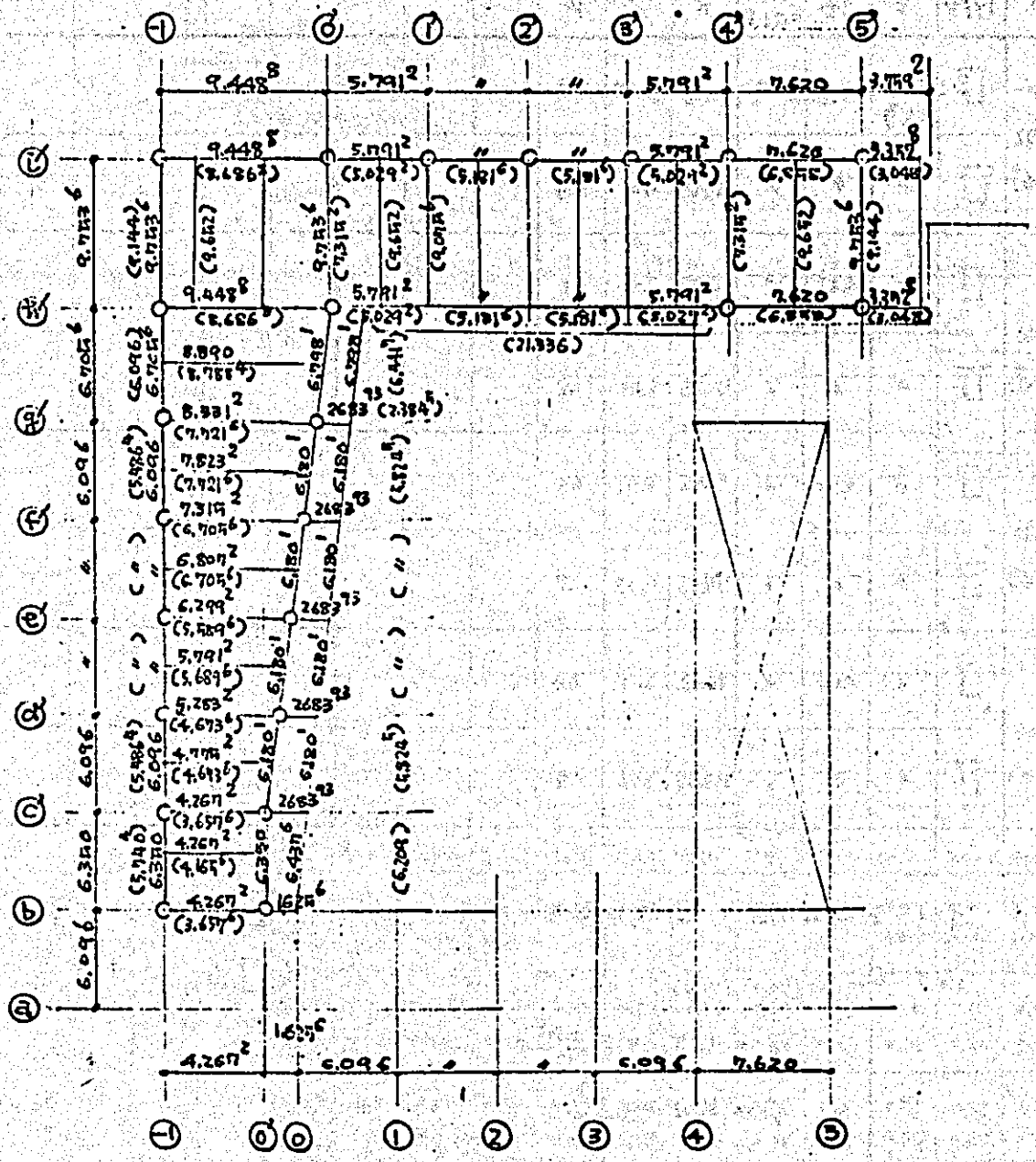
$$\beta = 1 + (b_1 - 1)t_1^2$$

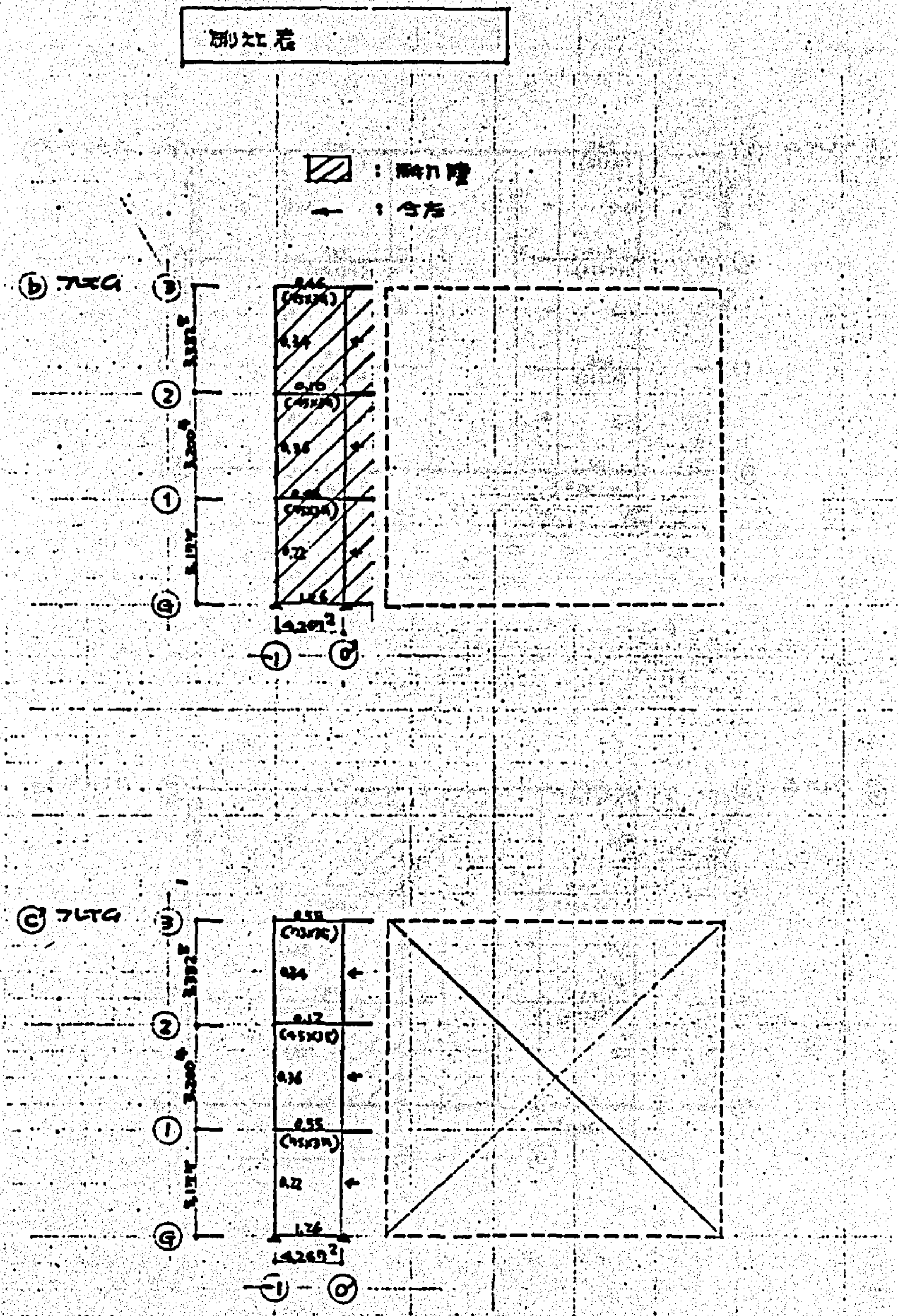
$$\gamma = 1 + (b_1 - 1)t_1$$

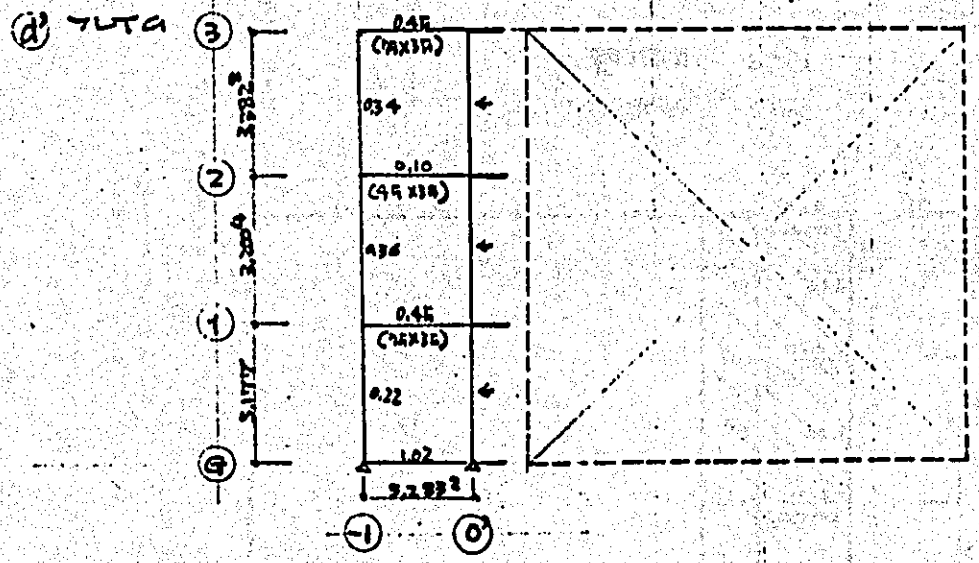
$$b_1 = \frac{B}{b}$$

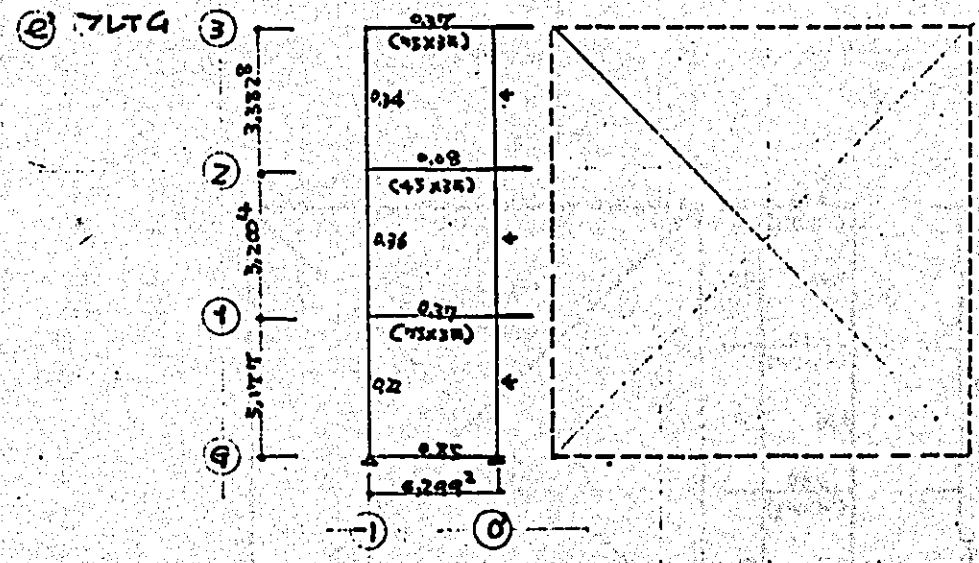
$$t_1 = \frac{t}{D}$$

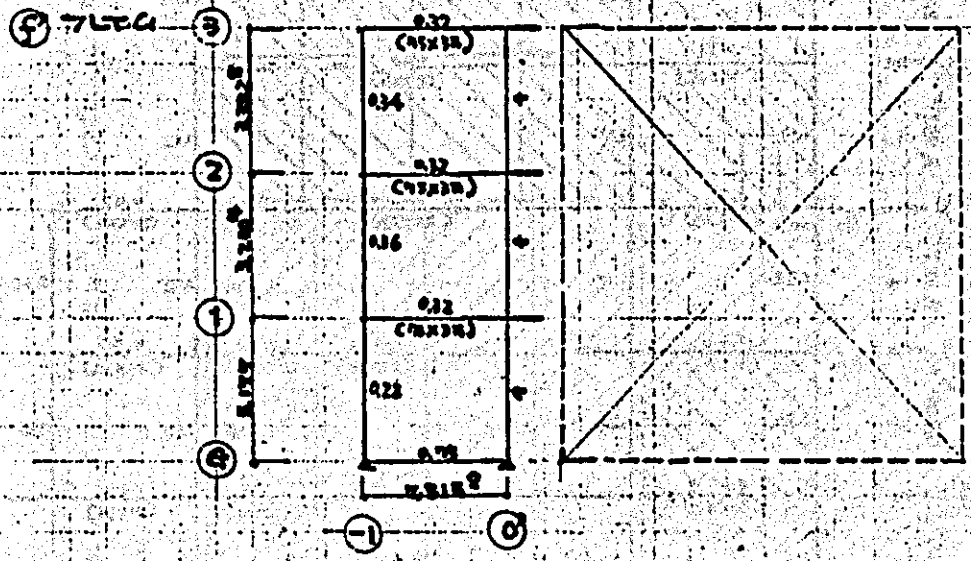
スパン長さ ― mm　（ 内法 ）

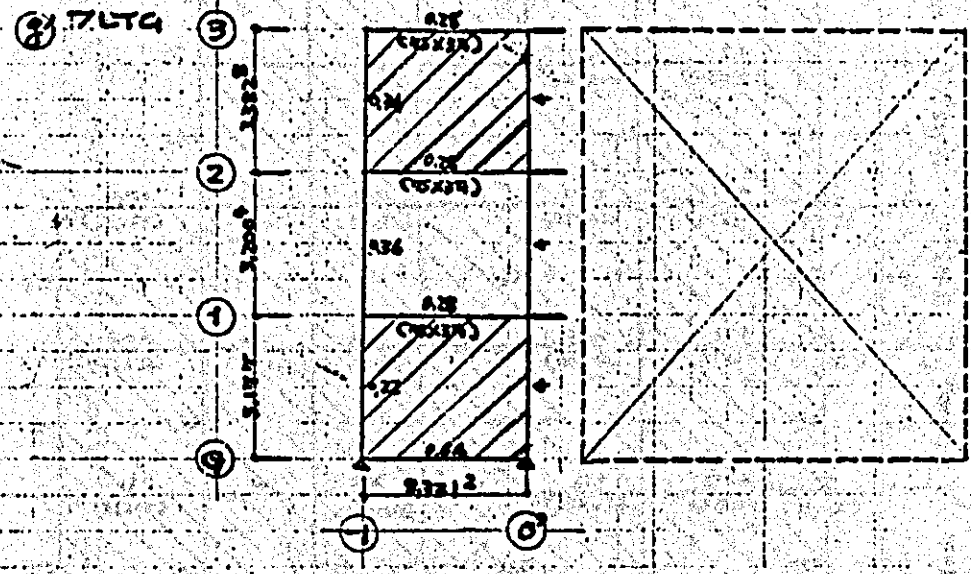



耐力壁
(b)
(c)
3,392
3,200
3,157
4,269
0.34
0.36
0.22
1.26
0.12
0.55
0.24

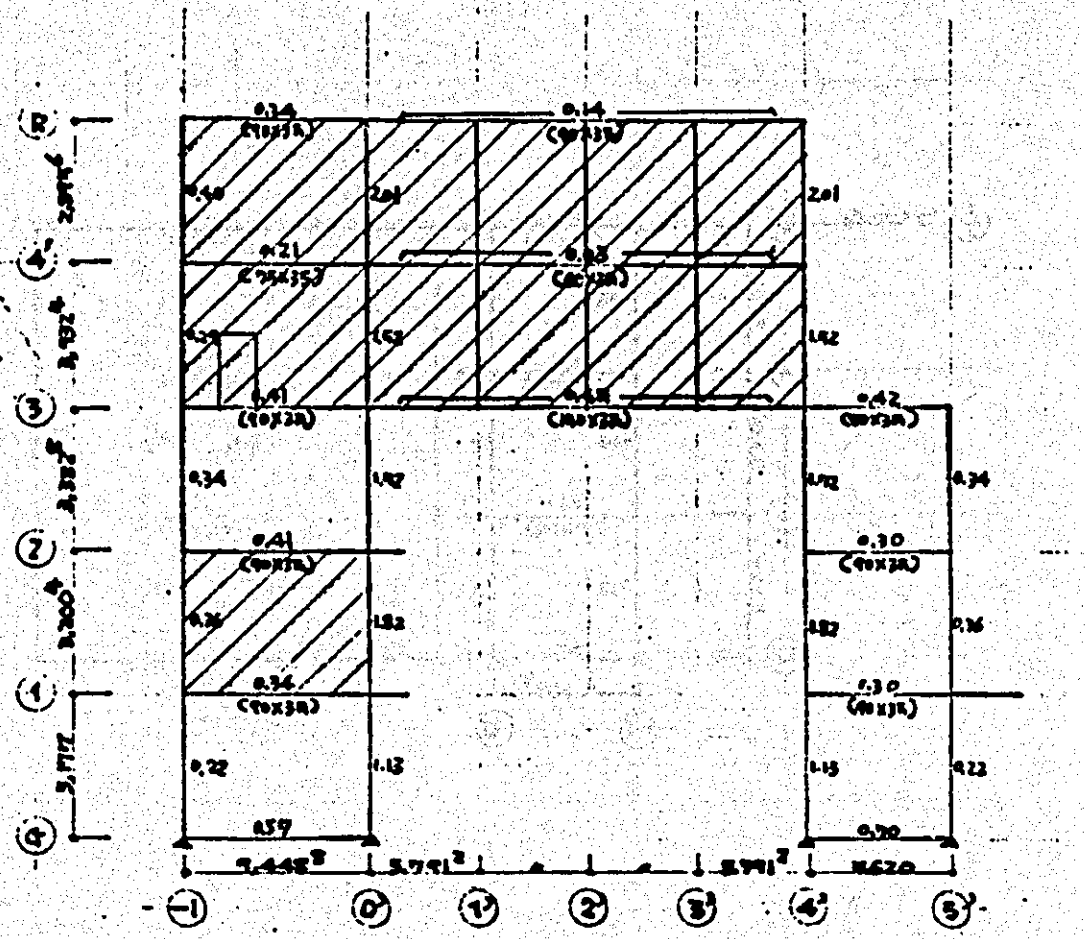

d' TLTG
3
2
1
G
3.382
3.200
3.177
0.45
(78X37)
0.34
0.10
(45 X38)
0.36
0.45
(78X38)
0.22
1.02
9.282
-1
0


② TLTG
3
2
1
G
3.382
3.200
3.177
0.37
(78X38)
0.14
0.08
(45 X38)
0.36
0.37
(78X38)
0.22
0.25
9.299
-1
0

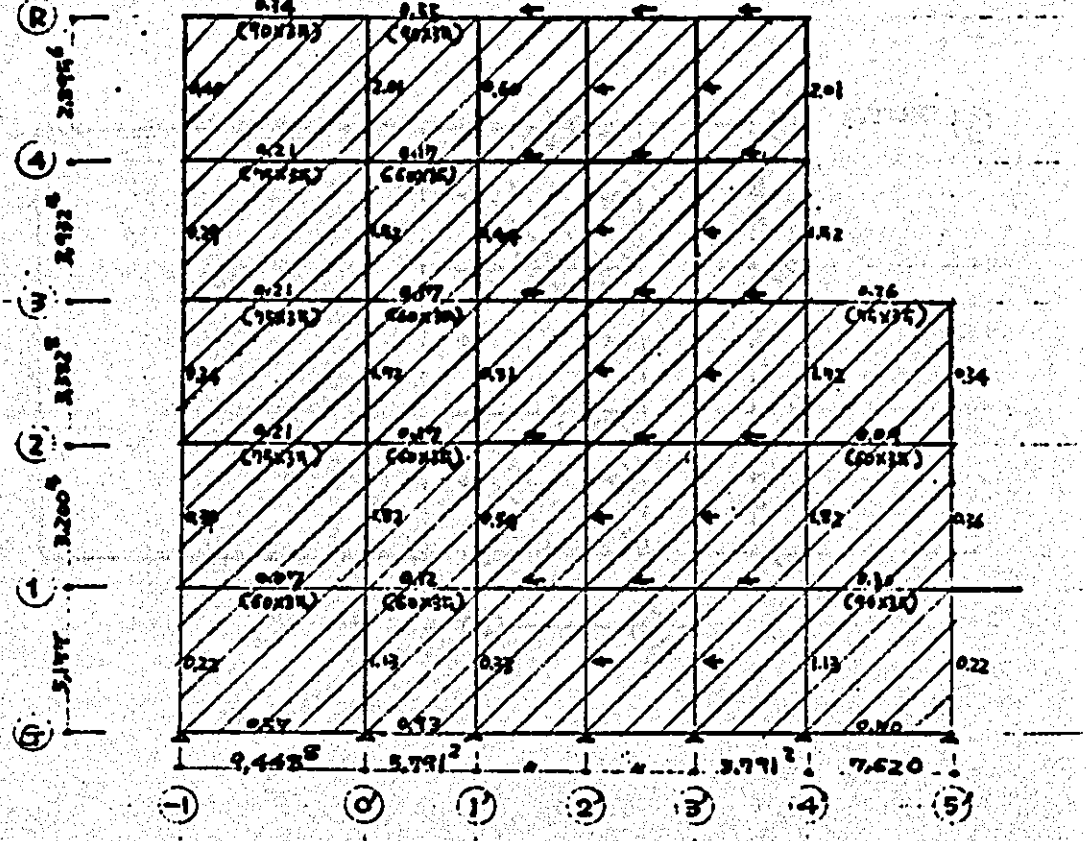


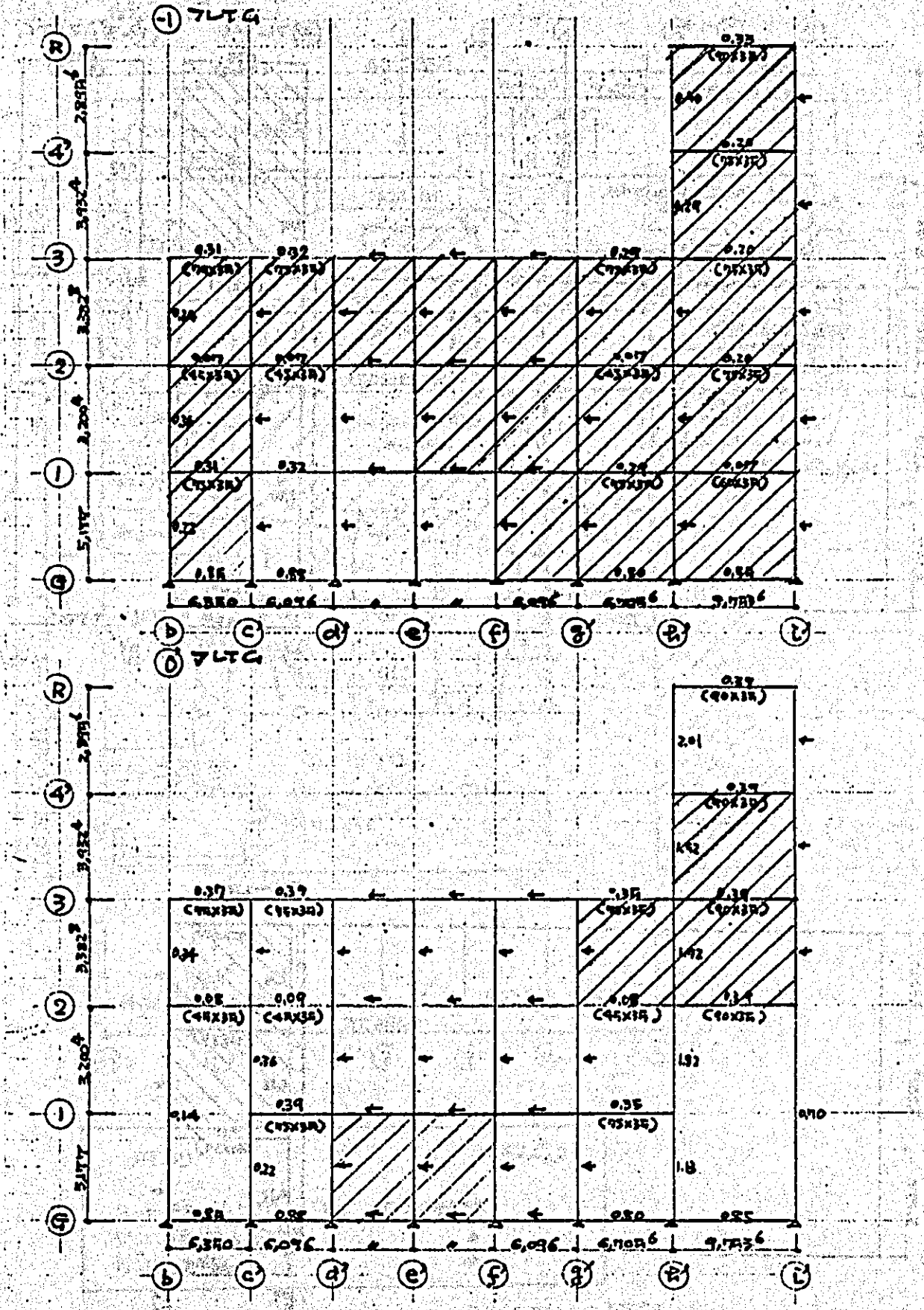


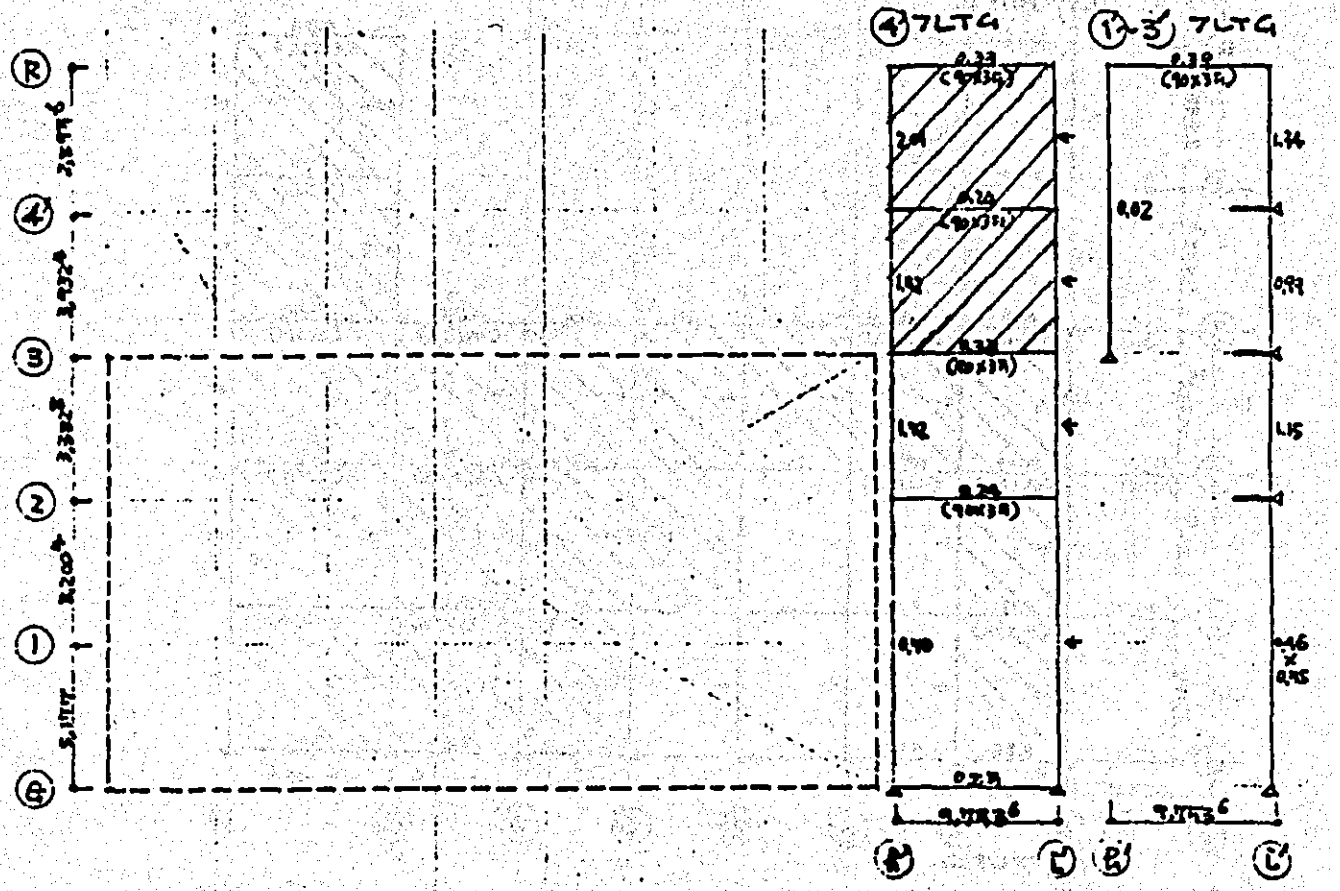
(h) 7LTG

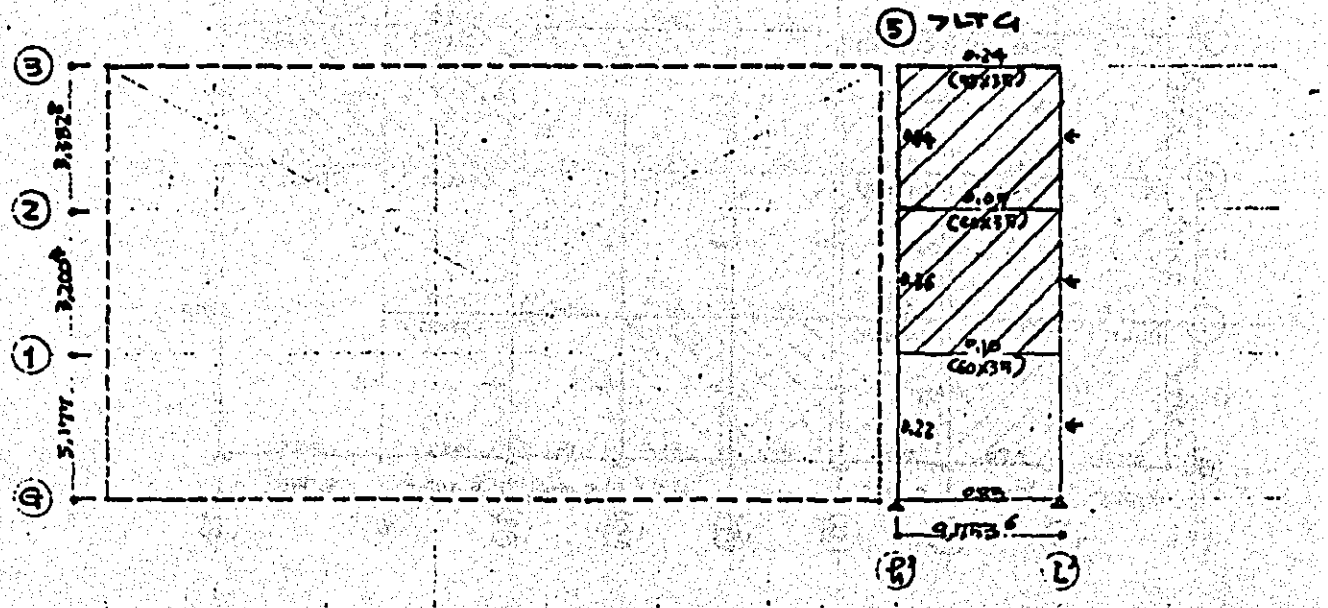


(j) 7LTG

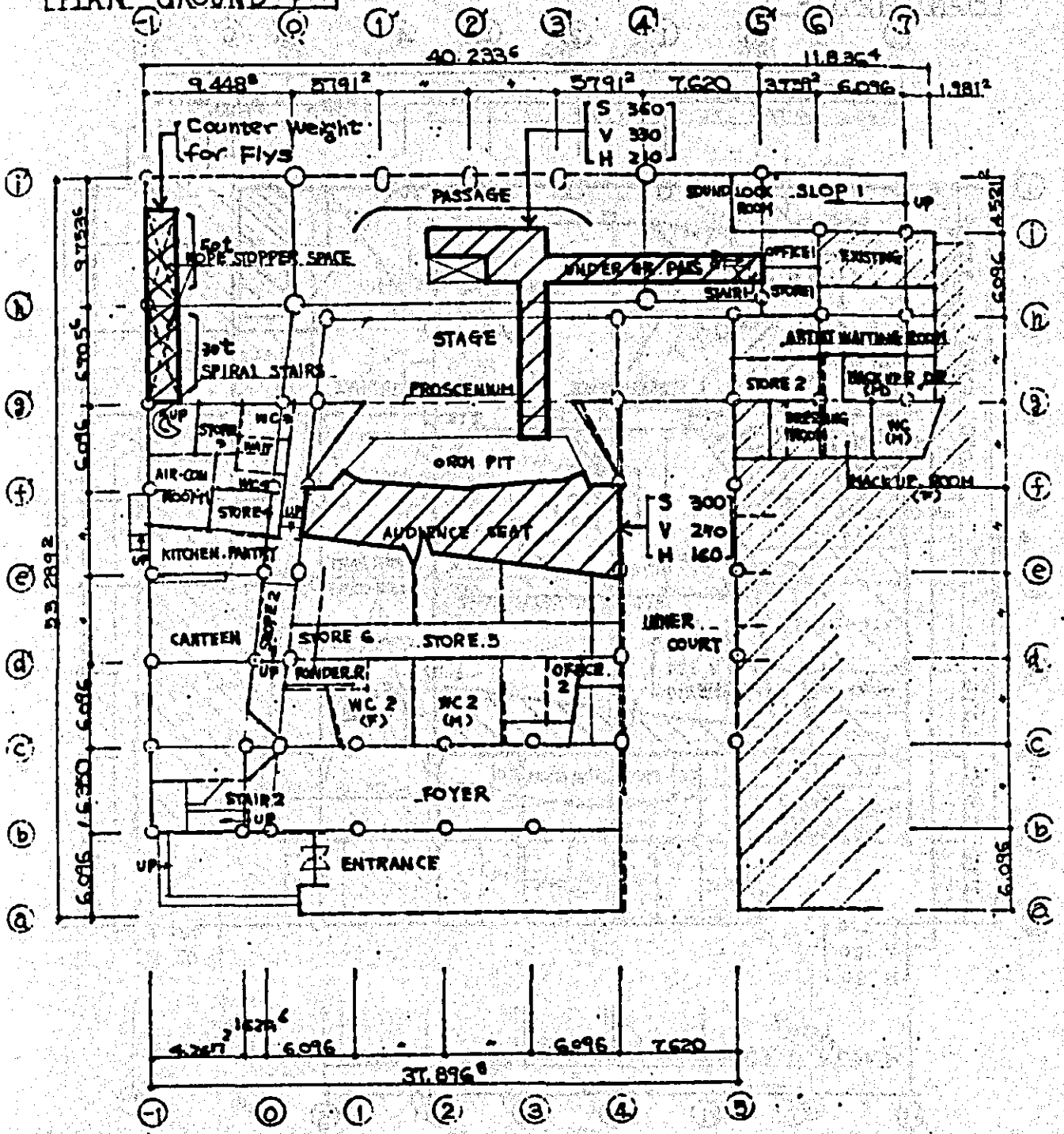



① 7LTG
⑦ 7LTG
R
4
3
2
1
G
b
c
d
e
f
g
h
i


④ 7LTG
①-③ 7LTG
Ⓡ
④
③
②
①
Ⓐ
Ⓑ
Ⓒ
Ⓓ

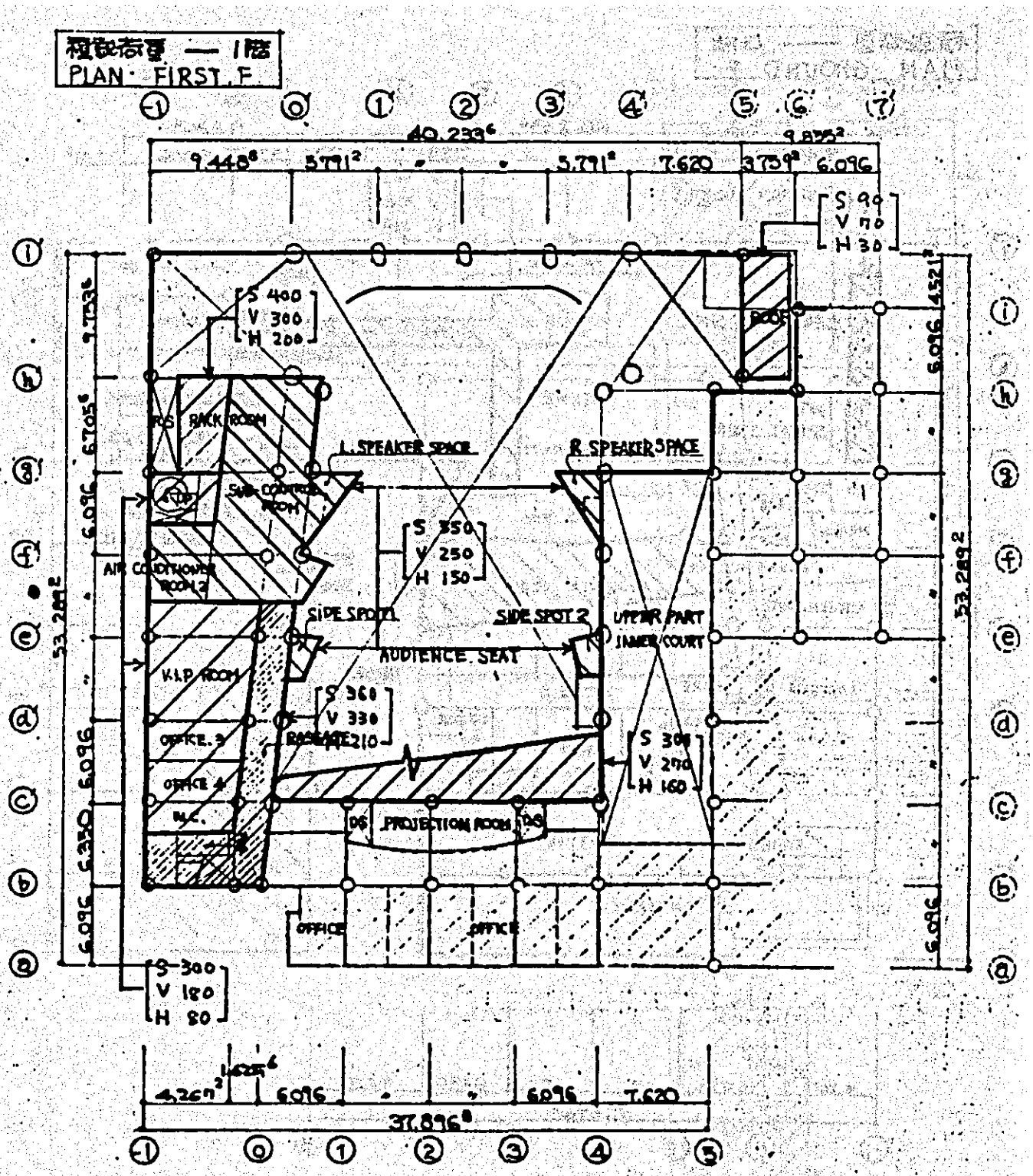

⑤ 7LTG
③
②
①
Ⓐ
Ⓑ
Ⓒ

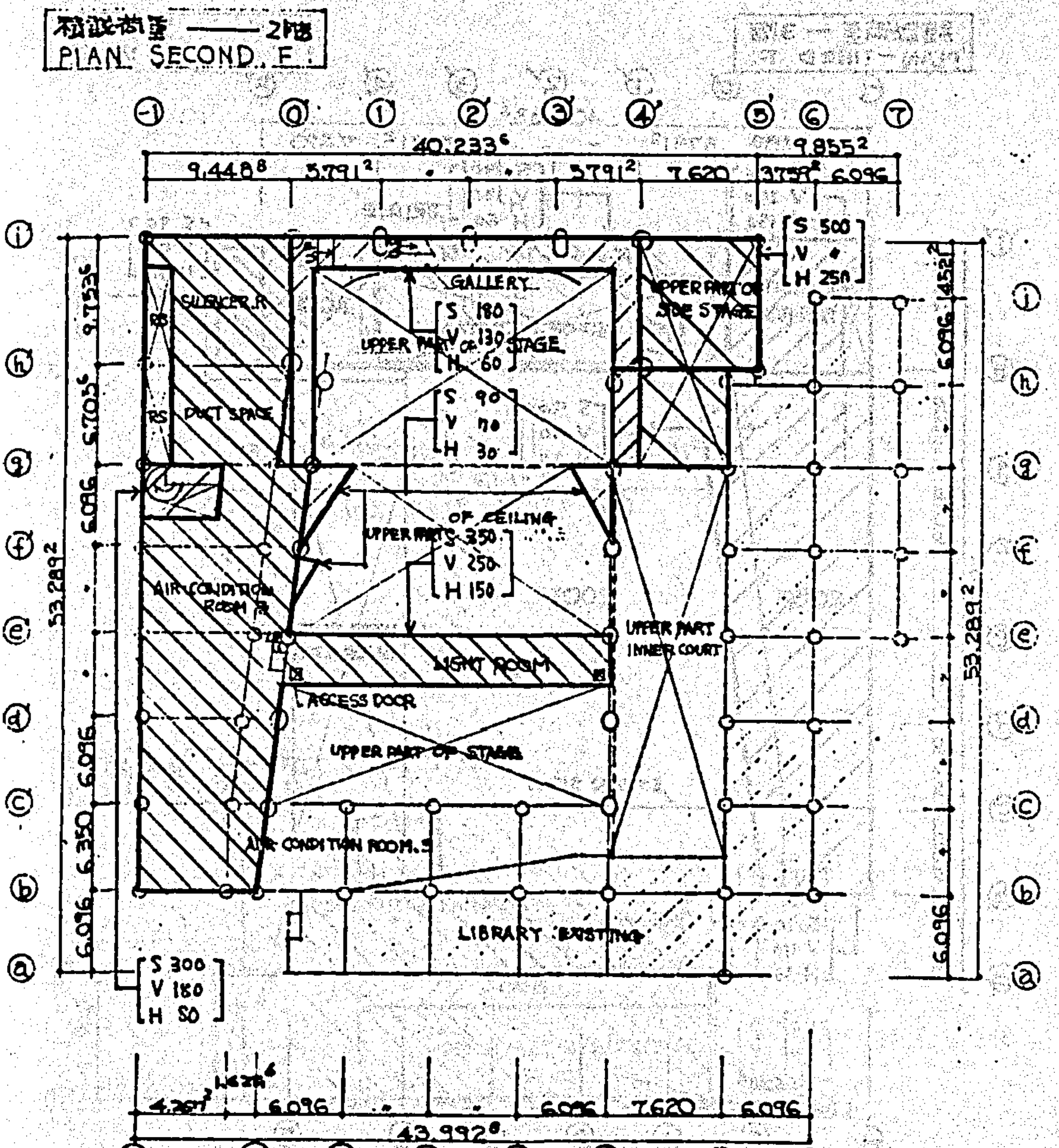
積載荷重 —— G階
PLAN GROUND F

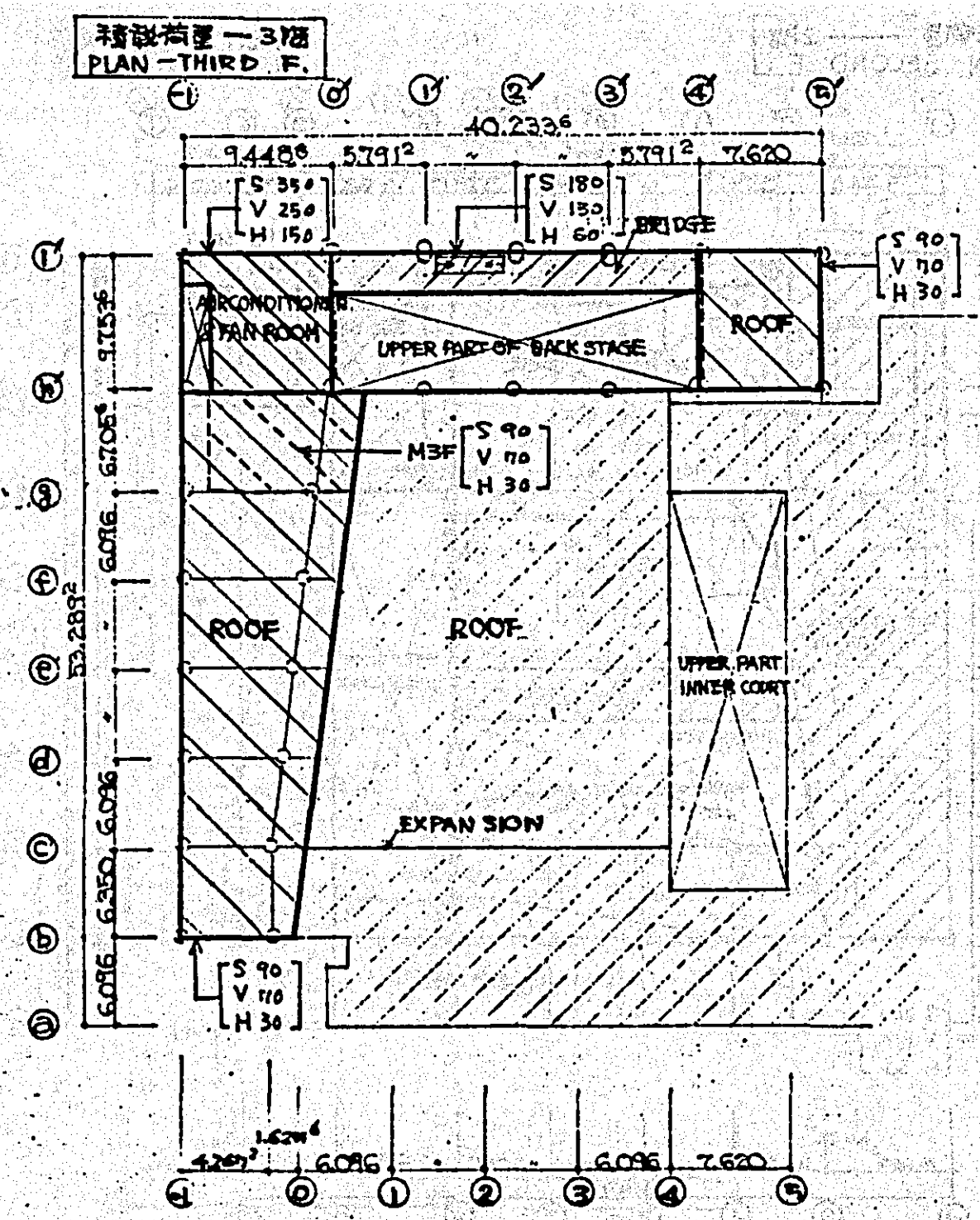


床用	kg/m²
S：床・はり　用	積載荷重
V：居室・廊下	〃
H：地震力	〃

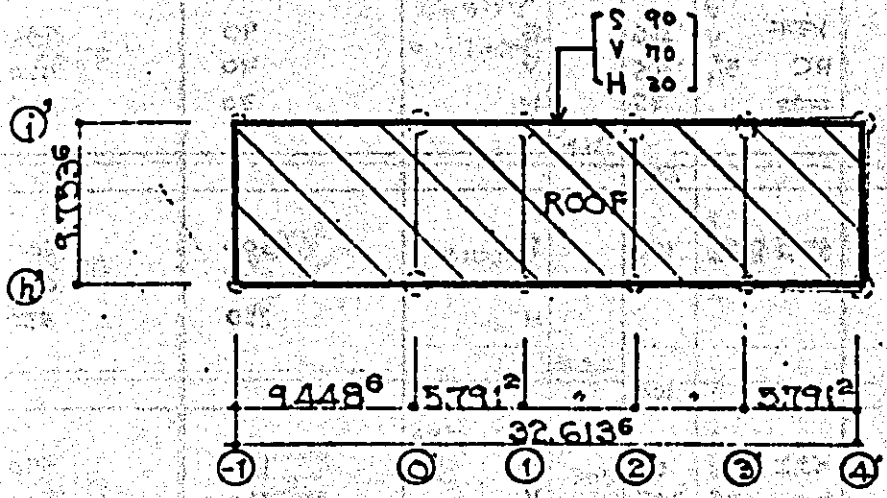
(1 P.S.f. = 4.88266 kg/m²
0.20481 P.S.f = 1 kg/m²)


PLAN · FIRST F.
40.239
9.448
5.791
5.791
7.620
3.759
6.096
9.875
S 90
V 70
H 30
S 400
V 300
H 200
ROOF
P.S. BACK ROOM
L. SPEAKER SPACE
R. SPEAKER SPACE
SUB-CONTROL ROOM
AIR CONDITIONER ROOM 2
S 350
V 250
H 150
SIDE SPOT 1
SIDE SPOT 2
UPPER PART INNER COURT
AUDIENCE SEAT
V.I.P. ROOM
OFFICE 3
OFFICE 4
W.C.
S 360
V 330
BAGGAGE 210
S 300
V 270
H 160
D.S.
PROJECTION ROOM
D.S.
OFFICE
OFFICE
S 300
V 180
H 80
4.267
6.096
6.096
7.620
37.896
-1
0
1
2
3
4
5
6
7
a
b
c
d
e
f
g
h
i

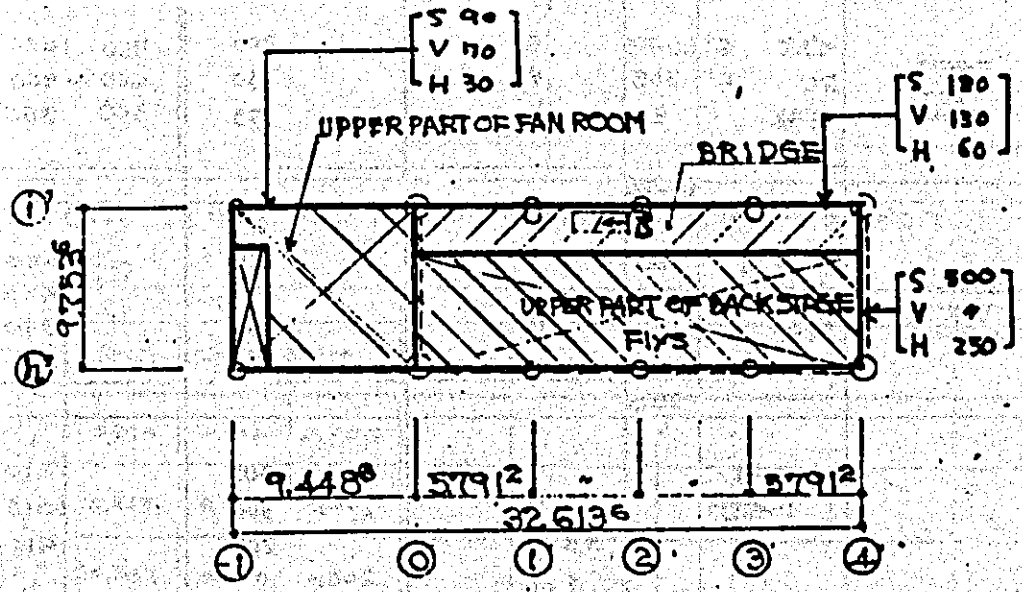

平面図 —— 2階
PLAN SECOND F
40.233⁶
9.855²
9.448⁸
3.791²
3.791²
7.620
6.096
GALLERY
UPPER PART OF STAGE
S 180
V 130
H 60
S 90
V 110
H 30
SILENCER R
DUCT SPACE
UPPER PART OF SIDE STAGE
S 500
H 250
UPPER PARTS OF CEILING
S 350
V 250
H 150
AIR CONDITION ROOM R
UPPER PART INNER COURT
LIGHT ROOM
ACCESS DOOR
UPPER PART OF STAGE
AIR CONDITION ROOM S
LIBRARY EXISTING
S 300
V 180
H 50
53.289²
6.096
6.350
5.705⁶
9.753⁶
4.572
43.992⁸
6.096
7.620
6.096


積載荷重 一3階
PLAN—THIRD F.
40.233.6
9.448.6
5.791.2
5.791.2
7.620
S 350
V 250
H 150
S 180
V 130
H 60
BRIDGE
S 90
V 110
H 30
AIRCONDITIONER FAN ROOM
UPPER PART OF BACK STAGE
ROOF
M3F
S 90
V 110
H 30
ROOF
ROOF
UPPER PART INNER COURT
EXPAN SION
S 90
V 110
H 30
9.753.6
6.705.6
6.096
6.096
6.350
6.096
53.289.2
1.524.6
4.267.2
6.096
6.096
7.620

積載荷重 —— R階
PLAN - ROOF F

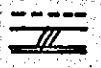
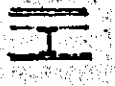


積載荷重 —— 4階
PLAN - FOURTH F



単位荷重

床　　kg/m²

	固定荷重			積載荷重		計
屋上		防水 RC 5" 天井	300 305 35	S V H	90 70 30	740 720 680
			650			
スリコ		鉄骨骨組	100	S V H	500 500 250	600 600 350
			100			
ギャラリイ		仕上 RC 5" 天井	60 305 45	S V H	180 130 60	590 540 470
			410			
中間床			〃	S V H	90 70 30	500 480 440
			410			
空調室 副調室 3-2F～1F		仕上 6" RC 5" 天井	60～365 305 50	S V H	350 250 150	760 1060 660～960 560 860
			410-710			
照明室		仕上 骨組 天井	60 100 40	S V H	350 250 150	550 450 350
			200			
ラック室		空調室 〃 に含む		S V H	400 300 200	1110 1010 910
			710			
事務室		ギャラリイ 〃 に含む		S V H	300 180 80	710 590 490
			410			

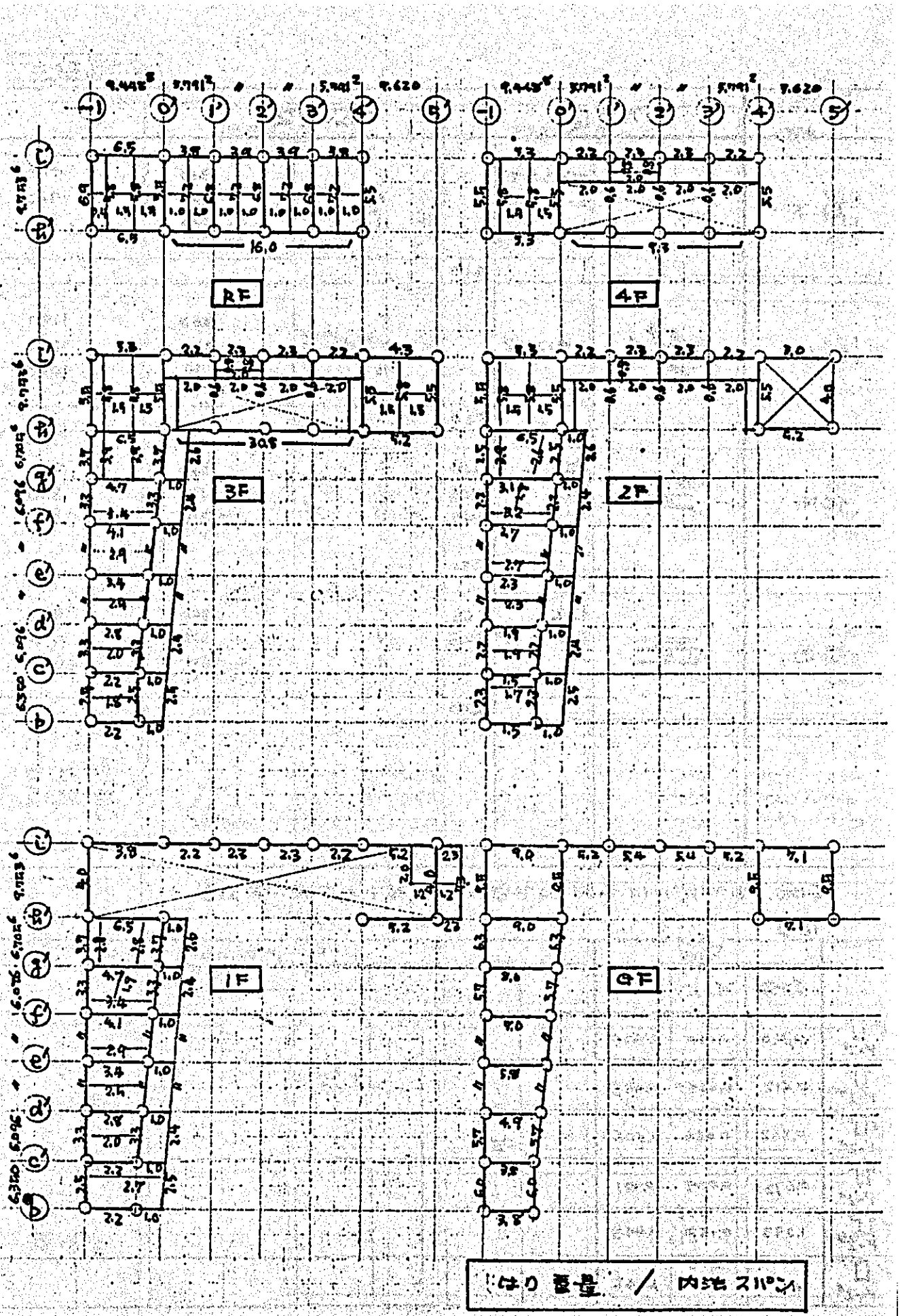
kg/m2

	固定荷重			積載荷重		計
廊下		ギャラリイ 以下に含む		S	360	770
				V	330	740
				H	210	620
			410			
階段		410×2		S	360	1180
				V	330	1150
				H	210	1030
			820			
便所		仕上	200	S	360	910
		RC 5"	305	V	330	880
		天井	45	H	210	760
			550			
舞台		仕上	65	S	360	730
		RC 5"	305	V	330	700
				H	210	580
			370			

(はり、柱サイズには最終報告書において若干の変更がある。)

はり

	t/m			t/ クリア・スパン							
	躯体	仕上	Σ								
1'-6" T 1'-2"	0.390	0.010	0.406			See 次P.					
2' T 1'-2"	0.412	0.024	0.436								
2'-6" T 1'-2"	0.542	0.064	0.606								
3' T 1'-2"	0.672	0.079	0.751								
5' T 1'-2"	1.293	0.152	1.445								
4' □ 1'-2"	1.041	—	1.041								

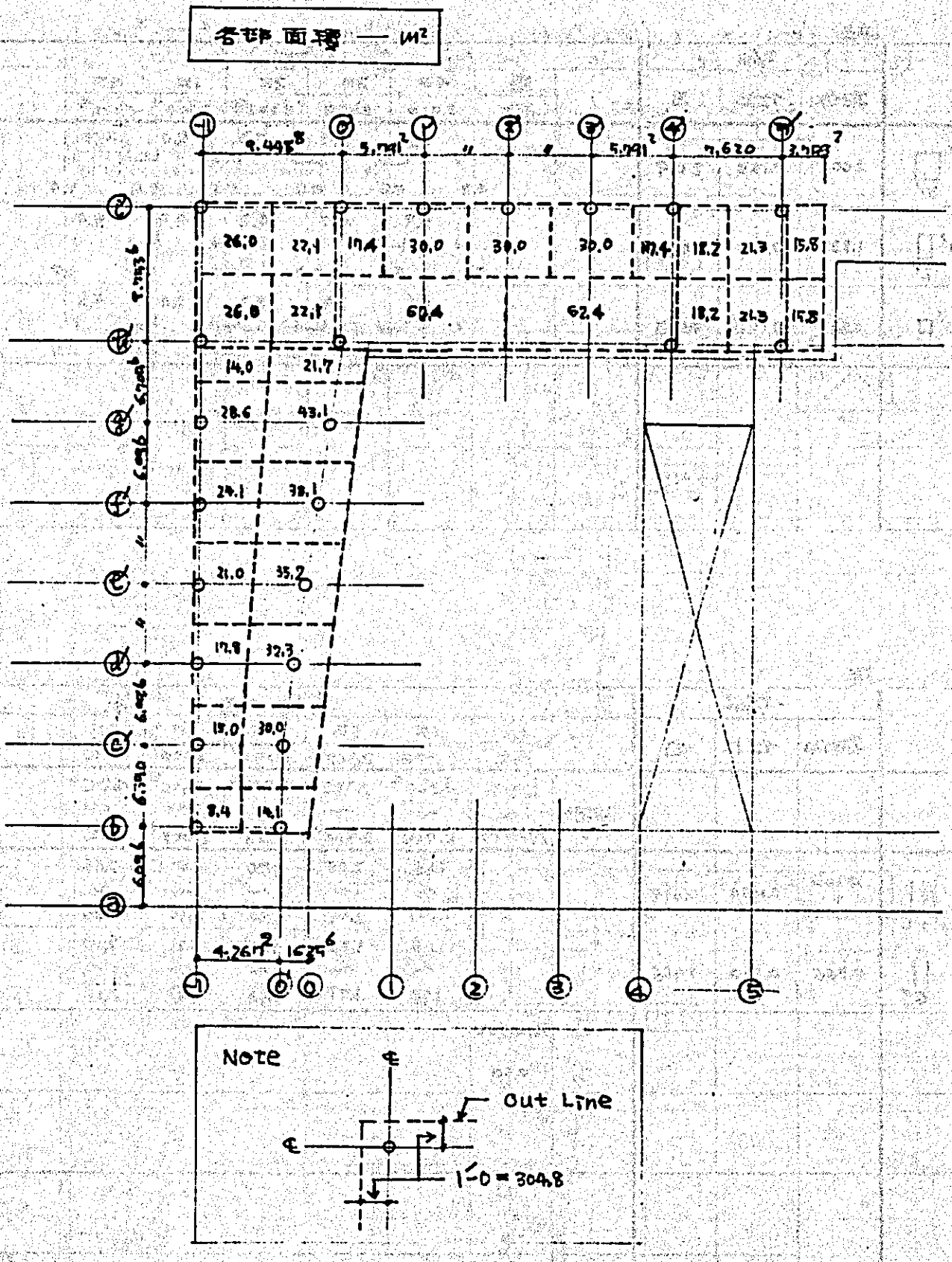

RF
4F
3F
2F
1F
GF
1:はり重量 / 内法スパン

柱：

	t/m 躯体	t/m 仕上	t/m Σ	t/階 階	4F	3F	2F	1F	GF
				高さ	3,810	3,048	3,352[8]	3,200[4]	6,121[4]
3'/3' □	2.006	0.183	2.189		8.8 / 4.2	6.17 / 17.8	7.3 / 6.8	7.0 / 7.2	14.0 / 10.5
3' □ 2'	1.338	0.182	1.520		5.9 / 5.0	4.7 / 8.3	5.2 / 9.0	4.9 / 5.1	9.4 / 7.4
2' □ 2'	0.892	0.061	0.953		3.6 / 1.8	2.9 / 3.3	3.2 / 3.1	3.0 / 3.1	5.8 / 4.4

階：

	t/m2 躯体	t/m2 仕上	t/m2 Σ	t/内法高 m 階	4F	3F	2F	1F	GF
				高さ	2,895[4]	3,962[4]	3,352[8]	3,200[4]	4,902[2]
				内法高 はり下 ～ 床スラブ下	2,268[4] ～ 2,768	3,352[8] ～ 3,835[4]	2,743[2] ～ 3,228[8]	2,590[8] ～ 3,073[4]	4,292[6] ～ 4,921[2]
5"+6"	0.203 + 0.366	0.050	0.619		1.43 ～ 1.71	2.08 ～ 2.37	1.70 ～ 2.00	1.60 ～ 1.90	2.66 ～ 2.80
6"	0.366	0.100	0.466		1.06 ～ 1.28	1.36 ～ 1.79	1.28 ～ 1.50	1.21 ～ 1.43	2.00 ～ 2.11
				Parapet 0.50					


各部面積 — ㎡
9.495
5.791
5.791
7.620
3.048
26.0
22.1
10.4
30.0
30.0
30.0
17.4
18.2
24.3
15.8
26.8
22.1
60.4
62.4
18.2
24.3
15.8
14.0
21.7
28.6
43.1
24.1
38.1
21.0
35.2
17.8
32.3
15.0
30.0
8.4
14.1
4.267
1.524
Note
Out Line
1'-0" = 304.8

柱 軸方向力一覧表　(t)

		Ⓑ Ⓘ		Ⓑ Ⓒ		Ⓒ Ⓘ		Ⓒ Ⓒ	
4	S								
	B								
	C								
	W								
	Σ								
3	S								
	B								
	C								
	W								
	Σ								
2	S	0.96 × 8.4	8.1	× 14.1	13.5	× 15.0	14.4	× 30.0	29.8
	B	1.1 + 0.4	1.5	1.1 + 1.0	2.1	1.1 + 0.9	2.0	1.1 + 1.9	3.0
		1.8	1.8	1.8 + 1.3	3.1	3.4	3.4	3.4 + 2.6	6.0
	C		1.6		1.6		1.6		1.6
	W								
	Σ	13.0	13.0	20.3	20.3	21.4	21.4	39.4	39.4
1	S	0.96 × 8.4	8.1	× 14.1	13.5	× 15.0	14.4	× 30.0	28.8
	B	1.1 + 0.4	1.5	1.1 + 1.0	2.1	1.1 + 0.9	2.0	1.1 + 1.9	3.0
		1.8	1.8	1.8 + 1.3	3.1	3.4	3.4	3.4 + 2.6	6.0
	C		3.1		3.1		3.1		3.1
	W	1.85 × 4.7	8.7	× 3.2	5.9	× 5.6	10.4	—	
		1.50 —		—		—		—	
	Σ	36.2	23.2	48.0	27.7	54.7	33.3	80.3	40.9
G	S	1.14 × 8.4	9.7	× 8.4	9.7	0.59 × 15.0	8.9	× 15.8	9.0
				0.74 × 5.7	4.3			× 15.0	11.1
	B	1.1 + 0.4	1.5	1.1 + 1.0	2.1	1.1 + 0.9	2.0	1.1 + 1.9	3.0
		1.8	1.8	1.8	1.8	3.4	3.4	3.4 + 2.6	6.0
	C		4.4		4.4		4.4		4.4
	W	1.76 × 4.7	8.3	× 3.2	5.6	× 7.7	19.6	× 2.1	3.7
		1.43 —		—		1.43 × 3.0	4.3	× 9.8	14.0
	Σ	61.9	25.7	75.9	27.9	96.3	36.6	131.5	51.2
F	S								
	B	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
		2.3	2.3	2.3	2.3	4.4	4.4	4.4	4.4
	C		2.9		2.9		2.9		2.9
	W	2.60 × 4.7	12.2	× 3.2	8.3	× 7.7	20.0	× 2.1	5.5
		2.11 —		—		—		2.11 × 6.2	13.1
	Σ	80.7	18.8	90.8	14.9	120.0	28.7	158.8	27.3

		④ -1		④ ⊙		⊖ -1		⊖ ⊙	
4	S								
	B								
	C								
	W								
	Σ								
3	S								
	B								
	C								
	W								
	Σ								
2	S	0.96 × 10.8	17.1	× 32.3	31.0	× 21.0	20.2	× 35.2	33.8
	B	1.4 + 1.1	2.5	1.4 + 2.1	3.5	1.7 + 1.3	3.0	1.7 + 2.3	4.0
		3.3	3.3	3.3 + 2.6	5.9	3.3	3.3	3.3 + 2.6	5.9
	C		1.6		1.6		1.6		1.6
	W								
	Σ	24.5	24.5	42.0	42.0	28.1	28.1	45.3	45.3
1	S	0.96 × 17.8	17.1	× 32.3	31.0	× 21.0	20.2	× 35.2	33.8
	B	1.4 + 1.1	2.5	1.4 + 2.1	3.5	1.7 + 1.3	3.0	1.7 + 2.3	4.0
		3.3	3.3	3.3 + 2.6	5.9	3.3	3.3	3.3 + 2.6	5.9
	C		3.1		3.1		3.1		3.1
	W	1.85 × 5.5	10.2	—		× 5.5	10.2	—	
		1.50 —		—		—		—	
	Σ	60.7	36.2	85.5	43.5	67.9	39.8	92.1	46.8
G	S	0.59 × 17.8	10.5	× 17.8	10.5	× 21.0	12.4	× 21.0	12.4
				0.74 × 14.5	10.7			× 14.2	10.5
	B	1.4 + 1.1	2.5	1.4 + 2.1	3.5	1.7 + 1.3	3.0	1.7 + 2.3	4.0
		3.3	3.3	3.3 + 2.6	5.9	3.3	3.3	3.3 + 2.6	5.9
	C		4.4		4.4		4.4		4.4
	W	1.76 × 5.5	9.7	—		× 5.5	9.7	—	
		1.43 × 2.3	3.3	× 8.2	11.7	× 2.8	4.0	× 8.2	11.7
	Σ	94.4	33.7	132.2	46.7	104.7	36.8	141.0	48.9
F	S								
	B	1.8	1.8	1.8	1.8	2.2	2.2	2.2	2.2
		4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
	C		2.9		2.9		2.9		2.9
	W	2.60 × 5.5	14.3	—		× 5.5	14.3	—	
		2.11 —		× 5.9	12.4	× 4.5	9.5	× 9.9	20.9
	Σ	117.7	23.3	153.6	21.4	137.9	33.2	171.3	30.3

		ⓕ (-1)		ⓕ (0)		ⓖ (-1)		ⓖ (0)	
4	S								
	B								
	C								
	W								
	Σ								
3	S								
	B								
	C								
	W								
	Σ								
2	S	0.96 × 24.1	23.1	× 38.1	36.6	× 28.6	27.5	× 43.1	41.4
						0.48 × 14.3	6.9	× 21.6	10.4
	B	2.1 + 1.5	3.6	2.1 + 2.5	3.6	4.7 + 2.7	7.4	4.7 + 5.5	10.2
		3.3	3.3	3.3 + 2.6	5.9	5.4	5.4	5.4 + 2.7	7.1
	C		1.6		1.6		1.6		1.6
	W								
	Σ	31.6	31.6	47.7	47.7	48.8	48.8	70.7	70.7
1	S	0.96 × 24.1	23.1	× 38.1	36.6	× 14.3	13.7	× 35.9	34.5
						1.15 × 14.3	16.4	0.94 × 8.2	3.9
	B	2.1 + 1.5	3.6	2.1 + 2.5	4.6	2.4 + 1.8	4.2	2.4 + 2.5	5.2
		3.3	3.3	3.3 + 2.6	5.9	3.5	3.5	3.5 + 2.7	6.2
	C		3.1		3.1		3.1		3.1
	W	1.85 × 5.5	10.2	—		× 5.5	10.2	—	
		1.50 × 7.0	10.5	× 3.1	4.7	× 7.8	11.7	—	
	Σ	85.4	53.8	102.6	54.9	111.6	62.8	123.6	52.9
G	S	0.96 × 24.1	23.1	× 38.1	36.6	1.01 × 14.3	14.4	0.96 × 43.1	41.4
						1.15 × 14.3	16.4		
	B	2.1 + 1.5	3.6	2.1 + 2.5	4.6	2.4 + 1.8	4.2	2.4 + 1.8	4.2
		3.3	3.3	3.3 + 2.6	5.9	3.5	3.5	3.5 + 2.7	6.2
	C		4.4		4.4		4.4		4.4
	W	1.96 × 5.5	9.7	—		× 5.5	9.7	—	
		1.43 × 7.0	10.0	× 4.8	6.9	× 11.8	11.2	× 1.6	2.3
	Σ	139.5	54.1	161.0	58.4	175.4	63.8	182.1	58.5
F	S					15.0	15.0		
	B	2.6	2.6	2.6	2.6	3.0	3.0	3.0	3.0
		4.3	4.3	4.3	4.3	3.6	3.6	3.6	3.6
	C		2.9		2.9		2.9		2.9
	W	2.60 × 5.5	14.3	—		× 5.5	14.3	—	
		2.11 × 10.4	21.9	× 13.7	28.9	× 9.6	11.8	× 17.5	26.4
	Σ	185.5	46.0	199.7	38.7	226.0	50.6	218.0	33.9

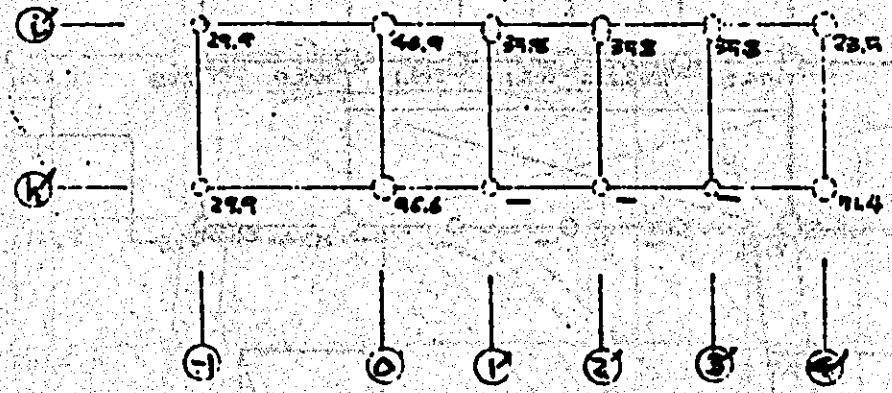
		Ⓑ ①'		Ⓑ ⓪		Ⓑ ④		Ⓑ Ⓓ	
4	S	0.72 × 24.5	17.6	× 84.5	60.8	× 61.6	44.4		
	B	3.3	3.3	11.8	11.8	8.5	8.5		
		3.5 + 3.7	7.2	8.8 + 11.0	19.8	3.8 + 5.5	14.3		
	C		1.8		4.2		4.2		
	W								
	Σ	29.9	29.9	96.6	96.6	71.4	71.4		
3	S	0.48 × 24.5	11.8	× 22.9	11.0				
				0.60 × 61.6	37.0	× 61.6	37.0		
	B	3.3	3.3	10.2	10.2	6.9	6.9		
		3.5 + 3.7	7.2	3.5 + 3.7	7.2	2.8	2.8		
	C		3.3		7.5		7.5		
	W	2.11 × 9.0	19.0	× 15.7	33.1	× 15.8	33.3		
		1.72 −		× 4.6	7.9	−			
	Σ	74.5	44.6	210.5	113.9	158.9	87.5		
2	S	0.96 × 14.0	13.4	× 21.7	20.8	0.72 × 18.2	13.1	× 21.3	15.3
		0.48 × 14.0	6.7	× 21.7	10.4				
		0.96 × 24.5	23.5	× 22.9	22.0				
	B	6.0 + 1.9	7.9	10.2 + 1.9	12.1	9.5	9.5	2.7	2.7
		7.2 + 3.7	10.9	7.2 + 17.7	14.9	3.5 + 14.4	17.9	3.5 + 1.7	5.2
	C		3.1		6.5		6.5		1.6
	W	1.68 × 9.0	15.1	× 15.7	26.4	× 15.8	26.5		
		1.36 −		× 4.6		−			
	Σ	155.1	80.6	323.6	113.1	232.4	73.5	24.8	24.8
1	S	0.96 × 38.5	37.0	× 38.5	37.0	0.60 × 18.2	10.9	× 21.3	12.8
				0.54 × 16.5	8.9	× 10.4	9.6		
	B	3.3 + 0.9	4.2	3.3 + 0.9	4.2	−		−	
		5.3 + 3.7	9.0	5.3 + 3.7	9.0	−		−	
	C		3.1		7.2		7.2		3.1
	W	1.89 × 7.6	14.1	−		−		× 4.6	8.5
		1.50 × 8.2	12.3	× 11.6	11.4	−		−	
	Σ	234.8	119.7	401.3	117.7	296.1	23.17	49.2	24.4
G	S	1.01 × 14.0	14.1	0.96 × 21.7	20.8	−		0.72 × 15.8	11.4
	B	2.7 + 0.9	3.6	2.7 + 1.9	4.6	−		2.3	2.3
		4.6	4.6	1.9 + 1.4	3.3	−		3.5 + 3.7	7.2
	C		4.4		10.5		10.5		4.4
	W	1.96 × 7.6	13.4	−		−		× 4.6	8.1
		1.43 × 11.8	11.2	× 6.7	9.6	−		−	
	Σ	286.1	91.3	490.1	48.8	266.6	10.5	82.6	33.4
F	S	40.0	40.0						
	B	3.5	3.5	12.3	12.3	11.6	11.6	2.8	2.8
		6.0	6.0	6.0	6.0	3.6	3.6	3.6	3.6
	C		2.9		7.0		7.0		2.9
	W	2.60 × 7.6	20.0	−		−		× 4.6	12.0
		2.11 −		−		−		−	
	Σ	358.5	72.4	475.4	29.3	288.8	22.2	103.9	21.3

		⑦ ⑨		⑫ ⑥		⑦ ①		⑤ ④	
4	S	0.72 × 24.5	17.6	× 39.5	28.4	× 30.0	21.6	× 16.6	12.0
	B	3.3	3.3	5.8	5.3	3.9	3.9	2.0	2.0
		3.5 + 3.7	7.2	3.5 + 5.5	9.0	3.6 + 3.7	7.3	3.5 + 1.8	5.3
	C		1.8		4.2		3.0		4.2
	W								
	Σ	29.9	29.9	46.9	46.9	35.8	35.9	23.5	23.5
3	S	0.48 × 24.5	11.8	× 22.9	11.0				
				0.54 × 7.5	4.1	× 13.5	7.3	× 7.5	4.1
				0.60 × 9.1	5.5	× 16.5	9.9	× 9.1	5.5
	B	3.3	3.3	4.9 +1.3	6.2	3.1 +2.5	5.6	1.6 +1.3	2.9
		3.5 + 3.7	6.2	3.5 + 3.7	6.2	0.8	0.8	2.8	2.8
	C		3.3		7.5		5.3		7.5
	W	2.11 × 9.0	19.0	× 7.0	14.8	× 5.2	11.0	× 7.2	15.2
		1.72 −		× 4.6	7.9	−		−	
	Σ	73.5	43.6	110.1	63.2	73.7	39.9	61.5	38.0
2	S	0.96 × 24.5	23.5	× 22.9	22.0			0.72 × 18.2	13.1
				0.54 × 7.5	4.1	× 13.5	7.3	× 7.5	4.1
	B	3.3	3.3	4.9 +1.3	6.2	3.1 +2.5	5.6	4.2 +1.3	5.5
		3.5 + 3.7	7.2	3.5 + 3.7	7.2	0.8	0.8	3.5 + 1.7	5.2
	C		3.1		6.5		5.0		6.5
	W	1.68 × 9.0	15.1	× 7.0	11.8	× 5.2	8.7	× 7.2	12.1
		1.36 −		× 4.6	6.3	−		−	
	Σ	125.7	57.2	174.2	64.1	103.1	27.4	108.0	46.5
1	S	0.96 × 24.5	23.5	× 22.9	22.0			0.60 × 18.2	10.9
				0.54 × 13.2	7.1	× 13.5	7.3	× 13.5	7.3
	B	3.3	3.3	4.9 +1.3	6.2	3.1 +2.5	5.6	3.7 +1.3	5.0
		3.5 + 3.7	7.2	3.5 + 3.7	7.2	0.8	0.8	2.8	2.8
	C		3.1		7.2		5.1		7.2
	W	1.85 × 9.0	16.7	× 7.0	13.0	× 5.2	9.6	× 6.1	11.3
		1.50 × 4.9	7.4	× 4.6	6.9	−		−	
	Σ	186.9	61.2	244.1	69.6	131.5	28.4	152.5	44.9
G	S	−							
	B	2.7	2.7	4.3	4.3	3.1	3.1	3.7	3.7
		2.8	2.8						10.5
	C		4.4		10.5		7.4		
	W	1.76 × 9.0	15.8	× 7.0	12.3	× 5.2	9.2	× 6.1	10.7
		1.43 −		−		−		−	
	Σ	212.6	25.7	271.2	27.1	154.2	19.7	197.4	24.9
F	S	25.0	25.0						
	B	3.5	3.5	5.5	5.5	4.0	4.0	4.8	4.8
		3.6	3.6	3.6	3.6			3.6	3.6
	C		2.9		7.0		4.7		7.0
	W	2.60 × 9.0	23.4	× 7.0	18.2	× 5.2	13.5	× 6.1	15.9
		2.11 −		−		−		−	
	Σ	271.0	98.4	313.5	34.3	173.4	22.2	208.7	31.3

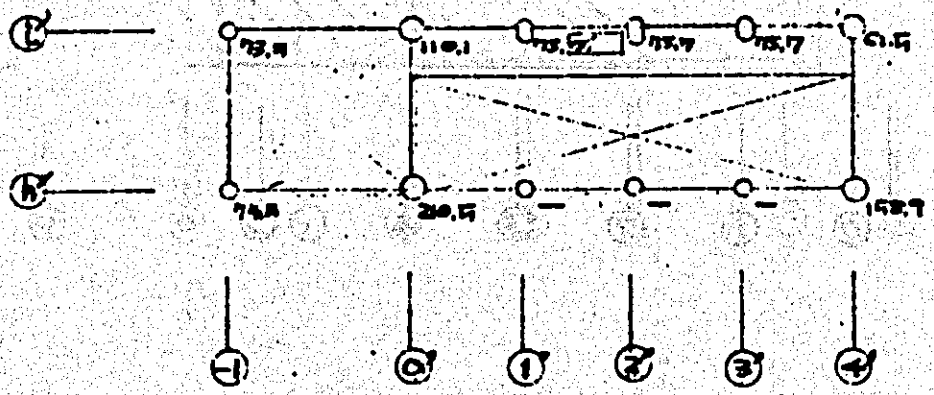
		⑥ ⑤		○ ○	○ ○	○ ○
4	S					
	B					
	C					
	W					
	Σ					
3	S					
	B					
	C					
	W					
	Σ					
2	S	0.72 × 21.3	15.3			
	B	2.7	2.7			
	C	3.8 + 1.7	5.2			
	W		1.6			
	Σ	24.8	24.8			
1	S	0.60 × 21.3	12.8			
	B	2.1	2.1			
	C	2.8	2.8			
	W	1.55 × 8.1	3.1			
		1.80 —	15.0			
	Σ	63.6	37.8			
G	S	0.72 × 15.8	11.4			
	B	2.1 + 2.3	4.4			
	C	3.5 + 3.7	7.2			
	W	1.76 × 8.1	4.4			
		1.43 —	14.3			
	Σ	105.3	41.7			
F	S					
	B	2.8	2.8			
	C	3.6	3.6			
	W	2.60 × 8.1	2.9			
		2.11 × 7.0	54.8			
	Σ	184.2	78.9			

(注)
以上の内容について，一部に空欄があるが，その設備は無いである。

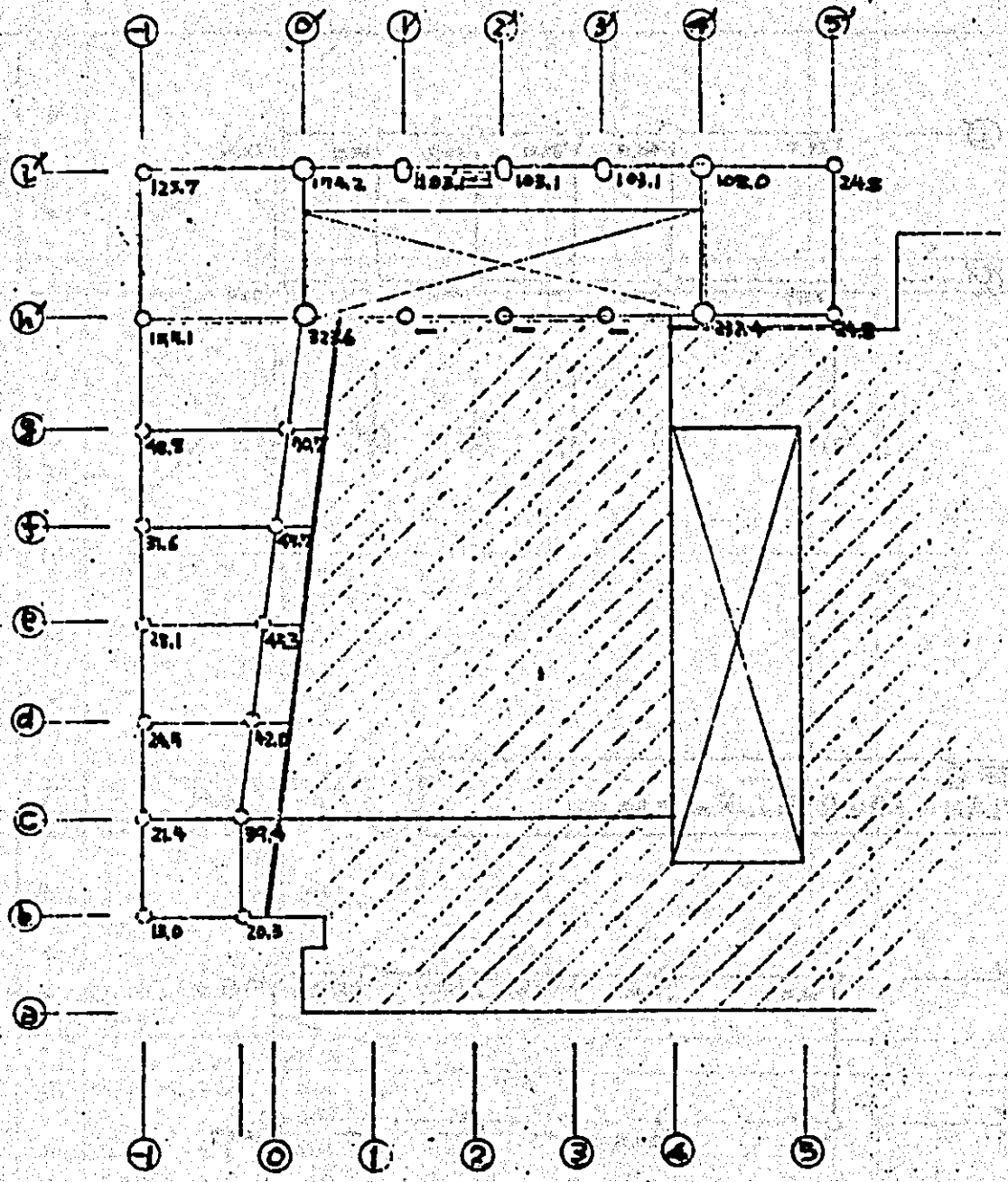
鉛直荷重
KEY PLAN - ROOF. F. = 4階柱 (t)



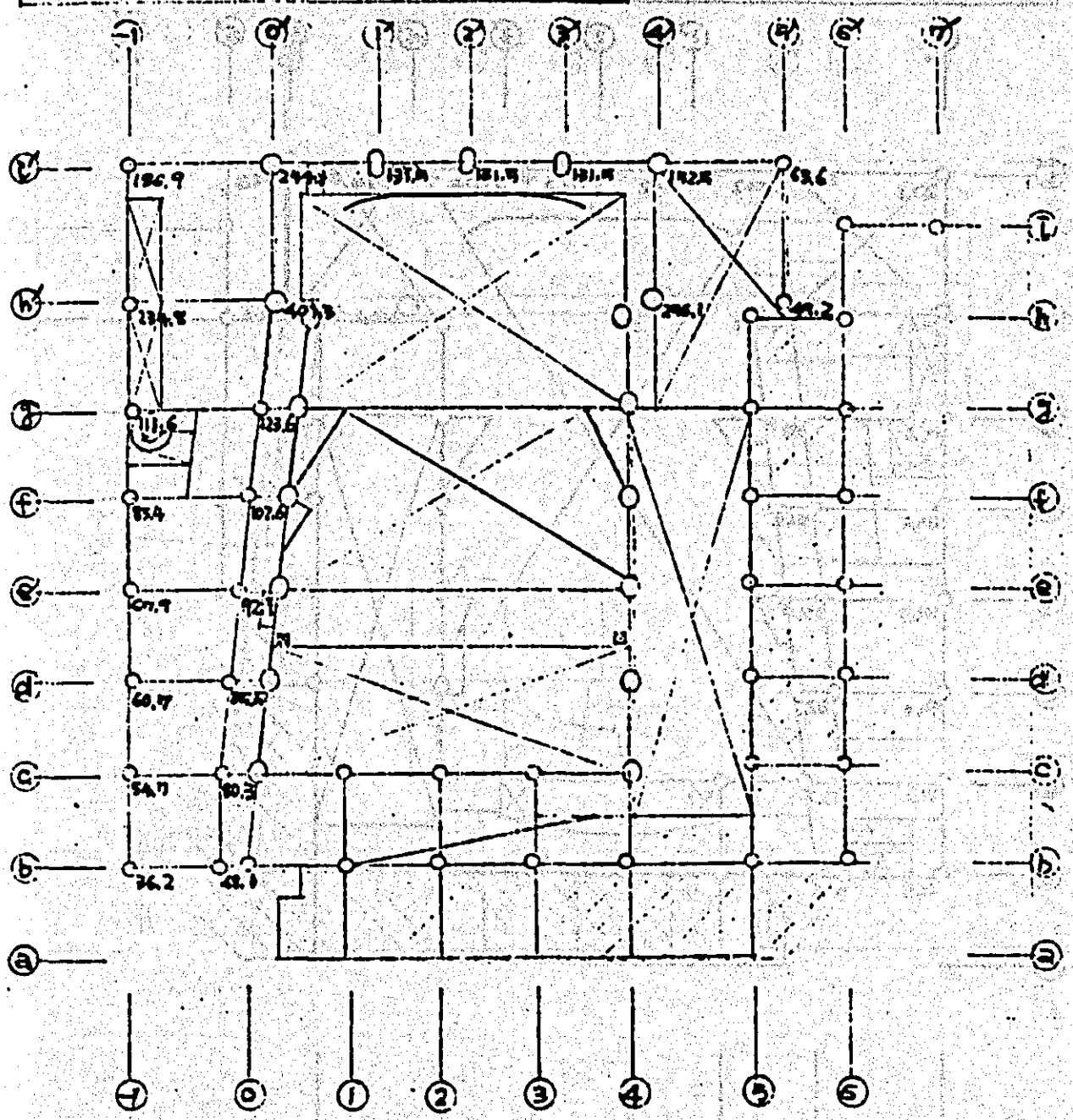
鉛直荷重
KEY PLAN - FOURTH. F. = 3階柱 (t)



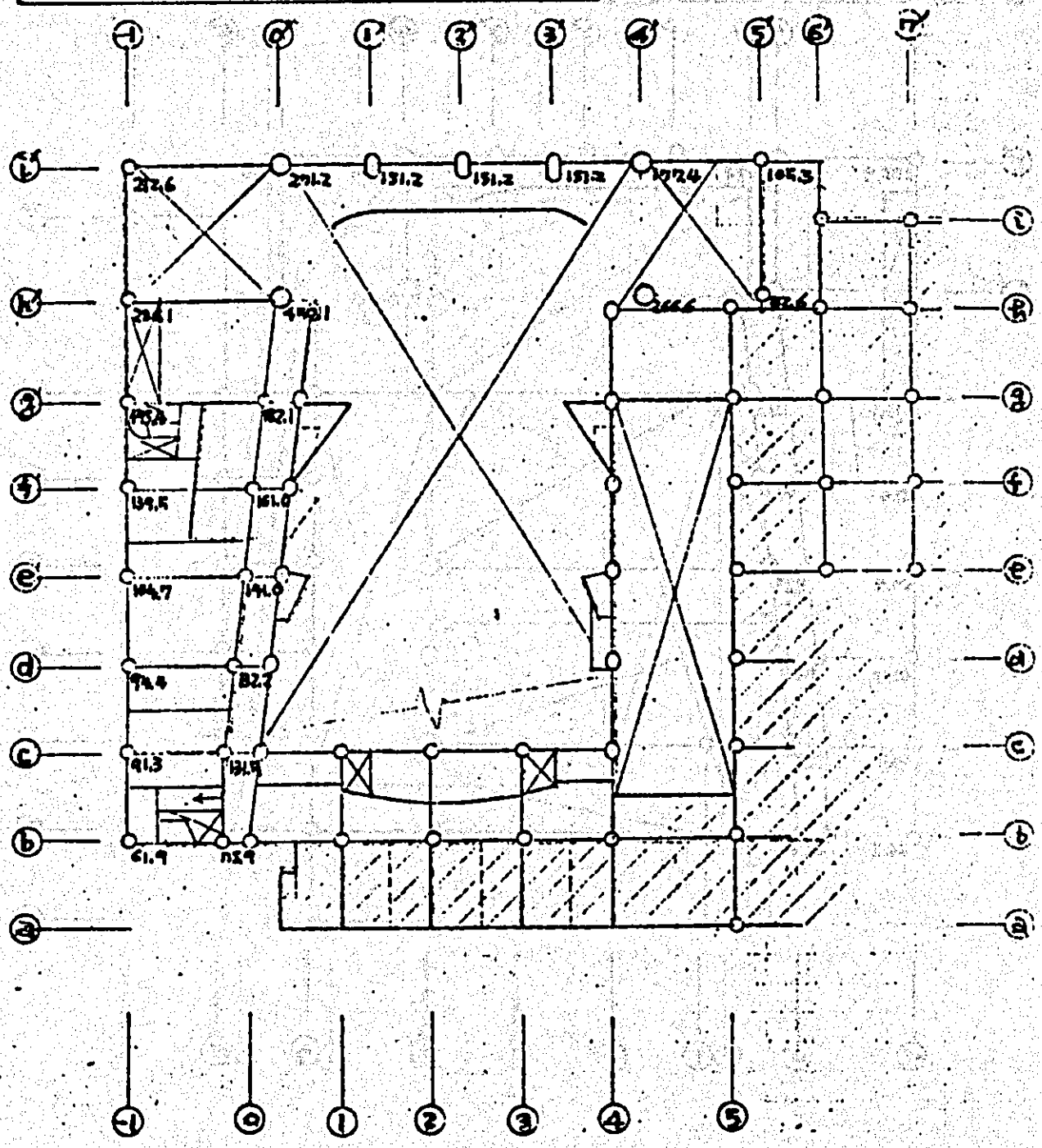
鉛直柱筋
KEY PLAN - THIRD. F. -2階柱



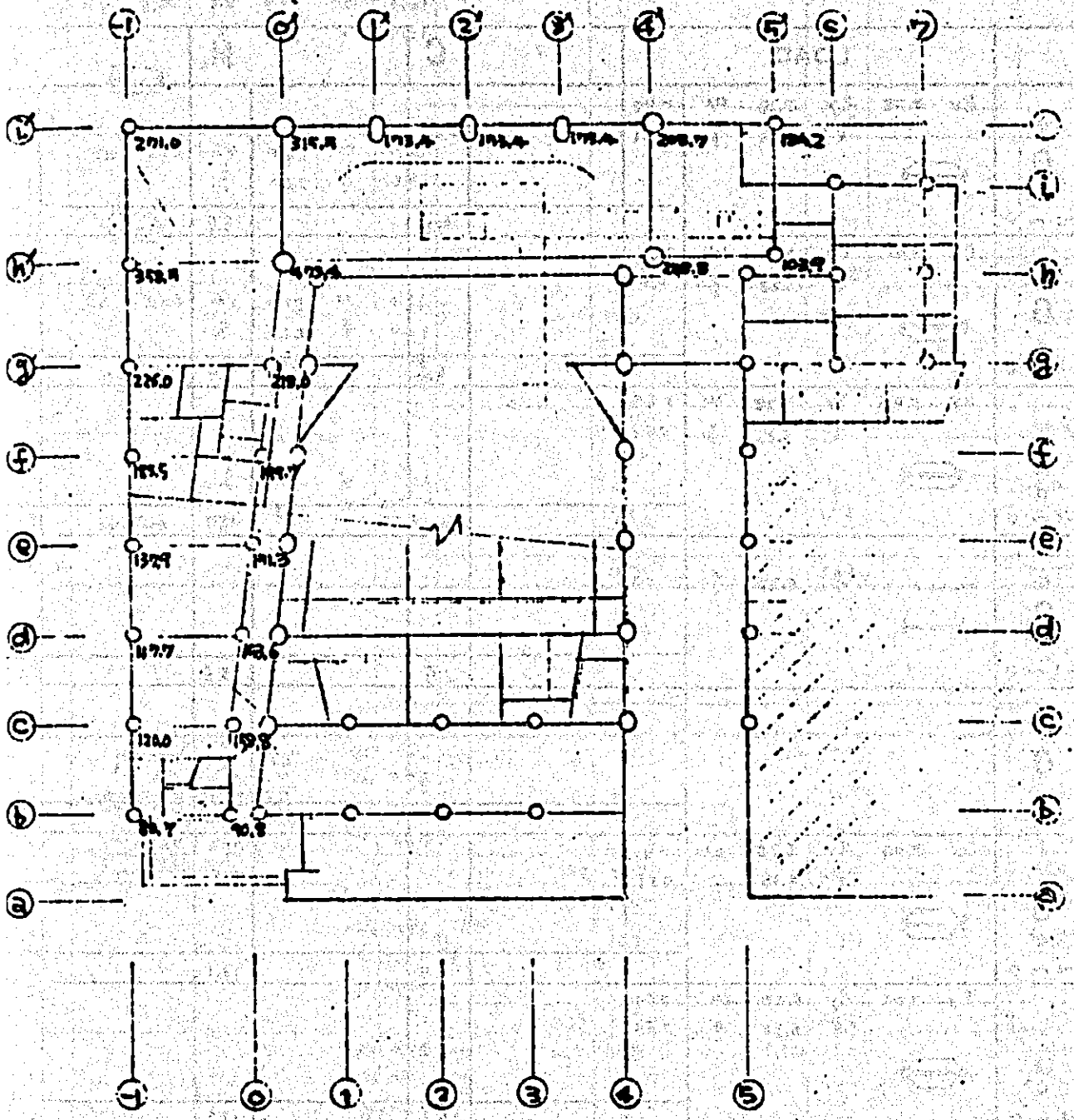
鉛直荷重
KEYPLAN-SECOND F.= 1階柱



鉛直荷重
KEY PLAN - FIRST F. = G階床



鉛直柱配置
KEY PLAN GROUND F. 一基階

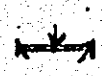
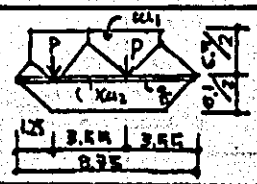


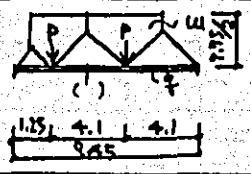
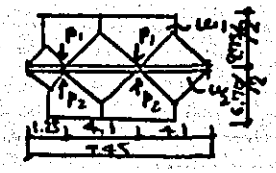
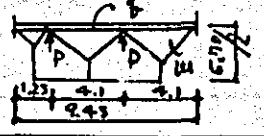
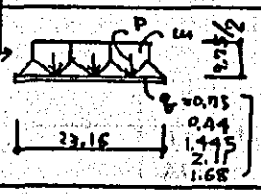
はり・CMoQ

（CMoQの結果はCOMPUTERにより求めた。）

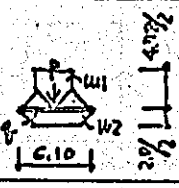
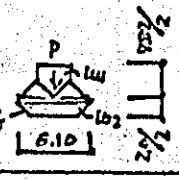
[tm] [t]

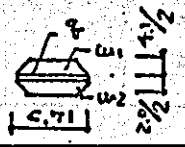
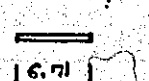
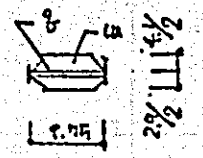
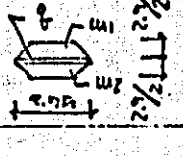
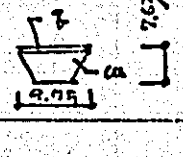
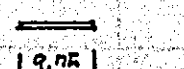
	LOAD		C	M_0	Q
3 G d' −1 ~ 0	l_x 3.05 l_y 5.28 w l 5.28 γ	0.72 0.61			
			5.8	8.9	5.7
2 G d' −1 ~ 0	l_x 3.05 l_y 5.28 w l 5.28 γ	0.66 0.61			
			5.4	8.4	5.4
1 G d' −1 ~ 0	l_x 3.05 l_y 5.28 w l 5.28 γ	0.59 0.61			
			5.0	7.7	5.0
q G d' −1 ~ 0	l 5.28 γ	1.04			
			2.4	3.6	2.7
G					
3 G e' −1 ~ 0	l_x 3.05 l_y 6.30 w l 6.30 γ	0.72 0.61			
			8.5	13.1	7.2
2 G e' −1 ~ 0	l_x 3.05 l_y 6.30 w l 6.30 γ	0.66 0.61			
			8.0	12.2	6.7
1 G e' −1 ~ 0	l_x 3.05 l_y 6.30 w l 6.30 γ	0.59 0.61			
			7.4	11.3	6.2
G G e' −1 ~ 0	l 6.30 γ	1.04			
			3.4	5.2	3.3

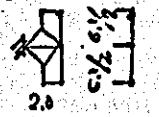
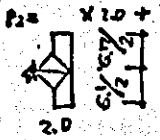
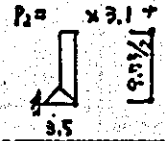
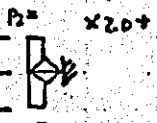
	LOAD				C		M_0		Q	
3 G f′		l_x 3.05	l_y 7.32	w	0.72					
		l 7.32	g		0.61					
−1 ~ 0						14.8		17.9		8.6
2 G f′		l_x 3.05	l_y 7.32	w	0.66					
		l 7.32	g		0.61					
−1 ~ 0						11.0		16.8		9.1
1 G f′		l_x 3.05	l_y 7.32	w	0.96					
		l 7.32	g		0.61	14.8		22.6		10.7
		l 3.05	P		1.76	4.9		9.8		2.7
−1 ~ 0						19.7		32.4		13.4
G G f′		l 7.32	g		1.04	4.6		7.0		3.8
		l 3.05	P		2.11+0.44 =2.55	7.1		14.2		3.9
−1 ~ 0						11.7		21.2		7.7
G										
3 G g′				w_1	0.72	15.7	14.0	(20.0) 24.3	10.6	8.0
				w_2	0.72		13.5	21.1		8.4
				g	0.61					
				P	0.44					
						29.2	27.5	45.4	19.0	16.4
2 G g′				w_1	0.66	14.6	13.0	(18.6) 22.6	9.9	7.4
				w_2	0.66		12.7	19.7		7.9
				g	0.61					
				P	0.44					
						27.3	25.7	42.3	17.8	15.3
1 G g′				w_1	0.96	30.5	25.8	(36.0) 38.0	21.0	14.6
				w_2	0.96		16.8	26.3		12.3
				g	0.61					
				P	1.76+0.44 =2.20					
						47.3	42.6	64.3	31.3	24.9
G G g′				g	1.04		6.0	9.1		4.3
		l 3.35								
		l 3.05	P		2.60+0.44 =3.04	16.4	12.3	(14.8) 23.5	11.8	6.7
					(9.7%)	22.4	18.3	32.9	16.1	11.0

	LOAD			C.		M_i		Q	
				T_c	T_o			T_c	T_o
α G h' −1 ~ 0		w_1	0.72						
		ϕ	0.75						
		P	0.75						
				36.7	32.8	(46.1)	57.2	22.8	17.0
G' h' −1 ~ 0	〃	w_1	0.54						
		ϕ	0.75						
		P	0.75						
				30.7	27.3	(38.6	47.6	19.2	14.3
3 G h' −1 ~ 0		w_1	0.66	34.7	30.9	(43.6	54.0	21.6	16.1
		w_2	0.72	19.6	17.7	(24.8	30.7	11.9	9.0
		ϕ	0.75						
		P_1'	0.75						
		P_2'	0.44						
				54.3	48.6	(68.4)	84.7	33.5	25.1
2 G h' −1 ~ 0	〃	w_1	0.66	34.7	30.9	(43.6	54.0	24.6	16.1
		w_2	0.66	18.2	16.4	(23.0	28.5	11.1	8.3
		ϕ	0.75						
		P_2'	0.75 0.44						
				52.9	47.3	(66.6	82.5	32.7	24.4
1 G h' −1 ~ 0		w_1	0.99						
		ϕ	0.75						
		P	1.76+0.44 = 2.20						
				42.9	37.6	(53.7	65.7	26.9	19.6
4 G h' −1 ~ 0	 ℓ 9.45	ϕ	1.04						
					7.7		11.6		4.9
G									
G		$P_1 = \{1.32\times(8.38+19.86)\} + \{6.43\times5.07\} + \{0.75\} = 79.3$ t							
		$P_2 = \{1.32\times4.19\} + \{6.43\times2.90\} = 24.2$ t							
R G h' 0' ~ 4'		w_1	1.32 0.72+0.60						
		ϕ	6.43						
		P	0.75						
					590.2		904.9		141.4

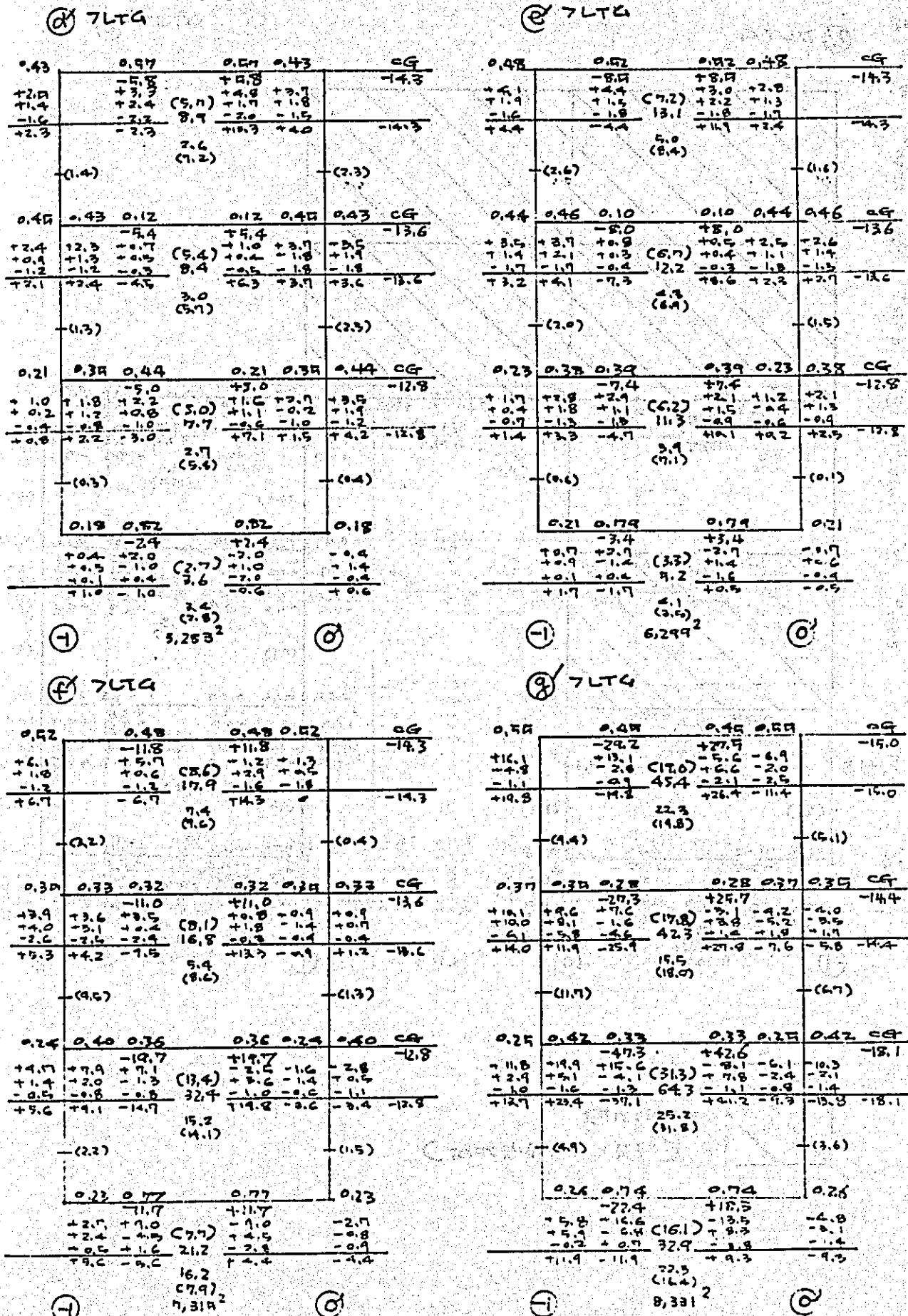
	LOAD			C	M_0	Q
	l_x 3.81 l_y 9.75	w	0.72			
3 G h′		l 7.62	q 0.28			
4′ ~ 11′		l 9.75/2	P 0.15	20.9	37.9	12.7
2 G h′		l 7.62	q 0.75			
4′ ~ 9′				3.6	5.4	2.9
1 G h′		l 7.62	q 0.75			
4′ ~ 5′				3.6	5.4	2.9
0 G h′		l 7.62	q 1.04			
4′ ~ 5′				5.0	7.5	4.0
G						
		w_1	0.72	5.2	9.2	3.8
3 G 0	4.27/2 w_1 w_2 6.35 2.97/2	w_2	0.72	4.4	6.6	3.9
		q	0.61			
b ~ c′		P	0.44	9.6	15.8	7.7
		w_1	0.66	4.8	8.4	3.5
2 G 0		w_2	0.66	3.4	5.2	3.0
		q	0.39			
b ~ c′		P	0.39	8.2	13.6	6.5
G						
1 G 0	6.35	q	1.04			
b ~ c′				3.5	5.2	3.3

	LOAD			C	Mo	Q
3 G o c' ~ d'		w_1	0.72	5.3	9.6	4.0
		w_2	0.72	4.0	6.1	3.7
		q	0.61			
		P	0.44			
				9.3	15.7	7.7
2 G o c' ~ d'	〃	w_1	0.66	4.9	8.8	3.6
		w_2	0.66	3.2	4.8	2.9
		q	0.39			
		P	0.39			
				8.1	13.6	6.5
1 G o c' ~ d'	〃	w_1	0.59	4.5	8.2	3.4
		w_2	0.59	3.6	5.5	3.4
		q	0.61			
		P	0.44			
				8.1	13.7	6.8
G G o c' ~ d'	6.10	q	1.04			
				3.2	4.8	3.2
G						
3 G o f' ~ g'		w_1	0.72	4.4	15.7	6.0
		w_2	0.72	4.0	6.1	3.7
		q	0.61			
		P	0.44			
				12.4	21.8	9.7
2 G o f' ~ g'	〃	w_1	0.66	7.7	14.3	5.5
		w_2	0.66	3.2	4.8	2.9
		q	0.29			
		P	0.39			
				10.9	19.1	8.4
1 G o f' ~ g'	〃	w_1	0.96	10.8	20.1	7.7
		w_2	0.96	4.7	7.1	4.3
		q	0.61			
		P	0.44			
				15.5	27.2	12.0
9 G o f' ~ g'	6.10	q	1.04			
				3.2	4.8	3.2

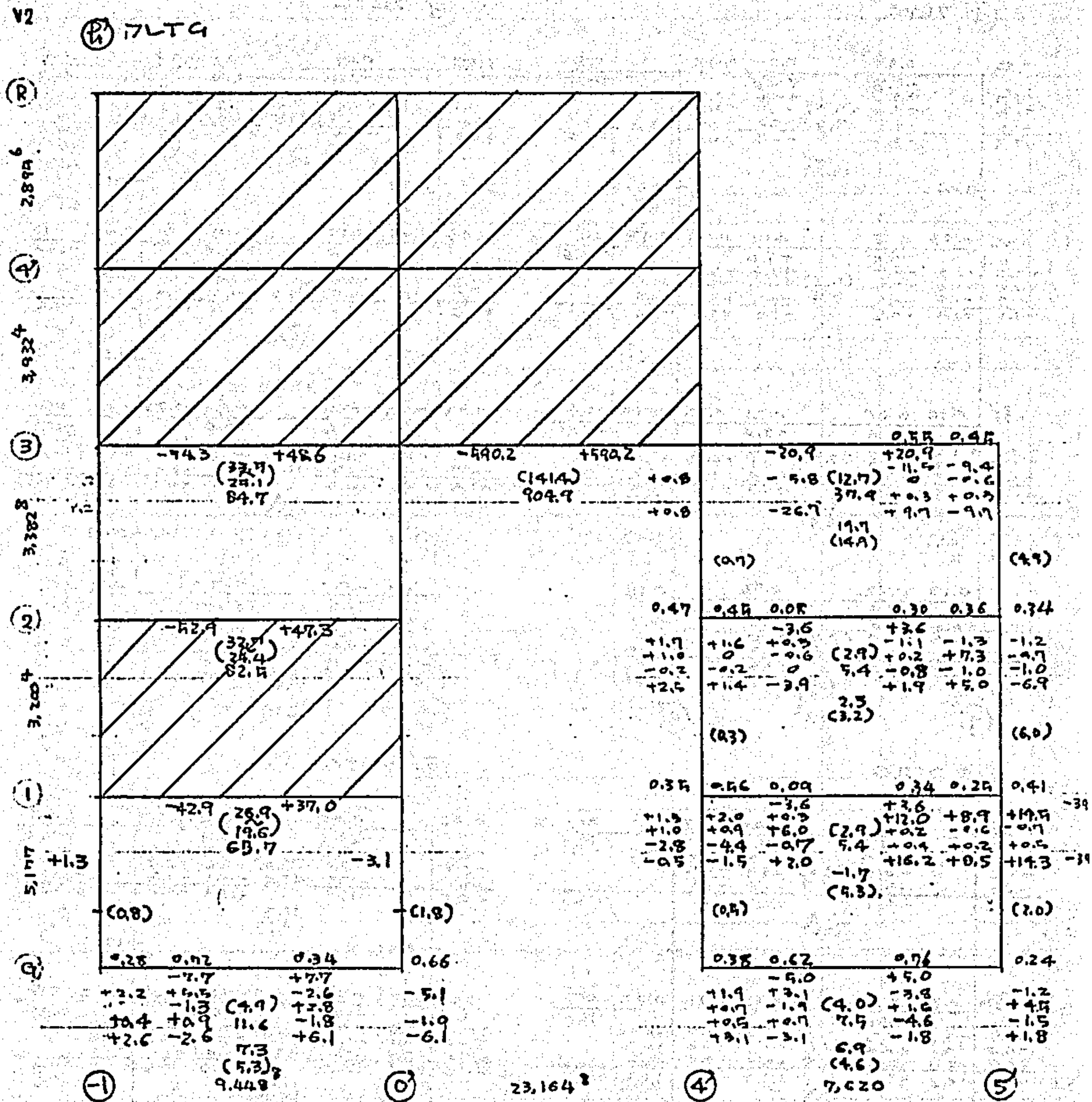
	LOAD			C	M_o	Q
	0.72 + 0.60 = 1.32	w_1	1.32			
3 G 0 g′ ~ h′		w_2	1.32			
		q	0.61			
				15.6	24.0	12.1
		w_1	0.66			
2 G 0 g′ ~ h′	〃	w_2	0.66			
		q	0.39			
				8.1	12.5	6.3
		w_1	0.96			
1 G 0 g′ ~ h′	〃	w_2	0.96			
		q	0.61			
				12.0	18.4	9.4
G 0 g′ ~ h′		q	1.04			
				3.9	5.9	3.5
R~2 0 h′ ~ i′		w_{max}	0.72	7.5	12.1	7.9
				11.4	17.4	6.0
		q	0.75	5.9	8.9	3.7
				24.8	38.4	17.6
R G 1′ h ~ i′		w_1	0.92			
		w_2	0.71			
		q	0.75			
				21.7	32.8	12.3
2 G 4′ h′ ~ i′		w	0.60			
		q	0.75 + (0.54 × 1.4) = 1.51			
				25.6	39.5	14.1
		0.72 × 1				
G G 4′ h′ ~ i′		q	1.04			
				8.2	12.4	5.1

	LOAD		C	Mo	Q
3 CG c' 0' ~	$P_1 = 0.72 \times 5.1 + 0.39 \times 6.1 =$	6.05	× 2.0	12.1	× 1.0 6.1
	$P_2 = 0.72 \times 2.0 + 0.39 \times 2.0 =$	2.22	× 1.0	2.2	× 1.0 2.2
					
				14.3	8.3
2 CG c' 0' ~	$P_1 = 0.66 \times 5.1 + 0.39 \times 6.1 =$	5.05	× 2.0	11.5	× 1.0 5.8
	$P_2 =$ × 2.0 + × 2.0 =	2.10	× 1.0	2.1	× 1.0 2.1
				13.6	7.9
1 CG c' 0' ~	$P_1 = 0.59 \times 5.1 + 0.39 \times 6.1 =$	5.39	× 2.0	10.8	× 1.0 5.4
	$P_2 =$ × 2.0 + × 2.0 =	1.96	× 1.0	2.0	× 1.0 2.0
				12.8	7.4
3 CG d' 0' ~	$P_1 = 0.72 \times 5.4 + 0.39 \times 6.4 =$	6.38	× 2.0	12.8	× 1.0 6.4
	$P_2 =$ × 2.0 + × 2.0 =	2.27	× 1.0	2.2	× 1.0 2.2
					
				15.0	8.6
2 CG d' 0' ~	$P_1 = 0.66 \times 5.4 + 0.39 \times 6.4 =$	6.06	× 2.0	12.1	× 1.0 6.1
	$P_2 =$ × 2.0 + × 2.0 =	2.30	× 1.0	2.3	× 1.0 2.3
				14.4	8.4
1 CG d' 0' ~	$P_1 = 0.96 \times 5.4 + 0.39 \times 6.4 =$	7.48	× 2.0	15.4	× 1.0 7.7
	$P_2 =$ × 2.0 + × 2.0 =	2.70	× 1.0	2.7	× 1.0 2.7
				18.1	10.4
1 CG h 4' ~	$P_1 = 0.72 \times 7.0 + 0.75 \times 4.9 =$	8.72	× 3.5	30.5	× 1.0 8.7
	$P_2 =$ × 3.1 + × 3.5 =	4.86	× 1.75	8.5	× 1.0 4.9
					
				39.0	13.6
4'~2 CG 4'~2 ~ 2'	$P_1 = 0.59 \times 4.8 + 0.39 \times 5.8 =$	4.56	× 2.0	9.7	× 1.0 4.9
	$P_2 =$ × 2.0 + × 2.0 =	1.86	× 1.0	1.9	× 1.0 1.9
					
				11.6	6.8
CG					

長期応力 — 固定法による。

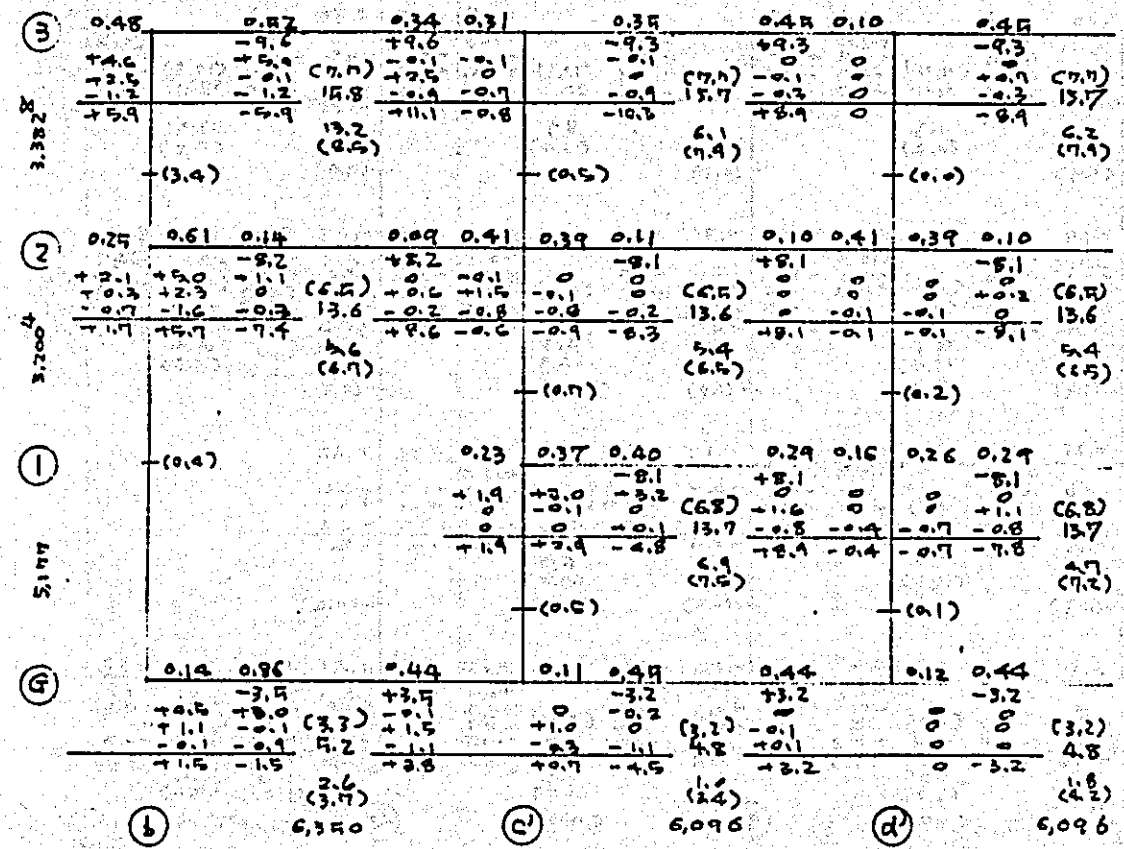


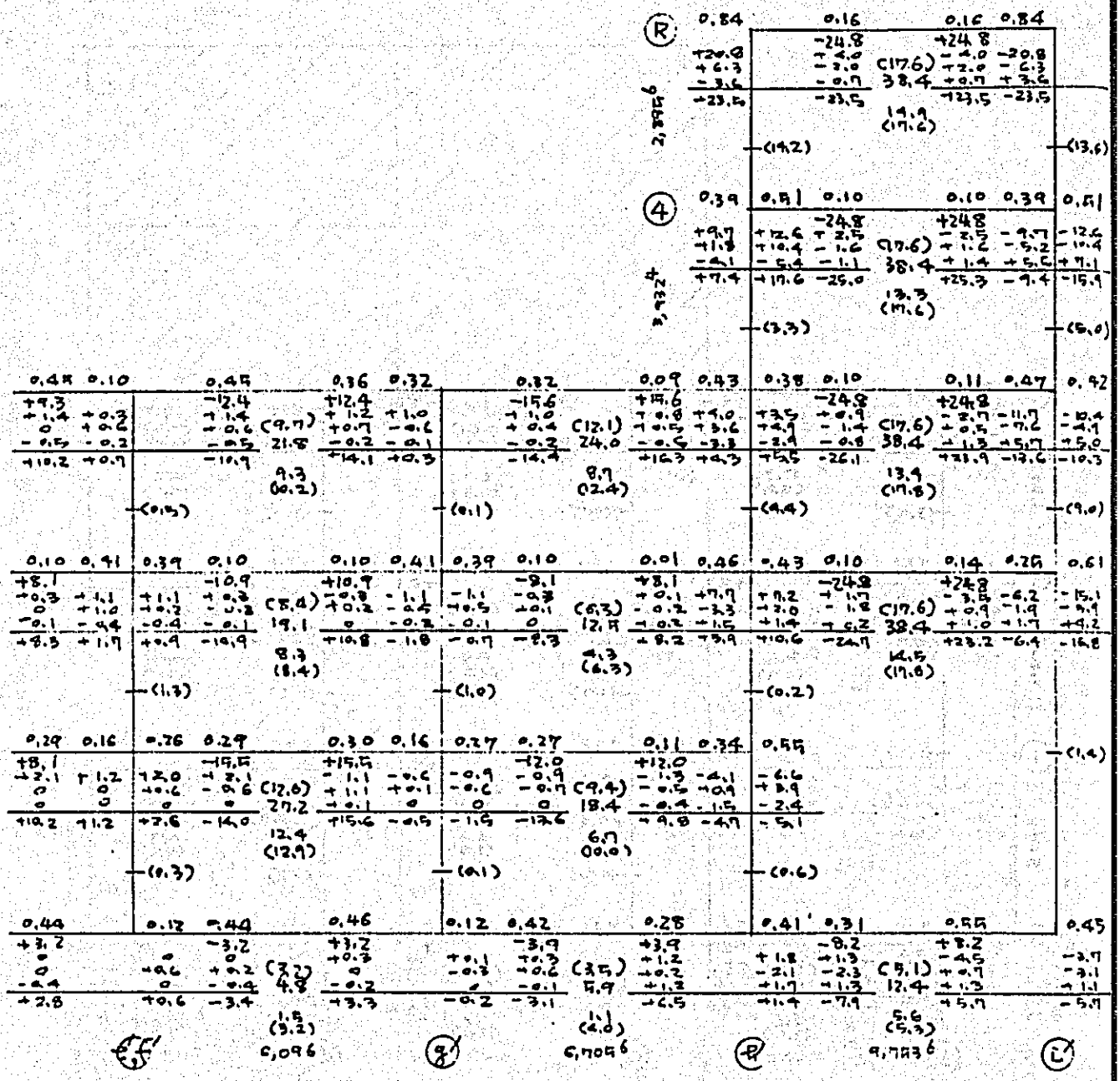
V2

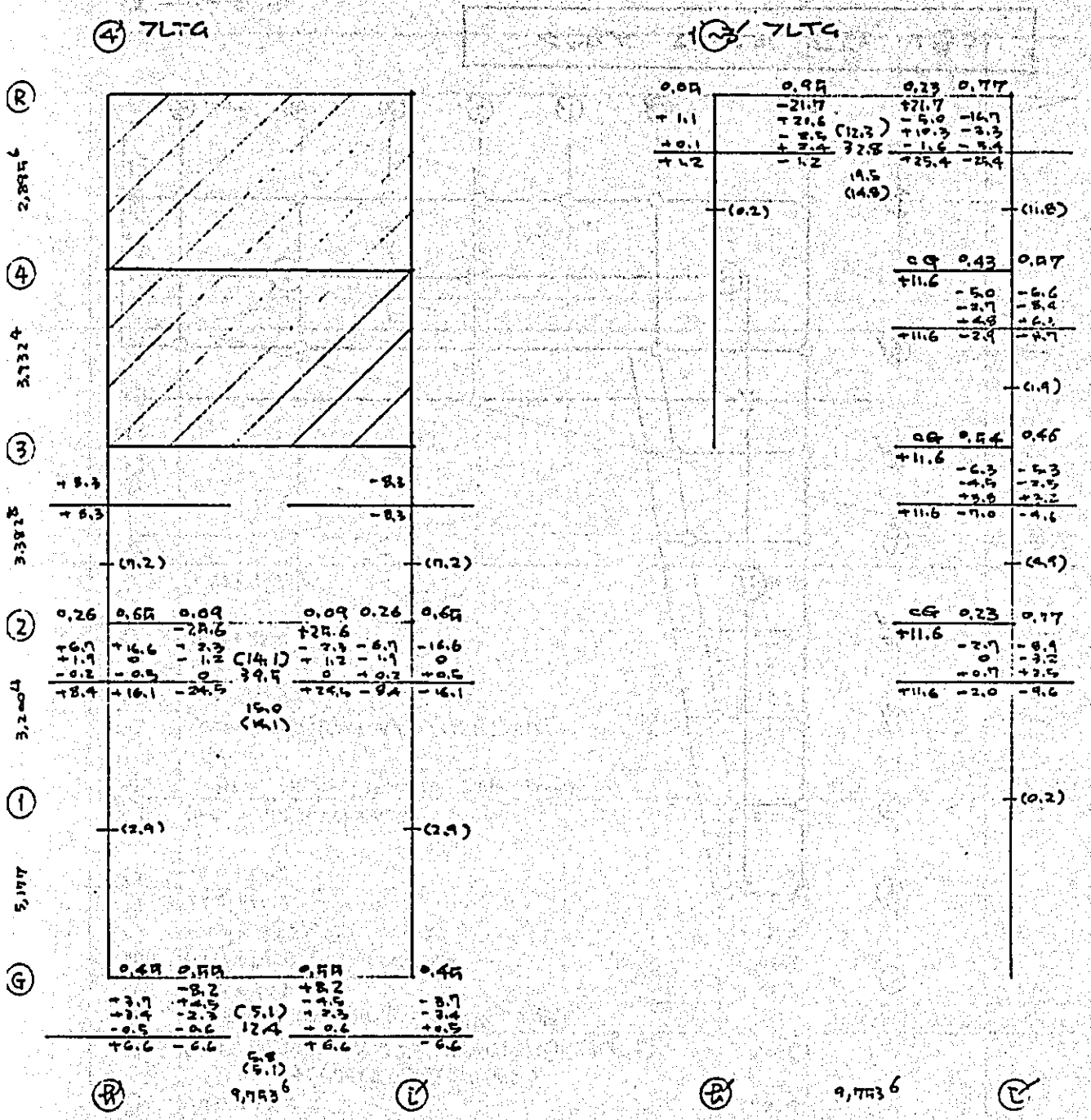


= 耐力壁
(将来とも撤去不可)

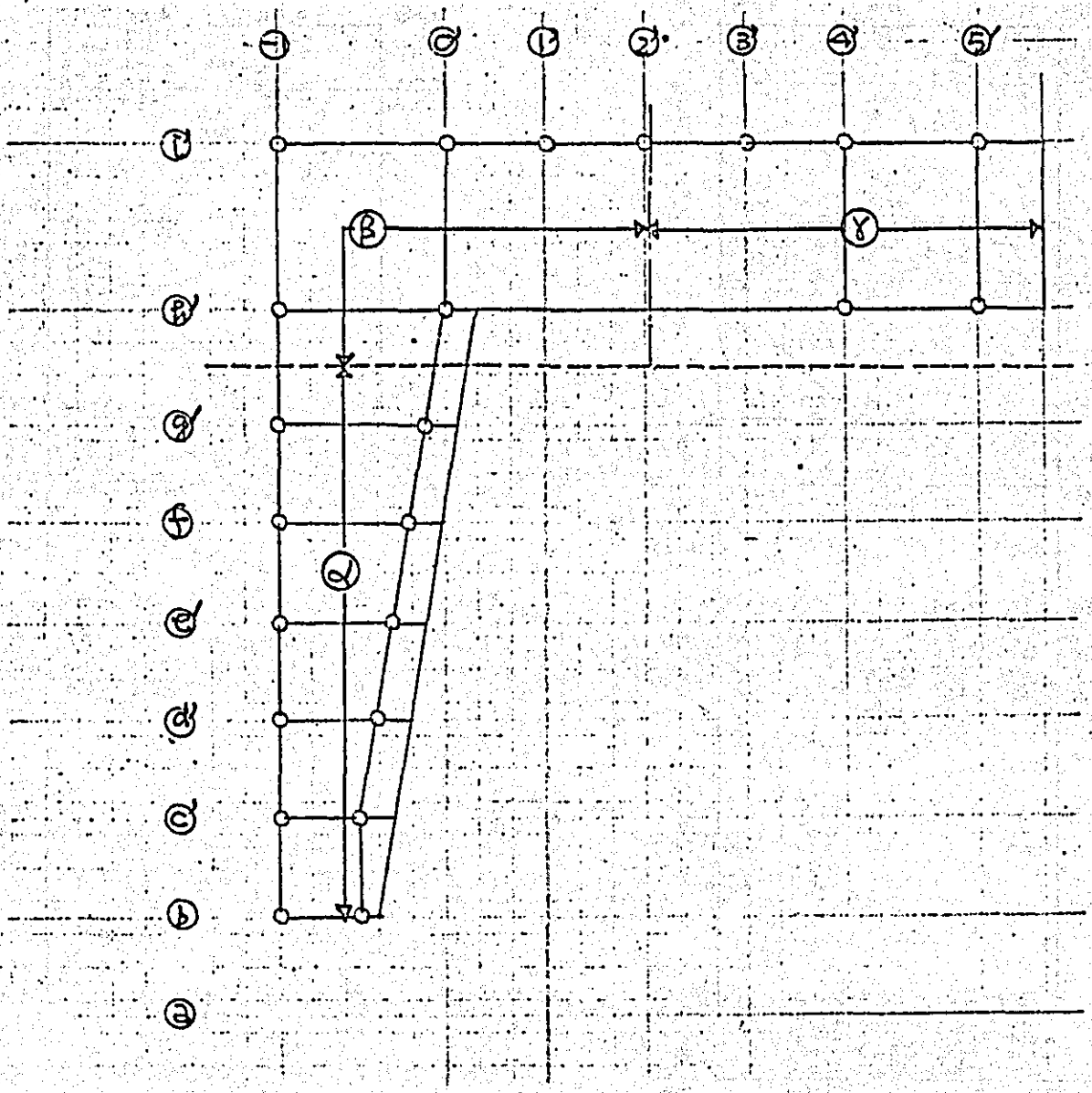
⑩ 7LTG (1)






④ 7LTG
1~3 7LTG
R
4
3
2
1
G
2,895
3,732
3,382
3,200
5,177
9,753
9,753
Ⓡ
Ⓘ
Ⓟ
Ⓣ

地震力 短辺 における ブロック



α ——ブロック

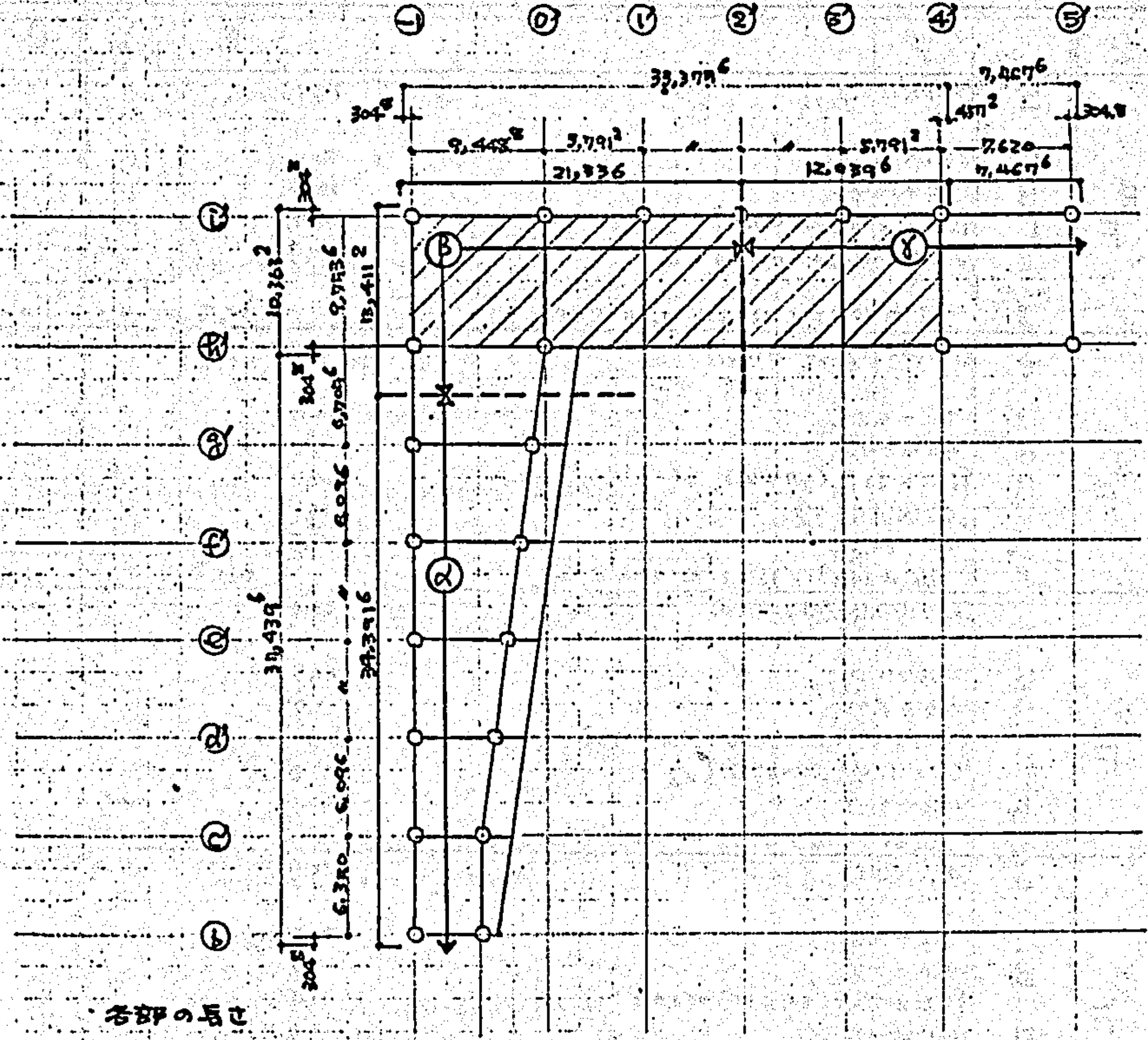
				W	K_W	Q
R_{1L}	S					
	G					
	B					
	C					
	W					
	Σ					
T_{1L}	S					
	G					
	B					
	C					
	W					
	Σ					
W_{1L}	S	(0.68×307.7)	209.2			
	G	19.4+32.6	52.0			
	B	18.6+17.3	35.9			
	C	(3.2×12)/2	19.2			
	W	{(0.50×40.4)+{(1.70×35.7)+(1.28×24.3)+(0.10×24.7)}/2	67.3		0.05	
	Σ	$\bar{w}$ = 383.6/307.7 = 1.25 t/m²		383.6	19.2	20.0
R_{2L}	S	(0.44×379.9)+(0.56×307.7)	188.1			
	G	13.0+24.7	37.7			
	B	17.8+16.7	34.5			
	C	(3.0×12)/2	18.0			
	W	{(1.66×29.7)+(1.21×62.0)}/2	61.3			
	Σ	19.2+47.1	66.3		〃	
		$\bar{w}$ = 395.9/307.7 = 1.29 t/m²		395.9	19.8	40.0
T_{2L}	S	(0.91×14.3)+(1.03×22.7)+(0.86×133.4)+(0.62×50.5)+(0.49×82.5)+(0.76×4.3)	226.1			
	G	19.4+32.6	52.0			
	B	19.5+16.2	35.7			
	C	(5.8×12)/2	34.8			
	W	{(2.66×29.0)+(2.00×62.0)}/2	100.6			
	Σ	18.0+61.3	79.3		〃	
		$\bar{w}$ = 528.5/307.7 = 1.72 t/m²		528.5	26.4	60.0
G_{1L}	S					
	G	33.3+63.9	97.2			
	B					
	C					
	W					
	Σ	34.8+100.6	135.4		〃	
				232.6	11.6	119.0

β ——ブロック

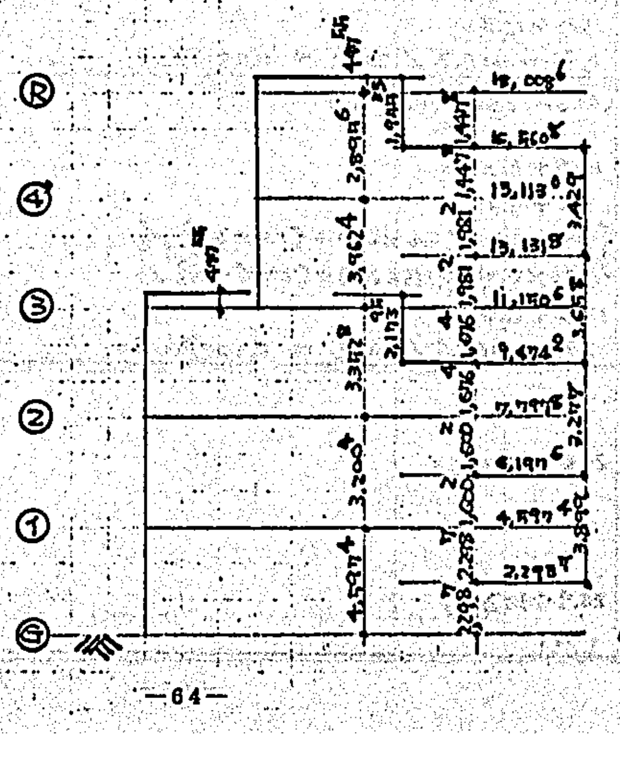
				W	Kw	Q
2F	S	(0.65×221.1)	150.3			
	G	25.7+22.6	51.3			
	B	7.4+26.0	33.4			
	C	{(8.3×2)+(5.9×15)+(3.6×2)}/2	16.3			
	W	P(0.50×53.6)+{(1.83×47.4)}/2	60.4		0.05	
	Σ	ω = 311.7 / 221.1 = 1.41 t/m2		311.7	15.9	16.0
4F	S	(0.47×125.3)+(0.39×95.8)	92.4			
	G	19.8+11.0	30.8			
	B	9.0+12.5	21.5			
	C	{(6.7×2)+(4.7×1.0+(2.9×2)}/2	13.1			
	W	{(2.08×44.4)+(1.56×21.5)}/2	62.9			
		16.3+33.9	50.2		〃	
	Σ	ω = 270.9 / 221.1 = 1.23 t/m2		270.9	13.5	30.0
3F	S	(0.47×41.1)+(0.56×96.2)+(0.43×35.7)	97.5			
	G	31.7+14.7	46.4			
	B	9.0+19.3	28.3			
	C	{(7.3×2)+(5.2×1.5)+(3.2×2)}/2	14.4			
	W	P(0.50×6.8)+{(1.90×31.1)+(1.28×33.0)}/2	51.0			
		13.1+62.9	76.0		0.05	
	Σ	ω = 313.6 / 256.8 = 1.22 t/m2		313.6	13.7	46.0
2F	S	(0.47×41.1)+(0.56×131.9)+(0.44×36.7)	105.9			
	G	16.3+13.5	29.8			
	B	8.0+17.0	25.0			
	C	{(7.0×2)+(4.9×1.5)+(3.0×2)}/2	13.8			
	W	{(1.60×31.1)+(1.21×17.5)}/2	35.5			
		14.4+47.6	62.0		〃	
	Σ	ω = 275.0 / 256.8 = 1.07 t/m2		275.0	13.8	60.0
RF	S	(0.91×14.0)+(0.86×21.7)	31.4			
	G	14.8+7.7	22.5			
	B	1.0+4.1	5.1			
	C	{(14.0×2)+(9.4×1.5)+(5.8×2)}/2	26.9			
	W	{(2.66×31.1)}/2	41.4			
		13.8+35.5	49.3		4	
	Σ	ω = 176.6 / 256.8 = 0.69 t/m2		176.6	8.8	69.0
GF	S					
	G	28.6+25.3	53.9			
	B					
	C					
	W					
		26.9+41.4	68.3		〃	
	Σ			122.2	6.1	76.0

γ ―― ブロック

				W	kW	Q
R F	S	(0.68×124.8)	84.9			
	G	15.7 + 15.7	31.4			
	B	4.0 + 14.4	18.4			
	C	{(8.3 × 2) + (5.4 × 1.5)} / 2	12.7			
	W	P(0.50×34.1)+{(1.43×29.1)} / 2	37.9		0.05	
	Σ	w̄ = 185.3 / 123.2 = 1.50 t/m2		185.3	9.3	10.0
4 F	S	(0.47×29.0)+(0.35×95.8)	47.2			
	G	9.2 + 5.5	14.7			
	B	4.0 + 0.9	4.9			
	C	{(6.7 × 2) + (4.7 × 1.5)} / 2	10.2			
	W	{(2.08×29.1)} / 2	30.3		〃	
		12.7 + 20.8	33.5			
	Σ	w̄ = 140.8 / 123.2 = 1.14 t/m2		140.8	7.1	18.0
3 F	S	(0.47×41.1)+(0.68×79.0)	73.0			
	G	29.4+11.0	40.4			
	B	7.0 + 6.7	13.7			
	C	{(7.3 × 2) + (5.2 × 1.5)+(3.2 × 2)} / 2	14.4			
	W	P(0.50×18.0)+{(1.10×26.2)} / 2	31.2			
		10.2 + 30.3	40.5		0.05	
	Σ	w̄ = 213.2 / 202.2 = 1.05 t/m2		213.2	10.17	29.0
2 F	S	(0.47×37.6)	17.7			
	G	12.7 + 9.5	22.2			
	B	4.0 + 0.9	4.9			
	C	{(7.0 × 2) + (4.9 × 1.5) + (3.0 × 2)} / 2	13.8			
	W	{(1.60×26.2)} / 2	21.0		〃	
		14.4 + 22.3	36.7			
	Σ	w̄ = 116.3 / 202.2 = 0.58 t/m2		116.3	5.8	33.0
1 F	S	(0.68×32.6)+(0.44×12.0)	27.4			
	G	14.9 + 4.0	18.9			
	B	5.8 + 9.3	15.1			
	C	{(14.0 × 2) + (9.4 × 1.5) + (5.8 × 2)} / 2	26.9			
	W	P(0.50×16.7)+{(2.66×21.2) + (2.00×9.0)} / 2	45.5			
		13.8 + 21.0	34.8		〃	
	Σ	w̄ = 168.6 / 241.2 = 0.70 t/m2		168.6	8.4	44.0
G F	S					
	G	24.8 + 19.0	43.8			
		26.9+37.2	64.1		〃	
	Σ			107.9	5.4	50.0


33,379.6
7,467.6
304.8
457.2
9,448.8
3,791.2
3,791.2
7,620
21,336
12,039.6
7,467.6
β
γ
α
10,363.2
9,753.6
13,411.2
30,439.6
29,391.6
6,096
6,096
6,350
304.8

・各部の高さ


18,008.6
16,560.8
13,113.6
13,131.8
11,150.6
9,474.2
7,797.8
6,197.6
4,597.4
2,298.8
3,962.4
3,352.8
3,200.4
4,597.4
2,298.8

各部の高さ

ダッカ市における サイクロン風速

: V = 120 [miles/hour]

= 120 × 1,609.34/3,600

= 53.64

速度圧

: $P = \frac{1}{2} \rho V^2$

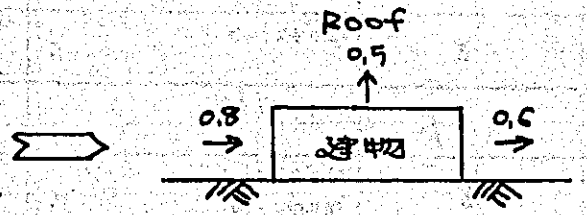
(ρ : 空気密度 $= \frac{1}{8}$ kg·sec²/m⁻⁴)

$\sim P = \frac{1}{2} \times \frac{1}{8} \times 53.64^2$

= 180 [kg/m²]

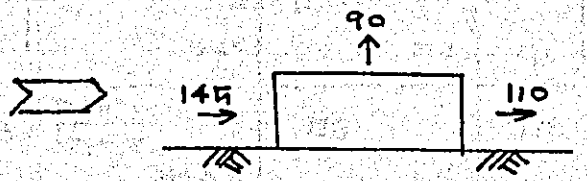
風力する数

: C =



風向

C × q



[kg/m²]

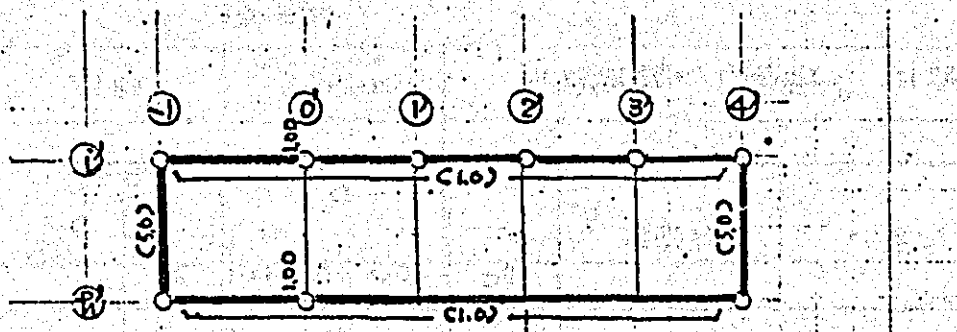
(145+110=255)

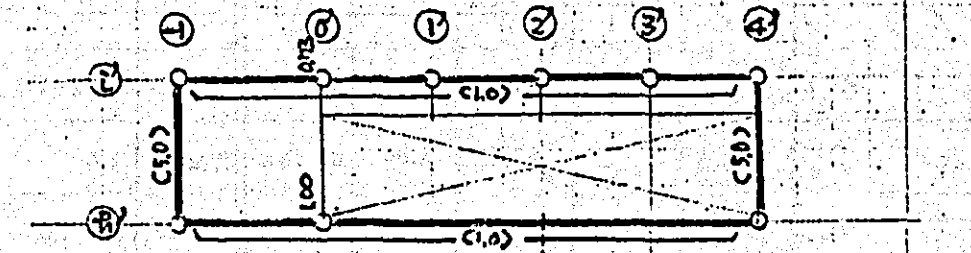
風圧力

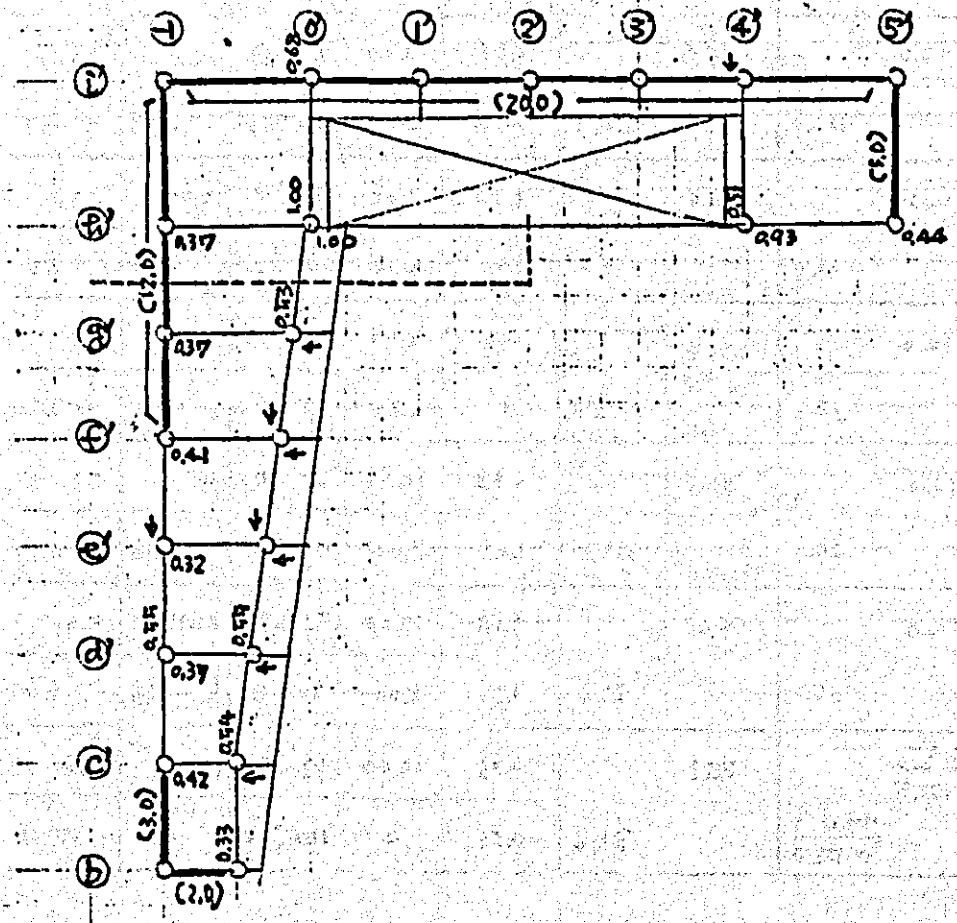
風向	レベル	ブロック	表面積		H	Q
←→	RF	α				
		β+γ	10.36×1.95	20.2	× 0.255 5.2	5.2
	4F	α				
		β+γ	10.36×3.43	35.5	× 0.255 9.1	14.3
	3F	α	34.39×2.17	74.6	× 0.145 10.8	10.8
		β+γ	10.36×1.48 13.41×2.17	44.4	× 0.145 6.4	20.7
	2F	α	34.39×3.28	112.8	× 0.145 16.4	29.2
		β+γ	13.41×3.28	44.0	× 0.145 6.4	27.1
	1F	α	34.39×3.90	134.1	× 0.145 19.4	46.6
		β+γ	13.41×3.90	52.3	× 0.145 7.6	34.7
↕	RF	α+β	21.34×1.95	41.6	× 0.255 10.6	10.6
		γ	12.04×1.95	23.5	× 0.145 3.4	3.4
	4F	α+β	21.34×3.43	73.2	× 0.255 18.6	29.2
		γ	12.04×3.43	41.3	× 0.145 6.0	9.4
	3F	α+β	21.34×3.66	78.1	× 0.255 19.9	49.1
		γ	12.04×1.48 7.47×2.17	34.0	× 0.145 4.9	14.3
	2F	α+β	21.34×3.28	70.0	× 0.255 17.9	67.0
		γ	12.81×3.28	64.0	× 0.145 9.3	23.6
	1F	α+β	21.34×3.90	83.2	× 0.255 21.2	85.2
		γ	19.51×3.90	76.1	× 0.145 11.0	34.6

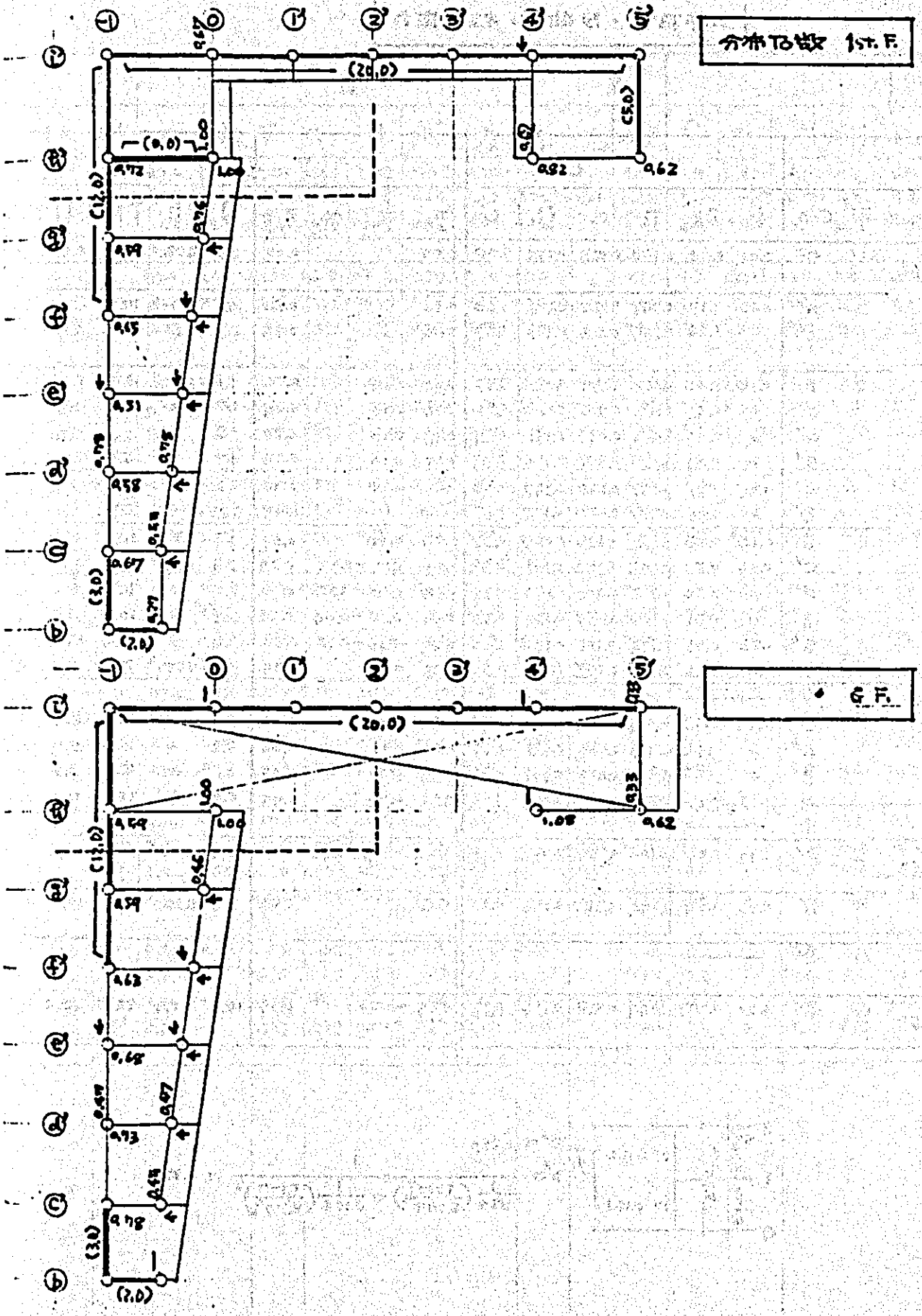
一般に、地震力 > 風圧力

方向	レベル	ブロック	地震力	風圧力	D				Q/ΣD
					Dc	Dw	Dc : Dw	Σ	
↔	R_F	α	/	/					
		β+γ	26.0	5.2	0	2.00	0 : 100	2.00	13.0
	4_F	α	/	/					
		β+γ	48.0	14.3	0	2.00	0 : 100	2.00	24.0
	3_F	α	20.0	10.8	3.78	2.00	65 : 35	5.78	3.6
		β+γ	75.0	20.7	2.74	20.00	12 : 88	22.74	13.3
	2_F	α	40.0	27.2	6.00	2.00	75 : 25	8.00	5.0
		β+γ	93.0	27.1	3.16	20.00	14 : 86	23.16	4.1
	1_F	α	67.0	46.6	5.82	2.00	74 : 26	7.82	9.6
		β+γ	113.0	34.7	3.29	20.00	14 : 86	23.29	4.9
↕	R_F	α+β	16.0	10.6	2.00	5.00	29 : 71	7.00	2.3
		γ	10.0	3.4	0	5.00	0 : 100	5.00	2.0
	4_F	α+β	30.0	24.2	1.73	5.00	26 : 74	6.73	4.5
		γ	12.0	9.4	0	5.00	0 : 100	5.00	2.4
	3_F	α+β	66.0	49.1	5.83	15.00	28 : 72	20.83	3.2
		γ	24.0	14.3	1.02	5.00	17 : 83	6.02	4.8
	2_F	α+β	100.0	67.0	7.18	15.00	32 : 68	22.18	4.9
		γ	35.0	23.6	1.24	5.00	20 : 80	6.24	5.6
	1_F	α+β	136.0 → 131.8	88.2	4.26	15.00	22 : 78	19.26	6.8
		γ	44.0 → 317.0	34.6	0.66	0	100 : 0	0.66	96.1


分布荷重 4th. F.
C1.0)
C5.0)
1.00

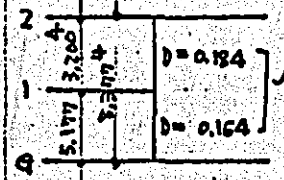

3rd. F.
C1.0)
C5.0)
1.00


2nd. F.
(2.0)
C5.0)
1.00
0.37
0.93
0.44
0.41
0.32
0.37
0.42
0.33
(2.0)


分布荷重 1st. F.
G. F.
(20.0)
(9.0)
1.00
(12.0)
(3.0)
(2.0)
5.0

分布荷物・反曲点・柱の応力

Frame	Fl.	Col.	k_c	Σk_b	$\bar{k}$	a	D	D'	y_0	y_1	$y_{2,3}$	Σy	Q	h	TM	MU	ML
0'	4'	R'	2.01	0.78	0.194	0.088	0.178	1.00	0.00			0.00	2.3	2.898	6.7	6.7	0
	3	R'	1.82	1.13	0.302	0.157	0.238	1.00	0.30			0.30	4.5	3.932	17.7	12.4	5.3
		L'	"	0.78	0.257	0.114	0.173	0.73	0.25			0.25	3.3	"	12.9	9.7	3.2
	2	b	0.34	0.42	0.662	0.249	0.085	0.33	0.30	−0.25		0.05	1.1	3.382	3.6	3.4	0.2
		c'	"	0.93	1.368	0.406	0.138	0.54	0.35	−0.10		0.25	1.7	"	5.8	4.3	1.5
		d'	"	0.96	1.412	0.414	0.141	0.55	0.35	−0.10		0.25	1.8	"	6.0	4.5	1.5
		g'	"	0.91	1.338	0.401	0.136	0.53	0.35	−0.10		0.25	1.7	"	5.7	4.3	1.4
		R'	1.72	1.21	0.342	0.150	0.257	1.00	0.40	−0.15		0.30	3.2	"	10.8	7.6	3.2
		L'	"	0.78	0.227	0.102	0.174	0.68	0.40			0.40	2.2	"	8.3	5.0	3.3
	1	b	0.14	0.93	3.321	0.624	0.087	0.27	0.55	0.10		0.65	1.2	8.370	10.2	3.6	6.6
		c'	0.36	0.56	0.978	0.280	0.101	0.59	0.45	0.15	−0.05	0.55	2.5	8.200	17.9	3.6	14.4
		d'	"	0.96	1.333	0.400	0.144	0.78	0.45	0.10	−0.05	0.50	3.5	"	11.2	5.6	5.6
		g'	"	0.91	1.264	0.387	0.139	0.76	0.45	0.10	−0.05	0.50	3.4	"	10.9	5.5	5.5
		R'	1.82	0.82	0.229	0.101	0.184	1.00	0.55	−0.15	−0.05	0.35	4.5	"	14.4	9.4	5.0
		L'	0.70	1.24	0.886	0.307	0.218	0.67	0.65	0.10		0.75	8.0	8.377	29.3	6.4	18.9
	G	b	———														
		c'	0.22	2.12	4.818	0.707	0.185	0.45	0.55	0.10		0.65	3.1	8.177	18.5	5.5	10.3
		d'	"	2.54	5.773	0.743	0.163	0.47	0.55	0.10		0.65	3.2	"	16.5	5.7	10.8
		g'	"	2.42	5.500	0.733	0.161	0.46	0.55	0.10		0.65	3.1	"	16.2	5.7	10.5
		R'	1.13	2.00	0.885	0.307	0.347	1.00	0.65	0.20		0.75	6.8	"	38.2	8.8	26.4
		L'	———														
4'	2'	R'	1.72	0.57	0.166	0.077	0.132	0.51	0.55	−0.25	−0.20	0.10	2.4	3.382	8.1	7.3	0.8
	1	R'	0.70	1.09	0.979	0.280	0.196	0.62	0.05			0.65	3.5	8.377	29.3	10.2	19.1
	G	R'	———														
5'	G	R'	0.22	0.95	2.159	0.719	0.114	0.33	0.55	−0.20		0.35	18.5	5.177	95.8	62.3	33.5



$$D' = 0.320$$

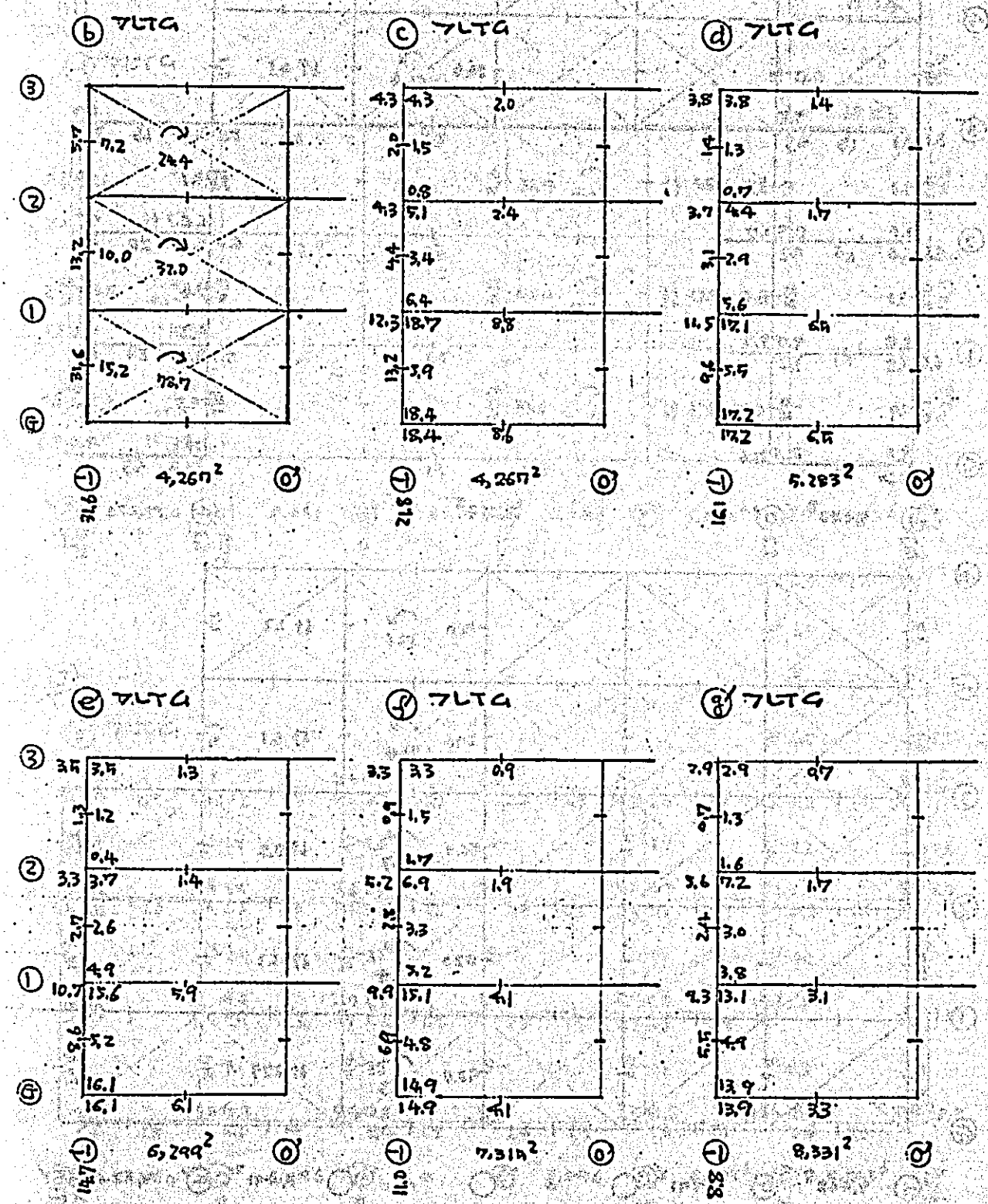
$$D' = \frac{1}{\frac{1}{0.184}\left(\frac{3.200^4}{8.377^4}\right)^2 + \frac{1}{0.164}\left(\frac{5.177}{8.377^4}\right)^2} = 0.320$$

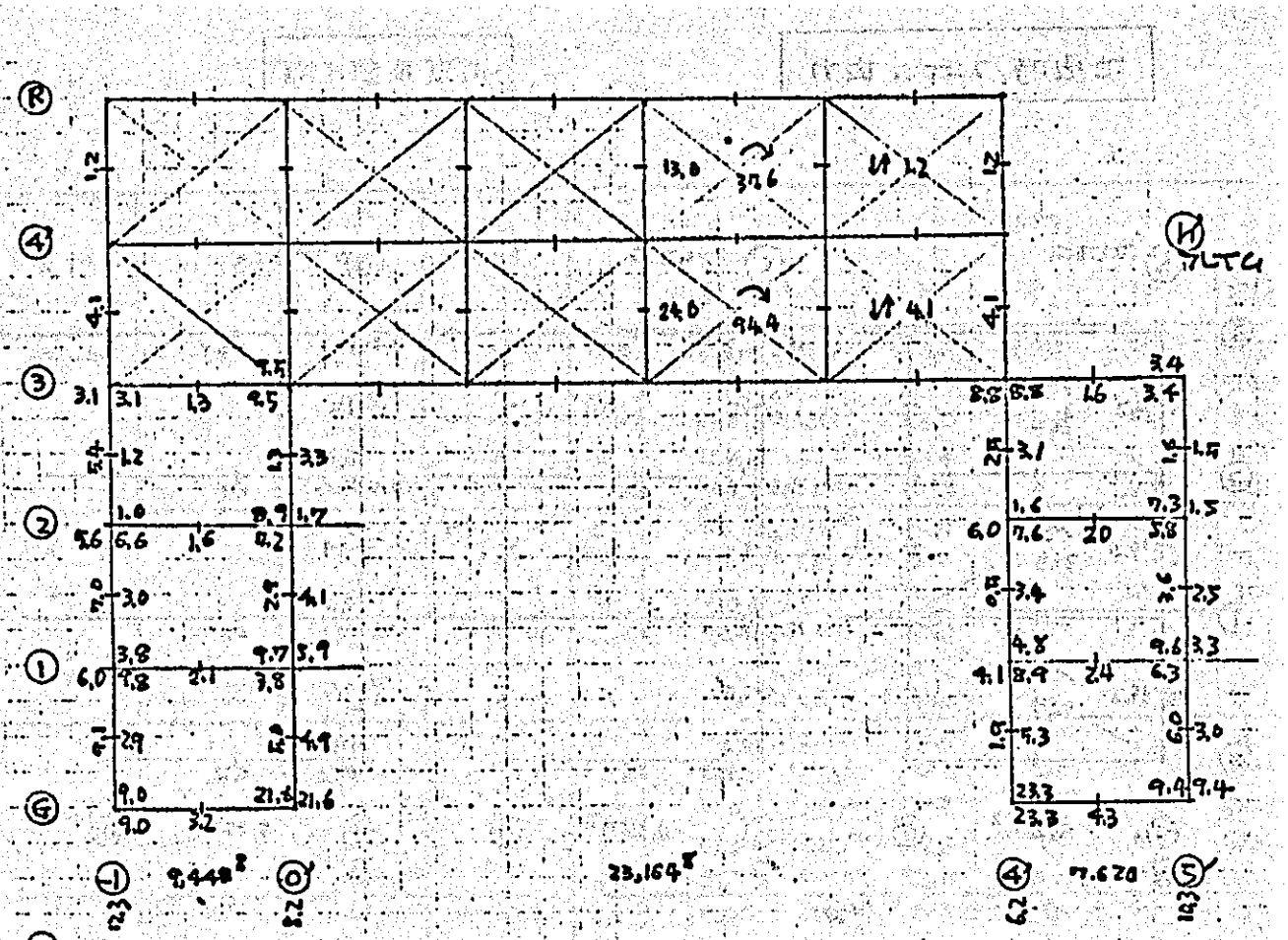
			D					y								
ание	Fl.	Col.	k_c	Σk_f	$\bar{F}$	a	D	D'	y_0	y_1	$\bar{y}_{23}$	Σy	Q	h	TM	MU	ML
c'	2	−1	0.34	0.67	0.935	0.330	0.112	0.42	0.35	−0.20		0.19	1.5	3.382[5]	5.1	4.3	0.8
	1	0	0.36	0.67	0.931	0.318	0.114	0.617	0.45	0.20	−0.05	0.60	3.4	3.200[4]	10.7	4.3	6.4
	G	0	0.22	1.81	4.114	0.603	0.148	0.78	0.55	0.05		0.60	5.9	5.177	30.7	12.3	18.4
a'	2	−1	0.34	0.55	0.809	0.258	0.095	0.37	0.35	−0.20		0.15	1.3	3.382[5]	4.5	3.8	0.7
	1	0	0.36	0.55	0.764	0.276	0.099	0.58	0.45	0.20	−0.05	0.60	2.9	3.200[4]	9.3	3.7	5.6
	G	0	0.22	1.47	3.341	0.626	0.138	0.73	0.55	0.05		0.60	5.5	5.177	28.7	11.5	17.2
e'	2	−1	0.34	0.45	0.662	0.249	0.085	0.32	0.30	−0.20		0.10	1.2	3.382[5]	3.9	3.5	0.4
	1	0	0.36	0.45	0.625	0.238	0.086	0.51	0.45	0.20	−0.05	0.60	2.6	3.200[4]	8.2	3.3	4.9
	G	0	0.22	1.22	2.773	0.581	0.128	0.68	0.55	0.05		0.60	5.2	5.177	26.8	10.7	16.1
f'	2	−1	0.34	0.64	0.941	0.320	0.109	0.41	0.35			0.35	1.5	3.382[5]	5.0	3.3	1.7
	1	0	0.36	0.64	0.889	0.308	0.111	0.65	0.45		−0.05	0.50	3.3	3.200[4]	10.4	5.2	5.2
	G	0	0.22	1.05	2.386	0.544	0.120	0.63	0.55	0.05		0.60	4.8	5.177	24.8	9.9	14.9
g'	2	−1	0.34	0.56	0.824	0.292	0.099	0.37	0.35			0.35	1.3	3.382[5]	4.5	2.9	1.6
	1	0	0.36	0.56	0.778	0.280	0.101	0.59	0.45		−0.05	0.40	3.0	3.200[4]	9.4	5.6	3.8
	G	0	0.22	0.92	2.091	0.511	0.112	0.69	0.55	0.05		0.60	4.9	5.177	23.2	9.3	13.9
h'	2	−1	0.34	0.92	1.206	0.376	0.128	0.37	0.45	−0.20		0.25	1.2	3.382[5]	4.1	3.1	1.0
		0'	1.72	1.27	0.369	0.196	0.268	1.00	0.40	−0.25		0.15	3.3	〃	11.2	9.5	1.7
		4'	1.72	1.17	0.340	0.148	0.250	0.93	0.40	−0.24		0.15	3.1	0	10.4	8.8	1.6
		8'	0.34	0.72	1.049	0.346	0.118	0.44	0.35	−0.05		0.30	1.5	0	4.9	3.4	1.5
	1	−1	0.36	0.75	1.042	0.342	0.123	0.72	0.45		−0.05	0.40	3.0	3.200[4]	9.4	5.6	3.8
		0'	1.82	〃	0.206	0.093	0.170	1.00	0.50		−0.05	0.45	4.1	0	13.1	7.2	5.9
		4'	1.82	0.60	0.165	0.076	0.139	0.82	0.50		−0.05	0.45	3.4	0	10.8	6.0	4.8
		8'	0.36	〃	0.833	0.294	0.106	0.62	0.45		−0.05	0.40	2.5	0	8.1	4.8	3.3
	G	−1	0.22	0.91	2.068	0.508	0.112	0.69	0.55	0.05		0.60	29	5.177	15.0	6.0	9.0
		0'	1.13	0	0.403	0.168	0.189	1.00	0.95	0.10		0.85	4.9	0	25.4	3.8	21.6
		4'	1.13	1.00	0.442	0.181	0.205	1.08	0.75	0.10		0.85	5.3	0	27.4	4.1	23.3
		8'	0.22	0	2.293	0.532	0.1177	0.62	0.55	0.05		0.60	3.0	0	15.17	6.3	9.4

耐力壁の応力

方向	フレーム	階	スパン	D	応力 Q	R	M	L	N	ΣN
←→	ヒ′	4′	−1 ～ 4′	1.0	13.0	2.898^6	37.6	32.613^6	1.2	1.2
		3	〃	〃	24.0	3.932^4	94.4	〃	2.9	4.1→3.3
		2	−1 ～ 0′	20.0	66.0	3.382^8	223.3	40.233^6	5.5	8.8
		1	〃	〃	82.0	3.200^4	262.4	〃	6.5	15.3
		G	〃	〃	98.6	5.177	507.3	〃	12.6	27.9
	b	2	−1 ～ 0′	2.0	9.2	3.382^8	24.4	4.269^2	5.7	5.7
		1	〃	〃	18.0	3.200^4	32.0	〃	8.8	13.2
●		G	〃	〃	15.2	5.177	98.7	〃	18.4	31.6
4 ↓	−1	2	b ～ c′	3.0	9.6	3.382^8	32.8	6.346^8	5.1	5.1
		1	〃	〃	13.8	3.200^4	43.2	〃	6.8	11.9
		G	〃	〃	20.4	5.177	109.6	〃	16.6	28.5
	4	4′	B′ ～ C′	5.0	11.5	2.898^6	33.3	9.753^6	3.4	3.4
		3	〃	〃	22.5	3.932^4	88.5	〃	9.1	12.5→5.4
		2	F′ ～ C′	12.0	37.4	3.382^8	126.9	22.755^2	5.8	5.8→11.2
		1	〃	〃	54.0	3.200^4	172.8	〃	7.7	13.5→18.9
		G	〃	〃	81.6	5.177	422.4	〃	18.7	32.2→37.6
	4′	4′	B′ ～ C′	5.0	10.0	2.898^6	29.0	9.753^6	3.0	3.0
		3	〃	〃	18.0	3.932^4	70.8	〃	7.3	10.3
	5′	2	B′ ～ C′	5.0	24.0	3.382^8	81.2	9.753^6	8.3	8.3
		1	〃	〃	28.0	3.200^4	89.6	〃	9.2	17.5

地震時 フレーム 応力


ⓑ フレーム
ⓒ フレーム
ⓓ フレーム
ⓔ フレーム
ⓕ フレーム
ⓖ フレーム
4,267²
4,267²
5,283²
6,299²
7,314²
8,331²


⑧
④
③
②
①
Ⓖ
13.0
37.6
24.0
94.4
24.0
94.4
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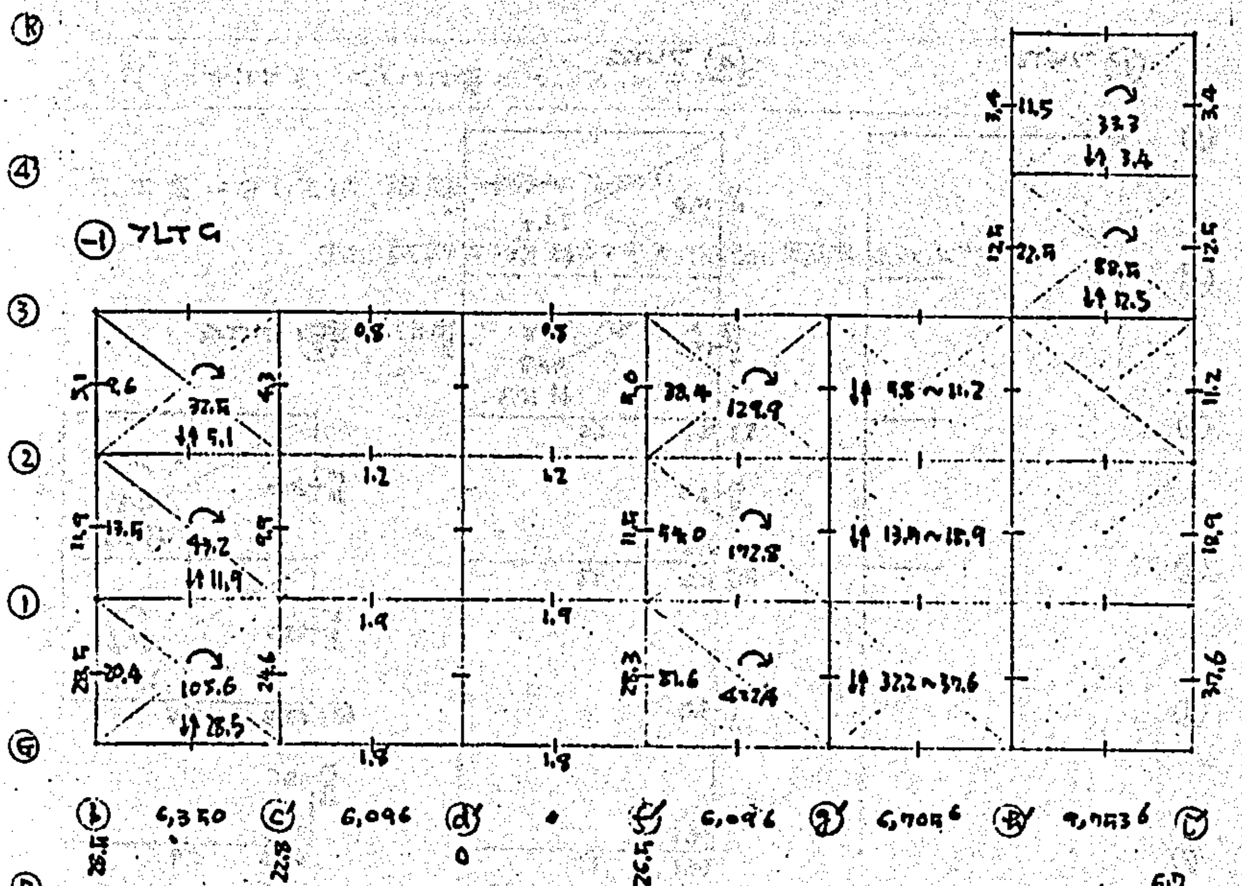
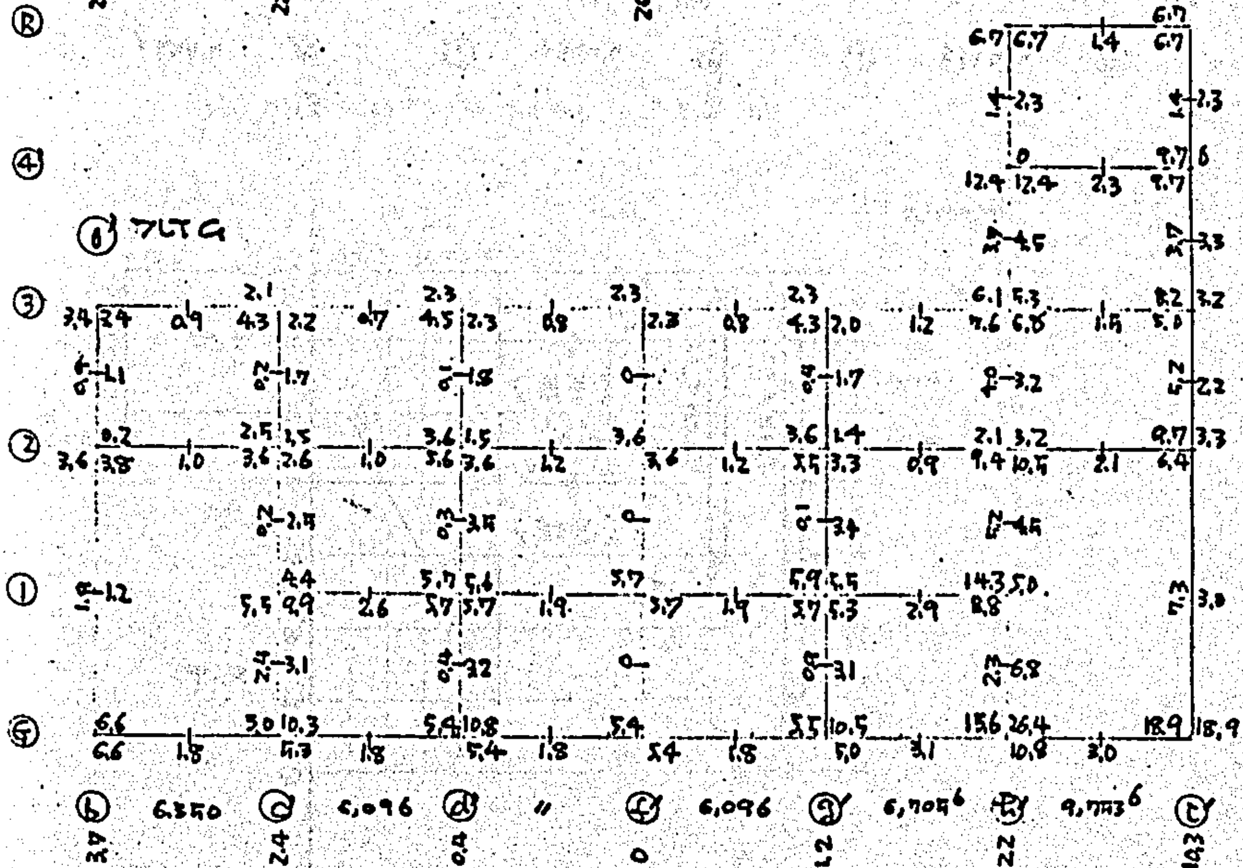
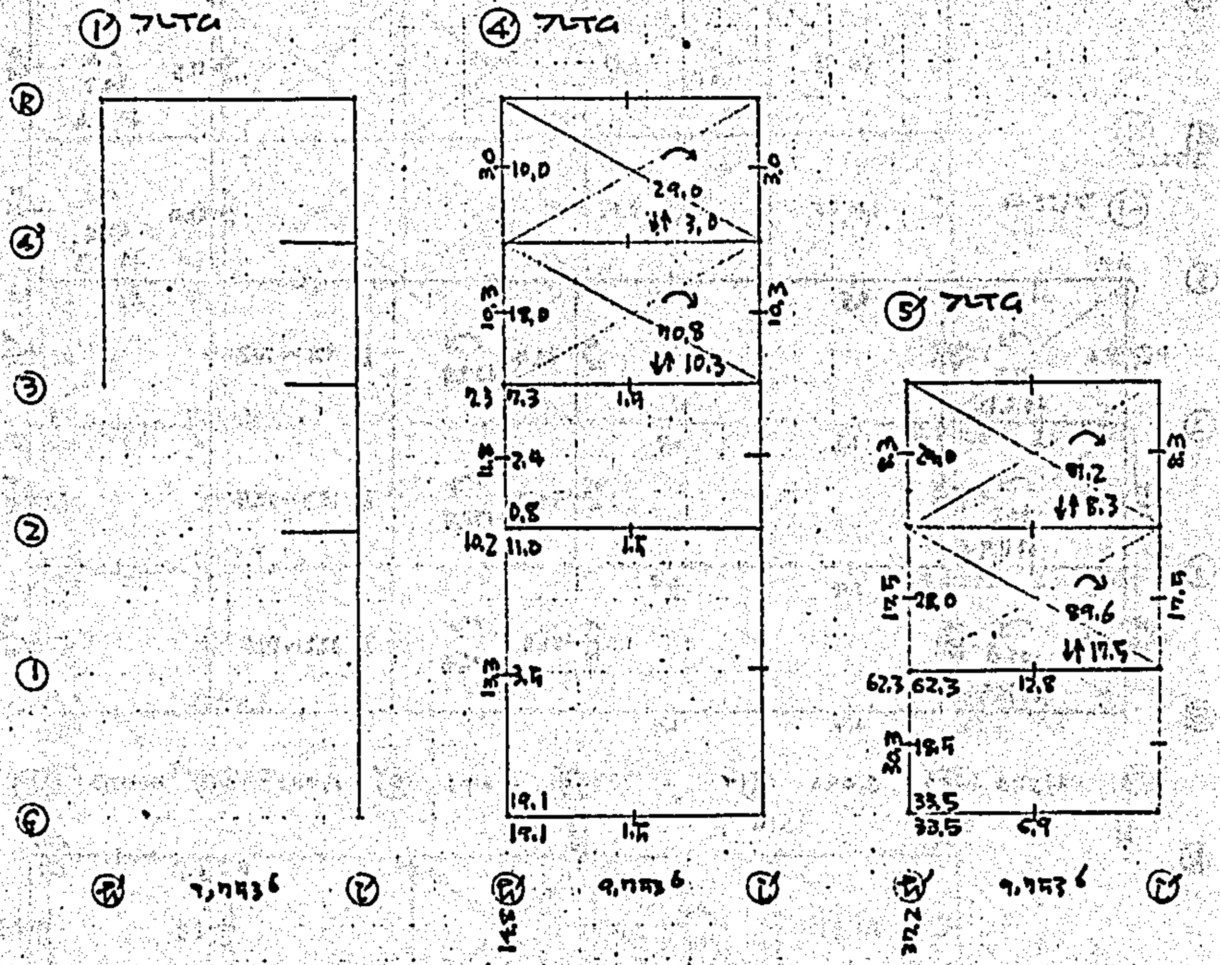






3. 一 基礎の設計

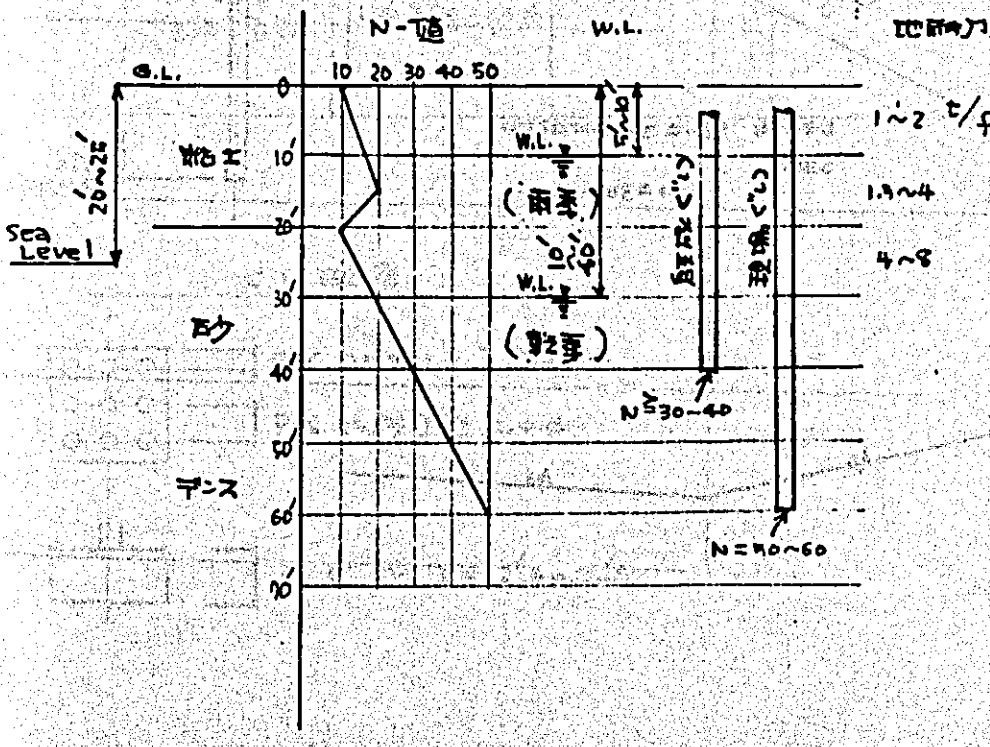
ダッカ における くい施工についての データ

本工事においては 設計部分になっている。

また 既設部分における 振動、騒音を防ぐ"ため

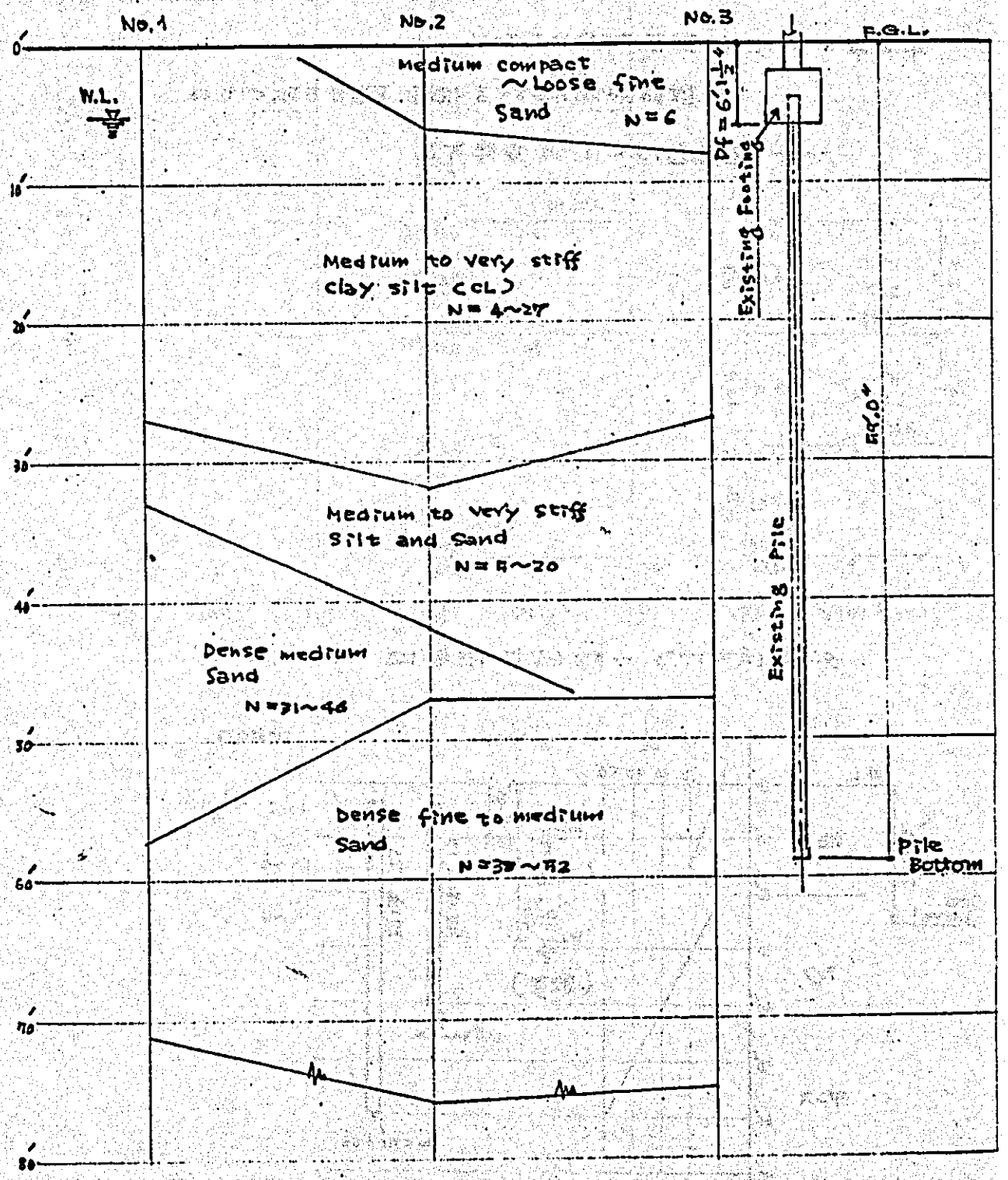
現場造成ぐい を使用する。

ダッカ における 一般的な 柱状図

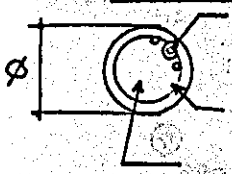


柱状図

("30,7,77 — Preliminary Report" by "Foundation Consultant, Dacca" による。)



くい仕様

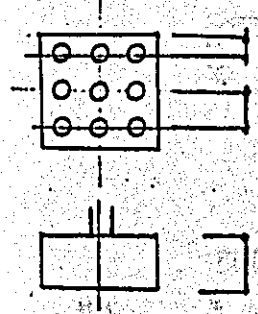


(F = 39,000 P.S.i)

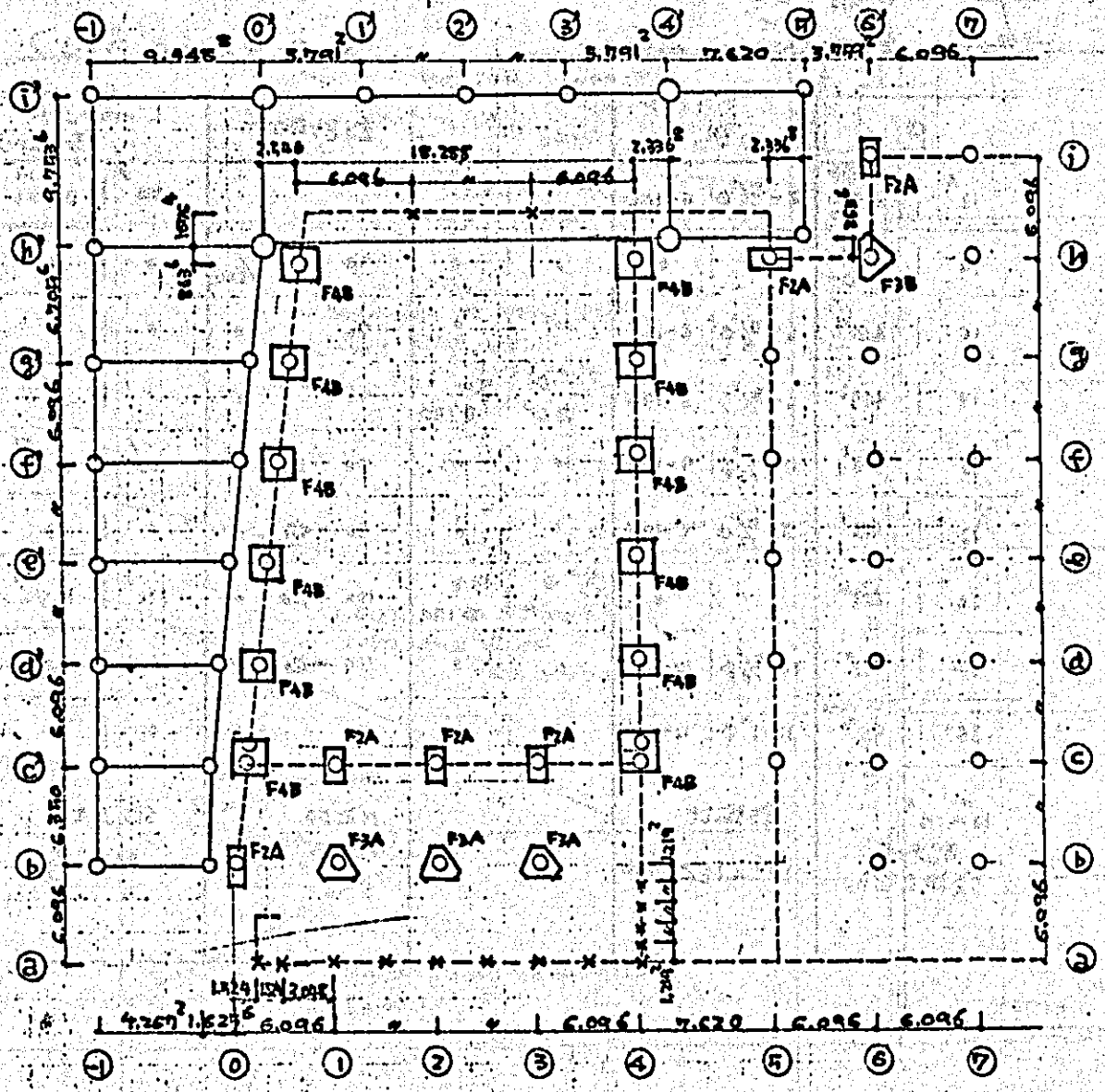
(28 Fc = 2,800 P.S.i)

φ	n	n'	許容支持力	L max (GL~)
12" | 304.8 MM	5-5/8"φ | 8-16φ	1/4"φ @c" | cφ @150		80' | 24,384 M
14 | 355.6	〃 | 〃	〃 | 〃	60 T/Each	〃 | 〃
16 | 406.4	6-5/8"φ | 6-16φ	〃 | 〃	70 〃	〃 | 〃
18 | 457.2	6-3/4"φ | 6-19φ	3/8"φ @c" | 9φ @150	75 〃	〃 | 〃
20 | 508	8-3/4"φ | 8-19φ	〃 | 〃	80 - 85 〃	160' | 34,450 M
22 | 558.8	8-7/8"φ | 8-19φ	〃 | 〃	90 - 95 〃	〃 | 〃
24 | 609.6	〃 | 〃	1/2"φ @6" | 13φ @150	100 - 110 〃	120' | 36,576 M
30 | 762	10-7/8"φ | 10-19φ	〃 | 〃	105 - 120 〃	〃 | 〃
36 | 914.4 MM	12-1"φ | 12-25φ	〃 | 〃	130 〃	〃 | 〃
12"~14" が多く使用される。	1.鉄筋比 1% ≧ Pg ≧ 0.4%		N ≧ 50 Fs = 3	細長比 80 ≧ L/φ

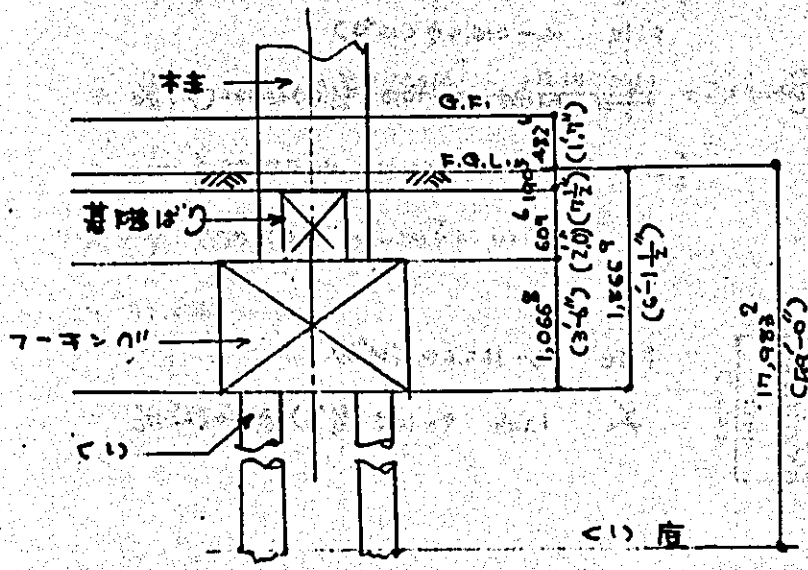
くい配置図

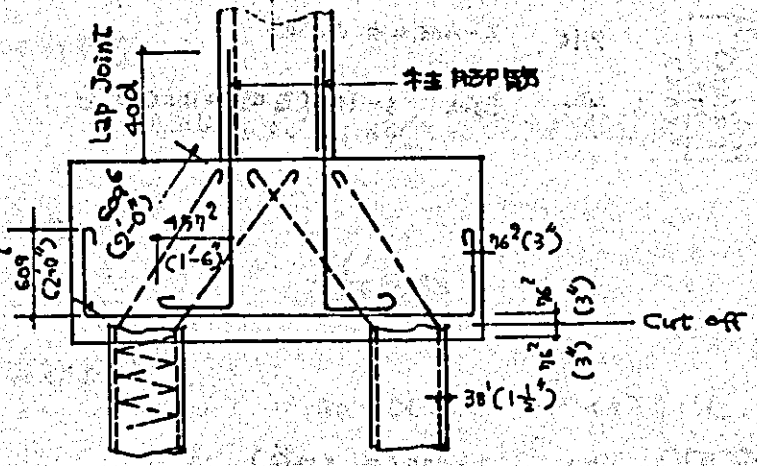


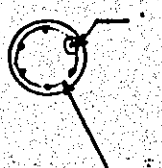
杭伏図 データ



1' -12" = 304.8 MM
1" = 25.4 MM







主筋

5－16Φ（5/8"φ）for 355.6 Φ（14"Φ）

～

7－16Φ（5/8"φ）for 406.4Φ（16"Φ）

帯筋

6φ（1/4"Φ）@ 150（6"）c/c

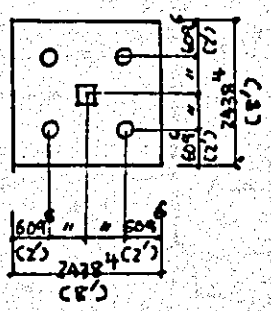
許容支持力

355.6Φ　40 t/Each

406.4Φ　50 t/Each

杭基礎 フーチング データ

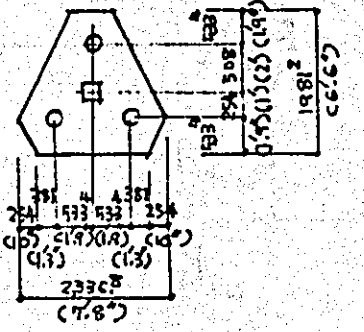
F4B



Pile 4-406.4φ (16"φ)

Each 16-19φ (¾"φ) @150 (6") c/c

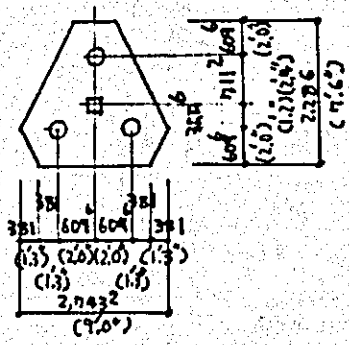
F3A



Pile 3-355.6φ (14"φ)

Each 7-19φ (¾"φ) @150 (6") c/c

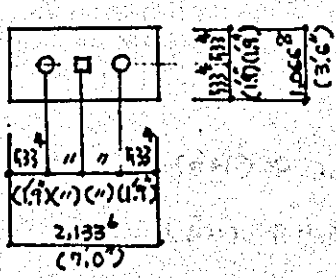
F3B



Pile 3-406.4φ (16"φ)

Each 8-19φ (¾"φ) @150 (6") c/c

F2A



Pile 2-355.6φ (14"φ)

8-19φ (¾"φ)

12-13φ (½"φ)

(1' = 12" = 304.8 MM
1" = 25.4 MM)

くいの設計支持力

$$R = \frac{1}{3}\left\{15\bar{N}A_P + \left(\frac{N S L_S}{n} + 2N_C L_C\right)\psi\right\} - W$$

$$= \frac{1}{3}\left\{15\times 40\times\frac{\pi\times 0.4064^2}{4} + \left(\frac{9144\times 10}{n} + 2\times 9.144\times n\right)\pi\times 0.4064\right\} - W$$

$$= \frac{1}{3}\left\{77.83 + (18.288 + 91.440)1.276\right\} - W$$

$$= \frac{1}{3}\left\{77.83 + 140.09\right\} - W$$

$$= 72.64 - W$$

$$\downarrow$$

$$= 50\ t/pile$$

基礎自重

$$48''\times 48''\times 60''\times 2\ t/m^3 = 1.219^2\times 1.524\times 2 = 4.5\ t/pile$$

くい自重

$$\frac{\pi\times 16''^2}{4}\times 60'\times 2.4\ t/m^3 = \frac{\pi\times 0.4064^2}{4}\times 18.288\times 2.4 = 5.7\ t/pile$$

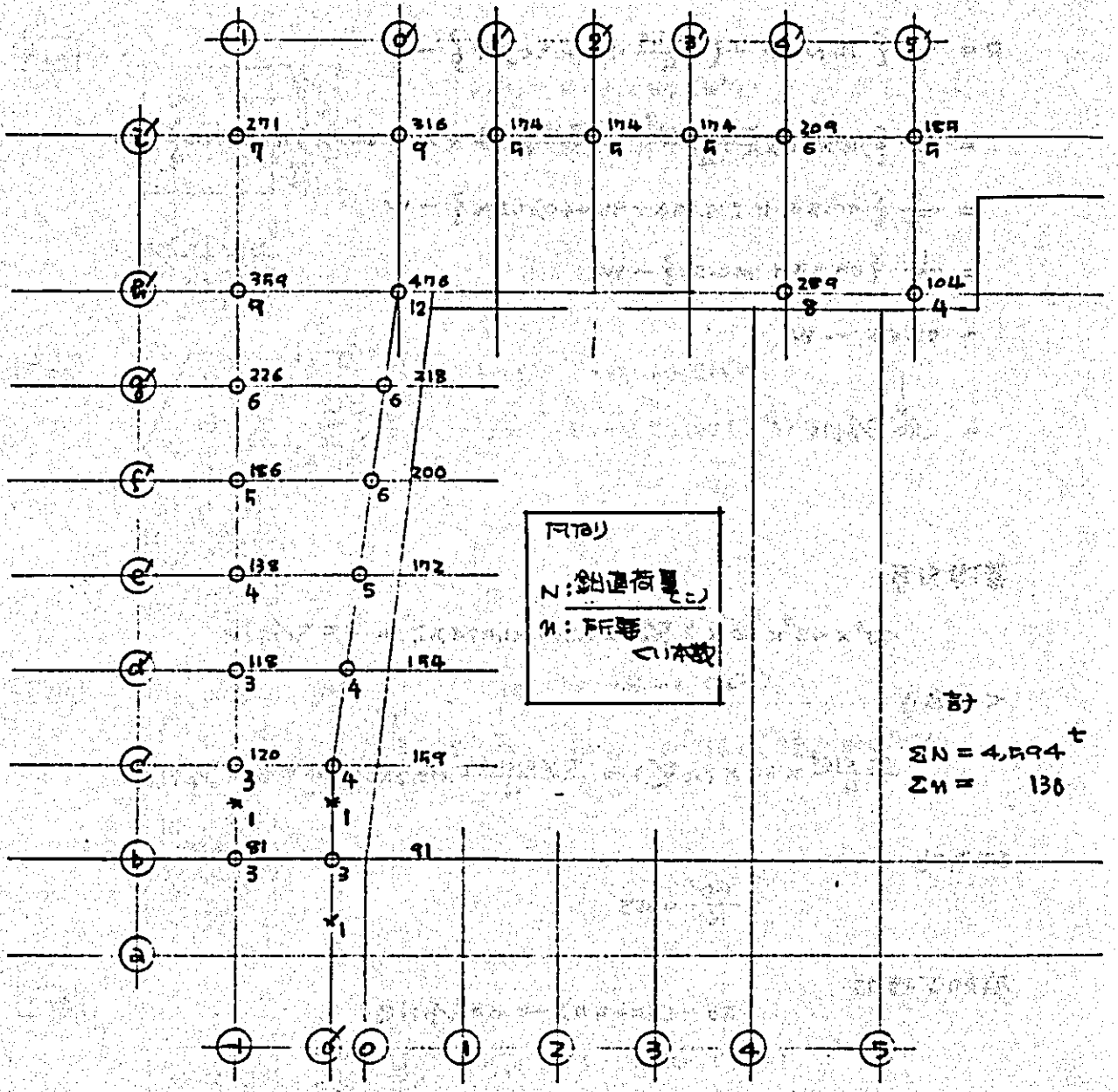
細長比

$$\frac{60'}{16''} = 45$$

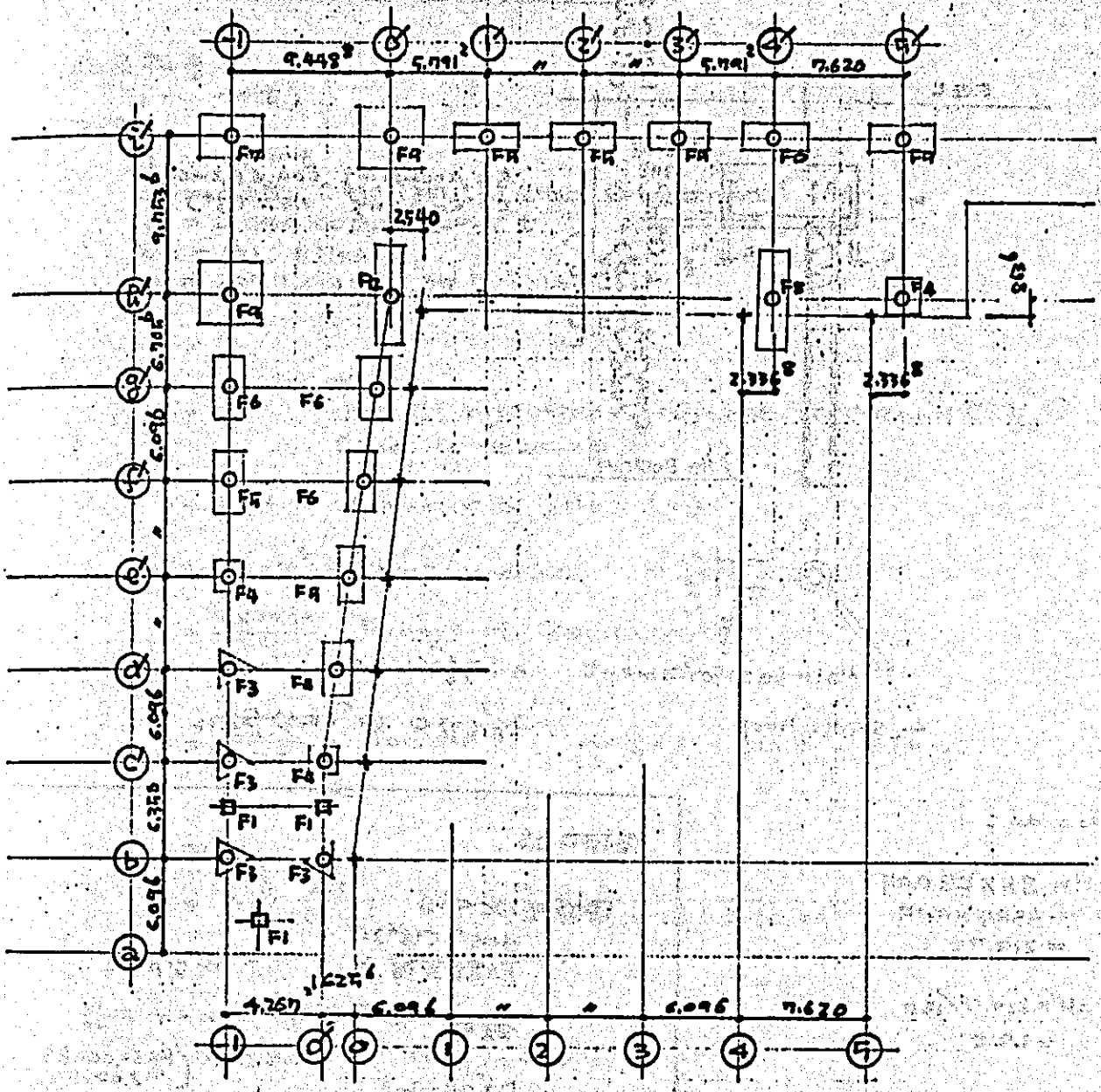
有効支持力

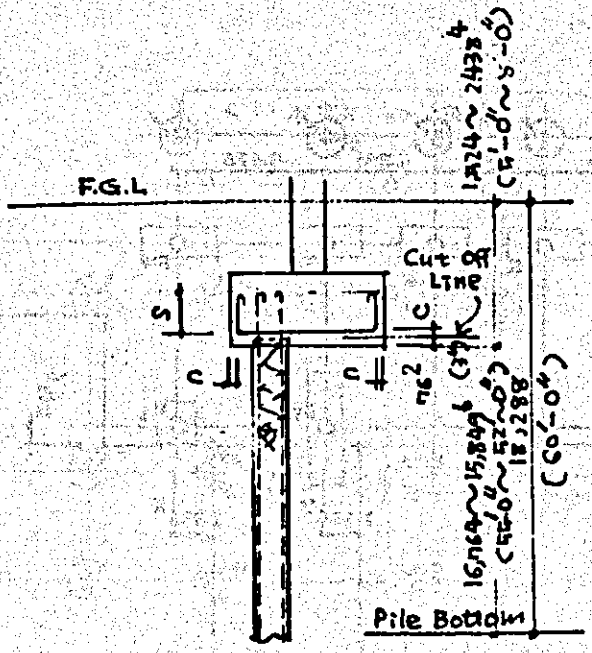
$$50 - (4.5 + 5.7) \rightarrow 40\ t/pile$$

くい本数の決定

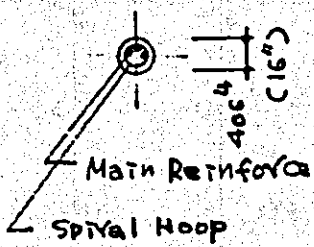

-1
0
1
2
3
4
5
271
9
316
9
174
5
174
5
174
5
209
6
159
5
359
9
476
12
289
8
104
4
226
6
218
6
156
5
200
6
138
4
172
5
118
3
154
4
120
3
159
4
81
3
91
3
*1
*1
*1
計
ΣN = 4,594 t
Σn = 130

基礎　配置図


9.448
5.791
5.791
7.620
2540
2.336
2.336
4.267
6.096
6.096
7.620
F1
F2
F3
F4
F5
F6
F8
F9



S = Anchoring 609.6 (2'-0")
C = Covering 76.2 (3")



6 - 7/8" (16) φ

3/8" (9) φ @ " (mm) S/C

N = 40 t

H = ΣN × F.B 0.05
= 4594 × 0.05
= 229.7 t

ΔH = 229.7 / 130
= 1.8 t

使用材料

現場造成ぐい
406φ (16") φ
設計支持力 = 50 t/pile

鉄筋
M.S. Bar (F = 33,000 P.S.I = 2,400 kg/cm²)

コンクリート
砂利骨材
(28Fc = 3,000 P.S.I = 210 kg/cm²)

基礎

鉄筋
JIS Standard SD35

コンクリート
レンガ骨材
(28Fc = 2,600 P.S.I = 180 kg/cm²)

1 P.S.I = 0.070307 kg/cm² = 7.03 t/cm²

水平力に対するくいの適否

鉛直荷重

$N = 40\,t$

水平力

$\Sigma N = 4,594\,t$

$K_R = 0.05$ (Horizontal Load Coefficient)

$H = 4,594 \times 0.05 = 229.7\,t$

$\Sigma n = 131$ piles

$\Delta H = 229.7 / 131 = 1.77\,t/pile$

$K_H = 2.00$: lateral direction Coefficient of Ground (kg/cm^3)
(For N Value = 5)

$D = 40.64$: Diameter of Pile (cm)

$E = 1.99 \times 10^5$: Young's Modulus (kg/cm^2)

$I = \frac{\pi \times 40.64^4}{64}$: Moment of Inertia (cm^4)
$= 133,901$

$\beta = \sqrt[4]{\frac{K_H \cdot D}{4EI}} = 0.005255\ (cm^{-1}) \sim l = 60' = 1828.8\ (cm) \sim \beta l = 9.6$

くい頭変位

$y = 0.5 \times \frac{\Delta H}{EI\beta^3} = 0.5 \times \frac{1770}{1.99 \times 10^5 \times 133,901 \times 0.005255^3}$
$= 0.23\ (cm)$

最大モーメント発生位置

$l = 0.8 \times \frac{1}{\beta} = 152.2\ (cm)$

最大モーメント

$M = 0.3 \times \frac{\Delta H}{\beta} = 0.3 \times \frac{1,770}{0.005255}$
$= 99,905\ (kg\,cm)$
$= 1.00\ (t\,m)$

*

N = 40,000 (kg)

M = 99,905 (kgcm)

D = 40.64 (cm)

N/D^2 = 24.219
M/D^3 = 1.488

〜

以下、図表により、

主筋 fc = 140 → 120 (kg/cm²)
rfc = 15×120 = 1800 (〃)
ft = 2,320 (〃)

〜

$N/D^2 fc$ = 0.20
$M/D^3 fc$ = 0.012] Pg = 0 %

$N/D^2 rfc$ = 0.013
$M/D^3 rfc$ = 0.0008] Pg = 0

$N/D^2 ft$ = 0.010
$M/D^2 ft$ = 0.0006] Pg = 0

〜

Pg min = 0.4 % 〜 1.0 %
ag 〃 = 5.19 cm² 〜 12.97 cm²

〜

6 − 5/8" (16) φ
(1.979 × 6 = 11.88 cm²)

*

帯筋

pw = 0.2 %

3/8" (9) φ

as = 0.7126 cm²

$P = \frac{0.7162 \times 2}{40.64 \times 0.002}$

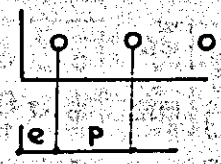
= 17.63 cm

〜

3/8" (9) φ

@ 6" (150)

フーチング の設計



e : へりあき　1,219 mm (4'-0")

P : 間隔　610 mm (2'-0")

材料

鉄筋　: JIS Standard SD35

ft (引張り)　2,200 kg/cm²

fb (付着)　18 〃

コンクリート　: 28Fc = 2,600 P.S.I. = 180 kg/cm²

fs (せん断)　6 kg/cm²

fp (パンチング)　15 〃

パンチング に対する最小成

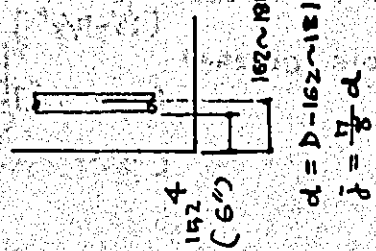
$$\frac{R}{\pi \psi d} < f_p \sim d > \frac{R}{\pi \psi f_p}$$

$$= \frac{40,000}{\pi \times 40.64 \times 15}$$

$$= 20.9\ cm$$

$$\sim$$

$$D = 3'-0'' = 91.44\ cm$$

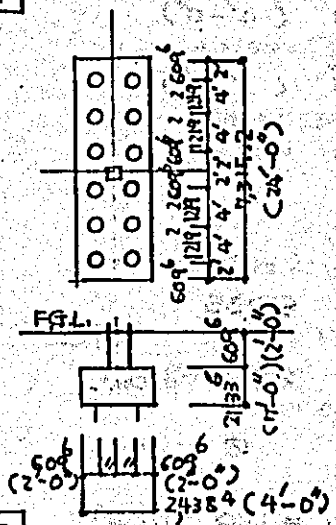


許容応力度

SD35　　$f_t = 2.2$ [t/cm²]
　　$f_b = 19.0$ [t/cm²]
Fc 180　　$f_s = 6.0$ 〃

M/S CASE-2 BAR　$f_t = 1.26\pi$ [t/cm²]
　　$f_b = 10.8$ [t/cm²]

F12



D 213.36 cm　d 197.2 cm　j 172.5 cm　B 243.84 cm

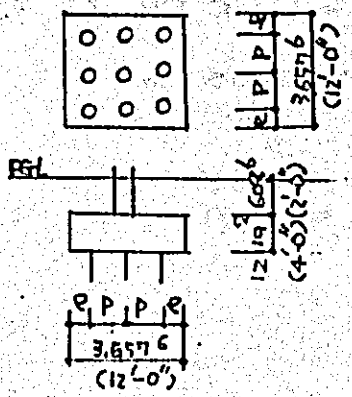
$Q_F = 40 \times 6 = 240$ t
$M_F = 240 \times (1.219^2 \times 1.\pi - 0.4\pi) = 330.9$ t·m

φ 117.3 t/cm²　Q_{AL} 252.4 t
at 97.2 t·cm
[φ 128.8~64.4, at 191.6]

↕ 23~12-D22 (@100~200)
[31~16-1"]

↔ 29-D16 (@250)
[29-5/8"]

F9



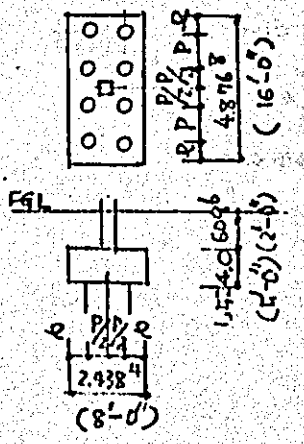
D 121.92 d 103.8 j 90.8 2D+a 268.6

$Q_F = 40 \times 2 = 80$
$M_F = 80(1.219^2 - 0.30) = 113.5$

φ 48.9　Q_{AL} 196.3
at 36.8
[φ 81.6, at 64.0]

↕ 15-D19 (@250)
[23-3/4"]

F8



D 152.40 d 136.2 j 119.2 B 243.84

$Q_F = 40 \times 4 = 160$
$M_F = 160(1.219 - 0.4\pi) = 123.6$

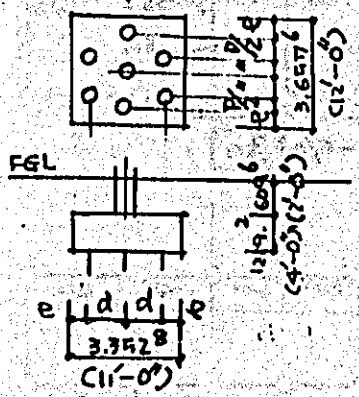
φ 114.6　Q_{AL} 174.4
at 46.9
[φ 124.3~62.2, at 81.6~42.3]

↕ 19-D19 (@125)
[23-7/8"]

↔ 20-D16 (@250)
[20-5/8"]

F7

D 121.92 d 103.8 j 90.8 2D+q 269.6



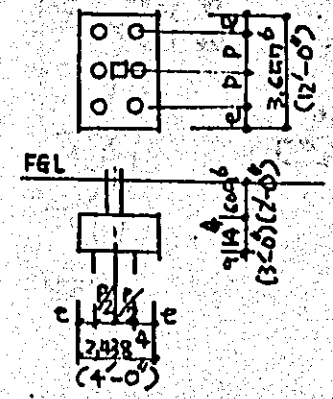
1 $Q_F = 40.0 + 2 \times 40.0 \times 0.37$
$= 40.0 + 29.6$
$= 69.6$ φ 42.6 QAL 146.3
[φ 71.0]

$M_F = 40.0 (1.219^2 - 0.3) + 29.6 (0.609^6 - 0.3)$
$= 36.8 + 9.2$
$= 46.0$ at 23.0 [at 40.0]
13 − D19 (@250) [23-3/4"]

↪ $Q_F = 2 \times 40.0 \times 0.74 = 59.2$ φ 36.2 QAL 146.3
$M_F = 59.2 (1.066^8 - 0.3) = 45.4$ at 22.7
15 − D19 (@250)
[φ 60.4, at 39.8, 23-3/4"]

F6

D 91.44 d 75.24 j 65.8 2D+q 211.4

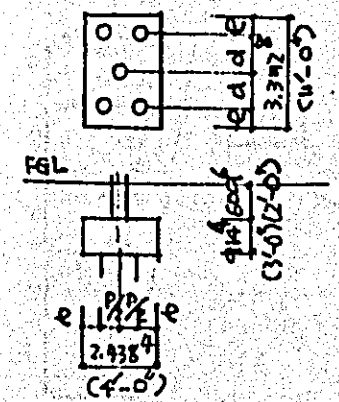


1 $Q_F = 2 \times 40.0 = 80.0$ φ 69.5 QAL 83.5
$M_F = 80.0 (1.219^2 - 0.3) = 73.5$ at 50.8
19 − D19 (@125)
[φ 112.6, at 88.3, 31-3/4"]

↪ $Q_F = 40.0$ φ 33.8 QAL 83.5
$M_F = 40.0 (0.609^6 - 0.3) = 12.9$ at 8.9
15 − D16 (@250)
[φ 96.3, at 15.5, 15-5/8"]

F5

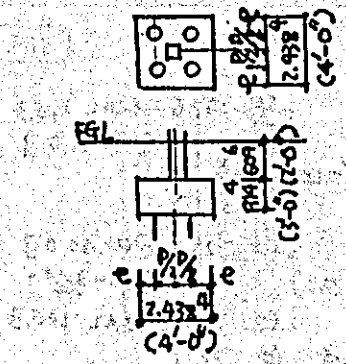
D 91.44 d 75.24 j 65.8 2D+q 211.4



1 $Q_F = 2 \times 40.0 = 80.0$ φ 69.5 QAL 83.5
$M_F = 80.0 (1.066^8 - 0.3) = 61.3$ at 42.3
16 − D19 (@150)
[φ 112.6, at 73.6, 19-7/8"]

↪ 13 − D16 (@250)
[13 − 7/8"]

F4



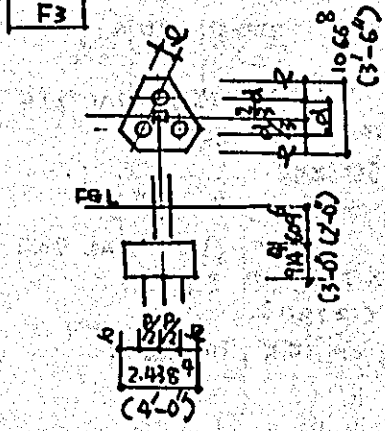
D 91.44 d 73.34 j 64.2 2D+a 207.6

QF = 40.0
MF = 40.0 (0.609 − 0.3) = 12.4

φ 34.6 QAL 80.0
at 8.8

10-D16 C@250
[φ 57.7, at 15.3, 12-5/8"]

F3



d = 1066

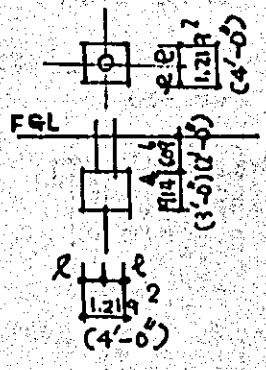
D 91.44 d 71.44 j 62.5 B min. 109.6

QF = 40.0
MF = 40.0 (0.7112 − 0.3) = 16.5

φ 35.6 QAL 39.6
at 12.0

17-D16C @180 + 2-D16
[φ 39.3, at 20.9, 10-3/4"]

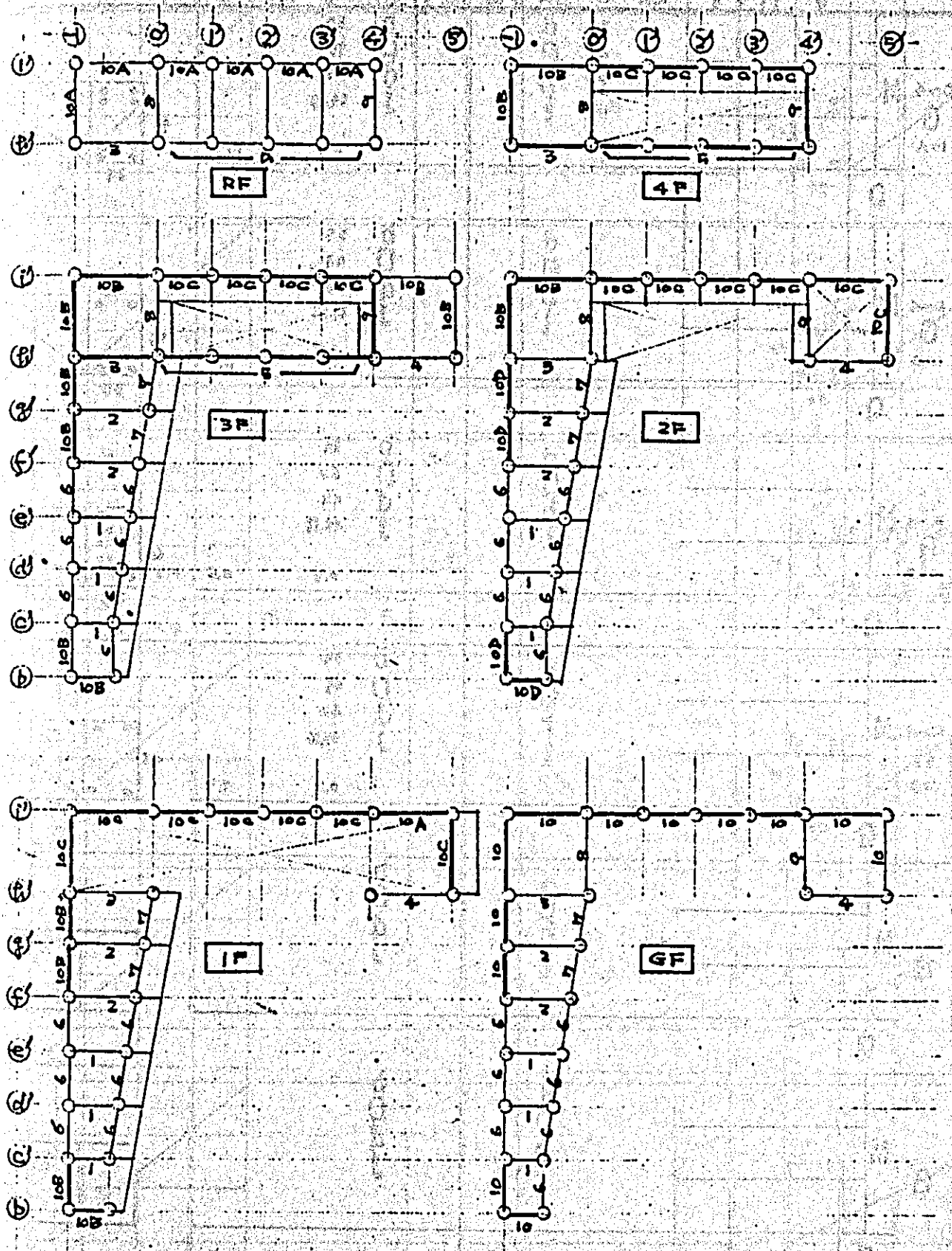
F1



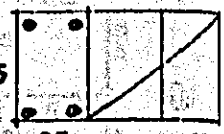
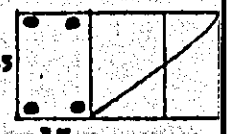
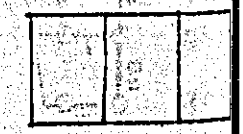
D 91.44

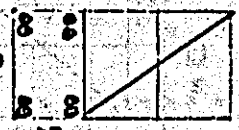
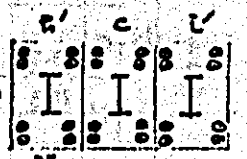
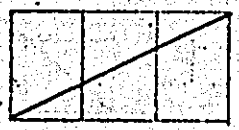
6-D16 C@200
[6-5/8"]

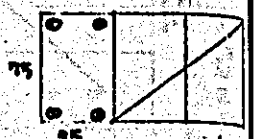
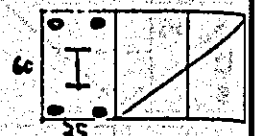
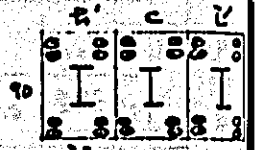
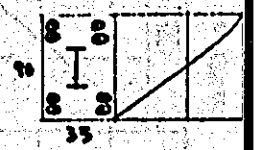
4. 一大ばり の配置

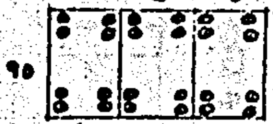
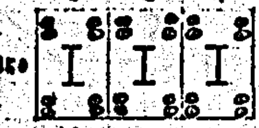
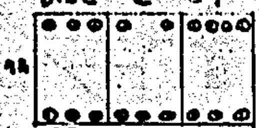


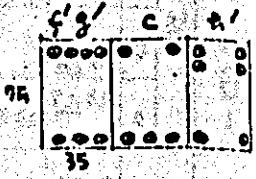
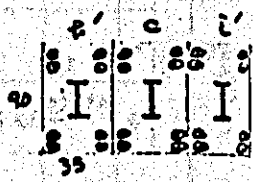
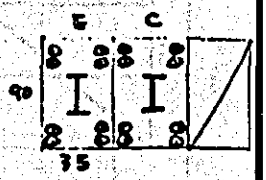
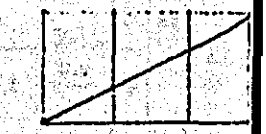
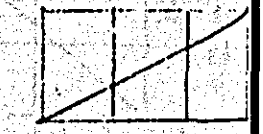
はり符号 ・ キイプラン

		STRESS V	H	T	C Pt γ σt η QA σ ΔQ Pw φ		
R~4 G 10A	M				b 35 D 90 d 85 j 14,38 0,8 10,8		
	Q						
R~4 G 10B	M				b 35 D 78 d 70 j 61,25 0,8 8,7		
	Q						
R~4 G 10C	M				b 35 D 60 d 55 j 48,13 0,8 6,6		
	Q						
R~4 G 10D	M				b 35 D 45 d 40 j 35,00 0,8 4,5		
	Q						
G	M				b D d j		
	Q						
G	M				b D d j		
	Q						

		STRESS V	H	T	C Pt γ mt n σA α ΔQ Pw β	b d	SECTION
RG3	M					b 35 d 90 j 85 n 14.4 c.14	
	Q						
RG5	M					b d j	
	Q						
RG8	M	c' 23.5 c 14.9 i' 23.5	6.7 6.7		14.9 9.1 14.9	b d j	
	Q	17.6	1.4		18.2 0		
RG9	M					b d j	
	Q						
G	M					b d j	
	Q						
G	M					b d j	
	Q						

		STRESS V	H	T	C Pt γ at n QA α ΔQ Pw φ		SECTION
4 G 3	M					b 35 D 95 d 70 j 41.25	
	Q						
4 G 5	M					b 35 D 60 d 45 j 48.13	
	Q						
4 G 8	M t'	25.0	12.4		15.3	b 35 D 90 d 85 j 99.38	
	C	19.3			8.1		
	t''	25.3	9.17		15.3		
	Q	17.6°	2.3		18.2 0		
4 G 9	M					b 35 D 90 d 85 j 99.38	
	Q						
G	M					b D d j	
	Q						
G	M					b D d j	
	Q						

			STRESS V	H	T	C Pt γ at n QA	α	ΔQ	Pw	φ			SECTION
3G1	M	-1	2.3 4.4	4.3 3.5	7.9 / 2.0				1.7 / 0.9		b	35	-1 c 0  45 35 D D10 @150
		c	2.6 5.0						3.7		D	45	
		0	10.3 11.9	4.3 3.5					2.3		d	40	
											j	61.25	
			9.2-8.4	2.0 1.3		12.9		0		11.4			
30G2	M	-1	6.3 19.5	3.3 2.9					14.7		b		-1 c 0  45 35 D D10 @100
		c	9.4 22.3						16.3		D	〃	
		0	14.3 24.4	3.3 2.9					19.6		d		
											j		
			9.6-19.5	4.9 0.7		12.9	1.38	2.0	0.0029	26.9			
3G3	M										b	35	-1 c 0  90 40
											D	90	
											d	85	
											j	74.38	
3G4	M	4'	26.7	3.8					16.3		b		4' c 5'  90 40
		c	19.9						12.0		D	〃	
		5'	9.7	3.4					5.9		d		
											j		
			14.9	1.6		14.6		0		16.7			
3G5	M	4'									b	40	0 c 4'  150 40
											D	150	
											d	143	
											j	126.9	
												0.4 / 24.0	
3G6	M	b	2.9	3.4					3.5		b	35	b+e' c f'  45 35
		c	5.4						4.9		D	45	
		c' f'	8.6	2.3					6.5		d	40	
											j	61.25	
			6.7	0.9		12.9		0		5.1			

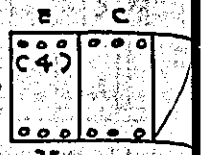
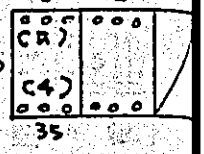
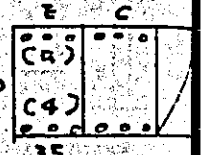
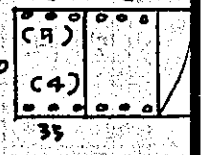
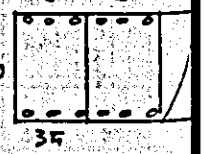
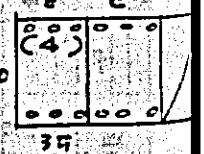
		STRESS V	H	T	C Pt γ at μ Qa α ΔQ Pw φ		SECTION
3G7	g'	14.4	2.3		10.17	b 35 D 75 d 70 J 61.25	
	M c	9.3			6.9		
	h'	16.3	6.1		12.1		
	Q	17.4	1.2				
3G9	h'	26.1	6.8		16.0	b 35 D 90 d 85 J 94.38	
	M c	13.4			8.2		
	i'	23.9	8.2		14.6		
	Q	17.8	1.5		15.6 1.47 0	0.4 10.8	
3G9	M					b D d J	
	Q						
G	M					b D d J	
	Q						
G	M					b D d J	
	Q						
G	M					b D d J	
	Q						

			STRESS V	STRESS H	STRESS T	C Pt γ at n: Q_A	α	ΔQ	Pw	ρ	b D d j	SECTION
2G1	M	-1	4.8-9.3	5.1 3.7		13.0	1.09	0	15.2		b 35 D 45 d 40 j 35	-1 c 0 45 35
		c	4.3						9.6			
		0	6.3-8.6	5.1 3.7		13.4	2.17	0	30.4			
	Q		3.7-6.9	2.4 4.4		7.4		0		16.4		
2G2	M	-1	9.4-15.9	6.9 9.2		15.1	0.83	0.75	20.3		b 35 D 75 d 70 j 61.25	-1 c 0 75 35
		0	15.9						11.5			
		c	13.3-23.8	6.9 9.2		16.2	1.24	0.4	38.4			
	Q		8.6-18.0	1.9 4.7		12.9	1.25	1.9	0.0029	24.8		□ D10 @100
2G3	M_S	-1	15.0	6.6		15.0	1.02	0.8	30.4		b 35 D 90 d 85 j 44.38	-1 c 0 90 35
		c	29.5						22.9			
		0	52.0	8.9		20.6	4.36	0.9	40.6			
	Q		31.2	4.6		15.6	1.86	10.0	0.0058	35.0		□ D13 @100
2G4	M	4'	3.9	9.6	11.5 3.17				4.4		b D d j	4' c 5' 45 35
		c	2.5						1.8			
		5'	4.9	9.3	9.2 5.4				3.8 2.1			
	Q		3.2	2.6	9.2							
G5	M										b D d j	
	Q											
2G6	M	b	17.4	3.8							b 35 D 45 d 40 j 35	b b' e' f' 45 35
		c	5.6						7.3			
		e' f'	8.6	3.6		15.4	1.09	0.4	15.2			
	Q		6.7	1.2		7.4		0		16.0		

		STRESS V	H	T	C Pt γ at n QA α ΔQ Pw φ	b D d J	SECTION
2G17	M f,g'	10.8	3.6		19.3 1.45 0.7 20.3	b D d J	f,g' C e' 45 35 □D10 @D0
	M C	9.3					
	M e'	8.2	2.1		14.6 18.2		
	Q	8.4	1.2		7.4 1.0 1.0 0.0028 20.0		
2G8	M e'	24.7	10.5		15.1	b 35 D 90 d 85 J 74.38	e' C f' 90 35
	M C	14.5			8.9		
	M f'	23.2	9.7		14.3		
	Q	17.8	2.1		15.6 1.82 0 19.9		
2G9	M E	24.8	11.0		18.0	b D d J	E C 90 35 □D10 @D100
	M C	15.8			9.2		
	Q	14.1	1.5		15.6 0 15.8		
G	M				2G9 Toyston MT (from CS1) = 0.55 T/m × 9.7536 m/2 = 2.68 tm ψo = 2 (50+28) = 210 cm Ao = 80×28 = 2,000 cm²	b D d J	
	Q						
G	M				at = Mt ψo / 2fAo = 268×210 / 2×2.8×2000 = 7.0 → 4-D16 pw = Mt / 2fbAo + 0.002	b D d J	
	Q				= 268 / 2×2×35×2,000 + 0.002 = 0.00296		
G	M					b D d J	
	Q						

		STRESS V	STRESS H	STRESS T	C Pt γ at Π QA α ΔQ Pw φ	b D d j	SECTION
1G1	M -1	3.0 4.7	12.7 13.6	21.7 15.7	12.7 9.2 — 10.1 8.3	b 35 D 75 d 70 j 61.25	-1 c 0
	M c	3.9					75
	M 0	9.1 14.1	12.7 13.6	25.8 11.6	15.0 6.5 — 12.0 5.4		35
	Q	5.8 7.1	8.8 8.9	13.9	12.9 — 0 — 19.3 1.13 1.9 0.0027	21.2	□ D10 @150
1G2	M -1	14.9 22.1	18.1 13.1		21.6 1.66 0.95 40.6	b D d j	-1 c 0
	M 0	25.2			— 18.7		75
	M c	19.8 41.2	18.1 13.1		24.8 1.66 1.0 40.6		35
	Q	14.1 31.8	4.1 3.1		12.9 1.40 13.7 0.0084	43.3	□ D13 @75
1G3	M -1	31.8	9.8		12.6 — 14.4	b 35 D 90 d 85 j 94.38	-1 c 0
	M c	29.6			— 17.8		90
	M 0	42.4	9.7		16.8 1.02 0.8 30.4		35
	Q	25.8	2.1		15.6 1.36 4.5 0.0037	28.9	□ D16 @100
1G4	M 4'	7.6	8.9	5.9 10.9	— 2.7 4.3	b D d j	13
	M c	4.7					4' c 5'
	M 5'	16.2	9.6		— 9.9		90
	Q	5.3	2.4	9.1	15.6 — 0	6.8	35
1G6	M b					b 35 D 75 d 70 j 61.25	b-e' c f'
	M c	5.9			— 7.0		75
	M c' e'	10.2	9.9	20.1	— 9.4		35
	Q	7.5	1.9		12.9 — 0.01	10.2	
1G7	M f' g'	13.6	8.9		— 11.6	b D d j	f' g' c g'
	M c	12.4			— 9.2		95
	M g'	9.8	14.3	24.1 4.5	— 11.2 2.1		35
	Q	7.9-10.0	1.9-2.9		12.9 — 0	17.6	

( ) = CASE 2, M/S-BAR, UNLESS NOTED SAME TO CASE 1

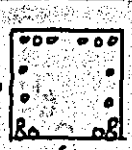
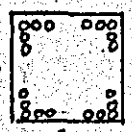
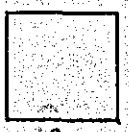
			STRESS V	STRESS H	STRESS T	C Pt γ at QA α ΔQ Pw	φ		SECTION
FG 1	M	E	1.0-1.7	18.4-16.1	19.4 / 17.4	5.7 (11.8) / 5.1 (10.6)		b 35.56 D 121.92 d 111.92 j 97.73	
	M	C	9.1			1.9			
	Q		2.8-2.5	8.6-6.1	20.0	31.3 0	17.0 (18.9)		
FG 2	M	E	5.6-11.9	14.9 13.9	25.8 / 9.3	7.5 (14.7) / 2.7 (5.6)		b D d j	
	M	C	16.2			9.5			
	Q		7.9	4.1-3.3	16.1	31.3 0	14.7 (19.2)		
FG 3	M	-1	6.3	9.0	15.3 / 2.7	7.1 (4.3) / 1.8 (1.6)		b D d j	
	M	C	3.9			1.8			
	M	D	9.1	21.6	30.7 / 12.9	9.0 (15.6) / 3.6 (11.6)			
	Q		5.2	3.2	11.6	31.3 0	9.9 (11.0)		
FG 4	M	4'	3.1	23.3	26.4 / 20.2	7.7 (16.8) / 5.9 (12.3)		b D d j	
	M	C	6.9			3.2			
	M	5'	1.8	9.4	17.6 / 11.2	2.2 (4.8) / 2.3 (6.8)			
	Q		4.6	4.3	13.2	31.3 0	11.2 (12.4)		
FG 6	M	b	1.5	6.6	17.1 / 5.1	2.1 (4.3) / 1.5 (3.1)		b D d j	
	M	C	3.6			1.2			
	M	c' f'	4.5	5.4	9.9 / 0.9	2.9 (6.0) / 0.3 (0.6)			
	Q		4.2	1.8	11.8	31.3 0	6.6 (7.4)		
FG 7	M	f' g'	3.4	5.5	8.9 / 2.1	2.6 (5.4) / 0.6 (1.3)		b D d j	
	M	C	1.5			0.7			
	M	B'	6.5	15.6	22.1 / 9.1	6.4 (13.4) / 2.7 (5.7)			
	Q		4.0	3.1	10.2	31.3 0	8.7 (9.6)		

		STRESS V	H	I	C Pt γ wt η QA α ΔQ Pw φ		SECTION
FG 8	M B'	3.1	10.8	13.9 7.7		4.1 (5.4) 2.2 (4.7)	E C (4) 120 35
	M C	1.1				0.5	
	M D'	6.5	12.9	25.4 12.4		3.4 (14.8) 3.6 (7.8)	
	Q	4.0	3.0	10.0	31.3 0	8.5 (7.8)	
FG 9	M B'	7.9	19.1	27.0 11.7		3.9 (16.4) 3.3 (6.8)	E C (5) 120 (4) 35
	M C	3.6				3.2	
	M D'	5.7	19.1	24.8 13.4		7.7 (14.1) 3.9 (8.1)	
	Q	4.3	1.5	8.3	31.3 0	7.1 (7.8)	
FG 10C	M E	6.6	33.5	40.1 26.9		11.6 (24.3) 7.8 (16.3)	C8 120 C5 35
	M C	5.8				2.7	
	Q	5.1	6.9	12.9	31.3 0	16.1 (12.8)	
G	M						
	Q						
G	M						
	Q						
G	M						
	Q						

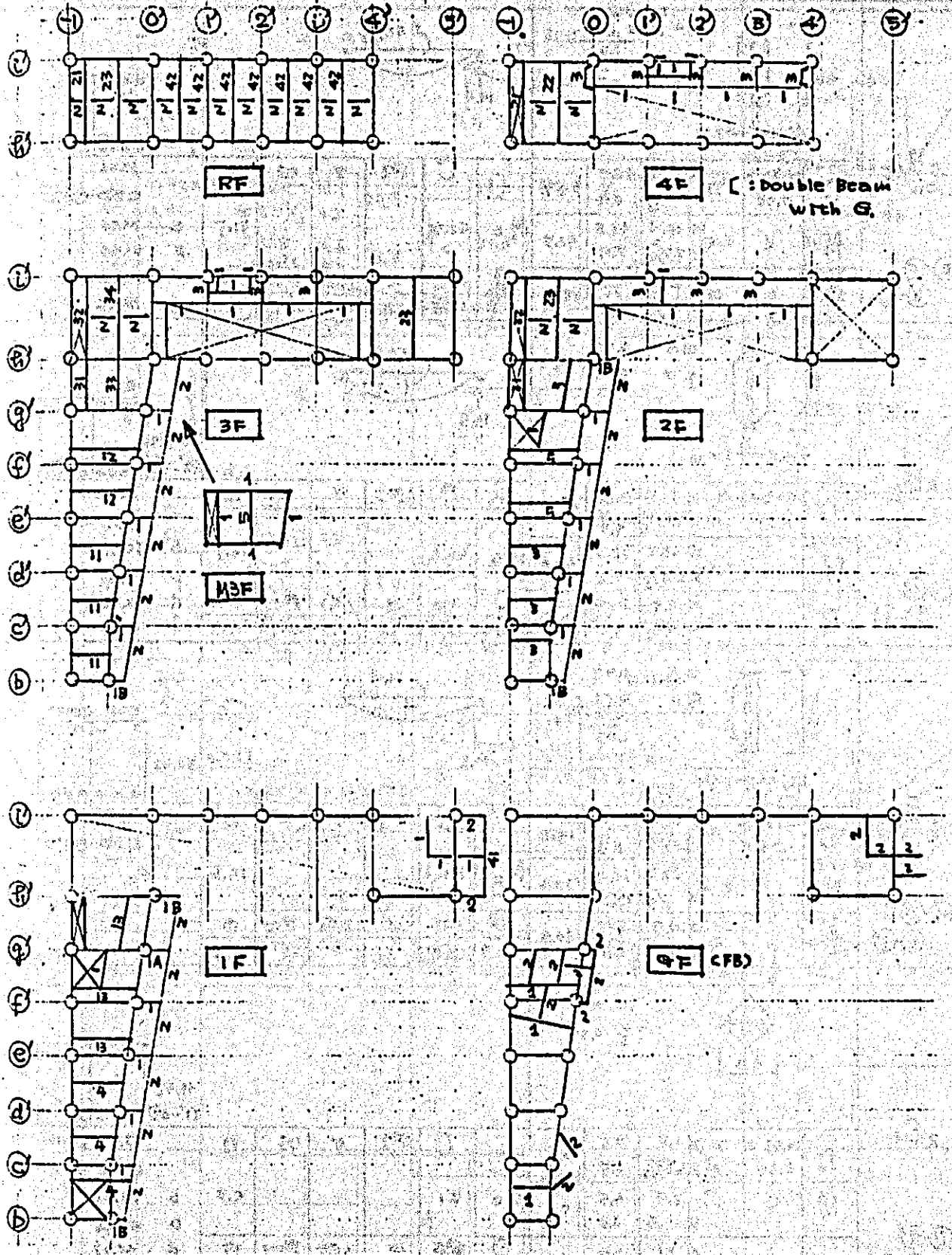
5. — 柱の設計

( )=CASE 2, M/S BAR, UNLESS NOTED SAME TO CASE 1,

			STRESS V	H	T	N/BD M/BD² P_t at Qa ΔQ Pw φ		SECTION
$_2C_{C'D'}$	X	N	39.4	2.0	41.4 37.4		B 60 p_g 0.8 D // q_g 21.8 J 48.125	60
		MU	-9.0	4.3	0.3 8.3			
		ML	-3.6	0.8	2.8 4.4			
		Q	2.3	1.5	5.3	17.3 26.0 0		
	Y	N	39.4	0.2	39.6 39.7		B D J	60 (12-D) (12-9/16")
		MU	-5.9	4.3	10.2 1.7			
		ML	5.7	2.5	8.2 3.2			
		Q	3.4	1.7	6.8	// 0		
$_1C_{C'D'}$	X	N	80.3	4.4	84.7 83.9		B D J	60 //
		MU	-3.7	4.3	0.6 8.0			
		ML	-4.2	6.4	2.2 10.6			
		Q	2.5	3.4	9.3	// 0		
	Y	N	80.3	0.2	80.5 80.1		B D J	60
		MU	1.7	3.6	5.3 1.9			
		ML	2.9	4.4	7.3 1.5			
		Q	0.17	2.5	5.17	// 0		
$_9C_{C'D'}$	X	N	131.5	13.2	144.7 118.3	40.7 32.9	B D J	60 //
		MU	-1.5	12.3	10.8 13.8			
		ML	-0.6	18.4	17.8 19.0	8.2 8.8 (0)		
		Q	0.4	5.9	12.2	// 0		
	Y	N	131.5	2.4	133.9 129.1		B D J	60
		MU	1.9	5.5	7.4 3.6			
		ML	1.5	10.3	11.8 8.8			
		Q	0.17	3.1	6.9	// 0		
$_2C_{G'D'}$	X	N	70.7	0.7	71.4 70.0		B D J	60
		MU	11.4	2.9	14.3 8.5			
		ML	5.8	1.6	7.4 4.2			
		Q	5.1	1.3	7.17	17.3 26.0 0		
	Y	N	70.7	0.4	71.1 70.3		B D J	60 (18-7/8") 14-D7
		MU	9.3	4.3	4.6 4.0			
		ML	0.7	1.4	2.1 0.7			
		Q	0.1	1.7	3.5	// //		
$_1C_{G'D'}$	X	N	123.6	2.4	126.0 121.2	34.3	B D J	60 //
		MU	7.6	5.6	13.2 2.0			
		ML	13.8	3.8	17.6 10.0	6.4 0.5 18.0 (0.65) (23.4)		
		Q	6.7	3.0	12.7	// //		
	Y	N	123.6	0.1	123.7 123.5		B D J	60
		MU	1.8	5.5	7.3 3.7			
		ML	1.5	5.5	7.0 4.0			
		Q	1.0	3.4	7.8	// //		
$_9C_{G'D'}$	X	N	182.1	5.5	187.6 176.6		B D J	60 //
		MU	9.3	9.3	18.6 0			
		ML	9.3	13.9	23.2 4.6			
		Q	3.6	4.9	13.4	// //		
	Y	N	182.1	0.9	183.0 181.2		B D J	60
		MU	0.5	5.7	6.2 5.2			
		ML	0.2	10.5	10.7 10.3			
		Q	0.1	3.1	6.3	// //		

			STRESS V	H	T	N/BD M/BD² Pt mt QA ΔQ Pw φ		SECTION
4C (1'1")	X	N					B D J	 90
		M U						
		M L						
		Q						
	Y	N	46.9	0		8.17	B 60 Pg 1.8	60
		M U	25.4	0		5.2 0.12 6.11 (0.2) (10.8)	D 90 αg 41.2	16-D22
		M L	8.17	0			J 74.393	(16-7/8")
		Q	11.8	0		26.8 40.2 0		
4C (B'0")	X	N					B 90 Pg 0.8 D 90 αg 64.8 J 74.395	 90
		M U						
		M L						
		Q						
	Y	N	96.6	1.4	98.0 99.7	11.9	B D J	90
		M U	23.5	6.7	30.2 15.8	3.2 0 (0)		20-D22
		M L	17.6	0	17.6			(20-7/8")
		Q	14.2	2.3	18.8	40.2 60.7 0		
3C	X	N					B D J	 90 90
		M U						
		M L						
		Q						
	Y	N	210.5	3.7	214.2 206.8			
		M U	7.4	12.4	19.8 5.0			
		M L	5.5	5.3	10.8 0.7			
		Q	3.3	4.5	12.3	// 0		
2C	X	N	323.6	1.3	324.9 322.3		B D J	 90 90
		M U	19.2	9.5	19.17 0.17			
		M L	20.0	1.7	21.17 18.3			
		Q	8.9	3.3	15.2	// 0		
	Y	N	323.6	4.0	327.6 319.7		B D J	
		M U	4.3	7.6	11.9 3.3			
		M L	10.6	3.2	13.8 7.4			
		Q	4.4	3.2	10.8	// 0		
1C	X	N	401.3	2.9	414.2 398.4		B D J	 90 90
		M U						
		M L						
		Q						
	Y	N	401.3	5.2	406.5 396.1		B D J	
		M U	5.9	9.4	17.3 3.5			
		M L	5.1	5.0	10.1 0.1			
		Q	9.2	4.3	9.2	// 0		
6C	X	N	450.1	5.6	455.1 445.1	56.2	B D J	 90 90
		M U	13.5	3.8	17.3 9.7	4.3 0 (0)		
		M L	9.1	21.6	30.7 12.5			
		Q	6.7	4.9	16.5	// 0		
	Y	N	450.1	2.3	452.4 447.8	55.9	B D J	
		M U	4.7	8.8	13.4 4.1	3.8 0 (0)		
		M L	1.4	26.4	27.8 25.0			
		Q	0.6	6.8	14.3	// 0		

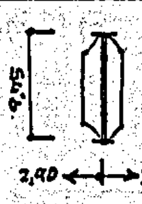
			STRESS V	H	T	N/BD M/BD² Pt at QA ΔQ Pw φ		SECTION
2C 8'-1	X	N	155.1	5.4	160.5 / 149.7	44.6 / 41.6	B 60 0.8	
		MU	-0.1	3.1	3.1	1.4 0 (0)	D " 28.8	60
		ML	0	1.0	1.0		J 48.173	
		Q	0.	1.2	1.2	17.3 / 26.0 0		60
	Y	N					B	12-D22
		MU					D	
		ML					J	
		Q						
1C	X	N	234.8	7.0	241.8 / 227.8		B	
		MU					D	60
		ML					J	60
		Q						
	Y	N					B	
		MU					D	
		ML					J	
		Q						
6C	X	N	286.1	9.1	295.2 / 277.0	82.0 / 76.9	B	
		MU	1.3	6.0	7.3 / 4.5		D	60
		ML	2.6	9.0	11.6 / 6.4	9.4 (0)	J	60
		MQ	0.8	2.9	5.3	" 0		
	Y	N					B	
		MU					D	
		ML					J	
		Q						
2C 8'-5'	X	N	24.8	1.6	26.4 / 23.2		B	
		MU	9.7	3.4	13.1 / 6.3		D	60
		ML	6.9	1.5	8.4 / 5.4		J	60
		Q	4.9	1.5	7.9	17.3 / 26.0 "		12-17
	Y	N					B	
		MU					D	
		ML					J	
		Q						
4C	X	N	49.7	3.6	52.8 / 45.6	18.7 / 12.7	B	
		MU	-5.0	5.8	0.8 / 10.8	6.6 / 8.1 0.27 / 0.12	D	60
		ML	-14.3	3.3	11.0 / 17.6		J	60
		Q	6.0	2.5	9.8	" "		
	Y	N					B	
		MU					D	
		ML					J	
		Q						
6C	X	N	82.6	6.0	88.6 / 76.6		B	
		MU	-8.5	6.3	2.2 / 14.8		D	10 10 90
		ML	-1.8	9.4	7.6 / 11.2		J	60
		Q	2.0	3.0	8.0	" "		
	Y	N	82.6	30.3	112.9 / 52.3	20.9 / 9.17	B	24-7/8" 16-D22
		MU	0	62.3	62.3	12.8 0.38 20.5 (0.78) (37.8)	D	
		ML	0	33.5	33.5		J	
		Q	0	18.5	37.0			



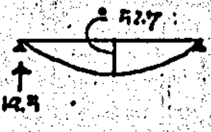
下ぎばり、小ばり
ギャラン

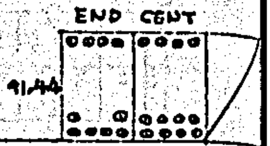
	LOAD	STRESS	SECTION

$_RB_{42}$ ⓖ-ⓘ' ⓗ'-ⓘ



w = Roof 0.72 + Flrs 0.60 = 1.32
q = 0.75

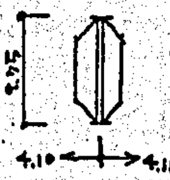




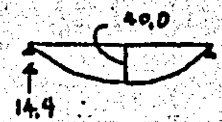
						C	Pt	γ	at	n
C	1.32 × 2	× 10.9	28.8	34.7						
	0.75	× 9.75²/12	5.9							
M		× 16.6	43.8	52.7	Mc	52.7				31.7
		× 9.75²/8	8.9							
Q		× 6.0	15.8	19.5	Q	QA	α	ΔQ	Pw	φ
		× 9.75/2	3.7		19.5	15.8	1.0	0.7	0.0023	12.3

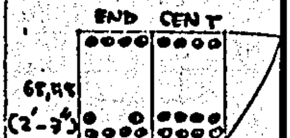
35.56 ○D25
□D10-@150
b 35.56
D 91.44
d 86.44
j 75.64

$_RB_{23}$ ①-ⓖ ⓗ'-ⓘ



w = 0.72
q = 0.61

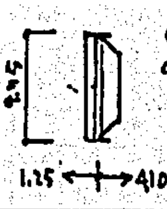




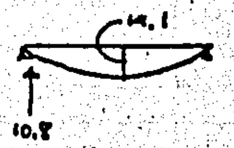
						C	Pt	γ	at	n
C	0.72 × 2	× 14.9	21.5	26.3						
	0.61	× 9.75²/12	4.8							
M		× 22.8	32.8	40.0	Mc	40.0				32.7
		× 9.75²/8	7.2							
Q		× 7.9	11.4	14.4	Q	QA	α	ΔQ	Pw	φ
		× 9.75/2	3.0		14.4	13.8	1.0	0.7	0.0024	12.3

35.56 ○D25
□D10-@150
b 35.56
D 68.58
d 63.58
j 55.63

$_RB_{21}$ ①-ⓖ ⓗ'-ⓘ'



w = 0.72
q = 0.61 + 0.72 × 1.25/2 = 1.05

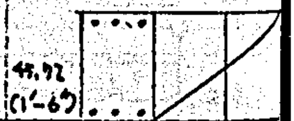


						C	Pt	γ	at	n
C	0.72 ×	× 14.9	10.8	19.1						
	1.05 ×	× 9.75²/12	8.3							
M		× 22.8	16.4	28.9	Mc	19.1				15.6
		× /8	12.5							
Q		× 7.9	5.7	10.8	Q	QA	α	ΔQ	Pw	φ
		× 9.75/2	5.1		10.8	13.8		0		9.2

35.56 ○D25
□D10-@150
4

$_RB_1$ ⓘ'-ⓗ' ○-○

w 0.72
q 0.39



						C	Pt	γ	at	n
C	0.72 × 2	× 1.8	2.6	3.1						
	0.39	× 4.1²/12	0.5							
M		2.9	4.3	5.1	Mc	5.1				6.5
		× /8	0.8							
Q		× 2.1	3.0	3.8	Q	QA	α	ΔQ	Pw	φ
		× 4.1/2	0.8		3.8	6.3				5.9

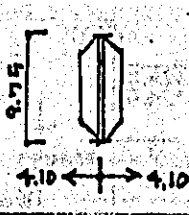
23.40 (0'-10") ○D19
□D10-@150
b 25.40
D 45.72
d 40.72
j 35.63

LOAD

STRESS

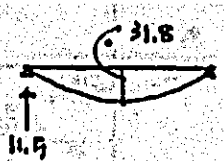
SECTION

$_4B_{22}$ (①-②, Ⓚ-Ⓛ)



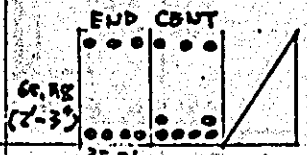
w 0.54
ρ 0.61

C	0.54×2×0.61	×14.9	16.1	20.9
		×9.15²/12	4.8	
M		×22.8	24.6	31.8
		×9.15²/8	7.2	
Q		×7.9	8.5	11.5
		×9.15/2	3.0	



	C	Pt	γ	at	n
Mc	31.8				26.0

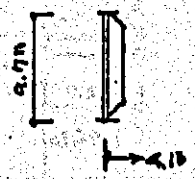
Q	QA	α	ΔQ	Pw	φ
11.5	13.8		0		9.8



□ D10-@150

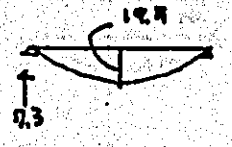
b 35.56
D 60.58
d 53.58
j 55.63

$_4B_{21}$ (①-②, Ⓗ-Ⓘ)



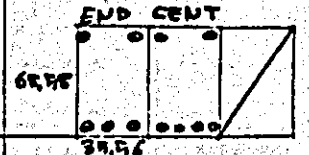
w 0.54
ρ 0.61

C	0.54	×14.9	8.0	12.8
	0.61	×9.15²/12	4.8	
M		×22.8	12.3	19.9
		×9.15²/8	7.2	
Q		×7.9	4.3	7.3
		×9.15/2	3.0	



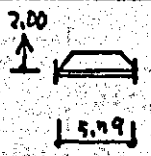
	C	Pt	γ	at	n
Mc	19.9				18.9

Q	QA	α	ΔQ	Pw	φ
7.3	13.8		0		6.2



□ D10-@150

$_4B_1$ (Ⓐ-Ⓑ, ⓞ-Ⓟ)



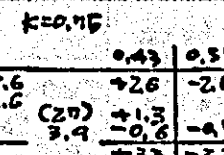
w 0.54
ρ 0.39

0.54×3/4+0.39=0.93

C	0.93	×5.19²/12	2.6	2.6
M		×5.19²/8	3.9	3.9
Q		×5.19/2	2.9	2.9

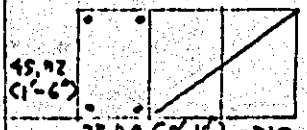
k=0.75 k=1.00

	0.43	0.57
−2.6	+2.6	−2.6 +2.6
+2.6 (2.9) 3.9	+1.3 −0.6	−0.7 (2.9) 3.9
0 2.2 (3.3)	+3.3	−3.3 0.9 (2.8) −2.6



	C	Pt	γ	at	n
Mx	3.3				4.3
c	2.2				

Q	QA	α	ΔQ	Pw	φ
3.3	6.3				6.6



□D10-@150

b 25.40
D 45.72
d 40.72
j 1663

B

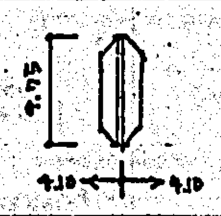
C				
M				
Q				

	C	Pt	γ	at	n
M					

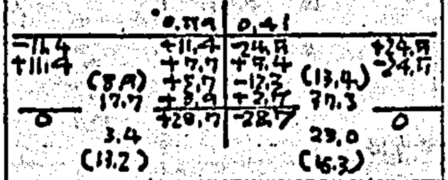
Q	QA	α	ΔQ	Pw	φ

	LOAD	STRESS	SECTION

$_3B_{34}$



w 0.66
q 0.61



1 c 0

76.20

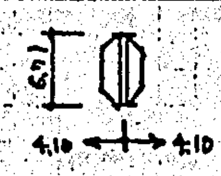
C	0.66 × 2 × 14.9	19.7	24.5
	0.61 × 9.75²/12	4.8	
M	× 22.8	30.1	39.3
	× 9.75²/8	9.2	
Q	× 9.9	10.4	13.4
	× 9.75/2	3.0	

		C	Pt	γ	at	n
M	0	0				
	c	23.0				16.9
	1	28.7	15.9	1.20	0.83	30.4
Q		QA	α	ΔQ	Pw	φ
16.3		15.9	1.19	0		18.7

35.56 ⊙D25
□D10 @ 150
b 35.56
D 76.20
d 71.20
j 62.30

①-⓪'
ⓗ-ⓘ

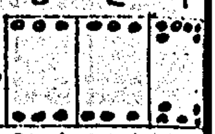
$_3B_{33}$



w 0.92
q 0.61

0 c 1

76.20



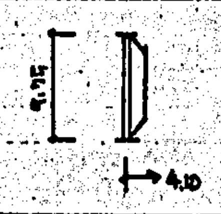
C	0.92 × 2 × 6.4	9.1	11.4
	0.61 × 6.91²/12	2.3	
M	× 10.1	14.3	17.7
	× 6.91²/8	3.4	
Q	× 4.8	6.8	8.9
	× 6.91/2	2.1	

		C	Pt	γ	at	n
M	1	28.7				
	c	3.4				2.9
	0	0				
Q		QA	α	ΔQ	Pw	φ
13.2		15.5		6		14.1

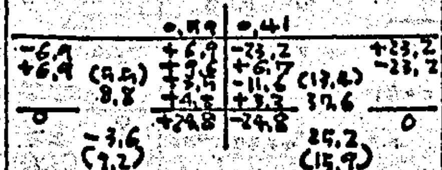
35.56 ⊙D25
□D10 @ 150

①-⓪
ⓙ-ⓑ

$_3B_{32}$

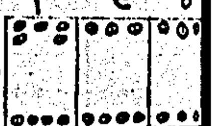


w 0.66
q 0.61 + W 1.08
= 1.69



1 c 0

76.20



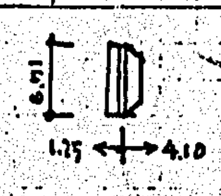
C	0.66 × 14.9	9.8	23.2
	1.69 × 9.75²/12	13.4	
M	× 22.8	15.0	37.6
	× 9.75²/8	22.6	
Q	× 7.9	5.2	13.4
	× 9.75/2	8.2	

		C	Pt	γ	at	n
M	0	0				
	c	25.2				18.4
	1	24.8	13.8	1.00	0.7	25.4
Q		QA	α	ΔQ	Pw	φ
15.9		15.9	1.24	0		

35.56 ⊙D25
□D10 @ 150

①-⓪"
ⓚ-ⓘ

$_3B_{31}$



w 0.92
q 0.61

0 c 1

76.20

C	0.92 × 6.4	4.6	6.9
	0.61 × 6.91²/12	2.3	
M	× 10.1	7.3	8.8
	× 6.91²/8	1.5	
Q	× 4.8	3.5	5.5
	× 6.91/2	2.0	

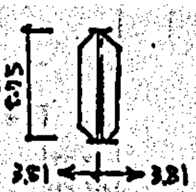
		C	Pt	γ	at	n
M	1	24.8				
	c	−3.6				
	0	0				
Q		QA	α	ΔQ	Pw	φ
9.2		15.9		0		

34.56 ⊙D25
□D10 @ 150

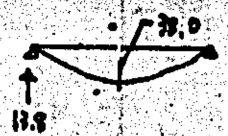
①-⓪
ⓙ-ⓑ'

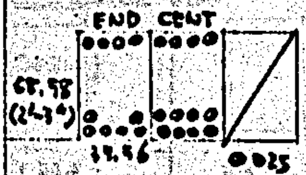
LOAD	STRESS	SECTION

$_3B_{23}$ ④-⑤ ⓗ-ⓘ



ω 0.72
q 0.61



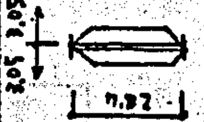


C	0.72 × 2 × 14.0	20.2		25.0
	0.61 × 9.75²/12	4.8		
M	× 21.4	30.8		38.0
	× /8	7.2		
Q	× 7.5	10.5		13.8
	× 9.75/2	3.0		

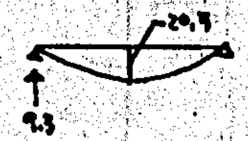
	C	Pt	γ	m	n
Mc	38.0				31.0
Q	Q_A	α	ΔQ	Pw	φ
13.8	13.8		0		13.8

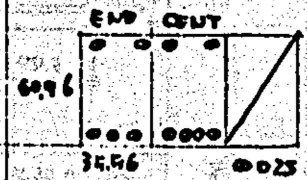
□D10-@50
b 35.56
D 68.58
d 63.58
j 55.63

$_3B_{12}$ ④-⑤ ①-⓪



ω 0.72
q 0.61



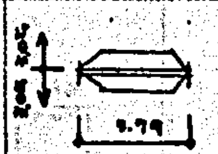


C	0.72 × 2 × 7.2	10.4		13.5
	0.61 × 7.82²/12	3.1		
M	× 11.0	15.8		20.5
	× /8	4.7		
Q	× 4.8	6.9		9.3
	× 7.82/2	2.4		

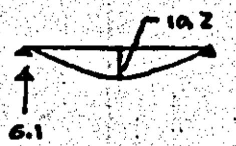
	C	Pt	γ	m	n
Mc	20.5				19.0
Q	Q_A	α	ΔQ	Pw	φ
9.3	12.2		0		10.6

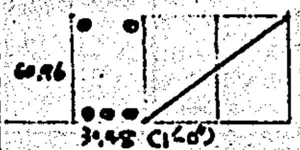
□D10-@150
b 35.56
D 60.96
d 55.96
j 48.97

$_3B_{11}$ ④-⑤ ①-⓪



ω 0.72
q 0.44



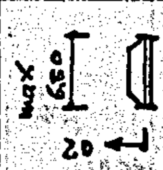


C	0.72 × 2 × 3.77	5.3		6.5
	0.44 × 5.97²/12	1.2		
M	× 5.8	8.4		10.2
	× /8	1.8		
Q	× 3.3	4.8		6.1
	× 5.97/2	13		

	C	Pt	γ	m	n
Mc	10.2				7.5
Q	Q_A	α	ΔQ	Pw	φ
6.1	9.0		0		6.9

□D10-@150
b 30.48
D 60.96
d 55.96
j 48.97

$_3B_2$ ⓪-⓪ ⓑ-ⓑ



ω 0.72
q $\overset{P}{0.39}$ + $\overset{W}{0.23}$
= 0.62
0.72×1+0.62=1.34

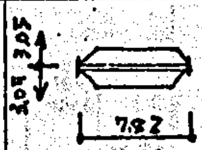
C	1.34 × 6.8²/12			5.2
M	× /8			7.7
Q	× 6.8/2			4.6

	C	Pt	γ	m	n
Mo	5.2				6.6
Q	Q_A	α	ΔQ	Pw	φ
4.6	7.4		0		9.2

□D10@150
b 25.40
D 45.72
d 40.72
j 35.63

	LOAD	STRESS	SECTION

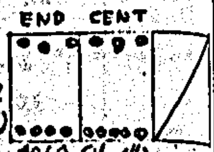
2B5



w 0.66
q 0.39

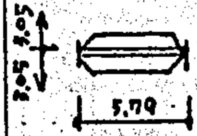
	LOAD			
C	0.66 × 2	× 7.2	9.5	11.5
	0.39	× 7.82²/12	2.0	
M		× 11.0	14.5	12.5
		× /8	3.0	
Q		× 4.8	6.3	7.8
		× 7.82/2	1.5	

	M	C	Pt	γ	at
Mc	14.5				22.3
Q	Qa	α	ΔQ	Pw	?
7.8	8.7		0		10.4



45.72 (1'-6")
40.64 (1'-4") @025
□ D10 @150
b 40.64
D 45.72
d 40.72
j 35.63

2B3



w 0.66
q 0.39

	LOAD			
C	0.66 × 2	× 3.7	4.9	6.0
	0.39	× 5.79²/12	1.1	
M		× 5.8	7.7	9.3
		× /8	1.6	
Q		× 3.3	4.4	5.5
		× 5.79/2	1.1	

	M	C	Pt	γ	at
Mc	9.3				11.9
Q	Qa	α	ΔQ	Pw	?
5.5	6.5		0		9.4

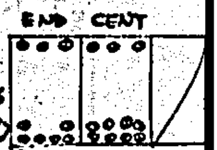
45.72
30.48 (1'-0")
□ D10 @150
b 30.48
D 45.72
d 40.72
j 35.63

2B23

CMoQ = 3B34

	LOAD
C	24.5
M	37.3
Q	13.4

	M	C	Pt	γ	at
Mc	37.3				30.5
Q	Qa	α	ΔQ	Pw	?
13.4	13.8		0		13.4



68.58 (2'-3")
35.56 @025
□ D10 @150
b 35.56
D 68.58
d 63.58
j 55.63

2B5

CMoQ = 3B33

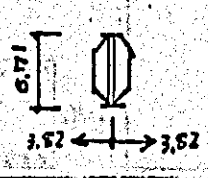
	LOAD
C	11.4
M	17.7
Q	8.9

	M	C	Pt	γ	at
Mc	17.7				22.6
Q	Qa	α	ΔQ	Pw	?
8.9	8.7	1.0	0.2	0.0021	13.9

45.72 (1'-6")
40.64 (1'-4") @025
□ D10 @150
b 40.64
D 45.72
d 40.72
j 35.63

LOAD

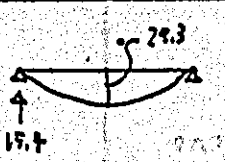
B_{13}



w 0.96
q_B 0.44
$W_{1.53}$
1.97

C	0.96 × 2 × 6.1	11.7		19.1
	1.97 × 6.71/2	7.4		
M	× 9.5	18.2		29.3
	× 1/8	11.1		
Q	× 4.6	7.8		13.4
	× 6.71/2	6.6		

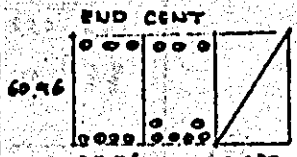
STRESS



	M	C	Pt	γ	Pt
Mc	29.3				27.2

Q	Qa	q	ΔQ	Pw	φ
15.4	10.4	1.0	5.0	0.0049	18.0

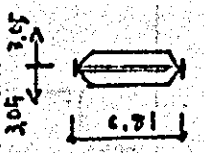
SECTION



□ D13-@150

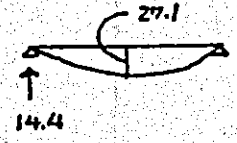
b 35.56
D 60.96
d 55.96
j 48.97

B_{13}



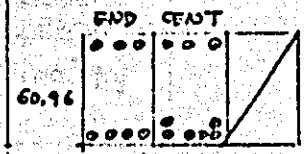
w 0.96
q 1.77

C	0.96 × 2 × 5.3	10.2		19.8
	1.91 × 6.81/2	17.6		
M	× 8.2	15.7		27.1
	× 1/8	11.4		
Q	× 4.0	9.7		14.4
	× 6.81/2	6.7		



	M	C	Pt	γ	Pt
Mc	27.1				25.2

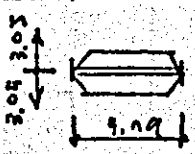
Q	Qa	q	ΔQ	Pw	φ
14.4	10.9	1.0	4.0	0.0043	14.0



□ D13-@150

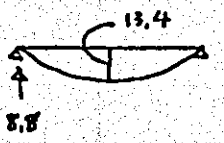
b 35.56
D 60.96
d 55.96
j 48.97

B_{4}



w 0.59
q_B 0.39
$W_{1.18}$
1.57

C	0.59 × 2 × 3.71	4.4		8.8
	1.57 × 3.09²/2	4.4		
M	× 5.8	6.8		13.4
	× 1/8	6.6		
Q	× 3.3	3.9		8.4
	× 5.09/2	4.5		



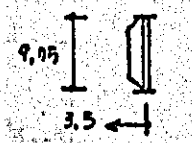
	M	C	Pt	γ	Pt
Mc	13.4				12.1

Q	Qa	q	ΔQ	Pw	φ
8.4	7.6	1.0	0.8	0.0026	11.2

□ D10 @ 150

b 35.56
D 43.72
d 40.72
j 35.56

B_{41}

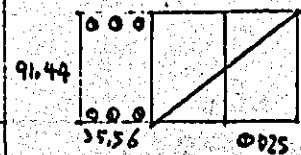


w 0.72
q 0.79

C	0.72 × 13.0	9.4		15.3
	0.75 × 9.15²/2	5.9		
M	× 19.5	14.3		23.2
	× 1/8	8.9		
Q	× 7.0	5.0		9.9
	× 9.15/2	3.7		

	M	C	Pt	γ	Pt
Mc	23.2				13.9

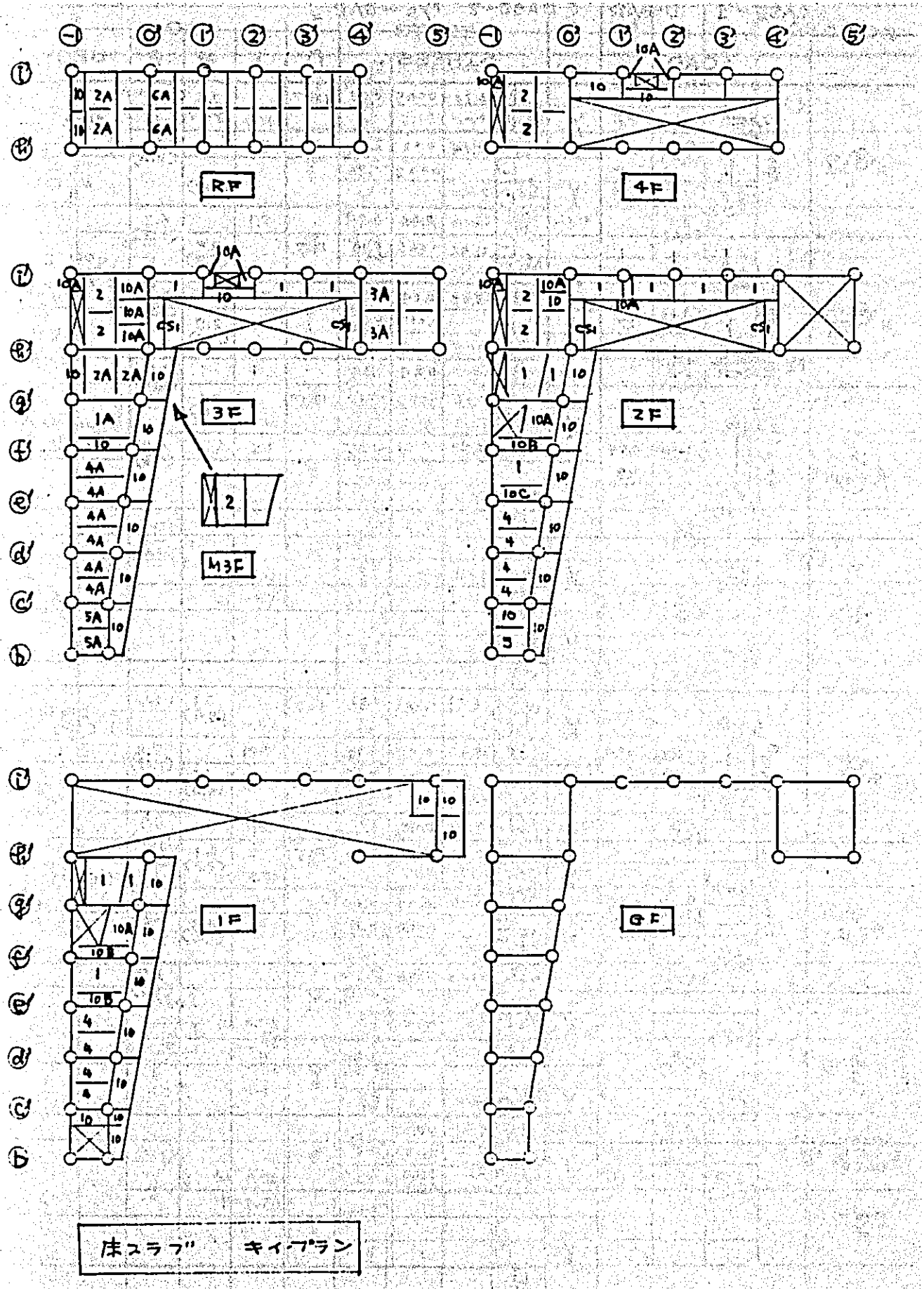
Q	Qa	q	ΔQ	Pw	φ
8.7	16.2				5.5



□ D10@150

b 35.56
D 91.44
d 86.44
j 75.64

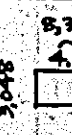
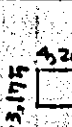
	LOAD	STRESS	SECTION
F B1	7.82 $q = B\ 1.04 + W\ 2.43 \times 2 = 7.90$ C M 7.90 × 7.82²/8 = 45.1 Q × 7.82/2 = 23.1	M C Pt n mt Mc 45.1 20.3 Q Qw α ΔQ Pw φ 23.1 20.9 1.45 0 11.2	121.92 35.56 ○ 025 D D10-@150 b 35.56 D 121.92 d 111.92 j 99.93
F B2	3.05 $q = B\ 0.92 + W\ 2.43 = 2.97$ C M 2.97 × 3.05²/8 = 3.5 Q × 3.05/2 = 4.5	M C Pt n mt Mc 3.5 3.6 Q Qw α ΔQ Pw φ 4.5 8.2 0 4.8	60.96 30.48 • D19 D D10-@150 b 30.48 D 60.96 d 50.96 j 44.59
B	C M Q	M C Pt n mt Mc Q Qw α ΔQ Pw φ	
F B1 CASE-2 M/S-BAR	C M Q	M C Pt n mt M 35.43 Q Qw α ΔQ Pw φ 18.8	8-19



床スラブ　キープラン

CASE－1 D-BAR (CASE-2 M/S－BAR)

	LOAD		STRESS				D	J	at	φ	SECTION
R S_{6A}	2,895⁶ / 4,896⁸ ω 0.74 λ 1.7	X	M	6.20	0.075	0.47	12.7		2.6 (4.4)		D10 @ 200 (1/2") ～
			Q	2.14	0.52	1.11		8.9		6.9 (11.7)	
		Y	M		0.042	0.26			1.6 (2.8)		〃 @ 250 ～ 〃 ～
			Q		0.46	0.99		8.1		6.8 (11.5)	
R S_{2A}	4,099⁴ / 4,896⁸ ω 0.74 λ 1.2 DZ 4,099⁴ / (16+24×1.2) = 9.2	X	M	12.44	0.056	0.70	12.7		3.9 (6.8)		D10 @ 150 (1/2") ～
			Q	3.03	0.49	1.49				9.3 (15.7)	
		Y	M		0.037	0.46			2.8 (4.9)		〃 @ 250 ～
			Q		0.45	1.37				9.4 (15.7)	
R S_{10}	1,250⁶ / 2,753⁸ ω 0.74 λ 7.8	X	M	1.16	0.083	0.10	12.7		0.6 (1.0)		D10 @ 200 (1/2") D.
			Q	0.93	0.51	0.47				4.4 (7.3)	
		Y	M								〃 200 D.
			Q								
S		X	M								
			Q								
		Y	M								
			Q								
$4S_2$	4,099⁴ / 4,896⁸ ω 0.59 λ 1.2	X	M	9.91	0.056	0.56	12.7		3.1 (5.4)		D10 @ 150 (1/2") ～
			Q	2.43	0.49	1.19		8.9		7.4 (12.3)	
		Y	M		0.037	0.37			2.3 (4.0)		〃 @ 200 ～
			Q		0.45	1.09		8.1		7.5 (12.7)	
$4S_{10}$	5,791² / 2,896⁸ ω 0.59 λ 2.9	X	M	2.36	0.093	0.20	12.7		0.1 (0.2)		D10 @ 200 (1/2") D
			Q	1.18	0.31	0.60				3.7 (6.2)	
		Y	M		0.057	0.13			0.8 (1.4)		〃 200 D
			Q		0.46	0.54				3.7 (6.2)	
S		X	M								
			Q								
		Y	M								
			Q								
S		X	M								
			Q								
		Y	M								
			Q								

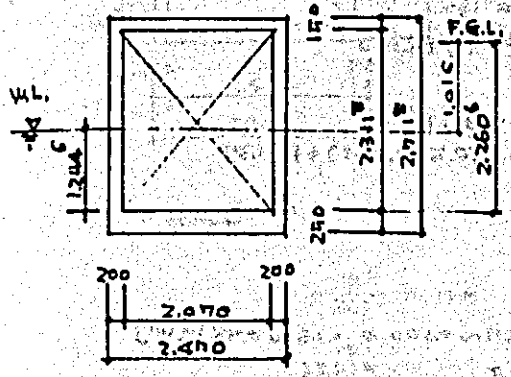
	LOAD		STRESS				D	J	at	φ	SECTION
S_{2A} 3·2 2		X	M	12,77	0.056	0.72	12.7		4.0 (7.0)		D10 @ 150 (½") ~
			Q	3.19	0.49	1.53		8.9		9.6 (16.0)	
		Y	M		0.037	0.47			2.9 (5.0)		T½ @ 200 ~
			Q		0.45	1.40		8.1		9.6 (16.0)	
S_{3A} 3·2 3		X	M	10.74	0.062	0.67	12.7		3.8 (6.6)		D10 @ 150 (½") ~
			Q	2.82	0.50	1.41				9.8 (16.7)	
		Y	M		0.042	0.45			2.8 (4.9)		½" @ 200 ~
			Q		0.46	1.30				8.1 (14.2)	
S_{1A} 3·2 1		X	M	11.84	0.082	0.97	12.7		5.4 (9.4)		D13 @ 150 (½" @ 100) ~
			Q	2.96	0.51	1.91				9.4 (17.7)	
		Y	M		0.042	0.50			3.1 (5.4)		½" @ 200 (½" @ 100) ~
			Q		0.46	1.36				9.3 (14.7)	
S_{4A} 3·2 4		X	M	7.06	0.053	0.59	12.7		3.3 (5.7)		D10 @ 200 (½") ~
			Q	2.32	0.51	1.18				7.4 (12.5)	
		Y	M		0.037	0.40			2.8 (4.3)		½" @ 250 ~
			Q		0.46	1.07				7.3 (12.2)	
S_{5A} 3·2 5		X	M	7.66	0.063	0.48	12.7		2.7 (4.7)		D10 @ 150 (½") ~
			Q	2.41	0.50	1.21				7.6 (12.7)	
		Y	M		0.042	0.32			2.0 (3.5)		½" @ 250 ~
			Q		0.46	1.11				7.6 (12.7)	
S_{10} 3·2 10		X	M	3.04	0.063	0.25	12.7		1.4 (2.4)		D10 @ 200 (½") ~
			Q	1.42	0.51	0.98				4.9 (8.2)	
		Y	M		0.037	0.17			1.0 (1.7)		½" @ 250 ~
			Q		0.96	0.70				4.8 (8.0)	
S_{5} 2 5		X	M	13.12	0.050	0.66	12.7		3.7 (6.4)		D10 @ 150 (½") ~
			Q	3.28	0.46	1.61				9.4 (15.7)	
		Y	M		0.042	0.55			3.4 (5.9)		½" @ 150 ~
			Q		0.45	1.48				10.1 (17.0)	
S_{1} C 2 1		X	M	(0.74 0.20	1.5²/₂ 1.5	1.13	19.2		5.1 (8.9)		D10 @ 100 (½" @ 100 @ 200)
			Q	(0.74 0.20	1.5	1.31		11.1		6.6 (11.0)	
		Y	M								½" @ 250 P.
			Q								

	LOAD			STRESS			D	J	at	φ	SECTION
$_1S_1$	4,099 × 6,704; ω 1.06, λ 1.6	X	M (E/C)	17.81	0.078	1.39	12.7		7.8 (13.6)		D13 @170 (1/2" @100)
			Q	4.39	0.51	2.22		8.9		13.9 (23.2)	
		Y	M (E/C)		0.057	1.02			6.3 (11.0)		〃 @200 (1/2" @100)
			Q		0.46	2.00		8.1		13.7 (22.8)	
$_1S_1$	≒ 7,315² × 3,800; ω 1.06, λ 1.8	X	M (E/C)	16.86	0.081	1.37	12.7		7.7 (13.4)		D13 @190 (1/2" @100)
			Q	4.24	0.51	2.16				13.5 (22.4)	
		Y	M (E/C)		0.057	0.77			6.0 (10.4)		〃 @200 (1/2" @100)
			Q		0.46	1.95				13.4 (22.3)	
$_1S_4$	4,267² ~ 6,299² × 3,048; ω 0.71, λ 2.1	X	M (E/C)	6.60	0.083	0.55	12.7		3.1 (5.4)		D10 @200 (1/2") ~
			Q	2.16	0.51	1.10				6.9 (11.5)	
		Y	M (E/C)		0.057	0.38			2.3 (4.0)		〃 @250 ~
			Q		0.46	1.00				6.9 (11.4)	
$_1S_{10}$	≒ 3,000 × 4,800; ω 0.74, λ 1.6	X	M (E/C)	6.66	0.078	0.52	12.7		2.9 (5.0)		D10 @200 (1/2") ~
			Q	2.22	0.51	1.13				7.1 (11.8)	
		Y	M (E/C)		0.057	0.38			2.3 (4.0)		〃 @250 ~
			Q		0.46	1.02				7.0 (11.7)	
$_1S_{10B}$		X	M (E/C)								D13 @150 (1/2" @100, 300 (200))
			Q								
		Y	M (E/C)								D10 @250 (1/2")
			Q								
S		X	M (E/C)								
			Q								
		Y	M (E/C)								
			Q								
S_T	l=2.0; P 0.4, q 1.18	X	M (E/C)	M = (0.4×2) + (1.18×2²/2) = 3.16; Q = 0.4 + (1.18×2) = 2.76							at 6.6 (10.4); 6.4 (10.6)
			Q				D=30	j=24			
		Y	M (E/C)		2-D13 (2-1/2") / step						
			Q	W20A							
S		X	M (E/C)	M = 3.16/2 = 1.58; D20 j 15.3					at 5.2 (8.2)		
			Q	D13 @200 (1/2" @150)							
		Y	M (E/C)								
			Q								

地下通路
オーケストラ・ピット　の設計

地下通路

CASE － 1.



単位荷重　[t/m²]

上部スラブ

L.L.	300		
D.L.	仕上	65	] 425
	R.C.	360	
T.L.	785		

下部スラブ

L.L.	180		
D.L.	仕上	100	] 700
	R.C.	600	
T.L.	880		

壁

D.L.	仕上	50	] 530
	R.C.	480	

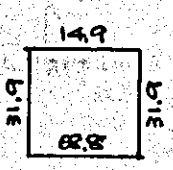
～×2.56 = 1.36 t/m

断り比

$\frac{19^3}{22^7} = 14.9$

$\frac{28^3}{22^7} = 68.8$

$\frac{20^3}{25^1} = 31.9$



鉛直荷重

T.L.　(0.785×2.47) + (1.36×2) + (0.88×2.07) = 6.48 t

6.48 / 2.47 = 2.62 t/m²

< 地耐力　5.00 t/m²　O.K.

D.L.　(0.425×2.47) + (1.36×2) + (0.70×2.07) = 5.22 t

5.22 / 2.47 = 2.11 t/m²

> 浮力　1.50 t/m²　O.K.

CMoQ

$g_1 = 0.785$ [t/m]

C $0.785 \times 2.27^2/12 = 0.34$ [tm]
Mo $/8 = 0.51$
Q $2.27/2 = 0.89$ [t]

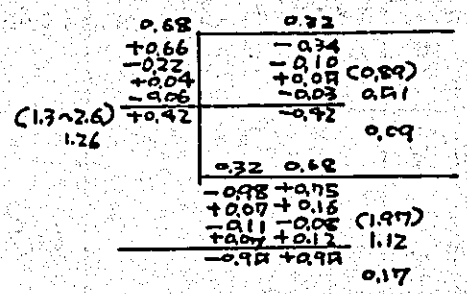
$g_2 = 2.62 - 0.88 = 1.74$ [t/m]

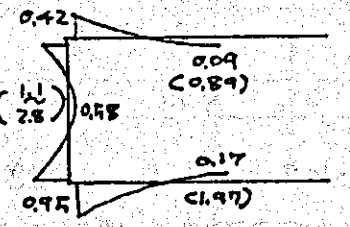
C $1.740 \times 2.27^2/12 = 0.75$ [tm]
Mo $/8 = 1.12$
Q $\times 2.27/2 = 1.97$ [t]

$w_{max} = k_a \delta h + \{k_a(\delta-1)+1\} p'$
$= 0.5 \times 1.8 \times (0.3 + 1.02) + \{0.5(1.8-1)+1\} 1.37$
$= 3.11$ [t/m]
$W \fallingdotseq 3.11 \times 2.51/2$
$= 3.91$ [t]

C $3.91 \times 2.51 \times 0.067 \sim 0.100 = 0.66 \sim 0.98$ [tm]
Mo $\times 0.128 = 1.26$
Q $3.9 \times 0.33 \sim 0.67 = 1.3 \sim 2.6$ [t]

応力

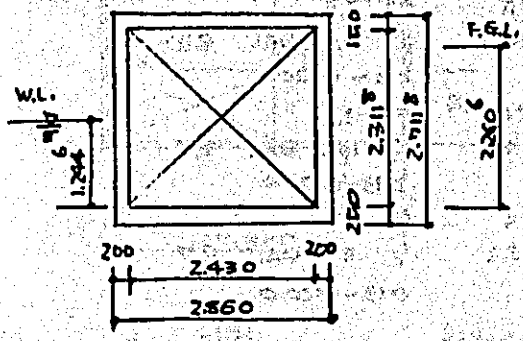




部材の設計

上部スラブ	M 0.42 [tm]	D	19 [cm]	at 1.9 [cm²]	
	Q 0.89 [t]	j	10.9 [cm]	Qp 4.5 [Qm]	QAL 6.5 [t]
				D13 − @200	
壁	M 0.95	D	20	at 3.3	
	Q 2.80	j	14.4	Qp 10.8	QAL 8.6
				D13 − @200	
下部スラブ	M 0.95	D	25	at 2.9	
	Q 1.97	j	16.2	Qp 6.8	QAL 9.7
				D13 − @200	

CASE − 2,



隔り比

$$\frac{15^3}{263} = 12.8$$

$$\frac{25^2}{263} = 59.4$$

$$\frac{20^3}{251} = 31.9$$

鉛直荷重

T.L. $(0.785 \times 2.83) + (1.36 \times 2) + (0.88 \times 2.43) = 11.08\ t$

$11.08/2.86 = 2.48[t/m^2]$

< Bearing Capacity

D.L. $(0.485 \times 2.83) + (1.36 \times 2) + (0.70 \times 2.43) = 5.62\ t$

$5.62/2.86 = 1.97[t/m^2]$

> Buoyancy

C Mo Q

$w = 0.785$

C $0.785 \times 2.63^2/12 = 0.45$

Mo $/8 = 0.68$

Q $\times 2.63/2 = 1.03$

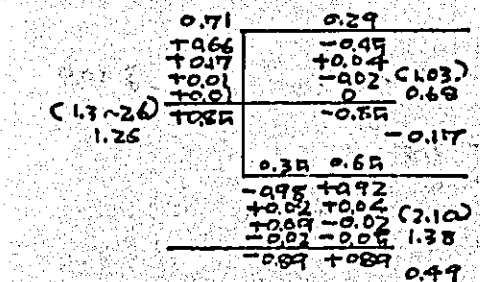
$w = 2.48 - 0.88 = 1.60$

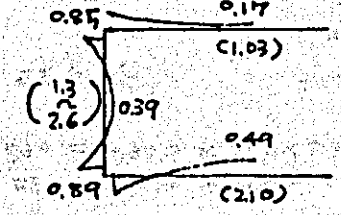
C $1.60 \times 2.63^2/12 = 0.92$

Mo $/8 = 1.38$

Q $\times 2.63/2 = 2.10$

応力

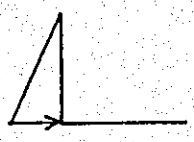




部材の設計

上部スラブ	M	0.85	D	15	at	3.9
	Q	1.03	j	10.9	φ	5.2 QAL 6.5
					D13 − @200	
壁	M	0.89	D	20	at	3.1
	Q	2.60	j	14.4	φ	10.0 QAL 8.6
					D13−@200	
下部スラブ	M	0.89	D	25	at	2.7
	Q	2.10	j	16.2	φ	11.2 QAL 9.7
					D13−@200	

CASE − 3.



Cantilever Type Wall

w_{max} 3.11 [t/m]

M $3.98 \times (0.30+2.26)/3 = 3.40$ [tm/m]

Q $3.11 \times (0.30+2.26)/2 = 3.98$ [t/m]

D 20 j 14.4 at 11.8

φ 19.4 QAL 8.6

D16 @150

鉛直荷重

T.L. $0.785 \times 8.05 \times 4.45$
$1.36 \times (7.85+4.25) \times 2$
$0.88 \times 7.65 \times 4.05$
$= 88.3$ [t]

$88.3/8.05 \times 4.45 = 2.46$ [t/m²]

< Bearing Capacity

D.L. $0.42 \times 8.05 \times 4.45$
$1.36 \times (7.85+4.25) \times 2$
$0.70 \times 7.65 \times 4.05$
$= 69.8$ [t]

$69.8/8.05 \times 4.45 = 1.95$ [t/m²]

> Buoyancy

下部スラブ

w 2.46 − 0.88 [t/m²] lx 4.25 ly 7.85 λ 1.85 D 25 j 16.2

M $1.58 \times 4.25^2 \times 0.082 = 2.34$ at 7.2

Q $\times 4.25 \times 0.81 = 3.43$ φ 11.8

D16 @150

上部スラブ

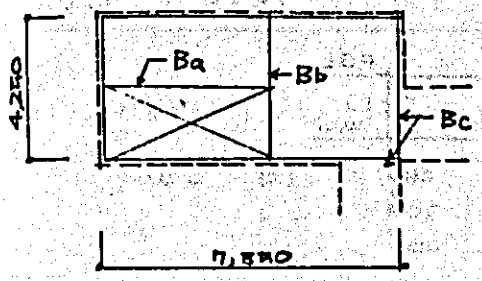
w 0.785 lx ≒ 3.5 ly 4.25 λ 1.2 D15 j 10.9

M $0.785 \times 3.5^2 \times 0.064 = 0.62$ at 2.8

Q $\times 3.5 \times 0.49 = 1.35$ φ 6.9

D13 @150

スラブ 開口まわり



b 20 D40 d35 j 30.6
~25 QAL 3.68 ~ 4.59

Ba $q = \text{slab}\ 0.785 \times 1.0 + \text{Beam}\ 0.10 = 0.885$ [t/m]
$M_0 = 0.885 \times 4.5^2/8 = 2.24$ [tm] at 3.66 2-D16
$Q = \quad \times 4.5/2 = 1.99$ [t] Qp 3.6

Bb $P = 1.99$ (from Ba) [t]
$W = 0.785 \times 4.25^2/4 = 3.54$ [t]
$M_0 = 1.99 \times 4.25/4 + 3.54 \times 4.25/6 = 4.62$ [tm] at 7.54 2-D25
$Q = 1.99/2 + 3.54/2 = 2.77$ [t] Qp 5.0

Bc = Ba

階段

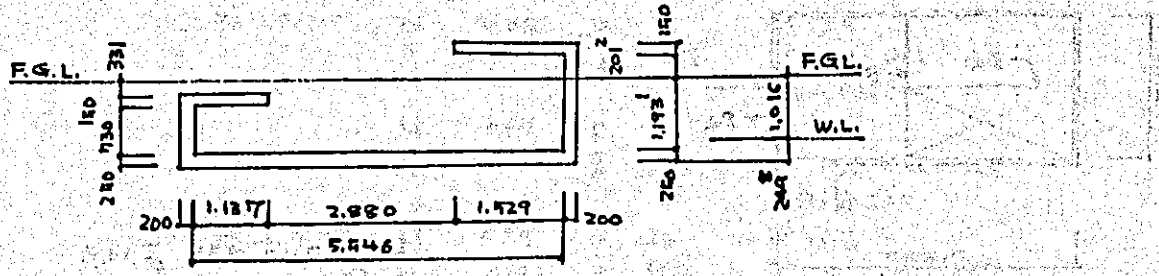
L.L. 180
D.L. Finish 100
RC 360] 460 × 1.5
T.L. 870 [kg/m²]

M $0.87 \times 1^2/2 = 0.44$ [tm] at 0.92 [cm²]
Q $0.87 \times 1 = 0.87$ [t] Qp 2.01 [cm]

D = 30
j 24

1-D13 / Step

オーケストラ・ピット



単位荷重 [kg/m²]

上部スラブ L.L. 360
D.L. Finish 65] 425
R.C. 360
T.L. 785

下部スラブ L.L. 180
D.L. Finish 100] 700
R.C. 600
T.L. 880

壁 D.L. Finish 50] 530
R.C. 480

～ × 1.39 = 740 [kg/m]
× 0.76 = 400 ["]

片持スラブ

D13 j 10.9 [cm]

M 0.785 × 1.83²/2 = 0.92* [tm] at 4.2 [cm²]
Q × 1.83 = 1.20 [t] Q 6.1 [cm]

壁

D 20 j 14.4 [cm]

wmax = 0.8 × 1.8 × 1.49 = 1.34 [t/m]
M = 1.34 × 1.49²/6 = 0.50
Q = × 1.49/2 = 1.00 Q 3.9 [cm]

ΣM = 0.92* + 0.50 = 1.42 at 4.9 [cm²]

D13 @200

下部スラブ

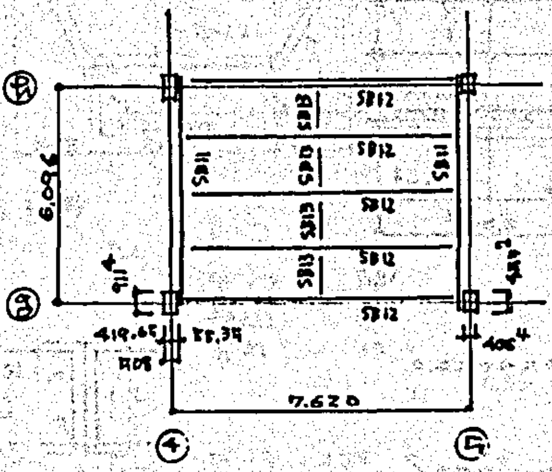
DL = 420 > Buoyancy 249 [kg/m²]
O.K.

7. 一 鉄骨部材の設計

スノコ の設計

(1) スノコ

ω = D.L. 100
L.L. 500
T.L. 600 [kg/m²]



SB13 [-250×50×4.0

SB12

$q = 0.6 \times 1.5 = 0.9$ t/m

Span = 7,328mm

$$J_n = \frac{5 \times 0.009 \times 732.8^4}{384 \times 2{,}100 \times 732.8/300} = 6{,}587.8 \quad [\mathrm{cm}^4]$$

H-350×175×7×11 (Y=14)

J = 13,600 > 6,587.8
O.K.

$M_0 = 0.9 \times 7.328^2/8 = 6.04$ [tm]

$\ell_b = 732.8/2 = 366.4$, $i_b = 4.58$, $\lambda_b = 80.1$, $C = 1.0$, $\eta = 2.33$
$f_b = 1.36$, $Z_x = 775$

$$\frac{\sigma}{f} = \frac{604}{775 \times 1.36} = 0.57 < 1.00$$

$Q = 0.9 \times 7.328/2 = 3.3$ [t]

SB11

$q \fallingdotseq 0.6 \times 7.328/2 = 2.2$ t/m

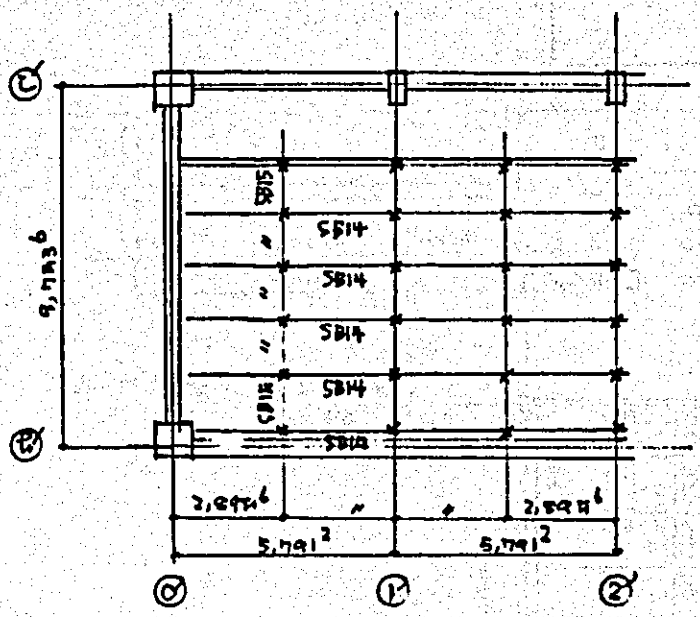
Span = 6,553.2

$$J_n = \frac{5 \times 0.022 \times 655.3^4}{384 \times 2{,}100 \times 655.3/300} = 11{,}515.5 \quad [\mathrm{cm}^4]$$

[-380×100×10.5×16

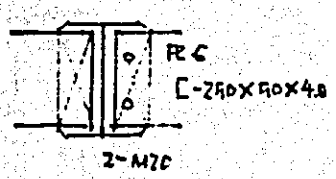
J = 14,500 > 11,515.5
O.K.

(2) スジ⑬ ・ C2)



w = D.L. 100
L.L. 500
T.L. 600 [kg/m²]

SB13 [-250×50×4.0×8.0

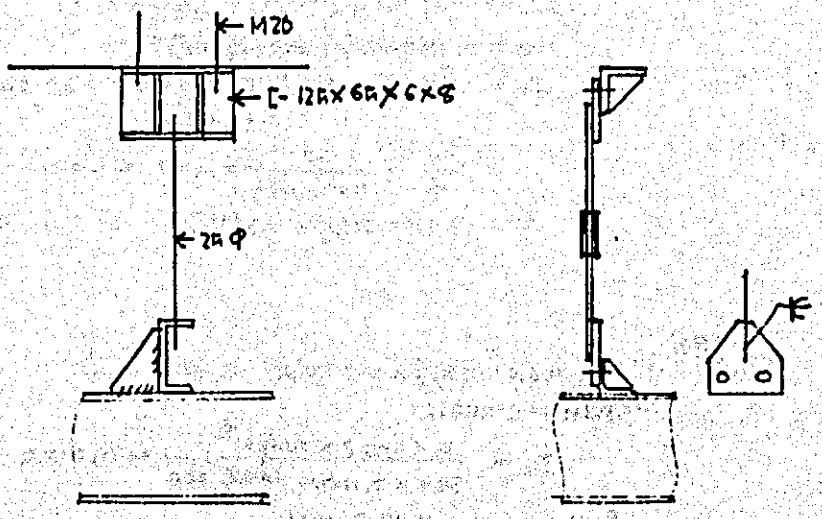


SB14

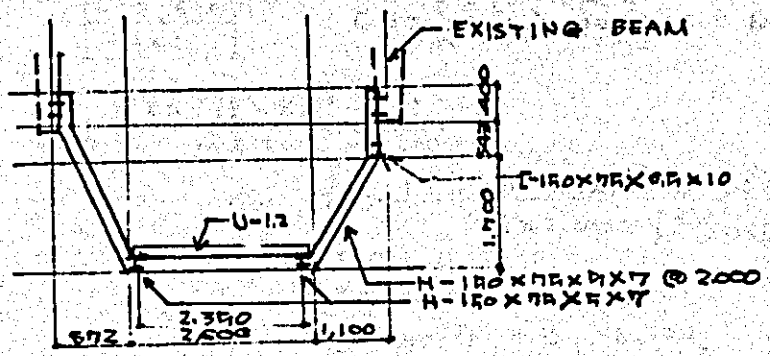
$w = 0.6 \times 1.0 = 0.7$ t/m
SPAN 2,850 mm
LIKE TO SB12
H-350×175×7×11 (Y=14)

吊木

$N = 0.6 \times 2,850 \times 1.0 \approx 2.6$[t]
$a_n = 2.6 / 1.0 = 2.6$ [cm²]



照明室の設計



床荷重

WALL 30[kg/m²]

D.L. イエヒ 90
デッキ 15
梁組 35
天井 30

L.L. 350

T.L. デッキ 135 + 〃 = 485 [kg/m²]
梁組 170 + 〃 = 520

デッキ　q 0.485[t/m]
span 2.35[m]

$$J_n = \frac{5 \times 0.00485 \times 235^3 \times 300}{384 \times 2,100} = 117.8 \ [cm^4]$$

$$z_n = \frac{0.485 \times 2.35^2 \times 100}{8 \times 1.4} = 23.9 \ [cm^3]$$

U-1.2　J = 136 > 117.8
Z = 25.5 > 23.9 → V-1.6

はり　q (0.22×1.3)+(0.03×2.4) = 0.348 [t/m]
span 2m

$$J_n = \frac{5 \times 0.00348 \times 200^3 \times 300}{384 \times 2,100} = 111.3$$

H-150×75×5×7 (Y=8)
J = 666 > 111.3

ϕ_b 200, λ_t 1.96, λ_t 102.0, C 1.00, ν 5.60
f_b 1.58 2×88.8

$$\frac{M}{f} = \frac{0.348 \times 2^2 \times 100}{8} \times \frac{1}{88.8 \times 1.58}$$

$$= 0.27 < 1.00$$

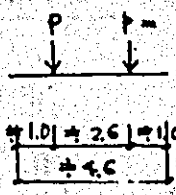
$M_D = 2.2 \times 6.8^2/8 = 11.8$ [tm]

$Z_x \geq 762$

$$\frac{M}{f} = \frac{1180}{762 \times 1.6} = 0.97 < 1.00$$

$Q = 2.2 \times 6.8/2 = 7.2$ [t]

7LTC1



Q = 1.5 [t]
Mo = 1.5 [t·m]

$$\delta = \frac{Pa(3l^2 - 4a^2)}{24EJ} \leq \frac{l}{300}$$

$$\sim \quad J_H > \frac{1.5 \times 100 (3 \times 460^2 - 4 \times 100^2)}{24 \times 2{,}100 \times (460/300)} = 1{,}154.5 \ [cm^4]$$

H-150×150×7×10

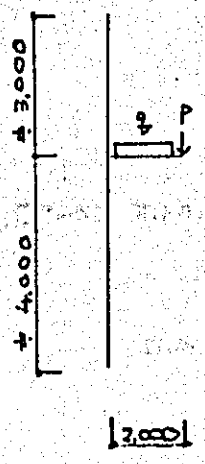
J = 1,640 > 1,154.5

ℓ_b 260 ib, 4.12, λ_b 63.1, C 1.00, η 4.12

f_b 1.43, Z_x 219

$$\frac{\sigma}{f} = \frac{150}{219 \times 1.43} = 0.48 < 1.00$$

サイド・スポット・ルーム の設計



屋根および床

$P \fallingdotseq 0.10\ [t/m^2] \times 3.0\ [m] \times 1.5\ [m] = 0.45\ [t]$

$q \fallingdotseq 0.40\ [t/m^2] \times 1.5\ [m] = 0.60\ [t/m]$

(D.L. 200 + L.L. 200 = 400 [kg/m²])

$$J_H = \frac{P l^3}{3 E \delta_{cr}} + \frac{q l^4}{8 E \delta_{cr}} \qquad \delta_{cr} = \frac{200}{200} = 1\ [cm]$$

$$= \frac{0.60 \times 200^3}{3 \times 2{,}100 \times 1} + \frac{0.004 \times 200^4}{8 \times 2{,}100 \times 1}$$

$$= 761.9 + 3 \times 1.0$$

$$= 1{,}142.9 \qquad [cm^4]$$

H-150×150×7×10

$J = 1{,}640 > 1{,}142.9$

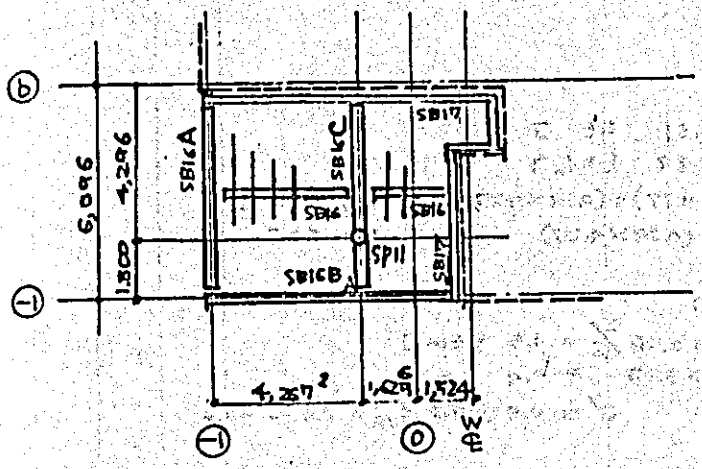
$M \fallingdotseq 0.6 \times 2 + 0.4 \times 2^2/2 = 2.0\ [tm]$

p_b 206 t_b 4.12 λ_b 48.5 f_b 1.60 C 1,175 η 4.12

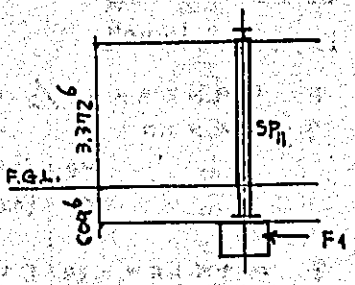
$$\frac{\sigma}{f} = \frac{M}{Z f} = \frac{200}{219 \times 1.6} = 0.57$$

$M/P_1 = 2.0/7.0 = 0.29\ [t]$

玄関庇の設計



key plan



key section

単位荷重　[t/m²]

D.L.　屋根　0.06　0.13　0.19　0.03
　　モヤ　0.01
　　野縁　0.06
　　天井　0.06

W.L.　C = −1.3　　Cp = −0.16
　　p = 0.12

モヤ　@600　span = 3.000

$w = 0.13 \times 0.6 = 0.078$ [t/m]

$I_h = \frac{5 \times 0.00078 \times 300^4}{384 \times 2{,}100} = 39.2$ [cm⁴]

$Z_h = \frac{0.078 \times 3^2 \times 100}{8} \times \frac{1}{1.4} = 6.3$ [cm³]

[− 100 × 50 × 20 − 2.3　I 50.17 [cm⁴]　Z 16.1 [cm³]

ﾘﾆｱﾊﾞﾘ (SB16A)

$P = 0.19 \times 2.15 \times 3.0 = 1.23$ [t]

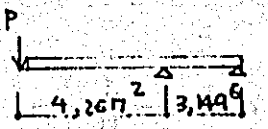
$M_0 = 1.23 \times 6/4 = 1.84$ [tm]

H − 250 × 250 × 9 × 14

φb 300　ib 6.37　λb 43.7　c 1.0　M 4.91　f 1.6　Zx 867

$\frac{N}{f} = \frac{154}{867 \times 1.6} = 0.13 < 1.00$

片持はり　(SB16B)



P　0.19 × 2.15 × 3.0/2 = 0.61　[t]

q　0.19 × 1.5 = 0.29　[t/m]

ME = (0.61 × 4.27) + (0.29 × 4.27²/2) = 5.3 [tm]

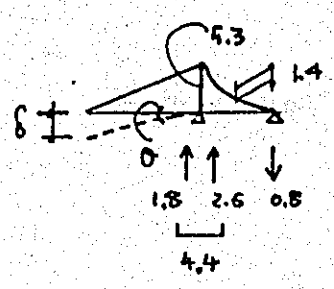
Q = (0.61) + (0.29 × 4.27) = 1.8 [t]

q　0.19 × 1.5 = 0.29 [t/m]

Mo = 0.29 × 3.15²/2 = 1.4 [tm]

Q = × 3.15 = 0.9 [t]

Q' = 0.9 ± 5.3/3.15 = 2.6 ~ −0.8



H − 250 × 250 × 9 × 14　(r=16)

Ib 427　Ib 6.57　λb 12.2　C 1.75

η 4.91　fb 1.6　Zx 867 [cm³]

$$\frac{\sigma}{f} = \frac{M_E}{Z_x \cdot f_b} = \frac{530}{867 \times 1.60} = 0.38 \leq 1.00$$

J = 10,800 [cm⁴]

$$\delta_0 = \frac{Pl^3}{3EJ} + \frac{wl^4}{8EJ} = \frac{0.61 \times 427^3}{3 \times 2{,}100 \times 10{,}800} + \frac{0.0029 \times 427^4}{8 \times 2{,}100 \times 10{,}800}$$

= 0.71 + 0.53

= 1.24 [cm]

$$\theta = \frac{M_E l}{4EJ} = \frac{530 \times 315}{4 \times 2{,}100 \times 10{,}800} = 0.0018 \text{ [RAD]}$$

δ' = 0.0018 × 427 = 0.79 [cm]

→ Σδ = 2.03 [cm]

δ/span = 1/210

```
コチラ ハ DEMOS-E センタ デス
/000/ ON
    78-01-17,18:02
/001/ BAT C
    * データ ヲ イレテ クダサイ :
ON
LIB-FRAP-GEN
11
2T
   1 TTL1 TR:BTV-TRUSS:
   2 GEN1 1,1,15,2,2316,48,745,8
   3 CNT1 ,2100
  11 JNT4 1,0,1,6,11
  12       1,5000,79,12,2,7,12
  13       1,11580,24,3,8,13
  14       1,1737,36,4,9,14
  15       1,2316,48,5,10,15
  16       2,0,1,2,3,4,5
  17       2,376,8,6,7,8,9,10
  18       2,745,8,11,12,13,14,15
  21 JNT5 110000,1
  22       010000,5
  31 SGT2 1,4,50,20,1,1,6
  32       2,4,20,20,0,8,1.2
  41 MMB4 1,,,,1,2,2,3,3,4,4,5,11,12,12,13,13,14,14,15,1,6,6,11,5,10,10,15
  42       2,,,,6,7,7,8,8,9,9,10,2,7,7,12,3,8,8,13,4,9,9,14,2,6,3,7,7,11,8,12,4,10,3,9,9,15,8,14
  51 J-L3 1,,-28,5,,,,,11,15
  52       1,,-75,3,,,,,12,13,14
  61 G-G1 1,2,3,4,5,6,3,6,4,6,6,6,7
OFF
/EOJ
    イッカツショリ ヲ ウケツケマシタ. BSN "R0245" BRT "17-18-03-27"
/002/
```

TR:B 1

***** STRUCTURAL ANALYSIS BY FRAP-GEN, NTT *****

* TITLE TV-TRUSS:

* TYPE OF STRUCTURE --- PLANE TRUSS + PLATE

* METHOD OF ANALYSIS --- EXACT SOLUTION

* SHEAR DEFORMATION --- NON

* TEST VALUES

UNBALANCE FORCE TBL	---	1.00000E-05
ZERO TEST (STIFF.)	---	1.00000E-02
ZERO TEST (LOAD)	---	1.00000E-01
VERTICAL DRCTN COS.	---	1.00000E-03

TR:B 2

***** JOINT DISPLACEMENT *****

NO	LD		D-X	D-Y
15	1		-3.392E-01	-3.748E-01
14	1		-9.147E-02	-2.449E+00
13	1		1.895E-01	-3.259E+00
12	1		4.705E-01	-2.449E+00
11	1		7.182E-01	-3.748E-01
10	1		-2.438E-01	-2.291E-01
9	1		9.447E-02	-2.212E+00
8	1		1.895E-01	-3.046E+00
7	1		2.845E-01	-2.212E+00
6	1		6.228E-01	-2.291E-01
5	1	SPT	3.790E-01	0.000E+00
4	1		3.790E-01	-2.069E+00
3	1		1.895E-01	-2.877E+00
2	1		9.909E-15	-2.069E+00
1	1	SPT	0.000E+00	0.000E+00

TR:B — 3

***** MEMBER FORCE (MEMBER AXIS) *****

I- J	LD	AXIAL	SHEAR-Y		AXIAL	SHEAR-Y
1- 2	1	-3.981E-12	0.000E+00		3.981E-12	0.000E+00
1- 6	1	-1.414E+02	0.000E+00		-1.414E+02	0.000E+00
2- 3	1	-7.614E+01	0.000E+00		7.614E+01	0.000E+00
2- 6	1	-9.084E+01	6.040E-14		9.084E+01	2.842E-14
2- 7	1	4.954E+01	0.000E+00		-4.954E+01	0.000E+00
3- 4	1	-7.614E+01	0.000E+00		7.614E+01	0.000E+00
3- 7	1	-5.342E+01	6.750E-14		5.342E+01	4.619E-14
3- 8	1	5.827E+01	0.000E+00		-5.827E+01	0.000E+00
3- 9	1	-5.342E+01	3.553E-15		5.342E+01	0.000E+00
4- 5	1	-7.958E-13	0.000E+00		0.000E+00	0.000E+00
4- 9	1	4.954E+01	0.000E+00		-4.954E+01	0.000E+00
4- 10	1	-9.084E+01	-3.553E-15		9.084E+01	-2.487E-14
5- 10	1	1.414E+02	0.000E+00		-1.414E+02	0.000E+00
6- 7	1	-7.614E+01	0.000E+00		-7.614E+01	0.000E+00
6- 11	1	9.191E+01	0.000E+00		-9.191E+01	0.000E+00
7- 8	1	2.139E+01	0.000E+00		-2.139E+01	0.000E+00
7- 11	1	-1.180E+02	1.776E-14		1.180E+02	6.750E-14
7- 12	1	-8.382E+01	0.000E+00		-8.382E+01	0.000E+00
8- 9	1	2.139E+01	0.000E+00		-2.139E+01	0.000E+00
8- 12	1	-1.585E+01	9.903E-14		1.585E+01	9.370E-14
8- 13	1	7.530E+01	0.000E+00		-7.530E+01	0.000E+00
8- 14	1	-1.585E+01	5.773E-15		1.585E+01	-3.864E-14
9- 10	1	7.614E+01	0.000E+00		-7.614E+01	0.000E+00
9- 14	1	8.382E+01	0.000E+00		-8.382E+01	0.000E+00
9- 15	1	-1.180E+02	1.066E-14		1.180E+02	-4.263E-14
10- 15	1	-9.191E+01	0.000E+00		-9.191E+01	0.000E+00
11- 12	1	9.952E+01	0.000E+00		-9.952E+01	0.000E+00
12- 13	1	1.129E+02	0.000E+00		-1.129E+02	0.000E+00
13- 14	1	1.129E+02	0.000E+00		-1.129E+02	0.000E+00
14- 15	1	9.952E+01	0.000E+00		-9.952E+01	0.000E+00

TR:B 4

***** SUPPORT REACTION *****

NO	LD	F-X	F-Y
1	1	-3.981E-12	1.414E+02
5	1	0.000E+00	-1.414E+02

P001 M ケイワン オラサ

CASE 1　SM50A + H.T.B. F10T

H-500×200×10×16 (r=20)

A = 114.2

Web　6-M20　R = 9.42×6 = 56.5

Ae　[50 − {2(1.6+2.0)} + (2.1×6)}] × 1.0 = 30.2

Na　30.2 × 2.2 = 66.4 > 56.5

比　56.5 / 1.6{38 − (6×2.1)}×2 = 0.70 → P9×400

Flg　Ae　{114.2 − (40.36×1.0) − 6(2.1×1.0)} / 2 = 30.6

Na　30.6 × 2.2 = 67.4

8-M20　R = 9.42×8 = 75.4 > 67.4

比　16 × 200　1.6{20 − (2×2.1)}×1.6 = 40.4] 74.9

2RS　22 × 76　2.2{14 − (2×2.1)}×1.6 = 34.5]

ΣNa = 56.5 + (2×67.4) = 191.3 > Nmax 141.4

トラス支点間は R.C. により もたせて,

$q = 6.43$ t/m

$M_0 = 6.43 \times 5.791^2/8 = 27.0$ [t·m]　at 1.9

$Q = 〃 \times 5.791/2 = 18.6$ [t]　Φ 64

<QAL 68.1 [t]

D 74.8 → 648.2

下弦材 2-D25 により OK.

H-300×150×6.5×9 (Y=13)

A = 46.78

Web 3-M20 R = 9.42×3 = 28.3

Ae [30 - {2(9+1.3)+(2.1×3)}] × 0.65 = 12.5

Na 12.5 × 2.2 = 27.6 < 28.3

比 27.6 / 1.6×{20 - (3×2.1)}×2 = 0.63 → P9×200

Flg Ae {46.78 - (28.6×0.65) - 4(2.1×0.9)}/2 = 11.3

Na 11.3 × 2.2 = 24.8

4-M20 R = 4.71×6 = 28.3 > 24.8

比 24.8 / 1.6×{15 - (2×2.1)} = 1.44 → P16×150

Σ Na = 27.6 + (2×24.8) = 77.2

——→ 仮設材に使用

H-200×200×8×12 (Y=13)

A = 63.53

Web 3-M20 R = 9.42×3 = 28.3

Ae [20 - {2(1.2+1.3)+2.1}] × 0.8 = 10.3

Na 10.3 × 2.2 = 22.7 < 28.3

比 22.7 / 1.6×(18 - 2.1)×2 = 0.90 → P9×100

Flg Ae {63.53 - (15×0.8) - 4(2.1×1.2)}/2 = 20.7

Na 20.7 × 2.2 = 45.6

6-M20 R = 7.42×6 = 66.5 > 45.6

P9×200 0.9{20 - (2×2.1)} × 1.6 = 22.8]

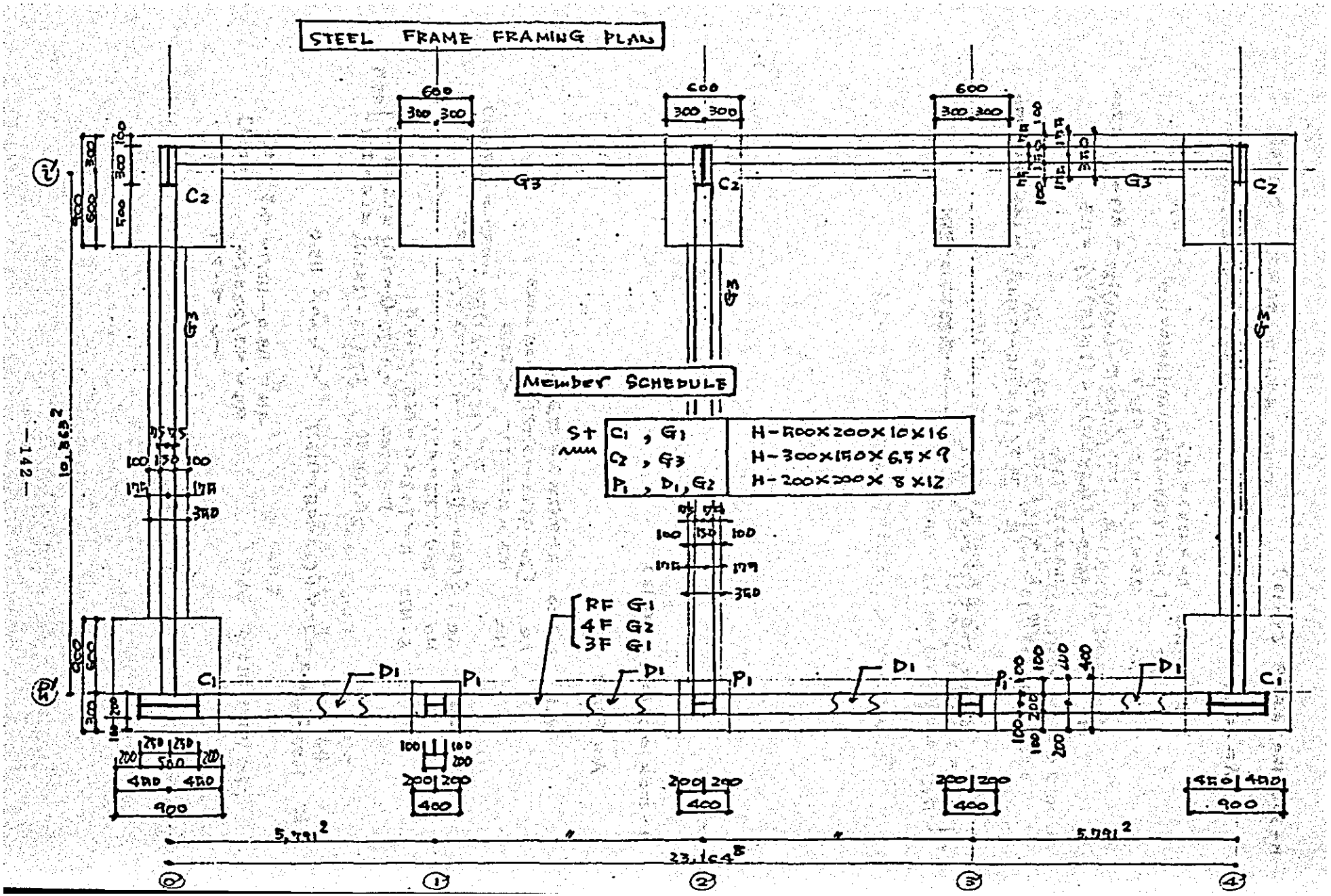
2P12×80 1.2{16 - (2×2.1)} × 1.6 = 22.7] 45.5

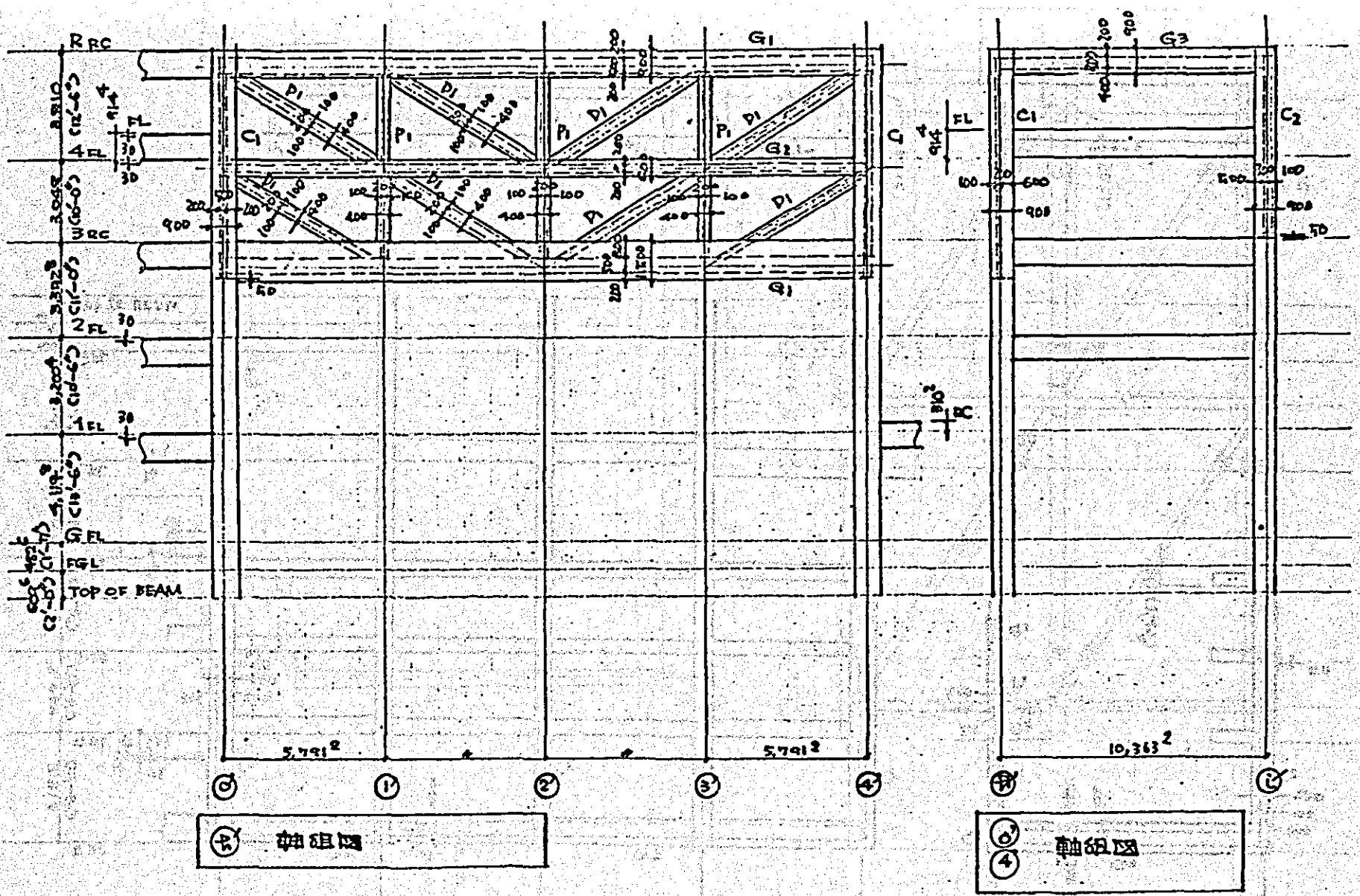
Σ Na = 22.7 + (2×45.5) = 113.7 < Nmax 118.0

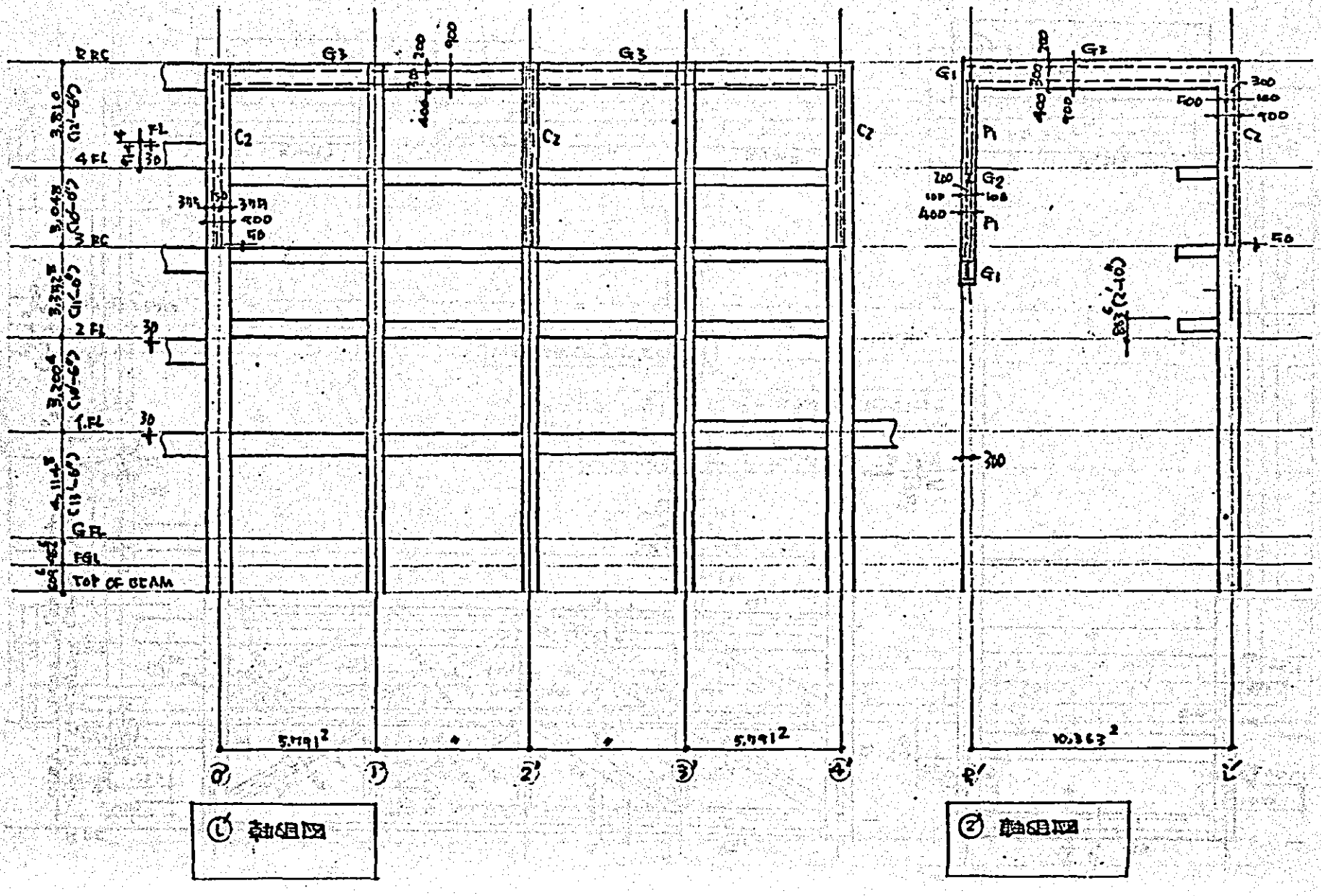
ΔN = 118.0 - 113.7 = 4.3 [t]

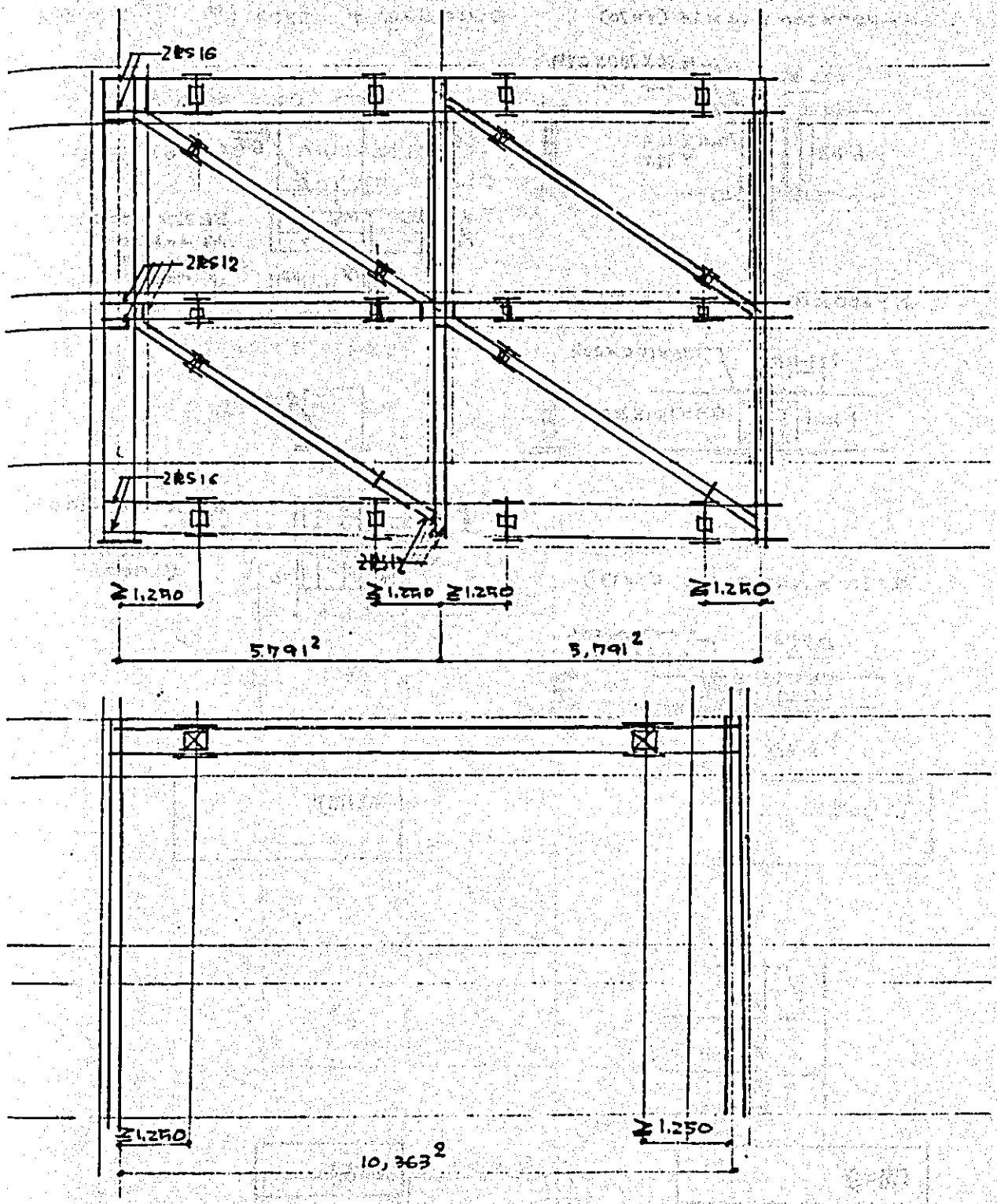
as = 4.3/22 = 2.0 [cm²]

～ t-D19


STEEL FRAME FRAMING PLAN
Member SCHEDULE
C1 , G1 H-500×200×10×16
C2 , G3 H-300×150×6.5×9
P1 , D1, G2 H-200×200×8×12
RF G1
4F G2
3F G1
C1
C2
G3
D1
P1
5,791²
23,164²
5,791²
①
②
③
④
Ⓐ
Ⓑ

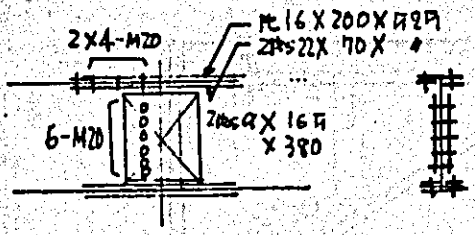

R RC
4 FL
3 RC
2 FL
1 FL
G FL
FGL
TOP OF BEAM
G1
G2
G3
C1
C2
P1
D1
5,791²
10,363²
軸組図
軸組図

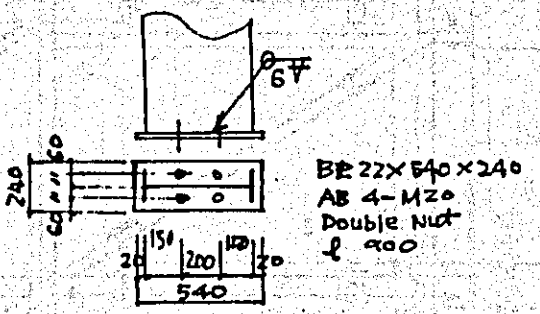

RRC
3RC
4FL
2FL
1FL
GFL
FGL
TOP OF BEAM
G3
G2
G1
C2
P1
5.799 1²
5.799 1²
10.363²
① 축하중도
② 축하중도


2-S16
2-S12
2-S16
≧1,250
≧1,250
≧1,250
≧1,250
5,791²
5,791²
≧1,250
≧1,250
10,363²

軸5直下図

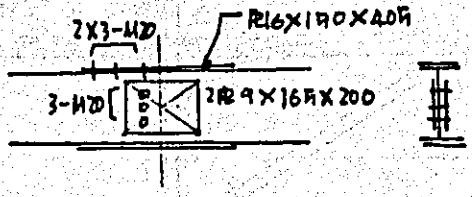
H-700×200×10×16 (Y=20)

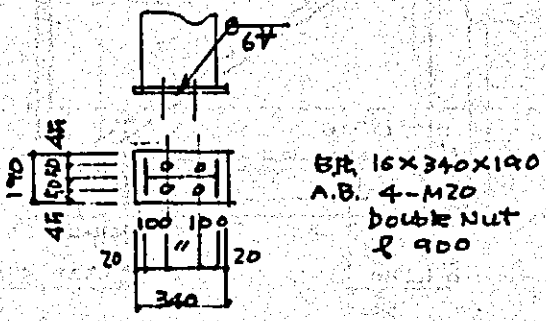




BE 22×540×240
AB 4-M20
Double Nut
ℓ 900

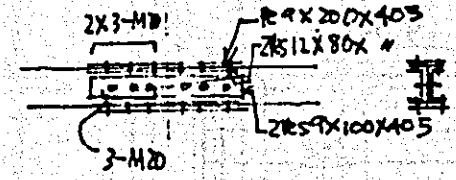
H-300×150×6.5×9 (Y=13)





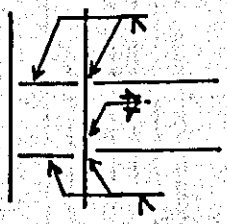
BPL 16×340×190
A.B. 4-M20
double Nut
ℓ 900

H-200×200×8×12 (Y=13)



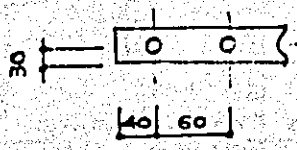
はり端部

柱脚部



溶接

材料



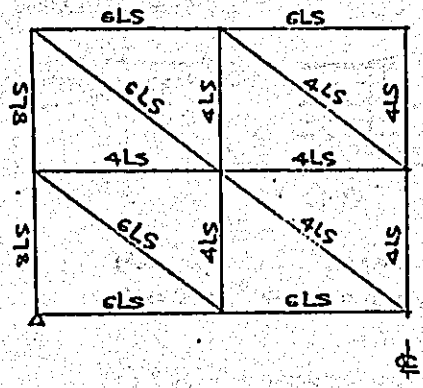
H, Rib PL SM50A
Splice PL SS41
H.T.B. F10T

CASE－2　　M/S STEEL ＋ WELDING

L-本材 主材 により.

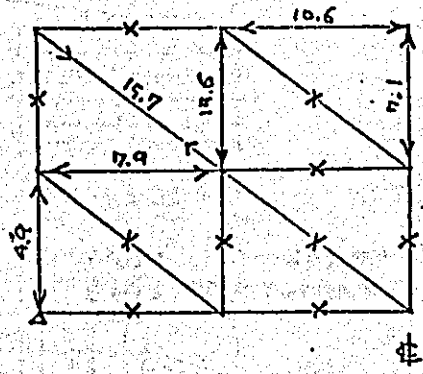
L－3″×3″×3/8″　A=13.484 [cm²]
　　γ=1.269 [t/cm³]
　　F=13.484×1.269=17.1 [t]

主材	耐力
4LS	F=68.2 [t]
6LS	F=102.3 〃
8LS	F=136.5 〃



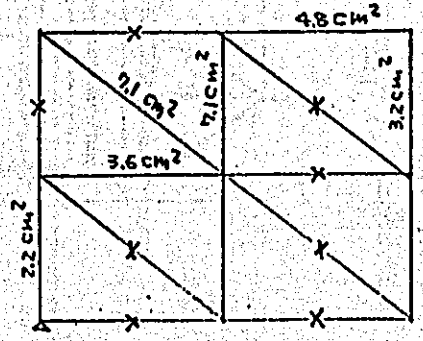
限界断面

本



許容耐力

本



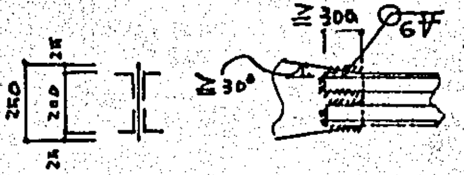
所要断面

すべて4-D19により O.K.

仕口

4LS − 3″×3″×3/8″

F = 68.2 [t]



PL $nA = 13.484 \times 4 = 53.936$ [cm²]

$nD = 53.964 / 2.54 = 21.234 \rightarrow 25$ [cm] = PL1″

WELDING ～ 2LS に対して、

6V $R = 0.6 \times 0.7 \times 0.8 = 0.336$ [t/cm] = 1/4 V

$n\ell = 13.484$ [cm²] × 1.265 [t/cm²] / 0.336 [t/cm]

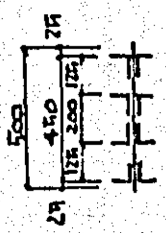
= 50.766 [cm] → 60 [cm]

6LS − 〃

PL $nA = 13.484 \times 6 = 80.904$ [cm²]

$nD = 80.904 / 2.54 = 31.852 \rightarrow 40$ [cm]

8LS − 〃

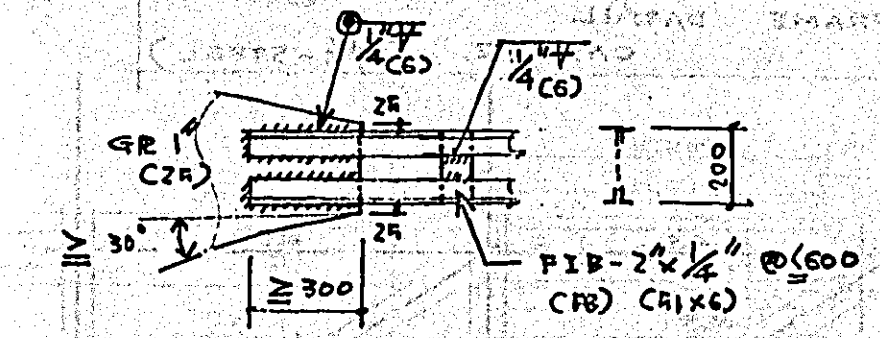


PL $nA = 13.484 \times 8 = 107.872$ [cm²]

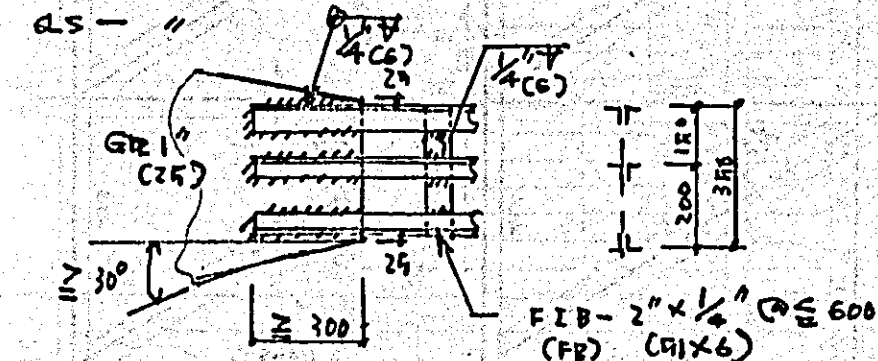
$nD = 107.872 / 2.54 = 42.469 \rightarrow 50$ [cm]

つなぎ材 FIB − 2″×1/4″ @ 2′−0″

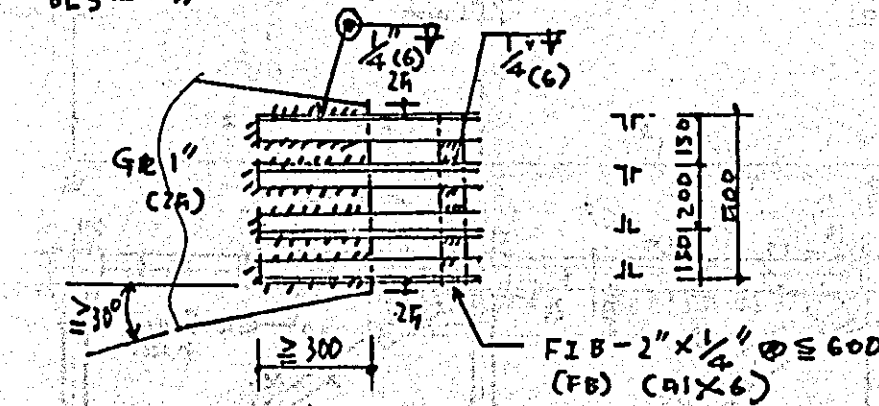
4LS – 3" × 3" × 3/8" (76×76×10)

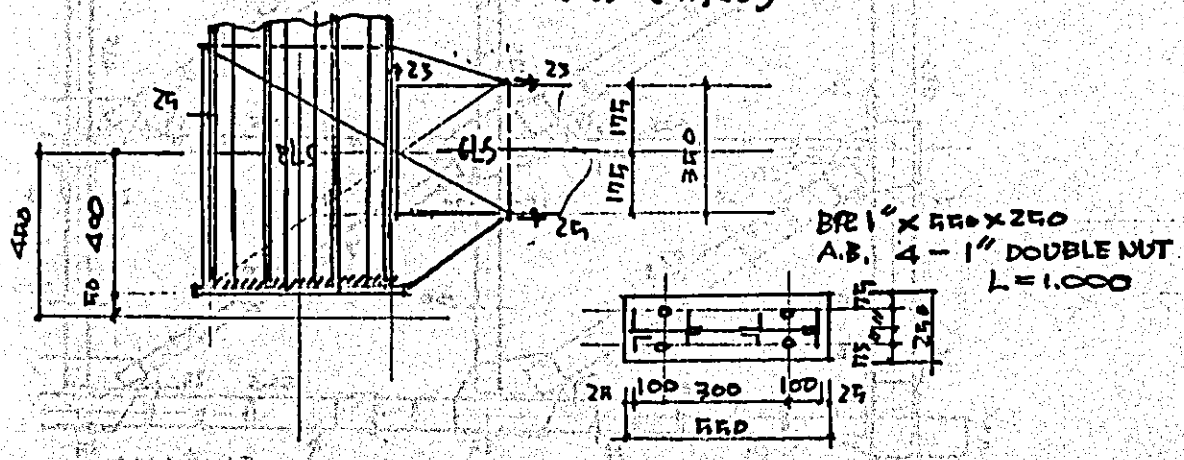


2LS – "



8LS – "

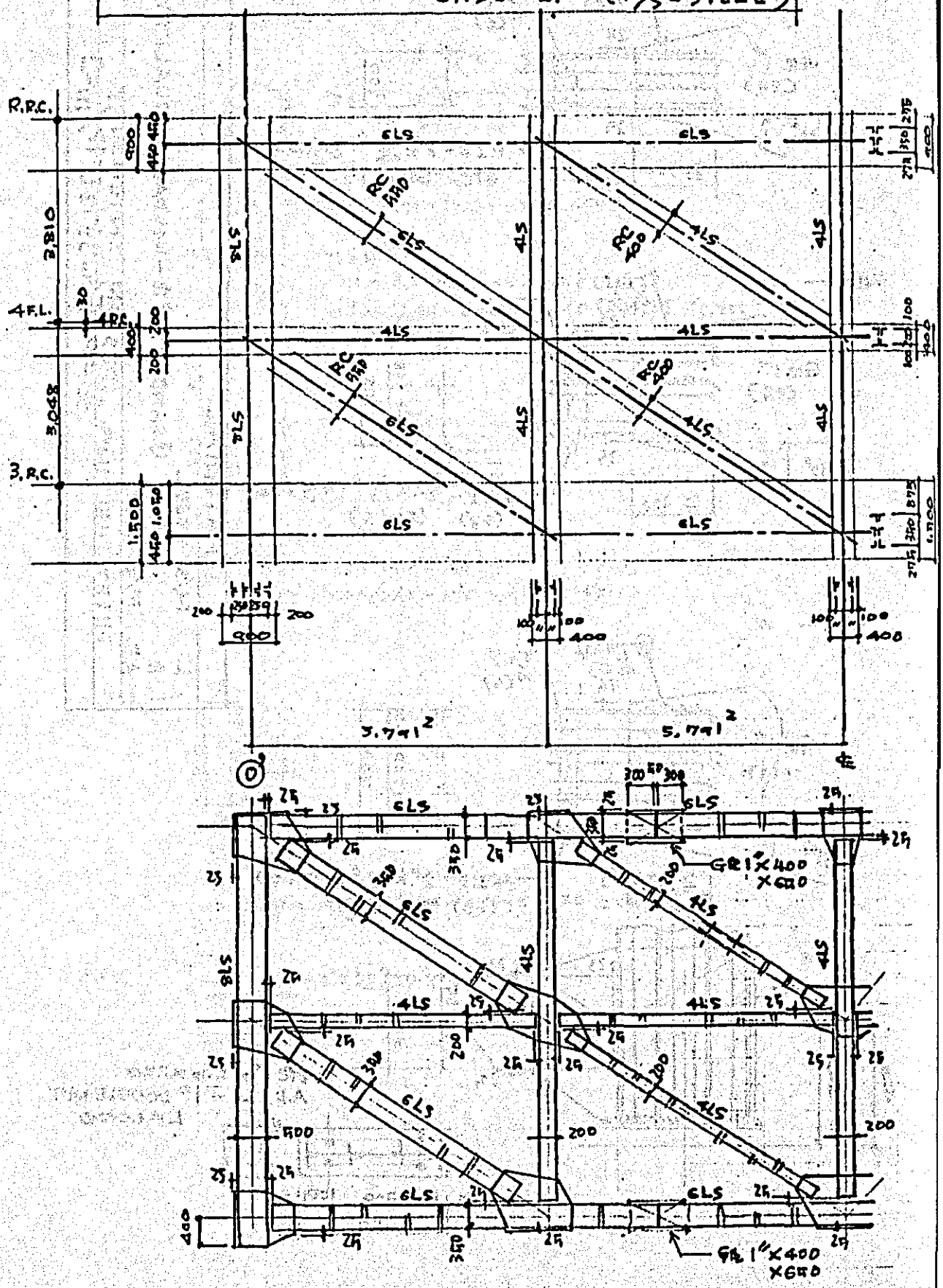




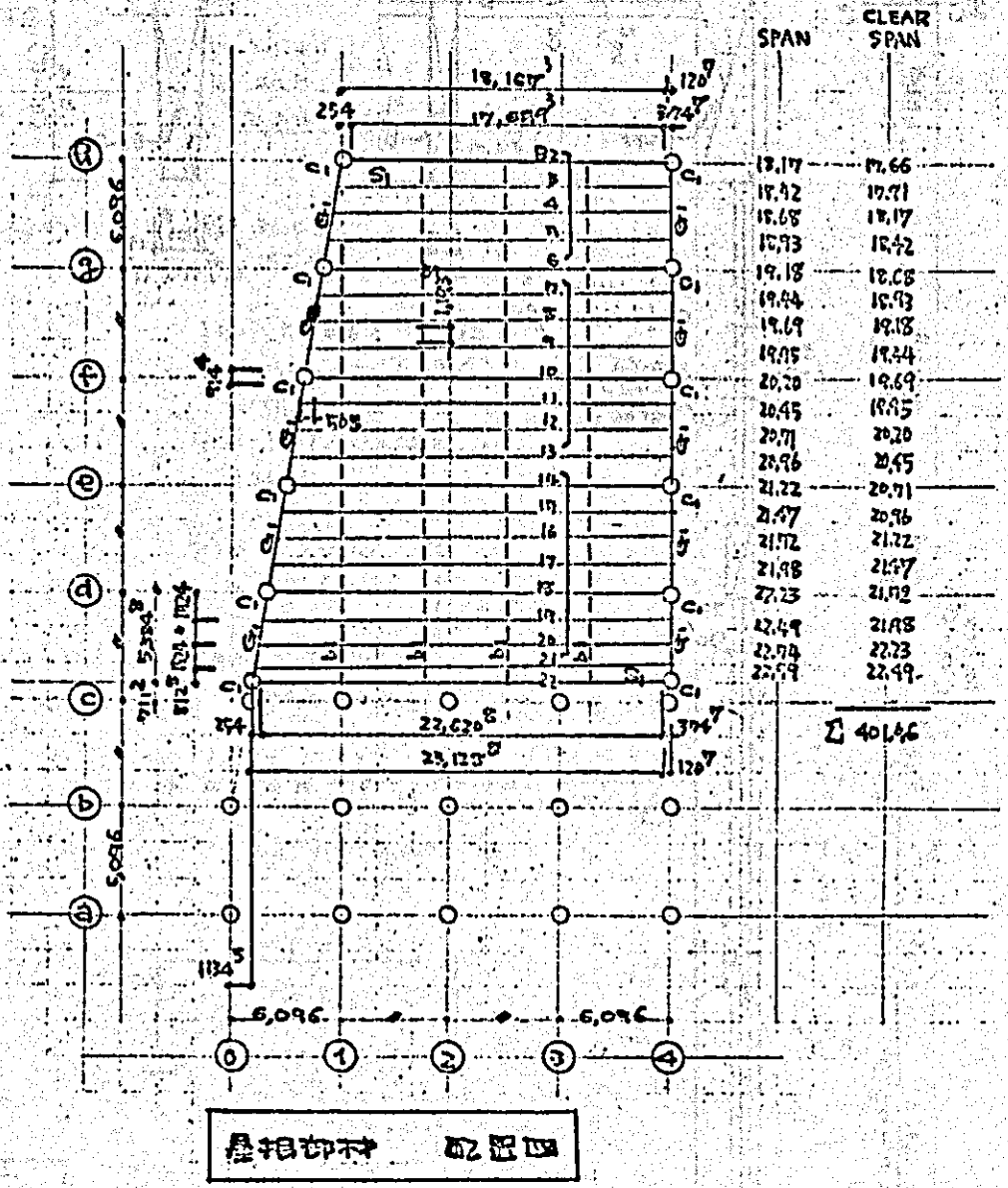
MATERIAL	
⊥	M/S STEEL (SANJUKTA'K – WELDABLE QUALITY)
R	"
A.B.	M/S BAR
FILLET WELDING DESIGN INTENSITY	$f = 0.8 t/cm^2 = 1.12 kip/in^2$

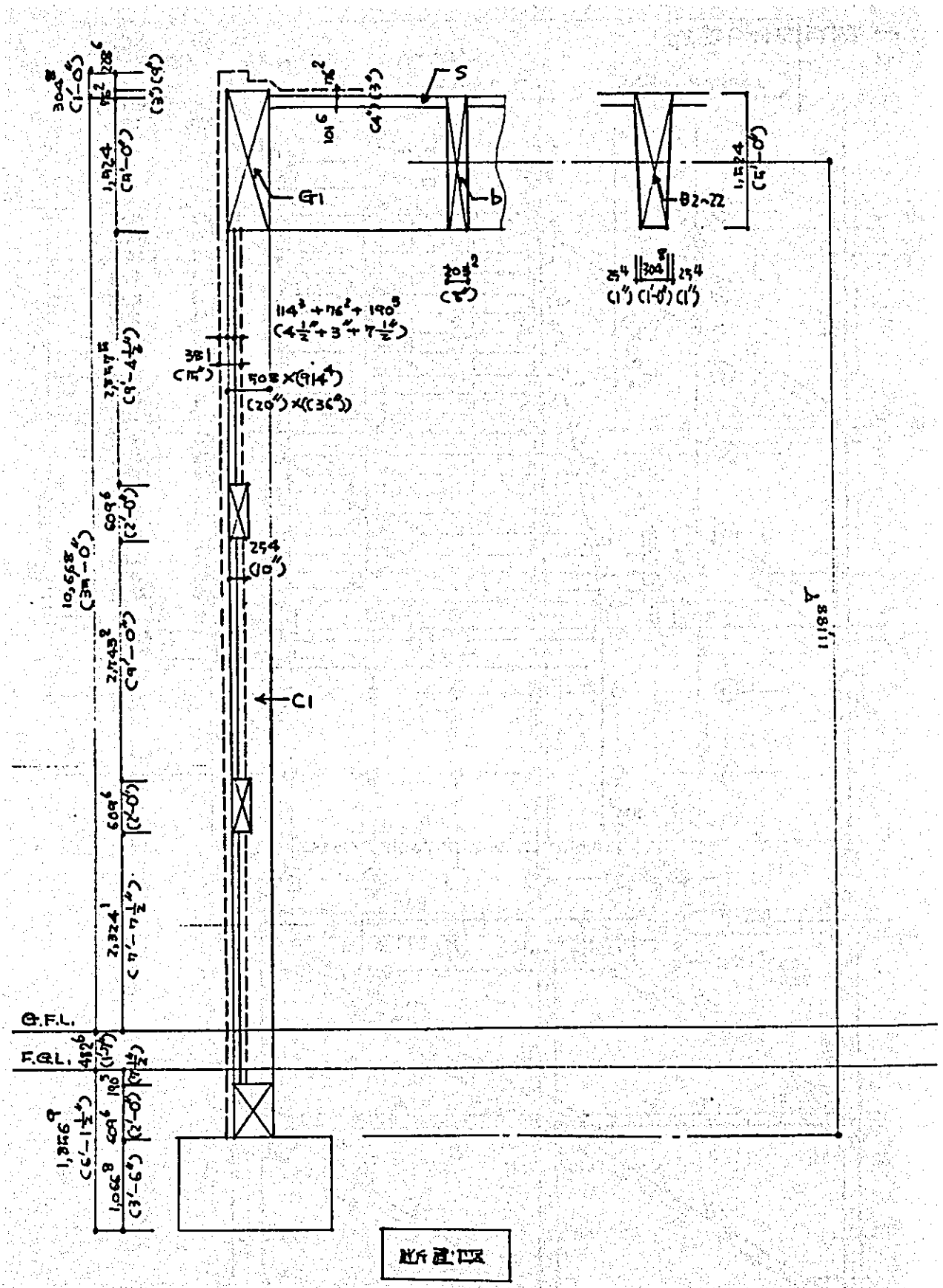
(h) SITE STEEL FRAME DATAIL

CASE-2. (M/S-STEEL)



8. 一 既存部分の検討


SPAN
CLEAR SPAN
18,167
17,659
254
374
120
23,620
23,123
6,096
屋根伏せ図


G1
S
b
B2~B2
C1
G.F.L.
F.G.L.
254
(10")
381
(15")
508×(914)
(20")×((36"))
114³+76²+190⁵
(4½"+3"+7½")
254
(1")
304
(1'-0")
254
(1")
11188

剛比

柱

b 91.44
D 50.8

$$k = \frac{91.44 \times 50.8^3}{12} \times \frac{1}{1117} = 892.7$$

はり

b 33.02
D 152.4

$$b_a = \{0.5 - 0.6(a/l)\}a$$
$$= \{0.5 - 0.6(119.3/1817 \sim 2313)\}119.3$$
$$= 55.0 \sim 56.0$$
$$b = 33.02 + 2 \times 55.5$$
$$= 144$$

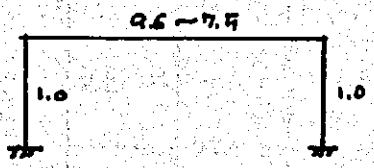
$B/b = 144/33.02 = 4.36$

$t/D = 12.7/152.4 = 0.083$

$\phi = 1.6$

$$k = 1.6 \times \frac{33.02 \times 152.4^3}{12} \times \frac{1}{1,817 \sim 2,313}$$
$$= 8,576.6 \sim 6,737.4$$

$k' = 9.6 \sim 7.5$
$(k_0 = 892.7)$



分布荷重

kc	Σkb	k̄	a	D
1.0	9.6	9.6	0.87	0.87
	7.5	7.5	0.84	0.84

$Y = 0.855$

単位荷重

床　　kg/m²

	断面	荷重		積載荷重		計
屋上（一般）		WATER PROOF	275	S	90	730
		RC 4"	245	V	70	710
		CEILING	120	H	30	670
			640			
〃（フロント、ステージ上部）		〃	640	S	90 250	1030
		+		V	70 + 250	1010
		STEEL FRAME	50	H	30 125	845
			690			
照明室		FINISH	60	S	350	550
		STEEL FRAME	100	V	250	450
		CEILING	40	H	150	350
			200			

はり

b × D	t/m 躯体	仕上	Σ	t/クリヤースパン							
20" × 60"	1.827	—	1.827								
10" × 24"	0.372	—	0.372								
8" × 60"	0.694	—	0.694								
12"/14" × 60"	1.127	—	1.127								

COLUMN

b × D	t/m 躯体	仕上	Σ	R=10.427	t/内法高					
20" × 36"	1.118	—	1.118	11.62						

WALL

	躯体	仕上	Σ	NET R=8.59	t/内法高 ＿＿m					
4½"+3"+½"	0.193	0.458 +0.060	0.731	6.29						

柱 軸方向力

MINIMUM (C5)

S	1.01 × 9.09 × 3.05	= 28.0	
B	1.83 × 2.59	= 4.7	
	0.37 × 2.59 × 2	= 1.9	
	0.69 × 1.19 × 3	= 2.5	
	1.13 × 17.66/2	= 10.0	
C	11.6	= 11.6	
W	6.3 × 2.59	= 16.3	75.0 [t]

MAXIMUM (C2)

S	0.71 × 10.61 × 6.10	= 46.0	
B	1.83 × 5.18	= 9.5	
	0.37 × 5.18 × 2	= 3.8	
	0.69 × 1.19 × 8	= 6.6	
	1.13 × 20.71/2	= 11.7	
C	11.6	= 11.6	
W	6.3 × 5.18	= 32.6	121.8 [t]

はり C Mo Q

MINIMUM (B2)

$q = (1.01 \times 1.524) + (1.13) + (0.69 \times 1.19 \times 3/18.17) = 2.80$ [t/m]

$C \quad 2.80 \times 18.17^2/12 = 77.0$ [tm]

$M_0 \quad /8 = 115.6$

$Q \quad \times 18.17/2 = 25.4$ [t]

MAXIMUM (B22)

$q = (1.01 \times 1.524) + (1.13) + (0.69 \times 1.19 \times 4/22.99) = 2.81$ [t/m]

$C \quad 2.81 \times 22.99^2/12 = 123.7$ [tm]

$M_0 \quad /8 = 185.6$

$Q \quad \times 22.99/2 = 32.3$ [t]

地震力

：全荷重

床	0.845 × 18.68 × 6.10	96.3		
	0.67 × 21.22 × 23.67	336.6		
	0.35 × ≒50.0	17.5	450.4	
はり	1.827 × (30.18 + 29.77)	109.5		
	0.302 × (30.18 − 4.57 + 29.77 − 4.57)	18.9		
	1.127 × 401.46	452.4		
	0.694 × (1.193² × 73 + 0.482² × 4)	61.8	642.6	
柱	11.62 × 12/2	69.7		
壁	6.29 × (30.18 − 4.75 + 29.777 − 4.57)/2	159.8		

$\Sigma = 1322.5$ [t]

（面積 $= \{(18.17+23.13)/2\} \times \{(6.096 \times 5) - 0.711^2\} = 614.7$ [m²]
平均荷重 $= 1322.5/614.7 = 2.15$ [t/m²]）

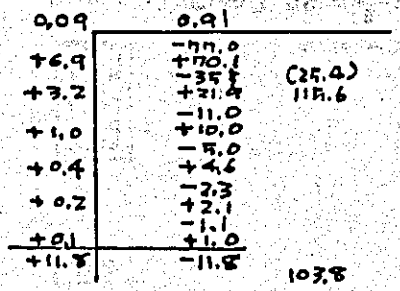
水平震度 $= 0.05$

水平力 $= 1,322.5 \times 0.05 = 66.1$ [t]

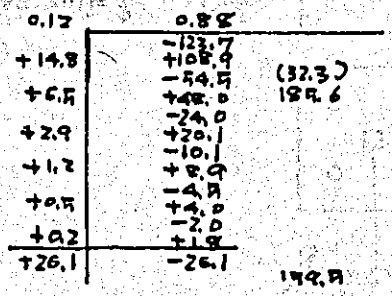
（1 方向は耐力壁はにつき OK.
〃 のみ検討する。）

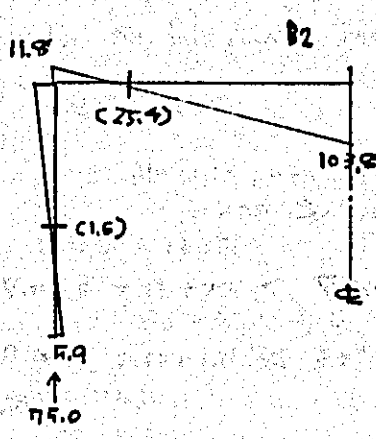
鉛直荷重時　応力

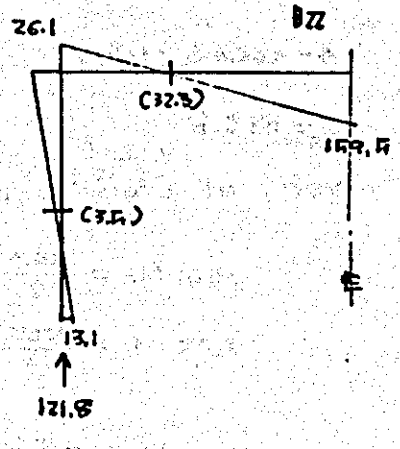
⑧ FRAME



Ⓒ FRAME







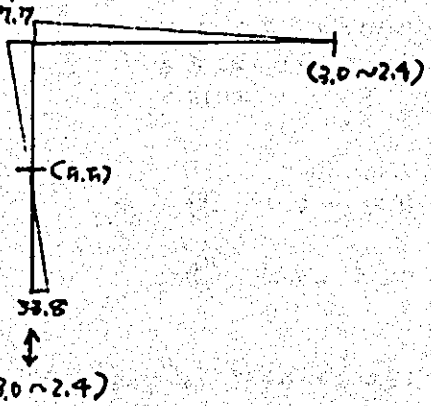
地震時　応力

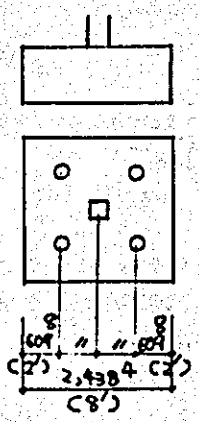
$\bar{Q}_c = 66.1 / 12.0 = 5.5$　（D = 0.84 ~ 0.87, Dmax ≒ Dmin）

TM = 5.5 × 11.19 = 61.5

y = 0.55

FACE MOMENT = [23.5] 27.7





$d = (106.68 - 13.24) \times \frac{7}{8} = 80$ [cm]

<1) 4-406.4φ (16"φ)

$R_A = 70$ t/p

Vertical Load (75.0 ~ 121.8 ≪ 70×4

MIN $M_A = \frac{75.0}{2} \times 1.219^6 = 45.7 > 5.9 + 33.8 = 39.7$

MAX 〃 $= \frac{121.8}{2} \times$ • $= 74.3 > 13.1 + 33.8 = 46.9$

O.K.

鉄筋 16-19φ ($\frac{3}{4}$"φ) @150(6") c/c

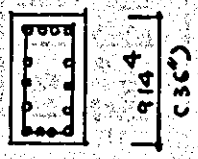
$M_A = 16 \times 2.85$ [cm²] $\times 2.4$ [t/cm²] $\times 0.8$ [m]

$= 37.6$ [tm]

$> \frac{121.8}{2} \times \frac{1.219^6}{2} = 37.1$

O.K.

柱の 許容応力



・14−25Φ C1"φ)

5Φ8
(20")

Formula on Ultimate Intensity

$N \leqq 0.4bDFc$

$$Mu = 0.8 at\sigma_y D + 0.5ND\left(1 - \frac{N}{bDFc}\right)$$

$N > 0.4bDFc$

$$Mu = 0.8 at\sigma_y D + 0.12 b D^2 Fc$$

In this case

N = 115.0 ～121.8 [t]

$0.4bDFc = 0.4 \times 91.44 \times 50.8 \times 180 = 334.45$ [t] $> N$

～

$Mu = 0.8 \times (5 \times 5.07) \times 2.4 \times 50.8 + 0.12 \times 91.44 \times 50.8^2 \times 180$
$= 2,472.5 + 5,097,032.4$
$= 5,099,504.9$ [kgcm]
$= 51.0$ [tm]

M ㊀ 11.8 + 23.5 = 35.3
© 26.1 + 23.5 = 49.6
] < Mu

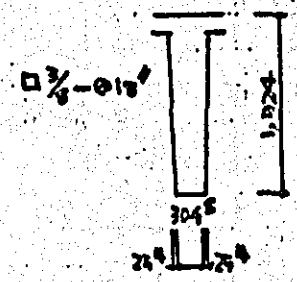
O.K.

$QAS = 91.44 \times (50.8 - 5)\frac{7}{8} \times 9 = 33.0$ [t]

> QD ㊀ 1.6 + (5.5 × 1.5) = 9.9
© 3.5 〃 = 11.8 [t]

O.K.

ALLOWABLE STRESS OF EXISTING BEAM : $B_{2}\sim 22$



$\bar{b} = (30.48 + 34.56)/2 = 33.02$
$D = 142.4$
$d \fallingdotseq 152.4 - 10 = 142.4$
$j = 142.4 \times \frac{7}{8} = 124.6$

	σ_t	cp
$\frac{1}{2}\phi$ (12.7)	1.27	3.99
$1\frac{1}{8}\phi$ (28.6)	6.41	8.98

$M_u = 0.9\, a_t\, \sigma_y\, d$ ------- σ_y = (Mild Steel Bar) = 33,000 [P.S.I.] = 23 [t/cm²]

$Q_{AL} = b\, j\, f_s = 33.02 \times 124.6 \times 6 = 24.7$ [t]
St. □ 3/8' @ 18' (9.5φ @ 457.2) --- $p_w = 0.0008$
$Q_{AL} = \varphi f_b j$ ------ $f_b = 7.2 \sim 10.8$ [kg/cm²]

			M	a_t	cp	d	j	M_u	Q_{AL}
B22	END	TOP	$(2-\frac{1}{2})+(3-1\frac{1}{8})$	21.77	34.91	142.4	124.6	64.2	31.3 ≈ 46.9
		BTM	$(5-1\frac{1}{8})$	32.07		〃	〃	94.8	
	CENT	TOP	$(2-\frac{1}{2})$	2.83		〃	〃	7.5	
		BTM	$(8-1\frac{1}{8})$	91.30		〃	〃	191.2	
B 14~21	END	TOP	$(2-\frac{1}{2})+(6-1\frac{1}{8})$	41.01	61.34	〃	〃	120.9	58.8 ≈ 87.3
		BTM	$(8-1\frac{1}{8})$	61.38		〃	〃	181.2	
	CENT	TOP	$(2-\frac{1}{2})$	2.83		〃	〃	7.5	
		BTM	$(14-1\frac{1}{8})$	89.78		〃	〃	264.6	
B 11~13	END	TOP	$(2-\frac{1}{2})+(4-1\frac{1}{8})$	28.19	43.89	〃	〃	83.1	39.4 ≈ 59.1
		BTM	$(8-1\frac{1}{8})$	51.30		〃	〃	151.2	
	CENT	TOP	$(2-\frac{1}{2})$	2.83		〃	〃	8.3	
		BTM	$(12-1\frac{1}{8})$	76.96		〃	〃	226.9	
B 2~12	END	TOP	$(2-\frac{1}{2})+(4-1\frac{1}{8})$	29.19	43.89	〃	〃	83.1	39.4 ≈ 59.1
		BTM	$(6-1\frac{1}{8})$	32.48		〃	〃	88.4	
	CENT	TOP	$(2-\frac{1}{2})$	2.83		〃	〃	8.3	
		BTM	$(10-1\frac{1}{8})$	64.13		〃	〃	189.0	

		V		H	T	
β2	ME	11.8		27.7	39.5	< 83.1
	C	103.8	±	0	103.8	< 189.0
	Q	25.4		3.0×1.5	29.9	< 39.4 ～ 59.1

O.K

β22	ME	26.1		27.7	53.8	< 64.2
	C	159.5	±	0	159.5	≒ 161.2
	Q	32.3		2.4×1.7	35.9	< 31.3 ～ 47.0

O.K.

以上の検討より、
既設オーディトリウムは 現有 5% の
地震にたいして安全である。

(完)