UNIVERSIDAD DE CARTAGENA

FACULTAD DE INGENIERIA CIVIL

PROYECTO DE GRADO

CALCULO ESTRUCTURAL EDIFICIO "EL TURBI"

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I N T R O D U C C I O N

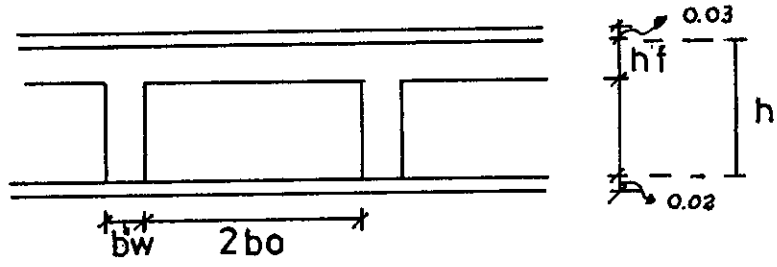
Ahora cuando terminamos la ejecución de nuestra tesis de grado,la cual comprendió todo lo relacionado a cálculo estructural,sanitaria,programación de actividades y presupuesto,no podemos pasar por alto nuestros agradecimientos a todos aquellos profesores que muy gentilmente nos indicaron el recto camino de la enseñanza que en su campo le concierne.

De antemano le damos público agradecimiento a todas las personas que llegasen a consultar nuestro proyecto, su gentil y generosa actitud al indicarnos los posibles errores u omisiones en lo que pudimos caer,debido a la inexperiencia que poseiamos al iniciar su ejecución.

Este proyecto,ha sido nuestra satisfacción al concluir una etapa más en nuestra vida cotidiana,ya que comprendió lo expuesto anteriormente.Para su ejecución fué necesario poner en práctica todos los conocimientos adquiridos en esta facultad acompañado de minuciosas investigaciones que nos ayudaron a concretizar nuestros objetivos.

Todos los cálculos se hicieron en base a las normas del ACI - 77, con la asesoria de los Ingenieros José España y Juan Roca.

PLACA TIPO



2 bo = 60 cm

bw = 12 cm

hf = 5 cm

h = 40 cm

Requisitos:

bw $\geq$ 10 cm (OK)

2bo $\leq$ 75 cm (OK)

h $\leq$ 3.5 bw(OK)

ANALISIS DE CARGA : PLACA TIPO

Peso Torta 0.05 x 2.4	0.12	Ton/m^2
Peso Nervio 0.12 x 0.35 x 2.4/0.72	0.14	Ton/m^2
Peso Acabado (Plantilla y Baldoza)	0.12	Ton/m^2

	0.38 Ton/m^2
Peso Particiones	0.10 Ton/m^2
Peso de Monolítico	0.14 Ton/m
Peso Pañete Techo 0.02 x 2.2	0.044 Ton/m^2
Carga Muerta Total	0.664 Ton/m^2
Carga Viva	0.200 Ton/m^2
Carga de Diseño 1.4 x 0.664 + 1.7 x 0.2	1.2696Ton/m^2
Carga de Diseño 1.2696 x 0.72	0.914 Ton/m^2

ANALISIS DE CARGA PLACA TECHO

Peso Torta 0.05 x 2.4	0.120 Ton/m^2
Peso Nervio 0.12 x 0.35 x 2.4/0.72	0.140 Ton/m^2
Peso Monolítico	0.140 Ton/m^2
Peso Pañete 0.02 x 2.2	0.044 Ton/m^2
Peso Capa Impermeabilizante	0.090 Ton/m^2
Total Carga Muerta	0.614 Ton/m^2
Carga Viva Posible	0.100 Ton/m^2
Carga de Diseño 1.4(0.614) + 1.7(0.100)	1.030 Ton/m^2
Carga de Diseño 1.03 x 0.72	0.740 Ton/m^2

Chequeo para ver si la losa lleva refuerzo de flexión.-

$U = 0.266 \times 1.4 + 1.7 \times 0.14 \qquad U = 0.617$ Ton/m.

$Mu = Ux(2bo)^2/12 = 0.617x(0.60)^2/12$

$Mu = 0.01851$ Ton-m= 18.51 Kg-m.

$$ft = \frac{6xMu}{bh(f)^2} = 6x(1851)/100x(5)^2 = 4442 \text{ Kg/cm}$$

$1.3 \phi \sqrt{f'c} = 1.3 \times 0.65 \sqrt{210} = 12.25 \text{ Kg/cm}^2$

$ft < 1.3 \phi \sqrt{f'c}$ no requiere refuerzo a flexión.

Refuerzo por Temperatura.-

$fy = 40.000$

$AS = 0.0020 \times b \times hf$

$AS = 0.0020 \times 100 \times 5 = 1.0 \text{ cm}^2$

Usar varillas #3 o 3/8

Espaciamiento:

$S = A_{varilla} \times b/AS = 0.71x100/1.0 = 71.0$ cm

$S = 45$ cm

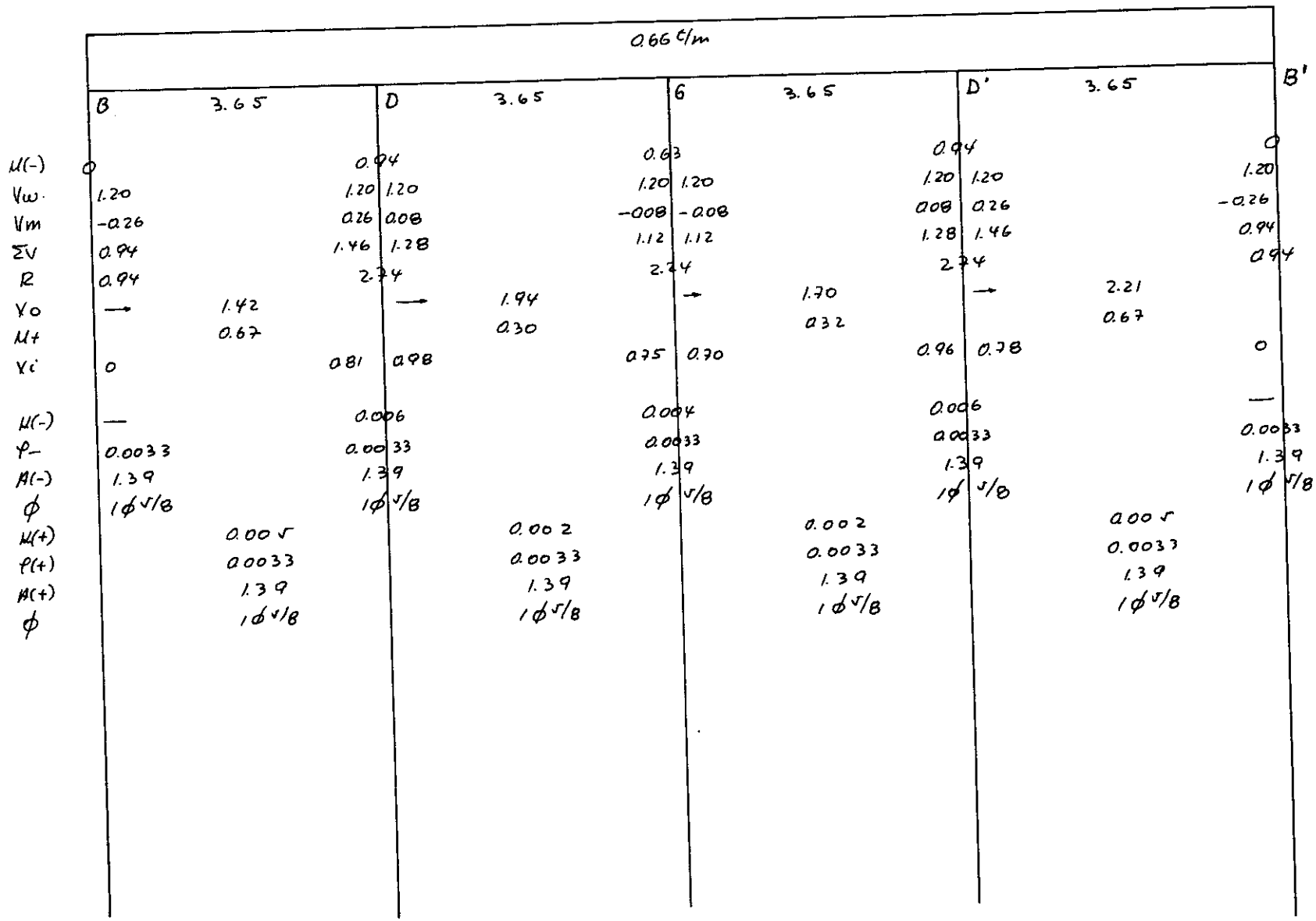
$S = 5xh = 5x5 = 25$ cm

Se coge el menor S= 25 cm.

NERVIOS PLACA TIPO

NERVIO 1 Y 6

b = 12 cm h = 40 cm d = 35 cm



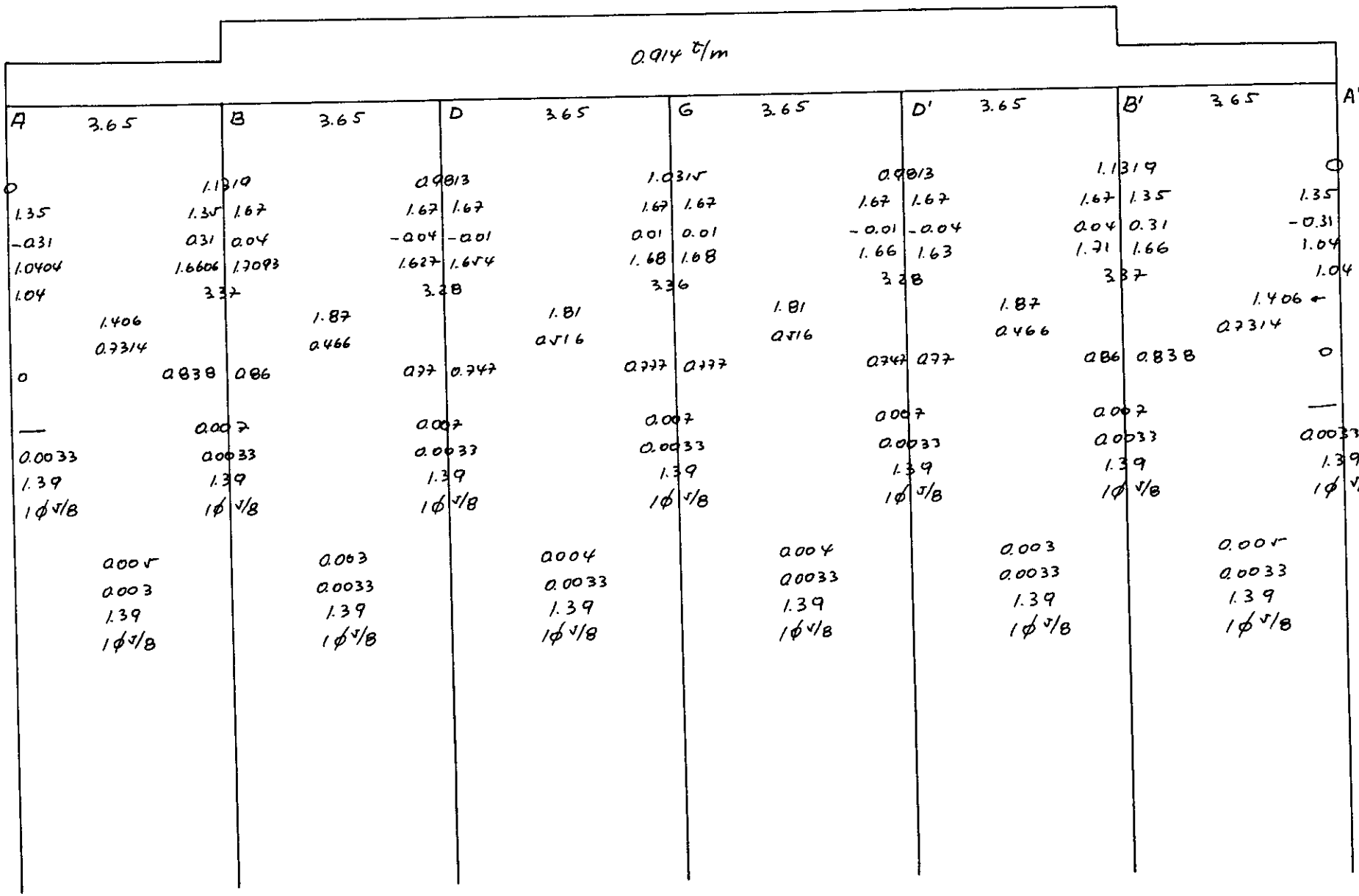
NERVIO 2

b = 12 cm h = 40cm d = 35 cm

	0.8√ t/m								
	B	3.6√	D	3.6√	G	3.6√	D'	3.6√	B'
M(-)	0		1.2133		0.809		1.2133		0
Vw	1.√√13		1.√√13	1.√√13	1.√√13	1.√√13	1.√√13	1.√√13	1.√√13
Vm	-0.3324		0.332	0.1108	-0.1108	-0.1108	0.1108	0.3324	-0.3324
ΣV	1.2189		1.884	1.6621	1.440√	1.440√	1.6621	1.884	1.219
R	1.2189		3.546		2.881		3.546		1.219
Xo	1.434		2.216	1.9√√4	1.694	1.694	1.9√√	2.216	1.434
M(+)		0.8739		0.4117		0.4117		0.8739	
Xl	0		0.7821	0.971	0.710√	0.710√	0.971	0.782	0.0
M(-)	—		0.012		0.009		0.012		—
ρ(-)	0.0033		0.0033		0.0033		0.0033		0.0033
A(-)	1.39		1.39		1.39		1.39		1.39
ϕ	1ϕ √/8		1ϕ √/8		1ϕ √/8		1ϕ √/8		1ϕ √/8
M(+)		0.012		0.012		0.012		0.012.	
ρ(+)		0.0033		0.0033		0.0033		0.0033	
A		1.39		1.39		1.39		1.39	
ϕ		1ϕ √/8		1ϕ √/8		1ϕ √/8		1ϕ √/8	

NERVIO 3

b = 12 cm h = 40 cm d = 35 cm



NERVIO 4

b = 12 cm h = 40 cm d = 35 cm

0.914 t/m

	A	3.65	B	3.65	D	3.65	G	3.65	D'	3.65	B'	3.65	A'
M(-)	0		1.29		0.94		1.05		0.94		1.29		0
Vω	1.67		1.67 1.67		1.67 1.67		1.67 1.67		1.67 1.67		1.67 1.67		1.67
VM	-0.35		0.35 0.10		-0.10 -0.03		0.03 0.03		-0.03 -0.10		0.10 0.35		-0.34
ΣV	1.32		2.02 1.77		1.57 1.64		1.7 1.7		1.64 1.57		1.77 2.02		1.32
R	1.32		3.79		3.21		3.40		3.21		3.79		1.32
Vo		1.44		1.94		1.79		1.86		1.72		2.21	
Mt		0.95		0.43		0.53		0.53		0.41		0.94	
xi	0.0		0.97 0.97		0.74 0.72		0.79 0.78		0.71 0.77		0.98 0.77		0
M(-)	—		0.009		0.006		0.007		0.006		0.009		—
ρ(-)	0.0033		0.0033		0.0033		0.0033		0.0033		0.0033		0.003
A(-)	1.39		1.39		1.39		1.39		1.39		1.39		1.39
ϕ	1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8
M(+)		0.006		0.003		0.004		0.004		0.003		0.006	
ρ(+)		0.0033		0.0033		0.0033		0.0033		0.0033		0.003	
A(+)		1.39		1.39		1.39		1.39		1.39		1.39	
ϕ		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8		1ϕ V/8	

NERVIO 5

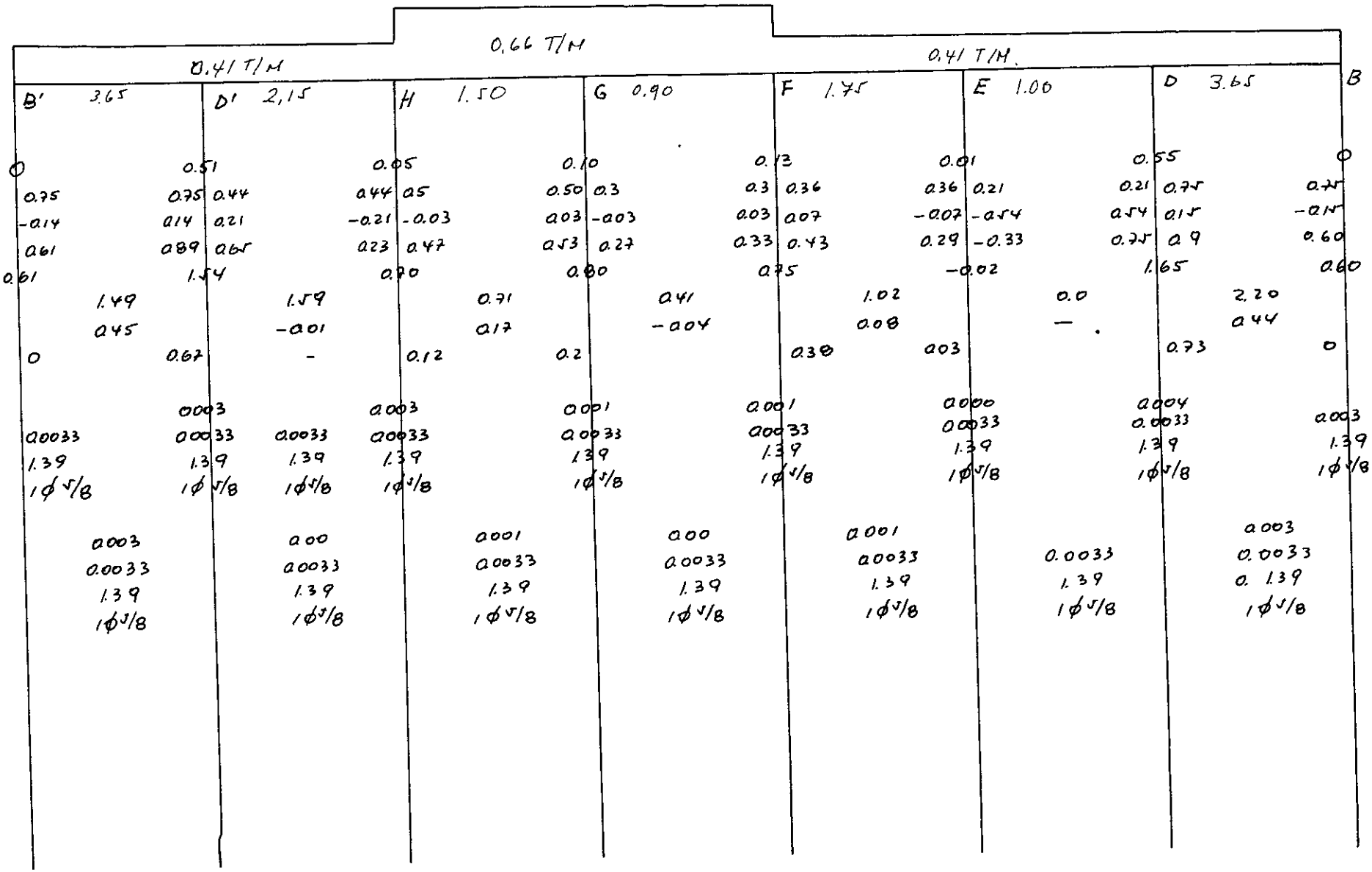
b=12cm h=40cm d=35cm

0.79 t/m

	B	3.65	D	3.65	G	3.65	D'	3.65	B'
M(-)	0		1.13		0.75		1.13		0
Vω	1.44		1.44	1.44	1.44	1.44	1.44	1.44	1.44
Vm	-0.31		0.31	0.10	-0.10	-0.10	0.10	0.31	-0.31
ΣV	1.13		1.75	1.54	1.34	1.34	1.54	1.75	1.13
R	1.13		3.29		2.68		3.29		1.13
Xo		1.43		1.95		1.70		2.22	
M+		0.81		0.37		0.39		0.72	
Vc	0		0.79	0.98	0.73	0.70	0.95	0.78	0
M(-)			0.008		0.005		0.008		—
A(-)	0.003		0.0033		0.0033		0.0033		0.0033
A(-)	1.29		1.39		1.39		1.39		1.39
ϕ	1ϕ 1/8		1ϕ 1/8		1ϕ 1/8		1ϕ 1/8		1ϕ 1/8
M(+)		0.006		0.003		0.003		0.005	
A(+)		0.0033		0.0033		0.0033		0.0033	
A(+)		1.39		1.39		1.39		1.39	
ϕ		1ϕ 1/8		1ϕ 1/8		1ϕ 1/8		1ϕ 1/8	

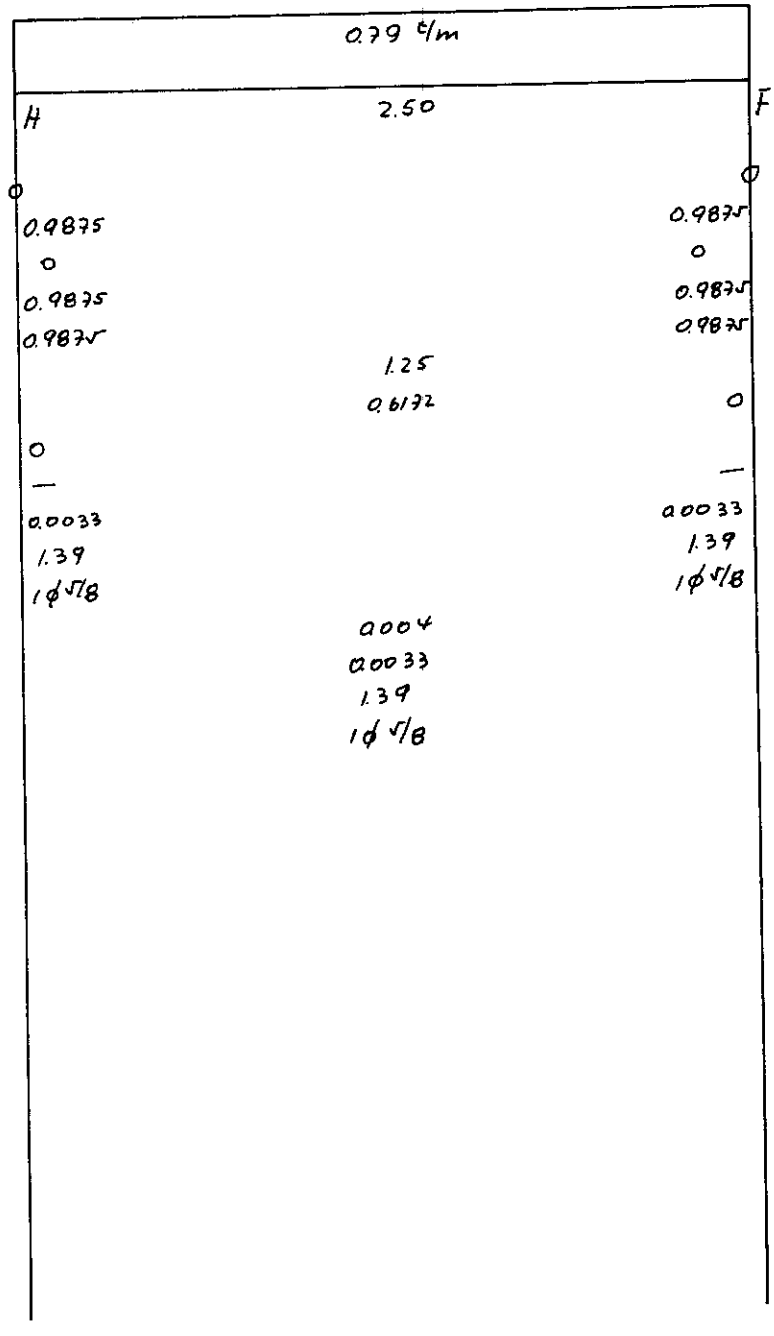
NERVIO 7

b=12cm h=40cm d=35cm



NERVIO 8

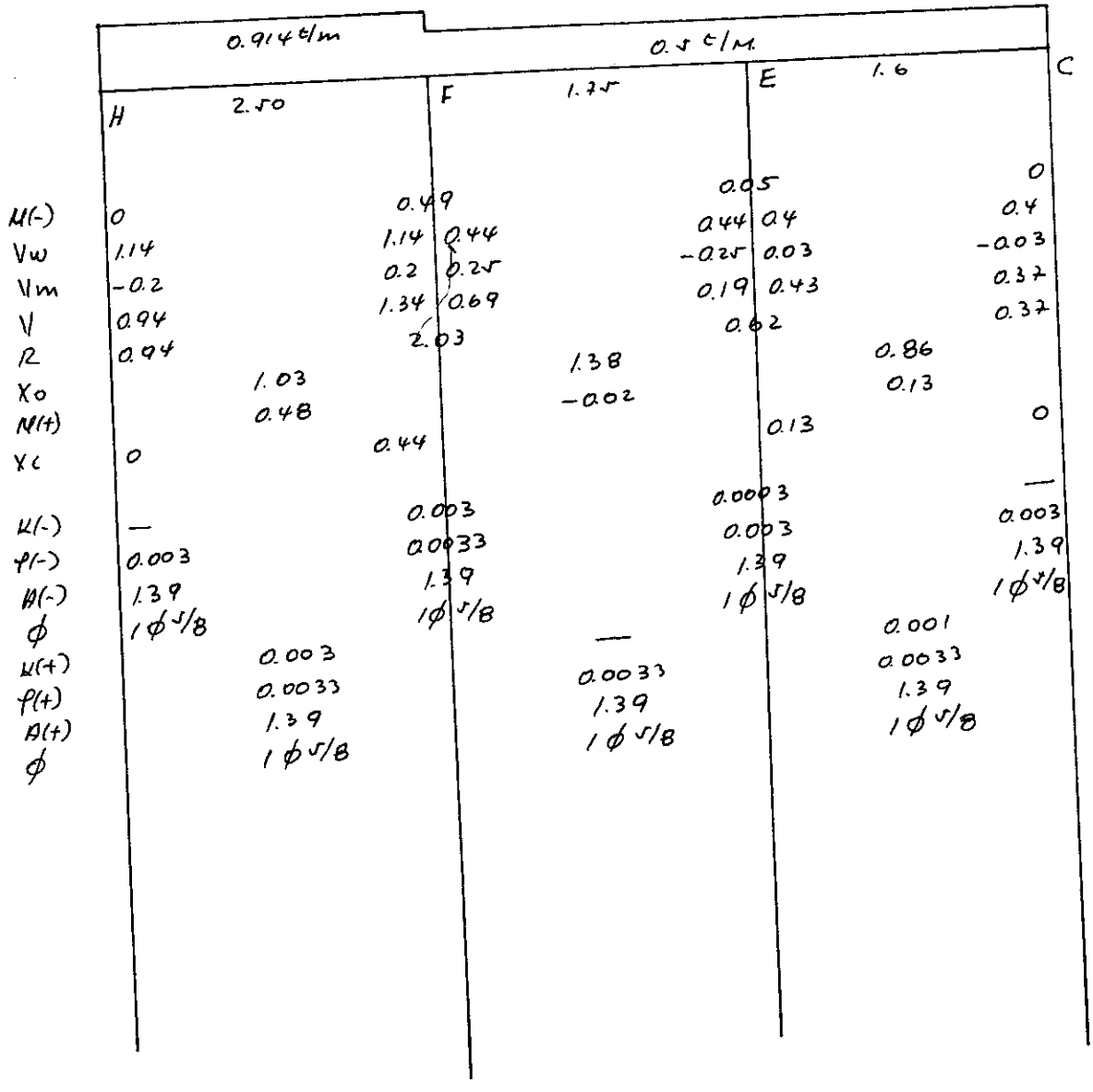
b = 12cm h = 40cm d = 35cm



	H		F
M(-)	0		0
Vw	0.9875		0.9875
Vm	0		0
ΣV	0.9875		0.9875
R	0.9875		0.9875
Xo		1.25	
M(+)		0.6172	0
Vi	0		
M(-)	—		—
ρ(-)	0.0033		0.0033
ρx(-)	1.39		1.39
ϕ	1ϕ √/8		1ϕ √/8
M(+)		0.004	
γ(+)		0.0033	
ρs		1.39	
ϕ		1ϕ √/8	

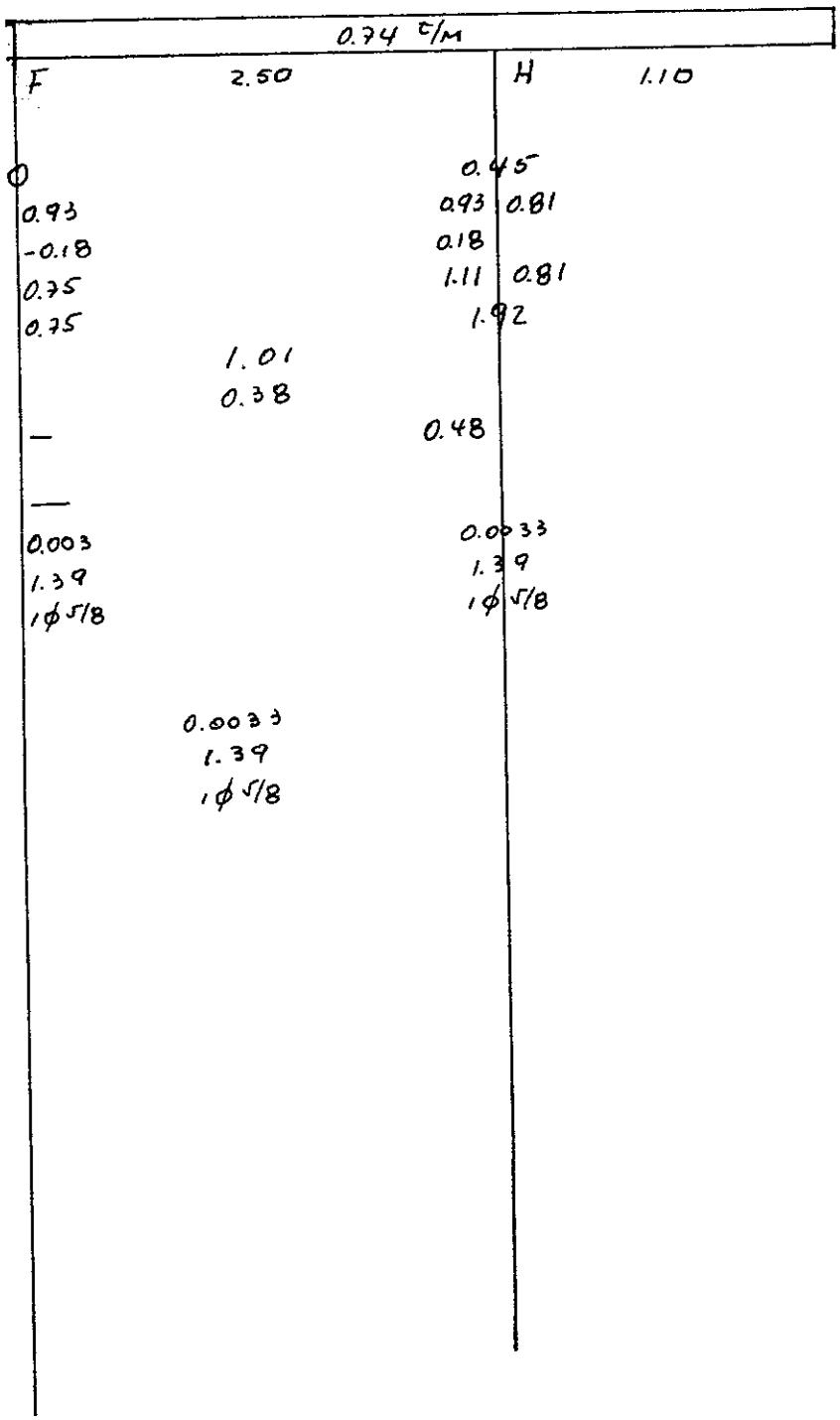
NERVIO 9

b=12cm h=40cm d= 35 cm



NERVIO 10

b = 12 cm h = 40 cm d = 35 cm



	F		H	
M(-)	0		0.45	
Vw	0.93		0.93	0.81
Vm	-0.18		0.18	
ΣV	0.75		1.11	0.81
R	0.75		1.92	
Xo		1.01		
M(+)		0.38		
Xi	—		0.48	
μ(-)	—			
ρ(-)	0.003		0.0033	
A(-)	1.39		1.39	
ϕ	1ϕ 5/8		1ϕ 5/8	
μ(+)				
ρ(+)		0.0033		
A(+)		1.39		
ϕ		1ϕ 5/8		

NERVIOS PLACA TECHO

NERVIO 1

b= 12cm h=40cm d=35 cm

w= 0.54 t/m

	3.65			3.65			3.65			3.65		
M(-)	0		0.77			0.91			0.77			0.0
Vω	0.99		0.99	0.99		0.99	0.99		0.99	0.99		0.99
V-	-0.21		0.21	0.07		-0.07	-0.07		0.07	0.21		-0.21
V	0.78		1.20	1.06		0.92	0.92		1.06	1.20		0.78
R	0.78		2.26			1.84			2.26			0.78
Xo		1.44			1.96			1.70			2.22	
M(+)		0.56			0.27			0.27			0.56	
Xc	0.0		0.77	0.96		0.69	0.69		0.97	0.77		0.0
W(-)	—		0.00			0.003			0.005			—
ρ(-)	0.0033		0.0033			0.0033			0.0033			0.0033
As(-)	1.39		1.39			1.39			1.39			1.39
ϕ	1ϕ1/8		1ϕ1/8			1ϕ1/8			1ϕ1/8			1ϕ1/8
W(+)		0.004			0.002			0.002			0.004	
ρ(+)		0.0033			0.0033			0.0033			0.0033	
As(+)		1.39			1.39			1.39			1.39	
ϕ		1ϕ1/8			1ϕ1/8			1ϕ1/8			1ϕ1/8	

NERVIO 2

b = 12cm h = 40cm d = 35cm

$w = 0.69$ T/M

	3.65		3.65		3.65		3.65	
M(-)	0.0	0.98		0.656		0.98		0.0
Vw	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
VM	-0.27	0.27	0.09	-0.09	-0.09	0.09	0.27	-0.27
ΣV	0.99	1.53	1.35	1.17	1.17	1.35	1.53	0.99
R	0.99	2.88		2.34		2.88		0.99
X_o	1.43		1.95		1.70		2.21	
M(+)	0.71		0.33		0.33		0.71	
Xi	0	0.78	0.97	0.72	0.71	0.97	0.78	0
M(-)	—			0.0	05	0.0	07	—
P(-)	0.0033	0.0	77	0.0	33	0.0	33	0.003
As(-)	1.39	0.0	33	1.	39	1.	39	1.39
ϕ	1ϕ 5/8"	1.	39	1ϕ	5/8"	1ϕ	5/8"	1ϕ 5/8"
M(+)	0.005	1ϕ	5/8"	0.002		0.002	0.005	
P(+)	0.0033			0.0033		0.0033	0.0033	
As(+)	1.39			1.39		1.39	1.39	
ϕ	1ϕ 5/8"			1ϕ 5/8"		1ϕ 5/8"	1ϕ 5/8"	

NERVIO 3

b = 12 cm h = 40 cm d = 35 cm

	0.59 T/M			0.74 T/M						0.59 T/M	
	3.65	3.65	3.65	3.65	3.65	3.65					
M(-)	0	0.782	0.7968	0.934	0.797	0.902					0
Vw											
V(-)											
V	0.828	1.33 1.38	1.32 1.34	1.36 1.36	1.34 1.32	1.38 1.33					0.828
R	0.828	2.706	2.66	2.72	2.66	2.70					0.828
Xo		1.40	1.87	1.81	1.84	1.78			2.24		
M(+)		0.58	0.38	0.42.	0.42	0.38			0.58		
Xi	0.00	0.844 0.852	0.77 0.75	0.77 0.77	0.75 0.77	0.852 0.843					0.00
M(-)	—	0.006	0.005	0.006	0.005	0.006					—
P(-)	0.003	0.0033	0.0033	0.0033	0.0033	0.0033					0.003
As(-)	1.39	1.39	1.39	1.39	1.39	1.39					1.39
ϕ	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8					1ϕ 5/8
M(+)		0.004	0.003	0.003	0.0033	0.003			0.004		
P(+)		0.0033	0.0033	0.0033.	0.0033	0.0033			0.0033		
A(+)		1.39	1.39	1.39	1.39	1.39			1.39		
ϕ		1ϕ 5/8	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8	1ϕ 5/8			1ϕ 5/8		

NERVIO 4

b=12cm h=40cm d= 35cm

0.74

		3.65			3.65			3.65			3.65			3.65			3.65	
M(-)	0		1.04			0.76			0.85			0.76			1.04			0
Vw	1.35		1.35	1.35		1.35	1.35		1.35	1.35		1.35	1.35		1.35	1.35		1.35
V(-)	-0.28		0.28	0.08		-0.08	-0.02		0.02	0.02		-0.02	-0.08		0.08	0.28		-0.28
V	1.07		1.63	1.43		1.27	1.33		1.37	1.37		1.33	1.27		1.43	1.63		1.07
R	1.07		3.06			2.60			2.74			2.60			3.06			1.07
Xo		1.45			1.93			1.80			1.85			1.72			2.20	
M(+)		0.78			0.34			0.44			0.42			0.33			0.75	
Xc	0		0.75	0.97		0.76	0.71		0.76	0.78		0.73	0.76		0.97	0.77		0
M(-)	—		0.01			0.005			0.005			0.005			0.01			—
ρ(-)	0.0033		0.0033			0.0033			0.0033			0.0033			0.0033			0.003
As(-)	1.39		1.39			1.39			1.39			1.39			1.39			1.39
φ	1φ5/8		1φ5/8			1φ5/8			1φ5/8			1φ5/8			1φ5/8			1φ5/8
M(+)		0.006			0.002			0.003			0.003			0.002			0.005	
ρ(+)		0.0033			0.0033			0.0033			0.0033			0.0033			0.0033	
As(+)		1.39			1.39			1.39			1.39			1.39			1.39	
φ		1φ5/8			1φ5/8			1φ5/8			1φ5/8			1φ5/8			1φ5/8	

NERVIO 5

b = 12cm h = 40 cm d = 35 cm

2.4.

0.64 T/M

	3.65		3.65		3.65		3.65	
M(-)	0		0.92		0.61		0.92	
Vω	1.17		1.17	1.17	1.17	1.17	1.17	1.17
V-								
V	0.92		1.42	1.25	1.09	1.09	1.25	1.42	0.92
R	0.92		2.67		2.18		2.67	0.92
Xo		1.44		1.95		1.70		2.22
M+		0.66		0.3		0.32		0.66
Xc	0		0.77	0.98	0.72	0.70	0.95	0.78	0
M(-)	—		0.006		0.004		0.006	—
P(-)	0.0033		0.0033		0.0033		0.0033	0.0033
As	1.39		1.39		1.39		1.39	1.39
ϕ	1ϕ J/8		1ϕ J/8		1ϕ J/8		1ϕ J/8	1ϕ J/8
M(+)		0.004		0.002		0.002		0.004
P(+)		0.0033		0.0033		0.0033		0.0033
A(+)		1.39		1.39		1.39		1.39
ϕ		1ϕ J/8		1ϕ J/8		1ϕ J/8		1ϕ J/8

NERVIO 6

b = 12 cm h = 40 cm d = 35 cm

$w = 0.54$ T/M

		3.65		3.65		3.65		3.65	
M(-)	0	0	0.77		0.51		0.77		0.0
Vw		0.99	0.99	0.99	0.99	0.99	0.99	0.99	
VM		-0.21	0.21	0.07	-0.07	-0.07	0.21	-0.21	
ΣV		0.78	1.20	1.06	0.92	0.92	1.20	0.78	
R		0.78	2.26		1.84		2.26	0.78	
Xo		1.44		1.96		1.70		2.22	
M(+)		0.56		0.27		0.27		0.56	
Vi		0	0.77	0.96	0.69	0.70	0.95	0.77	0
M(-)			0.007		0.005		0.007		0.0
ρ(-)		0.0033	0.0033		0.0033		0.0033		0.0033
As(-)		1.39	1.39		1.39		1.39		1.39
ϕ		1ϕ 5/8"	1ϕ 5/8"		1ϕ 5/8"		1ϕ 5/8"		1ϕ 5/8"
M(+)			0.005	0.003		0.0033		0.005	
ρ(+)			0.0033	0.0033		0.0033		0.0033	
As(+)			1.39	1.39		1.39		1.39	
ϕ			1ϕ 5/8"	1ϕ 5/8"		1ϕ 5/8"		1ϕ 5/8"	

NERVIO 7

b = 12cm h = 40cm d = 35cm

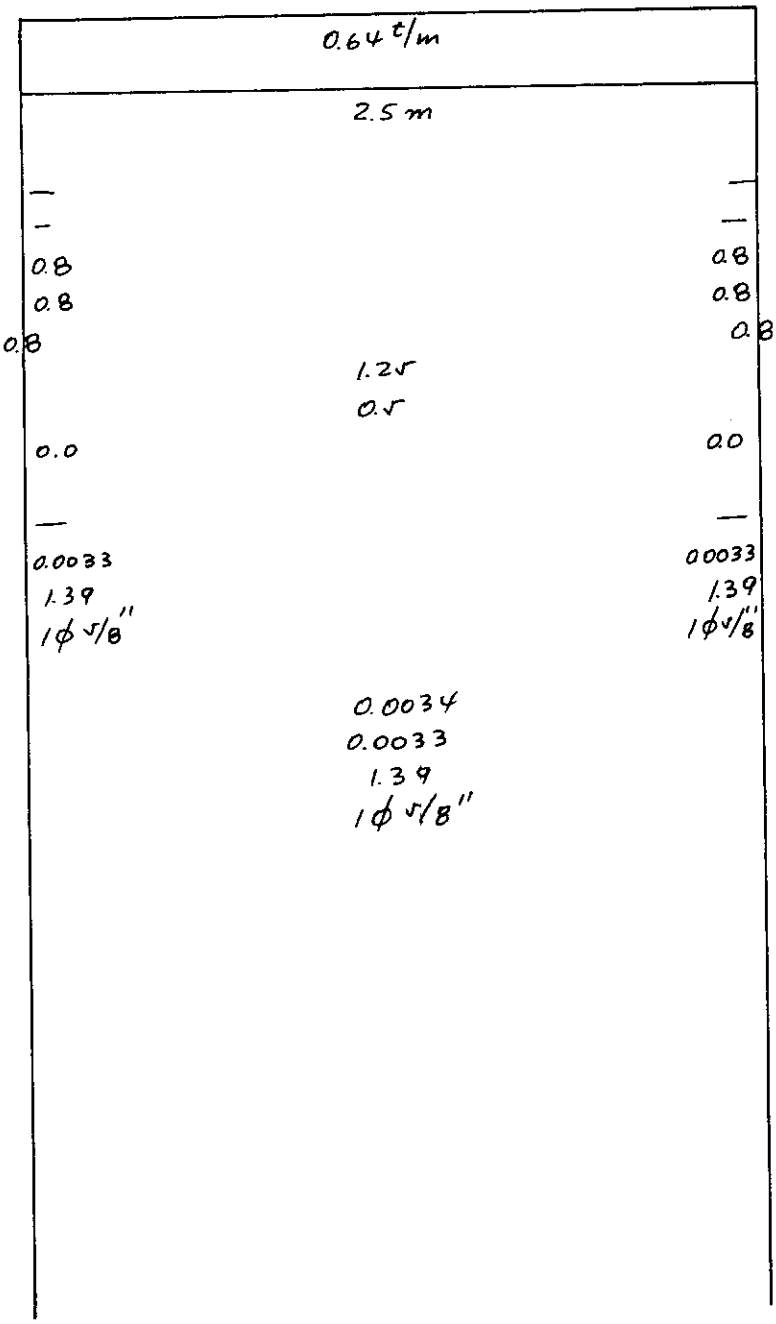
0.54 t/m

0.33 t/m | 0.33 t/m

	3.65		2.15		1.50		0.90		1.75		1.0		3.65	
M(-)	0	✗	0.41		0.04		0.09		0.05		0.12		0.54	0.0
Vw	0.60		0.60	0.35	0.35	0.41	0.41	0.24	0.24	0.29	0.29	0.17	0.17	0.60	0.60
Vm	-0.11		0.11	0.17	-0.17	-0.03	0.03	0.04	-0.04	-0.04	0.04	-0.42	0.42	0.15	-0.15
ΣV	0.49		0.71	0.52	0.18	0.38	0.44	0.28	0.20	0.25	0.33	-0.25	0.59	0.75	0.45
R	0.49		1.23		0.56		0.72		0.45		0.08		1.34		0.45
Xo		1.48		1.58		0.70		0.52		0.76				2.27	
M+		0.36		0.001		0.09		-0.02		0.05				0.31	
Xi	0		0.69	1.47	0.46	0.11	0.21		0.23		0.47		0.9		0.0
M(-)	—		0.003		0.0004		0.001		0.0003		0.001		0.004		—
ρ(-)	0.0033		0.0033		0.0033		0.0033		0.0033		0.0033		0.0033		0.0033
As(-)	1.39		1.39		1.39		1.39		1.39		1.39		1.39		1.39
ϕ	1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8
M+		0.002		—		0.001		—		0.0003		—		0.002	
ρ+		0.0033		0.0033		0.0033		0.0033		0.0033		0.0033		0.0033	
As		1.39		1.39		1.39		1.39		1.39		1.39		1.39	
ϕ		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8		1ϕ 5/8	

NERVIO 8

b = 12cm h = 40cm d = 35cm



M(-)	—		—
V M	—		—
Vw	0.8		0.8
ΣV	0.8		0.8
R	0.8		0.8
Xo		1.2r	
M(+)		0.r	
Xr	0.0		0.0
M(-)	—		—
P(-)	0.0033		00033
A(-)	1.39		1.39
ϕ	1ϕ r/8"		1ϕr/8"
M(+)		0.0034	
P(+)		0.0033	
A(+)		1.39	
ϕ		1ϕ r/8"	

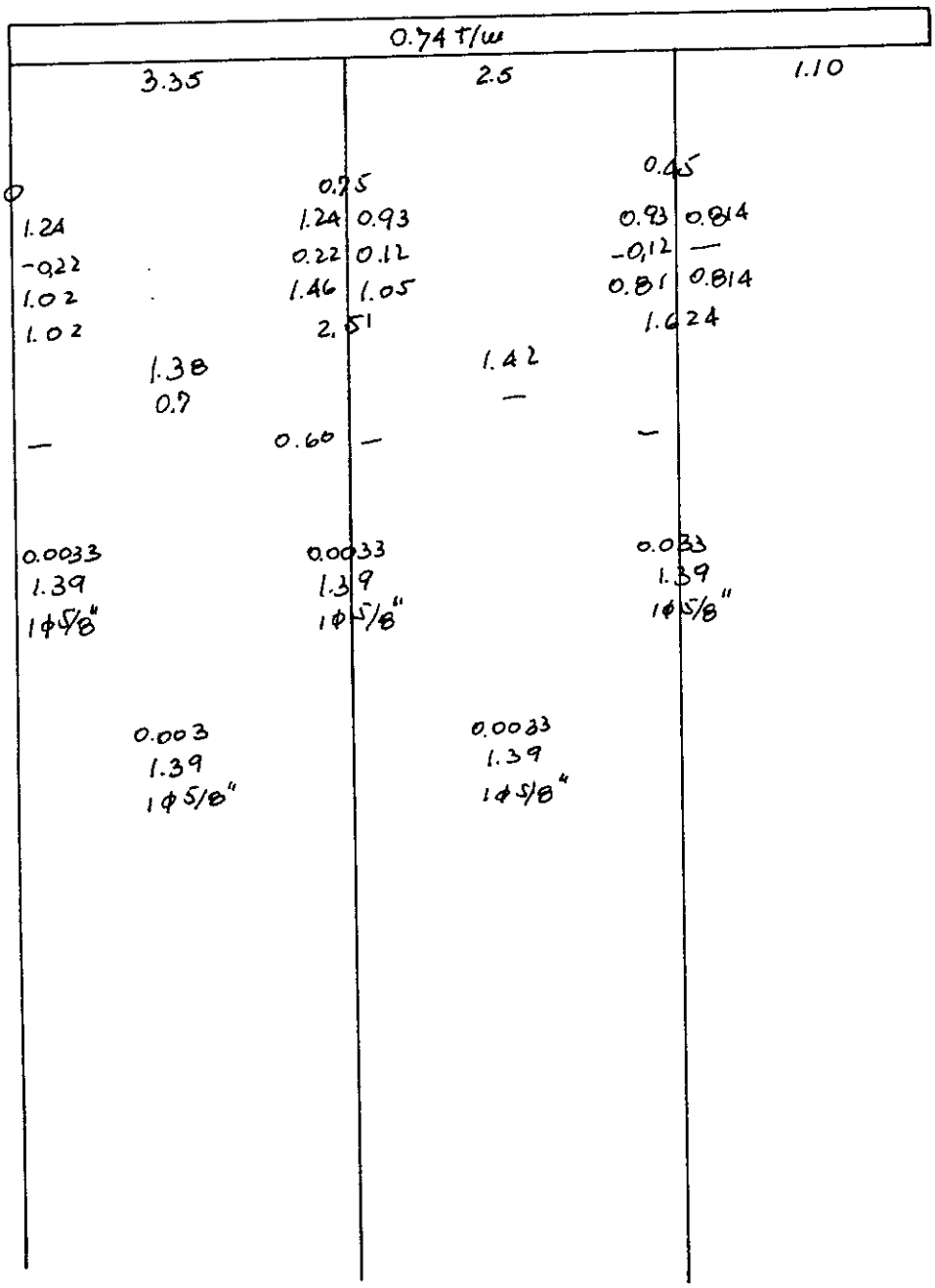
NERVIO 9

b = 12 cm. h = 40 cm d = 35 cm

	0.74 T/m		0.45 T/m		
	2.50	1.75	1.60		
M(-)	0	040	0.06		0
V_w	0.93	0.93 0.39	0.39	0.36	0.36
V_H	-0.16	0.16 0.79	-0.79	0.04	-0.04
V	0.77	1.09 0.58	0.20	0.40	0.32
R	0.77	1.67	0.60		0.32
X_o	1.04	1.24	0.84		
M(+)	0.4	-003	0.13		
Xi	0.0	0.42	0.17		0.0
K(-)	—	—	—		—
P(-)	0.0033	0.0033	0.033		0.0033
A_s(-)	1.39	1.39	1.39		1.39
ϕ	1 ϕ 5/8"	1 ϕ 5/8"	1 ϕ 5/8"		1 ϕ 5/8"
K(+)					
P(+)	0.0033	0.0033	0.0033		
A_s(+)	1.39	1.39	1.39		
ϕ	1 ϕ 5/8"	1 ϕ 5/8"	1 ϕ 5/8"		

NERVIO 10

b = .12 cm h = 40 cm d = 35 cm



H(-)	0			0.25			0.45	
Vω	1.24			1.24	0.93		0.93	0.814
VH	-0.22			0.22	0.12		-0.12	—
V	1.02			1.46	1.05		0.81	0.814
R	1.02			2.51			1.624	
X_o		1.38				1.42		
H(+)		0.7				—		
X_i	—			0.60	—		—	
K(-)								
ρ(-)	0.0033			0.0033			0.0033	
As(-)	1.39			1.39			1.39	
ϕ	1ϕ5/8"			1ϕ5/8"			1ϕ5/8"	
K(+)								
ρ(+)		0.003				0.0033		
As(+)		1.39				1.39		
ϕ		1ϕ5/8"				1ϕ5/8"		

PREDISEÑOS

PREDISEÑO DE VIGAS

Placa Tipo Niveles 1 al 6

Viga A

Reacción del Nervio Tipo : 1.32 Ton

Carga por Metro : 1.32/0.72 = 1.83 Ton/m

Carga Total = 1.15x1.83 = 2.105Ton/m

Long. de la Luz Tipo = 3.65 m

$M = wL^2/12 = 2.105x(3.65)^2/12 = 2.34$ Ton/m

Altura de Prediseño = 40 cm

K Intermedio = 0.03634

$= Mu/Kd^2 = \dfrac{234}{0.03634(35)^2} = 5.256$ 20 cm

Peso de la Viga = 0.20 x 0.4 x 2.4 x 1.4 = 0.27 Tom/m

Mediante el precedimiento anterior se obtuvo el sgte.cuadro:

	A	B	C	D	E	F	G	H
7	20x20	40x40	20x40	40x40	20x40	20x40	40x40	20x
1al6	20x40	40x40	20x40	40x40	20x40	20x40	40x40	20x
8					30x40			30x

PREDISEÑO DE COLUMNAS

Método de areas aferente

Peso de la placa : $WL + WD = 340 + 929.6 = 1269.6 = W$

$Pn = WAqn$: P = Carga de prediseño
Aq = Area aferente
n = Número de placas.

$Wu_1 = Pn/L_1$: L_1 = Longitud aferente transversal al pórtico o viga.

$$Mu = \frac{Wu_1}{12} \times L_2^2$$

Wu_1 = Carga repartida de prediseño
L_2 = Longitud aferente longitudinal a la viga.

Columna 21-24 Portico D

$Aq = [(3.65/2) + 1.4] \times 3.65 = 11.77$

$n = 1$

$Pn = (11.77)(1269.6)(1) = 14943.19$

$L_1 = 3.65$ y $L_2 = 3.225$

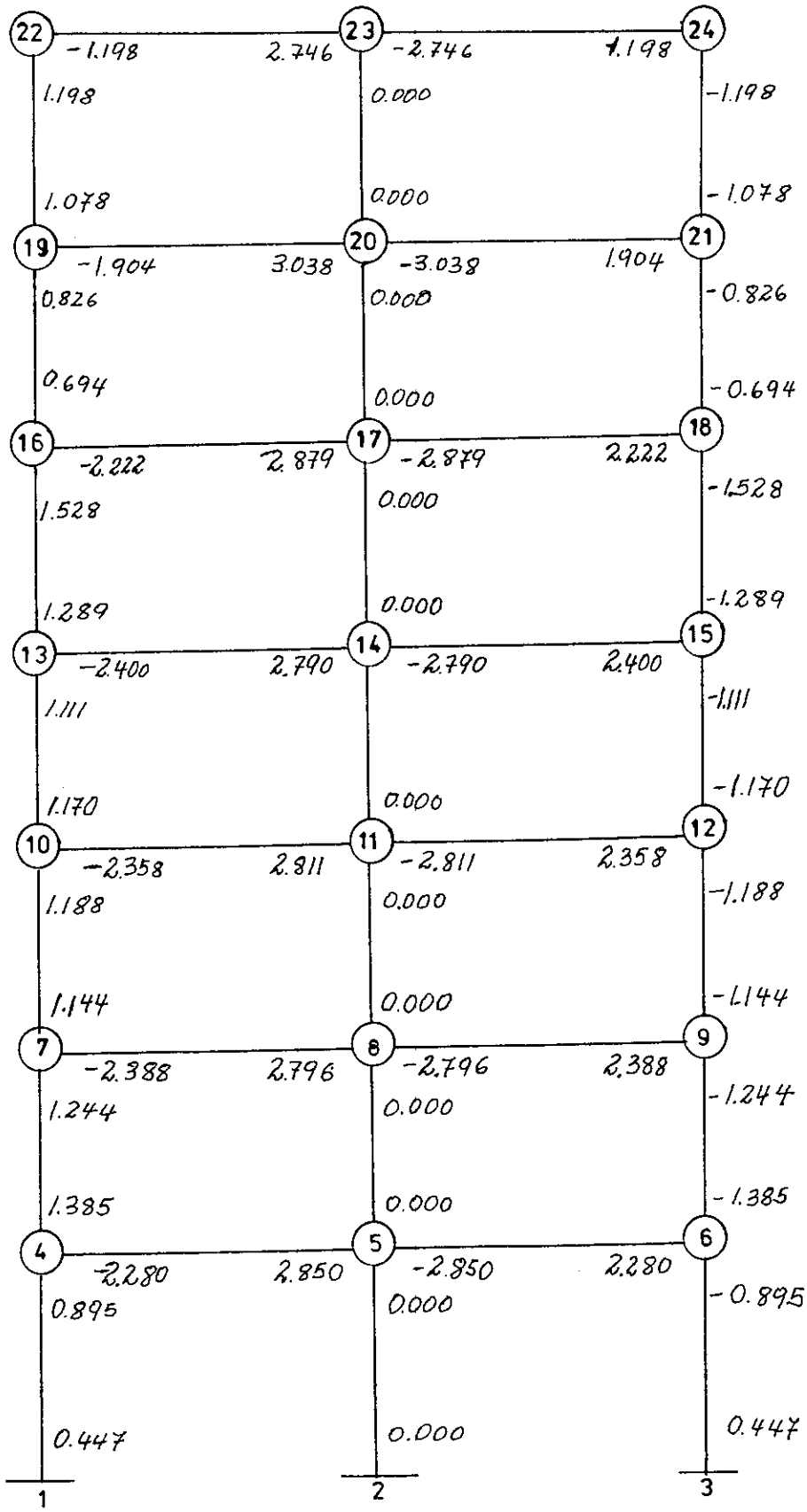
$Wu_1 = Pn/L_1 = 14943.19/3.65 = 4094.03$

$$Mu = \frac{Wu_1}{12} \times L_2^2 = 3548.37$$

Sección 30 x 30.

PORTICO CARGA VERTICAL

PORTICO A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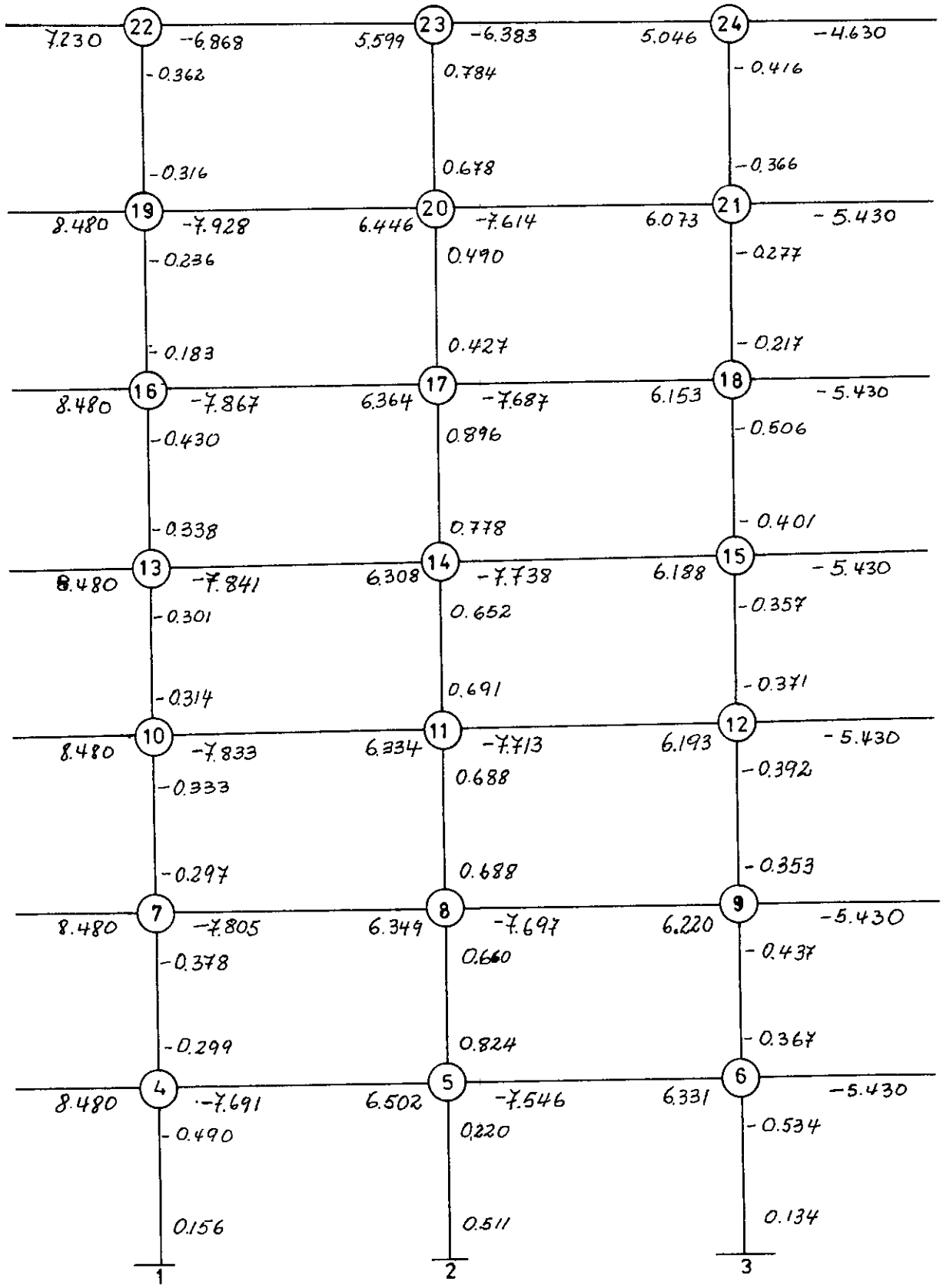
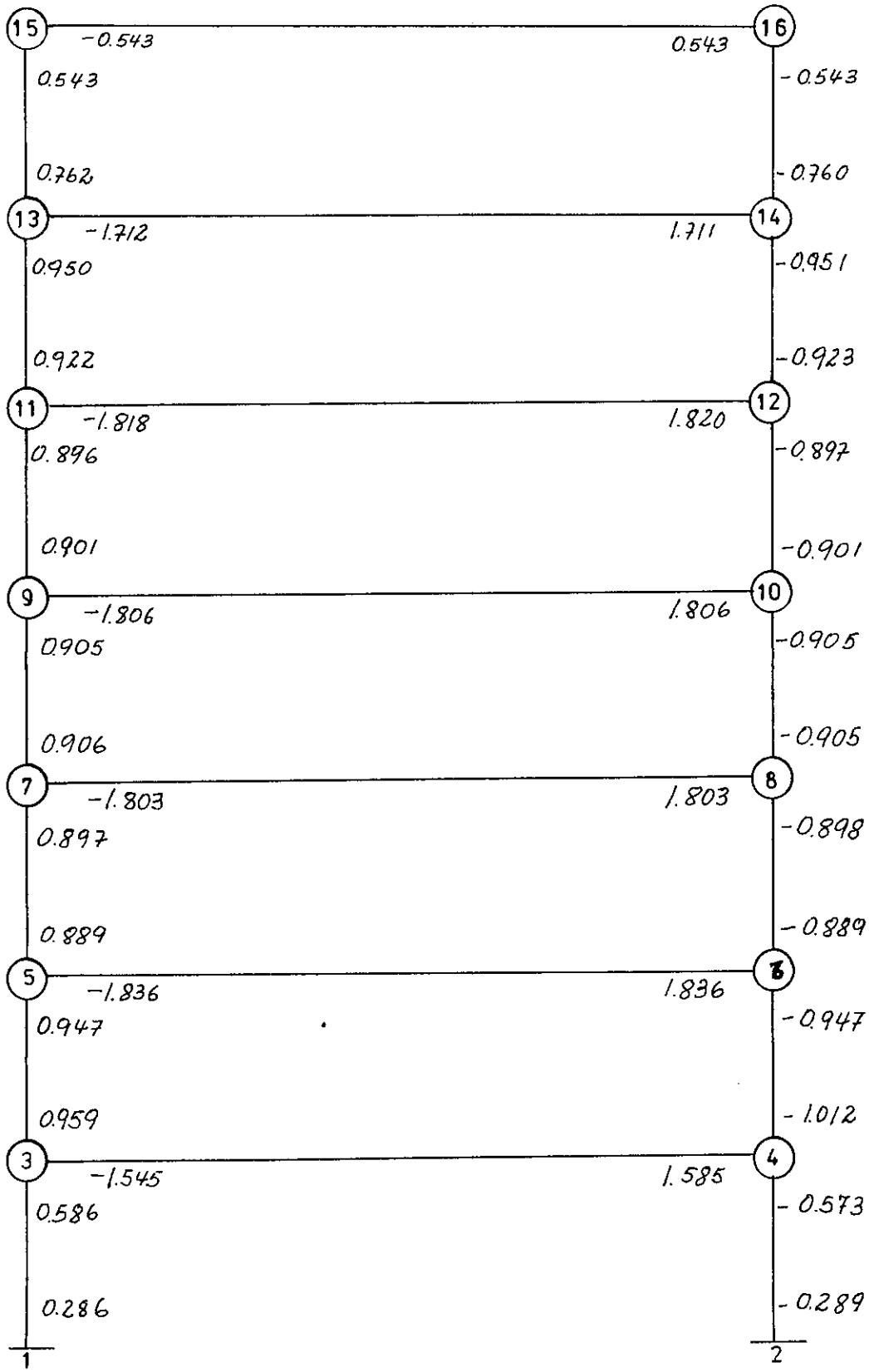
23
24
-1.198
2.746
-2.746
1.198
1.198
0.000
-1.198
1.078
0.000
-1.078
19
20
21
-1.904
3.038
-3.038
1.904
0.826
0.000
-0.826
0.694
0.000
-0.694
16
17
18
-2.222
2.879
-2.879
2.222
1.528
0.000
-1.528
1.289
0.000
-1.289
13
14
15
-2.400
2.790
-2.790
2.400
1.111
-1.111
1.170
0.000
-1.170
10
11
12
-2.358
2.811
-2.811
2.358
1.188
0.000
-1.188
1.144
0.000
-1.144
7
8
9
-2.388
2.796
-2.796
2.388
1.244
0.000
-1.244
1.385
0.000
-1.385
4
5
6
-2.280
2.850
-2.850
2.280
0.895
0.000
-0.895
0.447
0.000
0.447
1
2
3

PORTICO B


22
23
24
19
20
21
16
17
18
13
14
15
10
11
12
7
8
9
4
5
6
1
2
3
7.230
-6.868
5.599
-6.383
5.046
-4.630
-0.362
0.784
-0.416
-0.316
0.678
-0.366
8.480
-7.928
6.446
-7.614
6.073
-5.430
-0.236
0.490
-0.277
-0.183
0.427
-0.217
8.480
-7.867
6.364
-7.687
6.153
-5.430
-0.430
0.896
-0.506
-0.338
0.778
-0.401
8.480
-7.841
6.308
-7.738
6.188
-5.430
-0.301
0.652
-0.357
-0.314
0.691
-0.371
8.480
-7.833
6.334
-7.713
6.193
-5.430
-0.333
0.688
-0.392
-0.297
0.688
-0.353
8.480
-7.805
6.349
-7.697
6.220
-5.430
-0.378
0.660
-0.437
-0.299
0.824
-0.367
8.480
-7.691
6.502
-7.546
6.331
-5.430
-0.490
0.220
-0.534
0.156
0.511
0.134

PORTICO C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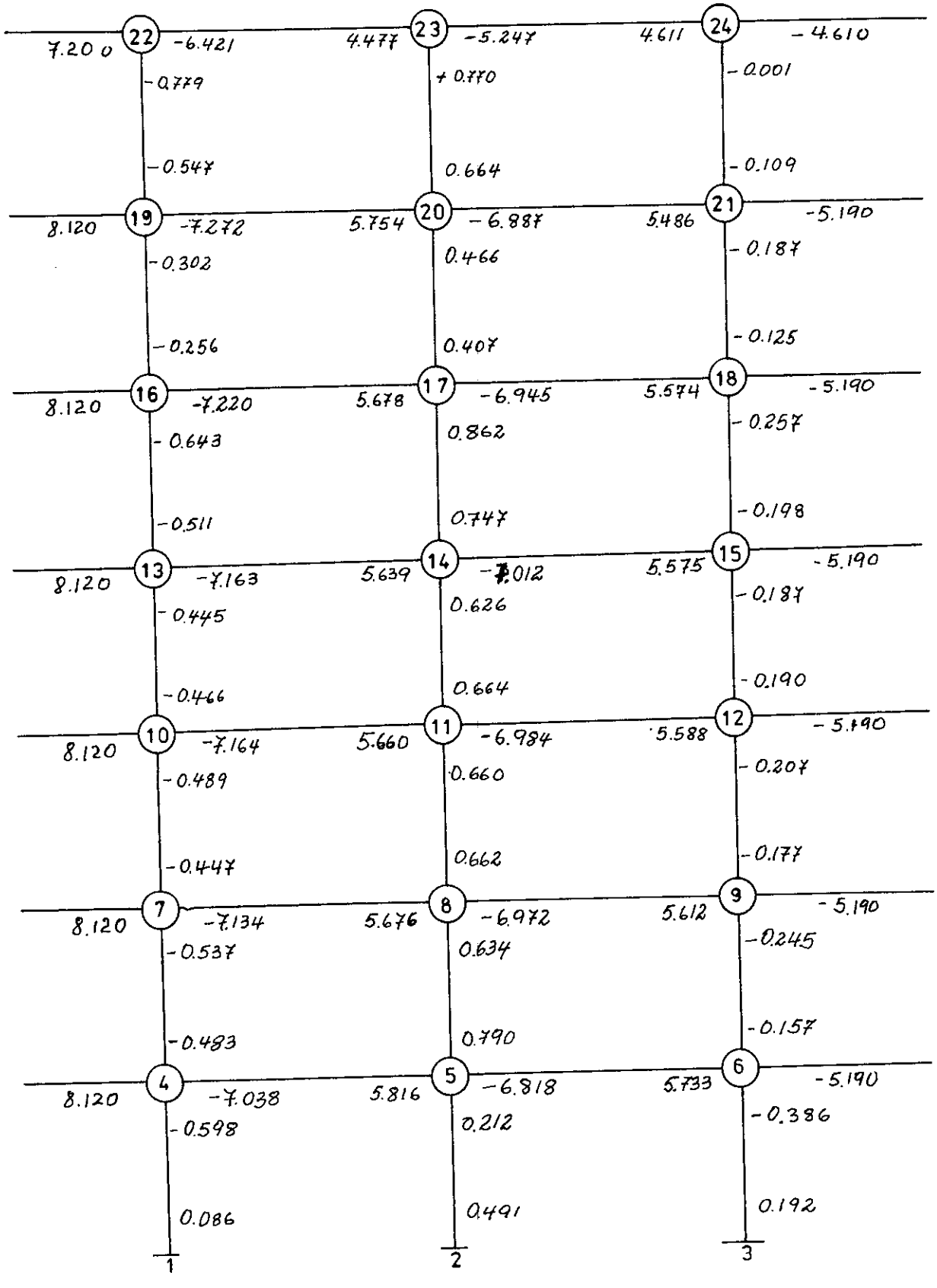
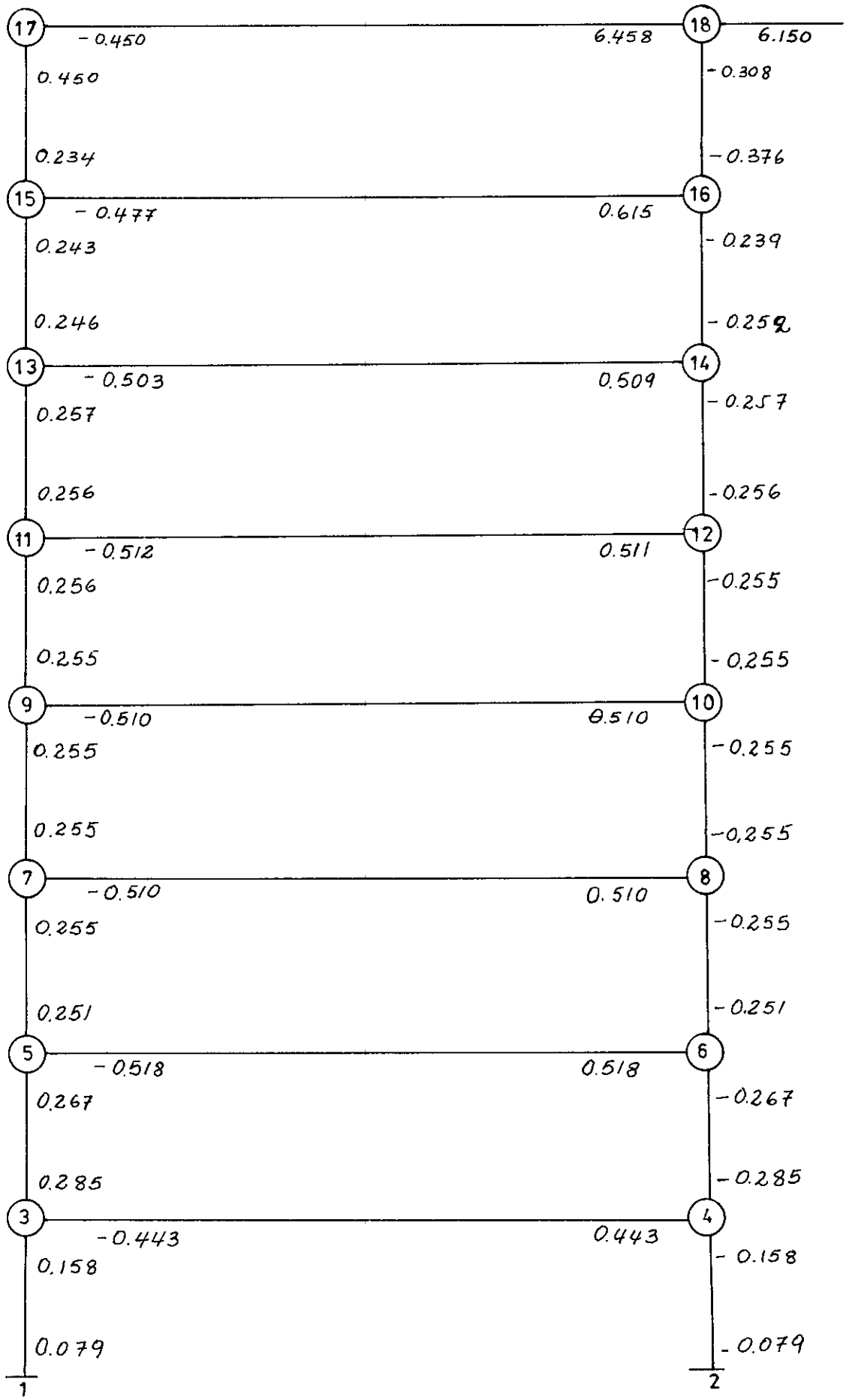
16
-0.543
0.543
0.543
-0.543
0.762
-0.760
13
14
-1.712
1.711
0.950
-0.951
0.922
-0.923
11
12
-1.818
1.820
0.896
-0.897
0.901
-0.901
9
10
-1.806
1.806
0.905
-0.905
0.906
-0.905
7
8
-1.803
1.803
0.897
-0.898
0.889
-0.889
5
6
-1.836
1.836
0.947
-0.947
0.959
-1.012
3
4
-1.545
1.585
0.586
-0.573
0.286
-0.289
1
2

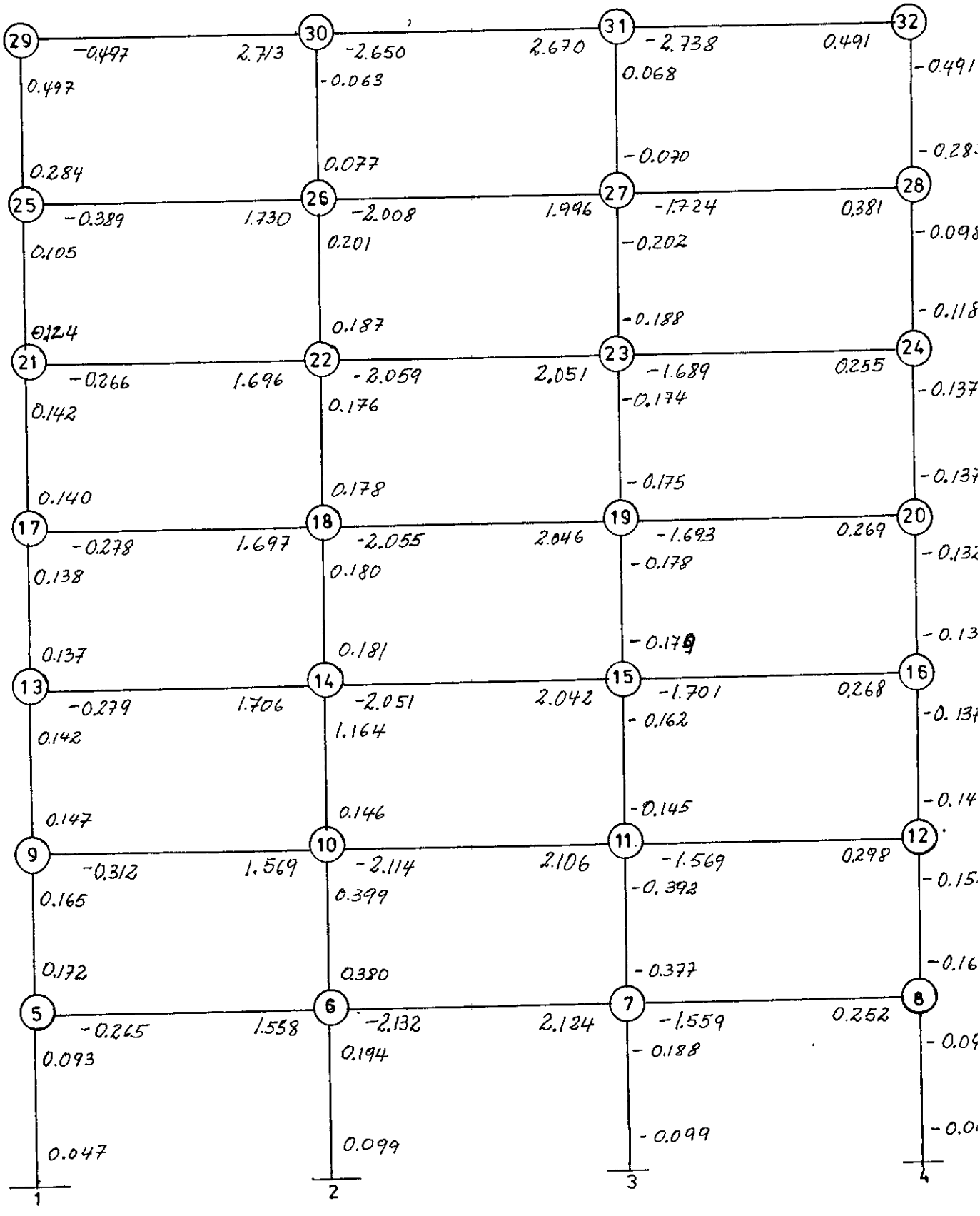
PORTICO D


22
23
24
19
20
21
16
17
18
13
14
15
10
11
12
7
8
9
4
5
6
1
2
3
7.200
-6.421
4.477
-5.247
4.611
-4.610
-0.779
+0.770
-0.001
-0.547
0.664
-0.109
8.120
-7.272
5.754
-6.887
5.486
-5.190
-0.302
0.466
-0.187
-0.256
0.407
-0.125
8.120
-7.220
5.678
-6.945
5.574
-5.190
-0.643
0.862
-0.257
-0.511
0.747
-0.198
8.120
-7.163
5.639
-7.012
5.575
-5.190
-0.445
0.626
-0.187
-0.466
0.664
-0.190
8.120
-7.164
5.660
-6.984
5.588
-5.190
-0.489
0.660
-0.207
-0.447
0.662
-0.177
8.120
-7.134
5.676
-6.972
5.612
-5.190
-0.537
0.634
-0.245
-0.483
0.790
-0.157
8.120
-7.038
5.816
-6.818
5.733
-5.190
-0.598
0.212
-0.386
0.086
0.491
0.192

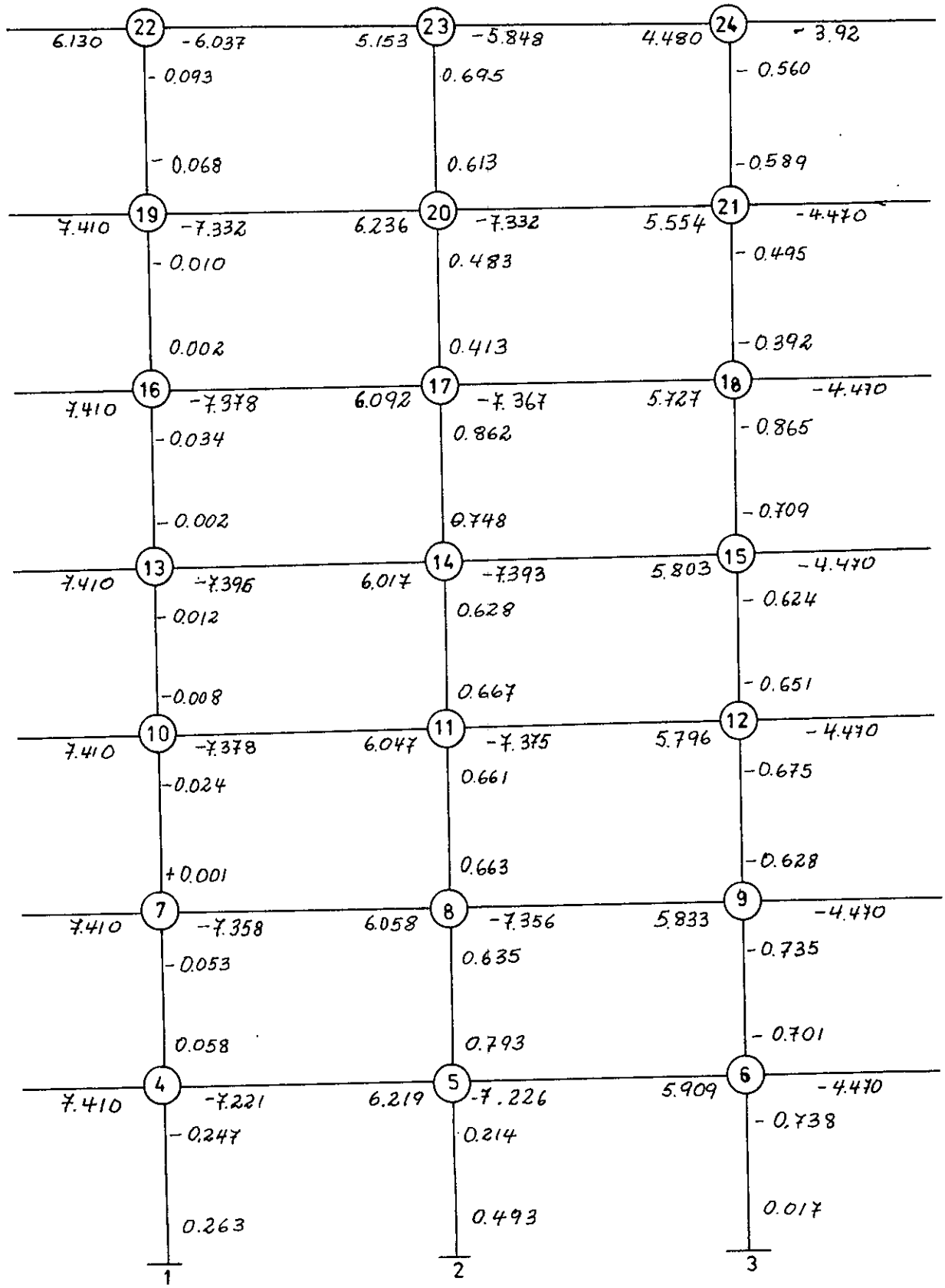
PORTICO E


17
18
15
16
13
14
11
12
9
10
7
8
5
6
3
4
1
2
-0.450
6.458
6.150
0.450
-0.308
0.234
-0.376
-0.477
0.615
0.243
-0.239
0.246
-0.252
-0.503
0.509
0.257
-0.257
0.256
-0.256
-0.512
0.511
0.256
-0.255
0.255
-0.255
-0.510
0.510
0.255
-0.255
0.255
-0.255
-0.510
0.510
0.255
-0.255
0.251
-0.251
-0.518
0.518
0.267
-0.267
0.285
-0.285
-0.443
0.443
0.158
-0.158
0.079
-0.079

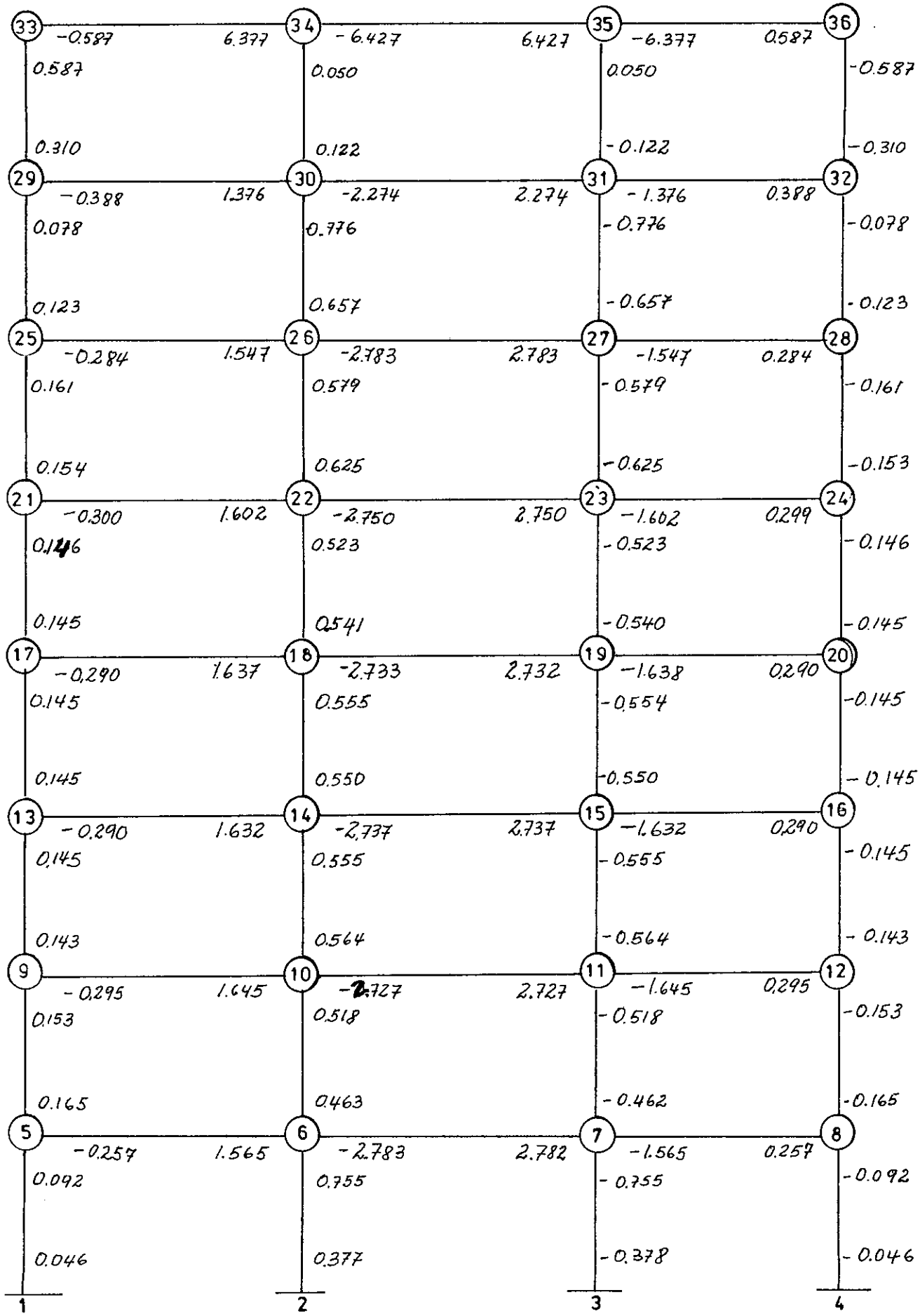
PORTICO F


29
30
31
32
-0.497
2.713
-2.650
2.670
-2.738
0.491
0.497
-0.063
0.068
-0.491
0.284
0.077
-0.070
25
26
27
28
-0.389
1.730
-2.008
1.996
-1.724
0.381
0.105
0.201
-0.202
-0.098
0.124
0.187
-0.188
-0.118
21
22
23
24
-0.266
1.696
-2.059
2.051
-1.689
0.255
0.142
0.176
-0.174
-0.137
0.140
0.178
-0.175
17
18
19
20
-0.278
1.697
-2.055
2.046
-1.693
0.269
0.138
0.180
-0.178
0.137
0.181
13
14
15
16
-0.279
1.706
-2.051
2.042
-1.701
0.268
0.142
1.164
-0.162
0.147
0.146
-0.145
9
10
11
12
-0.312
1.569
-2.114
2.106
-1.569
0.298
0.165
0.399
-0.392
0.172
0.380
-0.377
5
6
7
8
-0.265
1.558
-2.132
2.124
-1.559
0.252
0.093
0.194
-0.188
0.047
0.099
-0.099
1
2
3
4

PORTICO 6


22
23
24
6.130
-6.037
5.153
-5.848
4.480
-3.92
-0.093
0.695
-0.560
-0.068
0.613
-0.589
19
20
21
7.410
-7.332
6.236
-7.332
5.554
-4.470
-0.010
0.483
-0.495
0.002
0.413
-0.392
16
17
18
7.410
-7.378
6.092
-7.367
5.727
-4.470
-0.034
0.862
-0.865
-0.002
0.748
-0.709
13
14
15
7.410
-7.396
6.017
-7.393
5.803
-4.470
-0.012
0.628
-0.624
-0.008
0.667
-0.651
10
11
12
7.410
-7.378
6.047
-7.375
5.796
-4.470
-0.024
0.661
-0.675
+0.001
0.663
-0.628
7
8
9
7.410
-7.358
6.058
-7.356
5.833
-4.470
-0.053
0.635
-0.735
0.058
0.793
-0.701
4
5
6
7.410
-7.221
6.219
-7.226
5.909
-4.470
-0.247
0.214
-0.738
0.263
0.493
0.017
1
2
3

PORTICO H


33 34 35 36
-0.587 6.377 -6.427 6.427 -6.377 0.587
0.587 0.050 0.050 -0.587
0.310 0.122 -0.122 -0.310
29 30 31 32
-0.388 1.376 -2.274 2.274 -1.376 0.388
0.078 0.776 -0.776 -0.078
0.123 0.657 -0.657 -0.123
25 26 27 28
-0.284 1.547 -2.783 2.783 -1.547 0.284
0.161 0.579 -0.579 -0.161
0.154 0.625 -0.625 -0.153
21 22 23 24
-0.300 1.602 -2.750 2.750 -1.602 0.299
0.146 0.523 -0.523 -0.146
0.145 0.541 -0.540 -0.145
17 18 19 20
-0.290 1.637 -2.733 2.732 -1.638 0.290
0.145 0.555 -0.554 -0.145
0.145 0.550 -0.550 -0.145
13 14 15 16
-0.290 1.632 -2.737 2.737 -1.632 0.290
0.145 0.555 -0.555 -0.145
0.143 0.564 -0.564 -0.143
9 10 11 12
-0.295 1.645 -2.727 2.727 -1.645 0.295
0.153 0.518 -0.518 -0.153
0.165 0.463 -0.462 -0.165
5 6 7 8
-0.257 1.565 -2.783 2.782 -1.565 0.257
0.092 0.755 -0.755 -0.092
0.046 0.377 -0.378 -0.046
1 2 3 4

PORTICO CARGA DE VIENTO

CARGAS DE VIENTO

FORMULAS

$V = 90$ K/Hora

$Vh = V \left(h/11 \right)^{0.13}$

$p = 0.008 \, (Vh)^2$

$P = p \times A$

$P' = 1.7 \, P$

EJEMPLO

PORTICO A

Nivel 2

$h = 3.1$

$Vh = 90 \left(3.1/11 \right)^{0.13} = 76.33$

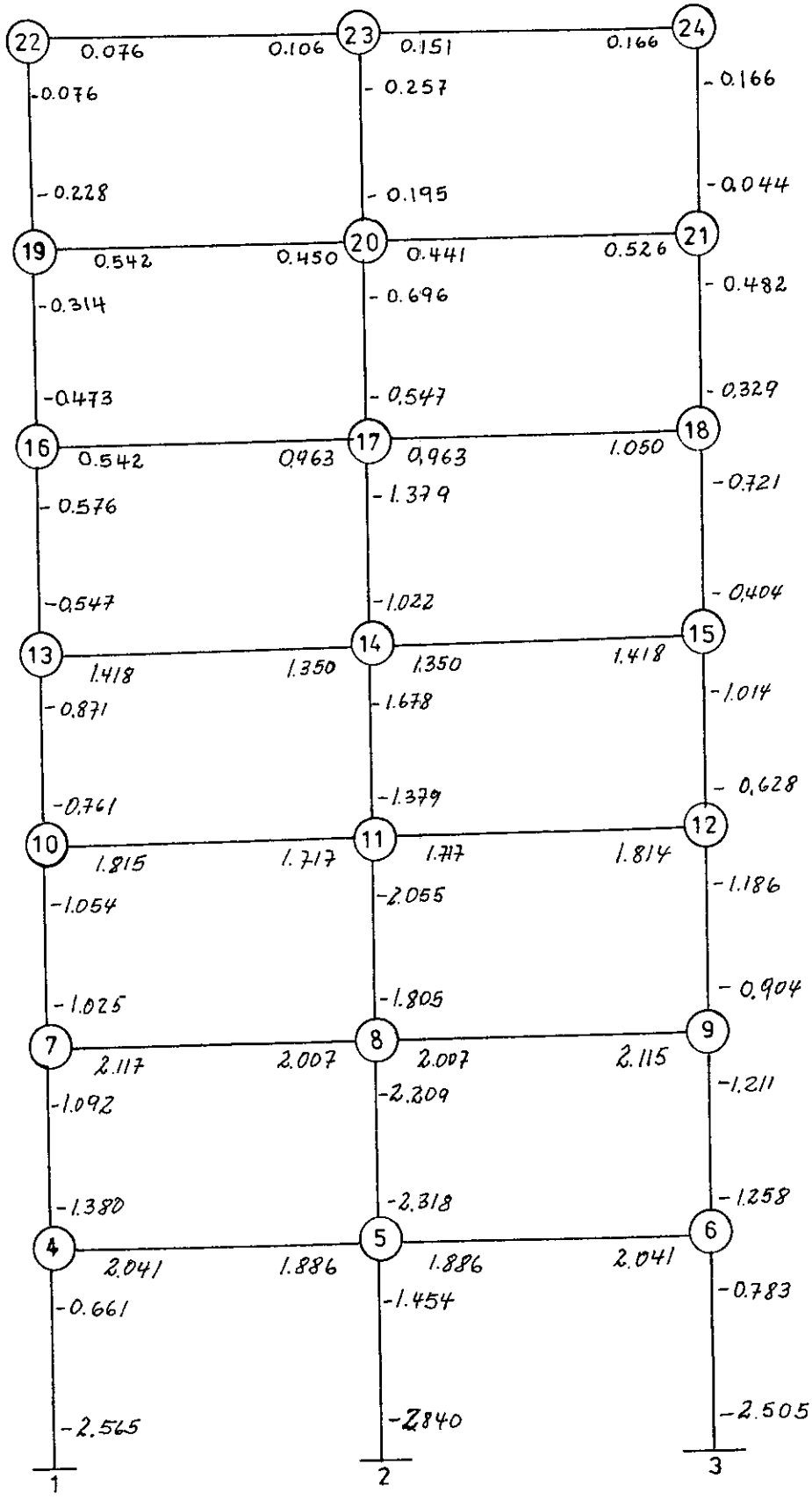
$p = 0.008 \left(76.33 \right)^2 = 46.61$

$A = 3 \times 1.825 = 5.475$

$P = 5.475 \times 46.61 = 255.19$

$1.7P = 433.82 \quad 434 \text{ Kg} = 0.434 \text{ Tom.}$

PORTICO A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23
24
0.076
0.106
0.151
0.166
-0.076
- 0.257
- 0.166
- 0.228
- 0.195
- 0.044
19
20
21
0.542
0.450
0.441
0.526
-0.314
- 0.696
- 0.482
-0.473
- 0.547
- 0.329
16
17
18
0.542
0.463
0.963
1.050
- 0.576
- 1.379
- 0.721
-0.547
-1.022
- 0.404
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1.418
-0.871
-1.678
-1.014
-0.761
-1.379
- 0.628
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11
12
1.815
1.717
1.717
1.814
-1.054
-2.055
-1.186
-1.025
-1.805
- 0.904
7
8
9
2.117
2.007
2.007
2.115
-1.092
-2.209
-1.211
-1.380
-2.318
-1.258
4
5
6
2.041
1.886
1.886
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-2.505
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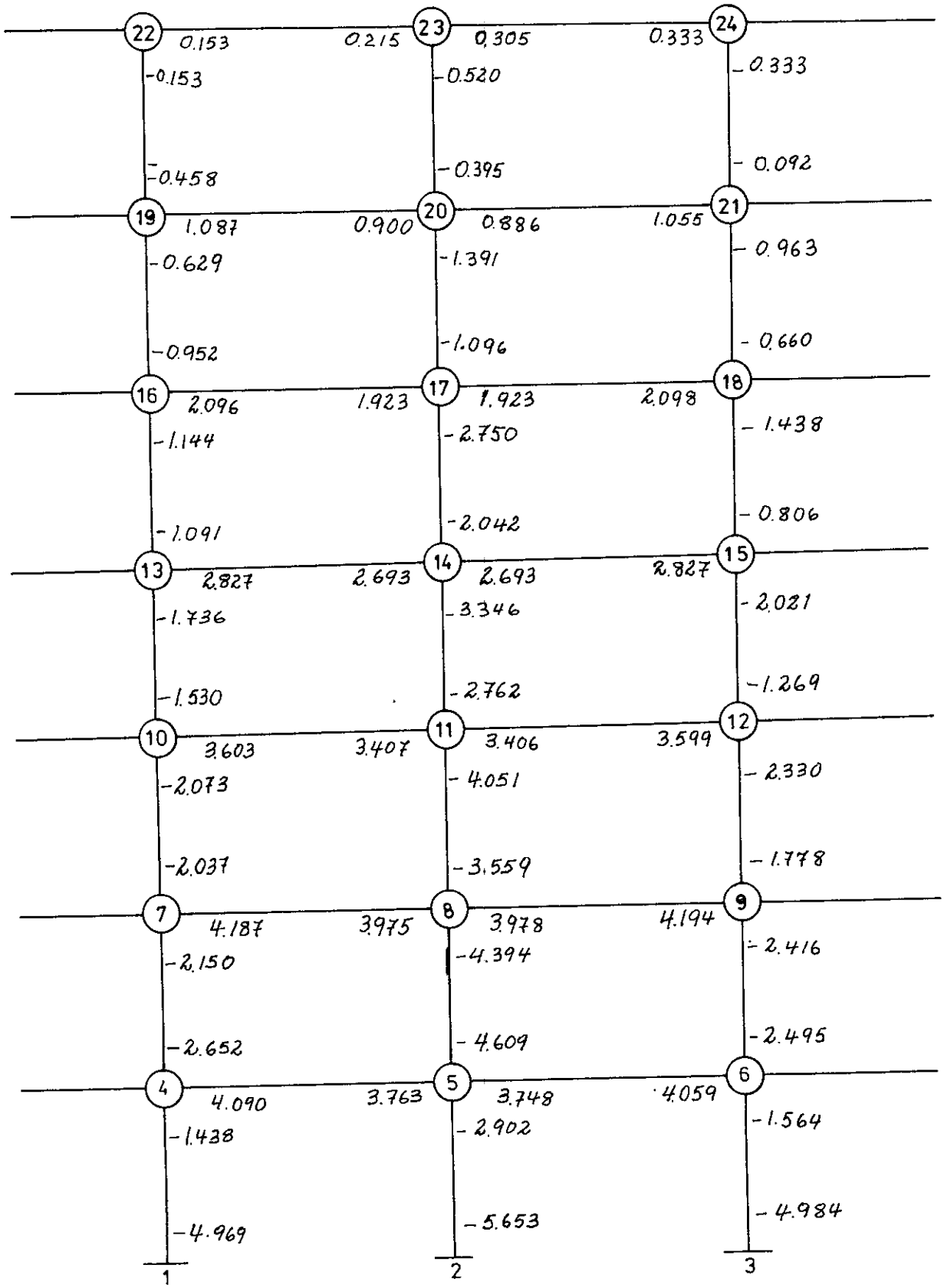
PORTICO B D G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0.886
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-2.750
-1.438
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-2.042
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14
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-1.530
-2.762
-1.269
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3.406
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-2.150
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-2.416
-2.652
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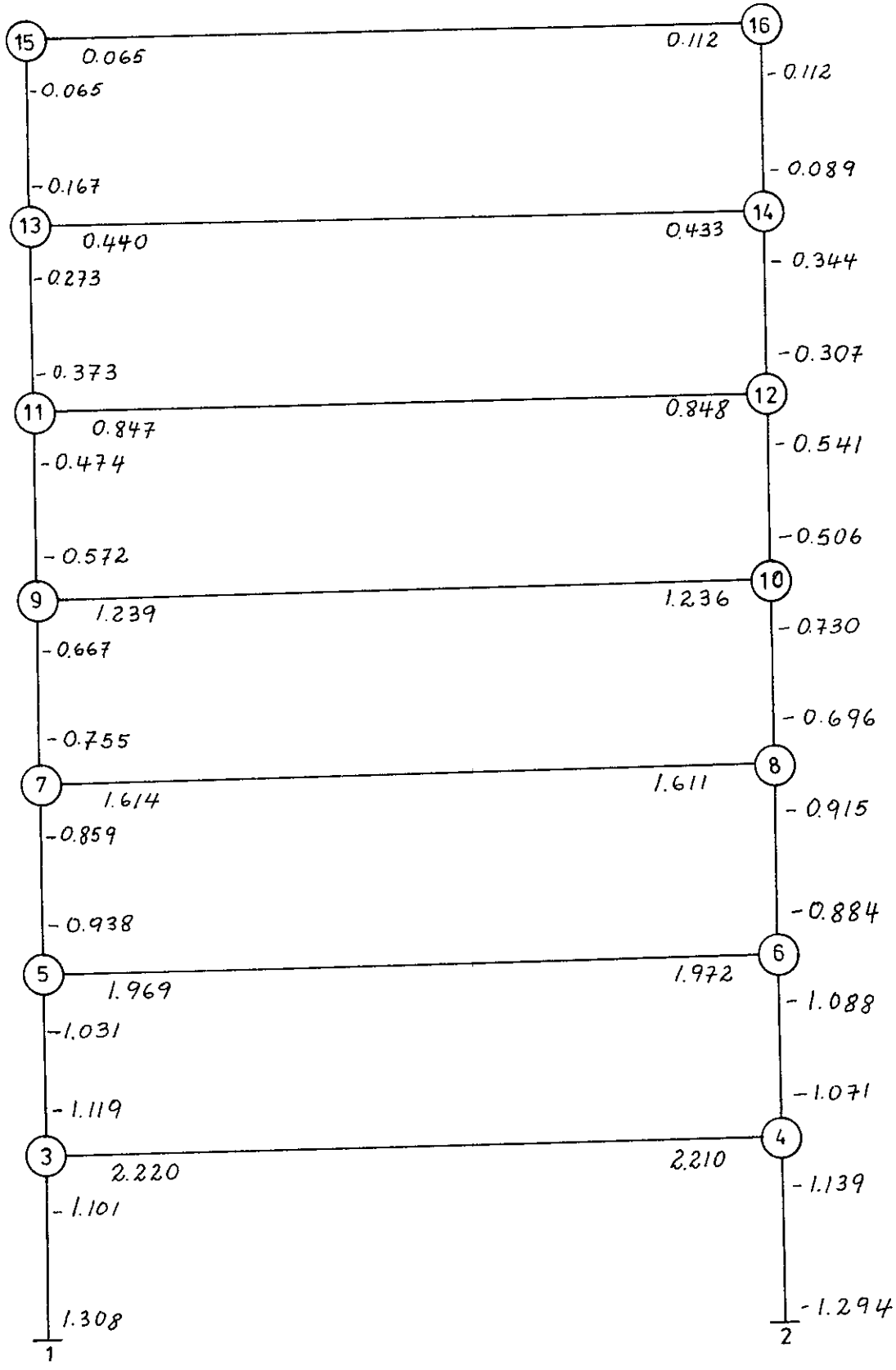
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-0.373
-0.307
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0.847
0.848
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-0.541
-0.572
-0.506
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1.239
1.236
-0.667
-0.730
-0.755
-0.696
7
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1.614
1.611
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-0.915
-0.938
-0.884
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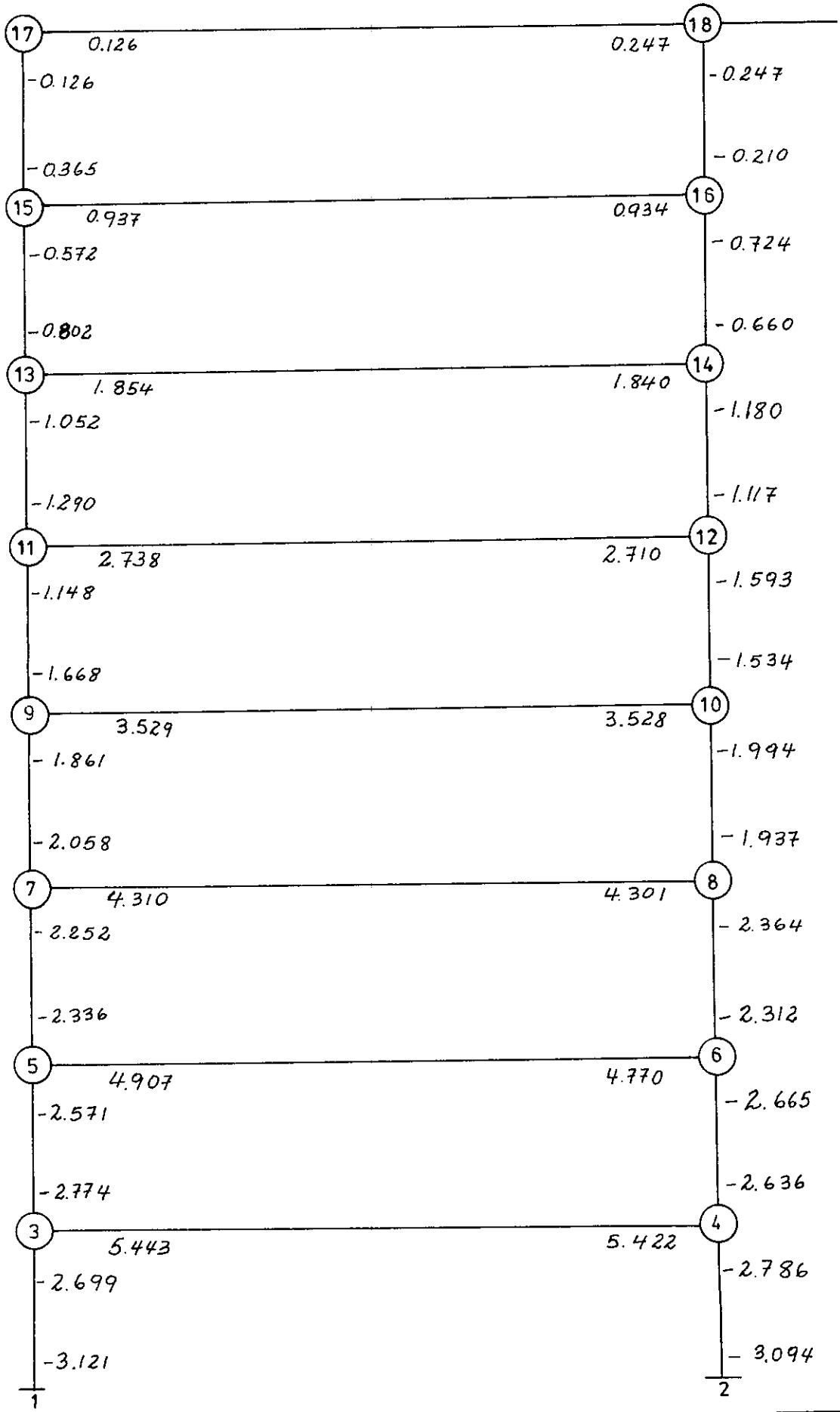
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-0.802
-0.660
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14
1.854
1.840
-1.052
-1.180
-1.290
-1.117
11
12
2.738
2.710
-1.148
-1.593
-1.668
-1.534
9
10
3.529
3.528
-1.861
-1.994
-2.058
-1.937
7
8
4.310
4.301
-2.252
-2.364
-2.336
-2.312
5
6
4.907
4.770
-2.571
-2.665
-2.774
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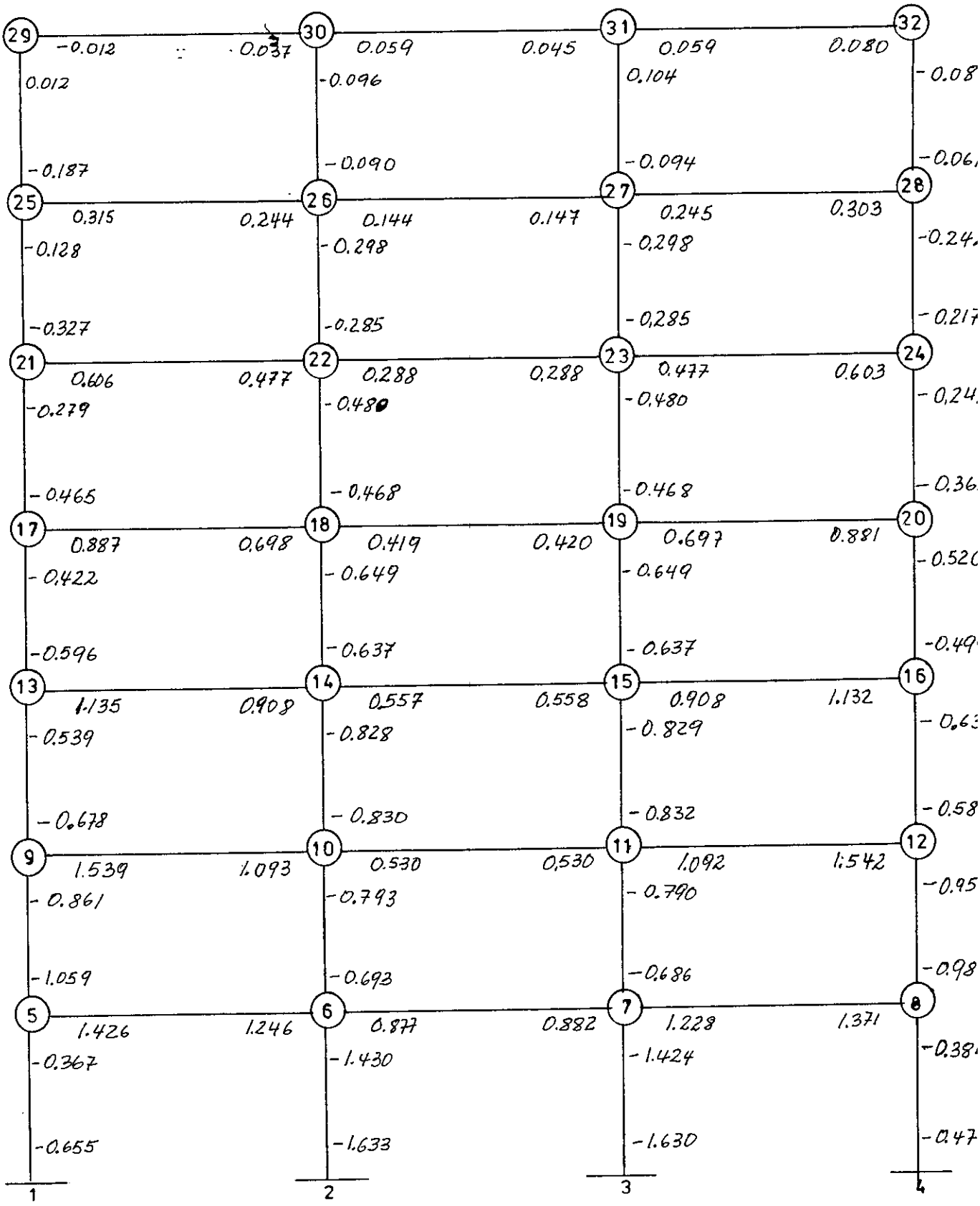
PORTICO F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-0.187
-0.090
-0.094
-0.06
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26
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0.245
0.303
-0.128
-0.298
-0.298
-0.24
-0.327
-0.285
-0.285
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21
22
23
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0.477
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-0.480
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7
8
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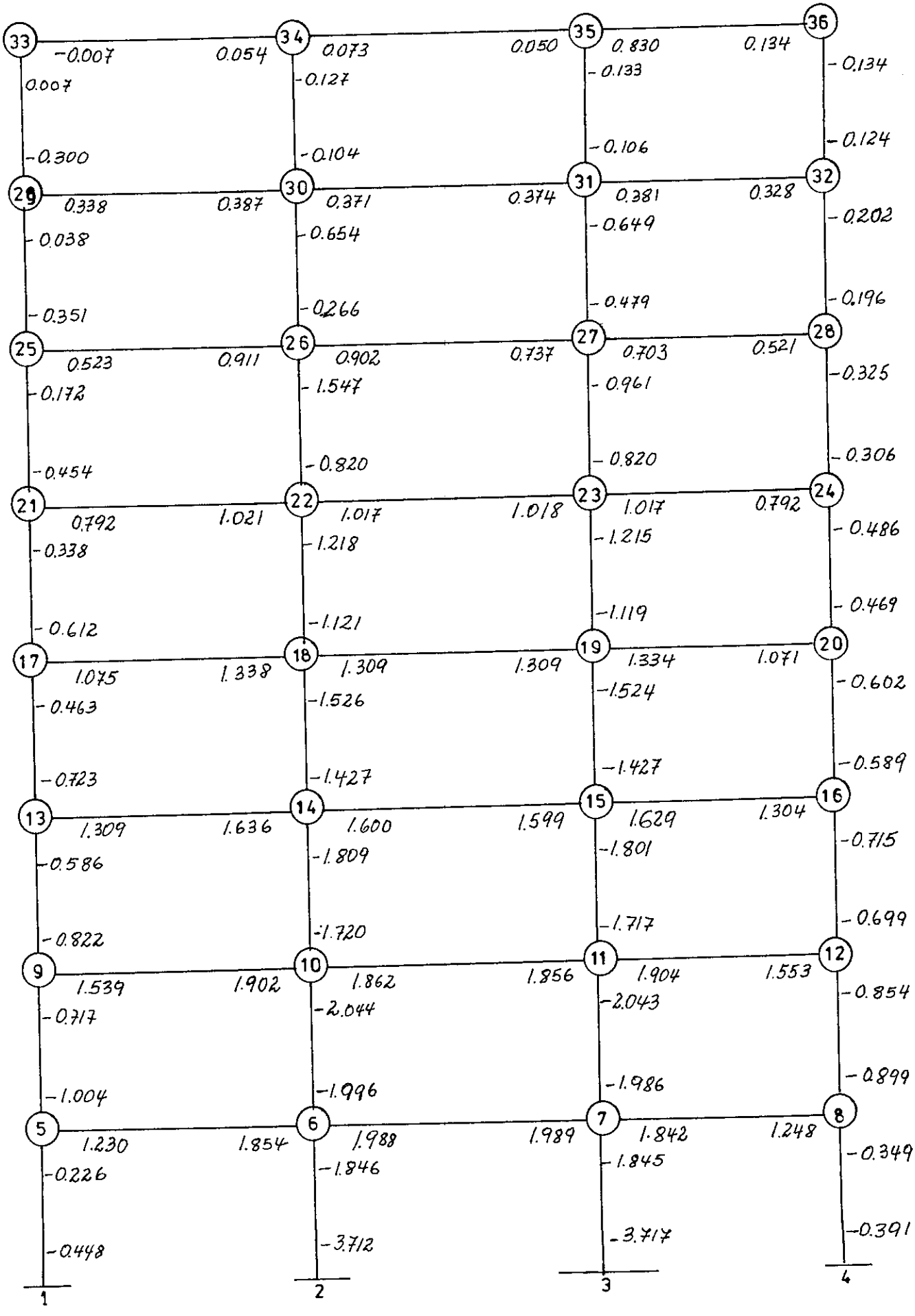
2
3
4

PORTICÓ H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17 18 19 20
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-0.723 -1.427 -1.427 -0.589
13 14 15 16
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-0.586 -1.809 -1.801 -0.715
-0.822 -1.720 -1.717 -0.699
9 10 11 12
1.539 1.902 1.862 1.856 1.904 1.553
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-1.004 -1.996 -1.986 -0.899
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-0.448 -3.712 -3.717 -0.391
1 2 3 4

VIGAS

VIGA "A" NIVEL 2-7

b=20cm h=40cm d=35 cm

2.10 T/M

	3.65 M			3.65M		
M(-)	2.400		3.038	3.038		2.400
Vω	3.833		3.833	3.833		3.833
VM	-0.175		0.175	0.175		-0.175
ΣV	3.658		4.008	4.008		3.658
R	3.658		8.0	16		3.658
X_o	→ 1.74			→ 1.91		
M(+)		0.78			0.79	
Xi	→ 0.88		1.05 ←	→ 1.04		0.87 ←
			VIENTO	IZQUIERDA →		
M(-)	0.283		5.045	1.031		4.515
Vω	3.833		3.833	3833		3.833
VM	-1.305		1.305	-0.955		0.955
ΣV	2.528		5.138	2.878		4.788
R	2.528		8.0	16		4.788
X_o	→ 1.20			→ 1.37		
M(+)		1.23			0.94	
Xi	→ 0.12		1.37 ←	→ 0.43		1.33 ←
			VIENTO	DERECHA ←		
M(-)	4.517		1.031	5.045		0.285
Vω	3.833		3.833	3.833		3.833
VM	0.955		-0.955	1.305		-1.305
ΣV	4.788		2.878	5.138		2.528
R	4.788		8.0	16		2.528
X_o	→ 2.28			→ 2.45		
M(+)		0.94			1.25	
Xi	→ 1.33		0.43 ←	→ 1.36		0.11 ←
K(-)	0.016		0.019	0.019		0.017
ρ(-)	0.005		0.006	0.006		0.005
As(-)	3.70		4.44	4.44		3.70
φ(-)	1φ5/8"+1φ3/4		1φ5/8"+1φ3/4"	1φ5/8"+1φ3/4"		1φ5/8"+1φ3/4"
K(+)		0.005			0.005	
ρ(+)		0.0033			0.0033	
As(+)		2.44			2.44	
φ(+)		2φ1/2"			2φ1/2"	

VIGA "A" NIVEL 8

b = 20 cm h = 40 cm d = 35 cm

1.76 T/M

	3.65 M			3.65 M		
M(-)	1.198		2.746	2.746		1.198
Vω	3.212		3.212	3.212		3.212
VM	-0.424		0.424	0.424		- 0.424
ΣV	2.788		3.636	3.636		2.788
R	2.788		7.272			2.788
Xo	→ 1.58			→ 2.07		
M(+)		1.01			1.01	
Xi	→ 0.51		1.00 ←	→ 1.00		0.50 ←
			VIENTO	IZQUIERDA →		
M(-)	1.122		2.852	2.595		1.364
Vω	3.212		3.212	3.212		3.212
VM	-0.474		0.474	0.337		-0.337
ΣV	2.738		3.686	3.549		2.875
R	2.738		7.235			2.875
Xo	→ 1.56			→ 2.02		
M(+)		1.01			0.98	
Xi	→ 0.48		1.01 ←	→ 0.96		0.57 ←
			VIENTO	DERECHA ←		
M(-)	1.274		2.640	2.897		1.032
Vω	3.212		3.212	3.212		3.212
VM	-0.374		0.374	0.511		- 0.511
ΣV	2.838		3.586	3.723		2.701
R	2.838		7.309			2.701
Xo	→ 1.61			→ 2.11		
M(+)		1.01			1.03	
Xi	→ 0.54		0.97 ←	→ 1.03		0.47 ←
K(-)	0.005		0.010	0.011		0.005
ρ(-)	0.0033		0.0033	0.0033		0.0033
As(-)	2.44		2.44	2.44		2.44
Φ(-)	2Φ1/2"		2Φ1/2"	2Φ1/2"		2Φ1/2"
K(+)		0.004			0.004	
ρ(+)		0.0033			0.0033	
As(+)		2.44			2.44	
Φ(+)		2Φ1/2"			2Φ1/2"	

VIGA "B" NIVEL 2-7

b = 40cm h = 40cm d = 35cm

5.54 T/M

	1.75	3.90		3.90		1.40
M(-)	7.230	6.868	5.599	6.383	5.046	4.630
Vω	9.695	10.803	10.803	10.803	10.803	7.756
VM	—	0.325	-0.325	0.343	-0.343	—
ΣV	9.695	11.128	10.478	11.146	10.460	7.756
R	20.	823	21.	624	18.	216
Xo		→ 2.01		→ 2.01		
M(+)		4.32		4.82		
Xi		→ 0.76	0.64 ←	→ 0.69	0.57 ←	

VIENTO IZQUIERDA →

M(-)	7.230	6.715	5.814	6.078	5.379	4.630
Vω	9.695	10.803	10.803	10.803	10,803	7.756
VM	—	0.231	-0.231	0.179	-0,179	—
ΣV	9.695	11.034	10.572	10.982	10.624	7.756
R	20.	729	21.	554	18.	380
Xo		→ 1.99		→ 1.98		
M(+)		4.26		4.79		
Xi						

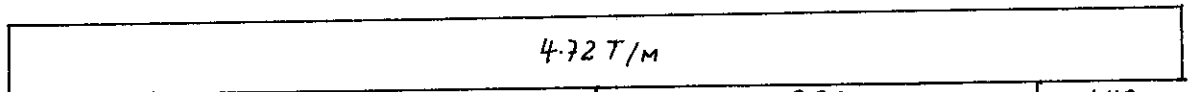
VIENTO DERECHA ←

M(-)	7.230	7.021	5.384	6.688	4.713	4.630
Vω	9.695	10.803	10.803	10.803	10.803	7.756
VM	—	0.420	-0.420	0.506	-0.506	—
ΣV	9.695	11.223	10.383	11.309	10.297	7.756
R	20.	918	21.	692	18.	053
Xo		→ 2.03		→ 2.04		
M(+)		4.37		4.85		
Xi						

K(-)	0.013	0.013	0.011	0.012	0.010	0.009
ρ(-)	0.004	0.004	0.0033	0.0033	0.0033	0.0033
As(-)	5.92	5.92	4.89	4.89	4.89	4.89
φ(-)	3φ5/8"	3φ5/8"	3φ5/8"	3φ5/8"	3φ5/8"	3φ5/8"
K(+)		0.008		0.009		
ρ(+)		0.0033		0.0033		
As(+)		4.89		4.89		
φ(+)		3φ5/8"		3φ5/8"		

VIGA "B" NIVEL 8

b = 40cm h = 40cm d = 35 cm



	1.75		3.90		3.90		1.40
M(-)	8.480	7.928		6.502	7.738	6.331	5.430
Vω	8.260	9.204		9.204	9.204	9.204	6.608
VM	—	0.366		-0.366	0.361	-0.361	—
ΣV	8.260	9.570		8.838	9.565	8.843	6.608
R		17.830			18.403	15.451	
Xo		→ 2.03			→ 2.03		
M(+)			1.79		1.97		
Xi		→ 1.16		1.00 ←	→ 1.20	1.03 ←	

VIENTO IZQUIERDA →

M(-)	8.480	3.741		10.477	3.760	10.525	5.430
Vω	8.260	9.204		9.204	9.204	9.204	6.608
VM	—	-1.727		1.727	-1.735	1.735	—
ΣV	8.260	7.477		10,931	7.469	10.939	6.608
R		15.737			18.400	17.547	
Xo		→ 1.58			→ 1.58		
M(+)			2.17		2.14		
Xi		→ 0.63		1.37 ←	→ 0.63	1.37 ←	

VIENTO DERECHA ←

M(-)	8.480	12.115		2.527	11.716	2.137	5.430
Vω	8.260	9.204		9.204	9.204	9.204	6.608
VM	—	2.458		-2.458	2.456	-2.456	—
ΣV	8.260	11.662		6.746	11.660	6.748	6.608
R		19.922			18.406	13.496	
Xo		→ 2.47			→ 2.47		
M(+)			2.29		2.68		
Xi		→ 1.49		0.45 ←	→ 1.40	0.37 ←	
K(-)	0.015	0.022		0.019	0.022	0.019	0.010
ρ(-)	0.0045	0.0065		0.0055	0.0065	0.0055	0.0033
As(-)	6.66	9.62		8.14	9.62	8.14	4.89
φ(-)	4φ5/8"	5φ5/8"		5φ5/8"	5φ5/8"	5φ5/8"	3φ5/8"
K(+)			0.004			0.005	
ρ(+)			0.0033			0.0033	
As(+)			4.89			4.89	
φ(+)			3φ5/8"			3φ5/8"	

VIGA "C" NIVEL 2 - 7

b = 20cm h = 40cm d = 35cm

	4.8 T/M		4.5 T/M
	1.375 ↓		1.375
M(-)	1.803		1.803
Vω	6.495		6.293
VM	—		—
ΣV	6.495		6.293
R	6.495		6.293
X_o	→ 1.35		
M(+)		2.581	
Xi	→ 0.315		0.324 ←
	VIENTO IZQUIERDA →		
M(-)	-0.875		3.010
Vω	6.495		6.293
VM	-1.413		1.413
ΣV	5.082		7.706
R	5.082		7.706
X_o	→ 1.059		
M(+)		3.565	
Xi	—		0.47 ←
	VIENTO DERECHA →		
M(-)	3.018		-0.305
Vω	6.495		6,293
VM	1.208		-1.208
ΣV	7.703		5.085
R	7.703		5.085
X_o	→ 1.62		
M(+)		3.178	—
Xi	→ 0.45		
K(-)	0.011		0.011
ρ(-)	0.0033		0.0033
As(-)	2.45		2.45
φ(-)	2φ1/2"		2φ1/2"
K(+)	0.003	0.0131	0.001
ρ(+)	0.0033	0.004	0.0033
As(+)	2.45	2.96	2.45
φ(+)	2φ5/8"	2φ5/8"	2φ5/8"

VIGA "C" NIVEL 8

b = 20cm h = 40cm d = 35cm

1.50 T/M

2.75

M(-)	0.543		0.543
Vω	2.063		2.063
VM	—		—
ΣV	2.063		2.063
R	2.063		2.063
Xo	→ 1.375		
M(+)		0.825	
Xi	→ 0.295		0.295 ←

VIENTO IZQUIERDA →

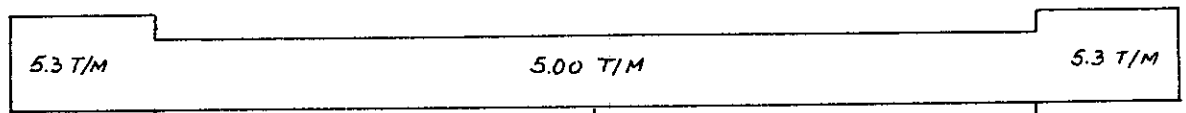
M(-)	0.359		0.491
Vω	2.063		2.063
VM	-0.048		0.048
ΣV	2.015		2.111
R	2.015		2.111
Xo	→ 1.343		
M(+)		0.994	
Xi	→ 0.50		0.56 ←

VIENTO DERECHA ←

M(-)	0.456		0.264
Vω	2.063		2.063
VM	0.070		-0.070
ΣV	2.133		1.993
R	2.133		1.993
Xo	→ 1.422		
M(+)		1.061	
Xi	→ 0.23		0.14 ←
K(-)	0.002		0.002
ρ(-)	0.0033		0.0033
As(-)	2.45		2.45
φ(-)	2φ1/2"		2φ1/2"
K(+)		0.004	
ρ(+)		0.0033	
As(+)		2.45	
φ(+)		2φ1/2"	

VIGA "D" NIVEL 2 - 7

b = 40cm h = 40cm d = 35cm



		1.75	3.90		3.90		1.40
M(-)	8.120	7.272		5.816	7.012	5.733	5.190
Vω	9.275	9.750		9.750	9.750	9.750	7.420
VM	—	0.373		-0.373	0.328	-0.328	—
ΣV	9.275	10.123		9.377	10.078	9.422	7.420
R		19.398		19.455		16.842	
Xo		→ 2.02			→ 2.02		
M(+)			2.95		3.17		
Xi		→ 0.94		0.80 ←	→ 0.90	0.75 ←	

VIENTO IZQUIERDA →

M(-)	8.120	3.085		9.791	3.034	9.927	5.190
Vω	9.275	9.750		9.750	9.750	9.750	7.420
VM	—	-1.719		1.719	-1.767	1.767	—
ΣV	9.275	8.031		11.469	7.983	11.517	7.420
R		17.306		19.452		18.937	
Xo		→ 1.61			→ 1.60		
M(+)			3.38		3.35		
Xi		→ 0.45		1.13 ←	→ 0.44	1.14 ←	

VIENTO DERECHA ←

M(-)	8.120	11.459		1.841	10.990	1.539	5.190
Vω	9.275	9.750		9.750	9.750	9.750	7.420
VM	—	2.466		-2.466	2.423	-2.423	—
ΣV	9.275	12.216		7.284	12.173	7.327	7.420
R		21.491		19.457		14.747	
Xo		→ 2.44			→ 2.44		
M(+)			3.44		3.86		
Xi		→ 1.27		0.30 ←	→ 1.19	0.21 ←	

K(-)	0.015	0.021		0.018	0.020	0.018	0.010
ρ(-)	0.0045	0.0060		0.0055	0.0060	0.0045	0.0033
As(-)	6.66	8.88		8.14	8.88	8.14	4.89
Φ(-)	4Φ5/8"	5Φ5/8"		5Φ5/8"	5Φ5/8"	5Φ5/8"	3Φ5/8"
K(+)			0.007		0.007		
ρ(+)			0.0033		0.0033		
As(+)			4.89		4.89		
Φ(+)			4Φ1/2"		4Φ1/2"		

VIGA "D" NIVEL 8

b = 40cm h = 40cm d = 35cm

	4.70T/M			4.01 T/M			4.70T/M
	1.75	3.90		3.90			1.40
M(-)	7.200	6.421	4.477	5.247	4.611		4.610
Vw	8,225	7.820	7.820	7.820	7.820		6.580
VM	—	0.498	-0.498	0.163	-0.163		—
ΣV	8.225	8,318	7.322	7.983	7.657		6.580
R	16.	543	15.	305	14.		237
Xo		→ 2.07		→ 1.99			
M(+)		2.19		2.70			
Xi		→ 1.03	0,79 ←	→ 0.83	0.75 ←		

VIENTO IZQUIERDA →

M(-)	7.200	6.268	4.692	4.942	4.944		4.610
Vw	8,225	7.820	7.820	7.820	7.820		6.580
VM	—	0.404	-0,404	-0.001	0.001		—
ΣV	8.225	8,224	7.416	7.819	7.821		6.580
R	16.	449	15.	235	14.		401
Xo		→ 2.05		→ 1.95			
M(+)		2.16		2.68			
Xi		→ 1.01	0,81 ←	→ 0.79	0.79 ←		

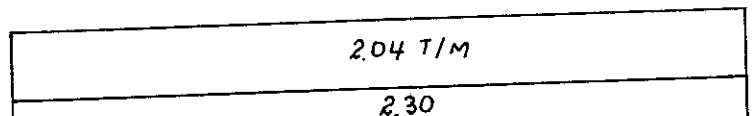
VIENTO DERECHA ←

M(-)	7.200	6.574	4.262	5.552	4.278		4.610
Vw	8,225	7.820	7.820	7.820	7.820		6.580
VM	—	0.593	-0.593	0,327	-0,327		—
ΣV	8.225	8.413	7.227	8.147	7.493		6.580
R	16.	638	15.	374	14.		073
Xo		→ 2,10		→ 2.03			
M(+)		2.26		2.72			
Xi		→ 1.04	0,74 ←	→ 0.87	0,71 ←		

K(-)	0,013	0.012	0,009	0,011	0.009		0.009
ρ(-)	0.004	0.0033	0,0033	0.0033	0,0033		0.0033
As(-)	5.92	4.89	4.89	4.89	4.89		4.89
φ(-)	5φ1/2"	5φ1/2"	4φ1/2"	4φ1/2"	4φ1/2"		4φ1/2"
K(+)		0,004		0.005			
ρ(+)		0.0033		0.0033			
As(+)		4.89		4.89			
φ(+)		4φ1/2"		4φ1/2"			

VIGA "E" NIVEL 2-8

b = 20cm h = 40cm d = 35 cm



M(-)	0.518		0.615
Vω	2.346		2.346
VM	-0.042		0.042
ΣV	2.304		2.388
R	2.304		2.304
Xo	→ 1.129		
M(+)		0.783	
Xi	→ 0.253		0.295 ←

VIENTO IZQUIERDA →

M(-)	-3.694		4.528
Vω	2.346		2.346
VM	-3.575		3.575
ΣV	-1.229		5.921
R	-1.229		5.921
Xo			
M(+)			
Xi			

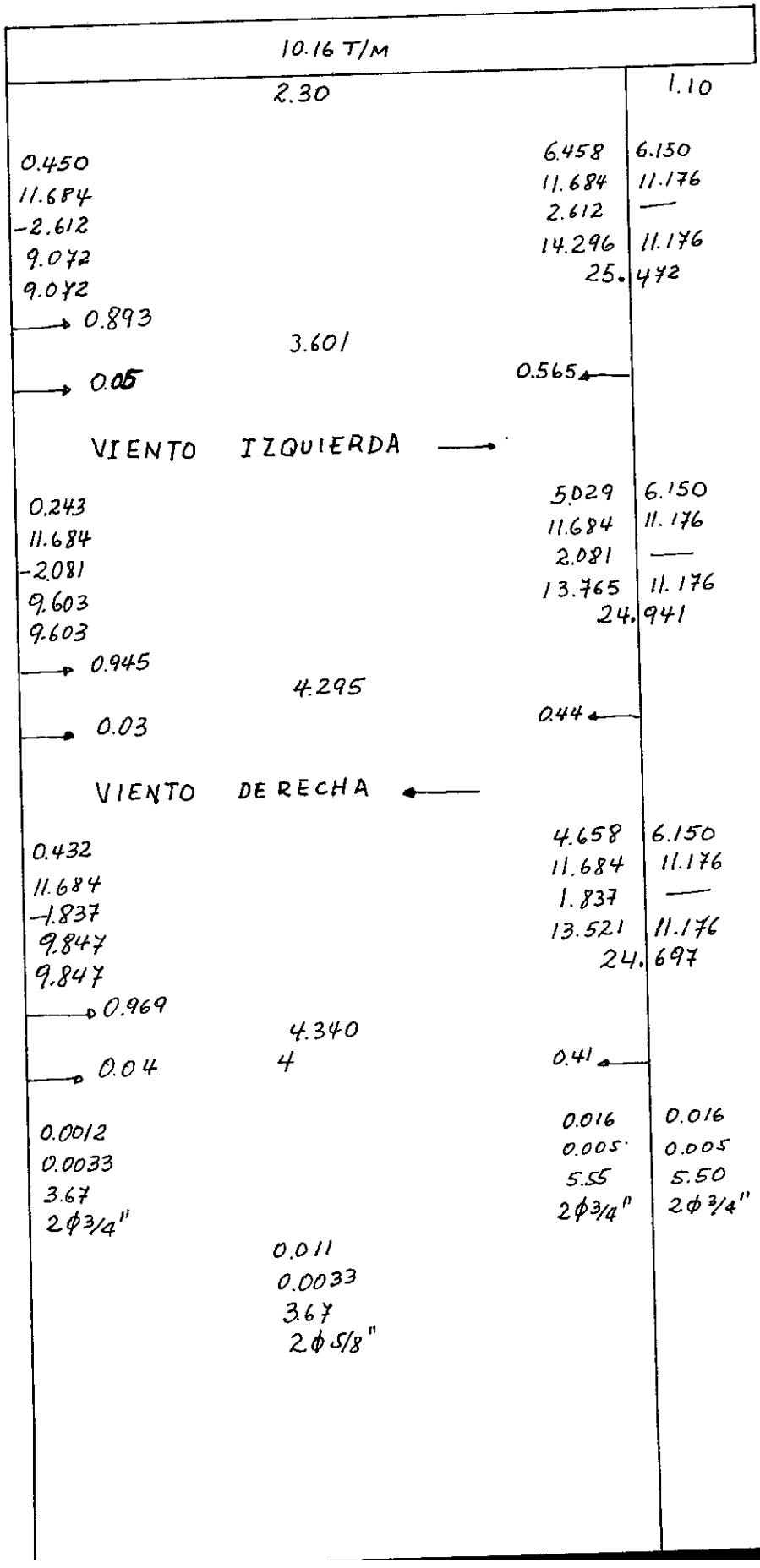
VIENTO DERECHA ←

M(-)	4.471		-3.605
Vω	2.346		2.346
VM	3.511		-3.511
ΣV	5.857		-1.165
R	5.857		-1.165
Xo			
M(+)			
Xi			

K(-)	0.0163		0.0165
ρ(-)	0.005		0.005
As(-)	3.70		3.70
φ(-)	2φ5/8"		2φ5/8"
K(+)	0.0135	0.003	0.0135
ρ(+)	0.0040	0.0033	0.0040
As(+)	2.96	2.45	2.96
φ(+)	2φ5/8"	2φ5/8"	2φ5/8"

VIGA "E" NIVEL 9

b= 30 cm h= 40cm d= 35cm



M(-)	0.450		6.458 / 6.130
Vω	11.684		11.684 / 11.176
VM	-2.612		2.612 / —
ΣV	9.072		14.296 / 11.176
R	9.072		25.472
Xo	→ 0.893		
M(+)		3.601	
Xi	→ 0.05		0.565 ←

VIENTO IZQUIERDA →

M(-)	0.243		5.029 / 6.150
Vω	11.684		11.684 / 11.176
VM	-2.081		2.081 / —
ΣV	9.603		13.765 / 11.176
R	9.603		24.941
Xo	→ 0.945		
M(+)		4.295	
Xi	→ 0.03		0.44 ←

VIENTO DERECHA ←

M(-)	0.432		4.658 / 6.150
Vω	11.684		11.684 / 11.176
VM	-1.837		1.837 / —
ΣV	9.847		13.521 / 11.176
R	9.847		24.697
Xo	→ 0.969		
M(+)		4.340	
Xi	→ 0.04	4	0.41 ←
K(-)	0.0012		0.016 / 0.016
ρ(-)	0.0033		0.005 / 0.005
As(-)	3.67		5.55 / 5.50
φ(-)	2φ3/4"		2φ3/4" / 2φ3/4"
K(+)		0.011	
ρ(+)		0.0033	
As(+)		3.67	
φ(+)		2φ5/8"	

VIGA "F" NIVEL 2-7

b = 20cm h = 40 cm d = 35cm

	2.17 T/M		3.49 T/M	3.79 T/M	2.17 T/M	
	2.30		1.375	1.375	2.30	
M(-)	0.389	1.730	2.132	2.124	1.724	0.381
Vw	2.496	2.496	4.902	5.108	2.496	2.496
VM	-0.583	0.583	0.003	-0.003	0.584	-0.584
ΣV	1.913	3.079	4.905	5.105	3.080	1.912
R	1.913	7.984		8.185		1.912
Xo	→ 0.882		→ 1.403		→ 1.419	
M(+)	0.454		1.315		0.462	
Xi	→ 0.234	0.77 ←	→ 0.539	0.514 ←	→ 0.767	0.229 ←
			VIENTO IZQUIERDA →			
M(-)	-0.863	2.232	0.941	2.255	0.372	1.442
Vw	2.496	2.496	4.902	5.108	2.496	2.496
VM	-1.346	1.346	-0.478	0.478	-0.465	0.465
ΣV	1.150	3.842	4.424	5.586	2.031	2.961
R	1.150	8.266		7.617		2.961
Xo	→ 0.530		→ 1.268		→ 0.936	
M(+)	1.168		1.863		0.578	
Xi	→	0.73 ←	→ 0.23	0.48 ←	→ 0.21	0.63 ←
			VIENTO DERECHA ←			
M(-)	-1.446	0.363	2.257	0.932	2.214	-0.871
Vw	2.496	2.496	4.902	5.108	2.496	2.496
VM	-0.787	0.787	0.482	-0.482	1.341	-1.341
ΣV	1.709	3.283	5.384	4.626	3.837	1.115
R	1.709	8.667		8.463		1.115
Xo	→ 0.788		→ 1.529		→ 1.768	
M(+)	2.119		1.860		1.178	
Xi	—	0.11 ←	→ 0.51	←	→ 0.73	—
K(-)	0.0014	0.008	0.008	0.008	0.008	0.0053
ρ(-)	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
As(-)	2.45	2.45	2.45	2.45	2.45	2.45
Φ(-)	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"
K(+)	0.0055	0.008		0.007	0.0043	0.0032
ρ(+)	0.0033	0.0033		0.0033	0.0033	0.0033
As(+)	2.45	2.45		2.45	2.45	2.45
φ(+)	2φ1/2"	2φ1/2"		2φ1/2"	2φ1/2"	2φ1/2"

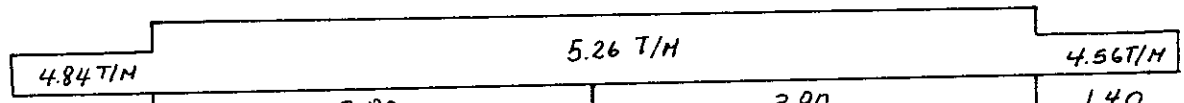
VIGA "F" NIVEL 8

b = 20Cm h = 40 cm d = 35 cm

	5.24 T/M		3.81 T/M		5.24 T/M	
	2.30		2.75		2.30	
M(-)	0.497	2.713	2.650	2.670	2.738	0.491
Vw	6.026	6.026	5.239	5.239	6.026	6.026
VM	-0.963	0.963	-0.007	0.007	0.977	-0.977
ΣV	5.063	6.985	5.232	5.246	7.003	5.049
Xo	→ 0.966		→ 1.373		→ 1.336	
M(+)	1.949		0.942		1.942.	
Xi	→ 0.104		→ 0.670	0.674 ←	→ 0.476	0.104 ←
			VIENTO IZQUIERDA →			
M(-)	0.382	2.063	1.943	2.036	2.009	0.428
Vw	6.026	6.026	5.239	5.239	6.026	6.026
VM	-0.731	0.731	-0.034	0.034	0.687	-0.687
ΣV	5.295	6.757	5.205	5.273	6.713	5.339
R	5.295	11.	962	11.	986	5.339
Xo	→ 1.010		→ 1.366		→ 1.281	
M(+)	2.293		1.612		2.291	
Xi	→ 0.075	0.35 ←	→ 0.45	0.46 ←	→ 0.34	0.10 ←
			VIENTO DERECHA ←			
M(-)	0.864	2.007	2.032	1.969	2.098	0.308
Vw	6.026	6.026	5.232	5.232	6.026	6.026
VM	-0.714	0.714	0.023	-0.023	0.778	-0.778
ΣV	5.312	6.740	5.262	5.216	6.804	5.248
R	5.312	12.	002	12.	020	5.248
Xo	→ 1.014		→ 1.381		→ 1.298	
M(+)	2.328		1.602		2.319	
Xi	→ 0.07	0.34 ←	→ 0.46	0.45 ←	→ 0.36	0.06 ←
K(-)	0.0018	0.010	0.010	0.010	0.010	0.0018
ρ(-)	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
As(-)	2.45	2.45	2.45	2.45	2.45	2.45
Φ(-)	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"	2φ1/2"
K(+)	0.0085		0.006		0.0084	
ρ(+)	0.0033		0.0033		0.0033	
As(+)	2.45		2.45		2.45	
Φ(-)	2φ1/2"		2φ1/2"		2φ1/2"	

VIGA "G" NIVEL 2 - 7

b = 40cm h = 40 cm d = 35 cm



		1.75	3.90		3.90		1.40
M(-)	7.410	7.396		6.236	7.393	5.909	4.470
Vω	8.470	10.257		10.257	10.257	10.257	6.384
VM	—	0.297		-0.297	0.381	-0.381	—
ΣV	8.470	10.554		9.960	10.638	9.876	6.384
R	19.	024		20.	598	16.	260
Xo		→ 2.01			→ 2.02		
M(+)			3.21			3.35	
Xi		→ 0.90		0.78 ←	→ 0.89	0.75 ←	

VIENTO IZQUIERDA →

M(-)	7.410	3.209		10.211	3.415	10.103	4.470
Vω	8.470	10.257		10.257	10.257	10.257	6.384
VM	—	-1.795		1.795	-1.715	1.715	—
ΣV	8.470	8.462		12.052	8.542	11.972	6.384
R	16.	932		20.	594	18.	356
Xo		→ 1.61			→ 1.62		
M(+)			3.60			3.50	
Xi		→ 0.44		1.12 ←	→ 0.47	1.13 ←	

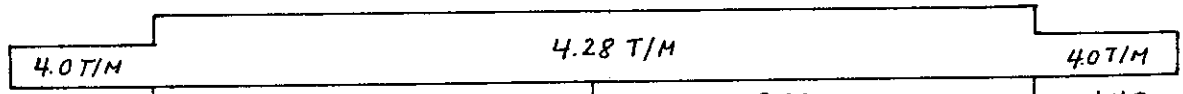
VIENTO DERECHA ←

M(-)	7.410	11.583		2.261	11.371	1.715	4.470
Vω	8.470	10.257		10.257	10.257	10.257	6.384
VM	—	2.390		-2.390	2.476	-2.476	—
ΣV	8.470	12.647		7.867	12.733	7.781	6.384
R	21.	117		20.	600	14.	165
Xo		→ 2,40			→ 2.42		
M(+)			3.59			4.04	
Xi		→ 1.24		0.34 ←	→ 1.18	0.24 ←	

K(-)	0.014	0.022		0.019	0.021	0.019	0.008
P(-)	0.004	0.0065		0.0055	0.006	0.0055	0.0033
As(-)	5.92	9.62		8.14	8.88	8.14	4.89
Φ(-)	3Φ5/8"	5Φ5/8"		5Φ5/8"	5Φ5/8"	5Φ5/8"	3Φ5/8"
K(+)			0.007			0.008	
P(+)			0.0033			0.0033	
As(+)			4.89			4.89	
Φ(+)			4Φ1/2"			4Φ1/2"	

VIGA " G " NIVEL 8

b = 40 cm h = 40 cm d = 35 cm



	1.75	3.90		3.90		1.40
M(-)	6.130	6.037	5.153	5.848	4.480	3.920
Vω	7.000	8.346	8.346	8.346	8.346	5.600
VM	—	0.227	-0.227	0.351	-0.351	—
ΣV	7.000	8.573	8.119	8.697	7.995	5.600
R	15.	573	16.	816	13.	595
X_o		→ 2.00		→ 2.03		
M(+)		2.536		2.98		
Xi		→ 0.91	0.81 ←	→ 0.85	0.69 ←	

VIENTO IZQUIERDA →

M(-)	6.130	5.884	5.368	5.543	4.813	3.920
Vω	7.000	8.346	8.346	8.346	8.346	5.600
VM	—	0.132	-0.132	0.187	-0.187	—
ΣV	7.000	8.478	8.214	8.533	8.161	5.600
R	15.	478	16.	747	13.	761
X_o		→ 1.98		→ 1.99		
M(+)		2.51		2.95		
Xi		→ 0.90	0.84 ←	→ 0.82	0.74 ←	

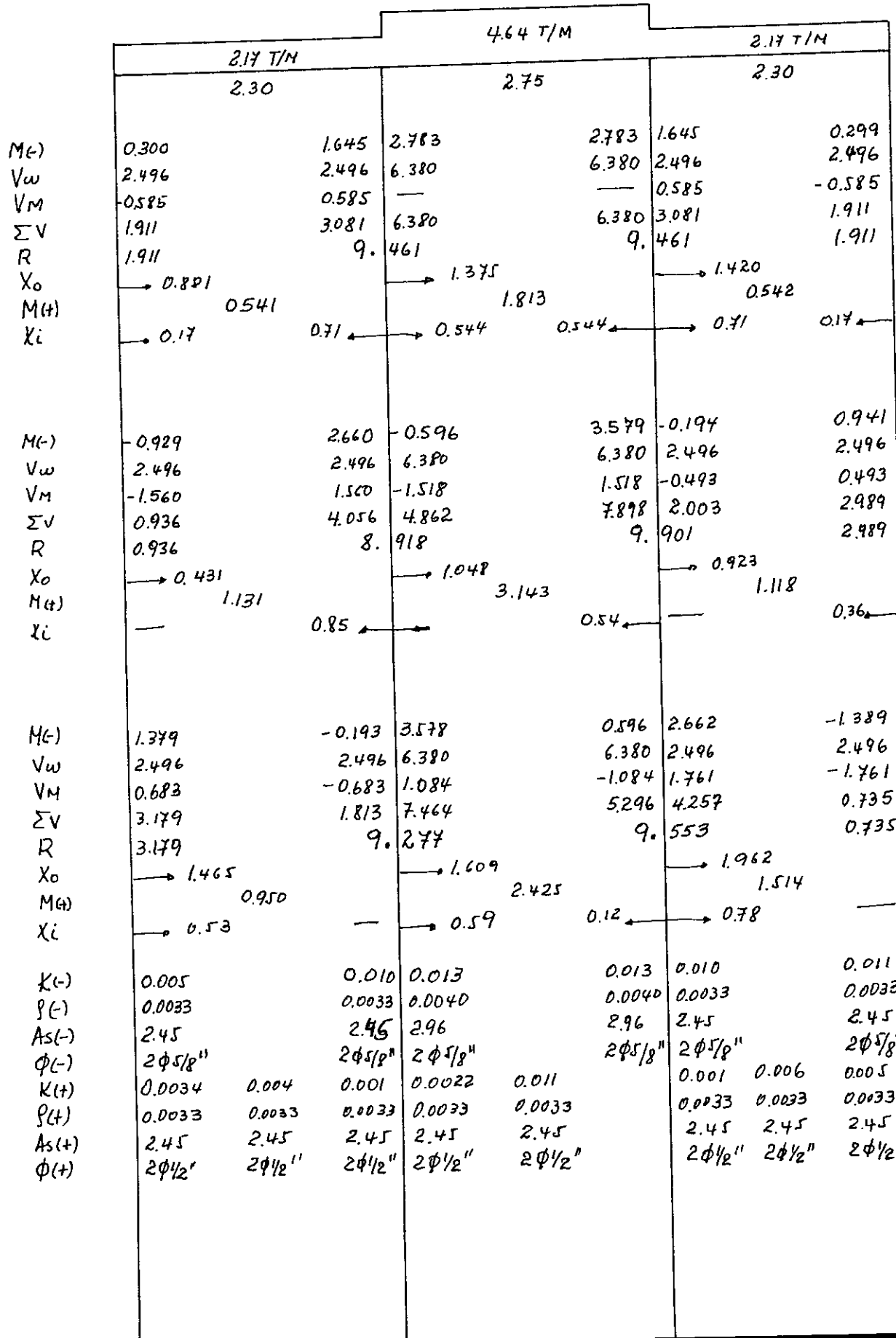
VIENTO DERECHA

M(-)	6.130	6.190	4.938	6.153	4.147	3.920
Vω	7.000	8.346	8.346	8.346	8.346	5.600
VM	—	0.321	-0.321	0.514	0.514	—
ΣV	7.000	8.667	8.025	8.860	7.832	5.600
R	15.	667	16.	885	13.	432
X_o		→ 2.03		→ 2.07		
M(+)		2.61		3.02.		
Xi						

K(-)	0.011	0.012	0.010	0.011	0.009	0.007
ρ(-)	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
As(-)	4.89	4.89	4.89	4.89	4.89	4.89
φ(-)	4φ1/2"	4φ1/2"	4φ1/2"	4φ1/2"	4φ1/2"	4φ1/2"
K(+)		0.005		0.006		
ρ(+)		0.0033		0.0033		
As(+)		4.89		4.89		
φ(+)		4φ1/2"		4φ1/2"		

VIGA "H" NIVEL 2 - 7

b = 20 cm h = 40 cm d = 35 cm



VIGA "H" NIVEL 8

b = 20cm h = 40cm d = 35cm

	1.75 T/M		3.96 T/M		1.75 T/M	
	2.30		2.75		2.30	
M(-)	0.587	6.377	6.427	6.427	6.377	0.587
Vω	2.013	2.013	5.445	5.445	2.013	2.013
VM	-2.517	2.517	—	—	2.517	-2.517
ΣV	-0.504	4.530	5.445	5.445	4.530	-0.504
R	-0.504	9.	975	9.	975	-0.504
Xo			→ 1.375			
M(+)			-2.684			
Xi						
			VIENTO IZQUIERDA →			
M(-)	0.446	4.823	4.766	4.858	4.160	0.541
Vω	2.013	2.013	5,445	5.445	2.013	2.013
VM	-1.903	1.903	-0.033	0.033	1.573	-1.573
ΣV	0.110	3.916	5.412	5.478	3.586	0.440
R	0.110	9.	328	9.	064	0.440
Xo	→ 0.063		→ 1.367		→ 2.049	
M(+)	-0.443		-1.068		-0.486	
Xi						
			VIENTO DERECHA ←			
M(-)	0.435	4.742	4875	4.783	5.405	0.340
Vω	2.013	2.013	5.445	5.445	2.013	2.013
VM	-1.873	+1.873	0.092	-0.092	2.894	-2.894
ΣV	0.140	3.886	5.537	5.353	4.907	-0.881
R	0.140	9.	423	10.	260	-0.881
Xo	→ 0.080		→ 1.398			
M(+)	-0.429		-1.004			
Xi						
K(-)	0.002	0.002	0.0233	0.0235	0.01	0.0233	0.002	0.0021
ρ(-)	0.0033	0.0033	0.0070	0.0070	0.0033	0.0070	0.0033	0.0033
As(-)	2.45	2.45	5.18	5.18	2.45	5.18	2.45	2.45
φ(-)	2φ3/4"	2φ3/4"	2φ3/4"	2φ3/4"	2φ3/4"	2φ3/4"	2φ3/4"	2φ3/4"
K(+)		—			—		—	
ρ(+)		0.0033			0.0033		0.0033	
As(+)		2.45			2.45		2.45	
φ(+)		2φ1/2"			2φ1/2"		2φ1/2"	

VIGA "H" NIVEL 9

b = 30cm h = 40cm d = 35 cm

10.16 TON/M

	2.30		2.75		2.30	
M(-)	0.388	1.376	2.274	2.274	1.376	0.388
Vω	11.684	11.684	13.970	13.970	11.684	11.684
VM	-0.430	0.430	—	—	0.430	-0.430
ΣV	11.254	12.114	13.970	13.970	12.114	11.254
R	11.254	26.084		26.084		11.254
Xo	→ 1.108		→ 1.375		→ 1.192	
M(+)	5.845		7.330		5.946	
Xi	→ 0.035	0.569 ←	→ 0.174	0.174 ←	→ 0.120	0.036 ←
			VIENTO IZQUIERDA →			
M(-)	-0.038	1.322	1.427	1.986	0.746	0.537
Vω	11.684	11.684	13.970	13.970	11.684	11.684
VM	-0.591	0.591	-0.203	0.203	0.091	-0.091
ΣV	11.093	12.275	13.767	14.173	11.775	11.593
R	11.093	26.042		25.948		11.593
Xo	→ 1.092		→ 1.355		→ 1.159	
M(+)	6.094		7.900		6.077	
Xi	—	0.12 ←	→ 0.11	0.15 ←	→ 0.07	0.05 ←
			VIENTO DERECHA ←			
M(-)	0.545	0.742	1.427	1.425	1.318	0.045
Vω	11.684	11.684	13.970	13.970	11.684	11.684
VM	-0.086	0.086	0.001	-0.001	0.553	-0.553
ΣV	11.598	11.770	13.980	13.960	12.237	11.131
R	11.598	25.750		26.197		11.131
Xo	→ 1.142		→ 1.376		→ 1.204	
M(+)	6.075		8.191		6.051	
Xi	→ 0.05	0.07 ←	→ 0.11	0.11 ←	→ 0.12	0.01 ←
K(-)	0.0015	0.0034	0.006	0.006	0.0034	0.0015
ρ(-)	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
As(-)	3.67	3.67	3.67	3.67	3.67	3.67
φ(-)	2φ5/8"	2φ5/8"	2φ5/8"	2φ5/8"	2φ5/8"	2φ5/8"
K(+)	0.0001	0.014	0.020		0.015	
ρ(+)	0.0033	0.0045	0.006		0.0045	
As(+)	3.67	5.00	6.66		5.00	
φ(+)	2φ3/4"	2φ3/4"	2φ7/8"		2φ3/4"	

COLUMNAS

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\Psi = \frac{\Sigma COL}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
A	1		647			647		1
	2		647			647		1
	3		647			647		1
	4	647	736		146	1383	146	9.47
	5	647	736	146	146	1383	292	4.74
	6	647	736	146		1383	146	9.47
	7	736	736		146	1472	146	10.08
	8	736	736	146	146	1472	292	5.04
	9	736	736	146		1472	146	10.08
	10	736	736		146	1472	146	10.08
	11	736	736	146	146	1472	292	5.04
	12	736	736	146		1472	146	10.08
	13	736	736		146	1472	146	10.08
	14	736	736	146	146	1472	292	5.04
	15	736	736	146		1472	146	10.08
	16	736	233		146	969	146	6.64
	17	736	233	146	146	969	292	3.32
	18	736	233	146		969	146	6.64
	19	233	233		146	466	146	3.19
	20	233	233	146	146	466	292	1.60
	21	233	233	146		466	146	3.19
	22	233			146	233	146	1.60
	23	233		146	146	233	292	1.80
	24	233		146		233	146	1.60

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
B2	1		647			647		1.
	2		647			647		1.
	3		647			647		1
	4	647	736		274	1383	274	5.047
	5	647	736	274	274	1383	548	2.52
	6	647	736	274		1383	274	5.047
	7	736	736		274	1422	274	5.372
	8	736	736	274	274	1422	548	2.686
	9	736	736	274		1422	274	5.372
	10	736	736		274	1422	274	5.372
	11	736	736	274		1422	548	2.686
	12	736	736	274		1422	274	5.372
	13	736	736		274	1422	274	5.372
	14	736	736	274	274	1422	548	2.686
	15	736	736	274		1422	274	5.372
	16	736	233		274	969	274	3.536
	17	736	233	274	274	969	548	1.768
	18	736	233	274		969	274	3.536
	19	233	233		274	466	274	1.701
	20	233	233	274	274	466	548	0.850
	21	233	233	274		466	274	1.701
	22	233			274	233	274	0.850
	23	233		274	274	233	548	0.425
	24	233		274		233	274	0.850

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\psi = \frac{\Sigma COL}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
C								
	1		136			136		1.000
	2		136			136		1.000
	3	136	155		194	291	194	1.50
	4	136	155	194		291	194	1.50
	5	155	155		194	310	194	1.60
	6	155	155	194		310	194	1.60
	7	155	155		194	310	194	1.60
	8	155	155	194		310	194	1.60
	9	155	155		194	310	194	1.60
	10	155	155	194		310	194	1.60
	11	155	155		194	310	194	1.60
	12	155	155	194		310	194	1.60
	13	155	155		194	310	194	1.60
	14	155	155	194		310	194	1.60
	15	155			194	155	194	0.80
	16	155		194		155	194	0.80

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\Psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
D	1		647			647		1
	2		647			647		1
	3		647			647		1
	4	647	736		274	1383	274	5.047
	5	647	736	274	274	1383	548	2.52
	6	647	736	274		1383	274	5.047
	7	736	736		274	1422	274	5.372
	8	736	736	274	274	1422	548	2.686
	9	736	736	274		1422	274	5.372
	10	736	736		274	1422	274	5.372
	11	736	736	274		1422	548	2.686
	12	736	736	274		1422	274	5.372
	13	736	736		274	1422	274	5.372
	14	736	736	274	274	1422	548	2.686
	15	736	736	274		1422	274	5.372
	16	736	233		274	969	274	3.536
	17	736	233	274	274	969	548	1.768
	18	736	233	274		969	274	3.536
	19	233	233		274	466	274	1.701
	20	233	233	274	274	466	548	0.850
	21	233	233	274		466	274	1.701
	22	233			274	233	274	0.850
	23	233		274	274	233	548	0.425
	24	233		274		233	274	0.850

45143

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
E	1		205			205		1.00
	2		205			205		1.00
	3	205	233		232	438	232	1.89
	4	205	233	232		438	232	1.89
	5	233	233		232	466	232	2.01
	6	233	233	232		466	232	2.01
	7	233	233		232	466	232	2.01
	8	233	233	232		466	232	2.01
	9	233	233		232	466	232	2.01
	10	233	233	232		466	232	2.01
	11	233	233		232	466	232	2.01
	12	233	233	232		466	232	2.01
	13	233	233		232	466	232	2.01
	14	233	233	232		466	232	2.01
	15	233	233		232	466	232	2.01
	16	233	233	232		466	232	2.01
	17	211			348	211	348	0.61
	18	211		348		211	348	0.61

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\Psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
	1		136			136		1.000
	2		323			323		1.000
	3		323			323		1.000
	4		136			136		1.000
	5	136	155		232	291	232	1.25
F'	6	323	368	232	191	691	423	1.63
	7	323	368	191	232	691	423	1.63
	8	136	155	232		291	232	1.25
	9	155	155		232	310	232	1.34
	10	368	155	232	191	523	423	1.24
	11	368	155	191	232	523	423	1.24
	12	155	155	232		310	232	1.34
	13	155	155		232	310	232	1.34
	14	155	155	232	191	310	423	0.73
	15	155	155	191	232	310	423	0.73
	16	155	155	232		310	232	1.34
	17	155	155		232	310	232	1.34
	18	155	155	232	191	310	423	0.73
	19	155	155	191	232	310	423	0.73
	20	155	155	232		310	232	1.34
	21	155	155		232	310	232	1.34
	22	155	155	232	191	310	423	0.73
	23	155	155	191	232	310	423	0.73
	24	155	155	232		310	232	1.34
	25	155	155		232	310	232	1.34
	26	155	155	232	191	310	423	0.73
	27	155	155	191	232	310	423	0.73
	28	155	155	232		310	232	1.34
	29	155			232	155	232	0.67
	30	155		232	191	155	423	0.37
	31	155		191	232	155	423	0.37
	32	155		232			232	0.67

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\Psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
6	1		647			647		1
	2		647			647		1
	3		647			647		1
	4	647	736		274	1383	274	5.047
	5	647	736	274	274	1383	548	2.52
	6	647	736	274		1383	274	5.047
	7	736	736		274	1422	274	5.372
	8	736	736	274	274	1422	548	2.686
	9	736	736	274		1422	274	5.372
	10	736	736		274	1422	274	5.372
	11	736	736	274		1422	548	2.686
	12	736	736	274		1422	274	5.372
	13	736	736		274	1422	274	5.372
	14	736	736	274	274	1422	548	2.686
	15	736	736	274		1422	274	5.372
	16	736	233		274	969	274	3.536
	17	736	233	274	274	969	548	1.768
	18	736	233	274		969	274	3.536
	19	233	233		274	466	274	1.701
	20	233	233	274	274	466	548	0.850
	21	233	233	274		466	274	1.701
	22	233			274	233	274	0.850
	23	233		274	274	233	548	0.425
	24	233		274		233	274	0.850

TABLA Nº1 CALCULO DEL GRADO DE RESTRICCION

PORTICO	NUDO	RIGIDEZ RELATIVA "K"				Σ COLUM	Σ VIGA	$\Psi = \frac{\Sigma COL.}{\Sigma VIGA}$
		COL. POR DEBAJO	COL. POR ENCIMA	VIGA IZQ	VIGA DERECHA			
	1		136			136		1.00
	2		947			947		1.00
	3		947			947		1.00
	4		136			136		1.00
	5	136	155		464	291	464	0.63
	6	947	1078	464	388	2025	852	2.38
	7	947	1078	388	464	2025	852	2.38
	8	136	155	464		291	464	0.63
	9	155	155		464	310	464	0.67
	10	1078	1078	464	388	2156	852	2.53
	11	1078	1078	388	464	2156	852	2.53
	12	155	155	464		310	464	0.67
	13	155	155		464	310	464	0.67
	14	1078	1078	464	388	2156	852	2.53
	15	1078	1078	388	464	2156	852	2.53
	16	155	155	464		310	464	0.67
	17	155	155		464	310	464	0.67
	18	1078	1078	464	388	2156	852	2.53
	19	1078	1078	388	464	2156	852	2.53
	20	155	155	464		310	464	0.67
	21	155	155		464	310	464	0.67
	22	1078	552	464	388	1630	852	1.91
	23	1078	552	388	464	1630	852	1.91
	24	155	155	464		310	464	0.67
	25	155	155		464	310	464	0.67
	26	552	552	464	388	1104	852	1.30
	27	552	552	388	464	1104	852	1.30
	28	155	155	464		310	464	0.67
	29	155	141		464	296	464	0.64
	30	552	500	464	388	1052	852	1.23
	31	552	500	388	464	1052	852	1.23
	32	155	141	464		296	464	0.64
	33	141			696	141	696	0.20
	34	500		696	581	500	1277	0.39
	35	500		581	696	500	1277	0.39
	36	141		696		141	696	0.20

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
A	1	1-4	1.00	9.47	5.24	2.25	0.002133	0.73	1079.19	3.10	218.93	40.11	1.35
		2-5	1.00	4.74	2.87	1.77	0.002133	0.73	1079.19	3.10	353.78	63.95	1.35
		3-6	1.00	9.47	5.24	2.25	0.002133	0.73	1079.19	3.10	218.93	40.15	1.35
											791.64	144.21	1.35
	2	4-7	9.47	10.08	9.78	2.95	0.002133	0.73	1079.19	2.50	195.83	33.66	1.30
		5-8	4.74	5.04	4.89	2.18	0.002133	0.73	1079.19	2.50	358.59	54.27	1.30
		6-9	9.47	10.08	9.78	2.95	0.002133	0.73	1079.19	2.50	195.83	33.70	1.30
											750.25	121.63	1.30
	3	7-10	10.08	10.08	10.08	3.00	0.002133	0.73	1079.19	2.50	189.35	27.53	1.24
		8-11	5.04	5.04	5.04	2.21	0.002133	0.73	1079.19	2.50	348.92	44.91	1.24
		9-12	10.08	10.08	10.08	3.00	0.002133	0.73	1079.19	2.50	189.35	27.57	1.24
											728.62	100.01	1.24
	4	10-13	10.08	10.08	10.08	3.00	0.002133	0.73	1079.19	2.50	189.35	21.39	1.18
		11-14	5.04	5.04	5.04	2.21	0.002133	0.73	1079.19	2.50	348.92	35.53	1.18
		12-15	10.08	10.08	10.08	3.00	0.002133	0.73	1079.19	2.50	189.35	21.43	1.18
											728.62	78.37	1.18
	5	13-16	10.08	6.64	8.36	2.75	0.002133	0.73	1079.19	2.50	225.35	15.26	1.10
		14-17	5.04	3.32	4.18	2.05	0.002133	0.73	1079.19	2.50	405.52	26.19	1.10
		15-18	10.08	6.64	8.36	2.75	0.002133	0.73	1079.19	2.50	225.35	15.30	1.10
											856.22	56.75	1.10
	6	16-19	6.64	3.19	4.92	2.19	0.002133	0.73	341.62	2.50	112.48	9.13	1.14
		17-20	3.32	1.60	2.46	1.67	0.002133	0.73	341.62	2.50	193.43	16.83	1.14
		18-21	6.64	3.19	4.92	2.19	0.002133	0.73	341.62	2.50	112.48	9.17	1.14
											418.39	35.13	1.14
	7	19-22	3.19	1.60	2.40	1.66	0.002133	0.83	322.95	2.50	185.07	3.59	1.04
		20-23	1.60	0.80	1.20	1.33	0.002133	0.83	322.95	2.50	288.30	8.06	1.04
		21-24	3.19	1.60	2.40	1.66	0.002133	0.83	322.95	2.50	185.07	3.63	1.04
											658.44	15.28	1.04

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
		1-4	1.00	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	380.19	157.069	2.28
		2-5	1.00	2.524	1.762	1.516	0.002133	0.73	1079.19	3.10	482.25	160.192	2.28
	1	3-6	1.00	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	340.19	139.466	2.28
											1162.63	456.732	2.28
		4-7	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	133.379	1.78
		5-8	2.524	2.686	2.605	1.709	0.002133	0.73	1079.19	2.50	583.49	135.733	1.78
	2	6-9	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	118.314	1.78
											1260.95	387.420	1.78
13		7-10	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	110.025	1.59
		8-11	2.680	2.636	2.636	1.728	0.002133	0.73	1079.19	2.50	570.73	111.605	1.59
	3	9-12	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	97.498	1.59
											1251.01	319.128	1.59
		10-13	5.372	5.372	5.372	2.272	0.002133	0.73	1079	2.50	330.14	87.548	1.42
		11-14	2.686	2.686	2.686	1.728	0.002133	0.73	1079	2.50	570.73	88.354	1.42
	4	12-15	5.372	5.372	5.372	2.272	0.002133	0.73	1079	2.50	330.14	77.559	1.42
											1231.01	253.461	1.42
		13-16	5.372	3.536	4.454	2.102	0.002133	0.73	1079	2.50	385.70	65.071	1.23
		14-17	2.686	1.768	2.227	1.617	0.002133	0.73	1079	2.50	651.77	65.103	1.23
	5	15-18	5.372	3.536	4.454	2.102	0.002133	0.73	1079	2.50	385.70	57.620	1.23
											1423.17	187.794	1.23
		16-19	3.536	1.701	2.619	1.712	0.002133	0.73	341.62	2.50	184.06	42.594	1.38
		17-20	1.768	0.850	1.309	1.420	0.002133	0.73	341.62	2.50	267.54	41.825	1.38
	6	18-21	3.536	1.701	2.619	1.712	0.002133	0.73	341.62	2.50	184.06	37.681	1.38
											635.66	122.127	1.38
		19-22	1.701	0.850	1.276	1.412	0.002133	0.33	322.95	2.50	255.79	20.799	1.11
		20-23	0.850	0.425	0.638	1.239	0.002133	0.33	322.95	2.50	332.21	19.283	1.11
	7	21-24	1.701	0.850	1.276	1.412	0.002133	0.33	322.95	2.50	255.79	18.424	1.11
											813.79	58.506	1.11

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	ψ_i	ψ_j	ψ	K	Ig	Bd	El	Lu	Pcr	Pu	δ
C	1	1-3	1.000	1.50	1.25	1.406	0.000675	0.73	227.75	3.10	118.32	52.00	
		2-4	1.0	1.50	1.25	1.406	0.000675	0.73	227.75	3.10	118.32	51.371	
											236.64	103.371	2.66
	2	3-5	1.50	1.60	1.55	1.473	0.000675	0.73	227.75	2.50	165.76	43.672	
		4-6	1.50	1.60	1.55	1.473	0.000675	0.73	227.75	2.50	165.76	43.665	
											331.51	87.337	1.60
	3	5-7	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	35.465	
		6-8	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	35.455	
											327.06	70.92	1.45
	4	7-9	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	27.258	
		8-10	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	27.245	
											327.06	54.503	1.31
	5	9-11	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	19.051	
		10-12	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	19.035	
											327.06	38.086	1.20
	6	11-13	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	10.844	
		12-14	1.60	1.60	1.60	1.483	0.000326	0.73	227.75	2.50	163.53	10.825	
											327.06	21.669	1.10
	7	13-15	1.60	0.80	1.20	1.394	0.000326	0.83	215.30	2.50	174.96	2.637	
		14-16	1.60	0.80	1.20	1.394	0.000326	0.83	215.30	2.50	174.96	2.625	
											349.92	5.252	1.02

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
		1-4	1.000	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	340.19	157.223	2.18
	1	2-5	1.000	2.524	1.762	1.516	0.002133	0.73	1079.19	3.10	482.25	143.755	2.18
		3-6	1.000	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	340.19	139.785	2.18
											1162.63	440.763	2.18
		4-7	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	132.96	1.73
	2	5-8	2.524	2.686	2.605	1.709	0.002133	0.73	1079.19	2.50	583.49	121.526	1.73
		6-9	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	118.076	1.73
											1260.95	372.562	1.73
10		7-10	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	109.033	1.55
	3	8-11	2.686	2.686	2.686	1.728	0.002133	0.73	1079.19	2.50	570.73	99.633	1.55
		9-12	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	96.705	1.55
											1231.01	305.369	1.55
		10-13	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	85.985	1.39
	4	11-14	2.686	2.686	2.686	1.728	0.002133	0.73	1079.19	2.50	570.73	78.617	1.39
		12-15	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	76.207	1.39
											1231.01	240.807	1.39
		13-16	5.372	3.536	4.454	2.102	0.002133	0.73	1079.19	2.50	385.70	62.933	1.21
	5	14-17	7.686	1.768	2.227	1.617	0.002133	0.73	1079.19	2.50	651.77	57.601	1.21
		15-18	5.372	3.536	4.454	2.102	0.002133	0.73	1079.19	2.50	385.70	55.711	1.21
											1423.17	176.245	1.21
		16-19	3.536	1.701	2.619	1.712	0.002133	0.73	341.62	2.50	184.06	59.883	1.34
	6	17-20	1.768	0.850	1.309	1.420	0.002133	0.73	341.62	2.50	267.54	36.585	1.34
		18-21	3.536	1.701	2.619	1.720	0.002133	0.73	341.62	2.50	184.06	35.215	1.34
											635.66	111.683	1.34
		19-22	1.701	0.850	1.276	1.412	0.002133	0.83	322.95	2.50	255.79	17.515	1.09
	7	20-23	0.850	0.425	0.638	1.239	0.002133	0.83	322.95	2.50	332.21	16.251	1.09
		21-24	1.701	0.850	1.276	1.412	0.002133	0.83	322.95	2.50	255.79	15.401	1.09
											845.79	49.767	1.09

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

E

PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	El	Lu	Pcr	Pu	δ
1	1-3	1.000	1.89	1.445	1.451	0.000675	0.73	341.6	3.10	166.63	57.29	
	2-4	1.000	1.89	1.445	1.451	0.000675	0.73	341.6	3.10	166.63	73.30	
										333.26	130.59	2.27
2	3-5	1.89	2.01	1.95	1.550	0.000675	0.73	341.6	2.50	224.53	50.43	
	4-6	1.89	2.01	1.95	1.550	0.000675	0.73	341.6	2.50	224.53	66.44	
										449.06	116.87	1.59
3	5-7	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	43.82	
	6-8	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	59.77	
										442.76	103.59	1.50
4	7-9	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	37.202	
	8-10	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	53.09	
										442.76	90.29	1.41
5	9-11	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.33	30.59	
	10-12	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.33	46.41	
										442.76	77.00	1.33
6	11-13	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	23.98	
	12-14	2.01	2.01	2.01	1.561	0.000326	0.73	341.6	2.50	221.38	39.73	
										442.76	63.71	1.26
7	13-15	2.01	2.01	2.01	1.561	0.000326	0.83	341.6	2.50	221.38	17.36	
	14-16	2.01	2.01	2.01	1.561	0.000326	0.83	341.6	2.50	221.38	33.06	
										442.76	50.42	1.19
8	15-17	2.01	0.61	1.31	1.420	0.000326	0.63	341.6	3.00	185.78	10.75	
	16-18	2.01	0.61	1.31	1.420	0.000326	0.63	341.6	3.00	185.78	26.38	
										371.56	37.13	1.17

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
F	1	1-5	1.00	1.25	1.125	1.38	0.00045	0.73	227.75	3.10	122.82	19.77	1.49
		2-6	1.00	1.63	1.315	1.42	0.0010667	0.73	539.31	3.10	274.69	68.30	1.49
		3-7	1.00	1.63	1.315	1.42	0.0010667	0.73	539.31	3.10	274.69	67.11	1.49
		4-8	1.00	1.25	1.125	1.38	0.00045	0.73	227.75	3.10	122.82	26.80	1.49
	2	5-9	1.25	1.34	1.295	1.42	0.00045	0.73	227.75	2.50	148.36	17.91	1.24
		6-10	1.63	1.24	1.435	1.45	0.0010667	0.73	539.31	2.50	405.06	58.75	1.24
		7-11	1.63	1.24	1.435	1.45	0.0010667	0.73	539.31	2.50	405.06	57.76	1.24
		8-12	1.25	1.34	1.295	1.42	0.00045	0.73	227.75	2.50	148.36	23.17	1.24
	3	9-13	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	15.49	1.34
		10-14	1.24	0.73	0.985	1.34	0.00045	0.73	227.75	2.50	200.29	49.41	1.34
		11-15	1.24	0.73	0.985	1.34	0.00045	0.73	227.75	2.50	200.29	48.62	1.34
		12-16	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	19.71	1.34
	4	13-17	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	13.07	1.24
		14-18	0.73	0.73	0.730	1.27	0.00045	0.73	227.75	2.50	222.98	40.23	1.24
		15-19	0.73	0.73	0.730	1.27	0.00045	0.73	227.75	2.50	222.98	39.65	1.24
		16-20	1.34	1.34	1.340	1.43	0.00045	0.73	227.75	2.50	175.88	16.24	1.24
	5	17-21	1.34	1.34	1.340	1.43	0.00045	0.73	227.75	2.50	175.88	10.65	1.18
		18-22	0.73	0.73	0.73	1.27	0.00045	0.73	227.75	2.50	222.98	31.06	1.18
		19-23	0.73	0.73	0.73	1.27	0.00045	0.73	227.75	2.50	222.98	30.69	1.18
		20-24	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	12.78	1.18
	6	21-25	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	8.23	1.12
		22-26	0.73	0.73	0.73	1.27	0.00045	0.73	227.75	2.50	222.98	21.89	1.12
		23-27	0.73	0.73	0.73	1.27	0.00045	0.73	227.75	2.50	222.98	21.72	1.12
		24-28	1.34	1.34	1.34	1.43	0.00045	0.73	227.75	2.50	175.88	9.51	1.12
	7	25-29	1.34	0.67	1.005	1.34	0.00045	0.80	218.89	2.50	192.50	5.816	1.07
		26-30	0.73	0.37	0.55	1.21	0.00045	0.80	218.89	2.50	236.09	12.721	1.07
		27-31	0.73	0.37	0.55	1.21	0.00045	0.80	218.89	2.50	236.09	12.753	1.07
		28-32	1.34	0.67	1.005	1.34	0.00045	0.80	218.89	2.50	192.50	5.843	1.07

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	ψ_i	ψ_j	ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
		1-4	1.0	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	340.19	154.012	2.19
	1	2-5	1.0	2.524	1.762	1.516	0.002133	0.73	1079.19	3.10	482.25	152.124	2.19
		3-6	1.0	5.047	3.024	1.805	0.002133	0.73	1079.19	3.10	340.19	135.536	2.19
											1162.63	441.672	2.19
		4-7	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	130.723	1.73
	2	5-8	2.524	2.686	2.605	1.709	0.002133	0.73	1079.19	2.50	583.49	128.752	1.73
		6-9	5.047	5.372	5.210	2.243	0.002133	0.73	1079.19	2.50	338.73	114.408	1.73
											1260.95	373.283	1.73
6		7-10	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	106.570	1.55
	3	8-11	2.686	2.686	2.686	1.728	0.002133	0.73	1079.19	2.50	570.73	105.716	1.55
		9-12	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	93.616	1.55
											1231.01	305.902	1.55
		10-13	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	83.890	1.39
	4	11-14	2.686	2.686	2.686	1.728	0.002133	0.73	1079.19	2.50	570.73	83.557	1.39
		12-15	5.372	5.372	5.372	2.272	0.002133	0.73	1079.19	2.50	330.14	73.701	1.39
											1231.0	241.148	1.39
		13-16	5.372	3.536	4.454	2.102	0.002133	0.73	1079.19	2.50	385.70	61.214	1.22
	5	14-17	2.686	1.768	2.227	1.617	0.002133	0.73	1079.19	2.50	651.77	61.398	1.22
		15-18	5.372	3.536	4.454	2.102	0.002133	0.73	1079.19	2.50	385.70	53.786	1.22
											1423.77	176.398	1.22
		16-19	3.536	1.701	2.619	1.712	0.002133	0.73	341.62	2.50	184.06	38.538	1.33
	6	17-20	1.768	0.805	1.309	1.420	0.002133	0.73	341.62	2.50	267.54	39.259	1.33
		18-21	3.536	1.701	2.619	1.712	0.002133	0.73	341.62	2.50	184.06	33.871	1.33
											635.66	111.648	1.33
		19-22	1.701	0.850	1.276	1.412	0.002133	0.83	322.95	2.50	255.79	76.544	1.09
	7	20-23	0.850	0.425	0.638	1.239	0.002133	0.83	322.95	2.50	332.21	77.762	1.09
		21-24	1.701	0.850	1.276	1.412	0.002133	0.83	322.95	2.50	255.79	74.638	1.09
											843.79	248.944	1.09

TABLA Nº 2 CALCULO DEL FACTOR DE AMPLIFICACION (δ) POR PISO

	PISO	COL	Ψ_i	Ψ_j	Ψ	K	Ig	Bd	EI	Lu	Pcr	Pu	δ
H	1	1-5	1.00	0.63	0.815	1.292		0.73	227.75	3.10	140.12	36.06	1.30
		2-6	1.00	2.38	1.690	1.502		0.73	1581.50	3.10	719.96	103.16	1.30
		3-7	1.0	2.38	1.690	1.502		0.73	1581.50	3.10	719.96	106.05	1.30
		4-8	1.00	0.63	0.815	1.292		0.73	227.75	3.10	140.12	34.22	1.30
	2	5-9	0.63	0.67	0.650	1.243		0.73	227.75	2.50	232.77	31.26	1.19
		6-10	2.38	2.53	2.455	1.673		0.73	1581.50	2.50	892.27	92.14	1.19
		7-11	2.38	2.53	2.455	1.673		0.73	1581.50	2.50	892.27	94.59	1.19
		8-12	0.63	0.67	0.650	1.243		0.73	227.75	2.50	232.77	30.67	1.19
	3	9-13	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	27.57	1.17
		10-14	2.53	2.53	2.53	1.691		0.73	1581.50	2.50	873.38	81.42	1.17
		11-15	2.53	2.53	2.53	1.691		0.73	1581.50	2.50	873.38	83.45	1.17
		12-16	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	27.11	1.17
	4	13-17	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	23.89	1.14
		14-18	2.53	2.53	2.53	1.691		0.73	1581.50	2.50	873.38	70.70	1.14
		15-19	2.53	2.53	2.53	1.691		0.73	1581.50	2.50	873.38	72.27	1.14
		16-20	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	23.62	1.14
	5	17-21	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	20.27	1.11
		18-22	2.53	1.91	2.22	1.615		0.73	1581.50	2.50	957.51	59.98	1.11
		19-23	2.53	1.91	2.22	1.615		0.73	1581.50	2.50	957.51	61.11	1.11
		20-24	0.67	0.67	0.67	1.249		0.73	227.50	2.50	230.54	20.13	1.11
	6	21-25	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	16.52	1.13
		22-26	1.91	1.30	1.605	1.484		0.73	809.83	2.50	580.69	49.26	1.13
		23-27	1.91	1.30	1.605	1.484		0.73	809.83	2.50	580.69	49.95	1.13
		24-28	0.67	0.67	0.67	1.249		0.73	227.75	2.50	230.54	16.63	1.13
	7	25-29	0.67	0.64	0.655	1.249		0.83	215.30	2.50	230.54	12.84	1.10
		26-30	1.30	1.23	1.265	1.410		0.83	765.57	2.50	608.09	38.27	1.10
		27-31	1.30	1.23	1.265	1.410		0.83	765.57	2.50	608.09	38.68	1.10
		28-32	0.67	0.64	0.655	1.249		0.83	215.30	2.50	230.54	13.14	1.10
	8	29-33	0.64	0.20	0.42	1.167		0.63	241.72	3.00	194.64	12.20	1.08
		30-34	1.23	0.39	0.81	1.291		0.63	859.51	3.00	565.53	27.29	1.08
		31-35	1.23	0.39	0.81	1.291		0.63	859.51	3.00	565.53	27.41	1.08
		32-36	0.64	0.20	0.42	1.167		0.63	241.72	3.00	194.64	12.20	1.08

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
A	1	1-4	40x40	1.38	2.259	3.14	42.780	16.00	8 No. 5	0.01	No 3 a 0.25
		2-5	40x40	1.38	2.130	2.96	68.564	16.00	8 No. 5	0.01	No 3 a 0.25
		3-6	40x40	1.38	2.214	3.08	42.809	16.00	8 No. 5	0.01	No 3 a 0.25
	2	4-7	40x40	1.30	2.074	2.76	36.017	16.00	8 No. 5	0.01	No 3 a 0.25
		5-8	40x40	1.30	1.739	2.31	58.272	16.00	8 No. 5	0.01	No 3 a 0.25
		6-9	40x40	1.30	1.982	2.64	36.046	16.00	8 No. 5	0.01	No 3 a 0.25
	3	7-10	40x40	1.24	1.682	2.14	29.469	16.00	8 No. 5	0.01	No 3 a 0.25
		8-11	40x40	1.24	1.541	1.98	48.195	16.00	8 No. 5	0.01	No 3 a 0.25
		9-12	40x40	1.24	1.781	2.26	29.499	16.00	8 No. 5	0.01	No 3 a 0.25
	4	10-13	40x40	1.18	1.487	1.78	22.921	16.00	8 No. 5	0.01	No 3 a 0.25
		11-14	40x40	1.18	1.259	1.51	38.118	16.00	8 No. 5	0.01	No 3 a 0.25
		12-15	40x40	1.18	1.594	1.91	22.952	16.00	8 No. 5	0.01	No 3 a 0.25
	5	13-16	40x40	1.10	1.578	1.78	16.373	16.00	8 No. 5	0.01	No 3 a 0.25
		14-17	40x40	1.10	1.034	1.16	28.041	16.00	8 No. 5	0.01	No 3 a 0.25
		15-18	40x40	1.10	1.687	1.89	16.405	16.00	8 No. 5	0.01	No 3 a 0.25
	6	16-19	30x30	1.14	0.875	1.00	9.825	10.32	8 No. 4	0.01	No 3 a 0.20
		17-20	30x30	1.14	0.522	0.60	17.964	10.32	8 No. 4	0.01	No 3 a 0.20
		18-21	30x30	1.14	0.981	1.13	9.858	10.32	8 No. 4	0.01	No 3 a 0.20
	7	19-22	30x30	1.04	1.198	1.25	3.952	10.32	8 No. 4	0.01	No 3 a 0.20
		20-23	30x30	1.04	0.193	0.20	8.569	10.32	8 No. 4	0.01	No 3 a 0.20
		21-24	30x30	1.04	1.198	1.25	3.993	10.32	8 No. 4	0.01	No 3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
B	1	1-4	40x40	2.28	5.844	8.764	157.069	16.00	8 No. 5	0.01	No. 3 a 0.25
		2-5		2.28	4.623	10.540	160.197	16.00	8 No. 5	0.01	No. 3 a 0.25
		3-6		2.28	3.839	8.753	139.466	16.00	8 No. 5	0.01	No. 3 a 0.25
	2	4-7		1.78	2.213	3.939	133.379	16.00	8 No. 5	0.01	No. 3 a 0.25
		5-8		1.78	4.075	7.254	135.733	16.00	8 No. 5	0.01	No. 3 a 0.25
		6-9	40x40	1.78	2.147	3.822	118.374	16.00	8 No. 5	0.01	No. 3 a 0.25
	3	7-10	40x40	1.59	1.806	2.872	110.025	16.00	8 No. 5	0.01	No. 3 a 0.25
		8-11	40x40	1.59	3.554	5.651	111.605	16.00	8 No. 5	0.01	No. 3 a 0.25
		9-12	40x40	1.59	2.042	3.247	97.498	16.00	8 No. 5	0.01	No. 3 a 0.25
	4	10-13	40x40	1.42	1.528	2.168	87.548	16.00	8 No. 5	0.01	No. 3 a 0.25
		11-14	40x40	1.42	2.999	4.259	88.354	16.00	8 No. 5	0.01	No. 3 a 0.25
		12-15	40x40	1.42	1.784	2.533	77.559	16.00	8 No. 5	0.01	No. 3 a 0.25
	5	13-16	40x40	1.23	1.181	1.453	65.071	16.00	8 No. 5	0.01	No. 3 a 0.25
		14-17	40x40	1.23	2.735	3.364	65.103	16.00	8 No. 5	0.01	No. 3 a 0.25
		15-18	40x40	1.23	1.458	1.793	57.620	16.00	8 No. 5	0.01	No. 3 a 0.25
	6	16-19	30x30	1.38	0.851	1.174	42.594	10.32	8 No. 4	0.01	No. 3 a 0.20
		17-20	30x30	1.38	1.412	1.949	41.852	10.32	8 No. 4	0.01	No. 3 a 0.20
		18-21	30x30	1.38	0.930	1.283	37.681	10.32	8 No. 4	0.01	No. 3 a 0.20
	7	19-22	30x30	1.11	0.581	0.645	20.799	10.32	8 No. 4	0.01	No. 3 a 0.20
		20-23	30x30	1.11	0.978	1.086	19.283	10.32	8 No. 4	0.01	No. 3 a 0.20
		21-24	30x30	1.11	0.562	0.624	18.424	10.32	8 No. 4	0.01	No. 3 a 0.20

TABLA No. [illegible] DISEÑO [illegible] DE [illegible]

	PISO	COL	b x h	δ	[illegible]	[illegible]	[illegible]	As	REF	ρ	ESTRIBOS
C	1	1-3	20x30	2.66	1.23	3.28	52.00	7.74	6 No. 4	0.010	No.3 a 0.20
		2-4	20x30	2.66	1.29	3.43	51.37	7.74	6 No. 4	0.010	No.3 a 0.20
	2	3-5	20x30	1.60	1.56	2.50	43.67	7.74	6 No. 4	0.010	No.3 a 0.20
		4-6	20x30	1.60	1.56	2.50	43.67	7.74	6 No. 4	0.010	No.3 a 0.20
	3	5-7	20x30	1.45	1.37	1.99	35.47	7.74	6 No. 4	0.010	No.3 a 0.20
		6-8	20x30	1.45	1.36	1.99	3.46	7.74	6 No. 4	0.010	No.3 a 0.20
	4	7-9	20x30	1.31	1.25	1.64	27.26	7.74	6 No. 4	0.010	No.3 a 0.20
		8-10	20x30	1.31	1.23	1.61	27.25	7.74	6 No. 4	0.010	No.3 a 0.20
	5	9-11	20x30	1.20	1.86	2.23	19.05	7.74	6 No. 4	0.010	No.3 a 0.20
		10-12	20x30	1.20	1.08	1.30	19.04	7.74	6 No. 4	0.010	No.3 a 0.20
	6	11-13	20x30	1.10	0.97	1.07	10.85	7.74	6 No. 4	0.010	No.3 a 0.20
		12-14	20x30	1.10	0.97	1.07	10.83	7.74	6 No. 4	0.010	No.3 a 0.20
	7	13-15	20x30	1.02	0.76	0.78	2.64	7.74	6 No. 4	0.010	No.3 a 0.20
		14-16	20x30	1.02	0.76	0.78	2.62	7.74	6 No. 4	0.010	No.3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
		1-4	40x40	2.19	3.791	8.302	157.223	16.00	8 No. 5	0.01	No. 3 a 0.25
	1	2-5		2.19	4.608	10.092	143.755	16.00	8 No. 5	0.01	No. 3 a 0.25
		3-6		2.19	3.882	8.502	139.785	16.00	8 No. 5	0.01	No. 3 a 0.25
		4-7		1.73	2.351	4.067	132.96	16.00	8 No. 5	0.01	No. 3 a 0.25
	2	5-8		1.73	4.050	7.007	121.526	16.00	8 No. 5	0.01	No. 3 a 0.25
		6-9	40x40	1.73	1.996	3.453	118.076	16.00	8 No. 5	0.01	No. 3 a 0.25
9											
		7-10	40x40	1.55	1.923	2.981	109.033	16.00	8 No. 5	0.01	No. 3 a 0.25
	3	8-11	40x40	1.55	3.533	5.472	99.633	16.00	8 No. 5	0.01	No. 3 a 0.25
		9-12	40x40	1.55	1.903	2.949	96.703	16.00	8 No. 5	0.01	No. 3 a 0.25
		10-13	40x40	1.39	1.636	2.274	85.983	16.00	8 No. 5	0.01	No. 3 a 0.25
	4	11-14	40x40	1.39	2.979	4.141	78.617	16.00	8 No. 5	0.01	No. 3 a 0.25
		12-15	40x40	1.39	1.656	2.302	76.207	16.00	8 No. 5	0.01	No. 3 a 0.25
		13-16	40x40	1.21	1.340	1.962	62.933	16.00	8 No. 5	0.01	No. 3 a 0.25
	5	14-17	40x40	1.21	2.709	3.278	57.601	16.00	8 No. 5	0.01	No. 3 a 0.25
		15-18	40x40	1.21	1.271	1.538	55.711	16.00	8 No. 5	0.01	No. 3 a 0.25
		16-19	30x30	1.34	0.906	1.214	39.883	10.32	8 No. 4	0.01	No. 3 a 0.20
	6	17-20	30x30	1.34	1.393	1.867	36.585	10.32	8 No. 4	0.01	No. 3 a 0.20
		18-21	30x30	1.34	0.863	1.156	35.215	10.32	8 No. 4	0.01	No. 3 a 0.20
		19-22	30x30	1.09	0.779	0.849	17.515	10.32	8 No. 4	0.01	No. 3 a 0.20
	7	20-23	30x30	1.09	0.968	1.055	16.251	10.32	8 No. 4	0.01	No. 3 a 0.20
		21-24	30x30	1.09	0.251	0.274	15.401	10.32	8 No. 4	0.01	No. 3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
E	1	1-3	30x30	2.27	2.40	5.45	57.29	10.32	8 No. 4	0.0114	No. 3 a 0.20
		2-4	30x30	2.27	2.40	5.45	73.30	10.32	8 No. 4	0.0114	No. 3 a 0.20
	2	3-5	30x30	1.59	2.27	3.61	50.43	10.32	8 No. 4	0.0114	No. 3 a 0.20
		4-6	30x30	1.59	2.20	3.50	66.44	10.32	8 No. 4	0.0114	No. 3 a 0.20
	3	5-7	30x30	1.50	1.94	2.91	43.82	10.32	8 No. 4	0.0114	No. 3 a 0.20
		6-8	30x30	1.50	1.96	2.94	59.77	10.32	8 No. 4	0.0114	No. 3 a 0.20
	4	7-9	30x30	1.41	1.74	2.45	37.20	10.32	8 No. 4	0.0114	No. 3 a 0.20
		8-10	30x30	1.41	1.69	2.38	53.09	10.32	8 No. 4	0.0114	No. 3 a 0.20
	5	9-11	30x30	1.33	1.44	1.92	30.59	10.32	8 No. 4	0.0114	No. 3 a 0.20
		10-12	30x30	1.33	1.39	1.85	46.41	10.32	8 No. 4	0.0114	No. 3 a 0.20
	6	11-13	30x30	1.26	1.17	1.47	23.98	10.32	8 No. 4	0.0114	No. 3 a 0.20
		12-14	30x30	1.26	1.08	1.36	39.73	10.32	8 No. 4	0.0114	No. 3 a 0.20
	7	13-15	30x30	1.19	0.79	0.94	17.36	10.32	8 No. 4	0.0114	No. 3 a 0.20
		14-16	30x30	1.19	0.72	0.86	33.06	10.32	8 No. 4	0.0114	No. 3 a 0.20
	8	15-17	30x30	1.17	0.45	0.53	10.75	10.32	8 No. 4	0.0114	No. 3 a 0.20
		16-18	30x30	1.17	0.44	0.51	26.38	10.32	8 No. 4	0.0114	No. 3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
		1-5	20X30	1.49	0.53	0.79	19.77	7.74	6 No. 4	0.01	No.3 a 0.20
		2-6	20X40	1.49	1.30	1.94	68.30	12.00	6 No. 5	0.015	No.3 a 0.20
	1	3-7	20X40	1.49	1.30	1.94	67.77	12.00	6 No. 5	0.015	No.3 a 0.20
		4-8	20X30	1.49	0.39	0.58	26.80	7.74	6 No. 4	0.01	No.3 a 0.20
		5-9	20X30	1.24	0.93	1.16	17.91	7.74	6 No. 4	0.01	No.3 a 0.20
		6-10	20X40	1.24	0.90	1.12	58.75	12.00	6 No. 5	0.015	No.3 a 0.20
	2	7-11	20X40	1.24	0.89	1.12	57.76	12.00	6 No. 5	0.015	No.3 a 0.20
		8-12	20X30	1.24	0.86	1.07	23.17	7.74	6 No. 4	0.01	No.3 a 0.20
		9-13	20X30	1.34	0.62	0.84	15.49	7.74	6 No. 4	0.01	No.3 a 0.20
		10-14	20X30	1.34	1.50	2.01	49.41	7.74	6 No. 4	0.01	No.3 a 0.20
	3	11-15	20X30	1.34	0.75	1.01	48.62	7.74	6 No. 4	0.01	No.3 a 0.20
		12-16	20X30	1.34	0.58	0.78	19.71	7.74	6 No. 4	0.01	No.3 a 0.20
		13-17	20X30	1.24	0.55	0.68	13.07	7.74	6 No. 4	0.01	No.3 a 0.20
		14-18	20X30	1.24	0.62	0.77	40.23	7.74	6 No. 4	0.01	No.3 a 0.20
	4	15-19	20X30	1.24	0.62	0.77	39.65	7.74	6 No. 4	0.01	No.3 a 0.20
		16-20	20X30	1.24	0.49	0.61	16.24	7.74	6 No 4	0.01	No.3 a 0.20
		17-21	20X30	1.18	0.46	0.55	10.65	7.74	6 No. 4	0.01	No.3 a 0.20
		18-22	20X30	1.18	0.50	0.59	31.06	7.74	6 No. 4	0.01	No.3 a 0.20
	5	19-23	20X30	1.18	0.50	0.59	30.69	7.74	6 No. 4	0.01	No.3 a 0.20
		20-24	20X30	1.18	0.40	0.47	12.78	7.74	6 No. 4	0.01	No.3 a 0.20
		21-25	20X30	1.12	0.34	0.39	8.23	7.74	6 No. 4	0.01	No.3 a 0.20
		22-26	20X30	1.12	0.38	0.43	21.89	7.74	6 No. 4	0.01	No.3 a 0.20
	6	23-27	20X30	1.12	0.38	0.43	21.72	7.74	6 No. 4	0.01	No.3 a 0.20
		24-28	20X30	1.12	0.26	0.30	9.31	7.74	6 No. 4	0.01	No.3 a 0.20
		25-29	20X30	1.07	0.38	0.41	5.82	7.74	6 No. 4	0.01	No.3 a 0.20
		26-30	20X30	1.07	0.13	0.14	12.72	7.74	6 No. 4	0.01	No.3 a 0.20
	7	27-31	20X30	1.07	0.13	0.14	12.76	7.74	6 No. 4	0.01	No.3 a 0.20
		28-32	20X30	1.07	0.43	0.46	5.85	7.74	6 No. 4	0.01	No.3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

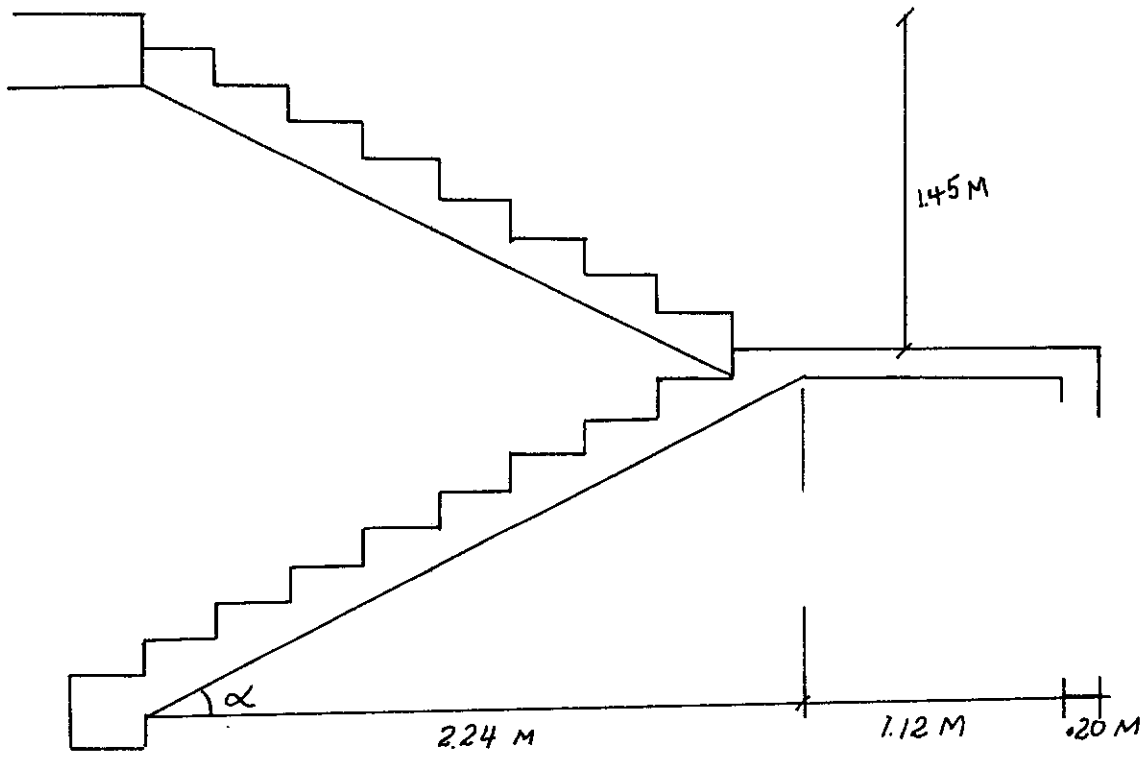
	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
6	1	1-4	40x40	2.19	3.924	8.594	154.012	16.00	8 No. 5	0.01	No. 3 a 0.25
		2-5	"	2.19	4.640	10.162	152.124	16.00	8 No. 5	0.01	No. 3 a 0.25
		3-6		2.19	3.751	8.215	135.536	16.00	8 No. 5	0.01	No. 3 a 0.25
	2	4-7		1.73	2.033	3.517	130.123	16.00	8 No. 5	0.01	No. 3 a 0.25
		5-8		1.73	4.052	7.010	128.752	16.00	8 No. 5	0.01	No. 3 a 0.25
		6-9	40x40	1.73	2.377	4.112	114.408	16.00	8 No. 5	0.01	No. 3 a 0.25
	3	7-10	40x40	1.55	1.574	2.440	106.570	16.00	8 No. 5	0.01	No. 3 a 0.25
		8-11	40x40	1.55	3.584	5.478	105.716	16.00	8 No. 5	0.01	No. 3 a 0.25
		9-12	40x40	1.55	2.254	3.494	93.616	16.00	8 No. 5	0.01	No. 3 a 0.25
	4	10-13	40x40	1.39	1.534	2.132	83.890	16.00	8 No. 5	0.01	No. 3 a 0.25
		11-14	40x40	1.39	2.981	4.144	83.557	16.00	8 No. 5	0.01	No. 3 a 0.25
		12-15	40x40	1.39	1.984	2.758	73.701	16.00	8 No. 5	0.01	No. 3 a 0.25
	5	13-16	40x40	1.22	0.884	1.078	61.212	16.00	8 No. 5	0.01	No. 3 a 0.25
		14-17	40x40	1.22	2.780	3.392	61.398	16.00	8 No. 5	0.01	No. 3 a 0.25
		15-18	40x40	1.22	1.727	2.107	53.786	16.00	8 No. 5	0.01	No. 3 a 0.25
	6	16-19	30x30	1.33	0.716	0.952	38.538	10.32	8 No. 4	0.01	No. 3 a 0.20
		17-20	30x30	1.33	1.406	1.870	39.239	10.32	8 No. 4	0.01	No. 3 a 0.20
		18-21	30x30	1.33	1.094	1.455	33.871	10.32	8 No. 4	0.01	No. 3 a 0.20
	7	19-22	30x30	1.09	0.395	0.431	16.544	10.32	8 No. 4	0.01	No. 3 a 0.20
		20-23	30x30	1.09	0.911	0.993	17.762	10.32	8 No. 4	0.01	No. 3 a 0.20
		21-24	30x30	1.09	0.670	0.730	14.638	10.32	8 No. 4	0.01	No. 3 a 0.20

TABLA Nº3 DISEÑO ESTRUCTURAL DE COLUMNAS

	PISO	COL	B x H	δ	Mc	Mu	P	As	Ref	ρ	ESTRIBOS
		1-5	20x30	1.30	0.37	0.48	35.06	7.74	6 No. 4	0.01	No.3 a 0.20
		2-6	30x50	1.30	3.07	3.99	103.16	17.04	6 No. 6	0.01	No.3 a 0.30
	1	3-7	30x50	1.30	3.07	3.99	106.05	17.04	6 No. 6	0.01	No.3 a 0.30
		4-8	20x30	1.30	0.33	0.43	34.22	7.74	6 No. 4	0.01	No.3 a 0.20
		5-9	20x30	1.19	0.88	1.05	31.26	7.74	6 No. 4	0.01	No. 3 a 0.20
		6-10	30x50	1.19	1.92	2.28	92.14	17.04	6 No. 6	0.01	No. 3 a 0.30
24	2	7-11	30x50	1.19	1.92	2.28	94.59	17.04	6 No. 6	0.01	No. 3 a 0.30
		8-12	20x30	1.19	0.80	0.95	30.61	7.74	6 No. 4	0.01	No. 3 a 0.20
		9-13	20x30	1.17	0.72	0.84	27.57	7.74	6 No. 4	0.01	No. 3 a 0.20
		10-14	30x50	1.17	1.77	2.07	81.42	17.04	6 No. 6	0.01	No. 3 a 0.30
	3	11-15	30x50	1.17	1.77	2.07	83.43	17.04	6 No. 6	0.01	No. 3 a 0.30
		12-16	20x30	1.17	0.65	0.76	27.11	7.74	6 No. 4	0.01	No. 3 a 0.20
		13-17	20x30	1.14	0.65	0.74	23.89	7.74	6 No. 4	0.01	No 3 a 0.20
		14-18	30x50	1.14	1.56	1.78	70.70	17.04	6 No. 6	0.01	No 3 a 0.30
	4	15-19	30x50	1.14	1.56	1.78	72.27	17.04	6 No. 6	0.01	No. 3 a 0.30
		16-20	20x30	1.14	0.56	0.64	23.62	7.74	6 No. 4	0.01	No. 3 a 0.20
		17-21	20x30	1.11	0.57	0.63	20.21	7.74	6 No. 4	0.01	No. 3 a 0.20
		18-22	30x50	1.11	1.31	1.45	59.98	17.04	6 No. 6	0.01	No. 3 a 0.30
	5	19-23	30x50	1.11	1.30	1.44	61.11	17.04	6 No. 6	0.01	No. 3 a 0.30
		20-24	20x30	1.11	0.47	0.52	20.13	7.74	6 No. 4	0.01	No. 3 a 0.20
		21-25	20x30	1.13	0.46	0.52	16.52	7.74	6 No. 4	0.01	No. 3 a 0.20
		22-26	30x40	1.13	1.60	1.81	49.26	12.00	6 No. 5	0.01	No 3 a 0.25
	6	23-27	30x40	1.13	1.16	1.31	29.95	12.00	6 No. 5	0.01	No. 3 a 0.25
		24-28	20x30	1.13	0.37	0.42	16.63	7.74	6 No. 4	0.01	No. 3 a 0.20
		25-29	20x30	1.10	0.36	0.40	12.84	7.74	6 No. 4	0.01	No. 3 a 0.20
		26-30	30x40	1.10	1.07	1.18	38.27	12.00	6 No. 5	0.01	No. 3 a 0.25
	7	27-31	30x40	1.10	1.07	1.18	38.68	12.00	6 No. 5	0.01	No. 3 a 0.25
		28-32	20x30	1.10	0.24	0.26	13.14	7.74	6 No. 4	0.01	No. 3 a 0.20
		29-33	20x30	1.08	0.59	0.64	12.20	7.74	6 No. 4	0.01	No. 3 a 0.20
		30-34	30x40	1.08	0.17	0.18	27.29	12.00	6 No. 5	0.01	No. 3 a 0.25
	8	31-35	30x40	1.08	0.17	0.18	27.41	12.00	6 No. 5	0.01	No. 3 a 0.25
		32-36	20x30	1.08	0.59	0.64	12.20	7.74	6 No. 4	0.01	No. 3 a 0.20

ESCALERA

ESCALERA



de Peldaños 8

Huella = 0.28 m

Contra Huella = 0.1611 m

Espesor Tasa Inclinado = 0.15 m

Espesor Tasa Descanso = 0.15 m

Ancho Losa = 1.20 m

Long. descanso = 1.12 m.

$$\cos\alpha = \frac{1}{1 + (0.1611/0.28)^2}$$

$\cos\alpha = 0.8667$

ANALISIS DE CARGA

a) En la Parte Inclinada

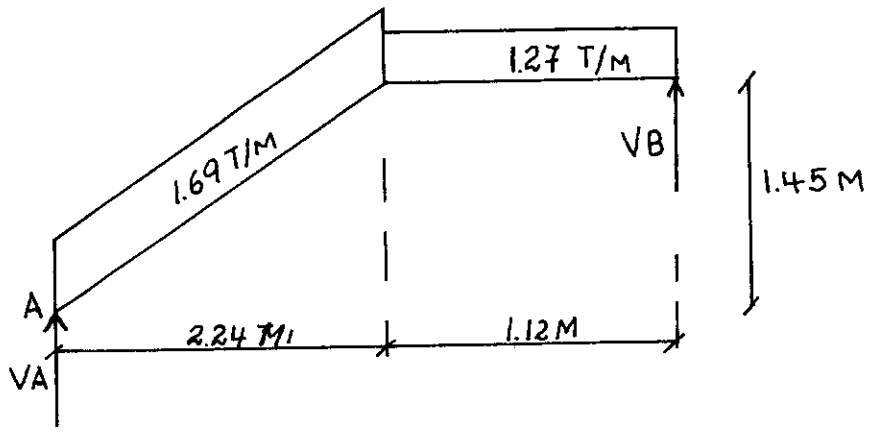
Peldaños de Granito y Pañete		120	Kg/m^2
Peldaños de Concreto	0.0806 x 2400	247	Kg/m^2
Placa Peso en Proyección Horizontal	0.15 x 2400 x 1/Cos	415.34	Kg/m^2
Carga Muerta		782.34	Kg/m^2
Carga Viva		350	Kg/m^2

$u = 1.4\ C.M + 1.7\ C.V = 1.4 \times 782.34 + 1.7 \times 350 = 1.69\ Ton/m^2$

b) En el Descenso

Piso de Granito y Pañetes	120	Kg/m^2
Placa de 0.15 x 2400	360	Kg/m^2
Carga Muerta	480	Kg/m^2
Carga Viva	350	Kg/m^2

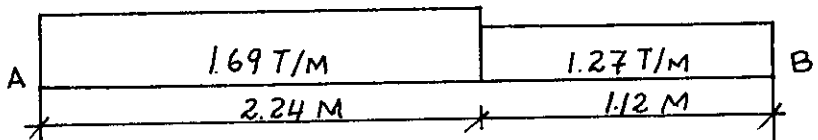
$u = 1.4 \times 480 + 1.7 \times 350 = 1.267\ Ton/m^2$



MB = 0 $\quad 3.36\ VA - 1.27 \times (1.12)^2 - 1.69 \times 2.24(1.12+1.12) = 0$

$VA = 2.76$ Ton

$VB = 5.21 - VA \qquad VB = 2.45$ Ton



M(-)	—		—
ΣV	2.76		2.45
X_o		1.63	
M(+)		2.25	
K(-)	0.012		0.012
AS(-)	4.75		4.75
ϕ(-)	4ϕ½"		4ϕ½"
K(+)		0.013	
AS(+)		5.76 a	
ϕ(+)		5ϕ½"	

CHEQUEO DE REQUISITOS

a) Requisito de Flexión:

$$Mu = \phi\, Mn = \phi\, Ru\, bd^2$$

$$225\ Tom/m = 0.9 \times 0.0548 \times 120\ (d^2)$$

$$d^2 = 38.02\ cm^2 \qquad d = 6.17\ cm$$

b) Requisito de Cortante :

$$Vu \leq \phi\, Vc = 0.53\, \phi\, \sqrt{210}\ bd$$

$$2760 = 0{,}53 \times 0.85 \times \sqrt{210} \times 120\ (d)$$

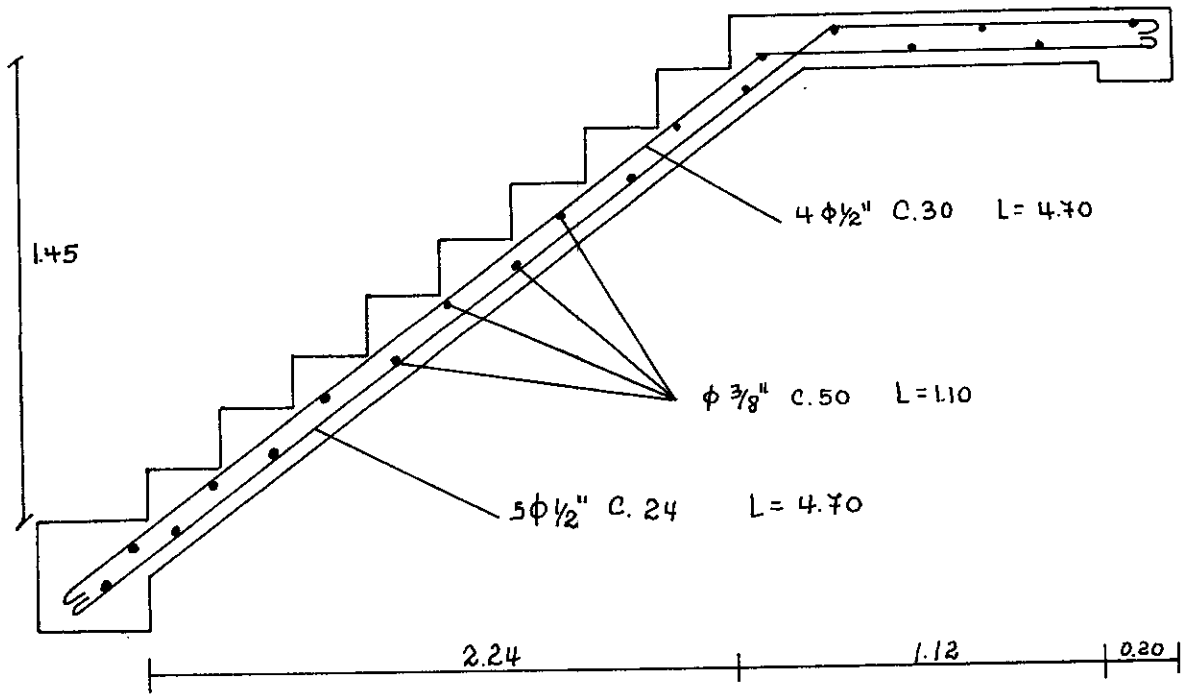
$$d = 3.52$$

c) Acero por temperatura

$$AS_{Temp.} = 0.0020 x h x b \qquad AS_T = 0.0020 x 15 x 336 = 10.08\ cm^2$$

Usar 16 ϕ 3/8" @ 50 cm

ESCALERA



PLACA ASCENSORES

Analisis de Carga:

Peso propio : 0.20x2.4x1.0x1.00x1.4 =	0.672	Ton/m
Carga Viva ; 20x1.7x1.0	0.340	Ton/m

Ascenso Tipo C - 10

No de ascensores = 2

No de personas de cada ascensor = 10

Carga = 800 Kg

Velocidad de o.8 a 1.5 m/seg

Area = 2.3 x 1.75 = 4.03 m^2

Carga de ascensores = 12/4.03 x 1.0	2.978	Ton/m
Carga Total	3.99	Ton/m

$M (+) = wL^2/8 = 3.99x\overline{1.75}^2/8 = 1.53$ Ton-m/m.

$K = 153/100x(17)^2 = 0.0053 \rightarrow \rho = 0.0033$

$AS = 0.0033x100x17 = 5.61\ cm^2/m$ 1 ø 5/8" @ 30 cm

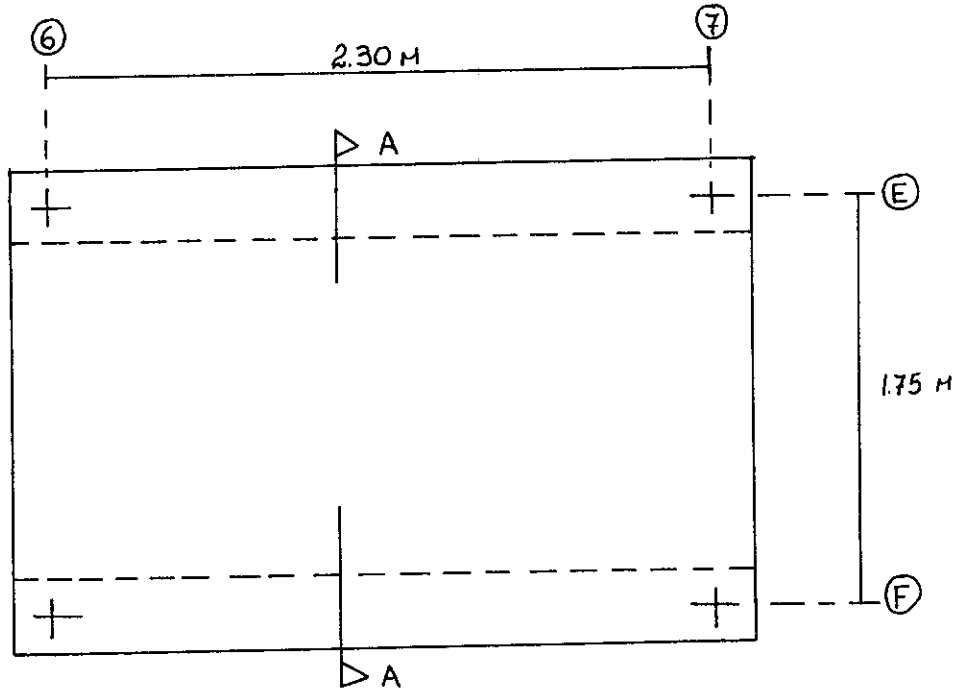
$ASt = 0.0025\ bt = 0.0025 \times 100 \times 20 = 5\ cm^2/m$ 1ø1/2"@25 cm

Chequeo de Cortante.-

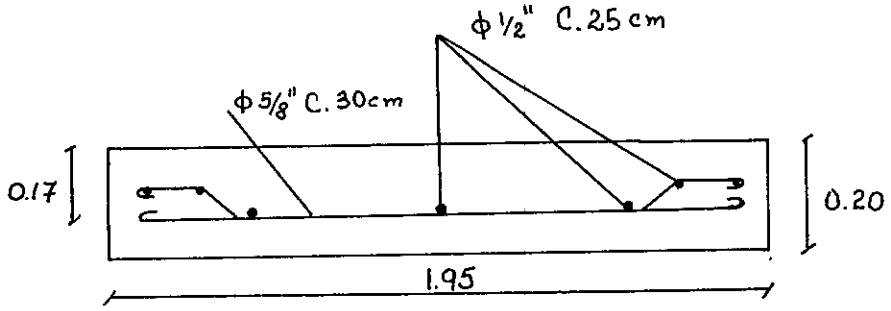
$R = 3.99x1.75/2 = 3.49$ Tom

$Vu = 3.49/100x17 = 2.05\ Kg/cm^2$

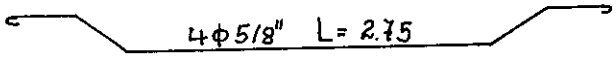
$\phi Vc = 0.85 \times 0.53x\sqrt{210} = 3.46\ Kg/cm^2$ $Vu < \phi Vc$

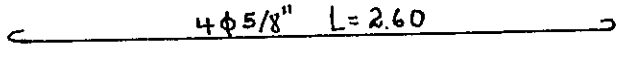


PLANTA



CORTE A-A





CIMENTACION

Calculo de la Capacidad Portante del Pilote

Los pilotes serán vaciados en el sitio.

Diámetro del pilote = dp = 0.30 m.

Longitud del pilote = L = 8.0 m.

Cap. por punta = Qp

Cap. por fricción = Qf

$Qp = \pi R^2 (\gamma LNq + 1.3cNc + 0.6 \gamma RNr)$

$Qf = \pi dpL.S$

Qt = Qp + Qf

FS = Factor de seguridad

R = Radio del pilote = dp/2

Nq, Nc, Nr son factores de Cap. de carga en función del angulo de Rozamiento ($\emptyset$)

c = Cohesión

γ = Peso unitario del suelo

S = Fricción del suelo atravesado por el pilote

a) Calculo de Qf

dp = 0.30 m

L = 8.0 m

S = 0.7 Kg/cm^2 (Según el libro mecanica de suelo y fundaciones 2^a parte. Autor: José A Covo).

$Qf = \pi dp.L.S.$

$Qf = \pi \times 0.3 \times 8.0 \times 0.7 = 52.78$ Ton

$Qf = 52.78$ Ton.

b) Calculo de Qp

$q = 1.10$ Kg/cm^2 (Fuente: Mecánica de suelos y Funda - ciones 2^a parte Jose A Covo).

$c = q/2 = 0.55$ Kg/cm^2

Para Arcillas con Betas Grises Blanda

Tenemos:

$\phi = 0$; $Nq = 1$; $Nc = 5.7$ $Nr = 0.00$

$Qp = \pi (0.15)^2 (1.9 \times 8.0 \times 1 + 1.3 \times 5.5 \times 5.7) = 3.95$ Ton

$Qt = Qf + Qp = 52.78 + 3.95 = 56.73$ Ton

$$Qadm = \frac{Qt}{Fx\ S} = \frac{56.73}{3} = 18.92 \text{Ton}$$

Qadm = 18.00 Ton

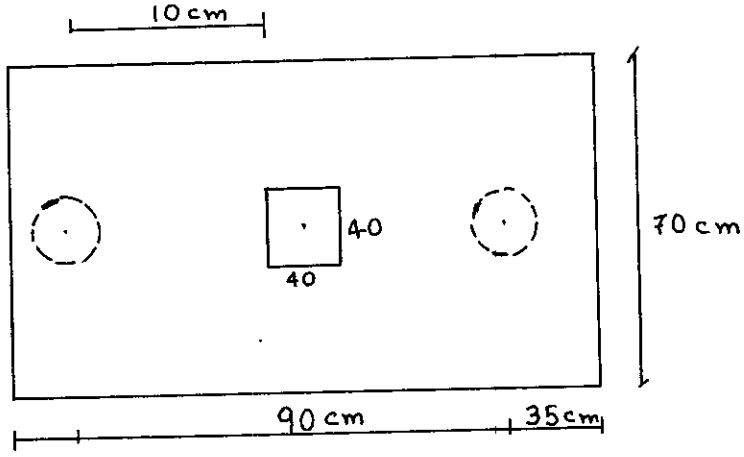
ZAPATA TIPO T-1

de Pilotes 2

Columna (1 - 4),(3 - 6). Pórtico A

Columna (1 - 5),(4 - 8). Pórtico F

Columna (1 - 5),(4 - 8). Pórtico H



Col. (3 - 6) P - A. (Sección 40x40)

Pu = 42.81 Ton

Mu = 3.14 Ton-m

dp = 30 cm.

Qad = 18 Ton

Qu = 1.5 x 18 = 27 Ton

Pcim = 2.4 (1.6x0.575x0.7) = 1.55 Ton x 1.4 = 2.17 Ton.

P Total = 44.36 Ton

$$p = Pt/N \pm Mc/I$$

c = 0.45 m ; $I = 1x2(0.45)^2 = 0.405$ Pilote-m^2

p =44.36/2 ± 3.14x0.45/0.405

pmáx= 25.67 Ton

pmin= 18.68 Ton

Chequeo por Aplastamiento

Presión de contacto admisible = 0.7x0.85x210 = 124.95 Kg/cm^2

Presión de contacto = Pu/ 40x40 = 42810/1600 = 26.76 Kg/cm^2

124.95 > 26.76

Chequeo por Punzonamiento

d = 35 cm ; H= 57.5 cm

Vc (d/2)= 1.06 $f'c$ bod

bo= 4(40 + 35) = 300 cm

Vc (d/2)= 1.06 210 x300x35 = 161289 Kg

Vu/0 = 33270/0.85 = 3914 Kg

Vu/0 $<$ Vc (d/2)

Chequeo por Cortante

Vc (d) = 0.85x0.53 $f'c$ x 70 x35 = 15994.5 Kg

Vu (d) = 4500 Kg

Vc (d) $>$ Vu (d)

Calculo del Refuerzo

a) Lado largo

M = 25.67 Ton x 0.25 m = 6.42 Ton-m.

AS = M/0.95 0 d = 6420/o.95x0.9x4200x0.5 = 3.58 cm^2

AS min = 0.0020 x 70 x 42.5 = 5.95 cm.

Usar 1 ϕ 1/2" C 14 cm en el lado más largo.

b) Lado corto

AS min = 0.0020x160x42.5 = 13.60 cm^2

Usar 11 ϕ 1/2"

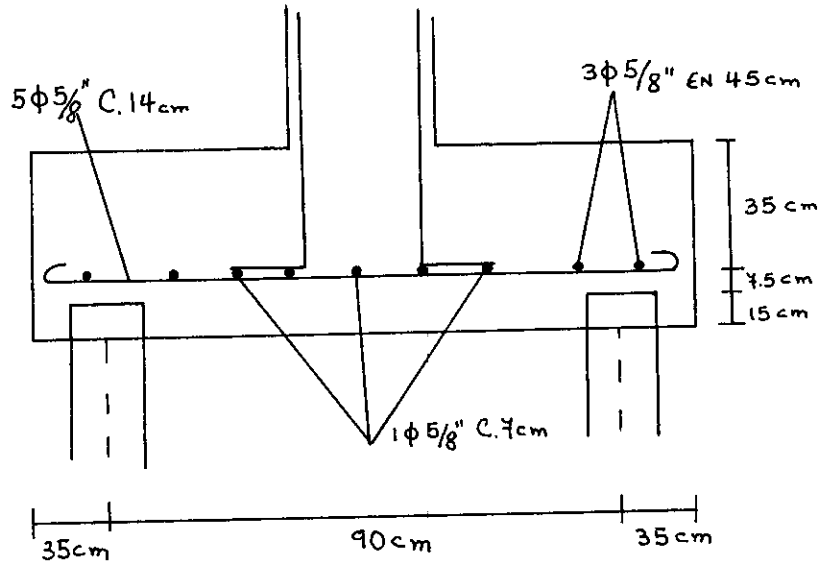
Cantidad de hierro en la banda $AS_1 = \frac{2}{B+1} AS$

= L/B = 160/70 = 2.29 B+1=3.29

$AS_1 = \frac{2}{3.29} \times 13.60 = 11.9\ cm^2$ 10 ϕ 5/8

En la franja central de 70 cm. Usar 1 d1/2 C 7cm

En cada la do de la franja usar 3 ϕ 5/8"



ZAPATA TIPO T-2

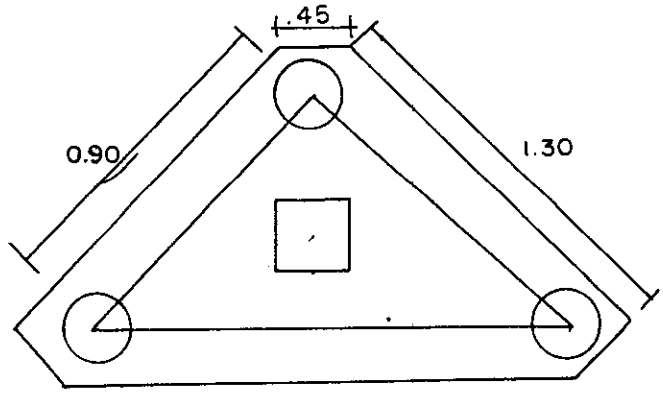
de Pilotes 3

Columna (2 - 5) Pórtico A

Columna (1 - 3), (2 - 4) Pórtico C

Columna (1 - 3), (2 - 4) Pórtico E

Columna (2 - 6), (3 - 7) Pórtico F



Col. (2-5) P - A (40x40)

Pu = 68.57 Ton

Mu = 2.96 Ton-m

dp = 30 cm

Qadm= 18 Ton

Qu = 1.5 x 18 = 27 Ton

Pcim= $1.4 \times 2.4 \times 74.5 \times 5243.755\ cm^3 \times 1\ Ton / 10^6 cm^3$

Pcim= 1.31 Ton.

Ptotal = 69.88 Ton.

$$p = Pt/N = Mc/I$$

c = 0.52 m ; $I = 1x3(o.52)^2 = 0.81$ Pilote-m^2

p =69.88/3 ± 2.96x0.52/0.81

pmáx=25.20 Tom.

pmin=21.40 Ton

Chequeo por Aplastamiento

Presión de contacto admisible = 124.95 kg/cm^2

Presión de contacto = 69.29/1600 = 43.31 Kg/cm^2

$$Pc < Pa$$

Chequeo por Punzonamiento

d = 52 cm ; H = 74.5 cm

Vc (d/2) = 1.06 f'c bod ; bo = 4(40+52) = 340 cm

Vc (d/2) = 235021 Kg

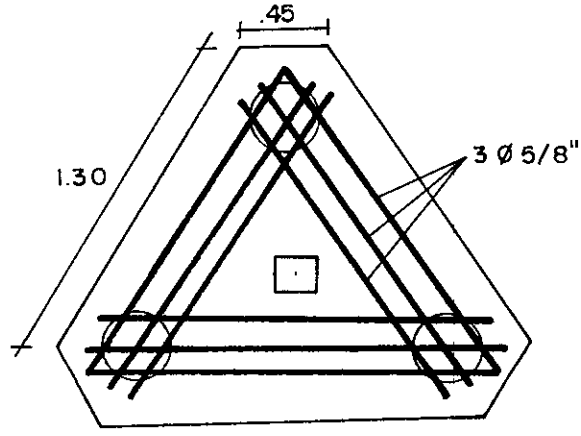
Vu / ϕ = 25000Kg/0.85 = 29411 Kg

$$Vc\ (d/2) > Vu/\phi$$

DISEÑO A LA FLEXION

$AS = Pt / f_y x tg \ \ x3 \ = 69880/4200x3x1 = 5.55 \ cm^2$

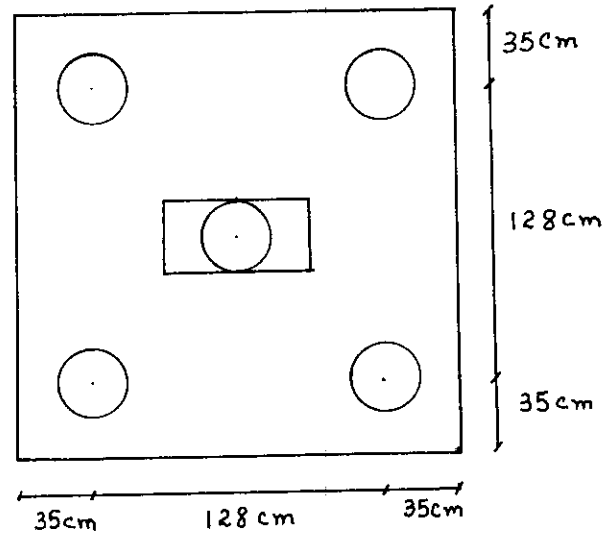
Usar 3ϕ 5/8



ZAPATA TIPO T-3

de Pilotes 5

Columna (2 - 6), (3 - 7) Pórtico H



Col (3 - 7) P - H (30x50)

Pu = 106.05 Ton

Mu = 4.0 Ton-m

dp = 30 cm

Qad = 18 Ton

qu = 1.5x18=27 Ton.

Pcim= 2.4 (1.98 x 1.98 x 0.42) x 1.4 = 5.53 Ton

Ptotal = 111.58 Ton

$p = Pt/N \pm Mc/I$

c = 0.45 ; $I = 2x2(0.45)^2 = 0.81$

p = 111.58/5 ± 4x0.45/0.81

pmáx= 24.54 Ton

pmin= 20.10 Ton

Chequeo por Aplastamiento .-

Presión de contacto = Pt/ 30x50 = 110/30x50 = 73.33 Kg/cm^2

$73.33\ Kg/cm^2 < 124.95\ Kg/cm^2$

Chequeo por Punzonamiento.-

d = 42 cm ; H = 64.5 cm

$Vc\ (d/2) = 1.06 \sqrt{f'c}\ bod$; bo = 4(30+42) = 288 cm

$Vc\ (d/2) = 1.06\sqrt{210}\ x288x42 = 185804\ Kg$

$Vu\ /\ \phi = 88000/0.85 = 103529\ Kg$

$$Vu\ (d/2) > Vu/\phi$$

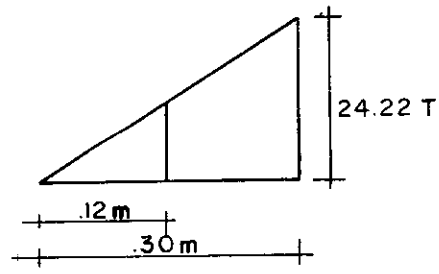
Chequeo por Cortante.-

a) Lado menor de la columna

$Vc\ (d) = 0.85x0.53\sqrt{f'c}\ x\ db = 0.85x0.53\sqrt{210}\ x198x42 =$

$Vc\ (d) = 54289\ Kg$

$$\frac{12x24.22}{30} = 9688Kg$$



$Vu = 2x9688Kg = 19376\ Kg$

$$Vu < Vc\ (d)$$

b) Lado Mayor de la columna

$$\frac{22x24.22\ Ton}{30} = 17.76$$

$Vu = 2x17.76 = 35.52$

$$Vu < Vc\ (d)$$

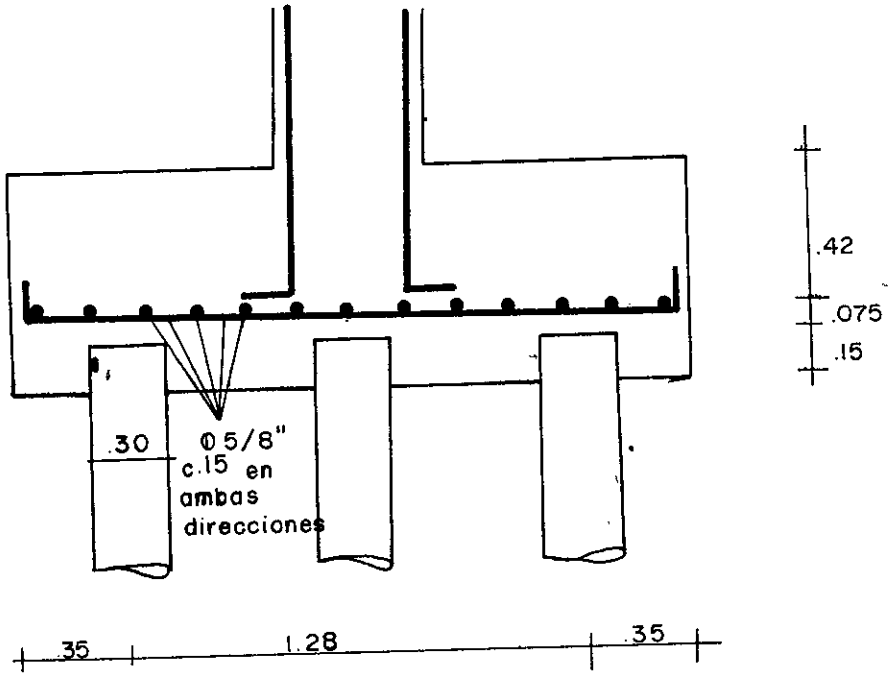
DISEÑO A LA FLEXION

$M = 24.22 \text{ Ton} \times 2 \times 0.49 = 23.74 \text{ Ton-m}$

$$AS = \frac{M}{\phi f_y x 0.95d} = \frac{23740}{0.9 x 4200 x 0.95 x 0.42} = 15.74 \text{ cm}^2$$

$ASmin = 0.0020 x 198 x 64.5 = 25.54 \text{ cm}^2$

Usar 13 ϕ 5/8" ➡ 1 ϕ 5/8" @ 15 cm en ambas direcciones.



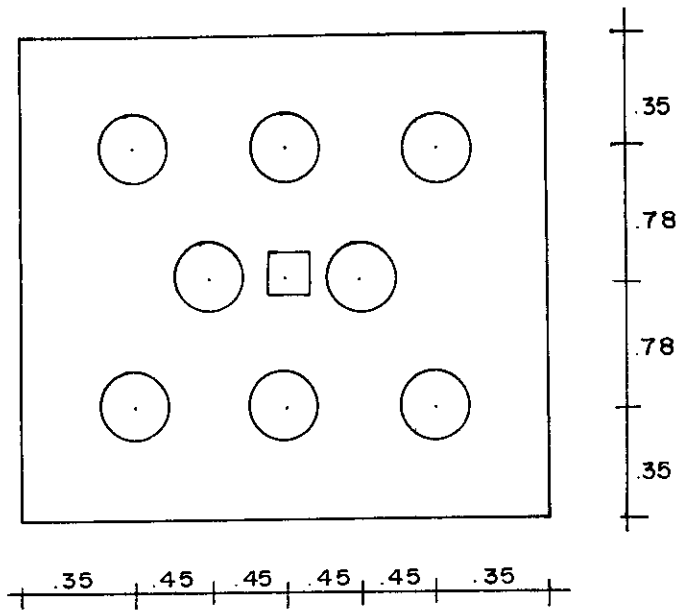
CABEZOTE TIPO T-4

de Pilotes 8

Columna (1-4),(2-3),(3-6) Pórtico B

Columna (1-4) Pórtico G

Columna (1-4) Pórtico D



Col. (2-5)

Pu = 160.20 Ton

Mu = 10.54 Toh-m

dv = 30 cm

Qad = 18 Ton

Qu = 27 cm

Pcim= 2.4x2.50x2.26x0.675 = 9.15 Ton

Ptotal = 169.35 Ton

$p = Pt/N \pm Mc/I$; c= 0.78 ; $I = 3x2(0.78)^2 = 3.65$ Pil-m^2

$p = 169.35/8 \pm 10.54 \times 0.78/3.65 = 21.17 \pm 2.25$

pmáx = 23.42 Ton — Pilote Ext

pmin = 18.92 Ton

21.17 Ton — Pilote Central

Chequeo por Punzonamiento.-

d = 45 cm ; H = 67.5 cm

$Vc\ (d/2) = 1.06 \sqrt{f'c}\ bod$; bo = 4(40+45) = 340 cm

$Vc\ (d/2) = 1.06 \sqrt{210} \times 340 \times 45 = 235021$ Kg

$Vu / \phi = 169350/0.85 = 199000$ Kg

$$Vc\ (d/2) > Vu/\phi$$

Chequeo por Corte .-

$Vc\ (d) = 0.85 \times 0.53 \sqrt{210}\ xbd = 73444$ Kg

$Vu = 3 \times 23.42 = 70260$ Kg

$$Vc\ (d) > Vu$$

DISEÑO A LA FLEXION

a) Lado Largo

$M = 0.45x21.17 + 0.9(23.42+18.92) = 47.63$ Ton-m

$$AS = \frac{47630 \text{ Kg-m}}{0.9x4200x0.95x0.45} = 29.43 \text{ cm}^2$$

$ASmin = 0.002x2.26x67.5 = 30.51 \text{ cm}^2$

Usar 16 ø 5/8" ➡ 1 ø 5/8" @ 14 cm

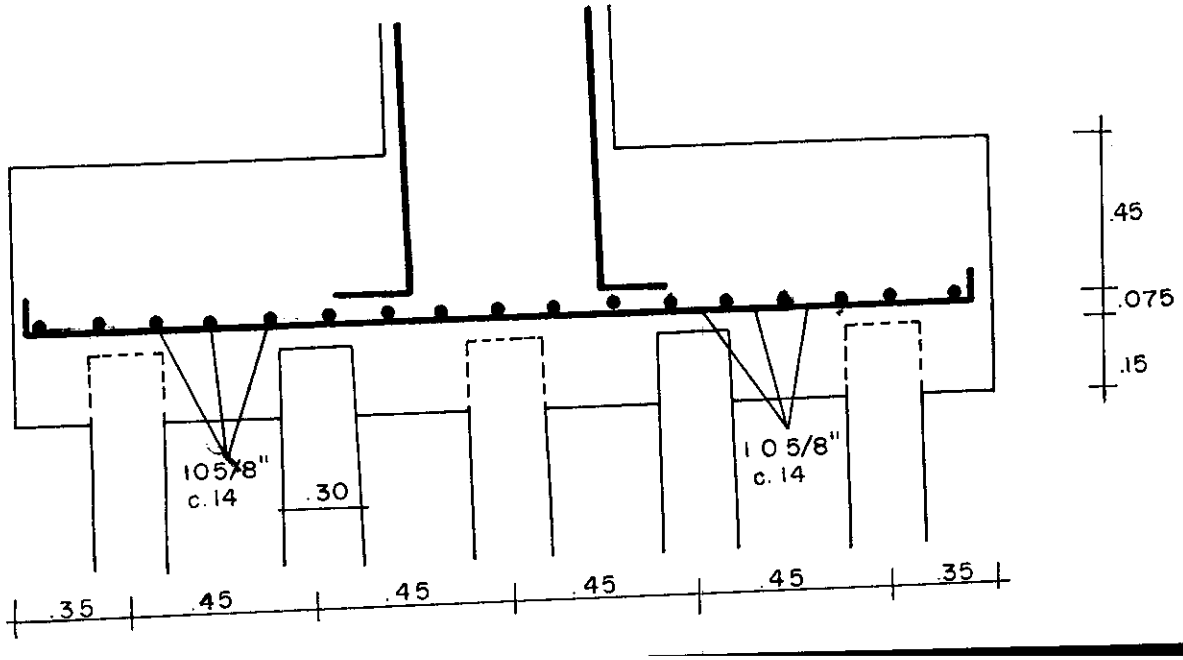
b) Lado Corto

$M = 3x0.78x23.42 = 54.8$ Ton-m

$$AS = \frac{54800}{0.9x4200x0.95x0.45} = 33.91 \text{ cm}^2$$

$ASmin = 0.002x250x76.5 = 33.75 \text{ cm}^2$

Usar 17 ø 5/8" ➡ 1 ø 5/8" @ 14 cm



ZAPATA TIPO T-5

Columna (2 - 5),(3 - 6) Pórtico D

Columna (2 - 5),(3 - 6) Pórtico G

Pe = 152.13 Ton

Pi = 152.20 Ton

Qad= 18 Ton

Qu =1.5x18 = 27 Ton

dp = 30 cm

Sección = 40x40

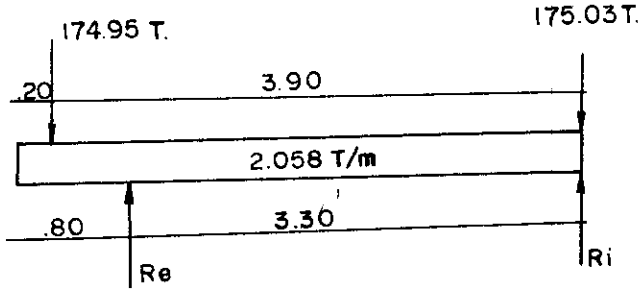
Pcim ext= 15 % Pe

Pt ext = 180.90 Ton

Pcim int= 15 % Pi

Pcim int= 1.15x152.2 = 175.03 Ton

W_{viga} = 2.4 Ton/m^3 x 0.70 x 0.875 x 1.4 = 2.058 Ton/m



$\Sigma Mi = 0 \Rightarrow 3.3Re - 3.9x174.95 - 2.058x(4.1)^2/2 = 0$

Re = 212.00 Tn.

$\sum Me = 0 \rightarrow 3.3Ri - 175.03x3.3 - 2.058x(3.3)^2 + 2.058x(0.8)^2/2 +$

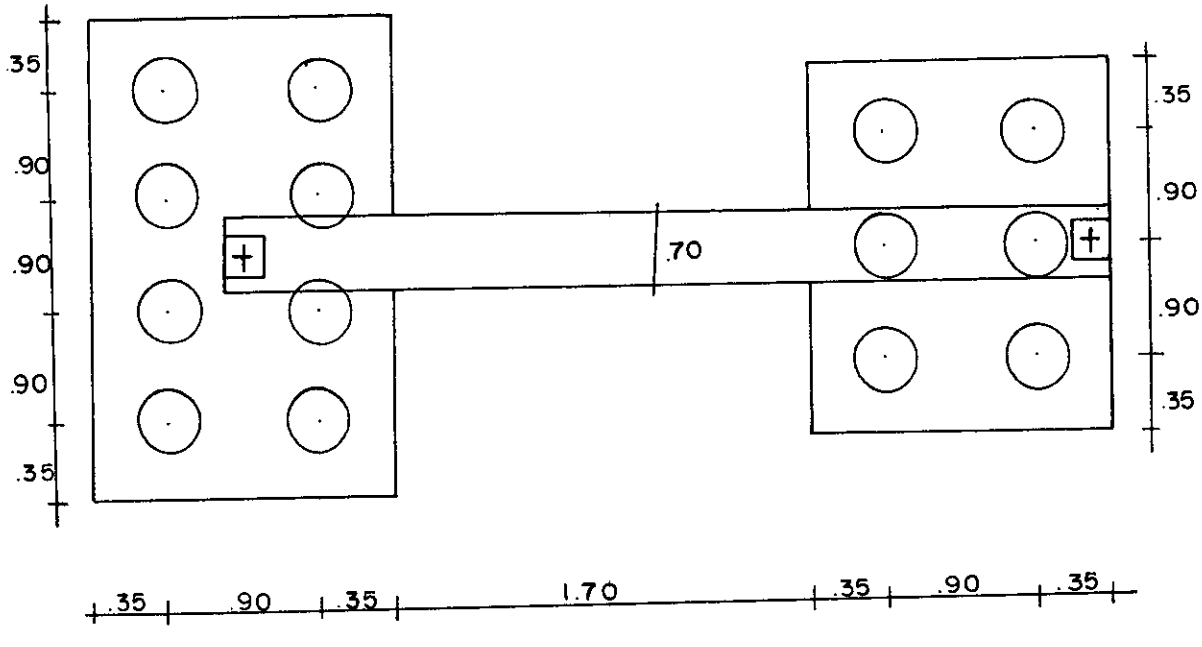
$174.95x0.6 = 0 \rightarrow Ri = 146.42$

de pilotes

Zap. ext ± 212/27 = 7.85 ≃ 8 Pilotes

de pilotes

Zap. int = 146.42/27 = 5.42 ≃ 6 Pilotes



Chequeo por Cortante

a) Zap. ext

$Vc\ (d) = 0.53\ \phi \sqrt{f'c}\ db = 0.53x0.85\ \sqrt{210}\ x160x80 = 83.56$ Ton

$vu = 26.5$ Ton x 2 = 53 Ton $Vu \angle Vc(d)$

Refuerzo para la Zapata Interior

a) Ref. en dirección del lado largo.-

$M = 0.7x24.4x2 = 34.16$ Ton-m

$AS = 34160/0.9x4200x0.95x0.8 = 11.89\ cm^2$

$ASmin = 0.002x160x80 = 25.6\ cm^2$

Usar: 10 ϕ 3/4" @16 cm.

b) Ref. en dirección del lado corto

$M = 0.25x24.4x3 = 18.3$ Ton-m

$AS = 18300/\ 0.9x4200x0.95x0.8 = 6.37\ cm^2$

$ASmin = 0.002x250x80 = 40\ cm^2$

Usar: 15 ϕ 3/4" @16.67 cm

Refuerzo para la Zapata Ext

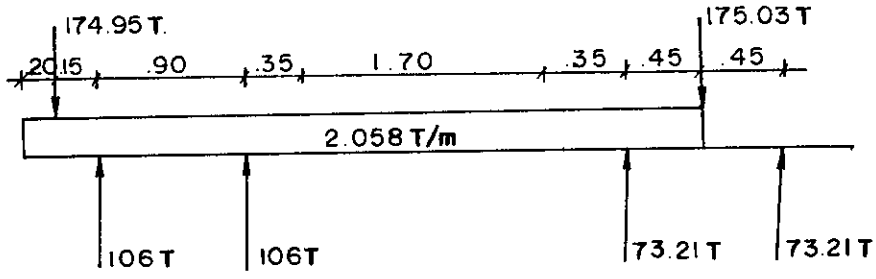
$M = 0.25x2x26.5 + 1.35x2x26.5 = 84.80$ Ton-m

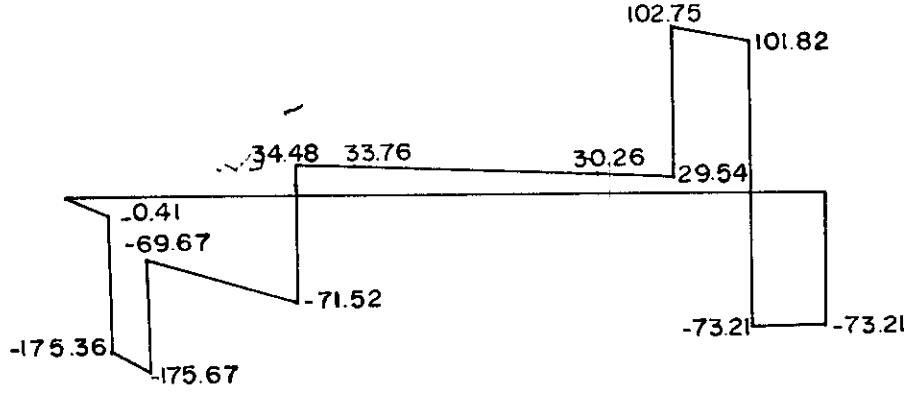
$AS = 84800/0.9x4200x0.95x0.8 = 29.52\ cm^2$

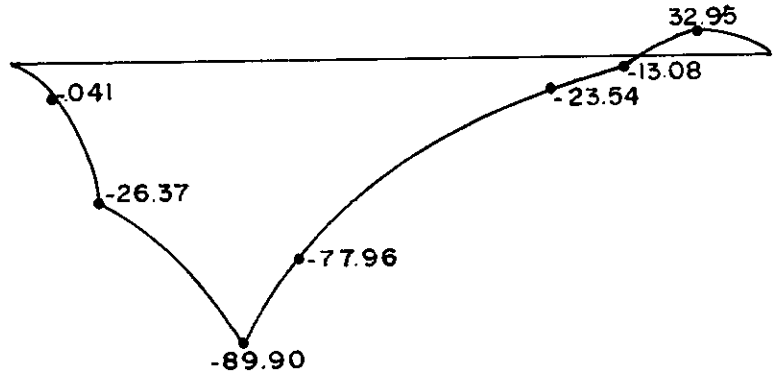
$AS\ min = 0.002x160x80 = 25.6\ cm^2$

$AS_1 = (2/B+1)xAS$ $B+1 = 1/b + 1 = (2.50/1.60)+1 = 2.5625$

$AS_1 = 2 \times 29.52/2.5625 = 23.04\ cm^2$.







Calculo del Ancho de la Viga

$Vu \leq 0.53 \phi \sqrt{f'c}\, bd \rightarrow Vu = 33.76$ Ton $\rightarrow b = \dfrac{33760}{0.53 \times 0.85 \sqrt{210} \times 80}$

$b = 64.64 \simeq 70$cm.

Refuerzo de la Viga

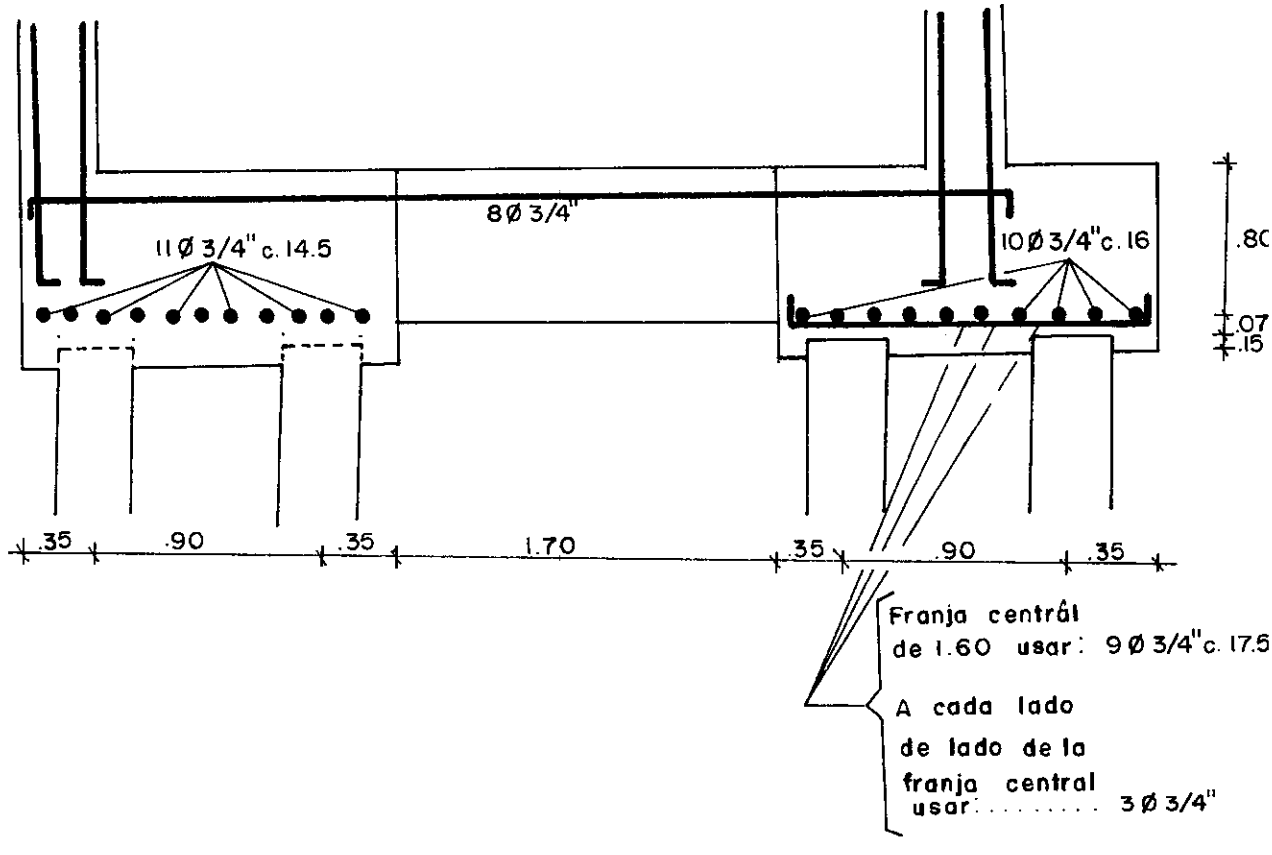
Para el momento del ext. izq. $M = 77.96$ Ton-m

$K = 7796/70x(80)^2 = 0.0174 \quad \rho = 0.0055 \quad AS = \rho bd = 30.8\ cm^2$

Usar 8 ϕ 7/8" @ϕ a 8.75 cm

Usar 9 ∅ 3/4" @ 17.50 cm en una franja central de 1.60 m de ancho.

Al lado de cada franja usar 3 ∅ 3/4".



Calculo de la Viga de Amarre

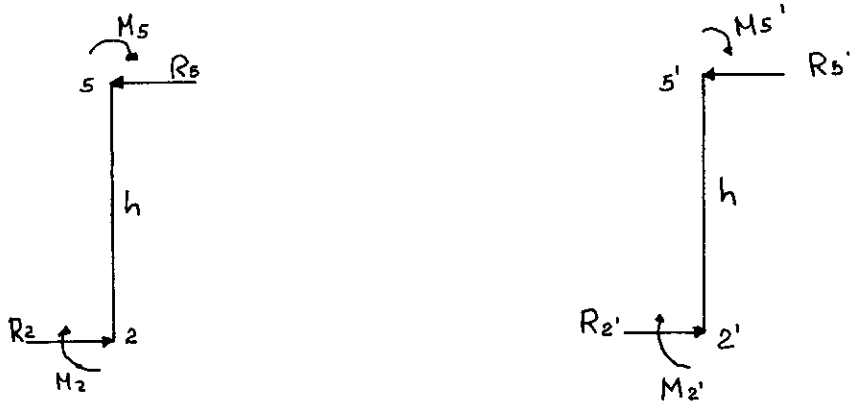
Diseño como Columna y como Tensor

a) Diseño como Tensor

Haciendo cuerpo libre en el primer tramo del pórtico más desfavorable por momento. Combinando los efectos producidos por carga vertical y viento.

Tomamos el Pórtico G

Analisis del cuerpo libre



Aplicando momento en 5 y 5'

$R_2 = (M_5 + M_2)/h$ $\qquad$ $R_2' = (M_5' + M_2')/h$

$$R_2 = \frac{2.902 + 5.653}{3.30} = 2.59 \qquad R_2' = \frac{0.214 + 0.494}{3.30} = 0.214$$

$P = R_2 + R_2' = 2.81$ Ton

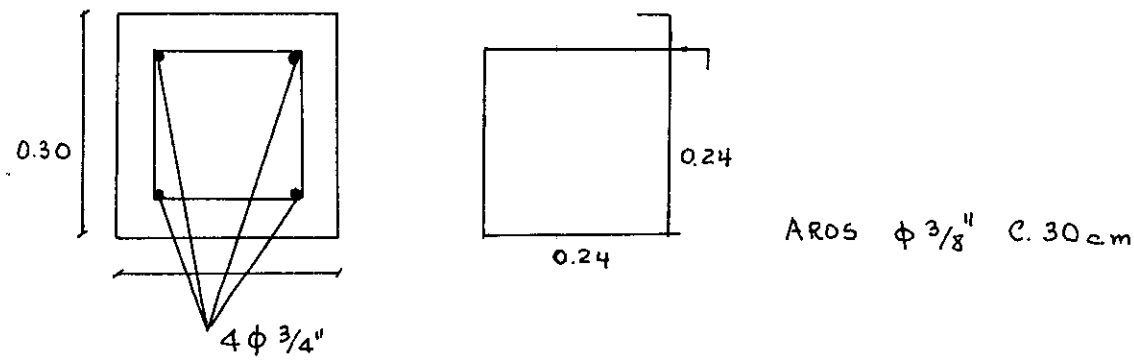
$fs = P/A$ $\qquad$ $AS = P/fs$ $\qquad$ $AS = 2810/4200$

b) Diseño como Columna

Como columna necesita cuantía mínima.

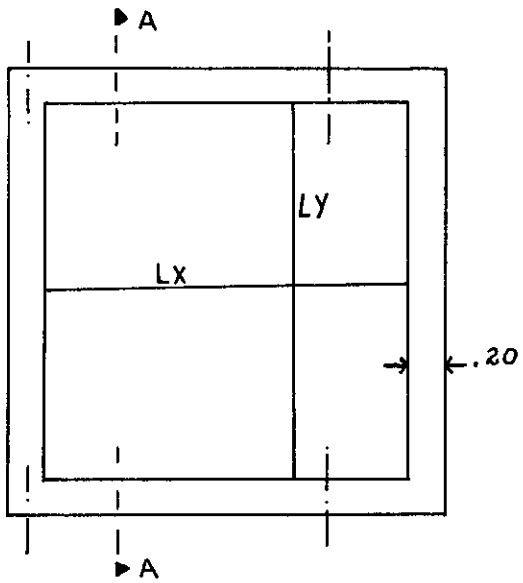
$AS = 0.01 tb = 0.01 \times 25 \times 30 = 7.5\ cm^2$

Tomamos $4\ \phi\ 3/4"$

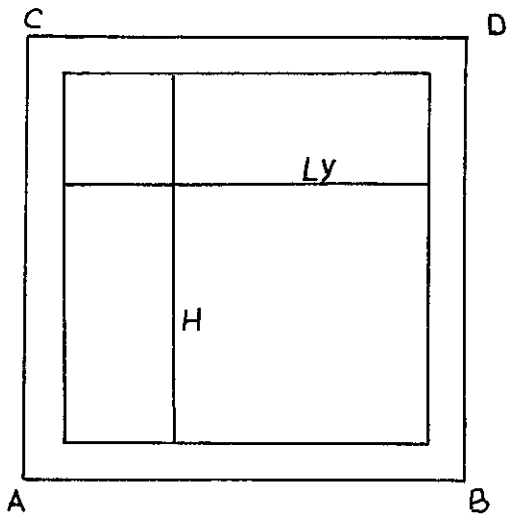


TANQUES

TANQUE ALTO



PLANTA



CORTE "A - A"

Medidas Internas :

H= 1.70 m ; Lx = 3.35 m ; Ly = 3.90 m.

Dimensiones:

Espesor Tapa = 0.20 m.

Espesor Muro = 0.20 m.

Espesor Fondo = 0.20 m.

Analisis de Carga

Tapa CD

Peso = 2.40 Ton/m^3 x 0.20 m x 1.0 m = 0.48 Ton/m

Muro CA

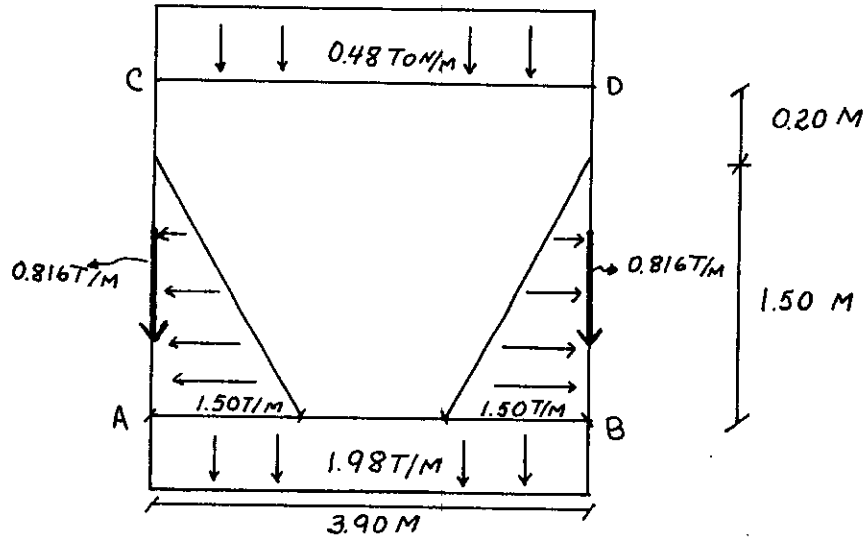
Peso = 2.4 Ton/m^3 x 1.70 m x 0.20 m = 0.816Ton/m

Peso del Agua = 1 Ton/m^3x 1.50 m x 1 m= 1.50 Ton/m

Fondo AB

Peso = 2.4 Ton/m^3 x 0.20 m x 1 m = 0.48 Ton/m

Peso del agua = 1 Ton/m^3 x1.50 m x 1 m= 1.5 Ton/m



Analisis Estructural

MfAC = - MfBD = $qc^2/60L^2$ 10a (a+c) + $3c^2$ = 0.198 Ton/m.

$MfCA = - MfDB = qC^3/60L^2 \ (5a + 2C) = 0.117$ Ton/m

$MfCD = - MfDC = wL^2/12 = 0.61$ Ton/m

$MfAB = - MfBA = wL^2/12 = 2.51$ Ton/m

Para el Diseño se Siguió el Metodo de Slopedeflection

Momentos Definitivos :

MAB = 1.98 Ton/m

MAC =-1.98 Ton/m

MCD = 0.69 Ton/m

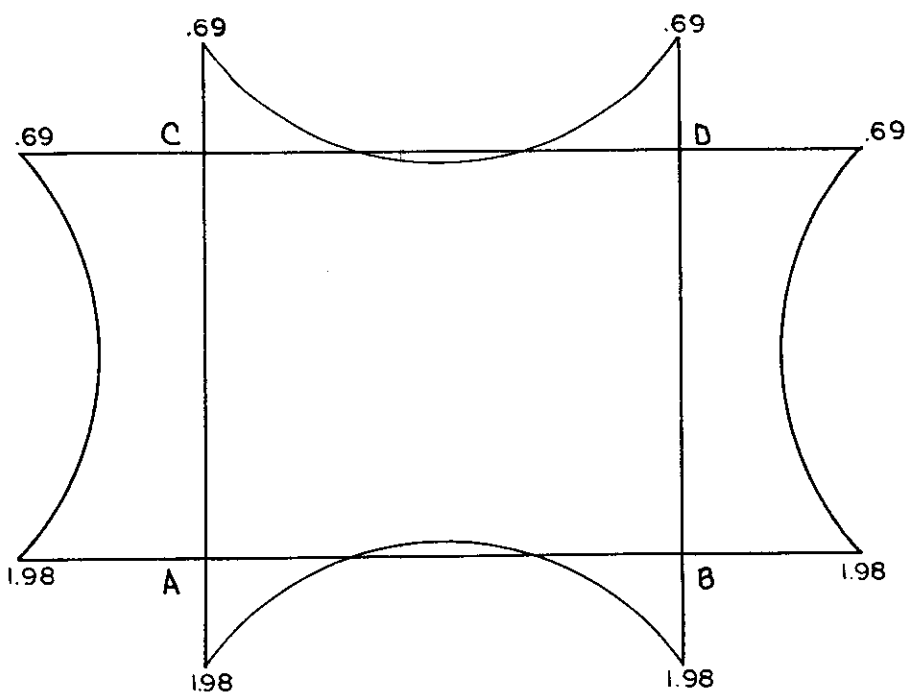
MCA =-0.69 Ton/m

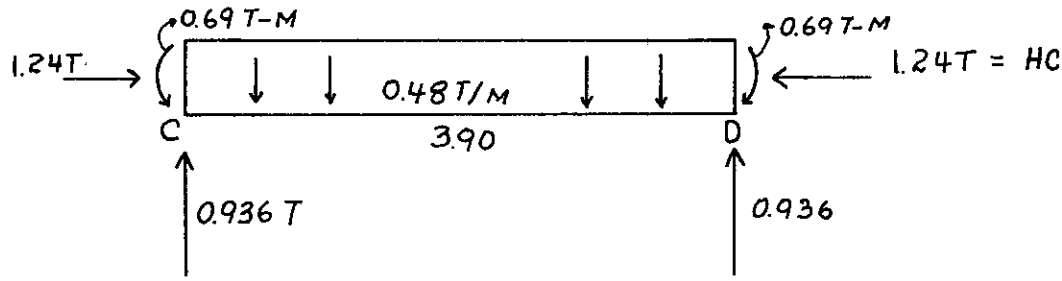
MBD = 1.98 Ton/m

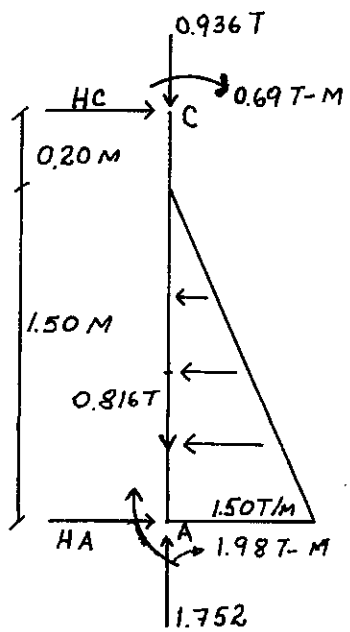
MBA =-1.98 Ton/m

MDC =-0.69 Ton/m

MDB =-0.69 Ton/m





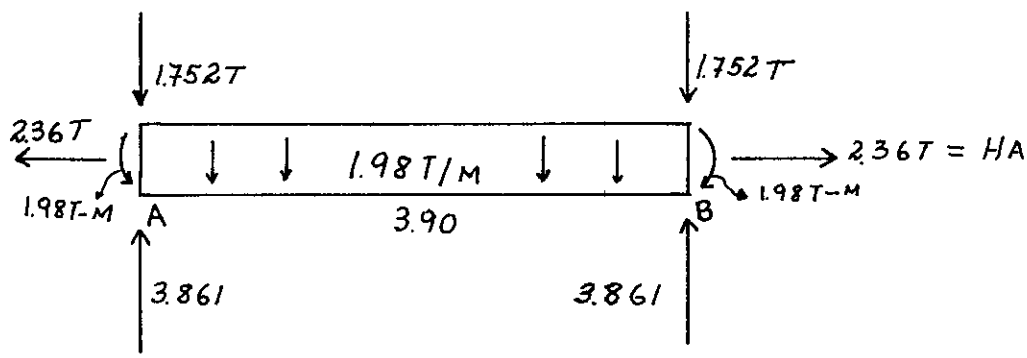


$$\Sigma Mc = 0$$

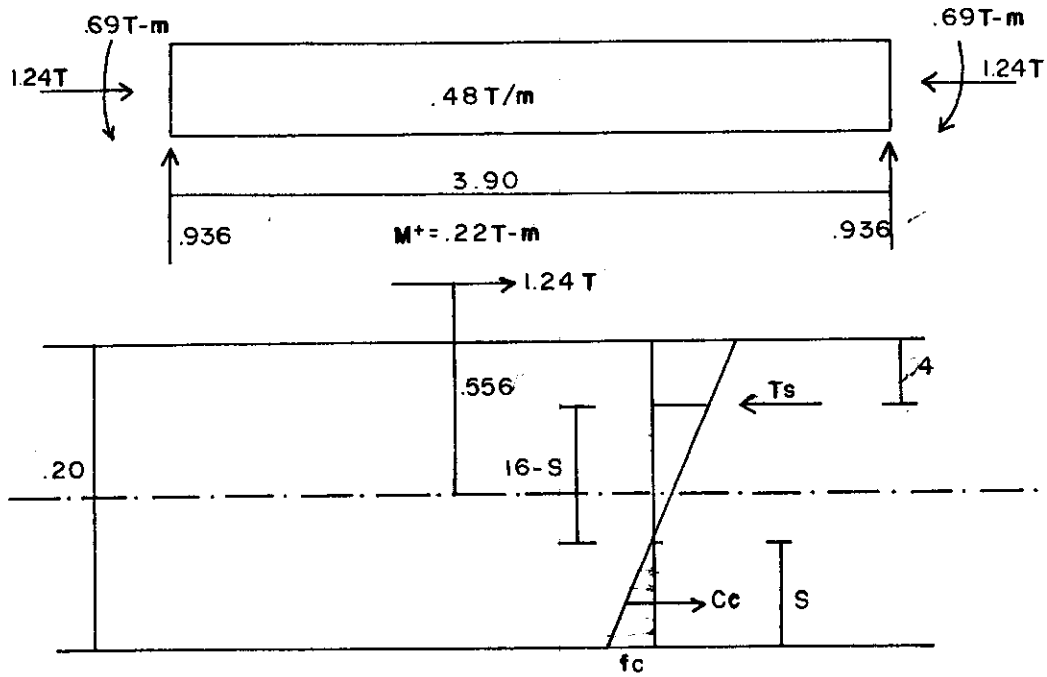
$$0.69+1.98-1.70HA+\left(0.2+\frac{2}{3}x1.5\right)\frac{1.5x1.5}{2} = 0$$

$$HA = \frac{2.67 + 1.35}{1.7} = 2.36 \text{ Ton}$$

$$Hc = -1.125 + 2.36 = 1.24 \text{ Ton}$$



DISEÑO DE LA TAPA



$e = M/P = 0.69/1.24 = 0.556$ m

$f_y = 60000$ psi ; $fs = 0.5$ $f_y = 2100$ Kg/cm^2

$f'c = 3000$ psi ; $fc = 0.45$ $f'c = 94.5$ Kg/cm^2

$AS = M/fsxJxd$; $J = 1 - K/3$; $K = n/(n+r)$

$n = Es/Ec$

$n = 9$; $r = fs/fc = 22.2$; $K = 9/(9+20) = 0.31$

$J = 1 - 0.310/3 = 0.897$

AS (+) $= 22/2.1x0.897x16 = 0.73$ cm^2

AS min $= 0.0020x100x20 = 4$ cm^2 Usar 1 ϕ 1/2" @ 30 cm

AS (-) $= 69/2.1x0.897x16 = 2.29$ cm^2 Usar 1 ϕ 1/2 @ 30 cm

$\Sigma FH = \phi \rightarrow 1.24 + C_c - Ts = \phi$ (1)

$\Sigma MP = \phi \quad 49.6\ Ts - (65.6 - (1/3)S\ Cc = \phi$ (2)

$Cc = 100xSxfc/2 = 50xSxfc$ (3)

$nAS = 9 \times 4.0 = 36\ cm^2$

$Ts = nAS\ (16-S)fc/S \qquad Ts = 36(16-S)\ fc/S$ (4)

En (2) $49.6\ [36(16-S)fc/S] - (65.6x3 - S)50\ S = \phi$

$3x49.6x36(16-S) - (65.6x3-S)50\ S^2 = \phi$

$85708.8 - 5356.85 - 9840\ S^2 + 50\ S^3 = 0$

$S^3 - 196.8S^2 - 107.14S + 1714.176 = 0$

$S = 2.71$

En (4) $Ts = 36[(16 - 2.85)/2.85]\ xfc = 176.55\ fc$

En (3) $Cc = 50xSxfc = 135.5\ fc$

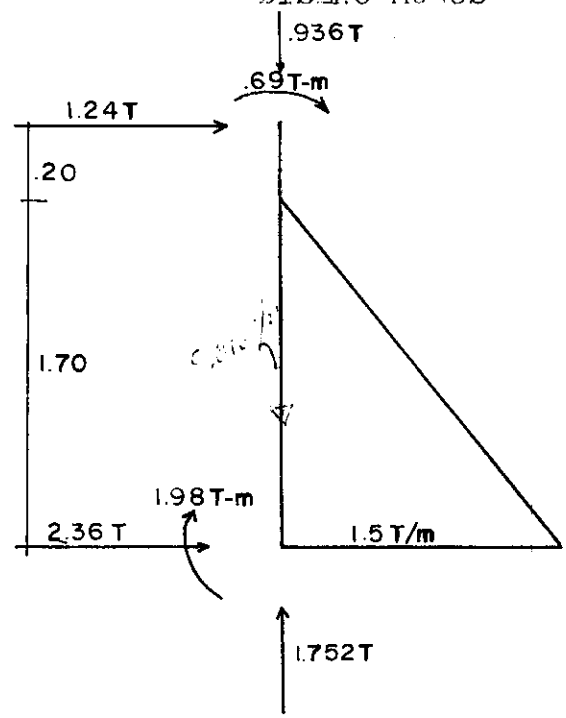
En (1) $1.24 + 142.5fc - 184fc = \phi$

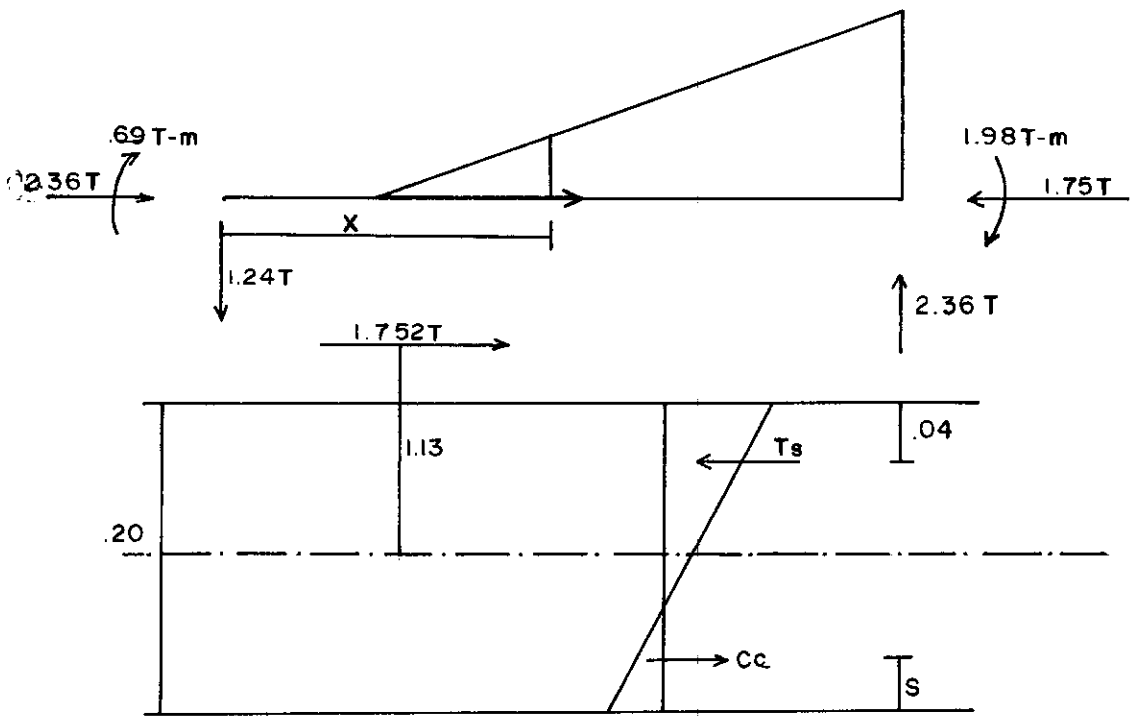
$fc = 1.24/41.5 = 29.88\ Kg/cm^2$

$Ts = 184 \times 29.88 = 5497.83$

$fs = Ts/AS = 5497.83/4 = 1374.46\ Kg/cm^2$

DISEÑO MUROS

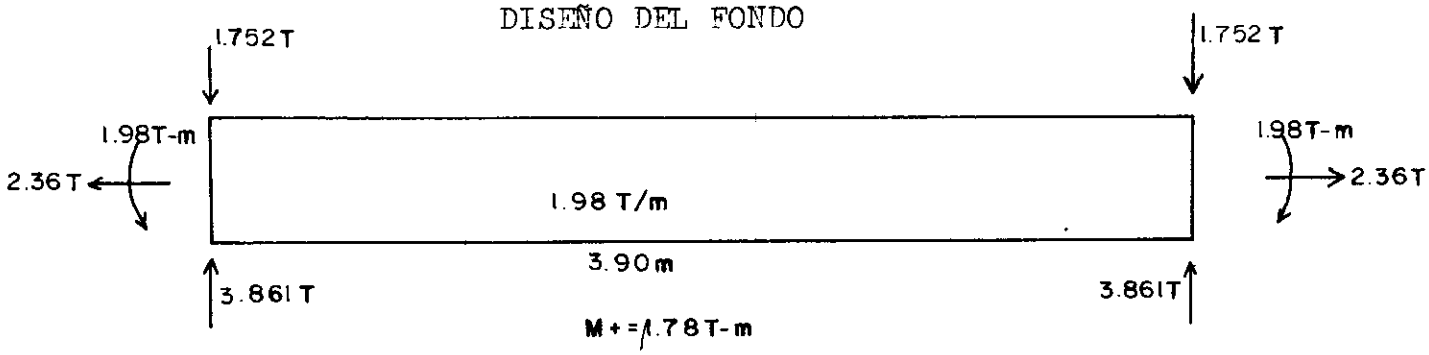


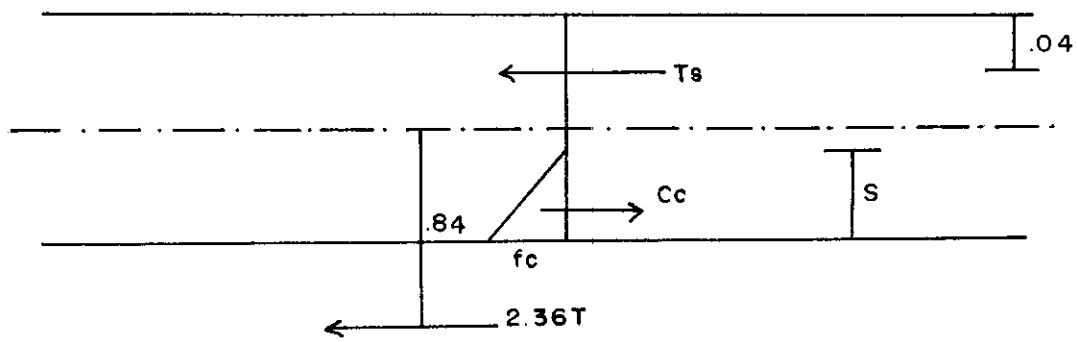


$fs = Ts/AS = 14360.58/8 =$

$fs = 1795.07\ Kg/cm^2$

DISEÑO DEL FONDO





$e = M/P = 1.98/2.36 = 84$ cm

AS (+) = 178 / 2.1x0.897x16 = 5.91 Usar 1 ø 5/8" @ 30 cm

AS (-) = 198 / 2.1x0.897x16 = 6.55 Usar 1 ø 5/8" @ 25 cm

(1) $\leq FH = 0$ $Cc - Ts - 2.36 = 0$

(2) $\leq M = 0$ $(74 + (1/3)S)Cc - 90\ Ts = 0$

$Cc = 50xsxfc$

(3) $Ts = n\ AS\ (16-S)fc/S$

$nAS = 9x6.57 = 59.13\ cm^2$ $Ts \pm 59.13(16-S)fc/S$

$e = M/P = 1.98 / 1.752 = 1.13$ m

AS (-)= $M/fsxJxd = 198/2.1x0.897x16 = 6.90$ cm^2

Usar : 1 ϕ 5/8" @ 25 cm

AS (+)= AS min ➡ 1 ϕ 1/2" @ 30 cm

$nAS = 9x8.00 = 72$ cm^2

$Ts = nAS(16-S)fc/S$; $Cc = 50xSxfc$ (1)

$Cc + 1.75 - Ts = 0$ $\Sigma FH = 0$ (2)

$107\ Ts - (123 - \frac{1}{S}\ S)\ Cc = 0$ $\Sigma M = 0$ (3)

En (3) :

$107x72.0(16-S)fc/S - 1/3(3x123-5)x50xSxfc = 0$

$3 \times 107 \times 72.0\ (16-S) - (3 \times 123 - S)x50xS^2 = 0$

$369792 - 23112\ S - 18450\ S^2 + 50\ S^3 = 0$

$S^3 - 369\ S^2 - 462.24\ S + 7395.84 = 0$

$S = 3.91$ cm

$Ts = 72.0\ (16-3.91)/3.91 = 22.63\ fc$ $Ts = 222.63\ fc$

$Cc = 50 \times 3.91 fc = 195.5 fc$ $Cc = 195.5\ fc$

$195.5\ fc + 1.75 - 22.63\ fc = 0$ $fc = 1.75/27.13 =$

$fc = 64.50$ Kg/cm^2

$Ts = 222.63 \times 64.50 = 14360.58$

En (2) $(3x74+5)f\phi xS^2x50 - 90x3x59.13(16-S)f\phi = 0$

$$50S^3 + 1100S^2 + 15965.1S - 255441.6 = 0$$

$$S^3 + 222\,S^2 + 319.30\,S - 5108.83 = 0$$

$$S = 4.10 \text{ cm}$$

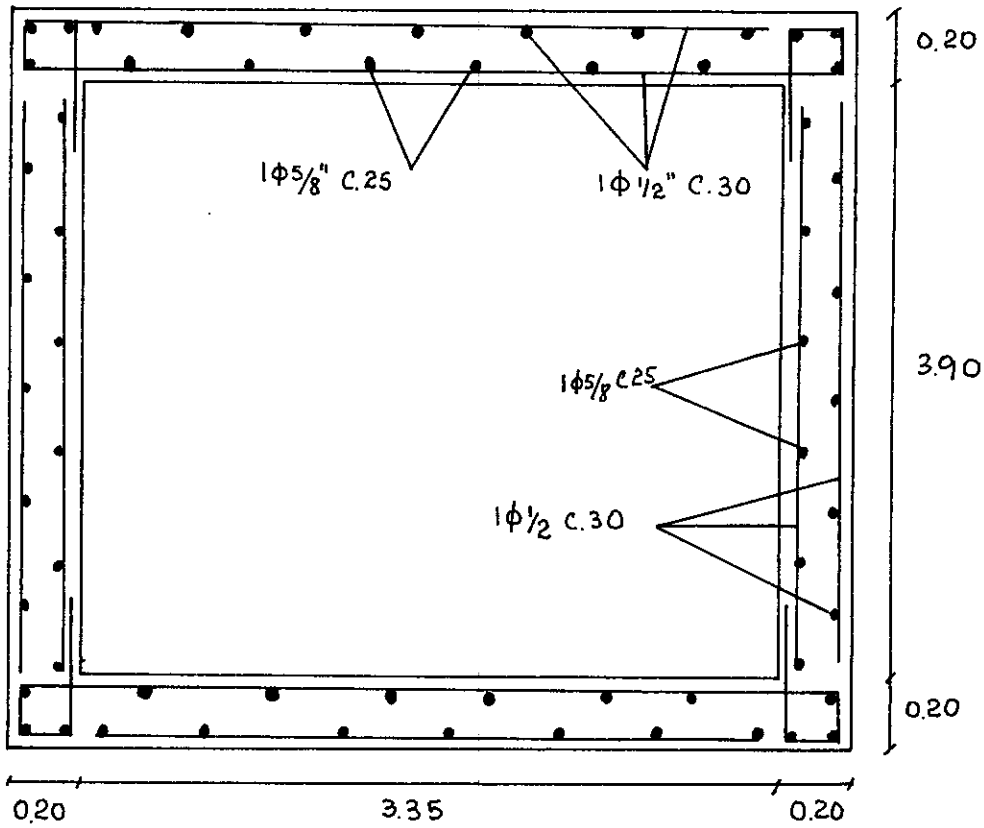
$Cc = 50xSxfc = 205\ fc$

$Ts = 59.13(16-4.10)fc/4.10 = 171.62\ fc$

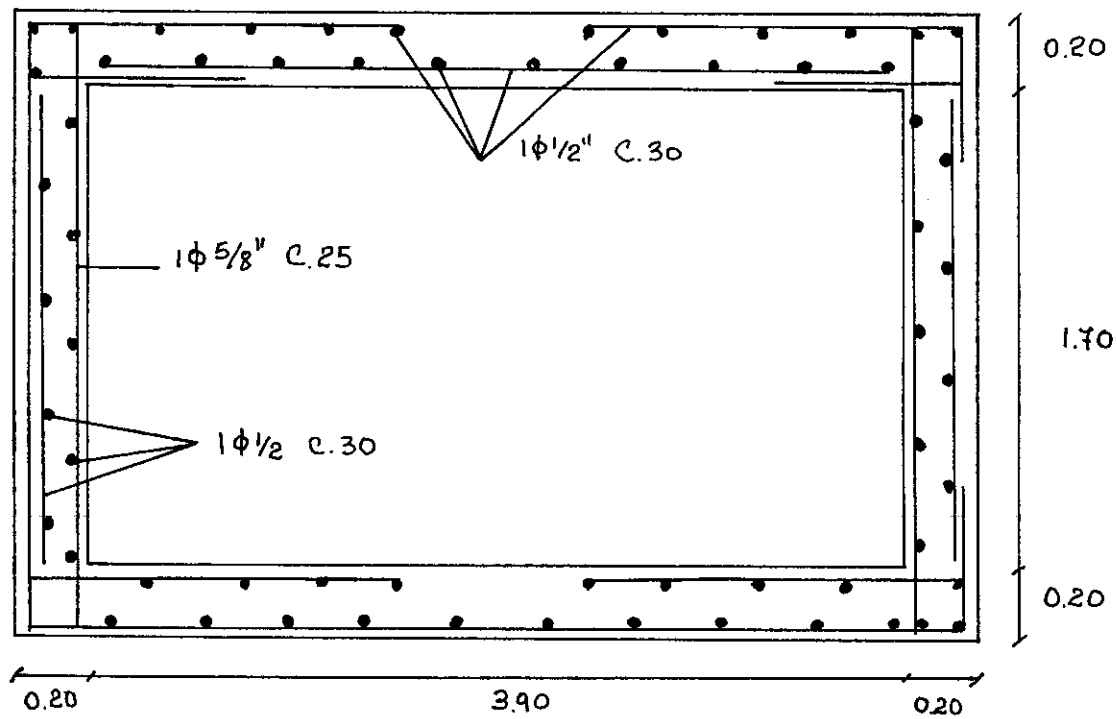
$205\ fc - 171.62\ fc - 2.36 = 0 \rightarrow fc = 236/33.38 = 70.70\ Kg/cm^2$

$Ts = 171.62 \times 70.70 = 12134.15$

$fs = Ts/AS = 12134.15/6.57 = 1846.9 >$

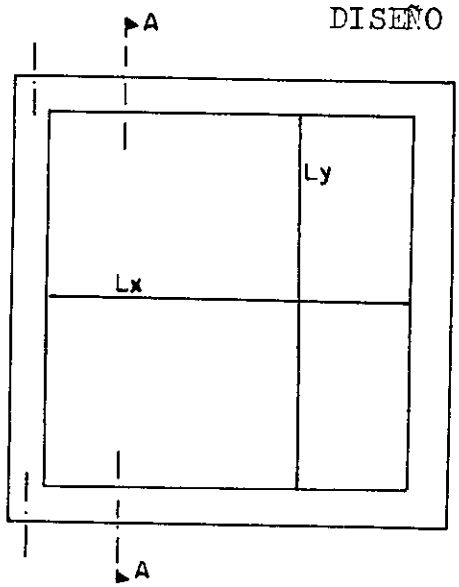


PLANTA TANQUE ALTO

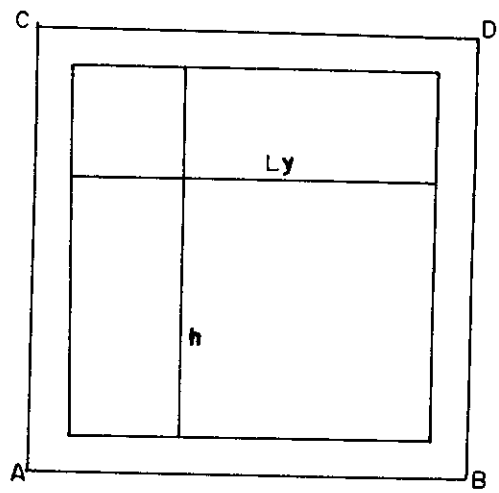


CORTE A – A

DISEÑO DE TANQUE SUBTERRANEO



PLANTA



CORTE "A-A"

Dimensiones Interiores :

LX = LY = 5.70 m

h = 1.90 m

Espesor Paredes = 0.20 m.

Espesor Tapa = 0.30 m.

Espesor Fondo = 0.30 m.

Datos del Suelo :

γ = 1.9 Ton/m^3 $\quad$ ϕ = 33°

Ka = Tg^2(45-ϕ/2)

Ka = Tg^2(45-33/2) = 0.295

CALCULO DE LOS FACTORES DE GIRO (D)

$$I_{CD} = I_{aB} = 100 \times (30)^3/12 = 225000 \text{ cm}^4$$

$$I_{aC} = 100 \times (20)^3/12 = 66667 \text{ cm}^4$$

$$K_{CD} = K_{aB} = 225000/590 = 362.90$$

$$K_{aC} = 66667/220 = 303.03$$

$$D_{CD} = D_{aB} = - \frac{362.9}{362.9 + 303.03} = - 0.545$$

$$D_{CD} = D_{aB} = - 0.545$$

$$D_{aC} = D_{Ca} = - \frac{303.03}{362.9 + 303.03} = - 0.455$$

$$D_{aC} = D_{Ca} = - 0.455$$

ACCION PESO PROPIO

Carga en CD

Peso Propio : 2.4 Ton/m^3 x 0.30 x 1.0 m	= 0.72 Ton/m
Acabados	= 0.08 Ton/m
Sobre carga	= 0.40 Ton/m
Carga Total	= 1.20 Ton/m

Carga en AB

Peso Propio : 2.4 Ton/m^3 x 0.30 m x 1.0 = 0.72 Ton/m.

$MfCD = - wL^2/12 = - 1.2 \times (6.2)^2/12$

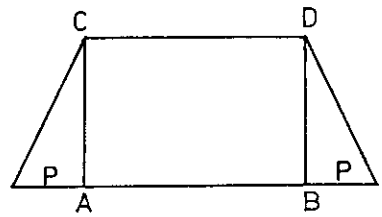
MfCD = - 3.844 Ton/m

$MfaB = - wL^2/12 = - ^{\wedge}.72 \times (6.2)^2/12$

MfaB = - 2.31 Ton/m.

AB	AC	CA	CD
- 0.545	- 0.455	- 0.455	- 0.545
- 2.310 + 1.259	— + 1.051	— + 1.749	- 3.844 + 2.095
— - 0.477	+ 0.875 - 0.398	+ 0.526 - 0.239	— - 0.287
— + 0.065	- 0.120 + 0.055	- 0.199 + 0.091	— + 0.108
— - 0.025	+ 0.046 - 0.021	+ 0.028 - 0.013	— - 0.015
— + 0.004	- 0.007 + 0.003	- 0.011 + 0.005	— + 0.006
— - 0.002	+ 0.003 - 0.001	+ 0.002 - 0.001	— - 0.001
— + 0.001	- 0.001 0.000	- 0.001 0.000	— + 0.001
- 1.485	+ 1.485	+ 1.937	- 1.937

ACCION DEL TERRENO



Carga en CD y AB = 0

Carga en AC :

γ = 1.9 Ton/m^3 ; Ka = 0.295

P = 1.9 x 2.20 x 0.295 = 1.233 Ton/m

MfaC = $wL^2/20$ = 1.233 x $(2.2)^2/20$ = - 0.298 Ton/m

MfCa = $wL^2/30$ = 1.233 x $(2.2)^2/30$ = + 0.199 Ton/m.

AB	AC	CA	CD
- 0.545	- 0.455	- 0.455	- 0.545
——	- 0.298	+ 0.199	——
+ 0.162	+ 0.136	- 0.091	- 0.108
——	- 0.046	+ 0.689	——
+ 0.025	+ 0.021	- 0.309	- 0.371
——	- 0.155	+ 0.011	——
+ 0.084	+ 0.071	- 0.005	- 0.006
——	- 0.003	+ 0.036	——
+ 0.002	+ 0.001	- 0.016	- 0.020
——	- 0.008	+ 0.001	——
+ 0.004	+ 0.004	- 0.000	- 0.001
——	- 0.000	+ 0.002	——
0.000	0.000	- 0.001	- 0.001
——	- 0.001	0.000	——
+ 0.001	0.000	0.000	0.000
+ 0.278	- 0.278	+ 0.507	- 0.507

ACCION DEL AGUA

Carga en CD = 0

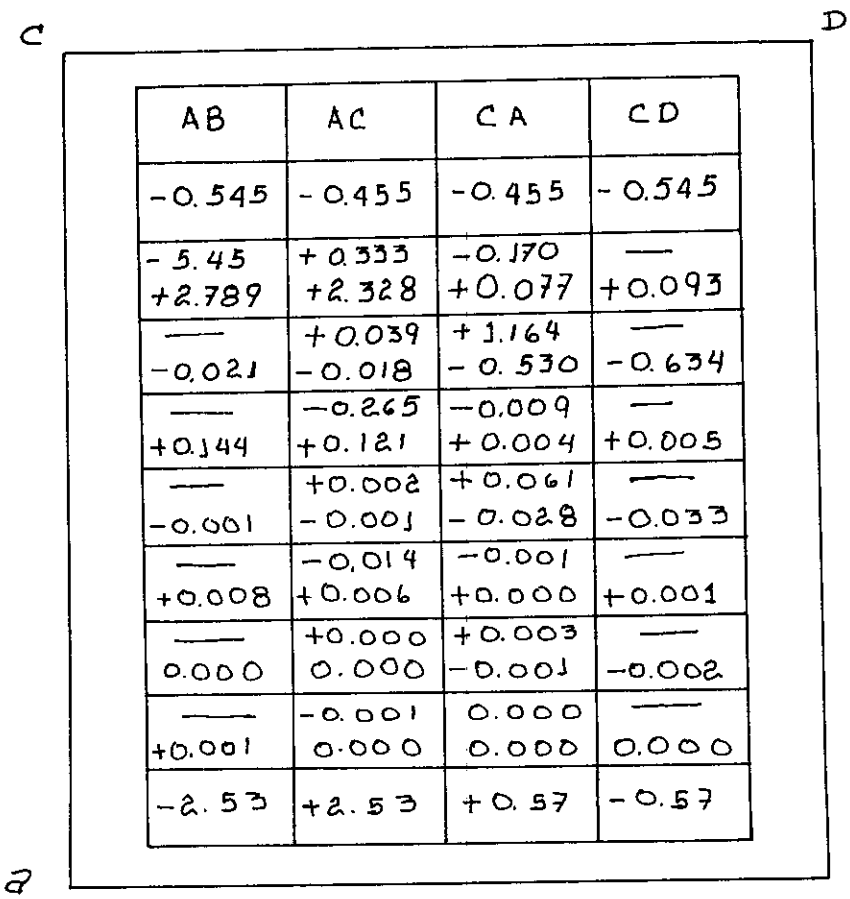
Carga en AB = 1.7m x 1.0 Ton/m^3 x 1.0 m = 1.70 Ton/m

Carga en AC = 1.7m x 1.0 Ton/m^3 x 1.0 m = 1.70 Ton/m

$MfaC = qC^2/60L^2\ (10a + 3C^2) = + 1.7 \times (1.7)^2/60 \times (2.2)^2 (\ 10 \times 0.5 \times 2.2 + 3 \times (1.7)^2 = + 0.333$ Ton/m

$MfCa = qC^3/60L^2\ (5a + 2C) = - 1.7 \times (1.7)^3/60 \times (2.2)^2 (\ 5 \times 0.5 + 2 \times 1.7\ ) = - 0.170$ Ton/m.

$MfaB = - wL^2/12 = - 1.7 \times (6.2)^2/12 = - 5.45$ Ton/m.



AB	AC	CA	CD
-0.545	-0.455	-0.455	-0.545
-5.45 +2.789	+0.333 +2.328	-0.170 +0.077	— +0.093
— -0.021	+0.039 -0.018	+1.164 -0.530	— -0.634
— +0.144	-0.265 +0.121	-0.009 +0.004	— +0.005
— -0.001	+0.002 -0.001	+0.061 -0.028	— -0.033
— +0.008	-0.014 +0.006	-0.001 +0.000	— +0.001
— 0.000	+0.000 0.000	+0.003 -0.001	— -0.002
— +0.001	-0.001 0.000	0.000 0.000	— 0.000
-2.53	+2.53	+0.57	-0.57

MOMENTOS FINALES

Peso Propio + Acción del Terreno + Acción del Agua

MaC = + 1.485 - 0.278 + 2.53 = + 3.737 Ton/m

MCa = + 1.937 + 0.507 + 0.57 = + 3.014 Ton/m

MCD = - 1.937 - 0.507 - 0.57 = - 3.014 Ton/m

MaB = - 1.485 + 0.278 - 2.53 = - 3.737 Ton/m

Peso Propio + Acción del Terreno

MaC = + 1.485 - 0.278 = + 1.207 Ton/m

MaB = - 1.485 + 0.278 = - 1.207 Ton/m

MCa = + 1.937 + 0.507 = + 2.444 Ton/m

MCD = - 1.937 - 0.507 = - 2.444 Ton/m

DISEÑO ESTRUCTURAL

(Método Elástico)

f_y = 60000 psi ; fs = 0.4 f_y = 1680 Kg/cm^2 = 1.68 Ton/cm^2

f'c= 3000 psi ; fc = 0.45 f'c = 94.5Kg/cm^2 = 0.0945 Ton/cm^2

As = M/fs x j x d ; j = 1-K/3; K = n/(n+r); n = Es/Ec = 9

r =fs/fc = 17.77 ; K = 9/(9+17.77) = 0.336 j = 0.888

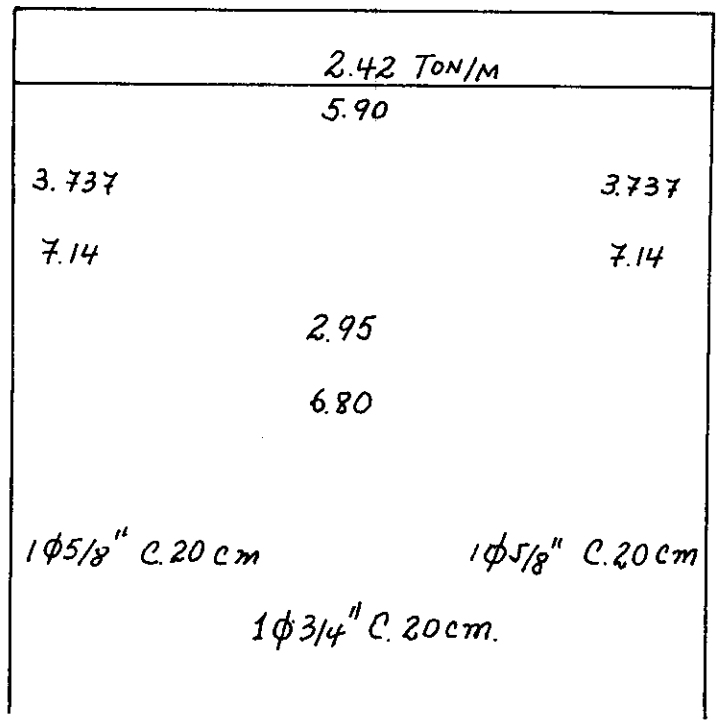
Tapa (Con la Acción del Agua)

	1.20 Ton/M		
	5.90 M		
M(-)	3.014		3.014
Vw	3.54		3.54
Vm	—		—
R	3.54		3.54
Xo		2.95	
M(+)		2.21	
Xi	0.96		0.96
As(-)	1φ5/8" C.25cm		1φ5/8" C.25cm

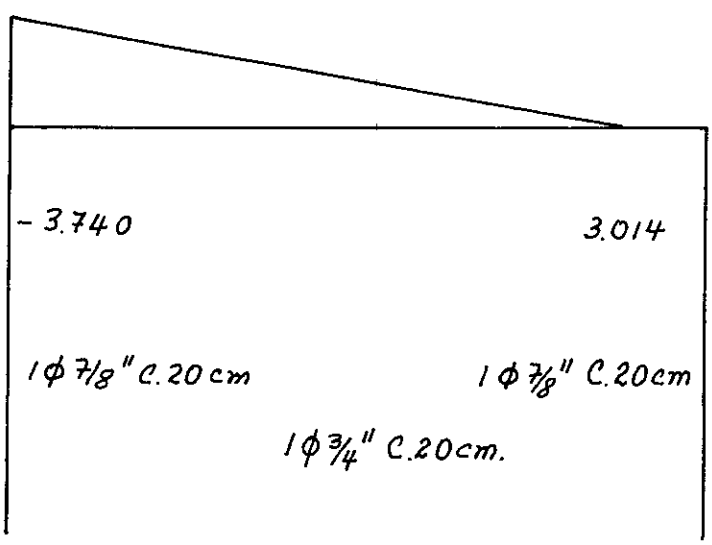
Tapa (Sin la Acción del Agua)

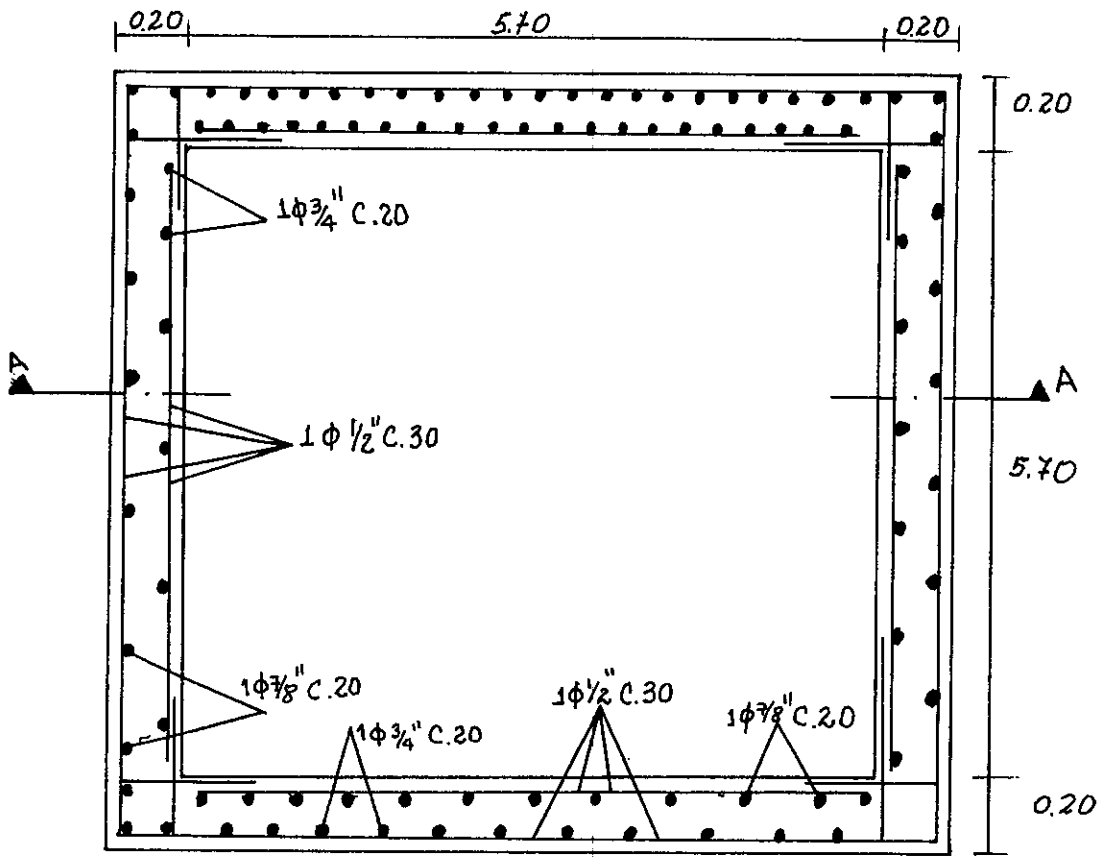
	1.20 Ton/M		
	5.90 M		
M(-)	2.444		2.444
Vw	3.54		3.54
Vm	—		—
R	3.54		3.54
Xo		2.95	
M(+)		2.78	
Xi	0.75		0.75
As(+)		1φ5/8" C.25cm.	

Fondo (Con la Acción del Agua)

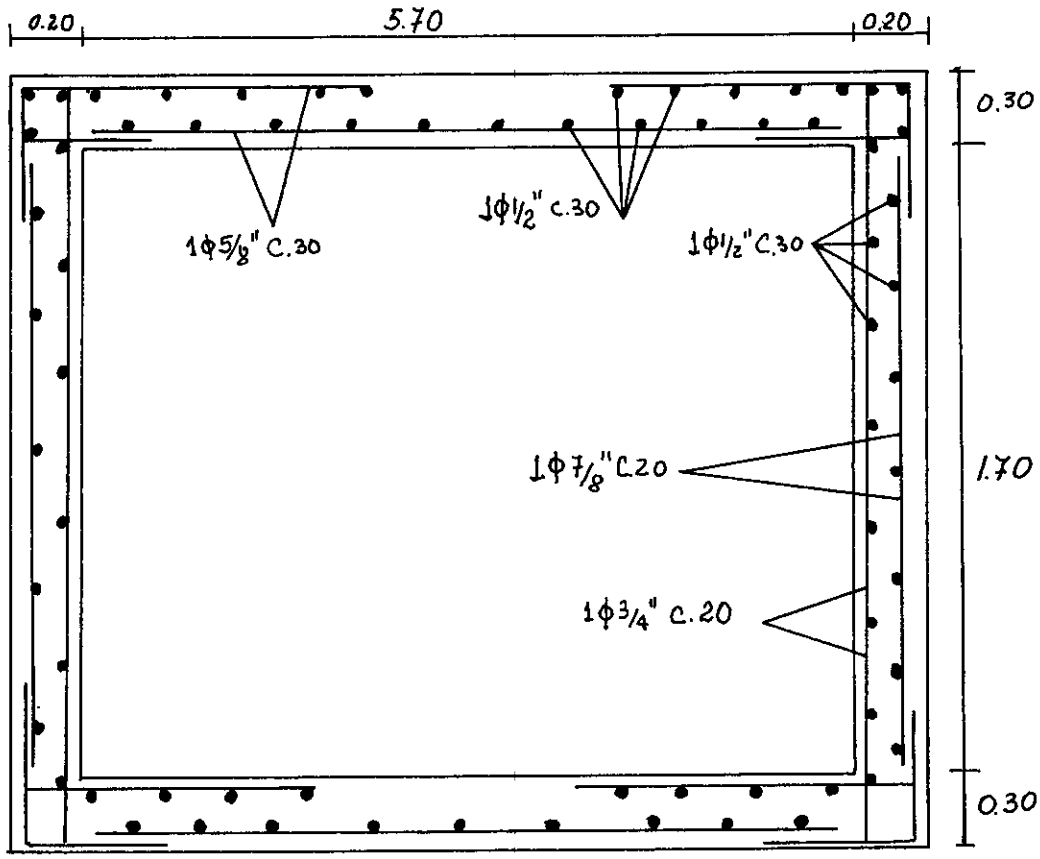


Paredes





PLANTA TANQUE SUBTERRANEO


0.20
5.70
0.20
0.30
1ϕ1/2" c.30
1ϕ5/8" C.30
1ϕ1/2"C.30
1ϕ7/8"C.20
1.70
1ϕ3/4" C.20
0.30

CORTE A-A

PLANEACION

ACTIVIDADES	PRECEDENCIAS
1- Demolición	-
2- Limpieza	1
3- Trazado y localización	2
4- Acarreo de materiales preliminares	2
5- Replanteo	3
6- Cerramiento de lote y caseta	4-5
7- Conexión de agua y energía	4-5
8- Construcción de alberca	6
9- Acarreo de materiales de construcción	6
10- Pilotaje	5
11- Excavación de cimientos	10
12- Solado para cimientos	11
13- Corte y figuración del hierro para zapata	9
14- Colocación de hierro y formaleta para zapatas.	12-13
15- Fundición de zapatas	14
16- Andamios	9
17- Corte y figuración del hierro para columnas pisos 1^{o} - 7^{o}	9
18- Colocacion de acero y formaleta para columnas piso 1^{o}	15-16-17
19- Fundición de columnas	18
20- Descimbrado	19

21-	Figuración y colocación de formaletas para placa 2° piso.	16-20
22-	Corte, figuración y colocación de hierro para placa.	21
23-	Colocación de monolíticos y tuberías.	22
24-	Fundición de placa.	23
25-	Descimbrado.	24
26-	Excavación para viga de amarre.	10
26A-	Fundición viga amarre	26
26B-	Sobrecimiento en Block # 6	26A
27-	Impermeabilización sobrecimiento	26B
28-	Relleno y compactación material seleccionado.	27
29-	Colocación hierro y formaletas columnas 2° piso.	17-25
30-	Fumdición columnas 2° piso	29
31-	Descimbrado	30
32-	Figuración y colocación formaletas placa 3° piso.	31
33-	Corte y figuración, colocación de hierro para placa.	32
34-	Colocación de monoliticos y tuberias	33
35-	Fundición de placa.	34
36-	Descimbrado.	35
37-	Corte de hierro y fundido de dinteles	9
38-	Levante de muros piso 1°.	27-25
39-	Repello de muros piso 1°.	38

78- Colocación de monoliticos y tuberías	77
79- Fundición de placa.	78
80- Descimbrado.	79
80A- Excavación de cimientos escalera.	10
80B- Fundición de cimiento escalera	80A
81- Corte, y figuración del hierro de las escaleras.	17-80B
82- Colocación de hierro y formaleta escalera 1^{o} y 2^{o} piso.	81-24-80
83- Fundición de escalera.	82
84- Descimbrado.	83
85-Colocación de hierro y formaleta escalera 2^{o} y 3^{o} piso.	84-36
86- Fundición de escalera.	85
87- Descimbrado.	86
88- Colocación de hierro y formaleta escalera 3^{o} y 4^{o} piso.	87-48
89- Fundición de escalera.	88
90- Descimbrado.	89
91- Colocación de hierro y formaleta escalera 4^{o} y 5^{o} piso.	90-56
92- Fundición de escalera.	91
93- Descimbrado.	92
94- Colocación de hierro y formaleta escalera 5^{o}y6^{o} piso.	93-64

95-	Fundición de escalera	94
96-	Descimbrado.	95
97-	Colocación de hierro y formaleta escalera 6° y 7° piso.	96-72
98-	Fundición de escalera.	97
99-	Descimbrado.	98
100-	Levante de muros piso 3°	48B-41
101-	Repello Muros piso 3°	100
102-	Levante de muros piso 4°	101-56
103-	Repello de muros piso 4°.	102
104-	Levante de muros piso 5°.	103-64
105-	Repello de muros piso 5°.	104
106-	Levante de muros piso 6°.	105-72
107-	Repello de muros piso 6°.	106
108-	Levante de muros piso 7°.	107-80
109-	Repello de muros piso 7°.	108
110-	Instalación de tuberías agua potable y aguas negras.	72
111-	Repello de cielo.	80
112-	Bajantes aguas lluvias.	80
113-	Colocación de marcos de puertas y ventanas.	109
114-	Piso en baldosa granito.	113
115-	Zócalo.	114

CALCULO DE LOS TIEMPOS

Los creadores del sistema PERT se asesoraron de las personas que debían ejecutar las diferentes actividades y acordaron con ellas tres (3) posibles tiempos de ejecución:

1) El Tiempo Mínimo: Suponiendo que durante la ejecución todo saliera bién. Este estimativo recibe el nombre de " Tiempo Optimista", siendo la probabilidad de que se cumpla en este tiempo o menos, inferior al 1 % de los casos.

2) Estimativo del posible tiempo de ejecución en condiciones normales, llamado " Tiempo más Probable ".

3) El Tiempo Máximo: Suponiendo que todo saliera mal. Se llama " Tiempo Pesimista ", y la probabilidad de que la ejecución de la actividad alcance este tiempo o lo exceda, es inferior al 1 % de los casos.

El método PERT supone que estos tres estimativos de tiempo siguen una distribución beta, ya que algunos estimativos del tiempo más probable tenderán hacia el optimista, en tanto que otros estarán más cercano al pesimista.

Ta = Tiempo Optimista

Tm = Tiempo más Probable

Tb = Tiempo Pesimista

Como a estos tres tiempos no se les puede dar el mismo grado de confiabilidad, siendo lógico darle más importancia al estimativo del tiempo más probalbe que a los otros dos, se encontró el Tiempo Esperado (Te), Así ;

$$Te = (Ta+4Tm+Tb)/6$$

CALCULO DE TIEMPOS

ACTIVIDADES	PRECEDENCIAS	Ta	Tb	Tm	Te
1	-	2	4	3	3.00
2	1	3	5	4	4.00
3	2	2	4	3	3.00
4	2	1	3	2	2.00
5	3	1	3	2	2.00
6	4-5	3	6	4	4.17
7	4-5	1	3	2	2.00
8	6	1	3	2	2.00
9	6	10	20	15	15.00
10	5	7	13	10	10.00
11	10	1	5	3	3.00
12	9	3	7	5	5.00
13	11-12	5	11	8	8.00
14	13	8	12	10	10.00
15	9	1	3	2	2.00
16	9	15	35	25	25.00
17	15-16	3	9	6	6.00
18	17	2	7	5	4.83
19	18	2	5	3	3.17
20	15-19	3	8	6	5.83
21	20	3	7	5	5.00
22	21	2	5	3	3.17
23	22	2	7	4	4.17
24	23	1	4	2	2.17
25	10	1	5	3	3.00
26A	25	2	6	4	4.00
26B	26A	1	4	2	2.17

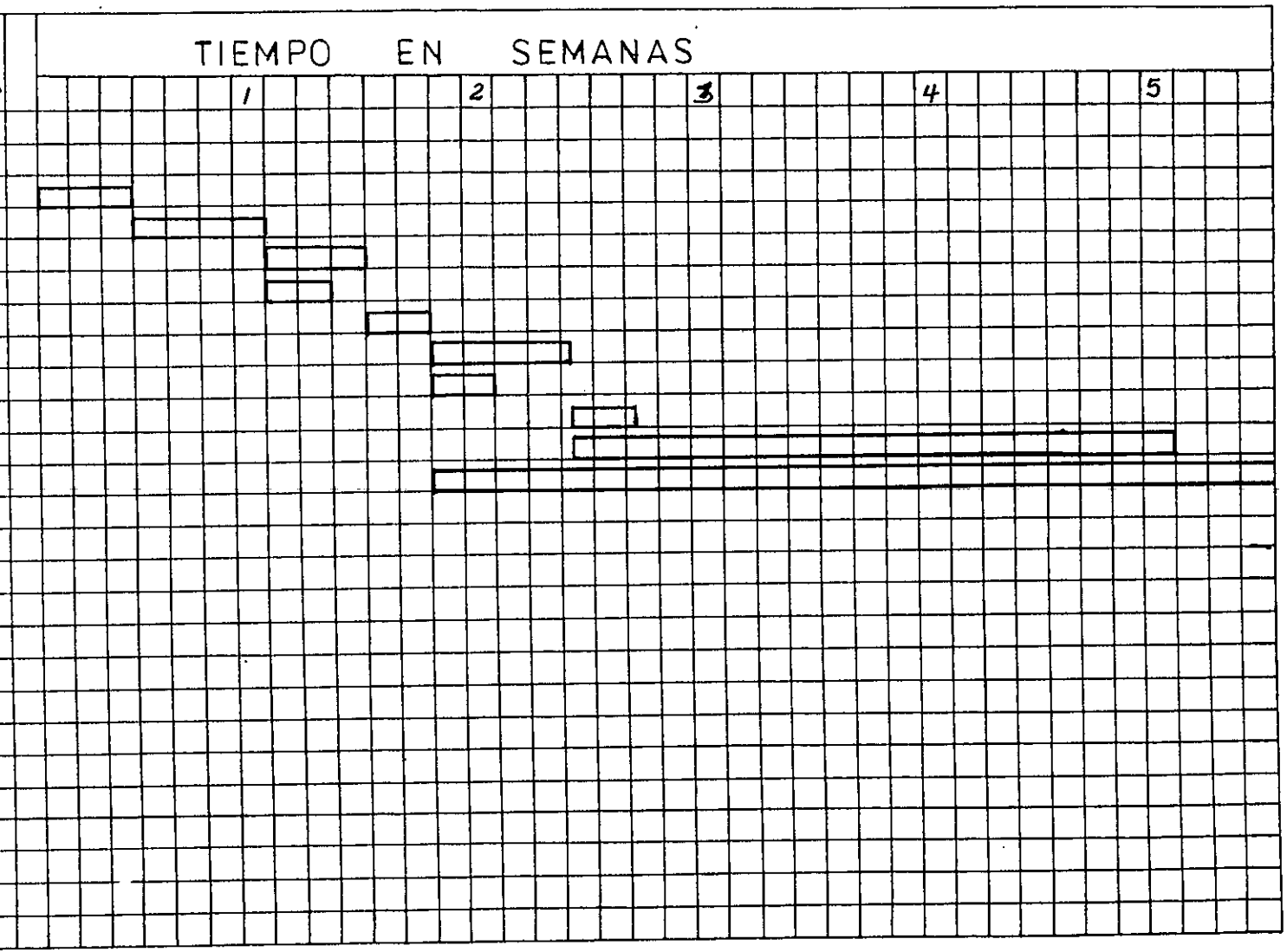
27	26B	1	3	2	2.00
28	27	1	3	2	2.00
29	16-24	3	11	7	7.00
30	29	3	8	6	5.83
31	30	1	4	2	2.17
32	31	3	8	6	5.83
33	32	3	7	5	5.00
34	33	2	5	3	3.17
35	34	2	7	4	4.17
36	35	1	4	2	2.17
37	9	1	4	2	2.17
38	26B-24	3	9	6	6.00
39	38	3	11	7	7.00
40	39-36	3	9	6	6.00
41	40	3	11	7	7.00
42	16-36	3	11	7	7.00
43	42	3	8	6	5.83
44	43	1	4	2	2.17
45	44	3	8	6	5.83
46	45	3	7	5	5.00
47	46	2	5	3	3.17
48A	47	2	7	4	4.17
48B	48A	1	4	2	2.17
49	48B	3	11	7	7.00
50	49	3	8	6	5.83
51	50	1	4	2	2.17
52	51	3	8	6	5.83
53	52	3	7	5	5.00
54	53	2	5	3	3.17
55	54	2	7	4	4.17
56	55	1	4	2	2.17
57	56	3	11	7	7.00

58	57	3	8	6	5.83
59	58	1	4	2	2.17
60	59	3	8	6	5.83
61	60	3	7	5	5.00
62	61	2	5	3	3.17
63	62	2	7	4	4.17
64	63	1	4	2	2.17
65	64	3	11	7	7.00
66	65	3	8	6	5.83
67	66	1	4	2	2.17
68	67	3	8	6	5.83
69	68	3	7	5	5.00
70	69	2	5	3	3.17
71	70	2	7	4	4.17
72	71	1	4	2	2.17
73	72	3	11	7	7.00
74	73	3	8	6	5.83
75	74	1	4	2	2.17
76	75	3	8	6	5.83
77	76	3	7	5	5.00
78	77	2	5	3	3.17
79	78	2	7	4	4.17
80	79	1	4	2	2.17
80A	10	1	4	2	2.17
80B	80A	2	4	3	3.17
81	80B	5	11	8	8.00
82	81-24-80B	3	7	5	5.00
83	82	3	7	5	5.00
84	83	1	4	2	2.17
85	84-36	3	7	5	5.00
86	85	3	7	5	5.00
87	86	1	4	2	2.17

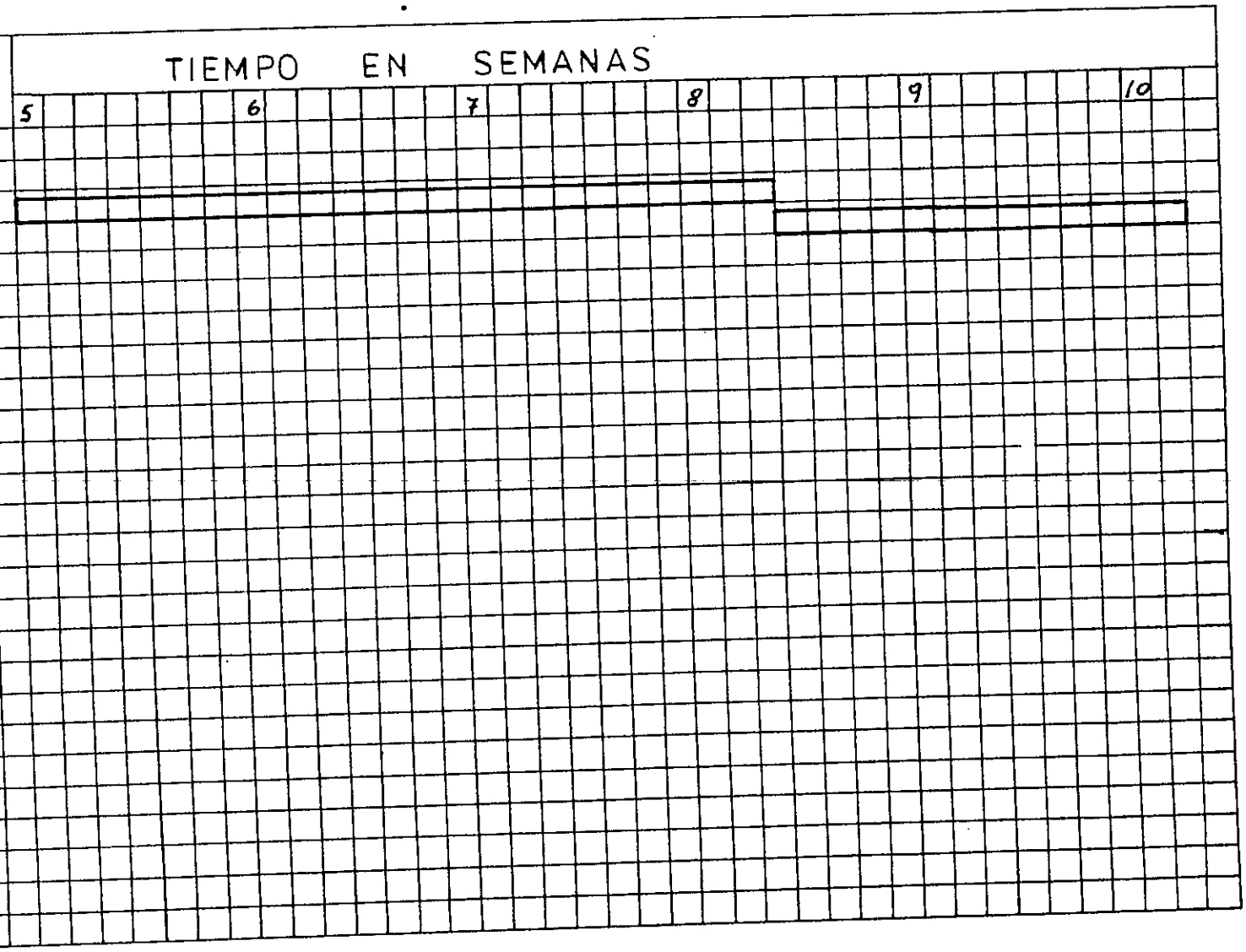
88	87-48B	3	7	5	5.00
89	88	3	7	5	5.00
90	89	1	4	2	2.17
91	90-56	3	7	5	5.00
92	91	3	7	5	5.00
93	92	1	4	2	2.17
94	93-64	3	7	5	5.00
95	94	3	7	5	5.00
96	95	1	4	2	2.17
97	96-72	3	7	5	5.00
98	97	3	7	5	5.00
99	98	1	4	2	2.17
100	48B-41	3	9	6	6.00
101	100	3	11	7	7.00
102	101-56	3	9	6	6.00
103	102	3	11	7	7.00
104	103-64	3	9	6	6.00
105	104	3	11	7	7.00
106	105-72	3	9	6	6.00
107	106	3	11	7	7.00
108	107-80	3	9	6	6.00
109	108	3	11	7	7.00
110	72	9	17	13	13.00
111	80	20	40	30	30.00
112	80	3	5	4	4.00
113	109	13	20	16	16.17
114	113	20	40	30	30.00
115	114	9	17	13	13.00
116	113	15	25	20	20.00
117	111	9	17	13	13.00
118	115-116	20	40	30	30.00

119	99	9	17	13	13.00
120	72	7	13	10	10.00
121	120	7	13	10	10.00
122	118	1	5	3	3.00
123	9-80	1	4	2	2.17
124	123	1	5	3	3.00
125	124	2	5	3	3.17
126	125	2	4	3	3.00
127	126-122-121	3	11	7	7.00

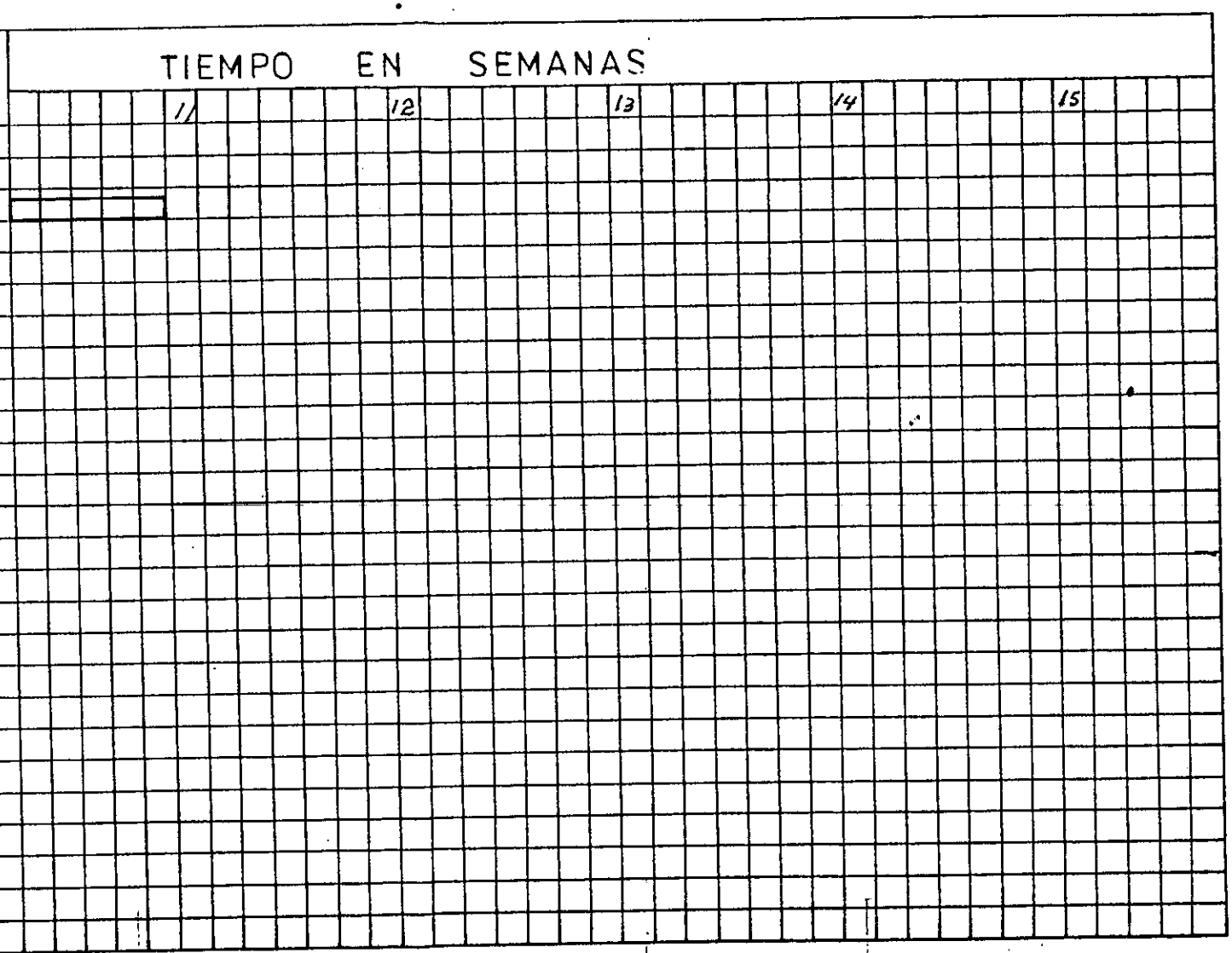
ACT.	PRECEDENCIA
1	—
2	1
3	2
4	2
5	3
6	4-5
7	4-5
8	6
9	6
10	5



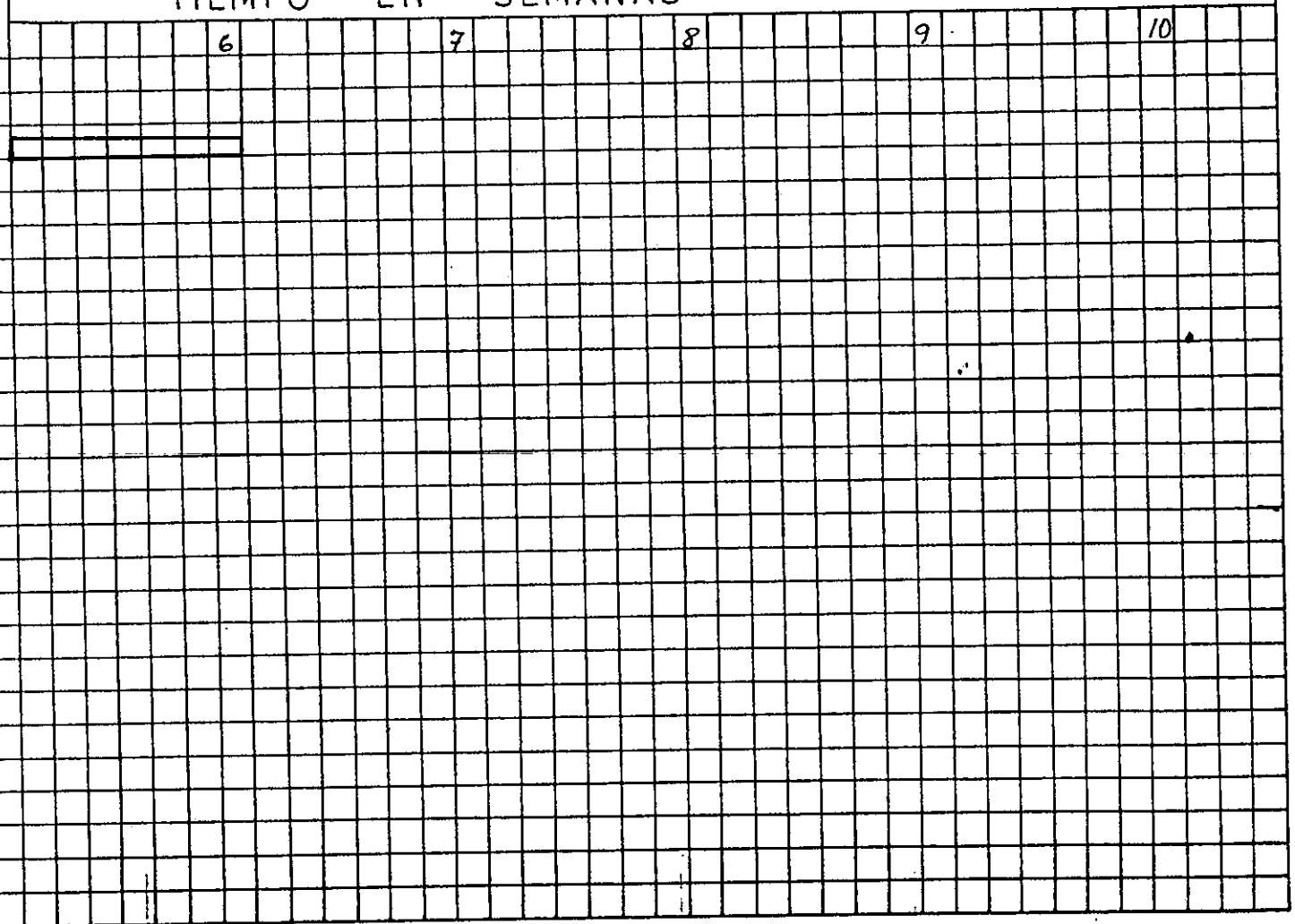
ACT.	PRECEDENCIA
10	5
11	10



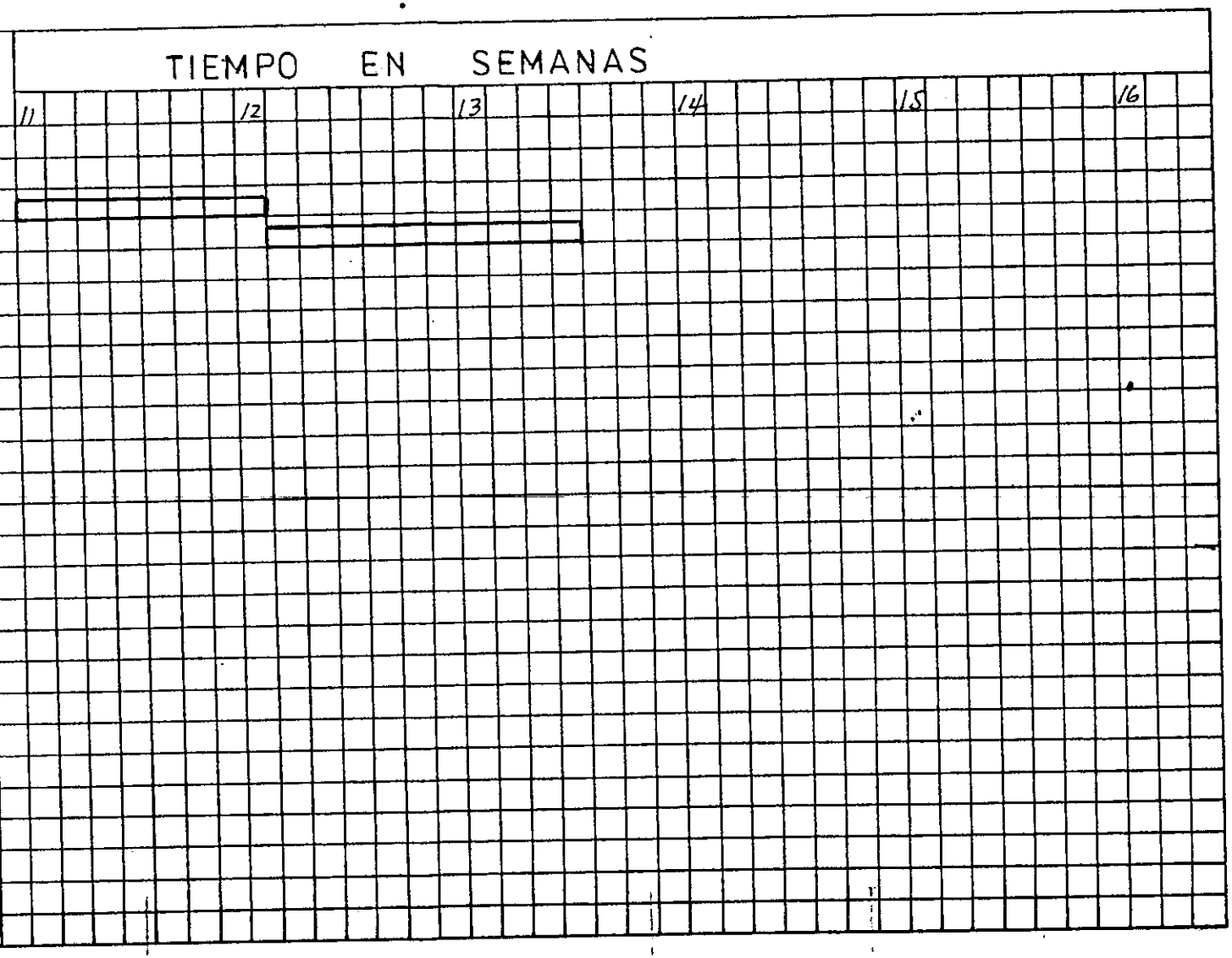
ACT.	PRECEDENCIA
12	11



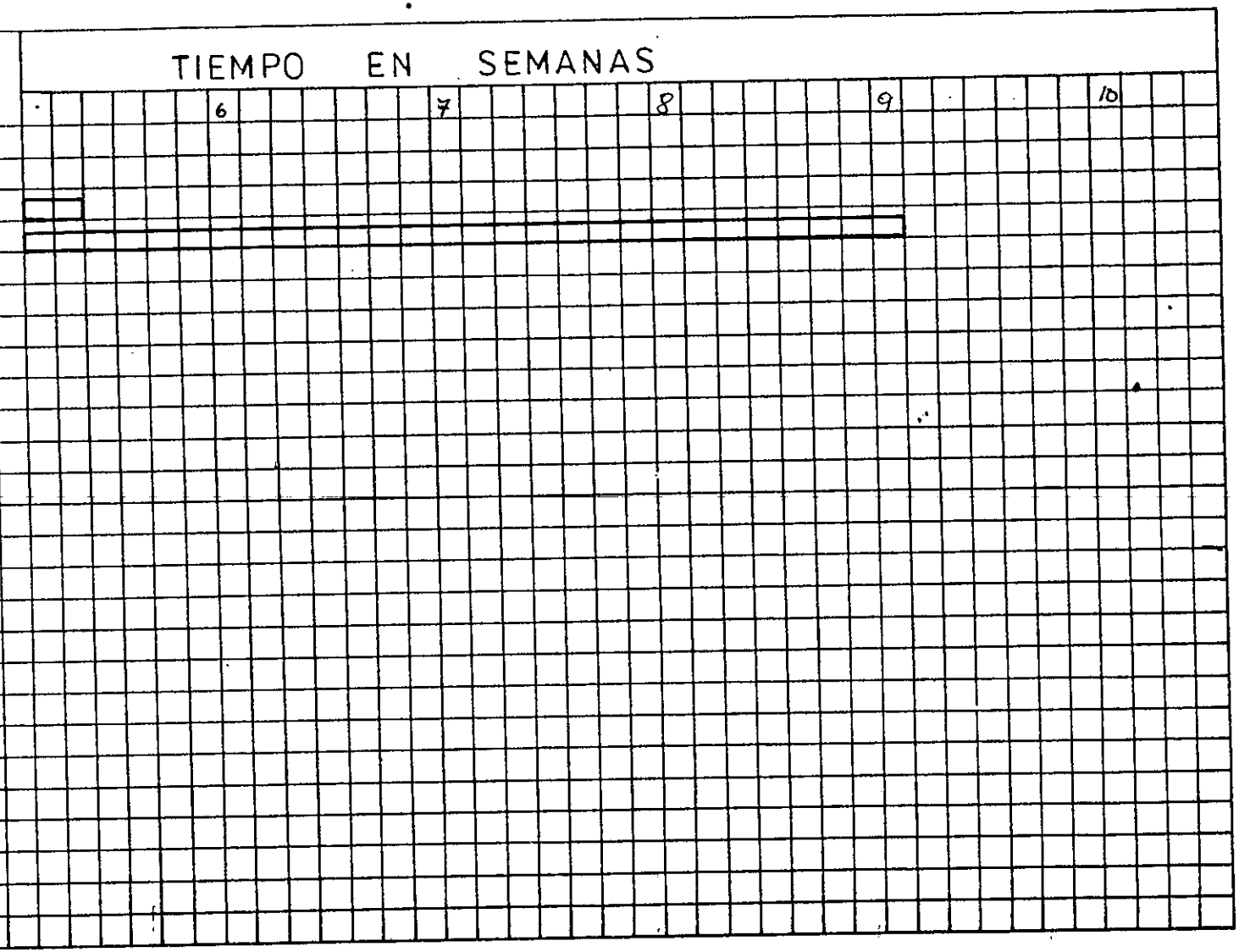
ACT.	PRECEDENCIA
13	9
14	
15	



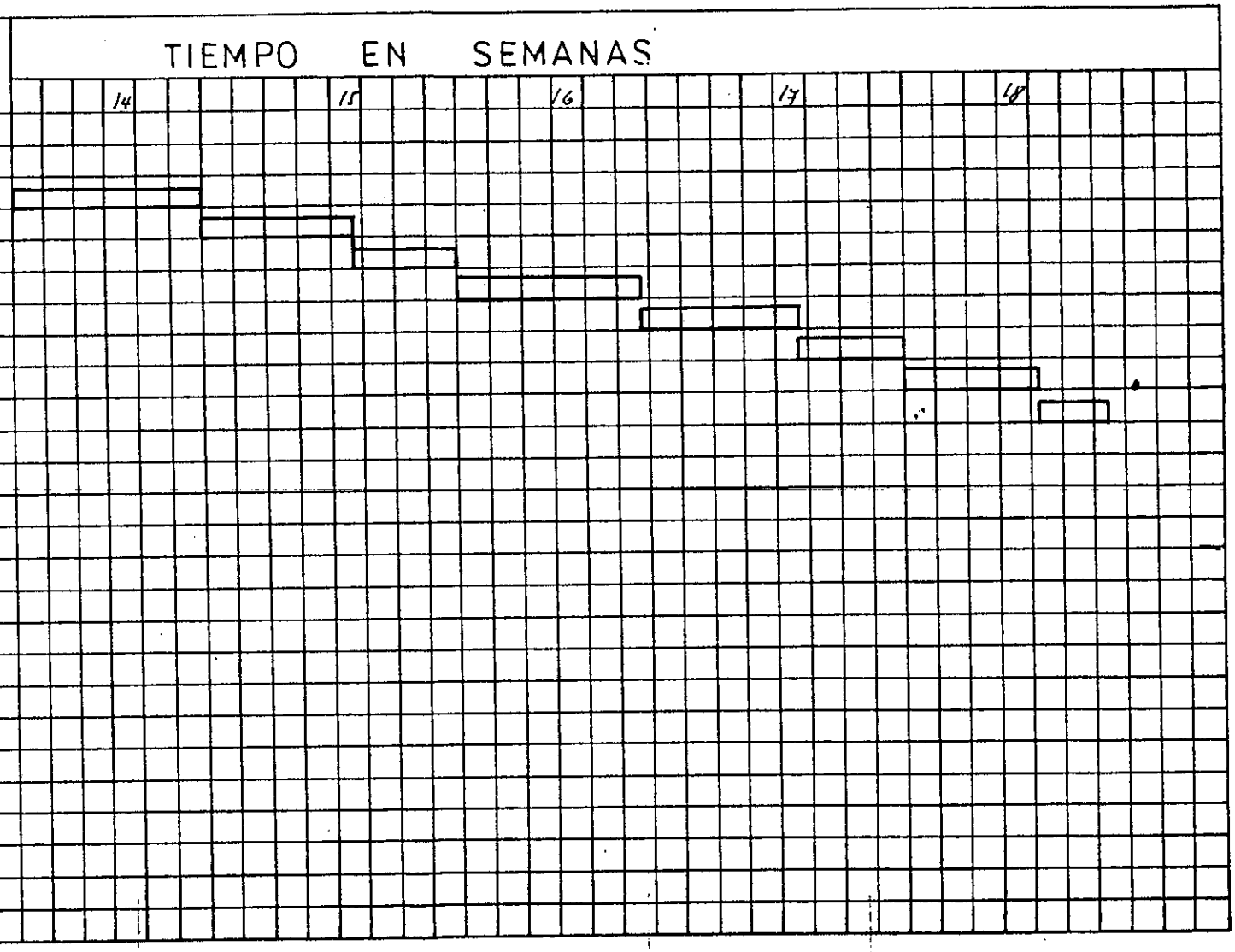
ACT.	PRECEDENCIA
14	12 - 13
15	14



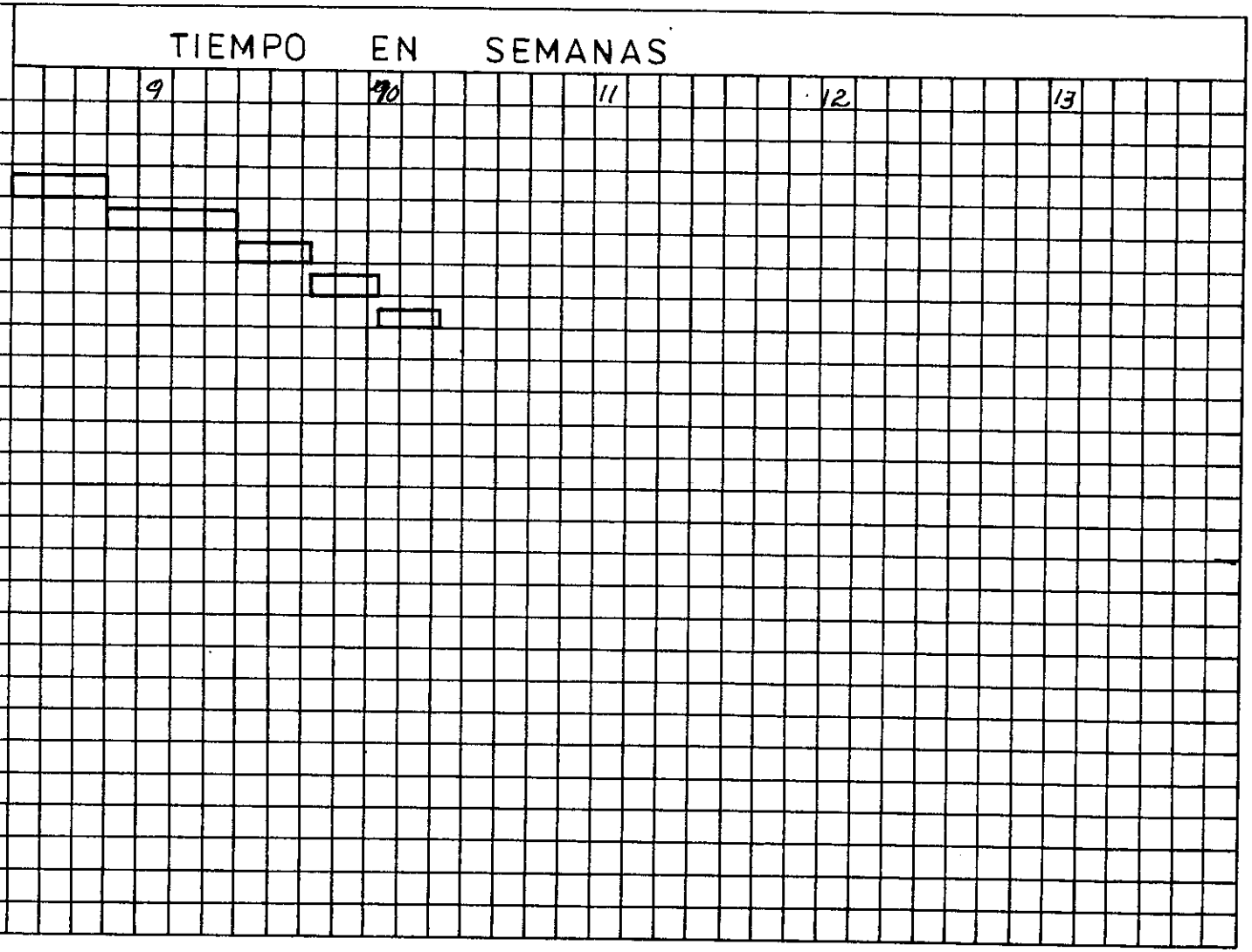
ACT.	PRECEDENCIA
16	9
17	9



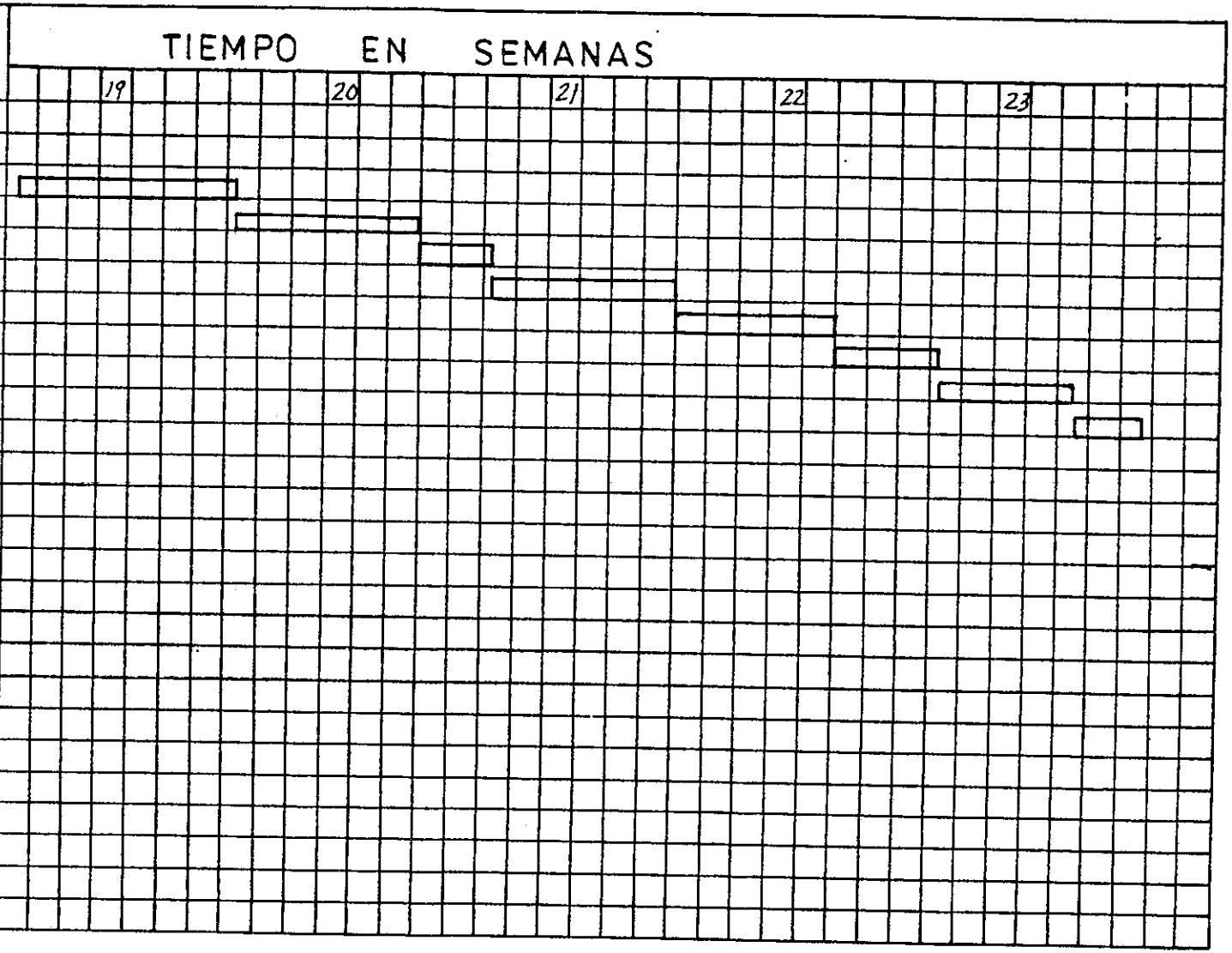
ACT.	PRECEDENCIA
18	15,16,17
19	18
20	19
21	20
22	21
23	22
24	23
25	24



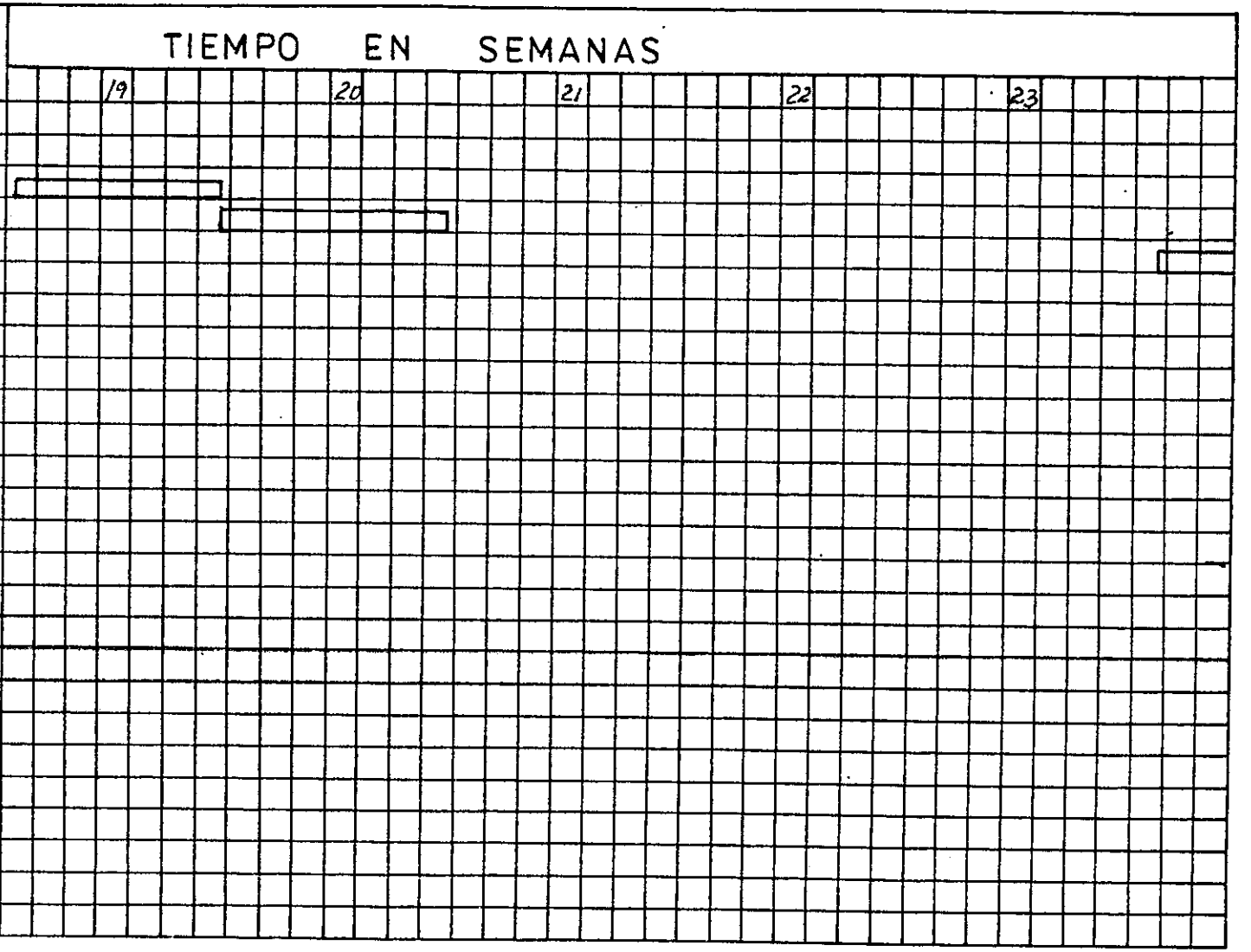
ACT.	PRECEDENCIA
26	10
26-A	26
26-B	26-A
27	26-B
28	27



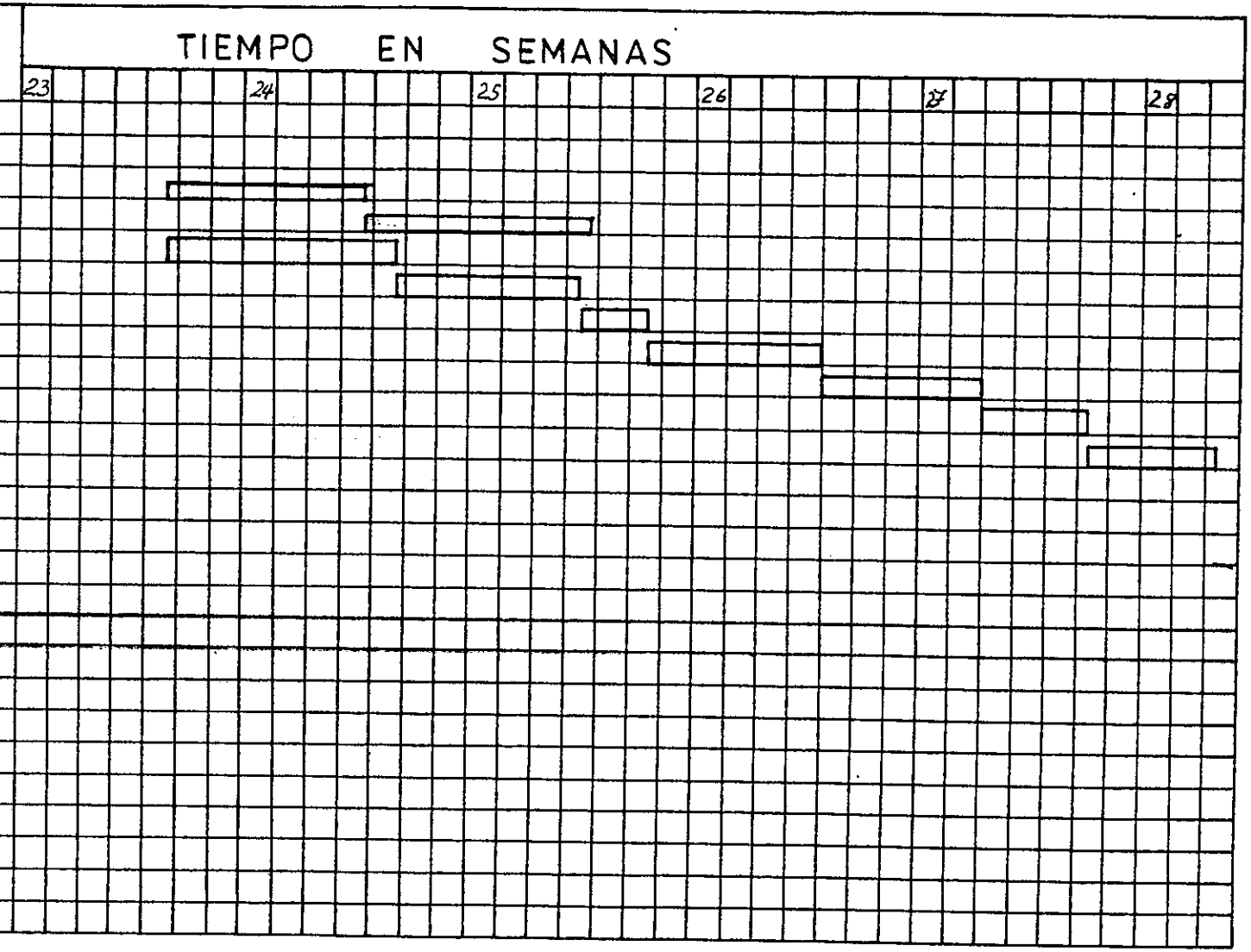
ACT.	PRECEDENCIA
29	17, 25
30	29
31	30
32	31
33	32
34	33
35	34
36	35



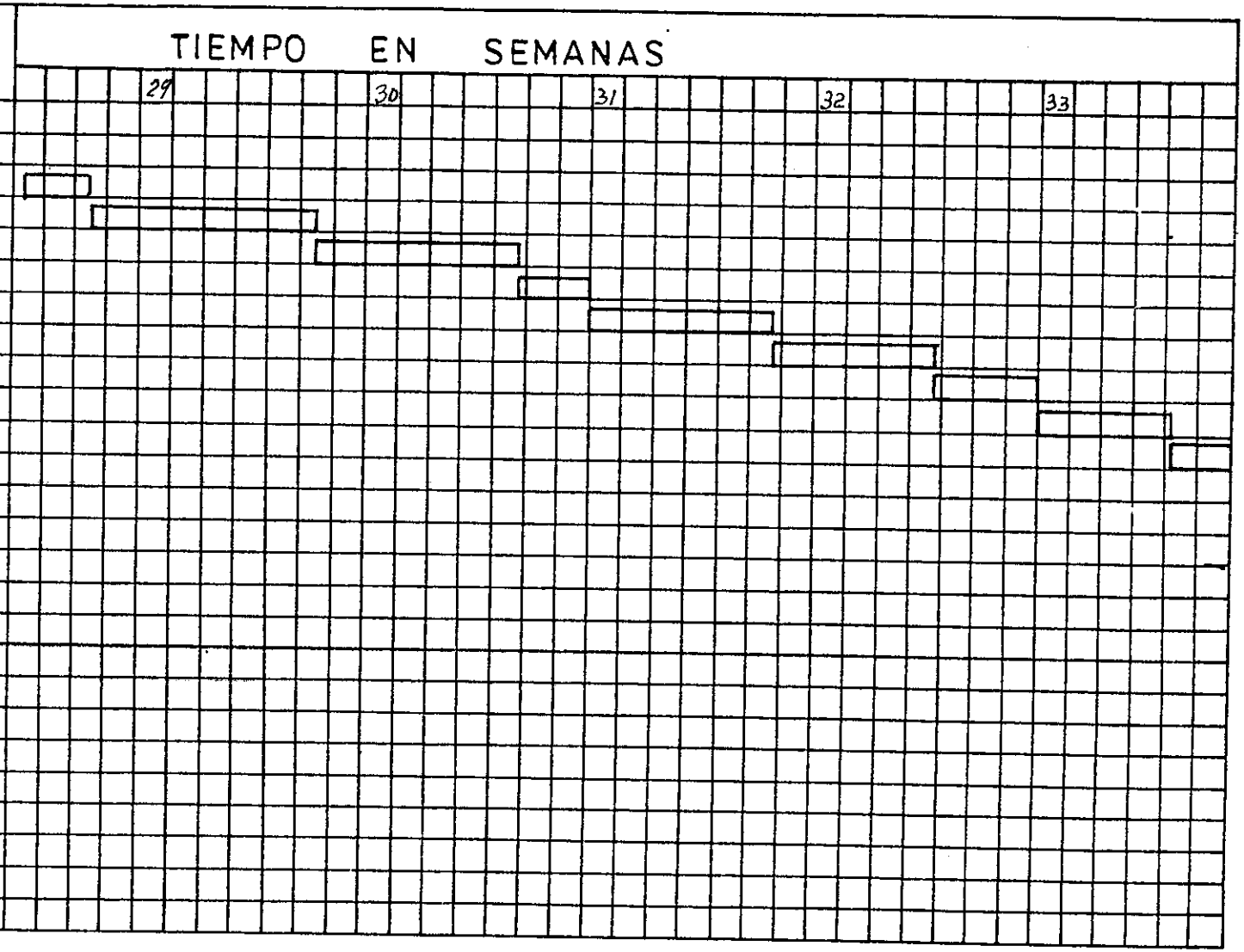
ACT.	PRECEDENCIA
38	27,25
39	38
40	39,36



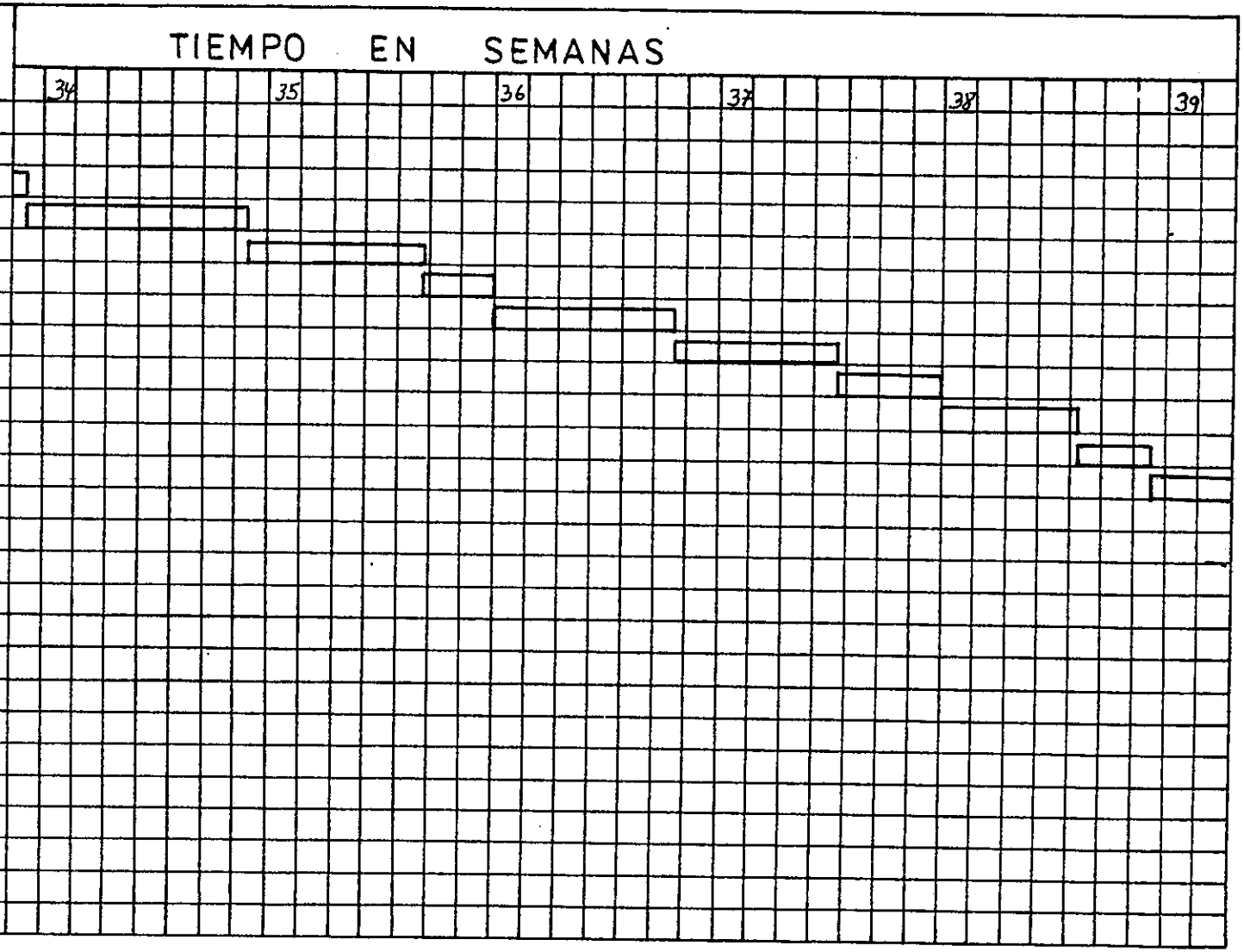
ACT.	PRECEDENCIA
40	39, 36
41	40
42	36
43	42
44	43
45	44
46	45
47	46
48-A	47



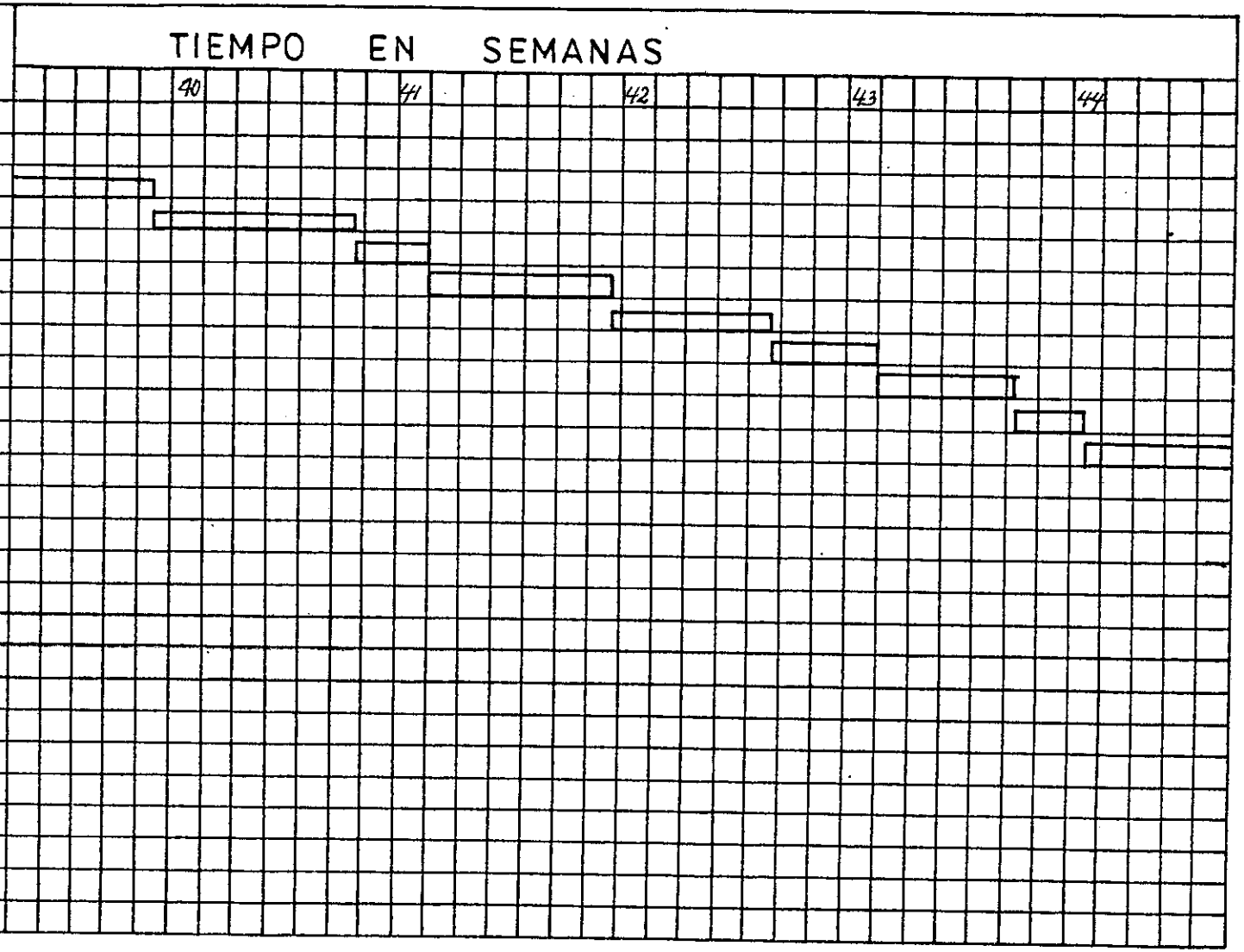
ACT.	PRECEDENCIA
48-B	48-A
49	48-B
50	49
51	50
52	51
53	52
54	53
55	54
56	55



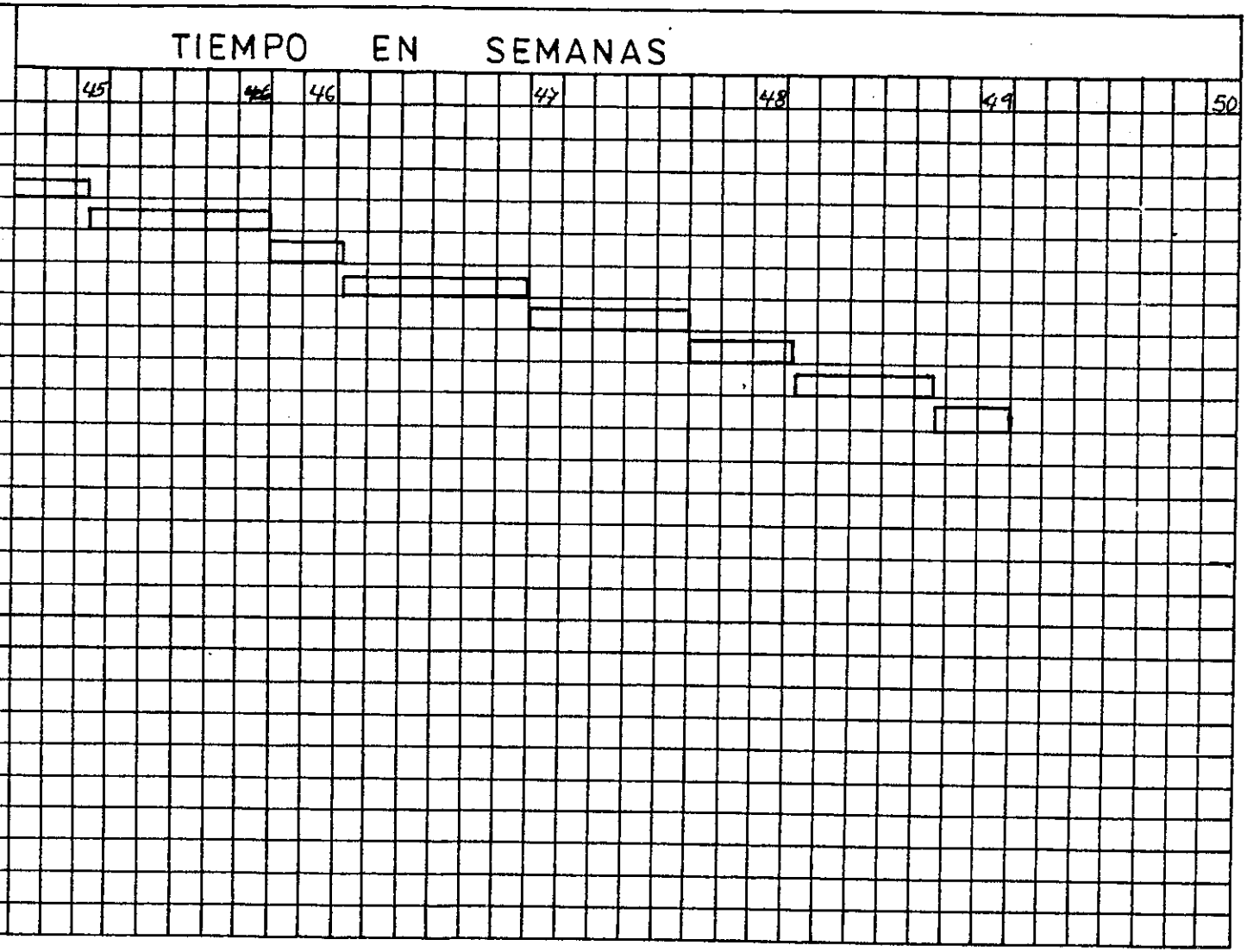
ACT.	PRECEDENCIA
56	55
57	56
58	57
59	58
60	59
61	60
62	61
63	62
64	63
65	64



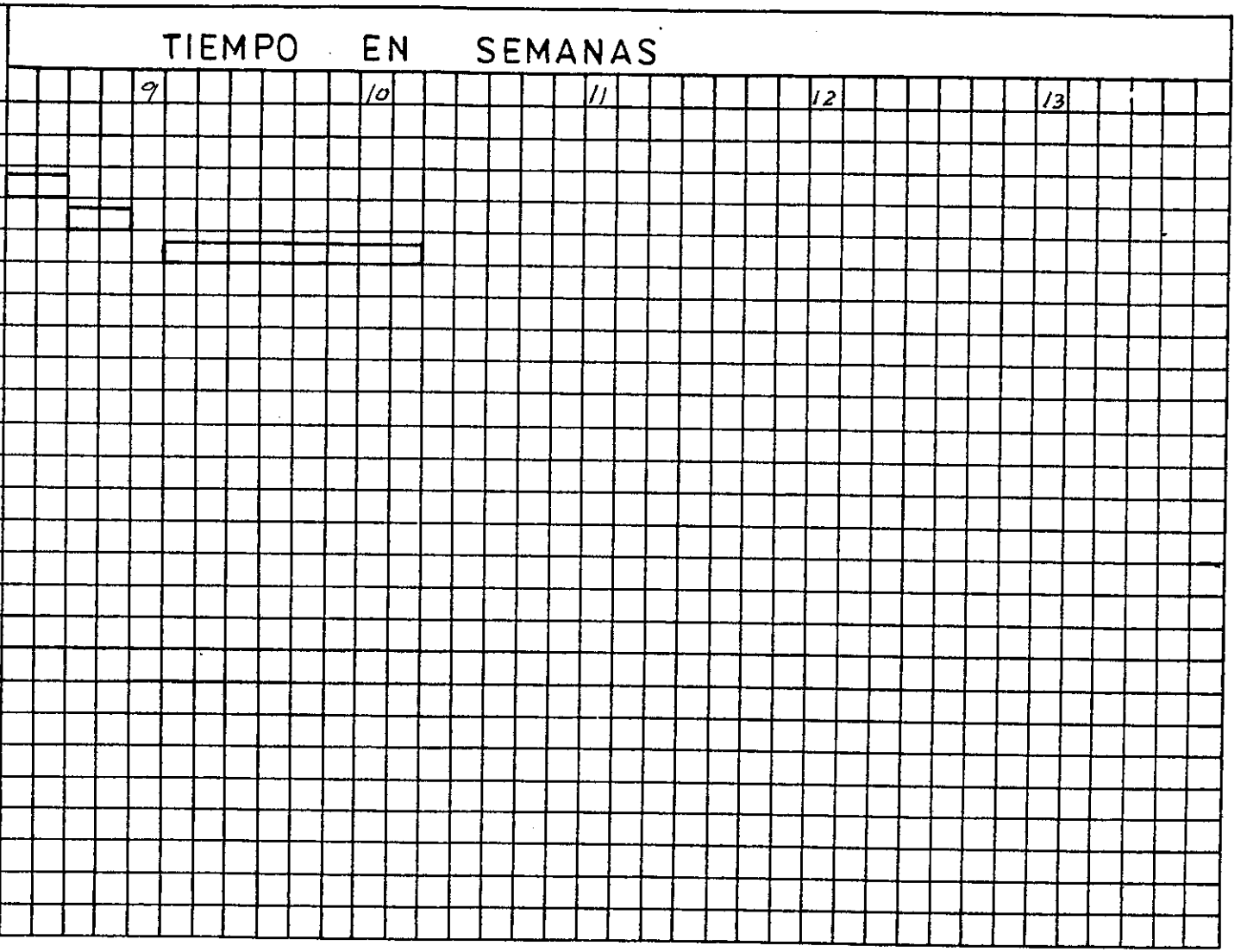
ACT.	PRECEDENCIA
65	64
66	65
67	66
68	67
69	68
70	69
71	70
72	71
73	72



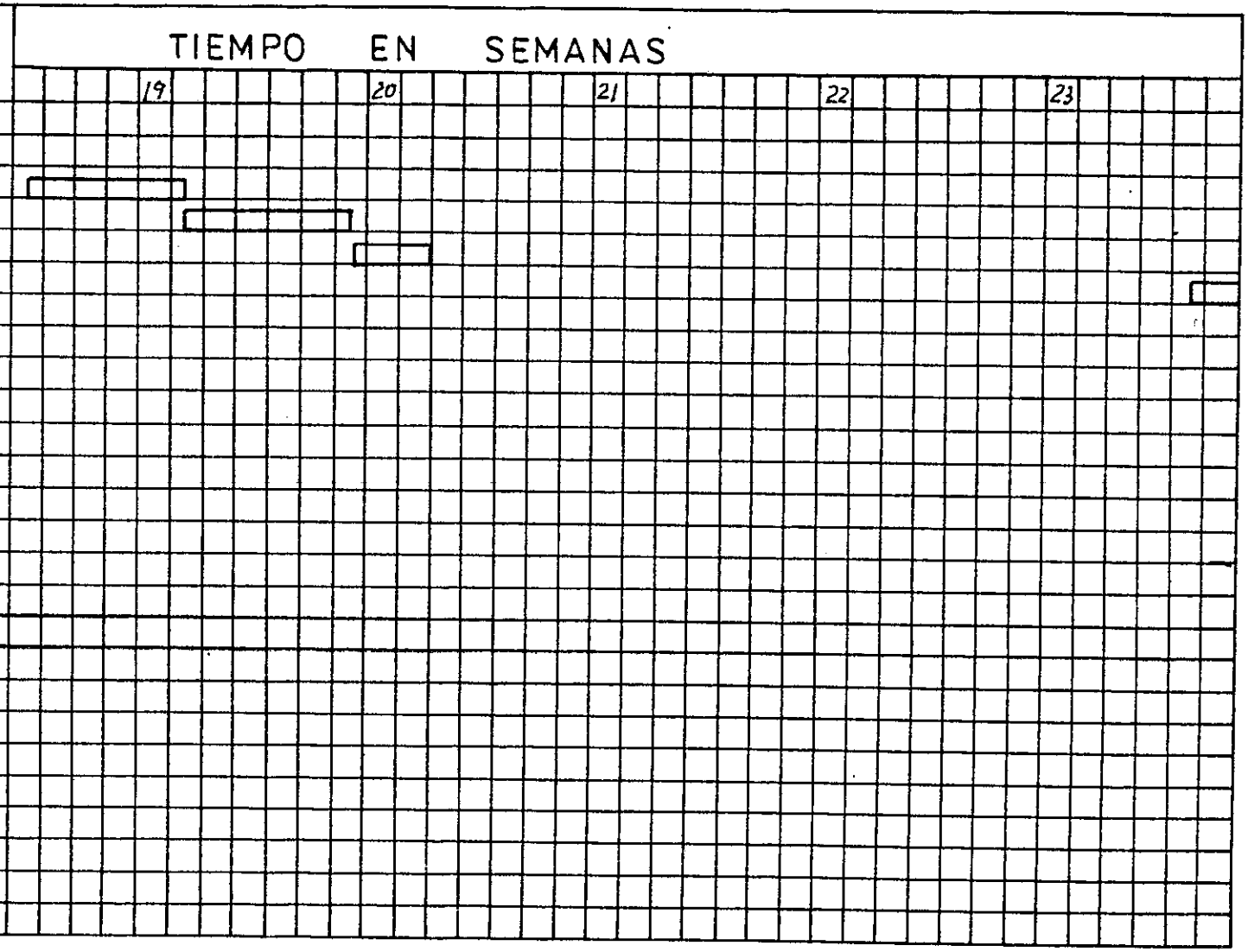
ACT.	PRECEDENCIA
73	72
74	73
75	74
76	75
77	76
78	77
79	78
80	79



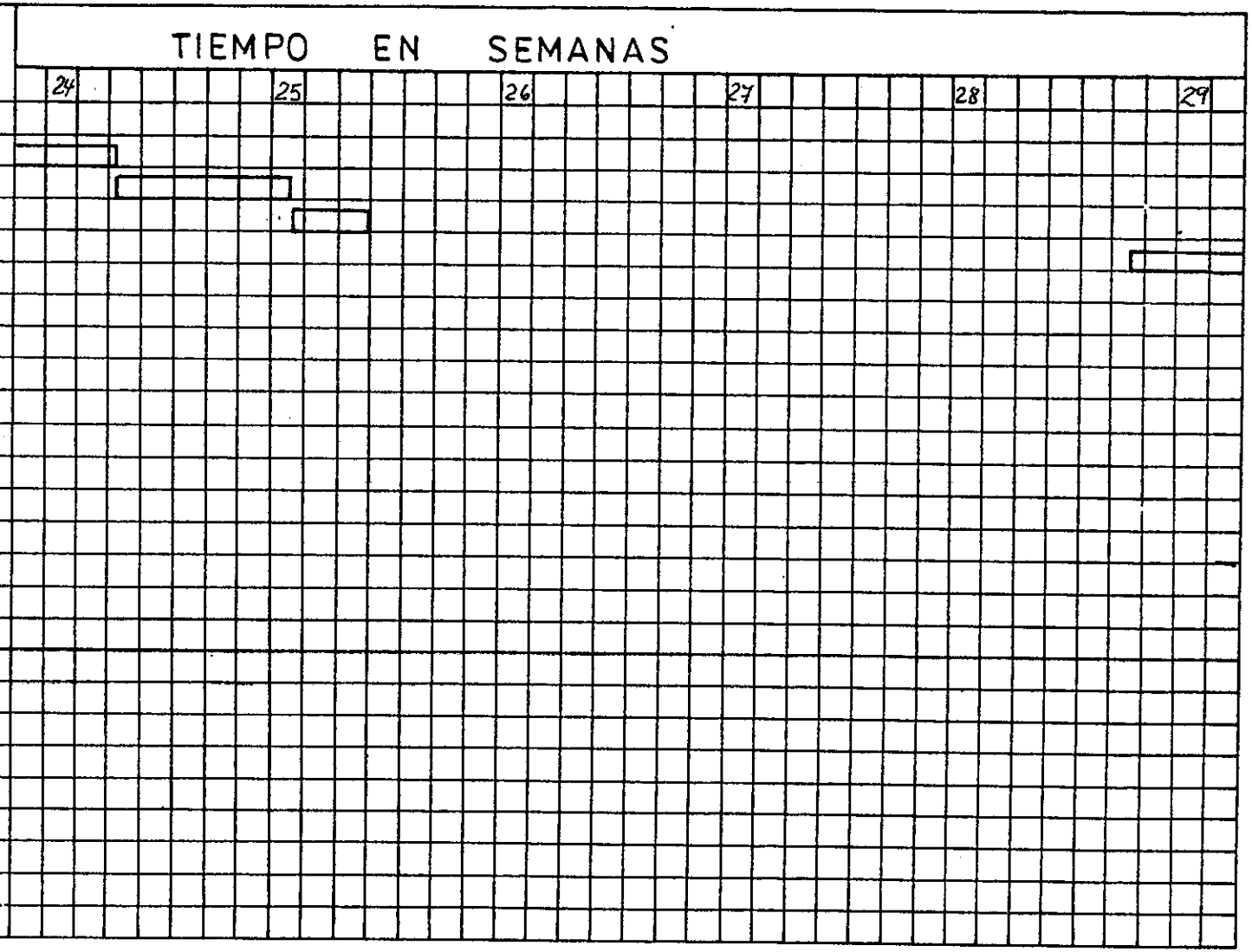
ACT.	PRECEDENCIA
80-A	10
80-B	80-A
81	17



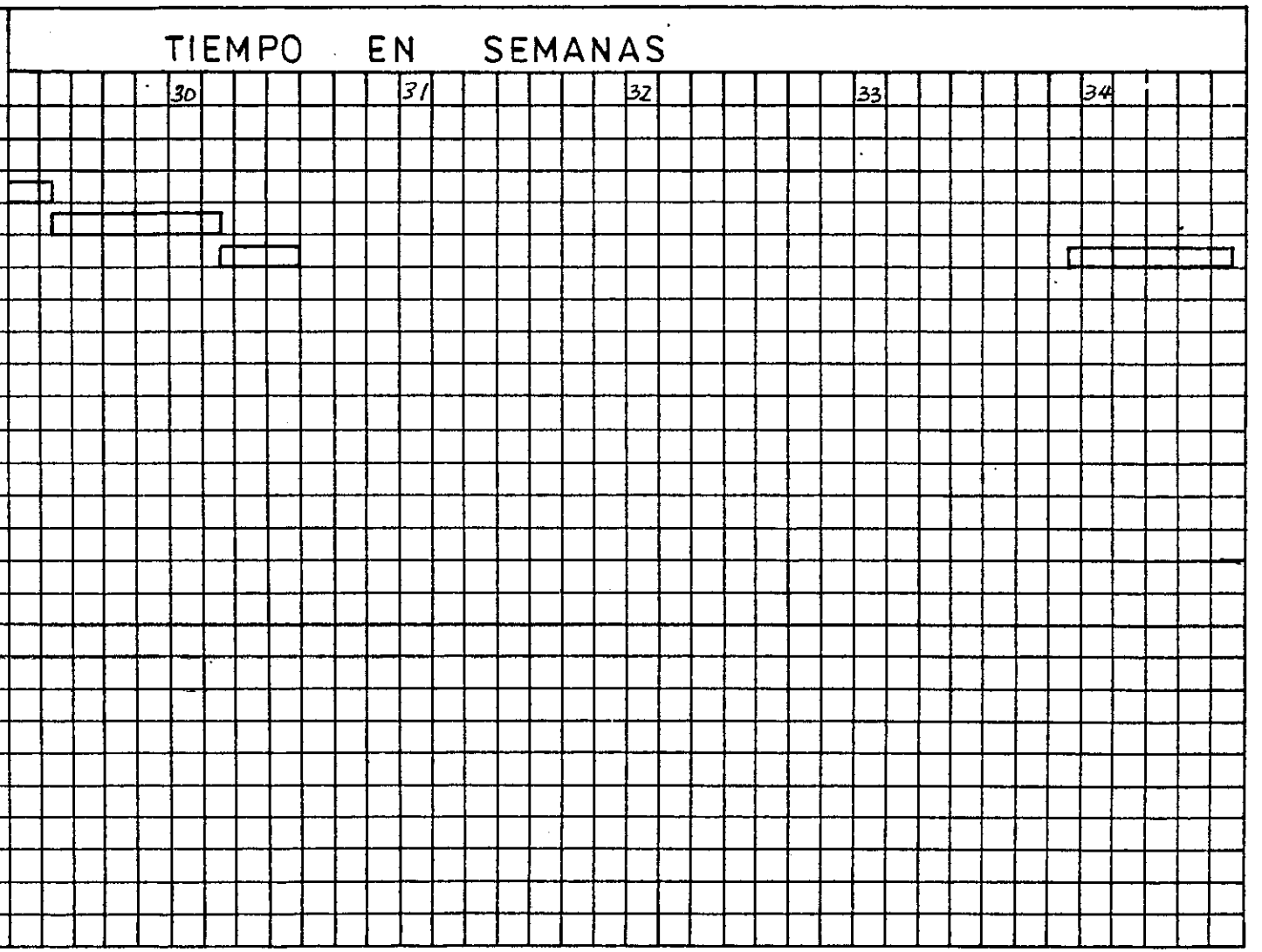
ACT.	PRECEDENCIA
82	25, 81, 80-B
83	82
84	83
85	84, 36



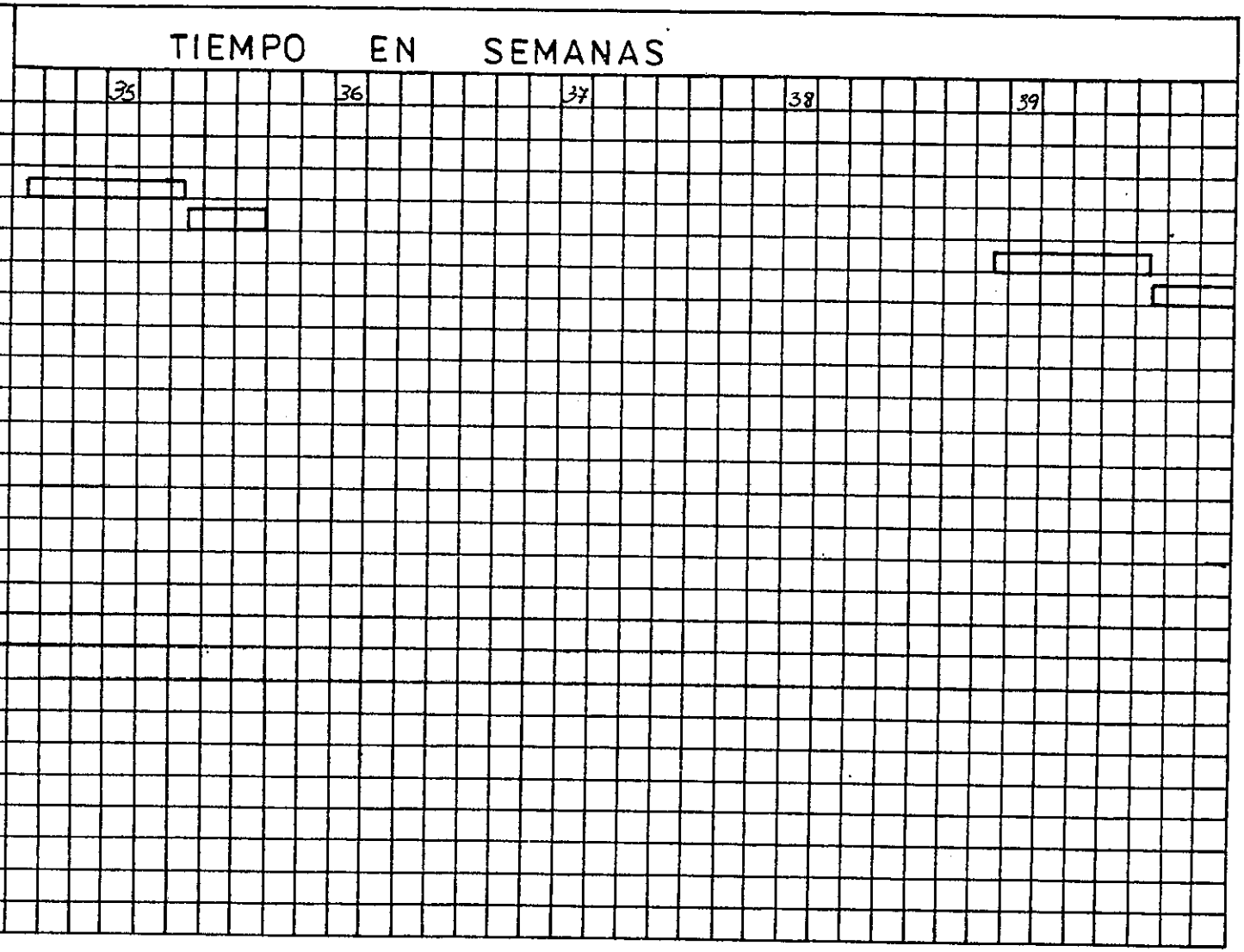
ACT.	PRECEDENCIA
85	84, 36
86	85
87	86
88	48-B, 87



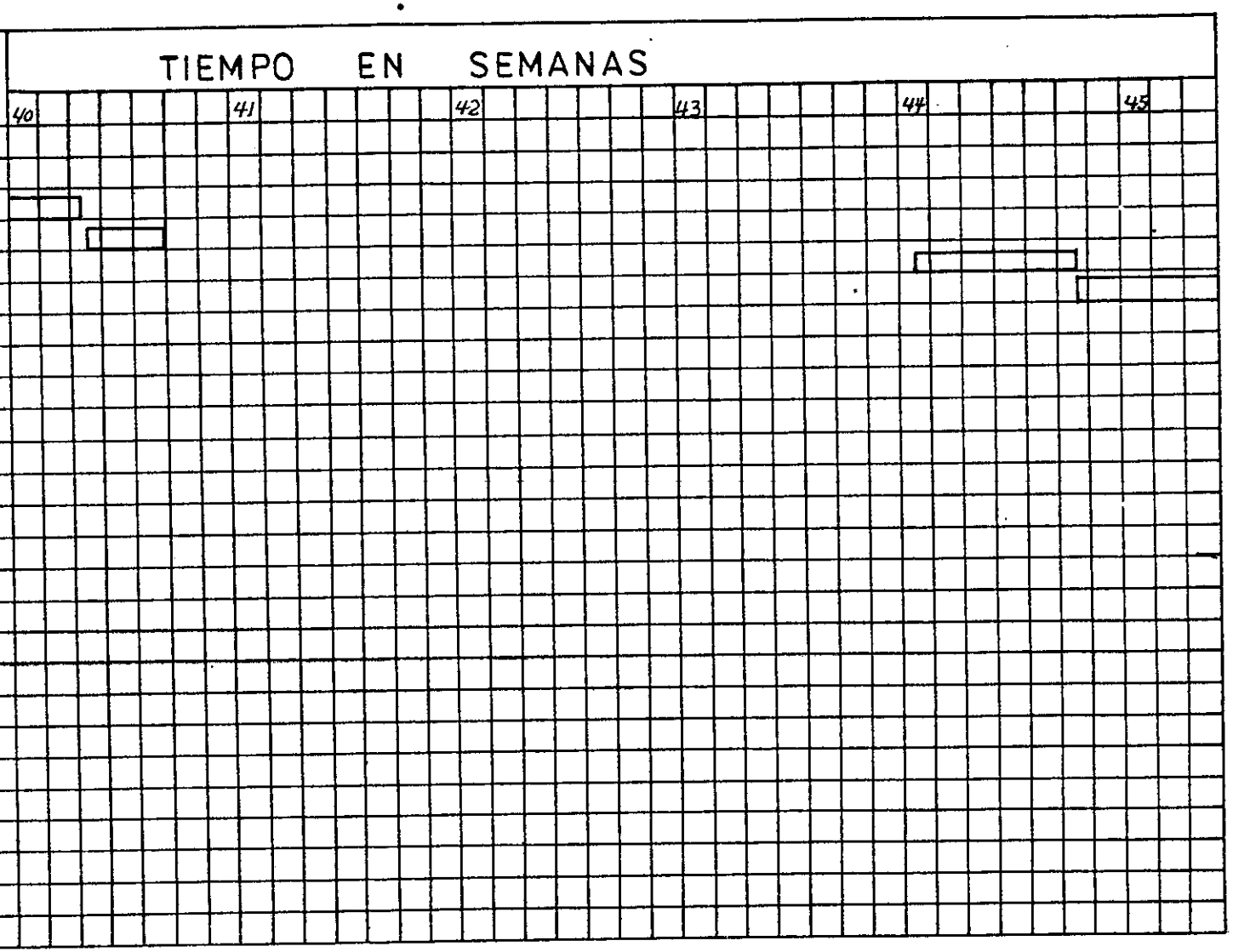
ACT.	PRECEDENCIA
88	48-B, 87
89	88
90	89
91	90, 56



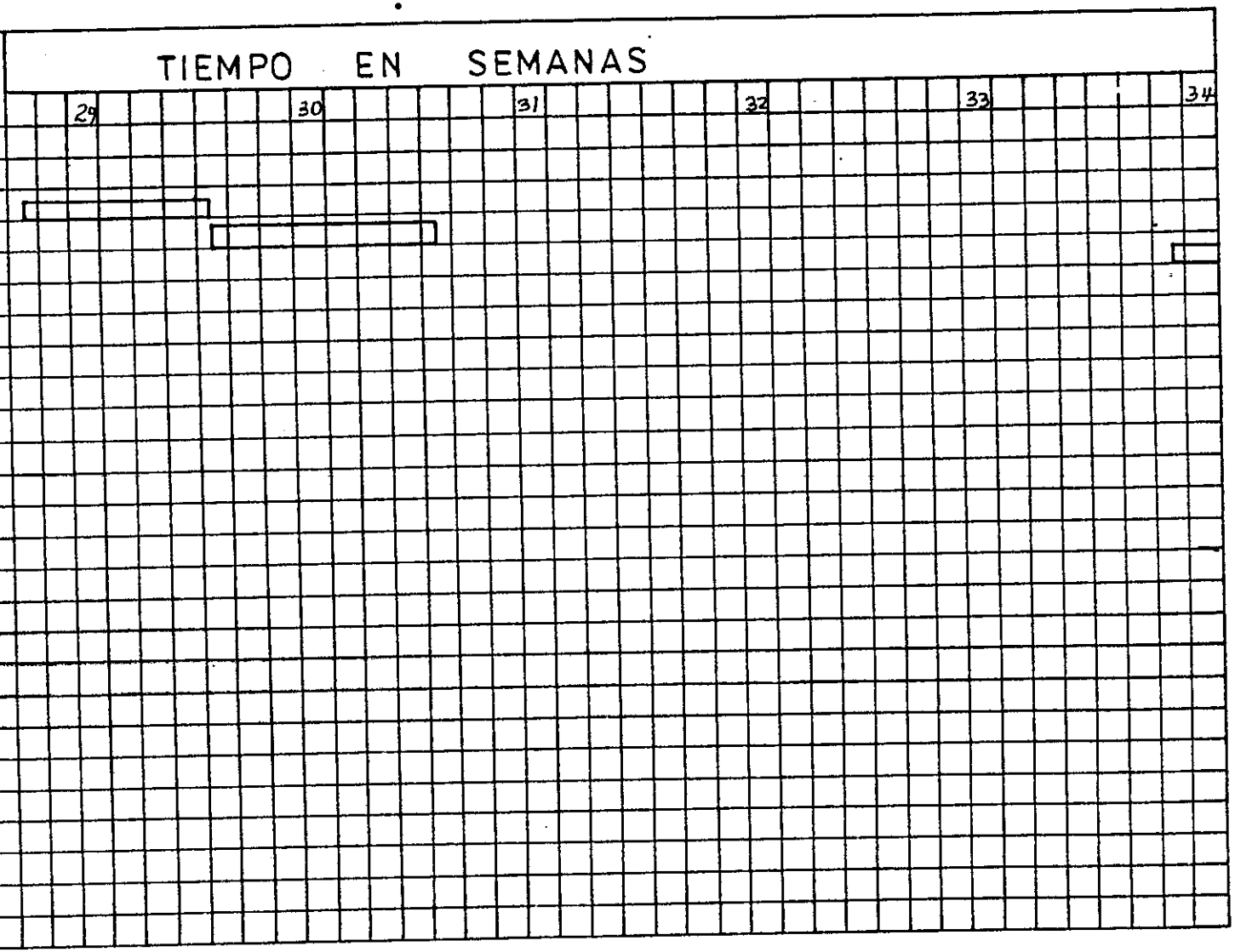
ACT.	PRECEDENCIA
92	91
93	92
94	93, 64
95	94



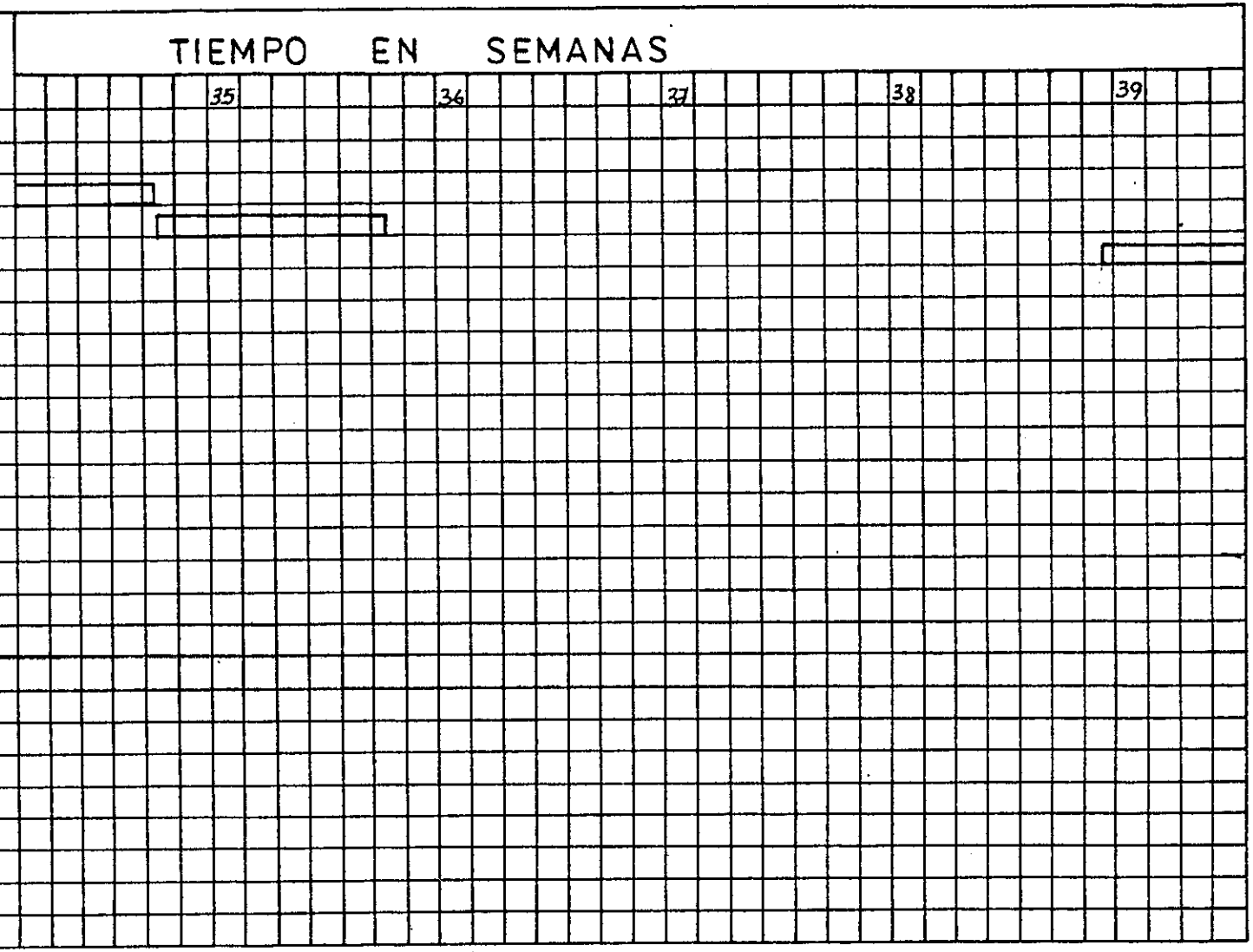
ACT.	PRECEDENCIA
95	94
96	95
97	96,72
98	97



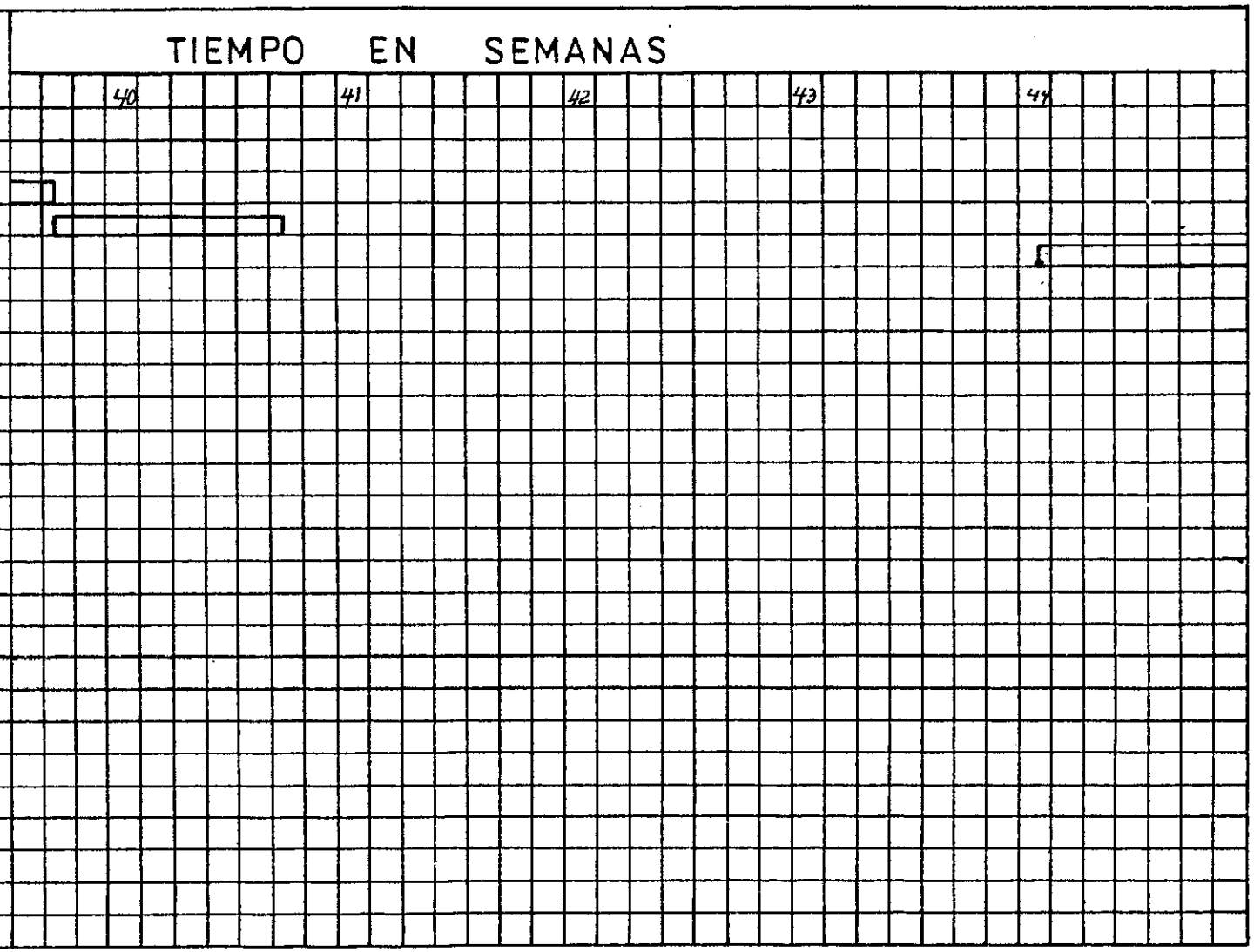
ACT.	PRECEDENCIA
100	48-B, 41
101	100
102	56, 101



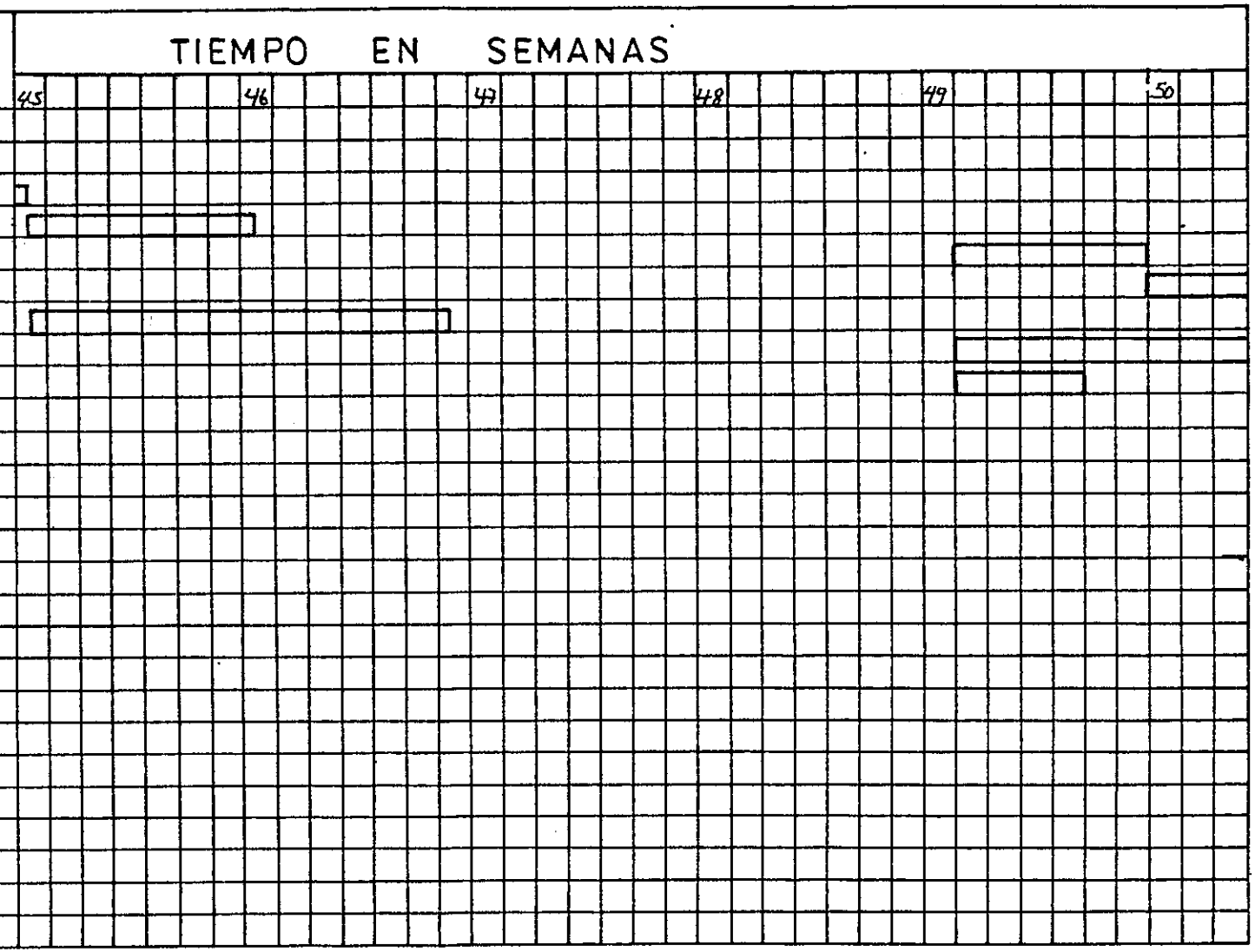
ACT.	PRECEDENCIA
102	56, 101
103	102
104	64, 103



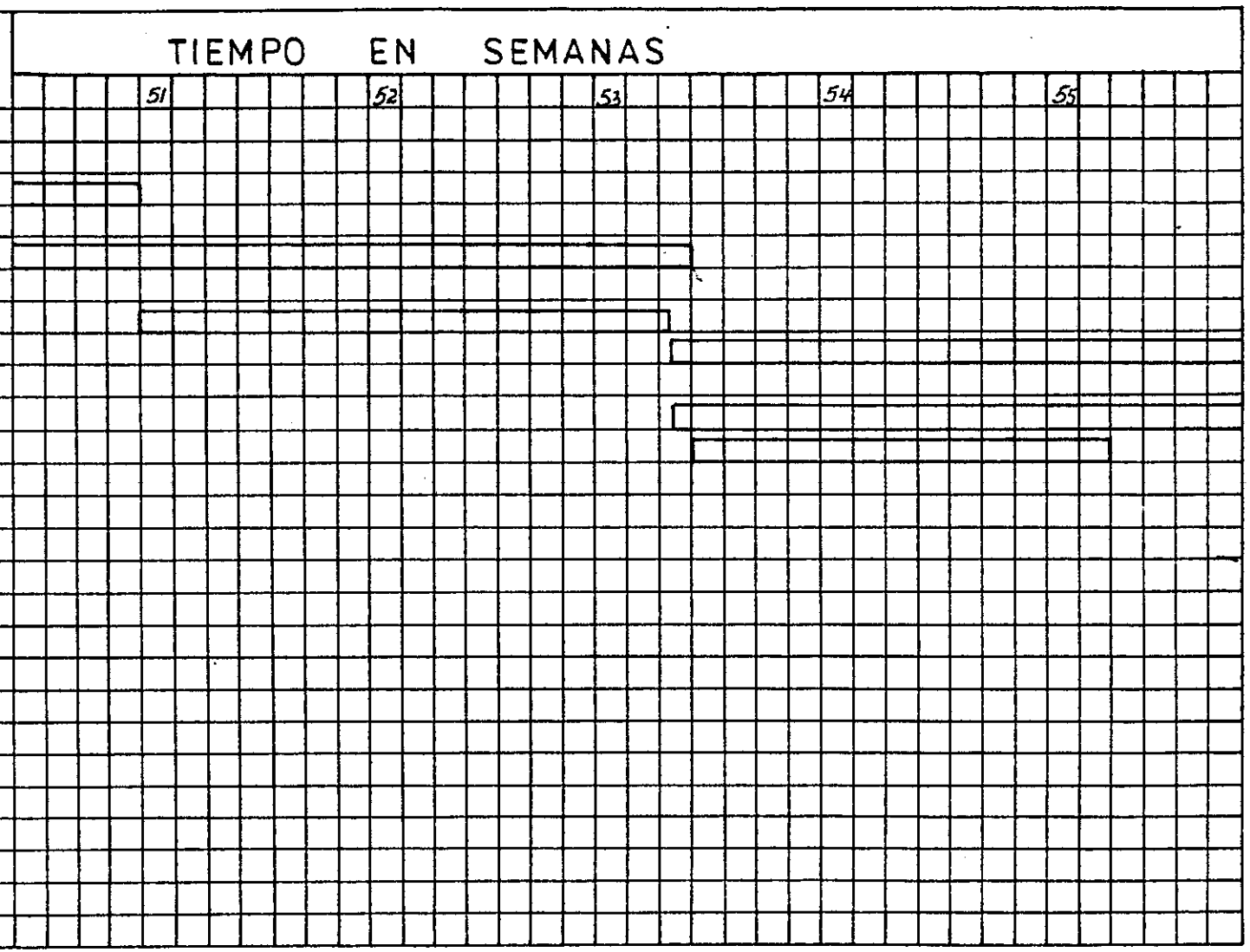
ACT.	PRECEDENCIA
104	64, 103
105	104
106	72, 105



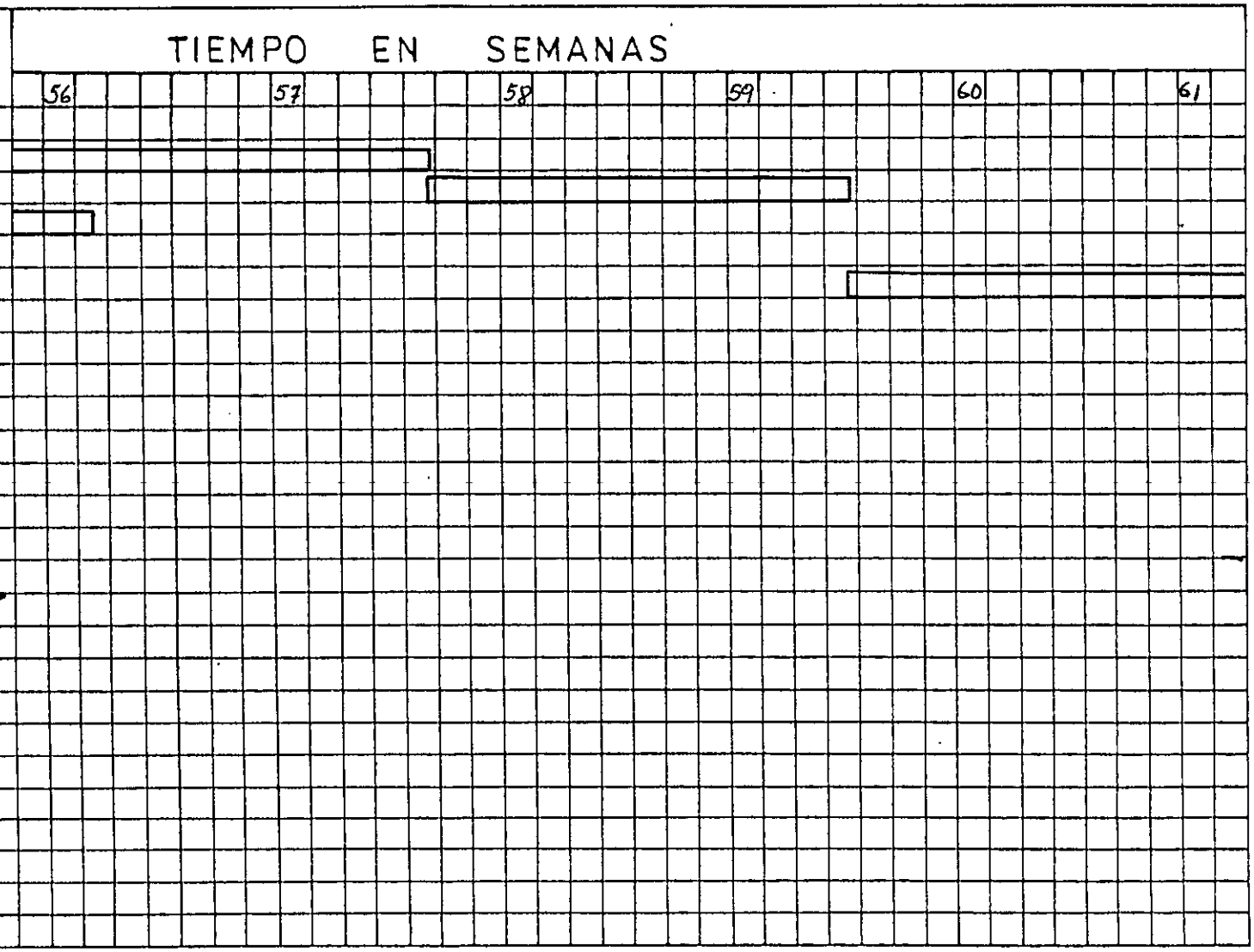
ACT.	PRECEDENCIA
106	72, 105
107	106
108	80, 107
109	108
110	72
111	80
112	80



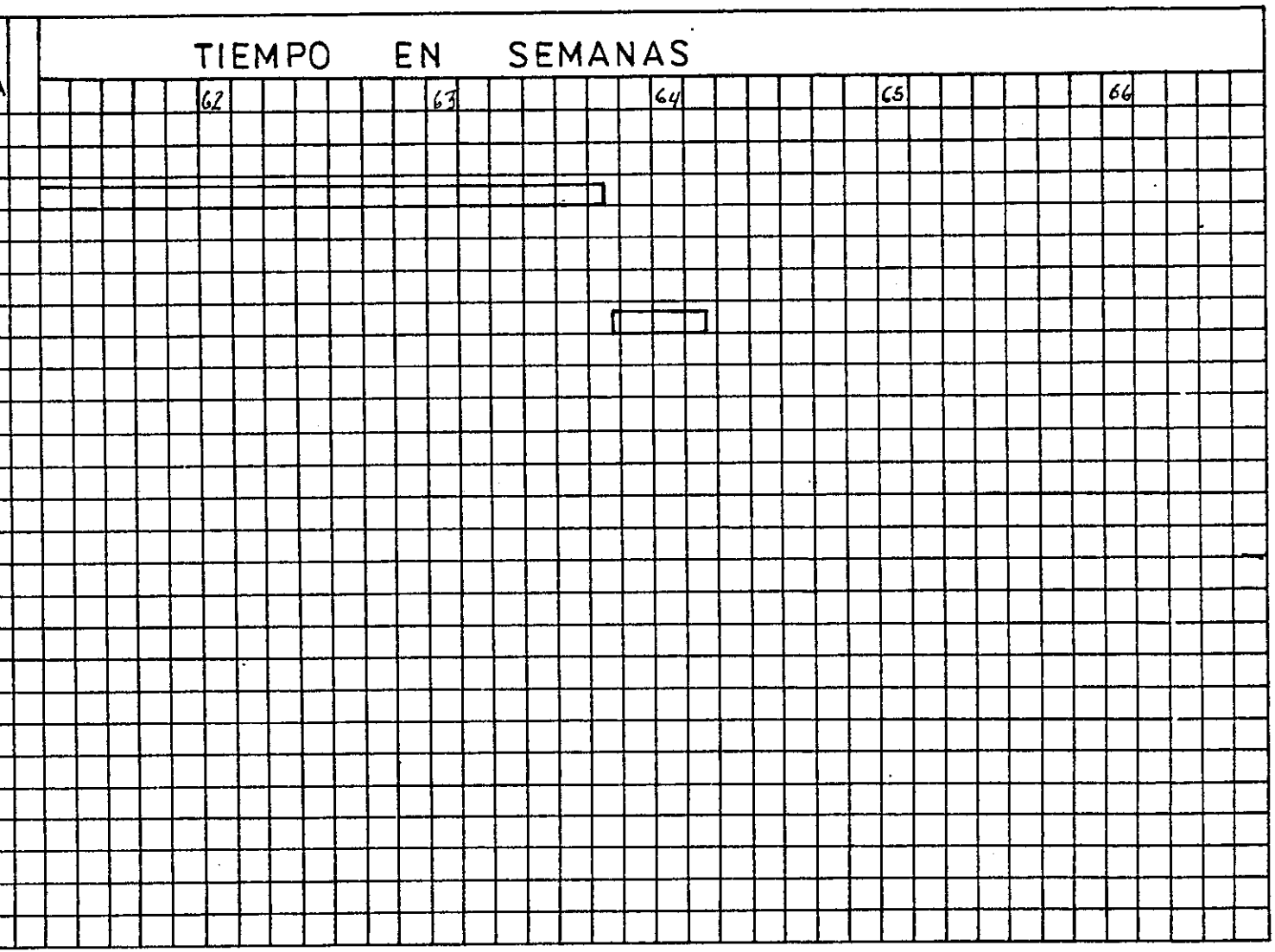
ACT.	PRECEDENCIA
109	108
110	72
111	80
112	80
113	109
114	113
115	114
116	113
117	111



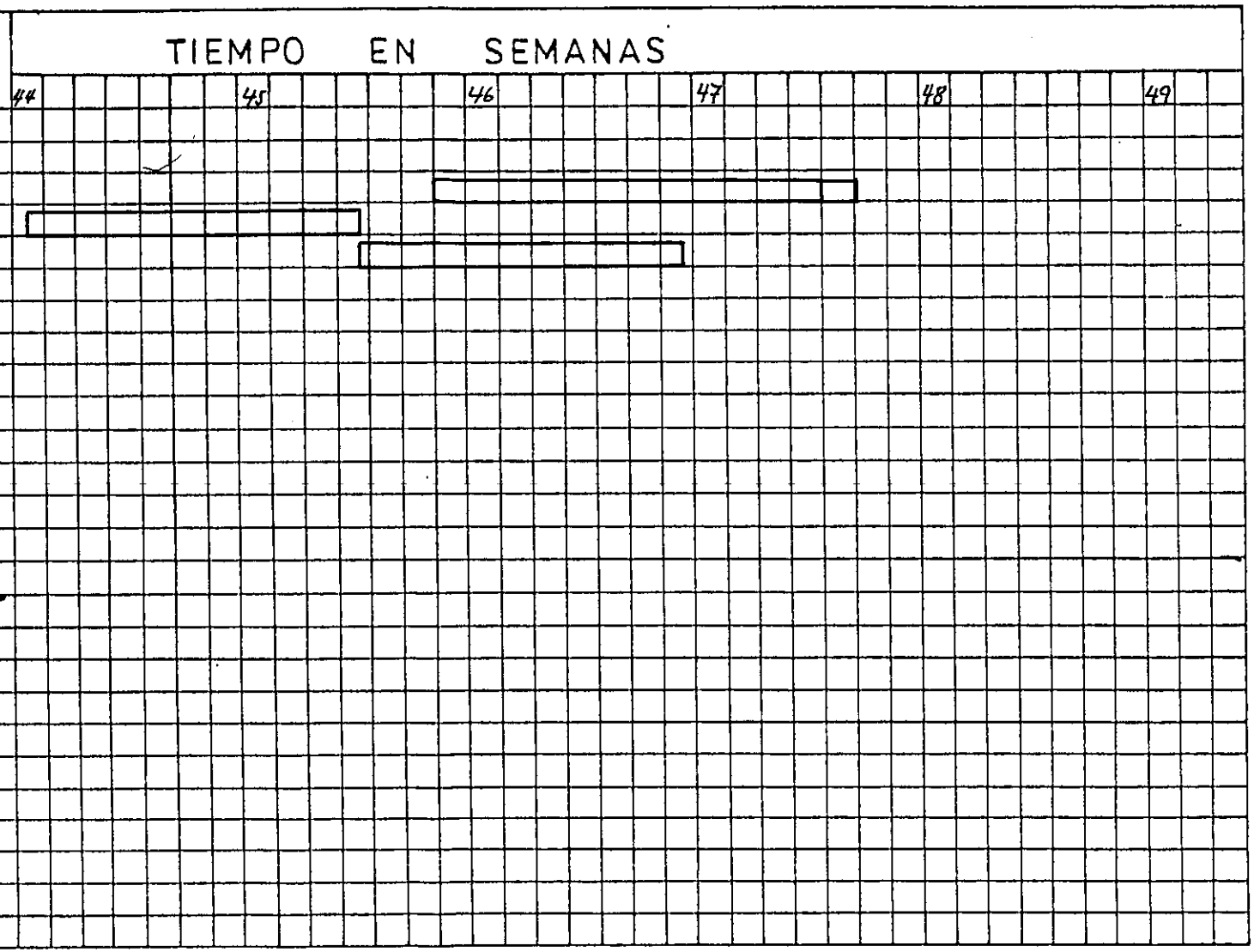
ACT.	PRECEDENCIA
114	113
115	114
116	113
117	111
118	115,116



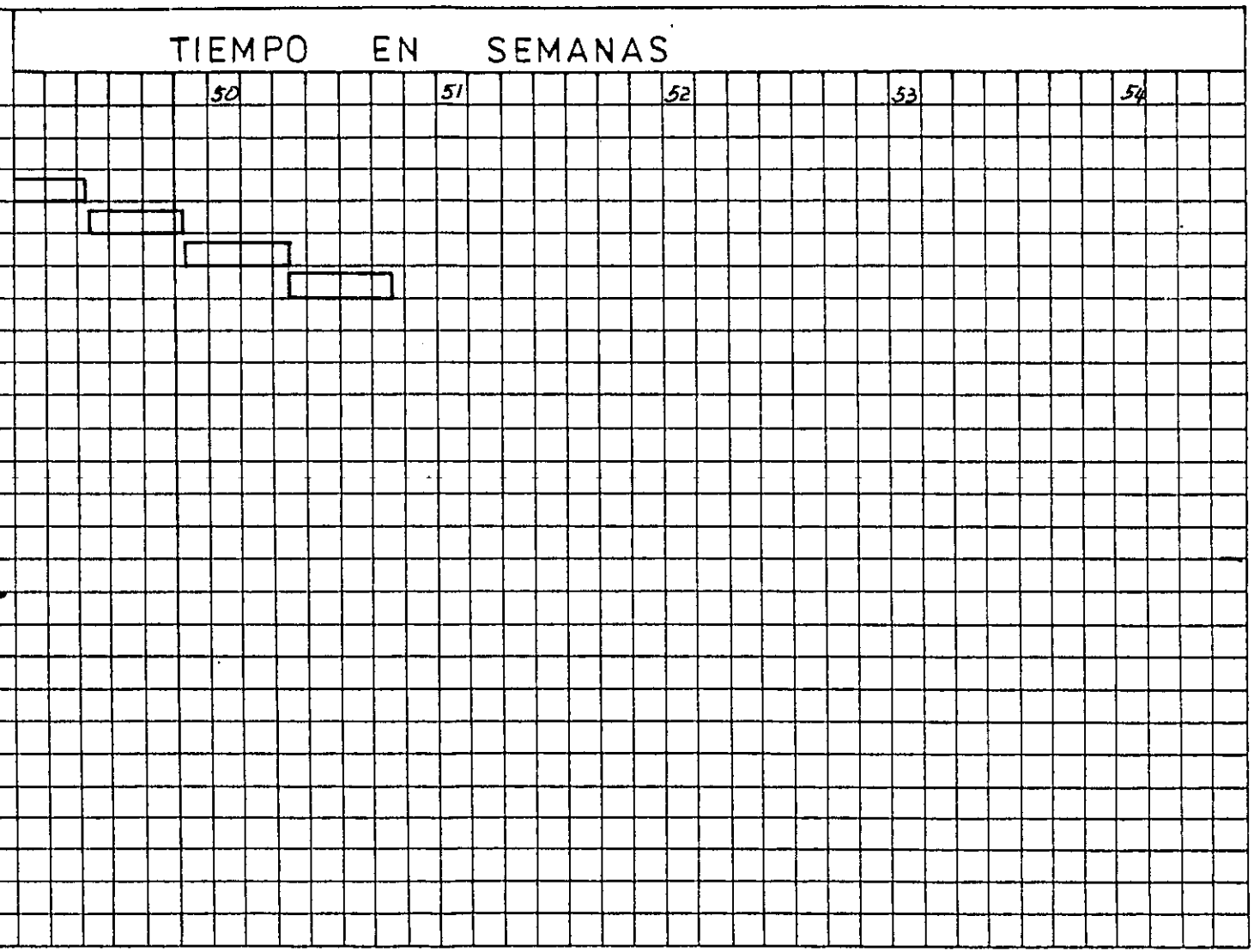
ACT.	PRECEDENCIA
118	115,116
119	99
120	72
121	120
122	118



ACT.	PRECEDENCIA
119	99
120	72
121	120



ACT.	PRECEDENCIA
123	9, 80
124	123
125	124
126	125



ACT.	PRECEDENCIA	TIEMPO EN SEMANAS
		65 66 67 68
127	122, 125	

PRESUPUESTO

FECHA: SEP. / 83	OBRA:
ANALISIS DE PRECIO UNITARIO	PRESUPUESTO: CASTRO-TORRES
ITEM. MORTERO 1:4	DIRECCION:
	UNIDAD: $1M^3$

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CEMENTO	Kg	362.5	6.40	2320.00	
ARENA	M^3	1.16	860.00	997.60	
AGUA	LTS	137.	0.20	27.40	
Sub-Total					3345.00
DESPERDICIO 5%				167.25	
TOTAL MATERIALES					3512.25
EQUIPOS					
MANO DE OBRA					
COSTOS INDIRECTOS					
VALOR UNITARIO TOTAL					# 3512.25

FECHA: SEP. / 83	OBRA: PRESUPUESTO: CASTRO-TORRES
ANALISIS DE PRECIO UNITARIO	DIRECCION:
ITEM. CONCRETO 1:2:3	UNIDAD. 1 M^3

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CEMENTO	Kg	350.00	6.40	2240.00	
ARENA	M^3	0.555	860.00	477.30	
TRITURADO	M^3	0.835	1260.00	1052.10	
AGUA	LTS	210	0.20	42.00	
Sub-TOTAL					3811.40
DESPERDICIO 5%				190.57	
TOTAL MATERIALES					4001.97
EQUIPOS					
MEZCLADORA Y FABRICACION					350.00
TOTAL					350.00
MANO DE OBRA					
COSTOS INDIRECTOS					
VALOR UNITARIO TOTAL					# 4351.97

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. CONCRETO 1:2:4

UNIDAD. 1 M³

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CEMENTO	Kg	300.00	6.40	1920.00	
ARENA	M³	0.475	860.00	408.50	
TRITURADO	M³	0.950	1260.00	1197.00	
AGUA	LTS	204	0.20	40.80	
SUB-TOTAL					3566.30
DESPERDICIOS 5%				178.32	
TOTAL MATERIALES					3744.62
EQUIPOS					
MESCLADORA Y FABRICACION					350.00
TOTAL					350.00
MANO DE OBRA					
COSTOS INDIRECTOS					
VALOR UNITARIO TOTAL					# 4094.62

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO - TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. EXCAVACION ZAPATA

UNIDAD: 1 M^3

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
DERRUMBE (2%) MANO DE OBRA					7.00
RETIRO MATERIAL					50.00
EQUIPOS					
HERRAMIENTA (5%) MANO DE OBRA					17.50
MANO DE OBRA					
MANO DE OBRA					350.00
COSTOS INDIRECTOS					
AUI (25%)					106.13
VALOR UNITARIO TOTAL					$ 530.63

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO - TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. SOLADO PARA CIMIENTOS (ZAP.)

UNIDAD. M^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CONCRETO SIMPLE (1:2:4)		0.05	4094.62	204.73	
					204.73
EQUIPOS					
					15.00
MANO DE OBRA					
					160.00
COSTOS INDIRECTOS					
AUI (25%)					94.93
VALOR UNITARIO TOTAL					$ 474.66

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. ZAPATA

UNIDAD. m^3.

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
a) Formaleta.					
block #4	u	64	21 00	1344 00	
MORTERO	m^3	0.0768	3345 00	256 89	
DESP. 5%				80 04	
b) REFUERZO					
HIERRO	Kg.	80 70	56 67	4573 49	
ALAMBRE	Kg.	1,21	75	90 78	
DESP. 5%				233 21	
c) CONCRETO	m^3	2,52	4351 92	11004 64	
TOTAL					17583 01
EQUIPOS					
MANO DE OBRA					
ROTURA CABEZA DE PILOTE	u	5	570 00	2850 00	
FORMALETERIA	ml	7.92	100 00	792 00	
Fig. y COLOCACION DE HIERRO	Kg.	80 70	7 50	605 25	
VACIADO	m^3	2,52	1200 00	3024 00	
TOTAL					7271 25
COSTOS INDIRECTOS					
					6213 75
AUI (25%)					
					$ 31067 82
COSTO UNITARIO	u				
VALOR UNITARIO TOTAL					$ 12328 50

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO - TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. EXCAVACION VIGA AMARRE 0,30 x 0,30

UNIDAD: 1 ML

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
DERRUMBE (2%) MANO DE OBRA					1.40
RETIRO MATERIAL					15.00
EQUIPOS					
HERRAMIENTA (5%) MANO DE OBRA					3.50
MANO DE OBRA					
MANO DE OBRA					70.00
COSTOS INDIRECTOS					
AUI (25%)					22.48
VALOR UNITARIO TOTAL					$ 112.38

FECHA: SEP. /83	OBRA: PRESUPUESTO: CASTRO-TORRES
ANALISIS DE PRECIO UNITARIO	DIRECCION:
ITEM. SOBRECIMIENTO EN BLOCK # 6	UNIDAD: ML h = 0.50 M.

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
BLOQUES		9	30.00	270.00	
MORTERO		0.022	3345.00	73.59	
DESPERDICIO 5%				17.18	
TOTAL MATERIALES					360.77
EQUIPOS					
HERRAMIENTAS					15.00
TOTAL					15.00
MANO DE OBRA					
					180.00
COSTOS INDIRECTOS					
AUI (25%)					138.94
VALOR UNITARIO TOTAL					$ 694.71

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. IMPERMEABILIZACION Sobrecimiento

UNIDAD. ml

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
Asfalto (3 capas)		3x1.5	40=x0.5	90.00	
Tela Asfaltica (2 capas)		2	30.71	61.42	
ACPM			7.00	7.00	
					158.42
EQUIPOS					
Herramientas					10=
MANO DE OBRA					
					50.00
COSTOS INDIRECTOS					
AUI (25%)					54.61
VALOR UNITARIO TOTAL					$ 273.03

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. RELLENO COMPACTADO

UNIDAD. 1 M^3

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
ZAHORRA	M^3	1	260.00	260.00	
PERDIDA POR COMPACTACION (30%)		0.3	260.00	78.00	
DESPERDICIO 5%				16.90	
TOTAL MATERIALES					354.90
EQUIPOS					
					80.00
MANO DE OBRA					
					280.00
COSTOS INDIRECTOS					
AUI (25%)					178.73
VALOR UNITARIO TOTAL					# 893.63

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. Columnas

UNIDAD: ml.

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CEIBA (1"x12")	pies	6	90 00	540 00	
Abarco (2"x4")	pies	2 64	55 00	145 20	
Triangle		1	120 00	120 00	
Puntillas	lbs	2	50 00	100 00	
Hierro	Kg.	31 04	56 67	1759 03	
Alambre	Kg.	0.465	75 00	34 87	
Desperdicios 5%				134 85	
Concreto (3000 psi)	m^3	0,40	4351 97	1740 78	
					$4574 83
TOTAL					
EQUIPOS					
MANO DE OBRA					
Parada Formaleteria	ml	2.5	208 00	520 00	
Figuracion y Colocacion Hierro	Kg.	31 04	7 50	232 80	
Vaciado de Concreto	m^3	0.40	1200 00	480 00	
					$1232 80
TOTAL					
COSTOS INDIRECTOS					
					1451 90
AUI (25%)					
					7259 53
Costo Unitario					
					$9033 81
VALOR UNITARIO TOTAL					

FECHA: SEP / 83

ANALISIS DE PRECIOS UNITARIO

OBRA.
PRESUPUETO.
DIRECCION:

ITEM: PLACA EN CONCRETO

UNIDAD. m^2

DESCRIPCION.	UN	CANT	Vr UNIT	Vr PARCIAL.	Vr ITEM.
a.) PLAFON					
CERCHAS	m^2	1		33.22	
Gatos	m^2	1		39.16	
ABARCO	m^2	1		15.45	
mangle	m^2	1		13.02	
Puntillas	m^2	1		12.00	
PANELES	m^2	1		227.70	
GUARDERAS	m^2			12.39	
Desperdicios 5%				17.64	
MANO de OBRA	m^2	1		260.00	
b.) Monoliticos					
ALIGERANTE 20x30x60	u	9	70.00	630.00	
Desperdicios 5%				31.50	
subida y TAPADA	u	9	18.00	162.00	
c.) REFUERZO					
Hierro 60.000 PSI	Kg	5.06	56.67	286.91	
Hierro 40.000 PSI	Kg	2.16	34.36	74.49	
ALAMBRE	Kg	0.108	75.00	8.12	
DESPERDICIO 5%				18.47	
FIGURACION y COLOCACION	Kg	7.22	7.50	54.15	
d.) CONCRETO SIMPLE					
CONCRETO 1:2:3	m^3	0.200	4351.97	870.39	
VACIADO	m^3	0.200	1200.=	2.40=	
e.) CURADO y DECIMBRE	m^2	1		50.=	
Sub TOTAL				3056.61	
A U I (25%)				714.15	
TOTAL					3770.76

FECHA: SEP / 83	OBRA.
ANALISIS DE PRECIOS UNITARIO	PRESUPUETO.
	DIRECCION:
ITEM: ESCALERA	UNIDAD.

DESCRIPCION.	UN	CANT	Vr UNIT	Vr PARCIAL.	Vr ITEM.
a) MUERTO o CIMIENTO	M			1200 00	
b) TRAZADO	M			2200 00	
c) FORMALETERIA					
PLAFON. Peiba 1"x12"	pie²	10 70	90 00	963 00	
Guarderas	pie²	4 29	90 00	386 10	
Contrahuellas	pie²	5 50	90 00	495 00	
Abarco 2"x4"	pie²	4 86	55 00	267 30	
Mangle		1 46	120 00	199 20	
Puntillas			50 00	50 00	
Desperdicios 5%				118 03	
Mano de Obra	m²	8 31	350 00	2908 50	
d) REFUERZO					
HIERRO	Kg.	60 09	56 67	3405 30	
ALAMBRE	Kg.	0.901	75	67 60	
Desp. 5%				173 64	
Figuracion y Colocacion	Kg.	60 09	2 50	450 67	
e) CONCRETO SIMPLE					
CONCRETO (3000 psi).	m³	1,65	4351 97	7180 75	
VACIADO	m³	1,65	1200 00	1980 00	
F) Curado y Descimbre				300 00	
SUB-TOTAL				22345 09	
IVA (25%)				5586 27	
COSTO TOTAL				$27931 36	

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. LEVANTE CON BLOQUE Nº 4

UNIDAD: m^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
BLOQUES		12.5	21.=	262.50	
MORTERO (1:4)		0.016	3512.25	56.20	
DESPERDICIO 5%				15.94	
					334.64
EQUIPOS					
HERRAMIENTA Y ANDAMIOS					10.00
MANO DE OBRA					
	H^2				110.00
COSTOS INDIRECTOS					
AUI (25%)					113.66
VALOR UNITARIO TOTAL					# 568.30

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PAÑETE DE MUROS

UNIDAD. 1 M²

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
MORTERO (1:4)	M³	0.02	3345.00	66.90	
DESPERDICIO 5%				3.35	
TOTAL MATERIALES					70.25
EQUIPOS					
HERRAMIENTAS Y ANDAMIOS					18.00
TOTAL					18.00
MANO DE OBRA					
					110.00
COSTOS INDIRECTOS					
AUI (25%)					49.56
VALOR UNITARIO TOTAL					$247.81

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PAÑETE DE CIELO

UNIDAD. $1\ M^2$

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
MORTERO (1:4)		0.03	3345.00	100.35	
DESPERDICIO (5%)				5.02	
TOTAL MATERIALES					105.37
EQUIPOS					
HERRAMIENTA Y ANDAMIOS					18.00
TOTAL					18.00
MANO DE OBRA					
					180.00
COSTOS INDIRECTOS					
AUI (25%.)					75.84
VALOR UNITARIO TOTAL					# 379.21

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PISO DE BAÑO

UNIDAD. 1 M²

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
MORTERO (1:4)	M²	0.03	3345.00	100.35	
BALDOSIN	M²	1	599.00	599.00	
JUNTAS				30.00	
Sub-TOTAL					729.35
DESPERDICIO 5%				36.47	
TOTAL MATERIALES					765.82
EQUIPOS					
HERRAMIENTAS					15.00
TOTAL					15.00
MANO DE OBRA					
					200.00
COSTOS INDIRECTOS					
AUI (25%)					245.21
VALOR UNITARIO TOTAL					$1226.03

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. ESTUCO DE MUROS

UNIDAD. M^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
Cemento Gris	bolsa	2	320.00	640.=	
yeso	bolsa	4	395.00	1580.=	
Caolin	"	8	245.00	1960.=	
					4180.=
REND PROMEDIO x Ma	M^2	250			
TOTAL MAT / M^2					16.72
EQUIPOS					
					6.00
					6.00
MANO DE OBRA					
					60.=
COSTOS INDIRECTOS					
AUI (25%)					20.68
VALOR UNITARIO TOTAL					# 103.40

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. BALDOSA DE GRANITO

UNIDAD. M^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
Mortero de pega		0.04	3512.25	140.49	
Baldosa	M^2	1	905.00	905.00	
Juntas	M^2	1	35.00	35.00	
					1080.49
Sub-Total				54.03	
Desperdicio 5%					
					1134.52
TOTAL					
EQUIPOS					
					14.00
MANO DE OBRA					
					800.00
COSTOS INDIRECTOS					
					362.13
AUI (25%)					
VALOR UNITARIO TOTAL					$1810.65

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. Zocalos

UNIDAD. 1 ML

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
MORTERO		0.02	3345.00	66.90	
ZOCALO	ML	1	70.00	70.00	
JUNTA				25.00	
SUB-TOTAL					161.90
DESPERDICIO 5%				8.10	
TOTAL MATERIALES					170.00
EQUIPOS					
HERRAMIENTAS					6.00
TOTAL					6.00
MANO DE OBRA					
					80.00
COSTOS INDIRECTOS					
AUI (25%.)					64.00
VALOR UNITARIO TOTAL					$320.00

FECHA: SEP. /83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. ESTUCO DE CIELO

UNIDAD. M^2

DESCRIPCION	UN.	CANTI.	Vr.UNIT.	Vr. PARCIAL	Vr.CAPITULO
MATERIALES					
ESTUCO	M^2	1	16.72	16.72	
DESPERDICIO 5%				0.84	
					17.56
EQUIPOS					
					6.00
MANO DE OBRA					
					80.00
COSTOS INDIRECTOS					
AUI (25%)					25.89
VALOR UNITARIO TOTAL					# 129.45

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO - TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. IMPERMEABILIZACION DE BAÑOS Y Coc. UNIDAD. M^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
Asfalto (3 capas)		3 x 1.5	40 = x 0.5	90. =	
Tela Asfaltica (2 capas)		2	30.71	61.42	
ACPM			7.00	7.00	
					158.42
EQUIPOS					
					10.00
MANO DE OBRA					
					150.00
COSTOS INDIRECTOS					
					79.63
AUI (25%)					
VALOR UNITARIO TOTAL					398.15

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. ENCHAPE DE BALDOSIN

UNIDAD. / M2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
MORTERO (1:4)		0.02	3345.00	66.90	
BALDOSIN DE COLOR	M²	1	749.00	749.00	
JUNTA				30.00	
SUB-TOTAL					845.90
DESPERDICIO 5%				42.30	
					888.20
EQUIPOS					
HERRAMIENTAS					15.00
TOTAL					15.00
MANO DE OBRA					
					220.00
COSTOS INDIRECTOS					
AUI (25%)					280.80
VALOR UNITARIO TOTAL					$1404.00

FECHA: SEP / 83				OBRA. PRESUPUETO. DIRECCION:	
ANALISIS DE PRECIOS UNITARIO					
ITEM: TANQUE ALTO				UNIDAD. U	
DESCRIPCION.	UN	CANT	Vr UNIT	Vr PARCIAL.	Vr ITEM.
a) Formaletas					
CERCHAS	m^2	20.48	33.22	680.34	
Gatos	m^2	66.56	39.10	2606.48	
Abarco	m^2	66.56	15.45	1028.35	
Mangle	m^2	66.56	13.00	865.28	
Puntillas	m^2	66.56	10.00	665.60	
Paneles	m^2	66.56	227.70	15155.71	
Desperdicios 5%				1050.08	
Mano de obra	m^2	66.56	270.00	17971.20	
b) Refuerzo					
Hierro 60000 PSi	Kg	597.97	56.67	33886.95	
Hierro 40000 PSi	Kg	218.62	34.36	7511.78	
Alambre	Kg	12.24	75.00	918.66	
Desperdicio 5%				2115.86	
figuracion y colocacion	Kg	816.59	8.50	6941.01	
c) Concreto Simple					
concreto (1:2:3)	M^3	8.416	4351.97	36626.18	
VACIADO	M^3	8.416	2000.=	16832.00	
d) CURADO y DECIMBRE	M^2	66.56	40.00	2662.40	
Sub TOTAL				147517.95	
AUI (25%)				36879.49	
COSTO UNITARIO				184397.44	

FECHA: SEP / 83				OBRA. PRESUPUETO. DIRECCION:	
ANALISIS DE PRECIOS UNITARIO					
ITEM: TANQUE SUB-TERRANEO				UNIDAD. U	
DESCRIPCION.	UN	CANT	Vr UNIT	Vr PARCIAL.	Vr ITEM.
a) EXCAVACION					
MANO DE OBRA	m^3	93.98	350.=	32893.=	
b.) Solado					
Concreto (1:2:4)	m^3	1.458	4094.62	5969.96	
Mano de obra	m^3	1.458	1000.=	1458.=	
c.) FORMALETA					
BLOCK #4 (HUECO)	m^2	58.32	453.36	26439.95	
CERCHAS	m^2	25.00	33.22	830.50	
Gatos	m^2	87.48	39.16	3425.71	
ABARCO	m^2	87.48	15.45	1351.56	
Mangle	m^2	87.48	13.00	1137.24	
PANELES	m^2	87.48	227.70	19857.96	
Puntillas	m^2	87.48	10.00	874.80	
Desperdicios 5%				2695.88	
Mano de OBRA	m^2	87.48	270.00	23619.60	
c.) REFUERZO					
Hierro 60000PSi	Kg	283084	56.67	160423.70	
Hierro 40 000 PSi	Kg	163.07	34.36	5603.08	
ALAMBRE	Kg	44.90	75.00	3367.50	
Desperdicios 5%				8469.71	
figuracion y Colocacion	Kg	2993.91	8.50	25448.23	
d.) concreto SIMPLE					
Concreto 3000 PSi	M^3	24.08	4755.60	114533.87	
VACIADO	M^3	24.08	1500.00	36120.00	
e.) CURADO Y DESCIMBRE	M^2	87.48	40.00	3499.20	
Sub - TOTAL				478019.45	
AUI (25%)				119504.86	
COSTO UNITARIO				597524.31	

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. MARCO DE CEIBA

UNIDAD. M.L

DESCRIPCION	UN.	CANTI.	Vr.UNIT.	Vr. PARCIAL	Vr.CAPITULO
MATERIALES					
CEIBA	Pie²	3.33	90.00	300.=	
PUNTILLAS y COLBON				20.=	
DESPERDICIOS 5%				16.=	
					336.=
EQUIPOS					
MANO DE OBRA					
Hechura y Colocacion					260.=
COSTOS INDIRECTOS					
AUI (25%)					149.=
VALOR UNITARIO TOTAL					$ 745.00

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PINTURA DE MUROS

UNIDAD: m^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
VINILO (4 MANOS)		4	21 50	86 00	
POR MASILLA			3 00	3 00	
DESP. 5%				4 45	
TOTAL					93 45
EQUIPOS					
TOTAL					5 00
MANO DE OBRA					
TOTAL					35 00
COSTOS INDIRECTOS					
AUI (25%)					33 36
VALOR UNITARIO TOTAL					$ 166 81

FECHA: SEP. / 83	OBRA: PRESUPUESTO: CASTRO-TORRES
ANALISIS DE PRECIO UNITARIO	DIRECCION:
ITEM. PINTURA DE CIELO	UNIDAD: M^2

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
VINILO (4 MANOS)		4	21.50	86.00	
POR MASILLA			3.00	3.00	
DESPERDICIO 5%				4.45	
					93.45
EQUIPOS					
					5.00
MANO DE OBRA					
					45.00
COSTOS INDIRECTOS					
AUI (25%)					35.86
VALOR UNITARIO TOTAL					$ 179.31

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PLANTILLA EN CONCRETO

UNIDAD: 1 M²

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
CONCRETO SIMPLE (1:2:4)		0.05	409462	204.73	
TOTAL MATERIALES					204.73
EQUIPOS					
HERRAMIENTA					15.00
TOTAL					15.00
MANO DE OBRA					
					160.00
COSTOS INDIRECTOS					
AUI (25 %)					94.93
VALOR UNITARIO TOTAL					$474.66

FECHA: SEP / 83	OBRA.
ANALISIS DE PRECIOS UNITARIO	PRESUPUETO.
	DIRECCION:
ITEM: GRANITO PULIDO	UNIDAD. GRADAS

DESCRIPCION.	UN	CANT	Vr UNIT	Vr PARCIAL.	Vr ITEM.
a.) MATERIALES					
GRANITO	Bolsa	1	830.=	830.=	
Cemento GRIS	"	1/2	320.=	160.=	
Rend. PROM: 2.50 M^2			990/2.5	396.=/M^2	
PLANTILLA		0.015	3512.25	52.68	
Desperdicio 5%				22.43	
b.) HERRAMIENTAS				60.00	
C) Mano de obra. colocacion y PULIDO DEL GRANITO				1000.=	
SUB TOTAL				1508.68	
Costo GRANITO Escalera #1.508.68 X 8.94				13487.60	
COSTO X GRADAS = 13487.60/17				793.39	
AUI (25%)				198.35	
COSTO UNITARIO				991.74	

FECHA: SEP. /83	OBRA: PRESUPUESTO: CASTRO-TORRES
ANALISIS DE PRECIO UNITARIO	DIRECCION:
ITEM. *MARCOS DE PUERTAS*	UNIDAD. U

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
VALOR MARCO DE PUERTA					$ 1800.=
EQUIPOS					
MANO DE OBRA					
					500.=
COSTOS INDIRECTOS					
VALOR UNITARIO TOTAL					2300.=

FECHA: SEP. / 83

OBRA:
PRESUPUESTO: CASTRO-TORRES

ANALISIS DE PRECIO UNITARIO

DIRECCION:

ITEM. PUERTAS EN TRIPLEX

UNIDAD: U

DESCRIPCION	UN.	CANTI.	Vr. UNIT.	Vr. PARCIAL	Vr. CAPITULO
MATERIALES					
PUERTA		1	2500	2500	
BISAGRAS		3	57	171	
CERRADURA		1	1000	1000	
TOTAL					3671
EQUIPOS					
MANO DE OBRA					
TOTAL					450
COSTOS INDIRECTOS					
AUI (25%)					1030 25
VALOR UNITARIO TOTAL					$ 5151 25

RELACION DE CANTIDADES DE OBRA

ITEMS	DESCRIPCION	UNIDAD	CANT.	V. UNIT.	V.TOTAL	V.TOTALITEMS
1	DEMOLICION Y LIMPIEZA	GLOBAL	—	60000.=		60000.=
2	TRAZADO LOCALIZACION Y REPLANT.	GLOBAL	—	28000.=		28000.=
3	CONEXION DE H_2O Y ENERGIA DE CONSTRUCCION	GLOBAL	—	10000.=		10000.=
4	PILOTAJE					
5	EXCAVACION DE ZAPATAS	M^3	593.25	530.63		31479.25
6	EXCAVACION VIGA DE AMARRE	ML	26442	112.38		29715.52
7	SOLADO PARA CIMIENTOS (ZAPATAS)	M^2	847.5	474.66		402274.35
8	SOBRECIMIENTO EN BLOCK #6	ML	264.2	694.71		183542.38
9	IMPERMEABILIZACION SOBRECIMIENTO	ML	264.42	273.03		72194.59
10	RELLENO (0.5)	M^3	219.8	893.63		196419.87
11	ZAPATAS	M^3	593.25	12328.50		7313882.63
12	COLUMNAS	ML	140	2903.81		406533.40
13	PLACA EN CONCRETO	M^2	3077.2	3770.76		11603382.67
14	PLACA DE PAVIMENTO	M^2	439.6	2135.32		938686.67
15	LEVANTAMIENTO DE MUROS #4	M^2	4413.5	568.30		2508192.05
16	PAÑETE DE MUROS	M^2	8827.0	247.81		2187418.87
17	PAÑETE DE CIELO	M^2	3077.2	379.21		1166905.01
18	PISO DE BAÑOS	M^2	365.3	1226.03		447868.76

RELACION DE CANTIDADES DE OBRA

ITEMS	DESCRIPCION	UNID.	CANT.	V. UNIT.	V. TOTAL	V. TOTAL-ITEM
19	ESTUCO DE MUROS	M^2	8827.0	103.40		912711.80
20	PISO EN BALDOSA DE GRANITO	M^2	2711.9	1810.65		4910301.74
21	ZOCALOS	ML	1613.2	320.00		484224.00
22	ESTUCO DE CIELO	M^2	3077.2	129.45		398343.54
23	IMPERMEABILIZACION DE BAÑOS Y C	M^2	630.3	398.15		250953.95
24	ENCHAPE DE BAÑOS Y COCINA	M^2	235.2	1404.00		330220.80
25	ESCALERAS EN CONCRETO	U	6	27931.36		167588.16
26	GRANITO PULIDO EN ESCALERA.	GRADAS	102	991.74		101157.48
27	TANQUES EN CONCRETO	U	2+1	322106.40		966319.20
28	MARCOS DE PUERTAS	U	180	2300.=		414000.=
29	MARCOS DE VENTANAS	ML	485	745.00		361325.=
30	PUERTAS EN TRIPLEX.	U	180	5151.25		927225.=
31	PINTURA DE MUROS	M^2	8827.0	166.81		1472431.87
32	PINTURA DE CIELO	M^2	3077.2	179.31		551772.73
33	SANITARIOS	U	78	6088.=		474864.=
34	LAVAMANOS	U	52	4149.=		215748.=
35	REJILLA DE PISO	Global	48	162.=		7776.=
36	JUEGO DE INSCRUSTACIONES	U	26	1220.=		31720.=

RELACION DE CANTIDADES DE OBRA

ITENS	DESCRIPCION	UNIDAD	CANTD.	V. UNIT.	V.TOTAL	V.TOTAL ITEN
37	PLANTILLA EN CONCRETO	M^2	2637.6	474.66		1251963.22
38	LAVADERO	U	26	4900.=		127400.=
39	COCINA INTEGRAL	U	26	138000=		3588000.=