

**REITORIA DA UNIVERSIDADE
DO PORTO**

PROCESSOS DE OBRAS

PASTA N.º

2312

UNIVERSIDADE DO PORTO

FACULDADE DE MEDICINA DENTÁRIA

ANEXO

(À MEMÓRIA DESCRITIVA E MEMÓRIA DE CÁLCULOS)

U. PORTO
MEMÓRIA DE CÁLCULOS

ac
arquivo
central

SECTOR A - (págs. 1-177)

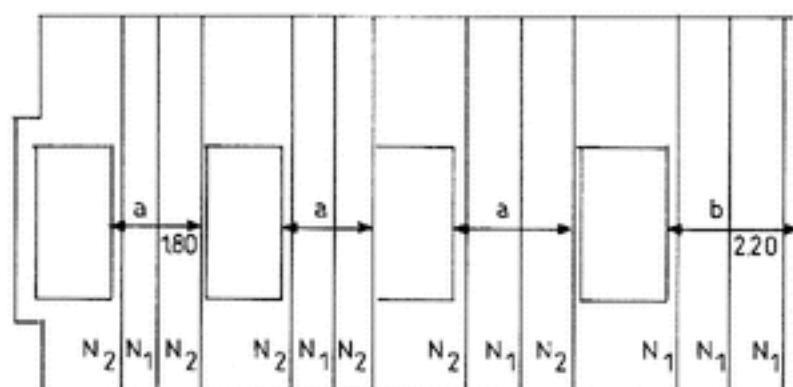
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SECTOR A

1. - LAJES

1.1 - PISO 3

Laje L3.1:



Laje aligeirada com furos devidos à existência de chaminé armada numa direcção;
 $l = 6.0m$. Um bordo livre e um bordo contínuo.

NERVURAS

$$N1 \rightarrow \text{esp} = 0.15$$

$$N2 \rightarrow \text{esp} = 0.125$$

ACÇÕES

$$g = 5,2 \text{ (p.p. laje aligeirada)} + 3,0 \text{ (rev.)} = 8,2 \text{ KN/m}^2$$

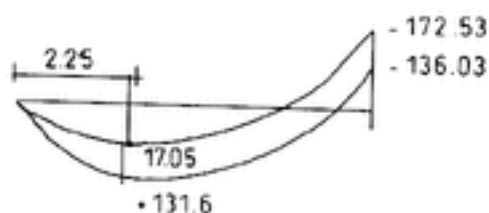
$$q = 1,0 \text{ (KN/m}^2\text{)}$$

$$\text{Peso de 1 chaminé} = 49,44 \text{ KN} \rightarrow 49,44/5 = 9,89 \text{ KN/m}$$

ZONA A

$$p_{sd} = 1,5 \times (8,2 + 1,0) \times 1,80 + 1,5 \times 9,0 = 38,34 \text{ KN.m}$$

Apesar da rigidez de N1 ser superior a N2, vamos admitir uma distribuição igual de momentos pelas três nervuras, uma vez que o peso da chaminé influencia com preponderância as nervuras N2.



$$M_{sd}^- = \frac{pl^2}{8} = \frac{38,34 \times 36}{8} = 172,53 \text{ KN.m}$$

$$M_{sd}^+ = 97,05$$

Redistribuição 20%

$$M_{sd}^+ = 138,03 \text{ KN.m}$$

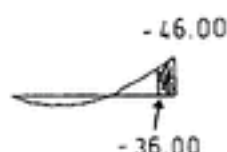
$$M_{sd}^+ = 131,6 \text{ KN.m}$$

$$M_{sd}^- / \text{nervura} = -46,00 \text{ KN.m}$$

$$M_{sd}^+ / \text{nervura} = 43,860 \text{ KN.m}$$

NERVURA N1

$$M_{sd}^+ = 43.86 \left| \begin{array}{l} \mu = 0,0378; w = 0,0392; A_s = 4,09 \text{ m}^2 / \text{ nerv} \\ b = 0,85 \quad 2\phi 12 + \phi 16 \\ d = 0,32 \end{array} \right.$$



$$M_{sd}^- = -36.00 \left| \begin{array}{l} \mu = 0,176; \quad w = 0,207; \quad A_s = 3,81 \text{ cm}^2 / \text{ m} \\ b = 0,15 \quad \Leftrightarrow A_s / m = 4,473 \text{ cm}^2 / \text{ nervura} \\ d = 0,32 \quad \rightarrow \text{Armadura m\u00ednima (HQ221 + 4\phi 10 ou 6\phi 10 / m)} \end{array} \right.$$

Esfor\u00e7o transverso

$$V_{ed} = 31,2 \text{ KN}$$

$$A_s / s / \text{min} = 1,5E - 4 \text{ cm}^2 / \text{ m} \rightarrow \phi 6 @ 0,30$$

$$V_{rd}^{\text{min}} = 18,7 + (V_{ed} - 31,2) = 49,9$$

Estribos m\u00ednimos: $\phi 6 @ 0,30$ 

NERVURA 2

$$M_{sd}^+ = 43.86 \left| \begin{array}{l} \mu = 0,0678; w = 0,072; A_s = 4,2 \text{ cm}^2 / \text{ nervura} \\ b = 0,475 \\ d = 0,32 \end{array} \right.$$

$M_{sd}^- \rightarrow$
id\u00eantica a N1 (ou condi\u00e7\u00f5es mais favor\u00e1veis)
 \Rightarrow Armadura m\u00ednima HQ221 + 4 ϕ 10/m ou 6 ϕ 10/m

Esfor\u00e7o transverso - id\u00eantica a N1 (ou condi\u00e7\u00f5es mais favor\u00e1veis)

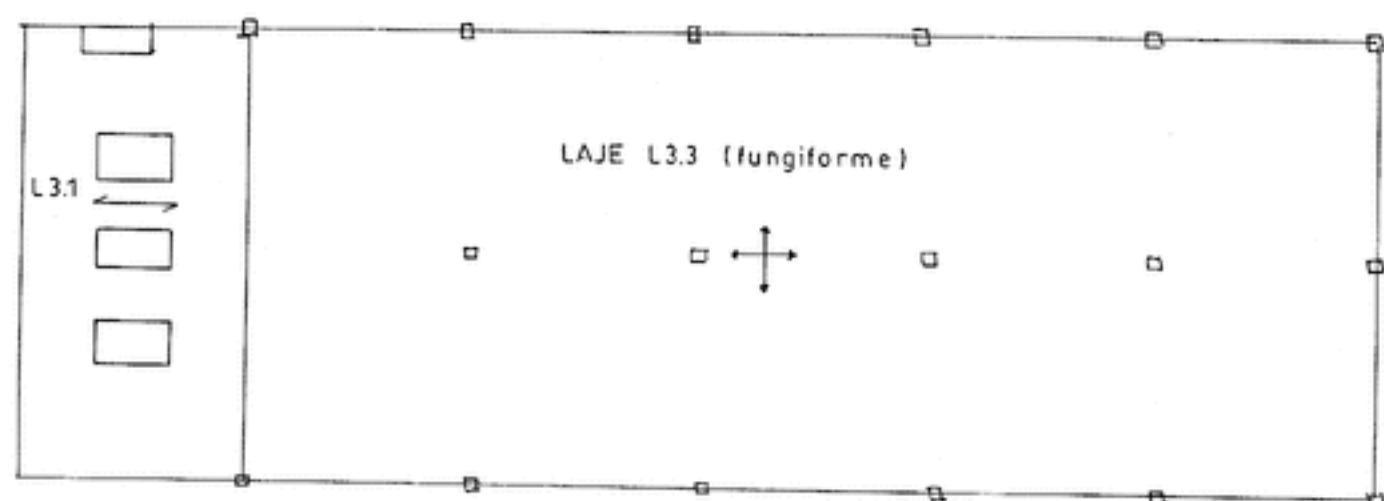
Estribos m\u00ednimos $\phi 6 @ 0,30$ Armadura negativa sobre o bordo livre - HQ221 + 4 ϕ 8/m

Zona B - Estruturalmente esta zona encontra-se em condi\u00e7\u00f5es id\u00eanticas podendo admitir armadura resistentes id\u00eanticas \u00e0s calculadas para a zona A. Haver\u00e1 altera\u00e7\u00f5es de armaduras do ponto de vista construtivos e no que diz respeito a armaduras m\u00ednimas.

Armadura de distribui\u00e7\u00e3o

Nervuras transversais: esp. = 0.10 - 2 ϕ 12/nervura; Estribos $\phi 6 @ 0,25$ Faixas transversais: esp. = 0.30 - 3 ϕ 12/m; Estribos: $\phi 6 @ 0,20$

DIMENSIONAMENTO DA LAJE DO PISO 3 - SECTOR A



U. PORTO

ac
arquivo
central

Laje L3.3:

Laje fungiforme - aligeirada, com distância entre pilares igual a 6.0m.

Dimensionamento utilizado: o método dos pórticos equivalentes. Nas páginas seguintes apresentam-se os diagramas de momentos flectores relativos aos pórticos equivalentes longitudinais e transversais, bem como as respectivas armaduras.

Pórticos longitudinais: PAA17
PAB17
PAC17

Pórticos transversais: PA1AC
PA2AC
PA3AC
PA4AC
PA5AC
PA6AC
PA7AC

Esforço transversal - Armaduras

Porticos equivalentes transversais: PA7AC
PA6AC
PA5AC
PA4AC
PA3AC
PA2AC

Faixas centrais:

Nervuras com estribos mínimos $\phi 6 @ 0.275$. Nas zonas a 1,80m dos apoios centrais e 0,95m dos apoios extremos teremos $\phi 6 @ 0.15$.

Faixas laterais:

Nervuras com estribos mínimos $\phi 6 @ 0.275$ em toda a sua extensão.

Pórticos equivalentes longitudinais: PAA17
PAB17
PAC17

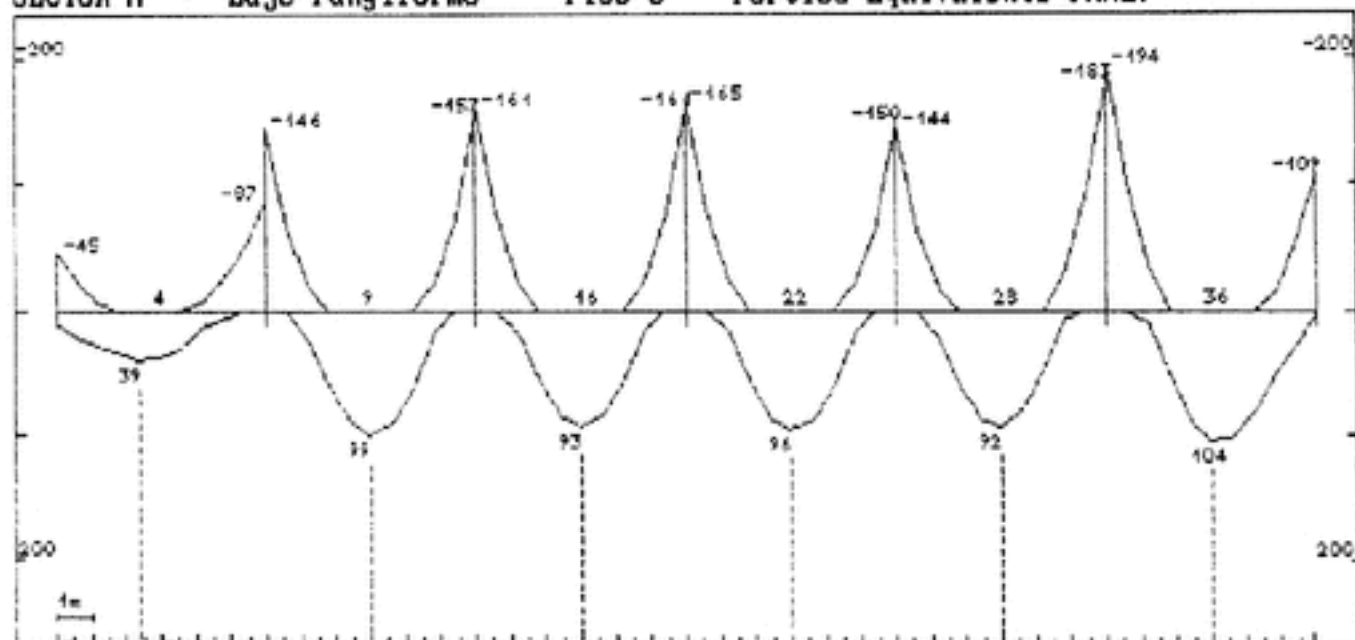
Faixas centrais:

Nervuras com estribos mínimos $\phi 6 @ 0.275$. Nas zonas a 1,80m dos apoios intermédios e 0,95m dos apoios extremos teremos $\phi 6 @ 0.15$.

Faixas laterais:

Estribos mínimos; nervuras com $\phi 6 @ 0.275$.

SECTOR A - Laje Fungiforme - Piso 3 - Portico Equivalente PAA17



Distribuição de Momentos

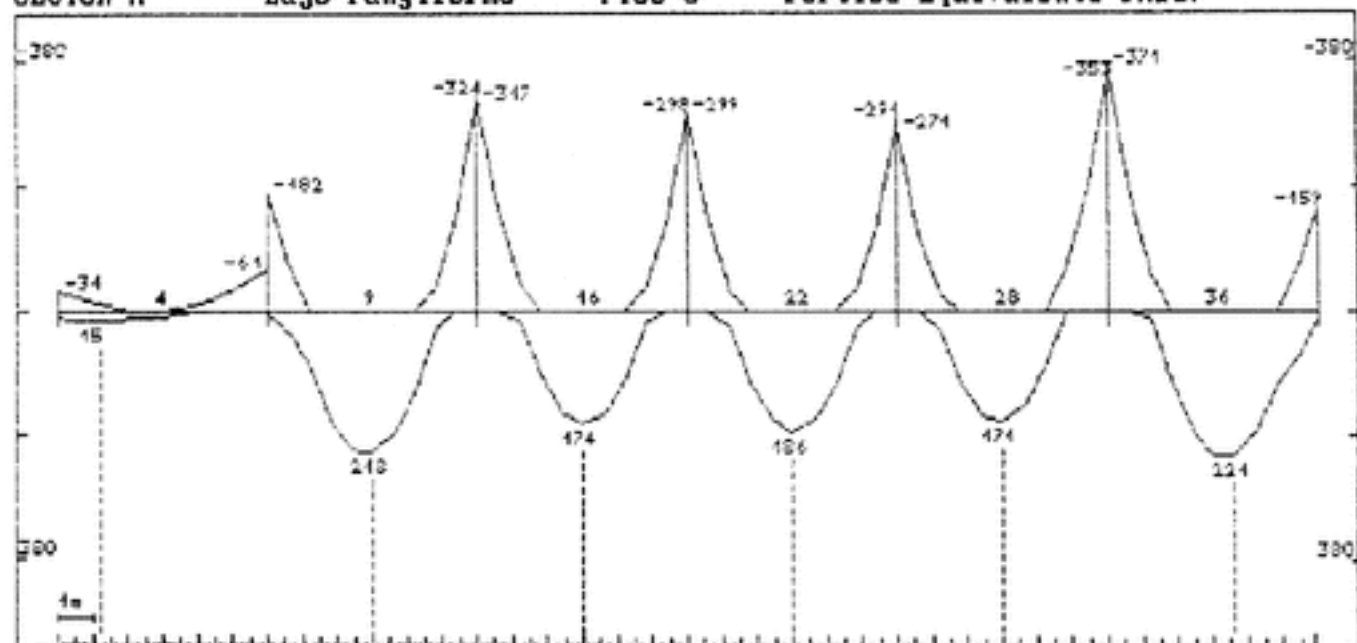
Faixa Central	-102,5	55	-122,2	59,1	-122,2	52,3	-113,2	49	-166,2	60,5	-77,2
$\times \frac{1}{4} =$	-25,9	13,95	-30,6	14,5	-30,6	13,0	-28,3	12,25	-41,55	15,1	-19,3
Faixa Lateral	-34,5	46,0	-40,8	40,9	-40,8	42,9	-37,8	40,0	-48,8	49,5	-25,80

Armaduras $\frac{k^2}{m^2}$
 $\frac{kg}{m^2}$

Nota: Momentos na Faixa Central $\times \frac{1}{4}$, para a existência de Viga Transvers. (3,00x0,30)

Faixa Central	3,08	4,15	3,72	3,16	3,7	4,18	3,4	3,11	4,55	3,37	2,23
$M^+ b = 0,06$	HQ100	2 ϕ 10	HQ100	2 ϕ 10	HQ100	2 ϕ 10	HQ100	2 ϕ 10	HQ100	2 ϕ 10	HQ100
$M^+ b = 0,35$	5 ϕ 10/m	7 ϕ 10/m	6 ϕ 10/m	5 ϕ 10/m	5 ϕ 10/m	5 ϕ 10/m	5 ϕ 10/m	5 ϕ 10/m	6 ϕ 10/m	5 ϕ 10/m	5 ϕ 10/m
Faixa Lateral	3,36	4,13	4,03	3,75	4,03	3,92	3,74	3,67	4,91	4,55	2,46
$M^+ b = 1,50$	HQ100	(2 ϕ 12)	HQ100	(2 ϕ 12)	HQ100	(2 ϕ 12)	HQ100	(2 ϕ 12)	HQ100	(2 ϕ 12)	HQ100
$M^+ b = 0,30$	5 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m	4 ϕ 10/m

SECTOR A - Laje Funiforme - Piso 3 - Portico Equivalente PAB17



Distribuição de Momentos:

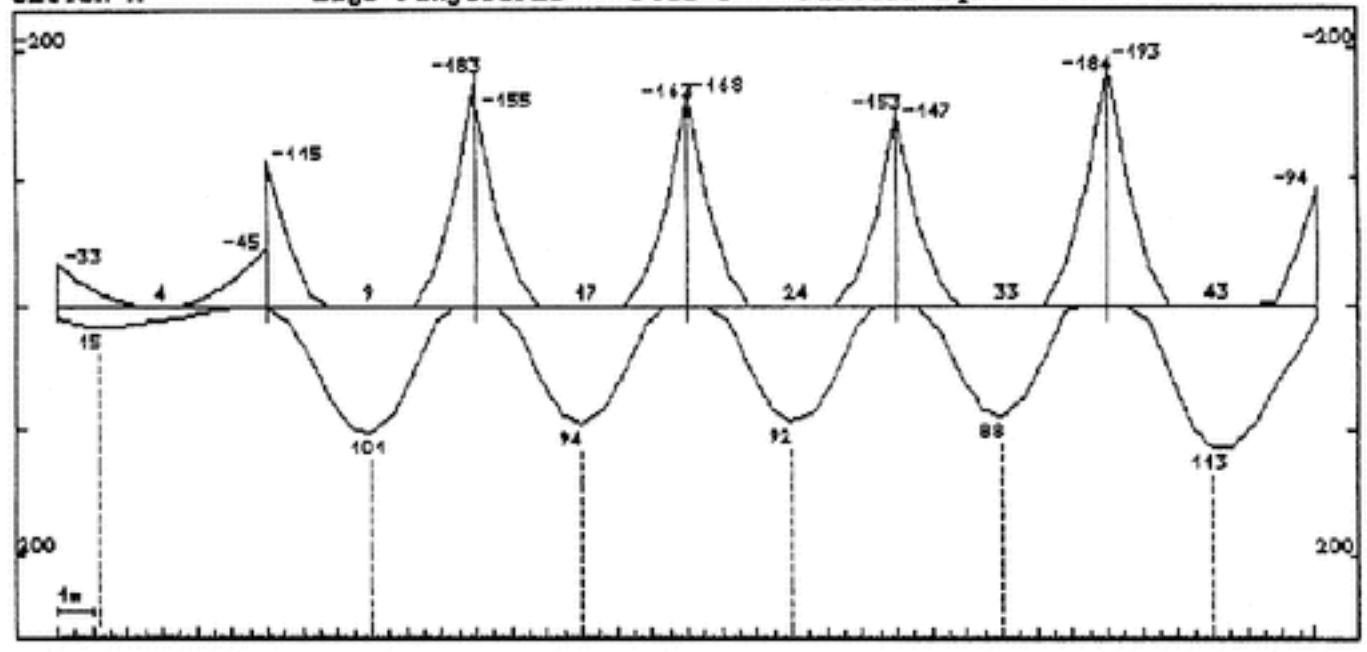
Faixa Central: -136,5 119,9 -243 75,7 -224,3 111,75 -218,25 93,6 -278,25 121,55 -120

Faixa Lateral: -46,5 78,1 -81 78,3 -74,75 83,25 -77,75 76,5 -92,75 99,45 -40

Aeraduras $\left\{ \begin{array}{l} A_s \text{ m}^2 \\ A_t \text{ m}^2 \end{array} \right.$

Faixa Central	13,9	16,1	23,9	8,8	21,9	9,4	21,2	8,6	23,7	16,3	16,27
$\left\{ \begin{array}{l} H^+ b = 3,0 \\ H^- b = 1,90 \end{array} \right.$	HQ 100 + 6 f10/m	(2 f12) + x 2 var. + Faixa Aul.	HQ 100 + 6 f10/m	(2 f12) + x 2 var. + F.A.	HQ 100 + 6 f10/m	(2 f12) + x 2 var. + F.A.	HQ 100 + 6 f10/m	(2 f12) + x 2 var. + F.A.	HQ 100 + 8 f10/m	(2 f16) + x 2 var. + Faixa Aul.	HQ 100 + 6 f10/m
Faixa Lateral	4,3	9,02	8,0	7,2	7,3	7,63	7,12	7,0	9,3	9,15	3,77
$\left\{ \begin{array}{l} H^+ b = 3,0 \\ H^- b = 0,60 \end{array} \right.$	HQ 100	(2 f12) + 4 f10 + x 4 var.	HQ 100 + 4 f6/m	(2 f12) + x 4 var.	HQ 100 + x 4 var.	(2 f12) + x 4 var.	HQ 100 + x 4 var.	(2 f12) + x 4 var.	HQ 100 + 4 f6/m	(2 f12) + 4 f10 + x 4 var.	HQ 100

SECTOR A - Laje Fungiforme - Piso 3 - Portico Equivalente PAC17



Distribuição de Momentos

Faixa Central	-87	532	-129	49	-119,2	52	-120	47,3	-144,8	60	-76,5
Faixa Lateral	-29	46,8	-43,0	40	-39,8	41	-40	38,7	-39,2	49	-25,5

ARMADURAS A_c

NÃO EXISTE VILA APARANTE. ÁREAS CENTRAIS ARMADURA NA ZONA DE BORDO DEVIDO A TAPADO EXISTENTE

EXISTE VILA APARANTE. ARMADURA REFERENCIAL ADQUA A 1 NERVURA (V_{34})

Faixa Central	8,26	5,27	12,56	4,5	11,54	4,78	3,63	1,08	4,4	4,365	2,22
$H^2 \times b = 1,625$ $H^2 \times b = 1,125$	HQ100 + 2φ10/m	(2φ16) + 21mm + (2φ16) + φ12/bordo	HQ100 (3φ12) + 21mm + 2φ12/bordo	(2φ16) + φ12/bordo	HQ100 (2φ12) + 21mm + 3φ12 (φ12/bordo)	HQ100 + 21mm + 5φ10/m	(2φ10) + 21mm	HQ100 + 5φ10/m	(2φ10) + 21mm	HQ100 + 5φ10/m	HQ100 + 5φ10/m

Faixa Lateral	2,79	4,3	4,29	3,66	3,92	3,76	3,94	3,54	3,86	4,51	2,43
$H^2 \times b = 1,50$ $H^2 \times b = 0,30$	HQ100 + 4φ6/m	(2φ12) + φ10	HQ100 (2φ12) + 22mm	HQ100 (2φ12) + 22mm	HQ100 (2φ12) + 22mm	HQ100 (2φ12) + 22mm	HQ100 (2φ12) + 22mm	HQ100 + 4φ6/m	(2φ12) + φ10	HQ100 + 4φ6/m	HQ100 + 4φ6/m

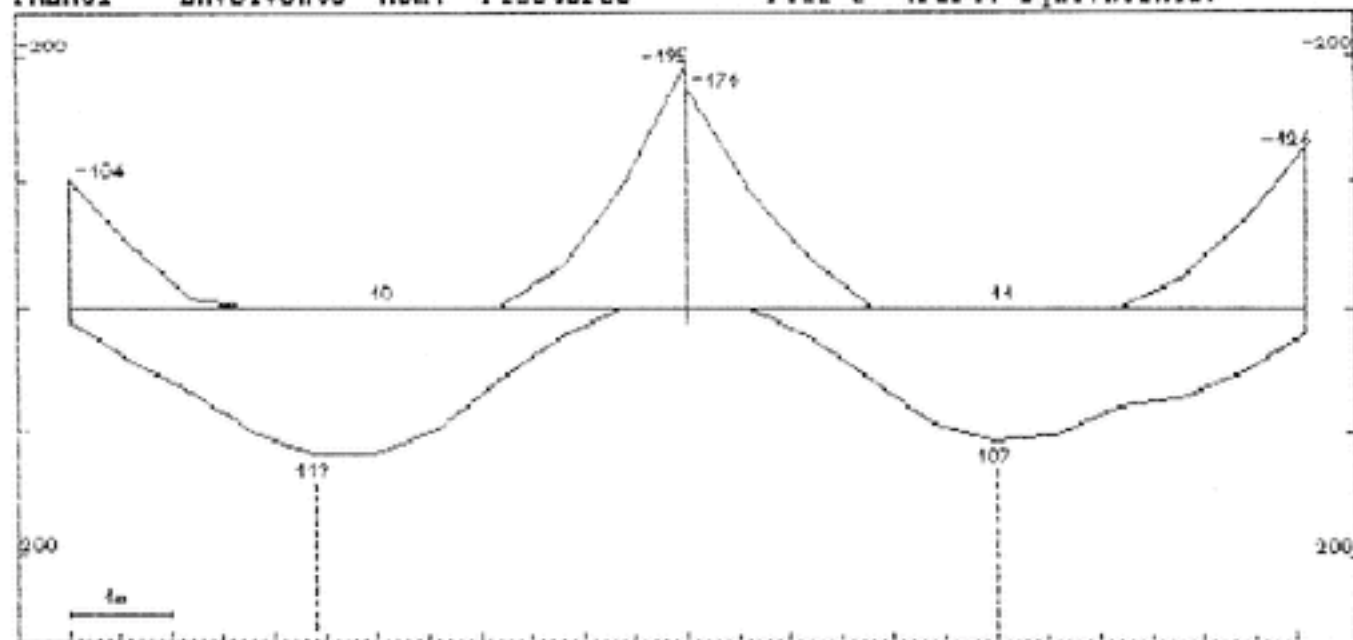
Nota: Armadura adicional no bordo da laje, devido a existência de paredes; (zona onde não existe vila aparante).

Paralela Exterior - Tabelas 1,20 x 2,10 (5 Tabelas)

$5,0 \times 2,10 = \frac{50 \times 2,1 \times 2,1}{10} = 7 \text{ Kw/m}$. ; Isolamento é Verificado em Paredes - Calado de Laje Fungiforme

$H^2 \times b = 2,6 \text{ m}^2$
 $H^2 \times b = 2,6 \text{ m}^2$

PAZAC1 Envolvente Mom. Flectores Piso 3 (Port. equivalente)



Distribuição de Momentos

Faixa Central

-78	65,45	-146,25	58,85	-74,5
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Faixa Lateral

-26	53,55	-187,5	48,15	-34,5
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ARMADURAS (cm²)

Faixa Central $\left\{ \begin{array}{l} M^+ b = 4,125 \\ M^- b = 1,675 \end{array} \right.$

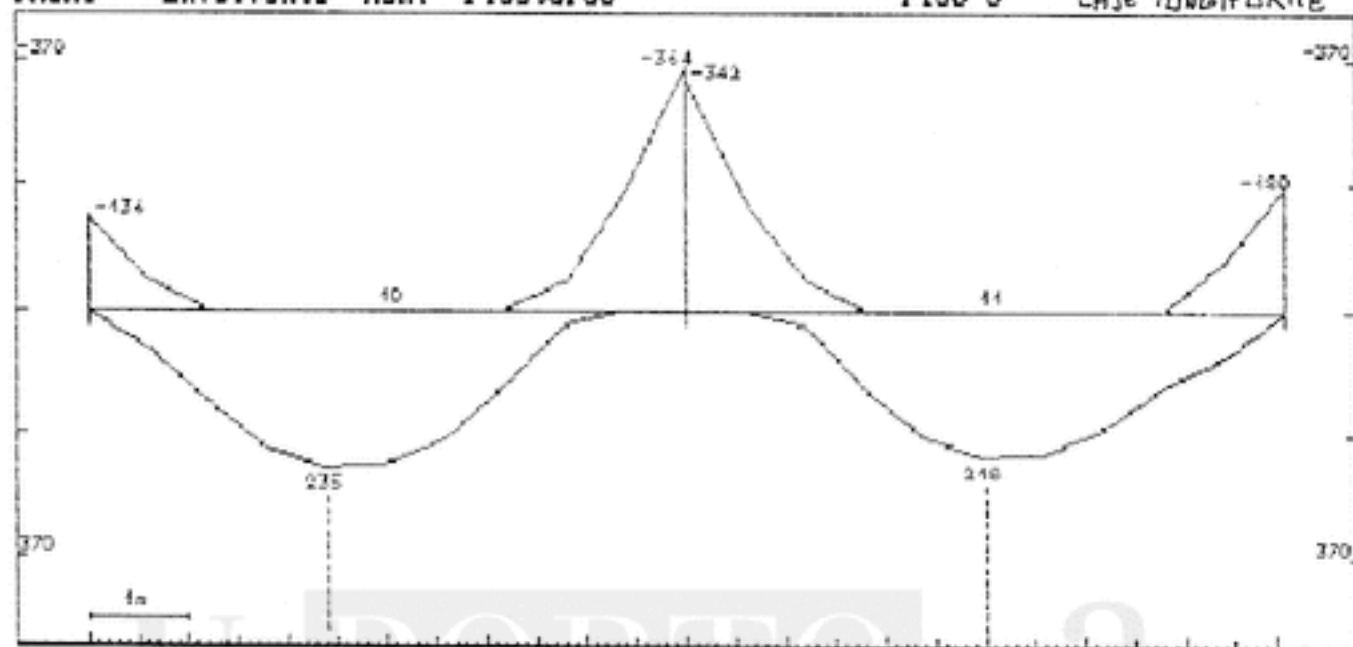
7,36	6,1	14,4	5,42	9,0
HR188	2φ16 (1 nerv.)	HR188	2φ16 (1 nerv.)	HR188
5φ10/m	(60%)	8φ10/m	(60%)	5φ10/m

Faixa Lateral $\left\{ \begin{array}{l} M^+ b = 9,30 \\ M^- b = 1,50 \end{array} \right.$

2,49	4,94	4,9	4,43	3,05
HR188	(2φ12+φ10)	HR188	(2φ12+φ10)	HR188
+ 4φ8/m	x 2 nerv.	+ 4φ8/m	x 2 nerv.	+ 4φ8/m

PAJAC Envolvente Mon. Flectores

Piso 3 LAJE FUNGIFORME



Distribuição de Momentos

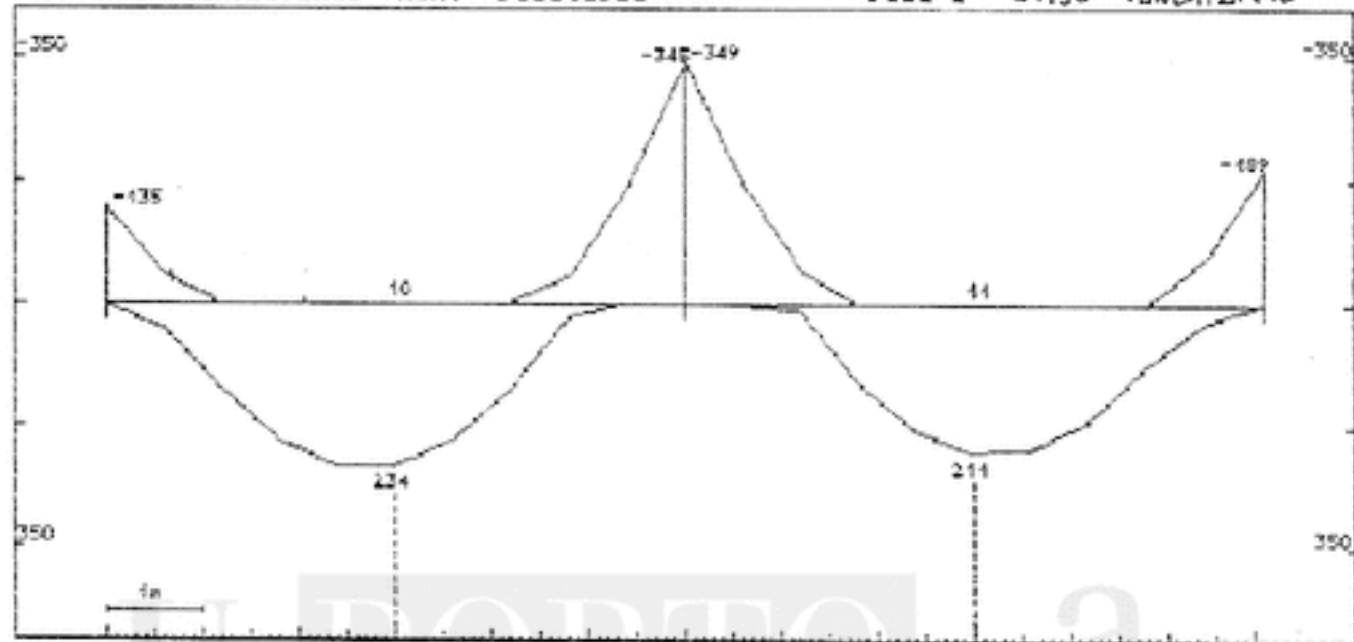
Faixa Central	-102	+129,25	-273	119,9	-135
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Faixa Lateral	-34	+105,75	-91,0	+98,1	-45,0
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ARMADURA (cm²)

Faixa Central	9,52	11,98	27,1	11,063	12,76
H ₁ b=30	HQ 100	(2φ16) Faixa Acanto	HQ 100	2φ16 Faixa Acanto	HQ 100
H ₂ b=1,90	6φ10/m	(2φ16) x 2 nerv.	7φ10/m	(2φ16) x 2 nerv.	6φ10/m
Faixa Lateral					
H ₁ b=20	3,18	9,74	9,08	9,02	4,26
H ₂ b=0,60	HQ 100	(2φ12+φ10) x 4 nerv.	HQ 100	(2φ12+φ10) x 4 nerv.	HQ 100
	+ 4φ8/m		+ 4φ6/m		+ 4φ8/m

PAIAC Envolvente Mon. Flectores Piso 3 LAJE FUNGIDORNE



DISTRIBUCIÓN DE MOMENTOS

FALSA CENTRAL	-109,25	+120,7	-264,75	116,05	-141,75
FALSA LATERAL	-33,75	+105,13	-87,25	+94,95	-47,25

• ARMADURAS (cm^2/m)

• FALSA CENTRAL

$$M^+ \rightarrow b = 2.0$$

$$M^- \rightarrow b = 2.90$$

$$9,45$$

$$4\phi 100 + 6\phi 10/m$$

$$11,93$$

$$(2\phi 16) \text{ FERRA ACERO} + (2\phi 16) \times 2 \text{ nerv.}$$

$$25,89$$

$$4\phi 100 + 7\phi 10/m$$

$$40,72$$

$$(2\phi 16) \text{ FERRA ACERO} + (2\phi 16) \times 2 \text{ nerv.}$$

$$13,42$$

$$4\phi 100 + 6\phi 10/m$$

• FALSA LATERAL

$$M^+ \rightarrow b = 3.0$$

$$M^- \rightarrow b = 0.60$$

$$3,16$$

$$4\phi 100 + 4\phi 8/m$$

$$9,17$$

$$(2\phi 12 + \phi 10) \times 4 \text{ nerv.}$$

$$8,67$$

$$4\phi 100 + 4\phi 6/m$$

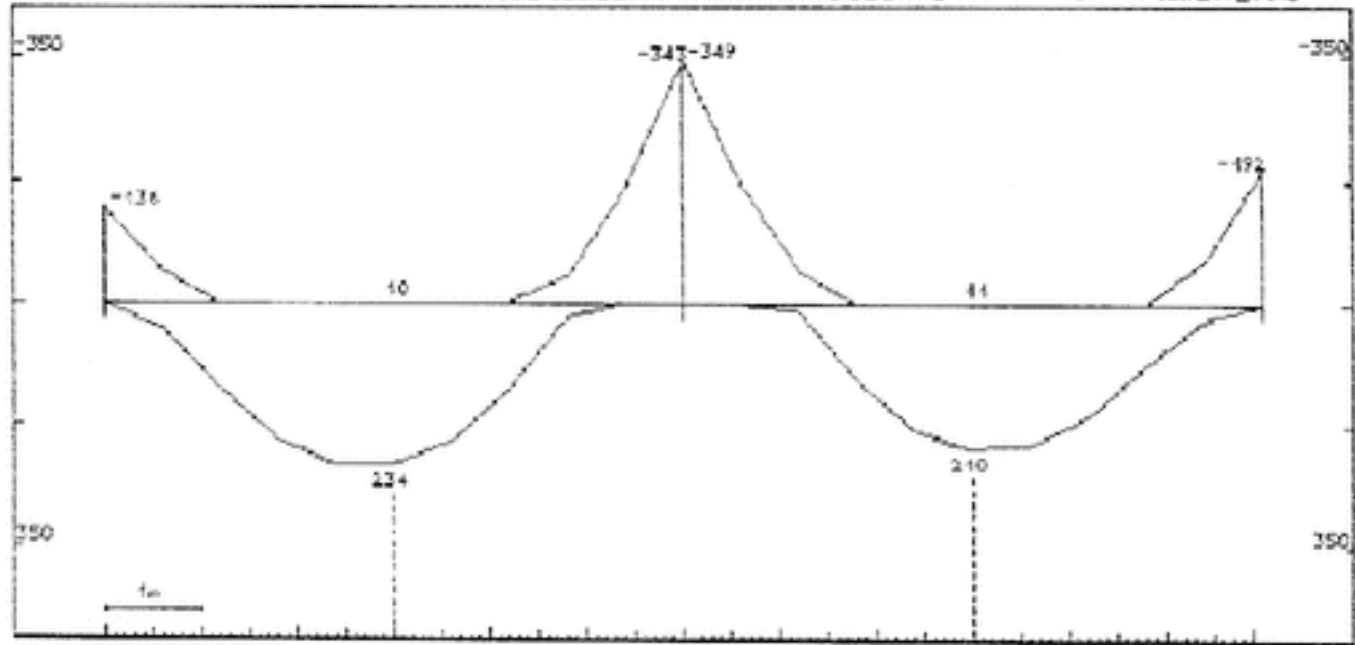
$$8,73$$

$$(2\phi 12 + \phi 10) \times 4 \text{ nerv.}$$

$$4,49$$

$$4\phi 100 + 4\phi 8/m$$

PA5AC Envolvente Mom. Plectores Piso 3 LAJE FUNGIDORNE



Distribuição de Momentos

Faixa Central -102	+128,7	-261,75	+115,5	-144
Faixa Lateral -34	+105,3	-87,25	+94,5	-48,0

ARMADOURAS (cm²)

Faixa Central

H⁺ b=20
H⁻ b=190

9,52	14,93	25,89	10,67	13,65
HA 188	(2φ16) Faixa Acervo	HA 188	(2φ16) Faixa Acervo	HA 188
0φ10/m	+ (2φ16) x 2 nerv.	+ 9φ10/m	+ (2φ16) x 2 nerv.	+ 6φ10/m

Faixa Lateral

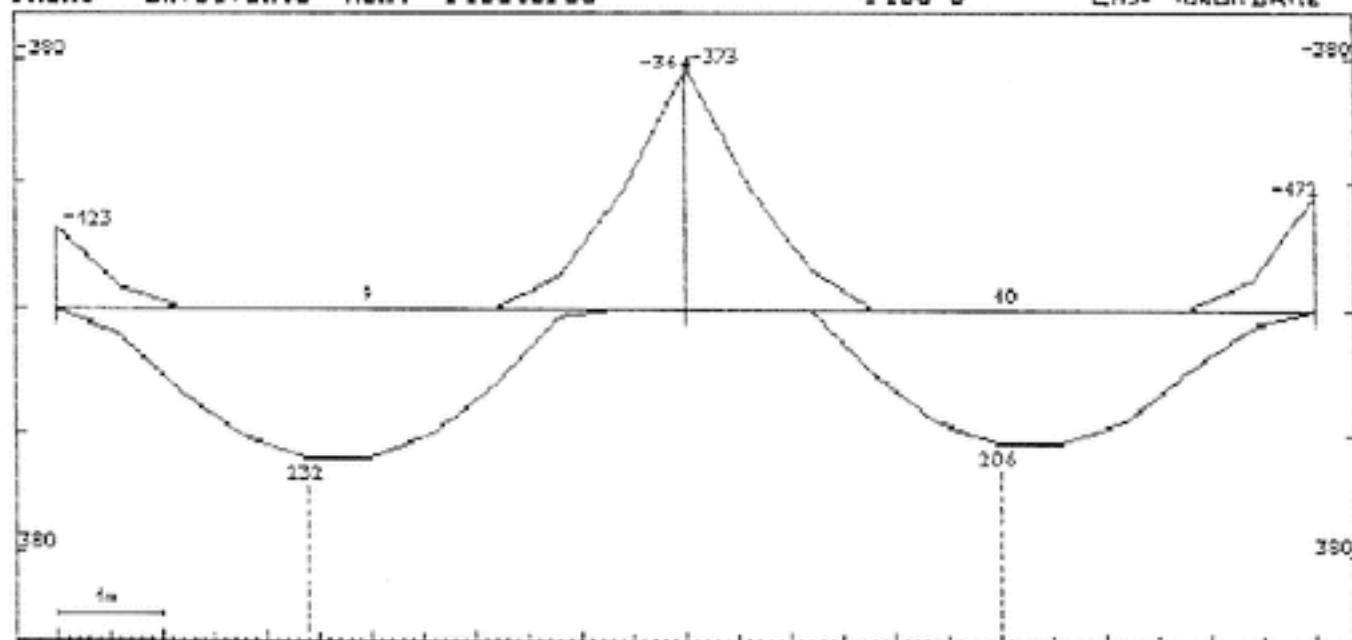
H⁺ b=20
H⁻ b=180

3,18	9,70	8,67	8,66	4,56
HA 188	(2φ12+φ10)	HA 188	(2φ12+φ10)	HA 188
+ 4φ8/m	x 4 nerv.	+ 4φ6/m	x 4 nerv.	+ 4φ8/m

PA6AC Envolvente Mon. Plectores

Piso 3

LARG. FUNGIFORME



Distribuição de Momentos

Faixa Central	9225	1276	-279,75	113,3	-129
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Faixa Lateral	-3975	10414	-93,25	93,0	arqu 43,0 central
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ARMADONAS (cm²)

Faixa Central

 $M^+ > b = 3.0$ $M^- > b = 1.90$

8,56

11,82

27,84

10,46

12,16

4R100

(2φ16) Faixa Acetato

4R100

(2φ16) Faixa Acetato

4R100

+ 6φ10/m

+ (2φ16)
x 2 nerv.

+ 7φ10/m

+ (2φ16)
x 2 nerv.

+ 6φ10/m

Faixa Lateral

 $M^+ > b = 2.0$ $M^- > b = 0.60$

2,87

9,61

9,33

8,55

4,07

4R100

(2φ12 + φ10)
x 4 nerv.

4R100

(2φ12 + φ10)
x 4 nerv.

4R100

+ 4φ8/m

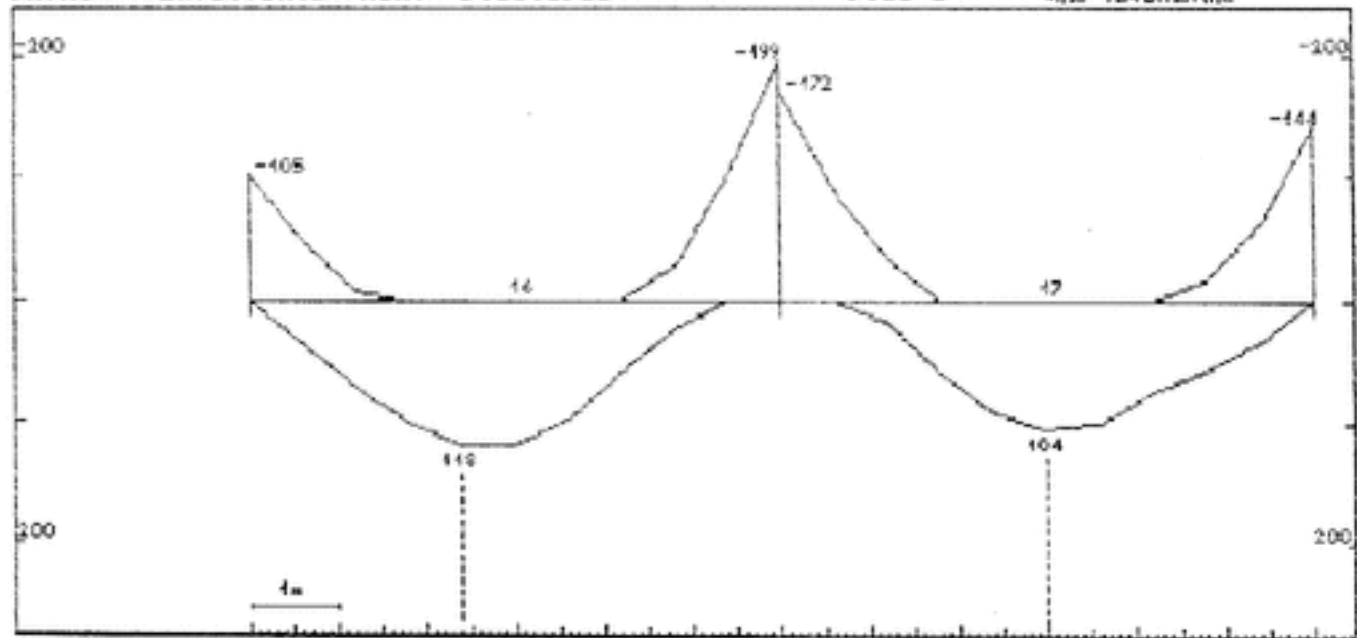
+ 4φ6/m

+ 4φ8/m

PA7AC Envolvente Mon. Flectores

Piso 3

LAS FUNDACION



DISTRIBUICAO DE MOMENTOS

Faixa Central -78,75 +64,9 -149,25 453,2 -108

Faixa Lateral -26,25 +53,1 -149,75 448 -36,0

ARMADURAS $\frac{A_s^+ m^2}{A_s^- m^2}$

	7,57	6,0	16,74	5,3	30,4
Faixa Central					
$H \times b = 41,25$	HR 100 + 8 $\phi 10/m$	(2 $\phi 16$) x 1 new.	HR 100 + 8 $\phi 10/m$	(2 $\phi 16$) x 1 new.	HR 100 + 8 $\phi 10/m$
$H \times b = 21,675$	+ 3 $\phi 12$ bando Vs.27	+ (2 $\phi 16$ + $\phi 12$) bando Vs.27	+ 3 $\phi 12$ bando Vs.27	+ 2 $\phi 16$ + $\phi 12$ bando Vs.27	+ 3 $\phi 12$ bando Vs.27
Faixa Lateral	3,52	4,90	5,0	4,30	3,52
$H \times b = 40,30$	HR 100	(2 $\phi 12$ + $\phi 10$) x 2 new.	HR 100 + 4 $\phi 6/m$	(2 $\phi 12$ + $\phi 10$) x 2 new.	HR 100
$H \times b = 41,50$	+ 4 $\phi 8/m$				+ 4 $\phi 8/m$

Bordo lateral Breda dispersa $\gamma = 1,77 \text{ Kg/m}^2$ ($\alpha = 0,15$)
Vila Vs.27

$p = 1,77 \times 4,5 = 8,0 \text{ Kg/m}$

$M_{ed} = \frac{pL^2}{10} = 27 \text{ Kg.m}$

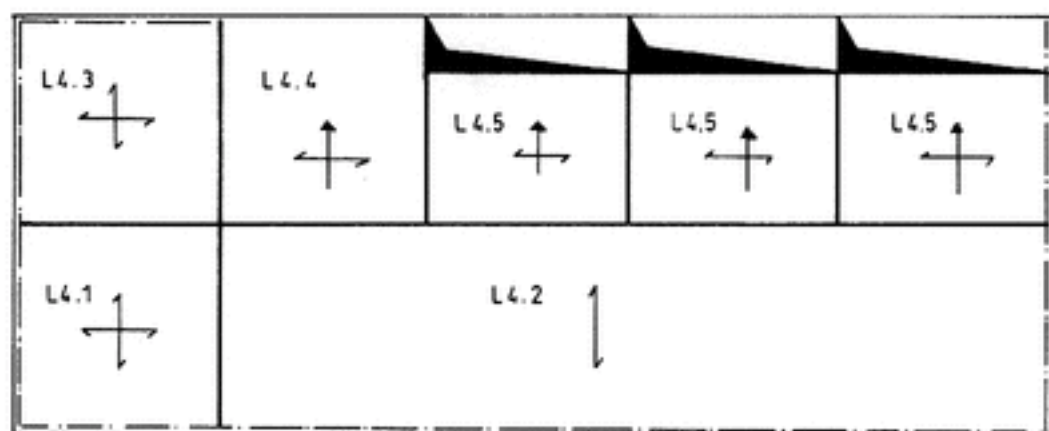


$M^+ = 27,0 \text{ Kg.m}$
 $b = 0,275$ | $\mu = 0,066$ $w = 0,0398$ $A_s = 2,16 \text{ cm}^2$

Nota: Armaduras desenhadas em conformidade com o código de normas de barras Vs.27

$M^+ = 27,0$
 $b = 0,275$ | $\frac{10 M^+}{b^2} \rightarrow A_s = 2,6 \text{ cm}^2$

DIMENSIONAMENTO DA LAJE DO PISO 4 - SECTOR A



$$g = 5.2(p.p.laje) + 2.0(div.) + 1.0(rev.) = 8,2KN/m^2$$

$$q = 3.0KN/m^2$$

U. PORTO

arquivo
central

1.2 - Piso 4

Laje L4.1:

Laje aligeirada armada em duas direcções com dois bordos continuos e dois descontinuos.

Vãos: $l_1 = l_2 = 6.0m$; Espessura $e = 0.35m$;
 $p_{sd} = 1.5 \times [5.2(p.p.) + 3.0(rev. + div.) + 3.0(sob.)] = 16.8KN/m^2$; utilização das tabelas: Barés; Direcção xx (nervuras 0.15); Direcção yy (nervuras 0.10);
 $m_x^+ = m_y^+ = 0.0269 \times 16.8 \times 6^2 = 16.27KN.m$;
 $m_x^- = m_y^- = -0.0699 \times 16.8 \times 6^2 = -42.28KN.m$.

Após redistribuição - $m_x^+ = m_y^+ = 22KN.m$; $m_x^- = m_y^- = -37.0KN.m$.

Direcção xx:

$$m_x^+ = 22KN.m \quad \rightarrow \quad m_x^+ / nerv. = 22 \times 0.65 = 18.7KN.m \quad \rightarrow$$

$$\mu = 0.0187 / 0.85 \times 0.32^2 \times 13.3 = 0.0161; \quad w = 0.0164; \quad A_s = 1.71cm^2 / nervura; \quad 3\phi 10 / nervura.$$

$$m_x^- = -37.0KN.m \quad \rightarrow \quad m_x^- / nerv. = -37 \times 0.85 = -31.45KN.m \quad \rightarrow$$

$$\mu = 0.03145 / 0.15 \times 0.32^2 \times 13.3 = 0.154; \quad w = 0.1776; \quad A_s^- = 3.26cm^2;$$

$$A_s^- / nerv. = \frac{3.26}{0.85} = 3.83cm^2 / nerv.; \quad A_s^- / m = \frac{0.15 \times 1.0 \times 0.32}{100} = 4.8cm^2 / m \quad (HQ2221 + 4\phi 10 / m \text{ ou } 6\phi 10 / m)$$

$$V_{sd}^{max} / nerv. = 30KN; \quad \tau_{ref} = 0.625MPa < 0.65; \quad \text{Estribos mínimos} \rightarrow \phi 6 @ 0.30.$$

Direcção yy:

$$m_y^+ = 22KN.m \quad \rightarrow \quad m_y^+ / nerv. = 22 \times 0.80 = 17.6KN.m \quad \rightarrow$$

$$\mu = 0.0176 / 0.80 \times 0.32^2 \times 13.3 = 0.0161; \quad w = 0.164; \quad A_s = 1.61cm^2 / nerv.; \quad 3\phi 10 / nerv.$$

$$m_y^- = -37KN.m \quad \rightarrow \quad m_y^- / nerv. = -29.6KN.m \quad \rightarrow$$

$$\mu = 0.0296 / 0.10 \times 0.32^2 \times 13.3 = 0.217; \quad w = 0.2645; \quad A_s^- = 2.32cm^2;$$

$$A_s^- / m = 4.04cm; \quad A_s^- / m^{min} = 4.8m^2 / m$$

$$(HQ221 + 4\phi 10 / m \text{ ou } 6\phi 10 / m).$$

$$V_{sd}^{max} / nerv. = 22KN; \quad \tau_{ref} = 0.687; \quad \text{Estribos mínimos: } \phi 6 @ 0.30$$

Laje L4.2:

Laje aligeirada armada numa direcção com um bordo contínuo e um bordo descontinuo.
 Vão $l = 6.0m$; espessura $e = 0.35m$;
 $p_{sd} = 1.5 \times [5.2(p.p.) + 3.0(rev. + div.) + 3.0(sob.)] = 16.8KN/m^2$; Nervuras
 esp. = $0.15m$.

Cálculo da faixa de $6.0m$ de laje através do cálculo do pórtico PA6AC, admitindo continuidade com L4.4 e L4.5 através da viga V4.4 $b = 0.30$; $h = 1.35$

Ver diagrama de momentos flectores na página seguinte.

$M^- /_{nerv.} = -35.72KN.m$; $\mu = 0.03572 / 0.15 \times 0.32^2 \times 13.3 = 0.174$;
 $w = 0.204$; $A_s = 3.77cm^2$; $A_s /_m = 4.43m^2/m$; $A_s^{min} /_m = 4.8cm^2/m \rightarrow (HQ 221 + 4\phi 10/m \text{ ou } 6\phi 10/m)$.

$M^+ /_{nerv.} = 52KN.m$; $\mu = 0.052 / 0.85 \times 0.32^2 \times 13.3 = 0.045$; $w = 0.047$;
 $A_s /_{nerv.} = 4.88m^2$; $(2\phi 16 + 1\phi 12) /_{nervura}$
 $V_{sd} /_{máx} = 54KN$; $\tau_{ref.} = 1.125MPa$; $V_{sd} > V_{ed} \rightarrow \phi 6 @ 0.15$;
 $V_{sd} < V_{ed} \rightarrow \phi 6 @ 0.30$

Armadura de distribuição: $A_s^d = 2\phi 10 /_{nervura}$.

Laje L4.3 (Idêntica à laje L4.1):

Laje aligeirada armada em duas direcções com dois bordos contínuos e dois bordos descontinuos.

Vãos: $l_1 = l_2 = 6.0m$; Espessura $e = 0.35m$; $p_{sd} = 16.8KN/m^2$.

Utilização das tabelas - Barés; Direcção xx nervuras $0.15m$; direcção yy nervuras $0.10m$.

Ver: Laje L4.1

$m_x^+ /_{nerv.} = m_y^+ /_{nerv.} = 18.7KN.m \rightarrow A_s^+ = 3\phi 10 /_{nervura} \rightarrow A_s^+ = 2\phi 12 /_{nervura}$.

$m_x^- /_{nerv.} = m_y^- /_{nerv.} = -31.45KN.m \rightarrow A_s^- = (HQ221 + 4\phi 10/m \text{ ou } 6\phi 10/m)$

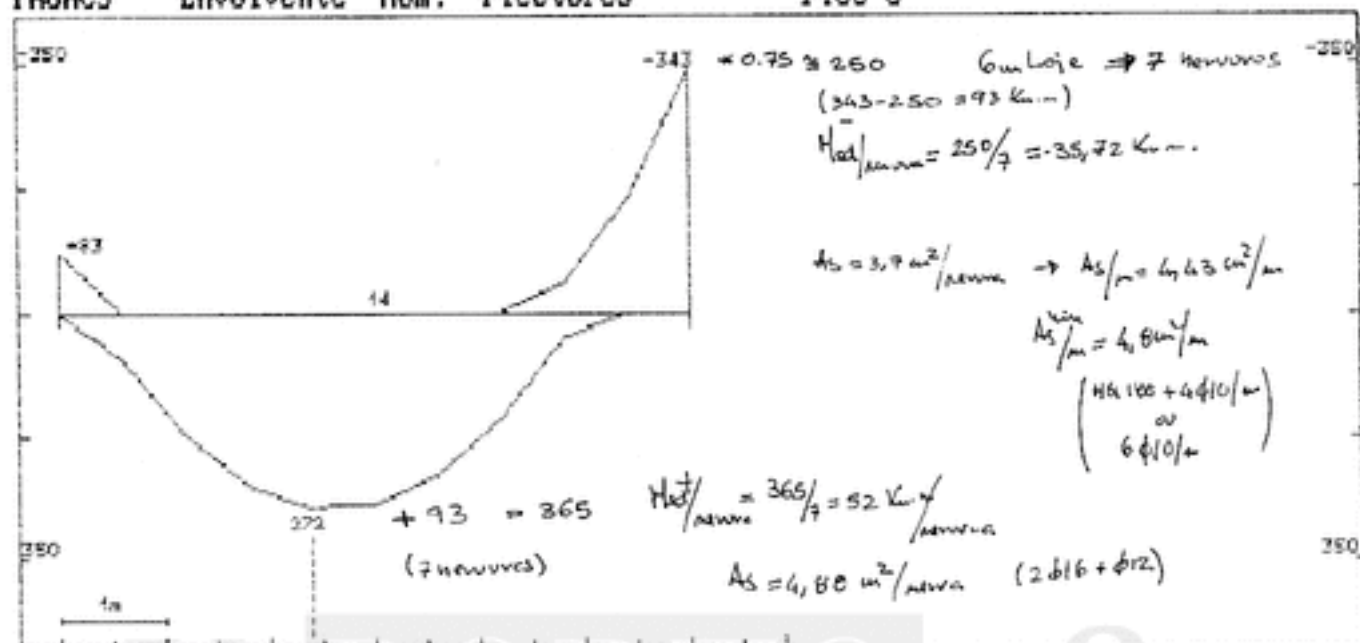
Estribos mínimos: $\phi 6 @ 0.30$.

Laje L4.4:

Laje aligeirada armada em duas direcções. Três bordos contínuos e um bordo livre.
 Vãos: $l_1 = l_2 = 6.0m$; espessura $e = 0.35m$; $p_{sd} = 16.8KN/m^2$
 Tabelas: Barés

PAGAC3 Envolvente Mom. Flectores

Piso 3



U. PORTO

arquivo central

Direcção xx:

2 apoios contínuos; nervuras esp. = 0.15; $m_1^+ = 0,0288 \times 16,8 \times 6^2 = +17,42 \text{KN.m}$;
 $m_2^+ = 0,0435 \times 16,8 \times 6^2 = 26,3 \text{KN.m}$; $m_1^- = -0,0664 \times 16,8 \times 6^2 = -40,2 \text{KN.m}$;
 $m_2^- = -0,0851 \times 16,8 \times 6^2 = -51,5 \text{KN.m}$

Após redistribuição:

$$m_1^+ = 28 \text{KN.m}; m_2^+ = 40 \text{KN.m};$$

$$m_2^+ = 40 \text{KN.m}; m_2^- = 38 \text{KN.m}$$

$$m_1^+ = 28 \text{KN.m} \quad m_1^+ / \text{nerv.} = 28 \times 0,85 = 23,8 \text{KN.m}; \quad \mu = 0,021; \quad w = 0,021;$$

$$A_s = 2,18 \text{cm}^2 / \text{nervura} (2\phi 12 / \text{nervura})$$

$$m_1^- = -30 \text{KN.m} \quad m_1^- / \text{nerv.} = -30 \times 0,85 = -25,5 \text{KN.m}; \quad \mu = 0,125; \quad w = 0,14;$$

$$A_s = 2,6 \text{cm}^2$$

$$A_s / m = 3,0 \text{cm}^2 / \text{m}; A_s^{\text{min}} / m \Rightarrow (\text{HQ221} + 4\phi 10 / \text{m ou } 6\phi 10 / \text{m})$$

$$V_{sd}^{\text{máx}} / \text{nervura} = 34 \text{KN}; \tau_{ref} = 0,7 \text{MPa}; \text{Estribos mínimos: } \phi 6 @ 0,30$$

$$m_2^+ = 40 \text{KN.m}; m_2^+ / \text{nerv.} = 34 \text{KN.m}; \mu = 0,029; w = 0,030; A_s = 3,14 \text{cm}^2 / \text{nerv.}$$

(3 ϕ 12/nerv).

$$m_2^- = -38 \text{KN.m} \quad m_2^- / \text{nerv.} = -32,3 \text{KN.m}; \quad \mu = 0,158; \quad w = 0,183;$$

$$A_s = 3,36 \text{cm}^2 / \text{nerv.}; A_s / m = 3,96 \text{cm}^2 / \text{m}; A_s^{\text{min}} / m \Rightarrow (\text{HQ221} + 4\phi 10 / \text{m ou } 6\phi 10 / \text{m}).$$

$$V_{sd}^{\text{máx}} \sin sd / \text{nerv.} = 44,2 \text{KN}; \tau_{ref} = 0,92 \text{MPa}; \text{Estribos mínimos: } \phi 6 @ 0,30.$$

Direcção yy:

1 apoio contínuo e um bordo livre; nervuras esp. = 0,10m;
 $m^+ = 0,0125 \times 16,8 \times 6^2 = 7,56 \text{KN.m}$; $m^- = -0,0559 \times 16,8 \times 6^2 = -33,8 \text{KN.m}$

Após redistribuição:

$$m^+ = 15 \text{KN.m}; m^+ / \text{nerv.} = 15 + 0,80 = 12 \text{KN.m};$$

$$\mu = 0,012 / 0,80 + 0,32^2 \times 13,3 = 0,011; w = 0,0111; A_s = 1,1 \text{cm}^2; (2\phi 10 / \text{nervura})$$

$$m^- = -26,4 \text{KN.m}; m^- / \text{nerv.} = -21,0 \text{KN.m};$$

$$\mu = 0,021 / 0,10 \times 0,32^2 \times 13,3 = 0,154; w = 0,177; A_s / \text{nerv.} = 2,17 \text{cm}^2 / \text{nerv.};$$

$$A_s / m = 2,72 \text{m}^2 / \text{nerv.}; A_s^{\text{min}} / \text{nerv.} = (\text{HQ221} + 4\phi 10 / \text{m ou } 6\phi 10 / \text{m}); \text{Estribos}$$

mínimos: $\phi 6 @ 0,30$.

Laje L4.5:

Laje aligeirada armada em duas direcções. Três bordos contínuos e um bordo livre. Vãos $l_x = 6.0m$; $l_y = 4.25m$; espessura: $e = 0.35m$; $f_{sd} = 16.8KN/m^2$.

Direcção xx (nervuras $e = 0.15$)

$$m_1^+ = 0.0217 \times 16.8 \times 6^2 = +13.13KN.m;$$

$$m_2^+ = 0.0384 \times 16.8 \times 6^2 = 23.22KN.m;$$

$$m_1^- = 0.0493 \times 16.8 \times 6^2 = -29.84KN.m;$$

$$m_2^- = -0.0837 \times 16.8 \times 6^2 = -50.622KN.m.$$

Após redistribuição:

$$m_1^+ = 21.0KN.m; \quad m_1^+/nerv = 17.05KN.m; \quad \mu = 0.015; \quad w = 0.0158;$$

$$A_s = 1.63/nerv; (2\phi 12/nerv)$$

$$m_1^- = -22.0KN.m; \quad m_1^-/nerv = -18.7KN.m; \quad \mu = 0.0915; \quad w = 0.10;$$

$$A_s = 1.83cm^2; A_s/nerv = 2.16cm^2/m; A_s^{min}/m = (HQ221 + 4\phi 10/m \text{ ou } 6\phi 10/m)$$

$$V_{sd}^{max}/nerv = 24.4; \tau_{ref} = 0.51MPa; \text{Estribos minimos: } \phi 6@0.30.$$

$$m_2^+ = 36KN.m; \quad m_2^+/nerv = 30.6KN.m; \quad \mu = 0.0264; \quad w = 0.0271;$$

$$A_s = 2.82m^2/nervura; (3\phi 12/nervura).$$

$$m_2^- = -38KN.m; m_2^-/nerv = -32.3KN.m; \mu = 0.158; w = 0.183; A_s = 3.36m^2;$$

$$A_s/m = 3.96m^2/m; A_s^{min}/m = (HQ221 + 4\phi 10/m \text{ ou } 6\phi 10/m).$$

$$V_{sd}^{min} = 42KN; \tau_{ref} = 0.87MPa; \text{Estribos minimos: } \phi 6@0.30.$$

Direcção yy: Idêntico a L4.4.

Painel de extremidade:

Laje aligeirada armada em duas direcções, 2 bordos contínuos, um bordo descontinuo e um bordo livre. Vãos: $l_x = 6.0m$; $l_y = 4.25m$; espessura $e = 0.35m$; $p_{sd} = 16.8KN/m^2$.

Tabelas Barés.

Direcção xx (nervuras $e = 0.15$):

$$m_1^+ = 28.00; m_2^+ = 49KN.m; m_1^- = -30KN.m; m_2^- = -50KN.m.$$

$$m_1^+ = 28.0KN.m; m_1^+/nerv = 23.84; \mu = 0.02; w = 0.02; A_s = 0.185m^2/nerv; (2\phi 12/nervura).$$

$$m_1^- = -30KN.m; m_1^-/nerv = -25.5; \mu = 0.124; w = 0.14; A_s = 2.57m^2;$$

$$A_s/m = 3.05m^2/m; A_s^{min}/m = (HQ221 + 4\phi 10/m \text{ ou } 6\phi 10/m).$$

$$V_{sd}^{max} = 33KN.m; \tau_{ref} = 0.69MPa; \text{Estribos minimos: } \phi 6@0.30.$$

$$m_2^* = 49 \text{ KN} \cdot \text{m}; \quad m_2^*/\text{neru} = 41,65 \text{ KN} \cdot \text{m}; \quad \mu = 0,036; \quad w = 0,032;$$

$$A_s = 3,87 \text{ m}^2/\text{neru} (3\phi 12/\text{nerura}).$$

NOTA: $3\phi 12 = 3,39 \text{ m}^2 - 3,87 = -0,86 \text{ m}^2$. Armadura em falta irá ser concentrada na viga de bordo livre V4.6.

$$m_2^* = -50 \text{ KN} \cdot \text{m}; \quad m_2^*/\text{neru} = -42,5 \text{ KN} \cdot \text{m}; \quad \mu = 0,21; \quad w = 0,25; \quad A_s = 4,61 \text{ m}^2;$$

$$A_s/m = 5,42 \text{ m}^2/\text{m} (\text{HQ221} + 4\phi 10/\text{mou } 6\phi 10/\text{m}).$$

$$V_{sd}^{max} = 56,1 \text{ KN}; \quad \tau_{ref} = 1,17 \text{ MPa}; \quad \text{Estribos: } V_{sd} > V_{cd} = 3,12 \phi 6 @ 0,20;$$

$$V_{sd} < V_{cd} = 31,2 \phi 6 @ 0,30$$

Direcção yy: (nerura e = 0,10 m) idêntico a L4.4. Direcção yy.

1.3 - Punçoamento - Laje fungiforme

(Combinações Acção de base $Q_1 + Q_2$)

PILARES DE CANTO

Pilar P7C:

$$N_{sd} = 152 \text{ KN}$$

$$M_{sd,x} = 119,4 \text{ KN} \cdot \text{m}$$

$$M_{sd,y} = -86,5 \text{ KN} \cdot \text{m}$$

$$A = (0,35 \times 0,35) + (0,16 \times 0,35) \times 2 + \frac{\pi \cdot 0,16^2}{4} = 0,2546$$

$$g = 5,2 (\text{p.p.laje}) + 1,0 (\text{rev.}) + 2,0 (\text{div.}) = 8,2 \text{ KN}/\text{m}^2$$

$$q = 3,0 \text{ KN}/\text{m}^2$$

$$\text{Perímetro crítico: } \mu = 2 \times 0,35 + \frac{2 \times 0,16}{4} = 0,951 \text{ m}$$

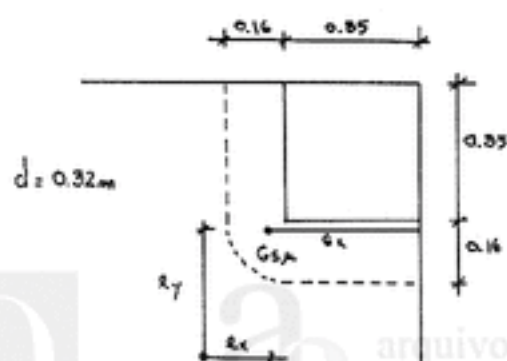
$$V_{sd} = N_{sd} - A \times 1,5 (g + q)$$

$$= 152 - 0,2546 \times 1,5 \times (8,2 + 3,0) = 147,7 \text{ KN}$$

$$G_x = G_y = \frac{\frac{0,51^2}{2} + 0,51^2}{2 \times 0,51} = 0,3825 \approx 0,38 \text{ m}$$

$$e_x = 0,175 + \frac{86,5}{152} - 0,38 = 0,364 \text{ m}$$

$$e_y = 0,175 + \frac{119,4}{152} + \frac{119,4}{152} - 0,38 = 0,58 \text{ m}$$



arquivo
central

$$V_{sd}^{max} = \frac{V_{sd}}{\mu} \times \left(1 + 1,5 \frac{|e_x| \times |e_y|}{\sqrt{b_x \times b_y}} \right) = \frac{147,7}{0,951} \left(1 + 1,5 \frac{0,364 + 0,58}{\sqrt{0,51 \times 0,51}} \right) = 586,5$$

$$v_{Rd} = (1,6 - d) \tau_1 d = 266,24$$

$$v_{Rd}^{max} = 1,6 v_{Rd} = 426 < v_{sd}^{max}$$

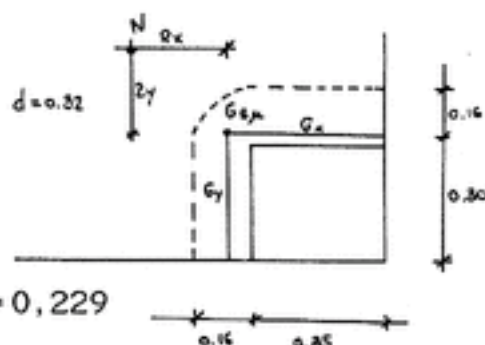
$$A_{sp} = 3/4 \frac{v_{sd} \cdot \mu}{f_{syd}} = 12,0 m^2 \quad 8\phi 10 - 2r$$

Pilar P7A:

$$N_{sd} = 142$$

$$M_{sd,x} = -72$$

$$M_{sd,y} = -85,6$$



$$A = 0,30 \times 0,35 + 0,30 \times 0,16 + 0,35 \times 0,16 + \frac{\pi \times 0,16^2}{4} = 0,229$$

$$g = 8,2 KN/m^2$$

$$q = 3,0 KN/m^2$$

$$\mu = 0,35 + 0,30 + \frac{\pi \times 0,16}{2} = 0,9013$$

$$V_{sd} = 138,15$$

$$G_x = \frac{0,51^2/2 + 0,46 \times 0,51}{0,51 + 0,46} = 0,376$$

$$l_x = 0,175 + \frac{85,6}{142} - 0,376 = 0,402$$

$$G_y = \frac{0,46^2/2 + 0,51 \times 0,46}{0,51 + 0,46} = 0,3509$$

$$l_y = 0,15 + \frac{72}{142} - 0,3509 = 0,306$$

$$v_{sd}^{max} = 489,4 KN/m$$

$$v_{Rd} = 266,24 KN/m$$

$$v_{Rd}^{max} = 426 KN/m < v_{sd}^{max}$$

$$A_{sp} = 9,5 m^2 \rightarrow 7\phi 10 - 2r$$

PILARES - BORDO LATERAL

Pilar P5C:

$$N_{sd} = 274,6 \text{ KN}$$

$$M_{sd,x} = 182 \text{ KN.m}$$

$$M_{sd,y} = -9,7 \text{ KN.m}$$

$$A = 0,35 \times 0,35 + 0,35 \times 0,16 \times 3 + \frac{\pi \times 0,16^2}{2} = 0,3307$$

$$g = 8,2 \text{ KN/m}^2$$

$$q = 3,0 \text{ KN/m}^2$$

$$\text{Perímetro crítico: } \mu = 3 \times 0,35 + \pi \times 0,16 = 1,55$$

$$V_{sd} = 269 \text{ KN}$$

$$G_x = 0$$

$$e_x = 0,035 \text{ m}$$

$$G_y = \frac{0,51^2 / 2 \times 2 + 0,67 \times 0,51}{2 \times 0,51 + 0,67} = 0,356 \text{ m}$$

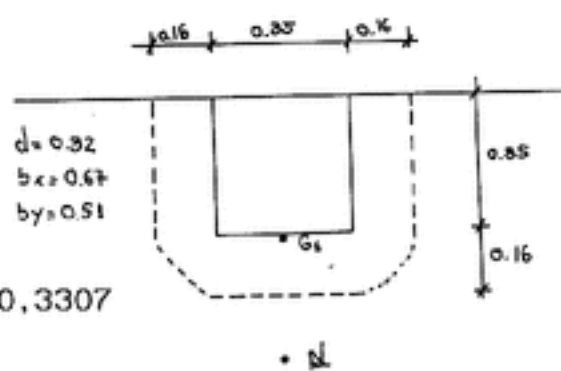
$$e_y = 0,175 + \frac{182}{274,6} - 0,356 = 0,482 \text{ m}$$

$$v_{sd}^{\min} = 403,8 \text{ KN/m}$$

$$v_{Rd} = 266,24 \text{ KN/m}$$

$$v_{R2}^{\max} = 1,6 v_{Rd} = 426 \text{ KN/m} > v_{sd}^{\max}$$

$$A_{sp} = 13,5 \text{ m}^2 - 9 \phi 10(2r)$$



Pilar P5A:

$$N_{sd} = 268$$

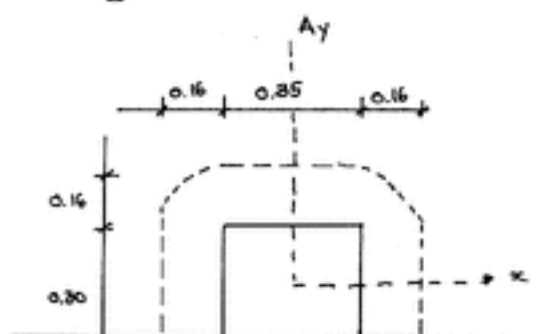
$$M_{sd,x} = -136$$

$$M_{sd,y} = -6,9$$

$$A = 0,3 \times 0,35 + 0,30 \times 0,16 \times 2 + 0,35 \times 0,16 + \frac{\pi \times 0,16^2}{2} = 0,2972$$

$$g = 8,2 \text{ KN/m}^2$$

$$q = 3,0 \text{ KN/m}^2$$



$$\mu = 0,30 \times 2 + 0,35 + \pi \times 0,16 = 1,452m$$

$$V_{sd} = 263KN$$

$$G_x = 0$$

$$e_x = \frac{6,9}{268} = 0,0257$$

$$G_y = \frac{0,46^2/2 \times 2 + 0,67 \times 0,46}{2 \times 0,46 + 0,67} = 0,3269$$

$$e_y = 0,15 + \frac{136}{268} - 0,3269 = 0,33$$

$$v_{sd}^{max} = 355,2$$

$$v_{Rd} = 266,24$$

$$v_{Rd}^{max} = 1,6 v_{Rd} = 426$$

$$A_{sp} = 11,12m^2 \rightarrow 7\phi 10(2r)$$

PILAR CENTRAL

Pilar P6B:

$$N_{sd} = 680KN$$

$$M_{sd,x} = -8,65KN.m$$

$$M_{sd,y} = 18,6KN.m$$

$$A = 0,35^2 + 0,35 \times 0,16 \times 4 + \pi \times 0,16^2 = 0,4269$$

$$g = 8,2KN/m^2$$

$$q = 3,0KN/m^2$$

$$\mu = 0,35 \times 4,0 + 2 \times \pi \times 0,16 = 2,405m$$

$$V_{sd} = 672,8KN$$

$$G_x = G_y = 0$$

$$e_x = 0,0274m$$

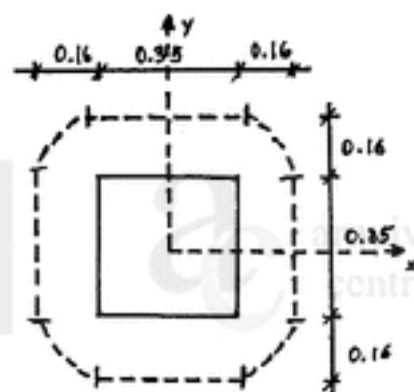
$$e_y = 0,01272m$$

$$v_{sd}^{max} = 304,88KN/m$$

$$V_{Rd} = 266,24KN/m$$

$$v_{sd}^{max} = 426KN/m$$

$$A_{sp} = 15,8m^2 \rightarrow 10\phi 10(2r)$$

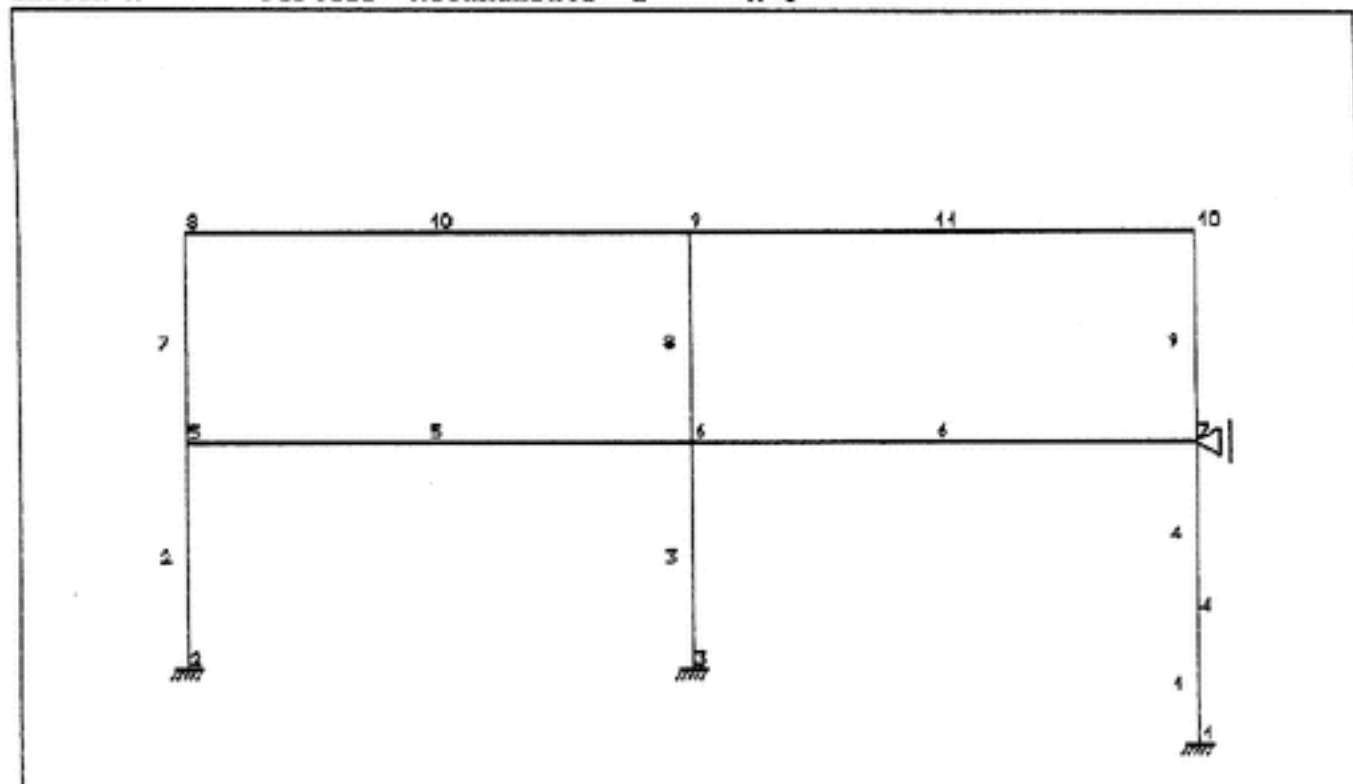


2. PÓRTICOS E VIGAS

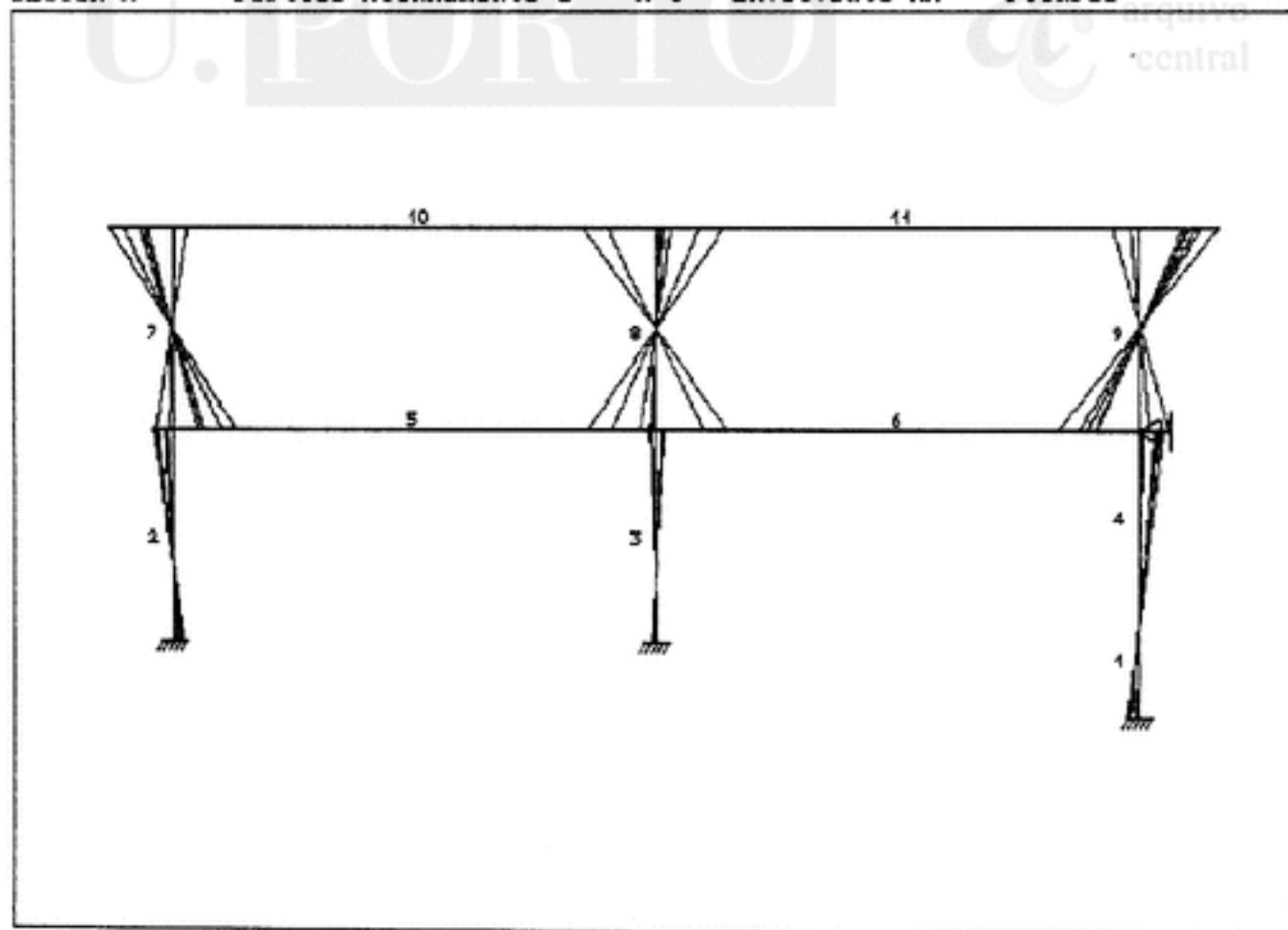
U. PORTO



SECTOR A - Portico Alinhamento 1 - A/C



SECTOR A - Portico Alinhamento 1 - A/C - Envolvente MM - Pilares



SECTOR A -- Portico Alinhamento 1 -- A-C

No. DE NOS	= 10	No. DE BARRAS	= 11
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 4	No. DE SECCOES TIPO	= 4
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.30000E+00	.30000E+00
2	.29000E+08	.30000E+00	.35000E+00
3	.29000E+08	.30000E+00	.50000E+00
4	.29000E+08	.30000E+00	.50000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	2	2	2 5	1	3	3 6	2
4	4 7	2	5	5 6	4	6	6 7	4
7	5 8	1	8	6 9	2	9	7 10	2
10	8 9	3	11	9 10	3			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	6.000	.000
4	12.000	1.000	5	.000	4.500	6	6.000	4.500
7	12.000	4.500	8	.000	8.700	9	6.000	8.700
10	12.000	8.700						

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	7	0	0	1

PILARES

Volume de Material (m3)=	2.7675	Area de Cofragem (m2)=	35.0100
ELEMENTOS NAO VERTICAIS			
Volume de Material (m3)=	3.6000	Area de Cofragem (m2)=	31.2000

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	25.600	11	25.600
5	29.800	6	29.800

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
10	5.800	3.000	11	5.800	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
9		5.800	
10		12.800	

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
11	3.000		

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	3.000		

ACCAO 4
SISMO1(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
8			64.750

ACCAO 5
SISMO2(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
8			42.140

ACCAO 6
VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
8			17.710

***** RESULTADOS *****

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-10.830	-2.708	-5.415	5.415	254.177	-254.177
2	11.777	23.391	7.815	-7.815	227.774	-227.774
3	-.102	-.318	-.093	.093	614.549	-614.549
4	2.708	-21.660	-5.415	5.415	254.177	-254.177
5	-61.709	165.692	-116.769	-151.431	-11.351	11.351
6	-160.468	76.631	-148.073	-120.127	-9.049	9.049
7	38.318	42.180	19.166	-19.166	111.005	-111.005
8	-4.906	-5.154	-2.395	2.395	315.045	-315.045
9	-54.971	-60.097	-27.397	27.397	134.050	-134.050
10	-42.180	174.452	-111.005	-155.095	29.792	-29.792
11	-169.298	60.097	-151.250	-114.850	27.397	-27.397

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-10.830	-254.177	-5.415
2	11.777	-227.774	7.815
3	-.102	-614.549	-.093
7	.000	.000	-12.933

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-10.702	-2.676	-5.351	5.351	255.267	-255.267
2	11.996	23.838	7.963	-7.963	215.396	-215.396
3	-.356	-.831	-.264	.264	598.837	-598.837
4	2.676	-21.404	-5.351	5.351	255.267	-255.267
5	-60.657	165.386	-116.645	-151.555	-9.909	9.909

6	-161.608	76.429	-148.296	-119.904	-9.309	9.309
7	36.819	38.245	17.872	-17.872	98.750	-98.750
8	-2.947	-.684	-.864	.864	298.986	-298.986
9	-55.025	-61.038	-27.634	27.634	135.363	-135.363
10	-38.245	163.042	-98.750	-140.350	28.498	-28.498
11	-162.359	61.038	-149.937	-116.163	27.634	-27.634

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-10.702	-255.267	-5.351
2	11.996	-215.396	7.963
3	-.356	-598.837	-.264
7	.000	.000	-12.974

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-11.113	-2.778	-5.556	5.556	241.586	-241.586
2	11.673	23.196	7.749	-7.749	228.647	-228.647
3	.158	.223	.085	-.085	599.266	-599.266
4	2.778	-22.225	-5.556	5.556	241.586	-241.586
5	-61.362	166.970	-116.499	-151.701	-11.486	11.486
6	-160.029	75.631	-148.166	-120.034	-7.350	7.350
7	38.166	42.621	19.235	-19.235	112.148	-112.148
8	-7.163	-9.855	-4.052	4.052	299.399	-299.399
9	-53.406	-54.992	-25.809	25.809	121.553	-121.553
10	-42.621	168.030	-112.148	-153.952	29.861	-29.861
11	-158.175	54.992	-136.747	-102.353	25.809	-25.809

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-11.113	-241.586	-5.556
2	11.673	-228.647	7.749
3	.158	-599.266	.085
7	.000	.000	-12.903

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000

SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-.293	-.073	-.146	.146	197.144	-197.144
2	11.373	23.365	7.720	-7.720	121.493	-121.493
3	3.642	8.048	2.598	-2.598	390.763	-390.763
4	.073	-.586	-.146	.146	197.144	-197.144
5	-2.047	144.748	-65.616	-113.184	17.179	-17.179
6	-68.131	100.181	-84.058	-94.742	60.135	-60.135
7	-21.319	-18.412	-9.460	9.460	55.877	-55.877
8	-84.665	-84.841	-40.358	40.358	193.521	-193.521
9	-99.596	-99.099	-47.308	47.308	102.402	-102.402
10	18.412	146.127	-55.877	-110.723	87.666	-87.666
11	-61.287	99.099	-76.998	-89.602	47.308	-47.308

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-.293	-197.144	-.146
2	11.373	-121.493	7.720
3	3.642	-390.763	2.598
7	.000	.000	-107.297

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-2.925	-.731	-1.463	1.463	184.980	-184.980
2	10.064	20.476	6.787	-6.787	131.194	-131.194
3	2.245	4.941	1.597	-1.597	393.226	-393.226
4	.731	-5.851	-1.463	1.463	184.980	-184.980
5	-16.561	131.980	-70.163	-108.637	8.055	-8.055
6	-82.869	81.508	-89.627	-89.173	35.429	-35.429
7	-3.916	-1.411	-1.268	1.268	61.030	-61.030
8	-54.052	-54.213	-25.777	25.777	194.962	-194.962
9	-75.658	-76.236	-36.165	36.165	95.807	-95.807
10	1.411	132.206	-61.030	-105.570	61.942	-61.942
11	-77.993	76.236	-83.593	-83.007	36.165	-36.165

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
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1	-2.925	-184.980	-1.463
2	10.064	-131.194	6.787
3	2.245	-393.226	1.597
7	.000	.000	-70.132

 COMBINACAO 6
 ACC.BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	-1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-15.371	-3.843	-7.685	7.685	127.477	-127.477
2	3.875	6.818	2.376	-2.376	177.054	-177.054
3	-4.357	-9.748	-3.134	3.134	404.869	-404.869
4	3.843	-30.741	-7.685	7.685	127.477	-127.477
5	-85.176	71.618	-91.660	-87.140	-35.080	35.080
6	-152.544	-6.769	-115.952	-62.848	-81.370	81.370
7	78.358	78.959	37.456	-37.456	85.394	-85.394
8	90.674	90.578	43.155	-43.155	201.777	-201.777
9	37.510	31.852	16.515	-16.515	64.629	-64.629
10	-78.959	66.395	-85.394	-81.206	-59.669	59.669
11	-156.974	-31.852	-114.771	-51.829	-16.514	16.514

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-15.371	-127.477	-7.685
2	3.875	-177.054	2.376
3	-4.357	-404.869	-3.134
7	.000	.000	105.570

 COMBINACAO 7
 ACC.BASE(-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-12.738	-3.185	-6.369	6.369	139.640	-139.640
2	5.184	9.707	3.309	-3.309	167.353	-167.353
3	-2.960	-6.641	-2.134	2.134	402.406	-402.406

4	3.185	-25.476	-6.369	6.369	139.640	-139.640
5	-70.662	84.386	-87.113	-91.687	-25.956	25.956
6	-137.806	11.904	-110.384	-68.416	-56.664	56.664
7	60.955	61.958	29.265	-29.265	80.240	-80.240
8	60.061	59.951	28.574	-28.574	200.335	-200.335
9	13.572	8.988	5.372	-5.372	71.224	-71.224
10	-61.958	80.316	-80.240	-86.360	-33.945	33.945
11	-140.267	-8.988	-108.176	-58.424	-5.371	5.371

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-12.738	-139.640	-6.369
2	5.184	-167.353	3.309
3	-2.960	-402.406	-2.134
7	.000	.000	68.405

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-9.639	-2.410	-4.820	4.820	256.443	-256.443
2	12.427	24.824	8.278	-8.278	219.763	-219.763
3	.556	1.150	.379	-.379	604.093	-604.093
4	2.410	-19.278	-4.820	4.820	256.443	-256.443
5	-54.468	171.984	-114.514	-153.686	-6.671	6.671
6	-153.752	85.046	-145.551	-122.649	2.994	-2.994
7	29.644	33.142	14.949	-14.949	105.249	-105.249
8	-19.382	-19.617	-9.286	9.286	304.856	-304.856
9	-65.768	-69.593	-32.229	32.229	133.794	-133.794
10	-33.142	175.645	-105.250	-152.750	41.514	-41.514
11	-156.028	69.593	-143.406	-114.594	32.229	-32.229

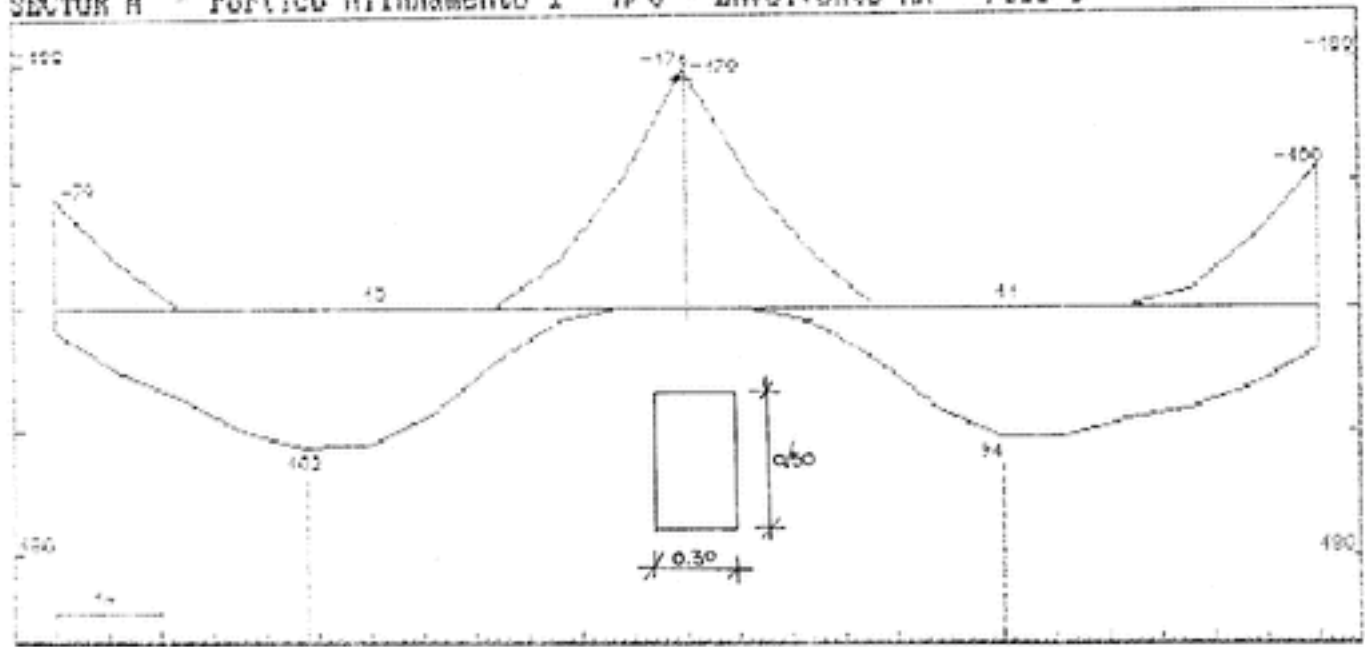
REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-9.639	-256.443	-4.820
2	12.427	-219.763	8.278
3	.556	-604.093	.379
7	.000	.000	-30.403

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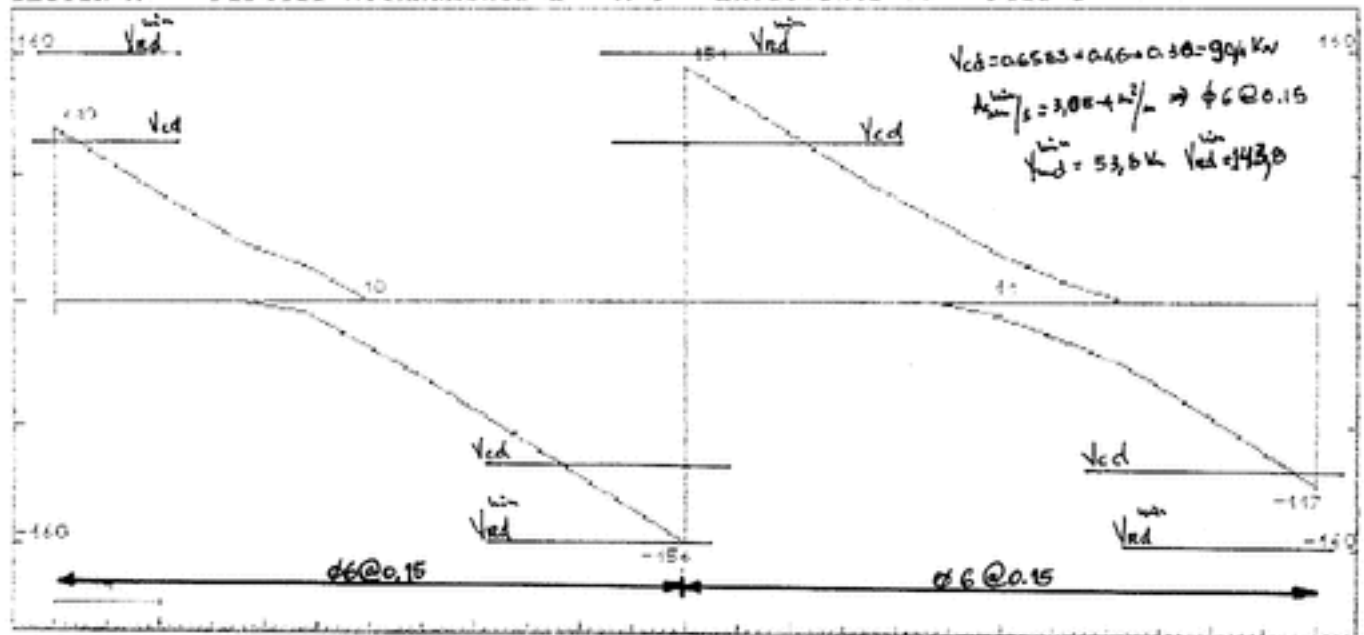
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√3.18

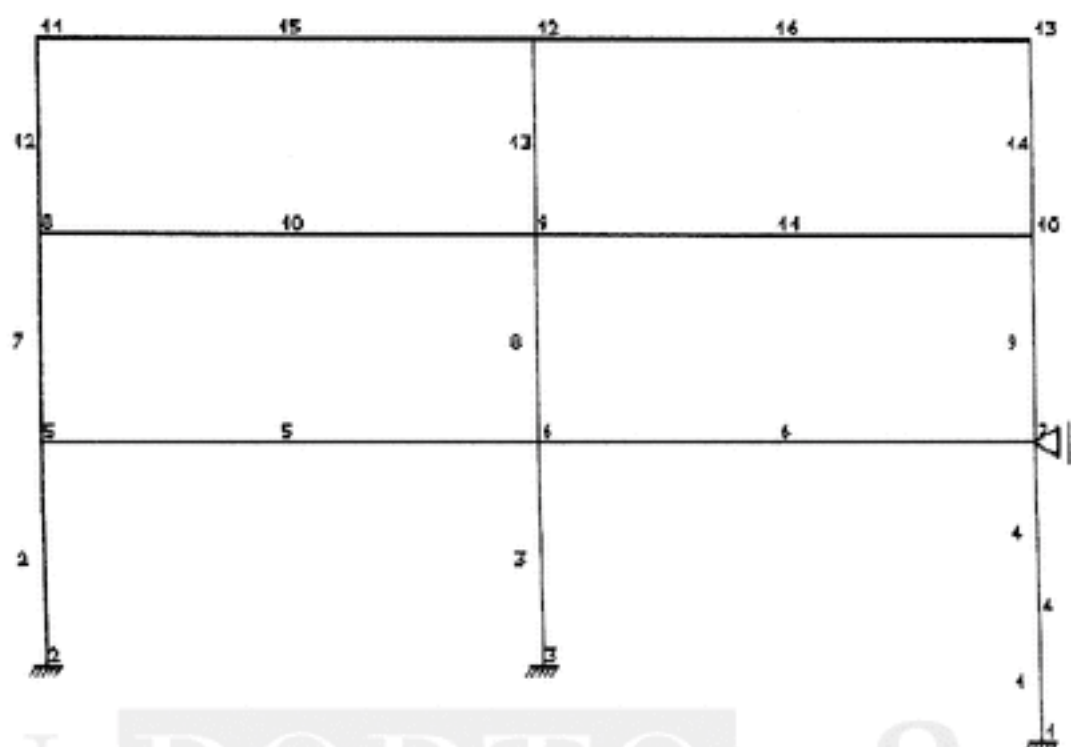


M_{ed}	-70	102	-165	74	-70
μ	0,083	0,121	0,195	0,111	0,106
W	0,089	0,135	0,234	0,124	0,118
A_s	4,74	7,14	13,32	6,53	6,22
	5φ12	5φ16	2φ12 + 4φ16	5φ16	6φ12

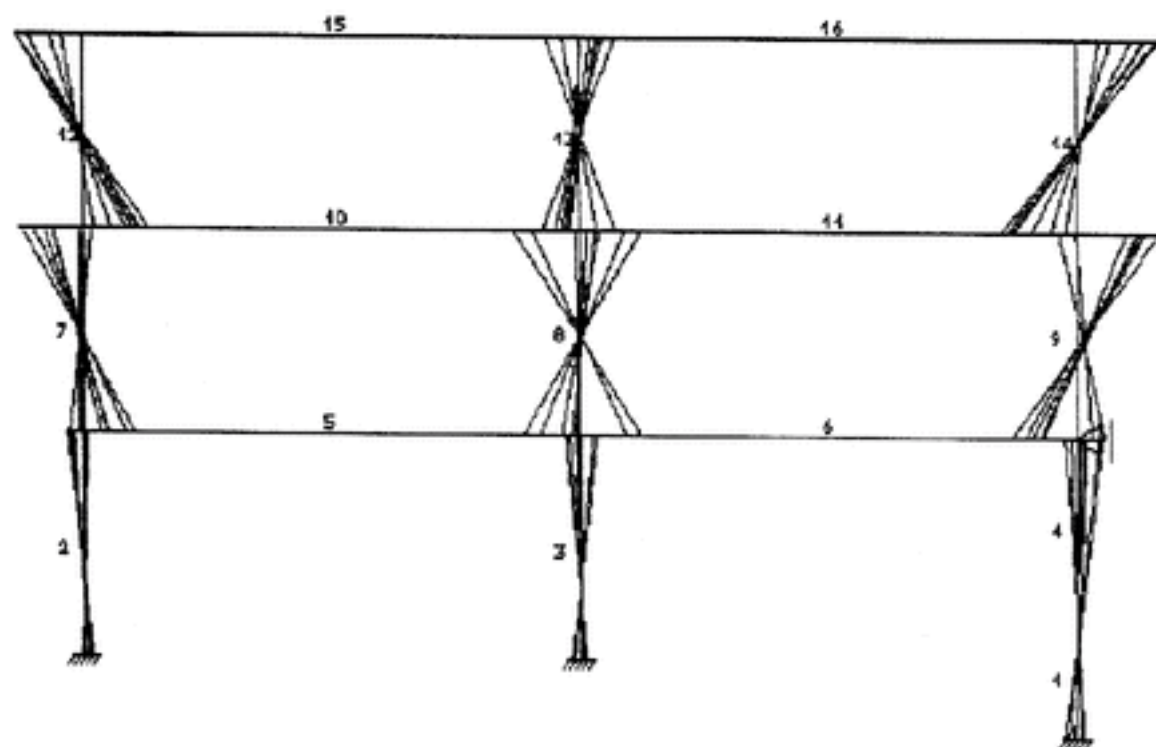
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SECTOR A - Portico Alinhamento 2 - A/C



SECTOR A - Portico Alinhamento 2 - A/C - Envolvente III - Pilares



SECTOR A -- PORTICO ALINHAMENTO 2 -- A-C

No. DE NOS	= 13	No. DE BARRAS	= 16
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 4	No. DE SECCOES TIPO	= 6
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.35000E+00	.35000E+00
4	.29000E+08	.15000E+01	.35000E+00
5	.29000E+08	.25000E+00	.40000E+00
6	.29000E+08	.10000E+01	.25000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	6	2	2 5	1	3	3 6	2
4	4 7	6	5	5 6	5	6	6 7	5
7	5 8	1	8	6 9	2	9	7 10	2
10	8 9	4	11	9 10	4	12	8 11	1
13	9 12	1	14	10 13	1	15	11 12	3
16	12 13	3						

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	6.000	.000
4	12.000	1.000	5	.000	4.500	6	6.000	4.500
7	12.000	4.500	8	.000	8.700	9	6.000	8.700
10	12.000	8.700	11	.000	12.600	12	6.000	12.600
13	12.000	12.600						

NOS DE APOIO	CODIGO	NOS DE APOIO	CODIGO
1	1 1 1	2	1 1 1
3	1 1 1	7	0 0 1

PILARES

Volume de Material (m3)=	5.2222	Area de Cofragem (m2)=	59.5800
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ELEMENTOS NAO VERTICAIS

Volume de Material (m3)=	8.9700	Area de Cofragem (m2)=	51.6000
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 ACCRO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	26.633	16	26.633
10	57.550	11	57.550
5	12.625	6	12.625

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
15	12.020	3.000	16	12.020	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
11		40.500	
13		40.500	
12		81.000	

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
16	4.300	10	12.000

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
16	4.300	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
12		9.000	
13		9.000	

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	4.300	11	12.000

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
15	4.300	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
12		9.000	
11		9.000	

ACCAO 4
SISMO1(e11)-E1

***** CARGA 7 *****

FORÇAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
11			17.770
8			41.890

ACCAO 5
SISMO2(e2i)-E2

***** CARGA 7 *****

FORÇAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
11			37.800
8			4.400

ACCAO 6
VENTO -W

***** CARGA 7 *****

FORÇAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
11			24.890
8			-3.600

RESULTADOS

COMBINACAO 1
ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.865	-.966	-1.933	1.933	551.531	-551.531
2	6.634	12.873	4.335	-4.335	533.786	-533.786
3	.282	.286	.126	-.126	1296.586	-1296.586
4	.966	-7.731	-1.933	1.933	551.531	-551.531
5	-46.467	59.240	-54.684	-58.941	-15.809	15.809
6	-53.121	56.542	-56.242	-57.383	-12.500	12.500
7	33.595	51.009	20.144	-20.144	479.103	-479.103

8	-6.404	-6.963	-3.183	3.183	1181.403	-1181.403
9	-48.812	-76.076	-29.735	29.735	494.149	-494.149
10	-126.212	383.277	-270.131	-355.819	-23.868	23.868
11	-362.233	167.678	-345.401	-280.549	-20.230	20.230
12	75.203	88.016	41.851	-41.851	208.972	-208.972
13	-14.080	-12.518	-6.820	6.820	480.182	-480.182
14	-91.603	-103.263	-49.965	49.965	213.599	-213.599
15	-88.016	188.315	-134.722	-168.155	56.785	-56.785
16	-175.797	103.263	-163.528	-139.349	49.965	-49.965

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.865	-551.531	-1.933
2	6.634	-533.786	4.335
3	.282	-1296.586	.126
7	.000	.000	-15.303

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-4.887	-1.222	-2.444	2.444	501.503	-501.503
2	6.302	12.266	4.126	-4.126	501.680	-501.680
3	1.546	2.922	.993	-.993	1198.571	-1198.571
4	1.222	-9.775	-2.444	2.444	501.503	-501.503
5	-45.571	61.580	-54.144	-59.481	-16.372	16.372
6	-52.508	55.012	-56.395	-57.230	-7.706	7.706
7	33.305	52.788	20.498	-20.498	447.536	-447.536
8	-11.993	-20.236	-7.673	7.673	1082.695	-1082.695
9	-45.237	-62.279	-25.599	25.599	444.273	-444.273
10	-124.052	358.329	-273.929	-352.021	-18.829	18.829
11	-322.704	144.314	-288.707	-229.243	-21.758	21.758
12	71.263	73.688	37.167	-37.167	173.607	-173.607
13	-15.390	-3.112	-4.744	4.744	441.967	-441.967
14	-82.035	-102.659	-47.357	47.357	215.029	-215.029
15	-73.688	169.725	-112.857	-144.870	52.101	-52.101
16	-166.613	102.659	-162.098	-140.779	47.357	-47.357

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-4.887	-501.503	-2.444
2	6.302	-501.680	4.126
3	1.546	-1198.571	.993
7	.000	.000	-15.449

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.393	-.848	-1.697	1.697	519.975	-519.975
2	7.476	14.593	4.904	-4.904	484.360	-484.360
3	-.873	-2.049	-.649	.649	1197.420	-1197.420
4	.848	-6.787	-1.697	1.697	519.975	-519.975
5	-44.840	58.808	-54.485	-59.140	-12.028	12.028
6	-55.166	55.924	-56.686	-56.939	-13.624	13.624
7	30.247	40.870	16.932	-16.932	429.875	-429.875
8	-1.593	5.570	.947	-.947	1081.593	-1081.593
9	-49.137	-79.607	-30.653	30.653	463.036	-463.036
10	-105.913	342.811	-219.492	-298.458	-24.288	24.288
11	-335.851	167.012	-341.115	-284.835	-14.535	14.535
12	65.044	87.293	39.061	-39.061	210.383	-210.383
13	-12.530	-21.816	-8.807	8.807	442.019	-442.019
14	-87.405	-88.830	-45.188	45.188	178.201	-178.201
15	-87.293	179.122	-136.134	-166.743	53.994	-53.994
16	-157.306	88.830	-140.276	-117.451	45.188	-45.188

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.393	-519.975	-1.697
2	7.476	-484.360	4.904
3	-.873	-1197.420	-.649
7	.000	.000	-15.333

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	8.688	2.172	4.344	-4.344	366.747	-366.747
2	10.587	22.171	7.279	-7.279	296.394	-296.394
3	8.441	18.147	5.908	-5.908	780.675	-780.675
4	-2.172	17.376	4.344	-4.344	366.747	-366.747

5	-4.244	64.558	-27.823	-47.927	14.295	-14.295
6	-9.038	67.847	-28.074	-47.676	56.936	-56.936
7	-17.927	-11.540	-7.016	7.016	268.572	-268.572
8	-73.668	-80.608	-36.732	36.732	704.674	-704.674
9	-85.222	-106.880	-45.739	45.739	319.071	-319.071
10	-23.820	271.105	-145.836	-228.264	35.795	-35.795
11	-165.946	168.561	-186.614	-187.486	11.498	-11.498
12	35.360	42.739	20.025	-20.025	122.736	-122.736
13	-24.551	-23.972	-12.442	12.442	289.795	-289.795
14	-61.681	-71.860	-34.241	34.241	131.585	-131.585
15	-42.739	122.497	-78.636	-105.222	46.681	-46.681
16	-98.525	71.860	-96.373	-87.485	34.240	-34.240

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	8.688	-366.747	4.344
2	10.587	-296.394	7.279
3	8.441	-780.675	5.908
7	.000	.000	-107.019

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO2(e2i)-E2	1.50000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO1(e1i)-E1	.00000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	5.070	1.268	2.535	-2.535	367.848	-367.848
2	8.678	17.962	5.920	-5.920	293.549	-293.549
3	6.139	13.099	4.275	-4.275	782.419	-782.419
4	-1.268	10.141	2.535	-2.535	367.848	-367.848
5	-12.322	57.204	-30.395	-45.355	6.364	-6.364
6	-17.127	58.250	-31.021	-44.729	36.927	-36.927
7	-5.641	3.777	-.444	.444	263.154	-263.154
8	-53.176	-57.236	-26.289	26.289	706.042	-706.042
9	-68.391	-85.189	-36.566	36.566	323.119	-323.119
10	-19.008	273.030	-144.713	-229.387	-4.928	4.928
11	-166.678	167.707	-186.878	-187.222	-6.810	6.810
12	15.231	27.999	11.085	-11.085	118.441	-118.441
13	-49.116	-46.091	-24.412	24.412	289.777	-289.777
14	-82.519	-86.645	-43.375	43.375	135.898	-135.898
15	-27.999	133.524	-74.341	-109.517	67.785	-67.785
16	-87.433	86.645	-92.060	-91.798	43.375	-43.375

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	5.070	-367.848	2.535
2	8.678	-293.549	5.920
3	6.139	-782.419	4.275

7

.000

.000

-76.029

COMBINACAO 6

ACC.BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	-1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-16.743	-4.186	-8.371	8.371	291.441	-291.441
2	-2.596	-6.900	-2.110	2.110	361.077	-361.077
3	-9.867	-21.610	-6.995	6.995	791.298	-791.298
4	4.186	-33.485	-8.371	8.371	291.441	-291.441
5	-61.217	10.608	-46.310	-29.440	-37.607	37.607
6	-68.895	-.899	-49.507	-26.243	-84.377	84.377
7	68.117	80.969	35.497	-35.497	314.767	-314.767
8	79.897	87.159	39.775	-39.775	712.351	-712.351
9	34.384	25.318	14.215	-14.215	265.198	-265.198
10	-147.203	171.680	-182.970	-191.130	-63.031	63.031
11	-281.667	12.282	-231.947	-142.152	-35.062	35.062
12	66.233	72.964	35.692	-35.692	131.797	-131.797
13	22.829	23.242	11.813	-11.813	289.273	-289.273
14	-37.600	-43.702	-20.847	20.847	123.046	-123.046
15	-72.964	98.358	-87.697	-96.161	9.036	-9.036
16	-121.600	43.702	-104.912	-78.946	20.848	-20.848

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-16.743	-291.441	-8.371
2	-2.596	-361.077	-2.110
3	-9.867	-791.298	-6.995
7	.000	.000	106.963

COMBINACAO 7

ACC.BASE(-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-13.125	-3.281	-6.563	6.563	290.340	-290.340

2	- .688	-2.692	- .751	.751	363.922	-363.922
3	-7.565	-16.561	-5.361	5.361	789.554	-789.554
4	3.281	-26.250	-6.563	6.563	290.340	-290.340
5	-53.139	17.963	-43.738	-32.012	-29.675	29.675
6	-60.806	8.698	-46.560	-29.190	-64.368	64.368
7	55.831	65.652	28.924	-28.924	320.184	-320.184
8	59.405	63.786	29.331	-29.331	710.982	-710.982
9	17.552	3.626	5.043	-5.043	261.150	-261.150
10	-152.015	169.755	-184.093	-190.007	-22.308	22.308
11	-280.935	13.136	-231.683	-142.417	-16.754	16.754
12	86.362	87.704	44.632	-44.632	136.091	-136.091
13	47.394	45.361	23.783	-23.783	289.291	-289.291
14	-16.763	-28.917	-11.713	11.713	118.733	-118.733
15	-87.704	87.331	-91.991	-91.867	-12.068	12.068
16	-132.692	28.917	-109.225	-74.633	11.713	-11.713

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-13.125	-290.340	-6.563
2	-.688	-363.922	-.751
3	-7.565	-789.554	-5.361
7	.000	.000	75.973

COMBINACAO 8
ACC.BASE W

arquivo
central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.262	-.316	-.631	.631	540.464	-540.464
2	8.207	16.339	5.455	-5.455	496.972	-496.972
3	2.441	4.972	1.647	-1.647	1236.378	-1236.378
4	.316	-2.524	-.631	.631	540.464	-540.464
5	-39.497	65.826	-52.424	-61.201	-9.436	9.436
6	-46.847	63.462	-54.043	-59.582	4.025	-4.025
7	23.157	39.382	14.890	-14.890	444.548	-444.548
8	-23.951	-25.665	-11.813	11.813	1121.134	-1121.134
9	-60.937	-86.113	-35.012	35.012	480.882	-480.882
10	-96.179	381.563	-249.211	-344.339	-23.487	23.487
11	-322.924	186.910	-319.444	-274.106	-19.066	19.066
12	56.796	71.812	32.977	-32.977	195.337	-195.337
13	-32.974	-30.344	-16.236	16.236	457.350	-457.350
14	-100.797	-110.105	-54.077	54.077	206.776	-206.776
15	-71.812	188.987	-125.137	-164.195	70.311	-70.311
16	-158.642	110.105	-152.756	-136.577	54.077	-54.077

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
-------------	-------------------	------------------	--------------------

1	-1.262	-540.464	-.631
2	8.207	-496.972	5.455
3	2.441	-1236.378	1.647
7	.000	.000	-38.406

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U. PORTO

ac arquivo central

Viga V3.21:

Dimensões: $b = 0,625m$ $n = 0,35m$

Viga embebida de dois tramos. Esforços actuantes originários de

- consideração da zona maciça idêntica à viga V3.27, inserida no pórtico equivalente transversal PA2AC, garantindo resistência aos esforços correspondentes. (Ver PA2AC1);
- viga funcionando com o apoio da laje L3.2 (ver diagramas de PA2AC2 - Piso 3);
- Existência de parede exterior:

Parede exterior - janelas $1,20 \times 2,10$ (2 janelas)

$$p = 5,0 \times (3,90 - 0,35) - \frac{5,0 \times 1,20 \times 2,10}{12} \times 2 = 15,65 \text{ KN/m}$$

$$M_{sd}^+ = M_{sd}^- = 1,5 \times \frac{pL^2}{16} = 52,8 \text{ KN.m}$$

MOMENTOS ACTUANTES

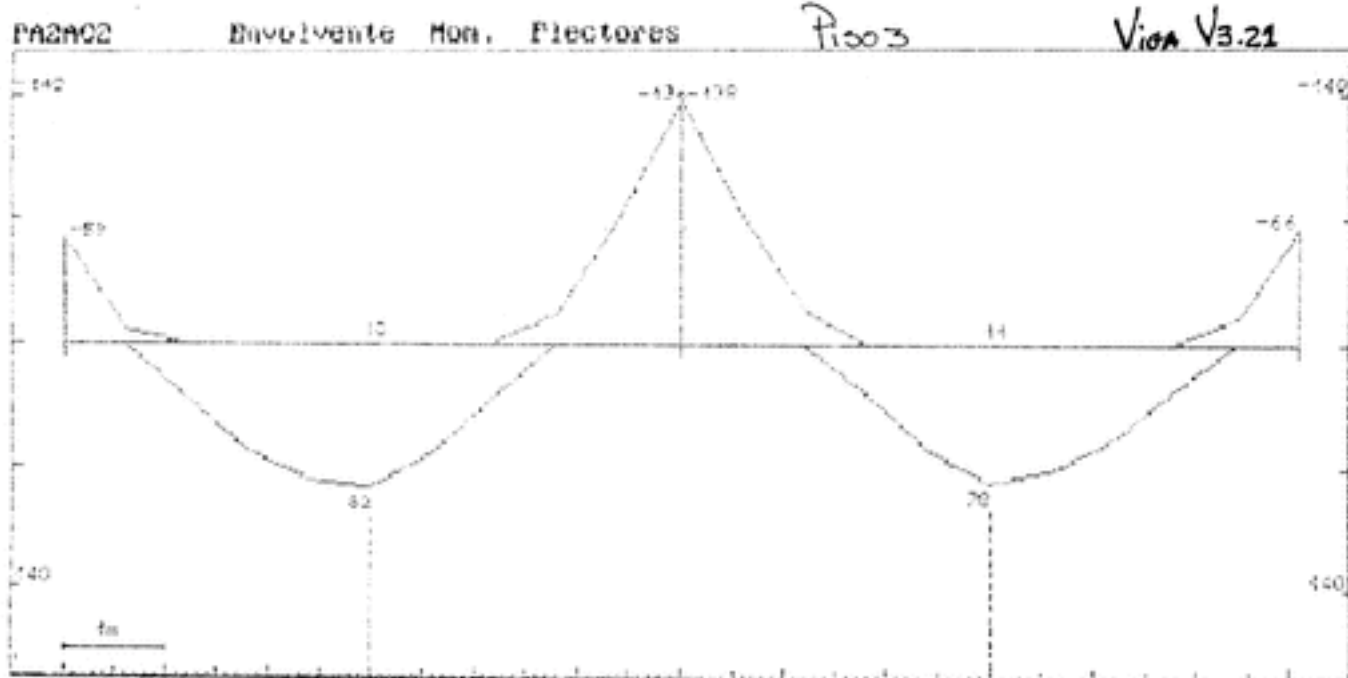
i)		$0,4 \times 65 = 26,0$		$0,4 \times 58,85 = 24$	
ii)	-59	+82	-138	+78	-66
iii)	-52,8	+52,8	-52,8	+52,8	-52,8
$M_{sd} =$	-111,8	+160,8	-190,8	+153,8	-118,8
$\mu =$	0,117	0,1614	0,20	0,1582	0,125
$A_s (m^2)$	11,2	16,4	20,6	15,7	12,0

Varões - (Admitindo alguma redistribuição, fundamentalmente devido à parcela de momentos iii))

HQ221	$6\phi 16$	HQ221	$6\phi 16$	HQ221
+		+	+	+
$4\phi 12$	+	$6\phi 16$	$6\phi 12$	$4\phi 12$
+	$6\phi 12$	+		+
$4\phi 12$		$6\phi 12$		$4\phi 12$

Esforço transverso: $V_{cd} = 154,6 \text{ KN}$; $V_{sd}^{max} = 215,3 \text{ KN}$; $A_{sw}^{min} / s = 7 \text{ m}^2 / m$
 $\phi 6 @ 0,15(4r)$; $V_{Rd}^{min} = 75,5 \text{ KN}$; $V_{Rd}^{min} = 221 \text{ KN}$.

Estribos mínimos: $\phi 6 @ 0,15(4 \text{ ramos})$



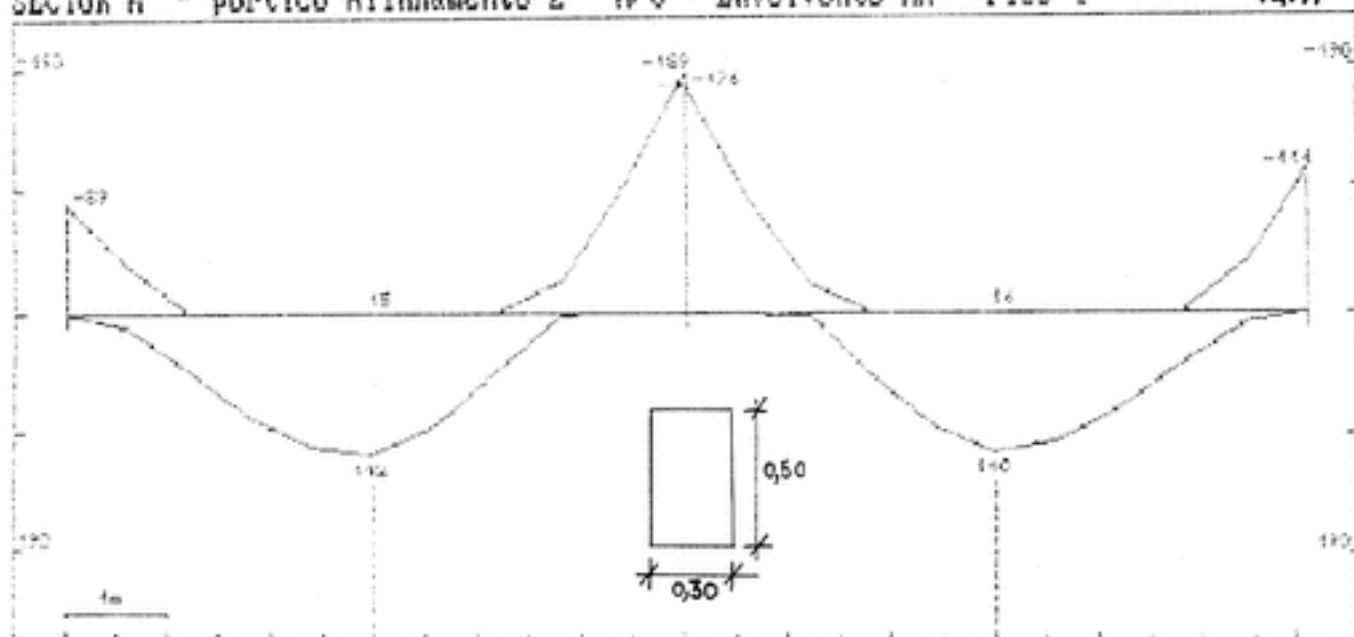
U. PORTO

ac arquivo central

Viga V3.21 - Diagrama de momentos devido às ações sobre a laje L3.1

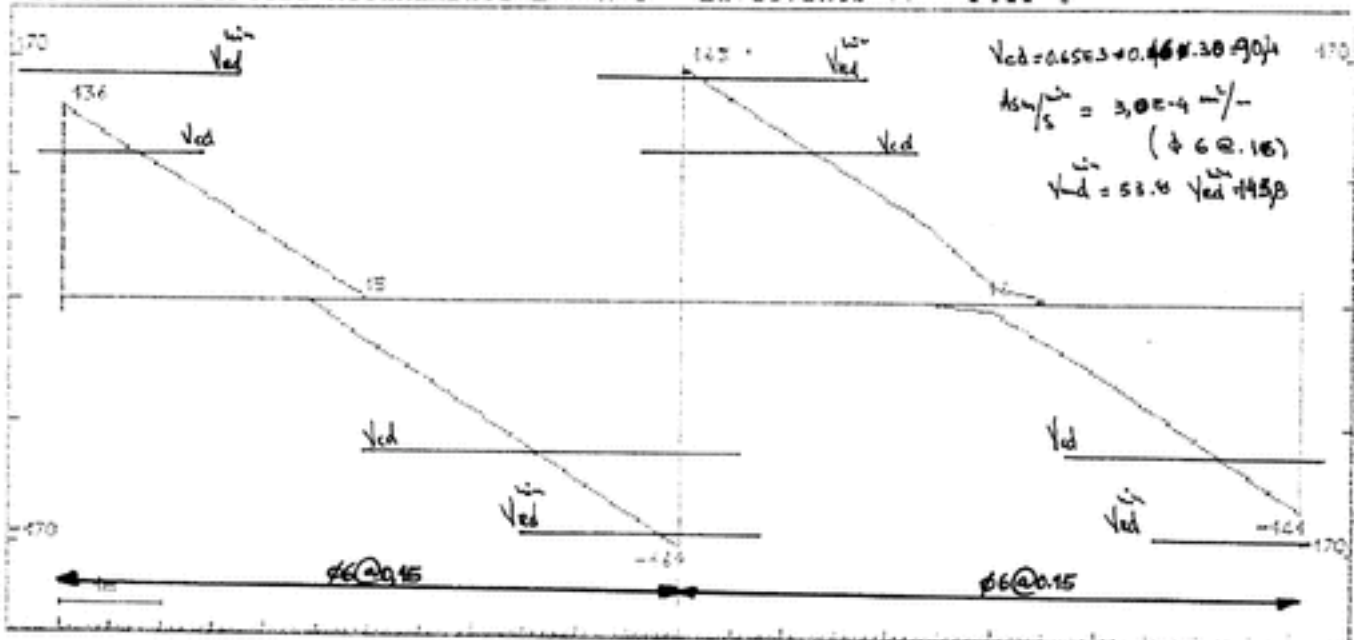
SECTOR A - portico Alinhamento 2 - A/C - Envolvente MM - Piso 4

V4.17

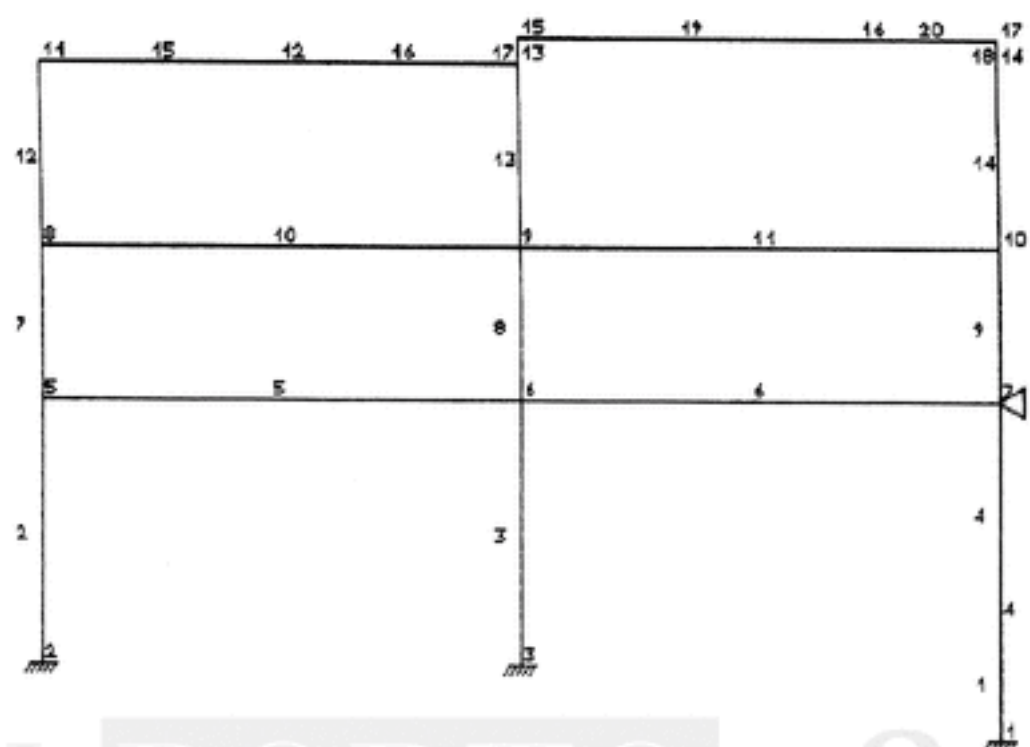


Med(k)	-80	112	-175	110	-100
μ	0,095	0,13	0,207	0,180	0,118
w	0,104	0,15	0,250	0,147	0,132
h_s	5,47	7,93	13,2	7,767	6,98
$2\phi 16$		4 $\phi 16$	7 $\phi 16$	4 $\phi 16$	2 $\phi 16$
$2\phi 12$					+ 3 $\phi 12$

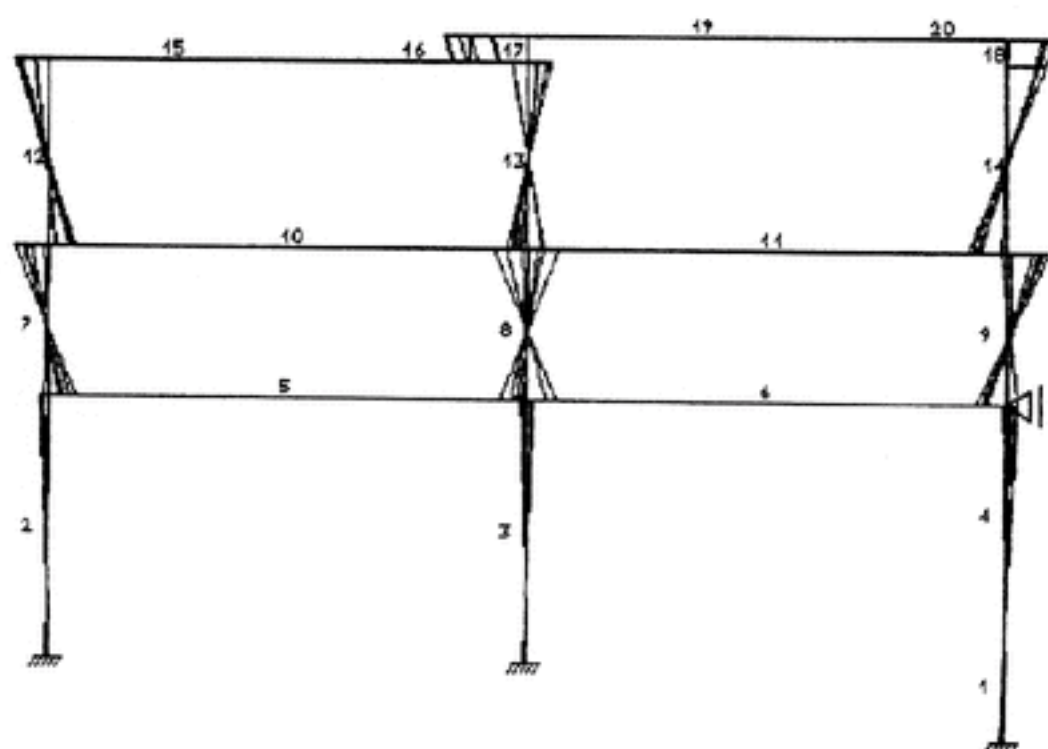
SECTOR A - Portico Alinhamento 2 - A/C - Envolvente UV - Piso 4



SECTOR A - Portico Alinhamento 3 - A/C



SECTOR A - Portico Alinhamento 3 - A/C - Envolvente MM - Pilares

arquivo
central

SECTOR A -- Portico Alinhamento 3 -- A-C

No. DE NOS	= 17	No. DE BARRAS	= 20
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 4	No. DE SECCOES TIPO	= 8
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS=	1

MATERIAL	E (KPa)	PROPRIEDADES b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.60000E+00	.35000E+00
4	.29000E+08	.30000E+00	.13500E+01
5	.29000E+08	.20000E+01	.35000E+00
6	.29000E+08	.25000E+00	.40000E+00
7	.29000E+08	.35000E+00	.20000E+01
8	.29000E+08	.10000E+01	.25000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	8	2	2 5	1	3	3 6	2
4	4 7	8	5	5 8	6	6	6 7	6
7	5 8	1	8	8 9	2	9	7 10	2
10	8 9	5	11	9 10	5	12	8 11	1
13	9 13	2	14	10 14	2	15	11 12	3
16	12 13	3	17	13 15	7	18	14 17	7
19	15 16	4	20	16 17	4			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	6.000	.000
4	12.000	1.000	5	.000	5.500	6	6.000	5.500
7	12.000	5.500	8	.000	8.700	9	6.000	8.700
10	12.000	8.700	11	.000	12.600	12	3.000	12.600
13	6.000	12.600	14	12.000	12.600	15	6.000	13.100
16	10.250	13.100	17	12.000	13.100			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	7	0	0	1

PILARES

Volume de Material (m3)= 8.1862 Area de Cofragem (m2)= 66.1600

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 13.2900 Area de Cofragem (m2)= 70.8000

ACCAO 1

PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	25.970	16	25.970
19	51.960	20	58.760
10	49.200	11	49.200

5 12.625

6 12.625

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		13.970	
11		81.000	
13		81.000	
15		81.000	
17		81.000	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
19	14.400	20	16.950
10	18.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
15		18.000	
17		18.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	9.270	18	9.270
11	18.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		4.770	
11		18.000	
13		18.000	

 ACCAO 4
 SISMO1(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
11			30.620

 ACCAO 5
 SISMO2(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
11			37.800
8			4.400

 ACCAO 8
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
11			26.940
8			1.050

RESULTADOS

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.80000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-3.234	-.231	-1.388	1.388	785.705	-785.705
2	5.584	10.707	2.962	-2.962	620.189	-620.189
3	.294	.253	.100	-.100	1592.016	-1592.016
4	.231	-8.468	-1.388	1.388	785.705	-785.705
5	-49.616	56.019	-55.745	-57.880	-26.703	26.703
6	-49.780	60.041	-55.099	-58.526	-22.503	22.503
7	38.909	56.017	29.885	-29.885	564.444	-564.444
8	-8.512	-8.610	-4.100	4.100	1479.036	-1479.036
9	-53.573	-81.547	-42.225	42.225	727.179	-727.179
10	-124.072	354.612	-263.943	-340.857	-8.462	8.462
11	-327.065	172.290	-328.196	-276.604	-.587	.587
12	68.055	83.096	38.757	-38.757	300.500	-300.500
13	-21.138	-25.568	-11.976	11.976	809.986	-809.986
14	-90.743	-76.223	-42.812	42.812	450.574	-450.574
15	-83.096	-135.036	-152.001	-6.579	54.921	-54.921

.51.

16	135.036	206.902	34.689	-193.269	54.921	-54.921
17	-181.294	202.795	43.003	-43.003	468.212	-468.212
18	76.248	-97.694	-42.874	42.874	450.588	-450.588
19	-202.779	-257.029	-319.713	-103.332	42.917	-42.917
20	257.029	97.702	103.334	-302.073	42.920	-42.920

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.234	-785.705	-1.388
2	5.584	-620.189	2.982
3	.294	-1592.018	.100
7	.000	.000	-18.338

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE
PERMANENTES-G	1.50000
SOBRECARGA2-Q2	.00000
SISMO2(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	1.50000
SISMO1(e1i)-E1	.00000
VENTO -W	.80000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-4.269	-.305	-1.830	1.830	714.872	-714.872
2	5.241	10.091	2.788	-2.788	558.097	-558.097
3	1.847	3.076	.859	-.859	1418.355	-1418.355
4	.305	-8.539	-1.830	1.830	714.872	-714.872
5	-48.014	59.479	-54.902	-58.723	-27.071	27.071
6	-49.418	57.712	-55.430	-58.195	-14.593	14.593
7	37.923	57.625	29.859	-29.859	503.195	-503.195
8	-13.140	-24.044	-11.820	11.820	1304.202	-1304.202
9	-49.173	-62.478	-34.891	34.891	656.677	-656.677
10	-120.097	323.266	-268.538	-336.282	-2.388	2.388
11	-268.622	132.042	-244.183	-198.837	.379	-.379
12	62.472	65.747	32.877	-32.877	234.657	-234.657
13	-30.800	-25.511	-14.387	14.387	723.778	-723.778
14	-69.585	-65.030	-34.511	34.511	458.040	-458.040
15	-65.747	-98.427	-113.157	-3.708	49.041	-49.041
16	98.427	150.859	24.883	-141.528	49.041	-49.041
17	-125.308	142.662	34.709	-34.709	460.747	-460.747
18	65.059	-82.355	-34.580	34.580	458.034	-458.034
19	-142.648	-285.431	-312.247	-110.798	34.626	-34.626
20	285.431	82.364	110.800	-309.538	34.628	-34.628

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-4.269	-714.872	-1.830
2	5.241	-558.097	2.788
3	1.847	-1418.355	.859
7	.000	.000	-18.469

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO	-W .60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	He (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-2.822	-.202	-1.209	1.209	692.144	-692.144
2	6.499	12.592	3.471	-3.471	543.185	-543.185
3	-.914	-2.174	-.581	.581	1410.286	-1410.286
4	.202	-5.844	-1.209	1.209	692.144	-692.144
5	-46.878	58.058	-55.282	-58.343	-20.013	20.013
6	-52.883	58.603	-55.859	-57.766	-23.250	23.250
7	34.286	40.862	23.484	-23.484	487.903	-487.903
8	-1.002	9.585	2.876	-2.876	1296.084	-1296.084
9	-52.959	-84.090	-42.828	42.828	634.378	-634.378
10	-94.917	290.976	-188.723	-254.077	-9.603	9.603
11	-291.224	175.030	-321.766	-283.034	1.132	-1.132
12	54.055	77.440	33.717	-33.717	299.179	-299.179
13	-9.317	-22.114	-8.059	8.059	720.243	-720.243
14	-90.940	-71.673	-41.696	41.696	351.344	-351.344
15	-77.440	-136.728	-150.880	-7.900	49.881	-49.881
16	136.728	209.173	36.010	-194.590	49.881	-49.881
17	-187.018	207.957	41.878	-41.878	377.148	-377.148
18	71.896	-92.579	-41.745	41.745	351.336	-351.336
19	-207.942	-174.672	-255.649	-75.596	41.793	-41.793
20	174.672	92.588	75.597	-229.842	41.796	-41.796

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-2.822	-692.144	-1.209
2	6.499	-543.185	3.471
3	-.914	-1410.286	-.581
7	.000	.000	-18.366

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO2(e2i)-E2	.00000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	He (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)

1	6.630	.474	2.841	-2.841	497.386	-497.386
2	8.552	17.753	4.783	-4.783	330.293	-330.293
3	6.699	14.272	3.813	-3.813	907.375	-907.375
4	-.474	13.260	2.841	-2.841	497.386	-497.386
5	-7.121	61.751	-28.770	-46.980	10.489	-10.489
6	-9.192	67.077	-28.227	-47.523	58.790	-58.790
7	-10.631	-7.631	-5.707	5.707	301.523	-301.523
8	-68.831	-75.530	-44.488	44.488	832.188	-832.188
9	-80.337	-102.824	-57.238	57.238	449.864	-449.864
10	-16.794	243.713	-131.360	-207.020	41.649	-41.649
11	-125.133	174.027	-161.051	-177.349	20.673	-20.673
12	24.424	33.247	14.788	-14.788	170.143	-170.143
13	-43.050	-48.640	-23.510	23.510	464.097	-464.097
14	-71.203	-71.404	-38.586	38.586	272.515	-272.515
15	-33.247	-79.030	-81.943	-7.091	60.721	-60.721
16	79.030	123.429	22.969	-112.003	60.719	-60.719
17	-74.651	93.246	37.378	-37.378	263.892	-263.892
18	71.463	-90.033	-37.155	37.155	272.511	-272.511
19	-93.245	-132.163	-175.692	-69.618	37.080	-37.080
20	132.163	90.028	69.619	-184.314	37.071	-37.071

REACOES NOS APOIOS

NO DO APOIO	MOHENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.630	-497.386	2.841
2	8.552	-330.293	4.783
3	6.699	-907.375	3.813
7	.000	.000	-118.869

 COMBINACAO 5
 ACC.BASE E2

ACCAO COEFICIENTE
 PERMANENTES-G 1.00000
 SOBRECARGA2-Q2 .40000
 SISMO2(e2i)-E2 1.50000

ACCAO COEFICIENTE
 SOBRECARGA1-Q1 .40000
 SISMO1(e1i)-E1 .00000
 VENTO -W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOHENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	2.481	.177	1.063	-1.063	490.492	-490.492
2	6.486	13.210	3.581	-3.581	336.987	-336.987
3	3.886	6.169	2.192	-2.192	907.575	-907.575
4	-.177	4.962	1.063	-1.063	490.492	-490.492
5	-17.952	51.549	-32.275	-43.475	-1.303	1.303
6	-20.536	53.992	-32.299	-43.451	26.640	-26.640
7	4.742	10.888	4.884	-4.884	304.712	-304.712
8	-39.182	-43.220	-25.751	25.751	831.802	-831.802
9	-58.954	-75.151	-41.908	41.908	447.041	-447.041
10	-30.086	232.783	-135.417	-202.963	-1.096	1.096
11	-138.281	156.518	-166.161	-172.239	.687	-.687
12	19.200	29.862	12.580	-12.580	169.295	-169.295
13	-51.282	-56.100	-27.534	27.534	462.658	-462.658
14	-81.365	-79.399	-41.222	41.222	274.802	-274.802
15	-29.862	-79.872	-81.095	-7.939	69.282	-69.282
16	79.872	125.131	23.817	-112.851	69.284	-69.284
17	-68.914	89.796	41.951	-41.951	261.605	-261.605

18	79.480	-100.224	-41.543	41.543	274.798	-274.798
19	-89.784	-125.904	-173.405	-71.905	41.627	-41.627
20	125.904	100.289	71.908	-186.601	41.630	-41.630

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	2.481	-490.492	1.063
2	6.486	-336.987	3.581
3	3.886	-907.575	2.192
7	.000	.000	-89.611

 COMBINACAO 6
 ACC.BASE(-E1)

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO2(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO1(e1i)-E1	-1.50000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-13.542	-.967	-5.804	5.804	404.003	-404.003
2	-1.742	-4.860	-1.200	1.200	394.708	-394.708
3	-7.763	-17.011	-4.504	4.504	936.344	-936.344
4	.967	-27.085	-5.804	5.804	404.003	-404.003
5	-61.340	10.210	-46.397	-29.353	-47.047	47.047
6	-85.303	3.307	-48.208	-27.542	-99.770	99.770
7	68.201	80.509	45.847	-45.847	348.311	-348.311
8	72.104	82.195	46.218	-48.218	858.783	-858.783
9	23.778	18.940	13.349	-13.349	376.460	-376.460
10	-139.796	137.609	-169.565	-168.835	-48.625	48.625
11	-254.427	.211	-211.569	-126.831	-18.586	18.586
12	59.287	66.793	32.328	-32.328	178.747	-178.747
13	34.624	36.272	18.178	-18.178	478.379	-478.379
14	-19.151	-1.269	-5.236	5.236	249.630	-249.630
15	-66.793	-71.297	-90.547	1.513	-13.606	13.606
16	71.297	105.350	14.365	-103.399	-13.604	13.604
17	-141.764	144.071	4.427	-4.427	286.777	-286.777
18	1.212	-3.534	-4.658	4.658	249.626	-249.626
19	-144.067	-178.603	-198.577	-46.733	4.732	-4.732
20	178.602	3.539	46.734	-161.429	4.721	-4.721

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-13.542	-404.003	-5.804
2	-1.742	-394.708	-1.200
3	-7.763	-936.344	-4.504
7	.000	.000	118.923

 COMBINACAO 7

ACC.BASE(-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISHO1(e1i)-E1	.00000
SISHO2(e2i)-E2	-1.50000	VENTO	-W .00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-9.393	-.871	-4.028	4.028	410.897	-410.897
2	.323	-.317	.001	-.001	388.013	-388.013
3	-4.951	-10.908	-2.884	2.884	938.144	-938.144
4	.871	-18.787	-4.028	4.028	410.897	-410.897
5	-50.510	20.412	-42.891	-32.859	-35.255	35.255
6	-53.958	18.392	-44.136	-31.614	-67.820	67.820
7	50.827	81.992	35.258	-35.258	345.122	-345.122
8	44.455	49.885	29.481	-29.481	859.150	-859.150
9	2.394	-8.733	-1.981	1.981	379.283	-379.283
10	-126.503	148.538	-185.528	-172.872	-5.879	5.879
11	-241.280	17.722	-208.460	-131.940	1.400	-1.400
12	64.511	70.178	34.538	-34.538	179.594	-179.594
13	42.858	43.732	22.202	-22.202	479.818	-479.818
14	-8.989	6.727	-.580	.580	247.342	-247.342
15	-70.178	-70.455	-91.395	2.381	-22.188	22.188
16	70.455	103.648	13.517	-102.551	-22.188	22.188
17	-147.501	147.521	-.148	.148	289.084	-289.084
18	-8.785	6.857	-.270	.270	247.339	-247.339
19	-147.528	-184.862	-200.884	-44.448	.165	-.165
20	184.862	-6.722	44.447	-159.142	.162	-.162

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-9.393	-410.897	-4.028
2	.323	-388.013	.001
3	-4.951	-938.144	-2.884
7	.000	.000	89.885

COMBINACAO 8
ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISHO1(e1i)-E1	.00000
SISHO2(e2i)-E2	.00000	VENTO	-W 1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.057	-.075	-.453	.453	752.927	-752.927
2	8.985	13.787	3.777	-3.777	567.932	-567.932

3	2.106	4.189	1.145	-1.145	1479.387	-1479.387
4	.075	-2.113	-.453	.453	752.927	-752.927
5	-41.813	63.291	-53.233	-80.392	-18.043	18.043
6	-43.928	66.399	-53.067	-60.558	-1.559	1.559
7	28.028	41.798	21.820	-21.820	514.699	-514.699
8	-23.553	-25.534	-15.340	15.340	1365.927	-1365.927
9	-64.288	-89.687	-48.110	48.110	692.369	-692.369
10	-94.260	343.584	-238.546	-319.654	-7.387	7.387
11	-277.515	189.698	-292.736	-263.464	-.593	.593
12	52.462	67.590	30.782	-30.782	278.153	-278.153
13	-40.534	-45.793	-22.135	22.135	753.538	-753.538
14	-100.032	-89.908	-48.703	48.703	428.905	-428.905
15	-67.589	-126.572	-137.753	-8.312	71.192	-71.192
16	126.572	195.353	34.276	-180.341	71.194	-71.194
17	-149.454	174.040	49.175	-49.175	432.793	-432.793
18	89.972	-114.428	-48.838	48.838	428.900	-428.900
19	-174.009	-228.215	-292.393	-103.112	48.978	-48.978
20	228.215	114.449	103.113	-288.504	48.984	-48.984

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.057	-752.927	-.453
2	6.985	-567.932	3.777
3	2.106	-1479.387	1.145
7	.000	.000	-46.099

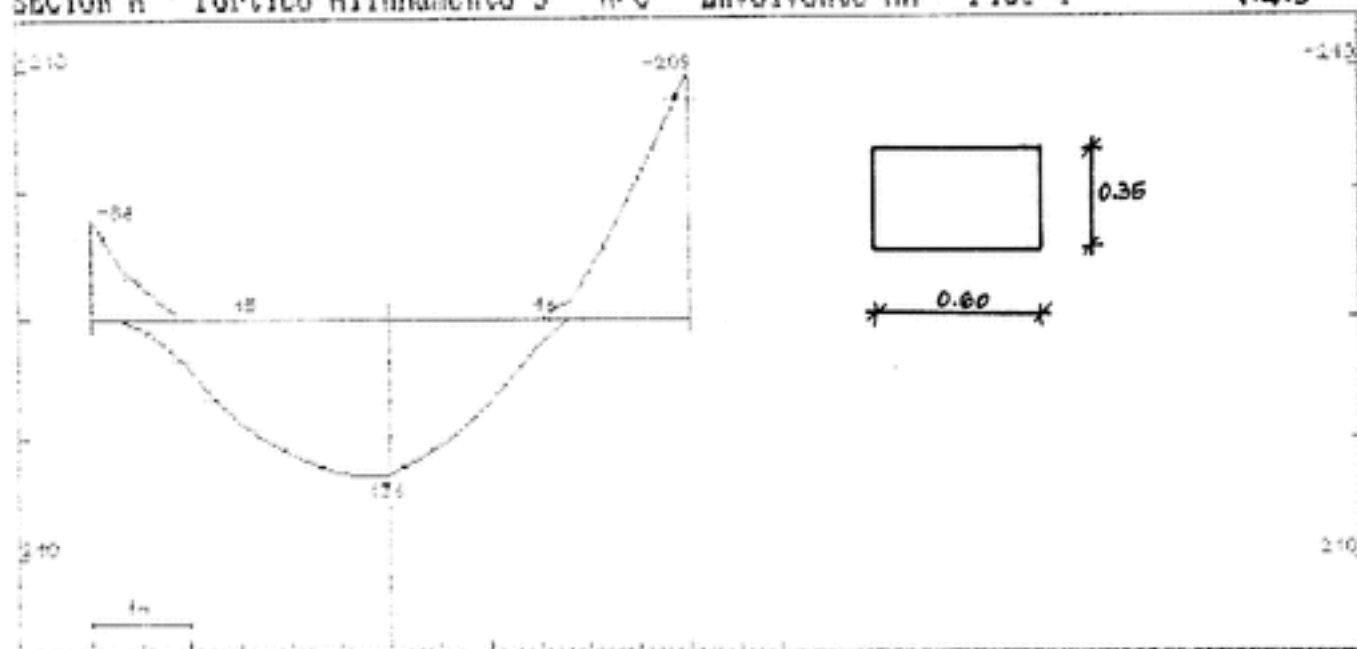
U. PORTO

#

arquivo
central

SECTOR A - Portico Alinhamento 3 - A/C - Envolvente MM - Piso 4

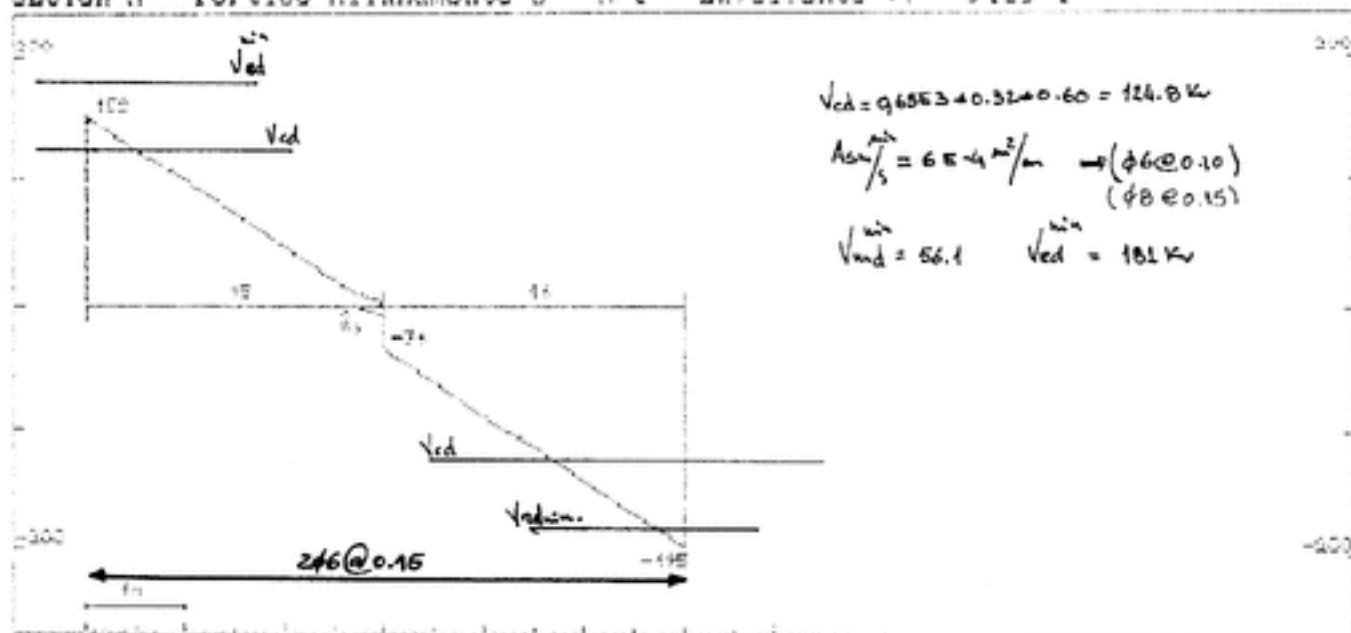
V.4.3



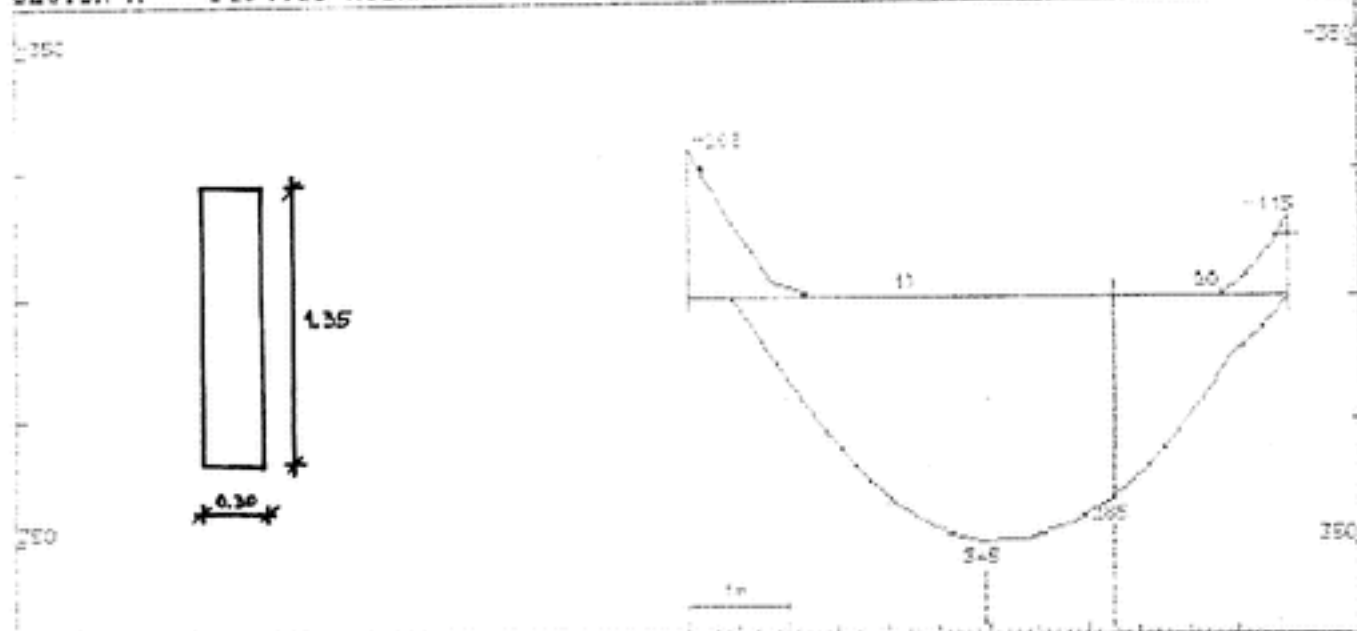
$M_{ed}(kN)$ - 66,2	156	- 185
μ 0,081	0,166	0,226
w 0,087	0,194	0,277
A_s 6,43	14,25	20,4
2 ϕ 16 + 3 ϕ 12	8 ϕ 16	10 ϕ 16

arquivo
central

SECTOR A - Portico Alinhamento 3 - A/C - Envolvente UU - Piso 4

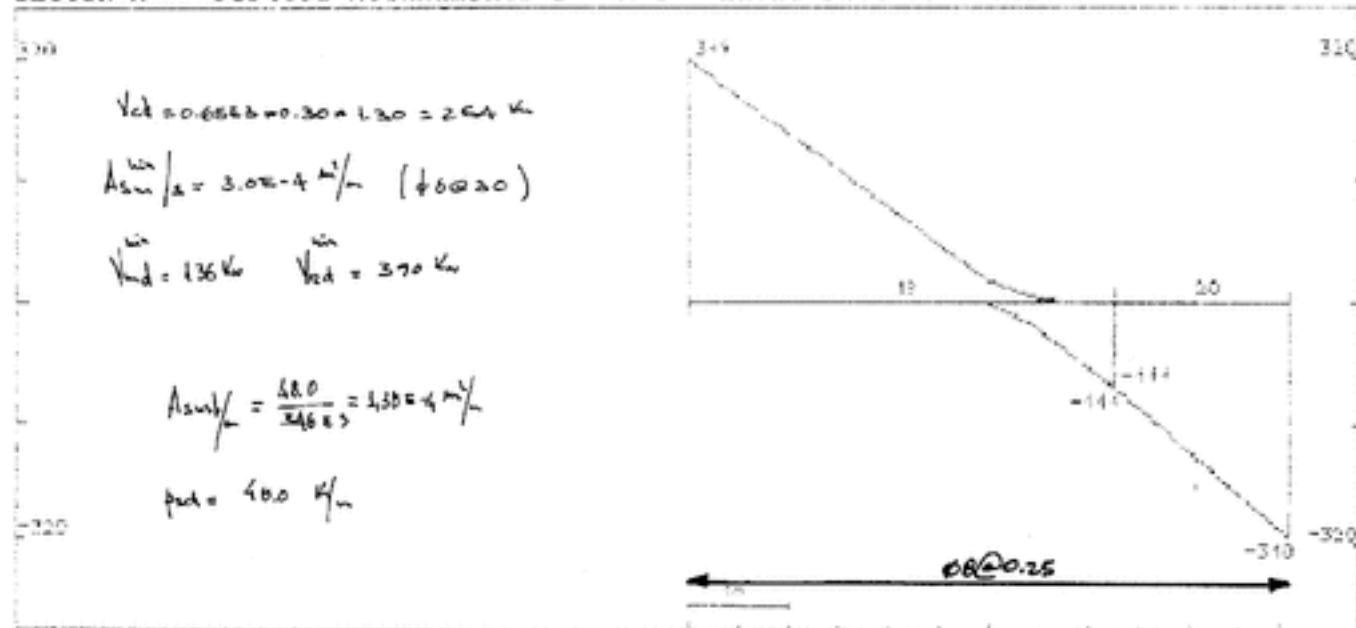


SECTOR A - Portico Alinhamento 3 - A/C - Envolvente MM - Piso 4 V4.19

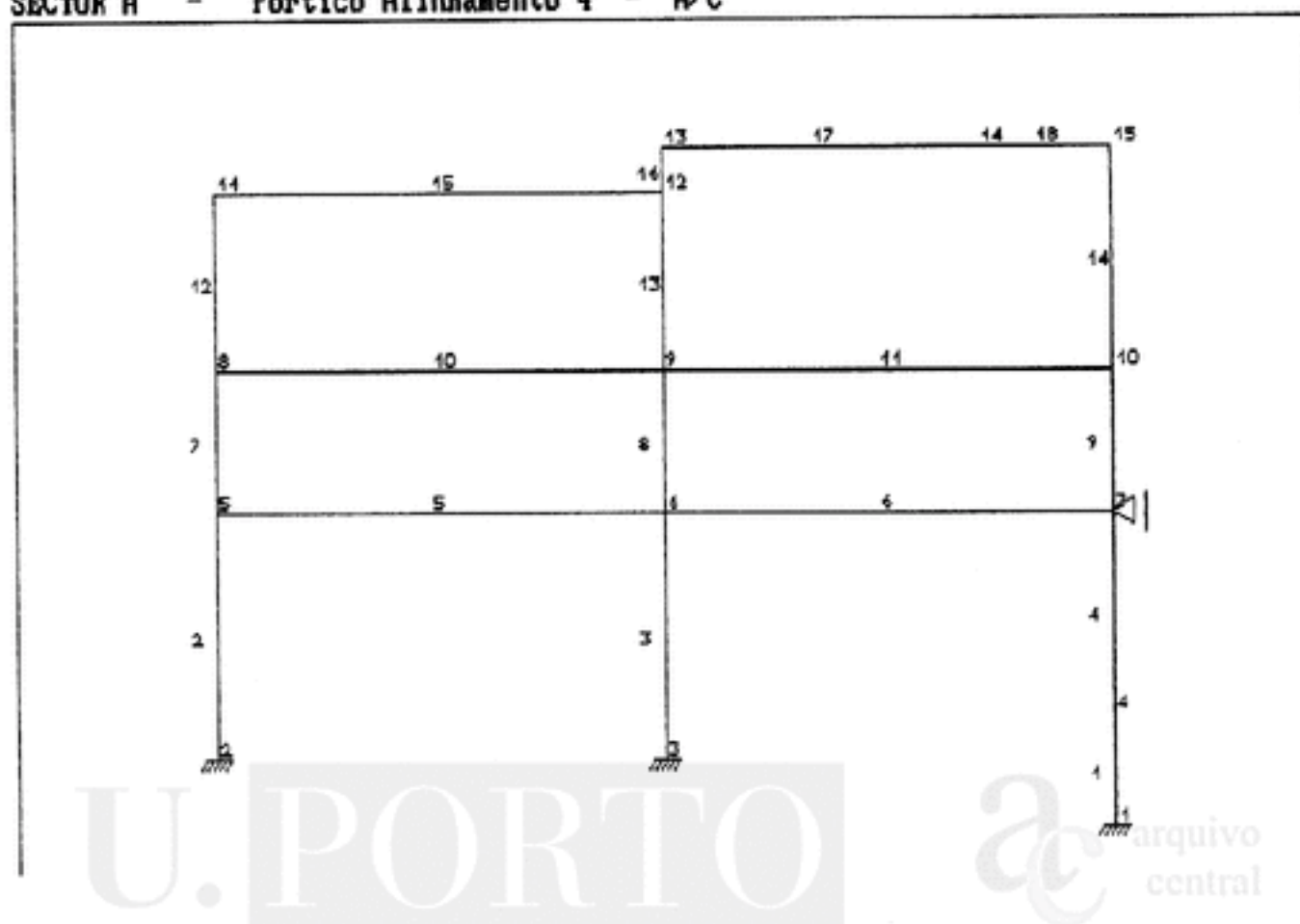


$A_{cl} = 3,92 m^2$	$M_{ed} (k \cdot m)$	-170	345	-105
	μ	0,0206	0,001	0,0156
	w	0,0289	0,0538	0,0166
Define o eadens de	$A_s (cm^2)$	4,21	8,2	2,36
Ala		5 ϕ 12	2 ϕ 12 + 3 ϕ 16	5 ϕ 12

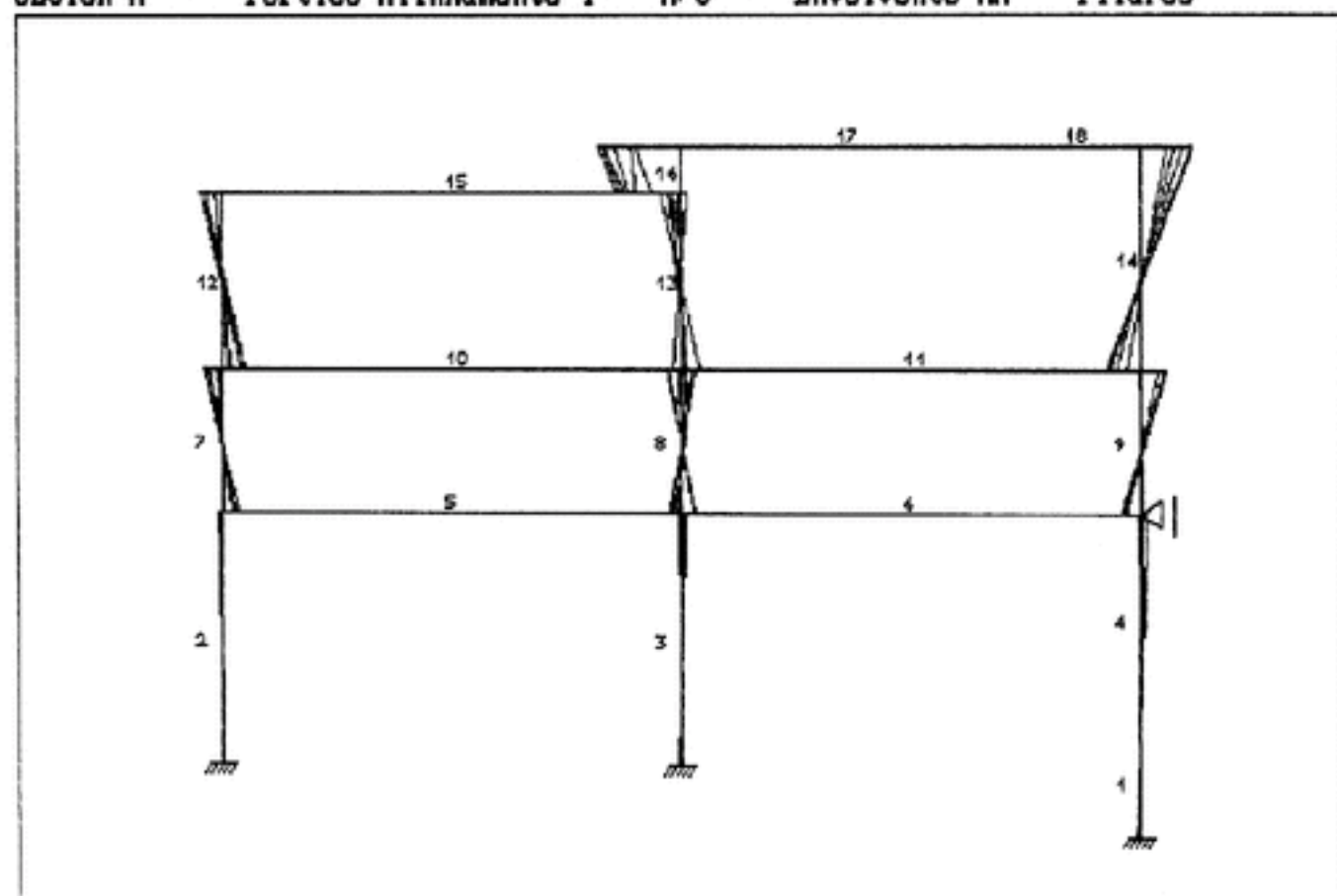
SECTOR A - Portico Alinhamento 3 - A/C - Envolvente W - Piso 4



SECTOR A - Portico Alinhamento 4 - A/C



SECTOR A - Portico Alinhamento 4 - A/C - Envolvente MM - Pilares



SECTOR A Portico alinhamento 4 -- A-C

NO. DE NOS	= 15	NO. DE BARRAS	= 18
NO. DE NOS POR BARRA	= 2	NO. DE INCOGNITAS POR NO	= 3
NO. DE APOIOS	= 4	NO. DE SECCOES TIPO	= 9
NO. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	E (KPa)	PROPRIEDADES	L (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00	
2	.29000E+08	.35000E+00	.35000E+00	
3	.29000E+08	.95000E+00	.35000E+00	
4	.29000E+08	.50000E+00	.35000E+00	
5	.29000E+08	.35000E+00	.35000E+00	
6	.29000E+08	.20000E+01	.35000E+00	
7	.29000E+08	.25000E+00	.40000E+00	
8	.29000E+08	.10000E+01	.25000E+00	
9	.29000E+08	.15000E+01	.35000E+00	

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	8	2	2 5	1	3	3 6	2
4	4 7	8	5	5 6	7	6	6 7	7
7	5 8	1	8	6 9	2	9	7 10	2
10	8 9	6	11	9 10	6	12	8 11	1
13	9 12	2	14	10 15	2	15	11 12	3
16	12 13	9	17	13 14	4	18	14 15	5

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	6.000	.000
4	12.000	1.000	5	.000	5.500	6	6.000	5.500
7	12.000	5.500	8	.000	8.700	9	6.000	8.700
10	12.000	8.700	11	.000	12.600	12	6.000	12.600
13	6.000	13.600	14	10.250	13.600	15	12.000	13.600

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	7	0	0	1

PILARES

Volume de Material (m3)= 6.1337 Area de Cofragem (m2)= 66.5600

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 12.5531 Area de Cofragem (m2)= 61.8375

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	24.000	17	37.180
18	27.413	10	49.200
11	49.200	5	12.625
6	12.625		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14		57.070	
11		81.000	
12		81.000	
13		81.000	
15		81.000	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
17	12.300	18	8.475
10	18.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14		9.000	
13		18.000	
15		18.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	9.000	11	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
11		18.000	
12		18.000	

 ACCAO 4
 SISMO1(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-7.260
11			33.400
8			17.740

 ACCAO 5
 SISMO2(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-7.560
11			34.800
8			12.440

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-4.932
11			21.000
8			10.420

RESULTADOS

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.787	-.271	-1.623	1.623	729.574	-729.574
2	5.391	10.345	2.861	-2.861	602.088	-602.088
3	.701	1.107	.329	-.329	1504.930	-1504.930
4	.271	-7.574	-1.623	1.623	729.574	-729.574
5	-49.044	57.289	-55.438	-58.187	-26.790	26.790
6	-50.067	58.637	-55.384	-58.241	-19.782	19.782
7	38.698	56.184	29.651	-29.651	546.650	-546.650
8	-8.329	-13.044	-6.679	6.679	1391.358	-1391.358
9	-51.062	-73.303	-38.864	38.864	671.333	-671.333
10	-129.329	337.399	-267.722	-337.078	-1.091	1.091
11	-340.361	184.650	-328.352	-276.448	-17.962	17.962
12	73.145	71.133	36.994	-36.994	278.928	-278.928
13	16.006	23.740	10.191	-10.191	725.928	-725.928
14	-111.348	-167.100	-56.826	56.826	394.885	-394.885

15	-71.133	179.564	-130.428	-166.572	49.594	-49.594
16	-203.304	263.090	59.786	-59.786	410.859	-410.859
17	-263.090	-181.644	-262.361	-53.074	56.826	-56.826
18	181.644	167.100	152.179	-246.385	56.826	-56.826

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.787	-729.574	-1.623
2	5.391	-602.088	2.861
3	.701	-1504.930	.329
7	.000	.000	-17.459

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-4.965	-3.355	-2.128	2.128	654.779	-654.779
2	5.047	9.736	2.688	-2.688	540.817	-540.817
3	2.190	4.216	1.165	-1.165	1343.996	-1343.996
4	.355	-9.930	-2.128	2.128	654.779	-654.779
5	-47.393	60.935	-54.555	-59.070	-27.185	27.185
6	-49.449	56.264	-55.677	-57.948	-11.027	11.027
7	37.657	57.934	29.872	-29.872	486.261	-486.261
8	-15.701	-32.275	-14.993	14.993	1229.250	-1229.250
9	-46.334	-52.137	-30.772	30.772	596.831	-596.831
10	-126.757	301.010	-273.358	-331.442	4.029	-4.029
11	-280.970	152.256	-242.852	-199.948	-23.841	23.841
12	68.823	56.350	32.096	-32.096	212.903	-212.903
13	12.236	37.984	12.877	-12.877	654.956	-654.956
14	-100.119	-167.485	-54.613	54.613	396.883	-396.883
15	-56.350	155.930	-91.403	-124.597	44.696	-44.696
16	-193.915	251.487	57.573	-57.573	408.860	-408.860
17	-251.487	-184.755	-260.363	-55.072	54.613	-54.613
18	184.755	167.485	154.177	-248.383	54.613	-54.613

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-4.965	-654.779	-2.128
2	5.047	-540.817	2.688
3	2.190	-1343.996	1.165
7	.000	.000	-17.617

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.141	-.224	-1.346	1.346	652.636	-652.636
2	6.335	12.276	3.384	-3.384	527.540	-527.540
3	-.732	-1.791	-.459	.459	1326.257	-1326.257
4	.224	-6.282	-1.346	1.346	652.636	-652.636
5	-46.499	56.871	-55.084	-58.541	-20.091	20.091
6	-53.463	57.465	-56.149	-57.476	-21.996	21.996
7	34.223	40.895	23.475	-23.475	472.456	-472.456
8	-1.617	6.247	1.447	-1.447	1211.567	-1211.567
9	-51.163	-79.441	-40.814	40.814	595.160	-595.160
10	-98.124	281.391	-190.856	-251.944	-1.832	1.832
11	-303.519	176.572	-323.558	-281.242	-5.815	5.815
12	57.229	65.851	31.559	-31.559	281.600	-281.600
13	15.882	5.292	5.429	-5.429	636.065	-636.065
14	-97.131	-131.349	-46.629	46.629	313.917	-313.917
15	-65.851	158.249	-133.100	-163.900	44.159	-44.159
16	-163.541	213.129	49.588	-49.588	323.667	-323.667
17	-213.129	-142.417	-202.169	-34.853	46.629	-46.629
18	142.417	131.349	120.458	-192.417	46.628	-46.628

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.141	-652.636	-1.346
2	6.335	-527.540	3.384
3	-.732	-1326.257	-.459
7	.000	.000	-17.471

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	2.585	.185	1.108	-1.108	448.135	-448.135
2	6.488	13.245	3.588	-3.588	324.312	-324.312
3	4.204	8.848	2.373	-2.373	867.751	-867.751
4	-.185	5.171	1.108	-1.108	448.135	-448.135
5	-17.245	52.557	-31.990	-43.760	-.881	.881

6	-19.839	54.461	-32.105	-43.645	29.564	-29.564
7	4.000	10.302	4.469	-4.469	292.322	-292.322
8	-41.567	-48.264	-28.072	28.072	791.886	-791.886
9	-59.632	-75.470	-42.219	42.219	404.489	-404.489
10	-32.075	223.539	-137.289	-201.111	20.201	-20.201
11	-149.574	153.195	-168.596	-169.804	4.195	-4.195
12	21.773	20.648	10.877	-10.877	155.033	-155.033
13	-25.701	-21.355	-12.066	12.066	422.179	-422.179
14	-77.725	-108.593	-38.024	38.024	234.686	-234.686
15	-20.648	116.448	-66.833	-98.767	60.977	-60.977
16	-95.093	144.005	48.914	-48.914	235.213	-235.213
17	-144.005	-100.591	-147.014	-31.911	38.023	-38.023
18	100.591	108.593	92.581	-146.486	38.023	-38.023

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	2.585	-448.135	1.108
2	6.488	-324.312	3.588
3	4.204	-867.751	2.373
7	.000	.000	-72.891

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	2.007	.143	.860	-.860	446.967	-446.967
2	6.196	12.603	3.418	-3.418	325.062	-325.062
3	3.804	7.979	2.142	-2.142	868.169	-868.169
4	-.143	4.014	.860	-.860	446.967	-446.967
5	-18.786	51.102	-32.489	-43.261	-2.562	2.562
6	-21.434	52.633	-32.675	-43.075	24.983	-24.983
7	6.183	12.952	5.980	-5.980	292.573	-292.573
8	-37.648	-43.639	-25.402	25.402	792.233	-792.233
9	-56.647	-71.671	-40.100	40.100	403.892	-403.892
10	-33.658	222.304	-137.759	-200.641	14.247	-14.247
11	-151.311	150.541	-169.328	-169.072	1.729	-1.729
12	20.706	19.827	10.393	-10.393	154.814	-154.814
13	-27.354	-22.895	-12.884	12.884	422.264	-422.264
14	-78.869	-109.151	-38.371	38.371	234.820	-234.820
15	-19.827	116.943	-66.614	-98.986	62.593	-62.593
16	-94.048	143.757	49.710	-49.710	235.079	-235.079
17	-143.758	-100.267	-146.880	-32.045	38.371	-38.371
18	100.267	109.151	92.715	-146.620	38.371	-38.371

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
-------------	-------------------	------------------	--------------------

1	2.007	-446.967	.860
2	6.196	-325.062	3.418
3	3.804	-868.169	2.142
7	.000	.000	-65.943

 COMBINACAO 6
 ACC.BASE-(E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	-1.50000
SISMO2(e2i)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-10.105	-.722	-4.331	4.331	394.596	-394.596
2	.161	-.629	-.085	.085	378.601	-378.601
3	-4.650	-10.283	-2.715	2.715	867.000	-867.000
4	.722	-20.210	-4.331	4.331	394.596	-394.596
5	-50.076	21.394	-42.655	-33.095	-35.342	35.342
6	-54.764	14.420	-44.599	-31.151	-66.103	66.103
7	50.705	62.116	35.257	-35.257	335.946	-335.946
8	43.653	46.093	28.046	-28.046	789.306	-789.306
9	5.789	2.276	2.520	-2.520	363.445	-363.445
10	-129.073	138.602	-167.612	-170.788	-25.303	25.303
11	-242.300	42.767	-202.456	-135.945	-28.350	28.350
12	66.957	65.452	33.951	-33.951	168.334	-168.334
13	57.605	63.656	31.093	-31.093	416.063	-416.063
14	-45.043	-81.523	-25.830	25.830	227.501	-227.501
15	-65.452	81.446	-80.134	-85.466	-16.149	16.149
16	-145.103	160.045	14.941	-14.941	242.398	-242.398
17	-160.045	-115.087	-154.199	-24.726	25.832	-25.832
18	115.087	81.522	85.396	-139.301	25.831	-25.831

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-10.105	-394.596	-4.331
2	.161	-378.601	-.085
3	-4.650	-867.000	-2.715
7	.000	.000	72.954

 COMBINACAO 7
 ACC.BASE-(E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-9.527	-.680	-4.083	4.083	395.765	-395.765
2	.452	.013	.085	-.085	377.852	-377.852
3	-4.249	-9.414	-2.484	2.484	866.581	-866.581
4	.680	-19.053	-4.083	4.083	395.765	-395.765
5	-48.535	22.849	-42.156	-33.594	-33.662	33.662
6	-53.169	16.248	-44.028	-31.722	-61.522	61.522
7	48.523	59.466	33.746	-33.746	335.695	-335.695
8	39.734	41.469	25.376	-25.376	788.959	-788.959
9	2.805	-1.523	.401	-.401	364.043	-364.043
10	-127.490	139.837	-167.142	-171.258	-19.348	19.348
11	-240.563	45.422	-201.724	-136.676	-25.884	25.884
12	68.024	66.273	34.435	-34.435	168.554	-168.554
13	59.257	65.196	31.911	-31.911	415.978	-415.978
14	-43.899	-80.964	-25.482	25.482	227.367	-227.367
15	-66.273	80.952	-80.354	-85.246	-17.765	17.765
16	-146.147	160.292	14.145	-14.145	242.532	-242.532
17	-160.292	-115.410	-154.334	-24.591	25.483	-25.483
18	115.410	80.964	85.261	-139.167	25.483	-25.483

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-9.527	-395.765	-4.083
2	.452	-377.852	.085
3	-4.249	-866.581	-2.484
7	.000	.000	66.005

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.647	-.118	-.706	.706	693.783	-693.783
2	6.717	13.255	3.631	-3.631	551.459	-551.459
3	2.321	4.635	1.265	-1.265	1403.203	-1403.203
4	.118	-3.293	-.706	.706	693.783	-693.783
5	-41.838	63.901	-53.135	-60.490	-18.658	18.658
6	-44.574	64.823	-53.438	-60.187	-.500	.500
7	28.583	42.744	22.290	-22.290	498.323	-498.323
8	-23.963	-30.097	-16.894	16.894	1289.275	-1289.275
9	-61.530	-82.880	-45.128	45.128	633.595	-633.595
10	-101.500	325.211	-240.815	-315.385	8.267	-8.267
11	-294.564	192.601	-295.094	-261.106	-10.209	10.209
12	58.756	56.893	29.654	-29.654	257.509	-257.509
13	-.550	6.717	1.581	-1.581	678.796	-678.796
14	-109.721	-161.432	-55.337	55.337	372.489	-372.489
15	-56.893	172.340	-117.109	-155.591	61.154	-61.154

16	-179.058	241.793	62.736	-62.736	382.807	-382.807
17	-241.793	-168.134	-242.409	-49.502	55.337	-55.337
18	168.134	161.432	144.557	-232.089	55.336	-55.336

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.647	-693.783	- .706
2	6.717	-551.459	3.631
3	2.321	-1403.203	1.265
7	.000	.000	-43.922

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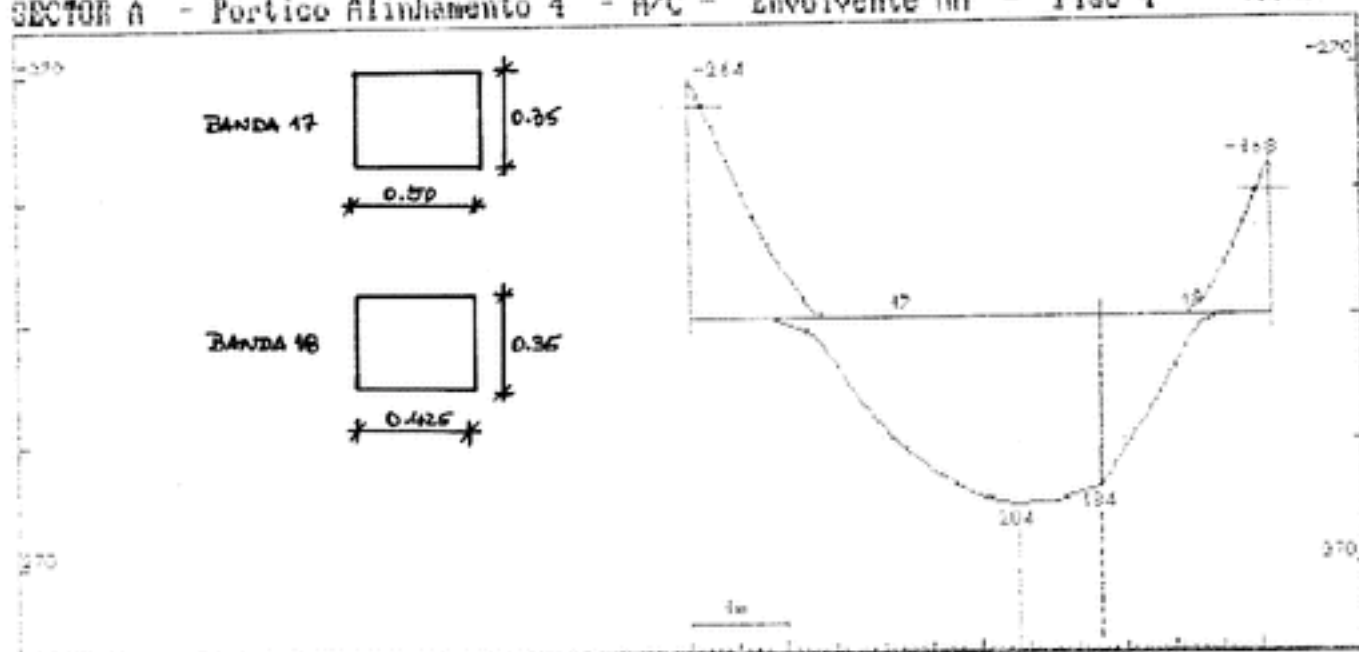
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U. PORTO

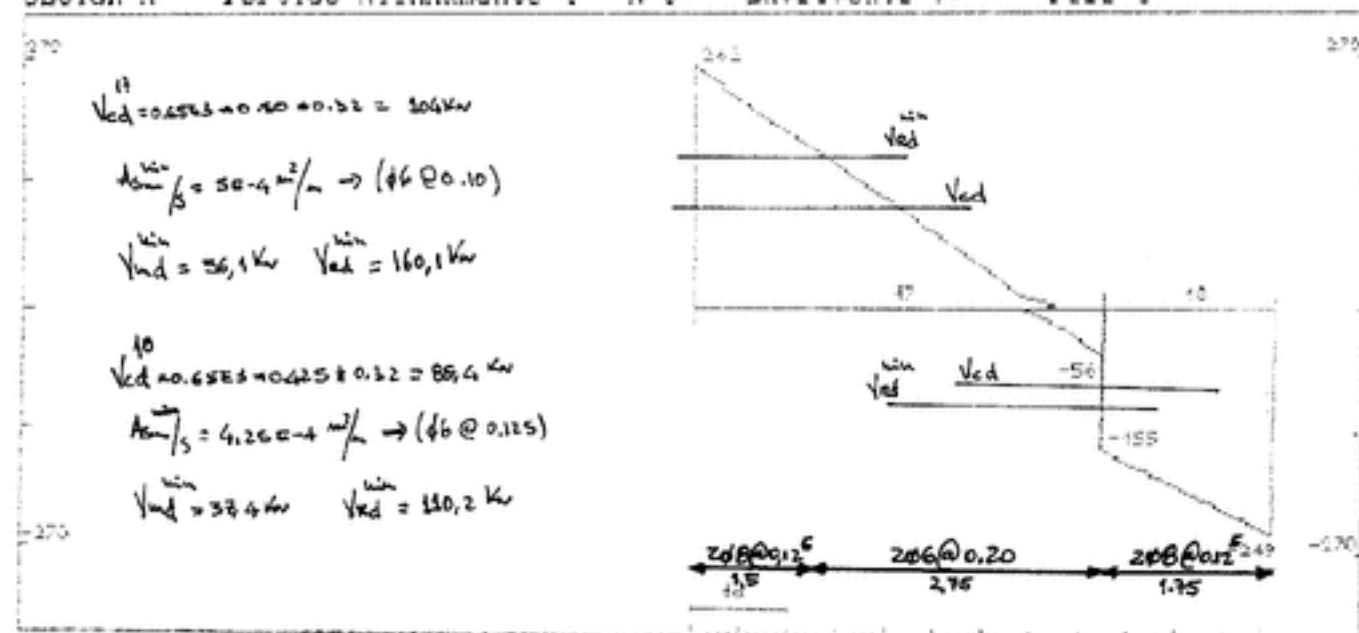

 arquivo
central

SECTOR A - Portico Alinhamento 4 - A/C - Envolvente MM - Piso 4 V.4.21

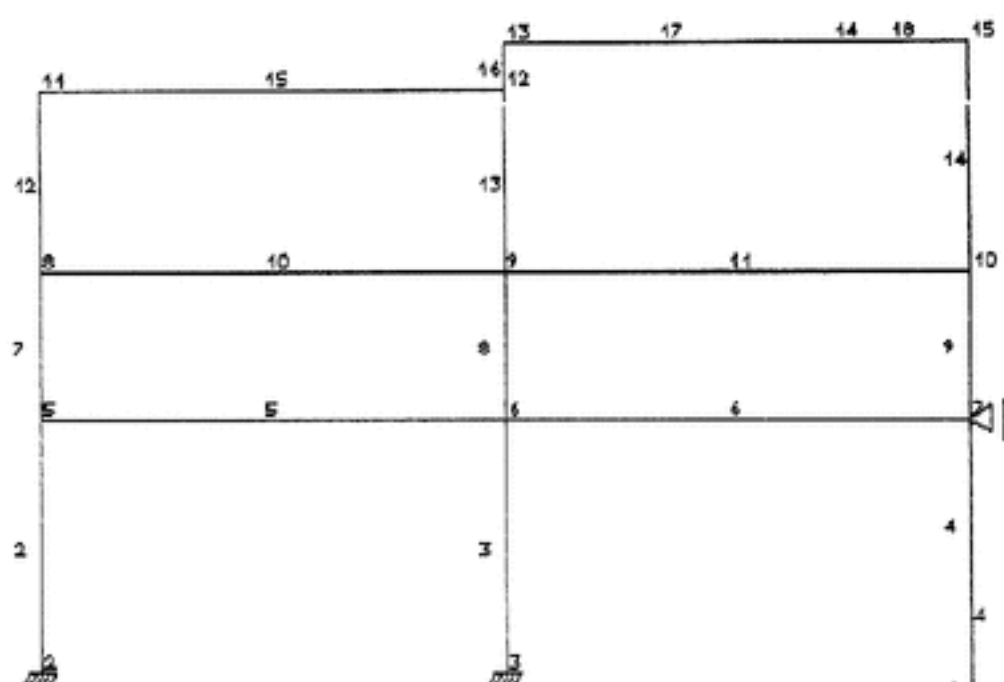


M_d (kNm)	-226	204	184	-130
μ	0.387	0.30	0.318	0.215
W	0.429 ($A'_A=0.6$)	0.324 ($A'_A=0.5$)	0.347 ($A'_A=0.5$)	0.275
A_s (cm ²)	25,6	19,82	18,04	14,31
	(-12,82)	(-9,91)	(-9,02)	
	8 ϕ 20	7 ϕ 20	6 ϕ 20	5 ϕ 20
	(-4 ϕ 20)	(-4 ϕ 20)	(-3 ϕ 20)	

SECTOR A - Portico Alinhamento 4 - A/C - Envolvente VU - Piso 4



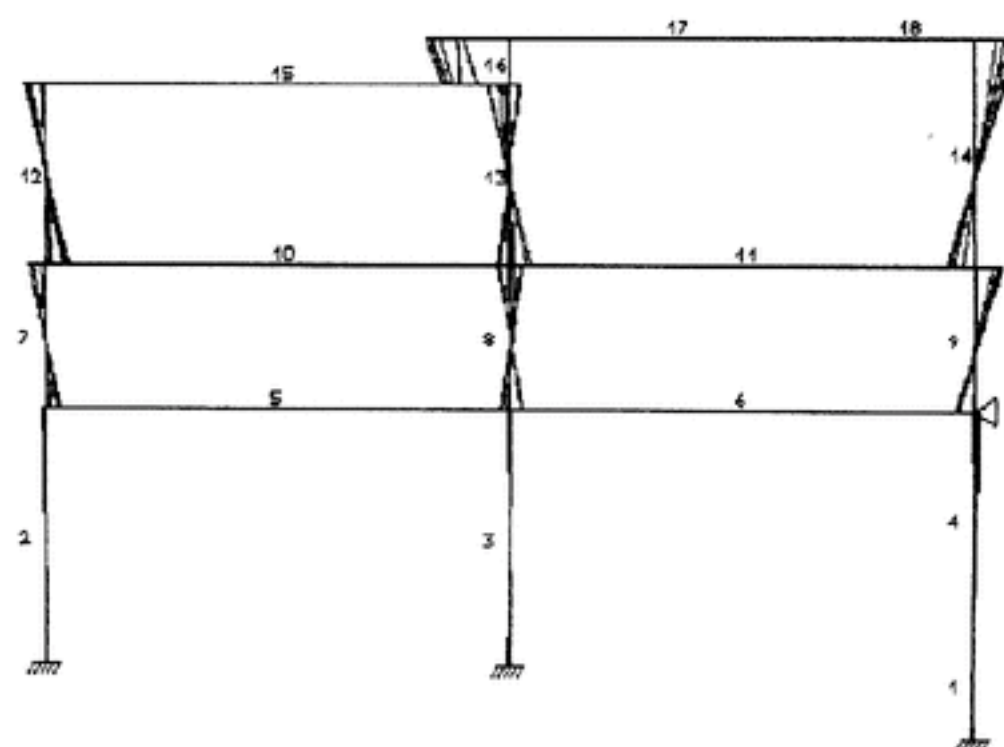
SECTOR A - Portico Alinhamento 5 - A/C



U. PORTO

arquivo
central

SECTOR A - Portico Alinhamento 5 - A/C - Envolvente MM - Pilares



SECTOR A -- Portico Alinhamento 5 -- A-C

No. DE NOS	= 15	No. DE BARRAS	= 18
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 4	No. DE SECCOES TIPO	= 8
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS=	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.95000E+00	.35000E+00
4	.29000E+08	.50000E+00	.35000E+00
5	.29000E+08	.20000E+01	.35000E+00
6	.29000E+08	.25000E+00	.40000E+00
7	.29000E+08	.10000E+01	.25000E+00
8	.29000E+08	.15000E+01	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	7	2	2 5	1	3	3 8	2
4	4 7	7	5	5 8	6	8	8 7	6
7	5 8	1	8	8 9	2	9	7 10	2
10	8 9	5	11	9 10	5	12	8 11	1
13	9 12	2	14	10 15	1	15	11 12	3
16	12 13	8	17	13 14	4	18	14 15	2

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	8.000	.000
4	12.000	1.000	5	.000	5.500	8	8.000	5.500
7	12.000	5.500	8	.000	8.700	9	8.000	8.700
10	12.000	8.700	11	.000	12.600	12	8.000	12.600
13	8.000	13.800	14	10.250	13.800	15	12.000	13.800

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	7	0	0	1

PILARES

Volume de Material (m3)= 6.0480

Area de Cofragem (m2)= 66.0700

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 12.5531

Area de Cofragem (m2)= 61.8375

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	24.000	17	31.570
18	3.063	10	49.200
11	49.200	5	12.625
6	12.625		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14		112.910	
11		81.000	
12		81.000	
13		81.000	
15		81.000	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
17	10.200	10	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13		18.000	
14		18.000	
15		18.000	

U. PORTO

 ACCAO 3
 SOBRECARGA2-Q2

arquivo
 central

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
15	9.000	11	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
11		18.000	
12		18.000	

 ACCAO 4
 SISMO1(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-9.072
11			41.800
8			1.610

 ACCAO 5
 SISMO2(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-7.560
11			34.800
8			10.150

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			-4.670
11			19.940
8			13.350

RESULTADOS

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	.80000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-3.439	-.246	-1.474	1.474	700.824	-700.824
2	5.391	10.334	2.859	-2.859	595.133	-595.133
3	.599	.692	.271	-.271	1502.575	-1502.575
4	.246	-6.878	-1.474	1.474	700.824	-700.824
5	-49.246	56.992	-55.521	-58.104	-27.103	27.103
6	-49.718	59.513	-55.180	-58.445	-20.622	20.622
7	38.912	56.967	29.962	-29.962	539.612	-539.612
8	-8.166	-11.706	-6.210	6.210	1389.291	-1389.291
9	-52.835	-78.324	-40.925	40.925	642.379	-642.379
10	-121.512	345.530	-265.064	-339.736	5.480	-5.480
11	-341.009	172.742	-330.445	-274.355	-7.448	7.448
12	64.545	62.175	32.492	-32.492	274.548	-274.548
13	7.166	19.009	6.717	-6.717	719.111	-719.111
14	-94.416	-142.601	-48.371	48.371	368.024	-368.024
15	-62.175	196.866	-126.048	-170.952	44.456	-44.456

16	-215.895	267.068	51.173	-51.173	399.653	-399.653
17	-267.068	-234.531	-251.165	-15.119	48.371	-48.371
18	234.531	142.601	211.484	-219.524	48.371	-48.371

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.439	-700.824	-1.474
2	5.391	-595.133	2.859
3	.599	-1502.575	.271
7	.000	.000	-18.829

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-4.855	-.332	-1.995	1.995	626.404	-626.404
2	5.054	9.743	2.690	-2.690	534.239	-534.239
3	2.125	4.078	-1.128	-1.128	1340.891	-1340.891
4	.332	-9.310	-1.995	1.995	626.404	-626.404
5	-47.510	60.747	-54.606	-59.019	-27.420	27.420
6	-49.075	57.080	-55.478	-58.147	-11.588	11.588
7	37.787	58.585	30.110	-30.110	479.633	-479.633
8	-15.750	-31.385	-14.724	14.724	1226.393	-1226.393
9	-47.771	-56.418	-32.559	32.559	568.257	-568.257
10	-119.378	308.315	-270.910	-333.890	10.245	-10.245
11	-280.985	143.017	-244.395	-198.405	-14.186	14.186
12	60.793	47.920	27.875	-27.875	208.723	-208.723
13	4.035	33.827	9.708	-9.708	648.110	-648.110
14	-86.599	-142.455	-46.746	46.746	369.851	-369.851
15	-47.920	172.583	-87.223	-128.777	39.839	-39.839
16	-206.410	255.957	49.547	-49.547	397.825	-397.825
17	-255.957	-237.875	-249.338	-16.946	46.745	-46.745
18	237.875	142.455	213.311	-221.352	46.745	-46.745

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-4.855	-626.404	-1.995
2	5.054	-534.239	2.690
3	2.125	-1340.891	1.128
7	.000	.000	-16.996

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO	-W

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-2.834	-.202	-1.215	1.215	639.101	-639.101
2	6.348	12.291	3.389	-3.389	521.625	-521.625
3	-.788	-1.910	-.491	.491	1329.783	-1329.783
4	.202	-5.888	-1.215	1.215	639.101	-639.101
5	-48.853	58.848	-55.147	-58.478	-20.325	20.325
6	-53.102	58.234	-55.957	-57.668	-22.517	22.517
7	34.382	41.522	23.714	-23.714	488.478	-488.478
8	-1.638	7.078	1.701	-1.701	1215.347	-1215.347
9	-52.588	-83.712	-42.587	42.587	581.433	-581.433
10	-91.977	287.401	-188.829	-253.971	3.780	-3.780
11	-304.801	168.480	-325.424	-279.378	1.904	-1.904
12	50.455	58.528	27.944	-27.944	277.649	-277.649
13	10.122	3.828	3.577	-3.577	635.954	-635.954
14	-82.748	-118.598	-40.883	40.883	302.056	-302.056
15	-58.528	174.831	-129.149	-167.851	39.907	-39.907
16	-178.459	221.943	43.484	-43.484	319.597	-319.597
17	-221.943	-192.340	-198.108	-3.151	40.883	-40.883
18	192.340	118.598	172.518	-180.558	40.883	-40.883

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-2.834	-639.101	-1.215
2	6.348	-521.625	3.389
3	-.788	-1329.783	-.491
7	.000	.000	-18.858

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO2(e2i)-E2	.00000	VENTO	-W

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.483	.106	.638	-.638	432.997	-432.997
2	5.798	11.709	3.183	-3.183	318.915	-318.915
3	3.188	8.637	1.788	-1.788	871.787	-871.787
4	-.106	2.987	.638	-.638	432.997	-432.997
5	-21.132	48.813	-33.262	-42.488	-5.244	5.244
6	-23.354	50.795	-33.301	-42.449	17.791	-17.791

.76.

7	9.423	17.543	8.427	-8.427	285.654	-285.654
8	-32.095	-35.902	-21.249	21.249	795.977	-795.977
9	-53.762	-70.037	-38.687	38.687	390.548	-390.548
10	-26.870	229.519	-135.425	-202.975	6.201	-6.201
11	-151.563	140.280	-171.084	-167.316	4.487	-4.487
12	9.327	8.772	4.641	-4.641	150.229	-150.229
13	-42.054	-34.134	-19.535	19.535	421.919	-421.919
14	-70.224	-97.362	-34.201	34.201	223.232	-223.232
15	-8.772	133.400	-62.029	-103.571	67.342	-67.342
16	-99.267	147.074	47.806	-47.806	230.143	-230.143
17	-147.074	-134.254	-141.951	-9.562	34.199	-34.199
18	134.254	97.362	129.672	-135.032	34.200	-34.200

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.483	-432.997	.636
2	5.796	-318.915	3.183
3	3.186	-871.767	1.786
7	.000	.000	-57.114

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	1.50000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.853	.132	.794	-.794	432.243	-432.243
2	5.996	12.153	3.300	-3.300	320.989	-320.989
3	3.457	7.231	1.943	-1.943	870.447	-870.447
4	-.132	3.706	.794	-.794	432.243	-432.243
5	-20.022	49.859	-32.902	-42.848	-3.952	3.952
6	-22.291	51.985	-32.926	-42.824	21.222	-21.222
7	7.869	15.338	7.252	-7.252	288.087	-288.087
8	-34.799	-39.540	-23.231	23.231	794.673	-794.673
9	-55.691	-72.657	-40.109	40.109	389.419	-389.419
10	-29.940	226.411	-136.455	-201.945	15.267	-15.267
11	-153.673	139.567	-171.551	-166.849	7.084	-7.084
12	14.602	13.520	7.211	-7.211	151.632	-151.632
13	-33.198	-25.496	-15.050	15.050	421.177	-421.177
14	-66.910	-94.910	-33.024	33.024	222.570	-222.570
15	-13.520	129.726	-63.432	-102.168	59.412	-59.412
16	-104.231	148.593	44.362	-44.362	230.805	-230.805
17	-148.593	-135.547	-142.613	-8.900	33.022	-33.022
18	135.547	94.910	129.010	-134.370	33.024	-33.024

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.853	-432.243	.794

2	5.996	-320.989	3.300
3	3.457	-870.447	1.943
7	.000	.000	-82.124

 COMBINACAO 6
 ACC.BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	-1.50000
SISMO2(e2i)-E2	.00000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-8.771	-.627	-3.759	3.759	383.888	-383.888
2	.791	.780	.282	-.282	378.283	-378.283
3	-3.797	-8.430	-2.223	2.223	863.550	-863.550
4	.827	-17.542	-3.759	3.759	383.888	-383.888
5	-48.736	24.536	-41.575	-34.175	-31.894	31.894
6	-51.181	18.618	-43.302	-32.448	-56.091	56.091
7	45.976	56.347	31.978	-31.978	334.688	-334.688
8	35.075	35.882	22.174	-22.174	786.073	-786.073
9	-1.075	-7.371	-2.640	2.640	351.418	-351.418
10	-128.157	140.507	-166.808	-171.592	-5.557	5.557
11	-241.281	43.598	-202.144	-136.256	-18.889	18.889
12	69.810	67.147	35.117	-35.117	167.880	-167.880
13	64.873	72.824	35.307	-35.307	412.338	-412.338
14	-38.227	-88.279	-21.328	21.328	215.162	-215.162
15	-87.147	85.867	-79.680	-85.920	-27.584	27.584
16	-158.691	186.413	7.723	-7.723	238.213	-238.213
17	-166.413	-149.213	-150.021	-1.491	21.330	-21.330
18	149.213	68.279	121.601	-126.962	21.329	-21.329

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-8.771	-383.888	-3.759
2	.791	-378.283	.282
3	-3.797	-863.550	-2.223
7	.000	.000	57.210

 COMBINACAO 7
 ACC.BASE(-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	-1.50000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-9.141	-.853	-3.917	3.917	384.619	-384.619
2	.592	.316	.165	-.165	374.189	-374.189
3	-4.069	-9.023	-2.380	2.380	884.871	-884.871
4	.653	-18.281	-3.917	3.917	384.619	-384.619
5	-47.846	23.489	-41.934	-33.816	-32.985	32.985
6	-52.244	17.428	-43.878	-32.072	-59.521	59.521
7	47.529	58.551	33.150	-33.150	332.255	-332.255
8	37.778	39.519	24.155	-24.155	787.377	-787.377
9	.853	-4.751	-1.218	1.218	352.547	-352.547
10	-123.087	143.615	-165.779	-172.621	-14.623	14.623
11	-239.152	44.292	-201.677	-136.723	-21.287	21.287
12	64.535	62.399	32.547	-32.547	166.476	-166.476
13	56.017	64.185	30.821	-30.821	413.080	-413.080
14	-39.541	-70.732	-22.505	22.505	215.823	-215.823
15	-62.399	89.541	-78.276	-87.324	-19.654	19.654
16	-153.727	164.893	11.166	-11.166	237.551	-237.551
17	-164.893	-147.920	-149.359	-2.153	22.507	-22.507
18	147.920	70.731	122.263	-127.824	22.505	-22.505

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-9.141	-384.619	-3.917
2	.592	-374.189	.165
3	-4.069	-884.871	-2.380
7	.000	.000	62.220

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO1(e1i)-E1	.00000
SISMO2(e2i)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.132	-.081	-.485	.485	669.718	-669.718
2	6.808	13.445	3.682	-3.682	544.475	-544.475
3	2.353	4.707	1.284	-1.284	1402.833	-1402.833
4	.081	-2.283	-.485	.485	669.718	-669.718
5	-41.569	64.057	-53.065	-60.560	-18.450	18.450
6	-43.732	66.239	-53.061	-60.564	.123	-.123
7	28.124	42.700	22.133	-22.133	491.410	-491.410
8	-25.032	-30.292	-17.289	17.289	1289.211	-1289.211
9	-63.976	-88.904	-47.775	47.775	609.154	-609.154
10	-93.622	333.133	-238.182	-318.018	16.654	-16.654
11	-294.876	181.805	-296.945	-259.255	.495	-.495
12	50.922	48.543	25.504	-25.504	253.229	-253.229
13	-7.964	3.561	-1.129	1.129	674.248	-674.248
14	-92.901	-138.778	-47.281	47.281	349.899	-349.899
15	-48.543	189.689	-112.829	-159.671	55.413	-55.413
16	-193.229	247.515	54.285	-54.285	373.970	-373.970

.79.

17	-247.515	-220.811	-233.582	-13.194	47.280	-47.280
18	220.811	138.778	201.459	-209.499	47.281	-47.281

REACOES NOS APOIOS

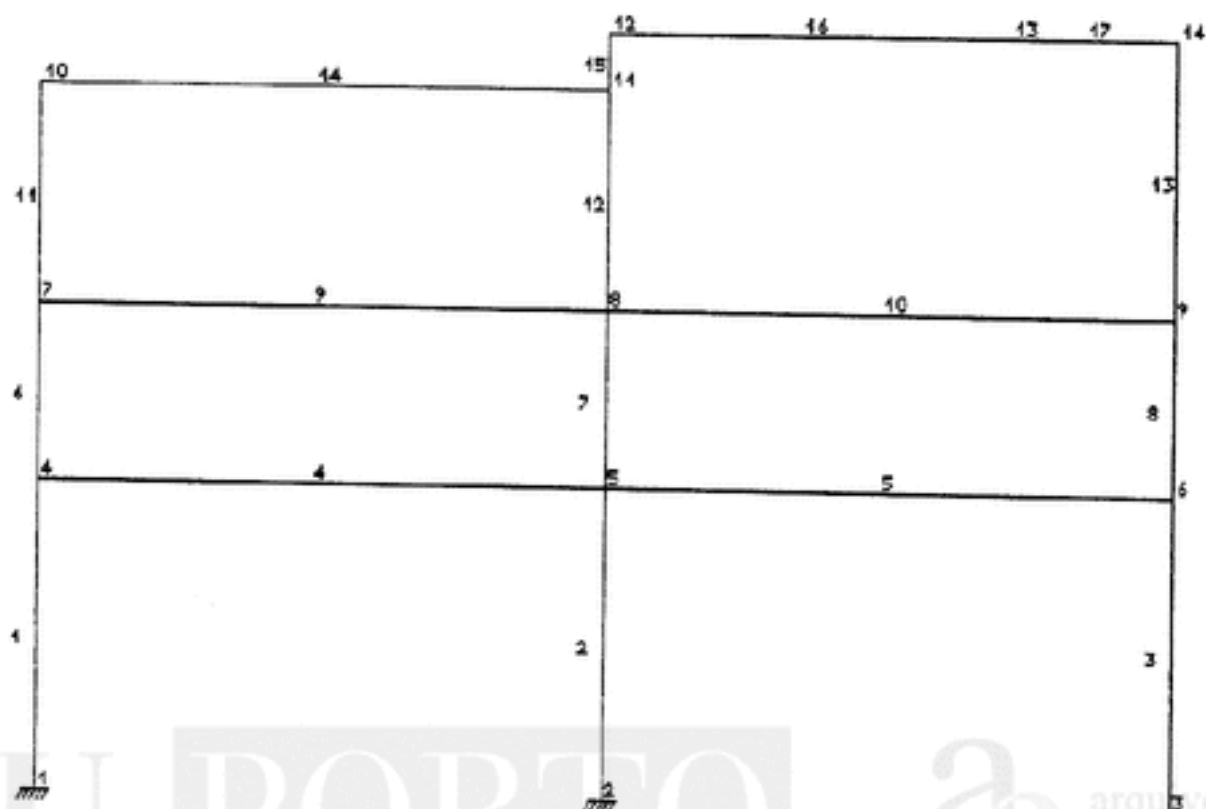
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.132	-669.718	-.485
2	6.808	-544.475	3.682
3	2.353	-1402.833	1.284
7	.000	.000	-47.412

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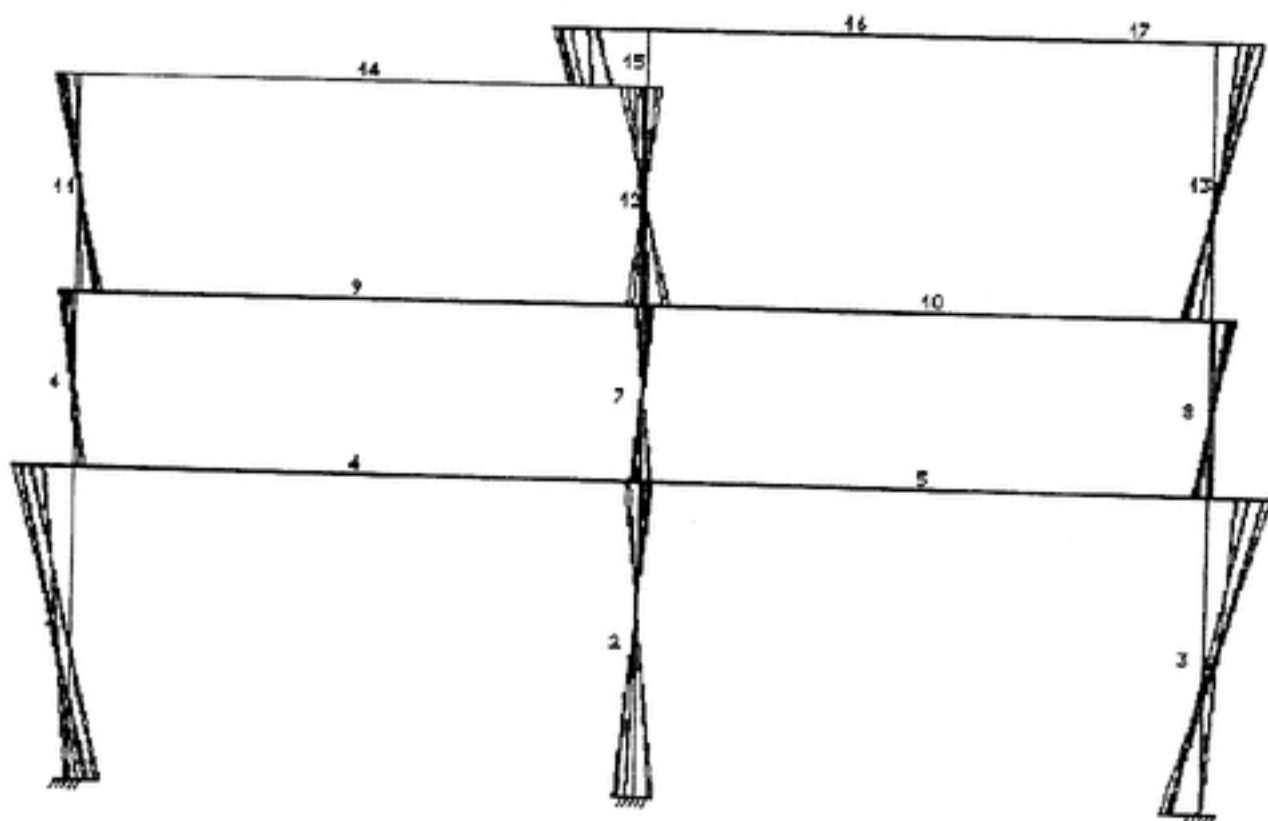
U. PORTO

ac arquivo
central

SECTOR A - Portico Alinhamento 6 - A/C



SECTOR A - Portico Alinhamento 6 - A/C - Envolvente MM - Pilares



SECTOR A -- Portico Alinhamento 6 -- A-C

No. DE NOS	= 14	No. DE BARRAS	= 17
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 3	No. DE SECCOES TIPO	= 7
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 3

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.95000E+00	.35000E+00
4	.29000E+08	.50000E+00	.35000E+00
5	.29000E+08	.20000E+01	.35000E+00
6	.29000E+08	.25000E+00	.30000E+01
7	.29000E+08	.15000E+01	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	6	2	2 5	6	3	3 6	6
4	4 5	6	5	5 6	6	6	4 7	1
7	5 8	2	8	6 9	2	9	7 8	5
10	8 9	5	11	7 10	1	12	8 11	2
13	9 14	1	14	10 11	3	15	11 12	7
16	12 13	4	17	13 14	2			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	6.000	.000	3	12.000	.000
4	.000	5.500	5	6.000	5.500	6	12.000	5.500
7	.000	8.700	8	6.000	8.700	9	12.000	8.700
10	.000	12.600	11	6.000	12.600	12	6.000	13.600
13	10.250	13.600	14	12.000	13.600			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1				

PILARES

Volume de Material (m3)=	15.4218	Area de Cofragem (m2)=	140.9700
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ELEMENTOS NAO VERTICAIS

Volume de Material (m3)=	20.3531	Area de Cofragem (m2)=	124.2375
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ACCAO 1
PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
14	24.000	16	31.570
17	3.063	9	49.200
10	49.200		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13		112.910	
10		81.000	
11		81.000	
12		81.000	
14		81.000	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
16	10.200	9	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
13		18.000	
14		18.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
14	9.000	10	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		18.000	
11		18.000	

 ACCAO 4
 SISMO1(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10			-3.550
10			42.800
7			-18.140

ACCAO 5
SISMO1(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
12			-5.371
10			32.630
7			1.840

ACCAO 6
VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
12			-3.200
10			17.730
7			11.240

===== RESULTADOS =====

COMBINACAO 1
ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	.00000	VENTO -W	.60000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.201E-04	.155E-01	.186E-02
5	.265E-05	.314E-01	.124E-02	6	-.139E-04	.182E-01	.635E-03
7	.170E-02	.711E-01	.282E-01	8	-.104E-03	.158E+00	.282E-01
9	-.125E-02	.750E-01	.287E-01	10	.148E-02	.106E+00	.180E-02
11	.480E-03	.238E+00	-.727E-03	12	.210E-02	.241E+00	.126E+00
13	-.403E-02	.131E+01	.122E+00	14	-.646E-02	.134E+00	.119E+00

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	59.009	178.068	43.105	-43.105	611.573	-611.573
2	-24.444	-8.730	-6.032	6.032	1240.035	-1240.035
3	-103.159	-185.785	-52.535	52.535	719.674	-719.674
4	-199.388	-294.121	-82.252	82.252	22.287	-22.287

5	310.817	220.672	88.581	-88.581	21.988	-21.988
6	21.320	45.299	20.818	-20.818	529.321	-529.321
7	-7.966	-10.378	-5.732	5.732	1410.868	-1410.868
8	-34.887	-62.866	-30.548	30.548	631.093	-631.093
9	-104.869	375.327	-257.324	-347.476	-2.337	2.337
10	-374.165	151.572	-339.499	-265.301	-15.581	15.581
11	59.570	57.035	29.899	-29.899	271.997	-271.997
12	9.216	20.080	7.512	-7.512	723.893	-723.893
13	-88.706	-137.325	-46.129	46.129	365.792	-365.792
14	-57.035	207.050	-123.497	-173.503	40.537	-40.537
15	-227.131	275.179	48.049	-48.049	401.894	-401.894
16	-275.179	-235.902	-253.396	-12.888	46.129	-46.129
17	235.902	137.325	209.253	-217.292	46.129	-46.129

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	59.009	-611.573	43.105
2	-24.444	-1240.035	-6.032
3	-103.159	-719.674	-52.535

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	.00000	VENTO	-W .60000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.175E-04	.137E-01	.168E-02
5	.301E-05	.277E-01	.125E-02	6	-.128E-04	.161E-01	.512E-03
7	.188E-02	.631E-01	.469E-01	8	-.501E-03	.140E+00	.468E-01
9	-.655E-03	.663E-01	.475E-01	10	.770E-03	.895E-01	.101E-01
11	.104E-02	.212E+00	.785E-02	12	.258E-02	.214E+00	.186E+00
13	-.416E-02	.134E+01	.183E+00	14	-.666E-02	.126E+00	.181E+00

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	49.558	153.372	36.896	-36.896	541.509	-541.509
2	-22.741	-4.895	-5.025	5.025	1096.145	-1096.145
3	-92.300	-168.033	-47.333	47.333	636.628	-636.628
4	-174.627	-253.431	-71.343	71.343	15.315	-15.315
5	279.214	193.433	78.774	-78.774	26.913	-26.913
6	21.255	47.807	21.582	-21.582	470.166	-470.166
7	-20.888	-32.305	-16.623	16.623	1246.263	-1246.263
8	-25.400	-39.945	-20.420	20.420	557.854	-557.854
9	-104.123	336.380	-263.691	-341.109	2.771	-2.771
10	-310.358	121.819	-252.823	-189.977	-24.422	24.422
11	56.317	43.348	25.555	-25.555	206.475	-206.475
12	6.284	34.936	10.569	-10.569	652.330	-652.330

13	-81.873	-137.853	-44.842	44.842	367.877	-367.877
14	-43.348	181.495	-84.975	-131.025	36.193	-36.193
15	-216.431	263.193	46.762	-46.762	399.808	-399.808
16	-263.193	-239.023	-251.311	-14.973	44.842	-44.842
17	239.023	137.853	211.338	-219.377	44.842	-44.842

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	49.558	-541.509	36.896
2	-22.741	-1096.145	-5.025
3	-92.300	-636.628	-47.333

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	.00000	VENTO -W	.60000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.184E-04	.134E-01	.188E-02
5	.231E-05	.275E-01	.123E-02	6	-.109E-04	.164E-01	.890E-03
7	.109E-02	.614E-01	.178E-01	8	.312E-03	.139E+00	.180E-01
9	-.145E-02	.678E-01	.181E-01	10	.175E-02	.967E-01	.131E-01
11	-.564E-04	.209E+00	.108E-01	12	.129E-02	.211E+00	.701E-01
13	-.311E-02	.105E+01	.669E-01	14	-.513E-02	.116E+00	.650E-01

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	47.989	156.960	37.263	-37.263	528.769	-528.769
2	-26.083	-12.375	-6.992	6.992	1086.264	-1086.264
3	-93.446	-158.086	-45.733	45.733	648.225	-648.225
4	-170.933	-258.258	-71.532	71.532	23.743	-23.743
5	267.028	195.210	77.040	-77.040	12.307	-12.307
6	13.973	29.293	13.521	-13.521	457.237	-457.237
7	3.605	10.614	4.444	-4.444	1234.836	-1234.836
8	-37.124	-69.840	-33.426	33.426	571.185	-571.185
9	-75.751	313.162	-181.831	-260.969	-5.528	5.528
10	-335.343	147.476	-333.711	-271.089	-5.261	5.261
11	46.458	54.132	25.792	-25.792	275.406	-275.406
12	11.567	4.723	4.177	-4.177	640.156	-640.156
13	-77.637	-111.930	-38.687	38.687	300.096	-300.096
14	-54.132	183.698	-126.906	-170.094	36.430	-36.430
15	-188.421	229.029	40.607	-40.607	321.564	-321.564
16	-229.029	-193.579	-200.066	-1.192	38.687	-38.687
17	193.579	111.930	170.557	-178.596	38.687	-38.687

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	47.989	-528.769	37.263
2	-26.083	-1086.264	-6.992
3	-93.446	-648.225	-45.733

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	1.50000
SISMO1(e2i)-E2	.00000	VENTO -W	.00000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.143E-04	.806E-02	.240E-02
5	.363E-05	.180E-01	.209E-02	6	-.493E-05	.112E-01	.178E-02
7	.118E-02	.372E-01	.112E+00	8	.995E-04	.911E-01	.113E+00
9	-.522E-03	.457E-01	.113E+00	10	.117E-02	.559E-01	.578E+00
11	.616E-03	.138E+00	.574E+00	12	.143E-02	.139E+00	.675E+00
13	-.242E-02	.746E+00	.672E+00	14	-.331E-02	.816E-01	.670E+00

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	7.287	92.222	18.093	-18.093	318.762	-318.762
2	-46.006	-24.471	-12.814	12.814	711.794	-711.794
3	-86.967	-116.213	-36.942	36.942	441.622	-441.622
4	-94.756	-152.873	-41.271	41.271	11.325	-11.325
5	198.414	151.865	58.380	-58.380	11.000	-11.000
6	2.533	19.124	6.768	-6.768	277.490	-277.490
7	-21.069	-18.897	-12.490	12.490	811.446	-811.446
8	-35.652	-47.361	-25.942	25.942	383.243	-383.243
9	-18.378	245.614	-131.327	-207.073	-20.043	20.043
10	-175.801	119.705	-178.549	-159.851	-8.884	8.884
11	-.746	-.814	-.400	.400	146.163	-146.163
12	-50.917	-41.310	-23.648	23.648	425.824	-425.824
13	-72.345	-98.303	-34.826	34.826	223.392	-223.392
14	.814	148.208	-57.963	-107.637	63.801	-63.801
15	-106.899	147.051	40.153	-40.153	229.989	-229.989
16	-147.051	-133.593	-141.790	-9.722	34.827	-34.827
17	133.593	98.303	129.832	-135.192	34.828	-34.828

REACCOS NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	7.287	-318.762	18.093
2	-46.006	-711.794	-12.814
3	-86.967	-441.622	-36.942

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	1.50000	VENTO -W	.00000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.150E-04	.811E-02	.292E-02
5	.405E-05	.179E-01	.263E-02	6	-.386E-05	.112E-01	.235E-02
7	.114E-02	.379E-01	.145E+00	8	.671E-04	.908E-01	.145E+00
9	-.516E-03	.454E-01	.145E+00	10	.106E-02	.571E-01	.454E+00
11	.493E-03	.137E+00	.451E+00	12	.135E-02	.139E+00	.540E+00
13	-.239E-02	.756E+00	.538E+00	14	-.349E-02	.811E-01	.536E+00

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-5.344	83.879	14.279	-14.279	320.646	-320.646
2	-61.022	-36.982	-17.819	17.819	709.385	-709.385
3	-98.858	-121.731	-40.107	40.107	442.147	-442.147
4	-81.646	-141.397	-37.174	37.174	10.650	-10.650
5	206.832	163.830	61.777	-61.777	10.168	-10.168
6	-2.232	13.846	3.629	-3.629	283.473	-283.473
7	-28.453	-27.025	-17.337	17.337	808.336	-808.336
8	-42.099	-53.707	-29.939	29.939	380.370	-380.370
9	-25.118	239.064	-133.542	-204.858	.857	-.857
10	-179.927	118.199	-179.488	-158.912	-2.042	2.042
11	11.271	10.303	5.532	-5.532	149.930	-149.930
12	-32.112	-24.195	-14.438	14.438	423.990	-423.990
13	-64.492	-92.217	-31.982	31.982	221.458	-221.458
14	-10.303	136.723	-61.730	-103.870	54.478	-54.478
15	-112.527	152.566	40.039	-40.039	231.922	-231.922
16	-152.566	-136.295	-143.724	-7.789	31.982	-31.982
17	136.295	92.217	127.899	-133.258	31.982	-31.982

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-5.344	-320.646	14.279
2	-61.022	-709.385	-17.819
3	-98.858	-442.147	-40.107

 COMBINACAO 6
 ACC.BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000

SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	-1.50000
SISMO1(e2i)-E2	.00000	VENTO	-W
			.00000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.710E-05	.978E-02	-.109E-02
5	-.137E-05	.178E-01	-.151E-02	6	-.125E-04	.966E-02	-.195E-02
7	.666E-03	.445E-01	-.140E+00	8	-.276E-03	.895E-01	-.140E+00
9	-.916E-03	.408E-01	-.140E+00	10	.364E-03	.661E-01	-.743E+00
11	-.126E-04	.135E+00	-.741E+00	12	.108E-02	.137E+00	-.688E+00
13	-.232E-02	.823E+00	-.690E+00	14	-.452E-02	.750E-01	-.691E+00

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	77.434	119.541	35.814	-35.814	386.871	-386.871
2	40.796	32.691	13.361	-13.361	703.344	-703.344
3	-11.027	-85.289	-17.512	17.512	381.964	-381.964
4	-147.808	-193.836	-56.941	56.941	15.208	-15.208
5	138.016	77.371	35.898	-35.898	16.060	-16.060
6	28.268	37.671	20.606	-20.606	329.931	-329.931
7	23.129	16.900	12.509	-12.509	796.182	-796.182
8	7.918	-12.564	-1.452	1.452	346.066	-346.066
9	-111.843	161.480	-160.927	-177.473	10.687	-10.687
10	-253.835	40.358	-204.780	-133.620	-16.757	16.757
11	74.173	70.635	37.130	-37.130	169.003	-169.003
12	75.455	80.357	39.952	-39.952	413.930	-413.930
13	-27.794	-61.428	-18.208	18.208	212.445	-212.445
14	-70.635	82.614	-80.803	-84.797	-27.071	27.071
15	-162.971	175.853	12.881	-12.881	240.935	-240.935
16	-175.854	-151.312	-152.736	1.224	18.207	-18.207
17	151.312	61.428	118.886	-124.245	18.206	-18.206

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	77.434	-386.871	35.814
2	40.796	-703.344	13.361
3	-11.027	-381.964	-17.512

 COMBINACAO 7
 ACC.BASE(-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	-1.50000	VENTO	-W
			.00000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
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1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.638E-05	.974E-02	-.161E-02
5	-.179E-05	.178E-01	-.205E-02	6	-.136E-04	.965E-02	-.252E-02
7	.701E-03	.438E-01	-.172E+00	8	-.244E-03	.898E-01	-.172E+00
9	-.922E-03	.411E-01	-.171E+00	10	.476E-03	.649E-01	-.618E+00
11	.111E-03	.135E+00	-.617E+00	12	.116E-02	.137E+00	-.554E+00
13	-.235E-02	.813E+00	-.556E+00	14	-.434E-02	.756E-01	-.557E+00

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	90.065	127.885	39.627	-39.627	384.987	-384.987
2	55.812	45.202	18.366	-18.366	705.753	-705.753
3	.864	-79.772	-14.347	14.347	381.439	-381.439
4	-160.918	-205.312	-61.038	61.038	15.883	-15.883
5	129.597	65.407	32.501	-32.501	16.893	-16.893
6	33.033	42.948	23.744	-23.744	323.949	-323.949
7	30.513	25.027	17.356	-17.356	799.292	-799.292
8	14.365	-6.218	2.546	-2.546	348.938	-348.938
9	-105.103	168.031	-158.712	-179.688	-10.214	10.214
10	-249.709	41.864	-203.841	-134.559	-23.599	23.599
11	62.155	59.518	31.198	-31.198	165.236	-165.236
12	56.651	63.243	30.742	-30.742	415.764	-415.764
13	-35.646	-67.513	-21.053	21.053	214.379	-214.379
14	-59.518	94.100	-77.036	-88.564	-17.748	17.748
15	-157.343	170.338	12.995	-12.995	239.002	-239.002
16	-170.338	-148.610	-150.803	-.709	21.052	-21.052
17	148.610	67.513	120.819	-126.179	21.053	-21.053

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	90.065	-384.987	39.627
2	55.812	-705.753	18.366
3	.864	-381.439	-14.347

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO1(e1i)-E1	.00000
SISMO1(e2i)-E2	.00000	VENTO	1.50000

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.000E+00	.000E+00	.000E+00
3	.000E+00	.000E+00	.000E+00	4	.210E-04	.139E-01	.299E-02
5	.410E-05	.291E-01	.246E-02	6	-.102E-04	.174E-01	.194E-02
7	.166E-02	.647E-01	.112E+00	8	-.385E-04	.147E+00	.111E+00
9	-.104E-02	.712E-01	.112E+00	10	.144E-02	.968E-01	.213E+00
11	.549E-03	.222E+00	.210E+00	12	.203E-02	.224E+00	.336E+00
13	-.380E-02	.123E+01	.332E+00	14	-.599E-02	.127E+00	.330E+00

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	27.646	151.972	32.658	-32.658	551.654	-551.654
2	-55.173	-30.845	-15.640	15.640	1150.865	-1150.865
3	-122.967	-183.231	-55.672	55.672	687.257	-687.257
4	-161.726	-253.391	-69.186	69.186	19.248	-19.248
5	308.089	230.547	89.773	-89.773	18.819	-18.819
6	9.754	33.156	13.409	-13.409	482.468	-482.468
7	-23.853	-24.820	-15.210	15.210	1309.823	-1309.823
8	-47.316	-70.614	-36.853	36.853	597.484	-597.484
9	-79.837	359.001	-231.573	-324.627	6.984	-6.984
10	-328.919	158.241	-306.546	-249.654	-8.331	8.331
11	46.682	44.130	23.285	-23.285	250.895	-250.895
12	-5.263	5.671	.105	-.105	678.650	-678.650
13	-87.627	-133.775	-45.184	45.184	347.831	-347.831
14	-44.130	199.262	-110.495	-162.205	49.880	-49.880
15	-204.932	254.917	49.985	-49.985	376.047	-376.047
16	-254.917	-222.194	-235.650	-11.127	45.185	-45.185
17	222.194	133.775	199.392	-207.431	45.185	-45.185

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	27.646	-551.654	32.658
2	-55.173	-1150.865	-15.640
3	-122.967	-687.257	-55.672

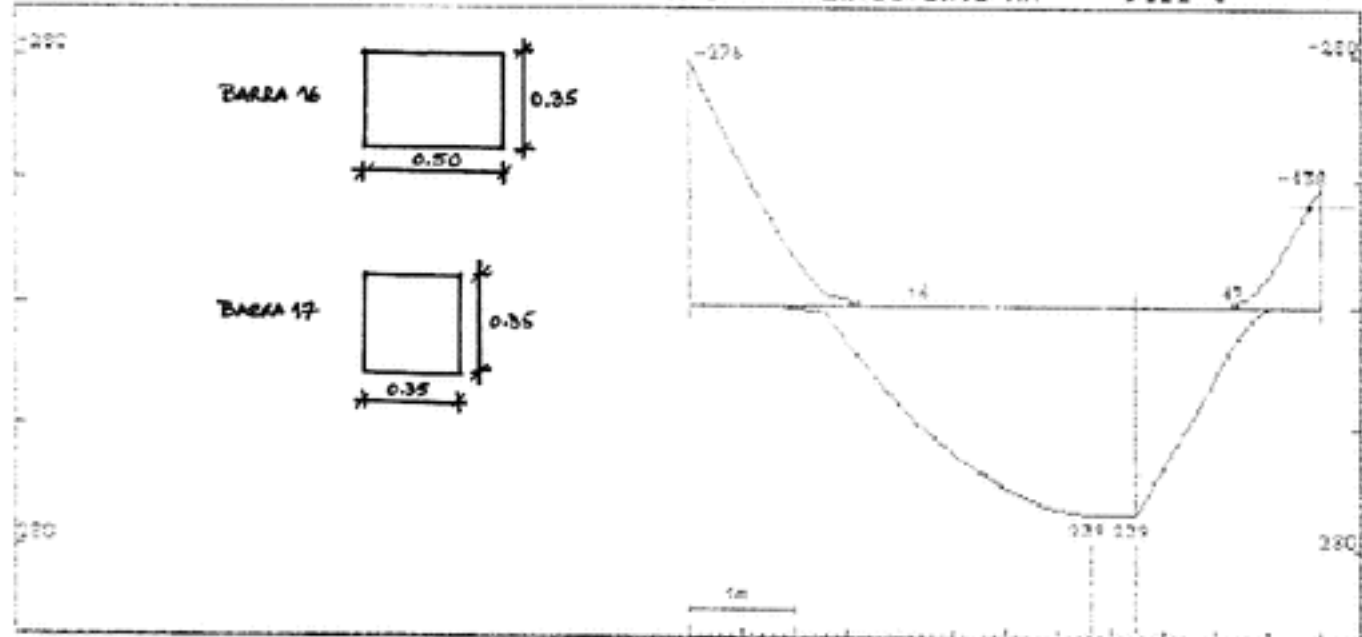
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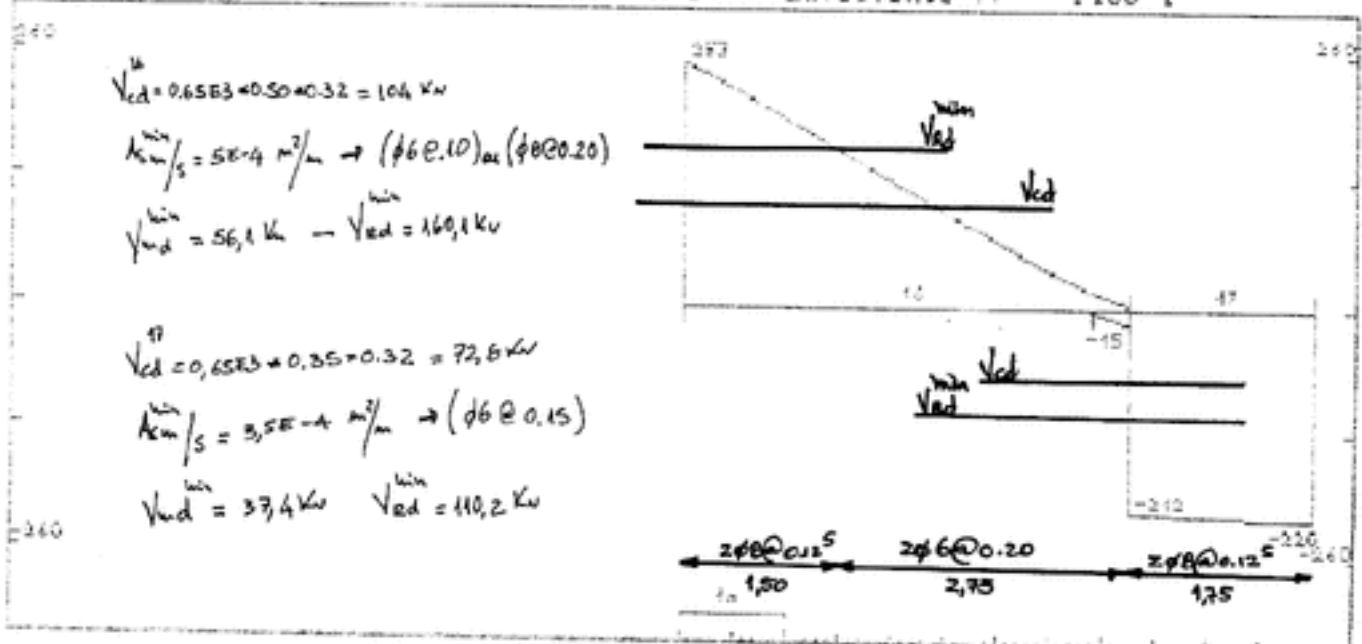
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central

SECTOR A - Portico Alinhamento 6 - A/C - Envolvente MM - Piso 4 V4.24

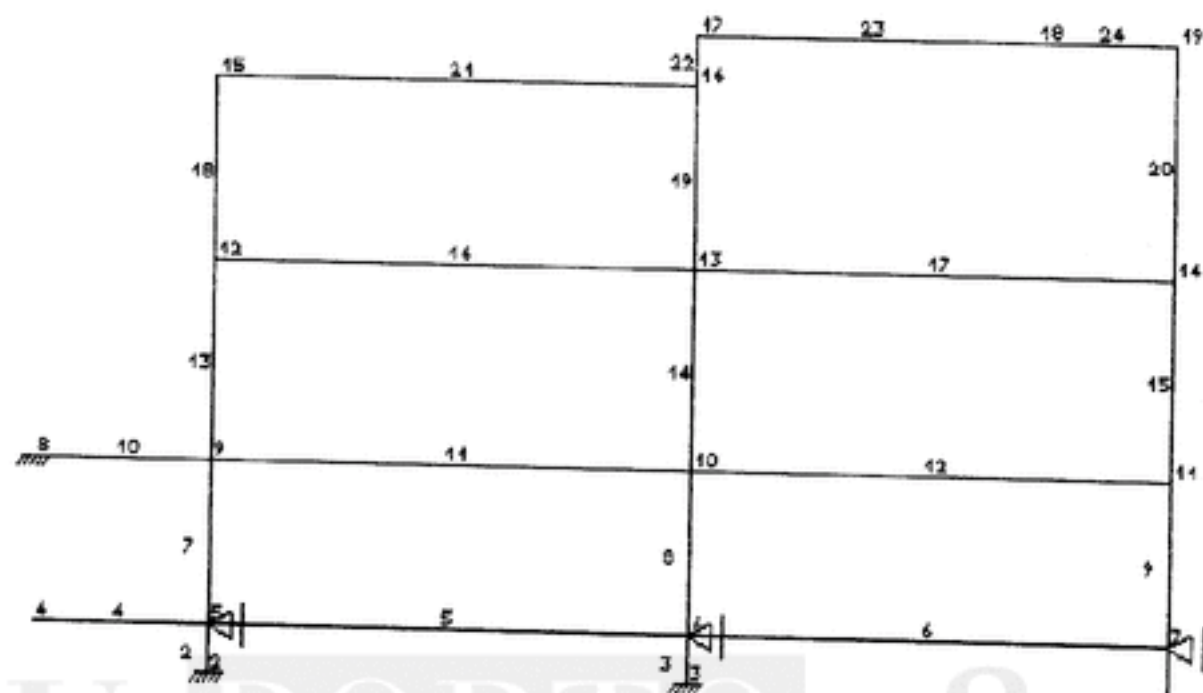


$M_{set}(kNm)$	-248	+239	+239	-110
μ	0.364	0.351	0.50	0.23
w	0.395 ($\frac{1}{2} \times 0.5$)	0.382 ($\frac{1}{2} \times 0.5$)	0.562 ($\frac{1}{2} \times 0.5$)	0.284
A_s	24.03 (-12.00)	23.55 (-11.80)	24.1 (-12.0)	12.16
VARCOES	8 ϕ 20 (-4 ϕ 20)	(5 ϕ 20 + 2 ϕ 25) (-4 ϕ 20)	(5 ϕ 20 + 2 ϕ 25) (-4 ϕ 20)	4 ϕ 20

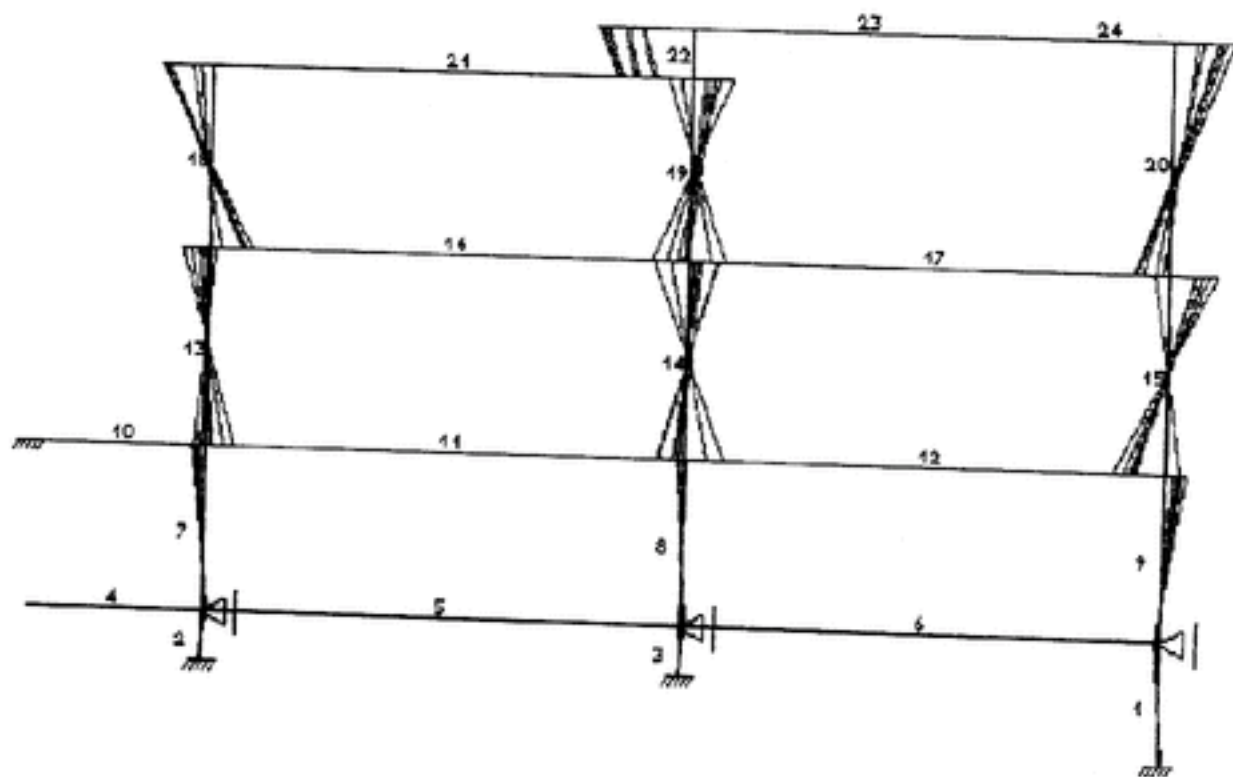
SECTOR A Portico Alinhamento 6 - A/C - Envolvente UU - Piso 4



SECTOR A - Portico Alinhamento 7 - A/C



SECTOR A - Portico Alinhamento 7 - Envolvente MM - Pilares



Sector A -- Portico Alinhamento 7 -- A-C

No. DE NOS	=	19	No. DE BARRAS	=	24
No. DE NOS POR BARRA	=	2	No. DE INCOGNITAS POR NO	=	3
No. DE APOIOS	=	7	No. DE SECCOES TIPO	=	8
No. DE PROPRIEDADES	=	3	TIPO DE SAIDA DE RESULTADOS=		1

MATERIAL	E (KPa)	PROPRIEDADES b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.10000E+01	.25000E+00
4	.29000E+08	.30000E+00	.30000E+00
5	.29000E+08	.12500E+01	.35000E+00
6	.29000E+08	.10000E+06	.10000E-03
7	.29000E+08	.50000E+00	.35000E+00
8	.29000E+08	.42500E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 7	3	2	2 5	3	3	3 6	2
4	4 5	6	5	5 6	6	6	6 7	6
7	5 9	3	8	6 10	2	9	7 11	2
10	8 9	5	11	9 10	5	12	10 11	5
13	9 12	4	14	10 13	2	15	11 14	2
16	12 13	5	17	13 14	5	18	12 15	4
19	13 16	2	20	14 19	1	21	15 16	7
22	16 17	2	23	17 18	8	24	18 19	2

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	-1.500	2	.000	.000	3	6.000	.000
4	-2.200	1.000	5	.000	1.000	6	6.000	1.000
7	12.000	1.000	8	-2.200	4.500	9	.000	4.500
10	6.000	4.500	11	12.000	4.500	12	.000	8.700
13	6.000	8.700	14	12.000	8.700	15	.000	12.600
16	6.000	12.600	17	6.000	13.600	18	10.250	13.600
19	12.000	13.600						

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	5	0	0	1
6	0	0	1	7	0	0	1
8	1	1	1				

PILARES

Volume de Material (m3)= 5.6027

Area de Cofragem (m2)= 63.4100

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 155.3591

Area de Cofragem (m2)=*****

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
21	32.740	23	29.760
24	16.160	10	26.600
11	26.600	12	26.600
16	26.600	17	26.600

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
18		57.070	
15		40.500	
16		40.500	
17		40.500	
19		40.500	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
23	5.100	10	9.080
12	9.080	16	9.080

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
17		9.000	
18		9.000	
19		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
21	4.500	11	9.080
17	9.080		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
15		9.000	
16		9.000	

 ACCAO 4
 SISMO(e1i) -E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
17			3.800
15			36.540
12			-18.500

 ACCAO 5
 SISMO(e2i) -E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
17			2.196
15			21.126
12			21.990

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
17			.850
15			10.940
12			35.240

***** RESULTADOS *****

 COMBINACAO 1
 ACC. BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO(e1i) -E1	.00000
SISMO(e2i) -E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.106	12.212	7.327	-7.327	552.919	-552.919
2	-4.719	-9.437	-14.156	14.156	618.990	-618.990
3	-1.284	-2.569	-3.853	3.853	1202.192	-1202.192
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	9.437	23.003	9.268	-9.268	618.990	-618.990

8	2.569	6.524	2.598	-2.598	1202.192	-1202.192
9	-12.212	-36.571	-13.938	13.938	552.919	-552.919
10	-16.606	93.234	-24.041	-93.703	-26.148	26.148
11	-128.774	175.376	-152.793	-168.327	-24.367	24.367
12	-170.634	100.988	-172.168	-148.952	-15.834	15.834
13	12.537	18.913	7.488	-7.488	372.494	-372.494
14	-11.266	-13.662	-5.935	5.935	861.697	-861.697
15	-64.417	-60.626	-29.772	29.772	403.967	-403.967
16	-84.753	183.875	-144.040	-177.080	-10.649	10.649
17	-161.455	125.638	-166.529	-154.591	-5.969	5.969
18	65.840	87.359	39.282	-39.282	228.455	-228.455
19	-8.758	-32.639	-10.615	10.615	518.087	-518.087
20	-65.012	-110.117	-35.741	35.741	249.376	-249.376
21	-87.359	167.612	-154.204	-180.956	45.846	-45.846
22	-134.973	170.203	35.231	-35.231	262.882	-262.882
23	-170.204	-159.236	-188.631	-33.601	35.741	-35.741
24	159.236	110.117	132.706	-175.126	35.741	-35.741

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.106	-552.919	7.327
2	-4.719	-618.990	-14.156
3	-1.284	-1202.192	-3.853
5	.000	.000	23.424
6	.000	.000	6.451
7	.000	.000	-21.265
8	-16.606	-24.041	-26.148

 COMBINACAO 2
 ACC. BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO(e1i) -E1	.00000
SISMO(e2i) -E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.611	13.222	7.933	-7.933	517.803	-517.803
2	-3.345	-6.691	-10.036	10.036	527.234	-527.234
3	-3.251	-6.503	-9.754	9.754	1080.163	-1080.163
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	6.691	16.333	6.578	-6.578	527.234	-527.234
8	6.503	16.093	6.456	-6.456	1080.163	-1080.163
9	-13.222	-39.654	-15.107	15.107	517.802	-517.802
10	-26.729	63.843	-42.002	-75.742	-26.146	26.146
11	-89.368	150.696	-109.479	-129.921	-26.163	26.163
12	-155.421	102.038	-169.457	-151.663	-11.428	11.428
13	9.192	18.507	6.595	-6.595	342.013	-342.013
14	-11.367	-23.405	-8.279	8.279	780.785	-780.785
15	-62.384	-49.064	-26.535	26.535	366.140	-366.140
16	-82.076	166.469	-146.494	-174.626	-8.553	8.553
17	-130.867	108.264	-123.467	-115.933	-7.941	7.941

18	63.568	77.972	36.292	-36.292	195.519	-195.519
19	-12.198	-22.472	-8.890	8.890	482.692	-482.692
20	-59.199	-109.734	-34.476	34.476	250.207	-250.207
21	-77.972	153.339	-134.769	-159.891	42.856	-42.856
22	-130.867	164.833	33.966	-33.966	262.051	-262.051
23	-164.833	-161.074	-187.800	-34.432	34.477	-34.477
24	161.074	109.733	133.537	-175.957	34.477	-34.477

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.611	-517.803	7.933
2	-3.345	-527.234	-10.036
3	-3.251	-1080.163	-9.754
5	.000	.000	16.614
6	.000	.000	16.210
7	.000	.000	-23.041
8	-26.729	-42.002	-26.146

 COMBINACAO 3
 ACC. BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO(e1i) -E1	.00000
SISMO(e2i) -E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	3.888	7.776	4.665	-4.665	481.511	-481.511
2	-5.033	-10.066	-15.100	15.100	578.870	-578.870
3	.849	1.698	2.548	-2.548	1071.977	-1071.977
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	10.066	24.536	9.886	-9.886	578.870	-578.870
8	-1.698	-3.852	-1.586	1.586	1071.977	-1071.977
9	-7.776	-23.121	-8.828	8.828	481.511	-481.511
10	-2.672	100.624	.633	-88.413	-27.692	27.692
11	-133.949	157.117	-156.699	-164.421	-22.369	22.369
12	-138.587	78.380	-129.734	-109.666	-18.862	18.862
13	8.790	10.375	4.563	-4.563	333.758	-333.758
14	-14.679	-6.709	-5.092	5.092	777.822	-777.822
15	-55.259	-61.038	-27.690	27.690	371.846	-371.846
16	-66.736	155.190	-104.958	-134.442	-10.387	10.387
17	-143.687	120.629	-164.403	-156.717	-3.928	3.928
18	56.361	84.408	36.095	-36.095	228.800	-228.800
19	-4.794	-40.251	-11.550	11.550	478.977	-478.977
20	-59.591	-95.338	-31.618	31.618	215.129	-215.129
21	-84.408	162.588	-154.550	-180.610	42.658	-42.658
22	-122.336	153.444	31.108	-31.108	224.117	-224.117
23	-153.444	-137.708	-163.366	-26.354	31.618	-31.618
24	137.708	95.337	111.959	-154.379	31.619	-31.619

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	3.888	-481.511	4.665
2	-5.033	-578.870	-15.100
3	.849	-1071.977	2.548
5	.000	.000	24.986
6	.000	.000	-4.133
7	.000	.000	-13.493
8	-2.672	.633	-27.692

 COMBINACAO 4
 ACC. BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO(e1i) -E1	1.50000
SISMO(e2i) -E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	2.894	5.788	3.473	-3.473	346.521	-346.521
2	-2.793	-5.586	-8.379	8.379	338.828	-338.828
3	-1.130	-2.260	-3.390	3.390	704.773	-704.773
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	5.586	13.676	5.503	-5.503	338.828	-338.828
8	2.260	5.837	2.313	-2.313	704.773	-704.773
9	-5.788	-17.046	-6.524	6.524	346.521	-346.521
10	-6.173	58.003	-9.696	-56.814	-34.051	34.051
11	-69.470	104.113	-84.922	-96.470	-29.035	29.035
12	-87.131	68.165	-93.857	-87.535	-16.483	16.483
13	-2.208	4.252	.487	-.487	197.091	-197.091
14	-22.820	-20.179	-10.238	10.238	514.447	-514.447
15	-51.119	-45.512	-23.007	23.007	258.986	-258.986
16	-9.309	140.954	-68.755	-112.637	-34.123	34.123
17	-53.390	109.323	-81.374	-100.018	-8.012	8.012
18	5.057	21.693	6.859	-6.859	128.336	-128.336
19	-67.385	-74.366	-36.346	36.346	320.436	-320.436
20	-63.811	-88.180	-31.019	31.019	158.968	-158.968
21	-21.693	137.995	-84.236	-123.004	61.668	-61.668
22	-63.629	88.949	25.319	-25.319	153.332	-153.332
23	-88.949	-88.094	-109.232	-25.918	31.019	-31.019
24	88.094	88.180	86.588	-114.868	31.020	-31.020

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	2.894	-346.521	3.473
2	-2.793	-338.828	-8.379
3	-1.130	-704.773	-3.390
5	.000	.000	13.883
6	.000	.000	5.703
7	.000	.000	-9.997
8	-6.173	-9.696	-34.051

 COMBINACAO 5
 ACC. BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO(e1i) -E1	.00000
SISMO(e2i) -E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.986	3.972	2.383	-2.383	352.259	-352.259
2	-3.058	-6.115	-9.173	9.173	345.509	-345.509
3	-1.806	-3.612	-5.418	5.418	697.750	-697.750
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	6.115	15.087	6.058	-6.058	345.509	-345.509
8	3.612	9.498	3.746	-3.746	697.750	-697.750
9	-3.972	-11.046	-4.291	4.291	352.259	-352.259
10	-2.438	66.138	-4.300	-62.210	-73.481	73.481
11	-61.553	114.825	-81.817	-99.575	-59.549	59.549
12	-71.255	87.049	-88.064	-93.328	-30.677	30.677
13	-19.672	-13.401	-7.875	7.875	201.481	-201.481
14	-53.068	-52.466	-25.127	25.127	510.112	-510.112
15	-76.003	-70.860	-34.967	34.967	258.931	-258.931
16	-7.983	140.857	-68.550	-112.842	10.588	-10.588
17	-48.978	120.677	-78.746	-102.646	8.747	-8.747
18	21.384	35.252	14.522	-14.522	132.931	-132.931
19	-39.413	-51.394	-23.284	23.284	318.524	-318.524
20	-49.816	-78.649	-26.217	26.217	156.285	-156.285
21	-35.252	123.985	-88.831	-118.409	46.209	-46.209
22	-72.591	95.515	22.924	-22.924	156.015	-156.015
23	-95.515	-92.930	-111.915	-23.235	26.218	-26.218
24	92.930	78.648	83.905	-112.185	26.219	-26.219

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.986	-352.259	2.383
2	-3.058	-345.509	-9.173
3	-1.806	-697.750	-5.418
5	.000	.000	15.230
6	.000	.000	9.163
7	.000	.000	-6.674
8	-2.438	-4.300	-73.481

 COMBINACAO 6
 ACC. BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000

SOBRECARGA2-Q2	.40000	SISMO(e1i) -E1	-1.50000
SISMO(e2i) -E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	4.921	9.842	5.905	-5.905	289.216	-289.216
2	-2.388	-4.776	-7.163	7.163	387.049	-387.049
3	.313	.626	.940	-.940	699.959	-699.959
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	4.776	11.469	4.641	-4.641	387.049	-387.049
8	-.626	-1.895	-.721	.721	699.959	-699.959
9	-9.842	-30.286	-11.465	11.465	289.216	-289.216
10	-17.966	39.221	-23.594	-42.916	40.303	-40.303
11	-83.054	83.854	-90.563	-90.829	29.751	-29.751
12	-120.335	27.954	-106.093	-75.299	12.121	-12.121
13	32.364	31.445	15.193	-15.193	253.570	-253.570
14	38.376	32.645	16.910	-16.910	503.037	-503.037
15	2.332	.421	.656	-.656	213.917	-213.917
16	-109.928	46.914	-101.198	-80.194	-.514	.514
17	-146.384	11.455	-113.184	-68.208	-11.859	11.859
18	78.483	91.002	43.458	-43.458	152.372	-152.372
19	66.824	43.356	28.251	-28.251	309.659	-309.659
20	-11.876	-43.026	-11.205	11.205	145.709	-145.709
21	-91.002	63.090	-108.272	-98.968	-11.351	11.351
22	-106.445	123.349	16.903	-16.903	166.591	-166.591
23	-123.349	-110.045	-122.491	-12.659	11.204	-11.204
24	110.045	43.026	73.329	-101.609	11.203	-11.203

REACÇÕES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.921	-289.216	5.905
2	-2.388	-387.049	-7.163
3	.313	-699.959	.940
5	.000	.000	11.805
6	.000	.000	-1.660
7	.000	.000	-17.370
8	-17.966	-23.594	40.303

 COMBINACAO 7
 ACC. BASE(-E2)

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO(e2i) -E2	-1.50000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO(e1i) -E1	.00000
VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	5.829	11.658	6.995	-6.995	283.478	-283.478

2	-2.123	-4.247	-6.370	6.370	380.368	-380.368
3	.989	1.978	2.967	-2.967	706.982	-706.982
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	4.247	10.058	4.087	-4.087	380.368	-380.368
8	-1.978	-5.556	-2.153	2.153	706.982	-706.982
9	-11.658	-36.286	-13.698	13.698	283.478	-283.478
10	-21.701	31.085	-28.990	-37.521	79.733	-79.733
11	-90.971	73.143	-93.667	-87.725	60.266	-60.266
12	-136.211	9.070	-111.886	-69.506	26.314	-26.314
13	49.828	49.098	23.554	-23.554	249.180	-249.180
14	68.624	64.932	31.799	-31.799	507.372	-507.372
15	27.216	25.770	12.616	-12.616	213.972	-213.972
16	-111.254	47.011	-101.403	-79.989	-45.225	45.225
17	-150.795	.101	-115.812	-65.580	-28.618	28.618
18	62.156	77.443	35.795	-35.795	147.777	-147.777
19	38.852	20.384	15.189	-15.189	311.571	-311.571
20	-25.871	-52.558	-16.006	16.006	148.392	-148.392
21	-77.443	77.100	-103.677	-103.563	4.107	-4.107
22	-97.483	116.782	19.299	-19.299	163.908	-163.908
23	-116.782	-105.208	-119.808	-15.342	16.005	-16.005
24	105.208	52.558	76.012	-104.292	16.004	-16.004

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	5.829	-283.478	6.995
2	-2.123	-380.368	-6.370
3	.989	-706.982	2.967
5	.000	.000	10.457
6	.000	.000	-5.120
7	.000	.000	-20.693
8	-21.701	-28.990	79.733

 COMBINACAO 8
 ACC. BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO(e1i) -E1	.00000
SISMO(e2i) -E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	4.418	8.835	5.301	-5.301	539.264	-539.264
2	-4.698	-9.395	-14.093	14.093	572.611	-572.611
3	-2.092	-4.184	-6.277	6.277	1122.464	-1122.464
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	9.395	23.056	9.272	-9.272	572.611	-572.611
8	4.184	10.907	4.312	-4.312	1122.463	-1122.463
9	-8.835	-25.739	-9.878	9.878	539.264	-539.264
10	-9.786	97.307	-14.595	-94.160	-74.252	74.252
11	-109.269	175.449	-137.272	-159.332	-61.480	61.480

12	-136.474	118.466	-151.303	-145.301	-33.023	33.023
13	-11.094	-3.608	-3.500	3.500	341.180	-341.180
14	-49.882	-51.527	-24.145	24.145	811.828	-811.828
15	-92.728	-87.459	-42.902	42.902	393.964	-393.964
16	-52.907	193.027	-124.949	-171.655	15.175	-15.175
17	-120.865	151.361	-143.219	-153.385	7.515	-7.515
18	56.515	76.810	34.186	-34.186	216.231	-216.231
19	-20.635	-43.645	-16.482	16.482	496.954	-496.954
20	-63.902	-109.490	-35.386	35.386	240.579	-240.579
21	-76.810	169.653	-146.031	-176.979	50.596	-50.596
22	-126.008	160.119	34.112	-34.112	249.775	-249.775
23	-160.119	-151.556	-179.575	-32.904	35.387	-35.387
24	151.556	109.490	127.959	-170.379	35.388	-35.388

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.418	-539.264	5.301
2	-4.698	-572.611	-14.093
3	-2.092	-1122.464	-6.277
5	.000	.000	23.365
6	.000	.000	10.588
7	.000	.000	-15.179
8	-9.786	-14.595	-74.252

U. PORTO

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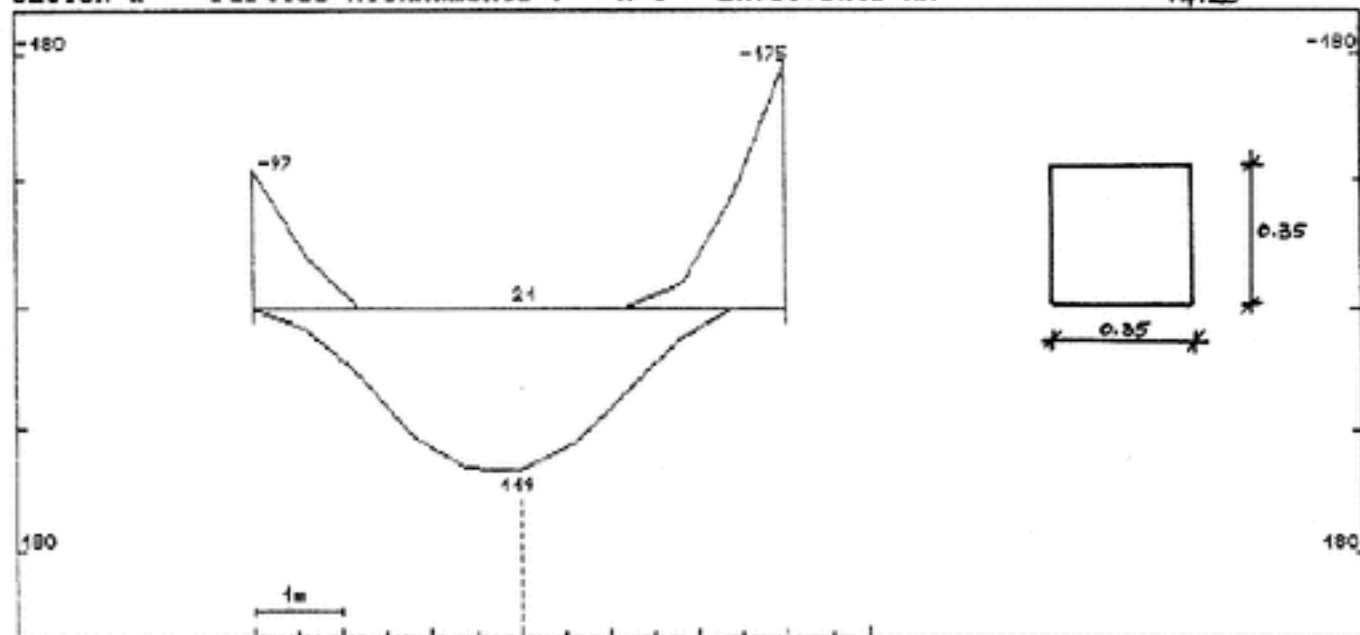
#####  #####  #  #
#          #  ##  ##
#####  #  #  #
#          #  #
#          #####  #  #

```

ac arquivo
central

SECTOR a - Portico Alinhamento 7 - A/C - Envolvente MM

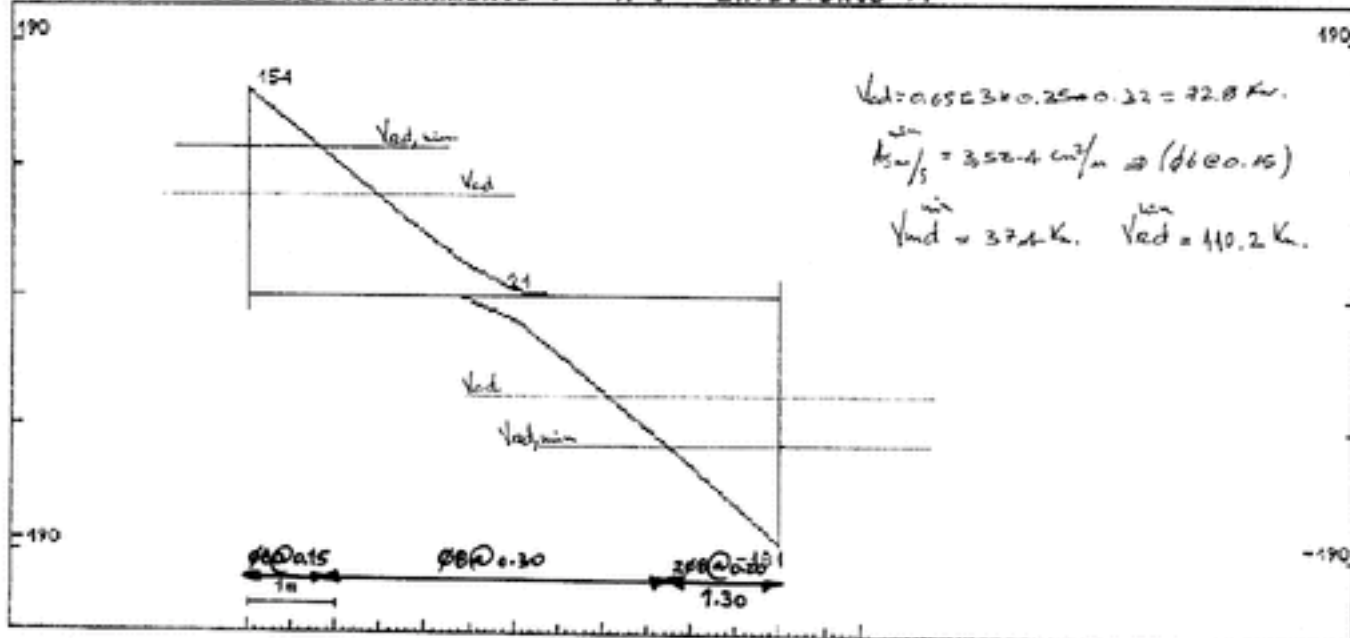
V4.25



$M_{ed}(kNm)$	-90	27	-160
μ	0,188	0,2496	0,335
w	0,224	0,312	0,370 ($4/4 \cdot 0.5$)
$I_s (cm^2)$	9,607	13,35	15,84 (-7.72)
V_{AROS}	5φ16	7φ16	8φ16 ($-4φ16$)

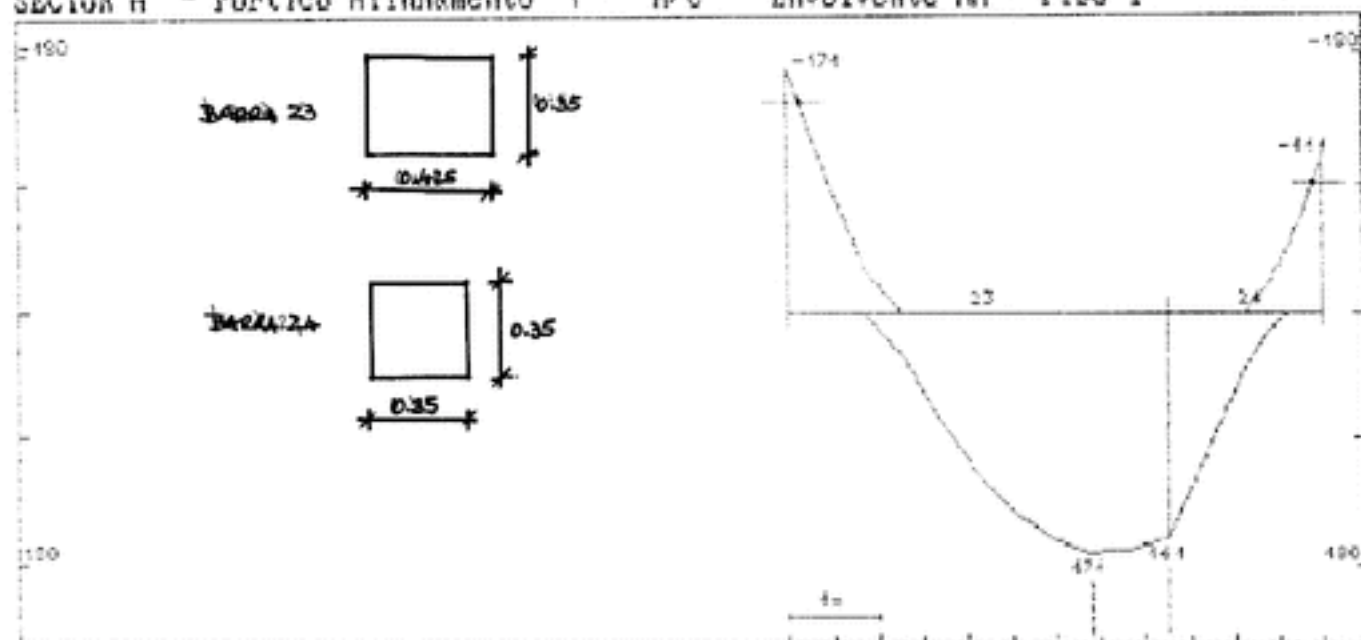
arquivo central

SECTOR A - Portico Alinhamento 7 - A/C - Envolvente VM



SECTOR A - Portico Alinhamento 7 - A/C - Envolvente MM - Piso 4

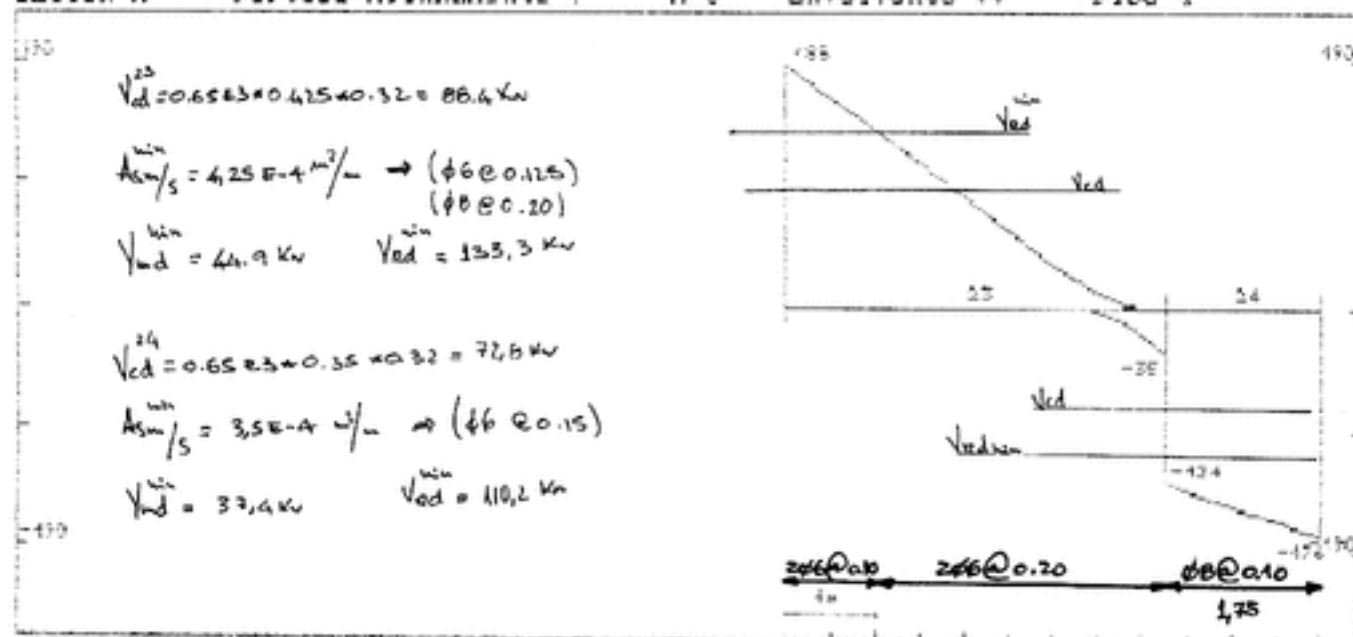
V.4.25



U. PORTO

-146	+171	+161	-90
0,252	0,295	0,3377	0,186
0,316	0,310 (A/A=0,5)	0,37 (A/A=0,05)	0,224
16,42	16,53	19,84	9,60
	(-8,3)	(-7,92)	
8φ20	(2φ16)	(2φ16)	5φ16
(4φ16+2φ20)	(4φ20)	(4φ20)	
(2φ16+φ20)	(-4φ16)	(-4φ16)	
(A/A=0,5)			

SECTOR A - Portico Alinhamento 7 - A/C - Envolvente UV - Piso 4



Viga V3.27:

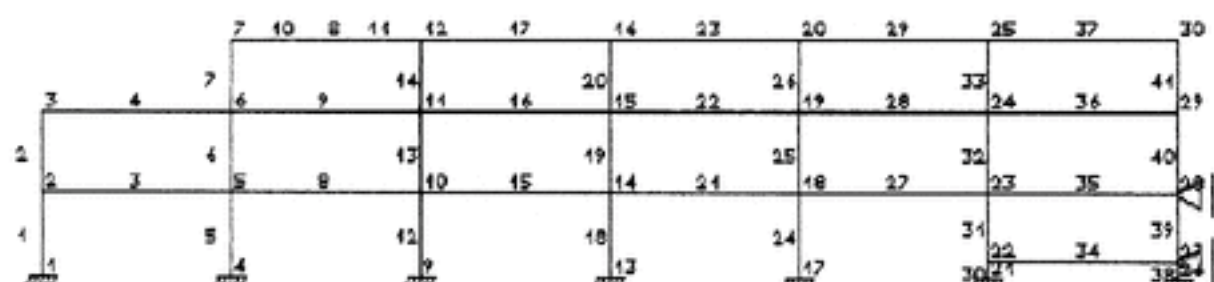
Dimensões: $b = 0.275$; $h = 0.35$

Viga embebida com dois tramos. Cálculo efectuado considerando a viga inserida no pórtico equivalente transversal PA7AC, quando do cálculo da laje fungiforme do piso 3. (Ver laje Piso 3 - Sector A); Armadura longitudinal definida no pórtico equivalente PA7AC. Esforço transversal: $V_{ed} = 57,2 \text{ kN}$; $V_{sd}^{máx} = 84 \text{ kN}$; Estribos mínimos $\phi 6 @ 0.20$ excepto a 1.0m dos apoios centrais e a 0,70m dos apoios extremos onde se define $\phi 6 @ 0.15$.

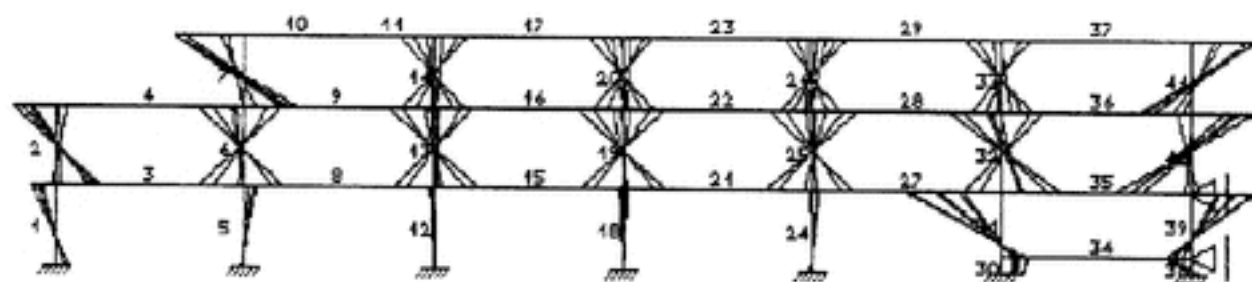
U. PORTO

ac arquivo
central

SECTOR A - Portico Alinhamento A - 1/7



SECTOR A - Portico Alinhamento A - 1/7 - Envolvente MM - Pilares



SECTOR A Portico alinhamento A 1-7

No. DE NOS	= 30	No. DE BARRAS	= 41
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 9	No. DE SECCOES TIPO	= 8
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS*	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.30000E+00	.30000E+00
2	.29000E+08	.30000E+00	.35000E+00
3	.29000E+08	.30000E+00	.50000E+00
4	.29000E+08	.90000E+00	.35000E+00
5	.29000E+08	.12500E+01	.35000E+00
6	.29000E+08	.30000E+00	.50000E+00
7	.29000E+08	.40000E+01	.25000E+00
8	.29000E+08	.10000E+04	.10000E-03

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	1	3	2 5	6
4	3 6	4	5	4 5	2	6	5 6	2
7	6 7	2	8	5 10	6	9	6 11	5
10	7 8	3	11	8 12	3	12	9 10	2
13	10 11	2	14	11 12	2	15	10 14	6
16	11 15	5	17	12 16	3	18	13 14	2
19	14 15	2	20	15 16	2	21	14 18	6
22	15 19	5	23	16 20	3	24	17 18	2
25	18 19	2	26	19 20	2	27	18 23	6
28	19 24	5	29	20 25	3	30	21 22	7
31	22 23	7	32	23 24	2	33	24 25	2
34	22 27	8	35	23 28	5	36	24 29	5
37	25 30	3	38	26 27	2	39	27 28	2
40	28 29	2	41	29 30	2			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	4.500	3	.000	8.700
4	6.000	.000	5	6.000	4.500	6	6.000	8.700
7	6.000	12.600	8	9.000	12.600	9	12.000	.000
10	12.000	4.500	11	12.000	8.700	12	12.000	12.600
13	18.000	.000	14	18.000	4.500	15	18.000	8.700
16	18.000	12.600	17	24.000	.000	18	24.000	4.500
19	24.000	8.700	20	24.000	12.600	21	30.000	.000
22	30.000	1.000	23	30.000	4.500	24	30.000	8.700
25	30.000	12.600	26	36.000	.000	27	36.000	1.000
28	36.000	4.500	29	36.000	8.700	30	36.000	12.600

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	4	1	1	1
9	1	1	1	13	1	1	1
17	1	1	1	21	1	1	1
26	1	1	1	27	0	0	1
28	0	0	1				

PILARES

Volume de Material (m3)= 12.7485

Area de Cofragem (m2)= 141.1200

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 27.2400

Area de Cofragem (m2)= 6157.8010

 ACCAO 1
 PERMANENTES G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	31.182	11	31.182
17	39.100	23	39.100
29	39.100	37	39.100
4	11.450	9	26.600
16	26.600	22	26.600
28	26.600	36	26.600
3	29.800	8	23.800
15	23.800	21	23.800
27	23.800	35	46.140

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
8		12.020	
7		40.500	
30		40.500	
12		81.000	
16		81.000	
20		81.000	
25		81.000	

 ACCAO 2
 SOBRECARGA1 Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	4.238	11	4.238
23	9.000	27	9.000
4	1.675	16	9.080
28	9.080	35	18.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
8		4.238	
7		9.000	
12		9.000	
16		9.000	
20		9.000	
25		9.000	
30		9.000	

 ACCAO 3
 SOBRECARGA2 Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
17	9.000	29	9.000
9	9.080	22	9.080
36	9.080		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		9.000	
16		9.000	
20		9.000	
25		9.000	

ACCAO 4
SISMO(e1i) E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
7			39.150
3			58.600

ACCAO 5
SISMO(e2i) E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
7			64.000
3			2.800

***** RESULTADOS *****

COMBINACAO 1
ACC.BASE Q1+Q2

ACCAO	COEFICIENTE
PERMANENTES G	1.50000
SOBRECARGA2 Q2	1.50000
SISMO(e2i) E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	1.50000
SISMO(e1i) E1	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	13.890	27.391	9.173	-9.173	169.232	-169.232
2	35.709	26.930	14.914	-14.914	49.106	-49.106
3	-63.100	146.946	-120.126	-148.074	-5.741	5.741
4	-26.930	86.667	-49.106	-69.019	14.914	-14.914
5	-4.612	-9.769	-3.196	3.196	711.797	-711.797
6	-2.255	10.143	1.878	-1.878	449.757	-449.757
7	48.260	74.464	31.468	-31.468	222.062	-222.062
8	-134.921	93.726	-113.966	-100.234	-10.815	10.815
9	-145.071	156.372	-158.676	-162.444	-14.676	14.676
10	-74.464	-129.891	-147.812	-11.575	31.468	-31.468
11	129.891	217.075	35.962	-195.349	31.468	-31.468
12	1.857	3.308	1.148	-1.148	1089.957	-1089.957
13	5.241	3.814	2.156	-2.156	883.568	-883.568
14	.672	.466	.292	-.292	560.511	-560.511
15	-102.275	107.947	-106.155	-108.045	-11.823	11.823
16	-160.858	160.537	-160.614	-160.506	-12.811	12.811
17	-217.541	216.269	-216.662	-216.238	31.759	-31.759
18	-.112	-.481	-.132	.132	1121.833	-1121.833
19	1.545	2.162	.883	-.883	906.148	-906.148
20	1.967	2.139	1.053	-1.053	582.630	-582.630
21	-109.010	105.766	-107.641	-106.559	-12.837	12.837
22	-164.666	149.964	-163.010	-158.110	-12.981	12.981
23	-218.409	209.753	-217.893	-215.007	32.812	-32.812
24	-.012	-.117	-.029	.029	1124.803	-1124.803
25	.007	-1.883	-.447	.447	888.094	-888.094
26	-4.696	-4.628	-2.391	2.391	575.871	-575.871
27	-105.656	210.357	-130.150	-165.050	-12.419	12.419
28	-143.385	182.061	-154.114	-167.006	-11.038	11.038
29	-205.125	229.642	-212.364	-220.536	30.422	-30.422
30	22.672	-25.187	-2.515	2.515	1401.830	-1401.830
31	25.187	97.670	35.102	-35.102	1401.830	-1401.830
32	22.013	11.407	-7.957	-7.957	915.270	-915.270
33	.062	-.481	-.107	.107	571.796	-571.796
34	.000	.000	.000	.000	-37.617	37.617
35	-330.040	132.764	-321.509	-255.751	14.726	-14.726
36	-193.530	98.082	-176.468	-144.652	-2.973	2.973
37	-229.161	68.300	-202.760	-149.140	30.314	-30.314
38	13.606	27.213	40.819	-40.819	623.792	-623.792
39	-27.213	-66.088	-26.657	26.657	623.792	-623.792
40	-66.676	-48.157	-27.341	27.341	368.042	-368.042
41	-49.925	-68.300	-30.314	30.314	223.390	-223.390

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	13.890	-169.232	9.173
4	-4.612	-711.797	-3.196
9	1.857	-1089.957	1.148
13	-.112	-1121.833	-.132
17	-.012	-1124.803	-.029
21	22.672	-1401.830	-2.515
26	13.606	-623.792	40.819
27	.000	.000	-29.859
28	.000	.000	-15.410

COMBINACAO 2

ACC.BASE Q1

ACCAO	COEFICIENTE
PERMANENTES G	1.50000
SOBRECARGA2 Q2	.00000
SISMO(e2i) E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	1.50000
SISMO(e1i) E1	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	13.613	26.893	9.001	-9.001	171.476	-171.476
2	35.927	28.330	15.299	-15.299	51.710	-51.710
3	-62.820	148.826	-119.766	-148.434	-6.298	6.298
4	-28.330	72.446	-51.710	-66.415	15.299	-15.299
5	-4.327	-9.103	-2.985	2.985	670.378	-670.378
6	-6.435	.951	-1.306	1.306	408.173	-408.173
7	40.699	74.481	29.533	-29.533	225.146	-225.146
8	-133.287	93.262	-113.771	-100.429	-7.977	7.977
9	-114.096	132.622	-116.612	-122.788	-15.540	15.540
10	-74.481	-139.124	-150.896	-8.492	29.533	-29.533
11	139.124	198.592	32.878	-192.266	29.533	-29.533
12	1.219	2.090	.735	-.735	993.198	-993.198
13	8.214	12.059	4.827	-4.827	786.607	-786.607
14	3.274	-9.066	-1.485	1.485	502.894	-502.894
15	-103.566	109.195	-106.162	-108.038	-12.068	12.068
16	-147.955	145.756	-160.926	-160.194	-9.228	9.228
17	-189.526	191.461	-175.628	-176.272	28.048	-28.048
18	.408	.622	.229	-.229	1026.538	-1026.538
19	-2.463	-7.311	-2.327	2.327	811.061	-811.061
20	-1.090	12.039	2.807	-2.807	529.028	-529.028
21	-107.354	105.321	-107.439	-106.761	-9.512	9.512
22	-137.354	124.519	-121.839	-117.561	-14.362	14.362
23	-203.500	195.666	-217.756	-215.144	30.855	-30.855
24	-.410	-.894	-.290	.290	1032.390	-1032.390
25	3.815	7.418	2.674	-2.674	794.905	-794.905
26	-1.691	-14.661	-4.193	4.193	522.775	-522.775
27	-108.241	209.495	-130.724	-164.476	-12.477	12.477
28	-130.246	166.193	-154.569	-166.551	-7.495	7.495
29	-181.005	200.919	-172.631	-179.269	26.663	-26.663
30	23.619	-26.213	-2.594	2.594	1300.594	-1300.594
31	26.213	101.816	36.580	-36.580	1300.594	-1300.594
32	17.582	1.682	4.587	-4.587	814.407	-814.407
33	-3.578	8.408	1.238	-1.238	513.701	-513.701
34	.000	.000	.000	.000	-39.173	39.173
35	-328.893	130.401	-321.712	-255.548	19.516	-19.516
36	-164.297	77.572	-134.154	-105.246	-4.147	4.147
37	-209.327	68.432	-199.432	-152.468	27.901	-27.901
38	13.963	27.926	41.889	-41.889	587.511	-587.511
39	-27.926	-67.821	-27.356	27.356	587.511	-587.511
40	-62.580	-37.189	-23.755	23.755	331.963	-331.963
41	-40.383	-68.432	-27.901	27.901	226.717	-226.717

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	13.613	-171.476	9.001
4	-4.327	-670.378	-2.985
9	1.219	-993.198	.735
13	.408	-1026.538	.229
17	-.410	-1032.390	-.290
21	23.619	-1300.594	-2.594
26	13.963	-587.511	41.889
27	.000	.000	-30.072

28

.000

.000

-15.915

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE
PERMANENTES G	1.50000
SOBRECARGA2 Q2	1.50000
SISMO(e2i) E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	.00000
SISMO(e1i) E1	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	14.012	27.681	9.265	-9.265	161.504	-161.504
2	34.309	23.850	13.847	-13.847	41.526	-41.526
3	-61.990	146.722	-119.978	-148.222	-4.582	4.582
4	-23.850	83.845	-41.526	-61.524	13.847	-13.847
5	-5.014	-10.514	-3.451	3.451	671.754	-671.754
6	-1.442	13.310	2.826	-2.826	409.874	-409.874
7	46.712	64.083	28.409	-28.409	186.979	-186.979
8	-134.766	95.417	-113.658	-100.542	-10.858	10.858
9	-143.866	139.004	-161.370	-159.750	-11.736	11.736
10	-64.083	-104.127	-126.229	-14.090	28.409	-28.409
11	104.127	202.710	32.120	-172.439	28.409	-28.409
12	2.158	3.968	1.361	-1.361	1010.970	-1010.970
13	1.207	-4.987	-.900	.900	804.667	-804.667
14	-2.563	7.353	-1.228	-1.228	525.663	-525.663
15	-100.592	108.624	-105.761	-108.439	-8.597	8.597
16	-131.453	134.122	-119.255	-120.145	-13.864	13.864
17	-210.064	199.417	-218.224	-214.676	29.637	-29.637
18	-.230	-.700	-.207	.207	1028.053	-1028.053
19	5.353	10.576	3.793	-3.793	809.805	-809.805
20	4.990	-7.116	-.545	.545	527.372	-527.372
21	-113.278	97.018	-109.810	-104.390	-12.596	12.596
22	-149.687	139.324	-162.287	-158.833	-9.526	9.526
23	-192.301	181.820	-177.697	-174.203	29.092	-29.092
24	-2.176	-4.430	-1.468	1.468	992.057	-992.057
25	-9.345	-13.218	-5.372	5.372	791.742	-791.742
26	-6.448	5.027	-.364	.364	518.144	-518.144
27	-83.244	150.293	-95.925	-118.275	-8.692	8.692
28	-119.657	149.262	-114.766	-124.634	-14.534	14.534
29	-186.846	231.901	-208.941	-223.959	28.727	-28.727
30	15.898	-17.681	-1.783	1.783	1209.760	-1209.760
31	17.681	68.438	24.605	-24.605	1209.760	-1209.760
32	19.780	16.553	8.651	-8.651	860.321	-860.321
33	8.453	1.560	2.568	-2.568	562.390	-562.390
34	.000	.000	.000	.000	-26.388	26.388
35	-238.511	97.310	-231.164	-184.096	7.263	-7.263
36	-174.268	97.841	-173.298	-147.822	-8.451	8.451
37	-233.462	68.579	-203.430	-148.470	31.295	-31.295
38	9.416	18.832	28.248	-28.248	541.138	-541.138
39	-18.832	-45.735	-18.448	18.448	541.138	-541.138
40	-51.575	-44.370	-22.844	22.844	357.042	-357.042
41	-53.472	-68.579	-31.295	31.295	209.219	-209.219

REACOES NOS APOIOS

NO DO APOIO	MOMENTO	VERTICAL	HORIZONTAL
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	(KN.m)	(KN)	(KN)
1	14.012	-161.504	9.265
4	-5.014	-671.754	-3.451
9	2.158	-1010.970	1.361
13	-.230	-1028.053	-.207
17	-2.176	-992.057	-1.468
21	15.898	-1209.760	-1.783
26	9.416	-541.138	28.248
27	.000	.000	-20.307
28	.000	.000	-11.659

COMBINACAO 4

ACC.BASE E1

ACCAO	COEFICIENTE
PERMANENTES G	1.00000
SOBRECARGA2 Q2	.40000
SISMO(e2i) E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	.40000
SISMO(e1i) E1	1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	9.121	20.745	6.637	-6.637	93.566	-93.566
2	-4.230	-10.278	-3.454	3.454	21.639	-21.639
3	-16.515	121.357	-71.926	-106.874	10.091	-10.091
4	10.278	78.046	-21.639	-51.081	84.446	-84.446
5	-4.106	-4.364	-1.882	1.882	435.261	-435.261
6	-48.745	-40.652	-21.285	21.285	259.676	-259.676
7	11.141	27.578	9.928	-9.928	130.062	-130.062
8	-68.248	84.377	-68.712	-74.088	29.494	-29.494
9	-48.535	121.511	-78.533	-102.859	53.233	-53.233
10	-27.578	-82.361	-85.962	-12.669	68.654	-68.654
11	82.361	144.737	26.384	-125.015	68.654	-68.654
12	.762	4.997	1.280	-1.280	658.399	-658.399
13	-43.171	-43.782	-20.703	20.703	520.929	-520.929
14	-20.406	-23.799	-11.334	11.334	338.435	-338.435
15	-46.203	94.310	-63.382	-79.418	51.476	-51.476
16	-57.324	123.686	-79.636	-101.756	43.865	-43.865
17	-120.938	138.217	-125.220	-130.980	57.320	-57.320
18	.369	3.558	.873	-.873	671.712	-671.712
19	-46.076	-45.696	-21.851	21.851	527.176	-527.176
20	-18.414	-20.107	-9.877	9.877	344.643	-344.643
21	-51.792	89.479	-65.119	-77.681	74.200	-74.200
22	-59.575	119.097	-80.776	-100.616	31.889	-31.889
23	-118.110	133.929	-125.464	-130.736	47.444	-47.444
24	.613	3.102	.826	-.826	661.950	-661.950
25	-49.429	-49.233	-23.491	23.491	516.724	-516.724
26	-22.000	-24.884	-12.022	12.022	339.711	-339.711
27	-43.152	131.082	-67.545	-96.855	98.516	-98.516
28	-47.864	133.659	-76.397	-104.995	20.420	-20.420
29	-109.044	152.994	-120.775	-135.425	35.421	-35.421
30	15.562	-16.450	-.888	.888	808.279	-808.279
31	16.450	69.249	24.485	-24.485	808.279	-808.279
32	-41.081	-45.659	-20.652	20.652	542.533	-542.533
33	-18.342	-18.194	-9.368	9.368	353.309	-353.309
34	.000	.000	.000	.000	-25.373	25.373
35	-159.249	106.023	-168.891	-151.149	143.654	-143.654
36	-69.658	108.462	-84.229	-97.163	9.134	-9.134
37	-134.801	60.495	-129.684	-104.916	26.053	-26.053

38	5.269	10.538	15.807	-15.807	397.328	-397.328
39	-10.538	-25.593	-10.323	10.323	397.328	-397.328
40	-80.430	-67.352	-35.186	35.186	246.179	-246.179
41	-41.110	-60.495	-26.053	26.053	149.016	-149.016

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.121	-93.566	6.637
4	-4.106	-435.261	-1.882
9	.762	-658.399	1.280
13	.369	-671.712	.873
17	.613	-661.950	.826
21	15.562	-808.279	-.888
26	5.269	-397.328	15.807
27	.000	.000	-.757
28	.000	.000	-168.517

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE
PERMANENTES G	1.00000
SOBRECARGA2 Q2	.40000
SISMO(e2i) E2	1.50000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	.40000
SISMO(e1i) E1	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	9.216	20.084	6.511	-6.511	97.723	-97.723
2	3.735	-2.732	.239	-.239	23.422	-23.422
3	-23.819	114.614	-74.301	-104.499	6.272	-6.272
4	2.732	74.896	-23.422	-49.298	4.439	-4.439
5	-3.839	-5.133	-1.994	1.994	430.405	-430.405
6	-34.151	-24.808	-14.038	14.038	254.909	-254.909
7	-1.739	16.996	3.912	-3.912	127.031	-127.031
8	-75.130	77.549	-70.997	-71.803	18.317	-18.317
9	-48.349	121.046	-78.580	-102.812	-13.511	13.511
10	-16.996	-83.852	-82.931	-15.700	99.912	-99.912
11	83.852	152.339	29.415	-128.046	99.913	-99.913
12	.912	4.136	1.122	-1.122	659.671	-659.671
13	-28.918	-28.528	-13.678	13.678	522.305	-522.305
14	-34.423	-36.852	-18.276	18.276	339.582	-339.582
15	-52.767	87.790	-65.563	-77.237	33.116	-33.116
16	-58.094	122.802	-79.911	-101.481	-8.914	8.914
17	-115.487	144.070	-123.336	-132.864	81.638	-81.638
18	.307	2.505	.625	-.625	671.773	-671.773
19	-31.813	-30.495	-14.835	14.835	527.155	-527.155
20	-31.585	-32.059	-16.319	16.319	344.505	-344.505
21	-58.482	82.594	-67.381	-75.419	48.576	-48.576
22	-60.722	117.883	-81.169	-100.223	-7.430	7.430
23	-112.011	139.962	-123.441	-132.759	65.320	-65.320
24	.136	1.545	.374	-.374	661.724	-661.724
25	-35.203	-33.996	-16.476	16.476	517.050	-517.050
26	-34.726	-36.401	-18.238	18.238	339.993	-339.993
27	-48.936	126.607	-69.255	-95.145	65.425	-65.425
28	-49.161	132.332	-76.834	-104.558	-5.669	5.669

29	-103.561	157.950	-119.035	-137.165	47.081	-47.081
30	14.796	-15.860	-1.064	1.064	809.015	-809.015
31	15.860	65.261	23.177	-23.177	809.015	-809.015
32	-25.231	-29.449	-13.019	13.019	542.032	-542.032
33	-31.020	-29.930	-15.628	15.628	352.376	-352.376
34	.000	.000	.000	.000	-24.241	24.241
35	-166.637	95.726	-171.838	-148.202	101.622	-101.622
36	-71.863	105.454	-85.097	-96.295	-3.061	3.061
37	-128.020	69.752	-127.011	-107.589	31.452	-31.452
38	5.976	11.951	17.927	-17.927	396.185	-396.185
39	-11.951	-29.024	-11.707	11.707	396.185	-396.185
40	-66.702	-52.542	-28.391	28.391	247.983	-247.983
41	-52.913	-69.752	-31.452	31.452	151.689	-151.689

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.216	-97.723	6.511
4	-3.839	-430.405	-1.994
9	.912	-659.671	1.122
13	.307	-671.773	.625
17	.136	-661.724	.374
21	14.796	-809.015	-1.064
26	5.976	-396.185	17.927
27	.000	.000	-5.393
28	.000	.000	-118.306

 COMBINACAO 6
 ACC.BASE-E1

arquivo
 central

ACCAO	COEFICIENTE
PERMANENTES G	1.00000
SOBRECARGA2 Q2	.40000
SISMO(e2i) E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	.40000
SISMO(e1i) E1	-1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	9.275	15.609	5.530	-5.530	127.689	-127.689
2	50.897	44.840	22.795	-22.795	39.854	-39.854
3	-66.507	75.895	-87.835	-90.965	-17.265	17.265
4	-44.840	23.875	-39.854	-32.866	-65.106	65.106
5	-2.136	-8.724	-2.413	2.413	448.631	-448.631
6	43.045	49.355	22.000	-22.000	274.826	-274.826
7	45.919	63.415	28.034	-28.034	140.421	-140.421
8	-110.216	41.572	-82.841	-59.959	-41.678	41.678
9	-119.149	54.091	-101.539	-79.853	-71.140	71.140
10	-63.415	-77.602	-96.321	-2.310	-30.691	30.691
11	77.602	118.418	16.025	-114.656	-30.692	30.692
12	1.445	-1.032	.092	-.092	654.280	-654.280
13	49.311	48.421	23.270	-23.270	516.472	-516.472
14	20.795	22.304	11.051	-11.051	334.940	-334.940
15	-89.851	51.160	-77.848	-64.952	-64.856	64.856
16	-123.307	57.407	-101.679	-79.713	-58.922	58.922
17	-140.723	116.814	-132.085	-124.115	-19.641	19.641
18	-.197	-3.492	-.820	.820	672.806	-672.806
19	47.976	47.731	22.788	-22.788	527.878	-527.878

20	21.009	23.474	11.406	-11.406	345.109	-345.109
21	-95.644	44.188	-79.976	-62.824	-88.463	88.463
22	-126.147	51.986	-103.056	-78.336	-47.539	47.539
23	-140.288	112.126	-132.794	-123.406	-8.236	8.236
24	-2.678	-7.330	-2.224	2.224	657.659	-657.659
25	45.003	45.095	21.452	-21.452	515.768	-515.768
26	16.741	18.412	9.014	-9.014	339.458	-339.458
27	-81.861	100.653	-79.068	-85.332	-112.139	112.139
28	-113.823	70.156	-97.974	-83.418	-35.100	35.100
29	-130.537	132.024	-127.852	-128.348	.779	-.779
30	10.005	-11.948	-1.943	1.943	826.183	-826.183
31	11.948	40.909	15.102	-15.102	826.183	-826.183
32	65.101	57.204	29.120	-29.120	553.177	-553.177
33	22.225	26.297	12.441	-12.441	355.084	-355.084
34	.000	.000	.000	.000	-17.045	17.045
35	-206.663	40.741	-187.674	-132.366	-126.158	126.158
36	-149.585	5.713	-114.675	-66.717	-18.420	18.420
37	-158.320	30.900	-138.537	-96.063	13.220	-13.220
38	9.806	19.612	29.417	-29.417	339.247	-339.247
39	-19.612	-47.628	-19.211	19.211	339.247	-339.247
40	6.887	14.947	5.198	-5.198	206.880	-206.880
41	-20.660	-30.900	-13.221	13.221	140.163	-140.163

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.275	-127.689	5.530
4	-2.136	-448.631	-2.413
9	1.445	-654.280	.092
13	-.197	-672.806	-.820
17	-2.678	-657.659	-2.224
21	10.005	-826.183	-1.943
26	9.806	-339.247	29.417
27	.000	.000	-31.584
28	.000	.000	150.567

 COMBINACAO 7
 ACC.BASE-E2

ACCAO	COEFICIENTE
PERMANENTES G	1.00000
SOBRECARGA2 Q2	.40000
SISMO(e2i) E2	-1.50000

ACCAO	COEFICIENTE
SOBRECARGA1 Q1	.40000
SISMO(e1i) E1	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	9.180	16.271	5.656	-5.656	123.532	-123.532
2	42.932	37.295	19.102	-19.102	38.072	-38.072
3	-59.203	82.839	-85.461	-93.339	-13.446	13.446
4	-37.295	27.025	-38.072	-34.648	14.901	-14.901
5	-2.404	-7.955	-2.302	2.302	453.488	-453.488
6	28.450	33.511	14.753	-14.753	279.593	-279.593
7	58.799	73.998	34.050	-34.050	143.452	-143.452
8	-103.334	48.400	-80.556	-62.244	-30.501	30.501
9	-119.335	54.556	-101.492	-79.900	-4.396	4.396
10	-73.998	-76.112	-99.352	.721	-61.950	61.950

11	76.112	110.816	12.994	-111.625	-61.951	61.951
12	1.294	-.171	.250	-.250	653.009	-653.009
13	35.057	33.168	16.244	-16.244	515.096	-515.096
14	34.812	35.357	17.992	-17.992	333.794	-333.794
15	-83.286	57.680	-75.668	-67.132	-46.495	46.495
16	-122.536	58.291	-101.404	-79.988	-6.144	6.144
17	-146.173	110.961	-133.969	-122.231	-43.959	43.959
18	-.135	-2.439	-.572	.572	672.744	-672.744
19	33.713	32.529	15.772	-15.772	527.899	-527.899
20	34.180	35.427	17.848	-17.848	345.247	-345.247
21	-88.954	51.073	-77.714	-65.086	-62.839	62.839
22	-125.001	53.201	-102.663	-78.729	-8.219	8.219
23	-146.388	106.092	-134.816	-121.384	-26.112	26.112
24	-2.201	-5.773	-1.772	1.772	657.886	-657.886
25	30.777	29.858	14.437	-14.437	515.442	-515.442
26	29.467	29.928	15.230	-15.230	339.176	-339.176
27	-76.077	105.128	-77.358	-87.042	-79.048	79.048
28	-112.526	71.483	-97.537	-83.855	-9.012	9.012
29	-136.020	127.068	-129.592	-126.608	-10.881	10.881
30	10.772	-12.539	-1.767	1.767	825.447	-825.447
31	12.539	44.897	16.410	-16.410	825.447	-825.447
32	49.251	40.995	21.487	-21.487	553.679	-553.679
33	34.903	38.033	18.701	-18.701	356.018	-356.018
34	.000	.000	.000	.000	-18.177	18.177
35	-199.276	51.039	-184.726	-135.314	-84.126	84.126
36	-147.381	8.721	-113.806	-67.586	-6.225	6.225
37	-165.101	21.643	-141.210	-93.390	7.821	-7.821
38	9.099	18.199	27.298	-27.298	340.390	-340.390
39	-18.199	-44.197	-17.827	17.827	340.390	-340.390
40	-6.842	.137	-1.596	1.596	205.076	-205.076
41	-8.858	-21.643	-7.821	7.821	137.490	-137.490

REACOES NOS APOIOS

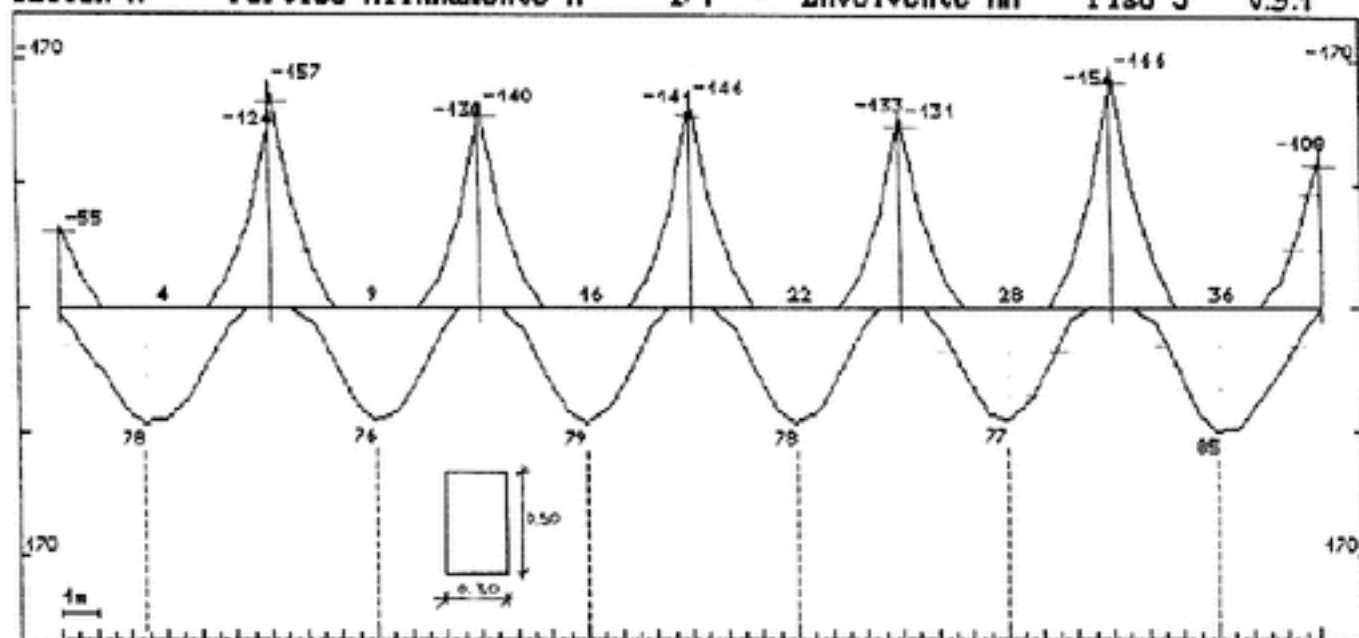
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.180	-123.532	5.656
4	-2.404	-453.488	-2.302
9	1.294	-653.009	.250
13	-.135	-672.744	-.572
17	-2.201	-657.886	-1.772
21	10.772	-825.447	-1.767
26	9.099	-340.390	27.298
27	.000	.000	-26.948
28	.000	.000	100.356

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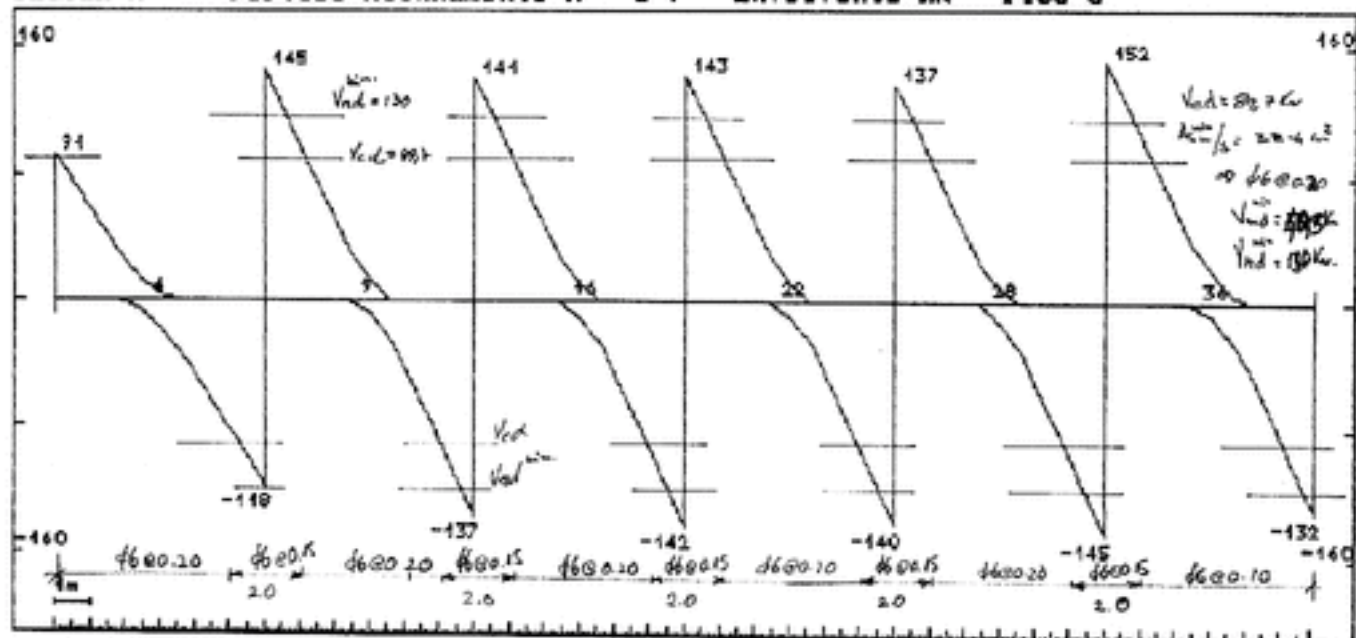
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SECTOR A - Portico Alinhamento A - 1/7 - Envolvente MM - Piso 3 $\sqrt{3.1}$



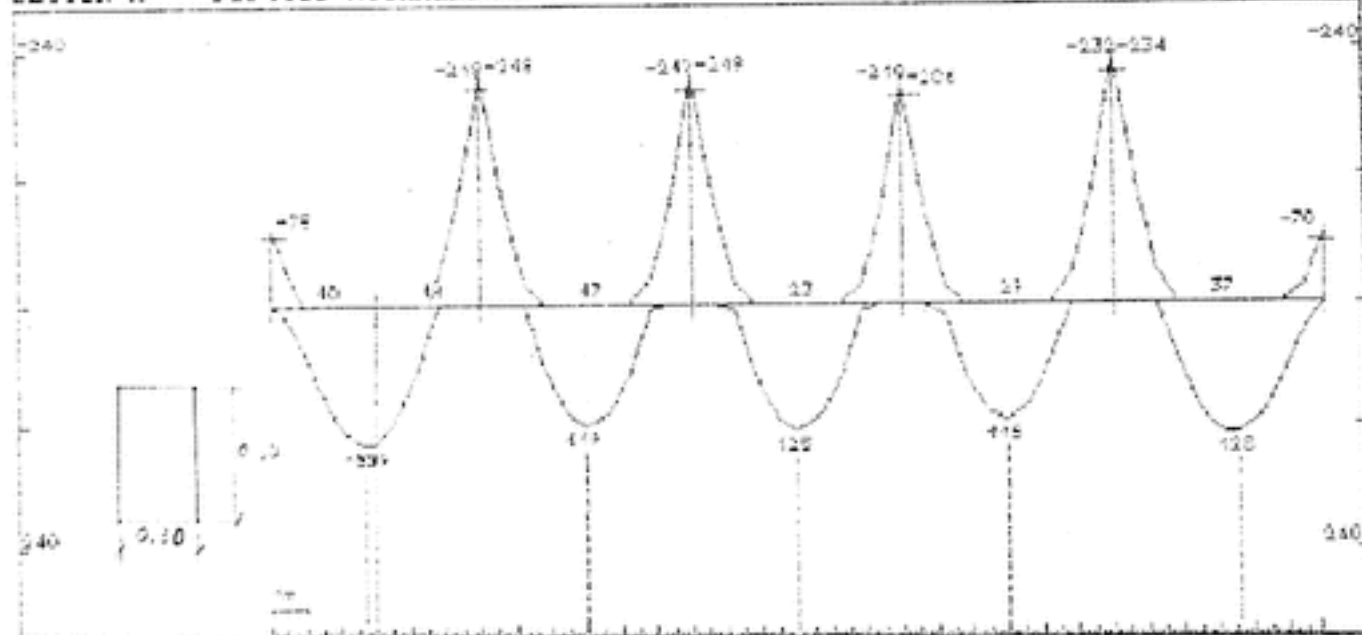
M _{ed} (kNm)	-55	78	-124	76	-157	76	-138	79	-140	79	-141	78	-133	77	-131	28	-15	85	-146	36	-109
μ	0.065	0.1	0.14	0.098	0.162	0.10	0.17	0.10	0.162	0.10	0.143	0.11	0.13	0.10	0.143	0.11	0.13	0.13	0.13	0.13	0.13
ν	7.65	5.33	10.0	5.17	8.5	5.4	8.9	5.4	8.8	5.4	8.1	5.85	6.76	5.4	8.1	5.85	6.76	5.4	8.1	5.85	6.76
Armas	4 ϕ 12	5 ϕ 12	5 ϕ 16	5 ϕ 12	3 ϕ 16 + 2 ϕ 12	5 ϕ 12	3 ϕ 16 + 2 ϕ 12	5 ϕ 12	3 ϕ 16 + 2 ϕ 12	5 ϕ 12	5 ϕ 12	5 ϕ 16	6 ϕ 12	5 ϕ 12	5 ϕ 12	5 ϕ 16	6 ϕ 12	5 ϕ 12	5 ϕ 16	6 ϕ 12	5 ϕ 12

SECTOR A - Portico Alinhamento A - 1/7 - Envolvente MM - Piso 3



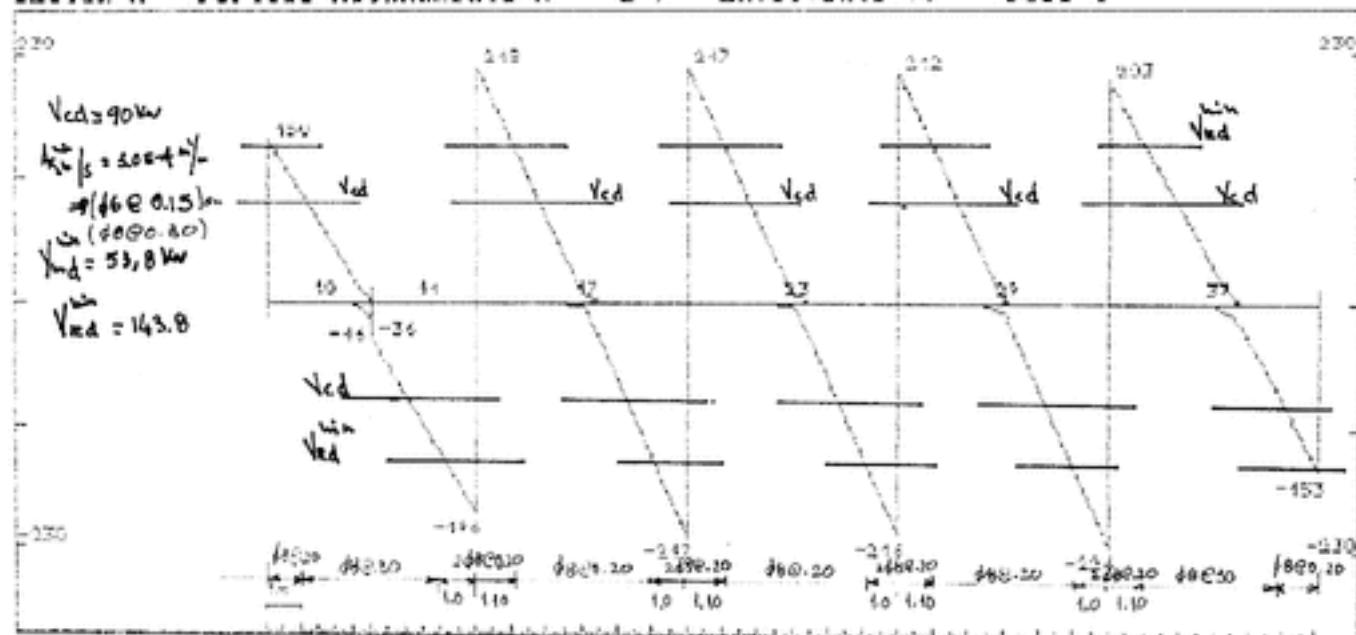
SECTOR A - Portico Alinhamento A - 1/7 - Envolvente MM - Piso 4

V.4.1

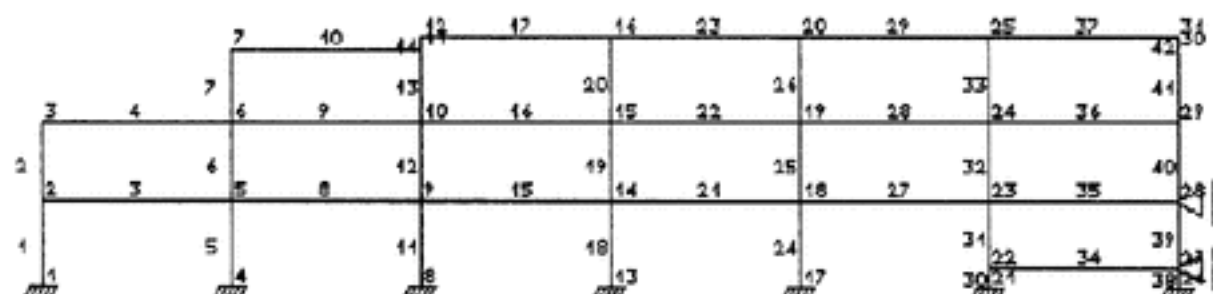


$H_{ed}(kNm)$	-70	139	-200	119	-200	125	-200	115	-215	120	-65
μ	0,083	0,165	0,237	0,141	0,237	0,140	0,237	0,136	0,204	0,152	0,077
w	0,089	0,192	0,293	0,161	0,293	0,17	0,293	0,155	0,319	0,175	0,083
$A_s(cm^2)$	4,74	10,12	15,45	8,48	15,45	8,97	15,45	8,16	16,85	9,21	4,37
	2 ϕ 16 + 2 ϕ 12	6 ϕ 16	2 ϕ 16 + 4 ϕ 20	5 ϕ 16	2 ϕ 16 + 3 ϕ 20	5 ϕ 16	2 ϕ 16 + 3 ϕ 20	5 ϕ 16	2 ϕ 16 + 4 ϕ 20	6 ϕ 16	2 ϕ 16 + 2 ϕ 12

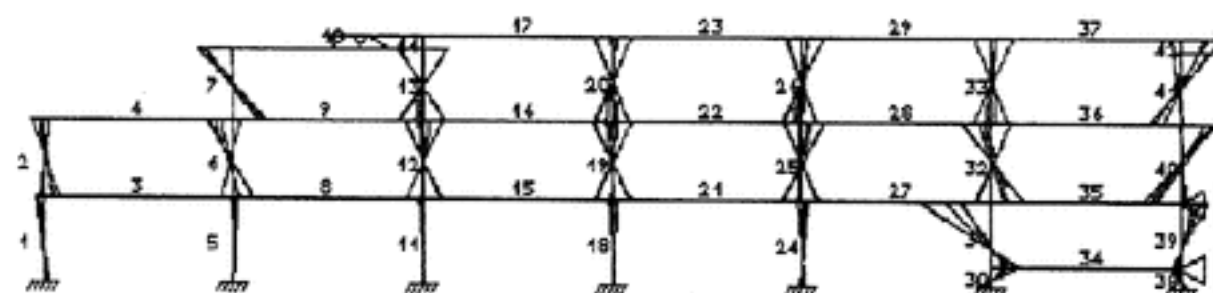
SECTOR A - Portico Alinhamento A - 1/7 - Envolvente UV - Piso 4



SECTOR A - Portico Alinhamento B - 1/7



SECTOR A - Portico Alinhamento B - 1/7 - Envolvente MM - Pilares



U. PORTO


 arquivo
central

SECTOR A Portico Alinhamento B 1-7

No. DE NOS	=	31	No. DE BARRAS	=	42
No. DE NOS POR BARRA	=	2	No. DE INCOGNITAS POR NO	=	3
No. DE APOIOS	=	9	No. DE SECCOES TIPO	=	9
No. DE PROPRIEDADES	=	3	TIPO DE SAIDA DE RESULTADOS	=	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.14000E+01	.35000E+00
4	.29000E+08	.30000E+00	.13500E+01
5	.29000E+08	.40000E+00	.35000E+00
6	.29000E+08	.20000E+01	.35000E+00
7	.29000E+08	.25000E+00	.40000E+00
8	.29000E+08	.40000E+01	.25000E+00
9	.29000E+08	.10000E+06	.10000E-03

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	1	3	2 5	7
4	3 6	5	5	4 5	2	6	5 6	2
7	6 7	2	8	5 9	7	9	6 10	6
10	7 11	3	11	8 9	2	12	9 10	2
13	10 11	2	14	11 12	4	15	9 14	7
16	10 15	6	17	12 16	4	18	13 14	2
19	14 15	2	20	15 16	2	21	14 18	7
22	15 19	6	23	16 20	4	24	17 18	2
25	18 19	2	26	19 20	2	27	18 23	7
28	19 24	6	29	20 25	4	30	21 22	8
31	22 23	8	32	23 24	2	33	24 25	2
34	22 27	9	35	23 28	6	36	24 29	6
37	25 31	4	38	26 27	2	39	27 28	2
40	28 29	2	41	29 30	2	42	30 31	4

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	4.500	3	.000	8.700
4	6.000	.000	5	6.000	4.500	6	6.000	8.700
7	6.000	12.600	8	12.000	.000	9	12.000	4.500
10	12.000	8.700	11	12.000	12.600	12	12.000	13.100
13	18.000	.000	14	18.000	4.500	15	18.000	8.700
16	18.000	13.100	17	24.000	.000	18	24.000	4.500
19	24.000	8.700	20	24.000	13.100	21	30.000	.000
22	30.000	1.000	23	30.000	4.500	24	30.000	8.700
25	30.000	13.100	26	36.000	.000	27	36.000	1.000
28	36.000	4.500	29	36.000	8.700	30	36.000	12.600
31	36.000	13.100						

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	4	1	1	1
8	1	1	1	13	1	1	1
17	1	1	1	21	1	1	1
26	1	1	1	28	0	0	1
27	0	0	1				

PILARES

Volume de Material (m3)= 14.7120

Area de Cofragem (m2)= 154.5000

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 101.7000

Area de Cofragem (m2)=*****

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
23	46.055	29	46.055
37	46.055	9	49.200
16	49.200	22	49.200
28	49.200	36	49.200
35	49.200	3	12.625
8	12.625	15	12.625
21	12.625	27	12.625
10	25.970	17	49.340
4	5.900		

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
10	13.970	3.000	17	6.670	3.000
23	11.070	3.000	29	11.070	3.000
37	11.070	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
7		81.000	
11		81.000	
12		81.000	
31		81.000	
16		162.000	
20		162.000	
25		162.000	

 ACCAO 2
 SOBRECARGA-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	9.270	23	16.020
37	16.020	16	18.000
28	18.000	35	18.000

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
10	4.770	3.000	23	7.020	3.000
37	7.020	3.000			

***** CARGA 7 *****

FORCAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
7		18.000	
11		18.000	
16		18.000	
20		18.000	
25		18.000	
31		18.000	

 ACCAO 3
 SOBRECARGA-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
17	11.550	29	16.020
9	18.000	22	18.000
36	18.000		

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
17	2.550	3.000	29	7.020	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	VERTICAL (KN)	HORIZONTAL (KN)
12			18.000	
16			18.000	
20			18.000	
25			18.000	

 ACCAO 4
 SISMO(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	VERTICAL (KN)	HORIZONTAL (KN)
7				89.000
3				1.013

 ACCAO 5
 SISMO(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	VERTICAL (KN)	HORIZONTAL (KN)
7				85.540
3				11.640

***** RESULTADOS *****

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA-Q1	1.50000
SOBRECARGA-Q2	1.50000	SISMO(e1i)-E1	.00000
SISMO(e2i)-E2	.00000		

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	10.282	19.661	6.654	-6.654	73.292	-73.292
2	21.547	13.194	8.272	-8.272	19.205	-19.205
3	-41.208	57.564	-54.087	-59.538	-1.618	1.618
4	-13.194	57.263	-19.205	-33.895	8.272	-8.272
5	-2.283	-5.964	-1.833	1.833	731.248	-731.248
6	16.302	44.635	14.509	-14.509	611.878	-611.878
7	76.369	79.673	40.011	-40.011	299.848	-299.848
8	-67.902	49.785	-59.832	-53.793	-17.959	17.959
9	-178.266	323.857	-278.135	-326.665	-17.230	17.230
10	-79.673	207.392	-151.349	-193.921	40.011	-40.011
11	2.397	3.796	1.376	-1.376	1505.501	-1505.501
12	1.913	-.866	.249	-.249	1395.135	-1395.135
13	-6.397	-3.241	-2.471	2.471	762.944	-762.944
14	-204.151	222.923	37.542	-37.542	420.504	-420.504
15	-55.494	56.930	-56.573	-57.052	-16.832	16.832
16	-316.595	297.847	-305.525	-299.275	-14.510	14.510
17	-222.923	276.360	-272.014	-289.826	37.538	-37.538
18	.522	.419	.209	-.209	1607.877	-1607.877
19	1.482	2.723	1.001	-1.001	1492.942	-1492.942
20	-1.901	-2.344	-.965	.965	889.892	-889.892
21	-58.831	52.410	-57.883	-55.742	-17.624	17.624
22	-298.669	290.419	-303.775	-301.025	-12.544	12.544
23	-274.017	213.051	-303.066	-282.744	36.574	-36.574
24	-2.851	-5.934	-1.952	1.952	1532.913	-1532.913
25	-8.429	-7.923	-3.893	3.893	1429.226	-1429.226
26	-12.262	-12.069	-5.530	5.530	839.469	-839.469
27	-38.047	91.251	-47.945	-65.680	-15.683	15.683
28	-270.235	352.242	-288.732	-316.068	-10.908	10.908
29	-200.982	400.062	-259.725	-326.085	31.044	-31.044
30	-32.084	-67.280	-99.365	99.365	2023.991	-2023.991
31	67.280	165.780	66.589	-66.589	2023.991	-2023.991
32	38.351	22.276	14.435	-14.435	1628.962	-1628.962
33	-3.564	-7.543	-2.524	2.524	971.242	-971.242
34	.000	.000	.000	.000	-165.954	165.954
35	-295.383	133.691	-329.349	-275.451	36.470	-36.470
36	-370.955	135.440	-341.653	-263.148	6.052	-6.052
37	-392.518	61.008	-348.157	-237.653	28.520	-28.520
38	12.243	24.486	36.730	-36.730	924.754	-924.754
39	-24.486	-59.467	-23.987	23.987	924.754	-924.754
40	-74.224	-70.969	-34.570	34.570	649.302	-649.302
41	-64.471	-46.748	-28.518	28.518	386.155	-386.155
42	46.746	-61.009	-28.524	28.524	386.152	-386.152

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	10.282	-73.292	6.654
4	-2.283	-731.248	-1.833
8	2.397	-1505.501	1.376
13	.522	-1607.877	.209
17	-2.851	-1532.913	-1.952
21	-32.084	-2023.991	-99.365
26	12.243	-924.754	36.730
28	.000	.000	-47.054
27	.000	.000	105.237

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA-Q1	1.50000
SOBRECARGA-Q2	.00000	SISMO(e1i)-E1	.00000
SISMO(e2i)-E2	.00000		

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	9.710	18.679	6.309	-6.309	74.947	-74.947
2	21.851	15.282	8.841	-8.841	21.345	-21.345
3	-40.529	59.790	-53.602	-60.023	-2.533	2.533
4	-15.282	46.514	-21.345	-31.755	8.841	-8.841
5	-1.275	-3.672	-1.099	1.099	648.138	-648.138
6	10.140	28.408	9.178	-9.178	528.492	-528.492
7	57.580	71.441	33.082	-33.082	298.333	-298.333
8	-66.259	49.394	-59.623	-54.002	-12.810	12.810
9	-132.502	270.476	-198.404	-244.396	-15.063	15.063
10	-71.441	208.254	-149.833	-195.437	33.082	-33.082
11	.976	1.114	.464	-.464	1349.296	-1349.296
12	5.891	11.486	4.137	-4.137	1238.754	-1238.754
13	5.774	-.271	1.411	-1.411	689.031	-689.031
14	-207.984	225.233	34.497	-34.497	345.077	-345.077
15	-56.399	58.035	-56.540	-57.085	-16.483	16.483
16	-287.736	270.176	-305.327	-299.473	-12.336	12.336
17	-225.233	245.913	-223.586	-230.479	34.493	-34.493
18	1.622	2.773	.977	-.977	1438.616	-1438.616
19	-3.286	-10.497	-3.282	3.282	1323.789	-1323.789
20	-15.218	-8.051	-5.288	5.288	802.231	-802.231
21	-57.522	51.948	-57.742	-55.883	-12.225	12.225
22	-244.460	240.349	-222.085	-220.715	-10.330	10.330
23	-237.862	184.782	-301.752	-284.058	29.204	-29.204
24	-3.846	-7.891	-2.608	2.608	1354.816	-1354.816
25	-3.644	5.214	.374	-.374	1250.398	-1250.398
26	.134	-7.623	-1.702	1.702	739.556	-739.556
27	-40.412	90.082	-48.534	-65.091	-15.207	15.207
28	-245.697	319.334	-290.127	-314.673	-8.254	8.254
29	-177.159	357.474	-185.498	-245.603	27.502	-27.502
30	-33.071	-69.349	-102.420	102.420	1824.429	-1824.429
31	69.349	171.016	68.676	-68.676	1824.429	-1824.429
32	31.975	8.290	9.587	-9.587	1429.654	-1429.654
33	-16.021	-11.648	-6.288	6.288	858.106	-858.106
34	.000	.000	.000	.000	-171.096	171.096
35	-293.074	129.372	-329.684	-275.116	43.882	-43.882
36	-311.603	98.752	-256.875	-185.925	7.621	-7.621

37	-345.826	48.234	-342.504	-243.306	21.214	-21.214
38	12.750	25.499	38.249	-38.249	852.849	-852.849
39	-25.499	-61.927	-24.979	24.979	852.849	-852.849
40	-67.445	-53.654	-28.833	28.833	577.733	-577.733
41	-45.098	-37.627	-21.212	21.212	391.808	-391.808
42	37.625	-48.235	-21.218	21.218	391.805	-391.805

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.710	-74.947	6.309
4	-1.275	-648.138	-1.099
8	.976	-1349.296	.464
13	1.622	-1438.616	.977
17	-3.846	-1354.816	-2.608
21	-33.071	-1824.429	-102.420
26	12.750	-852.849	38.249
28	.000	.000	-47.736
27	.000	.000	107.868

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE
PERMANENTES-G	1.50000
SOBRECARGA-Q2	1.50000
SISMO(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	.00000
SISMO(e1i)-E1	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	10.313	19.793	6.690	-6.690	72.582	-72.582
2	21.066	12.124	7.903	-7.903	18.527	-18.527
3	-40.859	57.405	-54.055	-59.570	-1.212	1.212
4	-12.124	60.261	-18.527	-34.573	7.903	-7.903
5	-2.860	-7.016	-2.195	2.195	672.514	-672.514
6	16.571	47.060	15.150	-15.150	553.621	-553.621
7	74.147	66.872	36.159	-36.159	234.435	-234.435
8	-66.960	51.895	-59.323	-54.302	-18.557	18.557
9	-181.468	288.187	-284.613	-320.187	-13.106	13.106
10	-66.872	153.318	-112.935	-141.750	36.159	-36.159
11	3.267	5.652	1.982	-1.982	1334.869	-1334.869
12	-2.775	-13.079	-3.775	3.775	1223.946	-1223.946
13	-15.646	-3.833	-4.995	4.995	680.097	-680.097
14	-149.485	165.068	31.167	-31.167	416.828	-416.828
15	-54.772	55.923	-56.621	-57.004	-12.801	12.801
16	-259.461	245.886	-223.663	-219.137	-11.886	11.886
17	-165.068	240.558	-268.338	-293.502	31.162	-31.162
18	-.682	-1.962	-.588	.588	1426.525	-1426.525
19	5.293	14.551	4.725	-4.725	1311.905	-1311.905
20	11.481	3.230	3.343	-3.343	788.918	-788.918
21	-59.253	54.437	-57.615	-56.010	-18.113	18.113
22	-271.918	263.216	-303.850	-300.950	-10.504	10.504
23	-243.788	184.591	-225.416	-205.684	34.505	-34.505
24	-1.003	-2.202	-.712	.712	1357.131	-1357.131
25	-11.525	-19.770	-7.451	7.451	1251.280	-1251.280
26	-21.841	-13.773	-8.094	8.094	740.689	-740.689

27	-40.710	82.543	-49.840	-63.785	-11.374	11.374
28	-221.605	292.153	-209.642	-233.158	-9.861	9.861
29	-170.818	338.217	-265.005	-320.805	26.411	-26.411
30	-21.107	-44.261	-65.368	65.368	1726.396	-1726.396
31	44.261	108.925	43.767	-43.767	1726.396	-1726.396
32	32.267	28.862	14.555	-14.555	1420.826	-1420.826
33	9.705	-1.665	1.827	-1.827	852.846	-852.846
34	.000	.000	.000	.000	-109.135	109.135
35	-223.735	101.421	-241.786	-201.014	17.839	-17.839
36	-330.720	136.186	-334.822	-269.978	2.866	-2.866
37	-336.552	57.608	-262.041	-169.059	28.238	-28.238
38	8.305	16.610	24.915	-24.915	761.553	-761.553
39	-16.610	-40.339	-16.271	16.271	761.553	-761.553
40	-61.083	-69.550	-31.103	31.103	560.538	-560.538
41	-66.636	-43.489	-28.237	28.237	290.560	-290.560
42	43.488	-57.609	-28.240	28.240	290.558	-290.558

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	10.313	-72.582	6.690
4	-2.860	-672.514	-2.195
8	3.267	-1334.869	1.982
13	-.682	-1426.525	-.588
17	-1.003	-1357.131	-.712
21	-21.107	-1726.396	-65.368
26	8.305	-761.553	24.915
28	.000	.000	-32.671
27	.000	.000	67.949

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA-Q1	.40000
SOBRECARGA-Q2	.40000	SISMO(e1i)-E1	1.50000
SISMO(e2i)-E2	.00000		

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.958	17.371	5.407	-5.407	37.852	-37.852
2	-6.258	-10.311	-3.945	3.945	7.241	-7.241
3	-11.113	54.699	-30.611	-45.139	9.352	-9.352
4	10.311	52.442	-7.241	-28.159	-2.426	2.426
5	-1.170	2.939	.393	-.393	408.046	-408.046
6	-28.437	-13.144	-9.900	9.900	328.371	-328.371
7	.042	3.922	1.017	-1.017	163.288	-163.288
8	-29.202	49.240	-34.535	-41.215	19.645	-19.645
9	-39.340	232.994	-136.924	-201.476	-13.341	13.341
10	-3.922	135.231	-75.088	-118.858	134.518	-134.518
11	2.634	10.110	2.832	-2.832	882.995	-882.995
12	-38.288	-43.119	-19.383	19.383	809.384	-809.384
13	-58.791	-61.251	-30.780	30.780	452.033	-452.033
14	-74.038	125.939	103.800	-103.800	244.963	-244.963
15	-21.063	53.937	-32.396	-43.354	41.859	-41.859
16	-131.084	211.031	-155.876	-182.524	-1.946	1.946

17	-125.944	179.677	-156.770	-174.680	103.731	-103.731
18	2.626	9.164	2.620	-2.620	928.603	-928.603
19	-40.445	-43.342	-19.949	19.949	852.304	-852.304
20	-43.750	-47.178	-20.665	20.665	514.355	-514.355
21	-22.656	52.241	-32.944	-42.806	64.429	-64.429
22	-123.939	206.589	-155.425	-182.975	-1.226	1.226
23	-132.499	138.818	-163.275	-165.381	83.065	-83.065
24	2.993	8.464	2.546	-2.546	881.199	-881.199
25	-46.346	-50.069	-22.956	22.956	809.077	-809.077
26	-48.808	-52.139	-22.943	22.943	478.634	-478.634
27	-14.359	65.716	-29.316	-46.434	89.931	-89.931
28	-107.712	238.100	-147.469	-190.931	-1.239	1.239
29	-86.679	251.532	-136.852	-191.804	60.124	-60.124
30	-20.110	-42.185	-62.294	62.294	1129.380	-1129.380
31	42.185	106.756	42.554	-42.554	1129.380	-1129.380
32	-35.203	-42.867	-18.588	18.588	909.542	-909.542
33	-44.849	-49.876	-21.528	21.528	550.544	-550.544
34	.000	.000	.000	.000	-104.849	104.849
35	-137.269	112.051	-173.403	-164.997	151.073	-151.073
36	-150.384	157.186	-168.066	-170.334	1.702	-1.702
37	-201.656	93.581	-182.341	-146.315	38.598	-38.598
38	4.953	9.905	14.858	-14.858	569.847	-569.847
39	-9.905	-24.055	-9.703	9.703	569.847	-569.847
40	-87.995	-81.097	-40.260	40.260	404.850	-404.850
41	-76.088	-74.285	-38.557	38.557	234.516	-234.516
42	74.315	-93.632	-38.633	38.633	234.514	-234.514

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.958	-37.852	5.407
4	-1.170	-408.046	.393
8	2.634	-882.995	2.832
13	2.626	-928.603	2.620
17	2.993	-881.199	2.546
21	-20.110	-1129.380	-62.294
26	4.953	-569.847	14.858
28	.000	.000	-181.630
27	.000	.000	80.288

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA-Q2	.40000
SISMO(e2i)-E2	1.50000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	.40000
SISMO(e1i)-E1	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.967	17.704	5.483	-5.483	37.093	-37.093
2	-7.808	-11.681	-4.640	4.640	6.887	-6.887
3	-9.896	55.914	-30.205	-45.545	10.123	-10.123
4	11.681	53.197	-6.887	-28.513	12.820	-12.820
5	-1.142	3.477	.519	-.519	408.519	-408.519
6	-31.415	-16.602	-11.433	11.433	328.848	-328.848

7	1.964	5.459	1.903	-1.903	163.658	-163.658
8	-27.975	50.466	-34.127	-41.623	22.074	-22.074
9	-38.558	233.698	-136.677	-201.723	-.515	.515
10	-5.459	134.546	-75.459	-118.487	130.215	-130.215
11	2.714	10.698	2.980	-2.980	882.711	-882.711
12	-41.306	-46.634	-20.938	20.938	809.092	-809.092
13	-56.663	-59.160	-29.698	29.698	451.746	-451.746
14	-75.460	125.689	100.365	-100.365	245.047	-245.047
15	-19.858	55.132	-31.996	-43.754	45.993	-45.993
16	-130.401	211.868	-155.622	-182.778	8.245	-8.245
17	-125.740	178.969	-156.853	-174.597	100.510	-100.510
18	2.786	9.819	2.801	-2.801	928.703	-928.703
19	-43.519	-46.861	-21.519	21.519	852.419	-852.419
20	-42.073	-45.593	-19.924	19.924	514.547	-514.547
21	-21.432	53.501	-32.530	-43.220	70.313	-70.313
22	-122.934	207.564	-155.095	-183.305	6.651	-6.651
23	-133.376	138.044	-163.550	-165.106	80.586	-80.586
24	3.328	9.340	2.815	-2.815	881.251	-881.251
25	-49.453	-53.677	-24.555	24.555	808.985	-808.985
26	-47.183	-50.597	-22.223	22.223	478.561	-478.561
27	-13.388	66.361	-29.046	-46.704	97.683	-97.683
28	-106.704	239.189	-147.119	-191.281	4.321	-4.321
29	-87.448	251.087	-137.055	-191.601	58.365	-58.365
30	-20.287	-42.559	-62.847	62.847	1128.952	-1128.952
31	42.559	107.896	42.987	-42.987	1128.952	-1128.952
32	-39.340	-47.049	-20.569	20.569	909.744	-909.744
33	-43.204	-48.325	-20.802	20.802	550.929	-550.929
34	.000	.000	.000	.000	-105.834	105.834
35	-134.917	115.087	-172.505	-165.895	161.239	-161.239
36	-148.936	158.935	-167.534	-170.866	4.555	-4.555
37	-202.763	91.164	-182.928	-145.728	37.562	-37.562
38	4.806	9.613	14.419	-14.419	570.691	-570.691
39	-9.613	-23.345	-9.417	9.417	570.691	-570.691
40	-91.742	-84.984	-42.077	42.077	404.796	-404.796
41	-73.951	-72.385	-37.522	37.522	233.929	-233.929
42	72.374	-91.213	-37.582	37.582	233.927	-233.927

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.967	-37.093	5.483
4	-1.142	-408.519	.519
8	2.714	-882.711	2.980
13	2.786	-928.703	2.801
17	3.328	-881.251	2.815
21	-20.287	-1128.952	-62.847
26	4.806	-570.691	14.419
28	.000	.000	-193.900
27	.000	.000	81.999

 COMBINACAO 6
 ACC.BASE-E1

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA-Q2	.40000
SISMO(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	.40000
SISMO(e1i)-E1	-1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	6.319	8.163	3.218	-3.218	60.627	-60.627
2	34.846	28.718	15.134	-15.134	19.535	-19.535
3	-43.009	23.706	-41.092	-34.658	-11.916	11.916
4	-28.718	17.709	-19.535	-15.865	13.615	-13.615
5	-1.530	-9.899	-2.540	2.540	453.477	-453.477
6	45.459	61.615	25.494	-25.494	374.152	-374.152
7	84.974	85.482	43.707	-43.707	182.966	-182.966
8	-59.266	18.515	-44.667	-31.083	-39.950	39.950
9	-164.298	127.575	-175.321	-163.079	-4.599	4.599
10	-85.482	98.722	-94.766	-99.180	-89.795	89.795
11	.121	-5.709	-1.242	1.242	862.870	-862.870
12	40.271	42.075	19.606	-19.606	788.740	-788.740
13	52.598	58.832	28.572	-28.572	439.818	-439.818
14	-157.496	126.856	-61.280	61.280	252.426	-252.426
15	-53.076	22.048	-43.046	-32.704	-60.798	60.798
16	-222.248	122.393	-185.843	-152.557	-13.563	13.563
17	-126.851	135.804	-164.233	-167.217	-61.218	61.218
18	-2.014	-8.627	-2.365	2.365	934.743	-934.743
19	41.655	45.859	20.837	-20.837	858.133	-858.133
20	41.267	43.946	19.367	-19.367	521.259	-521.259
21	-55.075	18.891	-43.906	-31.844	-83.999	83.999
22	-209.519	118.818	-184.317	-154.083	-12.096	12.096
23	-179.750	99.867	-177.642	-151.014	-41.850	41.850
24	-6.112	-14.957	-4.682	4.682	879.581	-879.581
25	36.458	40.537	18.332	-18.332	811.138	-811.138
26	34.712	38.241	16.580	-16.580	481.704	-481.704
27	-40.392	48.050	-36.599	-39.151	-107.013	107.013
28	-194.067	157.158	-175.351	-163.049	-10.345	10.345
29	-138.107	198.337	-154.290	-174.366	-25.271	25.271
30	-14.677	-30.762	-45.439	45.439	1171.550	-1171.550
31	30.762	72.989	29.643	-29.643	1171.550	-1171.550
32	76.370	66.649	34.052	-34.052	936.452	-936.452
33	40.746	41.237	18.633	-18.633	559.219	-559.219
34	.000	.000	.000	.000	-75.082	75.082
35	-197.409	36.933	-195.946	-142.454	-111.422	111.422
36	-264.552	-5.353	-214.184	-124.216	5.074	-5.074
37	-239.575	-25.177	-208.453	-120.203	-6.641	6.641
38	8.626	17.253	25.879	-25.879	475.073	-475.073
39	-17.253	-41.899	-16.900	16.900	475.073	-475.073
40	4.966	1.459	1.530	-1.530	332.619	-332.619
41	3.894	21.858	6.603	-6.603	208.404	-208.404
42	-21.890	25.226	6.673	-6.673	208.402	-208.402

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.319	-60.627	3.218
4	-1.530	-453.477	-2.540
8	.121	-862.870	-1.242
13	-2.014	-934.743	-2.365
17	-6.112	-879.581	-4.682
21	-14.677	-1171.550	-45.439
26	8.626	-475.073	25.879
28	.000	.000	129.852
27	.000	.000	32.303

 COMBINACAO 7
 ACC.BASE-E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA-Q1	.40000
SOBRECARGA-Q2	.40000	SISMO(e1i)-E1	.00000
SISMO(e2i)-E2	-1.50000		

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	6.309	7.830	3.142	-3.142	61.386	-61.386
2	36.396	30.088	15.829	-15.829	19.889	-19.889
3	-44.226	22.492	-41.497	-34.253	-12.687	12.687
4	-30.088	16.954	-19.889	-15.511	-1.631	1.631
5	-1.558	-10.437	-2.666	2.666	453.003	-453.003
6	48.438	65.074	27.027	-27.027	373.675	-373.675
7	83.052	83.945	42.820	-42.820	182.596	-182.596
8	-60.493	17.289	-45.076	-30.674	-42.379	42.379
9	-165.080	126.871	-175.568	-162.832	-17.425	17.425
10	-83.945	99.408	-94.396	-99.550	-85.491	85.491
11	.041	-6.297	-1.390	1.390	863.153	-863.153
12	43.289	45.590	21.162	-21.162	789.032	-789.032
13	50.471	56.741	27.490	-27.490	440.104	-440.104
14	-156.075	127.106	-57.845	57.845	252.342	-252.342
15	-54.281	20.853	-43.446	-32.304	-64.931	64.931
16	-222.931	121.556	-186.096	-152.304	-23.753	23.753
17	-127.055	136.511	-164.149	-167.301	-57.996	57.996
18	-2.173	-9.282	-2.546	2.546	934.642	-934.642
19	44.729	49.378	22.407	-22.407	858.018	-858.018
20	39.590	42.361	18.625	-18.625	521.068	-521.068
21	-56.300	17.630	-44.320	-31.430	-89.883	89.883
22	-210.524	117.843	-184.647	-153.753	-19.973	19.973
23	-178.873	100.641	-177.367	-151.289	-39.371	39.371
24	-6.447	-15.832	-4.951	4.951	879.529	-879.529
25	39.565	44.144	19.931	-19.931	811.231	-811.231
26	33.087	36.698	15.860	-15.860	481.777	-481.777
27	-41.363	47.405	-36.868	-38.882	-114.765	114.765
28	-195.075	156.069	-175.701	-162.699	-15.905	15.905
29	-137.339	198.782	-154.087	-174.569	-23.513	23.513
30	-14.499	-30.387	-44.887	44.887	1171.977	-1171.977
31	30.387	71.848	29.210	-29.210	1171.977	-1171.977
32	80.507	70.830	36.033	-36.033	936.251	-936.251
33	39.102	39.686	17.906	-17.906	558.834	-558.834
34	.000	.000	.000	.000	-74.097	74.097
35	-199.761	33.897	-196.844	-141.556	-121.588	121.588
36	-266.001	-7.101	-214.717	-123.683	2.221	-2.221
37	-238.468	-22.759	-207.866	-120.790	-5.605	5.605
38	8.773	17.545	26.318	-26.318	474.230	-474.230
39	-17.545	-42.609	-17.187	17.187	474.230	-474.230
40	8.712	5.345	3.347	-3.347	332.674	-332.674
41	1.756	19.958	5.568	-5.568	208.991	-208.991
42	-19.949	22.807	5.623	-5.623	208.989	-208.989

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.309	-61.386	3.142
4	-1.558	-453.003	-2.666
8	.041	-863.153	-1.390
13	-2.173	-934.642	-2.546

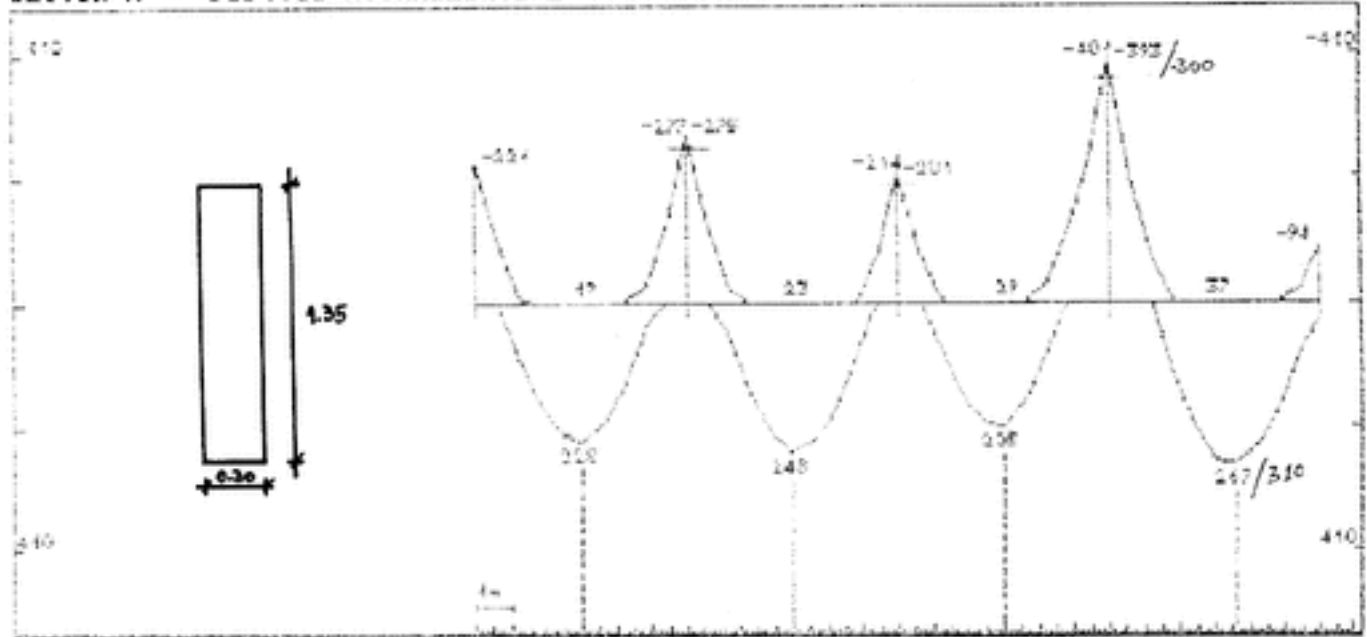
17	-6.447	-879.529	-4.951
21	-14.499	-1171.977	-44.887
26	8.773	-474.230	26.318
28	.000	.000	142.122
27	.000	.000	30.592

```
#####  #####  #  #  
#  #  #  #  #  #  
####  #  #  #  #  
#  #  #  #  #  
#  #####  #  #
```

U. PORTO

 arquivo
central

SECTOR A - Portico Alinhamento B - 1/7 - Envolvente MM - Piso 4 V.4.4

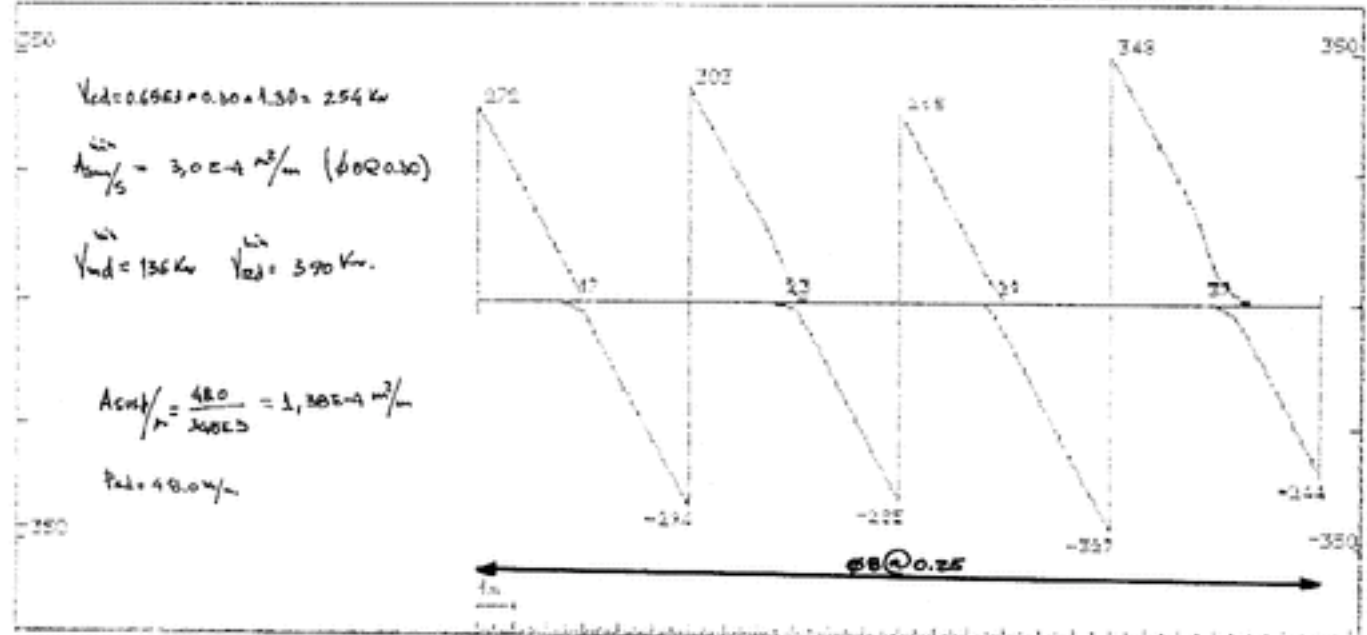


w_{in}
 $A_{sR} = 5,7 \text{ cm}^2$

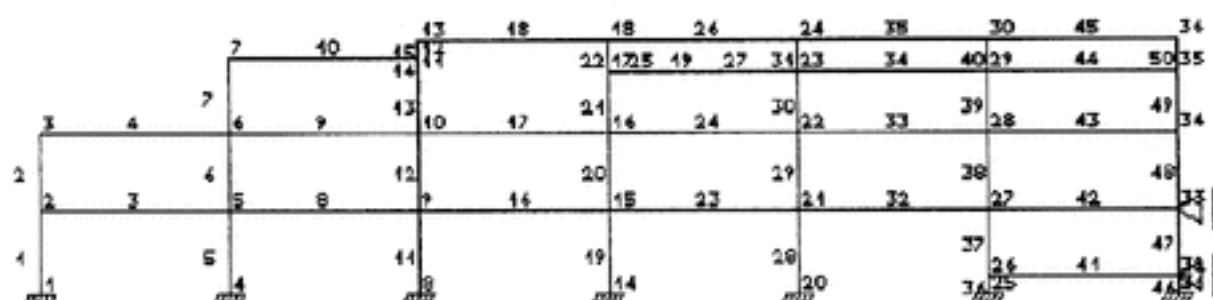
$M_{ed} (K-m)$	-200	228	-250	248	-200	205	-370	267	-70
μ	0,0296	0,0338	0,037	0,0367	0,0296	0,0304	0,055	0,0385	0,013
α	0,0305	0,0349	0,0384	0,0381	0,0305	0,0313	0,0579	0,0411	0,0135
$A_s (cm^2)$	4,50	5,22	5,7	5,70	4,50	4,67	8,63	6,14	2,02
	5φ12	5φ12	5φ12	5φ12	5φ12	5φ12	3φ12 + 2φ16	3φ12 + 2φ16	5φ12

DEFINIR ARMADURA DE ALTA

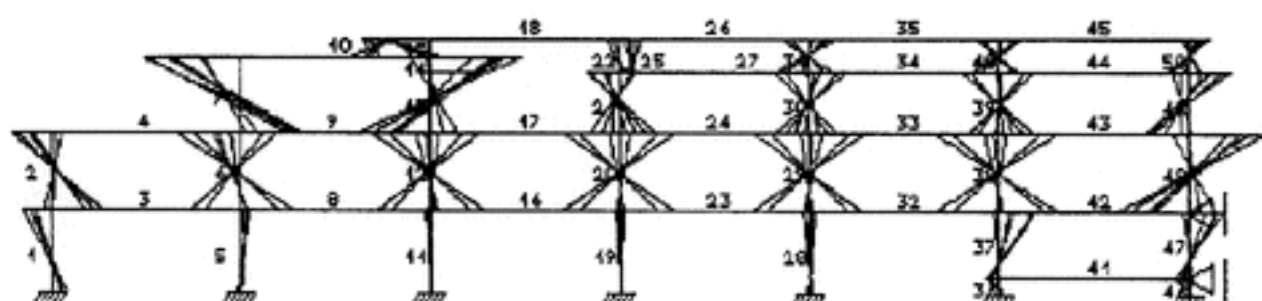
SECTOR A - Portico Alinhamento B - 1/7 - Envolvente UU - Piso 4



SECTOR A - Portico Alinhamento C - 1/7



SECTOR A - Portico Alinhamento C - 1/7 - Envolvente MM - Pilares



U. PORTO


 arquivo
central

SECTOR A Portico Alinhamento C 1-7

No. DE NOS = 36 No. DE BARRAS = 50
 No. DE NOS POR BARRA = 2 No. DE INCOGNITAS POR NO = 3
 No. DE APOIOS = 9 No. DE SECCOES TIPO = 13
 No. DE PROPRIEDADES = 3 TIPO DE SAIDA DE RESULTADOS = 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.30000E+00
2	.29000E+08	.35000E+00	.35000E+00
3	.29000E+08	.60000E+00	.35000E+00
4	.29000E+08	.15000E+00	.70000E+00
5	.29000E+08	.20000E+00	.13000E+01
6	.29000E+08	.40000E+00	.35000E+00
7	.29000E+08	.12500E+01	.35000E+00
8	.29000E+08	.30000E+00	.50000E+00
9	.29000E+08	.70000E+00	.35000E+00
10	.29000E+08	.40000E+01	.25000E+00
11	.29000E+08	.10000E+06	.10000E-03
12	.29000E+08	.27500E+00	.35000E+00
13	.29000E+08	.20000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	1	3	2 5	8
4	3 6	6	5	4 5	2	6	5 6	2
7	6 7	2	8	5 9	8	9	6 10	7
10	7 12	12	11	8 9	2	12	9 10	2
13	10 11	2	14	11 12	2	15	12 13	3
16	9 15	8	17	10 16	7	18	13 18	13
19	14 15	2	20	15 16	2	21	16 17	2
22	17 18	2	23	15 21	8	24	16 22	7
25	17 19	1	26	18 24	4	27	19 23	5
28	20 21	2	29	21 22	2	30	22 23	1
31	23 24	1	32	21 27	8	33	22 28	7
34	23 29	5	35	24 30	4	36	25 26	10
37	26 27	10	38	27 28	2	39	28 29	1
40	29 30	1	41	26 32	11	42	27 33	9
43	28 34	7	44	29 35	5	45	30 36	4
46	31 32	2	47	32 33	2	48	33 34	2
49	34 35	1	50	35 36	1			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	4.500	3	.000	8.700
4	6.000	.000	5	6.000	4.500	6	6.000	8.700
7	6.000	12.600	8	12.000	.000	9	12.000	4.500
10	12.000	8.700	11	12.000	11.800	12	12.000	12.600
13	12.000	13.600	14	18.000	.000	15	18.000	4.500
16	18.000	8.700	17	18.000	11.800	18	18.000	13.600
19	19.850	11.800	20	24.000	.000	21	24.000	4.500
22	24.000	8.700	23	24.000	11.800	24	24.000	13.600
25	30.000	.000	26	30.000	1.000	27	30.000	4.500
28	30.000	8.700	29	30.000	11.800	30	30.000	13.600
31	36.000	.000	32	36.000	1.000	33	36.000	4.500
34	36.000	8.700	35	36.000	11.800	36	36.000	13.600

NOS DE APOIO

CODIGO

NOS DE APOIO

CODIGO

1	1	1	1	6	1	1	1
8	1	1	1	14	1	1	1
20	1	1	1	25	1	1	1
31	1	1	1	32	0	0	1
33	0	0	1				

PILARES

Volume de Material (m3)= 14.5660 Area de Cofragem (m2)= 155.1300
 ELEMENTOS NAO VERTICAIS
 Volume de Material (m3)= 87.2157 Area de Cofragem (m2)=*****

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	14.350	26	3.500
35	3.500	45	3.500
25	5.625	27	12.000
34	12.000	44	12.000
9	26.600	17	26.600
24	26.600	33	26.600
43	26.600	3	24.362
8	24.362	16	24.362
23	24.362	32	24.362
18	8.720	4	5.900
42	14.360		

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
10	12.040	3.000			

 ACCAO 2
 SOBRECARGA-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	4.800	17	9.080
33	9.080	42	5.025

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
10	4.760	3.000			

 ACCAO 3
 SOBRECARGA-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
18	2.550	9	9.080

24

9.080

43

9.080

 ACCAO 4
 SISMO(e1i)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			15.150
7			50.700
3			1.230

 ACCAO 5
 SISMO(e2i)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
13			10.200
7			35.200
3			48.510

U. PORTO

arquivo central

===== RESULTADOS =====

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE
PERMANENTES-G	1.50000
SOBRECARGA-Q2	1.50000
SISMO(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	1.50000
SISMO(e1i)-E1	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	12.396	24.267	8.147	-8.147	119.898	-119.898
2	27.988	17.419	10.811	-10.811	22.471	-22.471
3	-52.255	125.477	-97.428	-121.835	-2.664	2.664
4	-17.419	41.893	-22.471	-30.629	10.811	-10.811
5	-2.514	-5.823	-1.853	1.853	510.151	-510.151
6	4.969	19.691	5.871	-5.871	274.896	-274.896
7	51.441	78.819	33.400	-33.400	95.271	-95.271
8	-124.624	101.897	-113.419	-105.843	-10.388	10.388
9	-113.026	182.407	-148.997	-172.123	-16.718	16.718
10	-78.819	99.843	-95.271	-102.279	33.400	-33.400
11	1.204	1.768	.661	-.661	700.934	-700.934
12	3.071	3.369	1.533	-1.533	486.208	-486.208
13	-31.204	-36.852	-21.953	21.953	154.896	-154.896

14	36.852	-54.415	-21.954	21.954	154.896	-154.896
15	-45.428	56.875	11.446	-11.446	52.617	-52.617
16	-106.736	111.230	-108.882	-110.380	-11.261	11.261
17	-154.572	162.798	-159.189	-161.931	6.769	-6.769
18	-56.875	45.463	-52.617	-48.813	11.446	-11.446
19	.346	.219	.125	-.125	647.764	-647.764
20	.321	-.140	.043	-.043	426.842	-426.842
21	4.773	10.890	5.053	-5.053	101.788	-101.788
22	9.895	-8.985	.505	-.505	69.719	-69.719
23	-111.769	106.302	-110.542	-108.720	-11.178	11.178
24	-167.431	152.054	-163.123	-157.997	1.759	-1.759
25	-20.785	-24.104	-32.069	16.460	4.547	-4.547
26	-36.478	5.542	-20.906	-10.594	11.952	-11.952
27	24.104	62.590	-16.460	-58.240	4.547	-4.547
28	-.456	-1.218	-.372	.372	659.900	-659.900
29	-1.495	-1.929	-.815	.815	443.459	-443.459
30	-3.280	-4.102	-2.381	2.381	130.979	-130.979
31	-4.579	-1.015	-3.108	3.108	23.107	-23.107
32	-103.590	115.047	-107.722	-111.541	-10.735	10.735
33	-146.845	183.307	-154.483	-166.637	3.325	-3.325
34	-53.910	80.126	-49.631	-58.369	5.274	-5.274
35	-4.527	23.945	-12.514	-18.986	8.844	-8.844
36	1.773	3.724	5.497	-5.497	712.773	-712.773
37	-3.724	-10.152	-3.965	3.965	712.773	-712.773
38	1.605	5.141	1.606	-1.606	505.675	-505.675
39	4.006	1.185	1.675	-1.675	159.142	-159.142
40	-2.140	-2.297	-2.465	2.465	37.248	-37.248
41	.000	.000	.000	.000	9.461	-9.461
42	-106.500	56.550	-95.558	-78.907	-16.306	16.306
43	-192.455	76.441	-179.896	-141.224	3.257	-3.257
44	-79.172	22.024	-63.525	-44.475	9.413	-9.413
45	-21.648	6.578	-18.262	-13.238	6.380	-6.380
46	4.353	8.707	13.060	-13.060	277.846	-277.846
47	-8.707	-21.145	-8.529	8.529	277.846	-277.846
48	-35.404	-44.603	-19.049	19.049	198.938	-198.938
49	-31.838	-17.119	-15.793	15.793	57.714	-57.714
50	-4.905	-6.578	-6.380	6.380	13.238	-13.238

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.396	-119.898	8.147
4	-2.514	-510.151	-1.853
8	1.204	-700.934	.661
14	.346	-647.764	.125
20	-.456	-659.900	-.372
25	1.773	-712.773	5.497
31	4.353	-277.846	13.060
32	.000	.000	-31.051
33	.000	.000	5.786

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE
PERMANENTES-G	1.50000
SOBRECARGA-Q2	.00000
SISMO(e2i)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	1.50000
SISMO(e1i)-E1	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	12.069	23.691	7.947	-7.947	120.805	-120.805
2	28.176	18.741	11.171	-11.171	23.805	-23.805
3	-51.867	127.660	-96.999	-122.263	-3.224	3.224
4	-18.741	35.209	-23.805	-29.295	11.171	-11.171
5	-2.083	-4.829	-1.536	1.536	468.505	-468.505
6	.634	9.430	2.396	-2.396	232.841	-232.841
7	40.910	77.168	30.276	-30.276	95.279	-95.279
8	-123.465	100.847	-113.401	-105.862	-7.156	7.156
9	-85.550	154.146	-108.267	-131.133	-16.709	16.709
10	-77.168	98.145	-95.279	-102.271	30.276	-30.276
11	.505	.454	.213	-.213	648.564	-648.564
12	6.550	12.578	4.554	-4.554	433.836	-433.836
13	-26.005	-40.839	-21.562	21.562	144.094	-144.094
14	40.839	-58.089	-21.563	21.563	144.094	-144.094
15	-40.056	48.770	8.714	-8.714	41.823	-41.823
16	-107.851	112.442	-108.866	-110.396	-11.497	11.497
17	-140.719	152.421	-158.610	-162.510	9.408	-9.408
18	-48.770	33.270	-41.823	-36.657	8.714	-8.714
19	.885	1.384	.504	-.504	594.274	-594.274
20	-3.213	-8.967	-2.900	2.900	373.377	-373.377
21	-5.053	7.831	.896	-.896	88.600	-88.600
22	13.081	-2.956	5.625	-5.625	56.187	-56.187
23	-110.613	105.392	-110.501	-108.761	-8.093	8.093
24	-138.402	123.004	-122.266	-117.134	5.612	-5.612
25	-20.911	-24.613	-32.412	16.803	-4.729	4.729
26	-30.314	7.630	-19.531	-11.969	14.339	-14.339
27	24.613	60.657	-16.803	-57.897	-4.729	4.729
28	-.973	-2.213	-.708	.708	621.796	-621.796
29	2.035	6.946	2.138	-2.138	405.053	-405.053
30	6.191	1.263	2.405	-2.405	132.871	-132.871
31	-5.442	-2.070	-4.173	4.173	24.765	-24.765
32	-105.214	115.108	-107.982	-111.280	-10.940	10.940
33	-136.140	169.210	-155.048	-166.072	5.345	-5.345
34	-56.478	79.224	-50.209	-57.791	1.849	-1.849
35	-5.560	23.284	-12.796	-18.704	10.165	-10.165
36	1.057	2.221	3.278	-3.278	668.668	-668.668
37	-2.221	-6.167	-2.397	2.397	668.668	-668.668
38	-2.845	-4.847	-1.831	1.831	461.629	-461.629
39	-3.435	-1.827	-1.697	1.697	158.080	-158.080
40	-2.312	-2.551	-2.701	2.701	36.687	-36.687
41	.000	.000	.000	.000	5.675	-5.675
42	-106.096	54.941	-95.758	-78.707	-11.505	11.505
43	-160.929	54.261	-137.478	-101.922	5.211	-5.211
44	-75.085	17.478	-63.601	-44.399	2.853	-2.853
45	-20.733	7.335	-17.983	-13.517	7.464	-7.464
46	4.813	9.627	14.440	-14.440	238.544	-238.544
47	-9.627	-23.380	-9.430	9.430	238.544	-238.544
48	-31.562	-33.656	-15.528	15.528	159.838	-159.838
49	-20.605	-11.378	-10.317	10.317	57.916	-57.916
50	-6.100	-7.335	-7.464	7.464	13.517	-13.517

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.069	-120.805	7.947
4	-2.083	-468.505	-1.536
8	.505	-648.564	.213
14	.885	-594.274	.504
20	-.973	-621.796	-.708

25	1.057	-668.668	3.278
31	4.813	-238.544	14.440
32	.000	.000	-29.546
33	.000	.000	5.407

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA-Q1	.00000
SOBRECARGA-Q2	1.50000	SISMO(e1i)-E1	.00000
SISMO(e2i)-E2	.00000		

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	12.456	24.418	8.194	-8.194	119.352	-119.352
2	27.547	16.539	10.497	-10.497	21.871	-21.871
3	-51.965	124.862	-97.482	-121.781	-2.302	2.302
4	-16.539	44.615	-21.871	-31.229	10.497	-10.497
5	-2.895	-6.543	-2.097	2.097	489.139	-489.139
6	5.524	22.370	6.641	-6.641	254.492	-254.492
7	47.566	59.910	27.558	-27.558	70.868	-70.868
8	-123.843	104.433	-112.866	-106.396	-11.041	11.041
9	-114.551	163.539	-152.395	-168.725	-10.420	10.420
10	-59.910	76.334	-70.868	-76.342	27.558	-27.558
11	1.750	2.912	1.036	-1.036	631.082	-631.082
12	-1.255	-6.774	-1.912	1.912	415.659	-415.659
13	-27.741	-22.935	-16.347	16.347	127.677	-127.677
14	22.935	-36.013	-16.347	16.347	127.677	-127.677
15	-40.321	51.532	11.211	-11.211	51.335	-51.335
16	-106.090	109.713	-109.027	-110.235	-8.094	8.094
17	-129.024	131.679	-119.257	-120.143	4.016	-4.016
18	-51.532	47.813	-51.335	-50.095	11.211	-11.211
19	-.216	-.900	-.248	.248	606.503	-606.503
20	3.471	8.452	2.839	-2.839	385.998	-385.998
21	14.539	13.282	8.975	-8.975	103.069	-103.069
22	7.777	-10.263	-1.381	1.381	71.247	-71.247
23	-112.283	108.450	-110.270	-108.992	-11.181	11.181
24	-154.670	141.315	-162.786	-158.334	-2.120	2.120
25	-21.060	-23.373	-31.822	16.213	10.355	-10.355
26	-37.550	5.137	-21.152	-10.348	9.830	-9.830
27	23.373	64.346	-16.213	-58.487	10.355	-10.355
28	.403	.504	.202	-.202	620.846	-620.846
29	-4.723	-10.637	-3.657	3.657	403.100	-403.100
30	-12.376	-9.149	-6.944	6.944	130.801	-130.801
31	-3.650	-.306	-2.198	2.198	22.941	-22.941
32	-104.231	109.496	-108.754	-110.509	-7.322	7.322
33	-118.302	152.714	-113.965	-125.435	1.166	-1.166
34	-51.547	79.310	-49.373	-58.627	5.610	-5.610
35	-4.831	23.772	-12.593	-18.907	7.632	-7.632
36	5.098	10.697	15.795	-15.795	643.401	-643.401
37	-10.697	-27.574	-10.934	10.934	643.401	-643.401
38	1.726	11.622	3.178	-3.178	461.360	-461.360
39	10.211	3.599	4.455	-4.455	159.545	-159.545
40	-1.699	-1.769	-1.927	1.927	37.309	-37.309
41	.000	.000	.000	.000	26.730	-26.730
42	-83.649	42.173	-71.533	-57.707	-21.434	21.434
43	-174.547	79.630	-176.380	-144.740	-.110	.110

44	-81.210	23.554	-63.609	-44.391	11.991	-11.991
45	-22.003	6.095	-18.401	-13.099	5.705	-5.705
46	2.566	5.131	7.697	-7.697	259.937	-259.937
47	-5.131	-12.462	-5.027	5.027	259.937	-259.937
48	-29.711	-44.151	-17.586	17.586	202.230	-202.230
49	-35.479	-19.380	-17.696	17.696	57.489	-57.489
50	-4.174	-6.095	-5.705	5.705	13.098	-13.098

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.456	-119.352	8.194
4	-2.895	-489.139	-2.097
8	1.750	-631.082	1.036
14	-.216	-606.503	-.248
20	.403	-620.846	.202
25	5.098	-643.401	15.795
31	2.566	-259.937	7.697
32	.000	.000	-39.453
33	.000	.000	8.875

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA-Q1	.40000
SOBRECARGA-Q2	.40000	SISMO(e1i)-E1	1.50000
SISMO(e2i)-E2	.00000		

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	7.752	17.566	5.626	-5.626	69.678	-69.678
2	.476	-3.963	-.830	.830	10.219	-10.219
3	-18.043	99.810	-59.460	-86.715	6.456	-6.456
4	3.963	40.923	-10.219	-25.181	1.015	-1.015
5	-2.707	-2.232	-1.098	1.098	304.267	-304.267
6	-29.767	-18.676	-11.534	11.534	147.039	-147.039
7	3.822	29.137	8.451	-8.451	50.089	-50.089
8	-67.811	83.260	-70.513	-75.662	16.893	-16.893
9	-26.070	139.632	-71.769	-109.623	-18.970	18.970
10	-29.137	63.295	-50.089	-61.475	84.501	-84.501
11	.156	3.243	.755	-.755	423.762	-423.762
12	-30.843	-28.827	-14.207	14.207	280.698	-280.698
13	-58.081	-49.387	-34.667	34.667	92.321	-92.321
14	49.387	-77.121	-34.668	34.668	92.321	-92.321
15	13.827	36.007	49.833	-49.833	30.846	-30.846
16	-55.660	89.778	-67.401	-78.774	31.855	-31.855
17	-52.724	124.373	-78.755	-102.637	1.490	-1.490
18	-36.007	26.248	-30.846	-27.594	72.558	-72.558
19	.235	2.928	.703	-.703	381.420	-381.420
20	-33.937	-33.217	-15.989	15.989	234.295	-234.295
21	-25.289	-13.144	-12.398	12.398	49.157	-49.157
22	10.655	-18.064	-4.117	4.117	36.829	-36.829
23	-58.770	87.189	-68.351	-77.824	48.547	-48.547
24	-65.867	115.040	-82.500	-98.892	-2.100	2.100
25	2.490	-15.671	-12.328	1.922	-8.281	8.281

26	-8.184	15.772	-9.235	-11.765	68.442	-68.442
27	15.671	79.689	-1.922	-47.878	-8.281	8.281
28	.839	3.418	.946	-.946	413.351	-413.351
29	-35.215	-34.566	-16.615	16.615	267.718	-267.718
30	-28.280	-32.368	-19.564	19.564	91.580	-91.580
31	-26.364	-22.144	-26.949	26.949	17.047	-17.047
32	-55.391	87.062	-67.809	-78.366	66.108	-66.108
33	-52.194	132.887	-77.247	-104.145	.852	-.852
34	-20.957	77.030	-26.654	-45.346	-.895	.895
35	6.372	24.934	-5.282	-15.718	41.493	-41.493
36	.769	1.583	2.352	-2.352	421.378	-421.378
37	-1.583	1.358	-.064	.064	421.378	-421.378
38	-39.114	-34.862	-17.613	17.613	293.725	-293.725
39	-24.696	-28.961	-17.309	17.309	101.482	-101.482
40	-20.643	-19.779	-22.457	22.457	24.292	-24.292
41	.000	.000	.000	.000	2.417	-2.417
42	-49.306	48.244	-49.287	-48.933	83.657	-83.657
43	-73.329	88.919	-88.098	-93.294	.548	-.548
44	-27.426	52.355	-31.845	-40.155	4.253	-4.253
45	-5.155	16.714	-8.574	-12.426	19.036	-19.036
46	-.073	-.146	-.219	.219	194.808	-194.808
47	.146	.354	.143	-.143	194.808	-194.808
48	-48.598	-51.524	-23.839	23.839	145.875	-145.875
49	-37.395	-34.802	-23.289	23.289	52.581	-52.581
50	-17.553	-16.714	-19.037	19.037	12.426	-12.426

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	7.752	-69.678	5.626
4	-2.707	-304.267	-1.098
8	.156	-423.762	.755
14	.235	-381.420	.703
20	.839	-413.351	.946
25	.769	-421.378	2.352
31	-.073	-194.808	-.219
32	.000	.000	-2.056
33	.000	.000	-107.638

 COMBINACAO 5
 ACC.BASE E2

ACCAO PERMANENTES-G	COEFICIENTE 1.00000	ACCAO SOBRECARGA-Q1	COEFICIENTE .40000
SOBRECARGA-Q2	.40000	SISMO(e1i)-E1	.00000
SISMO(e2i)-E2	1.50000		

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	7.530	18.070	5.689	-5.689	66.264	-66.264
2	-6.218	-9.346	-3.706	3.706	8.840	-8.840
3	-11.852	105.831	-57.424	-88.751	9.395	-9.395
4	9.346	43.813	-8.840	-26.560	69.059	-69.059
5	-3.106	-1.570	-1.039	1.039	306.545	-306.545
6	-42.519	-32.365	-17.829	17.829	149.310	-149.310
7	13.571	33.851	12.159	-12.159	51.224	-51.224

8	-61.742	89.361	-68.484	-77.691	26.185	-26.185
9	-25.019	140.042	-71.525	-109.867	39.070	-39.070
10	-33.851	61.196	-51.224	-60.340	64.959	-64.959
11	-.089	4.076	.886	-.886	422.543	-422.543
12	-43.635	-42.830	-20.587	20.587	279.383	-279.383
13	-44.759	-41.243	-27.743	27.743	91.009	-91.009
14	41.243	-63.437	-27.743	27.743	91.009	-91.009
15	2.241	34.975	37.216	-37.216	30.670	-30.670
16	-49.802	95.514	-65.469	-80.706	47.658	-47.658
17	-52.452	125.580	-78.508	-102.884	46.227	-46.227
18	-34.975	26.276	-30.670	-27.770	52.516	-52.516
19	.159	3.867	.895	-.895	384.762	-384.762
20	-46.501	-46.550	-22.155	22.155	237.686	-237.686
21	-15.836	-7.943	-7.671	7.671	53.200	-53.200
22	10.115	-13.809	-2.052	2.052	38.287	-38.287
23	-52.880	93.187	-66.370	-79.805	70.708	-70.708
24	-63.194	117.761	-81.602	-99.791	31.743	-31.743
25	-2.173	-15.790	-14.913	4.506	-5.618	5.618
26	-12.467	12.363	-10.517	-10.483	50.464	-50.464
27	15.790	68.843	-4.506	-45.294	-5.619	5.619
28	1.149	4.799	1.322	-1.322	412.410	-412.410
29	-47.818	-47.979	-22.809	22.809	266.407	-266.407
30	-20.083	-24.468	-14.371	14.371	90.212	-90.212
31	-19.545	-15.897	-19.690	19.690	16.675	-16.675
32	-50.168	91.507	-66.198	-79.977	94.838	-94.838
33	-49.699	135.443	-76.405	-104.987	23.310	-23.310
34	-24.829	71.374	-28.243	-43.757	-.298	.298
35	3.534	22.310	-6.193	-14.807	30.774	-30.774
36	.337	.664	1.001	-1.001	422.454	-422.454
37	-.664	5.928	1.504	-1.504	422.454	-422.454
38	-52.940	-49.029	-24.278	24.278	295.100	-295.100
39	-16.676	-21.334	-12.261	12.261	103.334	-103.334
40	-14.862	-14.310	-16.207	16.207	24.478	-24.478
41	.000	.000	.000	.000	-.503	.503
42	-44.494	54.896	-47.376	-50.844	120.621	-120.621
43	-69.738	93.239	-86.779	-94.613	11.294	-11.294
44	-35.178	40.585	-35.099	-36.901	3.647	-3.647
45	-8.000	12.977	-9.671	-11.329	14.568	-14.568
46	-1.015	-2.029	-3.044	3.044	193.687	-193.687
47	2.029	4.928	1.988	-1.988	193.687	-193.687
48	-59.824	-64.115	-29.509	29.509	142.843	-142.843
49	-29.124	-27.340	-18.214	18.214	48.230	-48.230
50	-13.245	-12.977	-14.568	14.568	11.329	-11.329

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	7.530	-66.264	5.689
4	-3.106	-306.545	-1.039
8	-.089	-422.543	.886
14	.159	-384.762	.895
20	1.149	-412.410	1.322
25	.337	-422.454	1.001
31	-1.015	-193.687	-3.044
32	.000	.000	5.534
33	.000	.000	-152.118

COMBINACAO 6

ACC.BASE-E1

ACCAO PERMANENTES-G	COEFICIENTE 1.00000
SOBRECARGA-Q2	.40000
SISMO(e2i)-E2	.00000

ACCAO SOBRECARGA-Q1	COEFICIENTE .40000
SISMO(e1i)-E1	-1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	8.564	14.450	5.114	-5.114	90.474	-90.474
2	36.639	27.543	15.281	-15.281	20.330	-20.330
3	-51.088	68.747	-70.144	-76.031	-10.167	10.167
4	-27.543	11.764	-20.330	-15.070	13.436	-13.436
5	-.605	-5.312	-1.315	1.315	325.808	-325.808
6	33.368	38.865	17.198	-17.198	169.521	-169.521
7	53.241	59.507	28.910	-28.910	57.422	-57.422
8	-96.803	53.792	-80.256	-65.919	-28.681	28.681
9	-103.870	65.874	-97.029	-84.363	1.725	-1.725
10	-59.507	49.664	-57.422	-54.142	-47.140	47.140
11	1.327	-1.021	.068	-.068	413.040	-413.040
12	34.260	32.571	15.912	-15.912	269.242	-269.242
13	23.405	8.195	10.194	-10.194	83.790	-83.790
14	-8.195	16.351	10.195	-10.195	83.790	-83.790
15	-66.014	29.068	-36.946	36.946	29.649	-29.649
16	-87.030	58.284	-77.878	-68.297	-44.525	44.525
17	-121.851	59.495	-101.089	-80.303	7.443	-7.443
18	-29.068	26.495	-29.649	-28.791	-59.671	59.671
19	.208	-2.600	-.532	.532	406.465	-406.465
20	34.058	32.843	15.929	-15.929	259.380	-259.380
21	31.605	27.131	18.947	-18.947	77.035	-77.035
22	3.393	9.885	7.377	-7.377	46.527	-46.527
23	-89.742	55.537	-78.788	-67.387	-60.985	60.985
24	-123.942	55.867	-102.042	-79.350	4.424	-4.424
25	-30.524	-16.290	-30.508	20.102	11.569	-11.569
26	-36.380	-7.036	-17.736	-3.264	-52.294	52.294
27	16.290	3.623	-20.102	-29.698	11.569	-11.569
28	-1.174	-4.460	-1.252	1.252	404.789	-404.789
29	33.464	32.128	15.617	-15.617	260.548	-260.548
30	24.207	27.152	16.568	-16.568	84.431	-84.431
31	20.312	20.514	22.681	-22.681	14.956	-14.956
32	-84.541	61.942	-76.854	-69.321	-77.854	77.854
33	-112.201	75.770	-96.768	-84.624	3.470	-3.470
34	-51.087	28.430	-39.776	-32.224	5.455	-5.455
35	-13.478	6.325	-11.692	-9.308	-29.614	29.614
36	3.682	7.758	11.441	-11.441	438.204	-438.204
37	-7.758	-25.643	-9.543	9.543	438.204	-438.204
38	37.791	38.912	18.263	-18.263	309.820	-309.820
39	29.049	30.062	19.068	-19.068	110.179	-110.179
40	18.005	16.935	19.411	-19.411	24.972	-24.972
41	.000	.000	.000	.000	20.984	-20.984
42	-74.090	14.368	-59.064	-39.156	-105.660	105.660
43	-143.730	-2.191	-115.016	-66.376	2.664	-2.664
44	-76.498	-25.402	-52.983	-19.017	5.113	-5.113
45	-23.260	-7.724	-15.664	-5.336	-10.202	10.202
46	4.815	9.631	14.446	-14.446	129.885	-129.885
47	-9.631	-23.389	-9.434	9.434	129.885	-129.885
48	9.021	1.173	2.427	-2.427	90.728	-90.728
49	1.018	14.761	5.090	-5.090	24.353	-24.353
50	10.641	7.724	10.203	-10.203	5.336	-5.336

REACOES NOS APOIOS

NO DO APOIO	MOMENTO	VERTICAL	HORIZONTAL
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	(KN.m)	(KN)	(KN)
1	8.564	-90.474	5.114
4	-.605	-325.808	-1.315
8	1.327	-413.040	.068
14	.208	-406.465	-.532
20	-1.174	-404.789	-1.252
25	3.682	-438.204	11.441
31	4.815	-129.885	14.446
32	.000	.000	-44.864
33	.000	.000	117.521

 COMBINACAO 7
 ACC.BASE-E2

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA-Q2	.40000
SISMO(e2i)-E2	-1.50000

ACCAO	COEFICIENTE
SOBRECARGA-Q1	.40000
SISMO(e1i)-E1	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	8.786	13.946	5.051	-5.051	93.888	-93.888
2	43.334	32.926	18.157	-18.157	21.708	-21.708
3	-57.279	62.726	-72.180	-73.995	-13.106	13.106
4	-32.926	8.875	-21.708	-13.692	-54.608	54.608
5	-.206	-5.975	-1.373	1.373	323.531	-323.531
6	46.120	52.554	23.494	-23.494	167.251	-167.251
7	43.492	54.793	25.201	-25.201	56.287	-56.287
8	-102.872	47.691	-82.284	-63.891	-37.973	37.973
9	-104.922	65.464	-97.272	-84.120	-56.315	56.315
10	-54.793	51.762	-56.287	-55.277	-27.598	27.598
11	1.572	-1.855	-.063	.063	414.258	-414.258
12	47.052	46.575	22.292	-22.292	270.557	-270.557
13	10.083	.051	3.269	-3.269	85.102	-85.102
14	-.051	2.667	3.269	-3.269	85.102	-85.102
15	-54.429	30.100	-24.329	24.329	29.826	-29.826
16	-92.887	52.548	-79.811	-66.364	-60.328	60.328
17	-122.123	58.287	-101.335	-80.057	-37.293	37.293
18	-30.100	26.467	-29.826	-28.614	-39.629	39.629
19	.284	-3.538	-.723	.723	403.123	-403.123
20	46.622	46.175	22.095	-22.095	255.989	-255.989
21	22.152	21.929	14.220	-14.220	72.992	-72.992
22	3.932	5.630	5.312	-5.312	45.068	-45.068
23	-95.632	49.540	-80.770	-65.405	-83.146	83.146
24	-126.615	53.146	-102.941	-78.451	-29.419	29.419
25	-25.861	-16.171	-27.923	17.517	8.907	-8.907
26	-32.097	-3.627	-16.454	-4.546	-34.316	34.316
27	16.171	14.468	-17.517	-32.283	8.908	-8.908
28	-1.484	-5.841	-1.628	1.628	405.730	-405.730
29	46.066	45.540	21.811	-21.811	261.860	-261.860
30	16.010	19.253	11.375	-11.375	85.799	-85.799
31	13.493	14.266	15.422	-15.422	15.327	-15.327
32	-89.764	57.496	-78.465	-67.709	-106.585	106.585
33	-114.696	73.214	-97.610	-83.782	-18.987	18.987
34	-47.214	34.086	-38.188	-33.812	4.859	-4.859
35	-10.639	8.949	-10.782	-10.218	-18.894	18.894
36	4.115	8.677	12.792	-12.792	437.128	-437.128
37	-8.677	-30.213	-11.112	11.112	437.128	-437.128

38	51.618	53.078	24.928	-24.928	308.444	-308.444
39	21.029	22.435	14.021	-14.021	108.327	-108.327
40	12.224	11.466	13.161	-13.161	24.786	-24.786
41	.000	.000	.000	.000	23.904	-23.904
42	-78.901	7.715	-60.974	-37.246	-142.624	142.624
43	-147.321	-6.510	-116.335	-65.057	-8.081	8.081
44	-68.745	-13.633	-49.730	-22.270	5.718	-5.718
45	-20.416	-3.987	-14.567	-6.433	-5.733	5.733
46	5.757	11.514	17.271	-17.271	131.006	-131.006
47	-11.514	-27.962	-11.279	11.279	131.006	-131.006
48	20.247	13.764	8.098	-8.098	93.760	-93.760
49	-7.253	7.299	.015	-.015	28.703	-28.703
50	6.333	3.987	5.734	-5.734	6.433	-6.433

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	8.786	-93.888	5.051
4	-.206	-323.531	-1.373
8	1.572	-414.258	-.063
14	.284	-403.123	-.723
20	-1.484	-405.730	-1.628
25	4.115	-437.128	12.792
31	5.757	-131.006	17.271
32	.000	.000	-52.453
33	.000	.000	162.001

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Viga V3.4:

Viga continua de 5 tramos. Esta viga é composta por duas zonas fundamentais:

- i) Dimensões $b = 0.30$ $h = 0.35$

Zona embebida funcionando como faixa de acerto de bordo da laje fungiforme L3.3; Armaduras longitudinais calculadas em PAC17 - (ver PAC17 - laje fungiforme); Esforço transverso: $V_{ed}^{max} = 62.4$ KN ; $V_{sd}^{max} = 84$ KN ; Estribos mínimos $\phi 6 @ 0.20$, excepto a 1.0m dos apoios intermédios e a 0.70m dos apoios extremos onde se define $\phi 6 @ 0.15$.

- ii) Dimensões: $b = 0.30$; $h = 0.69$

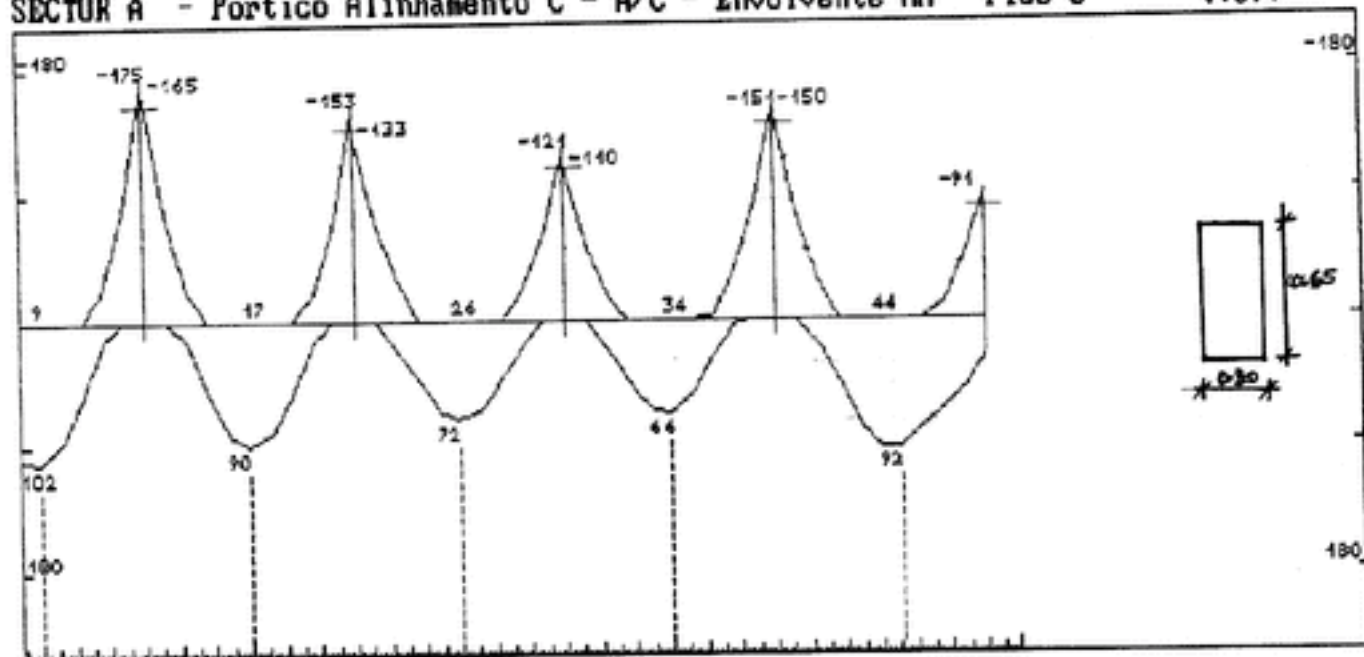
Zona de viga aparente calculada de acordo com as regras do método dos pórticos equivalentes, para a totalidade da carga da faixa central do pórtico PAC17. (Ver diagramas anexos).

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SECTOR A - Portico Alinhamento C - A/C - Envolvente MM - Piso 3

V.3.4

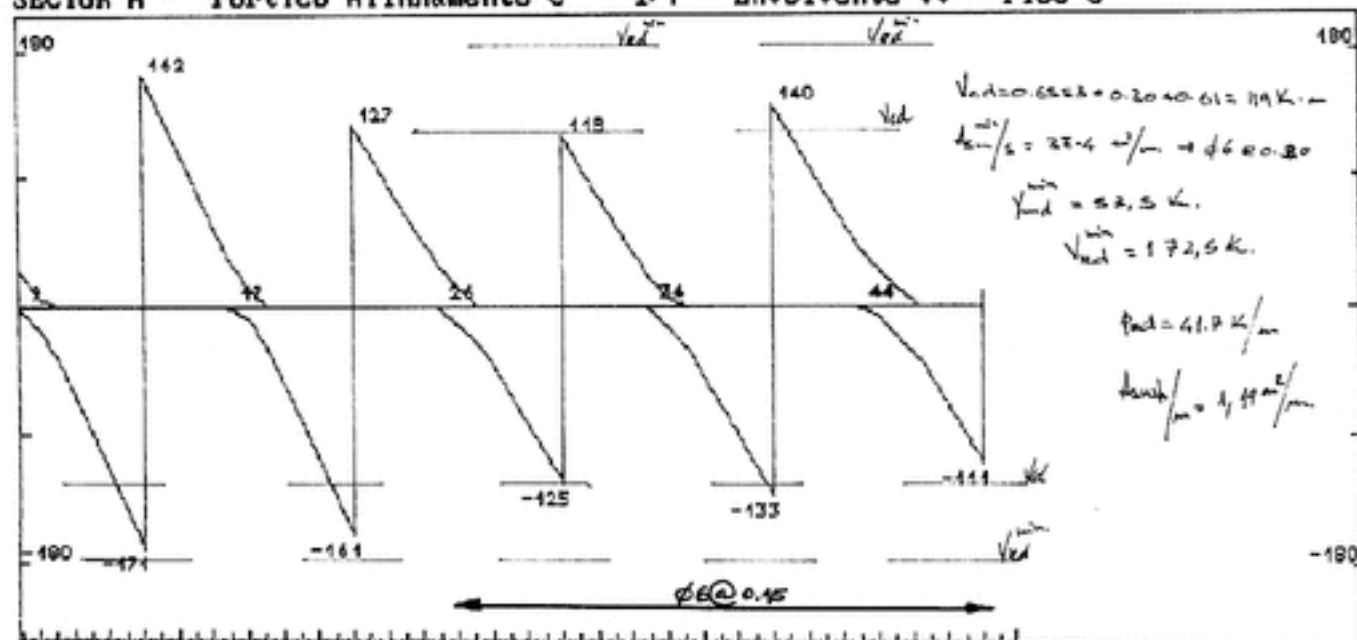


$M_{sd}(kNm)$ 102 -175 -165 -153 -133 -121 -140 -151 -150 91

μ	0.040	0.07	0.044	0.07	0.041	0.057
ν	0.060	0.076	0.044	0.099	0.066	0.061
$A_s (cm^2)$	3.27	5.79	3.25	6.93	4.61	4.23
	2 ϕ 16	4 ϕ 12	4 ϕ 12	5 ϕ 12	5 ϕ 12	4 ϕ 12

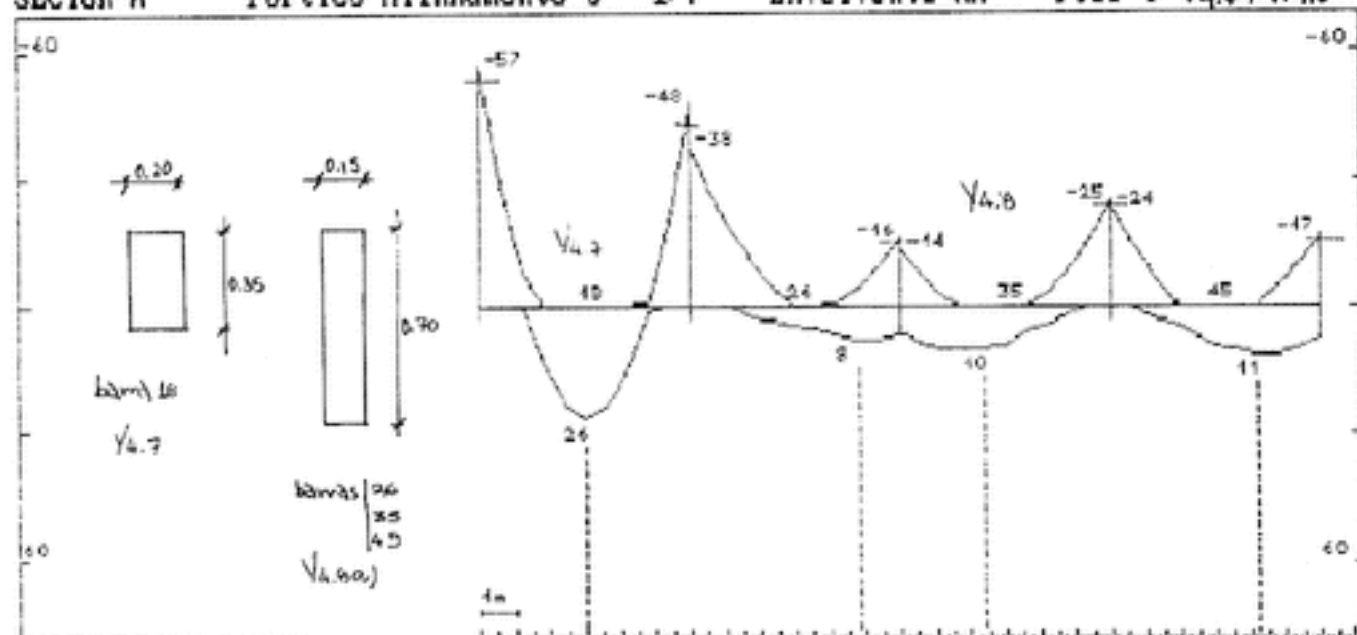
DO CÁLCULO DA
LAFE FUNGFORTE L.3.3

SECTOR A - Portico Alinhamento C - 1/7 - Envolvente UU - Piso 3



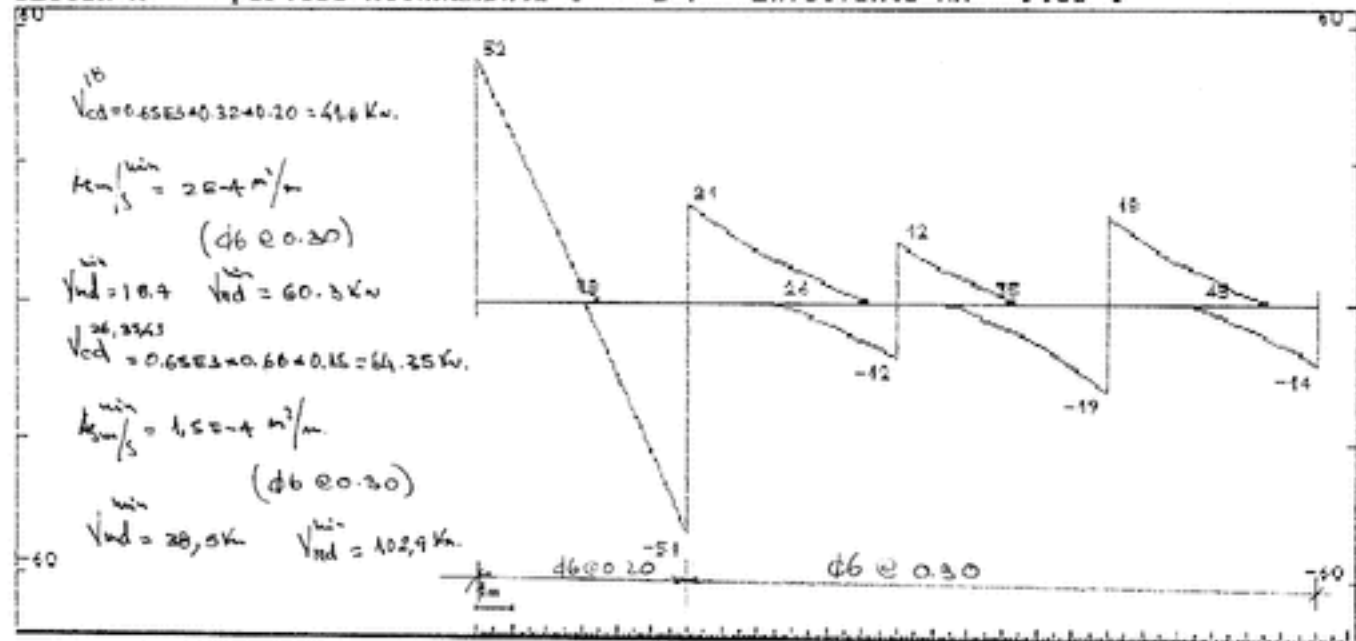
$V_{sd} = 0.6622 + 0.20 + 0.61 = 1.4722$
 $\frac{1.4722}{2} = 0.7361 \text{ kN/m} \rightarrow \phi 6 @ 0.20$
 $V_{sd}^{min} = 52.5 \text{ kN}$
 $V_{sd}^{max} = 172.5 \text{ kN}$
 $P_{sd} = 41.7 \text{ kN/m}$
 $q_{sd} = 4.99 \text{ kN/m}^2$

SECTOR A - Portico Alinhamento C - 1/7 - Envolvente MM - Piso 4 v.4.7+v.4.8

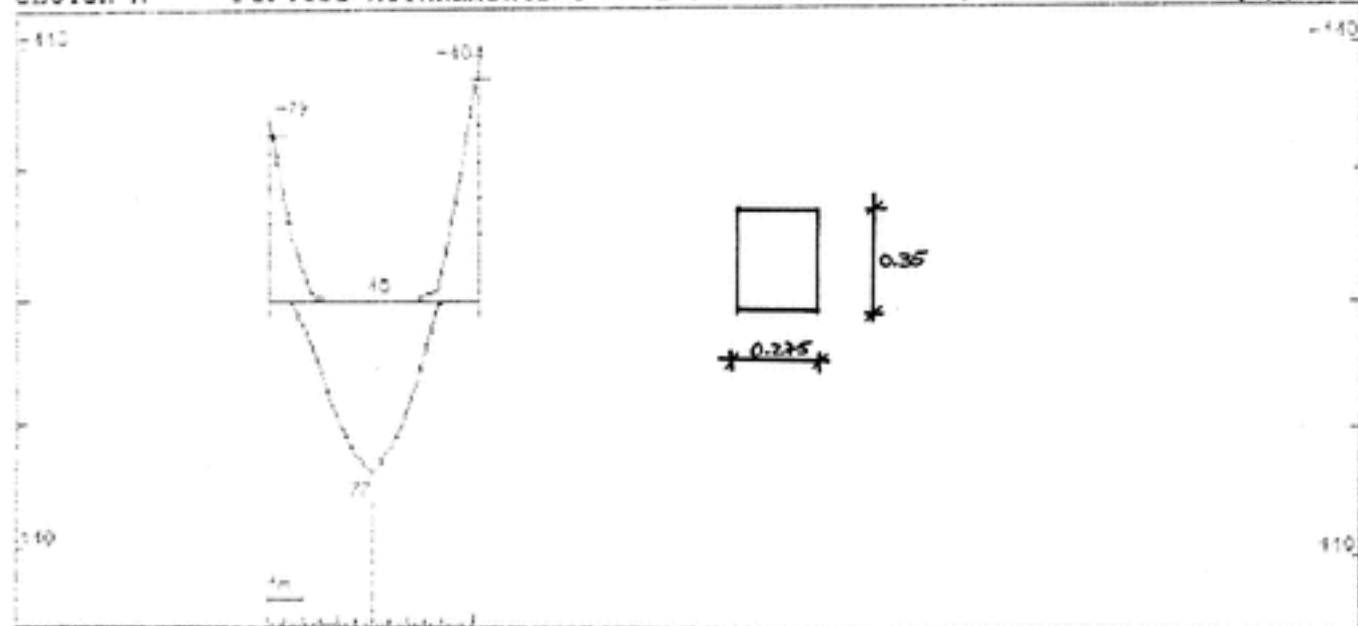


min Acl	Mud (kNm)	-52	26	-44	80	-14	10	-22	11	-15
Secção (0.25x0.20)	μ	0.19	0.095	0.16	0.05	0.009	0.014	0.011	0.025	0.015
0,96m ²	w	0.227	0.104	0.18	0.03	0.007	0.04	0.016	0.0259	0.015
Secção (0.20x0.15)	A_s (cm ²)	5,5	2,06	4,5	2,01	0,35	0,619	0,44	0,98	0,06
1,0m ²	Varões	4φ12	2φ10 2φ12	4φ12	3φ10	3φ10	3φ10	3φ10	3φ10	3φ10

SECTOR A - portico Alinhamento C - 1/7 - Envolvente MM - Piso 4



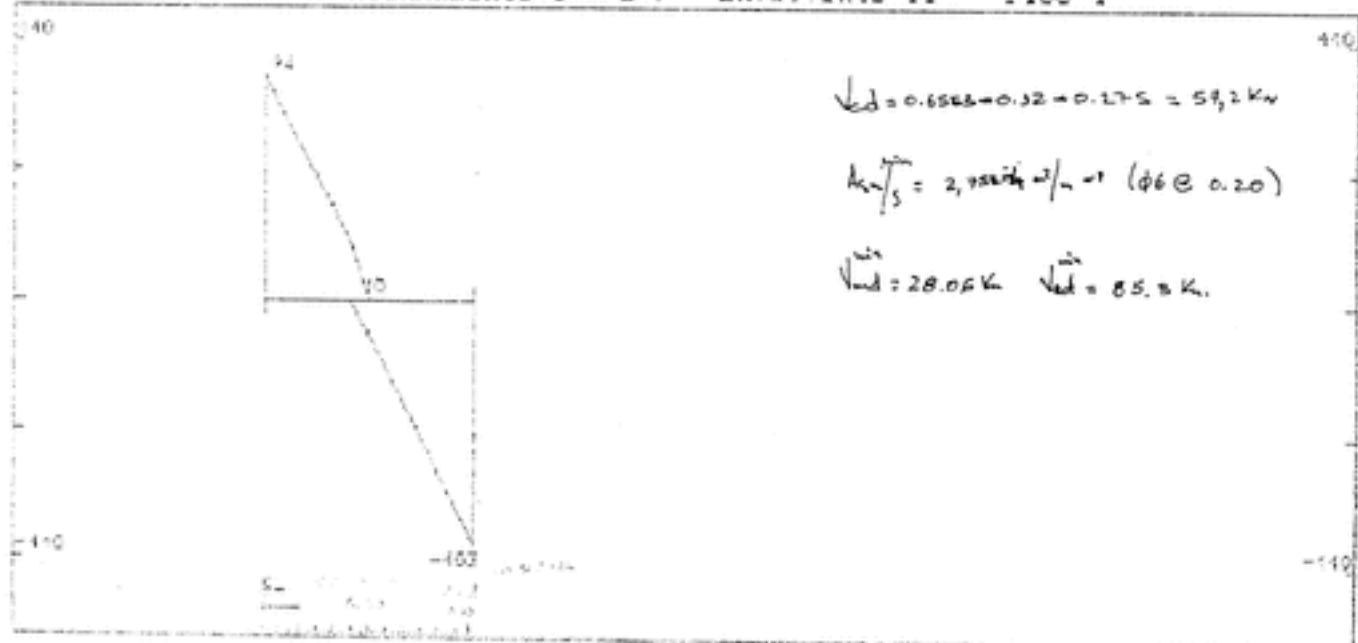
SECTOR A - Portico Alinhamento C - 1/7 - Envolvente MM - Piso 4 V4.7



$M_{kd}(K.m)$	-72	10	-95
μ	0.082	0.205	0.254
ν	0.229	0.247	0.318
$A_s (cm^2)$	7,7	8,34	10,7
	2Ø16	5Ø16	5Ø16
	+ 2Ø12		

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SECTOR A - Portico Alinhamento C - 1/7 - Envolvente II - Piso 4



Viga V4.6:

A viga V4.6, corresponde à nervura de remate da laje L4.5. Admitiu-se como zona de influência uma faixa de 0.30m para além da nervura maciça.

$$p_{ed} = 1,5 \times (0,50 \times 5,2 (\text{faixa da laje})) + 0,35 \times 0,35 \times 25 (p.p.) + 0,35 \times 5,0 (platabanda) = 11,12 \text{ KN/m}$$

$$\frac{pL^2}{8} = \frac{11,12 \times 36}{8} = 50 \text{ KN.m}; \mu = 0,105; w = 0,116; A_s = 4,96 \text{ m}^2; 5\phi 12$$

$$\frac{pL^2}{12} = \frac{11,12}{12} \times 36 = 34 \text{ KN.m}; \mu = 0,07; w = 0,0764; A_s = 3,27 \text{ m}^2; 4\phi 12$$

$$\frac{pL^2}{24} = 17 \text{ KN.m}; \mu = 0,0356; w = 0,037; A_s = 1,58 \text{ m}^2; 3\phi 12$$

ESFORÇO TRANSVERSO

$$V_{sd}^{max} = 35,92; V_{ed} = 72,8 \text{ KN}; \text{Estribos mínimos: } \phi 6 @ 0,15$$

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3. ACÇÕES HORIZONTAIS

3.1 - Direcção transversal

3.1.1 - Acção sísmica

= MÉTODO DE RAYLEIGH - COMBOIO =

Definição do comboio em pórticos transversais

Secções das vigas definidas de acordo com as condicionantes do R.S.A..
Nas zonas de lajes fungiformes foram determinados b e h equivalentes para
definição das vigas.

Todos os pórticos foram considerados como individuais exceptuando P4
= P5.

Considerou-se bloco impedido de se deslocar ao nível do Piso 2.

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QUANTIFICAÇÃO DAS ACCÕES GRAVÍTICAS AO NÍVEL DOS PISOS 3 E 4

Piso 3

$$A_1 = (6 \times 6 \times 10) = 360 m^2$$

$$A_2 = (6 \times 6 \times 2) = 72 m^2$$

$$G_1 = (5,2(p.p.) + 1,5(rev.) + 1,0(div.)) \times 360 = 2772 KN$$

(Peso da laje interior)

$$G_2 = (5,2(p.p.) + 1,5(rev.)) \times 72 = 482,4 KN$$

(Peso da laje de cobertura)

$$G_3 = (6,75 \times (2,75 + 2,0) \times 1,20 \times 4) + 4 = 615,6 KN$$

(Peso das chaminés)

$$G_4 = (0,30 \times 0,35) + 25 \times 16 \times 6 = 252 KN$$

(Viga bordadura)

$$G_5 = 3,77 \times (6 \times 6) \times \left(\frac{3,9}{2} + \frac{4,20}{2} \right) = 733 KN$$

(Parede exterior)

$$G_6 = 10 \times 3,0625 \times (4,9/2 + 4,2/2) + 8 \times 2,625 \times \left(\frac{3,9}{2} + \frac{4,2}{2} \right) + 2,25 \times \left(\frac{3,9}{2} + \frac{4,2}{2} \right) = 233,5 KN$$

$$G = 5090 KN$$

$$Q = 4,0(sob.) \times 360 = 1440 KN/m$$

$$G_3 = G + 0,4Q$$

$$G_3 = 5666 KN$$

Piso 4 (considerado apenas um nível)

$$A = 7 \times 36 + 3 \times (6 \times 4,5) = 333 m^2$$

$$G_1 = (5,2(p.p.) + 1,5(rev.) + 1,0(div.)) \times 333 = 2564 KN$$

$$G_2 = (0,30 \times 0,70 \times 25) \times 9 \times 6 = 283,5 KN$$

Viga bordadura

$$G_3 = (1,35 \times 0,35 \times 15) \times 6 \times 5 = 354 KN$$

Viga "degrau"

$$G_4 = (0,35 \times 0,35 \times 25) \times 6 \times 3 = 55,2 KN$$

Viga que atravessa zona de entrada de luz

$$G_5 = (0,7 \times 0,35 + 0,7 \times 0,15 + 0,6 \times 0,20 \times 2 + 2,10 \times 0,10) \times 18 \times 25 = 360 KN$$

Vigas e laje na zona do desnível

$$G_6 = (1,05 \times 0,35 \times 25 \times 18) = 165 KN$$

Viga de bordadura na zona do furo

$$G_7 = \left(6 \times 2,625 \times \frac{4,4}{2} + 12 \times 3,0625 \times \frac{4,4}{2} \right) = 115,5 KN$$

Pilares

$$G_8 = 3,77 \times \frac{3,9}{2} \times (7 \times 6) = 308,76$$

Parede exterior, abaixo do piso

$$G = 4206$$

Cobertura: $p.p. = 3,5 \text{ KN/m}^2$; $rev = 1,0 \text{ KN/m}^2$; $sob. = 1,0 \text{ KN/m}^2$

Admitindo pé-direito = 3.0m)

$$G_9 = (3.5(p.p.) + 1.0(rev.)) \times 333 = 1498,5 \text{ KN}$$

$$G_{10} = (6 \times 2,625 \times 3,0 + 12 \times 3,0625 \times 3) = 157,5 \text{ KN}$$

Pilares

$$G_{11} = 3,77 \times 6 \times 10 \times 3,0 = 678,6 \text{ KN}$$

Parede exterior

$$G = 6540$$

$$Q = 4,0(sob.) \times 333 = 1332 \text{ KN}$$

$$G_4 = 6540 + 0,4 \times 1332 = 7073 \text{ KN}$$

CÁLCULO DE FREQUÊNCIA
CÁLCULO DAS FORÇAS SÍSMICAS

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$G_i(\text{KN})$	$d_i(\text{m})$	$G_i d_i$	$G_i d_i^2$	$\frac{2d_i^2 a}{d_i^2 + a^2} \times G_i d_i$
7073	0,365	2581,6	942,3	186,37
5666	0,24	1359,84	326,4	98,166
	Σ	3941,5	1268,66	$\Sigma = 284,536 \text{ KN}$

$$f = \frac{1}{2\pi} \sqrt{g \frac{G_i d_i}{G_i d_i^2}} = 0,88 \text{ Hz} \quad w = f \times 2\pi = 5,52 \text{ rad/s}$$

$$\eta = 2,5$$

$$\alpha = 0,3 \quad S_a = 190 \text{ m/s}^2 \text{ (Acção sísmica tipo 2)}$$

Solo tipo II

$$j = 5\% \quad F_i = \frac{1,9 \times 0,3 \times 5,52^2}{9,81^2 \times 1,5} G_i d_i = 0,0722 G_i d_i$$

Forças sísmicas

$$F_3 = 98,16 \text{ KN}$$

$$F_4 = 186,37 \text{ KN}$$

Nas páginas seguintes encontram-se as listagens do pórtico comboio - Acção sísmica.

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Portico Comboio - Sector A - Forças SISMICAS Dir. Transversal

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
12			32.722
25			93.185
33			32.772
35			93.185
65			32.772

RESULTADOS

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.974	13.950	3.608	-3.608	-6.137	6.137
2	-13.950	-20.418	-8.183	8.183	-6.137	6.137
3	.000	.000	.000	.000	11.791	-11.791
4	20.418	16.403	6.137	-6.137	-8.183	8.183
5	11.607	23.218	6.004	-6.004	-1.970	1.970
6	-23.218	-36.682	-14.262	14.262	-1.970	1.970
7	.000	.000	.000	.000	32.057	-32.057
8	20.279	28.365	8.107	-8.107	-22.445	22.445
9	10.614	21.227	5.490	-5.490	8.107	-8.107
10	-21.228	-28.365	-11.808	11.808	8.107	-8.107
11	.000	.000	.000	.000	-18.994	18.994
12	.000	.000	.000	.000	-34.268	34.268
13	7.822	15.644	4.046	-4.046	-17.538	17.538
14	-15.645	-21.037	-8.734	8.734	-17.538	17.538
15	-15.327	-20.100	-9.084	9.084	-6.123	6.123
16	.000	.000	.000	.000	-6.214	6.214
17	36.364	32.131	11.416	-11.416	-1.143	1.143
18	20.100	16.636	6.123	-6.123	-9.084	9.084
19	12.977	25.957	6.713	-6.713	-4.002	4.002
20	-25.957	-37.936	-15.213	15.213	-4.002	4.002
21	-30.802	-36.198	-17.179	17.179	-1.706	1.706
22	.000	.000	.000	.000	15.711	-15.711
23	36.607	45.669	13.713	-13.713	.824	-.824
24	19.562	27.407	7.828	-7.828	-26.264	26.264
25	11.789	23.578	6.098	-6.098	21.540	-21.540
26	-23.578	-28.249	-12.340	12.340	21.540	-21.540
27	-17.420	-27.407	-11.494	11.494	7.828	-7.828
28	.000	.000	.000	.000	-19.450	19.450
29	.000	.000	.000	.000	-.072	.072
30	.000	.000	.000	.000	-37.800	37.800
31	7.919	15.840	4.096	-4.096	-15.876	15.876
32	-15.840	-21.832	-8.970	8.970	-15.876	15.876
33	-15.066	-17.808	-8.429	8.429	-4.427	4.427
34	.000	.000	.000	.000	-6.384	6.384
35	36.898	31.798	11.449	-11.449	-.521	.521
36	17.808	8.752	4.427	-4.427	46.981	-46.981
37	13.171	26.344	6.813	-6.813	-9.058	9.058
38	-26.344	-39.515	-15.681	15.681	-9.058	9.058
39	-33.755	-39.121	-18.686	18.686	-4.213	4.213
40	30.427	-16.573	27.708	-27.708	-8.639	8.639
41	.000	.000	.000	.000	16.109	-16.109
42	41.472	56.296	16.295	-16.295	2.485	-2.485
43	16.256	35.580	8.639	-8.639	28.031	-28.031
44	27.178	54.355	14.057	-14.057	3.194	-3.194
45	-54.356	-41.159	-22.742	22.742	3.194	-3.194
46	-15.137	-28.848	-11.278	11.278	-13.101	13.101
47	29.363	-35.637	-12.548	12.548	-13.100	13.100
48	.000	.000	.000	.000	-38.729	38.729
49	.000	.000	.000	.000	23.758	-23.758
50	.000	.000	.000	.000	126.060	-126.060

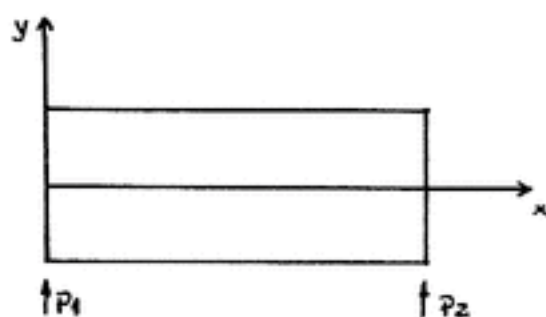
51	.000	.000	.000	.000	.000	-18.320	157.18.320
52	15.866	31.736	8.207	-8.207	-14.352	14.352	14.352
53	-31.736	-43.921	-18.014	18.014	-14.352	14.352	14.352
54	-30.243	-35.908	-16.962	16.962	8.996	-8.996	-8.996
55	.000	.000	.000	.000	-12.508	12.508	12.508
56	74.164	65.930	23.349	-23.349	22.706	-22.706	-22.706
57	35.908	34.492	11.733	-11.733	107.400	-107.400	-107.400
58	26.113	52.235	13.508	-13.508	6.946	-6.946	-6.946
59	-52.235	-77.431	-30.873	30.873	6.946	-6.946	-6.946
60	-57.929	-62.845	-30.967	30.967	8.686	-8.686	-8.686
61	28.353	-6.601	21.751	-21.751	-3.047	3.047	3.047
62	.000	.000	.000	.000	31.873	-31.873	-31.873
63	69.430	81.100	25.088	-25.088	22.801	-22.801	-22.801
64	.000	.000	.000	.000	54.749	-54.749	-54.749
65	6.600	17.783	4.064	-4.064	3.471	-3.471	-3.471
66	24.723	49.446	12.788	-12.788	29.152	-29.152	-29.152
67	-49.446	-66.228	-27.542	27.542	29.152	-29.152	-29.152
68	-14.872	-17.783	-6.664	6.664	4.064	-4.064	-4.064
69	.001	.001	.000	.000	-16.561	16.561	16.561
70	.000	.000	.000	.000	1.933	-1.933	-1.933
71	.000	.000	.000	.000	-3.175	3.175	3.175
72	7.208	14.417	3.728	-3.728	-17.125	17.125	17.125
73	-14.417	-21.143	-8.467	8.467	-17.125	17.125	17.125
74	-14.882	-17.750	-8.367	8.367	-5.912	5.912	5.912
75	.000	.000	.000	.000	-4.366	4.366	4.366
76	36.025	31.255	11.213	-11.213	1.903	-1.903	-1.903
77	17.750	17.721	5.912	-5.912	46.344	-46.344	-46.344
78	8.769	17.539	4.536	-4.536	3.157	-3.157	-3.157
79	-17.539	-34.862	-12.477	12.477	3.157	-3.157	-3.157
80	-28.939	-30.657	-15.281	15.281	3.710	-3.710	-3.710
81	12.935	-3.974	8.961	-8.961	-2.201	2.201	2.201
82	.000	.000	.000	.000	12.646	-12.646	-12.646
83	32.547	38.055	11.767	-11.767	4.708	-4.708	-4.708
84	.000	.000	.000	.000	22.126	-22.126	-22.126
85	3.974	9.235	2.201	-2.201	5.767	-5.767	-5.767
86	8.335	16.669	4.311	-4.311	13.968	-13.968	-13.968
87	-16.670	-29.820	-11.069	11.069	13.968	-13.968	-13.968
88	-8.235	-9.235	-3.565	3.565	2.201	-2.201	-2.201
89	.000	.000	.000	.000	-65.550	65.550	65.550
90	.000	.000	.000	.000	-2.790	2.790	2.790
91	.000	.000	.000	.000	2.196	-2.196	-2.196
92	-1.220	-2.447	-1.594	1.594	-26.334	26.334	26.334
93	2.447	7.323	2.791	-2.791	-26.334	26.334	26.334
94	-28.912	-25.503	-12.956	12.956	-19.458	19.458	19.458
95	-12.234	-18.873	-7.976	7.976	-7.444	7.444	7.444
96	.000	.000	.000	.000	-4.385	4.385	4.385
97	21.590	19.666	6.876	-6.876	-49.803	49.803	49.803
98	37.738	34.349	12.014	-12.014	25.046	-25.046	-25.046
99	18.873	25.790	7.444	-7.444	14.140	-14.140	-14.140
100	-1.265	-2.538	-1.654	1.654	3.444	-3.444	-3.444
101	2.538	8.299	3.096	-3.096	3.444	-3.444	-3.444
102	-50.318	-46.229	-22.987	22.987	4.734	-4.734	-4.734
103	-23.867	-30.272	-13.882	13.882	5.350	-5.350	-5.350
104	4.482	-4.225	.257	-.257	-2.094	2.094	2.094
105	.000	.000	.000	.000	-9.135	9.135	9.135
106	22.352	26.650	8.167	-8.167	-23.719	23.719	23.719
107	35.747	40.033	12.630	-12.630	15.940	-15.940	-15.940
108	4.225	8.338	2.094	-2.094	2.452	-2.452	-2.452
109	-2.209	-4.418	-2.881	2.881	22.891	-22.891	-22.891
110	4.418	14.232	5.328	-5.328	22.891	-22.891	-22.891
111	-40.881	-36.361	-18.391	18.391	14.724	-14.724	-14.724
112	-3.673	-8.338	-2.451	2.451	2.094	-2.094	-2.094

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.974	6.137	3.608
4	11.607	1.970	6.004
7	10.614	-8.107	5.490
8	.000	.000	-68.348
10	7.822	17.538	4.046
14	12.977	4.002	6.713
18	11.789	-21.540	6.098
19	.000	.000	-53.599
22	7.919	15.876	4.096
26	13.171	9.058	6.813
31	27.178	-3.194	14.057
32	.000	.000	-91.638
36	15.866	14.352	8.207
40	26.113	-6.946	13.508
45	24.723	-29.152	12.788
46	.000	.000	-88.763
49	7.208	17.125	3.728
53	8.769	-3.157	4.536
58	8.335	-13.968	4.311
59	.000	.000	-93.577
62	-1.220	26.334	-1.594
67	-1.265	-3.444	-1.654
73	-2.209	-22.891	-2.881
74	.000	.000	17.345

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CENTROS DE MASSA; CENTROS DE RIGIDEZ



Centro de massa x_c

$$\text{Piso 3} - x_c^3 = 18.0m$$

$$\text{Cobertura} - x_c^4 = 21.0m$$

Centro de rigidez

$$\text{Piso 3} - x_R^3 = 21,65m$$

$$\text{Cobertura} - x_R^4 = 19.08m$$

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EXCENTRICIDADES

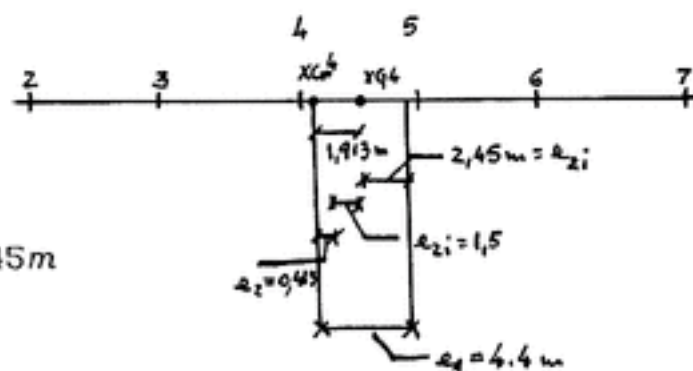
Nivel 4

$$a = 30$$

$$b_i = 1,913m$$

$$l_{1i} = 0,5b_i + 0,05a = 2,45m$$

$$l_{2i} = 0,05a = 1,5m$$



$$e_1 = 4.4m$$

$$(e_{1i})$$

$$e_2 = 0,41m$$

$$(e_{2i})$$

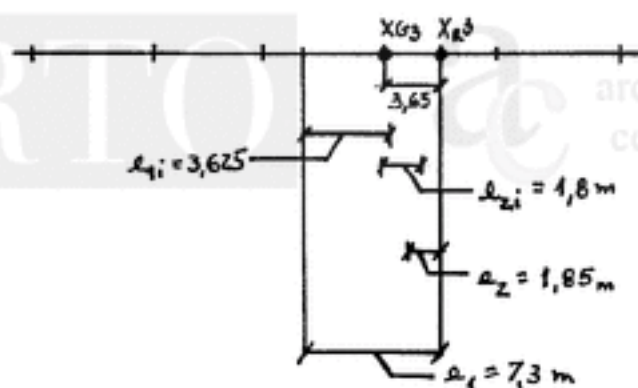
Nivel 3

$$a = 36$$

$$b_i = 3,65$$

$$l_{1i} = 0,5b_i + 0,05a = 3,625m$$

$$l_{2i} = 0,05a = 1,8m$$



$$e_1 = -7,3$$

$$(e_{1i})$$

$$e_2 = -1,85m$$

$$(e_{2i})$$

CORRECÇÃO DE TORÇÃO

Piso 4

$$e_1 = 4.4m$$

$$e_2 = 0.41m$$

 F_i^i → esforço transversal ao nível em causa antes da correcção.

 H → Esforço transversal total ao nível em causa.

 d_i → distância do pórtico ao c.d. rigidez.

$$F_i^F = F_i^i \left(1 + \frac{H \times e}{\sum F_i d_i^2} \times d_i \right)$$

$$d_2 = -13.1$$

$$d_3 = -7.1$$

$$d_4 = -1.1$$

$$d_5 = +4.9$$

$$d_6 = +10.9$$

$$d_7 = +17.9$$

$$c_1 = 4.4m$$

$$H = 185.37 KN$$

$$\sum F_i d_i^2 = 20027.5$$

$$F_i^F = F_i^i \left(1 + \frac{185.37 \times e}{20027.5} \times d_i \right)$$

$$F_2^F = F_2 \times (1 + (-0.523)) = 0.47 F_2$$

$$F_3^F = -0.72 F_3$$

$$F_4^F = -0.96 F_4$$

$$F_5^F = -1.2 F_5$$

$$F_6^F = -1.44 F_6$$

$$F_7^F = -1.73 F_7$$

$$c_2 = 0.41m$$

$$F_2^F = F_2 \times (1 + (-0.00487)) = F_2$$


$$F_3^F = F_3$$

$$F_4^F = F_4$$

$$F_5^F = F_5$$

$$F_6^F = F_6$$

$$F_7^F = F_7$$

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Piso 3

$$e_1 = 7,3m$$

$$e_2 = 1,85m$$

$$d_1 = -21,65$$

$$d_2 = -15,65$$

$$d_3 = -9,65$$

$$d_4 = -3,65$$

$$d_5 = +2,35$$

$$d_6 = +8,35$$

$$d_7 = +14,35$$

$$c_1 = 7,30m$$

$$H = 245,925KN$$

$$\sum F_i d_i^2 = 43684,55$$

$$F_i^F = F_i \left(1 + \frac{245,535 \times e}{43684,55} \right)$$

$$F_1^F = F_1 \times (1 + 0,8882) = 1,89F_1$$

$$F_2^F = 1,89F_1$$

$$F_3^F = 1,4F_3$$

$$F_4^F = 1,15F_4$$

$$F_5^F = 0,90F_5$$

$$F_6^F = 0,66F_6$$

$$F_7^F = 0,41F_7$$

$$c_2 = -1,85m$$

$$F_1^F = F_1 \times (1 + 0,2251) = 1,23F_1$$

$$F_2^F = 1,16F_2$$

$$F_3^F = 1,1F_3$$

$$F_4^F = 1,04F_4$$

$$F_5^F = 0,98F_5$$

$$F_6^F = 0,91F_6$$

$$F_7^F = 0,85F_7$$

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3.1.2 - Acção do vento

Admitiu-se estrutura impossibilitada de se mover no plano horizontal ao nível do piso 2.

h - altura acima do solo (Admitindo pé-direito do piso adicional igual a 3,5m)

$$h = 11,2m$$

Direcção 1 (Fundamental)

$$h/b = 0,207$$

$$\alpha = 0^\circ$$

$$\delta_{pe}$$

A

$$+0,7$$

B

Junta de dilatação
com os restantes
corpos

$$a/b = 1,333$$

Porto Fac. Med. Dentária \rightarrow Zona A $h = 11,2 - x = 39,6 \rightarrow w_k = 0,96 \text{ KN/m}^2$

Terreno \rightarrow Tipo II

$$p = 0,96 \times (0,7 + 0) = 0,672 \text{ KN/m}^2$$

$$F_{cobertura} = 0,672 \times \left[30 \times \left(3,5 + \frac{3,9}{2} \right) \right] = 109,87 \text{ KN}$$

$$F_{piso3} = 0,672 \times \left[30 \times \left(\frac{3,9}{2} + \frac{4,2}{2} \right) + 6 \times \frac{4,2}{2} \right] = 90 \text{ KN}$$

Direcção 2

$$h/b = 0,207$$

$$\alpha = 90^\circ$$

$$d_{pe}$$

A

$$+0,7$$

B

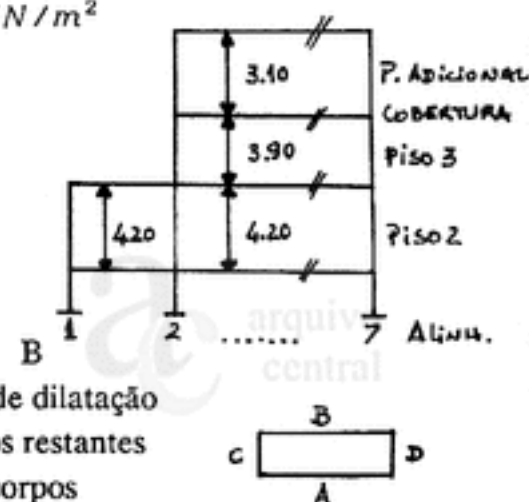
Junta de dilatação
com os restantes
corpos

$$a/b = 1,333$$

$$F_{cobertura} = 0,672 \times \left[12 \times \left(3,5 \times \frac{3,9}{2} \right) \right] = 43,95 \text{ KN}$$

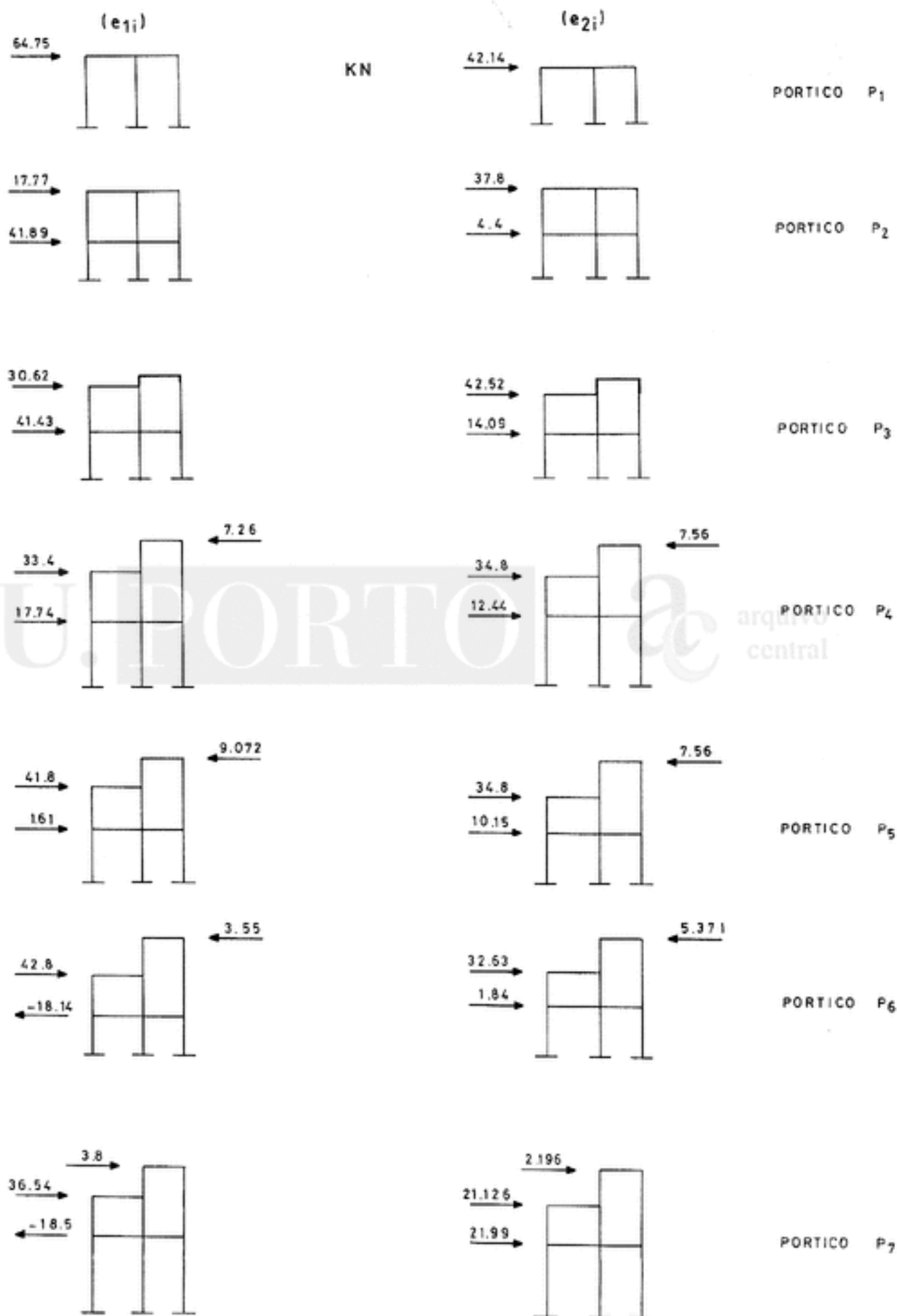
$$F_{piso3} = 0,672 \times \left(12 \times \left(\frac{3,9}{2} + \frac{4,2}{2} \right) \right) = 32,7 \text{ KN}$$

Distribuição das formas de vento pelos pórticos transversais, determinado de modo análogo ao efectuado para a acção sísmica. (Comboio).



- PÓRTICOS TRANSVERSAIS

- RESUMO APÓS CORRECÇÃO DE TORSÃO



Portico Comboio - Sector A - Forca VENTO - Dir. Transversal

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
12			30.000
25			54.935
33			30.000
35			54.935
65			30.000

RESULTADOS

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Na (KN)	Nd (KN)
1	4.852	9.705	2.510	-2.510	-4.270	4.270
2	-9.706	-14.205	-5.693	5.693	-4.270	4.270
3	.000	.000	.000	.000	8.203	-8.203
4	14.205	11.412	4.270	-4.270	-5.693	5.693
5	8.075	16.153	4.177	-4.177	-1.371	1.371
6	-16.153	-25.520	-9.922	9.922	-1.371	1.371
7	.000	.000	.000	.000	22.302	-22.302
8	14.108	19.734	5.640	-5.640	-15.615	15.615
9	7.384	14.768	3.819	-3.819	5.640	-5.640
10	-14.769	-19.734	-8.215	8.215	5.640	-5.640
11	.000	.000	.000	.000	-13.379	13.379
12	.000	.000	.000	.000	-23.805	23.805
13	5.488	10.978	2.839	-2.839	-11.133	11.133
14	-10.978	-15.017	-6.189	6.189	-11.133	11.133
15	-8.778	-11.965	-5.319	5.319	-3.666	3.666
16	.000	.000	.000	.000	-4.350	4.350
17	23.795	21.009	7.467	-7.467	5.325	-5.325
18	11.965	10.028	3.666	-3.666	-5.319	5.319
19	9.070	18.142	4.692	-4.692	-2.505	2.505
20	-18.143	-26.789	-10.698	10.698	-2.505	2.505
21	-18.182	-21.741	-10.237	10.237	-.992	.992
22	.000	.000	.000	.000	11.040	-11.040
23	23.962	29.922	8.981	-8.981	4.864	-4.864
24	11.713	16.231	4.657	-4.657	-15.556	15.556
25	8.281	16.561	4.283	-4.283	13.638	-13.638
26	-16.562	-20.391	-8.798	8.798	13.638	-13.638
27	-9.531	-16.232	-6.606	6.606	4.657	-4.657
28	.000	.000	.000	.000	-13.649	13.649
29	.000	.000	.000	.000	-2.667	2.667

30	.000	.000	.000	.000	-22.122	.166	22.122
31	5.537	11.075	2.864	-2.864	-10.147		10.147
32	-11.075	-11.075	-6.321	6.321	-10.147		10.147
33	-8.711	-10.665	-4.968	4.968	-2.658		2.658
34	.000	.000	.000	.000	-4.464		4.464
35	24.182	20.753	7.489	-7.489	1.347		-1.347
36	10.665	5.284	2.658	-2.658	27.794		-27.794
37	9.190	18.381	4.754	-4.754	-5.734		5.734
38	-18.381	-27.816	-10.999	10.999	-5.734		5.734
39	-20.166	-23.634	-11.231	11.231	-2.489		2.489
40	18.232	-10.268	16.928	-16.928	-5.147		5.147
41	.000	.000	.000	.000	11.289		-11.289
42	27.230	37.177	10.734	-10.734	1.579		-1.579
43	10.091	20.790	5.147	-5.147	16.387		-16.387
44	19.073	38.146	9.865	-9.865	2.729		-2.729
45	-38.146	-29.404	-16.083	16.083	2.729		-2.729
46	-7.773	-16.901	-6.327	6.327	-8.005		8.005
47	17.302	-20.948	-7.792	7.792	-8.005		8.005
48	.000	.000	.000	.000	-27.168		27.168
49	.000	.000	.000	.000	21.825		-21.825
50	.000	.000	.000	.000	75.764		-75.764
51	.000	.000	.000	.000	-12.418		12.418
52	11.088	22.179	5.736	-5.736	-9.872		9.872
53	-22.179	-31.100	-12.686	12.686	-9.872		9.872
54	-17.544	-21.541	-10.022	10.022	5.424		-5.424
55	.000	.000	.000	.000	-8.746		8.746
56	48.645	43.134	15.296	-15.296	19.134		-19.134
57	21.541	20.728	7.045	-7.045	64.785		-64.785
58	18.215	36.437	9.423	-9.423	3.980		-3.980
59	-36.437	-54.507	-21.654	21.654	3.980		-3.980
60	-34.511	-38.046	-18.604	18.604	5.352		-5.352
61	17.317	-3.824	13.494	-13.494	-1.693		1.693
62	.000	.000	.000	.000	22.330		-22.330
63	45.884	54.126	16.668	-16.668	16.085		-16.085
64	.000	.000	.000	.000	32.727		-32.727
65	3.823	10.459	2.380	-2.380	1.126		-1.126
66	17.234	34.467	8.914	-8.914	19.048		-19.048
67	-34.467	-46.595	-19.301	19.301	19.049		-19.049
68	-7.531	-10.459	-3.671	3.671	2.380		-2.380
69	.000	.000	.000	.000	-11.627		11.627
70	.000	.000	.000	.000	.469		-.469
71	.000	.000	.000	.000	-2.534		2.534
72	5.036	10.073	2.605	-2.605	-10.901		10.901
73	-10.073	-14.977	-5.964	5.964	-10.902		10.902
74	-8.651	-10.669	-4.954	4.954	-3.559		3.559
75	.000	.000	.000	.000	-3.058		3.058
76	23.628	20.427	7.342	-7.342	-.501		.501
77	10.669	10.686	3.559	-3.559	27.752		-27.752
78	6.119	12.238	3.165	-3.165	1.809		-1.809
79	-12.238	-24.573	-8.765	8.765	1.809		-1.809
80	-17.292	-18.571	-9.196	9.196	2.262		-2.262
81	7.884	-2.336	5.549	-5.549	-1.297		1.297
82	.000	.000	.000	.000	8.872		-8.872
83	21.439	25.332	7.795	-7.795	-.069		.069
84	.000	.000	.000	.000	13.016		-13.016
85	2.336	5.449	1.297	-1.297	3.002		-3.002
86	5.816	11.631	3.008	-3.008	9.092		-9.092
87	-11.632	-21.028	-7.776	7.776	9.092		-9.092
88	-4.304	-5.449	-1.990	1.990	1.297		-1.297
89	.000	.000	.000	.000	-46.034		46.034
90	.000	.000	.000	.000	-5.796		5.796
91	.000	.000	.000	.000	1.013		-1.013
92	-.854	-1.713	-1.116	1.116	-17.194		17.194
93	1.713	5.128	1.955	-1.955	-17.194		17.194
94	-20.276	-18.162	-9.152	9.152	-12.372		12.372
95	-6.760	-11.187	-4.602	4.602	-4.440		4.440
96	.000	.000	.000	.000	-3.071		3.071
97	15.148	13.787	4.822	-4.822	-34.928		34.928
98	24.921	22.671	7.932	-7.932	19.629		-19.629
99	11.187	15.451	4.440	-4.440	8.413		-8.413
100	-.883	-1.770	-1.153	1.153	1.841		-1.841
101	1.770	5.791	2.161	-2.161	1.841		-1.841
102	-35.182	-32.649	-16.150	16.150	2.719		-2.719

103	-13.797	-18.143	-8.190	8.190	3.223	.167	-3.223
104	2.692	-2.469	.224	-.224	-1.217		1.217
105	.000	.000	.000	.000	-6.385		6.385
106	15.603	18.603	5.701	-5.701	-16.617		16.617
107	23.774	26.839	8.436	-8.436	11.669		-11.669
108	2.469	4.833	1.217	-1.217	1.230		-1.230
109	-1.541	-3.082	-2.010	2.010	15.354		-15.354
110	3.082	9.931	3.718	-3.718	15.354		-15.354
111	-28.534	-25.643	-12.899	12.899	9.653		-9.653
112	-1.196	-4.833	-1.230	1.230	1.217		-1.217

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.852	4.270	2.510
4	8.075	1.371	4.177
7	7.384	-5.640	3.819
8	.000	.000	-47.715
10	5.488	11.133	2.839
14	9.070	2.505	4.692
18	8.281	-13.638	4.283
19	.000	.000	-37.770
22	5.537	10.147	2.864
26	9.190	5.734	4.754
31	19.073	-2.729	9.865
32	.000	.000	-64.403
36	11.088	9.872	5.736
40	18.215	-3.980	9.423
45	17.234	-19.048	8.914
46	.000	.000	-62.172
49	5.036	10.901	2.605
53	6.119	-1.809	3.163
58	5.816	-9.092	3.008
59	.000	.000	-65.690
62	-.854	17.194	-1.116
67	-.883	-1.841	-1.153
73	-1.541	-15.354	-2.010
74	.000	.000	12.112

EXCENTRICIDADES

Nivel 3

$$e = -1.0m$$

Nivel 4

$$e = 2.0m$$

d_i	Nível 3	Nível 4
	$d_1 = -19.00$	
	$d_2 = -13.00$	$d_2 = -13.00$
	$d_3 = -7.00$	$d_3 = -7.00$
	$d_4 = -1.00$	$d_4 = -1.00$
	$d_5 = +5.00$	$d_5 = +5.00$
	$d_6 = 11.00$	$d_6 = 11.00$
	$d_7 = 17.00$	$d_7 = 17.00$

Piso 3

$$H = 194.52$$

$$\sum F_i d_i^2 = 28900.08$$

$$e = +2.0$$

$$F_i^F = F_i \times \left(1 + \frac{194.52 \times e}{28900.08} \times d_i \right)$$

$$F_1^F = F_1 \times (1 + (-0.2557)) = 0.744 F_1$$

$$F_2^F = 0.83 F_2$$

$$F_3^F = 0.905 F_3$$

$$F_4^F = 0.99 F_4$$

$$F_5^F = 1.07 F_5$$

$$F_6^F = 1.15 F_6$$

$$F_7^F = 1.23 F_7$$

Piso 4

$$H = 109.844$$

$$\sum F_i d_i^2 = 11409.79$$

$$e = +2.0$$

$$F_i^F = F_i \times \left(1 + \frac{109.844 \times e}{11409.79} \times d_i \right)$$

$$F_2^F = F_2 \times (1 + 0.125) = 1.125 F_2$$


$$F_3^F = 1.06 F_3$$

$$F_4^F = F_4$$

$$F_5^F = 0.95 F_5$$

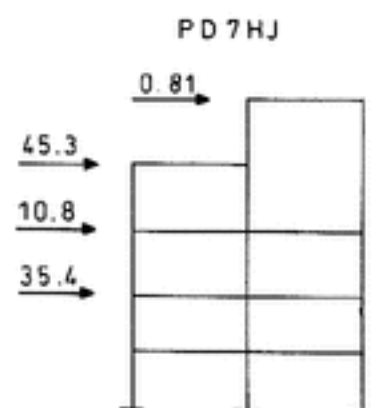
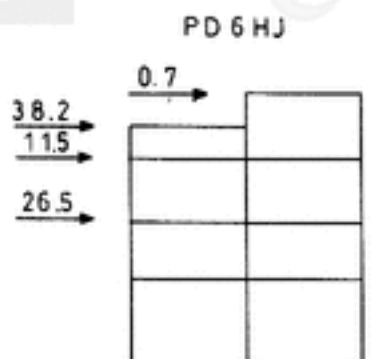
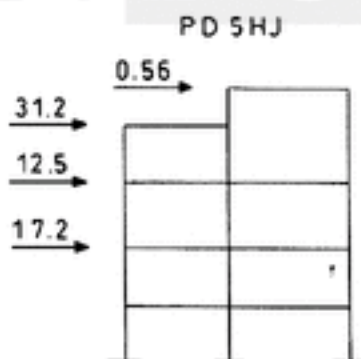
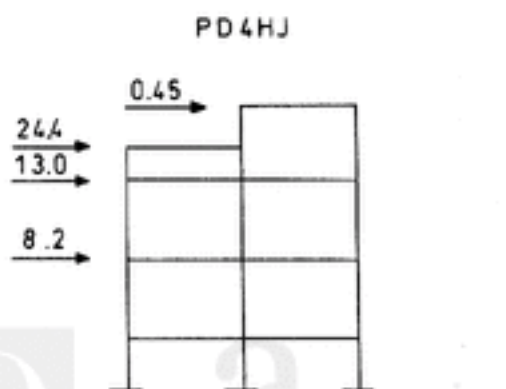
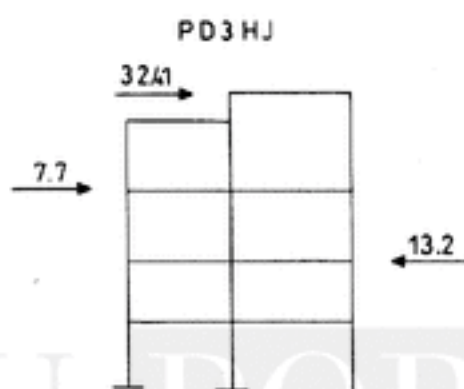
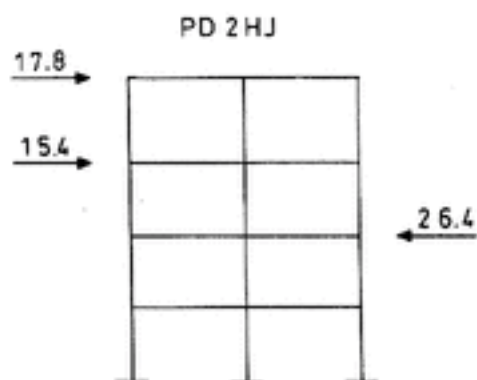
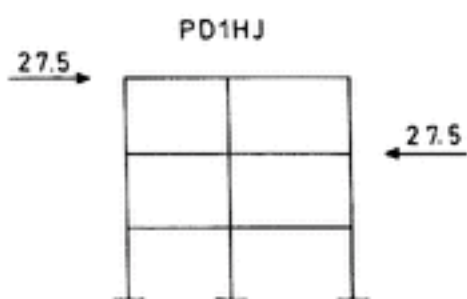
$$F_6^F = 0.9 F_6$$

$$F_7^F = 0.84 F_7$$

U. PORTO  arquivo central

- após correção de forças
- acção do vento

$e = e_1$



U. PORTO

arquivo central

3.2 - Direcção Longitudinal

3.2.1 - Acção sísmica

Considerações idênticas às efectuadas para a direcção transversal.

$$G_1 = 7073 \text{ KN}$$

$$G_2 = 5666 \text{ KN}$$

Do cálculo automático: $d_1 = 32,6 \text{ m}$
 $d_2 = 22,5 \text{ m}$

$G_i(\text{KN})$	$d_i(\text{m})$	$G_i d_i$	$G_i d_i^2$	$\frac{2w^{1.25}}{g^{1.25}} \times \tau_i d_i(\text{KN})$
7073	0,326	2305,8	751,7	193,44
5666	0,225	1274,85	286,84	63,06
Σ		3580,65	1038,53	$\Sigma = 256,5 \text{ KN}$

$$F = \frac{1}{\pi} \sqrt{\frac{g \sum G_i d_i}{\sum G_i d_i^2}} = 0,93 \text{ Hz} \Rightarrow w = 0,93 \times 2 \times \pi = 5,8 \text{ rad/s}$$

$\eta = 2,5$ - estrutura em pórtico. Ductilidade normal.

$\alpha = 0,3$ (zona D) $S_a = 200 \text{ m/s}^2$ (Acção sísmica tipo 2)

Solo tipo II

$$\zeta = 5\% \quad F_i = \frac{2,0 \times 0,3 \times 5,8^2}{9,81^2 \times 2,5} G_i d_i = 0,0839 G_i d_i$$

Forças sísmicas $F_3 = 63,06 \text{ KN}$
 $F_4 = 193,44 \text{ KN}$

Nas páginas seguintes encontram-se as listagens do pórtico comboio para a acção sísmica.

 ACCAO 1
 Forc.Sismicas

***** CARGA 7 *****

NO	FORCAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			21.020
29			96.700
32			21.020
63			96.700
66			21.020

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	5.788	11.879	3.046	-3.046	-6.449	6.449
2	-11.879	-18.119	-7.142	7.142	-6.449	6.449
3	.000	.000	.000	.000	10.188	-10.188
4	18.119	20.374	6.449	-6.449	13.877	-13.877
5	8.823	18.129	4.647	-4.647	-6.806	6.806
6	-18.129	-25.911	-10.486	10.486	-6.806	6.806
7	-17.236	-20.802	-9.753	9.753	-5.757	5.757
8	.000	.000	.000	.000	25.321	-25.321
9	22.573	22.417	7.498	-7.498	13.145	-13.145
10	20.802	13.737	3.757	-5.757	-9.753	9.753
11	8.823	18.123	4.646	-4.646	2.088	-2.088
12	-18.123	-26.001	-10.506	10.506	2.088	-2.088
13	-19.080	-23.894	-11.019	11.019	2.141	-2.141
14	.000	.000	.000	.000	40.472	-40.472
15	22.664	22.646	7.552	-7.552	13.659	-13.659
16	10.157	11.536	3.616	-3.616	-20.772	20.772
17	8.803	18.079	4.635	-4.635	-4.400	4.400
18	-18.079	-25.936	-10.480	10.480	-4.400	4.400
19	-19.243	-23.780	-11.031	11.031	-4.440	4.440
20	.000	.000	.000	.000	55.586	-55.586
21	22.533	22.535	7.511	-7.511	14.210	-14.210
22	12.243	12.092	4.036	-4.036	-31.804	31.804
23	8.782	18.030	4.623	-4.623	-.244	.244
24	-18.030	-25.846	-10.447	10.447	-.244	.244
25	-19.811	-24.379	-11.331	11.331	.021	-.021
26	.000	.000	.000	.000	70.654	-70.654
27	23.122	23.539	7.777	-7.777	15.094	-15.094
28	12.286	11.923	4.035	-4.035	-43.135	43.135
29	-1.722	-3.451	-2.249	2.249	-11.396	11.396
30	3.451	11.838	4.368	-4.368	-11.396	11.396
31	-33.218	-32.963	-15.757	15.757	-4.378	4.378
32	-19.979	-24.912	-11.510	11.510	-1.266	1.266
33	.000	.000	.000	.000	-6.617	6.617
34	21.380	20.726	7.018	-7.018	90.780	-90.780
35	29.403	35.929	10.889	-10.889	10.846	-10.846
36	12.989	18.818	5.301	-5.301	-54.646	54.646
37	-1.645	-3.290	-2.145	2.145	23.207	-23.207
38	3.290	9.822	3.746	-3.746	23.207	-23.207
39	-30.547	-25.558	-13.358	13.358	16.190	-16.190
40	-10.371	-18.818	-7.484	7.484	5.301	-5.301
41	.000	.000	.000	.000	-96.684	96.684
42	.000	.000	.000	.000	4.987	-4.987
43	.000	.000	.000	.000	34.560	-34.560
44	6.374	13.153	3.401	-3.401	-5.668	5.668
45	-13.153	-17.447	-7.286	7.286	-5.668	5.668

46	.000	.000	.000	.000	-85.998	85.998
47	17.446	16.564	5.668	-5.668	18.751	-18.751
48	10.586	21.190	5.479	-5.479	-10.176	10.176
49	-21.190	-29.328	-12.028	12.028	-10.176	10.176
50	-19.602	-21.664	-10.581	10.581	-5.442	5.442
51	.000	.000	.000	.000	-68.491	68.491
52	32.365	30.052	10.403	-10.403	17.305	-17.305
53	21.664	10.987	5.442	-5.442	23.975	-23.975
54	10.815	21.658	5.599	-5.599	.144	-.144
55	-21.658	-31.411	-12.635	12.635	.144	-.144
56	-27.154	-32.624	-15.328	15.328	-.706	.706
57	21.799	-17.701	8.196	-8.196	-6.148	6.148
58	.000	.000	.000	.000	-30.257	30.257
59	28.512	28.808	9.553	-9.553	19.997	-19.997
60	17.561	19.326	6.148	-6.148	8.051	-8.051
61	10.739	21.511	5.560	-5.560	-.441	.441
62	-21.512	-31.004	-12.504	12.504	-.441	.441
63	-26.857	-32.443	-15.205	15.205	-.324	.324
64	32.344	-39.906	-14.626	14.626	-.324	.324
65	.000	.000	.000	.000	-32.192	32.192
66	29.052	28.971	9.670	-9.670	22.700	-22.700
67	20.401	18.432	6.472	-6.472	-8.255	8.255
68	10.705	21.447	5.543	-5.543	-1.688	1.688
69	-21.448	-30.943	-12.474	12.474	-1.688	1.688
70	-27.292	-32.883	-15.429	15.429	-1.558	1.558
71	32.797	-40.453	-15.812	15.812	-1.558	1.558
72	.000	.000	.000	.000	-14.175	14.175
73	29.264	29.539	9.801	-9.801	25.655	-25.655
74	21.891	26.289	8.030	-8.030	-24.527	24.527
75	-2.037	-4.081	-2.660	2.660	-12.730	12.730
76	4.081	12.308	4.683	-4.683	-12.730	12.730
77	-39.734	-39.752	-18.925	18.925	-3.827	3.827
78	-27.194	-32.832	-15.391	15.391	.355	-.355
79	32.898	-40.352	-15.409	15.409	.355	-.355
80	.000	.000	.000	.000	-7.343	7.343
81	27.426	25.991	8.903	-8.903	9.433	-9.433
82	37.407	46.486	13.982	-13.982	22.124	-22.124
83	14.040	32.013	7.676	-7.676	-39.892	39.892
84	-1.706	-3.413	-2.226	2.226	28.945	-28.945
85	3.413	10.190	3.886	-3.886	28.945	-28.945
86	-36.181	-30.358	-15.843	15.843	20.043	-20.043
87	-16.128	-26.720	-10.987	10.987	6.061	-6.061
88	26.890	-32.110	-9.441	9.441	6.061	-6.061
89	.000	.000	.000	.000	-91.782	91.782
90	.000	.000	.000	.000	17.193	-17.193
91	.000	.000	.000	.000	35.258	-35.258
92	.000	.000	.000	.000	10.257	-10.257
93	6.081	12.166	3.146	-3.146	-4.561	4.561
94	-12.167	-14.196	-6.277	6.277	-4.561	4.561
95	.000	.000	.000	.000	-82.359	82.359
96	14.196	13.172	4.561	-4.561	31.962	-31.962
97	9.878	19.773	5.112	-5.112	-8.432	8.432
98	-19.774	-25.365	-10.747	10.747	-8.432	8.432
99	-16.953	-18.976	-9.213	9.213	-3.594	3.594
100	.000	.000	.000	.000	-66.499	66.499
101	29.147	27.248	9.399	-9.399	30.427	-30.427
102	18.976	14.324	5.550	-5.550	26.001	-26.001
103	10.103	20.231	5.230	-5.230	5.463	-5.463
104	-20.232	-27.607	-11.390	11.390	5.463	-5.463
105	-24.012	-28.315	-13.417	13.417	3.917	-3.917
106	13.991	-1.409	12.583	-12.583	-1.633	1.633
107	.000	.000	.000	.000	-49.879	49.879
108	24.371	22.746	7.853	-7.853	32.455	-32.455
109	1.408	6.339	1.291	-1.291	22.822	-22.822
110	10.281	20.594	5.323	-5.323	-1.152	1.152
111	-20.595	-29.475	-11.921	11.921	-1.152	1.152
112	-14.417	-16.392	-6.287	6.287	-1.912	1.912
113	.000	.000	.000	.000	-32.635	32.635
114	21.146	21.417	7.094	-7.094	26.820	-26.820
115	10.053	9.164	3.203	-3.203	16.534	-16.534
116	10.169	20.374	5.266	-5.266	.036	-.036
117	-20.375	-29.997	-11.731	11.731	.036	-.036
118	-14.767	-17.556	-6.597	6.597	.422	-.422
119	.000	.000	.000	.000	-15.637	15.637
120	22.248	22.629	7.480	-7.480	21.685	-21.685

121	8.392	8.296	2.781	-2.781	9.937	173.	-9.937
122	-2.252	-4.510	-2.940	2.940	-10.643		10.643
123	4.510	13.589	5.171	-5.171	-10.643		10.643
124	-35.865	-36.079	-17.130	17.130	-3.376		3.376
125	-14.424	-17.532	-6.522	6.522	-.613		.613
126	.000	.000	.000	.000	-8.111		8.111
127	22.275	21.325	7.267	-7.267	6.663		-6.663
128	27.874	33.583	10.243	-10.243	11.077		-11.077
129	9.237	11.128	3.394	-3.394	3.415		-3.415
130	-1.936	-3.872	-2.525	2.525	20.904		-20.904
131	3.872	11.561	4.409	-4.409	20.904		-20.904
132	-32.886	-27.977	-14.491	14.491	13.637		-13.637
133	-5.605	-11.128	-3.415	3.415	3.394		-3.394

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	5.788	6.449	3.046
4	8.825	6.806	4.647
8	8.823	-2.088	4.646
12	8.803	.400	4.635
16	8.782	.244	4.623
20	-1.722	11.396	-2.249
25	-1.645	-23.207	-2.145
26	.000	.000	12.509
27	.000	.000	-204.569
30	6.574	5.668	3.401
33	10.586	10.176	5.479
37	10.815	-.144	5.599
42	10.739	.441	5.560
47	10.705	1.688	5.543
52	-2.037	12.730	-2.660
58	-1.706	-28.945	-2.226
59	.000	.000	13.435
60	.000	.000	-120.944
64	6.081	4.561	3.146
67	9.878	8.432	5.112
71	10.103	-5.463	5.230
76	10.281	1.152	5.323
80	10.169	-.036	5.266
84	-2.252	10.643	-2.940
89	-1.936	-20.904	-2.525
90	.000	.000	15.046
91	.000	.000	-25.564

CENTROS DE MASSA

$$X_c^3 = X_c^4 = 6.00m$$

CENTROS DE RIGIDEZ

$$X_r^3 = 6,13m$$

$$X_r^4 = 5,50m$$

Piso 3:

$$a = 12m$$

$$b_i = 0,13m$$

$$e_{1i} = 0,5b_i + 0,05a = 0,665$$

$$e_{2i} = 0,05a = 0,60$$

$$e_1 = -0,80m$$

$$e_2 = 0,47m$$

$$d_1 = -6,13$$

$$d_2 = 1,13$$

$$d_3 = 4,87$$

$$H = 256,36$$

$$\sum F_i d_i^2 = 5046,7 \quad F_i^f = F_i^f \times \left(1 + \frac{256,38 \times e}{5046,7} \times d_i \right)$$

$$e_2 = 0,47$$

$$F_A^f = F_A \times (1 - 0,1463) = 0,854 F_A$$

$$F_B^f = 1,03 F_B$$

$$F_C^f = 1,12 F_C$$

$$e_1 = -0,80$$

$$F_A^f = F_A \times (1 + 0,2491) = 1,25 F_A$$

$$F_B^f = 0,954 F_B$$

$$F_C^f = 0,80 F_C$$

Correcção das forças nos pórticos, função de esforço transversal verificado.
(Procedimento idêntico ao realizado em FSISAT).

Piso 4:

$$a = 12m$$

$$b_i = 0,50m$$

$$e_{1i} = 0,5b_i + 0,05a = 0,85m$$

$$e_{2i} = 0,05a = 0,60m$$

$$e_1 = 1,35m$$

$$e_2 = -0,10m$$

$$d_1 = -5,50$$

$$d_2 = 0,50$$

$$d_3 = +6,50$$

$$H = 193,4$$

$$\sum F_i d_i^2 = 3822,79 \quad F_i^F = F_i^i \times \left(1 + \frac{193,4 \times e}{3822,79} \times d_i \right)$$

$$e_2 = -0,10$$

(e_{2i})

$$F_A^F = F_A \times (1 + 0,027) = 1,03 F_A$$

$$F_B^F = F_B$$

$$F_C^F = 0,97 F_C$$

$$e_1 = 1,35$$

(e_{1i})

$$F_A^F = F_A \times (1 - 0,3746) = 0,63 F_A$$

$$F_B^F = 1,04 F_B$$

$$F_C^F = 1,44 F_C$$

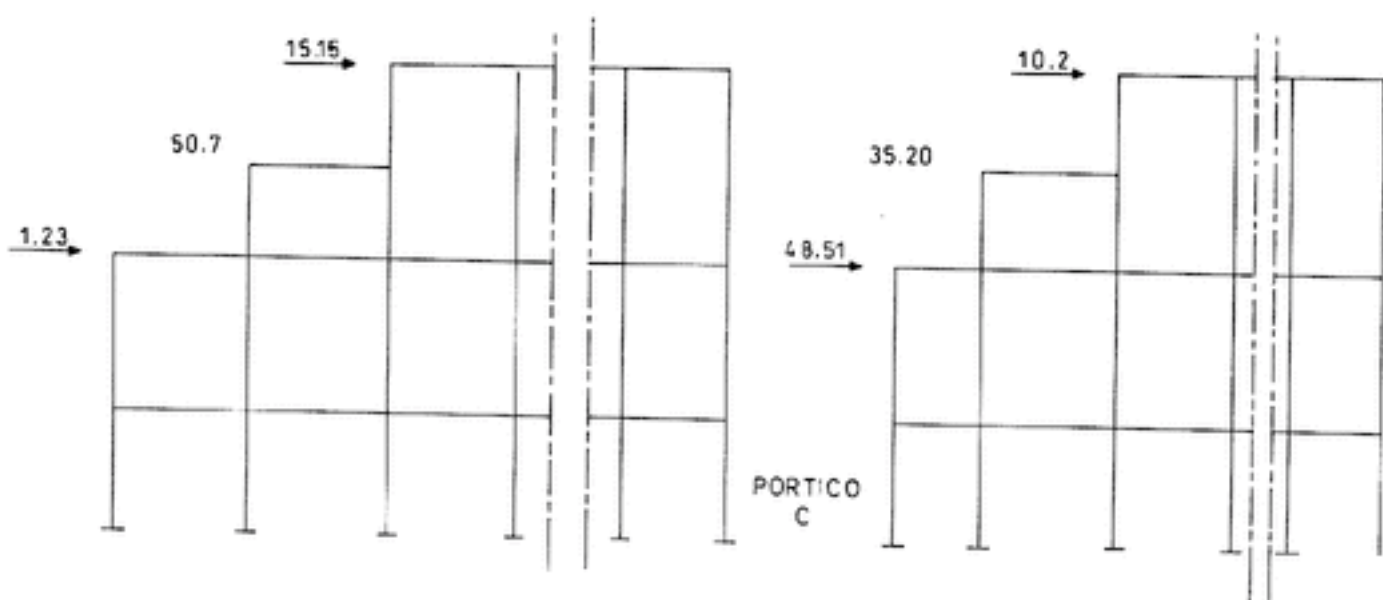
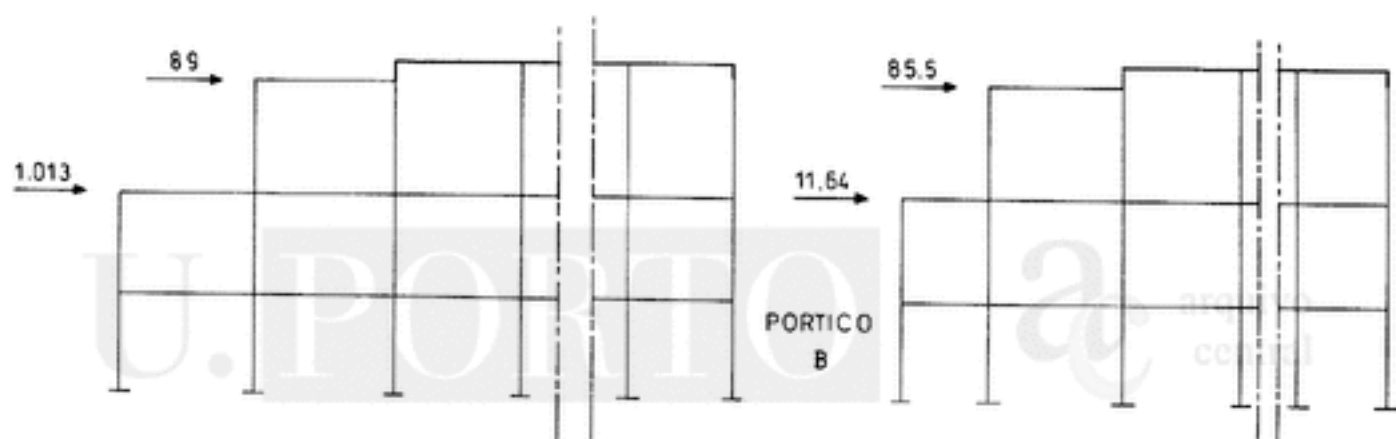
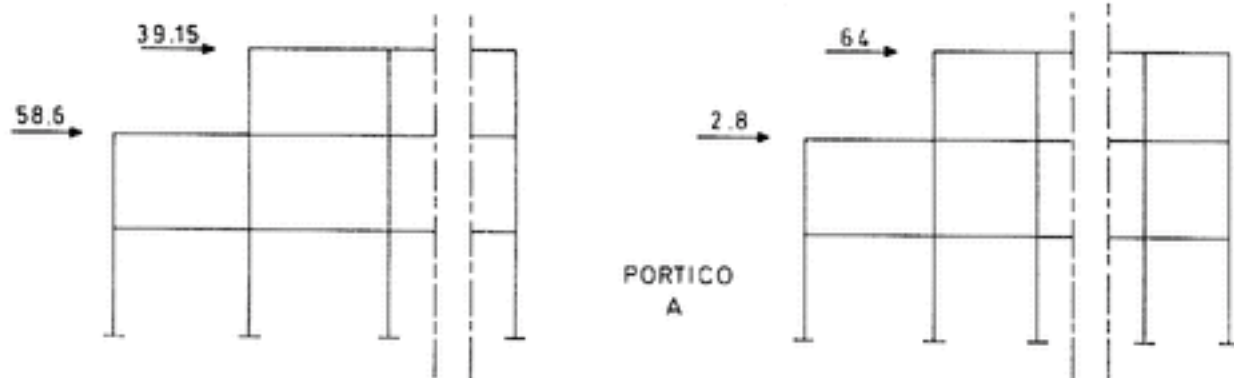

 arquivo
central

FORÇAS SÍSMICAS

- PÓRTICOS longitudinais

- RESUMO APÓS CORRECÇÃO DE TORSÃO

.176.



ACÇÃO DO VENTO - DIRECÇÃO LONGITUDINAL - DISTRIBUIÇÃO PELOS PÓRTICOS

Dado o pequeno desenvolvimento do bloco na direcção transversal ($l = 12.0m$) as forças determinadas devida à acção do vento determinados, consideram-se desprezáveis e portanto não se incluirá esta acção na direcção longitudinal.

U. PORTO

ac arquivo
central

SECTOR B - (págs. 178-315)

	Pág.
1. - LAJES	178
1.1 - Piso 2	178
1.2 - Piso 3	178
1.3 - Piso 4	178
2. - ACÇÕES HORIZONTAIS	182
3. - VIGAS	203

U. PORTO

arquivo central

SECTOR B**1. LAJES****1.1 - Piso 2***Laje L2.1:*

Folhas em anexo.

1.2 - Piso 3*Laje 3.3:*

Idêntica ao Sector A.

Laje 3.5:

Laje aligeirada armada em duas direcções com três bordos simplesmente apoiados em vigas de bordadura e com continuidade no quarto.

Vãos: $l_x = l_y = 12,0m$; espessura: $e = 0,35m$;

$p = 5,2(p.p.) + 2,3(rev.) + 2,0(div.) + 3,0(sob.) = 11,5KN/m^2$; utilização das tabelas das BS8810;

$m_x^- = 0,057 \times (1,5 \times 11,5) \times 12,0^2 \times (3 - 0,7) / 3 = 109,0KN.m/m$;

$b_{eq} = 0,20 / 0,90 = 0,222m$; $\mu = 0,360$; $w = 0,466$; $A_s = 11,39cm^2/m$ (armadura de compressão: $1,36cm^2/m$); $9\phi 12/m + \phi 8@0,20m$ (ou rede electrossoldada);

$m_x^+ = m_y^+ = 0,0043 \times (1,5 \times 11,5) \times 12,0^2 = 106,8KN.m/m$;

$M_{sd}^+ / nerv. = 96,1KN.m$; $\mu = 0,078$; $w = 0,085$; $A_s = 9,31cm^2 / nerv.$; $3\phi 20 / nerv.$;

$V_{cd} / nerv. = 41,6KN / nerv.$; estribos mínimos: $\phi 6@0,30m$;

$V_{sd}^{apoio\ simples\ máx} / nerv. = 82,0KN / nerv.$; estribos $\phi 6@0,15m$; $V_{sd}^{apoio\ continuo\ máx} / nerv. = 92,4KN / nerv.$;

estribos: $\phi 6@0,10m$.

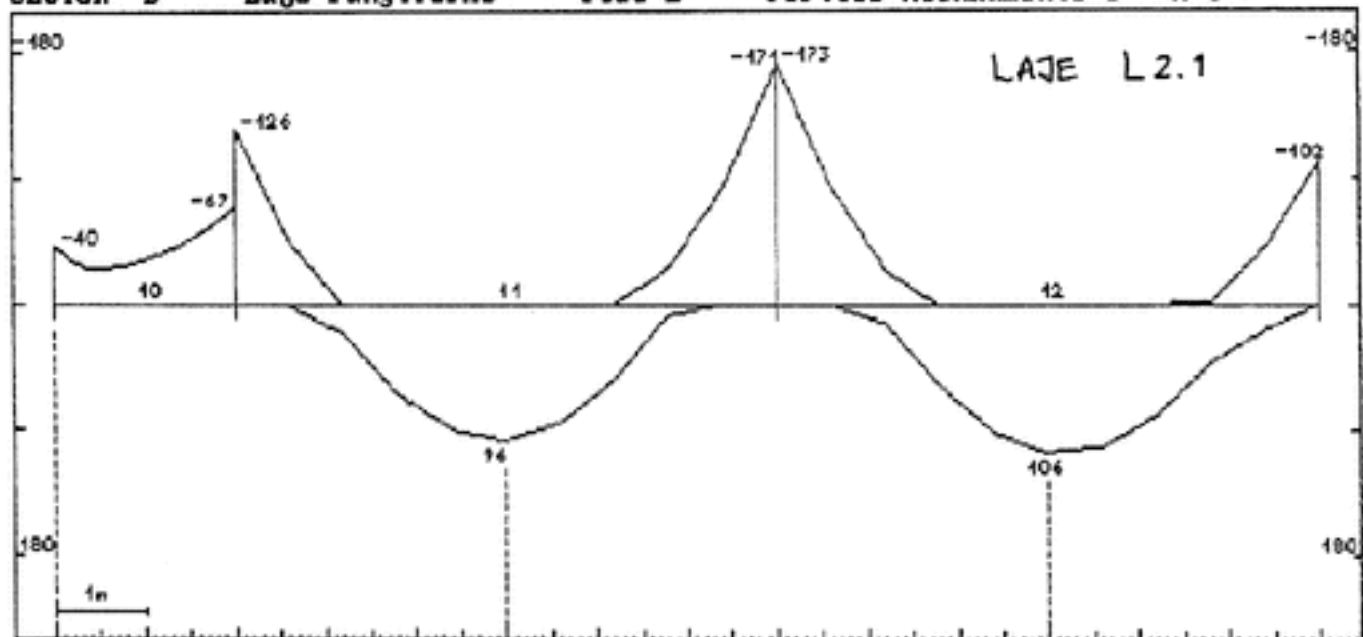
1.3 - Piso 4*Laje L4.2:*

Igual ao Sector A.

Laje L4.5:

Igual ao Sector A.

SECTOR B - Laje Fungiforme - Piso 2 - Portico Alinhamento B - A/C .179.



— DISTRIBUIÇÃO DE MOMENTOS FLECTORES:

FAIXA CENTRAL:

-30 -50 -94 53 -130 58 -76

FAIXA LATERAL:

-10 -17 -32 43 -43 48 -26

— MOMENTOS FLECTORES NAS NERVURAS DE 0,10m

FAIXA CENTRAL:

-7,5 -11,0 -15,0 13,2 -33,6 16,8 -13,8

FAIXA LATERAL:

-5,0 -8,5 -16,0 21,5 -21,5 24,0 -13,0

— ARMADURAS:

FAIXA CENTRAL:

A_s (cm²/m): 1,50 4,70 1,36

A_s (cm² /
m): 1,20 1,53

ARMADURA: 4φ10/m 2φ12 4φ10/m 2φ12 4φ10/m
+ HQ221 + HQ221 + HQ221

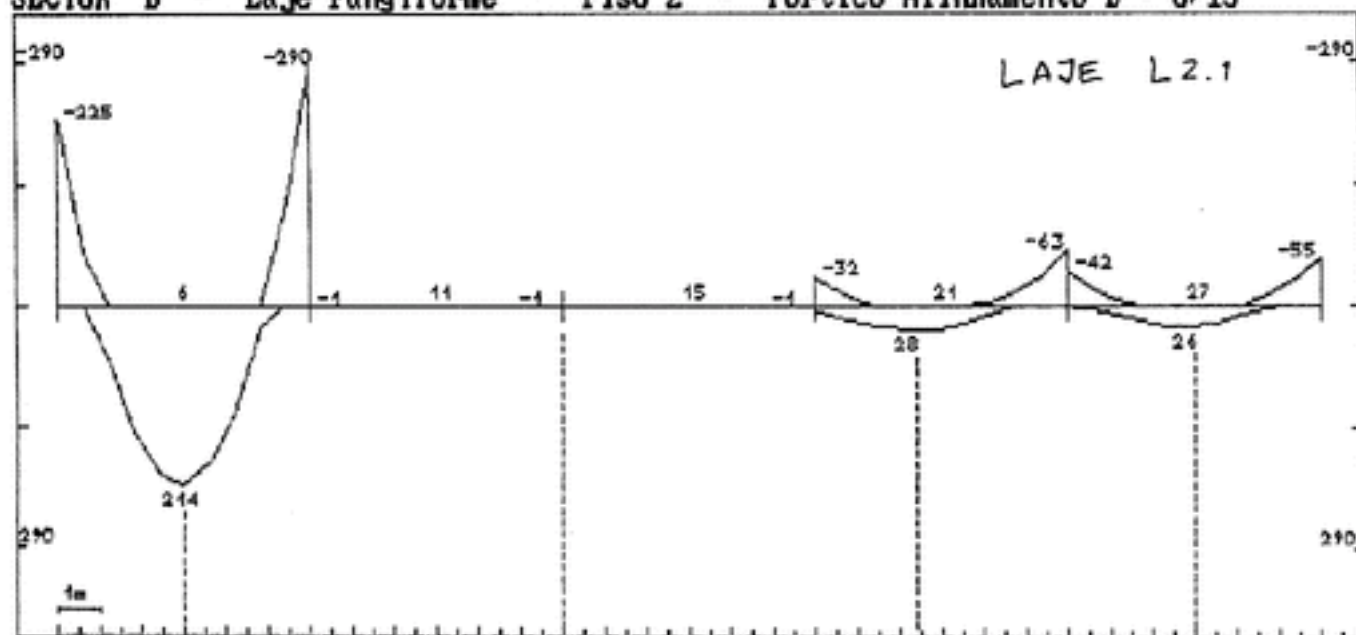
FAIXA LATERAL:

A_s (cm²/m): 1,60 2,24 1,28

A_s (cm² /
m): 1,97 2,20

ARMADURA: HQ221 2φ12 HQ221 2φ12 HQ221

SECTOR B - Laje Funiforme - Piso 2 - Portico Alinhamento B - 0/13 .180.



- Distribuição dos Momentos Flectores:

FAIXA CENTRAL:

-169 118 -218

FAIXA LATERAL:

-56 96 -72

- Momentos Flectores nas Nervuras de 0,15m:

FAIXA CENTRAL:

-54 38 -69

FAIXA LATERAL:

-14 24 18

- Momentos Flectores na Nervura de 0,20m:

-61 42 -80

- ARMADURAS:

NERVURAS DE 0,15m:

FAIXA CENTRAL:

0,02	7,10	+ A_s (cm^2/m)
	3,52	+ A_s (cm^2) nerv.
6Ø10/m + HQ221	2Ø16 2Ø16	+ ARMADURA
		+ HQ221

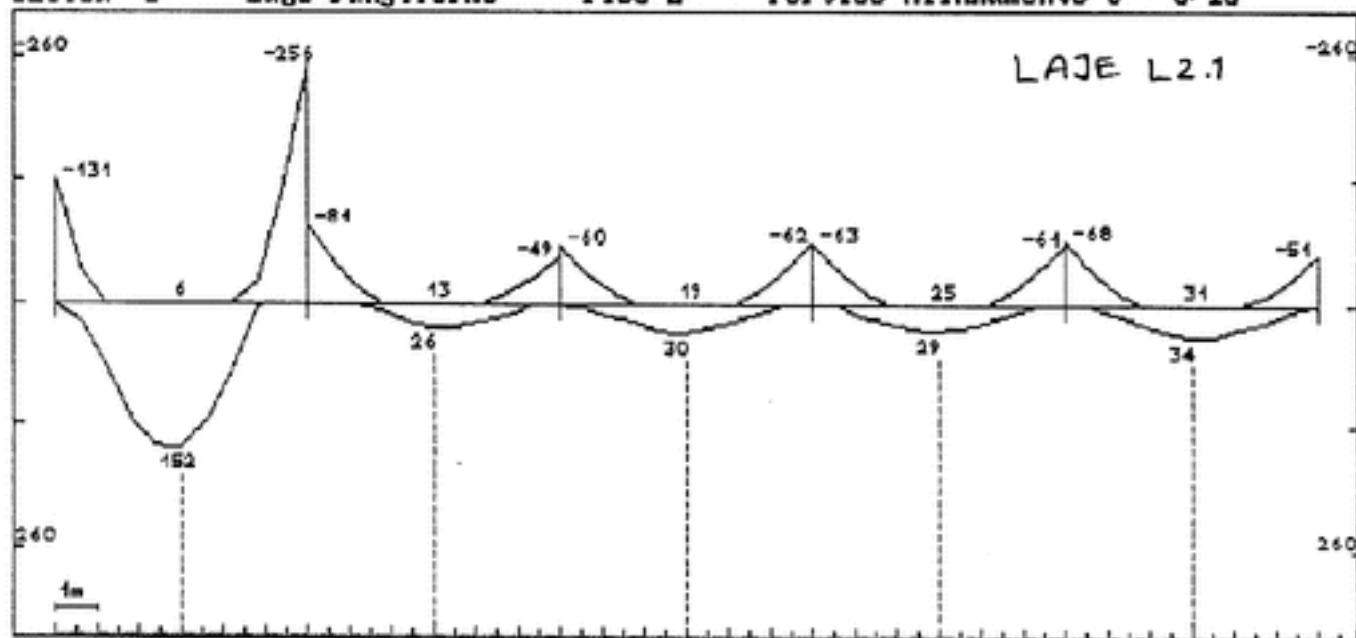
FAIXA LATERAL:

1,83	2,63	+ A_s (cm^2/m)
	2,20	+ A_s (cm^2) nerv.
4Ø10/m + HQ221	2Ø12 + 1Ø10	+ ARMADURA
		+ HQ221

NERVURAS DE 0,20m:

6,50	7,24	+ A_s (cm^2/m)
	3,90	+ A_s (cm^2) nerv.
6Ø10/m + HQ221	2Ø16	+ ARMADURA
		+ HQ221

SECTOR B - Laje Fungiforme - Piso 2 - Portico Alinhamento C - 8/13 .181.



- DISTRIBUIÇÃO DOS MOMENTOS FLECTORES:

FAIXA CENTRAL

-98 94 -192

FAIXA LATERAL

-33 58 -64

- MOMENTOS FLECTORES NAS NERVURAS DE 0,15m :

FAIXA CENTRAL

-29 27 -58

FAIXA LATERAL

-16 24 -32

- MOMENTOS FLECTORES NA FAIXA DE ACERTO DE 0,80m :

-69 67 -134

- ARMADURAS :

NERVURAS DE 0,15m :

FAIXA CENTRAL

3,49 2,08 + A_s (cm²/m)
2,48 - A_s /nerv. (cm²)

6Ø10/m₂ 2Ø12 6Ø10/m₂ - ARMADURA
+ + +
4Q221 1Ø10 4Q221

FAIXA LATERAL

1,59 3,21 - A_s (cm²/m)
4Ø10/m₂ 2,41 - A_s /nerv. (cm²)

4Q221 2Ø12 6Ø10/m₂ - ARMADURA
+ +
1Ø10 4Q221

FAIXA DE ACERTO DE 0,80m :

6,08 12,66 + A_s (cm²/m)
0,50 - A_s /nerv. (cm²)

3Ø12 4Ø16 2Ø12/2Ø16 - ARMADURA
+ +
4Ø10/m₂ 6Ø10/m₂
+ +
4Q221 4Q221

2 - ACÇÕES HORIZONTAIS

Acções gravíticas

Piso adicional

$$G_f = G_m + \psi_2 Q; \psi_2 = 0,4; G_m = 4,5 \text{ KN/m}^2; Q = 1,0 \text{ KN/m}^2$$

$$G_f = 4,5 + 0,4 \times 2 = 4,9 \text{ KN/m}^2 \approx 5,0 \text{ KN/m}^2$$

$$\text{Área} = 30 \times 12 = 360 \text{ m}^2$$

Acções Gravíticas:	- acções distribuidas na laje: 5,0x360	1800 KN
	- pesos próprios das vigas e pilares: 1,0x360	360 KN
	- paredes exteriores: 3,77x1,75x(6x8)	317 KN

TOTAL 2477 KN

Cobertura:

$$G_m = 7,5 \text{ KN/m}^2 \quad Q = 4,0 \text{ KN/m}^2$$

$$G_f = 7,5 + 0,4 \times 4 = 9,1 \text{ KN/m}^2$$

$$\text{Área} = 360 - 1,7 \times 12 = 339,6 \approx 340 \text{ m}^2$$

Acções Gravíticas:	- acções distribuidas na laje: 9,1x340	3094 KN
	- peso dos pilares: 25x0,35x0,35x3,5x17	182 KN
	- peso das vigas: (25-9,1)x29,85x0,35x25x0,35x1x0,35	169 KN
	- paredes exteriores: 3,77x3,50x6x8	633 KN

TOTAL 4078 KN

Piso 3:

$$G_m = 7,5 \text{ KN/m}^2 \quad Q = 4,0 \text{ KN/m}^2$$

$$G_f = 7,5 + 0,4 \times 4 = 9,1 \text{ KN/m}^2$$

$$\text{Área} = 360 \text{ m}^2$$

Acções Gravíticas:	- acções distribuidas na laje: 9,1x360	3276 KN
	- peso dos pilares: 25x0,35x0,35x3,85x17	200 KN
	- peso das vigas: 25x0,05x0,35x6x14	37 KN
	- paredes exteriores: 3,77x3,85x6x8	697 KN

TOTAL 4210 KN

Piso 2:

$$G_m = 7.5 \text{ KN/m}^2 \quad Q = 4.0 \text{ KN/m}^2$$

$$G_g = 7.5 + 0.4 \times 4 = 9.1 \text{ KN/m}^2$$

$$\text{Área} = 6 \times 12 = 72 \text{ m}^2$$

Acções Gravíticas:	- acções distribuídas na laje: $9,1 \times 72$	655 KN
	- peso dos pilares: $25 \times 0,35 \times 0,35 \times 3,85 \times 17$	200 KN
	- peso das vigas: $(25 - 9,1) \times 2,1 \times 0,35$	12 KN
	- paredes exteriores: $3,77 \times 3,85 \times 6$	87 KN
	TOTAL	954 KN

DETERMINAÇÃO DAS FREQUÊNCIAS

DIRECÇÃO LONGITUDINAL

$$f = 0,91 \text{ Hz} \rightarrow w = 0,91 \times 211 = 5,72 \text{ rad/s}$$

$\eta = 2.5$ (pórtico, ductilidade normal)

$\alpha = 0,3$ (Zona D)

Solo tipo II

$S_a = 200 \text{ cm/s}^2$ (Acção sísmica tipo II)

$\xi = 5\%$

$$\text{Forças sísmicas: } F_i = \frac{S_a \times \alpha \times w^2}{g^2 \times \eta} \times G_i \times d_i$$

$$F_i = \frac{2,0 \times 0,3 \times 5,72^2}{9,81^2 \times 2,5} \times G_i \times d_i = 0,0816 \times G_i \times d_i \quad \begin{array}{l} H_{cob} = 179,72 \text{ KN} \\ H_3 = 75,92 \text{ KN} \end{array}$$

DIRECÇÃO TRANSVERSAL

$$f = 0,89 \text{ Hz} \rightarrow w = 5,592 \text{ rad/s}$$

$\eta = 2.5$ (pórtico; ductilidade normal)

$\alpha = 0.3$ (Zona D)

solo tipo II

$S_a = 200 \text{ cm/s}^2$ (Acção sísmica tipo II)

$\xi = 5\%$

$$\text{Forças sísmicas: } F_i = \frac{S_a \times \alpha \times w^2}{g^2 \times \eta} \times G_i \times d_i$$

$$F_i = \frac{2,0 \times 0,3 \times 5,592^2}{9,81^2 \times 2,5} \times G_i \times d_i = 0,07798 G_i \times d_i \quad \begin{array}{l} H_{cob} = 176,87 \text{ KN} \\ H_3 = 74,86 \text{ KN} \end{array}$$

DETERMINAÇÃO DO CENTRO DE RIGIDEZ - DIRECÇÃO LONGITUDINAL

$$X_{cr}^{cob} = \frac{43.45 \times 6 + 56.98 \times 12}{79.29 + 43.45 + 56.98} = 5,26m$$

$$X_{cr}^3 = \frac{51.63 \times 6 + 91,65 \times 12}{112,36 + 51,63 + 91,65} = 5,51m$$

Piso 4 (cobertura):

$$a = 12m$$

$$b = 0,74m$$

$$e_{i1} = 0,5b_i + 0,05a = 0,97m$$

$$e_{i2} = 0,05a = 0,6m$$

$$e_2 = 0,14m$$

$$e_1 = 1,71m$$

$$d_A = -5,26m$$

$$d_B = 0,74m$$

$$d_C = 6,74m$$

$$\sum F_i d_i^2 = 79,29 \times 6,98^2 + 43,45 \times 0,74^2 + 56,98 \times 6,74^2 = 6475,2983$$

$$e_2 = 0,14m$$

$$F_i^f = F_i^i \left(1 + \frac{179,72 \times 0,14}{6475,2983} \times d_i \right)$$

$$F_i^f = F_i^i \times (1 + 0,0038856 \times d_i)$$

$$F_A^f = 79,29 [1 + 0,0038856 \times (-5,26)] = 77,67 KN$$

$$F_B^f = 43,57 KN$$

$$F_C^f = 58,47 KN$$

$$e_1 = 1,71$$

$$F_i^f = F_i^i \left(1 + \frac{179,72 \times 9,71}{6475,2983} \times d_i \right)$$

$$F_i^f = F_i^i \times (1 + 0,0474605 \times d_i)$$

$$F_A^f = 79,29 [1 + 0,0474605 \times (-5,26)] = 59,50 KN$$

$$F_B^f = 44,98 KN$$

$$F_C^f = 75,21 KN$$

Piso 3:

$$a = 12m$$

$$b = 0,49m$$

$$e_{i1} = 0,5b_i + 0,05a = 0,845m$$

$$e_{i2} = 0,05a = 0,6m$$

$$e_2 = -0,11m$$

$$e_1 = 1,335m$$

$$d_A = -5,51m$$

$$d_B = 0,49m$$

$$d_C = 6,49m$$

$$\sum F_i d_i^2 = 112,36 \times 5,51^2 + 51,63 \times 0,49^2 + 91,65 \times 6,49^2 = 7283,9642$$

$$e_2 = -0,11$$

$$F_i^f = F_i^i (1 - 0,0011465 \times d_i)$$

$$F_A^f = 112,36 [1 - 0,0011465 \times (-5,51)] = 113,07 KN$$

$$F_B^f = 51,63 (1 - 0,0011465 \times 0,49) = 51,60 KN$$

$$F_C^f = 91,65 (1 - 0,0011465 \times 6,49) = 90,97 KN$$

$$e_1 = 1,335$$

$$F_i^f = F_i^i (1 + 0,0139145 \times d_i)$$

$$F_A^f = 112,36 [1 + 0,0139145 \times (-5,51)] = 103,75 KN$$

$$F_B^f = 51,98 KN$$

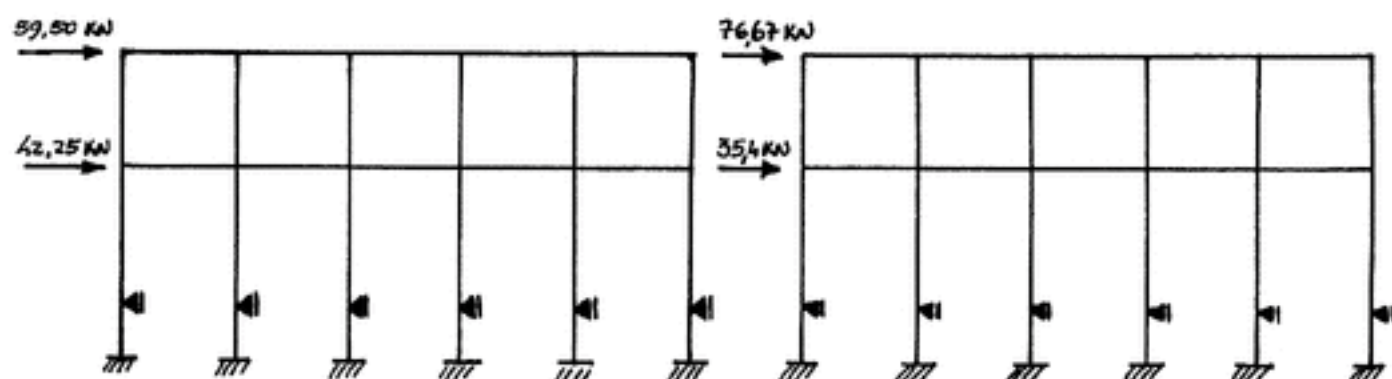
$$F_C^f = 99,93 KN$$

DISTRIBUIÇÃO DAS FORÇAS HORIZONTAIS DEVIDAS AO SISMO PELOS PÓRTICOS

 e_1 e_2

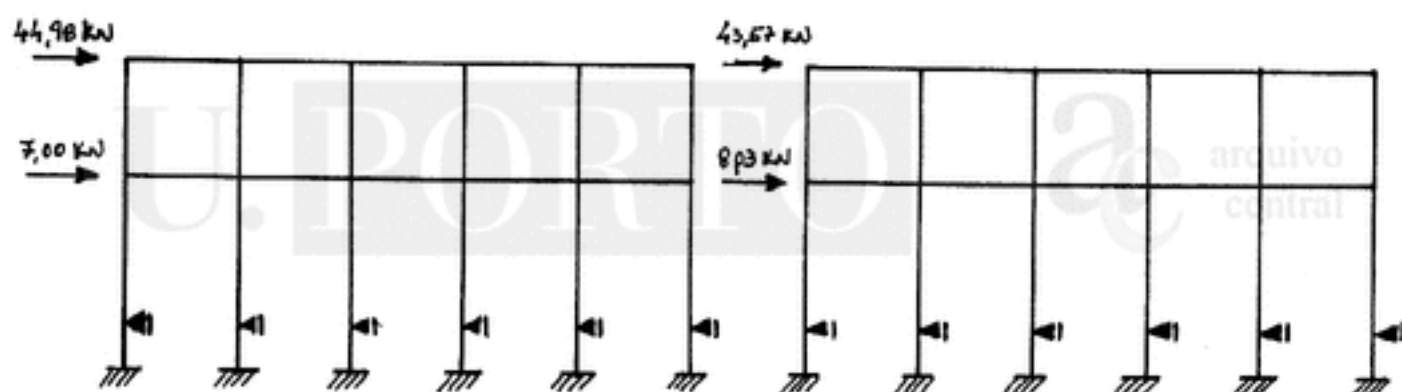
PÓRTICO A

PÓRTICO A



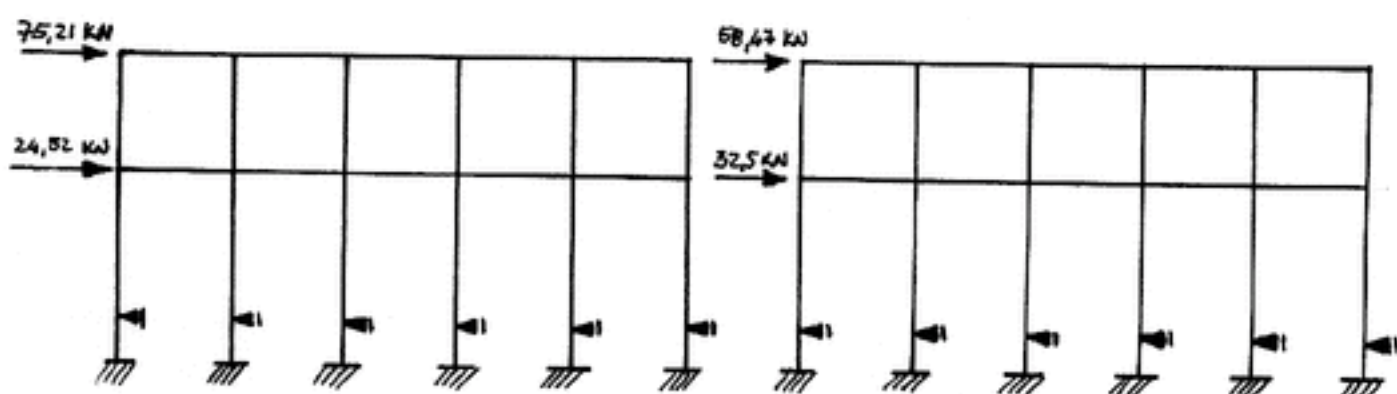
PÓRTICO B

PÓRTICO B



PÓRTICO C

PÓRTICO C



DETERMINAÇÃO DO CENTRO DE RIGIDEZ - DIRECÇÃO TRANSVERSAL

$$\sum T_{cob} \rightarrow \quad 36,36 \quad -0,47 \quad 27,17 \quad 27,17 \quad 66,58 \quad 20,06$$

$$\sum T_3 \rightarrow \quad 39,15 \quad 40,47 \quad 32,27 \quad 32,27 \quad 80,44 \quad 27,13$$

$$X_{cr}^{cob} = \frac{-0,47 \times 6 + 27,17 \times 12 + 27,17 \times 18 + 66,58 \times 24 + 20,06 \times 30}{36,36 - 0,47 + 27,17 + 27,17 + 66,58 + 20,06} = 17,03m$$

$$X_{cr}^3 = \frac{40,47 \times 6 + 32,27 \times 12 + 32,27 \times 18 + 80,44 \times 24 + 27,13 \times 30}{39,15 + 40,47 + 32,27 + 32,27 + 80,44 + 27,13} = 15,71m$$

Piso 4 (cobertura):

$$a = 30m$$

$$b = 2,03m$$

$$e_{i1} = 0,5b + 0,05a = 2,52m$$

$$e_{i2} = 0,05a = 1,5m$$

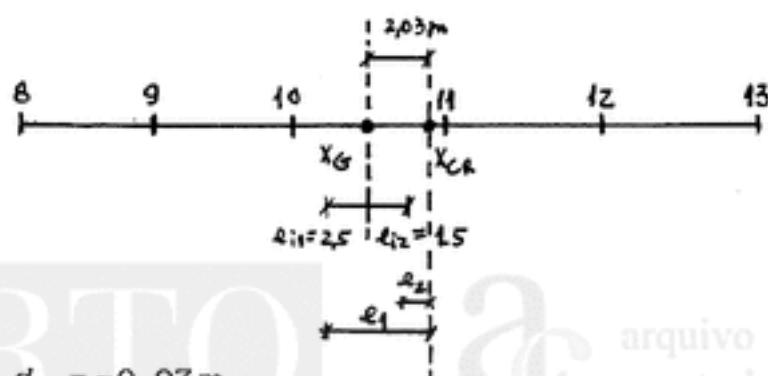
$$e_2 = 0,53m$$

$$e_1 = 4,55m$$

$$d_8 = 17,03m$$

$$d_9 = 11,03m$$

$$d_{10} = 5,03m$$



$$d_{11} = -0,97m$$

$$d_{12} = -6,97m$$

$$d_{13} = -12,97m$$

$$F_i^F = F_i^i \left(1 + \frac{H \times e}{\sum F_i d_i^2} \times d_i \right)$$

$$\sum F_i d_i^2 = 14642,06$$

$$\frac{H \times e_1}{\sum F_i d_i^2} = \frac{176,87 \times 4,55}{14642,06} = 0,0549621$$

$$\frac{H \times e_2}{\sum F_i d_i^2} = \frac{176,87 \times 0,53}{14642,06} = 0,0064021$$

$$e_1 = 4.55m$$

$$e_2 = 0.53m$$

$F_8^f = 36,36(1 + 0,0549621 \times 17,03) = 70,39KN$	$F_8^f = 36,36(1 + 0,0064021 \times 17,03) = 40,32KN$
$F_9^f = -0,47(1 + 0,0549621 \times 11,03) = -0,75KN$	$F_9^f = -0,50KN$
$F_{10}^f = -34,68KN$	$F_{10}^f = -28,04KN$
$F_{11}^f = -25,72KN$	$F_{11}^f = -27,00KN$
$F_{12}^f = -41,07KN$	$F_{12}^f = -63,61KN$
$F_{13}^f = -5,76KN$	$F_{13}^f = -18,39KN$

Piso 3

$$a = 30m$$

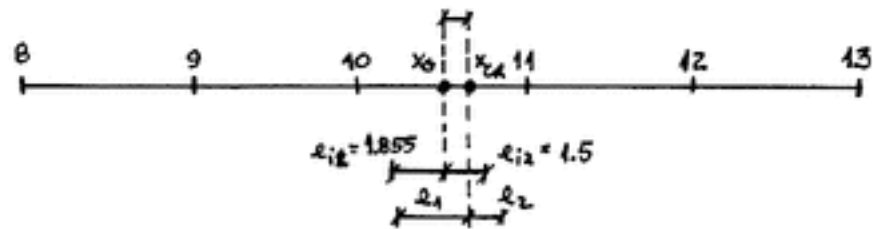
$$b = 0,71m$$

$$e_{i1} = 1,855m$$

$$e_{i2} = 1.5m$$

$$e_1 = 2,565m$$

$$e_2 = -0,79m$$



$$d_8 = 15,71m$$

$$d_{11} = -2,29m$$

$$d_9 = 9,71m$$

$$d_{12} = -8,29m$$

$$d_{10} = 3,71m$$

$$d_{13} = -14,29m$$

$$\sum F_i d_i^2 = 25159,675$$

$$e_1 = 2.565m$$

$$e_2 = -0,79m$$

$$F_i^f = F_i^i \left(1 + \frac{74,86 \times 2,565}{25159,675} \times d_i \right)$$

$$F_i^f = F_i^i \left(1 + \frac{74,86 \times (-0,79)}{25159,675} \times d_i \right)$$

$$F_i^f = F_i^i (1 + 0,0076318 \times d_i)$$

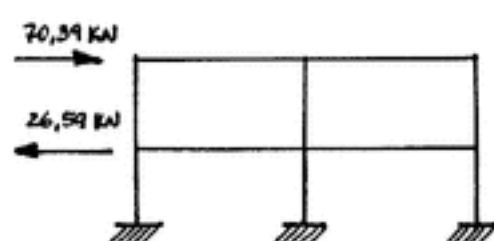
$$F_i^f = F_i^i (1 - 0,0023505 \times d_i)$$

$F_8^f = 39,15(1 + 0,0076318 \times 15,71) = 43,84KN$	$F_8^f = 39,15(1 - 0,0023505 \times 15,71) = 37,70KN$
$F_9^f = -43,47KN$	$F_9^f = -39,55KN$
$F_{10}^f = -33,18KN$	$F_{10}^f = -31,99KN$
$F_{11}^f = -31,71KN$	$F_{11}^f = -32,44KN$
$F_{12}^f = -75,35KN$	$F_{12}^f = -82,01KN$
$F_{13}^f = -24,17KN$	$F_{13}^f = -28,04KN$

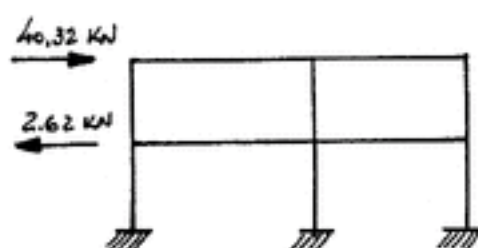
DIRECÇÃO TRANSVERSAL

 e_1

Pórtico 8

 e_2

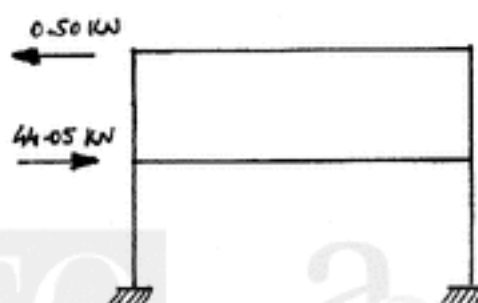
Pórtico 8



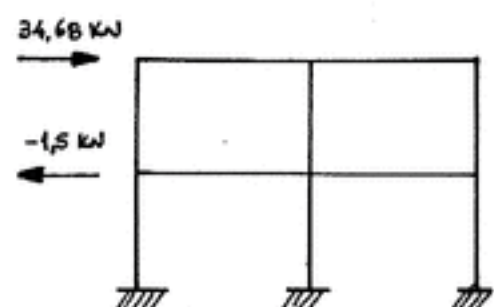
Pórtico 9



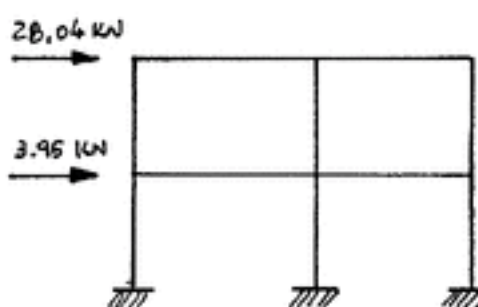
Pórtico 9



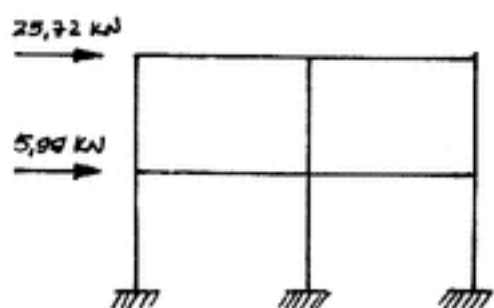
Pórtico 10



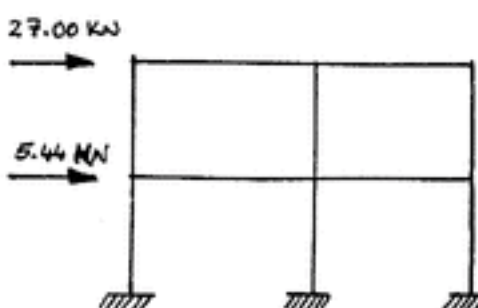
Pórtico 10



Pórtico 11

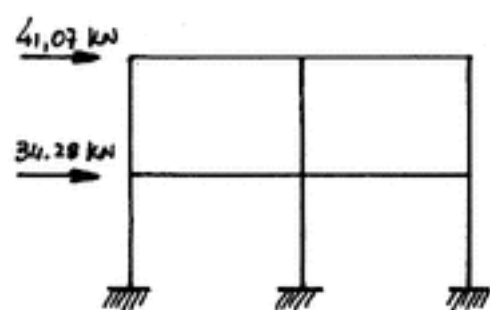


Pórtico 11

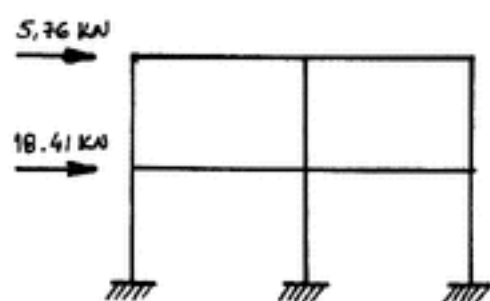


e_1

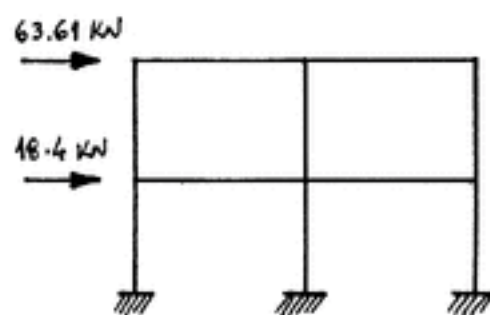
Pórtico 12



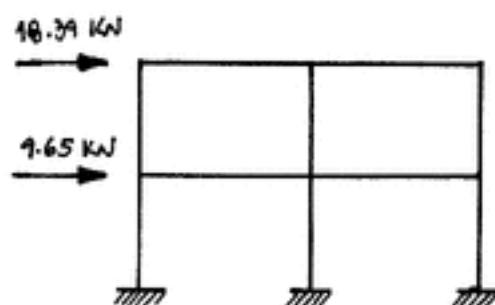
Pórtico 13

 e_2

Pórtico 12



Pórtico 13



U. PORTO


 arquivo
central

SECTOR B - Portico Comboio - Direccao Longitudinal

No. DE NOS	= 71	No. DE BARRAS	= 101
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 24	No. DE SECCOES TIPO	= 12
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 3

MATERIAL	PROPRIEDADES		
	E (KPa)	A (m2)	I (m4)
1	.29000E+08	.75000E+00	.56250E+00
2	.29000E+08	.10500E+00	.10719E-02
3	.29000E+08	.12250E+00	.12505E-02
4	.29000E+08	.90000E-01	.67500E-03
5	.29000E+08	.16250E+00	.18276E-02
6	.29000E+08	.22375E+00	.24529E-02
7	.29000E+08	.26000E+00	.27667E-02
8	.29000E+08	.15000E+01	.78125E-02
9	.29000E+08	.10500E+00	.78750E-03
10	.29000E+08	.47250E+00	.71761E-01
11	.29000E+08	.97500E-01	.34381E-02
12	.29000E+08	.10000E+04	.10000E-05

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	2	3	3 4	2
4	2 6	12	5	3 7	5	6	4 8	6
7	5 6	1	8	6 7	3	9	7 8	3
10	6 10	12	11	7 11	5	12	8 12	6
13	9 10	3	14	10 11	3	15	11 12	3
16	10 14	12	17	11 15	5	18	12 16	6
19	13 14	3	20	14 15	3	21	15 16	3
22	14 18	12	23	15 19	5	24	16 20	6
25	17 18	3	26	18 19	3	27	19 20	3
28	18 22	12	29	19 23	5	30	20 24	7
31	21 22	4	32	22 23	4	33	23 24	4
34	23 27	12	35	24 28	12	36	25 26	3
37	26 27	3	38	27 28	3	39	26 30	12
40	27 31	6	41	28 35	10	42	29 30	8
43	30 31	3	44	30 33	12	45	31 34	6
46	32 33	3	47	33 34	3	48	34 35	3
49	33 37	12	50	34 38	6	51	35 39	10
52	36 37	3	53	37 38	3	54	38 39	3
55	37 41	12	56	38 42	6	57	39 43	10
58	40 41	3	59	41 42	3	60	42 43	3
61	41 45	12	62	42 46	6	63	43 47	10
64	44 45	9	65	45 46	9	66	46 47	9
67	46 50	12	68	47 51	12	69	48 49	2
70	49 50	2	71	50 51	2	72	49 53	12
73	50 54	5	74	51 55	11	75	52 53	8
76	53 54	3	77	54 55	3	78	53 57	12
79	54 58	5	80	55 59	11	81	56 57	3
82	57 58	3	83	58 59	3	84	57 61	12
85	58 62	5	86	59 63	11	87	60 61	3
88	61 62	3	89	62 63	3	90	61 65	12
91	62 66	5	92	63 67	11	93	64 65	3
94	65 66	3	95	66 67	3	96	65 69	12
97	66 70	5	98	67 71	11	99	68 69	4
100	69 70	4	101	70 71	4			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)

1	.000	.000	2	.000	7.000	3	.000	11.200
4	.000	15.200	5	6.000	.000	6	6.000	7.000
7	6.000	11.200	8	6.000	15.200	9	12.000	.000
10	12.000	7.000	11	12.000	11.200	12	12.000	15.200
13	18.000	.000	14	18.000	7.000	15	18.000	11.200
16	18.000	15.200	17	24.000	.000	18	24.000	7.000
19	24.000	11.200	20	24.000	15.200	21	30.000	.000
22	30.000	7.000	23	30.000	11.200	24	30.000	15.200
25	31.000	.000	26	31.000	7.000	27	31.000	11.200
28	31.000	15.200	29	37.000	.000	30	37.000	7.000
31	37.000	11.200	32	43.000	.000	33	43.000	7.000
34	43.000	11.200	35	43.000	15.200	36	49.000	.000
37	49.000	7.000	38	49.000	11.200	39	49.000	15.200
40	55.000	.000	41	55.000	7.000	42	55.000	11.200
43	55.000	15.200	44	61.000	.000	45	61.000	7.000
46	61.000	11.200	47	61.000	15.200	48	62.000	.000
49	62.000	7.000	50	62.000	11.200	51	62.000	15.200
52	68.000	.000	53	68.000	7.000	54	68.000	11.200
55	68.000	15.200	56	74.000	.000	57	74.000	7.000
58	74.000	11.200	59	74.000	15.200	60	80.000	.000
61	80.000	7.000	62	80.000	11.200	63	80.000	15.200
64	86.000	.000	65	86.000	7.000	66	86.000	11.200
67	86.000	15.200	68	92.000	.000	69	92.000	7.000
70	92.000	11.200	71	92.000	15.200			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	0	0	1
5	1	1	1	9	1	1	1
13	1	1	1	17	1	1	1
21	1	1	1	22	0	0	1
25	1	1	1	26	0	0	1
29	1	1	1	32	1	1	1
36	1	1	1	40	1	1	1
44	1	1	1	45	0	0	1
48	1	1	1	49	0	0	1
52	1	1	1	56	1	1	1
60	1	1	1	64	1	1	1
68	1	1	1	69	0	0	1

PILARES

Volume de Material (m3)= 59.4325

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)=94040.5200

 ACCAO 1
 Forc Graviticas

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
3			4210.000
4			6555.000

***** RESULTADOS *****

 ACCAO 1

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.217E-03	-.227E-01	.000E+00
3	.354E-01	-.120E+00	.241E+02	4	.944E-02	-.143E+00	.363E+02
5	.000E+00	.000E+00	.000E+00	6	.267E-03	.495E-02	.455E-04
7	.246E-01	.232E-01	.237E+02	8	.621E-02	.253E-01	.357E+02
9	.000E+00	.000E+00	.000E+00	10	.459E-01	.658E-02	.575E-04
11	.196E-01	.106E-01	.233E+02	12	.719E-02	.973E-02	.351E+02
13	.000E+00	.000E+00	.000E+00	14	.449E-01	.143E-02	.537E-04
15	.200E-01	.229E-02	.230E+02	16	.685E-02	.310E-02	.346E+02
17	.000E+00	.000E+00	.000E+00	18	.443E-01	-.170E-02	.345E-04
19	.196E-01	-.272E-02	.226E+02	20	.658E-02	-.365E-02	.342E+02
21	.000E+00	.000E+00	.000E+00	22	.432E-01	.136E+00	.000E+00
23	.208E-01	.217E+00	.223E+02	24	.679E-02	.242E+00	.338E+02
25	.000E+00	.000E+00	.000E+00	26	.409E-01	-.114E+00	.000E+00
27	.283E-01	-.182E+00	.223E+02	28	.144E-02	-.197E+00	.338E+02
29	.000E+00	.000E+00	.000E+00	30	.155E-01	.194E-02	.414E-04
31	.108E-01	.162E-01	.221E+02	32	.000E+00	.000E+00	.000E+00
33	.436E-01	-.246E-01	.539E-04	34	.173E-01	-.394E-01	.220E+02
35	.363E-03	-.464E-01	.334E+02	36	.000E+00	.000E+00	.000E+00
37	.436E-01	-.631E-02	.512E-04	38	.163E-01	-.101E-01	.218E+02
39	.308E-03	-.154E-01	.333E+02	40	.000E+00	.000E+00	.000E+00
41	.434E-01	.257E-02	.332E-04	42	.159E-01	.410E-02	.217E+02
43	.480E-03	.944E-02	.331E+02	44	.000E+00	.000E+00	.000E+00
45	.419E-01	.138E+00	.000E+00	46	.199E-01	.221E+00	.216E+02
47	.879E-03	.246E+00	.330E+02	48	.000E+00	.000E+00	.000E+00
49	.399E-01	-.138E+00	.000E+00	50	.263E-01	-.221E+00	.216E+02
51	.847E-02	-.246E+00	.330E+02	52	.000E+00	.000E+00	.000E+00
53	.139E-01	.169E-02	.373E-04	54	.218E-01	.141E-01	.215E+02
55	.422E-02	.188E-01	.326E+02	56	.000E+00	.000E+00	.000E+00
57	.421E-01	.407E-02	.497E-04	58	.183E-01	.653E-02	.214E+02
59	.502E-02	.574E-02	.323E+02	60	.000E+00	.000E+00	.000E+00
61	.419E-01	.583E-03	.475E-04	62	.186E-01	.932E-03	.214E+02
63	.467E-02	.137E-02	.321E+02	64	.000E+00	.000E+00	.000E+00
65	.419E-01	-.383E-03	.310E-04	66	.184E-01	-.614E-03	.214E+02
67	.479E-02	-.443E-03	.320E+02	68	.000E+00	.000E+00	.000E+00
69	.415E-01	.131E+00	.000E+00	70	.197E-01	.209E+00	.214E+02
71	.536E-02	.233E+00	.319E+02	72	.000E+00	.000E+00	.000E+00

```

#####  #####  #  #
#          #  ##  ##
####      #  #  #
#          #  #  #
#          #####  #  #

```

No. DE NOS	= 56	No. DE BARRAS	= 77
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 19	No. DE SECCOES TIPO	= 16
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS=	3

MATERIAL	E (KPa)	PROPRIEDADES A (m2)	I (m4)
1	.29000E+08	.42750E+00	.23469E-02
2	.29000E+08	.10500E+00	.78750E-03
3	.29000E+08	.12250E+00	.12505E-02
4	.29000E+08	.16250E+00	.18276E-02
5	.29000E+08	.32000E+00	.34354E-02
6	.29000E+08	.21500E+00	.23635E-02
7	.29000E+08	.15000E+01	.45000E+01
8	.29000E+08	.22000E+00	.25833E-02
9	.29000E+08	.27250E+00	.31193E-02
10	.29000E+08	.24500E+00	.25010E-02
11	.29000E+08	.44000E+00	.51667E-02
12	.29000E+08	.54500E+00	.62385E-02
13	.29000E+08	.33500E+00	.37010E-02
14	.29000E+08	.90000E-01	.67500E-03
15	.29000E+08	.10500E+00	.10719E-02
16	.29000E+08	.10000E+04	.10000E-05

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	2	3	3 4	2
4	2 6	16	5	3 7	4	6	4 8	5
7	5 6	3	8	6 7	3	9	7 8	3
10	6 10	16	11	7 11	4	12	8 12	6
13	9 10	2	14	10 11	2	15	11 12	2
16	11 15	16	17	12 16	16	18	13 14	7
19	14 15	3	20	15 16	3	21	14 18	16
22	15 19	8	23	16 20	9	24	17 18	7
25	18 19	3	26	19 20	3	27	19 23	16
28	20 24	16	29	21 22	10	30	22 23	10
31	23 24	10	32	22 26	16	33	23 27	11
34	24 28	12	35	25 26	10	36	26 27	10
37	27 28	10	38	26 30	16	39	27 31	11
40	28 32	12	41	29 30	10	42	30 31	10
43	31 32	10	44	31 35	16	45	32 36	16
46	33 34	3	47	34 35	3	48	35 36	3
49	34 38	16	50	35 39	8	51	36 40	13
52	37 38	3	53	38 39	3	54	39 40	3
55	38 42	16	56	39 43	8	57	40 44	13
58	41 42	3	59	42 43	3	60	43 44	3
61	43 47	16	62	44 48	16	63	45 46	14
64	46 47	14	65	47 48	14	66	46 50	16
67	47 51	4	68	48 52	5	69	49 50	15
70	50 51	15	71	51 52	15	72	50 54	16
73	51 55	4	74	52 56	6	75	53 54	14
76	54 55	14	77	55 56	14			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	7.000	3	.000	11.200
4	.000	15.200	5	6.000	.000	6	6.000	7.000
7	6.000	11.200	8	6.000	15.200	9	12.000	.000
10	12.000	7.000	11	12.000	11.200	12	12.000	15.200

13	13.000	.000	14	13.000	7.000	15	13.000	11.200
16	13.000	15.200	17	25.000	.000	18	25.000	7.000
19	25.000	11.200	20	25.000	15.200	21	26.000	.000
22	26.000	7.000	23	26.000	11.200	24	26.000	15.200
25	32.000	.000	26	32.000	7.000	27	32.000	11.200
28	32.000	15.200	29	38.000	.000	30	38.000	7.000
31	38.000	11.200	32	38.000	15.200	33	39.000	.000
34	39.000	7.000	35	39.000	11.200	36	39.000	15.200
37	45.000	.000	38	45.000	7.000	39	45.000	11.200
40	45.000	15.200	41	51.000	.000	42	51.000	7.000
43	51.000	11.200	44	51.000	15.200	45	52.000	.000
46	52.000	7.000	47	52.000	11.200	48	52.000	15.200
49	58.000	.000	50	58.000	7.000	51	58.000	11.200
52	58.000	15.200	53	64.000	.000	54	64.000	7.000
55	64.000	11.200	56	64.000	15.200			

NOS DE APOIO				CODIGO			NOS DE APOIO				CODIGO		
1	1	1	1	2	0	0	1						
5	1	1	1	9	1	1	1						
13	1	1	1	14	0	0	1						
17	1	1	1	21	1	1	1						
22	0	0	1	25	1	1	1						
29	1	1	1	33	1	1	1						
34	0	0	1	37	1	1	1						
41	1	1	1	45	1	1	1						
46	0	0	1	49	1	1	1						
53	1	1	1										

PILARES

Volume de Material (m3)= 51.4105

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)=68034.7200

 ACCAO 1
 Forc Graviticas

***** CARGA 7 *****

NO	FORCAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			4210.000
4			6555.000

***** RESULTADOS *****

 ACCAO 1
 Forc Graviticas

DESLOCAMENTOS DOS NOS

NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)	NO	ROTACAO (rad.)	VERTICAL (cm)	HORIZONTAL (cm)
1	.000E+00	.000E+00	.000E+00	2	.260E-01	-.345E-01	.000E+00
3	.279E-01	-.119E+00	.242E+02	4	.596E-02	-.144E+00	.363E+02
5	.000E+00	.000E+00	.000E+00	6	.468E-01	.118E-01	.255E-04
7	.196E-01	.188E-01	.237E+02	8	.632E-02	.215E-01	.359E+02

9	.000E+00	.000E+00	.000E+00	10	.443E-01	.123E+00	.349E-04
11	.240E-01	.196E+00	.232E+02	12	.929E-02	.218E+00	.353E+02
13	.000E+00	.000E+00	.000E+00	14	.292E-04	-.502E-02	.000E+00
15	.398E-01	-.419E-01	.232E+02	16	.114E-01	-.508E-01	.353E+02
17	.000E+00	.000E+00	.000E+00	18	.286E-04	.501E-02	.542E-04
19	.386E-01	.418E-01	.227E+02	20	.111E-01	.507E-01	.345E+02
21	.000E+00	.000E+00	.000E+00	22	.423E-01	-.137E+00	.000E+00
23	.263E-01	-.220E+00	.227E+02	24	.105E-01	-.244E+00	.345E+02
25	.000E+00	.000E+00	.000E+00	26	.463E-01	.148E-02	.609E-04
27	.131E-01	.236E-02	.226E+02	28	.510E-02	.279E-02	.343E+02
29	.000E+00	.000E+00	.000E+00	30	.422E-01	.136E+00	.886E-04
31	.260E-01	.217E+00	.225E+02	32	.102E-01	.242E+00	.341E+02
33	.000E+00	.000E+00	.000E+00	34	.421E-01	-.136E+00	.000E+00
35	.262E-01	-.217E+00	.225E+02	36	.916E-02	-.242E+00	.341E+02
37	.000E+00	.000E+00	.000E+00	38	.460E-01	.734E-03	.302E-04
39	.130E-01	.117E-02	.225E+02	40	.426E-02	.130E-02	.340E+02
41	.000E+00	.000E+00	.000E+00	42	.418E-01	.136E+00	.439E-04
43	.259E-01	.217E+00	.224E+02	44	.909E-02	.242E+00	.339E+02
45	.000E+00	.000E+00	.000E+00	46	.432E-01	-.132E+00	.000E+00
47	.216E-01	-.211E+00	.224E+02	48	.576E-02	-.236E+00	.339E+02
49	.000E+00	.000E+00	.000E+00	50	.445E-01	.597E-02	.213E-04
51	.170E-01	.956E-02	.224E+02	52	.529E-02	.127E-01	.338E+02
53	.000E+00	.000E+00	.000E+00	54	.432E-01	.128E+00	.292E-04
55	.212E-01	.205E+00	.223E+02	56	.822E-02	.228E+00	.338E+02

U. P. C. R. T. O

arquivo central

SECTOR B - Portico Comboio - Direccao Longitudinal

 ACCAO 1
 Forcas Sismo

***** CARGA 7 *****

FORCAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			75.920
4			179.720

***** RESULTADOS *****

 ACCAO 1
 Forcas Sismo

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	23.447	46.895	10.049	-10.049	-18.399	18.399
2	-46.895	-33.900	-19.237	19.237	-18.399	18.399
3	-7.827	-17.126	-6.238	6.238	-5.279	5.279
4	.000	.000	.000	.000	-51.449	51.449
5	41.728	36.993	13.120	-13.120	62.921	-62.921
6	17.126	14.547	5.279	-5.279	173.481	-173.481
7	29.138	58.297	12.491	-12.491	4.082	-4.082
8	-58.308	-47.797	-25.263	25.263	4.087	-4.087
9	-19.732	-27.694	-11.856	11.856	.798	-.798
10	.011	.021	.005	-.005	-13.695	13.695
11	30.536	28.451	9.831	-9.831	49.515	-49.515
12	13.147	13.736	4.481	-4.481	161.625	-161.625
13	11.200	22.399	4.800	-4.800	.834	-.834
14	-22.451	-32.537	-13.092	13.092	.839	-.839
15	-22.385	-27.757	-12.536	12.536	-.149	.149
16	.031	.031	.010	-.010	4.197	-4.197
17	26.471	26.591	8.844	-8.844	48.958	-48.958
18	14.021	13.754	4.629	-4.629	149.090	-149.090
19	11.032	22.063	4.728	-4.728	.276	-.276
20	-22.125	-31.813	-12.842	12.842	.275	-.275
21	-21.315	-27.014	-12.082	12.082	.249	-.249
22	.031	.031	.010	-.010	21.767	-21.767
23	26.536	26.364	8.817	-8.817	48.198	-48.198
24	13.260	13.024	4.381	-4.381	137.008	-137.008
25	10.921	21.843	4.681	-4.681	-.168	.168
26	-21.904	-31.576	-12.733	12.733	-.168	.168
27	-20.959	-26.662	-11.905	11.905	-.180	.180
28	.030	.030	.010	-.010	39.181	-39.181
29	26.171	26.661	8.805	-8.805	47.370	-47.370
30	13.637	13.725	4.560	-4.560	125.101	-125.101
31	5.772	11.544	2.474	-2.474	13.047	-13.047
32	-11.574	-16.331	-6.644	6.644	13.037	-13.037
33	-10.450	-13.768	-6.055	6.055	4.482	-4.482
34	.120	.131	.251	-.251	42.853	-42.853
35	.043	.035	.078	-.078	100.428	-100.428
36	10.067	20.134	4.314	-4.314	-14.592	14.592
37	-20.156	-24.552	-10.645	10.645	-14.586	14.586

38	-14.882	-27.174	-10.514	10.514	-3.587	3.587
39	.022	.016	.006	-.006	-48.199	48.199
40	39.303	28.196	11.250	-11.250	45.518	-45.518
41	27.139	16.842	3.665	-3.665	112.908	-112.908
42	24.175	48.350	10.361	-10.361	3.054	-3.054
43	-48.384	-50.540	-23.553	23.553	3.054	-3.054
44	.017	.024	.007	-.007	-14.285	14.285
45	22.344	26.831	8.196	-8.196	21.964	-21.964
46	10.821	21.641	4.637	-4.637	-3.353	3.353
47	-21.695	-32.169	-12.825	12.825	-3.350	3.350
48	-25.049	-32.816	-14.466	14.466	-1.527	1.527
49	.030	.030	.010	-.010	3.178	-3.178
50	30.386	29.723	10.018	-10.018	23.606	-23.606
51	15.975	15.179	5.192	-5.192	98.439	-98.439
52	10.859	21.719	4.654	-4.654	-.827	.827
53	-21.780	-32.801	-12.993	12.993	-.827	.827
54	-25.795	-33.076	-14.718	14.718	-1.259	1.259
55	.030	.030	.010	-.010	20.827	-20.827
56	28.874	28.639	9.585	-9.585	25.329	-25.329
57	17.897	20.814	6.452	-6.452	83.719	-83.719
58	10.838	21.675	4.645	-4.645	.363	-.363
59	-21.735	-32.891	-13.006	13.006	.362	-.362
60	-25.898	-32.923	-14.705	14.705	1.220	-1.220
61	.030	.029	.010	-.010	38.478	-38.478
62	30.151	32.510	10.443	-10.443	27.028	-27.028
63	12.110	19.279	5.231	-5.231	69.012	-69.012
64	6.587	13.174	2.823	-2.823	15.357	-15.357
65	-13.204	-18.751	-7.608	7.608	15.347	-15.347
66	-13.874	-19.316	-8.298	8.298	5.144	-5.144
67	.116	.125	.241	-.241	34.673	-34.673
68	.038	.049	.087	-.087	56.979	-56.979
69	8.531	17.061	3.656	-3.656	-15.301	15.301
70	-17.083	-21.568	-9.203	9.203	-15.295	15.295
71	-10.831	-17.556	-7.097	7.097	-5.119	5.119
72	.022	.016	.006	-.006	-43.444	43.444
73	32.274	30.229	10.417	-10.417	14.320	-14.320
74	17.506	13.727	5.206	-5.206	48.902	-48.902
75	21.648	43.296	9.278	-9.278	2.735	-2.735
76	-43.327	-39.747	-19.780	19.780	2.735	-2.735
77	-17.732	-25.541	-10.818	10.818	1.154	-1.154
78	.016	.023	.007	-.007	-14.387	14.387
79	27.250	25.767	8.836	-8.836	5.358	-5.358
80	11.815	12.494	4.051	-4.051	38.084	-38.084
81	10.536	21.071	4.515	-4.515	.503	-.503
82	-21.124	-30.777	-12.357	12.357	.506	-.506
83	-19.399	-25.316	-11.179	11.179	-.171	.171
84	.029	.029	.010	-.010	2.486	-2.486
85	24.409	24.540	8.158	-8.158	4.180	-4.180
86	12.822	12.515	4.223	-4.223	26.906	-26.906
87	10.498	20.996	4.499	-4.499	.091	-.091
88	-21.055	-30.517	-12.279	12.279	.091	-.091
89	-18.593	-24.813	-10.851	10.851	.107	-.107
90	.029	.029	.010	-.010	19.264	-19.264
91	24.570	24.476	8.174	-8.174	2.752	-2.752
92	12.298	12.395	4.116	-4.116	16.055	-16.055
93	10.507	21.015	4.503	-4.503	-.045	.045
94	-21.073	-30.642	-12.313	12.313	-.045	.045
95	-18.317	-24.386	-10.676	10.676	.037	-.037
96	.029	.029	.010	-.010	36.080	-36.080
97	24.483	25.056	8.256	-8.256	1.116	-1.116
98	11.991	12.483	4.079	-4.079	5.379	-5.379
99	5.614	11.227	2.406	-2.406	12.345	-12.345
100	-11.256	-16.022	-6.495	6.495	12.335	-12.335
101	-9.034	-12.483	-5.379	5.379	4.079	-4.079

 ACCAO 1
 Forcas Sismo

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
3			74.860 5,347
4			176.870 12,434

***** RESULTADOS *****

 ACCAO 1
 Forcas Sismo

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	11.623	23.246	4.981	-4.981	-15.788	15.788
2	-23.268	-22.255	-10.839	10.839	-15.779	15.779
3	-10.475	-16.400	-6.719	6.719	-5.465	5.465
4	.022	.027	.008	-.008	-28.434	28.434
5	32.730	29.157	10.314	-10.314	70.740	-70.740
6	16.400	16.391	5.465	-5.465	170.151	-170.151
7	11.234	22.469	4.815	-4.815	1.689	-1.689
8	-22.526	-32.811	-13.176	13.176	1.691	-1.691
9	-23.701	-29.448	-13.287	13.287	.803	-.803
10	.031	.030	.010	-.010	-10.444	10.444
11	27.356	29.206	9.427	-9.427	70.852	-70.852
12	13.058	14.913	4.662	-4.662	156.863	-156.863
13	6.731	13.462	2.885	-2.885	13.681	-13.681
14	-13.492	-18.256	-7.559	7.559	13.670	-13.670
15	-11.086	-14.974	-6.515	6.515	4.537	-4.537
16	.136	.158	.294	-.294	72.071	-72.071
17	.060	.064	.125	-.125	140.513	-140.513
18	25.232	50.465	10.814	-10.814	-7.900	7.900
19	-50.465	-33.663	-20.031	20.031	-7.900	7.900
20	-2.525	-14.299	-4.206	4.206	-2.220	2.220
21	.000	.000	.000	.000	-30.471	30.471
22	36.030	35.656	5.974	-5.974	52.368	-52.368
23	14.235	13.901	2.345	-2.345	146.198	-146.198
24	24.783	49.767	10.650	-10.650	7.890	-7.890
25	-49.767	-33.482	-19.821	19.821	7.890	-7.890
26	-2.333	-13.965	-4.074	4.074	2.217	-2.217
27	.159	.142	.300	-.300	31.130	-31.130
28	.064	.063	.128	-.128	140.976	-140.976
29	20.572	41.144	8.817	-8.817	-35.268	35.268
30	-41.174	-53.033	-22.430	22.430	-35.258	35.258
31	-26.759	-40.095	-16.714	16.714	-11.714	11.714
32	.030	.031	.010	-.010	-68.888	68.888
33	79.651	63.415	23.844	-23.844	16.538	-16.538
34	40.032	31.020	11.842	-11.842	133.105	-133.105
35	22.635	45.270	9.701	-9.701	.451	-.451
36	-45.331	-71.857	-27.902	27.902	.451	-.451
37	-54.593	-61.560	-29.038	29.038	.252	-.252

38	.031	.030	.010	-.010	-31.285	31.285
39	63.036	78.840	23.646	-23.646	17.671	-17.671
40	30.540	38.997	11.590	-11.590	104.064	-104.064
41	20.553	41.107	8.809	-8.809	34.851	-34.851
42	-41.136	-53.263	-22.476	22.476	34.841	-34.841
43	-25.708	-39.065	-16.193	16.193	11.457	-11.457
44	.131	.131	.262	-.262	20.928	-20.928
45	.067	.066	.133	-.133	86.642	-86.642
46	10.260	20.520	4.397	-4.397	-17.439	17.439
47	-20.549	-26.510	-11.205	11.205	-17.429	17.429
48	-13.186	-20.433	-8.405	8.405	-5.847	5.847
49	.029	.030	.010	-.010	-34.257	34.257
50	39.565	31.498	11.844	-11.844	16.932	-16.932
51	20.368	15.509	5.979	-5.979	61.977	-61.977
52	11.263	22.526	4.827	-4.827	.127	-.127
53	-22.587	-35.799	-13.901	13.901	.127	-.127
54	-27.060	-30.912	-14.493	14.493	.056	-.056
55	.030	.029	.010	-.010	-15.528	15.528
56	31.361	39.278	11.773	-11.773	17.521	-17.521
57	15.403	20.135	5.923	-5.923	47.483	-47.483
58	10.204	20.409	4.373	-4.373	17.354	-17.354
59	-20.438	-26.411	-11.155	11.155	17.344	-17.344
60	-12.991	-20.193	-8.296	8.296	5.812	-5.812
61	.124	.118	.241	-.241	7.074	-7.074
62	.058	.053	.111	-.111	20.064	-20.064
63	5.691	11.382	2.439	-2.439	-12.391	12.391
64	-11.412	-15.929	-6.510	6.510	-12.381	12.381
65	-9.967	-13.694	-5.915	5.915	-4.359	4.359
66	.030	.030	.010	-.010	-24.144	24.144
67	25.778	23.804	8.264	-8.264	1.422	-1.422
68	13.641	13.176	4.470	-4.470	16.275	-16.275
69	9.341	18.683	4.003	-4.003	.690	-.690
70	-18.743	-28.078	-11.148	11.148	.690	-.690
71	-19.417	-23.816	-10.808	10.808	.624	-.624
72	.030	.030	.010	-.010	-8.993	8.993
73	23.692	25.497	8.198	-8.198	1.082	-1.082
74	10.640	12.433	3.846	-3.846	5.466	-5.466
75	5.704	11.408	2.444	-2.444	12.054	-12.054
76	-11.437	-16.066	-6.548	6.548	12.044	-12.044
77	-9.431	-12.433	-5.466	5.466	3.846	-3.846

BARRA	N	Nº	F
16	16,015	3	7,486
17	6,492	4	17,687
27	-38,218	7	7,486
28	6,556	8	17,687
44	-26,947	27	29,944
45	3,230	28	70,748
61	4,460	39	14,972
62	-5,603	40	35,374
		51	14,972
		52	17,687
		55	14,972
		56	17,687

ACÇÃO DO VENTO

h - altura acima do solo; $h = 11,2m$ (hipótese: altura do piso adicional: 3,5m)

DIRECÇÃO LONGITUDINAL

$$\frac{h}{b} = \frac{11,2}{12} = 0,93$$

$$\frac{a}{b} = \frac{30}{12} = 2,5$$

$$h = 11,2m \rightarrow w_k = 0,93KN/m^2$$

$$p_k = 0,93 \times (0,70 + 0,25) = 0,884KN/m^2$$

$$p = 0,884 \times 12 = 10,61KN/m$$

$$F_{cob} = 10,61 \times (3,5 + 4/2) = 58,36KN$$

$$F_3 = 10,61 \times (4/2 + 4,2/2) = 43,50KN$$

DIRECÇÃO TRANSVERSAL

$$w_k = 0,93KN/m$$

$$p_k = 0,884KN/m^2$$

$$p = 0,884 \times 30 = 26,52KN/m$$

$$F_{cob} = 26,52(3,5 + 4/2) = 145,86KN$$

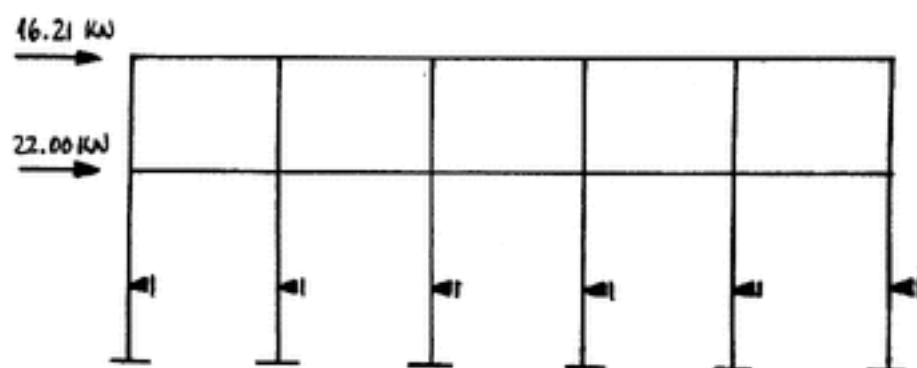
$$F_3 = 26,52(4/2 + 4,2/2) = 108,73KN$$



DISTRIBUIÇÃO DAS FORÇAS HORIZONTAIS DEVIDAS AO VENTO PELOS PÓRTICOS

DIRECÇÃO LONGITUDINAL

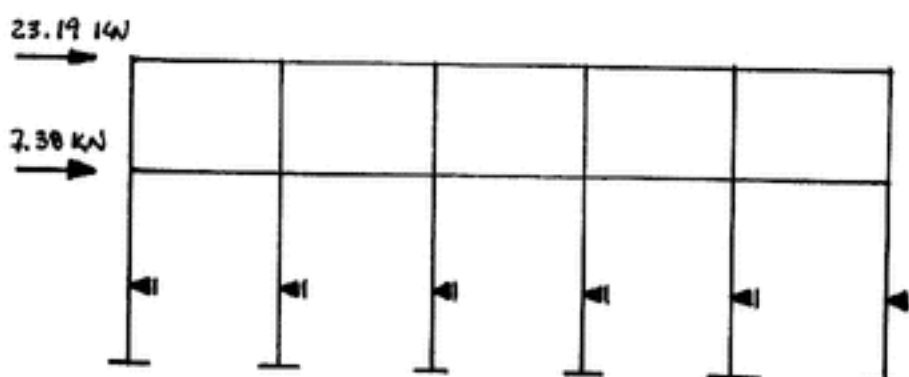
Pórtico A



Pórtico B

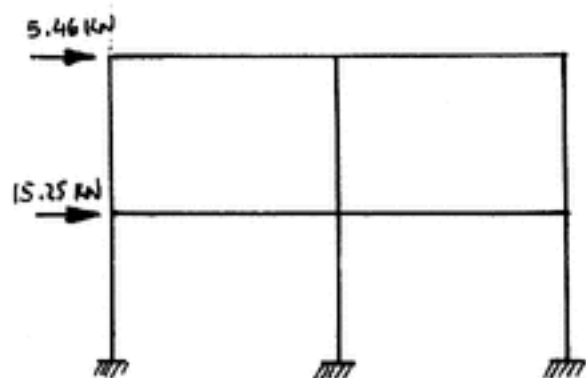


Pórtico C

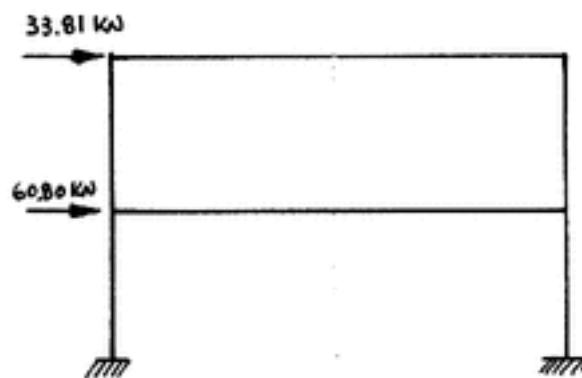


DIRECÇÃO TRANSVERSAL

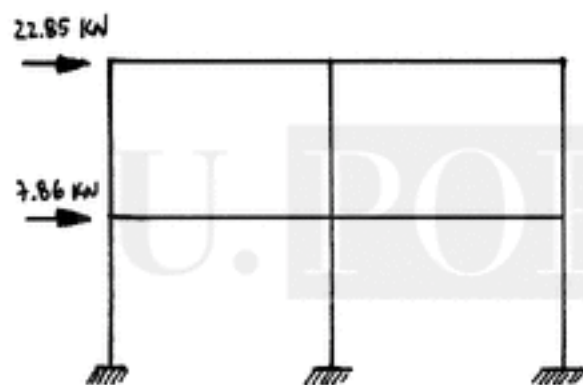
Pórtico 8



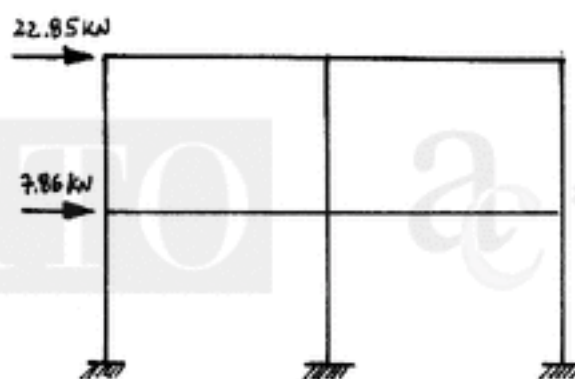
Pórtico 9



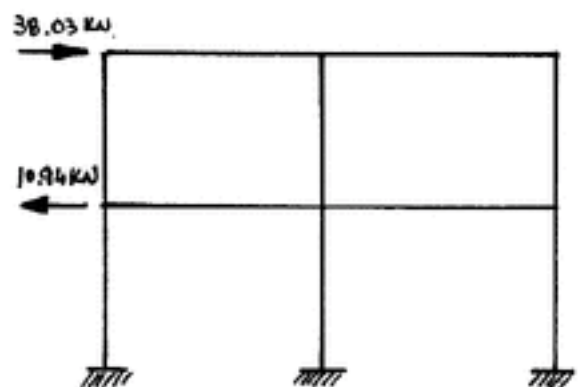
Pórtico 10



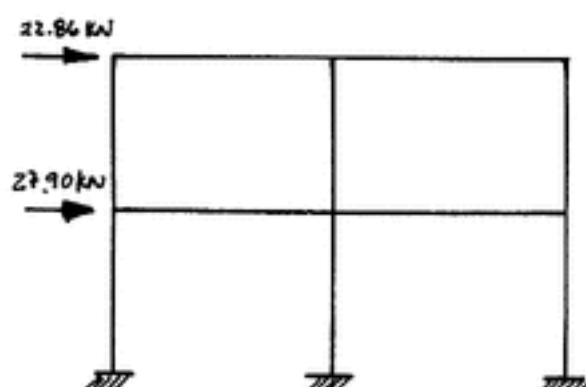
Pórtico 11



Pórtico 12



Pórtico 13



3 - VIGAS

(Ver folhas em anexo).

Viga V2.1 - idêntica à viga V2.1 do Sector A.

Viga V2.2 - idêntica à viga V2.2 do Sector A.

Viga V2.16

Viga V3.28

Viga V4.6 - idêntica à viga V4.6 do Sector A.

Viga V4.6/A - idêntica à viga V4.10 do Sector A.

Viga V4.25 - idêntica à viga V4.25 do Sector A.

Viga V4.24 - idêntica à viga V4.6 do Sector A.

Viga V3.29

Viga V4.24 - idêntica à viga V4.6 do Sector A.

Viga V4.24 - idêntica à viga V4.6 do Sector A.

Viga V3.30

Viga V4.26

Viga V3.3

Viga V4.1 - idêntica à viga V4.1 do Sector A.

Viga V4.5

Viga V3.6

Viga V4.10 - idêntica à viga V4.8 do Sector A.



SECTOR B - Portico Comboio - Direccao Longitudinal

 ACCAO 1
 Forcas Vento

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
3			43.300
4			58.360

***** RESULTADOS *****

 ACCAO 1
 Forcas Vento

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	9.642	19.284	4.132	-4.132	-6.408	6.408
2	-19.284	-14.457	-8.034	8.034	-6.408	6.408
3	-1.050	-4.907	-1.489	1.489	-1.534	1.534
4	.000	.000	.000	.000	-20.915	20.915
5	15.507	13.736	4.874	-4.874	36.955	-36.955
6	4.907	4.298	1.534	-1.534	56.871	-56.871
7	11.810	23.629	5.063	-5.063	1.390	-1.390
8	-23.633	-19.741	-10.327	10.327	1.392	-1.392
9	-5.251	-8.398	-3.412	3.412	.132	-.132
10	.004	.008	.002	-.002	-5.526	5.526
11	11.256	10.422	3.613	-3.613	30.041	-30.041
12	4.100	4.315	1.402	-1.402	53.459	-53.459
13	4.508	9.016	1.932	-1.932	.310	-.310
14	-9.037	-13.429	-5.349	5.349	.312	-.312
15	-6.646	-8.772	-3.855	3.855	-.073	.073
16	.013	.012	.004	-.004	1.755	-1.755
17	9.652	9.718	3.228	-3.228	28.546	-28.546
18	4.458	4.394	1.475	-1.475	49.604	-49.604
19	4.411	8.822	1.890	-1.890	.053	-.053
20	-8.847	-13.013	-5.205	5.205	.053	-.053
21	-6.430	-8.673	-3.776	3.776	.057	-.057
22	.012	.012	.004	-.004	8.851	-8.851
23	9.725	9.668	3.232	-3.232	27.118	-27.118
24	4.280	4.231	1.418	-1.418	45.828	-45.828
25	4.342	8.683	1.861	-1.861	-.087	.087
26	-8.708	-12.813	-5.124	5.124	-.087	.087
27	-6.476	-8.699	-3.794	3.794	-.081	.081
28	.012	.012	.004	-.004	15.835	-15.835
29	9.621	9.811	3.239	-3.239	25.788	-25.788
30	4.468	4.527	1.499	-1.499	42.034	-42.034
31	2.284	4.568	.979	-.979	4.623	-4.623
32	-4.580	-6.596	-2.661	2.661	4.620	-4.620
33	-3.259	-4.542	-1.950	1.950	1.472	-1.472
34	.044	.048	.092	-.092	21.498	-21.498
35	.015	.012	.027	-.027	42.153	-42.153

36	4.0	.027	-.027	42.153	-42.153	.205	
36	4.012	8.023	1.719	-1.719	-5.329	5.329	
37	-8.032	-10.216	-4.345	4.345	-5.326	5.326	
38	-4.419	-8.911	-3.332	3.332	-1.179	1.179	
39	.009	.007	.003	-.003	-18.860	18.860	
40	14.587	10.848	4.239	-4.239	23.621	-23.621	
41	8.899	5.570	1.206	-1.206	38.382	-38.382	
42	9.411	18.823	4.033	-4.033	1.110	-1.110	
43	-18.836	-17.568	-9.144	9.144	1.110	-1.110	
44	.007	.009	.003	-.003	-5.682	5.682	
45	8.721	10.056	3.129	-3.129	14.477	-14.477	
46	4.256	8.512	1.824	-1.824	-1.125	1.125	
47	-8.533	-12.875	-5.097	5.097	-1.123	1.123	
48	-8.291	-11.119	-4.853	4.853	-.581	.581	
49	.012	.012	.004	-.004	1.239	-1.239	
50	11.110	10.919	3.671	-3.671	14.232	-14.232	
51	5.550	5.173	1.787	-1.787	33.529	-33.529	
52	4.251	8.502	1.822	-1.822	-.293	.293	

53	-8.326	-12.999	-5.125	5.125	-.293	.293	
54	-8.572	-11.265	-4.959	4.959	-.429	.429	
55	.012	.012	.004	-.004	8.186	-8.186	
56	10.653	10.562	3.536	-3.536	14.067	-14.067	
57	6.092	7.202	2.216	-2.216	28.569	-28.569	
58	4.233	8.467	1.814	-1.814	.115	-.115	
59	-8.490	-13.000	-5.117	5.117	.115	-.115	
60	-8.689	-11.283	-4.993	4.993	.434	-.434	
61	.012	.012	.004	-.004	15.117	-15.117	
62	11.127	12.004	3.855	-3.855	13.943	-13.943	
63	4.080	6.608	1.781	-1.781	23.575	-23.575	
64	2.572	5.145	1.102	-1.102	5.521	-5.521	
65	-5.156	-7.439	-2.999	2.999	5.518	-5.518	
66	-4.608	-6.622	-2.807	2.807	1.751	-1.751	
67	.043	.046	.089	-.089	7.382	-7.382	
68	.013	.017	.030	-.030	23.187	-23.187	
69	3.339	6.678	1.431	-1.431	-5.528	5.528	
70	-6.687	-8.651	-3.652	3.652	-5.525	5.525	
71	-3.376	-5.968	-2.336	2.336	-1.741	1.741	
72	.008	.006	.002	-.002	-16.969	16.969	
73	11.980	11.255	3.873	-3.873	8.058	-8.058	
74	5.951	4.679	1.772	-1.772	16.670	-16.670	
75	8.430	16.859	3.613	-3.613	.957	-.957	
76	-16.872	-15.627	-7.738	7.738	.957	-.957	
77	-5.779	-8.754	-3.633	3.633	.372	-.372	
78	.006	.009	.003	-.003	-5.618	5.618	
79	10.151	9.576	3.288	-3.288	3.953	-3.953	
80	4.075	4.321	1.399	-1.399	13.037	-13.037	
81	4.097	8.194	1.756	-1.756	.194	-.194	
82	-8.214	-12.111	-4.839	4.839	.195	-.195	
83	-6.519	-8.769	-3.822	3.822	-.065	.065	
84	.011	.011	.004	-.004	.977	-.977	
85	9.054	9.110	3.027	-3.027	2.936	-2.936	
86	4.448	4.341	1.465	-1.465	9.213	-9.213	
87	4.077	8.155	1.747	-1.747	.025	-.025	
88	-8.178	-11.989	-4.802	4.802	.025	-.025	
89	-6.248	-8.613	-3.715	3.715	.034	-.034	
90	.011	.011	.004	-.004	7.526	-7.526	
91	9.127	9.093	3.037	-3.037	1.850	-1.850	
92	4.272	4.313	1.431	-1.431	5.500	-5.500	
93	4.078	8.157	1.748	-1.748	-.019	.019	
94	-8.179	-12.025	-4.811	4.811	-.019	.019	
95	-6.169	-8.477	-3.662	3.662	.014	-.014	
96	.011	.011	.004	-.004	14.084	-14.084	
97	9.101	9.316	3.070	-3.070	.701	-.701	
98	4.164	4.334	1.416	-1.416	1.839	-1.839	
99	2.179	4.359	.934	-.934	4.490	-4.490	
100	-4.370	-6.296	-2.539	2.539	4.486	-4.486	
101	-3.020	-4.334	-1.839	1.839	1.416	-1.416	

SECTOR B - Portico Comboio - Direccao Transversal

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
3			108.730
4			145.860

***** RESULTADOS *****

U. POLÍTEC

 ACCAO 1
 Forças Vento

arquivo
 central

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	12.032	24.065	5.157	-5.157	-13.839	13.839
2	-24.087	-23.806	-11.403	11.403	-13.831	13.831
3	-6.653	-12.551	-4.801	4.801	-4.250	4.250
4	.023	.027	.008	-.008	-29.368	29.368
5	30.459	27.026	9.581	-9.581	102.127	-102.127
6	12.551	12.950	4.250	-4.250	141.059	-141.059
7	11.496	22.993	4.927	-4.927	1.297	-1.297
8	-23.052	-34.436	-13.688	13.688	1.299	-1.299
9	-17.923	-23.547	-10.367	10.367	.468	-.468
10	.031	.031	.010	-.010	-10.753	10.753
11	25.334	27.161	8.749	-8.749	98.808	-98.808
12	10.596	12.098	3.782	-3.782	130.692	-130.692
13	6.847	13.694	2.934	-2.934	12.166	-12.166
14	-13.724	-19.114	-7.819	7.819	12.155	-12.155
15	-8.179	-12.147	-5.080	5.080	3.682	-3.682
16	.127	.149	.276	-.276	93.480	-93.480
17	.049	.051	.100	-.100	140.400	-140.400
18	25.797	51.595	11.056	-11.056	-7.139	7.139
19	-51.595	-35.628	-20.767	20.767	-7.139	7.139
20	1.228	-11.082	-2.463	2.463	-1.736	1.736
21	.000	.000	.000	.000	-31.038	31.038
22	34.251	33.901	5.679	-5.679	76.144	-76.144
23	11.031	11.004	1.836	-1.836	123.200	-123.200
24	25.053	50.312	10.766	-10.766	7.126	-7.126
25	-50.312	-34.828	-20.271	20.271	7.126	-7.126

26	.777	-11.058	-2.570	2.570	1.730	207.	-1.730
27	.150	.133	.283	-.283	32.682		-32.682
28	.054	.053	.107	-.107	106.589		-106.589
29	20.736	41.471	8.887	-8.887	-31.889		31.889
30	-41.501	-55.019	-22.981	22.981	-31.879		31.879
31	-19.767	-33.417	-13.296	13.296	-9.838		9.838
32	.030	.031	.010	-.010	-69.564		69.564
33	74.652	59.289	22.324	-22.324	34.447		-34.447
34	33.364	26.303	9.945	-9.945	114.619		-114.619
35	22.647	45.294	9.706	-9.706	.315		-.315
36	-45.355	-72.682	-28.104	28.104	.315		-.315
37	-45.580	-52.321	-24.475	24.475	.152		-.152
38	.031	.030	.010	-.010	-31.754		31.754
39	58.974	73.986	22.160	-22.160	30.815		-30.815
40	26.017	32.740	9.793	-9.793	90.143		-90.143
41	20.639	41.278	8.845	-8.845	31.604		-31.604
42	-41.308	-54.908	-22.909	22.909	31.594		-31.594
43	-19.200	-32.798	-12.999	12.999	9.679		-9.679

44	.122	.123	.245	-.245	16.961		-16.961
45	.057	.056	.114	-.114	60.888		-60.888
46	10.306	20.611	4.417	-4.417	-15.811		15.811
47	-20.641	-27.357	-11.428	11.428	-15.801		15.801
48	-9.885	-17.159	-6.761	6.761	-4.945		4.945
49	.030	.030	.010	-.010	-34.479		34.479
50	37.119	29.487	11.101	-11.101	24.525		-24.525
51	17.103	13.248	5.058	-5.058	53.808		-53.808
52	11.236	22.472	4.815	-4.815	.073		-.073
53	-22.533	-36.077	-13.955	13.955	.073		-.073
54	-22.784	-26.470	-12.313	12.313	.015		-.015
55	.030	.029	.010	-.010	-15.709		15.709
56	29.374	36.887	11.043	-11.043	22.883		-22.883
57	13.222	17.039	5.044	-5.044	41.492		-41.492
58	10.218	20.436	4.379	-4.379	15.775		-15.775
59	-20.465	-27.119	-11.330	11.330	15.765		-15.765
60	-9.884	-17.089	-6.743	6.743	4.948		-4.948
61	.116	.110	.226	-.226	27.901		-27.901
62	.050	.046	.096	-.096	22.855		-22.855
63	5.690	11.380	2.439	-2.439	-11.256		11.256
64	-11.410	-16.237	-6.582	6.582	-11.246		11.246
65	-8.044	-11.667	-4.928	4.928	-3.724		3.724
66	.030	.030	.010	-.010	-24.244		24.244
67	24.171	22.312	7.747	-7.747	4.109		-4.109
68	11.622	11.298	3.820	-3.820	13.703		-13.703
69	9.315	18.630	3.992	-3.992	.583		-.583
70	-18.690	-28.378	-11.207	11.207	.583		-.583
71	-16.155	-20.424	-9.145	9.145	.529		-.529
72	.030	.030	.010	-.010	-9.046		9.046
73	22.221	23.940	7.693	-7.693	2.047		-2.047
74	9.127	10.618	3.291	-3.291	4.558		-4.558
75	5.694	11.380	2.440	-2.440	10.994		-10.994
76	-11.418	-16.325	-6.605	6.605	10.984		-10.984
77	-7.616	-10.618	-4.558	4.558	3.291		-3.291

SECTOR B - Portico Alinhamento 8 - A/C

No. DE NOS	= 19	No. DE BARRAS	= 24
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 11	No. DE SECCOES TIPO	= 9
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.60000E+01	.25000E+00
2	.29000E+08	.35000E+00	.30000E+00
3	.29000E+08	.35000E+00	.35000E+00
4	.29000E+08	.10000E+01	.10000E-05
5	.29000E+08	.98450E+00	.35000E+00
6	.29000E+08	.40000E+00	.50000E+00
7	.29000E+08	.10500E+01	.35000E+00
8	.29000E+08	.65403E+00	.35000E+00
9	.29000E+08	.35000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 7	3	2	2 8	1	3	3 5	3
4	4 6	3	5	5 6	4	6	6 7	4
7	5 9	3	8	6 10	3	9	7 11	3
10	8 9	5	11	9 10	5	12	10 11	5
13	9 12	2	14	10 13	3	15	11 14	3
16	12 13	6	17	13 14	6	18	12 15	2
19	13 16	3	20	14 19	3	21	15 16	7
22	16 17	3	23	17 19	8	24	18 19	9

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	14.000	.000	2	.000	1.500	3	2.000	1.500
4	8.000	1.500	5	2.000	3.000	6	8.000	3.000
7	14.000	3.000	8	.000	6.500	9	2.000	6.500
10	8.000	6.500	11	14.000	6.500	12	2.000	10.700
13	8.000	10.700	14	14.000	10.700	15	2.000	14.600
16	8.000	14.600	17	8.000	15.600	18	12.250	15.600
19	14.000	15.600						

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
	1	1	1		1	1	1
1	1	1	1	2	1	1	1
3	1	1	1	4	1	1	1
5	0	0	1	6	0	0	1
7	0	0	1	8	0	0	1
9	0	0	1	10	0	0	1
11	0	0	1				

PILARES

Volume de Material (m3)=	12.6012	Area de Cofragem (m2)=	121.6100
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ELEMENTOS NAO VERTICAIS

Volume de Material (m3)=	11.0169	Area de Cofragem (m2)=	72.8447
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 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	15.000	11	15.000
12	15.000	16	16.350
17	16.350	21	27.738
23	26.513	24	14.413

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
16	.000	43.440	.000	6.000	17	43.440	.000	.000	6.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
15		67.500	
17		135.000	
18		57.070	
19		67.500	

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	8.000	12	8.000
23	6.800	24	.000

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
16	24.000	.000	.000	6.000					

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
17		18.000	
18		9.000	
19		9.000	

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
11	8.000	21	6.000

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
17	.000	24.000	.000	6.000					

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
15		9.000	

 ACCAO 4
 SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14			-26.590
19			70.390

 ACCAO 5
 SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14			-2.620
19			40.320

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
14			15.250
19			5.460

***** RESULTADOS *****

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO

COEFICIENTE

ACCAO

COEFICIENTE

PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	3.691	7.382	3.691	-3.691	658.161	-658.161
2	17.786	35.573	10.672	-10.672	38.332	-38.332
3	-4.302	-8.604	-8.604	8.604	581.776	-581.776
4	-.597	-1.193	-1.193	1.193	1305.391	-1305.391
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	8.604	22.738	8.955	-8.955	581.776	-581.776
8	1.193	3.153	1.242	-1.242	1305.391	-1305.391
9	-7.382	-24.254	-9.039	9.039	658.160	-658.160
10	-35.573	27.909	-38.332	-30.668	.000	.000
11	-77.684	111.945	-97.790	-109.210	.000	.000
12	-109.638	72.072	-109.761	-97.239	.000	.000
13	27.036	38.226	15.538	-15.538	453.318	-453.318
14	-5.461	-9.236	-3.499	3.499	1086.420	-1086.420
15	-47.818	-54.936	-24.465	24.465	560.922	-560.922
16	-125.177	254.626	-189.160	-261.470	-29.870	29.870
17	-263.033	149.843	-258.760	-191.870	-37.785	37.785
18	86.952	90.142	45.409	-45.409	264.158	-264.158
19	17.643	-.423	4.415	-4.415	566.190	-566.190
20	-94.907	-165.284	-53.100	53.100	369.051	-369.051
21	-90.142	104.621	-149.408	-154.234	45.408	-45.408
22	-104.197	154.022	49.824	-49.824	411.955	-411.955
23	-154.022	-41.255	-182.455	-117.362	49.824	-49.824
24	.000	206.539	99.105	-136.939	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	3.691	-658.161	3.691
2	17.786	-38.332	10.672
3	-4.302	-581.776	-8.604
4	-.597	-1305.391	-1.193
5	.000	.000	17.559
6	.000	.000	2.435
7	.000	.000	-12.729
8	.000	.000	-10.672
9	.000	.000	6.584
10	.000	.000	-4.741
11	.000	.000	-15.427

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	4.311	8.621	4.311	-4.311	591.608	-591.608
2	18.052	36.104	10.831	-10.831	48.836	-48.836
3	-2.905	-5.810	-5.810	5.810	496.635	-496.635
4	-2.571	-5.141	-5.141	5.141	1199.080	-1199.080
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	5.810	15.354	6.047	-6.047	496.635	-496.635
8	5.141	13.587	5.351	-5.351	1199.080	-1199.080
9	-8.621	-28.326	-10.556	10.556	591.608	-591.608
10	-36.104	7.431	-48.836	-20.164	.000	.000
11	-45.022	88.412	-60.268	-74.732	.000	.000
12	-95.379	73.299	-107.180	-99.820	.000	.000
13	22.237	37.646	14.258	-14.258	416.203	-416.203
14	-6.620	-21.333	-6.655	6.655	1017.168	-1017.168
15	-44.972	-39.147	-20.028	20.028	491.788	-491.788
16	-122.766	234.619	-192.093	-258.537	-28.234	28.234
17	-223.779	121.358	-220.965	-121.665	-39.385	39.385
18	85.119	80.598	42.492	-42.492	224.111	-224.111
19	10.493	7.041	4.496	-4.496	537.666	-537.666
20	-82.211	-164.080	-50.263	50.263	370.123	-370.123
21	-80.598	92.359	-122.861	-126.781	42.491	-42.491
22	-99.400	146.388	46.988	-46.988	410.883	-410.883
23	-146.388	-42.458	-181.383	-118.434	46.987	-46.987
24	.000	206.539	99.105	-136.939	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO	VERTICAL	HORIZONTAL
	(KN.m)	(KN)	(KN)
1	4.311	-591.608	4.311
2	18.052	-48.836	10.831
3	-2.905	-496.635	-5.810
4	-2.571	-1199.080	-5.141
5	.000	.000	11.856
6	.000	.000	10.492
7	.000	.000	-14.867
8	.000	.000	-10.831
9	.000	.000	8.211
10	.000	.000	-12.006
11	.000	.000	-9.472

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-W

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.739	3.477	1.739	-1.739	570.773	-570.773
2	12.780	25.559	7.668	-7.668	16.120	-16.120

3	-4.498	-8.996	-8.996	8.996	512.517	-512.517
4	1.438	2.875	2.875	-2.875	1165.049	-1165.049
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	8.996	23.776	9.364	-9.364	512.517	-512.517
8	-2.875	-7.599	-2.992	2.992	1165.049	-1165.049
9	-3.477	-11.425	-4.258	4.258	570.773	-570.773
10	-25.559	38.320	-16.120	-28.880	.000	.000
11	-83.678	95.495	-101.531	-105.469	.000	.000
12	-81.452	49.692	-72.793	-62.207	.000	.000
13	21.583	25.299	11.162	-11.162	382.106	-382.106
14	-6.444	1.494	-1.179	1.179	986.786	-986.786
15	-38.267	-55.854	-22.410	22.410	508.567	-508.567
16	-95.128	219.293	-118.041	-224.589	-27.954	27.954
17	-243.192	143.334	-256.538	-194.092	-33.018	33.018
18	69.829	82.725	39.116	-39.116	264.066	-264.066
19	22.404	-7.253	3.885	-3.885	505.659	-505.659
20	-87.480	-139.280	-46.278	46.278	314.475	-314.475
21	-82.725	97.756	-149.316	-154.326	39.116	-39.116
22	-90.503	133.505	43.002	-43.002	351.331	-351.331
23	-133.505	-43.633	-148.831	-89.786	43.001	-43.001
24	.000	182.914	85.605	-123.439	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.739	-570.773	1.739
2	12.780	-16.120	7.668
3	-4.498	-512.517	-8.996
4	1.438	-1165.049	2.875
5	.000	.000	18.360
6	.000	.000	-5.868
7	.000	.000	-5.996
8	.000	.000	-7.668
9	.000	.000	1.799
10	.000	.000	1.814
11	.000	.000	-18.152

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO 2(e2)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO 1(e1)-E1	1.50000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-.014	-.027	-.014	.014	433.911	-433.911
2	5.975	11.950	3.585	-3.585	7.092	-7.092
3	-2.894	-5.789	-5.789	5.789	279.379	-279.379
4	-2.178	-4.356	-4.356	4.356	775.378	-775.378
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	5.789	15.299	6.025	-6.025	279.379	-279.379
8	4.356	11.513	4.534	-4.534	775.378	-775.378

9	.027	.090	.033	-.033	433.911	-433.911
10	-11.950	34.166	-7.092	-29.308	.000	.000
11	-29.119	76.724	-46.666	-62.534	.000	.000
12	-29.038	70.034	-47.767	-61.433	.000	.000
13	-20.347	-5.338	-6.115	6.115	203.405	-203.405
14	-59.199	-57.150	-27.702	27.702	665.076	-665.076
15	-70.123	-63.772	-31.880	31.880	372.479	-372.479
16	17.500	219.931	-72.118	-185.102	.985	-.985
17	-77.145	178.111	-128.702	-128.518	16.100	-16.100
18	-12.162	-15.534	-7.102	7.102	131.286	-131.286
19	-85.636	-81.350	-42.817	42.817	351.272	-351.272
20	-114.338	-158.421	-55.665	55.665	243.961	-243.961
21	15.534	165.831	-60.186	-120.642	-7.097	7.097
22	-84.482	34.562	-49.919	49.919	230.630	-230.630
23	-34.563	30.179	-88.430	-86.968	-49.917	49.917
24	.000	128.242	60.670	-85.893	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-.014	-433.911	-.014
2	5.975	-7.092	3.585
3	-2.894	-279.379	-5.789
4	-2.178	-775.378	-4.356
5	.000	.000	11.814
6	.000	.000	8.890
7	.000	.000	.047
8	.000	.000	-3.585
9	.000	.000	-12.140
10	.000	.000	-32.236
11	.000	.000	-31.913

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	.318	.636	.318	-.318	414.497	-414.497
2	7.093	14.186	4.256	-4.256	10.296	-10.296
3	-2.846	-5.692	-5.692	5.692	298.562	-298.562
4	-1.795	-3.591	-3.591	3.591	772.405	-772.405
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	5.692	15.044	5.925	-5.925	298.562	-298.562
8	3.591	9.490	3.737	-3.737	772.405	-772.405
9	-.636	-2.090	-.779	.779	414.497	-414.497
10	-14.186	29.994	-10.296	-26.104	.000	.000
11	-30.835	73.439	-47.499	-61.701	.000	.000
12	-34.115	64.730	-49.498	-59.702	.000	.000
13	-14.204	-2.487	-3.974	3.974	224.959	-224.959
14	-48.813	-48.814	-23.244	23.244	661.206	-661.206

15	-62.640	-60.543	-29.329	29.329	354.795	-354.795
16	-13.015	194.975	-81.363	-175.857	-11.540	11.540
17	-102.312	147.534	-137.993	-119.227	-11.556	11.556
18	15.503	14.001	7.565	-7.565	143.595	-143.595
19	-43.850	-46.742	-23.229	23.229	347.357	-347.357
20	-86.991	-132.605	-44.815	44.815	235.568	-235.568
21	-14.001	121.513	-72.495	-108.333	7.567	-7.567
22	-74.771	59.107	-15.664	15.664	239.023	-239.023
23	-59.107	4.363	-96.823	-78.575	-15.664	15.664
24	.000	128.242	60.670	-85.893	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	.318	-414.497	.318
2	7.093	-10.296	4.256
3	-2.846	-298.562	-5.692
4	-1.795	-772.405	-3.591
5	.000	.000	11.617
6	.000	.000	7.328
7	.000	.000	-1.097
8	.000	.000	-4.256
9	.000	.000	-9.899
10	.000	.000	-26.982
11	.000	.000	-28.551

U.P.O.

 COMBINACAO 6
 ACC.BASE (-E1)

arquivo
 central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	4.409	8.818	4.409	-4.409	313.351	-313.351
2	14.668	29.336	8.801	-8.801	37.731	-37.731
3	-1.706	-3.411	-3.411	3.411	375.838	-375.838
4	1.867	3.734	3.734	-3.734	768.840	-768.840
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	3.411	9.015	3.550	-3.550	375.838	-375.838
8	-3.734	-9.867	-3.886	3.886	768.840	-768.840
9	-8.818	-28.974	-10.798	10.798	313.351	-313.351
10	-29.336	-9.725	-37.731	1.331	.000	.000
11	-56.764	35.688	-58.113	-51.087	.000	.000
12	-90.325	.756	-69.528	-39.672	.000	.000
13	57.475	53.903	26.519	-26.519	319.056	-319.056
14	64.504	58.035	29.176	-29.176	648.224	-648.224
15	28.218	13.791	10.002	-10.002	273.679	-273.679
16	-169.140	66.381	-128.817	-128.403	-35.208	35.208
17	-235.991	-18.794	-187.994	-69.226	-56.564	56.564
18	115.237	125.503	61.728	-61.728	190.240	-190.240
19	111.575	85.499	50.532	-50.532	331.827	-331.827
20	5.003	-37.721	-6.677	6.677	204.453	-204.453

21	-125.503	-46.850	-119.140	-61.688	61.724	-61.724
22	-38.649	150.911	112.261	-112.261	270.138	-270.138
23	-150.910	-90.522	-127.938	-47.460	112.259	-112.259
24	.000	128.242	60.670	-85.893	-.001	.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.409	-313.351	4.409
2	14.668	-37.731	8.801
3	-1.706	-375.838	-3.411
4	1.867	-768.840	3.734
5	.000	.000	6.961
6	.000	.000	-7.620
7	.000	.000	-15.207
8	.000	.000	-8.801
9	.000	.000	22.968
10	.000	.000	33.062
11	.000	.000	20.800

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	4.077	8.155	4.077	-4.077	332.765	-332.765
2	13.550	27.100	8.130	-8.130	34.526	-34.526
3	-1.754	-3.507	-3.507	3.507	356.655	-356.655
4	1.484	2.968	2.968	-2.968	771.813	-771.813
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	3.507	9.270	3.651	-3.651	356.655	-356.655
8	-2.968	-7.844	-3.089	3.089	771.813	-771.813
9	-8.155	-26.795	-9.986	9.986	332.765	-332.765
10	-27.100	-5.553	-34.526	-1.874	.000	.000
11	-55.048	38.973	-57.279	-51.921	.000	.000
12	-85.248	6.060	-67.798	-41.402	.000	.000
13	51.332	51.053	24.377	-24.377	297.502	-297.502
14	54.119	49.698	24.718	-24.718	652.095	-652.095
15	20.735	10.562	7.452	-7.452	291.363	-291.363
16	-138.625	91.337	-119.571	-137.649	-22.684	22.684
17	-210.824	11.783	-178.703	-78.517	-28.909	28.909
18	87.572	95.969	47.062	-47.062	177.931	-177.931
19	69.788	50.892	30.944	-30.944	335.742	-335.742
20	-22.345	-63.536	-17.527	17.527	212.846	-212.846
21	-95.969	-2.532	-106.831	-73.997	47.060	-47.060
22	-48.360	126.366	78.007	-78.007	261.744	-261.744
23	-126.366	-64.706	-119.544	-55.854	78.006	-78.006
24	.000	128.242	60.670	-85.893	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.077	-332.765	4.077
2	13.550	-34.526	8.130
3	-1.754	-356.655	-3.507
4	1.484	-771.813	2.968
5	.000	.000	7.158
6	.000	.000	-6.057
7	.000	.000	-14.063
8	.000	.000	-8.130
9	.000	.000	20.727
10	.000	.000	27.808
11	.000	.000	17.437

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	2.683	5.366	2.683	-2.683	620.004	-620.004
2	15.553	31.106	9.332	-9.332	31.355	-31.355
3	-4.139	-8.278	-8.278	8.278	532.042	-532.042
4	-1.069	-2.138	-2.138	2.138	1230.249	-1230.249
5	.000	.000	.000	.000	.000	.000
6	.000	.000	.000	.000	.000	.000
7	8.278	21.876	8.615	-8.615	532.042	-532.042
8	2.138	5.650	2.225	-2.225	1230.248	-1230.248
9	-5.366	-17.632	-6.571	6.571	620.004	-620.004
10	-31.106	30.196	-31.355	-30.445	.000	.000
11	-65.590	105.419	-86.062	-99.338	.000	.000
12	-88.878	75.158	-94.987	-90.413	.000	.000
13	13.518	24.720	9.104	-9.104	415.535	-415.535
14	-22.192	-25.725	-11.409	11.409	1035.924	-1035.924
15	-57.526	-63.266	-28.760	28.760	529.591	-529.591
16	-103.394	248.056	-165.025	-253.205	-31.911	31.911
17	-234.391	153.384	-242.596	-175.634	-45.140	45.140
18	78.674	81.285	41.015	-41.015	250.511	-250.511
19	12.060	-4.965	1.819	-1.819	540.122	-540.122
20	-90.118	-159.902	-51.024	51.024	353.957	-353.957
21	-81.285	104.746	-139.811	-147.631	41.014	-41.014
22	-99.781	142.616	42.835	-42.835	392.489	-392.489
23	-142.616	-39.549	-171.089	-110.368	42.834	-42.834
24	.000	199.451	95.055	-132.889	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	2.683	-620.004	2.683
2	15.553	-31.355	9.332

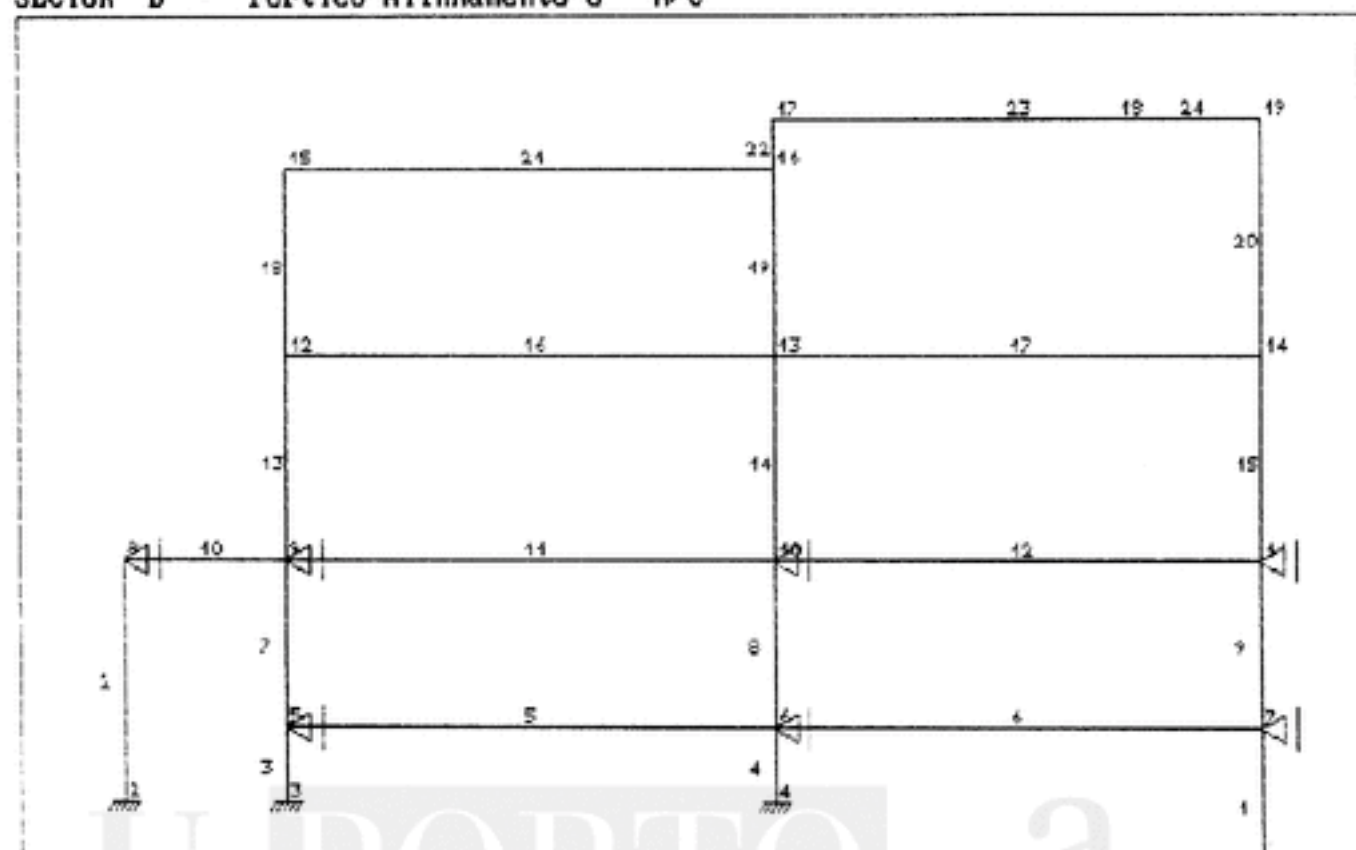
3	-4.139	-532.042	-8.278
4	-1.069	-1230.249	-2.138
5	.000	.000	16.893
6	.000	.000	4.363
7	.000	.000	-9.254
8	.000	.000	-9.332
9	.000	.000	.489
10	.000	.000	-13.634
11	.000	.000	-22.189

#

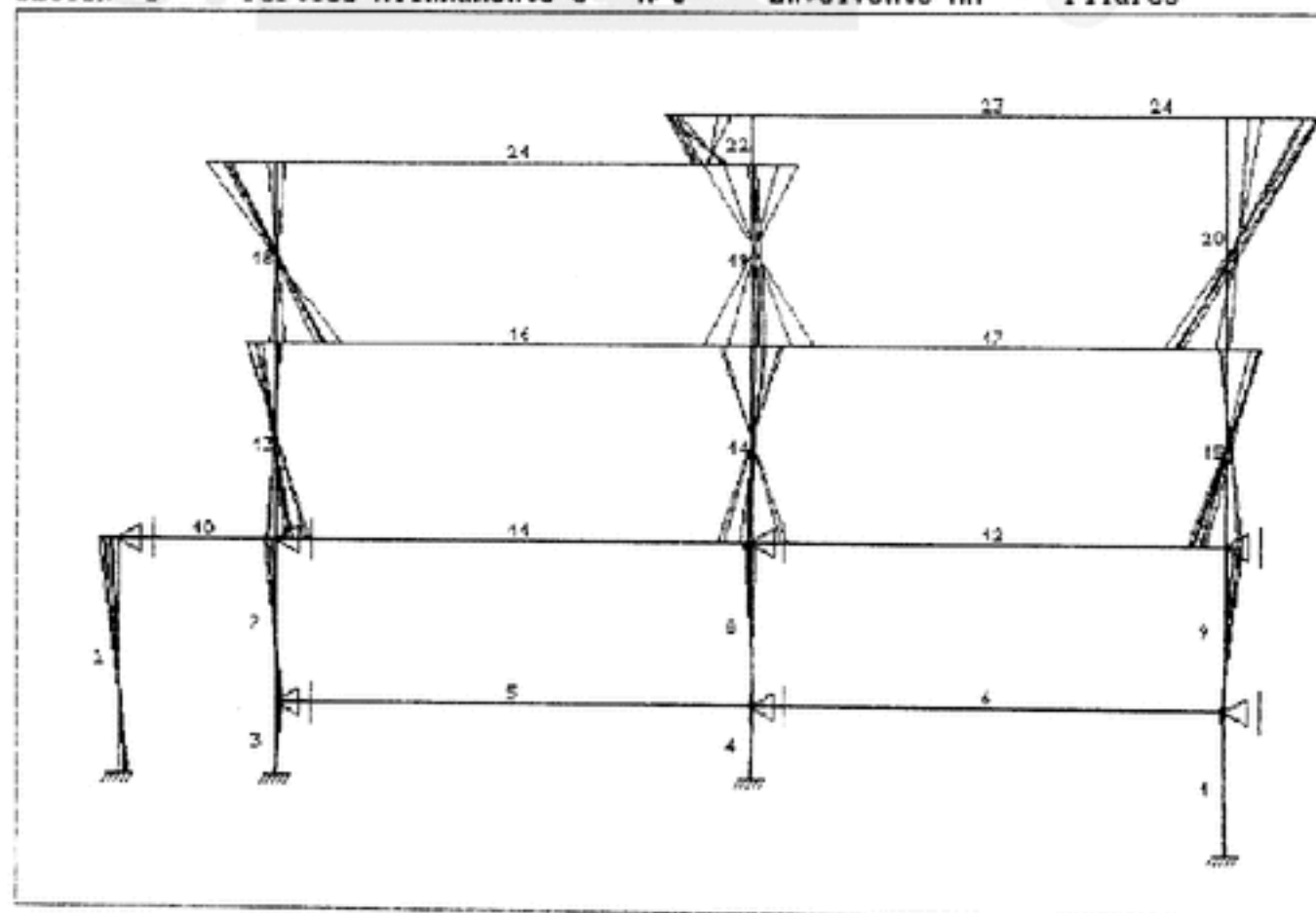
U. PORTO

ac arquivo central

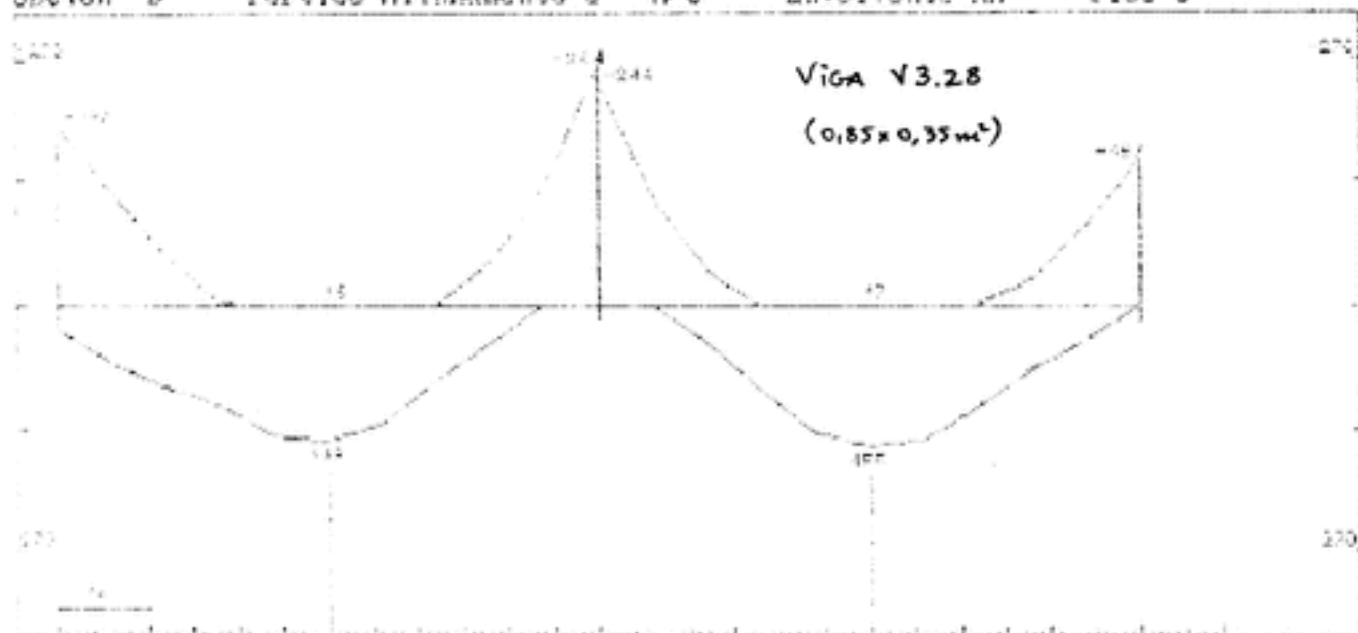
SECTOR B - Portico Alinhamento 8 - A/C



SECTOR B - Portico Alinhamento 8 - A/C - Envolvente MM - Pilares



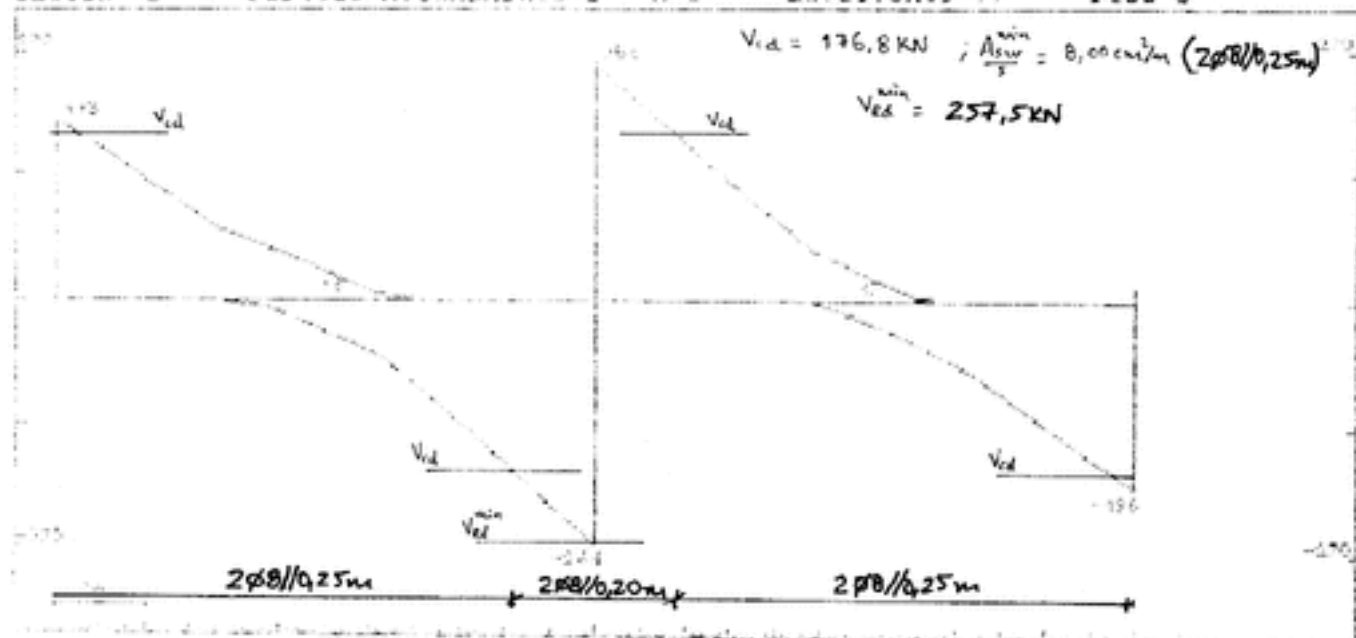
SECTOR B - Portico Alinhamento B - A/C - Envolvente MM - Piso 3



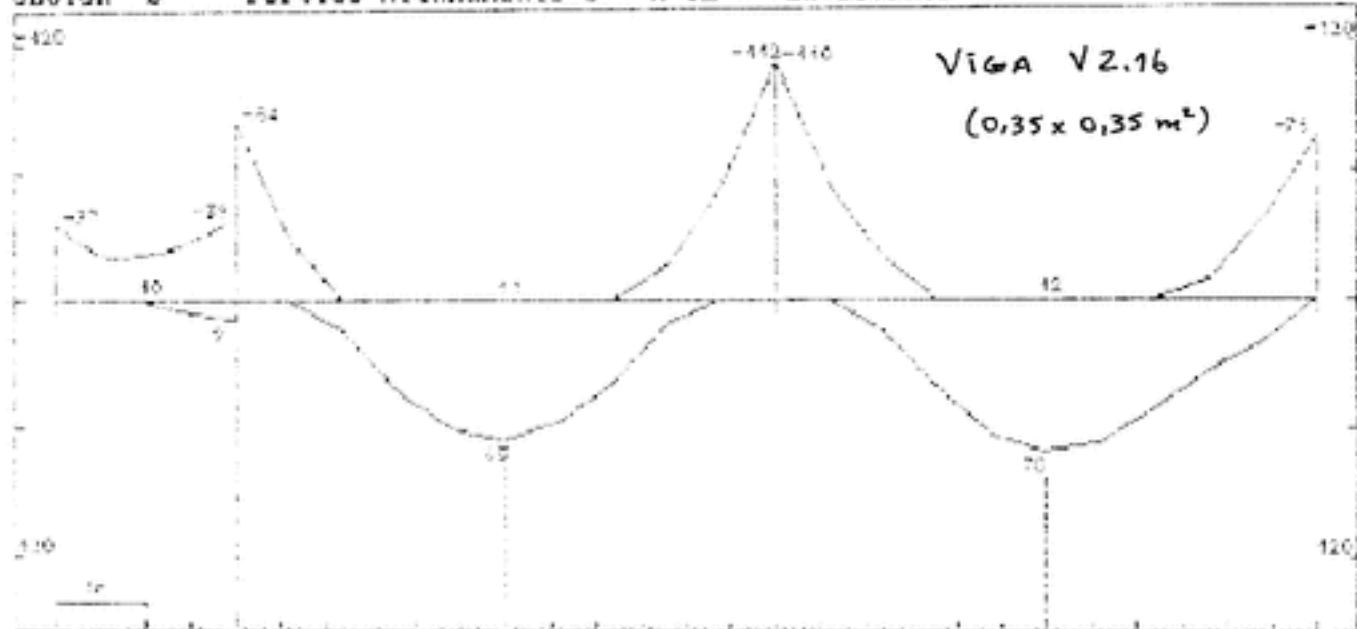
M_d (kNm):	-188	149	-245	155	-149
u :	0,162	0,129	0,212	0,134	0,129
w :	0,189	0,145	0,256	0,152	0,145
A_s (cm ²):	19,42	15,10	26,66	15,78	15,10
Varões:	6Ø20	5Ø20	9Ø20	5Ø20	6Ø20



SECTOR B - Portico Alinhamento B - A/C - Envolvente UU - Piso 3



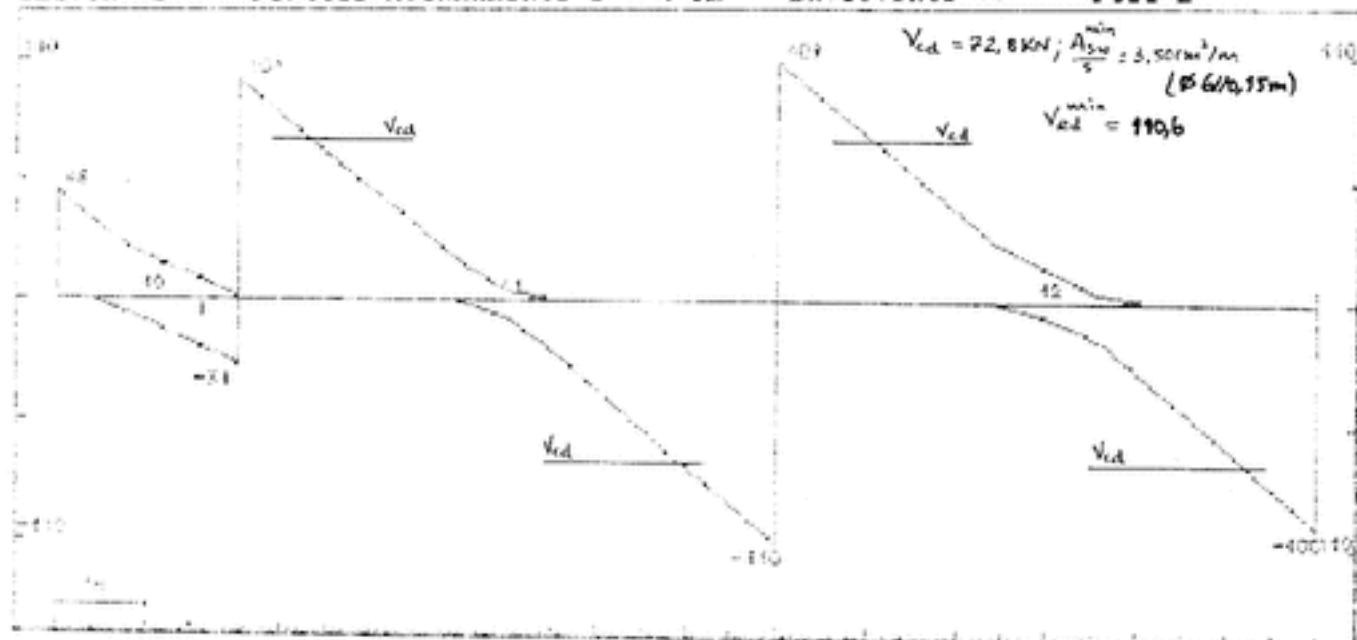
SECTOR B - Portico Alinhamento B - A/C - Envolvente MM - Piso 2



M_{d1} (kNm):	-35	-76	65	-104	70	-65
μ :	0,073	0,159	0,136	0,218	0,147	0,136
w :	0,079	0,185	0,155	0,266	0,168	0,155
A_s (cm ²):	3,37	7,91	6,63	11,38	7,21	6,63
Varões:	3ø12	2ø16+3ø12	4ø16	6ø16	4ø16	2ø16+2ø12



SECTOR B - Portico Alinhamento B - A/C - Envolvente UU - Piso 2



SECTOR B - Portico Alinhamento 9 - A/C

No. DE NOS	=	9	No. DE BARRAS	=	9
No. DE NOS POR BARRA	=	2	No. DE INCOGNITAS POR NO	=	3
No. DE APOIOS	=	2	No. DE SECCOES TIPO	=	4
No. DE PROPRIEDADES	=	3	TIPO DE SAIDA DE RESULTADOS=		1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.35000E+00
2	.29000E+08	.14582E+01	.35000E+00
3	.29000E+08	.50730E+00	.35000E+00
4	.29000E+08	.50000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 3	1	2	2 4	1	3	3 4	2
4	3 5	1	5	4 9	1	6	5 6	3
7	6 7	1	8	7 9	4	9	8 9	1

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	12.000	.000	3	.000	4.200
4	12.000	4.200	5	.000	8.100	6	6.000	8.100
7	6.000	9.100	8	10.250	9.100	9	12.000	9.100

NOS DE APOIO	CODIGO	NOS DE APOIO	CODIGO
1	1 1 1	2	1 1 1

PILARES

Volume de Material (m3)= 2.2295 Area de Cofragem (m2)= 25.4800

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 8.4541 Area de Cofragem (m2)= 42.1797

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
3	43.200	6	21.000
8	28.170	9	3.060

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
5		99.000	
8		112.910	
9		99.000	

 ACCAO 2

SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
3	24.000	8	13.600
9	.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
8		18.000	
9		18.000	

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
6	12.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
5		18.000	

ACCAO 4
SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			44.220
9			-.750

ACCAO 5
SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			64.050
9			-.500

ACCAO 6

VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			60.800
9			33.810

***** RESULTADOS *****

COMBINACAO 1
ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	103.816	311.305	98.838	-98.838	1110.536	-1110.536
2	-253.051	-400.505	-155.609	155.609	1327.391	-1327.391
3	-821.112	1080.511	-583.183	-626.417	-192.424	192.424
4	509.806	626.115	291.262	-291.262	527.353	-527.353
5	-680.006	-846.606	-311.553	311.553	700.975	-700.975
6	-626.115	-594.002	-351.853	54.853	291.264	-291.264
7	594.001	-302.735	291.266	-291.266	54.833	-54.833
8	302.736	495.939	-54.853	-321.077	291.268	-291.268
9	.000	350.667	196.365	-204.397	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	103.816	-1110.536	98.838
2	-253.051	-1327.391	-155.609

COMBINACAO 2
ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	112.305	322.384	103.497	-103.497	1002.201	-1002.201
2	-257.506	-415.613	-160.267	160.267	1300.727	-1300.727
3	-829.700	1052.613	-586.224	-623.376	-162.700	162.700
4	507.316	530.851	266.197	-266.197	415.977	-415.977
5	-637.000	-766.786	-286.487	286.487	677.351	-677.351
6	-530.851	-507.010	-267.477	78.477	266.198	-266.198
7	507.010	-240.810	266.200	-266.200	78.456	-78.456
8	240.810	416.119	-78.477	-297.453	266.201	-266.201
9	.000	350.667	196.365	-204.397	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	112.305	-1002.201	103.497
2	-257.506	-1300.727	-160.267

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	30.146	161.538	45.639	-45.639	859.859	-859.859
2	-177.704	-252.413	-102.409	102.409	969.668	-969.668
3	-504.166	750.498	-368.272	-409.328	-175.007	175.007
4	342.628	517.890	220.646	-220.646	491.587	-491.587
5	-498.086	-682.504	-240.937	240.937	560.341	-560.341
6	-517.890	-487.632	-316.087	19.087	220.648	-220.648
7	487.631	-266.982	220.650	-220.650	19.073	-19.073
8	266.982	379.087	-19.087	-234.443	220.651	-220.651
9	.000	303.417	169.365	-177.397	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	30.146	-859.859	45.639
2	-177.704	-969.668	-102.409

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000

SISMO 2(e2)-E2

.00000

VENTO

-W

.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	12.941	123.041	32.377	-32.377	598.099	-598.099
2	-169.445	-240.406	-97.584	97.584	729.826	-729.826
3	-416.961	586.215	-302.695	-330.905	-132.321	132.321
4	293.920	348.396	164.696	-164.696	295.404	-295.404
5	-345.809	-455.706	-163.574	163.574	398.921	-398.921
6	-348.396	-322.427	-189.204	34.404	164.698	-164.698
7	322.427	-157.729	164.699	-164.699	34.393	-34.393
8	157.729	240.828	-34.404	-167.256	164.701	-164.701
9	.000	214.878	120.110	-125.465	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.941	-598.099	32.377
2	-169.445	-729.826	-97.584

COMBINACAO 5

ACC.BASE E2

U.P.O.R.T.O

a

arquivo
central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	12.774	123.012	32.330	-32.330	597.935	-597.935
2	-169.648	-240.512	-97.657	97.657	729.990	-729.990
3	-416.421	586.698	-302.610	-330.990	-132.137	132.137
4	293.409	348.012	164.467	-164.467	295.325	-295.325
5	-346.187	-456.041	-163.720	163.720	399.000	-399.000
6	-348.012	-322.337	-189.125	34.325	164.469	-164.469
7	322.337	-157.868	164.470	-164.470	34.314	-34.314
8	157.868	241.163	-34.325	-167.335	164.471	-164.471
9	.000	214.878	120.110	-125.465	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.774	-597.935	32.330
2	-169.648	-729.990	-97.657

COMBINACAO 6

ACC.BASE (-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	162.066	246.283	97.226	-97.226	617.870	-617.870
2	-19.103	-115.387	-32.022	32.022	710.055	-710.055
3	-529.077	474.916	-321.313	-312.287	-66.794	66.794
4	282.794	356.887	164.021	-164.021	296.557	-296.557
5	-359.528	-449.683	-165.145	165.145	397.768	-397.768
6	-356.887	-320.854	-190.357	35.557	164.021	-164.021
7	320.855	-156.834	164.020	-164.020	35.546	-35.546
8	156.834	234.805	-35.557	-166.103	164.020	-164.020
9	.000	214.878	120.110	-125.465	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	162.066	-617.870	97.226
2	-19.103	-710.055	-32.022

COMBINACAO 7
ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	162.233	246.313	97.273	-97.273	618.035	-618.035
2	-18.900	-115.282	-31.948	31.948	709.890	-709.890
3	-529.617	474.433	-321.399	-312.201	-66.977	66.977
4	283.304	357.272	164.250	-164.250	296.636	-296.636
5	-359.151	-449.348	-165.000	165.000	397.689	-397.689
6	-357.272	-320.945	-190.436	35.636	164.251	-164.251
7	320.944	-156.695	164.250	-164.250	35.625	-35.625
8	156.695	234.470	-35.636	-166.024	164.250	-164.250
9	.000	214.878	120.110	-125.465	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	162.233	-618.035	97.273

2

-18.900

-709.890

-31.948

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-15.559	196.347	43.045	-43.045	977.560	-977.560
2	-335.442	-441.414	-184.966	184.966	1237.348	-1237.348
3	-618.458	1078.013	-501.704	-578.296	-200.487	200.487
4	422.111	527.657	243.530	-243.530	475.856	-475.856
5	-636.599	-805.246	-294.254	294.254	659.052	-659.052
6	-527.657	-529.278	-308.456	43.856	243.532	-243.532
7	529.278	-285.741	243.537	-243.537	43.838	-43.838
8	285.742	468.754	-43.856	-295.354	243.539	-243.539
9	.000	336.492	188.265	-196.297	.002	-.002

REACCOES NOS APOIOS

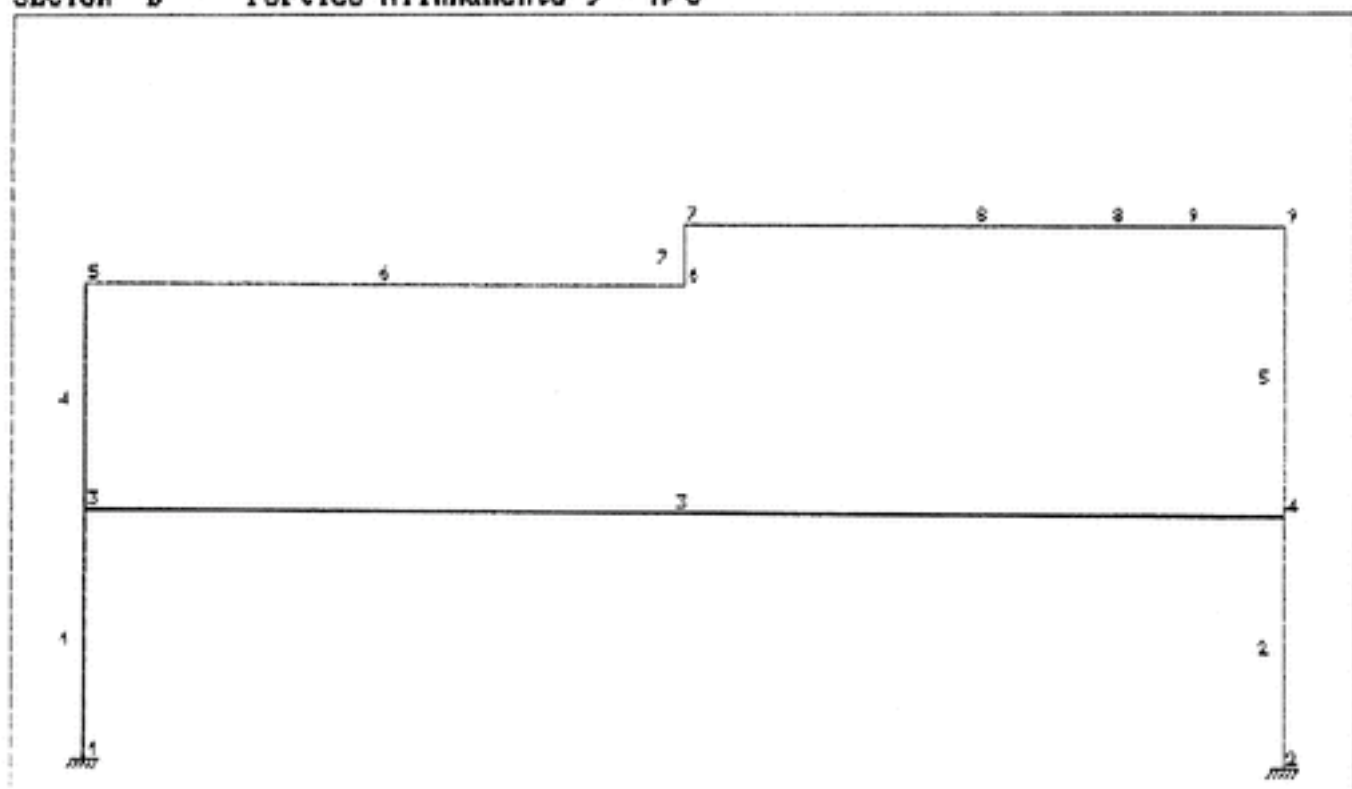
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-15.559	-977.560	43.045
2	-335.442	-1237.348	-184.966

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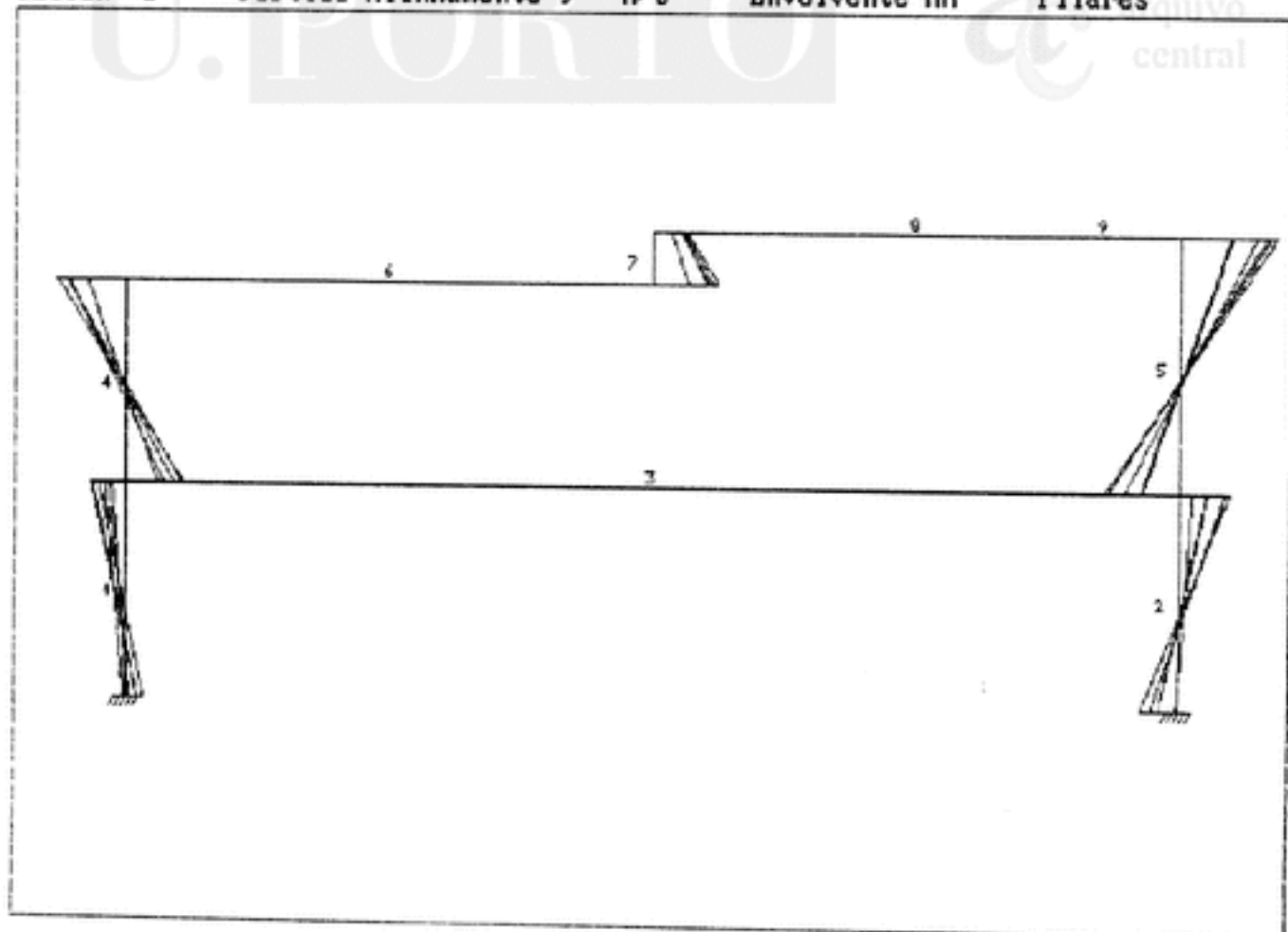
#####  #####  #  #
#          #      ## ##
#####  #      # # #
#          #      #  #
#          #####  #  #

```


SECTOR B - Portico Alinhamento 9 - A/C



SECTOR B - Portico Alinhamento 9 - A/C - Envolvente MM - Pilares



SECTOR B - Portico Alinhamento 10 - A/C

No. DE NOS	=	14	No. DE BARRAS	=	17
No. DE NOS POR BARRA	=	2	No. DE INCOGNITAS POR NO	=	3
No. DE APOIOS	=	6	No. DE SECCOES TIPO	=	6
No. DE PROPRIEDADES	=	3	TIPO DE SAIDA DE RESULTADOS	=	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.35000E+00
2	.29000E+08	.30000E+00	.50000E+00
3	.29000E+08	.16500E+01	.35000E+00
4	.29000E+08	.50730E+00	.35000E+00
5	.29000E+08	.50000E+00	.35000E+00
6	.29000E+08	.35000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 6	1	2	2 4	1	3	3 5	1
4	4 5	2	5	5 6	2	6	4 7	1
7	5 8	1	8	6 9	1	9	7 8	3
10	8 9	3	11	7 10	1	12	8 11	1
13	9 14	1	14	10 11	4	15	11 12	1
16	12 14	5	17	13 14	6			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	.000	2	.000	1.500	3	6.000	1.500
4	.000	6.500	5	6.000	6.500	6	12.000	6.500
7	.000	10.700	8	6.000	10.700	9	12.000	10.700
10	.000	14.600	11	6.000	14.600	12	6.000	15.600
13	10.250	15.600	14	12.000	15.600			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	4	0	0	1
5	0	0	1	6	0	0	1

PILARES

Volume de Material (m3)= 5.2430

Area de Cofragem (m2)= 59.9200

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 11.0597

Area de Cofragem (m2)= 60.0813

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	10.000	5	10.000
9	23.545	10	23.545
14	21.000	16	28.170
17	4.810		

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
9	.000	40.710	.000	6.000	10	40.710	.000	.000	6.000

***** CARGA 4 *****

BARRA	P (KN)	11 (m)	BARRA	P (KN)	11 (m)
9	9.105	3.000	10	9.105	3.000

***** CARGA 7 *****

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
10		67.500	
12		135.000	
13		112.910	
14		67.500	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****	
BARRA	P (KN/m)
4	.000
14	12.000

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
10	24.000	.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	11 (m)	BARRA	P (KN)	11 (m)
10	6.000	3.000			

***** CARGA 7 *****

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
13		18.000	
14		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

***** CARGA 1 *****			
BARRA	P (KN/m)	BARRA	P (KN/m)
5	.000	9	6.000
16	13.600	17	.000

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)	BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)
9	.000	24.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
9	6.000	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		9.000	

ACCAO 4
SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			-1.500
14			34.680

ACCAO 5
SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			3.950
14			28.040

ACCAO 6
VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			7.860
14			22.850

***** RESULTADOS *****

COMBINACAO 1

ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-2.193	-4.386	-1.012	1.012	731.740	-731.740
2	6.500	12.999	3.900	-3.900	520.366	-520.366
3	1.878	3.755	1.127	-1.127	1428.329	-1428.329
4	-33.322	47.053	-42.711	-47.289	.000	.000
5	-32.976	47.177	-42.633	-47.367	.000	.000
6	20.322	38.257	13.948	-13.948	477.654	-477.654
7	-17.833	-21.314	-9.321	9.321	1338.408	-1338.408
8	-42.791	-54.028	-23.052	23.052	684.373	-684.373
9	-166.506	335.749	-213.139	-366.618	-52.421	52.421
10	-340.005	206.910	-360.594	-219.164	-71.074	71.074
11	128.249	130.591	66.369	-66.369	264.515	-264.515
12	25.570	10.825	9.332	-9.332	611.196	-611.196
13	-152.882	-285.234	-89.411	89.411	465.210	-465.210
14	-130.591	122.999	-149.765	-147.235	66.369	-66.369
15	-133.825	209.526	75.702	-75.702	463.961	-463.961
16	-209.526	-69.453	-234.462	-141.469	75.701	-75.701
17	.000	354.687	196.365	-208.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-2.193	-731.740	-1.012
2	6.500	-520.366	3.900
3	1.878	-1428.329	1.127
4	.000	.000	10.048
5	.000	.000	-10.447
6	.000	.000	-22.040

COMBINACAO 2
ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.540	-3.080	-.711	.711	673.974	-673.974
2	7.548	15.095	4.529	-4.529	442.936	-442.936
3	.587	1.174	.352	-.352	1256.625	-1256.625

4	-29.640	45.865	-42.296	-47.704	.000	.000
5	-38.635	45.973	-43.777	-46.223	.000	.000
6	14.545	20.159	8.263	-8.263	400.641	-400.641
7	-8.404	-.659	-2.158	2.158	1165.144	-1165.144
8	-42.893	-60.134	-24.530	24.530	627.751	-627.751
9	-123.646	271.629	-149.182	-259.575	-50.162	50.162
10	-300.330	198.135	-355.444	-224.314	-58.508	58.508
11	103.487	124.371	58.425	-58.425	251.458	-251.458
12	29.360	-5.229	6.188	-6.188	550.126	-550.126
13	-138.001	-245.781	-78.323	78.323	403.438	-403.438
14	-124.371	114.122	-150.208	-146.792	58.425	-58.425
15	-108.893	173.506	64.613	-64.613	403.334	-403.334
16	-173.506	-108.906	-173.834	-79.696	64.613	-64.613
17	.000	354.687	196.365	-208.991	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.540	-673.974	-.711
2	7.548	-442.936	4.529
3	.587	-1256.625	.352
4	.000	.000	3.734
5	.000	.000	-2.510
6	.000	.000	-23.820

U. P. O. R. I. O

 COMBINACAO 3
 ACC.BASE Q2

arquivo
 central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-W

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-3.132	-6.264	-1.446	1.446	635.597	-635.597
2	5.629	11.259	3.378	-3.378	470.136	-470.136
3	3.054	6.107	1.832	-1.832	1228.202	-1228.202
4	-31.310	53.326	-41.331	-48.669	.000	.000
5	-32.217	42.944	-43.212	-46.788	.000	.000
6	20.051	43.323	15.089	-15.089	428.806	-428.806
7	-27.217	-41.844	-16.443	16.443	1136.321	-1136.321
8	-36.680	-35.018	-17.071	17.071	588.809	-588.809
9	-159.109	296.795	-218.399	-361.359	-38.633	38.633
10	-274.607	166.737	-252.889	-155.868	-68.509	68.509
11	115.786	93.736	53.723	-53.723	210.407	-210.407
12	19.655	32.728	13.432	-13.432	522.073	-522.073
13	-131.719	-264.520	-80.865	80.865	432.941	-432.941
14	-93.736	86.792	-95.657	-93.343	53.724	-53.724
15	-119.520	186.675	67.155	-67.155	428.730	-428.730
16	-186.675	-42.917	-226.230	-149.700	67.155	-67.155
17	.000	307.437	169.365	-181.991	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.132	-635.597	-1.446
2	5.629	-470.136	3.378
3	3.054	-1228.202	1.832
4	.000	.000	11.711
5	.000	.000	-18.275
6	.000	.000	-15.625

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.271	2.542	.587	-.587	453.752	-453.752
2	7.817	15.633	4.690	-4.690	264.792	-264.792
3	3.083	6.166	1.850	-1.850	807.053	-807.053
4	-2.552	47.590	-22.494	-37.506	.000	.000
5	-9.102	47.919	-23.530	-36.470	.000	.000
6	-13.082	-.733	-3.289	3.289	242.299	-242.299
7	-44.654	-46.868	-21.791	21.791	746.016	-746.016
8	-50.462	-53.221	-24.686	24.686	417.282	-417.282
9	-37.827	219.376	-103.639	-214.466	-23.303	23.303
10	-150.240	166.199	-181.548	-136.557	-34.938	34.938
11	38.560	39.504	20.016	-20.016	138.659	-138.659
12	-22.268	-17.349	-10.158	10.158	350.003	-350.003
13	-112.978	-190.219	-61.877	61.877	280.725	-280.725
14	-39.504	98.547	-67.559	-87.241	20.016	-20.016
15	-81.198	91.056	9.858	-9.858	262.762	-262.762
16	-91.056	-27.339	-120.562	-81.098	9.858	-9.858
17	.000	217.558	120.110	-128.527	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.271	-453.752	.587
2	7.817	-264.792	4.690
3	3.083	-807.053	1.850
4	.000	.000	-7.979
5	.000	.000	-23.641
6	.000	.000	-25.273

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000

SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO	-W .00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	1.119	2.239	.517	-.517	449.551	-449.551
2	7.646	15.291	4.587	-4.587	269.818	-269.818
3	2.935	5.871	1.761	-1.761	806.228	-806.228
4	-3.447	46.744	-22.784	-37.216	.000	.000
5	-10.029	46.888	-23.857	-36.143	.000	.000
6	-11.844	-.422	-2.920	2.920	247.034	-247.034
7	-42.586	-44.966	-20.846	20.846	745.155	-745.155
8	-49.127	-52.579	-24.216	24.216	413.408	-413.408
9	-45.996	213.811	-105.928	-212.177	-26.718	26.718
10	-155.273	159.230	-183.548	-134.557	-41.160	41.160
11	46.419	46.399	23.799	-23.799	141.106	-141.106
12	-13.572	-11.408	-6.405	6.405	349.431	-349.431
13	-106.651	-184.671	-59.453	59.453	278.851	-278.851
14	-46.399	90.765	-70.006	-84.794	23.798	-23.798
15	-79.357	96.750	17.394	-17.394	264.636	-264.636
16	-96.751	-32.887	-122.436	-79.224	17.394	-17.394
17	.000	217.558	120.110	-128.527	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.119	-449.551	.517
2	7.646	-269.818	4.587
3	2.935	-806.228	1.761
4	.000	.000	-7.508
5	.000	.000	-22.607
6	.000	.000	-24.732

 COMBINACAO 6
 ACC.BASE (-E1)

ACCAO PERMANENTES-G	COEFICIENTE 1.00000	ACCAO SOBRECARGA1-Q1	COEFICIENTE .40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO	-W .00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-6.270	-12.540	-2.894	2.894	384.345	-384.345
2	-1.234	-2.468	-.741	.741	342.854	-342.854
3	-1.829	-3.658	-1.097	1.097	798.397	-798.397
4	-48.633	10.129	-36.417	-23.583	.000	.000
5	-48.241	-1.406	-38.274	-21.726	.000	.000
6	51.101	55.952	25.489	-25.489	306.437	-306.437
7	41.770	39.559	19.364	-19.364	736.541	-736.541
8	13.946	6.689	4.913	-4.913	362.620	-362.620
9	-171.759	126.461	-141.447	-176.658	-33.251	33.251

10	-237.376	44.990	-216.272	-101.833	-44.570	44.570
11	115.808	113.270	58.738	-58.738	164.990	-164.990
12	71.355	48.315	30.685	-30.685	343.611	-343.611
13	-51.678	-131.602	-37.404	37.404	260.787	-260.787
14	-113.270	14.332	-93.890	-60.910	58.739	-58.739
15	-62.646	152.070	89.423	-89.423	282.701	-282.701
16	-152.070	-85.956	-140.501	-61.159	89.423	-89.423
17	.000	217.558	120.110	-128.527	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-6.270	-384.345	-2.894
2	-1.234	-342.854	-.741
3	-1.829	-798.397	-1.097
4	.000	.000	26.229
5	.000	.000	20.461
6	.000	.000	7.807

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-6.118	-12.236	-2.824	2.824	388.546	-388.546
2	-1.063	-2.126	-.638	.638	337.829	-337.829
3	-1.681	-3.363	-1.009	1.009	799.222	-799.222
4	-47.737	10.975	-36.127	-23.873	.000	.000
5	-47.314	-.375	-37.948	-22.052	.000	.000
6	49.863	55.641	25.120	-25.120	301.702	-301.702
7	39.701	37.657	18.419	-18.419	737.402	-737.402
8	12.611	6.047	4.443	-4.443	366.494	-366.494
9	-163.590	132.027	-139.158	-178.947	-29.837	29.837
10	-232.343	51.959	-214.271	-103.834	-38.348	38.348
11	107.949	106.375	54.955	-54.955	162.544	-162.544
12	62.659	42.374	26.931	-26.931	344.184	-344.184
13	-58.006	-137.151	-39.828	39.828	262.661	-262.661
14	-106.375	22.114	-91.444	-63.356	54.956	-54.956
15	-64.488	146.375	81.887	-81.887	280.827	-280.827
16	-146.375	-80.407	-138.627	-63.033	81.887	-81.887
17	.000	217.558	120.110	-128.527	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-6.118	-388.546	-2.824
2	-1.063	-337.829	-.638
3	-1.681	-799.222	-1.009
4	.000	.000	25.758

5	.000	.000	19.428
6	.000	.000	7.266

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

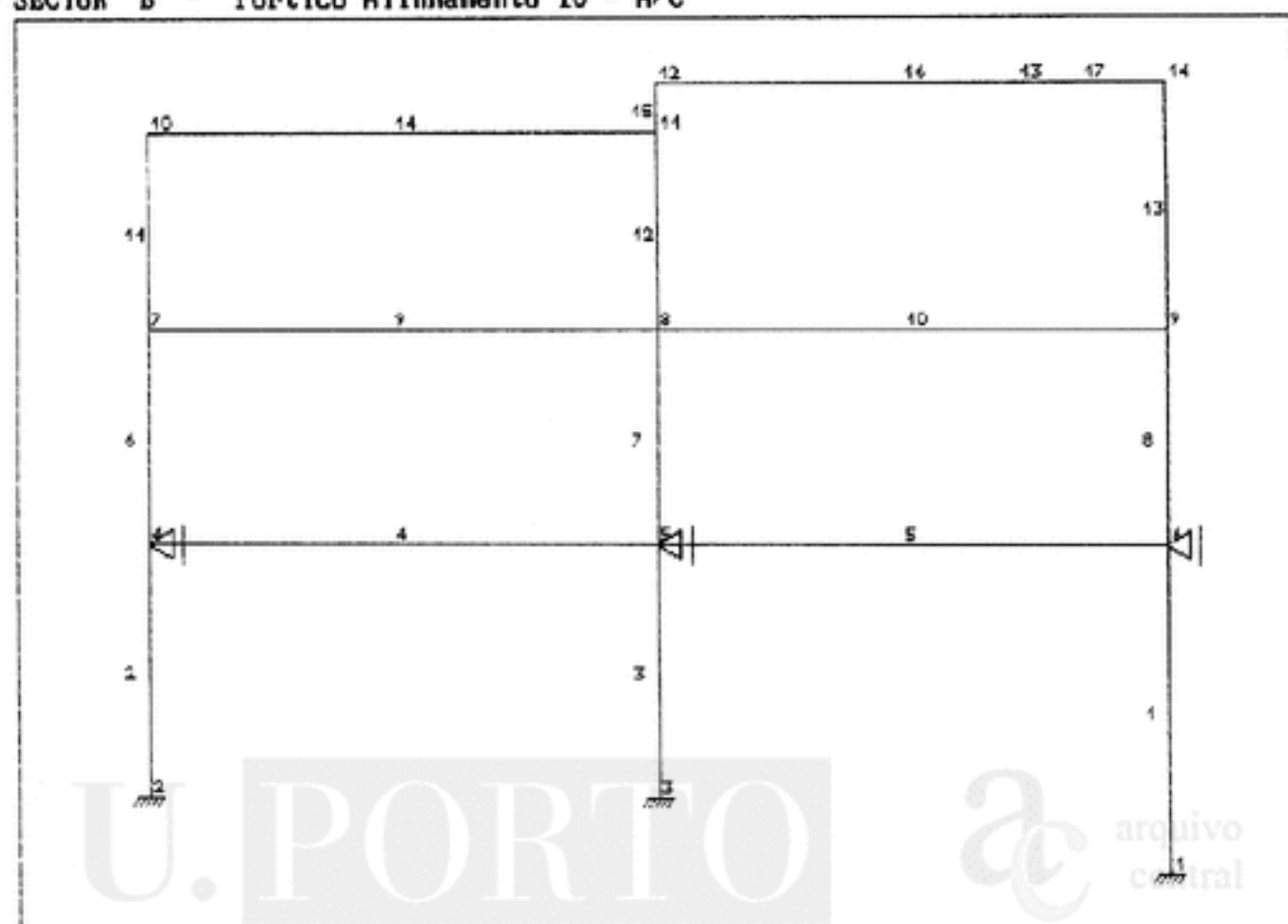
BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-.202	-.404	-.093	.093	701.799	-701.799
2	9.057	18.114	5.434	-5.434	464.121	-464.121
3	3.146	6.292	1.888	-1.888	1318.494	-1318.494
4	-18.890	58.801	-38.348	-51.652	.000	.000
5	-23.810	59.091	-39.120	-50.880	.000	.000
6	.776	17.882	4.442	-4.442	425.773	-425.773
7	-41.283	-44.912	-20.523	20.523	1227.723	-1227.723
8	-58.687	-67.237	-29.982	29.982	650.919	-650.919
9	-120.171	326.616	-186.689	-341.769	-48.172	48.172
10	-287.857	220.950	-318.512	-209.945	-70.081	70.081
11	102.289	102.916	52.617	-52.617	239.085	-239.085
12	6.153	-.754	-1.384	-1.384	567.442	-567.442
13	-153.713	-278.835	-88.275	88.275	440.974	-440.974
14	-102.916	126.408	-128.385	-136.215	52.617	-52.617
15	-125.654	179.654	54.001	-54.001	431.227	-431.227
16	-179.654	-61.677	-209.827	-129.383	54.001	-54.001
17	.000	340.512	188.265	-200.891	.000	.000

REACOES NOS APOIOS

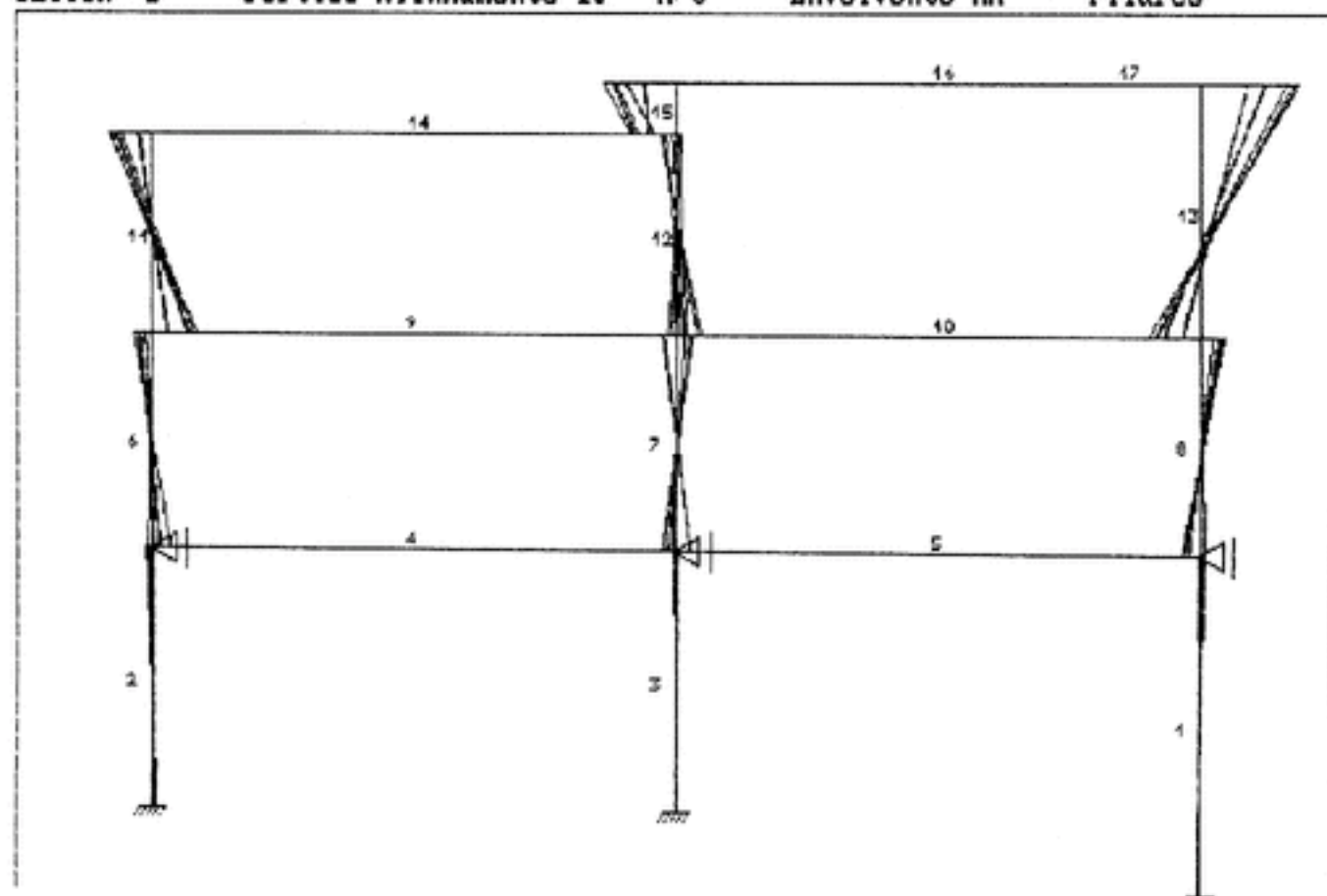
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-.202	-701.799	-.093
2	9.057	-464.121	5.434
3	3.146	-1318.494	1.888
4	.000	.000	-.992
5	.000	.000	-22.410
6	.000	.000	-29.889

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#####  #####  #  #
#          #  ##  ##
#####  #  #  #
#          #  #  #
#          #####  #  #
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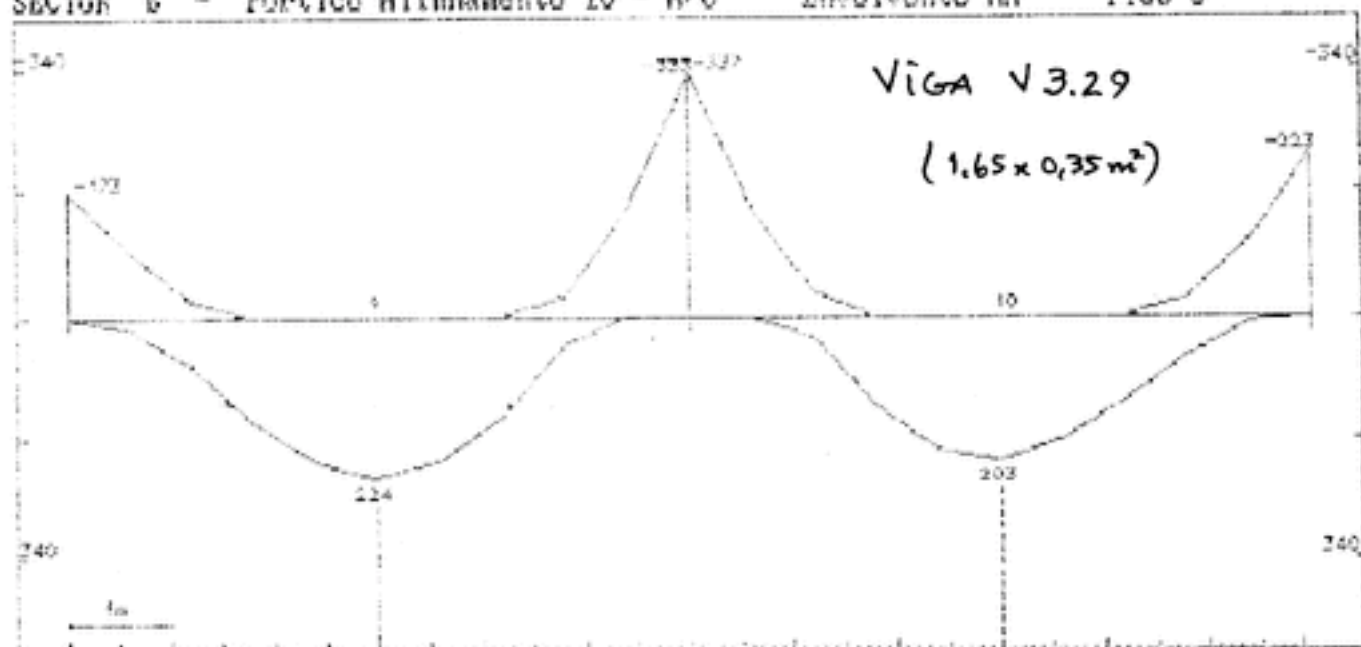
SECTOR B - Portico Alinhamento 10 - A/C



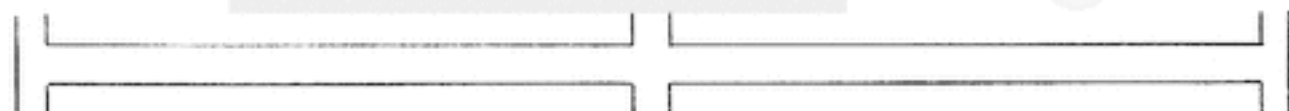
SECTOR B - Portico Alinhamento 10 - A/C - Envoltura MM - Pilares



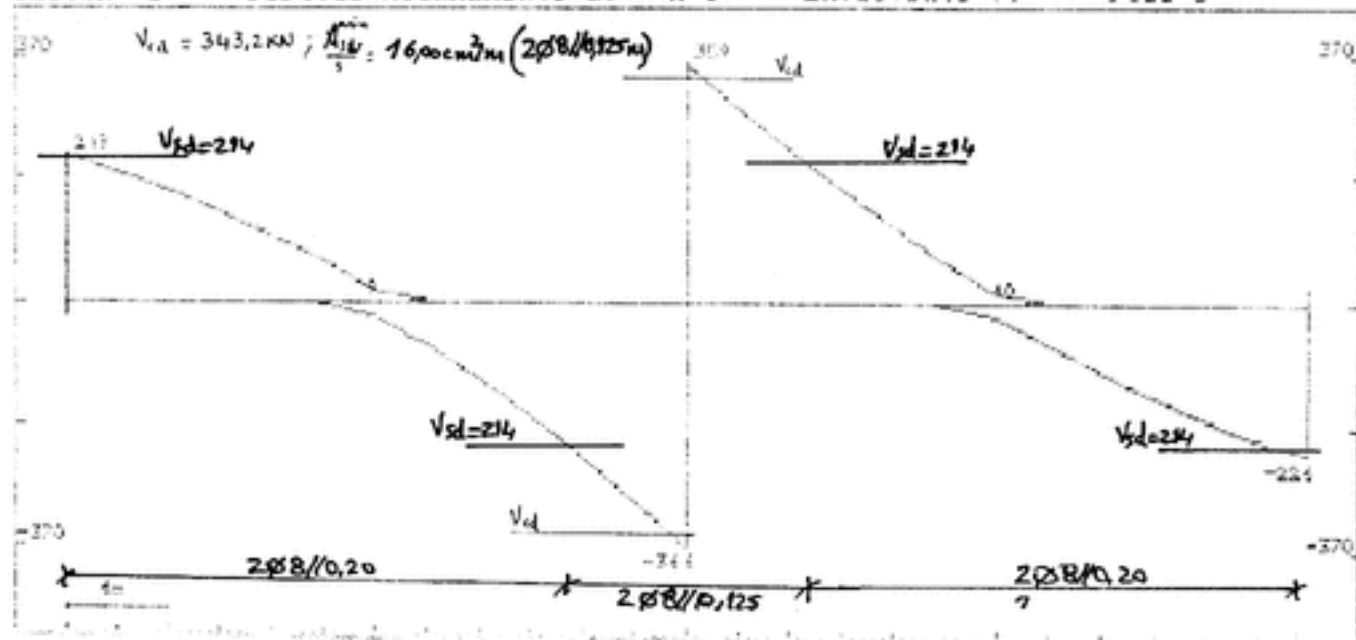
SECTOR B - Portico Alinhamento 10 - A/C - Envolvente NH - Piso 3



$M_{sd}(kNm)$:	-164	224	-311	203	-207
μ :	0,073	0,400	0,138	0,090	0,092
w :	0,078	0,110	0,153	0,098	0,101
$A_s(cm^2)$:	15,80	22,12	31,79	19,88	20,30
Varões:	4Ø20+4Ø16	5Ø16+4Ø20	10Ø20	5Ø16+4Ø20	4Ø20+4Ø16



SECTOR B - Portico Alinhamento 10 - A/C - Envolvente UV - Piso 3



SECTOR B - Portico Alinhamento 11 - A/C

No. DE NOS	= 14	No. DE BARRAS	= 17
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 6	No. DE SECCOES TIPO	= 6
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.35000E+00
2	.29000E+08	.25000E+00	.40000E+00
3	.29000E+08	.14582E+01	.35000E+00
4	.29000E+08	.50730E+00	.35000E+00
5	.29000E+08	.50000E+00	.35000E+00
6	.29000E+08	.35000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 6	1	2	2 4	1	3	3 5	1
4	4 5	2	5	5 6	2	6	4 7	1
7	5 8	1	8	6 9	1	9	7 8	3
10	8 9	3	11	7 10	1	12	8 11	1
13	9 14	1	14	10 11	4	15	11 12	1
16	12 14	5	17	13 14	6			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	12.000	.000	2	.000	1.500	3	6.000	1.500
4	.000	6.500	5	6.000	6.500	6	12.000	6.500
7	.000	10.700	8	6.000	10.700	9	12.000	10.700
10	.000	14.600	11	6.000	14.600	12	6.000	15.600
13	10.250	15.600	14	12.000	15.600			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	4	0	0	1
5	0	0	1	6	0	0	1

PILARES

Volume de Material (m3)= 5.2430 Area de Cofragem (m2)= 59.9200

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 9.6541 Area de Cofragem (m2)= 54.7797

ACCAO 1
PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	10.000	5	10.000
9	43.200	10	43.200
14	21.000	16	28.170
17	4.810		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		67.500	
12		135.000	
13		112.910	
14		67.500	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	.000	10	24.000
14	12.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
13		18.000	
14		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
5	.000	9	24.000
16	13.600	17	.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		9.000	

 ACCAO 4
 SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			5.990
14			25.720

 ACCAO 5

SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			5.440
14			27.000

ACCAO 6
VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			7.860
14			22.850

***** RESULTADOS *****

COMBINACAO 1
ACC.BASE Q1+Q2

U. P. O. P. O.

arquivo central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-1.216	-2.431	-.561	.561	794.631	-794.631
2	6.844	13.689	4.107	-4.107	584.067	-584.067
3	2.989	5.978	1.793	-1.793	1351.823	-1351.823
4	-37.146	49.429	-42.953	-47.047	.000	.000
5	-38.201	47.739	-43.410	-46.590	.000	.000
6	23.457	45.265	16.362	-16.362	541.114	-541.114
7	-17.206	-22.032	-9.342	9.342	1261.365	-1261.365
8	-45.308	-61.569	-25.447	25.447	748.041	-748.041
9	-180.026	333.711	-276.786	-328.014	-51.723	51.723
10	-336.128	219.461	-321.845	-282.956	-69.794	69.794
11	134.761	130.774	68.086	-68.086	264.328	-264.328
12	24.450	9.595	8.729	-8.729	611.507	-611.507
13	-157.892	-285.681	-90.525	90.525	465.086	-465.086
14	-130.774	124.307	-149.578	-147.422	68.086	-68.086
15	-133.901	210.716	76.815	-76.815	464.084	-464.084
16	-210.716	-69.005	-234.585	-141.345	76.815	-76.815
17	.000	354.687	196.365	-208.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.216	-794.631	-.561
2	6.844	-584.067	4.107
3	2.989	-1351.823	1.793
4	.000	.000	12.256
5	.000	.000	-11.136
6	.000	.000	-24.886

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-.610	-1.221	-.282	.282	737.776	-737.776
2	8.891	17.782	5.335	-5.335	467.013	-467.013
3	.641	1.282	.385	-.385	1173.832	-1173.832
4	-35.042	47.628	-42.902	-47.098	.000	.000
5	-42.618	46.107	-44.418	-45.582	.000	.000
6	17.260	21.033	9.117	-9.117	424.111	-424.111
7	-6.292	3.637	-.632	.632	1082.315	-1082.315
8	-44.887	-68.143	-26.912	26.912	692.194	-692.194
9	-124.124	253.988	-172.756	-216.044	-49.055	49.055
10	-291.390	211.648	-315.690	-289.110	-57.247	57.247
11	103.091	123.784	58.173	-58.173	251.355	-251.355
12	33.766	-4.281	7.560	-7.560	550.581	-550.581
13	-143.505	-245.767	-79.443	79.443	403.085	-403.085
14	-123.784	114.157	-150.105	-146.895	58.173	-58.173
15	-109.876	175.609	65.733	-65.733	403.685	-403.685
16	-175.609	-108.920	-174.186	-79.344	65.733	-65.733
17	.000	354.687	196.365	-208.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-.610	-737.776	-.282
2	8.891	-467.013	5.335
3	.641	-1173.832	.385
4	.000	.000	3.783
5	.000	.000	-1.017
6	.000	.000	-26.630

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
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PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-W .60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.074	-6.149	-1.419	1.419	659.013	-659.013
2	6.105	12.211	3.663	-3.663	534.957	-534.957
3	5.239	10.477	3.143	-3.143	1145.050	-1145.050
4	-35.029	54.200	-41.805	-48.195	.000	.000
5	-36.627	45.168	-43.576	-46.424	.000	.000
6	22.818	50.793	17.527	-17.527	493.153	-493.153
7	-28.051	-47.660	-18.026	18.026	1053.278	-1053.278
8	-39.019	-36.275	-17.927	17.927	612.589	-612.589
9	-174.129	288.889	-283.273	-321.527	-38.079	38.079
10	-254.930	166.995	-209.056	-179.744	-67.355	67.355
11	123.336	93.528	55.606	-55.606	209.879	-209.879
12	13.701	30.177	11.251	-11.251	522.696	-522.696
13	-130.720	-264.056	-80.567	80.567	432.845	-432.845
14	-93.528	89.752	-95.129	-93.871	55.606	-55.606
15	-119.929	186.785	66.857	-66.857	428.825	-428.825
16	-186.785	-43.381	-226.326	-149.604	66.857	-66.857
17	.000	307.437	169.365	-181.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.074	-659.013	-1.419
2	6.105	-534.957	3.663
3	5.239	-1145.050	3.143
4	.000	.000	13.863
5	.000	.000	-21.170
6	.000	.000	-16.508

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	2.952	5.904	1.362	-1.362	473.709	-473.709
2	10.104	20.208	6.062	-6.062	299.439	-299.439
3	5.640	11.280	3.384	-3.384	749.839	-749.839
4	-11.118	44.915	-24.367	-35.633	.000	.000
5	-15.352	43.046	-25.384	-34.616	.000	.000
6	-9.090	1.172	-1.885	1.885	275.072	-275.072
7	-40.844	-46.256	-20.738	20.738	688.821	-688.821
8	-48.950	-55.815	-24.944	24.944	439.093	-439.093

9	-52.864	202.727	-133.423	-183.377	-27.514	27.514
10	-145.315	160.987	-155.788	-161.012	-42.772	42.772
11	51.692	48.261	25.629	-25.629	141.649	-141.649
12	-11.155	-10.212	-5.479	5.479	349.656	-349.656
13	-105.172	-182.607	-58.730	58.730	278.082	-278.082
14	-48.261	89.366	-70.549	-84.251	25.628	-25.628
15	-79.154	99.305	20.151	-20.151	265.405	-265.405
16	-99.305	-34.951	-123.206	-78.454	20.151	-20.151
17	.000	217.558	120.110	-128.527	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	2.952	-473.709	1.362
2	10.104	-299.439	6.062
3	5.640	-749.839	3.384
4	.000	.000	-7.948
5	.000	.000	-24.122
6	.000	.000	-26.306

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	3.088	6.176	1.425	-1.425	474.725	-474.725
2	10.262	20.525	6.157	-6.157	298.261	-298.261
3	5.767	11.533	3.460	-3.460	750.001	-750.001
4	-10.737	45.268	-24.245	-35.755	.000	.000
5	-14.980	43.463	-25.253	-34.747	.000	.000
6	-9.787	.596	-2.188	2.188	274.016	-274.016
7	-41.822	-47.281	-21.215	21.215	688.993	-688.993
8	-49.639	-56.449	-25.259	25.259	439.978	-439.978
9	-50.842	204.145	-132.849	-183.951	-27.098	27.098
10	-144.000	162.779	-155.270	-161.530	-42.088	42.088
11	50.245	46.907	24.911	-24.911	141.167	-141.167
12	-12.864	-11.408	-6.224	6.224	349.772	-349.772
13	-106.330	-183.688	-59.187	59.187	278.448	-278.448
14	-46.907	90.906	-70.067	-84.733	24.910	-24.910
15	-79.498	98.186	18.688	-18.688	265.039	-265.039
16	-98.186	-33.870	-122.839	-78.821	18.688	-18.688
17	.000	217.558	120.110	-128.527	.001	-.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	3.088	-474.725	1.425
2	10.262	-298.261	6.157
3	5.767	-750.001	3.460

4	.000	.000	-8.346
5	.000	.000	-24.675
6	.000	.000	-26.684

 COMBINACAO 6
 ACC.BASE (-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO	-W .00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-8.536	-17.071	-3.940	3.940	418.043	-418.043
2	-3.421	-6.843	-2.053	2.053	361.739	-361.739
3	-4.274	-8.549	-2.565	2.565	743.204	-743.204
4	-43.338	15.904	-34.572	-25.428	.000	.000
5	-45.643	8.295	-36.225	-23.775	.000	.000
6	50.181	59.409	26.093	-26.093	327.167	-327.167
7	38.287	38.807	18.356	-18.356	681.552	-681.552
8	8.776	4.324	3.119	-3.119	394.268	-394.268
9	-165.725	122.717	-165.568	-151.232	-27.825	27.825
10	-220.923	57.691	-185.605	-131.195	-35.082	35.082
11	106.316	103.963	53.918	-53.918	161.599	-161.599
12	59.399	40.484	25.611	-25.611	344.715	-344.715
13	-62.015	-138.631	-40.948	40.948	263.073	-263.073
14	-103.963	25.368	-90.499	-64.301	53.918	-53.918
15	-65.852	145.379	79.527	-79.527	280.414	-280.414
16	-145.379	-78.927	-138.214	-63.446	79.527	-79.527
17	.000	217.558	120.110	-128.527	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-8.536	-418.043	-3.940
2	-3.421	-361.739	-2.053
3	-4.274	-743.204	-2.565
4	.000	.000	28.146
5	.000	.000	20.920
6	.000	.000	7.058

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO	-W .00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-8.672	-17.344	-4.002	4.002	417.027	-417.027
2	-3.580	-7.159	-2.148	2.148	362.918	-362.918
3	-4.401	-8.801	-2.640	2.640	743.042	-743.042
4	-43.719	15.551	-34.695	-25.305	.000	.000
5	-46.015	7.879	-36.356	-23.644	.000	.000
6	50.878	59.985	26.396	-26.396	328.223	-328.223
7	39.265	39.832	18.833	-18.833	681.381	-681.381
8	9.465	4.958	3.434	-3.434	393.383	-393.383
9	-167.747	121.298	-166.142	-150.659	-28.240	28.240
10	-222.238	55.899	-186.123	-130.677	-35.766	35.766
11	107.762	105.317	54.636	-54.636	162.082	-162.082
12	61.108	41.680	26.356	-26.356	344.599	-344.599
13	-60.857	-137.550	-40.491	40.491	262.706	-262.706
14	-105.317	23.827	-90.982	-63.818	54.636	-54.636
15	-65.508	146.498	80.990	-80.990	280.781	-280.781
16	-146.498	-80.008	-138.581	-63.079	80.991	-80.991
17	.000	217.558	120.110	-128.527	-.001	.001

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-8.672	-417.027	-4.002
2	-3.580	-362.918	-2.148
3	-4.401	-743.042	-2.640
4	.000	.000	28.544
5	.000	.000	21.473
6	.000	.000	7.436

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-W

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	1.739	3.477	.802	-.802	752.388	-752.388
2	11.162	22.324	6.697	-6.697	516.945	-516.945
3	5.818	11.636	3.491	-3.491	1238.167	-1238.167
4	-26.537	58.715	-39.637	-50.363	.000	.000
5	-30.294	56.544	-40.625	-49.375	.000	.000
6	4.213	22.564	6.376	-6.376	477.308	-477.308
7	-40.056	-46.651	-20.645	20.645	1147.179	-1147.179
8	-60.022	-73.530	-31.798	31.798	703.013	-703.013
9	-129.994	318.699	-238.549	-301.451	-47.477	47.477
10	-277.179	230.305	-277.812	-262.188	-68.917	68.917
11	107.430	102.600	53.854	-53.854	238.759	-238.759
12	5.131	-2.022	.797	-.797	567.916	-567.916
13	-156.774	-278.963	-88.926	88.926	440.825	-440.825
14	-102.600	128.047	-128.059	-136.541	53.854	-53.854

15	-126.024	180.676	54.652	-54.652	431.375	-431.375
16	-180.675	-61.549	-209.976	-129.234	54.652	-54.652
17	.000	340.512	188.265	-200.891	-.001	.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.739	-752.388	.802
2	11.162	-516.945	6.697
3	5.818	-1238.167	3.491
4	.000	.000	-.322
5	.000	.000	-24.135
6	.000	.000	-32.600

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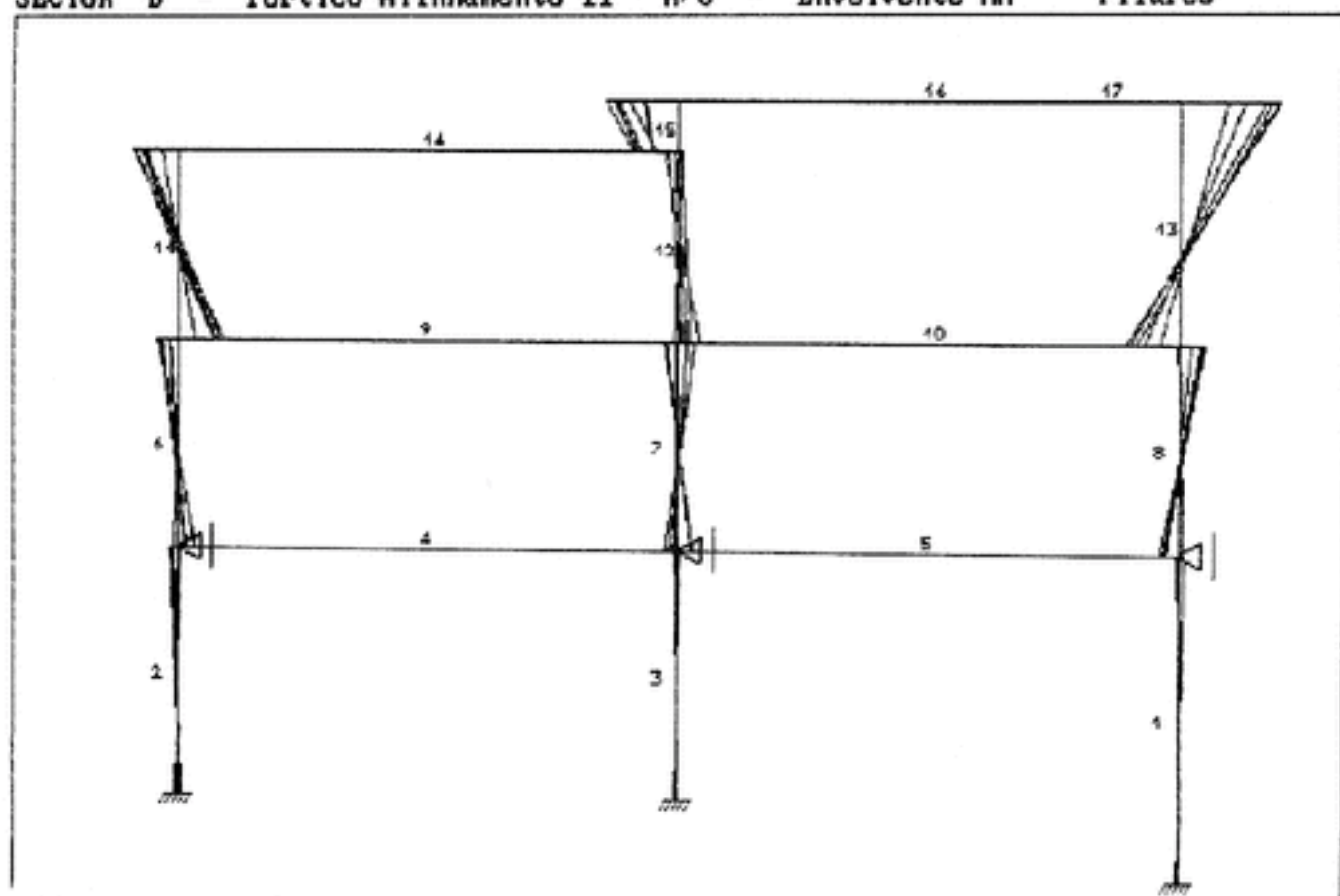
U. PORTO


 arquivo
central

SECTOR B - Portico Alinhamento 11 - A/C



SECTOR B - Portico Alinhamento 11 - A/C - Envolvente MM - Pilares



SECTOR B - Portico Alinhamento 12 - A/C

No. DE NOS	= 14	No. DE BARRAS	= 17
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 6	No. DE SECCOES TIPO	= 6
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.35000E+00	.35000E+00
2	.29000E+08	.10000E+01	.10000E-05
3	.29000E+08	.14582E+01	.35000E+00
4	.29000E+08	.50730E+00	.35000E+00
5	.29000E+08	.50000E+00	.35000E+00
6	.29000E+08	.35000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	1	2	2 5	1	3	3 6	1
4	4 5	2	5	5 6	2	6	4 7	1
7	5 8	1	8	6 9	1	9	7 8	3
10	8 9	3	11	7 10	1	12	8 11	1
13	9 14	1	14	10 11	4	15	11 12	1
16	12 14	5	17	13 14	6			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	6.000	.000	3	12.000	.000
4	.000	5.000	5	6.000	5.000	6	12.000	5.000
7	.000	9.200	8	6.000	9.200	9	12.000	9.200
10	.000	13.100	11	6.000	13.100	12	6.000	14.100
13	10.250	14.100	14	12.000	14.100			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	4	0	0	1
5	0	0	1	6	0	0	1

PILARES

Volume de Material (m3)= 5.0592 Area de Cofragem (m2)= 57.8200

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 8.4542 Area de Cofragem (m2)= 54.1797

 ACCAO 1
 PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
9	43.200	10	43.200
14	21.000	16	28.170
17	4.810		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
10		67.500	
12		135.000	
13		112.910	
14		67.500	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
10	24.000	14	12.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
13		18.000	
14		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
9	24.000	16	13.600
17	.000		

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
10		9.000	

 ACCAO 4
 SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
9			34.280
14			41.070

 ACCAO 5
 SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			18.400
14			63.610

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			-10.940
14			38.030

RESULTADOS

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.430	-2.859	-.858	.858	536.038	-536.038
2	6.307	12.615	3.784	-3.784	1264.201	-1264.201
3	10.447	20.894	6.268	-6.268	750.283	-750.283
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	2.859	36.661	9.410	-9.410	536.038	-536.038
7	-12.615	-21.638	-8.155	8.155	1264.200	-1264.200
8	-20.894	-52.634	-17.507	17.507	750.283	-750.283
9	-167.069	339.697	-273.629	-331.171	-56.207	56.207
10	-334.014	218.907	-321.584	-283.216	-69.423	69.423
11	130.408	125.500	65.617	-65.617	262.409	-262.409
12	15.955	3.775	5.059	-5.059	611.445	-611.445
13	-166.273	-291.849	-93.494	93.494	467.067	-467.067
14	-125.500	130.544	-147.659	-149.341	65.617	-65.617
15	-134.319	204.995	70.676	-70.676	462.102	-462.102
16	-204.995	-62.838	-232.604	-143.326	70.676	-70.676
17	.000	354.687	196.365	-208.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO	VERTICAL	HORIZONTAL
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	(KN.m)	(KN)	(KN)
1	-1.430	-536.038	-.858
2	6.307	-1264.201	3.784
3	10.447	-750.283	6.268
4	.000	.000	10.267
5	.000	.000	-11.940
6	.000	.000	-23.775

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	.811	1.621	.486	-.486	419.141	-419.141
2	2.173	4.347	1.304	-1.304	1085.163	-1085.163
3	10.448	20.896	6.269	-6.269	694.317	-694.317
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	-1.621	13.692	2.874	-2.874	419.141	-419.141
7	-4.347	3.639	-.169	.169	1085.163	-1085.163
8	-20.896	-58.729	-18.958	18.958	694.317	-694.317
9	-112.047	260.112	-169.723	-219.077	-52.709	52.709
10	-289.302	210.604	-315.516	-289.284	-56.870	56.870
11	98.355	118.419	55.583	-55.583	249.419	-249.419
12	25.551	-9.985	3.991	-3.991	550.570	-550.570
13	-151.875	-251.848	-82.392	82.392	405.033	-405.033
14	-118.419	120.408	-148.168	-148.832	55.583	-55.583
15	-110.424	169.998	59.574	-59.574	401.736	-401.736
16	-169.998	-102.839	-172.238	-81.292	59.574	-59.574
17	.000	354.687	196.365	-208.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	.811	-419.141	.486
2	2.173	-1085.163	1.304
3	10.448	-694.317	6.269
4	.000	.000	2.388
5	.000	.000	-1.473
6	.000	.000	-25.227

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000

SISMO 2(e2)-E2

.00000

VENTO

-W

.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.277	-2.553	-.766	.766	487.841	-487.841
2	10.442	20.884	6.265	-6.265	1056.349	-1056.349
3	8.045	16.091	4.827	-4.827	614.832	-614.832
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	2.553	41.571	10.506	-10.506	487.841	-487.841
7	-20.884	-46.944	-16.149	16.149	1056.349	-1056.349
8	-16.091	-28.466	-10.609	10.609	614.832	-614.832
9	-160.500	295.195	-279.951	-324.849	-42.576	42.576
10	-253.255	167.133	-208.754	-180.046	-66.239	66.239
11	118.928	88.093	53.083	-53.083	207.890	-207.890
12	5.003	24.289	7.511	-7.511	522.746	-522.746
13	-138.667	-270.048	-83.411	83.411	434.785	-434.785
14	-88.093	96.254	-93.140	-95.860	53.083	-53.083
15	-120.543	181.136	60.593	-60.593	426.884	-426.884
16	-181.136	-37.388	-224.386	-151.544	60.594	-60.594
17	.000	307.437	169.365	-181.991	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.277	-487.841	-.766
2	10.442	-1056.349	6.265
3	8.045	-614.832	4.827
4	.000	.000	11.272
5	.000	.000	-22.415
6	.000	.000	-15.436

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	28.916	57.831	17.349	-17.349	249.329	-249.329
2	35.690	71.381	21.414	-21.414	692.476	-692.476
3	35.195	70.391	21.117	-21.117	461.182	-461.182
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	-57.831	-59.019	-27.821	27.821	249.329	-249.329
7	-71.381	-110.082	-43.205	43.205	692.476	-692.476
8	-70.391	-105.967	-41.990	41.990	461.182	-461.182
9	17.606	248.524	-114.045	-202.755	-46.402	46.402
10	-102.782	221.411	-138.628	-178.172	-73.158	73.158

11	41.413	31.052	18.581	-18.581	135.284	-135.284
12	-35.660	-28.533	-16.460	16.460	351.093	-351.093
13	-115.445	-196.811	-63.726	63.726	283.011	-283.011
14	-31.052	110.346	-64.184	-90.616	18.581	-18.581
15	-81.813	83.933	2.121	-2.121	260.476	-260.476
16	-83.933	-20.747	-118.277	-83.383	2.122	-2.122
17	.000	217.558	120.110	-128.528	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	28.916	-249.329	17.349
2	35.690	-692.476	21.414
3	35.195	-461.182	21.117
4	.000	.000	-45.171
5	.000	.000	-64.620
6	.000	.000	-63.107

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	31.973	63.947	19.184	-19.184	232.258	-232.258
2	39.498	78.995	23.699	-23.699	695.369	-695.369
3	38.392	76.785	23.035	-23.035	475.361	-475.361
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	-63.947	-63.988	-30.461	30.461	232.258	-232.258
7	-78.995	-120.774	-47.564	47.564	695.368	-695.368
8	-76.785	-112.135	-44.981	44.981	475.361	-475.361
9	48.464	269.661	-105.379	-211.421	-36.346	36.346
10	-83.278	248.436	-130.874	-185.926	-54.475	54.475
11	15.524	7.432	5.886	-5.886	126.879	-126.879
12	-65.609	-49.236	-29.448	29.448	353.074	-353.074
13	-136.301	-215.782	-71.854	71.854	289.435	-289.435
14	-7.432	137.158	-55.779	-99.021	5.886	-5.886
15	-87.922	64.360	-23.561	23.561	254.052	-254.052
16	-64.361	-1.776	-111.853	-89.807	-23.559	23.559
17	.000	217.558	120.110	-128.528	-.002	.002

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	31.973	-232.258	19.184
2	39.498	-695.369	23.699
3	38.392	-475.361	23.035
4	.000	.000	-49.645
5	.000	.000	-71.263

6

.000

.000

-68.016

 COMBINACAO 6
 ACC.BASE (-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-35.201	-70.403	-21.121	21.121	351.336	-351.336
2	-34.470	-68.940	-20.682	20.682	680.944	-680.944
3	-29.619	-59.237	-17.771	17.771	370.708	-370.708
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	70.403	107.875	42.447	-42.447	351.336	-351.336
7	68.940	102.436	40.804	-40.804	680.944	-680.944
8	59.237	65.779	29.766	-29.766	370.708	-370.708
9	-227.747	79.996	-183.025	-133.775	-19.646	19.646
10	-265.898	-10.862	-204.527	-112.273	-15.199	15.199
11	119.872	122.292	62.093	-62.093	168.310	-168.310
12	83.467	58.365	36.367	-36.367	342.643	-342.643
13	-54.918	-125.674	-36.855	36.855	258.434	-258.434
14	-122.292	3.429	-97.210	-57.590	62.093	-62.093
15	-61.795	160.255	98.460	-98.460	285.052	-285.052
16	-160.255	-91.883	-142.853	-58.807	98.458	-98.458
17	.000	217.558	120.110	-128.528	.000	.000

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-35.201	-351.336	-21.121
2	-34.470	-680.944	-20.682
3	-29.619	-370.708	-17.771
4	.000	.000	63.568
5	.000	.000	61.486
6	.000	.000	47.537

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-38.259	-76.518	-22.955	22.955	368.407	-368.407
2	-38.277	-76.554	-22.966	22.966	678.052	-678.052
3	-32.816	-65.631	-19.689	19.689	356.529	-356.529
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	76.518	112.844	45.086	-45.086	368.407	-368.407
7	76.554	113.129	45.163	-45.163	678.052	-678.052
8	65.631	71.948	32.757	-32.757	356.529	-356.529
9	-258.605	58.858	-191.691	-125.109	-29.702	29.702
10	-285.402	-37.886	-212.281	-104.519	-33.882	33.882
11	145.760	145.912	74.788	-74.788	176.716	-176.716
12	113.415	79.068	49.355	-49.355	340.662	-340.662
13	-34.062	-106.703	-28.727	28.727	252.010	-252.010
14	-145.912	-23.383	-105.616	-49.184	74.788	-74.788
15	-55.685	179.828	124.142	-124.142	291.476	-291.476
16	-179.828	-110.854	-149.277	-52.383	124.139	-124.139
17	.000	217.558	120.110	-128.528	.002	-.002

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-38.259	-368.407	-22.955
2	-38.277	-678.052	-22.966
3	-32.816	-356.529	-19.689
4	.000	.000	68.042
5	.000	.000	68.129
6	.000	.000	52.446

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	6.369	12.739	3.822	-3.822	466.234	-466.234
2	14.396	28.793	8.638	-8.638	1151.137	-1151.137
3	16.963	33.926	10.178	-10.178	710.131	-710.131
4	.000	.000	.000	.000	.000	.000
5	.000	.000	.000	.000	.000	.000
6	-12.739	15.019	.543	-.543	466.234	-466.234
7	-28.793	-45.528	-17.695	17.695	1151.136	-1151.136
8	-33.926	-64.686	-23.479	23.479	710.131	-710.131
9	-107.355	330.753	-232.767	-307.233	-45.658	45.658
10	-269.704	238.307	-275.233	-264.767	-55.271	55.271
11	92.335	87.854	46.202	-46.202	233.467	-233.467
12	-15.521	-16.019	-8.087	8.087	568.671	-568.671
13	-173.621	-292.664	-95.160	95.160	445.363	-445.363
14	-87.854	145.052	-122.767	-141.833	46.203	-46.203
15	-129.033	167.148	38.115	-38.115	426.836	-426.836
16	-167.148	-47.848	-205.438	-133.772	38.116	-38.116

17	.000	340.512	188.265	-200.891	.000	.000
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REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	6.369	-466.234	3.822
2	14.396	-1151.137	8.638
3	16.963	-710.131	10.178
4	.000	.000	-3.279
5	.000	.000	-26.333
6	.000	.000	-33.657

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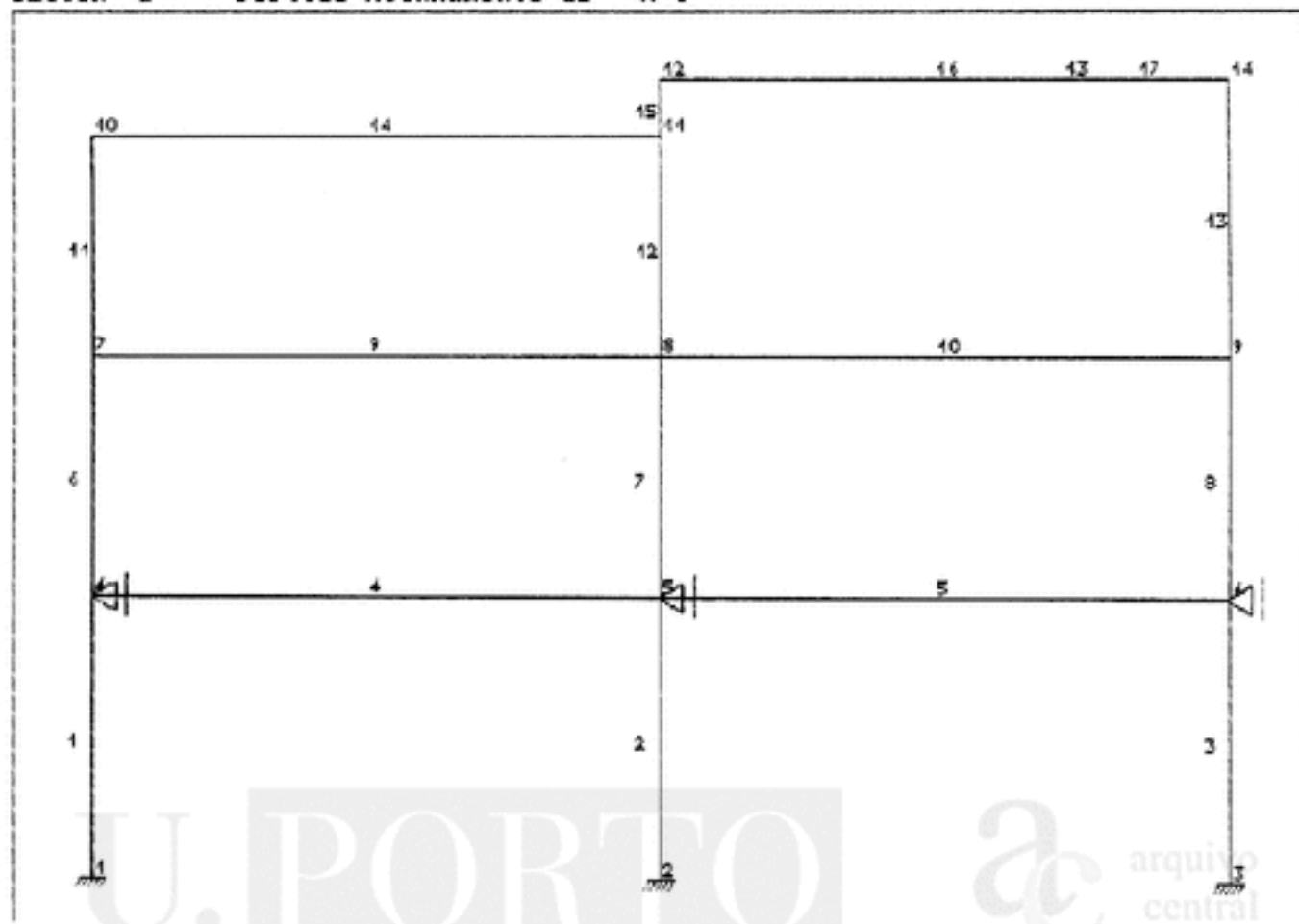
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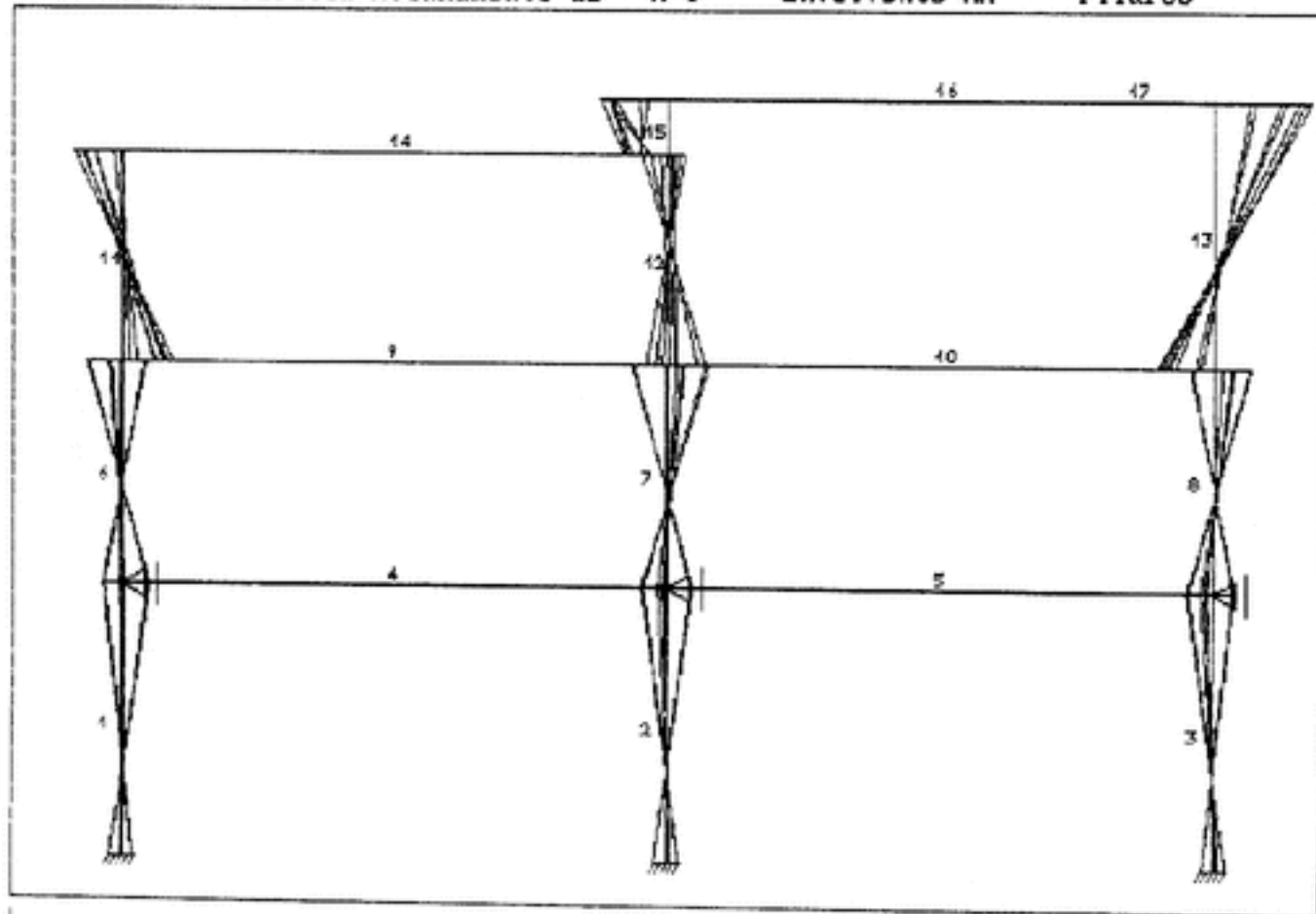
U. PORTO


 arquivo
central

SECTOR B - Portico Alinhamento 12 - A/C



SECTOR B - Portico Alinhamento 12 - A/C - Envolvente MM - Pilares



SECTOR B - Portico Alinhamento 13 - A/C

No. DE NOS	= 14	No. DE BARRAS	= 17
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 6	No. DE SECCOES TIPO	= 5
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS=	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.30000E+00	.30000E+00
2	.29000E+08	.30000E+00	.35000E+00
3	.29000E+08	.30000E+00	.50000E+00
4	.29000E+08	.96020E+00	.35000E+00
5	.29000E+08	.40418E+00	.50000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 4	1	2	2 5	2	3	3 6	1
4	4 5	3	5	5 6	3	6	4 7	1
7	5 8	2	8	6 9	1	9	7 8	4
10	8 9	4	11	7 10	1	12	8 11	2
13	9 14	1	14	10 11	5	15	11 12	2
16	12 14	5	17	13 14	5			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	6.000	.000	3	12.000	.000
4	.000	6.000	5	6.000	6.000	6	12.000	6.000
7	.000	10.200	8	6.000	10.200	9	12.000	10.200
10	.000	14.100	11	6.000	14.100	12	6.000	15.100
13	10.250	15.100	14	12.000	15.100			

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	1	1	1
3	1	1	1	4	0	0	1
5	0	0	1	6	0	0	1

PILARES

Volume de Material (m3)= 4.2135 Area de Cofragem (m2)= 54.6700

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 8.6116 Area de Cofragem (m2)= 54.8299

ACCAO 1
PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	26.610	5	26.610
9	26.820	10	26.820
14	28.863	16	27.638
17	15.538		

***** CARGA 4 *****

BARRA	P (KN)	11 (m)		BARRA	P (KN)	11 (m)
9	10.470	3.000	10	10.470	3.000	

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		67.500	
12		135.000	
13		57.070	
14		67.500	

 ACCAO 2
 SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)		BARRA	P (KN/m)
4	.000		10	6.000
14	6.000			

***** CARGA 4 *****

BARRA	P (KN)	11 (m)		BARRA	P (KN)	11 (m)
10	6.000	3.000				

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
13		9.000	
14		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)		BARRA	P (KN/m)
5	.000		9	6.000
16	6.800		17	.000

***** CARGA 4 *****

BARRA	P (KN)	11 (m)		BARRA	P (KN)	11 (m)
9	6.000	3.000				

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
10		9.000	

ACCAO 4
SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			18.410
14			5.760

ACCAO 5
SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			9.650
14			18.390

ACCAO 6
VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
9			27.900
14			22.860

***** RESULTADOS *****

COMBINACAO 1
ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	10.030	20.060	5.015	-5.015	498.824	-498.824
2	1.630	3.260	.815	-.815	1209.900	-1209.900
3	-7.343	-14.686	-3.671	3.671	633.027	-633.027
4	-40.811	156.996	-100.381	-139.109	.000	.000
5	-130.207	70.536	-129.690	-109.800	.000	.000

6	20.751	22.418	10.278	-10.278	398.444	-398.444
7	-30.049	-29.009	-14.061	14.061	941.101	-941.101
8	-55.851	-56.162	-26.670	26.670	523.227	-523.227
9	-76.266	206.813	-138.285	-181.800	-18.635	18.635
10	-166.588	119.871	-167.829	-152.256	-22.326	22.326
11	53.848	58.913	28.913	-28.913	260.159	-260.159
12	-11.216	-29.227	-10.370	10.370	591.472	-591.472
13	-63.709	-94.344	-32.256	32.256	370.971	-370.971
14	-58.913	127.761	-145.409	-168.358	28.914	-28.914
15	-98.533	117.076	18.543	-18.543	423.114	-423.114
16	-117.076	-114.779	-193.614	-116.328	18.542	-18.542
17	.000	209.123	99.105	-139.892	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	10.030	-498.824	5.015
2	1.630	-1209.900	.815
3	-7.343	-633.027	-3.671
4	.000	.000	5.263
5	.000	.000	-14.876
6	.000	.000	-22.998

COMBINACAO 2

ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-W

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	10.345	20.691	5.173	-5.173	456.005	-456.005
2	1.214	2.428	.607	-.607	1143.480	-1143.480
3	-7.118	-14.236	-3.559	3.559	604.567	-604.567
4	-38.614	156.521	-100.094	-139.396	.000	.000
5	-132.579	70.417	-130.105	-109.385	.000	.000
6	17.923	15.128	7.869	-7.869	355.911	-355.911
7	-26.371	-20.321	-11.117	11.117	873.979	-873.979
8	-56.180	-58.082	-27.205	27.205	495.182	-495.182
9	-60.227	179.512	-108.662	-148.423	-17.922	17.922
10	-153.192	118.863	-165.764	-154.321	-19.492	19.492
11	45.099	55.489	25.792	-25.792	247.250	-247.250
12	-5.999	-31.237	-9.548	9.548	559.791	-559.791
13	-60.781	-86.008	-29.957	29.957	340.861	-340.861
14	-55.489	120.792	-146.000	-167.767	25.792	-25.792
15	-89.555	105.799	16.244	-16.244	392.024	-392.024
16	-105.799	-123.115	-162.523	-86.219	16.244	-16.244
17	.000	209.123	99.105	-139.892	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
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1	10.345	-456.005	5.173
2	1.214	-1143.480	.607
3	-7.118	-604.567	-3.559
4	.000	.000	2.697
5	.000	.000	-11.724
6	.000	.000	-23.646

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	9.751	19.502	4.876	-4.876	473.910	-473.910
2	2.029	4.058	1.015	-1.015	1116.234	-1116.234
3	-7.641	-15.282	-3.821	3.821	580.609	-580.609
4	-40.306	159.955	-99.804	-139.686	.000	.000
5	-130.228	67.970	-130.121	-109.369	.000	.000
6	20.804	23.950	10.656	-10.656	374.106	-374.106
7	-33.785	-37.842	-17.054	17.054	846.426	-846.426
8	-52.688	-48.341	-24.055	24.055	471.240	-471.240
9	-75.087	193.999	-140.224	-179.861	-15.380	15.380
10	-139.908	104.255	-134.485	-122.600	-22.126	22.126
11	51.136	50.405	26.036	-26.036	233.882	-233.882
12	-16.249	-23.954	-10.308	10.308	532.080	-532.080
13	-55.914	-88.343	-29.440	29.440	348.640	-348.640
14	-50.405	114.913	-119.132	-140.635	26.037	-26.037
15	-90.960	106.687	15.728	-15.728	391.445	-391.445
16	-106.687	-97.155	-188.945	-120.997	15.727	-15.727
17	.000	185.498	85.605	-126.392	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	9.751	-473.910	4.876
2	2.029	-1116.234	1.015
3	-7.641	-580.609	-3.821
4	.000	.000	5.780
5	.000	.000	-18.069
6	.000	.000	-20.234

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	7.327	14.654	3.663	-3.663	300.387	-300.387
2	1.809	3.617	.904	-.904	742.613	-742.613
3	-4.295	-8.590	-2.147	2.147	394.688	-394.688
4	-18.386	112.625	-64.123	-95.537	.000	.000
5	-80.770	53.734	-84.336	-75.324	.000	.000
6	3.733	3.621	1.751	-1.751	236.263	-236.263
7	-35.472	-34.837	-16.740	16.740	562.741	-562.741
8	-45.144	-44.157	-21.262	21.262	319.364	-319.364
9	-35.797	129.199	-78.528	-109.662	-15.335	15.335
10	-87.638	81.457	-95.125	-93.065	-25.599	25.599
11	32.176	34.457	17.085	-17.085	157.735	-157.735
12	-6.725	-18.525	-6.474	6.474	357.953	-357.953
13	-37.300	-57.014	-19.248	19.248	226.299	-226.299
14	-34.457	77.380	-86.635	-100.943	17.086	-17.086
15	-58.855	69.467	10.611	-10.611	257.011	-257.011
16	-69.467	-72.951	-114.810	-67.338	10.611	-10.611
17	.000	129.965	60.670	-87.861	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	7.327	-300.387	3.663
2	1.809	-742.613	.904
3	-4.295	-394.688	-2.147
4	.000	.000	-1.913
5	.000	.000	-17.645
6	.000	.000	-19.115

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	7.585	15.171	3.793	-3.793	289.478	-289.478
2	2.157	4.314	1.079	-1.079	745.189	-745.189
3	-4.029	-8.059	-2.015	2.015	403.021	-403.021
4	-15.433	115.399	-63.169	-96.491	.000	.000
5	-77.722	56.994	-83.285	-76.375	.000	.000
6	.262	1.372	.389	-.389	226.309	-226.309
7	-41.991	-40.194	-19.568	19.568	565.414	-565.414
8	-48.935	-47.143	-22.876	22.876	326.645	-326.645
9	-21.590	141.467	-74.115	-114.075	-10.278	10.278
10	-76.356	93.232	-91.282	-96.908	-14.537	14.537
11	20.218	21.380	10.666	-10.666	152.194	-152.194

12	-24.917	-34.783	-15.308	15.308	360.057	-360.057
13	-46.088	-66.307	-22.938	22.938	229.738	-229.738
14	-21.380	97.554	-81.093	-106.485	10.668	-10.668
15	-62.771	58.130	-4.641	4.641	253.572	-253.572
16	-58.129	-63.658	-111.372	-70.776	-4.642	4.642
17	.000	129.965	60.670	-87.861	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	7.585	-289.478	3.793
2	2.157	-745.189	1.079
3	-4.029	-403.021	-2.015
4	.000	.000	-3.404
5	.000	.000	-20.647
6	.000	.000	-20.861

 COMBINACAO 6
 ACC.BASE (-E1)

ACCAO	COEFICIENTE
PERMANENTES-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO 2(e2)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO 1(e1)-E1	-1.50000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	4.451	8.903	2.226	-2.226	332.704	-332.704
2	-1.589	-3.178	-.795	.795	739.778	-739.778
3	-7.195	-14.390	-3.597	3.597	365.206	-365.206
4	-53.711	80.708	-75.330	-84.330	.000	.000
5	-113.069	17.913	-95.689	-63.971	.000	.000
6	44.808	43.573	21.043	-21.043	257.374	-257.374
7	35.539	35.080	16.814	-16.814	559.759	-559.759
8	-3.523	-3.222	-1.606	1.606	301.235	-301.235
9	-84.389	85.890	-93.845	-94.345	-1.737	1.737
10	-130.025	35.219	-109.896	-78.294	12.869	-12.869
11	40.815	48.025	22.780	-22.780	163.529	-163.529
12	9.055	-.448	2.207	-2.207	355.518	-355.518
13	-31.997	-48.121	-16.351	16.351	222.941	-222.941
14	-48.025	56.185	-92.429	-95.149	22.779	-22.779
15	-55.737	80.723	24.986	-24.986	260.369	-260.369
16	-80.723	-81.844	-118.169	-63.979	24.986	-24.986
17	.000	129.965	60.670	-87.861	.000	.000

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.451	-332.704	2.226
2	-1.589	-739.778	-.795
3	-7.195	-365.206	-3.597
4	.000	.000	18.817
5	.000	.000	17.609
6	.000	.000	1.991

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	4.193	8.386	2.097	-2.097	343.613	-343.613
2	-1.938	-3.875	-.969	.969	737.202	-737.202
3	-7.460	-14.921	-3.730	3.730	356.873	-356.873
4	-56.664	77.935	-76.285	-83.375	.000	.000
5	-116.117	14.653	-96.741	-62.919	.000	.000
6	48.278	45.822	22.405	-22.405	267.328	-267.328
7	42.058	40.437	19.642	-19.642	557.086	-557.086
8	.267	-.236	.007	-.007	293.954	-293.954
9	-98.596	73.622	-98.257	-89.933	-6.793	6.793
10	-141.307	23.444	-113.739	-74.451	1.807	-1.807
11	52.774	61.102	29.199	-29.199	169.071	-169.071
12	27.247	15.810	11.040	-11.040	353.414	-353.414
13	-23.208	-38.828	-12.660	12.660	219.503	-219.503
14	-61.102	36.011	-97.971	-89.607	29.197	-29.197
15	-51.821	92.060	40.238	-40.238	263.807	-263.807
16	-92.060	-91.137	-121.607	-60.541	40.240	-40.240
17	.000	129.965	60.670	-87.861	-.001	.001

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	4.193	-343.613	2.097
2	-1.938	-737.202	-.969
3	-7.460	-356.873	-3.730
4	.000	.000	20.308
5	.000	.000	20.611
6	.000	.000	3.738

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO	FORCA TRANSVERSAL	FORCA AXIAL
-------	---------	-------------------	-------------

	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	11.868	23.736	5.934	-5.934	453.553	-453.553
2	3.808	7.616	1.904	-1.904	1164.956	-1164.956
3	-5.519	-11.039	-2.760	2.760	630.633	-630.633
4	-17.676	177.971	-93.029	-146.461	.000	.000
5	-110.320	92.515	-122.713	-116.778	.000	.000
6	-6.061	-3.957	-2.385	2.385	360.524	-360.524
7	-75.266	-72.970	-35.294	35.294	895.783	-895.783
8	-81.476	-80.022	-38.452	38.452	513.855	-513.855
9	-34.795	226.919	-118.572	-182.613	-22.622	22.622
10	-123.509	148.469	-146.432	-154.753	-37.853	37.853
11	38.752	40.171	20.237	-20.237	241.952	-241.952
12	-30.440	-47.807	-20.063	20.063	566.737	-566.737
13	-68.447	-100.379	-34.454	34.454	359.103	-359.103
14	-40.171	145.362	-131.252	-166.315	20.238	-20.238
15	-97.554	97.728	.174	-.174	400.422	-400.422
16	-97.728	-101.657	-179.022	-112.560	.172	-.172
17	.000	202.036	95.055	-135.842	.000	.000

REACCOES NOS APOIOS

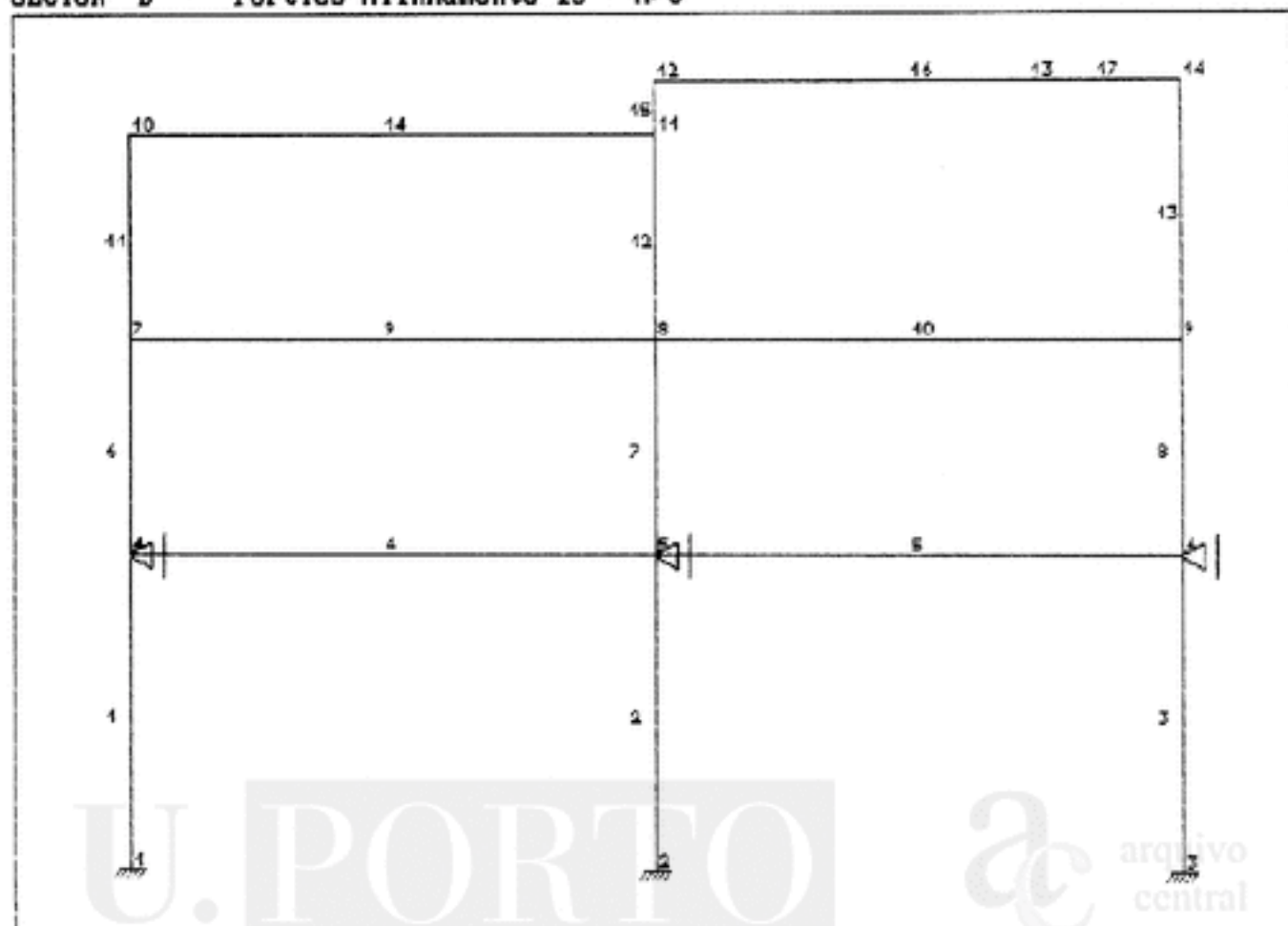
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	11.868	-453.553	5.934
2	3.808	-1164.956	1.904
3	-5.519	-630.633	-2.760
4	.000	.000	-8.319
5	.000	.000	-37.198
6	.000	.000	-35.692

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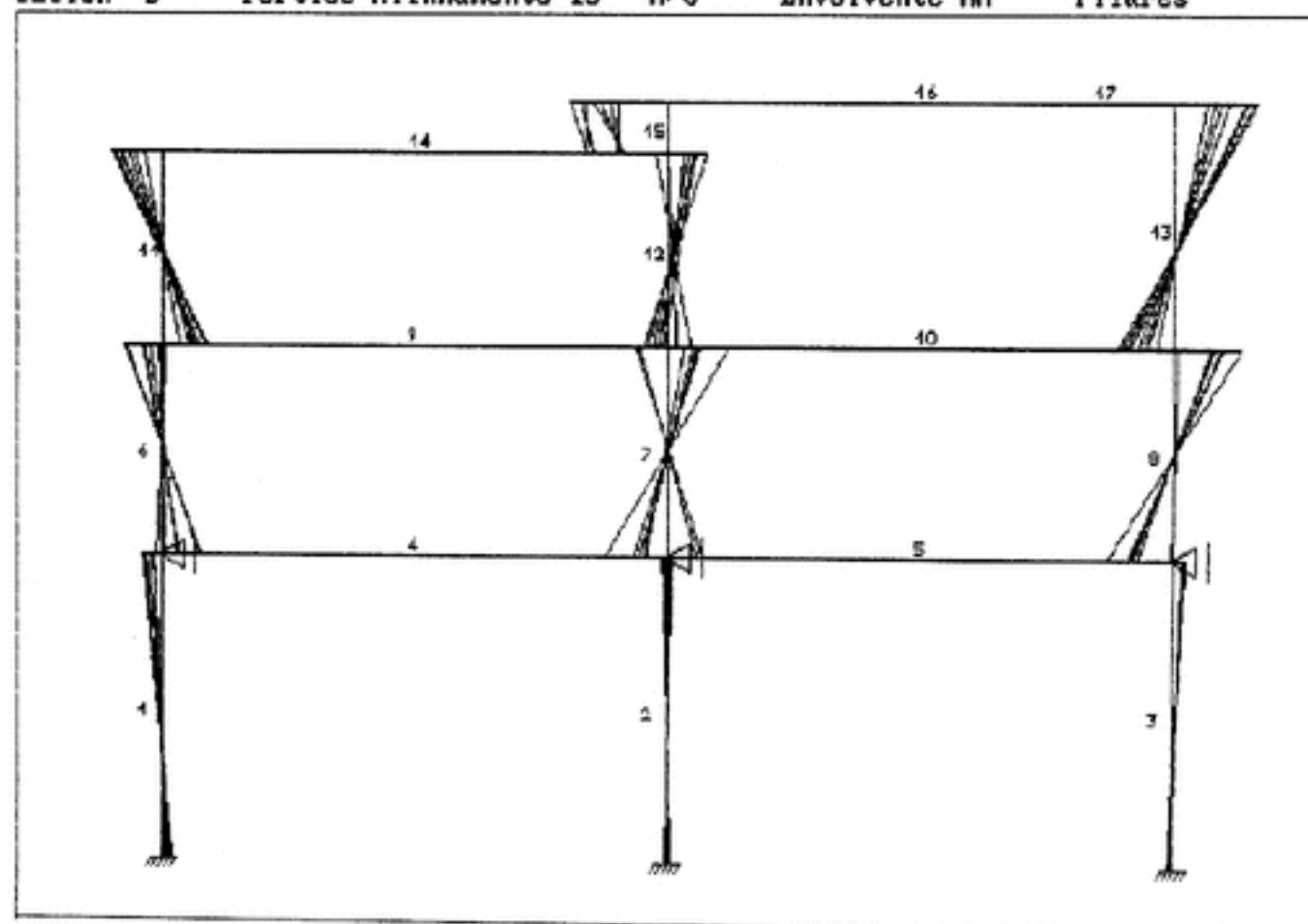
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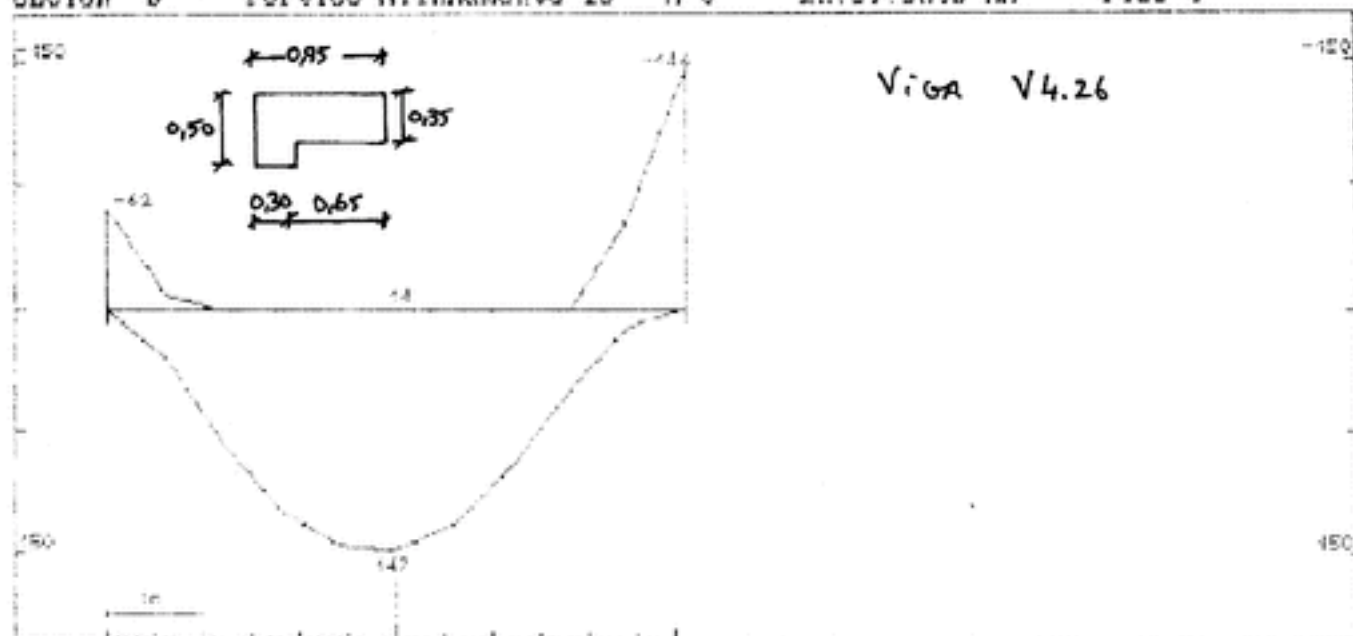
SECTOR B - Portico Alinhamento 13 - A/C



SECTOR B - Portico Alinhamento 13 - A/C - Envolvente MM - Pilares



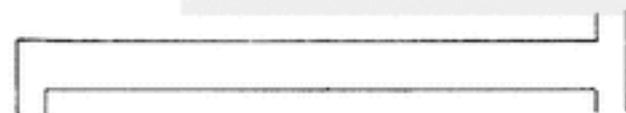
SECTOR 0 - Portico Alinhamento 13 - A/C - Envolvente III - Piso 4



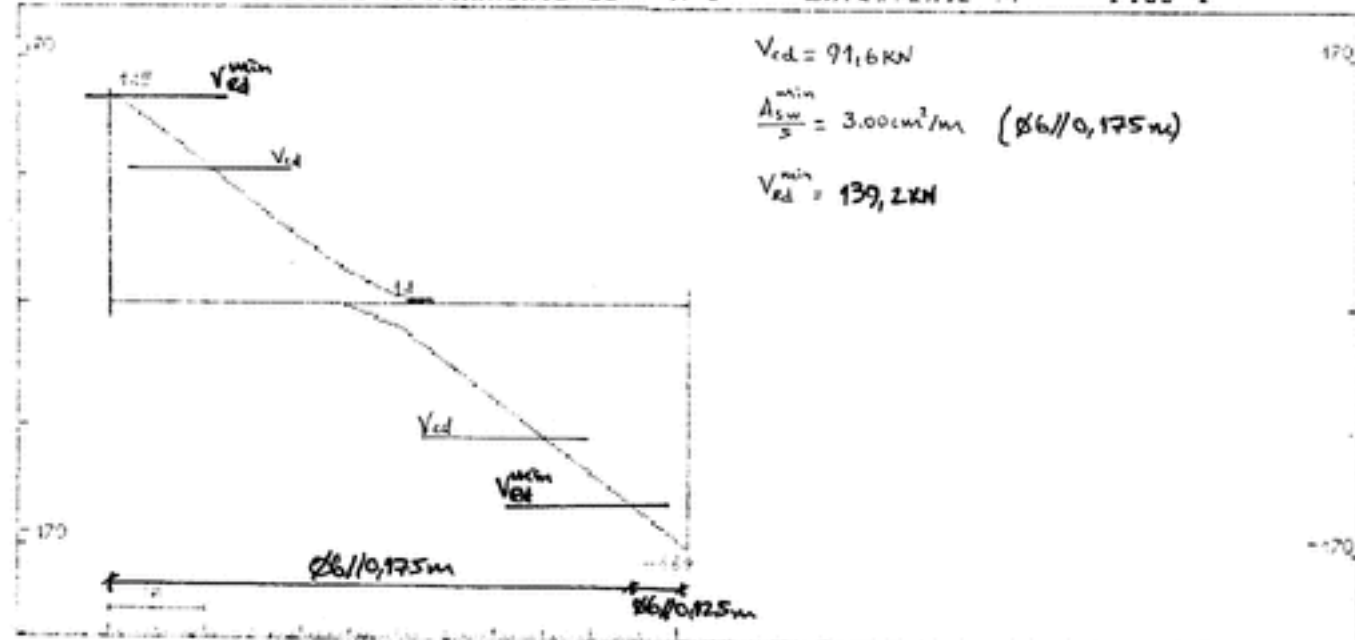
$M_{sd}(kNm)$: -56	147	-133
μ : 0,064	0,053	0,151
w : 0,068	0,055	0,174
$A_s(cm^2)$: 3,64	9,46	9,36
Varões: 3Ø12+2Ø10	2Ø16+2Ø20	3Ø12+3Ø16

U. PORTO

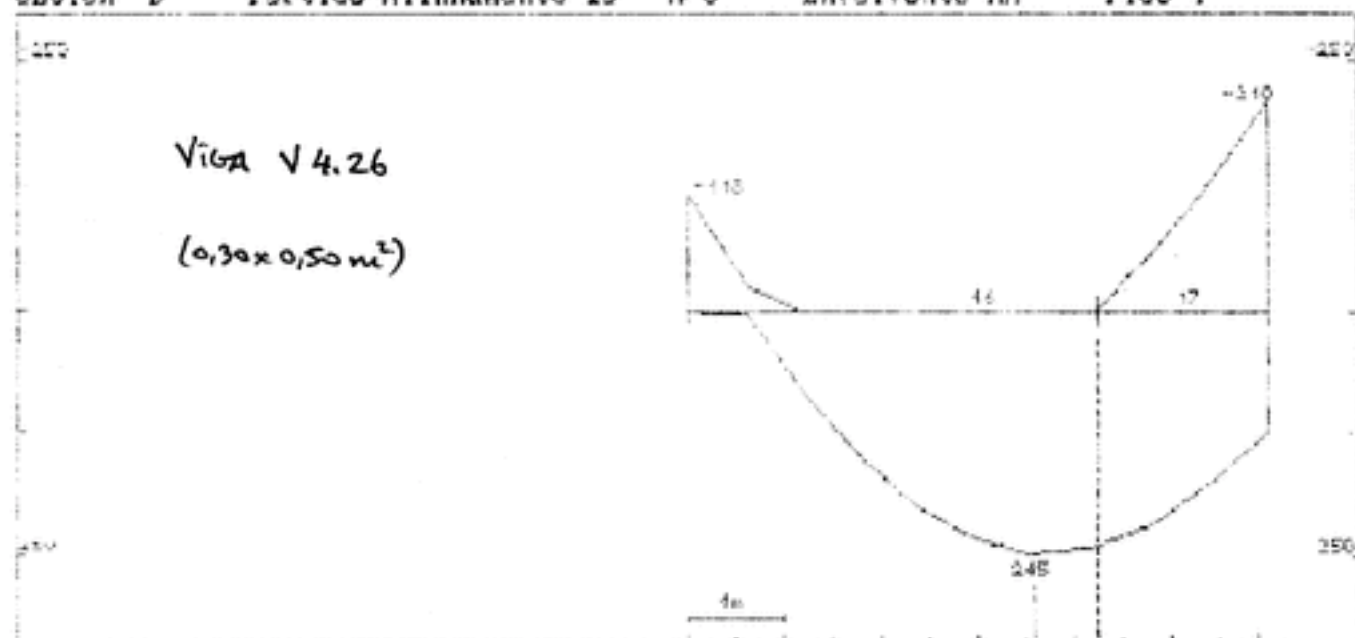
arquivo central



SECTOR 0 - Portico Alinhamento 13 - A/C - Envolvente IV - Piso 4



SECTOR B - Portico Alinhamento 13 - A/C - Envolvente MM - Piso 4



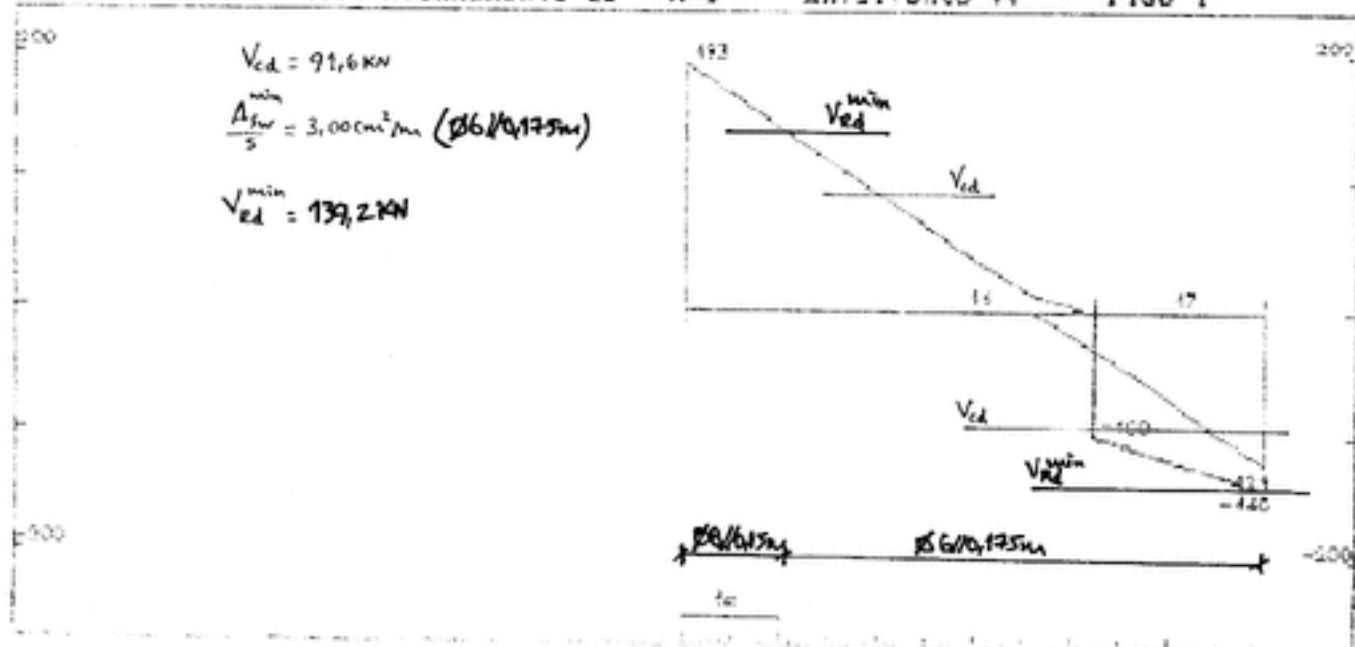
M_{sd} (kN.m):	-105	245	-201
μ :	0,119	0,278	0,228
w :	0,133	0,355	0,280
A_s (cm ²):	7,18	19,14	15,09
Varões:	4x816	4x825	3x816 + 3x820

U. PORTO

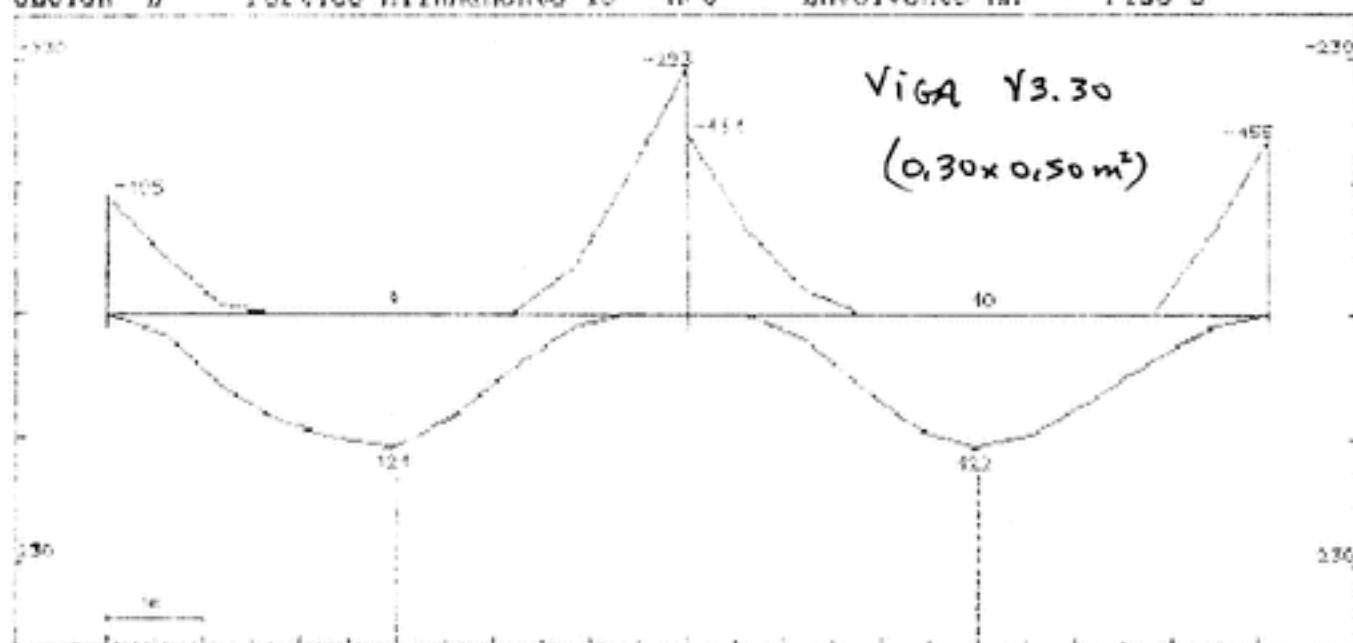
arquivo central



SECTOR B - Portico Alinhamento 13 - A/C - Envolvente W - Piso 4

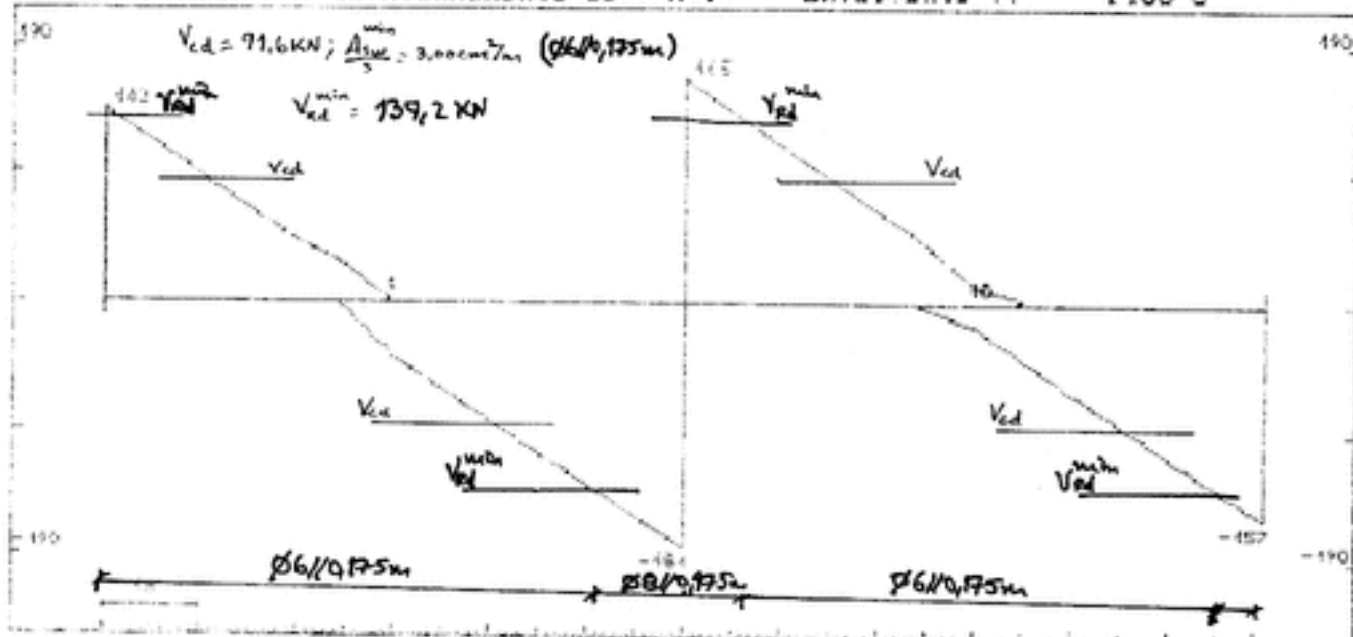


SECTOR B - Portico Alinhamento 13 - A/C - Envolvente III - Piso 3



M_{ed} (kNm):	-99	121	-209	122	-143
μ :	0,112	0,137	0,237	0,138	0,162
w :	0,125	0,156	0,293	0,158	0,189
A_s (cm ²):	6,73	8,41	15,81	8,49	10,16
Varões:	2Ø16+1Ø20	3Ø20	2Ø20+2Ø25	3Ø20	2Ø16+2Ø20

SECTOR B - Portico Alinhamento 13 - A/C - Envolvente IV - Piso 3



SECTOR B - Portico Alinhamento A - 8/13

No. DE NOS	= 24	No. DE BARRAS	= 33
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 12	No. DE SECCOES TIPO	= 8
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.25000E+00	.30000E+01
2	.29000E+08	.30000E+00	.35000E+00
3	.29000E+08	.35000E+00	.35000E+00
4	.29000E+08	.30000E+00	.30000E+00
5	.29000E+08	.30000E+00	.50000E+00
6	.29000E+08	.63200E+00	.35000E+00
7	.29000E+08	.40200E+00	.50000E+00
8	.29000E+08	.65000E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	1	2	2 3	2	3	3 4	2
4	2 6	8	5	3 7	6	6	4 8	7
7	5 6	1	8	6 7	3	9	7 8	3
10	6 10	5	11	7 11	6	12	8 12	7
13	9 10	3	14	10 11	3	15	11 12	3
16	10 14	5	17	11 15	6	18	12 16	7
19	13 14	3	20	14 15	3	21	15 16	3
22	14 18	5	23	15 19	6	24	16 20	7
25	17 18	3	26	18 19	3	27	19 20	3
28	18 22	5	29	19 23	6	30	20 24	7
31	21 22	4	32	22 23	4	33	23 24	4

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	5.000	3	.000	9.200
4	.000	13.100	5	6.000	.000	6	6.000	5.000
7	6.000	9.200	8	6.000	13.100	9	12.000	.000
10	12.000	5.000	11	12.000	9.200	12	12.000	13.100
13	18.000	.000	14	18.000	5.000	15	18.000	9.200
16	18.000	13.100	17	24.000	.000	18	24.000	5.000
19	24.000	9.200	20	24.000	13.100	21	30.000	.000
22	30.000	5.000	23	30.000	9.200	24	30.000	13.100

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	0	0	1
5	1	1	1	6	0	0	1
9	1	1	1	10	0	0	1
13	1	1	1	14	0	0	1
17	1	1	1	18	0	0	1
21	1	1	1	22	0	0	1

PILARES

Volume de Material (m3)= 15.3360

Area de Cofragem (m2)= 157.6100

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 17.6310

Area de Cofragem (m2)= 121.3200

ACCAO 1

Permanentes-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	13.125	5	16.350
6	37.290	10	18.000
11	16.350	12	37.290
16	18.000	17	26.820
18	37.290	22	18.000
23	26.820	24	37.290
28	18.000	29	26.820
30	37.290		

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)	BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)
5	.000	43.440	.000	6.000	11	43.440	.000	.000	6.000

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
17	10.470	3.000	23	10.470	3.000
29	10.470	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	VERTICAL (KN)	HORIZONTAL (KN)
4			67.500	
8			135.000	
12			135.000	
16			135.000	
20			135.000	
24			67.500	

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	7.000	6	12.000
11	.000	16	.000
18	12.000	23	6.000
28	.000	30	12.000

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)	BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)
11	24.000	.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
23	6.000	3.000			

***** CARGA 7 *****

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
4		9.000	
12		18.000	
24		9.000	

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
5	.000	10	.000
12	12.000	17	6.000
22	.000	24	12.000
29	6.000		

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)	BARRA	Q(KN)	P(KN)	l1(m)	l2 (m)
5	.000	24.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
17	6.000	3.000	29	6.000	3.000

***** CARGA 7 *****

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
8		18.000	
16		18.000	
20		18.000	

ACCAO 4
SISMO 1(e1)-E1

***** CARGA 7 *****

NO	FORÇAS APLICADAS NOS NOS		
	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			44.250
4			59.500

ACCAO 5
SISMO 2(e2)-E2

***** CARGA 7 *****

FORÇAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			35.400
4			77.670

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

FORÇAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			22.000
4			16.210

***** RESULTADOS *****

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	29.775	59.550	17.865	-17.865	551.644	-551.644
2	33.189	56.853	21.439	-21.439	460.339	-460.339
3	82.129	90.105	44.163	-44.163	308.238	-308.238
4	-92.739	88.285	-91.305	-89.820	.000	.000
5	-138.983	274.786	-152.101	-298.529	-35.924	35.924
6	-90.105	260.007	-193.488	-250.122	34.437	-34.437
7	.268	.536	.161	-.161	1474.717	-1474.717
8	8.987	7.511	3.928	-3.928	1298.687	-1298.687
9	-8.962	-11.208	-5.172	5.172	707.878	-707.878
10	-97.808	66.545	-86.211	-75.789	.000	.000
11	-273.335	175.028	-292.279	-158.351	-26.824	26.824
12	-248.800	210.093	-228.256	-215.354	29.265	-29.265
13	1.130	2.261	.678	-.678	1142.353	-1142.353
14	9.574	4.959	3.460	-3.460	985.727	-985.727
15	-5.014	1.693	-.851	.851	665.050	-665.050
16	-78.379	79.362	-80.836	-81.164	.000	.000
17	-174.973	161.265	-162.327	-157.758	-22.512	22.512
18	-211.786	221.442	-220.196	-223.414	28.413	-28.413
19	-.915	-1.830	-.549	.549	1150.888	-1150.888
20	7.451	8.279	3.745	-3.745	987.911	-987.911
21	-2.588	-3.888	-1.660	1.660	670.194	-670.194
22	-84.983	80.109	-81.812	-80.188	.000	.000
23	-166.956	167.458	-159.959	-160.126	-17.106	17.106
24	-217.554	244.706	-217.280	-226.330	26.753	-26.753
25	.570	1.140	.342	-.342	1214.864	-1214.864

26	12.353	12.976	6.031	-6.031	1044.992	-1044.992
27	9.971	15.556	6.545	-6.545	709.685	-709.685
28	-93.603	41.501	-89.684	-72.316	.000	.000
29	-190.404	99.569	-175.182	-144.903	-17.621	17.621
30	-260.262	67.967	-253.854	-189.756	33.298	-33.298
31	-6.664	-13.327	-3.998	3.998	521.725	-521.725
32	-28.174	-37.672	-15.678	15.678	449.409	-449.409
33	-61.897	-67.967	-33.298	33.298	304.506	-304.506

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	29.775	-551.644	17.865
2	.000	.000	3.574
5	.268	-1474.717	.161
6	.000	.000	3.767
9	1.130	-1142.353	.678
10	.000	.000	2.782
13	-.915	-1150.888	-.549
14	.000	.000	4.294
17	.570	-1214.864	.342
18	.000	.000	5.689
21	-6.664	-521.725	-3.998
22	.000	.000	-11.680

U. P. O. P. O.

 COMBINACAO 2
 ACC.BASE Q1

arquivo
 central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	33.909	67.818	20.346	-20.346	522.296	-522.296
2	24.570	39.575	15.273	-15.273	431.102	-431.102
3	66.829	87.482	39.567	-39.567	312.138	-312.138
4	-92.389	88.599	-91.194	-89.931	.000	.000
5	-106.404	225.033	-118.964	-223.666	-37.494	37.494
6	-87.482	233.983	-197.388	-246.222	29.841	-29.841
7	-6.125	-12.249	-3.675	3.675	1312.204	-1312.204
8	19.165	27.921	11.211	-11.211	1137.024	-1137.024
9	3.717	-18.768	-3.859	3.859	622.977	-622.977
10	-95.515	70.020	-85.249	-76.751	.000	.000
11	-256.671	169.755	-290.381	-160.249	-22.424	22.424
12	-215.215	176.517	-174.255	-161.355	25.982	-25.982
13	1.684	3.367	1.010	-1.010	1059.343	-1059.343
14	3.799	-8.615	-1.147	1.147	901.676	-901.676
15	-11.059	12.862	.462	-.462	610.551	-610.551
16	-77.186	77.684	-80.917	-81.083	.000	.000
17	-150.082	136.081	-130.876	-126.209	-24.033	24.033
18	-189.378	202.037	-219.695	-223.915	26.444	-26.444
19	-1.740	-3.481	-1.044	1.044	1039.255	-1039.255
20	12.161	20.616	7.804	-7.804	876.507	-876.507
21	1.840	-16.303	-3.709	3.709	590.319	-590.319

22	-86.364	82.379	-81.664	-80.336	.000	.000
23	-158.537	158.918	-159.979	-160.106	-12.520	12.520
24	-185.734	209.140	-163.904	-171.706	22.736	-22.736
25	1.497	2.995	.898	-.898	1097.263	-1097.263
26	7.872	.619	2.022	-2.022	926.744	-926.744
27	4.040	25.889	7.674	-7.674	624.159	-624.159
28	-93.246	38.145	-90.184	-71.816	.000	.000
29	-163.577	79.958	-142.479	-114.606	-18.172	18.172
30	-235.029	66.142	-249.953	-193.657	30.410	-30.410
31	-7.126	-14.251	-4.275	4.275	494.830	-494.830
32	-23.894	-27.503	-12.237	12.237	423.013	-423.013
33	-52.455	-66.142	-30.410	30.410	308.407	-308.407

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	33.909	-522.296	20.346
2	.000	.000	-5.073
5	-6.125	-1312.204	-3.675
6	.000	.000	14.886
9	1.684	-1059.343	1.010
10	.000	.000	-2.157
13	-1.740	-1039.255	-1.044
14	.000	.000	8.848
17	1.497	-1097.263	.898
18	.000	.000	1.123
21	-7.126	-494.830	-4.275
22	.000	.000	-7.962

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	12.207	24.414	7.324	-7.324	459.631	-459.631
2	36.681	63.377	23.823	-23.823	399.896	-399.896
3	78.722	71.708	38.572	-38.572	243.857	-243.857
4	-61.095	57.059	-59.735	-58.390	.000	.000
5	-142.099	254.275	-156.039	-294.591	-27.948	27.948
6	-71.708	222.897	-142.607	-193.003	28.846	-28.846
7	20.535	41.070	12.321	-12.321	1307.076	-1307.076
8	-.408	-12.209	-3.004	3.004	1162.169	-1162.169
9	-18.650	.553	-4.640	4.640	649.780	-649.780
10	-97.721	64.617	-86.517	-75.483	.000	.000
11	-223.416	140.001	-217.798	-124.832	-26.312	26.312
12	-223.450	190.620	-227.277	-216.333	24.206	-24.206
13	.208	.416	.125	-.125	1029.383	-1029.383
14	16.121	20.572	8.736	-8.736	872.735	-872.735
15	3.908	-8.171	-1.093	1.093	585.917	-585.917
16	-81.154	80.163	-81.165	-80.835	.000	.000
17	-164.481	152.825	-161.985	-158.100	-16.483	16.483

18	-182.449	186.776	-167.084	-168.526	23.113	-23.113
19	-.120	-.239	-.072	.072	1065.700	-1065.700
20	3.179	-3.951	-.184	.184	903.142	-903.142
21	-5.871	10.386	1.158	-1.158	616.081	-616.081
22	-83.102	78.762	-81.723	-80.277	.000	.000
23	-143.003	140.495	-128.960	-128.125	-17.824	17.824
24	-197.163	219.662	-218.055	-225.555	24.271	-24.271
25	-.185	-.370	-.111	.111	1122.972	-1122.972
26	17.501	25.133	10.151	-10.151	952.679	-952.679
27	14.046	2.183	4.161	-4.161	650.912	-650.912
28	-95.892	41.793	-90.017	-71.983	.000	.000
29	-179.674	98.071	-173.643	-146.442	-11.834	11.834
30	-221.845	53.535	-195.857	-139.753	28.432	-28.432
31	-6.402	-12.805	-3.841	3.841	459.429	-459.429
32	-28.989	-40.722	-16.598	16.598	387.445	-387.445
33	-57.349	-53.535	-28.432	28.432	241.003	-241.003

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	12.207	-459.631	7.324
2	.000	.000	16.499
5	20.535	-1307.076	12.321
6	.000	.000	-15.325
9	.208	-1029.383	.125
10	.000	.000	8.612
13	-.120	-1065.700	-.072
14	.000	.000	-.112
17	-.185	-1122.972	-.111
18	.000	.000	10.262
21	-6.402	-459.429	-3.841
22	.000	.000	-12.756

COMBINACAO 4

ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	46.353	92.707	27.812	-27.812	291.365	-291.365
2	-43.945	-14.402	-13.892	13.892	243.257	-243.257
3	32.863	24.307	14.659	-14.659	172.969	-172.969
4	-48.762	46.766	-48.108	-47.442	.000	.000
5	-18.462	209.274	-70.288	-186.932	37.823	-37.823
6	-24.307	170.712	-101.869	-150.671	103.909	-103.909
7	39.859	79.719	23.916	-23.916	850.660	-850.660
8	-74.193	-63.035	-32.673	32.673	751.892	-751.892
9	-37.304	-48.593	-22.025	22.025	416.208	-416.208
10	-52.292	68.333	-51.326	-56.674	.000	.000
11	-108.935	147.208	-148.751	-108.469	27.173	-27.173
12	-122.118	139.714	-123.337	-129.203	81.885	-81.885
13	6.151	12.302	3.691	-3.691	678.471	-678.471

14	-60.297	-57.209	-27.978	27.978	578.262	-578.262
15	-34.027	-40.130	-19.015	19.015	389.820	-389.820
16	-20.337	83.127	-43.535	-64.465	.000	.000
17	-55.972	140.702	-79.973	-108.217	18.210	-18.210
18	-99.584	146.699	-118.418	-134.122	62.869	-62.869
19	3.973	7.946	2.384	-2.384	689.220	-689.220
20	-63.652	-56.349	-28.572	28.572	580.037	-580.037
21	-32.728	-43.451	-19.533	19.533	393.128	-393.128
22	-27.420	83.118	-44.717	-63.283	.000	.000
23	-51.625	144.041	-78.692	-109.498	9.170	-9.170
24	-103.248	160.035	-116.805	-135.735	43.337	-43.337
25	5.192	10.383	3.115	-3.115	725.836	-725.836
26	-59.821	-53.146	-26.897	26.897	612.398	-612.398
27	-25.504	-32.178	-14.790	14.790	415.506	-415.506
28	-33.680	56.749	-50.155	-57.845	.000	.000
29	-65.392	105.599	-87.394	-100.796	-2.938	2.938
30	-127.857	60.048	-137.571	-114.969	28.548	-28.548
31	-1.752	-3.504	-1.051	1.051	344.710	-344.710
32	-53.245	-54.313	-25.609	25.609	286.865	-286.865
33	-51.286	-60.048	-28.547	28.547	186.069	-186.069

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	46.353	-291.365	27.812
2	.000	.000	-41.704
5	39.859	-850.660	23.916
6	.000	.000	-56.589
9	6.151	-678.471	3.691
10	.000	.000	-31.668
13	3.973	-689.220	2.384
14	.000	.000	-30.955
17	5.192	-725.836	3.115
18	.000	.000	-30.012
21	-1.752	-344.710	-1.051
22	.000	.000	-24.558

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE
Permanentes-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO 2(e2)-E2	1.50000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO 1(e1)-E1	.00000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	48.907	97.814	29.344	-29.344	286.064	-286.064
2	-49.064	-17.110	-15.756	15.756	237.960	-237.960
3	26.194	16.341	10.906	-10.906	170.598	-170.598
4	-48.750	46.780	-48.103	-47.447	.000	.000
5	-9.083	217.451	-67.362	-189.858	26.437	-26.437
6	-16.341	176.972	-99.498	-153.042	127.411	-127.411
7	42.845	85.690	25.707	-25.707	851.310	-851.310
8	-81.245	-68.227	-35.589	35.589	753.062	-753.062
9	-47.418	-59.979	-27.538	27.538	416.832	-416.832

10	-51.224	70.414	-50.802	-57.198	.000	.000
11	-101.807	154.355	-146.372	-110.848	18.385	-18.385
12	-116.993	145.071	-121.590	-130.950	99.875	-99.875
13	6.644	13.289	3.987	-3.987	678.013	-678.013
14	-66.277	-61.892	-30.516	30.516	578.223	-578.223
15	-43.620	-50.904	-24.237	24.237	389.777	-389.777
16	-17.426	85.879	-42.591	-65.409	.000	.000
17	-48.844	147.824	-77.598	-110.592	12.103	-12.103
18	-94.167	152.024	-116.627	-135.913	75.637	-75.637
19	4.390	8.779	2.634	-2.634	689.312	-689.312
20	-69.889	-61.203	-31.213	31.213	580.078	-580.078
21	-42.104	-54.046	-24.654	24.654	393.159	-393.159
22	-24.769	85.815	-43.826	-64.174	.000	.000
23	-44.517	151.129	-76.326	-111.864	5.544	-5.544
24	-97.978	165.318	-115.047	-137.493	50.985	-50.985
25	5.630	11.260	3.378	-3.378	725.809	-725.809
26	-66.064	-58.047	-29.550	29.550	612.382	-612.382
27	-34.746	-42.616	-19.836	19.836	415.505	-415.505
28	-31.011	59.494	-49.253	-58.747	.000	.000
29	-58.335	112.825	-85.013	-103.177	-4.172	4.172
30	-122.702	65.451	-135.812	-116.728	31.148	-31.148
31	-1.496	-2.991	-.897	.897	349.752	-349.752
32	-56.503	-56.798	-26.976	26.976	291.005	-291.005
33	-56.027	-65.451	-31.148	31.148	187.828	-187.828

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	48.907	-286.064	29.344
2	.000	.000	-45.100
5	42.845	-851.310	25.707
6	.000	.000	-61.295
9	6.644	-678.013	3.987
10	.000	.000	-34.503
13	4.390	-689.312	2.634
14	.000	.000	-33.846
17	5.630	-725.809	3.378
18	.000	.000	-32.928
21	-1.496	-349.752	-.897
22	.000	.000	-26.079

COMBINACAO 6

ACC.BASE (-E1)

ACCAO	COEFICIENTE
Permanentes-G	1.00000
SOBRECARGA2-Q2	.40000
SISMO 2(e2)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	.40000
SISMO 1(e1)-E1	-1.50000
VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-11.688	-23.375	-7.013	7.013	342.736	-342.736
2	72.620	72.756	34.613	-34.613	294.465	-294.465
3	60.274	75.350	34.775	-34.775	188.501	-188.501
4	-49.245	46.269	-48.271	-47.279	.000	.000
5	-133.031	109.787	-105.964	-151.256	-66.536	66.536

6	-75.350	128.561	-117.401	-135.139	-54.475	54.475
7	-22.339	-44.679	-13.404	13.404	851.284	-851.284
8	72.505	61.298	31.858	-31.858	741.951	-741.951
9	23.525	31.041	13.991	-13.991	413.389	-413.389
10	-74.094	25.771	-62.054	-45.946	.000	.000
11	-194.609	61.553	-177.306	-79.914	-48.668	48.668
12	-159.602	100.923	-136.050	-116.490	-40.484	40.484
13	-3.956	-7.911	-2.373	2.373	687.057	-687.057
14	61.806	54.411	27.671	-27.671	578.400	-578.400
15	25.445	37.532	16.148	-16.148	389.998	-389.998
16	-79.666	27.401	-62.711	-45.289	.000	.000
17	-141.409	55.053	-108.488	-79.702	-37.145	37.145
18	-138.455	108.226	-131.308	-121.232	-24.335	24.335
19	-4.404	-8.808	-2.642	2.642	687.957	-687.957
20	61.763	56.356	28.123	-28.123	580.211	-580.211
21	26.022	33.852	15.352	-15.352	393.253	-393.253
22	-80.356	29.617	-62.457	-45.543	.000	.000
23	-137.430	58.469	-107.255	-80.935	-24.372	24.372
24	-142.078	120.772	-129.821	-122.719	-8.984	8.984
25	-3.457	-6.913	-2.074	2.074	726.340	-726.340
26	64.745	59.218	29.515	-29.515	612.472	-612.472
27	33.123	44.605	19.930	-19.930	415.321	-415.321
28	-87.449	1.498	-68.325	-39.675	.000	.000
29	-150.809	18.086	-116.216	-71.974	-14.786	14.786
30	-165.377	20.584	-150.402	-102.138	10.945	-10.945
31	-6.804	-13.608	-4.083	4.083	284.887	-284.887
32	12.110	4.018	3.840	-3.840	245.212	-245.212
33	-22.104	-20.584	-10.946	10.946	173.238	-173.238

REACOES NOS APOIOS

arquivo

central

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-11.688	-342.736	-7.013
2	.000	.000	41.626
5	-22.339	-851.284	-13.404
6	.000	.000	45.261
9	-3.956	-687.057	-2.373
10	.000	.000	30.044
13	-4.404	-687.957	-2.642
14	.000	.000	30.766
17	-3.457	-726.340	-2.074
18	.000	.000	31.589
21	-6.804	-284.887	-4.083
22	.000	.000	7.923

 COMBINACAO 7
 ACC.BASE (-E2)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-14.241	-28.482	-8.545	8.545	348.038	-348.038

2	77.739	75.465	36.477	-36.477	299.762	-299.762
3	66.944	83.316	38.528	-38.528	190.873	-190.873
4	-49.257	46.255	-48.275	-47.275	.000	.000
5	-142.409	101.610	-108.890	-148.330	-55.150	55.150
6	-83.316	122.301	-119.772	-132.768	-77.977	77.977
7	-25.325	-50.650	-15.195	15.195	850.633	-850.633
8	79.557	66.489	34.773	-34.773	740.780	-740.780
9	33.638	42.427	19.504	-19.504	412.765	-412.765
10	-75.162	23.690	-62.579	-45.421	.000	.000
11	-201.738	54.405	-179.686	-77.534	-39.880	39.880
12	-164.728	95.566	-137.797	-114.743	-58.474	58.474
13	-4.449	-8.898	-2.670	2.670	687.514	-687.514
14	67.785	59.095	30.209	-30.209	578.438	-578.438
15	35.037	48.306	21.370	-21.370	390.042	-390.042
16	-82.577	24.649	-63.655	-44.345	.000	.000
17	-148.536	47.931	-110.863	-77.327	-31.038	31.038
18	-143.872	102.901	-133.098	-119.442	-37.103	37.103
19	-4.821	-9.641	-2.892	2.892	687.864	-687.864
20	68.000	61.210	30.764	-30.764	580.170	-580.170
21	35.397	44.446	20.473	-20.473	393.221	-393.221
22	-83.008	26.920	-63.348	-44.652	.000	.000
23	-144.538	51.381	-109.621	-78.569	-20.746	20.746
24	-147.348	115.489	-131.580	-120.960	-16.632	16.632
25	-3.895	-7.790	-2.337	2.337	726.367	-726.367
26	70.988	64.120	32.169	-32.169	612.487	-612.487
27	42.365	55.043	24.976	-24.976	415.322	-415.322
28	-90.118	-1.247	-69.228	-38.772	.000	.000
29	-157.865	10.860	-118.596	-69.594	-13.552	13.552
30	-170.532	15.181	-152.162	-100.378	8.345	-8.345
31	-7.061	-14.121	-4.236	4.236	279.845	-279.845
32	15.368	6.503	5.207	-5.207	241.072	-241.072
33	-17.363	-15.181	-8.345	8.345	171.478	-171.478

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-14.241	-348.038	-8.545
2	.000	.000	45.022
5	-25.325	-850.633	-15.195
6	.000	.000	49.968
9	-4.449	-687.514	-2.670
10	.000	.000	32.879
13	-4.821	-687.864	-2.892
14	.000	.000	33.657
17	-3.895	-726.367	-2.337
18	.000	.000	34.506
21	-7.061	-279.845	-4.236
22	.000	.000	9.444

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
Permanentes-G	1.50000	SOBRECARGA1-Q1	1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	19.318	38.635	11.591	-11.591	520.113	-520.113
2	44.561	63.578	25.747	-25.747	438.293	-438.293
3	78.095	87.925	42.569	-42.569	291.363	-291.363
4	-83.196	78.954	-81.819	-80.406	.000	.000
5	-141.673	243.704	-146.930	-271.300	-49.821	49.821
6	-87.925	237.575	-180.663	-230.547	18.254	-18.254
7	-2.391	-4.781	-1.434	1.434	1375.921	-1375.921
8	25.306	21.560	11.159	-11.159	1208.327	-1208.327
9	-3.313	-3.232	-1.678	1.678	664.800	-664.800
10	-99.479	62.352	-87.188	-74.812	.000	.000
11	-261.951	154.355	-272.228	-146.002	-36.984	36.984
12	-234.343	190.857	-212.853	-198.357	16.575	-16.575
13	-.086	-.173	-.052	.052	1084.488	-1084.488
14	23.164	17.992	9.799	-9.799	926.621	-926.621
15	.574	8.721	2.383	-2.383	624.971	-624.971
16	-85.343	73.008	-83.056	-78.944	.000	.000
17	-172.920	142.588	-155.648	-145.537	-29.568	29.568
18	-199.578	201.930	-205.213	-205.997	18.959	-18.959
19	-1.839	-3.678	-1.103	1.103	1091.712	-1091.712
20	21.278	20.819	10.023	-10.023	929.091	-929.091
21	2.449	3.310	1.477	-1.477	630.021	-630.021
22	-90.609	74.553	-83.676	-78.324	.000	.000
23	-165.857	148.218	-153.532	-147.653	-21.021	21.021
24	-205.240	223.124	-202.624	-208.586	20.436	-20.436
25	-.320	-.641	-.192	.192	1152.071	-1152.071
26	26.143	25.369	12.265	-12.265	981.829	-981.829
27	14.128	21.263	9.075	-9.075	666.372	-666.372
28	-100.056	34.548	-91.918	-70.082	.000	.000
29	-187.716	84.447	-167.804	-133.381	-17.830	17.830
30	-244.387	59.699	-236.386	-174.824	29.510	-29.510
31	-7.274	-14.548	-4.364	4.364	488.987	-488.987
32	-19.999	-29.056	-11.680	11.680	418.905	-418.905
33	-55.391	-59.699	-29.510	29.510	285.524	-285.524

REACOES NOS APOIOS

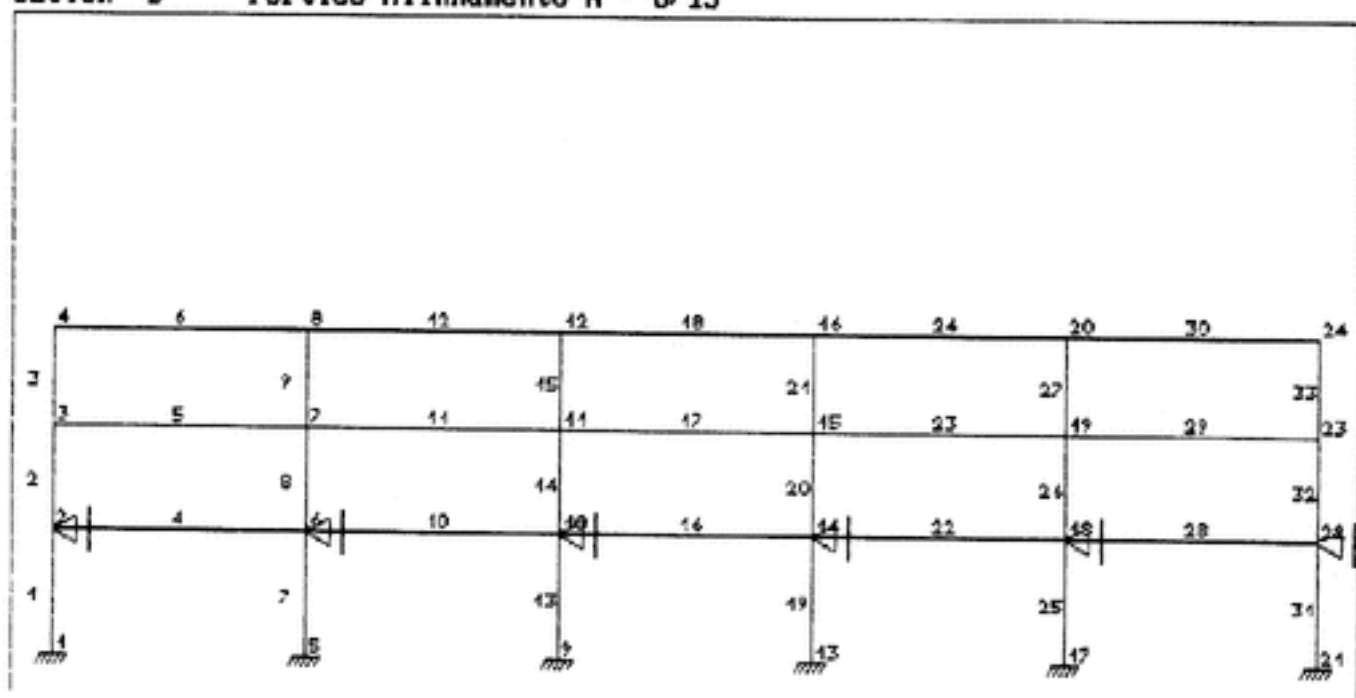
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	19.318	-520.113	11.591
2	.000	.000	14.157
5	-2.391	-1375.921	-1.434
6	.000	.000	12.593
9	-.086	-1084.488	-.052
10	.000	.000	9.851
13	-1.839	-1091.712	-1.103
14	.000	.000	11.126
17	-.320	-1152.071	-.192
18	.000	.000	12.457
21	-7.274	-488.987	-4.364
22	.000	.000	-7.315

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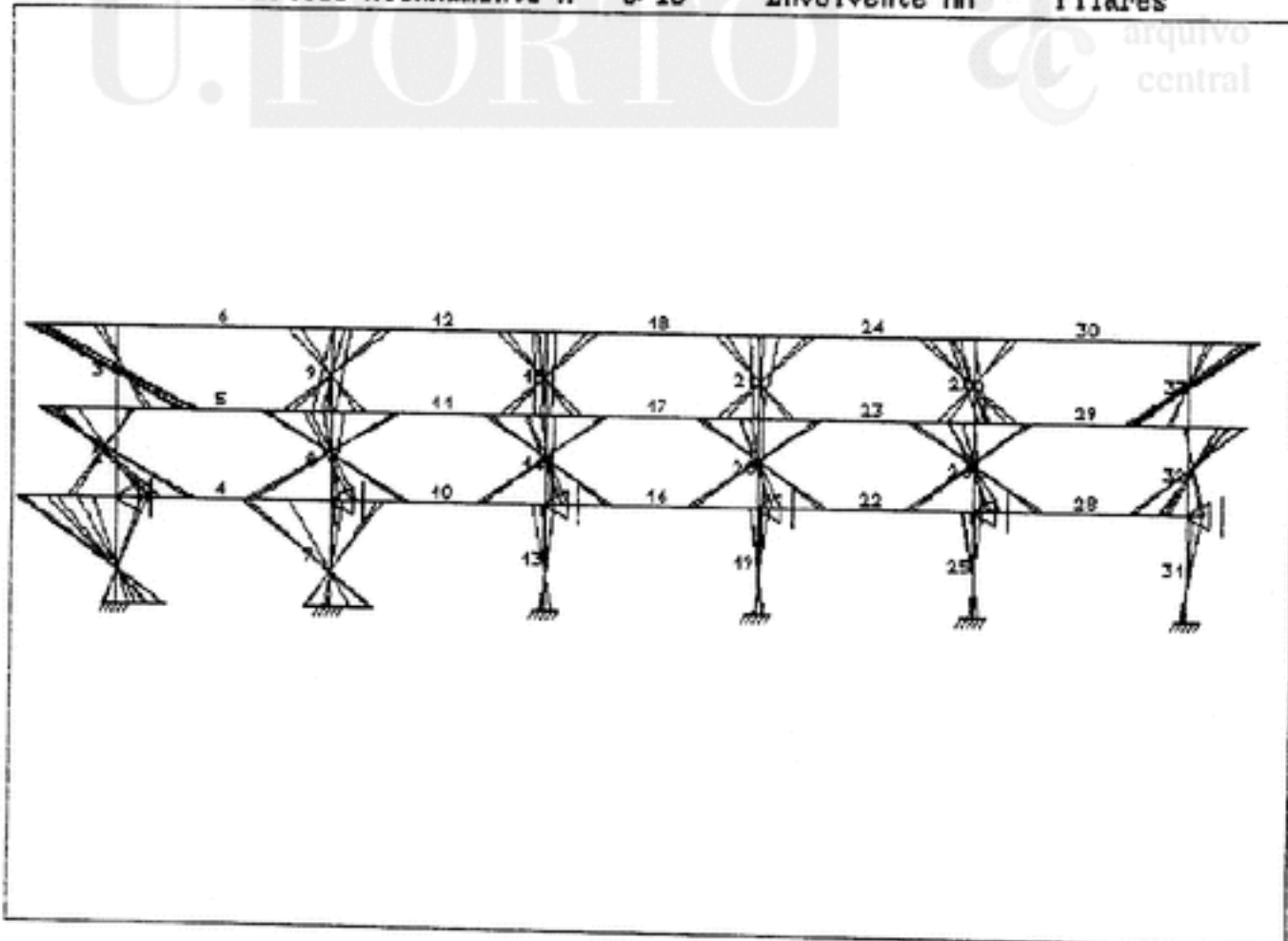
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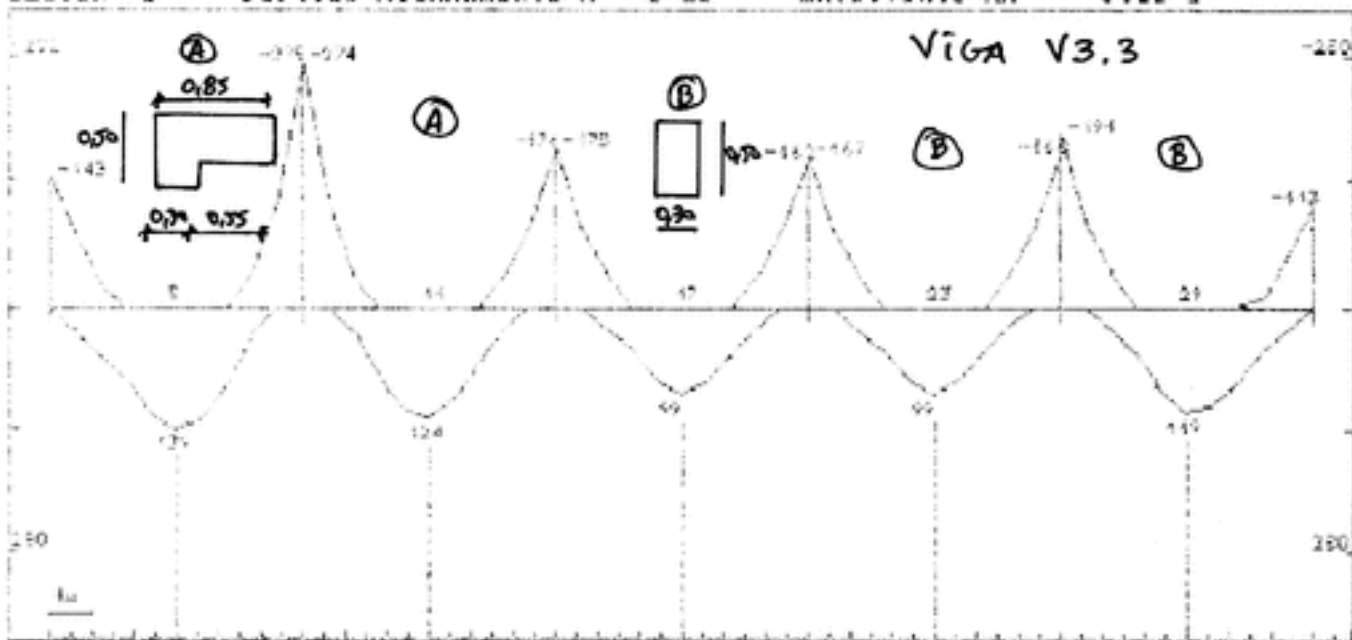
SECTOR B - Portico Alinhamento A - B/13



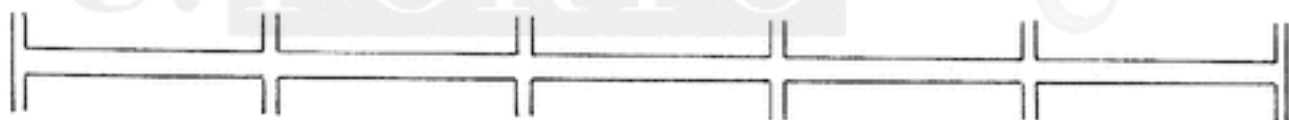
SECTOR C - Portico Alinhamento A - B/13 - Envolvente MM - Pilares



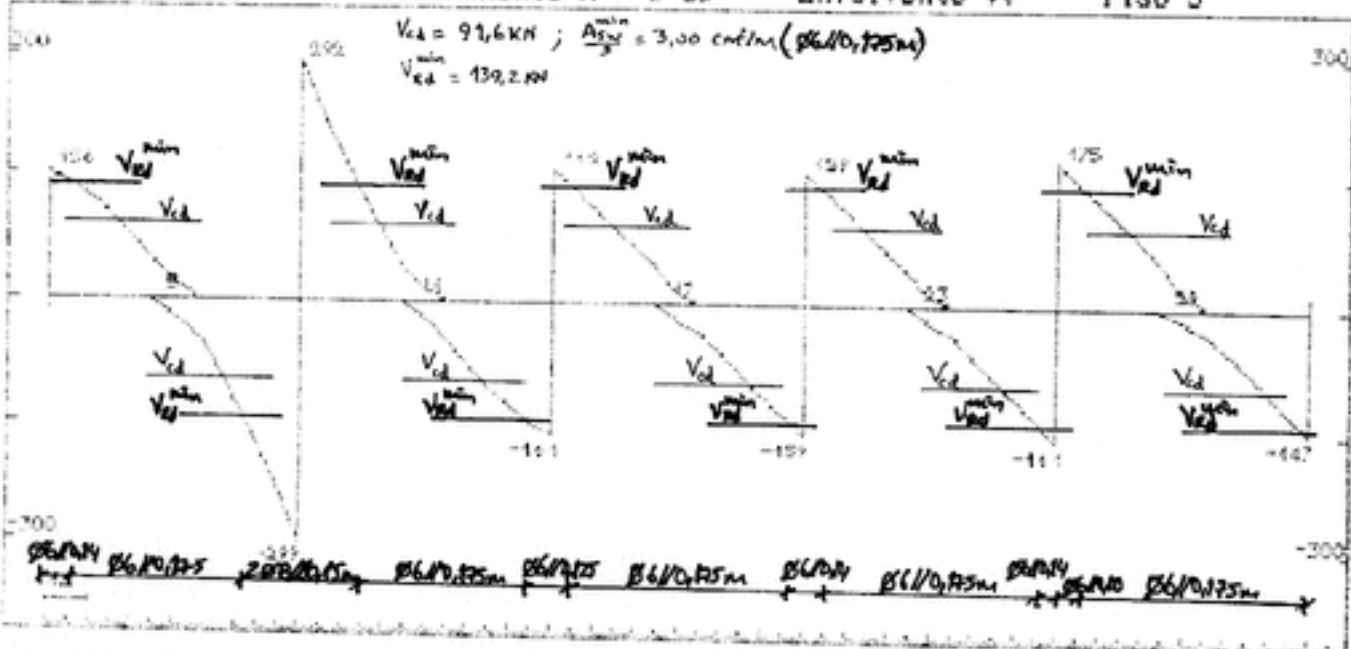
SECTOR B - Portico Alinhamento A - U/13 - Envolvente III - Piso 3



$M_{sd}(kNm)$:	-135	139	-254	124	-165	99	-156	99	-179	119	-106
μ :	0,153	0,056	0,288	0,050	0,187	0,112	0,277	0,112	0,203	0,135	0,120
w :	0,177	0,059	0,311	0,052	0,222	0,125	0,208	0,125	0,244	0,153	0,135
$A_s(cm^2)$:	9,52	8,97	16,74 (-8,39)	7,96	11,98	6,73	11,23	6,73	13,17	8,26	7,26
Varões:	3Ø16 + 3Ø12	3Ø20	2Ø16+4Ø20 (3Ø20)	3Ø20	4Ø20	2Ø20 + 1Ø16	4Ø20	2Ø20 + 1Ø16	4Ø20	3Ø20	2Ø16+1Ø20



SECTOR B - Portico Alinhamento A - B/13 - Envolvente IV - Piso 3



SECTOR B - Portico Alinhamento B - 8/13

No. DE NOS	= 24	No. DE BARRAS	= 32
No. DE NOS POR BARRA	= 2	No. DE INCOGNITAS POR NO	= 3
No. DE APOIOS	= 14	No. DE SECCOES TIPO	= 7
No. DE PROPRIEDADES	= 3	TIPO DE SAIDA DE RESULTADOS	= 1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.60000E+01	.25000E+00
2	.29000E+08	.35000E+00	.30000E+00
3	.29000E+08	.35000E+00	.35000E+00
4	.29000E+08	.25000E+00	.40000E+00
5	.29000E+08	.16200E+01	.35000E+00
6	.29000E+08	.30000E+00	.13500E+01
7	.29000E+08	.10000E+01	.10000E-05

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	3	2	2 3	3	3	3 4	3
4	4 5	3	5	2 7	7	6	3 8	5
7	4 11	5	8	5 12	6	9	6 7	1
10	7 8	1	11	8 10	7	12	9 10	3
13	10 11	3	14	11 12	3	15	10 14	7
16	11 15	5	17	12 16	6	18	13 14	3
19	14 15	3	20	15 16	3	21	14 18	4
22	15 19	5	23	16 20	6	24	17 18	3
25	18 19	3	26	19 20	3	27	18 22	4
28	19 23	5	29	20 24	6	30	21 22	2
31	22 23	2	32	23 24	2			

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	1.500	3	.000	5.000
4	.000	9.200	5	.000	14.100	6	6.000	.000
7	6.000	1.500	8	6.000	5.000	9	12.000	.000
10	12.000	5.000	11	12.000	9.200	12	12.000	14.100
13	18.000	.000	14	18.000	5.000	15	18.000	9.200
16	18.000	14.100	17	24.000	.000	18	24.000	5.000
19	24.000	9.200	20	24.000	14.100	21	30.000	.000
22	30.000	5.000	23	30.000	9.200	24	30.000	14.100

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	0	0	1
3	0	0	1	6	1	1	1
7	0	0	1	8	0	0	1
9	1	1	1	10	0	0	1
13	1	1	1	14	0	0	1
17	1	1	1	18	0	0	1
21	1	1	1	22	0	0	1

PILARES

Volume de Material (m3)= 15.8895

Area de Cofragem (m2)= 159.7900

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 33.7620

Area de Cofragem (m2)= 204.1200

ACCNO 1

PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
6	45.440	21	10.000
27	10.000	7	45.440
16	45.440	22	45.440
28	45.440	8	42.430
17	42.430	23	42.430
29	42.430		

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
8	136.320	6.000	17	9.940	3.000
23	9.940	3.000	29	9.940	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
5		99.000	
12		297.000	
16		198.000	
20		198.000	
24		99.000	

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
6	24.000	7	24.000
22	24.000	17	17.300
29	17.300		

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
17	5.300	3.000	29	5.300	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		54.000	
20		36.000	
24		18.000	

ACCAO 3
SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
16	24.000	28	24.000
8	17.300	23	17.300

***** CARGA 4 *****

BARRA	P (KN)	l1 (m)	BARRA	P (KN)	l1 (m)
8	41.190	6.000	23	5.300	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
5		18.000	
17		36.000	

 ACCAO 4
 SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			7.000
5			44.980

 ACCAO 5
 SISMO 2(e2)-E2

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			8.030
5			43.570

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4			14.120
5			19.970

***** RESULTADOS *****

 COMBINACAO 1
 ACC.BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-6.193	-12.386	-12.386	12.386	1655.433	-1655.433
2	12.386	32.735	12.892	-12.892	1655.433	-1655.433
3	187.625	381.134	135.419	-135.419	1354.434	-1354.434
4	377.504	250.014	128.065	-128.065	769.750	-769.750
5	.000	.000	.000	.000	.000	.000
6	-220.361	289.252	-300.998	-323.962	.000	.000
7	-758.638	1241.952	-584.684	-665.236	-1.118	1.118
8	-250.014	1167.437	-594.251	-747.154	116.083	-116.083
9	54.723	109.447	109.447	-109.447	323.962	-323.962
10	-109.447	-289.252	-113.914	113.914	323.962	-323.962
11	.000	.000	.000	.000	.000	.000
12	34.252	68.503	20.551	-20.551	2709.557	-2709.557
13	-68.503	-209.204	-66.121	66.121	2709.557	-2709.557
14	-225.978	-165.574	-79.909	79.909	1630.344	-1630.344
15	.000	.000	.000	.000	.000	.000
16	-806.770	197.786	-413.977	-210.983	12.669	-12.669
17	-1001.863	543.019	-356.689	-203.741	36.173	-36.173
18	12.480	24.960	7.488	-7.488	1382.998	-1382.998
19	-3.124	-.747	-.922	.922	1344.400	-1344.400
20	-.785	-16.580	-3.544	3.544	853.747	-853.747
21	-21.835	60.253	-38.597	-51.403	.000	.000
22	-196.254	393.111	-279.670	-345.290	15.292	-15.292
23	-526.439	89.695	-353.006	-207.424	32.629	-32.629
24	3.575	7.150	2.145	-2.145	1624.329	-1624.329
25	-35.243	-33.251	-16.308	16.308	1531.680	-1531.680
26	-18.416	-23.692	-8.593	8.593	840.901	-840.901
27	-32.160	54.689	-41.245	-48.755	.000	.000
28	-341.445	143.388	-345.489	-279.471	7.578	-7.578
29	-66.003	52.427	-282.478	-277.952	24.034	-24.034
30	.018	.036	.011	-.011	781.678	-781.678
31	-54.725	-78.048	-31.613	31.613	732.923	-732.923
32	-65.341	-52.427	-24.034	24.034	453.452	-453.452

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-6.193	-1655.433	-12.386
2	.000	.000	25.278
3	.000	.000	122.527
6	54.723	-323.962	109.447
7	.000	.000	-223.360
8	.000	.000	113.914
9	34.252	-2709.557	20.551
10	.000	.000	-86.672
13	12.480	-1382.998	7.488
14	.000	.000	-8.410
17	3.575	-1678.329	2.145

18	.000	.000	-18.453
21	.018	-781.678	.011
22	.000	.000	-31.623

 COMBINACAO 2
 ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-6.355	-12.710	-12.710	12.710	1471.281	-1471.281
2	12.710	33.590	13.228	-13.228	1471.282	-1471.282
3	190.567	388.045	137.765	-137.765	1168.969	-1168.969
4	371.690	225.994	121.976	-121.976	581.977	-581.977
5	.000	.000	.000	.000	.000	.000
6	-224.157	285.163	-302.312	-322.648	.000	.000
7	-759.734	1215.347	-586.992	-662.928	7.316	-7.316
8	-225.994	833.591	-433.477	-534.743	109.994	-109.994
9	53.950	107.900	107.900	-107.900	322.648	-322.648
10	-107.900	-285.163	-112.304	112.304	322.648	-322.648
11	.000	.000	.000	.000	.000	.000
12	37.333	74.666	22.400	-22.400	2345.463	-2345.463
13	-74.666	-230.426	-72.641	72.641	2345.463	-2345.463
14	-236.479	-158.364	-80.580	80.580	1372.700	-1372.700
15	.000	.000	.000	.000	.000	.000
16	-748.442	116.309	-309.835	-99.125	15.254	-15.254
17	-675.227	487.778	-311.457	-248.973	29.413	-29.413
18	10.459	20.917	6.275	-6.275	1227.790	-1227.790
19	2.092	19.001	5.022	-5.022	1189.450	-1189.450
20	19.482	-8.266	2.289	-2.289	811.305	-811.305
21	-23.009	62.967	-38.340	-51.660	.000	.000
22	-154.793	355.551	-279.020	-345.940	17.989	-17.989
23	-479.512	77.866	-265.331	-131.449	31.702	-31.702
24	5.930	11.861	3.558	-3.558	1433.267	-1433.267
25	-43.984	-57.059	-24.058	24.058	1340.085	-1340.085
26	-37.262	-30.876	-13.906	13.906	763.534	-763.534
27	-30.844	51.717	-41.521	-48.479	.000	.000
28	-261.230	104.441	-230.612	-178.348	7.837	-7.837
29	-46.990	41.767	-281.086	-279.344	17.794	-17.794
30	-1.538	-3.075	-.923	.923	681.672	-681.672
31	-48.642	-59.014	-25.632	25.632	633.193	-633.193
32	-45.427	-41.767	-17.795	17.795	454.844	-454.844

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-6.355	-1471.281	-12.710
2	.000	.000	25.938
3	.000	.000	124.536
6	53.950	-322.648	107.900
7	.000	.000	-220.203
8	.000	.000	112.304

9	37.333	-2345.463	22.400
10	.000	.000	-95.041
13	10.459	-1227.790	6.275
14	.000	.000	-1.253
17	5.930	-1433.267	3.558
18	.000	.000	-27.616
21	-1.538	-681.672	-.923
22	.000	.000	-24.710

 COMBINACAO 3
 ACC.BASE Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-3.625	-7.251	-7.251	7.251	1340.822	-1340.822
2	7.251	19.163	7.547	-7.547	1340.822	-1340.822
3	122.581	244.574	87.418	-87.418	1145.041	-1145.041
4	257.131	197.035	92.687	-92.687	763.840	-763.840
5	.000	.000	.000	.000	.000	.000
6	-141.743	193.942	-195.780	-213.180	.000	.000
7	-501.704	834.818	-381.201	-436.719	-13.741	13.741
8	-197.035	1185.376	-588.341	-753.064	80.705	-80.705
9	36.692	73.384	73.384	-73.384	213.180	-213.180
10	-73.384	-193.942	-76.379	76.379	213.180	-213.180
11	.000	.000	.000	.000	.000	.000
12	18.163	36.326	10.898	-10.898	2317.191	-2317.191
13	-36.326	-112.087	-35.336	35.336	2317.191	-2317.191
14	-136.772	-116.501	-51.688	51.688	1505.203	-1505.203
15	.000	.000	.000	.000	.000	.000
16	-585.958	209.225	-375.269	-249.691	2.610	-2.610
17	-1068.875	419.386	-306.638	-90.142	29.016	-29.016
18	12.036	24.072	7.222	-7.222	1196.493	-1196.493
19	1.636	-14.293	-3.014	3.014	1156.077	-1156.077
20	-19.595	-17.370	-7.544	7.544	721.055	-721.055
21	-25.709	53.211	-40.416	-49.584	.000	.000
22	-175.336	290.233	-185.331	-223.629	7.142	-7.142
23	-402.016	79.827	-333.913	-226.517	21.472	-21.472
24	-.435	-.870	-.261	.261	1385.089	-1385.089
25	-10.552	5.836	-1.123	1.123	1291.396	-1291.396
26	8.192	-6.800	.284	-.284	726.647	-726.647
27	-41.788	47.130	-44.110	-45.890	.000	.000
28	-304.261	132.424	-341.119	-283.841	5.734	-5.734
29	-73.027	44.584	-203.130	-193.649	21.754	-21.754
30	-1.041	-2.081	-.624	.624	671.880	-671.880
31	-45.049	-70.409	-27.490	27.490	625.990	-625.990
32	-62.015	-44.584	-21.755	21.755	342.150	-342.150

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-3.625	-1340.822	-7.251

2	.000	.000	14.797
3	.000	.000	79.871
6	36.692	-213.180	73.384
7	.000	.000	-149.762
8	.000	.000	76.379
9	18.163	-2317.191	10.898
10	.000	.000	-46.234
13	12.036	-1196.493	7.222
14	.000	.000	-10.235
17	-.435	-1439.089	-.261
18	.000	.000	-.862
21	-1.041	-671.880	-.624
22	.000	.000	-26.865

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-5.343	-10.687	-10.687	10.687	884.469	-884.469
2	10.687	28.244	11.123	-11.123	884.469	-884.469
3	58.487	170.245	54.460	-54.460	732.223	-732.223
4	177.534	100.222	56.685	-56.685	430.770	-430.770
5	.000	.000	.000	.000	.000	.000
6	-86.731	163.980	-152.245	-177.995	.000	.000
7	-347.779	693.222	-301.453	-359.027	8.275	-8.275
8	-100.222	675.355	-324.570	-420.426	124.155	-124.155
9	31.023	62.046	62.046	-62.046	177.995	-177.995
10	-62.046	-163.980	-64.579	64.579	177.995	-177.995
11	.000	.000	.000	.000	.000	.000
12	31.888	63.775	19.133	-19.133	1494.719	-1494.719
13	-63.775	-150.071	-50.916	50.916	1494.718	-1494.718
14	-160.802	-133.166	-59.993	59.993	931.487	-931.487
15	.000	.000	.000	.000	.000	.000
16	-382.349	147.839	-204.205	-126.035	17.350	-17.350
17	-542.189	311.905	-192.461	-115.699	64.158	-64.158
18	16.599	33.199	9.960	-9.960	777.165	-777.165
19	-38.385	-44.768	-19.798	19.798	757.585	-757.585
20	-41.329	-53.148	-19.281	19.281	497.821	-497.821
21	5.186	57.338	-19.579	-40.421	.000	.000
22	-61.741	250.081	-133.730	-196.510	16.834	-16.834
23	-258.757	78.512	-184.121	-124.039	44.875	-44.875
24	7.767	15.533	4.660	-4.660	910.823	-910.823
25	-65.024	-66.577	-31.334	31.334	847.476	-847.476
26	-50.348	-56.720	-21.850	21.850	485.057	-485.057
27	-7.847	50.286	-22.927	-37.073	.000	.000
28	-133.157	128.427	-165.908	-164.332	7.353	-7.353
29	-21.792	54.562	-148.618	-159.542	23.025	-23.025
30	3.568	7.135	2.141	-2.141	467.147	-467.147
31	-57.422	-70.169	-30.379	30.379	430.073	-430.073
32	-58.258	-54.562	-23.025	23.025	265.742	-265.742

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-5.343	-884.469	-10.687
2	.000	.000	21.810
3	.000	.000	43.337
6	31.023	-177.995	62.046
7	.000	.000	-126.625
8	.000	.000	64.579
9	31.888	-1494.719	19.133
10	.000	.000	-70.048
13	16.599	-777.165	9.960
14	.000	.000	-29.758
17	7.767	-925.223	4.660
18	.000	.000	-35.994
21	3.568	-467.147	2.141
22	.000	.000	-32.519

 COMBINACAO 5
 ACC.BASE E2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-5.331	-10.662	-10.662	10.662	884.777	-884.777
2	10.662	28.179	11.098	-11.098	884.777	-884.777
3	58.717	170.266	54.520	-54.520	732.495	-732.495
4	178.410	101.277	57.079	-57.079	430.913	-430.913
5	.000	.000	.000	.000	.000	.000
6	-86.896	163.923	-152.282	-177.958	.000	.000
7	-348.676	692.580	-301.581	-358.899	9.486	-9.486
8	-101.277	674.693	-324.713	-420.283	122.434	-122.434
9	31.013	62.025	62.025	-62.025	177.958	-177.958
10	-62.025	-163.924	-64.557	64.557	177.958	-177.958
11	.000	.000	.000	.000	.000	.000
12	31.783	63.567	19.070	-19.070	1494.879	-1494.879
13	-63.567	-149.818	-50.806	50.806	1494.878	-1494.878
14	-159.660	-131.960	-59.514	59.514	931.527	-931.527
15	.000	.000	.000	.000	.000	.000
16	-383.101	147.104	-204.453	-125.787	18.190	-18.190
17	-542.732	311.347	-192.644	-115.516	62.917	-62.917
18	16.530	33.061	9.918	-9.918	777.246	-777.246
19	-38.084	-44.459	-19.653	19.653	757.616	-757.616
20	-40.187	-51.947	-18.803	18.803	497.860	-497.860
21	5.023	57.195	-19.630	-40.370	.000	.000
22	-62.458	249.367	-133.969	-196.271	17.343	-17.343
23	-259.399	77.816	-184.344	-123.816	44.112	-44.112
24	7.720	15.441	4.632	-4.632	910.827	-910.827
25	-64.665	-66.236	-31.167	31.167	847.488	-847.488
26	-49.210	-55.526	-21.375	21.375	485.039	-485.039
27	-7.971	50.156	-22.969	-37.031	.000	.000
28	-133.921	127.572	-166.178	-164.062	7.553	-7.553
29	-22.290	53.834	-148.823	-159.337	22.737	-22.737

30	3.534	7.068	2.120	-2.120	466.630	-466.630
31	-57.224	-69.995	-30.290	30.290	429.599	-429.599
32	-57.577	-53.834	-22.737	22.737	265.537	-265.537

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-5.331	-884.777	-10.662
2	.000	.000	21.760
3	.000	.000	43.422
6	31.013	-177.958	62.025
7	.000	.000	-126.582
8	.000	.000	64.557
9	31.783	-1494.879	19.070
10	.000	.000	-69.876
13	16.530	-777.246	9.918
14	.000	.000	-29.571
17	7.720	-925.227	4.632
18	.000	.000	-35.799
21	3.534	-466.630	2.120
22	.000	.000	-32.411

COMBINACAO 6

ACC.BASE(-E1)

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd(KN)
1	-1.642	-3.285	-3.285	3.285	918.649	-918.649
2	3.285	8.680	3.419	-3.419	918.649	-918.649
3	129.447	223.991	84.152	-84.152	754.751	-754.751
4	220.685	164.202	78.548	-78.548	439.595	-439.595
5	.000	.000	.000	.000	.000	.000
6	-138.127	145.462	-163.897	-166.343	.000	.000
7	-444.675	625.679	-315.156	-345.324	-4.897	4.897
8	-164.202	633.442	-333.395	-411.601	11.078	-11.078
9	27.520	55.040	55.040	-55.040	166.343	-166.343
10	-55.040	-145.463	-57.286	57.286	166.343	-166.343
11	.000	.000	.000	.000	.000	.000
12	7.558	15.117	4.535	-4.535	1510.565	-1510.565
13	-15.117	-80.356	-22.732	22.732	1510.565	-1510.565
14	-86.451	-52.416	-28.340	28.340	935.498	-935.498
15	.000	.000	.000	.000	.000	.000
16	-458.872	71.127	-229.744	-100.496	.713	-.713
17	-581.025	273.729	-205.296	-102.864	-17.260	17.260
18	.782	1.563	.469	-.469	791.157	-791.157
19	30.405	34.888	15.546	-15.546	760.006	-760.006
20	32.617	27.262	12.220	-12.220	500.141	-500.141
21	-31.968	25.065	-31.151	-28.849	.000	.000
22	-138.631	173.137	-159.369	-170.871	4.039	-4.039
23	-300.991	29.809	-199.277	-108.883	-5.039	5.039
24	-2.558	-5.115	-1.535	1.535	910.742	-910.742

25	16.771	19.528	8.643	-8.643	849.023	-849.023
26	23.220	23.165	9.466	-9.466	483.130	-483.130
27	-36.721	19.506	-32.869	-27.131	.000	.000
28	-215.885	36.471	-195.022	-135.218	3.214	-3.214
29	-52.974	6.371	-161.847	-146.313	4.426	-4.426
30	-4.285	-8.570	-2.571	2.571	414.861	-414.861
31	-10.935	-21.153	-7.640	7.640	387.731	-387.731
32	-15.317	-6.371	-4.426	4.426	252.513	-252.513

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.642	-918.649	-3.285
2	.000	.000	6.703
3	.000	.000	80.733
6	27.520	-166.343	55.040
7	.000	.000	-112.326
8	.000	.000	57.286
9	7.558	-1510.565	4.535
10	.000	.000	-27.267
13	.782	-791.157	.469
14	.000	.000	15.077
17	-2.558	-925.142	-1.535
18	.000	.000	10.177
21	-4.285	-414.861	-2.571
22	.000	.000	-5.069

 COMBINACAO 7
 ACC.BASE(-E2)

arquivo
 central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-1.655	-3.309	-3.309	3.309	918.340	-918.340
2	3.309	8.746	3.444	-3.444	918.341	-918.341
3	129.217	223.970	84.092	-84.092	754.480	-754.480
4	219.809	163.147	78.154	-78.154	439.451	-439.451
5	.000	.000	.000	.000	.000	.000
6	-137.963	145.519	-163.861	-166.379	.000	.000
7	-443.778	626.320	-315.028	-345.452	-6.107	6.107
8	-163.147	634.104	-333.252	-411.744	12.799	-12.799
9	27.531	55.061	55.061	-55.061	166.379	-166.379
10	-55.061	-145.519	-57.309	57.309	166.379	-166.379
11	.000	.000	.000	.000	.000	.000
12	7.663	15.325	4.598	-4.598	1510.405	-1510.405
13	-15.325	-80.608	-22.841	22.841	1510.405	-1510.405
14	-87.593	-53.622	-28.819	28.819	935.457	-935.457
15	.000	.000	.000	.000	.000	.000
16	-458.120	71.861	-229.496	-100.744	.000	.000
17	-580.482	274.288	-205.112	-103.048	-.127	.127
18	.851	1.701	.510	-.510	-16.019	16.019
19	30.104	34.579	15.401	-15.401	791.076	-791.076
					759.976	-759.976

20	31.474	26.061	11.742	-11.742	500.102	-500.102
21	-31.805	25.207	-31.100	-28.900	.000	.000
22	-137.914	173.851	-159.130	-171.110	3.530	-3.530
23	-300.348	30.504	-199.054	-109.106	-4.275	4.275
24	-2.512	-5.023	-1.507	1.507	910.738	-910.738
25	16.412	19.187	8.476	-8.476	849.010	-849.010
26	22.082	21.972	8.991	-8.991	483.148	-483.148
27	-36.597	19.636	-32.827	-27.173	.000	.000
28	-215.121	37.326	-194.752	-135.487	3.014	-3.014
29	-52.476	7.100	-161.643	-146.517	4.713	-4.713
30	-4.252	-8.503	-2.551	2.551	415.378	-415.378
31	-11.133	-21.327	-7.729	7.729	388.205	-388.205
32	-15.999	-7.100	-4.714	4.714	252.717	-252.717

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-1.655	-918.340	-3.309
2	.000	.000	6.753
3	.000	.000	80.648
6	27.531	-166.379	55.061
7	.000	.000	-112.370
8	.000	.000	57.309
9	7.663	-1510.405	4.598
10	.000	.000	-27.439
13	.851	-791.076	.510
14	.000	.000	14.890
17	-2.512	-925.138	-1.507
18	.000	.000	9.983
21	-4.252	-415.378	-2.551
22	.000	.000	-5.178

 COMBINACAO 8
 ACC.BASE W

ACCAO	COEFICIENTE
PERMANENTES-G	1.50000
SOBRECARGA2-Q2	1.05000
SISMO 2(e2)-E2	.00000

ACCAO	COEFICIENTE
SOBRECARGA1-Q1	1.05000
SISMO 1(e1)-E1	.00000
VENTO -W	-1.50000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	-4.737	-9.473	-9.473	9.473	1511.560	-1511.560
2	9.473	25.036	9.860	-9.860	1511.560	-1511.560
3	183.114	353.741	127.823	-127.823	1239.409	-1239.409
4	344.339	235.159	118.265	-118.265	712.795	-712.795
5	.000	.000	.000	.000	.000	.000
6	-208.150	255.729	-272.150	-288.010	.000	.000
7	-698.079	1100.630	-526.614	-593.706	-11.622	11.622
8	-235.159	1067.108	-545.396	-684.054	88.310	-88.310
9	48.381	96.762	96.762	-96.762	288.010	-288.010
10	-96.762	-255.729	-100.712	100.712	288.010	-288.010
11	.000	.000	.000	.000	.000	.000
12	25.643	51.287	15.386	-15.386	2485.196	-2485.196
13	-51.287	-172.707	-53.332	53.332	2485.196	-2485.196
14	-192.340	-137.616	-67.338	67.338	1516.161	-1516.161

15	.000	.000	.000	.000	.000	.000
16	-735.584	164.083	-375.330	-184.830	2.383	-2.383
17	-929.492	484.060	-329.906	-181.429	20.971	-20.971
18	8.688	17.376	5.213	-5.213	1283.078	-1283.078
19	13.139	16.691	7.102	-7.102	1241.781	-1241.781
20	9.588	-3.299	1.283	-1.283	801.500	-801.500
21	-30.515	52.736	-41.297	-48.703	.000	.000
22	-190.361	338.131	-255.452	-304.708	8.203	-8.203
23	-480.761	76.342	-323.071	-188.264	22.256	-22.256
24	1.092	2.184	.655	-.655	1495.200	-1495.200
25	-14.683	-11.863	-6.320	6.320	1402.385	-1402.385
26	-6.207	-9.832	-3.273	3.273	783.097	-783.097
27	-40.237	45.569	-44.111	-45.889	.000	.000
28	-320.062	113.067	-314.579	-245.581	5.155	-5.155
29	-66.510	40.314	-260.033	-251.302	18.981	-18.981
30	-2.285	-4.570	-1.371	1.371	710.171	-710.171
31	-41.000	-60.375	-24.137	24.137	664.283	-664.283
32	-52.692	-40.314	-18.981	18.981	418.702	-418.702

REACOES NOS APOIOS

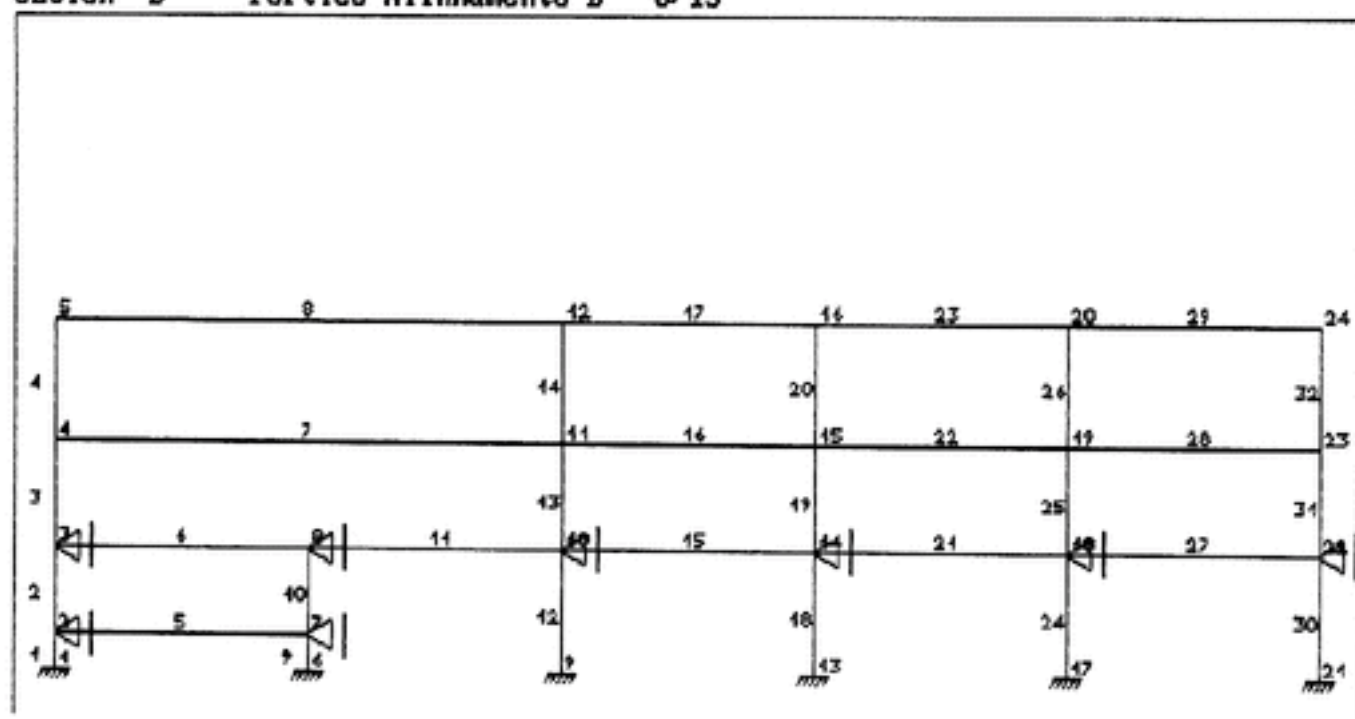
Nº DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	-4.737	-1511.560	-9.473
2	.000	.000	19.333
3	.000	.000	117.963
6	48.381	-288.010	96.762
7	.000	.000	-197.474
8	.000	.000	100.712
9	25.643	-2485.196	15.386
10	.000	.000	-68.718
13	8.688	-1283.078	5.213
14	.000	.000	1.890
17	1.092	-1533.000	.655
18	.000	.000	-6.976
21	-2.285	-710.171	-1.371
22	.000	.000	-22.766

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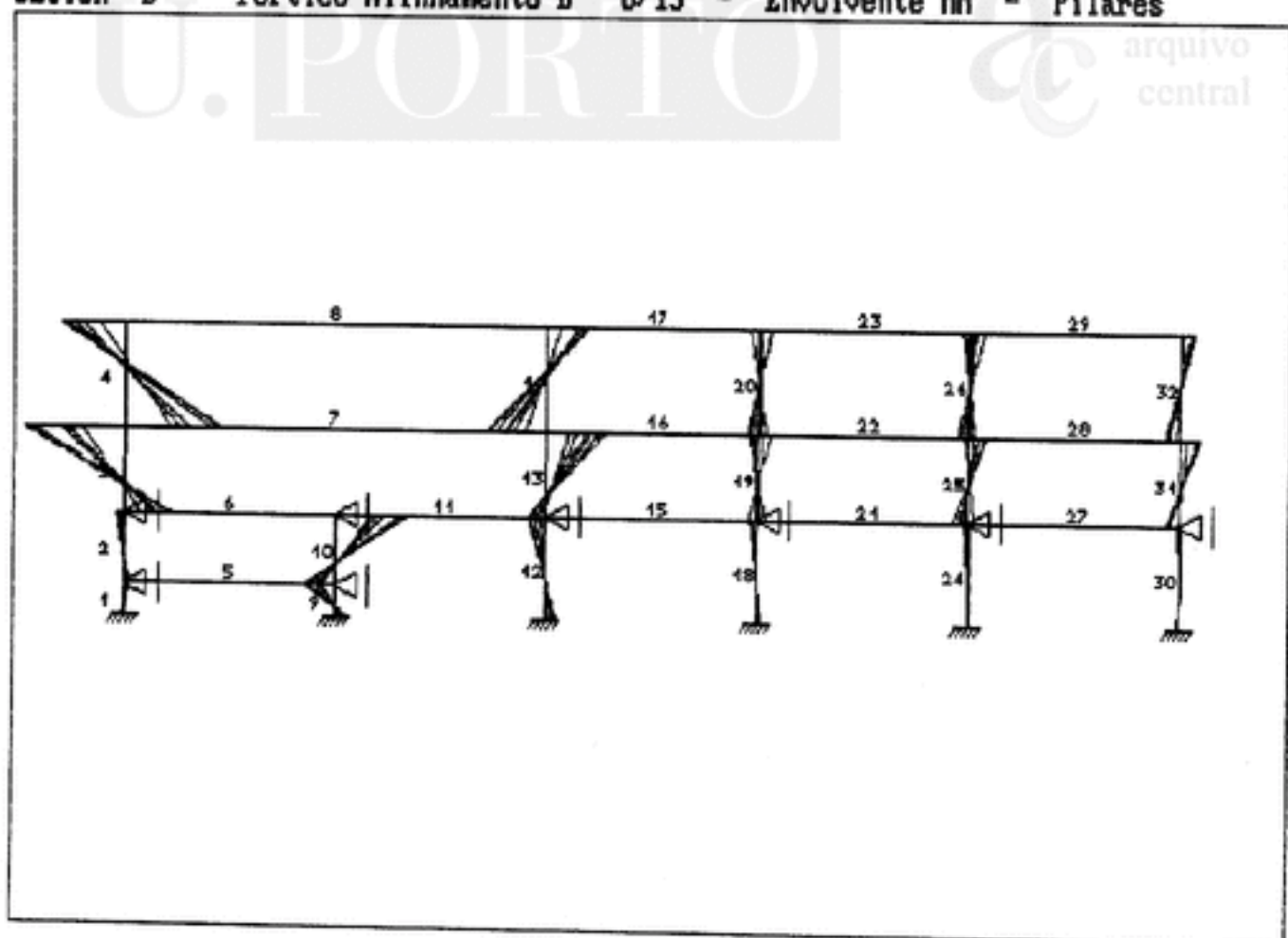
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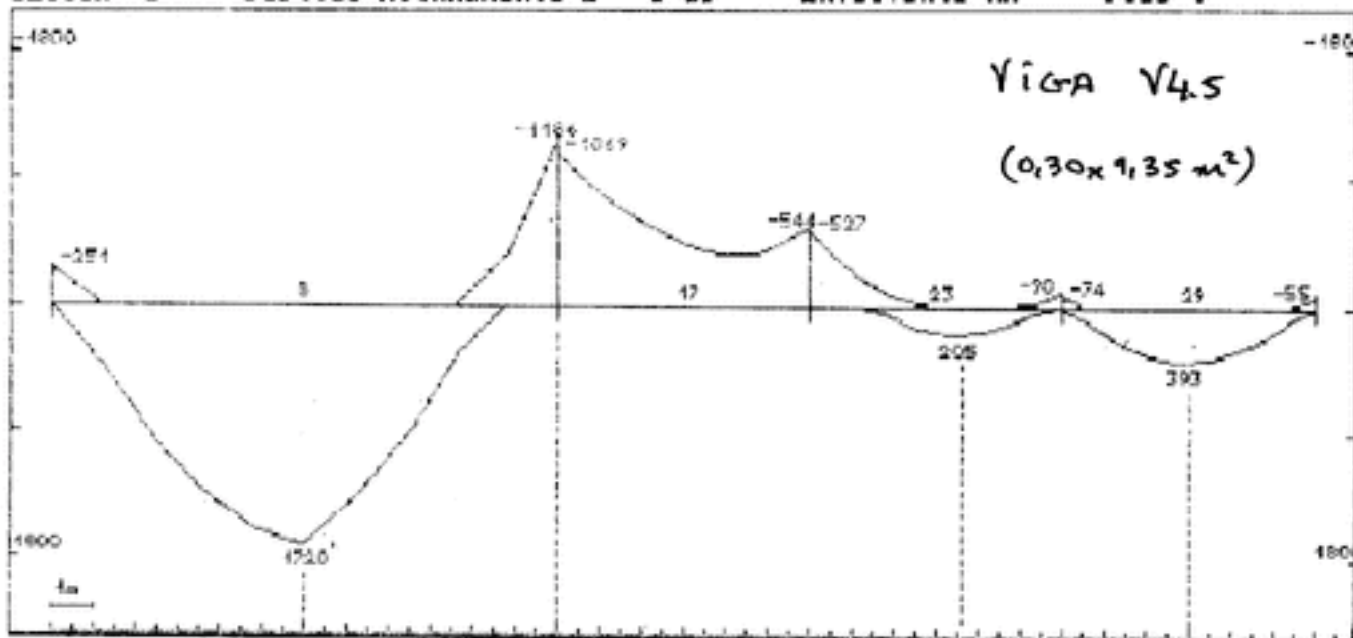
SECTOR B - Portico Alinhamento B - 8/13



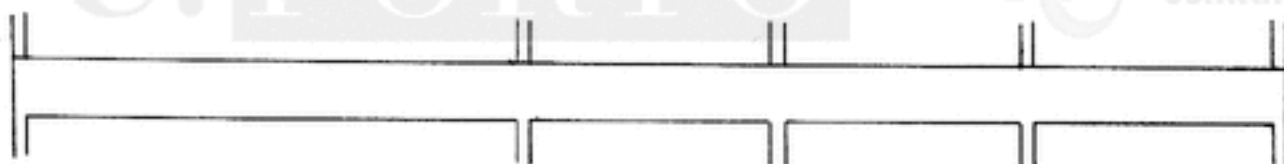
SECTOR B - Portico Alinhamento B - 8/13 - Envolvente MM - Pilares



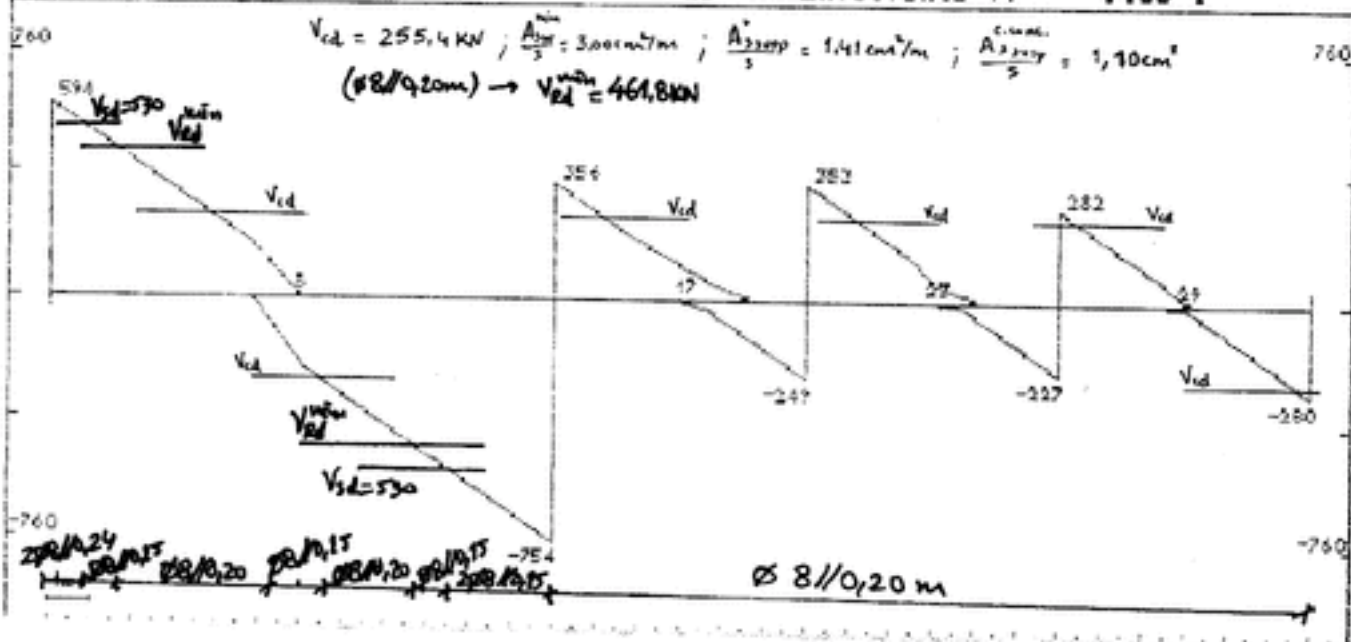
SECTOR B - Portico Alinhamento B - B/13 - Envolvente MM - Piso 4



M_d (kNm):	-231	1720	-1121	-531	205	-72	393	-48
μ :	0,034	0,251	0,164	0,078	0,030	0,012	0,057	0,007
w :	0,035	0,314	0,191	0,084	0,031	0,042	0,061	0,007
A_s (cm²):	5,24	47,21	28,62	12,55	4,63	1,82	9,12	1,06
	($A_s^{min} = 5,90 \text{ cm}^2$)							
Varões:	3Ø16	10Ø25	6Ø25	2Ø25+2Ø16	3Ø16	3Ø16	5Ø16	3Ø16



SECTOR B - Portico Alinhamento B - B/13 - Envolvente UV - Piso 4



SECTOR B - Portico Alinhamento C - 8/13

No. DE NOS	=	24	No. DE BARRAS	=	33
No. DE NOS POR BARRA	=	2	No. DE INCOGNITAS POR NO	=	3
No. DE APOIOS	=	12	No. DE SECCOES TIPO	=	9
No. DE PROPRIEDADES	=	3	TIPO DE SAIDA DE RESULTADOS	=	1

MATERIAL	PROPRIEDADES		
	E (KPa)	b (m)	h (m)
1	.29000E+08	.25000E+00	.80000E+01
2	.29000E+08	.35000E+00	.30000E+00
3	.29000E+08	.35000E+00	.35000E+00
4	.29000E+08	.30000E+00	.30000E+00
5	.29000E+08	.34747E+00	.85000E+00
6	.29000E+08	.40428E+00	.50000E+00
7	.29000E+08	.30000E+00	.50000E+00
8	.29000E+08	.35000E+00	.90000E+00
9	.29000E+08	.63200E+00	.35000E+00

BARRA	NOS	MAT.	BARRA	NOS	MAT.	BARRA	NOS	MAT.
1	1 2	3	2	2 3	3	3	3 4	3
4	2 6	9	5	3 7	5	6	4 8	8
7	5 6	1	8	6 7	3	9	7 8	3
10	6 10	1	11	7 11	5	12	8 12	8
13	9 10	1	14	10 11	3	15	11 12	3
16	10 14	1	17	11 15	5	18	12 16	8
19	13 14	1	20	14 15	3	21	15 16	3
22	14 16	7	23	15 19	6	24	16 20	8
25	17 18	2	26	18 19	2	27	19 20	2
28	18 22	7	29	19 23	6	30	20 24	8
31	21 22	4	32	22 23	4	33	23 24	4

NOS	CORDENADAS		NOS	CORDENADAS		NOS	CORDENADAS	
	X(m)	Y(m)		X(m)	Y(m)		X(m)	Y(m)
1	.000	.000	2	.000	5.000	3	.000	9.200
4	.000	14.100	5	6.000	.000	6	6.000	5.000
7	6.000	9.200	8	6.000	14.100	9	12.000	.000
10	12.000	5.000	11	12.000	9.200	12	12.000	14.100
13	18.000	.000	14	18.000	5.000	15	18.000	9.200
16	16.000	14.100	17	24.000	.000	18	24.000	5.000
19	24.000	9.200	20	24.000	14.100	21	30.000	.000
22	30.000	5.000	23	30.000	9.200	24	30.000	14.100

NOS DE APOIO	CODIGO			NOS DE APOIO	CODIGO		
1	1	1	1	2	0	0	1
5	1	1	1	6	0	0	1
9	1	1	1	10	0	0	1
13	1	1	1	14	0	0	1
17	1	1	1	16	0	0	1
21	1	1	1	22	0	0	1

PILARES

Volume de Material (m3)= 30.3210

ELEMENTOS NAO VERTICAIS

Volume de Material (m3)= 37.0683

Area de Cofragem (m2)= 280.7100

Area de Cofragem (m2)= 281.5978

ACCAO 1
PERMANENTES-G

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	22.500	22	18.000
10	18.000	5	17.480
11	17.480	17	27.950
23	26.820	29	26.820
6	12.760	12	12.760
18	12.760	24	12.760
30	12.760		

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
5	.000	43.440	.000	6.000	11	43.440	.000	.000	6.000

***** CARGA 4 *****

BARRA	P (KN)	11 (m)	BARRA	P (KN)	11 (m)
17	10.470 (*)	3.000	23	10.470	3.000
29	10.470	3.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORÇAS APLICADAS NOS NOS VERTICAL (KN)	HORIZONTAL (KN)
4		67.500	
8		135.000	
12		135.000	
16		135.000	
20		135.000	
24		67.500	

(*) - FOI ACRESCENTADO
PELA CARGA DESCARREGADA
PELA VIGA V3.T1 NA
VALOR DE 22 KN.

ACCAO 2
SOBRECARGA1-Q1

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
4	12.000	5	.000
17	6.000	29	6.000
12	.800	24	.800

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12 (m)	BARRA	Q(KN)	P(KN)	11(m)	12 (m)
5	.000	24.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	11 (m)	BARRA	P (KN)	11 (m)
17	6.000	3.000	29	6.000	3.000

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
4		9.000	
3		18.000	
10		18.000	
24		9.000	

 ACCAO 3
 SOBRECARGA2-Q2

***** CARGA 1 *****

BARRA	P (KN/m)	BARRA	P (KN/m)
11	.000	23	8.000
8	.800	18	.800
30	.800		

***** CARGA 2 *****

BARRA	Q(KN)	P(KN)	11(m)	12(m)	BARRA	Q(KN)	P(KN)	11(m)	12(m)
11	24.000	.000	.000	6.000					

***** CARGA 4 *****

BARRA	P (KN)	11 (m)	BARRA	P (KN)	11 (m)
23	8.000	6.000			

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
12		18.000	
20		18.000	

 ACCAO 4
 SISMO 1(e1)-E1

***** CARGA 7 *****

NO	MOMENTO (KN.m)	FORCAS APLICADAS NOS NOS	
		VERTICAL (KN)	HORIZONTAL (KN)
3			24.520
4			75.210

 ACCAO 5
 SISMO 2(e2)-E2

***** CARGA 7 *****

FORCAS APLICADAS NOS NOS

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			32.500
4			58.470

 ACCAO 6
 VENTO -W

***** CARGA 7 *****

NO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
3			7.380
4			23.190

***** RESULTADOS *****

 COMBINACAO 1
 ACC BASE Q1+Q2

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	1.50000	SISMO 1(+1)-E1	1.00000
SISMO 2(+2)-E2	.00000	VENTO -W	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	17.740	35.479	10.644	-10.644	459.472	-459.472
2	60.723	54.651	27.470	-27.470	319.441	-319.441
3	35.868	26.205	12.668	-12.668	172.527	-172.527
4	-96.202	187.518	-140.031	-170.489	.000	.000
5	-90.519	287.953	-148.914	-313.886	10.374	-10.374
6	-26.205	45.861	-57.777	-84.263	-1.248	1.248
7	-205.979	-411.957	-123.587	123.587	1045.450	-1045.450
8	-.029	-3.410	-.819	.819	964.177	-964.177
9	.454	3.032	.711	-.711	352.395	-352.395
10	224.468	310.711	89.196	-89.196	.000	.000
11	-284.996	183.497	-297.897	-182.903	8.844	-8.844
12	-48.693	63.021	-58.632	-83.408	-.535	.535
13	-102.487	-204.974	-61.492	61.492	784.182	-784.182
14	1.868	.181	.488	-.488	678.870	-678.870
15	2.598	2.949	1.132	-1.132	347.383	-347.383
16	-107.605	10.919	-18.114	18.114	.000	.000
17	-186.276	165.414	-168.804	-161.851	8.200	-8.200
18	-85.971	165.363	-54.455	-87.585	.597	-.597
19	39.743	79.485	23.846	-23.846	772.147	-772.147
20	4.096	4.402	2.023	-2.023	703.710	-703.710
21	9.581	11.734	4.350	-4.350	379.664	-379.664
22	-94.499	73.191	-84.552	-77.448	.000	.000
23	-179.398	165.286	-182.394	-157.891	5.873	-5.873
24	-117.097	-12.257	-82.579	-39.461	4.947	-4.947
25	1.728	3.455	1.037	-1.037	830.553	-830.553
26	9.994	11.410	5.096	-5.096	664.888	-664.888
27	10.848	8.617	3.972	-3.972	326.546	-326.546

28	-88.640	43.337	-88.217	-73.783	.000	.000
29	-187.542	63.886	-180.652	-139.433	8.997	-8.997
30	3.640	16.971	-57.585	-64.455	8.919	-8.919
31	-6.620	-13.639	-4.092	4.092	392.422	-392.422
32	-29.698	-37.152	-15.917	15.917	318.639	-318.639
33	-26.734	-16.971	-8.919	8.919	179.205	-179.205

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	17.740	-459.472	10.644
2	.000	.000	16.826
5	-205.979	-1045.450	-123.587
6	.000	.000	122.768
9	-102.487	-784.182	-61.492
10	.000	.000	61.980
13	39.743	-772.147	23.848
14	.000	.000	-21.822
17	1.728	-830.553	1.037
18	.000	.000	4.060
21	-6.820	392.422	-4.092
22	.000	.000	-11.625

COMBINACAO 2

ACC.BASE Q1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	1.50000
SOBRECARGA2-Q2	.00000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-.60000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	17.516	35.031	10.509	-10.509	461.118	-461.118
2	61.716	57.063	26.281	-26.281	320.962	-320.962
3	37.594	26.365	13.053	-13.053	168.700	-168.700
4	-96.748	187.313	-140.156	-170.344	.000	.000
5	-94.657	260.006	-152.282	-308.538	10.800	-10.800
6	-26.365	47.183	-53.950	-60.890	-.861	.861
7	-196.424	-392.847	-117.854	117.854	967.049	-967.049
8	-3.840	-11.421	-3.634	3.634	881.110	-881.110
9	-6.351	-.115	-1.320	1.320	348.766	-348.766
10	209.375	297.057	84.405	-84.405	.000	.000
11	-242.235	153.281	-223.806	-128.994	8.486	-8.486
12	-47.068	62.929	-58.376	-63.664	-2.181	2.181
13	-91.205	-182.410	-54.723	54.723	721.948	-721.948
14	5.922	7.903	3.292	-3.292	616.756	-616.756
15	9.149	6.292	3.151	-3.151	319.122	-319.122
16	-120.589	-4.149	-20.786	20.786	.000	.000
17	-170.333	149.263	-168.639	-161.616	8.626	-8.626
18	-69.222	95.988	-52.959	-61.881	.971	-.971
19	48.499	96.998	29.099	-29.099	725.539	-725.539
20	.942	-2.293	-.322	.322	661.902	-661.902
21	3.648	9.050	2.632	-2.632	370.572	-370.572
22	-93.790	73.251	-84.423	-77.577	.000	.000
23	-150.818	143.739	-128.714	-127.371	5.672	-5.672

24	-105.038	-3.989	-79.191	-42.849	3.603	-3.603
25	1.533	3.068	.920	-.920	773.134	-773.134
26	12.194	16.268	6.777	-6.777	606.947	-606.947
27	15.039	10.569	5.226	-5.226	301.156	-301.156
28	-88.510	42.848	-88.610	-73.390	.000	.000
29	-175.096	64.832	-178.420	-141.665	7.223	-7.223
30	-6.581	16.257	-55.807	-59.033	8.829	-8.829
31	-6.628	-13.257	-3.977	3.977	388.838	-388.838
32	-29.591	-37.827	-16.052	16.052	315.448	-315.448
33	-27.008	-16.257	-8.829	8.829	173.783	-173.783

REACOES NOS APOIOS

NO DO APOIO	MOENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	17.516	-461.118	10.509
2	.000	.000	17.771
5	-196.424	-967.049	-117.854
6	.000	.000	114.221
9	-91.205	-721.948	-54.723
10	.000	.000	58.014
13	48.499	-725.539	29.099
14	.000	.000	-29.421
17	1.533	-773.134	.920
18	.000	.000	5.857
21	-6.628	-388.838	-3.977
22	.000	.000	-12.075

U. PORTO

COMBINACAO 3
ACC.BASE Q2

arquivo
central

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.50000	SOBRECARGA1-Q1	.00000
SOBRECARGA2-Q2	1.50000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO	-.60000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	10.892	21.783	6.535	-6.535	364.496	-364.496
2	42.285	39.867	19.560	-19.560	272.896	-272.896
3	28.135	22.562	10.346	-10.346	158.354	-158.354
4	-64.068	121.982	-91.598	-110.902	.000	.000
5	-68.002	243.659	-114.544	-238.256	4.786	-4.786
6	-22.562	46.058	-57.104	-64.936	-3.568	3.568
7	-145.606	-291.212	-87.364	87.364	904.739	-904.739
8	7.068	8.423	3.688	-3.688	858.247	-858.247
9	8.383	6.884	3.116	-3.116	324.355	-324.355
10	162.162	224.300	64.410	-64.410	.000	.000
11	-260.465	172.529	-295.636	-165.164	5.358	-5.358
12	-52.942	55.948	-56.919	-57.921	-.452	.452
13	-71.040	-142.081	-42.624	42.624	719.123	-719.123
14	.931	-3.966	-.727	.727	642.134	-642.134
15	-2.802	.626	-.444	.444	340.272	-340.272
16	-83.150	7.677	-12.579	12.579	.000	.000
17	-165.742	147.326	-136.697	-130.558	5.075	-5.075
18	-56.574	105.584	-52.852	-69.188	-.896	.896
19	37.952	75.304	22.771	-22.771	717.674	-717.674

20	9.588	13.184	5.417	-5.417	646.221	-646.221
21	14.660	13.666	5.781	-5.781	351.387	-351.387
22	-93.169	74.901	-84.031	-77.969	.000	.000
23	-175.149	149.740	-164.276	-155.809	4.711	-4.711
24	-119.250	-14.421	-79.699	-35.141	4.865	-4.865
25	1.866	3.733	1.120	-1.120	791.523	-791.523
26	8.490	6.513	3.572	-3.572	624.779	-624.779
27	5.316	5.963	2.302	-2.302	321.857	-321.857
28	-87.204	40.551	-88.775	-73.225	.000	.000
29	-161.579	50.156	-147.113	-109.972	5.981	-5.981
30	8.458	14.366	-57.216	-64.324	7.186	-7.186
31	-7.276	-14.553	-4.366	4.366	349.271	-349.271
32	-25.998	-29.308	-13.168	13.168	276.046	-276.046
33	-20.848	-14.366	-7.187	7.187	166.074	-166.074

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	10.892	-364.496	6.535
2	.000	.000	13.025
5	-145.606	-904.739	-87.364
6	.000	.000	91.052
9	-71.040	-719.123	-42.624
10	.000	.000	41.897
13	37.952	-717.674	22.771
14	.000	.000	-17.354
17	1.866	-791.523	1.120
18	.000	.000	2.452
21	-7.276	-349.271	-4.366
22	.000	.000	-8.802

 COMBINACAO 4
 ACC.BASE E1

ACCAO	COEFICIENTE	ACCAO	COEFICIENTE
PERMANENTES-G	1.00000	SOBRECARGA1-Q1	.40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	18.764	37.527	11.258	-11.258	218.305	-218.305
2	-14.635	-18.581	-7.909	7.909	151.362	-151.362
3	-27.774	-39.233	-13.675	13.675	93.211	-93.211
4	-22.892	112.633	-66.943	-96.857	.000	.000
5	46.355	237.619	-58.151	-205.849	42.546	-42.546
6	39.233	63.539	-22.111	-56.369	99.141	-99.141
7	-97.744	-195.489	-58.647	58.647	616.534	-616.534
8	-75.235	-73.152	-35.330	35.330	580.521	-580.521
9	-59.452	-60.805	-24.542	24.542	226.324	-226.324
10	158.091	206.971	60.844	-60.844	.000	.000
11	-105.015	166.050	-148.348	-115.652	31.758	-31.758
12	-2.734	71.643	-27.755	-50.725	74.599	-74.599
13	-39.068	-78.177	-23.453	23.453	475.105	-475.105
14	-73.250	-69.599	-34.012	34.012	408.406	-408.406
15	-56.848	-59.855	-23.816	23.816	217.985	-217.985

16	-55.544	20.413	-5.855	5.855	.000	.000
17	-39.605	175.905	-74.768	-120.202	21.561	-21.561
18	-11.788	96.868	-25.060	-53.420	50.780	-50.780
19	52.061	104.123	31.237	-31.237	488.618	-488.618
20	-69.778	-62.988	-31.611	31.611	442.040	-442.040
21	-49.117	-52.670	-20.773	20.773	239.230	-239.230
22	-54.758	64.183	-52.433	-55.567	.000	.000
23	-63.300	132.719	-82.608	-105.582	10.723	-10.723
24	-44.197	17.975	-43.610	-34.670	30.009	-30.009
25	3.312	6.623	1.987	-1.987	508.768	-508.768
26	-35.487	-34.637	-16.696	16.696	402.300	-402.300
27	-30.753	-34.184	-13.248	13.248	206.908	-206.908
28	-35.299	53.893	-50.901	-57.099	.000	.000
29	-67.329	93.038	-89.810	-98.380	7.275	-7.275
30	16.188	40.222	-29.838	-48.642	16.761	-16.761
31	-2.036	-4.073	-1.222	1.222	275.221	-275.221
32	-49.820	-51.132	-24.036	24.036	218.122	-218.122
33	-41.907	-40.222	-16.761	16.761	119.742	-119.742

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	18.764	-218.305	11.258
2	.000	.000	-19.167
5	-97.744	-616.534	-58.647
6	.000	.000	23.316
9	-39.088	-475.105	-23.453
10	.000	.000	-10.559
13	52.061	-438.618	31.237
14	.000	.000	-62.848
17	3.312	-508.768	1.987
18	.000	.000	-18.683
21	-2.036	-275.221	-1.222
22	.000	.000	-22.814

 COMBINACAO 5
 ACC.BASE E2

ACCAO PERMANENTES-G	COEFICIENTE 1.00000	ACCAO SOBRECARGA1-Q1	COEFICIENTE .40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	17.997	35.995	10.798	-10.798	225.977	-225.977
2	-10.317	-15.348	-6.253	6.253	158.498	-158.498
3	-16.944	-27.667	-9.104	9.104	96.277	-96.277
4	-25.078	111.599	-67.480	-96.320	.000	.000
5	32.290	227.267	-62.220	-201.780	51.601	-51.601
6	27.667	56.710	-25.177	-53.303	78.601	-78.601
7	-98.365	-196.730	-59.019	59.019	615.073	-615.073
8	-68.757	-67.235	-32.379	32.379	578.152	-578.152
9	-47.048	-48.039	-19.405	19.405	225.313	-225.313
10	153.888	202.504	59.399	-59.399	.000	.000
11	-112.964	157.749	-151.058	-112.941	38.627	-38.627

12	-8.671	65.251	-29.810	-48.670	59.198	-59.198
13	-40.026	-80.052	-24.018	24.016	474.599	-474.599
14	-68.769	-83.753	-31.077	31.077	409.125	-409.125
15	-44.751	-47.367	-18.800	18.800	217.989	-217.989
16	-55.683	19.228	-6.076	6.076	.000	.000
17	-49.244	164.988	-78.194	-118.776	26.349	-26.349
18	-17.884	90.607	-27.119	-51.361	40.394	-40.394
19	49.865	99.729	29.919	-29.919	486.810	-486.810
20	-63.530	-57.662	-28.855	28.855	440.124	-440.124
21	-37.628	-40.553	-15.955	15.955	238.892	-238.892
22	-55.425	62.853	-52.762	-55.238	.000	.000
23	-69.698	127.529	-84.456	-103.734	13.449	-13.449
24	-50.054	13.505	-45.332	-33.148	24.439	-24.439
25	3.117	6.234	1.870	-1.870	509.441	-509.441
26	-31.805	-31.115	-14.981	14.981	402.608	-402.608
27	-23.188	-26.282	-10.092	10.092	206.783	-206.783
28	-37.282	51.712	-51.595	-56.405	.000	.000
29	-73.246	85.287	-92.092	-96.098	8.559	-8.559
30	12.777	34.059	-31.434	-47.046	14.350	-14.350
31	-2.255	-4.510	-1.353	1.353	270.650	-270.650
32	-47.202	-49.014	-22.908	22.908	214.245	-214.245
33	-36.253	-34.059	-14.349	14.349	118.146	-118.146

REACOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	17.987	-225.977	10.798
2	.000	.000	-17.052
5	-98.385	-615.073	-59.019
8	.000	.000	26.640
9	-40.026	-474.599	-24.018
10	.000	.000	-7.061
13	49.865	-486.810	29.919
14	.000	.000	-58.774
17	3.117	-509.441	1.870
18	.000	.000	-16.851
21	-2.255	-270.650	-1.353
22	.000	.000	-21.556

 COMBINACAO 6
 ACC.BASE(-E1)

ACCAO PERMANENTES-G	COEFICIENTE 1.00000	ACCAO SOBRECARGA1-Q1	COEFICIENTE .40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	-1.50000
SISMO 2(e2)-E2	.00000	VENTO -W	.00000

ESFORÇOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORÇA TRANSVERSAL		FORÇA AXIAL	
	Ne (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	.708	1.415	.425	-.425	311.977	-311.977
2	74.370	73.991	35.324	-35.324	231.930	-231.930
3	63.299	62.981	25.771	-25.771	120.205	-120.205
4	-75.785	86.901	-80.047	-83.753	.000	.000
5	-137.290	99.820	-111.725	-152.275	-27.227	27.227
6	-62.981	3.791	-49.105	-29.375	-87.044	87.044
7	-119.200	-238.400	-71.520	71.520	803.205	-803.205

8	66.257	60.720	30.233	-30.233	555.875	-555.875
9	51.808	55.824	21.966	-21.966	218.819	-218.819
10	85.242	133.290	36.422	-36.422	.000	.000
11	212.348	54.785	-184.780	-79.220	-18.960	18.960
12	-59.615	11.589	-47.244	-31.236	-65.079	65.079
13	-61.543	-123.086	-36.926	36.926	469.127	-469.127
14	66.785	61.932	30.647	-30.647	416.971	-416.971
15	52.260	55.149	21.920	-21.920	216.983	-216.983
16	-76.989	-17.415	-15.734	15.734	.000	.000
17	-168.978	29.274	-120.769	-74.201	-10.232	10.232
18	-66.738	40.896	-43.547	-34.933	-43.157	43.157
19	9.946	19.893	5.968	-5.968	462.210	-462.210
20	66.008	60.424	30.103	-30.103	416.716	-416.716
21	52.974	58.570	22.764	-22.764	237.257	-237.257
22	-68.487	37.117	-59.226	-48.772	.000	.000
23	-142.671	63.693	-107.258	-80.932	-2.893	2.893
24	-89.466	-25.835	-60.123	-18.357	-20.394	20.394
25	-.723	-1.446	-.434	.434	520.516	-520.516
26	42.955	43.437	20.570	-20.570	405.514	-405.514
27	38.456	39.072	15.822	-15.822	204.612	-204.612
28	-78.626	5.247	-66.230	-41.770	.000	.000
29	-145.586	-9.666	-119.970	-88.220	1.854	-1.854
30	-13.237	-15.655	-44.055	-34.425	-4.572	4.572
31	-6.873	-13.747	-4.124	4.124	215.515	-215.515
32	8.500	2.916	2.718	-2.718	173.745	-173.745
33	6.750	15.655	4.572	-4.572	105.525	-105.525

REACCOES NOS APOIOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	.708	-311.977	.425
2	.000	.000	34.899
5	-119.200	-603.205	-71.520
6	.000	.000	101.753
9	-61.543	-469.127	-36.926
10	.000	.000	67.573
13	9.946	-462.210	5.968
14	.000	.000	24.135
17	-.723	-520.516	-.434
18	.000	.000	21.003
21	-6.873	-215.515	-4.124
22	.000	.000	6.842

 COMBINACAO 7
 ACC.BASE(-E2)

ACCAO PERMANENTES-G	COEFICIENTE 1.00000	ACCAO SOBRECARGA1-Q1	COEFICIENTE .40000
SOBRECARGA2-Q2	.40000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	-1.50000	VENTO -W	.00000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO		FORCA TRANSVERSAL		FORCA AXIAL	
	Me (KN.m)	Hd (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	1.474	2.947	.884	-.884	304.305	-304.305
2	70.651	70.756	33.668	-33.668	224.794	-224.794
3	52.469	51.414	21.201	-21.201	117.139	-117.139

4	-73.599	87.934	-79.511	-84.289	.000	.000
5	-123.225	110.173	-107.655	-156.345	-36.282	36.282
6	-51.414	10.620	-46.039	-32.441	-86.505	66.505
7	-118.579	-237.159	-71.148	71.148	604.666	-604.666
8	59.779	54.802	27.281	-27.281	558.244	-558.244
9	39.404	43.058	16.829	-16.829	219.830	-219.830
10	89.446	137.757	37.867	-37.867	.000	.000
11	-204.379	63.086	-182.069	-81.931	-25.829	25.829
12	-53.678	17.961	-45.190	-33.290	-49.678	49.678
13	-60.605	-121.211	-36.363	36.363	469.633	-469.633
14	60.304	56.087	27.712	-27.712	416.253	-416.253
15	40.166	42.662	16.904	-16.904	216.978	-216.978
16	-76.851	-16.227	-15.513	15.513	.000	.000
17	-159.338	40.191	-117.343	-77.627	-15.020	15.020
18	-60.642	47.155	-41.486	-36.992	-32.771	32.771
19	12.143	24.286	7.286	-7.286	464.017	-464.017
20	59.761	55.098	27.347	-27.347	420.632	-420.632
21	41.484	46.453	17.946	-17.946	237.594	-237.594
22	-67.620	36.427	-58.899	-49.101	.000	.000
23	-136.773	66.883	-105.410	-62.780	-5.619	5.619
24	-93.608	-21.365	-56.402	-20.078	-14.824	14.824
25	-.528	-1.056	-.317	.317	519.843	-519.843
26	39.273	39.915	18.854	-18.854	405.206	-405.206
27	30.870	31.190	12.665	-12.665	204.737	-204.737
28	-76.643	7.428	-65.536	-42.464	.000	.000
29	-139.668	-1.895	-117.689	-70.501	.570	-.570
30	-9.826	-9.491	-42.459	-36.021	-2.161	2.161
31	-6.655	-13.310	-3.993	3.993	220.086	-220.086
32	5.882	.798	1.590	-1.590	177.622	-177.622
33	1.097	9.491	2.161	-2.161	107.121	-107.121

REACOES NOS APOS

NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	1.474	-304.305	.684
2	.000	.000	32.784
5	-118.579	-604.666	-71.148
6	.000	.000	98.429
9	-60.605	-469.633	-36.363
10	.000	.000	64.075
13	12.143	-464.017	7.286
14	.000	.000	20.062
17	-.528	-519.843	-.317
18	.000	.000	19.171
21	-6.655	-220.086	-3.993
22	.000	.000	5.583

 COMBINACAO 8
 ACC.BASE W

ACCAO PERMANENTES-G	COEFICIENTE 1.50000	ACCAO SOBRECARGA1-Q1	COEFICIENTE 1.05000
SOBRECARGA2-Q2	1.05000	SISMO 1(e1)-E1	.00000
SISMO 2(e2)-E2	.00000	VENTO -W	-1.50000

ESFORCOS FINAIS NAS BARRAS

BARRA	MOMENTO	FORCA TRANSVERSAL	FORCA AXIAL
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	Me (KN.m)	Md (KN.m)	Ve (KN)	Vd (KN)	Ne (KN)	Nd (KN)
1	13.958	27.916	8.375	-8.375	440.116	-440.116
2	63.673	59.446	29.314	-29.314	313.372	-313.372
3	42.498	34.617	15.737	-15.737	169.625	-169.625
4	-91.588	165.430	-126.743	-151.357	.000	.000
5	-101.941	253.575	-143.748	-284.652	2.507	-2.507
6	-34.617	40.708	-58.925	-60.955	-19.048	19.048
7	-186.971	-373.941	-112.182	112.182	978.484	-978.484
8	13.970	10.047	5.719	-5.719	905.201	-905.201
9	11.083	14.030	5.125	-5.125	342.198	-342.198
10	194.541	273.906	78.075	-78.075	.000	.000
11	-274.705	160.883	-278.350	-150.050	3.100	-3.100
12	-54.739	55.319	-59.843	-60.037	-13.923	13.923
13	-91.733	-183.466	-55.040	55.040	745.442	-745.442
14	15.683	13.344	6.911	-6.911	650.006	-650.006
15	13.035	13.891	5.495	-5.495	338.672	-338.672
16	-106.124	1.951	-17.362	17.362	.000	.000
17	-187.262	141.622	-163.284	-148.071	4.516	-4.516
18	-69.210	97.439	-55.235	-64.645	-8.428	8.428
19	37.957	75.913	22.774	-22.774	739.389	-739.389
20	17.286	16.370	8.013	-8.013	671.789	-671.789
21	18.829	21.798	8.291	-8.291	366.270	-366.270
22	-95.151	71.258	-84.982	-77.018	.000	.000
23	-176.822	147.811	-155.428	-145.757	4.239	-4.239
24	-119.235	-14.475	-82.225	-37.655	-.137	.137
25	1.340	2.679	.804	-.804	802.700	-802.700
26	17.418	18.579	8.571	-8.571	635.770	-635.770
27	16.646	15.179	6.536	-6.536	317.311	-317.311
28	-91.355	37.881	-89.912	-72.088	.000	.000
29	-183.236	50.580	-172.702	-128.483	6.274	-6.274
30	-.704	10.807	-58.256	-61.624	6.398	-6.398
31	-7.344	-14.688	-4.406	4.406	372.895	-372.895
32	-23.193	-30.033	-12.673	12.673	300.807	-300.807
33	-20.547	-10.807	-6.399	6.399	172.324	-172.324

REACCOS NOS APOIOS

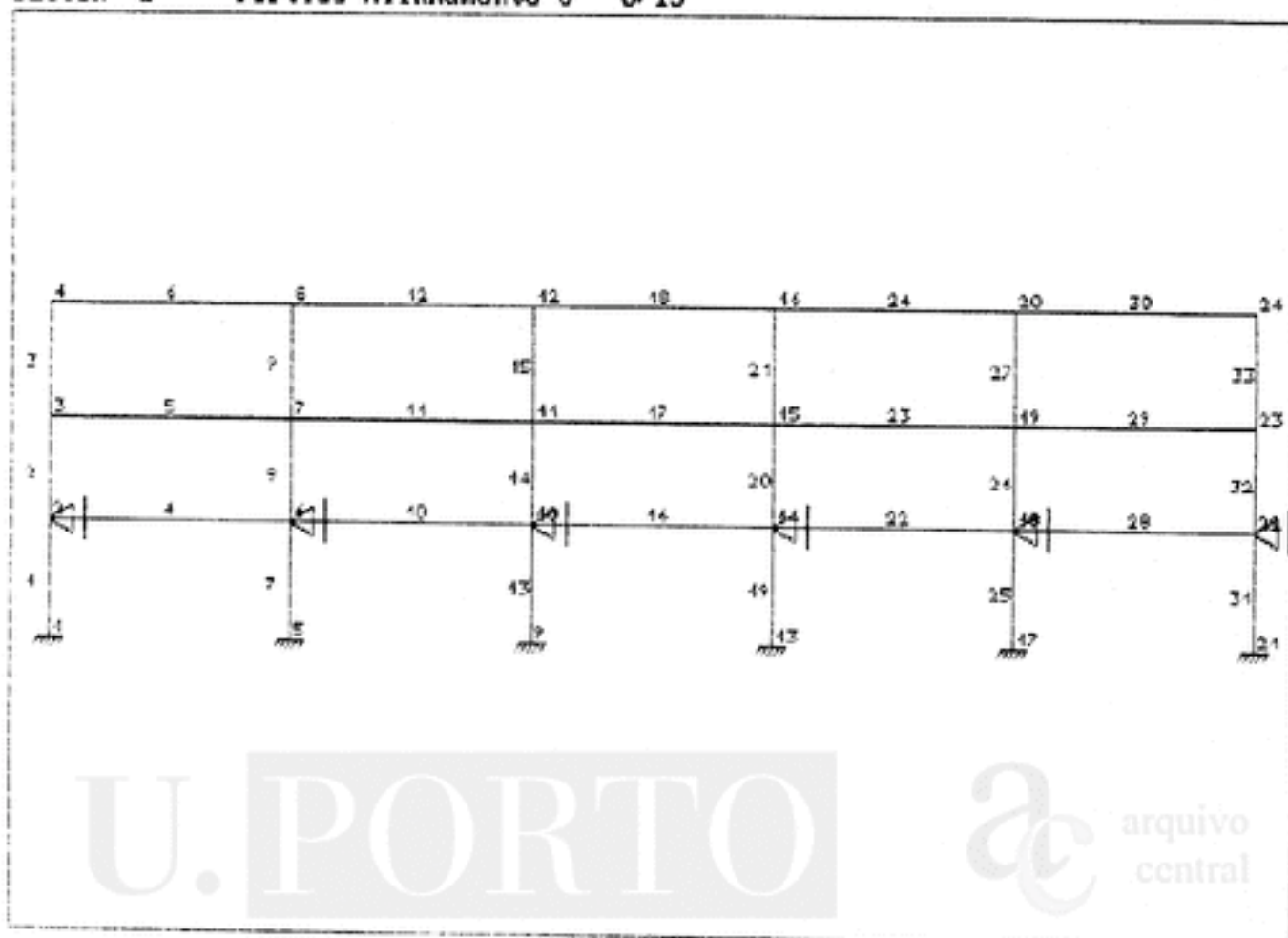
NO DO APOIO	MOMENTO (KN.m)	VERTICAL (KN)	HORIZONTAL (KN)
1	13.958	-440.116	8.375
2	.000	.000	20.939
5	-186.971	-978.484	-112.182
6	.000	.000	117.901
9	-91.733	-745.442	-55.040
10	.000	.000	61.951
13	37.957	-739.389	22.774
14	.000	.000	-14.781
17	1.340	-802.700	.804
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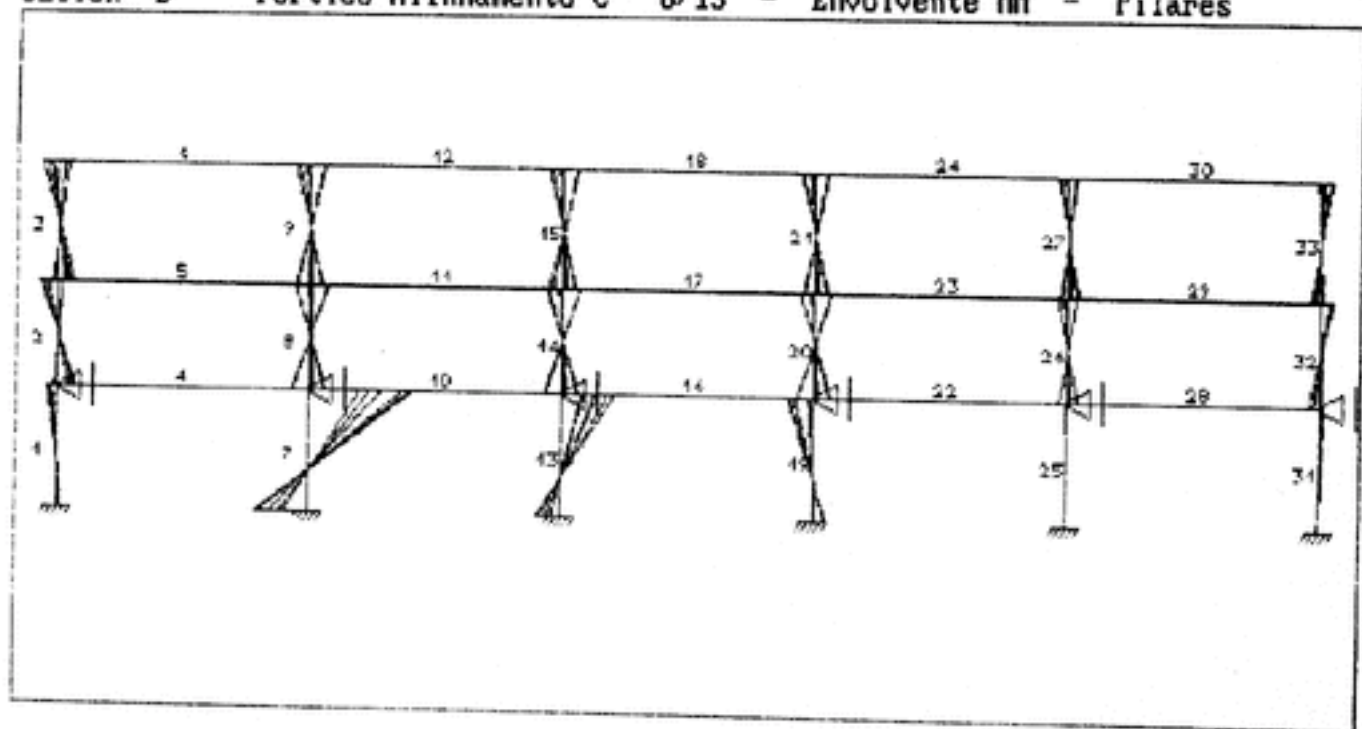
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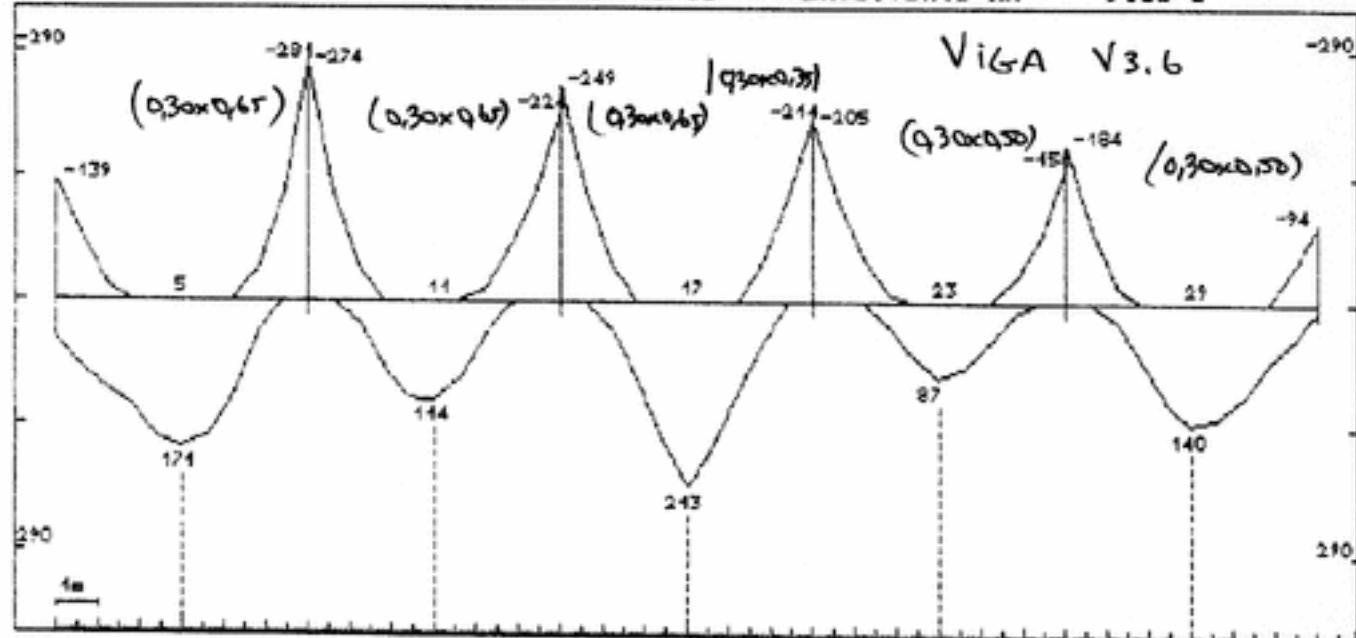
SECTOR B - Portico Alinhamento C - 8/13



SECTOR B - Portico Alinhamento C - 8/13 - Envolvente MM - Pilares



SECTOR B - Portico Alinhamento C - B/13 - Envolvente MM - Piso 3



Msd:	-133	171	-263	114	-225	243	185	-205	-195	87	-125	140	-87	
μ :	0,087	0,111	0,121	0,074	0,147	0,139	0,153	0,202	0,221	0,099	0,199	0,159	0,099	
w:	0,094	0,124	0,201	0,080	0,168	0,158	0,504	0,504	0,270	0,108	0,238	0,184	0,108	
A_s (cut):	6,70	8,81	14,28	5,68	11,96	11,24	18/19	20,71	14,56	5,84	12,82	9,92	5,84	
Varões:	2 ϕ 20 + 1 ϕ 12	3 ϕ 20	5 ϕ 20	2 ϕ 20	1 ϕ 20	2 ϕ 20	2 ϕ 20	2 ϕ 20	2 ϕ 20	2 ϕ 20	4 ϕ 20	2 ϕ 20 + 1 ϕ 16	2 ϕ 20	2 ϕ 20

SECTOR B - Portico Alinhamento C - B/13 - Envolvente UU - Piso 3

