

---

---

OBRA:  
**CORREDOR METROPOLITANO – LOTE 03**

ESTEIO ENGENHARIA E AEROLEVANTAMENTOS S.A.  
ENGEMIN ENGENHARIA E GEOLOGIA LTDA.  
CONSEL CONSULTORIA E PROJETOS DE ENGENHARIA LTDA.

Contrato n.º 11/2011  
CEF Contrato n.º 319.640-82/10

RF  
**VOLUME 3D – MEMÓRIA DE CÁLCULO DE ESTRUTURAS**  
**SUBTRECHO C.2b**

**BR-116 (Est.995=PP)(Curitiba)/ BR-476 (1463+16,71=PF)(Araucária)**

Julho / 2013



PAC DA MOBILIDADE DA REGIÃO METROPOLITANA DE CURITIBA  
PROGRAMA PRÓ TRANSPORTE - Ministério das Cidades  
ÓRGÃO FINANCIADOR - Caixa Econômica Federal

GOVERNO DO ESTADO DO PARANÁ  
SECRETARIA DE ESTADO DO DESENVOLVIMENTO URBANO  
COORDENAÇÃO DA REGIÃO METROPOLITANA DE CURITIBA





## ÍNDICE

<b>1</b>	<b>APRESENTAÇÃO</b>	<b>3</b>
<b>2</b>	<b>MAPA DE SITUAÇÃO</b>	<b>5</b>
<b>3</b>	<b>MEMÓRIA DESCRITIVA – OBRA DE ARTE ESPECIAL</b>	<b>7</b>
<b>4</b>	<b>MEMÓRIA DE CÁLCULO – TRINCHEIRAS FAZENDA RIO GRANDE</b>	<b>9</b>
4.1	Lajes	10
4.2	Apoios	11
4.3	Encontros	25
4.4	Alas	26
4.5	Carregamentos	27
4.6	Esforços	28
4.7	Dimensionamento	29
4.8	Alas	29
<b>5</b>	<b>MEMÓRIA DE CÁLCULO – PONTE SOBRE O RIO IGUAÇU</b>	<b>35</b>
5.1	Elementos de Projeto	36
5.2	Geometria	37
5.3	Carregamentos	38
5.4	Lajes	41
5.5	Longarinas	46
5.6	Cortinas	63
5.7	Viguetas Inferiores da Cortina (70X25)	69
5.8	Placa de Transição	70
5.9	Travessas – 25x60	71
5.10	Alas	74
5.11	Pilares	75
5.12	Blocos de Fundação	82
5.13	Rótulas de Concreto (40x40) cm <sup>2</sup>	84
5.14	Neoprenes: 35x45	84



---

## 1 APRESENTAÇÃO

## 1 APRESENTAÇÃO

O trabalho ora apresentado refere-se ao Projeto Executivo de Engenharia do Corredor Metropolitano, desenvolvido especificamente no subtrecho C.2b composto pelo segmento, entre a BR-116 (Est. 995=PP Curitiba) e a BR-476 (Est.1463+16,71 Araucária), com extensão total de 9.376,71 m.

Os serviços e projetos foram desenvolvidos de acordo com o Termo de Referência do Edital de Concorrência Pública 03/2011-COMEC (Lote 03) com extensão total de 9.376,71 m.

São as seguintes as principais informações referentes aos serviços e ao Contrato firmado entre o consórcio ESTEIO/ENGEMIN/CONSPEL e a COMEC – Coordenação da Região Metropolitana de Curitiba:

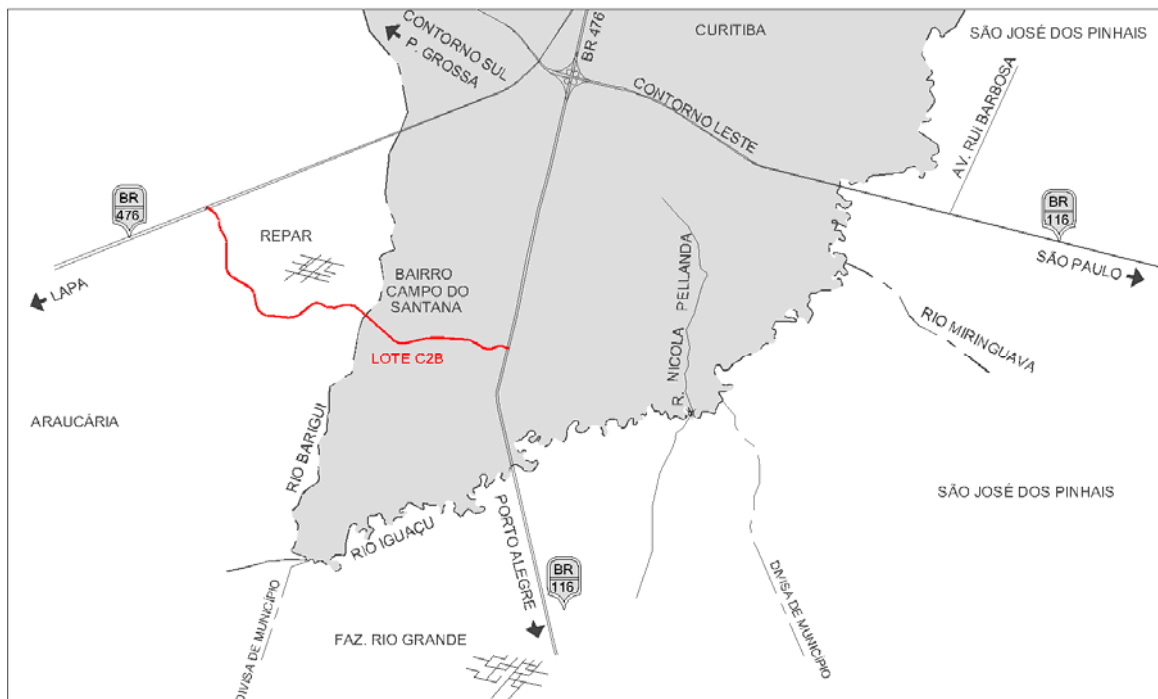
Objetivo:	Estudos e Projetos de Engenharia para Implantação do Corredor Metropolitano
Via:	Corredor Metropolitano
Trecho:	Contorno Leste (São José dos Pinhais) - BR-476 (Araucária)
Subtrecho:	BR-116 (Est. 995=PP Curitiba) e a BR-476 (Est.1463+16,71 Araucária)
Extensão Aprox.(trecho):	9,37 km
Edital:	Concorrência Pública 03/2011 - COMEC (Lote 03)
Contrato:	11/2011
Ordem de Serviço:	11/2011



---

## 2 MAPA DE SITUAÇÃO

## 2 MAPA DE SITUAÇÃO





---

### **3 MEMÓRIA DESCRITIVA – OBRA DE ARTE ESPECIAL**



### 3 MEMÓRIA DESCRITIVA - OBRA DE ARTE ESPECIAL

As pontes sobre o Rio Barigui estão localizadas entre as estacas 1187+15,00 a 1190+0,00 do eixo principal.

Com um comprimento total de 45,00m, possui três vãos contínuos e dois balanços. A seção transversal, com duas pistas é de 10,00 m já inclusas as faixas de segurança, estacionamento protegidas por defensas "New Jersey" e nas laterais externas temos passeios para pedestres com 2,50m totalizando uma largura de 13,45m.

A estrutura principal é composta por 03 longarinas e laje que transversalmente é constituída por três vãos centrais. As transversinas localizadas na região dos apoios, consideradas como elementos de rigidez, estão soltas da laje com o objetivo de facilitar o sistema construtivo.

Nas extremidades da obra estão previstas placas de transição entre os aterros e a estrutura, evitando-se assim o desconforto provocado por recalques do aterro.

A superestrutura está apoiada na meso através de aparelhos de apoios de neoprene fretado.

A infraestrutura considerando a natureza do perfil geotécnico existente no local é constituída por blocos de fundação que estão apoiados em estacas tipo hélice contínua de diâmetro igual a 400 mm.

As passagens inferiores estão localizadas entre as estacas 1011+2,79 e 1013+7,15 (compondo o dispositivo de interseção I-08 na BR-116) contendo duas células e 1187+15,00 (no eixo da Rua Ismael de Lima) em célula única célula.



---

#### **4 MEMÓRIA DE CÁLCULO – TRINCHEIRAS FAZENDA RIO GRANDE**

#### 4. MEMÓRIA DE CÁLCULO – TRINCHEIRAS FAZENDA RIO GRANDE

##### 4.1 Lajes

##### 4.1.1 Carga permanente:

$$\text{Peso próprio: } 0,79 \times 2,50 = 1,98 \text{ tf/m}^2$$

$$\text{Revestimento: } 0,05 \times 2,40 = 0,12 \text{ tf/m}^2$$

$$\text{Recapeamento: } = 0,20 \text{ tf/m}^2$$

$$g = 2,30 \text{ tf/m}^2$$

$$\text{Defensas: } V = 0,58 \text{ tf/m}$$

$$\text{Guarda-corpo: } V = 0,41 \text{ tf/m}$$

##### 4.1.2 Carga móvel: Classe 45

$$P = 7,50 \text{ tf/roda; } p = 0,50 \text{ tf/m}^2$$

$$\text{Impacto: } \varphi = 1,40 - 0,007 \times 17,30 = 1,28$$

$$P \times \varphi = 9,60 \text{ tf/roda; } p \times \varphi = 0,64 \text{ tf/m}^2$$

##### 4.1.3 Balanço dos passeios:

$$V = 0,58 + 0,41(0,20 \times 2,05 + 0,8 \times 2,05 \times 0,5) \times 2,5 + 0,5 \times 1,50$$

$$V = 4,82 \text{ tf/m}$$

$$M = 0,58 \times 0,254 + 0,41 \times 1,975 + 1,025 \times 1,025 + 2,05 \times 0,683 = 3,41 \text{ tf/m}$$

##### 4.1.4 Esforços ; Ruschtab 25 / tab 103

$$l_y/l_x = 0,80 ; t = 100 + 2 \times 5 + 32 = 142 \text{ cm} ; a = 200 \text{ cm}$$

$$l_x/a = 8,65 ; t/a = 0,71$$

##### 4.1.4.1 Sentido x

$$M_{gxm} = 0,0703 \times 2,30 \times 17,30^2 = 48,39 \text{ tfm/m}$$

$$\Delta \text{ borda passeio: } M_{gx} = 0,0703 \times 4,82 \times 17,30^2 = 101,41 \text{ tfm/m}$$

$$\Delta \text{ borda pista : } M_{gx} = 0,0703 \times 0,58 \times 17,30^2 = 12,20 \text{ tfm/m}$$

$$M_{px} = 2,225 \times 9,60 + 13,469 \times 0,64 = 29,98 \text{ tfm/m}$$

$$X_{gxm} = -0,125 \times 2,30 \times 17,30^2 = -86,05 \text{ tfm/m}$$

$$\Delta \text{ borda passeio: } X_{gx} = -0,125 \times 4,82 \times 17,30^2 = -180,32 \text{ tfm}$$

$$\Delta \text{ borda pista: } X_{gx} = -0,125 \times 0,58 \times 17,30^2 = -21,70 \text{ tfm}$$

$$X_{dx} = -2,04 \times 9,6 - 30,83 \times 0,64 = 39,32 \text{ tfm}$$

Centro da laje:

$$M_x = 48,39 + 29,98 = 78,37 \text{ tfm}$$

$$A_{s_x} = 0,34 \cdot 7837/94 = 28,35 \text{ cm}^2/\text{m} ; \text{fad} = 1,00$$

Borda da laje no passeio:

$$M_x = 48,39 + 101,41 + 29,98 = 179,78 \text{ tfm}$$

$$A_{s_x} = 0,34 \cdot 17978/94 = 68,85 \text{ cm}^2/\text{m} ; \text{fad} = 1,00$$

Borda da laje na pista:

$$M_x = 48,39 + 12,20 + 29,98 = 90,57 \text{ tfm}$$

$$A_{s_x} = 0,34 \cdot 9057/94 = 32,76 \text{ cm}^2/\text{m} ; \text{fad} = 1,00$$

Apoio central:

$$X = -86,05 - 39,32 = -125,37 \text{ tfm/m}$$

$$A_{s_x} = 0,345 \cdot 12537/96 = 45,05 \text{ cm}^2/\text{m} ; \text{fad} = 1,00$$

Borda da laje no passeio:

$$X = -86,05 - 180,32 - 39,32 = -305,69 \text{ tfm/m}$$

$$A_{s_x} = 0,365 \cdot 3056/96 = 116,23 \text{ cm}^2 ; \text{fad} = 1,00$$

Borda da laje na pista:

$$X = -86,05 - 21,70 - 39,32 = -147,07 \text{ tfm/m}$$

$$A_{s_x} = 0,35 \cdot 14707/96 = 53,62 \text{ cm}^2/\text{m} ; \text{fad} = 1,00$$

4.1.4.2 Sentido y:

$$M_{gym} = 0,0067 \cdot 2,30 \cdot 17,30^2 = 4,61 \text{ tfm/m}$$

$$M_{pym} = 0,52 \cdot 9,60 + 3,54 \cdot 0,64 = 7,26 \text{ tfm/m}$$

$$M_y = 4,61 + 7,26 = 11,87 \text{ tfm/m}$$

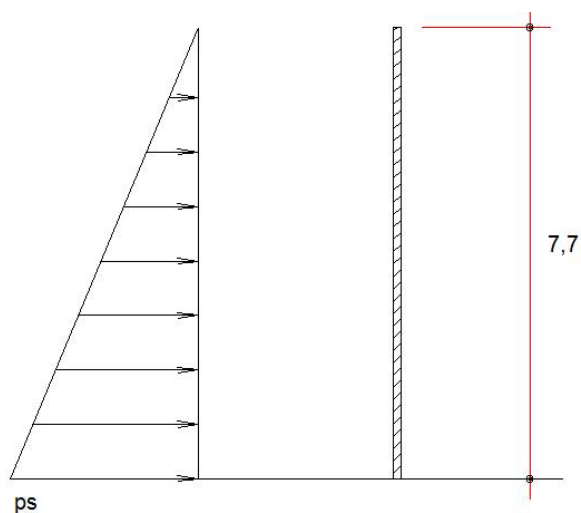
$$A_{s_y} = 0,3 \cdot 1187/94 = 4,17 \text{ cm}^2/\text{m}$$

## 4.2 Apoios

### 4.2.1 Carregamentos

#### 4.2.1.1 Permanentes

- Peso próprio: definido pelo programa "MIDAS/CIVIL" em função da geometria.
- Defensas: 0,58 tf/m
- Parapeito: 0,41 tf/m
- Recapeamento: 0,20 tf/m
- Retração:  $\Delta t = -15^\circ\text{C}$  com  $\alpha = 10-5/^\circ\text{C}$
- Placa de transição:  $R_g = 2,39 \text{ tf/m}$
- Empuxo nas cabeceiras:



$$ps = 0,33 \cdot 1,8 \cdot 7,70 = 4,57 \text{ tf/m}^2$$

#### 4.2.1.2 Móveis

Trem de carga homogeneizado:

$$P = 6,0 \text{ tf/roda}$$

$$p = 0,5 \text{ tf/m}^2$$

$$\text{Impacto: } \varphi = 1,30$$

Carga no passeio:

$$p = 0,50 \text{ tf/m}^2$$

Frenagem:

$$F = 0,30 \cdot 45 = 13,50 \text{ tf}$$

Temperatura:

$$\Delta t = \pm 15^\circ\text{C}$$

### 4.2.2 Pórticos Centrais

#### 4.2.2.1 Esforços

Definidos com a utilização do “MIDAS/CIVIL”. Ver ilustração e tabelas a seguir.

1303	1661	1662	1343	1663	1664	1665	1666	1667	1344	1668	1669
		1302						1301			

Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf*m)	Moment-y (tonf*m)	Moment-z (tonf*m)
1301	passaio(max)	I[161]	4,61	1,3	0,13	0,08	0,27	5,79
1301	passaio(max)	2/4	4,61	1,3	0,13	0,08	0,14	1,64
1301	passaio(max)	J[751]	4,61	1,3	0,13	0,08	0,55	0
1302	passaio(max)	I[151]	0	0	0,4	0,12	1,03	0,16
1302	passaio(max)	2/4	0	0	0,4	0,12	0,26	4,05
1302	passaio(max)	J[752]	0	0	0,4	0,12	1,54	8,24
1303	passaio(max)	I[754]	0	0	0	0	0	0
1303	passaio(max)	2/4	0	0	0	0	0	0
1303	passaio(max)	J[1042]	0	0	0	0	0	0
1343	passaio(max)	I[752]	0	0,13	0	0,51	0	0,19
1343	passaio(max)	2/4	0	0,13	0	0,51	0	0,12
1343	passaio(max)	J[1044]	0	0,13	0	0,51	0,81	0,06
1344	passaio(max)	I[751]	0,34	0,03	1,27	0,19	0,42	0,06
1344	passaio(max)	2/4	0,34	0,03	1,27	0,19	0,13	0,05
1344	passaio(max)	J[1049]	0,34	0,03	1,27	0,19	0	0,04
1661	passaio(max)	I[1042]	0	0,16	6,79	0,49	5,12	0,07
1661	passaio(max)	2/4	0	0,16	6,79	0,49	0	0,06
1661	passaio(max)	J[1043]	0	0,16	6,79	0,49	0	0,19
1662	passaio(max)	I[1043]	0	0,27	15,8	1,04	0	0,14
1662	passaio(max)	2/4	0	0,27	15,8	1,04	0	0,22
1662	passaio(max)	J[752]	0	0,27	15,8	1,04	0	0,31
1663	passaio(max)	I[1044]	0	0,09	0	0,1	0	0,07
1663	passaio(max)	2/4	0	0,09	0	0,1	0	0,01
1663	passaio(max)	J[1045]	0	0,09	0	0,1	0,16	0,07
1664	passaio(max)	I[1045]	0	0,01	0	0,07	0	0,05
1664	passaio(max)	2/4	0	0,01	0	0,07	0	0,04
1664	passaio(max)	J[1046]	0	0,01	0	0,07	0,24	0,03
1665	passaio(max)	I[1046]	0	0,01	0	0,18	0	0,03
1665	passaio(max)	2/4	0	0,01	0	0,18	0	0,03
1665	passaio(max)	J[1047]	0	0,01	0	0,18	0,76	0,02
1666	passaio(max)	I[1047]	0,05	0,05	0	0,25	0	0,03
1666	passaio(max)	2/4	0,05	0,05	0	0,25	0,02	0,01
1666	passaio(max)	J[1048]	0,05	0,05	0	0,25	1,08	0,05
1667	passaio(max)	I[1048]	1,56	0,1	0	0,36	0	0,04
1667	passaio(max)	2/4	1,56	0,1	0	0,36	1,27	0,09
1667	passaio(max)	J[751]	1,56	0,1	0	0,36	2,89	0,14
1668	passaio(max)	I[1049]	0,17	0,06	0,08	0,03	0,05	0,07
1668	passaio(max)	2/4	0,17	0,06	0,08	0,03	0	0,02
1668	passaio(max)	J[1050]	0,17	0,06	0,08	0,03	0,04	0,03
1669	passaio(max)	I[1050]	0	0	0	0	0	0
1669	passaio(max)	2/4	0	0	0	0	0	0
1669	passaio(max)	J[753]	0	0	0	0	0	0
1301	passaio(min)	I[161]	0	0	-0,13	-0,08	-0,27	0
1301	passaio(min)	2/4	0	0	-0,13	-0,08	-0,14	0
1301	passaio(min)	J[751]	0	0	-0,13	-0,08	-0,55	-2,51
1302	passaio(min)	I[151]	-20,62	-1,31	-0,4	-0,12	-1,03	-0,3
1302	passaio(min)	2/4	-20,62	-1,31	-0,4	-0,12	-0,26	0
1302	passaio(min)	J[752]	-20,62	-1,31	-0,4	-0,12	-1,54	0
1303	passaio(min)	I[754]	0	0	0	0	0	0
1303	passaio(min)	2/4	0	0	0	0	0	0
1303	passaio(min)	J[1042]	0	0	0	0	0	0
1343	passaio(min)	I[752]	-12,62	-0,13	-4,83	-0,51	-3,89	-0,19
1343	passaio(min)	2/4	-12,62	-0,13	-4,83	-0,51	-1,54	-0,12
1343	passaio(min)	J[1044]	-12,62	-0,13	-4,83	-0,51	0	-0,06
1344	passaio(min)	I[751]	-0,09	-0,03	0	-0,19	-0,04	-0,06
1344	passaio(min)	2/4	-0,09	-0,03	0	-0,19	-0,15	-0,05
1344	passaio(min)	J[1049]	-0,09	-0,03	0	-0,19	-0,42	-0,04
1661	passaio(min)	I[1042]	-8,63	-0,16	0	-0,49	0	-0,07
1661	passaio(min)	2/4	-8,63	-0,16	0	-0,49	-0,31	-0,06
1661	passaio(min)	J[1043]	-8,63	-0,16	0	-0,49	-5,74	-0,19
1662	passaio(min)	I[1043]	-13,93	-0,27	0	-1,04	-2,26	-0,14
1662	passaio(min)	2/4	-13,93	-0,27	0	-1,04	-7,2	-0,22
1662	passaio(min)	J[752]	-13,93	-0,27	0	-1,04	-12,14	-0,31
1663	passaio(min)	I[1044]	-9,3	-0,09	-0,99	-0,1	-1,5	-0,07
1663	passaio(min)	2/4	-9,3	-0,09	-0,99	-0,1	-0,71	-0,01
1663	passaio(min)	J[1045]	-9,3	-0,09	-0,99	-0,1	-0,08	-0,07
1664	passaio(min)	I[1045]	-6,38	-0,01	-1,27	-0,07	-1,8	-0,05
1664	passaio(min)	2/4	-6,38	-0,01	-1,27	-0,07	-0,78	-0,04
1664	passaio(min)	J[1046]	-6,38	-0,01	-1,27	-0,07	0	-0,03

1665	passaio(min)	II[1046]	-3.53	-0.01	-1.48	-0.18	-1.6	-0.03
1665	passaio(min)	2/4	-3.53	-0.01	-1.48	-0.18	-0.42	-0.03
1665	passaio(min)	J[1047]	-3.53	-0.01	-1.48	-0.18	0	-0.02
1666	passaio(min)	II[1047]	-0.72	-0.05	-1.35	-0.25	-1.08	-0.03
1666	passaio(min)	2/4	-0.72	-0.05	-1.35	-0.25	-0.03	-0.01
1666	passaio(min)	J[1048]	-0.72	-0.05	-1.35	-0.25	0	-0.05
1667	passaio(min)	II[1048]	0	-0.1	-3.34	-0.36	-0.36	-0.04
1667	passaio(min)	2/4	0	-0.1	-3.34	-0.36	0	-0.09
1667	passaio(min)	J[751]	0	-0.1	-3.34	-0.36	0	-0.14
1668	passaio(min)	II[1049]	-0.07	-0.06	-0.2	-0.03	-0.29	-0.07
1668	passaio(min)	2/4	-0.07	-0.06	-0.2	-0.03	-0.16	-0.02
1668	passaio(min)	J[1050]	-0.07	-0.06	-0.2	-0.03	-0.11	-0.03
1669	passaio(min)	II[1050]	0	0	0	0	0	0
1669	passaio(min)	2/4	0	0	0	0	0	0
1669	passaio(min)	J[753]	0	0	0	0	0	0
1301	Moveis(max)	II[161]	5.83	3.19	4.86	0.9	10.92	14.71
1301	Moveis(max)	2/4	5.83	3.19	4.86	0.9	4.99	10.14
1301	Moveis(max)	J[751]	5.83	3.19	4.86	0.9	20.4	26.89
1302	Moveis(max)	II[151]	3.55	6.21	4.87	0.74	12.01	15.91
1302	Moveis(max)	2/4	3.55	6.21	4.87	0.74	3.87	11.62
1302	Moveis(max)	J[752]	3.55	6.21	4.87	0.74	19.31	20.45
1303	Moveis(max)	II[754]	0	0	0	0	0	0
1303	Moveis(max)	2/4	0	0	0	0	0	0
1303	Moveis(max)	J[1042]	0	0	0	0	0	0
1343	Moveis(max)	II[752]	4.13	2.42	2.38	8.89	1.86	2.72
1343	Moveis(max)	2/4	4.13	2.42	2.38	8.89	0.7	1.56
1343	Moveis(max)	J[1044]	4.13	2.42	2.38	8.89	14.06	0.52
1344	Moveis(max)	II[751]	4.17	2.21	1.86	12.11	1.89	2.84
1344	Moveis(max)	2/4	4.17	2.21	1.86	12.11	1.94	2.16
1344	Moveis(max)	J[1049]	4.17	2.21	1.86	12.11	7.77	1.49
1661	Moveis(max)	II[1042]	3.7	1.67	16.14	4.12	12.84	0.61
1661	Moveis(max)	2/4	3.7	1.67	16.14	4.12	2.2	0.73
1661	Moveis(max)	J[1043]	3.7	1.67	16.14	4.12	5.14	2.07
1662	Moveis(max)	II[1043]	4.59	2.48	84.68	10.54	7.13	1.77
1662	Moveis(max)	2/4	4.59	2.48	84.68	10.54	2.77	2.52
1662	Moveis(max)	J[752]	4.59	2.48	84.68	10.54	2.74	3.29
1663	Moveis(max)	II[1044]	21.97	1.41	1.26	4.62	1.2	0.95
1663	Moveis(max)	2/4	21.97	1.41	1.26	4.62	5.13	0.33
1663	Moveis(max)	J[1045]	21.97	1.41	1.26	4.62	19.36	1.39
1664	Moveis(max)	II[1045]	42.72	0.28	1.44	2.58	4.99	0.95
1664	Moveis(max)	2/4	42.72	0.28	1.44	2.58	9.01	1.07
1664	Moveis(max)	J[1046]	42.72	0.28	1.44	2.58	14.3	1.2
1665	Moveis(max)	II[1046]	42.07	0.32	7.81	1.97	14.43	1.2
1665	Moveis(max)	2/4	42.07	0.32	7.81	1.97	9.03	1.09
1665	Moveis(max)	J[1047]	42.07	0.32	7.81	1.97	5.07	1.03
1666	Moveis(max)	II[1047]	22.14	1.5	15.85	3.73	17.57	1.43
1666	Moveis(max)	2/4	22.14	1.5	15.85	3.73	5.14	0.3
1666	Moveis(max)	J[1048]	22.14	1.5	15.85	3.73	2.02	1.01
1667	Moveis(max)	II[1048]	4.45	2.67	59.73	8.36	14.71	0.57
1667	Moveis(max)	2/4	4.45	2.67	59.73	8.36	1.52	1.83
1667	Moveis(max)	J[751]	4.45	2.67	59.73	8.36	3.68	3.13
1668	Moveis(max)	II[1049]	2.89	1.47	4.31	4.98	5.65	1.82
1668	Moveis(max)	2/4	2.89	1.47	4.31	4.98	2.38	0.65
1668	Moveis(max)	J[1050]	2.89	1.47	4.31	4.98	7.37	0.53
1669	Moveis(max)	II[1050]	0	0	0	0	0	0
1669	Moveis(max)	2/4	0	0	0	0	0	0
1669	Moveis(max)	J[753]	0	0	0	0	0	0
1301	Permanentes	II[161]	-319.61	-2.77	0	0	0	29.65
1301	Permanentes	2/4	-310.01	-2.77	0	0	0	38.52
1301	Permanentes	J[751]	-300.41	-2.77	0	0	0	47.38
1302	Permanentes	II[151]	-472.92	2.61	0	0	0	9.06
1302	Permanentes	2/4	-463.32	2.61	0	0	0	0.72
1302	Permanentes	J[752]	-453.72	2.61	0	0	0	-7.63
1303	Permanentes	II[754]	0	0	0	0	0	0
1303	Permanentes	2/4	0	0	0.27	0	-0.02	0
1303	Permanentes	J[1042]	0	0	0.54	0	-0.08	0
1343	Permanentes	II[752]	-251,7	0	-185,45	0	-142,34	0
1343	Permanentes	2/4	-251,7	0	-184,58	0	-52,15	0
1343	Permanentes	J[1044]	-251,7	0	-183,7	0	37,62	0
1344	Permanentes	II[751]	-135,24	0	-165,13	0	-51,74	0
1344	Permanentes	2/4	-135,24	0	-164,57	0	-0,23	0
1344	Permanentes	J[1049]	-135,24	0	-164,01	0	51,12	0



1661	Permanentes	II[1042]	-143,73	0	78,2	0	88,24	0
1661	Permanentes	2/4	-143,73	0	79,64	0	25,1	0
1661	Permanentes	J[1043]	-143,73	0	81,08	0	-39,19	0
1662	Permanentes	II[1043]	-249,09	0	267,14	0	32,6	0
1662	Permanentes	2/4	-249,09	0	267,7	0	-50,97	0
1662	Permanentes	J[752]	-249,09	0	268,27	0	-134,71	0
1663	Permanentes	II[1044]	-171,36	0	-40,83	0	-16,54	0
1663	Permanentes	2/4	-171,36	0	-39,39	0	15,54	0
1663	Permanentes	J[1045]	-171,36	0	-37,95	0	46,47	0
1664	Permanentes	II[1045]	-107,02	0	-22,45	0	5,08	0
1664	Permanentes	2/4	-107,02	0	-21,01	0	22,47	0
1664	Permanentes	J[1046]	-107,02	0	-19,57	0	38,7	0
1665	Permanentes	II[1046]	-84,16	0	-2,13	0	24,2	0
1665	Permanentes	2/4	-84,16	0	-0,69	0	25,33	0
1665	Permanentes	J[1047]	-84,16	0	0,75	0	25,31	0
1666	Permanentes	II[1047]	-101,5	0	17,23	0	36,66	0
1666	Permanentes	2/4	-101,5	0	18,67	0	22,3	0
1666	Permanentes	J[1048]	-101,5	0	20,11	0	6,79	0
1667	Permanentes	II[1048]	-138,01	0	133,52	0	31,92	0
1667	Permanentes	2/4	-138,01	0	134,4	0	-33,39	0
1667	Permanentes	J[751]	-138,01	0	135,28	0	-99,12	0
1668	Permanentes	II[1049]	-63,81	0	-27,09	0	1,87	0
1668	Permanentes	2/4	-63,81	0	-25,65	0	22,96	0
1668	Permanentes	J[1050]	-63,81	0	-24,21	0	42,9	0
1669	Permanentes	II[1050]	0	0	-0,54	0	-0,08	0
1669	Permanentes	2/4	0	0	-0,27	0	-0,02	0
1669	Permanentes	J[753]	0	0	0	0	0	0
1301	Fren + Tempe neg	II[161]	0,89	-5,78	5,01	-0,05	20,52	4,12
1301	Fren + Tempe neg	2/4	0,89	-5,78	5,01	-0,05	4,48	22,62
1301	Fren + Tempe neg	J[751]	0,89	-5,78	5,01	-0,05	-11,56	41,12
1302	Fren + Tempe neg	II[151]	-2,38	5,82	4,9	-0,25	19,94	-2
1302	Fren + Tempe neg	2/4	-2,38	5,82	4,9	-0,25	4,26	-20,63
1302	Fren + Tempe neg	J[752]	-2,38	5,82	4,9	-0,25	-11,41	-39,27
1303	Fren + Tempe neg	II[754]	0	0	0	0	0	0
1303	Fren + Tempe neg	2/4	0	0	0	0	0	0
1303	Fren + Tempe neg	J[1042]	0	0	0	0	0	0
1343	Fren + Tempe neg	II[752]	-105,97	-2,57	-2,54	-5,42	-4,9	-2,63
1343	Fren + Tempe neg	2/4	-105,97	-2,57	-2,54	-5,42	-3,66	-1,38
1343	Fren + Tempe neg	J[1044]	-105,97	-2,57	-2,54	-5,42	-2,42	-0,12
1344	Fren + Tempe neg	II[751]	-90,36	-2,53	1,08	-5,82	38,09	-2,55
1344	Fren + Tempe neg	2/4	-90,36	-2,53	1,08	-5,82	37,75	-1,76
1344	Fren + Tempe neg	J[1049]	-90,36	-2,53	1,08	-5,82	37,41	-0,97
1661	Fren + Tempe neg	II[1042]	-60,97	0,94	17,97	2,51	37,4	0,37
1661	Fren + Tempe neg	2/4	-60,97	0,94	17,97	2,51	23,02	-0,38
1661	Fren + Tempe neg	J[1043]	-60,97	0,94	17,97	2,51	8,65	-1,13
1662	Fren + Tempe neg	II[1043]	-100,15	2,32	-0,16	5,99	34,27	-0,93
1662	Fren + Tempe neg	2/4	-100,15	2,32	-0,16	5,99	34,32	-1,66
1662	Fren + Tempe neg	J[752]	-100,15	2,32	-0,16	5,99	34,37	-2,38
1663	Fren + Tempe neg	II[1044]	-126,46	-0,97	1,78	-2,66	10,85	-0,55
1663	Fren + Tempe neg	2/4	-126,46	-0,97	1,78	-2,66	9,43	0,23
1663	Fren + Tempe neg	J[1045]	-126,46	-0,97	1,78	-2,66	8	1,01
1664	Fren + Tempe neg	II[1045]	-131,66	-0,04	0,53	-0,86	11,28	0,69
1664	Fren + Tempe neg	2/4	-131,66	-0,04	0,53	-0,86	10,85	0,73
1664	Fren + Tempe neg	J[1046]	-131,66	-0,04	0,53	-0,86	10,42	0,76
1665	Fren + Tempe neg	II[1046]	-129,19	0,01	-2,57	1,04	8,84	0,76
1665	Fren + Tempe neg	2/4	-129,19	0,01	-2,57	1,04	10,9	0,75
1665	Fren + Tempe neg	J[1047]	-129,19	0,01	-2,57	1,04	12,95	0,73
1666	Fren + Tempe neg	II[1047]	-120,61	0,95	-3,44	2,88	7,47	1,03
1666	Fren + Tempe neg	2/4	-120,61	0,95	-3,44	2,88	10,22	0,27
1666	Fren + Tempe neg	J[1048]	-120,61	0,95	-3,44	2,88	12,97	-0,49
1667	Fren + Tempe neg	II[1048]	-96,14	2,48	0,2	5,74	-2,84	-0,08
1667	Fren + Tempe neg	2/4	-96,14	2,48	0,2	5,74	-2,94	-1,29
1667	Fren + Tempe neg	J[751]	-96,14	2,48	0,2	5,74	-3,03	-2,5
1668	Fren + Tempe neg	II[1049]	-48,5	-0,94	-12,89	-2,41	10,34	-1,18
1668	Fren + Tempe neg	2/4	-48,5	-0,94	-12,89	-2,41	20,66	-0,43
1668	Fren + Tempe neg	J[1050]	-48,5	-0,94	-12,89	-2,41	30,97	0,33
1669	Fren + Tempe neg	II[1050]	0	0	0	0	0	0
1669	Fren + Tempe neg	2/4	0	0	0	0	0	0
1669	Fren + Tempe neg	J[753]	0	0	0	0	0	0
1301	Moveis(min)	II[161]	-135,17	-6,22	-4,86	-0,9	-10,92	-15,8
1301	Moveis(min)	2/4	-135,17	-6,22	-4,86	-0,9	-4,99	-8,71
1301	Moveis(min)	J[751]	-135,17	-6,22	-4,86	-0,9	-20,4	-14,75
1302	Moveis(min)	II[151]	-144,82	-3,26	-4,87	-0,74	-12,01	-10,46

1302	Moveis(min)	2/4	-144,82	-3,26	-4,87	-0,74	-3,87	-9,04
1302	Moveis(min)	J[752]	-144,82	-3,26	-4,87	-0,74	-19,31	-27,09
1303	Moveis(min)	I[754]	0	0	0	0	0	0
1303	Moveis(min)	2/4	0	0	0	0	0	0
1303	Moveis(min)	J[1042]	0	0	0	0	0	0
1343	Moveis(min)	I[752]	-38,62	-2,42	-62,94	-8,89	-47,64	-2,72
1343	Moveis(min)	2/4	-38,62	-2,42	-62,94	-8,89	-16,96	-1,56
1343	Moveis(min)	J[1044]	-38,62	-2,42	-62,94	-8,89	-0,49	-0,52
1344	Moveis(min)	I[751]	-24,8	-2,21	-75,85	-12,11	-42,21	-2,84
1344	Moveis(min)	2/4	-24,8	-2,21	-75,85	-12,11	-19,12	-2,16
1344	Moveis(min)	J[1049]	-24,8	-2,21	-75,85	-12,11	-0,69	-1,49
1661	Moveis(min)	I[1042]	-20,64	-1,67	-3,98	-4,12	-1,99	-0,61
1661	Moveis(min)	2/4	-20,64	-1,67	-3,98	-4,12	-0,51	-0,73
1661	Moveis(min)	J[1043]	-20,64	-1,67	-3,98	-4,12	-13,14	-2,07
1662	Moveis(min)	I[1043]	-38,6	-2,48	-1,73	-10,54	-2,62	-1,77
1662	Moveis(min)	2/4	-38,6	-2,48	-1,73	-10,54	-24,11	-2,52
1662	Moveis(min)	J[752]	-38,6	-2,48	-1,73	-10,54	-50	-3,29
1663	Moveis(min)	I[1044]	-18,93	-1,41	-18,37	-4,62	-10,22	-0,95
1663	Moveis(min)	2/4	-18,93	-1,41	-18,37	-4,62	-0,45	-0,33
1663	Moveis(min)	J[1045]	-18,93	-1,41	-18,37	-4,62	-1	-1,39
1664	Moveis(min)	I[1045]	-11,66	-0,28	-7,63	-2,58	-3,1	-0,95
1664	Moveis(min)	2/4	-11,66	-0,28	-7,63	-2,58	-1,1	-1,07
1664	Moveis(min)	J[1046]	-11,66	-0,28	-7,63	-2,58	-1,07	-1,2
1665	Moveis(min)	I[1046]	-7,74	-0,32	-3,02	-1,97	-2,43	-1,2
1665	Moveis(min)	2/4	-7,74	-0,32	-3,02	-1,97	-0,86	-1,09
1665	Moveis(min)	J[1047]	-7,74	-0,32	-3,02	-1,97	-1,83	-1,03
1666	Moveis(min)	I[1047]	-10,83	-1,5	-2,09	-3,73	-1,63	-1,43
1666	Moveis(min)	2/4	-10,83	-1,5	-2,09	-3,73	-0,21	-0,3
1666	Moveis(min)	J[1048]	-10,83	-1,5	-2,09	-3,73	-8,1	-1,01
1667	Moveis(min)	I[1048]	-25,17	-2,67	-4,43	-8,36	-0,66	-0,57
1667	Moveis(min)	2/4	-25,17	-2,67	-4,43	-8,36	-15,81	-1,83
1667	Moveis(min)	J[751]	-25,17	-2,67	-4,43	-8,36	-44,93	-3,13
1668	Moveis(min)	I[1049]	-10,62	-1,47	-9,67	-4,98	-8,19	-1,82
1668	Moveis(min)	2/4	-10,62	-1,47	-9,67	-4,98	-0,74	-0,65
1668	Moveis(min)	J[1050]	-10,62	-1,47	-9,67	-4,98	-1,56	-0,53
1669	Moveis(min)	I[1050]	0	0	0	0	0	0
1669	Moveis(min)	2/4	0	0	0	0	0	0
1669	Moveis(min)	J[753]	0	0	0	0	0	0

#### 4.2.2.2 Travessas (60x150)

##### a) Apoios:

Flexão:

$$M_g = -134,71 \text{ tfm} ; M_p = -50,00 \text{ tfm} ; M_t = -34,34 \text{ tfm}$$

$$M_{\max} = -219,05 \text{ tfm}$$

$$A_s = 0,36 \cdot 21905/142 = 55,53 \text{ cm}^2 \text{ (12}\phi 25\text{)}$$

Cortante:

$$V_{ge} = 81,08 \text{ tf} ; V_{pe} = 16,14 \text{ tf}$$

$$V_{e_{\max}} = 97,22 \text{ tf}$$

$$\tau_{wd} = 1400 \cdot 97,22/60 \cdot 142 = 15,98 \text{ kgf/cm}^2$$

$$A_{se} = 19,09 \text{ cm}^2/\text{m} \text{ (}\phi 10\text{c/15 – duplo)}$$

$$V_{gd} = 40,83 \text{ tf} ; V_{pd} = 18,37 \text{ tf}$$

$$V_{d_{\max}} = 59,20 \text{ tf}$$

$$\tau_{wd} = 1400 \cdot 59,20/60 \cdot 142 = 9,73 \text{ kgf/cm}^2$$

$$A_{se} = 9,47 \text{ cm}^2/\text{m} \text{ (}\phi 10\text{c/20 – duplo)}$$

b) Vão:

$$M_g = 38,70 \text{ tfm} ; M_p = 24,85 \text{ tfm}$$

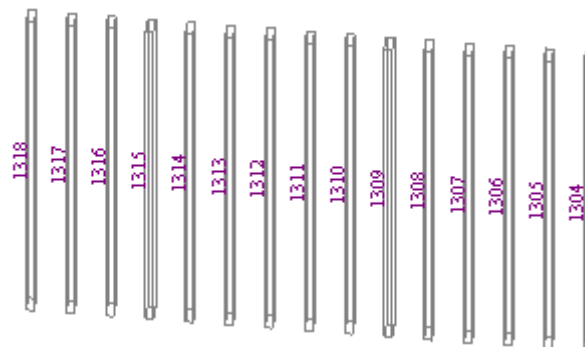
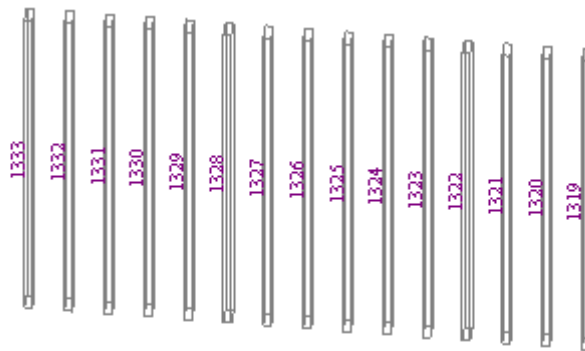
$$M_{\text{máx}} = 63,55 \text{ tfm}$$

$$A_s = 0,33 \cdot 6355 / 142 = 14,77 \text{ cm}^2$$

#### 4.2.2.3 Pilares

a) Esforços

Definidos com a utilização do programa "MIDAS/CIVIL". Ver tabelas e ilustrações abaixo.



Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf*m)	Moment-y (tonf*m)	Moment-z (tonf*m)
1304	Moveis(max)	IF202	3.26	0.01	0.13	0	0.45	0.05
1304	Moveis(max)	2/4	3.26	0.01	0.13	0	0.67	0.01
1304	Moveis(max)	J[755]	3.26	0.01	0.13	0	2.87	0.06
1305	Moveis(max)	IF203	1.7	0.01	0.13	0	0.45	0.05
1305	Moveis(max)	2/4	1.7	0.01	0.13	0	0.66	0.01
1305	Moveis(max)	J[756]	1.7	0.01	0.13	0	2.83	0.05
1306	Moveis(max)	IF204	0.99	0.01	0.14	0	0.46	0.05
1306	Moveis(max)	2/4	0.99	0.01	0.14	0	0.65	0
1306	Moveis(max)	J[757]	0.99	0.01	0.14	0	2.81	0.05
1307	Moveis(max)	IF205	0.79	0.01	0.14	0	0.46	0.05
1307	Moveis(max)	2/4	0.79	0.01	0.14	0	0.64	0
1307	Moveis(max)	J[758]	0.79	0.01	0.14	0	2.77	0.05
1308	Moveis(max)	IF206	0.7	0.01	0.14	0	0.47	0.05
1308	Moveis(max)	2/4	0.7	0.01	0.14	0	0.63	0.01
1308	Moveis(max)	J[759]	0.7	0.01	0.14	0	2.73	0.05
1309	Moveis(max)	IF207	0.68	0.01	0.14	0	0.48	0.05
1309	Moveis(max)	2/4	0.68	0.01	0.14	0	0.61	0.01
1309	Moveis(max)	J[760]	0.68	0.01	0.14	0	2.68	0.05
1310	Moveis(max)	IF208	0.66	0.01	0.14	0	0.5	0.05
1310	Moveis(max)	2/4	0.66	0.01	0.14	0	0.6	0.01
1310	Moveis(max)	J[761]	0.66	0.01	0.14	0	2.64	0.05
1311	Moveis(max)	IF209	0.66	0.01	0.15	0	0.52	0.05
1311	Moveis(max)	2/4	0.66	0.01	0.15	0	0.6	0
1311	Moveis(max)	J[762]	0.66	0.01	0.15	0	2.65	0.05
1312	Moveis(max)	IF210	0.65	0.01	0.15	0	0.54	0.05
1312	Moveis(max)	2/4	0.65	0.01	0.15	0	0.61	0
1312	Moveis(max)	J[763]	0.65	0.01	0.15	0	2.72	0.06
1313	Moveis(max)	IF211	0.64	0.01	0.16	0	0.56	0.05
1313	Moveis(max)	2/4	0.64	0.01	0.16	0	0.64	0.01
1313	Moveis(max)	J[764]	0.64	0.01	0.16	0	2.89	0.06
1314	Moveis(max)	IF212	0.67	0.01	0.17	0	0.59	0.05
1314	Moveis(max)	2/4	0.67	0.01	0.17	0	0.68	0.01
1314	Moveis(max)	J[765]	0.67	0.01	0.17	0	3.04	0.06
1315	Moveis(max)	IF213	0.82	0.01	0.17	0	0.61	0.05
1315	Moveis(max)	2/4	0.82	0.01	0.17	0	0.71	0.01
1315	Moveis(max)	J[766]	0.82	0.01	0.17	0	3.21	0.06
1316	Moveis(max)	IF214	1.07	0.01	0.18	0	0.64	0.06
1316	Moveis(max)	2/4	1.07	0.01	0.18	0	0.75	0.01
1316	Moveis(max)	J[767]	1.07	0.01	0.18	0	3.37	0.06
1317	Moveis(max)	IF215	1.68	0.02	0.18	0	0.66	0.06
1317	Moveis(max)	2/4	1.68	0.02	0.18	0	0.78	0.01
1317	Moveis(max)	J[768]	1.68	0.02	0.18	0	3.51	0.06
1318	Moveis(max)	IF216	2.97	0.02	0.19	0	0.68	0.07
1318	Moveis(max)	2/4	2.97	0.02	0.19	0	0.8	0.01
1318	Moveis(max)	J[769]	2.97	0.02	0.19	0	3.61	0.06
1319	Moveis(max)	IF217	3.26	0.01	0.48	0	1.53	0.05
1319	Moveis(max)	2/4	3.26	0.01	0.48	0	0.17	0.01
1319	Moveis(max)	J[770]	3.26	0.01	0.48	0	0.77	0.06
1320	Moveis(max)	IF218	1.7	0.01	0.48	0	1.52	0.05
1320	Moveis(max)	2/4	1.7	0.01	0.48	0	0.17	0.01
1320	Moveis(max)	J[771]	1.7	0.01	0.48	0	0.77	0.05
1321	Moveis(max)	IF219	0.99	0.01	0.47	0	1.51	0.05
1321	Moveis(max)	2/4	0.99	0.01	0.47	0	0.17	0
1321	Moveis(max)	J[772]	0.99	0.01	0.47	0	0.78	0.05
1322	Moveis(max)	IF220	0.79	0.01	0.47	0	1.49	0.05
1322	Moveis(max)	2/4	0.79	0.01	0.47	0	0.16	0
1322	Moveis(max)	J[773]	0.79	0.01	0.47	0	0.78	0.05
1323	Moveis(max)	IF221	0.7	0.01	0.46	0	1.48	0.05
1323	Moveis(max)	2/4	0.7	0.01	0.46	0	0.16	0.01
1323	Moveis(max)	J[774]	0.7	0.01	0.46	0	0.79	0.05
1324	Moveis(max)	IF222	0.68	0.01	0.45	0	1.46	0.05
1324	Moveis(max)	2/4	0.68	0.01	0.45	0	0.16	0.01
1324	Moveis(max)	J[775]	0.68	0.01	0.45	0	0.79	0.05
1325	Moveis(max)	IF223	0.66	0.01	0.45	0	1.44	0.05
1325	Moveis(max)	2/4	0.66	0.01	0.45	0	0.16	0.01
1325	Moveis(max)	J[776]	0.66	0.01	0.45	0	0.81	0.05
1326	Moveis(max)	IF224	0.66	0.01	0.45	0	1.46	0.05
1326	Moveis(max)	2/4	0.66	0.01	0.45	0	0.16	0

1326	Moveis(max)	J[777]	0,66	0,01	0,45	0	0,83	0,05
1327	Moveis(max)	IF[225]	0,65	0,01	0,46	0	1,51	0,05
1327	Moveis(max)	2/4	0,65	0,01	0,46	0	0,16	0
1327	Moveis(max)	J[778]	0,65	0,01	0,46	0	0,86	0,06
1328	Moveis(max)	IF[226]	0,64	0,01	0,49	0	1,61	0,05
1328	Moveis(max)	2/4	0,64	0,01	0,49	0	0,17	0,01
1328	Moveis(max)	J[779]	0,64	0,01	0,49	0	0,89	0,06
1329	Moveis(max)	IF[227]	0,67	0,01	0,52	0	1,69	0,05
1329	Moveis(max)	2/4	0,67	0,01	0,52	0	0,17	0,01
1329	Moveis(max)	J[780]	0,67	0,01	0,52	0	0,92	0,06
1330	Moveis(max)	IF[228]	0,82	0,01	0,55	0	1,78	0,05
1330	Moveis(max)	2/4	0,82	0,01	0,55	0	0,17	0,01
1330	Moveis(max)	J[781]	0,82	0,01	0,55	0	0,96	0,06
1331	Moveis(max)	IF[229]	1,07	0,01	0,58	0	1,87	0,06
1331	Moveis(max)	2/4	1,07	0,01	0,58	0	0,18	0,01
1331	Moveis(max)	J[782]	1,07	0,01	0,58	0	0,99	0,06
1332	Moveis(max)	IF[230]	1,68	0,02	0,6	0	1,95	0,06
1332	Moveis(max)	2/4	1,68	0,02	0,6	0	0,18	0,01
1332	Moveis(max)	J[783]	1,68	0,02	0,6	0	1,02	0,06
1333	Moveis(max)	IF[231]	2,97	0,02	0,62	0	2,01	0,07
1333	Moveis(max)	2/4	2,97	0,02	0,62	0	0,19	0,01
1333	Moveis(max)	J[784]	2,97	0,02	0,62	0	1,05	0,06
1304	Permanentes	IF[202]	-30,46	-0,02	14,98	0	19,54	-0,07
1304	Permanentes	2/4	-29,33	-0,02	-1,35	0	-8,09	0,02
1304	Permanentes	J[755]	-28,19	-0,02	-8,77	0	18,32	0,1
1305	Permanentes	IF[203]	-26,77	-0,01	15,01	0	19,63	-0,05
1305	Permanentes	2/4	-25,64	-0,01	-1,32	0	-8,13	0,01
1305	Permanentes	J[756]	-24,5	-0,01	-8,74	0	18,14	0,07
1306	Permanentes	IF[204]	-24,29	-0,01	15,01	0	19,61	-0,03
1306	Permanentes	2/4	-23,15	-0,01	-1,33	0	-8,12	0,01
1306	Permanentes	J[757]	-22,01	-0,01	-8,74	0	18,17	0,05
1307	Permanentes	IF[205]	-22,94	0	15,02	0	19,67	-0,02
1307	Permanentes	2/4	-21,81	0	-1,31	0	-8,14	0
1307	Permanentes	J[758]	-20,67	0	-8,73	0	18,08	0,02
1308	Permanentes	IF[206]	-22,2	0	15,03	0	19,68	-0,01
1308	Permanentes	2/4	-21,06	0	-1,31	0	-8,15	0
1308	Permanentes	J[759]	-19,92	0	-8,72	0	18,05	0,01
1309	Permanentes	IF[207]	-21,92	0	15,04	0	19,73	0,01
1309	Permanentes	2/4	-20,78	0	-1,29	0	-8,17	0
1309	Permanentes	J[760]	-19,64	0	-8,71	0	17,97	-0,01
1310	Permanentes	IF[208]	-21,77	0	15,04	0	19,73	0,02
1310	Permanentes	2/4	-20,63	0	-1,29	0	-8,17	0
1310	Permanentes	J[761]	-19,5	0	-8,71	0	17,96	-0,01
1311	Permanentes	IF[209]	-21,77	0,01	15,05	0	19,76	0,03
1311	Permanentes	2/4	-20,63	0,01	-1,28	0	-8,19	0
1311	Permanentes	J[762]	-19,5	0,01	-8,7	0	17,9	-0,03
1312	Permanentes	IF[210]	-21,98	0,01	15,06	0	19,77	0,04
1312	Permanentes	2/4	-20,85	0,01	-1,28	0	-8,19	0
1312	Permanentes	J[763]	-19,71	0,01	-8,69	0	17,88	-0,04
1313	Permanentes	IF[211]	-21,99	0,01	15,04	0	19,73	0,04
1313	Permanentes	2/4	-20,86	0,01	-1,29	0	-8,17	0
1313	Permanentes	J[764]	-19,72	0,01	-8,71	0	17,97	-0,04
1314	Permanentes	IF[212]	-22,2	0,01	15,05	0	19,74	0,06
1314	Permanentes	2/4	-21,06	0,01	-1,29	0	-8,18	0
1314	Permanentes	J[765]	-19,93	0,01	-8,71	0	17,94	-0,06
1315	Permanentes	IF[213]	-22,82	0,01	15,03	0	19,7	0,07
1315	Permanentes	2/4	-21,69	0,01	-1,3	0	-8,16	0
1315	Permanentes	J[766]	-20,55	0,01	-8,72	0	18,01	-0,07
1316	Permanentes	IF[214]	-24,02	0,02	15,03	0	19,7	0,08
1316	Permanentes	2/4	-22,89	0,02	-1,3	0	-8,16	-0,01
1316	Permanentes	J[767]	-21,75	0,02	-8,72	0	18,02	-0,1
1317	Permanentes	IF[215]	-26,16	0,02	15,02	0	19,65	0,1
1317	Permanentes	2/4	-25,02	0,02	-1,32	0	-8,14	-0,01
1317	Permanentes	J[768]	-23,89	0,02	-8,73	0	18,1	-0,11
1318	Permanentes	IF[216]	-29,41	0,03	15,02	0	19,65	0,12
1318	Permanentes	2/4	-28,27	0,03	-1,32	0	-8,14	-0,01
1318	Permanentes	J[769]	-27,14	0,03	-8,73	0	18,11	-0,14
1319	Permanentes	IF[217]	-30,46	-0,02	-14,98	0	-19,54	-0,07
1319	Permanentes	2/4	-29,33	-0,02	1,35	0	8,09	0,02
1319	Permanentes	J[770]	-28,19	-0,02	8,77	0	-18,32	0,1
1320	Permanentes	IF[218]	-26,77	-0,01	-15,01	0	-19,63	-0,05



1320	Permanentes	2/4	-25,64	-0,01	1,32	0	8,13	0,01
1320	Permanentes	J[771]	-24,5	-0,01	8,74	0	-18,14	0,07
1321	Permanentes	IF[219]	-24,29	-0,01	-15,01	0	-19,61	-0,03
1321	Permanentes	2/4	-23,15	-0,01	1,33	0	8,12	0,01
1321	Permanentes	J[772]	-22,01	-0,01	8,74	0	-18,17	0,05
1322	Permanentes	IF[220]	-22,94	0	-15,02	0	-19,67	-0,02
1322	Permanentes	2/4	-21,81	0	1,31	0	8,14	0
1322	Permanentes	J[773]	-20,67	0	8,73	0	-18,08	0,02
1323	Permanentes	IF[221]	-22,2	0	-15,03	0	-19,68	-0,01
1323	Permanentes	2/4	-21,06	0	1,31	0	8,15	0
1323	Permanentes	J[774]	-19,92	0	8,72	0	-18,05	0,01
1324	Permanentes	IF[222]	-21,92	0	-15,04	0	-19,73	0,01
1324	Permanentes	2/4	-20,78	0	1,29	0	8,17	0
1324	Permanentes	J[775]	-19,64	0	8,71	0	-17,97	-0,01
1325	Permanentes	IF[223]	-21,77	0	-15,04	0	-19,73	0,02
1325	Permanentes	2/4	-20,63	0	1,29	0	8,17	0
1325	Permanentes	J[776]	-19,5	0	8,71	0	-17,96	-0,01
1326	Permanentes	IF[224]	-21,77	0,01	-15,05	0	-19,76	0,03
1326	Permanentes	2/4	-20,63	0,01	1,28	0	8,19	0
1326	Permanentes	J[777]	-19,5	0,01	8,7	0	-17,9	-0,03
1327	Permanentes	IF[225]	-21,98	0,01	-15,06	0	-19,77	0,04
1327	Permanentes	2/4	-20,85	0,01	1,28	0	8,19	0
1327	Permanentes	J[778]	-19,71	0,01	8,69	0	-17,88	-0,04
1328	Permanentes	IF[226]	-21,99	0,01	-15,04	0	-19,73	0,04
1328	Permanentes	2/4	-20,86	0,01	1,29	0	8,17	0
1328	Permanentes	J[779]	-19,72	0,01	8,71	0	-17,97	-0,04
1329	Permanentes	IF[227]	-22,2	0,01	-15,05	0	-19,74	0,06
1329	Permanentes	2/4	-21,06	0,01	1,29	0	8,18	0
1329	Permanentes	J[780]	-19,93	0,01	8,71	0	-17,94	-0,06
1330	Permanentes	IF[228]	-22,82	0,01	-15,03	0	-19,7	0,07
1330	Permanentes	2/4	-21,69	0,01	1,3	0	8,16	0
1330	Permanentes	J[781]	-20,55	0,01	8,72	0	-18,01	-0,07
1331	Permanentes	IF[229]	-24,02	0,02	-15,03	0	-19,7	0,08
1331	Permanentes	2/4	-22,89	0,02	1,3	0	8,16	-0,01
1331	Permanentes	J[782]	-21,75	0,02	8,72	0	-18,02	-0,1
1332	Permanentes	IF[230]	-26,16	0,02	-15,02	0	-19,65	0,1
1332	Permanentes	2/4	-25,02	0,02	1,32	0	8,14	-0,01
1332	Permanentes	J[783]	-23,89	0,02	8,73	0	-18,1	-0,11
1333	Permanentes	IF[231]	-29,41	0,03	-15,02	0	-19,65	0,12
1333	Permanentes	2/4	-28,27	0,03	1,32	0	8,14	-0,01
1333	Permanentes	J[784]	-27,14	0,03	8,73	0	-18,11	-0,14
1304	Fren + Tempe neg	IF[202]	0,88	-0,02	0,38	0	1,76	-0,08
1304	Fren + Tempe neg	2/4	0,88	-0,02	0,38	0	0,02	0
1304	Fren + Tempe neg	J[755]	0,88	-0,02	0,38	0	-1,73	0,07
1305	Fren + Tempe neg	IF[203]	0,56	-0,01	0,38	0	1,76	-0,07
1305	Fren + Tempe neg	2/4	0,56	-0,01	0,38	0	0,02	0
1305	Fren + Tempe neg	J[756]	0,56	-0,01	0,38	0	-1,71	0,07
1306	Fren + Tempe neg	IF[204]	0,3	-0,01	0,38	0	1,76	-0,06
1306	Fren + Tempe neg	2/4	0,3	-0,01	0,38	0	0,02	0
1306	Fren + Tempe neg	J[757]	0,3	-0,01	0,38	0	-1,71	0,06
1307	Fren + Tempe neg	IF[205]	0,14	-0,01	0,38	0	1,75	-0,05
1307	Fren + Tempe neg	2/4	0,14	-0,01	0,38	0	0,03	0
1307	Fren + Tempe neg	J[758]	0,14	-0,01	0,38	0	-1,7	0,05
1308	Fren + Tempe neg	IF[206]	0,03	-0,01	0,38	0	1,75	-0,04
1308	Fren + Tempe neg	2/4	0,03	-0,01	0,38	0	0,03	0
1308	Fren + Tempe neg	J[759]	0,03	-0,01	0,38	0	-1,69	0,04
1309	Fren + Tempe neg	IF[207]	-0,03	-0,01	0,38	0	1,75	-0,04
1309	Fren + Tempe neg	2/4	-0,03	-0,01	0,38	0	0,03	0
1309	Fren + Tempe neg	J[760]	-0,03	-0,01	0,38	0	-1,68	0,03
1310	Fren + Tempe neg	IF[208]	-0,07	-0,01	0,38	0	1,75	-0,03
1310	Fren + Tempe neg	2/4	-0,07	-0,01	0,38	0	0,03	0
1310	Fren + Tempe neg	J[761]	-0,07	-0,01	0,38	0	-1,68	0,03
1311	Fren + Tempe neg	IF[209]	-0,08	0	0,38	0	1,74	-0,02
1311	Fren + Tempe neg	2/4	-0,08	0	0,38	0	0,04	0
1311	Fren + Tempe neg	J[762]	-0,08	0	0,38	0	-1,67	0,02
1312	Fren + Tempe neg	IF[210]	-0,06	0	0,38	0	1,74	-0,01
1312	Fren + Tempe neg	2/4	-0,06	0	0,38	0	0,04	0
1312	Fren + Tempe neg	J[763]	-0,06	0	0,38	0	-1,67	0,01
1313	Fren + Tempe neg	IF[211]	-0,04	0	0,38	0	1,75	0
1313	Fren + Tempe neg	2/4	-0,04	0	0,38	0	0,04	0
1313	Fren + Tempe neg	J[764]	-0,04	0	0,38	0	-1,68	0

1314	Fren + Tempe neg	IF[212]	0,01	0	0,38	0	1,75	0,01
1314	Fren + Tempe neg	2/4	0,01	0	0,38	0	0,04	0
1314	Fren + Tempe neg	J[765]	0,01	0	0,38	0	-1,68	-0,01
1315	Fren + Tempe neg	IF[213]	0,08	0	0,38	0	1,76	0,02
1315	Fren + Tempe neg	2/4	0,08	0	0,38	0	0,04	0
1315	Fren + Tempe neg	J[766]	0,08	0	0,38	0	-1,69	-0,02
1316	Fren + Tempe neg	IF[214]	0,16	0,01	0,38	0	1,77	0,02
1316	Fren + Tempe neg	2/4	0,16	0,01	0,38	0	0,04	0
1316	Fren + Tempe neg	J[767]	0,16	0,01	0,38	0	-1,7	-0,02
1317	Fren + Tempe neg	IF[215]	0,27	0,01	0,38	0	1,78	0,03
1317	Fren + Tempe neg	2/4	0,27	0,01	0,38	0	0,03	0
1317	Fren + Tempe neg	J[768]	0,27	0,01	0,38	0	-1,71	-0,03
1318	Fren + Tempe neg	IF[216]	0,38	0,01	0,38	0	1,78	0,04
1318	Fren + Tempe neg	2/4	0,38	0,01	0,38	0	0,03	0
1318	Fren + Tempe neg	J[769]	0,38	0,01	0,38	0	-1,72	-0,04
1319	Fren + Tempe neg	IF[217]	0,83	-0,01	-0,02	0	-0,08	-0,05
1319	Fren + Tempe neg	2/4	0,83	-0,01	-0,02	0	0,01	0
1319	Fren + Tempe neg	J[770]	0,83	-0,01	-0,02	0	0,09	0,05
1320	Fren + Tempe neg	IF[218]	0,38	-0,01	-0,02	0	-0,07	-0,04
1320	Fren + Tempe neg	2/4	0,38	-0,01	-0,02	0	0,01	0
1320	Fren + Tempe neg	J[771]	0,38	-0,01	-0,02	0	0,08	0,04
1321	Fren + Tempe neg	IF[219]	0,08	-0,01	-0,01	0	-0,05	-0,04
1321	Fren + Tempe neg	2/4	0,08	-0,01	-0,01	0	0	0
1321	Fren + Tempe neg	J[772]	0,08	-0,01	-0,01	0	0,06	0,03
1322	Fren + Tempe neg	IF[220]	-0,11	-0,01	-0,01	0	-0,04	-0,03
1322	Fren + Tempe neg	2/4	-0,11	-0,01	-0,01	0	0	0
1322	Fren + Tempe neg	J[773]	-0,11	-0,01	-0,01	0	0,04	0,03
1323	Fren + Tempe neg	IF[221]	-0,24	0	-0,01	0	-0,03	-0,02
1323	Fren + Tempe neg	2/4	-0,24	0	-0,01	0	0	0
1323	Fren + Tempe neg	J[774]	-0,24	0	-0,01	0	0,02	0,02
1324	Fren + Tempe neg	IF[222]	-0,3	0	0	0	-0,02	-0,01
1324	Fren + Tempe neg	2/4	-0,3	0	0	0	-0,01	0
1324	Fren + Tempe neg	J[775]	-0,3	0	0	0	0	0,01
1325	Fren + Tempe neg	IF[223]	-0,33	0	0	0	-0,01	0
1325	Fren + Tempe neg	2/4	-0,33	0	0	0	-0,01	0
1325	Fren + Tempe neg	J[776]	-0,33	0	0	0	-0,01	0
1326	Fren + Tempe neg	IF[224]	-0,34	0	0	0	0	0
1326	Fren + Tempe neg	2/4	-0,34	0	0	0	-0,01	0
1326	Fren + Tempe neg	J[777]	-0,34	0	0	0	-0,03	0
1327	Fren + Tempe neg	IF[225]	-0,33	0	0,01	0	0,01	0,01
1327	Fren + Tempe neg	2/4	-0,33	0	0,01	0	-0,01	0
1327	Fren + Tempe neg	J[778]	-0,33	0	0,01	0	-0,04	-0,01
1328	Fren + Tempe neg	IF[226]	-0,31	0	0,01	0	0,01	0,02
1328	Fren + Tempe neg	2/4	-0,31	0	0,01	0	-0,01	0
1328	Fren + Tempe neg	J[779]	-0,31	0	0,01	0	-0,04	-0,02
1329	Fren + Tempe neg	IF[227]	-0,27	0,01	0,01	0	0,02	0,03
1329	Fren + Tempe neg	2/4	-0,27	0,01	0,01	0	-0,01	0
1329	Fren + Tempe neg	J[780]	-0,27	0,01	0,01	0	-0,05	-0,03
1330	Fren + Tempe neg	IF[228]	-0,21	0,01	0,01	0	0,02	0,04
1330	Fren + Tempe neg	2/4	-0,21	0,01	0,01	0	-0,01	0
1330	Fren + Tempe neg	J[781]	-0,21	0,01	0,01	0	-0,05	-0,04
1331	Fren + Tempe neg	IF[229]	-0,12	0,01	0,01	0	0,02	0,05
1331	Fren + Tempe neg	2/4	-0,12	0,01	0,01	0	-0,01	0
1331	Fren + Tempe neg	J[782]	-0,12	0,01	0,01	0	-0,05	-0,05
1332	Fren + Tempe neg	IF[230]	0,03	0,01	0,01	0	0,03	0,06
1332	Fren + Tempe neg	2/4	0,03	0,01	0,01	0	-0,01	0
1332	Fren + Tempe neg	J[783]	0,03	0,01	0,01	0	-0,05	-0,05
1333	Fren + Tempe neg	IF[231]	0,21	0,01	0,01	0	0,03	0,06
1333	Fren + Tempe neg	2/4	0,21	0,01	0,01	0	-0,01	0
1333	Fren + Tempe neg	J[784]	0,21	0,01	0,01	0	-0,05	-0,06
1304	Moveis(min)	IF[202]	-11,22	-0,01	-0,48	0	-1,53	-0,05
1304	Moveis(min)	2/4	-11,22	-0,01	-0,48	0	-0,17	-0,01
1304	Moveis(min)	J[755]	-11,22	-0,01	-0,48	0	-0,77	-0,06
1305	Moveis(min)	IF[203]	-10,33	-0,01	-0,48	0	-1,52	-0,05
1305	Moveis(min)	2/4	-10,33	-0,01	-0,48	0	-0,17	-0,01
1305	Moveis(min)	J[756]	-10,33	-0,01	-0,48	0	-0,77	-0,06
1306	Moveis(min)	IF[204]	-10,57	-0,01	-0,47	0	-1,51	-0,05
1306	Moveis(min)	2/4	-10,57	-0,01	-0,47	0	-0,17	-0,01
1306	Moveis(min)	J[757]	-10,57	-0,01	-0,47	0	-0,78	-0,05
1307	Moveis(min)	IF[205]	-10,63	-0,01	-0,47	0	-1,49	-0,05
1307	Moveis(min)	2/4	-10,63	-0,01	-0,47	0	-0,16	-0,01

1307	Moveis(min)	J[758]	-10.63	-0.01	-0.47	0	-0.78	-0.05
1308	Moveis(min)	IF[206]	-10.02	-0.01	-0.46	0	-1.48	-0.05
1308	Moveis(min)	2/4	-10.02	-0.01	-0.46	0	-0.16	-0.01
1308	Moveis(min)	J[759]	-10.02	-0.01	-0.46	0	-0.79	-0.05
1309	Moveis(min)	IF[207]	-8.82	-0.01	-0.45	0	-1.46	-0.05
1309	Moveis(min)	2/4	-8.82	-0.01	-0.45	0	-0.16	-0.01
1309	Moveis(min)	J[760]	-8.82	-0.01	-0.45	0	-0.79	-0.05
1310	Moveis(min)	IF[208]	-9.57	-0.01	-0.45	0	-1.44	-0.05
1310	Moveis(min)	2/4	-9.57	-0.01	-0.45	0	-0.16	-0.01
1310	Moveis(min)	J[761]	-9.57	-0.01	-0.45	0	-0.81	-0.05
1311	Moveis(min)	IF[209]	-10.83	-0.01	-0.45	0	-1.46	-0.05
1311	Moveis(min)	2/4	-10.83	-0.01	-0.45	0	-0.16	0
1311	Moveis(min)	J[762]	-10.83	-0.01	-0.45	0	-0.83	-0.05
1312	Moveis(min)	IF[210]	-11.2	-0.01	-0.46	0	-1.51	-0.05
1312	Moveis(min)	2/4	-11.2	-0.01	-0.46	0	-0.16	0
1312	Moveis(min)	J[763]	-11.2	-0.01	-0.46	0	-0.86	-0.05
1313	Moveis(min)	IF[211]	-10.51	-0.01	-0.49	0	-1.61	-0.05
1313	Moveis(min)	2/4	-10.51	-0.01	-0.49	0	-0.17	-0.01
1313	Moveis(min)	J[764]	-10.51	-0.01	-0.49	0	-0.89	-0.05
1314	Moveis(min)	IF[212]	-9.2	-0.01	-0.52	0	-1.69	-0.05
1314	Moveis(min)	2/4	-9.2	-0.01	-0.52	0	-0.17	-0.01
1314	Moveis(min)	J[765]	-9.2	-0.01	-0.52	0	-0.92	-0.06
1315	Moveis(min)	IF[213]	-10.11	-0.01	-0.55	0	-1.78	-0.05
1315	Moveis(min)	2/4	-10.11	-0.01	-0.55	0	-0.17	-0.01
1315	Moveis(min)	J[766]	-10.11	-0.01	-0.55	0	-0.96	-0.06
1316	Moveis(min)	IF[214]	-12.96	-0.01	-0.58	0	-1.87	-0.06
1316	Moveis(min)	2/4	-12.96	-0.01	-0.58	0	-0.18	-0.01
1316	Moveis(min)	J[767]	-12.96	-0.01	-0.58	0	-0.99	-0.08
1317	Moveis(min)	IF[215]	-16.64	-0.01	-0.6	0	-1.95	-0.06
1317	Moveis(min)	2/4	-16.64	-0.01	-0.6	0	-0.18	-0.02
1317	Moveis(min)	J[768]	-16.64	-0.01	-0.6	0	-1.02	-0.09
1318	Moveis(min)	IF[216]	-21.62	-0.01	-0.62	0	-2.01	-0.06
1318	Moveis(min)	2/4	-21.62	-0.01	-0.62	0	-0.19	-0.02
1318	Moveis(min)	J[769]	-21.62	-0.01	-0.62	0	-1.05	-0.11
1319	Moveis(min)	IF[217]	-11.22	-0.01	-0.13	0	-0.45	-0.05
1319	Moveis(min)	2/4	-11.22	-0.01	-0.13	0	-0.67	-0.01
1319	Moveis(min)	J[770]	-11.22	-0.01	-0.13	0	-2.87	-0.06
1320	Moveis(min)	IF[218]	-10.33	-0.01	-0.13	0	-0.45	-0.05
1320	Moveis(min)	2/4	-10.33	-0.01	-0.13	0	-0.66	-0.01
1320	Moveis(min)	J[771]	-10.33	-0.01	-0.13	0	-2.83	-0.06
1321	Moveis(min)	IF[219]	-10.57	-0.01	-0.14	0	-0.46	-0.05
1321	Moveis(min)	2/4	-10.57	-0.01	-0.14	0	-0.65	-0.01
1321	Moveis(min)	J[772]	-10.57	-0.01	-0.14	0	-2.81	-0.05
1322	Moveis(min)	IF[220]	-10.63	-0.01	-0.14	0	-0.46	-0.05
1322	Moveis(min)	2/4	-10.63	-0.01	-0.14	0	-0.64	-0.01
1322	Moveis(min)	J[773]	-10.63	-0.01	-0.14	0	-2.77	-0.05
1323	Moveis(min)	IF[221]	-10.02	-0.01	-0.14	0	-0.47	-0.05
1323	Moveis(min)	2/4	-10.02	-0.01	-0.14	0	-0.63	-0.01
1323	Moveis(min)	J[774]	-10.02	-0.01	-0.14	0	-2.73	-0.05
1324	Moveis(min)	IF[222]	-8.82	-0.01	-0.14	0	-0.48	-0.05
1324	Moveis(min)	2/4	-8.82	-0.01	-0.14	0	-0.61	-0.01
1324	Moveis(min)	J[775]	-8.82	-0.01	-0.14	0	-2.68	-0.05
1325	Moveis(min)	IF[223]	-9.57	-0.01	-0.14	0	-0.5	-0.05
1325	Moveis(min)	2/4	-9.57	-0.01	-0.14	0	-0.6	-0.01
1325	Moveis(min)	J[776]	-9.57	-0.01	-0.14	0	-2.64	-0.05
1326	Moveis(min)	IF[224]	-10.83	-0.01	-0.15	0	-0.52	-0.05
1326	Moveis(min)	2/4	-10.83	-0.01	-0.15	0	-0.6	0
1326	Moveis(min)	J[777]	-10.83	-0.01	-0.15	0	-2.65	-0.05
1327	Moveis(min)	IF[225]	-11.2	-0.01	-0.15	0	-0.54	-0.05
1327	Moveis(min)	2/4	-11.2	-0.01	-0.15	0	-0.61	0
1327	Moveis(min)	J[778]	-11.2	-0.01	-0.15	0	-2.72	-0.05
1328	Moveis(min)	IF[226]	-10.51	-0.01	-0.16	0	-0.56	-0.05
1328	Moveis(min)	2/4	-10.51	-0.01	-0.16	0	-0.64	-0.01
1328	Moveis(min)	J[779]	-10.51	-0.01	-0.16	0	-2.89	-0.05
1329	Moveis(min)	IF[227]	-9.2	-0.01	-0.17	0	-0.59	-0.05
1329	Moveis(min)	2/4	-9.2	-0.01	-0.17	0	-0.68	-0.01
1329	Moveis(min)	J[780]	-9.2	-0.01	-0.17	0	-3.04	-0.06
1330	Moveis(min)	IF[228]	-10.11	-0.01	-0.17	0	-0.61	-0.05
1330	Moveis(min)	2/4	-10.11	-0.01	-0.17	0	-0.71	-0.01
1330	Moveis(min)	J[781]	-10.11	-0.01	-0.17	0	-3.21	-0.06
1331	Moveis(min)	IF[229]	-12.96	-0.01	-0.18	0	-0.64	-0.06



1331	Moveis(min)	2/4	-12,96	-0,01	-0,18	0	-0,75	-0,01
1331	Moveis(min)	J[782]	-12,96	-0,01	-0,18	0	-3,37	-0,08
1332	Moveis(min)	lf[230]	-16,64	-0,01	-0,18	0	-0,66	-0,06
1332	Moveis(min)	2/4	-16,64	-0,01	-0,18	0	-0,78	-0,02
1332	Moveis(min)	J[783]	-16,64	-0,01	-0,18	0	-3,51	-0,09
1333	Moveis(min)	lf[231]	-21,62	-0,01	-0,19	0	-0,68	-0,06
1333	Moveis(min)	2/4	-21,62	-0,01	-0,19	0	-0,8	-0,02
1333	Moveis(min)	J[784]	-21,62	-0,01	-0,19	0	-3,61	-0,11

$$V_{\max} = 472,92 + 144,82 + 20,62 + 2,38 = 640,74 \text{ tf}$$

$$V_{\min} = 319,61 - 5,83 - 4,61 - 0,89 = 308,28 \text{ tf}$$

$$M_L = 12,01 + 1,03 + 20,52 = 33,56 \text{ tfm}$$

$$M_T = 29,65 + 15,91 + 5,79 + 4,12 = 55,47 \text{ tfm}$$

$$H_L = 4,87 + 0,40 + 5,01 = 10,28 \text{ tf}$$

$$H_T = 2,77 + 6,22 + 1,30 + 5,78 = 16,07 \text{ tf}$$

#### 4.2.2.4 Dimensionamento

Será utilizado o programa "CONDE3" do professor Lauro M. dos Santos.

a)  $V_{\max} + M$ :

$$V_d = 1,40 \cdot 640,74 = 897,04 \text{ tf}$$

$$M_{Ld} = 1,40 \cdot 33,56 = 46,98 \text{ tfm}$$

$$M_{Td} = 1,40 \cdot 55,47 = 77,66 \text{ tfm}$$

$$A_{s_{\min}} = 0,50\% = 60,00 \text{ cm}^2 (20\phi 20)$$

b)  $-V_{\min} + M$ :

$$V_d = 1,40 \cdot 308,28 = 431,59 \text{ tf}$$

$$M_{Ld} = 46,98 \text{ tfm}$$

$$M_{Td} = 77,66 \text{ tfm}$$

$$A_{s_{\min}} = 60,00 \text{ cm}^2$$

#### 4.2.3 Blocos

$$\text{Peso próprio} = 41,60 \text{ tf}$$

$$V_{\max} = 670,44 + 41,60 = 712,34 \text{ tf}$$

$$V_{\min} = 308,28 + 41,60 = 349,88 \text{ tf}$$

$$M_L = 33,56 + 10,28 \cdot 1,20 = 45,90 \text{ tfm}$$

$$M_T = 55,47 + 16,07 \cdot 1,20 = 74,75 \text{ tfm}$$

$$V_{\max/\text{est}} = 712,34/6 + 45,90/3 \cdot 2,2 + 74,75/2 \cdot 3,0 = 138,1 \text{ tf/est}$$

$$V_{\min/\text{est}} = 349,88/6 - 45,90/3 \cdot 2,2 + 74,75/2 \cdot 3,0 = 38,9 \text{ tf/est}$$

$$Z_L = 3 \cdot 138,1 \cdot 0,95/0,8 \cdot 1,16 = 424,12 \text{ cm}^2$$

$$A_{s_L} = 1,4 \cdot 424,12/4,348 = 136,6 \text{ cm}^2$$

$$Z_T = 2 \cdot 138,1 \cdot 1,0/0,8 \cdot 1,16 = 297,63 \text{ tf}$$

$$As_T = 1,4 \cdot 297,63 / 4,348 = 95,8 \text{ cm}^2$$

### 4.3 Encontros

#### 4.3.1 Vigas de Coroamento

Como elementos de ligação dos topos das estacas, estão sujeitos apenas a esforços secundários. Serão detalhados com armaduras mínimas.

#### 4.3.2 Estacas

$$V_{\text{máx}} = 55 \text{ tf} ; M_{\text{máx}} = 20,36 \text{ tfm}$$

Verificação estrutural:

$$\text{Perfil W530x66: } S = 83,6 \text{ cm}^2$$

$$W = 1332 \text{ cm}^3$$

$$\sigma = \frac{55000}{83,6} + \frac{2036000}{1332} = 2186 \frac{\text{kgf}}{\text{cm}^2} < \sigma_{\text{adm}} \rightarrow \text{OK}$$

Verificação geotécnica:

$$A_p = 0,087 \text{ m}^2 ; A_l = 1,38 \text{ m}^2/\text{m}$$

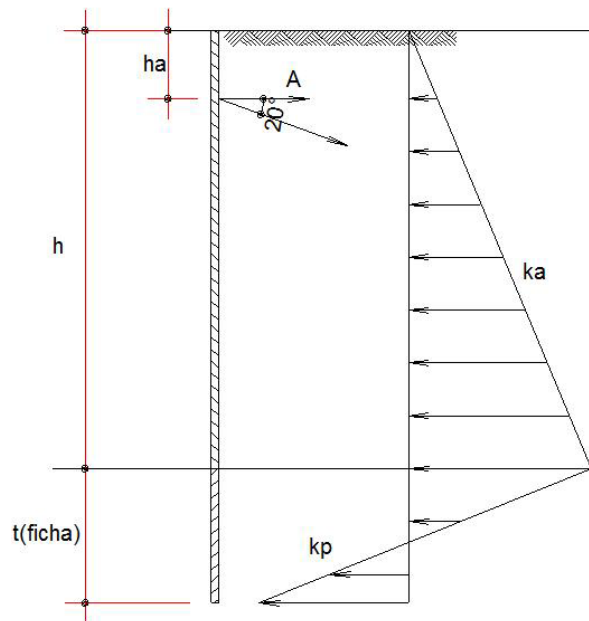
$$\text{Silte arenoso: } k = 25 \text{ tf/m}^2 ; N = 30 ; k \cdot N = 750 \text{ tf/m}^2$$

$$\Sigma(N/3+1) = 40,6 \text{ tf/m}^2$$

$$N = 750 \cdot 0,087 + 40,6 \cdot 1,38 = 121 \text{ tf}$$

$$N_{\text{adm}} = N/2 = 60,5 \text{ tf} \rightarrow \text{OK}$$

#### 4.4 Alas



Parâmetros adotados para o solo:

$$c = 0 ; \varphi = 25^\circ ; \gamma = 1,80 \text{ tf/m}^3 ; \delta = 2/3\varphi$$

para terrapleno horizontal temos:

$$\lambda_{ah} = 0,40 ; ka = \lambda_{ah} \cdot \gamma = 0,40 \cdot 1,80 = 0,72 \text{ tf/m}^3$$

$$\lambda_{ph} = 4,00 ; kp = \lambda_{ph} \cdot \gamma = 4,00 \cdot 1,80 = 7,20 \text{ tf/m}^3$$

$$A = a \cdot ka \cdot (0,1h)^2 ; t = f \cdot h$$

Esforços nos Tirantes					
H	$h_A/h$	f	a	A	t
8,5	0,14	0,66	24	12,5	5,2
7,5	0,16	0,66	24	9,7	4,9
6,5	0,18	0,66	25	7,6	4,3
5,5	0,22	0,65	27	5,9	3,6
4,5	0,27	0,63	28	4,1	2,8
3,5	0,37	0,59	33	2,9	2,1
2,5	0,48	0,55	37	1,7	1,4

Tirantes:

Será utilizado a fórmula proposta por Bustamante para tirantes re-injetáveis.

$$T = \pi \cdot D_s \cdot L_b \cdot q_s$$

T = capacidade de carga do bulbo

$L_b$  = comprimento do bulbo

$q_s$  = aderência na ruptura

$D_s = \alpha \cdot D$ , sendo  $D$  o diâmetro da perfuração.

Considerando as sondagens:  $\alpha = 1,4 \therefore D_s = 1,4 \cdot 10 = 14 \text{ cm}$

$q_s = 1,5 \text{ kgf/cm}^2$

Tirantes superiores:

$$T = 1,75 \cdot 12,5 / \cos 20^\circ = 23,28 \text{ tf}$$

$$L_b = 2,2 \cdot 23280 / \pi \cdot 14 \cdot 1,5 = 776 \text{ cm (adotado 800 cm)}$$

Tirantes inferiores:

$$T = 1,75 \cdot 4,1 / \cos 20^\circ = 7,63 \text{ tf}$$

$$L_b = 4,5 \cdot 7630 / \pi \cdot 14 \cdot 1,5 = 520 \text{ cm (adotado 600 cm)}$$

## TRINCHEIRA 2

### 4.5 Carregamentos

#### 4.5.1 Permanentes

Peso Próprio:  $h \cdot 2,50$

Defensas :  $0,58 \text{ tf/m}$

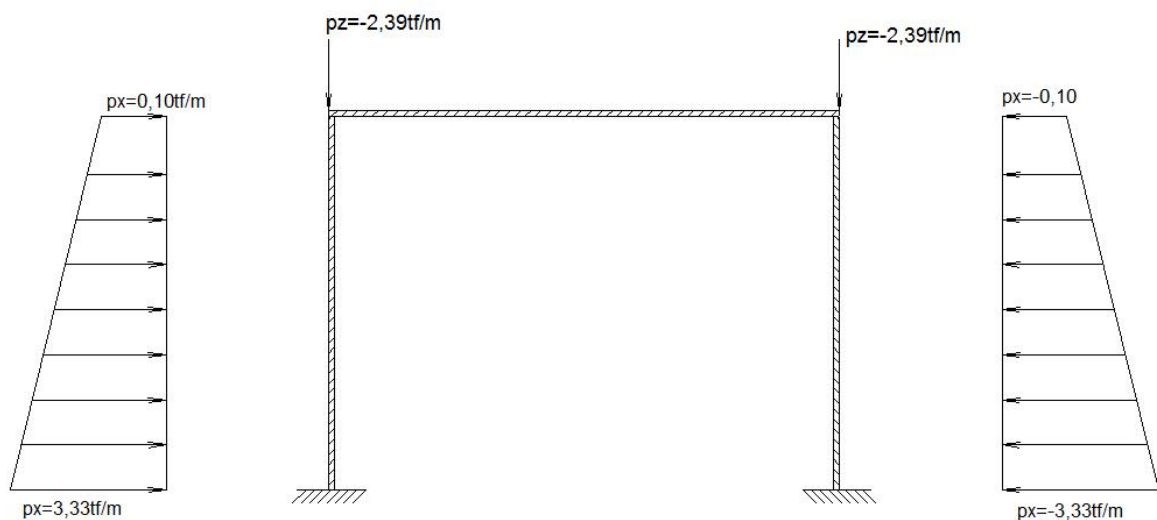
Parapeito :  $0,41 \text{ tf/m}$

Pavimento :  $0,17 \text{ tf/m}^2$

Recapeamento :  $0,20 \text{ tf/m}^2$

Retração :  $\Delta t = 15^\circ\text{C}$   $c/\alpha = 10^{-5}/^\circ\text{C}$

Placa de transição + empuxo:



#### 4.5.2 Móveis

4.5.2.1 Trem tipo:  $P = 6,0 \text{ tf/roda}$

$$p = 0,5 \text{ tf/m}^2$$

$$\text{impacto} : \varphi = 1,37$$

4.5.2.2 Carga no passeio:

$$p = 0,50 \text{ tf/m}^2$$

4.5.2.3 Frenagem

$$F = 0,30 \cdot 45 = 13,50 \text{ tf}$$

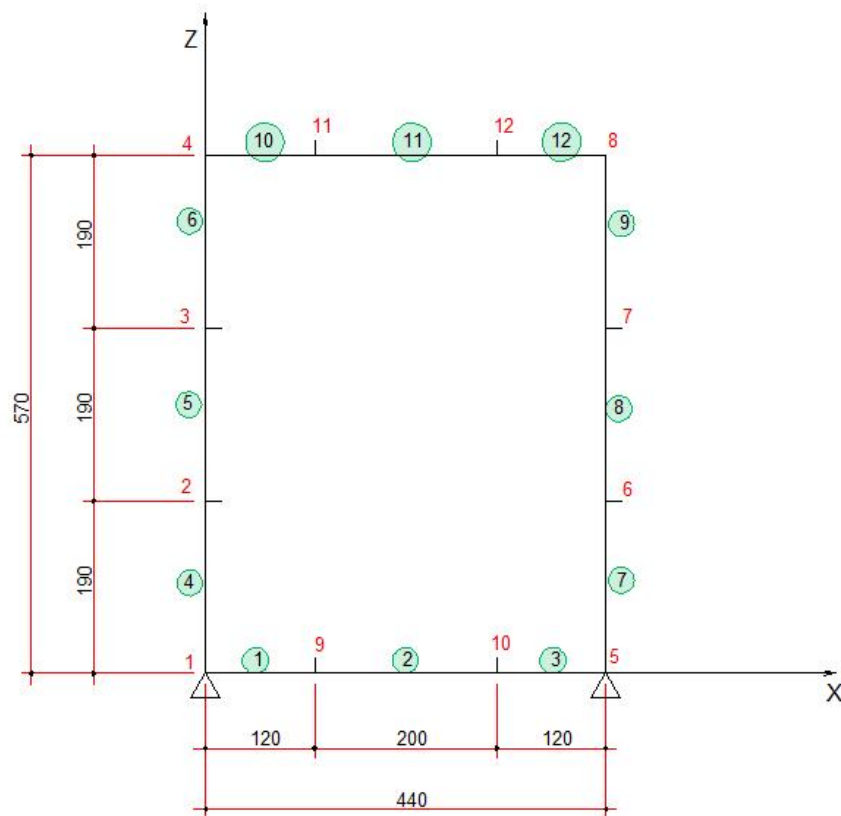
4.5.2.4 Temperatura

$$\Delta t = -15^\circ\text{C}$$

#### 4.6 Esforços

Serão calculados com a utilização do programa "SAP 90". Ver anexo 1

Esquema estrutural:



#### 4.7 Dimensionamento

Concreto :  $f_{ck} = 25\text{MPa}$  ; Aço ; CA.50

##### 4.7.1 Laje superior

Apoio:  $M_g = -3,02\text{tfm/m}$  ;  $M_p = -5,38-0,47-1,90 = -7,75\text{tfm/m}$

$$M_{g+p} = -10,77\text{ tfm/m} \rightarrow A_s = 14,50\text{cm}^2/\text{m}$$

$$F_{ad} = 1,24 \therefore A_s \cdot f_{ad} = 17,98\text{ cm}^2/\text{m}$$

Vão:  $M_g = -0,31\text{ tfm/m}$  ;  $M_p = 4,49+0,98 = 5,47\text{ tfm/m}$

$$M_{g+p} = 5,16\text{ tfm/m} \rightarrow A_s = 7,15\text{ cm}^2/\text{m}$$

$$F_{ad} = 1,74 \therefore A_s \cdot f_{ad} = 12,44\text{ cm}^2/\text{m}$$

##### 4.7.2 Paredes:

Face ext.:  $M_{g+p} = 10,77\text{ tfm/m} \rightarrow A_s = 10,17\text{ cm}^2/\text{m}$

$$F_{ad} = 1,23 \rightarrow A_s \cdot f_{ad} = 12,50\text{cm}^2$$

Face int.:  $M_{g+p} = 8,44\text{ tfm/m} \rightarrow A_s = 7,97\text{ cm}^2/\text{m}$

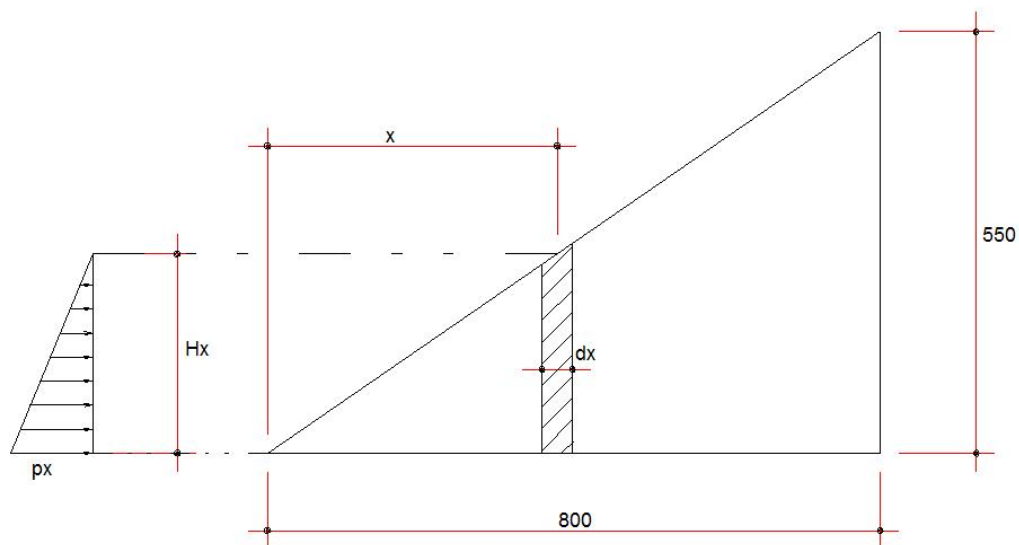
$$F_{ad} = 1,17 \rightarrow A_s \cdot f_{ad} = 9,32\text{cm}^2$$

##### 4.7.3 Vigas: (30x50)

$$M_{\text{máx}} = 8,37\text{ tfm} \rightarrow A_s = 6,51\text{ cm}^2$$

$$F_{ad} = 1,23 \rightarrow A_s \cdot f_{ad} = 8,0\text{ cm}^2$$

#### 4.8 Alas



$\beta=0$  ( inclinação do talude)

$\alpha=0$  (paramento vertical)

$\rho=30^\circ$  (atrito interno)

$\gamma=0$

$k_a=0,333$

$H_x = (5,5/8,0)x = 0,688x$

$P_x = 0,333x * 1,90 * H_x = 0,435x$

$E_x = \frac{px * Hx}{2}$  ;  $dEx = (px * Hx)/2 * dx$

$E = \int_0^8 0,15x^2 dx = 25,60$  tf

$M = \frac{k_a}{6} * E * tg \frac{x}{2} = \frac{120}{6} * 25,60 * tg \frac{90}{2} = 5,12$  tfm/m

$A_s = 0,34 * 512 / 25 = 6,96$  cm<sup>2</sup>/m

Arm. em malha :  $6,96 / \sqrt{2} = 4,92$  cm<sup>2</sup>/m

Adotado : malha dupla de  $\phi 10$  c/15

## ANEXO 1

F R A M E   E L E M E N T   F O R C E S						
ELT LOAD	AXIAL DIST		1-2 PLANE		1-3 PLANE	
AXIAL	ID COMB	FORCE ENDI	SHEAR	MOMENT	SHEAR	MOMENT
TORQ						
1	-----					
	1	.00				
		.0	.00	.00	2.42	.94
		1.2	.00	.00	1.10	3.05
	2	.00				
		.0	.00	.00	-.86	2.15
		1.2	.00	.00	-.86	1.12
	3	.00				
		.0	.00	.00	.00	-.90
		1.2	.00	.00	.00	-.90
	4	.00				
		.0	.00	.00	6.00	-3.55
		1.2	.00	.00	6.00	3.65
2	-----					
	1	.00				
		.0	.00	.00	1.10	3.05
		1.0	.00	.00	.00	3.60
		2.0	.00	.00	-1.10	3.05
	2	.00				
		.0	.00	.00	-.86	1.12
		2.0	.00	.00	-.86	-.59
	3	.00				
		.0	.00	.00	.00	-.90
		2.0	.00	.00	.00	-.90
	4	.00				
		.0	.00	.00	.00	3.65
		2.0	.00	.00	.00	3.65
3	-----					
	1	.00				
		.0	.00	.00	-1.10	3.05
		1.2	.00	.00	-2.42	.94
	2	.00				
		.0	.00	.00	-.86	-.59
		1.2	.00	.00	-.86	-1.62
	3	.00				
		.0	.00	.00	.00	-.90
		1.2	.00	.00	.00	-.90
	4	.00				
		.0	.00	.00	-6.00	3.65
		1.2	.00	.00	-6.00	-3.55
4	-----					
	1	-4.85				
		.0	-6.29	.94		
		1.9	-.59	-5.59		
	2	.76				
		.0	-.71	2.15		
		1.9	-.71	.80		
	3	-8.22				
		.0	1.10	-.90		
		1.9	1.10	1.19		
	4	.00				
		.0	.71	-3.55		





F R A M E   E L E M E N T   F O R C E S						
ELT LOAD		AXIAL DIST		1-2 PLANE		1-3 PLANE
AXIAL						
ID	COMB	FORCE	ENDI	SHEAR	MOMENT	SHEAR   MOMENT
TORQ						
1.9		.71	-2.21			
5 -----						
	1	-4.85				
			.0	-.59	-5.59	
			.3	.00	-5.68	
			1.9	2.83	-3.45	
	2	.76				
			.0	-.71	.80	
			1.9	-.71	-.55	
	3	-8.22				
			.0	1.10	1.19	
			1.9	1.10	3.28	
	4	.00				
			.0	.71	-2.21	
			1.9	.71	-.87	
6 -----						
	1	-4.85				
			.0	2.83	-3.45	
			1.9	3.97	3.02	
	2	.76				
			.0	-.71	-.55	
			1.9	-.71	-1.90	
	3	-8.22				
			.0	1.10	3.28	
			1.9	1.10	5.38	
	4	.00				
			.0	.71	-.87	
			1.9	.71	.47	
7 -----						
	1	-4.85				
			.0	6.29	-.94	
			1.9	.59	5.59	
	2	-.76				
			.0	-.54	1.62	
			1.9	-.54	.59	
	3	-8.22				
			.0	-1.10	.90	
			1.9	-1.10	-1.19	
	4	.00				
			.0	-.71	3.55	
			1.9	-.71	2.21	
8 -----						
	1	-4.85				
			.0	.59	5.59	
			.3	.00	5.68	
			1.9	-2.83	3.45	
	2	-.76				
			.0	-.54	.59	
			1.9	-.54	-.43	
	3	-8.22				
			.0	-1.10	-1.19	
			1.9	-1.10	-3.28	

F R A M E   E L E M E N T   F O R C E S							
ELT LOAD		AXIAL DIST		1-2 PLANE		1-3 PLANE	
AXIAL							
ID	COMB	FORCE	ENDI	SHEAR	MOMENT	SHEAR	MOMENT
TORQ							
4	.00						
			.0	-.71	2.21		
			1.9	-.71	.87		
9							
	1	-4.85					
			.0	-2.83	3.45		
			1.9	-3.97	-3.02		
	2	-.76					
			.0	-.54	-.43		
			1.9	-.54	-1.46		
	3	-8.22					
			.0	-1.10	-3.28		
			1.9	-1.10	-5.38		
	4	.00					
			.0	-.71	.87		
			1.9	-.71	-.47		
10							
	1	-3.97					
			.0	.00	.00	2.46	-3.02
			1.2	.00	.00	1.12	-.87
	2	-.54					
			.0	.00	.00	-.76	1.90
			1.2	.00	.00	-.76	.98
	3	-1.10					
			.0	.00	.00	8.22	-5.38
			1.2	.00	.00	8.22	4.49
	4	-.71					
			.0	.00	.00	.00	-.47
			1.2	.00	.00	.00	-.47
11							
	1	-3.97					
			.0	.00	.00	1.12	-.87
			1.0	.00	.00	.00	-.31
			2.0	.00	.00	-1.12	-.87
	2	-.54					
			.0	.00	.00	-.76	.98
			2.0	.00	.00	-.76	-.54
	3	-1.10					
			.0	.00	.00	.00	4.49
			2.0	.00	.00	.00	4.49
	4	-.71					
			.0	.00	.00	.00	-.47
			2.0	.00	.00	.00	-.47
12							
	1	-3.97					
			.0	.00	.00	-1.12	-.87
			1.2	.00	.00	-2.46	-3.02
	2	-.54					
			.0	.00	.00	-.76	-.54
			1.2	.00	.00	-.76	-1.46
	3	-1.10					
			.0	.00	.00	-8.22	4.49



F R A M E   E L E M E N T   F O R C E S

ELT LOAD		AXIAL DIST		1-2 PLANE		1-3 PLANE	
AXIAL							
ID	COMB	FORCE	ENDI	SHEAR	MOMENT	SHEAR	MOMENT
TORQ							
1.2		.00	.00	-8.22	-5.38		
	4		-.71				
			.0	.00	.00	.00	-.47
			1.2	.00	.00	.00	-.47



---

## **5 MEMÓRIA DE CÁLCULO – PONTE SOBRE O RIO IGUAÇU**

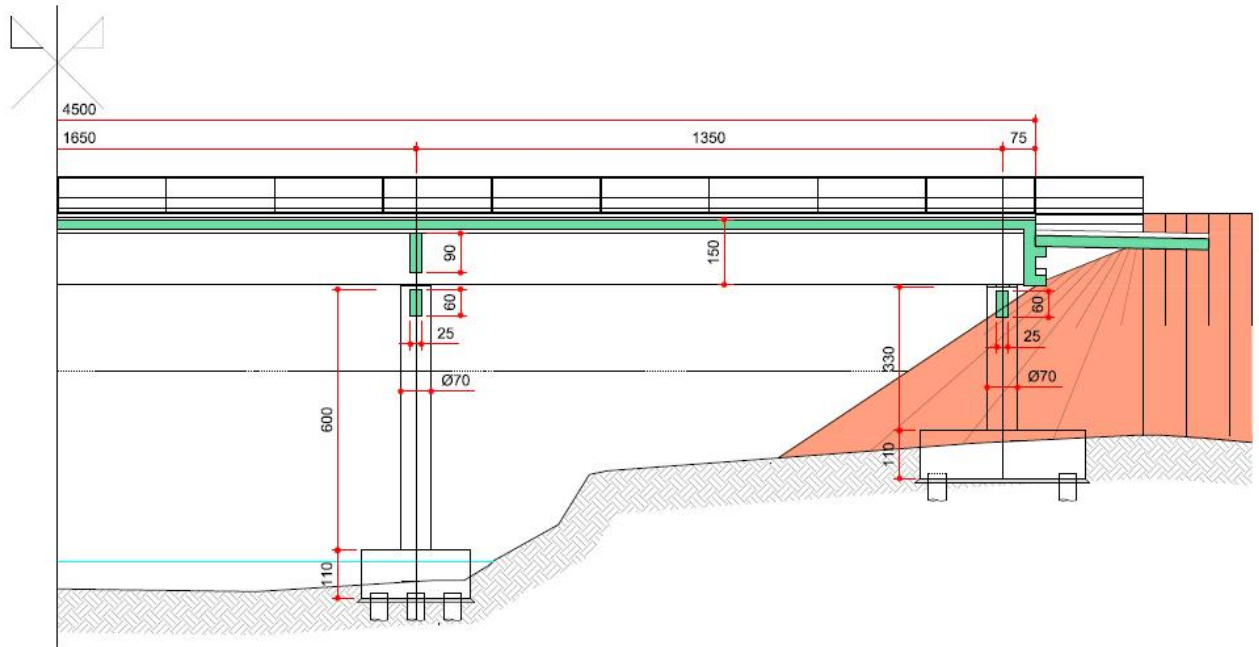
## **5 MEMÓRIA DE CÁLCULO – PONTE SOBRE O RIO IGUAÇU**

### **5.1 Elementos de Projeto**

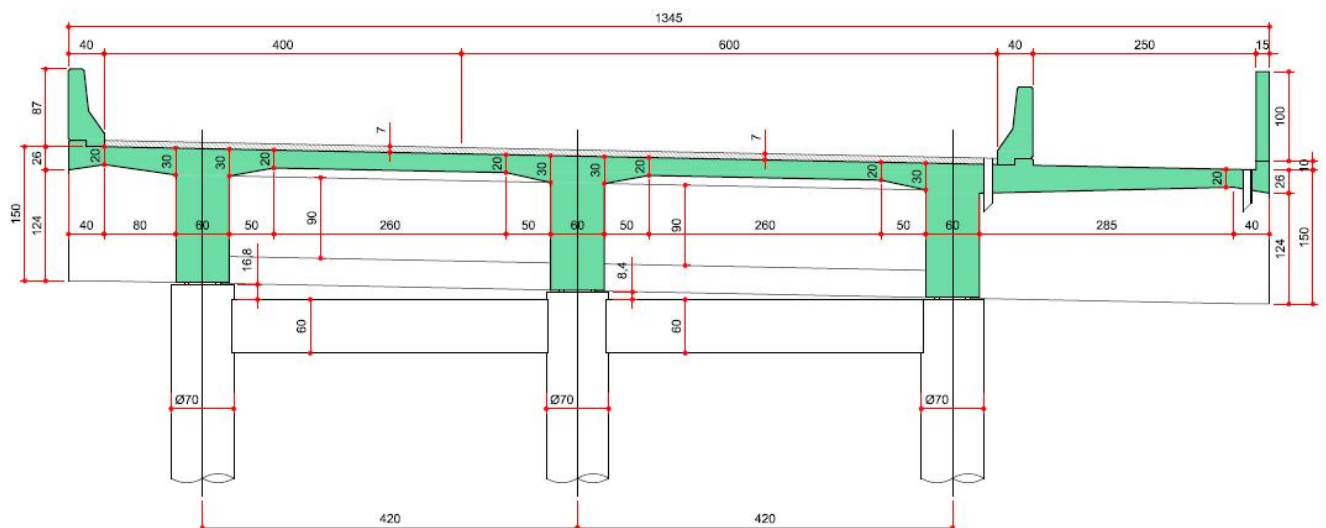
- Obra com 45,00m de extensão e largura de 13,45m, constituída por 3 vãos contínuos e 2 balanços: 0,75:13,50:16,50:13,50:0,75
- Carregamento com veículo Classe 45 (NBR 7188)
- Classe de agressividade ambiental II (NBR 6118)
- Materiais utilizados: concreto: C30  
aço: CA-50
- Cobrimento das armaduras = 30mm.
  
- Bibliografia adotada:
  - Normas brasileiras: NBR 6118; NBR 7187; NBR 7188; NBR 6122; NBR 6123; NBR 7480 e NBR 9092.
  - Construções de Concreto – F. Leonhardt / E. Monnig
  - Concreto Armado e Protendido: Hübert Rüsch
  - Cálculo de Concreto Armado – Lauro M. dos Santos
  - Curso de Concreto Armado: José C. Sússekind
  - Fundações – Teoria e Prática: ABMS/ABEF
  - Beton Kalender.
  - Técnica de Armar das Estruturas: Péricles Fusco
  - Software CONDE 3 – versão 3.1 – Lauro M. dos Santos.
  - Software MIDAS/CIVIL – Midas Technology Co. Ltda

## 5.2 Geometria

### 5.2.1 Seção Longitudinal



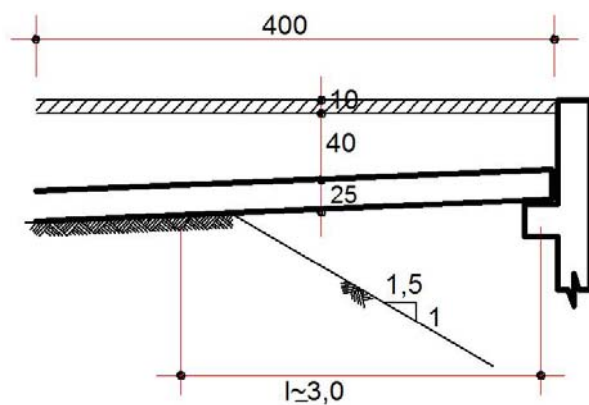
### 5.2.2 Seção Transversal



### 5.3 Carregamentos

#### 5.3.1 Permanente

- Peso próprio: definido pelo programa "Midas / Civil" em função da geometria ( $\gamma=2,50\text{tf/m}^3$ )
- Defensas:  $0,58\text{tf/m}$
- Guarda-corpo:  $0,41\text{ tf/m}$
- Pavimentação =  $0,07 \times 2,40 = 0,17\text{tf/m}^2$
- Possível recapeamento:  $0,20\text{tf/m}^2$
- Retração:  $\Delta t = -15^\circ\text{C}$  c/  $\alpha = 10^{-5}/^\circ\text{C}$
- Placa de transição:



$$pp = 0,63\text{ tf/m}^2$$

$$\text{pavimento} = 0,24\text{ tf/m}^2$$

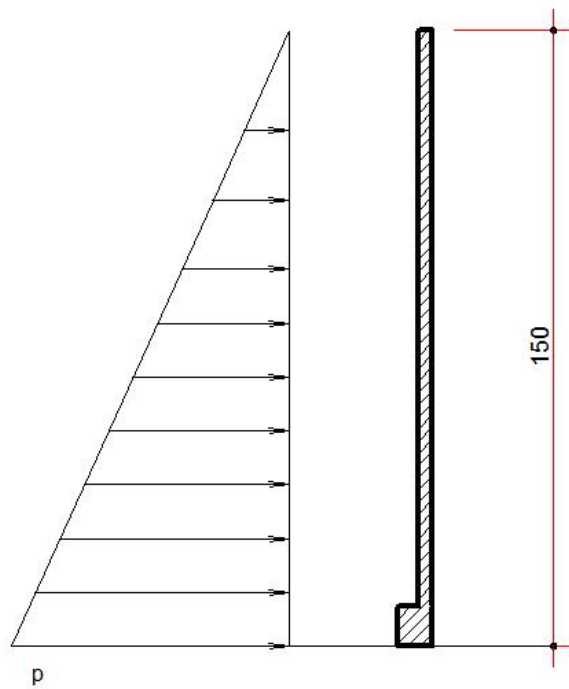
$$\text{lastro} = \underline{0,72\text{ tf/m}^2}$$

$$g = 1,59\text{ tf/m}^2$$

$$l \cong 3,00\text{ m}$$

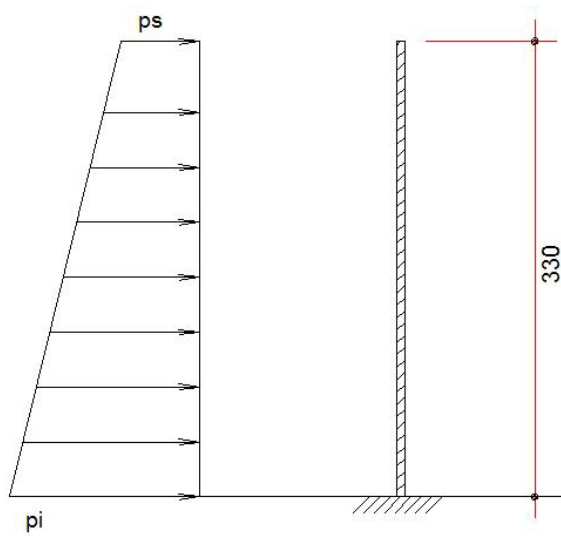
$$Rg = 1,59 \times 1,50 = 2,39\text{ tf/m}$$

- Empuxo do solo nas cortinas:



$$p = 0,33 \cdot 1,80 \cdot 1,50 = 0,89 \text{ tf/m}^2$$

- Empuxo do solo nos pilares:



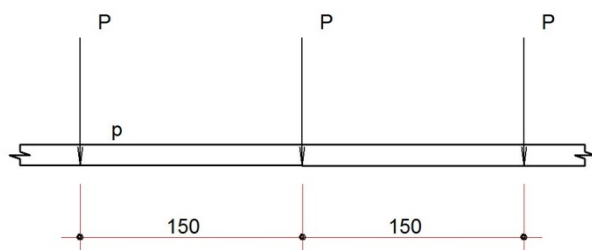
$$ps = 0,33 \cdot 1,80 \cdot 1,50 \cdot 3 \cdot 0,70 = 1,87 \text{ tf/m}$$

$$pi = 0,33 \cdot 1,80 \cdot 4,8 \cdot 3 \cdot 0,70 = 5,99 \text{ tf/m}$$



### 5.3.2 Cargas Móveis

- Trem de carga homogeneizado:

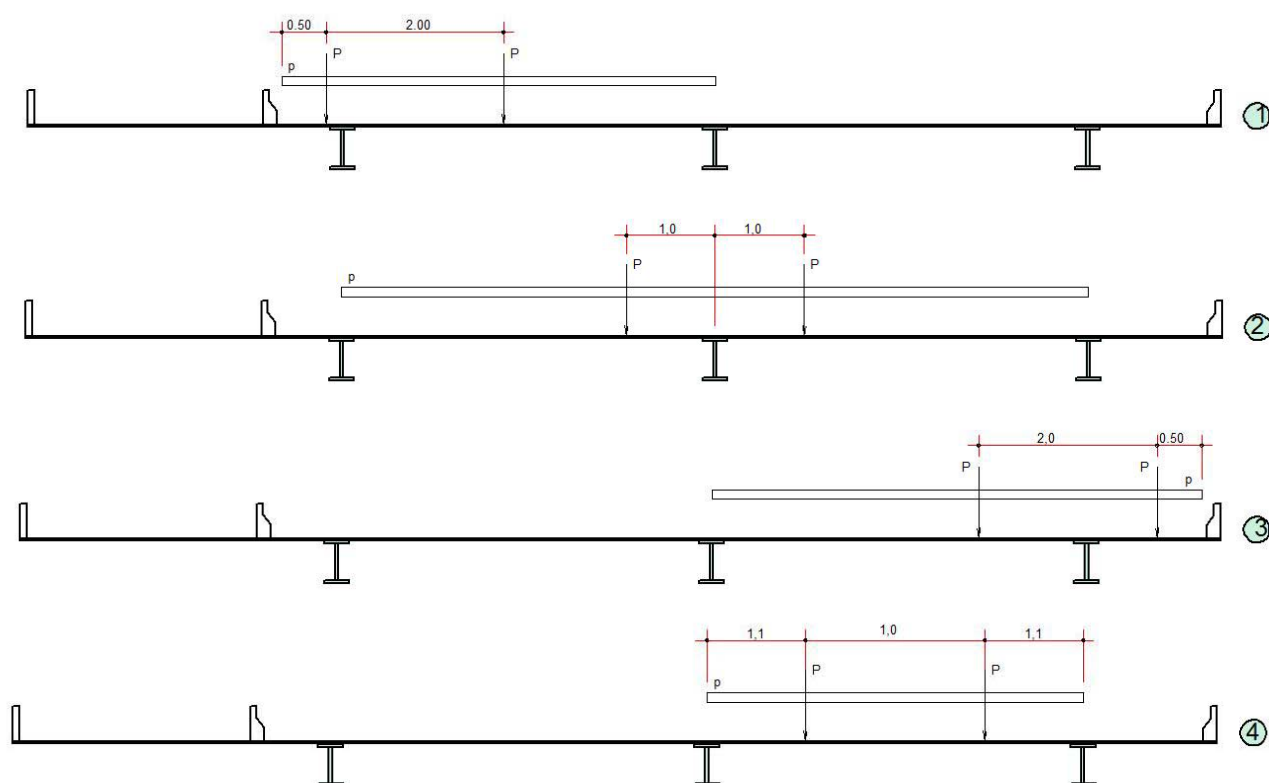


$$P = 6,0 \text{ tf/roda}$$

$$p = 0,5 \text{ tf/m}^2$$

$$\text{impacto: } \varphi = 1,30$$

- Posição do veículo na seção:



- Carga no passeio:  $q = 0,50 \text{ tf/m}^2$

- Frenagem:

$$F = 0,30 \cdot 45 = 13,50 \text{ tf}$$

- Temperatura:  $\Delta t = \pm 15^\circ\text{C}$

- Vento:

$$V_0 = 40 \text{ m/s} ; V_k = 1,0 \cdot 0,94 \cdot 0,95 \cdot 40 = 35,72 \text{ m/s}$$

$$q = 35,72^2 / 16 \cong 80 \text{ kgf/m}^2 \cdot 3,60 = 0,29 \text{ tf/m}$$

## 5.4 Lajes

### 5.4.1 Esforços

Definidos através do “MIDAS/CIVIL”. Ver ilustrações a seguir.

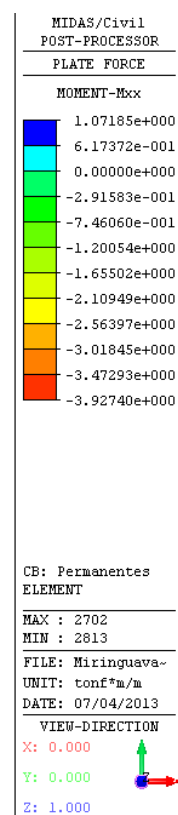
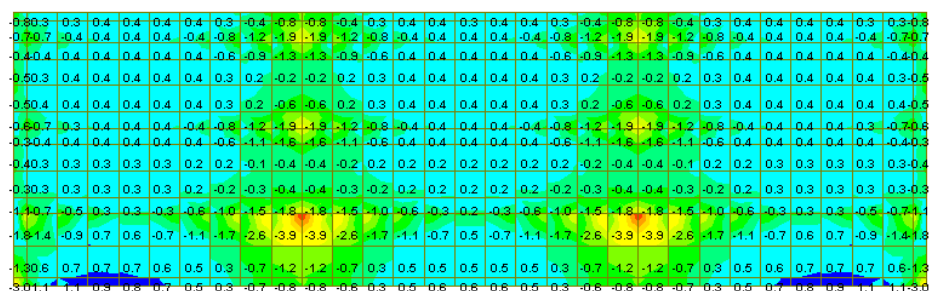


Ilustração 1 – Permanentes Mxx.

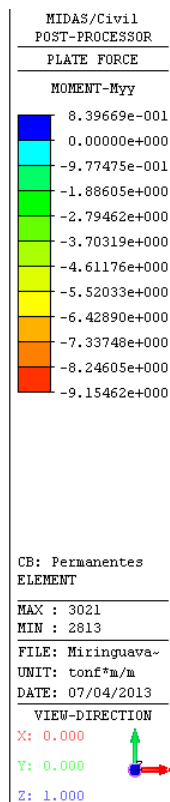
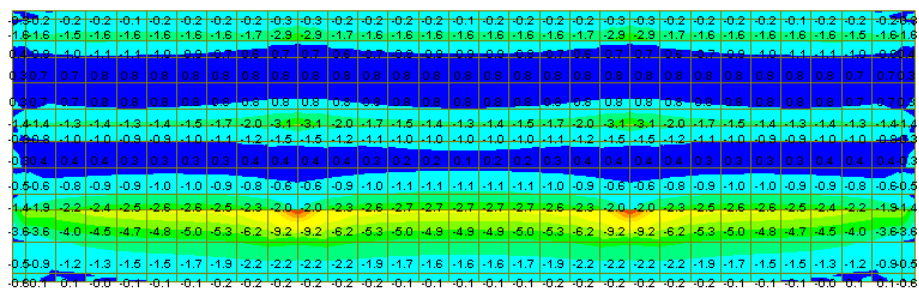


Ilustração 2 – Permanentes Myy.

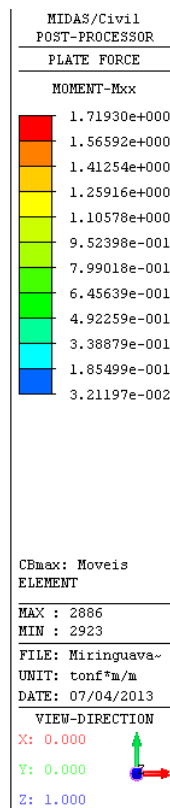
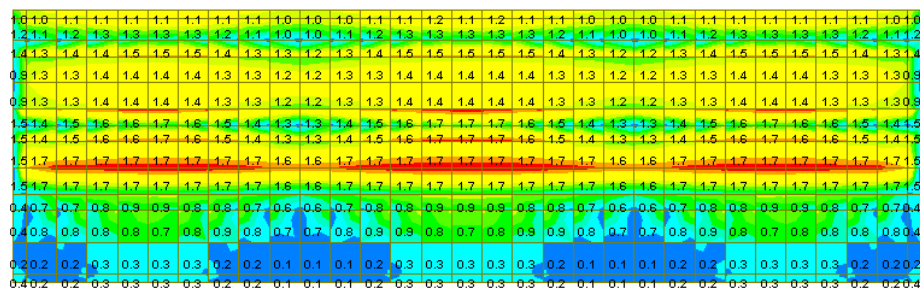
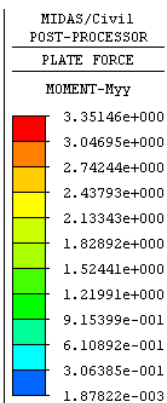
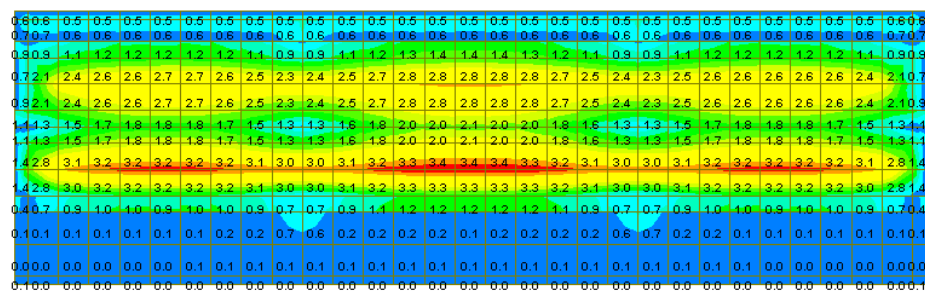
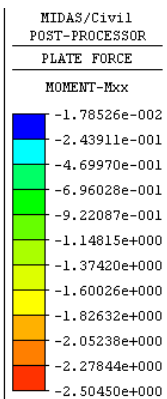
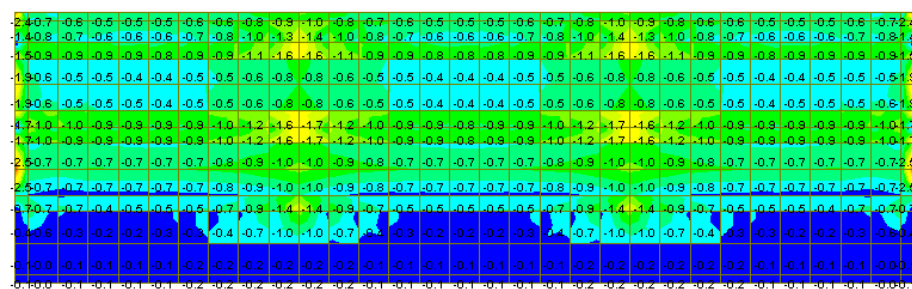


Ilustração 3 – Móveis máx Mxx.



CBmax: Moveis  
ELEMENT  
MAX : 2886  
MIN : 2727  
FILE: Miringuava-  
UNIT: tonf\*m/m  
DATE: 07/04/2013  
VIEW-DIRECTION  
X: 0.000  
Y: 0.000  
Z: 1.000

Ilustração 4 – Móveis máx Myy.



CBmin: Moveis  
ELEMENT  
MAX : 2762  
MIN : 2857  
FILE: Miringuava-  
UNIT: tonf\*m/m  
DATE: 07/04/2013  
VIEW-DIRECTION  
X: 0.000  
Y: 0.000  
Z: 1.000

Ilustração 5 – Móveis mín Mxx.

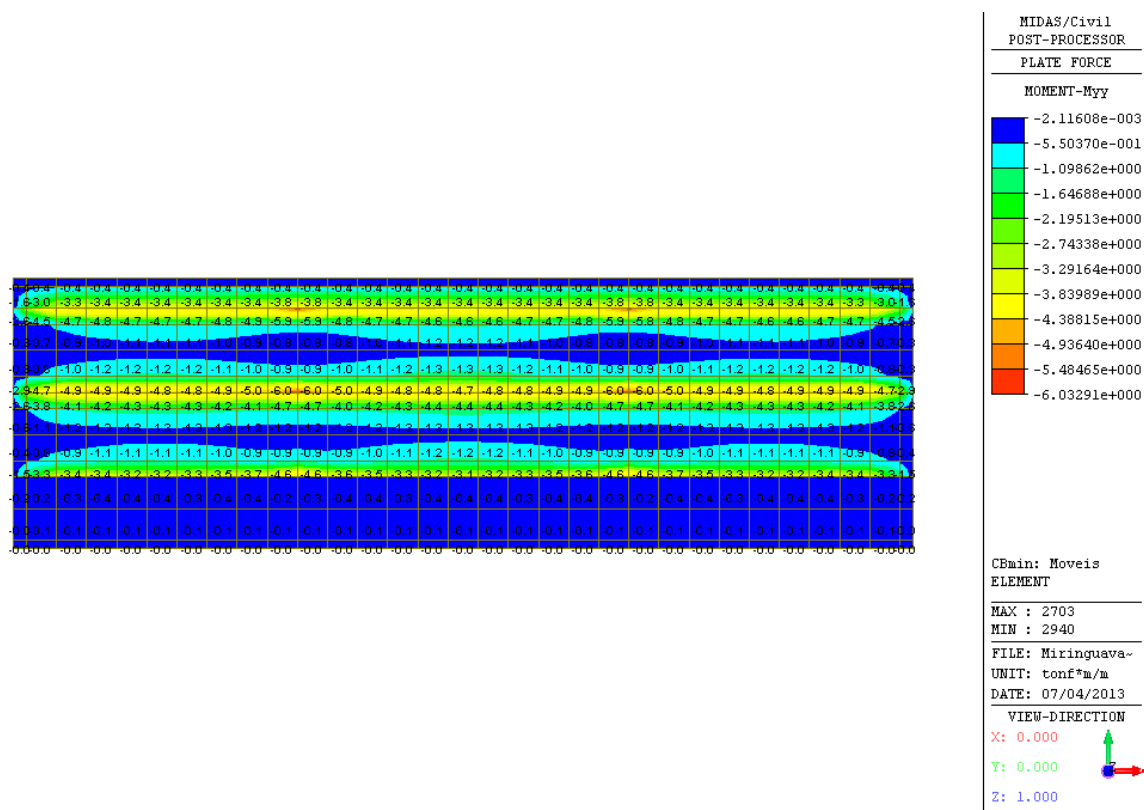


Ilustração 6 – Móveis mín Myy.

## 5.4.2 Balanços

### 5.4.2.1 Lateral do Passeio

$$Mgy_{\text{máx}} = -9,20 \text{ tfm/m} ; Mpy_{\text{máx}} = -4,60 \text{ tfm/m}$$

$$M_{\text{máx}} = -9,20 - 4,60 = -13,80 \text{ tfm/m}$$

$$As = 0,36 \cdot 1380 / 26 = 19,11 \text{ cm}^2 (\Phi 16 \text{ com } 10)$$

$$\text{Fadiga} = 1,00$$

### 5.4.2.2 Lateral da Pista

$$Mgy_{\text{máx}} = -2,90 \text{ tfm/m} ; Mpy_{\text{máx}} = -5,90 \text{ tfm/m}$$

$$M_{\text{máx}} = -2,90 - 5,90 = -8,80 \text{ tfm/m}$$

$$As = 0,35 \cdot 880 / 26 = 11,85 \text{ cm}^2/\text{m}$$

$$\text{Fadiga} = 1,44 \rightarrow As \cdot \text{Fad} = 17,16 \text{ cm}^2/\text{m}$$

### 5.4.3 Pistas

#### 5.4.3.1 Vãos

$$M_{gy_{máx}} = 0,80 \text{ tfm/m} ; M_{py_{máx}} = 3,40 \text{ tfm/m} ; M_{py_{mín}} = -1,30 \text{ tfm/m}$$

$$M_{máx} = 0,80 + 3,40 = 4,20 \text{ tfm/m} \rightarrow As = 9,19 \text{ cm}^2/\text{m}$$

$$Fadiga = 1,68 \rightarrow As \cdot Fad = 15,44 \text{ cm}^2/\text{m} \text{ (16}\Phi \text{ com 12)}$$

$$M_{gx_{máx}} = 0,40 \text{ tfm/m} ; M_{pa_{máx}} = 1,40 \text{ tfm/m} ; M_{px_{mín}} = -0,80 \text{ tfm/m}$$

$$M_{máx} = 0,40 + 1,40 = 1,80 \text{ tfm/m} \rightarrow As = 4,08 \text{ cm}^2/\text{m}$$

$$Fadiga = 1,88 \rightarrow As \cdot Fad = 7,67 \text{ cm}^2/\text{m}$$

#### 5.4.3.2 Apoio Central

$$M_{gy_{máx}} = -3,10 \text{ tfm/m} ; M_{py_{máx}} = -6,00 \text{ tfm/m}$$

$$M_{máx} = -3,10 - 6,00 = -9,10 \text{ tfm/m} \rightarrow As = 12,07 \text{ cm}^2/\text{m}$$

$$Fadiga = 1,25 \rightarrow As \cdot Fad = 15,10 \text{ cm}^2/\text{m}$$

### 5.4.4 Verificação das Defensas

$$M = 6,0 \cdot 0,97 / 1,94 = 3,00 \text{ tfm/m}$$

$$As / 2,75 \text{ cm}^2/\text{m} \text{ (}\Phi 8 \text{ com 15 - adot.)}$$

### 5.4.5 Verificação do Guarda Corpo

$$M = 0,20 \cdot 1,20 = 0,24 \text{ tfm/m}$$

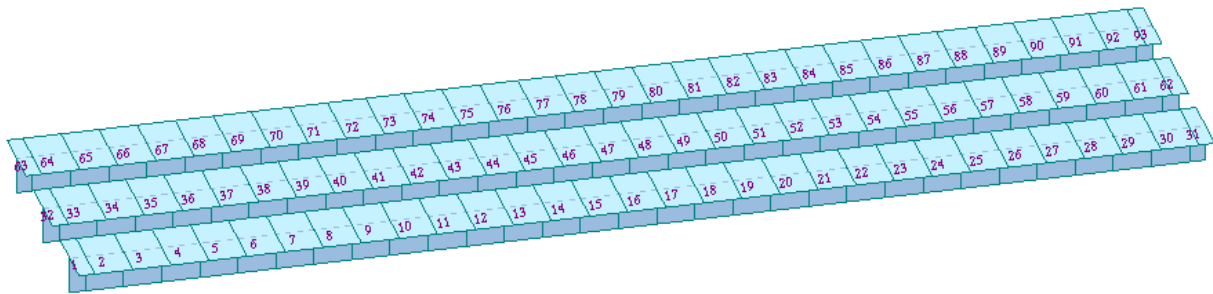
$$As = 0,72 \text{ cm}^2/\text{m} \text{ (}\Phi 6,3 \text{ com 15 - adot.)}$$

## 5.5 Longarinas

### 5.5.1 Esforços

Foram definidos através do “MIDAS/CIVIL”.

Ver ilustração e tabelas a seguir.



Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf*m)	Moment-y (tonf*m)	Moment-z (tonf*m)
1	Moveis(max)	IF8511	0.55	1.91	12.72	1.69	1.5	0.01
1	Moveis(max)	2/4	0.55	1.91	12.72	1.69	2.07	0.17
1	Moveis(max)	JF11591	0.55	1.91	12.72	1.69	3.47	0.34
2	Moveis(max)	IF11591	1.06	0.22	4.52	0.82	4.26	0.23
2	Moveis(max)	2/4	1.06	0.22	4.52	0.82	20.83	0.07
2	Moveis(max)	JF11601	1.06	0.22	4.52	0.82	45.22	0.5
3	Moveis(max)	IF11601	0.9	0.03	4.74	0.99	45.82	0.25
3	Moveis(max)	2/4	0.9	0.03	4.74	0.99	60.7	0.34
3	Moveis(max)	JF11611	0.9	0.03	4.74	0.99	77.94	0.44
4	Moveis(max)	IF11611	0.82	0.04	6.71	2.41	78.38	0.39
4	Moveis(max)	2/4	0.82	0.04	6.71	2.41	88.34	0.41
4	Moveis(max)	JF11621	0.82	0.04	6.71	2.41	98.31	0.45
5	Moveis(max)	IF11621	0.78	0.05	12	3.62	98.43	0.44
5	Moveis(max)	2/4	0.78	0.05	12	3.62	101.08	0.48
5	Moveis(max)	JF11631	0.78	0.05	12	3.62	106.32	0.52
6	Moveis(max)	IF11631	0.78	0.04	17.27	4.39	106.32	0.52
6	Moveis(max)	2/4	0.78	0.04	17.27	4.39	101.24	0.57
6	Moveis(max)	JF11641	0.78	0.04	17.27	4.39	101.14	0.61
7	Moveis(max)	IF11641	0.84	0.07	22.65	5.16	101.02	0.64
7	Moveis(max)	2/4	0.84	0.07	22.65	5.16	91.42	0.66
7	Moveis(max)	JF11651	0.84	0.07	22.65	5.16	84.19	0.68
8	Moveis(max)	IF11651	1.04	0.17	28.18	6.18	83.95	0.75
8	Moveis(max)	2/4	1.04	0.17	28.18	6.18	69.96	0.69
8	Moveis(max)	JF11661	1.04	0.17	28.18	6.18	57.05	0.65
9	Moveis(max)	IF11661	1.46	0.76	33.79	7.65	56.7	0.82
9	Moveis(max)	2/4	1.46	0.76	33.79	7.65	38.72	0.3
9	Moveis(max)	JF11671	1.46	0.76	33.79	7.65	24.33	0.15
10	Moveis(max)	IF11671	1.89	3.94	39.4	10.01	23.94	0.63
10	Moveis(max)	2/4	1.89	3.94	39.4	10.01	10.07	0.6
10	Moveis(max)	JF11681	1.89	3.94	39.4	10.01	10.08	1.38
11	Moveis(max)	IF11681	1.56	1.1	3.36	2.42	10.15	1.4
11	Moveis(max)	2/4	1.56	1.1	3.36	2.42	8.24	0.63
11	Moveis(max)	JF11691	1.56	1.1	3.36	2.42	20.35	0.65
12	Moveis(max)	IF11691	1.2	0.19	3.5	2.59	20.67	0.18
12	Moveis(max)	2/4	1.2	0.19	3.5	2.59	32.05	0.33
12	Moveis(max)	JF11701	1.2	0.19	3.5	2.59	48.83	0.83
13	Moveis(max)	IF11701	0.82	0.04	4.45	2.99	49.17	0.66
13	Moveis(max)	2/4	0.82	0.04	4.45	2.99	61.59	0.7
13	Moveis(max)	JF11711	0.82	0.04	4.45	2.99	77.02	0.77
14	Moveis(max)	IF11711	0.65	0.09	7.65	3.88	77.3	0.7
14	Moveis(max)	2/4	0.65	0.09	7.65	3.88	85.8	0.7
14	Moveis(max)	JF11721	0.65	0.09	7.65	3.88	97.18	0.7
15	Moveis(max)	IF11721	0.59	0.09	11.3	4.49	97.35	0.66
15	Moveis(max)	2/4	0.59	0.09	11.3	4.49	100.26	0.64
15	Moveis(max)	JF11731	0.59	0.09	11.3	4.49	107.49	0.62
16	Moveis(max)	IF11731	0.58	0.07	15.36	4.94	107.54	0.61
16	Moveis(max)	2/4	0.58	0.07	15.36	4.94	104.46	0.61
16	Moveis(max)	JF11741	0.58	0.07	15.36	4.94	107.54	0.61
17	Moveis(max)	IF11741	0.59	0.06	19.79	5.41	107.49	0.62
17	Moveis(max)	2/4	0.59	0.06	19.79	5.41	100.26	0.64
17	Moveis(max)	JF11751	0.59	0.06	19.79	5.41	97.35	0.66
18	Moveis(max)	IF11751	0.65	0.08	24.58	6.85	97.18	0.7
18	Moveis(max)	2/4	0.65	0.08	24.58	6.85	85.8	0.7
18	Moveis(max)	JF11761	0.65	0.08	24.58	6.85	77.3	0.7
19	Moveis(max)	IF11761	0.82	0.18	29.7	8.48	77.02	0.77
19	Moveis(max)	2/4	0.82	0.18	29.7	8.48	61.59	0.7
19	Moveis(max)	JF11771	0.82	0.18	29.7	8.48	49.17	0.66
20	Moveis(max)	IF11771	1.2	0.78	35.02	9.9	48.83	0.83
20	Moveis(max)	2/4	1.2	0.78	35.02	9.9	32.05	0.33
20	Moveis(max)	JF11781	1.2	0.78	35.02	9.9	20.67	0.18
21	Moveis(max)	IF11781	1.56	3.94	40.42	11.46	20.35	0.65
21	Moveis(max)	2/4	1.56	3.94	40.42	11.46	8.24	0.63
21	Moveis(max)	JF11791	1.56	3.94	40.42	11.46	10.15	1.4
22	Moveis(max)	IF11791	1.89	1.09	1	2.7	10.08	1.38
22	Moveis(max)	2/4	1.89	1.09	1	2.7	10.07	0.6
22	Moveis(max)	JF11801	1.89	1.09	1	2.7	23.94	0.63
23	Moveis(max)	IF11801	1.46	0.19	1.24	2.86	24.33	0.15
23	Moveis(max)	2/4	1.46	0.19	1.24	2.86	38.72	0.3



23	Moveis(max)	JF11811	1.46	0.19	1.24	2.86	56.7	0.82
24	Moveis(max)	JF11811	1.04	0.03	3.72	2.83	57.05	0.65
24	Moveis(max)	2/4	1.04	0.03	3.72	2.83	69.96	0.69
24	Moveis(max)	JF11821	1.04	0.03	3.72	2.83	83.95	0.75
25	Moveis(max)	JF11821	0.84	0.09	7.1	3.71	84.19	0.68
25	Moveis(max)	2/4	0.84	0.09	7.1	3.71	91.42	0.66
25	Moveis(max)	JF11831	0.84	0.09	7.1	3.71	101.02	0.64
26	Moveis(max)	JF11831	0.78	0.09	11.01	4.44	101.14	0.61
26	Moveis(max)	2/4	0.78	0.09	11.01	4.44	101.24	0.57
26	Moveis(max)	JF11841	0.78	0.09	11.01	4.44	106.32	0.52
27	Moveis(max)	JF11841	0.78	0.09	15.49	5.15	106.32	0.52
27	Moveis(max)	2/4	0.78	0.09	15.49	5.15	101.08	0.48
27	Moveis(max)	JF11851	0.78	0.09	15.49	5.15	98.43	0.44
28	Moveis(max)	JF11851	0.82	0.08	20.59	6.92	98.31	0.45
28	Moveis(max)	2/4	0.82	0.08	20.59	6.92	88.34	0.41
28	Moveis(max)	JF11861	0.82	0.08	20.59	6.92	78.38	0.39
29	Moveis(max)	JF11861	0.9	0.14	26.42	8.58	77.94	0.44
29	Moveis(max)	2/4	0.9	0.14	26.42	8.58	60.7	0.34
29	Moveis(max)	JF11871	0.9	0.14	26.42	8.58	45.82	0.25
30	Moveis(max)	JF11871	1.06	0.94	32.89	9.81	45.22	0.5
30	Moveis(max)	2/4	1.06	0.94	32.89	9.81	20.83	0.07
30	Moveis(max)	JF11881	1.06	0.94	32.89	9.81	4.26	0.23
31	Moveis(max)	JF11881	0.55	0.55	4.58	7.13	3.47	0.34
31	Moveis(max)	2/4	0.55	0.55	4.58	7.13	2.07	0.17
31	Moveis(max)	JF8521	0.55	0.55	4.58	7.13	1.5	0.01
32	Moveis(max)	JF8531	0.62	2.91	20.94	7.35	2.8	0.04
32	Moveis(max)	2/4	0.62	2.91	20.94	7.35	1.54	0.67
32	Moveis(max)	JF11891	0.62	2.91	20.94	7.35	2.27	1.37
33	Moveis(max)	JF11891	1.06	1.12	4.62	12.79	2.55	1.15
33	Moveis(max)	2/4	1.06	1.12	4.62	12.79	20.59	0.31
33	Moveis(max)	JF11901	1.06	1.12	4.62	12.79	50.12	0.65
34	Moveis(max)	JF11901	0.8	0.13	5.02	10.74	50.63	0.26
34	Moveis(max)	2/4	0.8	0.13	5.02	10.74	69.4	0.36
34	Moveis(max)	JF11911	0.8	0.13	5.02	10.74	89.12	0.46
35	Moveis(max)	JF11911	0.66	0.08	8.18	8.65	89.49	0.4
35	Moveis(max)	2/4	0.66	0.08	8.18	8.65	101.9	0.35
35	Moveis(max)	JF11921	0.66	0.08	8.18	8.65	114.36	0.3
36	Moveis(max)	JF11921	0.62	0.07	14.58	6.52	114.45	0.27
36	Moveis(max)	2/4	0.62	0.07	14.58	6.52	117.04	0.24
36	Moveis(max)	JF11931	0.62	0.07	14.58	6.52	123.6	0.21
37	Moveis(max)	JF11931	0.68	0.13	20.81	5.28	123.6	0.2
37	Moveis(max)	2/4	0.68	0.13	20.81	5.28	117.8	0.28
37	Moveis(max)	JF11941	0.68	0.13	20.81	5.28	117.98	0.39
38	Moveis(max)	JF11941	0.92	0.19	27.2	7.25	117.91	0.4
38	Moveis(max)	2/4	0.92	0.19	27.2	7.25	106.56	0.61
38	Moveis(max)	JF11951	0.92	0.19	27.2	7.25	98.87	0.81
39	Moveis(max)	JF11951	1.43	0.09	34.05	9.29	98.71	0.89
39	Moveis(max)	2/4	1.43	0.09	34.05	9.29	81.77	1.03
39	Moveis(max)	JF11961	1.43	0.09	34.05	9.29	67.23	1.16
40	Moveis(max)	JF11961	2.17	0.79	41.39	11.46	66.98	1.38
40	Moveis(max)	2/4	2.17	0.79	41.39	11.46	45.07	0.79
40	Moveis(max)	JF11971	2.17	0.79	41.39	11.46	29.04	0.2
41	Moveis(max)	JF11971	2.82	5.59	49.08	14.24	28.77	1.52
41	Moveis(max)	2/4	2.82	5.59	49.08	14.24	10.84	2.44
41	Moveis(max)	JF11981	2.82	5.59	49.08	14.24	10.22	5.97
42	Moveis(max)	JF11981	2.24	4.71	3.16	13.32	10.28	6
42	Moveis(max)	2/4	2.24	4.71	3.16	13.32	9.4	2.47
42	Moveis(max)	JF11991	2.24	4.71	3.16	13.32	24.95	1.52
43	Moveis(max)	JF11991	1.61	0.73	3.51	11.55	25.17	0.24
43	Moveis(max)	2/4	1.61	0.73	3.51	11.55	37.69	0.78
43	Moveis(max)	JF12001	1.61	0.73	3.51	11.55	57.83	1.37
44	Moveis(max)	JF12001	0.82	0.18	5.82	9.99	58.06	1.15
44	Moveis(max)	2/4	0.82	0.18	5.82	9.99	71.85	1.01
44	Moveis(max)	JF12011	0.82	0.18	5.82	9.99	90.59	0.88
45	Moveis(max)	JF12011	0.49	0.28	9.74	8.33	90.78	0.8
45	Moveis(max)	2/4	0.49	0.28	9.74	8.33	100.07	0.59
45	Moveis(max)	JF12021	0.49	0.28	9.74	8.33	113.76	0.38
46	Moveis(max)	JF12021	0.53	0.17	14.04	6.6	113.88	0.36
46	Moveis(max)	2/4	0.53	0.17	14.04	6.6	116.8	0.24
46	Moveis(max)	JF12031	0.53	0.17	14.04	6.6	125.36	0.14
47	Moveis(max)	JF12031	0.55	0.07	18.66	6.31	125.4	0.14
47	Moveis(max)	2/4	0.55	0.07	18.66	6.31	121.8	0.13

47	Moveis(max)	JF12041	0.55	0.07	18.66	6.31	125.4	0.14
48	Moveis(max)	JF12041	0.53	0.14	23.71	7.83	125.36	0.14
48	Moveis(max)	2/4	0.53	0.14	23.71	7.83	116.8	0.24
48	Moveis(max)	JF12051	0.53	0.14	23.71	7.83	113.88	0.36
49	Moveis(max)	JF12051	0.49	0.2	29.35	9.47	113.76	0.38
49	Moveis(max)	2/4	0.49	0.2	29.35	9.47	100.07	0.58
49	Moveis(max)	JF12061	0.49	0.2	29.35	9.47	90.78	0.79
50	Moveis(max)	JF12061	0.82	0.09	35.76	11.15	90.59	0.87
50	Moveis(max)	2/4	0.82	0.09	35.76	11.15	71.85	1.01
50	Moveis(max)	JF12071	0.82	0.09	35.76	11.15	58.06	1.15
51	Moveis(max)	JF12071	1.61	0.79	42.81	12.97	57.83	1.36
51	Moveis(max)	2/4	1.61	0.79	42.81	12.97	37.69	0.78
51	Moveis(max)	JF12081	1.61	0.79	42.81	12.97	25.17	0.24
52	Moveis(max)	JF12081	2.24	5.57	50.33	15.45	24.95	1.52
52	Moveis(max)	2/4	2.24	5.57	50.33	15.45	9.4	2.47
52	Moveis(max)	JF12091	2.24	5.57	50.33	15.45	10.28	6
53	Moveis(max)	JF12091	2.82	4.71	1.07	11.86	10.22	5.97
53	Moveis(max)	2/4	2.82	4.71	1.07	11.86	10.84	2.44
53	Moveis(max)	JF12101	2.82	4.71	1.07	11.86	28.77	1.52
54	Moveis(max)	JF12101	2.17	0.73	1.7	9.71	29.04	0.2
54	Moveis(max)	2/4	2.17	0.73	1.7	9.71	45.07	0.78
54	Moveis(max)	JF12111	2.17	0.73	1.7	9.71	66.98	1.37
55	Moveis(max)	JF12111	1.43	0.18	4.83	7.78	67.23	1.15
55	Moveis(max)	2/4	1.43	0.18	4.83	7.78	81.77	1.02
55	Moveis(max)	JF12121	1.43	0.18	4.83	7.78	98.71	0.89
56	Moveis(max)	JF12121	0.92	0.27	8.86	5.79	98.87	0.81
56	Moveis(max)	2/4	0.92	0.27	8.86	5.79	106.56	0.61
56	Moveis(max)	JF12131	0.92	0.27	8.86	5.79	117.91	0.4
57	Moveis(max)	JF12131	0.68	0.16	13.36	5.92	117.98	0.39
57	Moveis(max)	2/4	0.68	0.16	13.36	5.92	117.8	0.28
57	Moveis(max)	JF12141	0.68	0.16	13.36	5.92	123.6	0.2
58	Moveis(max)	JF12141	0.62	0.06	18.45	7.83	123.6	0.21
58	Moveis(max)	2/4	0.62	0.06	18.45	7.83	117.04	0.24
58	Moveis(max)	JF12151	0.62	0.06	18.45	7.83	114.45	0.28
59	Moveis(max)	JF12151	0.66	0.05	24.44	9.97	114.36	0.3
59	Moveis(max)	2/4	0.66	0.05	24.44	9.97	101.9	0.35
59	Moveis(max)	JF12161	0.66	0.05	24.44	9.97	89.49	0.4
60	Moveis(max)	JF12161	0.8	0.13	31.75	12.26	89.12	0.46
60	Moveis(max)	2/4	0.8	0.13	31.75	12.26	69.4	0.36
60	Moveis(max)	JF12171	0.8	0.13	31.75	12.26	50.63	0.26
61	Moveis(max)	JF12171	1.06	1.4	40.28	14.7	50.12	0.65
61	Moveis(max)	2/4	1.06	1.4	40.28	14.7	20.59	0.31
61	Moveis(max)	JF12181	1.06	1.4	40.28	14.7	2.55	1.15
62	Moveis(max)	JF12181	0.62	2.24	2.85	8.08	2.27	1.37
62	Moveis(max)	2/4	0.62	2.24	2.85	8.08	1.54	0.67
62	Moveis(max)	JF8541	0.62	2.24	2.85	8.08	2.8	0.04
63	Moveis(max)	JF8551	0.52	0.51	17.61	7.63	2.69	0.02
63	Moveis(max)	2/4	0.52	0.51	17.61	7.63	2.2	0.81
63	Moveis(max)	JF12191	0.52	0.51	17.61	7.63	3.62	1.63
64	Moveis(max)	JF12191	1.32	1.31	5.17	14.17	4.38	1.33
64	Moveis(max)	2/4	1.32	1.31	5.17	14.17	23.03	0.35
64	Moveis(max)	JF12201	1.32	1.31	5.17	14.17	51.45	0.09
65	Moveis(max)	JF12201	1.21	0.24	5.46	11.84	52	0.09
65	Moveis(max)	2/4	1.21	0.24	5.46	11.84	69.82	0.13
65	Moveis(max)	JF12211	1.21	0.24	5.46	11.84	90.1	0.17
66	Moveis(max)	JF12211	1.2	0.11	7.37	9.78	90.51	0.17
66	Moveis(max)	2/4	1.2	0.11	7.37	9.78	102.46	0.19
66	Moveis(max)	JF12221	1.2	0.11	7.37	9.78	114.43	0.22
67	Moveis(max)	JF12221	1.23	0.16	13.6	7.97	114.53	0.22
67	Moveis(max)	2/4	1.23	0.16	13.6	7.97	117.67	0.24
67	Moveis(max)	JF12231	1.23	0.16	13.6	7.97	124.01	0.26
68	Moveis(max)	JF12231	1.27	0.23	19.84	6.29	124.01	0.26
68	Moveis(max)	2/4	1.27	0.23	19.84	6.29	118.05	0.28
68	Moveis(max)	JF12241	1.27	0.23	19.84	6.29	118.08	0.3
69	Moveis(max)	JF12241	1.33	0.21	26.23	4.74	117.99	0.31
69	Moveis(max)	2/4	1.33	0.21	26.23	4.74	106.64	0.32
69	Moveis(max)	JF12251	1.33	0.21	26.23	4.74	98.28	0.32
70	Moveis(max)	JF12251	1.42	0.09	32.82	3.44	98.1	0.34
70	Moveis(max)	2/4	1.42	0.09	32.82	3.44	81.48	0.28
70	Moveis(max)	JF12261	1.42	0.09	32.82	3.44	66.39	0.3

71	Moveis(max)	IF12261	1.58	0.31	39.58	4.2	66.11	0.35
71	Moveis(max)	2/4	1.58	0.31	39.58	4.2	44.73	0.35
71	Moveis(max)	JF12271	1.58	0.31	39.58	4.2	28.01	1.02
72	Moveis(max)	IF12271	1.79	1.03	46.29	4.66	27.71	0.55
72	Moveis(max)	2/4	1.79	1.03	46.29	4.66	11.41	4.01
72	Moveis(max)	JF12281	1.79	1.03	46.29	4.66	11.33	8.21
73	Moveis(max)	IF12281	1.32	5.6	3.77	15.38	11.44	8.21
73	Moveis(max)	2/4	1.32	5.6	3.77	15.38	9.37	4.01
73	Moveis(max)	JF12291	1.32	5.6	3.77	15.38	23.52	0.57
74	Moveis(max)	IF12291	1.26	1.44	3.97	12.74	23.78	1.06
74	Moveis(max)	2/4	1.26	1.44	3.97	12.74	36.96	0.38
74	Moveis(max)	JF12301	1.26	1.44	3.97	12.74	56.85	0.37
75	Moveis(max)	IF12301	1.19	0.31	4.71	10.87	57.12	0.32
75	Moveis(max)	2/4	1.19	0.31	4.71	10.87	71.72	0.28
75	Moveis(max)	JF12311	1.19	0.31	4.71	10.87	90.16	0.33
76	Moveis(max)	IF12311	1.17	0.12	8.5	9.3	90.38	0.31
76	Moveis(max)	2/4	1.17	0.12	8.5	9.3	100.37	0.3
76	Moveis(max)	JF12321	1.17	0.12	8.5	9.3	113.95	0.28
77	Moveis(max)	IF12321	1.17	0.1	12.85	7.92	114.08	0.27
77	Moveis(max)	2/4	1.17	0.1	12.85	7.92	117.48	0.26
77	Moveis(max)	JF12331	1.17	0.1	12.85	7.92	126.08	0.24
78	Moveis(max)	IF12331	1.16	0.15	17.65	6.7	126.13	0.24
78	Moveis(max)	2/4	1.16	0.15	17.65	6.7	122.47	0.23
78	Moveis(max)	JF12341	1.16	0.15	17.65	6.7	126.13	0.24
79	Moveis(max)	IF12341	1.17	0.23	22.92	5.53	126.08	0.24
79	Moveis(max)	2/4	1.17	0.23	22.92	5.53	117.48	0.26
79	Moveis(max)	JF12351	1.17	0.23	22.92	5.53	114.08	0.27
80	Moveis(max)	IF12351	1.17	0.21	28.61	4.6	113.95	0.28
80	Moveis(max)	2/4	1.17	0.21	28.61	4.6	100.37	0.3
80	Moveis(max)	JF12361	1.17	0.21	28.61	4.6	90.38	0.31
81	Moveis(max)	IF12361	1.19	0.09	34.72	5.34	90.16	0.33
81	Moveis(max)	2/4	1.19	0.09	34.72	5.34	71.72	0.28
81	Moveis(max)	JF12371	1.19	0.09	34.72	5.34	57.12	0.32
82	Moveis(max)	IF12371	1.26	0.34	41.14	5.88	56.85	0.37
82	Moveis(max)	2/4	1.26	0.34	41.14	5.88	36.96	0.38
82	Moveis(max)	JF12381	1.26	0.34	41.14	5.88	23.78	1.06
83	Moveis(max)	IF12381	1.32	1.11	47.58	6.25	23.52	0.57
83	Moveis(max)	2/4	1.32	1.11	47.58	6.25	9.37	3.96
83	Moveis(max)	JF12391	1.32	1.11	47.58	6.25	11.44	8.11
84	Moveis(max)	IF12391	1.79	5.53	1.12	14	11.33	8.1
84	Moveis(max)	2/4	1.79	5.53	1.12	14	11.41	3.95
84	Moveis(max)	JF12401	1.79	5.53	1.12	14	27.71	0.55
85	Moveis(max)	IF12401	1.58	1.42	1.29	11.21	28.01	1.02
85	Moveis(max)	2/4	1.58	1.42	1.29	11.21	44.73	0.35
85	Moveis(max)	JF12411	1.58	1.42	1.29	11.21	66.11	0.35
86	Moveis(max)	IF12411	1.42	0.3	3.87	9.14	66.39	0.3
86	Moveis(max)	2/4	1.42	0.3	3.87	9.14	81.48	0.28
86	Moveis(max)	JF12421	1.42	0.3	3.87	9.14	98.1	0.34
87	Moveis(max)	IF12421	1.33	0.11	7.88	7.34	98.28	0.32
87	Moveis(max)	2/4	1.33	0.11	7.88	7.34	106.64	0.32
87	Moveis(max)	JF12431	1.33	0.11	7.88	7.34	117.99	0.31
88	Moveis(max)	IF12431	1.27	0.06	12.52	5.73	118.08	0.3
88	Moveis(max)	2/4	1.27	0.06	12.52	5.73	118.05	0.28
88	Moveis(max)	JF12441	1.27	0.06	12.52	5.73	124.01	0.26
89	Moveis(max)	IF12441	1.23	0.09	17.83	4.17	124.01	0.26
89	Moveis(max)	2/4	1.23	0.09	17.83	4.17	117.67	0.24
89	Moveis(max)	JF12451	1.23	0.09	17.83	4.17	114.53	0.22
90	Moveis(max)	IF12451	1.2	0.05	23.87	3.96	114.43	0.22
90	Moveis(max)	2/4	1.2	0.05	23.87	3.96	102.46	0.19
90	Moveis(max)	JF12461	1.2	0.05	23.87	3.96	90.51	0.17
91	Moveis(max)	IF12461	1.21	0.06	30.78	4.77	90.1	0.17
91	Moveis(max)	2/4	1.21	0.06	30.78	4.77	69.82	0.13
91	Moveis(max)	JF12471	1.21	0.06	30.78	4.77	52	0.09
92	Moveis(max)	IF12471	1.32	0.15	38.38	5.36	51.45	0.09
92	Moveis(max)	2/4	1.32	0.15	38.38	5.36	23.03	0.35
92	Moveis(max)	JF12481	1.32	0.15	38.38	5.36	4.38	1.31
93	Moveis(max)	IF12481	0.52	2.62	4.61	5.51	3.62	1.62
93	Moveis(max)	2/4	0.52	2.62	4.61	5.51	2.2	0.81
93	Moveis(max)	J[856]	0,52	2,62	4,61	5,51	2,69	0,02
1	Permanentes	I[851]	-102,74	0,51	32,65	-8,18	1,3	-0,88

1	Permanentes	2/4	-102 74	0 51	33 73	-8 18	-9 07	-1 04
1	Permanentes	JF1159I	-102 74	0 51	34 81	-8 18	-19 78	-1 2
2	Permanentes	JF1159I	-150 84	11 11	-40 64	11 77	-12 06	-0 51
2	Permanentes	2/4	-150 84	11 11	-38 05	11 77	17 45	-8 84
2	Permanentes	JF1160I	-150 84	11 11	-35 47	11 77	45 03	-17 17
3	Permanentes	JF1160I	-189 56	4 34	-28 63	9 16	45 79	-15 22
3	Permanentes	2/4	-189 56	4 34	-26 04	9 16	66 29	-18 48
3	Permanentes	JF1161I	-189 56	4 34	-23 45	9 16	84 85	-21 74
4	Permanentes	JF1161I	-209 93	-0 63	-15 93	6 44	85 32	-19 72
4	Permanentes	2/4	-209 93	-0 63	-13 34	6 44	96 3	-19 25
4	Permanentes	JF1162I	-209 93	-0 63	-10 75	6 44	105 33	-18 77
5	Permanentes	JF1162I	-222 66	-2 26	-3 01	3 38	105 51	-17 71
5	Permanentes	2/4	-222 66	-2 26	-0 42	3 38	106 79	-16 02
5	Permanentes	JF1163I	-222 66	-2 26	2 17	3 38	106 14	-14 33
6	Permanentes	JF1163I	-230 97	-2 13	9 94	0 12	106 03	-13 96
6	Permanentes	2/4	-230 97	-2 13	12 53	0 12	97 6	-12 37
6	Permanentes	JF1164I	-230 97	-2 13	15 11	0 12	87 24	-10 77
7	Permanentes	JF1164I	-236 67	-1 62	22 85	-3 27	86 84	-10 78
7	Permanentes	2/4	-236 67	-1 62	25 43	-3 27	68 74	-9 57
7	Permanentes	JF1165I	-236 67	-1 62	28 02	-3 27	48 69	-8 36
8	Permanentes	JF1165I	-240 94	-1 58	35 65	-6 91	48 02	-8 63
8	Permanentes	2/4	-240 94	-1 58	38 24	-6 91	20 31	-7 44
8	Permanentes	JF1166I	-240 94	-1 58	40 83	-6 91	-9 34	-6 25
9	Permanentes	JF1166I	-244 56	-3 23	48 34	-11 21	-10 27	-6 81
9	Permanentes	2/4	-244 56	-3 23	50 93	-11 21	-47 5	-4 39
9	Permanentes	JF1167I	-244 56	-3 23	53 52	-11 21	-86 67	-1 97
10	Permanentes	JF1167I	-246 88	-12 98	61 13	-17 73	-87 86	-4 61
10	Permanentes	2/4	-246 88	-12 98	63 71	-17 73	-134 67	5 12
10	Permanentes	JF1168I	-246 88	-12 98	66 3	-17 73	-183 43	14 86
11	Permanentes	JF1168I	-247 21	12 53	-66 65	20 77	-183 27	14 85
11	Permanentes	2/4	-247 21	12 53	-64 06	20 77	-134 26	5 45
11	Permanentes	JF1169I	-247 21	12 53	-61 47	20 77	-87 18	-3 95
12	Permanentes	JF1169I	-246 11	2 58	-53 87	14 28	-85 98	-1 36
12	Permanentes	2/4	-246 11	2 58	-51 28	14 28	-46 55	-3 29
12	Permanentes	JF1170I	-246 11	2 58	-48 7	14 28	-9 05	-5 23
13	Permanentes	JF1170I	-244 39	0 53	-41 19	10 04	-8 1	-4 71
13	Permanentes	2/4	-244 39	0 53	-38 6	10 04	21 82	-5 11
13	Permanentes	JF1171I	-244 39	0 53	-36 01	10 04	49 8	-5 51
14	Permanentes	JF1171I	-243 27	-0 02	-28 4	6 48	50 49	-5 26
14	Permanentes	2/4	-243 27	-0 02	-25 81	6 48	70 82	-5 25
14	Permanentes	JF1172I	-243 27	-0 02	-23 23	6 48	89 21	-5 24
15	Permanentes	JF1172I	-242 68	-0 08	-15 51	3 19	89 63	-5 13
15	Permanentes	2/4	-242 68	-0 08	-12 93	3 19	100 29	-5 07
15	Permanentes	JF1173I	-242 68	-0 08	-10 34	3 19	109 02	-5 01
16	Permanentes	JF1173I	-242 51	0	-2 59	0	109 16	-4 98
16	Permanentes	2/4	-242 51	0	0	0	110 13	-4 98
16	Permanentes	JF1174I	-242 51	0	2 59	0	109 16	-4 98
17	Permanentes	JF1174I	-242 68	0 08	10 34	-3 19	109 02	-5 01
17	Permanentes	2/4	-242 68	0 08	12 93	-3 19	100 29	-5 07
17	Permanentes	JF1175I	-242 68	0 08	15 51	-3 19	89 63	-5 13
18	Permanentes	JF1175I	-243 27	0 02	23 23	-6 48	89 21	-5 24
18	Permanentes	2/4	-243 27	0 02	25 81	-6 48	70 82	-5 25
18	Permanentes	JF1176I	-243 27	0 02	28 4	-6 48	50 49	-5 26
19	Permanentes	JF1176I	-244 39	-0 53	36 01	-10 04	49 8	-5 51
19	Permanentes	2/4	-244 39	-0 53	38 6	-10 04	21 82	-5 11
19	Permanentes	JF1177I	-244 39	-0 53	41 19	-10 04	-8 1	-4 71
20	Permanentes	JF1177I	-246 11	-2 58	48 7	-14 28	-9 05	-5 23
20	Permanentes	2/4	-246 11	-2 58	51 28	-14 28	-46 55	-3 29
20	Permanentes	JF1178I	-246 11	-2 58	53 87	-14 28	-85 98	-1 36
21	Permanentes	JF1178I	-247 21	-12 53	61 47	-20 77	-87 18	-3 95
21	Permanentes	2/4	-247 21	-12 53	64 06	-20 77	-134 26	5 45
21	Permanentes	JF1179I	-247 21	-12 53	66 65	-20 77	-183 27	14 85
22	Permanentes	JF1179I	-246 88	12 98	-66 3	17 73	-183 43	14 86
22	Permanentes	2/4	-246 88	12 98	-63 71	17 73	-134 67	5 12
22	Permanentes	JF1180I	-246 88	12 98	-61 13	17 73	-87 86	-4 61
23	Permanentes	JF1180I	-244 56	3 23	-53 52	11 21	-86 67	-1 97
23	Permanentes	2/4	-244 56	3 23	-50 93	11 21	-47 5	-4 39
23	Permanentes	JF1181I	-244 56	3 23	-48 34	11 21	-10 27	-6 81
24	Permanentes	JF1181I	-240 94	1 58	-40 83	6 91	-9 34	-6 25
24	Permanentes	2/4	-240 94	1 58	-38 24	6 91	20 31	-7 44
24	Permanentes	JF1182I	-240,94	1,58	-35,65	6,91	48,02	-8,63





25	Permanentes	II11821	-236.67	1.62	-28.02	3.27	48.69	-8.36
25	Permanentes	2/4	-236.67	1.62	-25.43	3.27	68.74	-9.57
25	Permanentes	II11831	-236.67	1.62	-22.85	3.27	86.84	-10.78
26	Permanentes	II11831	-230.97	2.13	-15.11	-0.12	87.24	-10.77
26	Permanentes	2/4	-230.97	2.13	-12.53	-0.12	97.6	-12.37
26	Permanentes	II11841	-230.97	2.13	-9.94	-0.12	106.03	-13.96
27	Permanentes	II11841	-222.66	2.26	-2.17	-3.38	106.14	-14.33
27	Permanentes	2/4	-222.66	2.26	0.42	-3.38	106.79	-16.02
27	Permanentes	II11851	-222.66	2.26	3.01	-3.38	105.51	-17.71
28	Permanentes	II11851	-209.93	0.63	10.75	-6.44	105.33	-18.77
28	Permanentes	2/4	-209.93	0.63	13.34	-6.44	96.3	-19.25
28	Permanentes	II11861	-209.93	0.63	15.93	-6.44	85.32	-19.72
29	Permanentes	II11861	-189.56	-4.34	23.45	-9.16	84.85	-21.74
29	Permanentes	2/4	-189.56	-4.34	26.04	-9.16	66.29	-18.48
29	Permanentes	II11871	-189.56	-4.34	28.63	-9.16	45.79	-15.22
30	Permanentes	II11871	-150.84	-11.11	35.47	-11.77	45.03	-17.17
30	Permanentes	2/4	-150.84	-11.11	38.05	-11.77	17.45	-8.84
30	Permanentes	II11881	-150.84	-11.11	40.64	-11.77	-12.06	-0.51
31	Permanentes	II11881	-102.74	-0.51	-34.81	8.18	-19.78	-1.2
31	Permanentes	2/4	-102.74	-0.51	-33.73	8.18	-9.07	-1.04
31	Permanentes	II18521	-102.74	-0.51	-32.65	8.18	1.3	-0.88
32	Permanentes	II18531	-93.23	2.9	10.64	6.81	0.62	0.14
32	Permanentes	2/4	-93.23	2.9	11.72	6.81	-2.87	-0.76
32	Permanentes	II11891	-93.23	2.9	12.8	6.81	-6.7	-1.67
33	Permanentes	II11891	-137.14	-1.35	-33.11	-2.12	-1.21	-0.71
33	Permanentes	2/4	-137.14	-1.35	-30.53	-2.12	22.65	0.31
33	Permanentes	II11901	-137.14	-1.35	-27.94	-2.12	44.58	1.32
34	Permanentes	II11901	-166.42	0.33	-22.95	-1.39	44.91	0.97
34	Permanentes	2/4	-166.42	0.33	-20.36	-1.39	61.15	0.73
34	Permanentes	II11911	-166.42	0.33	-17.77	-1.39	75.45	0.49
35	Permanentes	II11911	-172.68	0.76	-12.45	-0.86	75.62	0.42
35	Permanentes	2/4	-172.68	0.76	-9.86	-0.86	83.98	-0.15
35	Permanentes	II11921	-172.68	0.76	-7.27	-0.86	90.41	-0.72
36	Permanentes	II11921	-174.74	0.7	-2.09	-0.32	90.46	-0.74
36	Permanentes	2/4	-174.74	0.7	0.5	-0.32	91.06	-1.27
36	Permanentes	II11931	-174.74	0.7	3.09	-0.32	89.71	-1.79
37	Permanentes	II11931	-177.87	0.44	8.22	0.26	89.65	-1.75
37	Permanentes	2/4	-177.87	0.44	10.8	0.26	82.51	-2.08
37	Permanentes	II11941	-177.87	0.44	13.39	0.26	73.44	-2.41
38	Permanentes	II11941	-182.78	0.2	18.56	0.94	73.25	-2.33
38	Permanentes	2/4	-182.78	0.2	21.15	0.94	58.36	-2.47
38	Permanentes	II11951	-182.78	0.2	23.73	0.94	41.53	-2.62
39	Permanentes	II11951	-188.97	0.17	29.01	1.75	41.23	-2.49
39	Permanentes	2/4	-188.97	0.17	31.59	1.75	18.5	-2.62
39	Permanentes	II11961	-188.97	0.17	34.18	1.75	-6.17	-2.75
40	Permanentes	II11961	-195.51	0.85	39.64	2.72	-6.6	-2.55
40	Permanentes	2/4	-195.51	0.85	42.22	2.72	-37.29	-3.19
40	Permanentes	II11971	-195.51	0.85	44.81	2.72	-69.93	-3.83
41	Permanentes	II11971	-200.83	4.55	50.34	4.06	-70.52	-2.75
41	Permanentes	2/4	-200.83	4.55	52.93	4.06	-109.25	-6.16
41	Permanentes	II11981	-200.83	4.55	55.52	4.06	-149.92	-9.58
42	Permanentes	II11981	-203.16	-4.61	-55.14	-4.11	-149.71	-9.49
42	Permanentes	2/4	-203.16	-4.61	-52.55	-4.11	-109.33	-6.03
42	Permanentes	II11991	-203.16	-4.61	-49.96	-4.11	-70.89	-2.58
43	Permanentes	II11991	-202.78	-0.87	-44.42	-2.8	-70.3	-3.6
43	Permanentes	2/4	-202.78	-0.87	-41.83	-2.8	-37.95	-2.95
43	Permanentes	II12001	-202.78	-0.87	-39.25	-2.8	-7.55	-2.3
44	Permanentes	II12001	-201.16	-0.08	-33.77	-1.88	-7.12	-2.45
44	Permanentes	2/4	-201.16	-0.08	-31.18	-1.88	17.23	-2.38
44	Permanentes	II12011	-201.16	-0.08	-28.59	-1.88	39.65	-2.32
45	Permanentes	II12011	-199.63	0.07	-23.29	-1.14	39.96	-2.38
45	Permanentes	2/4	-199.63	0.07	-20.7	-1.14	56.45	-2.44
45	Permanentes	II12021	-199.63	0.07	-18.12	-1.14	71.01	-2.49
46	Permanentes	II12021	-198.71	0.06	-12.92	-0.53	71.19	-2.51
46	Permanentes	2/4	-198.71	0.06	-10.33	-0.53	79.91	-2.55
46	Permanentes	II12031	-198.71	0.06	-7.74	-0.53	86.69	-2.59
47	Permanentes	II12031	-198.41	0	-2.59	0	86.75	-2.6
47	Permanentes	2/4	-198.41	0	0	0	87.72	-2.6
47	Permanentes	II12041	-198.41	0	2.59	0	86.75	-2.6
48	Permanentes	II12041	-198.71	-0.06	7.74	0.53	86.69	-2.59
48	Permanentes	2/4	-198.71	-0.06	10.33	0.53	79.91	-2.55
48	Permanentes	II12051	-198.71	-0.06	12.92	0.53	71.19	-2.51



49	Permanentes	II12051	-199.63	-0.07	18.12	1.14	71.01	-2.49
49	Permanentes	2/4	-199.63	-0.07	20.7	1.14	56.45	-2.44
49	Permanentes	II12061	-199.63	-0.07	23.29	1.14	39.96	-2.38
50	Permanentes	II12061	-201.16	0.08	28.59	1.88	39.65	-2.32
50	Permanentes	2/4	-201.16	0.08	31.18	1.88	17.23	-2.38
50	Permanentes	II12071	-201.16	0.08	33.77	1.88	-7.12	-2.45
51	Permanentes	II12071	-202.78	0.87	39.25	2.8	-7.55	-2.3
51	Permanentes	2/4	-202.78	0.87	41.83	2.8	-37.95	-2.95
51	Permanentes	II12081	-202.78	0.87	44.42	2.8	-70.3	-3.6
52	Permanentes	II12081	-203.16	4.61	49.96	4.11	-70.89	-2.58
52	Permanentes	2/4	-203.16	4.61	52.55	4.11	-109.33	-6.03
52	Permanentes	II12091	-203.16	4.61	55.14	4.11	-149.71	-9.49
53	Permanentes	II12091	-200.83	-4.55	-55.52	-4.06	-149.92	-9.58
53	Permanentes	2/4	-200.83	-4.55	-52.93	-4.06	-109.25	-6.16
53	Permanentes	II12101	-200.83	-4.55	-50.34	-4.06	-70.52	-2.75
54	Permanentes	II12101	-195.51	-0.85	-44.81	-2.72	-69.93	-3.83
54	Permanentes	2/4	-195.51	-0.85	-42.22	-2.72	-37.29	-3.19
54	Permanentes	II12111	-195.51	-0.85	-39.64	-2.72	-6.6	-2.55
55	Permanentes	II12111	-188.97	-0.17	-34.18	-1.75	-6.17	-2.75
55	Permanentes	2/4	-188.97	-0.17	-31.59	-1.75	18.5	-2.62
55	Permanentes	II12121	-188.97	-0.17	-29.01	-1.75	41.23	-2.49
56	Permanentes	II12121	-182.78	-0.2	-23.73	-0.94	41.53	-2.62
56	Permanentes	2/4	-182.78	-0.2	-21.15	-0.94	58.36	-2.47
56	Permanentes	II12131	-182.78	-0.2	-18.56	-0.94	73.25	-2.33
57	Permanentes	II12131	-177.87	-0.44	-13.39	-0.26	73.44	-2.41
57	Permanentes	2/4	-177.87	-0.44	-10.8	-0.26	82.51	-2.08
57	Permanentes	II12141	-177.87	-0.44	-8.22	-0.26	89.65	-1.75
58	Permanentes	II12141	-174.74	-0.7	-3.09	0.32	89.71	-1.79
58	Permanentes	2/4	-174.74	-0.7	-0.5	0.32	91.06	-1.27
58	Permanentes	II12151	-174.74	-0.7	2.09	0.32	90.46	-0.74
59	Permanentes	II12151	-172.68	-0.76	7.27	0.86	90.41	-0.72
59	Permanentes	2/4	-172.68	-0.76	9.86	0.86	83.98	-0.15
59	Permanentes	II12161	-172.68	-0.76	12.45	0.86	75.62	0.42
60	Permanentes	II12161	-166.42	-0.33	17.77	1.39	75.45	0.49
60	Permanentes	2/4	-166.42	-0.33	20.36	1.39	61.15	0.73
60	Permanentes	II12171	-166.42	-0.33	22.95	1.39	44.91	0.97
61	Permanentes	II12171	-137.14	1.35	27.94	2.12	44.58	1.32
61	Permanentes	2/4	-137.14	1.35	30.53	2.12	22.65	0.31
61	Permanentes	II12181	-137.14	1.35	33.11	2.12	-1.21	-0.71
62	Permanentes	II12181	-93.23	-2.9	-12.8	-6.81	-6.7	-1.67
62	Permanentes	2/4	-93.23	-2.9	-11.72	-6.81	-2.87	-0.76
62	Permanentes	II8541	-93.23	-2.9	-10.64	-6.81	0.62	0.14
63	Permanentes	II8551	-94.29	-11.53	15.54	12.71	0.56	-0.96
63	Permanentes	2/4	-94.29	-11.53	16.62	12.71	-4.46	2.65
63	Permanentes	II12191	-94.29	-11.53	17.7	12.71	-9.83	6.25
64	Permanentes	II12191	-135.17	-12.14	-33.87	-0.84	-5.06	7.43
64	Permanentes	2/4	-135.17	-12.14	-31.28	-0.84	19.37	16.54
64	Permanentes	II12201	-135.17	-12.14	-28.69	-0.84	41.86	25.64
65	Permanentes	II12201	-172.9	0.54	-23.64	0.2	42.25	22.47
65	Permanentes	2/4	-172.9	0.54	-21.05	0.2	59.01	22.07
65	Permanentes	II12211	-172.9	0.54	-18.46	0.2	73.83	21.66
66	Permanentes	II12211	-185.47	3.75	-12.97	0.95	74.04	19.82
66	Permanentes	2/4	-185.47	3.75	-10.38	0.95	82.8	17.01
66	Permanentes	II12221	-185.47	3.75	-7.8	0.95	89.61	14.2
67	Permanentes	II12221	-187.21	3.59	-2.34	1.73	89.68	13.48
67	Permanentes	2/4	-187.21	3.59	0.24	1.73	90.47	10.78
67	Permanentes	II12231	-187.21	3.59	2.83	1.73	89.32	8.08
68	Permanentes	II12231	-185.08	2.6	8.24	2.57	89.24	7.88
68	Permanentes	2/4	-185.08	2.6	10.83	2.57	82.09	5.93
68	Permanentes	II12241	-185.08	2.6	13.42	2.57	72.99	3.98
69	Permanentes	II12241	-181.57	1.81	18.78	3.53	72.77	4.05
69	Permanentes	2/4	-181.57	1.81	21.37	3.53	57.71	2.7
69	Permanentes	II12251	-181.57	1.81	23.96	3.53	40.72	1.34
70	Permanentes	II12251	-177.75	1.89	29.23	4.66	40.35	1.58
70	Permanentes	2/4	-177.75	1.89	31.82	4.66	17.46	0.16
70	Permanentes	II12261	-177.75	1.89	34.4	4.66	-7.37	-1.26
71	Permanentes	II12261	-174.5	3.46	39.45	6.06	-7.88	-0.99
71	Permanentes	2/4	-174.5	3.46	42.04	6.06	-38.44	-3.58
71	Permanentes	II12271	-174.5	3.46	44.62	6.06	-70.94	-6.18
72	Permanentes	II12271	-172.33	9.28	49.23	8.17	-71.61	-4.68
72	Permanentes	2/4	-172.33	9.28	51.82	8.17	-109.5	-11.64
72	Permanentes	II12281	-172.33	9.28	54.41	8.17	-149.34	-18.6



73	Permanentes	II12281	-170 74	-9 07	-53 99	-7	-149 19	-18 5
73	Permanentes	2/4	-170 74	-9 07	-51 41	-7	-109 67	-11 7
73	Permanentes	II12291	-170 74	-9 07	-48 82	-7	-72 08	-4 9
74	Permanentes	II12291	-169 92	-3 02	-44 22	-4 86	-71 41	-6 33
74	Permanentes	2/4	-169 92	-3 02	-41 63	-4 86	-39 22	-4 06
74	Permanentes	II12301	-169 92	-3 02	-39 04	-4 86	-8 97	-1 79
75	Permanentes	II12301	-169 96	-0 98	-34 02	-3 39	-8 46	-2
75	Permanentes	2/4	-169 96	-0 98	-31 43	-3 39	16 08	-1 27
75	Permanentes	II12311	-169 96	-0 98	-28 85	-3 39	38 69	-0 54
76	Permanentes	II12311	-170 38	-0 12	-23 61	-2 15	39 05	-0 72
76	Permanentes	2/4	-170 38	-0 12	-21 02	-2 15	55 78	-0 63
76	Permanentes	II12321	-170 38	-0 12	-18 43	-2 15	70 58	-0 54
77	Permanentes	II12321	-170 67	0 07	-13 12	-1 04	70 79	-0 63
77	Permanentes	2/4	-170 67	0 07	-10 53	-1 04	79 66	-0 69
77	Permanentes	II12331	-170 67	0 07	-7 94	-1 04	86 59	-0 74
78	Permanentes	II12331	-170 76	0	-2 59	0	86 66	-0 77
78	Permanentes	2/4	-170 76	0	0	0	87 63	-0 77
78	Permanentes	II12341	-170 76	0	2 59	0	86 66	-0 77
79	Permanentes	II12341	-170 67	-0 07	7 94	1 04	86 59	-0 74
79	Permanentes	2/4	-170 67	-0 07	10 53	1 04	79 66	-0 69
79	Permanentes	II12351	-170 67	-0 07	13 12	1 04	70 79	-0 63
80	Permanentes	II12351	-170 38	0 12	18 43	2 15	70 58	-0 54
80	Permanentes	2/4	-170 38	0 12	21 02	2 15	55 78	-0 63
80	Permanentes	II12361	-170 38	0 12	23 61	2 15	39 05	-0 72
81	Permanentes	II12361	-169 96	0 98	28 85	3 39	38 69	-0 54
81	Permanentes	2/4	-169 96	0 98	31 43	3 39	16 08	-1 27
81	Permanentes	II12371	-169 96	0 98	34 02	3 39	-8 46	-2
82	Permanentes	II12371	-169 92	3 02	39 04	4 86	-8 97	-1 79
82	Permanentes	2/4	-169 92	3 02	41 63	4 86	-39 22	-4 06
82	Permanentes	II12381	-169 92	3 02	44 22	4 86	-71 41	-6 33
83	Permanentes	II12381	-170 74	9 07	48 82	7	-72 08	-4 9
83	Permanentes	2/4	-170 74	9 07	51 41	7	-109 67	-11 7
83	Permanentes	II12391	-170 74	9 07	53 99	7	-149 19	-18 5
84	Permanentes	II12391	-172 33	-9 28	-54 41	-8 17	-149 34	-18 6
84	Permanentes	2/4	-172 33	-9 28	-51 82	-8 17	-109 5	-11 64
84	Permanentes	II12401	-172 33	-9 28	-49 23	-8 17	-71 61	-4 68
85	Permanentes	II12401	-174 5	-3 46	-44 62	-6 06	-70 94	-6 18
85	Permanentes	2/4	-174 5	-3 46	-42 04	-6 06	-38 44	-3 58
85	Permanentes	II12411	-174 5	-3 46	-39 45	-6 06	-7 88	-0 99
86	Permanentes	II12411	-177 75	-1 89	-34 4	-4 66	-7 37	-1 26
86	Permanentes	2/4	-177 75	-1 89	-31 82	-4 66	17 46	0 16
86	Permanentes	II12421	-177 75	-1 89	-29 23	-4 66	40 35	1 58
87	Permanentes	II12421	-181 57	-1 81	-23 96	-3 53	40 72	1 34
87	Permanentes	2/4	-181 57	-1 81	-21 37	-3 53	57 71	2 7
87	Permanentes	II12431	-181 57	-1 81	-18 78	-3 53	72 77	4 05
88	Permanentes	II12431	-185 08	-2 6	-13 42	-2 57	72 99	3 98
88	Permanentes	2/4	-185 08	-2 6	-10 83	-2 57	82 09	5 93
88	Permanentes	II12441	-185 08	-2 6	-8 24	-2 57	89 24	7 88
89	Permanentes	II12441	-187 21	-3 59	-2 83	-1 73	89 32	8 08
89	Permanentes	2/4	-187 21	-3 59	-0 24	-1 73	90 47	10 78
89	Permanentes	II12451	-187 21	-3 59	2 34	-1 73	89 68	13 48
90	Permanentes	II12451	-185 47	-3 75	7 8	-0 95	89 61	14 2
90	Permanentes	2/4	-185 47	-3 75	10 38	-0 95	82 8	17 01
90	Permanentes	II12461	-185 47	-3 75	12 97	-0 95	74 04	19 82
91	Permanentes	II12461	-172 9	-0 54	18 46	-0 2	73 83	21 66
91	Permanentes	2/4	-172 9	-0 54	21 05	-0 2	59 01	22 07
91	Permanentes	II12471	-172 9	-0 54	23 64	-0 2	42 25	22 47
92	Permanentes	II12471	-135 17	12 14	28 69	0 84	41 86	25 64
92	Permanentes	2/4	-135 17	12 14	31 28	0 84	19 37	16 54
92	Permanentes	II12481	-135 17	12 14	33 87	0 84	-5 06	7 43
93	Permanentes	II12481	-94 29	11 53	-17 7	-12 71	-9 83	6 25
93	Permanentes	2/4	-94 29	11 53	-16 62	-12 71	-4 46	2 65
93	Permanentes	II8561	-94 29	11 53	-15 54	-12 71	0 56	-0 96
1	Moveis(min)	II8511	-0 18	-0 55	-4 58	-7 13	-0 44	-0 01
1	Moveis(min)	2/4	-0 18	-0 55	-4 58	-7 13	-3 89	-0 6
1	Moveis(min)	II11591	-0 18	-0 55	-4 58	-7 13	-7 58	-1 2
2	Moveis(min)	II11591	-3 88	-0 94	-32 89	-9 81	-10 03	-0 93
2	Moveis(min)	2/4	-3 88	-0 94	-32 89	-9 81	-7 53	-0 22
2	Moveis(min)	II11601	-3 88	-0 94	-32 89	-9 81	-8 06	-0 11
3	Moveis(min)	II11601	-3 3	-0 14	-26 42	-8 58	-8 07	-0 05
3	Moveis(min)	2/4	-3 3	-0 14	-26 42	-8 58	-9 02	-0 07
3	Moveis(min)	II11611	-3 3	-0 14	-26 42	-8 58	-12 35	-0 09



4	Moveis(min)	IF11611	-3.05	-0.08	-20.59	-6.92	-12.45	-0.08
4	Moveis(min)	2/4	-3.05	-0.08	-20.59	-6.92	-15.88	-0.08
4	Moveis(min)	IF11621	-3.05	-0.08	-20.59	-6.92	-19.32	-0.09
5	Moveis(min)	IF11621	-2.89	-0.09	-15.49	-5.15	-19.42	-0.09
5	Moveis(min)	2/4	-2.89	-0.09	-15.49	-5.15	-22.93	-0.11
5	Moveis(min)	IF11631	-2.89	-0.09	-15.49	-5.15	-26.45	-0.13
6	Moveis(min)	IF11631	-2.75	-0.09	-11.01	-4.44	-26.54	-0.13
6	Moveis(min)	2/4	-2.75	-0.09	-11.01	-4.44	-30.15	-0.15
6	Moveis(min)	IF11641	-2.75	-0.09	-11.01	-4.44	-33.75	-0.17
7	Moveis(min)	IF11641	-2.56	-0.09	-7.1	-3.71	-33.85	-0.18
7	Moveis(min)	2/4	-2.56	-0.09	-7.1	-3.71	-37.55	-0.19
7	Moveis(min)	IF11651	-2.56	-0.09	-7.1	-3.71	-41.25	-0.2
8	Moveis(min)	IF11651	-2.31	-0.03	-3.72	-2.83	-41.36	-0.22
8	Moveis(min)	2/4	-2.31	-0.03	-3.72	-2.83	-45.17	-0.22
8	Moveis(min)	IF11661	-2.31	-0.03	-3.72	-2.83	-48.98	-0.23
9	Moveis(min)	IF11661	-2.04	-0.19	-1.24	-2.86	-49.09	-0.28
9	Moveis(min)	2/4	-2.04	-0.19	-1.24	-2.86	-53.29	-0.28
9	Moveis(min)	IF11671	-2.04	-0.19	-1.24	-2.86	-59.56	-0.52
10	Moveis(min)	IF11671	-1.88	-1.09	-1	-2.7	-59.78	-0.49
10	Moveis(min)	2/4	-1.88	-1.09	-1	-2.7	-68.75	-2.44
10	Moveis(min)	IF11681	-1.88	-1.09	-1	-2.7	-79.97	-5.29
11	Moveis(min)	IF11681	-1.62	-3.94	-40.42	-11.46	-80.92	-5.3
11	Moveis(min)	2/4	-1.62	-3.94	-40.42	-11.46	-60.88	-2.52
11	Moveis(min)	IF11691	-1.62	-3.94	-40.42	-11.46	-51.4	-0.52
12	Moveis(min)	IF11691	-1.65	-0.78	-35.02	-9.9	-51.14	-0.57
12	Moveis(min)	2/4	-1.65	-0.78	-35.02	-9.9	-43.87	-0.31
12	Moveis(min)	IF11701	-1.65	-0.78	-35.02	-9.9	-38.82	-0.31
13	Moveis(min)	IF11701	-1.82	-0.18	-29.7	-8.48	-38.72	-0.26
13	Moveis(min)	2/4	-1.82	-0.18	-29.7	-8.48	-35.85	-0.25
13	Moveis(min)	IF11711	-1.82	-0.18	-29.7	-8.48	-33.64	-0.25
14	Moveis(min)	IF11711	-1.96	-0.08	-24.58	-6.85	-33.59	-0.24
14	Moveis(min)	2/4	-1.96	-0.08	-24.58	-6.85	-31.6	-0.23
14	Moveis(min)	IF11721	-1.96	-0.08	-24.58	-6.85	-29.61	-0.22
15	Moveis(min)	IF11721	-2.02	-0.06	-19.79	-5.41	-29.56	-0.21
15	Moveis(min)	2/4	-2.02	-0.06	-19.79	-5.41	-27.66	-0.2
15	Moveis(min)	IF11731	-2.02	-0.06	-19.79	-5.41	-25.77	-0.2
16	Moveis(min)	IF11731	-2.01	-0.07	-15.36	-4.94	-25.72	-0.19
16	Moveis(min)	2/4	-2.01	-0.07	-15.36	-4.94	-23.91	-0.19
16	Moveis(min)	IF11741	-2.01	-0.07	-15.36	-4.94	-25.72	-0.19
17	Moveis(min)	IF11741	-2.02	-0.09	-11.3	-4.49	-25.77	-0.2
17	Moveis(min)	2/4	-2.02	-0.09	-11.3	-4.49	-27.66	-0.2
17	Moveis(min)	IF11751	-2.02	-0.09	-11.3	-4.49	-29.56	-0.21
18	Moveis(min)	IF11751	-1.96	-0.09	-7.65	-3.88	-29.61	-0.22
18	Moveis(min)	2/4	-1.96	-0.09	-7.65	-3.88	-31.6	-0.23
18	Moveis(min)	IF11761	-1.96	-0.09	-7.65	-3.88	-33.59	-0.24
19	Moveis(min)	IF11761	-1.82	-0.04	-4.45	-2.99	-33.64	-0.25
19	Moveis(min)	2/4	-1.82	-0.04	-4.45	-2.99	-35.85	-0.25
19	Moveis(min)	IF11771	-1.82	-0.04	-4.45	-2.99	-38.72	-0.26
20	Moveis(min)	IF11771	-1.65	-0.19	-3.5	-2.59	-38.82	-0.31
20	Moveis(min)	2/4	-1.65	-0.19	-3.5	-2.59	-43.87	-0.31
20	Moveis(min)	IF11781	-1.65	-0.19	-3.5	-2.59	-51.14	-0.57
21	Moveis(min)	IF11781	-1.62	-1.1	-3.36	-2.42	-51.4	-0.51
21	Moveis(min)	2/4	-1.62	-1.1	-3.36	-2.42	-60.88	-2.52
21	Moveis(min)	IF11791	-1.62	-1.1	-3.36	-2.42	-80.92	-5.3
22	Moveis(min)	IF11791	-1.88	-3.94	-39.4	-10.01	-79.97	-5.29
22	Moveis(min)	2/4	-1.88	-3.94	-39.4	-10.01	-68.75	-2.44
22	Moveis(min)	IF11801	-1.88	-3.94	-39.4	-10.01	-59.78	-0.49
23	Moveis(min)	IF11801	-2.04	-0.76	-33.79	-7.65	-59.56	-0.52
23	Moveis(min)	2/4	-2.04	-0.76	-33.79	-7.65	-53.29	-0.28
23	Moveis(min)	IF11811	-2.04	-0.76	-33.79	-7.65	-49.09	-0.28
24	Moveis(min)	IF11811	-2.31	-0.17	-28.18	-6.18	-48.98	-0.23
24	Moveis(min)	2/4	-2.31	-0.17	-28.18	-6.18	-45.17	-0.22
24	Moveis(min)	IF11821	-2.31	-0.17	-28.18	-6.18	-41.36	-0.22
25	Moveis(min)	IF11821	-2.56	-0.07	-22.65	-5.16	-41.25	-0.2
25	Moveis(min)	2/4	-2.56	-0.07	-22.65	-5.16	-37.55	-0.19
25	Moveis(min)	IF11831	-2.56	-0.07	-22.65	-5.16	-33.85	-0.18
26	Moveis(min)	IF11831	-2.75	-0.04	-17.27	-4.39	-33.75	-0.17
26	Moveis(min)	2/4	-2.75	-0.04	-17.27	-4.39	-30.15	-0.15
26	Moveis(min)	IF11841	-2.75	-0.04	-17.27	-4.39	-26.54	-0.13
27	Moveis(min)	IF11841	-2,89	-0,05	-12	-3,62	-26,45	-0,13
27	Moveis(min)	2/4	-2,89	-0,05	-12	-3,62	-22,93	-0,11





27	Moveis(min)	Jf11851	-2 89	-0 05	-12	-3 62	-19 42	-0 09
28	Moveis(min)	Jf11851	-3 05	-0 04	-6 71	-2 41	-19 32	-0 09
28	Moveis(min)	2/4	-3 05	-0 04	-6 71	-2 41	-15 88	-0 08
28	Moveis(min)	Jf11861	-3 05	-0 04	-6 71	-2 41	-12 45	-0 08
29	Moveis(min)	Jf11861	-3 3	-0 03	-4 74	-0 99	-12 35	-0 09
29	Moveis(min)	2/4	-3 3	-0 03	-4 74	-0 99	-9 02	-0 07
29	Moveis(min)	Jf11871	-3 3	-0 03	-4 74	-0 99	-8 07	-0 05
30	Moveis(min)	Jf11871	-3 88	-0 22	-4 52	-0 82	-8 06	-0 11
30	Moveis(min)	2/4	-3 88	-0 22	-4 52	-0 82	-7 53	-0 22
30	Moveis(min)	Jf11881	-3 88	-0 22	-4 52	-0 82	-10 03	-0 93
31	Moveis(min)	Jf11881	-0 18	-1 91	-12 72	-1 69	-7 58	-1 2
31	Moveis(min)	2/4	-0 18	-1 91	-12 72	-1 69	-3 89	-0 6
31	Moveis(min)	Jf8521	-0 18	-1 91	-12 72	-1 69	-0 44	-0 01
32	Moveis(min)	Jf8531	-0 15	-2 24	-2 85	-8 08	-1 16	-0 04
32	Moveis(min)	2/4	-0 15	-2 24	-2 85	-8 08	-5 89	-0 88
32	Moveis(min)	Jf11891	-0 15	-2 24	-2 85	-8 08	-12 3	-1 79
33	Moveis(min)	Jf11891	-4 83	-1 41	-40 28	-14 7	-16 18	-1 46
33	Moveis(min)	2/4	-4 83	-1 41	-40 28	-14 7	-9 19	-0 4
33	Moveis(min)	Jf11901	-4 83	-1 41	-40 28	-14 7	-9 59	-0 53
34	Moveis(min)	Jf11901	-4 09	-0 13	-31 75	-12 26	-9 6	-0 23
34	Moveis(min)	2/4	-4 09	-0 13	-31 75	-12 26	-10 41	-0 33
34	Moveis(min)	Jf11911	-4 09	-0 13	-31 75	-12 26	-12 65	-0 42
35	Moveis(min)	Jf11911	-3 77	-0 05	-24 44	-10 02	-12 7	-0 37
35	Moveis(min)	2/4	-3 77	-0 05	-24 44	-10 02	-16 35	-0 35
35	Moveis(min)	Jf11921	-3 77	-0 05	-24 44	-10 02	-20 06	-0 32
36	Moveis(min)	Jf11921	-3 52	-0 06	-18 45	-7 93	-20 11	-0 3
36	Moveis(min)	2/4	-3 52	-0 06	-18 45	-7 93	-24 1	-0 28
36	Moveis(min)	Jf11931	-3 52	-0 06	-18 45	-7 93	-28 1	-0 27
37	Moveis(min)	Jf11931	-3 22	-0 17	-13 36	-6 04	-28 16	-0 27
37	Moveis(min)	2/4	-3 22	-0 17	-13 36	-6 04	-32 51	-0 33
37	Moveis(min)	Jf11941	-3 22	-0 17	-13 36	-6 04	-36 87	-0 41
38	Moveis(min)	Jf11941	-2 81	-0 27	-8 86	-5 79	-36 94	-0 43
38	Moveis(min)	2/4	-2 81	-0 27	-8 86	-5 79	-41 71	-0 57
38	Moveis(min)	Jf11951	-2 81	-0 27	-8 86	-5 79	-46 47	-0 71
39	Moveis(min)	Jf11951	-2 35	-0 18	-4 83	-7 78	-46 55	-0 78
39	Moveis(min)	2/4	-2 35	-0 18	-4 83	-7 78	-51 74	-0 84
39	Moveis(min)	Jf11961	-2 35	-0 18	-4 83	-7 78	-56 93	-0 91
40	Moveis(min)	Jf11961	-1 92	-0 73	-1 7	-9 71	-57 02	-1 08
40	Moveis(min)	2/4	-1 92	-0 73	-1 7	-9 71	-63 34	-0 54
40	Moveis(min)	Jf11971	-1 92	-0 73	-1 7	-9 71	-72 89	-0 09
41	Moveis(min)	Jf11971	-1 85	-4 71	-1 07	-11 86	-73 09	-1 1
41	Moveis(min)	2/4	-1 85	-4 71	-1 07	-11 86	-87 08	-2 67
41	Moveis(min)	Jf11981	-1 85	-4 71	-1 07	-11 86	-104 63	-6 86
42	Moveis(min)	Jf11981	-1 77	-5 59	-50 33	-15 47	-106 23	-6 89
42	Moveis(min)	2/4	-1 77	-5 59	-50 33	-15 47	-80 01	-2 7
42	Moveis(min)	Jf11991	-1 77	-5 59	-50 33	-15 47	-65 13	-1 1
43	Moveis(min)	Jf11991	-1 76	-0 79	-42 81	-12 98	-64 89	-0 21
43	Moveis(min)	2/4	-1 76	-0 79	-42 81	-12 98	-53 58	-0 55
43	Moveis(min)	Jf12001	-1 76	-0 79	-42 81	-12 98	-45 77	-1 08
44	Moveis(min)	Jf12001	-1 92	-0 09	-35 76	-11 16	-45 67	-0 9
44	Moveis(min)	2/4	-1 92	-0 09	-35 76	-11 16	-41 05	-0 84
44	Moveis(min)	Jf12011	-1 92	-0 09	-35 76	-11 16	-37 76	-0 77
45	Moveis(min)	Jf12011	-2 13	-0 2	-29 35	-9 47	-37 71	-0 7
45	Moveis(min)	2/4	-2 13	-0 2	-29 35	-9 47	-35 07	-0 56
45	Moveis(min)	Jf12021	-2 13	-0 2	-29 35	-9 47	-32 5	-0 41
46	Moveis(min)	Jf12021	-2 36	-0 14	-23 71	-7 83	-32 47	-0 39
46	Moveis(min)	2/4	-2 36	-0 14	-23 71	-7 83	-30 3	-0 3
46	Moveis(min)	Jf12031	-2 36	-0 14	-23 71	-7 83	-28 13	-0 21
47	Moveis(min)	Jf12031	-2 45	-0 07	-18 66	-6 31	-28 1	-0 21
47	Moveis(min)	2/4	-2 45	-0 07	-18 66	-6 31	-26 3	-0 19
47	Moveis(min)	Jf12041	-2 45	-0 07	-18 66	-6 31	-28 1	-0 21
48	Moveis(min)	Jf12041	-2 36	-0 17	-14 04	-6 6	-28 13	-0 21
48	Moveis(min)	2/4	-2 36	-0 17	-14 04	-6 6	-30 3	-0 3
48	Moveis(min)	Jf12051	-2 36	-0 17	-14 04	-6 6	-32 47	-0 39
49	Moveis(min)	Jf12051	-2 13	-0 28	-9 74	-8 33	-32 5	-0 41
49	Moveis(min)	2/4	-2 13	-0 28	-9 74	-8 33	-35 07	-0 56
49	Moveis(min)	Jf12061	-2 13	-0 28	-9 74	-8 33	-37 71	-0 7
50	Moveis(min)	Jf12061	-1 92	-0 18	-5 82	-9 99	-37 76	-0 77
50	Moveis(min)	2/4	-1 92	-0 18	-5 82	-9 99	-41 05	-0 84
50	Moveis(min)	Jf12071	-1 92	-0 18	-5 82	-9 99	-45 67	-0 9
51	Moveis(min)	Jf12071	-1 76	-0 73	-3 51	-11 55	-45 77	-1 08
51	Moveis(min)	2/4	-1 76	-0 73	-3 51	-11 55	-53 58	-0 55



51	Moveis(min)	Jf12081	-1 76	-0 73	-3 51	-11 55	-64 89	-0 21
52	Moveis(min)	Jf12081	-1 77	-4 71	-3 16	-13 32	-65 13	-1 1
52	Moveis(min)	2/4	-1 77	-4 71	-3 16	-13 32	-80 01	-2 69
52	Moveis(min)	Jf12091	-1 77	-4 71	-3 16	-13 32	-106 23	-6 87
53	Moveis(min)	Jf12091	-1 85	-5 57	-49 08	-14 23	-104 63	-6 84
53	Moveis(min)	2/4	-1 85	-5 57	-49 08	-14 23	-87 08	-2 66
53	Moveis(min)	Jf12101	-1 85	-5 57	-49 08	-14 23	-73 09	-1 1
54	Moveis(min)	Jf12101	-1 92	-0 79	-41 39	-11 46	-72 89	-0 09
54	Moveis(min)	2/4	-1 92	-0 79	-41 39	-11 46	-63 34	-0 54
54	Moveis(min)	Jf12111	-1 92	-0 79	-41 39	-11 46	-57 02	-1 08
55	Moveis(min)	Jf12111	-2 35	-0 09	-34 05	-9 28	-56 93	-0 91
55	Moveis(min)	2/4	-2 35	-0 09	-34 05	-9 28	-51 74	-0 84
55	Moveis(min)	Jf12121	-2 35	-0 09	-34 05	-9 28	-46 55	-0 78
56	Moveis(min)	Jf12121	-2 81	-0 19	-27 2	-7 23	-46 47	-0 71
56	Moveis(min)	2/4	-2 81	-0 19	-27 2	-7 23	-41 71	-0 57
56	Moveis(min)	Jf12131	-2 81	-0 19	-27 2	-7 23	-36 94	-0 43
57	Moveis(min)	Jf12131	-3 22	-0 13	-20 81	-5 24	-36 87	-0 41
57	Moveis(min)	2/4	-3 22	-0 13	-20 81	-5 24	-32 51	-0 33
57	Moveis(min)	Jf12141	-3 22	-0 13	-20 81	-5 24	-28 16	-0 27
58	Moveis(min)	Jf12141	-3 52	-0 07	-14 58	-6 52	-28 1	-0 27
58	Moveis(min)	2/4	-3 52	-0 07	-14 58	-6 52	-24 1	-0 28
58	Moveis(min)	Jf12151	-3 52	-0 07	-14 58	-6 52	-20 11	-0 3
59	Moveis(min)	Jf12151	-3 77	-0 08	-8 18	-8 65	-20 06	-0 32
59	Moveis(min)	2/4	-3 77	-0 08	-8 18	-8 65	-16 35	-0 35
59	Moveis(min)	Jf12161	-3 77	-0 08	-8 18	-8 65	-12 7	-0 37
60	Moveis(min)	Jf12161	-4 09	-0 13	-5 02	-10 74	-12 65	-0 42
60	Moveis(min)	2/4	-4 09	-0 13	-5 02	-10 74	-10 41	-0 33
60	Moveis(min)	Jf12171	-4 09	-0 13	-5 02	-10 74	-9 6	-0 23
61	Moveis(min)	Jf12171	-4 83	-1 12	-4 62	-12 79	-9 59	-0 53
61	Moveis(min)	2/4	-4 83	-1 12	-4 62	-12 79	-9 19	-0 4
61	Moveis(min)	Jf12181	-4 83	-1 12	-4 62	-12 79	-16 18	-1 45
62	Moveis(min)	Jf12181	-0 15	-2 89	-20 94	-7 35	-12 3	-1 77
62	Moveis(min)	2/4	-0 15	-2 89	-20 94	-7 35	-5 89	-0 87
62	Moveis(min)	Jf8541	-0 15	-2 89	-20 94	-7 35	-1 16	-0 04
63	Moveis(min)	Jf8551	-0 14	-2 63	-4 61	-5 51	-0 49	-0 02
63	Moveis(min)	2/4	-0 14	-2 63	-4 61	-5 51	-4 79	-0 16
63	Moveis(min)	Jf12191	-0 14	-2 63	-4 61	-5 51	-9 91	-0 32
64	Moveis(min)	Jf12191	-4 87	-0 15	-38 38	-5 36	-13 04	-0 2
64	Moveis(min)	2/4	-4 87	-0 15	-38 38	-5 36	-8 93	-0 09
64	Moveis(min)	Jf12201	-4 87	-0 15	-38 38	-5 36	-9 49	-0 64
65	Moveis(min)	Jf12201	-4 21	-0 06	-30 78	-4 77	-9 5	-0 32
65	Moveis(min)	2/4	-4 21	-0 06	-30 78	-4 77	-10 28	-0 5
65	Moveis(min)	Jf12211	-4 21	-0 06	-30 78	-4 77	-14 13	-0 68
66	Moveis(min)	Jf12211	-3 9	-0 05	-23 87	-3 96	-14 2	-0 62
66	Moveis(min)	2/4	-3 9	-0 05	-23 87	-3 96	-18 17	-0 62
66	Moveis(min)	Jf12221	-3 9	-0 05	-23 87	-3 96	-22 15	-0 62
67	Moveis(min)	Jf12221	-3 72	-0 09	-17 83	-4 07	-22 23	-0 59
67	Moveis(min)	2/4	-3 72	-0 09	-17 83	-4 07	-26 33	-0 65
67	Moveis(min)	Jf12231	-3 72	-0 09	-17 83	-4 07	-30 44	-0 73
68	Moveis(min)	Jf12231	-3 57	-0 06	-12 52	-5 68	-30 52	-0 74
68	Moveis(min)	2/4	-3 57	-0 06	-12 52	-5 68	-34 78	-0 83
68	Moveis(min)	Jf12241	-3 57	-0 06	-12 52	-5 68	-39 05	-0 97
69	Moveis(min)	Jf12241	-3 45	-0 11	-7 88	-7 38	-39 13	-1 01
69	Moveis(min)	2/4	-3 45	-0 11	-7 88	-7 38	-43 57	-1 17
69	Moveis(min)	Jf12251	-3 45	-0 11	-7 88	-7 38	-48 02	-1 32
70	Moveis(min)	Jf12251	-3 32	-0 3	-3 87	-9 25	-48 1	-1 43
70	Moveis(min)	2/4	-3 32	-0 3	-3 87	-9 25	-52 75	-1 3
70	Moveis(min)	Jf12261	-3 32	-0 3	-3 87	-9 25	-57 39	-1 16
71	Moveis(min)	Jf12261	-3 18	-1 44	-1 29	-11 37	-57 48	-1 35
71	Moveis(min)	2/4	-3 18	-1 44	-1 29	-11 37	-62 66	-0 28
71	Moveis(min)	Jf12271	-3 18	-1 44	-1 29	-11 37	-70 46	-0 28
72	Moveis(min)	Jf12271	-3 07	-5 6	-1 12	-14 2	-70 65	-0 24
72	Moveis(min)	2/4	-3 07	-5 6	-1 12	-14 2	-81 8	-0 85
72	Moveis(min)	Jf12281	-3 07	-5 6	-1 12	-14 2	-95 73	-1 61
73	Moveis(min)	Jf12281	-2 58	-1 11	-47 58	-6 25	-97 02	-1 87
73	Moveis(min)	2/4	-2 58	-1 11	-47 58	-6 25	-72 63	-1 04
73	Moveis(min)	Jf12291	-2 58	-1 11	-47 58	-6 25	-60 84	-0 32
74	Moveis(min)	Jf12291	-2 63	-0 34	-41 14	-5 88	-60 63	-0 39
74	Moveis(min)	2/4	-2 63	-0 34	-41 14	-5 88	-51 57	-0 29
74	Moveis(min)	Jf12301	-2 63	-0 34	-41 14	-5 88	-45 26	-1 35
75	Moveis(min)	Jf12301	-2 66	-0 09	-34 72	-5 34	-45 17	-1 16
75	Moveis(min)	2/4	-2 66	-0 09	-34 72	-5 34	-41 6	-1 3

75	Moveis(min)	JF12311	-2 66	-0 09	-34 72	-5 34	-38 91	-1 43
76	Moveis(min)	JF12311	-2 64	-0 21	-28 61	-4 6	-38 86	-1 32
76	Moveis(min)	2/4	-2 64	-0 21	-28 61	-4 6	-36 48	-1 17
76	Moveis(min)	JF12321	-2 64	-0 21	-28 61	-4 6	-34 1	-1 02
77	Moveis(min)	JF12321	-2 61	-0 23	-22 92	-5 6	-34 06	-0 98
77	Moveis(min)	2/4	-2 61	-0 23	-22 92	-5 6	-31 84	-0 92
77	Moveis(min)	JF12331	-2 61	-0 23	-22 92	-5 6	-29 64	-0 87
78	Moveis(min)	JF12331	-2 58	-0 15	-17 65	-6 77	-29 6	-0 86
78	Moveis(min)	2/4	-2 58	-0 15	-17 65	-6 77	-27 55	-0 85
78	Moveis(min)	JF12341	-2 58	-0 15	-17 65	-6 77	-29 6	-0 86
79	Moveis(min)	JF12341	-2 61	-0 1	-12 85	-7 99	-29 64	-0 87
79	Moveis(min)	2/4	-2 61	-0 1	-12 85	-7 99	-31 84	-0 92
79	Moveis(min)	JF12351	-2 61	-0 1	-12 85	-7 99	-34 06	-0 98
80	Moveis(min)	JF12351	-2 64	-0 12	-8 5	-9 37	-34 1	-1 02
80	Moveis(min)	2/4	-2 64	-0 12	-8 5	-9 37	-36 48	-1 15
80	Moveis(min)	JF12361	-2 64	-0 12	-8 5	-9 37	-38 86	-1 3
81	Moveis(min)	JF12361	-2 66	-0 31	-4 71	-10 93	-38 91	-1 42
81	Moveis(min)	2/4	-2 66	-0 31	-4 71	-10 93	-41 6	-1 28
81	Moveis(min)	JF12371	-2 66	-0 31	-4 71	-10 93	-45 17	-1 15
82	Moveis(min)	JF12371	-2 63	-1 42	-3 97	-12 81	-45 26	-1 33
82	Moveis(min)	2/4	-2 63	-1 42	-3 97	-12 81	-51 57	-0 29
82	Moveis(min)	JF12381	-2 63	-1 42	-3 97	-12 81	-60 63	-0 39
83	Moveis(min)	JF12381	-2 58	-5 53	-3 77	-15 44	-60 84	-0 32
83	Moveis(min)	2/4	-2 58	-5 53	-3 77	-15 44	-72 63	-1 04
83	Moveis(min)	JF12391	-2 58	-5 53	-3 77	-15 44	-97 02	-1 87
84	Moveis(min)	JF12391	-3 07	-1 03	-46 29	-4 66	-95 73	-1 61
84	Moveis(min)	2/4	-3 07	-1 03	-46 29	-4 66	-81 8	-0 85
84	Moveis(min)	JF12401	-3 07	-1 03	-46 29	-4 66	-70 65	-0 24
85	Moveis(min)	JF12401	-3 18	-0 31	-39 58	-4 2	-70 46	-0 28
85	Moveis(min)	2/4	-3 18	-0 31	-39 58	-4 2	-62 66	-0 28
85	Moveis(min)	JF12411	-3 18	-0 31	-39 58	-4 2	-57 48	-1 33
86	Moveis(min)	JF12411	-3 32	-0 09	-32 82	-3 44	-57 39	-1 15
86	Moveis(min)	2/4	-3 32	-0 09	-32 82	-3 44	-52 75	-1 28
86	Moveis(min)	JF12421	-3 32	-0 09	-32 82	-3 44	-48 1	-1 42
87	Moveis(min)	JF12421	-3 45	-0 21	-26 23	-4 82	-48 02	-1 3
87	Moveis(min)	2/4	-3 45	-0 21	-26 23	-4 82	-43 57	-1 15
87	Moveis(min)	JF12431	-3 45	-0 21	-26 23	-4 82	-39 13	-1
88	Moveis(min)	JF12431	-3 57	-0 23	-19 84	-6 32	-39 05	-0 96
88	Moveis(min)	2/4	-3 57	-0 23	-19 84	-6 32	-34 78	-0 83
88	Moveis(min)	JF12441	-3 57	-0 23	-19 84	-6 32	-30 52	-0 74
89	Moveis(min)	JF12441	-3 72	-0 16	-13 6	-7 9	-30 44	-0 73
89	Moveis(min)	2/4	-3 72	-0 16	-13 6	-7 9	-26 33	-0 65
89	Moveis(min)	JF12451	-3 72	-0 16	-13 6	-7 9	-22 23	-0 59
90	Moveis(min)	JF12451	-3 9	-0 11	-7 37	-9 62	-22 15	-0 61
90	Moveis(min)	2/4	-3 9	-0 11	-7 37	-9 62	-18 17	-0 61
90	Moveis(min)	JF12461	-3 9	-0 11	-7 37	-9 62	-14 2	-0 61
91	Moveis(min)	JF12461	-4 21	-0 23	-5 46	-11 62	-14 13	-0 66
91	Moveis(min)	2/4	-4 21	-0 23	-5 46	-11 62	-10 28	-0 49
91	Moveis(min)	JF12471	-4 21	-0 23	-5 46	-11 62	-9 5	-0 32
92	Moveis(min)	JF12471	-4 87	-1 29	-5 17	-13 91	-9 49	-0 63
92	Moveis(min)	2/4	-4 87	-1 29	-5 17	-13 91	-8 93	-0 09
92	Moveis(min)	JF12481	-4 87	-1 29	-5 17	-13 91	-13 04	-0 2
93	Moveis(min)	JF12481	-0 14	-0 51	-17 61	-7 63	-9 91	-0 32
93	Moveis(min)	2/4	-0 14	-0 51	-17 61	-7 63	-4 79	-0 16
93	Moveis(min)	JF8561	-0 14	-0 51	-17 61	-7 63	-0 49	-0 02

## 5.5.2 Dimensionamento

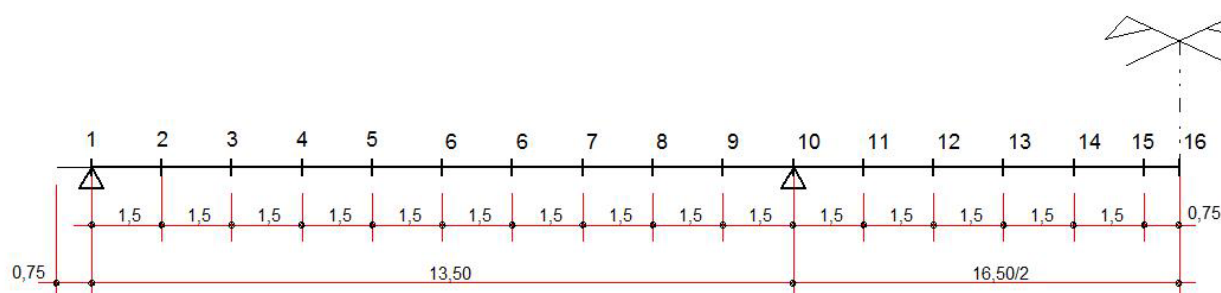
Concreto:  $f_{ck} = 25 \text{ Mpa}$  ; Aço: CA-50

E.L.U.:  $\gamma_f = 1,4$  ;  $\gamma_c = 1,4$  ;  $\gamma_s = 1,15$

Fadiga: coeficiente definido por flutuação de tensões.

Cobrimento das armaduras = 30 mm

### 5.5.2.1 Seções estudadas.



#### 5.5.2.1.1 Long.1:

##### 5.5.2.1.1.1 Flexão : $h=150\text{cm}$ ; $d=142\text{cm}$ ; $bf=360\text{m}$

Seção	Mg (tfm)	Mp+ (tfm)	Mp- (tfm)	Mmáx (tfm)	As (cm²)	Fadiga	As x fad.(cm²)
1	-9,83	4,38	-13,04	-22,87	5,31	1,00	-7,97
2	42,25	52,00	-9,50	94,25	21,90	1,00	21,90
3	74,04	90,51	-14,20	164,55	38,24	1,00	38,24
4	89,68	114,53	-22,23	204,21	47,56	1,00	47,56
5	89,24	124,01	-30,52	213,25	49,56	1,00	49,56
6	72,77	117,99	-39,13	190,76	44,33	1,00	44,33
7	40,35	98,10	-48,10	168,45	39,17	1,00	-39,15
				-7,75	1,78	1,00	-7,75
8	-7,88	66,10	-57,48	58,22	13,53	1,00	14,00
				-65,36	14,98	1,00	-19,47
9	-71,61	27,71	-70,46	-142,07	34,04	1,00	-34,04
10	-149,34	9,37	-97,02	-246,36	60,22	1,00	-60,22
11	-71,41	23,78	-60,63	-132,04	31,63	1,00	-31,63
12	-8,46	57,12	-45,17	48,66	11,31	1,00	11,31
				-52,63	12,06	1,00	-16,29
13	39,05	90,38	-38,86	129,43	30,08	1,00	32,16
				-0,19	0,04	1,00	-0,04
14	70,79	114,08	-34,06	185,59	43,13	1,00	43,13
15	86,66	126,08	-29,60	212,74	49,44	1,00	49,44
16	87,63	126,13	-27,55	213,76	49,68	1,00	49,68

5.5.2.1.2 Cortante:  $h = 150 \text{ cm}$  ;  $d = 142 \text{ cm}$  ;  $bw = 60 \text{ cm}$

Seção	Vg (tf)	Vp+ (tf)	Vp- (tf)	Vmáx (tf)	$\tau_{wd}$ (kgf/m <sup>2</sup> )	Ase (cm <sup>2</sup> /m)	Fadiga	AsexFad. (cm <sup>2</sup> /m)
1	-33,87	5,17	-39,10	72,97	11,99	12,95	1,40	18,10
2	-28,69	5,46	-38,38	67,07	11,02	11,46	1,56	17,91
3	-18,46	7,36	-30,78	49,24	8,09	6,95	2,24	15,58
4	-7,80	13,60	-23,87	31,67	5,20	2,51	3,30	8,28
5	2,83	19,84	-17,83	22,67	3,73	0,25	4,60	1,15
6	13,42	26,23	-12,58	39,65	6,52	4,54	3,49	15,86
7	23,96	32,82	-7,88	56,78	9,33	8,86	1,88	16,63
8	34,40	39,58	-3,87	73,98	12,16	13,22	1,34	17,71
9	44,62	41,30	-1,29	85,92	14,12	16,23	1,07	17,40
10e	54,41	46,29	-1,12	100,70	16,55	19,97	1,00	19,97
10d	-53,99	3,77	-47,58	101,57	16,69	20,19	1,00	20,19
11	-48,82	3,97	-41,14	89,96	14,78	17,12	1,08	18,42
12	-39,04	4,71	-34,72	73,76	12,12	13,15	1,22	16,10
13	-28,85	8,50	-28,61	57,46	9,44	9,03	1,68	15,15
14	-18,43	12,85	-22,92	41,35	6,79	4,95	2,95	14,61
15	-7,94	17,65	-17,65	25,59	4,20	0,97	3,68	3,57
16	0,00	18,03	-18,03	18,03	2,96	-----	-----	-----

5.5.2.2 Long. 2

5.5.2.2.1 Flexão:  $h = 150 \text{ cm}$  ;  $d = 142 \text{ cm}$  ;  $bf = 420 \text{ cm}$

Seção	Mg (tfm)	Mp+ (tfm)	Mp- (tfm)	Mmáx (tfm)	As (cm <sup>2</sup> )	Fadiga	As x fad (cm <sup>2</sup> )
1	-6,70	2,55	-16,18	-22,88	-5,24	1,00	-5,24
2	44,91	50,63	-9,60	95,54	22,20	1,00	22,20
3	75,62	89,49	-12,70	165,11	38,37	1,00	38,37
4	90,46	114,45	-20,11	204,91	47,62	1,00	47,62
5	89,65	123,60	-28,16	213,25	49,55	1,00	49,42
6	73,25	117,91	-36,94	191,16	44,42	1,00	44,42
7	41,23	98,71	-46,55	139,94	32,52	1,11	36,15
				-5,32	-1,24	1,00	-1,24
8	-6,60	66,98	-57,02	60,38	14,03	1,06	14,84
				-63,62	-14,78	1,25	-18,42
9	-70,52	28,77	-73,09	-143,61	-34,21	1,00	-34,21
10	-149,71	9,40	-106,23	-255,94	-63,99	1,00	-63,99
11	-70,30	25,17	-64,89	-135,19	-31,92	1,00	-31,92
12	-7,12	58,06	-45,67	50,94	11,84	1,01	11,96
				-52,79	-12,27	1,28	-15,71
13	39,96	90,78	-37,71	130,74	30,38	1,05	31,98
14	71,19	113,88	-32,47	185,07	43,00	1,00	43,00
15	86,75	125,36	-28,13	212,11	49,30	1,00	49,30
16	87,72	125,40	-28,10	213,12	49,53	1,00	47,53

5.5.2.2.2 Cortante: h = 150 cm ; d = 142 cm ; bw = 60 cm

Seção	Vg (tf)	Vp+ (tf)	Vp- (tf)	Vmáx (tf)	$\tau_{wd}$ (kgf/m <sup>2</sup> )	Ase (cm <sup>2</sup> /m)	Fad	AsexFad. (cm <sup>2</sup> /m)
1	- 33,11	3,46	-40,28	73,39	12,06	13,06	1,37	17,85
2	- 22,95	4,62	-31,75	54,70	8,99	8,34	2,89	24,09
3	- 12,45	5,02	-24,44	36,89	6,06	3,83	3,14	12,03
4	-2,09	8,18	-18,45	20,54	3,37	----	----	----
5	8,22	14,58	-13,36	22,80	3,75	----	----	----
6	18,56	20,81	-8,86	39,31	6,46	4,45	2,72	12,12
7	31,59	27,20	-4,83	58,79	9,66	9,37	1,39	13,01
8	39,64	34,05	-1,70	73,69	12,11	13,14	1,11	14,60
9	50,34	41,39	-1,07	91,73	15,07	17,69	1,00	17,69
10e	55,52	49,08	-0,25	104,60	17,19	20,95	1,00	20,95
10d	- 55,14	2,41	-50,33	105,47	17,33	21,17	1,00	21,17
11	- 44,42	3,16	-48,21	92,63	15,22	17,92	1,18	21,15
12	- 33,77	3,51	-35,76	67,53	11,10	11,59	1,38	16,04
13	- 23,29	5,82	-29,35	52,64	8,65	7,82	1,84	14,37
14	- 12,92	9,74	-23,71	36,63	6,02	3,77	3,62	13,66
15	-7,74	14,04	-17,91	25,65	4,21	0,99	4,10	4,06
16	0,00	18,66	-18,66	18,66	3,07	----	----	----

5.5.2.3 Long.3

5.5.2.3.1 Flexão: h = 150 cm ; d = 142 cm ; bf = 420 cm

Seção	Mg (tfm)	Mp+ (tfm)	Mp- (tfm)	Mmáx (tfm)	As (cm <sup>2</sup> )	Fadiga	As x fad.(cm <sup>2</sup> )
1	-19,78	4,26	-10,03	-29,81	6,83	1,00	6,83
2	45,79	45,82	-8,07	91,61	21,29	1,00	21,29
3	85,32	78,38	-12,45	163,69	38,04	1,00	38,04
4	105,51	98,43	-19,42	203,94	47,39	1,00	47,39
5	106,03	106,32	-26,54	212,35	49,35	1,00	49,35
6	86,84	101,02	-33,85	187,86	43,66	1,00	43,66
7	48,02	83,95	-41,36	131,97	30,67	1,02	31,28
8	-10,27	56,70	-49,09	46,43	10,79	1,00	10,79
				-59,36	13,60	1,37	18,63
9	-87,86	23,94	-59,78	-147,64	35,17	1,00	35,17
10	-183,43	8,24	-80,92	-264,35	66,64	1,00	66,64
11	-87,18	20,67	-51,14	-138,32	32,75	1,00	32,75
12	-9,05	49,17	-38,72	40,12	9,32	1,00	9,32
				-47,77	10,95	1,37	15,00
13	49,80	77,30	-33,59	127,10	29,54	1,00	29,54
14	89,21	97,35	-29,56	186,56	43,36	1,00	43,36
15	109,02	107,49	-25,72	216,51	50,32	1,00	50,32
16	110,13	107,54	-23,91	217,67	50,59	1,00	50,59



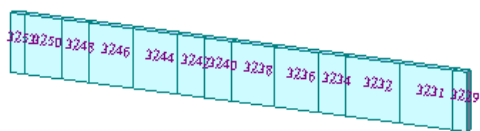
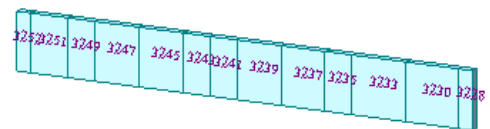
5.5.2.3.2 Cortante:  $h = 150 \text{ cm}$  ;  $d = 142 \text{ cm}$  ;  $b_w = 60 \text{ cm}$

Seção	Vp (tf)	Vp+ (tf)	Vp- (tf)	Vmáx (tfm)	$\tau_{wd}$ (kgf/m <sup>2</sup> )	Ase (cm <sup>2</sup> /m)	Fad	Ase x fad.(cm <sup>2</sup> /m)
1	-40,64	3,77	- 32,89	73,53	12,08	13,09	1,16	15,18
2	-28,63	4,52	- 26,42	55,05	9,05	8,43	1,52	12,81
3	-15,93	4,74	- 20,59	36,52	6,00	3,74	2,81	10,51
4	3,01	6,71	- 15,49	18,50	3,04	----	----	----
5	9,94	12,00	- 11,01	21,94	3,61	----	----	----
6	22,85	17,27	-7,10	40,12	6,59	4,65	2,17	10,09
7	35,65	22,65	-3,72	58,30	9,58	9,25	1,18	10,92
8	48,34	28,18	-1,24	76,52	12,57	13,85	1,00	13,85
9	61,13	33,79	-1,00	94,92	15,60	18,51	1,00	18,51
10e	66,30	39,40	-0,25	105,70	17,37	21,23	1,00	21,23
10d	-66,65	2,61	- 40,42	107,07	17,59	21,57	1,00	21,57
11	-53,87	3,36	- 35,02	88,89	14,61	16,98	1,00	16,98
12	-41,19	3,50	- 29,70	10,89	11,65	12,43	1,11	12,43
13	-28,40	4,45	- 24,58	52,98	8,71	7,91	1,52	7,91
14	-15,51	7,65	- 19,79	35,30	5,80	3,43	3,31	3,43
15	-2,59	11,30	- 15,36	17,95	2,95	----	----	----
16	0,00	14,98	- 14,98	14,98	2,46	----	----	----

## 5.6 Cortinas

### 5.6.1 Esforços

Definidos no “MIDAS/CIVIL”, Ver ilustração e tabelas a seguir.







Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf*m)	Moment-y (tonf*m)	Moment-z (tonf*m)
3228	Moveis(max)	II7831	0.01	0.02	0.03	0.01	0	0
3228	Moveis(max)	2/4	0.01	0.02	0.03	0.01	0.03	0
3228	Moveis(max)	J17371	0.01	0.02	0.03	0.01	0.07	0
3229	Moveis(max)	II7851	0.01	0	0.03	0.07	0	0
3229	Moveis(max)	2/4	0.01	0	0.03	0.07	0.03	0
3229	Moveis(max)	J114531	0.01	0	0.03	0.07	0.07	0.01
3230	Moveis(max)	II7371	0.03	0.01	0.08	0.06	0.08	0.01
3230	Moveis(max)	2/4	0.03	0.01	0.08	0.06	0.38	0
3230	Moveis(max)	J114561	0.03	0.01	0.08	0.06	0.68	0
3231	Moveis(max)	II14531	0.03	0	0.08	0.28	0.08	0
3231	Moveis(max)	2/4	0.03	0	0.08	0.28	0.38	0
3231	Moveis(max)	J114551	0.03	0	0.08	0.28	0.68	0
3232	Moveis(max)	II14551	0.19	0.01	0.15	0.45	0.71	0.01
3232	Moveis(max)	2/4	0.19	0.01	0.15	0.45	1.26	0
3232	Moveis(max)	J18511	0.19	0.01	0.15	0.45	1.81	0.02
3233	Moveis(max)	II14561	0.19	0.02	0.15	0.08	0.71	0.01
3233	Moveis(max)	2/4	0.19	0.02	0.15	0.08	1.26	0
3233	Moveis(max)	J18521	0.19	0.02	0.15	0.08	1.81	0.01
3234	Moveis(max)	II8511	0.77	0.1	3.91	1.61	8.94	0.05
3234	Moveis(max)	2/4	0.77	0.1	3.91	1.61	7.66	0.01
3234	Moveis(max)	J17791	0.77	0.1	3.91	1.61	7.44	0.01
3235	Moveis(max)	II8521	0.77	0.03	3.91	0.36	8.94	0.02
3235	Moveis(max)	2/4	0.77	0.03	3.91	0.36	7.66	0.01
3235	Moveis(max)	J17801	0.77	0.03	3.91	0.36	7.44	0.03
3236	Moveis(max)	II7791	0.8	0	4.24	1.21	7.63	0
3236	Moveis(max)	2/4	0.8	0	4.24	1.21	9.81	0
3236	Moveis(max)	J17861	0.8	0	4.24	1.21	12.03	0
3237	Moveis(max)	II7801	0.8	0.01	4.24	0.53	7.63	0.01
3237	Moveis(max)	2/4	0.8	0.01	4.24	0.53	9.81	0
3237	Moveis(max)	J17871	0.8	0.01	4.24	0.53	12.03	0.01
3238	Moveis(max)	II7861	0.73	0.01	7.58	0.82	12.01	0.01
3238	Moveis(max)	2/4	0.73	0.01	7.58	0.82	7.48	0
3238	Moveis(max)	J17751	0.73	0.01	7.58	0.82	4.19	0.01
3239	Moveis(max)	II7871	0.73	0.01	7.58	1.47	12.01	0.01
3239	Moveis(max)	2/4	0.73	0.01	7.58	1.47	7.48	0
3239	Moveis(max)	J17761	0.73	0.01	7.58	1.47	4.19	0.01
3240	Moveis(max)	II7751	0.51	0.02	10.76	0.73	3.99	0.01
3240	Moveis(max)	2/4	0.51	0.02	10.76	0.73	3.63	0.01
3240	Moveis(max)	J18531	0.51	0.02	10.76	0.73	3.64	0.05
3241	Moveis(max)	II7761	0.51	0.09	10.76	1.91	3.99	0.02
3241	Moveis(max)	2/4	0.51	0.09	10.76	1.91	3.63	0
3241	Moveis(max)	J18541	0.51	0.09	10.76	1.91	3.64	0.01
3242	Moveis(max)	II8531	0.45	0.08	2.77	2.07	6.05	0.05
3242	Moveis(max)	2/4	0.45	0.08	2.77	2.07	5.17	0.01
3242	Moveis(max)	J17771	0.45	0.08	2.77	2.07	5.71	0.01
3243	Moveis(max)	II8541	0.45	0.03	2.77	0.69	6.05	0.01
3243	Moveis(max)	2/4	0.45	0.03	2.77	0.69	5.17	0.01
3243	Moveis(max)	J17781	0.45	0.03	2.77	0.69	5.73	0.02
3244	Moveis(max)	II7771	0.58	0.01	2.98	1.31	6	0.01
3244	Moveis(max)	2/4	0.58	0.01	2.98	1.31	9.36	0
3244	Moveis(max)	J17881	0.58	0.01	2.98	1.31	12.87	0.01
3245	Moveis(max)	II7781	0.58	0.01	2.98	0.82	6.02	0.01
3245	Moveis(max)	2/4	0.58	0.01	2.98	0.82	9.35	0
3245	Moveis(max)	J17891	0.58	0.01	2.98	0.82	12.84	0.01
3246	Moveis(max)	II7881	0.68	0.01	4.56	0.8	12.89	0
3246	Moveis(max)	2/4	0.68	0.01	4.56	0.8	12.04	0
3246	Moveis(max)	J17691	0.68	0.01	4.56	0.8	11.28	0
3247	Moveis(max)	II7891	0.68	0.01	4.56	1.21	12.86	0.01
3247	Moveis(max)	2/4	0.68	0.01	4.56	1.21	11.98	0
3247	Moveis(max)	J17701	0.68	0.01	4.56	1.21	11.13	0.01
3248	Moveis(max)	II7691	0.64	0.03	9.3	0.7	11.04	0.01
3248	Moveis(max)	2/4	0.64	0.03	9.3	0.7	8.47	0.01
3248	Moveis(max)	J18551	0.64	0.03	9.3	0.7	8.76	0.05
3249	Moveis(max)	II7701	0.64	0.1	9.4	2.02	10.89	0.03
3249	Moveis(max)	2/4	0.64	0.1	9.4	2.02	8.25	0
3249	Moveis(max)	J18561	0.64	0.1	9.4	2.02	8.52	0.02
3250	Moveis(max)	II8551	0.12	0.04	0.78	1.16	1.04	0.02
3250	Moveis(max)	2/4	0.12	0.04	0.78	1.16	0.61	0

3250	Moveis(max)	J[1454]	0.12	0.04	0.78	1.16	0.18	0.01
3251	Moveis(max)	I[856]	0.12	0.01	0.76	0.33	1.02	0.01
3251	Moveis(max)	2/4	0.12	0.01	0.76	0.33	0.6	0
3251	Moveis(max)	J[742]	0.12	0.01	0.76	0.33	0.18	0.02
3252	Moveis(max)	I[742]	0.01	0	0.34	0.1	0.14	0
3252	Moveis(max)	2/4	0.01	0	0.34	0.1	0.07	0
3252	Moveis(max)	J[782]	0.01	0	0.34	0.1	0.01	0.01
3253	Moveis(max)	I[1454]	0.01	0.01	0.35	0.36	0.14	0
3253	Moveis(max)	2/4	0.01	0.01	0.35	0.36	0.07	0
3253	Moveis(max)	J[784]	0.01	0.01	0.35	0.36	0.01	0
3228	Permanentes	I[783]	-14.78	-1.19	4.21	0.45	-0.03	0.98
3228	Permanentes	2/4	-14.78	-1.32	4.94	0.45	-0.95	1.23
3228	Permanentes	J[737]	-14.78	-1.45	5.67	0.45	-2.01	1.51
3229	Permanentes	I[785]	-14.78	1.19	4.21	-0.45	-0.03	-0.98
3229	Permanentes	2/4	-14.78	1.32	4.94	-0.45	-0.95	-1.23
3229	Permanentes	J[1453]	-14.78	1.45	5.67	-0.45	-2.01	-1.51
3230	Permanentes	I[737]	-36.43	0.23	7.6	1.55	-2.22	0.54
3230	Permanentes	2/4	-36.43	-0.3	10.46	1.55	-9.32	0.57
3230	Permanentes	J[1456]	-36.43	-0.83	13.32	1.55	-18.68	1.01
3231	Permanentes	I[1453]	-36.43	-0.23	7.6	-1.55	-2.22	-0.54
3231	Permanentes	2/4	-36.43	0.3	10.46	-1.55	-9.32	-0.57
3231	Permanentes	J[1455]	-36.43	0.83	13.32	-1.55	-18.68	-1.01
3232	Permanentes	I[1455]	-43.89	3.21	12.84	-1.58	-19.06	2.78
3232	Permanentes	2/4	-43.89	3.74	15.71	-1.58	-30.3	0.05
3232	Permanentes	J[851]	-43.89	4.26	18.57	-1.58	-43.8	-3.1
3233	Permanentes	I[1456]	-43.89	-3.21	12.84	1.58	-19.06	-2.78
3233	Permanentes	2/4	-43.89	-3.74	15.71	1.58	-30.3	-0.05
3233	Permanentes	J[852]	-43.89	-4.26	18.57	1.58	-43.8	3.1
3234	Permanentes	I[851]	-38.85	-10.83	-16.67	0.09	-35.85	-5.36
3234	Permanentes	2/4	-38.85	-10.56	-15.22	0.09	-29.47	-1.08
3234	Permanentes	J[779]	-38.85	-10.3	-13.76	0.09	-23.67	3.09
3235	Permanentes	I[852]	-38.85	10.83	-16.67	-0.09	-35.85	5.36
3235	Permanentes	2/4	-38.85	10.56	-15.22	-0.09	-29.47	1.08
3235	Permanentes	J[780]	-38.85	10.3	-13.76	-0.09	-23.67	-3.09
3236	Permanentes	I[779]	-62.65	-0.56	-14.04	0.09	-23.46	0.22
3236	Permanentes	2/4	-62.65	-0.12	-11.68	0.09	-15.11	0.44
3236	Permanentes	J[786]	-62.65	0.31	-9.31	0.09	-8.29	0.38
3237	Permanentes	I[780]	-62.65	0.56	-14.04	-0.09	-23.46	-0.22
3237	Permanentes	2/4	-62.65	0.12	-11.68	-0.09	-15.11	-0.44
3237	Permanentes	J[787]	-62.65	-0.31	-9.31	-0.09	-8.29	-0.38
3238	Permanentes	I[786]	-69.25	-0.58	-8.02	-0.26	-8.21	0.24
3238	Permanentes	2/4	-69.25	-0.14	-5.66	-0.26	-3.76	0.48
3238	Permanentes	J[775]	-69.25	0.29	-3.29	-0.26	-0.85	0.43
3239	Permanentes	I[787]	-69.25	0.58	-8.02	0.26	-8.21	-0.24
3239	Permanentes	2/4	-69.25	0.14	-5.66	0.26	-3.76	-0.48
3239	Permanentes	J[776]	-69.25	-0.29	-3.29	0.26	-0.85	-0.43
3240	Permanentes	I[775]	-55.48	9.3	-2.41	-0.44	-0.85	2.98
3240	Permanentes	2/4	-55.48	9.57	-0.95	-0.44	-0.18	-0.79
3240	Permanentes	J[853]	-55.48	9.84	0.5	-0.44	-0.09	-4.67
3241	Permanentes	I[776]	-55.48	-9.3	-2.41	0.44	-0.85	-2.98
3241	Permanentes	2/4	-55.48	-9.57	-0.95	0.44	-0.18	0.79
3241	Permanentes	J[854]	-55.48	-9.84	0.5	0.44	-0.09	4.67
3242	Permanentes	I[853]	-58.49	-9.86	-10.47	0.23	-6.67	-4.71
3242	Permanentes	2/4	-58.49	-9.6	-9.02	0.23	-2.77	-0.82
3242	Permanentes	J[777]	-58.49	-9.33	-7.56	0.23	0.54	2.96
3243	Permanentes	I[854]	-58.49	9.86	-10.47	-0.23	-6.67	4.71
3243	Permanentes	2/4	-58.49	9.6	-9.02	-0.23	-2.77	0.82
3243	Permanentes	J[778]	-58.49	9.33	-7.56	-0.23	0.54	-2.96
3244	Permanentes	I[777]	-74.26	-0.32	-7.87	0.21	0.72	0.42
3244	Permanentes	2/4	-74.26	0.12	-5.5	0.21	5.06	0.48
3244	Permanentes	J[788]	-74.26	0.55	-3.14	0.21	7.87	0.26
3245	Permanentes	I[778]	-74.26	0.32	-7.87	-0.21	0.72	-0.42
3245	Permanentes	2/4	-74.26	-0.12	-5.5	-0.21	5.06	-0.48
3245	Permanentes	J[789]	-74.26	-0.55	-3.14	-0.21	7.87	-0.26
3246	Permanentes	I[788]	-67.72	-0.27	-1.62	-0.24	7.9	0.41
3246	Permanentes	2/4	-67.72	0.16	0.74	-0.24	8.19	0.44
3246	Permanentes	J[769]	-67.72	0.6	3.11	-0.24	6.94	0.19
3247	Permanentes	I[789]	-67.72	0.27	-1.62	0.24	7.9	-0.41
3247	Permanentes	2/4	-67.72	-0.16	0.74	0.24	8.19	-0.44
3247	Permanentes	J[770]	-67.72	-0.6	3.11	0.24	6.94	-0.19
3248	Permanentes	I[769]	-41.53	10.3	4.01	-0.46	6.81	3.09
3248	Permanentes	2/4	-41.53	10.56	5.46	-0.46	4.92	-1.09

3248	Permanentes	Jf855f	-41.53	10.83	6.92	-0.46	2.45	-5.37
3249	Permanentes	If770f	-41.53	-10.3	4.01	0.46	6.81	-3.09
3249	Permanentes	2/4	-41.53	-10.56	5.46	0.46	4.92	1.09
3249	Permanentes	Jf856f	-41.53	-10.83	6.92	0.46	2.45	5.37
3250	Permanentes	If855f	-20.55	-5.39	-9.28	0.17	-10.11	-3.56
3250	Permanentes	2/4	-20.55	-5.02	-7.28	0.17	-5.56	-0.7
3250	Permanentes	Jf1454f	-20.55	-4.65	-5.28	0.17	-2.1	1.96
3251	Permanentes	If856f	-20.55	5.39	-9.28	-0.17	-10.11	3.56
3251	Permanentes	2/4	-20.55	5.02	-7.28	-0.17	-5.56	0.7
3251	Permanentes	Jf742f	-20.55	4.65	-5.28	-0.17	-2.1	-1.96
3252	Permanentes	If742f	-14.38	1.73	-5.32	-0.1	-1.9	1.53
3252	Permanentes	2/4	-14.38	1.6	-4.59	-0.1	-0.9	1.2
3252	Permanentes	Jf782f	-14.38	1.46	-3.86	-0.1	-0.06	0.89
3253	Permanentes	If1454f	-14.38	-1.73	-5.32	0.1	-1.9	-1.53
3253	Permanentes	2/4	-14.38	-1.6	-4.59	0.1	-0.9	-1.2
3253	Permanentes	Jf784f	-14.38	-1.46	-3.86	0.1	-0.06	-0.89
3228	Moveis(min)	If783f	0	0	-0.18	-0.07	0	0
3228	Moveis(min)	2/4	0	0	-0.18	-0.07	0	0
3228	Moveis(min)	Jf737f	0	0	-0.18	-0.07	-0.01	-0.01
3229	Moveis(min)	If785f	0	-0.02	-0.18	-0.01	0	0
3229	Moveis(min)	2/4	0	-0.02	-0.18	-0.01	0	0
3229	Moveis(min)	Jf1453f	0	-0.02	-0.18	-0.01	-0.01	0
3230	Moveis(min)	If737f	-0.01	0	-0.38	-0.28	-0.01	0
3230	Moveis(min)	2/4	-0.01	0	-0.38	-0.28	-0.07	0
3230	Moveis(min)	Jf1456f	-0.01	0	-0.38	-0.28	-0.14	0
3231	Moveis(min)	If1453f	-0.01	-0.01	-0.38	-0.06	-0.01	-0.01
3231	Moveis(min)	2/4	-0.01	-0.01	-0.38	-0.06	-0.07	0
3231	Moveis(min)	Jf1455f	-0.01	-0.01	-0.38	-0.06	-0.14	0
3232	Moveis(min)	If1455f	-0.46	-0.02	-0.7	-0.08	-0.15	-0.01
3232	Moveis(min)	2/4	-0.46	-0.02	-0.7	-0.08	-0.25	0
3232	Moveis(min)	Jf851f	-0.46	-0.02	-0.7	-0.08	-0.36	-0.01
3233	Moveis(min)	If1456f	-0.46	-0.01	-0.7	-0.45	-0.15	-0.01
3233	Moveis(min)	2/4	-0.46	-0.01	-0.7	-0.45	-0.25	0
3233	Moveis(min)	Jf852f	-0.46	-0.01	-0.7	-0.45	-0.36	-0.02
3234	Moveis(min)	If851f	-2.5	-0.03	-5.88	-0.36	-1.95	-0.02
3234	Moveis(min)	2/4	-2.5	-0.03	-5.88	-0.36	-0.99	-0.01
3234	Moveis(min)	Jf779f	-2.5	-0.03	-5.88	-0.36	-0.75	-0.03
3235	Moveis(min)	If852f	-2.5	-0.1	-5.88	-1.61	-1.95	-0.05
3235	Moveis(min)	2/4	-2.5	-0.1	-5.88	-1.61	-0.99	-0.01
3235	Moveis(min)	Jf780f	-2.5	-0.1	-5.88	-1.61	-0.75	-0.01
3236	Moveis(min)	If779f	-2.63	-0.01	-4.66	-0.53	-0.77	-0.01
3236	Moveis(min)	2/4	-2.63	-0.01	-4.66	-0.53	-1.8	0
3236	Moveis(min)	Jf786f	-2.63	-0.01	-4.66	-0.53	-3.36	-0.01
3237	Moveis(min)	If780f	-2.63	0	-4.66	-1.21	-0.77	0
3237	Moveis(min)	2/4	-2.63	0	-4.66	-1.21	-1.8	0
3237	Moveis(min)	Jf787f	-2.63	0	-4.66	-1.21	-3.32	0
3238	Moveis(min)	If786f	-2.53	-0.02	-0.95	-1.47	-3.38	-0.01
3238	Moveis(min)	2/4	-2.53	-0.02	-0.95	-1.47	-4.99	0
3238	Moveis(min)	Jf775f	-2.53	-0.02	-0.95	-1.47	-6.61	-0.01
3239	Moveis(min)	If787f	-2.53	-0.01	-0.95	-0.82	-3.34	-0.01
3239	Moveis(min)	2/4	-2.53	-0.01	-0.95	-0.82	-4.86	0
3239	Moveis(min)	Jf776f	-2.53	-0.01	-0.95	-0.82	-6.4	-0.01
3240	Moveis(min)	If775f	-2.11	-0.09	-0.8	-1.91	-6.62	-0.02
3240	Moveis(min)	2/4	-2.11	-0.09	-0.8	-1.91	-7.78	0
3240	Moveis(min)	Jf853f	-2.11	-0.09	-0.8	-1.91	-9.73	-0.01
3241	Moveis(min)	If776f	-2.11	-0.02	-0.8	-0.71	-6.4	-0.01
3241	Moveis(min)	2/4	-2.11	-0.02	-0.8	-0.71	-7.78	-0.01
3241	Moveis(min)	Jf854f	-2.11	-0.02	-0.8	-0.71	-9.73	-0.05
3242	Moveis(min)	If853f	-2.88	-0.03	-12.63	-0.69	-9.68	-0.01
3242	Moveis(min)	2/4	-2.88	-0.03	-12.63	-0.69	-7.77	-0.01
3242	Moveis(min)	Jf777f	-2.88	-0.03	-12.63	-0.69	-6.1	-0.02
3243	Moveis(min)	If854f	-2.83	-0.08	-12.42	-2.08	-9.68	-0.05
3243	Moveis(min)	2/4	-2.83	-0.08	-12.42	-2.08	-7.77	-0.01
3243	Moveis(min)	Jf778f	-2.83	-0.08	-12.42	-2.08	-6.1	-0.01
3244	Moveis(min)	If777f	-3.44	-0.01	-6.03	-0.82	-6.07	-0.01
3244	Moveis(min)	2/4	-3.44	-0.01	-6.03	-0.82	-4.25	0
3244	Moveis(min)	Jf788f	-3.44	-0.01	-6.03	-0.82	-2.85	-0.01
3245	Moveis(min)	If778f	-3.4	-0.01	-5.88	-1.31	-6.07	-0.01
3245	Moveis(min)	2/4	-3.4	-0.01	-5.88	-1.31	-4.25	0
3245	Moveis(min)	Jf789f	-3.4	-0.01	-5.88	-1.31	-2.85	-0.01
3246	Moveis(min)	If788f	-3.54	-0.01	-4.13	-1.21	-2.84	-0.01
3246	Moveis(min)	2/4	-3.54	-0.01	-4.13	-1.21	-2.27	0

3246	Moveis(min)	Jf769l	-3.54	-0.01	-4.13	-1.21	-4.13	-0.01
3247	Moveis(min)	If789l	-3.5	-0.01	-4.13	-0.8	-2.84	0
3247	Moveis(min)	2/4	-3.5	-0.01	-4.13	-0.8	-2.27	0
3247	Moveis(min)	Jf770l	-3.5	-0.01	-4.13	-0.8	-4.13	0
3248	Moveis(min)	If769l	-3.14	-0.1	-3.78	-2.07	-4.15	-0.03
3248	Moveis(min)	2/4	-3.14	-0.1	-3.78	-2.07	-5.91	0
3248	Moveis(min)	Jf855l	-3.14	-0.1	-3.78	-2.07	-9.32	-0.02
3249	Moveis(min)	If770l	-3.12	-0.03	-3.78	-0.7	-4.15	-0.01
3249	Moveis(min)	2/4	-3.12	-0.03	-3.78	-0.7	-5.91	-0.01
3249	Moveis(min)	Jf856l	-3.12	-0.03	-3.78	-0.7	-9.32	-0.05
3250	Moveis(min)	If855l	-0.51	-0.01	-5.82	-0.34	-7.01	-0.01
3250	Moveis(min)	2/4	-0.51	-0.01	-5.82	-0.34	-3.81	0
3250	Moveis(min)	Jf1454l	-0.51	-0.01	-5.82	-0.34	-0.82	-0.02
3251	Moveis(min)	If856l	-0.51	-0.04	-5.82	-1.16	-7.01	-0.02
3251	Moveis(min)	2/4	-0.51	-0.04	-5.82	-1.16	-3.81	0
3251	Moveis(min)	Jf742l	-0.51	-0.04	-5.82	-1.16	-0.82	-0.01
3252	Moveis(min)	If742l	-0.02	-0.01	-1.58	-0.36	-0.63	0
3252	Moveis(min)	2/4	-0.02	-0.01	-1.58	-0.36	-0.31	0
3252	Moveis(min)	Jf782l	-0.02	-0.01	-1.58	-0.36	-0.01	0
3253	Moveis(min)	If1454l	-0.02	0	-1.58	-0.1	-0.63	0
3253	Moveis(min)	2/4	-0.02	0	-1.58	-0.1	-0.31	0
3253	Moveis(min)	Jf784l	-0.02	0	-1.58	-0.1	-0.01	-0.01

## 5.6.2 Esquema



## 5.6.3 Seção 1:

Cargas permanentes:  $M_g = -10,11 \text{ tfm}$

$$V_{1e} = -9,28 \text{ tf}$$

$$V_{1d} = 3,11 \text{ tf}$$

Cargas móveis:  $M_p^+ = 1,04 \text{ tfm}$

$$M_p^- = -9,32 \text{ tfm}$$

$$V_{1e} = -7,01 \text{ tf}$$

$$V_{1d} = 4,56 \text{ tf}$$

$$M_{\text{máx}} = -19,43 \text{ tfm} \rightarrow A_s = 4,42 \text{ cm}^2 ; f_{ad} = 1,0$$

$$V_{1e} = 16,29 \text{ tf} \rightarrow \tau_{\text{wd}} = 6,29 \text{ kgf/cm}^2 \rightarrow A_{se} = 1,74 \text{ cm}^2/\text{m}$$

$$V_{1d} = 7,67 \text{ tf} \rightarrow \tau_{\text{wd}} = 2,96 \text{ kgf/cm}^2$$

## 5.6.4 Seção 2:

Cargas permanentes:  $M_g = 7,87 \text{ tfm}$

Cargas móveis:  $M_p^+ = 12,89 \text{ tfm}$

$$M_p^- = -6,07 \text{ tfm}$$

$$M_{\text{máx}} = 20,76 \text{ tfm} \rightarrow A_s = 4,72 \text{ cm}^2$$

$$F_{ad} = 1,37 \rightarrow A_s \cdot f_{ad} = 6,47 \text{ cm}^2$$

### 5.6.5 Seção 3:

Cargas permanentes:  $M_g = -0,85 \text{ tfm}$

Cargas móveis:  $M_p^+ = 6,00 \text{ tfm}$

$M_p^- = -9,73 \text{ tfm}$

$$M_{\text{máx}} = -10,58 \text{ tfm} \rightarrow A_s = 2,41 \text{ tfm}$$

$$F_{ad} = 1,67 \rightarrow A_s \cdot f_{ad} = 4,01 \text{ cm}^2$$

### 5.6.6 Seção 4:

Cargas permanentes:  $M_g = -3,76 \text{ tfm}$

Cargas móveis:  $M_{p+} = 7,48 \text{ tfm}$

$M_{p-} = -4,99 \text{ tfm}$

$$M_{\text{máx}} = 3,72 \text{ tfm} \rightarrow A_s = 0,85 \text{ cm}^2$$

$$F_{ad} = 1,00$$

### 5.6.7 Seção 5:

Cargas permanentes:  $M_g = -35,85 \text{ tfm}$

$V_{5e} = -16,64 \text{ tf}$

$V_{5d} = 18,57 \text{ tf}$

Cargas móveis:  $M_p^+ = 8,94 \text{ tfm}$

$M_p^- = -1,95 \text{ tfm}$

$V_{5e} = -5,88 \text{ tf}$

$V_{5d} = 0,70 \text{ tf}$

$$M_{\text{máx}} = -37,80 \text{ tfm} \rightarrow A_s = 8,60 \text{ cm}^2$$

$$F_{ad} = 1,00$$

$$V_{5e} = 22,55 \text{ tf} \rightarrow \tau_{wd} = 8,71 \text{ kgf/cm}^2 \rightarrow A_{se} = 3,29 \text{ cm}^2/\text{m}$$

$$V_{5d} = 19,27 \text{ tf} \rightarrow \tau_{wd} = 7,44 \text{ kgf/cm}^2 \rightarrow A_{se} = 2,48 \text{ cm}^2/\text{m}$$

## 5.7 Viguetas Inferiores da Cortina (70X25)

### 5.7.1 Balanço Lado do Passeio

Reação do empuxo:  $0,94 \cdot 1,275 \cdot 0,5 + 0,803 \cdot 1,275/3 + 2,89 \cdot 0,125 = 1,302 \text{ tf/m}$

Reação momento: 50% do momento da faixa II = 0,915 tfm

Reação horizontal da ala devido ao peso:  $2,74 \cdot 1,13/1,275 = 2,43 \text{ tf}$

$M = 0,915 + 1,302 \cdot 3,55^2 \cdot 0,5 + 2,43 \cdot 3,425 = 17,44 \text{ tfm}$

$A_s = 0,34 \cdot 1744/65 = 9,12 \text{ cm}^2$

$V = 1,302 \cdot 3,55 + 2,43 = 7,05 \text{ tf}$

$\tau_{wd} = 1400 \cdot 7,05/25 \cdot 65 = 6,07 \text{ kgf/cm}^2$

$A_{se} = 1,61 \text{ cm}^2/\text{m}$

### 5.7.2 Balanço Lado da Pista

Reação do empuxo = 1,302 tf/m

Reação momento = 0,915 tfm

Reação horizontal da ala:  $3,40 \cdot 1,16/1,275 = 3,09 \text{ tf}$

$M = 0,915 + 1,302 \cdot 1,5^2 \cdot 0,5 + 3,40 \cdot 1,375 = 7,05 \text{ tfm}$

$A_s = 0,33 \cdot 705/65 = 3,58 \text{ cm}^2$

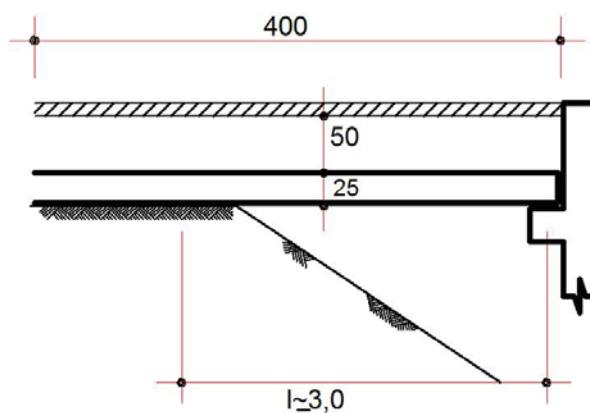
### 5.7.3 Vãos

$M_{adot} = 4,20^2 \cdot 1,302 \cdot 0,125 = 2,87 \text{ tfm}$

$A_{smin} = 2,63 \text{ cm}^2$



## 5.8 Placa de Transição



Carga permanente:  $pp = 0,25 \times 2,50 = 0,63 \text{ tf/m}^2$   
 pavimento =  $0,10 \times 2,40 = 0,24 \text{ tf/m}^2$   
 lastro =  $0,50 \times 1,80 = 0,90 \text{ tf/m}^2$   
 $g = 1,77 \text{ tf/m}^2$

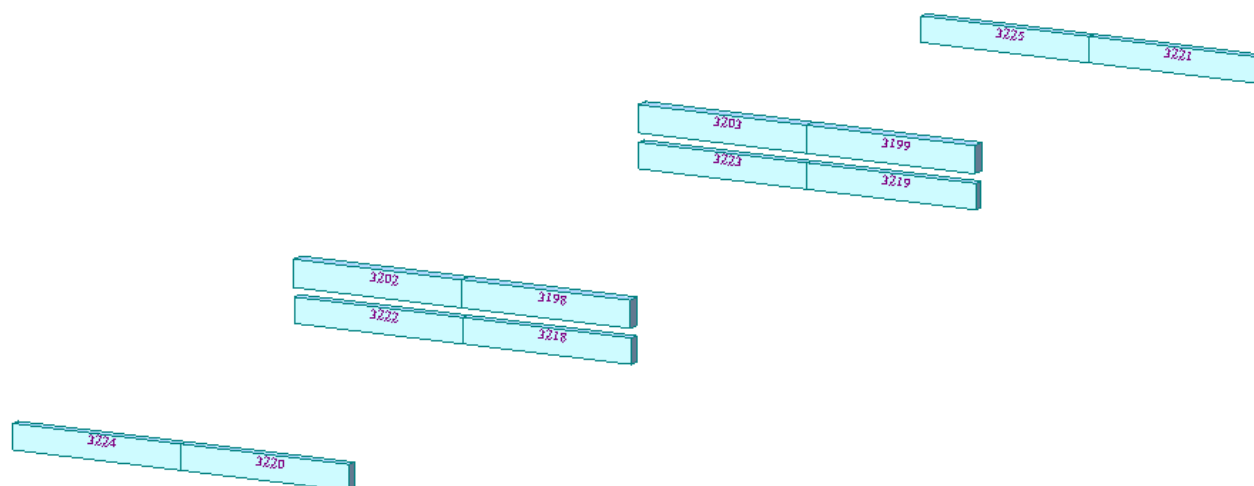
Carga móvel:  $p = 45,00/3 \times 3 = 2,50 \text{ tf/m}^2$

$M_0 = (1,77 + 2,50) \times 3,0^2/8 = 4,80 \text{ tfm/m}$

$As = 0,24 \times 480/21 = 7,77 \text{ cm}^2/\text{m} (\phi 10c/10)$

## 5.9 Travessas – 25x60

Os esforços foram definidos através do “MIDAS/CIVIL”, ver ilustração e tabelas a seguir:







Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf*m)	Moment-y (tonf*m)	Moment-z (tonf*m)
3198	Moveis(max)	IF1487	20.07	0.19	1.01	0.58	3.52	0.4
3198	Moveis(max)	2/4	20.07	0.19	1.01	0.58	1.69	0
3198	Moveis(max)	JF1489	20.07	0.19	1.01	0.58	3.49	0.36
3199	Moveis(max)	IF1488	20.07	0.17	1.01	0.51	3.52	0.36
3199	Moveis(max)	2/4	20.07	0.17	1.01	0.51	1.69	0
3199	Moveis(max)	JF1490	20.07	0.17	1.01	0.51	3.49	0.4
3202	Moveis(max)	IF1489	25.05	0.18	1.2	0.54	3.49	0.38
3202	Moveis(max)	2/4	25.05	0.18	1.2	0.54	2.14	0
3202	Moveis(max)	JF1491	25.05	0.18	1.2	0.54	3.17	0.4
3203	Moveis(max)	IF1490	24.8	0.19	1.2	0.58	3.49	0.4
3203	Moveis(max)	2/4	24.8	0.19	1.2	0.58	2.12	0
3203	Moveis(max)	JF1492	24.8	0.19	1.2	0.58	3.18	0.38
3218	Moveis(max)	IF1441	6.08	0.09	0.22	0.04	0.38	0.17
3218	Moveis(max)	2/4	6.08	0.09	0.22	0.04	0.08	0.01
3218	Moveis(max)	JF1443	6.08	0.09	0.22	0.04	1.36	0.17
3219	Moveis(max)	IF1442	6.08	0.08	0.22	0.04	0.38	0.15
3219	Moveis(max)	2/4	6.08	0.08	0.22	0.04	0.08	0.01
3219	Moveis(max)	JF1444	6.08	0.08	0.22	0.04	1.36	0.19
3220	Moveis(max)	IF1447	7.16	0.1	0.11	0.13	0.27	0.2
3220	Moveis(max)	2/4	7.16	0.1	0.11	0.13	0.23	0
3220	Moveis(max)	JF1449	7.16	0.1	0.11	0.13	0.91	0.13
3221	Moveis(max)	IF1448	7.16	0.06	0.11	0.19	0.27	0.13
3221	Moveis(max)	2/4	7.16	0.06	0.11	0.19	0.23	0
3221	Moveis(max)	JF1450	7.16	0.06	0.11	0.19	0.89	0.21
3222	Moveis(max)	IF1443	6.56	0.08	0.67	0.04	1.35	0.17
3222	Moveis(max)	2/4	6.56	0.08	0.67	0.04	0.06	0.01
3222	Moveis(max)	JF1445	6.56	0.08	0.67	0.04	0.95	0.17
3223	Moveis(max)	IF1444	6.47	0.09	0.67	0.04	1.35	0.2
3223	Moveis(max)	2/4	6.47	0.09	0.67	0.04	0.06	0.01
3223	Moveis(max)	JF1446	6.47	0.09	0.67	0.04	0.95	0.15
3224	Moveis(max)	IF1449	9.32	0.09	0.34	0.19	0.64	0.19
3224	Moveis(max)	2/4	9.32	0.09	0.34	0.19	0.18	0
3224	Moveis(max)	JF1451	9.32	0.09	0.34	0.19	0.23	0.2
3225	Moveis(max)	IF1450	9.24	0.1	0.34	0.18	0.64	0.21
3225	Moveis(max)	2/4	9.24	0.1	0.34	0.18	0.18	0
3225	Moveis(max)	JF1452	9.24	0.1	0.34	0.18	0.23	0.19
3198	Permanentes	IF1487	-69.68	0	-1.23	-0.05	-0.76	0
3198	Permanentes	2/4	-69.68	0	-0.06	-0.05	0.6	0
3198	Permanentes	JF1489	-69.68	0	1.12	-0.05	-0.51	0.01
3199	Permanentes	IF1488	-69.68	0	-1.23	0.05	-0.76	0
3199	Permanentes	2/4	-69.68	0	-0.06	0.05	0.6	0
3199	Permanentes	JF1490	-69.68	0	1.12	0.05	-0.51	-0.01
3202	Permanentes	IF1489	-45.31	-0.03	-4.9	-0.01	-6.34	-0.05
3202	Permanentes	2/4	-45.31	-0.03	-3.72	-0.01	2.71	0
3202	Permanentes	JF1491	-45.31	-0.03	-2.54	-0.01	9.28	0.06
3203	Permanentes	IF1490	-45.31	0.03	-4.9	0.01	-6.34	0.05
3203	Permanentes	2/4	-45.31	0.03	-3.72	0.01	2.71	0
3203	Permanentes	JF1492	-45.31	0.03	-2.54	0.01	9.28	-0.06
3218	Permanentes	IF1441	-8.63	0.01	0.22	-0.01	2.1	0.02
3218	Permanentes	2/4	-8.63	0.01	1.01	-0.01	0.81	0
3218	Permanentes	JF1443	-8.63	0.01	1.8	-0.01	-2.14	-0.02
3219	Permanentes	IF1442	-8.63	-0.01	0.22	0.01	2.1	-0.02
3219	Permanentes	2/4	-8.63	-0.01	1.01	0.01	0.81	0
3219	Permanentes	JF1444	-8.63	-0.01	1.8	0.01	-2.14	0.02
3220	Permanentes	IF1447	-23.58	-0.03	0	-0.08	2.14	-0.08
3220	Permanentes	2/4	-23.58	-0.03	0.79	-0.08	1.32	-0.03
3220	Permanentes	JF1449	-23.58	-0.03	1.57	-0.08	-1.16	0.03
3221	Permanentes	IF1448	-23.58	0.03	0	0.08	2.14	0.08
3221	Permanentes	2/4	-23.58	0.03	0.79	0.08	1.32	0.03
3221	Permanentes	JF1450	-23.58	0.03	1.57	0.08	-1.16	-0.03
3222	Permanentes	IF1443	-4.77	0.01	-0.6	-0.01	-0.12	0.01
3222	Permanentes	2/4	-4.77	0.01	0.19	-0.01	0.31	0
3222	Permanentes	JF1445	-4.77	0.01	0.98	-0.01	-0.92	-0.02
3223	Permanentes	IF1444	-4.77	-0.01	-0.6	0.01	-0.12	-0.01
3223	Permanentes	2/4	-4.77	-0.01	0.19	0.01	0.31	0
3223	Permanentes	JF1446	-4.77	-0.01	0.98	0.01	-0.92	0.02
3224	Permanentes	IF1449	-13.01	0.01	-2.03	-0.02	-2.77	0
3224	Permanentes	2/4	-13.01	0.01	-1.24	-0.02	0.68	-0.03
3224	Permanentes	JF1451	-13.01	0.01	-0.46	-0.02	2.46	-0.06

3225	Permanentes	IF1450]	-13,01	-0,01	-2,03	0,02	-2,77	0
3225	Permanentes	2/4	-13,01	-0,01	-1,24	0,02	0,68	0,03
3225	Permanentes	JF1452]	-13,01	-0,01	-0,46	0,02	2,46	0,06
3198	Moveis(min)	IF1487]	-6,22	-0,17	-1,21	-0,51	-1,91	-0,36
3198	Moveis(min)	2/4	-6,22	-0,17	-1,21	-0,51	-0,55	0
3198	Moveis(min)	JF1489]	-6,22	-0,17	-1,21	-0,51	-2,31	-0,4
3199	Moveis(min)	IF1488]	-6,22	-0,19	-1,21	-0,58	-1,91	-0,4
3199	Moveis(min)	2/4	-6,22	-0,19	-1,21	-0,58	-0,55	0
3199	Moveis(min)	JF1490]	-6,22	-0,19	-1,21	-0,58	-2,31	-0,36
3202	Moveis(min)	IF1489]	-5,5	-0,19	-0,63	-0,58	-1,55	-0,4
3202	Moveis(min)	2/4	-5,5	-0,19	-0,63	-0,58	-0,54	0
3202	Moveis(min)	JF1491]	-5,5	-0,19	-0,63	-0,58	-1,86	-0,38
3203	Moveis(min)	IF1490]	-5,5	-0,18	-0,63	-0,54	-1,55	-0,38
3203	Moveis(min)	2/4	-5,5	-0,18	-0,63	-0,54	-0,54	0
3203	Moveis(min)	JF1492]	-5,5	-0,18	-0,63	-0,54	-1,86	-0,4
3218	Moveis(min)	IF1441]	-1,59	-0,08	-0,67	-0,04	-1,47	-0,15
3218	Moveis(min)	2/4	-1,59	-0,08	-0,67	-0,04	-0,19	-0,01
3218	Moveis(min)	JF1443]	-1,59	-0,08	-0,67	-0,04	-0,56	-0,19
3219	Moveis(min)	IF1442]	-1,59	-0,09	-0,67	-0,04	-1,47	-0,17
3219	Moveis(min)	2/4	-1,59	-0,09	-0,67	-0,04	-0,19	-0,01
3219	Moveis(min)	JF1444]	-1,59	-0,09	-0,67	-0,04	-0,56	-0,17
3220	Moveis(min)	IF1447]	-2,33	-0,06	-0,34	-0,19	-0,85	-0,13
3220	Moveis(min)	2/4	-2,33	-0,06	-0,34	-0,19	-0,38	0
3220	Moveis(min)	JF1449]	-2,33	-0,06	-0,34	-0,19	-0,24	-0,21
3221	Moveis(min)	IF1448]	-2,32	-0,1	-0,34	-0,13	-0,85	-0,2
3221	Moveis(min)	2/4	-2,32	-0,1	-0,34	-0,13	-0,38	0
3221	Moveis(min)	JF1450]	-2,32	-0,1	-0,34	-0,13	-0,24	-0,13
3222	Moveis(min)	IF1443]	-1,51	-0,09	-0,45	-0,04	-0,92	-0,2
3222	Moveis(min)	2/4	-1,51	-0,09	-0,45	-0,04	-0,23	-0,01
3222	Moveis(min)	JF1445]	-1,51	-0,09	-0,45	-0,04	-1,46	-0,15
3223	Moveis(min)	IF1444]	-1,51	-0,08	-0,45	-0,04	-0,92	-0,17
3223	Moveis(min)	2/4	-1,51	-0,08	-0,45	-0,04	-0,23	-0,01
3223	Moveis(min)	JF1446]	-1,51	-0,08	-0,45	-0,04	-1,46	-0,17
3224	Moveis(min)	IF1449]	-1,96	-0,1	-0,11	-0,18	-0,28	-0,21
3224	Moveis(min)	2/4	-1,96	-0,1	-0,11	-0,18	-0,49	0
3224	Moveis(min)	JF1451]	-1,96	-0,1	-0,11	-0,18	-0,87	-0,19
3225	Moveis(min)	IF1450]	-1,96	-0,09	-0,11	-0,19	-0,28	-0,19
3225	Moveis(min)	2/4	-1,96	-0,09	-0,11	-0,19	-0,49	0
3225	Moveis(min)	JF1452]	-1,96	-0,09	-0,11	-0,19	-0,85	-0,2

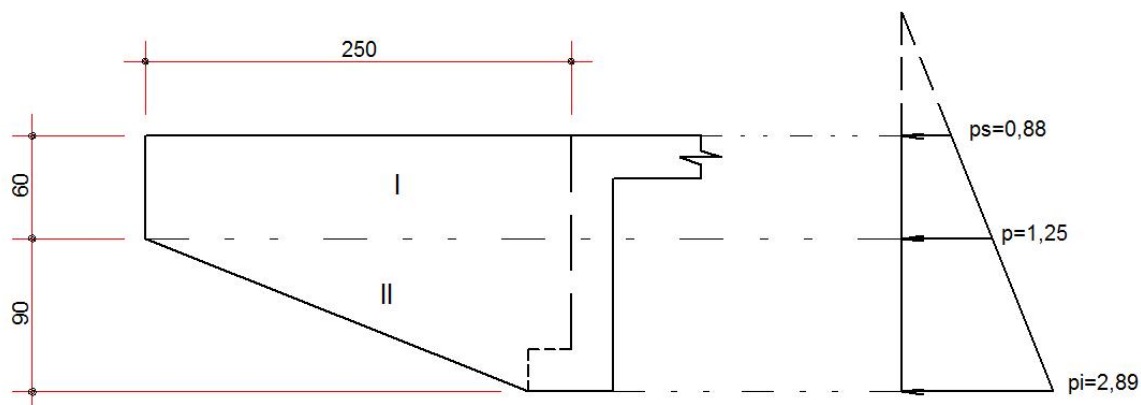
Considerando os esforços do “MIDAS/CIVIL” temos:

$$M_{\text{máx}} = 2,77 + 0,92 = 3,69 \text{ tfm}$$

$$A_s = 2,21 \text{ cm}^2 \text{ (} 2\phi 16 \text{ – adotado)}$$

$$A_{s_{\text{mín}}} = 2,55 \text{ cm}^2/\text{m} \text{ (} \phi 6,3\text{c}/20 \text{)}$$

## 5.10 Alas



Solo:  $\varphi = 25^\circ$  ;  $\gamma = 1,80 \text{ tf/m}^3$  ;  $\lambda = ka \cdot \gamma = 0,63 \text{ tf/m}^2$

$$p = 45/3 \cdot 6 = 2,50 \text{ tf/m}^2$$

$$h_0 = 2,50/1,80 = 1,39 \text{ m}$$

$$ps = 1,39 \cdot 0,63 = 0,88 \text{ tf/m}^2$$

$$pi = (1,39 + 1,50) \cdot 0,63 = 2,89 \text{ tf/m}^2$$

Faixa I:

$$M = 1,065 \cdot 0,60 \cdot 2,5^2 \cdot 0,50 = 2,00 \text{ tfm}$$

$$d = 19,00 \text{ cm} \rightarrow As = 0,34 \cdot 200/19 = 3,58 \text{ cm}^2$$

Faixa II:

$$M = 2,07 \cdot 0,90 \cdot 1,4^2 \cdot 0,50 = 1,83 \text{ tfm}$$

$$As = 0,34 \cdot 183/19 = 3,27 \text{ cm}^2$$

Faixa III:

$$M = 2,105 \cdot 0,90 \cdot 1,06^2 \cdot 0,50 = 1,06 \text{ tfm}$$

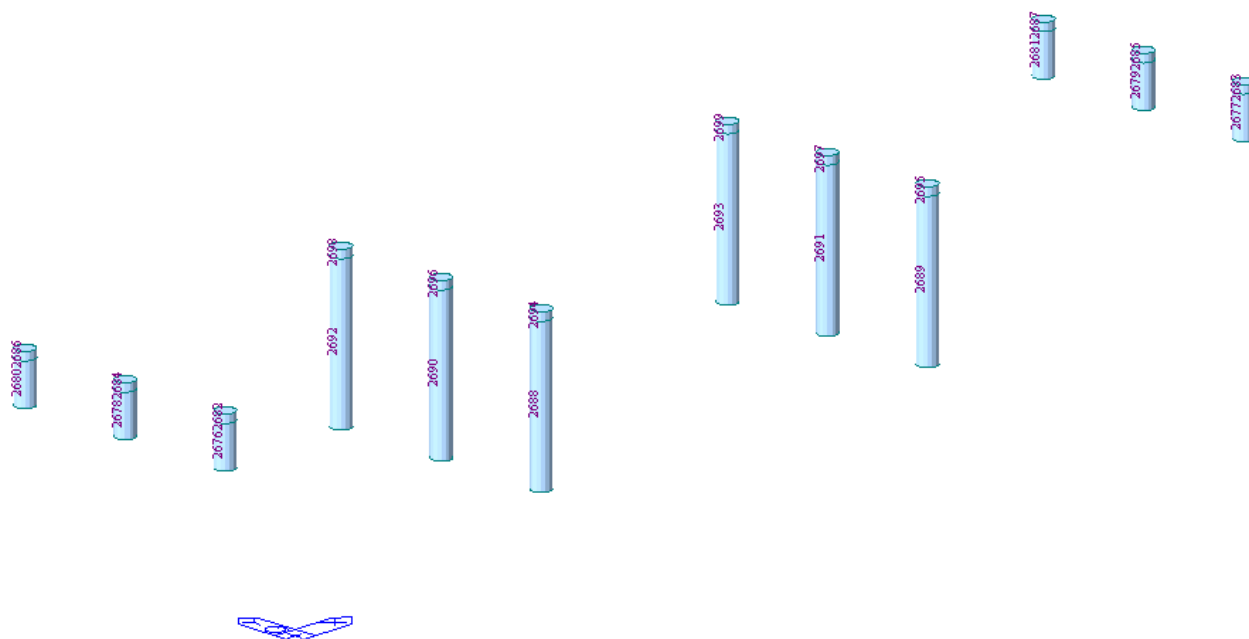
$$As = 1,81 \text{ cm}^2$$

## 5.11 Pilares

### 5.11.1 Esforços

Esforços definidos pelo programa "MIDAS/CIVIL".

Ver ilustração e tabela a seguir:





Elem	Load	Part	Axial (tonf)	Shear- y (tonf)	Shear- z (tonf)	Torsion (tonf*m)	Moment- y (tonf*m)	Moment- z (tonf*m)
2676	Moveis(max)	II448I	5	0.98	1.58	0.07	2.93	1.54
2676	Moveis(max)	2/4	5	0.98	1.58	0.07	1.75	1.79
2676	Moveis(max)	J11447	5	0.98	1.58	0.07	0.58	2.11
2677	Moveis(max)	II477I	5	0.96	5.67	0.05	10.69	1.54
2677	Moveis(max)	2/4	5	0.96	5.67	0.05	6.44	1.79
2677	Moveis(max)	J11448	5	0.96	5.67	0.05	2.18	2.11
2678	Moveis(max)	II478I	5.37	1.65	1.57	0.08	2.94	0.39
2678	Moveis(max)	2/4	5.37	1.65	1.57	0.08	1.76	1.44
2678	Moveis(max)	J11449	5.37	1.65	1.57	0.08	0.59	2.84
2679	Moveis(max)	II507I	5.37	1.65	6.78	0.07	12.64	0.39
2679	Moveis(max)	2/4	5.37	1.65	6.78	0.07	7.55	1.43
2679	Moveis(max)	J11450	5.37	1.65	6.78	0.07	2.46	2.83
2680	Moveis(max)	II508I	5.6	0.64	1.7	0.06	3.21	0.35
2680	Moveis(max)	2/4	5.6	0.64	1.7	0.06	1.93	0.41
2680	Moveis(max)	J11451	5.6	0.64	1.7	0.06	0.65	0.76
2681	Moveis(max)	II537I	5.6	0.63	6.72	0.07	12.65	0.35
2681	Moveis(max)	2/4	5.6	0.63	6.72	0.07	7.6	0.41
2681	Moveis(max)	J11452	5.6	0.63	6.72	0.07	2.56	0.76
2682	Moveis(max)	II1447I	5.04	6.72	1.62	0.09	0.65	2.69
2682	Moveis(max)	2/4	5.04	6.72	1.62	0.09	0.4	1.68
2682	Moveis(max)	J11435	5.04	6.72	1.62	0.09	0.16	0.67
2683	Moveis(max)	II1448I	5.04	6.72	5.73	0.14	2.29	2.69
2683	Moveis(max)	2/4	5.04	6.72	5.73	0.14	1.43	1.68
2683	Moveis(max)	J11436	5.04	6.72	5.73	0.14	0.57	0.67
2684	Moveis(max)	II1449I	5.36	9.7	1.6	0.15	0.64	3.88
2684	Moveis(max)	2/4	5.36	9.7	1.6	0.15	0.4	2.42
2684	Moveis(max)	J11437	5.36	9.7	1.6	0.15	0.16	0.97
2685	Moveis(max)	II1450I	5.36	9.64	6.96	0.18	2.78	3.85
2685	Moveis(max)	2/4	5.36	9.64	6.96	0.18	1.74	2.41
2685	Moveis(max)	J11438	5.36	9.64	6.96	0.18	0.7	0.96
2686	Moveis(max)	II1451I	5.65	1.48	1.72	0.14	0.69	0.59
2686	Moveis(max)	2/4	5.65	1.48	1.72	0.14	0.43	0.37
2686	Moveis(max)	J11439	5.65	1.48	1.72	0.14	0.17	0.15
2687	Moveis(max)	II1452I	5.65	1.48	6.81	0.14	2.72	0.59
2687	Moveis(max)	2/4	5.65	1.48	6.81	0.14	1.7	0.37
2687	Moveis(max)	J11440	5.65	1.48	6.81	0.14	0.68	0.15
2688	Moveis(max)	II457I	4.48	0.31	0.4	0.14	1.63	0.79
2688	Moveis(max)	2/4	4.48	0.31	0.4	0.14	0.54	0.31
2688	Moveis(max)	J11441	4.48	0.31	0.4	0.14	0.63	1.23
2689	Moveis(max)	II468I	4.48	0.31	0.41	0.13	1.6	0.79
2689	Moveis(max)	2/4	4.48	0.31	0.41	0.13	0.5	0.31
2689	Moveis(max)	J11442	4.48	0.31	0.41	0.13	0.56	1.23
2690	Moveis(max)	II487I	4.09	0.32	0.47	0.14	1.91	0.81
2690	Moveis(max)	2/4	4.09	0.32	0.47	0.14	0.64	0.14
2690	Moveis(max)	J11443	4.09	0.32	0.47	0.14	0.73	0.38
2691	Moveis(max)	II498I	4.09	0.32	0.49	0.12	1.94	0.81
2691	Moveis(max)	2/4	4.09	0.32	0.49	0.12	0.61	0.13
2691	Moveis(max)	J11444	4.09	0.32	0.49	0.12	0.64	0.38
2692	Moveis(max)	II517I	4.92	0.38	0.46	0.13	1.87	0.89
2692	Moveis(max)	2/4	4.92	0.38	0.46	0.13	0.62	0.06
2692	Moveis(max)	J11445	4.92	0.38	0.46	0.13	0.74	0.59
2693	Moveis(max)	II528I	4.92	0.38	0.48	0.14	1.88	0.89
2693	Moveis(max)	2/4	4.92	0.38	0.48	0.14	0.58	0.06
2693	Moveis(max)	J11446	4.92	0.38	0.48	0.14	0.65	0.59
2694	Moveis(max)	II1441I	4.49	6.05	0.43	0.03	0.61	1.65
2694	Moveis(max)	2/4	4.49	6.05	0.43	0.03	0.67	0.74
2694	Moveis(max)	J11429	4.49	6.05	0.43	0.03	0.74	0.07
2695	Moveis(max)	II1442I	4.49	6.05	0.44	0.03	0.54	1.65
2695	Moveis(max)	2/4	4.49	6.05	0.44	0.03	0.61	0.74
2695	Moveis(max)	J11430	4.49	6.05	0.44	0.03	0.67	0.07
2696	Moveis(max)	II1443I	4.12	4.79	0.59	0.02	0.67	1.31
2696	Moveis(max)	2/4	4.12	4.79	0.59	0.02	0.76	0.6
2696	Moveis(max)	J11431	4.12	4.79	0.59	0.02	0.85	0.15
2697	Moveis(max)	II1444I	4.12	4.78	0.63	0.03	0.59	1.31
2697	Moveis(max)	2/4	4.12	4.78	0.63	0.03	0.68	0.6
2697	Moveis(max)	J11432	4.12	4.78	0.63	0.03	0.76	0.15
2698	Moveis(max)	II1445I	4.94	1.7	0.51	0.03	0.71	0.3
2698	Moveis(max)	2/4	4.94	1.7	0.51	0.03	0.78	0.12

2698	Movéis(max)	Jf1433	4.94	1.7	0.51	0.03	0.86	0.21
2699	Movéis(max)	If14461	4.94	1.7	0.53	0.03	0.63	0.3
2699	Movéis(max)	2/4	4.94	1.7	0.53	0.03	0.7	0.12
2699	Movéis(max)	Jf1434	4.94	1.7	0.53	0.03	0.78	0.21
2676	Permanentes	If4481	-85.96	1.36	13.7	1.32	18.38	-4.71
2676	Permanentes	2/4	-85.24	1.36	9.98	1.32	9.6	-5.73
2676	Permanentes	Jf1447	-84.52	1.36	7.8	1.32	3.03	-6.75
2677	Permanentes	If4771	-85.96	1.36	-13.7	-1.32	-18.38	-4.71
2677	Permanentes	2/4	-85.24	1.36	-9.98	-1.32	-9.6	-5.73
2677	Permanentes	Jf1448	-84.52	1.36	-7.8	-1.32	-3.03	-6.75
2678	Permanentes	If4781	-55.64	-0.63	11.24	0.43	13.87	1.43
2678	Permanentes	2/4	-54.92	-0.63	7.52	0.43	6.94	1.9
2678	Permanentes	Jf1449	-54.2	-0.63	5.34	0.43	2.21	2.37
2679	Permanentes	If5071	-55.64	-0.63	-11.24	-0.43	-13.87	1.43
2679	Permanentes	2/4	-54.92	-0.63	-7.52	-0.43	-6.94	1.9
2679	Permanentes	Jf1450	-54.2	-0.63	-5.34	-0.43	-2.21	2.37
2680	Permanentes	If5081	-57.49	1.82	10.62	-0.5	12.64	6.21
2680	Permanentes	2/4	-56.77	1.82	6.9	-0.5	6.17	4.84
2680	Permanentes	Jf1451	-56.05	1.82	4.72	-0.5	1.91	3.47
2681	Permanentes	If5371	-57.49	1.82	-10.62	0.5	-12.64	6.21
2681	Permanentes	2/4	-56.77	1.82	-6.9	0.5	-6.17	4.84
2681	Permanentes	Jf1452	-56.05	1.82	-4.72	0.5	-1.91	3.47
2682	Permanentes	If14471	-84.52	-22.23	7.77	1.41	3.11	-8.89
2682	Permanentes	2/4	-84.37	-22.23	7.77	1.41	1.94	-5.56
2682	Permanentes	Jf1435	-84.23	-22.23	7.77	1.41	0.78	-2.22
2683	Permanentes	If14481	-84.52	-22.23	-7.77	-1.41	-3.11	-8.89
2683	Permanentes	2/4	-84.37	-22.23	-7.77	-1.41	-1.94	-5.56
2683	Permanentes	Jf1436	-84.23	-22.23	-7.77	-1.41	-0.78	-2.22
2684	Permanentes	If14491	-50.59	9.94	5.39	0.46	2.15	3.98
2684	Permanentes	2/4	-50.45	9.94	5.39	0.46	1.35	2.49
2684	Permanentes	Jf1437	-50.3	9.94	5.39	0.46	0.54	0.99
2685	Permanentes	If14501	-50.59	9.94	-5.39	-0.46	-2.15	3.98
2685	Permanentes	2/4	-50.45	9.94	-5.39	-0.46	-1.35	2.49
2685	Permanentes	Jf1438	-50.3	9.94	-5.39	-0.46	-0.54	0.99
2686	Permanentes	If14511	-56.51	14.84	4.71	-0.56	1.88	5.93
2686	Permanentes	2/4	-56.36	14.84	4.71	-0.56	1.18	3.71
2686	Permanentes	Jf1439	-56.22	14.84	4.71	-0.56	0.47	1.48
2687	Permanentes	If14521	-56.51	14.84	-4.71	0.56	-1.88	5.93
2687	Permanentes	2/4	-56.36	14.84	-4.71	0.56	-1.18	3.71
2687	Permanentes	Jf1440	-56.22	14.84	-4.71	0.56	-0.47	1.48
2688	Permanentes	If4571	-	-0.22	0.2	0.03	1.17	-1.78
2688	Permanentes	2/4	-	-0.22	0.2	0.03	0.63	-1.17
2688	Permanentes	Jf1441	-	-0.22	0.2	0.03	0.08	-0.56
2689	Permanentes	If4681	-	-0.22	-0.2	-0.03	-1.17	-1.78
2689	Permanentes	2/4	-	-0.22	-0.2	-0.03	-0.63	-1.17
2689	Permanentes	Jf1442	-	-0.22	-0.2	-0.03	-0.08	-0.56
2690	Permanentes	If4871	-	-1.18	0.17	0.04	0.99	-3.28
2690	Permanentes	2/4	-	-1.18	0.17	0.04	0.53	-0.08
2690	Permanentes	Jf1443	-	-1.18	0.17	0.04	0.06	3.12
2691	Permanentes	If4981	-	-1.18	-0.17	-0.04	-0.99	-3.28
2691	Permanentes	2/4	-	-1.18	-0.17	-0.04	-0.53	-0.08
2691	Permanentes	Jf1444	-	-1.18	-0.17	-0.04	-0.06	3.12
2692	Permanentes	If5171	-	-1.15	0.14	0.03	0.82	-3.1
2692	Permanentes	2/4	-	-1.15	0.14	0.03	0.44	-0.01
2692	Permanentes	Jf1445	-	-1.15	0.14	0.03	0.07	3.08
2693	Permanentes	If5281	-	-1.15	-0.14	-0.03	-0.82	-3.1
2693	Permanentes	2/4	-	-1.15	-0.14	-0.03	-0.44	-0.01
2693	Permanentes	Jf1446	-	-1.15	-0.14	-0.03	-0.07	3.08
2694	Permanentes	If14411	-	-8.85	0.21	0.01	0.09	-2.67
2694	Permanentes	2/4	-	-8.85	0.21	0.01	0.06	-1.34
2694	Permanentes	Jf1429	-	-8.85	0.21	0.01	0.03	-0.01
2695	Permanentes	If14421	-	-8.85	-0.21	-0.01	-0.09	-2.67
2695	Permanentes	2/4	-	-8.85	-0.21	-0.01	-0.06	-1.34
2695	Permanentes	Jf1430	-	-8.85	-0.21	-0.01	-0.03	-0.01
2696	Permanentes	If14431	-	2.67	0.17	0.01	0.06	1.09
2696	Permanentes	2/4	-	2.67	0.17	0.01	0.03	0.69
2696	Permanentes	Jf1431	-	2.67	0.17	0.01	0.01	0.29
2697	Permanentes	If14441	-	2.67	-0.17	-0.01	-0.06	1.09
2697	Permanentes	2/4	-	2.67	-0.17	-0.01	-0.03	0.69
2697	Permanentes	Jf1432	-	2,67	-0,17	-0,01	-0,01	0,29
2698	Permanentes	If14451	-	3.63	0.13	0.02	0.06	2.16
2698	Permanentes	2/4	-	3.63	0.13	0.02	0.04	1.62





2698	Permanentes	JF1433	-	3.63	0.13	0.02	0.02	1.08
2699	Permanentes	IF14461	-	3.63	-0.13	-0.02	-0.06	2.16
2699	Permanentes	2/4	-	3.63	-0.13	-0.02	-0.04	1.62
2699	Permanentes	JF1434	-	3.63	-0.13	-0.02	-0.02	1.08
2676	F T V	IF4481	7.26	-1.55	18.29	1.37	34.64	-4.89
2676	F T V	2/4	7.26	-1.55	18.29	1.37	20.92	-3.72
2676	F T V	JF1447	7.26	-1.55	18.29	1.37	7.2	-2.56
2677	F T V	IF4771	6.82	-1.51	-14.03	-1.37	-26.54	-4.83
2677	F T V	2/4	6.82	-1.51	-14.03	-1.37	-16.01	-3.69
2677	F T V	JF1448	6.82	-1.51	-14.03	-1.37	-5.49	-2.56
2678	F T V	IF4781	-8.3	-1.55	14.8	0.5	28.21	-1.96
2678	F T V	2/4	-8.3	-1.55	14.8	0.5	17.11	-0.79
2678	F T V	JF1449	-8.3	-1.55	14.8	0.5	6.01	0.37
2679	F T V	IF5071	-8.71	-1.5	-10.5	-0.5	-20.03	-1.89
2679	F T V	2/4	-8.71	-1.5	-10.5	-0.5	-12.16	-0.77
2679	F T V	JF1450	-8.71	-1.5	-10.5	-0.5	-4.29	0.35
2680	F T V	IF5081	5.2	-1.09	13.91	-0.43	26.45	1.32
2680	F T V	2/4	5.2	-1.09	13.91	-0.43	16.02	2.13
2680	F T V	JF1451	5.2	-1.09	13.91	-0.43	5.59	2.95
2681	F T V	IF5371	4.82	-1.04	-9.61	0.43	-18.28	1.38
2681	F T V	2/4	4.82	-1.04	-9.61	0.43	-11.08	2.16
2681	F T V	JF1452	4.82	-1.04	-9.61	0.43	-3.87	2.94
2682	F T V	IF14471	6.47	-11.54	18.28	1.43	7.31	-4.62
2682	F T V	2/4	6.47	-11.54	18.28	1.43	4.57	-2.89
2682	F T V	JF1435	6.47	-11.54	18.28	1.43	1.83	-1.15
2683	F T V	IF14481	6.04	-11.49	-14.01	-1.43	-5.61	-4.6
2683	F T V	2/4	6.04	-11.49	-14.01	-1.43	-3.5	-2.87
2683	F T V	JF1436	6.04	-11.49	-14.01	-1.43	-1.4	-1.15
2684	F T V	IF14491	-7.3	-2.12	14.83	0.5	5.93	-0.85
2684	F T V	2/4	-7.3	-2.12	14.83	0.5	3.71	-0.53
2684	F T V	JF1437	-7.3	-2.12	14.83	0.5	1.48	-0.21
2685	F T V	IF14501	-7.71	-2.05	-10.52	-0.5	-4.21	-0.82
2685	F T V	2/4	-7.71	-2.05	-10.52	-0.5	-2.63	-0.51
2685	F T V	JF1438	-7.71	-2.05	-10.52	-0.5	-1.05	-0.21
2686	F T V	IF14511	4.99	9.46	13.89	-0.49	5.56	3.79
2686	F T V	2/4	4.99	9.46	13.89	-0.49	3.47	2.37
2686	F T V	JF1439	4.99	9.46	13.89	-0.49	1.39	0.95
2687	F T V	IF14521	4.6	9.5	-9.6	0.49	-3.84	3.8
2687	F T V	2/4	4.6	9.5	-9.6	0.49	-2.4	2.37
2687	F T V	JF1440	4.6	9.5	-9.6	0.49	-0.96	0.95
2688	F T V	IF4571	5.39	-0.5	0.46	0.06	2.27	-2.13
2688	F T V	2/4	5.39	-0.5	0.46	0.06	1.04	-0.8
2688	F T V	JF1441	5.39	-0.5	0.46	0.06	-0.19	0.54
2689	F T V	IF4681	5.9	-0.5	-0.25	-0.06	-1.2	-2.13
2689	F T V	2/4	5.9	-0.5	-0.25	-0.06	-0.54	-0.8
2689	F T V	JF1442	5.9	-0.5	-0.25	-0.06	0.12	0.54
2690	F T V	IF4871	-13.63	-0.94	0.37	0.06	1.86	-2.91
2690	F T V	2/4	-13.63	-0.94	0.37	0.06	0.87	-0.38
2690	F T V	JF1443	-13.63	-0.94	0.37	0.06	-0.12	2.16
2691	F T V	IF4981	-13.11	-0.94	-0.15	-0.06	-0.79	-2.91
2691	F T V	2/4	-13.11	-0.94	-0.15	-0.06	-0.37	-0.38
2691	F T V	JF1444	-13.11	-0.94	-0.15	-0.06	0.05	2.16
2692	F T V	IF5171	3.92	-0.93	0.34	0.03	1.71	-2.9
2692	F T V	2/4	3.92	-0.93	0.34	0.03	0.79	-0.37
2692	F T V	JF1445	3.92	-0.93	0.34	0.03	-0.13	2.15
2693	F T V	IF5281	4.44	-0.93	-0.13	-0.03	-0.63	-2.89
2693	F T V	2/4	4.44	-0.93	-0.13	-0.03	-0.28	-0.37
2693	F T V	JF1446	4.44	-0.93	-0.13	-0.03	0.06	2.14
2694	F T V	IF14411	4.79	-0.74	0.48	0.01	-0.17	-0.91
2694	F T V	2/4	4.79	-0.74	0.48	0.01	-0.25	-0.8
2694	F T V	JF1429	4.79	-0.74	0.48	0.01	-0.32	-0.69
2695	F T V	IF14421	5.31	-0.74	-0.27	-0.01	0.1	-0.91
2695	F T V	2/4	5.31	-0.74	-0.27	-0.01	0.14	-0.8
2695	F T V	JF1430	5.31	-0.74	-0.27	-0.01	0.18	-0.69
2696	F T V	IF14431	-13.7	-1.08	0.35	0.01	-0.13	-0.29
2696	F T V	2/4	-13.7	-1.08	0.35	0.01	-0.18	-0.13
2696	F T V	JF1431	-13.7	-1.08	0.35	0.01	-0.23	0.04
2697	F T V	IF14441	-13.19	-1.08	-0.14	-0.01	0.06	-0.29
2697	F T V	2/4	-13.19	-1.08	-0.14	-0.01	0.08	-0.13
2697	F T V	JF1432	-13.19	-1.08	-0.14	-0.01	0.1	0.04
2698	F T V	IF14451	4.59	-0.55	0.34	0.02	-0.14	0.75
2698	F T V	2/4	4.59	-0.55	0.34	0.02	-0.19	0.83



2698	F T V	Jf1433	4.59	-0.55	0.34	0.02	-0.24	0.91
2699	F T V	If14461	5.11	-0.55	-0.13	-0.02	0.07	0.75
2699	F T V	2/4	5.11	-0.55	-0.13	-0.02	0.09	0.83
2699	F T V	Jf1434	5.11	-0.55	-0.13	-0.02	0.11	0.91
2676	Moveis(min)	If4481	-42.73	-0.52	-5.67	-0.05	-10.69	-0.72
2676	Moveis(min)	2/4	-42.73	-0.52	-5.67	-0.05	-6.44	-0.58
2676	Moveis(min)	Jf1447	-42.73	-0.52	-5.67	-0.05	-2.18	-0.97
2677	Moveis(min)	If4771	-42.73	-0.52	-1.58	-0.07	-2.93	-0.72
2677	Moveis(min)	2/4	-42.73	-0.52	-1.58	-0.07	-1.75	-0.58
2677	Moveis(min)	Jf1448	-42.73	-0.52	-1.58	-0.07	-0.58	-0.96
2678	Moveis(min)	If4781	-59.21	-1.94	-6.78	-0.07	-12.64	-0.58
2678	Moveis(min)	2/4	-59.21	-1.94	-6.78	-0.07	-7.55	-1.07
2678	Moveis(min)	Jf1449	-59.21	-1.94	-6.78	-0.07	-2.46	-2.2
2679	Moveis(min)	If5071	-59.21	-1.94	-1.57	-0.08	-2.94	-0.58
2679	Moveis(min)	2/4	-59.21	-1.94	-1.57	-0.08	-1.76	-1.07
2679	Moveis(min)	Jf1450	-59.21	-1.94	-1.57	-0.08	-0.59	-2.2
2680	Moveis(min)	If5081	-52.4	-0.69	-6.72	-0.07	-12.65	-1.82
2680	Moveis(min)	2/4	-52.4	-0.69	-6.72	-0.07	-7.6	-2.22
2680	Moveis(min)	Jf1451	-52.4	-0.69	-6.72	-0.07	-2.56	-2.65
2681	Moveis(min)	If5371	-52.4	-0.69	-1.7	-0.06	-3.21	-1.8
2681	Moveis(min)	2/4	-52.4	-0.69	-1.7	-0.06	-1.93	-2.21
2681	Moveis(min)	Jf1452	-52.4	-0.69	-1.7	-0.06	-0.65	-2.63
2682	Moveis(min)	If14471	-42.67	-1.79	-5.73	-0.14	-2.29	-0.72
2682	Moveis(min)	2/4	-42.67	-1.79	-5.73	-0.14	-1.43	-0.45
2682	Moveis(min)	Jf1435	-42.67	-1.79	-5.73	-0.14	-0.57	-0.18
2683	Moveis(min)	If14481	-42.67	-1.79	-1.62	-0.09	-0.65	-0.72
2683	Moveis(min)	2/4	-42.67	-1.79	-1.62	-0.09	-0.4	-0.45
2683	Moveis(min)	Jf1436	-42.67	-1.79	-1.62	-0.09	-0.16	-0.18
2684	Moveis(min)	If14491	-59.84	-7.53	-6.96	-0.18	-2.78	-3.01
2684	Moveis(min)	2/4	-59.84	-7.53	-6.96	-0.18	-1.74	-1.88
2684	Moveis(min)	Jf1437	-59.84	-7.53	-6.96	-0.18	-0.7	-0.75
2685	Moveis(min)	If14501	-59.84	-7.53	-1.6	-0.15	-0.64	-3.01
2685	Moveis(min)	2/4	-59.84	-7.53	-1.6	-0.15	-0.4	-1.88
2685	Moveis(min)	Jf1438	-59.84	-7.53	-1.6	-0.15	-0.16	-0.75
2686	Moveis(min)	If14511	-52.45	-8.74	-6.81	-0.14	-2.72	-3.5
2686	Moveis(min)	2/4	-52.45	-8.74	-6.81	-0.14	-1.7	-2.19
2686	Moveis(min)	Jf1439	-52.45	-8.74	-6.81	-0.14	-0.68	-0.87
2687	Moveis(min)	If14521	-52.45	-8.66	-1.72	-0.14	-0.69	-3.47
2687	Moveis(min)	2/4	-52.45	-8.66	-1.72	-0.14	-0.43	-2.17
2687	Moveis(min)	Jf1440	-52.45	-8.66	-1.72	-0.14	-0.17	-0.87
2688	Moveis(min)	If4571	-61.6	-0.35	-0.41	-0.13	-1.6	-0.65
2688	Moveis(min)	2/4	-61.6	-0.35	-0.41	-0.13	-0.5	-0.05
2688	Moveis(min)	Jf1441	-61.6	-0.35	-0.41	-0.13	-0.56	-0.87
2689	Moveis(min)	If4681	-61.6	-0.35	-0.4	-0.14	-1.63	-0.65
2689	Moveis(min)	2/4	-61.6	-0.35	-0.4	-0.14	-0.54	-0.05
2689	Moveis(min)	Jf1442	-61.6	-0.35	-0.4	-0.14	-0.63	-0.87
2690	Moveis(min)	If4871	-81.08	-0.14	-0.49	-0.12	-1.94	-0.37
2690	Moveis(min)	2/4	-81.08	-0.14	-0.49	-0.12	-0.61	-0.08
2690	Moveis(min)	Jf1443	-81.08	-0.14	-0.49	-0.12	-0.64	-0.91
2691	Moveis(min)	If4981	-81.08	-0.14	-0.47	-0.14	-1.91	-0.37
2691	Moveis(min)	2/4	-81.08	-0.14	-0.47	-0.14	-0.64	-0.08
2691	Moveis(min)	Jf1444	-81.08	-0.14	-0.47	-0.14	-0.73	-0.91
2692	Moveis(min)	If5171	-74.01	-0.2	-0.48	-0.14	-1.88	-0.52
2692	Moveis(min)	2/4	-74.01	-0.2	-0.48	-0.14	-0.58	-0.34
2692	Moveis(min)	Jf1445	-74.01	-0.2	-0.48	-0.14	-0.65	-1.15
2693	Moveis(min)	If5281	-74.01	-0.2	-0.46	-0.13	-1.87	-0.52
2693	Moveis(min)	2/4	-74.01	-0.2	-0.46	-0.13	-0.62	-0.34
2693	Moveis(min)	Jf1446	-74.01	-0.2	-0.46	-0.13	-0.74	-1.16
2694	Moveis(min)	If14411	-61.69	-1.36	-0.44	-0.03	-0.54	-0.56
2694	Moveis(min)	2/4	-61.69	-1.36	-0.44	-0.03	-0.61	-0.36
2694	Moveis(min)	Jf1429	-61.69	-1.36	-0.44	-0.03	-0.67	-0.19
2695	Moveis(min)	If14421	-61.69	-1.36	-0.43	-0.03	-0.61	-0.56
2695	Moveis(min)	2/4	-61.69	-1.36	-0.43	-0.03	-0.67	-0.36
2695	Moveis(min)	Jf1430	-61.69	-1.36	-0.43	-0.03	-0.74	-0.19
2696	Moveis(min)	If14431	-82.29	-4.07	-0.63	-0.03	-0.59	-1.09
2696	Moveis(min)	2/4	-82.29	-4.07	-0.63	-0.03	-0.68	-0.49
2696	Moveis(min)	Jf1431	-82.29	-4.07	-0.63	-0.03	-0.76	-0.22
2697	Moveis(min)	If14441	-82.29	-4.07	-0.59	-0.02	-0.67	-1.09
2697	Moveis(min)	2/4	-82.29	-4.07	-0.59	-0.02	-0.76	-0.49
2697	Moveis(min)	Jf1432	-82.29	-4.07	-0.59	-0.02	-0.85	-0.22
2698	Moveis(min)	If14451	-74.32	-6.29	-0.53	-0.03	-0.63	-1.68
2698	Moveis(min)	2/4	-74.32	-6.29	-0.53	-0.03	-0.7	-0.74



2698	Moveis(min)	JF1433	-74.32	-6.29	-0.53	-0.03	-0.78	-0.22
2699	Moveis(min)	JF14461	-74.32	-6.19	-0.51	-0.03	-0.71	-1.65
2699	Moveis(min)	2/4	-74.32	-6.19	-0.51	-0.03	-0.78	-0.74
2699	Moveis(min)	JF1434	-74.32	-6.19	-0.51	-0.03	-0.86	-0.22

### 5.11.2 P0 ≡ P30:

#### 5.11.2.1 Resumo dos Esforços

$$N_{\max} = 85,96 + 42,73 + 5,92 + 0,23 + 1,12 = 135,96 \text{ tf}$$

$$N_{\min} = 57,49 - 5,60 - 6,10 - 0,20 - 1,09 = 44,50 \text{ tf}$$

$$M_L = 18,38 + 12,64 + 4,28 + 23,96 + 0,04 = 59,30 \text{ tfm}$$

$$M_T = 4,71 + 0,58 + 0,04 + 0,82 + 2,74 = 8,89 \text{ tfm}$$

$$M_R = (59,30^2 + 8,89^2)^{1/2} = 59,96 \text{ tfm}$$

$$H_L = 13,70 + 5,67 + 0,12 + 15,97 + 2,20 = 37,66 \text{ tf}$$

$$H_T = 1,36 + 0,98 + 2,27 + 0,28 + 0,03 = 4,92 \text{ tf}$$

#### 5.11.2.2 Dimensionamento

Concreto:  $f_{ck} = 25 \text{ Mpa}$  ; Aço: CA-50

Será utilizado o programa do prof. Lauro M. dos Santos: CONDE3.

#### 5.11.2.3 $V_{\max} + M$ : $\phi = 70 \text{ cm}$

$$V_d = 1,4 \cdot 135,96 = 190,34 \text{ tf}$$

$$M_d = 1,4 \cdot 59,96 = 83,94 \text{ tf}$$

$$A_s = 60,4 \text{ cm}^2$$

#### 5.11.2.4 $V_{\min} + M$ :

$$V_d = 1,4 \cdot 44,50 = 62,30 \text{ tf}$$

$$M_d = 83,94 \text{ tf}$$

$$A_s = 73,1 \text{ cm}^2 (24\phi 20)$$

### 5.11.3 P10 ≡ P20

#### 5.11.3.1 Resumo dos Esforços

$$N_{\max} = 133,85 + 81,08 + 13,35 + 0,26 + 0,02 = 228,56 \text{ tf}$$

$$N_{\min} = 133,85 - 4,09 - 13,35 - 0,26 - 0,02 = 116,13 \text{ tf}$$

$$M_L = 1,17 + 1,94 + 1,32 + 0,55 = 4,98 \text{ tfm}$$

$$M_T = 3,28 + 0,65 + 2,27 + 0,73 = 6,93 \text{ tfm}$$

$$M_R = (4,98^2 + 6,93^2)^{0,5} = 8,53 \text{ tfm}$$

$$H_L = 0,20 + 0,49 + 0,35 + 0,11 = 1,15 \text{ tf}$$

$$H_T = 1,18 + 0,38 + 0,76 + 0,24 = 2,56 \text{ tf}$$

### 5.11.3.2 Dimensionamento

#### 5.11.3.2.1 $V_{\text{máx}} + M$ : $\phi = 70 \text{ cm}$

$$V_d = 1,4 * 228,56 = 319,98 \text{ tf}$$

$$M_d = 1,4 * 8,53 = 11,94 \text{ tfm}$$

$$A_{s_{\text{mín}}} = 0,8\% * 70^2 * \pi / 4 = 30,79 \text{ cm}^2$$

#### 5.11.3.2.2 $V_{\text{mín}} + M$

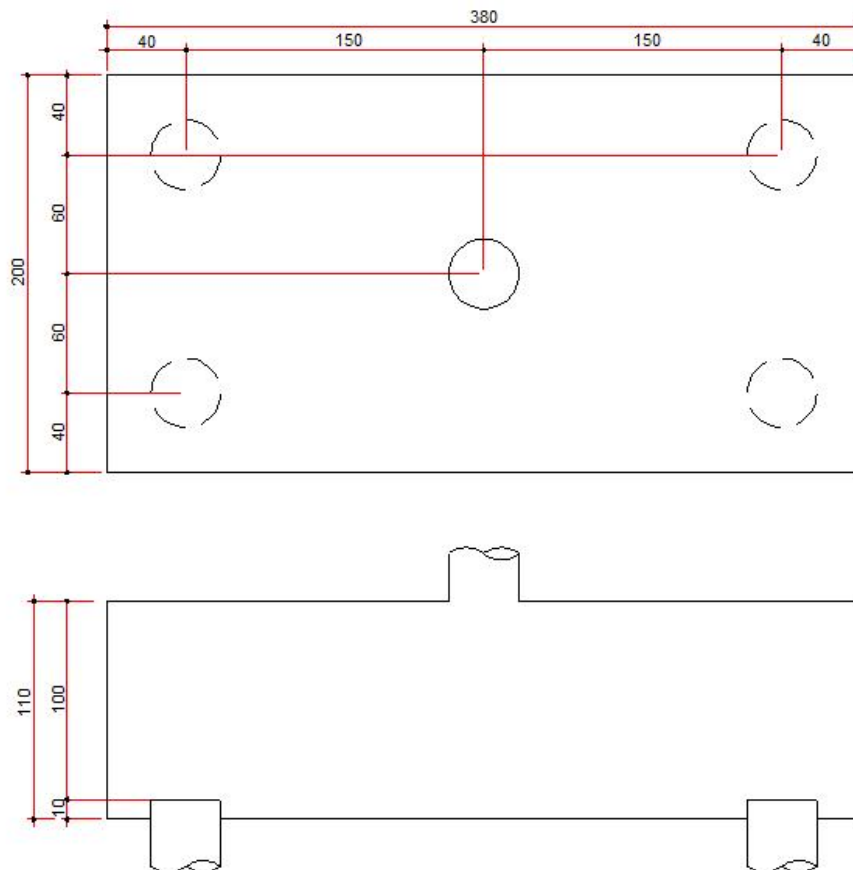
$$V_d = 1,4 * 116,13 = 162,58 \text{ tf}$$

$$M_d = 11,94 \text{ tfm}$$

$$A_{s_{\text{mín}}} = 30,79 \text{ cm}^2 (10\phi 20)$$

## 5.12 Blocos de Fundação

### 5.12.1 P0 ≡ P30:



$$pp = 20,90 \text{ tf}$$

$$V_{\text{máx}} = 135,96 + 20,90 = 156,86 \text{ tf}$$

$$V_{\text{mín}} = 44,50 + 20,90 = 65,40 \text{ tf}$$

$$M_L = 59,30 + 37,60 \cdot 1,0 = 96,90 \text{ tfm}$$

$$M_T = 8,89 + 4,92 \cdot 1,0 = 13,81 \text{ tfm}$$

$$V_{\text{máx/est}} = 156,86/4 + 96,90/2 \cdot 3 + 13,81/2 \cdot 1,2 = 61,1 \text{ tf}$$

$$V_{\text{mín/est}} = 65,40/4 - 96,90/2 \cdot 3 - 13,81/2 \cdot 1,2 = -5,55 \text{ tf}$$

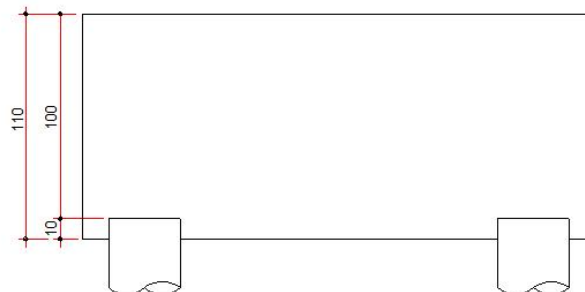
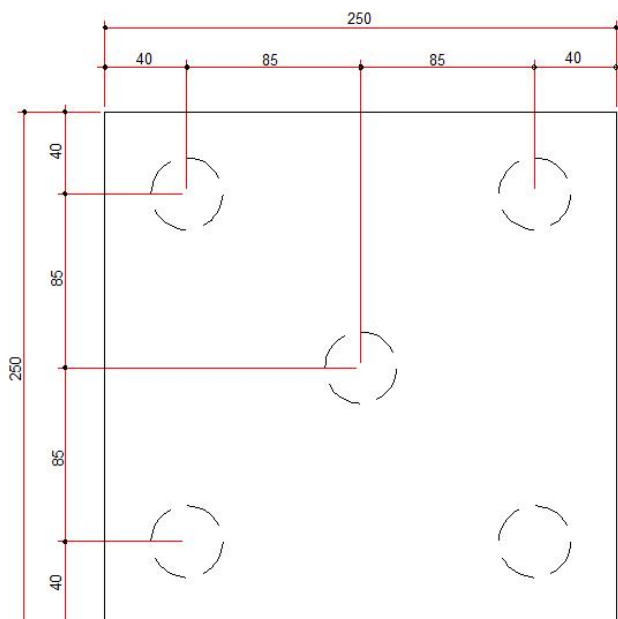
$$Z_x = 2 \cdot 61,10 \cdot 1,50 / 0,80 \cdot 0,96 = 238,67 \text{ tf}$$

$$As_x = 1,4 \cdot 238,67 / 4,348 = 76,85 \text{ cm}^2$$

$$Z_y = 2 \cdot 61,10 \cdot 0,60 / 0,80 \cdot 0,96 = 95,47 \text{ tf}$$

$$As_y = 1,4 \cdot 95,47 / 4,348 = 30,74 \text{ cm}^2$$

### 5.12.2 P10 ≡ P20



$$pp = 17,19 \text{ tf}$$

$$V_{\text{máx}} = 228,56 + 17,19 = 245,75 \text{ tf}$$

$$V_{\text{mín}} = 116,13 + 17,19 = 133,32 \text{ tf}$$

$$M_L = 4,98 + 1,15 \cdot 1,0 = 6,13 \text{ tfm}$$

$$M_T = 6,93 + 2,56 \cdot 1,0 = 9,49 \text{ tfm}$$

$$V_{\text{máx/est}} = 245,75/5 + (6,13 + 9,49)/2 \cdot 1,7 = 53,75 \text{ tf}$$

$$V_{\text{mín/est}} = 133,32/5 - (6,13 + 9,49)/2 \cdot 1,7 = 22,10 \text{ tf}$$

$$Z_x = Z_y = 2 \cdot 53,75 \cdot 0,85 / 0,8 \cdot 0,96 = 118,98 \text{ tf}$$

$$As_x = As_y = 1,4 \cdot 118,98 / 4,348 = 38,31 \text{ cm}^2$$

### 5.13 Rótulas de Concreto (40x40) cm<sup>2</sup>

$$V_{\text{máx}} = 228,56 \text{ tf}$$

$$H = (1,15^2 + 2,56^2)^{0,5} = 2,81 \text{ tf}$$

$$f_{c_{\text{adm}}} \leq 178 \cdot (3600/1600)^{1/3} = 233 \text{ kgf/cm}^2 > 210$$

$$\text{logo: } V_{d_{\text{adm}}} = 210 \cdot 40 \cdot 40 = 336000 \text{ kgf} \rightarrow \text{OK}$$

Fretagem:

$$Z = 0,3 \cdot 228,56 \cdot (1 - 40/60) = 22,86 \text{ tf}$$

$$A_s = 1,4 \cdot 22,86 / 4,348 = 7,36 \text{ cm}^2$$

### 5.14 Neoprenes: 35x45

$$h = 4 \cdot 12 + 5 \cdot 3 + 2 \cdot 2,5 = 68 \text{ mm}$$

$$V_{\text{máx}} = 135,96 \text{ tf}$$

$$V_{\text{mín}} = 44,50 \text{ tf}$$

$$\delta = 3,29 \text{ cm}$$

$$f_{\text{máx}} = 135960 / 35 \cdot 45 = 86,30 \text{ kgf/cm}^2 \rightarrow \text{OK}$$

$$f_{\text{mín}} = 44500 / 35 \cdot 45 = 28,25 \text{ kgf/cm}^2 \rightarrow \text{OK}$$

$$\text{tg} \gamma = 3,29 / 5,30 = 0,62 < 0,70 \rightarrow \text{OK}$$

Fretagem: será adotado a calculada nas rótulas.