

**Memorial de cálculo**  
**ENGº MILLENO RAMOS DE SOUZA**

|                                |    |
|--------------------------------|----|
| Memorial de cálculo.....       | 1  |
| Resumo de resultados.....      | 2  |
| Pavimento Nível Baldrame ..... | 3  |
| Relatório das Sapatas .....    | 4  |
| Resultados dos Pilares.....    | 5  |
| Resultados da Viga V1.....     | 7  |
| Resultados da Viga V2.....     | 8  |
| Resultados da Viga V3.....     | 9  |
| Resultados da Viga V4.....     | 10 |
| Resultados da Viga V5.....     | 11 |
| Resultados da Viga V6.....     | 12 |
| Resultados da Viga V7.....     | 13 |
| Resultados da Viga V8.....     | 14 |
| Resultados da Viga V9.....     | 15 |
| Resultados da Viga V10.....    | 16 |
| Resultados da Viga V11.....    | 17 |
| Resultados da Viga V12.....    | 18 |
| Resultados da Viga V13.....    | 19 |
| Pavimento Nível Cobertura..... | 20 |
| Resultados dos Pilares.....    | 21 |
| Resultados da Viga V1.....     | 23 |
| Resultados da Viga V2.....     | 24 |
| Resultados da Viga V3.....     | 25 |
| Resultados da Viga V4.....     | 26 |
| Resultados da Viga V5.....     | 27 |
| Resultados da Viga V6.....     | 28 |
| Resultados da Viga V7.....     | 29 |
| Resultados da Viga V8.....     | 30 |
| Resultados da Viga V9.....     | 31 |
| Resultados da Viga V10.....    | 32 |
| Resultados da Viga V11.....    | 33 |
| Resultados da Viga V12.....    | 34 |
| Resultados da Viga V13.....    | 35 |

## Resumo de resultados

### Análise de 1ª ordem:

Processo de pórtico espacial

### Cargas verticais:

Peso próprio = 42.75 tf

Adicional = 99.34 tf

Total = 142.10 tf

### Deslocamento horizontal:

Direção X = 0.01 cm (limite 0.28)

Direção Y = 0.04 cm (limite 0.28)

### Coefficiente Gama-Z:

Direção X = 1.04 (limite 1.10)

Direção Y = 1.04 (limite 1.10)

### Análise de 2ª ordem:

Processo P-Delta

Deslocamentos no topo da edificação:

Vento X+: 0.03 »» 0.03 (+2.59%)

Vento X-: 0.03 »» 0.03 (+2.59%)

Vento Y+: 0.13 »» 0.13 (+3.38%)

Vento Y-: 0.13 »» 0.13 (+3.38%)

Desaprumo X+: 0.03 »» 0.03 (+2.69%)

Desaprumo X-: 0.03 »» 0.03 (+2.69%)

Desaprumo Y+: 0.04 »» 0.04 (+3.50%)

Desaprumo Y-: 0.04 »» 0.04 (+3.50%)

**Pavimento Nível Baldrame**

# Relatório das Sapatas

Nível Baldrame  
Lance 1

fck = 200.00 kgf/cm<sup>2</sup>

E = 212874 kgf/cm<sup>2</sup>

Peso Espec = 2500.00 kgf/m<sup>3</sup>

cobr = 3.00 cm

| Nome | Dados               |                  |                                 |      |                                                                     |                             | Resultados       |                |                                         |                                         |
|------|---------------------|------------------|---------------------------------|------|---------------------------------------------------------------------|-----------------------------|------------------|----------------|-----------------------------------------|-----------------------------------------|
|      | Esforços            |                  |                                 | Solo |                                                                     |                             | Dimensões (cm)   |                | Armadura                                |                                         |
|      | MB<br>MH<br>(kgf.m) | FB<br>FH<br>(tf) | Carga<br>Carga<br>total<br>(tf) | Padm | E Solo<br>(kgf/m <sup>3</sup> )<br>Coesão<br>(kgf/cm <sup>2</sup> ) | Ângulo<br>atrito<br>(graus) | B<br><br>H       | H0<br><br>H1   | AsB inf<br><br>AsB sup                  | AsH inf<br><br>AsH sup                  |
| S1   | 0.00<br>0.00        | 0.31<br>1.25     | 6.39<br>8.00                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>100.00  | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S2   | 0.00<br>0.00        | 0.05<br>0.70     | 7.14<br>8.93                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 95.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) |
| S3   | 0.00<br>0.00        | 0.08<br>0.04     | 5.33<br>6.68                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 80.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/14<br>(3.02 cm <sup>2</sup> ) |
| S4   | 0.00<br>0.00        | 0.08<br>0.06     | 5.63<br>6.97                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 80.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/14<br>(3.02 cm <sup>2</sup> ) |
| S5   | 0.00<br>0.00        | 0.08<br>0.05     | 5.76<br>7.19                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S6   | 0.00<br>0.00        | 0.07<br>0.30     | 6.88<br>8.57                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S7   | 0.00<br>0.00        | 0.06<br>0.08     | 7.94<br>9.87                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 100.00<br>110.00 | 15.00<br>30.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) |
| S8   | 0.00<br>0.00        | 0.57<br>0.46     | 5.88<br>7.32                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S9   | 0.00<br>0.00        | 0.02<br>0.07     | 6.97<br>8.66                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S10  | 0.00<br>0.00        | 0.03<br>0.07     | 2.60<br>3.32                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 60.00<br>70.00   | 25.00<br>25.00 | 6 ø 8.0 c/12<br>(3.02 cm <sup>2</sup> ) | 6 ø 8.0 c/10<br>(3.02 cm <sup>2</sup> ) |
| S11  | 0.00<br>0.00        | 0.03<br>0.12     | 6.05<br>7.56                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>100.00  | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S12  | 0.00<br>0.00        | 0.03<br>0.08     | 5.85<br>7.29                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S13  | 0.00<br>0.00        | 0.03<br>0.08     | 5.88<br>7.32                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S14  | 0.00<br>0.00        | 0.06<br>0.08     | 6.56<br>8.17                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>100.00  | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S15  | 0.00<br>0.00        | 0.04<br>0.07     | 7.18<br>8.97                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 95.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) |
| S16  | 0.00<br>0.00        | 0.07<br>0.08     | 7.29<br>9.08                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 95.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) |
| S17  | 0.00<br>0.00        | 0.03<br>0.24     | 6.48<br>8.09                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>100.00  | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S18  | 0.00<br>0.00        | 0.28<br>0.03     | 5.73<br>7.17                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S19  | 0.00<br>0.00        | 0.08<br>0.03     | 5.62<br>6.97                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 80.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/14<br>(3.02 cm <sup>2</sup> ) |
| S20  | 0.00<br>0.00        | 0.08<br>0.07     | 5.75<br>7.18                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S21  | 0.00<br>0.00        | 0.07<br>0.32     | 6.86<br>8.55                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 90.00<br>105.00  | 25.00<br>25.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |
| S22  | 0.00<br>0.00        | 0.06<br>0.10     | 7.93<br>9.87                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 100.00<br>110.00 | 15.00<br>30.00 | 8 ø 8.0 c/13<br>(4.02 cm <sup>2</sup> ) | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) |
| S23  | 0.00<br>0.00        | 0.57<br>0.47     | 5.87<br>7.30                    | 1.00 | 1300.00<br>0.25                                                     | 30                          | 85.00<br>95.00   | 25.00<br>25.00 | 7 ø 8.0 c/14<br>(3.52 cm <sup>2</sup> ) | 6 ø 8.0 c/15<br>(3.02 cm <sup>2</sup> ) |

# Resultados dos Pilares

Nível Baldrame  
Lance 1

fck = 250.00 kgf/cm²

E = 238000 kgf/cm²  
cobr = 2.00 cm

Peso Espec = 2500.00 kgf/m³

| Dados        |                     |                   |                              |                    |                           |                           | Resultados                     |                             |                        |                |
|--------------|---------------------|-------------------|------------------------------|--------------------|---------------------------|---------------------------|--------------------------------|-----------------------------|------------------------|----------------|
| Pilar        | Seção (cm)          | Nível Altura (cm) | lib vinc lih vinc (cm)       | Nd máx Nd mín (tf) | MBd topo MBd base (kgf.m) | MHd topo MHd base (kgf.m) | As b Ferros As h % armad total |                             | Estribo Topo Base cota | Esb b Esb h    |
| P1<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 8.79<br>6.11       | 527<br>0                  | 2089<br>0                 | 2.45<br>2.45<br>0.9<br>12.5    | 2 ø 12.5<br>2 ø 12.5<br>4 ø | ø 5.0 c/ 15            | 23.07<br>13.84 |
| P2<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 9.81<br>6.63       | 94<br>0                   | 1175<br>0                 | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P3<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 7.31<br>4.99       | 137<br>0                  | 68<br>0                   | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P4<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 7.71<br>5.28       | 127<br>0                  | 98<br>0                   | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P5<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 7.89<br>5.41       | 124<br>0                  | 80<br>0                   | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P6<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 9.44<br>6.52       | 114<br>0                  | 495<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P7<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 10.90<br>7.59      | 105<br>0                  | 137<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P8<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 8.09<br>5.53       | 957<br>0                  | 778<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P9<br>1:100  | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 9.58<br>6.68       | 36<br>0                   | 121<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P10<br>1:100 | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 3.53<br>2.20       | 53<br>0                   | 115<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P11<br>1:100 | 18.00<br>X<br>30.00 | 5.00<br>120.00    | 120.00<br>RR<br>120.00<br>RR | 8.25<br>5.72       | 53<br>0                   | 211<br>0                  | 1.57<br>1.57<br>0.6<br>10.0    | 2 ø 10.0<br>2 ø 10.0<br>4 ø | ø 5.0 c/ 12            | 23.07<br>13.84 |
| P12<br>1:100 | 18.00<br>X          | 5.00<br>120.00    | 120.00<br>RR                 | 7.98<br>5.66       | 43<br>0                   | 133<br>0                  | 1.57<br>1.57                   | 2 ø 10.0<br>2 ø 10.0        | ø 5.0 c/ 12            | 23.07<br>13.84 |

| Dados        |               |                   |                        |                    |                           |                           | Resultados                                     |                        |             |
|--------------|---------------|-------------------|------------------------|--------------------|---------------------------|---------------------------|------------------------------------------------|------------------------|-------------|
| Pilar        | Seção (cm)    | Nível Altura (cm) | lib vinc lih vinc (cm) | Nd máx Nd mín (tf) | MBd topo MBd base (kgf.m) | MHd topo MHd base (kgf.m) | As b Ferros As h % armad total                 | Estribo Topo Base cota | Esb b Esb h |
|              | 30.00         |                   | 120.00 RR              |                    |                           |                           | 0.6 4 ø 10.0                                   |                        |             |
| P13<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 8.01 5.71          | 51 0                      | 130 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P14<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 8.94 6.38          | 102 0                     | 131 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P15<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 9.79 7.01          | 68 0                      | 130 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P16<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 10.01 7.10         | 103 0                     | 132 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P17<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 8.90 6.19          | 52 0                      | 400 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P18<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 7.86 5.23          | 459 0                     | 56 0                      | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P19<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 7.71 5.30          | 126 0                     | 53 0                      | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P20<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 7.88 5.41          | 125 0                     | 122 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P21<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 9.41 6.51          | 115 0                     | 529 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P22<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 10.90 7.59         | 105 0                     | 165 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |
| P23<br>1:100 | 18.00 X 30.00 | 5.00 120.00       | 120.00 RR<br>120.00 RR | 8.06 5.52          | 942 0                     | 779 0                     | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 23.07 13.84 |

## Resultados da Viga V1

$f_{ck} = 250.00 \text{ kgf/cm}^2$

Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$

Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P1           | 30.00             |                     |                 | 6 ø 8.0<br>2.75 |                     |               |                     |                | 0.06         |             |
| 1            | 582.83            | 13.00<br>x<br>30.00 | 3 ø 8.0<br>1.36 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.12         | 0.80        |
| P2           | 30.00             |                     |                 | 6 ø 8.0<br>3.00 |                     |               |                     |                | 0.07         |             |
| 2            | 282.46            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.04        |
| P3           | 30.00             |                     |                 | 2 ø 8.0<br>0.66 |                     |               |                     |                | 0.07         |             |
| 3            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.02         | 0.06        |
| P4           | 30.00             |                     |                 | 2 ø 8.0<br>0.77 |                     |               |                     |                | 0.10         |             |
| 4            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.02         | 0.06        |
| P5           | 30.00             |                     |                 | 2 ø 8.0<br>0.79 |                     |               |                     |                | 0.10         |             |
| 5            | 330.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.03         | 0.08        |
| P6           | 30.00             |                     |                 | 4 ø 8.0<br>1.76 |                     |               |                     |                | 0.06         |             |
| 6            | 475.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.86 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.12         | 0.34        |
| P7           | 30.00             |                     |                 | 4 ø 8.0<br>2.10 |                     |               |                     |                | 0.07         |             |
| 7            | 490.49            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.98 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.16         | 0.43        |
| P8           | 18.00             |                     |                 | 4 ø 8.0<br>1.70 |                     |               |                     |                | 0.06         |             |

## Resultados da Viga V2

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P9           | 21.22             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |
| 1            | 268.87            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.00         | 0.01        |
| P10          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |

## Resultados da Viga V3

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P11          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.01         |             |
| 1            | 307.70            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.00         | 0.02        |
| P12          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.01         |             |
| 2            | 307.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.00         | 0.02        |
| P13          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.01         |             |
| 3            | 342.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.00         | 0.03        |
| P14          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.05         |             |
| 4            | 487.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.11        |
| P15          | 18.00             |                     |                           | 2 ø 8.0<br>0.59           |                                  |                            |                                  |                             | 0.06         |             |
| 5            | 496.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.12        |
| P16          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.05         |             |

## Resultados da Viga V4

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P18          | 30.00             |                     |                           | 2 ø 8.0<br>0.72           |                                  |                            |                                  |                             | 0.09         |             |
| 1            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.02         | 0.06        |
| P19          | 30.00             |                     |                           | 2 ø 8.0<br>0.72           |                                  |                            |                                  |                             | 0.09         |             |
| 2            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.02         | 0.06        |
| P20          | 30.00             |                     |                           | 2 ø 8.0<br>0.83           |                                  |                            |                                  |                             | 0.11         |             |
| 3            | 330.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.03         | 0.08        |
| P21          | 30.00             |                     |                           | 4 ø 8.0<br>1.79           |                                  |                            |                                  |                             | 0.06         |             |
| 4            | 475.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.86           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.12         | 0.34        |
| P22          | 30.00             |                     |                           | 3 ø 10.0<br>2.17          |                                  |                            |                                  |                             | 0.10         |             |
| 5            | 490.49            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.98           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.16         | 0.43        |
| P23          | 18.00             |                     |                           | 2 ø 10.0<br>1.62          |                                  |                            |                                  |                             | 0.21         |             |

## Resultados da Viga V5

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P10          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |
| 1            | 292.58            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.00         | 0.02        |
| P2           | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.02         |             |

## Resultados da Viga V6

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P18          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.02         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.09        |
| P11          | 30.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.04         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P3           | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |

## Resultados da Viga V7

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P19          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P12          | 30.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.04         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P4           | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |

## Resultados da Viga V8

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P20          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P13          | 30.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.04         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P5           | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |

## Resultados da Viga V9

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P21          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P14          | 30.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.04         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.07        |
| P6           | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.03         |             |

Resultados da Viga V10

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P22          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.03         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.07        |
| P15          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.07        |
| P7           | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.03         |             |

Resultados da Viga V11

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P23          | 30.00             |                     |                 | 3 ø 8.0<br>1.40 |                     |               |                     |                | 0.11         |             |
| 1            | 418.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.69 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.08         | 0.22        |
| P16          | 30.00             |                     |                 | 3 ø 8.0<br>1.53 |                     |               |                     |                | 0.12         |             |
| 2            | 418.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.69 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.08         | 0.22        |
| P8           | 30.00             |                     |                 | 3 ø 8.0<br>1.40 |                     |               |                     |                | 0.11         |             |

## Resultados da Viga V12

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P17          | 18.17             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |
| 1            | 316.54            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.00         | 0.03        |
| P11          | 22.57             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |

## Resultados da Viga V13

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P18          | 12.99             |                     |                 | 2 ø 8.0<br>0.89 |                     |               |                     |                | 0.11         |             |
| 1            | 345.40            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.04         | 0.11        |
| P17          | 30.00             |                     |                 | 3 ø 8.0<br>1.55 |                     |               |                     |                | 0.13         |             |
| 2            | 435.19            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.72 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.09         | 0.24        |
| P9           | 30.00             |                     |                 | 4 ø 8.0<br>1.78 |                     |               |                     |                | 0.06         |             |
| 3            | 431.68            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.79 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.10         | 0.28        |
| P1           | 25.46             |                     |                 | 3 ø 8.0<br>1.23 |                     |               |                     |                | 0.10         |             |

**Pavimento Nivel Cobertura**

# Resultados dos Pilares

Nível Cobertura  
Lance 2

fck = 250.00 kgf/cm²

E = 238000 kgf/cm²  
cobr = 2.00 cm

Peso Espec = 2500.00 kgf/m³

| Dados        |                     |                   |                              |                    |                           |                           | Resultados                                        |                        |                |  |
|--------------|---------------------|-------------------|------------------------------|--------------------|---------------------------|---------------------------|---------------------------------------------------|------------------------|----------------|--|
| Pilar        | Seção (cm)          | Nível Altura (cm) | lib vinc lih vinc (cm)       | Nd máx Nd mín (tf) | MBd topo MBd base (kgf.m) | MHd topo MHd base (kgf.m) | As b Ferros As h % armad total                    | Estribo Topo Base cota | Esb b Esb h    |  |
| P1<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 3.68<br>2.17       | 445<br>428                | 2167<br>1816              | 2.45 2 ø 12.5<br>2.45 2 ø 12.5<br>0.9 4 ø<br>12.5 | ø 5.0 c/ 15            | 67.28<br>40.37 |  |
| P2<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 4.62<br>2.76       | 423<br>270                | 1223<br>1023              | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P3<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 3.61<br>2.10       | 633<br>356                | 114<br>73                 | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P4<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 3.85<br>2.27       | 649<br>364                | 142<br>111                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P5<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 3.89<br>2.30       | 649<br>363                | 75<br>49                  | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P6<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 4.52<br>2.76       | 639<br>354                | 418<br>369                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P7<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 5.15<br>3.21       | 628<br>346                | 176<br>108                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P8<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 3.41<br>1.94       | 913<br>804                | 867<br>705                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P9<br>1:100  | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 4.50<br>2.77       | 225<br>78                 | 151<br>105                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P10<br>1:100 | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 2.48<br>1.26       | 304<br>182                | 567<br>262                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P11<br>1:100 | 18.00<br>X<br>30.00 | 355.00<br>350.00  | 350.00<br>RR<br>350.00<br>RR | 5.85<br>3.73       | 54<br>52                  | 458<br>300                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø<br>10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |  |
| P12<br>1:100 | 18.00<br>X          | 355.00<br>350.00  | 350.00<br>RR                 | 5.68<br>3.66       | 54<br>50                  | 204<br>159                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0                    | ø 5.0 c/ 12            | 67.28<br>40.37 |  |

| Dados        |                  |                   |                        |                    |                           |                           | Resultados                                     |                        |                |
|--------------|------------------|-------------------|------------------------|--------------------|---------------------------|---------------------------|------------------------------------------------|------------------------|----------------|
| Pilar        | Seção (cm)       | Nível Altura (cm) | lib vinc lih vinc (cm) | Nd máx Nd mín (tf) | MBd topo MBd base (kgf.m) | MHd topo MHd base (kgf.m) | As b Ferros As h % armad total                 | Estribo Topo Base cota | Esb b Esb h    |
|              | 30.00            |                   | 350.00 RR              |                    |                           |                           | 0.6 4 ø 10.0                                   |                        |                |
| P13<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 5.69<br>3.68       | 65<br>62                  | 203<br>158                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P14<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 6.36<br>4.16       | 295<br>198                | 204<br>159                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P15<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 7.01<br>4.63       | 157<br>101                | 202<br>157                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P16<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 4.88<br>3.08       | 796<br>401                | 193<br>142                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P17<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 4.25<br>2.58       | 334<br>192                | 279<br>274                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P18<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 3.82<br>2.19       | 831<br>578                | 221<br>111                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P19<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 3.86<br>2.29       | 650<br>366                | 86<br>60                  | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P20<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 3.89<br>2.30       | 650<br>364                | 91<br>81                  | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P21<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 4.51<br>2.75       | 640<br>356                | 467<br>406                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P22<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 5.15<br>3.21       | 628<br>346                | 217<br>139                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |
| P23<br>1:100 | 18.00 X<br>30.00 | 355.00<br>350.00  | 350.00 RR<br>350.00 RR | 3.40<br>1.94       | 892<br>788                | 869<br>707                | 1.57 2 ø 10.0<br>1.57 2 ø 10.0<br>0.6 4 ø 10.0 | ø 5.0 c/ 12            | 67.28<br>40.37 |

## Resultados da Viga V1

$f_{ck} = 250.00 \text{ kgf/cm}^2$

Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$

Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P1           | 30.00             |                     |                 | 3 ø 8.0<br>1.42 |                     |               |                     |                | 0.12         |             |
| 1            | 582.83            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.94 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.15         | 0.62        |
| P2           | 30.00             |                     |                 | 4 ø 8.0<br>1.78 |                     |               |                     |                | 0.06         |             |
| 2            | 282.46            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.00         | 0.01        |
| P3           | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.03         |             |
| 3            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.05        |
| P4           | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 4            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.04        |
| P5           | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 5            | 330.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.05        |
| P6           | 30.00             |                     |                 | 2 ø 8.0<br>1.01 |                     |               |                     |                | 0.17         |             |
| 6            | 475.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.05         | 0.23        |
| P7           | 30.00             |                     |                 | 3 ø 8.0<br>1.35 |                     |               |                     |                | 0.12         |             |
| 7            | 490.49            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.70 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.08         | 0.34        |
| P8           | 18.00             |                     |                 | 2 ø 8.0<br>0.83 |                     |               |                     |                | 0.11         |             |

## Resultados da Viga V2

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P9           | 21.22             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.02         |             |
| 1            | 268.87            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.01         | 0.06        |
| P10          | 18.00             |                     |                           | 2 ø 8.0<br>0.58           |                                  |                            |                                  |                             | 0.01         |             |

## Resultados da Viga V3

$f_{ck} = 250.00 \text{ kgf/cm}^2$

Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$

Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P11          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 1            | 307.70            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.06        |
| P12          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 2            | 307.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.06        |
| P13          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 3            | 342.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.06        |
| P14          | 18.00             |                     |                 | 2 ø 8.0<br>1.02 |                     |               |                     |                | 0.17         |             |
| 4            | 487.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.59 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.06         | 0.27        |
| P15          | 18.00             |                     |                 | 3 ø 8.0<br>1.43 |                     |               |                     |                | 0.12         |             |
| 5            | 496.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.75 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.09         | 0.38        |
| P16          | 18.00             |                     |                 | 2 ø 8.0<br>0.76 |                     |               |                     |                | 0.10         |             |

## Resultados da Viga V4

$f_{ck} = 250.00 \text{ kgf/cm}^2$

Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$

Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P18          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.03         |             |
| 1            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.05        |
| P19          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 2            | 295.71            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.04        |
| P20          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |
| 3            | 330.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.01         | 0.05        |
| P21          | 30.00             |                     |                 | 2 ø 8.0<br>1.03 |                     |               |                     |                | 0.17         |             |
| 4            | 475.00            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.05         | 0.23        |
| P22          | 30.00             |                     |                 | 3 ø 8.0<br>1.37 |                     |               |                     |                | 0.12         |             |
| 5            | 490.49            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.70 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.08         | 0.34        |
| P23          | 18.00             |                     |                 | 2 ø 8.0<br>0.81 |                     |               |                     |                | 0.11         |             |

Resultados da Viga V5

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P10          | 30.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.02         |             |
| 1            | 292.58            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.02         | 0.08        |
| P2           | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.02         |             |

## Resultados da Viga V6

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P18          | 18.00             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.05         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.59 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.06         | 0.24        |
| P11          | 30.00             |                     |                 | 3 ø 8.0<br>1.25 |                     |               |                     |                | 0.10         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.05         | 0.21        |
| P3           | 18.00             |                     |                 | 2 ø 8.0<br>0.59 |                     |               |                     |                | 0.05         |             |

## Resultados da Viga V7

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P19          | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P12          | 30.00             |                     |                           | 3 ø 8.0<br>1.20           |                                  |                            |                                  |                             | 0.10         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P4           | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |

## Resultados da Viga V8

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P20          | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P13          | 30.00             |                     |                           | 3 ø 8.0<br>1.20           |                                  |                            |                                  |                             | 0.10         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P5           | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |

## Resultados da Viga V9

fck = 250.00 kgf/cm<sup>2</sup>  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm<sup>2</sup>  
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados                |                           |                                  |                            |                                  |                             |              |             |
|--------------|-------------------|---------------------|---------------------------|---------------------------|----------------------------------|----------------------------|----------------------------------|-----------------------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm <sup>2</sup> ) | As Sup (cm <sup>2</sup> ) | As esq trecho (cm <sup>2</sup> ) | Asw min (cm <sup>2</sup> ) | As dir trecho (cm <sup>2</sup> ) | Asw Pele (cm <sup>2</sup> ) | Fissura (mm) | Flecha (cm) |
| P21          | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P14          | 30.00             |                     |                           | 3 ø 8.0<br>1.20           |                                  |                            |                                  |                             | 0.10         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58           |                           |                                  | ø 5.0 c/ 16                |                                  |                             | 0.05         | 0.22        |
| P6           | 18.00             |                     |                           | 2 ø 8.0<br>0.61           |                                  |                            |                                  |                             | 0.05         |             |

# Resultados da Viga V10

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P22          | 18.00             |                     |                 | 2 ø 8.0<br>0.62 |                     |               |                     |                | 0.05         |             |
| 1            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.05         | 0.22        |
| P15          | 30.00             |                     |                 | 3 ø 8.0<br>1.19 |                     |               |                     |                | 0.10         |             |
| 2            | 430.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.05         | 0.22        |
| P7           | 18.00             |                     |                 | 2 ø 8.0<br>0.62 |                     |               |                     |                | 0.05         |             |

# Resultados da Viga V11

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P23          | 30.00             |                     |                 | 2 ø 8.0<br>0.80 |                     |               |                     |                | 0.09         |             |
| 1            | 418.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.04         | 0.17        |
| P16          | 30.00             |                     |                 | 2 ø 8.0<br>1.03 |                     |               |                     |                | 0.15         |             |
| 2            | 418.50            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.04         | 0.17        |
| P8           | 30.00             |                     |                 | 2 ø 8.0<br>0.80 |                     |               |                     |                | 0.09         |             |

# Resultados da Viga V12

fck = 250.00 kgf/cm²  
Cobrimento = 2.00 cm

Ecs = 238000 kgf/cm²  
Peso específico = 2500.00 kgf/m³

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P17          | 18.17             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.02         |             |
| 1            | 316.54            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.02         | 0.09        |
| P11          | 22.57             |                     |                 | 2 ø 8.0<br>0.61 |                     |               |                     |                | 0.06         |             |

## Resultados da Viga V13

$f_{ck} = 250.00 \text{ kgf/cm}^2$   
Cobrimento = 2.00 cm

$E_{cs} = 238000 \text{ kgf/cm}^2$   
Peso específico = 2500.00 kgf/m<sup>3</sup>

| Dados        |                   |                     | Resultados      |                 |                     |               |                     |                |              |             |
|--------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------|---------------------|----------------|--------------|-------------|
| Pilar Trecho | Apoio 1 e 1o (cm) | Seção (cm)          | As Inf (cm²)    | As Sup (cm²)    | As esq trecho (cm²) | Asw min (cm²) | As dir trecho (cm²) | Asw Pele (cm²) | Fissura (mm) | Flecha (cm) |
| P18          | 12.99             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.01         |             |
| 1            | 345.40            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.03         | 0.10        |
| P17          | 30.00             |                     |                 | 2 ø 8.0<br>0.98 |                     |               |                     |                | 0.14         |             |
| 2            | 435.19            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.04         | 0.17        |
| P9           | 30.00             |                     |                 | 3 ø 8.0<br>1.20 |                     |               |                     |                | 0.10         |             |
| 3            | 431.68            | 13.00<br>x<br>30.00 | 2 ø 8.0<br>0.58 |                 |                     | ø 5.0 c/ 16   |                     |                | 0.06         | 0.23        |
| P1           | 25.46             |                     |                 | 2 ø 8.0<br>0.58 |                     |               |                     |                | 0.04         |             |