

1a 4) Gabarito

5) A partir de prof $\approx 12\text{m} \rightarrow N_{SAT} \approx 30$ À superfície: $\sigma_{adm} = 20 N_{SAT} = 600 \text{ kPa}$ Solte orenho \Rightarrow solicitações "não drenada"

$$\underline{\underline{\sigma_b = \sigma_{adm} + \gamma D = 600 + 18 \times 12 = 600 + 200 = 800 \text{ kPa}}}$$

max $\rightarrow 1200 \text{ kPa}$ OK

6) a) P6 e P9 - tubulões isolados

$$P = 330 \text{ tf} = 3300 \text{ kN}$$

$$A_b = \frac{P}{\sigma_b} = \frac{3300}{800} = 4,13 \text{ m}^2 = \frac{\pi B^2}{4}$$

$$\underline{\underline{B = 230 \text{ cm}}} \text{ diâmetro de base}$$

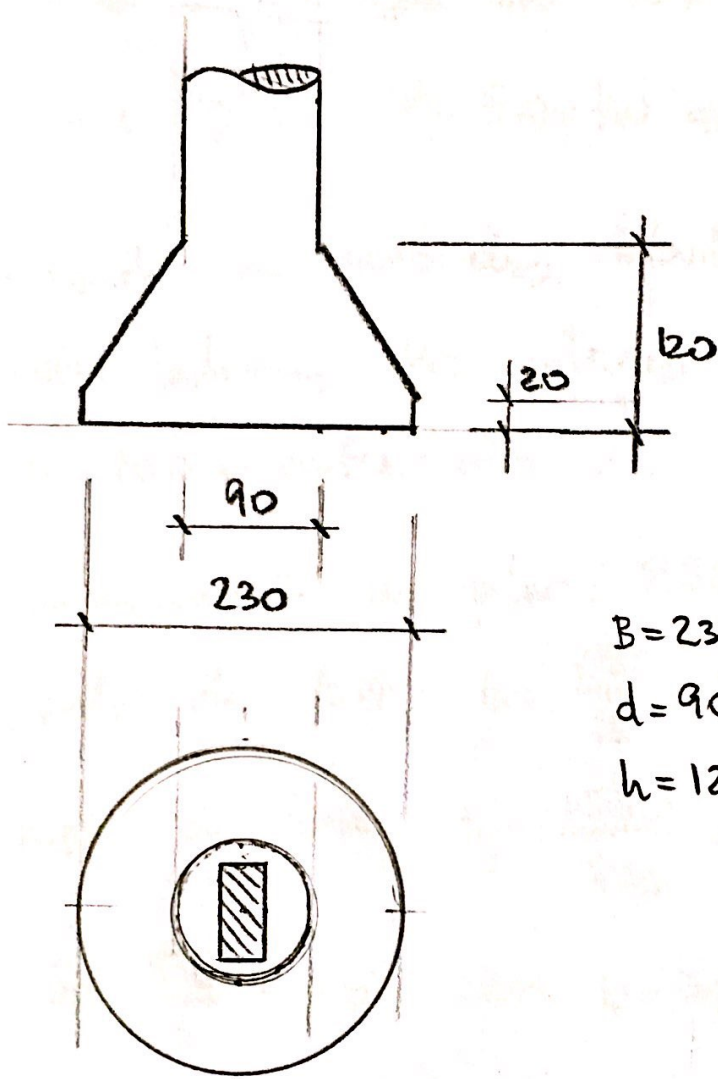
Fuste: adote-se $\sigma_c = 5000 \text{ kPa} = 5,0 \text{ MPa}$

$$\underline{\underline{dov}} \ D_f = \sqrt{\frac{4P}{\pi \sigma_c}} = \sqrt{\frac{4 \times 3300}{\pi \times 5000}} = \underline{\underline{90 \text{ cm}}} > 70 \text{ cm} \underline{\underline{OK}}$$

Altura da base: $\phi 60^\circ$

$$h = 0,866 (B - d) = 0,866 (230 - 90) = \underline{\underline{120 \text{ cm}}} < 180 \text{ cm} \underline{\underline{OK}}$$

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$$B = 230 \text{ cm}$$

$$d = 90 \text{ cm}$$

$$h = 120 \text{ cm}$$

6b) Como se trata de pilar alongado, melhor 2 tubulões em falsa elipse.

③

P20 e P5 $\rightarrow P = 3100 \text{ kN} \Rightarrow 1550 \text{ kN}$ por tubulões

Supondo as bases dos tubulões limitadas pelas laterais dos pilares, com distância de 10cm entre eles:

Comprimento do pilar, 250 cm

$$\text{Valor de } b = \frac{250}{2} - 5 = \underline{120 \text{ cm}}$$

$$\text{Área da base: } A_b = \frac{1550}{800} = 1,94 \text{ m}^2$$

$$A_b = \frac{\pi b^2}{4} + x b \quad \text{com } b = 120 \text{ cm} \rightarrow \underline{x = 70 \text{ cm}}$$

$$\underline{a = b + x = 190 \text{ cm}}$$

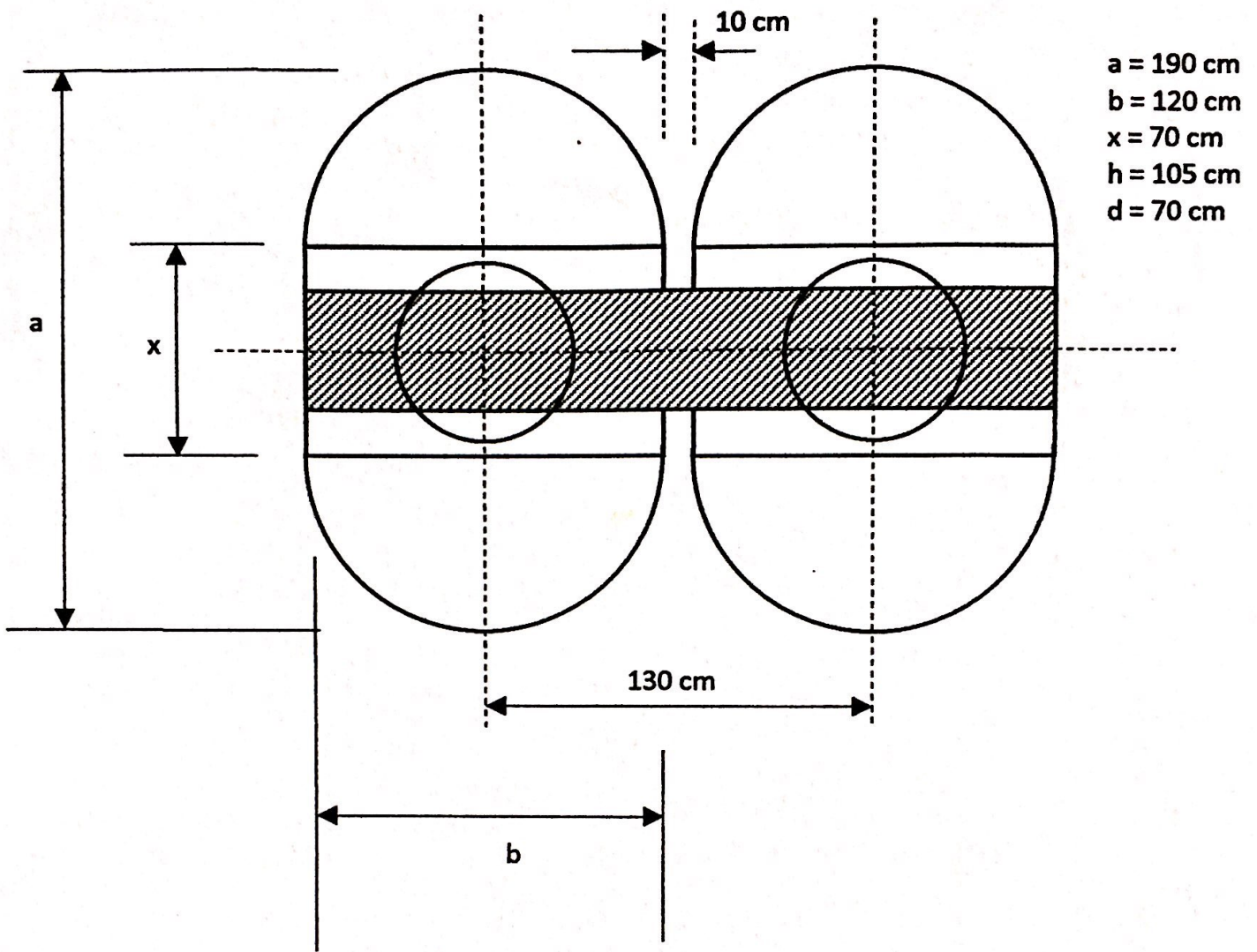
$$\text{Diâmetro do fuste: } D_f = \sqrt{\frac{4P}{\pi \sigma_c}} = 62 \text{ cm} < 70 \text{ cm}$$

$$\text{adota-se } \underline{D_f = 70 \text{ cm}}$$

Altura da base:

$$h = 0,866(a - d) = 0,866(190 - 70) = \underline{105 \text{ cm}} < 180 \text{ cm}$$

OK



6c) P24 e P19 - alavancos, pois o 4
tubos são excêntricos próximos à divisa.

Procedimento semelhante à sapata alavancada:

$$P24 \rightarrow 1500 \text{ kN} \quad 30 \times 30 \text{ cm}$$

$$P19 \rightarrow 2900 \text{ kN} \quad 30 \times 60 \text{ cm}$$

$$\underline{P24}: R_1 = 1,2 P_1 = 1,2 \times 1500 = 1800 \text{ kN}$$

$$A_1 = \frac{R_1}{\sigma_s} = \frac{1800}{800} = 2,25 \text{ m}^2$$

adota-se $a = 2b$ e como $\left. \begin{array}{l} A = \frac{\pi b^2}{4} + b \cdot x \\ a = b + x \end{array} \right\} \Rightarrow$

$$\Rightarrow A = \frac{\pi b^2}{4} + b \cdot (a - b) = \frac{\pi b^2}{4} + b^2 \quad \therefore b = \sqrt{\frac{A}{\frac{\pi}{4} + 1}} = \underline{115 \text{ cm}}$$

$$\text{Excentricidade: } e = \frac{b}{2} - \frac{b_0}{2} = \frac{115}{2} - \frac{30}{2} = 42,5 \text{ cm}$$

$$R_1 = P_1 \frac{l}{l - e} = 1500 \frac{508}{508 - 42,5} = 1637 \text{ kN}$$

$$\text{Nova área: } A = \frac{1637}{800} = 2,05 \text{ m}^2$$

$$\text{Fixando-se } b = 115 \text{ cm} \rightarrow 2,05 = \frac{\pi \times 1,15^2}{4} + 1,15 \cdot x$$
$$\underline{x = 90 \text{ cm}} \quad \underline{a = 205 \text{ cm}}$$

$$\frac{a}{b} = 1,80 \quad \underline{OK}$$

$$\text{Fuste: } d = \sqrt{\frac{4R}{\pi \sigma_c}} = \sqrt{\frac{4 \times 1637}{\pi \times 5000}} = 65 \text{ cm} < 70 \text{ cm} \quad (5)$$

$$R_2 = P_2 - \frac{\Delta P}{2}$$

$$\text{adota-se } \underline{d = 70 \text{ cm}}$$

$$\text{Base: } h = 0,866(a - d) = 0,866(205 - 70) = \underline{120 \text{ cm}}$$

$$< 180 \text{ cm } \underline{\text{OK}}$$

Pilar P19

$$R_2 = P_2 - \frac{\Delta P_1}{2} = 2900 - \frac{1637 - 1500}{2} = 2832 \text{ kN}$$

$$B = \sqrt{\frac{4R}{\pi \sigma_c}} = \sqrt{\frac{4 \times 2832}{\pi \times 800}} = \underline{215 \text{ cm}}$$

$$d = \sqrt{\frac{4R}{\pi \sigma_c}} = \sqrt{\frac{4 \times 2832}{\pi \times 5000}} = \underline{85 \text{ cm}} > 70 \text{ cm } \underline{\text{OK}}$$

$$h = 0,866(B - d) = \underline{115 \text{ cm}} < 180 \text{ cm } \underline{\text{OK}}$$

