

# ЗАДАТАК 1

1.1  $G_z = 10 \cdot 1,0 \cdot 25 = 250 \text{ kN/m}$

$V = 1000 \text{ kN/m}$

$V_{\max} = 1250 \text{ kN/m}$

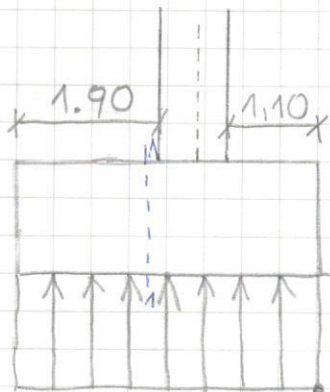
$e = \frac{170 + 30 \cdot 11,0}{1250}$

$e = 0,40 \text{ m}$

УЧВАЈА СЕ:

$B = 4,0 \text{ m}$

$B_{\text{pot}} \geq \frac{1250}{\frac{1040}{3} - 0,85 \cdot 25 \cdot 1,50} = 3,97 \text{ m}$



$b_{\max} = \frac{4,0}{2} + 0,4 - \frac{1,0}{2} = 1,90 \text{ m}$

$b_{\min} = \frac{4,0}{2} - 0,4 - \frac{1,0}{2} = 1,10 \text{ m}$

$p_n = \frac{1250}{4,0} = 312,5 \frac{\text{kN}}{\text{m}^2}$

1.2.  $M_{1-1} = 312,5 \cdot \frac{1,90^2}{2} = 564,06 \frac{\text{kNm}}{\text{m}}$

УЧВАЈА СЕ

$h_{\text{pot}} \geq \kappa \cdot \sqrt{\frac{M_{1-1}}{1,0}} = 3,51 \cdot \sqrt{\frac{564,06}{1,0}} = 83,36 \text{ cm}$

$h_T = 0,90 \text{ m}$

1.3

Плешката зид

Вертикално статно оптере.

Плешката темеља

Плешката капа која има

$G_z = 250 \text{ kN/m}$

$V = 1000 \text{ kN/m}$

$G_b = 4,0 \cdot 0,9 \cdot 25 = 90 \text{ kN/m}$

$G_t = (4,0 - 1,0) \cdot 0,5 \cdot 18 = 27 \text{ kN/m}$

$p_n^g = \frac{1367}{4,0} = 341,75 \frac{\text{kN}}{\text{m}^2}$

$\Sigma V = 1367 \frac{\text{kN}}{\text{m}}$

Случај  $p_1$  ↓ →

$p_s^{p_1} = \frac{100}{4,0} = 25 \frac{\text{kN}}{\text{m}^2}$

128 ↓

$p_{1,2}^{p_1} = \frac{100}{4,0} \pm \frac{[100 \cdot 0,4 + 20 \cdot (3,5 + 0,9)] \cdot 6}{4,0^2}$

$p_{1,2}^{p_1} = 73 \frac{\text{kN}}{\text{m}^2}$

$p_2^{p_1} = -23 \frac{\text{kN}}{\text{m}^2}$

Случај  $p_2$  ↓ ←

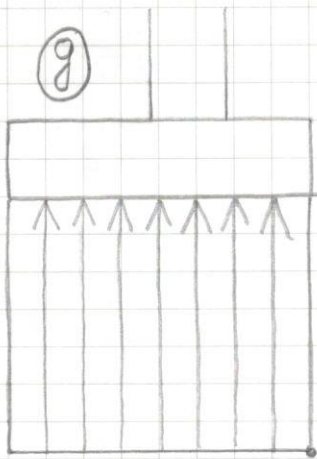
$p_s^{p_2} = 25 \frac{\text{kN}}{\text{m}^2}$

48 ↓

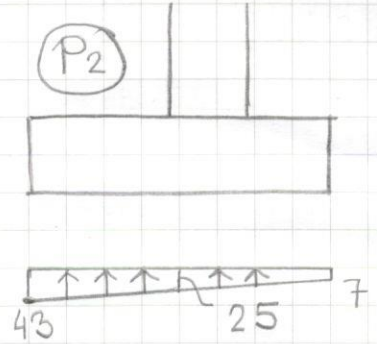
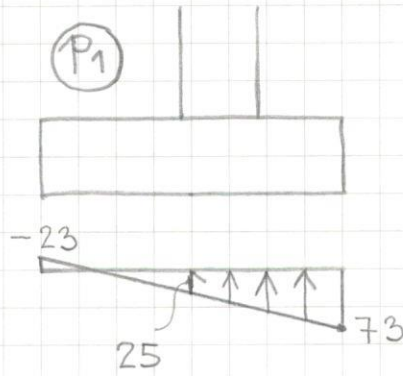
$p_{1,2}^{p_2} = \frac{100}{4,0} \pm \frac{[100 \cdot 0,4 - 20 \cdot (3,5 + 0,9)] \cdot 6}{4,0^2}$

$p_1^{p_2} = 7 \frac{\text{kN}}{\text{m}^2}$

$p_2^{p_2} = 43 \frac{\text{kN}}{\text{m}^2}$



341,75

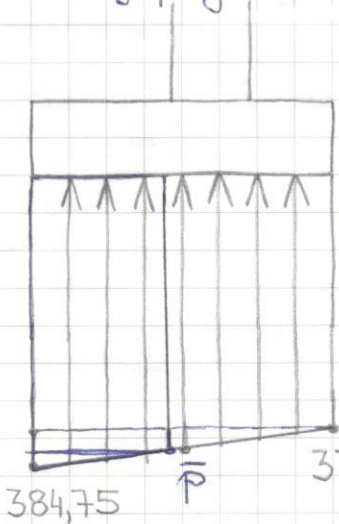


$$p_s^{g+p} = 341,75 + 25 = 366,75 \frac{\text{kN}}{\text{m}^2} > 346,67 \frac{\text{kN}}{\text{m}^2} = \frac{b_{gr}}{3}$$

$$\Delta = \left| \frac{346,67 - 366,75}{346,67} \right| = 5,79\% > 5\%$$

$$p_1^{g+p} = 341,75 + 73 = 414,75 \frac{\text{kN}}{\text{m}^2} < 520 \frac{\text{kN}}{\text{m}^2} = \frac{b_{gr}}{2}$$

1.4 Мјеродавна комбинација  $g+p_2$



$$(384,75 - 334,75) : 4,0 = x : 2,10$$

$$x = 26,25 \frac{\text{kN}}{\text{m}^2} \quad \bar{p} = 361 \frac{\text{kN}}{\text{m}^2}$$

$$Q_1 = 361 \cdot 1,9 = 685,9 \frac{\text{kN}}{\text{m}}$$

$$Q_2 = \frac{1}{2} (384,75 - 361) \cdot 1,9 = 22,56 \frac{\text{kN}}{\text{m}}$$

$$M_{1-1} = 685,9 \cdot \frac{1,9}{2} + 22,56 \cdot \frac{2}{3} \cdot 1,90$$

$$M_{1-1} = 680,18 \frac{\text{kNm}}{\text{m}}$$

$$h_{pot} \geq 3,51 \cdot \sqrt{\frac{680,18}{1,0}} = 91,54 \text{ cm}$$



## ЗАДАТАК 2

$$2.1 \quad G_{ST} = 0,80 \cdot 0,80 \cdot 10 \cdot 25 = 160 \text{ kN}$$

$$e = \frac{380 + 200 \cdot 11,0}{5160}$$

$$V = 5000 \text{ kN}$$

$$e = 0,50 \text{ m}$$

$$V_{\max} = 5160 \text{ kN}$$

$$A_{\text{pot}} \geq \frac{5160}{\frac{900}{3} - 0,85 \cdot 25 \cdot 1,5} = 19,245 \text{ m}^2$$

$$k = 1,50$$

$$k \cdot B_{\text{pot}}^2 \geq 19,245 \text{ m}^2 \Rightarrow B_{\text{pot}} \geq 3,58 \text{ m}$$

УСВАЈА СЕ:

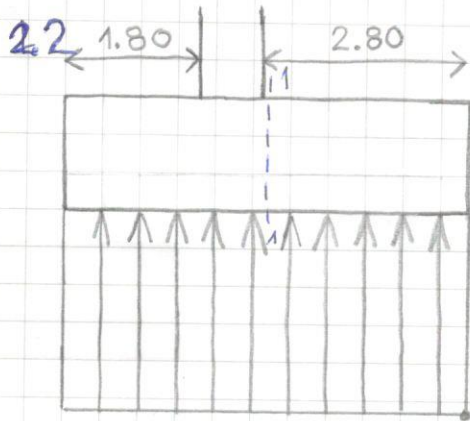
$$B = 3,60 \text{ m}$$

$$L = 5,40 \text{ m}$$

$$e_{\max} = \frac{5,40}{2,0} + 0,5 - \frac{0,80}{2} = 2,80 \text{ m}$$

$$e_{\min} = \frac{5,40}{2} - 0,5 - \frac{0,80}{2} = 1,80 \text{ m}$$

$$p_m = \frac{5160}{3,6 \cdot 5,4} = 265,43 \frac{\text{kN}}{\text{m}^2}$$



$$Q_{1-1} = 265,43 \cdot 2,80 \cdot 3,60 = 2675,534 \text{ kN}$$

$$M_{1-1} = 2675,534 \cdot 1,40 = 3745,748 \text{ kNm}$$

$$h_a = \frac{2675,534}{2,5 \cdot 0,8 \cdot 1700} = 0,787 \text{ m}$$

$$h_m = 2,52 \cdot \sqrt{\frac{3745,748}{2,5 \cdot 0,80}} = 109,057 \text{ cm}$$

УСВАЈА СЕ:  $h_T = 1,15 \text{ m}$

2.3 Пешкиња шпудра

$$G_{ST} = 160 \text{ kN}$$

Вертикално статно оптерећење  $V = 5000 \text{ kN}$

Пешкиња шемења  $G_b = 5,4 \cdot 3,6 \cdot 1,15 \cdot 25 = 558,9 \text{ kN}$

Пешкиња надскоја  $G_N = (5,4 \cdot 3,6 - 0,8^2) \cdot 0,5 \cdot 18 = 169,2 \text{ kN}$

$$p_m = \frac{5888,1}{5,4 \cdot 3,6} = 302,886 \frac{\text{kN}}{\text{m}^2}$$

$$\Sigma V = 5888,1 \text{ kN}$$

$$\tau_{\text{час}} = \frac{5160 - [(0,8 + 2 \cdot 1,09) \cdot (0,8 + 2 \cdot 1,09)] \cdot 302,886}{2 \cdot [(0,8 + 1,09) + (0,8 + 1,09)] \cdot 1,09} = 299,77 \frac{\text{kN}}{\text{m}^2}$$

$$\tau_{\text{час}} = 299,77 \frac{\text{kN}}{\text{m}^2} < 900 \frac{\text{kN}}{\text{m}^2} = 0,03 \text{ } \checkmark \text{ k}$$



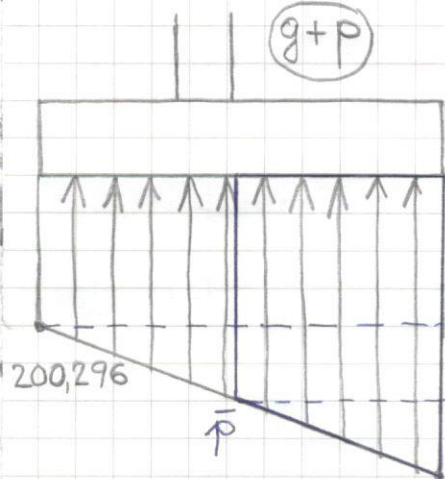
$$2.4 \quad p_s^p = 0 \quad p_{1,2}^p = \frac{[100 + 300 \cdot (4,5 + 1,15)] \cdot 6}{3,6 \cdot 5,4^2} \quad p_1^p = 102,59 \frac{\text{kN}}{\text{m}^2}$$

$$p_2^p = -102,59 \frac{\text{kN}}{\text{m}^2}$$

$$p_s^{g+p} = 302,886 \frac{\text{kN}}{\text{m}^2} > 300 \frac{\text{kN}}{\text{m}^2} = \frac{6gr}{3}$$

$$\Delta = \left| \frac{300 - 302,886}{300} \right| \cdot 100 = 0,96\% < 5\%$$

$$p_1^{g+p} = 302,886 + 102,59 = 405,476 \frac{\text{kN}}{\text{m}^2} < 450 \frac{\text{kN}}{\text{m}^2} = \frac{6gr}{2}$$



$$(405,476 - 200,296) : 5,40 = X : (1,80 + 0,80)$$

$$X = 98,7904 \frac{\text{kN}}{\text{m}^2} \Rightarrow \bar{p} = 299,086 \frac{\text{kN}}{\text{m}^2}$$

$$Q_1 = 299,086 \cdot 2,80 \cdot 3,60 = 3014,787 \text{ kN}$$

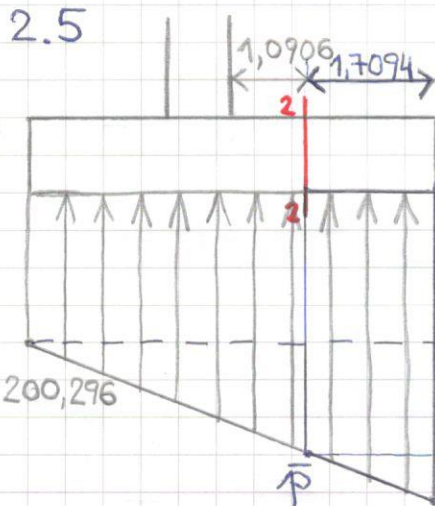
$$Q_2 = \frac{1}{2} \cdot 106,39 \cdot 2,80 \cdot 3,60 = 536,206 \text{ kN}$$

$$Q_{1+2} = 3014,787 + 536,206 = 3550,99 \text{ kN}$$

$$405,476 \cdot h_a = \frac{3550,99}{2,5 \cdot 0,8 \cdot 1700} = 1,044 \text{ m}$$

$$M_{1-1} = 3014,787 \cdot 0,50 \cdot 2,8 + 536,206 \cdot \frac{2}{3} \cdot 2,8 = 5221,62 \text{ kNm}$$

$$h_m = 2,52 \cdot \sqrt{\frac{5221,62}{2,5 \cdot 0,8}} = 128,76 \text{ m}$$



$$(405,476 - 200,296) : 5,4 = X : (1,80 + 0,80 + 1,0906)$$

$$X = 140,024 \frac{\text{kN}}{\text{m}^2} \Rightarrow \bar{p} = 340,32 \frac{\text{kN}}{\text{m}^2}$$

$$S_1 = 340,32 \cdot 1,7094 \cdot 3,6 = 2094,27 \frac{\text{kN}}{\text{m}^2}$$

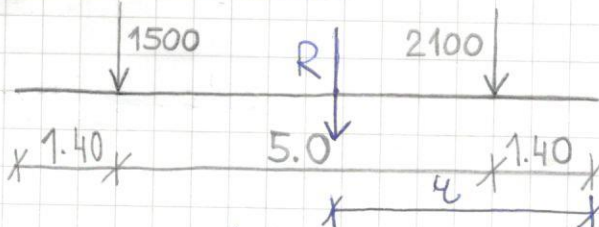
$$S_2 = \frac{1}{2} \cdot 65,156 \cdot 1,7094 \cdot 3,6 = 200,48 \frac{\text{kN}}{\text{m}^2}$$

$$S = 2294,75 \text{ kN}$$

$$\tau_{\text{max}} = \frac{2294,75}{(0,8 + 1,0906) \cdot 1,0906} = 1112,94 \frac{\text{kN}}{\text{m}^2} > 900 \frac{\text{kN}}{\text{m}^2} = 0,03 \text{ } \tau_k$$



### ЗАДАТАК 3



$$R = 1500 + 2100 = 3600 \text{ kN}$$

$$u = \frac{2100 \cdot 1,40 + 1500 \cdot 6,40}{3600}$$

$$u = 3,4833 \text{ m}$$

$$u = \frac{B_1 \cdot \frac{L}{2} \cdot \frac{L}{4} + B_2 \cdot \frac{L}{2} \cdot \frac{3L}{4}}{\frac{L}{2} \cdot (B_1 + B_2)} = \frac{B_1 \cdot \frac{L}{4} + B_2 \cdot \frac{3L}{4}}{B_1 + B_2}$$

$$3,4833 = \frac{1,95 B_1 + 5,85 \cdot B_2}{B_1 + B_2}$$

$$s = \frac{\Delta b_z}{M_v} \cdot d \Rightarrow \Delta b_z = \frac{s \cdot M_v}{d} = \frac{0,05 \cdot 25750}{5,0} = 257,5 \frac{\text{kN}}{\text{m}^2}$$

$$\frac{R}{A} = 257,5 \Rightarrow \frac{L}{2} (B_1 + B_2) = \frac{R}{257,5} \Rightarrow B_1 + B_2 = 3,585 \text{ m}$$

$$B_1 = 3,585 - B_2$$

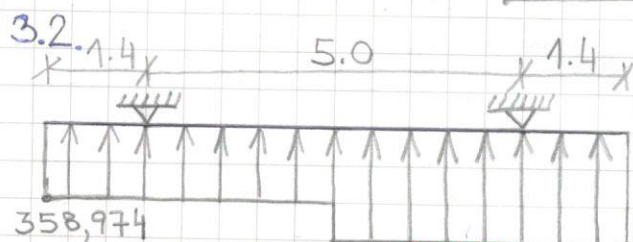
$$3,4833 = \frac{1,95 \cdot (3,585 - B_2) + 5,85 \cdot B_2}{3,585 - B_2 + B_2}$$

$$B_2 = 1,40 \text{ m}$$

$$3,4833 = \frac{6,99075 - 1,95 \cdot B_2 + 5,85 \cdot B_2}{3,585}$$

$$B_1 = 2,20 \text{ m}$$

$$p_m = \frac{3600}{3,9 \cdot (1,4 + 2,2)} = 256,41 \frac{\text{kN}}{\text{m}^2}$$



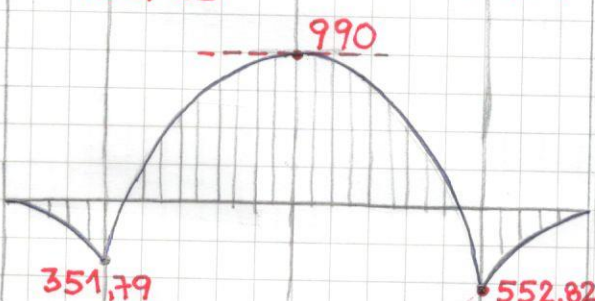
$$V_L \cdot 5,0 - 358,974 \cdot 3,9 \cdot (2,5 + 1,95) - 564,102 \cdot 3,9 \cdot (1,95 - 1,40) = 0$$

$$V_L = 1487,9985 \text{ kN}$$



$$V_D \cdot 5,0 - 564,102 \cdot 3,9 \cdot (2,5 + 1,95) - 358,974 \cdot 3,9 \cdot (1,95 - 1,40) = 0$$

$$V_D = 2111,9979 \text{ kN}$$



$$h_M^0 = 2,278 \cdot \sqrt{\frac{552,82}{0,60}} = 69,146 \text{ cm}$$

$$h_M^p = 2,278 \cdot \sqrt{\frac{990}{1,40}} = 60,57 \text{ cm}$$

$$h_a = \frac{1322,255}{0,9 \cdot 0,6 \cdot 1700} = 1,44 \text{ m}$$

$$h_k = 1,25 \text{ m}$$

$$h_T = 1,50 \text{ m}$$

3.3

$$p_m = 256,41 \frac{\text{kN}}{\text{m}^2}$$

$$M_{1-1} = 256,41 \cdot 0,8^2 \cdot 0,5 = 82,05 \text{ kNm/m}$$

$$h_{M,dp} = 3,51 \cdot \sqrt{82,05} = 31,79 \text{ cm}$$

$$d_p = 35 \text{ cm}$$