



I grafički:

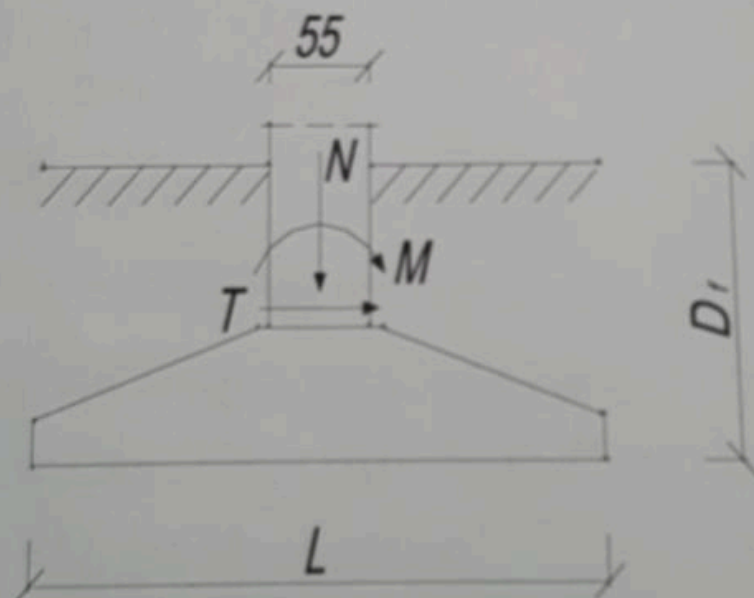
Kandidat: Džemal Zeković Br. indeksa: 008-023/20

1. Prema podacima iz projekta, stub preseka 50/55cm prenosi na temelj sledeće opterećenje:

stalno: $N_g = 460 + 2\alpha + 5\beta$ kN
 $M_g = -120 - (\beta + 2\alpha)$ kNm
 $H_g = -(30 - \alpha + \beta)$ kN
povremeno $N_p = 130 + \beta + \alpha$ kN
 $M_p = \pm (40 + \alpha/2 + \beta/3)$ kNm
 $H_p = \pm (30 + \beta + \alpha/2)$ kN

Dimenzionisati temelj stuba, kao nesimetričan temelj MB30, ukoliko je fundiran na $D_f = 135$ cm, na kojoj dozvoljeni napon u tlu iznosi $q_a = 180 + \beta$ kN/m²

Skica temelja i pozitivan znak opterećenja:



Broj indeksa 008- α β /xx

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JK

$$008-023/20 \quad \gamma = 2 ; \beta = 3$$

$$N_g = 460 + 2 \cdot 2 + 5 \cdot 3 = 479 \text{ kN}$$

MB 30

$$M_g = -120 - (3 + 2 \cdot 2) = -127 \text{ kNm}$$

$D_f = 135 \text{ cm}$

$$H_g = -(30 - 2 + 3) = -31 \text{ kN}$$

$$q_a = 180 + 3 = 183 \frac{\text{kN}}{\text{m}^2}$$

$$N_p = 130 + 3 + 2 = 135 \text{ kN}$$

$$p_{rel} = k_t = 0,55 \text{ m}$$

$$M_p = \pm \left(40 + \frac{2}{2} + \frac{3}{2} \right) = \pm 42 \text{ kNm}$$

$$H_p = \pm \left(30 + 3 + \frac{2}{2} \right) = 34 \text{ kN} ; e = \frac{\sum M_g}{N_g} = \frac{M_g + H_g \cdot k_t}{N_g} = \frac{127 + 31 \cdot 0,55}{479}$$

$$N_k = N_g + N_p = 479 + 135 = 614 \text{ kN}$$

$$e = 0,301 = 0,3$$

$$\sum M_{t1} = M_1 + H_1 \cdot k_t - N_k \cdot e = 169 + 65 \cdot 0,55 - 614 \cdot 0,3 = 20,55$$

$$\sum M_{t2} = M_2 + H_2 \cdot k_t - N_k \cdot e = 85 + (-3) \cdot 0,55 - 614 \cdot 0,3 = -100,85$$

$$\text{usvojeno } \sum M_{t2} = -100,85$$

$$k = \frac{L_s}{b_s} = \frac{55}{50} = 1,1$$

Potrebne dimenzije osnove temelja

$$k^2 (2a - \gamma_{sv} \cdot D_f) \cdot B^3 - k \cdot N_k \cdot B - 6 \sum M_{t2} = 0$$

$$1,1^2 (183 - 20 \cdot 135) \cdot B^3 - 1,1 \cdot 614 \cdot B - 6 \cdot 100,85 = 0$$

$$1,1^2 \cdot 156 \cdot B^3 - 675,4 B - 605,1 = 0$$

$$188,76 B^3 - 675,4 B - 605,1 = 0$$

$$B = 2,2384 \text{ m} \quad \gamma \quad \boxed{B = 2,35 \text{ m}}$$

$$L = 2,585 \text{ m} \quad \gamma \quad \boxed{L = 2,65 \text{ m}}$$

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- Kontrola pritiska na tlo za sračunate
dimenzije temelja -

- Stalno opterećenje

$$\Sigma V = N_g + G_t = 479 + 2,35 \cdot 2,65 \cdot 20 \cdot 1,35 = 647,1425 \text{ kN}$$

$$\Sigma M = M_g + H_g \cdot h_t - N_g \cdot e = 127 + 31 \cdot 0,55 - 479 \cdot 0,3 = 0,35 \text{ kNm} \approx 0$$

$$\Sigma M \approx 0$$

$$\sigma = \frac{\Sigma V}{B \cdot L} = \frac{647,1425}{2,35 \cdot 2,65} = 103,317 \frac{\text{kN}}{\text{m}^2} q_d = 123 \text{ kN/m}^2$$

- STALNO + POVRREMENO opterećenje

$$1) \Sigma V = N_g + N_p + G_t = 782,1425 \text{ kN}$$

$$\Sigma M = M_g + H_g \cdot h_t + M_p + H_p \cdot h_t - N_p \cdot e = 20,55$$

$$\sigma_{\max/\min} = \frac{782,1425}{2,35 \cdot 2,65} \pm \frac{6 \cdot 20,55}{2,35 \cdot 2,65^2}$$

$$\sigma_{\max} = 133,066 \frac{\text{kN}}{\text{m}^2} < q_d = 123 \frac{\text{kN}}{\text{m}^2}$$

$$\sigma_{\min} = 118,124 \frac{\text{kN}}{\text{m}^2} < q_d = 123 \frac{\text{kN}}{\text{m}^2}$$

$$2) \Sigma V = 782,1425 \text{ kN}$$

$$\Sigma M = 100,25$$

$$\sigma_{\max/\min} = \frac{782,1425}{2,35 \cdot 2,65} \pm \frac{6 \cdot 100,25}{2,35 \cdot 2,65^2}$$

$$\sigma_{\max} = 162,261 \frac{\text{kN}}{\text{m}^2} < q_d = 123 \frac{\text{kN}}{\text{m}^2}$$

$$\sigma_{\min} = 88,929 \frac{\text{kN}}{\text{m}^2} < q_d = 123 \frac{\text{kN}}{\text{m}^2}$$

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- Statičke veličine i dimensionisanje temelja -

- Reaktivno opterećenje tla

- Stalno -

$$G_{ng} = \frac{N_g}{B \cdot L} = \frac{479}{2,35 \cdot 2,65} = 76,92 \frac{kN}{m^2}$$

- PUVREMENO -

$$G_{np1/2} = \frac{N_p}{B \cdot L} \pm \frac{6 \Sigma M}{B \cdot L^2}$$

$$G_{np1/2} = \frac{135}{2,35 \cdot 2,65} \pm \frac{6 \cdot 20,55}{2,35 \cdot 2,65^2}$$

$$G_{np1} = 29,149 \frac{kN}{m^2}$$

$$G_{np2} = 14,207 \frac{kN}{m^2}$$

$$h = h_0 - 0,05 = 0,55 - 0,05 = 0,5m$$

$$M_{I-IIg} = 76,92 \cdot 1,625 \cdot \frac{1,625 \cdot 2,35}{2} = 238,662 \text{ kNm}$$

$$M_{II-IIIg} = 76,92 \cdot 1,175 \cdot \frac{1,175 \cdot 2,65}{2} = 140,712 \text{ kNm}$$

$$M_{I-IIp} = \frac{29,149 + 20,3}{2} \cdot 1,625 \cdot 2,35 \cdot 0,861 = 81,293 \text{ kNm}$$

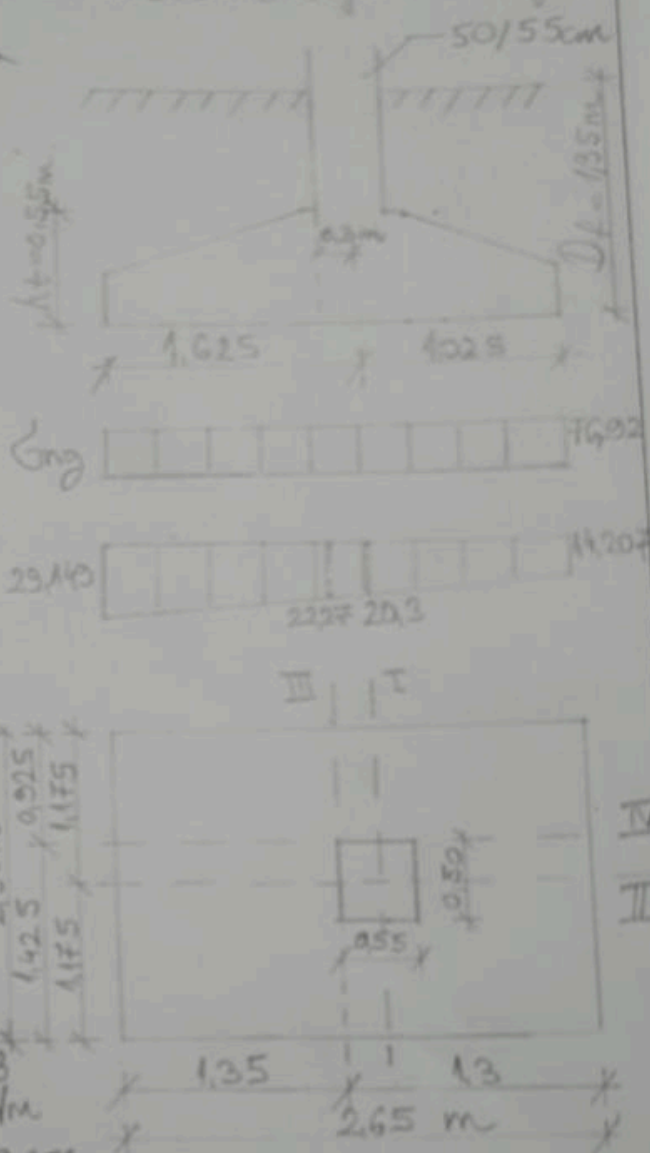
$$M_{II-IIIp} = \frac{29,149 + 14,207}{2} \cdot 2,65 \cdot 1,175 \cdot \frac{1,175}{2} = 39,656 \text{ kNm}$$

$$Q_{III-IIIg} = 76,92 \cdot 1,35 \cdot 2,35 = 244,029 \text{ kN}$$

$$Q_{III-IIIp} = \left(\frac{29,149 + 14,207}{2} \right) \cdot 1,35 \cdot 2,35 = 81,563 \text{ kN}$$

$$Q_{IV-IVg} = 76,92 \cdot 2,65 \cdot 0,925 = 188,55 \text{ kN}$$

$$Q_{IV-IVp} = \left(\frac{29,149 + 14,207}{2} \right) \cdot 2,65 \cdot 0,925 = 53,138 \text{ kN}$$



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$$Q_{uIII} = Q_{III-IIg} \cdot 1,6 + Q_{III-IIIp} \cdot 1,8 = 244,029 \cdot 1,6 + 81,563 \cdot 1,8 = 537,26 \text{ kN}$$

$$Q_{uIV} = Q_{IV-IVg} \cdot 1,6 + Q_{IV-IVp} \cdot 1,8 = 188,55 \cdot 1,6 + 53,138 \cdot 1,8 = 397,328 \text{ kN}$$

$$\sigma_{aII} = \frac{Q_{uIII}}{b \cdot t \cdot z} = \frac{537,26}{3 \cdot 0,5 \cdot 0,9 \cdot 0,5} = 795,941 \frac{\text{kN}}{\text{m}^2} = 0,796 \text{ MPa} < 1,1 \text{ MPa} = \sigma_r$$

$$\sigma_{aIV} = \frac{Q_{uIV}}{b \cdot t \cdot z} = \frac{397,328}{3 \cdot 0,55 \cdot 0,9 \cdot 0,5} = 535,122 \frac{\text{kN}}{\text{m}^2} = 0,535 \text{ MPa} < 1,1 \text{ MPa} = \sigma_r$$

$$M_{B30} = r \cdot \sigma_r = 1,1 \text{ MPa}; f_B = 20,5 \cdot 10^3 \frac{\text{kN}}{\text{m}^2}$$

$$M_{uI} = 238,662 \cdot 1,6 + 81,293 \cdot 1,8 = 528,187 \text{ kNm}$$

$$M_{uII} = 140,712 \cdot 1,6 + 39,656 \cdot 1,8 = 296,52 \text{ kNm}$$

$$r_I^* = \frac{h_{0I}}{\sqrt{\frac{M_{uI}}{f_B \cdot b_{1I}}}} = \frac{0,5 \text{ m}}{\sqrt{\frac{528,187 \text{ kNm}}{20,5 \cdot 10^3 \frac{\text{kN}}{\text{m}^2} \cdot 3 \cdot 0,5}}} = 3,815$$

$$r_I^* = 3,830$$

$$\mu_1 = 7,149\%$$

$$r_{II}^* = \frac{h_{0II}}{\sqrt{\frac{M_{uII}}{f_B \cdot b_{1II}}}} = \frac{0,5 \text{ m}}{\sqrt{\frac{296,52 \text{ kNm}}{20,5 \cdot 10^3 \frac{\text{kN}}{\text{m}^2} \cdot 3 \cdot 0,55}}} = 5,34$$

$$r_{II}^* = 5,334$$

$$\mu_1 = 3,627\%$$

$$R_{A400/500} = f_{cv} = 400 \text{ MPa}$$

$$A_{a1} = \frac{f_B}{\sigma_v} \cdot \mu_1 \cdot \frac{b_{1I} \cdot h_{1I}}{100} = \frac{20,5}{400} \cdot 7,149 \cdot \frac{3 \cdot 50 \cdot 50}{100} = 27,479 \text{ cm}^2$$

$$A_{a2} = \frac{f_B}{\sigma_v} \cdot \mu_1 \cdot \frac{b_{1II} \cdot h_{1II}}{100} = \frac{20,5}{400} \cdot 3,627 \cdot \frac{3 \cdot 55 \cdot 50}{100} = 15,335 \text{ cm}^2$$

$$A_{a1,1} = \text{pukovano} (11 \phi 16 + 6 \phi 12) = 28,89 \text{ cm}^2$$

$$A_{a1,2} = \text{pukovano} (7 \phi 16 + 6 \phi 8) = 17,088 \text{ cm}^2$$

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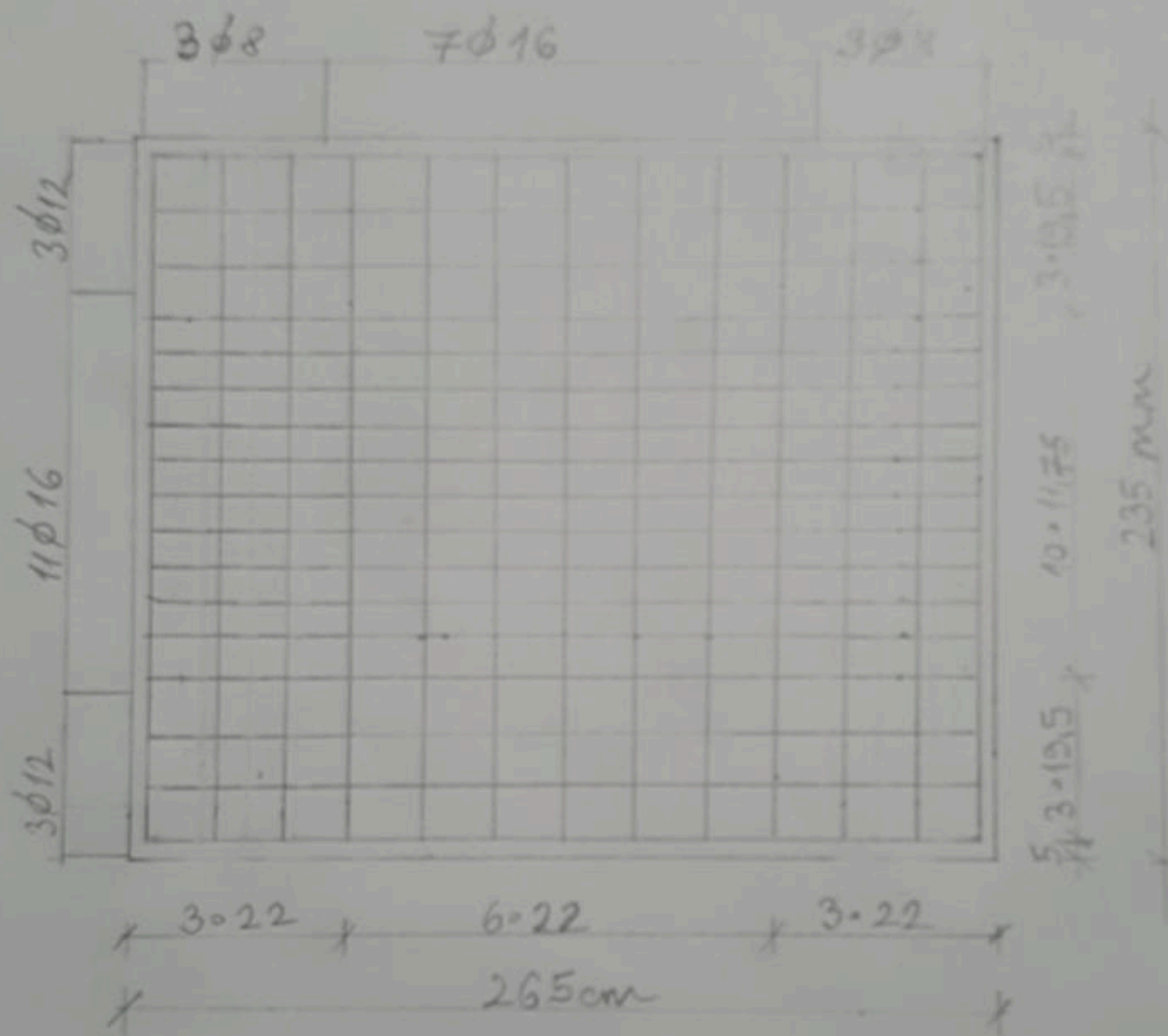
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$R = 1.25$



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