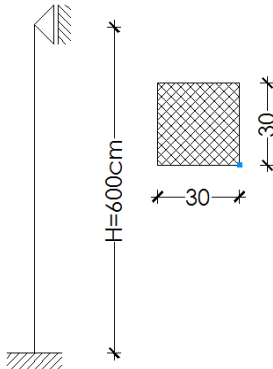


POS S – Armirano betonski stub

1. Statička šema



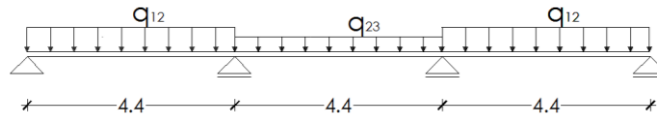
Pretpostavljene dimenzije: stuba **30/30cm**

2. Analiza opterećenja

2.1 Stalno:

- sopstvena težina se zanemaruje
- opterećenje od POS8

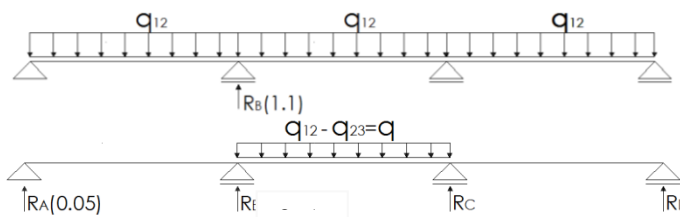
a	b	a
c	d	c
a	b	a



$$\begin{aligned}
 g_{12} & \text{ - od sopstvene težine podvlake} && 2.33 \text{ kN/m}' \\
 & \text{ - od POS KP} && \frac{13.4 \text{ kN/m}' = (Q_{3a} + Q_{3c})/l_x}{g_{12} = 15.73 \text{ kN/m}'}
 \end{aligned}$$

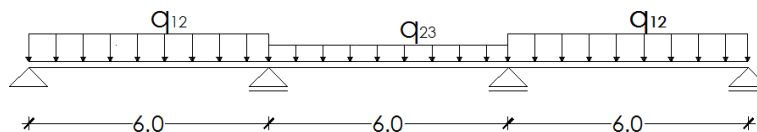
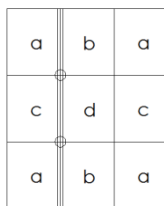
$$\begin{aligned}
 g_{23} & \text{ - od sopstvene težine podvlake} && 2.33 \text{ kN/m}' \\
 & \text{ - od POS KP} && \frac{12.3 \text{ kN/m}' = (Q_{3b} + Q_{2a})/l_x}{g_{23} = 14.63 \text{ kN/m}'}
 \end{aligned}$$

$$\max R_8 = 1.1 \cdot 15.73 \cdot 4.4 - 0.55 \cdot (15.73 - 14.63) \cdot 4.4 = 73.5 \text{ kN}$$



$$\begin{aligned}
 R_A = R_D &= 0.05 \cdot g \cdot l, \quad R_B = R_C = ? \\
 R_B + R_C &= q \cdot l - (R_A + R_D) \\
 R_B + R_C &= q \cdot l + 0.1 \cdot q \cdot l = 1.1 \cdot g \cdot l \\
 R_B = R_C &= 0.55 \cdot g \cdot l
 \end{aligned}$$

-opterećenje od POS9



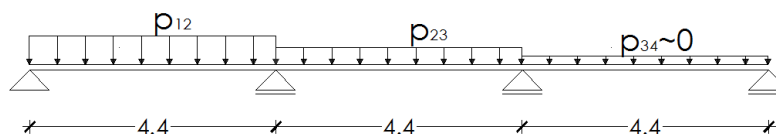
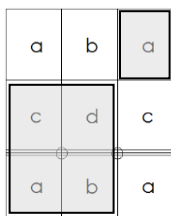
g₁₂ - od sopstvene težine podvlake 2.33 kN/m'
 - od POS KP $\frac{44.73-38.4}{6} = 13.4 \text{ kN/m}' = (Q_{1a} + Q_{1b})/l_y$
 $g_{12} = 16.18 \text{ kN/m}'$

g₂₃ - od sopstvene težine podvlake 2.33 kN/m'
 - od POS KP $\frac{40.8-37.64}{6} = 13.07 \text{ kN/m}' = (Q_{1c} + Q_{1d})/l_y$
 $g_{23} = 15.40 \text{ kN/m}'$

$\max R_9 = 1.1 \cdot 16.18 \cdot 6.0 - 0.55 \cdot (16.18 - 15.4) \cdot 6.0 = 104.2 \text{ kN}$

2.2 Povremeno:

-opterećenje od POS8



p₁₂' $\frac{20.08+24.08}{4.4} = 10.04 \text{ kN/m}' \equiv (Q_{3a} + Q_{3c})/l_x$

p₁₂'' $\frac{2 \cdot 20.08}{4.4} = 9.12 \text{ kN/m}' \equiv (2Q_{3a})/l_x$
 $p_{12} = 19.16 \text{ kN/m}'$

p₂₃' $\frac{23.66+21.43}{4.4} = 10.2 \text{ kN/m}' \equiv (Q_{3b} + Q_{2d})/l_x$

p₂₃'' $\frac{2 \cdot 20.08}{4.4} = 9.12 \text{ kN/m}' \equiv (2Q_{3a})/l_x$
 $p_{23} = 19.32 \text{ kN/m}'$

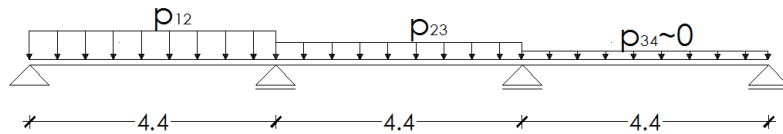
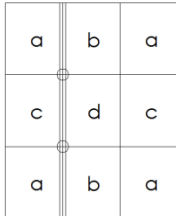
p₃₄' $\frac{20.08+24.08}{4.4} = 10.04 \text{ kN/m}' \equiv (Q_{3a} + Q_{3c})/l_x$

p₃₄'' $-\frac{2 \cdot 29.36}{4.4} = -13.34 \text{ kN/m}' \equiv -(2Q_{2h})/l_x$

$p_{34} = -3.3 \text{ kN/m} \approx 0$ radi pojednostavljenja ovo ćemo zanemariti... a opt u prava dva polja izjednačiti

$$\max R_8 = 1.2 \cdot 19.32 \cdot 4.4 = 101.4 \text{ kN}$$

-opterećenje od POS9



$$p_{12}' = \frac{37.28 + 32}{6.0} = 11.55 \text{ kN/m} = (Q_{1a} + Q_{1b})/l_y$$

$$p_{12}'' = \frac{2 \cdot 37.28}{6.0} = 12.43 \text{ kN/m} = (2Q_{1a})/l_y$$

$$p_{12} = 23.98 \text{ kN/m}$$

$$p_{23}' = \frac{34 + 31.37}{6.0} = 10.89 \text{ kN/m} = (Q_{1c} + Q_{1d})/l_y$$

$$p_{23}'' = \frac{2 \cdot 37.28}{6.0} = 12.43 \text{ kN/m} = (2Q_{1a})/l_y$$

$$p_{23} = 23.32 \text{ kN/m}$$

$$p_{34}' = \frac{37.28 + 32}{6.0} = 11.55 \text{ kN/m} = (Q_{1a} + Q_{1b})/l_y$$

$$p_{34}'' = -\frac{2 \cdot 28.93}{6.0} = -9.64 \text{ kN/m} = (2Q_{1f})/l_y$$

$$p_{34} = 1.9 \text{ kN/m} \approx 0$$

$$\max R_9 = 1.1 \cdot 23.98 \cdot 6.0 - 0.55 \cdot (23.98 - 23.32) \cdot 6.0 = 156 \text{ kN}$$

3. Statički uticaji

$$N_g = 73.96 + 104.68 = 178.64 \text{ kN}$$

$$N_p = 101.4 + 156 = 257 \text{ kN}$$

4. Dimenzionisanje

MB35, RA400/500

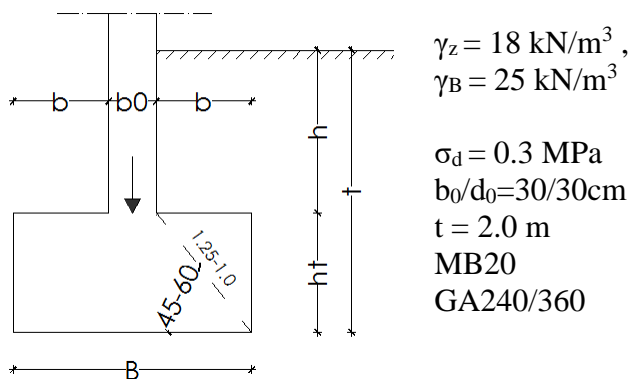
$$N_u = 1.9 \cdot 178.64 + 2.1 \cdot 257 = 879 \text{ kN}$$

$$\lambda = \frac{h_i}{i_b} = \frac{h_i}{\sqrt{\frac{I_b}{A_b}}} = \frac{600}{300} \cdot \sqrt{12} = 69.28 \rightarrow \text{metod dopunske ekscentričnosti, vidjeti prethodno izložen}$$

materijal u kome je detaljno urađen primjer stuba proračunatog metodom dopunske ekscentričnosti.
Priložiti crtež armatutre stuba u poprečnom presjeku.

POS T – Armirano betonski temelj

1. Statička šema



2. Analiza opterećenja

2.1 Stalno:

- sopstvena težina stuba $0.3^2 \cdot 6.0 \cdot 25 = 13.5 \text{ kN}$
 - reakcija od POS S $\underline{178.5 \text{ kN}}$
 $V_g = 192.14 \text{ kN}$

2.2 Povremeno:

- reakcija od POS S $\underline{257 \text{ kN}}$
 $V_p = 280.11 \text{ kN}$

3. Statički uticaji

$$V = V_g + V_p = 449 \text{ kN}$$

4. Dimenzionisanje

$$A_{\text{potr.}} = \frac{V}{\sigma_n}$$

$$\sigma_n = \sigma_{\text{doz}} - \beta \cdot \gamma \cdot D_f = 300 - 0.85 \cdot 25 \cdot 2.0 = 257.5 \text{ kN/m}^2$$

$$A_{pot} = \frac{449}{257.5} = 1.74 \Rightarrow L = B = \sqrt{A} = 1.32m$$

Usvojeno **L=B=1.4m**

Određivanje visine temelja po uobičajenom postupku teorije ploča:

Transvezalna sila:

$$Q = \frac{449}{1.4^2} \cdot 1.4 \cdot 0.55 = 176kN$$

Moment savijanja:

$$M = 176 \cdot \frac{0.55}{2} = 48.4kNm$$

Potrebna visina temelja:

$$h_M = c \cdot \sqrt{\frac{M}{b'}}$$

$$b' \approx 3 \cdot b_0 = 3 \cdot 0.3 = 0.9m$$

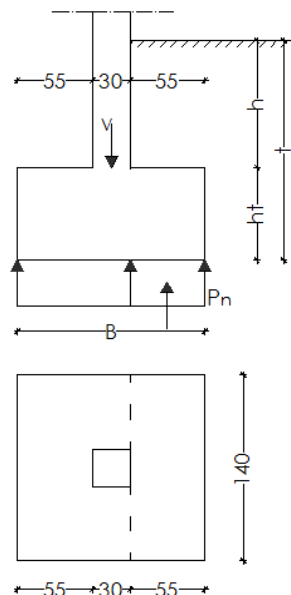
$$h_Q = \frac{Q}{0.9 \cdot \tau \cdot b'}$$

$$h_Q = 15.5cm$$

$$\text{ako je } h_t/b=1.0 \rightarrow h_t = 1.0 \cdot 55 = 55 \text{ cm}$$

pretpostavka: $a_a=5cm$

$$h=h_t-a_a=55-5=50cm$$



5. Kontrola napona

Ukupna sila:

- od POS S	449 kN
- od temelja	$1.4^2 \cdot 0.55 \cdot 25 = 27.0 \text{ kN}$
-od zemlje nad temeljem	$(1.4^2 - 0.3^2) \cdot 1.45 \cdot 18 = 48.8 \text{ kN}$
	$\Sigma V = 525 \text{ kN}$

$$\sigma_{svr.} = \frac{\Sigma V}{A} = \frac{556}{1.4^2} = 283.7kN/m^2 < \sigma_d = 300kN/m^2$$

$$\sigma_{st} = \frac{\Sigma V}{A} = 267kN/m^2 < \sigma_{doz} = 300kN/m^2$$

6. Kontrola temelja na proboj

$$\tau_{rac} = \frac{V - [(a_0 + 2h) \cdot (b_0 + 2h)] \cdot P_n}{2[(a_0 + h) \cdot (b_0 + h)] \cdot h} \leq \tau_{doz}$$

$$\tau_{doz} = 0.03 \cdot \beta_s, \beta_s = MB$$

$$\tau_{doz} = 0.03 \cdot 20000 = 600 \text{ kN/m}^2$$

$$P_n = \frac{V}{A} = \frac{449}{1.4^2} = \frac{229 \text{ kN}}{\text{m}^2}$$

$$\tau_{rac} = \frac{449 - (0.3 + 2 \cdot 0.5)(0.3 + 2 \cdot 0.5) \cdot 229}{2(0.3 + 0.5)(0.3 + 0.5) \cdot 0.55} = 88 \text{ kN/m}^2 < \tau_{doz}$$

7. Armatura temelja

$$f_a = \frac{M_u}{0.9 \cdot h \cdot \sigma_a}$$

$$M_u = 51.88 \text{ kNm}$$

$$f_a = \frac{51.88}{0.9 \cdot 0.5 \cdot 24} = 4.8 \text{ cm}^2$$

$$A_a = \frac{M_u}{0.9 h \sigma_v} = \frac{1.65 \cdot 48.4 \cdot 10^2}{0.9 \cdot 50 \cdot 24} = 7.6 \text{ cm}^2$$

Usvojena Armatura $\phi 14/25$ $6.15 \text{ cm}^2/\text{m} > 7.6 \text{ cm}^2/1.4 \text{ m} = 5.42 \text{ cm}^2/\text{m}$

Nactati temelj u osnovi presjeka.