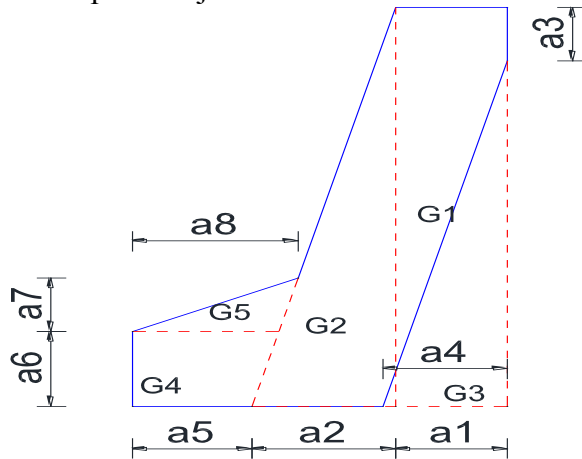


Analiza opterećenja

Vertikalne sile:

Stalno opterećenje:



Slika 5: Određivanje težine masivnog zida

$$G_{ZIDA} = G_1 + G_2 - G_3 + G_4 + G_5$$

$$G_1 = 10.82 * 24 \text{ kN/m}^3 = 259.68 \text{ kN/m}^3$$

$$G_2 = 6.96 * 24 \text{ kN/m}^3 = 167.04 \text{ kN/m}^3$$

$$G_3 = 5.22 * 24 \text{ kN/m}^3 = 125.28 \text{ kN/m}^3$$

$$G_4 = 2.41 * 24 \text{ kN/m}^3 = 57.84 \text{ kN/m}^3$$

$$G_5 = 0.95 * 24 \text{ kN/m}^3 = 22.8 \text{ kN/m}^3$$

$$G_{zida} = 259.68 + 167.04 - 125.04 + 57.84 + 22.8 = 382.32 \text{ kN/m}^3$$

4.3.2.2. Horizontalne sile

Aktivni pritisci

Aktivni pritisak po Coulomb-u :

Za $\phi = 33^\circ$; $\alpha = 104^\circ$; $\beta = 33^\circ$; $\delta = 1/2 \phi = 16.5^\circ$ dobija se :

$$a = \frac{\sin^2(\alpha + \phi)}{\sin^2 \alpha \sin(\alpha - \delta) \left[1 + \sqrt{\frac{\sin(\phi + \delta) \sin(\phi - \beta)}{\sin(\alpha - \delta) \sin(\alpha + \beta)}} \right]^2}$$

$$a = \frac{\sin^2(104+33)}{\sin^2 104 \times \sin(104-16.5) \times \left[1 + \sqrt{\frac{\sin(33+16.5) \times \sin(33-33)}{\sin(104-16.5) \times \sin(104+33)}} \right]^2} = 0.495$$

$$e_1 = \gamma k^a H$$

$$e_1 = 20 \frac{kN}{m^3} * 7.46 m * 0.483 = 73.55 \frac{kN}{m^2}$$

Smanjenje aktivnog pritiska uslijed postojanja kohezije:

$$p_c = -2c\sqrt{k_a} ; \text{ Pa je:}$$

$$e_1 = \gamma k^a H - 2c\sqrt{k_a} 20$$

$$e_1 = 20 * 0.493 * 7.46 - 2 * 7 * \sqrt{0.493}$$

$$e_1 = 63.72 kN/m'$$

$$E_1 = e_1 H/2$$

$$E_1 = 63.72 \frac{kN}{m^2} * \frac{7.46m}{2} = 237.67 kN/m'$$

$$E_{1V} = E_1 \sin(\delta - 104^\circ + 90^\circ)$$

$$E_{1V} = 237.67 kN/m' * \sin(2.5) = 10.37 kN/m'$$

$$E_{1H} = E_1 \cos \delta$$

$$E_{1H} = 237.67 kN/m' * \cos(2.5) = 237.44 kN/m'$$

Određivanje težišta potporne konstrukcije:

$$A_1 = 40.26m^2 \quad x_1 = 2.43m \quad y_1 = 4.14m$$

$$A_2 = 10.88m^2 \quad x_2 = 3.38m \quad y_2 = 2.53m$$

$$A_3 = 3.2m^2 \quad x_3 = 2.29m \quad y_3 = 1.69m$$

$$A_4 = 1.075m^2 \quad x_4 = 4.14m \quad y_4 = 5.39m$$

$$A_5 = 6.6m^2 \quad x_5 = 0.61m \quad y_5 = 5.85m$$

$$A_6 = 1.24m^2 \quad x_6 = 3.65m \quad y_6 = 8.0m$$

$$x_t = \frac{x_1 A_1 - x_2 A_2 - x_3 A_3 - x_4 A_4 - x_5 A_5 - x_6 A_6}{A_1 - A_2 - A_3 - A_4 - A_5 - A_6} = 2.04m$$

$$y_t = \frac{y_1 A_1 - y_2 A_2 - y_3 A_3 - y_4 A_4 - y_5 A_5 - y_6 A_6}{A_1 - A_2 - A_3 - A_4 - A_5 - A_6} = 4.2m$$

■ Ukupna horizontalna sila

Prva kombinacija opterećenja : $E_u = E_a(\text{aktivni prit. tla}) + P$ (hor.pritisak od korisnog opterećenja)

$$E_u = 237.44 \frac{\text{kN}}{\text{m}} + 0 = 237.44 \text{ kN/m'}$$

Kontrola zida na klizanje

Prva kombinacija opterećenja : $E_u = E_a(\text{aktivni prit. tla}) + P$ (hor.pritisak od korisnog opterećenja)

$$F_{sk} = \frac{\sum N \text{tg } \varphi}{T}$$

Zanemaren je uticaj kohezije temeljnog tla na klizanje masivnog zida.

$$\sum V = G_{zida} + E_{1V}$$

$$\sum V = 382.32 \text{ kN/m} + 10.37 \text{ kN/m} = 392.69 \text{ kN/m'}$$

$$N = \sum V \cos 15 + E_{1H} \sin 15$$

$$N = 392.69 \cos 15 + 237.44 * \sin 15 = 440.76 \text{ kN/m'}$$

$$T = E_{1H} \cos 15 - \sum V \sin 15$$

$$T = 237.44 \cos 15 - 392.69 \sin 15 = 127.71 \text{ kN/m'}$$

$$F_{sk} = \frac{440.76 * \text{tg} 35}{127.71} = 2.42 > 1.5$$

Kontrola zida na prevrtanje

Prva kombinacija opterećenja : $E_u = E_a(\text{aktivni prit. tla}) + P$ (hor.pritisak od korisnog opterećenja)

M_h – moment horizontalnih sila oko tačke A

$$M_h = 237.44 * \frac{7.46}{3} = 590.43 \text{ kNm/m'}$$

M_v – moment vertikalnih sila oko tačke A

$$M_v = 382.32 * 2.83 + 10.4 * 3.87 = 1122.21 \text{ kNm/m'}$$

$$F_{pk} = M_v/M_h$$

$$F_{pk} = \frac{1122.21}{590.43} = 1.92 > 1.5$$

Kontrola napona u temeljnoj spojnici

$F_{pt} = B_t * 1,0$ – površina temelja

$$F_{pt} = 3.15 * 1 = 3.15 \text{ m}^2$$

$$W_{pt} = B_t^2/6$$

$$W_{pt} = 1.65 \text{ m}^2$$

M_{th} - moment horizontalnih sila oko težišta temelja

$$M_{th} = 237.44 * \frac{7.46}{3} = 590.43 \text{ kNm/m}$$

M_{tv} - moment vertikalnih sila oko težišta temelja

$$M_v = 382.32 * \left((4.86 - 2.04) - \frac{3.05}{2} \right) + 10.4 * (3.87 - 1.625) = 518.45 \text{ kNm/m'}$$

$$M_t = M_{th} - M_{tv}$$

$$M_t = 590.43 - 518.45 = 71.98 \text{ kNm/m'}$$

$$\sigma_{\frac{1}{2}} = \frac{\sum V}{F_{pt}} + \frac{M_t}{W_{pt}}$$

$$\sigma_{\frac{1}{2}} = \frac{392.69}{3.15} + \frac{71.98}{1.65}$$

$$\sigma_1 = 168.29 \text{ Kn/m}$$

$$\sigma_2 = 81.04 \text{ Kn/m}$$