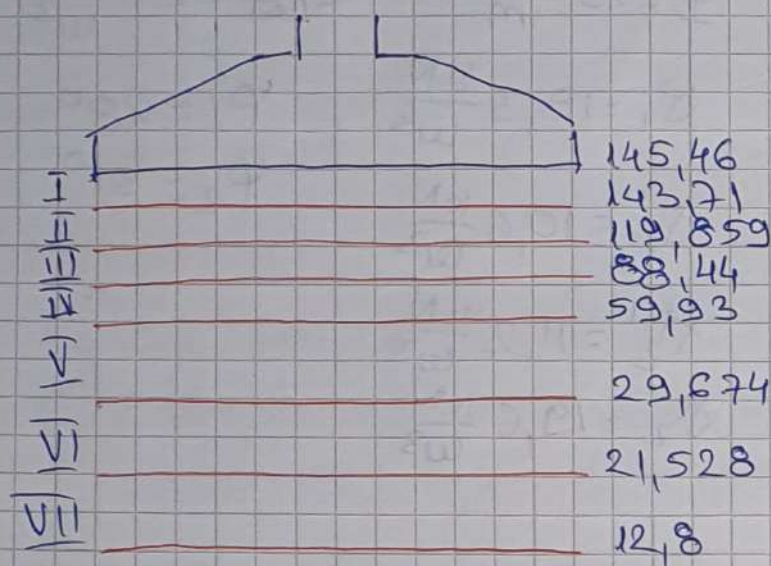


# IV ВЕРНБА

\* НАСТАВАК ПРОРАЧУНА ВЕРТИКАЛНОГ СЕГАЊА ТЛА  $S_i$



$b_{2G_i}$

$$S_i = \frac{b_{2G_i} \cdot h_i}{E_{S_i}} \cdot \beta_i$$

$$S_I = \frac{143,71 \left[ \frac{KN}{cm^2} \right] \cdot 0,5 \left[ cm \right]}{1800 \left[ \frac{N}{cm^2} \right]} \cdot 0,623 =$$

$$= \frac{143,71 \cdot \frac{1000 \left[ N \right]}{(100)^2 cm^2} \cdot 0,5 \cdot 100 cm}{1800 \frac{N}{cm^2}} \cdot 0,623 =$$

$$= \frac{143,71 \cdot \frac{1000 N}{10000 cm^2} \cdot 50 cm}{1800 \frac{N}{cm^2}} \cdot 0,623 = 0,2487 cm$$

$$S_{II} = \frac{119,859 \cdot 5}{1800} \cdot 0,623 = 0,2074 cm$$

$$S_{III} = 0,152 cm$$

$$S_{IV} = 0,1037 cm$$

$$S_V = 0,147 cm$$

$$S_{VI} = 0,1066 cm$$

$$S_{VII} = 0,0634 cm$$

$$\Sigma S = S_I + S_{II} + \dots + S_{VII} =$$

$$= 0,2487 + 0,2074 + 0,152 +$$

$$+ 0,1037 + 0,147 + 0,1066 +$$

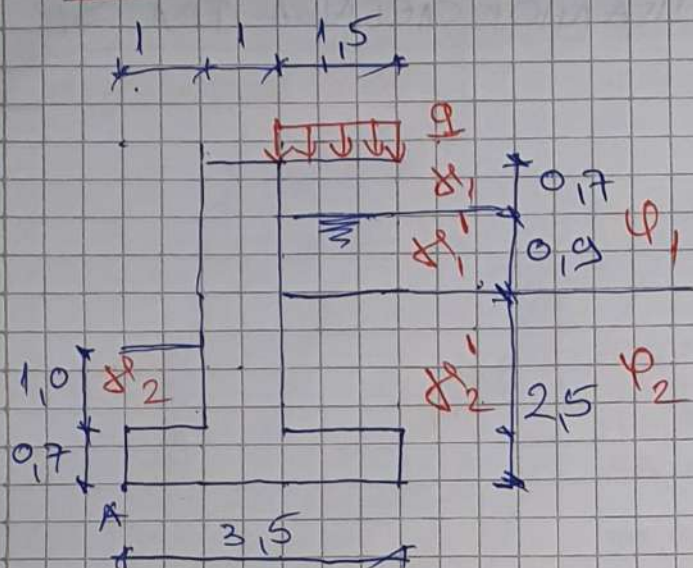
$$+ 0,0634 = 1,0288 cm$$

УКУПНО СЕГАЊЕ ТЛА

ИЗНОСИ 1,0288 cm



## \* ЗАДАЧА 2: УСЛУГОВАЯ СТАБИЛЬНОСТЬ ПОПРЯКОГ ЗУБА НА ПРЕУРАБЕ И КЛУЗАБЕ



$$\gamma = 10 \frac{kN}{m^3}$$

$$\phi_{bet} = 24^\circ$$

$$\phi_1 = 18.3^\circ$$

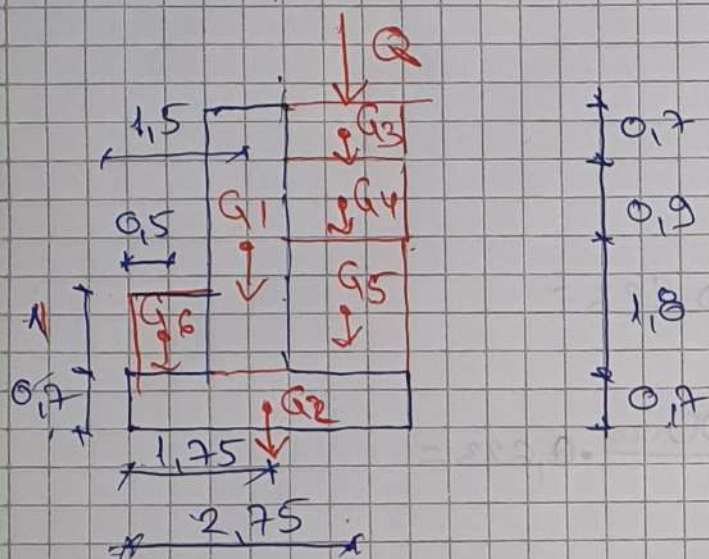
$$\phi_1 = 28^\circ$$

$$\phi_1' = 10.6^\circ$$

$$\phi_2 = 31^\circ$$

$$\phi_2' = 11.2^\circ$$

$$\phi_2 = 19.6^\circ$$



$$G_1 = \phi_{bet} \cdot 1 \cdot 2.4 = 24 \cdot 2.4 = 57.6 \text{ kN}$$

$$G_2 = 24 \cdot 3.5 \cdot 0.7 = 58.8 \text{ kN}$$

$$G_3 = \phi_1 \cdot 0.7 \cdot 1.5 = 19.215 \text{ kN}$$

$$G_4 = \phi_1' \cdot 0.9 \cdot 1.5 = 10.6 \cdot 0.9 \cdot 1.5 = 14.31 \text{ kN}$$

$$G_5 = \phi_2' \cdot 1.8 \cdot 1.5 = 11.2 \cdot 1.8 \cdot 1.5 = 30.24 \text{ kN}$$

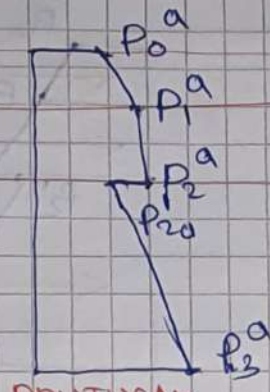
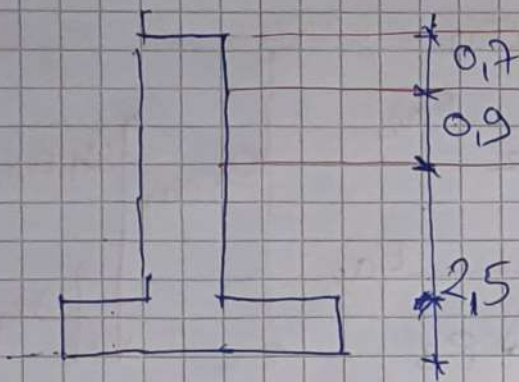
$$G_6 = \phi_3' \cdot 1 \cdot 1 = 19.6 \text{ kN}$$

$$Q = \gamma \cdot 1.5 = 10 \cdot 1.5 = 15 \text{ kN}$$

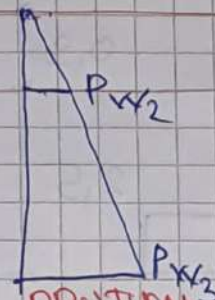
$$ka_1 = \tan^2\left(45^\circ - \frac{\phi_1}{2}\right) = \tan^2\left(45^\circ - \frac{28^\circ}{2}\right) = \tan^2 31^\circ = 0.38103$$

$$ka_2 = \tan^2\left(45^\circ - \frac{\phi_2}{2}\right) = \tan^2 29.5^\circ = 0.32$$

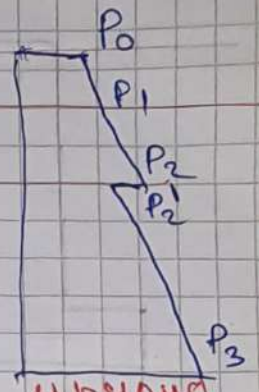




НПУТУАК  
ТНА



НПУТУАК  
BODY



УКРУННО  
НПУТУАК

НПУТУАК ТНА:

$$P_0^a = q \cdot k_{a1} = 10 \cdot 0,36103 = 3,6103 \frac{\text{kN}}{\text{m}^2}$$

$$P_1^a = P_0 + \gamma_1 \cdot 0,7 \cdot k_{a1} = q \cdot k_{a1} + \gamma_1 \cdot 0,7 \cdot k_{a1} = (q + \gamma_1 \cdot 0,7) \cdot k_{a1} = (10 + 18,3 \cdot 0,7) \cdot 0,36103 = 8,235 \frac{\text{kN}}{\text{m}^2}$$

$$P_2^a = (q + \gamma_1 \cdot 0,7 + \gamma_1' \cdot 0,9) k_{a1} = (10 + 18,3 \cdot 0,7 + 10,6 \cdot 0,9) \cdot k_{a1} = 11,679 \frac{\text{kN}}{\text{m}^2}$$

$$P_2^{a1} = (q + \gamma_1 \cdot 0,7 + \gamma_1' \cdot 0,9) \cdot k_{a2} = 10,352 \frac{\text{kN}}{\text{m}^2}$$

$$P_3^a = P_2^a + \gamma_2' \cdot 2,5 \cdot k_{a2} = 19,312 \frac{\text{kN}}{\text{m}^2}$$

НПУТУАК BODY:

$$P_{rx2} = \gamma_w \cdot 0,9 = 9,81 \cdot 0,9 = 8,829 \frac{\text{kN}}{\text{m}^2}$$

$$P_{rx3} = \gamma_w (0,9 + 2,5) = 9,81 \cdot 3,4 = 33,354 \frac{\text{kN}}{\text{m}^2}$$

УКРУННО НПУТУАК:

$$P_0 = P_{a0} = 3,6103 \frac{\text{kN}}{\text{m}^2}$$

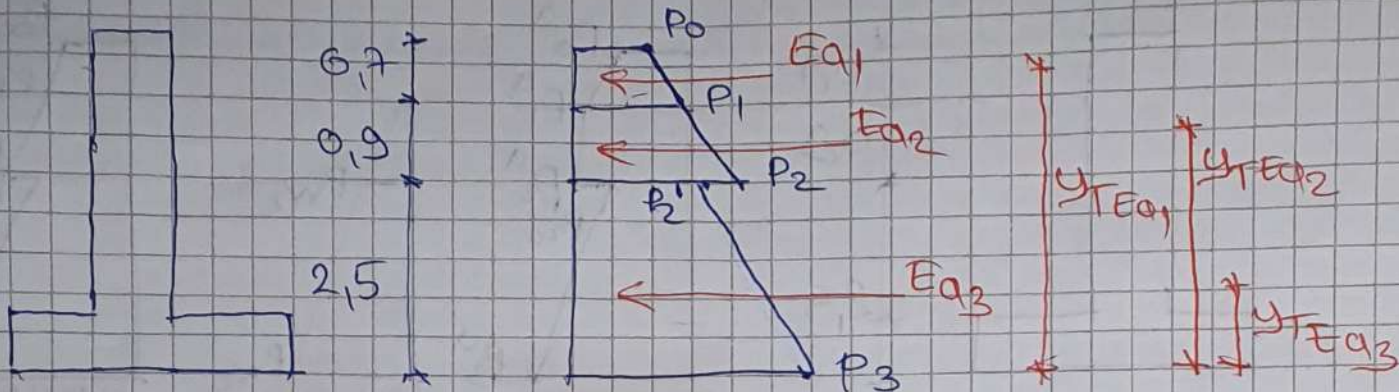
$$P_1 = P_{a1} = 8,235 \frac{\text{kN}}{\text{m}^2}$$

$$P_2 = P_{a2} + P_{rx2} = 11,679 + 8,829 = 20,508 \frac{\text{kN}}{\text{m}^2}$$

$$P_2' = P_{a2}' + P_{rx2} = 10,352 + 8,829 = 19,181 \frac{\text{kN}}{\text{m}^2}$$

$$P_3 = P_{a3} + P_{rx3} = 19,312 + 33,354 = 52,666 \frac{\text{kN}}{\text{m}^2}$$





$Ea_1, Ea_2, Ea_3$  - РЕЗУЛТАНТЕ УКУПНОГ ДРУГОВА

$$Ea_1 = \frac{P_0 + P_1}{2} \cdot 0,7 = \frac{3,6103 + 8,235}{2} \cdot 0,7 = 4,1458 \frac{kN}{m}$$

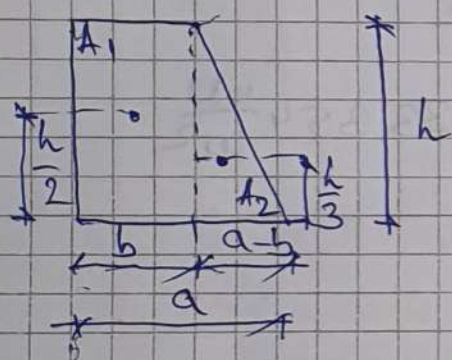
$$Ea_2 = \frac{P_1 + P_2}{2} \cdot 0,9 = \frac{8,235 + 20,508}{2} \cdot 0,9 = 12,934 \frac{kN}{m}$$

$$Ea_3 = \frac{P_2 + P_3}{2} \cdot 2,5 = \frac{19,181 + 52,666}{2} \cdot 2,5 = 89,8088 \frac{kN}{m}$$

ПОМОЋАЈ ЛЕГОВАЊА  $Ea_1, Ea_2$  и  $Ea_3$

~~РЕЗУЛТАНТЕ~~

ПРОЦЕНА ТРАПЕЗА:



$$A_1 = b \cdot h$$

$$A_2 = (a - b) \cdot h \cdot \frac{1}{2}$$

$$y_{T1} = \frac{h}{2}$$

$$y_{T2} = \frac{h}{3}$$

$$y_T = \frac{y_{T1} \cdot A_1 + y_{T2} \cdot A_2}{A_1 + A_2}$$

$Ea_1:$   $A_1 = P_0 \cdot 0,7 = 2,527$

$$A_2 = (P_1 - P_0) \cdot 0,7 \cdot \frac{1}{2} = 1,619$$

$$y_{T1} = \frac{0,7}{2} + 0,9 + 2,5 = 3,75$$

$$y_{T2} = \frac{0,7}{3} + 0,9 + 0,25 = 3,633$$

$$y_{TEa1} = \frac{3,75 \cdot 2,527 + 3,633 \cdot 1,619}{2,527 + 1,619} = 3,704 m$$



$$Eq_2: A_1 = p_1 \cdot 0,9 = 7,4115$$

$$A_2 = (p_2 - p_1) \cdot 0,9 \cdot \frac{1}{2} = 5,523$$

$$y_{T1} = \frac{0,9}{2} + 2,5 = 2,95$$

$$y_{T2} = \frac{0,9}{3} + 2,5 = 2,8$$

$$y_{TEq2} = \frac{2,95 \cdot 7,4115 + 2,8 \cdot 5,523}{7,4115 + 5,523} = 2,886 \text{ м}$$

$$Eq_3: A_1 = p_2' \cdot 2,5 = 47,953$$

$$A_2 = (p_3 - p_2') \cdot 2,5 \cdot \frac{1}{2} = 41,856$$

$$y_{T1} = \frac{2,5}{2} = 1,25$$

$$y_{T2} = \frac{2,5}{3} = 0,833$$

$$y_{TEq3} = \frac{1,25 \cdot 47,953 + 0,833 \cdot 41,856}{47,953 + 41,856} = 1,056 \text{ м}$$

ПРОВЕРКА СТАБИЛЬНОСТИ НА ПРЕДУПРАВЬ

$$F_s = \frac{N_s}{M_p} > 1,8 \text{ — УСЛОВ}$$

$N_s$  — МОМЕНТ СТАБИЛЬНОСТИ

$M_p$  — МОМЕНТ ПРЕДУПРАВЬ

$$\begin{aligned} N_s &= 0,5 \cdot G_6 + 1,5 \cdot G_1 + 1,75 \cdot G_2 + 2,75 (Q + G_3 + G_4 + G_5) \\ &= 9,8 + 86,4 + 102,9 + 41,25 + 52,841 + 39,3525 + \\ &\quad + 83,15 = 415,7038 \text{ кНм/м} \end{aligned}$$

$$\begin{aligned} M_p &= Eq_1 \cdot 3,704 + Eq_2 \cdot 2,886 + Eq_3 \cdot 1,056 = \\ &= 15,356 + 37,328 + 94,838 = 147,522 \text{ кНм/м} \end{aligned}$$

$$F_s = \frac{N_s}{M_p} = \frac{415,7038}{147,522} = 2,818 > 1,8 \text{ — ЗУД JE СТАБИ-}$$

ЛЕН НА  
ПРЕДУПРАВЬ



## ПРОВЕРА СТАБИЛЬНОСТИ НА КЛУЗАКЕ

$$F_s = \frac{T_{TR}}{\Sigma H} \geq 1,5$$

$T_{TR}$  - СУМА ТРЕЊА

$\Sigma H$  - СУМА ~~ХОРУЗО~~ ХОРУЗО ИТАЛИЈУХ СУМА

$$T_{TR} = \Sigma V \cdot \operatorname{tg} \varphi$$

$$\Sigma V = G_1 + G_2 + G_3 + G_4 + G_5 + G_6 + Q = 214,765 \frac{\text{кН}}{\text{м}}$$

$$\operatorname{tg} \varphi = \operatorname{tg} 31^\circ = 0,6$$

$$\Sigma H = E_{a1} + E_{a2} + E_{a3} = 106,889 \frac{\text{кН}}{\text{м}}$$

$$F_s = \frac{214,765 \cdot 0,6}{106,889} = 1,206 < 1,5$$

ЗУД НУЏЕ СТАБИЛАН НА КЛУЗАКЕ