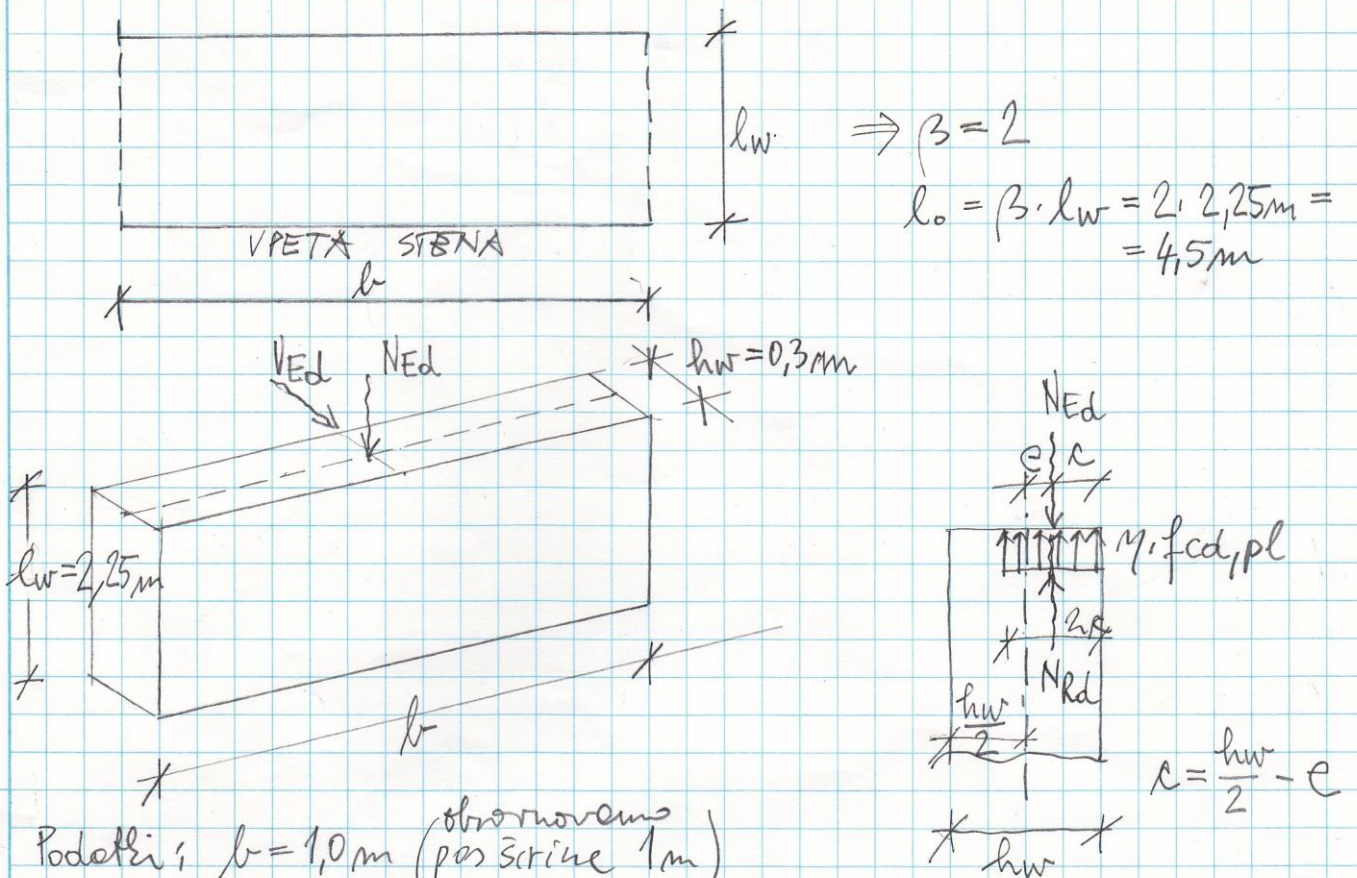


6. VAJA: NEARMIRANE IN ŠIBKO ARMIRANE BETONSKE KONSTRUKCIJE

RAČUNSKI PRIMER: KONZOLNA STENA Z NAVPIČNO IN HORIZONTALNO OBTEŽBO



Podatki: $b = 1,0\text{m}$ (obrnjeno)
 $l_w = 2,25\text{m}$
 $h_w = 0,3\text{m}$
 $N_{Ed} = 500\text{ kN}$
 $V_{Ed} = 5\text{ kN}$
 beton C25/30

Na majno slabino proglušnosti preverimo spodnj prečez stene (ob upetju). Letno tezo zanemarimo.

$$M_{Ed} = V_{Ed} \cdot l_w = 5\text{ kN} \cdot 2,25\text{m} = 11,25\text{ kNm}$$

$$e_o = \frac{M_{Ed}}{N_{Ed}} = \frac{11,25 \cdot 100\text{ kNm}}{500\text{ kN}} = 2,25\text{ cm}$$

$$e_i = \frac{l_o}{400} = \frac{450}{400} = 1,125\text{ cm}$$

$$e_{tot} = e_o + e_i = 2,25 + 1,125 = 3,375\text{ cm}$$

$$f_{cd,pl} = \alpha_{cc,pl} \cdot \frac{f_{ck}}{\gamma_c} = 0,8 \cdot \frac{25\text{ kN/cm}^2}{1,5} = 1,33\text{ kN/cm}^2$$

→ knetenj vitkosti $\frac{l_o}{h_w} = \frac{4,5\text{m}}{0,3\text{m}} = 15 \leq 25 \checkmark$ stena je lahko nearmirana

$$h_{wv} = 0,3 \text{ m} > h_{wv, \text{min}} = 0,12 \text{ m} \quad \checkmark$$

o Preverba osno upogibne moči:

$$N_{Ed} \leq N_{Rd} = b \cdot h_{wv} \cdot f_{cd, pl} \cdot \phi$$

$$500 \text{ kN} \leq N_{Rd} = 100 \text{ cm} \cdot 30 \text{ cm} \cdot 1,33 \frac{\text{kN}}{\text{cm}^2} \cdot 0,584 = 2330,2 \text{ kN} \quad \checkmark$$

$$\phi = 1,14 \cdot \left(1 - \frac{2 \cdot e_{tot}}{h_{wv}}\right) - 0,02 \cdot \frac{l_0}{h_{wv}}$$

$$= 1,14 \cdot \left(1 - \frac{2 \cdot 3,375 \text{ cm}}{30 \text{ cm}}\right) - 0,02 \cdot \frac{450 \text{ cm}}{30 \text{ cm}} = 0,584 \leq \left(1 - \frac{2e_{tot}}{h_{wv}}\right)$$

$$= \left(1 - \frac{2 \cdot 3,375 \text{ cm}}{30 \text{ cm}}\right) = 0,775$$

o Preverba strižne moči:

$$\tau_{cp} \leq f_{crd}$$

$$\tau_{cp} = k \cdot \frac{V_{Ed}}{A_{cc}} = 1,5 \cdot \frac{5 \text{ kN}}{100 \text{ cm} \cdot 2 \cdot 11,62 \text{ cm}} = 0,0032 \frac{\text{kN}}{\text{cm}^2}$$

$$c = \frac{h_{wv}}{2} - e_{tot} = \frac{30 \text{ cm}}{2} - 3,38 \text{ cm} = 11,62 \text{ cm}$$

$$A_{cc} = b \cdot 2c$$

$$\sigma_{cp} = \frac{N_{Ed}}{A_{cc}} = \frac{500 \text{ kN}}{100 \text{ cm} \cdot 2 \cdot 11,62 \text{ cm}} = 0,22 \frac{\text{kN}}{\text{cm}^2}$$

$$\sigma_{c, \text{lim}} = f_{cd, pe} \cdot 2 \cdot \sqrt{f_{ctd, pl} (f_{ctd, pl} + f_{cd, pl})} =$$

$$= 1,33 \rightarrow 2 \sqrt{0,096 (0,096 + 1,33)} = 0,59 \frac{\text{kN}}{\text{cm}^2} > \sigma_{cp} \Rightarrow$$

$$f_{ctd, pl} = \alpha_{ct, pl} \cdot \frac{f_{ctk, 0,05}}{\gamma_c} = 0,8 \cdot \frac{0,18}{1,5} = 0,096 \frac{\text{kN}}{\text{cm}^2}$$

$$\Rightarrow f_{crd} = \sqrt{f_{ctd, pl}^2 + \sigma_{cp} f_{ctd, pl}} = \sqrt{0,096^2 + 0,22 \cdot 0,096} = 0,174 \frac{\text{kN}}{\text{cm}^2}$$

$$\tau_{cp} = 0,0032 \frac{\text{kN}}{\text{cm}^2} < f_{crd} = 0,174 \frac{\text{kN}}{\text{cm}^2} \quad \checkmark \Rightarrow \text{strižna odpornost v tem premeru je zagotovljena}$$

D.N.: Določiti največjo možno projektno obtežbo v vodoravni smeri V_{Ed} , da bo nearmirana stena še varna. ($R \cdot V_{Ed} = 18,41 \text{ kN}$)

→ RAZMISLI:

V vaji smo lastno težo stene zanemarli. V realnosti jo me. Katere verneostne posledice že obtežijo μ_1, μ_2 uporabimo?! (stijp → bolj neuporabno; MANJŠA OSNA OBTEŽBA!)