

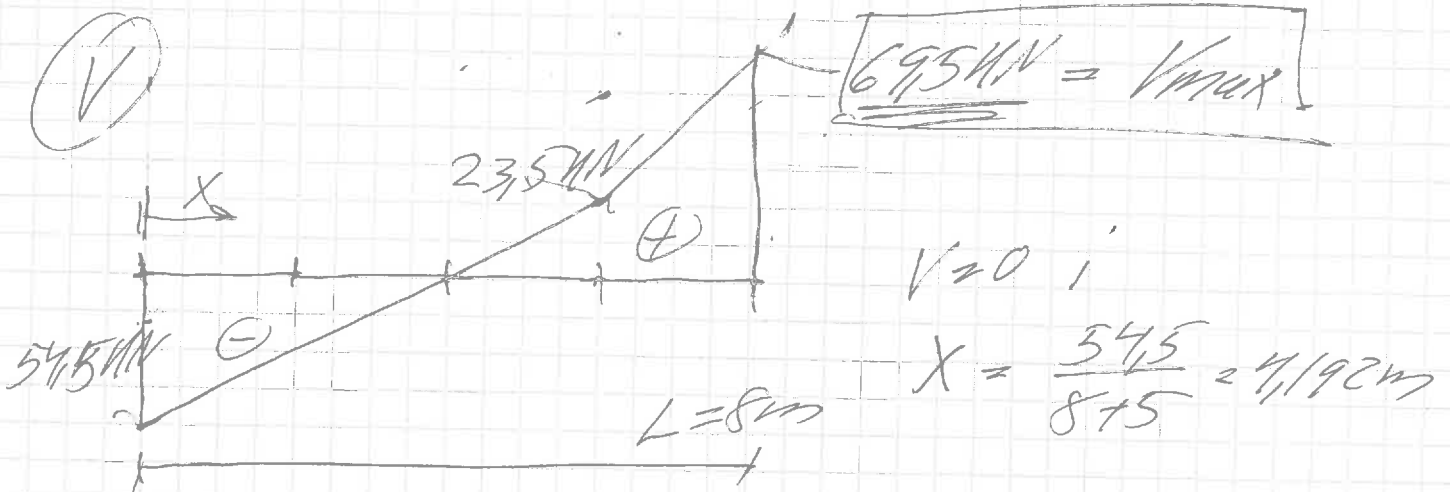
Spm 1

$$R_{q/m} = \frac{\frac{1}{2}(q+p)L^2}{L} + p \cdot \frac{L}{4} \cdot \frac{1}{2} \cdot L$$

$$= \frac{1}{2}(q+p)L + \frac{7}{32}pL = \frac{1}{2}(8+5) \cdot 8 + \frac{7}{32} \cdot 10 \cdot 8 = \underline{69,5 \text{ kN}}$$

$$R_{vmax} = (q+p)L + p \cdot \frac{L}{4} - R_{q/m}$$

$$= (8+5) \cdot 8 + 10 \cdot 8/4 - 69,5 = \underline{34,5 \text{ kN}}$$



Momentet er størst i $x=4,192 \text{ m}$, hvor

$$M_{max} = R_{vmax}x - \frac{1}{2}(p+q)x^2$$

$$= 34,5 \cdot 4,192 - \frac{1}{2}(8+5) \cdot 4,192^2 = \underline{114,2 \text{ kNm}}$$

Betons konstruktions, maj 18, opg 1

2/4

SPM 2

$$f_{cd} = 35 / 1,45 = 24,1 \text{ MPa} \Rightarrow E_{u3} = 3,5 \cdot 10^{-3}$$

$$f_{yd} = 500 / 1,2 = 416,7 \text{ MPa} \Rightarrow E_{yd} = 2,0835 \cdot 10^{-3}$$

$$d_1 = 519 + 48 = 567 \text{ mm}$$

$$d_2 = \dots \dots \dots 519 \text{ mm}$$

$$A_{s1} = A_{s2} = 477 (20/2)^2 = 1256 \text{ mm}^2$$

Vi antager flydning i de to lag armering
og ingen overrivning, dvs

$$\eta = \frac{(A_{s1} + A_{s2}) f_{yd}}{b \cdot f_{cd}} = \frac{(1256 + 1256) \cdot 416,7}{1200 \cdot 24,1} = 36,15 \text{ mm}$$

$$x = 36,15 / 0,8 = 45,19 \text{ mm}$$

$\Rightarrow$

$$E_{s1} = \frac{E_{u3}}{x} (d_1 - x) = \frac{3,5 \cdot 10^{-3}}{45,19} (567 - 45,19) = 40,9 \cdot 10^{-3}$$

$$E_{s2} = \frac{E_{u3}}{x} (d_2 - x) = \frac{3,5 \cdot 10^{-3}}{45,19} (519 - 45,19) = 36,7 \cdot 10^{-3}$$

Da $E_{yd} < E_{s2} < E_{s1} < E_{yd}$ er antagelsen
korrekt $\Rightarrow$

$$\begin{aligned} M_{yd} &= A_{s1} f_{yd} (d_1 - \frac{\eta}{2}) + A_{s2} f_{yd} (d_2 - \frac{\eta}{2}) \\ &= 1256 \cdot 416,7 (567 - 36,15/2) \\ &\quad + 1256 \cdot 416,7 (519 - 36,15/2) \\ &= 549,5 \text{ kNm} = 549,5 \text{ kNm} \end{aligned}$$

Momentberegningen er i orden

OBS: Tager man kun et lag armering
med, så er træbrottet ikke normalt armeret.

Der er to brækkeløkke som også
skal tages med i regning.

I kan godt regne med en d og en E_s

Beton Konstruktør, maj 18, opg. 1 3/4

Spm 3

$$V_v = 9,7 - 35/200 = \underline{9,525} > 9,45$$

$$Z = \frac{d_i + d_e}{2} - \frac{g}{2} = \frac{567 + 510}{2} - \frac{36,5}{2} = \underline{524,9 \text{ mm}}$$

$$\Rightarrow V_{ed,C} = 2 \cdot 200 \cdot 0,525 \cdot 24,1 \cdot 524,9 \cdot \frac{25}{1 + 2,52} = \underline{916,0 \text{ kN}}$$

$$V_{ed,W} = 2 \cdot 27 \left(\frac{6}{2}\right)^2 \cdot 4/6,7 \cdot \frac{524,9}{125} \cdot 25 = \underline{494,7 \text{ kN}}$$

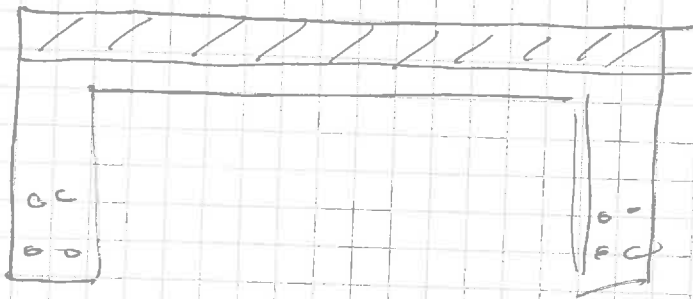
$$V_{ed,L} = 2 \cdot 2,47 \left(\frac{20}{2}\right)^2 \cdot 4/6,7 \cdot \frac{1}{2,5} = \underline{837,8 \text{ kN}}$$

$$V_{rd} = \underline{395,8 \text{ kN}}$$

For skydnings beregningen er i orden

Spørsmål 4

$$\alpha = 5,9$$



V : antager x
oppe i flang

$$\begin{aligned} \Rightarrow S_L &= b x \cdot \frac{x}{2} - \alpha (A_{s1} (d_1 - x) + A_{s2} (d_2 - x)) \\ &= 1200 \cdot x^2 / 2 - 5,9 \cdot 1256 ((567 - x) + (519 - x)) = 0 \end{aligned}$$

$$\Rightarrow x = \underline{104,1 \text{ mm}}$$

$$\begin{aligned} \Rightarrow I_L &= \frac{1}{12} b x^3 + b x \left(\frac{x}{2} \right)^2 + \alpha (A_{s1} (d_1 - x)^2 + A_{s2} (d_2 - x)^2) \\ &= \frac{1}{12} \cdot 1200 \cdot 104,1^3 + 1200 \cdot 104,1 \cdot (104,1 / 2)^2 \\ &\quad + 5,9 \cdot 1256 ((567 - 104,1)^2 + (519 - 104,1)^2) \\ &= \underline{3,316 \cdot 10^9 \text{ mm}^4} \end{aligned}$$

$$\Rightarrow EI = \frac{2 \cdot 10^5}{5,9} \cdot 3,316 \cdot 10^9 = \underline{1,124 \cdot 10^{12} \text{ Nmm}^2}$$

$$\begin{aligned} \Rightarrow V &= \frac{5}{384} (p + q) L^4 / EI \\ &= \frac{5}{384} (5 + 8) \cdot 10^3 \cdot 8000^4 \\ &\quad \underline{1,124 \cdot 10^{12}} = \underline{6,16 \text{ mm}} \end{aligned}$$

$$\angle L/250 = 32 \text{ mm}$$