

$$f_{cd} = 45 / 1,45 = 31,0 \text{ MPa}$$

$$f_{yd} = 550 / 1,2 = 458,3 \text{ MPa}$$

$$E_{u3} = 3,5 \cdot 10^3$$

$$E_{yd} = 458,3 / 2 \cdot 10^5 = 2,292 \cdot 10^{-3} \quad E_{u4} = 3 \cdot 10^2$$

Spm 1

Jeg antager

1) at jeg kan nøjes med de 3 stænger i træksiden

2) at de stænger flyder men ikke rives over

$$M_{TV} = 0$$

$$M_{Eud} = M_{TV} + N_{Ed}(e_0 + e_1) = 500 \cdot 10^3 (5 + 50) \\ = 27,5 \cdot 10^6 \text{ Nmm} = \underline{27,5 \text{ MNm}}$$

$$v = \frac{1}{10} \frac{E_{yd} + E_{u3}}{d} \cdot L_s^2$$

$$L_s = 0,7 L = 0,7 \cdot 8 = 5,6 \text{ m}$$

$$d = 300 - 25 \cdot 8 - 24/2 = \underline{255 \text{ mm}}$$

2)

$$v = \frac{1}{10} \frac{2,292 \cdot 10^{-3} + 3,5 \cdot 10^{-3}}{255} (0,7 \cdot 8000)^2 = \underline{74,2 \text{ mm}}$$

$$M_{Ed} = M_{Eud} + N_{Ed} \cdot v = 27,5 \cdot 10^6 + 500 \cdot 10^3 \cdot 74,2 \\ = 63,1 \cdot 10^6 \text{ Nmm} = \underline{63,1 \text{ MNm}}$$

$$N = A_{sp} f_{cd} - A_{st} f_{yd} = M_{Ed} \quad \Leftrightarrow$$

$$y = \frac{N_{Ed} + A_{st} f_{yd}}{b \cdot f_{cd}} = \frac{500 \cdot 10^3 + 377 (24/2)^2 \cdot 458,3}{600 \cdot 31,0} \\ = \underline{60,32 \text{ mm}}$$

$$\Rightarrow x = y / \lambda = \frac{60,32}{0,8} = \underline{75,40 \text{ mm}}$$

$$\epsilon_s = \frac{\epsilon_{u3}}{x} (d-x) = \frac{3,5 \cdot 10^{-3}}{75,40} (255 - 75,40)$$

$$= 8,34 \cdot 10^{-3}$$

Dg $\epsilon_{gd} \leq \epsilon_s \leq \epsilon_{uk}$ er antagelse 2. harmoni

2)

$$M_{ed} = b y f_{cd} \left(\frac{h}{2} - \frac{y}{2} \right) + A_s f_{yd} \left(d - \frac{h}{2} \right)$$

$$= 600 \cdot 60,32 \cdot 310 \cdot \left(\frac{300}{2} - \frac{60,32}{2} \right)$$

$$+ 3 \pi \left(\frac{24}{2} \right)^2 \cdot 458,3 \left(255 - \frac{300}{2} \right)$$

$$= 199,8 \cdot 10^6 \text{ Nmm} = \underline{199,8 \text{ kNm}}$$

$$> M_{ed} = 63,1 \text{ kNm}$$

OK, harmoni
- antagelse 1 er korrekt

SPM 2

Beregninger og antagelser som i SPM 1, men begynder om den anden aksel

2) $M_{TV} = 0$

$$M_{Ecd} = M_{TV} + N_{Ed}(e_0 + e_1)$$

$$= 0 + 500 \cdot 10^3 (5 + 100) = 52,5 \cdot 10^6 \text{ Nmm} = \underline{52,5 \text{ kNm}}$$

Har 2 stænger i y-ret med, dvs

$$d = 600 - 25 - 8 - 24/2 = \underline{535 \text{ mm}}$$

$$u = e_2 = \frac{1}{10} \cdot \frac{2,292 \cdot 10^{-3} + 3,5 \cdot 10^{-3}}{535} (0,78000)^2$$

$$= \underline{32,7 \text{ mm}}$$

$$M_{Ed} = M_{Ecd} + N_{Ed} \cdot u$$

$$= 52,5 \cdot 10^6 + 500 \cdot 10^3 \cdot 32,7$$

$$= 68,9 \cdot 10^6 \text{ Nmm} = \underline{68,9 \text{ kNm}}$$

$$y = \frac{M_{ed} + A_s f_{yd}}{b f_{cd}} = \frac{500 \cdot 10^3 + 277 (2410)^2 \cdot 458,3}{300 \cdot 31,0}$$

$$= 98,4 \text{ mm}$$

$$\Rightarrow x = y \lambda = \frac{98,4}{0,8} = 122,9 \text{ mm}$$

$$\Rightarrow \epsilon_s = \frac{3,5 \cdot 10^{-3}}{122,9} (555 - 122,9) = 17,3 \cdot 10^{-3}$$

$$\text{Da } \epsilon_{yd} = 2,292 \cdot 10^{-3} < \epsilon_s = 17,3 \cdot 10^{-3} < \epsilon_{yk} = 5 \cdot 10^{-2} = 50 \cdot 10^{-3}$$

er integreret 2 om flydning bevist

$\Rightarrow$

$$M_{ed} = b \eta f_{cd} \left(\frac{h}{2} - \frac{y}{2} \right) + A_s f_{yd} \left(d - \frac{h}{2} \right)$$

$$= 300 \cdot 98,4 \cdot 31,0 \left(\frac{600}{2} - \frac{98,4}{2} \right)$$

$$+ 277 \left(\frac{241}{2} \right)^2 \cdot 458,3 \left(555 - \frac{600}{2} \right)$$

$$= 335,3 \cdot 10^6 \text{ Nmm} = \underline{\underline{335,3 \text{ kNm}}}$$

$$> M_{ed} = 68,9 \text{ kNm}$$

Traverset holdt

Befestigung: maj 17, opy 2

4/5



Jeg har fra spm 1

$$C_y = 5 + 50 + 71,2 = 126,2 \text{ mm}$$

$$M_{ed,y} = 63,9 \text{ kNm}$$

$$M_{rd,y} = 189,8 \text{ kNm}$$

og fra spm 2

$$C_x = 5 + 100 + 32,8 = 137,8 \text{ mm}$$

$$M_{ed,x} = 68,9 \text{ kNm}$$

$$M_{rd,x} = 335,3 \text{ kNm}$$

12. ...

V: Gennemsnit

$$N_{ed} = A_c f_{cd} + A_s f_{yd}$$

$$= 300 \cdot 600 \cdot 3,0 + 677 \left(\frac{24}{2}\right)^2 \cdot 4583$$

$$= 6824 \cdot 10^3 \text{ N} = 6824 \text{ kN}$$

$$N_{Ed} / N_{Rd} = 500 / 6824 = 0,073 \approx 0,1$$

$$\Rightarrow \alpha = 1,0 \quad ; \quad \text{Tab. 7.3}$$

$$\Rightarrow \left(\frac{M_{Ed,x}}{M_{Rd,x}} \right)^\alpha + \left(\frac{M_{Ed,y}}{M_{Rd,y}} \right)^\alpha$$

$$= \left(\frac{68,9}{335,7} \right)^{1,0} + \left(\frac{63,1}{199,8} \right)^{1,0} = 0,52 \leq 1$$

Traversnit kan holdes