

$$M_{IV} = P \cdot L/2 = 10 \cdot 6/2 = \underline{30 \text{ kNm}}$$

$$M_{Ecd} = M_{IV} + N_{Ed} \cdot (e_1 + e_2) = 30 + 200(50 + 5) \cdot 10^{-3} = \underline{41 \text{ kNm}}$$

$$d = 500 - 50 = 450 \text{ mm}$$

$$f_{cd} = 35/1.45 = 24.1 \text{ MPa}$$

$$f_{yd} = 500/1.12 = 446.7 \text{ MPa}$$

$$\epsilon_{cu3} = 3.5 \text{ ‰}$$

$$\epsilon_{yd} = 446.7 / 2 \cdot 10^5 = 2.084 \text{ ‰}$$

$$\epsilon_{cu4} = 5 \text{ ‰}$$

$$\Rightarrow \epsilon_2 = \nu = \frac{1}{10} \frac{\epsilon_{cu3} + \epsilon_{yd}}{d} \cdot \frac{1}{\epsilon_s}$$

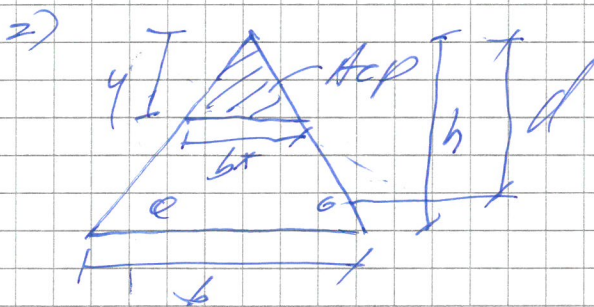
$$= \frac{1}{10} \cdot \frac{3.5 \text{ ‰} + 2.084 \text{ ‰}}{450} \cdot (2 \cdot 6000)^2 = 178.7 \text{ mm}$$

vi) armering

$$M_{Ed} = M_{IV} + N_{Ed} \cdot \epsilon_2 = 41 + 200 \cdot 178.7 \cdot 10^{-3} = \underline{76.7 \text{ kNm}}$$

1) Flgning av. We overv. m. m. i. brakarmering

2) vi kan regne med brakarmering



$$A_{cp} = \frac{N_{Ed} + A_s f_{cd}}{f_{cd}} = \frac{200 \cdot 10^3 + 217 (24/2)^2 446.7}{24.1}$$

$$= 23.94 \cdot 10^3 \text{ mm}^2$$

$$A_{cp} = \frac{1}{2} 4 \cdot b_x = \frac{1}{2} 4 \left(\frac{b}{h} \cdot y \right) \Rightarrow y = \sqrt{\frac{2 A_{cp} \cdot h}{b}}$$

$$\Rightarrow y = \sqrt{\frac{2 \cdot 23.94 \cdot 10^3 \cdot 500}{500}} = 218.8 \text{ mm}$$

$$\Rightarrow x = y/\alpha = 218.8/0.8 = 273.5 \text{ mm} \Rightarrow$$

$$\epsilon_s = \frac{\epsilon_{cu3}}{x} (d - x) = \frac{3.5 \text{ ‰}}{273.5} (450 - 273.5) = 2.26 \text{ ‰}$$

$\epsilon_{yd} < \epsilon_s < \epsilon_{cu4} \Rightarrow$ Flgning, ej overv. m. m. i. brakarmering

2)

$$M_{\text{red}} = A_{\text{cp}} f_{\text{cd}} \left(\frac{h}{2} - \frac{2}{3} a \right) + A_{\text{sf}} f_{\text{cd}} (d - \frac{1}{2} a)$$

$$= 23,94 \cdot 10^3 \cdot 241 \left(500/2 - \frac{2}{3} \cdot 218,8 \right)$$

$$+ 217 (241/2) \cdot 416,7 (450 - 500/2)$$

$$= 135,5 \cdot 10^6 \text{ Nmm} = \underline{\underline{135,5 \text{ kNm}}}$$

 $> M_{\text{Ed}}$ Sjklus beregne $\leftarrow$ tilstrekket