Prov i hållfasthetslära i Konstruktion B

1. nitar 19 mm oslagna ⇒ 20 mm slagna = D

$$\sigma_{max} = \frac{N}{A} = \frac{N}{B \cdot H} = \frac{8 \cdot 10^3}{(120 - 2 \cdot \underbrace{20}_{D}) \cdot \underbrace{12}_{H=t}} = 8{,}33 \text{ MPa} \approx \underline{\underline{8{,}3 \text{ MPa}}}$$

↑ s. 13 i TS

$$\sigma_H = \frac{F}{n \cdot t \cdot D} = \frac{8 \cdot 10^3}{2 \cdot 12 \cdot 20} = 16{,}67 \text{ MPa} \approx \underline{\underline{16{,}7 \text{ MPa}}}$$

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2. $$\tau_s = \frac{F}{n \cdot a \cdot l} = \frac{60 \cdot 10^3}{2 \cdot 4 \cdot 60} = \underline{\underline{125 \text{ MPa}}}$$

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3. Nitdiamder 16 mm ⇒ Nithålsdiameter 17 mm = D

$$\tau = \frac{F}{m \cdot n \cdot A_n} \quad (\text{s } 14 \text{ TS})$$

1 MPa = 1 N/mm²

$$A_n = \pi \cdot r^2 = \pi \left(\frac{D}{2}\right)^2 = \frac{\pi D^2}{4}$$

$$\tau < \tau_{till} \Rightarrow \frac{F}{m \cdot n \cdot \frac{\pi D^2}{4}} < \tau_{till} \Rightarrow F < \tau_{till} \cdot m \cdot n \cdot \frac{\pi D^2}{4} \Rightarrow$$

$$\Rightarrow F < 100 \cdot 2 \cdot 1 \cdot \frac{\pi \cdot 17^2}{4} = 45{,}4 \text{ kN}$$

$$\sigma_H = \frac{F}{n \cdot t \cdot D} \quad (\text{s } 14 \text{ TS})$$

$$\sigma_H < \sigma_{H till} \Rightarrow$$

$$\Rightarrow \frac{F}{n \cdot t \cdot D} < \sigma_{H till} \Rightarrow F < \sigma_{H till} \cdot n \cdot t \cdot D = 260 \cdot 1 \cdot 8 \cdot 17 = 35{,}4 \text{ kN}$$

ty skarvplåtarna totalt är 12 mm

$$\sigma = \frac{N}{A}, \quad \sigma < \sigma_{till} \Rightarrow \frac{N}{A} < \sigma_{till}$$

$$N = F$$

$$A = B \cdot t = (50 - 17) \cdot 8 = 264$$

$$\frac{F}{A} < \sigma_{till} \Rightarrow F < \sigma_{till} \cdot A = 140 \cdot 264 = 36{,}96 \text{ kN}$$

Alltså: $F_{till} = \underline{\underline{35{,}4 \text{ kN}}}$ ty det är den minsta av de största krafterna.

4. ($m = 296$ för 3:orna), $m = 306$ för 2:orna

$$M_{bmax} = \frac{QL}{8} = \frac{mgL}{8} = \frac{306 \cdot 9{,}82 \cdot 1600}{8} = 600984 \text{ Nmm}$$

(296) (581344 Nmm)

↑ belastningsfall 10

$$M_b = M_{bmax}$$

$$\sigma_{bmax} = \frac{M_b}{W_b}$$

$$W_b = W_x = \frac{B \cdot H^2}{6} = \frac{63 \cdot 95^2}{6} = 94762{,}5 \text{ mm}^3$$

(581344) (6,13 N/mm²)

$$\sigma_{bmax} = \frac{M_b}{W_b} = \frac{600984}{94762{,}5} = 6{,}34 \text{ N/mm}^2$$

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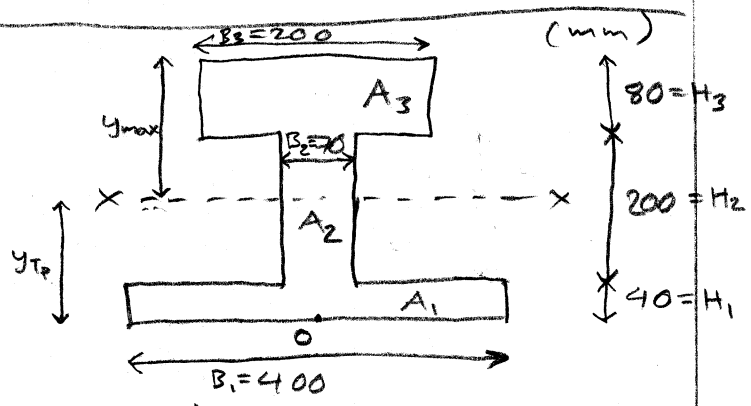
5. $$\sigma_{bmax} = \frac{M_b}{W_b}$$

$$W_b = \frac{I_x}{y_{max}}$$



Tyngdpunkt i y-led:

$$(A_1 + A_2 + A_3)\, y_{Tp} = A_1 y_{Tp1} + A_2 y_{Tp2} + A_3 y_{Tp3}$$

$$y_{Tp} = \frac{A_1 y_{Tp1} + A_2 y_{Tp2} + A_3 y_{Tp3}}{A_1 + A_2 + A_3} =$$

$$= \frac{B_1 H_1 y_{Tp1} + B_2 H_2 y_{Tp2} + B_3 H_3 y_{Tp3}}{B_1 H_1 + B_2 H_2 + B_3 H_3} =$$

$y_{Tp1} = H_1/2 = 20$

$y_{Tp2} = H_1 + H_2/2 = 40 + \frac{200}{2} = 140$

$y_{Tp3} = H_1 + H_2 + H_3/2 =$
$= 40 + 200 + 80/2 = 280$

$$= \frac{400 \cdot 40 \cdot 20 + 70 \cdot 200 \cdot 140 + 200 \cdot 80 \cdot 280}{400 \cdot 40 + 70 \cdot 200 + 200 \cdot 80} = 146{,}96 \text{ mm}$$

$$y_{max} = (H_1 + H_2 + H_3) - y_{Tp} = (40 + 200 + 80) - 146{,}96 = 173{,}04 \text{ mm}$$

Steiners sats:

$$I_{tot} = I_1 + A_1 \cdot a_1^2 + I_2 + A_2 \cdot a_2^2 + I_3 + A_3 \cdot a_3^2 =$$

$a_1 = y_{Tp} - H_1/2 = 126{,}96$

$a_2 = y_{Tp} - (H_1 + H_2/2) = 6{,}96$

$a_3 = H_1 + H_2 + H_3/3 - y_{Tp} = 133{,}04$

$$= \frac{B_1 H_1^3}{12} + B_1 H_1 a_1^2 + \frac{B_2 H_2^3}{12} + B_2 H_2 a_2^2 + \frac{B_3 H_3^3}{12} + B_3 H_3 a_3^2 =$$

$$= \frac{400 \cdot 40^3}{12} + 400 \cdot 40 \cdot 126{,}96^2 + \frac{70 \cdot 200^3}{12} + 70 \cdot 200 \cdot 6{,}96^2 + \frac{200 \cdot 80^3}{12} + 200 \cdot 80 \cdot 133{,}04^2 =$$

$$= 5991072469 \text{ mm}^4$$

forts →

(forts. av 5)

$I_x = I_{tot}$

$$W_b = \frac{I_x}{y_{max}} = \frac{599107246,9}{173,04} = 3,46 \cdot 10^6 \ mm^3$$

$$\sigma_{bmax} = \frac{M_b}{W_b} = \frac{40 \cdot 10^3 \cdot 10^3}{3,46 \cdot 10^6} = \underline{11,6 \ MPa} = \sigma_{bdmax}$$

(σ_{bdmax}: ↑ drag; p.g.a. ovansida och nedböjning)

$$\sigma_{btmax} = \frac{y_{Tp}}{y_{max}} \cdot \sigma_{bdmax} = \frac{146,96}{173,04} \cdot 11,56 = \underline{9,82 \ MPa}$$

(σ_{btmax}: ↑ tryck; undersida)