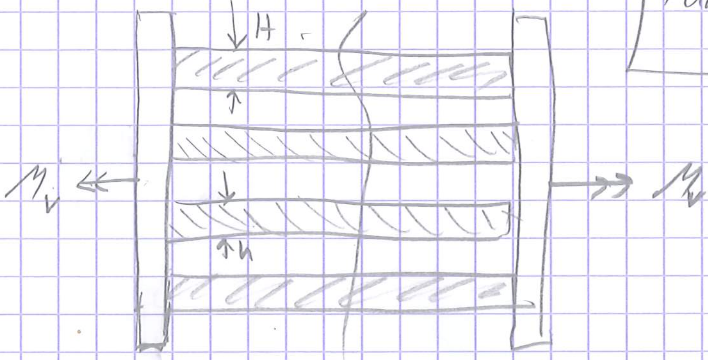
2.6.25

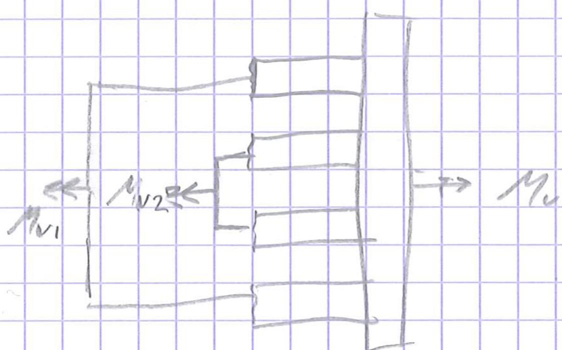


tunnväggigt

Givet: utfrl elastiskt-idealplastiskt (T, τ_s)

Sökt: flytlastförhöjningen vid vridning

Snitta o frilägg



Jmv:

$\Rightarrow: -M_{v1} - M_{v2} + M_v = 0$

$\Rightarrow M_{v1} = M_v - M_{v2}$

Komp: $\theta_1 = \theta_2$

Konst: $\theta_1 = \frac{M_{v1} L}{G K_1} = \left\{ K_1 = 2\pi R^3 H \right\} = \frac{M_{v1} L}{G \cdot 2\pi R^3 H}$

$\theta_2 = \frac{M_{v2} L}{G K_2} = \left\{ K_2 = 2\pi a^3 h \right\} = \frac{M_{v2} L}{G \cdot 2\pi a^3 h}$

Sätt samman

komp $\theta_1 = \theta_2$

$$\Rightarrow \quad \frac{M_{v1} L}{G \cdot 2\pi R^3 H} = \frac{M_{v2} L}{G \cdot 2\pi a^3 h}$$

$$\frac{M_{v1}}{R^3 H} = \frac{M_{v2}}{a^3 h}$$

jmv: $M_{v1} = M_v - M_{v2}$

$$\Rightarrow \quad \frac{M_v - M_{v2}}{R^3 H} = \frac{M_{v2}}{a^3 h}$$

$$M_v a^3 h - M_{v2} a^3 h = M_{v2} R^3 H$$

$$M_{v2} = \frac{M_v a^3 h}{a^3 h + R^3 H}$$

$$\therefore \quad M_{v1} = M_v - M_{v2}$$

$$\Rightarrow \quad M_{v1} = M_v \left(1 - \frac{a^3 h}{a^3 h + R^3 H}\right) = \frac{M_v R^3 H}{a^3 h + R^3 H}$$

Spänningar o begynnande plast

$$\tau_1 = \frac{M_{v1}}{W_{v1}} = \frac{M_v R^3 H}{2\pi R^2 H (a^3 h + R^3 H)} = \frac{M_v R}{2\pi (a^3 h + R^3 H)}$$

$$\tau_2 = \frac{M_{v2}}{W_{v2}} = \dots = \frac{M_v a}{2\pi (a^3 h + R^3 H)}$$

$\therefore \ |\tau_1| > |\tau_2| \Rightarrow$ plasticering först i ytterröret

$$\tau_1 = \tau_s = \frac{M_{vs} R}{2\pi (a^3 h + R^3 H)}$$

$$M_{vs} = \frac{2\pi (a^3 h + R^3 H)}{R} \tau_s$$

Full plasticering

$\tau_1 = \tau_2 = \tau_s$

$M_{v1}^f = \tau_s W_{v1} = 2\pi R^2 H \tau_s$

$M_{v2}^f = \dots = 2\pi a^2 h \tau_s$

Jmv: $M_{v1}^f = M_{vf} - M_{v2}^f$

$\Rightarrow M_{vf} = 2\pi \tau_s (a^2 h + R^2 H)$

$$\Rightarrow \beta = \frac{a^2 h (R - a)}{a^3 h + R^3 H}$$