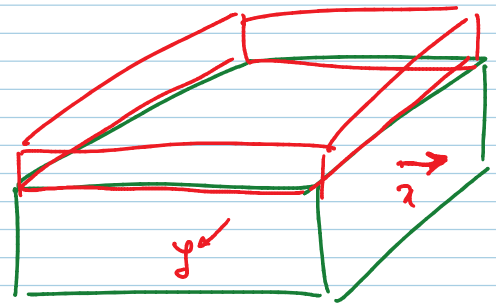
Dis 6, Mon Oct 8

Monday, October 08, 2012
4:03 PM



$\uparrow z \quad \sigma_z = 0 \qquad \epsilon_z \neq 0?$

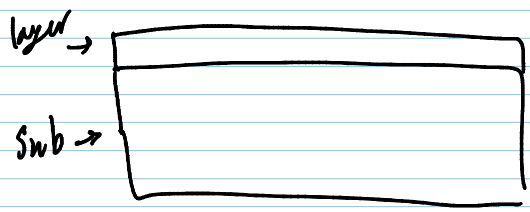
$\rightarrow \epsilon_x$

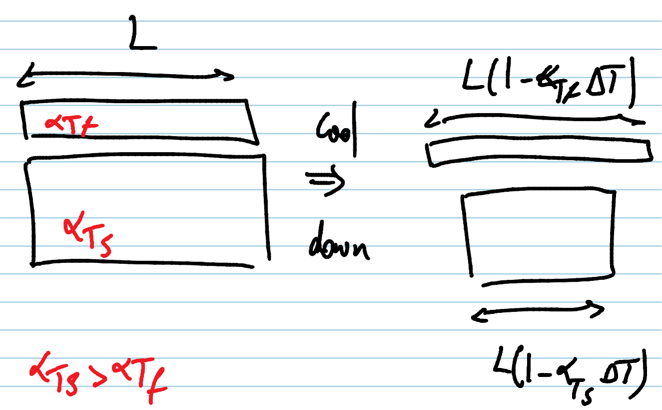
ϵ_y

biaxial modulus

$$\alpha_T = \frac{d\epsilon}{dT}$$

$$\alpha_T (T - T_0) = \epsilon(T) - \epsilon(T_0)$$





$\alpha_{Ts} > \alpha_{Tf}$

$\Delta T = T - T_0$

film $\Rightarrow$ $L(1-\alpha_{Tf}\Delta T) \rightarrow L(1-\alpha_{Ts}\Delta T)$

$$\epsilon = (\alpha_{Tf} - \alpha_{Ts})\Delta T = \frac{L_{new} - L_{old}}{}$$

$\alpha_{Ts} > \alpha_{Tf} \qquad \epsilon < 0 \qquad \sigma < 0 \qquad$ Compressive $\qquad \sigma = E' \epsilon$

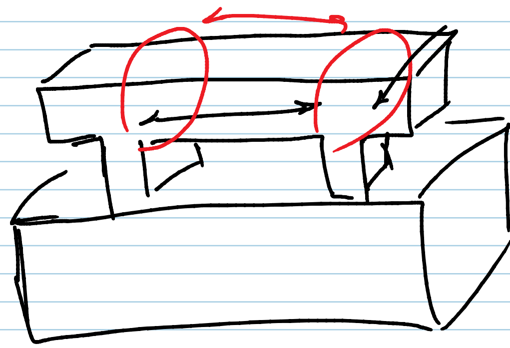
$\epsilon > 0$ $\sigma > 0$ tensile

biaxial

H @ T

$$\epsilon_z = -\alpha_{Tf}\Delta T - \nu \underbrace{(\alpha_{Tf} - \alpha_{Ts})\Delta T E' * 2}_{\sigma_x = \sigma_y}$$

$$H_{new} = H(1 + \epsilon_z)$$

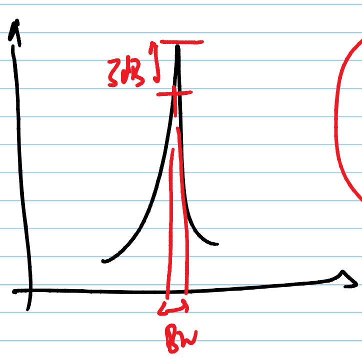


after release

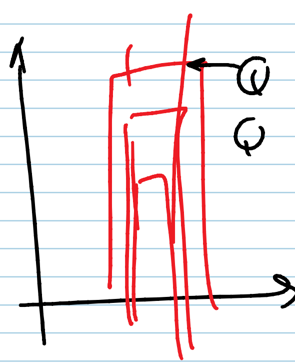
$L >> W$

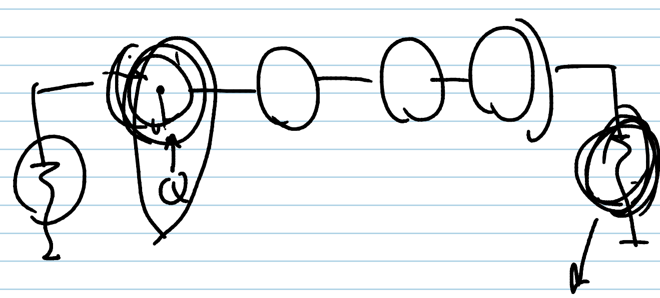
regular Young Mod.

not biaxial

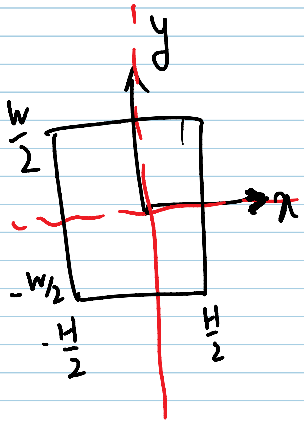


$$Q = \frac{BW}{f_0}$$



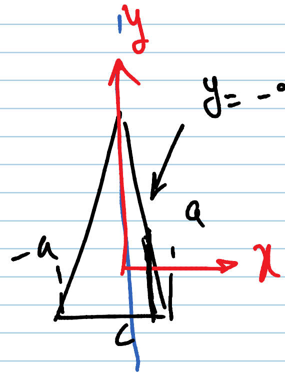


y

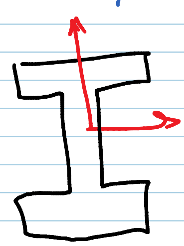


$$I = \iint x^2\,dx\,dy = W\,2\int_0^{H/2} x^2\,dx = W\,2\,\frac{x^3}{3}\Big]_0^{H/2} = \frac{1}{12} W H^3$$

$$I = \iint y^2\,dx\,dy = \frac{1}{12} H W^3$$

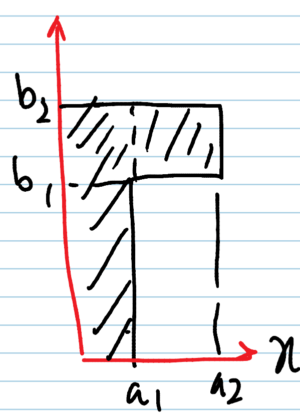


$$I = \iint x^2\,dx\,dy = 2\int x^2\left(\int dy\right)dx$$



$$= 2\int x^2\left(\int_c^{-\alpha x+b} dy\right)dx$$

$$= 2\int_0^a x^2\,(-\alpha x+b-c)\,dx$$



$$I = 4\iint x^2\,dx\,dy = 4\int_0^{a_1}\int_0^{b^2} x^2\,dx\,dy$$

$$+ 4\int_{a_1}^{a_2}\int_{b_1}^{b_2} x^2\,dx\,dy$$

$$= 4\left(\int^{b_1}\int^{a_1} x^2\,dx\,dy + \int^{b_2}\int^{a_2} x^2\,dx\,dy\right)$$

$$= \lambda \left(\int_0^{b_1} \int_0^{a_1} x^2 \, dx \, dy + \int_{b_1}^{b_2} \int_0^{a_2} x^2 \, dx \, dy \right)$$