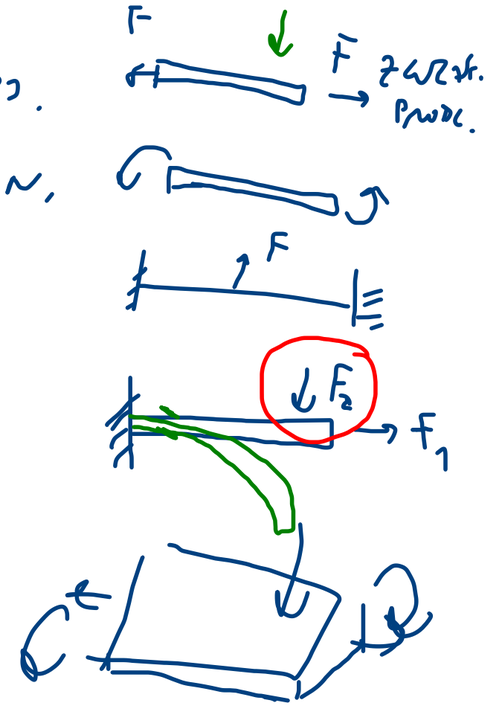
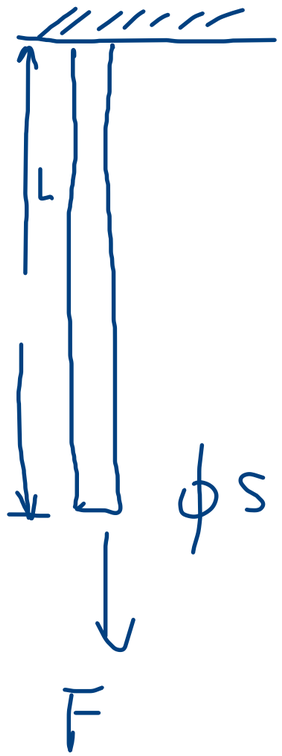
POJMY A ZÁKLADNÍ ÚLOHY PR. A PEVN.

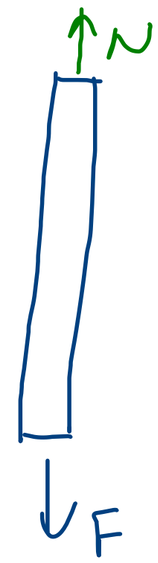
→ TYČ / PRUT	1D	OSOVÉ ZATÍŽENÍ	OSA NAP.
→ TYČ V KRUTU	1D	TORZE	VÍCE OSÁ N.
STRUNA	1D	OS. PŘEDEPNUTÍ, PŘÍČNÉ Z.	OSA N.
→ NOSNÍK	1D	OSOVÉ, PŘÍČNÉ	OSA N.
MEMBRÁNA	2D		
DESKA	2D	OSOVÉ, PŘÍČNÉ, OHYB. MOM. TORZE	



TYČ NAMÁHANÁ TAHEM / TLAKEM



1) URČENÍ REAKCÍ

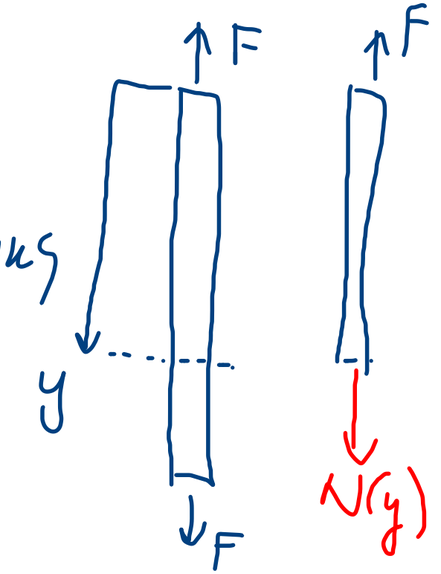


$\rightarrow x: \; 0 = 0$

$\uparrow y: \; N - F = 0 \rightarrow \underline{\underline{N = F}}$

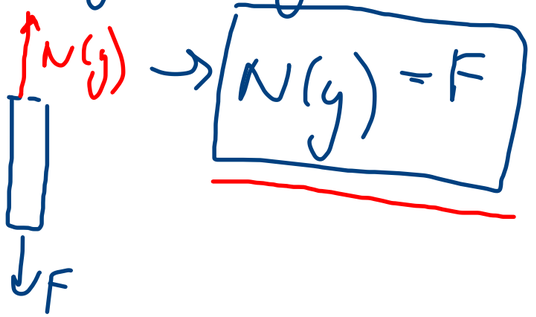
$\circlearrowleft_A:$

2) VNITŘNÍ STATICKÉ ÚČINKY
- MMR



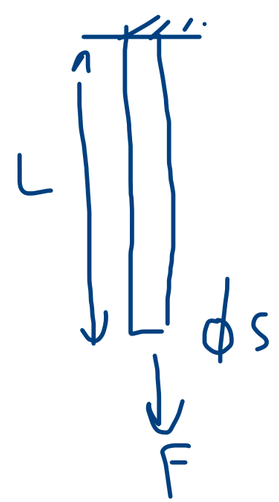
N .. NORMÁLOVÁ SÍLA

$\uparrow y: \; F - N(y) = 0$



NAPĚTÍ

$$\sigma_y = \frac{N(y)}{S}$$



$[\sigma] = \frac{N}{m^2} = Pa$

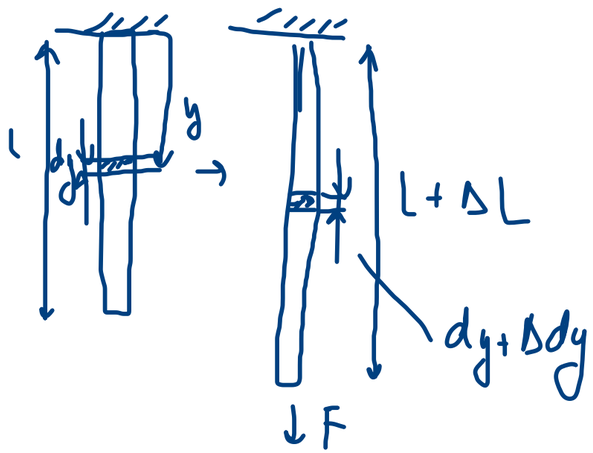
$\frac{lb}{ft^2} = psi$

1 MPa ... $1 N/mm^2$ / 1 N (0.1 kg) .. 20 kg .. 200 mPa
150 g

⊕ TAH

⊖ TLAK

DEFORMACE



$$\varepsilon = \frac{\Delta L}{L}$$

$$\varepsilon(y) = \frac{\Delta dy}{dy}$$

$[\varepsilon] = 1 = 1 strain = 10^6 \mu strain$

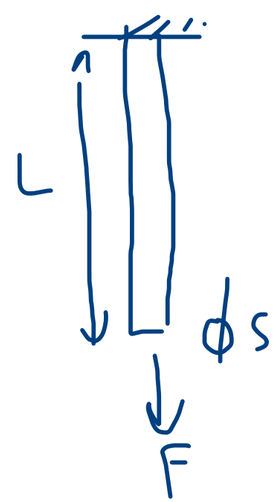
$\varepsilon \doteq 10\text{–}100 \cdot 10^{-6} = 10\text{–}100 \mu strain$

⊕ TAH .. PRODLOUŽÍ

⊖ TLAK .. ZKRÁTÍ

NAPĚTÍ

$$\sigma_y = \frac{N(y)}{S}$$



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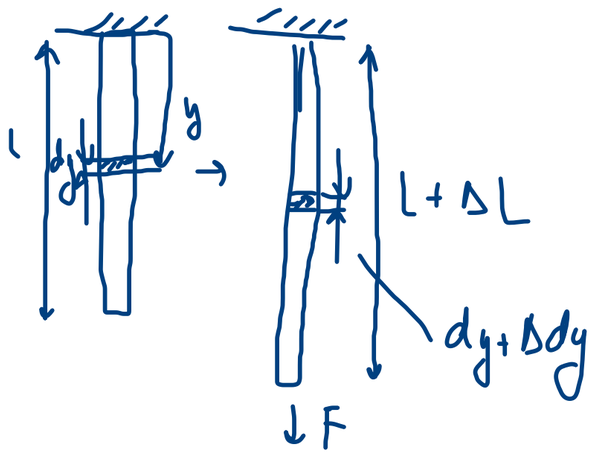
DEFORMACE



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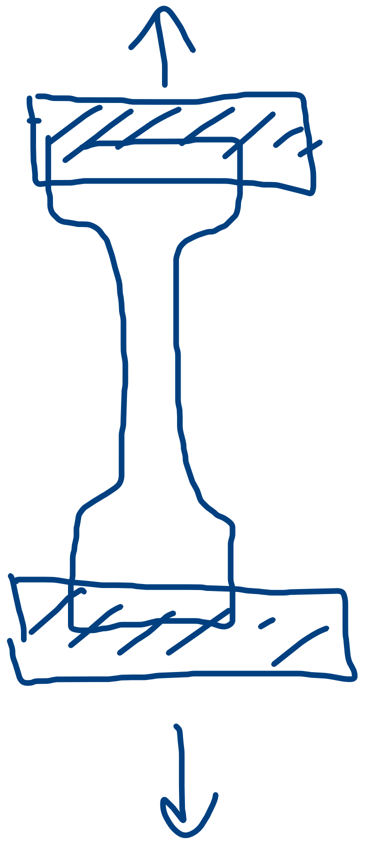
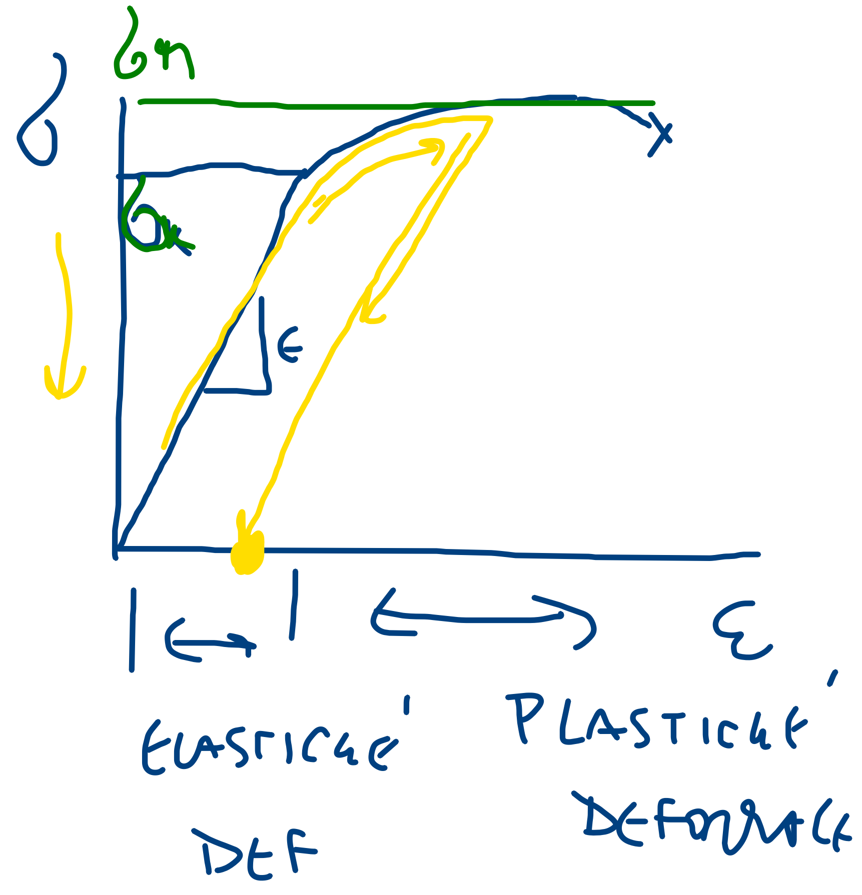
⊕ TAH .. PRODLOUŽÍ

⊖ TLAK .. ZKRÁTÍ

VZTAH MEZI NAPĚTÍM A DEFORMACÍ





HOOKEŮV ZÁKON

$$\sigma = E \cdot \varepsilon$$

E .. YOUNGŮV MODUL PRUŽNOSTI

$E_{ocel} = 210 \text{ GPa} = 2.1 \; 10^{11} \text{ Pa}$

$E_{dural} = 70 \text{ GPa}$

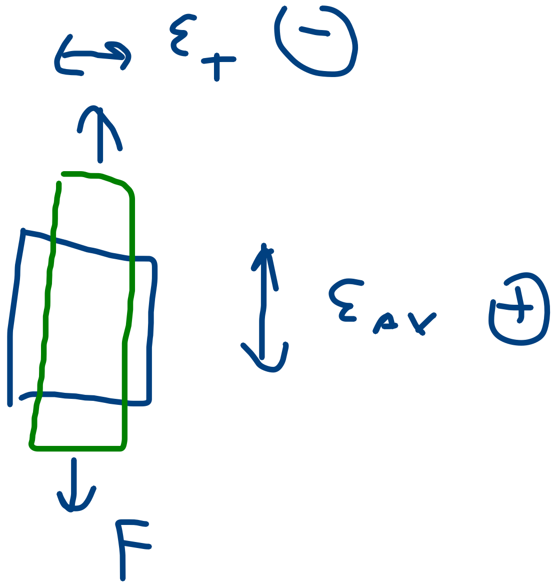
σ_k .. MEZ KLUZU

$$\sigma < \frac{\sigma_k}{k}$$

σ_m .. MEZ PEVNOSTI

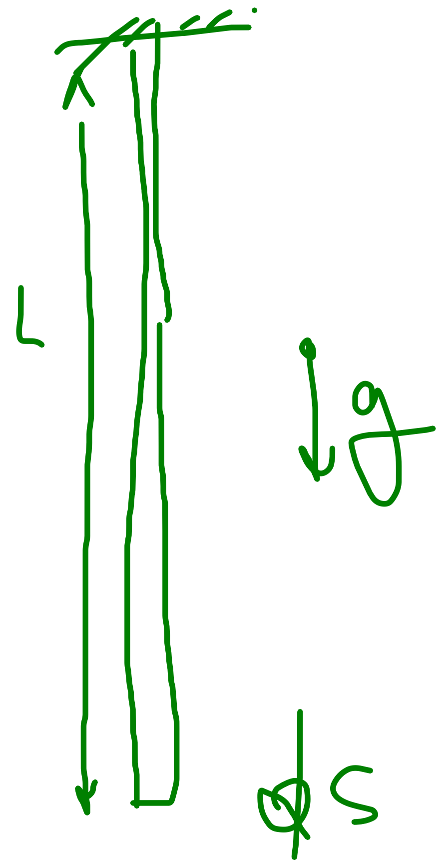
POISSONOVO ČÍSLO

$$\nu = - \frac{\varepsilon_T}{\varepsilon_A}$$



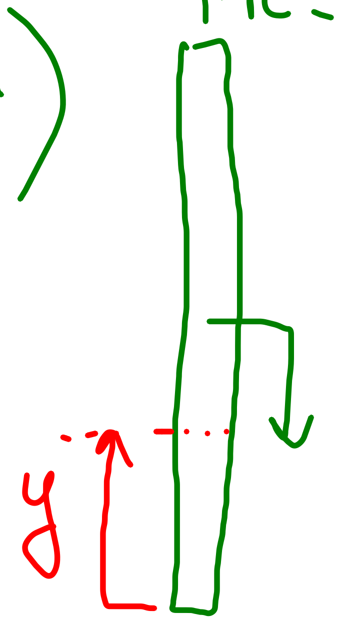
$\nu_{ocel} = 0.3$

$\nu = 0 - 0.5$



1)

$\uparrow R = mg = V\rho g = LS\rho g$



$F_g = m\cdot g$

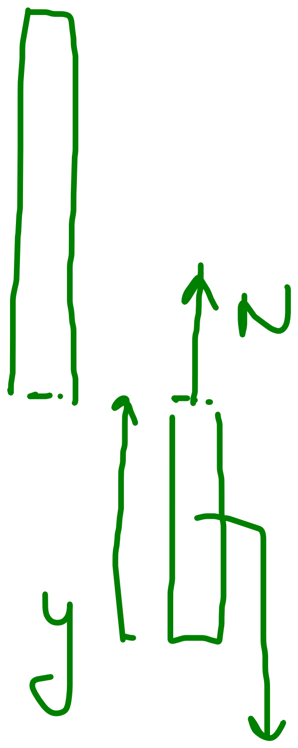
$\sigma_{max} = \sigma(L) = L\cdot\rho\cdot g = \sigma_K$

$L_{krit} = \frac{\sigma_k}{\rho\cdot g}$ = 2.6 km (ocel 200 MPa)

= 19.5 km (ocel 1500 MPa)

= 263 km (kevlar)

2) VSÚ



$N(y) = y\cdot S\rho g$

$\uparrow N(y) \rightarrow \sigma(y) = \frac{N(y)}{S} = y\cdot\rho\cdot g$

$y\cdot\rho\cdot S\cdot g$

$\varepsilon(y) = \frac{\sigma(y)}{E} = \frac{1}{E}\, y\cdot\rho\cdot g$

$\varepsilon(y) = \frac{\Delta dy}{dy}$

$\Delta L = \int_0^L \varepsilon(y)\,dy = \int_0^L \frac{1}{E}\, y\rho g\,dy = \frac{\rho g}{E}\frac{1}{2}L^2$