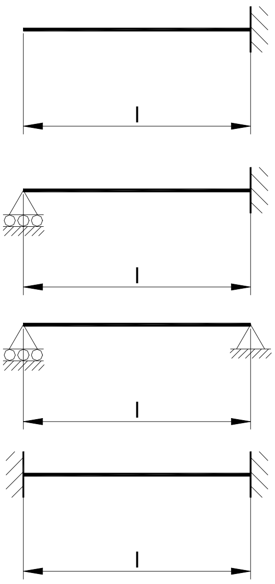
FORMULÁRIO PARA RESISTÊNCIA DOS MATERIAIS II

$$\sigma_{fl} = \frac{\pi^2 \times E}{\lambda^2} \qquad \lambda = \frac{\ell_{fl}}{i} \qquad i_x = \sqrt{\frac{I_x}{A}} \qquad i_y = \sqrt{\frac{I_y}{A}}$$

$$\lambda_{lim} = \sqrt{\frac{\pi^2 \times E}{\sigma_p}}$$

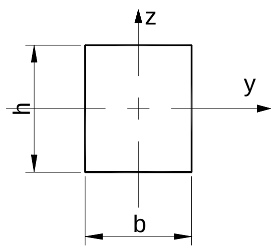


$\ell_{fl} = 2\,l$

$\ell_{fl} = 0{,}7\,l$

$\ell_{fl} = l$

$\ell_{fl} = 0{,}5\,l$



$$I_y = \frac{b \times h^3}{12}$$

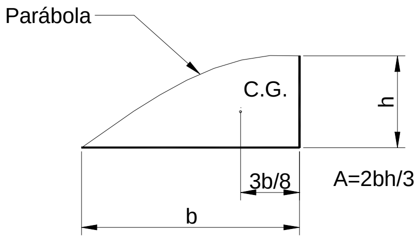
$$I_z = \frac{h \times b^3}{12}$$

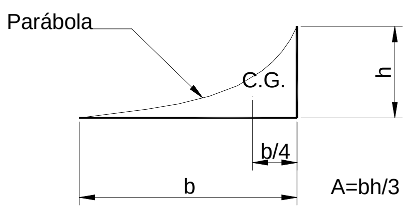
Tetmajer

$$\sigma_{fl} = a - b\lambda + c\lambda^2$$

Material	λ_{lim}	a	b	c
Aço st 37	105	303	1,16	0
Aço st 50	89	329	0,63	0
Ferro Fundido	80	764	12,2	0,05
Madeira	100	287	0,20	0
Aço ao Niquel	86	461	2,34	0
Alumínio	66	139	0,89	0

Formula da parábola para barras com $\lambda<\lambda_{lim}$ ➔ $\sigma_{fl} = \sigma_e - \dfrac{\sigma_e - \sigma_p}{\lambda_{lim}^2} \times \lambda^2$





$$\sigma_{eq} = \sigma_1 - \sigma_3 \qquad \sigma_{eq} = \sqrt{\frac{(\sigma_1-\sigma_2)^2 + (\sigma_1-\sigma_3)^2 + (\sigma_2-\sigma_3)^2}{2}} \qquad \sigma_{eq} \le \sigma_e$$

$$\sigma_{eq} = \sigma_1 - \sigma_3 \qquad \sigma_{eq} = \sqrt{\frac{(\sigma_1-\sigma_2)^2 + (\sigma_1-\sigma_3)^2 + (\sigma_2-\sigma_3)^2}{2}} \qquad \sigma_{eq} = \sigma_1 - k \times \sigma_3$$

$$k = \left|\frac{\sigma_T}{\sigma_C}\right| \qquad \sigma_1 = \frac{pd}{2e} \qquad \sigma_2 = \frac{pd}{4e} \qquad \sigma_1 = \sigma_2 = \frac{pd}{4e}$$

FORMULÁRIO PARA RESISTÊNCIA DOS MATERIAIS II

$$\varepsilon_x = \frac{1}{E}\left(\sigma_x - \nu \times \sigma_y\right) \qquad \varepsilon_y = \frac{1}{E}\left(\sigma_y - \nu \times \sigma_x\right) \qquad \gamma_{xy} = \frac{2(1+\nu)}{E} \times \tau_{xy}$$

$$\varepsilon_{x'} = \frac{\varepsilon_x + \varepsilon_y}{2} + \frac{\varepsilon_x - \varepsilon_y}{2}\cos 2\theta + \frac{\gamma_{xy}}{2}\operatorname{sen} 2\theta \qquad \frac{\gamma_{x'y'}}{2} = \frac{\varepsilon_y - \varepsilon_x}{2}\operatorname{sen} 2\theta + \frac{\gamma_{xy}}{2}\cos 2\theta$$

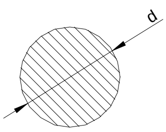
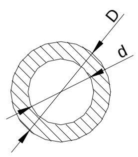
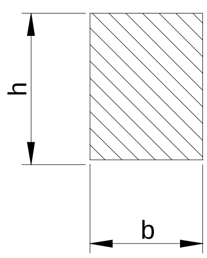
$$\varepsilon_1 = \frac{\varepsilon_x + \varepsilon_y}{2} + \sqrt{\left(\frac{\varepsilon_x - \varepsilon_y}{2}\right)^2 + \left(\frac{\gamma_{xy}}{2}\right)^2} \qquad \varepsilon_2 = \frac{\varepsilon_x + \varepsilon_y}{2} - \sqrt{\left(\frac{\varepsilon_x - \varepsilon_y}{2}\right)^2 + \left(\frac{\gamma_{xy}}{2}\right)^2}$$

$$\operatorname{tg} 2\theta_1 = \frac{\gamma_{xy}}{\varepsilon_x - \varepsilon_y} \qquad \frac{\gamma_{máx}}{2} = \sqrt{\left(\frac{\varepsilon_x - \varepsilon_y}{2}\right)^2 + \left(\frac{\gamma_{xy}}{2}\right)^2}$$

$$\sigma_2 = \frac{E\varepsilon_2 + \nu \times E\varepsilon_1}{1-\nu^2} \qquad \sigma_1 = \frac{E\varepsilon_1 + \nu \times E\varepsilon_2}{1-\nu^2}$$

$$\tau = \frac{T}{W_t} \qquad \theta = \frac{T \times L}{G \times I_t} \qquad \tau \leq \bar{\tau} \qquad I_t = \frac{4 \times A_m^2}{\oint \frac{ds}{t}} \qquad \tau = \frac{T}{2 \times t \times A_m}$$

Propriedades de seção à Torção

Seção Transversal	I_t	W_t
	$\frac{\pi \times d^4}{32}$	$\frac{\pi \times d^3}{16}$
	$\frac{\pi}{32}\left(D^4 - d^4\right)$	$\frac{\pi}{16 \times D}\left(D^4 - d^4\right)$
	$\beta \times h \times b^3$	$\alpha \times h \times b^2$

h/b	β	h/b	α
1	0,14	1	0,21
2	0,23	2	0,25
3	0,26	3	0,27
4	0,28	4	0,28
5	0,29	5	0,29
10	0,31	10	0,31
20	0,32	20	0,32
∞	0,33	∞	0,33

$$\tau = \frac{V \times \mathcal{M}\bar{s}}{b \times I} \qquad F = \frac{\mathcal{M}\bar{s}}{I}\int_0^e V\,dx \qquad \tau \leq \bar{\tau}$$