

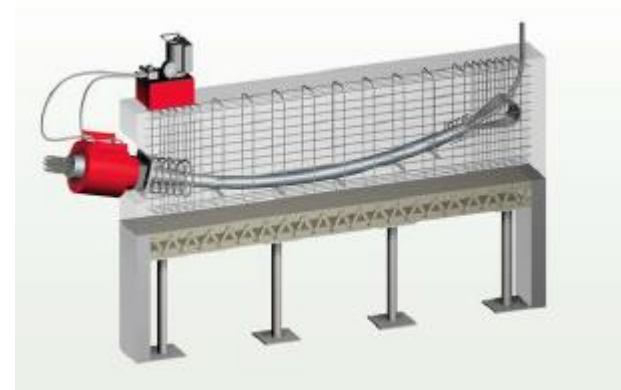
Concreto Protendido

Conceitos Básicos Exemplo

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Rui Nobhiro Oyamada

Januário Pellegrino Neto



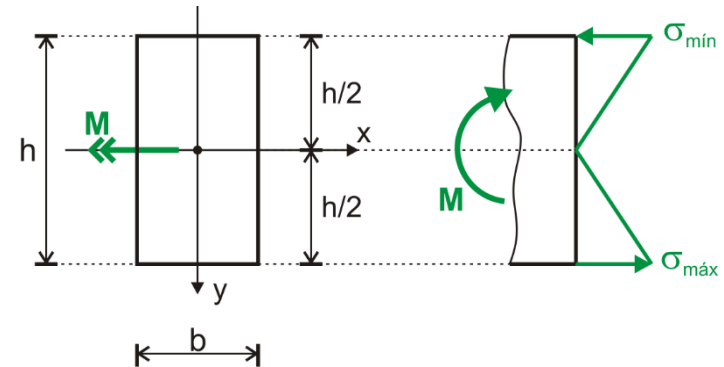
Flexão Normal Simples – FNS

Tensões máxima e mínima

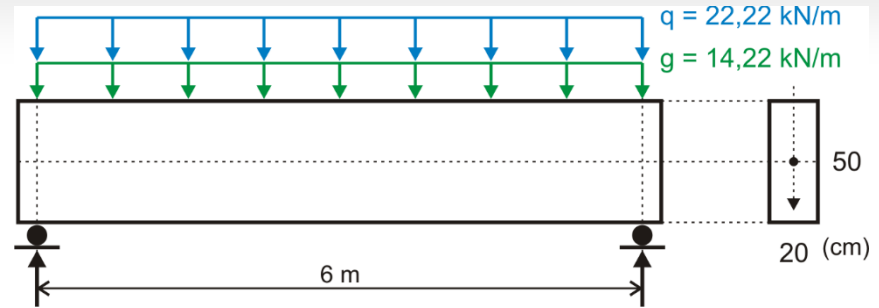
$$\sigma = \frac{M}{I} \cdot y \quad \left\{ \begin{array}{l} y_{\text{máx}} = +\frac{h}{2} \therefore \sigma_{\text{máx}} = \frac{M}{I} \cdot y_{\text{máx}} = \frac{M}{I} \cdot \frac{h}{2} = \frac{M}{W_{\text{máx}}} \\ y_{\text{mín}} = -\frac{h}{2} \therefore \sigma_{\text{mín}} = \frac{M}{I} \cdot y_{\text{mín}} = \frac{M}{I} \cdot \left(-\frac{h}{2}\right) = -\frac{M}{W_{\text{mín}}} \end{array} \right.$$

Seções retangulares

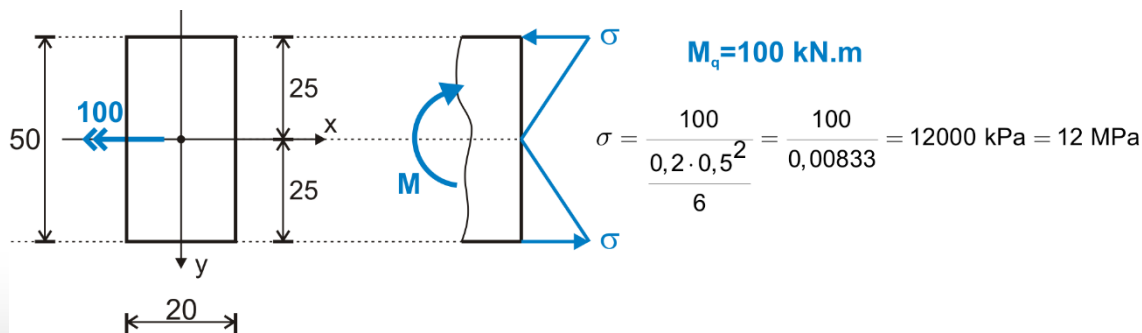
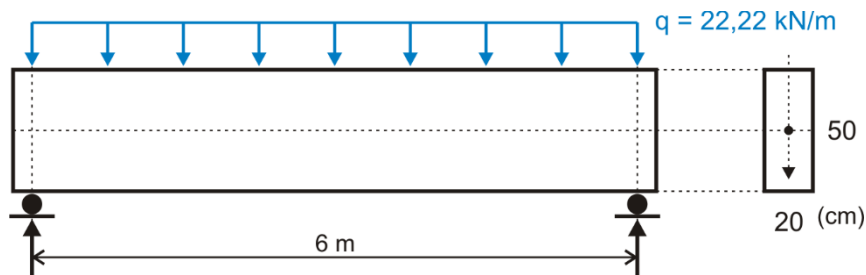
$$I = \frac{b \cdot h^3}{12} \quad \left\{ \begin{array}{l} y_{\text{máx}} = +\frac{h}{2} \therefore W_{\text{máx}} = \frac{I}{y_{\text{máx}}} = \frac{\frac{b \cdot h^3}{12}}{+\frac{h}{2}} = +\frac{b \cdot h^2}{6} \\ y_{\text{mín}} = -\frac{h}{2} \therefore W_{\text{mín}} = \frac{I}{y_{\text{mín}}} = \frac{\frac{b \cdot h^3}{12}}{-\frac{h}{2}} = -\frac{b \cdot h^2}{6} \end{array} \right.$$



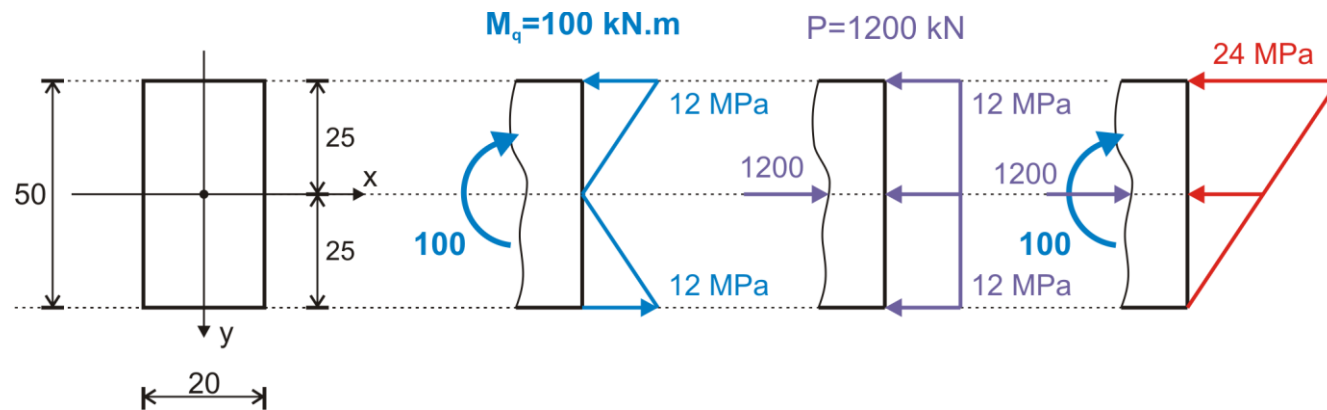
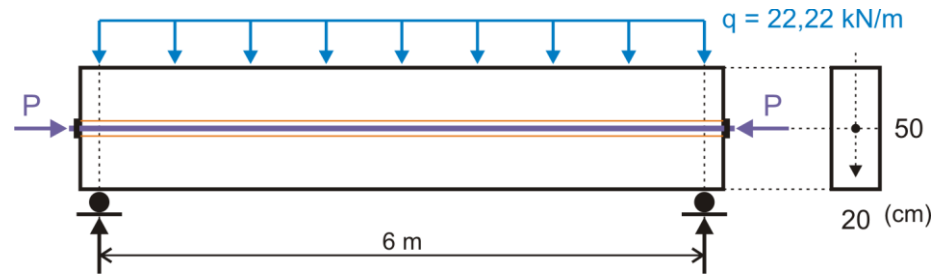
Exemplo
Apostila – Protendido
capítulo 1



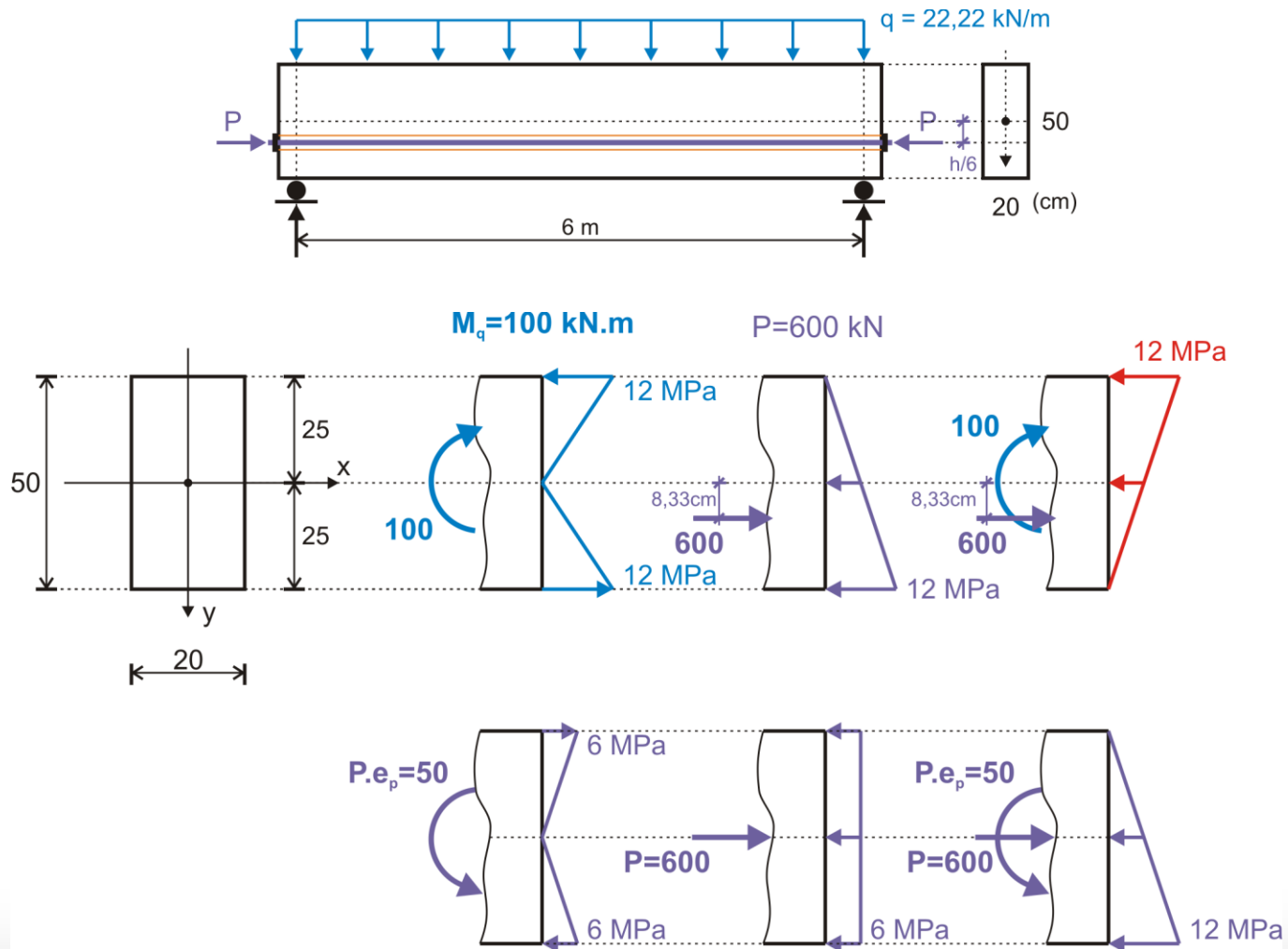
Considerando apenas a carga q – acidental



Protensão centrada que elimina as tensões de tração

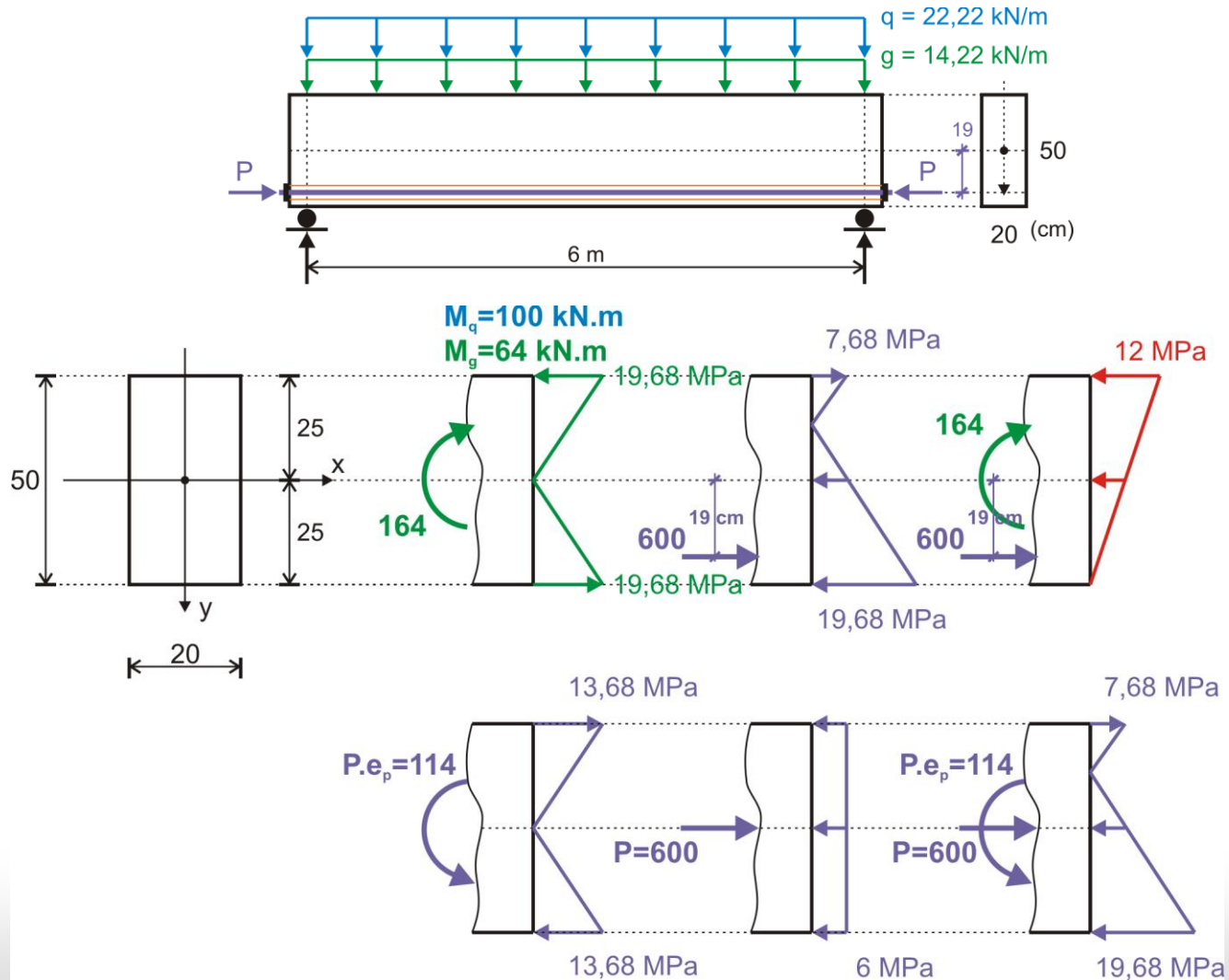


Protensão excêntrica ($e_p = h/6$) que elimina as tensões de tração



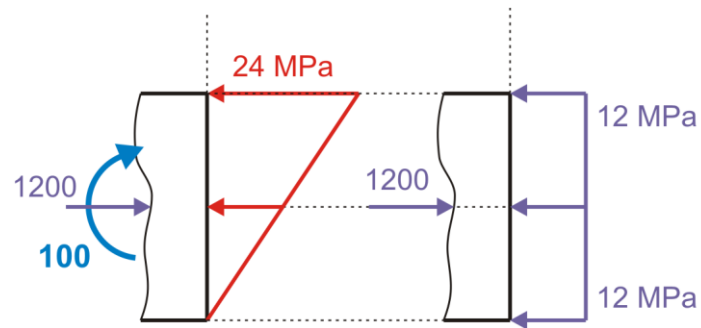
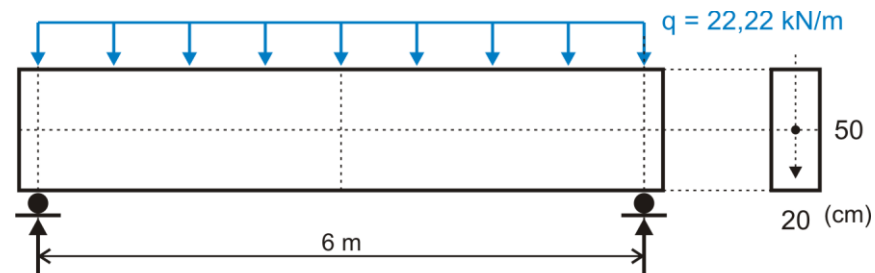
Protensão excêntrica

Para $P = 600 \text{ kN}$, acrescentando $g = 14,22 \text{ kN/m}$, qual o acréscimo de excentricidade que elimina as tensões de tração



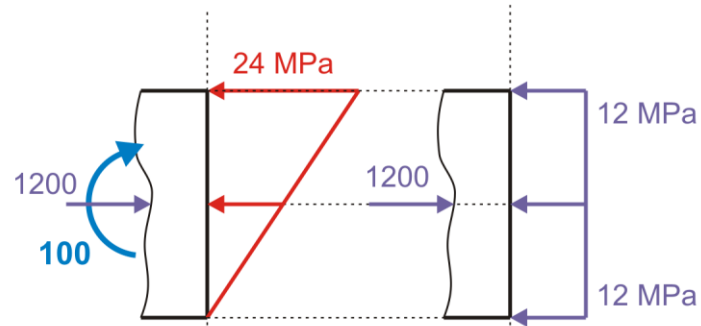
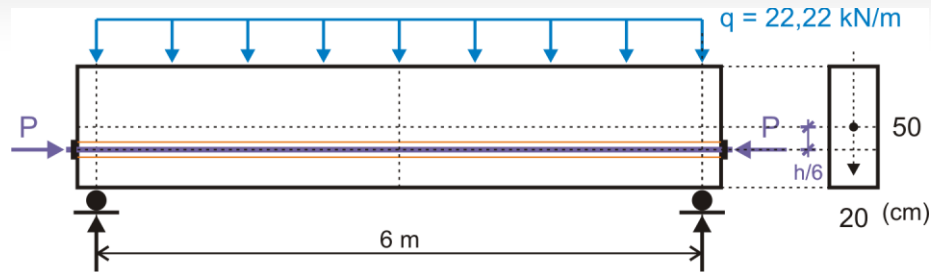
Resumo

Protensão centrada



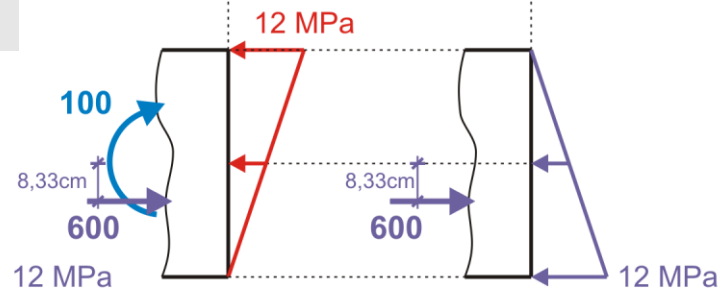
Resumo

Protensão excêntrica
"distância nuclear"

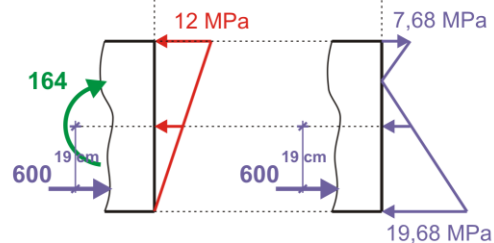
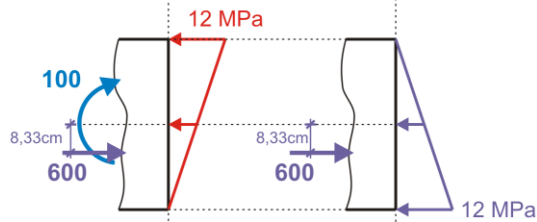
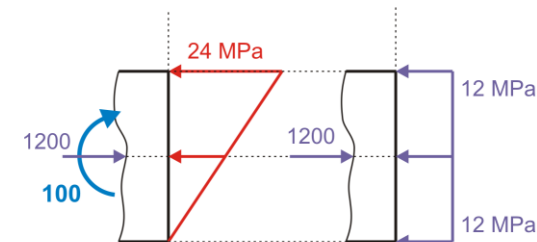
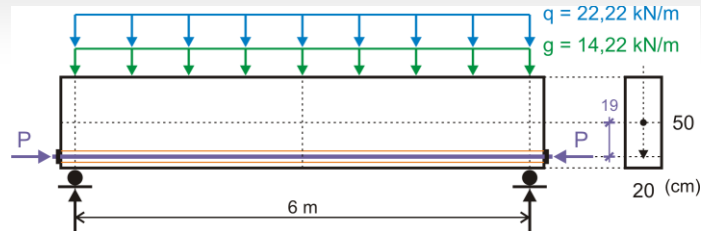


Eficiência da protensão excêntrica

"metade da carga e
metade da compressão máxima"



Resumo



Carga total: $g + q$
 “mantendo a protensão de 600 kN
 e aumentando-se a excentricidade”

