Mecânica dos Sólidos

Cargas combinadas

Vasos de pressão de paredes finas

Vasos de pressão de paredes finas

Vasos de pressão de paredes finas

Cargas combinadas


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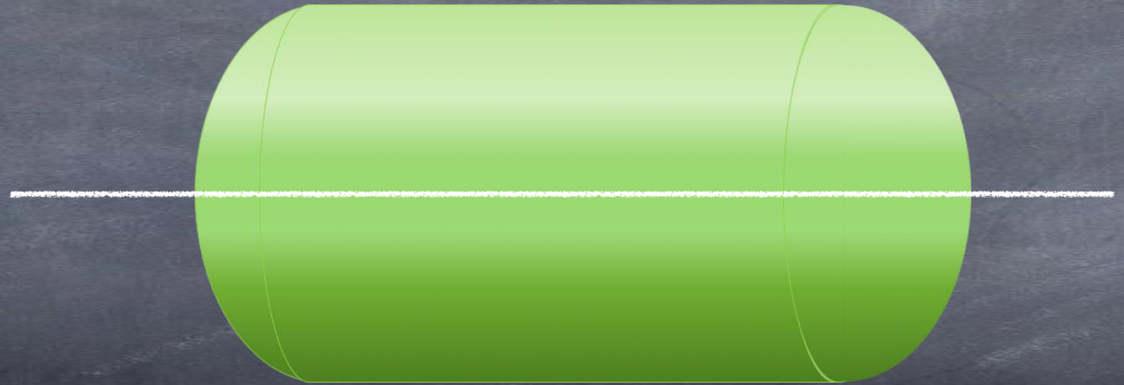
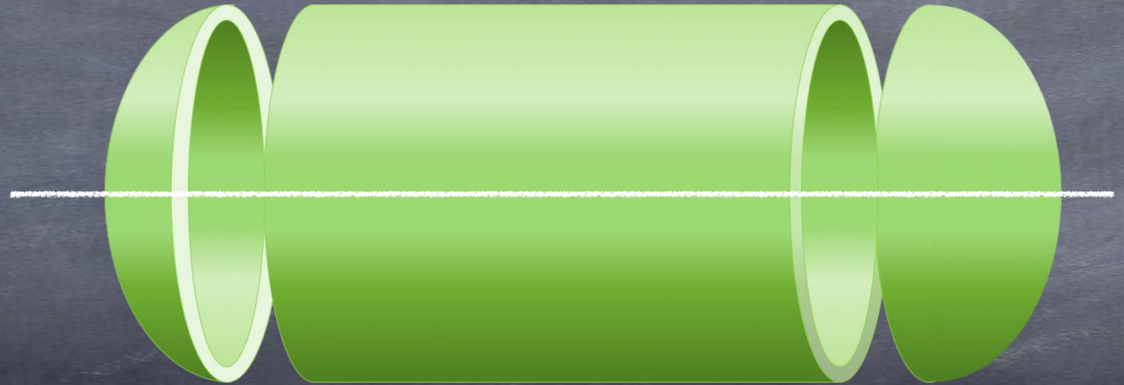
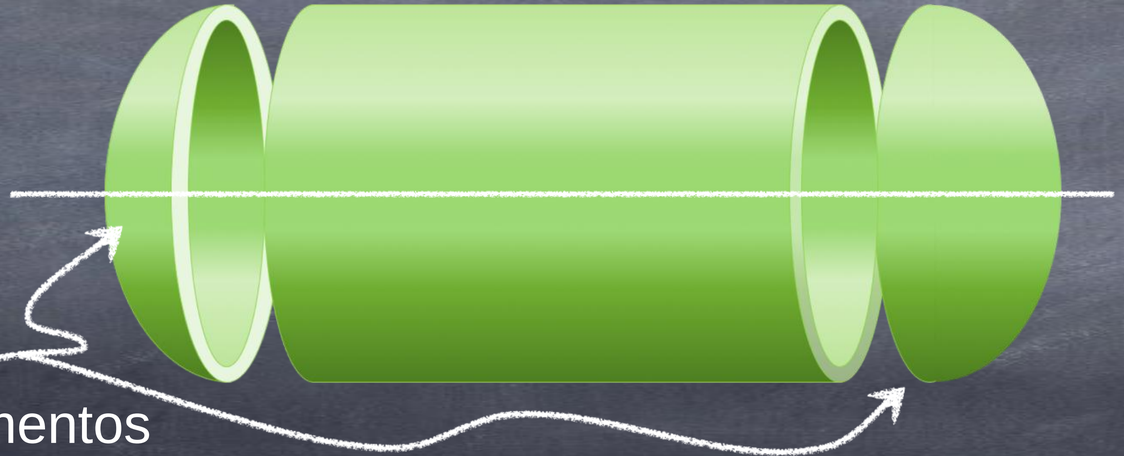


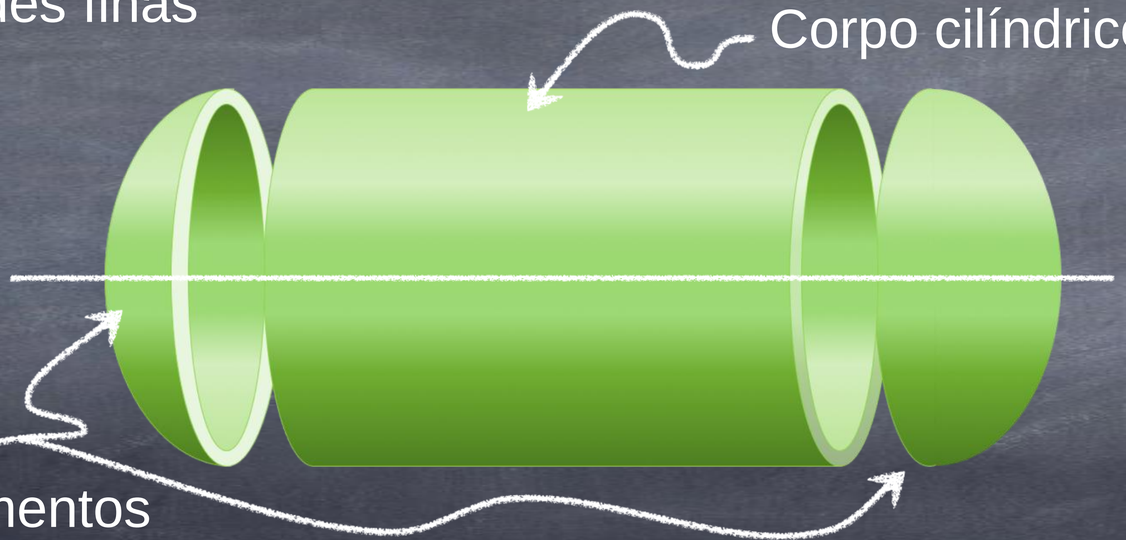
Vasos de pressão de paredes finas



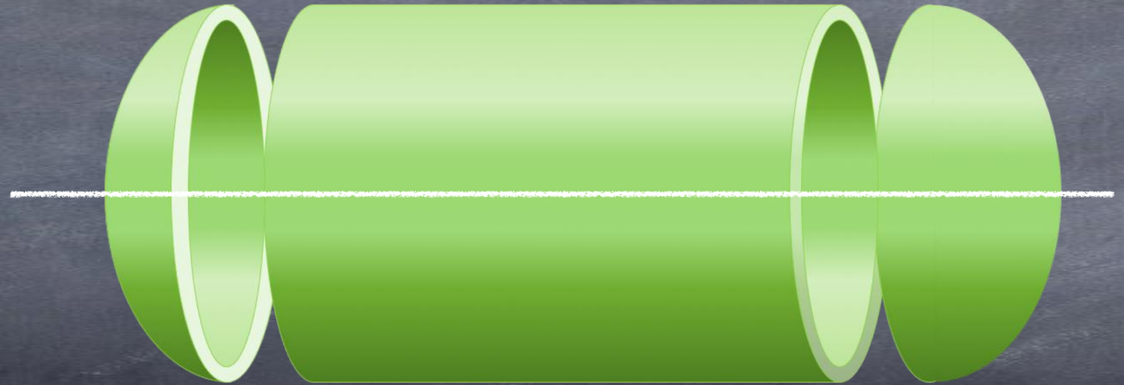
Vasos de pressão de paredes finas



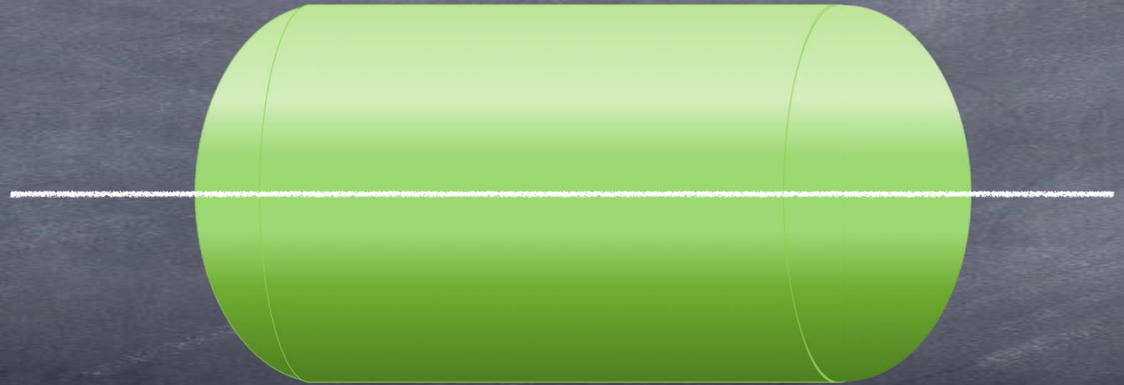
Vasos de pressão de paredes finas



Vasos de pressão de paredes finas

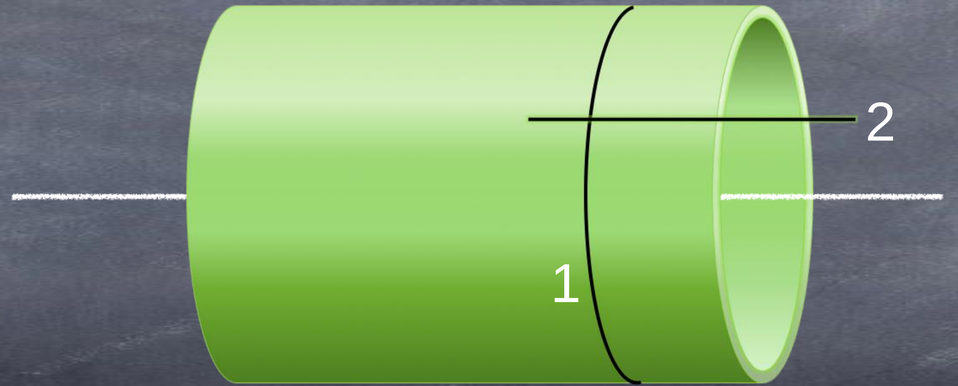


Vasos de pressão de paredes finas



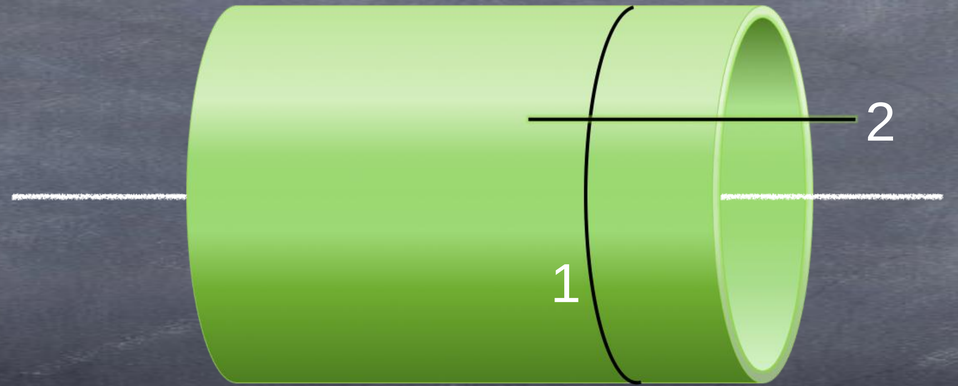
Vasos de pressão de paredes finas

Corpo cilíndrico



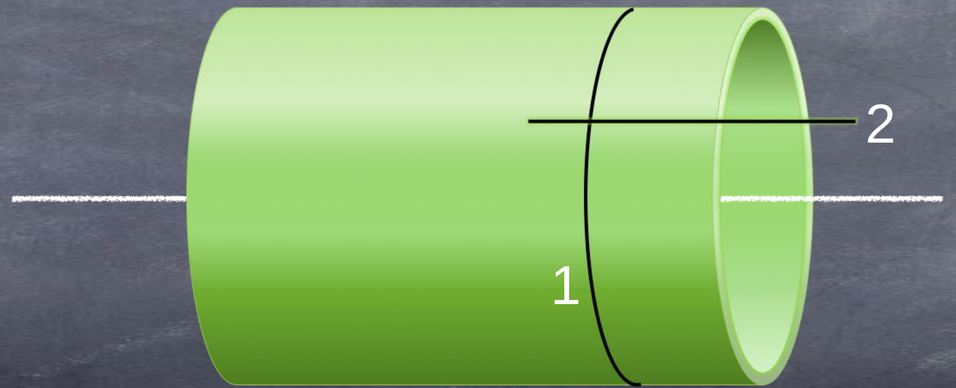
Vasos de pressão de paredes finas

Corpo cilíndrico



Vasos de pressão de paredes finas

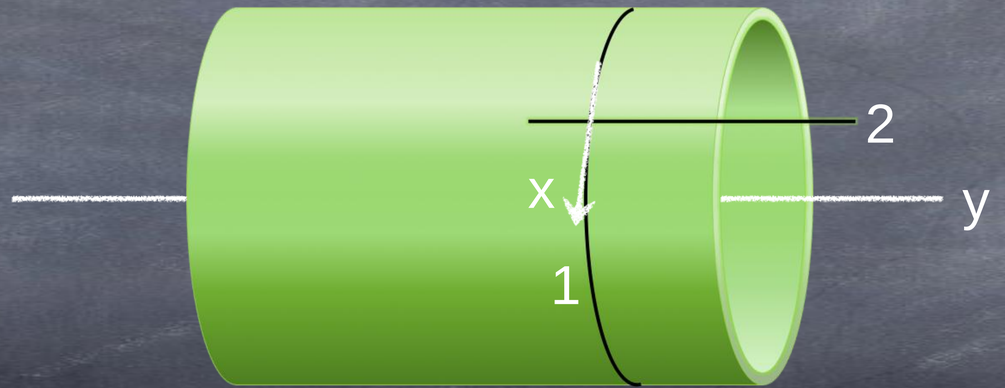
Corpo cilíndrico



1 - direção circunferencial

Vasos de pressão de paredes finas

Corpo cilíndrico

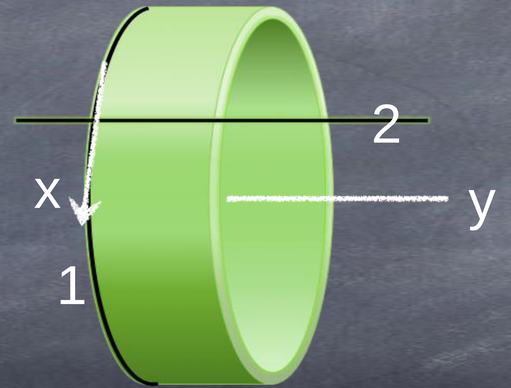


1 - direção circunferencial

2 - direção longitudinal

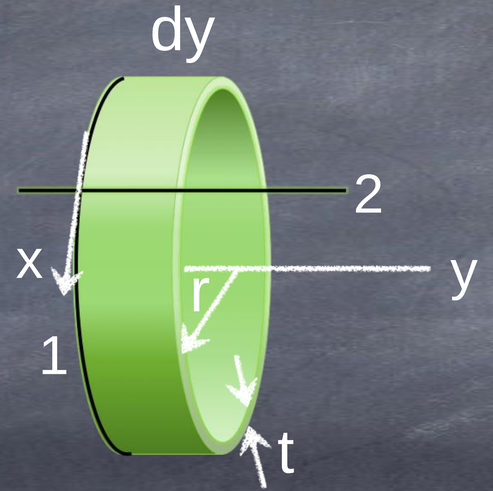
Vasos de pressão de paredes finas

Corpo cilíndrico



Vasos de pressão de paredes finas

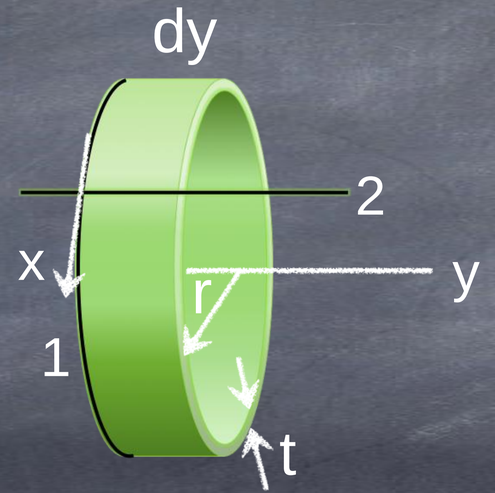
Corpo cilíndrico



Vasos de pressão de paredes finas

Corpo cilíndrico

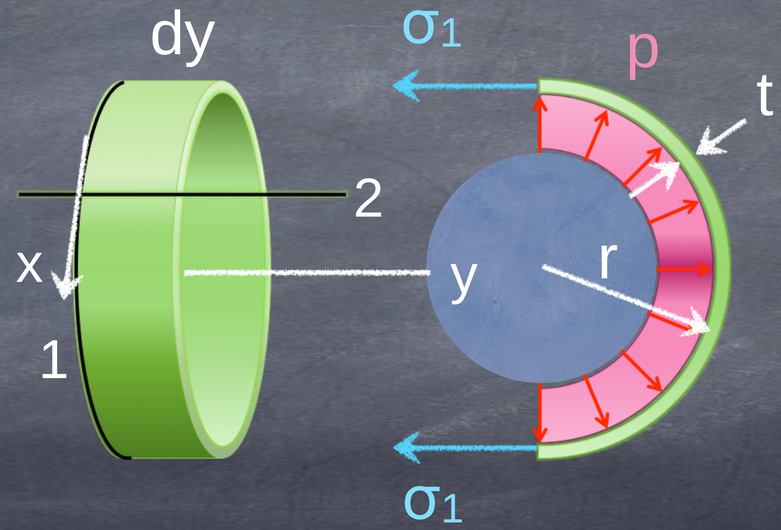
$r/t \geq 10$



Vasos de pressão de paredes finas

Corpo cilíndrico

$r/t \geq 10$

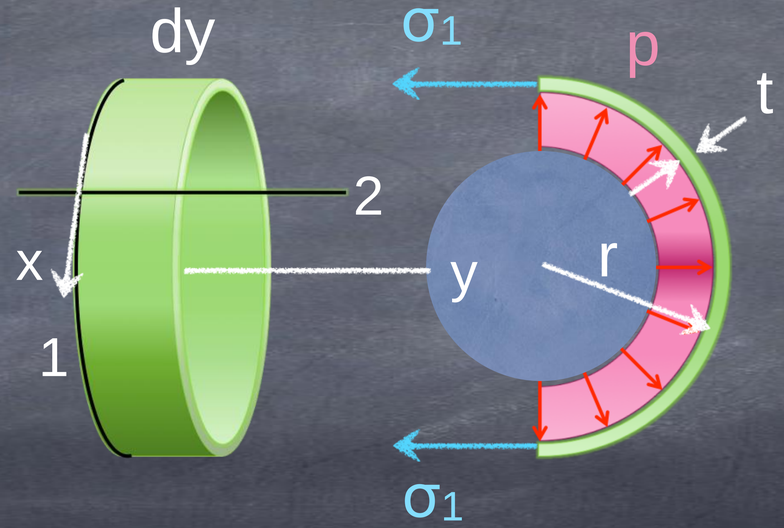


Vasos de pressão de paredes finas

$r/t \geq 10$

Corpo cilíndrico

$$\Sigma F_x = 0 \Rightarrow 2\,[\sigma_1\,(t \,.\, dy)] - p\,(2r \,.\, dy) = 0$$



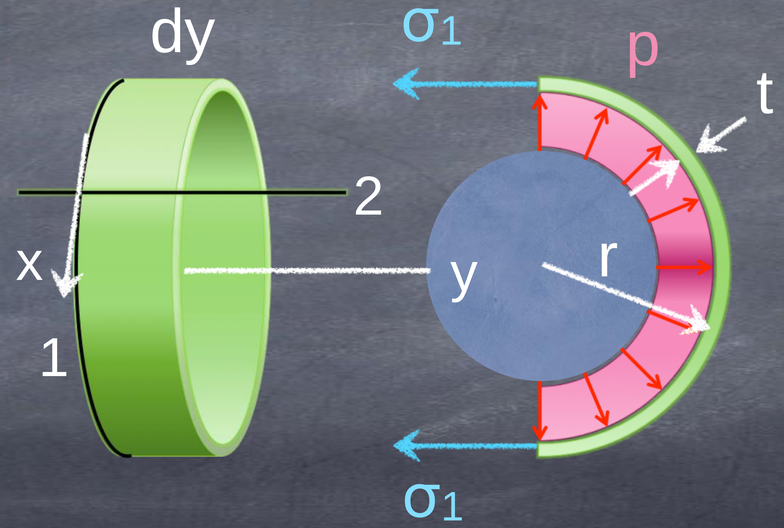
Vasos de pressão de paredes finas

$r/t \geq 10$

Corpo cilíndrico

$$\Sigma F_x = 0 \Rightarrow 2\,[\sigma_1\,(t \,.\, dy)] - p\,(2r \,.\, dy) = 0$$

$$\sigma_1 = (p \,.\, r / t)$$



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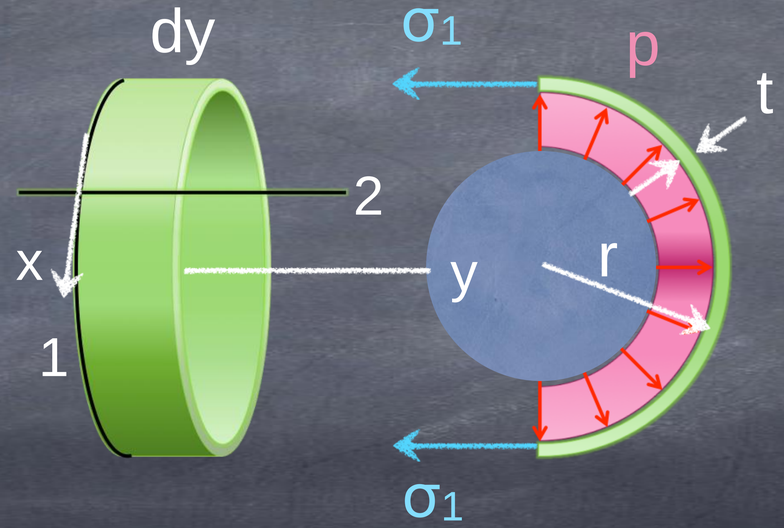
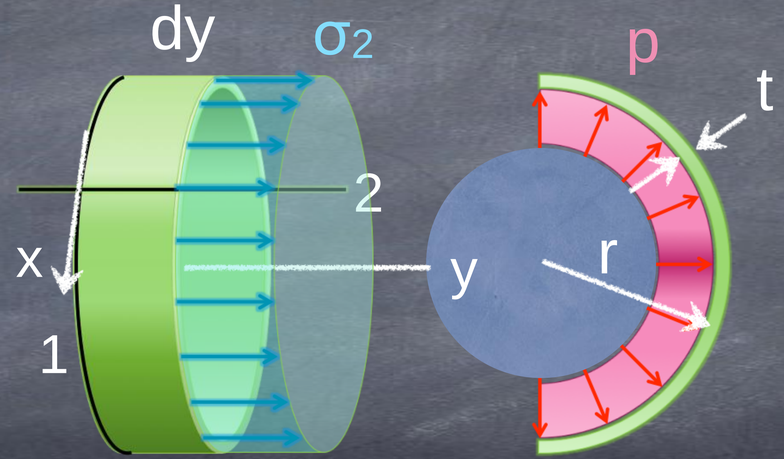


Vasos de pressão de paredes finas

Corpo cilíndrico

$\Sigma F_y = 0 \Rightarrow \sigma_2 (2\pi r \,.\, t) - p (\pi r^2) = 0$

$r/t \geq 10$



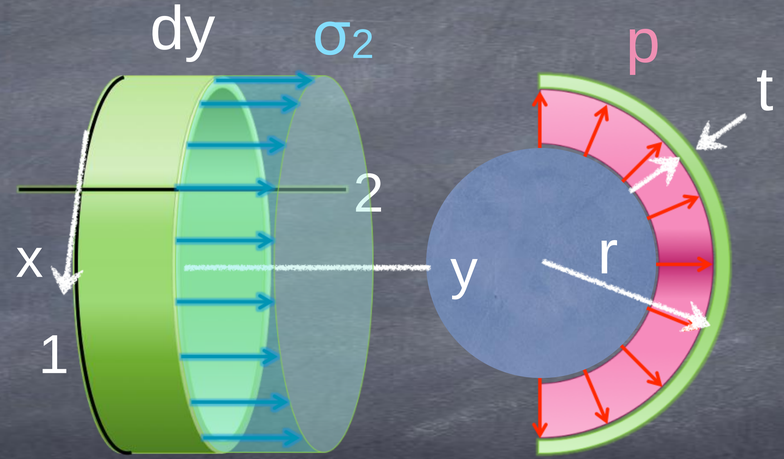
Vasos de pressão de paredes finas

r/t ≥ 10

Corpo cilíndrico

$\Sigma F_y = 0 \Rightarrow \sigma_2 (2\pi r \,.\, t) - p (\pi r^2) = 0$

$\sigma_2 = (p \,.\, r / 2t)$



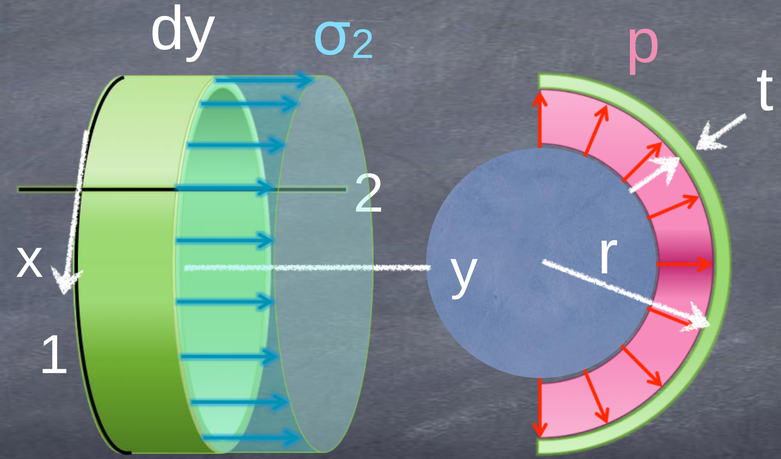
Vasos de pressão de paredes finas

$r/t \geq 10$

Corpo cilíndrico

$$\Sigma F_y = 0 \Rightarrow \sigma_2 (2\pi r \,.\, t) - p (\pi r^2) = 0$$

$$\sigma_2 = (p \,.\, r / 2t)$$



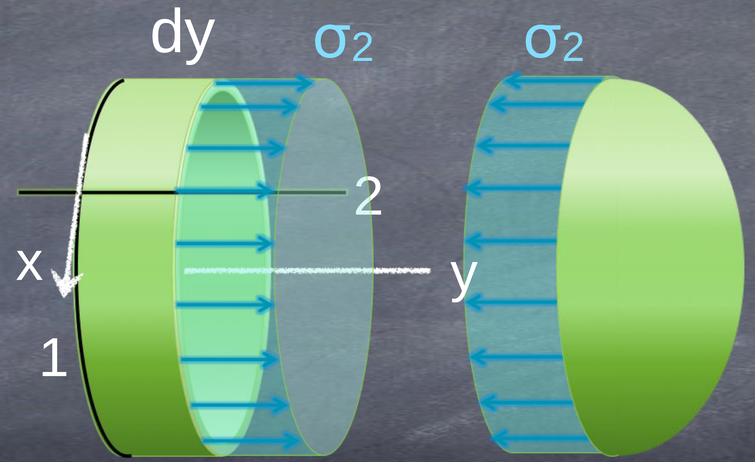
Vasos de pressão de paredes finas

$r/t \geq 10$

Fechamento

$\Sigma F_y = 0 \Rightarrow \sigma_2 (2\pi r \,.\, t) - p (\pi r^2) = 0$

$\sigma_2 = (p \,.\, r / 2t)$

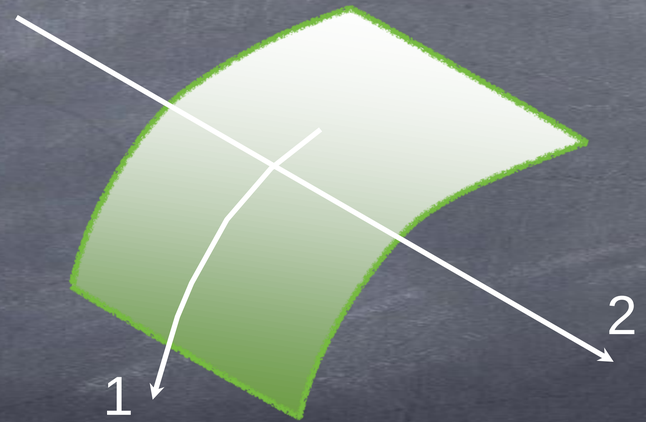


Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Vasos de pressão de paredes finas

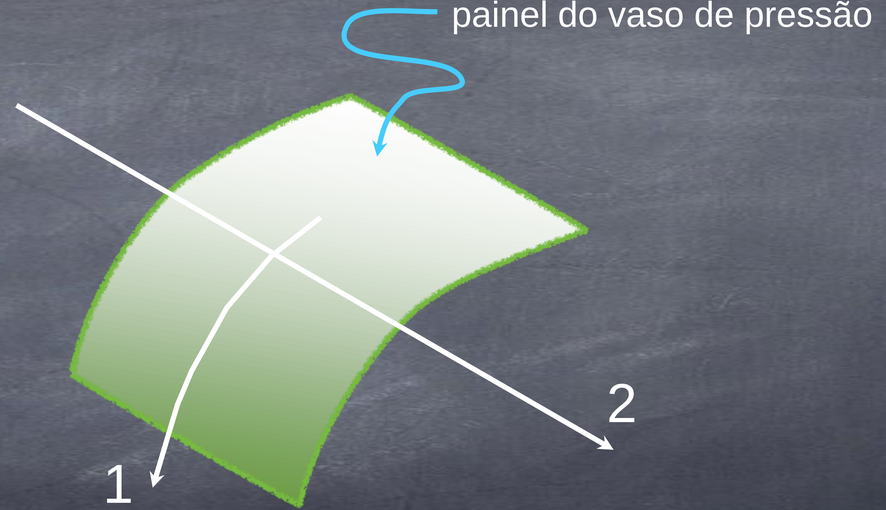
Estado de tensão causado por cargas combinadas



Cargas combinadas

Vasos de pressão de paredes finas

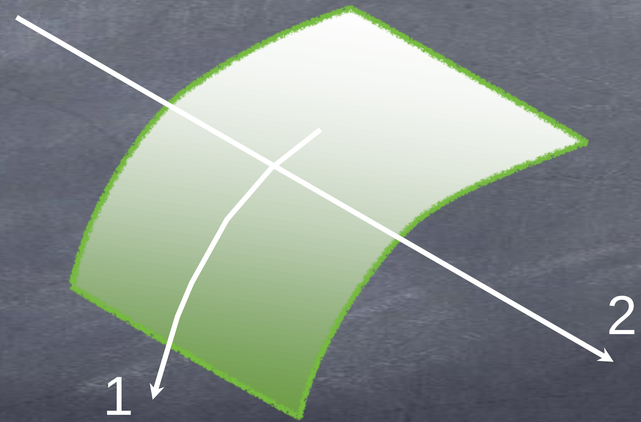
Estado de tensão causado por cargas combinadas



Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

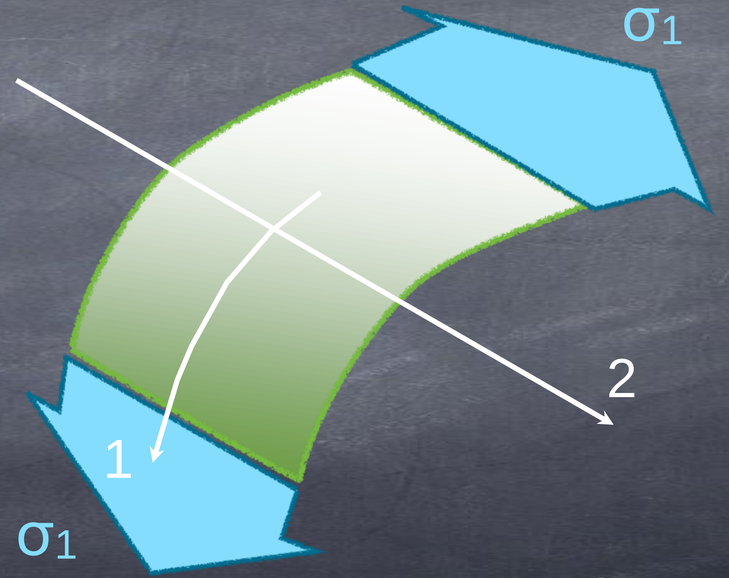
Na dir. 1



Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Na dir. 1

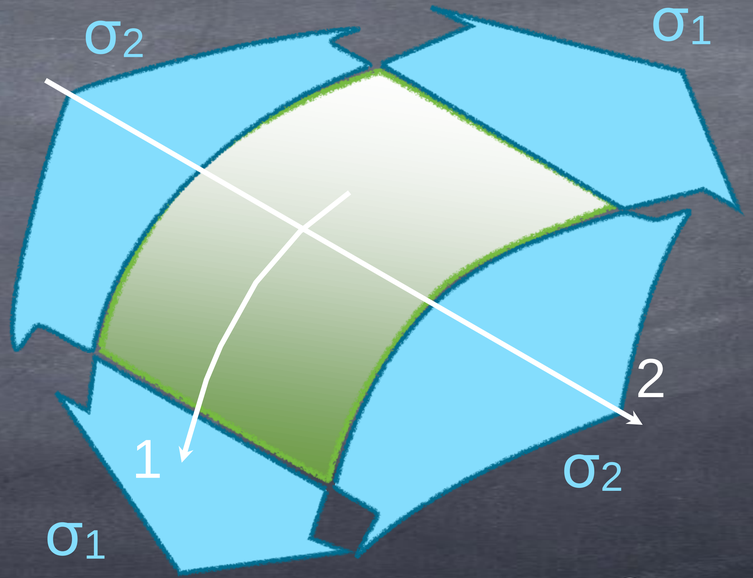


Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Na dir. 1 e na dir. 2

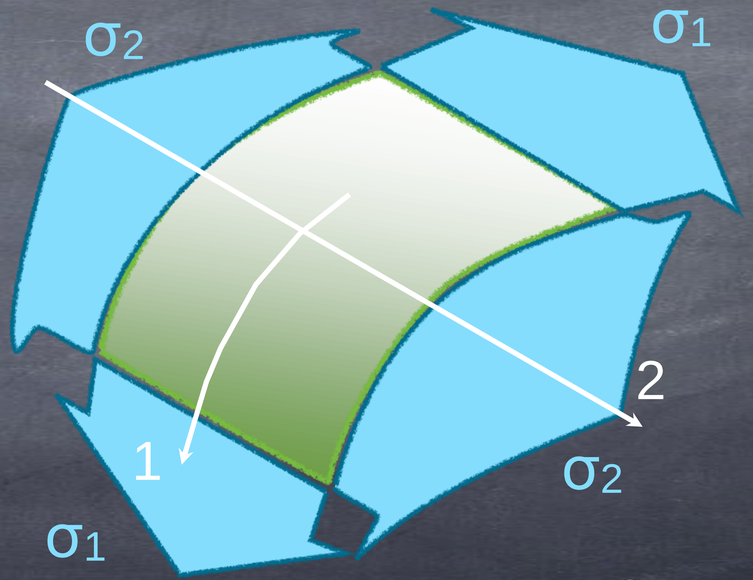


Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Na dir. 1 e na dir. 2 ⟶ tensões combinadas

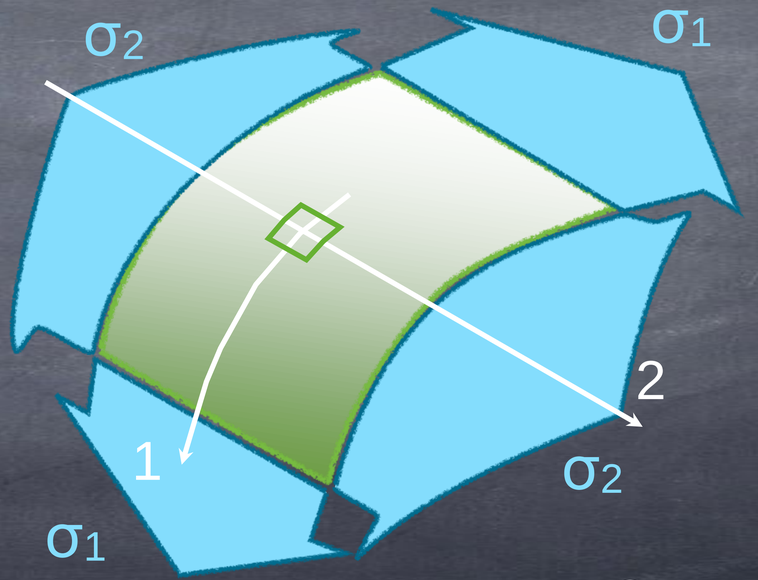


Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Na dir. 1 e na dir. 2 ⟶ tensões combinadas

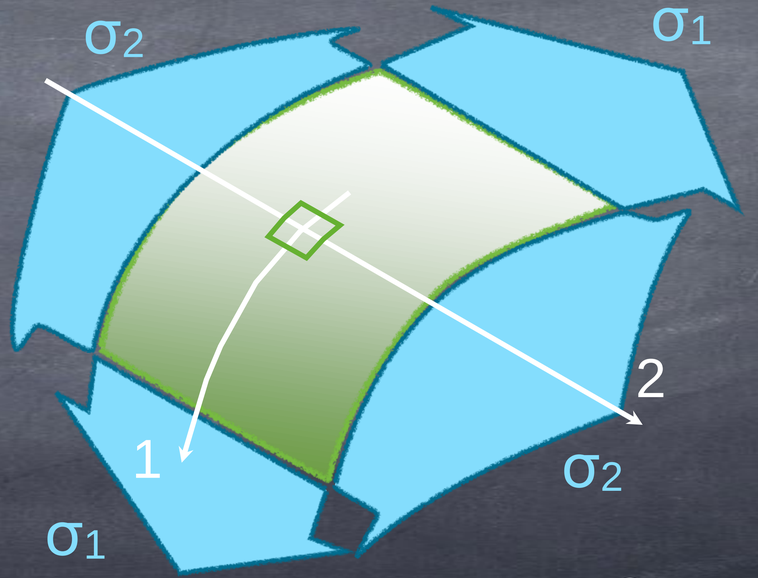


Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Representação

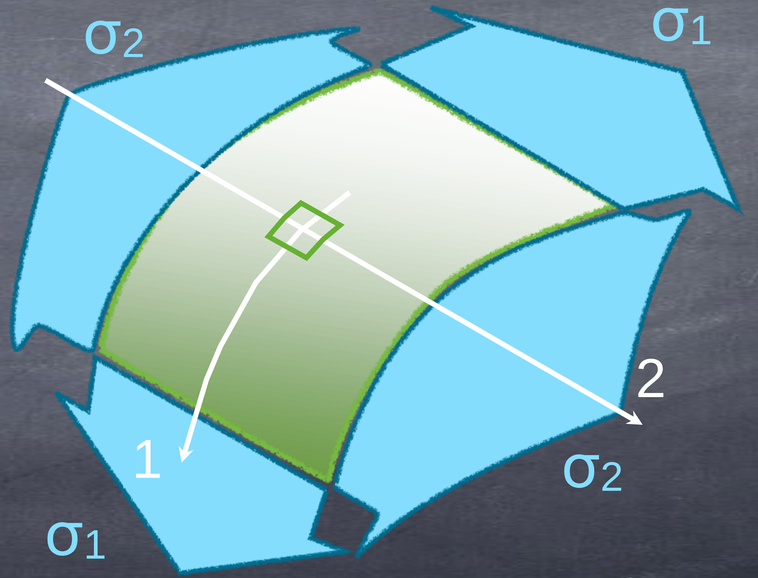


Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Representação

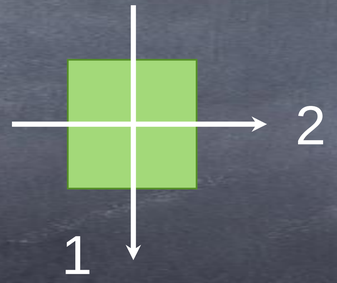


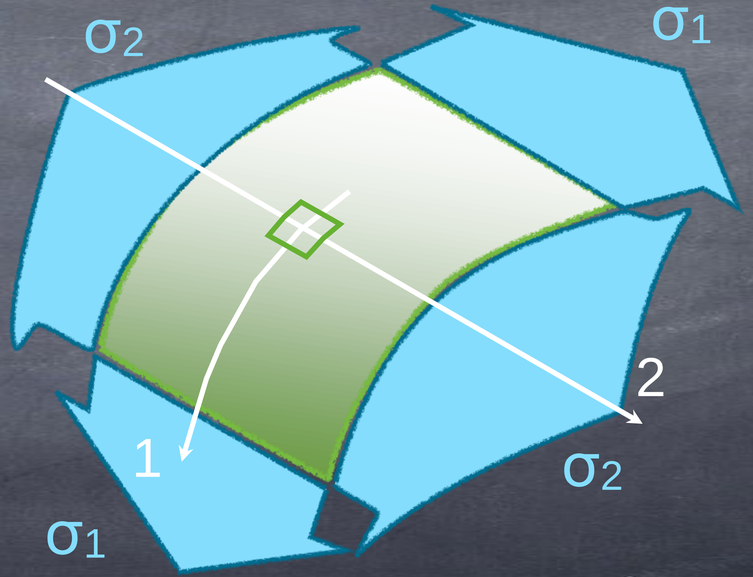
Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Representação



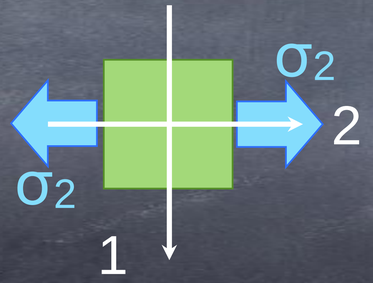


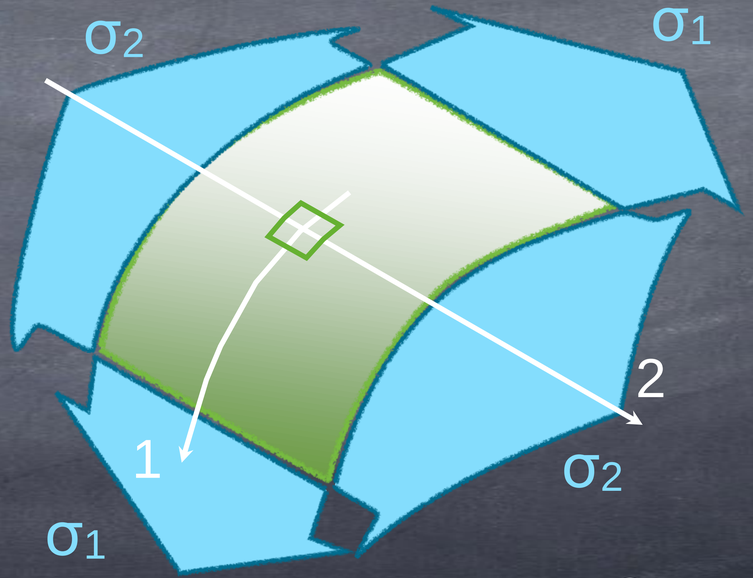
Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Representação



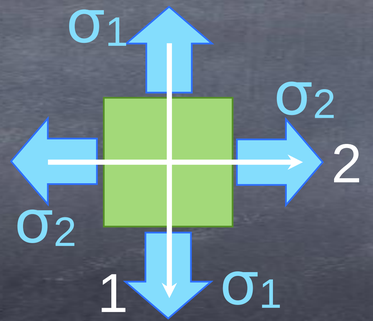


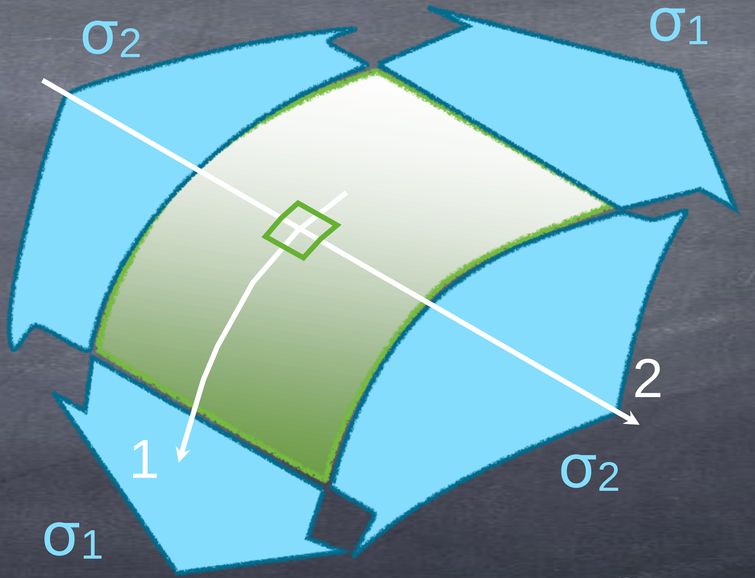
Cargas combinadas

Vasos de pressão de paredes finas

Estado de tensão causado por cargas combinadas

Representação



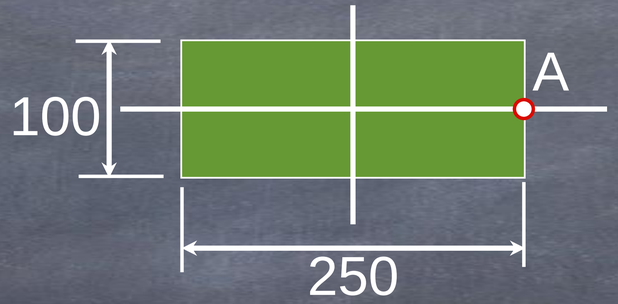


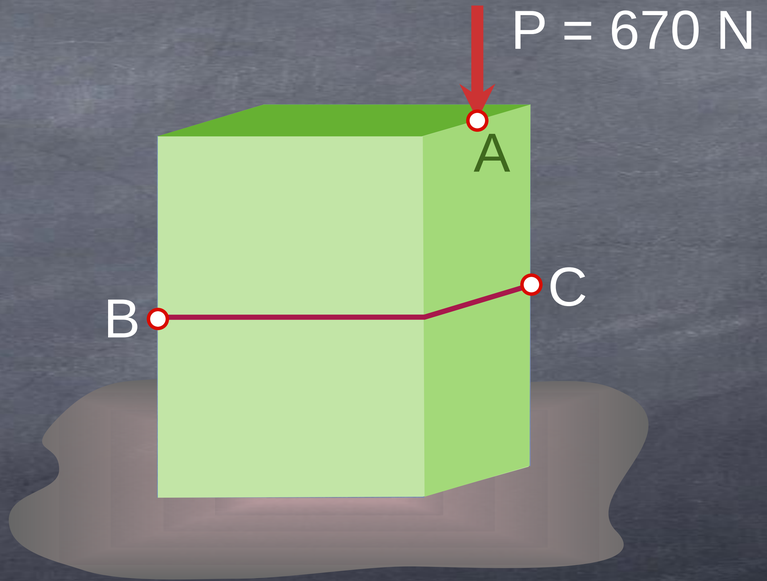
Cargas combinadas

Outros exemplos

Outros exemplos

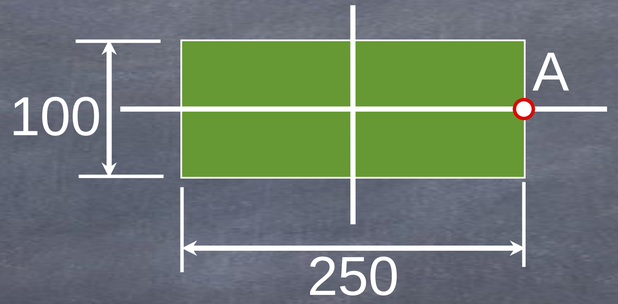
Determinar o estado de tensões nos pontos B e C da barra da figura.

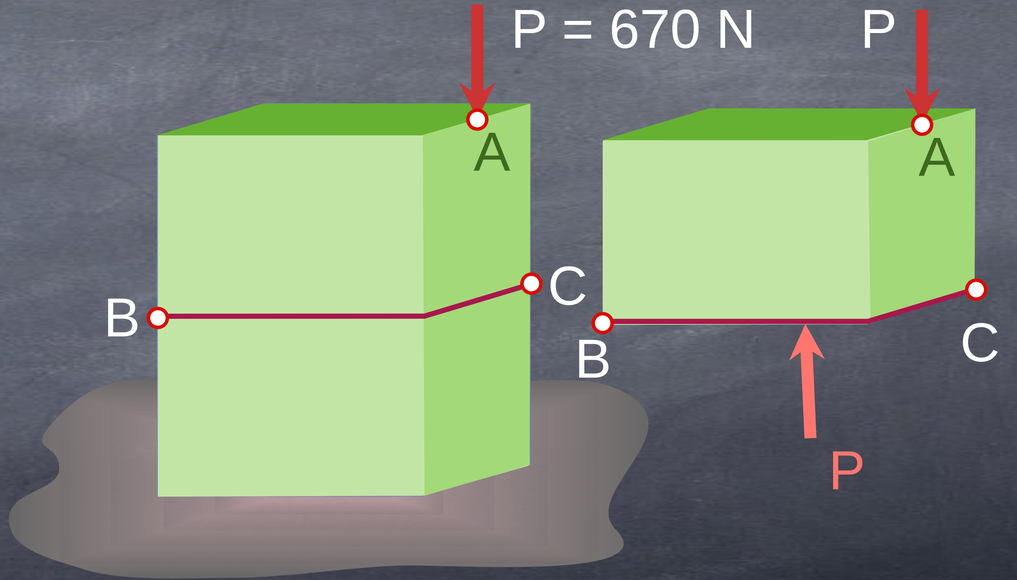




Outros exemplos

a) Tensão causada pela força normal

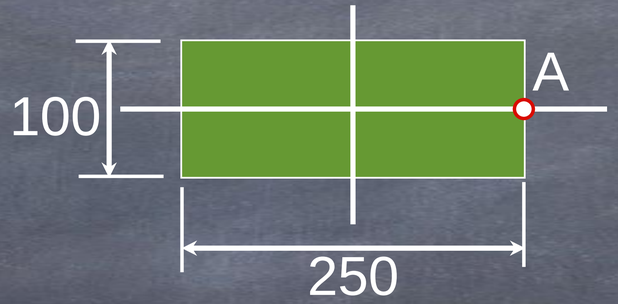


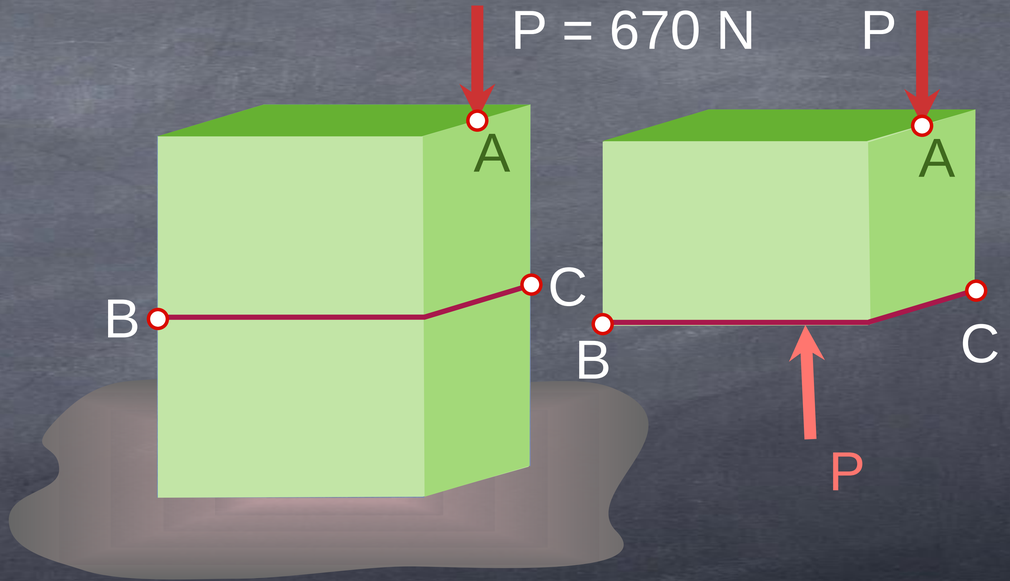


Outros exemplos

a) Tensão causada pela força normal

$\sigma = P / A$

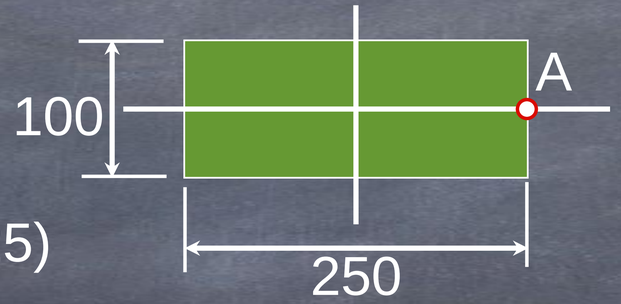


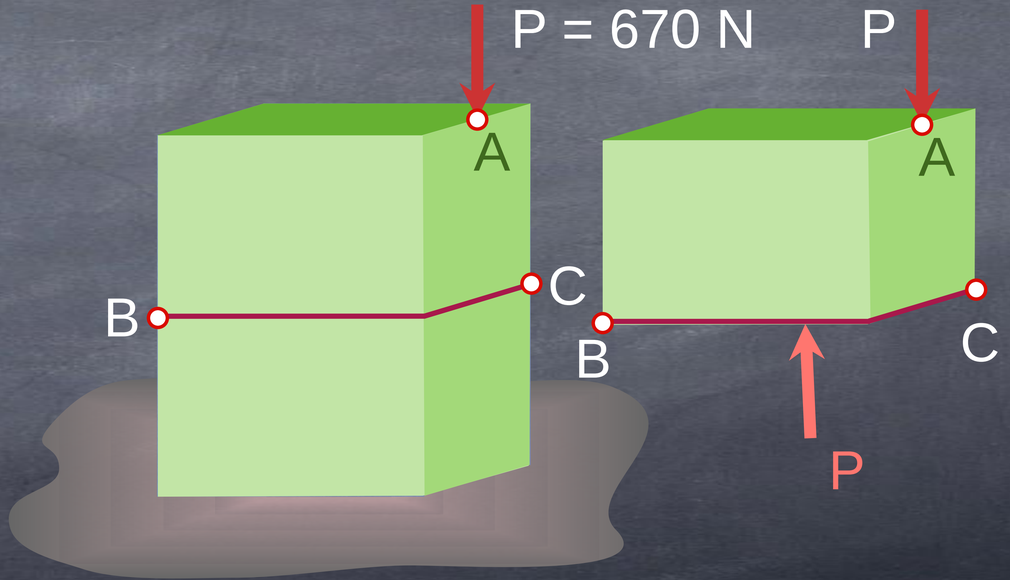


Outros exemplos

a) Tensão causada pela força normal

$$\sigma = P / A = -670 / (0{,}10 \times 0{,}25)$$



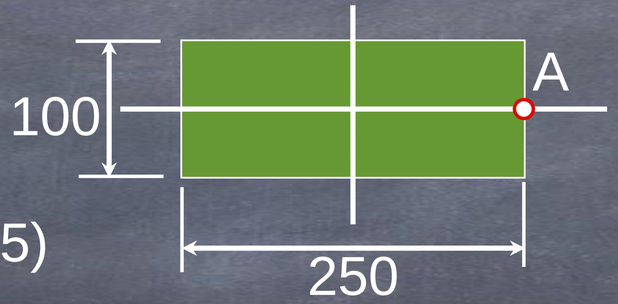


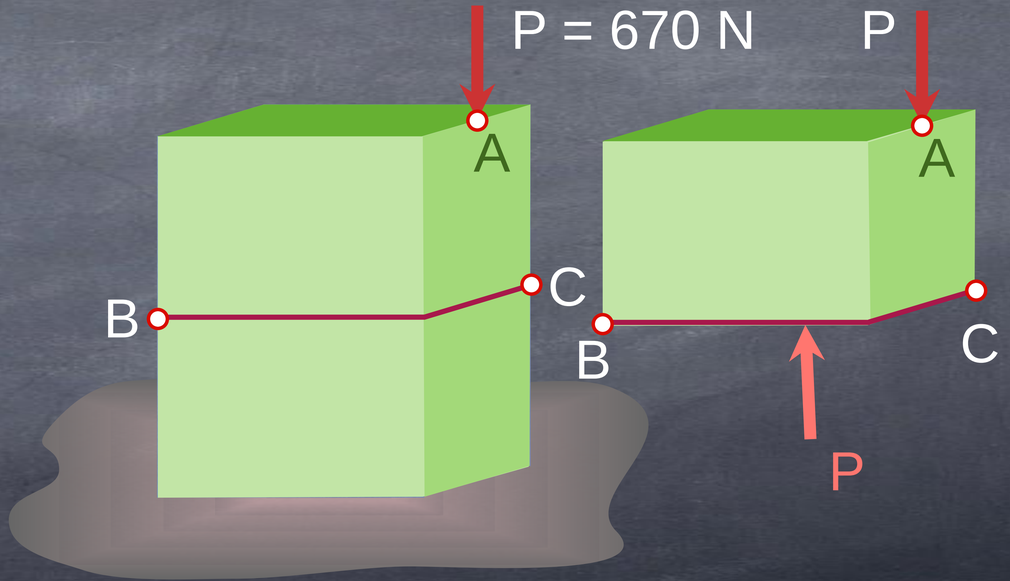
Outros exemplos

a) Tensão causada pela força normal

$\sigma = P / A = -670 / (0{,}10 \times 0{,}25)$

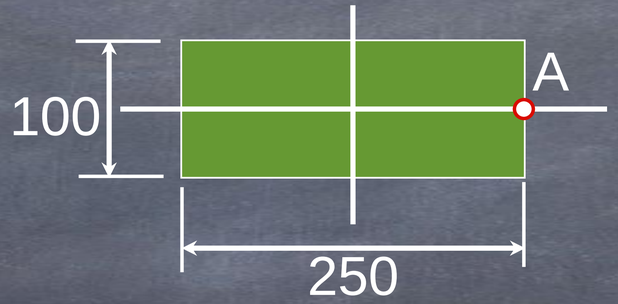
$\sigma = -26.800\ N/m^2$

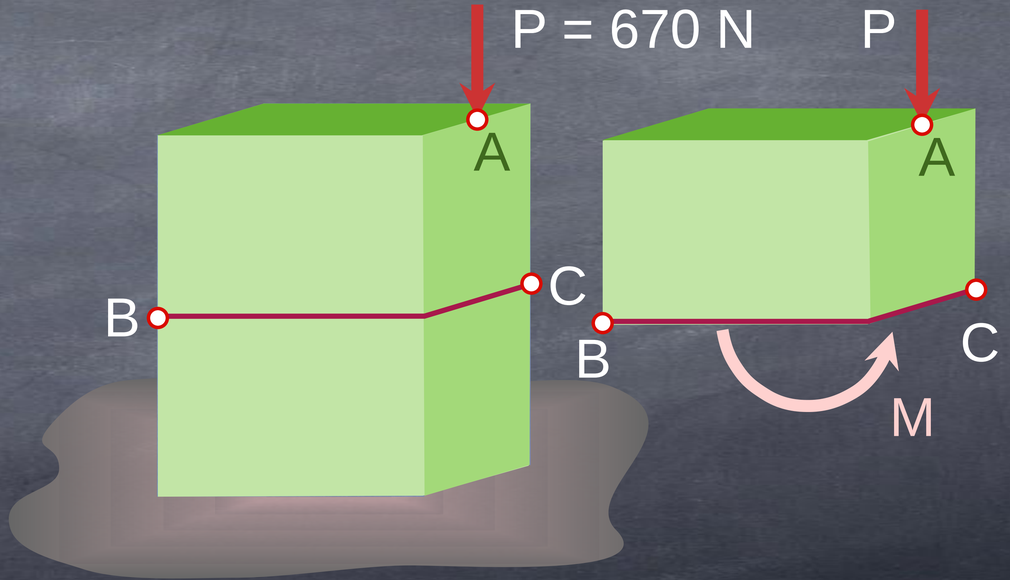




Outros exemplos

b) Tensão causada pelo momento fletor

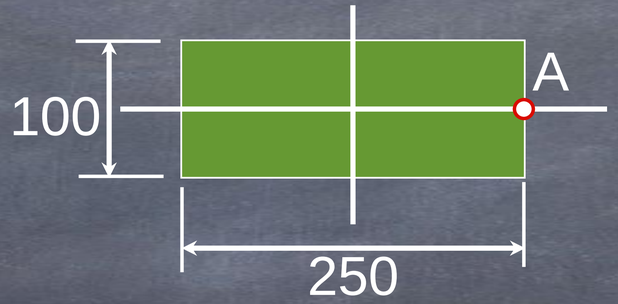


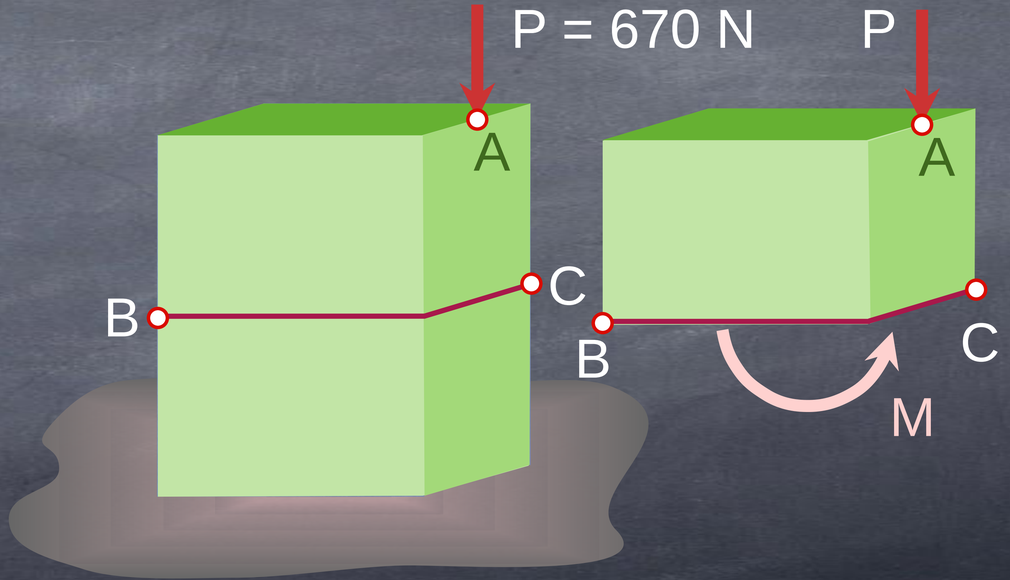


Outros exemplos

b) Tensão causada pelo momento fletor

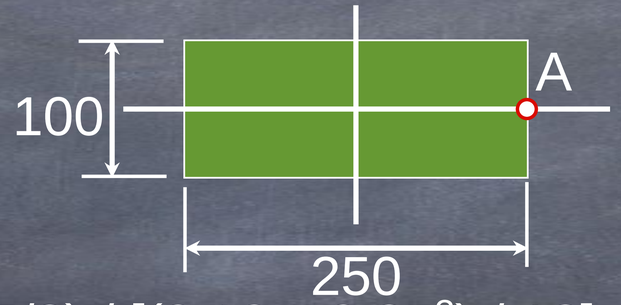
$\sigma_{max} = \pm M\, c / I$





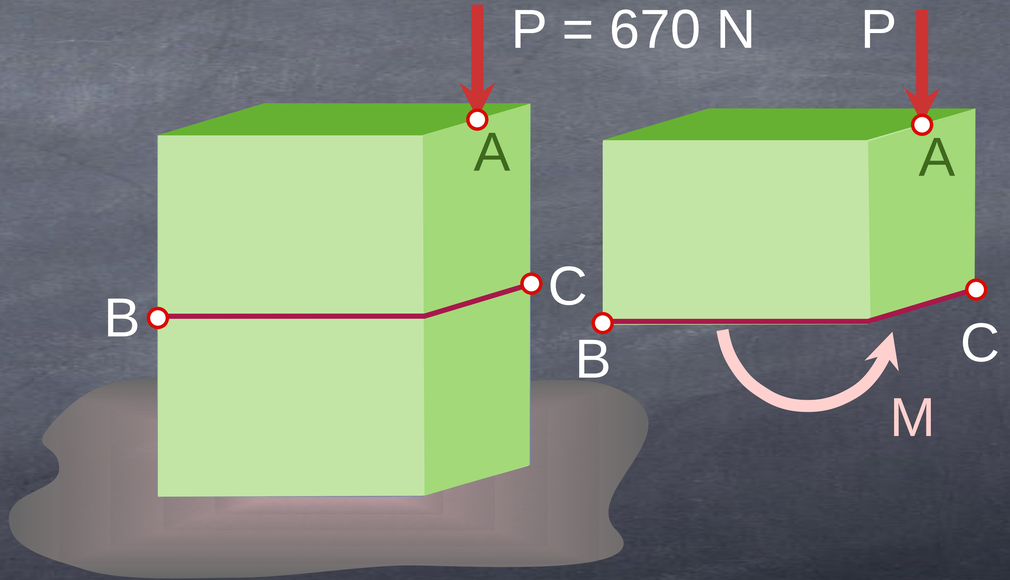
Outros exemplos

b) Tensão causada pelo momento fletor



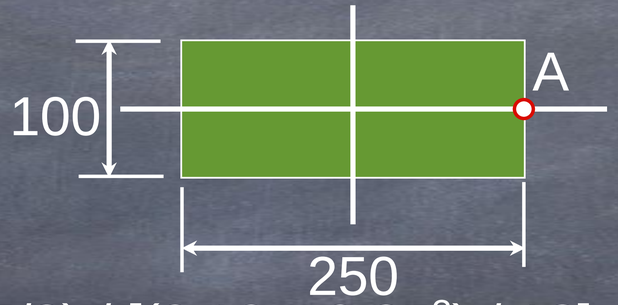
$$\sigma_{max} = \pm M\, c / I$$

$$\sigma_{max} = \pm 670 \times (0{,}25/2) \times (0{,}25/2) / [(0{,}10 \times 0{,}25^3) / 12]$$



Outros exemplos

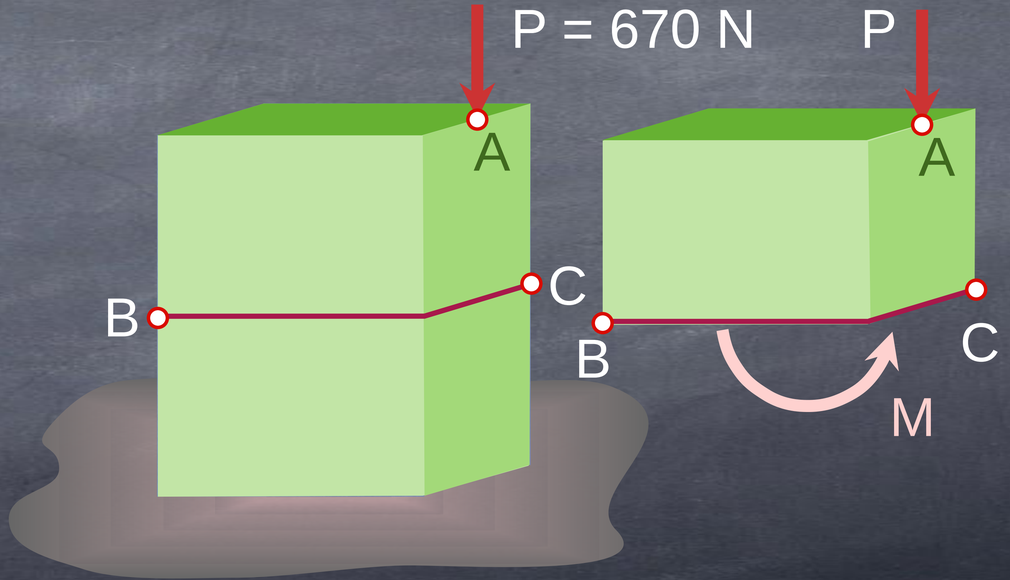
b) Tensão causada pelo momento fletor



$\sigma_{max} = \pm M\ c / I$

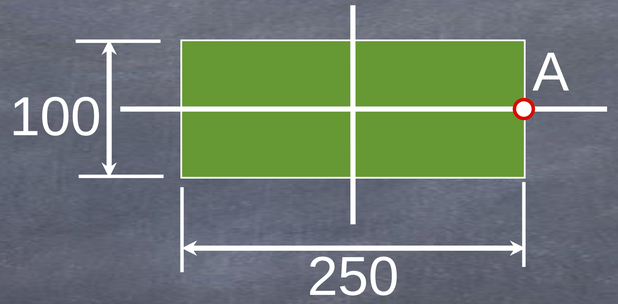
$\sigma_{max} = \pm 670 \times (0{,}25/2) \times (0{,}25/2) / [(0{,}10 \times 0{,}25^3) / 12]$

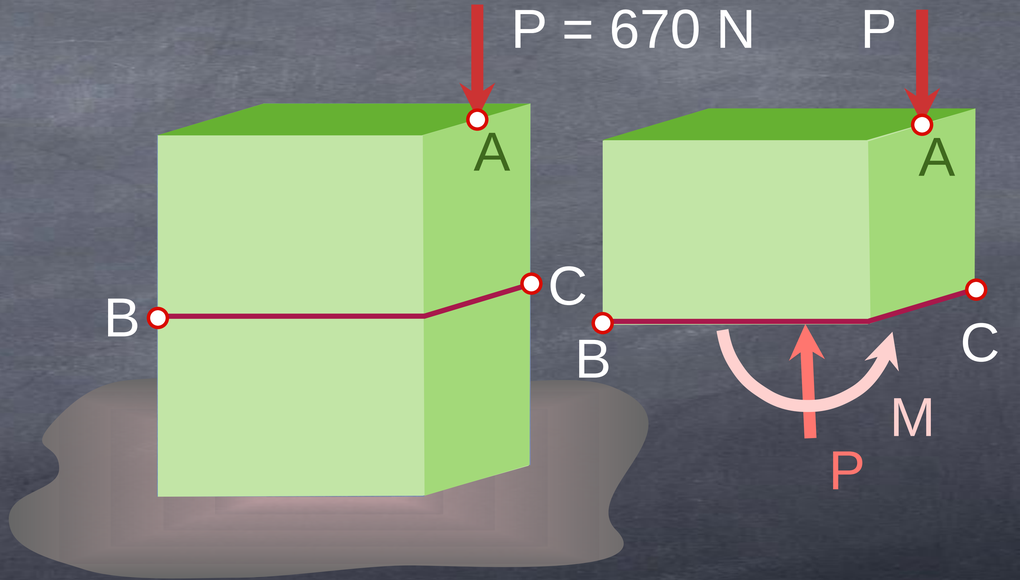
$\sigma_{max} = \pm 80.400\ N/m^2$



Outros exemplos

c) Superposição das tensões

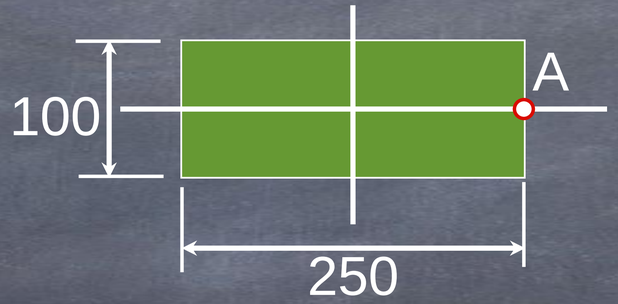


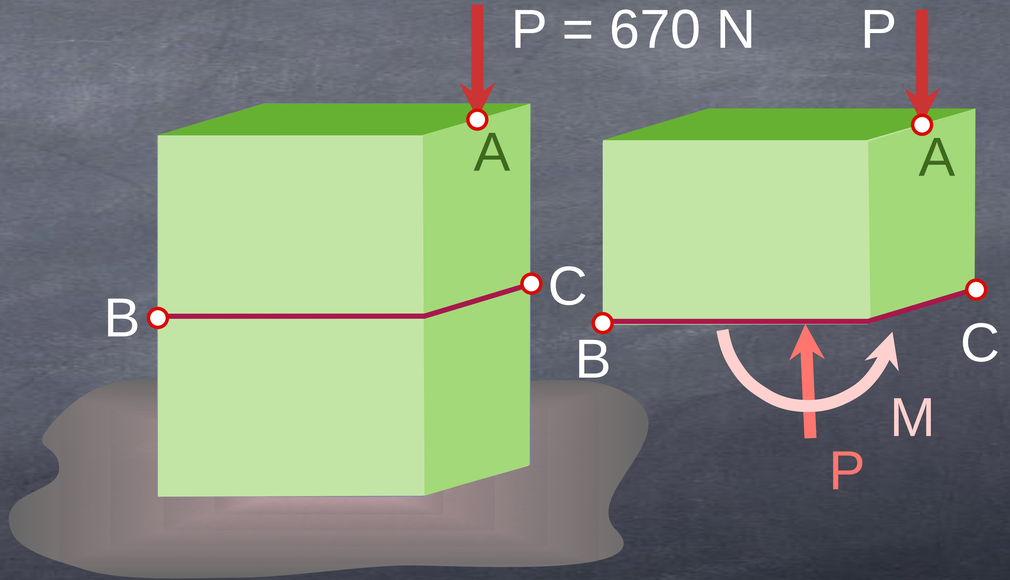


Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max}$



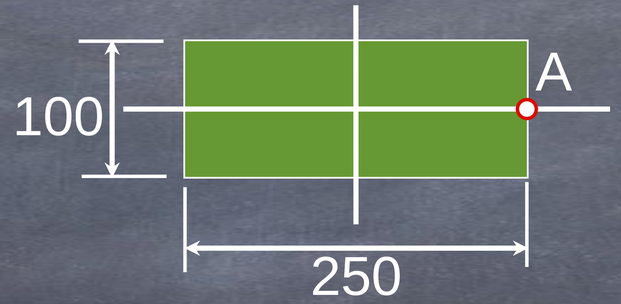


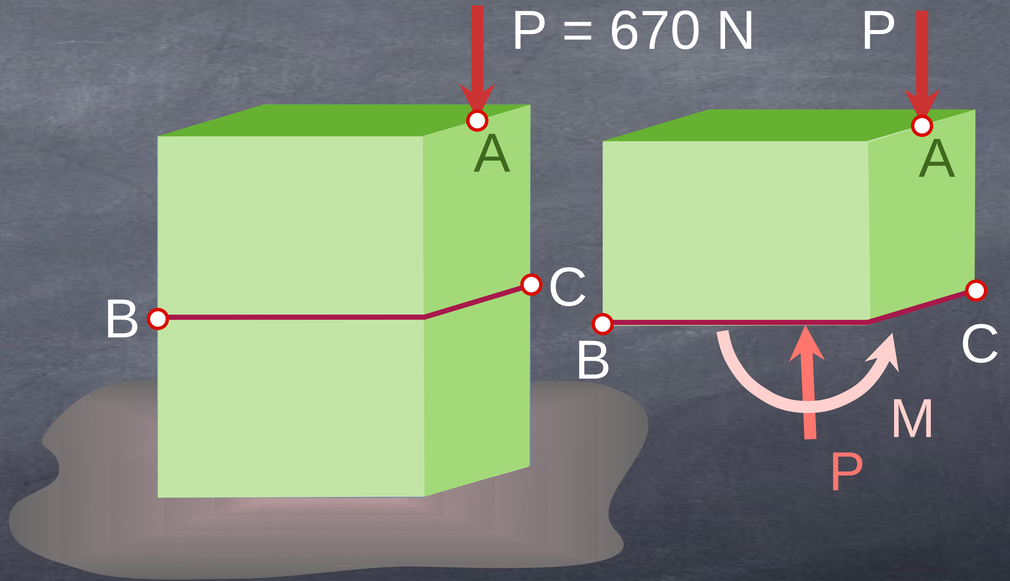
Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max}$

$\sigma_C = \sigma - \sigma_{max}$



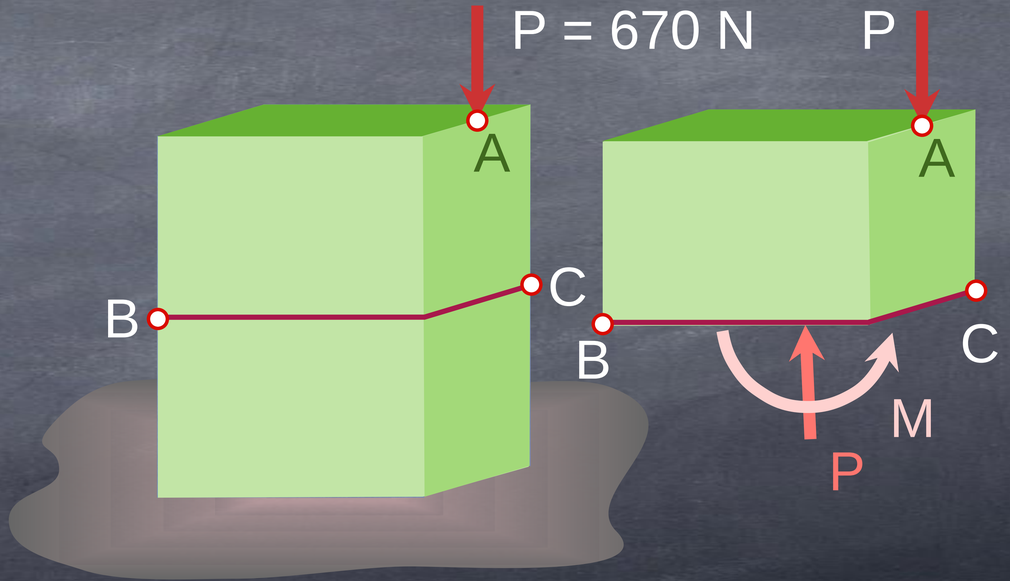


Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max}$

$\sigma_C = \sigma - \sigma_{max}$

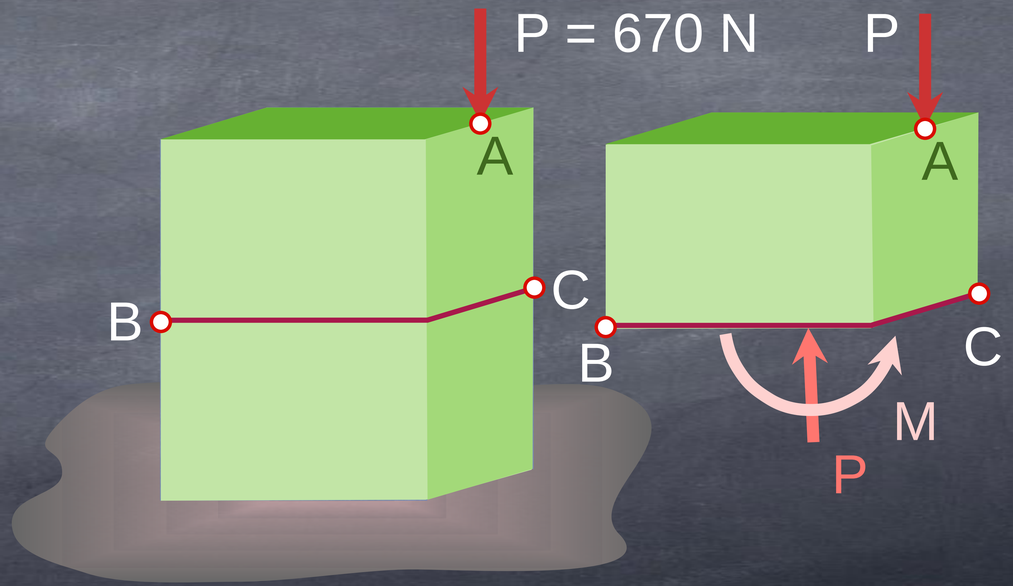


Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max} = -26.800 + 80.400$

$\sigma_C = \sigma - \sigma_{max}$

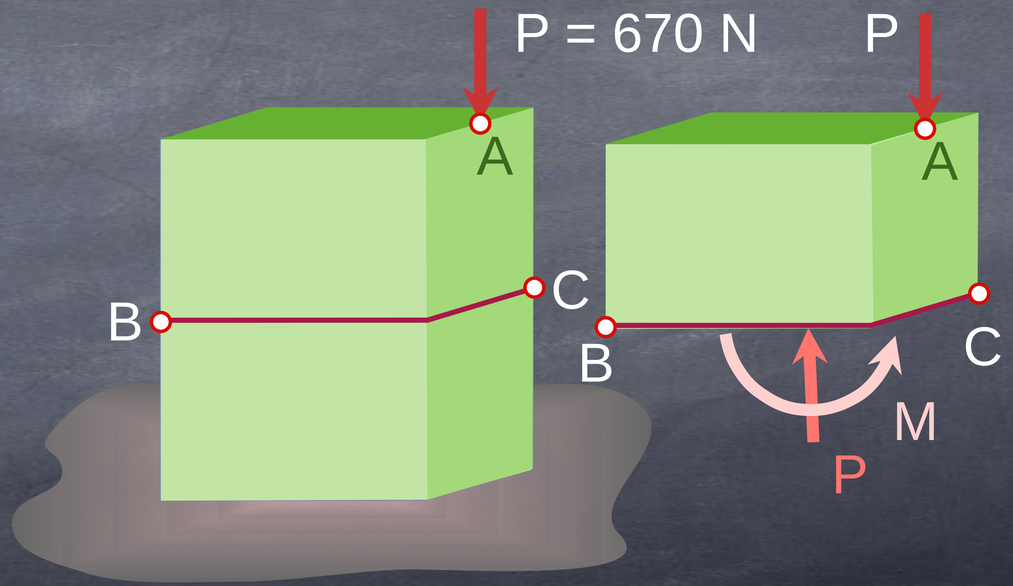


Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max} = -26.800 + 80.400$

$\sigma_C = \sigma - \sigma_{max} = -26.800 - 80.400$

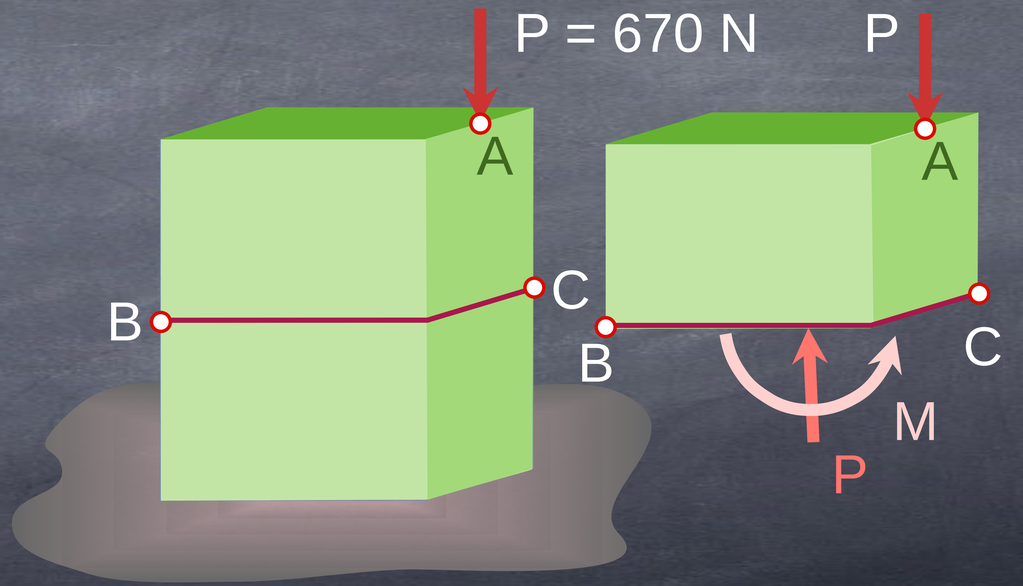


Outros exemplos

c) Superposição das tensões

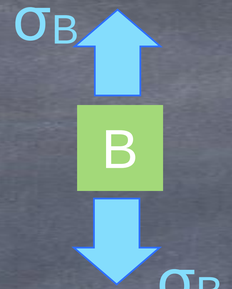
$\sigma_B = \sigma + \sigma_{max} = 53.600\ N/m^2$

$\sigma_C = \sigma - \sigma_{max} = -107.200\ N/m^2$



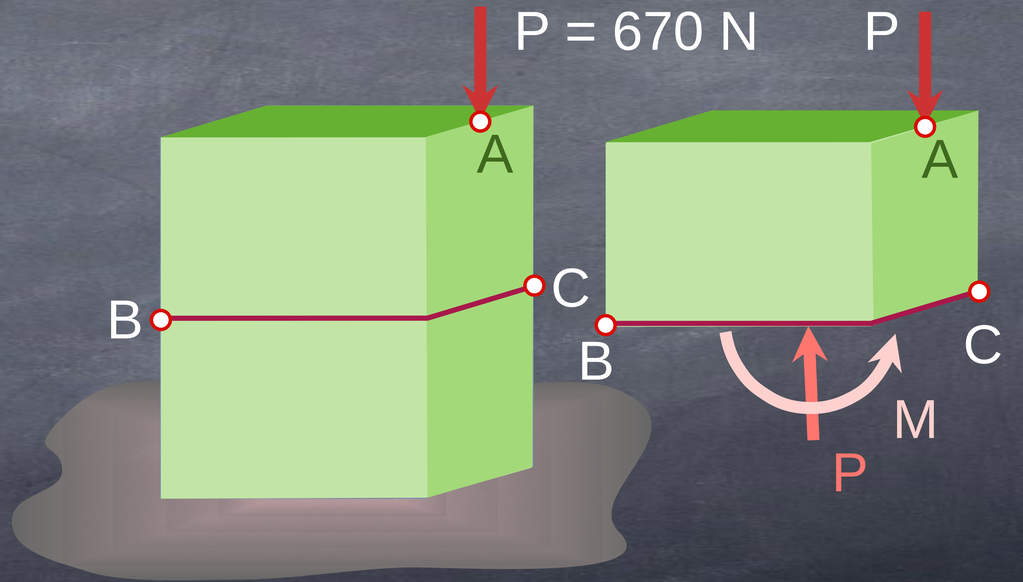
Outros exemplos

c) Superposição das tensões



$\sigma_B = \sigma + \sigma_{max} = 53.600\ N/m^2$

$\sigma_C = \sigma - \sigma_{max} = -107.200\ N/m^2$

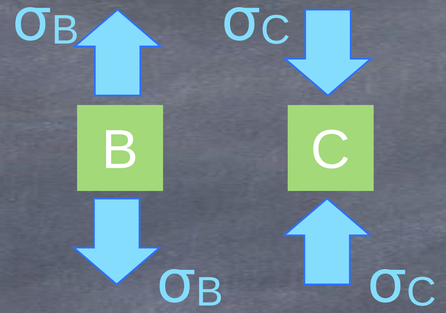


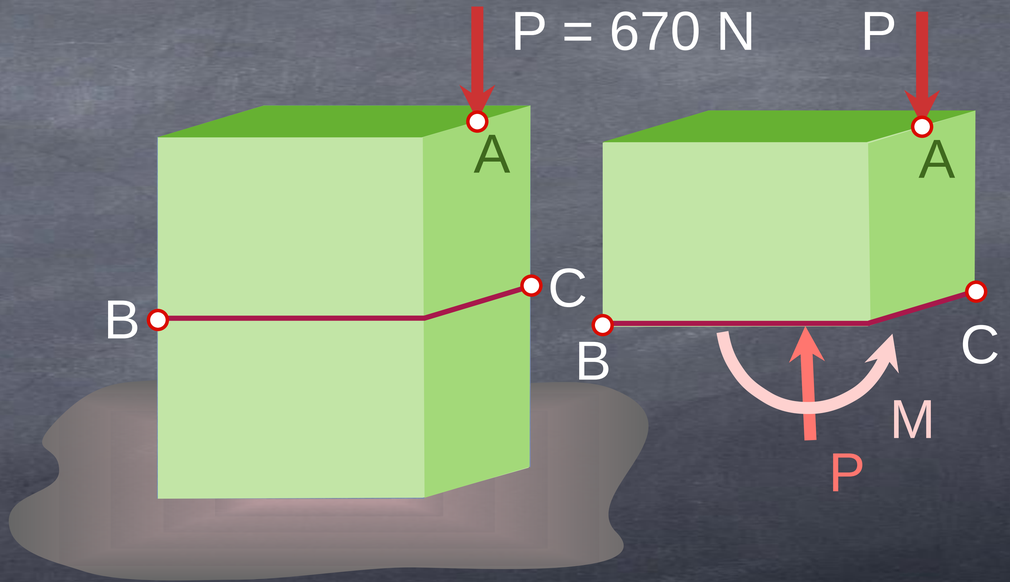
Outros exemplos

c) Superposição das tensões

$\sigma_B = \sigma + \sigma_{max} = 53.600\ N/m^2$

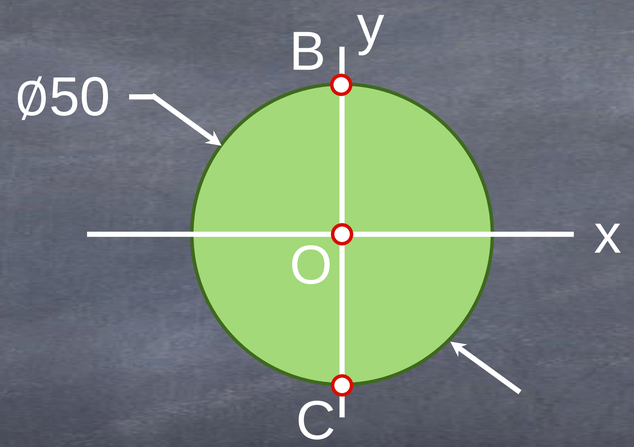
$\sigma_C = \sigma - \sigma_{max} = -107.200\ N/m^2$

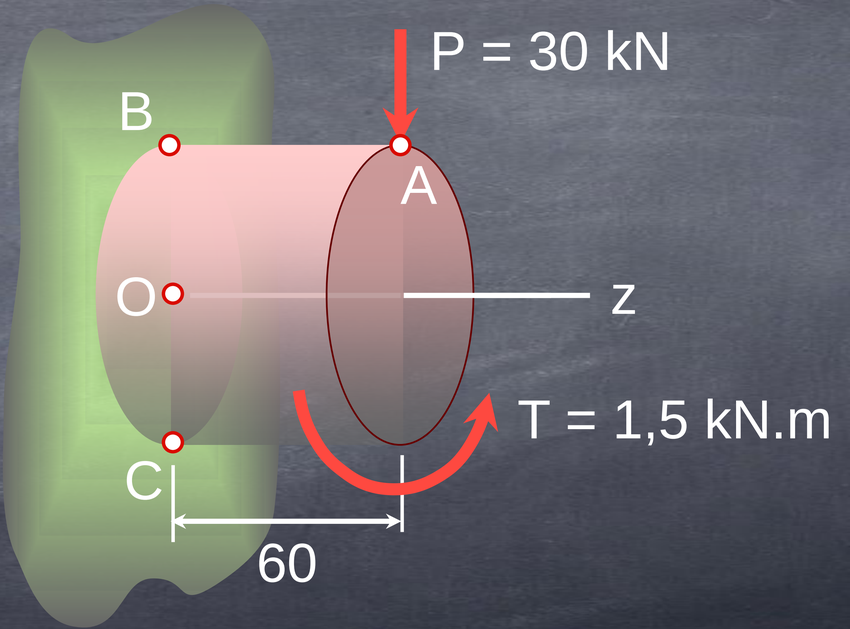




Outros exemplos

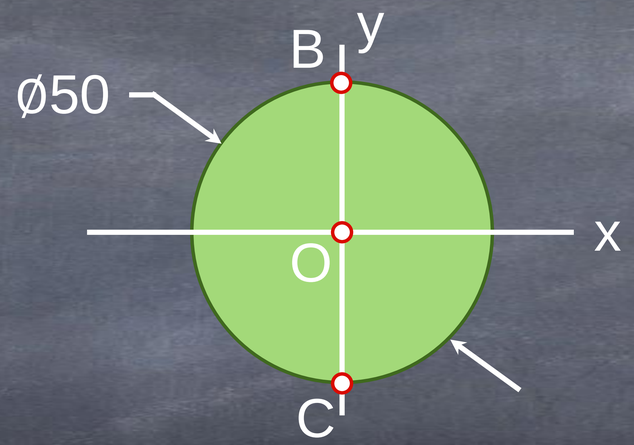
Determinar o estado de tensões nos pontos B, C e O da barra da figura.

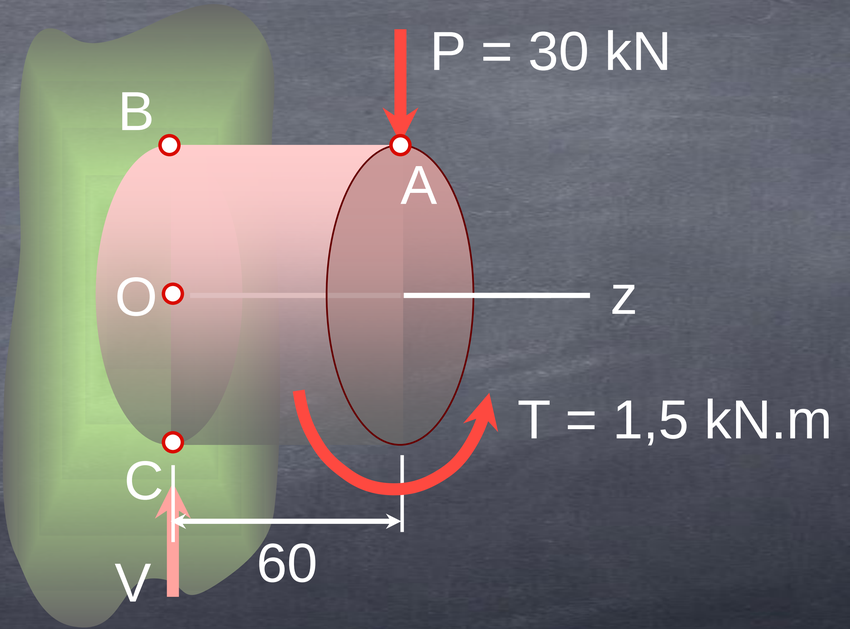




Outros exemplos

a) Tensão cisalhante causada pela força transversal

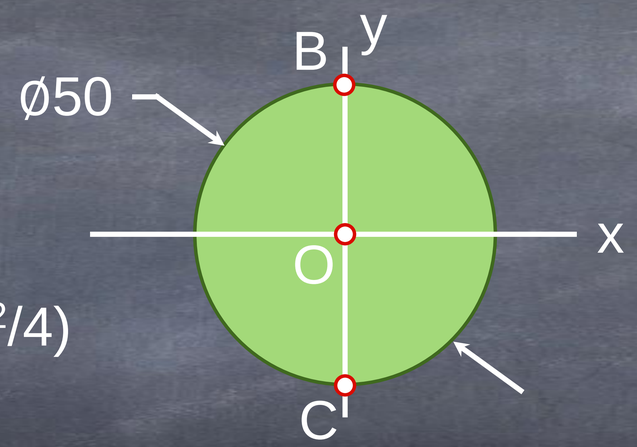


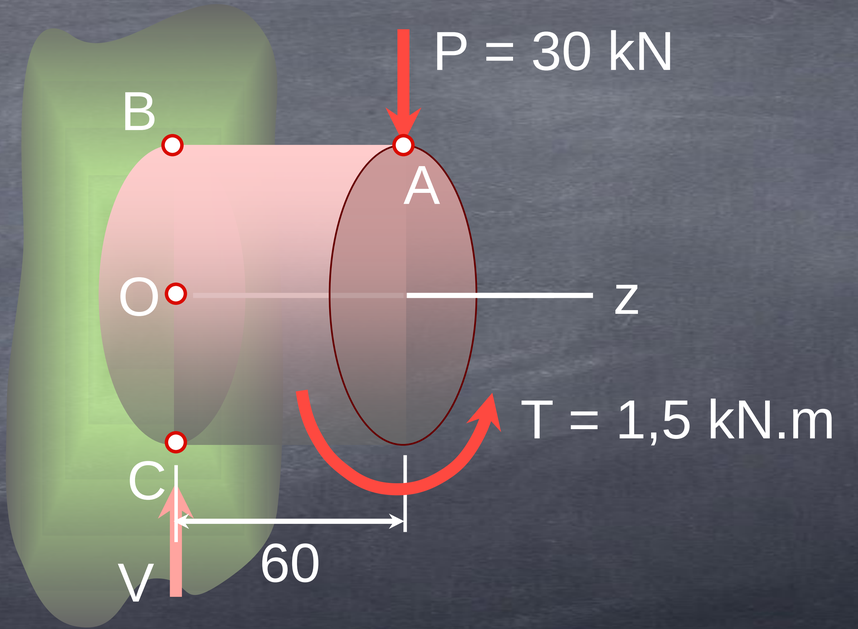


Outros exemplos

a) Tensão cisalhante causada pela força transversal

$$\tau = V / A = 30 \times 10^3 / (\pi \times 0{,}05^2/4)$$



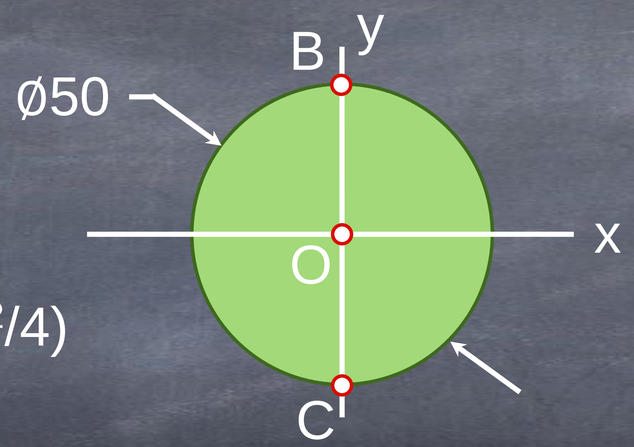


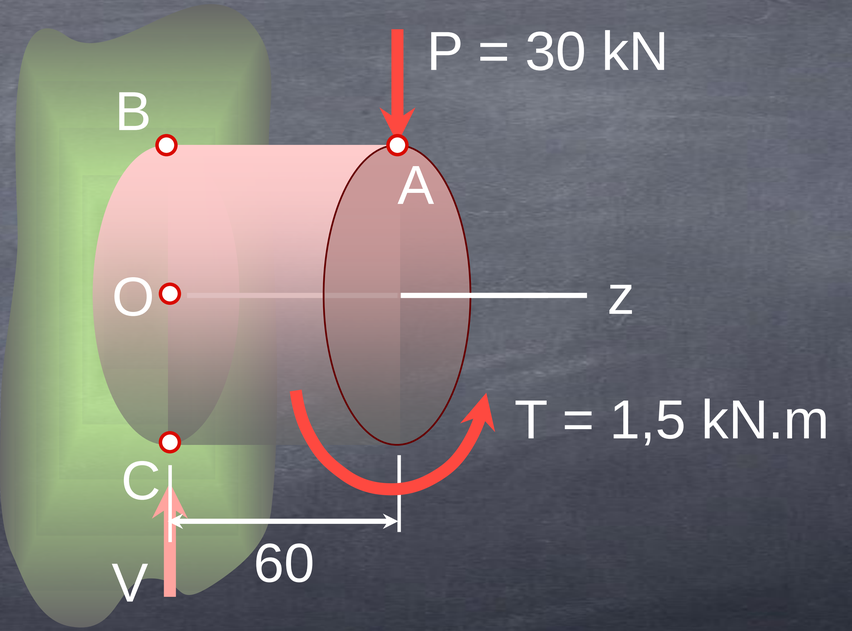
Outros exemplos

a) Tensão cisalhante causada pela força transversal

$\tau = V / A = 30 \times 10^3 / (\pi \times 0{,}05^2/4)$

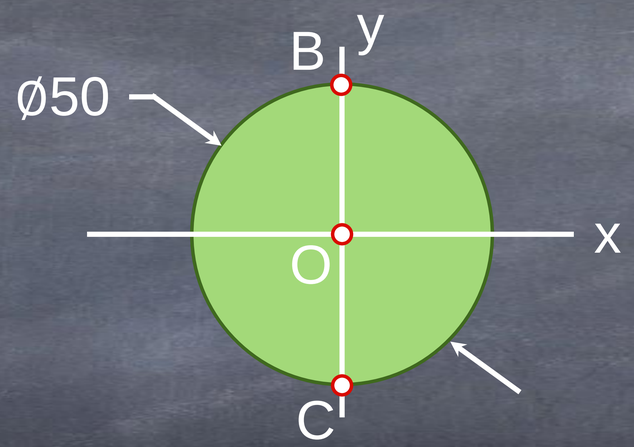
$\tau = 15{,}28$ MPa

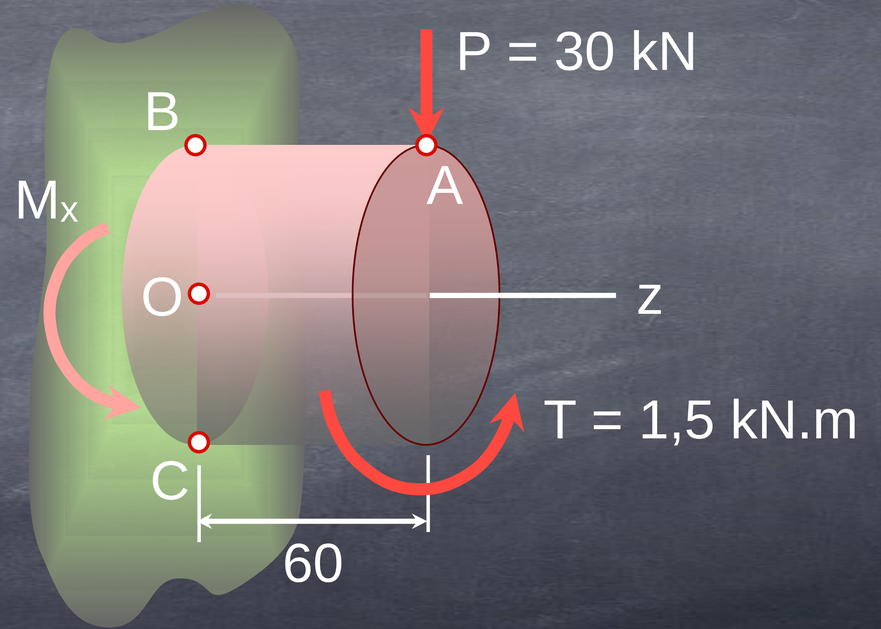




Outros exemplos

b) Tensão normal causada pelo momento fletor

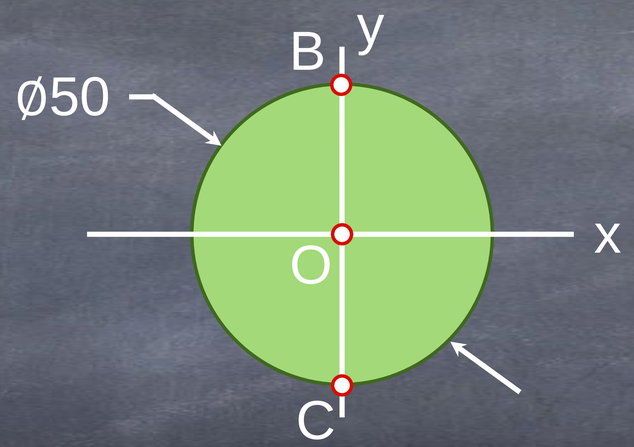


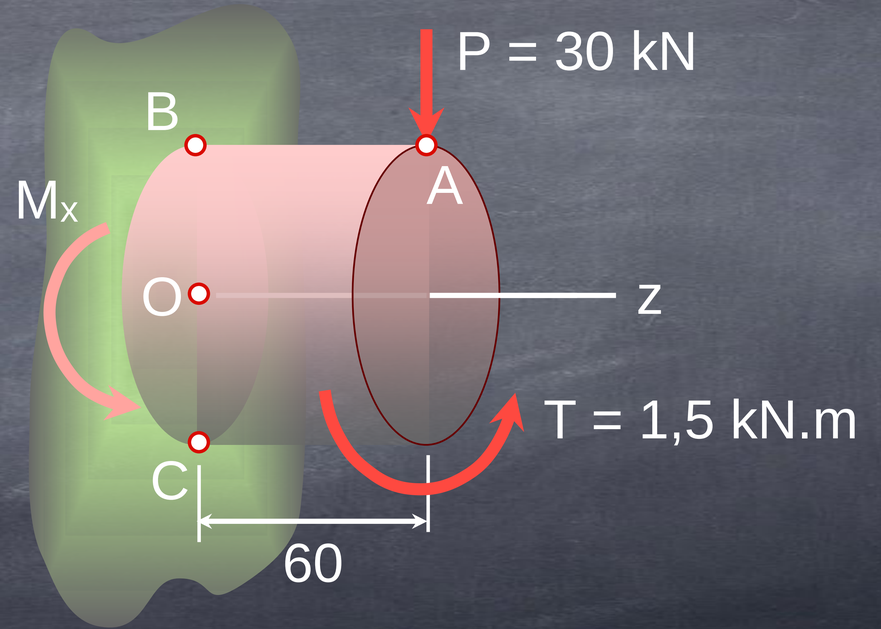


Outros exemplos

b) Tensão normal causada pelo momento fletor

$$\sigma_{max} = \pm M_x \, r / I_{xx}$$



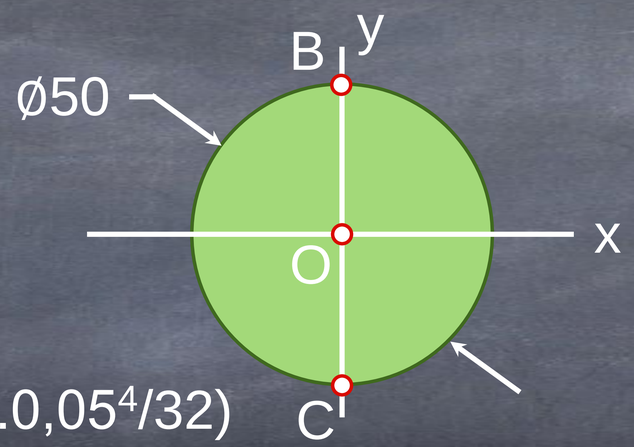


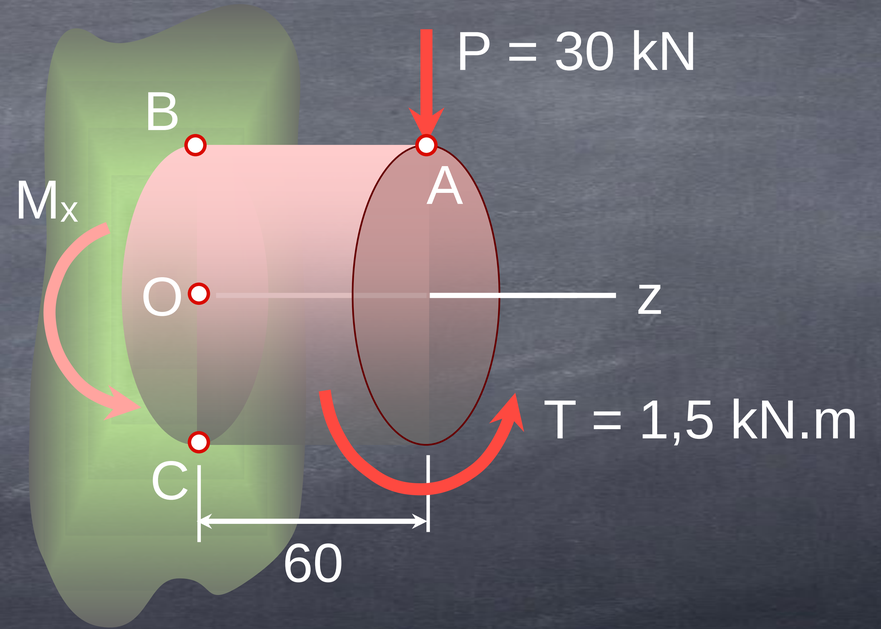
Outros exemplos

b) Tensão normal causada pelo momento fletor

$$\sigma_{max} = \pm M_x \, r / I_{xx}$$

$$\sigma_{max} = \pm 30.10^3.(0,06).(0,025)/(\pi.0,05^4/32)$$





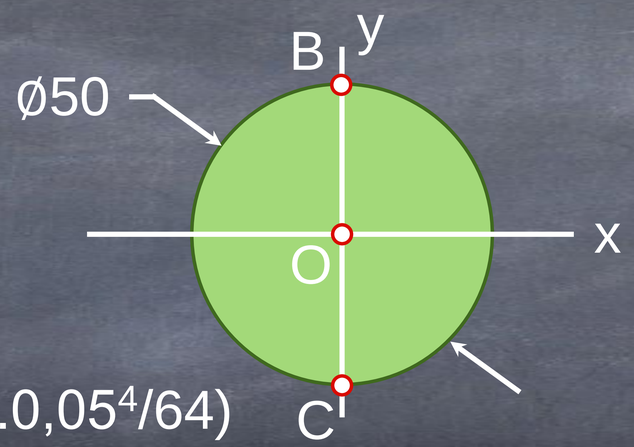
Outros exemplos

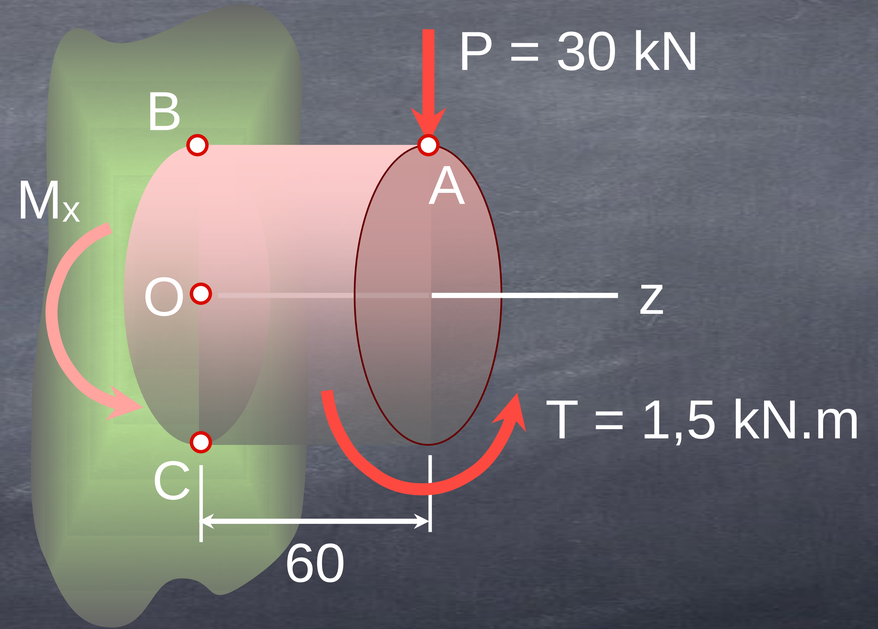
b) Tensão normal causada pelo momento fletor

$\sigma_{max} = \pm M_x \, r / I_{xx}$

$\sigma_{max} = \pm 30.10^3.(0,06).(0,025)/(\pi.0,05^4/64)$

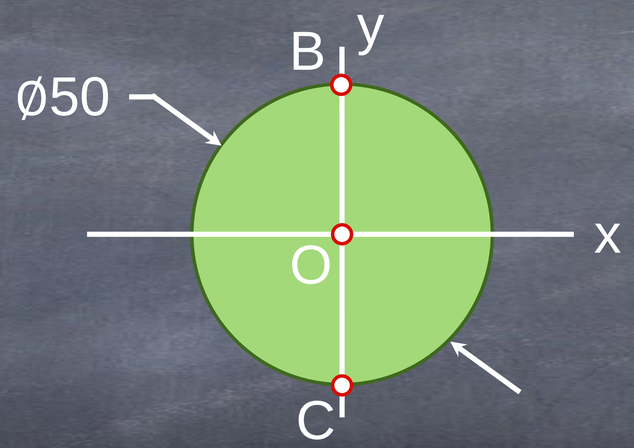
$\sigma_{max} = \pm 146,7 \text{ MPa}$

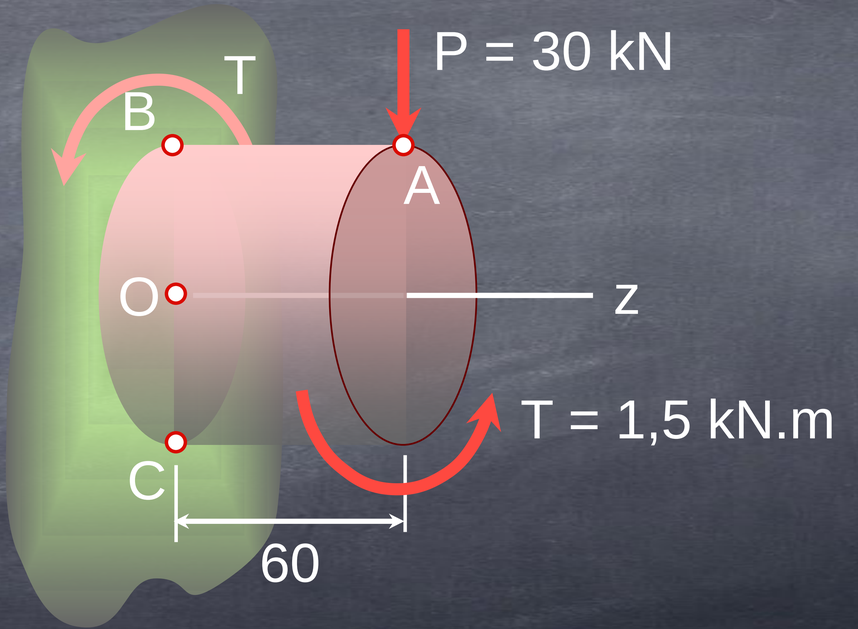




Outros exemplos

c) Tensão normal causada pelo momento torsor

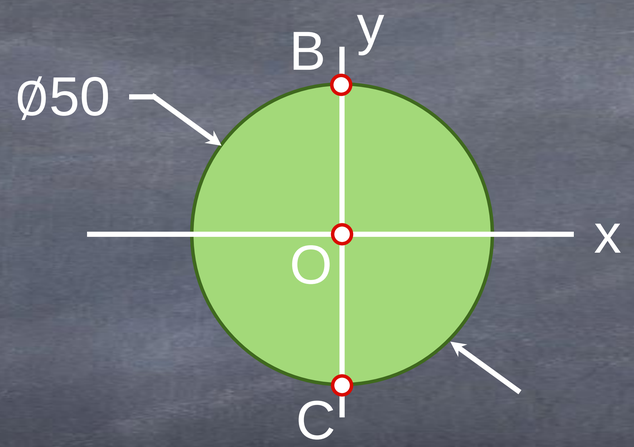


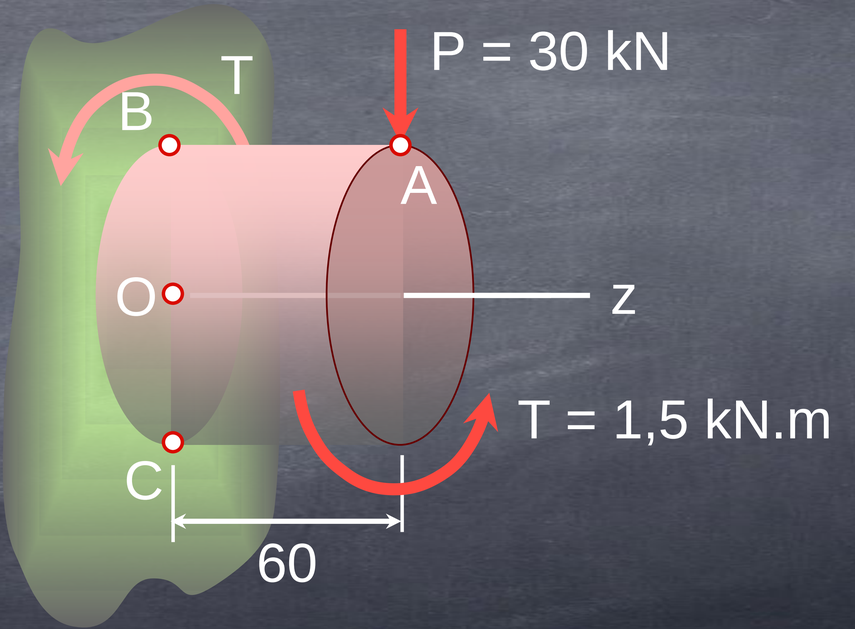


Outros exemplos

c) Tensão normal causada pelo momento torsor

$\tau_{max} = T \cdot r / J_{zz}$



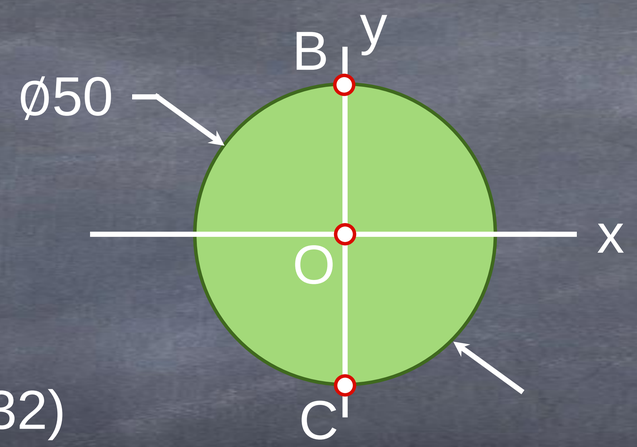


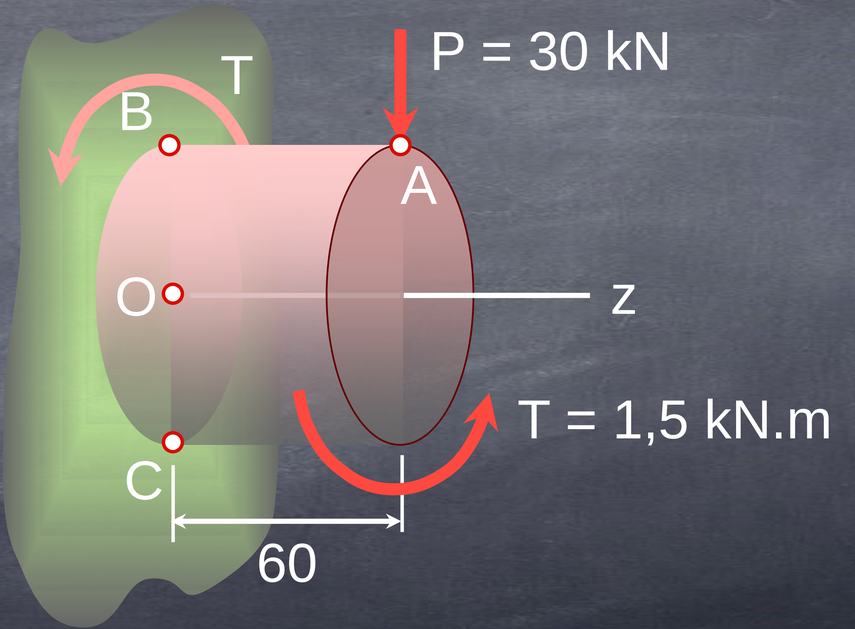
Outros exemplos

c) Tensão normal causada pelo momento torsor

$\tau_{max} = T \cdot r / J_{zz}$

$\tau_{max} = 1{,}5.10^3.(0{,}025)/(\pi.0{,}05^4/32)$





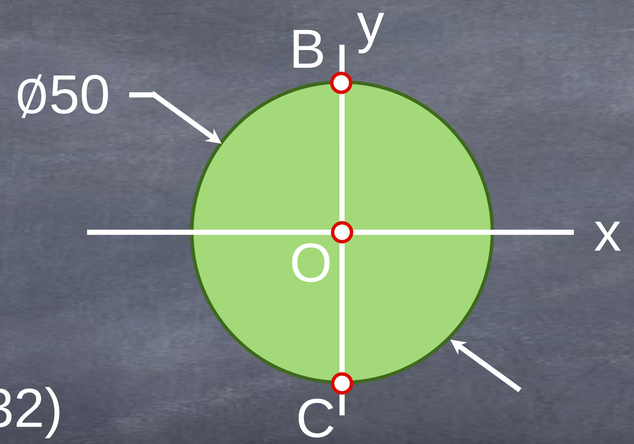
Outros exemplos

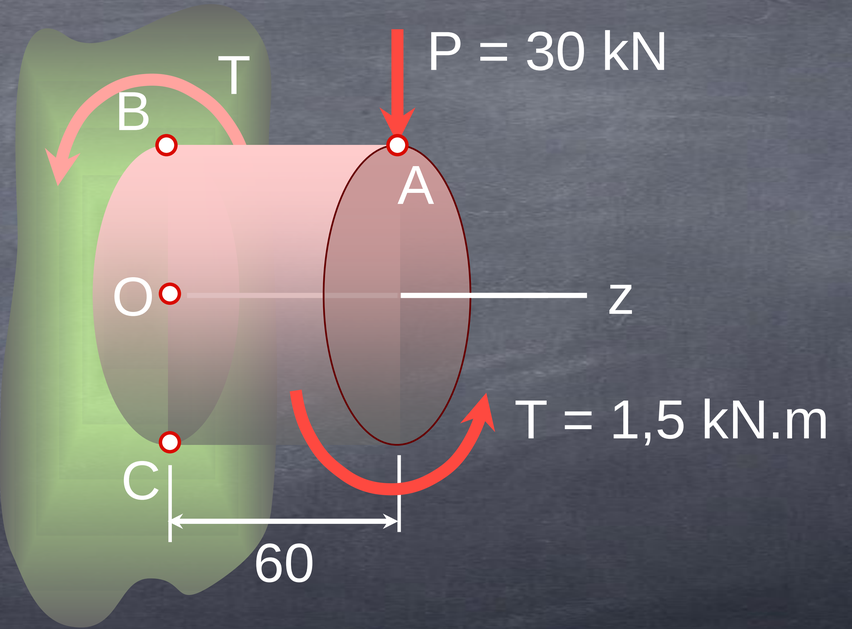
c) Tensão normal causada pelo momento torsor

$\tau_{max} = T\,r / J_{zz}$

$\tau_{max} = 1{,}5.10^{3}.(0{,}025)/(\pi.0{,}05^{4}/32)$

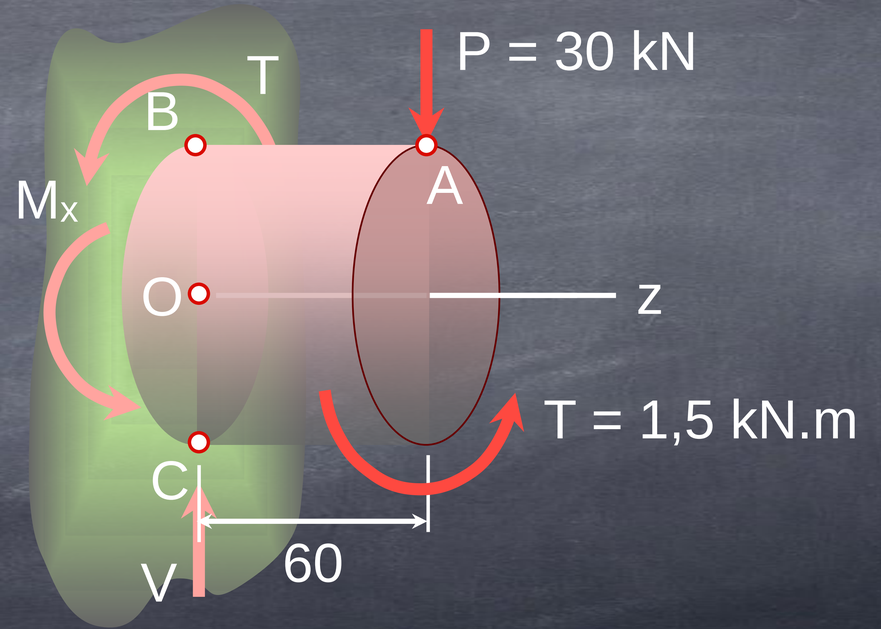
$\tau_{max} = 61{,}12$ MPa





Outros exemplos

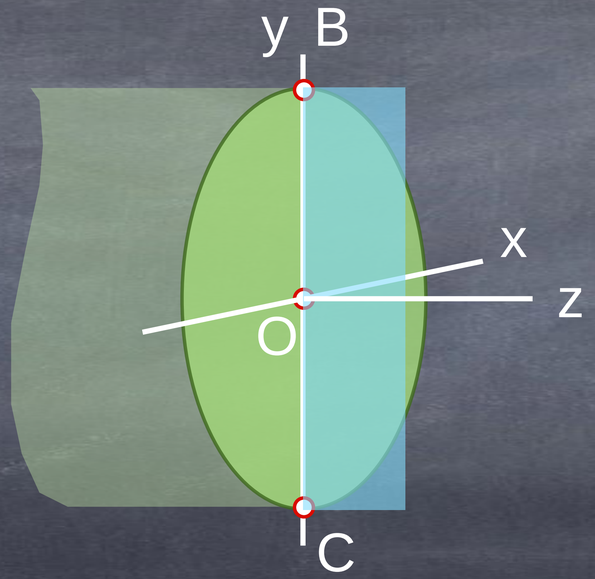
d) Superposição das tensões

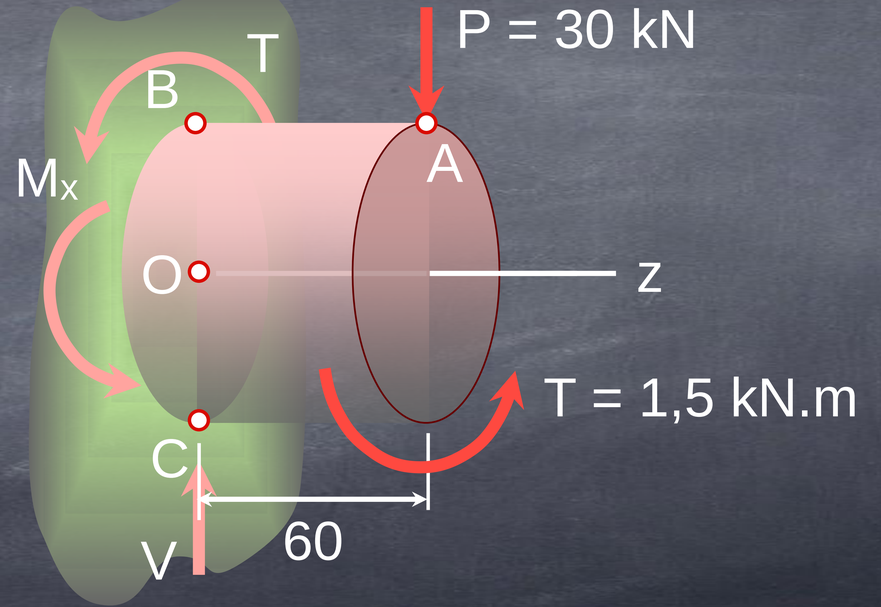


Outros exemplos

d) Superposição das tensões

d.1) $\tau = V / A$



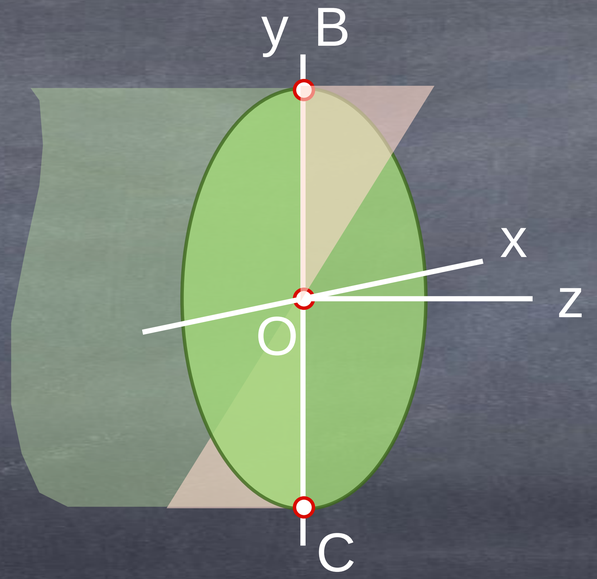


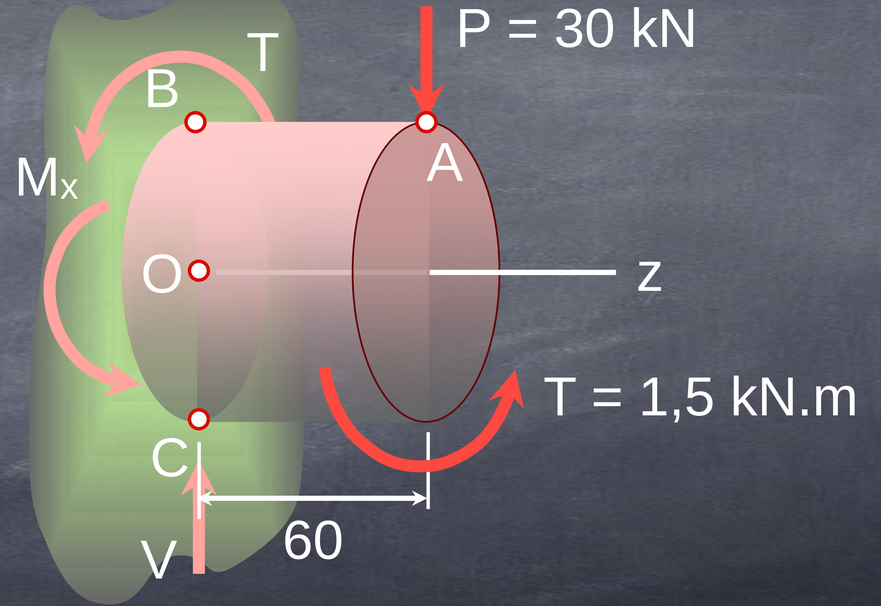
Outros exemplos

d) Superposição das tensões

d.1) $\tau = V / A$

d.2) $\sigma_{max} = \pm M_x \cdot r / I_{xx}$





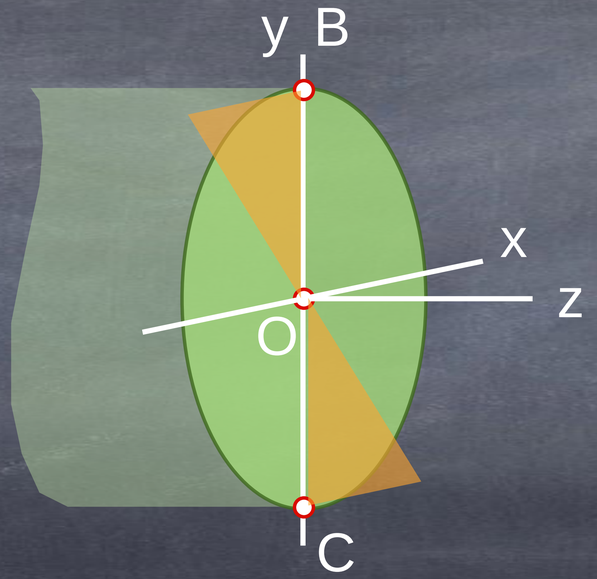
Outros exemplos

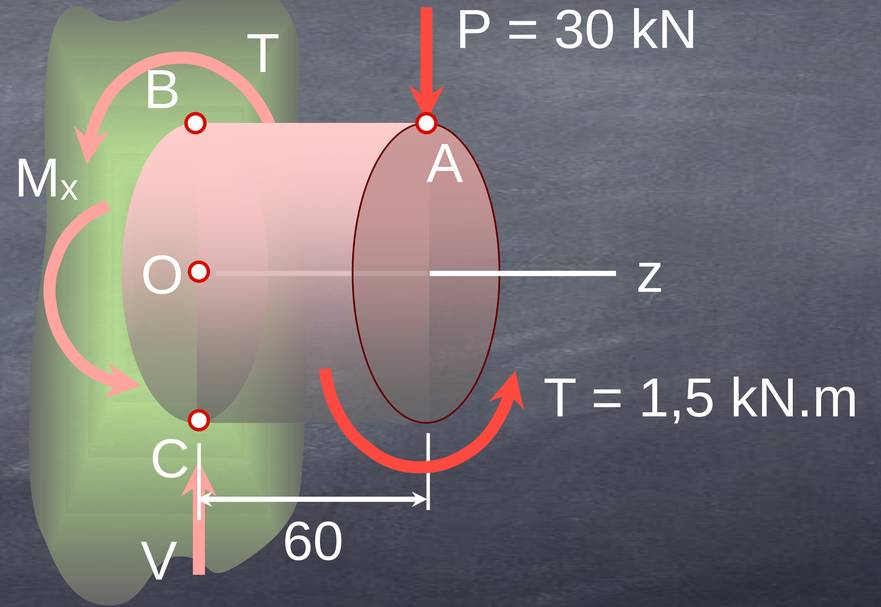
d) Superposição das tensões

d.1) $\tau = V / A$

d.2) $\sigma_{max} = \pm M_x \cdot r / I_{xx}$

d.3) $\tau_{max} = T \cdot r / J$





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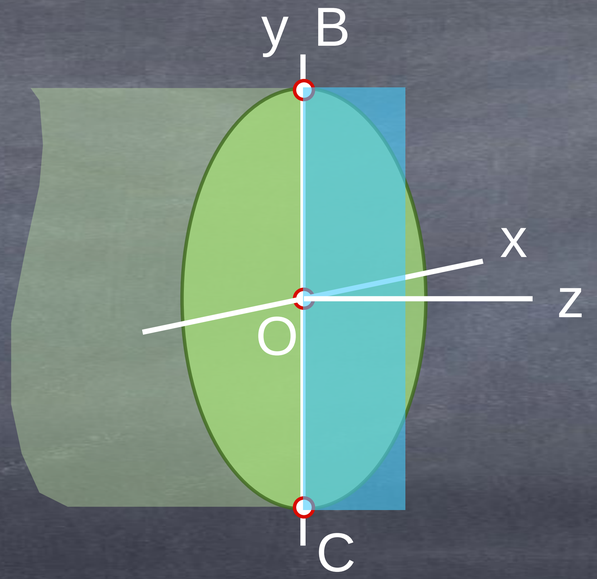

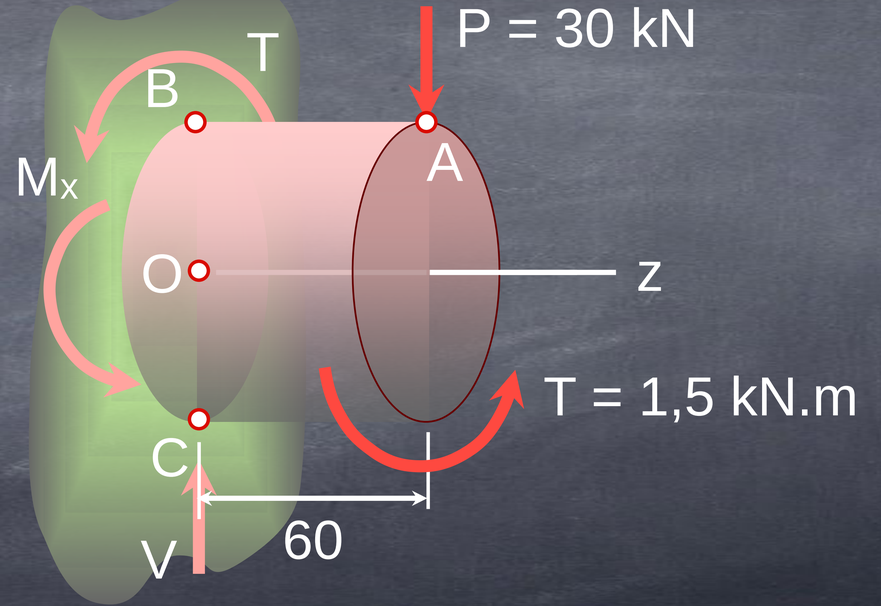

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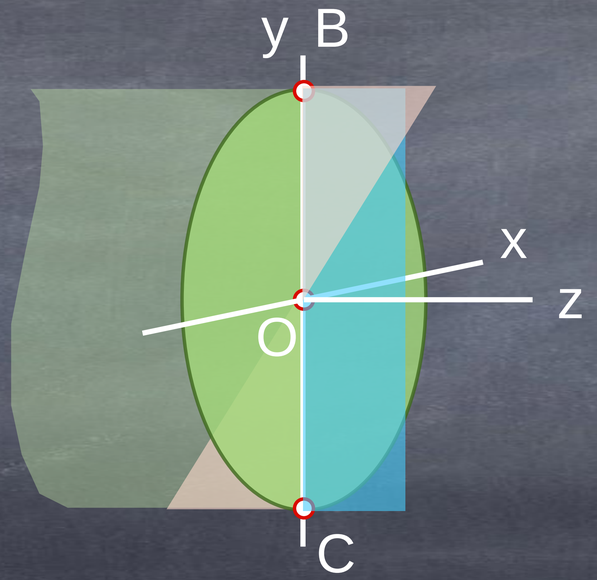

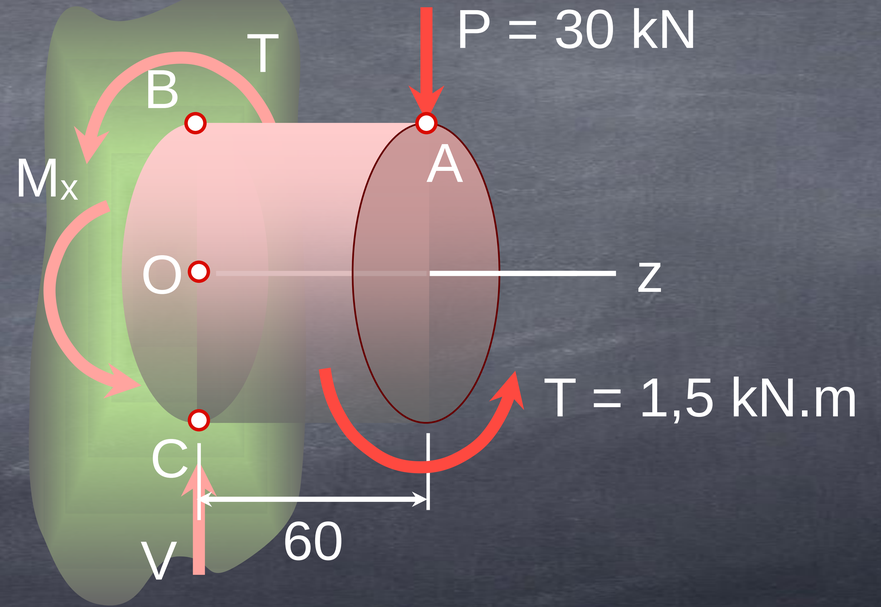

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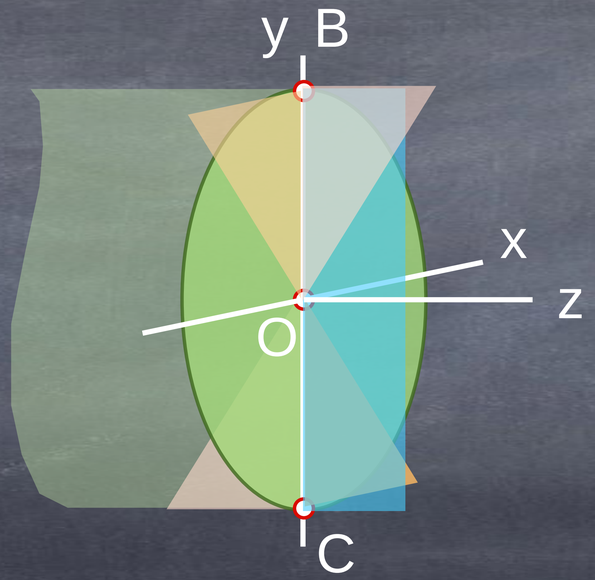

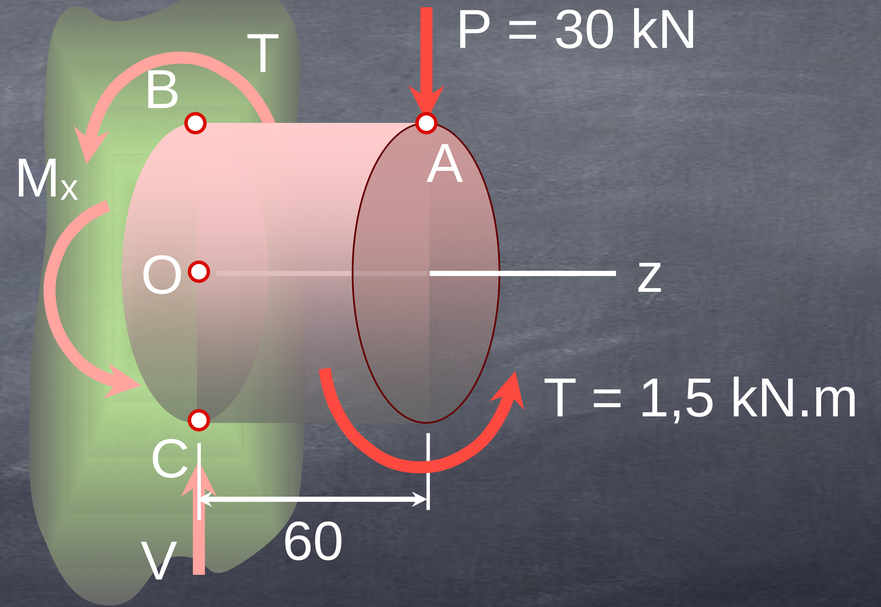

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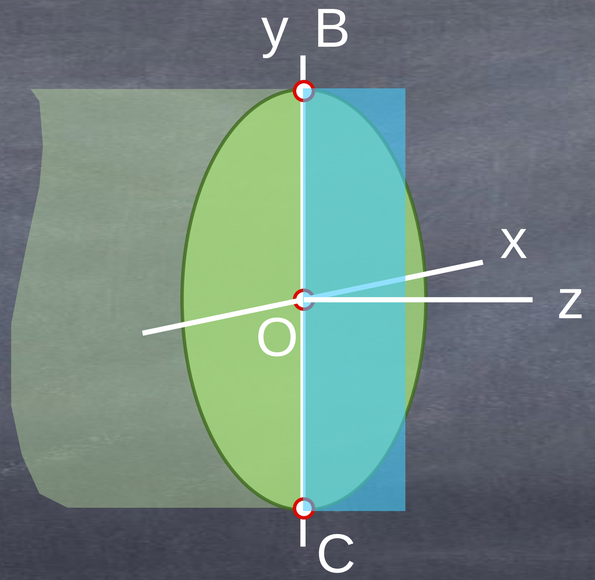

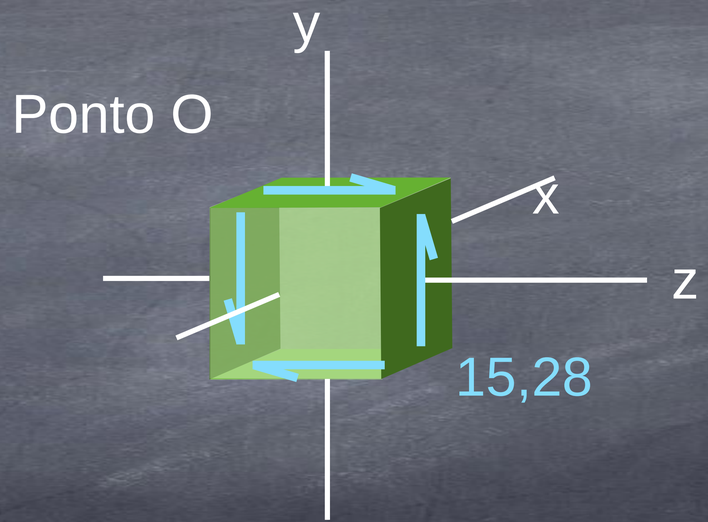

Outros exemplos

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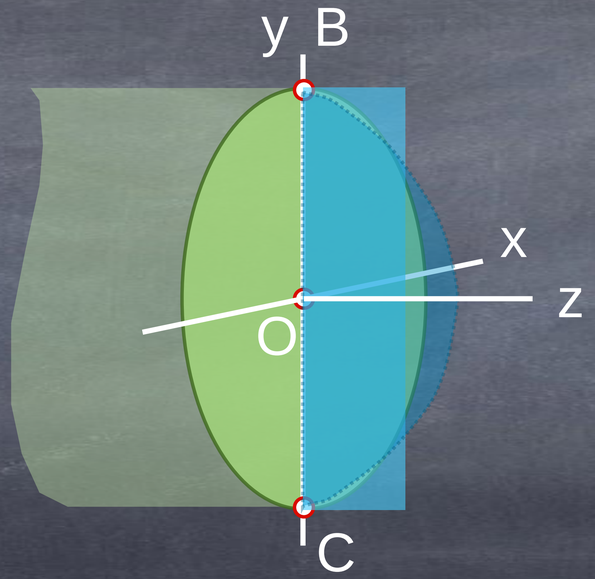
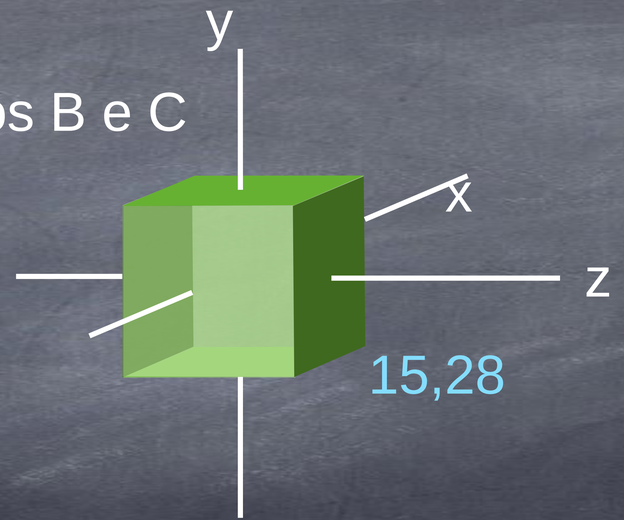


Pontos B e C



Outros exemplos

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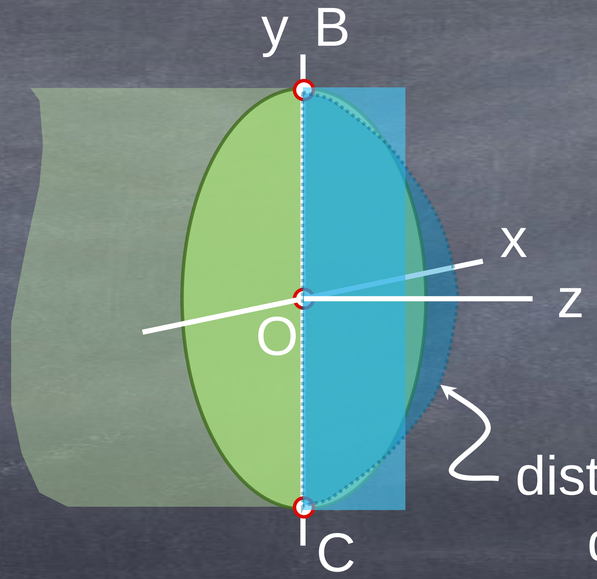
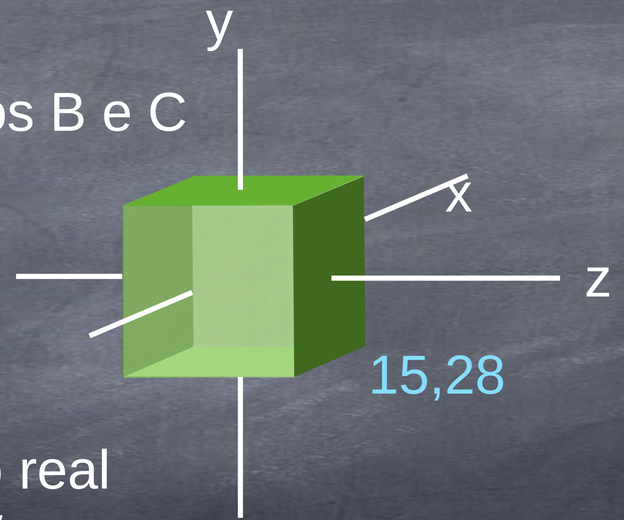


Pontos B e C

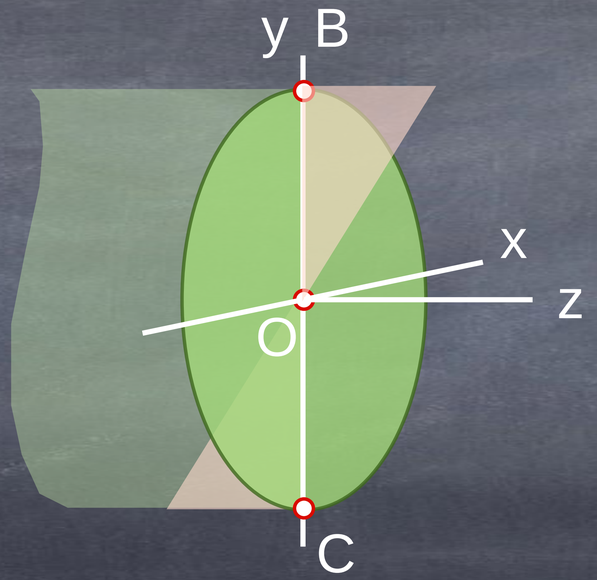


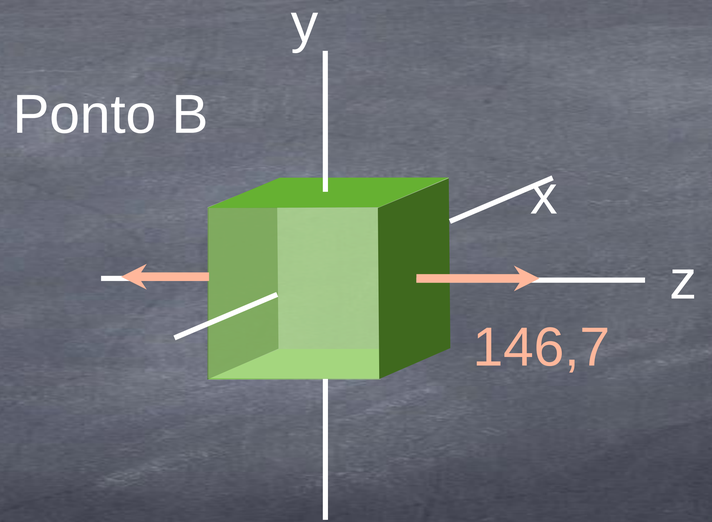
Outros exemplos

d) Superposição das tensões

d.1) $\tau = V / A$

d.2) $\sigma_{max} = \pm M_x \cdot r / I_{xx}$





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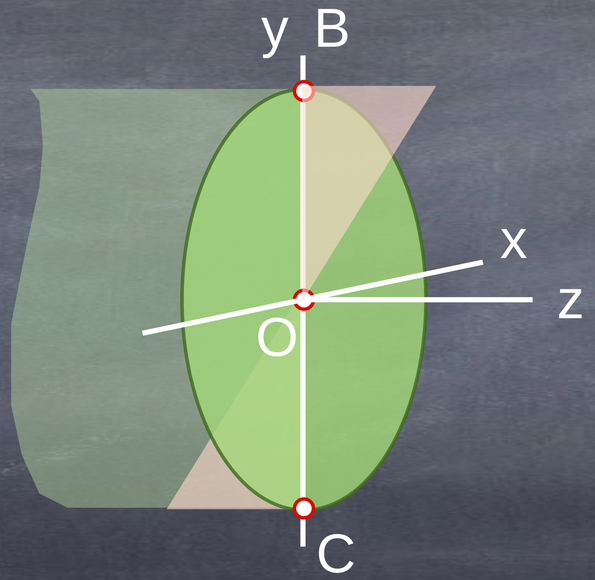

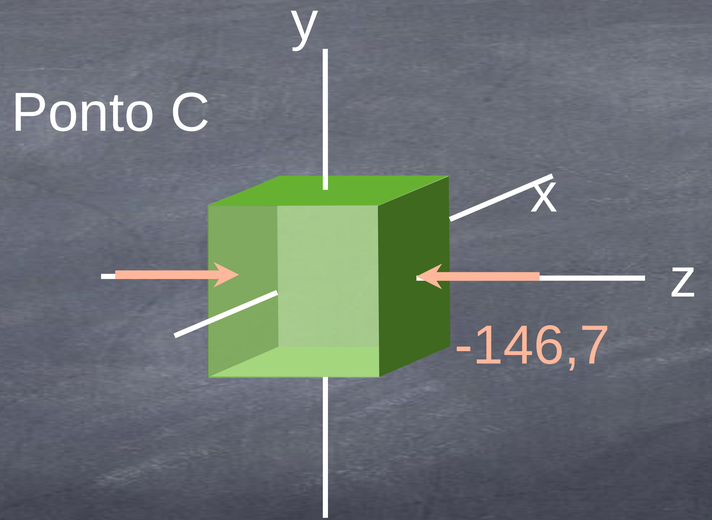

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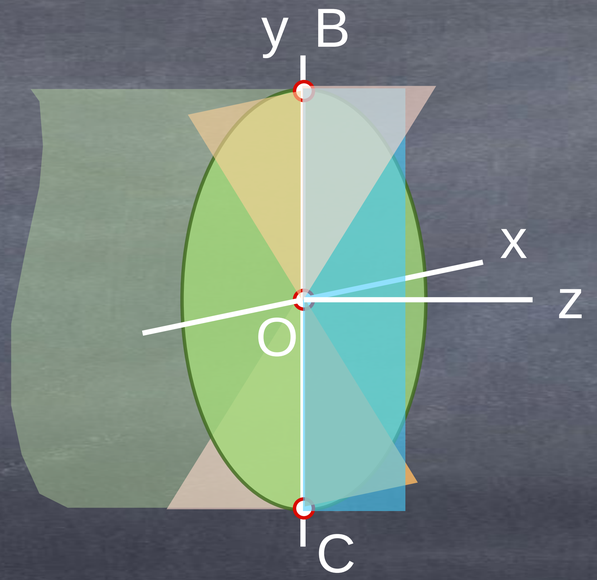

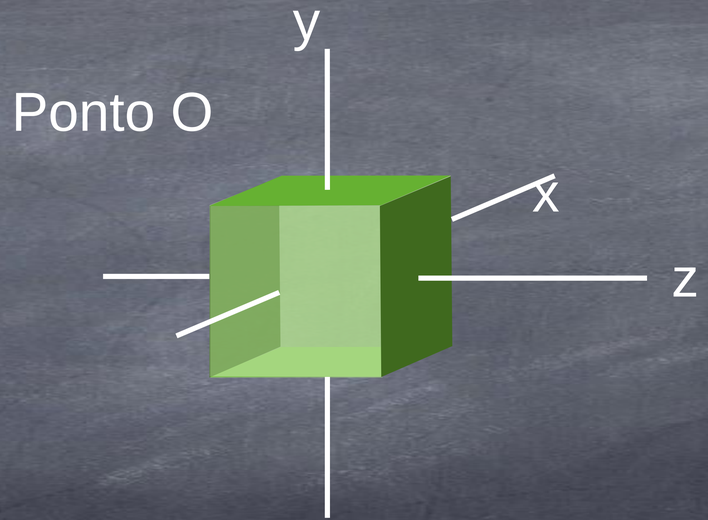

Outros exemplos

d) Superposição das tensões

d.1) $\tau = V / A$

d.2) $\sigma_{max} = \pm M_x \cdot r / I_{xx}$

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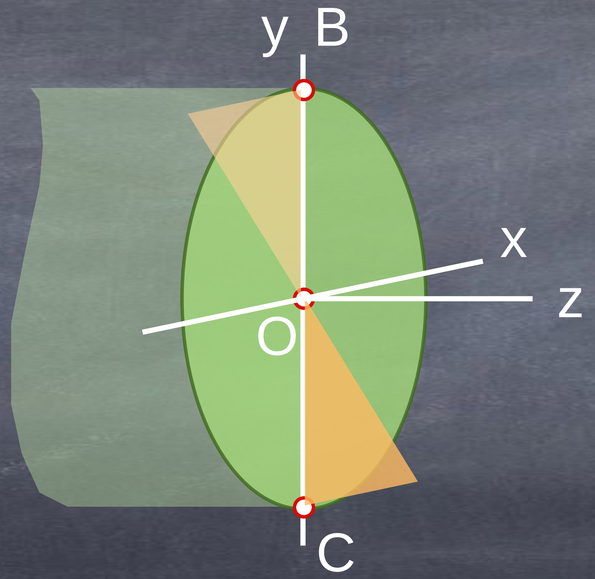
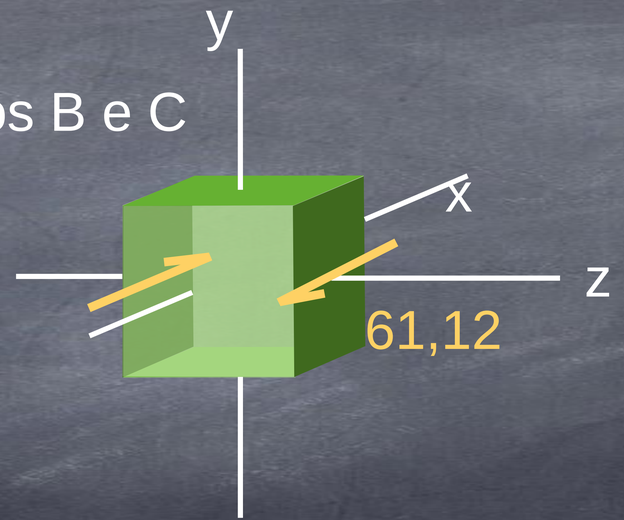


Pontos B e C



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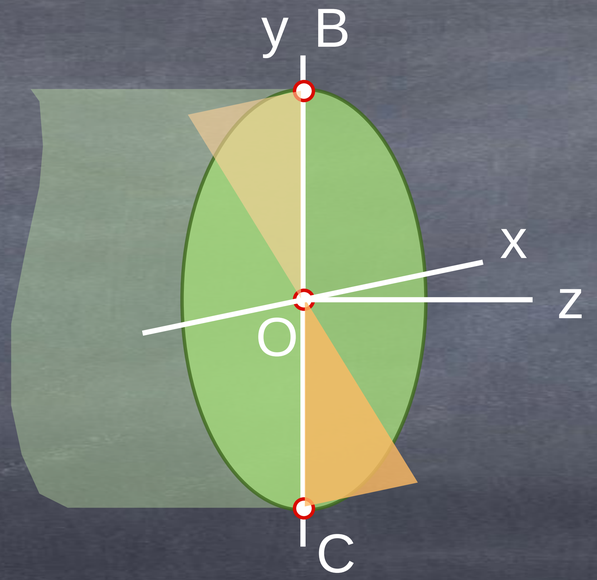

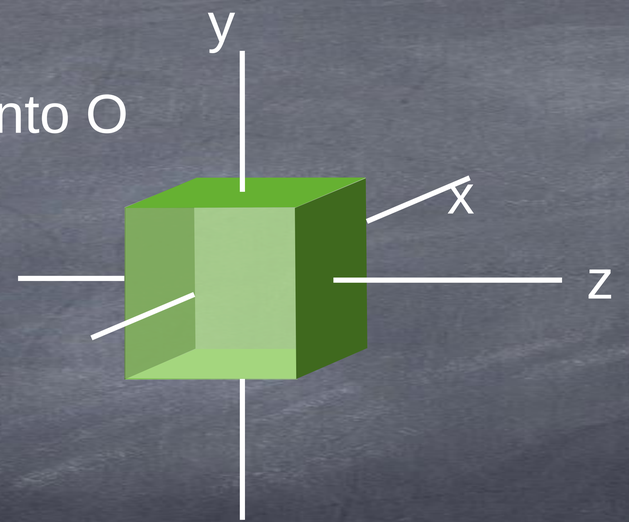

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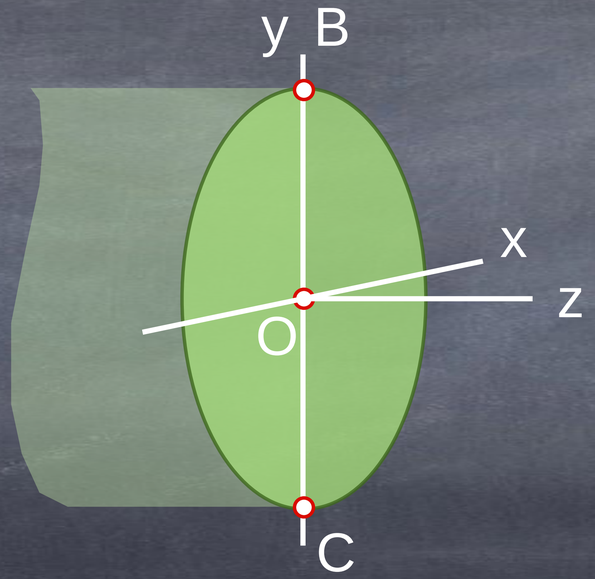

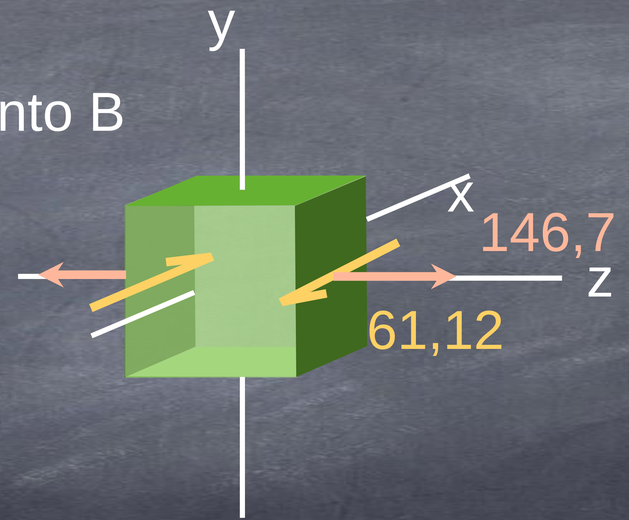

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