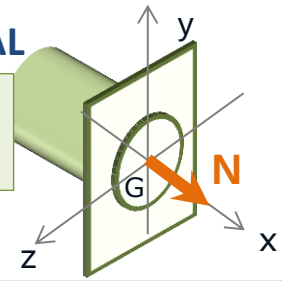
SYNTHESE – SOLLICITATIONS SIMPLES

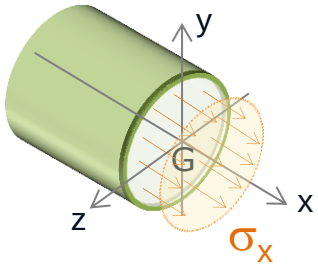
EFFORTS INTERIEURS —*Equivalence*→ CONTRAINTES —*Lois de comportement*→ DEFORMATIONS —*Intégration*→ DEPLACEMENTS

EFFORT NORMAL

$$\{T_{int}\}=\begin{Bmatrix}N & 0\\ 0 & 0\\ 0 & 0\end{Bmatrix}_G$$

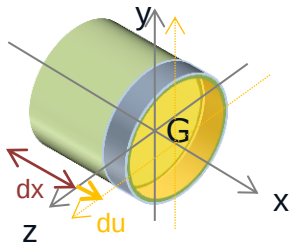
N > 0 Traction
N < 0 Compression





$$\sigma_x=\frac{N}{S}$$

Contrainte normale uniforme dans la section



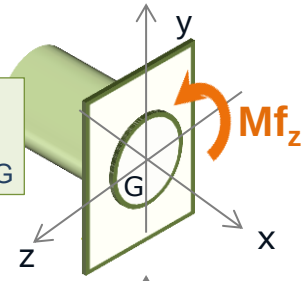
$$\sigma_x=E.\varepsilon_x=E.\frac{du}{dx}$$

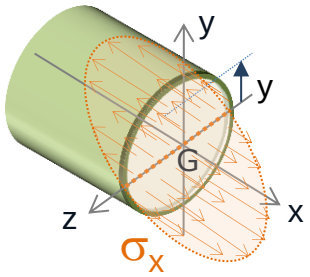
Si N et S constants :

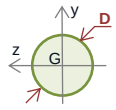
$$\Delta L=\frac{N.L}{E.S}$$

FLEXION PURE

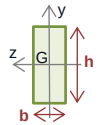
$$\{T_{int}\}=\begin{Bmatrix}0 & 0\\ 0 & 0\\ 0 & Mf_z\end{Bmatrix}_G$$







$$I_{Gz}=\frac{\pi D^4}{64}$$



$$I_{Gz}=\frac{bh^3}{12}$$

$$\sigma_x=\frac{-Mf_z}{I_{Gz}}.y$$

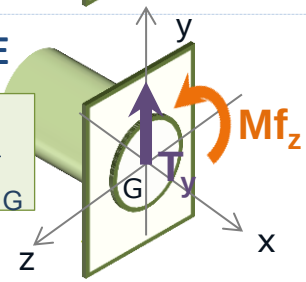
$$v''=\frac{Mf_z}{E.I_{Gz}}$$

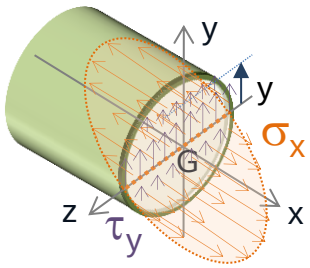
Intégrer deux fois puis traduire les conditions aux limites

Pour les cas simples, on calcule la flèche à l'aide de formulaires

FLEXION SIMPLE

$$\{T_{int}\}=\begin{Bmatrix}0 & 0\\ T_y & 0\\ 0 & Mf_z\end{Bmatrix}_G$$





τ maxi pour y = 0

$$\tau_y\ max=\frac{T_y}{S_r}$$

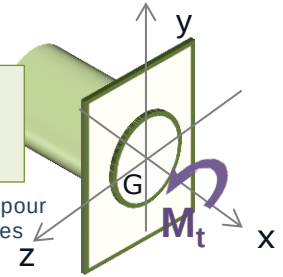
Section réduite → $\frac{3}{4}S$; $\frac{2}{3}S$; $S_{âme}$

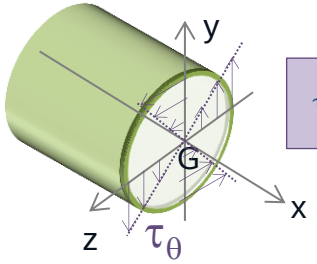
Déplacements induits par l'effort tranchant négligés devant ceux induits par le moment de flexion

→ Les déplacements se calculent comme en flexion pure

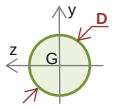
TORSION

$$\{T_{int}\}=\begin{Bmatrix}0 & 0\\ 0 & 0\\ 0 & Mt\end{Bmatrix}_G$$

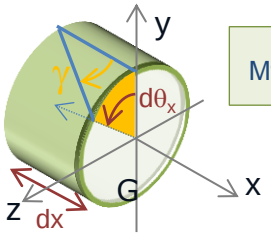




$$\tau_\theta=\frac{Mt}{I_{Gx}}.r$$



$$I_{Gx}=\frac{\pi D^4}{32}$$



$$Mt=G.I_{Gx}.\frac{d\theta_x}{dx}$$

Si Mt constant :

$$\Delta\theta_x=\frac{Mt.L}{G.I_{Gx}}$$

Uniquement valable pour les sections circulaires