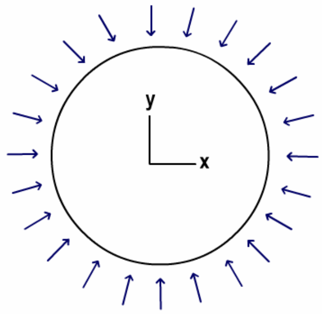
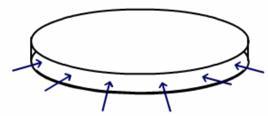
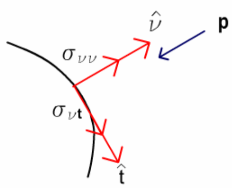
Problema 2 : Disco sometido a tensiones



Vista Planta



Vista Elevación



Equilibrio

$$\sigma_{\nu\nu} = -p \qquad \sigma_{\nu t} = 0 \qquad \vec{\sigma}_{\nu} = \sigma_{\nu\nu}\,\hat{\nu} \qquad \boxed{\vec{\sigma}_{\nu} = -p\,\hat{\nu}}$$

Por lo tanto, en un sistema cartesiano, tenemos que:

$$\boxed{\begin{array}{l}\sigma_{xx} = -p \\ \sigma_{yy} = -p\end{array}}$$

Variación del radio $\delta \mathbf{r} = \varepsilon_{xx}\,\mathbf{r}$

Determinamos ε_{xx}

$$\varepsilon_{xx} = \frac{1}{E}(\sigma_{xx} - \nu\sigma_{yy} - \nu\sigma_{zz})$$

$$= \frac{1}{E}(-p + \nu p)$$

$$\varepsilon_{xx} = \frac{p}{E}(\nu - 1)$$

$$\boxed{\delta \mathbf{r} = \frac{p}{E}(\nu - 1)r}$$

Variación del espesor $\delta \mathbf{e} = \varepsilon_{zz}\,e$

Determinamos ε_{zz}

$$\varepsilon_{zz} = \frac{1}{E}(\sigma_{zz} - \nu\sigma_{xx} - \nu\sigma_{yy})$$

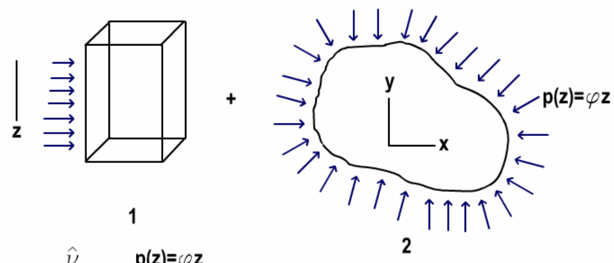
$$= \frac{1}{E}(\nu p + \nu p)$$

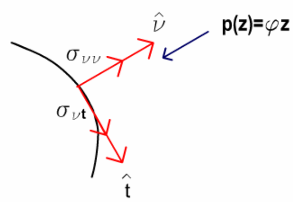
$$\varepsilon_{zz} = \frac{2\nu p}{E}$$

$$\boxed{\delta \mathbf{e} = \frac{2\nu \mathbf{pe}}{E}}$$

Problema 5: Presión Hidrostática

Como es un sólido prismático y la presión es hidroestática podemos descomponer el problema:

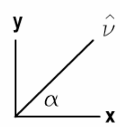




Equilibrio

$$\left.\begin{array}{l} \sigma_{\nu\nu} = -p(z) \\ \sigma_{\nu t} = 0 \end{array}\right| \quad \vec{\sigma}_\nu = \sigma_{\nu\nu}\,\hat{\nu} \quad \Big| \quad \boxed{\vec{\sigma}_\nu = -\varphi z\,\hat{\nu}}$$

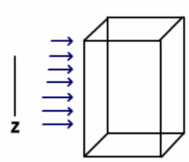
Suponiendo que ν forma un ángulo α con el eje coordenado:

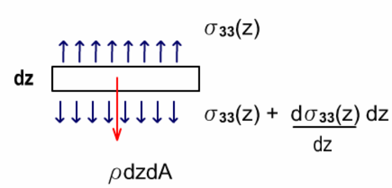


$$\hat{\nu} = \begin{bmatrix} cos(\alpha) \\ sen(\alpha) \\ 0 \end{bmatrix}$$

Por lo tanto tenemos que, en coordenadas cartesianas:

$$\boxed{\begin{array}{l} \sigma_{11} = -\varphi z \\ \sigma_{22} = -\varphi z \end{array}}$$





Equilibrio:

$$-\sigma_{33}(z)A + \sigma_{33}(z)A + \frac{d\sigma_{33}(z)}{dz} dzA + \rho Adz = 0$$

$$\left(\frac{d\sigma_{33}(z)}{dz} + \rho\right)dz = 0$$

$\sigma_{33}(z) = -\rho z + C_1$ Condiciones de Borde $C_1 = z_o(\rho - \varphi)$

$$\boxed{\sigma_{33}(z) = -\rho(z - z_o) - \varphi z_o}$$