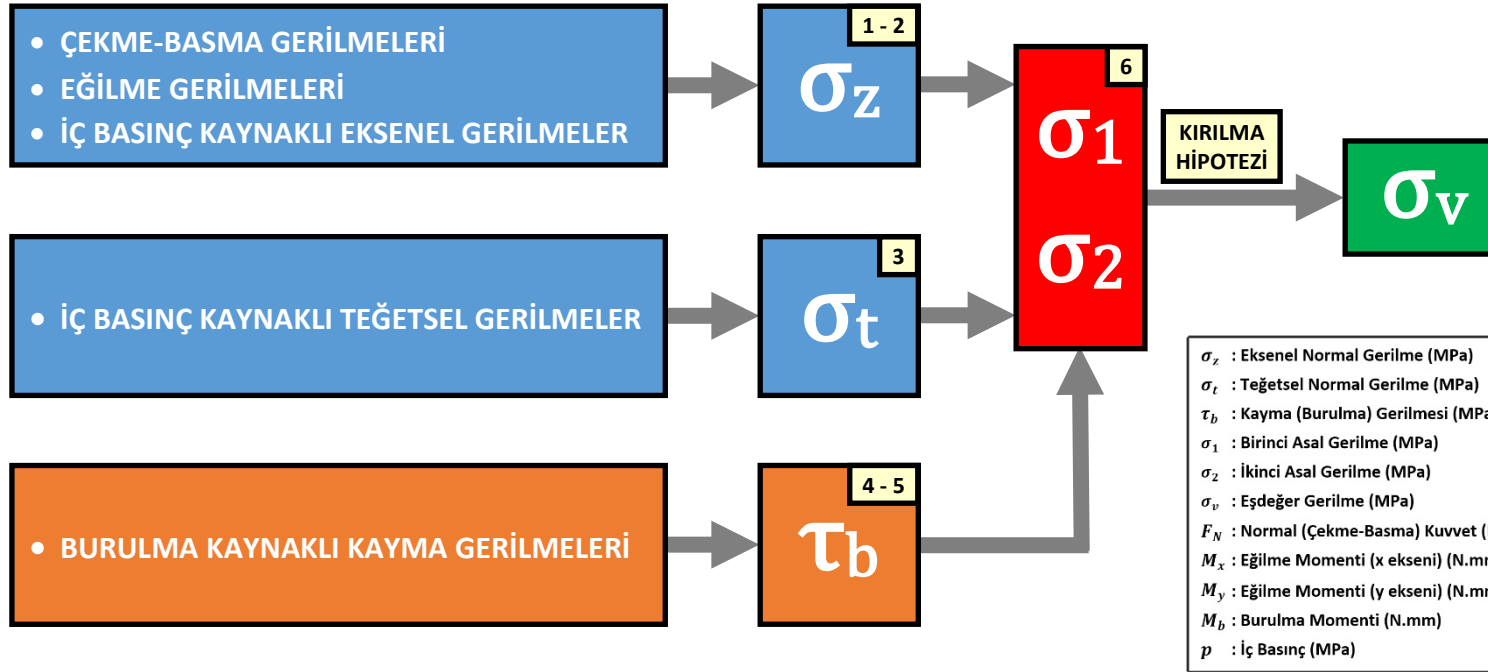


## DAİRESEL KESİTLİ ÇUBUKLAR İÇİN BİRLEŞİK MUKAVEMET HESABI



$$1 \quad (\sigma_z)_{x,y} = \frac{F_N}{A} + \frac{pd}{4s} + \frac{M_x}{I_x}y - \frac{M_y}{I_y}x$$

$$4 \quad (\tau_b)_{x,y} = \frac{M_b}{I_p} \sqrt{x^2 + y^2}$$

$$3 \quad \sigma_t = \frac{pd}{2s}$$

$$I_x = I_y = \frac{\pi(D^4 - d^4)}{64}$$

$$2 \quad (\sigma_z)_{max} = \left( \frac{F_N}{A} + \frac{pd}{4s} \right) \pm \frac{\sqrt{(M_x)^2 + (M_y)^2}}{I_x} \frac{D}{2}$$

$$5 \quad (\tau_b)_{max} = \frac{M_b D}{I_p} \frac{1}{2}$$

$$s = \frac{D - d}{2}$$

$$I_p = \frac{\pi(D^4 - d^4)}{32}$$

$$A = \frac{\pi(D^2 - d^2)}{4}$$

$$6 \quad \sigma_{1,2} = \left( \frac{\sigma_z + \sigma_t}{2} \right) \pm \sqrt{\left( \frac{\sigma_z - \sigma_t}{2} \right)^2 + (\tau_b)^2}$$

TRESKA ( $\sigma_1$  ile  $\sigma_2$  ters işaretli ise)

$$\sigma_v = \sigma_1 - \sigma_2$$

TRESKA ( $\sigma_1$  ile  $\sigma_2$  aynı işaretli ise)

$$\sigma_v = \max(|\sigma_1|, |\sigma_2|)$$

VON MISES

$$\sigma_v = \sqrt{(\sigma_1)^2 + (\sigma_2)^2 - \sigma_1 \sigma_2}$$