

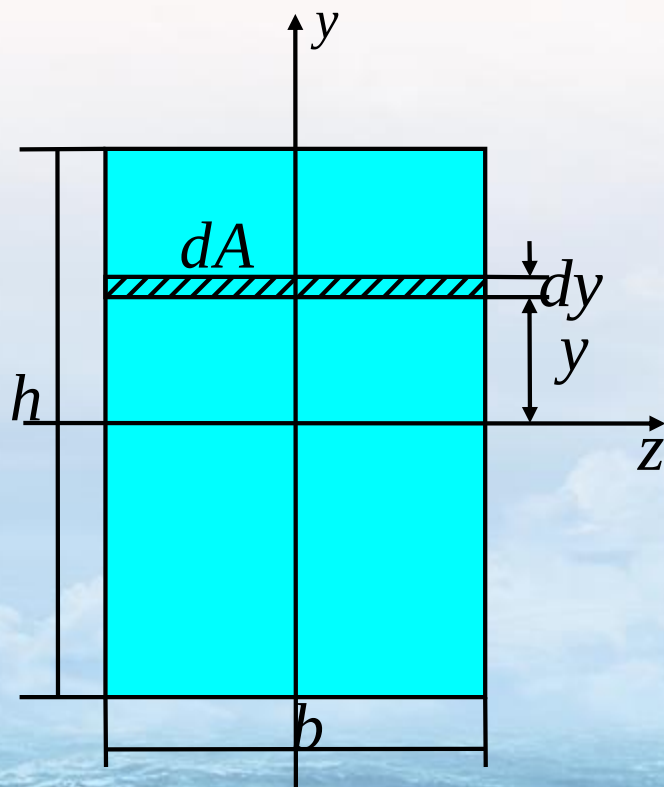
惯性矩



梁的应力

常用截面的惯性矩

1. 矩形



$$J_z = \int_A y^2 dA$$

$$= \int_{-h/2}^{h/2} y^2 b \cdot dy$$

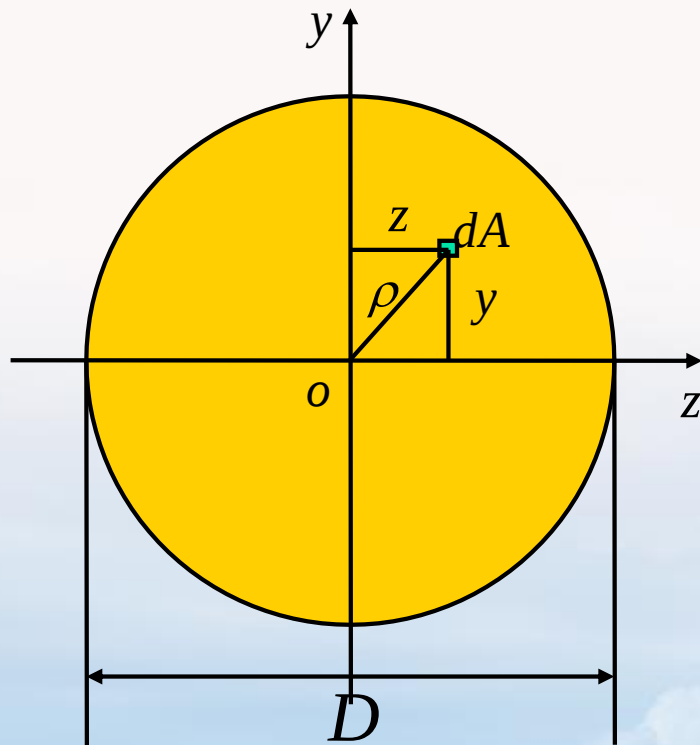
$$= \frac{bh^3}{12}$$

$$W_z = \frac{J_z}{h/2} = \frac{bh^2}{6}$$



梁的应力

实心圆



$$J_P = \int_A \rho^2 dA$$



$$J_P = \int_A (y^2 + z^2) dA$$



$$\begin{aligned} J_P &= \int_A y^2 dA + \int_A z^2 dA \\ &= J_z + J_y \end{aligned}$$

对于圆形截面, $J_y = J_z$

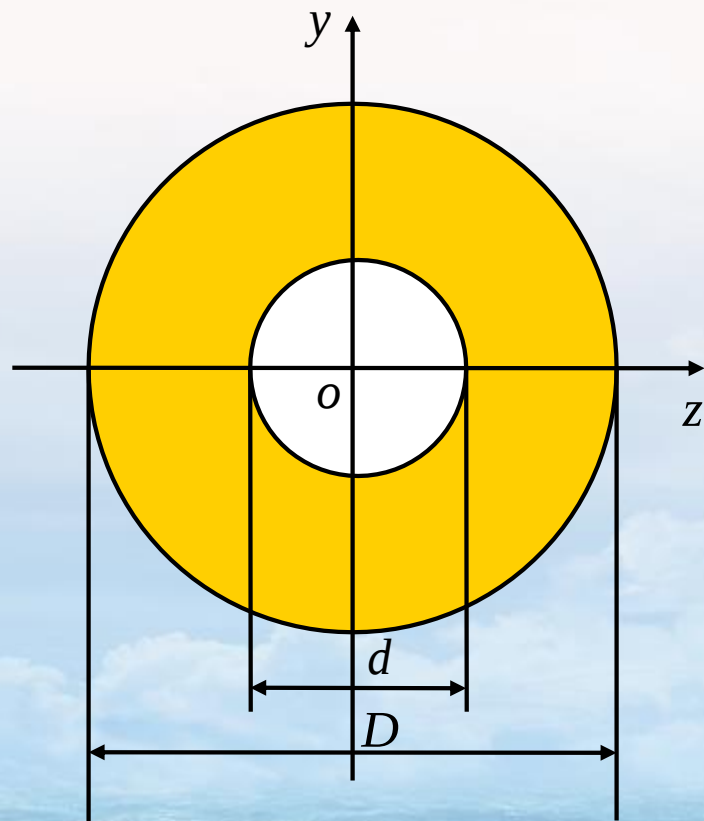
$$\therefore J_P = \frac{\pi D^4}{32}$$

$$\therefore J_y = J_z = \frac{J_P}{2} = \frac{\pi D^4}{64}$$



梁的应力

空心圆



$$J_z = \frac{J_P}{2} = \frac{\pi D^4}{64} (1 - \alpha^4)$$

$$\text{其中, } \alpha = \frac{d}{D}$$

$$W_z = \frac{\pi D^3}{32} (1 - \alpha^4)$$

