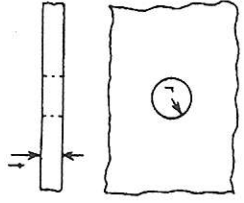
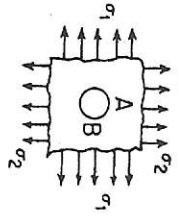


6. Circular hole in an infinite plate

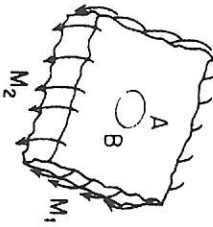


6a. Elastic stress, in-plane normal stress



- (a1) Uniaxial stress, $\sigma_2 = 0$
 $\sigma_A = 3\sigma_1$ $\sigma_B = -\sigma_1$
- (a2) Biaxial stress, $\sigma_2 = \sigma_1$
 $\sigma_A = \sigma_B = 2\sigma_1$
- (a3) Biaxial stress, $\sigma_2 = -\sigma_1$ (pure shear)
 $\sigma_A = -\sigma_B = 4\sigma_1$

6b. Elastic stress, out-of-plane bending



Note: M_1 and M_2 are unit moments. See Table 11.2.

(b1) Simple bending, $M_2 = 0$

$$\sigma_A = K_1 \frac{6M_1}{t^2}$$

where $K_1 = 1.79 + \frac{0.25}{0.39 + (2r/t)}$ $\frac{0.81}{1 + (2r/t)^2} + \frac{0.26}{1 + (2r/t)^3}$

(b2) Cylindrical bending, $M_2 = \nu M_1$

$$\sigma_A = K_1 \frac{6M_1}{t^2}$$

where $K_1 = 1.85 + \frac{0.509}{0.70 + (2r/t)}$ $\frac{0.214}{1 + (2r/t)^2} + \frac{0.335}{1 + (2r/t)^3}$ for $\nu = 0.3$

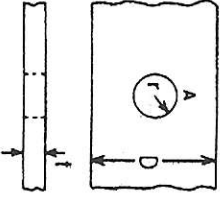
(b3) Isotropic bending, $M_2 = M_1$

$$\sigma_A = K_1 \frac{6M_1}{t^2}$$

where $K_1 = 2$ (independent of r/t)

(Refs. 1 and 26-30)

7. Central circular hole in a member of rectangular cross section



7a. Elastic stress, axial tension



$$\sigma_{\max} = \sigma_A = K_1 \sigma_{\text{nom}}$$

where $\sigma_{\text{nom}} = \frac{P}{t(D - 2r)}$

$$K_1 = 3.00 - 3.13 \left(\frac{2r}{D}\right) + 3.66 \left(\frac{2r}{D}\right)^2 - 1.53 \left(\frac{2r}{D}\right)^3$$

(Refs. 5 and 25)