
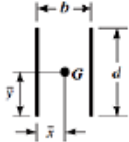
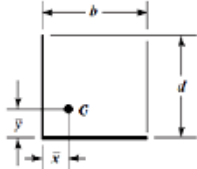
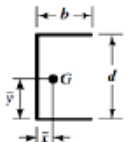
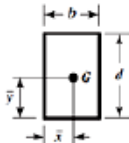



Design Exam Equations:

$$d_o = \left\{ \frac{16}{\pi \tau_{all} (1-k^4)} \sqrt{\left(K_m M + \frac{\alpha F_a d_o (1+k^2)}{8} \right)^2 + (K_T T)^2} \right\}^{1/3}$$

Table (4.1) Torsional Properties of Fillet Welds

Weld	Throat Area	Location of G	Unit Second Polar Moment of Area
	$A = 0.707 hd$	$\bar{x} = 0$ $\bar{y} = d/2$	$J_u = d^3/12$
	$A = 1.414 hd$	$\bar{x} = b/2$ $\bar{y} = d/2$	$J_u = \frac{d(3b^2 + d^2)}{6}$
	$A = 0.707h(2b + d)$	$\bar{x} = \frac{b^2}{2(b+d)}$ $\bar{y} = \frac{d^2}{2(b+d)}$	$J_u = \frac{[b+d]^4 - 6b^2d^2}{12(b+d)}$
	$A = 0.707h(2b + d)$	$\bar{x} = \frac{b^2}{2b+d}$ $\bar{y} = d/2$	$J_u = \frac{8b^3 + 6bd^2 + d^3}{12} - \frac{b^4}{2b+d}$
	$A = 1.414h(b + d)$	$\bar{x} = b/2$ $\bar{y} = d/2$	$J_u = \frac{[b+d]^3}{6}$
	$A = 1.414 \pi hr$		$J_u = 2\pi r^3$

$$\sigma_{max,min} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\tau_{max} = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$I = \frac{\pi}{64} (D_{out}^4 - D_{in}^4)$$

$$J = \frac{\pi}{32} (D_{out}^4 - D_{in}^4)$$