.3 A welded connection of steel plates, as shown in Fig.4-3 , is subjected to an eccentric

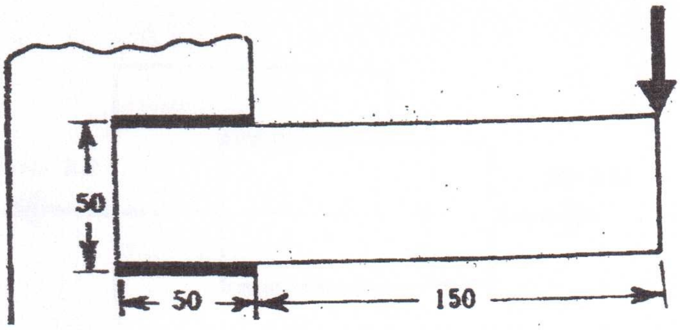


Fig. 4-3

force of 10 kN. Determine the throat dimension of the weld if the permissible shear stress is limited to 95 N/mm^2 . Assume static conditions.
(Ans. 8.59 mm)

.4 A solid circular shaft, 25 mm in diameter, is welded to a support by means of a fillet weld as shown in Fig. 4-4 Determine the leg dimension of the weld if the permissible shear stress is 95 N/mm^2 .
(Ans. 7.64 mm)

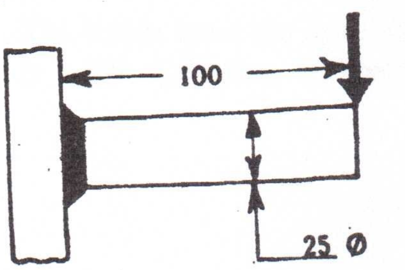
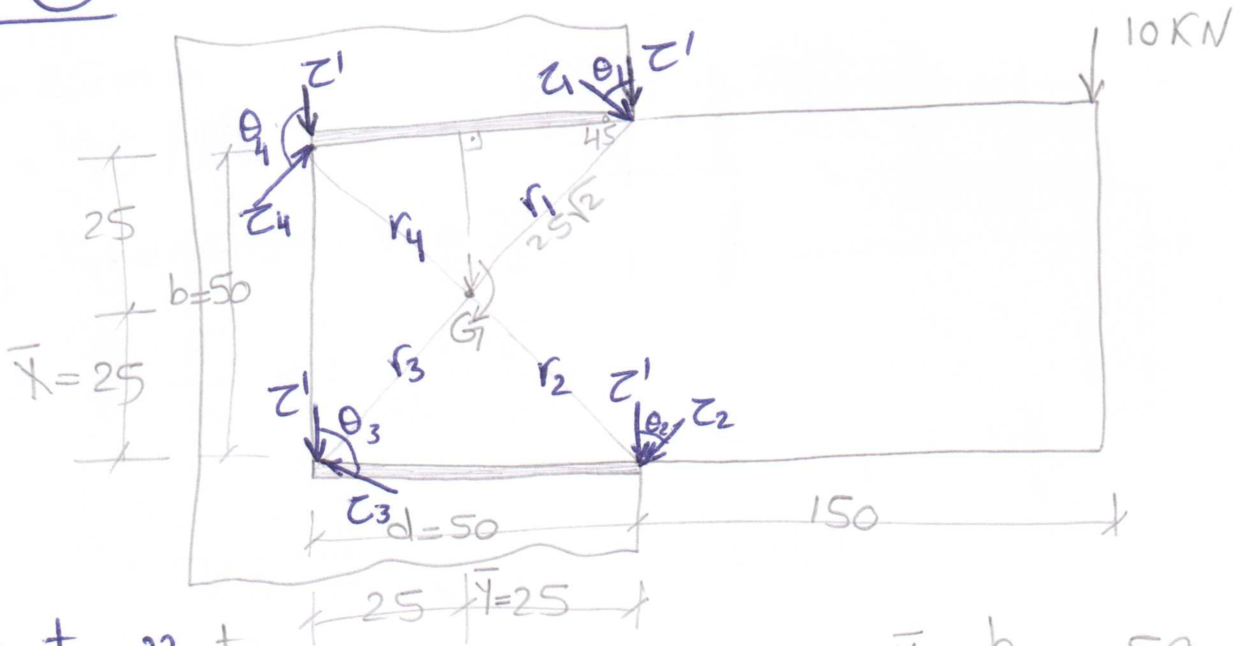


Fig. 4-4

No 3



throat = ?? = t

$\tau_{all} = 95\ MPa$

$\bar{X} = \frac{b}{2} = \frac{50}{2} = 25mm$

$\bar{Y} = \frac{d}{2} = \frac{50}{2} = 25mm$

$$\tau' = \frac{F}{A} = \frac{10 * 10^3}{0.707h * 2d} = \frac{141.44}{h}$$

$$\tau_s = \frac{Tr}{J} = \frac{10^4(150+25) * r}{0.707h\ J_u}$$

$$J_u = \frac{d(3b^2+d^2)}{6} = \frac{50(3*50^2+50^2)}{6} = 83333.3\ mm^3$$

the max. shear is expected at point ① or ② for symmetry

$r_1 = r_2 = r_3 = r_4 = 25\sqrt{2}$ mm

$\theta_1 = \theta_2 = 45°$

$$\tau_{s1} = \frac{(10^4 * 175) * 25\sqrt{2}}{0.707h * 83333.3} = \frac{1050.16}{h}$$

$$\tau_{max} = \sqrt{\tau'^2 + \tau_{s1}^2 + 2\tau'\tau_{s1}\cos\theta_1} \leq \tau_{all}$$

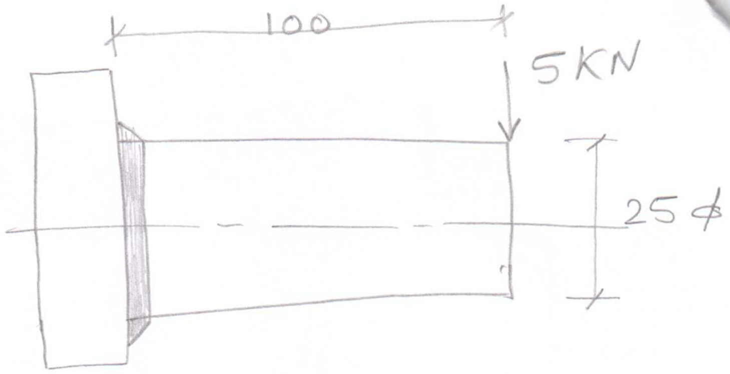
$$\sqrt{\left(\frac{141.44}{h}\right)^2 + \left(\frac{1050.16}{h}\right)^2 + 2\left(\frac{141.44}{h}\right)\left(\frac{1050.16}{h}\right)\cos 45} = 95$$

$$\frac{1154.51}{h} = 95$$

$$\therefore h = \frac{1154.51}{95} = 12.15\ mm$$

$t = 0.707h$
$= 8.59mm$

NO 4



$d = 25\,mm$

$\tau_{all} = 95\,MPa$

leg dimension $h = ??$

$$\tau = \frac{F}{A_w} = \frac{5 * 10^3}{1.414 \pi h r}$$

$$= \frac{5 * 10^3 * 2}{1.414 \pi h * 25} = \frac{90.045}{h}$$

$$\sigma_b = \frac{My}{I} = \frac{(5 * 10^3 * 100) * 25/2}{0.707h * \pi \left(\frac{25}{2}\right)^3} = \frac{1440.7}{h}$$

$$\tau_{max} = \sqrt{\left(\frac{\sigma_b}{2}\right)^2 + \tau^2} \leq \tau_{all}$$

$$\sqrt{\left(\frac{1440.7}{2h}\right)^2 + \left(\frac{90.045}{h}\right)^2} \leq 95$$

$$\frac{725.9678}{h} \leq 95$$

$$\frac{725.9678}{95} \leq h$$

$$h \geq 7.64\ mm$$