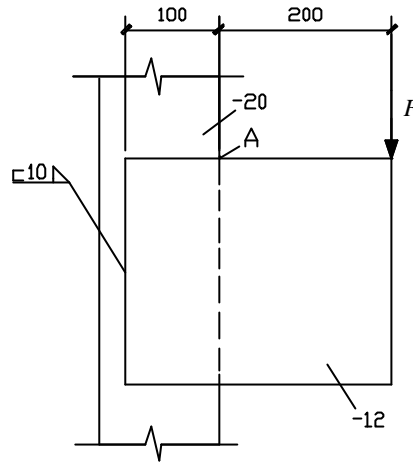


【题目】试设计如图所示厚度为 12mm 的支托板和柱搭接接头的角焊缝。作用力设计值 $F = 100\text{kN}$ (静力荷载), 至柱翼缘边距离为 200mm。钢材 Q235, 焊条 E43 系列。



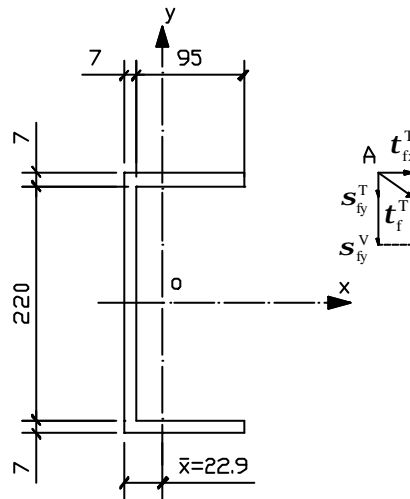
【解答】

采用三面围焊。

$$\text{选 } h_f = 10\text{mm} < h_{f\max} = 1.2t_{\min} = 1.2 \times 12 = 14.4\text{mm}$$

$$\leq h_{f\max} = t - (1 \sim 2) = 12 - (1 \sim 2) = 10 \sim 11\text{mm}$$

$$> h_{f\min} = 1.5\sqrt{t_{\min}} = 1.5\sqrt{20} = 6.7\text{mm}$$



一、焊缝有效截面的几何特性

焊缝有效截面的形心位置

$$\bar{x} = \frac{2 \times 0.7 \times 1 \times 9.5 \left(\frac{1}{2} \times 9.5 + 0.35 \right)}{0.7 \times (2 \times 9.5 + 23.4)} = 2.29\text{cm}$$

$$I_x = \frac{1}{12} \times 0.7 \times 1 \times 23.4^3 + 2 \times 0.7 \times 1 \times 9.5 \times 11.35^2 = 2461\text{cm}^4$$

$$I_y = 0.7 \times 1 \times 23.4 \times 2.29^2 + 2 \left[\frac{1}{12} \times 0.7 \times 1 \times 9.5^3 + 0.7 \times 1 \times 9.5 \left(\frac{9.5}{2} + 0.35 - 2.29 \right)^2 \right]$$

$$= 291 \text{cm}^4$$

$$I_p = 2461 + 291 = 2752 \text{cm}^4$$

二、焊缝强度验算 (A 点)

$$T = 100(20 + 10 + 0.35 - 2.29) = 2806 \text{kN} \cdot \text{cm}$$

$$s_{fy}^T = \frac{Tr_x}{I_p} = \frac{2806 \times 7.56 \times 10^5}{2752 \times 10^4} = 77 \text{N/mm}^2$$

$$t_{fx}^T = \frac{Tr_y}{I_p} = \frac{2806 \times 11.7 \times 10^5}{2752 \times 10^4} = 119 \text{N/mm}^2$$

$$s_{fy}^V = \frac{V}{A_f} = \frac{100 \times 10^3}{0.7 \times (2 \times 9.5 + 23.4) \times 10^2} = 34 \text{N/mm}^2$$

$$\sqrt{\left(\frac{s_{fy}^T + s_{fy}^V}{b_f} \right)^2} + (t_{fx}^T)^2 = \sqrt{\left(\frac{77 + 34}{1.22} \right)^2} + 119^2 = 150 \text{N/mm}^2$$

$$< f_f^w = 160 \text{N/mm}^2 \text{ (满足)}$$