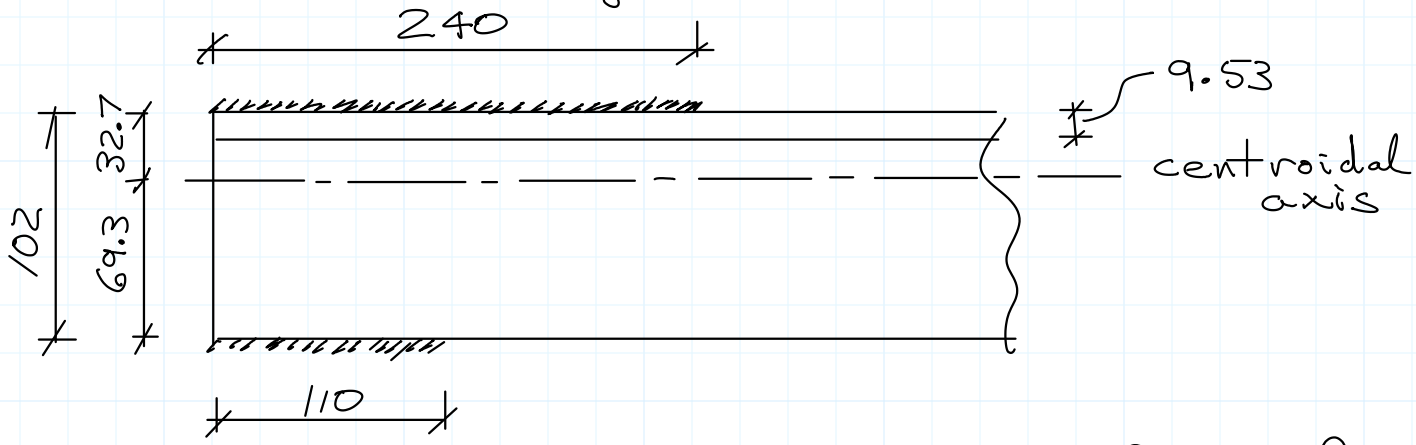
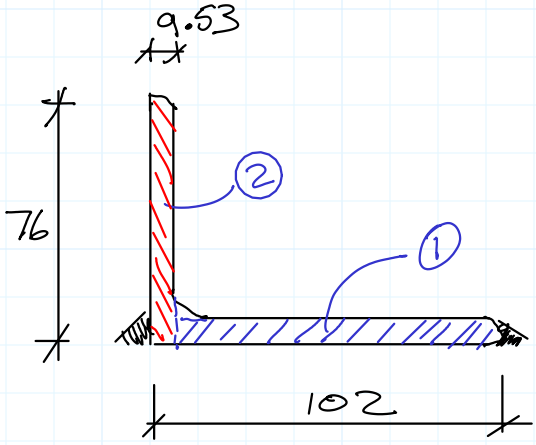
T_r for welded L102×76×9.5
350W Steel

350 mm weld, distributed thus:



For 'balanced weld' (minimize effect of eccentricities)

$240 \times 32.7 \approx 110 \times 69.3$ $(\Sigma M \approx 0)$



Area ① connected on 2 parallel edges

$L = \frac{110+240}{2} = 175\text{mm}$

$w = 102 - 9.53 = 92.47$

$2w > L > w$

$185 > 175 > 92.5$

$\therefore A_{n2} = 0.50wt + 0.25Lt$
$= 0.50 \times 92.47 \times 9.53$
$+ 0.25 \times 175 \times 9.53$
$= 857.6\ mm^2$

Area ② connected on one edge

$L = 240\text{mm}$
$w = 76\ mm$
$L > w$

$\bar{x} = \frac{76}{2} = 38\ mm$

$A_{n3} = \left(1 - \frac{\bar{x}}{L}\right) wt$

$= \left(1 - \frac{38}{240}\right) \times 76 \times 9.53$

$= 609.6\ mm^2$

$$A_{ne} = A_{n1} + A_{n2} + A_{n3}$$

$$= 0 + 857.6 + 609.6$$

$$= 1467 \text{ mm}^2$$

$$T_r = \phi_u A_{ne} F_u$$

$$= 0.75 \times 1467 \times .450 = 495 \text{ kN}$$

Note: L102x76x9.5 has $A_g = 1610$

$$A_{ne} = 0.91 A_g$$

$\therefore$ connection has "91% efficiency"

- longer welds would improve this, to a limited extent, although 91% isn't too terrible.