Esercizio

$T_2 = 7500 \, N$
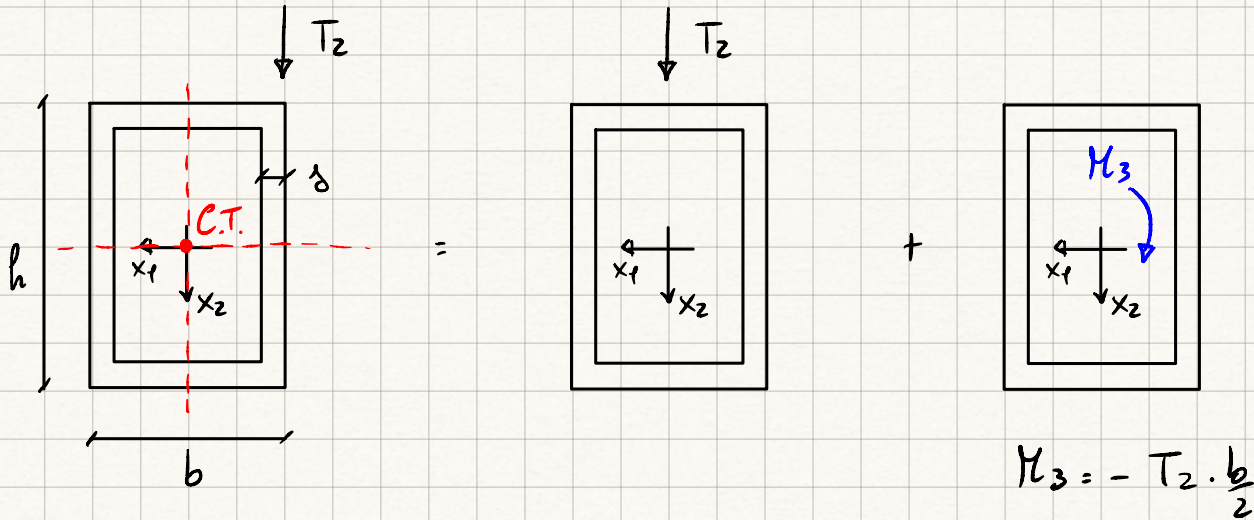
$b = 50 \, mm \qquad h = 100 \, mm \qquad \delta = 5 \, mm$

$I_1 = 1,74 \cdot 10^6 \, mm^4$

Svolgimento

Problema Taglio   Torsione

$M_3 = -T_2 \cdot \dfrac{b}{2}$
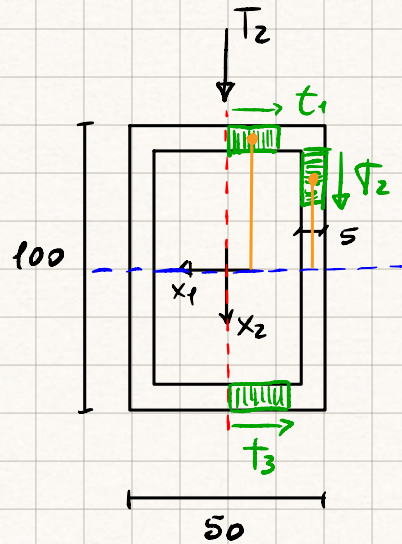
Risolviamo il problema di Taglio.

$$\tau_{3i} = -\frac{T_2 \, S_1^*}{I_1 \cdot \delta_j}$$

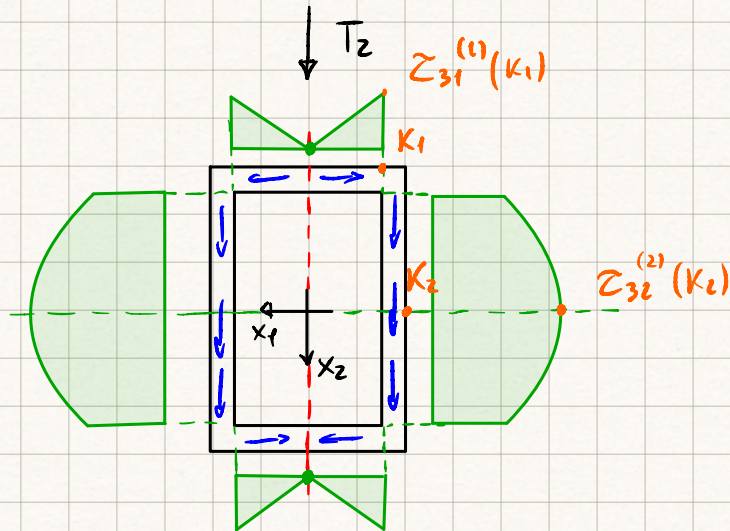$$S_1^{*(1)} = -5 \, T_1 \cdot (50 - 2,5)$$

$$S_1^{*(2)} = -5 \cdot 25 \cdot (50 - 2,5) - 5 \, T_2 \left(50 - 5 - \frac{T_2}{2}\right)$$

$$S_1^{*(3)} = -S_1^{*(1)}$$

$$\tau_{31}^{(1)} = -\frac{7500\left[-5\,T_1(50-2,5)\right]}{1,74\cdot 10^6 \cdot 5}$$

$$\tau_{32}^{(2)} = -\frac{7500\left[-5\cdot 25\cdot(50-2,5)-5\,T_2\left(50-5-\frac{T_2}{2}\right)\right]}{1,74\cdot 10^6 \cdot 5}$$

$$\tau_{31}^{(3)} = -\tau_{31}^{(1)}$$

$$\tilde{\tau}_{31}^{(1)}(K_1) = \frac{7500 \left[5 \cdot 20 \left(50 - 2,5 \right) \right]}{1,74 \cdot 10^6 \cdot 5} = 4,09 \text{ MPa}$$

$$\tilde{\tau}_{32}^{(2)}(K_2) = - \frac{7500 \left[-5 \cdot 25 \cdot \left(50 - 2,5 \right) - 5 \cdot 45 \cdot \left(50 - 5 - \frac{45}{2} \right) \right]}{1,74 \cdot 10^6 \cdot 5} = 9,48 \text{ MPa}$$

@gquadroblogesercizi

Risolviamo il problema di Torsione.

$$M_3 = -T_2 \cdot \frac{b}{2} =$$

$$= -7500 \cdot 25 \ Nmm$$

$$= -187500 \ Nmm$$
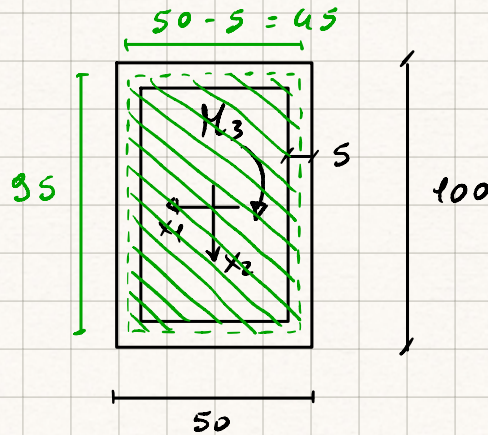
Formula di Bredt: $\quad \tau_{3i} = \dfrac{M_3}{2 \, \Omega \, \delta_j}$
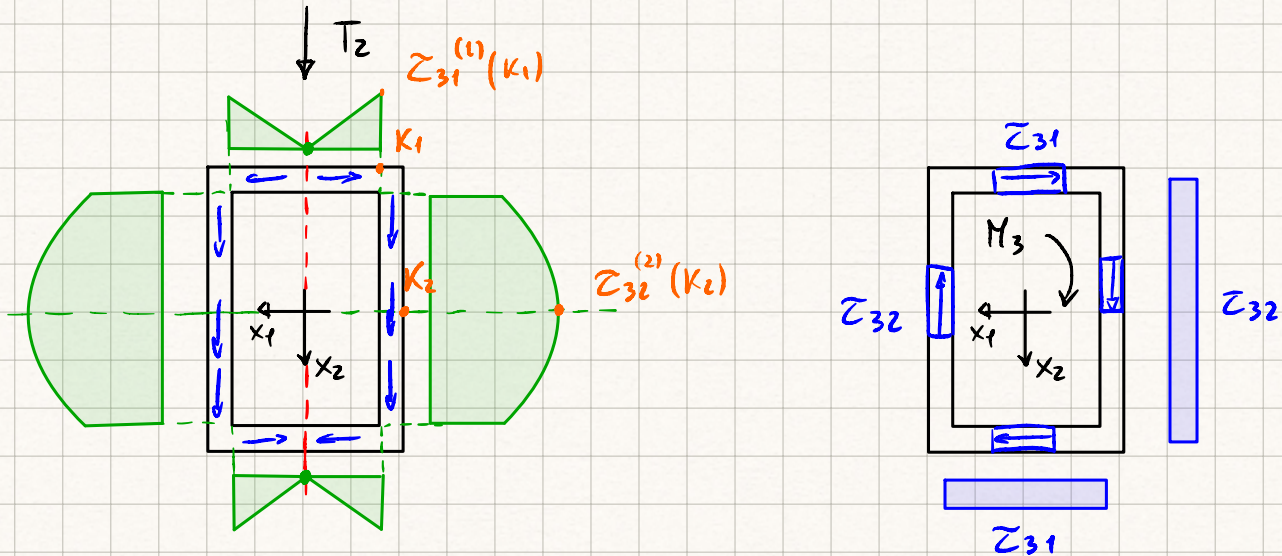
Ω = area racchiusa dalla linea media della sezione

δ_j = spessore del Tratto esaminato

$$\Omega = 95 \cdot 45 \ mm^2 = 4275 \ mm^2$$

$$\tau_{3i} = -\frac{187500}{2 \cdot 4275 \cdot \delta_j} \quad \Rightarrow \quad \tau_{31} = \tau_{32} = -\frac{187500}{2 \cdot 4275 \cdot 5} \ MPa =$$

$$= -4,39 \ MPa$$
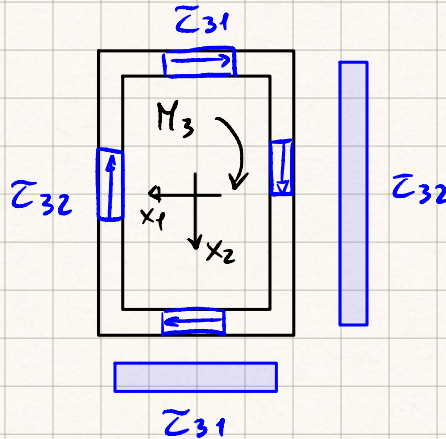
Unendo i risultati:

$$|\widetilde{\tau}_{32}(K_2)| = 9,48\ MPa + 4,35\ MPa = 13,87\ MPa$$