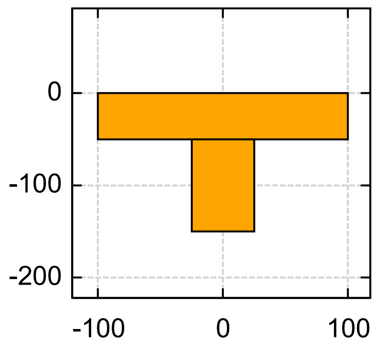
SHEAR FACTOR CALCULATIONS

Section geometry	Height	Width
Top subsection	$h_1 := 50\ mm$	$b_1 := 200\ mm$
Bottom subsection	$h_2 := 100\ mm$	$b_2 := 50\ mm$
Total section height	$h := h_1 + h_2 = 150\ mm$	

Section material	Elastic modulus	Shear modulus	(typical timber properties)
Top subsection	$E_1 := 11000\ MPa$	$G_1 := 600\ MPa$	
Bottom subsection	$E_2 := 11000\ MPa$	$G_2 := 600\ MPa$	
Shear stiffness	$GA := G_1 \cdot h_1 \cdot b_1 + G_2 \cdot h_2 \cdot b_2 = 9 \cdot 10^6\ N$		

Section view



$$y_n := \frac{b_2 \cdot h_2 \cdot E_2 \cdot \left(h_1 + \frac{h_2}{2}\right) + b_1 \cdot h_1 \cdot E_1 \cdot \frac{h_1}{2}}{b_1 \cdot h_1 \cdot E_1 + b_2 \cdot h_2 \cdot E_2}$$

Position of neutral axis from the top edge $y_n = 50\ mm$

$$EI := \frac{h_1^{3} \cdot b_1 \cdot E_1}{12} + \frac{h_2^{3} \cdot b_2 \cdot E_2}{12} + b_1 \cdot h_1 \cdot E_1 \cdot \left(y_n - \frac{h_1}{2}\right)^2 + b_2 \cdot h_2 \cdot E_2 \cdot \left(h_1 + \frac{h_2}{2} - y_n\right)^2$$

Bending stiffness $EI = 2,75 \cdot 10^{11}\ N\ mm^2$

$$k_s := \frac{6 \cdot \left(E_1 \cdot b_1 \cdot h_1 + E_2 \cdot b_2 \cdot \left(h - h_1\right)\right)^2 \cdot \left(E_1^{2} \cdot b_1 \cdot h_1^{3} \cdot \left(h_1 \cdot \left(h_1 \cdot \left(h_1 \cdot \left(h_1 \cdot \left(h_1 \cdot \left(\left(\left(E_2 \cdot b_2 \cdot \left(E_2 \cdot b_2 \cdot \left(E_2 \cdot b_2 \cdot \left(E_2 \cdot b_2 \cdot \left(E_2\right.\right.\right.\right.\right.\right.\right.\right.\right.\right.\right.\right.}{}$$

Bending stiffness	$EI = 2,75 \cdot 10^{11}\ N\ mm^2$
Shear correction factor	$k_s = 1,8$
Corrected shear stiffness	$GAc := \frac{GA}{k_s} = 5 \cdot 10^6\ N$