Double vertical post load bearing in long term-duration loading

Wood type: C24

Width of wooden element: $b := 90\ mm$

Height of wooden element: $h := 95\ mm$

Buckling length about x axis: $l_x := 2.886\ m$

Buckling length about y axis: $l_y := 0.962\ m$

Factor for support condition at the ends of the element: $\mu_x := 1 \quad \mu_y := 1$

Factor for solid timber straightness: $\beta_c := 0.2$

Charac. wood compression strength parallel to the grain: $f_{c.0.k} := 21\ MPa$

Charac. wood modulus of elasticity parallel to the grain: $E_{0.05} := 7400\ MPa$

Factor for duration loading and service: $k_{mod} := 0.6$

Partial factor for material properties: $\gamma_M := 1.30$

Design wood compression strength:

$$f_{c.0.d} := \frac{k_{mod} \cdot f_{c.0.k}}{\gamma_M} = 9.692\ \frac{N}{mm^2}$$

Cross-sectional area:

$$A := b \cdot h = 85.5\ cm^2$$

Second moment of area:

$$I_x := \frac{h^3 \cdot b}{12} = 643.031\ cm^4 \qquad I_y := \frac{h \cdot b^3}{12} = 577.125\ cm^4$$

Radius of gyration:

$$i_x := \sqrt{\frac{I_x}{A}} = 27.424\ mm \qquad i_y := \sqrt{\frac{I_y}{A}} = 25.981\ mm \qquad i := min\left(i_x, i_y\right) = 25.981\ mm$$

Design element length:

$$l_{ef.x} := \mu_x \cdot l_x = 2.886\ m \qquad l_{ef.y} := \mu_y \cdot l_y = 0.962\ m$$

Slenderness ratio:

$$\lambda_x := \frac{l_{ef.x}}{i_x} = 105.236 \qquad \lambda_y := \frac{l_{ef.y}}{i_y} = 37.027 \qquad \lambda := \max\left(\lambda_x, \lambda_y\right) = 105.236$$

Relative slenderness:

$$\lambda_{rel} := \frac{\lambda}{\pi} \cdot \sqrt{\frac{f_{c.0.k}}{E_{0.05}}} = 1.784$$

Instability factor:

$$k := 0.5 \cdot \left(1 + \beta_c \cdot \left(\lambda_{rel} - 0.3\right) + {\lambda_{rel}}^2\right) = 2.241$$

$$k_c := \frac{1}{k + \sqrt{k^2 - {\lambda_{rel}}^2}} = 0.278$$

Design buckling strength:

$$k_c \cdot f_{c.0.d} = 2.696 \ \frac{N}{mm^2}$$

Compressive stress/Design buckling strength equation :

$$N_{c.k} := f_{c.0.k} \cdot A \cdot k_c = 49.936 \ kN$$

$$N_{c.d} := f_{c.0.d} \cdot A \cdot k_c = 23.048 \ kN$$