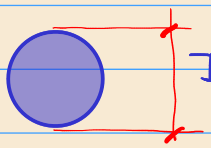
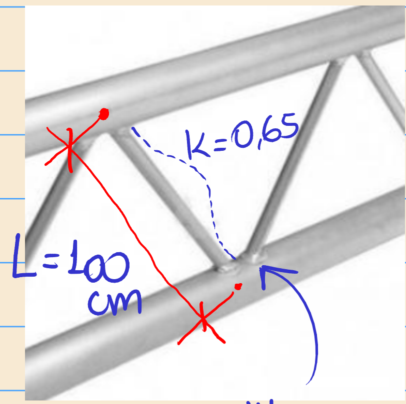
ROUND SECTION – DETERMINE THE DESIGN COMPRESSIVE STRENGTH.

CONSIDER A CIRCULAR CROSS-SECTION BAR WITH 20 mm OF DIAMETER AND LENGTH (L_c) OF 100 cm.





WELDED ALL THE ROUND

K – EFFETIVE LENGTH FACTOR

$K = 0.5$ → FOR DESIGN WE'LL ADOPT $K = 0.65$

↑ THEORETICAL VALUE.

THE SLENDERNESS RATIO

$$\lambda = \frac{L_c}{r} \leq 200$$

L_c ← EFFECTIVE LENGTH

r ← RADIUS OF GYRATION

$$r = \frac{D}{4} = \frac{2}{4} = 0.5 \text{ cm}$$

You can analyze the effective length or adopt a theoretical length factor.

$$\lambda = \frac{0.65 \cdot 100}{0.5} = 130 < 200 \quad \text{OK!}$$

(lambda

FOLLOWING THE ROAD MAP

TABLE USER NOTE E1.1 Selection Table for the Application of Chapter E Sections				
Cross Section	Without Slender Elements		With Slender Elements	
	Sections in Chapter E	Limit States	Sections in Chapter E	Limit States
	E3	FB	NA	NA

FB → FLEXURAL BUCKLING.

E3 → CHAPTER E3 IS APPLICABLE

We don't have slender elements and as a consequence we don't have local buckling in this case.

ELASTIC BUCKLING STRESS

(E → 20000, units kN/cm²)

$$F_e = \frac{\pi^2 . E}{\left(\frac{L_c}{r}\right)^2} = \frac{\pi^2 . 20000}{130^2} = 11.68 \text{ kN/cm}^2$$

Yield Stress

$$f_y = 25 \text{ kN/cm}^2$$

E3 - FLEXURAL BUCKLING OF MEMBER WITHOUT SLENDER ELEMENTS.

$$4.71\sqrt{\frac{20000}{25}} = 133.22$$

$$\frac{L_c}{r} \leq 4.71\sqrt{\frac{E}{f_y}} \Rightarrow F_n = \left(0.658^{\frac{F_y}{F_e}}\right) \cdot f_y$$

OR

$$\frac{L_c}{r} > 4.71\sqrt{\frac{E}{f_y}} \Rightarrow F_n = 0.877 \cdot F_e$$

$$P_n = F_n \cdot A_g$$

GROSS AREA

$$A_g = \frac{\pi \cdot D^2}{4} = \frac{\pi \cdot 2^2}{4} = 3,1416 \text{ cm}^2$$

$$F_n = \left(0.658^{\frac{F_y}{F_e}}\right) \cdot F_y$$

$$F_n = \left(0.658^{\frac{25}{11.68}}\right) \cdot 25 = 10.206 \text{ kN/cm}^2$$

$P_n = F_n \cdot A_g = 32{,}063$ kN

$\phi_c P_n = 0.9 \times 32{,}063 = 28{,}857$ kN