$$Ycg := \frac{510 \cdot 810 \cdot \frac{810}{2} + 2 \cdot \left(300 \cdot 150 \cdot \frac{300}{2} \right)}{810 \cdot 510 + 2 \cdot 300 \cdot 150}$$ $Ycg := \text{round}(Ycg, 0)\ \text{mm}$ $Ycg = 359\text{mm}$

$c2 := 359\text{mm}$ $c1 := 810\text{mm} - c2$

$$x := 510 \cdot \frac{810^3}{12}\ \text{mm}^4 + 510 \cdot 810 \cdot \left(\frac{810\text{mm}}{2} - c2 \right)^2\ \text{mm}^2$$

$$y := 2 \cdot \left[150 \cdot \frac{300^3}{12}\ \text{mm}^4 + 150 \cdot 300\text{mm}^2 \cdot \left(\frac{300\text{mm}}{2} - c2 \right)^2 \right]$$

$I := x + y$ $I = 2.807 \times 10^{10}\ \text{mm}^4$

$Ac := 510 \cdot 810\text{mm}^2 + 2 \cdot 300 \cdot 150\text{mm}^2$

$S2 := \frac{I}{c2}$ $r := \sqrt{\frac{I}{Ac}}$

Datos

$Pi := 3250\text{kN}$ $R := 0.8$ $e := 285\text{mm}$ $fc := 35\text{MPa}$

$fci := 30\text{MPa}$ $Ap := 2700\text{mm}^2$ $\varepsilon cu := 0.003$ $b := 510\text{mm}$ $dp := 735\text{mm}$

1.- Calculos

$Pe := Pi \cdot R$ $fr := 0.625 \sqrt{\frac{fc}{1\text{MPa}}} \cdot \text{MPa}$ $Mcr := fr \cdot S2 + Pe \cdot \left(\frac{r^2}{c2} + e \right)$

$Pe = 2.6 \times 10^3\ \text{kN}$ $c2 = 359\text{mm}$ $S2 = 7.818 \times 10^7\ \text{mm}^3$

$fr = 3.698\text{MPa}$ $r^2 = 5.579 \times 10^4\ \text{mm}^2$ $Mcr = 1.434 \times 10^3\ \text{kN} \cdot \text{m}$

2a.- Calculos

$Ep := 1500\frac{MPa}{0.008}$ $Ec := 4700\cdot\sqrt{\frac{fc}{1MPa}}\,MPa$ $\varepsilon 1 := \frac{Pe}{Ap\cdot Ep}$ $\varepsilon 2 := \frac{Pe}{Ac\cdot Ec}\cdot\left(1+\frac{e^2}{r^2}\right)$

$\beta 1 := 0.85 - 0.008\cdot\left(\frac{fc}{1MPa} - 30\right)$ $fpu := 1800MPa$ $fpy := 1500MPa$

Tomo fps por Iteracion

$fps := 1505MPa$

$a := Ap\cdot\frac{fps}{\beta 1\cdot fc\cdot b}$ $c := \frac{a}{\beta 1}$ $\varepsilon 3 := \varepsilon cu\cdot\frac{dp - c}{c}$ $\varepsilon ps := \varepsilon 1 + \varepsilon 2 + \varepsilon 3$

$resp := if(a \le 510mm, "Viga Rectangular", "Viga T")$ $resp = "Viga Rectangular"$

$\varepsilon 1 = 5.136\times 10^{-3}$ $\varepsilon 2 = 4.565\times 10^{-4}$ $\varepsilon 3 = 3.355\times 10^{-3}$ $\varepsilon ps = 8.947\times 10^{-3}$

$a = 281.046mm$ $c = 346.97mm$ $\beta 1 = 0.81$

$fps := if\left[\varepsilon ps \le 0.008, \frac{1500}{0.008}\cdot\varepsilon ps, \frac{fpu - fpy}{(0.067 - 0.008)\cdot 1MPa}\cdot(\varepsilon ps - 0.008) + 1500\right]\cdot MPa$

$Mn := Ap\cdot fps\cdot\left(dp - \frac{a}{2}\right)$

$fps = 1.505\times 10^{3}\,MPa$

$Mn = 2.415\times 10^{3}\,kN\cdot m$

2b.- Calculos

Según ACI

$$\rho p := \frac{Ap}{b \cdot dp} \qquad \frac{fpy}{fpu} = 0.833$$

$$\gamma p := if\left[\left(0.8 \le \frac{fpy}{fpu}\right) < 0.85, 0.55, if\left(0.85 \le \frac{fpy}{fpu} < 0.9, 0.4, 0.28\right)\right] \qquad \gamma p = 0.55$$

$$fps := fpu \cdot \left(1 - \frac{\gamma p}{\beta 1} \cdot \rho p \cdot \frac{fpu}{fc}\right) \qquad fps = 1.347 \times 10^3 \text{ MPa}$$

$$Mn := Ap \cdot fps \cdot \left(dp - \frac{a}{2}\right) \qquad Mn = 2.162 \times 10^3 \text{ kN·m}$$

y con γp de 0.4, para los que no consideraron el 1er caso

$$\gamma p := 0.4$$

$$fps := fpu \cdot \left(1 - \frac{\gamma p}{\beta 1} \cdot \rho p \cdot \frac{fpu}{fc}\right) \qquad fps = 1.471 \times 10^3 \text{ MPa}$$

$$Mn := Ap \cdot fps \cdot \left(dp - \frac{a}{2}\right) \qquad Mn = 2.361 \times 10^3 \text{ kN·m}$$