

EN 1993-1-3

## Design Summary

| Check            | Reference | Ratio |
|------------------|-----------|-------|
| Section Capacity | 6.2       | 0.47  |

## CROSS-SECTION CHECK [EN1993.1.1(6.2)]

### Loading

Axial Force  $N_{Ed} = -69.4 \text{ kN}$

Shear Force of Major Axis  $V_{Ed,y} = -53.9 \text{ kN}$

Shear Force of Minor Axis  $V_{Ed,z} = 0.0 \text{ kN}$

Moment Force of Major Axis  $M_{y,Ed} = 149.58 \text{ kN m}$

Moment Force of Minor Axis  $M_{z,Ed} = 0.0 \text{ kN m}$

Kombinasyon adi

1.35xDEAD+1.35xSELF+1.35xPURLIN+1.35xSHEETING+1.5xSNOW1+1.05xWindRight(Cpi+)

### Cross-Section Properties

Section : HEA300 (Hot Rolled)

$h$  : 290 mm

$b$  : 300 mm

$t_w$  : 8.5 mm

$t_f$  : 14 mm

$r$  : 27 mm

$A$  : 109.35 cm<sup>2</sup>

$I_{yy}$  : 17779.6 cm<sup>4</sup>

$i_y$  : 12.8 cm

$I_{zz}$  : 6304.01 cm<sup>4</sup>

$i_z$  : 7.59 cm

$W_{el,y}$  : 420.27 cm<sup>3</sup>

$W_{el,z}$  : 420.27 cm<sup>3</sup>

$W_{pl,y}$  : 1344.1 cm<sup>3</sup>

$W_{pl,z}$  : 637.36 cm<sup>3</sup>

$W_{eff,y}$  : 1192.04 cm<sup>3</sup>

$W_{eff,z}$  : 420 cm<sup>3</sup>

Steel Grade : S275

### Material Properties

Modulus of Elasticity ,  $E = 2.100\text{E}+8 \text{ kN/m}^2$

Shear Modulus ,  $G = 8.077\text{E}+7 \text{ kN/m}^2$

Yield Strength ,  $f_y = 275000 \text{ kN/m}^2$

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– *Compression Resistance* [EN 1993- 6.2.4]

$$N_{c,Rd} = \frac{A \times f_y}{\gamma_{M0}} = \frac{0.01094 \times 275000}{1.1} = 2733.75 \text{ kN}$$

$$\frac{N_{Ed}}{N_{c,Rd}} = \frac{|-69.4|}{|2733.75|} = 0.0254 \leq 1 \rightarrow \text{Satisfactory}$$

– *Shear Resistance About Major Axis* [EN 1993– 6.2.6]

$$V_{pl,y,Rd} = \frac{A_{vz} \times (f_y / \sqrt{3})}{\gamma_{M0}} = \frac{0.01 \times (275000 / \sqrt{3})}{1.1} = 492.19 \text{ kN}$$

$$\tau_{t,Ed} = \frac{T_{Ed}}{I_t} \times \max\{t_w, t_f\} = \frac{0.0}{8.52E-07} \max\{0.0085, 0.014\} = 0.0 \text{ kN/m}^2$$

$$\tau_{t,Ed} = 0 \rightarrow V_{pl,y,T,Rd} = V_{pl,y,Rd}$$

$$\frac{V_{Ed,y}}{V_{pl,y,T,Rd}} = \frac{|-53.9|}{|492.19|} = 0.11 \leq 1 \rightarrow \text{Satisfactory}$$

– *Shear Resistance About Minor Axis* [EN 1993– 6.2.6]

$$V_{Ed,z} = 0 \rightarrow \text{Satisfactory}$$

– *Bending Resistance About Major Axis* [EN 1993– 6.2.5]

$$V_{Ed,y} \leq 0.5 V_{pl,T,Rd} \rightarrow -53.9 \leq 0.5 \times 492.19 (246.1 \text{ kN})$$

→ *No moment reduction needed* (6.2.8)

$$M_{c,y,Rd} = M_{pl,y,Rd} = \frac{W_{pl,y} \times f_y}{\gamma_{M0}} = \frac{0.00134 \times 275000}{1.1} = 336.03 \text{ kN m}$$

– *Bending Resistance About Minor Axis* [EN 1993– 6.2.5]

$$V_{Ed,z} = 0 \rightarrow \text{No moment reduction needed (6.2.8)}$$

$$M_{c,z,Rd} = M_{pl,z,Rd} = \frac{W_{pl,z} \times f_y}{\gamma_{M0}} = \frac{0.000637 \times 275000}{1.1} = 159.34 \text{ kN m}$$

– *Section Check Ratio* [EN 1993– 6.2.9]

$$M_{z,Ed} = 0 \text{ and } \Delta M_{z,Ed} = 0 \rightarrow$$

$$\frac{N_{Ed}}{N_{Rd}} + \frac{M_{y,Ed} + \Delta M_{y,Ed}}{M_{y,Rd}} \leq 1$$

$$\frac{|-69.4|}{2733.75} + \frac{|149.58 + 0.0|}{336.03} = 0.471 \leq 1 \rightarrow \text{Satisfactory}$$