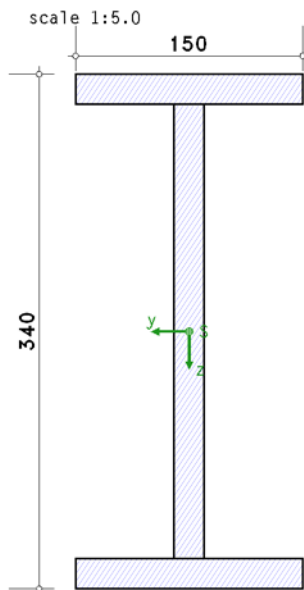


POS. 12: KINDMANN/KRÜGER 5.6.4

verification of cross-section EC 3-1-8 (12.10), NA: Deutschland

1. input report



steel

steel grade S235

material safety factor

resistance of cross-sections $\gamma_{M0} = 1.00$

geometry

parameter (I-section):

overall depth $h = 340.0$ mm, web thickness $t_w = 20.0$ mm

flange width $b_f = 150.0$ mm, flange thickness $t_f = 20.0$ mm

welded section, full penetrated (DHW-weld)

resistance

plastic verification acc. to EC 3-1-1, 6.2

internal forces and moments referring to local axes of cross-section

σ -generating forces (N, M) work at centroid, τ -generating forces (V, T_t) work at shear center

Lk 1: $N_{Ed} = 1410.00$ kN, $M_{y,Ed} = 112.00$ kNm, $M_{z,Ed} = 39.80$ kNm

notes

buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: $N = 1410.00$ kN, $M_y = 112.00$ kNm, $M_z = 39.80$ kNm

2.1.1. plastic verification

plastic verification for $N = 1410.00$ kN, $M_y = 112.00$ kNm, $M_z = 39.80$ kNm

plate buckling: section class of the section $1 \leq 2$ **ok**

plastic values: $N_{pl,Rd} = A \cdot f_y / \gamma_{M0} = 2820.00$ kN, $M_{pl,y,Rd} = W_{pl,y} \cdot f_y / \gamma_{M0} = 331.35$ kNm

$M_{pl,z,Rd} = W_{pl,z} \cdot f_y / \gamma_{M0} = 59.89$ kNm

bending and axial force

deduction M_y : $N_{c,lim} = \min(0.25 \cdot N_{pl,Rd}, 0.5 \cdot A_w \cdot f_y / \gamma_{M0}) = 705.00$ kN, $A_w = h_w \cdot t_w = 6000.00$ cm²

$N_{Ed} > N_{c,lim}$: $f_{N,y} = (1-n)/(1-0.5 \cdot a) = 0.667 < 1$, $n = |N_{Ed}| / N_{pl,Rd} = 0.500$, $a = (A - A_f) / A = 0.500 \leq 0.5$

$A_f = 2 \cdot b_f \cdot t_f = 60.00$ cm², $A = 120.00$ cm² $\Rightarrow M_{pl,N,y,Rd} = M_{pl,y,Rd} \cdot f_{N,y} = 220.90$ kNm

deduction M_z : $N_{c,lim} = A_w \cdot f_y / \gamma_{M0} = 1410.00$ kN, $A_w = h_w \cdot t_w = 6000.00$ cm²

$N_{Ed} \leq N_{c,lim}$ or $n \leq a$: $f_{N,z} = 1 \Rightarrow M_{pl,z,Rd} = M_{pl,z,Rd} \cdot f_{N,z} = 59.89$ kNm

bending

verification: $(|M_{y,Ed}| / M_{pl,N,y,Rd})^\alpha + (|M_{z,Ed}| / M_{pl,z,Rd})^\beta = 0.257 + 0.360 = 0.617 < 1$ **ok**

with $\alpha = 2.00$, $\beta = 2.50 = 5 \cdot n \geq 1$

utilization: $U = 0.617^{1/2} = 0.786$

3. final result

maximum utilization: resistance max $U = 0.786 < 1$ **ok**

verification succeeded