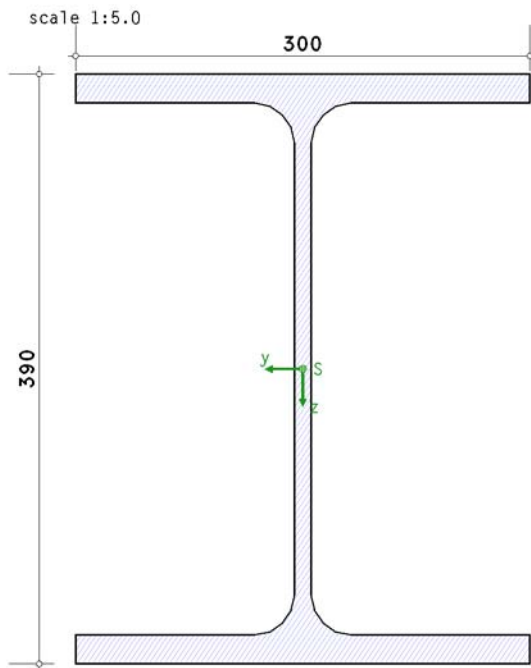


POS. 2: WAGENKNECHT 2.6.2

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

section HE400A

resistance

elastic verification, calculation as thin-walled cross-section

valid normal, shear-, equivalent stress: $\sigma_{x,Rd} = 235.0 \text{ N/mm}^2$, $\tau_{Rd} = 135.7 \text{ N/mm}^2$, $\sigma_{v,Rd} = 235.0 \text{ N/mm}^2$

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: $N_{Ed} = -1190.00 \text{ kN}$, $M_{y,Ed} = 225.00 \text{ kNm}$, $V_{z,Ed} = 370.00 \text{ kN}$, $M_{z,Ed} = -26.00 \text{ kNm}$, $V_{y,Ed} = -180.00 \text{ kN}$

notes

buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: $N = -1190.00 \text{ kN}$, $M_y = 225.00 \text{ kNm}$, $V_z = 370.00 \text{ kN}$, $M_z = -26.00 \text{ kNm}$, $V_y = -180.00 \text{ kN}$

2.1.1. elastic verification

elastic verification for $N = -1190.00 \text{ kN}$, $M_y = 225.00 \text{ kNm}$, $V_z = 370.00 \text{ kN}$, $M_z = -26.00 \text{ kNm}$

$V_y = -180.00 \text{ kN}$

elastic stresses: $\max |\sigma_x| = 217.75 \text{ N/mm}^2$, $\max \tau = 95.50 \text{ N/mm}^2$, $\max \sigma_v = 218.45 \text{ N/mm}^2$

$\max \sigma_x$ bei $y = 150.0 \text{ mm}$, $z = 195.0 \text{ mm}$: $\sigma_x = 68.07 \text{ N/mm}^2$, $\tau = 0.00 \text{ N/mm}^2$, $\sigma_v = 68.07 \text{ N/mm}^2$

$\min \sigma_x$ bei $y = -150.0 \text{ mm}$, $z = -195.0 \text{ mm}$: $\sigma_x = -217.75 \text{ N/mm}^2$, $\tau = 0.00 \text{ N/mm}^2$, $\sigma_v = 217.75 \text{ N/mm}^2$

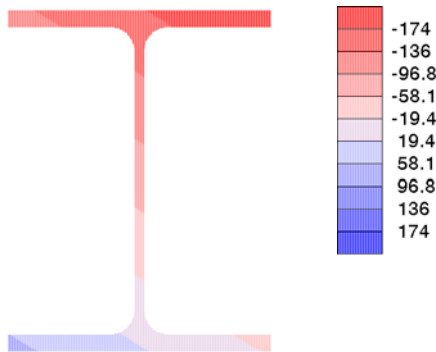
$\max \tau$ bei $y = 0.0 \text{ mm}$, $z = 0.0 \text{ mm}$: $\sigma_x = -74.84 \text{ N/mm}^2$, $\tau = 95.50 \text{ N/mm}^2$, $\sigma_v = 181.55 \text{ N/mm}^2$

$\max \sigma_v$ bei $y = 0.0 \text{ mm}$, $z = -185.5 \text{ mm}$: $\sigma_x = -167.45 \text{ N/mm}^2$, $\tau = 81.00 \text{ N/mm}^2$, $\sigma_v = 218.45 \text{ N/mm}^2$

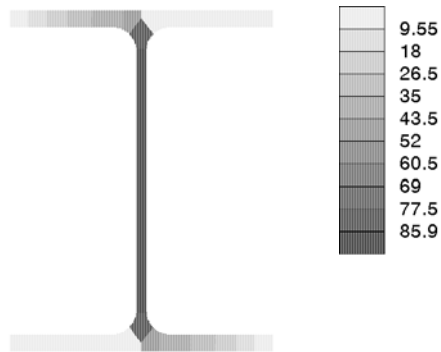
valid equivalent stress: $\sigma_{v,Rd} = 235.0 \text{ N/mm}^2$

verification: $\sigma_v = 218.45 \text{ N/mm}^2 < \sigma_{v,Rd} = 235.00 \text{ N/mm}^2 \Rightarrow U_\sigma = 0.930 < 1$ **ok**

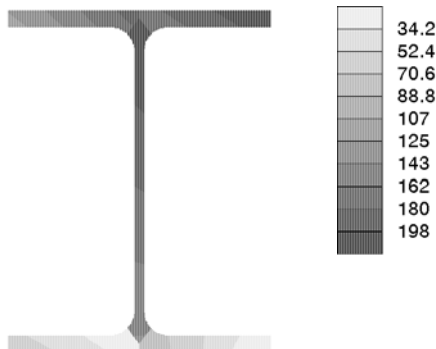
normal stresses σ_x [N/mm²]
min σ_x = -217.8, max σ_x = 68.1



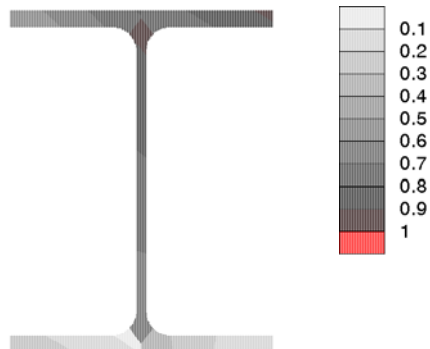
shear stresses τ [N/mm²]
max τ = 95.5



equivalent stresses σ_v [N/mm²]
max σ_v = 218.5



utilization U_σ
max U_σ = 0.930



stresses, utilizations

y mm	z mm	σ_x N/mm ²	τ N/mm ²	σ_v N/mm ²	U_σ
-300.0	0.0	-217.83	0.00	217.83	0.927
-150.0	9.5	-167.55	81.00	218.53	0.930
-144.5	195.0	-73.19	95.50	180.87	0.770
0.0	390.0	68.13	0.00	68.13	0.290

y,z: node coordinates; σ_x, τ, σ_v : stresses; U_σ : stress utilization

3. final result

maximum utilization: resistance max $U = 0.930 < 1$ **ok**

verification succeeded