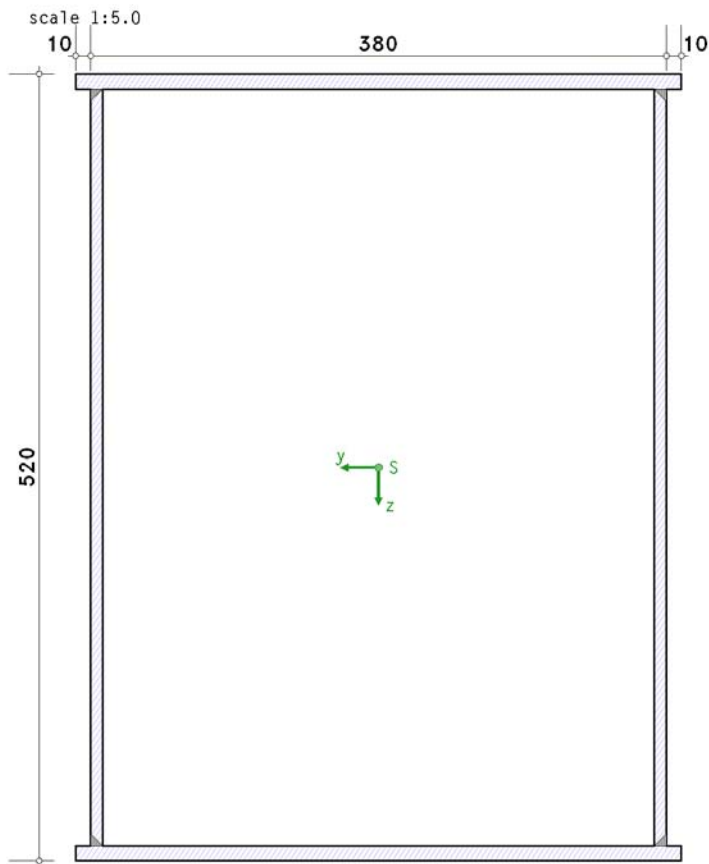


POS. 6: WAGENKNECHT 8.4.1

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 parameters (box section):

overall depth $h = 520.0$ mm, web thickness $t_w = 8.0$ mm, flange width $b_f = 380.0$ mm

projection $b_{\bar{u}} = 10.0$ mm, flange thickness $t_f = 10.0$ mm

resistance

elastic verification, calculation as thin-walled cross-section

valid normal, shear-, equivalent stress: $\sigma_{x,Rd} = 235.0$ N/mm², $\tau_{Rd} = 135.7$ N/mm², $\sigma_{v,Rd} = 235.0$ N/mm²

internal forces and moments referring to main axes

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

Lk 1: $M_{y,Ed} = 484.00$ kNm, $V_{z,Ed} = 185.00$ kN, $T_{t,Ed} = 162.00$ kNm

notes

buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: $M_y = 484.00$ kNm, $V_z = 185.00$ kN, $T_t = 162.00$ kNm

2.1.1. elastic verification

elastic verification for $M_y = 484.00$ kNm, $V_z = 185.00$ kN, $T_t = 162.00$ kNm

elastic stresses: $\max |\sigma_x| = 183.19$ N/mm², $\max \tau = 80.73$ N/mm², $\max \sigma_v = 217.03$ N/mm²

$\max \sigma_x$ bei $y = 200.0$ mm, $z = 260.0$ mm: $\sigma_x = 183.19$ N/mm², $\tau = 2.27$ N/mm², $\sigma_v = 183.23$ N/mm²

$\min \sigma_x$ bei $y = 200.0$ mm, $z = -260.0$ mm: $\sigma_x = -183.19$ N/mm², $\tau = -2.27$ N/mm², $\sigma_v = 183.23$ N/mm²

$\max \tau$ bei $y = 190.0$ mm, $z = 0.0$ mm: $\sigma_x = 0.00$ N/mm², $\tau = 80.73$ N/mm², $\sigma_v = 139.83$ N/mm²

$\max \sigma_v$ bei $y = 186.0$ mm, $z = 255.0$ mm: $\sigma_x = 179.67$ N/mm², $\tau = 70.29$ N/mm², $\sigma_v = 217.03$ N/mm²

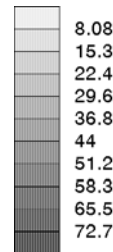
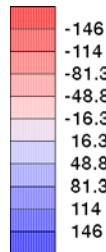
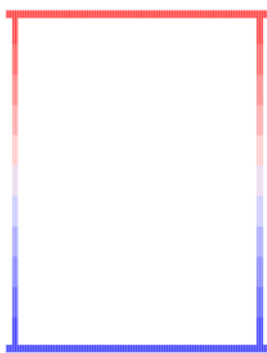
valid equivalent stress: $\sigma_{v,Rd} = 235.0$ N/mm²

verification: $\sigma_v = 217.03 \text{ N/mm}^2 < \sigma_{v,Rd} = 235.00 \text{ N/mm}^2 \Rightarrow U_\sigma = 0.924 < 1$ **ok**

c/t-ratio: outstand flange: utilization $U_{c/t} = 0.063 < 1$ **ok**
 internal compression parts: utilization $U_{c/t} = 0.758 < 1$ **ok**
 total: utilization $U_{c/t} = 0.758 < 1$ **ok**

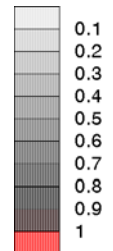
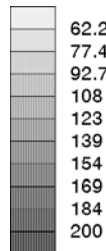
normal stresses σ_x [N/mm²]
 min $\sigma_x = -183.0$, max $\sigma_x = 183.0$

shear stresses τ [N/mm²]
 max $\tau = 80.8$



equivalent stresses σ_v [N/mm²]
 max $\sigma_v = 216.9$

utilization U_σ
 max $U_\sigma = 0.923$



stresses, utilizations

y mm	z mm	σ_x N/mm ²	τ N/mm ²	σ_v N/mm ²	U_σ	y mm	z mm	σ_x N/mm ²	τ N/mm ²	σ_v N/mm ²	U_σ
0.0	0.0	-182.95	2.27	182.99	0.779	-14.0	515.0	179.56	70.22	216.87	0.923
0.0	520.0	182.95	2.27	182.99	0.779	-10.0	260.0	0.00	80.79	139.93	0.595
-14.0	5.0	-179.56	70.22	216.87	0.923						

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

3. final result

maximum utilization: stress max $U_\sigma = 0.924 < 1$ **ok**
 c/t-ratio max $U_{c/t} = 0.758 < 1$ **ok**
 resistance max $U = 0.924 < 1$ **ok**

verification succeeded