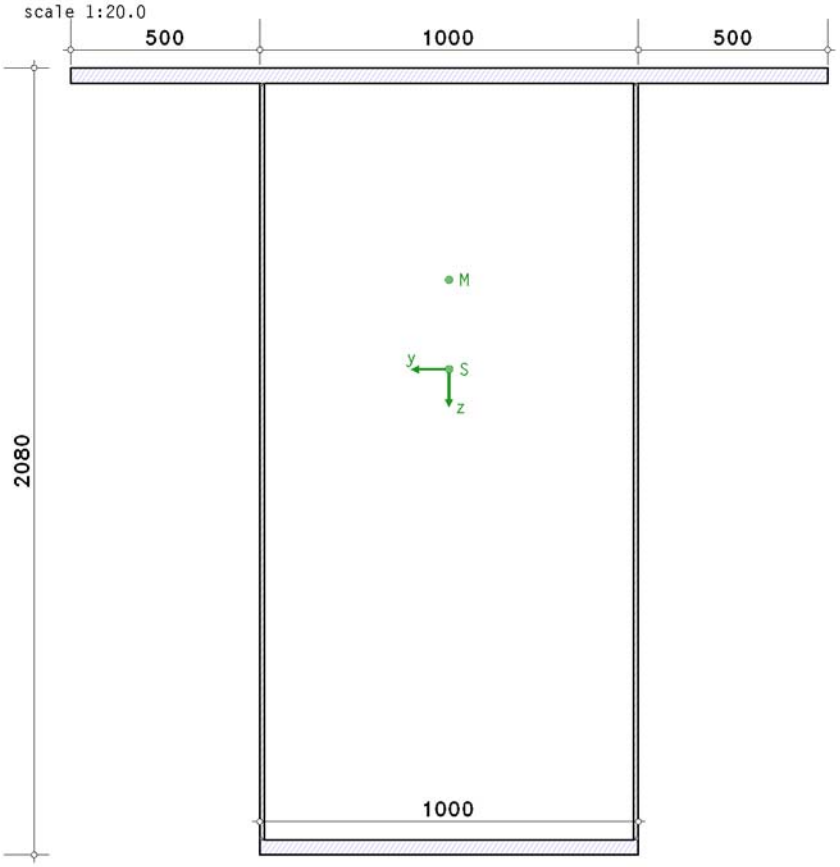
# POS. 31: VAYAS/ERMOPOULOS/IOANNIDIS 3

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

## 1. input report




**steel**
steel grade S355
**material safety factor**
resistance of cross-sections $\gamma_{M0}$ = 1.00
**geometry**
section parameters (box section):
overall depth h = 2080.0 mm, web thickness $t_w$ = 12.0 mm, flange width $b_f$ = 1000.0 mm
thickness of flanges $t_{fo}$ = 40.0 mm, $t_{fu}$ = 40.0 mm, projectione $b_{üo}$ = 500.0 mm, $b_{üu}$ = 0.0 mm
**resistance**
elastic verification, calculation with the stress plane (without shear)
valid normal stress: $\sigma_{x,Rd}$ = 355.0 N/mm²,
**internal forces and moments refering to local axes of cross-section**
$\sigma$-generating forces (N, M) work at centroid, $\tau$-generating forces (V, $T_t$) work at shear center
Lk 1: $M_{y,Ed}$ = 5000.00 kNm
Lk 2: $M_{y,Ed}$ = -5000.00 kNm
Lk 3: $M_{z,Ed}$ = 1000.00 kNm

notes
buckling is not investigated.

## 2. Lk 1

### 2.1. verification of cross-section

#### 2.1.1. elastic verification
elastic verification for $M_y$ = 5000.00 kNm
c/t-verification
flange top: section class 1, utilization $U_{c/t}$ = 0.209
projection top: section class 3, utilization $U_{c/t}$ = 0.321
webs: section class 3, utilization $U_{c/t}$ = 0.286
total: section class 3, c/t-utilization $U_{c/t}$ = 0.321 < 1 ok
verification

stress plane $\sigma_x = 0.00 + -0.000 \cdot y + 0.038 \cdot z$
min./max. normal stress $\sigma_{x,max} = 48.98$ N/mm², $\sigma_{x,min} = -30.44$ N/mm²
verification $U_\sigma = \sigma_{Ed}/\sigma_{Rd} = 0.138 < 1$ ok

# 3. Lk 2

## 3.1. verification of cross-section

### 3.1.1. elastic verification

elastic verification for $M_y = -5000.00$ kNm
c/t-verification
flange bottom: section class 1, utilization $U_{c/t} = 0.265$
webs: section class 3, utilization $U_{c/t} = 0.840$
total: section class 3, c/t-utilization $U_{c/t} = 0.840 < 1$ ok
verification
stress plane $\sigma_x = 0.00 + -0.000 \cdot y + -0.038 \cdot z$
min./max. normal stress $\sigma_{x,max} = 30.44$ N/mm², $\sigma_{x,min} = -48.98$ N/mm²
verification $U_\sigma = \sigma_{Ed}/\sigma_{Rd} = 0.138 < 1$ ok

# 4. Lk 3

## 4.1. verification of cross-section

### 4.1.1. elastic verification

elastic verification for $M_z = 1000.00$ kNm
c/t-verification
flange top: section class 1, utilization $U_{c/t} = 0.033$
projection top: section class 3, utilization $U_{c/t} = 0.148$
flange bottom: section class 1, utilization $U_{c/t} = 0.033$
webs: section class 3, utilization $U_{c/t} = 0.654$
total: section class 3, c/t-utilization $U_{c/t} = 0.654 < 1$ ok
verification
stress plane $\sigma_x = 0.00 + -0.013 \cdot y + 0.000 \cdot z$
min./max. normal stress $\sigma_{x,max} = 12.92$ N/mm², $\sigma_{x,min} = -12.92$ N/mm²
verification $U_\sigma = \sigma_{Ed}/\sigma_{Rd} = 0.036 < 1$ ok

# 5. final result

| | | |
|---|---|---|
| **maximum utilization [Lk 2]:** | stress | max $U_\sigma = 0.138 < 1$ ok |
| | c/t-ratio | max $U_{c/t} = 0.840 < 1$ ok |
| | resistance | max $U = 0.840 < 1$ ok |

**verification succeeded**