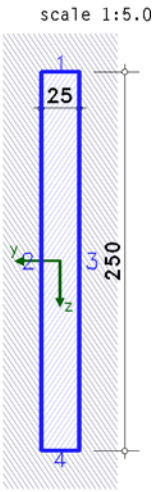
POS. 7: FLAT STEEL, EC3, STANDARD

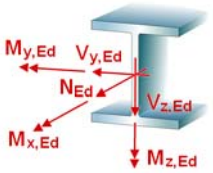
4H-EC3SA version: 10/2014-1m

Welded connection

EC 3-1-8 (12.10), NA: Deutschland



material
steel grade S 235
geometry
section parameters (flat steel):
length h = 250.0 mm, thickness t = 25.0 mm
plate: thickness t_p = 35.0 mm
welds as fillet weld:
a_{w1} = 6.0 mm, l_{w1} = 25.0 mm a_{w2} = 6.0 mm, l_{w2} = 250.0 mm a_{w3} = 6.0 mm, l_{w3} = 250.0 mm
a_{w4} = 6.0 mm, l_{w4} = 25.0 mm
design resistance
elastic cross-sectional check
weld verification with the simplified method
resolution of shear force is made by the stiffness of the single weld.
internal forces and moments (sign definition of statics)
Lk 1: N_{Ed} = 1.90 kN $V_{z,Ed}$ = -2.87 kN $M_{z,Ed}$ = 4.26 kNm



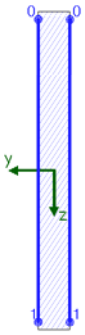
Lk 1:

cross-sectional check

design values:	N_{Ed} = 1.90 kN, $V_{z,Ed}$ = -2.87 kN, $M_{z,Ed}$ = 4.26 kNm
elastic stresses:	max σ_x = 163.9 N/mm², min σ_x = -163.3 N/mm², max τ = 0.7 N/mm², max σ_v = 163.9 N/mm²
valid stresses:	σ_{Rd} = 235.0 N/mm², τ_{Rd} = 135.7 N/mm²
utilizations:	design resistance U_σ = 0.697 < 1 ok.

verification of welds

calculation section:
weld 1: effective weld length l_{eff} = 13.0 mm < 30 mm ⇒ has no effect !!
weld 1: effective weld length l_{eff} = 13.0 mm < 6·a = 36.0 mm ⇒ has no effect !!
weld 4: effective weld length l_{eff} = 13.0 mm < 30 mm ⇒ has no effect !!
weld 4: effective weld length l_{eff} = 13.0 mm < 6·a = 36.0 mm ⇒ has no effect !!



weld 2: a_w = 6.0 mm l_w = 238.0 mm
weld 3: a_w = 6.0 mm l_w = 238.0 mm

design values:
N_{Ed} = 1.90 kN, $V_{z,Ed}$ = -2.87 kN, $M_{z,Ed}$ = 4.26 kNm
cross-sectional properties refering to centroid of the line cross section:
ΣA_w = 28.56 cm², Σl_w = 47.6 cm
$I_{w,y}$ = 1348.13 cm⁴, $I_{w,z}$ = 45.48 cm⁴, Δy_w = 0.0 mm, Δz_w = 0.0 mm
member forces distributed to the individual welds:
weld 2: N_w = -166.24 kN $M_{z,w}$ = 0.04 kNm $V_{z,w}$ = -1.44 kN
weld 3: N_w = 168.14 kN $M_{z,w}$ = 0.04 kNm $V_{z,w}$ = -1.44 kN
verifications in the edge points of the individual welds:
weld 2, pt. 0: $\sigma_{w,x}$ = -116.41 N/mm² $\tau_{w,z}$ = 1.00 N/mm² $\Rightarrow$ U_w = 0.560 < 1 **ok.**
pt. 1: $\sigma_{w,x}$ = -116.41 N/mm² $\tau_{w,z}$ = 1.00 N/mm² $\Rightarrow$ U_w = 0.560 < 1 **ok.**
weld 3, pt. 0: $\sigma_{w,x}$ = 117.75 N/mm² $\tau_{w,z}$ = 1.00 N/mm² $\Rightarrow$ U_w = 0.567 < 1 **ok.**
pt. 1: $\sigma_{w,x}$ = 117.75 N/mm² $\tau_{w,z}$ = 1.00 N/mm² $\Rightarrow$ U_w = 0.567 < 1 **ok.**
Result:
weld 3, pt. 0: $\sigma_{w,x}$ = 117.75 N/mm² $\tau_{w,z}$ = 1.00 N/mm²
$F_{w,Ed}$ = 7.06 kN/cm < $F_{w,Rd}$ = 12.47 kN/cm $\Rightarrow$ U_w = 0.567 < 1 **ok.**

Final result

maximum utilization: design resistance max U = 0.697 < 1 **ok.**

verification succeeded