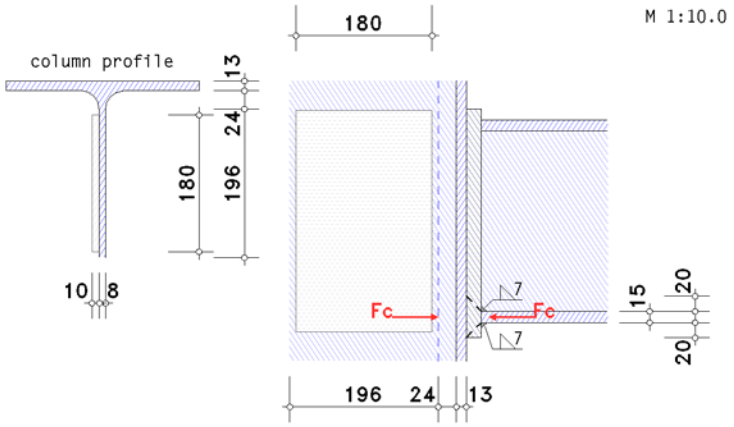
POS. 24: COLUMN WEB IN TRANSVERSE COMPRESSION

4H-EC3GK version: 1/2012-1k

beam or column web in transverse compression

Basic component 2

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



column:
- clear depth of the web d_c = 196.0 mm
- web thickness t_{wc} = 8.0 mm
- flange thickness t_{fc} = 13.0 mm
- root resp. leg length of the web weld s_c = 24.0 mm
- steel grade S 275
- shear area (without reinforcement) A_{vc} = 3174.00 mm²

beam:
- flange thickness t_{fb} = 15.0 mm
- weld between beam compression flange and end-plate: a_p = 7.0 mm

dispersion measure through end-plate: $s_p = 2 \cdot 20.0$ = 40.0 mm
reinforcement of column web with 1 supplementary web plate(s):
- plate thickness t_s = 10.0 mm, width b_s = 180.0 mm

longitudinal compressive stress in column web $\sigma_{com,Ed}$ = 159.0 N/mm²
transformation parameter β = 1.00
safety factors: γ_{M0} = 1.00, γ_{M1} = 1.10
stress:
- Lk 1 : $F_{c,wc,Ed}$ = 300.0 kN

design resistance

thickness of supplementary web plate t_s = 10.0 mm > thickness of column web t_{wc} = 8.0 mm **ok.**
width of supplementary web plate b_s = 180.0 mm < clear depth of the column web d_c = 196.0 mm **ok.**
width of supplementary web plate b_s = 180.0 mm < $40 \cdot \varepsilon \cdot t_s$ = 369.77 mm, ε = 0.92 **ok.**
width of supplementary web plate b_s = 180.0 mm > $d_c - 2 \cdot t_s$ = 176.0 mm, ass.: fillet weld with $a_s = t_s / 2^{0.5}$ = 7.1 mm **ok.**

effective width of column web in transverse compression $b_{eff,c,wc} = t_{fb} + 2 \cdot 2^{1/2} \cdot a_p + 5 \cdot (t_{fc} + s_c) + s_p$ = 259.8 mm
reinforcement of web with 1 supplementary web plate: effective web thickness $t_w = (1 + 0.5 \cdot n_s \cdot t_w)$ = 12.0 mm
assembly of supplementary web plates:
increase of shear area of $b_s \cdot t_{s,eff}$ = 720.00 mm², $t_{s,eff}$ = 4.0 mm
shear area with supplementary web plates A_v = 3894.00 mm²
plate slenderness $\lambda_p = 0.932 \cdot [(b_{eff,c} \cdot d_w \cdot f_y) / (E \cdot t_w^2)]^{1/2}$ = 0.634
reduction factor for web buckling $\rho = (\lambda_p - 0.2) / \lambda_p^2$ = 1.08 > 1.0 $\Rightarrow$ ρ = 1.00
reduction factor for interaction with shear stress: β = 1 $\Rightarrow$ ω = 0.74
design resistance of column/beam web in transverse compression:
- $F_{c,w,Rd} = \omega \cdot (k_w \cdot b_{eff,c} \cdot t_w \cdot f_{y,w}) / \gamma_{M0}$ = 633.2 kN, k_w = 1.00
- $F_{c,w,Rd,max} = \omega \cdot (k_w \cdot \rho \cdot b_{eff,c} \cdot t_w \cdot f_{y,w}) / \gamma_{M1}$ = 575.6 kN
- $F_{c,w,Rd} > F_{c,w,Rd,max}$ $\Rightarrow$ $F_{c,w,Rd}$ = 575.6 kN

verification

Lk 1: $F_{Ed} = 300.0$ kN $<$ $F_{Rd} = 575.6$ kN $\Rightarrow$ utilization $= 0.521 < 1$ **ok.**