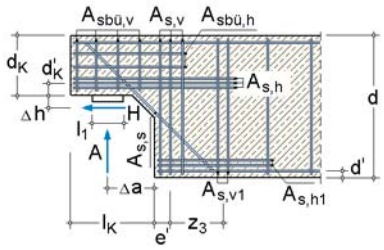
POS. 12: AUFLAGERK. VAR. 2

half joint

design calculation acc. to DIN EN 1992-1-1 (EC 2) / NA: Deutschland (4H-BETON version: 11/2007-4l)



reinforcem.BSt 500 (A)
concrete C30/37
material safety $\gamma_s = 1.15$, $\gamma_c = 1.50$

variant 2
beam section
width b = 30.0 cm height d = 60.0 cm
corbel section
length l_K = 30.0 cm height d_K = 30.0 cm
bearing plate
length l_1 = 10.0 cm width b_1 = 20.0 cm
lateral concrete cover (for anchorage length) c_V = 3.0 cm
reinforcement edge distances
d' = 6.0 cm d'_K = 4.0 cm (z_K = 22.0 cm, z_Q = 23.4 cm)
load (design calculation values - design loads)
A_d = 150.0 kN at Δa = 15.0 cm H_d = 40.0 kN at Δh = 3.0 cm
with e' = 8.0 cm ⇒ e = Δa + e' = 23.0 cm
design calculation acc. to Heft 525 (Heft 399), DAfStb
bearing stress: σ_a = 7.50 MN/m² < $\sigma_{Rd,max}$ = 14.45 MN/m²
verification of shear force: V_{Ed} = 150.0 kN < $V_{Rd,max}$ = 386.1 kN
load part for vertical reinforcement A_V = 0.40·A = 60.0 kN
tens. reinf. hor. : Z_{A+H} = 115.6 kN => min $A_{s,h}$ = 2.66 cm²
vertical: $Z_\perp$ = 60.0 kN => min $A_{s,v}$ = 1.38 cm²
anchoring of $A_{s,h}$: $Z_{V,1}$ = 57.8 kN => min $A_{s,v1}$ = 1.33 cm²
at z_3 = 56.0 cm
tens. splitt. reinf.: horizontal stirrup reinf. ($A_{sbü,v}$ non-struc.)
$\Delta a/d_K \le 0.5$ and $V_{Ed} > 0.3 \cdot V_{Rd,max}$ =115.8 kN ⇒ min $A_{sbü,h}$ = 1.33 cm²
load part for bent-up bars A_S = 90.0 kN with α = 45.0°
tension reinforcement schräg: Z_S = 127.3 kN => min $A_{s,s}$ = 2.93 cm²
tension anchoring for Z_{A+H} = 115.6 kN ⇒ min $A_{s,h1}$ = 2.66 cm²

selected:

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horiz. tensile reinf.   As,h :  4 Ø 10 = 2x3.1 = 6.3 cm² > 2.66 cm²
                vertical As,v :  4 Ø 10 = 2x3.1 = 6.3 cm² > 1.38 cm²
   anchoring of As,h    As,v1 :  3 Ø 8 = 2x1.5 = 3.0 cm² > 1.33 cm²
anchorage length from As,h :  min lb = 7.7 cm < 17.0 cm
 from beam-sided bearing plate edge towards corbel edge (lateral concrete cover 3.0 cm)
tensile split. reinf. Asbü,h :  3 Ø 8 = 2x1.5 = 3.0 cm² > 1.33 cm²
tension anchoring      As,h1 :  5 Ø 8 = 2x2.5 = 5.0 cm² > 2.66 cm²

!  reinforcement altogether 2-shear  !
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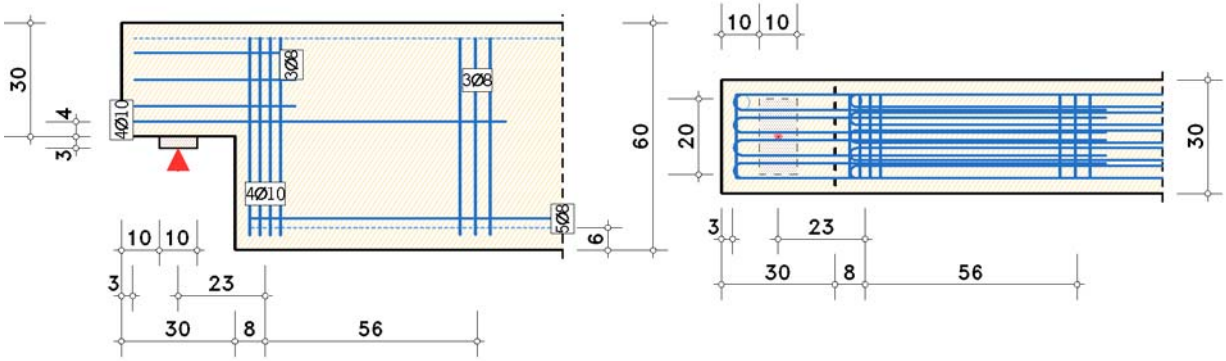
reinforcement drawing:

scale 1 : 20

plan view: min dbr = 4.0 cm



material properties

concrete	f_{ck}	α	ε_{c2}	ε_{c2u}	n_c	E_{cm}	f_{ctm}
	MN/m²	-	‰	‰	-	MN/m²	MN/m²
C30/37	30.0	0.850	-2.00	-3.50	2.00	32836.6	2.896

design value of compression strength $f_{cd} = \alpha_c f_{ck} / \gamma_c$
strain at reaching the maximum strength ε_{c2}, ult. compr. strain ε_{c2u}
concr. comp. stress $\sigma_c = f_{cd} (1-(1-\varepsilon_c/\varepsilon_{c2})^n)$ for $0 \geq \varepsilon_c > \varepsilon_{c2}$ and $\sigma_c = f_{cd}$ for $\varepsilon_{c2} \geq \varepsilon_c > \varepsilon_{c2u}$
modulus of elasticity E_{cm}, mean value of axial tensil strength f_{ctm}

reinforcem.	f_{yk}	f_{tk}	ε_{su}	E_s
	MN/m²	MN/m²	‰	MN/m²
BSt 500 (A)	500.0	525.0	25.00	200000.0

design yield strength $f_{yd} = f_{yk} / \gamma_s$
design tensile strength $f_{td} = f_{tk} / \gamma_s$
ult. tensile strain ε_{su}, modulus of elasticity E_s