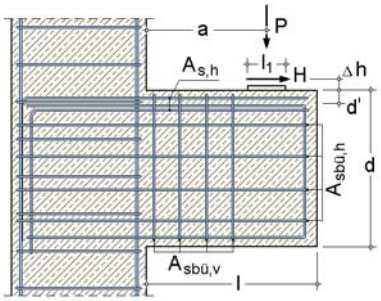
POS. 6: WALL BRACKET DIRECT

corbel

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 $\gamma_s = 1.15$, $\gamma_c = 1.50$

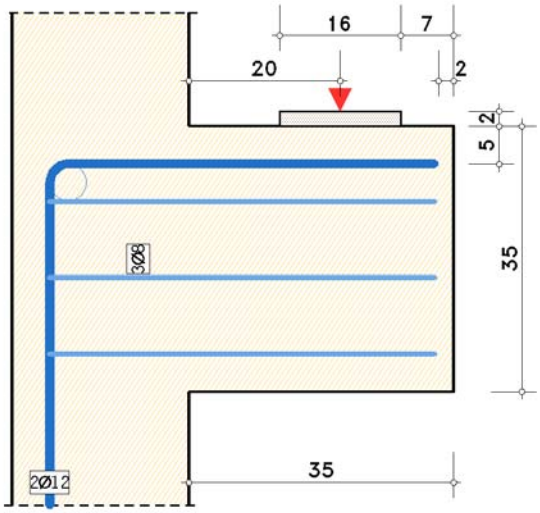
direct load introduction
corbel section
length l = 35.0 cm width b = 30.0 cm height d = 35.0 cm
bearing plate: length l_1 = 16.0 cm width b_1 = 12.0 cm
lateral concrete cover (for anchorage length) c_v = 2.0 cm
reinforcement edge distance
d' = 5.0 cm ⇒ h = 30.0 cm (z_Q = 27.0 cm, z_{P+H} = 25.0 cm)
load (design calculation values - design loads)
P_d = 187.0 kN at a = 20.0 cm H_d = 41.0 kN at Δh = 2.0 cm
method acc. to Heft 525, DAfStb
bearing stress: $\sigma_a = 9.74$ MN/m² < $\sigma_{Rd,max}$ = 14.45 MN/m²
verification of shear force: V_{Ed} = 187.0 kN < $V_{Rd,max}$ = 445.5 kN
tensile chord reinf.: Z = Z_{P+H} = 202.3 kN ⇒ min $A_{s,h}$ = 4.65 cm²
tens. spl. reinf.: vertical stirrup reinf. ($A_{sbü,h}$ non-struc.)
a > 0.5d and V_{Ed} > $V_{Rd,ct}$ = 38.8 kN ⇒ min $A_{sbü,v}$ = 3.01 cm²

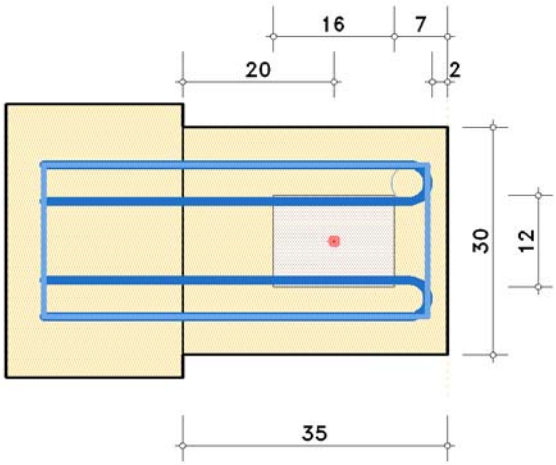
selected:
tensile chord reinf. $A_{s,h}$: 2 Ø 12 = 2x2.26 = 4.5 cm² < 4.65 cm²
anchorage length from $A_{s,h}$: min l_b = 21.0 cm ≥ 21.0 cm
from column-sided bearing plate edge towards corbel edge (lateral concrete cover 2.0 cm)
tensile splitting reinforcement $A_{sbü,h}$: 3 Ø 8 = 2x1.51 = 3.0 cm²

! reinforcement altogether 2-shear !

reinforcement drawing:
scale 1 : 10

plan view: As,h: min dbr = 4.8 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