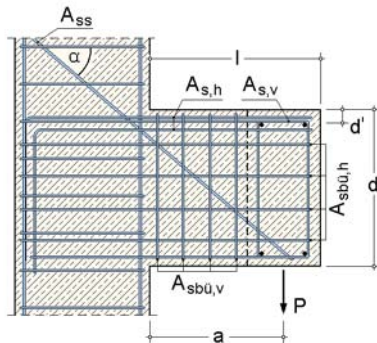


POS. 7: WALL BRACKET INDIRECT

corbel

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



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

indirect load introduction

corbel section

length $l = 35.0$ cm width $b = 30.0$ cm height $d = 35.0$ cm

reinforcement edge distance

$d' = 5.0$ cm $\Rightarrow h = 30.0$ cm ($z_0 = 27.0$ cm, $z_{P+H} = 27.0$ cm)

load (design calculation values - design loads)

$P_d = 187.0$ kN at $a = 20.0$ cm

distribution of load P_d into $P_{top} = 0.60 P$ and $P_{bottom} = 0.40 P$

method acc. to Heft 525, DAfStb

verifications for den load part $P_{top} = 112.2$ kN:

tensile chord reinf.: $Z_P = 83.2$ kN $\Rightarrow \min A_{s,h} = 1.91$ cm²

supporting reinf.: $Z_{\perp} = 112.2$ kN $\Rightarrow \min A_{s,v} = 2.58$ cm²

tens. spl. reinf.: vertical stirrup reinf. ($A_{sbü,h}$ non-struct.)

$a > 0.5d$ and $V_{Ed} > V_{Rd,ct} = 32.5$ kN $\Rightarrow \min A_{sbü,v} = 1.81$ cm²

verification of load part $P_{bottom} = 74.8$ kN ($\alpha = 39.8^\circ$):

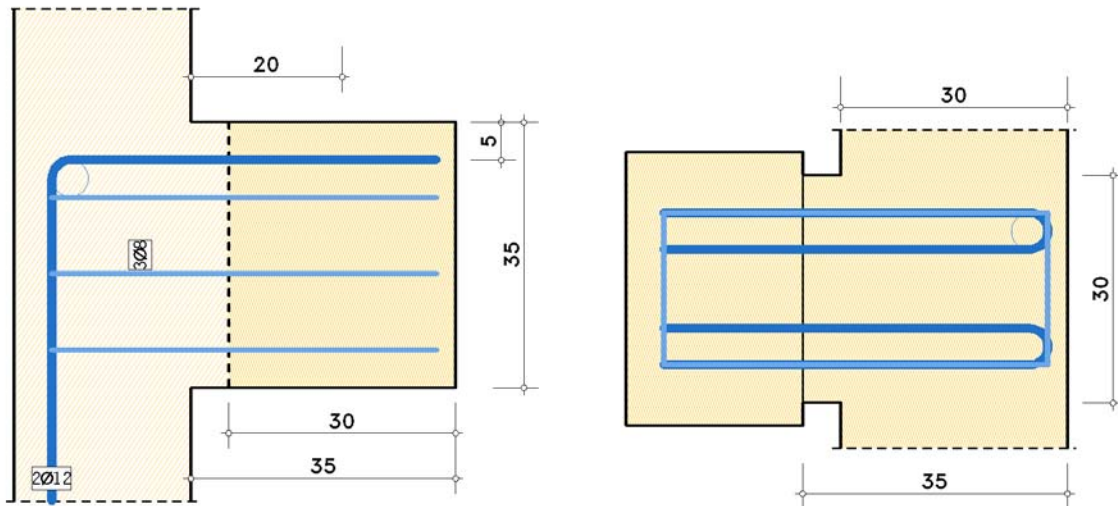
inclined reinf.: $Z_s = 93.1$ kN $\Rightarrow \min A_{s,s} = 2.14$ cm²

selected: tensile chord reinf. $A_{s,h} : 2 \text{ } \varnothing 12 = 2 \times 2.26 = 4.5 \text{ cm}^2 > 1.91 \text{ cm}^2$
tensile splitting reinforcement $A_{sbü,h} : 3 \text{ } \varnothing 8 = 2 \times 1.51 = 3.0 \text{ cm}^2$
! reinforcement altogether 2-shear !

reinforcement drawing:

scale 1 : 10

plan view: $A_{s,h}$: min dbr = 4.8 cm



material properties

concrete	f_{ck}	α	ϵ_{c2}	ϵ_{c2u}	n_c	E_{cm}	f_{ctm}
	MN/m ²	-	‰	‰	-	MN/m ²	MN/m ²
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 $\sigma_c = f_{cd} (1 - (\epsilon_c / \epsilon_{c2})^n)$ for $0 \leq \epsilon_c < \epsilon_{c2}$ and $\sigma_c = f_{cd}$ for $\epsilon_c \geq \epsilon_{c2}$
 modulus of elasticity E_{cm} , mean value of axial tensile strength f_{ctm}

reinforcem.	f_{yk}	f_{tk}	ϵ_{su}	E_s
	MN/m ²	MN/m ²	‰	MN/m ²
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