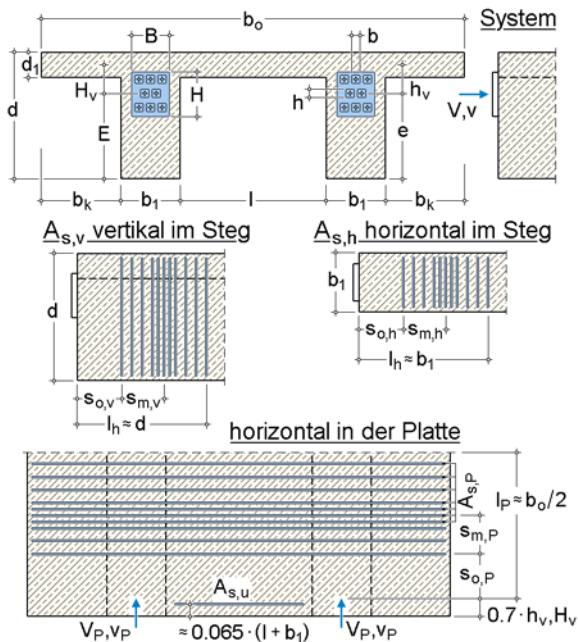


POS. 14: LOAD INTRODUCTION VAR 2

load introduction

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



variant 2 (F.Leonhardt, T.2)

cross section

heights: $d = 120.0 \text{ cm}$ $d_1 = 25.0 \text{ cm}$

widths: $b_k = 65.0 \text{ cm}$ $b_1 = 170.0 \text{ cm}$ $l = 65.0 \text{ cm}$

loaded area and design value of point load

$b = 25.0 \text{ cm}$ $h = 25.0 \text{ cm}$ $e = 55.0 \text{ cm}$ $V_{Ed} = 1271.0 \text{ kN}$

loaded area and design value of load group

$B = 55.0 \text{ cm}$ $H = 55.0 \text{ cm}$ $E = 60.0 \text{ cm}$ $V_{Ed} = 4887.0 \text{ kN}$

design calculation of point load

vertical : tensile force $Z_v = 257.8 \text{ kN} \Rightarrow A_{s,v} = 5.9 \text{ cm}^2$

$\sigma = 0$ at $s_{0,v} = 0.15 \text{ m}$ σ_{\max} at $s_{m,v} = 0.20 \text{ m}$

horizontal: tensile force $Z_h = 299.8 \text{ kN} \Rightarrow A_{s,h} = 6.9 \text{ cm}^2$

$\sigma = 0$ at $s_{0,h} = 0.17 \text{ m}$ σ_{\max} at $s_{m,h} = 0.31 \text{ m}$

slab : tensile force $Z_p = 94.3 \text{ kN} \Rightarrow A_{s,p} = 2.2 \text{ cm}^2$

($h_v = 0.52 \text{ m}$) $\sigma = 0$ at $s_{0,p} = 0.19 \text{ m}$ σ_{\max} at $s_{m,p} = 0.45 \text{ m}$

design calculation of load group

vertical : tensile force $Z_v = 475.8 \text{ kN} \Rightarrow A_{s,v} = 10.9 \text{ cm}^2$

$\sigma = 0$ at $s_{0,v} = 0.22 \text{ m}$ σ_{\max} at $s_{m,v} = 0.20 \text{ m}$

horizontal: tensile force $Z_h = 826.5 \text{ kN} \Rightarrow A_{s,h} = 19.0 \text{ cm}^2$

$\sigma = 0$ at $s_{0,h} = 0.30 \text{ m}$ σ_{\max} at $s_{m,h} = 0.33 \text{ m}$

slab : tensile force $Z_p = 311.2 \text{ kN} \Rightarrow A_{s,p} = 7.2 \text{ cm}^2$

($H_v = 0.47 \text{ m}$) $\sigma = 0$ at $s_{0,p} = 0.35 \text{ m}$ σ_{\max} at $s_{m,p} = 0.51 \text{ m}$

tensile force $Z_u = 0.2 \text{ kN}$ $Z_p = 62.2 \text{ kN}$

$\Rightarrow \min A_{s,u} = 1.4 \text{ cm}^2$

minimum reinforcement

$\Rightarrow A_{s,v} = 10.9 \text{ cm}^2$ $A_{s,h} = 19.0 \text{ cm}^2$ $A_{s,p} = 7.2 \text{ cm}^2$

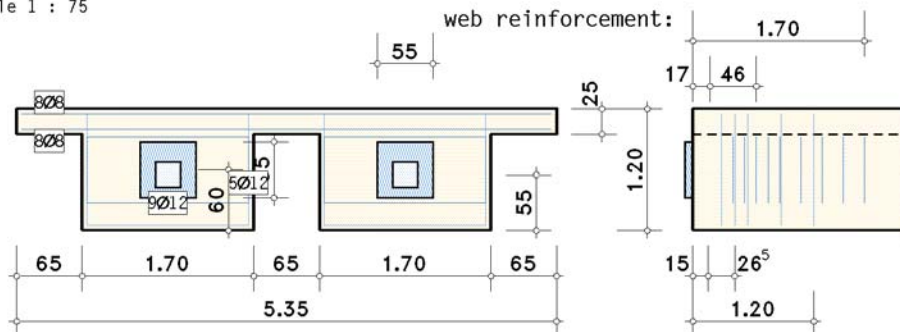
$A_{s,u} = 1.4 \text{ cm}^2$

reinforcem. BSt 500 (B)
material safety $\gamma_s = 1.15$

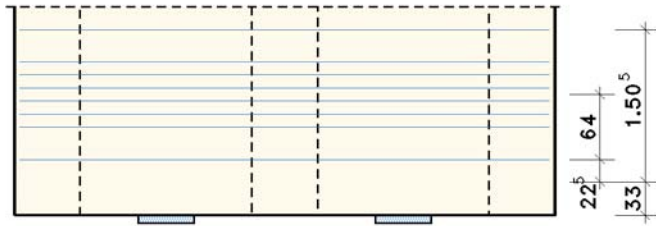
selected: web : $A_{s,v} : 5 \text{ } \varnothing 12 = 2 \times 5.7 = 11.3 \text{ cm}^2 > 10.94 \text{ cm}^2$
 $A_{s,h} : 9 \text{ } \varnothing 12 = 2 \times 10.2 = 20.4 \text{ cm}^2 > 19.01 \text{ cm}^2$
 slab : $A_{s,p} : 2 \times 8 \text{ } \varnothing 8 = 8.0 \text{ cm}^2 > 7.16 \text{ cm}^2$
 ! reinforcement altogether 2-shear !

reinforcement drawing:

scale 1 : 75



slab reinforcement:



material properties

reinforcem.	f_{yk} MN/m ²	f_{tk} MN/m ²	ϵ_{su} ‰	E_s MN/m ²
BSt 500 (B)	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