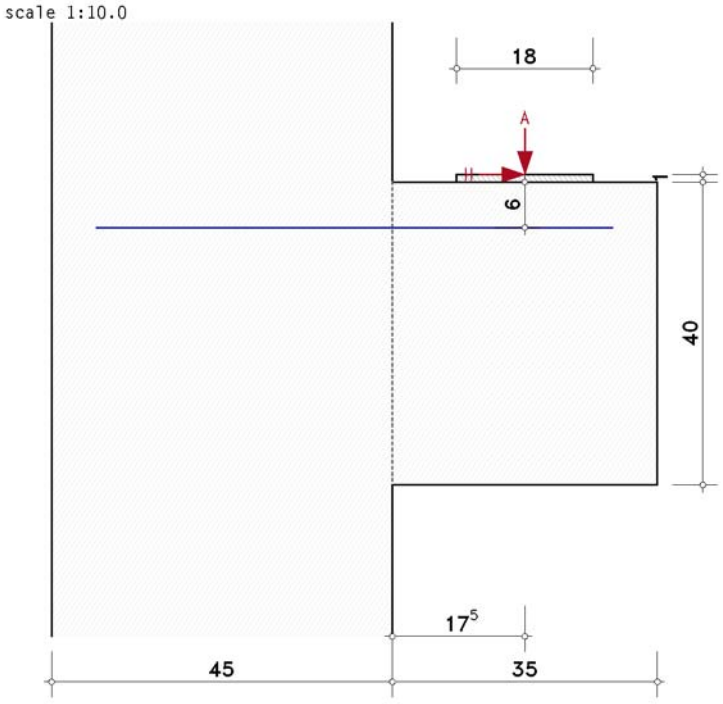
POS. 41: AVAK T.2, BSP. 14.1

dimensioning a load bracket EC 2 (1.11), NA: Deutschland

1. input protocol



cross section (single bracket)
bracket on a column
column: b = 35.0 cm, h = 45.0 cm
bracket: l_k = 35.0 cm, h_k = 40.0 cm, center distance (design calculation): d_{1k} = 6.0 cm
bearing plate: l_p = 18.0 cm, b_p = 20.0 cm
material properties
concrete: C35/45, reinforcement: B500A
material safety factors
design situation: basic combination
design resistance: concrete γ_c = 1.50, reinforcement γ_s = 1.15
parameters
Load application for Δa = 17.5 cm, Δh = 1.0 cm
design method acc. to EC 2-1-1, 6.5
load bracket, direct load application
bearing contact pressure: bearing joint of a plain/elastomeric bearing
design calculation values (ULS)
lc 1: A_{Ed} = 200.0 kN

2. note

general reinforcement rules are not taken into account.

3. design calculation

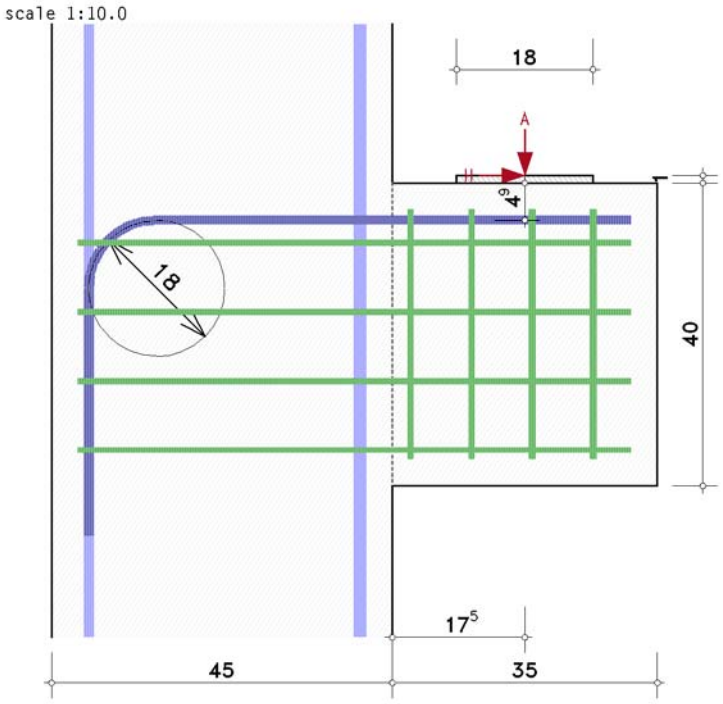
3.1. lc 1

design calculation values: A = 200.00 kN, H = 0.00 kN
bearing contact pressure (plain/elastomeric bearing): σ_p = 5.56 N/mm² < $\sigma_{Rd,max}$ = 16.86 N/mm² ok
verification of compression strut: x = 2.95 cm < perm x = 0.4·d = 13.6 cm ok
tension belt reinforcement: Z_{A+H} = 118.7 kN ⇒ req $A_{s,h}$ = 2.73 cm²
tensile splitting reinforcement: horizontal stirrup reinforcement ($A_{sb,v}$ constr.) for $\Delta a/h_k$ = 0.44 ≤ 0.5 (compact bracket)
⇒ req $A_{sb,h} = 0.3 \cdot A_{s,h}$ = 0.82 cm²
total: $A_{s,h}$ = 2.73 cm², $A_{sb,h}$ = 0.82 cm² (ΣA_{st} = 2.73 cm²)

4. final result

maximum reinforcement: $A_{s,h}$ = 2.73 cm², $A_{sb,h}$ = 0.82 cm²

5. selected reinforcement



calculation of the required anchorage lengths: calculate bonding conditions

concrete cover	$c_{v,v}$ = 3.5 cm
concrete cover	$c_{v,h}$ = 3.5 cm
column reinf. left	2Ø12, exst A_{sl} = 2.26 cm²
column reinf. right	4Ø16, exst A_{sr} = 8.04 cm²
main reinforcement	2Ø12, $D_{min,hor}$ = 4.8 cm, $D_{min,ver}$ = 18.0 cm, exst $A_{s,h}$ = 4.52 cm² > req $A_{s,h}$ = 2.73 cm² ok
(U-bents, 2-shear)	anchorage lengths: bracket req l_v = 15.6 cm < exst l_v = 23.0 cm ok
	column l_v = 32.7 cm
tensile splitting reinforcement	horizontal 4Ø8 (stirrup, 2-shear), exst $A_{sb,h}$ = 4.02 cm² > req $A_{sb,h}$ = 0.82 cm² ok
tensile splitting reinforcement	vertical 4Ø8 (stirrup, 2-shear), exst $A_{sb,v}$ = 4.02 cm²
center distance	exst d_{1k} = 4.90 cm < clc d_{1k} = 6.0 cm ok

design resistance ensured

6. regulations

EN 1990, Eurocode 0: Grundlagen der Tragwerksplanung;
Deutsche Fassung EN 1990:2002 + A1:2005 + A1:2005/AC:2010, Ausgabe Dezember 2010
EN 1990/NA, Nationaler Anhang zur EN 1990, Ausgabe Dezember 2010

EN 1992-1-1, Eurocode 2: Bemessung und Konstruktion von Stahlbeton- und Spannbetonbauteilen -
Teil 1-1: Allgemeine Bemessungsregeln und Regeln for den Hochbau;
Deutsche Fassung EN 1992-1-1:2004 + AC:2010, Ausgabe Januar 2011
EN 1992-1-1/NA, Nationaler Anhang zur EN 1992-1-1, Ausgabe April 2013

Frank Fingerloos, Gerhard Stenzel: Konstruktion und Bemessung von Details nach DIN 1045,
Betonkalender 2007 T.2, Verlag Ernst & Sohn, 2007