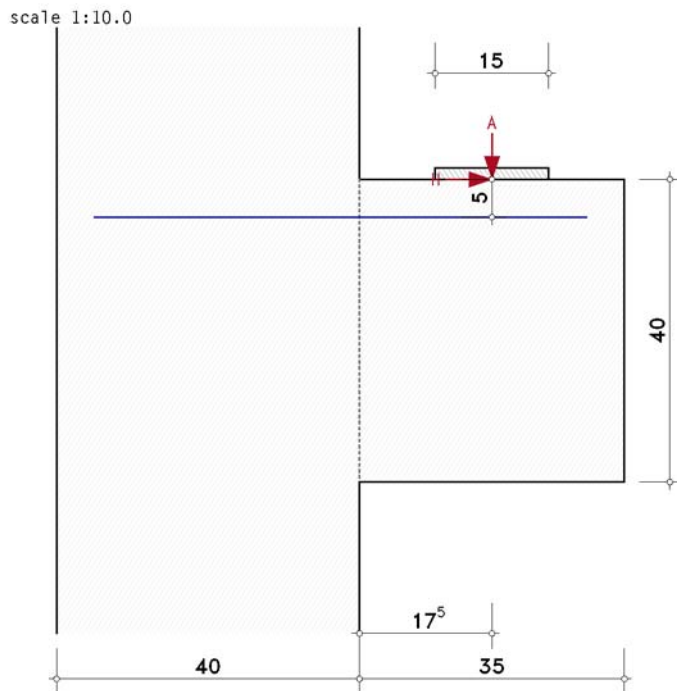


1. input protocol



cross section (single bracket)

bracket on a column

column: $b = 35.0 \text{ cm}$, $h = 40.0 \text{ cm}$

bracket: $l_k = 35.0 \text{ cm}$, $h_k = 40.0 \text{ cm}$, center distance (design calculation): $d_{1k} = 5.0 \text{ cm}$

bearing plate: $l_p = 15.0 \text{ cm}$, $b_p = 20.0 \text{ cm}$

material properties

concrete: C35/45, reinforcement: B500A

material safety factors

design situation: basic combination

design resistance: concrete $\gamma_c = 1.50$, reinforcement $\gamma_s = 1.15$

parameters

Load application for $\Delta a = 17.5 \text{ cm}$, $\Delta h = 0.0 \text{ cm}$

design method acc. to issue 600, DAfStb

load bracket, direct load application

bearing contact pressure: bearing joint of a plain/elastomeric bearing

design calculation values (ULS)

lc 1: $A_{Ed} = 260.0 \text{ kN}$, $H_{Ed} = 52.0 \text{ kN}$

1.1. durability and concrete cover

vertical: minimum strength class, concrete cover

due to reinforcement corrosion XC1 $\Rightarrow$ C16/20, $C_{nom} = 20 \text{ mm}$, $C_{nom,b} = 18 \text{ mm}$, $C_{nom,l} = 10 \text{ mm}$

$\Rightarrow C_{nom} = 20 \text{ mm} < c_v = 25 \text{ mm}$ **ok**

minimum concrete quality C16/20 with $f_{ck} = 16.0 \text{ N/mm}^2 < \text{exst } f_{ck} = 35.0 \text{ N/mm}^2$ **ok**

horizontal: minimum strength class, concrete cover

due to reinforcement corrosion XC1 $\Rightarrow$ C16/20, $C_{nom} = 20 \text{ mm}$, $C_{nom,l} = 26 \text{ mm} \Rightarrow C_{nom} = 26 \text{ mm} < c_v = 35 \text{ mm}$ **ok**

minimum concrete quality C16/20 with $f_{ck} = 16.0 \text{ N/mm}^2 < \text{exst } f_{ck} = 35.0 \text{ N/mm}^2$ **ok**

2. note

general reinforcement rules are not taken into account.

3. design calculation

3.1. lc 1

design calculation values: $A = 260.00 \text{ kN}$, $H = 52.00 \text{ kN}$

bearing contact pressure (plain/elastomeric bearing): $\sigma_p = 8.67 \text{ N/mm}^2 < \sigma_{Rd,max} = 16.86 \text{ N/mm}^2$ **ok**

verification of compression strut: $V_{Ed} = 260.0 \text{ kN} < V_{Rd,max} = 675.3 \text{ kN}$ **ok**

tension belt reinforcement: $Z_{A+H} = 214.4 \text{ kN} \Rightarrow \text{req } A_{s,h} = 4.93 \text{ cm}^2$

tensile splitting reinforcement: horizontal stirrup reinforcement ($A_{sb,v}$ constr.)

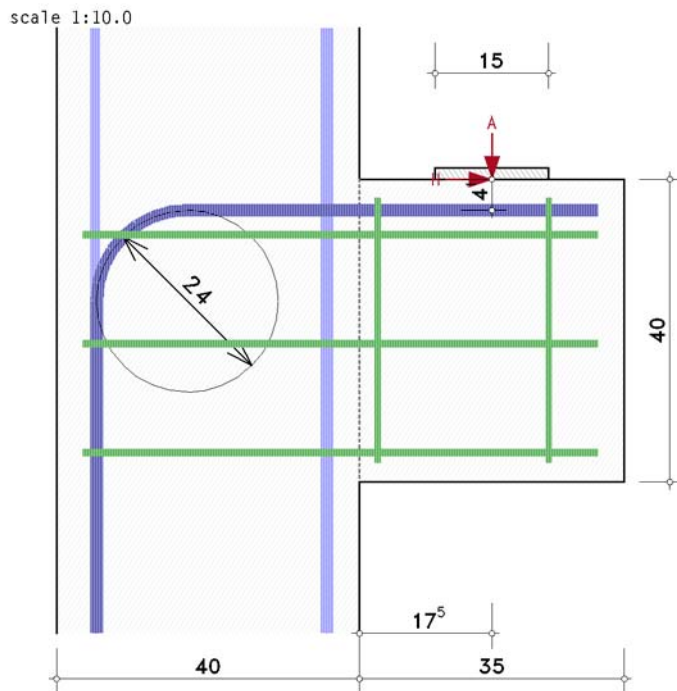
for $\Delta a \leq 0.5 \cdot h_k = 20.0 \text{ cm}$ and $V_{Ed} > 0.3 \cdot V_{Rd,max} = 202.6 \text{ kN} \Rightarrow \text{req } A_{sb,h} = 2.47 \text{ cm}^2$

total: $A_{s,h} = 4.93 \text{ cm}^2$, $A_{sb,h} = 2.47 \text{ cm}^2$ ($\Sigma A_{st} = 4.93 \text{ cm}^2$)

4. final result

maximum reinforcement: $A_{s,h} = 4.93 \text{ cm}^2$, $A_{sb,h} = 2.47 \text{ cm}^2$

5. selected reinforcement



calculation of the required anchorage lengths: bonding conditions good

concrete cover $c_{v,v} = 2.5 \text{ cm} > c_{nom,v} = 2.00 \text{ cm}$ **ok**

concrete cover $c_{v,h} = 3.5 \text{ cm} > c_{nom,h} = 2.60 \text{ cm}$ **ok**

column reinf. left $2\text{Ø}12$, exst $A_{sl} = 2.26 \text{ cm}^2$

column reinf. right $4\text{Ø}16$, exst $A_{sr} = 8.04 \text{ cm}^2$

main reinforcement $2\text{Ø}16$, $D_{min,hor} = 6.4 \text{ cm}$, $D_{min,ver} = 24.0 \text{ cm}$, exst $A_{s,h} = 8.04 \text{ cm}^2 > \text{req } A_{s,h} = 4.93 \text{ cm}^2$ **ok**

(U-bents, 2-shear) anchorage lengths: bracket req $l_v = 21.1 \text{ cm} < \text{exst } l_v = 21.5 \text{ cm}$ **ok**

column $l_v = 44.3 \text{ cm}$

tensile splitting reinforcement horizontal $3\text{Ø}10$ (stirrup, 2-shear), exst $A_{sb,h} = 4.71 \text{ cm}^2 > \text{req } A_{sb,h} = 2.47 \text{ cm}^2$ **ok**

tensile splitting reinforcement vertical $2\text{Ø}8$ (stirrup, 2-shear), exst $A_{sb,v} = 2.01 \text{ cm}^2$

center distance exst $d_{1k} = 4.10 \text{ cm} < \text{clc } d_{1k} = 5.0 \text{ cm}$ **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 für 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

Erläuterungen zu DIN EN 1992-1-1 and DIN EN 1992-1-1/NA, Teil 1

Deutscher Ausschuss für Stahlbeton, Heft 600, Beuth Verlag GmbH, 2020

Erläuterungen zu DIN 1045-1

Deutscher Ausschuss für Stahlbeton, Heft 525, Beuth Verlag GmbH, 2003