



**DECLARATION OF PERFORMANCE** **CONF-DOP\_HDB 12/17-E**  
**HALFEN HDB Shear Rail** No. H09-12/0454

|    |  |  |
|----|--|--|
| 1. | Unique identification code of the product-type   | <b>HALFEN HDB Shear Rail</b>   |
| 2. | Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)              | <b>HALFEN HDB Shear rail see Annex 1, 2, 3, 4</b>  |
| 3. | Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer: |  |
|    | Generic type and use   | HALFEN HDB double-headed studs with weldable ribbed shafts or HDB-G double-headed studs with weldable smooth shafts as punching shear reinforcement  |
|    | Product size covered   | HDB-G 10, HDB-G 12, HDB-G 14, HDB-G 16, HDB-G 18 and HDB-G 20 with smooth shafts<br>HDB 10, HDB 12, HDB 14, HDB 16, HDB 20 and HDB 25 with ribbed shafts   |
|    | Für die Verwendung in  | Concrete C20/25 to C50/60 according to EN 206-1:2000   |
|    | Base material / base material strength   | Steel material with $f_{yk} \geq 500$ MPa, $(f_t/f_y)_k \geq 1.05$ and $\epsilon_{uk} \geq 2,5\%$ acc. to EN 1992-1-1, annex C and provided data sheet   |
|    | Loading  | Static, quasi static and fatigue loading   |
| 4. | Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)                       | HALFEN GmbH (part of Leviat), Liebigstraße 14, 40764 Langenfeld, Germany   |
| 5. | Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2)                    | -  |
| 6. | System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V                           | System 1+  |
| 7. | In case of the declaration of performance concerning a construction product covered by a harmonised standard   | -  |
| 8. | In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued                    | Deutsches Institut für Bautechnik (DIBt) issued ETA-12/0454 on the basis of EAD 160003-00-0301. The notified body 0432 performed under system 1+<br>(i) Initial inspection of the manufacturing plant and of factory production control;<br>(ii) Continuous surveillance, assessment and evaluation of factory production control; |

| Declared performance   |  |                          |  |                                    |  |  |
|--|--|--------------------------|--|------------------------------------|--|--|
|  | Essential Characteristics  | Design Method            | Performance  | Harmonized Technical Specification |  |  |
| 9.   | Punching shear resistance at interior columns  | EOTA TR 060; EN 1992-1-1 | Annex 5 to 7   | EAD 160003-00-0301                 |  |  |
|  | Punching shear resistance of footings and ground slabs   |                          | Annex 8  |                                    |  |  |
|  | Punching shear resistance at edge- and corner-columns  |                          | Annex 9 to 11  |                                    |  |  |
|  | Punching shear resistance near openings  |                          | Annex 9,11   |                                    |  |  |
|  | characteristic fatigue strength  |                          | $\Delta\sigma_{Rsk,n} = 2 \cdot 10^6 = 70 \text{ MPa}$   |                                    |  |  |
|  | Increasing factor for punching shear resistance  |                          | $k_{pu,sl} / k_{pu,fo} = 1,96 / 1,5$   |                                    |  |  |
|  | Reaction to fire   |                          | Class A1   |                                    |  |  |
|  | Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies |                          | -  |                                    |  |  |
|  | 10.  |                          | The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9. |                                    |  |  |
| This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4. |  |                          |  |                                    |  |  |

Langenfeld, 01.10.1010

Signed for and on behalf of the manufacturer by



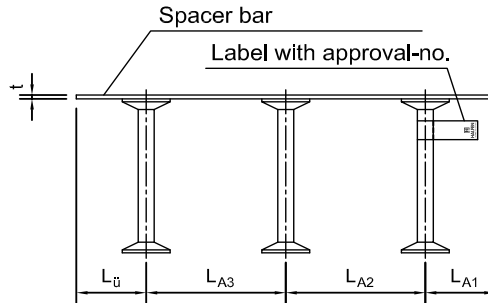
Richard Wachter  
(Managing Director)



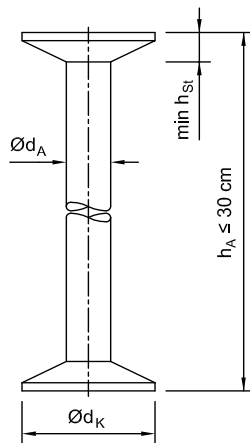
ppa. Dr.-Ing. Dirk Albartus  
(Manager Engineering)

Annex 1:

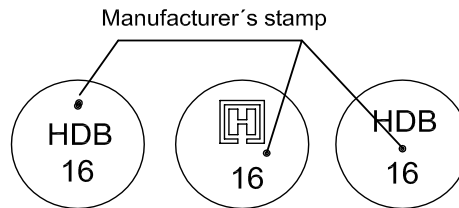
**HDB - G - Double Headed Stud - Elements**



**HDB - G stud dimensions**



HDB - G studs identification on both (heads/ends) e.g.

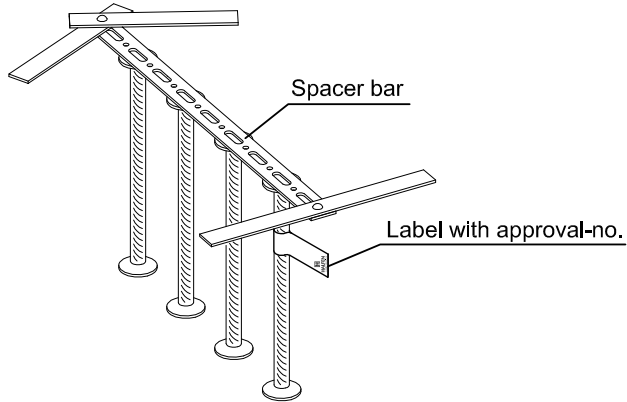


Material: reinforcement steel with a characteristic yield strength of  $f_{yk} \geq 500 \text{ MPa}$  acc. to EN 1992-1-1, annex C and provided data sheet

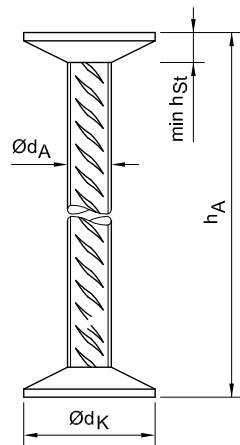
| Stud- $\varnothing$<br>$d_A$<br>[mm] | Head- $\varnothing$<br>$d_K$<br>[mm] | Head thickness<br>min $h_{St}$<br>[mm] | Stud section<br>A S DKA<br>[mm <sup>2</sup> ] | Characteristic value for<br>yield strength<br>$f_{yk}$<br>[MPa] | Anchor height<br>$h_A \leq 300 \text{ mm}$                       |
|--------------------------------------|--------------------------------------|--|---|---|--|
| 10                                   | 30                                   | 5                                      | 79  | 500   | $h_A =$<br>slab thickness -<br>upper and lower<br>concrete cover |
| 12                                   | 36                                   | 6                                      | 113   |   |  |
| 14                                   | 42                                   | 7                                      | 154   |   |  |
| 16                                   | 48                                   | 8                                      | 201   |   |  |
| 18                                   | 54                                   | 9                                      | 254   |   |  |
| 20                                   | 60                                   | 10                                     | 314   |   |  |

Annex 2:

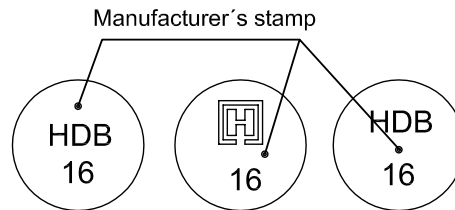
**HDB - Double-Headed Stud - Elements**



**HDB stud dimensions**



**HDB studs identification on both (heads/ends) e.g.**



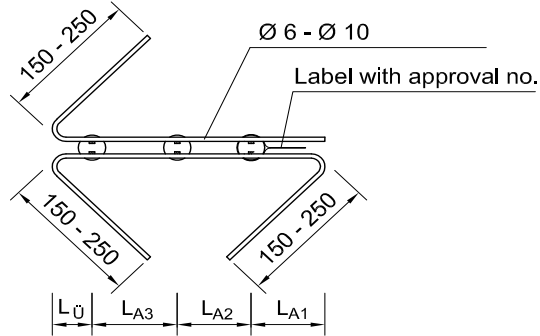
Material: reinforcement steel with a characteristic yield strength of  $f_{yk} \geq 500$  MPa acc. to EN 1992-1-1, annex C and provided data sheet

| Stud-Ø<br>$d_A$<br>[mm] | Head-Ø<br>$d_K$<br>[mm] | Head thickness<br>min $h_{St}$<br>[mm] | Stud section<br>A S DKA<br>[mm <sup>2</sup> ] | Characteristic value for<br>yield strength<br>$f_{yk}$<br>[MPa] | Anchor height<br>$h_A$<br>[mm]                                   |
|-------------------------|-------------------------|--|---|---|--|
| 10                      | 30                      | 5                                      | 79  | 500   | $h_A =$<br>slab thickness -<br>upper and lower<br>concrete cover |
| 12                      | 36                      | 6                                      | 113   |   |  |
| 14                      | 42                      | 7                                      | 154   |   |  |
| 16                      | 48                      | 7                                      | 201   |   |  |
| 20                      | 60                      | 9                                      | 314   |   |  |
| 25                      | 75                      | 12                                     | 491   |   |  |

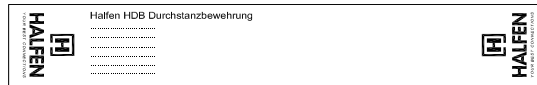
Annex 3:

**Spacer bars from reinforcement bars or round bars**

- with bent off endings



Example:  
Label with approval no.

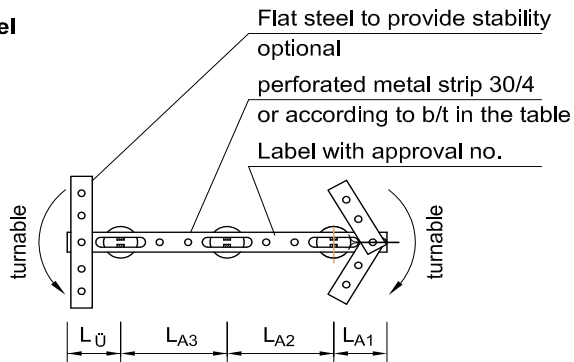


**Material:** Reinforcement steel (acc.to EN 1992-1-1 Annex C and provided data sheet)  
Round bars: A4 = 1.4571/ 1.4401/ 1.4404 (acc. to EN 10088-5:2009)  
S 235 JR = 1.0038 (acc.to EN10025-2:2004)

**Spacer bar from flat steel**

- with turnable flat steel

| Stud-Ø<br>Ø d <sub>A</sub> | b  | t |
|----------------------------|----|---|
| 10, 12                     | 30 | 3 |
| 14, 16                     | 40 | 3 |
| 18, 20                     | 60 | 3 |
| [mm]                       |    |   |

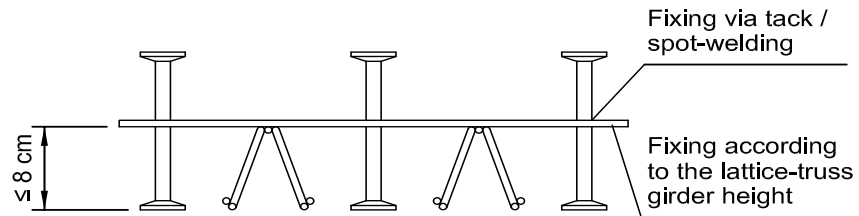


**Material:** A4 = 1.4571/ 1.4401/ 1.4404 (acc. to EN 10088-5:2009)  
S 235 JR = 1.0038 (acc.to EN10025-2:2004)  
DD11 = 1.0332 (acc. to EN10111:2008)

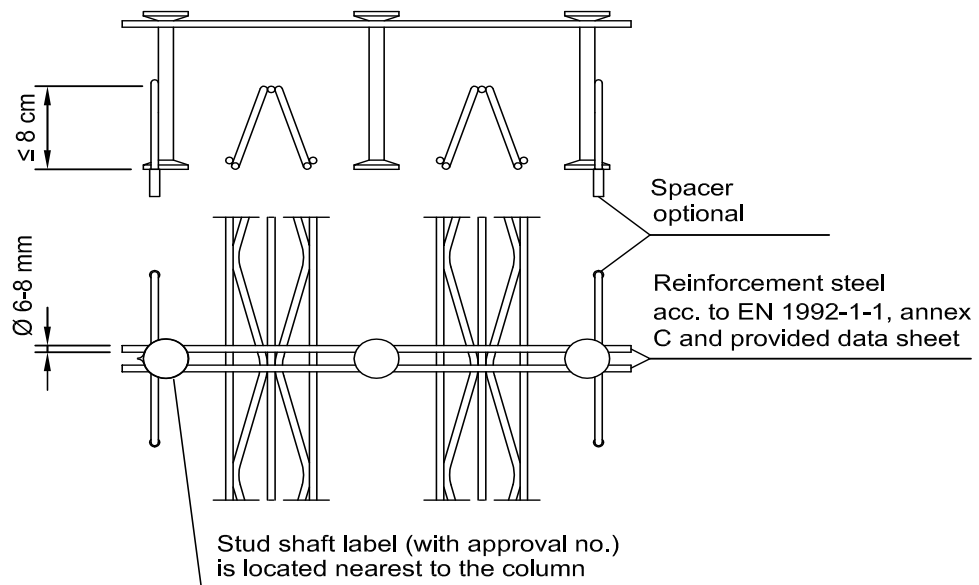
Annex 4:

**HDB (-G) - reinforcing elements for precast elements  
Types with spot-welded positioning-elements**

Positioning of the HDB - reinforcing elements on top of the lattice-truss girder



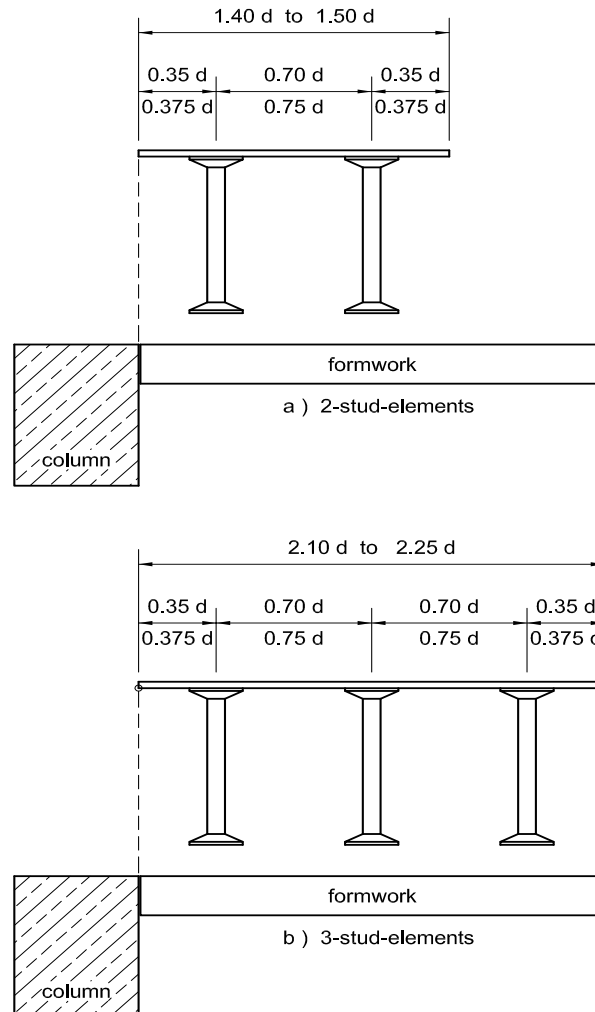
Fixing the HDB (-G) - reinforcing elements using spacers



## Annex 5:

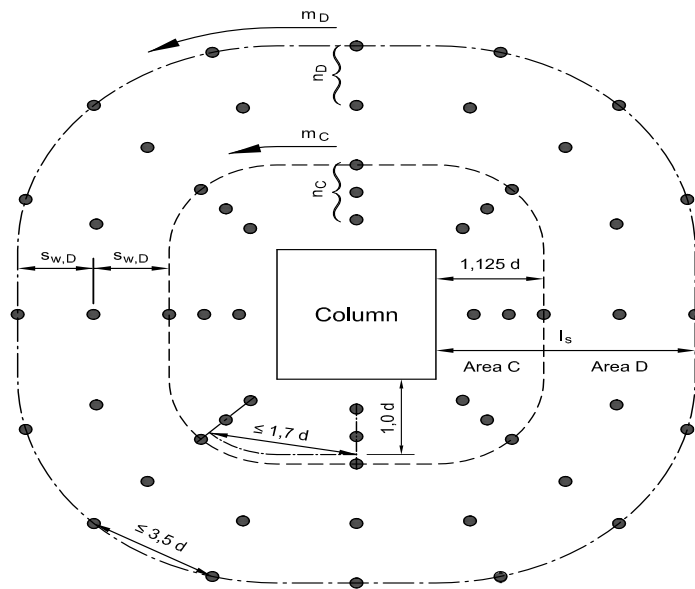
**Design of the HDB (-G) - system elements**

The symmetric overlap of the spacer bar is used to ensure correct spacing of the elements from the column. Furthermore, it ensures the right radial spacing between two adjacent stud elements.



Annex 6:

**Principle arrangement of the HDB (-G) - studs in slabs**



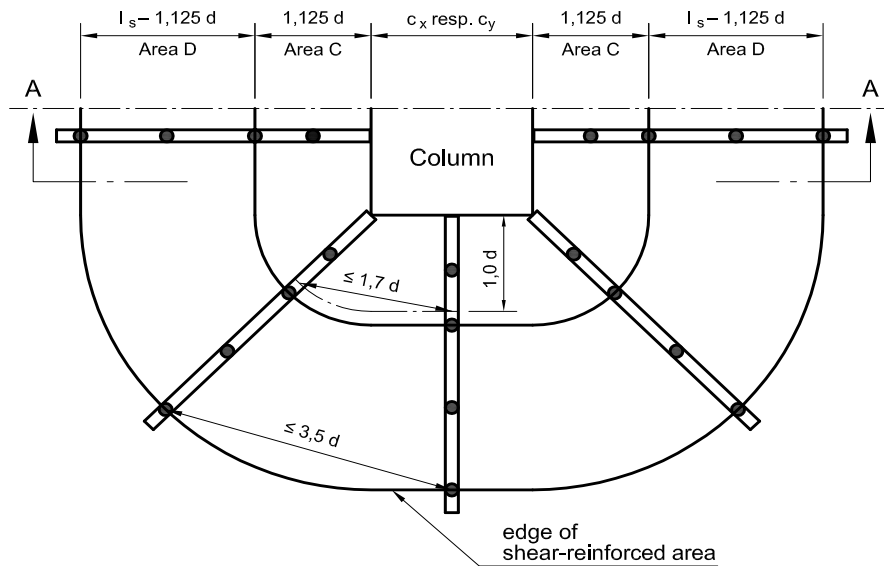
- mC number of elements (rows) in area C
- mD number of elements (rows) in area D
- nC number of studs of each element (row) in area C
- nD number of studs of each element (row) in area D
- s<sub>w,D</sub> radial spacing in area D



Annex 7:

**Placing the punching shear reinforcement in slabs**

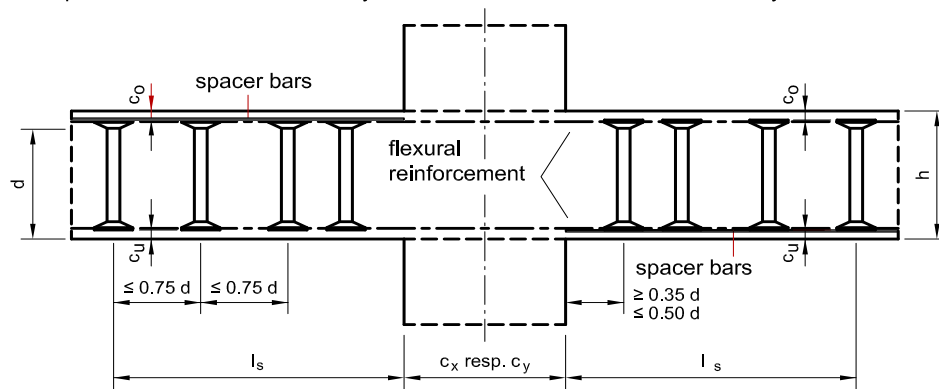
Plan view



Section A - A

Installation after placing the top and bottom reinforcement layers

Reverse installation; spacer bars are under the lower layer of reinforcement



Concrete cover  $c_o$  resp.  $c_u$  acc. to EN1992-1-1 : 2004 + AC : 2010, section 4.4

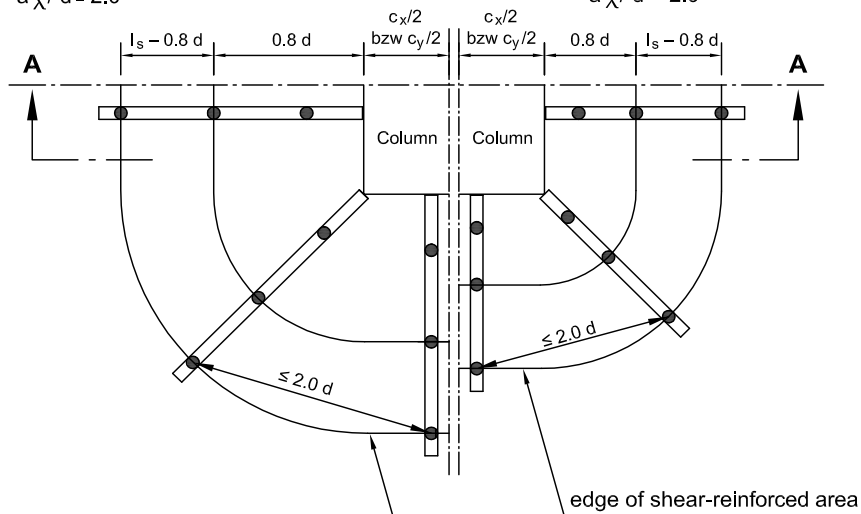
Annex 8:

**Arrangement of punching shear reinforcement using complete elements in footings and ground slabs**

Plan view

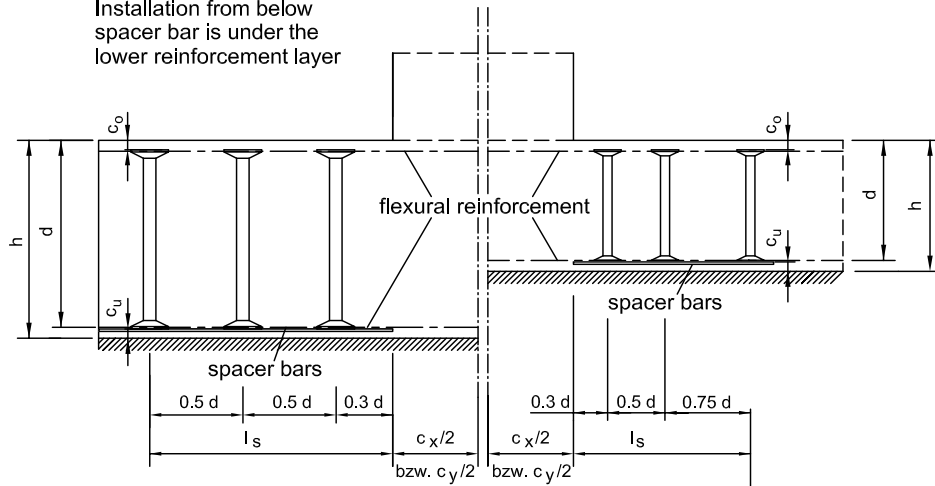
compact foundations  
 $a_{\lambda} / d \leq 2.0$

slender foundations  
 $a_{\lambda} / d > 2.0$



Section A - A

Installation from below  
 spacer bar is under the  
 lower reinforcement layer



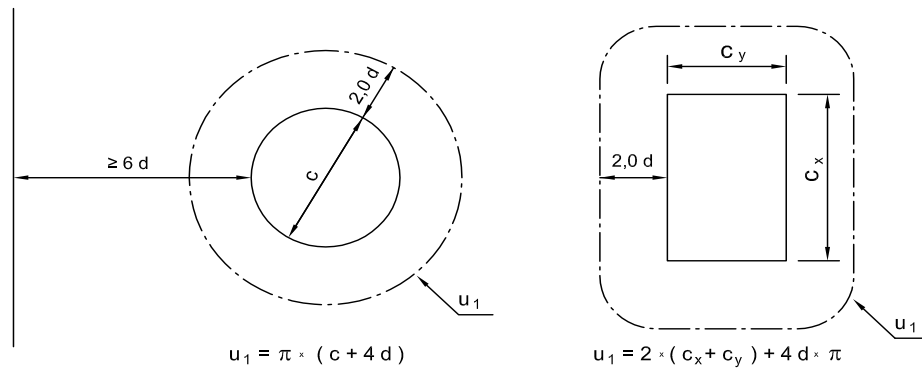
Concrete cover  $c_o$  resp.  $c_u$  acc. to EN1992-1-1 : 2004 + AC : 2010, section 4.4

Annex 9:

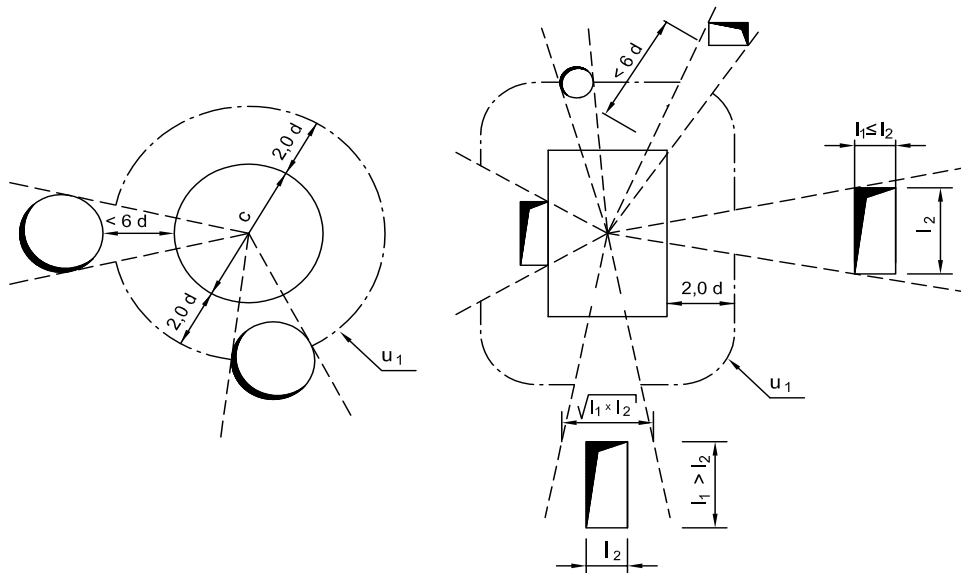
**Defining the critical perimeters  $u_1$  and  $u_{out}$**

**1. Critical perimeter  $u_1$**

a) Loaded areas ( columns ) are more than  $6d$  from openings or slab free edges

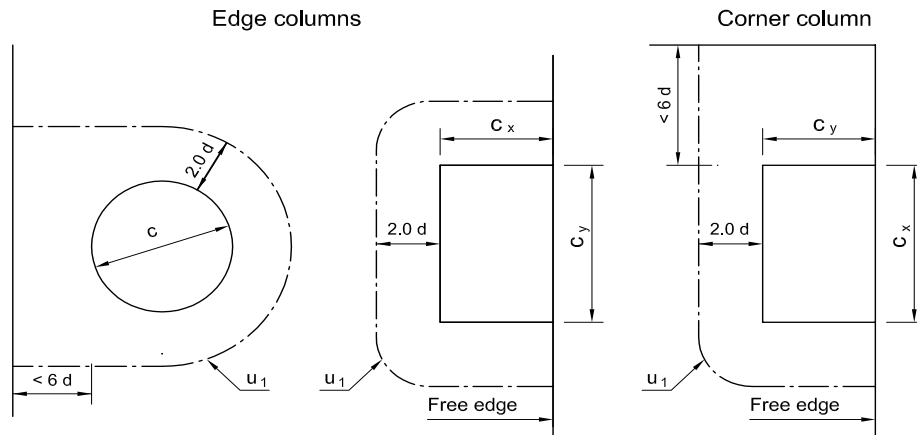


b) Loaded areas (columns) are less than  $6d$  from openings (voids) in the slab.



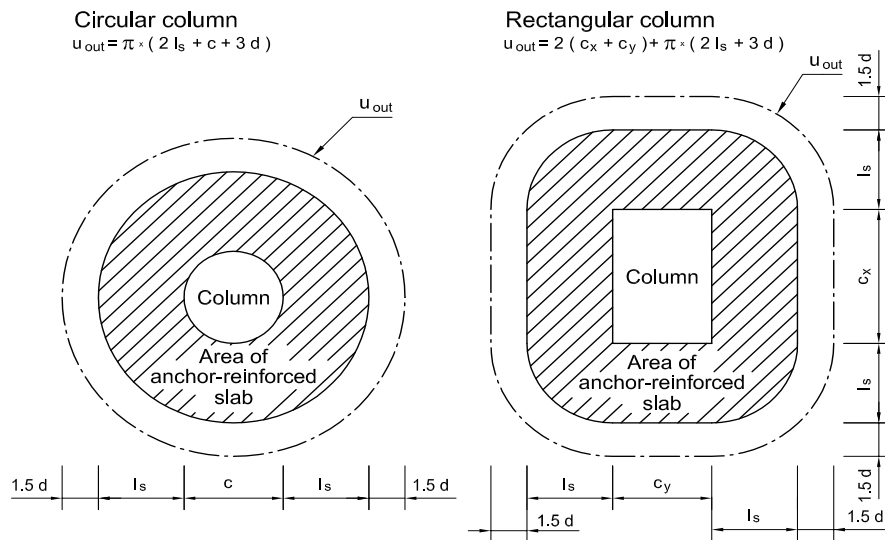
**Annex 10:**

c) Loaded areas ( columns ) at distances less than 6 d from free edges



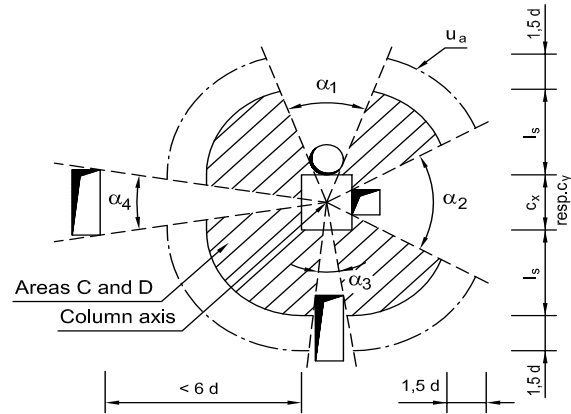
**2. Outermost perimeter u<sub>out</sub>**

a) Loaded areas ( columns ) are more than 6 d from openings or slab free edges



**Annex 11:**

a) Loaded areas (columns) are less than 6 d from opening in the slab



b) Loaded areas ( columns ) are less than 6 d from free edges

