

DECLARATION OF PERFORMANCE
HALFEN HDB Shear Rail

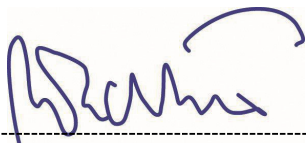
CONF-DOP_HDB 12/17-E
No. H09-12/0454

1.	Unique identification code of the product-type	HALFEN HDB Shear Rail
2.	Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	HALFEN HDB Shear rail see Annex 1, 2, 3, 4
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 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, 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+ (i) Initial inspection of the manufacturing plant and of factory production control; (ii) Continuous surveillance, assessment and evaluation of factory production control;

9.	Declared performance					
	Essential Characteristics	Design Method	Performance	Harmonized Technical Specification		
	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		$\Delta\sigma_{Rsk,n}=2*10^6 = 70 \text{ MPa}$			
	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, 18.12.2017

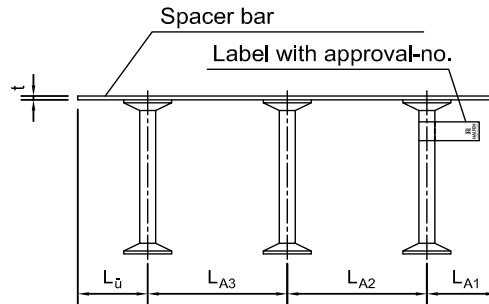
Signed for and on behalf of the manufacturer by


 Richard Wachter
 (Managing Director)

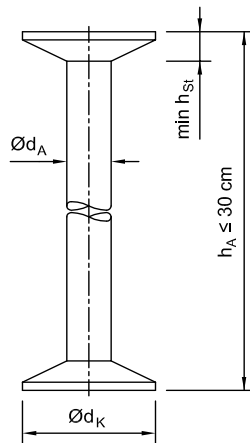

 ppa. Dr.-Ing. Dirk Albartus
 (Manager Engineering)

Annex 1:

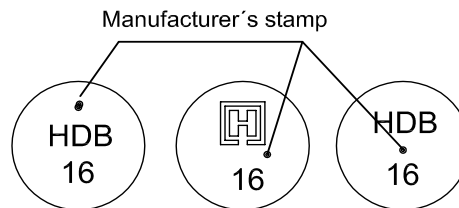
HDB - G - Double Headed Stud - Elements



HDB - G stud dimensions



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

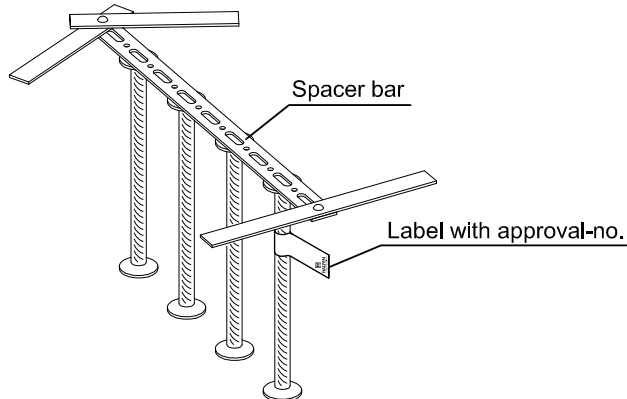


Material: reinforcement steel with a characteristic yield strength of $f_{yk} \geq 500$ MPa acc. to EN 1992-1-1, annex C and provided data sheet

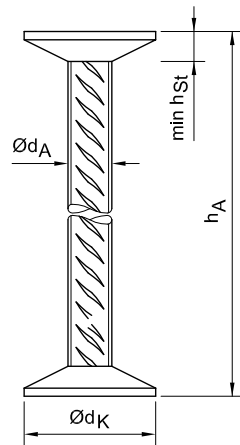
Stud-Ø d_A [mm]	Head-Ø d_K [mm]	Head thickness min h_{St} [mm]	Stud section AS DKA [mm ²]	Characteristic value for yield strength f_{yk} [MPa]	Anchor height $h_A \leq 300$ mm
10	30	5	79	500	$h_A =$ slab thickness - upper and lower concrete cover
12	36	6	113		
14	42	7	154		
16	48	8	201		
18	54	9	254	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

Annex 2:

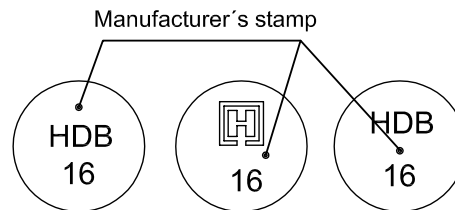
HDB - Double-Headed Stud - Elements



HDB stud dimensions



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



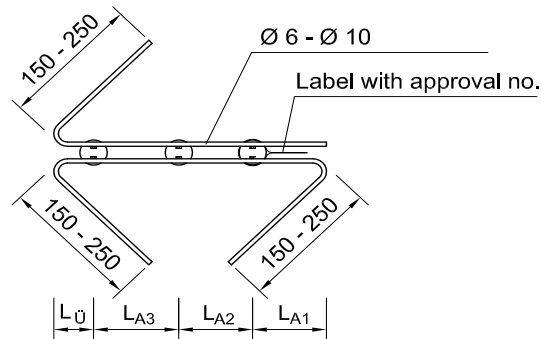
Material: reinforcement steel with a characteristic yield strength of $f_{yk} \geq 500$ MPa acc. to EN 1992-1-1, annex C and provided data sheet

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

Annex 3:

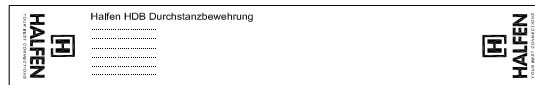
Spacer bars from reinforcement bars or round bars

- with bent off endings



Example:

Label with approval no.

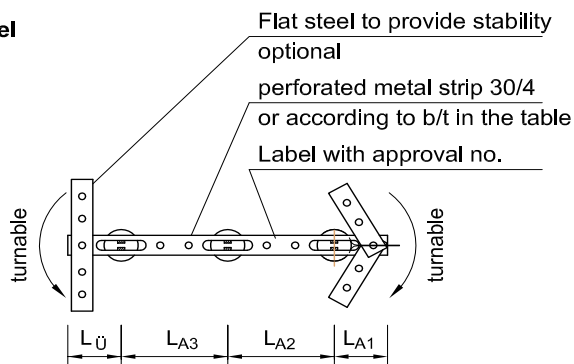


Material: Reinforcement steel (acc.to EN 1992-1-1 Annex C and provided data sheet)
 Round bars: A4 = 1.4571/ 1.4401/ 1.4404 (acc. to EN 10088-5:2009)
 S 235 JR = 1.0038 (acc.to EN10025-2:2004)

Spacer bar from flat steel

- with turnable flat steel

Stud -Ø Ø d _A	b	t
10, 12	30	3
14, 16	40	3
18, 20	60	3
[mm]		

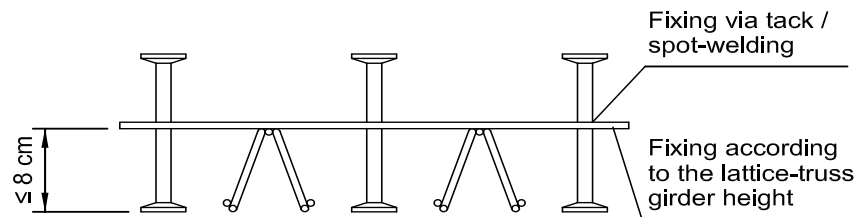


Material: A4 = 1.4571/ 1.4401/ 1.4404 (acc. to EN 10088-5:2009)
 S 235 JR = 1.0038 (acc.to EN10025-2:2004)
 DD11 = 1.0332 (acc. to EN10111:2008)

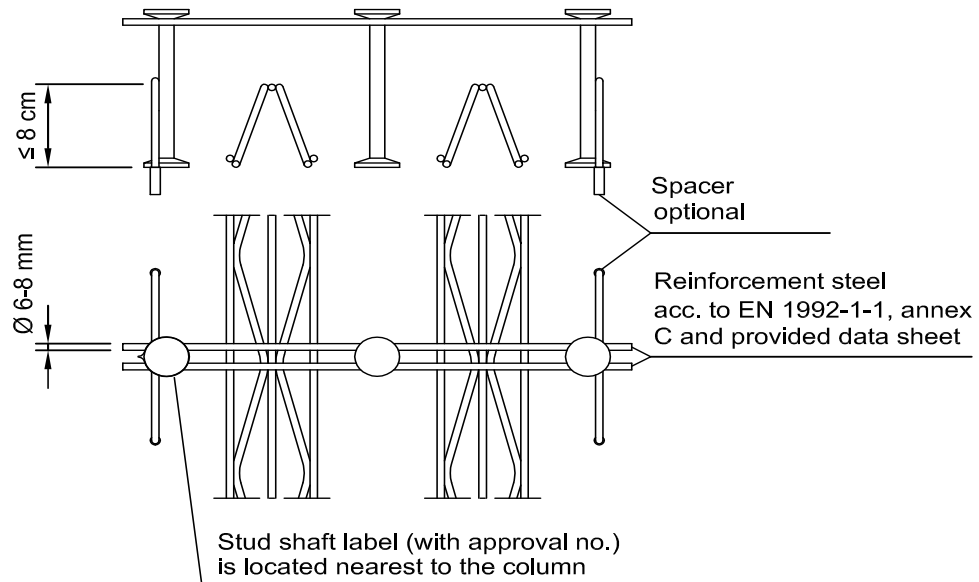
Annex 4:

**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



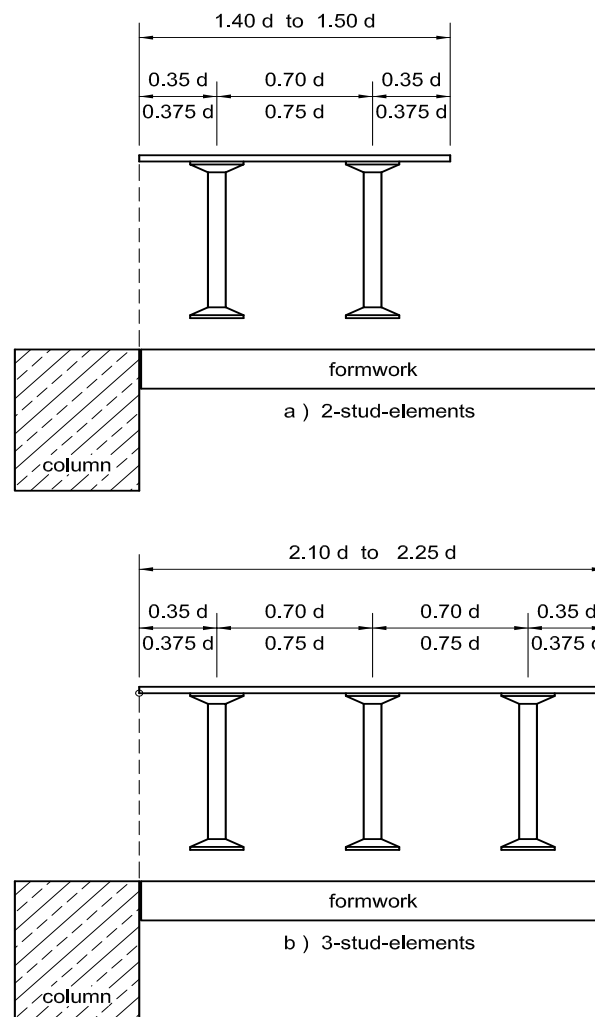
Fixing the HDB (-G) - reinforcing elements using spacers



Annex 5:

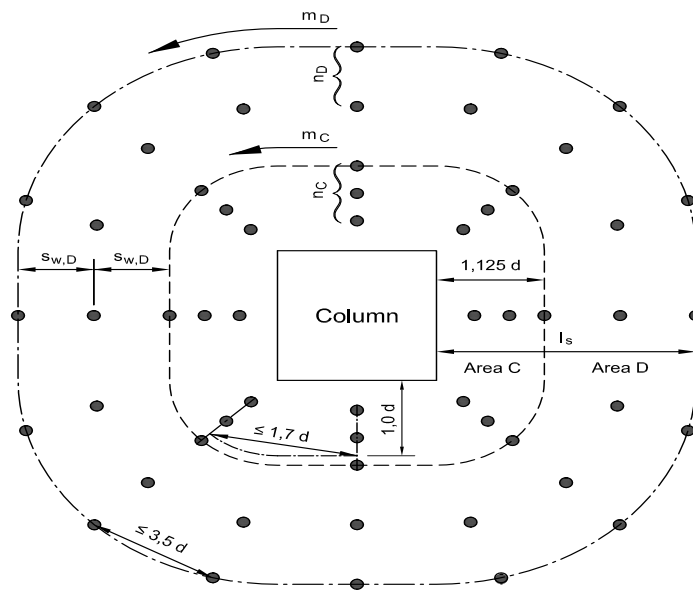
Design of the HDB (-G) - system elements

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

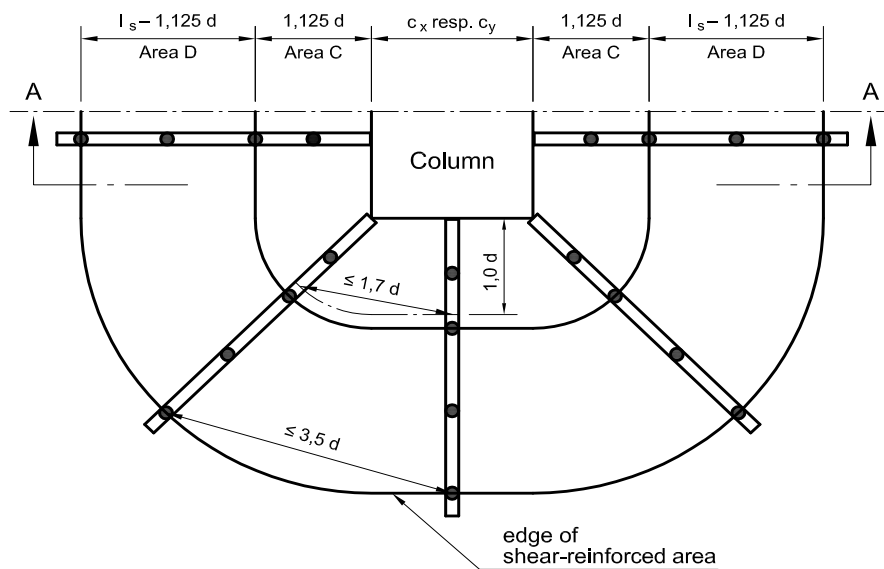


- m_C number of elements (rows) in area C
- m_D number of elements (rows) in area D
- n_C number of studs of each element (row) in area C
- n_D number of studs of each element (row) in area D
- s_{w,D} radial spacing in area D

Annex 7:

Placing the punching shear reinforcement using complete elements in slabs

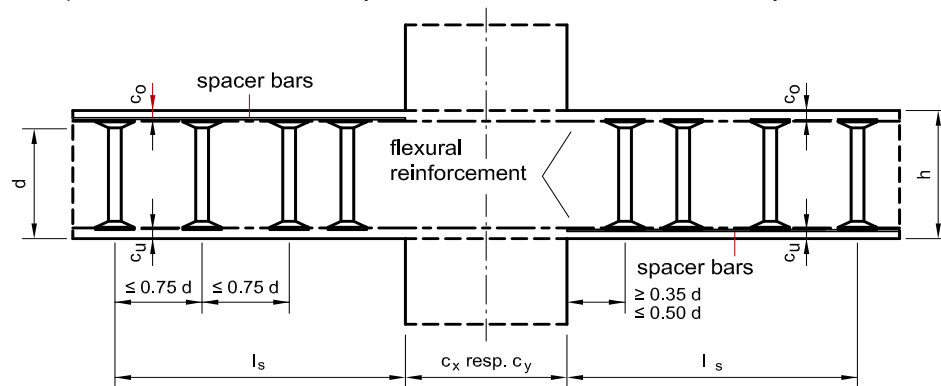
Plan view



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

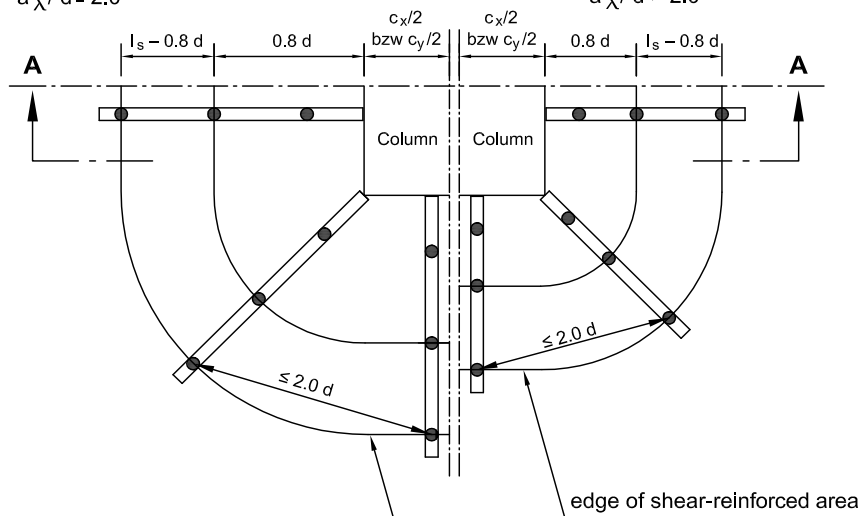
Annex 8:

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

Plan view

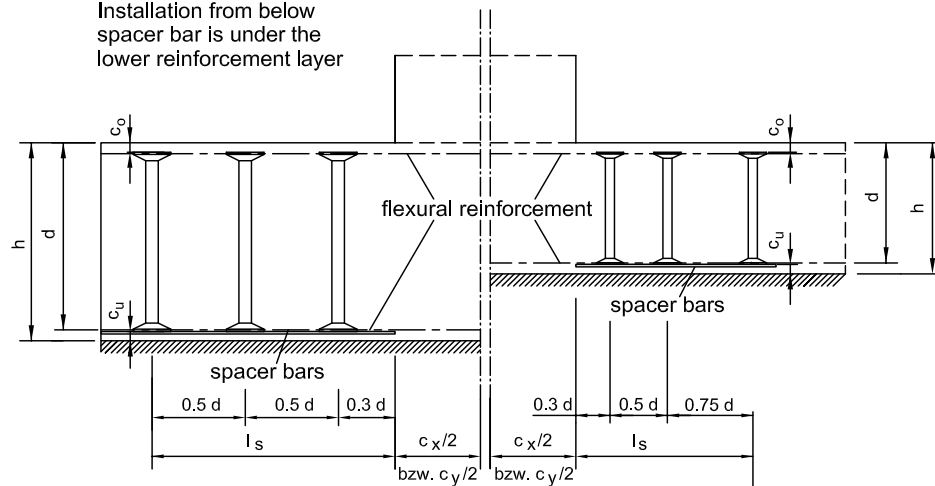
compact foundations
 $a_{\lambda}/d \leq 2.0$

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



Section A - A

Installation from below
spacer bar is under the
lower reinforcement layer



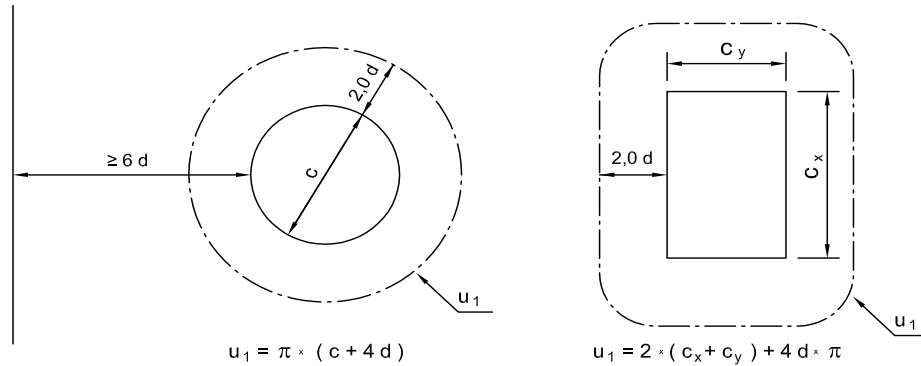
Concrete cover c_o resp. c_u acc. to EN1992-1-1 : 2004 + AC : 2010, section 4.4

Annex 9:

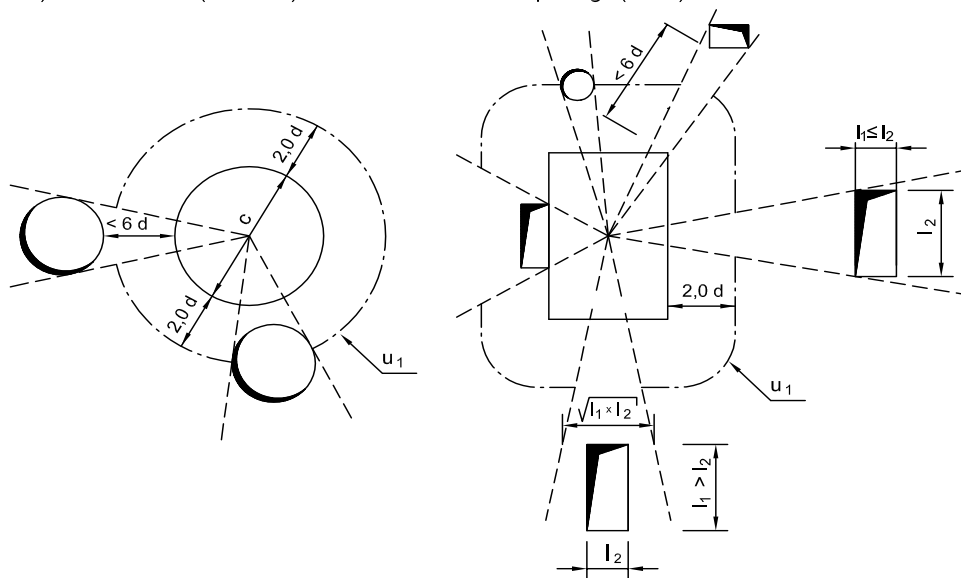
Defining the critical perimeters u_1 and u_{out}

1. Critical perimeter u_1

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

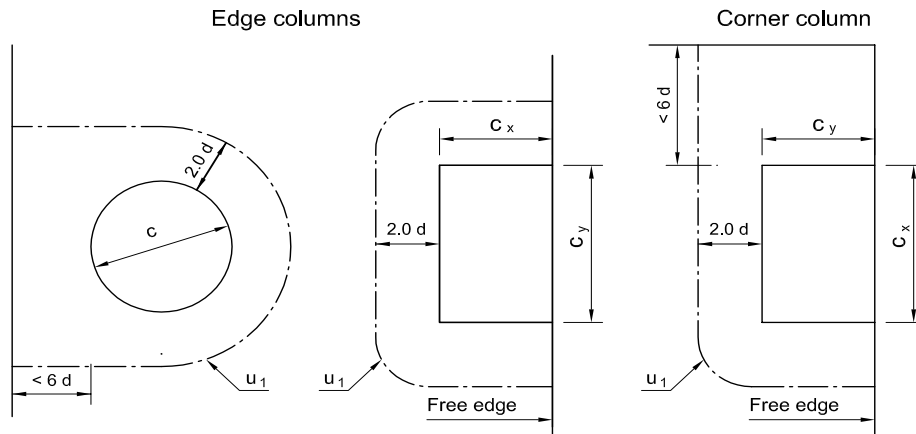


b) Loaded areas (columns) are less than 6d from openings (voids) in the slab.



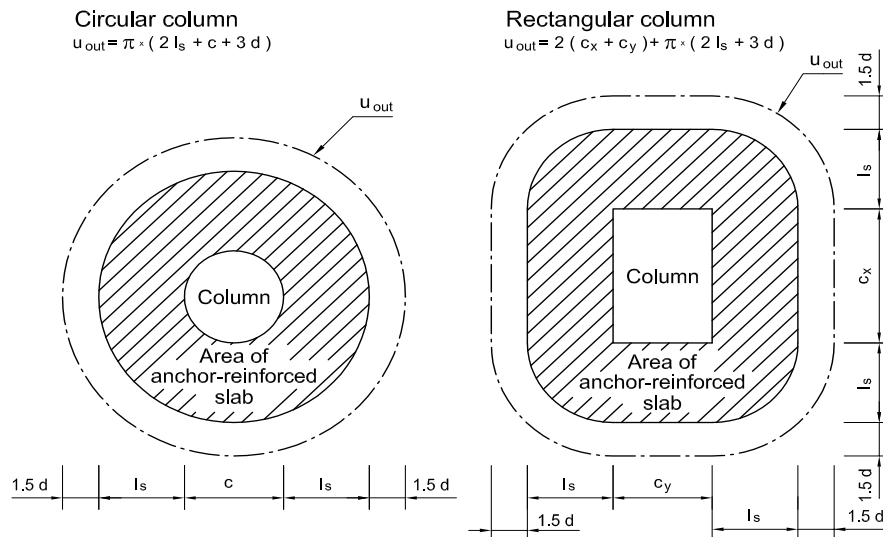
Annex 10:

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



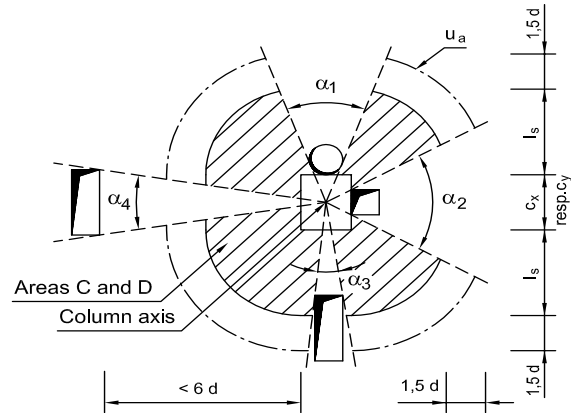
2. Outermost perimeter u_{out}

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



Annex 11:

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



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

