

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-13/0521  
of 1 September 2020

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the  
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Filigran punching reinforcement FDB II

Product family  
to which the construction product belongs

Filigran lattice girders as punching reinforcement

Manufacturer

Filigran Trägersysteme GmbH & Co. KG  
Zappenberg 6  
31633 Leese  
DEUTSCHLAND

Manufacturing plant

D-31633 Leese, Zappenberg 6

D-06896 Coswig OT Klieken, Haide Feld 2

PL-42285 Herby, ul. Lubliniecka 15

This European Technical Assessment  
contains

11 pages including 2 annexes which form an integral part  
of this assessment

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

EAD 160055-00-0301, Edition 09/2018

This version replaces

ETA-13/0521 issued on 14 June 2018

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## Specific Part

### 1 Technical description of the product

The lattice-girders FDB are made of ribbed reinforcement steel with mechanical properties according to EN 1992-1-1:2004 + AC:2010, Annex C. The rebars are weldable and have a characteristic yield strength of 500 MPa.

The lattice-girders consist of three rebar chords, connected by a diagonal which is bent as per requirement with a bending-diameter of  $\geq 20$  mm at the upper chord and at the lower chord of  $\geq 36$  mm. The loops of the diagonals overlap the chords with defined length. The distance between the diagonals with equal inclination to the chords is 200 mm.

The bent diagonals have a diameter of 9 mm and the chords have a diameter of 10 mm, the length of the lattice-girders is custom-made to meet the static requirements in each individual case. Their height  $h_L$  is between  $130 \text{ mm} \leq h_L \leq 300 \text{ mm}$ , thus allowing a use in slabs of a depth between 180 mm and 400 mm.

For the purpose of the assessment as punching shear reinforcement, only the effective bars of each lattice-girder are taken into account. The bending capacity of the lower and upper chord is not taken into account when assessing the load bearing resistance of the punching area of flat slabs.

The detailed product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the Product is used in compliance with the specifications and conditions given in Annex B and EOTA TR 058.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the Product of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

#### 3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Increasing factor for punching shear resistance	$K_{pu,msl} = 2,1$ $K_{pu,csl} = 2,1$ $K_{pu,asl} = 2,1$ $K_{pu,fo} = 1,5$
Increasing factor for maximum interface shear resistance	$k_{max,i} = 1,6$
Mechanical characteristic for fatigue loading	$\Delta\sigma_{Rsk,0,n} = 66,86+336,91 \cdot 0,999956911^{(lg n)} 5,912631783$ [MPa]

**3.2 Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	class A1

**4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base**

In accordance with EAD No. 160055-00-0301 the applicable European legal act is: [97/597/EC(EU)].

The system(s) to be applied is (are): [1+]

**5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

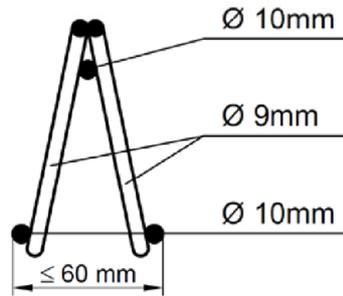
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 1 September 2020 by Deutsches Institut für Bautechnik

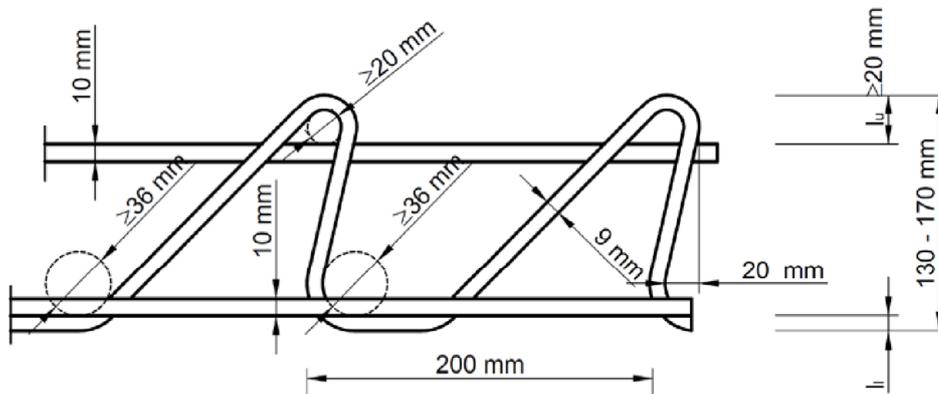
BD Dipl.-Ing. Andreas Kummerow  
Head of Department

*beglaubigt:*  
Schüler

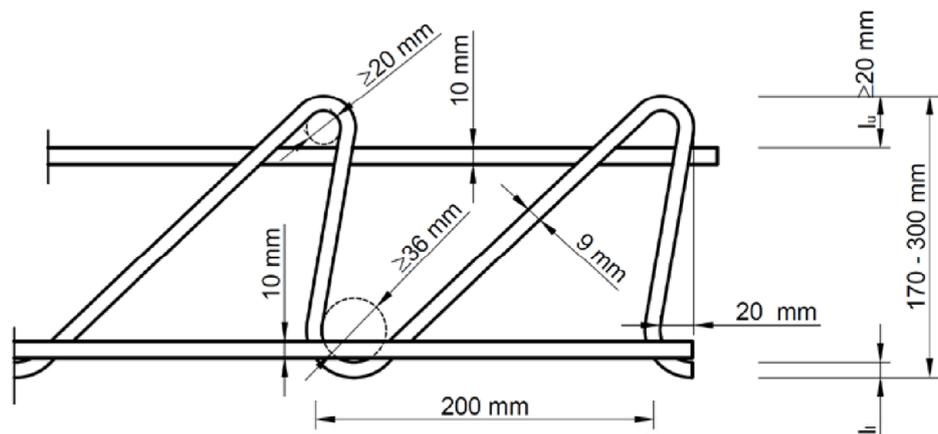
### Section of punching shear reinforcement FDB



### View of lower punching shear reinforcement FDB



### View of higher punching shear reinforcement FDB



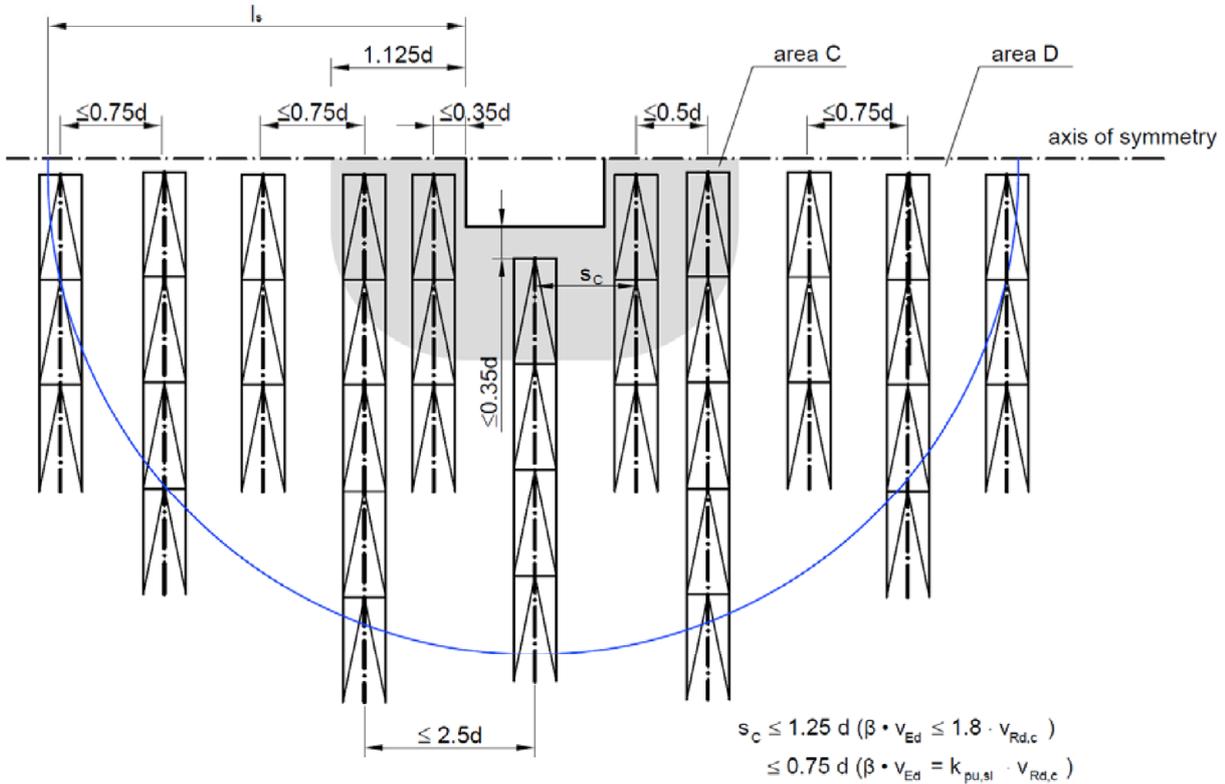
Material: reinforcement steel according EN 1992-1-1, Annex C  
with a characteristic yield strength of  $f_{yk} = 500 \text{ N/mm}^2$

Filigran® Punching Shear Reinforcement FDB

Description of Product

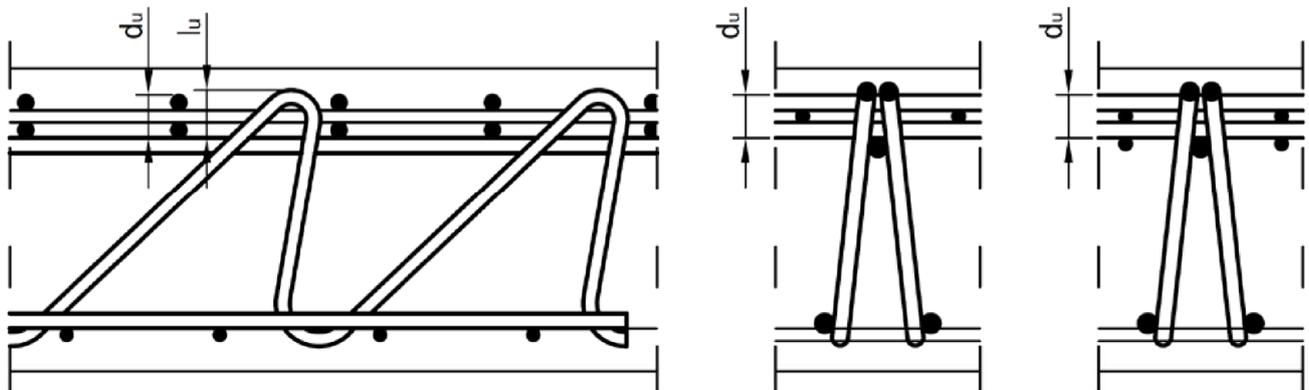
Annex A

### Arrangement and maximum spacing of punching shear reinforcement for inner columns



### Arrangement of bending reinforcement

$$l_u \geq d_u \leq 60 \text{ mm}$$



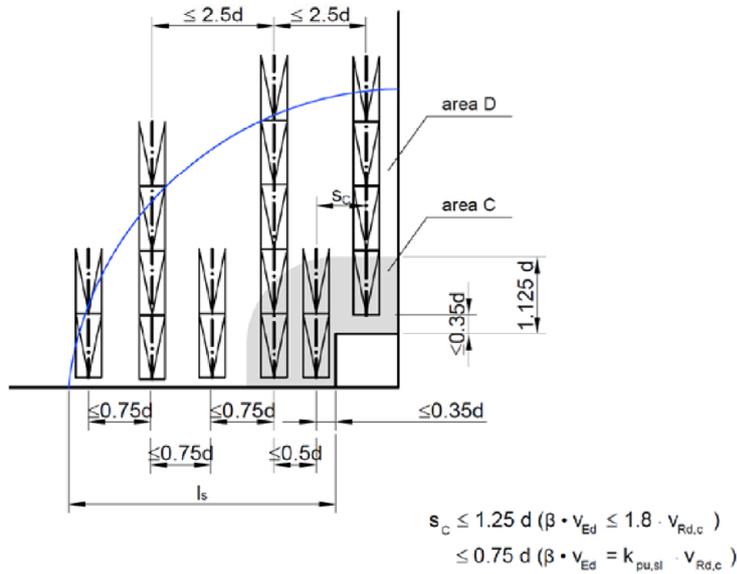
Filigran® Punching Shear Reinforcement FDB

Intended Use

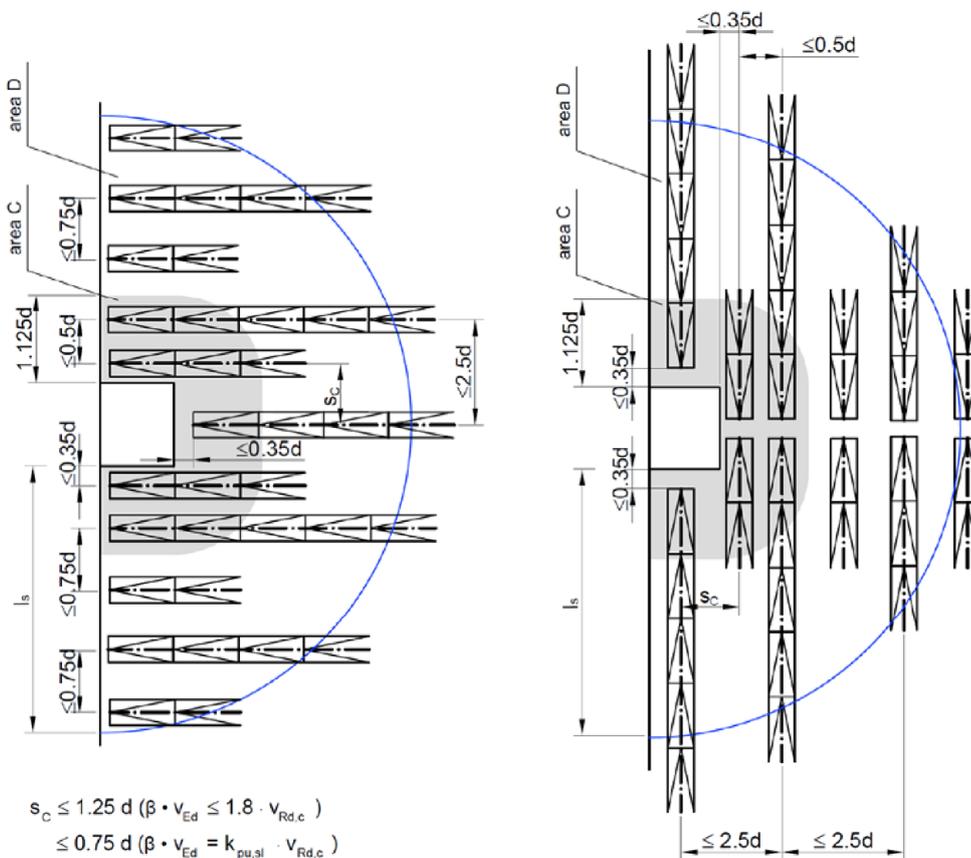
Arrangement of Punching Shear Reinforcement and Bending Reinforcement

Annex B1

### Arrangement and maximum spacing of punching shear reinforcement for corner columns



### Arrangement and maximum spacing of punching shear reinforcement for edge columns



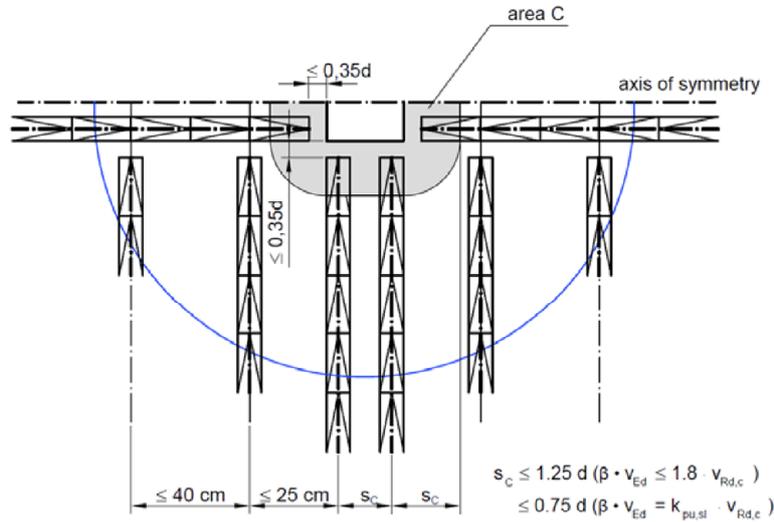
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Filigran® Punching Shear Reinforcement FDB

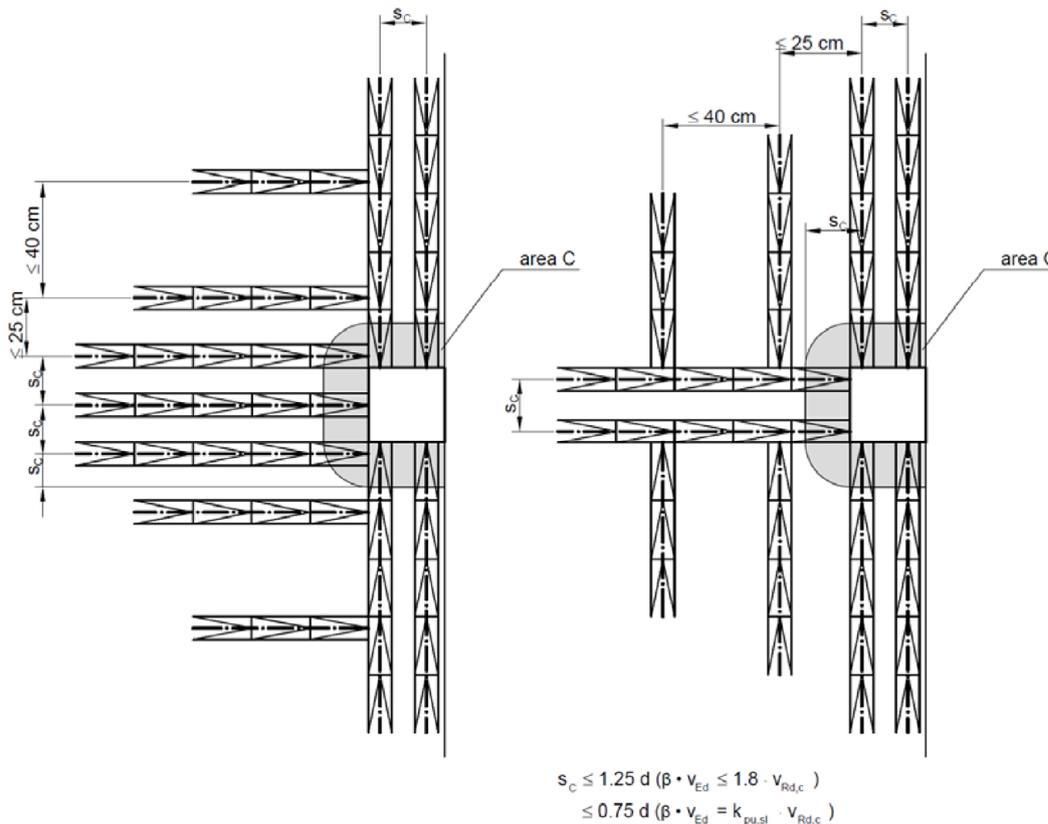
Intended Use  
Arrangement of punching shear reinforcement

Annex B2

### Alternativ arrangement and maximum spacing of punching shear reinforcement for inner columns



### Alternativ arrangement and maximum spacing of punching shear reinforcement for edge columns

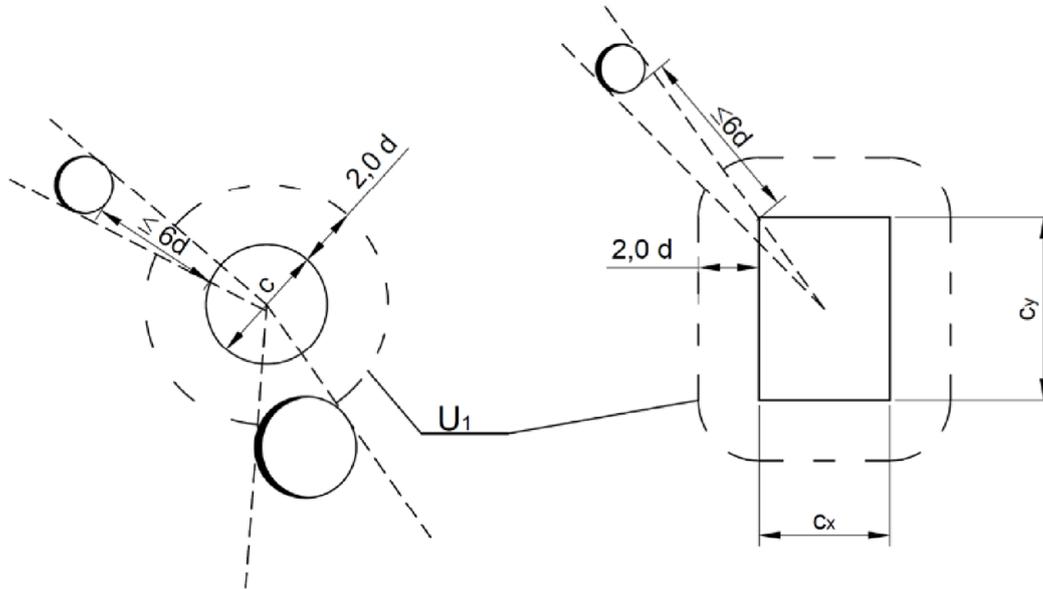


Filigran® Punching Shear Reinforcement FDB

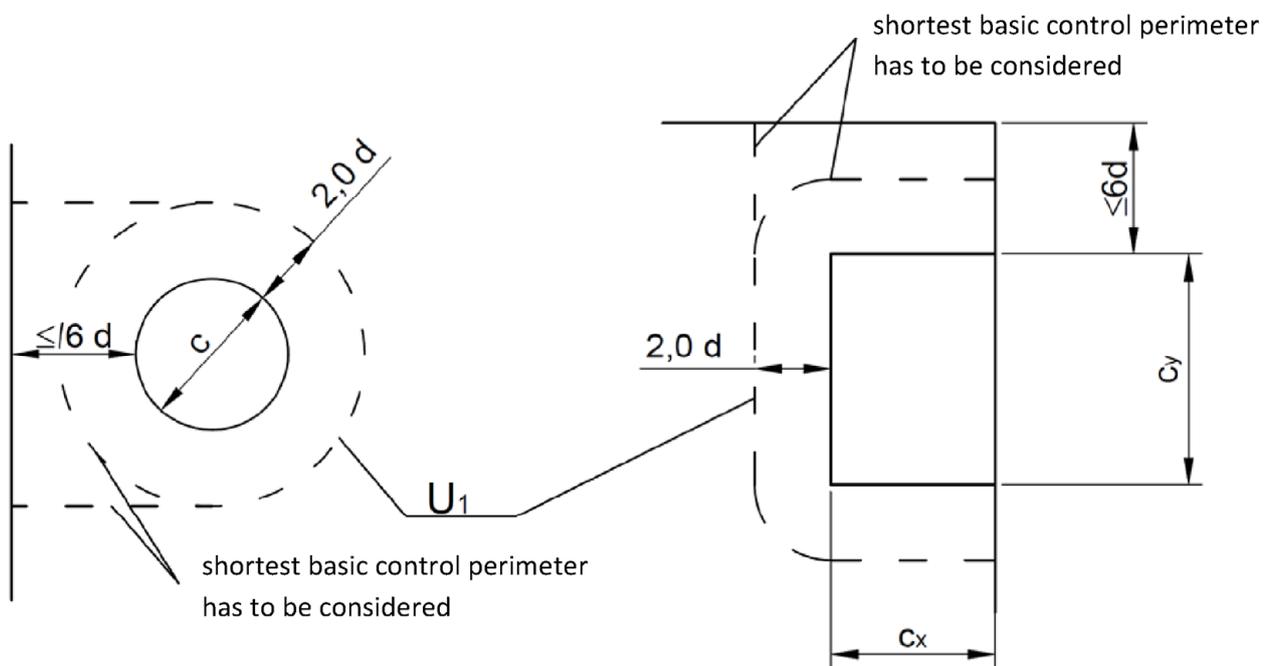
Intended Use  
Alternative Arrangement of Punching Shear Reinforcement

Annex B3

**Basic control perimeter near openings**



**Basic control perimeter for columns close to an edge**

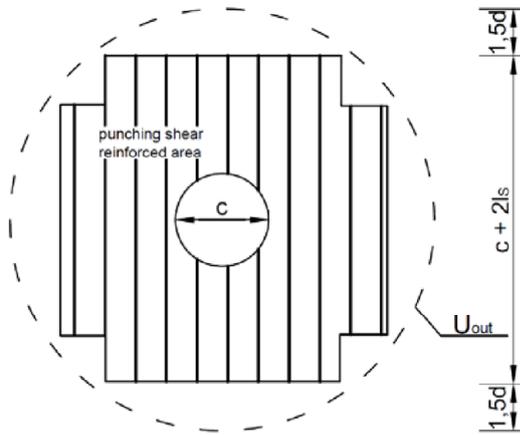


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**Filigran® Punching Shear Reinforcement FDB**

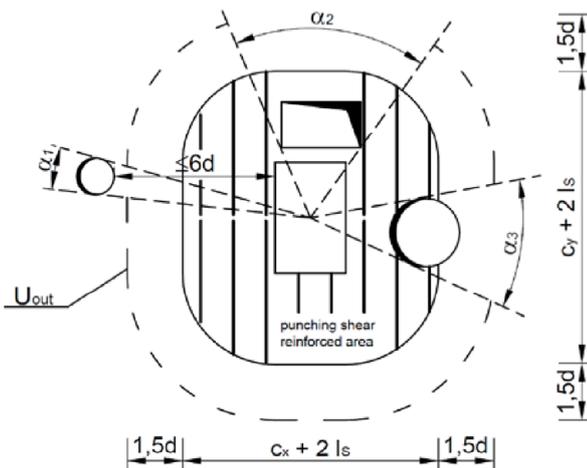
**Intended Use**  
**Control Perimeter near Edges and Openings**

**Annex B4**

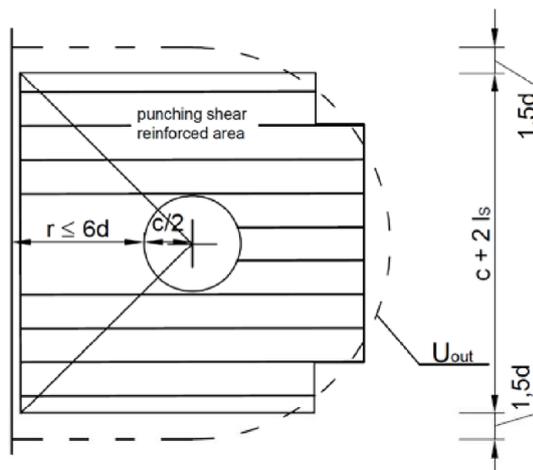


**Outer control perimeter**

$$U_{out} = (c + 2 \cdot l_s + 3.0 \cdot d) \cdot \pi$$



**Outer control perimeter near openings**

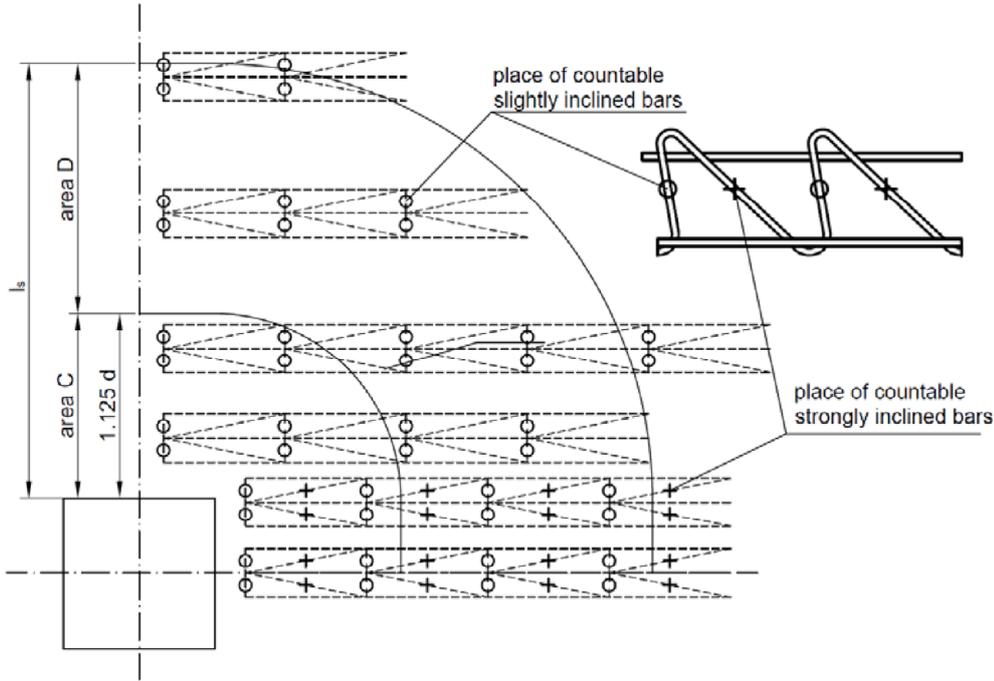


**Outer control perimeter near free edge of slab**

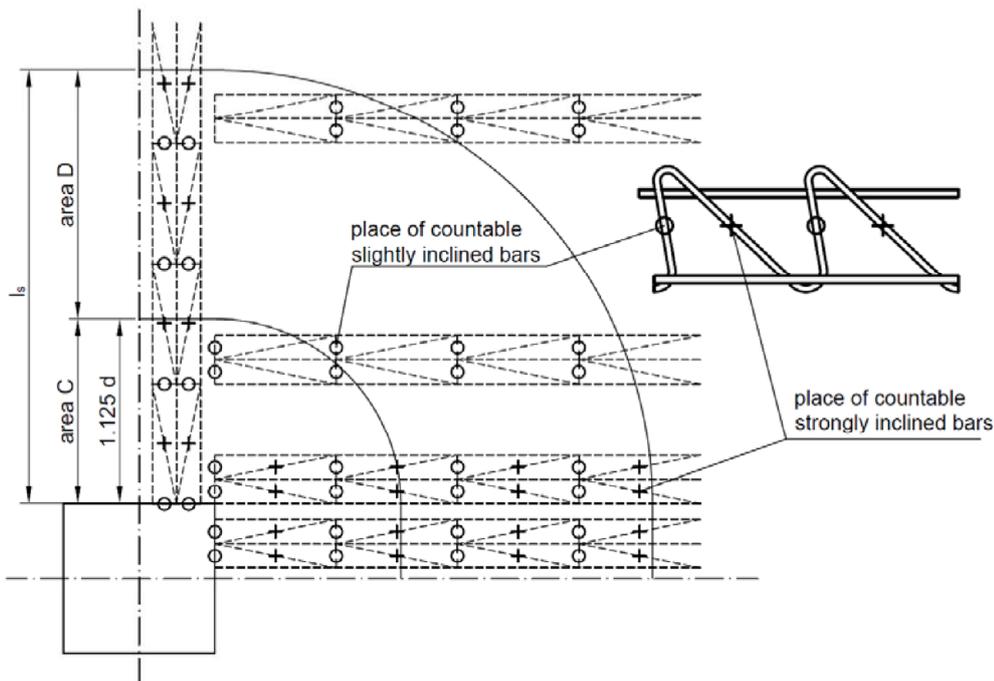
$$U_{out} = 2 \cdot r + c + (c + 2 \cdot l_s + 3.0 \cdot d) \cdot \pi / 2$$

$$\leq (c + 2 \cdot l_s + 3.0 \cdot d) \cdot \pi$$

### Effective bars and place



### Effective bars and place alternative arrangement



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Filigran® Punching Shear Reinforcement FDB

Intended Use  
Effective Bars and Place

Annex B6