GERMAN STRUCTURAL ENGINEERING INSTITUTE

Public-law institution

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Comp Reg.: I 18-1.15.1-45/08

Buildings Inspectorate approval

Permit number: Z-15.1-214

Applicant: Deutsche Kahneisen Ges. mbH
Nobelstraße 51/52
12057 Berlin

Object of permit: JORDAHL type JDA punch-through reinforcement in slabs with dimensions according to DIN 1045-1:2008-08

Valid until: 31 March 2014

The object of the approval mentioned above is hereby approved for general use under building regulations.

This Buildings Inspectorate approval comprises eleven pages and 15 annexes.
This Buildings Inspectorate approval replaces Buildings Inspectorate approval No. Z-15.1-214 of 26th March 2004. The object was first approved for general use under building regulations on 26th March 2004.

[Stamp: German Structural Engineering Institute]

I. GENERAL PROVISIONS

1 The Buildings Inspectorate approval constitutes confirmation that the object of the permit may be used or deployed in accordance with Land building regulations.

2 The Buildings Inspectorate approval does not replace the licences, permissions and certifications prescribed by law in order to carry out a building project.

3 The Buildings Inspectorate approval is granted without prejudice to the rights of third parties, in particular private intellectual property rights.

4 Those manufacturing and marketing the object of the permit must, without prejudice to more extensive regulations set out in the "Special Provisions", make copies of the Buildings Inspectorate approval available to those using or deploying the object of the permit, and must indicate that the Buildings Inspectorate approval must be present at the site where it is used. The authorities involved must, on request, be given copies of the Buildings Inspectorate approval.

5 The Buildings Inspectorate approval may only be duplicated in its entirety. Publication of an excerpt requires permission from the German Structural Engineering Institute. Texts and drawings from publicity documents must not contradict the Buildings Inspectorate approval. Translations of the Buildings Inspectorate approval must contain the words "Translation of the original German version not checked by the German Structural Engineering Institute".

6 The Buildings Inspectorate approval is granted on a revocable basis. The provisions of the Buildings Inspectorate approval may be subsequently extended and amended, in particular if new technical knowledge should necessitate this.

II. SPECIAL PROVISIONS

1. Object of permit and scope of deployment

The type JDA punch-through reinforcement consists of anchors made from reinforcing steel bars BSt 500 S, diameter = 10, 12, 14, 16, 20 or 25 mm, with heads apposed on both ends.

The anchors are fixed to assembly bars to support them in position.

The diameter of the apposed anchor heads is three times the diameter of the shaft. The reinforcement components must correspond to Annex 1.

The type JDA punch-through reinforcement is used as punch-through reinforcement in slabs produced in accordance with DIN 1045-1[1], section 10.5. The slabs must be made of normal concrete, hardness rating C 20/25 to C 50/60. The reinforcement components must be arranged in such a way that the anchors standing up perpendicularly are arranged in a star shape for support. The reinforcement components may be used for primarily static and for primarily non-static loads.

2 Provisions concerning the construction product

2.1 Requirements in relation to properties

The anchors must have the properties of a BSt 500 S in accordance with DIN 488-1[2]. The breaking load must correspond to the technical terms and conditions of delivery, as filed by the German Structural Engineering Institute.

If assembly rods connected to the anchors by tack welding are used to secure their position, these must be made of reinforcing steel BSt 500 S or BSt 500 NR in accordance with DIN 488[2] or BST 500 NR according to Buildings Inspectorate approval or rod or sheet steel suitable for welding, with increased corrosion resistance, in accordance with Buildings Inspectorate approval no. Z-30.3-6[3] or from construction steel S 235 JR in accordance with DIN EN 10025-2[4].

2.2 Manufacture, packaging, transport, storage and marking

2.2.1 Manufacture

The anchor heads are apposed in the manufacturing plant. At the same time the mark is indented into both heads. At least two anchors are joined together to form a reinforcement component, and a reinforcement component may only contain anchors of the same diameter.

2.2.1.1 Type JDA punch-through reinforcement, normal version

The anchors are welded to reinforcing steel with a diameter of 6 to 10 mm, to reinforcing steel bars or to sheet steel (tack welding), to secure the position of the double-headed anchor during concreting (see Annex 2).

2.2.1.2 JDA standard components

Two or three double-headed anchors are welded to reinforcing steel components with a diameter of 6 to 10 mm, or to sheet steel components (tack welding), to secure the position of the double-headed anchor during concreting. The length of the assembly frames and positioning of the anchors are as set out in Annex 3.

2.2.1.3 Punch-through reinforcement type JDA, MS and GT versions, for use in system floors.

The anchors are welded to BSt 500 S reinforcing steel components (tack welding), to secure their position during concreting. If the assembly bars are welded to the shaft of the anchors, then for anchors with a diameter of up to 16 mm, assembly bars with a diameter of 6 mm, and for larger anchor diameters, assembly bars with a diameter of 8 mm should be used. The shear resistance of the welding junctions between the anchor shaft and the assembly bar should not, for anchors with a shaft thickness of ≤ 12 mm, be less than 30% or more than 60%, and for larger diameters it should be no more than 50% of the fluid force of the relevant anchor. The distance between the lower side of the anchor heads on the side of the pressure area and the assembly bar should be a maximum of 80 mm (see Annexes 4 and 5). The same correspondingly also applies to anchors which are welded to the upper flange of lattice girders (see Annexes 4 to 6).

2.2.1.4 Punch-through reinforcement type JDA, FT version with temporary position securing, for use in system floors.

Steel bars with a diameter of 4 mm to 6 mm are welded to at least two anchors in a reinforcement component as spacers, which serve to secure their position during concreting. For this purpose, for anchors with

Diameter (mm)	10	12	14	16	20	25
Spacer with diameter (mm)	≤ 5	≤ 5	≤ 5	≤ 6	≤ 6	≤ 6

The spacers should be applied at a maximum distance of 80 mm from the outer edge of the anchor head on the pressure area side.

The upper anchor heads are protected in an assembly support until the concrete in the system slab has set. The temporary positioning support consists of a patented plastic lock as set out in Annex 7 or Annex 8, the properties of the materials for which are filed with the German Structural Engineering Institute, and which remains on the anchor heads until the concrete has set. When the assembly support is removed, section 4 of this Buildings Inspectorate approval should be complied with.

2.2.2 Packaging, transportation and storage

Packaging, transportation and storage must take place in such a way that the reinforcement components are not damaged. When the punch-through reinforcement is used in ready-made floor components, Annex 15 should be complied with.

2.2.3 Marking

The delivery note for the reinforcement components must be marked by the manufacturer using the compliance mark (Ü mark) in accordance with the compliance mark regulations of the individual Länder and must at least state the anchor diameter and anchor length. Items may only be labelled if the conditions set out in section 2.3 (proof of compliance) are fulfilled. A mark in accordance with Annex 1 should be indented into each head of the anchors, and should indicate the manufacturing plant and the anchor diameter. The key for the correspondence of the manufacturing plant should be filed with the German Structural Engineering Institute and the outside supervisory body. On the positioning support (assembly bars or assembly frames) and in JDA components with a temporary positioning support, the approval number should be applied in a weatherproof format to the anchor closest to the supports in each reinforcement component.

2.3 Proof of compliance

2.3.1 General

Confirmation that the reinforcements are compliant with the stipulations of this Buildings Inspectorate approval must be provided for every manufacturing plant, by means of a certificate of compliance based on production control within the plant and regular third-party surveillance, including an initial test of the reinforcements in accordance with the following stipulations.

For the purpose of granting the certificate of compliance and the third-part e, including the product checks that must be carried out as part of this ıe manufacturer of the reinforcements must commission a certification body rec ıe purpose and a monitoring body recognised for the purpose.

The German Structural Engineering Institute must be given, for its own information, a copy of the certificate of compliance issued by the certification body.

The German Structural Engineering Institute must also be given a copy of the report on the initial check for its own information.

2.3.2 Internal production control within the plant

An internal production control system must be set up and implemented in every manufacturing plant. An internal production control system means continuous monitoring of production carried out by the manufacturer, whereby the manufacturer ensures that the building products manufactured by him are in accordance with the provisions of this Buildings Inspectorate approval. The internal production control system should at least include the measures set out in the audit plan. The audit plan is filed with the German Structural Engineering Institute and the body responsible for monitoring.

The results of the internal production control system must be recorded and evaluated. The records must, in addition to the details set out in the audit plan, contain at least the following information:

- Description of the building product
- Type of check or audit
- Date of manufacture and audit of the building product
- Result of the checks and audits and comparison with requirements
- Signature of the person responsible for the internal production control system.

The records must be kept for at least five years and presented to the monitoring body commissioned to carry out third-party monitoring. They must be submitted to the German Structural Engineering Institute and to the competent highest building regulations authority on request. In the event of an unsatisfactory audit result, the manufacturer must take the required action without delay to remedy the defect. Building products that do not meet requirements must be handled in such a way that confusion with compliant products is impossible. After the defect is remedied - insofar as it is technically possible and necessary in order to prove that the defect has been remedied - the relevant audit must be repeated without delay.

2.3.3 Third-party monitoring

In every manufacturing plant the internal production control system must be checked by a third-party monitoring system, on a regular basis but at least twice a year. In the context of third-party monitoring, an initial check of the reinforcements must be carried out and samples may also be taken for sample testing. The sampling and testing processes are the responsibility of the corresponding monitoring body. In relation to the audit of the internal production control system, at least the audits indicated in the audit plan that has been filed must be carried out. The results of certification and third-party monitoring must be kept for at

least five years. They must be presented to the German Structural Engineering Institute by the certification body or the monitoring body on request.

3 Design and dimensioning provisions

3.1 General

Calculation of the section sizes and dimensions of the slabs and the shear force that acts on them and proof of their load-bearing capacity across predefined verification sections is carried out in accordance with DIN 1045-1[1], unless stipulated to the contrary below.

3.2 Design

Contrary to DIN 1045-1[1], section 13.3.1, the minimum slab thickness is 18 cm. The reinforcement required across the bending support must correspond to DIN 1045-1[1], section 13.3.2. The anchors that are set perpendicularly must always be arranged in the direction of the shear forces that are applied (component rows) and arranged in a star-shape to provide support. The lower anchor heads must reach at least to the bottom of the lowest reinforcement layer, and the upper anchor heads must reach to the top of the top reinforcement layer.

Only anchors of identical diameter may be used for support in the punch-through area.

The implementation planning must lead to the punch-through reinforcement being installed correctly into the concrete steel reinforcement network and, where applicable, into available lattice girders in accordance with the said Buildings Inspectorate approval. As a rule, this planning includes a suitable scale component drawing of the region with the punch-through reinforcement showing all reinforcements, steel reinforcing bars and the reinforcing steel mesh or lattice girders.

Free edges must be enclosed in accordance with DIN 1045-1[1], figure 71. If reinforcements in accordance with section 2.2.1.3 are used with assembly bars in reinforcing steel welded to the anchor shaft (or if the reinforcements are fixed to the upper flange of lattice girders), then the perpendicular bars (upper flanges of lattice girders) should, if possible, be in the concrete pressure area and certainly no higher than 8cm above the anchor heads on the pressure area side.

3.3 Dimensions

3.3.1 General

Proof that the slab is secured against punching through is provided in accordance with DIN 1045-1[1], section 10.5.3, insofar as no stipulation to the contrary is set out below.

DIN 1045-1[1], section 10.5.2 (14) is not applicable.

The increase in the resistance to shear force achieved by using angled tension components may be taken into account in accordance with DIN 1045[1], section 10.5.3 (5).

In order to determine the maximum load-bearing capacity, the normal tension with a favourable effect, σ_{cd}, must not be taken into account.

Outside the punch-through reinforcement, the normal tension in the floor should be defined in the mean of the outer verification section of the slab in accordance with DIN 1045-1[1], section 10.5.4.

A distinction is made below between areas C and D close to the supports.

Area C is the slab section at a distance of no more than 1 d from the support section. In JDA standard components in accordance with section 2.2.1.2 this is no more than 1.125 d from the support section). Area D is the slab section at a distance of no more than 4 d from the support section but excluding area C.

Measurement of the entire effective shear force including correction value β is carried out in the following steps:

(i) Calculating of the load-bearing capacity of the slab without punch-through reinforcements to check the maximum load-bearing capacity, taking into account the special regulations for edge and corner supports and supports close to openings in the slab.
(ii) Checking whether the shear force that can be absorbed - including correction value β - does not exceed that maximum load bearing capacity (cf. section 3.3.2.1)
(iii) Dimensioning of the punch-through reinforcement in area C for all the shear force to be absorbed (including correction value β) taking into account
- the special regulations for thick slabs
- the determination of the required component rows and the diameter,
- the spacing rules set out in section 3.3.5.

Shear force components with a favourable effect due to angled tension components may only be taken into account when dimensioning the anchoring system if the effect exists both in area C and in area D. Shear force components with an unfavourable effect must always be taken into account in their entirety.
(iv) Determining the reinforcement in area D by continuation of the component rows from area C and, where applicable, by arranging additional component rows to fulfil the spacing rules in accordance with section 3.3.5.

3.3.2 Proof of security against punching through

3.3.2.1 Maximum load-bearing capacity in the punch-through area.

The maximum shear force bearing capacity for slabs with punch-through reinforcements in the critical circular section is as follows, contrary to equation (107) in DIN 1045-1[1]:

$$v_{Rd,max} = 1{,}9\ v_{Rd,ct},$$

where

$v_{Rd,ct}$ deviating from DIN 1045-1[1] in accordance with section 3.3.2.2 must be calculated for inner, edge and corner supports.

The following must be demonstrated:

$$\frac{\beta \cdot V_{Ed}}{u_{krit}} \leq v_{Rd,max}$$

u_{krit} the size of the critical circular section in accordance with section 10.5.2 of DIN 1045-1[1], DIN 1045-1[1], section 10.5.2 (14) not being applicable in this case (see also 3.3.1).

β Load enhancement factor for horizontally non-displaceable positioned floor systems according to Table 1 or
alternatively ß according to DIN 1045-1[1], fig. 44 or according to Volume 525[5] of the DAfStb, section 10.5.3

Table 1: Correction values for more precise determination of load enhancing factors β

Correction value	Inner supports	Corner supports	Edge supports
$\beta_{\square}$	1.05	$\sqrt[5]{1+\left(\frac{e}{1.09 \cdot c}\right)^5 \left(\frac{c_x}{c_y}\right)^{0.15\frac{e}{c}}}$	$\sqrt[5]{1+\left(\frac{e}{1.25 \cdot c}\right)^5 \left(\frac{c_x}{c_y}\right)^{0.15\frac{e}{c}}}$
β_{red}	1.05	$\frac{1.17 \cdot \beta}{1+0.2 \cdot \frac{l_s}{d}} \geq 1$	$\frac{1.17 \cdot \beta}{1+0.15 \cdot \frac{l_s}{d}} \geq 1$

l_s Distance from the outermost anchoring row to the support section

e resulting mean of the floor support force $e = \frac{M_{Ed,Knoten}}{V_{Ed}}$

	on bending in two axes, e is defined as: $e = \frac{\sqrt{M_{Ed,Knoten,x}^{2} + M_{Ed,Knoten,y}^{2}}}{V_{Ed}}$
$M_{ed,Knoten}$	Resulting support compression moment of the floor-support connection
c_x	Edge supports: Edge length of the supports perpendicular to the free edge of the floor Corner supports: Longer edge length of the supports
c_y	Edge supports: Edge length of the supports parallel to the free floor edge Corner supports: Shorter edge length of the supports
c	Square corner and edge supports: c_x Rectangular corner and edge supports; $\sqrt{0.5 \cdot (c_x^2 + c_y^2)}$ Rounded corner and edge supports: $0.9.l_c$ l_c: Support diameter

3.3.2.2 Calculated values for shear force capacity

The critical circular section must be placed, in accordance with DIN 1045-1[1], section 10.5.2, for inner supports, and supports close to openings in the slab. Supports that are less than 6 d from at least one edge of the slab count as edge or corner supports.

For this purpose the circular section should be defined on the basis of DIN 1045-1[1], figure 41, whereby 6 d should be taken as the distance from the edge (instead of 3 d in accordance with figure 41).
If the definition of a circular section in accordance with DIN 1045-1[1], figure 39 gives rise to a smaller circular section length as a result, then this is definitive (see Annexes 11 to 14).
In the critical circular section, the shear force capacity $v_{Rd.ct}$ of the slab to calculate the maximum load bearing force is calculated from:

$$v_{Rd,ct} = \left[0.14 \cdot \kappa (100 \cdot \rho_l \cdot f_{ck})^{\frac{1}{3}} \right] \cdot d [MN/m]$$

where:

κ the scaling factor according to equation (106) in DIN 1045-1,

ρt = $\sqrt{\rho_{lx} \cdot \rho_{lx}} \le \min\left\{ 0.306 \frac{f_{ck}}{f_{yk}} : 0.02 \right\}$ and $f_{yk} \le 500$ N/mm²,

f_{yk} characteristic value for the extension boundary of the reinforcing steel,

f_{ck} characteristic value for the cylindrical pressure resistance of the concrete.

In the outer circular section at a distance of 1.5 d from the outermost anchor, the shear force capacity $v_{Rd.ct.a}$ is given by:

$$\frac{\beta_{red} \cdot V_{Ed}}{u_a} < v_{Rd,ct}^{au\beta en} = v_{Rd,ct} \cdot \kappa_a$$

Where

κ_a $\frac{1}{1 + 0.1 \cdot \frac{l_s}{d}} \ge 0.714$ and l_s is the distance from the outermost anchor of a component row in the support section

β_{red} According to Table 1 or alternatively β in accordance with DIN 1045-1[1], figure 44 or according to Volume 525 of the DAfStb, section 10.5.3.

$v_{Rd.ct}$ in accordance with DIN 1045-1:2001-07, equation (105)

3.3.3 Proof against fatigue

The proof against fatigue should be calculated on the basis of DIN 1045-1:2001-07, section 10.8.3, but for load fluctuation figures of $N \le 2*10^6$. The corresponding tension value is then $\Delta\sigma_{Rsk}(2*10^6) = 70$ N/mm².

For higher load fluctuation figures the proof has not been evaluated in the context of this Buildings Inspectorate approval.

Taking into account this steel tension verification limit, proof against fatigue for concrete, under pressure challenges in accordance with DIN 1045-1[1], section 10.8.4(4) does not need to be carried out in normal multi-storey buildings.

3.3.4 Dimensioning of the punch-through reinforcement

In area C in accordance with section 3.3.1 the number of anchors should be defined in such a way that the inequality set out below is satisfied for the measurement value including factor β:

$\beta \cdot V_{Ed} \le V_{Rd,sy}$ where

β Factor to take into account the non-rotational symmetrical distribution of shear force within the circular section close to edge and corner supports and for inner supports in irregular systems in accordance with Table 1 or, alternatively, in accordance with DIN 1045-1, fig. 44, or according to Volume 525 of the DAfStb, section 10.5.3.

$$V_{Rd,sy} = \frac{m_c \cdot n_c}{\eta} \cdot A_{s\_i} \cdot f_{yd}$$

Where A_{s_i} the area of the verification section of <u>one</u> double-headed anchor

n_c The number of anchors on a component row in area C (cf. Annex 9)

m_c The number of component rows in area C (cf. Annex 9)

f_{yd} Calculated value for the limit of the extent of the reinforcing steel (≤ 435 MPa)

η Factor to take into account the thickness of the slab depending on the static height:

η = = 1.0 where d ≤ 200 mm
= 1.6 where d ≥ 800 mm

Intermediate values should be interpolated linearly.

The <u>anchors in area D</u> are the anchors that must be arranged in sufficient numbers to satisfy the distance rules set out in Section 3.3.5:

3.3.5 Arrangement of anchors and distances between them.

For every component row situated on a radius extending from the support, at least two anchors must be placed in area C.

For thick slabs (d>50 cm) and simultaneous support diameters lc < 50 cm, for increased loads ($V_{Ed} > 0.85\ V_{Rd,max}$) at least three anchors must be put in place.

The component rows required in area C must be continued, taking into account the spacing rules for this section, up to the edge of the area with punch-through reinforcements. If applicable, additional component rows that are needed in area D to comply with the spacing rules for this area should be distributed equally between the rows calculated from area C.

If, within a single slab, shear force reinforcements are required outside area D, then, for horizontally non-displaceable flat floors with identical loads and approximately identical support distances, the anchors should be arranged as shear force protection at a distance of up to 1.5 d from the outer edge of area D, if the permissible anchor distances in this section are complied with and the component rows from area D are continued.

The anchor closest to the loaded area (support) must, for this purpose, have a distance of between 0.35 d and 0.5 d.

If JDA standard components are used as set out in Annex 10, area C may be extended to a distance of 1.125 d from the support section.

The distances between the anchors must not exceed the following values:

- In the direction of the radii extending from the loaded area (support), in areas C and D: 0.75 d.

Additionally, for distances s_D, the following applies in the radial direction in area D:

$$s_D = \frac{3 \cdot d}{2\, n_c} \frac{m_D}{m_C} \leq 0.75\, d$$

where

m_c is the number of component rows in area C

m_D is the number of component rows in area D,

n_c is the number of anchors in a component row in area C (see Annex 9)

- In a tangential direction in area C: 1.7 d
- In a tangential direction in area D: 3.5 d

3.3.6 Verification of fire resistance class

For verification of fire resistance class, DIN 4102-4[6] is applicable, in conjunction with DIN 4102-22[7] or DIN V ENV 1992-1-2[8] in conjunction with DIN Technical Report 92[9].

The necessary concrete covering for the anchor heads and assembly frames must be maintained in the region of the reinforcements.

4 Implementation provisions

Deviations of more than one tenth of the slab thickness, compared to the planning documents, in the position of and the distances between the anchors installed one relative to another in the punch-through reinforcement in the layout of the slab are inadmissible. The lower anchor heads of the double-headed bolts must extend at least as far as the lower edge of the lowermost reinforcement position and the upper anchor heads must extend at least as far as the upper edge of the uppermost reinforcement position. However, the minimum and maximum values specified in the corresponding documents apply unreservedly to the dimensions of and distances between the individual anchor bolts of the punch-through reinforcement components

When using FT version Type JDA components with temporary position supports for system floors, in accordance with Annexes 7 or 8 (cf. section 2.2.1.4), the assembly support for the upper anchor head must be removed at the earliest when the concrete of the finished slab has a characteristic hardness of $f_{c,cyl}$ = 12 N/mm^2.

When using JDA reinforcements in system floors, in the punch-through area - if component impacts cannot be avoided - to ensure safe transfer of pressure forces, the impact joints should be made at least 4 cm wide and filled with concrete locally.

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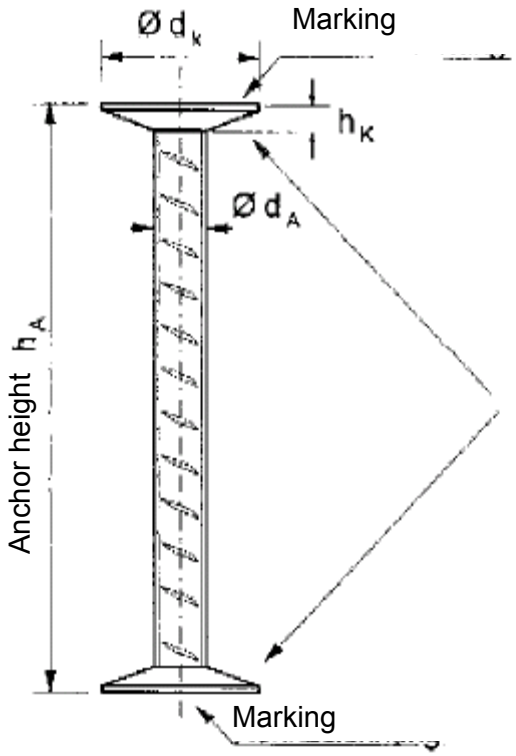
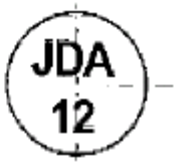
Häusler

Deutsches Institut für Bautechnik

Anchor shape



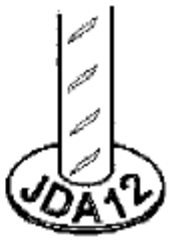
On both sides



e.g. Jordahl
Double-headed anchor
M 12

Alternative marking

On both sides



e.g. Jordahl
Double-headed anchor
M 12

Anchor Diameter d_A [mm]	Head diameter d_K [mm]	Head height h_K [mm]	Anchor cross-section A [mm²]	Load bearing capacity $F = A * f_{yd}$ [kN]
10	30	5	79	34,36
12	36	6	113	49,15
14	42	7	154	66,99
16	48	7	201	87,43
20	60	9	314	136,60
25	75	12	491	213,60

JORDAHL®
REINFORCEMENT
TECHNOLOGY

JORDAHL
punch-through reinforcement
Type JDA

Deutsche Kahneisen
Gesellschaft mbH
Nobelstraße 51-55
D-12057 Berlin
Tel. 030/6 82 83-02
Fax 030/6 82 83-498

Double-headed anchor
Dimensions
Load bearing capacities

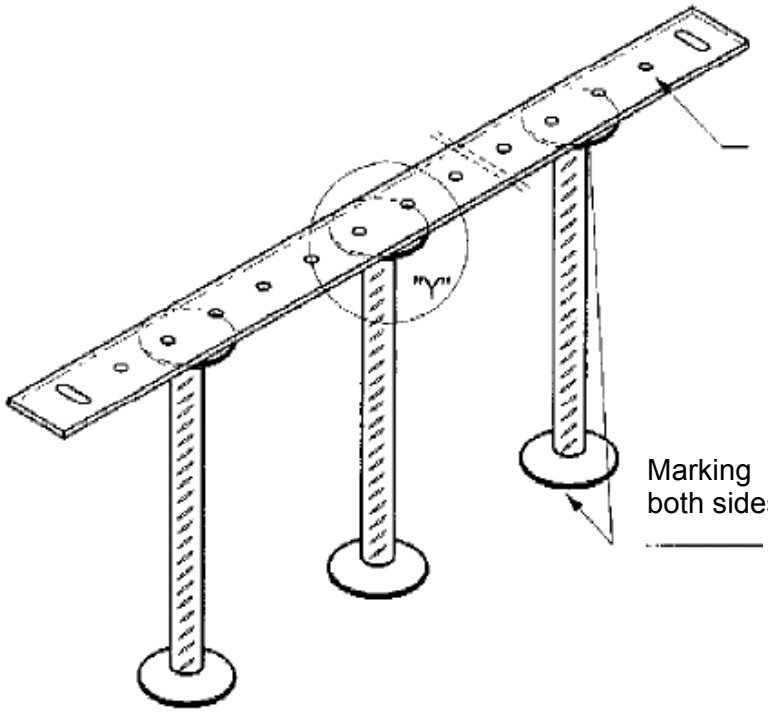
Annex 1

to Buildings
Inspectorate Approval
No. Z-15. 1-214

Dated 18 March 2009

Note: Translation of the German original version not checked by the German Institute for Structural Engineering.
Every page of the German original bears the official stamp of the German Institute for Structural Engineering.

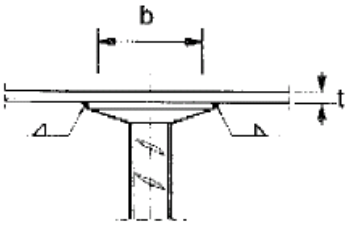
Punch-through reinforcement with double-headed anchors
Material, fixing frame



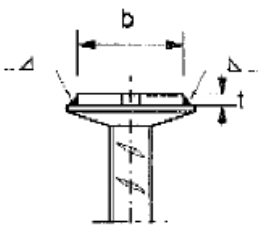
Materials:

Anchor: BSt 500S
Frames: S 235 JR
(1.0037 or ST 37-2)
1.4571/1.4401 (A4)
DIBt Approval No. Z-30.3-6

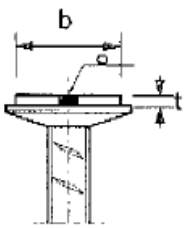
Frame reinforcement
Detail "Y"



Welded from the side
Below the frame



Welded from the side
above the head



Welded in the
middle in the
hole in the frame

Frame in
Perforated strip
w/d = 30/4

JORDAHL®
REINFORCEMENT
TECHNOLOGY

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JORDAHL
punch-through reinforcement
Type JDA

JDA punch-through reinforcement
Materials
Fixing frame

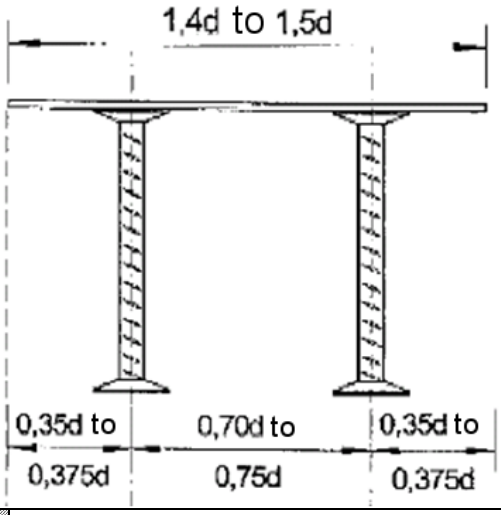
Deutsches Institut für Bautechnik

Annex 2

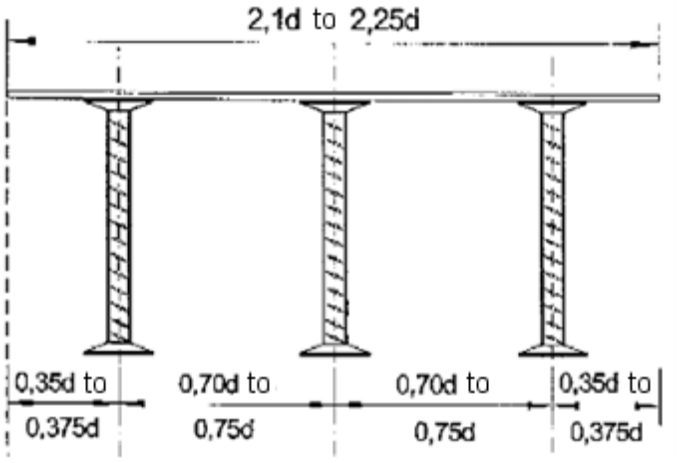
to Buildings
Inspectorate Approval
No. Z-15. 1-214

Dated 18 March 2009

JDA standard components



Support	Description: 2-part component



[bis = to]

Support	Description: 3-part component

JDA standard components are manufactured with a symmetrical overlap so that components can be correctly matched to each other. If multiple components are used they must be pushed up against each other.

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JORDAHL
punch-through reinforcement
Type JDA

JDA punch-through reinforcement
Representation of JDA
standard components

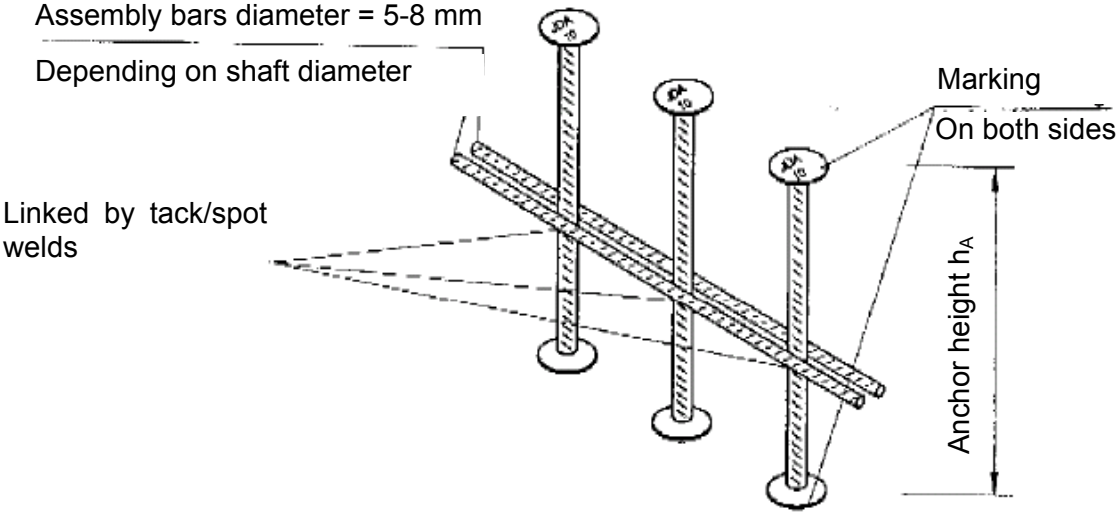
Annex 3

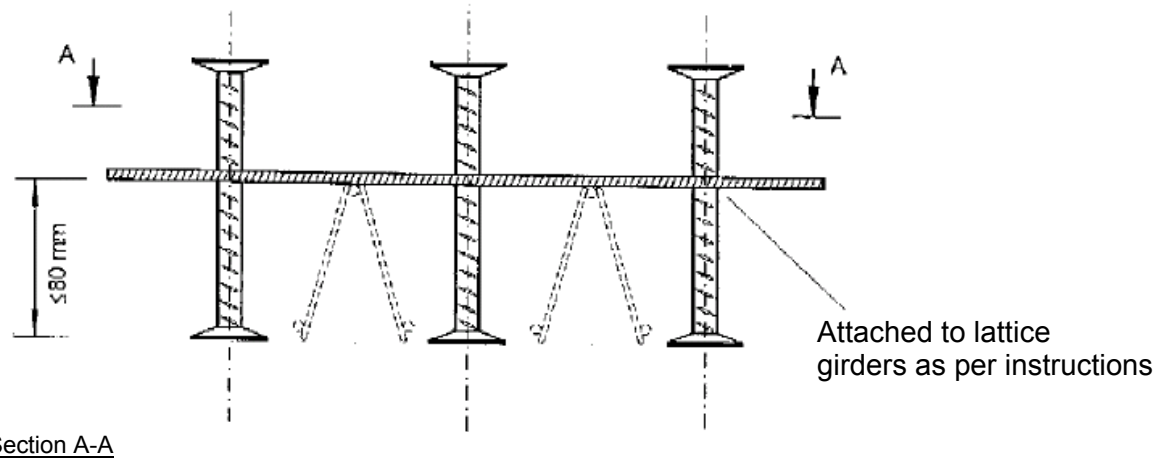
to Buildings
Inspectorate Approval

No. Z-15. 1-214
Dated 18 March 2009

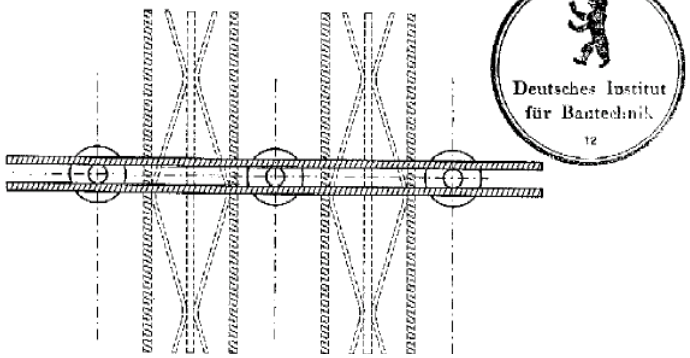
Assembly of JDA reinforcements in prefabricated floor units

Positioning of JDA reinforcements. MS version on the lattice girder of a prefabricated floor unit with supporting layer of local concrete





Section A-A

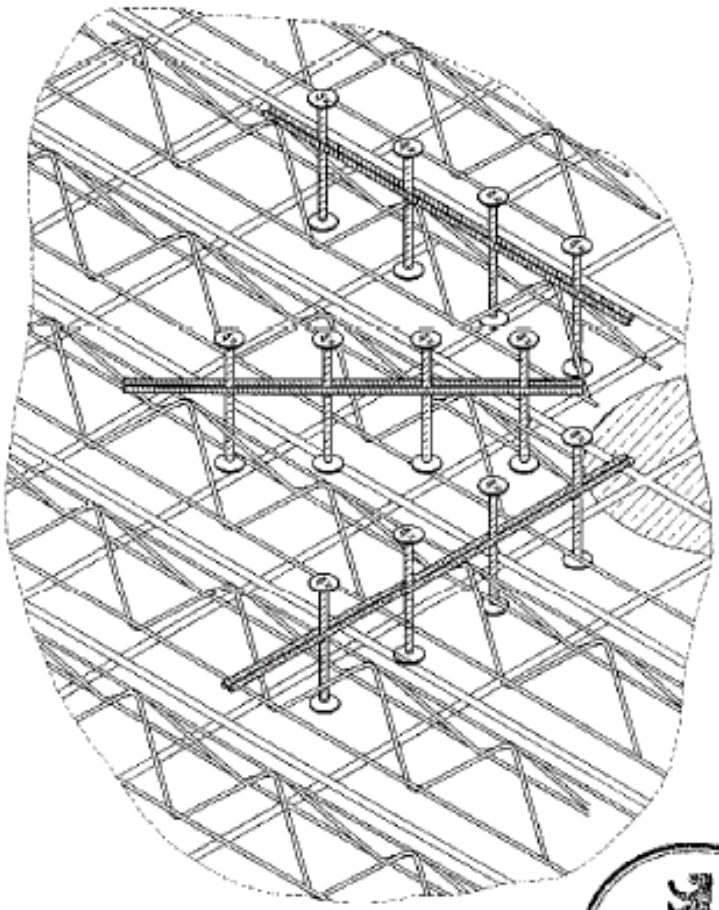


Material
Anchor: BSt 500S
Assembly bars: BSt 500S

JORDAHL ® REINFORCEMENT TECHNOLOGY	JORDAHL punch-through reinforcement Type JDA	Annex 4
Deutsche Kahneisen Gesellschaft mbH Nobelstraße 51-55 D-12057 Berlin Tel. 030/6 82 83-02 Fax 030/6 82 83-498	Anchor securing system MS version for use in prefabricated floor units	to Buildings Inspectorate Approval No. Z-15. 1-214 Dated 18 March 2009

Assembly of JDA reinforcements
MS version in prefabricated floor units

Positioning of JDA reinforcements, MS version on the lattice girders of a prefabricated floor unit with supporting local concrete layer.



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Assembly of reinforcements
MS version
for use in system
floor units

Annex 5

to Buildings
Inspectorate Approval
No. Z-15. 1-214

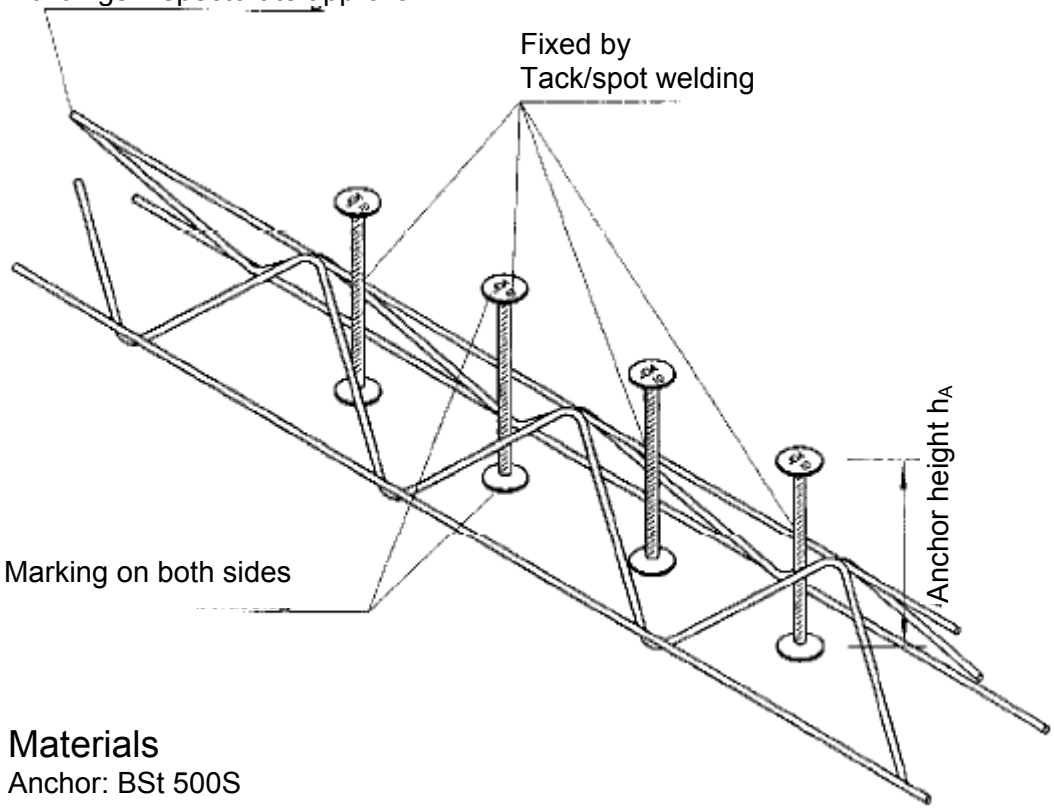
Dated 18 March 2009

Note: Translation of the German original version not checked by the German Institute for Structural Engineering.
Every page of the German original bears the official stamp of the German Institute for Structural Engineering.

Reinforcements with double-headed anchors
GT version

Secured in position by fixing to lattice girders

Lattice girders in accordance with
Buildings Inspectorate approval

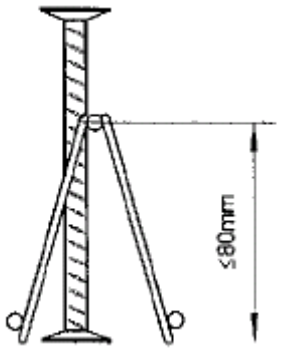


Materials

Anchor: BSt 500S

Lattice girders: BSt according to current Buildings Inspectorate approval for lattice girders

Section:



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JORDAHL
punch-through reinforcement
Type JDA

JDA punch-through reinforcement
GT version
Materials and deployment
for use in system
floor units

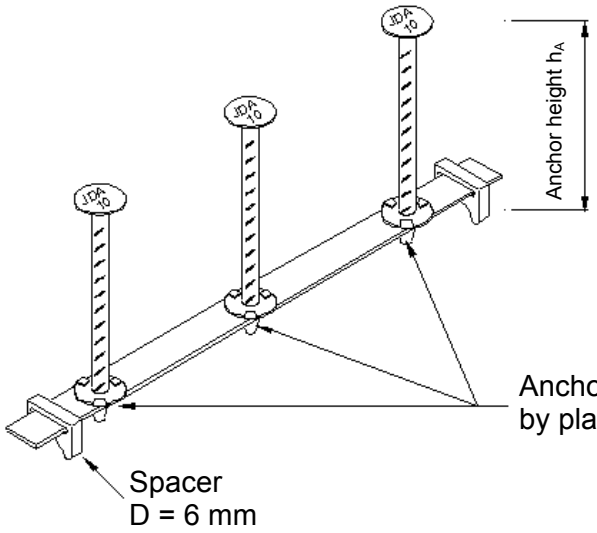
Annex 6

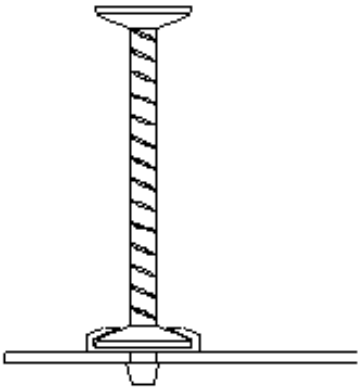
to Buildings
Inspectorate Approval
No. Z-15. 1-214

Dated 18 March 2009

Punch-through reinforcement with double-headed anchors
FT version with plastic patented lock

For use in system floor units





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JORDAHL
punch-through reinforcement
Type JDA

Punch-through reinforcement
FT version
Materials/connections

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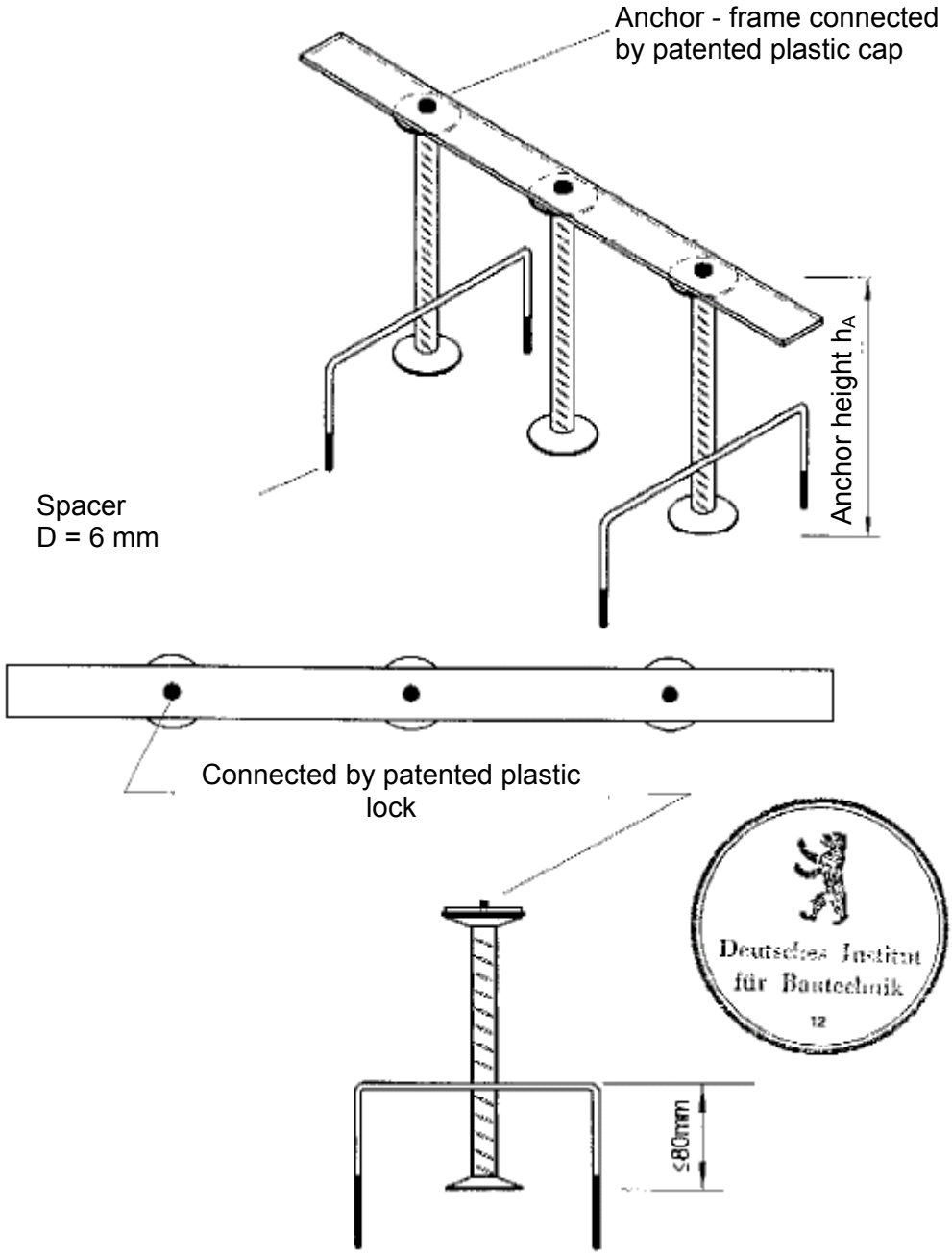
Inspectorate Approval
No. Z-15. 1-214
Dated 18 March 2009

Punch-through reinforcement with double-headed anchors
FT version with patented plastic lock

For use in system floor units



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punch-through reinforcement
Type JDA

Annex 8

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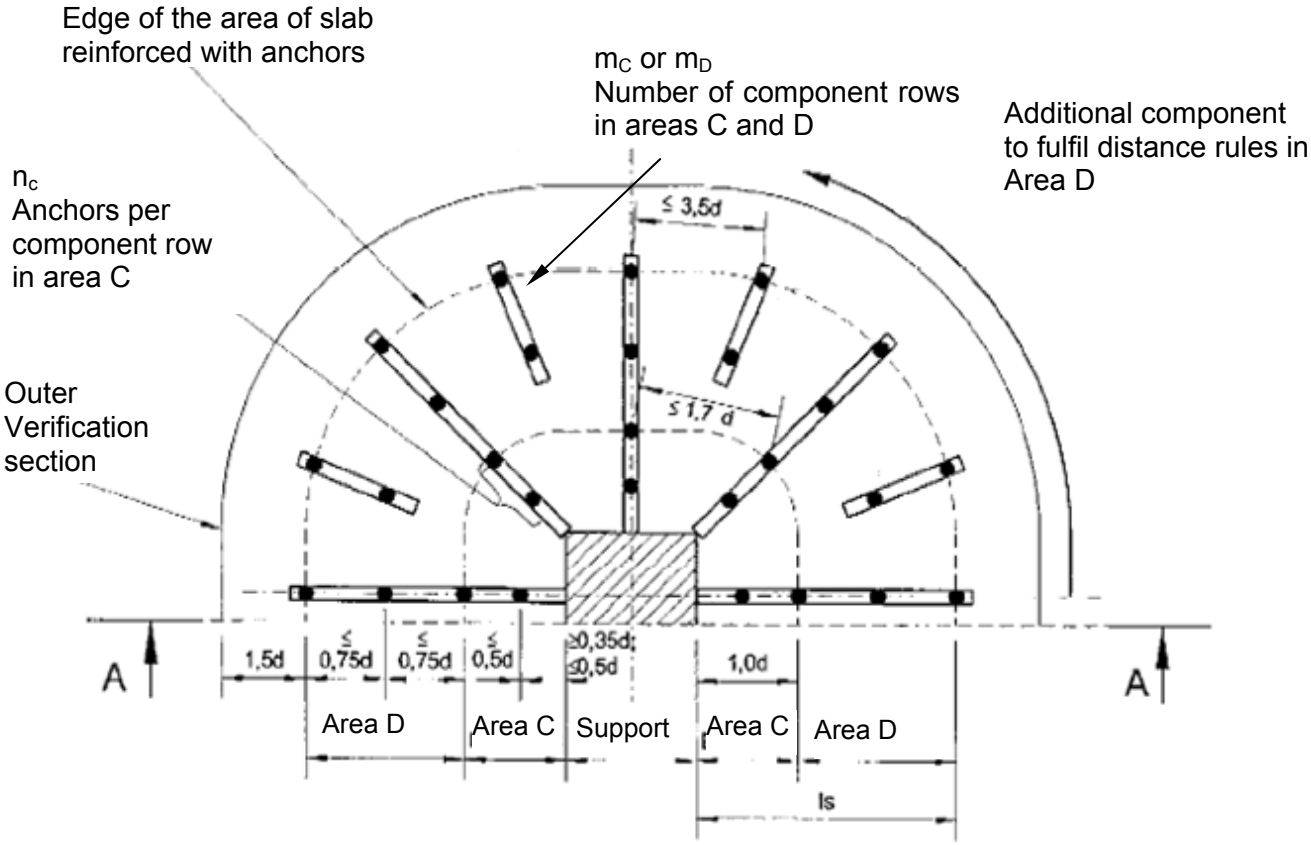
JDA punch-through reinforcement
FT version
Materials/connections

to Buildings
Inspectorate Approval
No. Z-15. 1-214
Dated 18 March 2009

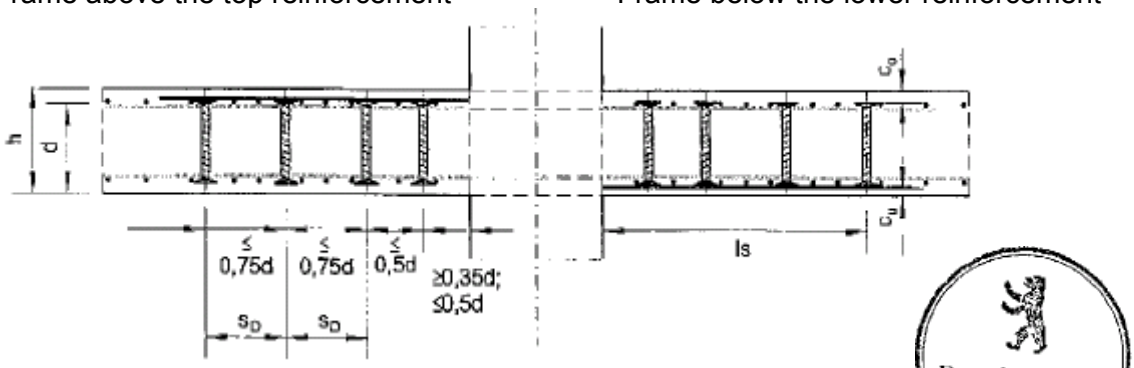
Arrangement in principle of punch-through reinforcement with continuous components



Section A-A

"Built from above"
Frame above the top reinforcement

"Built from below"
Frame below the lower reinforcement



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JDA punch-through reinforcement
Component arrangement with
continuous components

Annex 9

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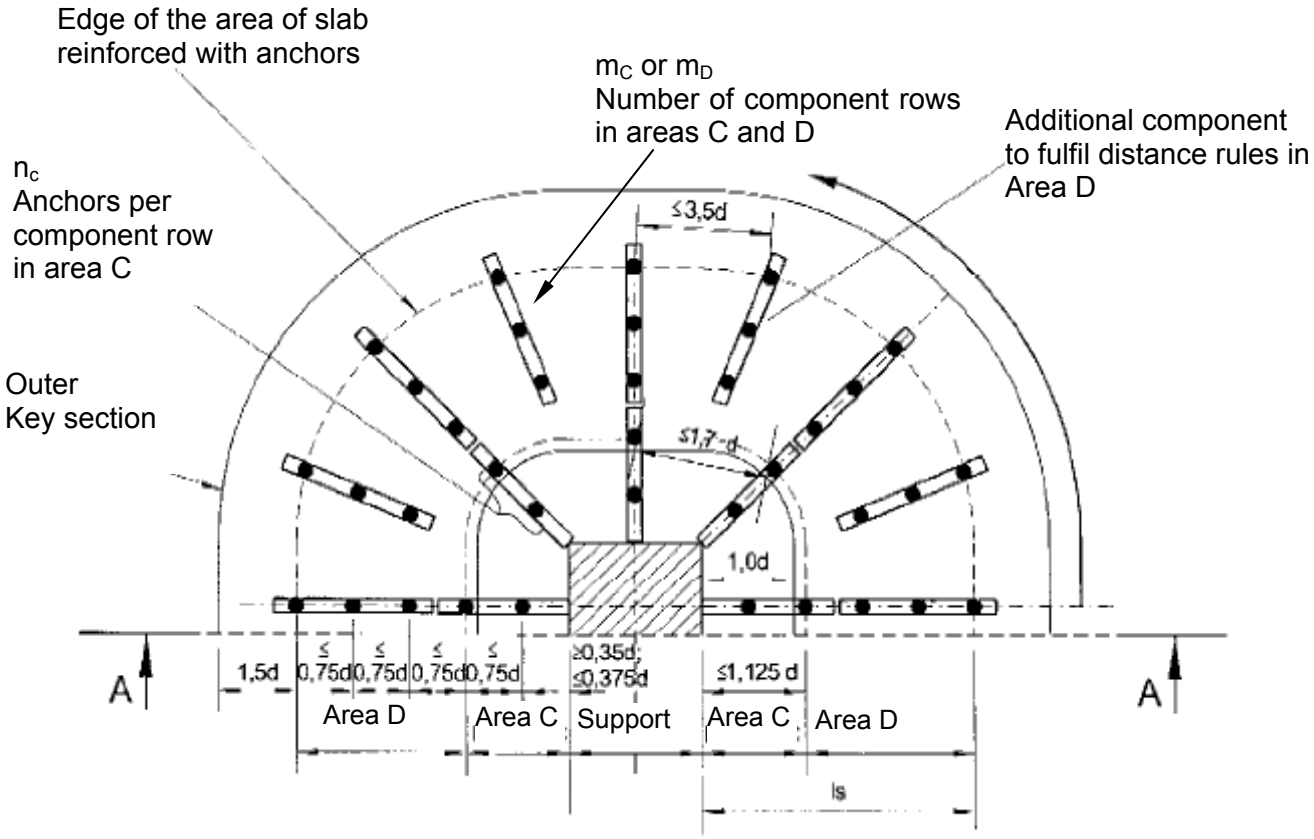
Inspectorate Approval
No. Z-15. 1-214

Dated 18 March 2009

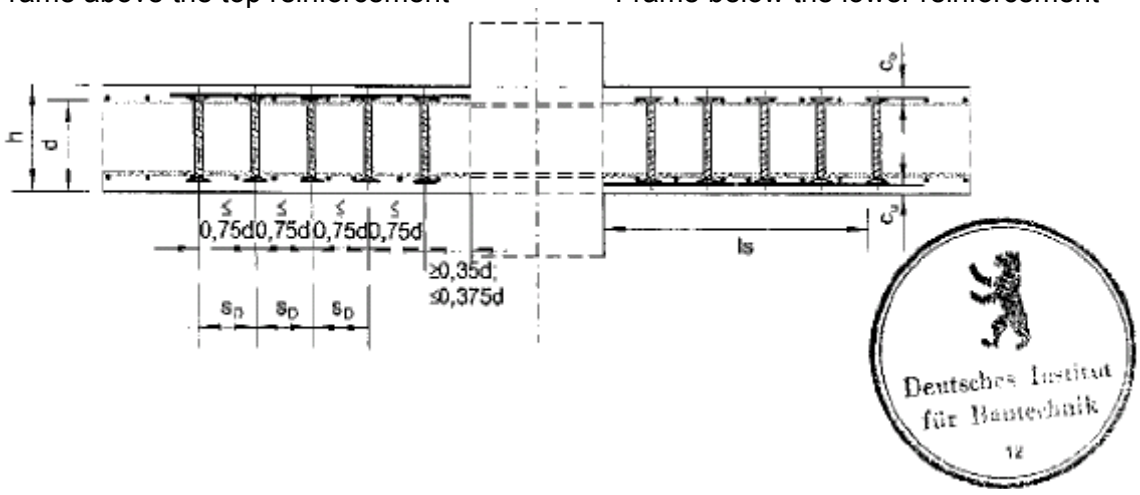
Principles for structuring punch-through reinforcement with shared standard components



Section A-A

"Built from above"
Frame above the top reinforcement

"Built from below"
Frame below the lower reinforcement



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JDA punch-through reinforcement
Component arrangement with
standard components

Annex 10

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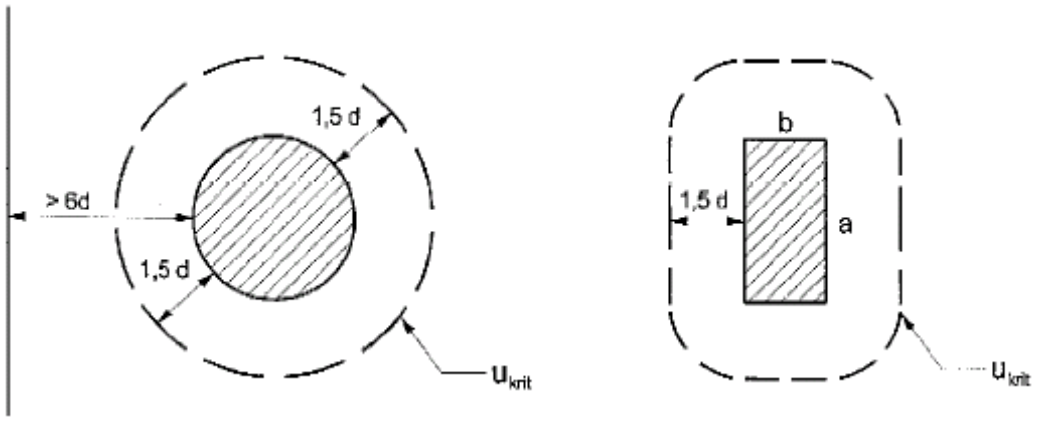
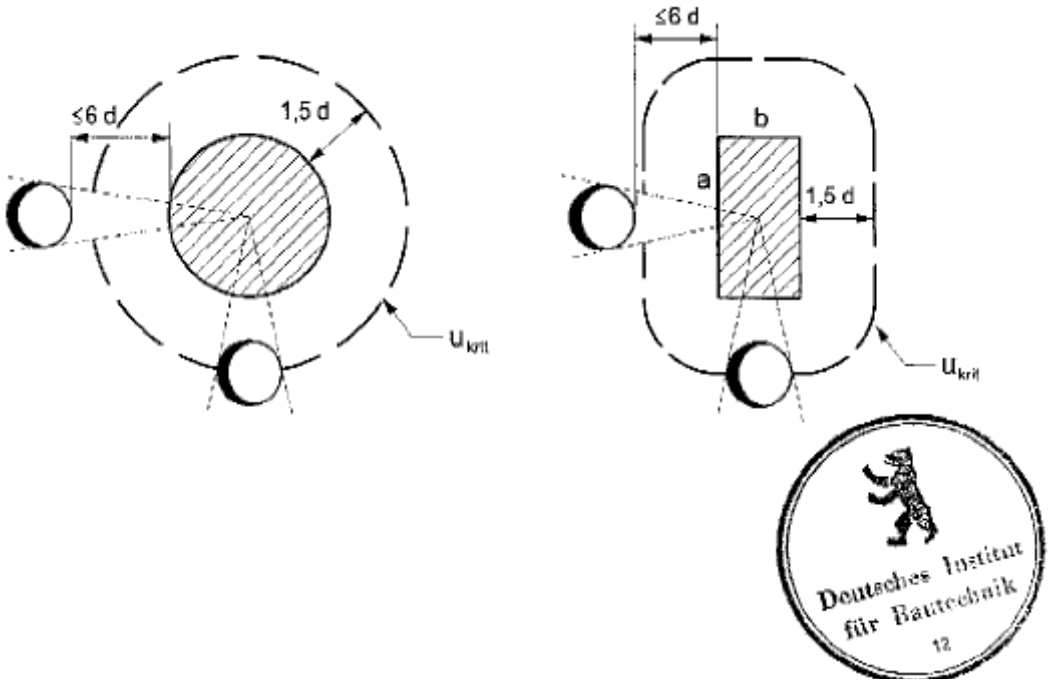
No. Z-15. 1-214
Dated 18 March 2009

Diagram of critical circular sections u_{krit}

a) Load-bearing area (support) is further than 6 d from openings or free edges.



b) Load-bearing area (support) is less than 6 d from openings in the slab.



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Punch-through reinforcement
Circular section plan u_{krit}

Annex 11

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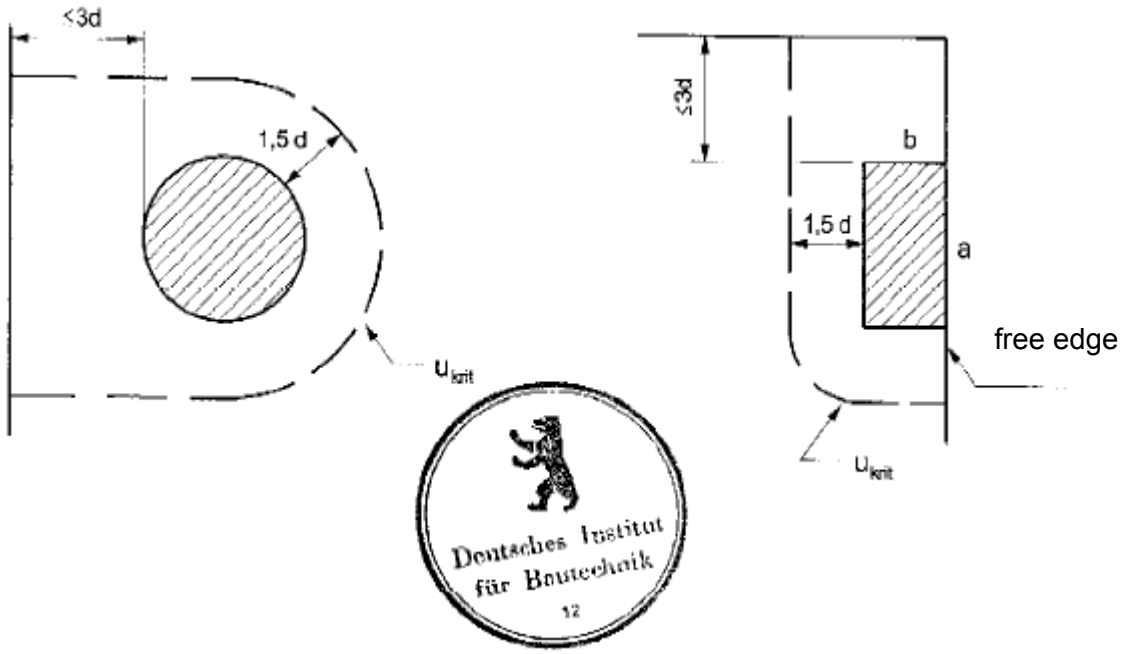
Inspectorate Approval
No. Z-15. 1-214

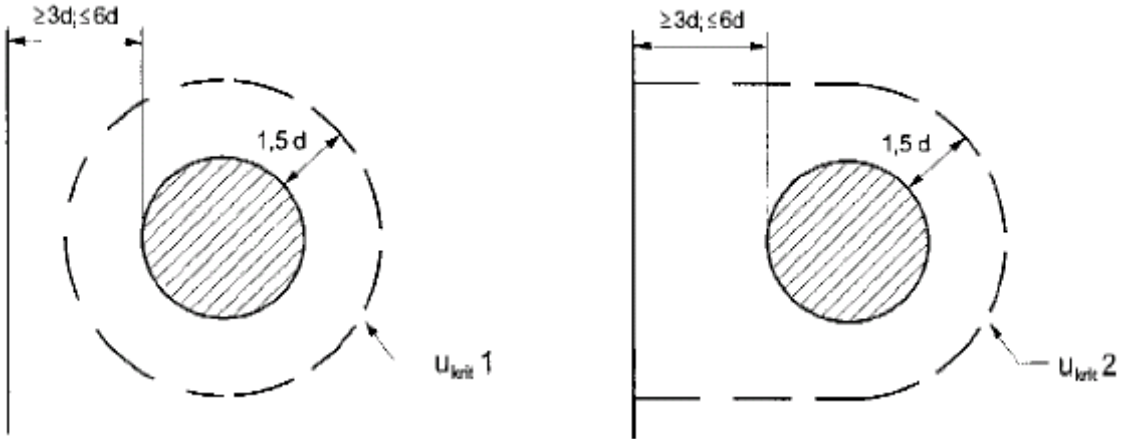
Dated 18 March 2009

c) Load-bearing area (support) is less than 3 d from free edges.



d) Load-bearing area (support) is more than 3 d and less than 6 d from free edges.

The circular section plan with smaller circular section length (u_{krit} 1 or u_{krit} 2) is used to calculate u_{krit}.



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Punch-through reinforcement
Circular section plan u_{krit}

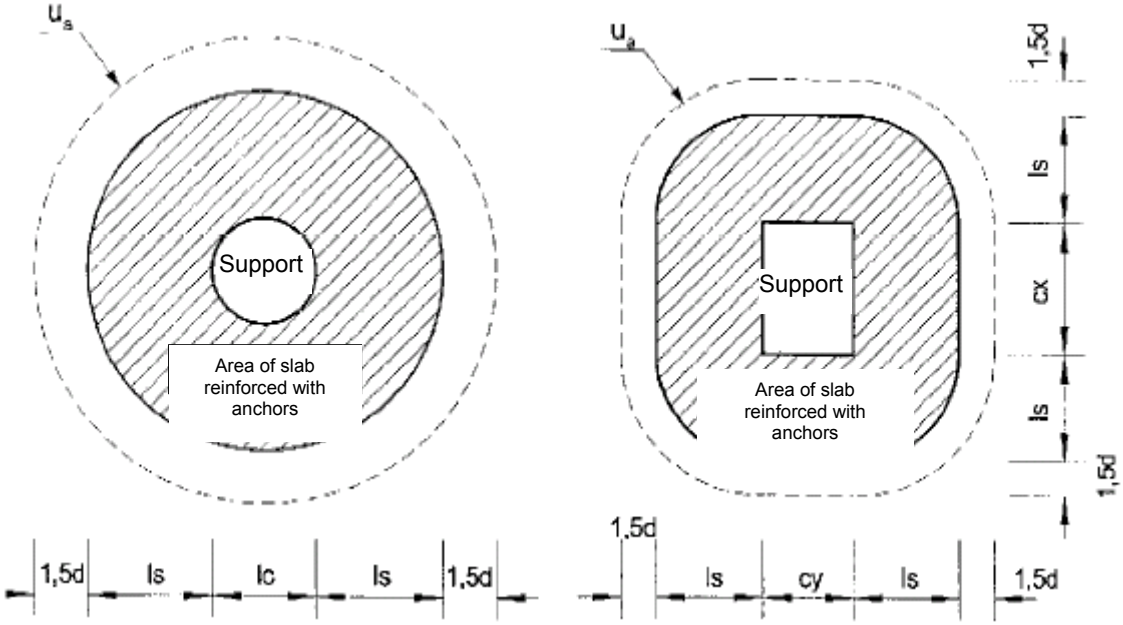
Annex 12

to Buildings
Inspectorate Approval
No. Z-15. 1-214

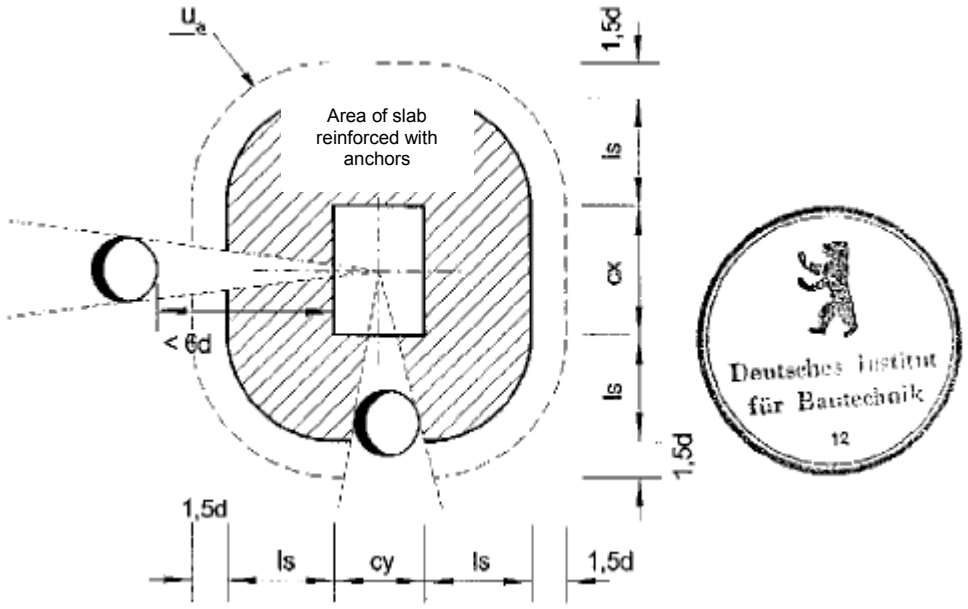
Dated 18 March 2009

Diagram of circular sections u_a

a) Load-bearing area (support) is further than 6 d from openings or free edges.



b) Load-bearing area (support) is less than 6 d from openings in the slab.



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Punch-through reinforcement
Circular section plan u_a

Annex 13

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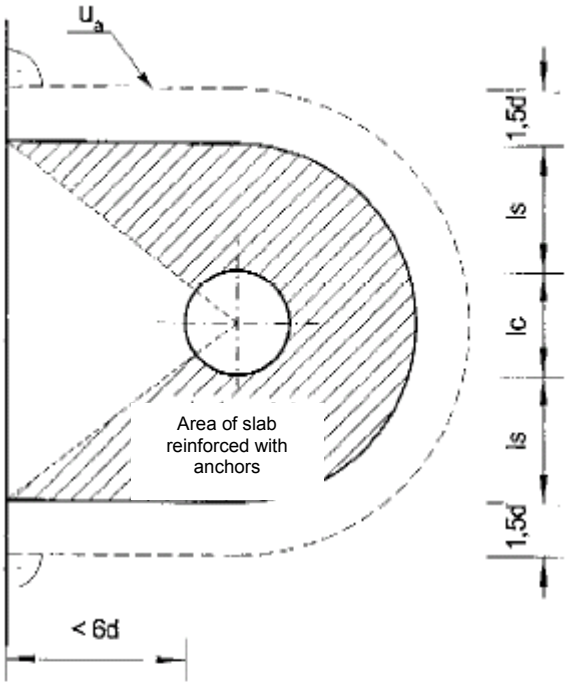
Inspectorate Approval
No. Z-15. 1-214

c) Load-bearing area (support) is less than 6 d from free edges.



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Punch-through reinforcement
Circular section plan u_a

Annex 14

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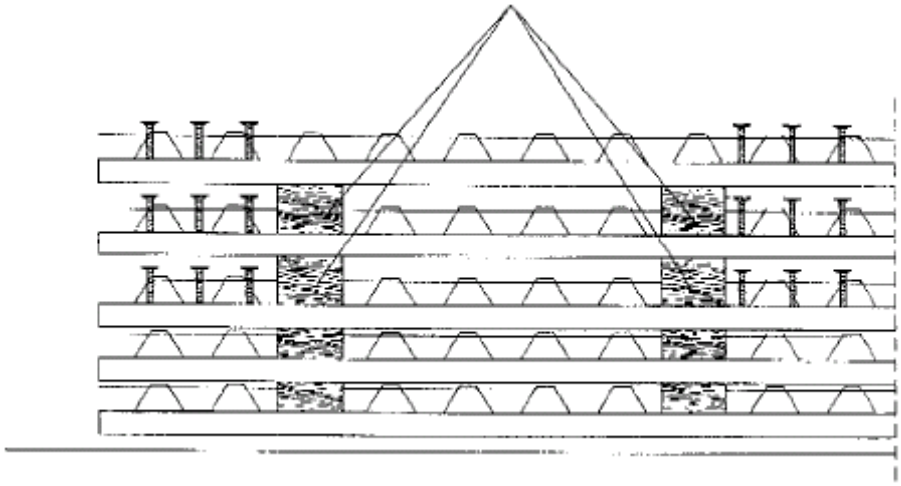
Inspectorate Approval
No. Z-15. 1-214

Dated 18 March 2009

Positioning and transportation when used in system floors

⚠ Taller spacers required



When storing and transporting system floors the JDA reinforcements must be taken into account, which protrude beyond the lattice girders because of their height.
The spacers required for storage of system floors must be correspondingly increased.

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Storage and transportation
when used in system floors

Annex 15

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