BUILDING COMMON GROUND

MAX FRANK

General Technical Approval

Egcopal SP, SPH, SPX

Impact sound insulated shear force dowels for connecting reinforced concrete components or masonry and reinforced concrete components

Z-15.7-357 | 13.06.2023

issued by: DIBt, Deutsches Institut für Bautechnik, Berlin

(Translation of the original German version not approved by Deutsches Institut für Bautechnik)

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DIBt

Approval and authorization body for building products and types

General Technical Approval / General type approval

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Applicant:
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Subject of approval:
Egcopal Type SP, SPH, SPX - Impact sound insulated shear force dowels for connecting reinforced concrete components or masonry and reinforced concrete components

The above-mentioned subject of regulation is hereby generally approved/authorized by the building authorities.

This decision comprises twelve pages and 13 annexes.

This general technical approval/general type approval replaces the general technical approval/general type approval no. Z-15.7-357 dated 14 December 2021. The subject matter was first granted general technical approval on 14 December 2021.

I GENERAL PROVISIONS

1 This notice is proof of the usability or applicability of the subject matter of the regulation within the meaning of the state building regulations.

2 This notice does not replace the legally required approvals, consents, and certificates for the implementation of construction projects.

3 This notice is granted without prejudice to the rights of third parties, especially private protective rights.

4 Copies of this notice must be provided to the user or implementer of the subject of regulation, notwithstanding further regulations in the "Special Provisions." Additionally, the user or implementer of the subject of regulation must be informed that this notice must be available at the location of use or application. Copies must also be provided to the involved authorities upon request.

5 This notice may only be reproduced in full. Publication of extracts requires the approval of Deutsches Institut für Bautechnik. Texts and drawings of promotional literature may not contradict this notice; translations must contain the note "Translation of the original German version not approved by Deutsches Institut für Bautechnik".

6 This notice is issued on a revocable basis. The provisions may be supplemented and amended at a later date, in particular if new technical findings make this necessary.

7 This notice refers to the information and documents provided by the applicant. Any change to this basis is not covered by this decision and must be disclosed to Deutsches Institut für Bautechnik without delay.

II SPECIAL PROVISIONS

1 Subject matter and scope of use and application

1.1 Subject of approval and area of application

The Max Frank impact sound insulation dowel "Egcopal" is the subject of the approval.

It is a connecting element between reinforced concrete components in accordance with DIN EN 1992-1-1 or between reinforced concrete, masonry and timber components. It is used for the planned transmission of shear forces with simultaneous reduction of sound transmission.

The "Egcopal" is approved in the variants SP, SPH and SPX in mandrel diameters 32 and 52 mm with the types O, F, O± and F±.

The ± elements are used to transmit both positive and negative transverse forces.

The "Egcopal" consists of an anchor body, either with a mandrel (type O and O±) or with a sleeve (type F and F±) and the soundproof housing (acoustic box) arranged as the corresponding counterpart.

For type O and O± the mandrel is fixed in the anchor body and for type F and F± in the soundproof housing.

1.2 Subject of authorization and scope of application

The subject of the license is the planning, dimensioning and execution of concrete components with the “Egcopal” impact sound insulation dowel (see Annex 1).

The “Egcopal” may be used as a form-fitting connecting element between reinforced concrete components or masonry / timber components and reinforced concrete components that fulfil the conditions for limiting deflection in accordance with DIN EN 1992-1-1, Section 7.4.2, under predominantly static loads.

The application is limited to normal concrete of strength classes C20/25 to C50/60.

The permissible ambient conditions are based on the exposure classes (DIN EN 1992-1-1, Table 4.1) and the corrosion resistance classes of the steels used in accordance with DIN EN 1993-1-4, Annex A.

The joint width between the components to be connected may be up to 100 mm.

2 Provisions for the construction product

2.1 Properties and composition

2.1.1 Building materials

The following building materials must be used:

for the anchor body:	Front screen: Stainless steel Corrosion resistance class III or IV in material grades S235 to S460 and Loop bracket: B500NR with a nominal diameter of ≤ 14 mm of material numbers 1.4362, 1.4482, 1.4571 or 1.4462 in accordance with the corresponding general technical approval as well as stainless steel bars of material number 1.4362 butt-welded to B500 in accordance with the deposited data sheet
for the load-bearing dowel part (dowels)	Quenched and tempered steel with material number 1.7227 or 1.7225 according to DIN EN 10083-3, as well as properties according to the data sheet provided
dowel coating	Stainless steel corrosion resistance class III or IV in material grade S235, sealing in accordance with the data sheet provided
Acoustic box housing	Galvanised sheet steel to DIN EN 10152
Load distribution plate	Stainless steel with material number 1.4301, 1.4362 or 1.4571 according to DIN EN 1993-1-4 in conjunction with DIN EN 1993-1-4/NA
Elastomeric bearing	Getzner Sylodyn according to general building authority approval Z-16.8-468
Interior Lining	Moulded part made of ARPRO 5126, data sheets deposited with DIBt
Components to be connected	- Concrete of at least strength class C20/25 and at most C50/60 - Reinforcing steel B500B according to DIN 488-1 - If necessary, masonry (on the side of the soundproof housing) of at least stone strength class 2 or wooden components

2.1.2 Dimensions

The dimensions of the "Egcopal" impact sound insulation dowels are specified in Annexes 3 and 4. The minimum dimensions of the components to be connected correspond to Annex 5. The installation of the "Egcopal" in areas subject exclusively to tensile stress is excluded.

Table 1: Dimensions in mm

Dowel diameter D Core diameter D_k	32 and 52 30 and 50	
Minimum centre distance in slab-like components e_{min} = 1,5 h_{min}	240	
Minimum lateral edge distance (centre distance) at right angles to the direction of loading a_r = 0,75 h_{min}	120	
Component with anchor body		
Minimum component thickness h_{min}	160	
Minimum edge distance (centre distance) in the direction of loading a_{r1} = 0,5 · h_{min}	80	
Component with acoustic box		
Minimum component thickness h_{min}	SP	SPH/ SPX
for components with eccentric arrangement or components with centric arrangement	210 250	230 270
Minimum overlap b of the acoustic box in the direction of loading (see Appendix 5)	80	

2.2 Production and labelling

2.2.1 Production

The "Egcopal" impact sound insulation dowel must be manufactured at the factory.

The procedures according to DIN EN ISO 17660-1 must be used for welded joints between stainless steel and reinforcing steel.

Before or after welding, the flat loops are bent and then the 3D bend is produced. The bending roll diameter of the loop stirrups must not be less than four times the bar diameter. The distance between the weld seam and the start of the bending roll must be at least 2 ds.

The load distribution disc must be structurally connected to the loop stirrups using spot welds. The dowel and sleeve are tack-welded to the anchor body to secure their position.

A recognised WPS welding procedure specification in accordance with DIN EN ISO 15609-1 must be available for welding, which must be observed by the welding personnel.

The welding manufacturer must provide a welding certificate in accordance with DIN EN 1090-1, Table B.1. The welders must have valid welder test certificates in accordance with DIN EN ISO 9606-1.

The welding company is obliged to ensure that the welding work fulfils the quality requirements placed on the construction product by means of work samples, if necessary.

The surfaces must be cleaned and smooth, tarnish colours must be removed.

2.2.2 Labelling

Each packaging unit of the "Egcopal" must be labelled by the manufacturer with the conformity mark (Ü mark) in accordance with the conformity mark regulations of the federal states.

Labelling may only be carried out if the requirements in section 2.3 "Proof of compliance" are met. The labelling must also contain at least the following information:

- The designation of the subject of the authorization
- Type designation

The manufacturer must include installation instructions with each delivery.

2.3 Confirmation of conformity

2.3.1 General information

Confirmation of conformity of the construction product with the provisions of this general building approval must be provided for each manufacturing plant with a declaration of conformity by the manufacturer on the basis of a factory production control and a certificate of conformity issued by a recognised certification body and regular external surveillance including initial testing of the construction product by a recognised surveillance body in accordance with the following provisions:

The manufacturer of the construction products must involve a recognised certification body and a recognised monitoring body for the issuing of the certificate of conformity and external monitoring, including the product tests to be carried out in the process.

The manufacturer must submit the declaration of conformity by labelling the construction products with the mark of conformity (Ü mark) with reference to the intended use.

The certification body shall provide the Deutsches Institut für Bautechnik with a copy of the certificate of conformity it has issued.

The Deutsches Institut für Bautechnik must also be provided with a copy of the initial test report.

2.3.2 Factory production control

A factory production control shall be set up and carried out in each manufacturing plant. Factory production control is understood to mean the continuous surveillance of production to be carried out by the manufacturer to ensure that the construction products manufactured by him comply with the provisions of this general building approval.

The factory production control shall include at least the measures listed in the deposited test plan and the measures listed below. The test plan is deposited with Deutsches Institut für Bautechnik and the body responsible for surveillance:

Checking the source material and components:

For the "Egcopal", only building materials for which proof of conformity has been provided in accordance with the applicable standards and approvals may be used.

- DIN 488 applies to reinforcing steel.
- For stainless reinforcing steel with a nominal diameter of 6 mm to 14 mm, the corresponding general building inspectorate approvals apply. For stainless steel bars according to the deposited data sheet of material number 1.4362 (see section 2.1.1), the mechanical properties must be verified by an acceptance test certificate 3.1 according to DIN EN 10204.
- DIN EN 1993-1-4 in conjunction with DIN EN 1993-1-4/NA applies to stainless steel

- For the material 1.7227 and 1.7225, the mechanical properties in accordance with the data sheet deposited with Deutsches Institut für Bautechnik and the external inspection body must be verified by an inspection certificate 3.1 in accordance with DIN EN 10204.
- The properties of the sealant material used must be verified in accordance with the data sheet provided by means of an acceptance test certificate 3.1 in accordance with DIN EN 10204.

Verifications and tests to be carried out on the finished construction product:

The component dimensions of the Max Frank impact sound insulation dowel "Egcopal" must be checked according to the test plan and compared with the requirements according to the test plan deposited with Deutsches Institut für Bautechnik and the external inspection body. The surface quality must be checked and compared with the requirements.

The results of the factory production control must be recorded and analyzed. In addition to the records specified in the test plan, the records must contain at least the following information:

- Designation of the construction product or the source material and the components
- Type of inspection or test
- Date of manufacture and testing of the construction product or the starting material or components
- Result of the checks and tests and, where applicable, comparison with the requirements
- Signature of the person responsible for factory production control.

The records must be kept for at least five years and submitted to the monitoring body responsible for external monitoring. They must be submitted to the Deutsches Institut für Bautechnik and the competent supreme building supervisory authority upon request.

If the test result is unsatisfactory, the manufacturer must immediately take the necessary measures to rectify the defect. Construction products that do not fulfil the requirements must be handled in such a way that confusion with conforming products is ruled out. Once the defect has been rectified, the relevant test must be repeated without delay - insofar as technically possible and necessary to prove that the defect has been rectified.

2.3.3 Initial testing of the construction product

The following must be checked as part of the initial inspection:

- Standardized surface treatment of the primary material
- Standardized execution of weld seams for all "Egcopal" classes.
- Compliance with the dimensions according to the approval for the "Egcopal" classes as well as means to ensure dimensional accuracy.

2.3.4 External monitoring

In each manufacturing plant, the factory production control must be checked regularly by external monitoring, but at least twice a year.

As part of the external monitoring, an initial inspection of the "Egcopal", in particular the weld seams, welded joints and surfaces, must be carried out and samples must also be taken for spot checks and tested as specified in the test plan. Sampling and testing are the responsibility of the recognised inspection body. The values of the primary material must be checked in accordance with the data sheet.

The results of certification and external surveillance must be kept for at least five years. They must be submitted by the certification body or the surveillance body to the Deutsches Institut für Bautechnik and the competent supreme building supervisory authority on request.

3 Provisions for planning, dimensioning and execution

Unless otherwise specified below, DIN EN 1992-1-1 always applies together with DIN EN 1992-1-1/NA for the design and dimensioning of the structural system produced with the type of construction.

3.1 Planning

The transmission (distribution and absorption) of the forces transmitted by the "Egcopal" into the adjacent components must be verified for each individual case.

The transmittable shear forces only apply to the specified joint widths. If the possibility of the calculated joint widths being exceeded cannot be ruled out, the transmittable shear forces of the next larger joint width must be applied.

When using the acoustic box of shear dowel type ±, care must be taken to ensure that the connected components are dimensioned and designed in the same way in both directions of loading.

The anchor body is equipped with two loop stirrups as standard and is therefore suitable for vertical shear forces in both directions. Optionally, the anchor body can be fitted with only one loop stirrup, which means that it can only withstand shear forces in one direction. In this case, the shear load capacity must be clearly labelled on the product.

The "Egcopal" of type O and F as well as type O± and F± is intended for connecting components where no horizontal stresses occur perpendicular to the "Egcopal" axis (e.g. due to temperature deformations).

The "Egcopal" may only be installed in slabs with straight edges. In all other cases, sufficient displacement must be verified for each "Egcopal".

If the "Egcopal" is installed over a corner, sufficient displacement must be verified.

The longitudinal reinforcement A_{sy} at the slab edge may be determined assuming a continuous edge beam - with spans corresponding to the spacing of the studs. The distributor reinforcement A_{sy} shown in Annex 7 may be used for this purpose

3.2 Dimensioning

The application is limited to normal concrete of strength classes C20/25 to C50/60.

For concrete strength C20/25, the design resistances and the required centre distances are given in Annexes 6 to 11 and apply to dowels in good bond areas.

The arrangement of the on-site reinforcement is specified in Annexes 7 to 11 and applies to a nominal concrete cover of 20 mm. This does not constitute proof of serviceability (see Section 3.4).

When used in masonry walls or wooden components, only the installation of the acoustic box is permitted. The resulting additional loads in masonry must be verified in accordance with DIN EN 1996-1-1 and on timber constructions in accordance with DIN EN 1995-1-1.

3.2.1 Verifications in ultimate limit state

3.2.1.1 Steel failure

The design values of the load-bearing capacity for the dowel cross-sections and the anchor bodies are specified in Annex 6 as a function of the joint width. The calculated joint width is $10 \leq z \leq 100$ mm.

3.2.1.2 Punching shear verification

If input values other than those shown in Annex 6 to 9 are available for the concrete strength class, the slab thickness or higher specifications for the longitudinal reinforcement A_{sy}, or if the required dowel spacing according to Section 3.2 or Annex 11 is not met, the safety against punching shear must be verified for slab-type components.

The following special feature must be taken into account:

Component with anchor body

The punching shear verification in accordance with DIN EN 1992-1-1, Section 6.4 together with DIN EN 1992-1-1/NA, NCI to 6.4 applies. The critical perimeter section must be determined in accordance with Annex 11.

Component with acoustic box

The punching shear verification according to Annex 11 applies, whereby the mutual influence of the punching shear cones must be taken into account if necessary.

The guidance of the critical circular cut and the determination of the distances between the dowels as well as the minimum edge distances must be selected in accordance with Annex 7 and Annex 11.

The radii of the critical round section begin at the level of the stirrups arranged directly next to the "Egcopal" (Annex 11).

The A_{sy} reinforcement parallel to the joint must be anchored with l_{bd} or at slab corners by means of push-in stirrups of the same cross-section.

The arrangement of the suspension reinforcement A_{sx} and transverse reinforcement A_{sy} is specified in Annex 11.

3.2.1.3 Concrete edge failure

Component with anchor body

The verification of the concrete edge failure is considered to be fulfilled for the side of the anchor body if the rules specified in this general building approval are observed.

Component with acoustic box

If the edge distances specified in Annex 9 deviate, the verification on the side of the acoustic box must be carried out in accordance with Annex 10, taking into account the design rules in Section 3.5. When verifying on the side of the acoustic box, the break-out cone must be set at 33° from the centre line (see Annex 10).

3.2.1.4 Consideration of frictional forces

The existing frictional forces are taken into account in the "Product load-bearing capacity" table in Appendix 6.

Frictional forces are not to be taken into account when determining the on-site reinforcement.

3.2.1.5 Verification with direct storage of the acoustic box

If the acoustic box is stored directly, suspension reinforcement may be dispensed with. The acoustic box is mounted directly in the following applications:

- Support in masonry walls and pillars, in reinforced concrete walls and columns
- Support on reinforced concrete joists (the load transfer to the joist must take place on the side of the joist subject to bending pressure).

The partial surface pressure under the acoustic box housing must be verified for support in masonry walls and pillars as well as timber components.

3.2.2 Verifications of the serviceability limits

3.2.2.1 Limitation of crack widths

The crack width verification of the slab edge beam must be carried out in accordance with DIN EN 1992-1-1, Section 7.3, taking into account the corresponding sections of DIN EN 1992-1-1/NA.

If shear tension occurs in the wall in the direction of loading of the shear force dowel and the crack width in the direction of loading of the shear force dowel is not limited to $_{wk}$ ≤ 0.2 mm, the load-bearing capacity of the dowel must be reduced by 1/3.

3.2.2.2 Limiting the deformation

The "Egcopal" may be used as a transverse force-locking connecting element between reinforced concrete components that fulfil the conditions for limiting deflection in accordance with DIN EN 1992-1-1, 7. 4. 2 in compliance with DIN EN 1992-1-1/NA, NCI Ad. 7.4.2 (2) are used.

3.2.3 Structural design

3.2.3.1 Factory configuration

The surface of the sleeve and dowel are treated at the factory to minimize friction. No changes may be made to the surface on site that would lead to an increase in surface roughness.

The edges of the sleeve opening must be burr-free.

The information in section 2.2.1 must be observed.

3.2.3.2 On-site design

Component with anchor body

The minimum component thickness h_{min} according to Section 2.1.2, Table 1 and Annex 5 must be complied with. The arrangement of the minimum reinforcement in the punching shear cone is specified in Annex 11.

The ratio of the diameters of longitudinal bars and stirrups $d_{sy}/d_{sx} \geq 1$ must be maintained.

The cap bracket with a diameter of 8 mm must be positioned at a distance of 20 mm from the end of the shear force mandrel or at a distance of 80 mm from the end of the sleeve.

If the component thickness h_k according to Annex 4 is exceeded, the cap bracket can be dispensed with.

Component with acoustic box

The minimum component thickness h_{min} according to Section 2.1.2, Table 1 and Annex 5 must be observed. The first suspension brackets d_{sx} must be attached directly to the acoustic box.

The clear distance s between the first two rear suspension brackets d_{sx} is 20 mm (see Appendix 7).

The diameter of the rear suspension reinforcement is limited to $d_s \leq 16$ mm.

The number of suspension brackets d_{sx} in the calculated breaking cone 2 ≤ nbracket ≤ 6 is.

The ratio of the diameters of longitudinal bars and stirrups $d_{sy}/d_{sx} \geq 1$ must be observed.

3.3 Fire resistance

Proof of usability in components subject to fire resistance requirements is not regulated by this general building approval/general type approval.

3.4 Sound insulation

For stair landings, the requirements of DIN 4109-1 are deemed to be fulfilled if the following conditions are met during construction:

- the reinforced concrete platform is at least 160 mm thick
- adjoining walls consist of masonry plastered on both sides with a mass per unit area of at least 270 kg/m² or

concrete walls with a comparable mass per unit area

- A maximum of two shear dowels are used per support side.
- The platform must be separated from the neighbouring walls by a joint.

For constructions deviating from this, the sound insulation behavior must be verified by means of suitability tests.

3.5 Provisions for execution

3.5.1 General information

The user of the type of construction or the company carrying out the construction work must submit a declaration of conformity in accordance with §§ 16 a Para. 5, 21 Para. 2 MBO to confirm the conformity of the type of construction with this general type approval.

3.5.2 Installation and assembly

When installing the "Egcopal", the minimum distances and minimum component thicknesses according to Table 1 and Appendix 5 must be observed.

Care must be taken to ensure that there are no angular deviations between neighbouring "Egcopal" dowels.

Installation must be carried out in accordance with the installation instructions, which are part of the delivery conditions. The installation of the shear dowel "Egcopal" must be aligned and angled correctly; particular attention should be paid to maintaining the minimum distance.

The dowel must be supported over the entire length of the load distribution plate, regardless of the joint width within the acoustic box. In order to ensure both the load-bearing capacity and the sound insulation properties, it must be ensured for the O and O± variants (see Appendix 1) that the pull-out path of the dowel from the insulation housing is less than 20 mm for type SP and SPH during the entire service life. For type SPX, the extraction path must be less than 40 mm. If this cannot be ensured, only type F or F± - fixing the dowel in the acoustic box - should be used.

If necessary, constructive measures must be taken to ensure that the joint widths on which the calculations are based are not exceeded.

With Egcopal type SPX, a projection of the dowel core of at least 10 mm over the load centring must be ensured.

The following standards and approvals are referred to in this general technical approval/general type approval:

- DIN 488-1:2009-08	Reinforcing steel - Part 1: Steel grades, properties, labelling
- DIN 4109-1:2016-07 A1:2017	Sound insulation in buildings - Part 1: Minimum requirements +
- DIN EN 1090-1:2012-02	Execution of steel structures and aluminium structures - Part 1: Conformity assessment method for structural members; German Version: EN 1090-1:2009 + A1:2011
- DIN EN 1992-1-1:2011-01	Eurocode 2: Design of reinforced and prestressed concrete structures - Part 1-1: General design rules and rules for buildings; German version EN 1992-1-1:2004+AC:2010 and
- DIN EN 1992-1-1/NA:2013-04	National Annex - Nationally Determined Parameters - Eurocode 2: Design of reinforced and prestressed concrete structures - Part 1-1: General design rules and rules for buildings

-	DIN EN 1993-1-4:2015-10	Eurocode 3: Design of steel structures - Part 1-4 steel structures - Part 1-4: General design rules and Supplementary rules for the application of stainless steels; German version: EN 1993-1-4:2006 + A1:2015
-	DIN EN 1993-1-4/NA:2017-01	National Annex - Nationally Determined Parameters - Eurocode 3: Design of steel structures - Part 1-4: General Design rules and supplementary rules for the application of stainless steels
-	DIN EN 1996-1-1:2013-02	Eurocode 6: Design of masonry structures - Part 1-1: General rules for design and construction buildings - Part 1-1: General rules for reinforced and unreinforced masonry; German version: EN-1996-1-1:2005 + A1:2012
-	DIN EN 10083-3:2007-01	Heat treatable steels - Part 3: Technical delivery conditions for alloy steels; German version EN 10083-3:2006
-	DIN EN 10152:2009-07	Electrolytically cold-rolled steel flat products for cold forming; Technical delivery conditions; German version EN 10152:2003
-	DIN EN 10204-1:2005-01	Metallic products - Types of inspection certificates; German version EN 10204:2004
-	DIN EN ISO 9606-1:2013-12	Testing of welders - Fusion welding - Part 1: Steels; German version EN ISO 9606-1:2013
-	DIN EN ISO 15609-1:2005-01	Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1:2004), German version EN ISO 15609-1:2004
-	DIN EN ISO 17660-1:2006-12	Welding - Welding of reinforcing steel - Part 1: Structural welds (ISO 17660-1:2006-12) welded joints (ISO 17660-1:2006), German version DIN EN ISO 17660-1:2006-12
-	Approval no. Z-16.8-468	Getzner Sylodyn from 18 May 2021

The data sheets are deposited with the Deutsches Institut für Bautechnik and the body responsible for external monitoring.

The test plan is deposited with Deutsches Institut für Bautechnik and the body responsible for external monitoring.

Dipl.-Ing. Beatrix Wittstock
Head of Division

Certified
Schüler

View Section Section View

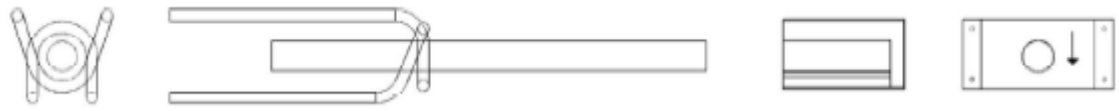

Fig. 1: Egcopal O

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Fig. 2: Egcopal F

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Fig. 3: Egcopal O±

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Fig. 4: Egcopal F±

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 1
System overview	

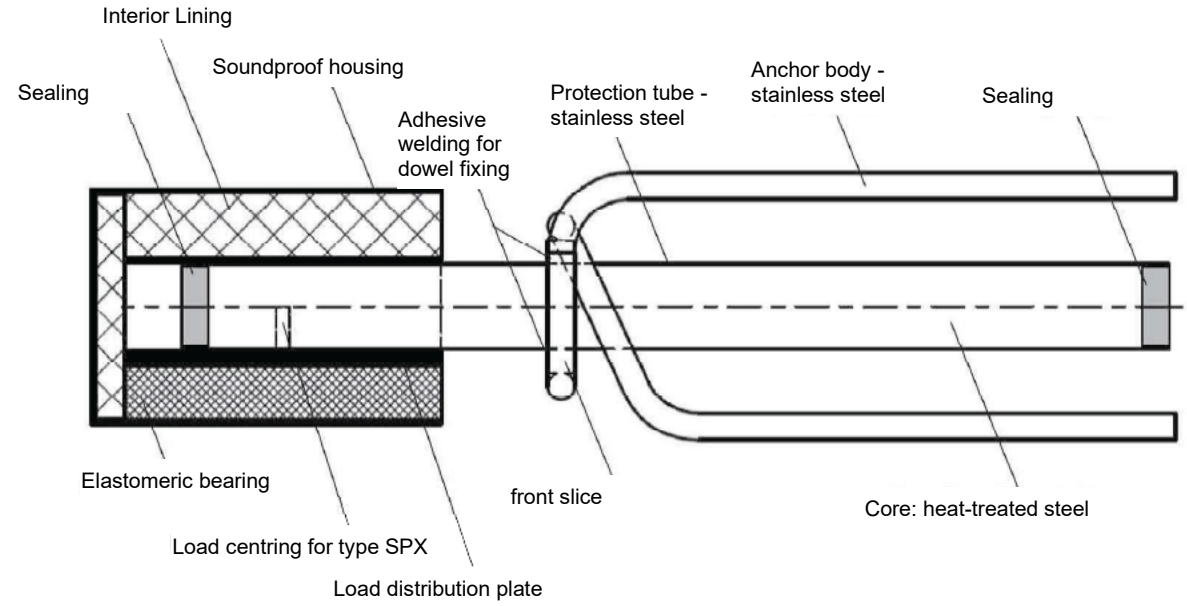

Fig. 5: Structure - Egcopal version O (in-situ concrete)

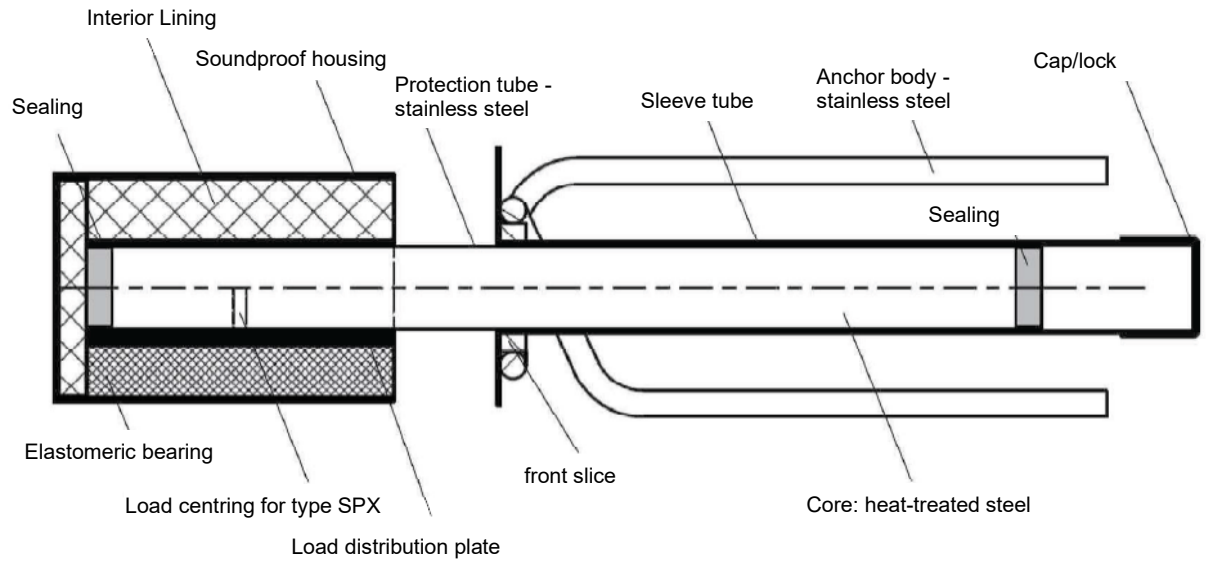

Fig. 6: Structure - Egcopal version F (precast element)

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 2
Building materials	

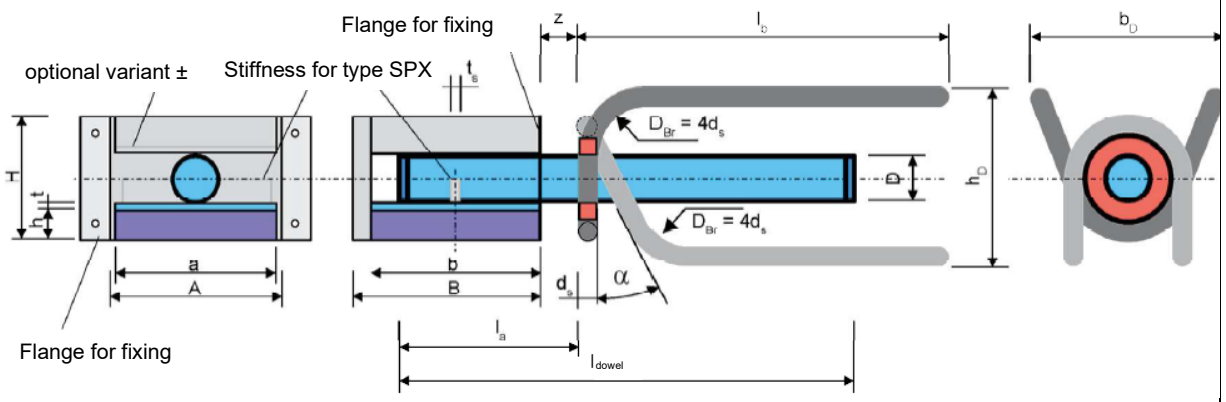

Fig. 7: Geometry Version O

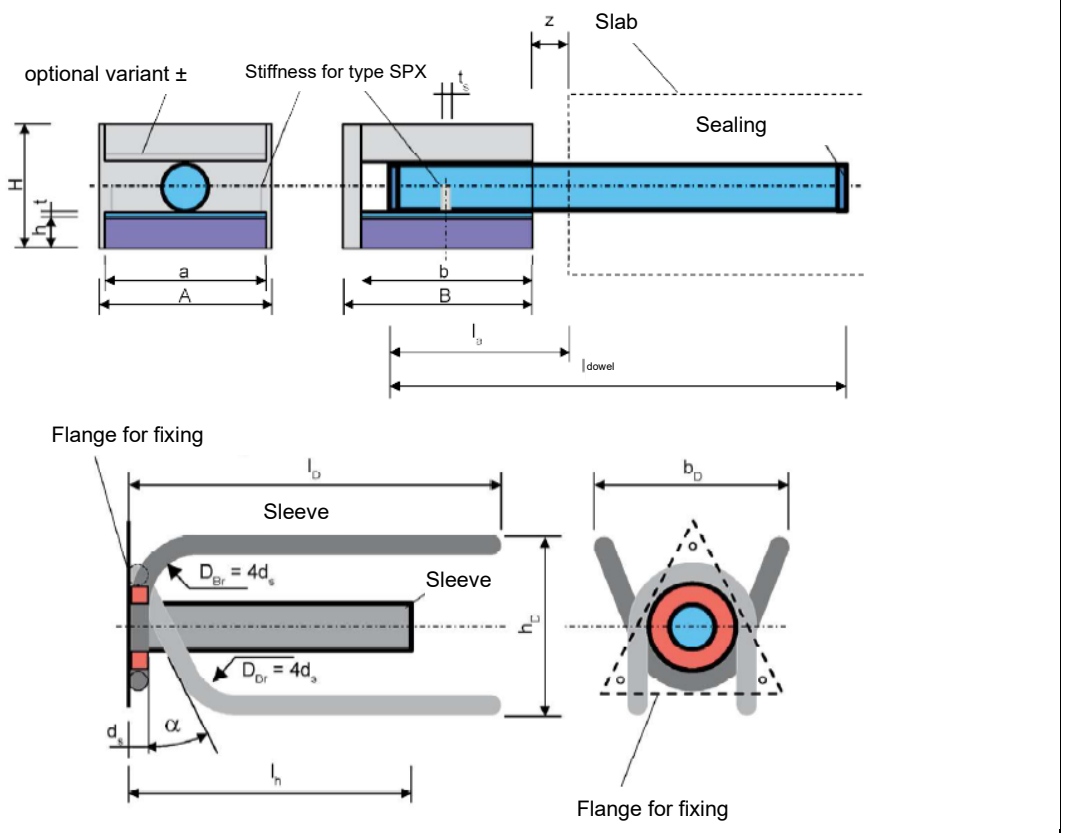

Fig. 8: Geometry Version F

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 3
Geometry - in-situ concrete (O) and precast element (F) design	

Table 1: Dimensions - components in mm				
Component	Designation	Types		
		SP	SPH	SPX
Dowel				
Outer dowel diameter	D	32	52	52
Core diameter	D_k	30	50	50
Anchor body				
Diameter of anchor body reinforcement	d_s	10	12	12
Height	h_D	100	112	112
Width	b_D	118	147	147
Length of the reinforcement	l_D	235	280	280
Length of sleeve only for type F	l_H	260	260	310
Slab height from which cap stirrups can be dispensed with	H_k	240	260	260
Acoustic box				
Width of the bearing	A	110	110	170
Depth of the bearing (in dowel direction)	B	119	119	120
Thickness of the bearing	H	20	20	15
Bearing plate	T	5	5	6
Width of the box	A	125	125	182
Depth of the box (in dowel direction)	B	132	132	132
Height of the box	H	88	108	107

Table 2: Dimensions - dowel lengths for type SP and type SPH in mm					
Joint widths		SP		SPH	
Formula symbol	z	l_{dowel}	l_a	l_{dowel}	l_a
Type: In-situ concrete	0-20	370	119		
	21-40	370	140		
	41-60	370	160	420	160
	61-80	370	180	420	180
	81-100	370	200	420	200
Type: Precast element	0-40	370	159		
	41-100	370	209	420	209

Table 3: Dimensions - dowel lengths for type SPX in mm			
Joint widths		SPX	
Formula symbol	z	l_{dowel}	l_a
Type: In-situ concrete	0-40	390	120
	30-70	420	150
	60-100	450	180
Type: Precast element	0-40	390	120
	30-70	420	150
	60-100	450	180

Egcopal type SP, SPH, SPX - Impact sound insulation dowel

Appendix 4

Geometry tabular

Table 4: Dimensions - component with anchor body in mm

Calculated column width for the punching shear verification	Minimum thickness of the component	Minimum edge distance in the direction of loading	Required centre distance in slab-like components	Minimum centre distance in slab-like components	Minimum lateral edge distance at right angles to the direction of loading
l_c	h_{min}	$a_{r1} = 0{,}5\ h_{min}$	e_{erf}	$e_{min} = 1{,}5\ h_{min}$	$a_r = 0{,}75\ h_{min}$
100	160	80	App. 8 App.11	240	120

Table 5: Dimensions - component with acoustic box (±) in mm

Calculated column width for the punching shear verification	Minimum thickness of the component for centred installation	Minimum thickness of the component for eccentric installation	Minimum edge distance in the direction of loading	Required centre distance in slab-like components	Minimum centre distance in slab-like components	Minimum lateral edge distance at right angles to the direction of loading
l_c	h_{min}	h_{min}	b	e_{erf}	$e_{min} = 1{,}5\ h_{min}$	$a_r = 0{,}75\ h_{min}$
137[1)]/194[2)]	250[1)]/270[2)]	210[1)]/230[2)]	80	App. 8 App. 10 App. 11	360	180

e_{erf} Minimal dowel spacing without mutual interference between the individual dowels
[1)] Value for type SP/SPH
[2)] Value for type SPX

In the usual installation situation with the acoustic box arranged in the wall, the smaller edge and centre distances of the component with anchor body can be used.

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 5
Connecting components	

Table 6: Product load-bearing capacity

z ≤	$V_{Rd,s}$ [kN]		
[mm]	SP	SPH	SPX
10	**37,3**	**37,3**	**75,6**
20	**37,3**	**37,3**	74,6
30	**37,3**	**37,3**	72,4
40	34,7	**37,3**	70,4
50	30,8	**37,3**	68,5
60	27,7	**37,3**	66,7
70	25,2	**37,3**	65,0
80	23,1	**37,3**	63,4
90	21,3	**37,3**	61,8
100	19,8	**37,3**	60,4

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 6
Design values of the product load-bearing capacity	

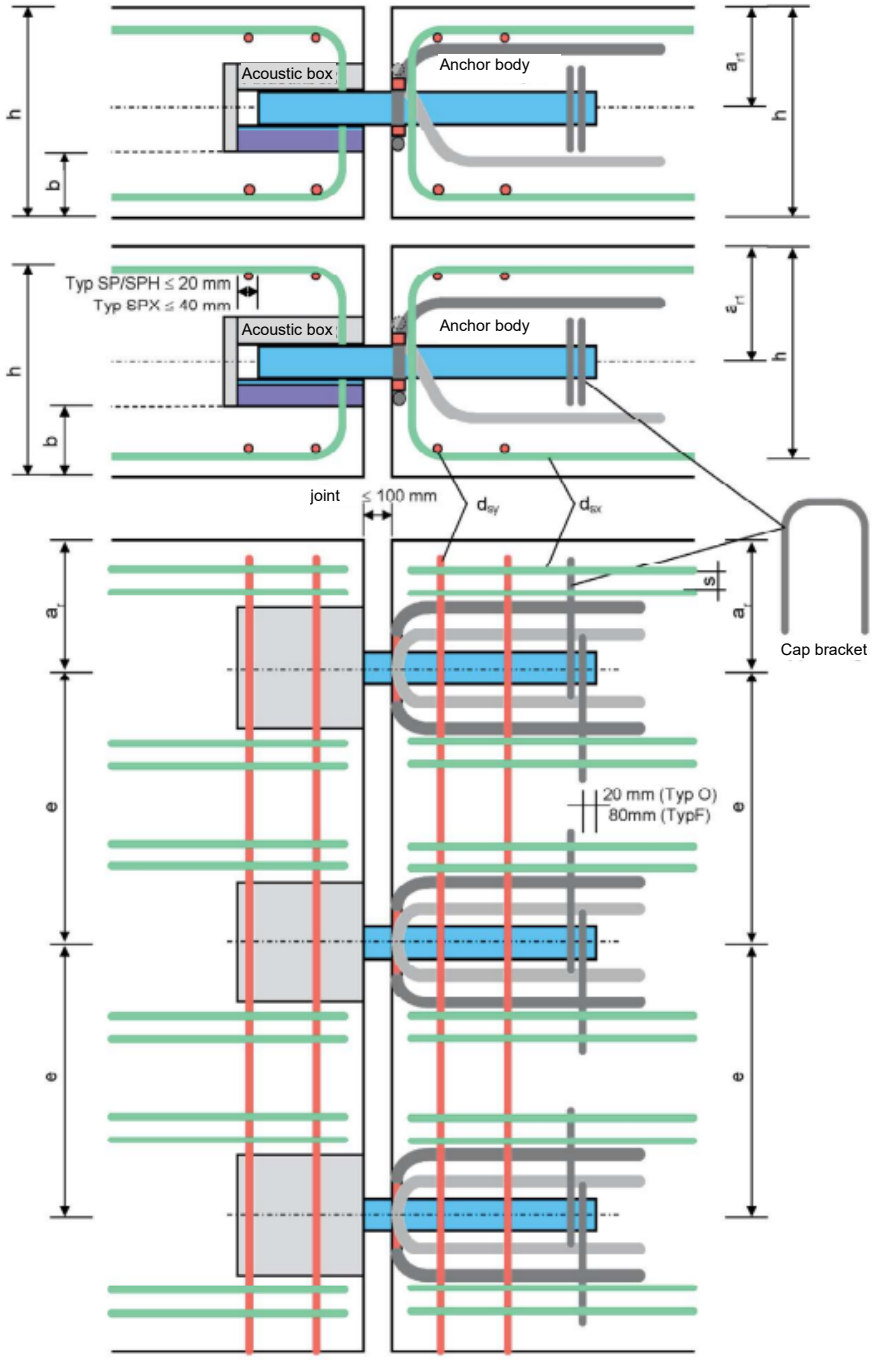

Fig. 9: On-site reinforcement (illustration of variant O)

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 7
On-site reinforcement	

Table 7: Required centre distances Shear force bearing capacity

V_{Ed}	h	Required centre distance depending on the degree of reinforcement									Minimum load-bearing capacity		
		required a for $\rho_l = 0{,}02$			required a for $\rho_l = 0{,}015$			required a for $\rho_l = 0{,}01$			Req.a for $\rho_l = 0{,}00$		
		C20/25	C25/30	C30/37	C20/25	C25/30	C30/37	C20/25	C25/30	C30/37	C20/25	C25/30	C30/37
[mm]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
20	160	240	240	240	240	240	240	275	255	240	337	302	275
20	180	240	240	240	240	240	240	240	240	240	293	262	240
20	200	240	240	240	240	240	240	240	240	240	260	240	240
20	220	240	240	240	240	240	240	240	240	240	240	240	240
20	240	240	240	240	240	240	240	240	240	240	240	240	240
37,3	160	407	378	355	448	416	391	513	476	448	629	562	513
37,3	180	354	329	309	390	362	340	446	414	390	547	489	447
37,3	200	313	291	274	345	320	301	395	367	345	484	433	395
37,3	220	281	261	246	309	287	270	354	329	309	434	388	355
37,3	240	259	241	240	285	265	249	326	303	285	404	361	330
60	160	655	608	572	721	669	629	825	766	721	1011	905	826
60	180	570	529	498	627	582	548	718	666	627	880	787	719
60	200	504	468	440	555	515	485	635	590	555	779	697	636
60	220	452	420	395	498	462	435	570	529	498	699	625	570
60	240	417	387	364	459	426	401	525	488	459	649	581	530
75,6	160	825	766	721	908	843	793	1040	965	908	1275	1140	1041
75,6	180	718	667	627	790	734	690	905	840	790	1109	992	906
75,6	200	636	590	555	699	649	611	801	743	699	982	878	802
75,6	220	570	529	498	627	582	548	718	667	627	881	788	719
75,6	240	525	488	459	578	537	505	662	615	578	819	732	668

Egcopal type SP, SPH, SPX - Impact sound insulation dowel

Minimum distances - shear force

Appendix 8

Design values of the concrete load-bearing capacity $V_{Rd,c}$ for concrete compressive strength class C20/25 in relation to the edge distance b in the load direction (**fat = elastomer decisive**)

Table 8: On-site reinforcement - due to concrete edge breakage

Edge distance b	Design values [1] of the concrete load-bearing capacity $V_{Rd,c}$			A_{sx}	A_{Sy} (top and bottom layer each)
	Type				
	SP	SPH	SPX		
[mm]	[kN]			[-]	
80	17,8	19,4	15,9	2 Ø 10	1 Ø 10
80	**37,3**	**37,3**	21,0	4 Ø 12	1 Ø 12
90	19,4	21,0	17,5	2 Ø 10	1 Ø 10
90	35,1	**37,3**	31,4	4 Ø 10	1 Ø 10
100	**37,3**	**37,3**	34,6	4 Ø 10	1 Ø 10
100	27,3	29,2	24,9	2 Ø 12	1 Ø 12
110	**37,3**	**37,3**	37,8	4 Ø 10	1 Ø 10
110			49,0	4 Ø 12	1 Ø 12
120	**37,3**	**37,3**	65,9	4 Ø 14	1 Ø 14
130	**37,3**	**37,3**	**75,6**	6 Ø 12	1 Ø 14
140	**37,3**	**37,3**	**75,6**	6 Ø 12	1 Ø 14
150	**37,3**	**37,3**	**75,6**	4 Ø 14	1 Ø 14
160	**37,3**	**37,3**	**75,6**	4 Ø 14	1 Ø 14

[1] In the case of direct bearing, the design value of the concrete load-bearing capacity is not decisive. The load-bearing capacity of the respective elastomer may be used.

The punching shear verification is considered to have been performed for component thicknesses h ≥ 2 • b and compliance with the edge distances and the reinforcement when utilising the design values of the actions specified above. In the case of deviating installations or deviating degrees of reinforcement or a different concrete compressive strength class, the verification can be carried out in accordance with Annex 9.

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 9
Design values of the concrete and elastomer load-bearing capacity Acoustic box (concrete edge failure)	

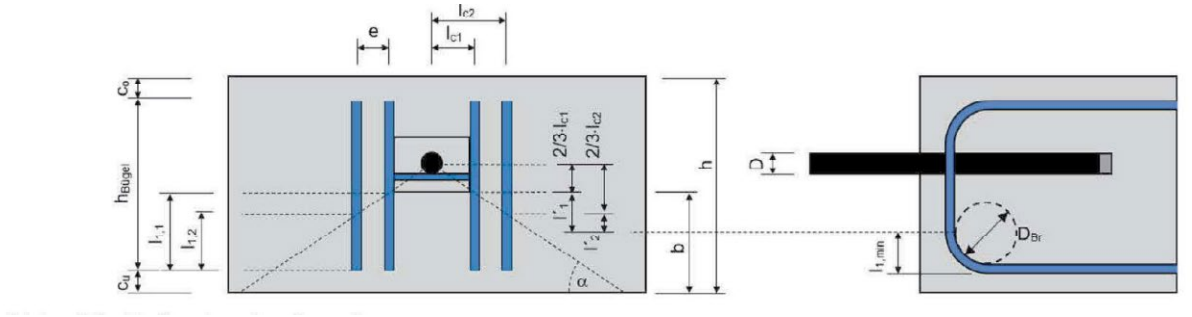

Fig. 10: Concrete edge breakage

$$V_{Rd,ce} = V_{Rd,1} + V_{Rd,2} \leq A_{sx1} \cdot f_{yd}$$

$V_{Rd,1}$ Rated value of the load that can be transferred via the hook effect

$V_{Rd,1}$ Rated value of the load that can be transmitted via the composite

Rated value of the load that can be transferred via the hook effect

$$V_{Rd,1} = \frac{X_1 \cdot f_{yk}}{\gamma_c} \cdot \sqrt{\frac{f_{ck}}{30}} \cdot \sum_{i=1}^{n} \Psi_i \cdot A_{sx1,i}$$

X_1 Pre-factor = 0.357

f_{yk} Characteristic reinforcing steel mesh

f_{ck} Characteristic concrete strength

γ_c Partial safety factor concrete = 1.5

Ψ_i Factor for considering the bracket distance $l_{c,i}$ from the dowel axis

$$= 1 - 0{,}2 \cdot \left[\frac{l_{c,i}}{c_1}\right]$$

$l_{c,i}$ Distance of the back hanger under consideration from the dowel

c_1 Edge distance starting from the dowel axis

$A_{sx1,i}$ Cross-sectional area of the bracket leg under consideration

Rated value of the load that can be transferred via the hook effect

$$\sum_{i=1}^{n} \pi \cdot d_s \cdot l'_{1,i} \cdot f_{db}$$

d_s Diameter of the back suspension reinforcement

$l'_{1,i}$ Effective anchoring length of the bracket under consideration

$$l_{1,i} - l_{1,min} \leq 0\ mm$$

$$l_{1,min} = 0{,}5 \cdot D_{Br} + d_s = 3d_s$$

D_{Br} Bending roll diameter of the back suspension reinforcement

d_s Diameter of the bracket leg under consideration

f_{bd} Design value of the anchorage

$$f_{bd} = \frac{2{,}25 \cdot 0{,}7 \cdot 0{,}3 \cdot f_{ck}^{\frac{2}{3}}}{\gamma_c}$$

For the verification of the concrete edge failure, only stirrups that are anchored in the excavation cone with min. l_1 may be used.

The angle of the break-out cone is *tan(α) = 2/3.*

The calculation method is equivalent for the application ±.

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 10
Concrete edge break Acoustic box	

The punching shear verification must be carried out by the planner in each individual case.
The critical perimeter section may be applied in accordance with Fig. 11 if two neighbouring perimeter sections do not overlap geometrically.

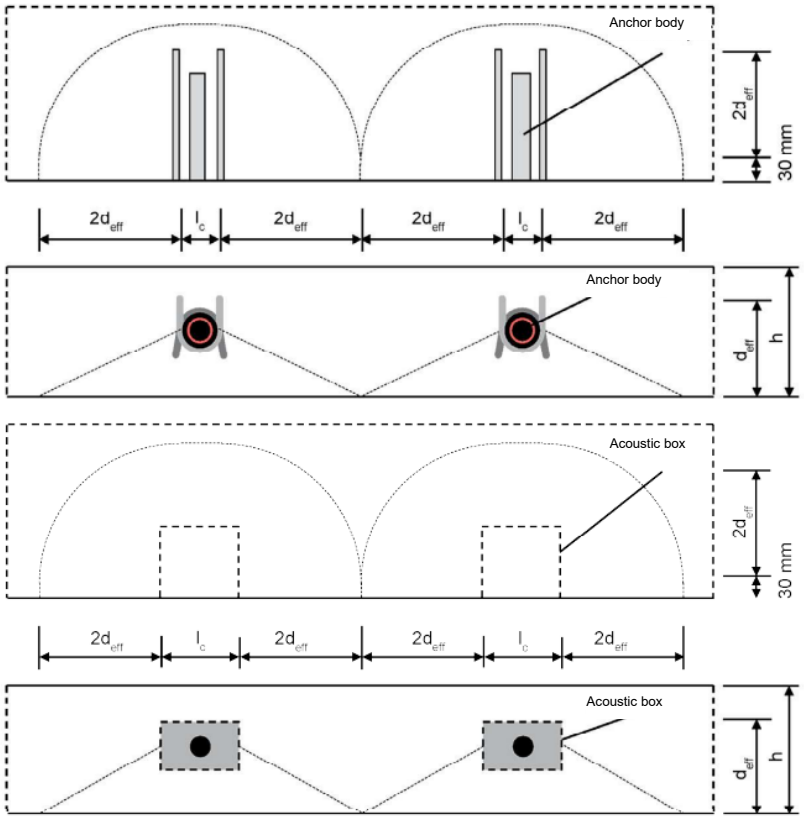

Fig. 11: Critical perimeter section, anchor body above, acoustic box below

If the perimeters do not intersect or are limited by a slab edge, the verification of punching shear can be dispensed with if the following reinforcement is inserted:

Table 9: On-site reinforcement - due to punching shear

Egcopal	Unit	Type		
		SP/SPH	SPX	
		$V_{Ed} \leq 37.3$ kN	$V_{Ed} \leq 60.0$kN	$V_{Ed} \leq 75.6$ kN
h	[mm]	≥ 160	≥ 160	≥ 180
n_x	[Quantity]	4	4	4
d_x	[mm]	10	14	14
n_y	[Quantity]	2	4	4
d_y	[mm]	10	14	14

Relevant design resistance Egcopal

$$V_{Rd} = min \begin{cases} V_{Rd,s} \\ V_{Rd,c} \\ F_{z,d} \end{cases}$$

$V_{Rd,s}$ Design resistance of the connection, according to Annex 6

$V_{Rd,c}$ Design resistance against concrete edge failure (Annex 9 and 10)

If the minimum distances according to Annex 8 are observed, shear force failure is excluded.

Alternatively, verification can be carried out by the planner.

$F_{z,d}$ Design resistance of the elastomer

$F_{z,d} = 37{,}3\ kN$ for Egcopal SP and SPH
$F_{z,d} = 75{,}6\ kN$ for Egcopal SPX

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 12
Relevant design resistance	

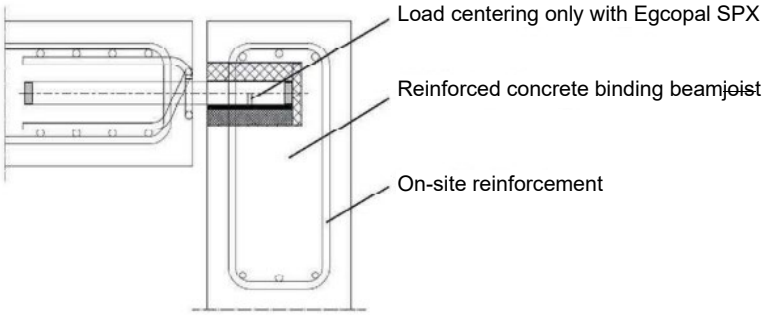

Fig. 12: Connection slab/reinforced concrete joist

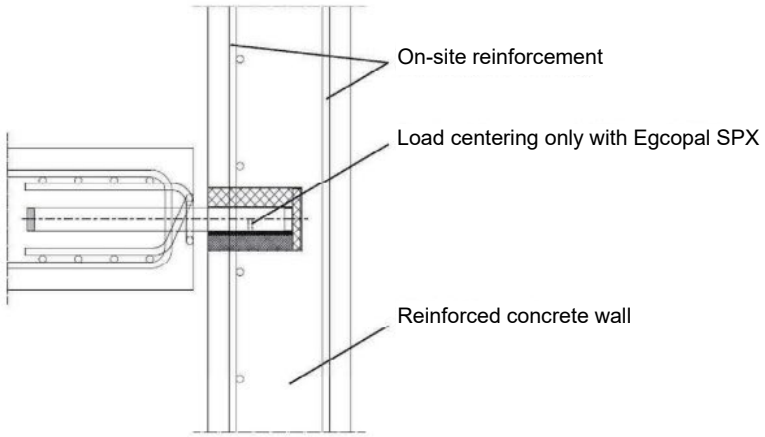

Fig. 13: Connection slab / reinforced concrete wall

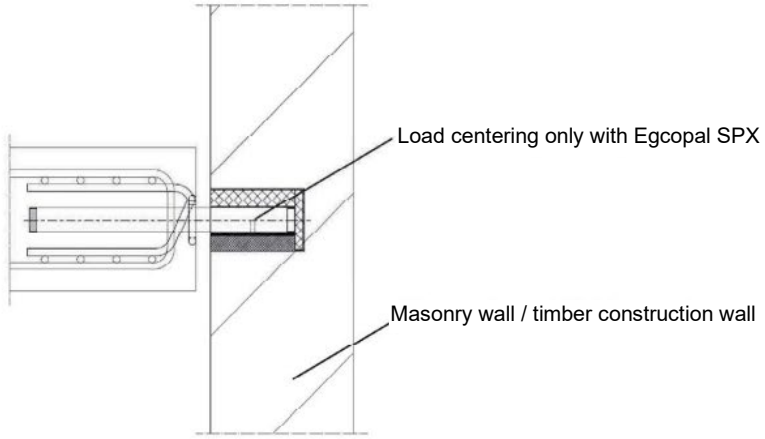

Fig. 14: Connection slab / masonry wall or timber construction wall

Egcopal type SP, SPH, SPX - Impact sound insulation dowel	Appendix 13
Installation situations Acoustic box in the wall	