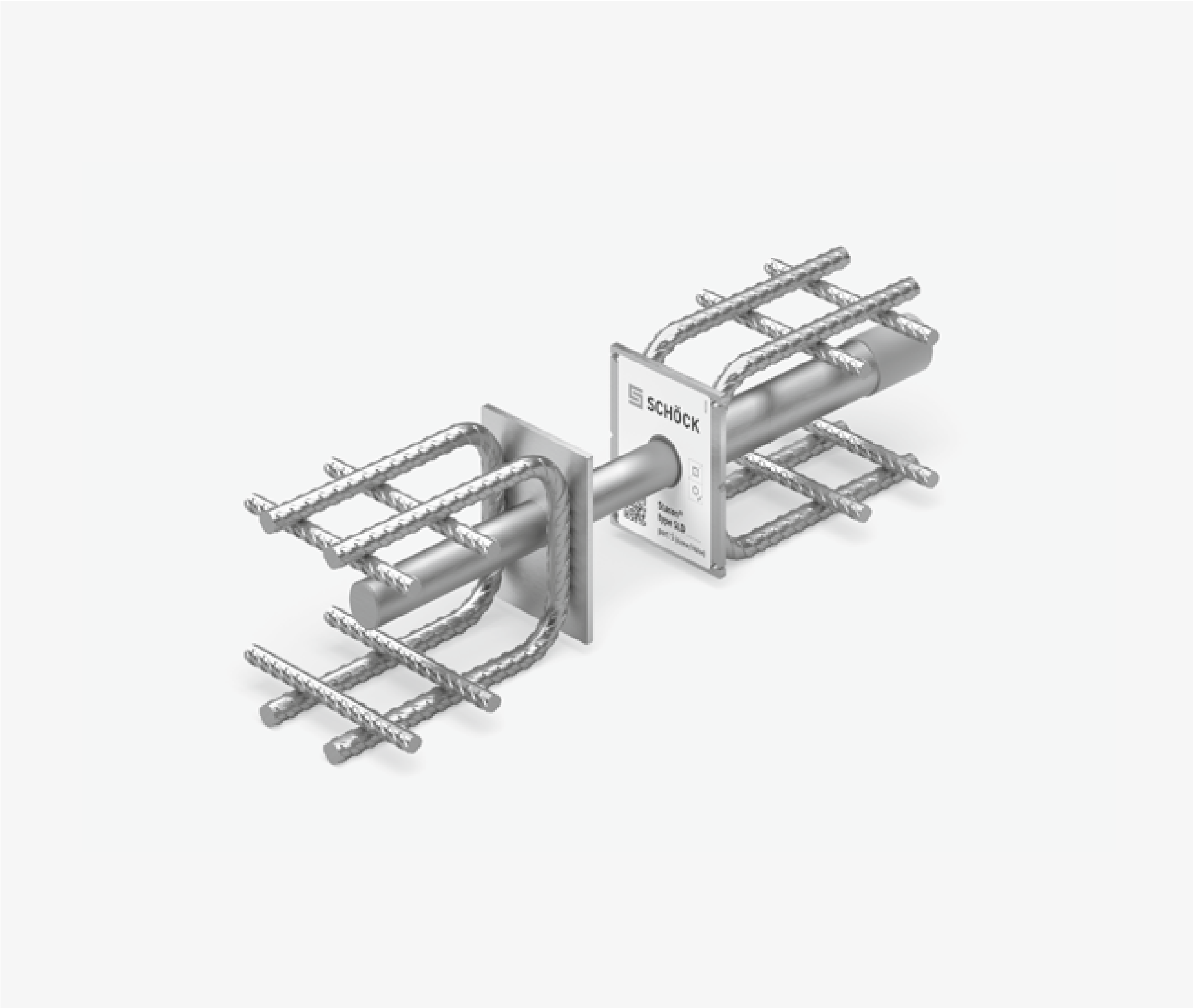
Schöck Stacon® type SLD, SLD-Q

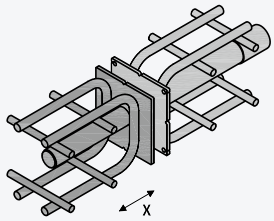


Schöck Stacon® type SLD
Heavy duty dowel for the transfer of high shear forces in expansion joints between thin concrete structural components with simultaneous freedom of movement in the direction of the dowel axis.

Schöck Stacon® type SLD-Q
Heavy-duty dowel for the transmission of high shear forces in expansion joints between thin concrete structural components with freedom of movement longitudinally and transversely to the dowel axis.

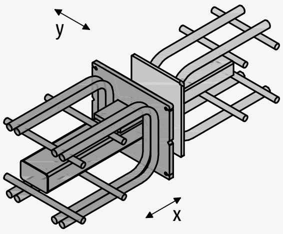
Product characteristics | Application areas

Schöck Stacon® type SLD



SLD

The heavy duty dowel serves the transmission of high shear forces in building joints and with this enables free movement in the direction of the dowel axis. Through the stiff anchoring body it is particularly suited for the connection of thin structural components.



SLD-Q

This heavy duty dowel serves the transmission of high shear forces in bulding joints and with this enables free movement in the longitudinal and transverse direction to the dowel axis. Through the stiff anchoring body it is particularly suited for the connection of thin structural components.

Type designations in planning documents

Dowel type
Sleeve movable transversely (optional)
Load-bearing level

SLD-Q-220

Product features

The Schöck Stacon® type SLD (heavy duty dowel) consists of a sleeve part and a dowel part, which are concreted into the respective building parts adjacent to the joint. The load is transferred from one structural component through the dowel into the sleeve then to the other structural component. With this, the welded-on stirrups and the face plate ensure optimum anchorage in the concrete.
The sleeve of the Schöck Stacon® type SLD is round and thus enables freedom of movement along the dowel axis, in order to prevent induced stresses due to structural component elongation. The forces can be transmitted perpendicularly and transversely to the dowel axis. Should a freedom of movement lateral to the dowel axis be required, the Schöck Stacon® dowel type SLD-Q can be used. The sleeve of this dowel is rectangular and thus enables displacement of ± 12 mm in the transversal direction. Furthermore, this type of dowel is also square in order to enable an optimum slippage in all directions.

Application areas

The Schöck Stacon® type SLD has undergone the United Kingdom Technical Assessment by the British Board of Agreement (BBA) for the transmission of mainly static, structurally relevant shear forces in expansion joints. The technical building regulation EOTA TR 065 in conjunction with the United Kingdom Technical Assessment UKTA 23/6888 regulates the design according to BS EN 1992-1-1 (EC2) for the concrete strength classes C20/25 to C50/60. The joint widths can vary between 10 and 60 mm. In addition, joint widths up to 80 mm with special types in accordance with the UKTA are also possible.
The dowel and sleeve consist of stainless steels with material numbers 1.4362, 1.4482, 1.4571 as well as 1.4404 and thus meet the requirements of corrosion resistance class 3 in accordance with BS EN 1993-1-4.
All dimensions, reinforcement and geometry tables listed below apply according to BS EN 1992-1-1 (EC2).

Product description

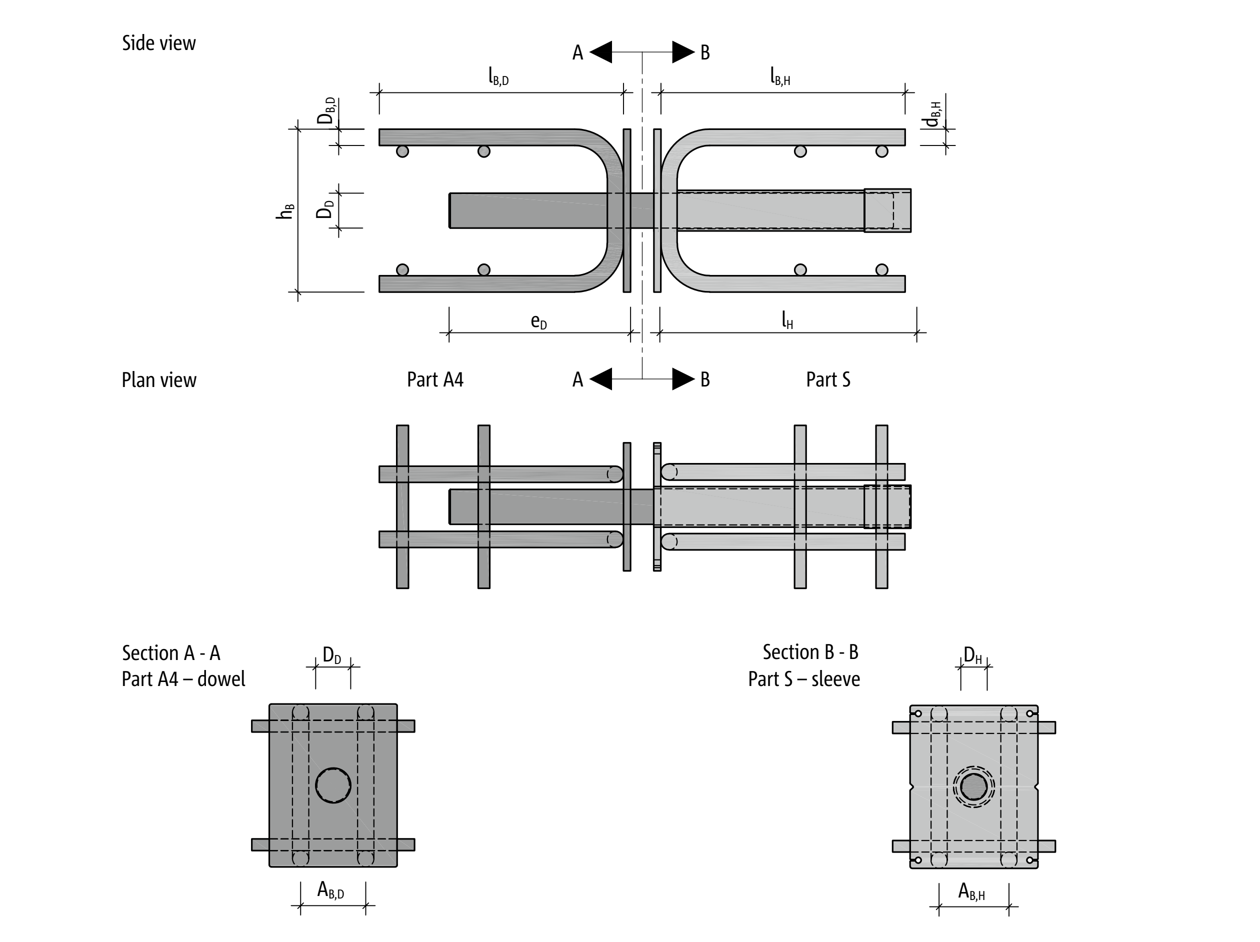


Fig. 26: Dimensions Schöck Stacon® type SLD 220 to SLD 450

Schöck Stacon® type SLD	220	250	300	350	400	450
Dowel element dimensions [mm]						
Dowel diameter D_D	22	25	30	35	40	45
Stirrup diameter $d_{B,D}$	10	12	14	12	14	14
Number of stirrups	2	2	2	4	2	4
Stirrup height h_B	100	120	140	170	200	230
Stirrup leg length $l_{B,D}$	154	184	216	258	348	400
Stirrup spacing $A_{B,D}$	46	49	56	97	70	113
Dowel embedment length e_D	114	129	156	183	208	235
Sleeve element dimensions [mm]						
Internal diameter D_H	23	26	31	36	41	46
Stirrup diameter $d_{B,H}$	10	12	14	12	14	14
Number of stirrups	2	2	2	4	2	4
Stirrup height h_B	100	120	140	170	200	230
Stirrup leg length $l_{B,H}$	154	184	216	258	348	400
Stirrup spacing $A_{B,H}$	49	53	60	97	70	113
Sleeve length l_H	180	195	220	245	270	295

Product description

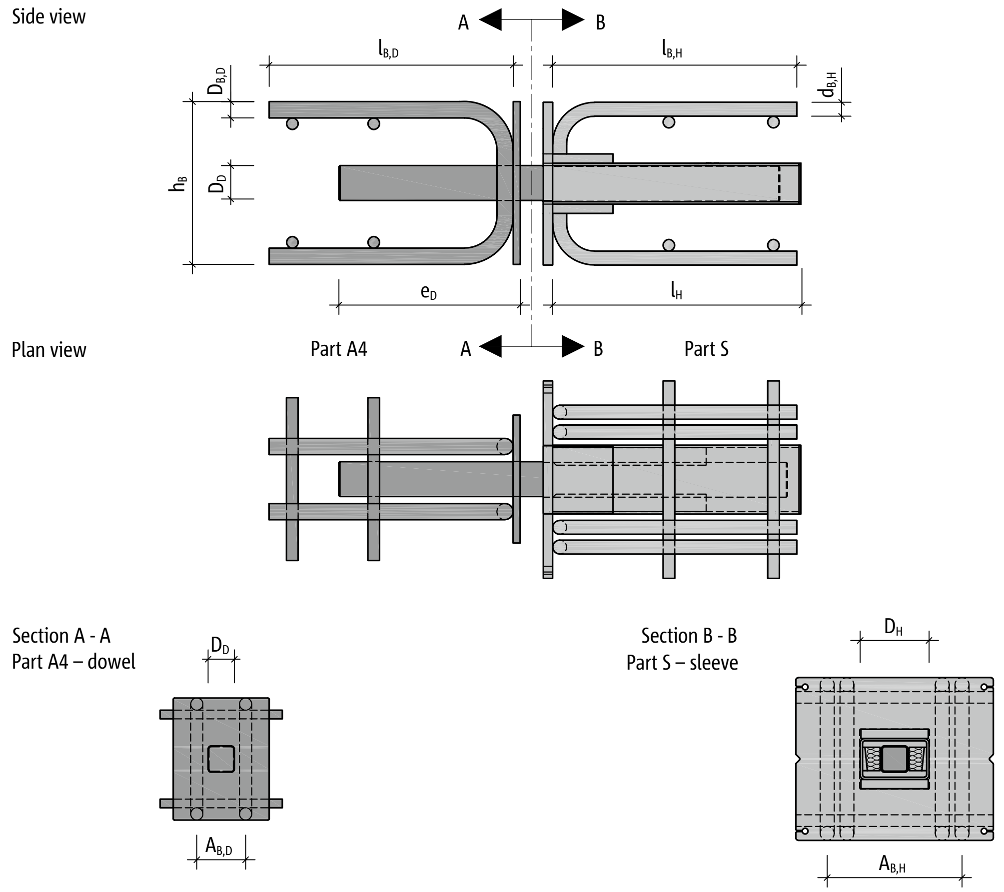


Fig. 27: Dimensions Schöck Stacon® type SLD-Q 220 to SLD-Q 400

Schöck Stacon® type SLD-Q	220	300	400
Dowel element dimensions [mm]			
Length of side of dowel D_D	22	30	40
Stirrup diameter $d_{B,D}$	10	14	14
Number of stirrups	2	2	4
Stirrup height h_B	100	140	200
Stirrup leg length $l_{B,D}$	154	216	350
Stirrup spacing $A_{B,D}$	46	56	102
Dowel embedment length e_D	114	156	210
Sleeve element dimensions [mm]			
Internal diameter D_H	47	55	65
Stirrup diameter $d_{B,H}$	10	12	14
Number of stirrups	2	4	4
Stirrup height h_B	100	140	200
Stirrup leg length $l_{B,H}$	156	218	350
Stirrup spacing $A_{B,H}$	72	116	132
Sleeve length l_H	180	220	270

Design process

Determination of the shear force path v_{Ed} in the joint using FEM software or using simplified structural models.

Determination of a simplified shear force path v'_{Ed} for the design.

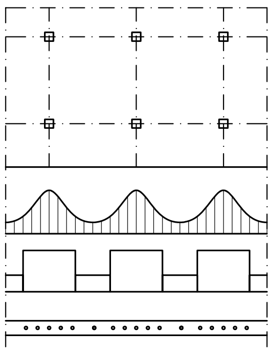
Determination of the expected maximum joint width.
See page 11

Examination of the minimum structural component dimensions and the applicable shear force dowels. See page 24

Examination of the shear force load-bearing capacity of the slab and determination of the required degree of reinforcement. See page 28

Reading of the maximum slab load-bearing capacity $V_{Rd,c,P}$ per dowel depending on slab thickness and degree of reinforcement.
See page 29

Are transversely movable dowels required?
See page 12



Transversely movable dowel not required

Selection of the matching load-bearing level of the Schöck Stacon® type SLD. Determination of the load-bearing capacity of the connection.
See design tables from page 30
$V_{Rd,dowel} = \min(V_{Rd,c,P}; V_{Rd,ce,s})$

Transversely movable dowel required

Selection of the matching load-bearing level of the Schöck Stacon® type SLD-Q. Determination of the load-bearing capacity of the connection.
See design tables from page 32
$V_{Rd,dowel} = \min(V_{Rd,c,P}; V_{Rd,ce,s})$

Are larger transverse displacements expected in the joint on a daily basis? See page 34
$V_{Rd,dowel} = V_{Rd,ce,SLS}$

Calculation of the required dowel spacing
$e_{req} = V_{Rd,dowel}$ [kN] / v'_{Ed} [kN/m]

Examination of the dowel spacing. See page 24
$1.5 \cdot h_{slab} \leq e \leq 8 \cdot h_{slab}$

Determination of the required edge reinforcement.
See page 35

You can find examples for the use of the design tables from page 39. Alternatively all Schöck Stacon® types can be designed using the Schöck Scalix® design software.

SLD

Structural design

Minimum dowel spacing/component dimensions

Schöck Stacon® type SLD	220	250	300	350	400	450
Minimum structural component dimension [mm]						
Minimum slab thickness h_{min} for c_v = 20 mm	150	160	180	210	240	270
Minimum slab thickness h_{min} for c_v = 30 mm	160	180	200	230	260	290
Minimum slab thickness h_{min} for c_v = 40 mm	180	200	220	250	280	310
Minimum wall thickness b_w	200	215	240	280	370	420
Beam width b_u	1.5 h_{min}					
Dowel spacing [mm]						
Minimum horizontal $e_{h,min}$	1.5 × slab thickness					
Maximum horizontal $e_{h,max}$	8 × slab thickness					
Minimum vertical $e_{v,min}$	150	160	180	210	240	270
Edge distances [mm]						
Minimum horizontal $e_{Rh,min}$	0.75 × slab thickness					

Schöck Stacon® type SLD-Q	220	300	400
Minimum structural component dimension [mm]			
Minimum slab thickness h_{min} for c_v = 20 mm	150	180	240
Minimum slab thickness h_{min} for c_v = 30 mm	160	200	260
Minimum slab thickness h_{min} for c_v = 40 mm	180	220	280
Minimum wall thickness b_w	200	240	370
Beam width b_u	1.5 h_{min}		
Dowel spacing [mm]			
Minimum horizontal $e_{h,min}$	1.5 × slab thickness		
Maximum horizontal $e_{h,max}$	8 × slab thickness		
Minimum vertical $e_{v,min}$	150	180	240
Edge distances [mm]			
Minimum horizontal $e_{Rh,min}$	0.75 × slab thickness		

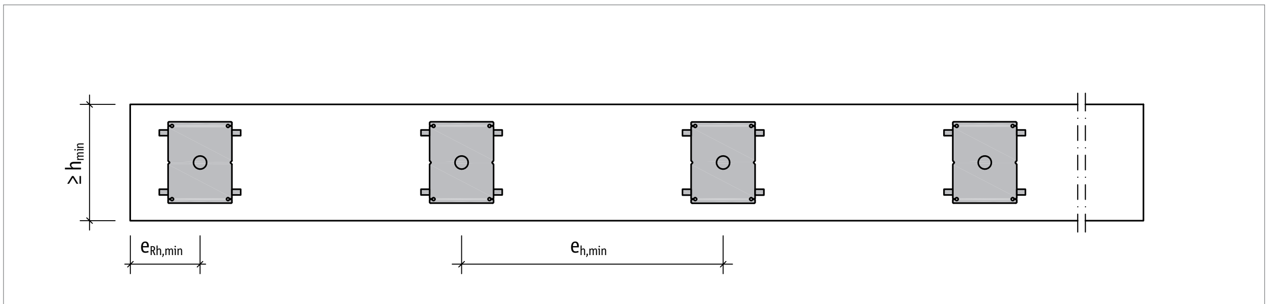


Fig. 1: Schöck Stacon® type SLD: Minimum structural component measurements and dowel spacings with one slab

Minimum dowel spacing/component dimensions

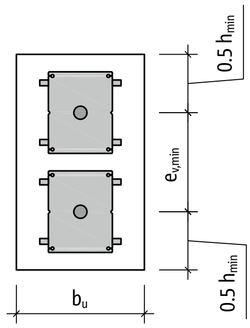


Fig. 29: Schöck Stacon® type SLD: Minimum structural component measurements and dowel spacings in the front face of a balcony or a wall

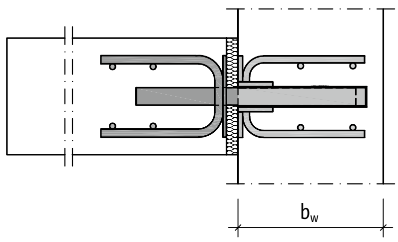


Fig. 30: Schöck Stacon® type SLD: Minimum structural component thickness of a wall or column

Shear force load-bearing capacity of slabs

Verification of the shear force load-bearing capacity
The shear force resistance of the slab is directed in accordance with BS EN 1992-1-1, para. 6.2. The following conditions must be met for slabs without shear force reinforcement:

$v_{Rd,c}$ [kN/m] ≥ v_{Ed} [kN/m]

with:

$v_{Rd,c}$: Design value of the shear force resistance of the slab in accordance with BS EN 1992-1-1, para. 6.2.2 (1)

v_{Ed}: Design value of the applied shear force without reduction in accordance with BS EN 1992-1-1, para. 6.2.2 (6)

Shear force dowels introduce the loads punctually into the slab. A linear support can be assumed for a dowel spacing of up to five times the static useful height. In this case the verification of the shear force load-bearing capacity, as shown in the diagram below, may be carried out across the complete slab width.
The load-bearing capacities $v_{Rd,c}$ for some slab thicknesses, concrete strength classes and degrees of reinforcement are listed in a table, see page 28. The required degree of reinforcement of the slab in the edge area can be determined and the maximum load-bearing capacity in accordance with BS EN 1992-1-1, para. 6.2 can be checked by referring to this table.

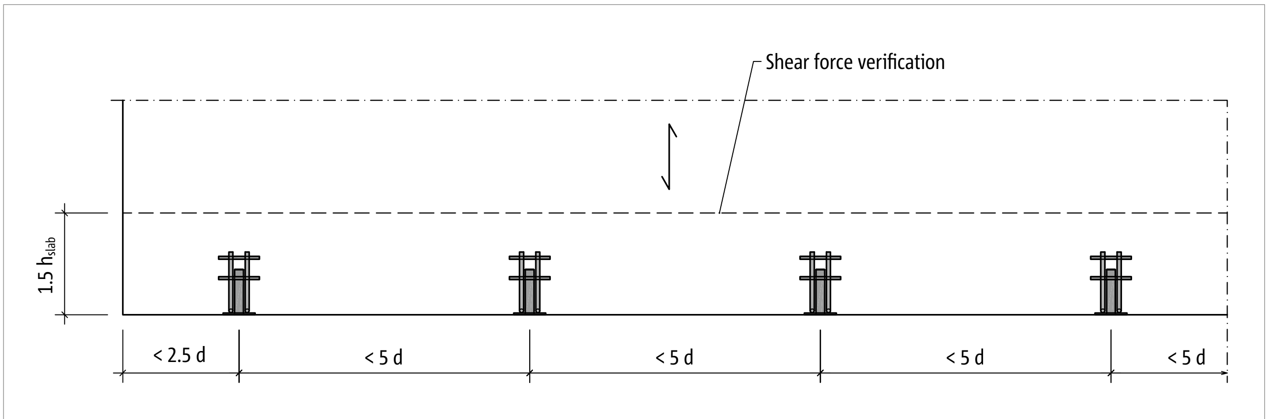


Fig. 31: Closed shear force verification of the slab with small dowel spacings

If the dowel spacing is more than five times the static useful height, the verification of the shear force load-bearing capacity must be carried out section by section in the area of the shear force dowels. This principle is presented in the diagram below. In this case every dowel, independent of the load-bearing level and joint width, can only introduce a certain maximum shear force into the slab.
The maximum shear forces $V_{Rd,c,P}$ for some slab thicknesses, concrete strength classes and degrees of reinforcement are listed in a table, see page 29.
This verification is not required for walls, columns and downstand beams.

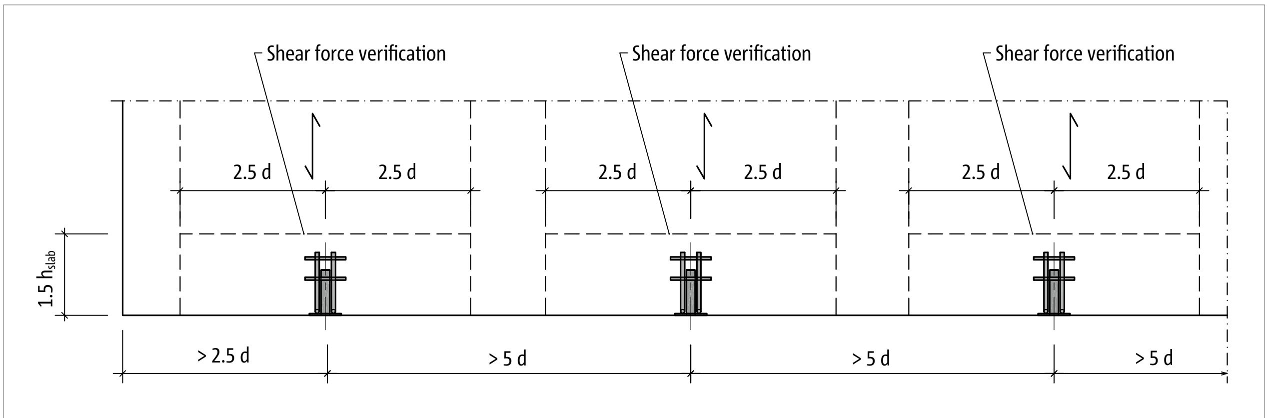


Fig. 32: Section-by-section shear force verification with large dowel spacings

SLD

Structural design

Shear force load-bearing capacity of slabs

Information on upper and lower slab reinforcement

- The degrees of reinforcement given in the tables on page28 and page 29 are to be installed at the top and bottom of the slab and anchored on the free edge of the slab. For this, the existing concrete reinforcement can be fully taken into account.
- In accordance with BS EN 1992-1-1, para. 9.3.1.2, at least 50 % of the required field reinforcement must be anchored in the support. As the support is indirect when connecting with shear force dowels, this reinforcement must be anchored in the edge beam as shown in the diagram below.
- If the length $l_{b,ind}$ for the anchorage of the reinforcement is not sufficient, the required anchorage length can be reduced by using angle hooks, welded-on cross bars or varying the ratio between existing and required reinforcement.

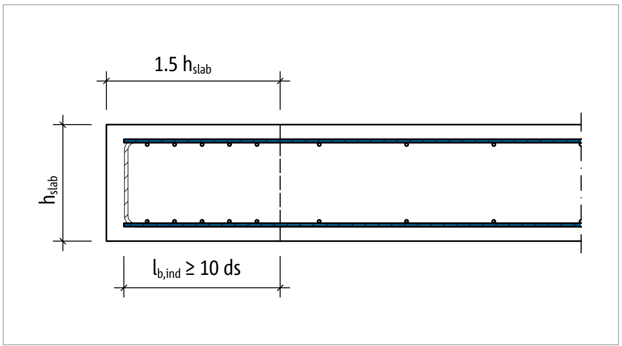


Fig. 33: Anchorage of the upper and lower reinforcement at the edge of the slab

Shear force load-bearing capacity of the slab

The design values of the shear force load-bearing capacity for selected concrete strengths, degrees of reinforcement and slab thicknesses in accordance with BS EN 1992-1-1, para. 6.2.2 (1) are specified in the following table. The minimum value of the shear force load-bearing capacity has already been taken into account here. These load-bearing capacities are independent of the selected shear force dowel and refer only to the slab.

Shear force resistance of the slab without shear force reinforcement for linear support									
Shear force resistance for		C28/35				C32/40			
		degree of reinforcement ρ_{ly} [%]							
Slab thickness [mm]		0.25	0.50	0.75	1.00	0.25	0.50	0.75	1.00
c_v = 20 mm	c_v = 30 mm	$v_{Rd,c}$ [kN/m]							
150	160	65.5	72.3	82.8	91.1	70.0	75.6	86.5	95.2
160	170	70.7	78.1	89.4	98.4	75.6	81.6	93.5	102.9
170	180	76.0	83.9	96.0	105.7	81.2	87.7	100.4	110.5
180	190	81.2	89.7	102.6	113.0	86.8	93.7	107.3	118.1
190	200	85.9	94.9	108.6	119.5	91.8	99.2	113.5	125.0
200	210	91.1	100.6	115.2	126.8	97.4	105.2	120.5	132.6
210	220	96.4	106.4	121.8	134.1	103.0	111.3	127.4	140.2
220	230	101.6	112.2	128.5	141.4	108.6	117.3	134.3	147.8
230	240	106.1	117.4	134.4	147.9	113.4	122.8	140.5	154.7
240	250	109.3	121.7	139.3	153.4	116.9	127.3	145.7	160.3
250	260	112.2	125.6	143.7	158.2	120.0	131.3	150.3	165.4
260	270	115.4	129.8	148.6	163.6	123.4	135.7	155.4	171.0
270	280	118.5	134.0	153.4	168.9	126.7	140.1	160.4	176.6
280	290	121.7	138.2	158.2	174.2	130.1	144.5	165.4	182.1
290	300	124.8	142.4	163.0	179.4	133.4	148.9	170.4	187.6
300	310	127.5	146.1	167.3	184.1	136.3	152.8	174.9	192.5
310	320	130.6	150.2	172.0	189.3	139.6	157.1	179.8	197.9
320	330	133.6	154.3	176.7	194.5	142.8	161.4	184.7	203.3
330	340	136.6	158.4	181.3	199.6	146.1	165.6	189.6	208.7
340	350	139.6	162.5	186.0	204.7	149.3	169.9	194.5	214.0
350	360	142.0	165.7	189.7	208.8	151.8	173.3	198.3	218.3
360	370	145.0	169.7	194.3	213.9	155.0	177.5	203.2	223.6
370	380	147.2	172.8	197.8	217.7	157.3	180.6	206.8	227.6
380	390	150.1	176.7	202.3	222.7	160.5	184.8	211.5	232.8
390	400	153.0	180.7	206.9	227.7	163.6	189.0	216.3	238.1
400	410	155.9	184.7	211.4	232.7	166.7	193.1	221.0	243.3
410	420	158.8	188.6	215.9	237.7	169.8	197.2	225.8	248.5
420	430	161.7	192.6	220.5	242.6	172.8	201.4	230.5	253.7
430	440	164.5	196.5	224.9	247.6	175.9	205.5	235.2	258.9
440	450	167.4	200.4	229.4	252.5	178.9	209.5	239.9	264.0
450	460	170.2	204.3	233.9	257.4	181.9	213.6	244.5	269.1
460	470	173.0	208.2	238.3	262.3	185.0	217.7	249.2	274.3
470	480	175.8	212.1	242.8	267.2	188.0	221.7	253.8	279.4
480	490	178.6	215.9	247.2	272.1	191.0	225.8	258.5	284.5
490	500	181.4	219.8	251.6	276.9	193.9	229.8	263.1	289.5
500	510	184.2	223.6	256.0	281.8	196.9	233.8	267.7	294.6

Shear force load-bearing capacity of the slab

Each shear force dowel has only one limited range of influence in which it can introduce the shear force into the slab. If the dowel spacing is greater than five times the static useful height, the load-bearing capacity of the connection is limited by the shear force load-bearing capacity of the slab within this range of influence.
The following table specifies the design values of the shear force load-bearing capacity for selected slab thicknesses, and degrees of reinforcement given. These values apply irrespective of the load-bearing level of the selected Schöck Stacon® type SLD.

Shear force load-bearing capacity of the slab with punctual support									
Shear force load-bearing capacity for		C28/35				C32/40			
		degree of reinforcement ρ_{ly} [%]							
Slab thickness [mm]		0.25	0.50	0.75	1.00	0.25	0.50	0.75	1.00
c_v = 20 mm	c_v = 30 mm	$V_{Rd,c,P}$ per dowel [kN]							
150	160	40.9	45.2	51.8	56.9	43.8	47.3	54.1	59.5
160	170	47.7	52.7	60.3	66.4	51.0	55.1	63.1	69.5
170	180	55.1	60.8	69.6	76.6	58.9	63.6	72.8	80.1
180	190	62.9	69.5	79.5	87.6	67.3	72.6	83.2	91.5
190	200	70.4	77.8	89.1	98.0	75.3	81.3	93.1	102.5
200	210	79.3	87.5	100.2	110.3	84.7	91.5	104.8	115.4
210	220	88.7	97.9	112.1	123.4	94.8	102.4	117.2	129.0
220	230	98.6	108.8	124.6	137.2	105.3	113.8	130.3	143.4
230	240	108.2	119.7	137.1	150.9	115.7	125.3	143.3	157.8
240	250	117.0	130.2	149.1	164.1	125.1	136.2	155.9	171.5
250	260	125.1	140.0	160.2	176.4	133.8	146.4	167.6	184.4
260	270	134.4	151.2	173.1	190.6	143.8	158.1	181.0	199.2
270	280	144.0	162.8	186.4	205.2	153.9	170.2	194.9	214.6
280	290	154.0	174.8	200.1	220.4	164.6	182.8	209.2	230.4
290	300	164.1	187.3	214.3	235.9	175.4	195.8	224.1	246.7
300	310	173.4	198.7	227.5	250.4	185.4	207.8	237.9	261.8
310	320	184.1	211.8	242.5	266.9	196.8	221.5	253.5	279.0
320	330	195.1	225.3	258.0	284.0	208.5	235.6	269.7	296.8
330	340	206.3	239.2	273.8	301.4	220.6	250.1	286.3	315.1
340	350	217.8	253.5	290.2	319.3	232.9	265.0	303.4	333.8
350	360	227.2	265.1	303.5	334.1	242.9	277.3	317.3	349.3
360	370	239.3	280.0	320.6	352.9	255.8	292.9	335.3	368.9
370	380	248.4	291.6	333.8	367.4	265.4	304.8	349.0	384.1
380	390	260.8	307.0	351.5	386.9	278.9	321.1	367.5	404.5
390	400	273.5	323.0	369.8	407.0	292.4	337.8	386.6	425.6
400	410	286.5	339.4	388.4	427.6	306.3	354.8	406.1	447.1
410	420	299.7	356.0	407.5	448.7	320.5	372.2	426.2	469.0
420	430	313.3	373.2	427.2	470.0	334.8	390.2	446.6	491.5
430	440	326.9	390.5	447.0	492.1	349.6	408.4	467.5	514.6
440	450	341.1	408.3	467.4	514.5	364.5	426.9	488.8	537.9
450	460	355.3	426.5	488.3	537.3	379.7	445.9	510.4	561.7
460	470	369.8	445.0	509.4	560.7	395.4	465.3	532.7	586.3
470	480	384.6	464.0	531.1	584.5	411.3	485.0	555.2	611.2
480	490	399.6	483.1	553.1	608.8	427.4	505.2	578.4	636.6
490	500	415.0	502.8	575.5	633.4	443.5	525.7	601.8	662.2
500	510	430.6	522.7	598.4	658.7	460.3	546.5	625.7	688.6

Load-bearing capacity of Stacon® type SLD

Design resistance $V_{Rd,ce,s}$ = min [resistance against steel failure $V_{Rd,s}$, concrete edge failure $V_{Rd,ce}$ and crack width limitation $V_{Rd,ce,SLS}$]
The following design values were determined on the basis of UKTA 23/6888, the technical regulation EOTA TR 065 and BS EN 1992-1-1. The values listed here apply only in connection with a reinforcement arrangement shown on page 35.

Schöck Stacon® type SLD			220	250	300	350	400	450
Design values with			$V_{Rd,ce,s}$ [kN] Check the shear force load-bearing capacity in advance (see design procedure on page23)					
Slab thickness [mm]		Joint width [mm]						
c_v = 20 mm	c_v = 30 mm							
150	160	20	56.8	-	-	-	-	-
		30	45.7	-	-	-	-	-
		40	38.1	-	-	-	-	-
		50	32.6	-	-	-	-	-
		60	28.5	-	-	-	-	-
160	180	20	56.8	74.7	-	-	-	-
		30	45.7	60.7	-	-	-	-
		40	38.1	50.9	-	-	-	-
		50	32.6	43.7	-	-	-	-
		60	28.5	38.2	-	-	-	-
180	200	20	56.8	74.7	123.3	-	-	-
		30	45.7	60.7	101.8	-	-	-
		40	38.1	50.9	86.0	-	-	-
		50	32.6	43.7	74.2	-	-	-
		60	28.5	38.2	65.2	-	-	-
200	220	20	56.8	74.7	123.3	-	-	-
		30	45.7	60.7	101.8	-	-	-
		40	38.1	50.9	86.0	-	-	-
		50	32.6	43.7	74.2	-	-	-
		60	28.5	38.2	65.2	-	-	-
220	240	20	56.7	74.7	118.5	171.5	-	-
		30	45.7	60.7	101.8	156.2	-	-
		40	38.1	50.9	86.0	133.3	-	-
		50	32.6	43.7	74.2	115.7	-	-
		60	28.5	38.2	65.2	102.0	-	-
230	250	20	56.8	74.7	121.3	176.0	-	-
		30	45.7	60.7	101.8	156.2	-	-
		40	38.1	50.9	86.0	133.3	-	-
		50	32.6	43.7	74.2	115.7	-	-
		60	28.5	38.2	65.2	102.0	-	-
250	270	20	56.8	74.7	123.3	184.9	243.6	-
		30	45.7	60.7	101.8	156.2	217.2	-
		40	38.1	50.9	86.0	133.3	187.0	-
		50	32.6	43.7	74.2	115.7	163.3	-
		60	28.5	38.2	65.2	102.0	144.5	-

Load-bearing capacity of Stacon® type SLD

Schöck Stacon® type SLD			220	250	300	350	400	450
Design values with			$V_{Rd,ce,s}$ [kN] Check the shear force load-bearing capacity in advance (see design procedure on page23)					
Slab thickness [mm]		Joint width [mm]						
c_v = 20 mm	c_v = 30 mm							
280	300	20	56.8	74.7	123.3	186.4	255.9	356.2
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
300	320	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
330	350	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
350	370	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
380	400	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
400	420	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
430	450	20	56.8	74.7	123.3	179.3	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7
480	500	20	56.8	74.7	123.3	186.4	255.9	357.1
		30	45.7	60.7	101.8	156.2	217.2	307.9
		40	38.1	50.9	86.0	133.3	187.0	267.9
		50	32.6	43.7	74.2	115.7	163.3	235.7
		60	28.5	38.2	65.2	102.0	144.5	209.7

Load-bearing capacity of Stacon® type SLD-Q

Design resistance $V_{Rd,ce,s}$ = min [resistance against steel failure $V_{Rd,s}$, concrete edge failure $V_{Rd,ce}$ and crack width limitation $V_{Rd,ce,SLS}$]
The following design values were determined on the basis of UKTA 23/6888, the technical regulation EOTA TR 065 and BS EN 1992-1-1. The values listed here apply only in connection with a reinforcement arrangement shown on page 35.

Schöck Stacon® type SLD-Q			220	300	400
Design values with			$V_{Rd,ce,s}$ [kN] Check the shear force load-bearing capacity in advance (see design procedure on page23)		
Slab thickness [mm]		Joint width [mm]			
c_v = 20 mm	c_v = 30 mm				
150	160	20	55.4	-	-
		30	55.4	-	-
		40	50.7	-	-
		50	43.5	-	-
		60	38.1	-	-
160	180	20	59.9	-	-
		30	59.9	-	-
		40	50.7	-	-
		50	43.5	-	-
		60	38.1	-	-
180	200	20	74.1	138.8	-
		30	60.4	138.8	-
		40	50.7	122.9	-
		50	43.5	106.8	-
		60	38.1	94.2	-
200	220	20	74.1	148.9	-
		30	60.4	144.0	-
		40	50.7	122.9	-
		50	43.5	106.8	-
		60	38.1	94.2	-
220	240	20	72.6	158.5	-
		30	60.4	144.0	-
		40	50.7	122.9	-
		50	43.5	106.8	-
		60	38.1	94.2	-
230	250	20	74.1	163.2	-
		30	60.4	144.0	-
		40	50.7	122.9	-
		50	43.5	106.8	-
		60	38.1	94.2	-
250	270	20	74.1	171.7	310.4
		30	60.4	144.0	310.4
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4

Load-bearing capacity of Stacon® type SLD-Q

Schöck Stacon® type SLD-Q			220	300	400
Design values with			$V_{Rd,ce,s}$ [kN] Check the shear force load-bearing capacity in advance (see design procedure on page23)		
Slab thickness [mm]		Joint width [mm]			
c_v = 20 mm	c_v = 30 mm				
280	300	20	74.1	171.7	334.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
300	320	20	74.1	171.7	350.1
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
330	350	20	73.4	171.7	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
350	370	20	74.1	171.7	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
380	400	20	74.1	171.7	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
400	420	20	74.1	171.7	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
430	450	20	74.1	171.4	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4
480	500	20	74.1	171.7	359.6
		30	60.4	144.0	312.1
		40	50.7	122.9	272.6
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4

Operating strength of Stacon® type SLD-Q | On-site reinforcement

Operational strength of transversely movable dowels

With larger transverse displacements every day of more than 2 mm, the dowel can rub against the inside of the sleeve which increases wear. These frequent displacements occur when external members such as, for example, balcony slabs or façade components, are connected. In these cases the load must be limited.

The load-bearing capacities of the Schöck Stacon® type SLD-Q for the ultimate limit state are listed in the bottom table. As these values are smaller than the load-bearing capacities without regular displacement with the respective minimum slab thickness, these values apply irrespective of the slab thickness.

Schöck Stacon® type SLD-Q		220	300	400
Design values with		$V_{Rd,ce,SLS}$ [kN]		
Joint width [mm]	10–50	40.9	94.7	198.3
	60	38.1	94.2	198.3

On-site reinforcement

The on-site reinforcement specified here was designed for the following requirements:

- Slab edge reinforcement to avoid concrete edge failure (Pos. 1)
- Bending moments and shear forces of the flush edge beam as continuous support for a maximum dowel spacing of 8 • h_{slab} (Pos. 2)
- Transverse reinforcement for anchorage of the slab flexible reinforcement in the flush downstand beam in accordance with BS EN 1992-1-1

The first slip-in stirrup of the Position 1 right and left of the shear force dowel must be directly in contact with the welded-on dowel bracket.

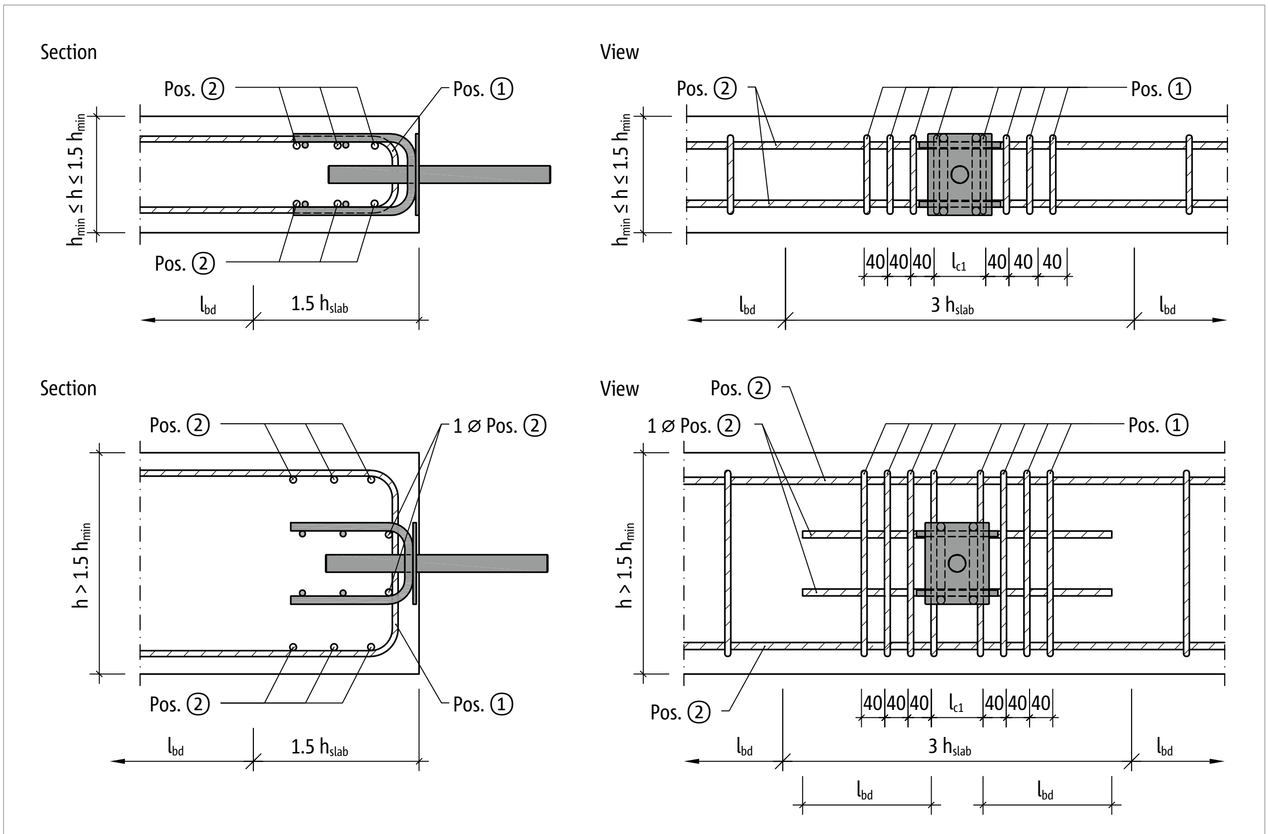


Fig. 34: On-site reinforcement with Schöck Stacon® type SLD

On-site reinforcement

Schöck Stacon® type SLD		220	250	300	350	400	450
On-site reinforcement for		Number and diameter					
Slab thickness [mm]							
c_v = 20 mm	c_v = 30 mm						
Pos. 1: U-stirrup							
150–200	160-220	2 x 2 ⌀ 12	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-	-	-
210–300	230-320	2 x 2 ⌀ 10	2 x 2 ⌀ 12	2 x 2 ⌀ 16	2 x 3 ⌀ 16	2 x 4 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 2 ⌀ 10	2 x 2 ⌀ 10	2 x 3 ⌀ 12	2 x 3 ⌀ 16	2 x 4 ⌀ 16	2 x 4 ⌀ 20
410–500	430–520	2 x 2 ⌀ 10	2 x 2 ⌀ 10	2 x 3 ⌀ 10	2 x 2 ⌀ 16	2 x 3 ⌀ 16	2 x 4 ⌀ 20
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 0.5 %							
150–200	160-220	2 x 3 ⌀ 12	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-	-	-
210–300	230-320	2 x 4 ⌀ 16	2 x 4 ⌀ 16	2 x 4 ⌀ 16	2 x 4 ⌀ 16	2 x 5 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 3 ⌀ 16	2 x 5 ⌀ 16	2 x 4 ⌀ 20	2 x 4 ⌀ 20	2 x 4 ⌀ 20	2 x 4 ⌀ 20
410–500	430–520	2 x 2 ⌀ 16	2 x 4 ⌀ 16	2 x 5 ⌀ 20	2 x 6 ⌀ 20	2 x 6 ⌀ 20	2 x 6 ⌀ 20
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 1.0 %							
150–200	160-220	2 x 5 ⌀ 12	2 x 5 ⌀ 12	2 x 3 ⌀ 16	-	-	-
210–300	230-320	2 x 5 ⌀ 16	2 x 6 ⌀ 16	2 x 7 ⌀ 16	2 x 7 ⌀ 16	2 x 5 ⌀ 20	2 x 5 ⌀ 20
310–400	330–420	2 x 3 ⌀ 16	2 x 6 ⌀ 16	2 x 7 ⌀ 20	2 x 7 ⌀ 20	2 x 7 ⌀ 20	2 x 7 ⌀ 20
410–500	430–520	2 x 2 ⌀ 16	2 x 4 ⌀ 16	2 x 6 ⌀ 20	2 x 7 ⌀ 20	2 x 8 ⌀ 20	2 x 8 ⌀ 20

Schöck Stacon® type SLD-Q		220	300	400
On-site reinforcement for		Number and diameter		
Slab thickness [mm]				
c_v = 20 mm	c_v = 30 mm			
Pos. 1: U-stirrup				
150–200	160-220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230-320	2 x 2 ⌀ 12	2 x 3 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 2 ⌀ 10	2 x 3 ⌀ 16	2 x 3 ⌀ 20
410–500	430–520	2 x 2 ⌀ 10	2 x 2 ⌀ 16	2 x 3 ⌀ 20
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 0.5 %				
150–200	160-220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230-320	2 x 3 ⌀ 16	2 x 3 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 5 ⌀ 16	2 x 4 ⌀ 20	2 x 5 ⌀ 20
410–500	430–520	2 x 2 ⌀ 16	2 x 6 ⌀ 20	2 x 6 ⌀ 20
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 1.0 %				
150–200	160-220	2 x 5 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230-320	2 x 6 ⌀ 16	2 x 6 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 6 ⌀ 16	2 x 7 ⌀ 20	2 x 7 ⌀ 20
410–500	430–520	2 x 4 ⌀ 12	2 x 7 ⌀ 25	2 x 8 ⌀ 25

Distance of the first U-stirrup laterally from the dowel

$l_{c1} = A_{B,D/H} + d_{b,D/H} + \varnothing$ Pos. 1

l_{c1}:	Centre distance of the first U-stirrup next to the Schöck Stacon® type SLD
$A_{B,D/H}$:	Centre distance of the welded-on stirrup on the sleeve and/or dowel element (see page 21 or 22)
$d_{b,D/H}$:	Diameter of the welded-on stirrup on the sleeve and/or dowel element (see page 21 or 22)
⌀ Pos. 1:	Diameter of the on-site reinforcement of Pos. 1

SLD

Structural design

Precast construction | Joint tapes

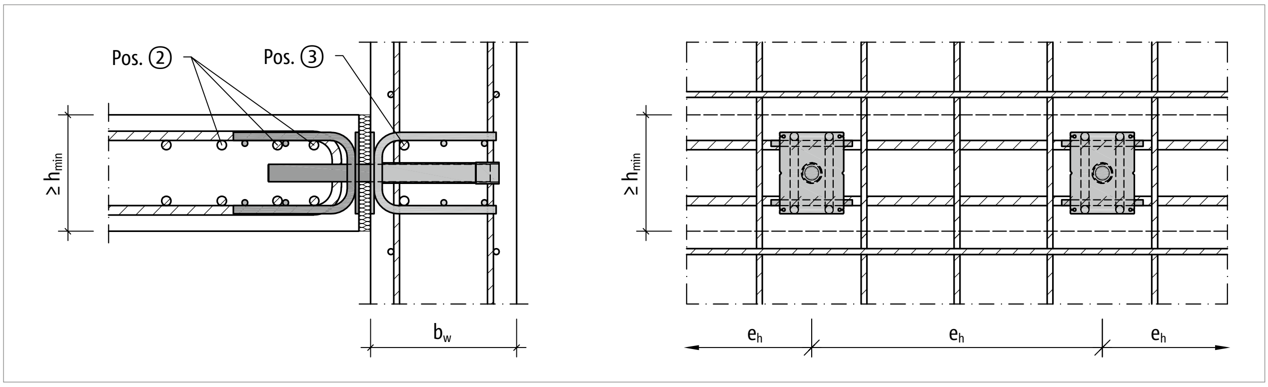


Fig. 35: Schöck Stacon® type SLD: on-site reinforcement with floor-wall connection

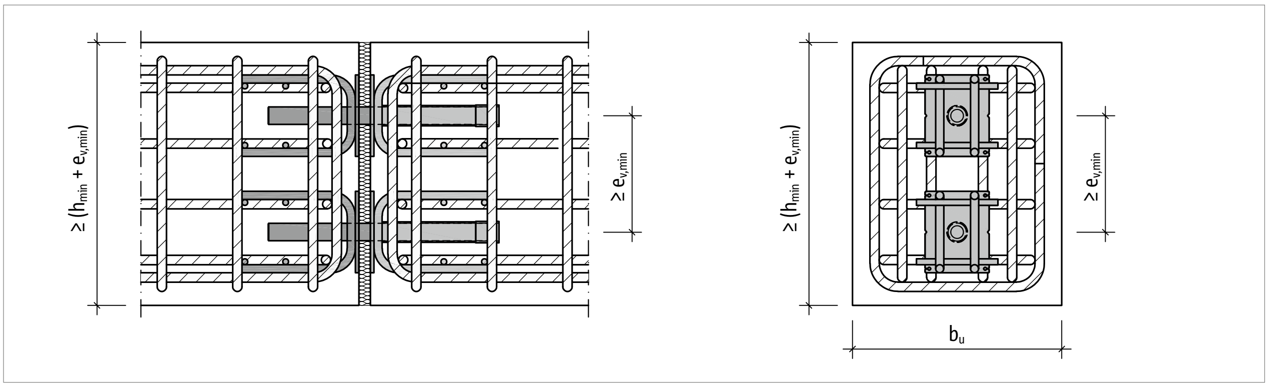


Fig. 36: Schöck Stacon® type SLD: on-site reinforcement with beam connection

Schöck Stacon®	220	250	300	350	400	450
On-site reinforcement for	Number and diameter					
Pos. 3: Longitudinal bar within the dowel for walls and downstand beams						
Type SLD	2 x 1 Ø 8	2 x 1 Ø 10	2 x 1 Ø 12	2 x 1 Ø 16	2 x 1 Ø 16	2 x 1 Ø 20

Schöck Stacon®	220	300	400
On-site reinforcement for	Number and diameter		
Pos. 3: Longitudinal bar within the dowel for walls and downstand beams			
Type SLD-Q	2 x 1 Ø 10	2 x 1 Ø 16	2 x 1 Ø 20

Prefabricated construction and joint tapes

If the end faces of the connected structural components are divided by compound joints or joint tapes, only the undisturbed part of the structural component height can be used as the basis for the design. Accordingly, the on-site reinforcement for the shear force dowel must also only be located in this area.

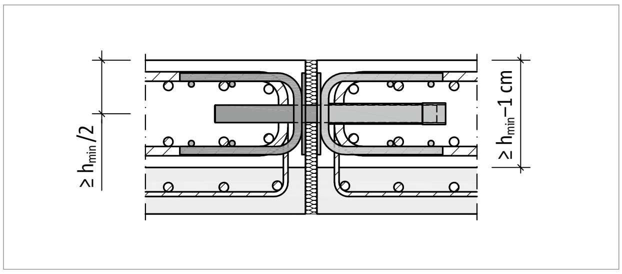


Fig. 37: Schöck Stacon® type SLD: on-site reinforcement with semi precast floor slab units

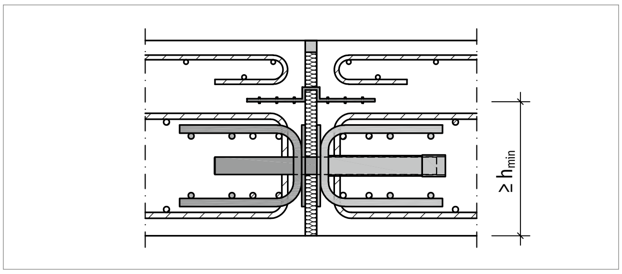


Fig. 38: Schöck Stacon® type SLD: Expansion joint with joint tape

Verification of the load-bearing capacity

Verification of the load-bearing capacity in accordance with technical building regulation EOTA TR 065
The load-bearing capacity of an expansion joint connection with the Schöck Stacon® type SLD results from the minimum of the verifications against shear force load-bearing capacity of the slab, concrete edge failure and steel load-bearing capacity.

Ultimate limit state:

V_{Ed}	$\leq V_{Rd,c}$	Shear force load-bearing capacity of the complete slab and in the area of the dowels
V_{Ed}	$\leq V_{Rd,ce,s}$	Load-bearing capacity of the shear force dowel
$V_{Rd,ce,s}$	$= \min (V_{Rd,ce}; V_{Rd,s})$	

Serviceability limit state:

$V_{Ed,SLD}$	$\leq V_{Rd,ce,SLS}$	Limitation of the crack widths (≤ 0.3 mm)
$V_{Ed,SLS}$	$\leq V_{Rd,s,20,SLS}$	Operating strength of the transversely movable shear force dowels SLD-Q

with:

V_{Ed}:	Design value of the applied shear force in the ultimate limit state
$V_{Ed,SLS}$:	Design value of the applied shear force in the serviceability limit state as quasi-permanent load combination
$V_{Rd,c}$:	Design value of the shear force load-bearing capacity of the concrete structural component
$V_{Rd,dowel}$:	Design value of the shear force load-bearing capacity of the dowel connection
$V_{Rd,ce}$:	Design value of the resistance to concrete edge failure
$V_{Rd,s}$:	Design value of the resistance to steel failure
$V_{Rd,ce,SLS}$:	Design value for the limitation of the crack widths in the concrete
$V_{Rd,s,20,SLS}$:	Design value for the wear resistance of transversely movable dowels

These verifications are fulfilled in compliance with the previous design tables. In the case of downstand beams, columns and walls, the verification of the shear force load-bearing capacity can be dispensed with.

SLD

Structural design

Steel load-bearing capacity

Steel load-bearing capacity in accordance with technical building regulation EOTA TR 065 and UKTA 23/6888
Steel load-bearing capacity of the Schöck Stacon® type SLD was determined by means of the load-deformation curve from tests. Until this load-bearing capacity is reached, all deformations from concrete and steel are elastic and reversible. This load-bearing capacity is always relevant in structural components in which concrete failure due to concrete edge failure or shear force failure can be excluded. This is the case, for example, in walls or columns.

Schöck Stacon® type SLD		220	250	300	350	400	450
Steel load-bearing capacity for		$V_{Rd,s}$ [kN]					
Joint width [mm]	10	73.6	95.3	153.1	225.8	303.7	414.8
	20	56.8	74.7	123.3	186.4	255.9	357.1
	30	45.7	60.7	101.8	156.2	217.2	307.9
	40	38.1	50.9	86.0	133.3	187.0	267.9
	50	32.6	43.7	74.2	115.7	163.3	235.7
	60	28.5	38.2	65.2	102.0	144.5	209.7

Schöck Stacon® type SLD-Q		220	300	400
Steel load-bearing capacity for		$V_{Rd,s}$ [kN]		
Joint width [mm]	10	94.0	205.9	359.6
	20	74.1	171.7	359.6
	30	60.4	144.0	312.1
	40	50.7	122.9	272.6
	50	43.5	106.8	240.5
	60	38.1	94.2	214.4

Design example

Connection of a floor plate to a wall

Boundary conditions:

Slab:	Concrete:	C32/40	
	Slab thickness:	h_{slab}	= 250 mm
	Concrete cover:	c_v	= 30 mm
	Reinforcement in slab:	⌀16/200 = a_s	= 1005 mm²/m
Wall:	Concrete:	C32/40	
	Wall thickness:	b_w	= 250 mm
	Concrete cover:	c_v	= 30 mm
Joint:	Joint length:	l_f	= 5 m
	Joint width on installation:	f_E	= 20 mm
	Maximum joint width:	f	= 28 mm
	No transverse displacements expected		Schöck Stacon® type SLD
Load:	Simplified load:	v'_{Ed}	= 100 kN/m

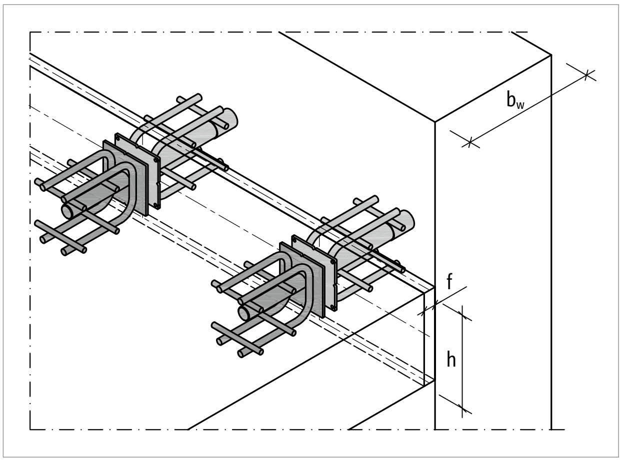


Fig. 39: Design example of floor-wall connection

Degree of reinforcement of the slab which is anchored in the edge beam (see diagram page 27):

Anchorage length ⌀16:	$l_{b,eq}$	= 570 mm
Minimum anchorage length:	$l_{min} = 10 \cdot 16$	= 160 mm
Existing anchorage length:	$l_{b,ind} = 1.5 \cdot h - c_v$	= 345 mm ≥ 160 mm
Degree of anchored reinforcement:	$\rho_{ly} = l_{b,ind}/l_{b,eq} \cdot a_s/d$	= 0.29 %

Examination of the minimum structural component dimensions:

Read off from the table on page 24

SLD 300 selected

Minimum slab thickness $h_{min} = 200$ mm ≤ $h_{slab} = 250$ mm

Minimum wall thickness $b_{w,min} = 240$ mm ≤ $b_w = 250$ mm

Schöck Stacon® type SLD	220	250	300	350
Minimum structural component dimension [mm]				
Minimum slab thickness h_{min} for c_v = 20 mm	150	160	180	210
Minimum slab thickness h_{min} for c_v = 30 mm	~~160~~	~~180~~	→ 200	230
Minimum slab thickness h_{min} for c_v = 40 mm	180	200	220	250
Minimum wall thickness b_w	~~200~~	~~215~~	→ 240	280

Design example

Verification of the shear force load-bearing capacity of the slab:
Verification by means of the table on page 28
$v'_{Ed} = 100$ kN/m ≤ $v_{Rd,c} = 116.9$ kN/m
The degree of reinforcement of the slab is sufficient.

Shear force resistance of the slab without shear force reinforcement for linear support						
Shear force resistance for		C28/35		C32/40		
		Degree of reinforcement ρ_{ly} [%]				
Slab thickness [mm]		0.75	1.0	0.25	0.5	0.75
c_v = 20 mm	c_v = 30 mm	$v_{Rd,c}$ [kN/m]				
230	240	134.4	147.9	113.4	122.8	140.5
240	250	139.3	153.4	116.9	127.3	145.7
250	260	143.7	158.2	120.0	131.3	150.3

Maximum shear force load-bearing capacity of the slab per dowel:
Read off from the table on page 29
The slab can accept no more than 125.1 kN/dowel.

Shear force load-bearing capacity of the slab with punctual support						
Shear force resistance for		C28/35		C32/40		
		Degree of reinforcement ρ_{ly} [%]				
Slab thickness [mm]		0.75	1.0	0.25	0.5	0.75
c_v = 20 mm	c_v = 30 mm	$v_{Rd,c,P}$ per dowel [kN/m]				
230	240	137.1	150.9	115.7	125.3	143.3
240	250	149.1	164.1	125.1	136.2	155.9
250	260	160.2	176.4	133.8	146.4	167.6

Selection of the matching load-bearing level:
Read off from the table on page 30
SLD 300 selected
$V_{Rd,ce,s} = 101.8$ kN ≤ $V_{Rd,c,P} = 125.1$ kN
Thus the load-bearing capacity of the dowel $V_{Rd,ce,s}$ is decisive for the design.
$V_{Rd,dowel} = 101.8$ kN

Schöck Stacon® type SLD			250	300	350
Design values with			$V_{Rd,ce,s}$ [kN]		
Slab thickness [mm]		Joint width [mm]			
c_v = 20 mm	c_v = 30 mm				
230	250	20	74.7	123.3	178.4
		30	60.7	101.8	156.2
		40	50.9	86.0	133.3
		50	43.7	74.2	115.7
		60	38.2	65.2	102.0

Calculation of the required dowel spacing:
$e_{req} = V_{Rd,dowel} / v'_{Ed} = 101.8$ kN / 100 kN/m
$e_{req} = 1.02$ m

Selection of the dowel spacing and number of dowels:
$n_{dowel} = l_f / e_{req} = 5$ m / 1.02 m = 4.9 ≈ 5 dowels
$e_{sel} = l_f / n_{dowel} = 5$ m / 5 dowels = 1.0 m

Examination of the dowel spacing:
Details in the table on page 24
Minimum dowel spacing $e_{h,min} = 1.5 \cdot h_{slab} = 1.5 \cdot 250$ mm = 375 mm ≤ 1000 mm
Maximum dowel spacing $e_{h,max} = 8 \cdot h_{slab} = 8 \cdot 250$ mm = 2000 mm ≥ 1000 mm

Determination of the required edge reinforcement:

Slab:
Read off from the table on page 35
Pos. 1: 2 ⌀ 16 right and left of the dowel
Pos. 2: 4 ⌀ 16 at upper and lower slab edge

Schöck Stacon® type SLD		250	300	350
On-site reinforcement for		Number and diameter		
Slab thickness [mm]				
c_v = 20 mm	c_v = 30 mm			
Pos. 1: U-stirrup				
150–200	160–220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230–320	2 x 2 ⌀ 12	2 x 2 ⌀ 16	2 x 3 ⌀ 16
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 0.5 %				
150–200	160–220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230–320	2 x 4 ⌀ 16	2 x 4 ⌀ 16	2 x 4 ⌀ 16

Design example

Wall:
Read off from the table on page 36
Pos. 3: 1 ⌀ 12 in the dowel stirrup top and bottom
In the wall only one longitudinal bar is required at the top and bottom to absorb the splitting tensile force.

Schöck Stacon®	250	300	350
On-site reinforcement for	Number and diameter		
Pos. 3: Longitudinal bar within the dowel for walls and downstand beams			
Type SLD	2 x 1 ⌀ 10	2 x 1 ⌀ 12	2 x 1 ⌀ 16

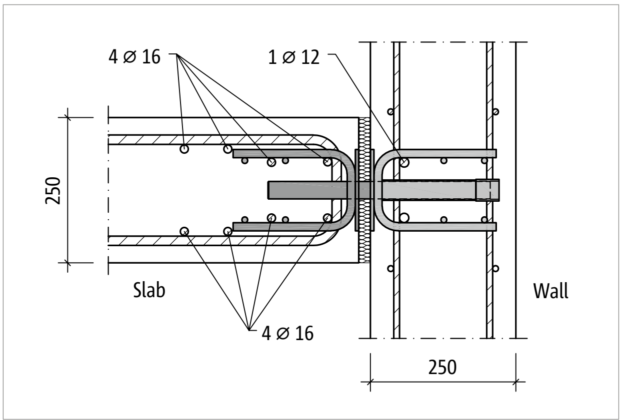


Fig. 40: Section through floor-wall connection showing reinforcement set-up

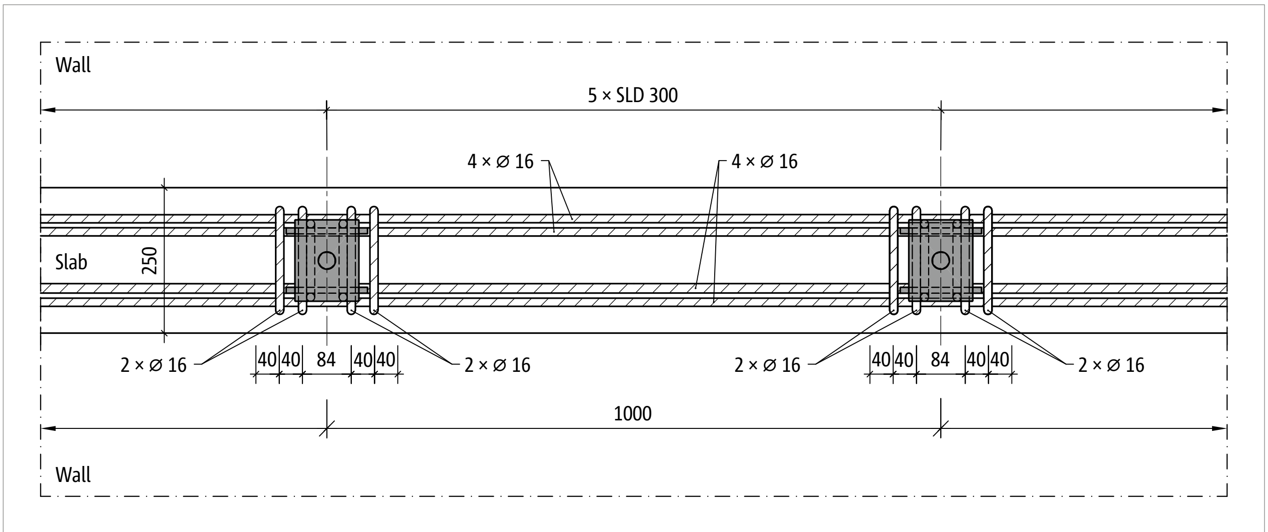


Fig. 41: View of the floor showing reinforcement set-up

SLD

Structural design

Design example

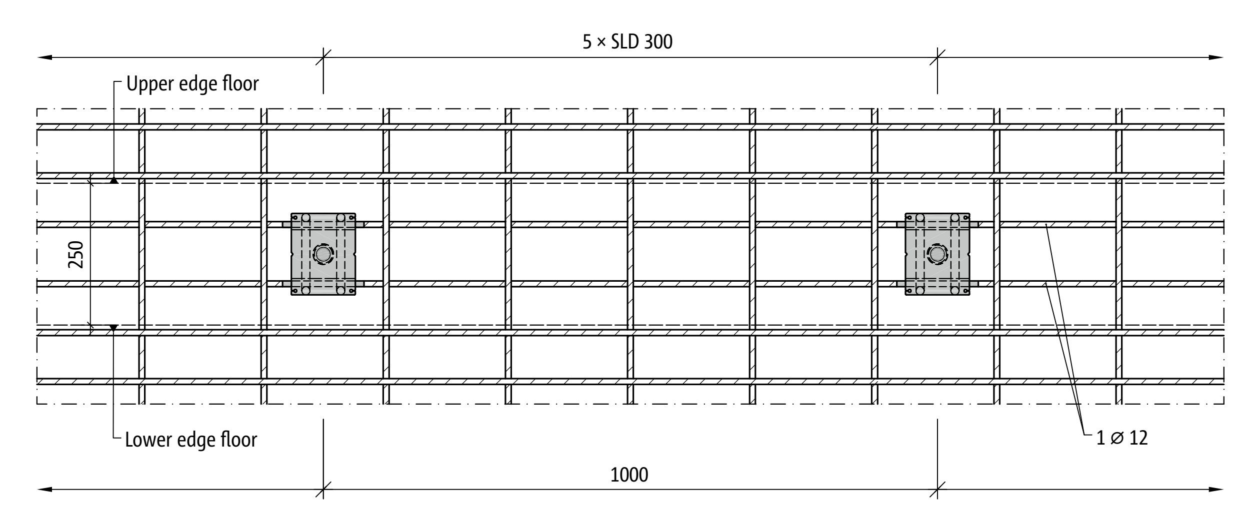


Fig. 42: View of the wall showing reinforcement set-up

Design example

Connection of a floor plate to a downstand beam

Boundary conditions:

Slab:	Concrete:	C32/40	
	Slab thickness:	h_{slab}	= 300 mm
	Concrete cover:	c_v	= 30 mm
	Reinforcement in slab:	$\varnothing 16\,/100 = a_s$	= 2011 mm²/m
Downstand beam:	Concrete:	C32/40	
	Height:	h_u	= 500 mm
	Width:	b_w	= 300 mm
	Concrete cover:	c_v	= 30 mm
Joint:	Joint length:	l_f	= 20 m
	Joint width on installation:	f_E	= 20 mm
	Maximum joint width:	f	= 28 mm
	Transverse displacements expected		Schöck Stacon® type SLD-Q
	The expected daily transverse displacements are smaller than 2 mm.		
	Offset slab downstand beam	v_u	= 100 mm
Load:	Simplified load:	v'_{Ed}	= 100 kN/m

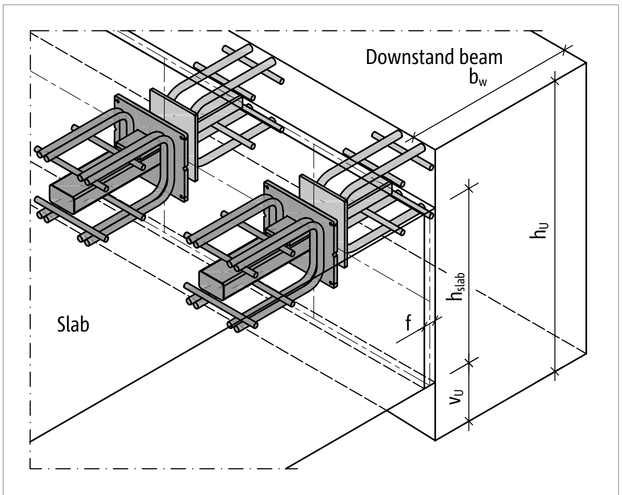


Fig. 43: Design example of floor-wall connection

Degree of reinforcement of the slab which is anchored in the edge beam (see diagram page 27):

Anchorage length ⌀16:	$l_{b,eq}$	= 570 mm
Minimum anchorage length:	$l_{min} = 10 \cdot 16$	= 160 mm
Existing anchorage length:	$l_{b,ind} = 1.5 \cdot h - c_v$	= 420 mm ≥ 160 mm
Degree of anchored reinforcement:	$\rho_{ly} = l_{b,ind}/l_{b,eq} \cdot a_s/d$	= 0.57 %

Examination of the minimum structural component dimensions:

Read off from the table on page 24

SLD-Q 300 selected

Minimum slab thickness	$h_{min} = 200\text{ mm} \le h_{slab} = 300\text{ mm}$
Minimum wall thickness / downstand beam width	$b_{w,min} = 240\text{ mm} \le b_w = 300\text{ mm}$

Design example

Verification of the shear force load-bearing capacity of the slab:
Verification by means of the table on page 28
$v'_{Ed} = 100$ kN/m $\leq v_{Rd,c} = 148.9$ kN/m
The degree of reinforcement of the slab is sufficient.

Shear force resistance of the slab without shear force reinforcement for linear support						
Shear force resistance for		C28/35	C32/40			
		Degree of reinforcement ρ_{ly} [%]				
Slab thickness [mm]		1.0	0.25	0.5	0.75	1.0
c_v = 20 mm	c_v = 30 mm	$v_{Rd,c}$ [kN/m]				
280	290	174.2	130.1	144.5	165.4	182.1
290	300	179.4	133.4	148.9	170.4	187.6
300	310	184.1	136.3	152.8	174.9	192.5

Maximum shear force load-bearing capacity of the slab per dowel:
Read off from the table on page 29
The slab can accept no more than 195.8 kN/dowel.

Shear force load-bearing capacity of the slab with punctual support						
Shear force resistance for		C28/35	C32/40			
		Degree of reinforcement ρ_{ly} [%]				
Slab thickness [mm]		1.0	0.25	0.5	0.75	1.0
c_v = 20 mm	c_v = 30 mm	$v_{Rd,c,P}$ per dowel [kN/m]				
280	290	220.4	164.6	182.8	209.2	230.4
290	300	235.9	175.4	195.8	224.1	246.7
300	310	250.4	185.4	207.8	237.9	261.8

Selection of the matching load-bearing level:
Read off from the table on page 32
SLD-Q 300 selected
$V_{Rd,ce,s} = 144.0$ kN $\leq V_{Rd,c,P} = 195.8$ kN/dowel
Thus the load-bearing capacity of the dowel $V_{Rd,ce,s}$ is decisive for the design.
As no daily transverse displacements larger than 2 mm are to be expected, the load-bearing capacity does not have to be reduced in accordance with page 34.
$V_{Rd,dowel} = 144.0$ kN

Schöck Stacon® type SLD-Q			220	300	400
Design values with			$V_{Rd,ce,s}$ [kN]		
Slab thickness [mm]		Joint width [mm]			
c_v = 20 mm	c_v = 30 mm				
280	300	20	74.1	171.7	334.6
		30	60.4	144.0	312.1
		40	50.7	122.9	268.7
		50	43.5	106.8	240.5
		60	38.1	94.2	214.4

Calculation of the required dowel spacing:
$e_{req} = V_{Rd,dowel} / v'_{Ed} = 144.0$ kN / 100 kN/m
$e_{req} = 1.44$ m

Selection of the dowel spacing and number of dowels:
$n_{dowel} = l_f / e_{req} = 20$ m / 1.44 m = 13.9 ≈ 14 dowels
$e_{sel} = l_f / n_{dowel} = 20$ m / 14 dowels ≈ 1.4 m

Examination of the dowel spacing:
Details in the table on page 24
Minimum dowel spacing $e_{h,min} = 1.5 \cdot h_{slab} = 1.5 \cdot 300$ mm = 450 mm ≤ 1400 mm
Maximum dowel spacing $e_{h,max} = 8 \cdot h_{slab} = 8 \cdot 300$ mm = 2400 mm ≥ 1400 mm

Design example

Determination of the required edge reinforcement:

Slab:
Read off from the table on page 35
Pos. 1: 3 ⌀ 16 right and left of the dowel
Pos. 2: 6 ⌀ 16 at upper and lower slab edge

Schöck Stacon® type SLD-Q		220	300	400
On-site reinforcement for		Number and diameter		
Slab thickness [mm]				
c_v = 20 mm	c_v = 30 mm			
Pos. 1: U-stirrup				
150–200	160–220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230–320	~~2 x 2 ⌀ 12~~	2 x 3 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	2 x 2 ⌀ 10	2 x 3 ⌀ 16	2 x 3 ⌀ 20
Pos. 2: Joint longitudinal reinforcement for the degree of reinforcement of the slab ≤ 1.0 %				
150–200	160–220	2 x 5 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230–320	~~2 x 6 ⌀ 16~~	2 x 6 ⌀ 16	2 x 4 ⌀ 20

Downstand beam:
Read off from the table on page 35
Pos. 1: 3 ⌀ 16 right and left of the dowel

Schöck Stacon® type SLD-Q		220	300	400
On-site reinforcement for		Number and diameter		
Slab thickness [mm]				
c_v = 20 mm	c_v = 30 mm			
Pos. 1: U-stirrup				
150–200	160–220	2 x 3 ⌀ 12	2 x 3 ⌀ 16	-
210–300	230–320	2 x 2 ⌀ 12	2 x 3 ⌀ 16	2 x 4 ⌀ 20
310–400	330–420	~~2 x 2 ⌀ 10~~	2 x 3 ⌀ 16	2 x 3 ⌀ 20

Read off from the table on page 36
Pos. 3: 1 ⌀ 16 in the dowel stirrup top and bottom
In the wall only one longitudinal bar is required at the top and bottom to absorb the splitting tensile force.

Schöck Stacon®	220	300	400
On-site reinforcement for	Number and diameter		
Pos. 3: Longitudinal bar within the dowel for walls and downstand beams			
Type SLD-Q	2 x 1 ⌀ 10	2 x 1 ⌀ 16	2 x 1 ⌀ 20

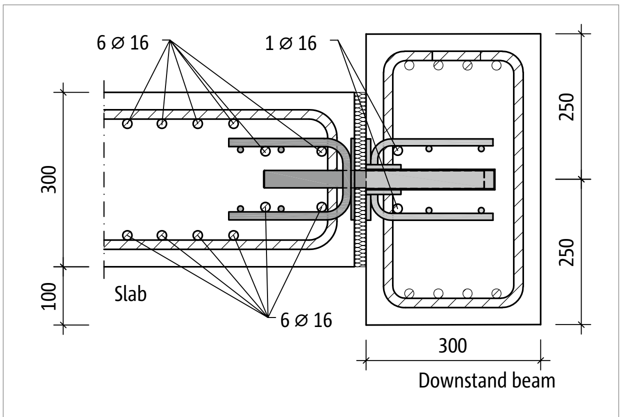


Fig. 44: Section through floor-downstand beam connection showing reinforcement set-up

SLD

Structural design

Design example

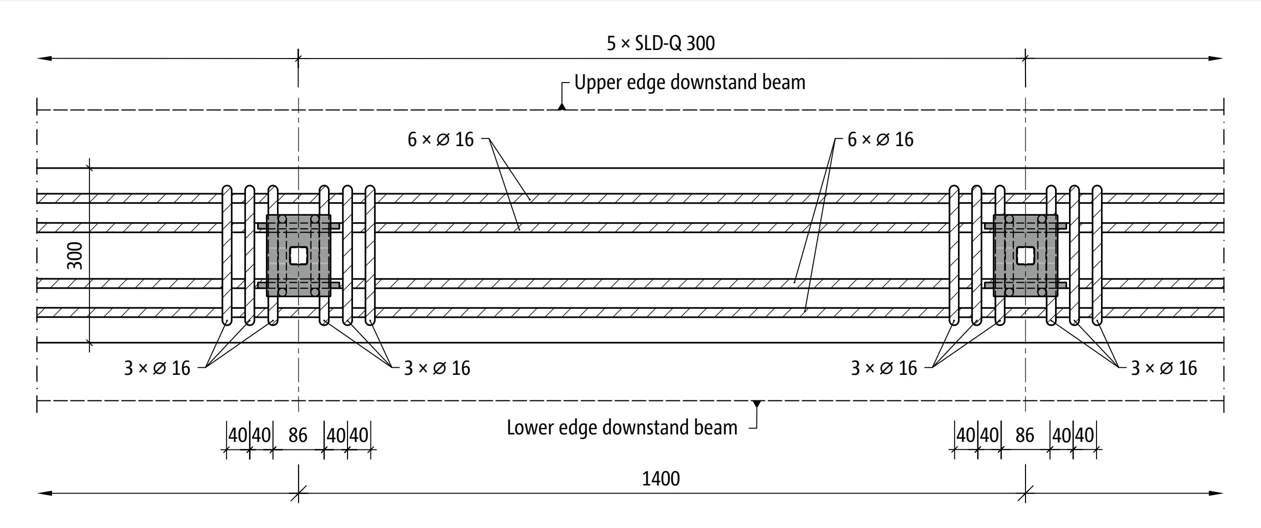


Fig. 45: View of the floor showing reinforcement set-up

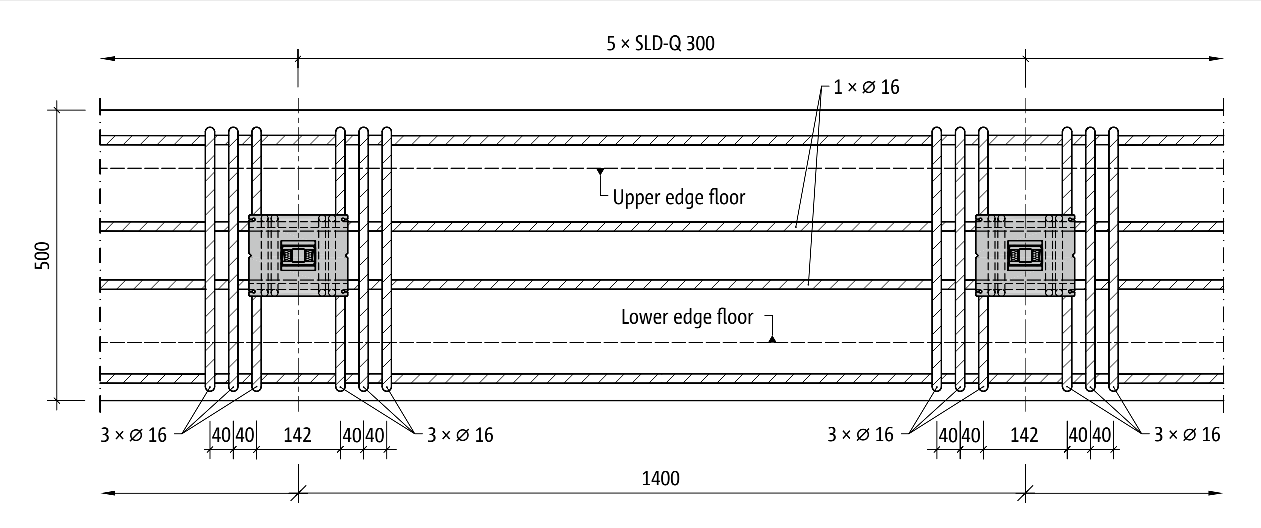
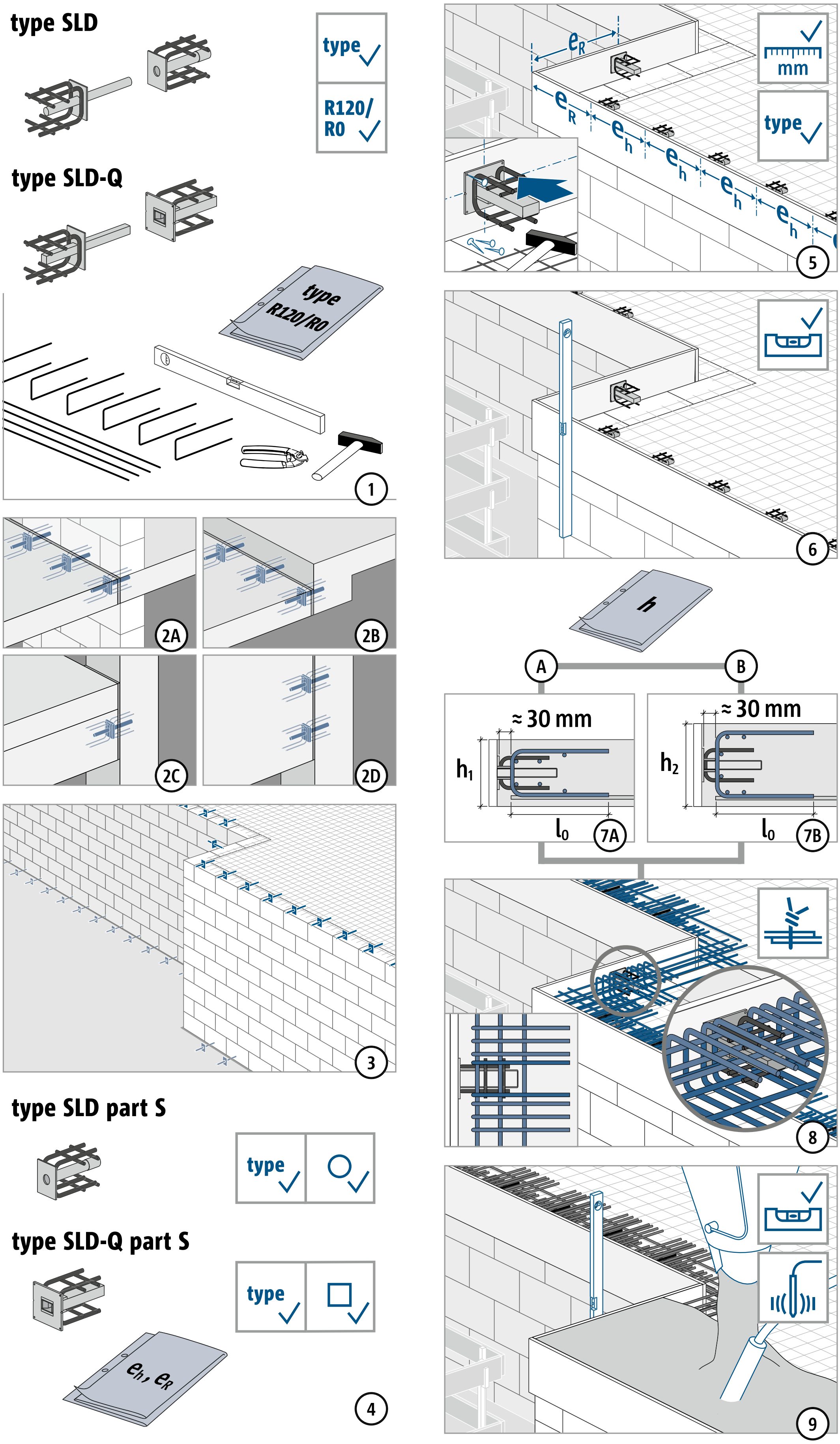


Fig. 46: View of the downstand beam showing reinforcement set-up

Installation instructions



SLD

Structural design

Installation instructions