Schöck Tronsole® type Q

Schöck Tronsole® type Q
Serves as point support with sound insulation of winding stair flight and staircase wall. The stair flight can be produced in in-situ concrete or as fully precast component. The staircase wall can consist of reinforced concrete or masonry.

Product characteristics

Product characteristics

- Impact sound pressure level difference $\Delta L^*_{n,w} \geq 30$ dB, tested in accordance with DIN 7396; Test reports Nos. 91386-10 to 91386-11;
- High value and efficient Elodur® elastomer support for point connection.
- With DIBt general building supervisory approval under the No. Z-15.7-311
- Fire resistance class R90 up to maximum 65 mm joint width with optionally obtainable fire protective collars (Fire Protection Report No. GS 3.2/13-390-1)
- Joint widths to maximum 100 mm can be realised
- Rotatable load-bearing component enables the alignment of the sliding sleeve parallel to the stair reinforcement

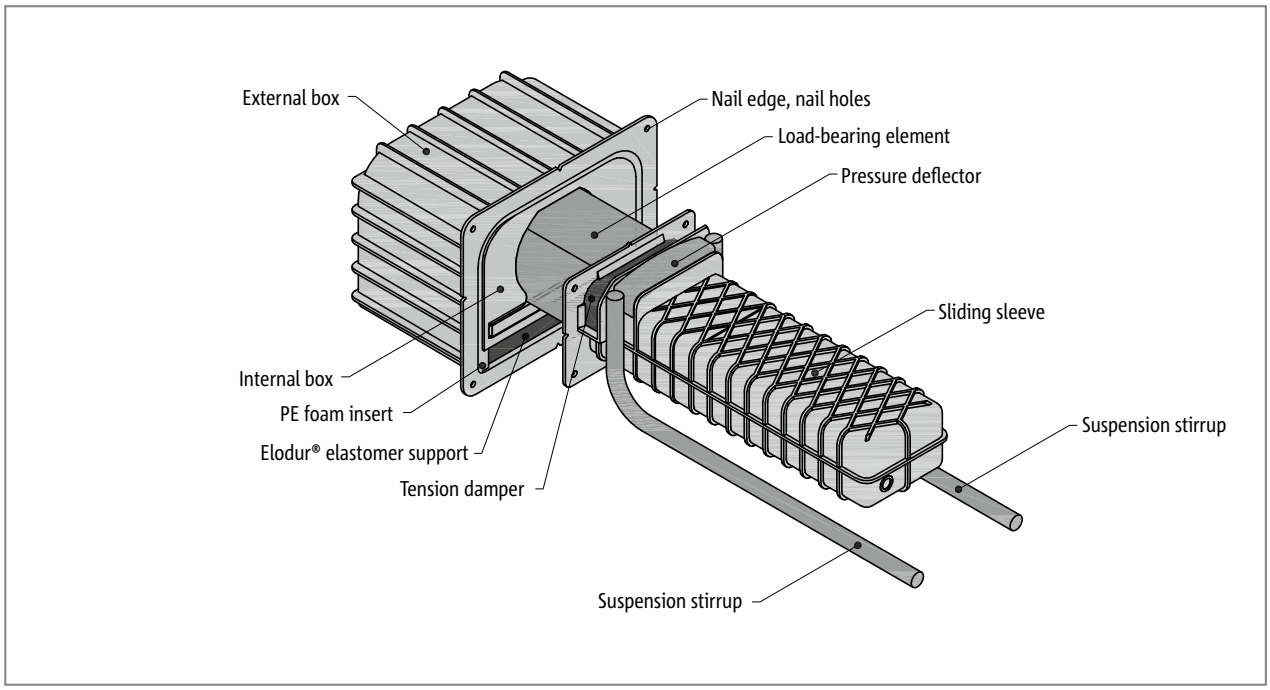


Fig. 76: Schöck Tronsole® type Q: Wall component, load-bearing component and sliding sleeve with detailed components

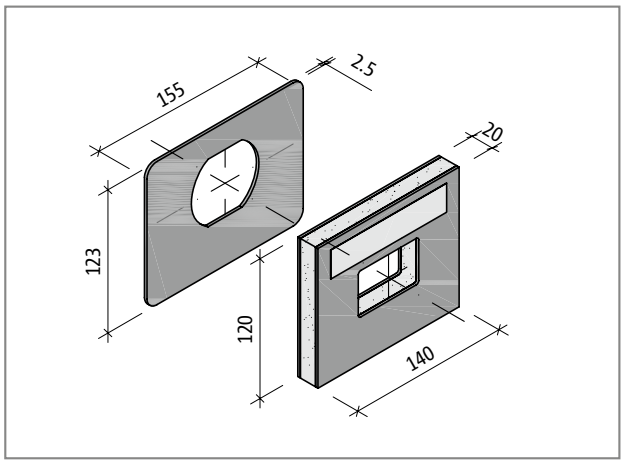


Fig. 77: Schöck Tronsole® type Q: Fire protection set consisting of fire protective cover (t = 2.5 mm) and fire protective collar(s)

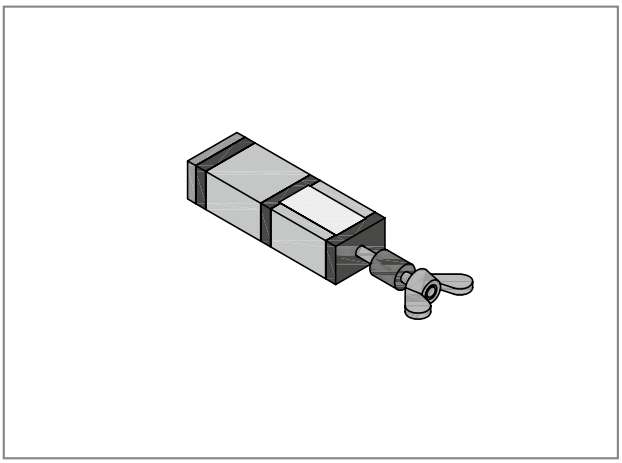


Fig. 78: Schöck Tronsole® type Q: Assembly element

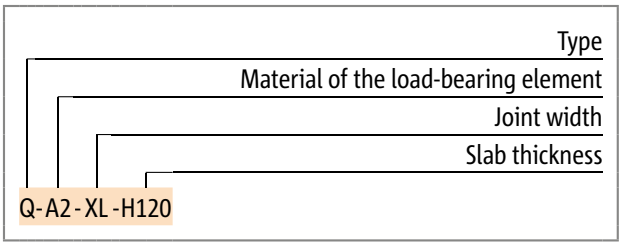
Product selection | Type designations

Schöck Tronsole® type Q variants

The design of the Schöck Tronsole® type Q can vary as follows:

- Material of the load-bearing component:
  Type Q-FV: Load-bearing component made from hot-dipped construction steel
  Type Q-A2: Load-bearing component made from stainless steel
- Joint width:
  XL designates a range of the joint width between 51 mm and 100 mm. The long version of the load-bearing component is required for this range. With smaller joint widths the designation XL is omitted. For this reason the short version of the load-bearing component is selected.
- Slab thickness:
  H120 stands for a configuration of the sliding sleeve with a ⌀8 mm hanger loop, which is employed with tread thicknesses with h = 120 mm or h = 130 mm For larger slab thicknesses the designation H120 is omitted without replacement.

Type designation in planning documents



Q

Installation variants

Installation with different inclination angles of the stair flight

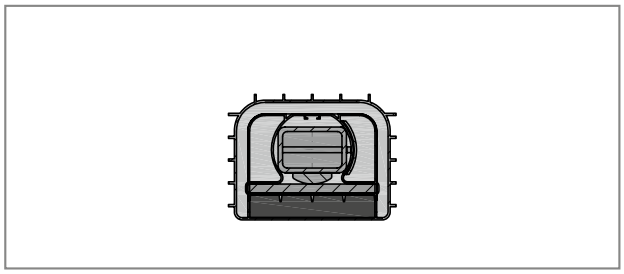


Fig. 79: Schöck Tronsole® type Q: Installation variant horizontal installation of the load-bearing element

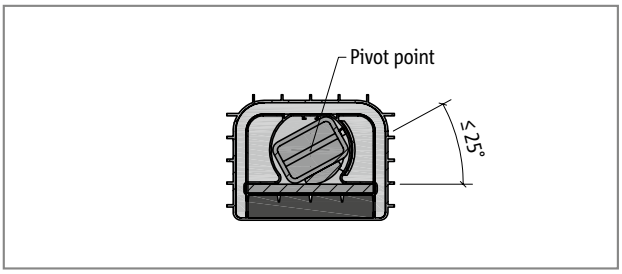


Fig. 80: Schöck Tronsole® type Q: Installation variant inclined installation of the load-bearing element

Installation with different joint widths

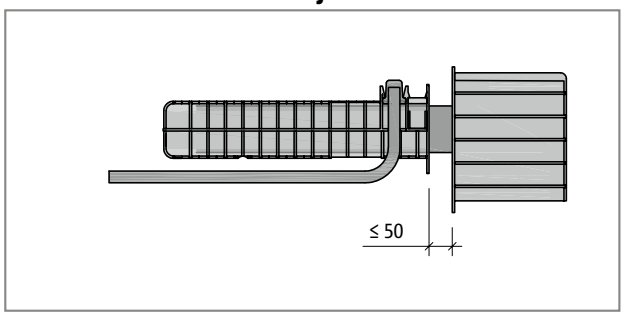


Fig. 81: Schöck Tronsole® type Q: Installation variant joint width ≤ 50 mm

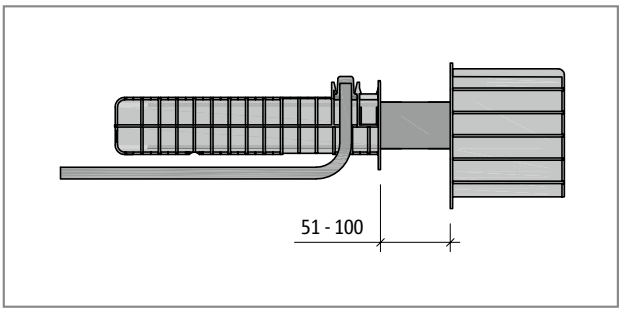


Fig. 82: Schöck Tronsole® type Q...-XL: Installation variant joint width 51 mm - 100 mm

Q

Installation with different slab thicknesses

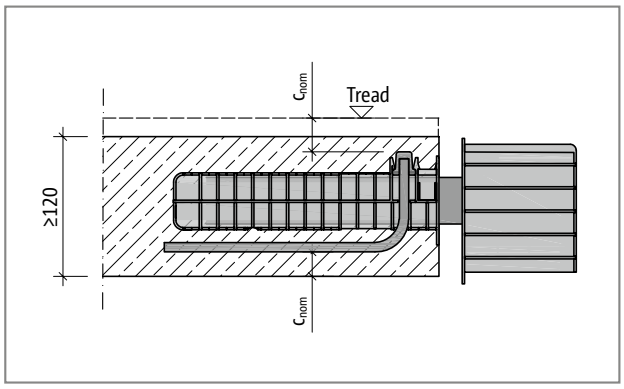


Fig. 83: Schöck Tronsole® type Q: Installation with slab thickness h = 120 mm requires the inclusion of the concrete of the tread for the enabling of the concrete cover c_{nom}

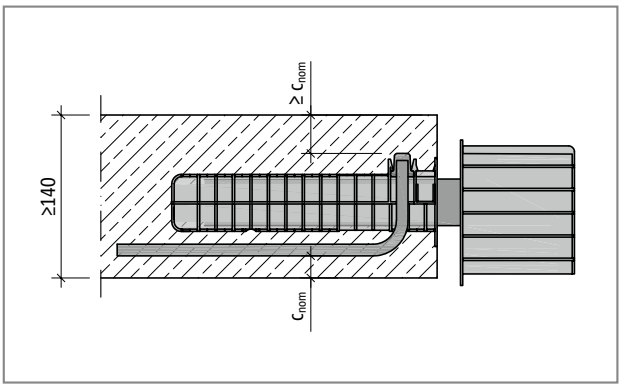


Fig. 84: Schöck Tronsole® type Q: Installation with slab thickness h ≥ 140 mm taking note of the concrete cover c_{nom}

Installation variants

- The rotatability of the load-bearing component of the Schöck Tronsole® type Q enables the alignment of the sliding sleeve parallel to the level of the reinforcement in the stair flight. In this way a matching of the sliding sleeve and the load-bearing component to the pitch of the stairs takes place.
- Two different lengths of the load-bearing component allow joint widths up to 50 mm resp. between 51 and 100 mm. With the use of the Tronsole® type L for the avoidance of acoustic bridges between the stair string and the stairwell wall there results a minimum joint width of 15 mm, to which the given soundproofing values refer.
- The minimum slab thickness of a stair flight with Tronsole® type Q lies at h = 120 mm.

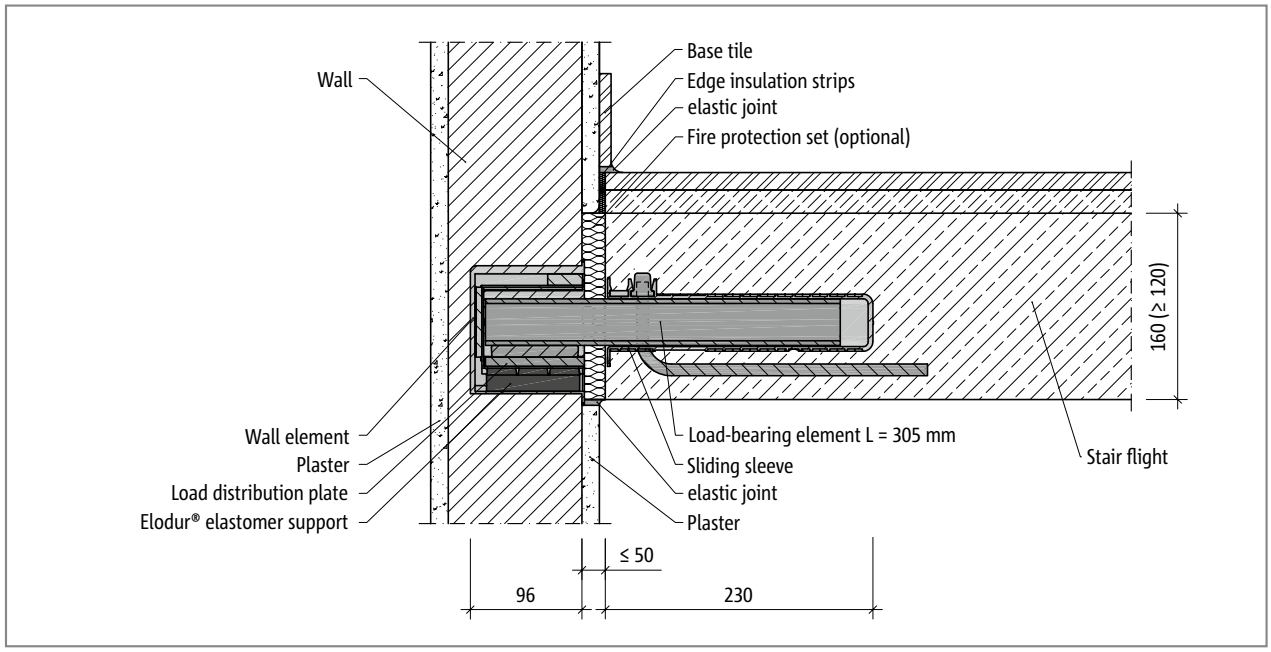


Fig. 85: Schöck Tronsole® type Q-FV or Q-A2: Installation cross-section wall thickness 11.5 cm

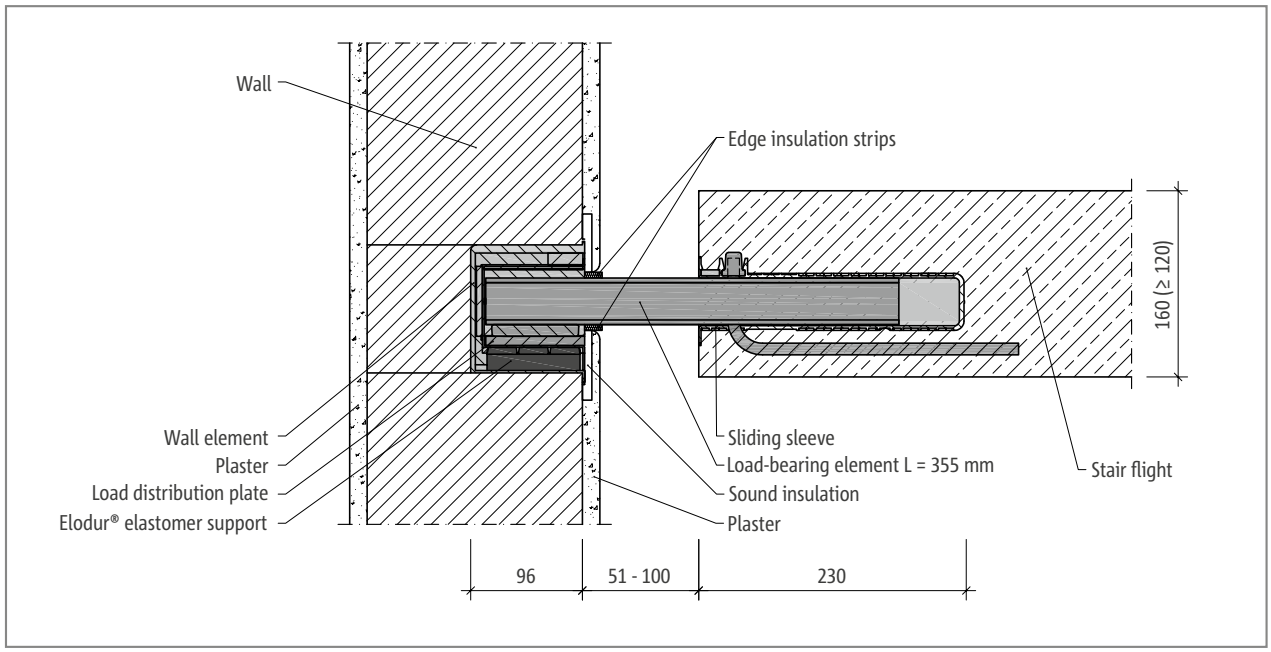


Fig. 86: Schöck Tronsole® type Q-FV-XL or Q-A2-XL: Installation cross-section

Q

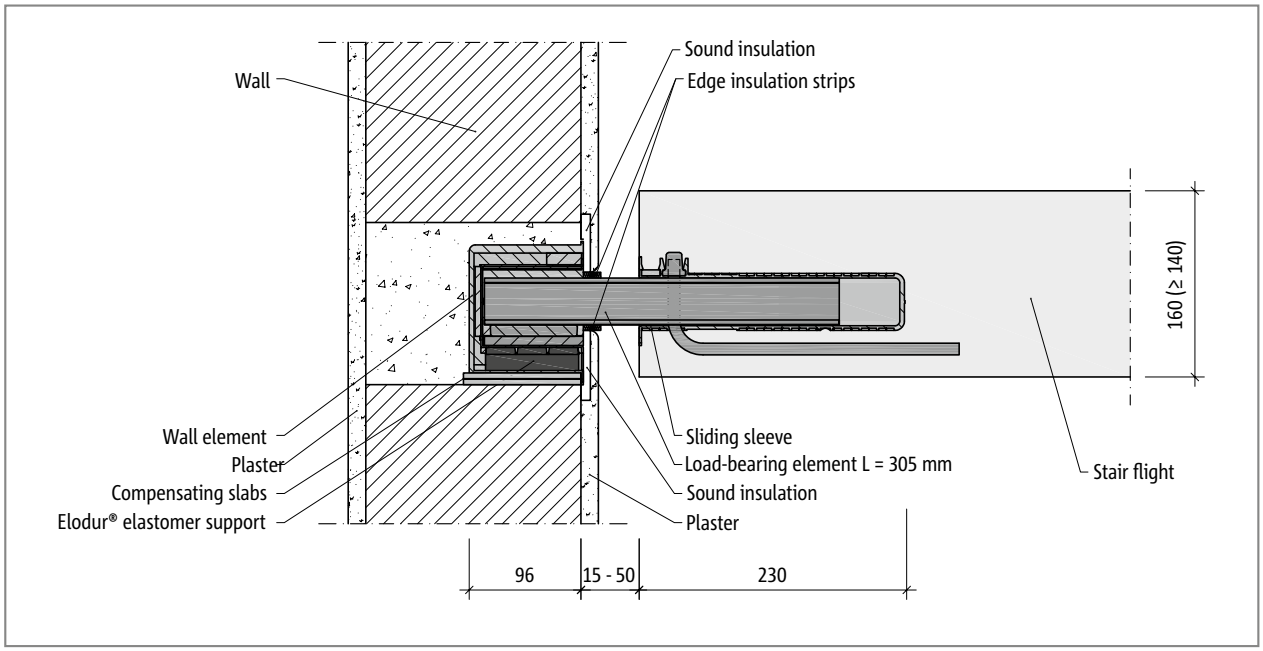


Fig. 87: Schöck Tronsole® type Q-FV or Q-A2: Installation cross-section with precast stairs flight

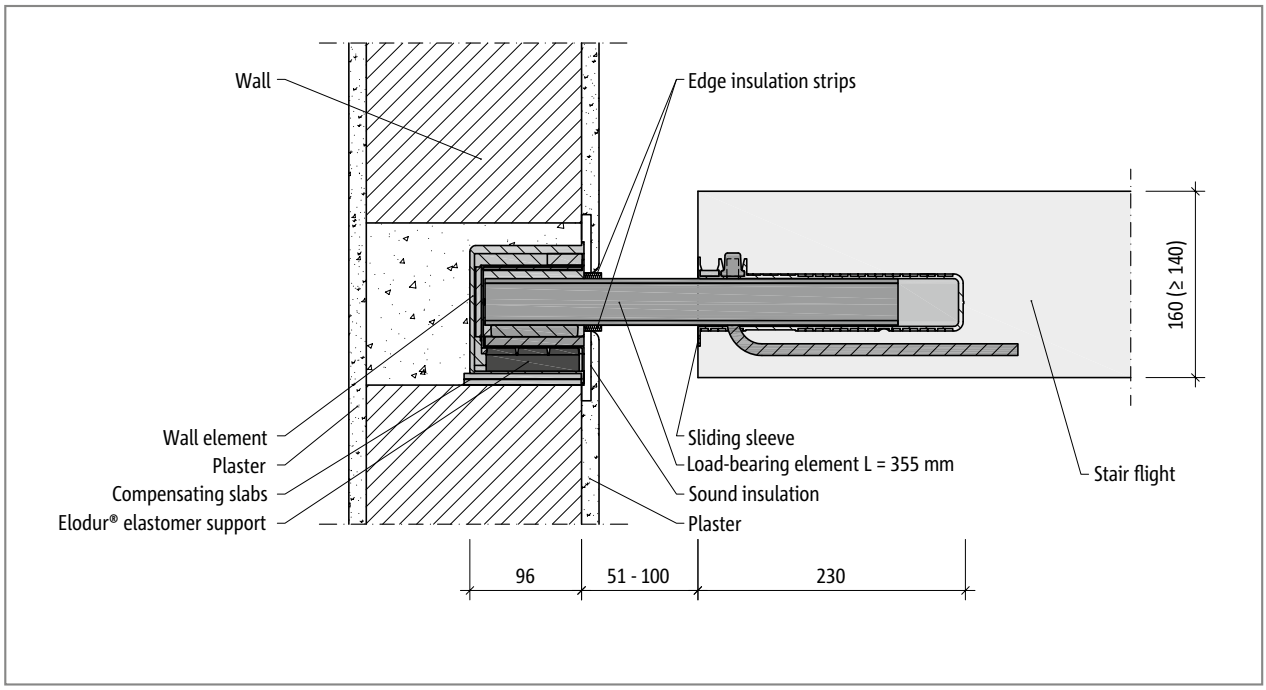


Fig. 88: Schöck Tronsole® type Q-FV-XL or Q-A2-XL: Installation cross-section with precast stairs flight

Element arrangement

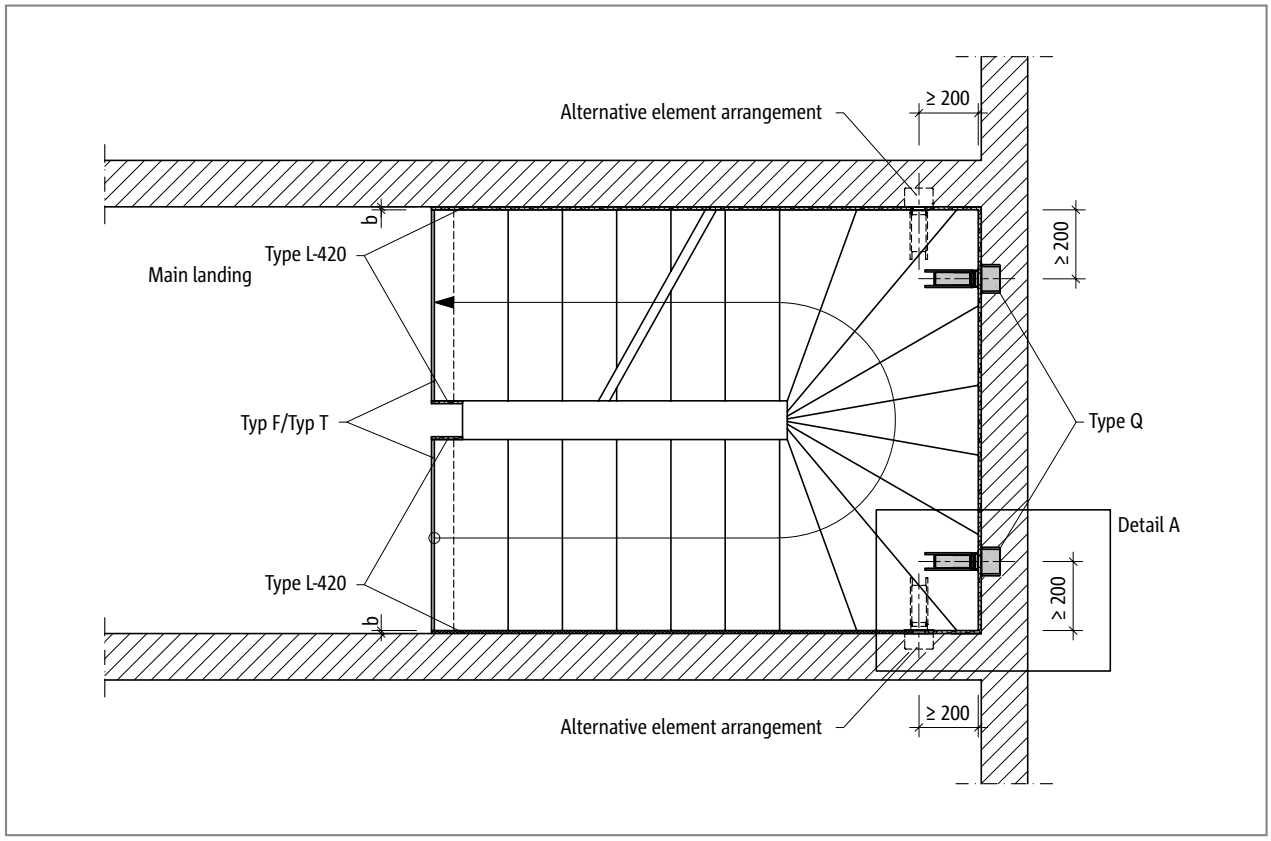


Fig. 89: Schöck Tronsole® type Q: Component arrangement in the layout using the Tronsole® type L

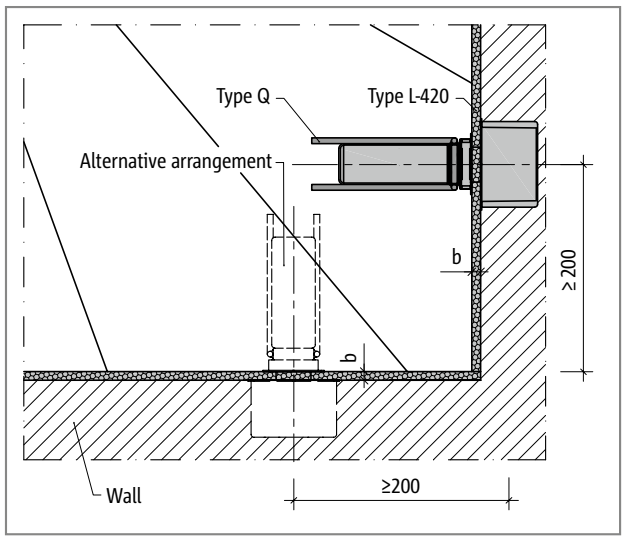


Fig. 90: Schöck Tronsole® type Q: Component arrangement, Detail A, joint width b = 15 mm with in-situ concrete, with precast stair flights the necessity of an additional installation tolerance is to be checked by the planner

Q

Element arrangement

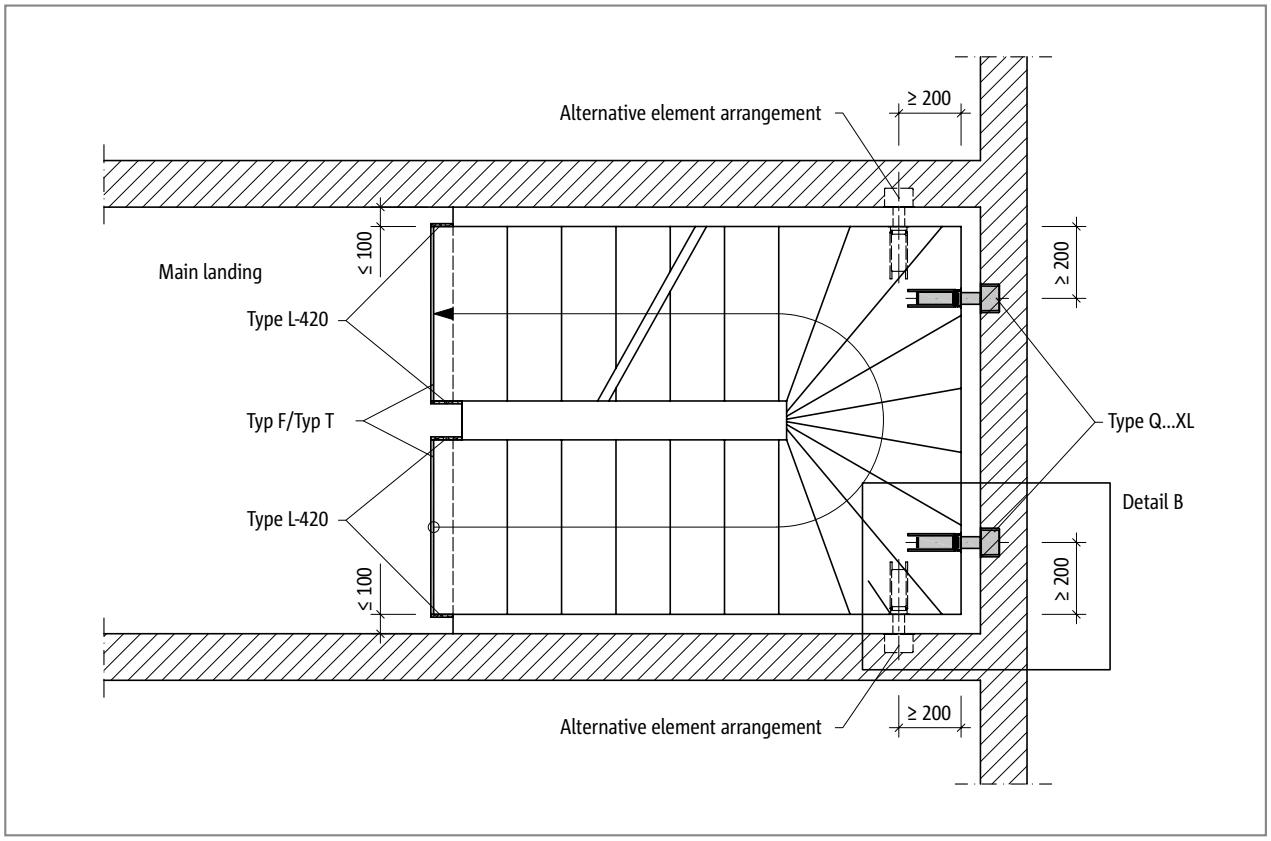


Fig. 91: Schöck Tronsole® type Q...-XL: Component arrangement in the layout with a joint width of maximum 100 mm

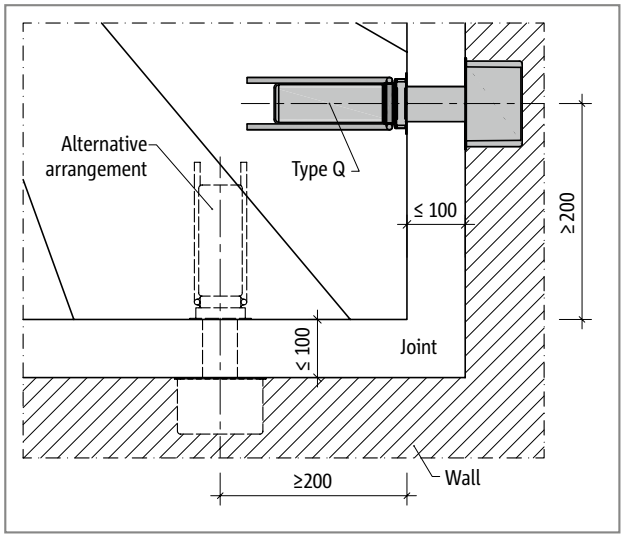


Fig. 92: Schöck Tronsole® type Q: Component configuration, Detail B

Combination possibilities

- The given acoustic insulation values are only achieved in combination with the Tronsole® type L-420 or with a sufficiently wide air joint (50 mm). For prefabricated construction with regard to installation tolerances the explanation for the Tronsole® type L on page 160 is to be noted.
- The use of the Schöck Tronsole® type B is suitable for the sound insulation of stair flight and floor slab. The Tronsole® type Q and B can be combined.
- The employment of the Schöck Tronsole® type F or type T is suitable for the sound insulation of the stair-head and/or stair-foot and landing slab or floor. Tronsole® type F is suitable for precast stairs, while type T is used for in-situ concrete and fully pre-fabricated stair flights.

Product description

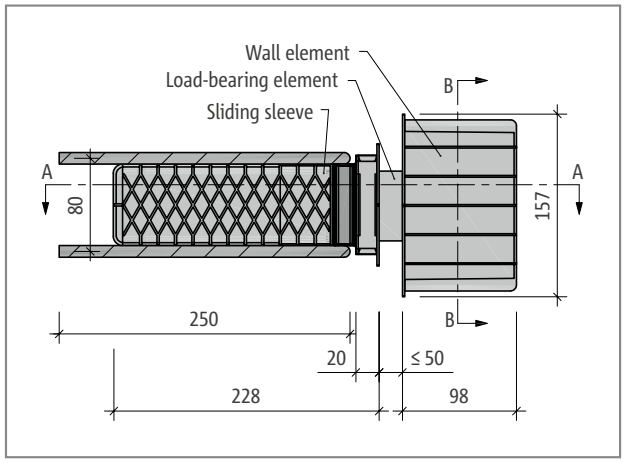


Fig. 93: Schöck Tronsole® type Q: Product layout

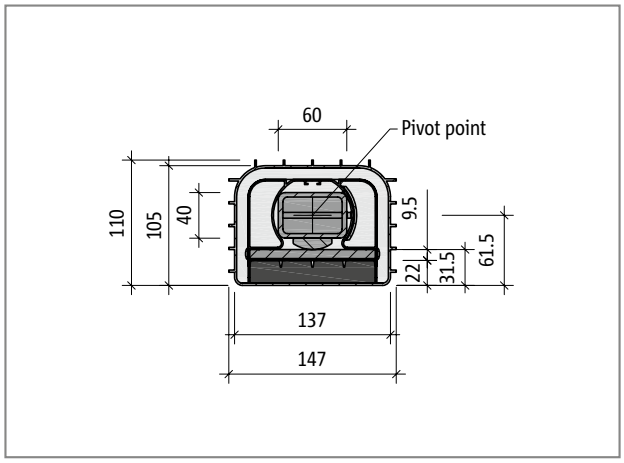


Fig. 94: Schöck Tronsole® type Q: Product cross-section B-B with horizontal load-bearing element

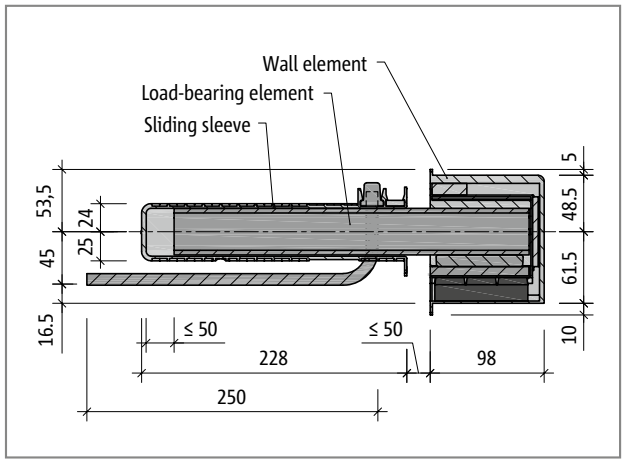


Fig. 95: Schöck Tronsole® type Q: Product section A-A

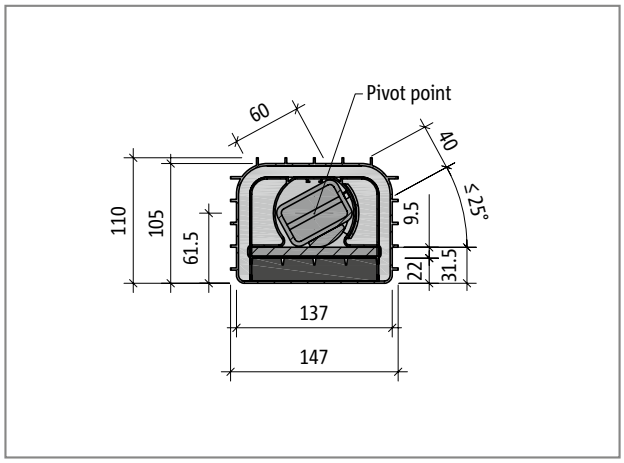


Fig. 96: Schöck Tronsole® type Q: Product cross-section with rotated load-bearing element

Product information

- For slab thicknesses h = 120mm and h= 130 mm the case of the Schöck Tronsole® type Q is supplied with ⌀8 mm and a length of 210 mm.
- For slab thicknesses of h ≥ 140 mm the rod diameter of the hanger loop increases to ⌀10 mm in the layout.
- For approval reasons the Schöck Tronsole® type Q must be used always in the set with wall component, load-bearing profile and staircase.

Q

Design

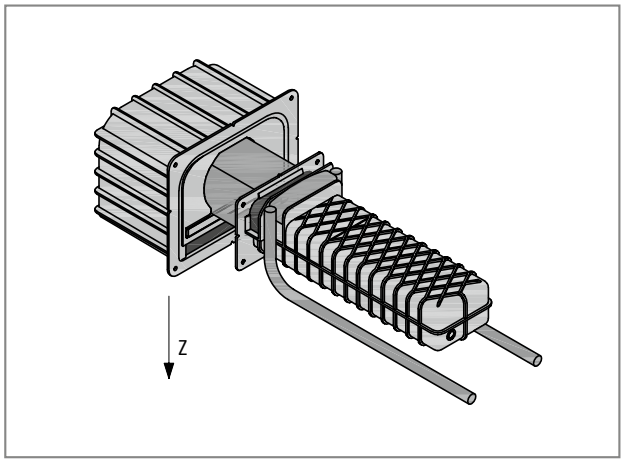


Fig. 97: Schöck Tronsole® type Q: 3D view with centre line designation

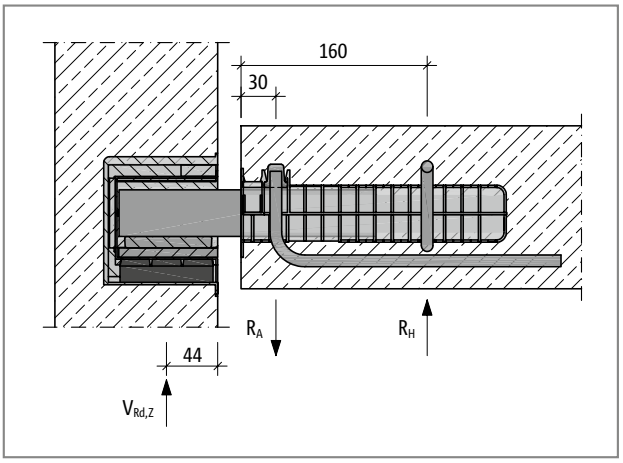


Fig. 98: Schöck Tronsole® type Q: Static system

Design

For the bearing surface of the Tronsole® at least the compression strength class 20 in combination with mortar group III is required as masonry. With lower compression strength classes a concrete pressure pad under the wall element can be used, with which the permitted pressing is observed.
The shear force $V_{Ed,z}$ is transmitted via the Elodur® elastomer support into the wall element of the Tronsole® type Q with a surface area of 110 mm × 80 mm.

Q

Notes on design

- The stress impacting the masonry is calculated as follows: $\sigma_{Ed} = V_{Ed} / (110 \cdot 80)$ mm². With the maximum utilisation of 40.1 kN σ is$_{Ed}$ = 4.5 N/mm².
- Listed in the design tables are the $V_{Rd,z}$values for various joint widths. Intermediate values may be interpolated linearly.
- The application range of the Schöck Tronsole® type Q stretches exclusively on structural components with mainly static loading according to DIN EN 1991-1-1 (EC1) and DIN EN 1991-1-1/NA.
- The verification of the shear force in the stair flight and in the landing slab must be carried out by the structural engineer.
- With the predefined concrete strengths it is a matter of the minimum requirements, which are the basis for the design.
- For stair flights exposure classs XC1 is assumed.
- According to DIN EN 1992-1-1 (EC2) and DIN EN 1992-1-1/NA, with exposure class XC1, the following nominal concrete cover results:
  In-situ concrete staiir flight: c_{nom} = 20 mm.
  Prefabricated stair flight: c_{nom} = 15 mm.
- For the Tronsole® type Q, with the stair slab thicknesses h = 120 mm and H = 130 mm the product designation H120 must be taken into account, as the products own hanger loops in these cases is adjusted to a lower construction height.
- With configuration of the 120 mm thick stair slabs with the Schöck Tronsole® type Q, the required upper concrete cover is achieved through the concrete of the tread.
- With the installation of several elements of the Tronsole® type Q, the minimum separation of Tronsole® to Tronsole® is 400 mm.

Design

Schöck Tronsole® type		Q-FV	Q-FV-XL	Q-A2	Q-A2-XL
Design values with		Concrete strength class ≥ C20/25			
Slab thickness [mm]	Joint width [mm]	$V_{Rd,z}$ [kN/element]			
120, 130	15	28.3	-	28.3	-
	20	27.6	-	27.6	-
	30	26.4	-	26.4	-
	40	25.3	-	25.3	-
	50	24.3	24.3	24.3	24.3
	60	-	23.4	-	23.4
	70	-	22.6	-	21.9
	80	-	21.8	-	20.5
	90	-	21.0	-	19.3
	100	-	20.3	-	18.2
≥ 140	15	38.4	-	34.2	-
	20	36.6	-	32.5	-
	30	33.5	-	29.7	-
	40	30.8	-	27.3	-
	50	28.3	33.0	25.3	25.3
	60	-	30.5	-	23.5
	70	-	28.4	-	21.9
	80	-	26.6	-	20.5
	90	-	24.9	-	19.3
	100	-	23.5	-	18.2

Schöck Tronsole® type		Q-FV	Q-FV-XL	Q-A2	Q-A2-XL
Design values with		Concrete strength class ≥ C25/30			
Slab thickness [mm]	Joint width [mm]	$V_{Rd,z}$ [kN/element]			
120, 130	15	30.2	-	30.2	-
	20	29.5	-	29.5	-
	30	28.2	-	28.2	-
	40	27.1	-	27.1	-
	50	26.0	26.0	25.3	25.3
	60	-	25.0	-	23.5
	70	-	24.1	-	21.9
	80	-	23.2	-	20.5
	90	-	22.5	-	19.3
	100	-	21.7	-	18.2
≥ 140	15	38.4	-	34.2	-
	20	36.6	-	32.5	-
	30	33.5	-	29.7	-
	40	30.8	-	27.3	-
	50	28.3	33.0	25.3	25.3
	60	-	30.5	-	23.5
	70	-	28.4	-	21.9
	80	-	26.6	-	20.5
	90	-	24.9	-	19.3
	100	-	23.5	-	18.2

Design

Schöck Tronsole® type		Q-FV	Q-FV-XL	Q-A2	Q-A2-XL
Design values with		Concrete strength ≥ C30/37			
Slab thickness [mm]	Joint width [mm]	$V_{Rd,z}$ [kN/element]			
120, 130	15	32.0	-	32.0	-
	20	31.3	-	31.3	-
	30	29.9	-	29.7	-
	40	28.7	-	27.3	-
	50	27.6	27.6	25.3	25.3
	60	-	26.5	-	23.5
	70	-	25.6	-	21.9
	80	-	24.7	-	20.5
	90	-	23.8	-	19.3
	100	-	23.0	-	18.2
≥ 140	15	38.4	-	34.2	-
	20	36.6	-	32.5	-
	30	33.5	-	29.7	-
	40	30.8	-	27.3	-
	50	28.3	33.0	25.3	25.3
	60	-	30.5	-	23.5
	70	-	28.4	-	21.9
	80	-	26.6	-	20.5
	90	-	24.9	-	19.3
	100	-	23.5	-	18.2

Schöck Tronsole® type		Q-FV	Q-FV-XL	Q-A2	Q-A2-XL
Design values with		Concrete strength ≥ C35/45			
Slab thickness [mm]	Joint width [mm]	$V_{Rd,z}$ [kN/element]			
120, 130	15	33.9	-	33.9	-
	20	33.1	-	32.5	-
	30	31.7	-	29.7	-
	40	30.4	-	27.3	-
	50	28.3	29.2	25.3	25.3
	60	-	28.1	-	23.5
	70	-	27.0	-	21.9
	80	-	26.1	-	20.5
	90	-	24.9	-	19.3
	100	-	23.5	-	18.2
≥ 140	15	38.4	-	34.2	-
	20	36.6	-	32.5	-
	30	33.5	-	29.7	-
	40	30.8	-	27.3	-
	50	28.3	33.0	25.3	25.3
	60	-	30.5	-	23.5
	70	-	28.4	-	21.9
	80	-	26.6	-	20.5
	90	-	24.9	-	19.3
	100	-	23.5	-	18.2

On-site reinforcement

Required on-site reinforcement

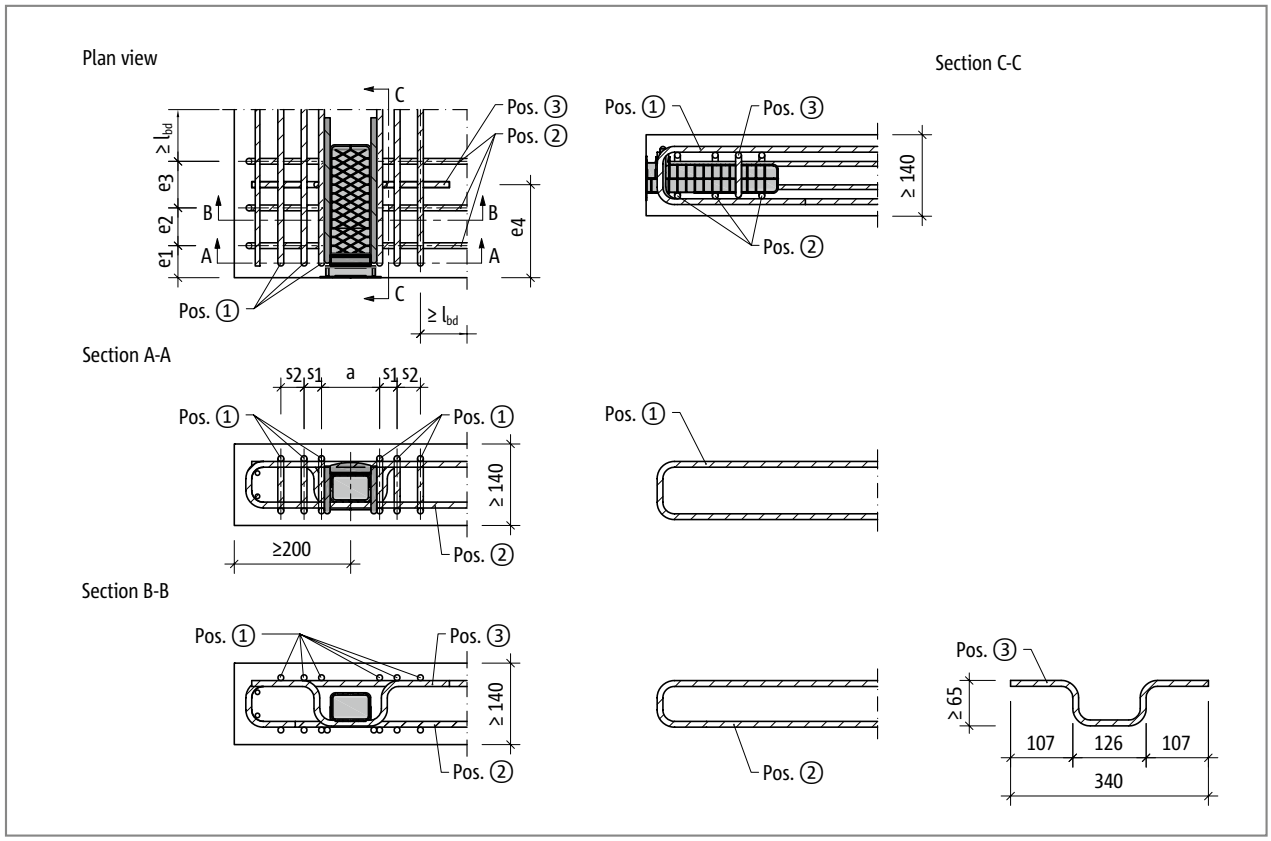


Fig. 99: Schöck Tronsole® type Q: On-site reinforcement

Schöck Tronsole® type		Q		
On-site reinforcement	**Slab thickness [mm]**	**Separation [mm]**		**Concrete strength class ≥ C20/25**
Pos. 1 tie, A_{sx}				
Pos. 1	120, 130	a	100	6 • H8
		s_1	30	
		s_2	30	
Pos. 1	≥ 140	a	100	6 • H10
		s_1	30	
		s_2	30	
Pos. 2 ties as transverse reinforcement, A_{sy}				
Pos. 2	120, 130	e_1	50	3 • H8
		e_2	70	
		e_3	80	
Pos. 2	≥ 140	e_1	55	3 • H10
		e_2	65	
		e_3	80	
Pos. 3 hat brackets				
Pos. 3	120, 130	e_4	160	1 • H8
Pos. 3	≥ 140			1 • H10

Schöck Tronsole® type Q, table: On-site reinforcement

On-site reinforcement

On-site reinforcement

- The height of the on-site hat bracket (Pos. 3) depends on the slab thickness h. It should be so selected that the hat bracket can be fed around the underside of the sleeve and its ends are in the 2nd position of the slab reinforcement.
- The underside of the sliding sleeve of the Tronsole® type Q is for the force transmission to the on-site hat bracket (Pos. 3) is fitted with a notch on the contact side.
- The ties, A_{sx} (Pos. 1), with sufficient length on the statically required slab reinforcement A_{sx}, which is to be verified by the structural engineer, may be taken into account.
- If the impacting shear force $V_{Ed,z}$ with slab thickness 140 is smaller or equal to the acceptable shear force $V_{Rd.z}$ with slab thickness 120,130, then the on-site reinforcement can be selected analogue to the slab thickness 120,130.

Application example spiral staircase

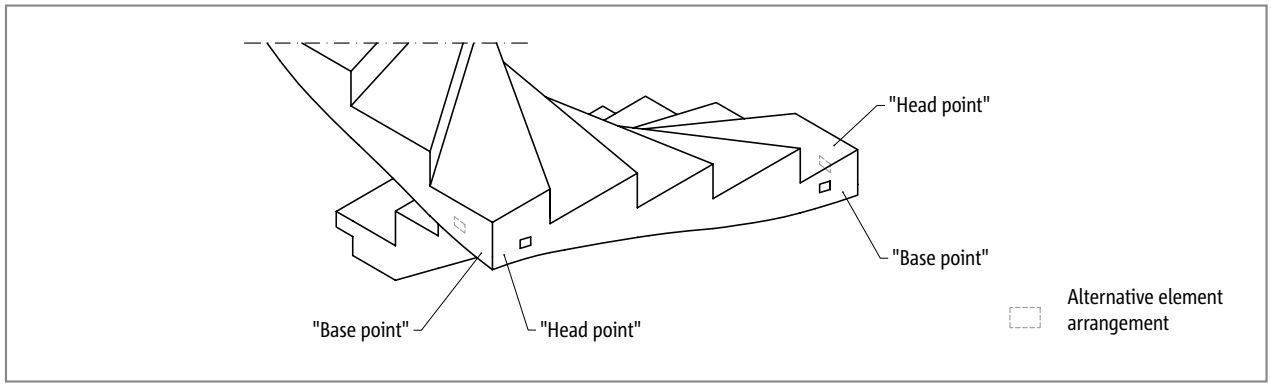
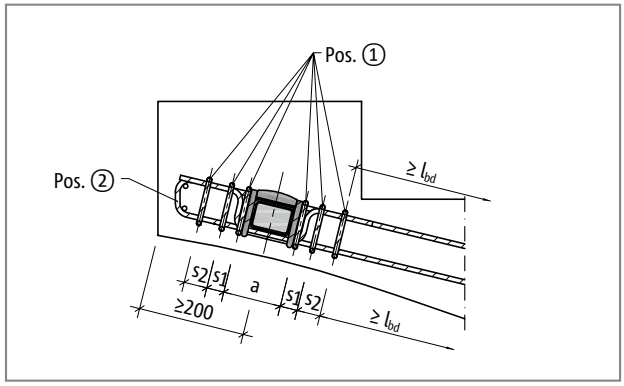
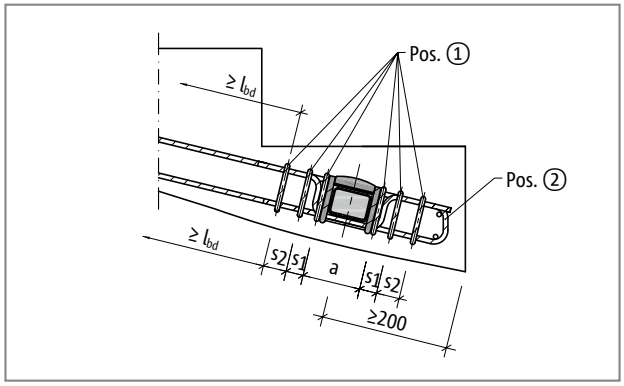
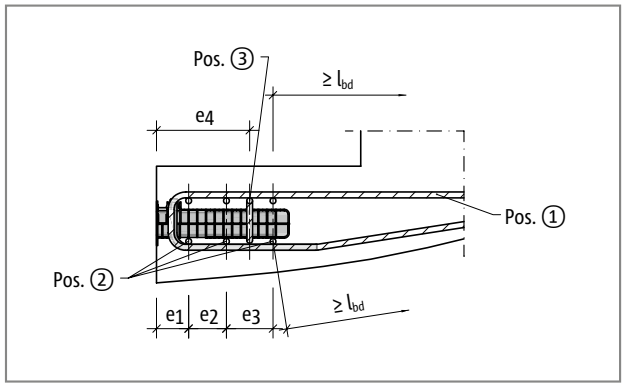


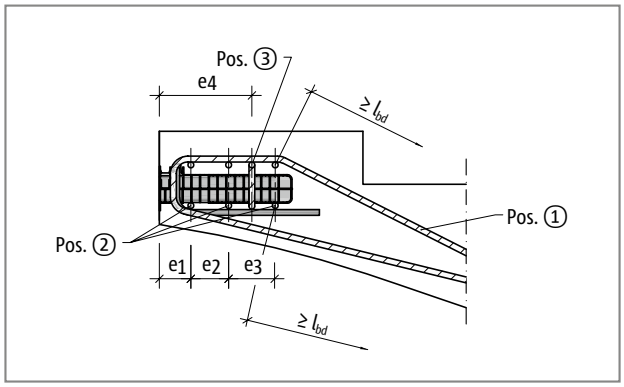
Fig. 100: Schöck Tronsole® type Q: Attachment point in “head point” and “base point”

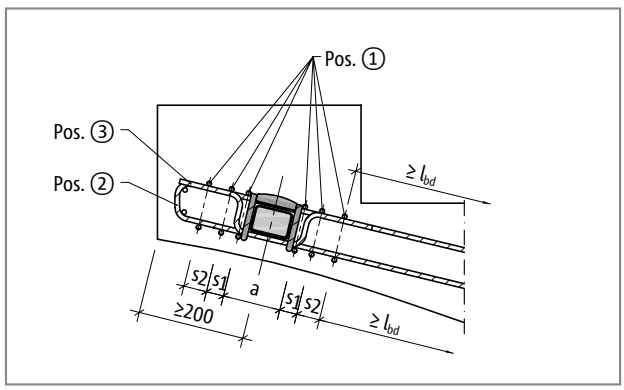
Cross-sectional views

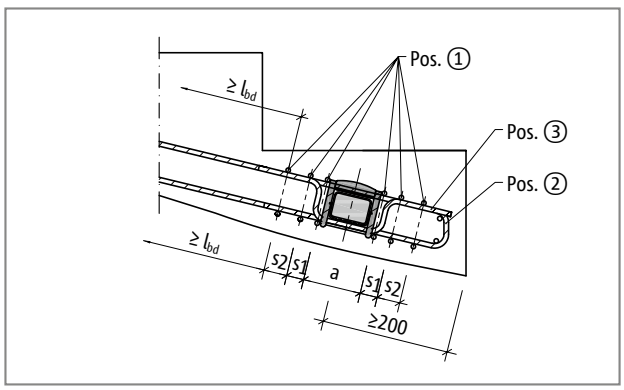












Q

Deflection

Deformation of the Elodur® elastomer support

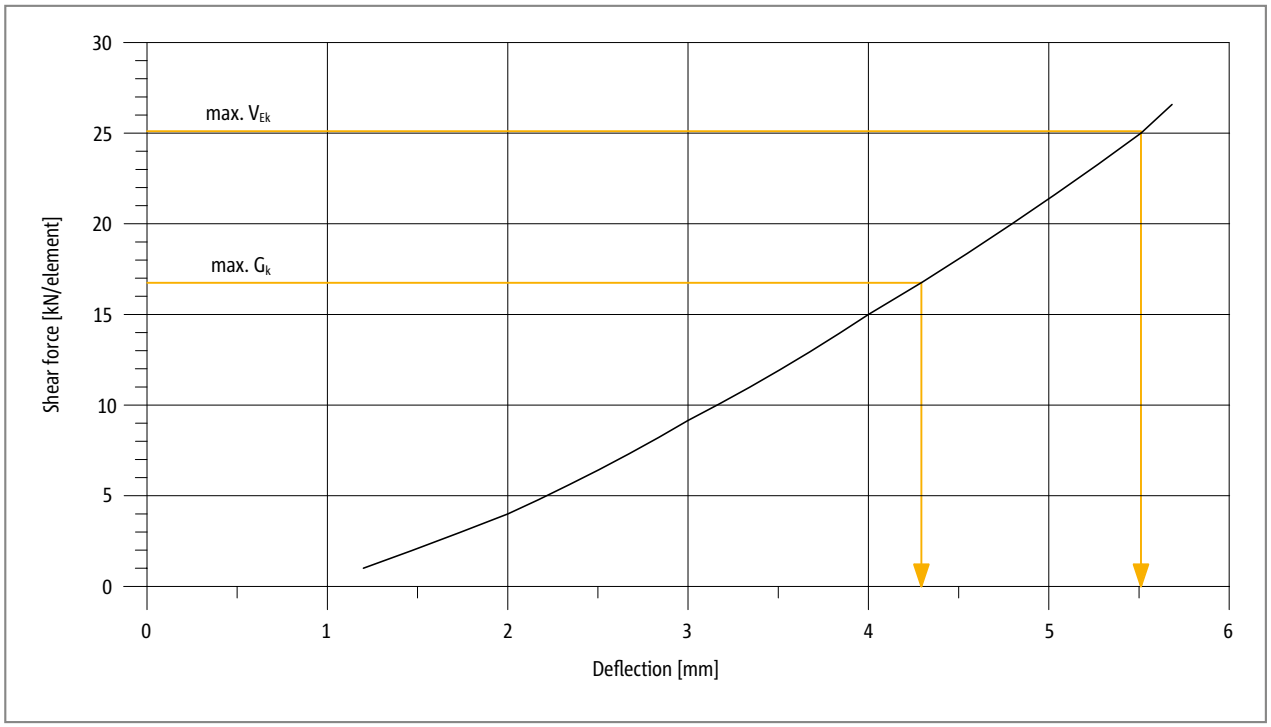


Fig. 101: Schöck Tronsole® type Q: Deformation of the Elodur® elastomer support

Q

Notes on deformation

- With deflection, it is understood to be the vertical deformation of the Elodur® elastomer support under vertical shear force load.
- Max. V_{Ek} = Max. V_{Ed}/γ, whereby γ= 1.4
- γ = 1.4 applies under the assumption that Max. V_{Ed} is made up of two thirds from own weight and one third from live load.
- Thus Max. is V_{Ek} the maximum service load and the maximum own weight is Max. G_k = 2/3 • Max. V_{Ek}.

On-site hat bracket

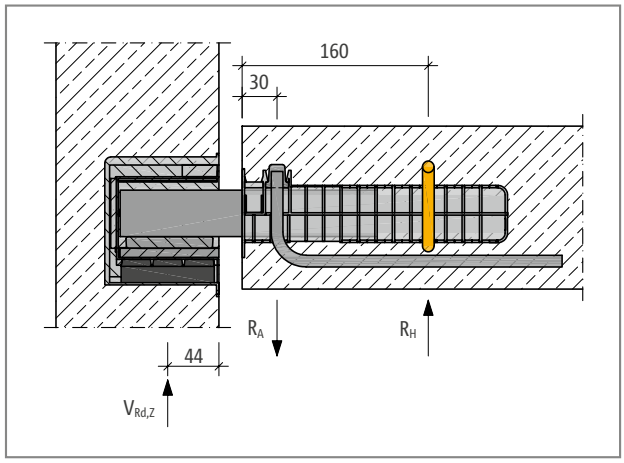


Fig. 102: Schöck Tronsole® type Q: Here: On-site hat bracket coloured orange

Hat bracket for the development of the static system required

The sliding sleeve of the Schöck Tronsole® type Q contains a hanger loop. As assumed, a hat bracket must be added for the development of the static system. Through the hanger loop and the hat bracket a force pair is generated, which is necessary for the restraint of the Tronsole® in the reinforced concrete structural component

Hazard warning - missing hat bracket

- For the given load-bearing capacity of the Schöck Tronsole®, the on-site hat bracket (Pos. 3) is absolutely necessary.
- The hat bracket must be planned as part of the on-site reinforcement and integrated in the planned notch on the underside of the carrier sleeve.

Load-bearing element

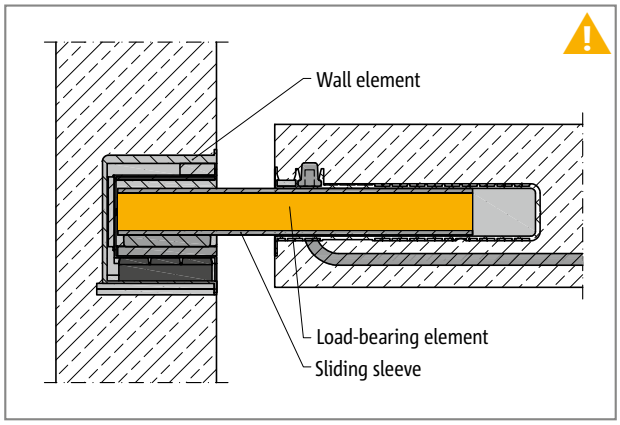


Fig. 103: Schöck Tronsole® type Q: Multi-part product (wall component, load-bearing component, sliding sleeve); load-bearing element (yellow) must be installed on the building site.

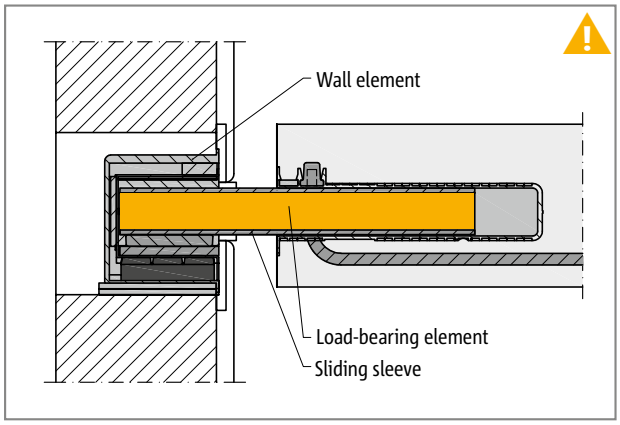


Fig. 104: Schöck Tronsole® type Q: Multi-part product (wall component, load-bearing component, sliding sleeve); load-bearing element (yellow) must be installed on the building site.

Load-bearing element for the transmission of shear force required

Schöck Tronsole® type Q consists of a wall element, sliding sleeve and load-bearing element. The load-bearing element must be installed on site. The wall element is installed on site. The sliding sleeve can be installed in the prefabrication plant or on site. Each sliding sleeve is to be assigned to a load-bearing element,

Hazard warning - missing load-bearing element

- The step will collapse without the load-bearing element.
- The load-bearing element must be installed on site.

Precast construction

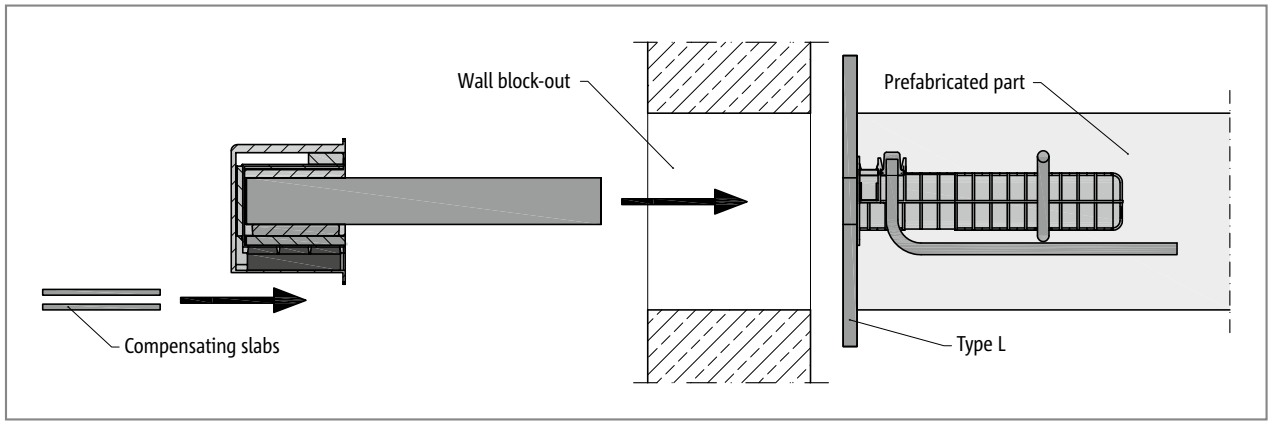


Fig. 105: Schöck Tronsole® type Q: Wall recess with prefabricated construction

Precast part construction

- The wall element of the Schöck Tronsole® type Q lies on a level full-faced support. Configuration of the support: Compressive strength class 20 and mortar group III,
- The stress impacting the masonry is calculated as follows: $\sigma_{Ed} = V_{Ed} / (110 \cdot 80)$ mm². With the maximum utilisation of 40.1 kN σ is$_{Ed}$ = 4.5 N/mm².
- The Schöck Tronsole® type Q is subsequently pushed through the staircase wall. A full-length block-out is to be arranged in the staircase wall.
- With the installing of the staircase the height of the stairs, if required, is to be adjusted using pressure-resistant compensating plates under the wall element. The complete support surface of the wall element must be underlaid flush with the compensating plates.

Fire protection | Materials

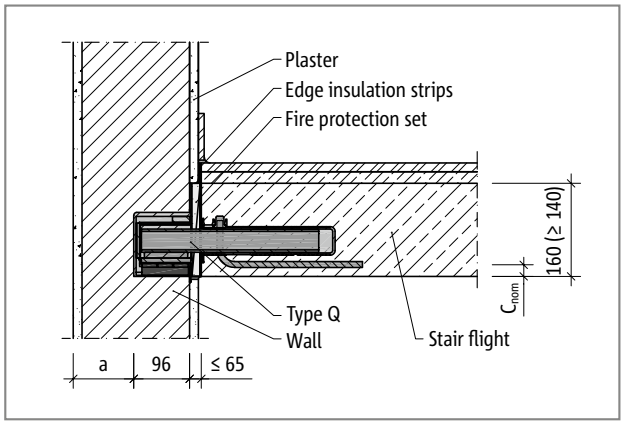


Fig. 106: Schöck Tronsole® type Q: Fire protection configuration

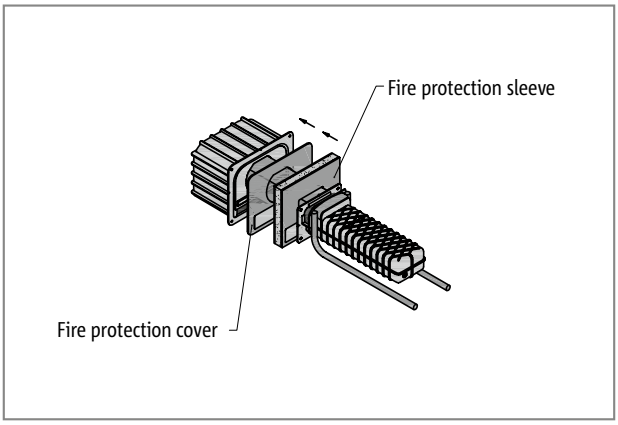


Fig. 107: Schöck Tronsole® type Q: 3D view of the product with two-part fire protection set

Fire protection

- The fire protection classification of the staircase wall is not disturbed by the wall element if a backing of at least 40 mm masonry blocks (a ≥ 40 mm) is carried out. A mineral render may be added to the thickness.
- A minimum separation of the hanger loops of the Tronsole® type Q for the structural component surface of u ≥ 35 mm is to be maintained.
- With the Schöck Tronsole® type Q the fire resistance class R90 is achievable for the surrounding structural components up to a joint width of a maximum of 65 mm.
- R90 Landings can be achieved using Tronsole® type Q with a thickness of h ≥ 160 mml
- R90 Treads can be achieved using Tronsole® type Q with a minimum thickness of h ≥ 140 mm, if the concrete of the tread is available as required concrete cover
- For the achievement of fire resistance class R90 an optional fire protective set is necessary for the Tronsole® type Q. This set consists of a fire protection cover and, depending on the joint width, one, two or three fire protection sleeves.
- The wall element of the Tronsole® type Q is to be protected here through the fire protection cover which, using a product-own adhesive surface, is fixed to the adhesive label of the wall element.
- The load-bearing element is protected through the fire protection sleeve(s).
- Joint width ≤ 25 mm: 1 fire protection set
- Joint width 26 mm to 45 mm: 1 fire protection set + 1 additional fire protection collar
- Joint width 46 mm to 65 mm: 1 fire protection set + 2 additional fire protection collars

Materials and construction materials

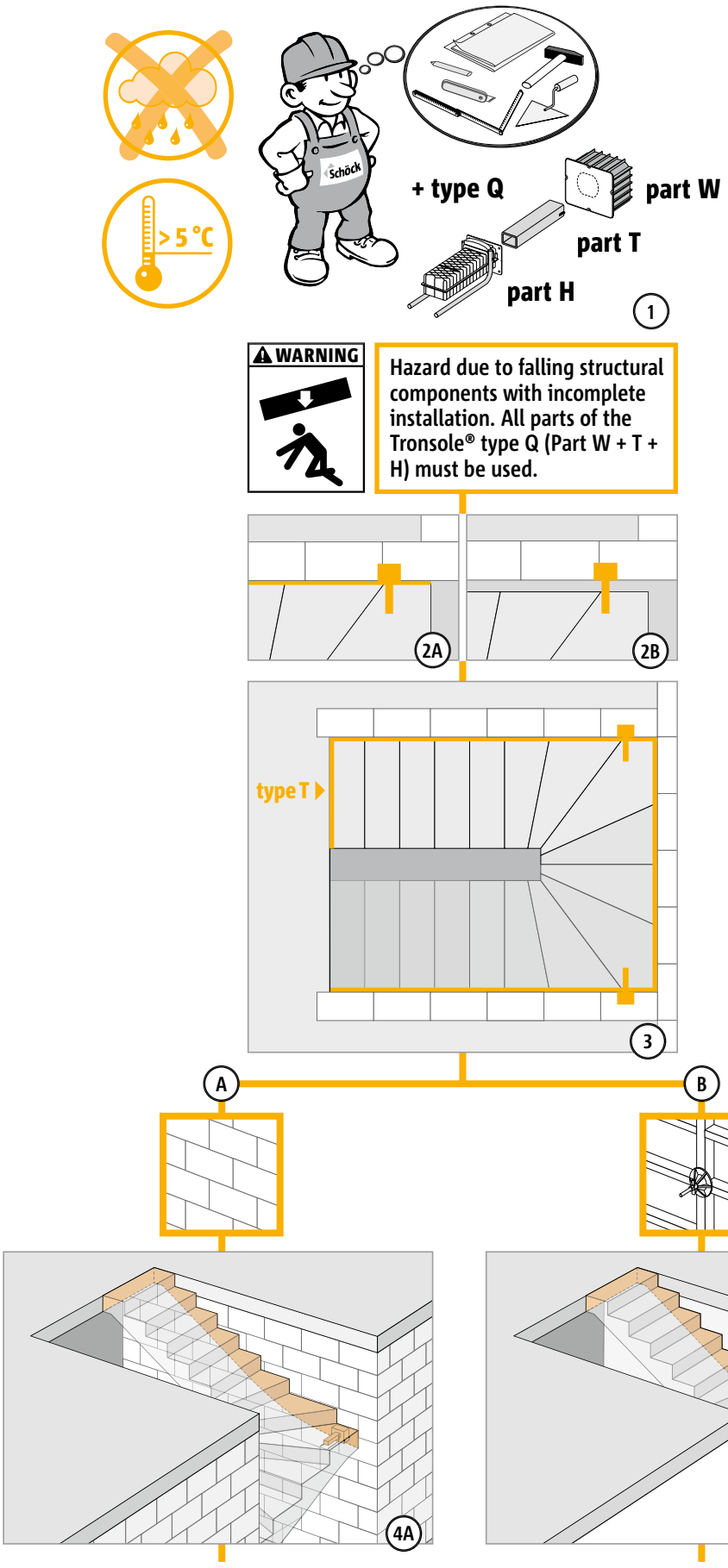
Schöck Tronsole® type Q	Material
External box	Polystyrene
Internal box	Polystyrene
PE foam insert	PE foam according to DIN EN 14313
Elastomer support	Polyurethane according to DIN EN 13165
Load distribution plate	Fine-grain construction steel S460 according to DIN EN 10025
Load-bearing element	FV: S355 JO; A2: S355, corrosions protection class. II according to Z-30.3-6
Sleeve	Polystyrene
Hanger loop	Reinforcing steel B500B according to DIN 488-1
Pressure deflector	Construction steel S355 JO according to DIN EN 10025
Tension damper	Polyurethane according to DIN EN 13165

Installation

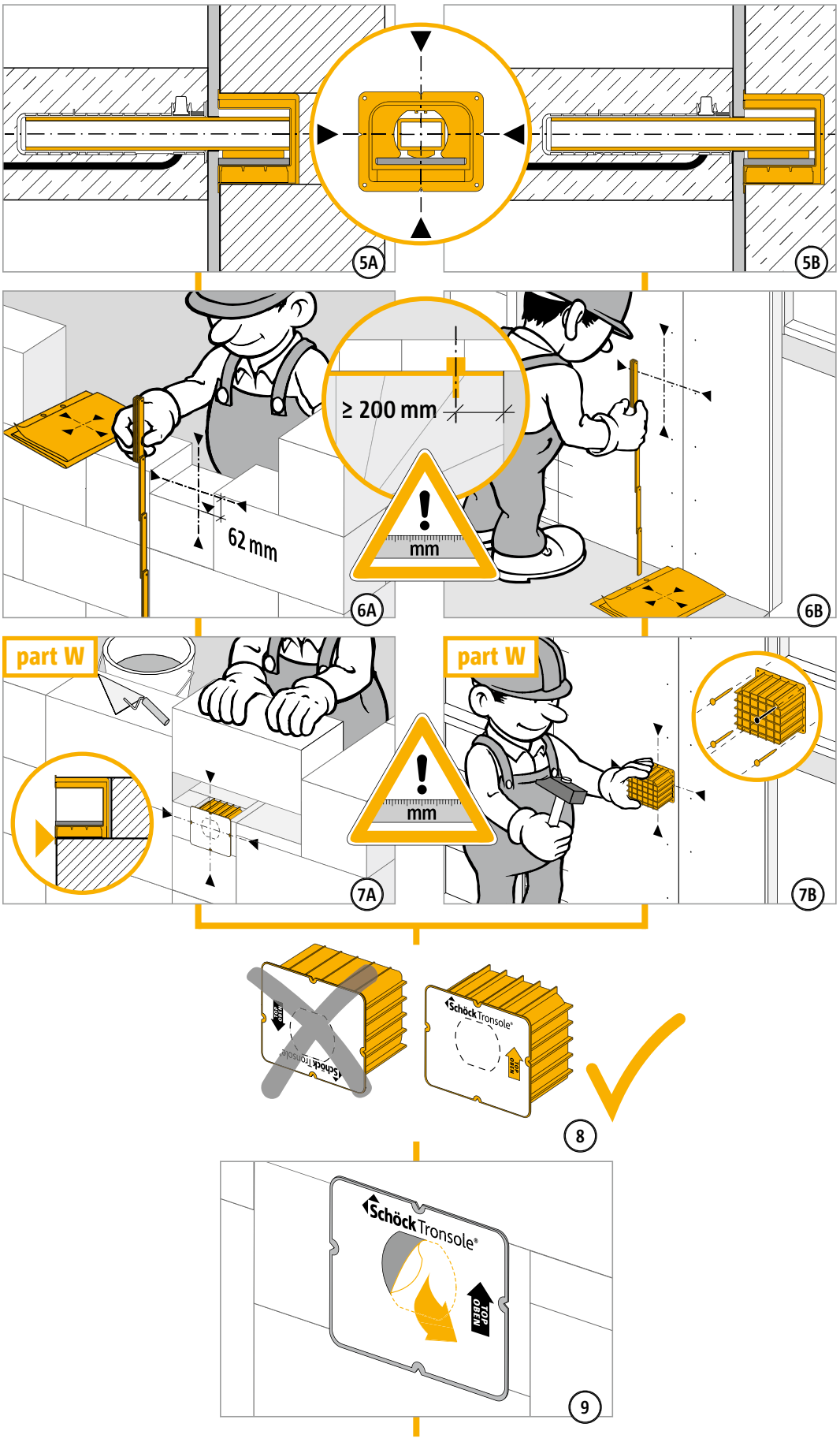
Installation

- The wall element of the Schöck Tronsole® type Q lies on a level full-faced support. Configuration of the support: Compressive strength class 20 and mortar group III,
- The stress impacting the masonry is calculated as follows: $\sigma_{Ed} = V_{Ed} / (110 \cdot 80)$ mm². With the maximum utilisation of 40.1 kN σ is$_{Ed}$ = 4.5 N/mm².
- With the installing of the staircase the height of the stairs, if required, is to be adjusted using pressure-resistant compensating plates under the wall element. The complete support surface of the wall element must be underlaid flush with the compensating plates.

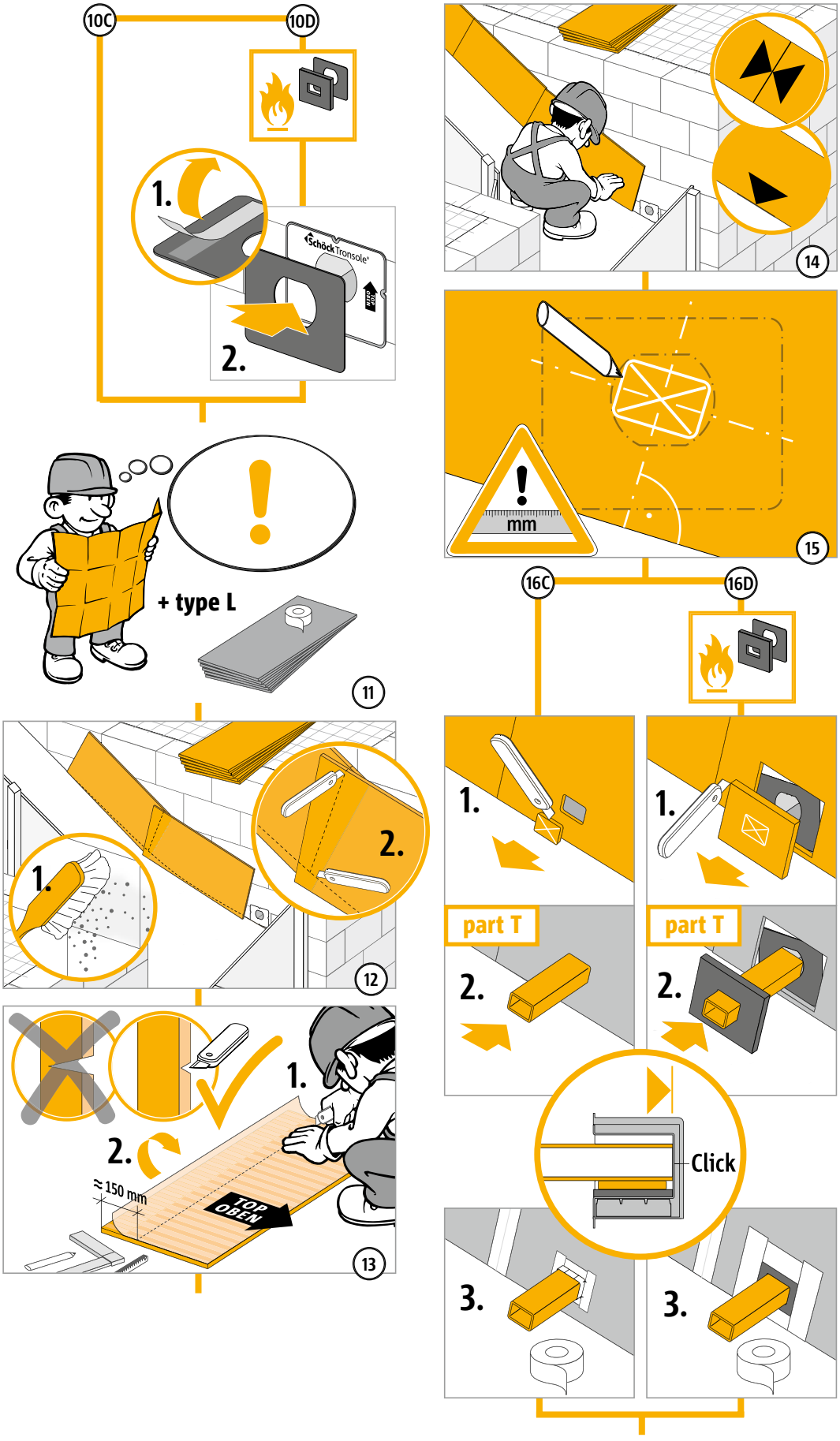
Installation instructions building site in-situ concrete



Installation instructions building site in-situ concrete



Installation instructions building site in-situ concrete



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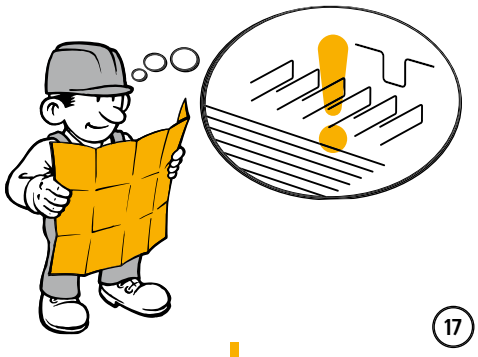
Installation instructions building site in-situ concrete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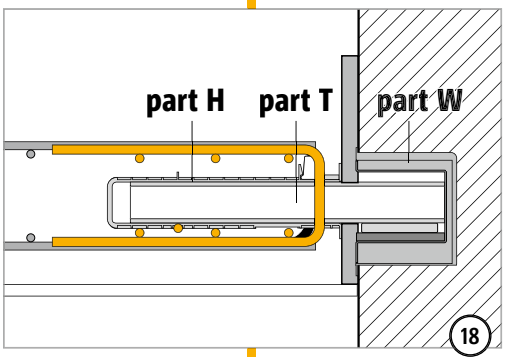

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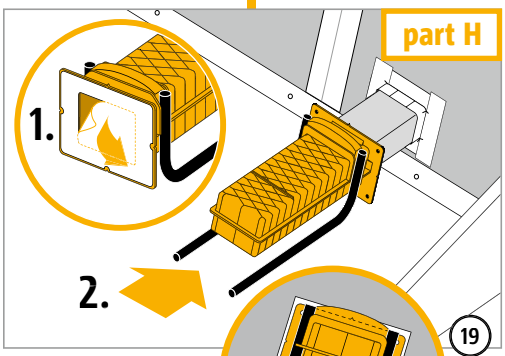

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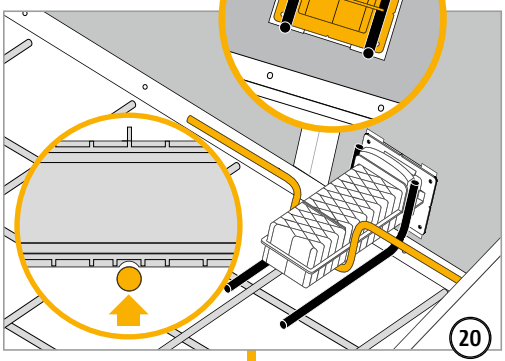
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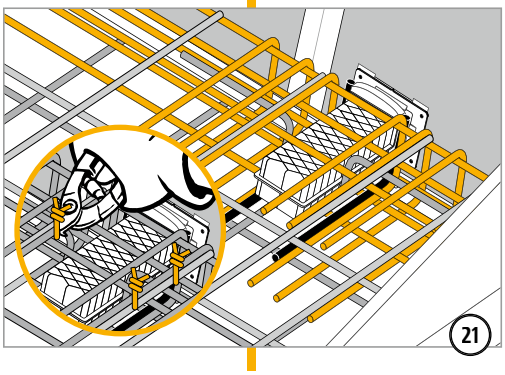
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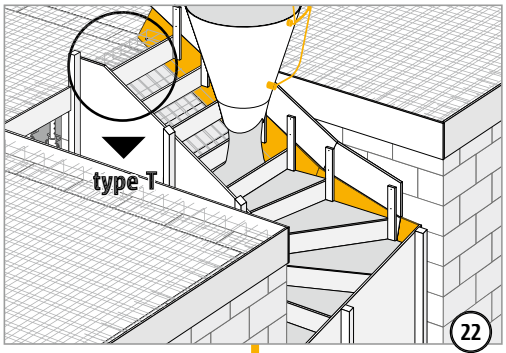

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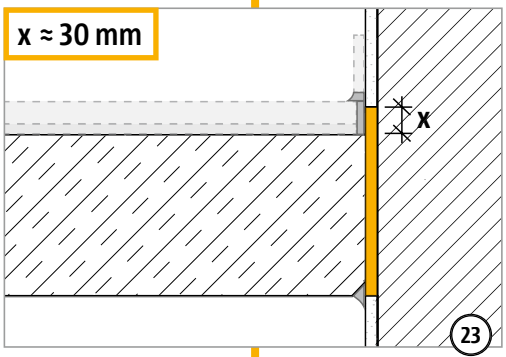

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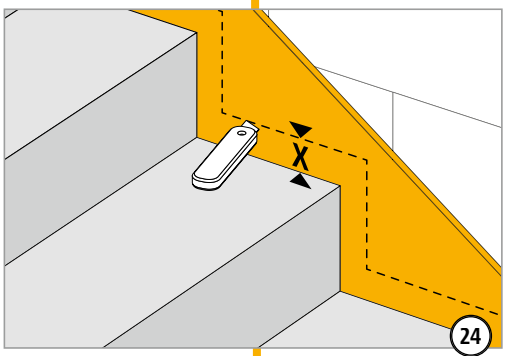

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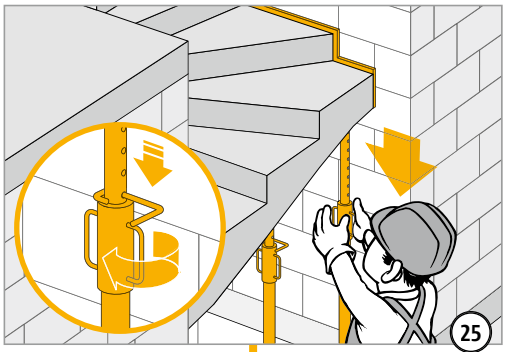
Hazard due to falling structural components with missing support. Turn down all construction supports slowly. Remove only load-free supports.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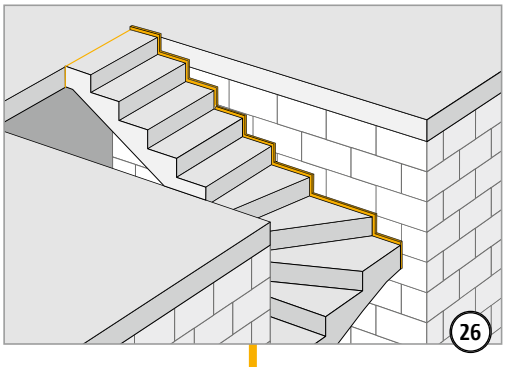
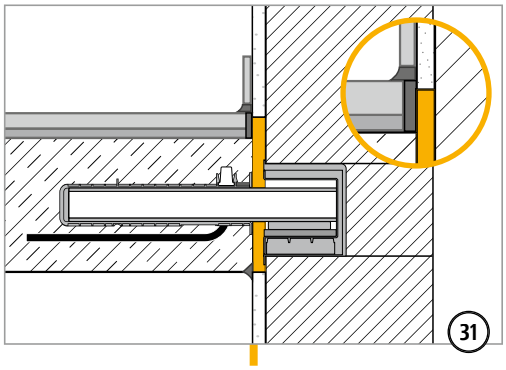
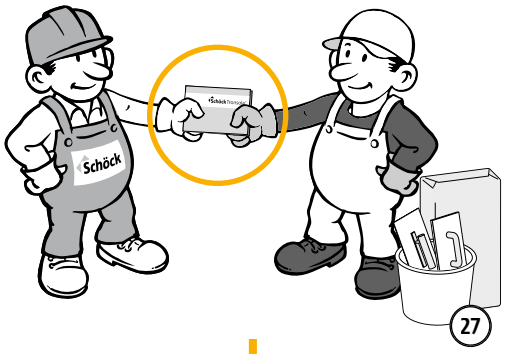
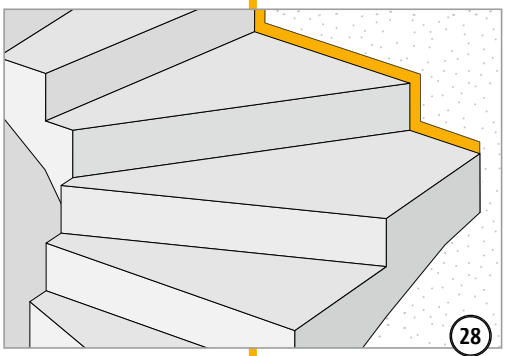
Q

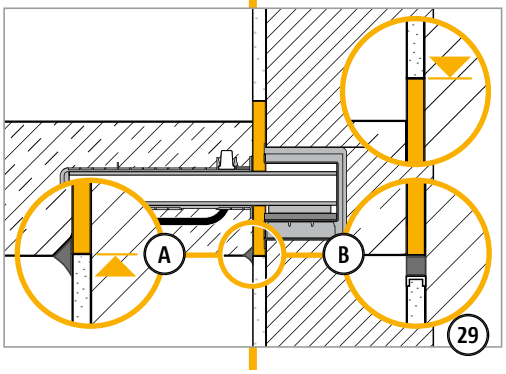
Installation instructions building site in-situ concrete

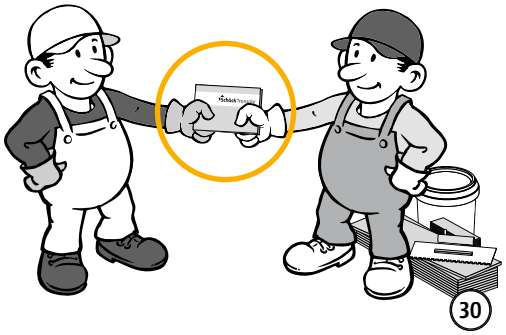












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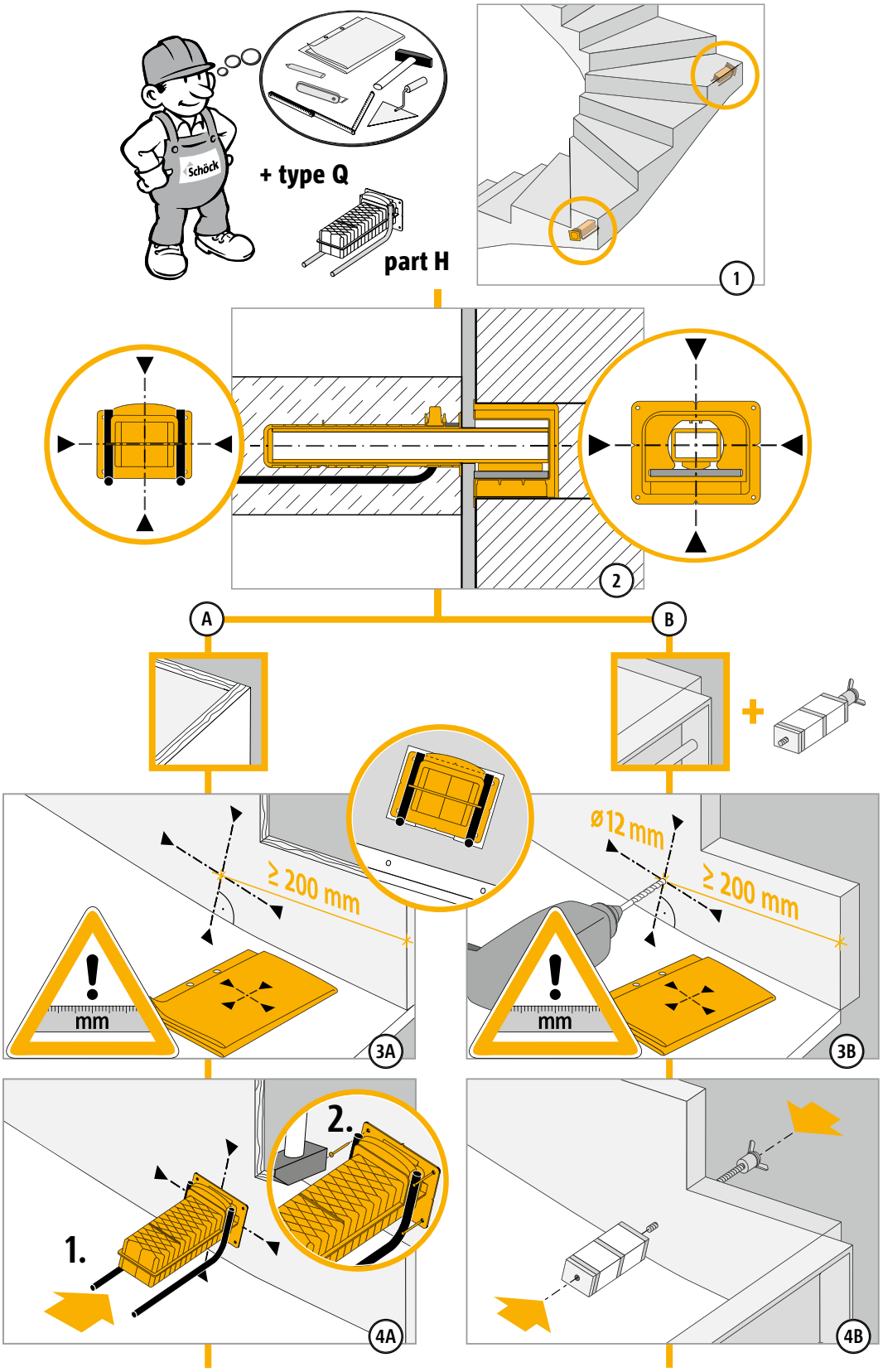
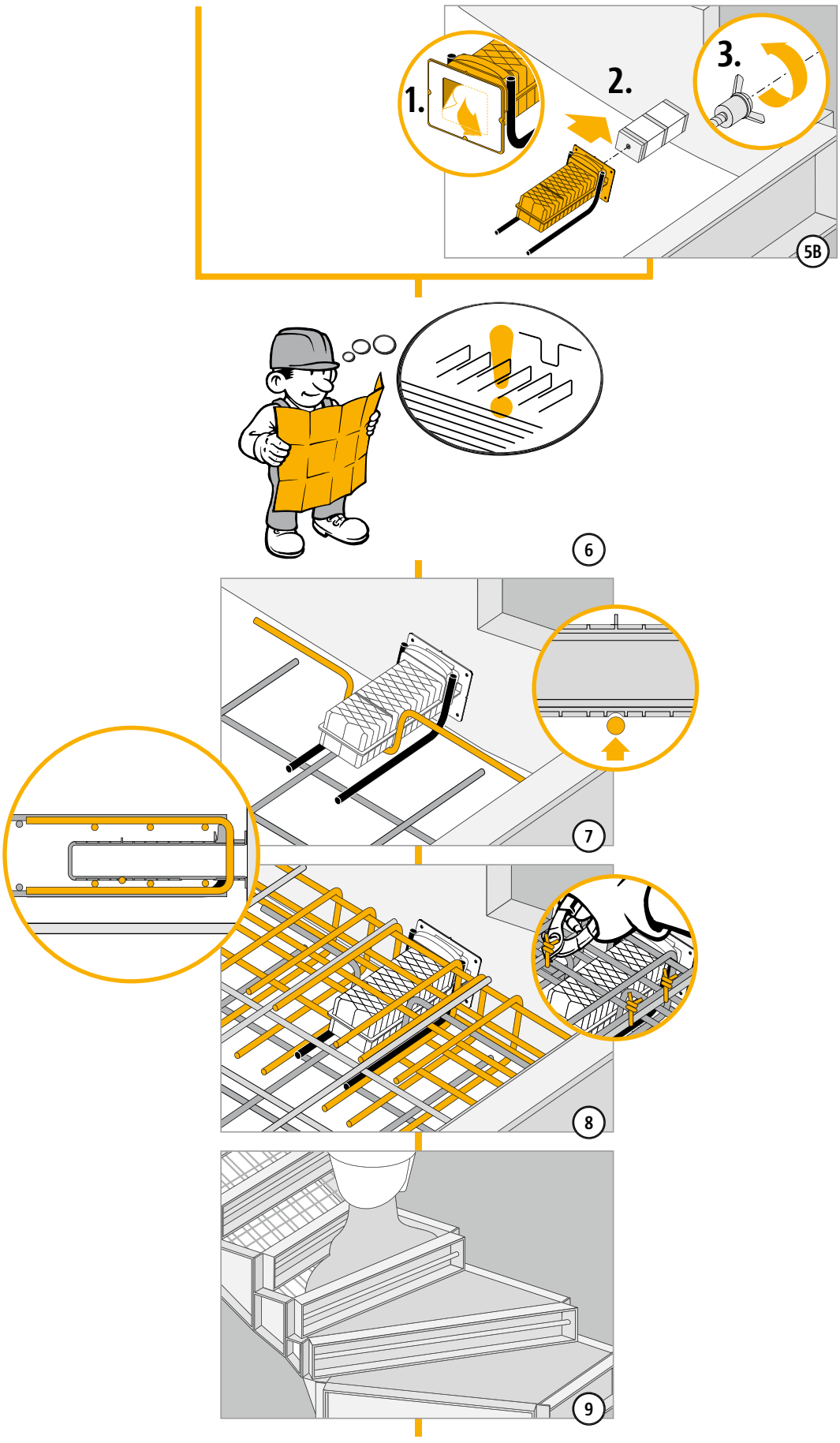
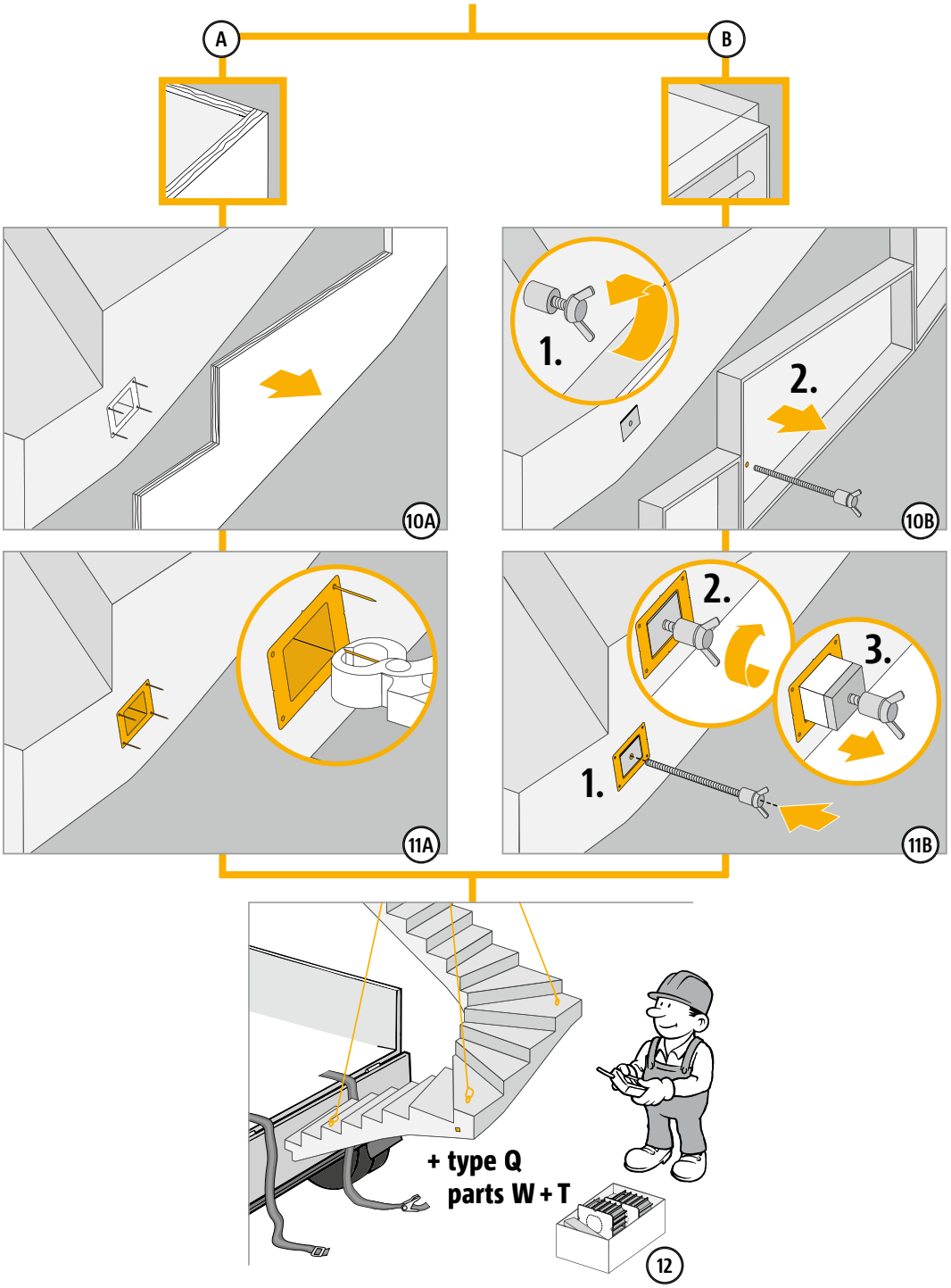
Installation instructions for prefabricating plant



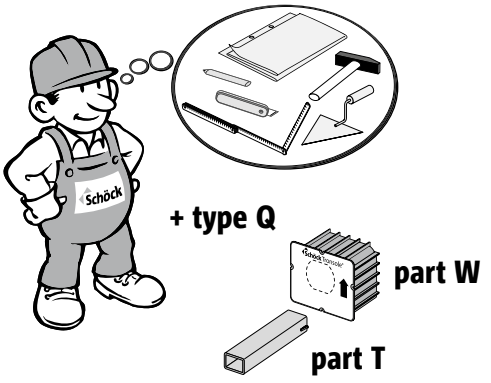
Installation instructions for prefabricating plant

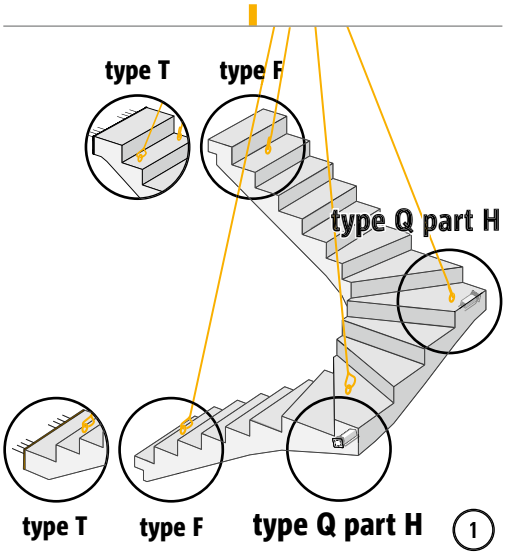


Installation instructions for prefabricating plant

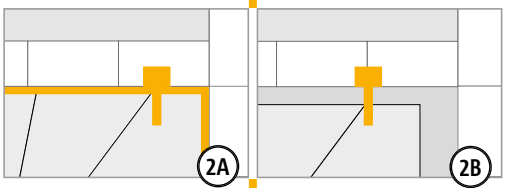


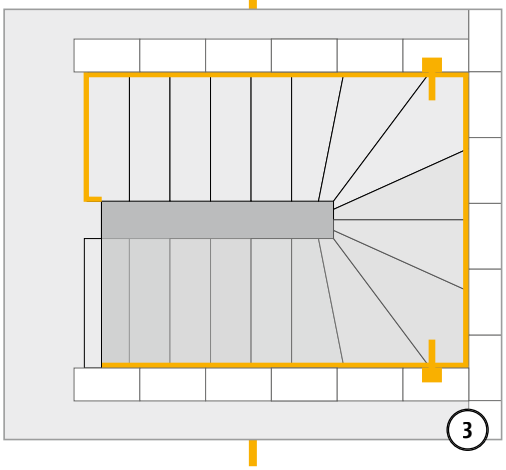
Installation instructions building site precast components

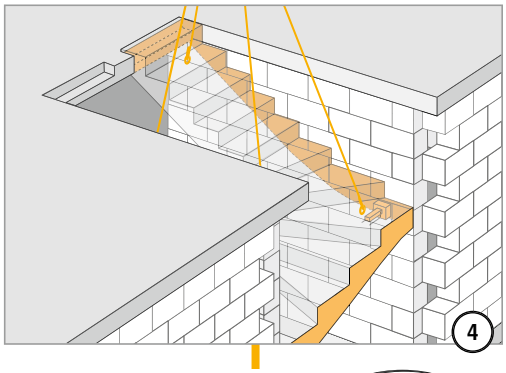


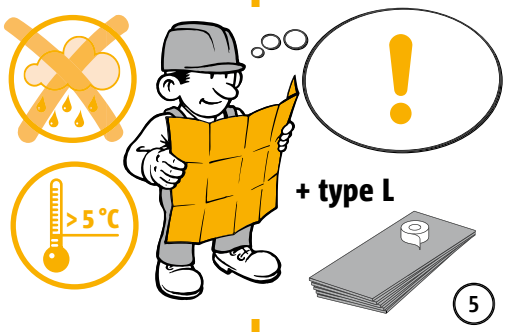


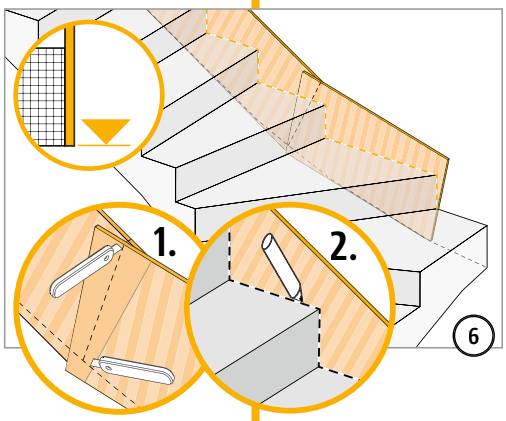
Hazard due to falling structural components with incomplete installation. All parts of the Tronsole® type Q (part W + T) must be used.

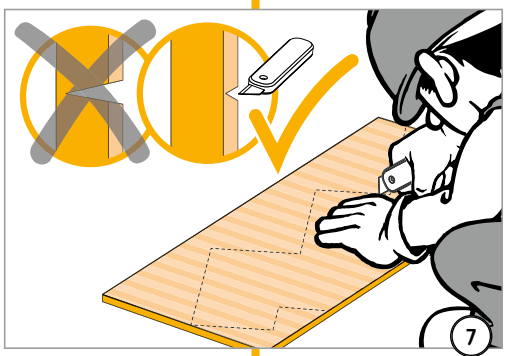


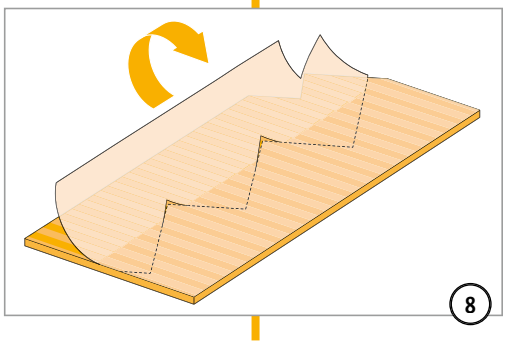












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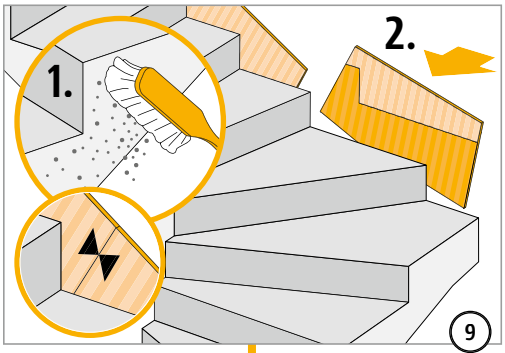
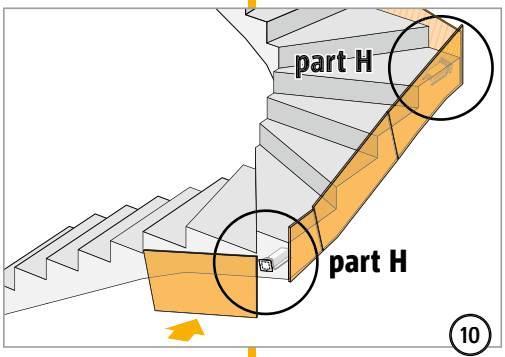
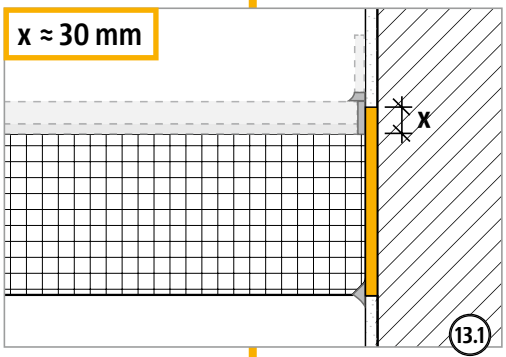
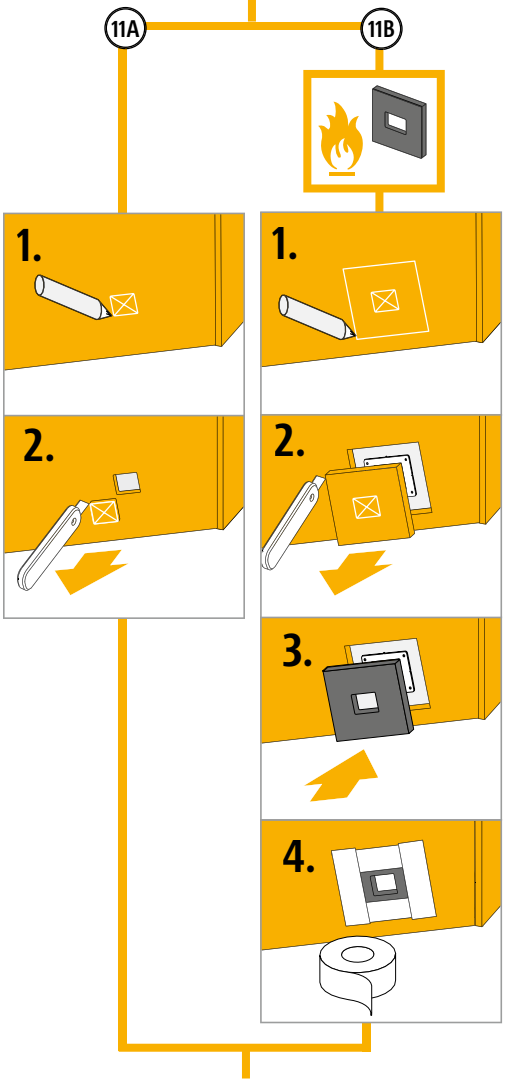
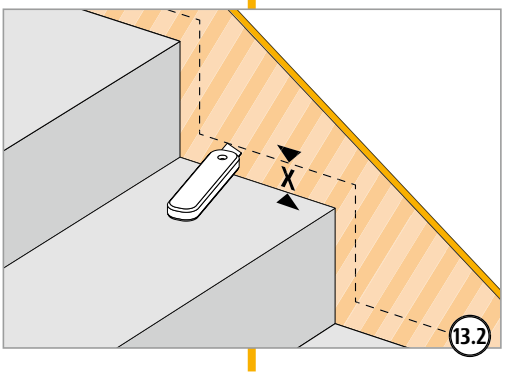
Installation instructions building site precast components











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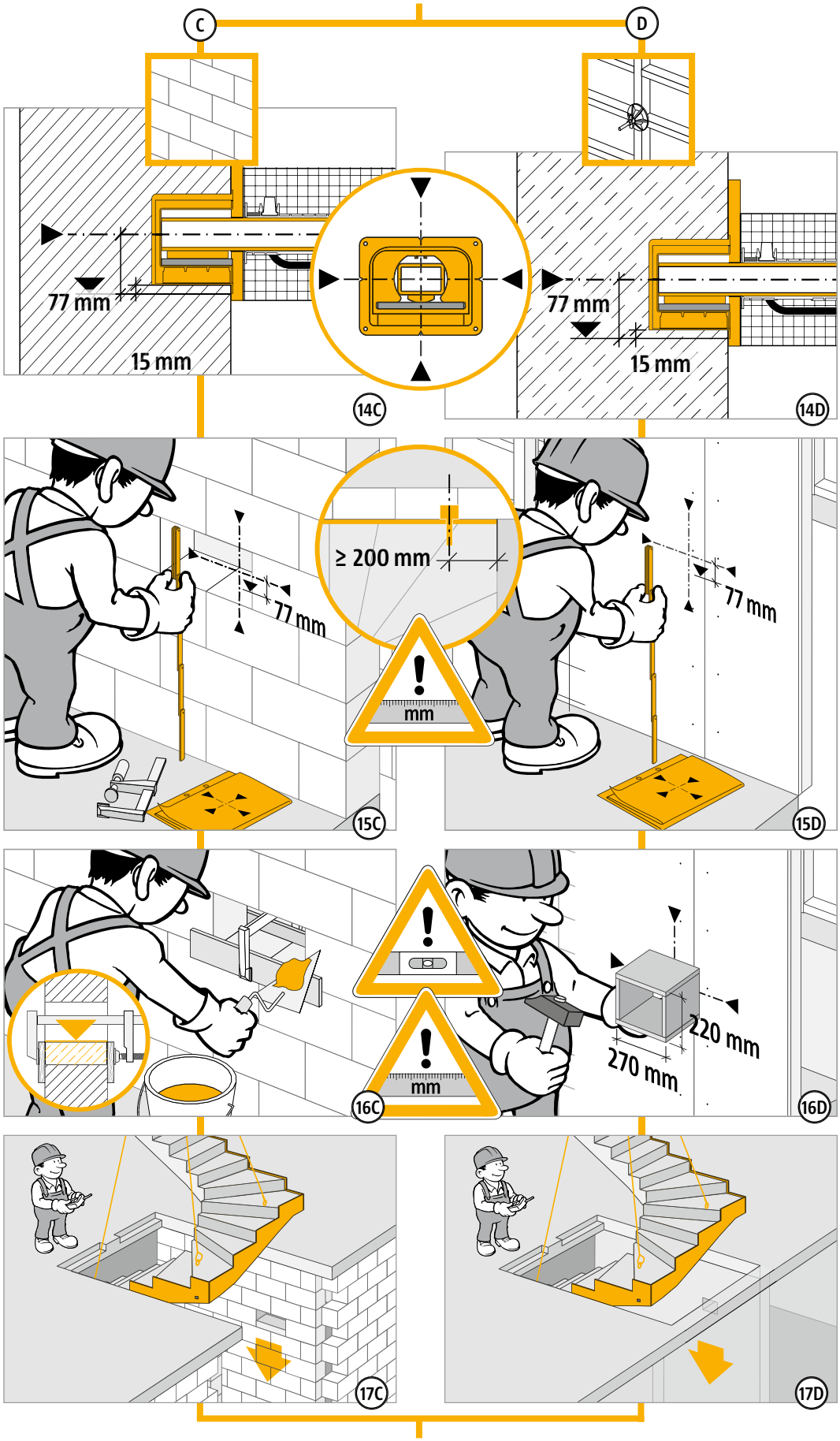
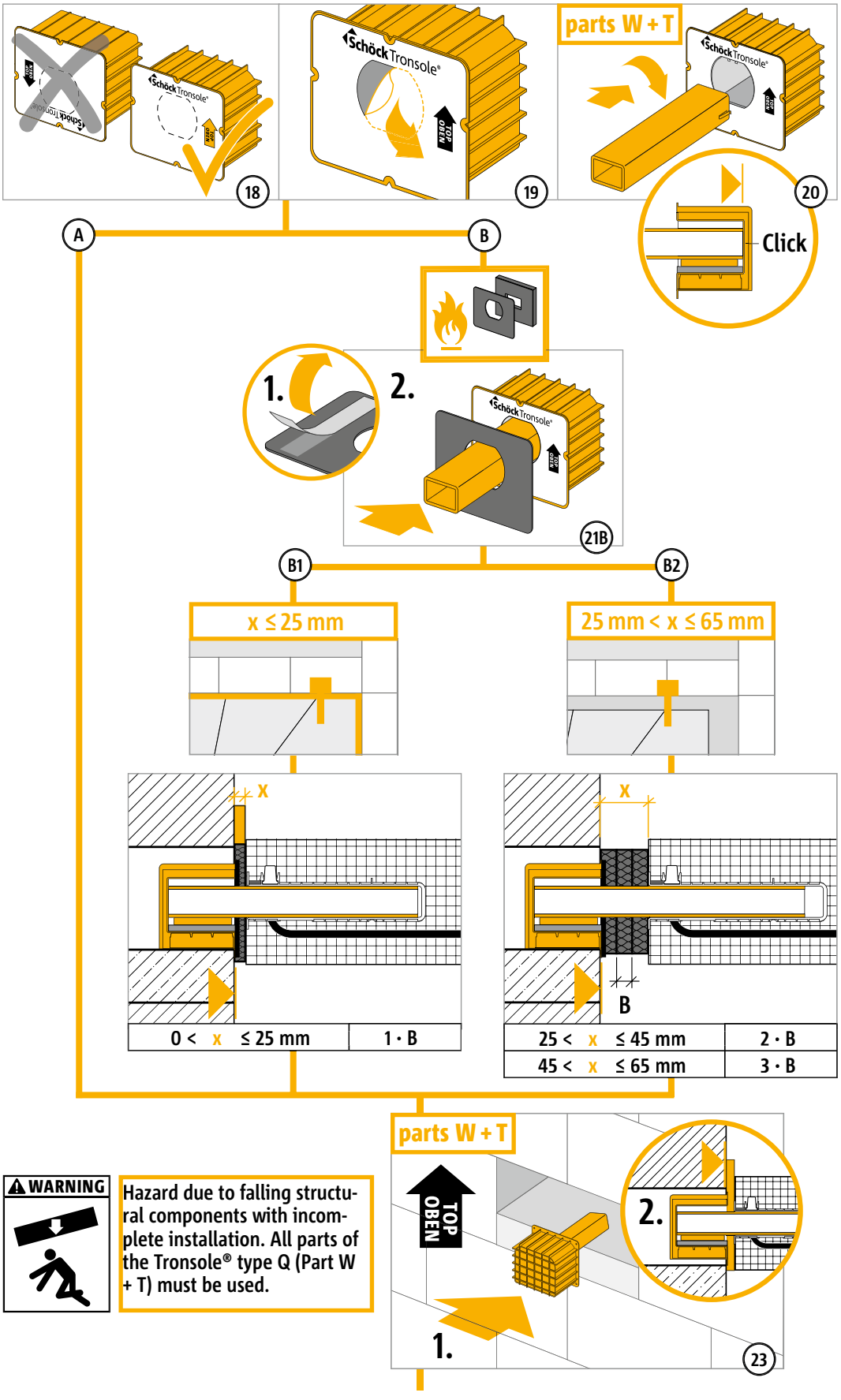
Installation instructions building site precast components

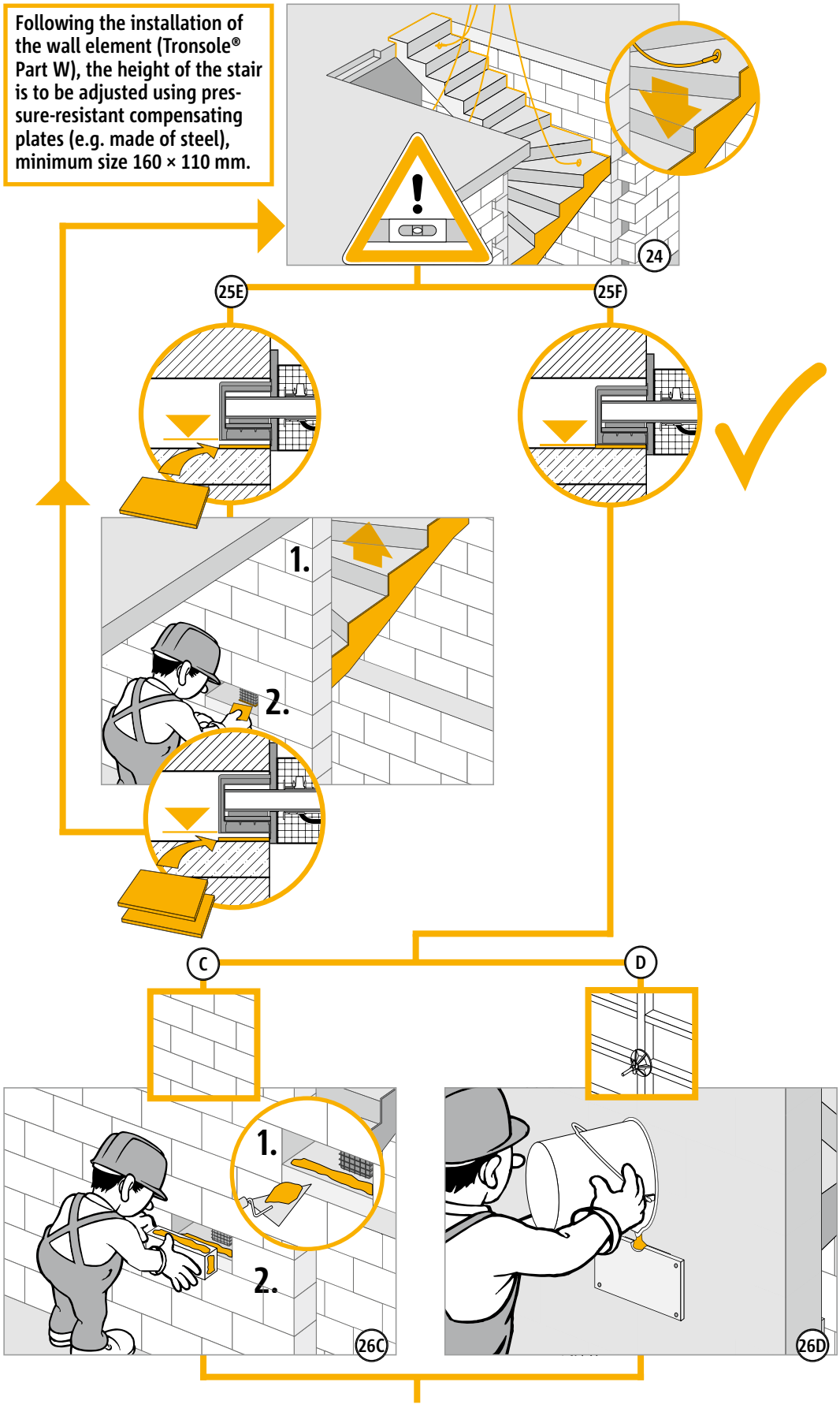


Installation instructions building site precast components

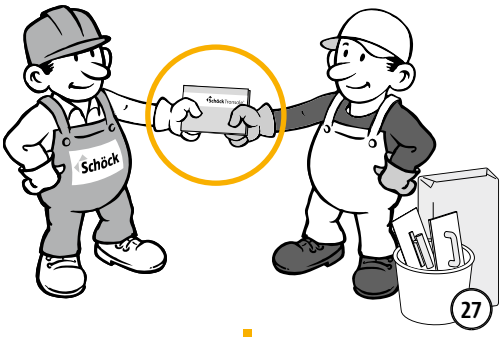


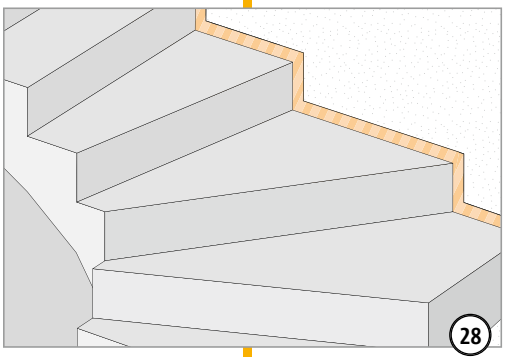
Installation instructions building site precast components

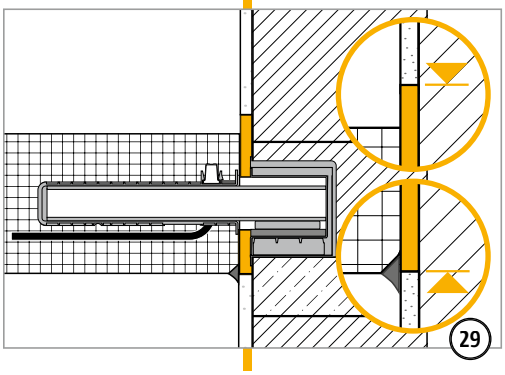
Following the installation of the wall element (Tronsole® Part W), the height of the stair is to be adjusted using pressure-resistant compensating plates (e.g. made of steel), minimum size 160 × 110 mm.

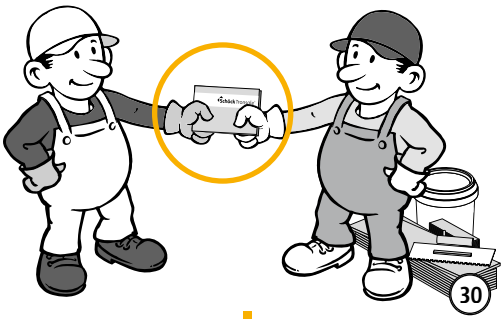


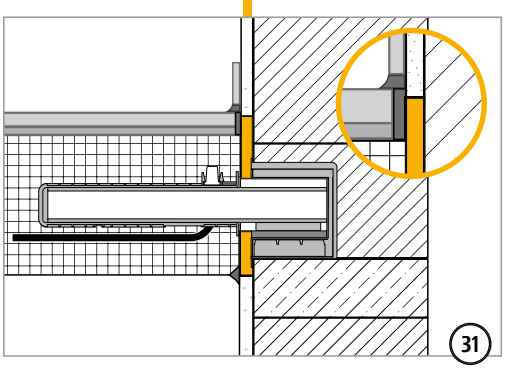
Installation instructions building site precast components











Check list

- ☐ Is the geometry of the structural component to be sound insulated matched to the measurements of the Schöck Tronsole® type Q?
- ☐ Have the effects on the Schöck Isokorb® connection been specified at design level?
- ☐ With the Tronsole® type Q is the minimum concrete strength taken into account according to the design table?
- ☐ Have the requirements with regard to fire protection been cleared and announced?
- ☐ Due to an R90 requirement are larger concrete covers and the resultant larger structural component heights taken into account?
- ☐ With a R90 requirement on the fire resistance class is the joint planned with a width of maximum 65 mm?
- ☐ With V_{Ed} at the slab edge of the landing, is the limiting value of the slab load-bearing capacity checked?
- ☐ Is the required on-site reinforcement, including the hat brackets, taken into account?