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VST SYSTEM MANUAL

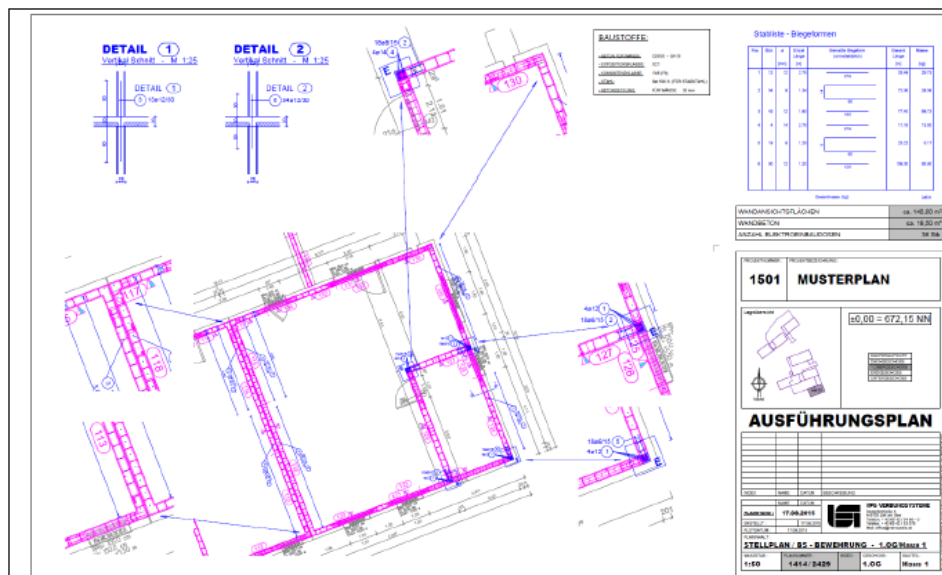
INSTALLATION ON SITE

1. Assembly prerequisites

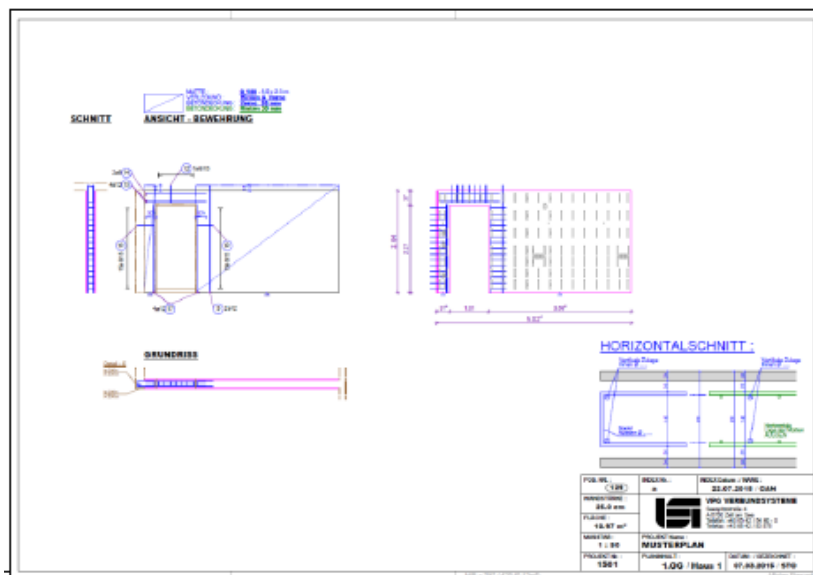
1.1. Planning documents

- final plans / work plans (floor plan, cross-section, detail)
- production and assembly plans (wall layout plan, wall element plan, ceiling split plan, staircase split plan)
- reinforcement plans (wall reinforcement plan on site, ceiling reinforcement plan, staircase reinforcement plan on site)

SAMPLE WALL LAYOUT PLAN / ON-SITE REINFORCEMENT



SAMPLE PLAN OF ELEMENT PLAN



1.2. Site equipment and condition of site

- level concrete surface (in line with tolerances: Evenness tolerances as per DIN)
- concrete must be proven to be stable
- any starter bars made of foundation plates must be checked for completeness
- tower crane with sufficient load-carrying capacity (see point 5.2)
- tool and assembly material (see points 3 + 4).
- workable entrance, unloading, and turning options for heavy goods vehicles with semi-trailers, as well as sufficient storage areas for VST transport racks
- Support material must be available

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INSTALLATION ON SITE

2. Wall assembly

2.1. Wall (wall, wall brackets, high walls, gable walls)

Set out location of walls with a pencil and measure on the surface of the concrete. The implementation and layout plans are the basis, at a scale of 1:50. If necessary, a surveyor should be involved.

Draw lines with the aid of a chalk line on the installation surface (left).

Chalk line with colour container (below).



Level the wall with the aid of a rotary laser, a yardstick, and a reflector: Set up the laser and adjust horizontally. Position the yardstick at the desired height using a height adjustment sheet and attach a reflector to the yardstick at the level of the laser, then set the clearance to “zero”.

Reflector (below).



Lift VST transport rack with walls from the heavy goods vehicle or storage location to the assembly site. Short crane paths during transfer reduce assembly time.



The walls are searched for in sequence based on the wall sequence plan.

Hook the crane hook into the holder. Walls with a length of 1.25 m or more are always attached on two crane hooks.

Carefully pull the wall out of the VST transport frame and lift to the installation site.



Set the wall down in the correct location.



In order to close the joint between the VST element and the surface of the concrete, a joint tape is used, which is stuck to the bottom of the wall. This joint tape is not mandatory.



Installing a prop: Threaded holders are installed in the wall at the factory. The push-pull prop is fixed using a M10 screw in this holder. A screwdriver can be used to speed up installation.



Fix prop to concrete surface: Initially, a hole is drilled through the push-pull prop and into the surface of the concrete using an impact drill (with M8 drill bit).

Insert self-tapping concrete screw M8 into the prepared hole through the push-pull prop with an impact wrench.



The wall is fixed into position with floor ties (screwed into the wall and connected to the surface of the concrete with a nail gun).



In the case of external walls, U-braces are screwed in on the outside (e= around 60cm).

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INSTALLATION ON SITE

Before installing the U-braces and floor ties, it is possible to manoeuvre the wall into the correct position on the floor markings if required. The wall can now be suspended from crane hooks. The wall is now secured with push-pull props, floor ties, and U-braces.

When the wall is fixed into position, the next step is to check the vertical alignment, which is adjusted by turning the push-pull prop.

This procedure is now repeated. The connection between two walls in a longitudinal or transverse direction is made with U-braces (e= around 40 cm) and corner brackets (e= around 40 cm).



Longitudinal direction:

Screw in the U-brace with a clearance of around 40 cm centrally from the wall joint.

Transverse direction:

Screw in the corner bracket with a clearance of around 40 cm from the wall corner.

Wall brackets:

Remove any threaded rods present first, then the same as the wall. After transporting the wall mount, fit the threaded rods once more (help counter pressure of concrete).

High walls and gable walls:

identical to a normal wall, depending on the height, an additional longer push-pull prop may be attached. Transport is carried out with the mounting frame.



GABLE WALL

2.2. Parapet

Same as a normal wall but also connected with U-braces on both sides to adjacent walls.



PARAPET

2.3. Prop

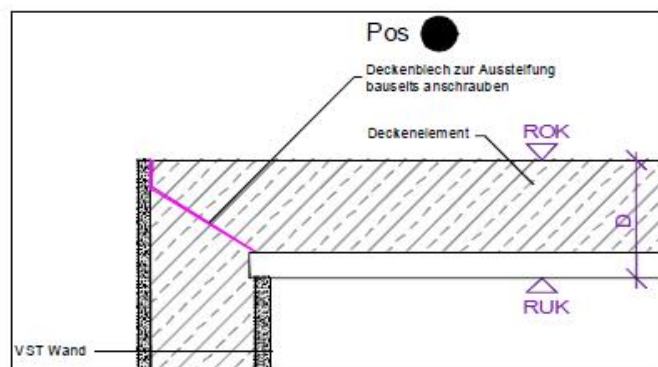
Props are lifted into gaps between two walls and screwed into position, then connected to adjacent walls on both sides with U-braces.



PROP

2.4. Upper wall end, slab edge formwork

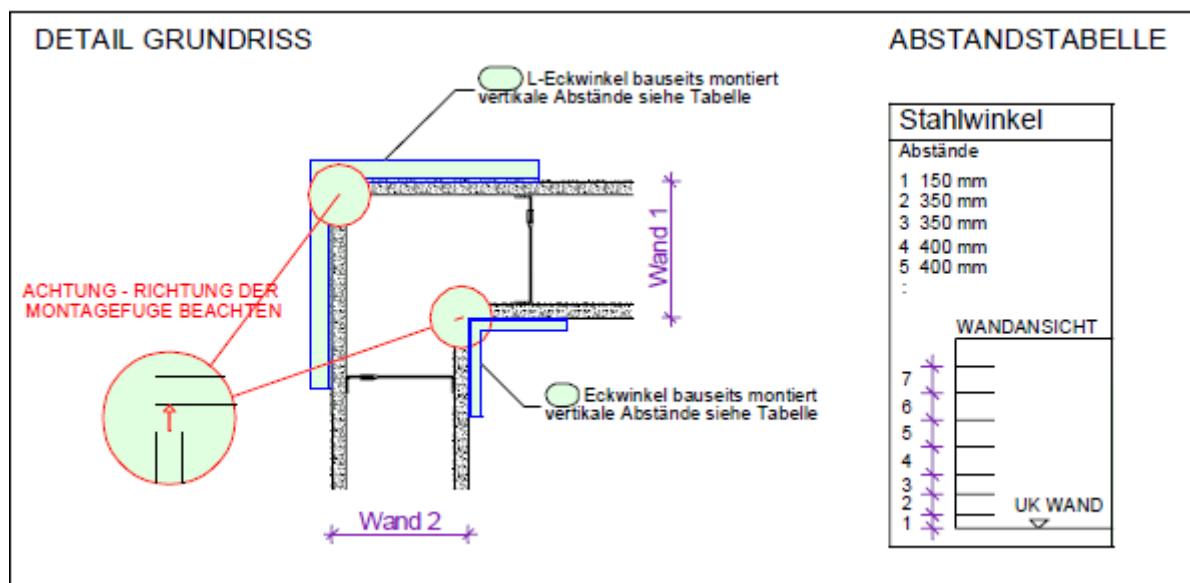
Outer wall layers raised on one side, which create the slab edge formwork, should be reinforced with ceiling panels.



2.5. Detail of corner joint without reinforcement connection

If a corner is created without reinforcement, the walls are simply placed together and screwed together with L-shaped corner brackets both on the outside and the inside (see table for clearances).

CAUTION - NOTE DIRECTION OF ASSEMBLY JOINTS!



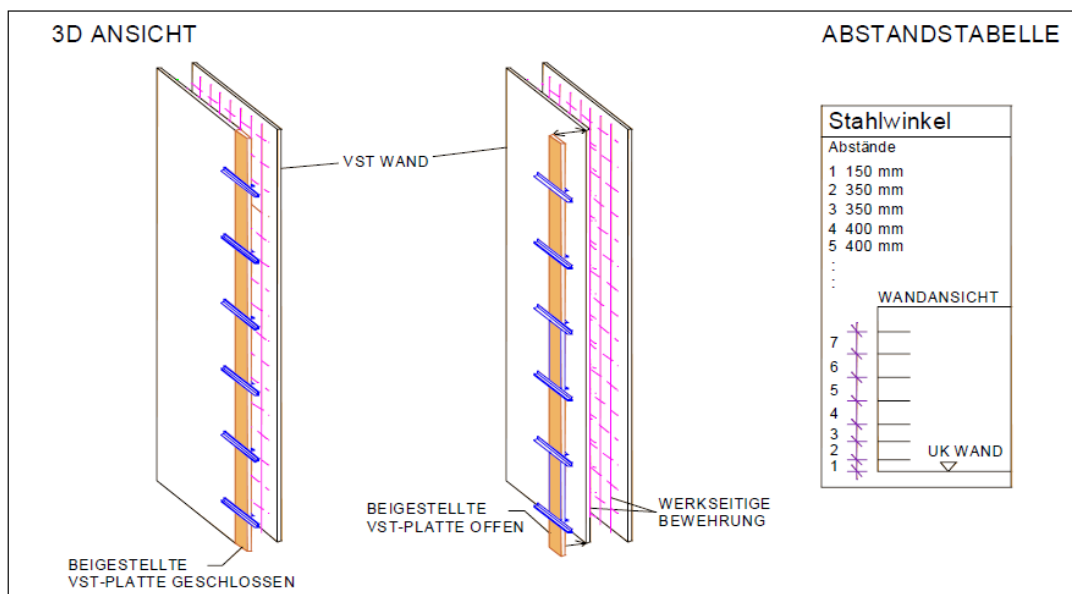
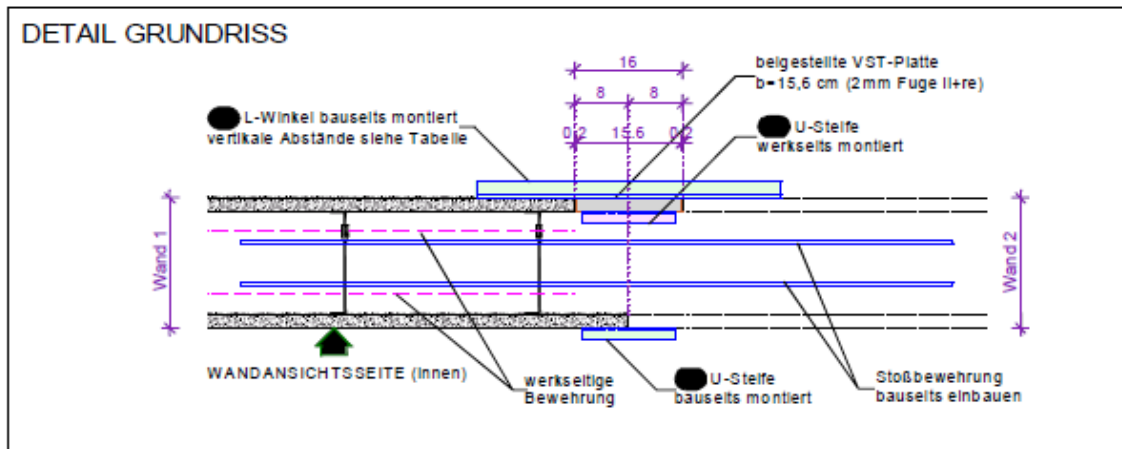
2.6. Detail A: on-site wall joint with reinforcement connection in a longitudinal direction

In the case of a wall connection with necessary shock reinforcement there is a 16 cm wide slot on one side of the wall for installing the reinforcement on site.

After installation of reinforcement, this is then sealed using the VST formwork provided and then screwed to the wall elements with L-angles ⑨ (see table for clearances).

Installation process:

- transfer wall 1
- Installing the on-site shock reinforcement into the wall
- transfer wall 2
- attach reinforcement to the correct position on the factory-installed reinforcement
- screw VST panel using L-angle ⑨
- remove L-angle ⑨ after concrete has set



2.7. Detail B: T-joint within a wall element with reinforcement connection

In the case of walls with a T-shaped wall connection (T-joint) and necessary

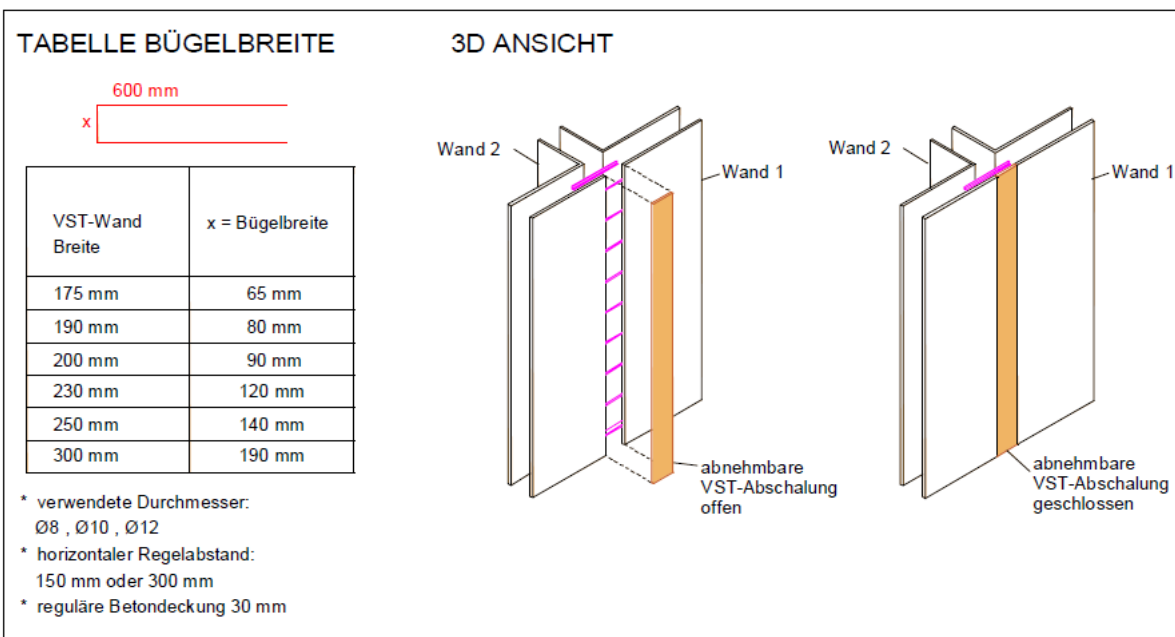
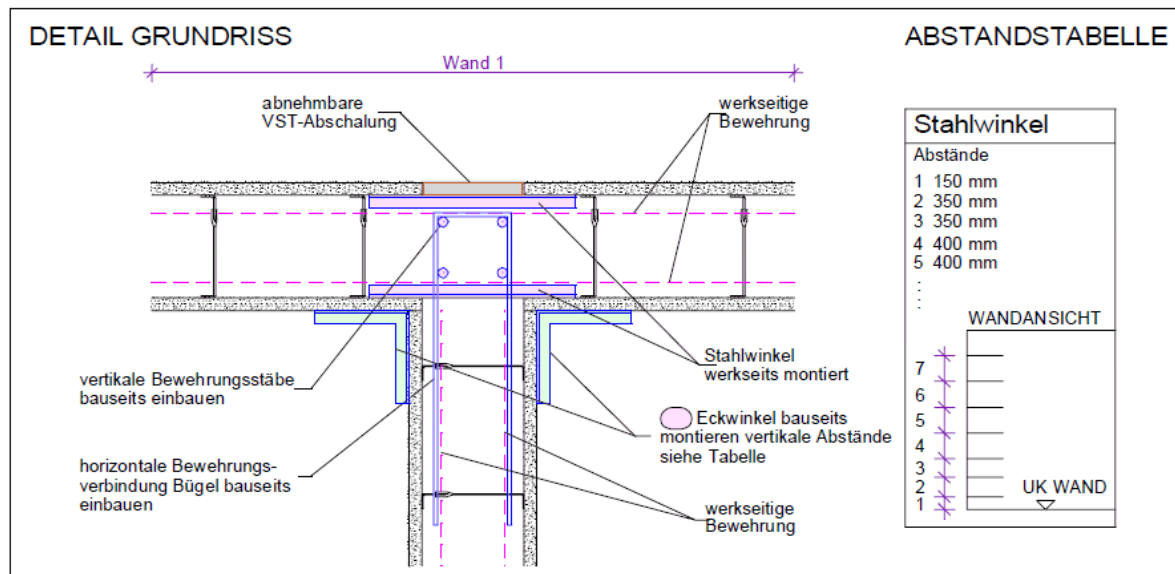
In the case of continuous wall 1, a removable formwork is provided for the reinforcement network in all directions, which is required for installing the reinforcement connection (connectors + vertical rods).

After the walls have been transferred and fixed into position, the removable formwork is removed, the

reinforcement is installed, and the wall is sealed once again. The air space with the

removable formwork is 2 mm on each side. The adjoining wall is kept in position

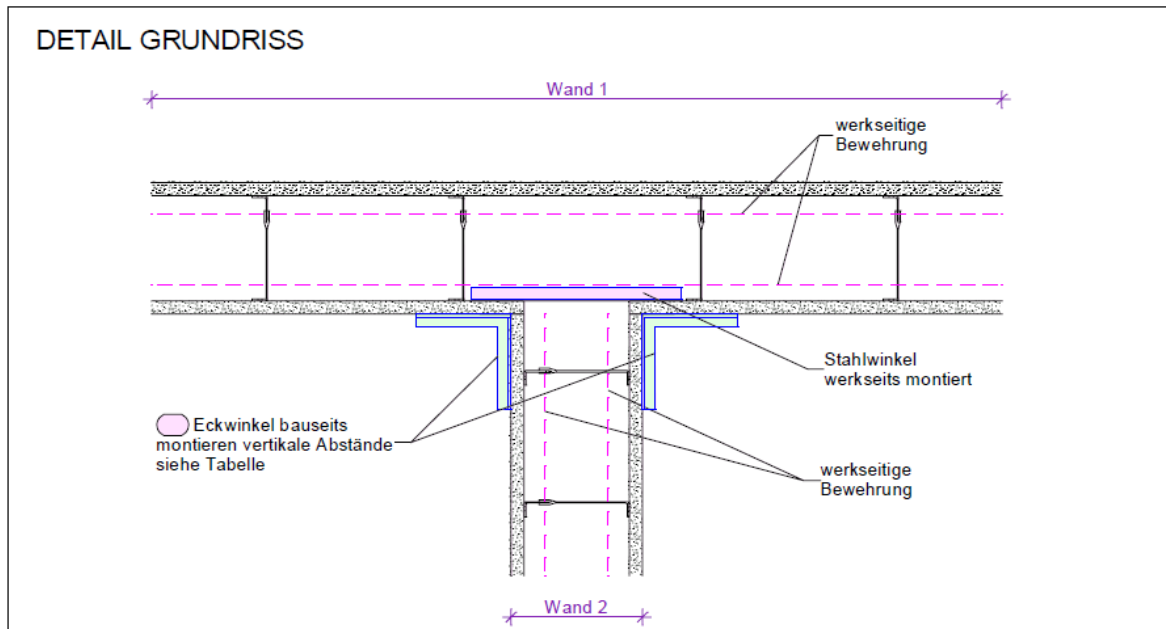
by screwing in corner brackets on site.



2.8. Detail C: T-joint within a wall element without reinforcement connection

for walls with a T-shaped wall connection (T-joint) and without reinforcement network.

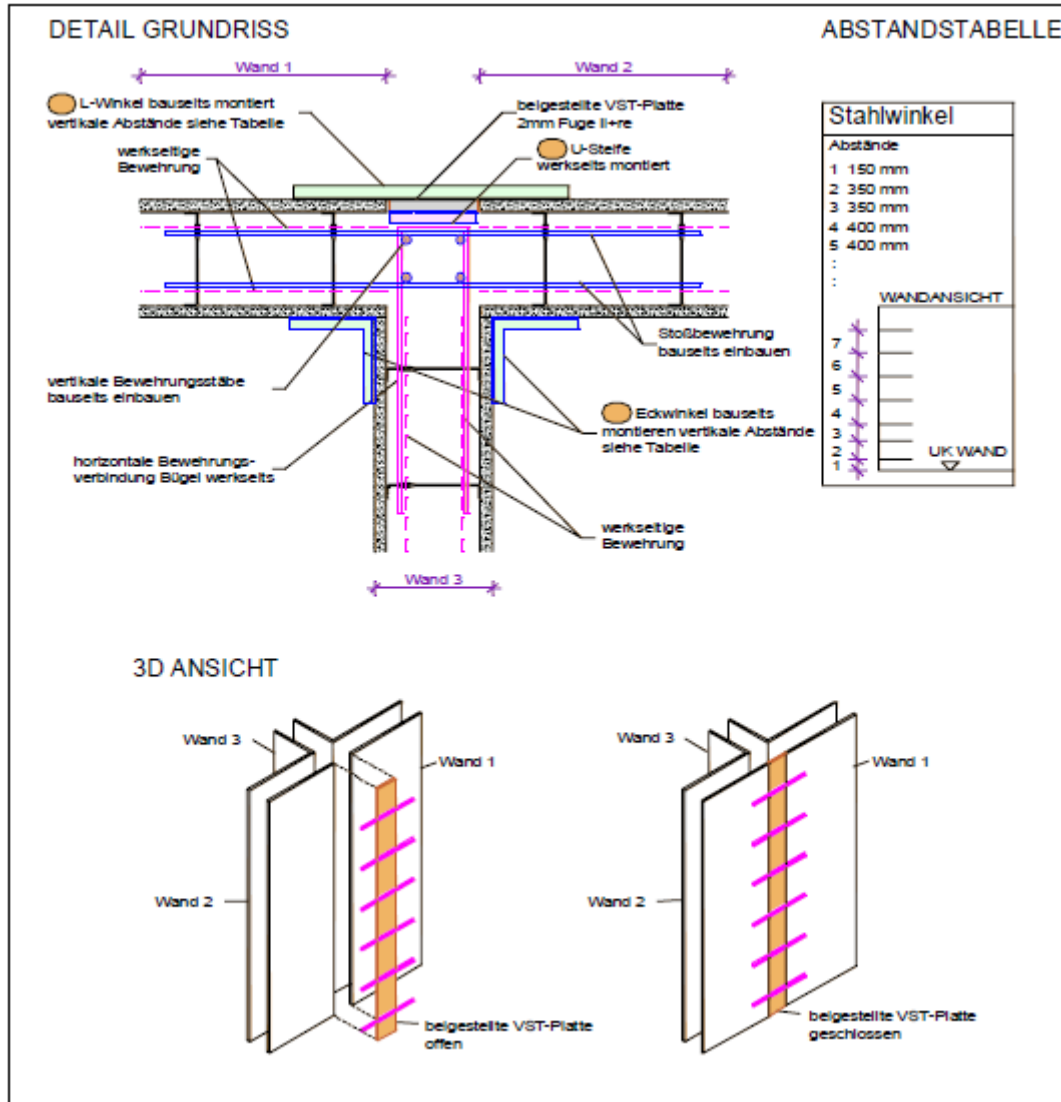
The adjoining wall is held in position by screwing in corner brackets on site.



2.9. Detail D: T-joint with reinforcement connection

In the case of a T-shaped wall joint (wall 1 / 2 / 3) and a necessary reinforcement network in all directions, the reinforcement connection (shock reinforcement between wall 1 and 2) is brought in via the open slot in the wall. The starter bars (brackets + vertical rods) for wall 3 are already available at the factory.

After reinforcement is installed, the slot in the wall is sealed with the VST panel provided, then screwed to the wall elements with L-angles (see table for clearances). The air space with regard to the formwork is 2 mm on each side. The adjoining wall is held in position by corner brackets mounted on site.

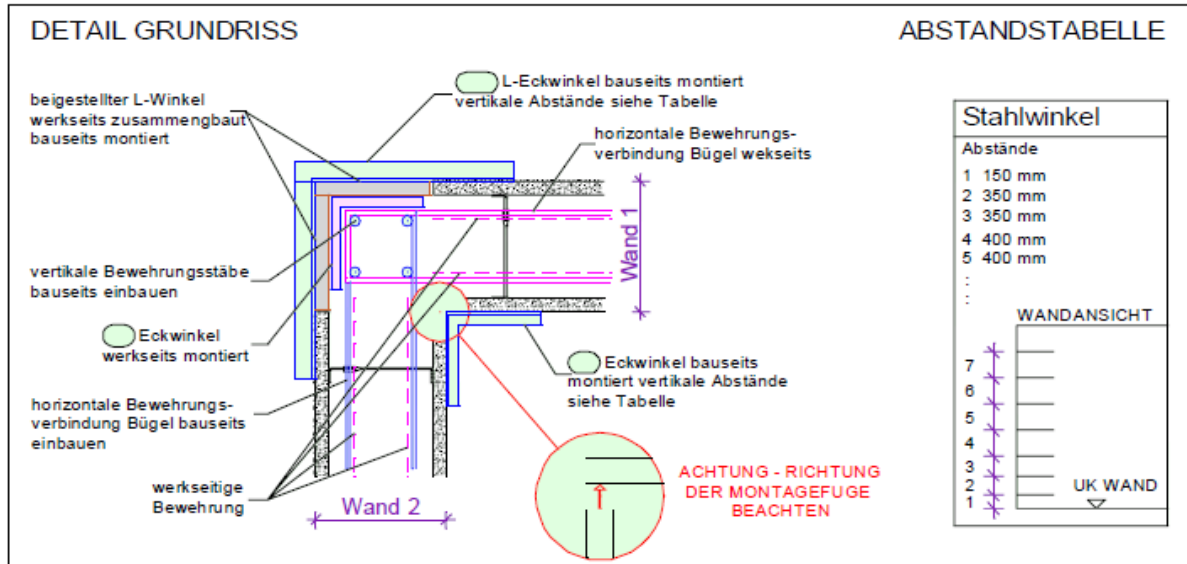


02.10 Detail E: Corner joint with reinforcement connection

If a corner is created with a reinforcement network, the walls are simply placed together at the interior corner - the outer corner is set up as an “open wall corner” into which the starter rods can be installed.

After the reinforcement is installed, the wall corner is sealed with the L-shaped VST formwork provided and then screwed to the wall elements with L-shaped corner brackets

CAUTION - NOTE DIRECTION OF ASSEMBLY JOINTS!



2.11. Detail F: Reinforcement connection on existing component with rebend reinforcement

When connecting a VST wall to an existing component with reinforcement connection through rebend reinforcement, the wall area is produced as an existing component without a system spacer. Instead of this, they are used in

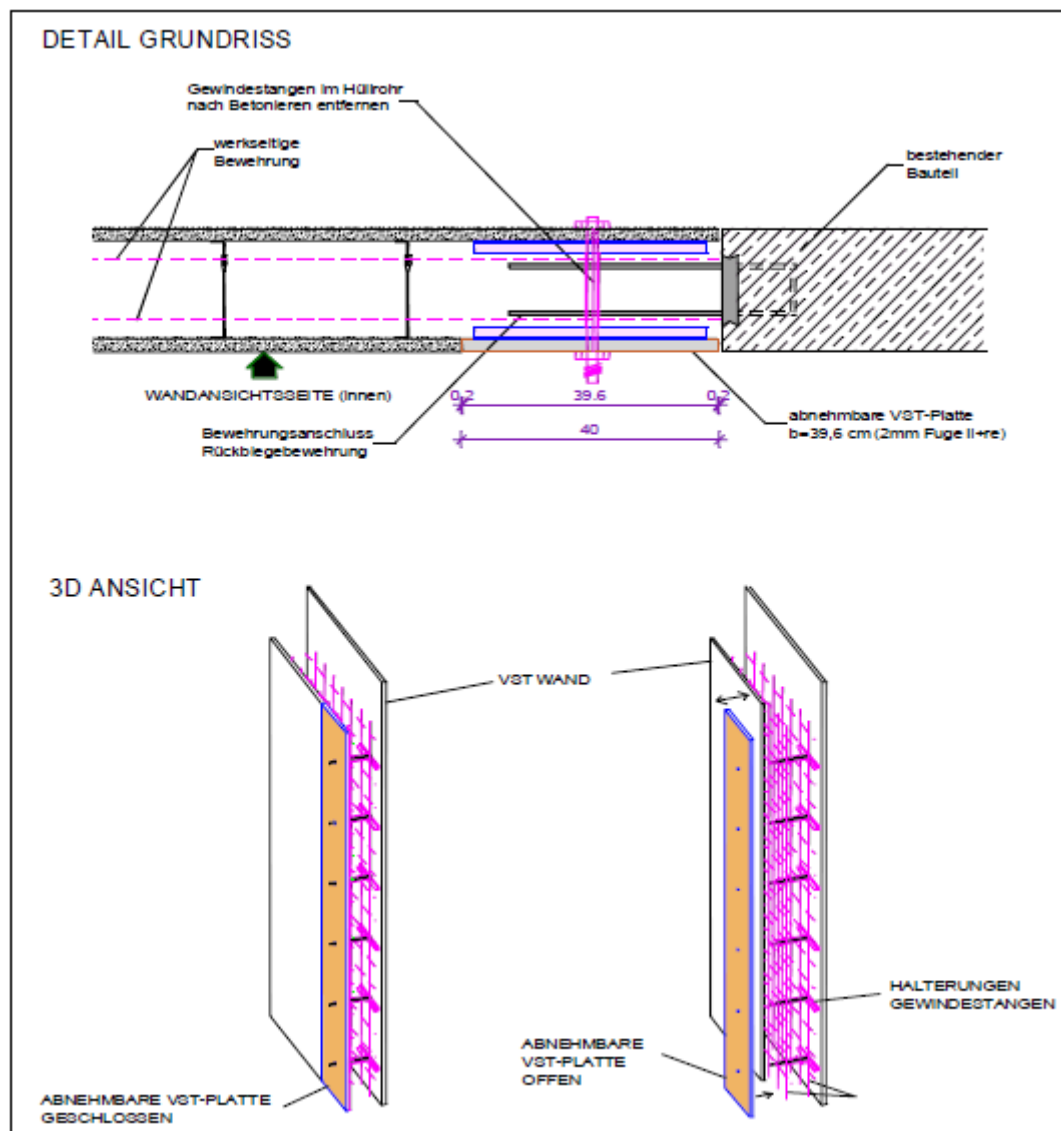
VST SYSTEM MANUAL

INSTALLATION ON SITE

threaded rods located in cladding, which connects a 40 cm wide and removable

VST panel with the outer wall layers on the opposite side.

After installing the walls, the rebend reinforcement can now be connected with the wall reinforcement in the 40 cm wide open space. The threaded rods are removed after the wall element is filled up with concrete. Remove threaded rods in cladding tube after concreting



2.12. Detail G: Corner joint with reinforcement connection

If a corner is created with a reinforcement network where only one side of the outer corner is accessible,

then accessible wall 1 is given a removable formwork, which is used for

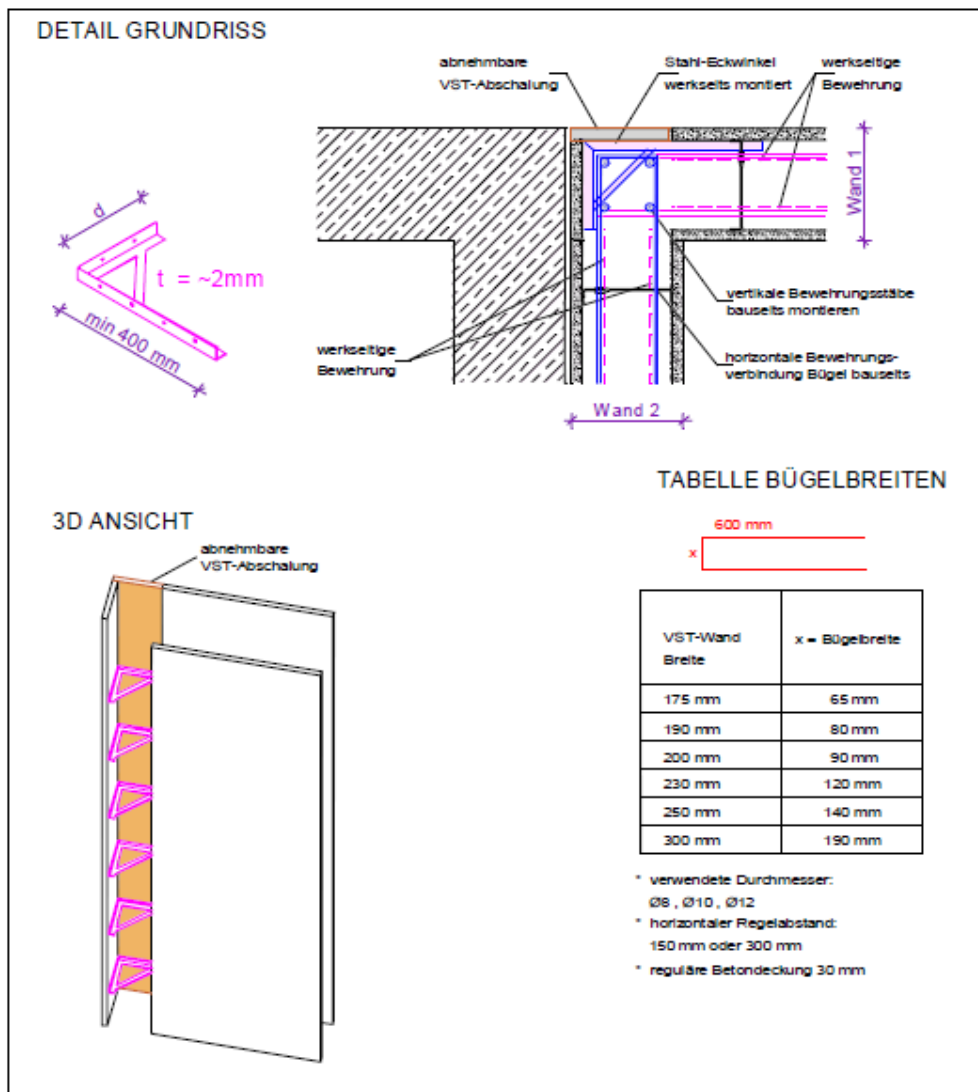
installing the reinforcement connection (connectors + vertical rods).

After the walls have been transferred and fixed into position, then the removable VST formwork is removed,

the reinforcement is installed and the wall is sealed once again. The air space with regard to the

removable formwork is 2 mm on each side. The inner corner is held in position by

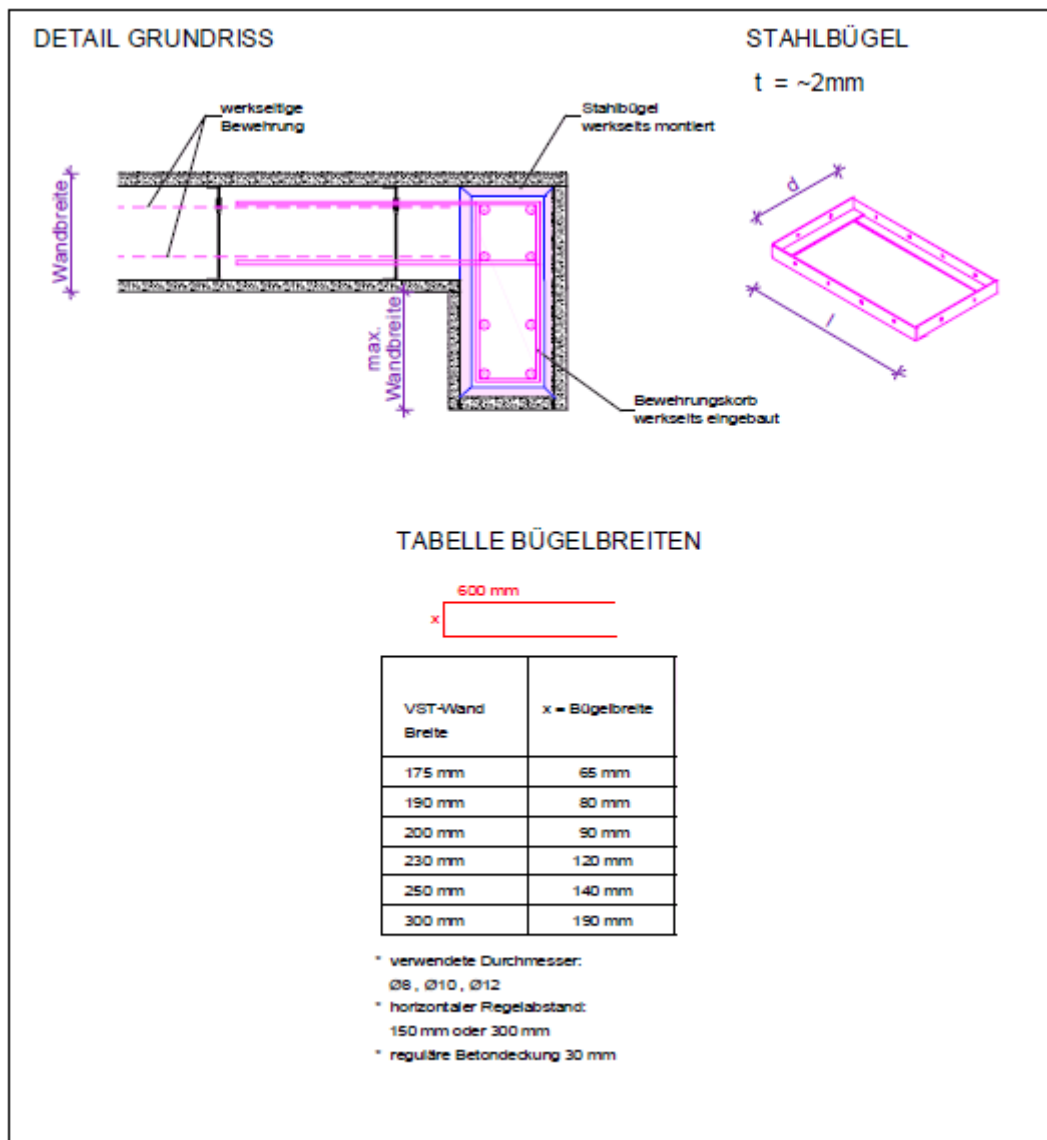
installing corner brackets on site.



2.13. Detail H: Wall connection with projection at end of wall

In the case of extremely short and reinforced walls, which in terms of reinforcement have to be connected with the connecting walls, then an element is completed on site that is already put together including the necessary reinforcement (e.g. bolts at the end of the wall, a connection wall in the case of wall openings, etc.).

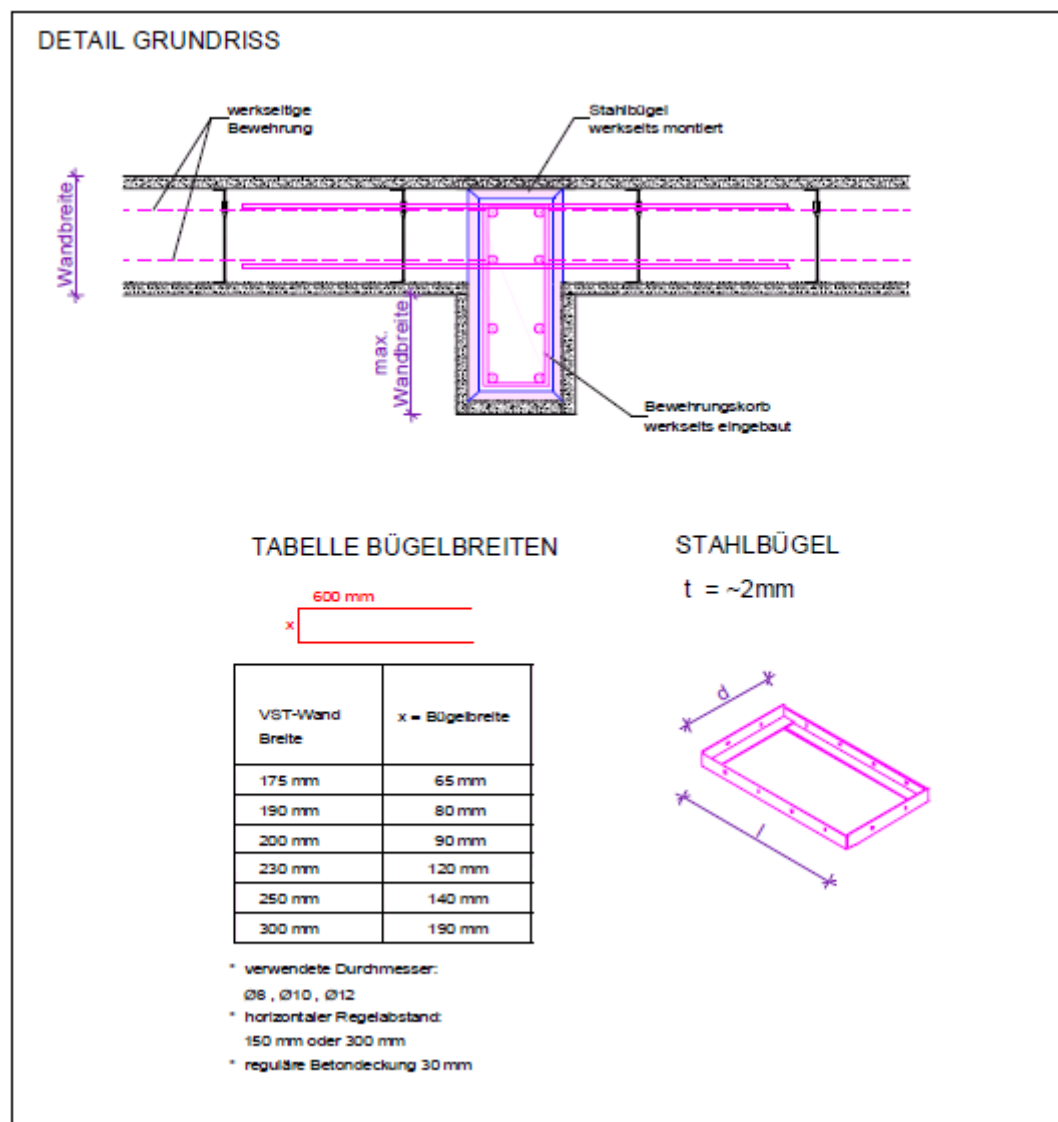
The projection of the overhang can, for loading capacity-related reasons, not be longer than the thickness of the wall itself.



2.14. Detail I: Projection within the wall element

Wall elements, which are not longer than their wall thickness analogous to detail “H”, can be integrated as a projection. However, it is not fixed to the end of the wall, and can be found anywhere within the wall element. In this case, this solution is prefabricated in the factory with all necessary reinforcements and is complete when it comes on site.

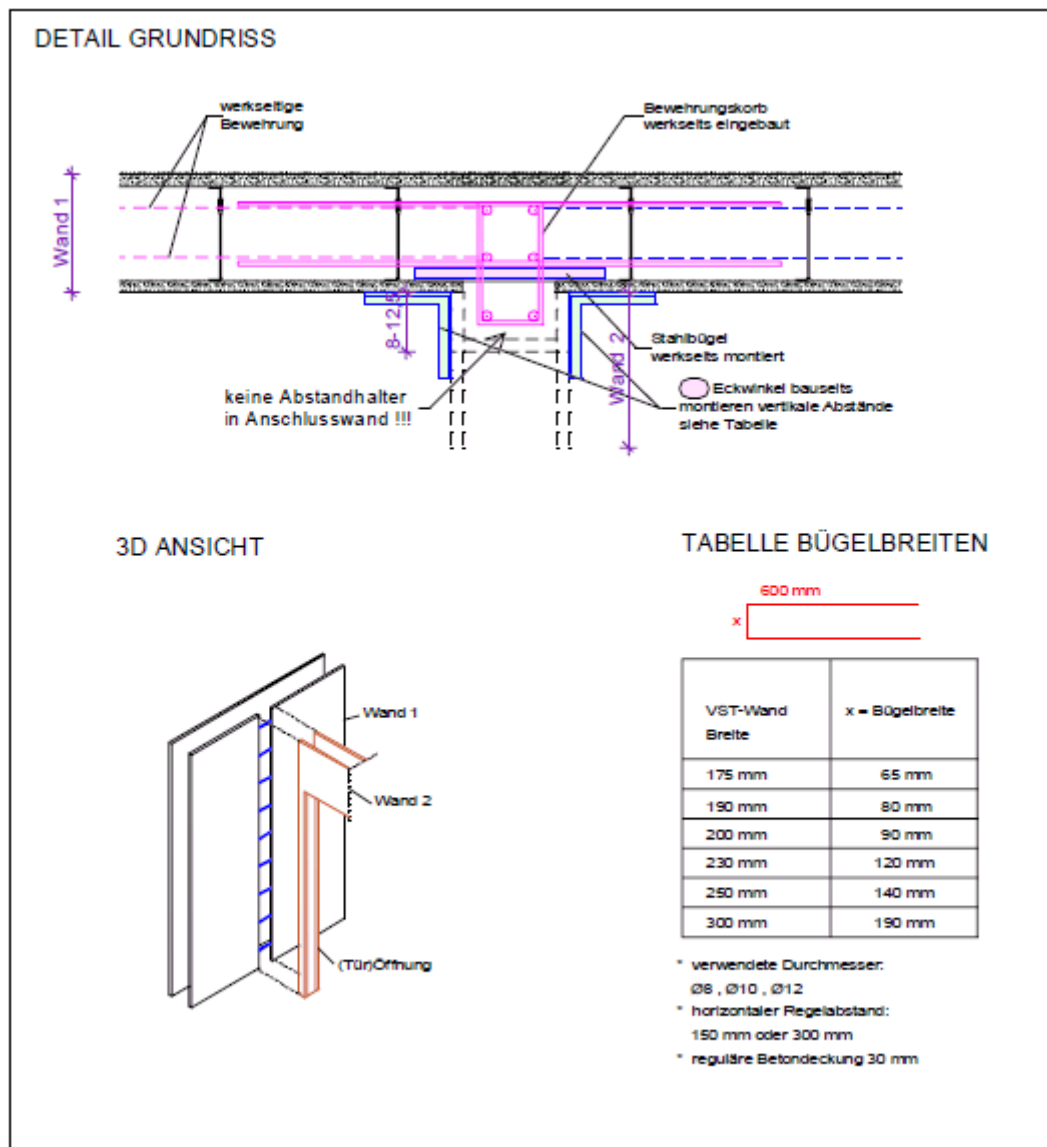
The projection of the overhang can, for loading capacity-related reasons, not be longer than the thickness of the wall itself. This projection can be the end of a wall, or the end of an opening (e.g. doors).



2.15. Detail J: Starter bars within the wall element

In the case of a T-shaped wall connection, where there is an opening in connecting wall 2 near the end of the wall (e.g. doors), then the necessary starter bars will already be installed in wall 1 at the factory. In this area, wall 2 contains no system spacers and no reinforcement bars.

The adjoining wall is held in position by screwing in corner brackets on site.



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INSTALLATION ON SITE

3. INSTALL CEILING

3.1. Structural slab

Installation of support variant 1:



Props in one direction (smaller clearance between props). This is the typical support type as it can be installed and removed easily. The advantage is that less material is used compared to variant 2.

The lower clearance between props is a disadvantage.

CONCRETE THICKNESS

SUPPORT WIDTH

12 -14cm	125cm
15 -17cm	120cm
18 -21cm	115cm
22 -26cm	110cm
27 -30cm	105cm

Installation of support variant 2:



Props in two directions (larger clearance between props). The centre distance of the upper beam position (secondary beams) is the same as in variant 1. The centre distance of the lower beam position (primary beams) is larger, which results in a larger clearance between props. Drawback: More props are required compared to variant 1.

Important note: (applies to both variants)

Height-related calibration of the ceiling support should be carried out with a rotary laser, if possible. If this is carried out with a guideline then the line must be kept taut and must not sag. This is ensured if calibration is carried out by 3 people (two people tighten the line and the third person adjusts the ceiling supports).



Attach the structural slab to the crane chain. Structural slabs are always attached to 4 crane chains.



Lift the structural slab to the assembly site



Setting up the structural slab at the assembly site (see ceiling design plan for the rotation direction)

Screwing structural slabs can start parallel to transportation. Panel joints must be screwed with U-braces. (left)

3.2. Surface mounted box



The location of openings (see ceiling design plan) is noted on the structural slabs. A box is produced at the VST site and

delivered to the building site.

Lift the surface mounted box to the assembly site

Screwing the surface mounted box to the ceiling

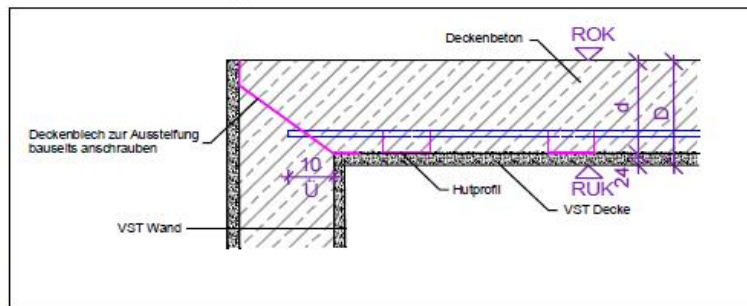
with metal brackets.

If necessary, cap profiles must be cut out in the area where there are openings in the slab.

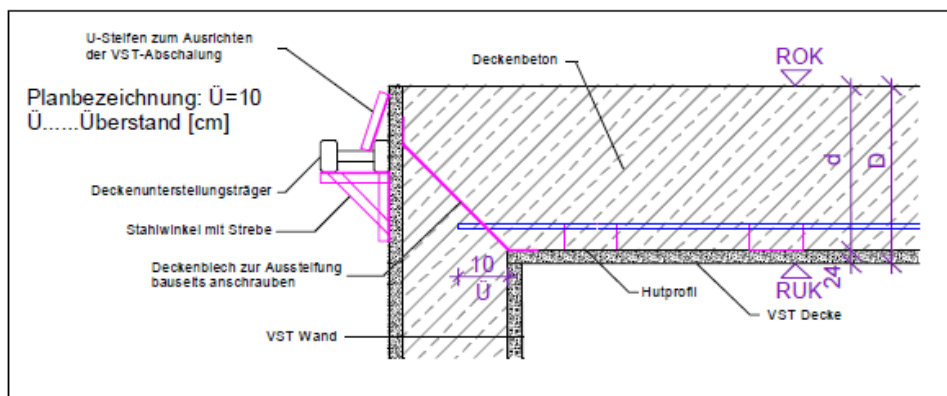


3.3. Formwork

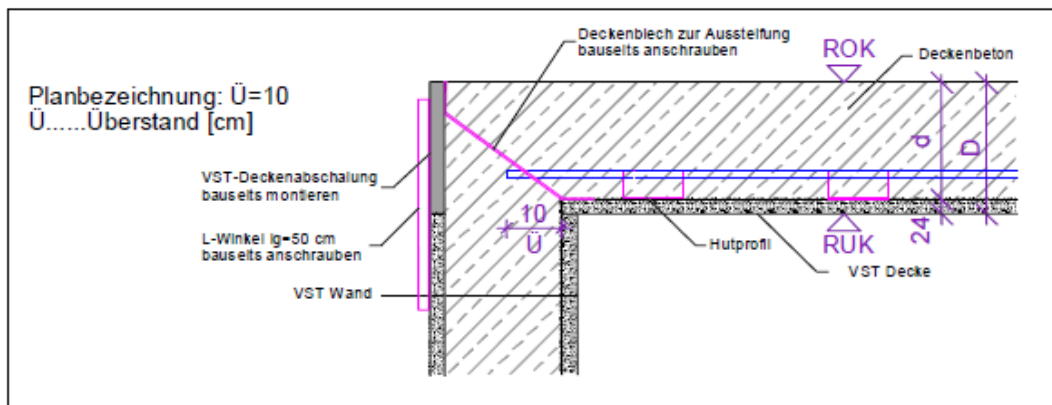
Formwork is used with free slab edges, recesses, and larger openings. Slab edge formwork on panels up to 25 cm thick are screwed to the panel using ceiling panels, pay attention to the alignment of the formwork.



Slab edge formwork in case of greater panel thicknesses must also be attached and made flush to ceiling panels with ceiling support beams, which are attached to the outside of the wall.



Slab edge formwork to be assembled on site is also, along with the ceiling panels, screwed with 50 cm long angle irons with approx. 40 cm clearance on the outside to the outer wall.



3.4. Expansion joints for ceiling grids

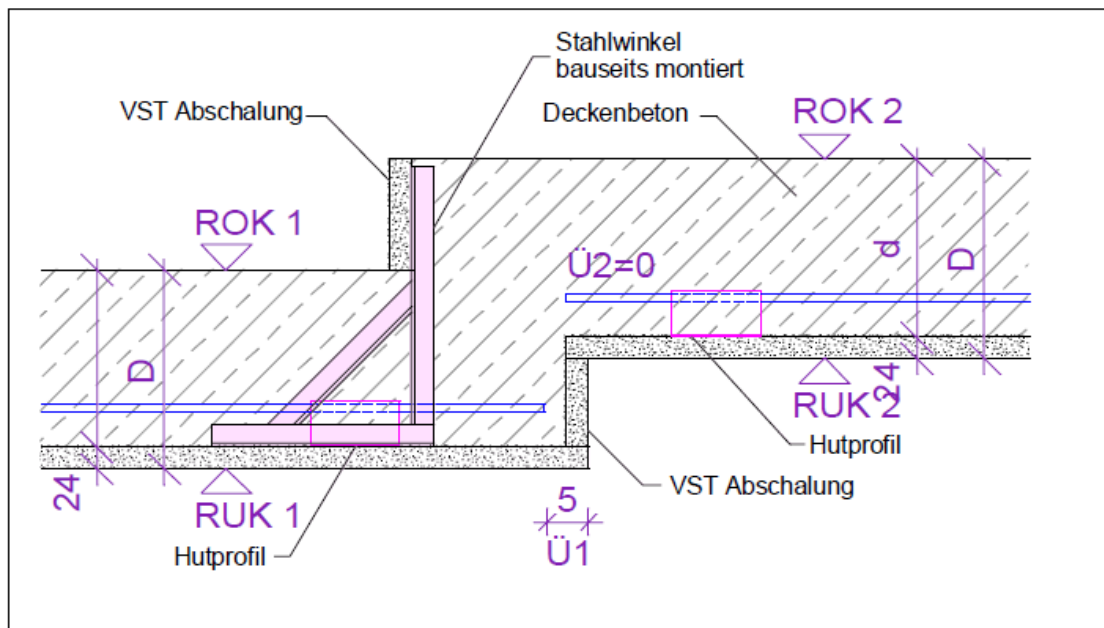
transport structural slab number 1

install the panel formwork in the area around the expansion joint

transport structural slab number 2

install the metal bracket or metal frame in the area around the expansion joint

screw the panel formwork with a metal bracket or metal frame.



Expansion joint variants:

Ceiling - support beam - ceiling

ceiling - wall - ceiling

4. INSTALLATION OF COLUMNS AND CAPITALS



Levelling the props

Attach props to the crane chains and lift to the assembly site

Set down in the correct location

Fixing into position with push-pull props

Carry out vertical adjustments with spirit level by turning the push-pull props, connect floor ties

Unhook the crane hook.



Set the capital on the prop

Screw to prop with metal bracket

After transporting the slab, connect to the slab from above

5. INSTALLATION OF SUPPORT BEAMS



Supports (wall, props, in-situ walls,...) must already be available

Also prepare support for longer support beams

Monitoring the support (height, clearance,...)

Attach support beam to crane chain and lift to assembly site

Slowly set down the support in the correct location (see view direction of wall sequence plan)

Screw the supports with U-braces and metal brackets to the VST wall or VST props.

Installation of support (Doka beams, tubular uprights, crowns)

Unhooking the crane hook.



6. INSTALL STAIRCASES

6.1. Straight staircases

Transfer takes place after the ceiling is installed but when ceiling reinforcement is not installed. Attach the flight of stairs in the right place on the crane hook (should, in a swaying position, have the final degree of tilt to simplify transport).



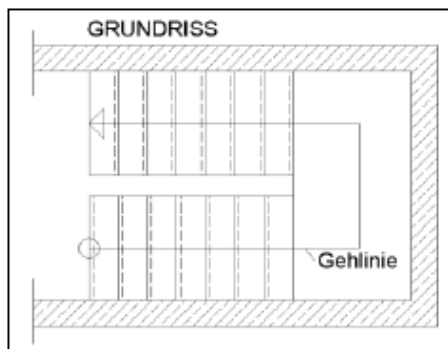
Set down slowly at the installation site (0.5 - 1 cm allowance from the wall).

Install acoustic decoupling elements if necessary (neoprene support, Tronsole).

Installation of support.

Unhook the crane hook.

6.2. U-shaped stairs



Transfer takes place after the ceiling is installed but when ceiling reinforcement is not installed.

Prepare support for intermediate landing.

Install the intermediate landing (note the height and air space) at the bottom step, if necessary, install a neoprene support.

Attach flight of stairs 1 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt to simplify transport).

Set down slowly at the installation site, fix the bottom and top steps, and install Tronsole on the top step if necessary.

Installation of support, unhook the crane hook.

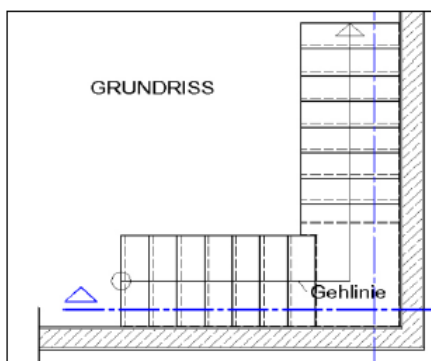


Attach flight of stairs 2 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt).

Set down slowly at the installation site, fix the bottom and top steps, and install Tronsole on the top and bottom steps if necessary.

Installation of support, unhook the crane hook.

6.3. U-shaped stairs



Transfer takes place after the ceiling is installed but when ceiling reinforcement is not installed. Prepare support for intermediate landing.

Install the intermediate landing (note the height and air space - similar to VST panel).

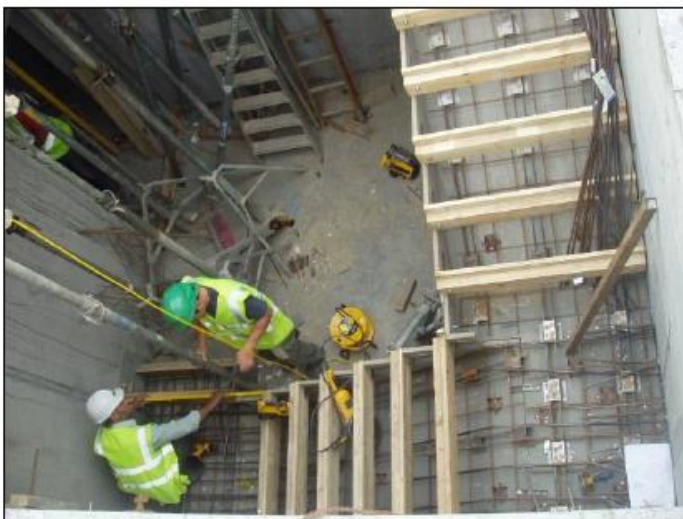
If necessary, install a neoprene support on the bottom step.

Attach flight of stairs 1 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt to

simplify transport).

Set down slowly at the installation site.

Fix the bottom and top steps, and install Tronsole on the top step Installation of support. Unhook the crane hook.



Attach flight of stairs 2 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt).

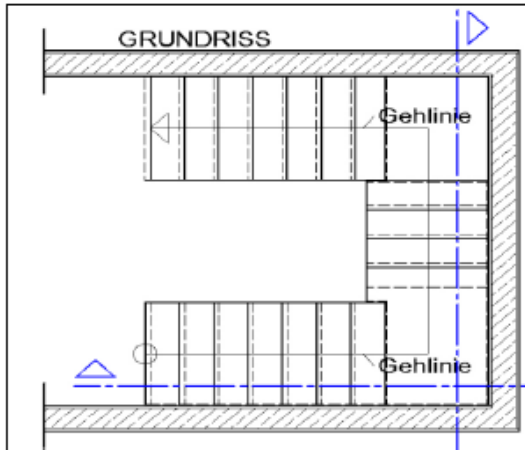
Set down slowly at the installation site.

Fix the bottom and top steps, and install Tronsole on the top and bottom steps if necessary.

Installation of support.

Unhook the crane hook.

6.4. Quarter landing stairs



Transfer takes place after the ceiling is installed but when ceiling reinforcement is not installed.

Prepare the support for the intermediate landing.

Install intermediate landing 1 (note the height and air space).

If necessary, install a neoprene support on the bottom step.

Attach flight of stairs 1 in the right place on the crane hook (should, in a swaying position, have the final

degree of tilt to simplify transport).

Set down slowly at the installation site.

Fix the bottom and top steps, and install Tronsole on the top step

Installation of support.

Unhook the crane hook.

Prepare the support for intermediate landing 2.

Install intermediate landing 2 (note the height and air space).

Attach flight of stairs 2 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt).

Set down slowly at the installation site.

Fix the bottom and top steps, and install Tronsole on the top and bottom steps if necessary.

Installation of support.

Unhook the crane hook.

Attach flight of stairs 3 in the right place on the crane hook (should, in a swaying position, have the final degree of tilt).

Set down slowly at the installation site.

Fix the bottom and top steps, and install Tronsole on the top and bottom steps if necessary.

Installation of support.

Unhook the crane hook.

Installing formwork.

6.5. Installation of reinforcement on site

After assembling the staircase, install reinforcement on site as per the staircase reinforcement plan.

Install ceiling reinforcement.

Spray wood risers with mould oil.

Concreting the staircase.

Remove the wood risers after setting.

Remove the support when completely set.

7. INSTALLING A SLOPING WALL

Installation of a sloping wall is more demanding. The combination of vertical and sloping walls means particular attention should be given to installation of the support. See point 6.1 (wall) regarding the transfer of vertical walls. Installation of the support for a sloping wall should be handled in the same manner as for a staircase. The elements are fixed into the correct position using push-pull props, ceiling supports, and metal brackets.

Installation of reinforcement on site should be carried out as per the reinforcement plans.



8. REINFORCEMENT WORK

A difference is made between factory reinforcement and reinforcement carried out on site. The separation between the two is already clear during planning. For example, plans are created for wall reinforcement at the factory and wall reinforcement on site (see Manual Reinforcement).

Calculation of necessary reinforcement and reinforcement work is based on national norms and guidelines.

Transportation of reinforcement is carried out in line with the reinforcement plans.

9. CONCRETING WORK

9.1. Concreting walls and props

In contrast to the in-situ method, concreting of VST walls is carried out in stages, whilst the curing time between the concreting stages (min. 1 hour) must be guaranteed.

e.g. Wall height 2.90 m

Concreting process 1: 30 – 45 inches (0 – 1.00 m)

Concreting process 2: 30 – 45 inches (1.00 – 2.20 m)

Concreting process 3: 2.20 – 2.90 m directly before concreting the ceiling



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It is important to carry out several concreting processes when concreting walls. This prevents the permitted concrete pressure on VST walls from being exceeded.

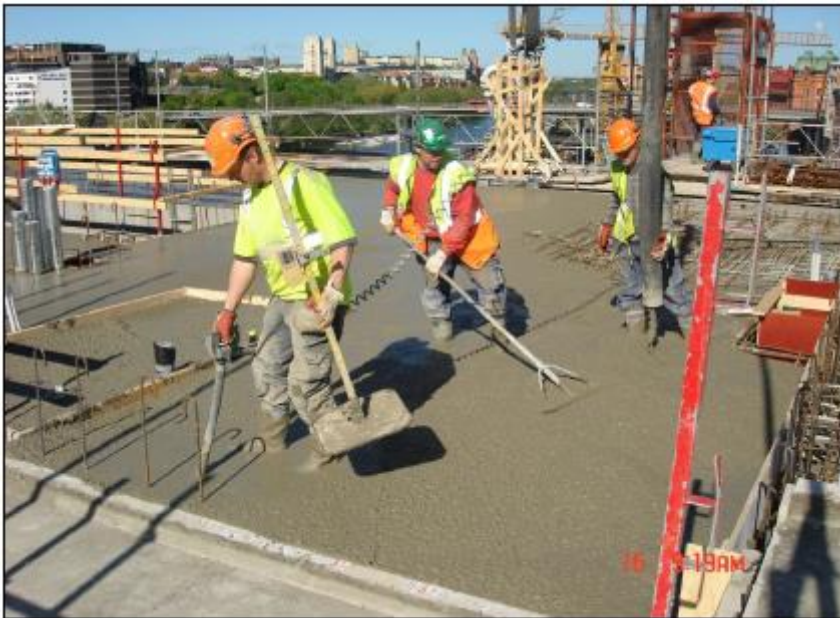
Pourable and self-compacting concrete with a flow diameter ≥ 59 cm / maximum grain size ≤ 14 mm should be used for concreting VST wall elements. Quality of concrete as per static requirements or according to the structural engineer's specifications.

Application of the concrete is in layers with a concrete bucket and a filling hose - fall height < 1.50 m. The entire wall is concreted. It must be borne in mind that concrete should be applied evenly, not in batches. The use of concrete vibrators is not permitted!

It shall be pointed out that quality-assured concrete should be used with regard to quality, strength, and properties.

9.2. Concreting ceilings, supports, staircases

The work processes whilst concreting ceilings, supports, and staircases are the same as with a traditional in-situ method. A concrete pump can be used for ceilings and supports. In the case of staircases, it is advisable to use a concrete bucket (low, step-by-step concreting).



Plasticised concrete with a flow diameter ≥ 45 cm / maximum grain size ≤ 32 mm should be used for concreting VST ceilings. Quality of concrete as per static requirements or according to the structural engineer's specifications.

Use of concrete vibrators is permitted.

Ceiling surfaces are smooth and level, and should be processed in line with tolerances in building construction.

It shall be pointed out that quality-assured concrete should be used with regard to quality, strength, and properties.

VST SYSTEM MANUAL

INSTALLATION ON SITE

10. REMOVAL OF TRANSPORTATION AIDS

Removal of transport aids (installation material, push-pull props, etc.) is done after the concrete has set. Installation of the support (ceiling, sloping walls, props, staircases) is done according to the structural engineer's specifications. Removed installation material will be delivered back to the VST plant after completion of work on site and can be reused.

11. INSTALLATION WORK

Technical unit parts with a flush-mounted design are either already installed in the factory in VST elements, or are installed by authorised companies during installation on site.

11.1. Electrical systems

Basic installation of electrical units takes place in the usual manner, identical to a traditional in-situ and/or - partition wall construction method with typical installation materials such as cavity wall boxes and flexible installation pipes.

Cavity wall boxes are attached to the VST elements using drill bits or compass saws. If cut-outs made on site collide with the system spacers of the VST elements, then these should be removed with a suitable tool.

Further necessary openings, holes, and slots for installation are in the VST components in line with planning specifications. Spacer-free installation zones as per DIN 18015-3 are not normally included in the VST elements!

11.2. Units for heating, ventilation, sanitation

Complete installation for heating, ventilation, and sanitation units also take place in a typical manner as expected for a typical construction project. The necessary openings, holes, and slots for installation are in the VST components in line with planning specifications.