

CLT by Stora Enso Construction



Stora Enso Wood Products

Building Solutions

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1

Frame construction



Frame construction

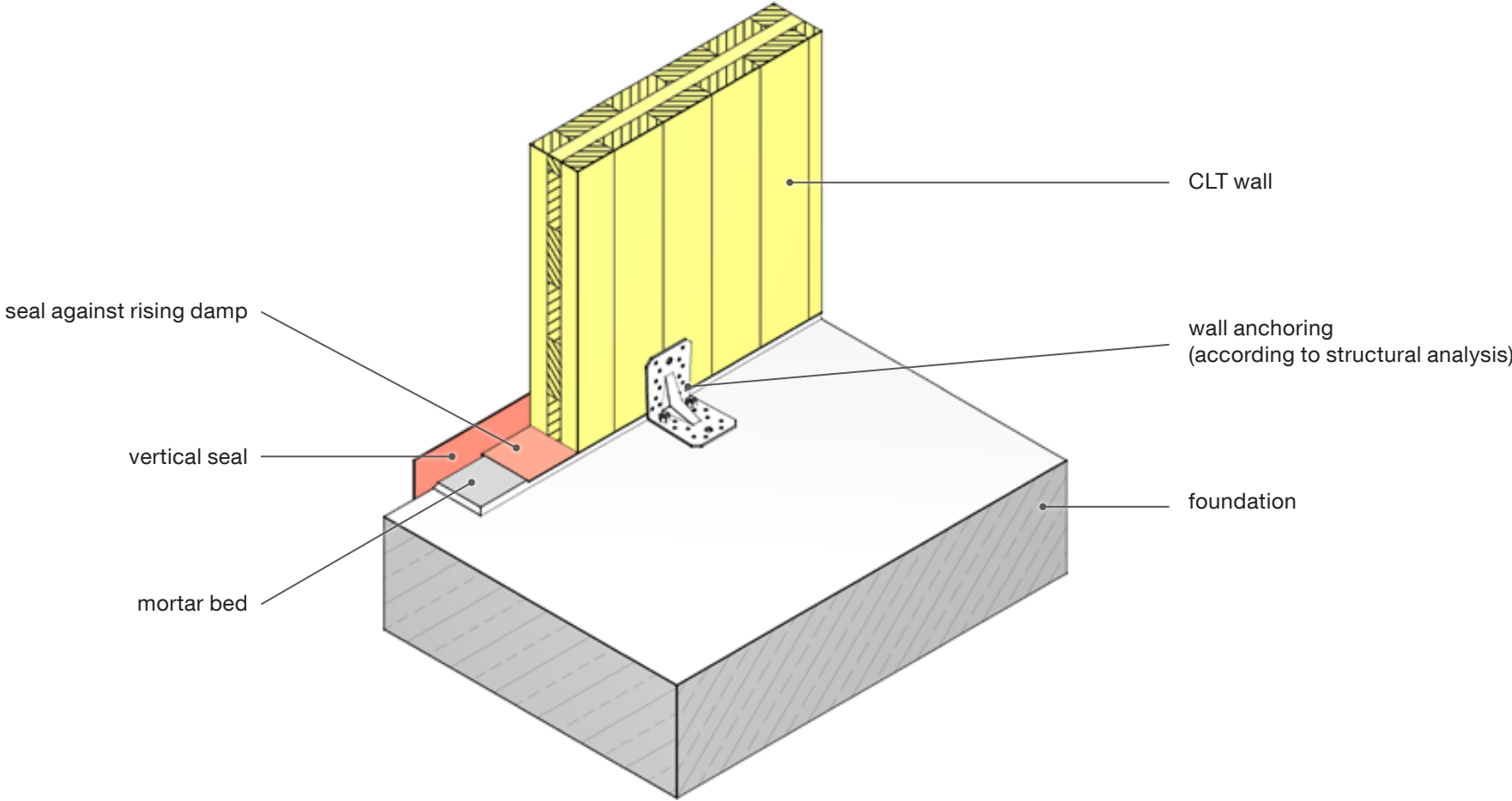
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Frame construction

Base and wall anchoring

1. Base with mortar bed



Execution

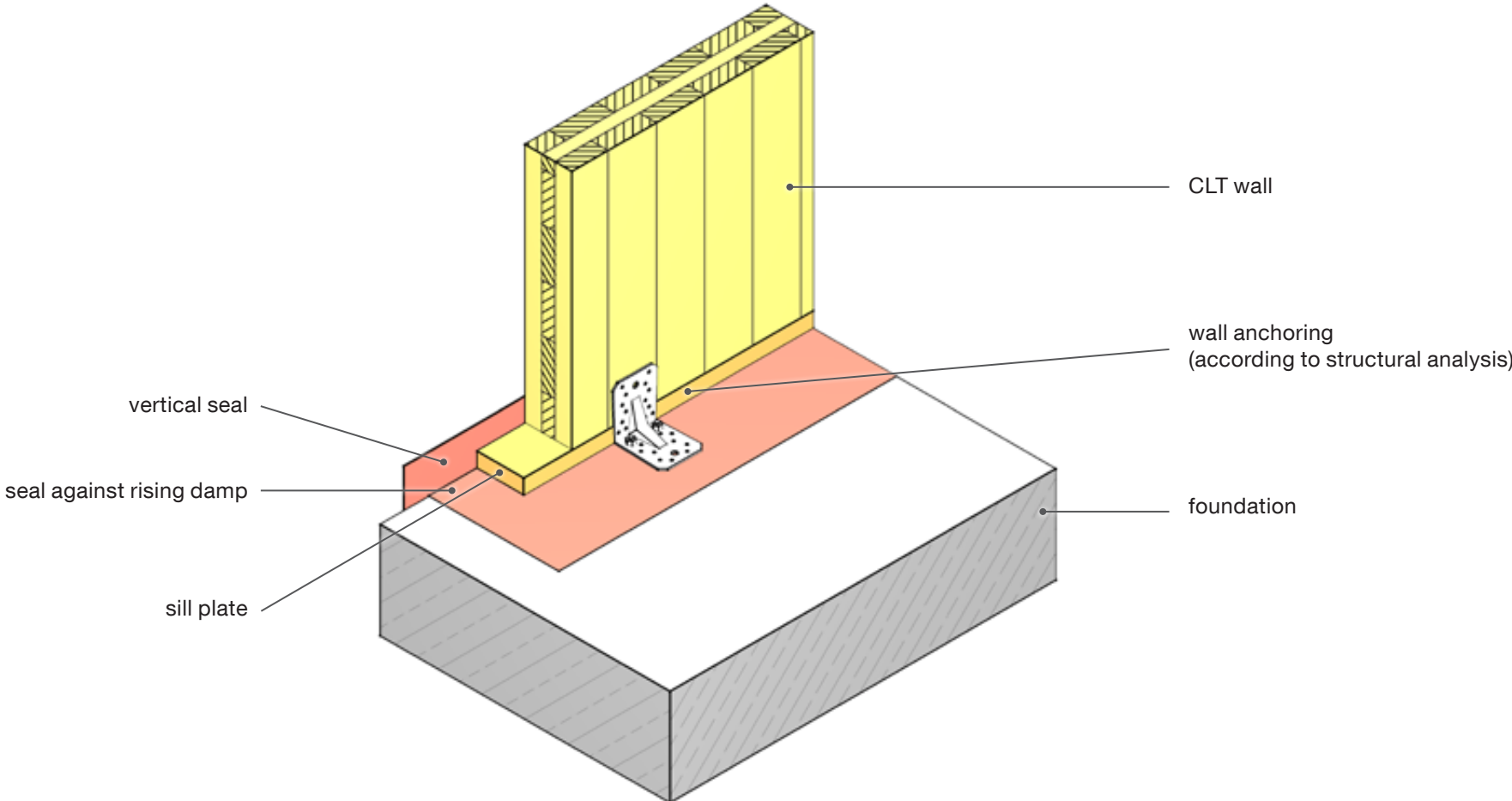
- The CLT element can be installed on a dry or wet mortar bed for tolerance compensation (full surface contact). The CLT must be protected against rising damp using a suitable damp-proof seal.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When fitting the wall anchoring (tensile and shear forces), the permissible edge distances for the connectors must be observed.

Illustrations



Frame construction

2. Base with sill plate

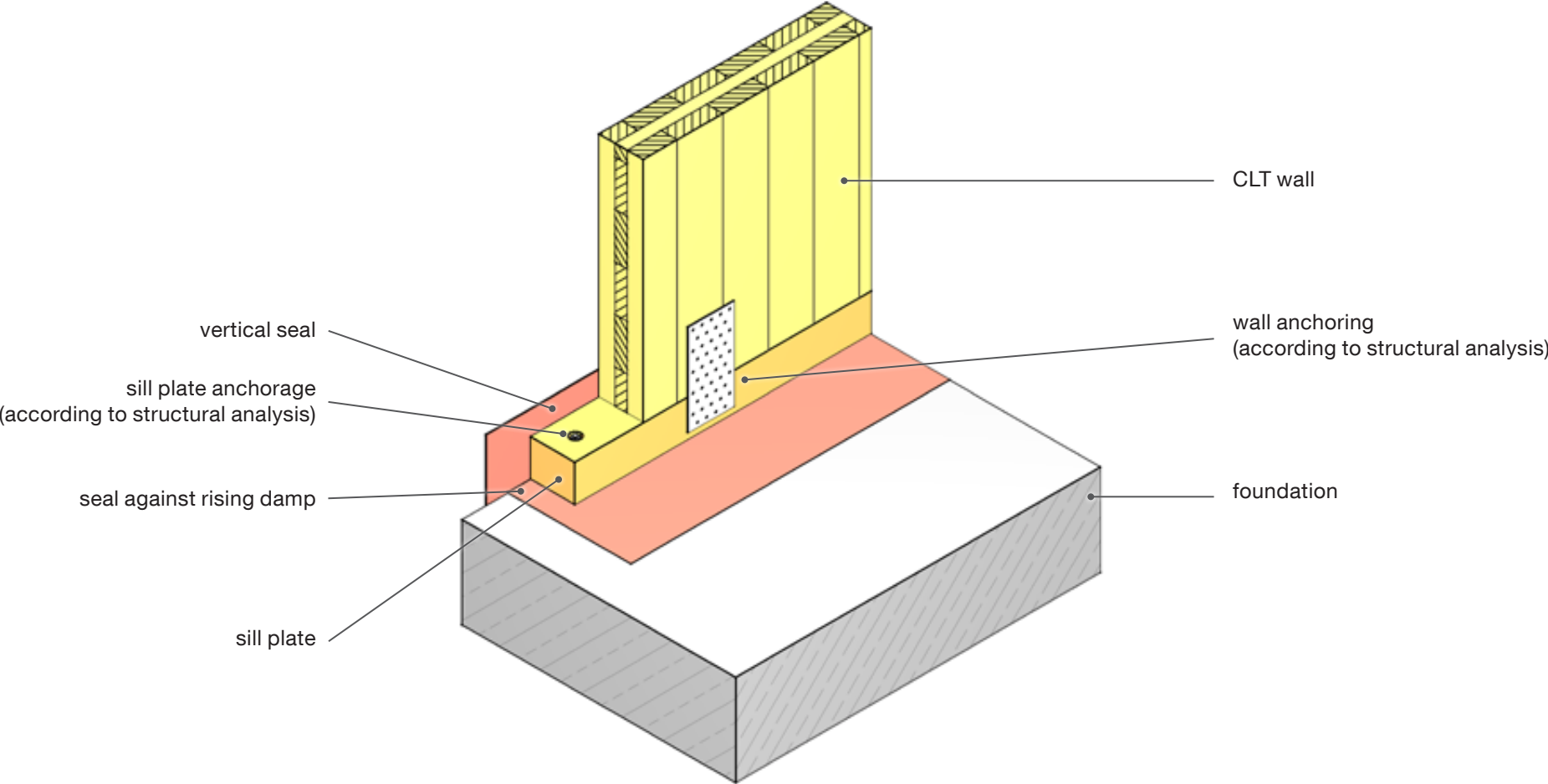


Execution

- The sill plate in turn must be protected against damp rising from the foundation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When fitting the wall anchoring (tensile and shear forces), the permissible edge distances for the connectors must be observed.

Frame construction

3. Base with raised sill plate

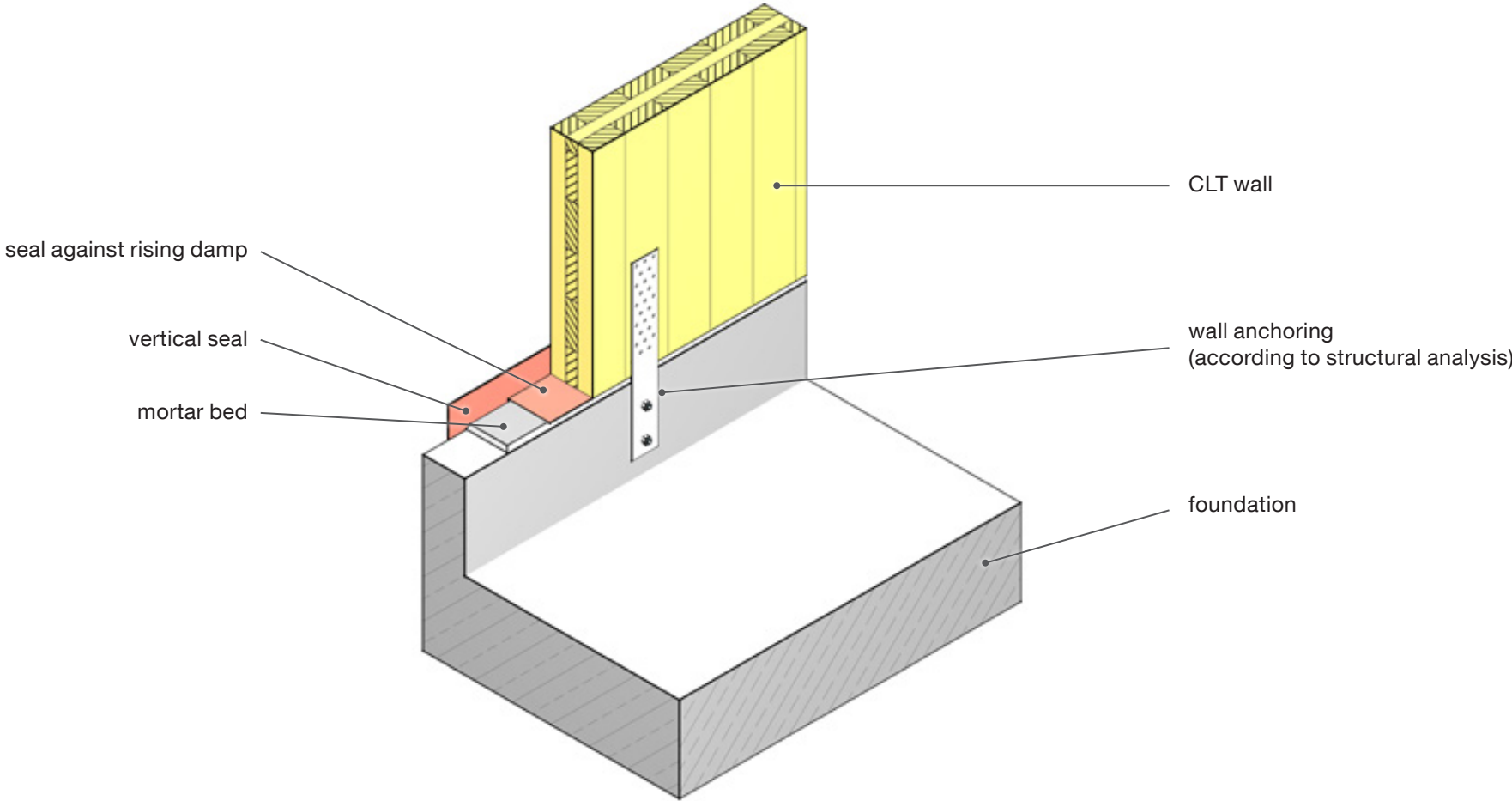


Execution

- The sill plate in turn must be protected against damp rising from the foundation.
- A raised sill plate enables a small but often necessary increase in the wall height from 2,950 mm to approx. 3,050 mm.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When fitting the wall anchoring (tensile and shear forces), the permissible edge distances for the connectors must be observed.

Frame construction

4. Concrete base (mortar bed)



Execution

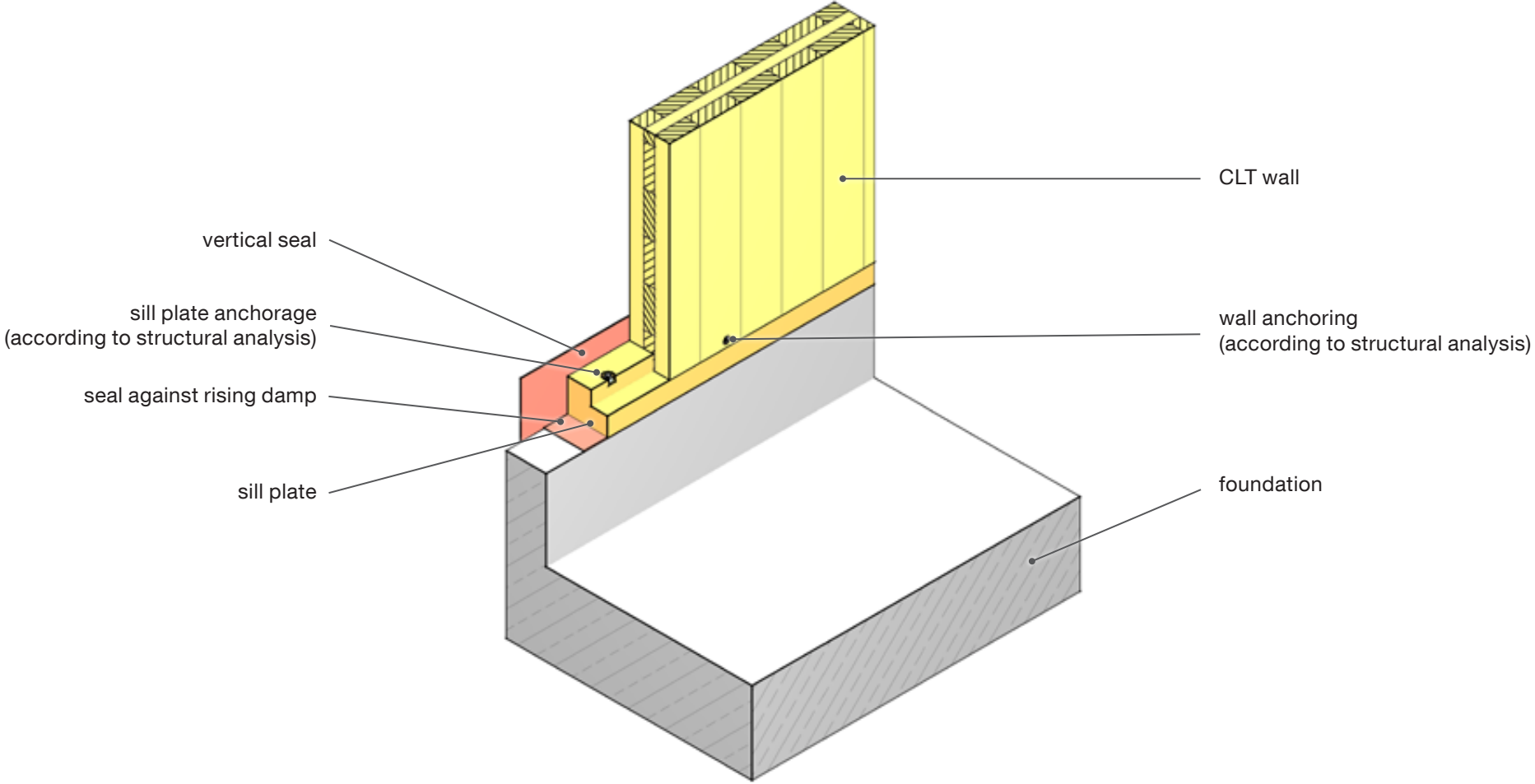
- The CLT element can be installed on a dry or wet mortar bed for tolerance compensation (full surface contact). The CLT must be protected against rising damp using a suitable damp-proof seal.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When fitting the wall anchoring (tensile and shear forces), the permissible edge distances for the connectors must be observed.

Illustrations



Frame construction

5. Concrete base (sill plate)



Execution

- The sill plate in turn must be protected against damp rising from the foundation.
- In the case of wall anchorings, as shown in the picture on the left, please note that costs will be higher because of the horizontal and vertical loads that have to be absorbed.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When screwing the CLT element to the sill plate, the permissible edge distances for the connectors must be observed.

Illustrations



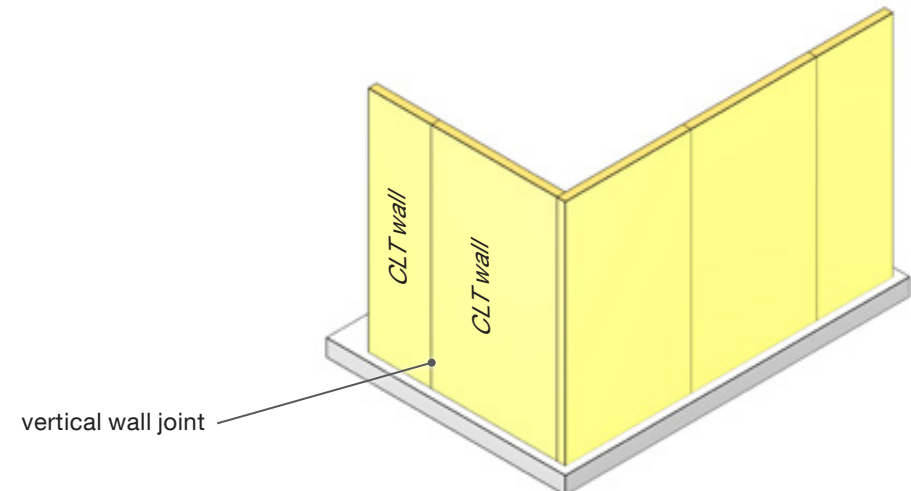
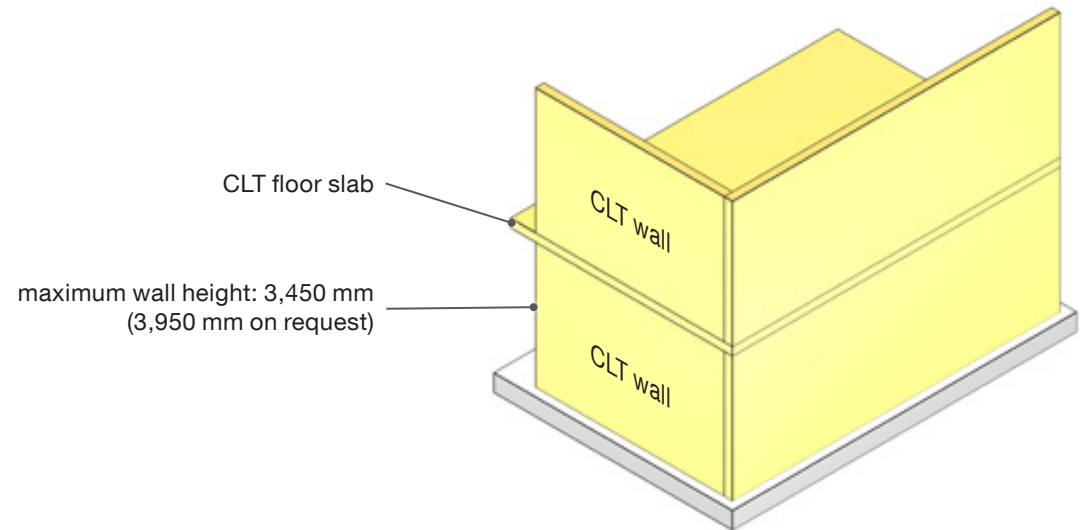
Frame construction

Wall joints

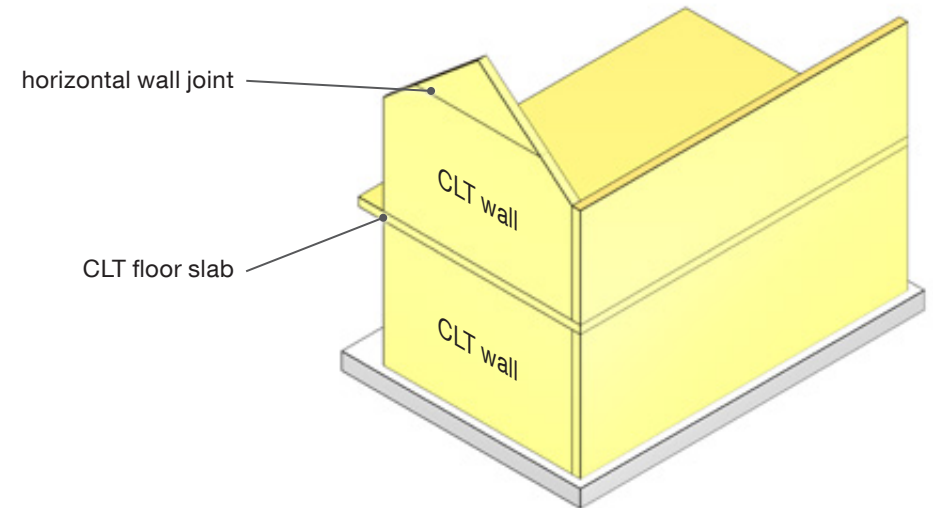
1. Basic design rules

CLT walls should preferably be full-storey height (no joints).

If the walls are higher than 2,950 mm or if extra-wide panels (requiring special transport) are to be avoided, the CLT walls can be joined vertically. See details under “Horizontal wall joint (external cover boards)” and “Vertical wall joint (lap)”.

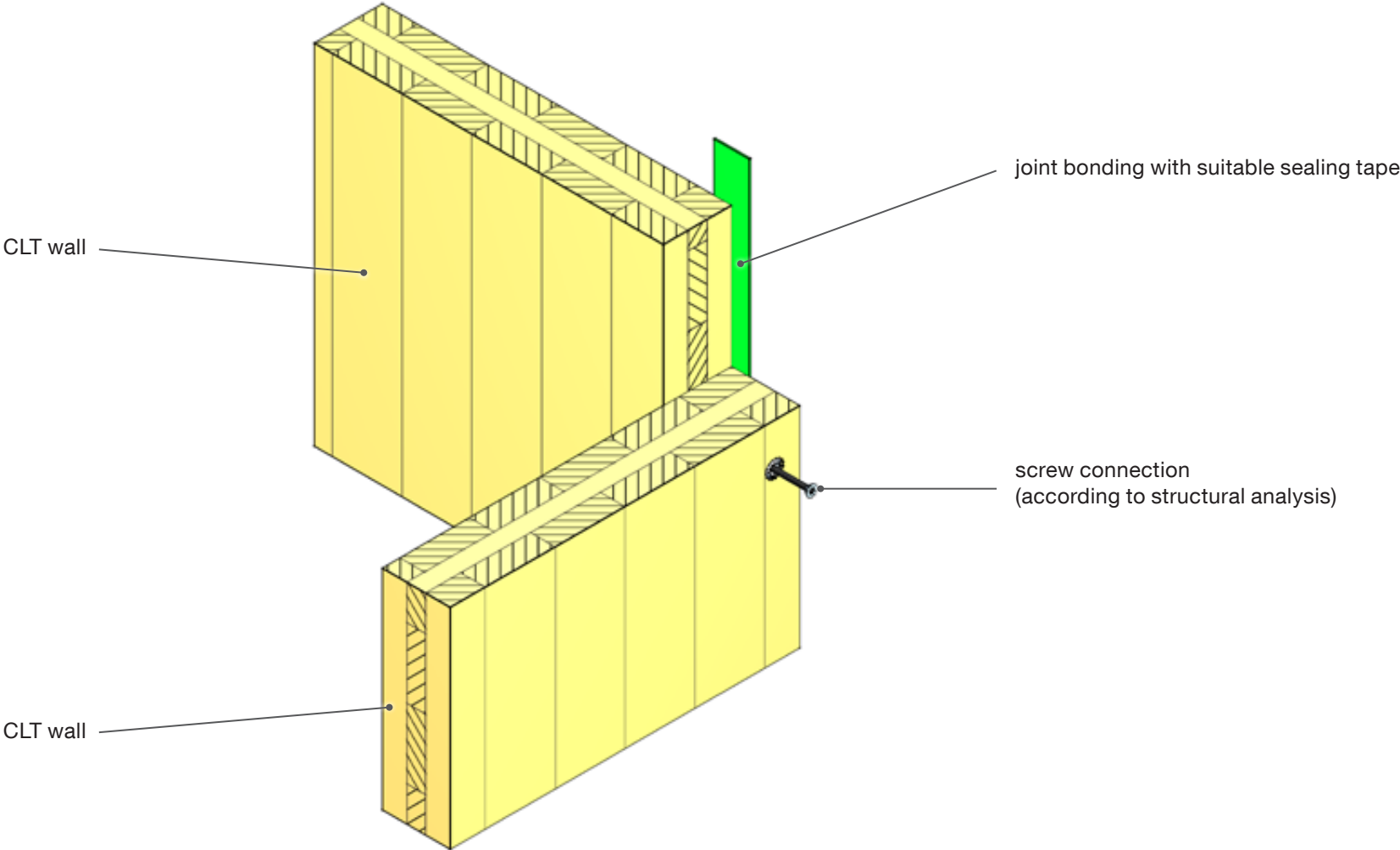


If alternatives 1 and 2 cannot be used, the panels must be joined horizontally. See details under “T-joint”, “Horizontal wall joint (cover board)” and “Horizontal wall joint (butt jointing)”.



Frame construction

2. Corner joint



Execution

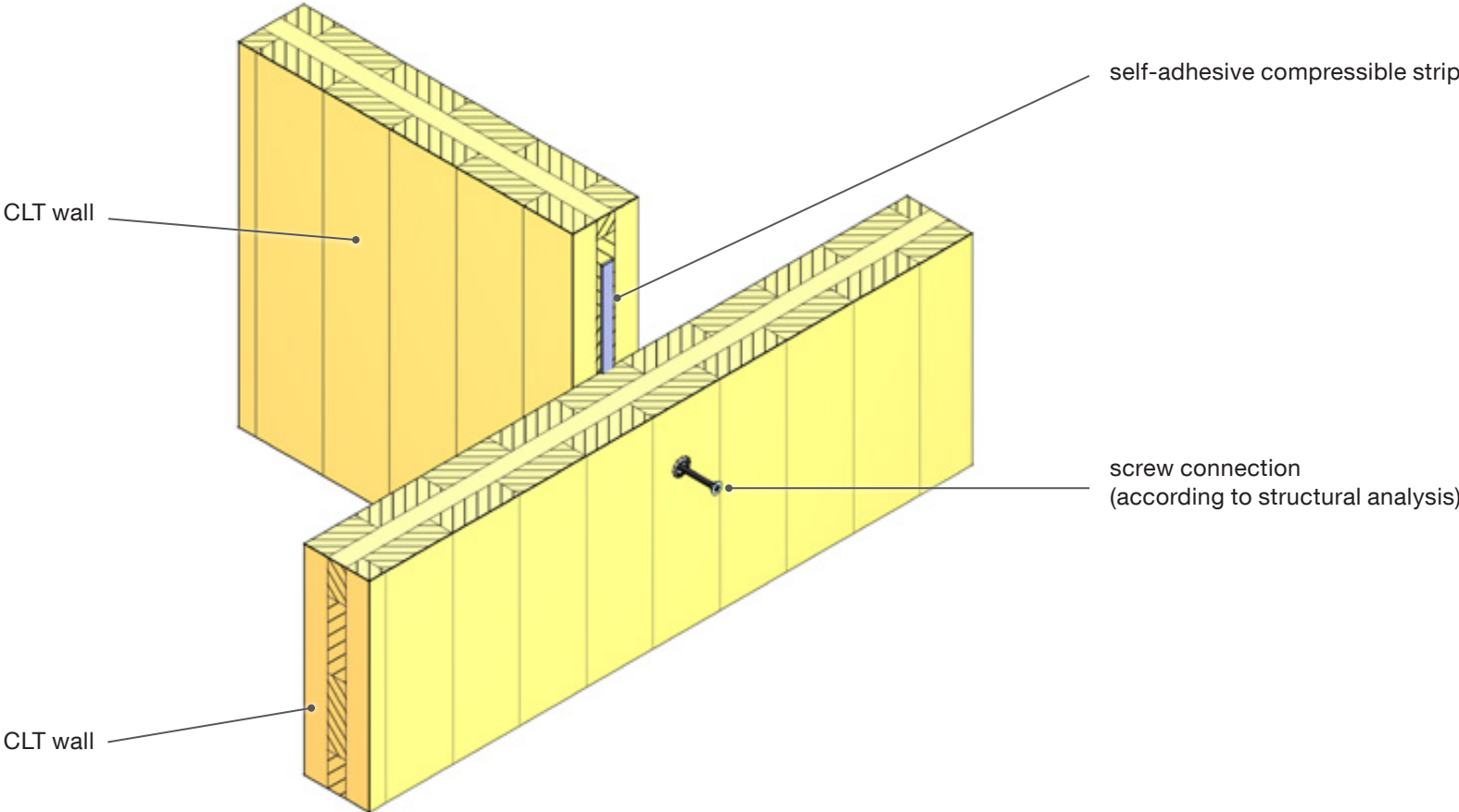
- To achieve the required airtightness in a building, the joints of the CLT elements can be sealed with suitable sealing tape on the inside or outside of the elements.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection at the corner joint must be made either purely constructionally (screw at 90°) or in a structurally effective way (slanted end-grain screwing).

Illustrations



Frame construction

3. T-joint



Execution

- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection at the T-joint must be made either purely constructionally (screw at 90°) or in a structurally effective way (slanted end-grain screwing).

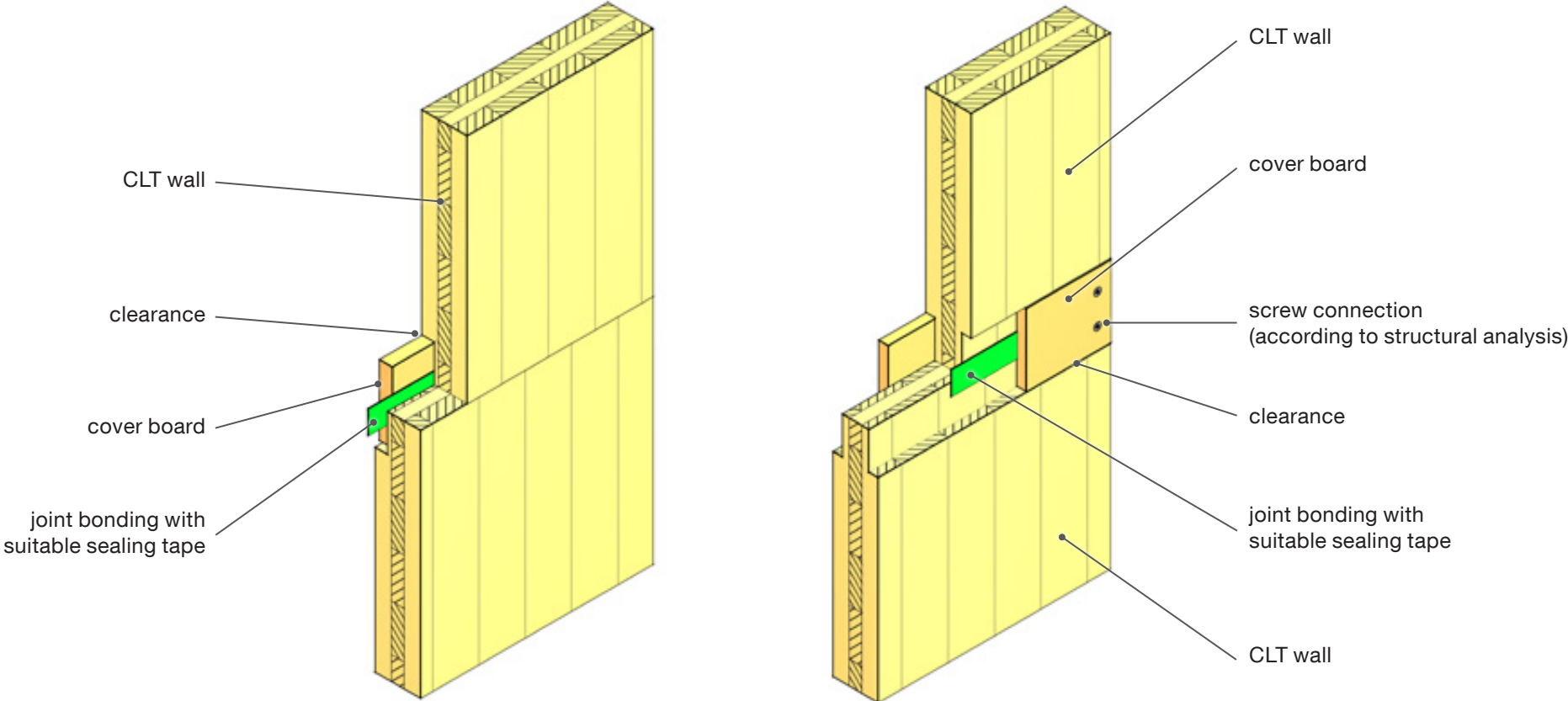
Illustrations



Frame construction

4. Horizontal wall joint (cover board)

The joints shown here have only limited torque rigidity.



Execution

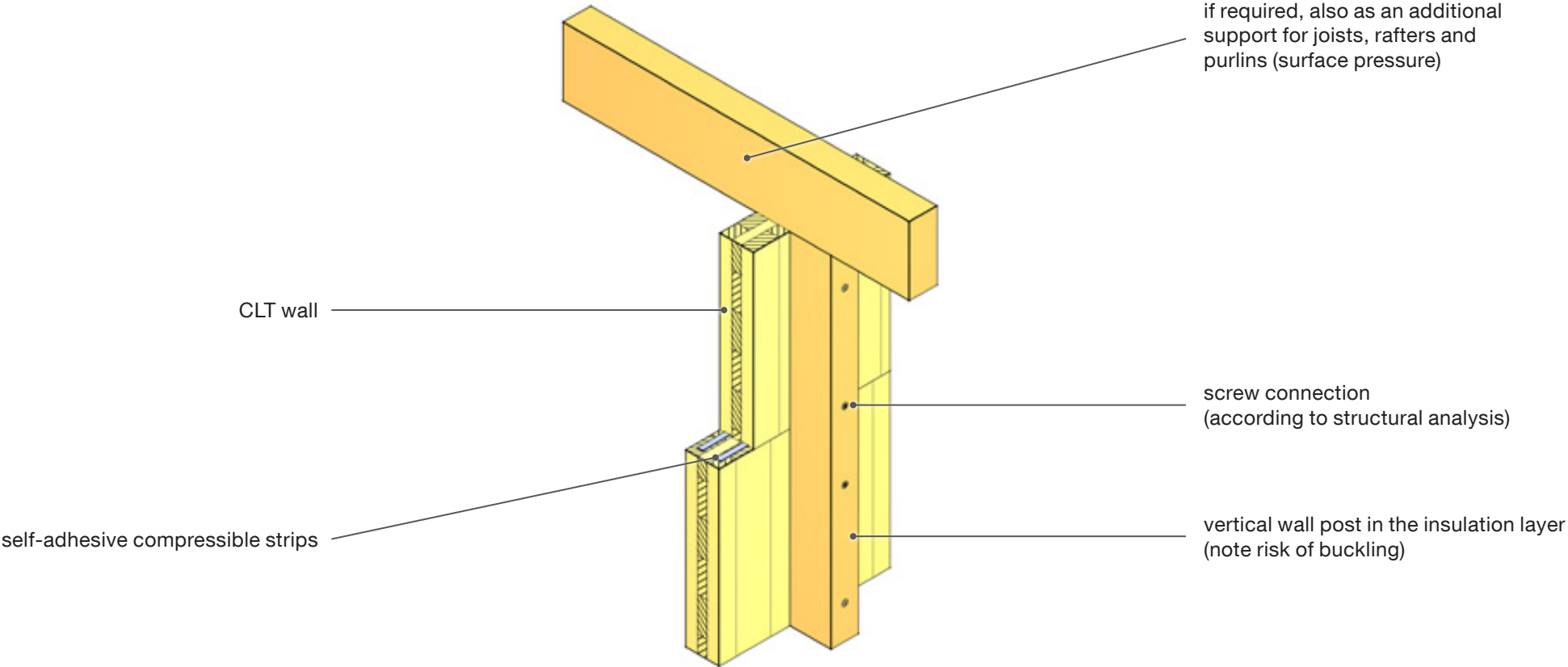
- When using cover boards (e.g. 3-layer board or laminated veneer lumber), the standard rebate dimensions of 27 × 80 mm should preferably be ensured.
- Sealing tape must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Frame construction

5. Horizontal wall joint (butt jointing)



Execution

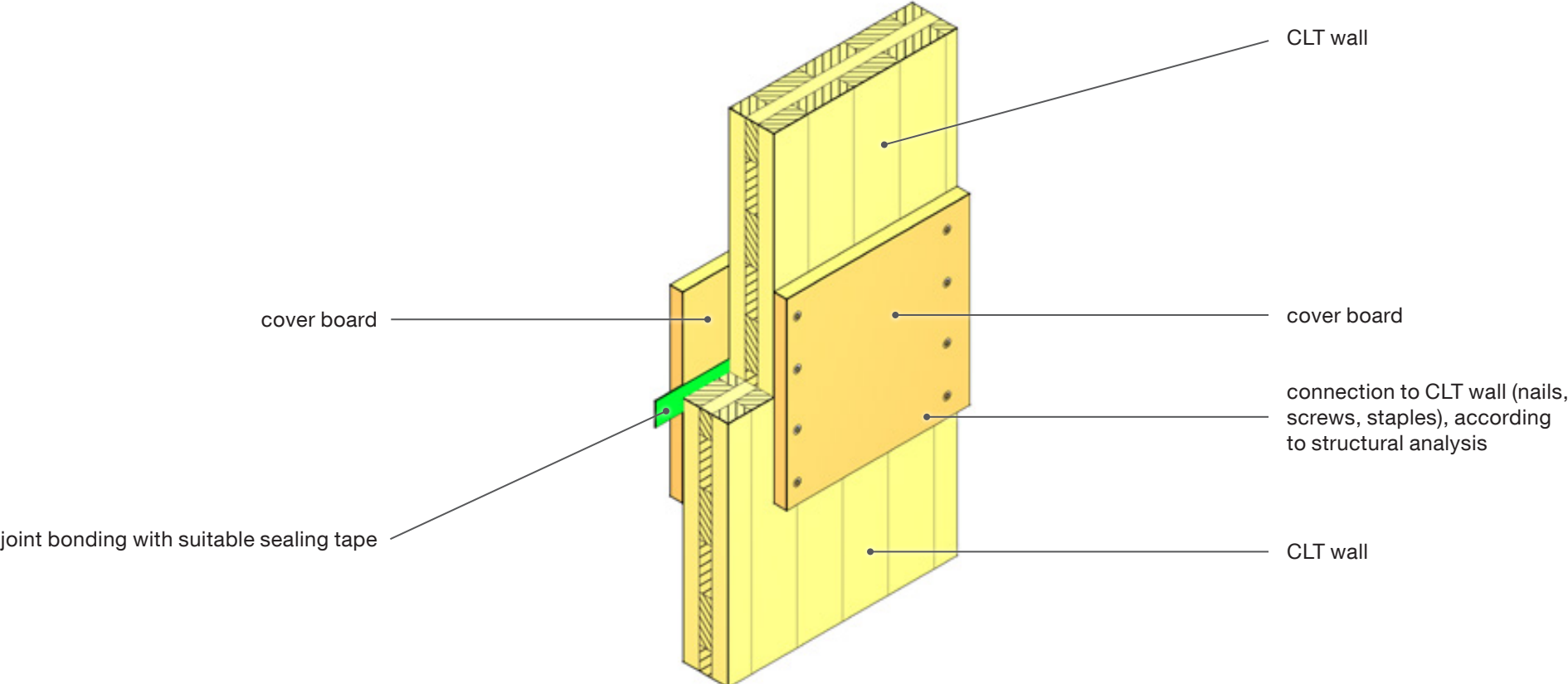
- Self-adhesive compressible strips must be used to make the structure airtight.
- If positioned appropriately, an interior wall can also assume the function of the wall post shown in the drawing.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The vertical wall post can serve as an additional support for, for example, joists or purlins (higher surface pressure).

Illustrations



Frame construction

6. Horizontal wall joint (external cover boards)

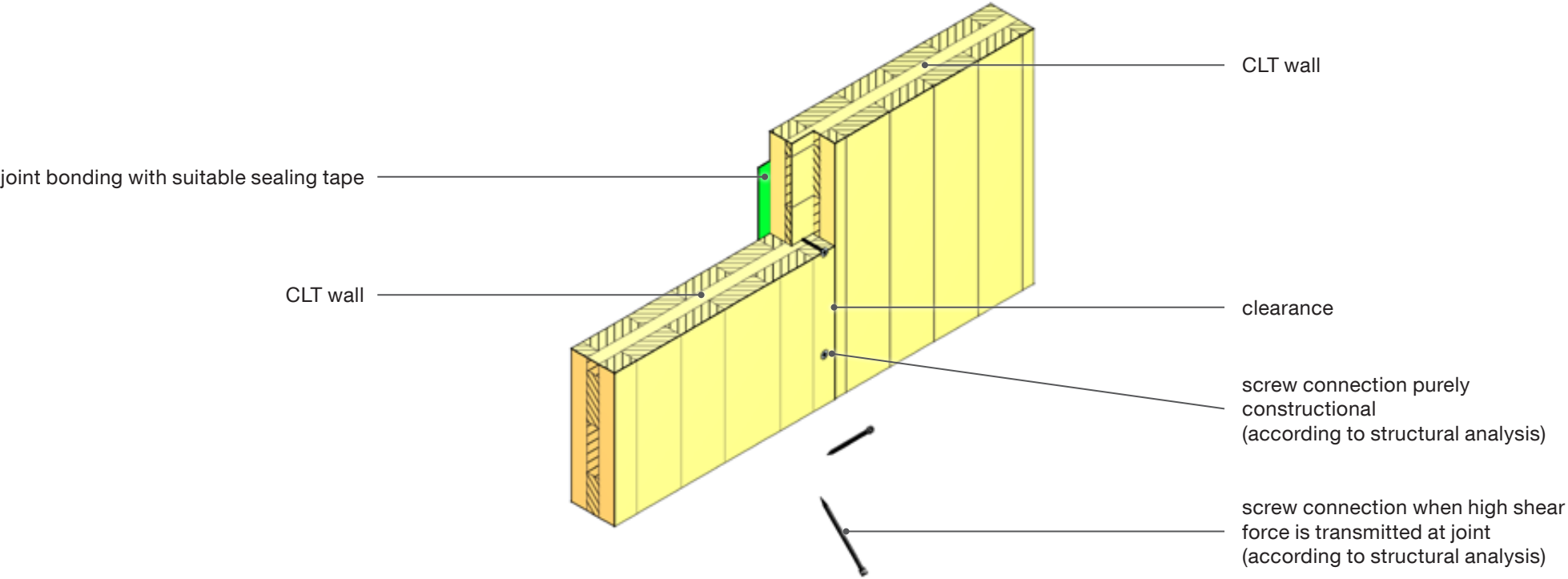


Execution

- When external cover boards are used (e.g. 3-layer plate or laminated veneer lumber), the subsequent layer structure must be adapted to them.
 - Sealing tape must be used to make the structure airtight.
 - The choice and rating of the connectors and all structural components depend on the structural requirements.
- With this type of CLT wall connection in particular the danger of buckling must be taken into account.
 - The joint can also be adhesively bonded to enhance its rigidity.

Frame construction

7. Vertical wall joint (lap)

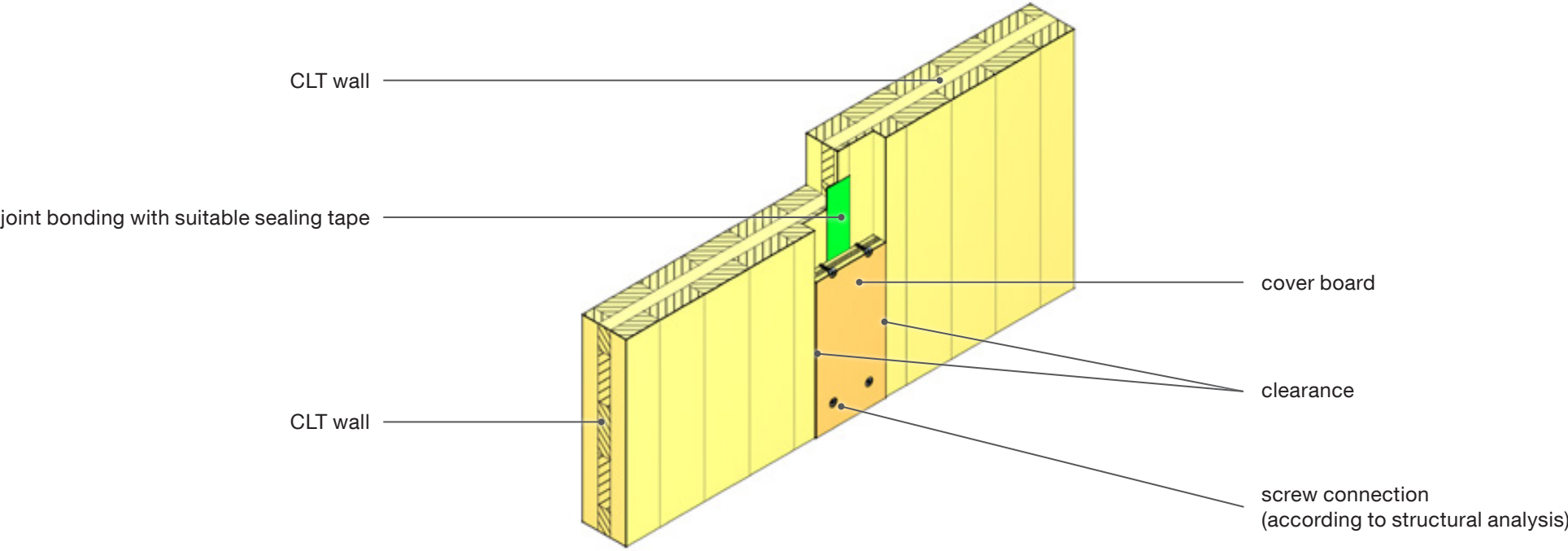


Execution

- Sealing tape must be used to make the structure airtight.
- The design must provide sufficient clearance (on one side), depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- If high shear force transmission at the joint cannot be avoided, the connectors must be specifically dimensioned and positioned as these forces require.

Frame construction

8. Vertical wall joint (cover board)



Execution

- When using cover boards (e.g. 3-layer board or laminated veneer lumber), the standard rebate dimensions of 27 × 80 mm should preferably be ensured.
- Sealing tape must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Instead of using screws, the cover board can be connected to the CLT walls with suitable glue which improves the transmission of the shear forces.

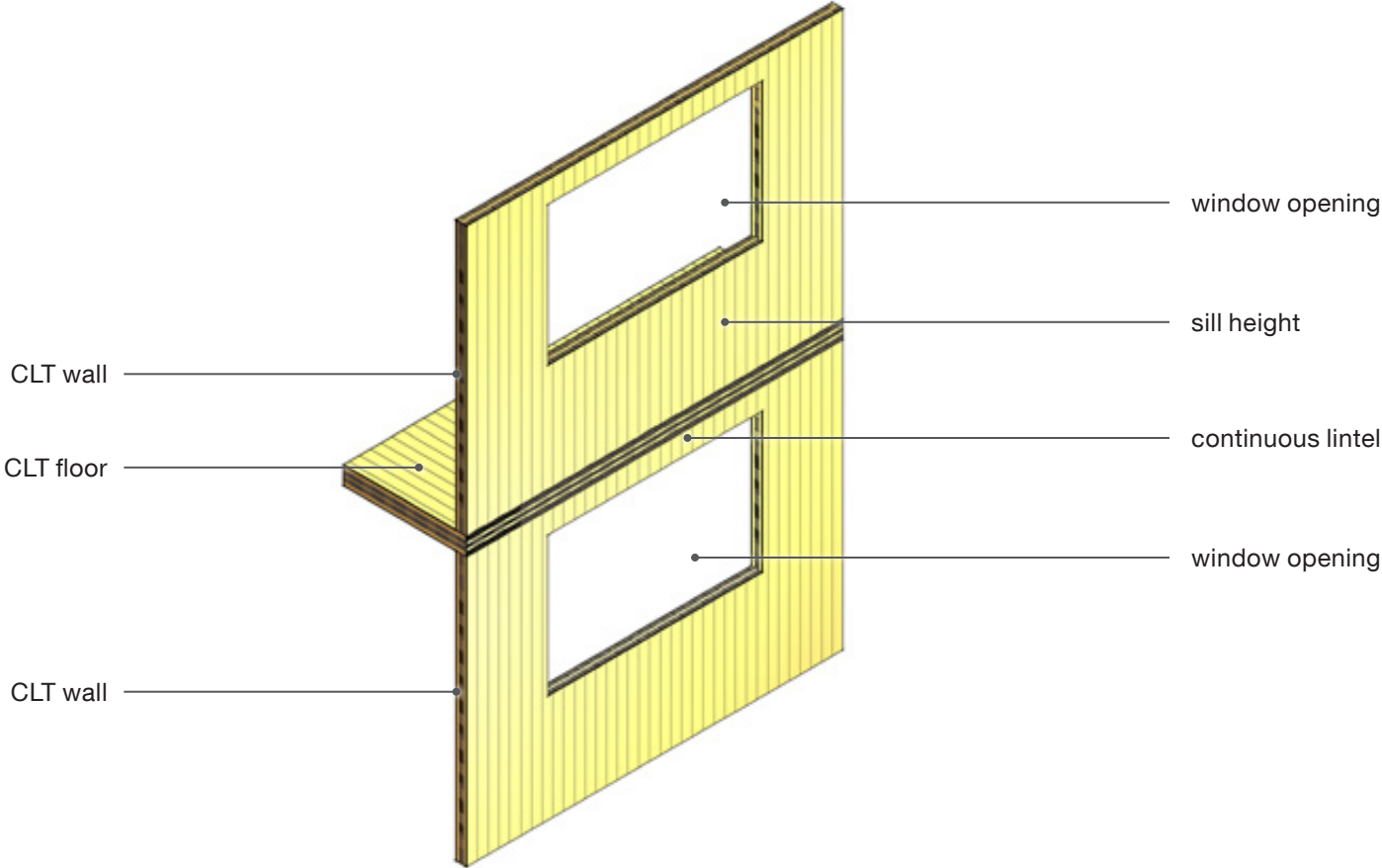
Illustrations



Frame construction

Lintels

1. Continuous lintel

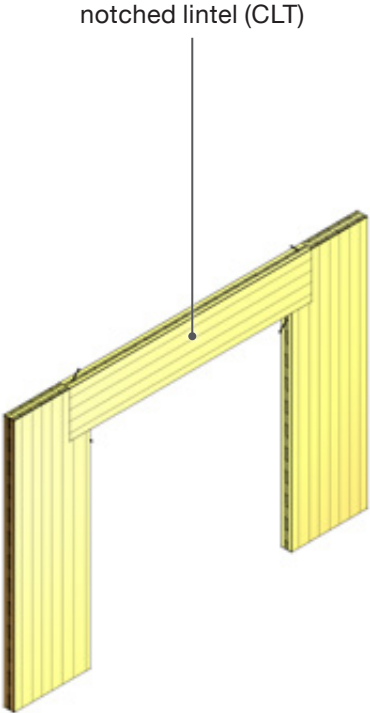
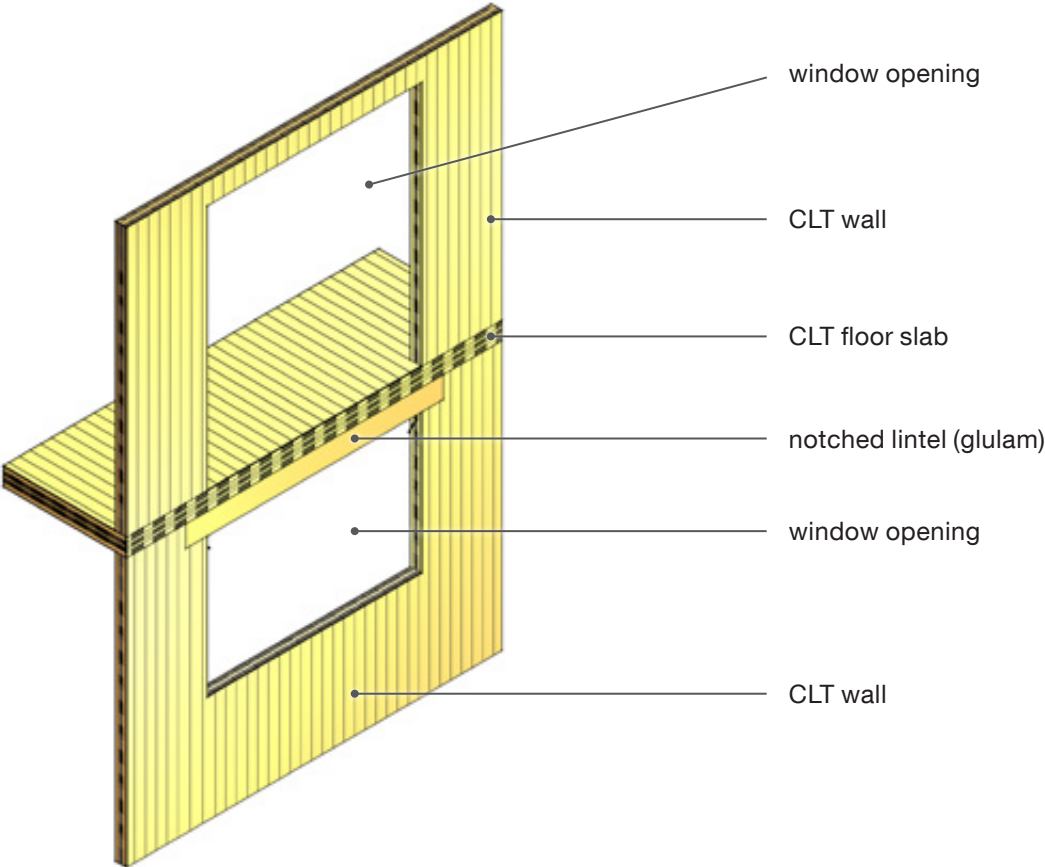


Execution

- If the lintel height is not sufficient from a structural engineering standpoint, there must be an appropriately dimensioned upstand from which the lintel can be suspended. If a wall above the lintel is used as an upstand, it is essential to
 - take account of the sill height of any window openings.
 - The choice and rating of the connectors and all structural components depend on the structural requirements.
- The lintel can be connected to the upstand (upper wall) with, for example, perforated metal plates or screws (end-grain screwing should be avoided in this case).

Frame construction

2. Notched lintel



Execution

- A notched lintel must be dimensioned according to the loads and forces acting on it.
- Attention must be paid to the surface pressure in the lintel support area.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- CLT lintels absorb and transmit shear forces significantly better than glulam lintels. This is because of the lack of transverse layers in glulam.

Illustrations



Frame construction

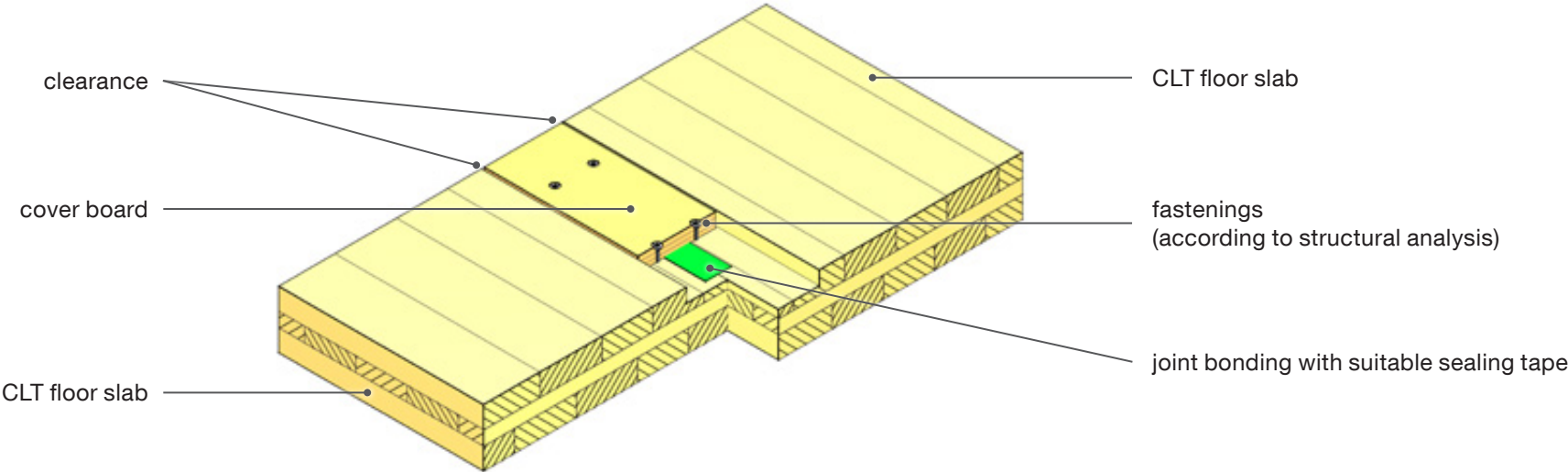
Illustrations



Frame construction

Floor joints

1. Cover board



Execution

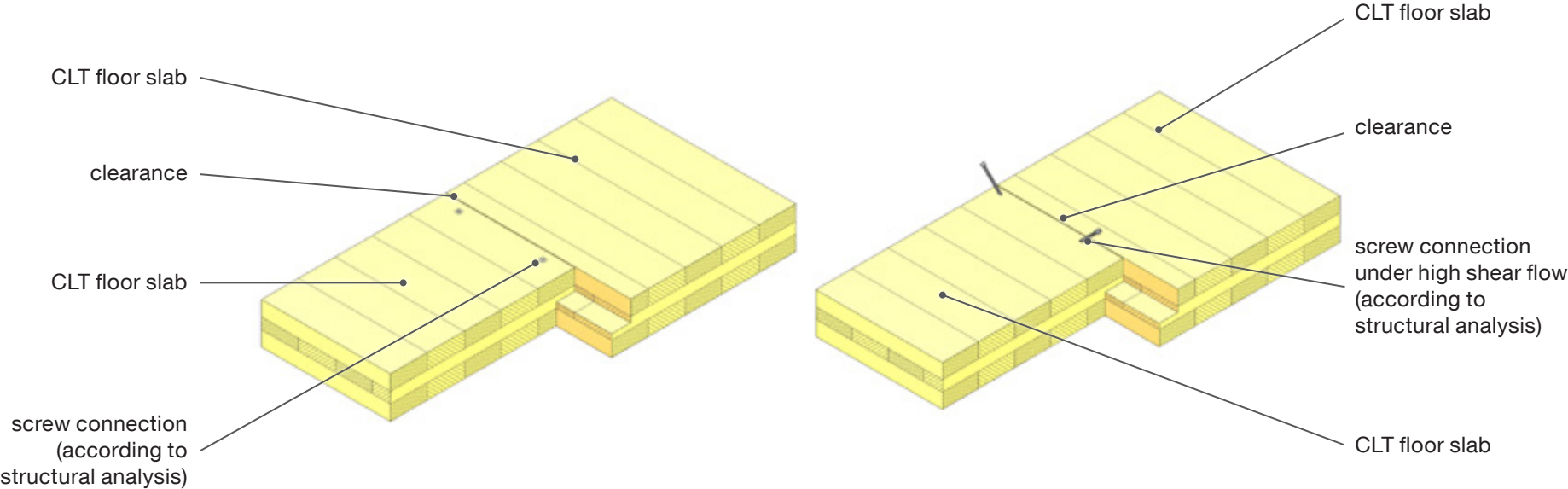
- When using cover boards at floor joints (e.g. OSB, 3-layer board or laminated veneer lumber), the standard rebate dimensions of 27 × 80 mm should preferably be ensured.
- Sealing tape must be used if necessary to make the connection airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Appropriately sized nails, screws or staples can be used as connectors (note permissible minimum diameter).

Illustrations



Frame construction

2. Half-lap



Execution

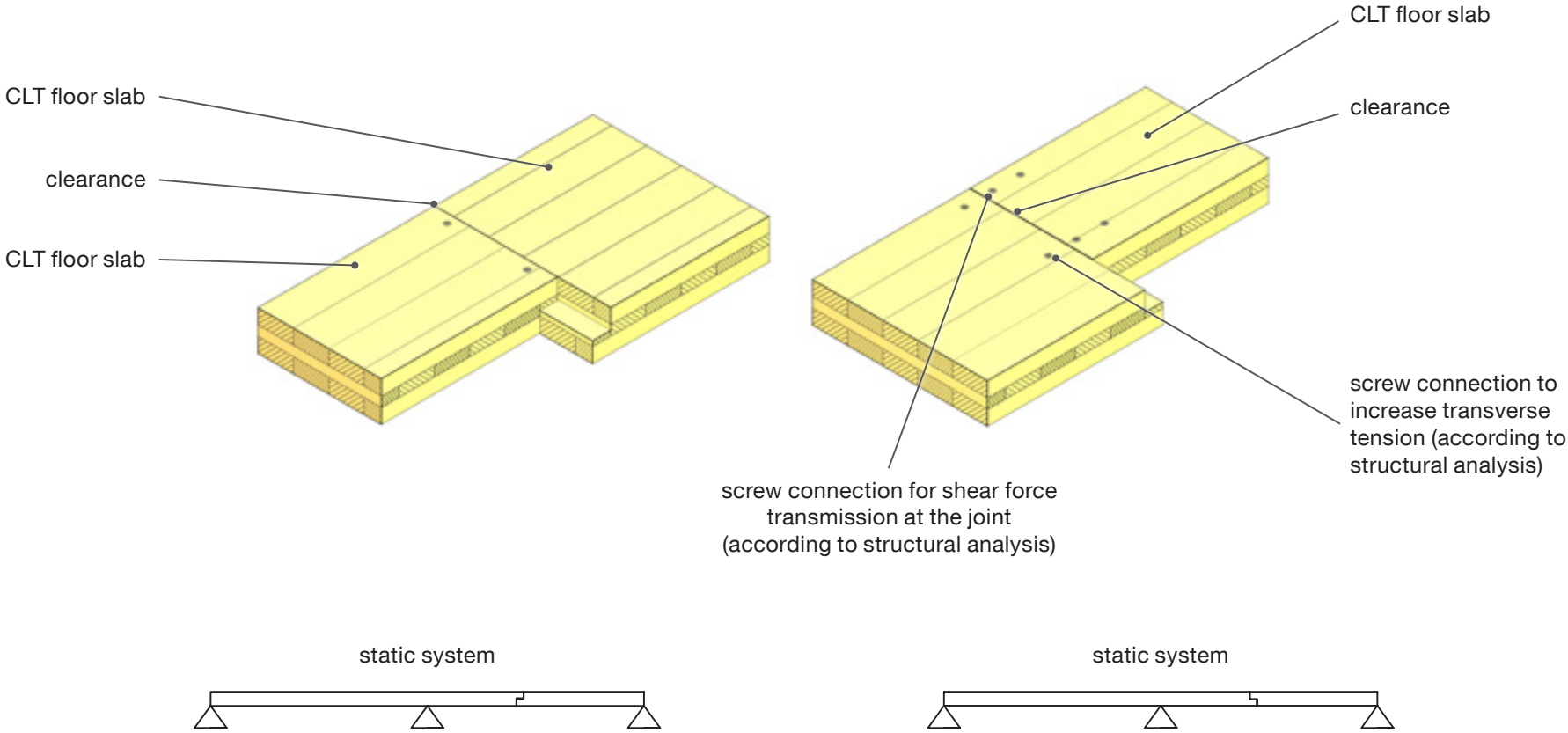
- Self-adhesive compressible strips or sealing tape must be used if necessary to make the connection airtight.
- The design must provide sufficient clearance (on one side), depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- If high shear flow can be expected at the joint, the connectors must be dimensioned and positioned accordingly.

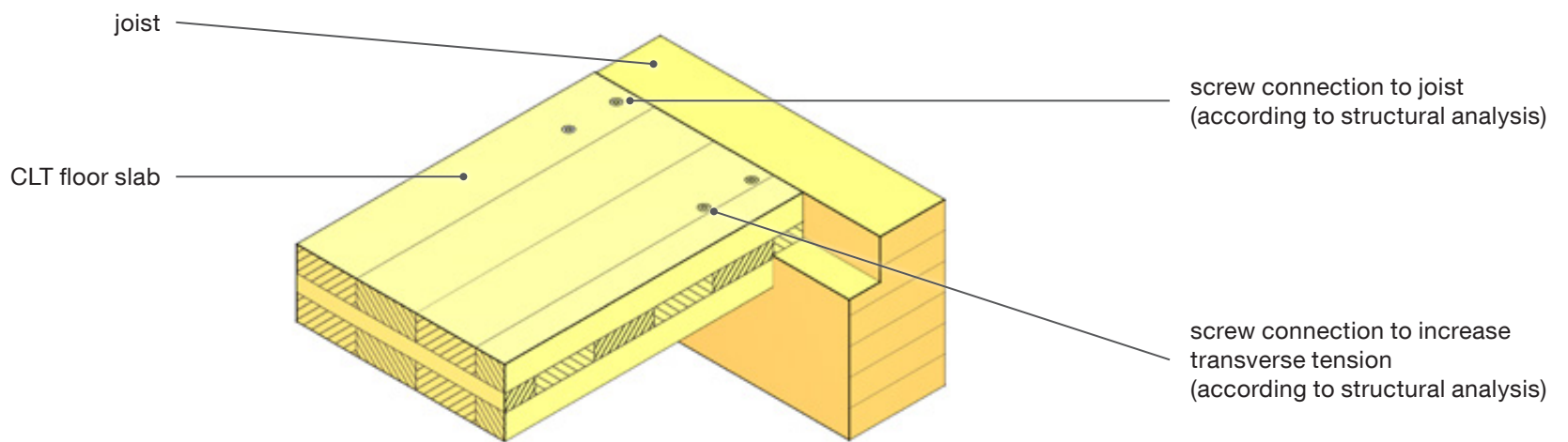
Illustrations



Frame construction

3. Structural analysis and transverse tension





Frame construction

Execution

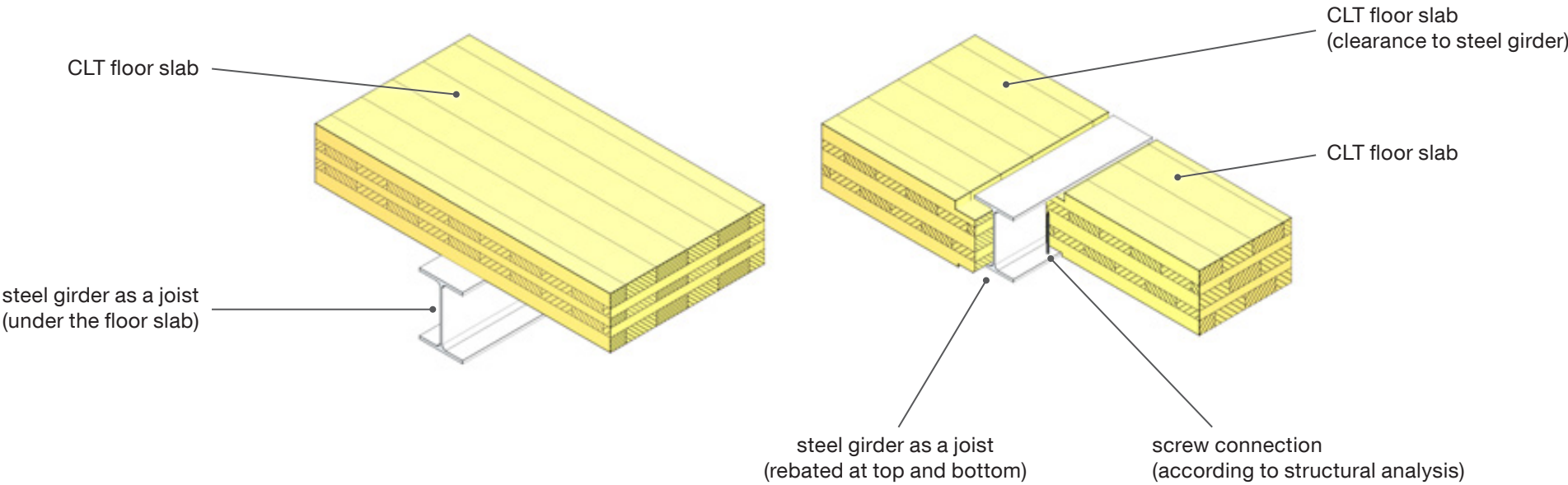
- Self-adhesive compressible strips or sealing tape must be used if necessary to make the connection airtight.
- The design must provide sufficient clearance, depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Depending on the static system, fully threaded screws must be used in order to secure effective lateral force connections at the joint and the point of support.

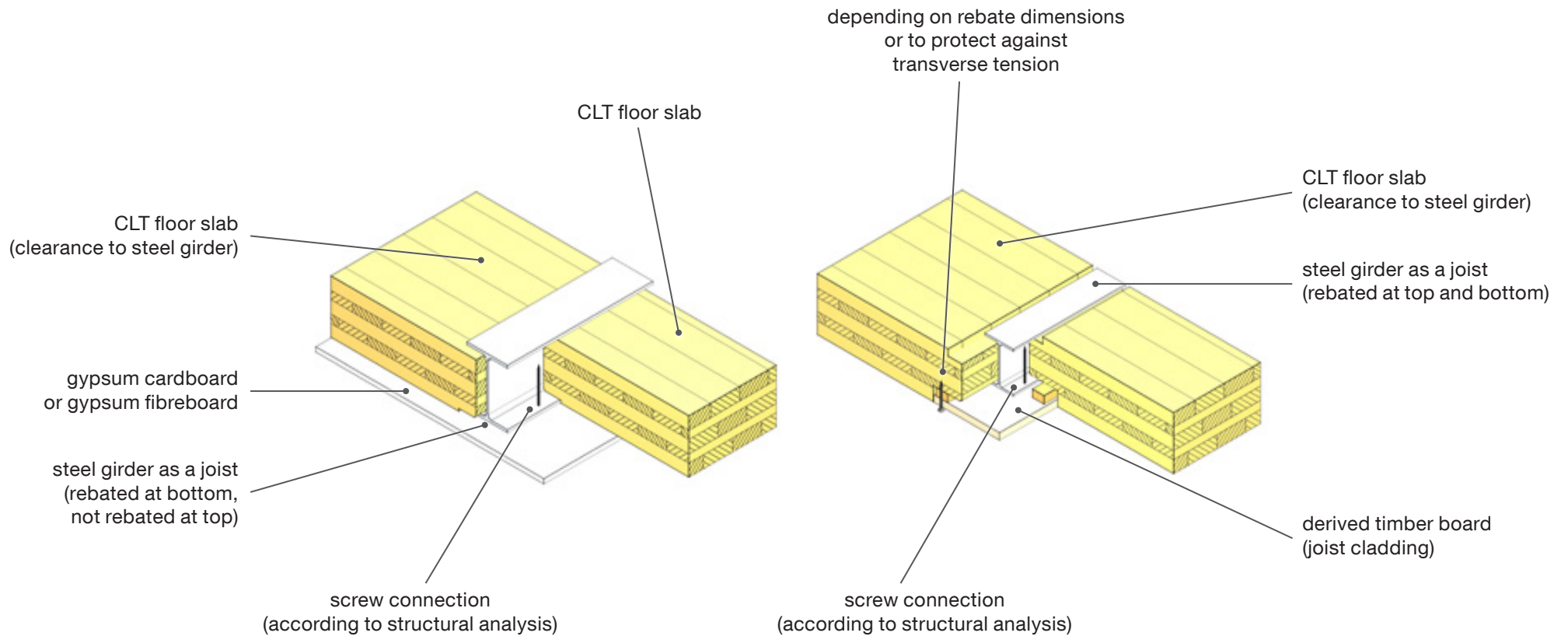
Illustrations



Frame construction

4. Steel joist





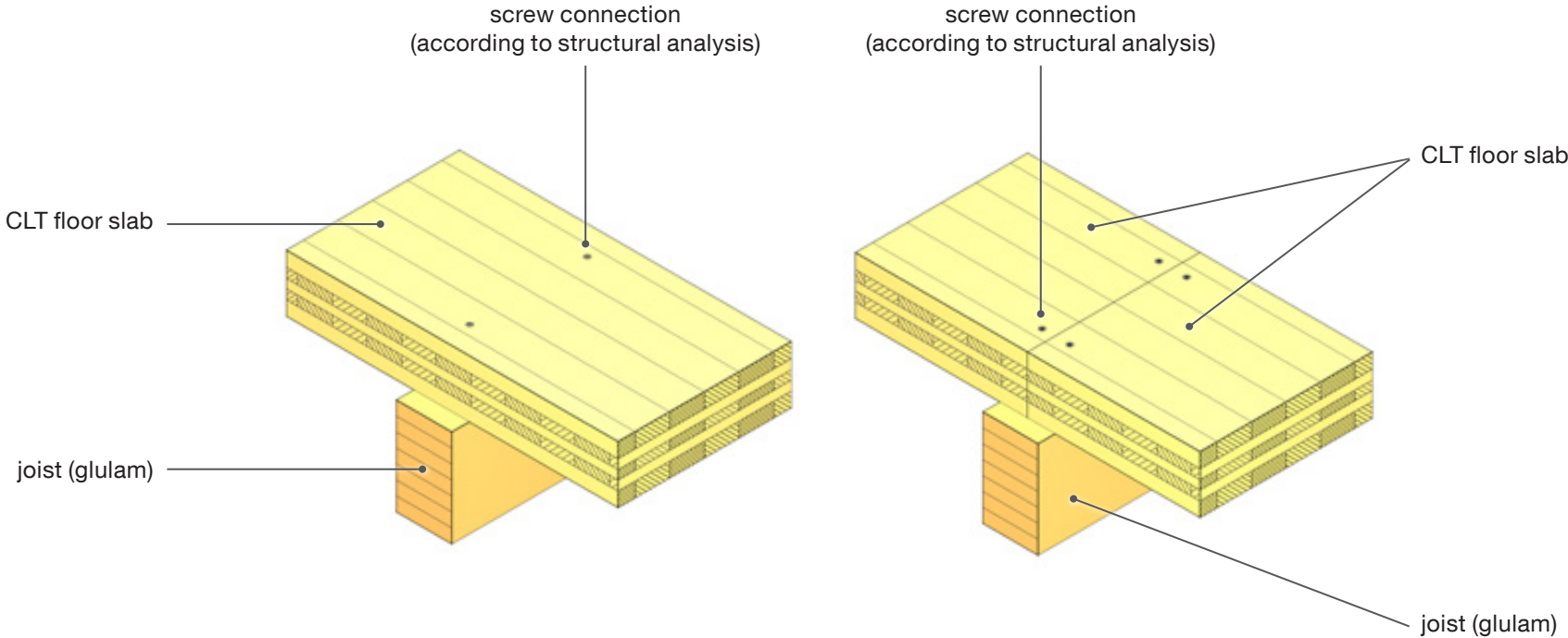
Frame construction

Execution

- Self-adhesive compressible strips must be inserted or other tape bonded if necessary to make the connection airtight.
- To ensure trouble-free assembly, CLT floor slabs must have sufficient clearance because of the cross-section of steel girders.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- In the case of specific fire protection requirements, metal joists must be clad or coated with special paint.

Frame construction

5. Wooden joist



Execution

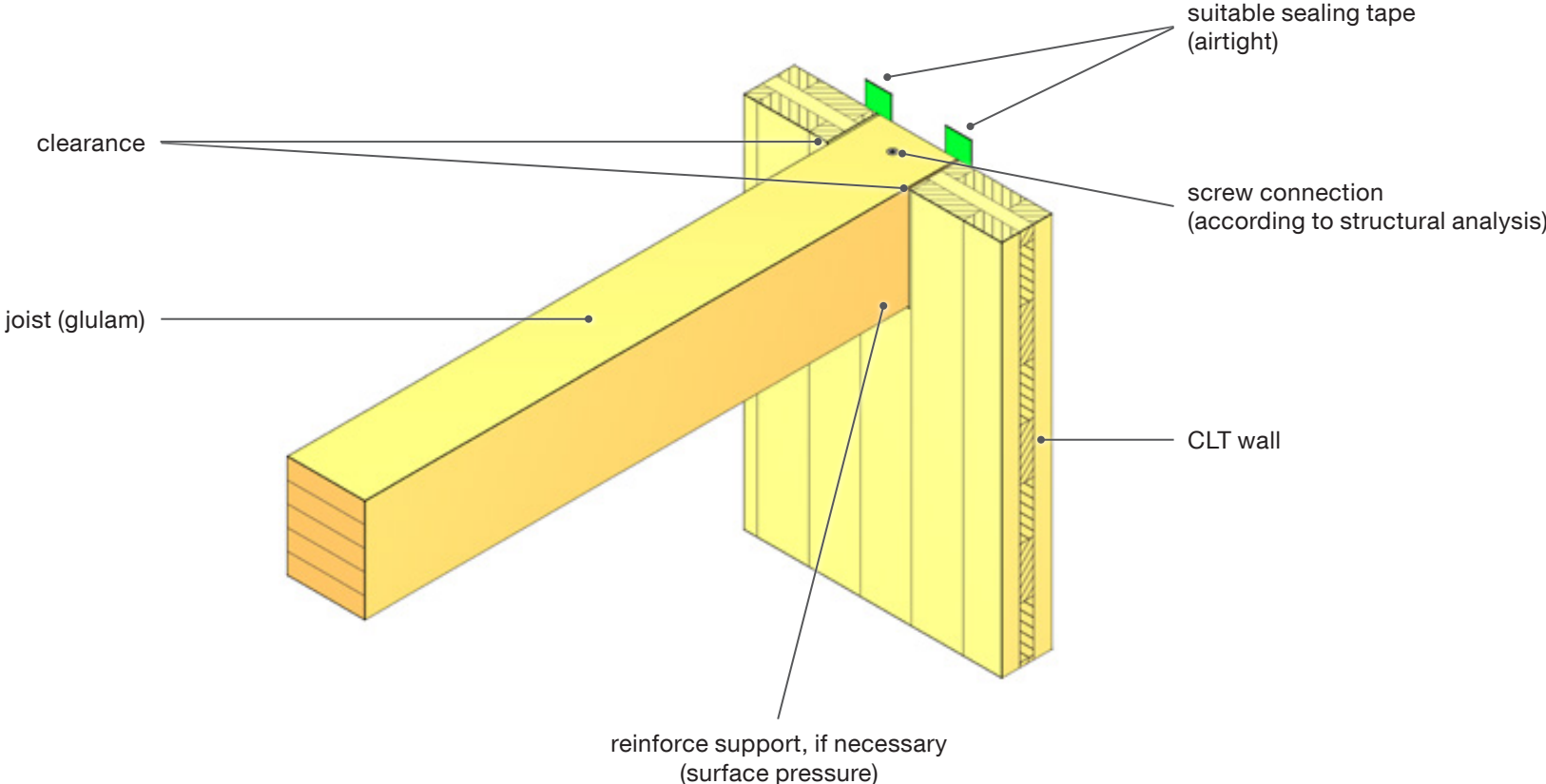
- Self-adhesive compressible strips or sealing tape must be used if necessary to make the connection airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Frame construction

6. Joist (wall cut-out)



Execution

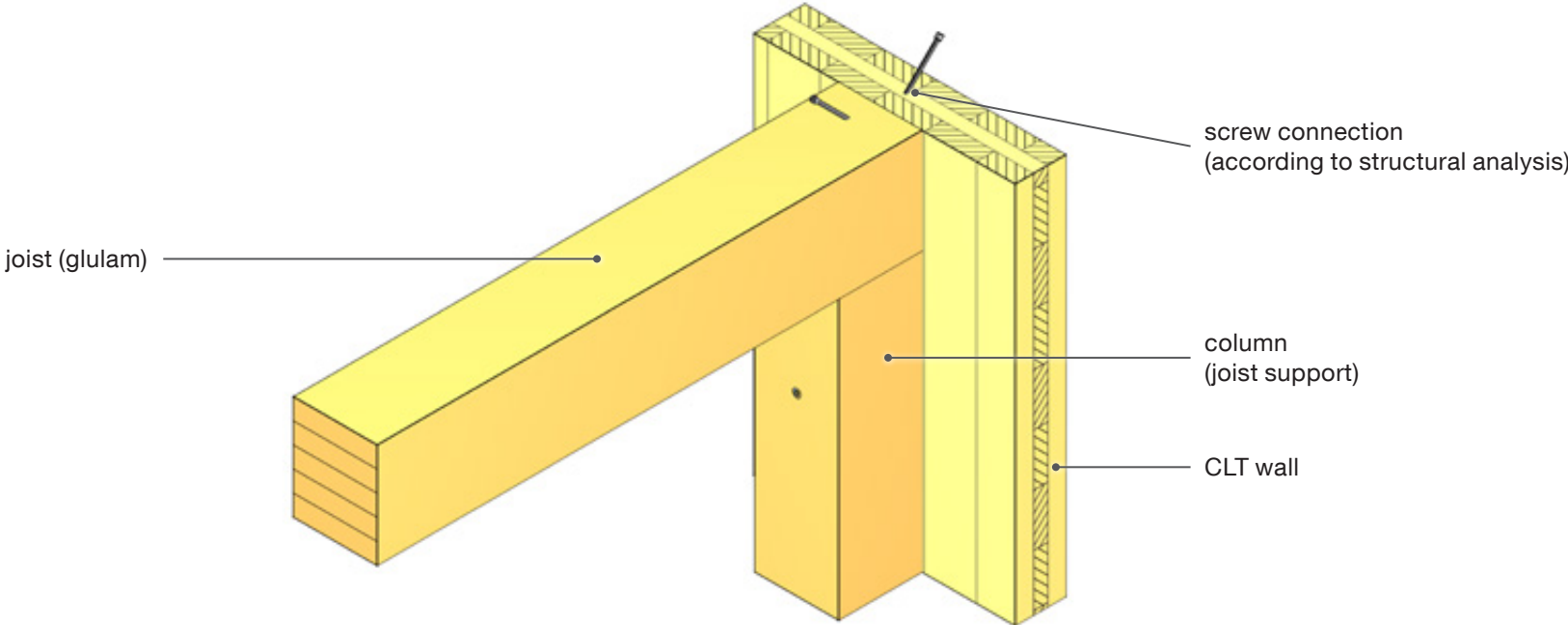
- A suitable sealing tape (joint bonding) must be used if necessary to make the structure airtight.
- The design must provide sufficient clearance, depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- If necessary, the support surface in the CLT wall must be reinforced with a metal plate and fully threaded screws (pressure).

Illustrations



Frame construction

7. Joist (column)



Execution

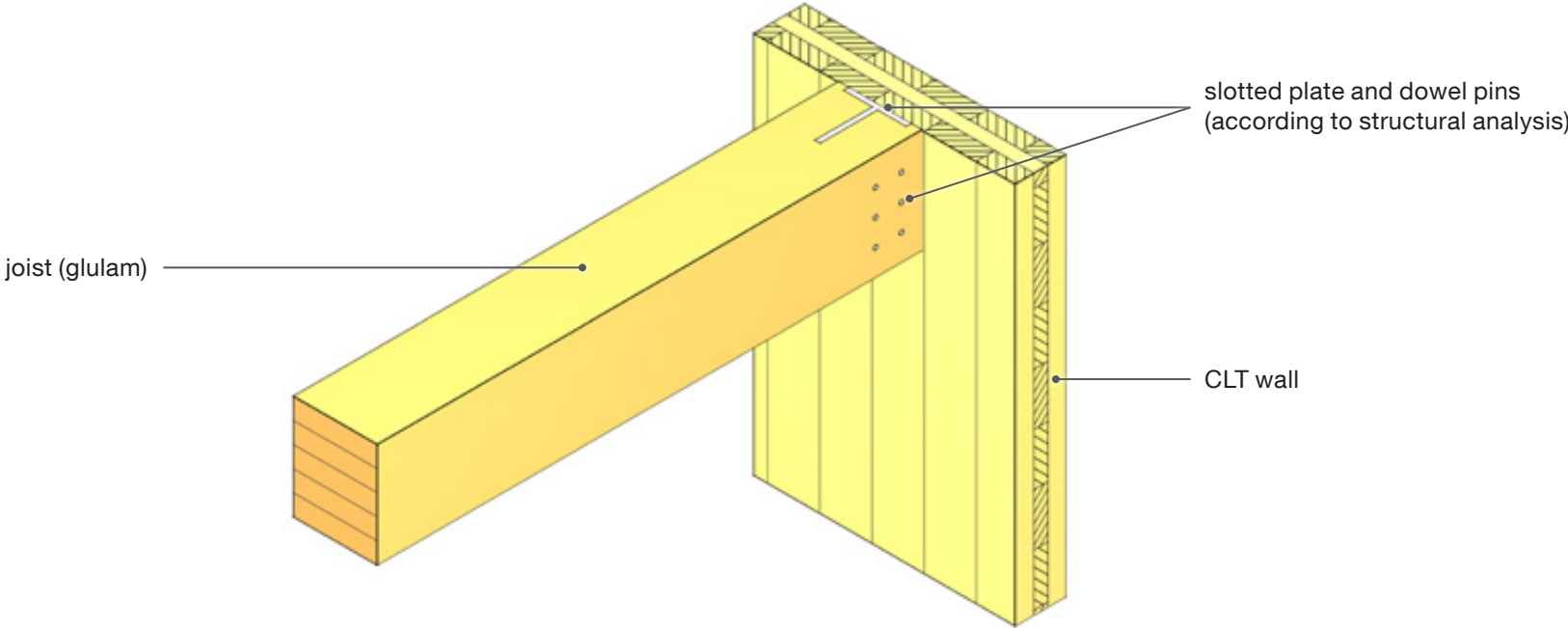
- The design must provide sufficient clearance, depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Frame construction

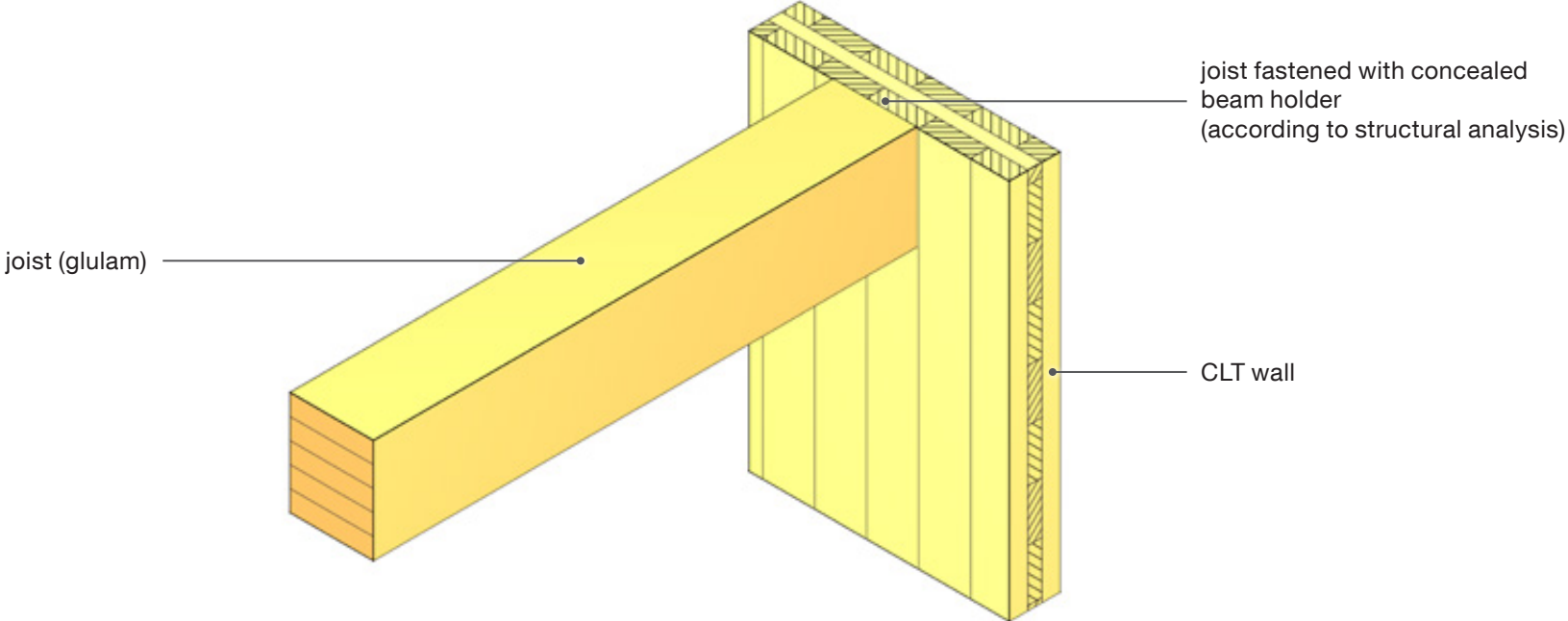
8. Joist (beam holder)



Execution

- The design must provide sufficient clearance, depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Frame construction



Execution

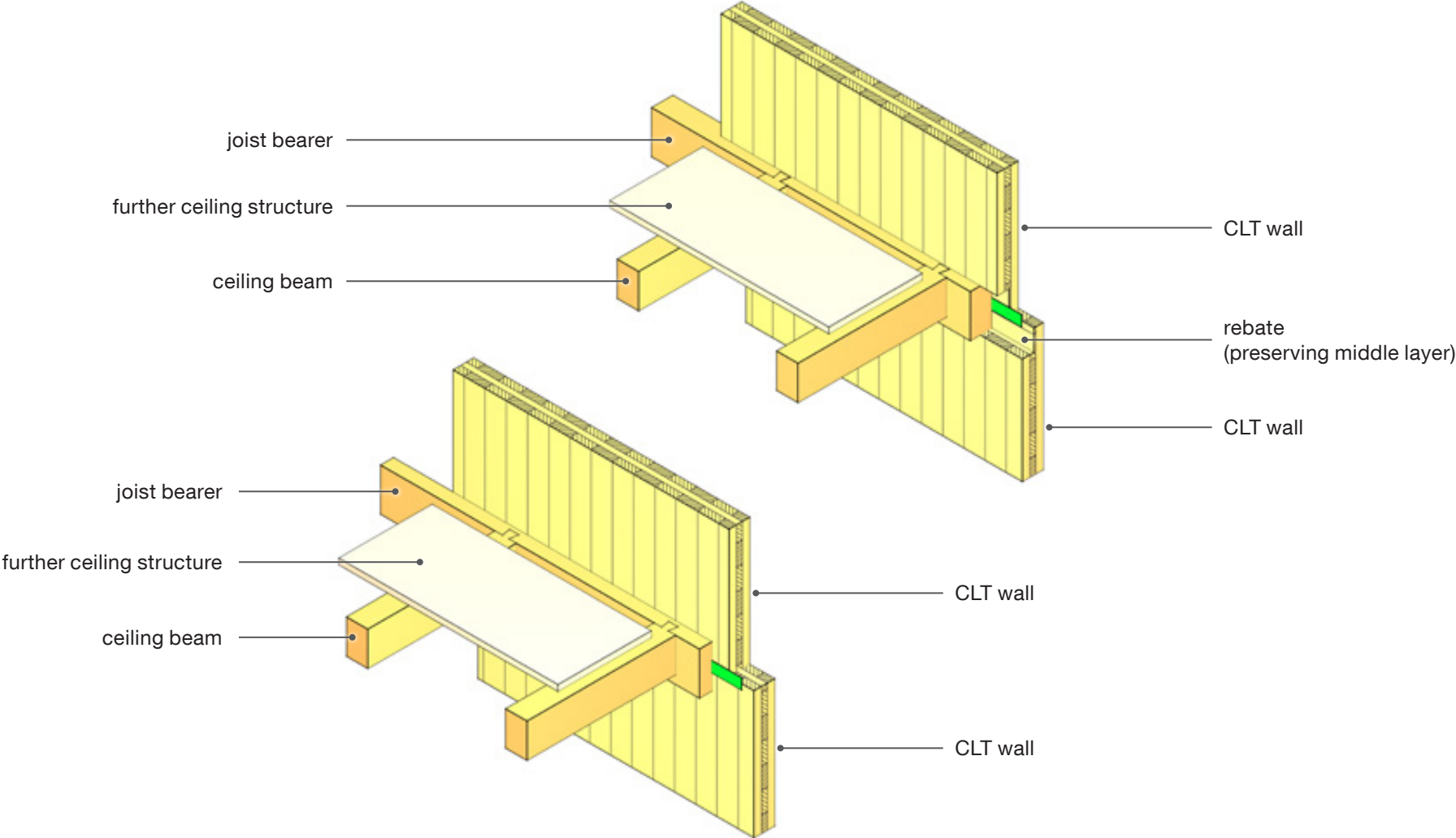
- The design must provide sufficient clearance, depending on the installation situation.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Appropriate beam holders must be used which correspond to the dimensions of the joists.

Illustrations



Frame construction

9. Joist bearer

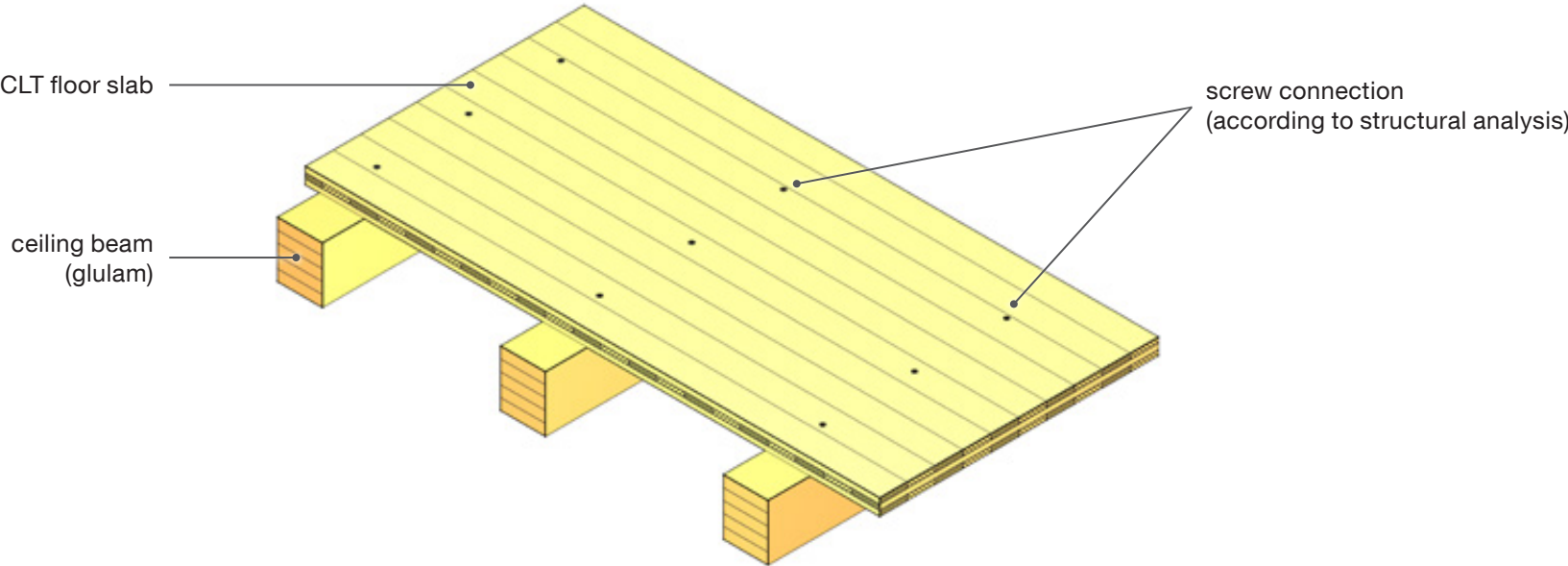


Execution

- Self-adhesive compressible strips or sealing tape must be used if necessary to make the connection airtight.
- To ensure airtightness of the CLT wall, it is essential to preserve its middle layer (rebate area).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Please note: Rebating reduces the support surface at the joint; additionally, the joist bearer can shrink, which would make load transfer impossible (surface pressure).

Frame construction

10. Wooden beam ceiling



Execution

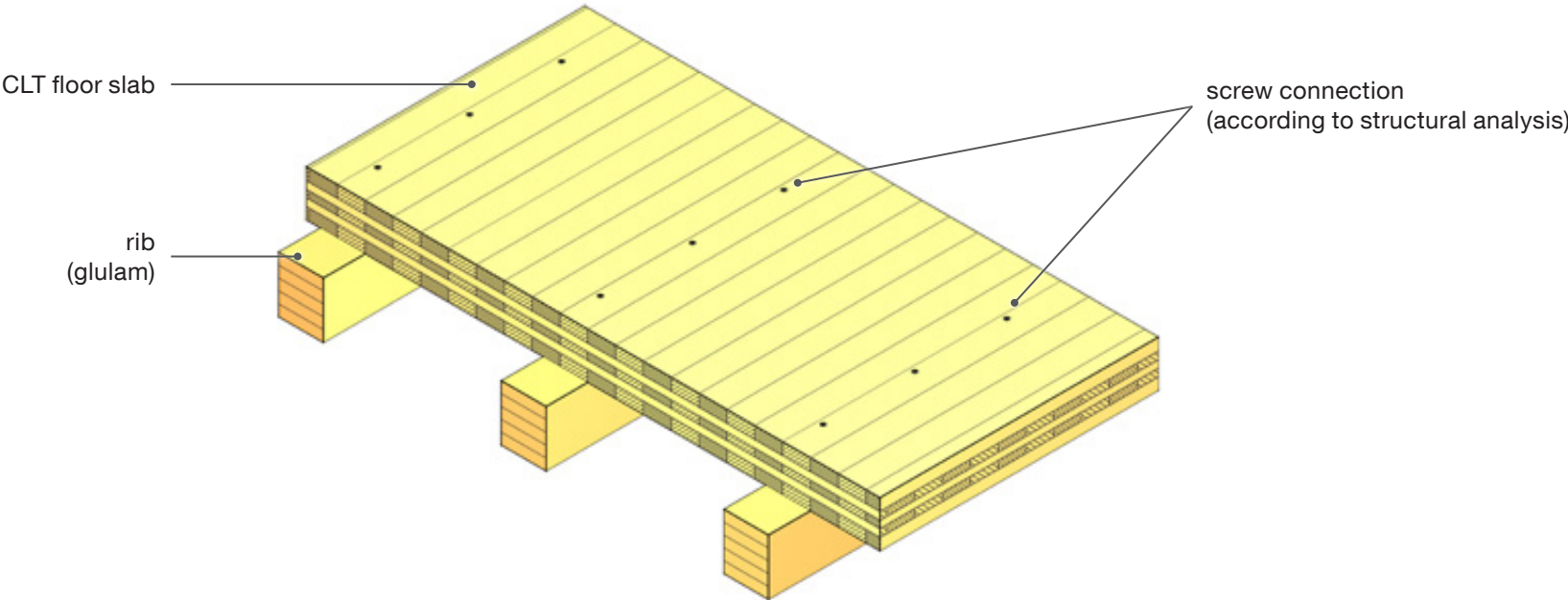
- Deflection (serviceability check) of the floor slab must be taken into account (centre distance of the beams and dimensions of the floor slab).
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Frame construction

11. Rib panel



Execution

- Deflection (serviceability check) of the floor slab must be taken into account (centre distance of the ribs and dimensions of the floor slab).
- Structural connection between the ribs and the floor slab by means of screwing or gluing.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The floor slab (with span direction parallel to that of the ribs) can be included in the structural analysis or can be estimated.

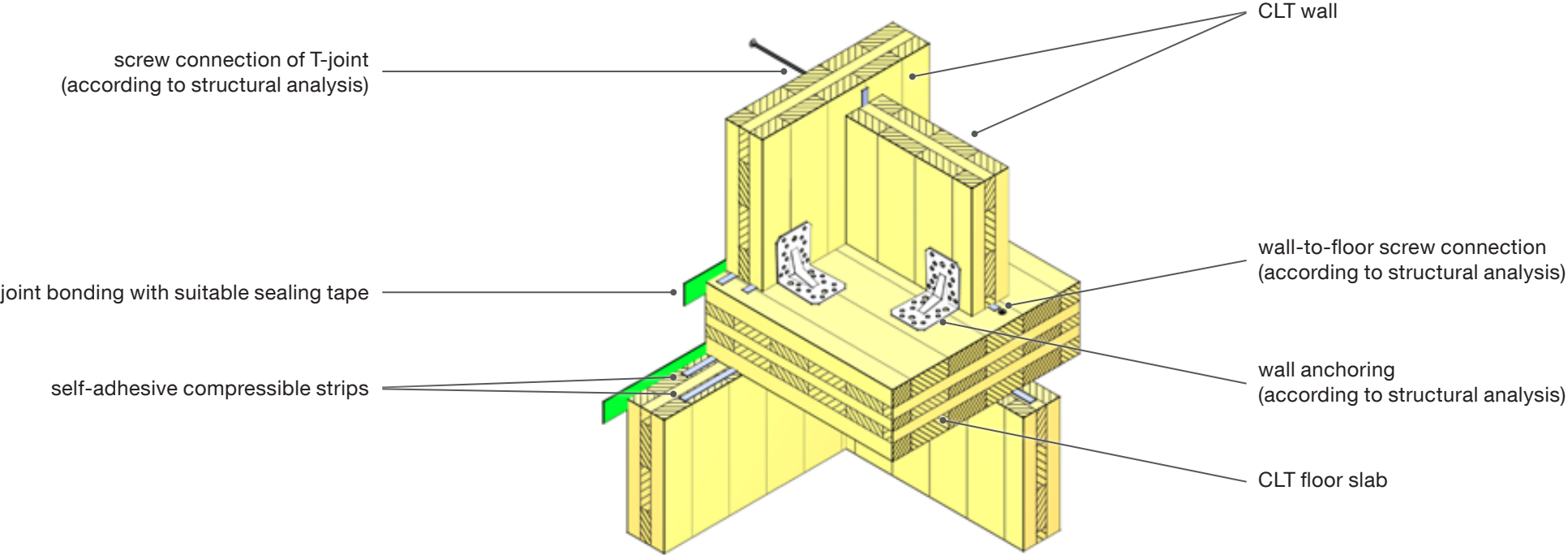
Illustrations



Frame construction

Connection nodes

1. Platform framing



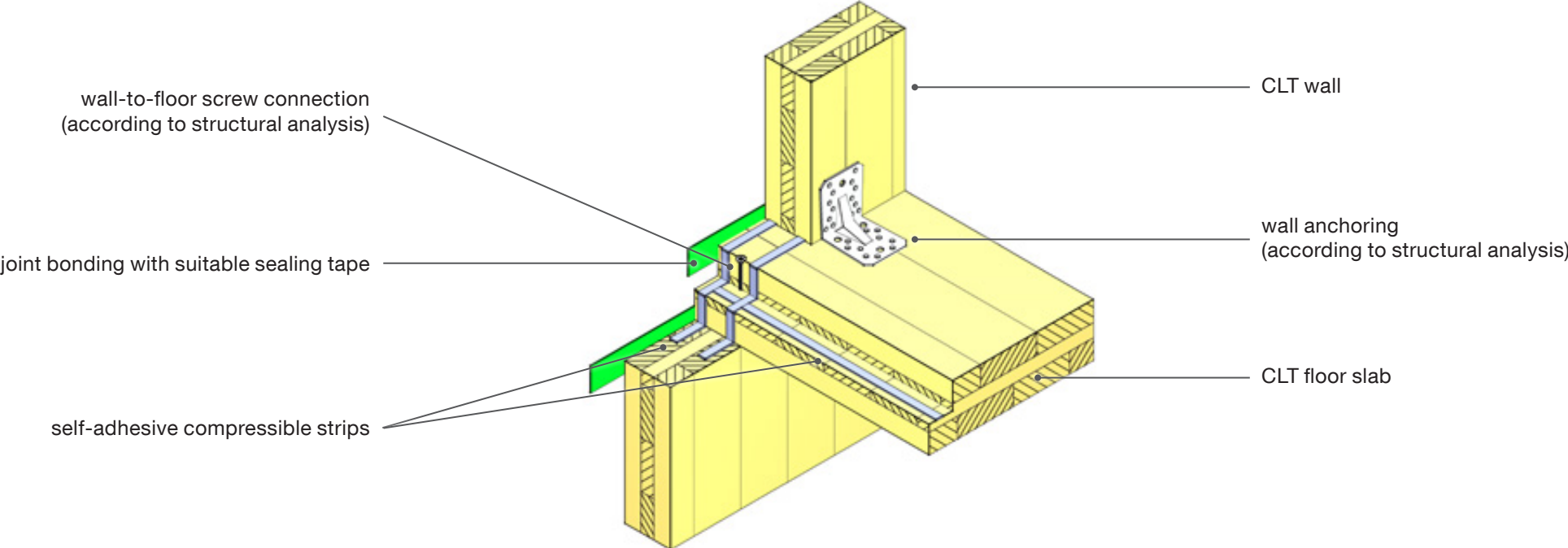
Execution

- To achieve the required airtightness in a building, the joints of the CLT elements can, apart from self-adhesive compressible strips, alternatively be sealed with suitable sealing tape on the inside or outside of the elements.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Wall anchoring for structurally effective connection between wall and floor (shear and tensile forces).
- Screw connection of T-joint from inside or outside.

Illustrations



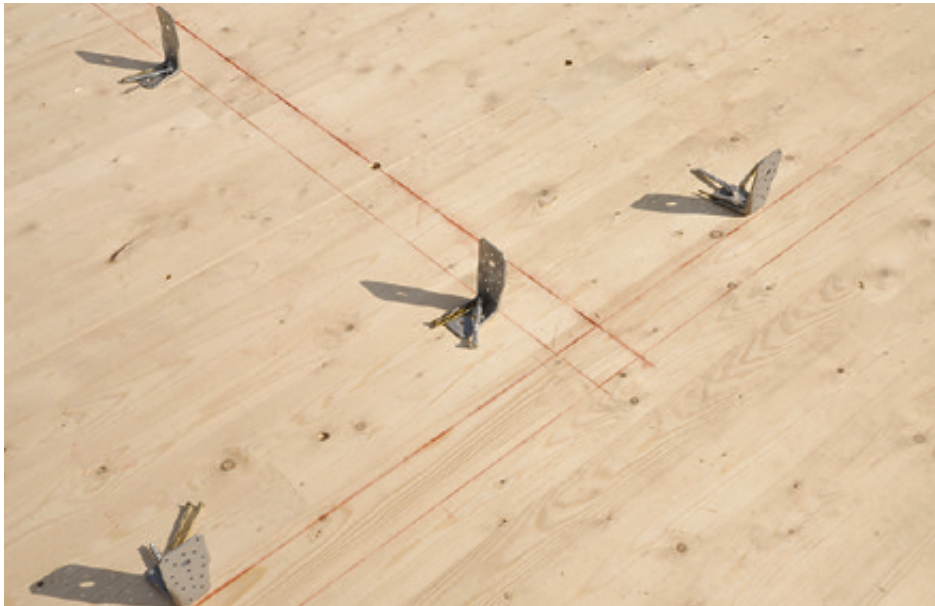
Frame construction



Execution

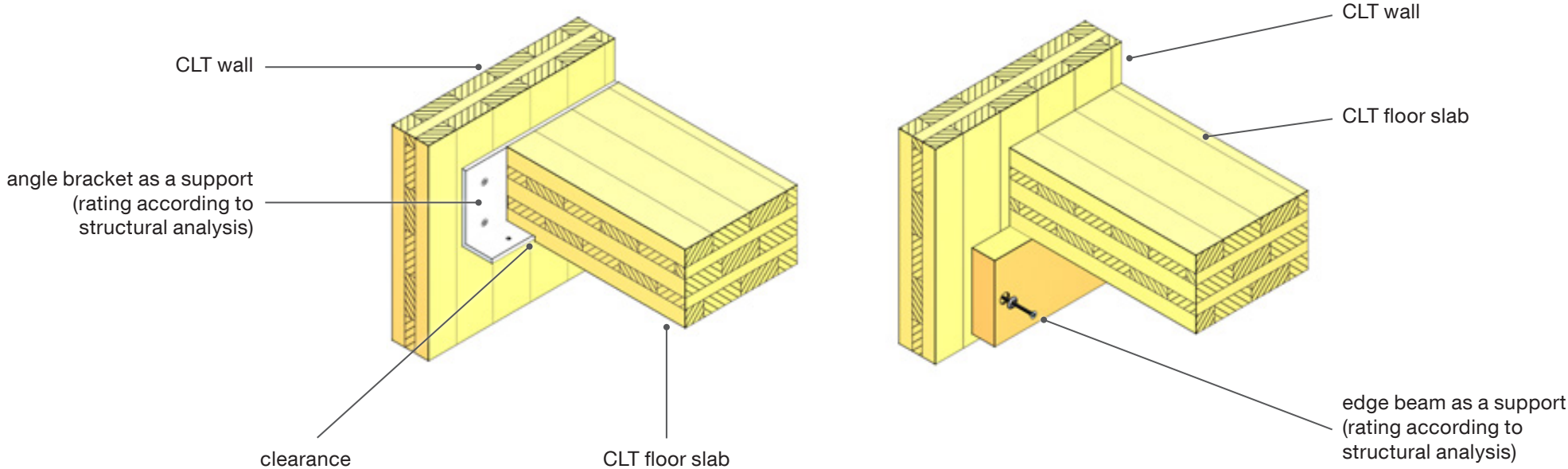
- To achieve the required airtightness in a building, the joints of the CLT elements can, apart from self-adhesive compressible strips, alternatively be sealed with suitable sealing tape on the inside or outside of the elements.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Wall anchoring for structurally effective connection between wall and floor (shear forces in wall direction; tensile and compressive forces from wind load).

Illustrations



Frame construction

2. Balloon framing



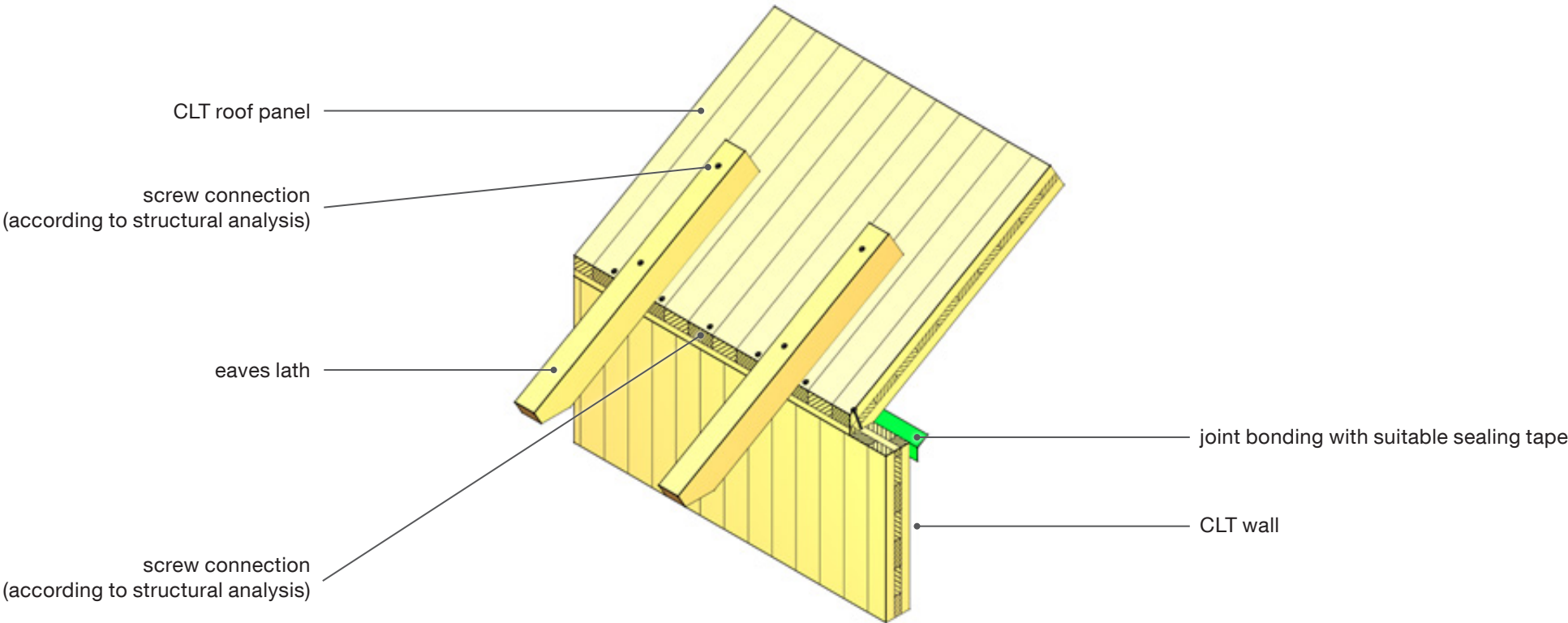
Execution

- In the case of specific fire protection requirements, the angle bracket on which the floor slab rests must be clad.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Frame construction

Roof

1. CLT roof structure (eaves laths)



Execution

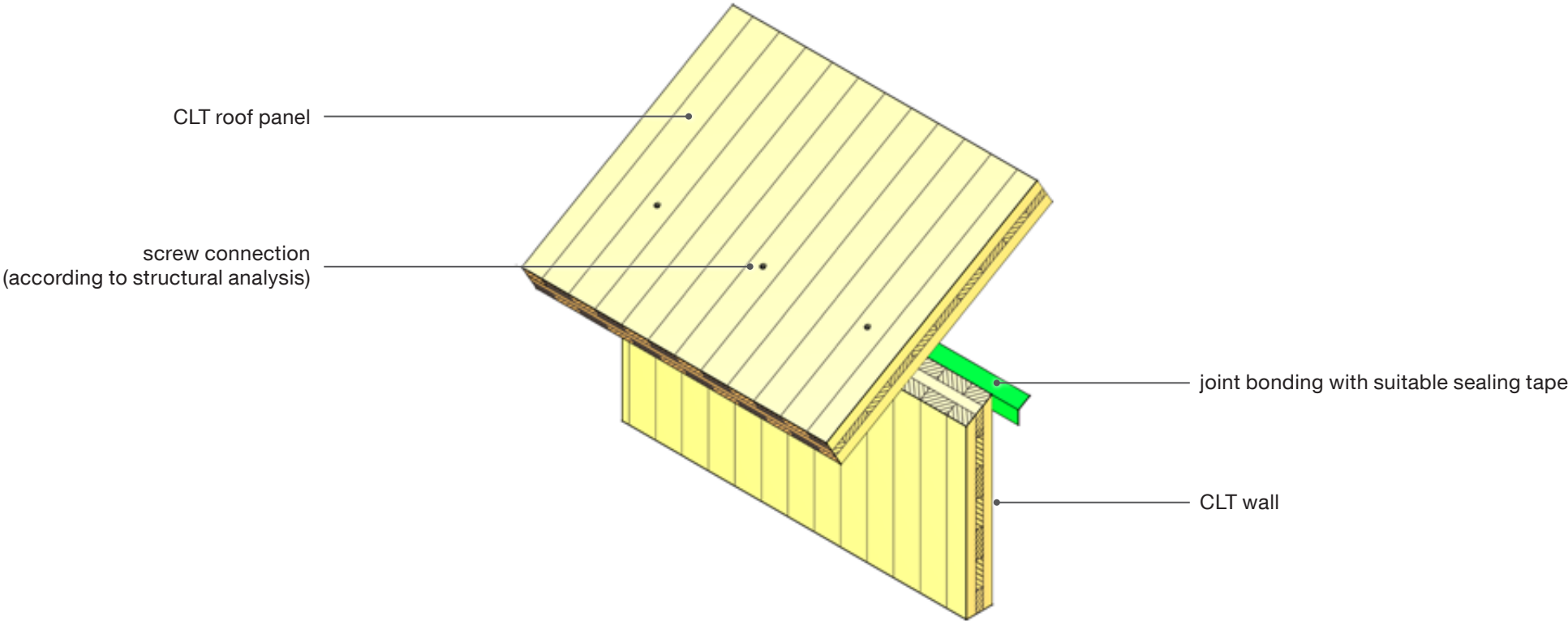
- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- Note edge distances of screw connection.

- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection between the roof and

CLT walls absorbs shear forces acting in the direction of the point of support and suction forces from the wind load.

Frame construction

2. CLT roof structure (butted against CLT wall)



Execution

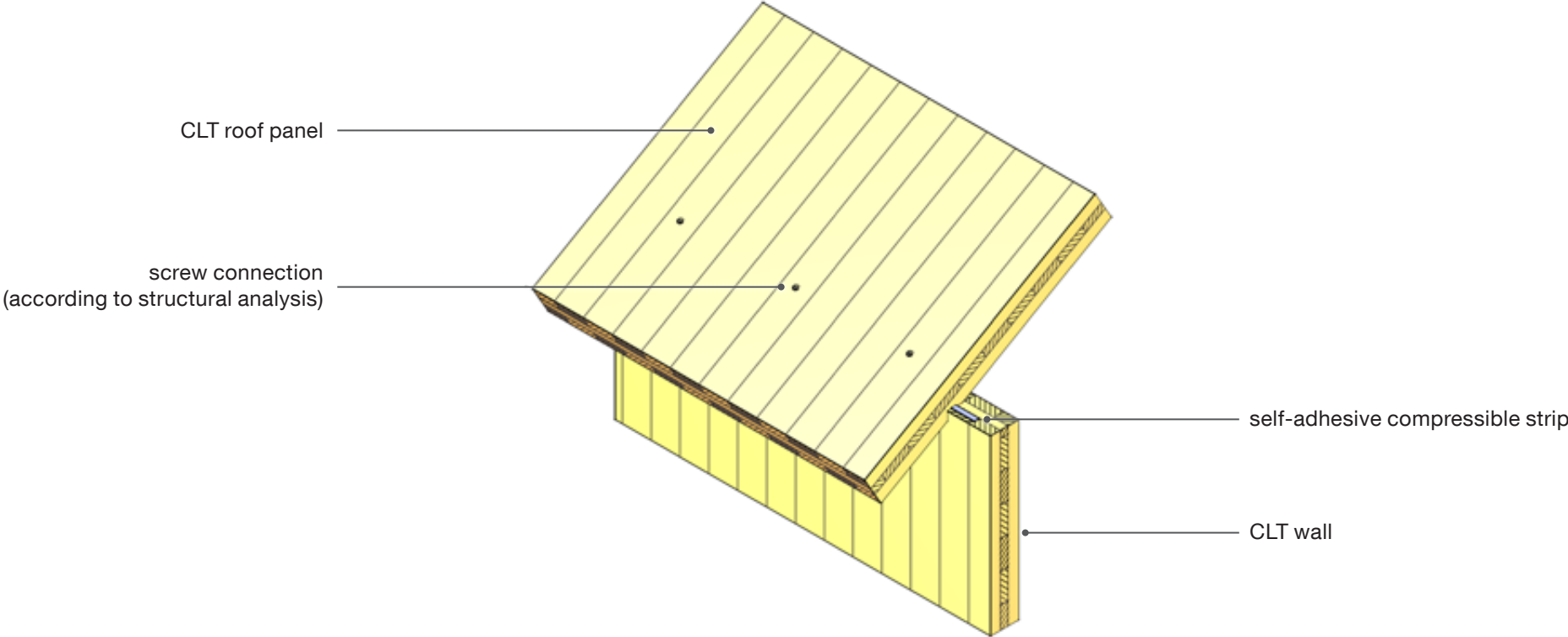
- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- Only the CLT wall needs a bevelled edge, with the CLT roof panel forming the roof projection and soffit.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection between the roof and CLT walls absorbs shear forces acting in the direction of the point of support and suction forces from the wind load.

Illustrations



Frame construction

3. CLT roof structure (birdsmouth joint)



Execution

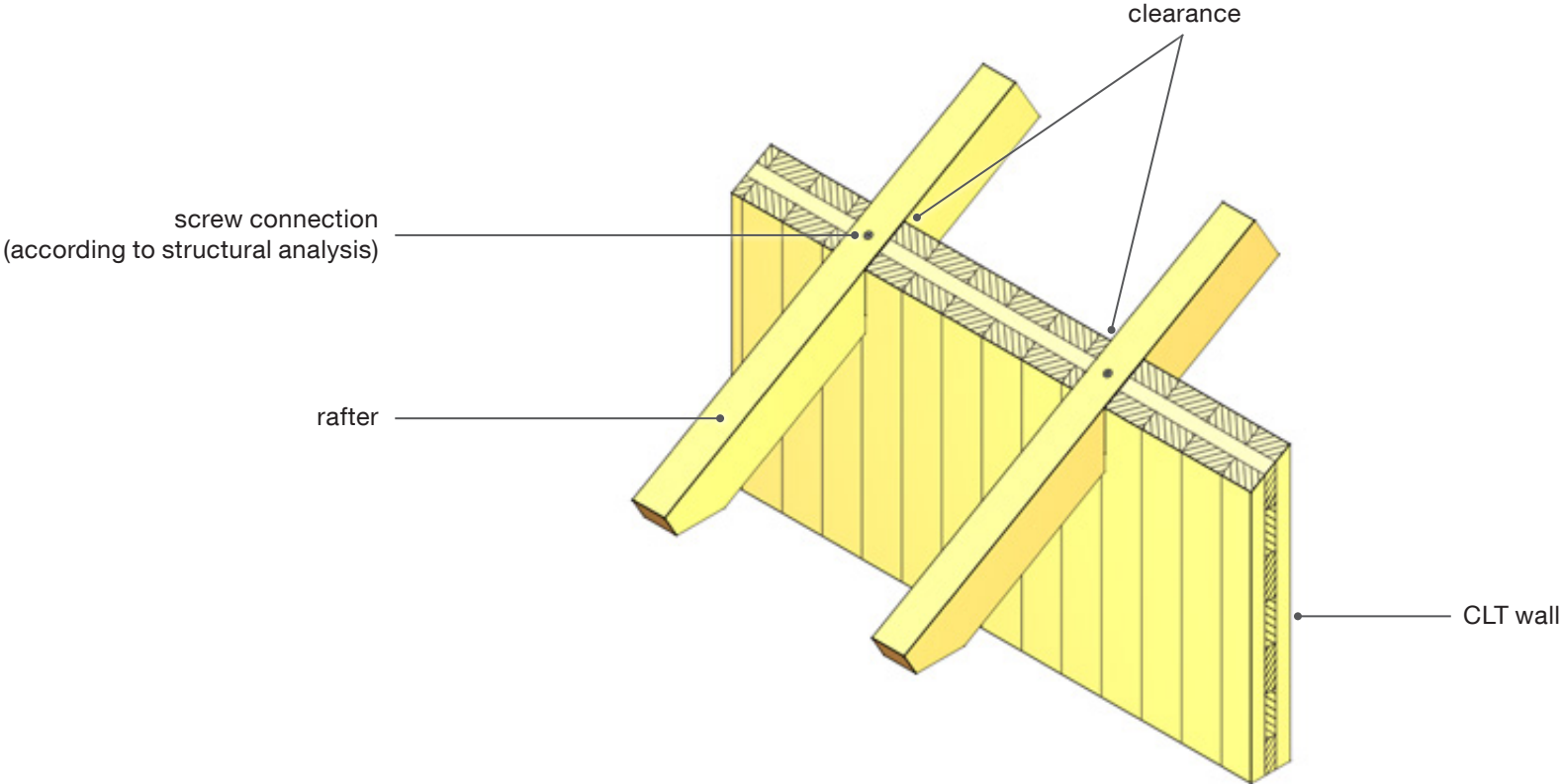
- Self-adhesive compressible strips must be used to make the structure airtight.
- The CLT wall has a straight edge requiring a birdsmouth to be machined in the roof panel (please note that the birdsmouth must not be too deep, otherwise it might weaken the lower longitudinal layer).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection between the roof and CLT walls absorbs shear forces acting in the direction of the point of support and suction forces from the wind load.

Illustrations



Frame construction

4. Rafter roof (rafter cut-outs in the CLT wall)



Execution

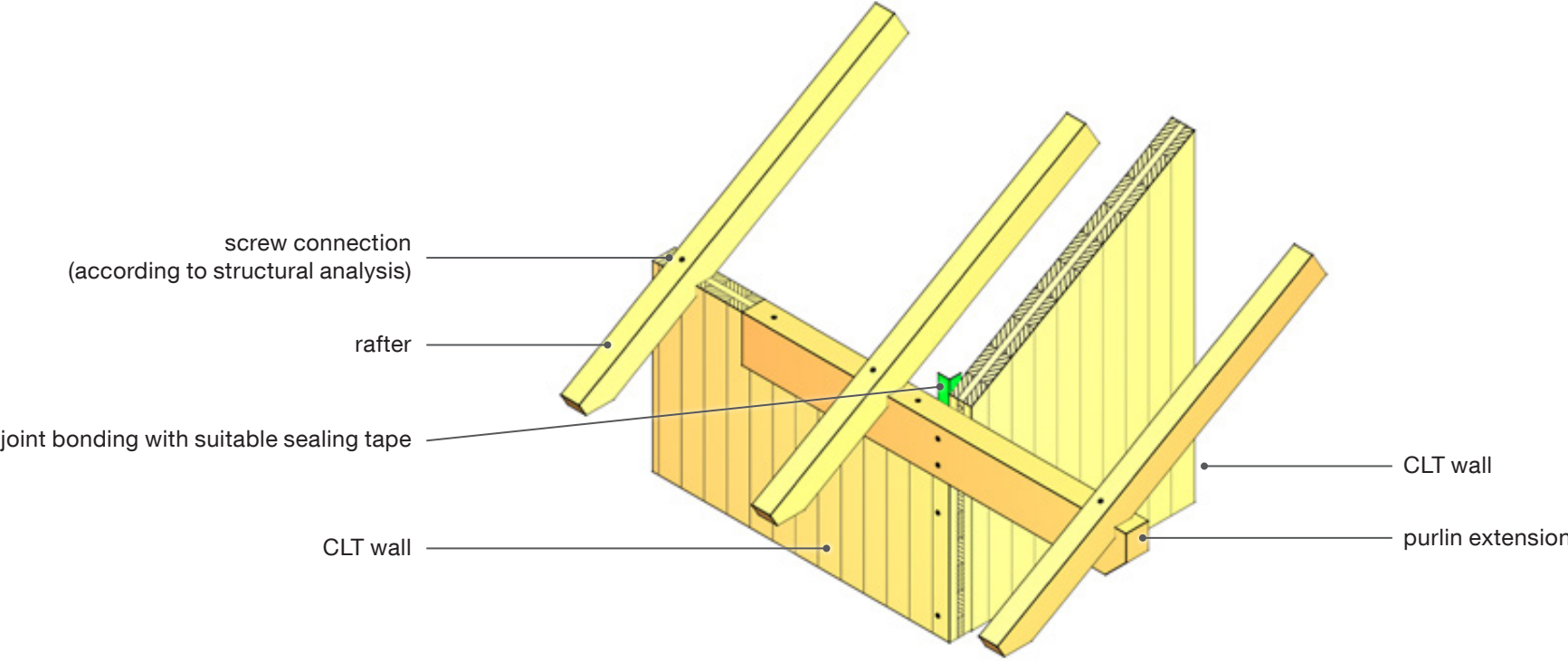
- Sufficient clearance must be provided in the rafter cut-outs in the wall.
- Depending on requirements, self-adhesive compressible strips or exterior sealing tapes must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection between the rafters and CLT wall absorbs the suction forces of the wind.

Illustrations



Frame construction

5. Rafter roof (birdsmouth in rafter)



Execution

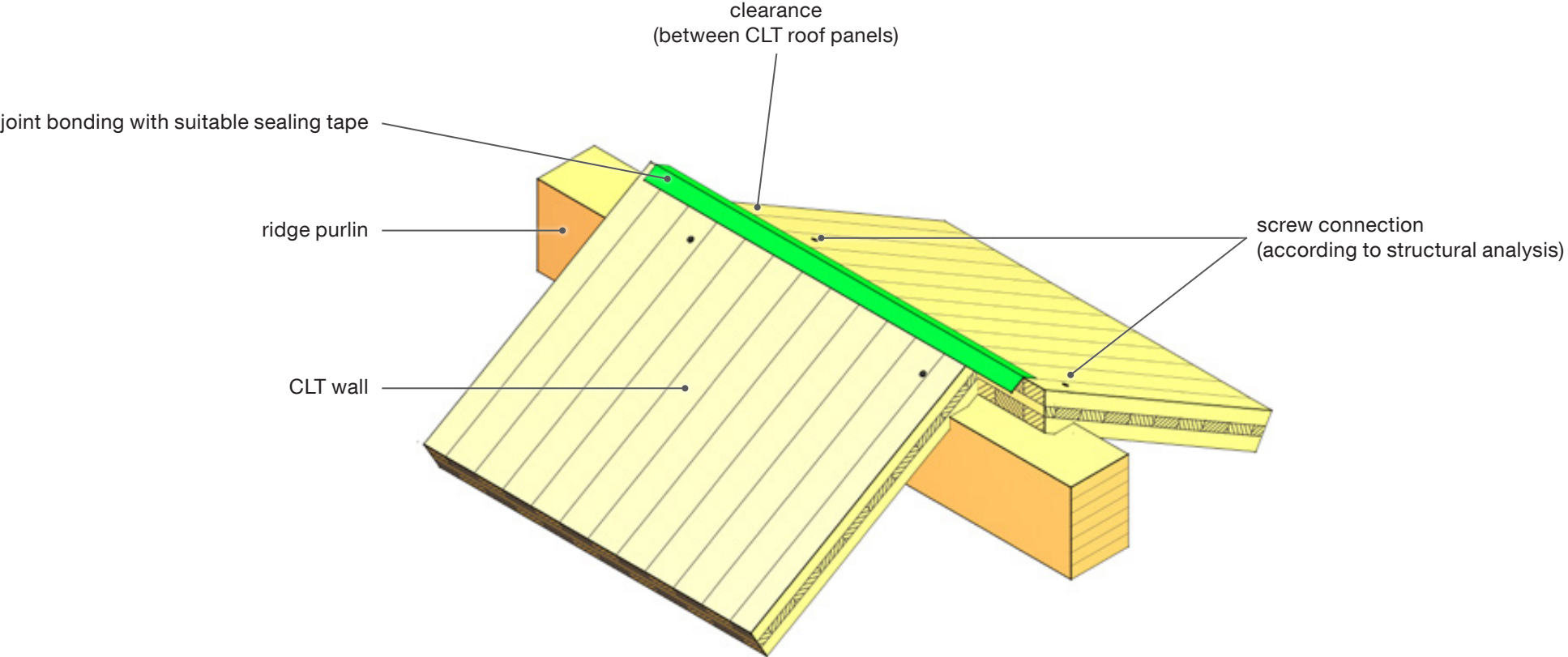
- When purlin extensions are attached, they must reach at least as far as the first rafter inside the gable wall.
- Depending on requirements, self-adhesive compressible strips or exterior sealing tapes must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The screw connection between the rafters and CLT wall or purlin extension absorbs the suction forces of the wind.

Illustrations



Frame construction

6. Ridge (with purlin)

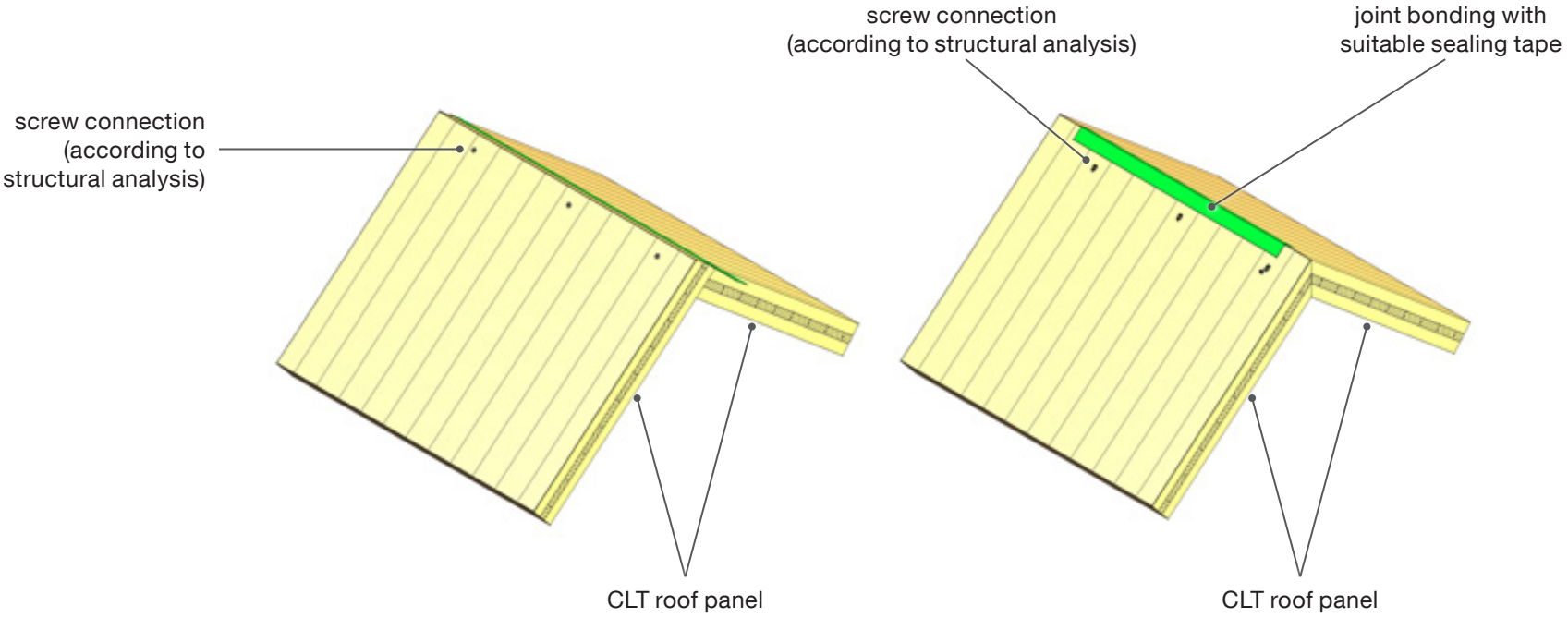


Execution

- The prescribed support point widths and areas must be observed.
- Ensure that the birdsmouth is sufficiently deep, based on the structure of the roof panels (number of layers).
- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Frame construction

7. Ridge (without purlin) in folded-plate structures



Execution

- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- The roof is fitted with the aid of falsework.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- In this case, the screw connection of the CLT roof panels can mainly absorb and transmit shear forces.

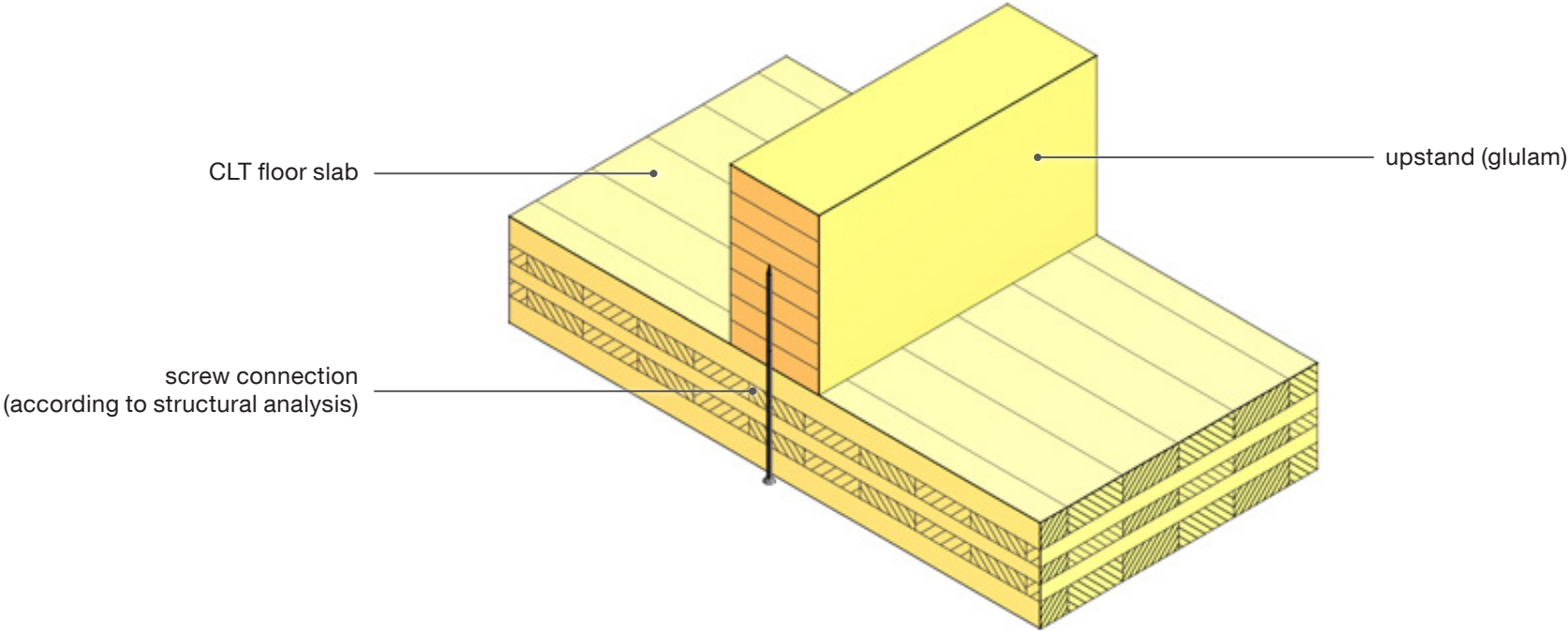
Illustrations



Frame construction

Cantilever and upstand

1. Wooden upstand

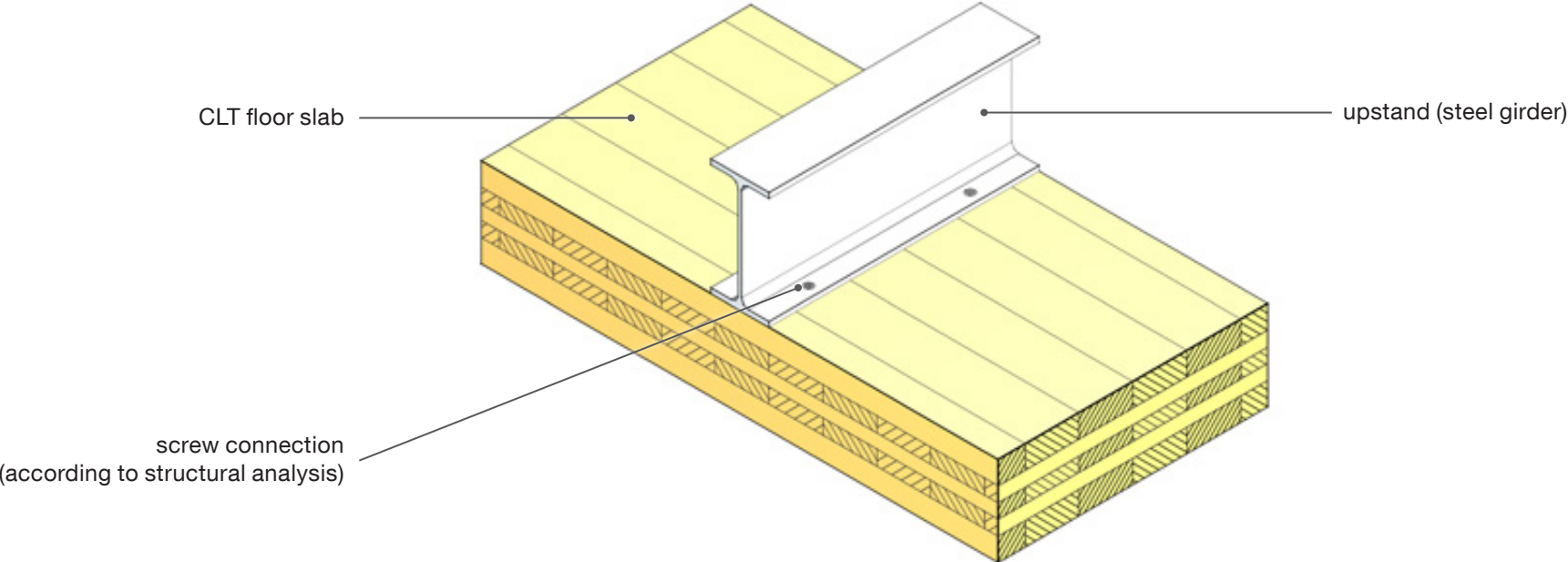


Execution

- The screw connection between the floor slabs and the upstand depends on the forces acting. The choice is between fully threaded screws and partly threaded flat-head screws.
- When using partly threaded flat-head screws
 - ensure that the head is buried.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Frame construction

2. Steel upstand



Execution

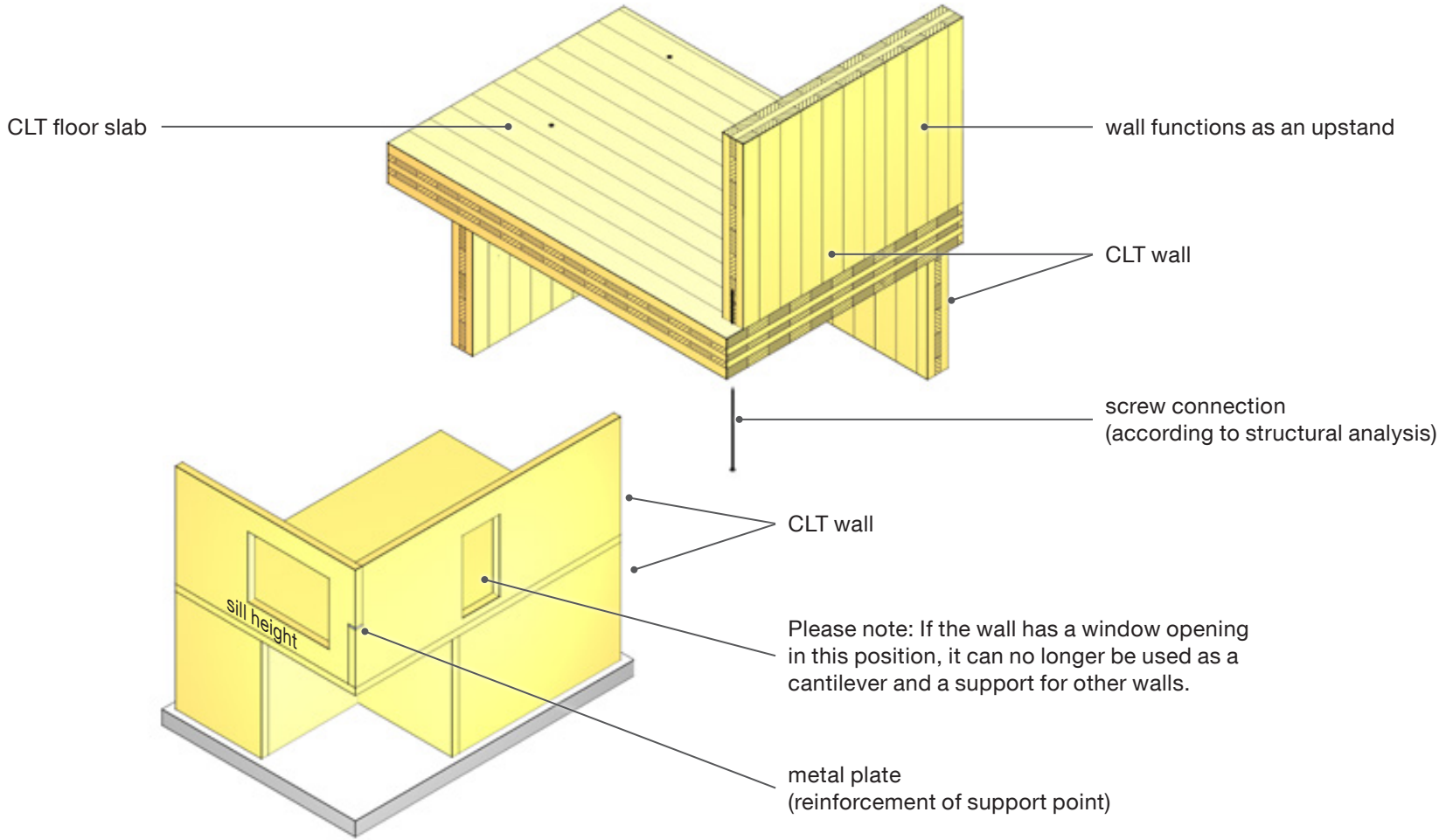
- In this case, fully threaded and partly headed screws can be used for the screw connection. As the screwing is carried out from above,

steel beams of low cross-sectional height must be provided with holes in the upper flange (through which screws can be inserted).

- The choice and rating of the connectors and all structural components depend on the structural requirements.

Frame construction

3. Wall as an upstand



Execution

- When using upper-floor CLT walls as upstands (for attaching the floor slab above), window openings and their sill height must be taken into account.
- Use metal plates and fully threaded screws to transmit forces from end grain to end grain (pressure).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Cantilever floor slabs must be connected to upper CLT walls with closely spaced, fully threaded screws.

Illustrations



2

Layer structure



Frame construction

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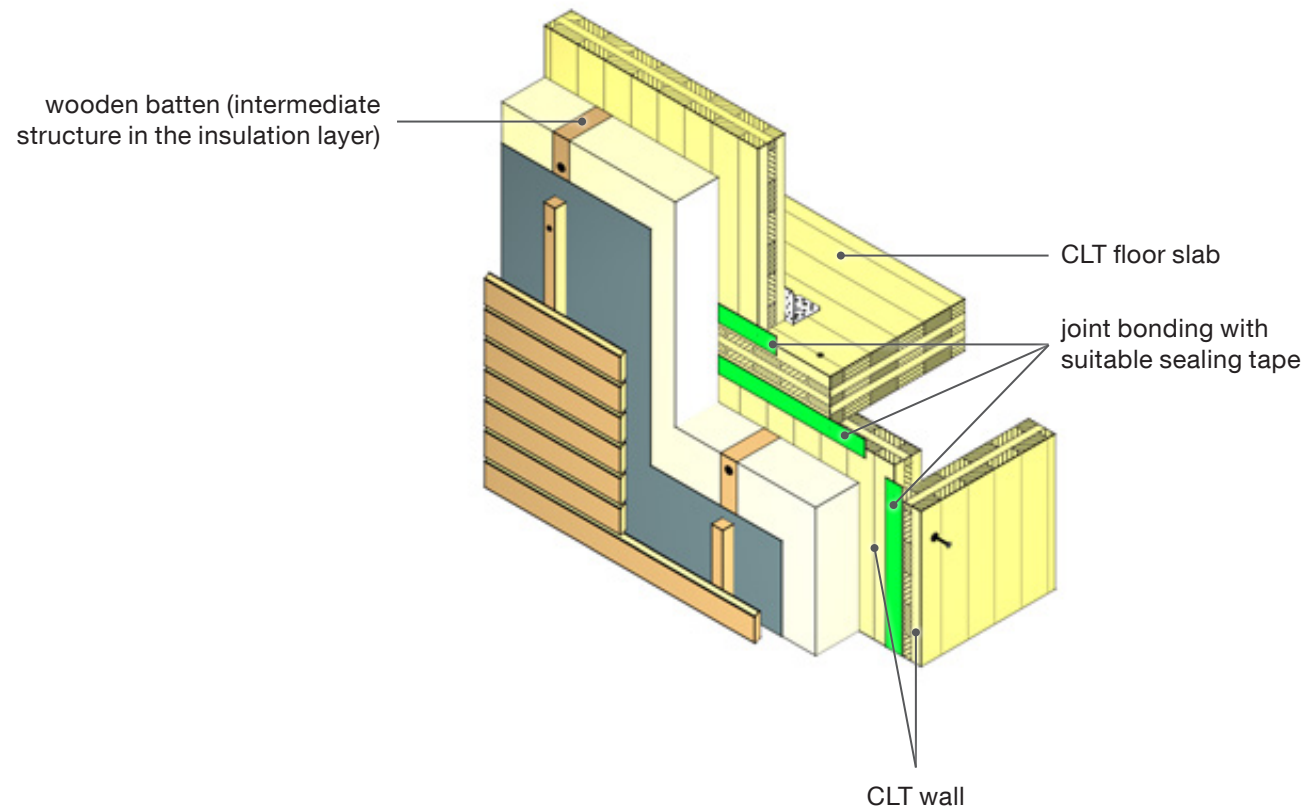
Layer structure

External wall

1. Insulation with mineral wool

Structure

- CLT wall
- insulation (mineral wool)
- vertical seal (for windtightness)
- battens
- horizontal wall cladding



Execution

- Heavy façades (material weight and wind load) must be structurally analysed and the battens sized accordingly.
- Ensure adequate air circulation (battens).
- The windtight and watertight layer must be appropriately designed to take account of the execution of the façade.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations



Layer structure

Illustrations

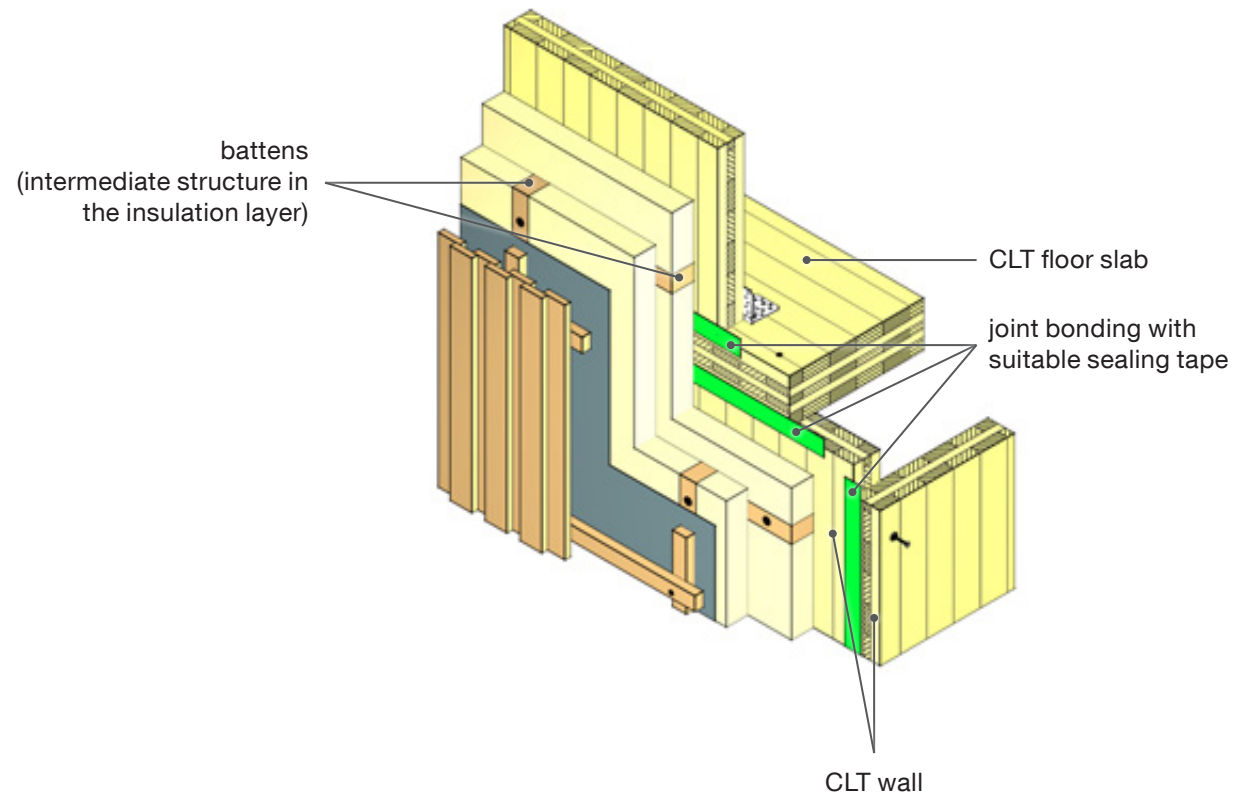


Layer structure

2. Insulation with wood fibre

Structure

- CLT wall
- insulation (wood fibre)
- insulation (wood fibre)
- vertical seal (for windtightness)
- battens and counter battens
- vertical wall cladding



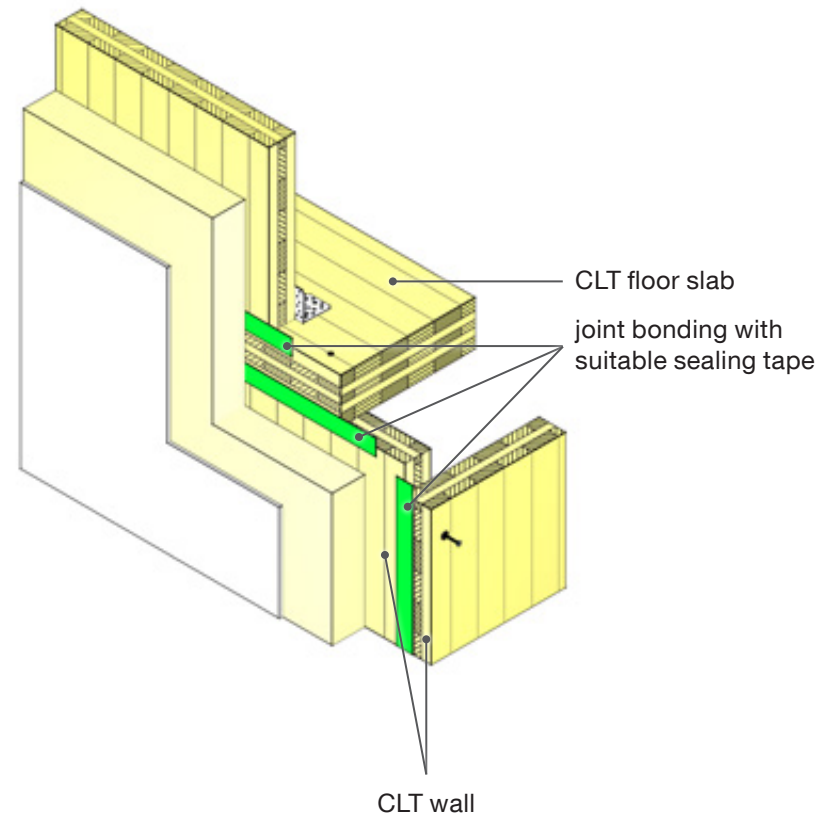
Execution

- Heavy façades (material weight and wind load) must be structurally analysed and the battens sized accordingly.
 - Ensure adequate air circulation (battens).
 - The windtight and watertight layer must be appropriately designed to take account of the execution of the façade.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
 - Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

Structure

- CLT wall
- insulation (wood fibre)
- plaster (incl. base)



Execution

- Splash-water areas must be constructed in accordance with the requirements (XPS insulation).
- The structural-physical properties of the plaster coat must be matched to the wall structure.
- Suitable profile sections must be used to protect plaster edges.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations

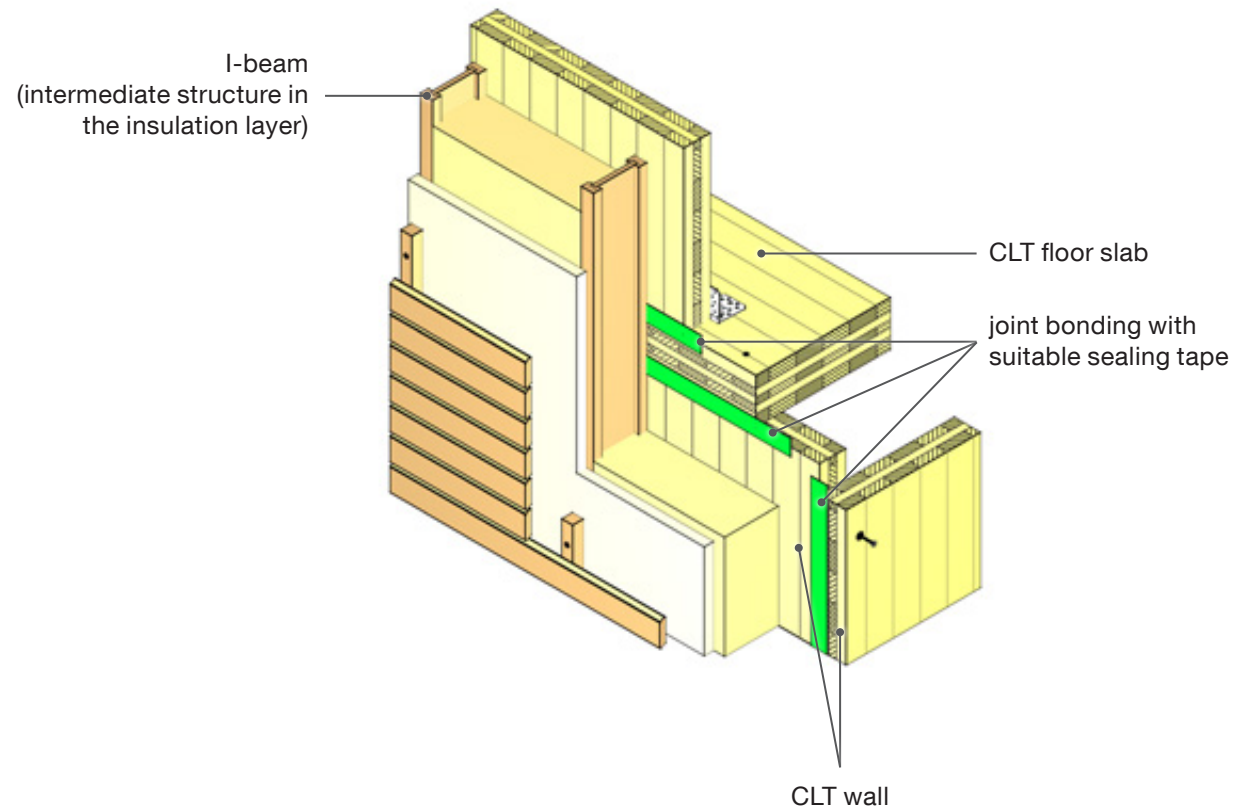


Layer structure

3. Insulation with cellulose

Structure

- CLT wall
- insulation (cellulose)
- insulation (wood fibre)
- vertical seal (for windtightness)
- battens
- horizontal wall cladding

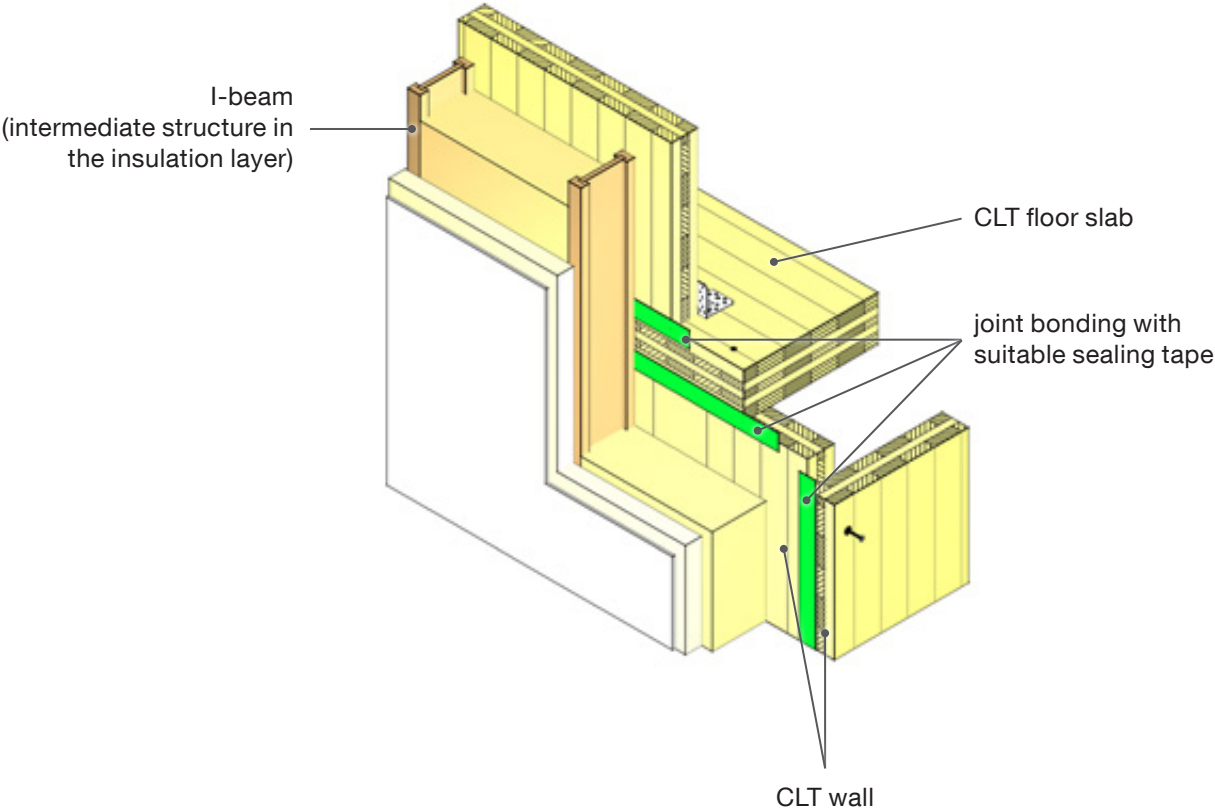


Execution

- Heavy façades (material weight and wind load) must be structurally analysed and the battens sized accordingly.
 - Ensure adequate air circulation (battens).
 - The windtight and watertight layer must be appropriately designed to take account of the execution of the façade.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
 - Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

- Structure**
- CLT wall
 - insulation (cellulose)
 - insulation (wood fibre)
 - plaster (incl. base)



Execution

- Splash-water areas must be constructed in accordance with the requirements (XPS insulation).
- The structural-physical properties of the plaster coat must be matched to the wall structure.
- Suitable profile sections must be used to protect plaster edges.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations

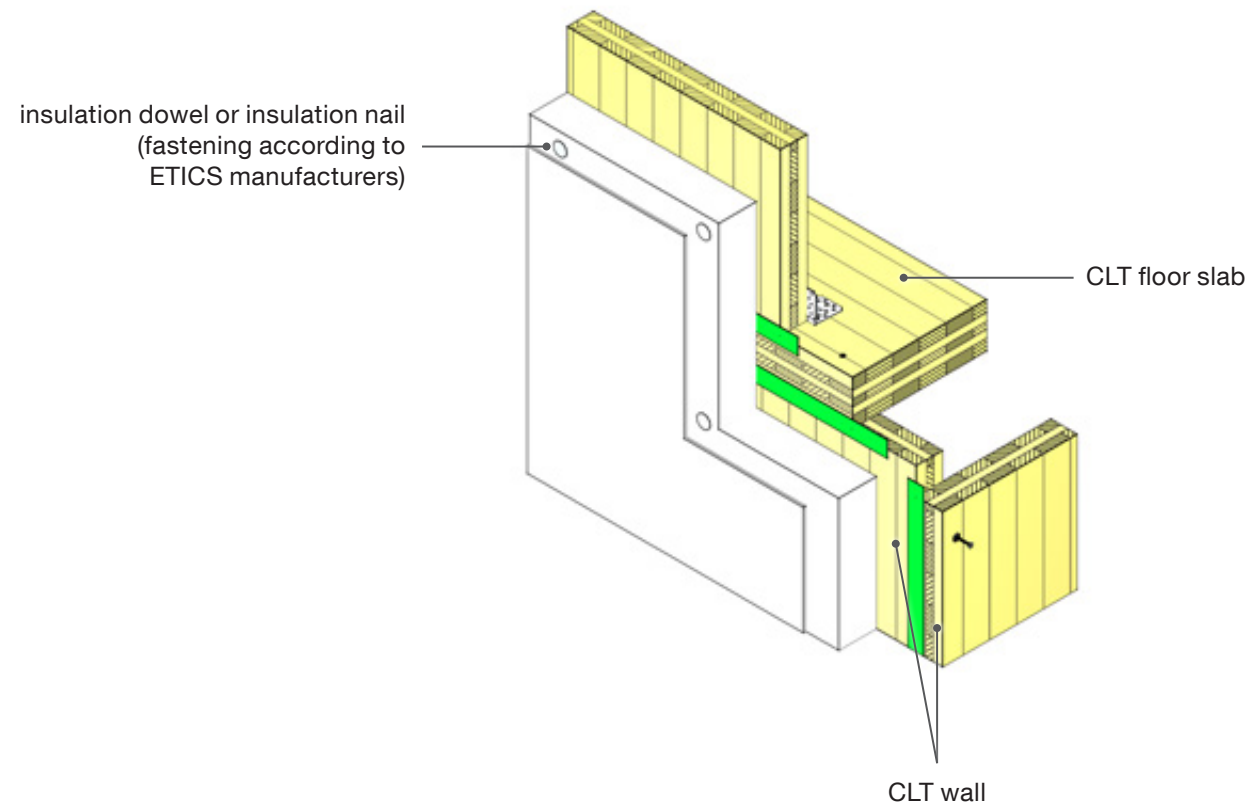


Layer structure

4. EPS insulation

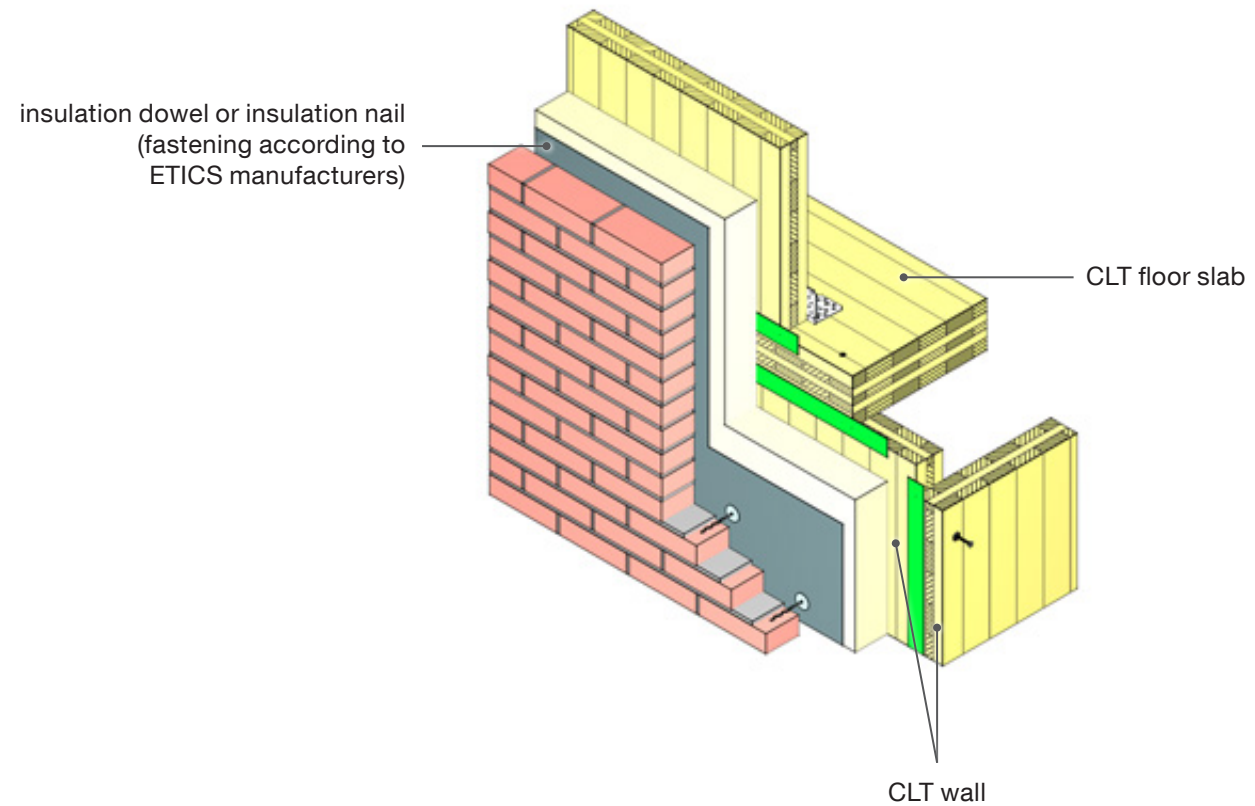
Structure

- CLT wall
- insulation (expanded polystyrene)
- plaster (incl. base)



Structure

- CLT wall
- insulation (mineral wool)
- vertical seal (for windtightness)
- brick façade



Layer structure

Execution

- Splash-water areas must be constructed in accordance with the requirements (XPS insulation).
- Apart from its price advantage, EPS insulation and its suitability in combination with wooden constructions must be viewed critically in terms of the environment, sound insulation, impermeability, etc.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations



Illustrations



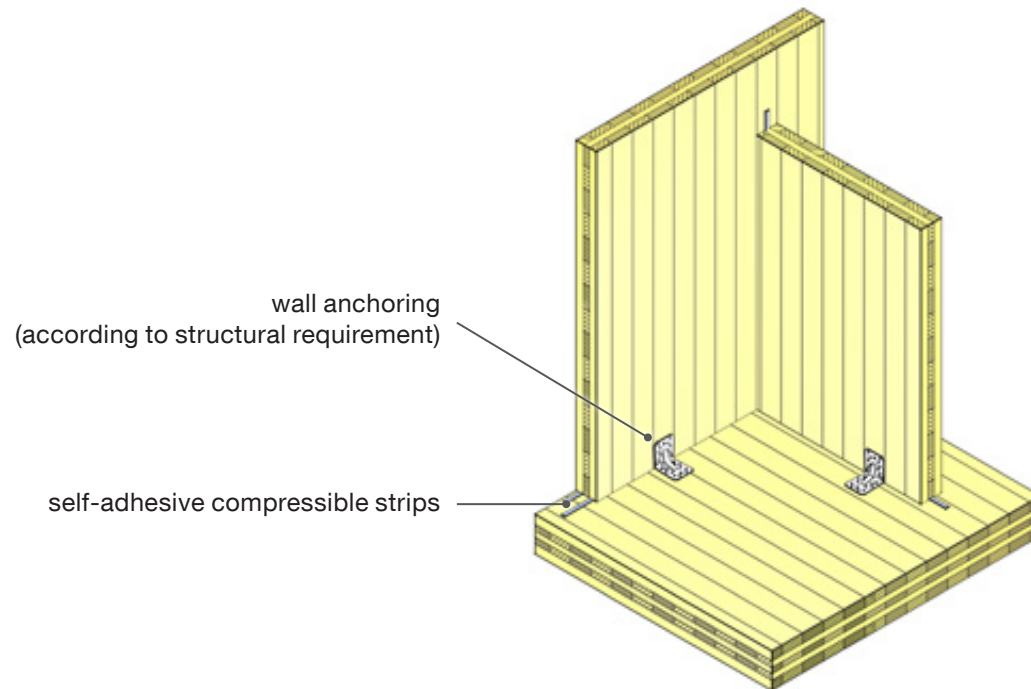
Layer structure

Internal wall

1. CLT in visible quality

Structure

- CLT wall



Execution

- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips or sealing tape.
- With visible CLT elements a distinction is made between single-side and double-side exposure.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations

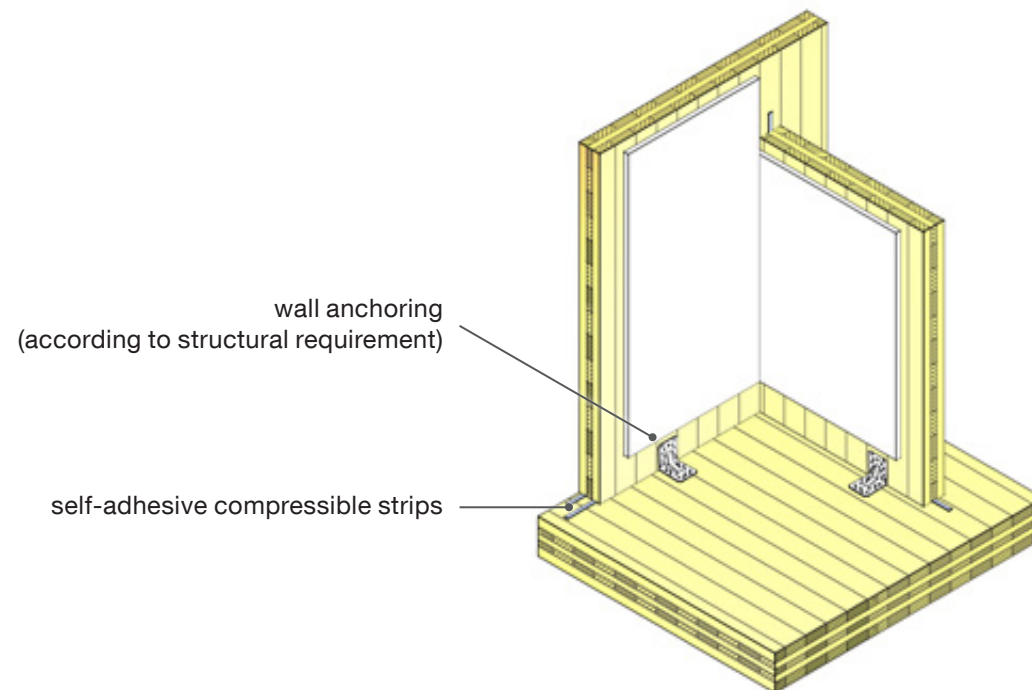


Layer structure

2. Direct facing

Structure

- CLT wall
- gypsum cardboard or gypsum fibreboard



Execution

- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips or sealing tape.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations

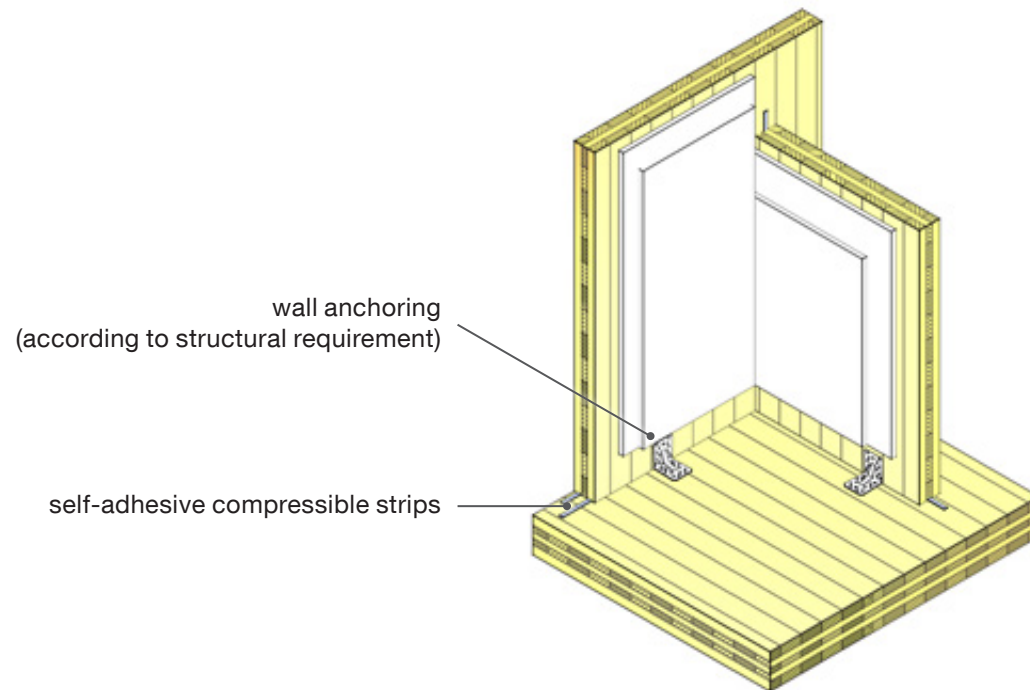


Layer structure

3. Double facing

Structure

- CLT wall
- gypsum cardboard or gypsum fibreboard
- gypsum cardboard or gypsum fibreboard



Execution

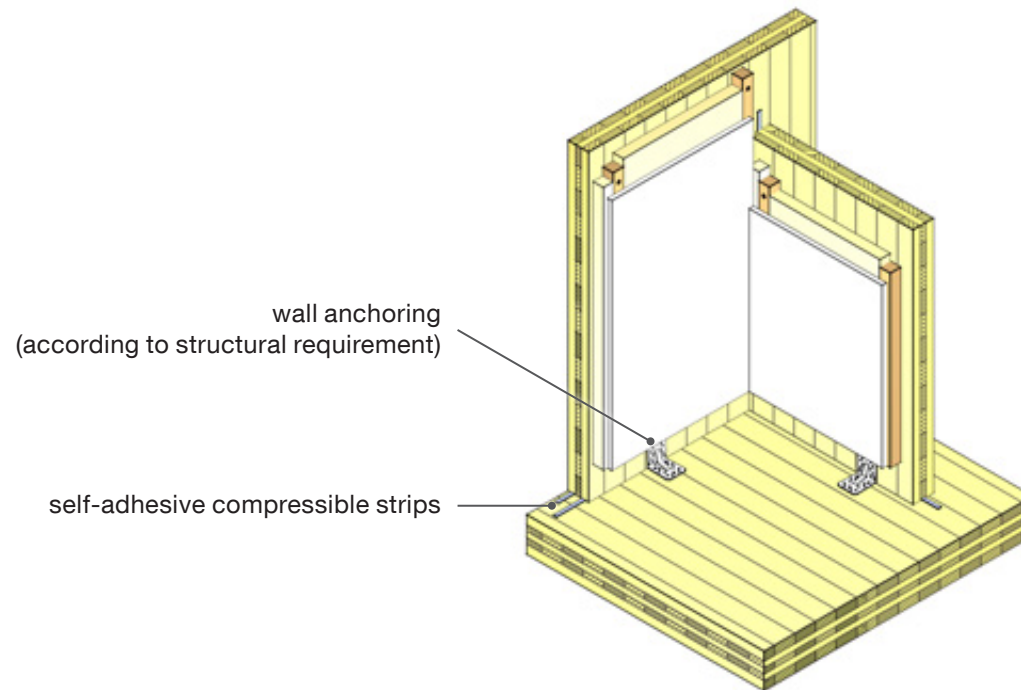
- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips or sealing tape.
- In the case of specific fire protection requirements, CLT elements are faced with a double layer of gypsum cardboard or gypsum fibreboard.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

4. Insulation panel (battens)

Structure

- CLT wall
- battens, insulation (between battens)
- gypsum cardboard or gypsum fibreboard



Execution

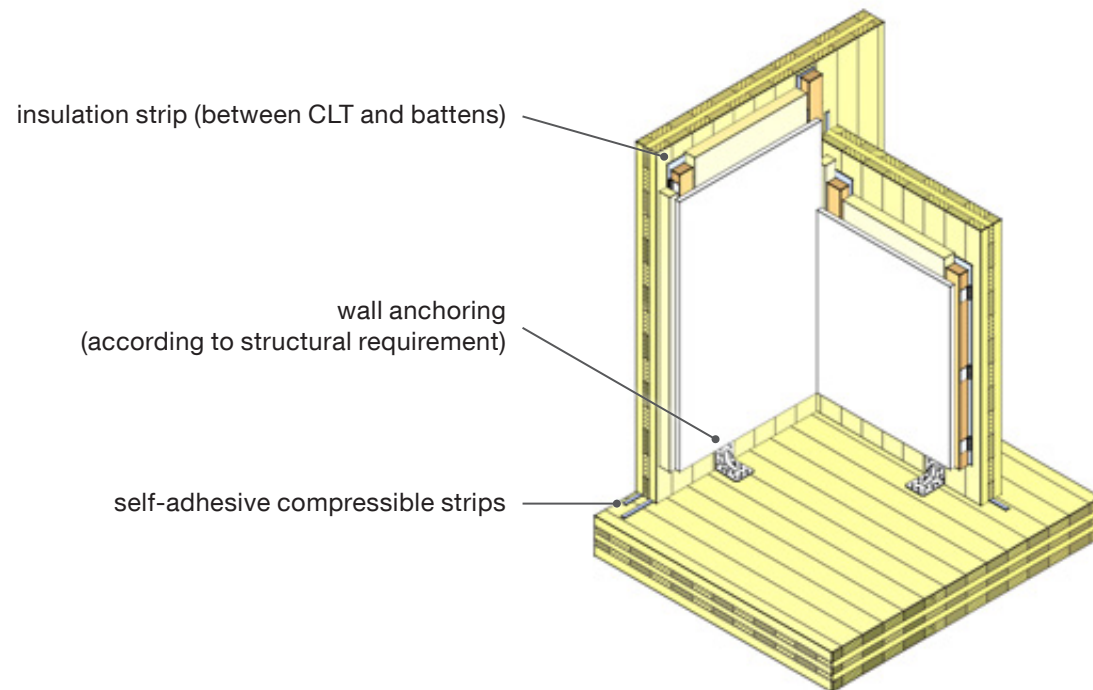
- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips or sealing tape.
- The service cavity secures a certain improvement in sound insulation but has disadvantages with regard to moisture control and heat storage.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

5. Insulation panel (spring clips)

Structure

- CLT wall
- battens (on spring clips),
insulation (between battens)
- gypsum cardboard or gypsum
fibreboard



Execution

- If the individual rooms in the building are required to be airtight, the joints of the CLT elements must be sealed with self-adhesive compressible strips or sealing tape.
- The service cavity secures a certain improvement in sound insulation but has disadvantages with regard to moisture control and heat storage.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations



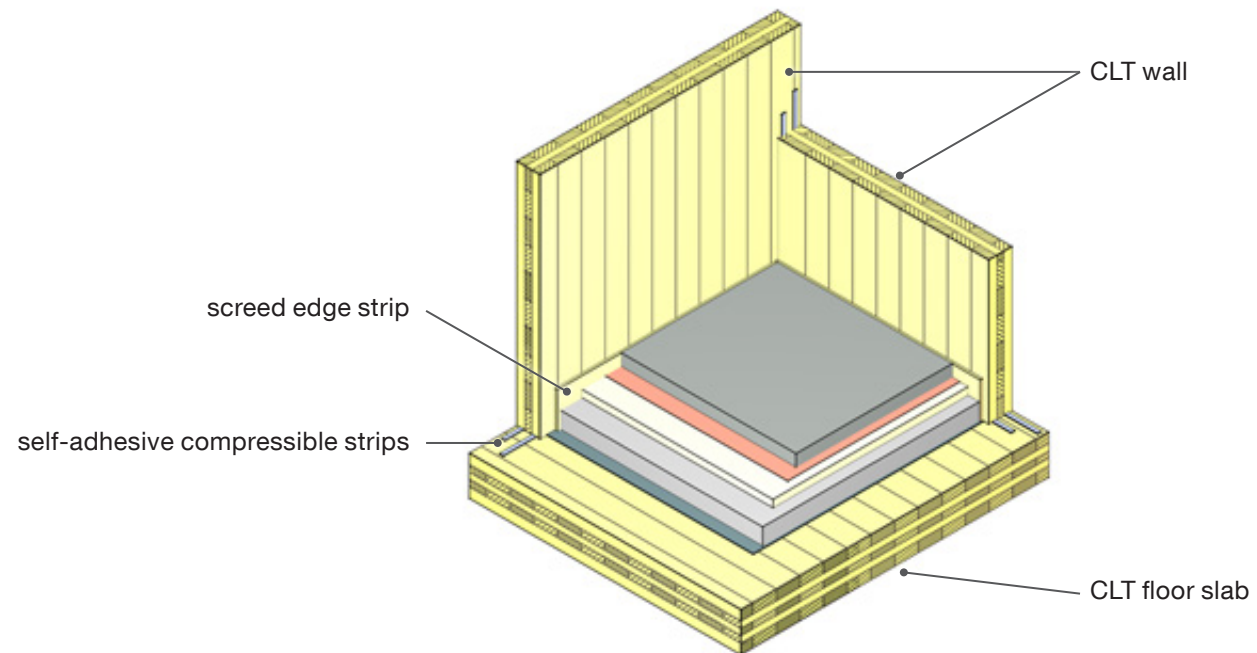
Layer structure

Floor structure

1. Wet screed

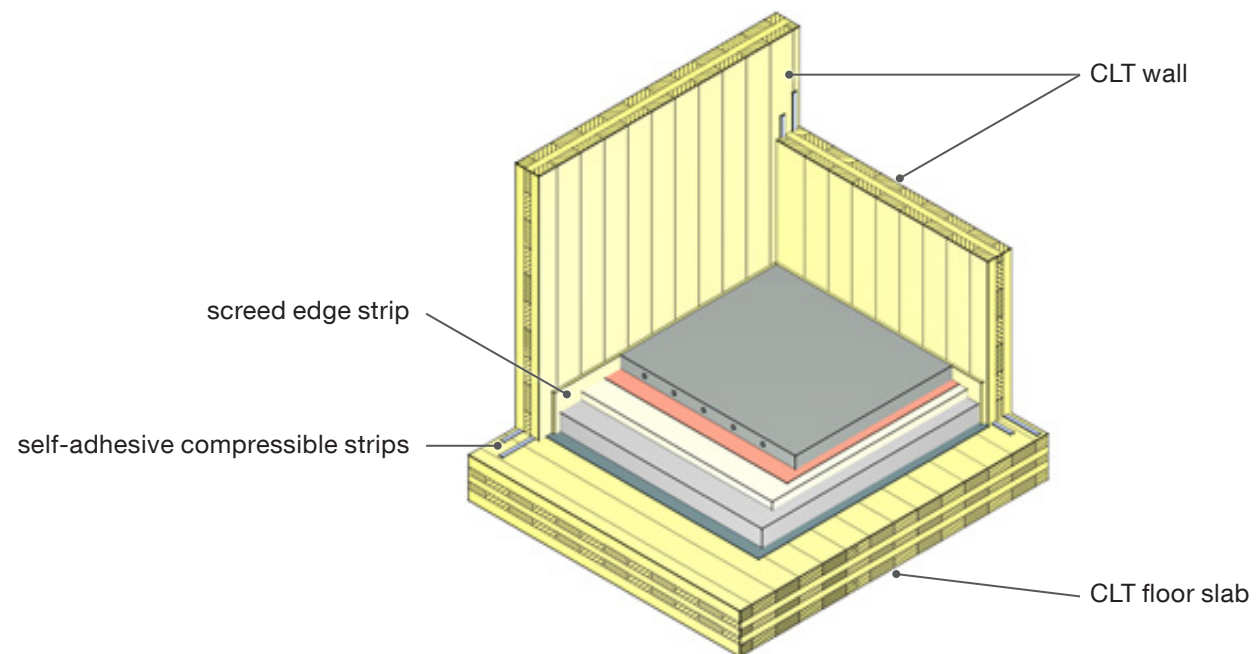
Structure

- screed
- separating layer
- impact sound insulation
- fill (gravel)
- trickle protection (optional)
- CLT floor slab



Structure

- screed (underfloor heating)
- separating layer
- impact sound insulation
- fill (gravel)
- trickle protection (optional)
- CLT floor slab



Layer structure

Execution

- The entire floor structure must always be designed according to the mass-spring-mass principle (sound insulation capacity).
- Do not forget the screed edge strips (to prevent indirect sound transmission).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations



Illustrations

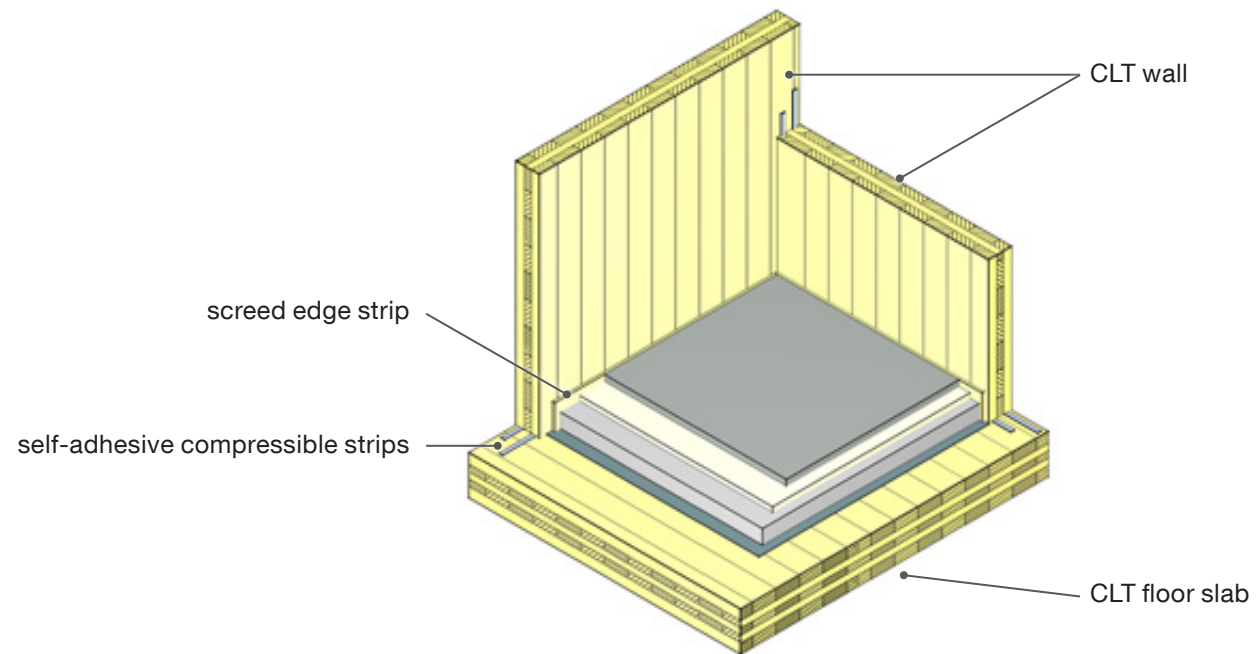


Layer structure

2. Dry screed

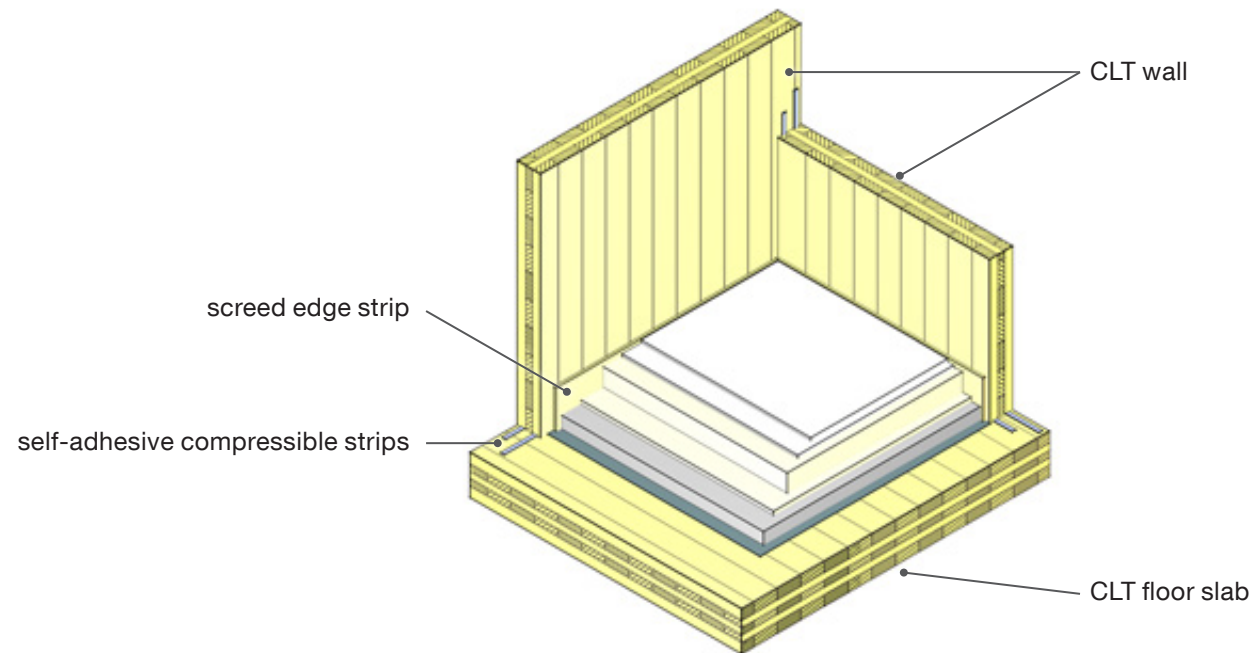
Structure

- dry screed separating layer
- impact sound insulation
- fill (gravel)
- trickle protection (optional)
- CLT floor slab



Structure

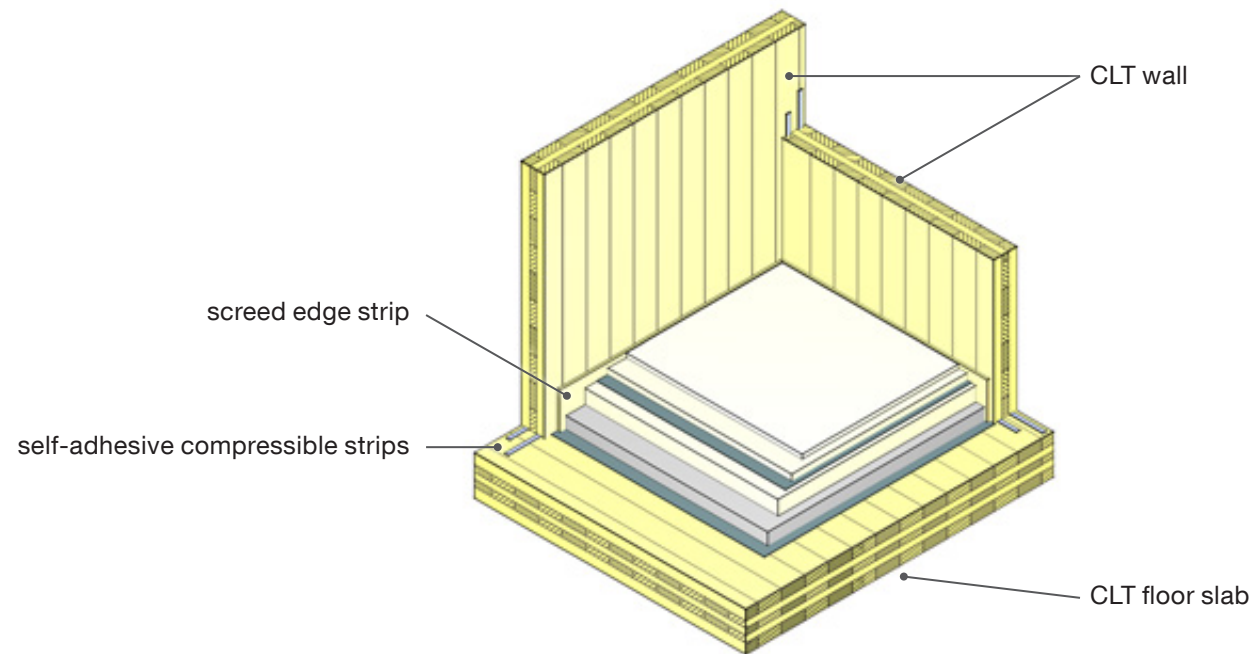
- plasterboard
- plasterboard
- wood wool board
- impact sound insulation
- fill (gravel)
- trickle protection (optional)
- CLT floor slab



Layer structure

Structure

- OSB
- wood wool board
- separating layer
- mineral wool
- fill (gravel)
- trickle protection (optional)
- CLT floor slab



Execution

- The entire floor structure must always be designed according to the mass-spring-mass principle (sound insulation capacity).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

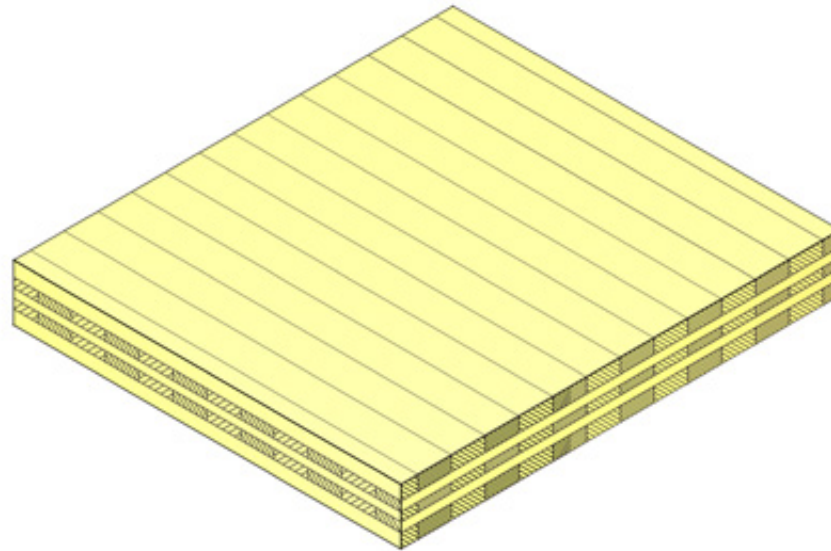
Layer structure

Floor

1. CLT in visible quality

Structure

- CLT floor slab



Execution

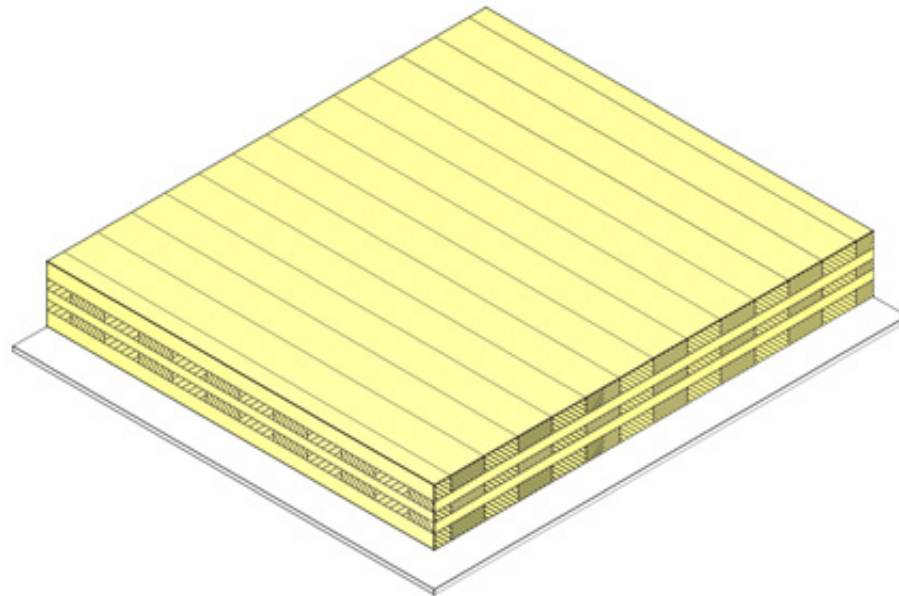
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

2. Direct facing

Structure

- CLT floor slab
- gypsum cardboard or gypsum fibreboard



Execution

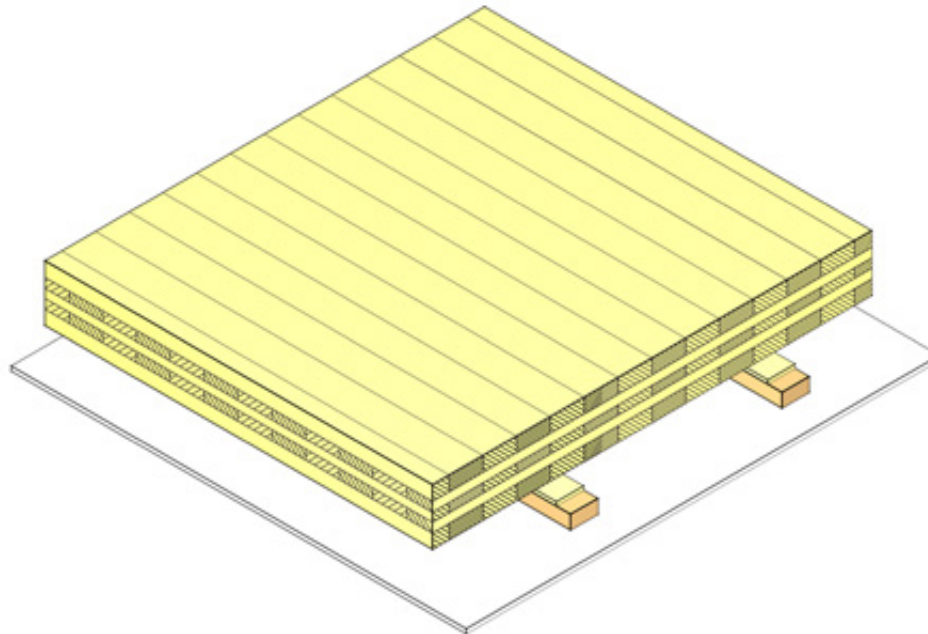
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

3. Insulation panel (battens)

Structure

- CLT floor slab
- battens (on insulation strips)
- gypsum cardboard or gypsum fibreboard



Execution

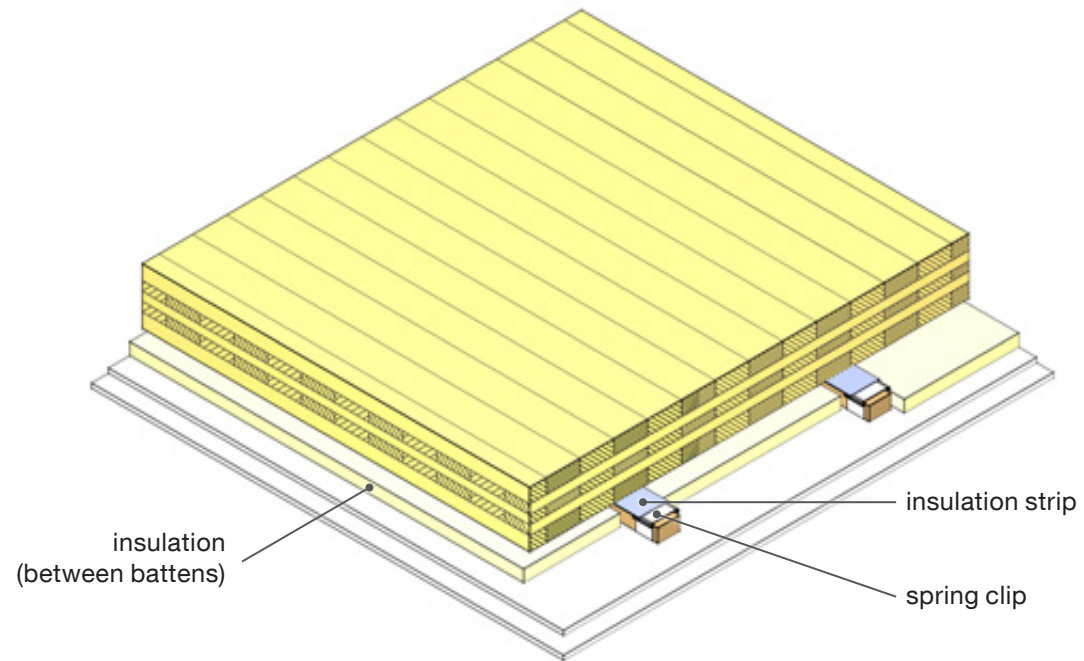
- A suspended ceiling secures a certain improvement in sound insulation but has disadvantages with regard to the CLT element's moisture control and heat storage capability.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

4. Insulation panel (spring clips)

Structure

- CLT floor slab
- battens (fastened with spring clips)
- gypsum cardboard or gypsum fibreboard
- gypsum cardboard or gypsum fibreboard



Execution

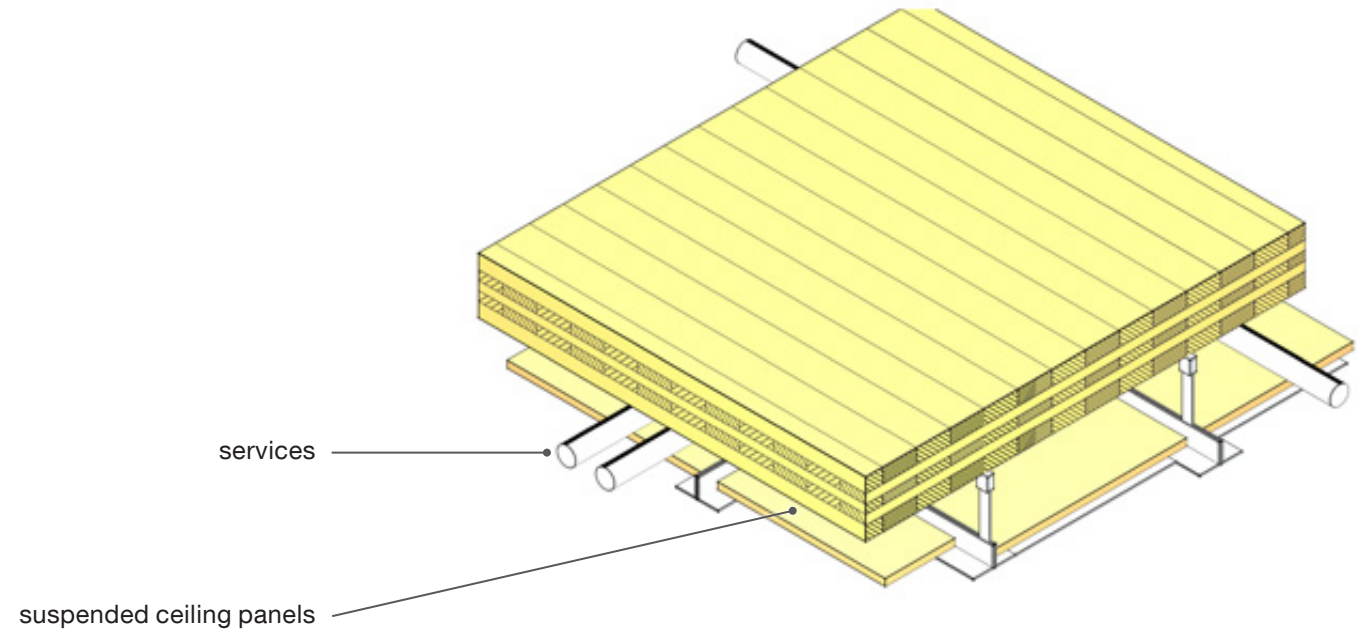
- A suspended ceiling secures a certain improvement in sound insulation but has disadvantages with regard to the CLT element's moisture control and heat storage capability.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

5. Suspended system

Structure

- CLT floor slab
- cavity (services)
- suspension system with ceiling panels



Execution

- A suspended ceiling secures a certain improvement in sound insulation but has disadvantages with regard to the CLT element's moisture control and heat storage capability.
- Concealed routing of services is possible.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Illustrations



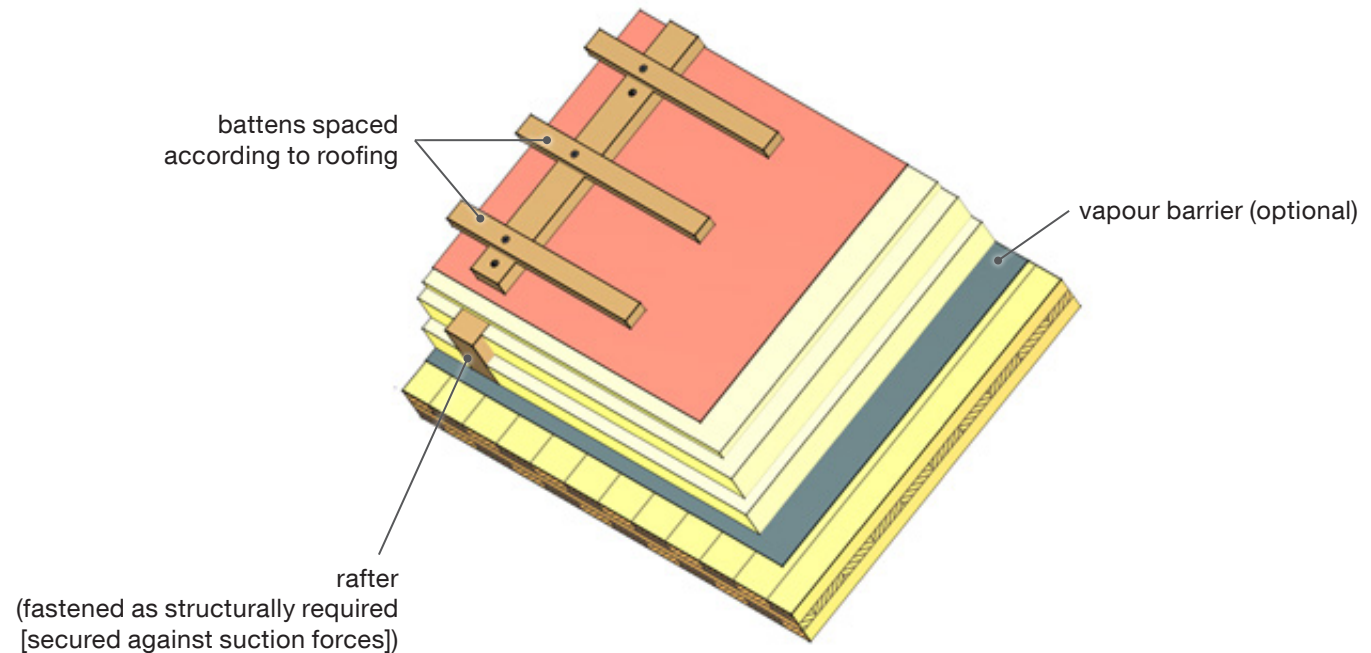
Layer structure

Roof

1. Steep roof insulated with wood fibre

Structure

- roofing
(not shown in the drawing)
- battens
- counter battens
- roofing membrane
- wood fibre (over rafters)
- wood fibre (2 layers)
- vapour barrier (optional)
- CLT roof panel



Execution

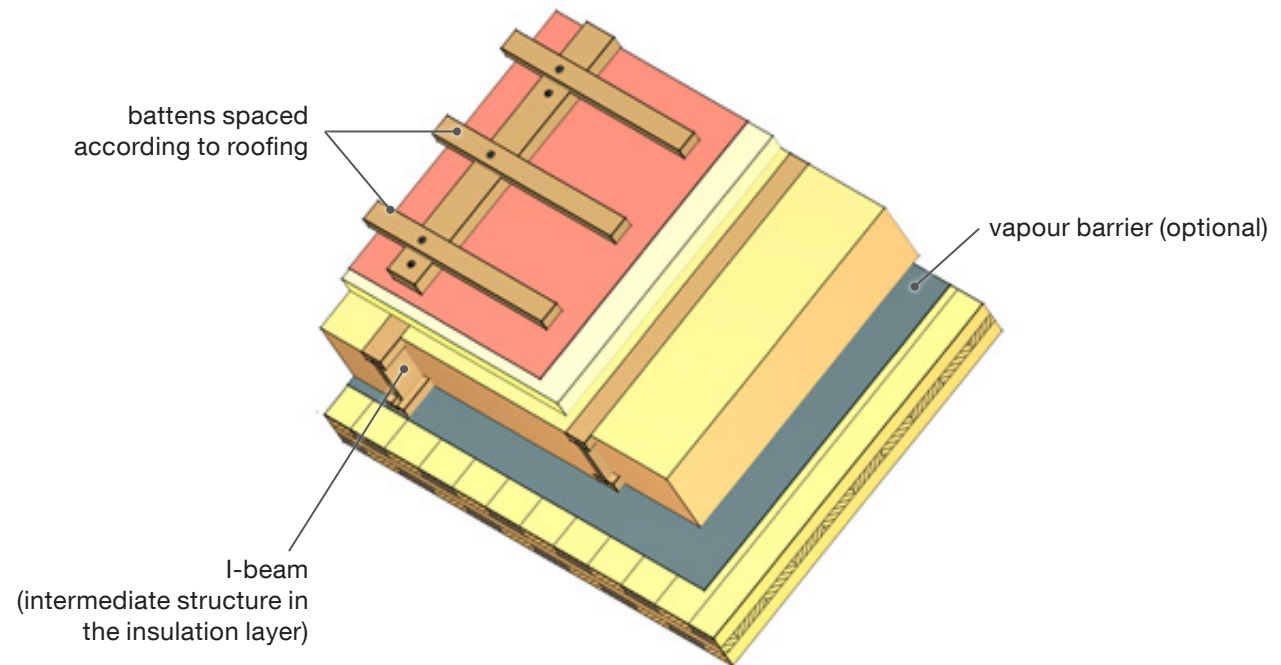
- If the roof structure is suitably designed and the layers are configured in the right order (with their permeability increasing from inside to outside), a vapour barrier may be omitted.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

2. Steep roof insulated with cellulose

Structure

- roofing
(not shown in the drawing)
- battens
- counter battens
- roofing membrane
- wood fibre (over rafters)
- cellulose insulation
- vapour barrier (optional)
- CLT roof panel



Execution

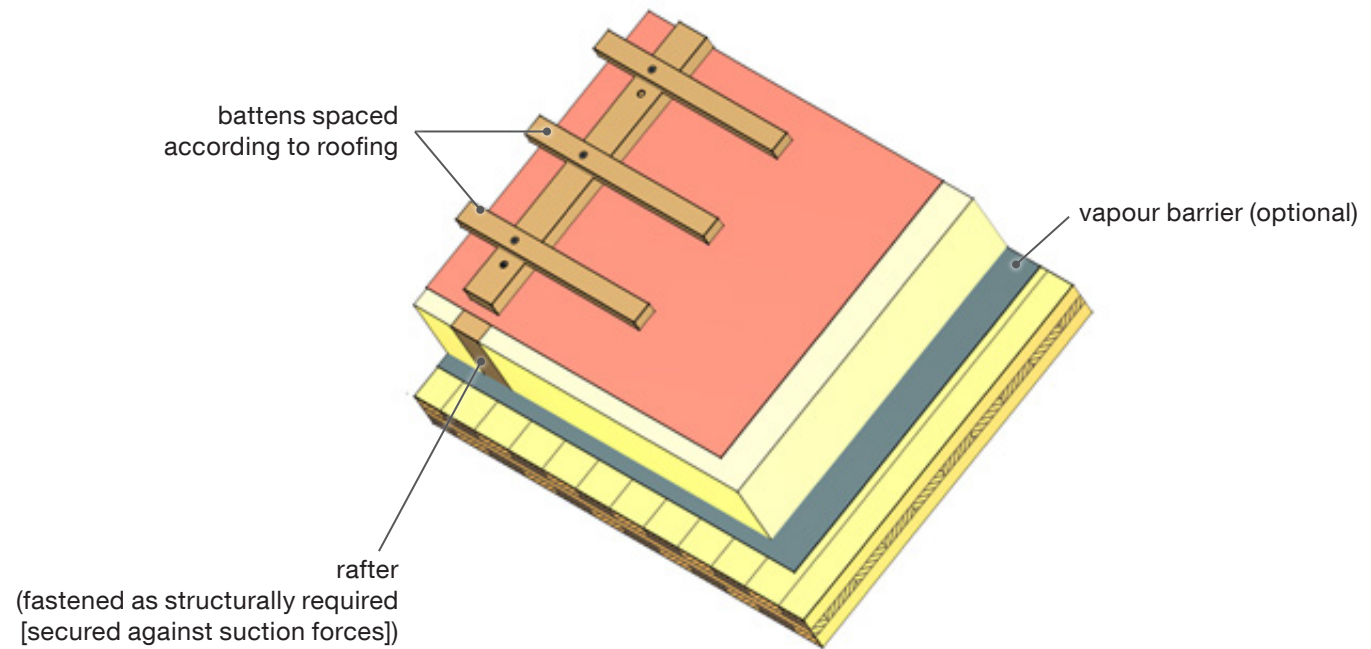
- If the roof structure is suitably designed and the layers are configured in the right order (with their permeability increasing from inside to outside), a vapour barrier may be omitted.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

3. Steep roof insulated with mineral wool

Structure

- roofing
(not shown in the drawing)
- battens
- counter battens
- roofing membrane
- mineral wool
- vapour barrier (optional)
- CLT roof panel



Execution

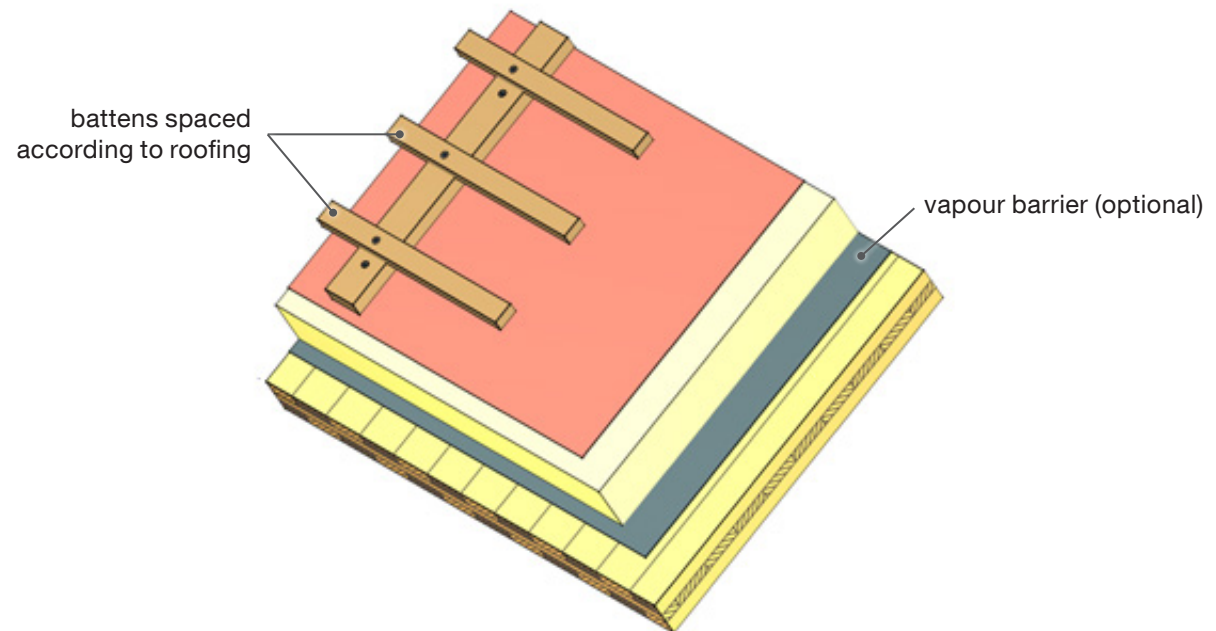
- If the roof structure is suitably designed and the layers are configured in the right order (with their permeability increasing from inside to outside), a vapour barrier may be omitted.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

4. Steep roof insulated with PUR

Structure

- roofing
(not shown in the drawing)
- battens
- counter battens
- roofing membrane
- PUR insulation
- vapour barrier
- CLT roof panel



Execution

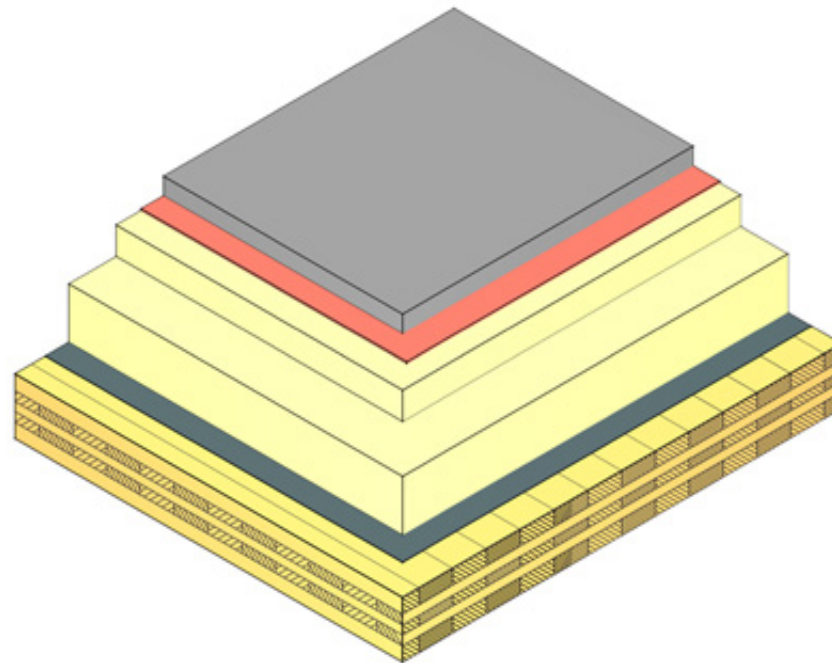
- Because of the PUR insulation's physical properties (non-permeable) a vapour barrier must be fitted.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

5. Flat roof

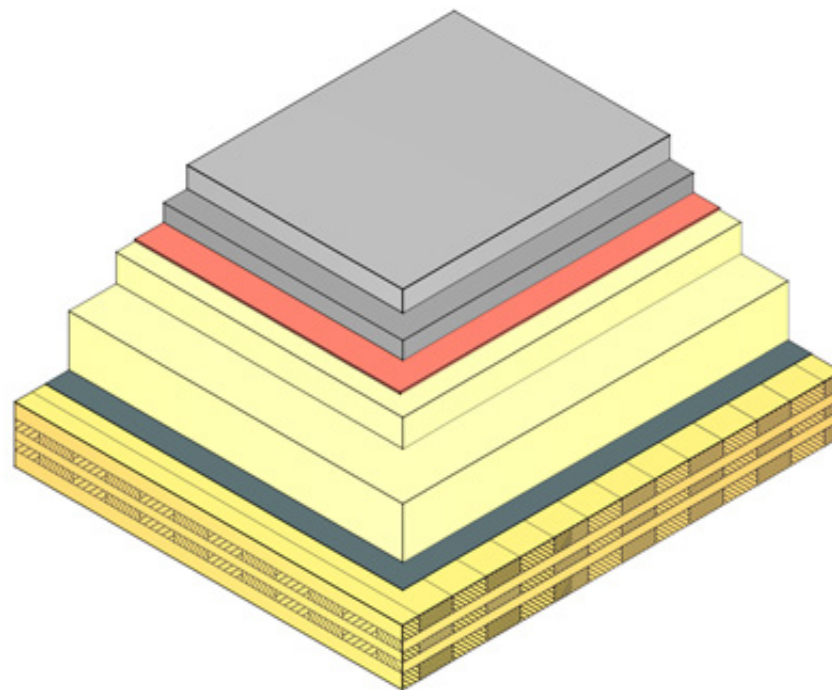
Structure

- fill (gravel)
- roofing membrane
- tapered insulation (EPS)
- mineral wool
- bitumen sheet
- CLT roof panel



Structure

- grass pavers
- fill (gravel)
- roofing membrane
- tapered insulation (EPS)
- mineral wool
- bitumen sheet
- CLT roof panel



Layer structure

Execution

- The gravel fill serves to keep the roof cladding in place and also to protect it against direct sunlight which would reduce the material's durability.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

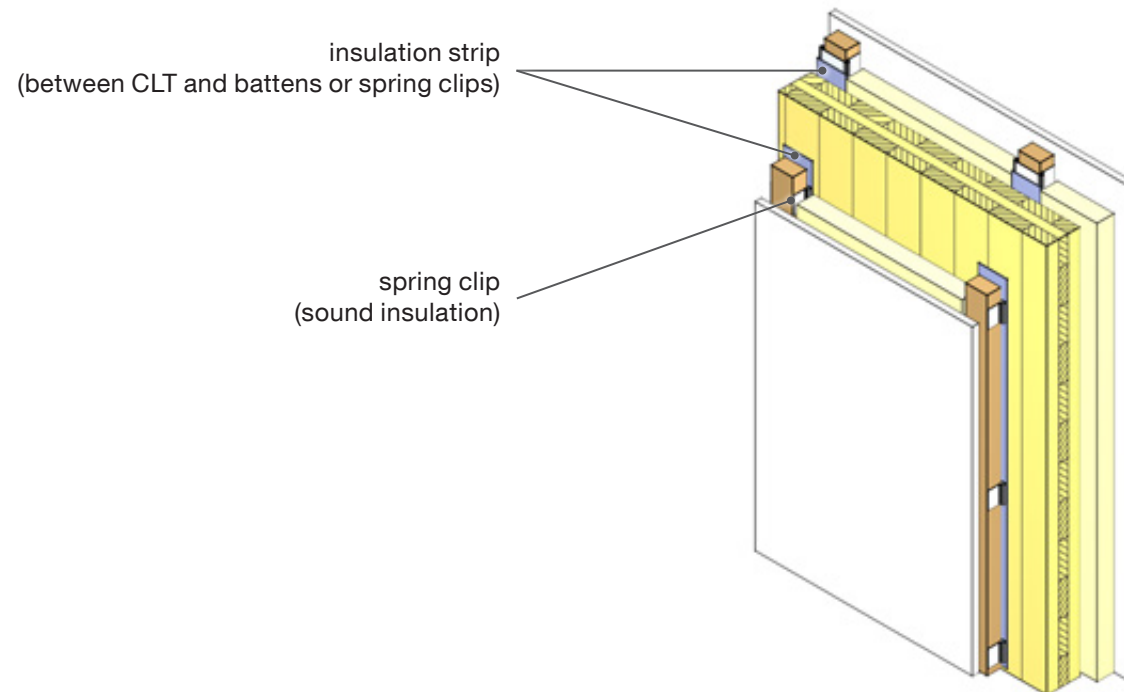
Layer structure

Apartment partition wall

1. Systems with single CLT structure

Structure

- gypsum cardboard or gypsum fibreboard
- battens (fastened with spring clips), insulation (between battens)
- CLT wall
- battens (fastened with spring clips), insulation (between battens)
- gypsum cardboard or gypsum fibreboard

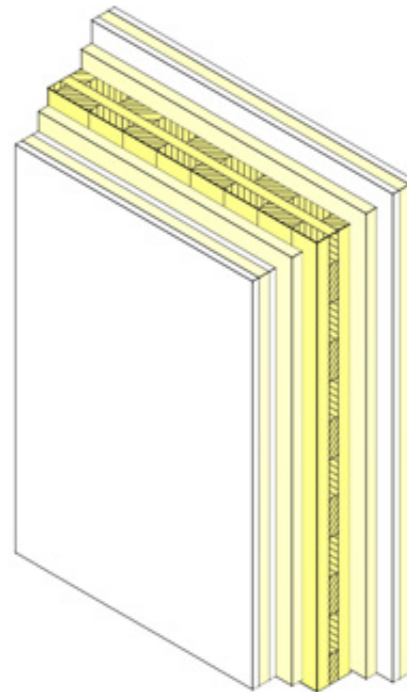


Execution

- Layer structures must be matched to the required structural-physical properties of the design.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Structure

- composite element (wood wool board with double-sided gypsum cardboard facing)
- impact sound insulation
- CLT wall
- impact sound insulation
- composite element (wood wool board with double-sided gypsum cardboard facing)

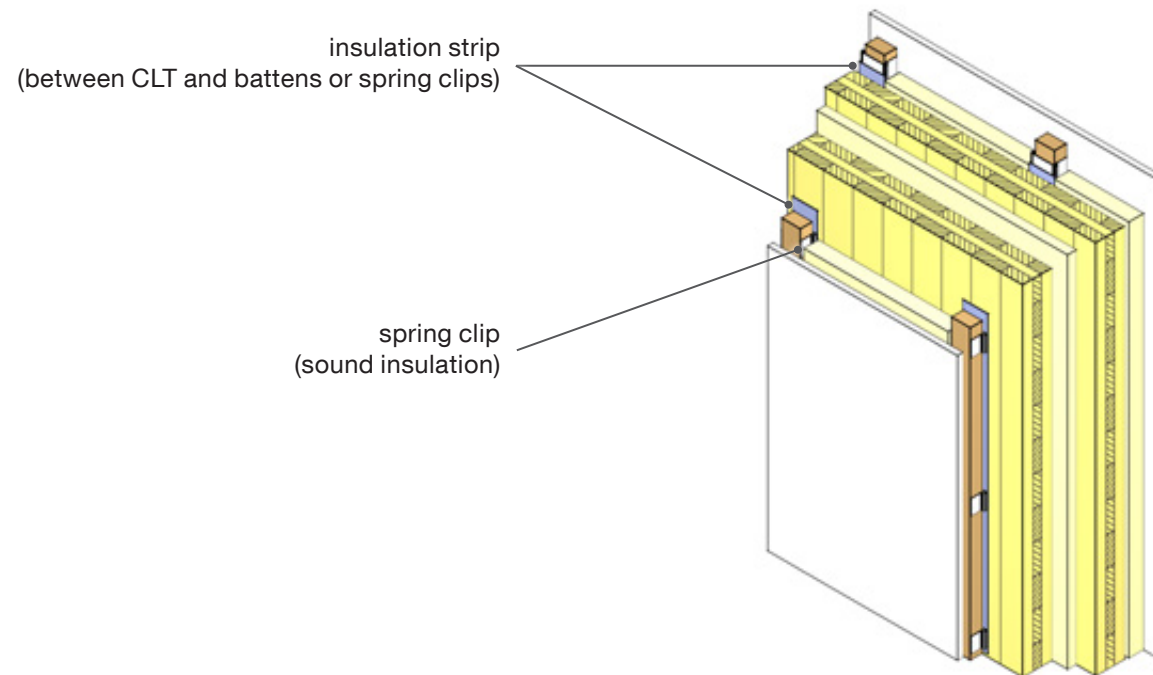


Layer structure

2. Systems with double CLT structure

Structure

- gypsum cardboard or gypsum fibreboard
- battens (fastened with spring clips), insulation (between battens)
- CLT wall
- impact sound insulation
- CLT wall
- battens (fastened with spring clips), insulation (between battens)
- gypsum cardboard or gypsum fibreboard

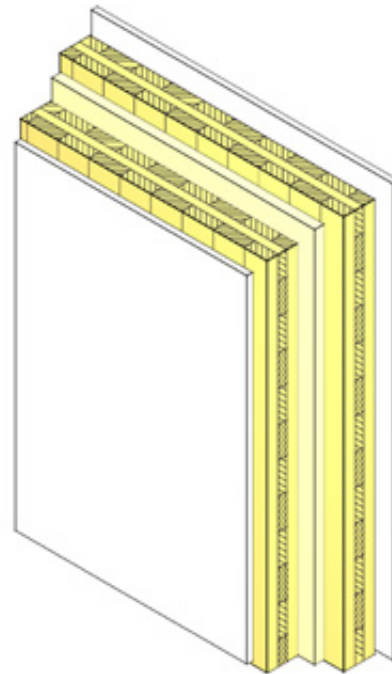


Execution

- Layer structures must be matched to the required structural-physical properties of the design.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Structure

- fire-protection plasterboard
- CLT wall
- impact sound insulation
- CLT wall
- fire-protection plasterboard



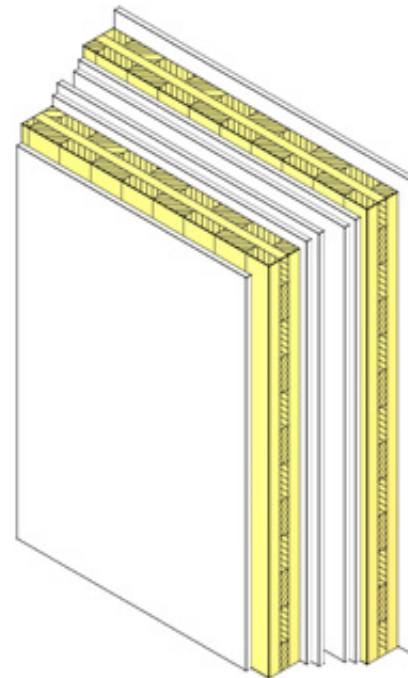
Layer structure

Building partition wall

1. System without intermediate insulation

Structure

- fire-protection plasterboard
- CLT wall
- gypsum fibreboard (2 layers)
- cavity
- gypsum fibreboard (2 layers)
- CLT wall
- fire-protection plasterboard



Execution

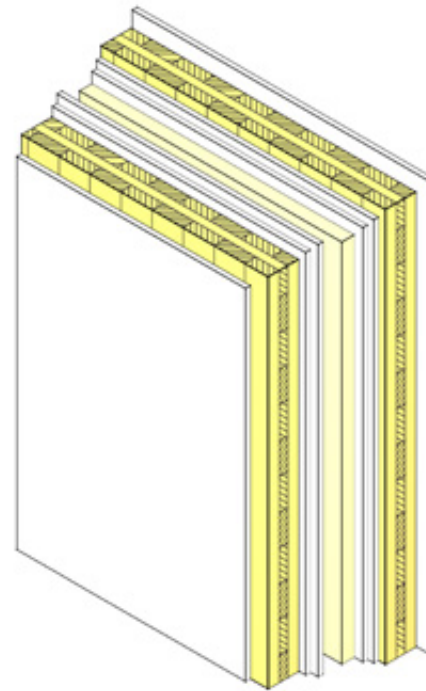
- Materials or tools which, through carelessness, are dropped into cavities can form a sound bridge.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

Layer structure

2. System with intermediate insulation

Structure

- fire-protection plasterboard
- CLT wall
- gypsum fibreboard (2 layers)
- mineral wool
- cavity
- gypsum fibreboard (2 layers)
- CLT wall
- fire-protection plasterboard



Execution

- Materials or tools which , through carelessness, are dropped into cavities can form a sound bridge.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Layer structures must be matched to the required structural-physical properties of the design.

3

Details



Details

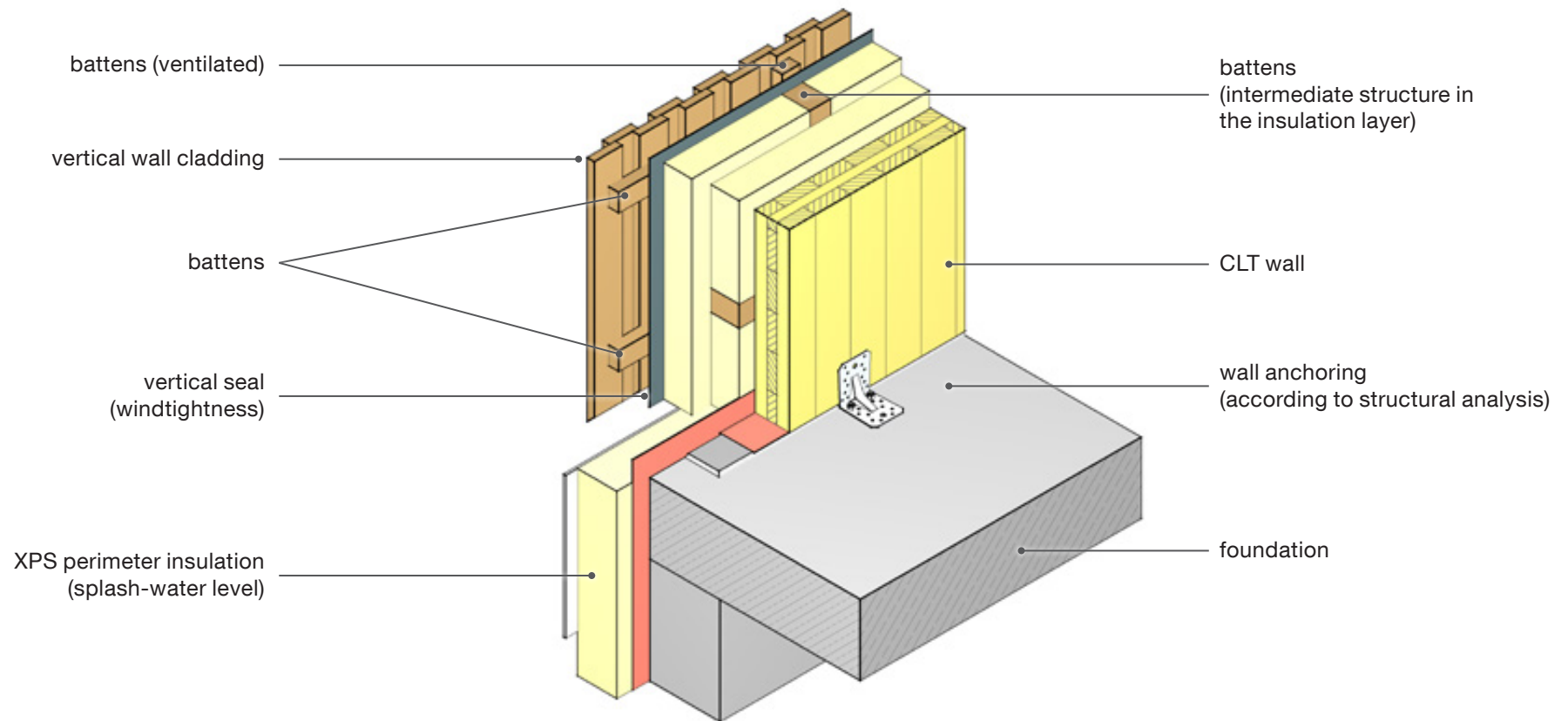
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Details

Base and wall anchoring

1. Base with ventilated façade



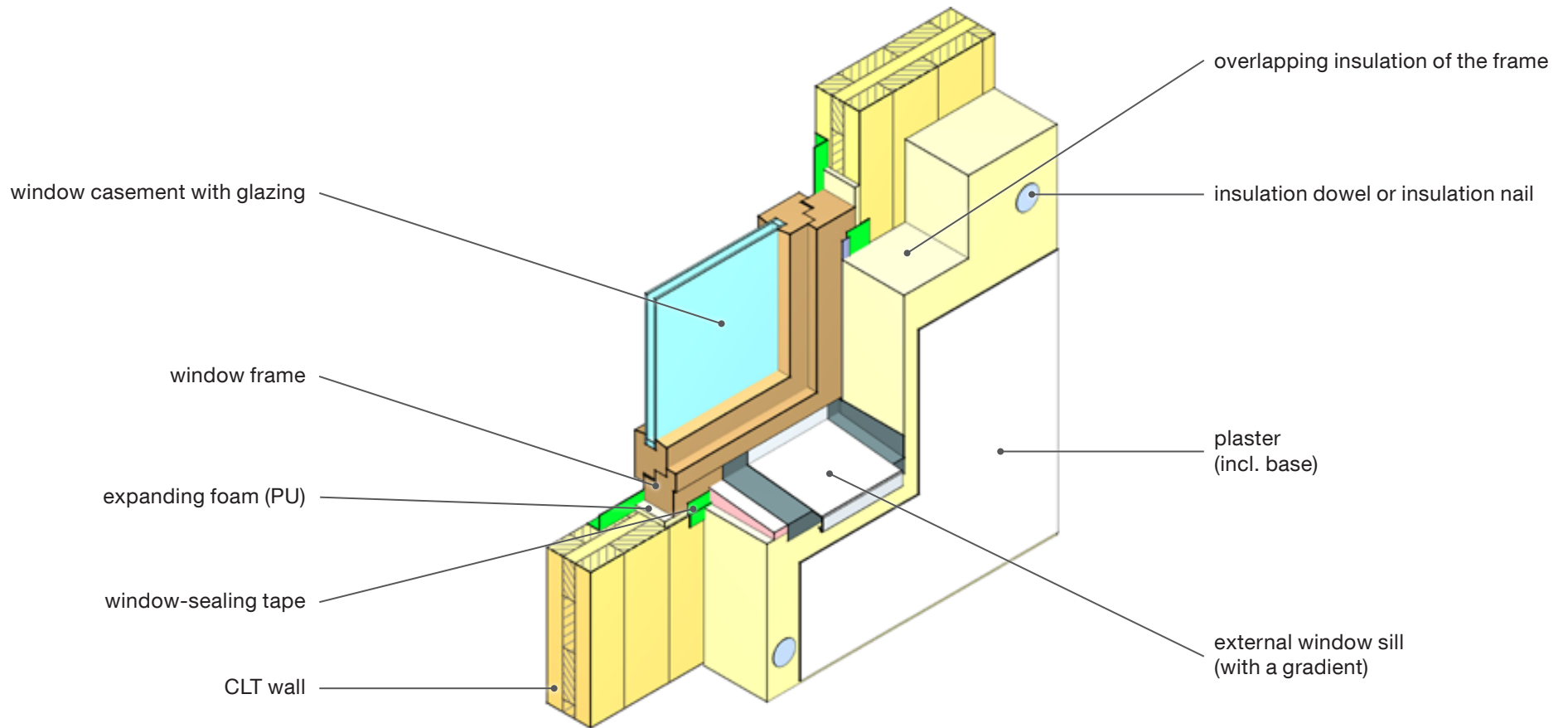
Execution

- Full surface contact of the CLT wall must be ensured by means of a mortar bed.
- The perimeter insulation up to splash-water level must be executed properly according to the cladding material and the projection of the roof.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- When fitting the wall anchoring (tensile and shear forces), the permissible edge distances for the connectors must be observed.

Details

Window connection

1. Installation with expanding foam



Execution

- Connection of the external window sill to the reveal (weak spot): with wooden façades an additional insulation layer must be installed under the window sill and vertically bonded at the side. If the façade is plastered, special measures must be taken at the end cap of the

window sill. The connection between the end cap and window sill must be sealed with butyl tape and the connection between the end cap and the plaster with sufficiently thick sealing tape (because of the expansion properties of the external window sill).

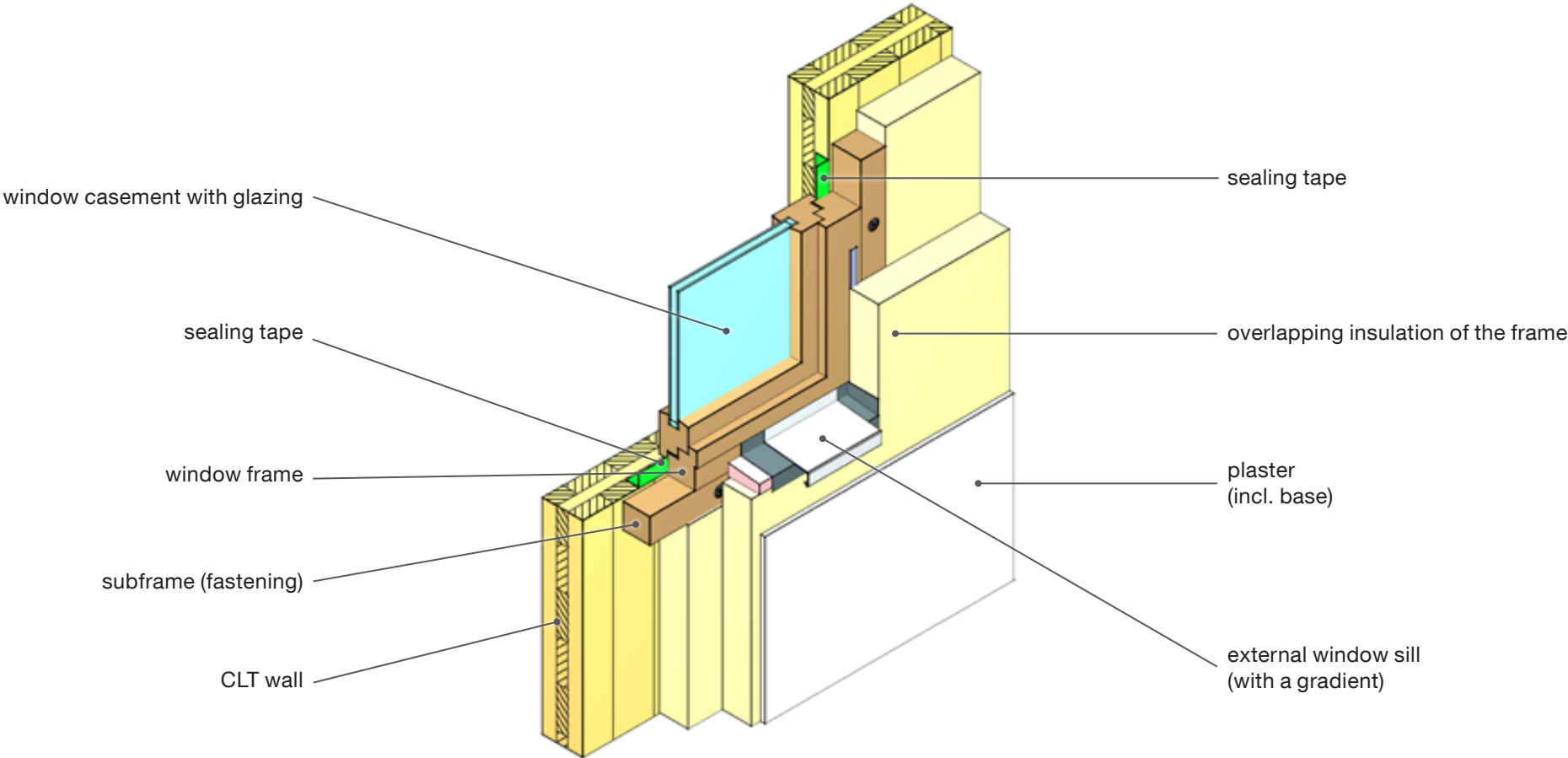
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Mechanical anchoring of the windows according to manufacturer's instructions and structural requirements.

Illustrations



Details

2. Installation with expanding foam tape



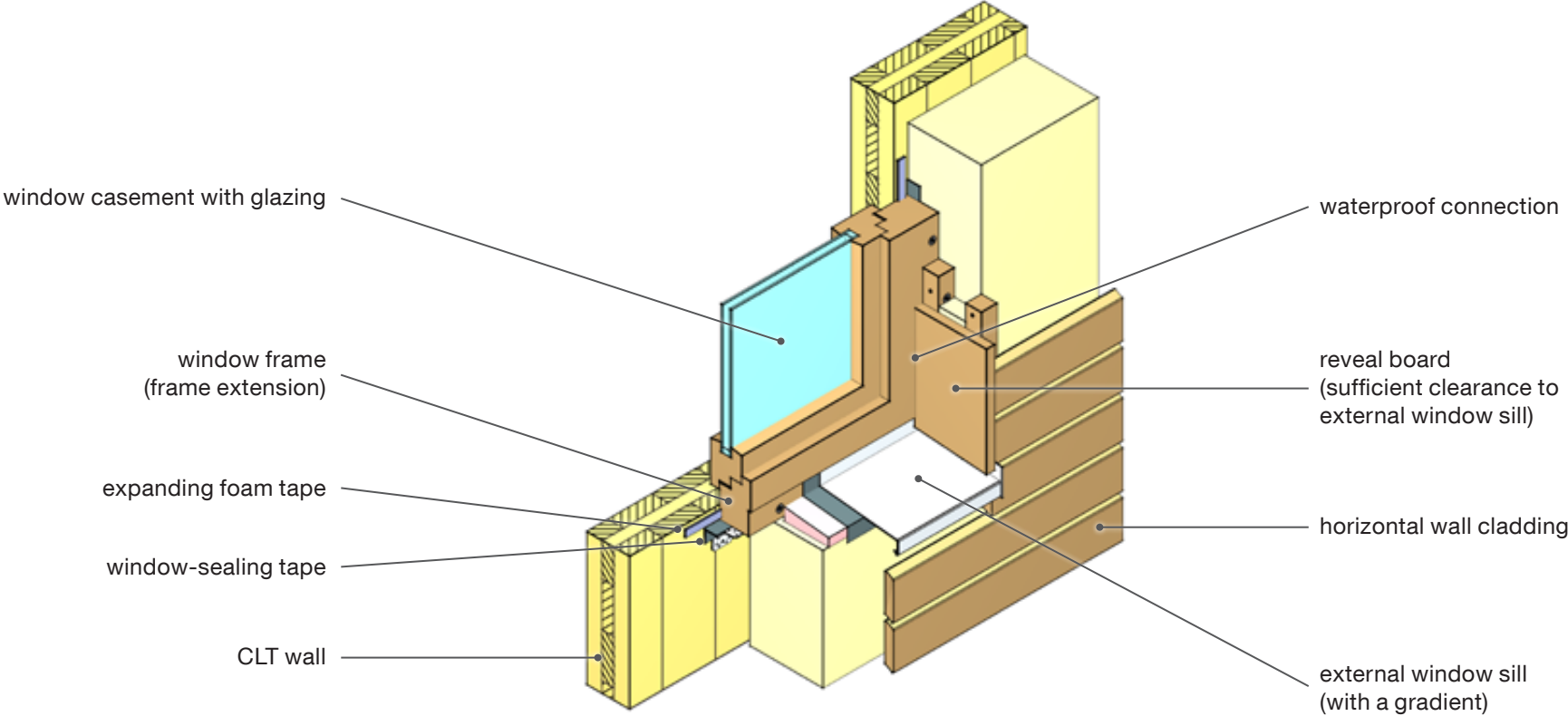
Execution

- Connection of the external window sill to the reveal (weak spot): with wooden façades an additional insulation layer must be installed under the window sill and vertically bonded at the side. If the façade is plastered, special measures must be taken at the end cap of the

window sill. The connection between the end cap and window sill must be sealed with butyl tape and the connection between the end cap and the plaster with sufficiently thick sealing tape (because of the expansion properties of the external window sill).

- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Mechanical anchoring of the windows according to manufacturer's instructions and structural requirements.

Details



Execution

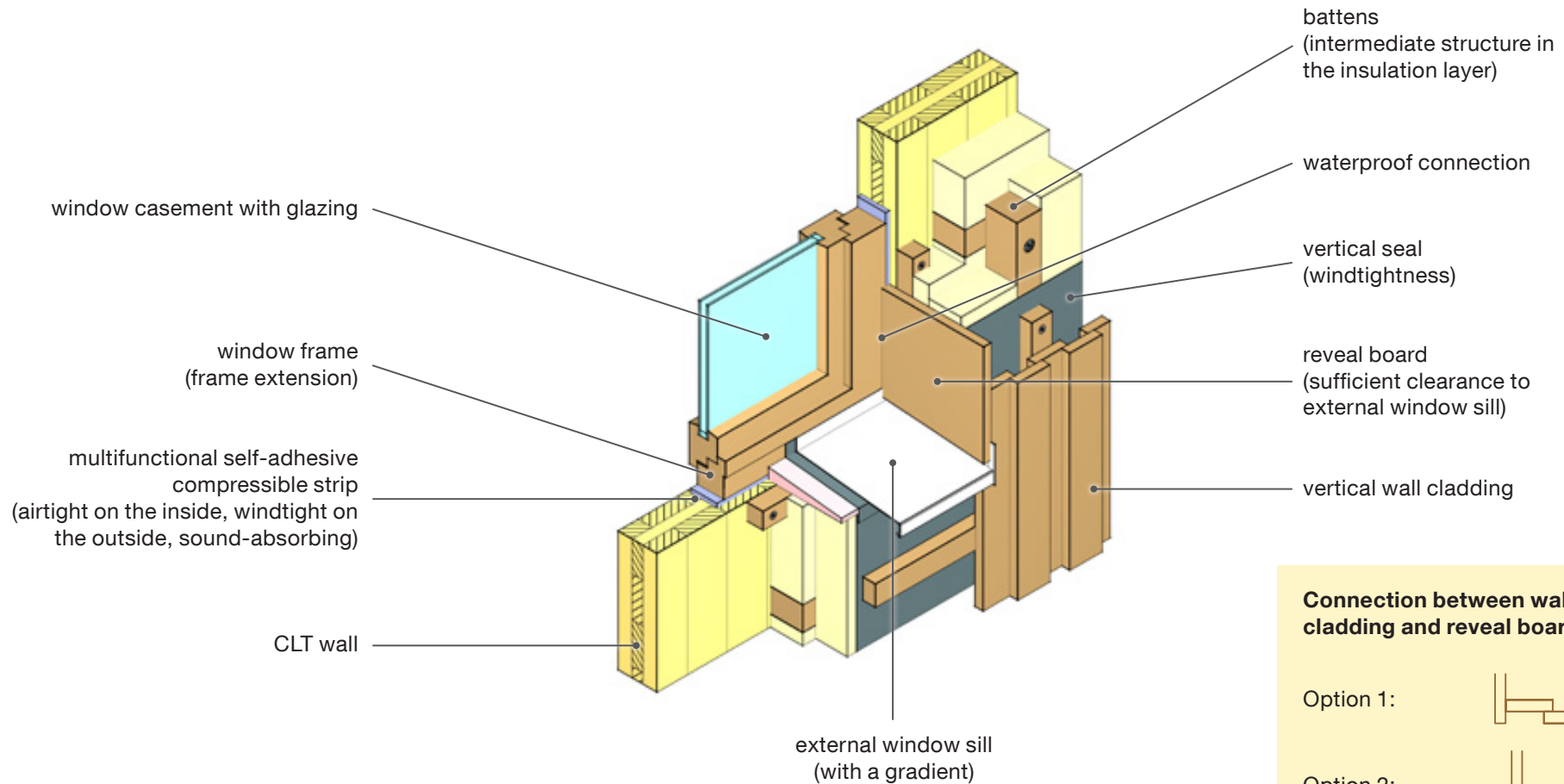
- Connection of the external window sill to the reveal (weak spot): with wooden façades an additional insulation layer must be installed under the window sill and vertically bonded at the side. If the façade is plastered, special measures must be taken at the end cap of the window sill. The connection between the end cap and window sill must be sealed with butyl tape and the connection between the end cap and the plaster with sufficiently thick sealing tape (because of the expansion properties of the external window sill).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Mechanical anchoring of the windows according to manufacturer's instructions and structural requirements.
- The connection between the window-sealing tape and the windtight insulation layer must be executed according to the manufacturer's specifications and current standards.

Illustrations



Details

3. Installation with multifunctional self-adhesive compressible strip



Connection between wall cladding and reveal board

Option 1:



Option 2:



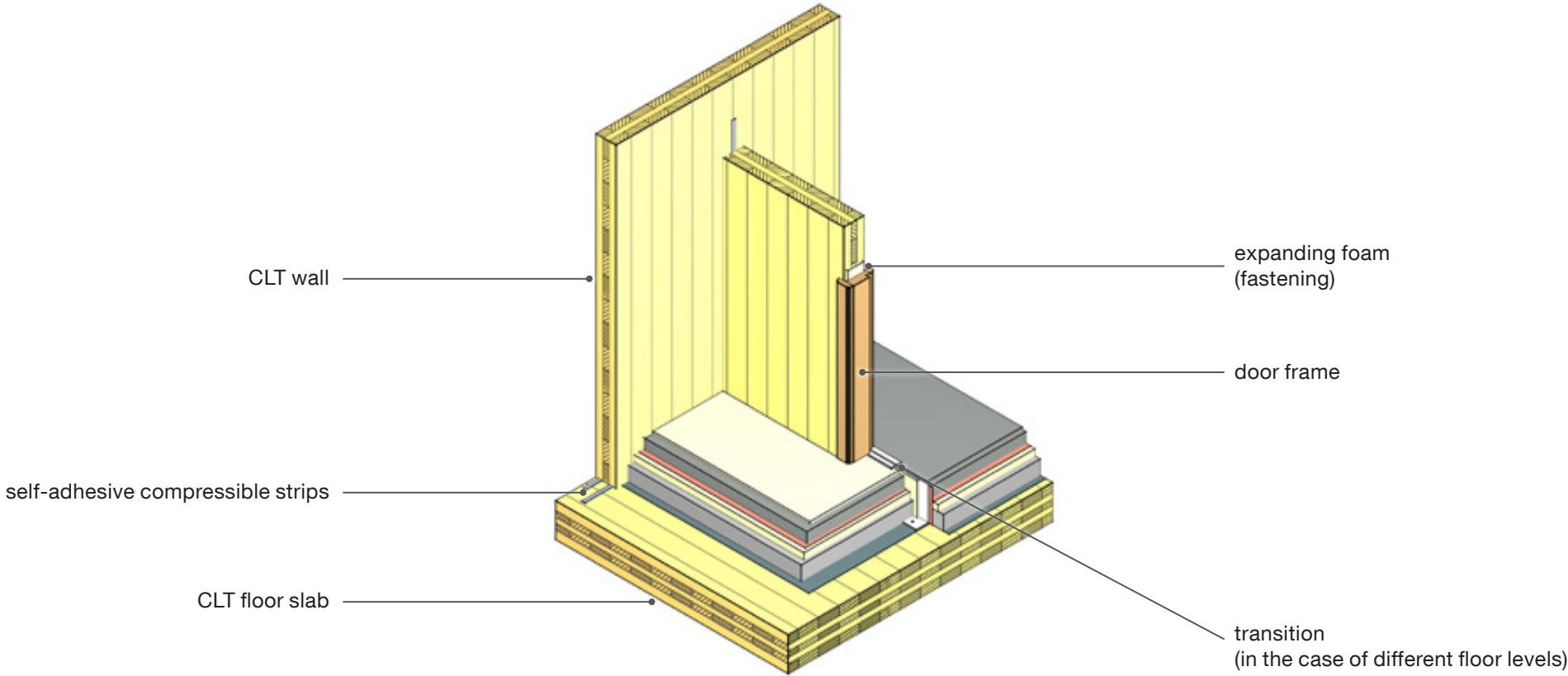
Execution

- Connection of the external window sill to the reveal (weak spot): with wooden façades an additional insulation layer must be installed under the window sill and vertically bonded at the side. If the façade is plastered, special measures must be taken at the end cap of the window sill. The connection between the end cap and window sill must be sealed with butyl tape and the connection between the end cap and the plaster with sufficiently thick sealing tape (because of the expansion properties of the external window sill).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Mechanical anchoring of the windows according to manufacturer's instructions and structural requirements.
- The connection between the window-sealing tape and the windtight insulation layer must be executed according to the manufacturer's specifications and current standards.

Details

Door connection

1. Internal door



Execution

- A suitable transition must be provided in the door area which takes account of the floor structure of the adjacent rooms. The transition between different floors can be achieved by fitting a transition strip or a Schlüter threshold strip.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

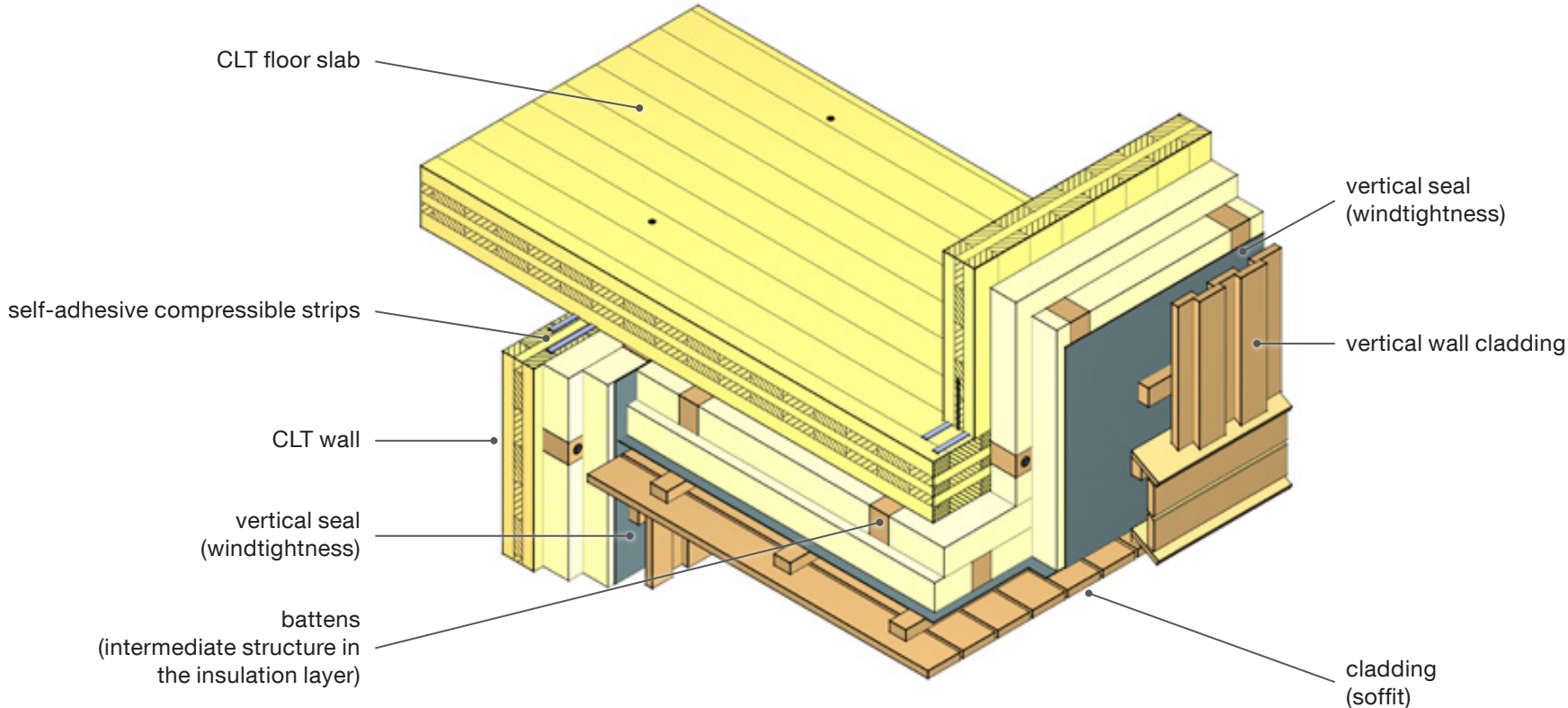
Illustrations



Details

Cantilever

1. Cantilever with wooden façade

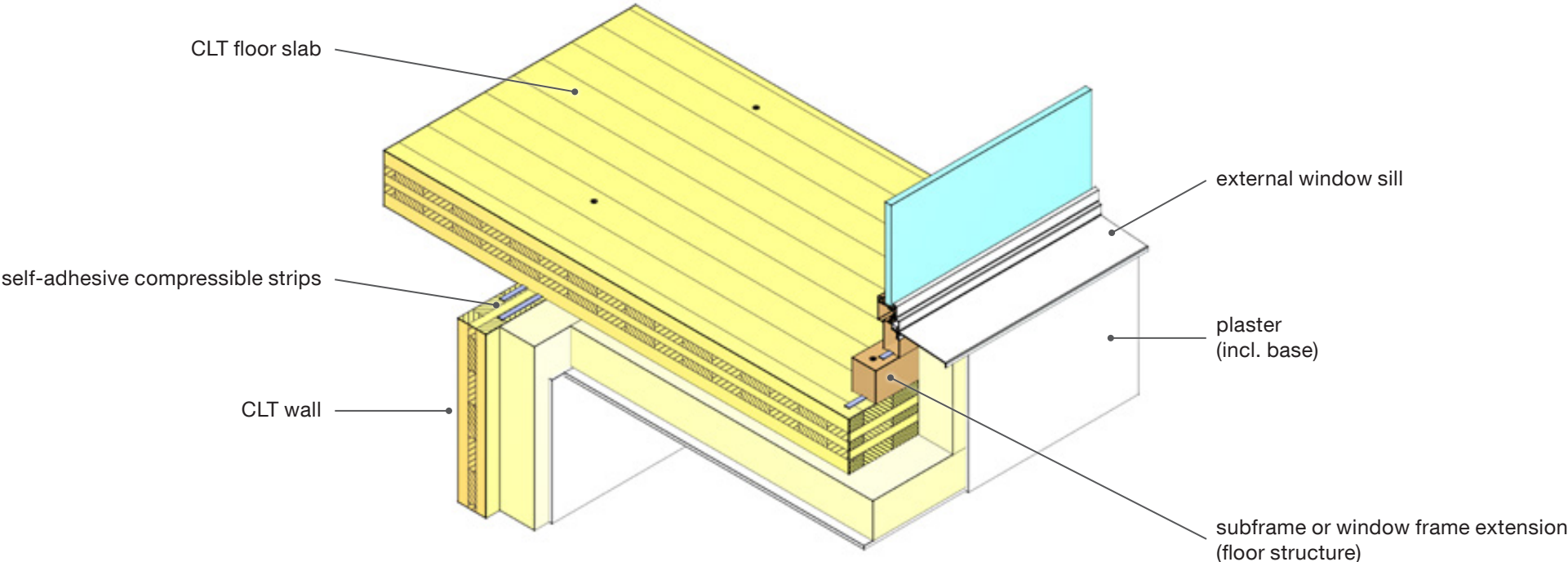


Execution

- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The projecting floor slab must be suspended with fully threaded screws (sized according to structural analysis).

Details

2. Cantilever with plastered façade

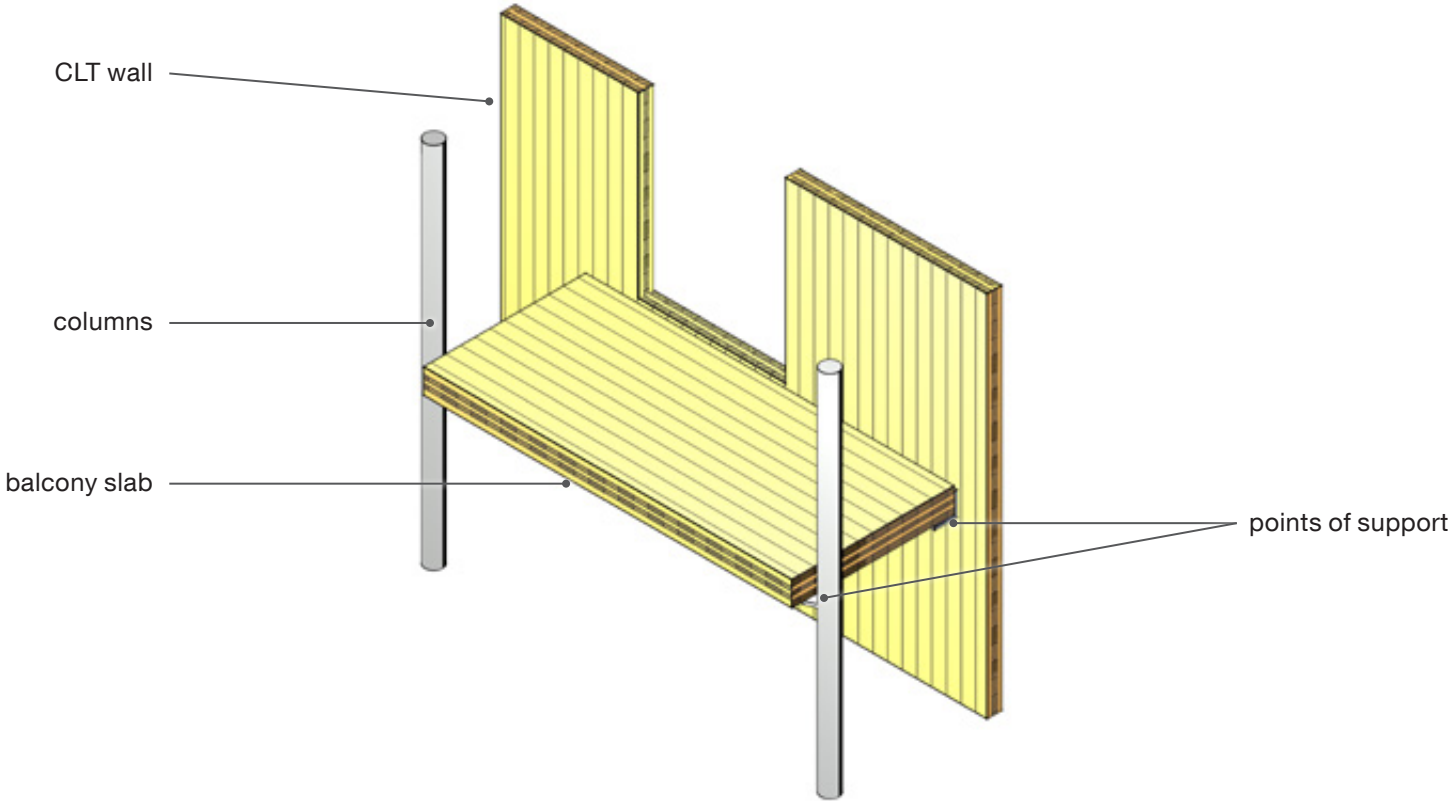


Execution

- Self-adhesive compressible strips or sealing tape must be used to make the structure airtight.
- The height of the subframe or the window frame extension depends on the floor structure.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Details

3. Balcony slab (supported)

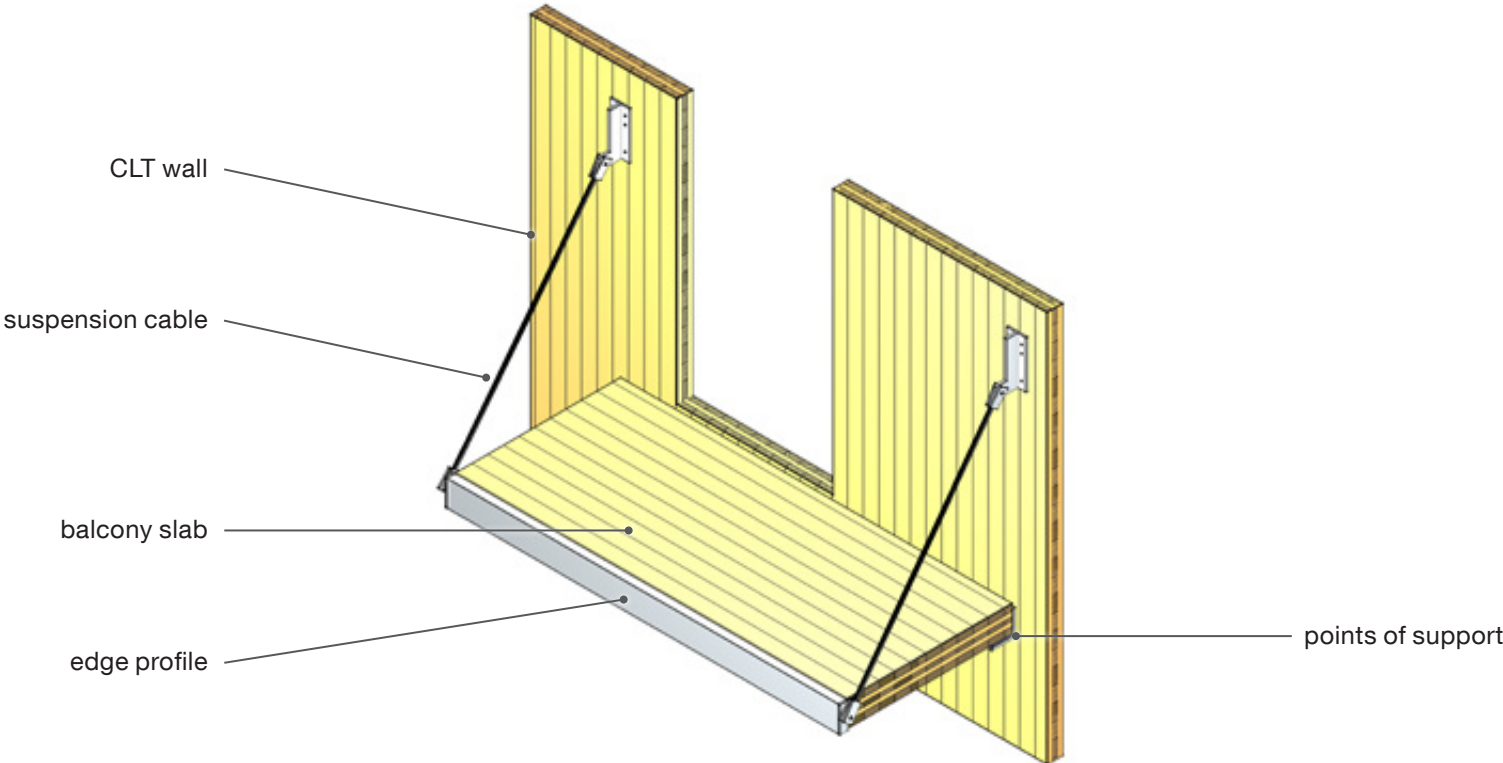


Execution

- Unlike cantilever floor slabs, projecting balcony slabs prevent the formation of thermal bridges.
- If a continuous insulation layer is required, the support brackets must be mounted on spacer blocks (of the same thickness as the insulation).
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The dimensions of the balcony slab depend on the structural requirements.

Details

4. Balcony slab (suspended)



Execution

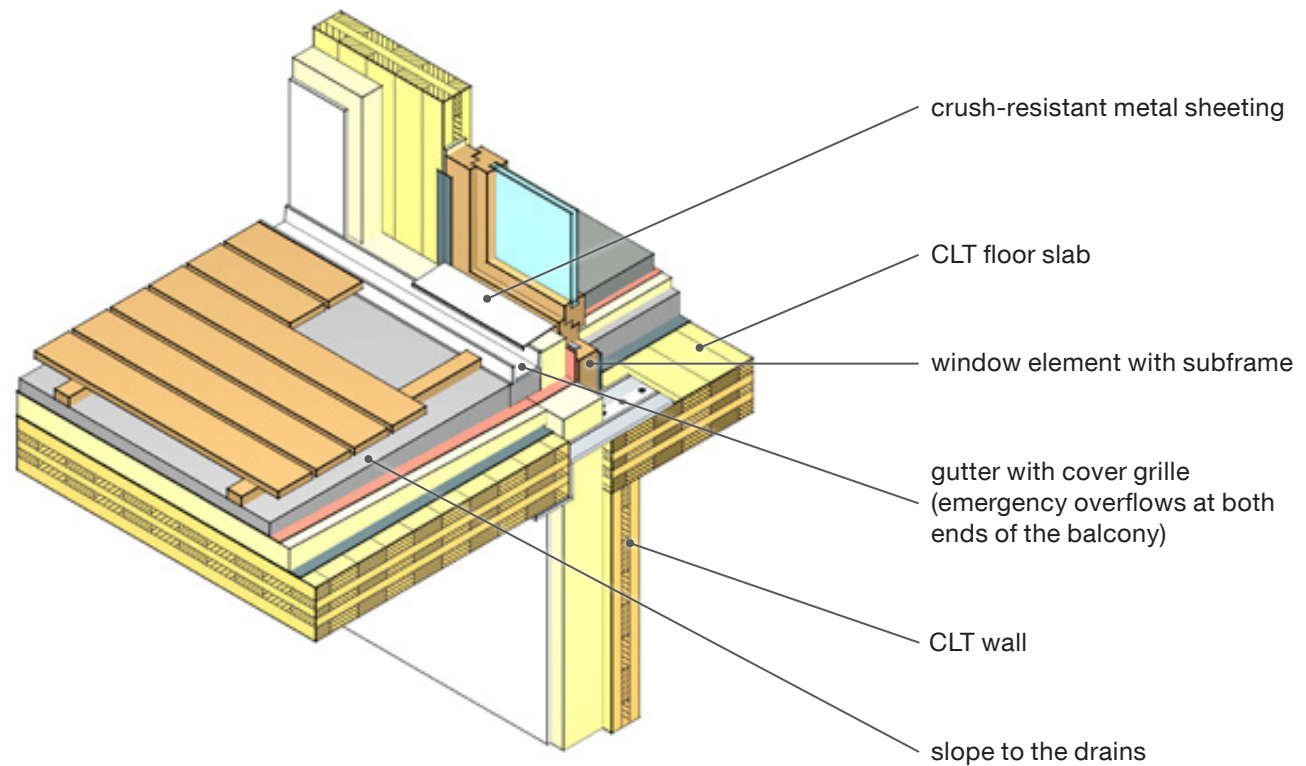
- | | | |
|---|---|--|
| <ul style="list-style-type: none">• Unlike cantilever floor slabs, projecting balcony slabs prevent the formation of thermal bridges.• If a continuous insulation layer is required, the support brackets must be mounted on | <p>spacer blocks (of the same thickness as the insulation).</p> <ul style="list-style-type: none">• The choice and rating of the connectors and all structural components depend on the | <p>structural requirements.</p> <ul style="list-style-type: none">• The dimensions of the balcony slab depend on the structural requirements.• Please note the risk of the wall buckling. |
|---|---|--|

Details

5. Balcony (timber planking on tapered insulation)

Structure

- larch floor grille
- battens
- fill
- seal
- tapered insulation
- roofing membrane (permeable)
- balcony slab



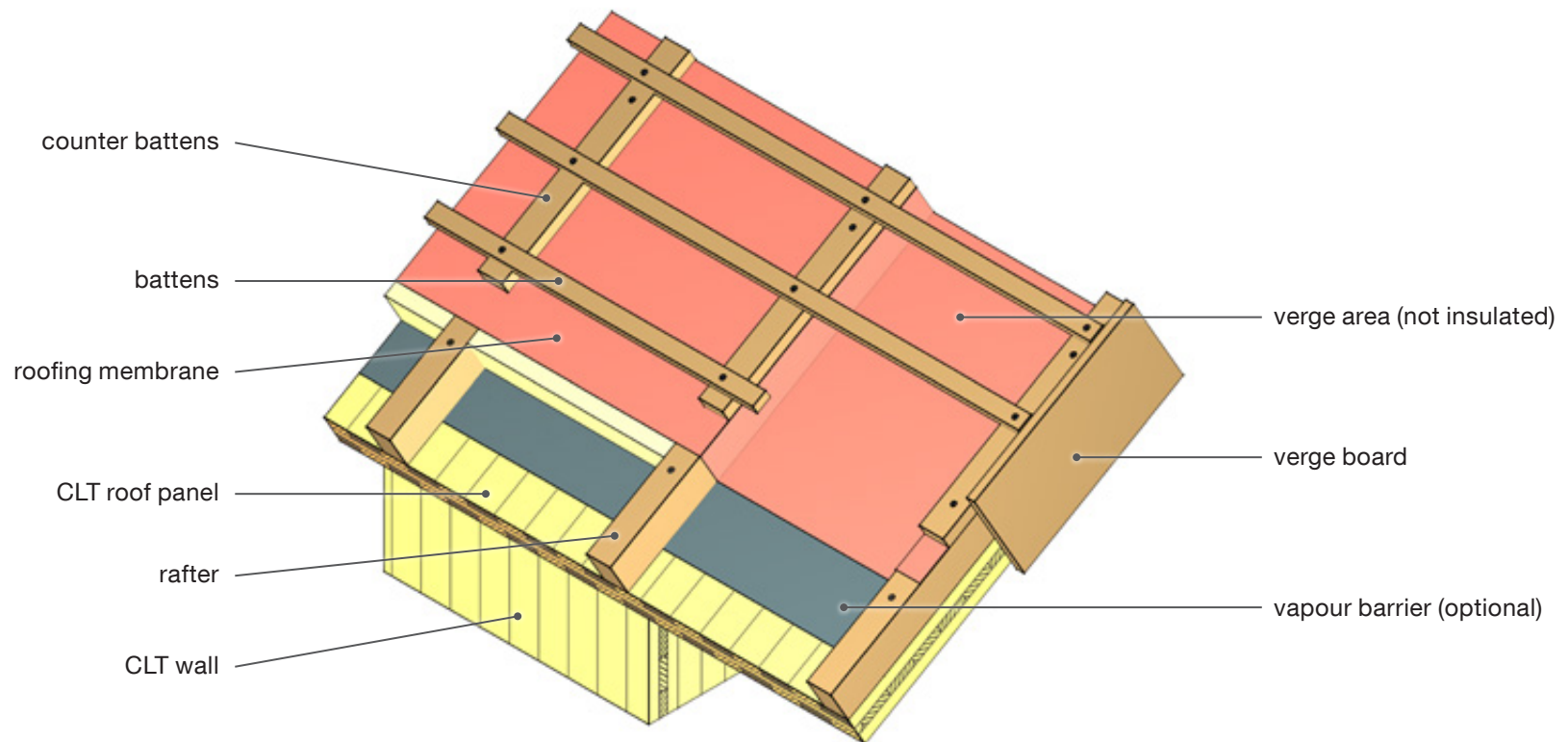
Execution

- Water is directed down the tapered insulation into drains.
 - There is a gutter with emergency outflows at both ends for excess water.
 - Protection against splash water appropriate to the degree of cover of the balcony must be provided.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Details

Steep roof

1. Wall-to-roof connection (CLT roof projection)

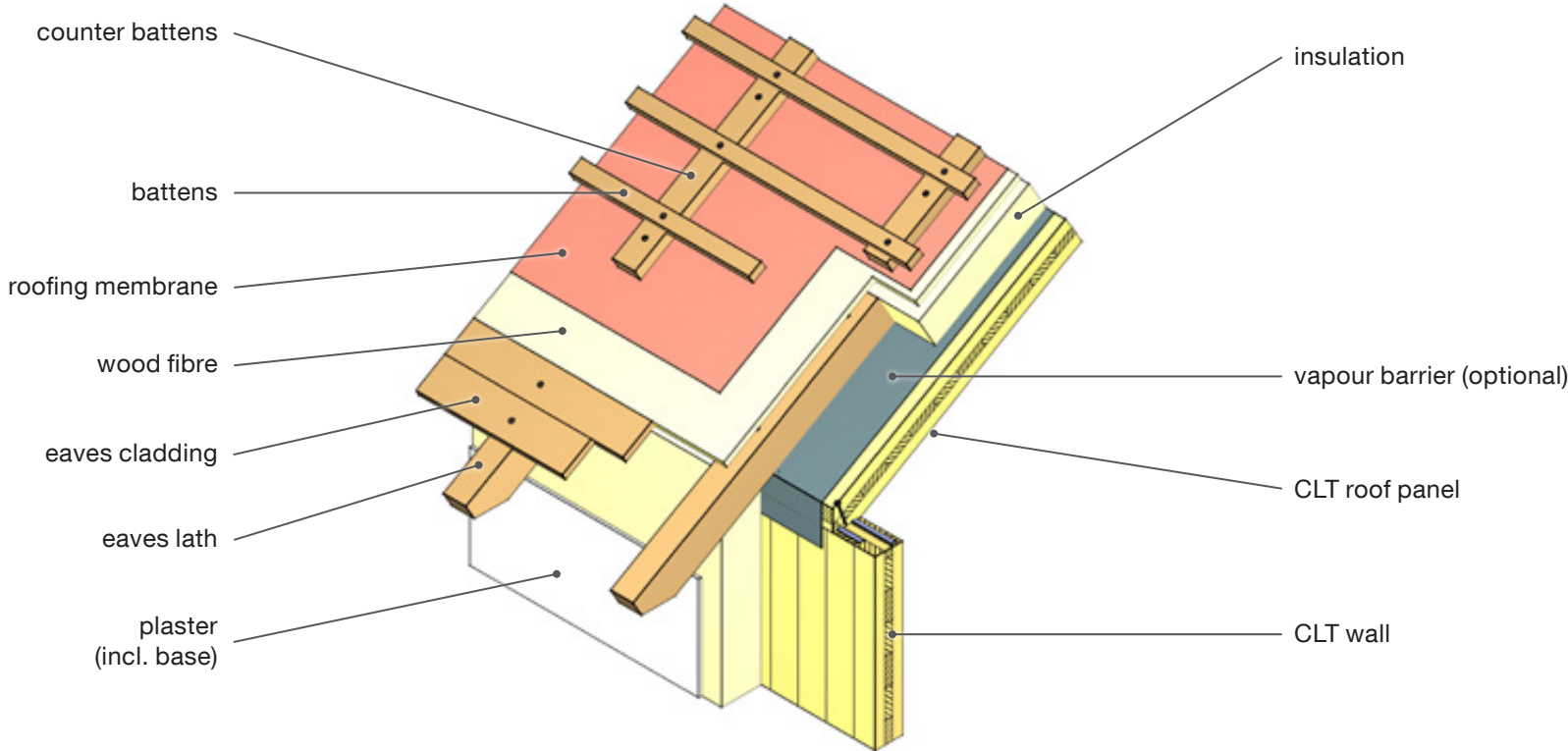


Execution

- The projecting CLT roof panel forms the soffit.
 - The verge area beyond the gable wall does not need to be insulated.
 - The verge board can remain visible or be covered with metal sheeting, as required.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
 - When sizing the CLT roof panel, attention must be paid to the lateral projection.

Details

2. Wall-to-roof connection (eaves laths)

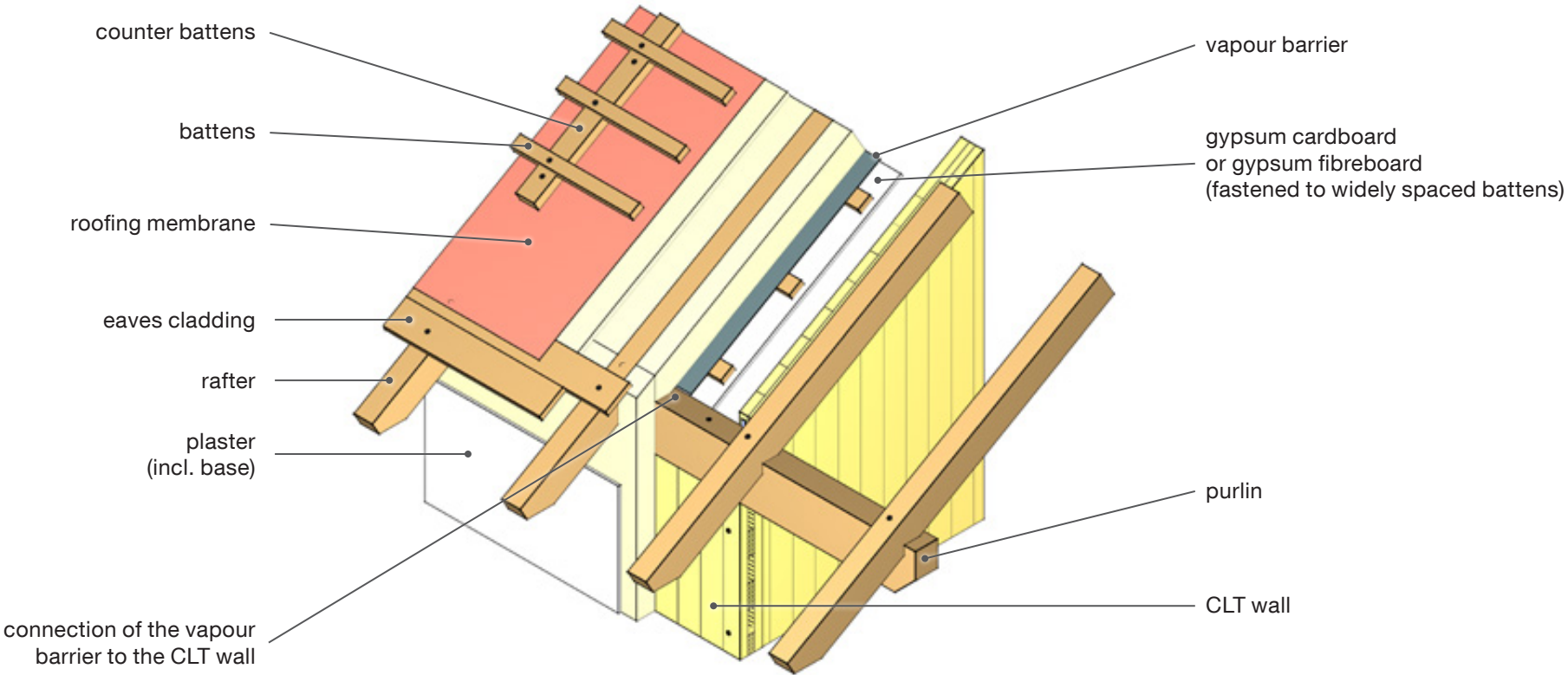


Execution

- The roof overhang is constructed with eaves laths (secured against suction forces as per structural analysis) and eaves cladding.
 - The wood fibre insulation over the rafters must be of the same thickness as the eaves
- cladding to avoid forming a rebate in the rafter projection.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The counter battens must be fastened according to the pressure resistance of the insulation.

Details

3. Wall-to-roof connection (rafter roof)

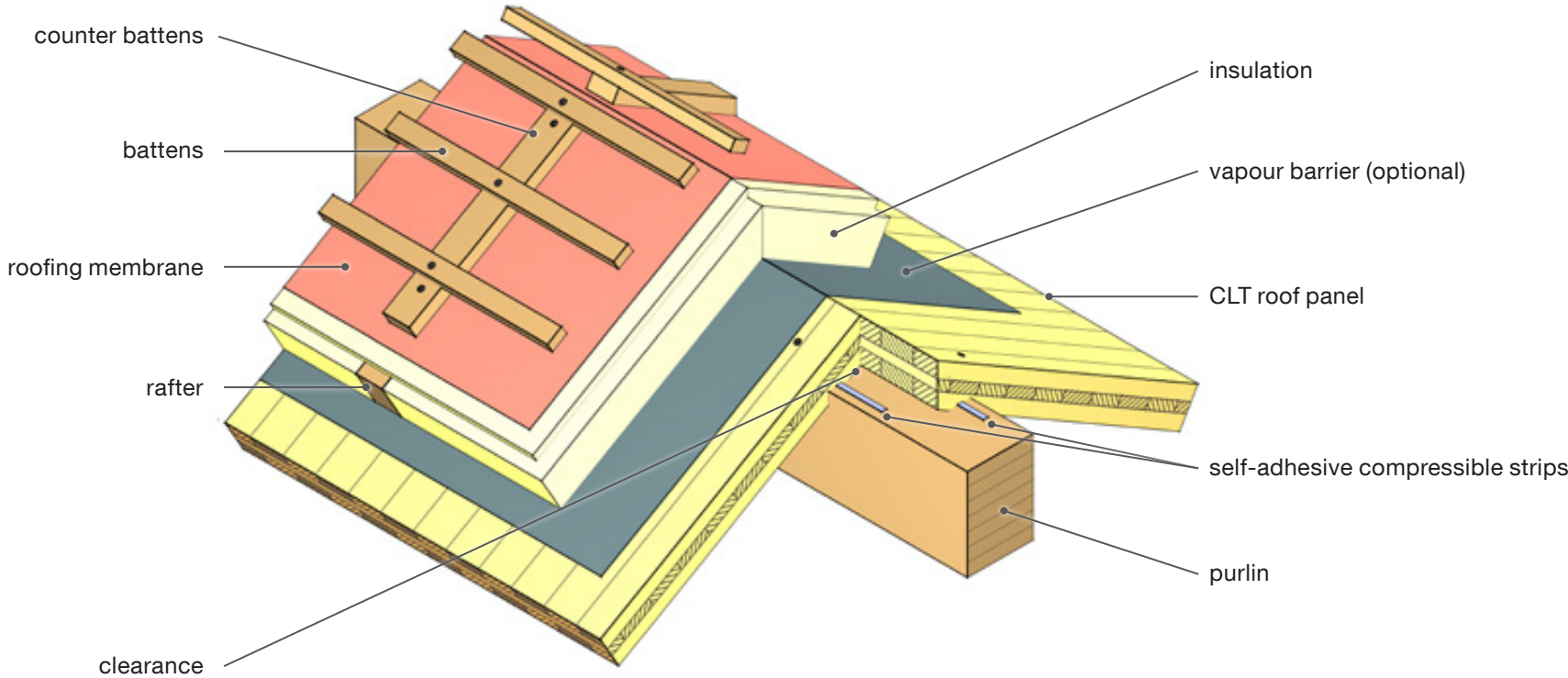


Execution

- | | | |
|--|--|--|
| <ul style="list-style-type: none">• The roof overhang is constructed with rafters (secured against suction forces as per structural analysis) and eaves cladding.• The wood fibre insulation over the rafters | <p>must be of the same thickness as the eaves cladding to avoid forming a rebate in the rafter projection.</p> <ul style="list-style-type: none">• The choice and rating of the connectors and all | <p>structural components depend on the structural requirements.</p> <ul style="list-style-type: none">• The connection between the vapour barrier and CLT wall must be airtight. |
|--|--|--|

Details

4. Ridge (with purlin)

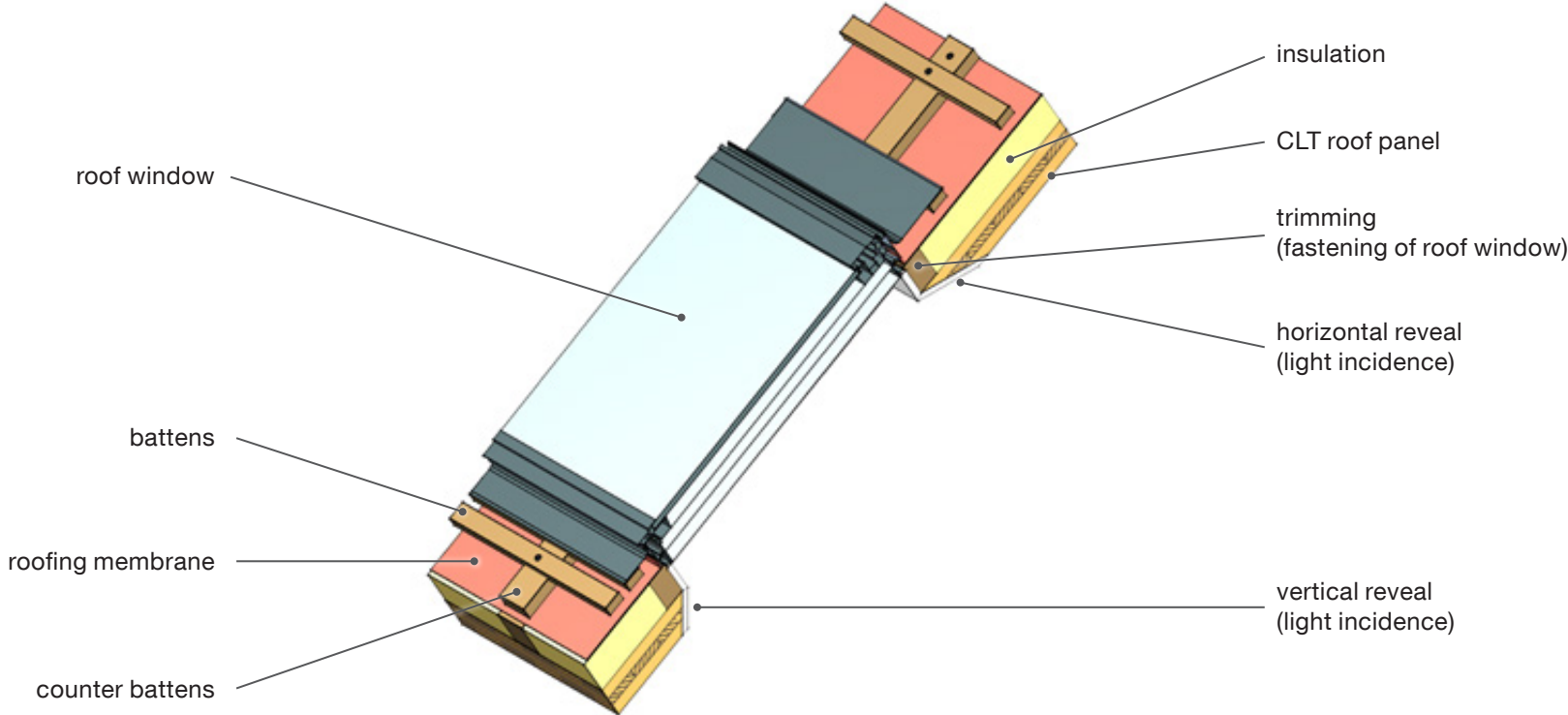


Execution

- If the roof structure is suitably designed and the layers are configured in the right order (with their permeability increasing from inside to outside), a vapour barrier may be omitted.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Self-adhesive compressible strips must be used to make the structure airtight.

Details

5. Roof window



Execution

- There must be a close connection between the roof window and the roofing membrane when fitting the window.
- The design of the inner reveals depends on the level of light incidence required.
- Reveal material: plasterboard or derived timber board.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

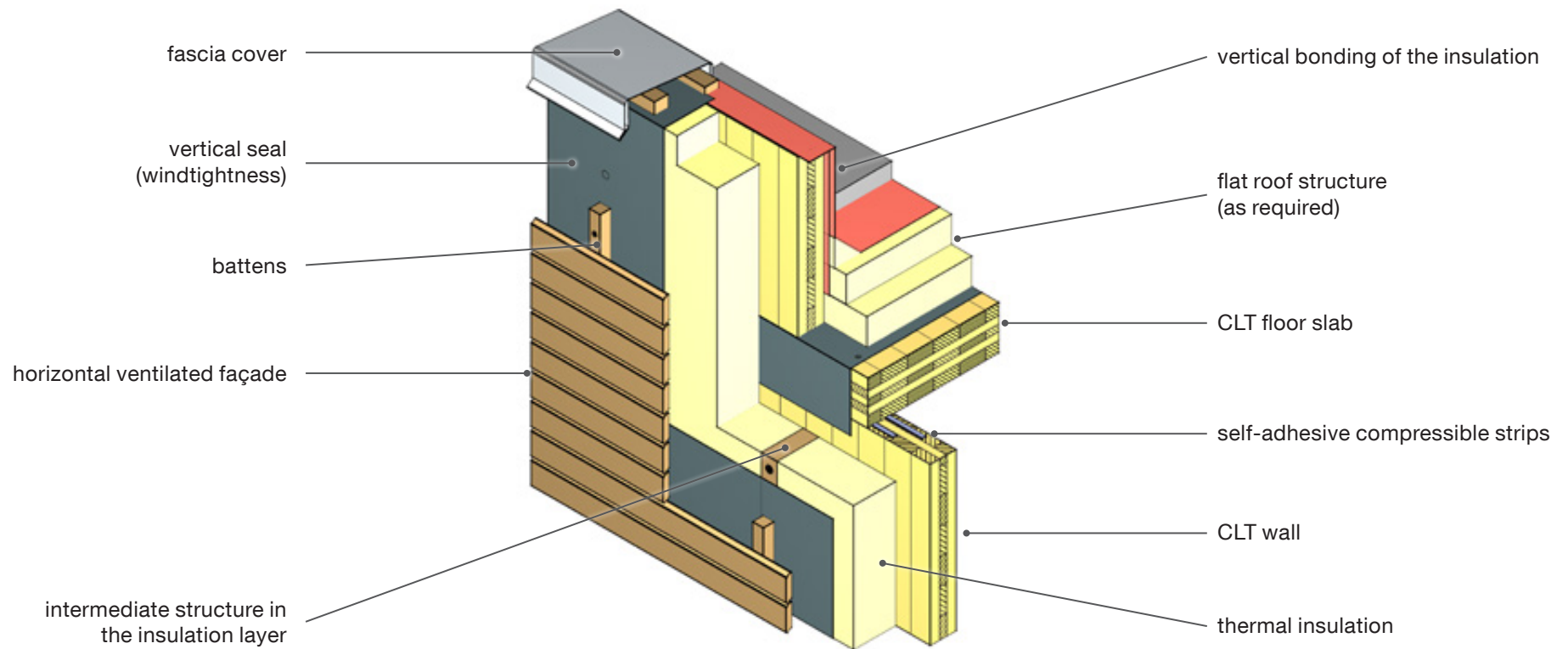
Illustrations



Details

Flat roof

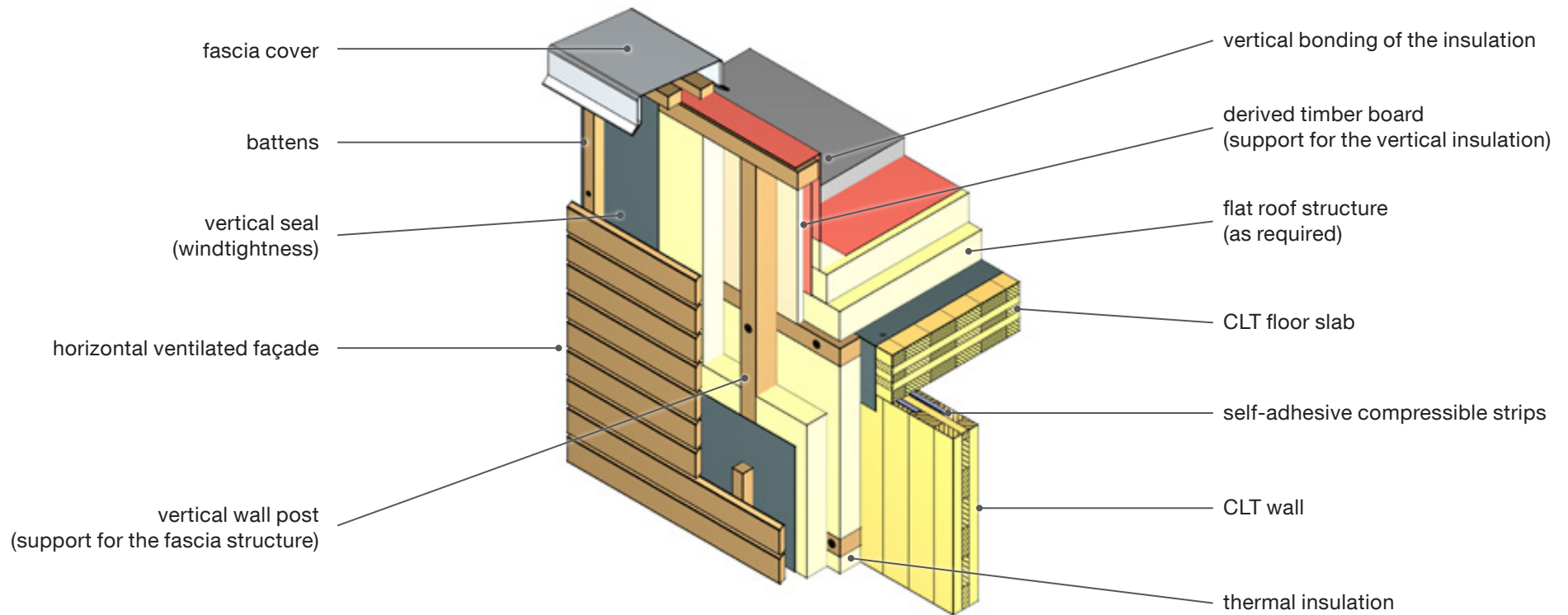
1. CLT fascia structure



Execution

- Flat roof insulation with a gradient.
- Anchor the fascia wall to the CLT roof panel (as per structural analysis).
- The choice and rating of the connectors and all structural components depend on the structural requirements.

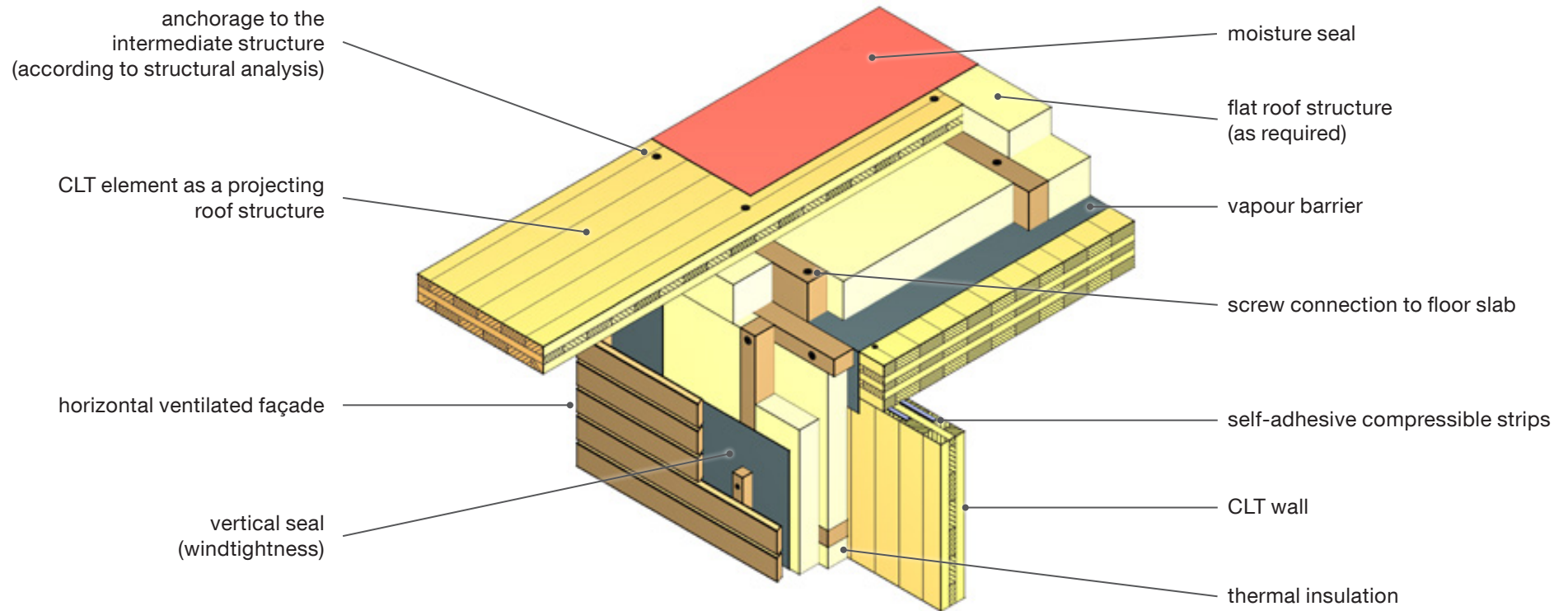
2. CLT fascia structure with wall post



Execution

- Flat roof insulation with a gradient.
- Vertical wall posts assume a structural function in the fascia (dimensions and fastening as per structural analysis).
- The choice and rating of the connectors and all structural components depend on the structural requirements.

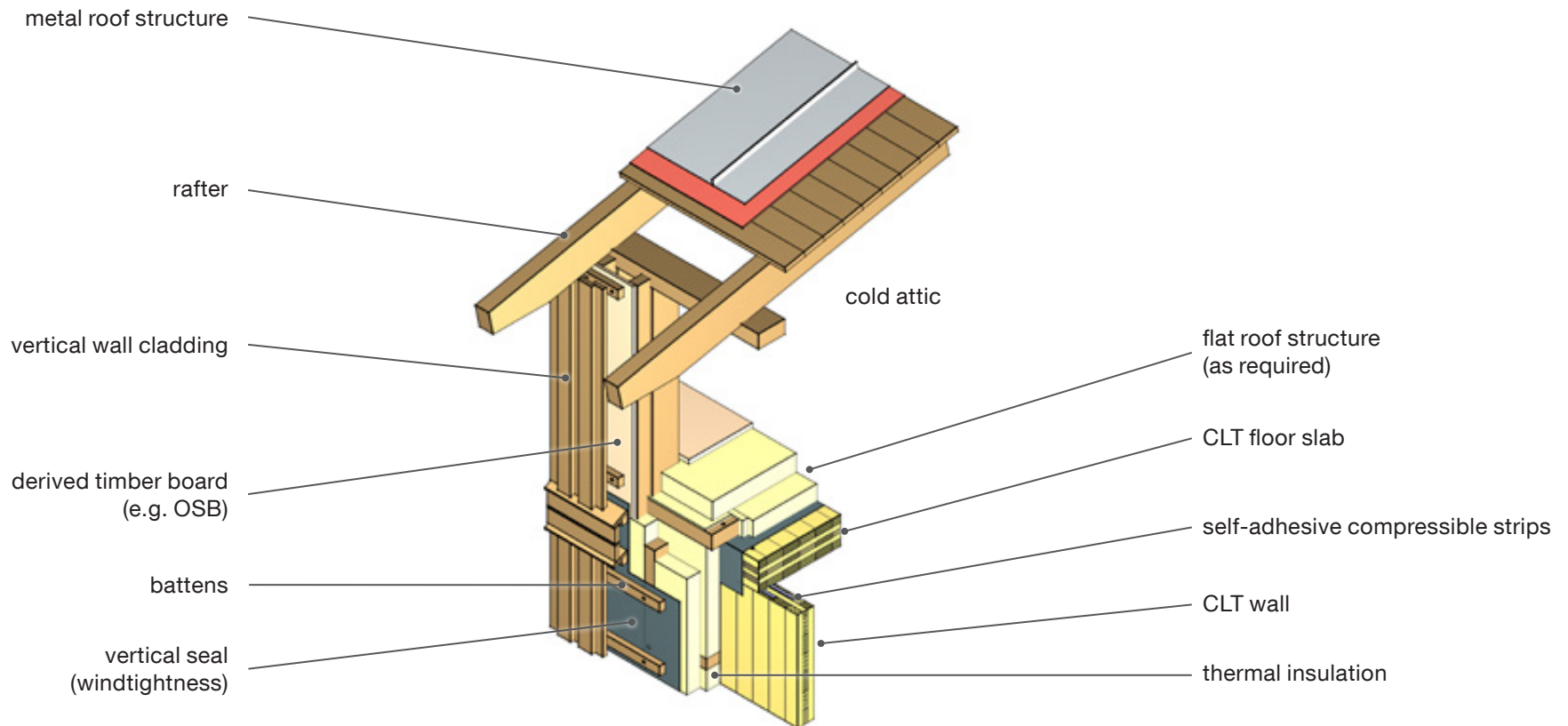
3. Projecting roof structure



Execution

- The soffit of the CLT roof overhang can remain visible or be covered with metal sheeting, as required.
- The edging must be executed according to the slope of the roof.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The CLT projection must be dimensioned according to the roof overhang (caution with a lateral projection).

4. Flat roof connection (with a cold attic above)



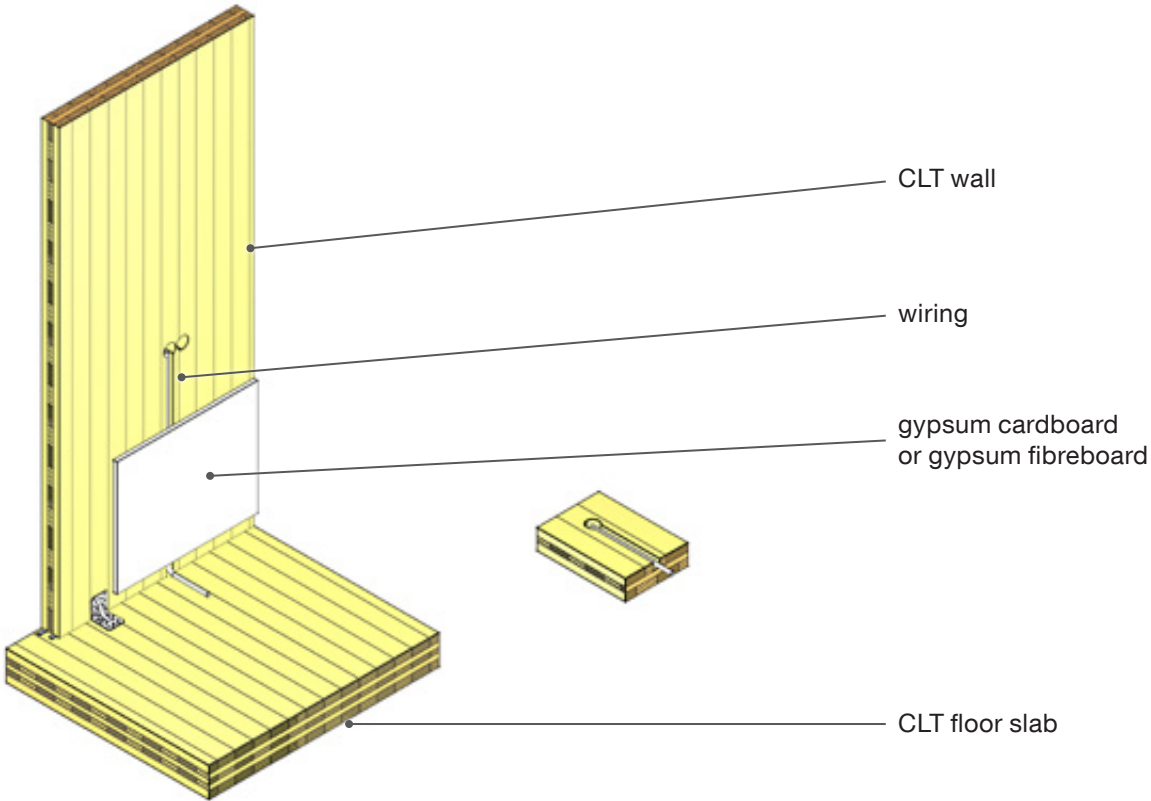
Execution

- The load transfer from the roof structure to the CLT roof and CLT walls must be taken into account.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Details

Electrical installations

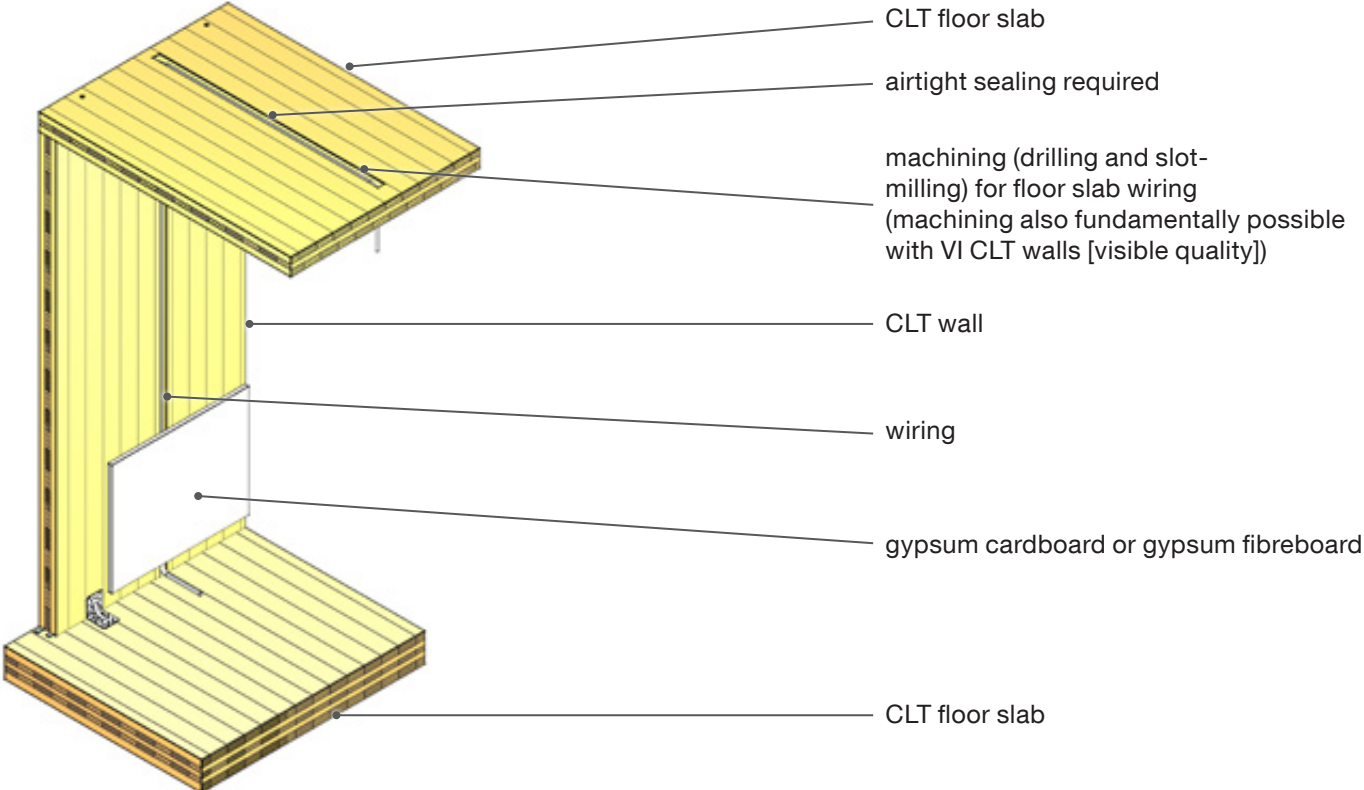
1. Execution before wall cladding



Execution

- Finish for NVI elements (non-visible quality).
- Cross milling (at right angles to the top layer) is possible only to a limited extent and must be carried out in accordance with the structural analysis.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Details



Execution

- Finish for NVI elements (non-visible quality).
- Machining (slot milling), for example with CLT floor slabs, is only possible in the direction of the top layer. Transverse layers must remain intact in order not to impair the load capacity.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Illustrations

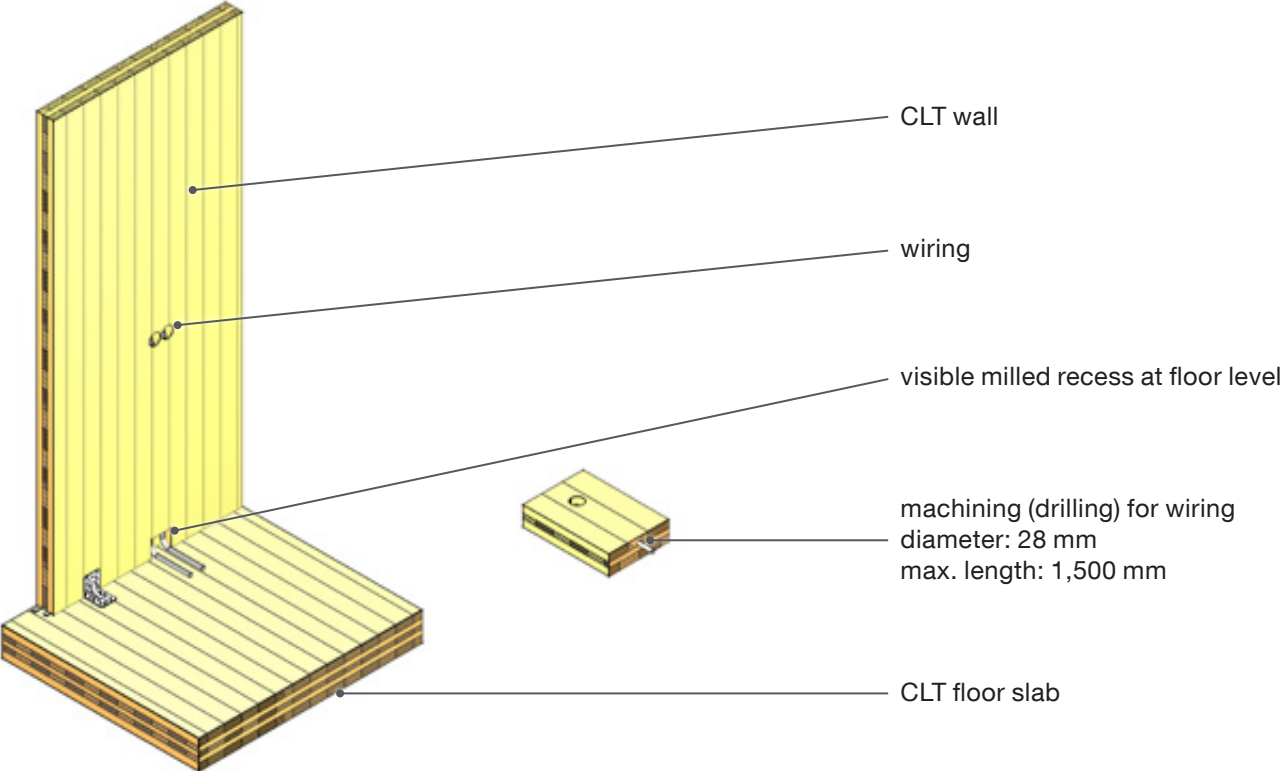


Illustrations



Details

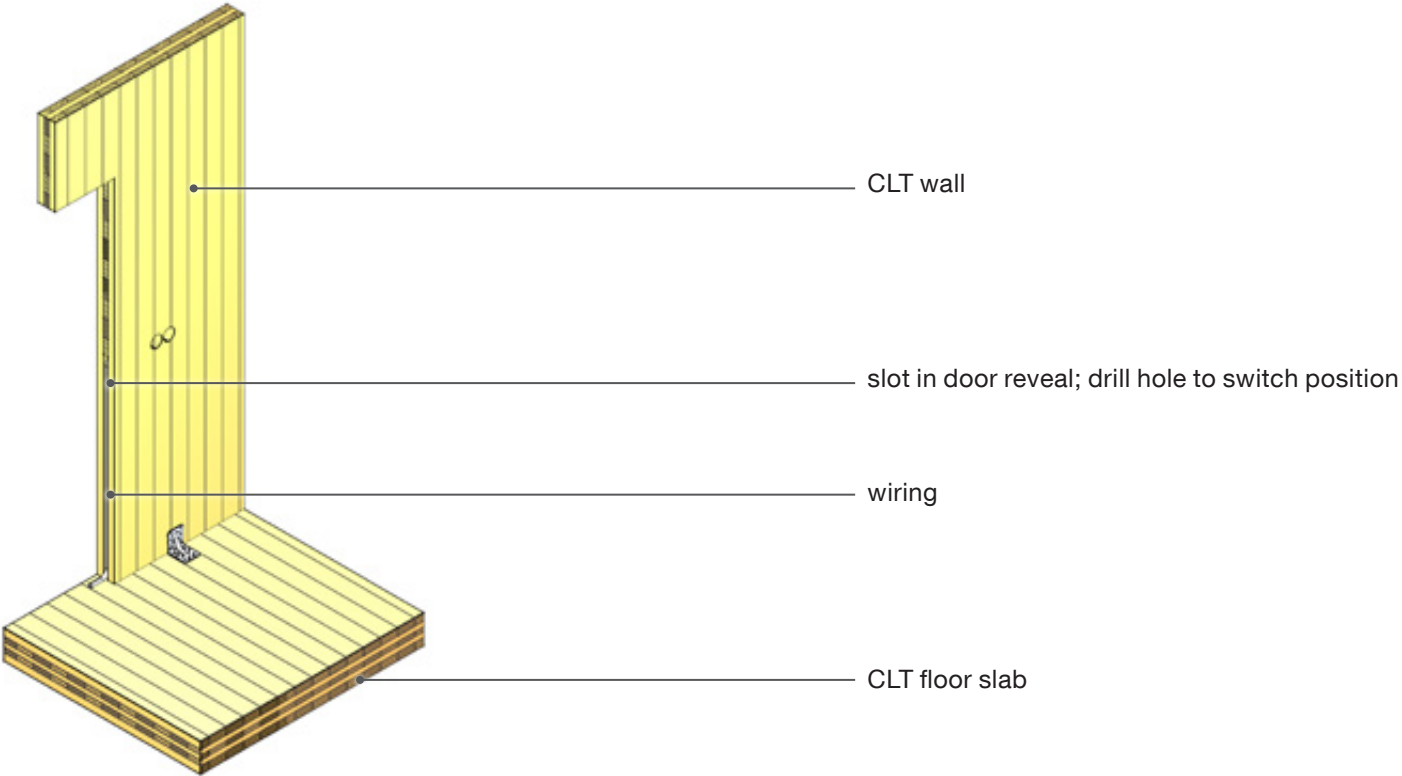
2. Execution with visible-quality CLT



Execution

- Finish for VI elements (visible quality).
 - Machining (drilling for cables) is only possible from the grain end of the CLT element.
 - Adjacent bores must have a minimum centre distance of 50 mm.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
 - Avoid penetrating the airtight layer when routing wiring.

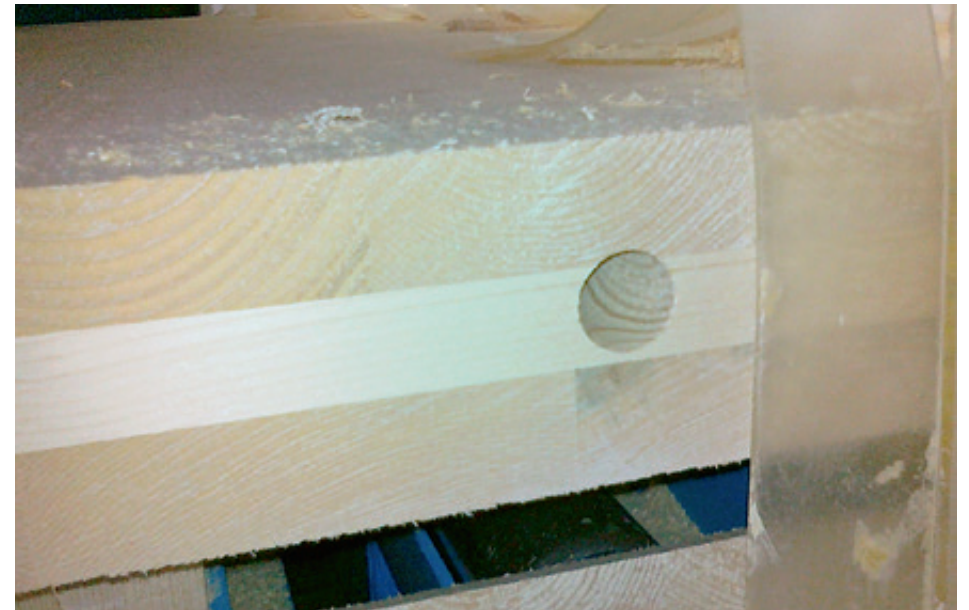
Details



Execution

- Finish for VI elements (visible quality).
- A slot is milled in the door reveal, later to be covered by the door frame, and a hole is drilled from the reveal to the position of the switch or socket.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Illustrations



Details

3. Lightning protection

Illustrations



Illustrations



Execution

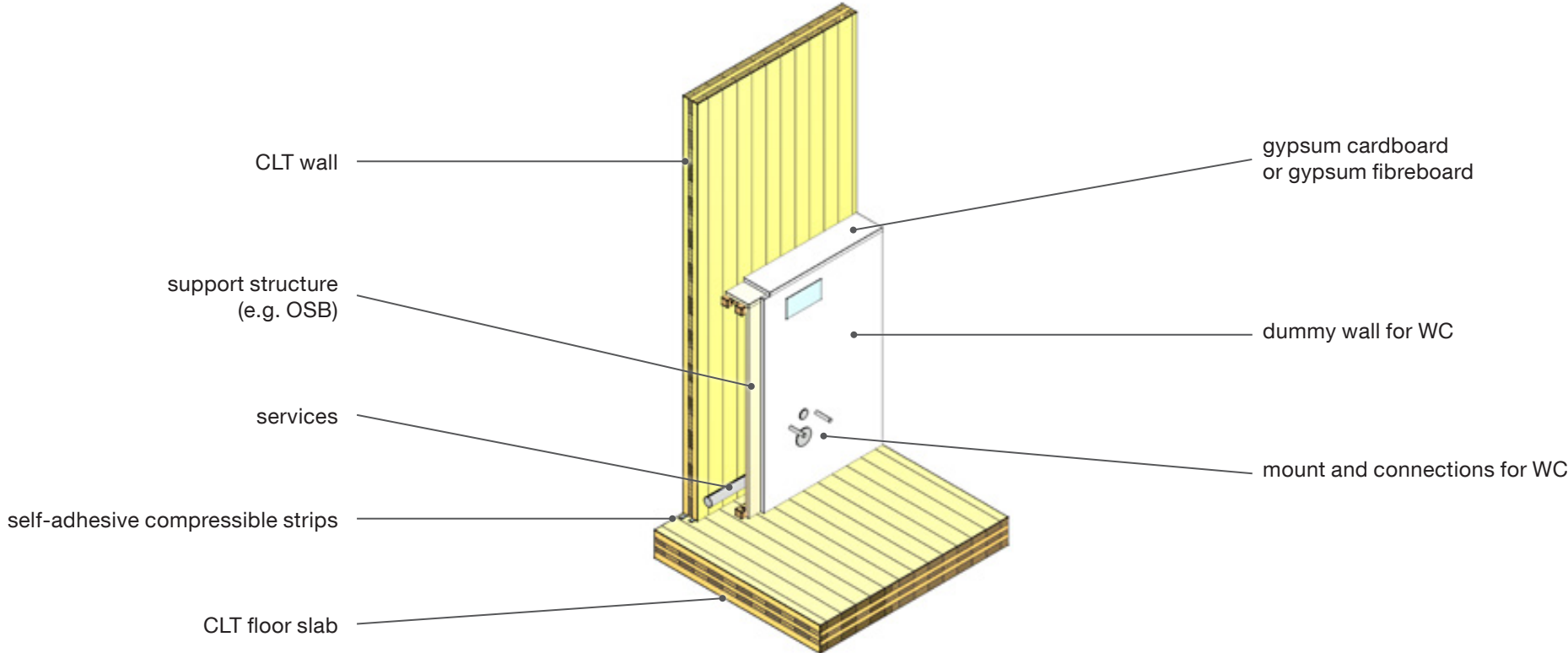
- Lightning protection systems protect people and buildings from major damage. The external lightning protection attracts the lightning current and conducts it safely into the ground.
- The choice and rating of the connectors and all

- structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Details

Sanitary installations

1. WC (dummy wall)



Execution

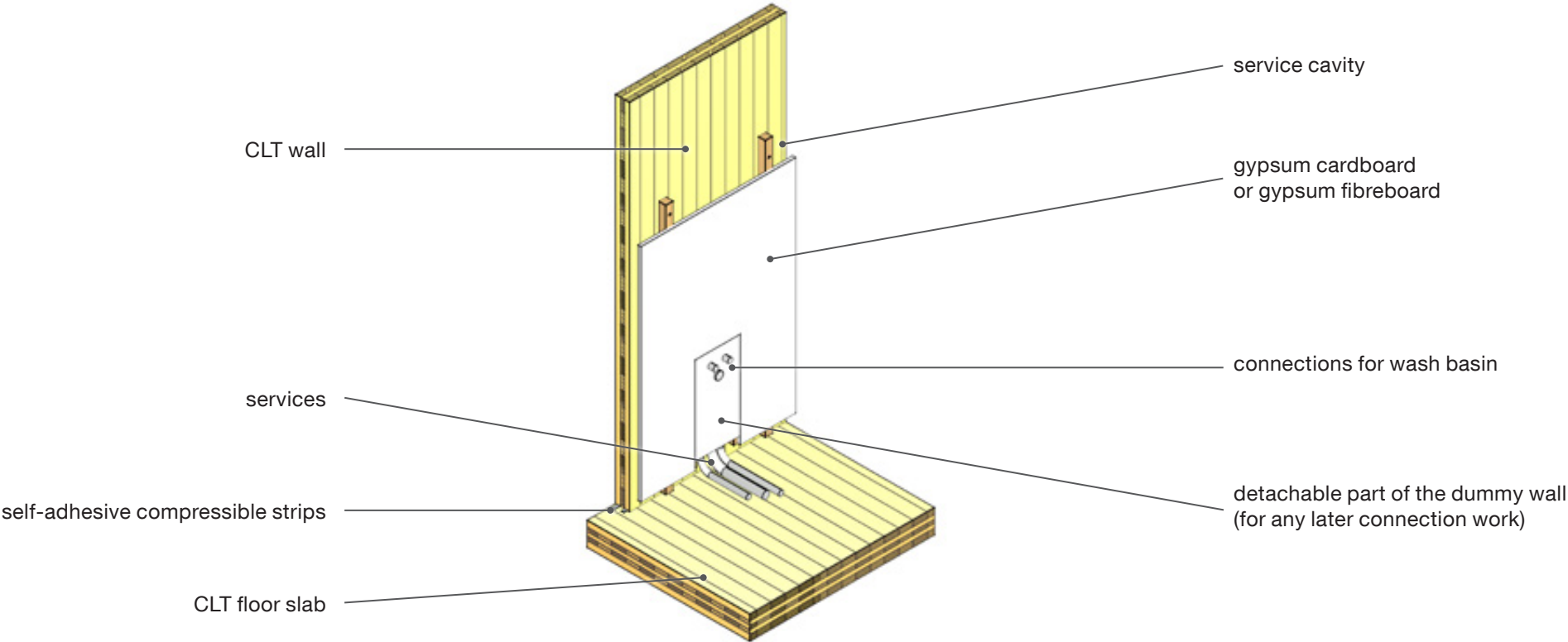
- The fastening of the services must be sound-insulated from the other components.
- The support structure of the dummy wall must also be sound-insulated from the CLT floors and walls.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Illustrations



Details

2. Wash basin (preparation for connection)



Execution

- The fastening of the services must be sound-insulated from the other components.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- Avoid penetrating the airtight layer when routing wiring.

Details

3. Sanitary installations — wet room

Illustrations



Illustrations



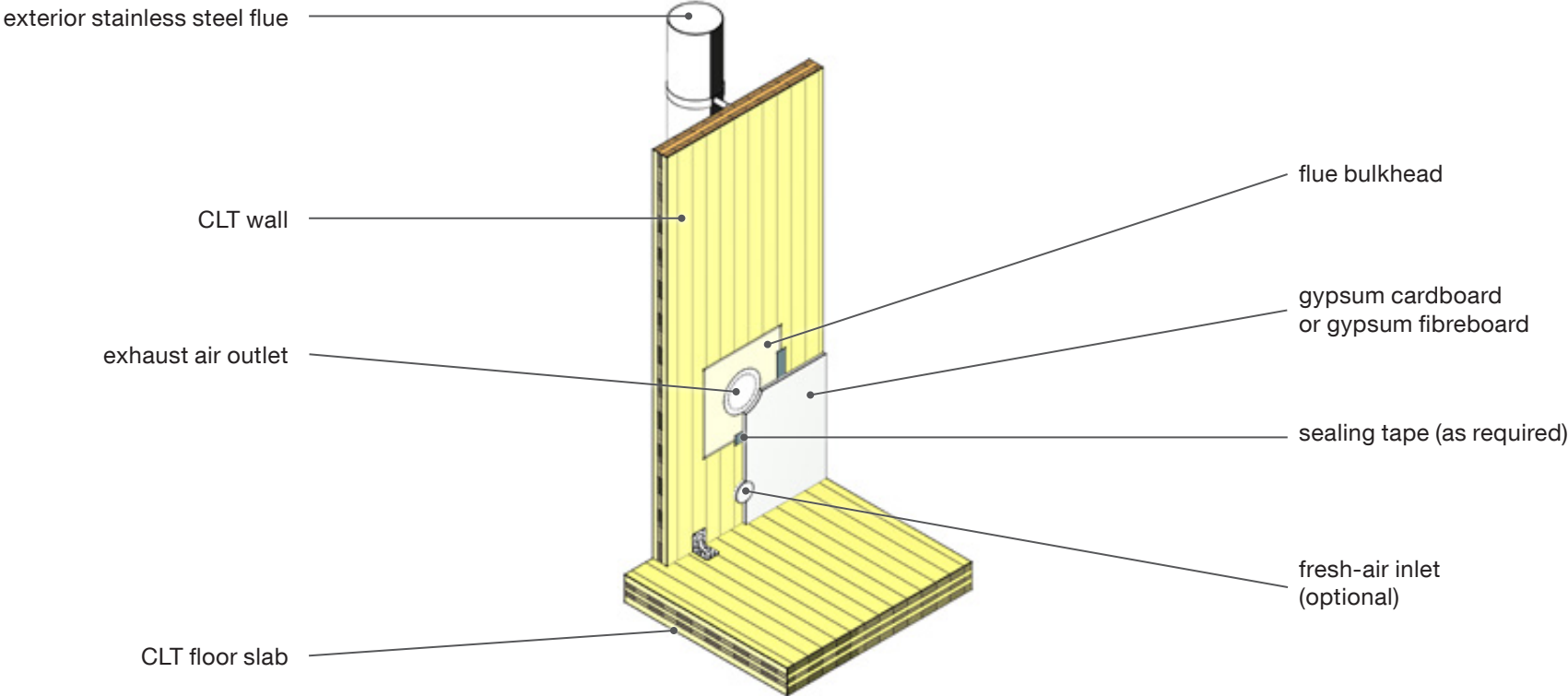
Execution

- If joints between sanitary installations and other building components are sealed with silicone, they must be checked regularly and renewed, if necessary.
- Tiles must be separated from CLT and plaster-board with an additional insulation layer as tile grouting is not waterproof.
- Avoid penetrating the airtight layer when routing wiring.
- The fastening of the services must be sound-insulated from the other components.

Details

Flue

1. Stainless steel flue on the outside of the wall



Execution

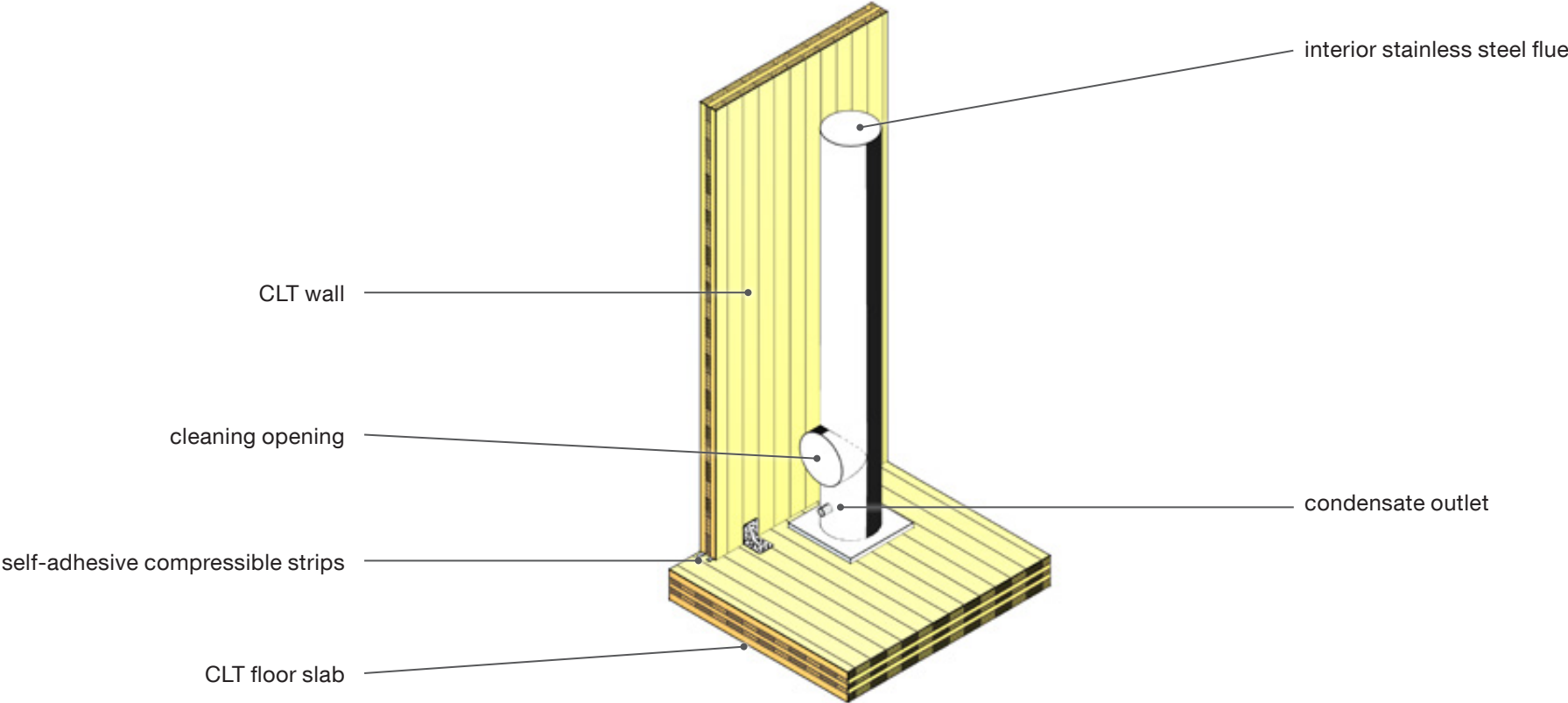
- When using a flue bulkhead, make sure that it is approved for wooden structures.
- Minimum distances to fireplaces and fire protection requirements specified by the manufacturer must be observed.
- The choice and rating of the connectors and all structural components depend on the structural requirements.
- The installation must always be discussed and agreed upon with the authorities and chimney sweep.

Illustrations



Details

2. Interior stainless steel flue



Execution

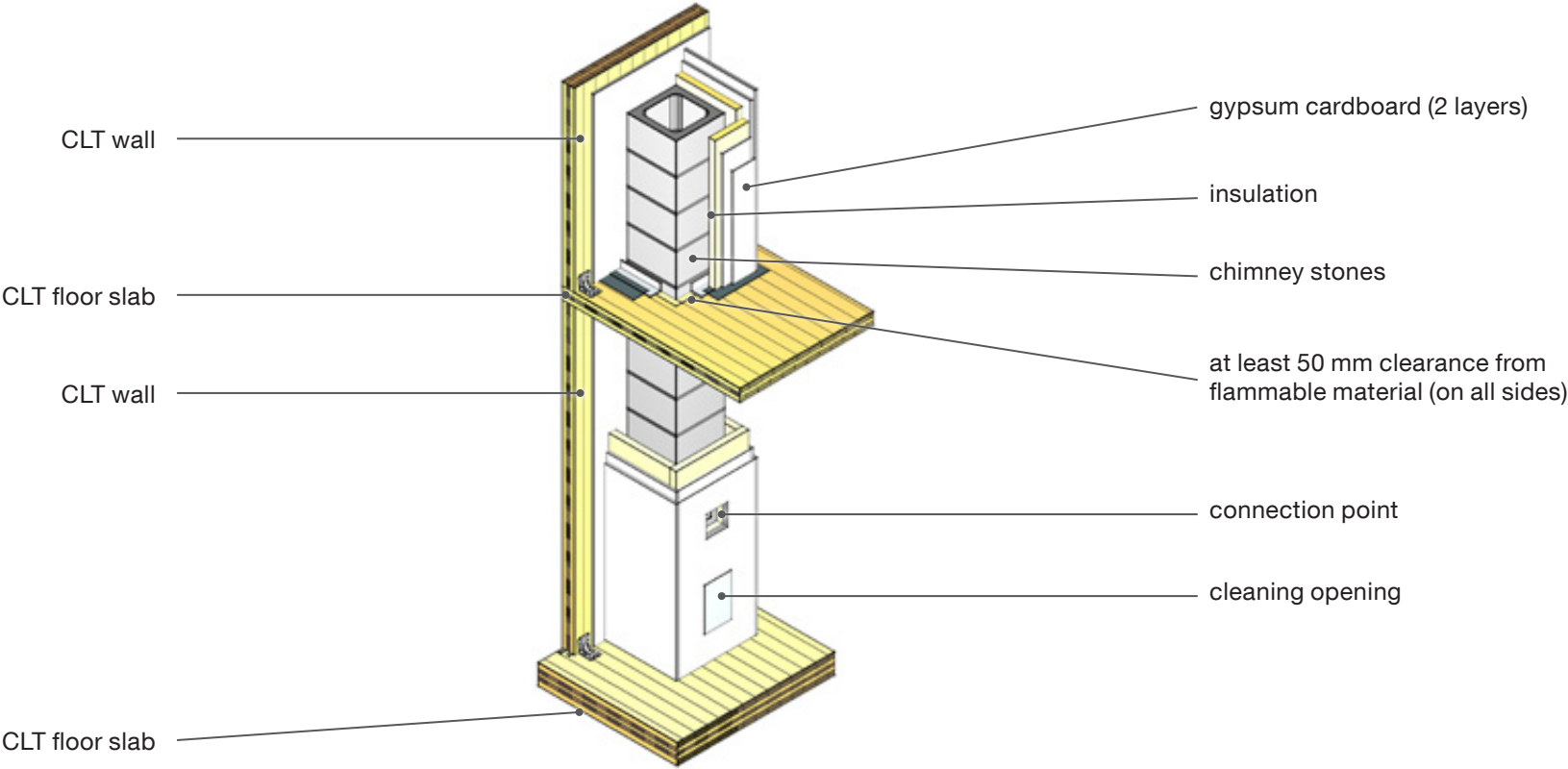
- Minimum distances to fireplaces and fire protection requirements specified by the manufacturer must be observed.
- The installation must always be discussed and agreed upon with the authorities and chimney sweep.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Details

3. Masonry chimney



Execution

- Minimum distances to fireplaces and fire protection requirements specified by the manufacturer must be observed.
- The installation must always be discussed and agreed upon with the authorities and chimney sweep.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



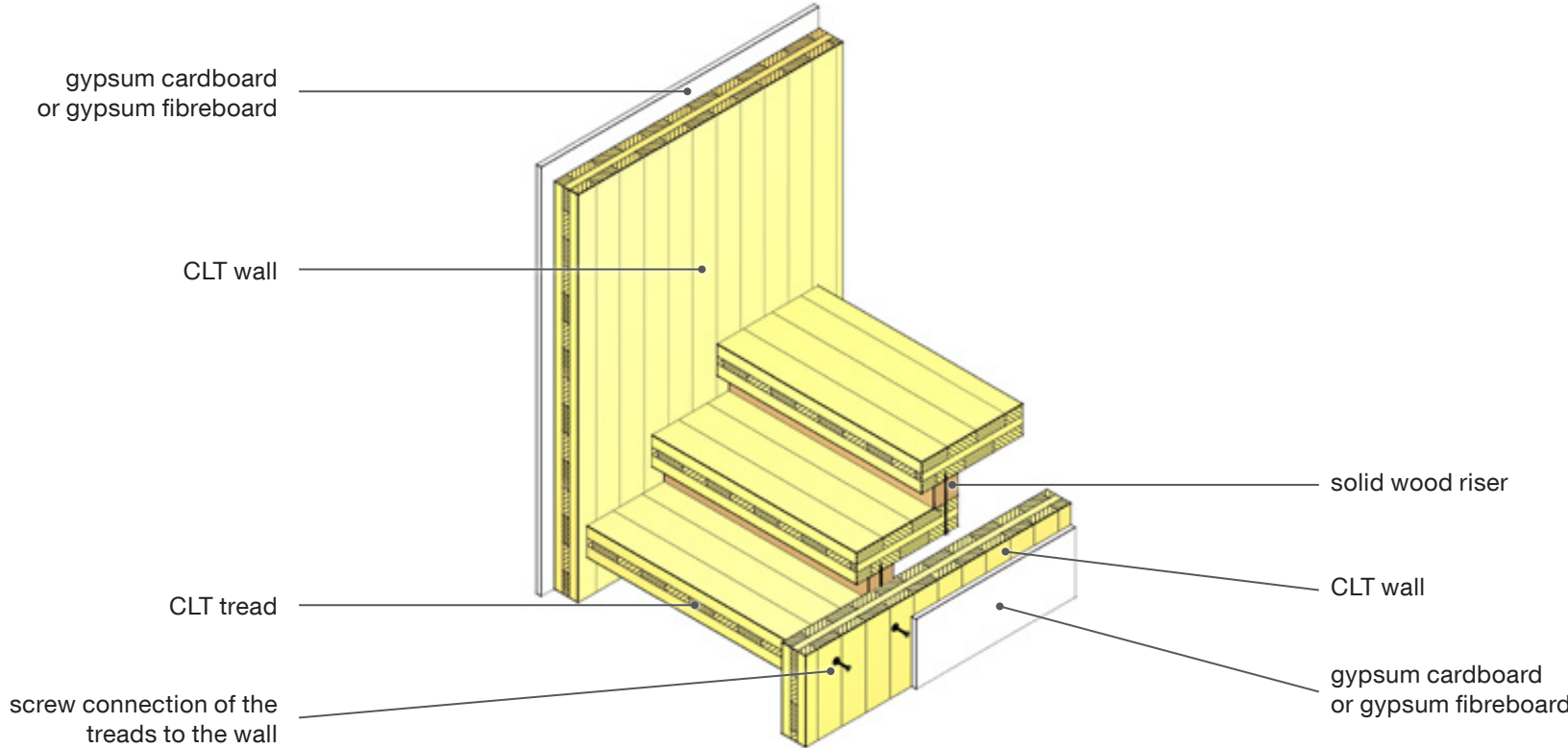
Illustrations



Details

Stairs

1. Screw connection to CLT walls



Execution

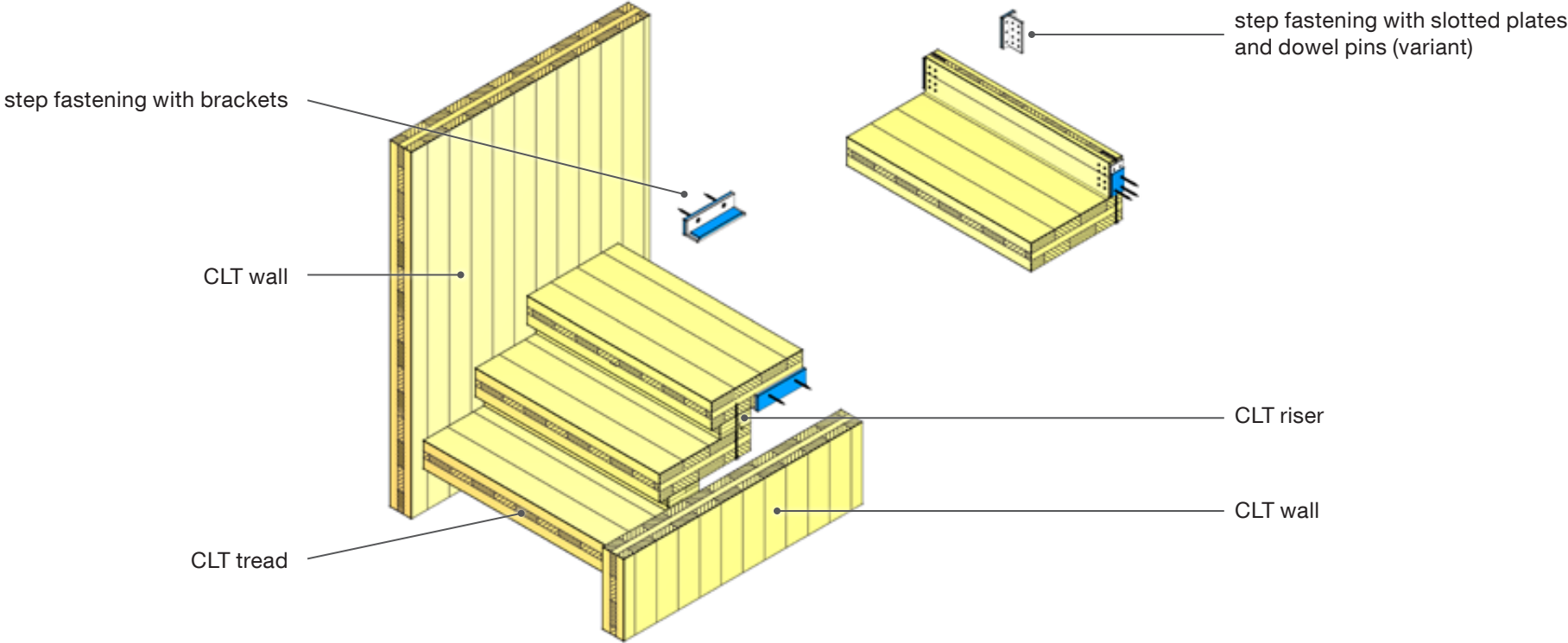
- The threads are fastened to the CLT wall.
- Treads and risers are connected with screws.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Details

2. Fastening with bracket or slotted plate

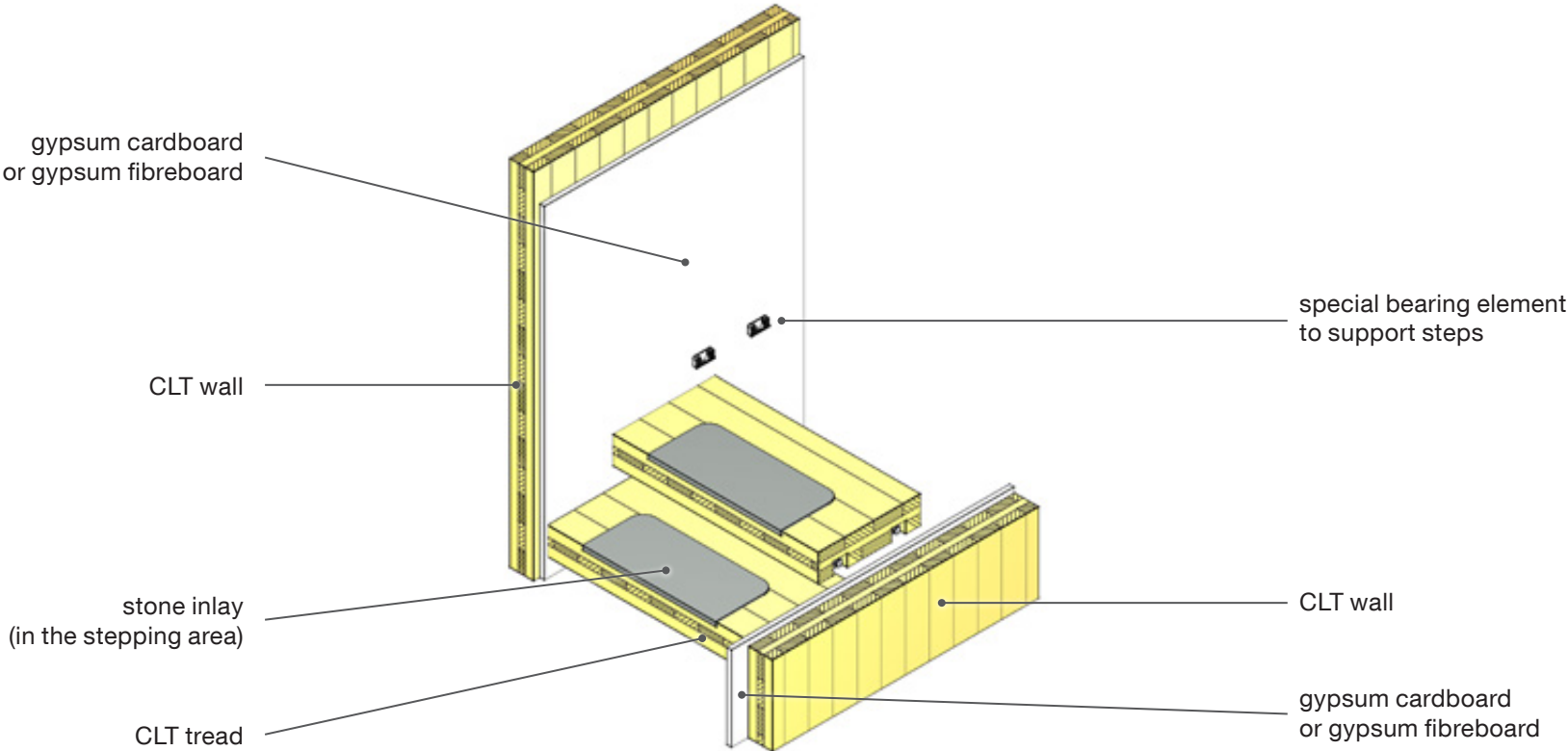


Execution

- The treads are fastened with brackets or slotted plates and dowel pins (variant) anchored to the CLT wall.
- Treads must be sound-insulated in the contact area with an elastic intermediate layer (e.g. sylomer).
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Details

3. Supported by special bearing elements

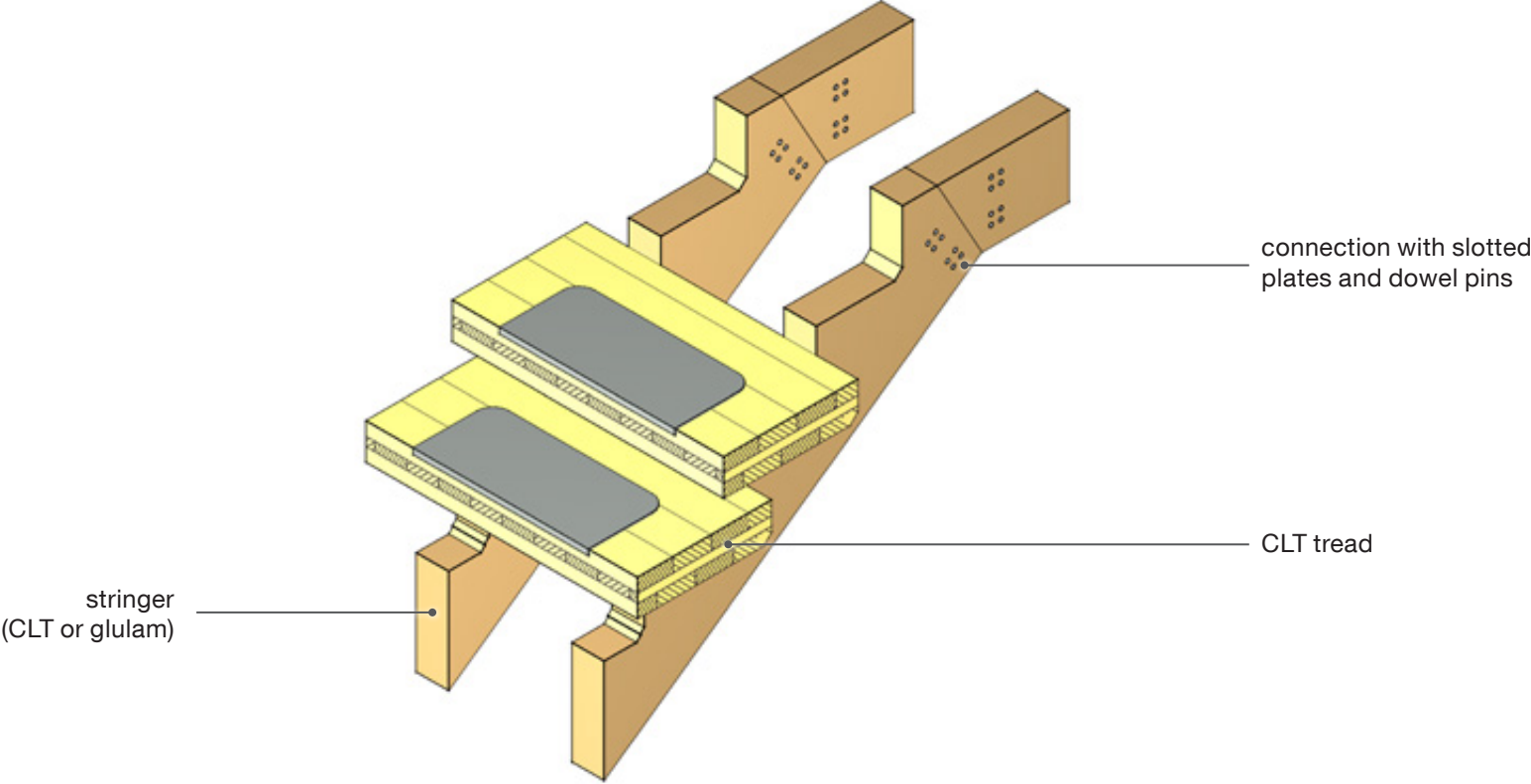


Execution

- The stairs are constructed without risers.
- The treads are mounted on special bearing elements (loads must be taken into account).
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Details

4. Supported by stringers



Execution

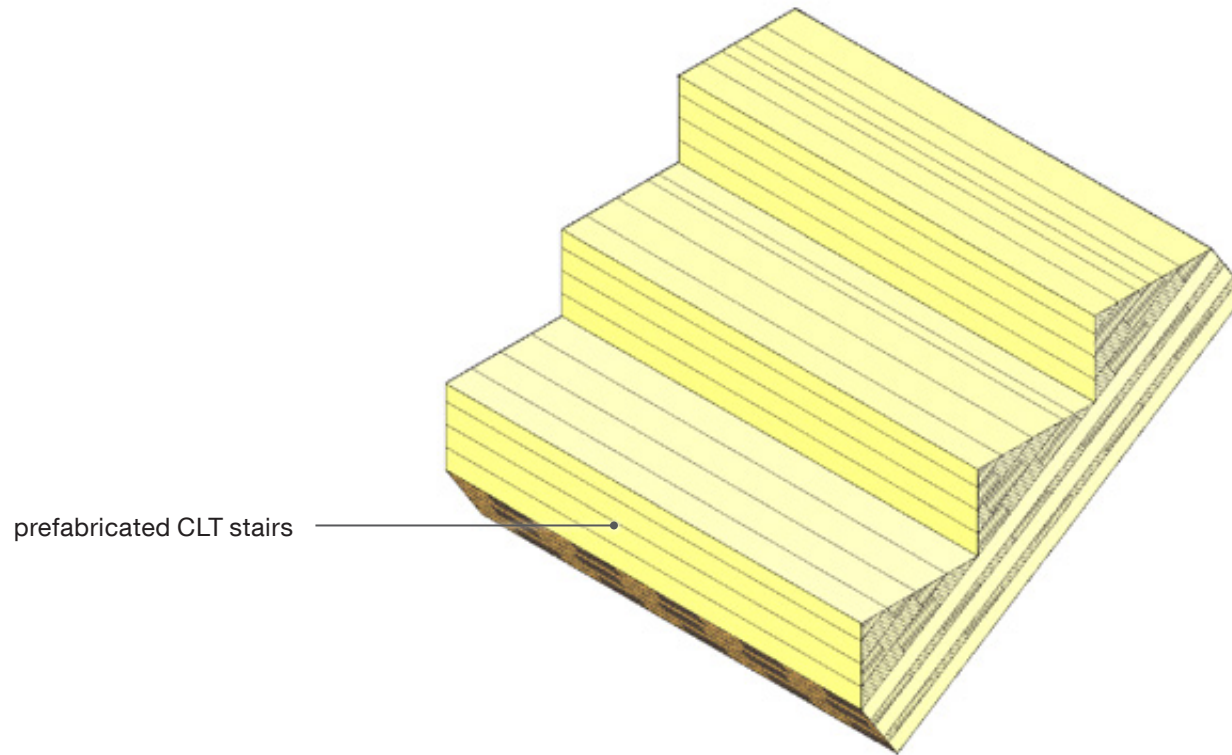
- The stairs are constructed without risers.
- The treads are screwed to stringers below the stone inlays in the stepping area.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Details

5. Prefabricated CLT stairs — Type 1



prefabricated CLT stairs

For the flight:
CLT standard build-up

For the treads:
special build-up
(cross-oriented layers only)

Execution

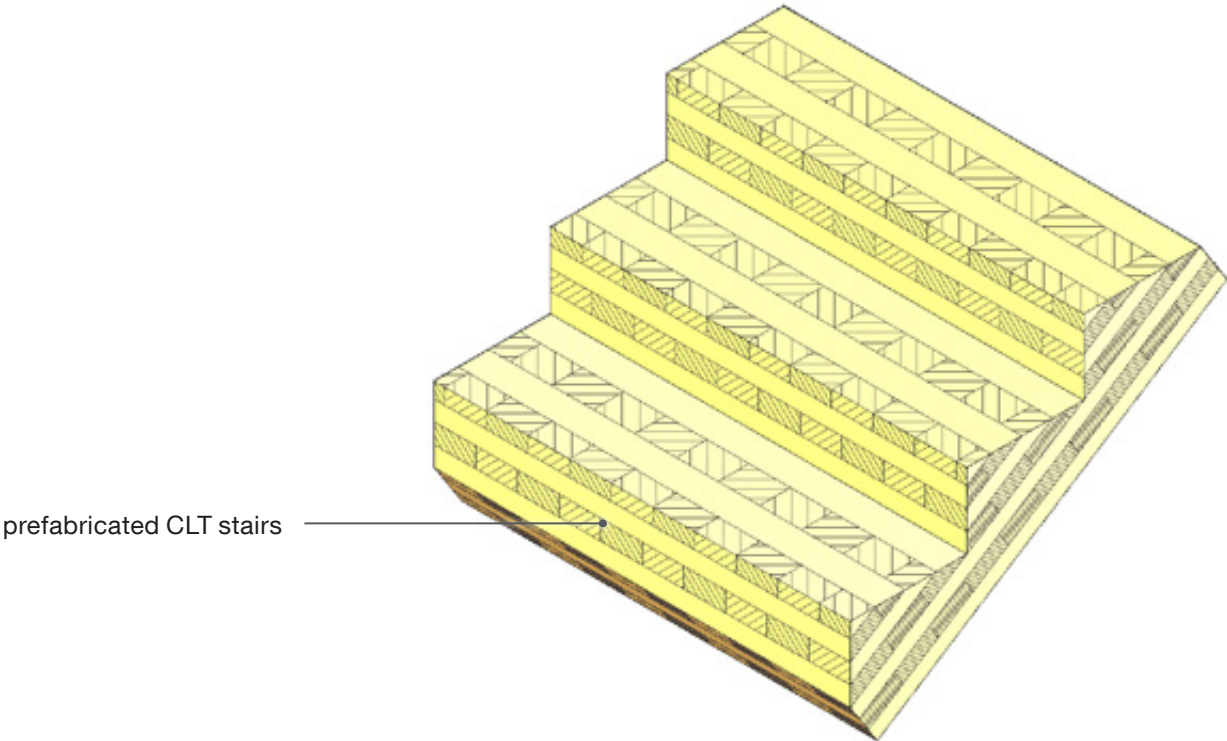
- Prefabricated Stora Enso CLT stairs are based on the idea of one-piece staircases that mainly use cross laminated timber.
- Factory prefabrication under safe weather conditions ensures the quality of the product.
- CE marked building component according to ETA-14/0349.
- Easy connection of stairs to the floor slab, usually with screws.
- The CLT stairs are installed already during the construction of the shell, no temporary stairs are needed. Saves time and money, and increases safety.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations



Details

6. Prefabricated CLT stairs — Type 2



For the flight and the treads:
CLT standard build-up

Execution

- Prefabricated Stora Enso CLT stairs are based on the idea of one-piece staircases that mainly use cross laminated timber.
- Factory prefabrication under safe weather conditions ensures the quality of the product.
- CE marked building component according to ETA-14/0349.
- Easy connection of stairs to the floor slab, usually with screws.
- The CLT stairs are installed already during the construction of the shell, no temporary stairs are needed. Saves time and money, and increases safety.
- The choice and rating of the connectors and all structural components depend on the structural requirements.

Illustrations





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