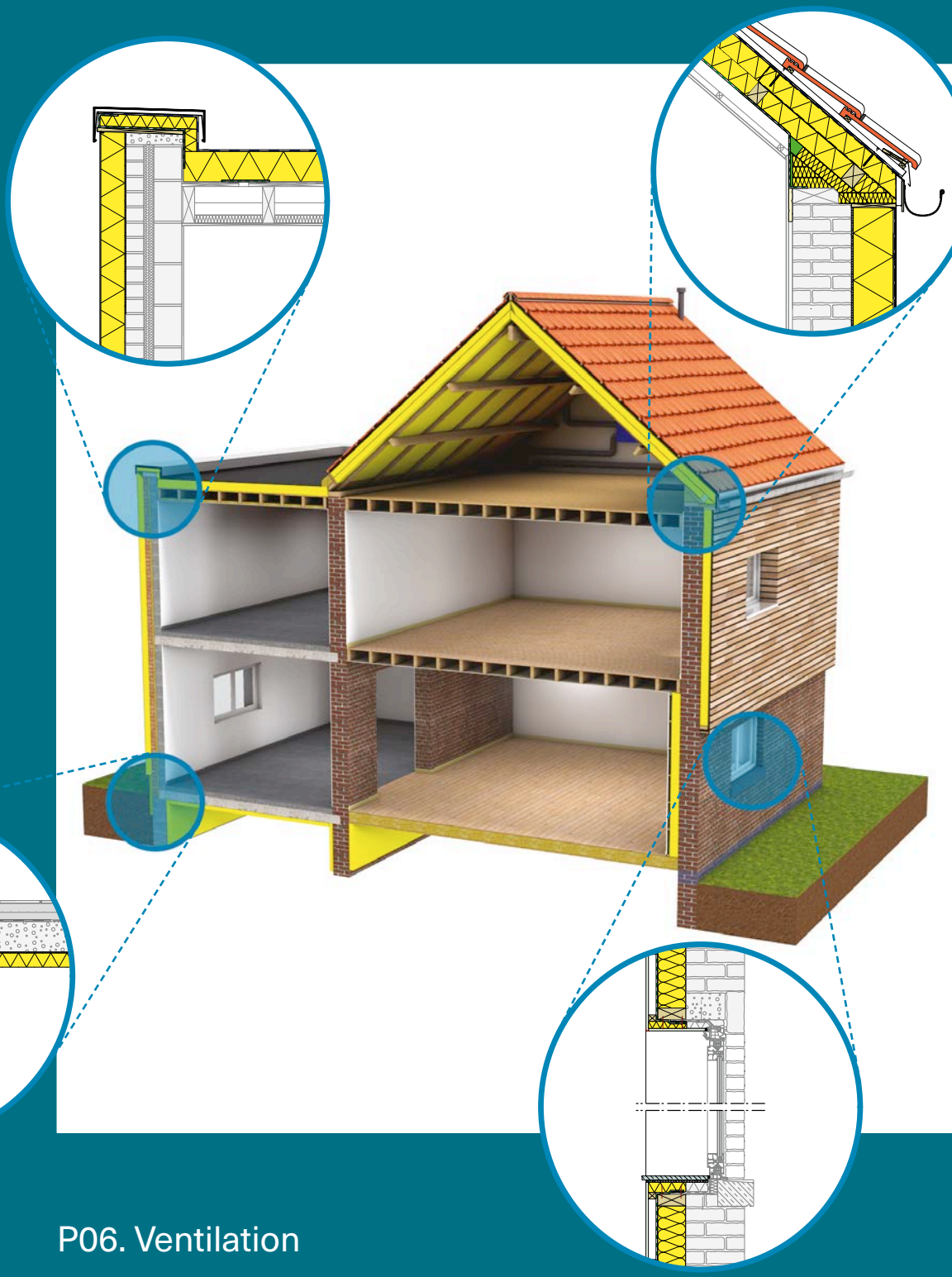
Buildwise Magazine

Themed edition

Renovation: it's all in the details



Jan-Feb 2025

Contents

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This Buildwise Magazine was produced within the framework of the Standards Antenna 'Construction Details', subsidised by NBN, and the Technological Service C-Tech, subsidised by the Brussels Capital Region (Innoviris).

Make the difference: anticipate your renovation details

At a time when energy renovation has become a major challenge, considered construction details are essential to ensure building performance and sustainability. This themed magazine highlights the importance of insulation continuity and suggests a number of concrete solutions for avoiding costly mistakes. Based on practical advice, find out how you can optimise your renovation projects, improve coordination between the various parties involved and help your clients find effective and sustainable solutions.

D. Langendries, Buildwise

Due to today's societal and ecological challenges, both new and renovated buildings are having to meet increasingly high energy performance levels (see the box opposite). This is an ambitious task for construction companies which have to respond to the needs of the market.

Future projects will have to meet strict requirements and clients will pay more and more attention to details. So in order to stand out in this context, companies need to highlight their expertise. One of the keys to success is to **be meticulous when preparing your sites**. That includes:
- analysing the impact of construction choices
- organising site phases carefully
- paying attention to every detail.

Taking this approach will enable you to:
- limit unforeseen circumstances
- ensure energy performances
- avoid pitfalls such as poorly designed construction nodes that can lead to damage and energy losses.

Thermal break: a must

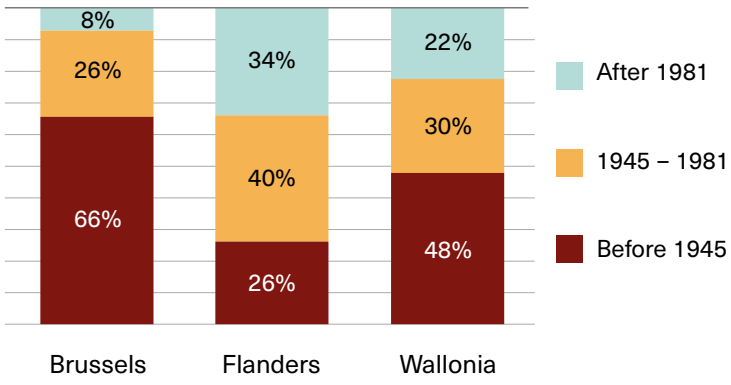
When carrying out renovations, thermal improvement of construction nodes is all too often overlooked. Focus is directed at the insulation of the façade surface, the gabled façade, the roof or even the floor above the basement, for example, while insufficient attention is paid to the connection between these elements. However, **carefully designed details improve the comfort, energy performances and sustainability of buildings**.

EPB: for existing buildings too

The construction sector is responsible for 36% of the greenhouse gas emissions in Europe. That is why in 2024, the European Union introduced the first version of the Energy Performance of Buildings Directive (EPB). Since then, the regional authorities in our country have imposed increasingly strict EPB regulations for new buildings.

The directive has already been revised several times. The April 2024 version stipulates that existing buildings must achieve **very high energy performances** or even be **nearly-zero energy** (NZE) by 2050. An enormous challenge, especially when you think that more than 90% of the building stock in Belgium requires major energy renovation!

Construction period of the building stock in Belgium



Take, for example, an externally insulated terraced house where special attention was not paid to the construction nodes. If we add the linear thermal losses at the eaves, window edges and floor connections to the transmission losses via the façades, **the total losses can as much as double depending on whether the details have been well- or poorly designed** (see Buildwise Article 2013/02.04). So what is the point of investing in the insulation of flat surfaces if the construction nodes are not addressed properly? What is the use of having a generous budget if the building's thermal losses remain high? And why should your client aim for label A for their EPB certificate if it does not ultimately deliver the energy performances and savings hoped for?

Poorly designed connections can also cause damage. If a 'bridge' or even a true thermal 'highway' is still present at the connections between the walls of the building envelope, there is a **risk of mould developing on the interior finishes at those construction nodes**. Take the renovation of a window opening, for example: can this be done without insulating the reveals and lintel? Simulations have shown that adding just 2 cm of insulation is enough for the surface temperature in winter to increase from 10.6 to 14 °C and for the temperature factor to improve from 0.4 to 0.63, an acceptable value for a building with internal climate class II (see Buildwise Article 2024/05.08).

In this magazine, every connection has been carefully designed according to the principle of 'EPB-compliant' construction nodes. The aim is to preserve the thermal break where possible or to add insulating elements around the construction node to create a path of least thermal resistance of at least 1 m. The current parts meet the current requirements for new buildings: $U_{roof,\ walls\ and\ floors} \leq 0.24\ W/m^2{\cdot}K$ and $U_{window} \leq 1.5\ W/m^2{\cdot}K$.

Thermal break and a whole lot more!

The challenge is multidimensional: renovating the building envelope means first and foremost ensuring insulation continuity. But that is not enough: a successful detail is the result of a combination of various aspects.

In 2015, our centre published a themed magazine about the construction detail, a true bundle of requirements. This special edition described the change in attitude and challenges facing the sector, focusing on new buildings in particular. Before the oil crisis of 1973, a building mainly had to be stable and watertight. But in the 2000s, these requirements changed: now a building had to demonstrate good thermal and acoustic performance and be properly ventilated, fire-proof, accessible for people with limited mobility and, of course, sustainable. All this also had to be economically viable. An enormous challenge in other words!

Today, expectations are even higher: that is why we strive for buildings that are both robust and resilient. The task is **all the more complex when renovation is involved** and you have an existing structure to deal with. What is more, clients' budgets usually only allow gradual, phased investment. This situation is often made more difficult by the fact that no architect or general contractor steps in to coordinate the works that are carried out by multiple building trades at different times during the life of the building.

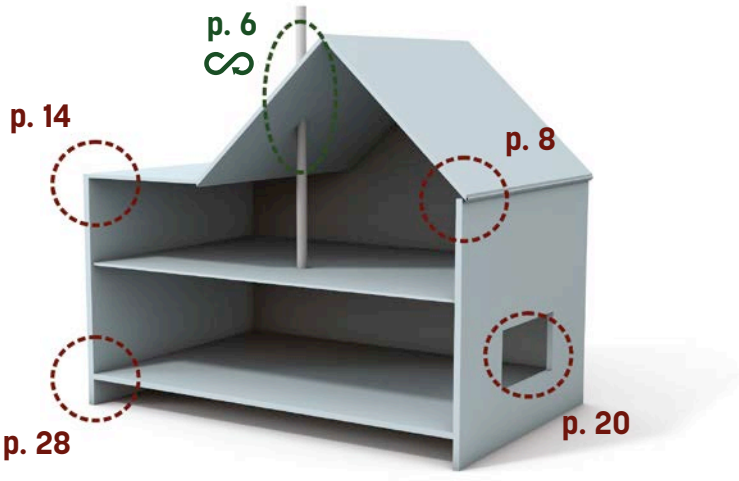
Directions for use for this special edition

To meet all these requirements and cope with the uncertainties and unforeseen circumstances that can arise during implementation, renovation projects require thorough preparation. As a building professional, you therefore have to:

- advise clients
- monitor sites closely
- implement construction details carefully.

In this magazine, we will focus on renovation details. The goal is to **assist you in the best possible way in your projects** by providing you with the tools you need to analyse the existing situation in more detail, consider the order of works, structure your quotations and implement effective construction nodes. We also aim to **facilitate dialogue** with other companies and consultancy firms involved in the project and with your clients by providing outlines and checklists designed to support your approach. Together, they can strengthen your position as a reliable company.

This edition examines the building envelope by studying the details of foundation bases that are specific to the renovation of single-family dwellings or small apartment buildings (highest floor < 10 m), as well as connections with the joinery, floors and roofs. Each article stresses the



importance of:

- **considering the details during the design process**
- **ensuring the effective coordination of works.** That way, you can avoid delicate situations that can arise due to poor anticipation of connections, as in the case of lock-ins (see the box opposite).

These articles are intended as practical data sheets that draw attention to the **points that should be taken into account from the start of any project** and the elements that you should photograph and document before commencing any works. The general rule is that you should never conceal a problem and that in case of doubt, you should consult an expert. The articles also provide an overview of the **essential aspects that should be included in your quotations**. While they in no way replace the advice of specialised experts, they do provide a valuable guide to renovation and complement the other documents in our Construction Details database. The usual reference documents are listed in each article. Naturally, all construction professionals must comply with regional requirements relating to EPB regulations (in the case of major renovations) and/or the conditions for granting renovation subsidies.

Ventilation: an essential factor

Last but not least in this introduction: ventilation. When renovating a home, not only the building envelope but also **indoor air quality and moisture management** should be taken into consideration. The damper the indoor air, the greater the risk of mould forming on the external walls, especially in older buildings where the walls are often poorly insulated and colder.

Efficient ventilation of buildings reduces these risks and creates a comfortable and healthy indoor climate at the same time. **An overall approach is therefore essential** for every renovation project. Installing effective ventilation systems can have a considerable influence on interior design, interior finishes and the elements of the building envelope. For that reason, the first article in this magazine is on ventilation. In particular, this will help you make your clients aware of the importance of taking this into account from the day work begins.

Contractors are not on their own

The good news is that you are not the only one faced with these challenges. Being aware of the scale of energy and ecological challenges, the Regions have introduced a series of measures to support the sector. To guide the energy transition of real estate assets, EPB auditors and certifiers can help you and your clients by reliably diagnosing renovation priorities. By doing this, they help establish a reasoned approach where each party can add real value to projects.

The Regions have also taken steps to guide private individuals in their projects, via **energy renovation platforms** in particular. Their role is to help renovation applicants define their project and find skilled building professionals. This magazine can serve as a reference guide for both these platforms and the companies that participate in them. It will help strengthen their quality criteria and facilitate coordination between the various building trades.

Finally, **support projects** are springing up all over our country. Some notable initiatives include the alliances of Renolution in Brussels or ACER in Wallonia. Other projects worth mentioning include CosmeReno in Flanders, Modul'Air in Brussels and Reno+ in Wallonia. For this last project, a team from Buildwise helped develop the first Wallonian renovation train in Braine-l'Alleud. For this innovative project, the roofs of a whole district were renovated. A detailed 3D survey of the attics concerned enabled a diagnosis of the existing situations to be carried out. This preparatory work not only made it a lot easier for contractors to draw up their quotations but also meant that the number of trips to the construction site prior to the start of the works was reduced considerably and that costs were optimised by sharing resources.

Renovation is therefore more of a focus than ever. Time to get started: it affects us all!

Happy reading!

Lock-in

Lock-in refers to a situation where a past decision has limited the options available for the future. In the context of building renovation, that means that certain works carried out can reduce the possibilities for future renovations or render insulation continuity impossible.

Ventilation: an aspect that concerns various trades!

Ventilation is an essential aspect of renovation projects and requires an overall approach to be taken from the start. As a professional who intervenes in the renovation of the building envelope, your role is to make the client aware of this and install certain components depending on the system chosen.

S. Caillou, Buildwise

Essential, even for renovations

Ventilation for homes is crucial, even for renovation projects, as it **ensures that the moisture created indoors is removed along with the various pollutants emitted by occupants, building materials and furnishings**. As a result, adequate indoor air quality is secured for occupants' comfort and health.

It is important to stress that uncontrolled air infiltrations via the building envelope and manually opening windows are not enough to guarantee optimum air quality. **Only with controlled ventilation can you find the right balance**, i.e. a flow rate that is not too low and not too high. That is the compromise between good air quality and controlled energy consumption.

Promoting an overall approach

For a ventilation system to be efficient, it must always be designed based on an overall approach. **Fresh air should be supplied in certain rooms, circulated through the home and then discharged from other rooms.** Depending on the system chosen, this can lead to the following, for example:

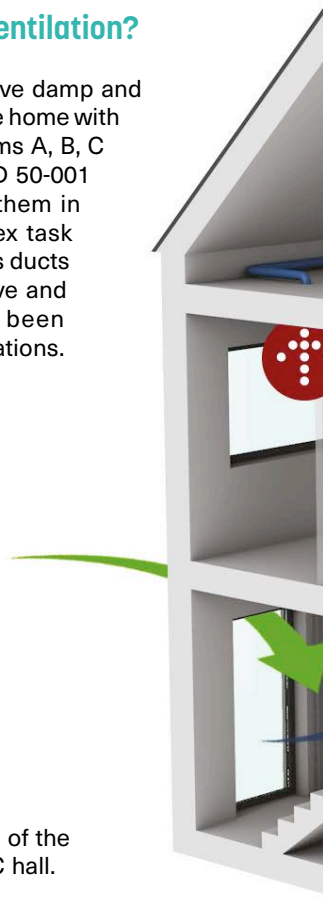
- the implementation of natural inlet openings in the façade or in certain windows
- the installation of air outlet and air inlet openings for mechanical systems on the roof or in the façade.

Installing a ventilation system also has an impact on the space inside the home as space will be required for the fan(s) and mechanical ventilation ducts.

For that reason, an overall approach to ventilation is required and it should be planned well before the start of renovation works on the building envelope. Although the professionals who intervene in the renovation are not usually involved in the overall design of the ventilation system, they can play an essential role in making the client aware of this and encouraging the client to take this into account from the start and to engage the services of a specialist installer.

How do you provide efficient ventilation?

The principle of ventilation is to remove damp and polluted air from a home and supply the home with fresh air. The classic ventilation systems A, B, C and D defined by the standard NBN D 50-001 are well-known. However, installing them in renovation projects can be a complex task because so many components such as ducts have to be installed. Several innovative and extremely efficient solutions have been developed in response to these limitations.



1 Principle of the system C hall.

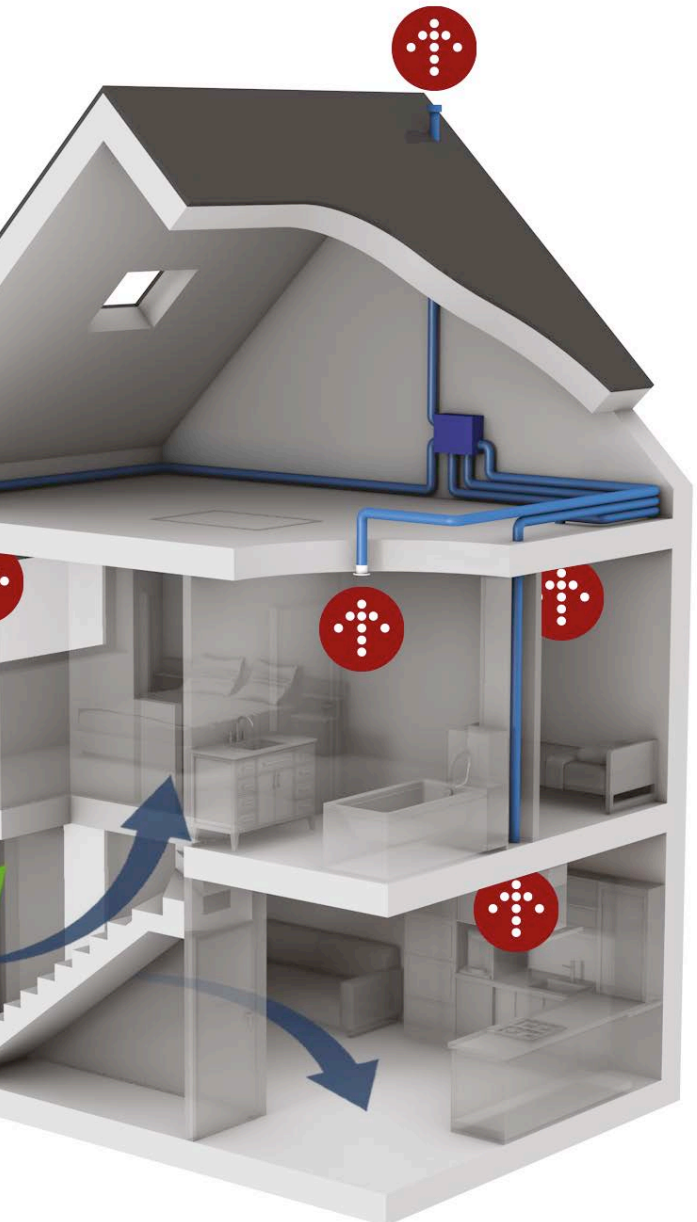
Innovation Paper 41 provides a detailed overview of a range of these systems designed to facilitate integration in renovation projects.

For example, **the system C hall is suitable for houses.** This system is even more efficient than a classic system C because it offers better control of the air flow rate and remains effective regardless of the airtightness of the building envelope. With this system, fresh air is only supplied to the entrance hall on the ground floor (see the diagram below). The polluted air is then extracted mechanically from the humid rooms (bathroom and kitchen) and even from the bedrooms.

This system illustrates the importance of an overall approach: it requires mechanical extraction in various rooms, efficient air circulation from the entrance hall to all rooms and an open-plan lounge and kitchen, for example.

What about apartment buildings?

Innovative ventilation systems that are suitable for apartment buildings are also described in Innovation Paper 41. An additional challenge with the general design of these buildings is the choice between a collective system that serves multiple apartments or individual systems that are installed in each home. The availability of vertical technical ducts and the possibility of installing suspended ceilings can help with this choice.



Installation by various building trades

The ventilation system generally encompasses the whole home and influences both the interior spaces and finishes as well as certain parts of the building envelope. **You may be entrusted to install a number of components.** Let's take the system C hall as an example to illustrate which components you may have to install:

- depending on the works carried out, during the installation of the external joinery or façade works a natural inlet opening will have to be installed above the front door
- the air outlet opening is usually installed during the roofing works or, in some cases, during the façade works. Special attention should be paid to connections in order to guarantee airtightness and insulation continuity
- installation of the ducts and fan can be combined with the installing of internal walls, the implementation of internal insulation, the rearrangement of the spaces or the replacement of finishes.

Minimal ventilation

When carrying out any renovation project, it is essential to provide minimal ventilation. Pending the installation of a complete system that meets the standard or Innovation Paper 41, **basic ventilation is vital**, if only to remove moisture from service spaces. This will prevent moisture-related problems such as the formation of mould, especially in older buildings that are often not insulated as well or have residual thermal bridges.

This minimal system must at least comprise mechanical outlet openings in the bathroom, kitchen and toilet. For a long-term approach, it is better to choose a central outlet linked to a duct network that serves these rooms. That network can then be integrated later on in a complete system of type C or D or in the variants described in Innovation Paper 41.

Façade-sloping roof: on the inside or outside?

When carrying out renovation works, a poorly designed connection between the façade and a sloping roof can have significant consequences. For instance, considerable air leaks can arise that can lead to heat losses or condensation problems. Significant thermal bridges can develop in this zone too.

D. De Bock, Buildwise

The order for insulating the roof and the façade on the outside plays a crucial role when choosing technical solutions. **You generally start with the insulation of the roof before tackling the façade.** The reverse is also possible provided that:

- a watertight shield such as a zinc cover is installed on top of the façade insulation, under the existing roof gutter or gutter box
- the height of the façade insulation is cut to size after the implementation of the roof overhang to align it with the final position of the roof gutter.

The table below refers to the relevant construction details and Buildwise Articles according to the installation of the insulation carried out.

On the pages to follow, solutions are suggested for insulating façades and roofs on the outside and inside, as well as an approach that combines these two methods of insulation.

The solution chosen for the connection between the façade and the roof should be based on TINs 175 (tiled roofs), 219 (slate roofs) and 266 (metal roofs). You can also use the type solutions described in TINs 243, 257, 264, 274 or 279, as well as in the technical specifications of suppliers of external façade insulation systems such as ETICS.

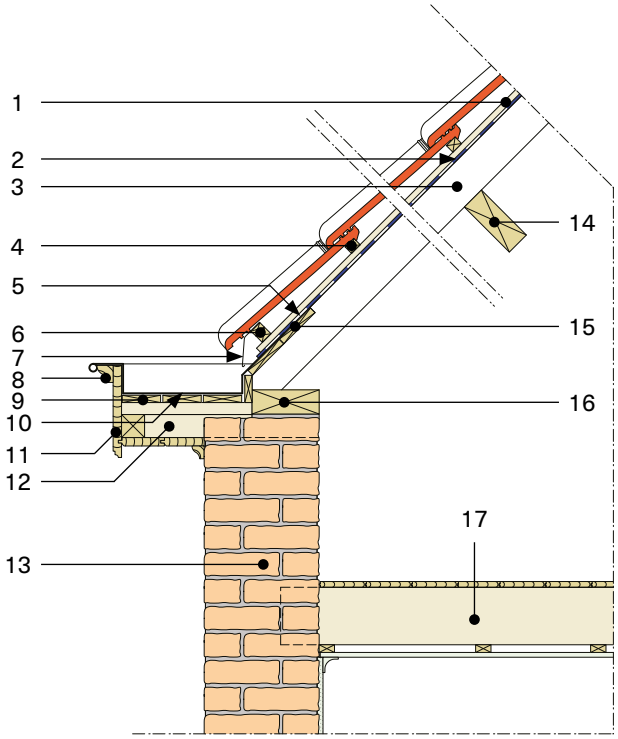
A Overview of the possible combinations of façade and sloping roof, depending on the positioning of the insulation installed.

Insulation of the sloping roof \ Insulation of the façade	On the outside (see TIN 257)	On the inside (see Buildwise Article 2017/03.12)
On the outside (see TIN 251, § 5.5.3)	See diagram 3 (p. 10) See Construction Details Sheet 1435 (solid wall) or 1436 (cavity wall)	See diagram 6 (p. 11) See Buildwise Article 2023/02.03
On the inside (see Buildwise Article 2024/05.05)	See diagram 5 (p. 10)	See diagram 4 (p. 10) See Construction Details Sheet 1434

Existing situation

This article is based on the eaves of a traditional house from pre-1945 (see diagram 1 and Construction Details Sheet 1434). The existing elements that will be retained are shown in grey in the diagrams below.

1. Counter-batten
2. Roof frame
3. Rafters
4. Batten
5. Upstand of the box gutter on boarding
6. Base lath (raised batten)
7. Profile or cam
8. Eaves trim
9. Boarding on laths
10. Gutter bottom
11. Fascia boarding
12. Box gutter support
13. Existing solid wall
14. Purlin
15. Boarding
16. Wall plate
17. Built-in wooden floor beam

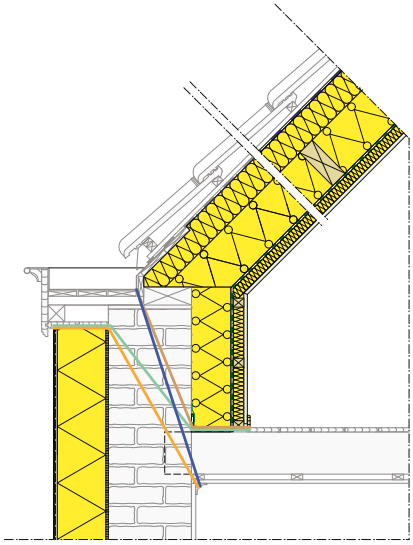


1 Eaves of a traditional pre-1945 house.

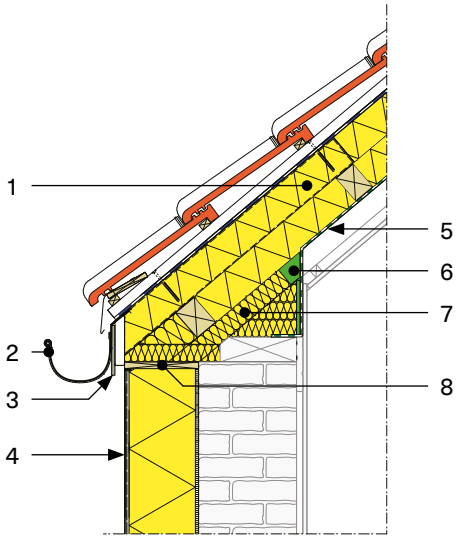
Façade and roof insulation solutions

When carrying out renovation works, there are various possible combinations for insulating the façade and sloping roof, depending on whether you want to insulate these elements on the outside or inside:

- **insulating the façade and roof on the outside** (see diagram 3 on the next page). In this case, the work of the roofer and the work of the façade worker converge at the horizontal board (see no. 8)
- **insulating the façade and roof on the inside** (see diagram 4 on the next page)
- **insulating the façade on the outside and insulating the roof on the inside** (see diagram 5 on the next page). With this solution, a thermal bridge almost always occurs. However, the impact of this can be reduced by complying with rule 3 of the energy performance regulations (EPB) which requires the path of least thermal resistance between the indoor and outdoor climate to be a minimum of 1 m long (see diagram 2 opposite). This requirement is mandatory for renovations where the EPB unit connects to a new section. In other cases, you must try to get as close to this as possible
- **insulating the façade on the inside and insulating the roof on the outside** (see diagram 6, p. 11). In this case, the phasing of the works has a direct influence on the final detail:
  - diagram 6A shows the existing situation where a layer of insulation has been applied between the rafters on the roof. In case of doubt regarding the effectiveness of the damp proofing, it is recommended to install a new membrane on the inside and connect it under the wall plate
  - diagram 6B illustrates the insulation of the façade on the inside before the roof is insulated on the outside. If it is not certain whether there is damp proofing behind the rafters and what state it is in, it is recommended to apply a new damp-proof membrane when insulating the roof and to connect it to the wall plate. This option must be stated in the quotation as the existing damp proofing will not become visible until the roof covering is removed. The façade damp proofing is then bonded to that of the roof by creating airtight penetrations at the rafters
  - diagram 6C corresponds to the insulation of the roof on the outside after the façade has been insulated on the inside.

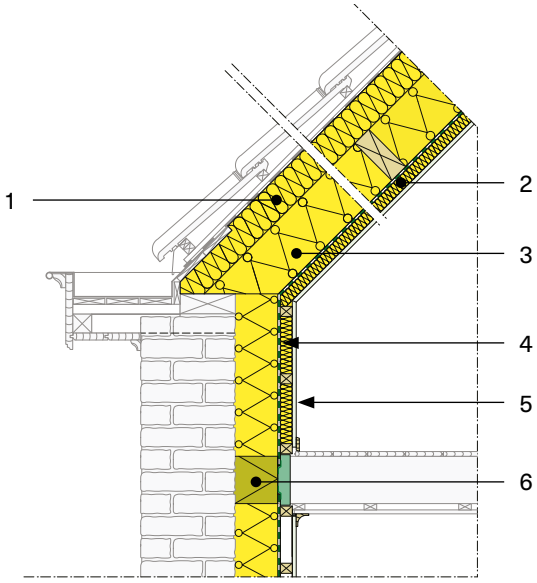


2 Paths of least thermal resistance.



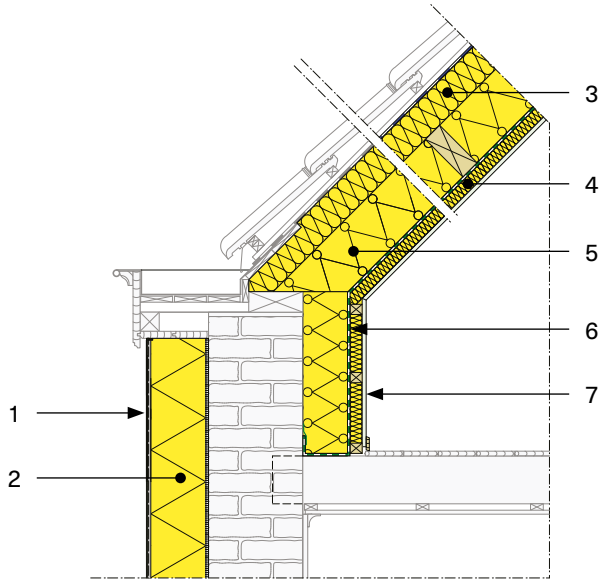
1. Rigid thermal insulation
2. Roof gutter
3. Edge board
4. Cladding on external insulation
5. Damp proofing
6. Airtight connection
7. Flexible thermal insulation
8. Finishing of the underside of the roof overhang

3 Insulating of the façade and the roof on the outside.



1. Flexible thermal insulation
2. Pipe cavity, possibly with insulation
3. Thermal insulation
4. Damp proofing
5. Interior finish
6. Insulation at the wooden floor beam

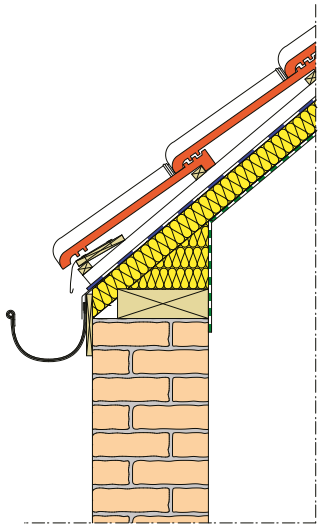
4 Insulating of the façade and the roof on the inside.



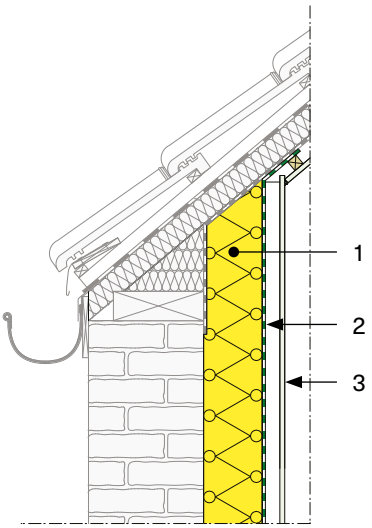
1. Cladding on external insulation
2. Rigid thermal insulation
3. Flexible thermal insulation
4. Pipe cavity, possibly with insulation
5. Thermal insulation
6. Damp proofing
7. Interior finish

5 Insulating of the façade on the outside and insulating of the roof on the inside.

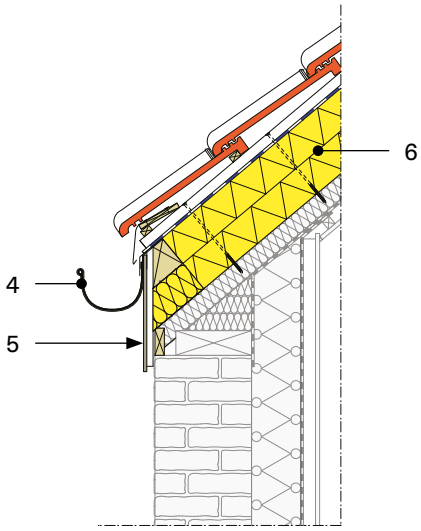
A. Existing situation



B. Phase 1: insulating of the façade on the inside



C. Phase 2: insulating of the roof on the outside



1. Thermal insulation
2. Damp proofing
3. Interior finish
4. Roof gutter
5. Edge board
6. Rigid thermal insulation

6 Insulating of the façade on the inside and insulating of the roof on the outside, starting with the façade insulation (B), followed by the roof insulation (C).

Checklist for the roof insulation works

Essential checks before starting work

The roof timberwork (see Buildwise Article 2022/01.07):
- ☑ are there any visible signs of insect or mould infestation?
- ☑ is strengthening or structural modification required (e.g. movement of shoring)?
- ☑ is there any deformation that is visible with the naked eye (deformation > L/250)?
- ☑ should it be corrected to allow aesthetic installation of the roof?

☑ Are there any visible damp or mould problems on the interior finishes directly below the roof?

☑ In the case of sarking roofs, are the rafters and trusses wide enough? Without predrilling, TIN 251 recommends rafters at least 50 mm wide. If there are narrow trusses, lateral elements can be added.

☑ Will the roof have to bear additional loads such as solar panels?

☑ Is there a roof frame and is it in a good state of repair?

☑ If there is no roof frame, can a substitute roof frame then be installed with water drainage to the outside at the eaves (see Buildwise Article 2009/03.06)?

☑ Is there already insulation between the rafters and can this be kept?

☑ Can the damp proofing be fixed to the wall head so that it is airtight? Is levelling with mortar required? (see diagram 3, p. 10)

Important points for attention during implementation

☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.

☑ When insulating on the outside (see diagram 3, p. 10), leave sufficient space between the edge board and the façade (e.g. ≥ 20 cm for an ETICS and ≥ 24 cm for boarding).

☑ Fill the space behind the edge boards completely with insulation (see diagram 3, p. 10).

☑ Limit the risk of water running off from the roof frame onto the wall head, façade cladding or plastering downwards by ensuring that water from the roof frame drains off into the roof gutter or by installing an efficient drip moulding (see Buildwise Article 2020/06.02).

☑ Provide effective and airtight damp proofing in the roof construction. In the case of sarking roofs, (see diagram 3, p. 10), bond the damp proofing to the façade or the wall plate. It may be necessary to level the brickwork using mortar.

☑ Adjust the damp proofing to the type of roof frame. If it is damp-proof (bituminised, metal layer...), you should use class E3 damp proofing ($\mu_{d,eq}$ > 25 m) (see TIN 251) and install it carefully.

☑ Preferably avoid any direct contact between the insulation and a roof frame made of micro-perforated plastic (see Buildwise Article 2021/06.02).

Essential elements in a quotation

Be sure to include the following elements in your quotation:
- ☑ install an air screen and damp proofing and connect them correctly to the façade
- ☑ when replacing the roofing, install a vapour-permeable roof frame which is to be connected to the roof gutter. Otherwise an efficient drip moulding and roof overhang must be provided to limit the amount of water running off onto the façade after it has been insulated
- ☑ fill the space between the edge board and the façade with insulation
- ☑ seal off this space (see diagrams 3, no. 8, p. 10, and 6, p. 11)
- ☑ when insulating on the inside, insulate the wall to floor level. This task will preferably be carried out by the company insulating the roof.

Possibly include the following elements in your quotation:
- ☑ correct the flatness of the roof timberwork if it does not meet certain requirements (see Buildwise Article 2015/02.27), especially if a flat roofing material is used (see diagrams 3, p. 10, and 6, p. 11)
- ☑ strengthen or adjust the roof timberwork
- ☑ install one or more jacket pipes for the passage of technical cables through the roof (see Construction Details Sheet 1205)
- ☑ install fixing brackets for solar panels
- ☑ carry out an airtightness test after the works in order to improve the home's EPB score and thus draw attention to the quality of the work carried out.

Checklist for the façade insulation works

Essential checks before starting work

- ☑ Are there visible stability problems in the subsoil (cracks, out of plumb...)?
- ☑ In the case of cavity walls, does the substrate remain stable when you manually apply pressure to it?
- ☑ In the case of cavity walls, is the cavity already insulated?
- ☑ Are there signs of damp on the façade and/or in the home at the connection between the façade and the roof?
- ☑ Can the roof overhang be connected to the façade insulation properly?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ If possible, post-insulate the cavity wall before insulating the façade on the outside. Any movement of outside air in the cavity should at least be avoided (see Construction Detail Sheets 1574).
- ☑ The façade insulation is to be connected to the finish on the underside of the roof overhang (see diagrams 3 and 5, p. 10).
- ☑ If the beams of the attic floor run parallel to the gables, fill the space between the beam closest to the external wall and this wall with foam and then connect the air screen to it (see diagram 4, p. 10).
- ☑ Prevent air flows between the insulation and the wall (see diagrams 4 and 5, p. 10).

Essential elements in a quotation

When insulating the façade <u>on the outside</u>:

- ☑ if the roof is insulated after the façade, specify the total thickness of the façade insulation construction (insulation + finish)
- ☑ provide a durable and watertight joint (sealing tape and flexible joint) at the connection to the roof overhang (ETICS)
- ☑ keep a space of at least 10 mm between the finish of the underside of the roof overhang and façade cladding that needs to be ventilated (see TIN 243).

When insulating the façade <u>on the inside</u>:

- ☑ provide a specific item to ensure the continuity of airtightness.

Façade-flat roof: roof first or façade first?

The order in which the insulation of the roof and the façade is carried out can have a significant influence on the connection detail. To avoid a roof sealer having to intervene and temporarily seal off the eaves after the insulation of the façade, it is best to insulate the roof first.

E. Mahieu, Buildwise

We assume that the façades will be insulated on the outside. In that case, the roof sealer should take the necessary steps to **ensure the continuity of the façade and roof insulation**. To do that, insulating material should be installed against and on the roof upstands. Also, a sufficiently large overhang should be provided to ensure the connection to the façade insulation and finish. The necessary width of the overhang will depend on the thickness of the façade insulation provided and the type of façade cladding (a construction with ventilated façade cladding is thicker than an ETICS, for example).

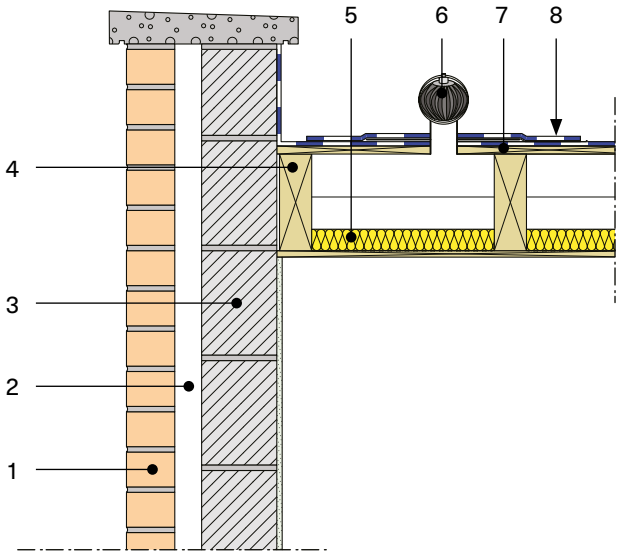
For the correct design and implementation of this connection detail, please refer to TINs 244 and 280 for flat roofs and TINs 243, 257, 274 and 279 for façades.

It goes without saying that you need to have the necessary permits and authorisations to be able to renovate façades (building line decree, heritage...).

Wooden roof floors

Diagram 1 shows the detail diagram for the **thermal insulation of existing façades and flat roofs with a wooden roof floor** (see also Construction Detail Sheets 1597). These details are based on a cavity wall. The detailing for a solid wall is similar.

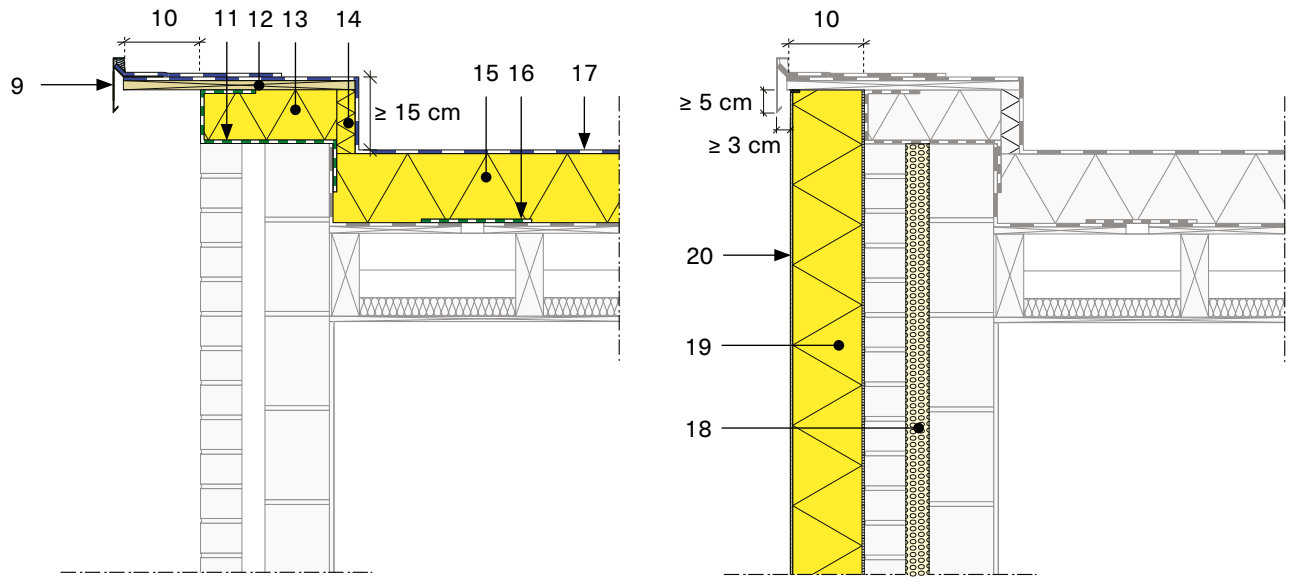
A. Existing situation



1. Façade brickwork
2. Air cavity
3. Supporting brickwork
4. Supporting beams
5. Existing roof insulation
6. Ventilation pipes
7. Wooden roof floor
8. Roof seal

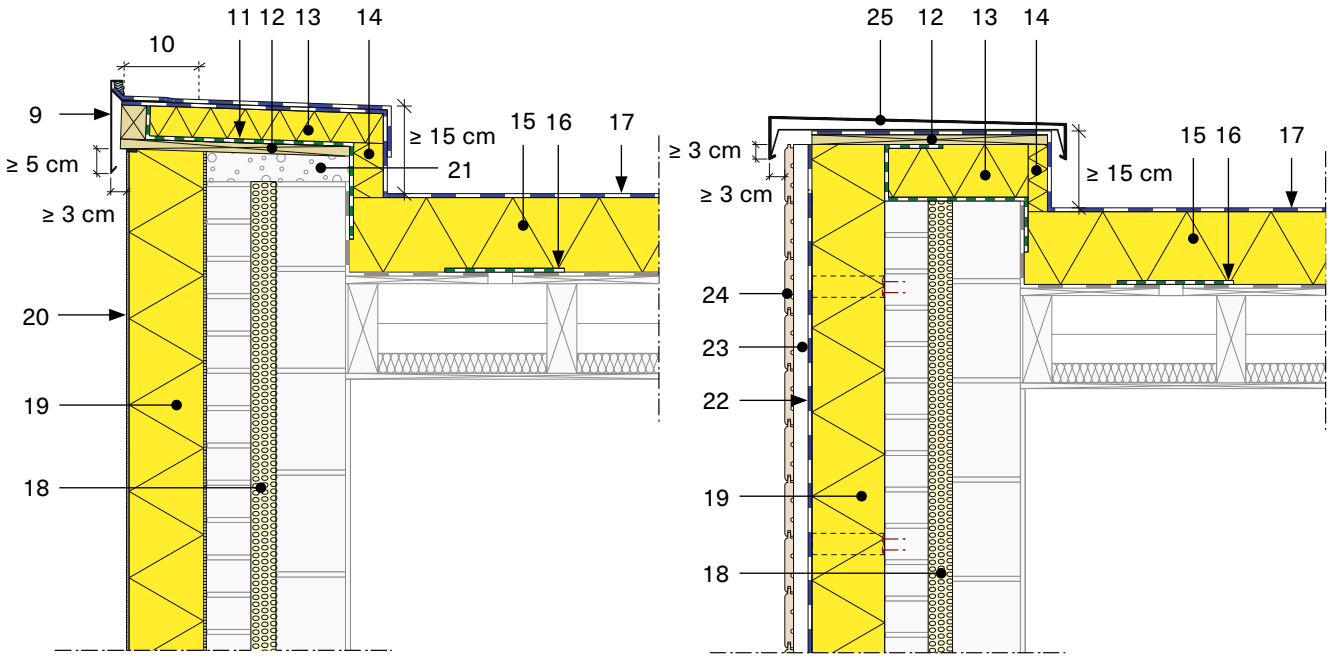
1 Renovation solutions for connecting a flat roof with a wooden roof floor to a façade insulated on the outside (continued on the next page).

B. Situation after renovation with an ETICS: phased implementation



C. Situation after renovation with an ETICS: variant

D. Situation after renovation with ventilated façade cladding



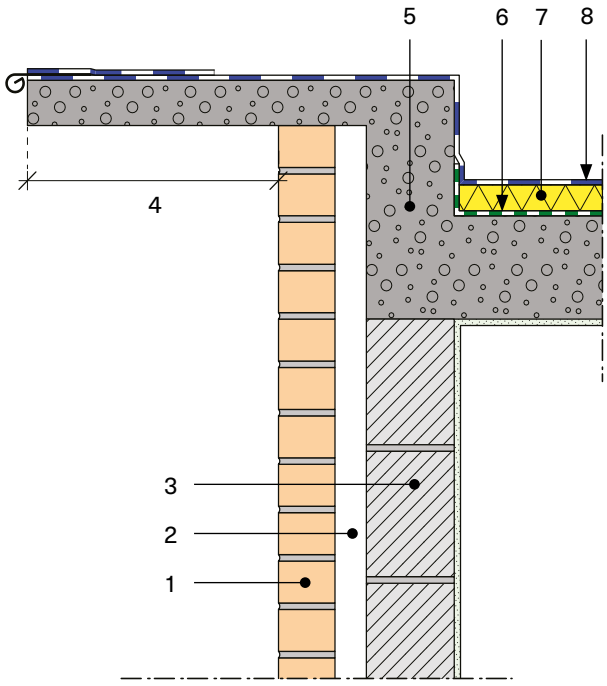
9. Roof edge profile
10. Overhang of the roof edge
11. Extension of the damp proofing
12. Moisture-resistant sheet material (supported by wooden elements or an L-profile)
13. Intermediate insulation
14. Intermediate insulation
15. Roof insulation
16. Damp-proof sealing of the damp proofing
17. Roof seal
18. Cavity insulation
19. Façade insulation
20. Façade finish (ETICS)
21. Capstone
22. Rain screen
23. Ventilated air cavity
24. Façade cladding
25. Metal coping

Concrete roof floors

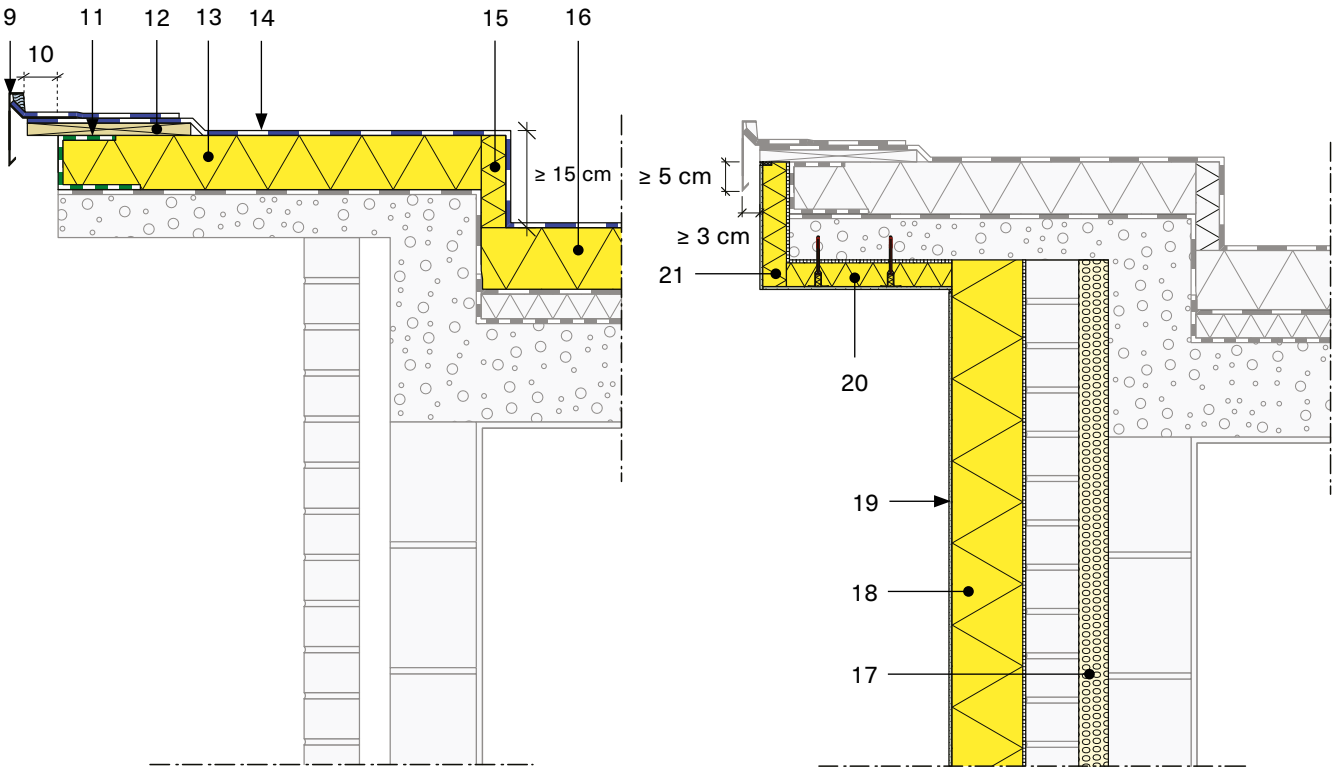
Diagrams 2 and 3 shows the detail diagrams for the **thermal insulation of existing façades and flat roofs with a concrete roof floor** (see also Construction Detail Sheets 1595). These details are based on a cavity wall. The detailing for a solid wall is similar.

1. Façade brickwork
2. Air cavity
3. Supporting brickwork
4. Roof overhang
5. Concrete roof floor
6. Damp proofing
7. Roof insulation
8. Roof seal
9. Roof edge profile
10. Overhang of the roof edge
11. Extension of the damp proofing to protect the edge of the insulation
12. Moisture-resistant sheet material
13. Intermediate insulation
14. Roof seal
15. Intermediate insulation
16. Roof insulation
17. Cavity insulation
18. Façade insulation (ETICS)
19. Façade finish (ETICS)
20. Insulation of the roof overhang (ETICS)
21. Insulation of the roof overhang (ETICS)

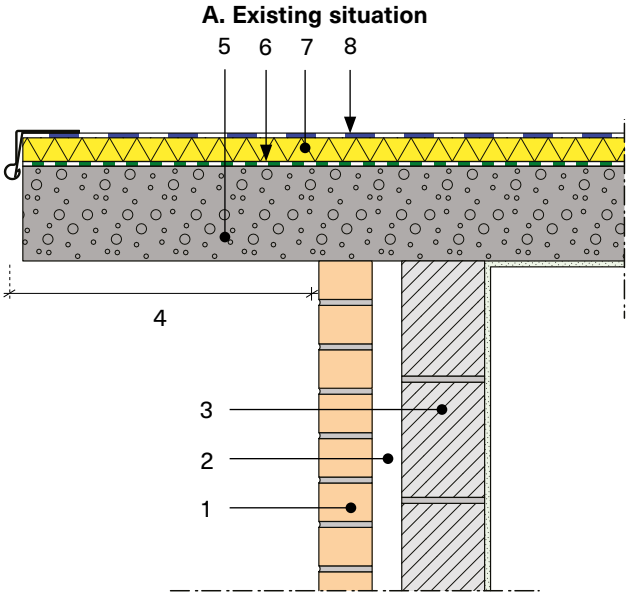
A. Existing situation



B. Situation after renovation: phased implementation

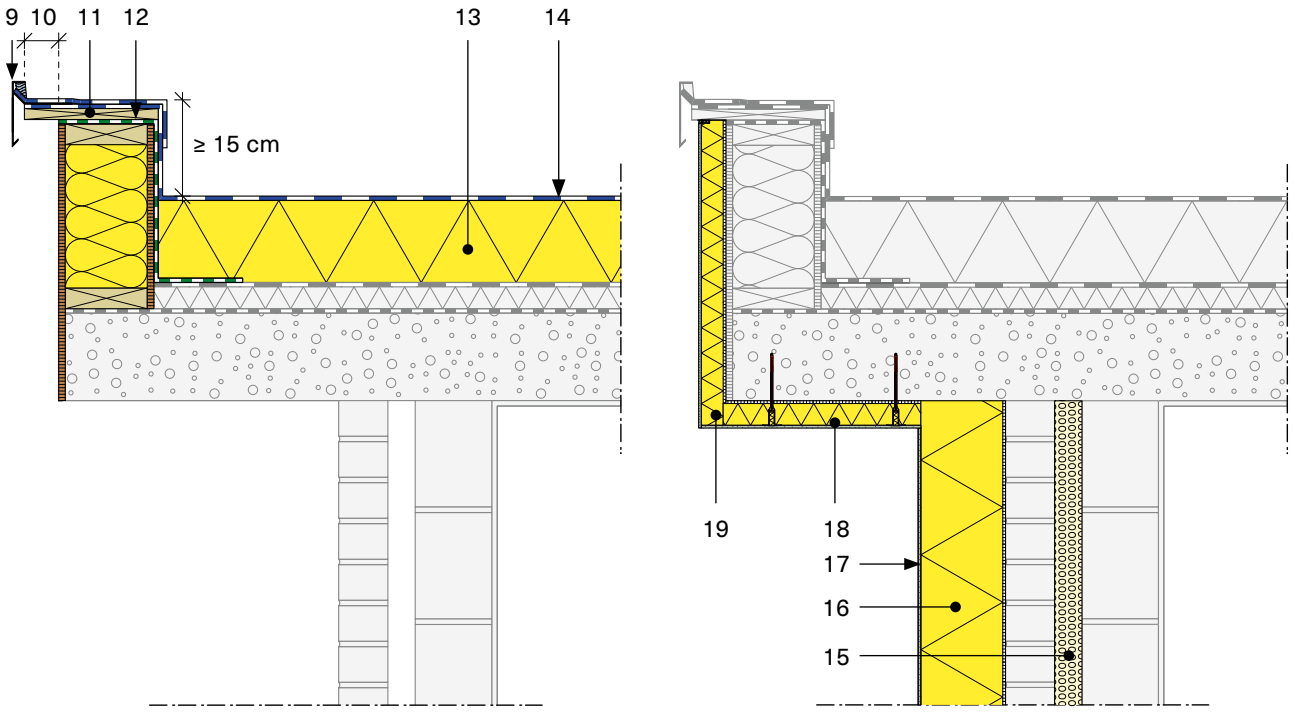


2 Connection of a renovated flat roof with a concrete roof floor to a façade insulated on the outside.



1. Façade brickwork
2. Air cavity
3. Supporting brickwork
4. Roof overhang
5. Concrete roof floor
6. Damp proofing
7. Roof insulation
8. Roof seal
9. Roof edge profile
10. Overhang of the roof edge
11. Moisture-resistant sheet material
12. Extension of the damp proofing
13. Roof insulation
14. Roof seal
15. Cavity insulation
16. Façade insulation (ETICS)
17. Façade finish (ETICS)
18. Insulation of the roof overhang (ETICS)
19. Insulation of the roof overhang (ETICS)

B. Situation after renovation: phased implementation



3 Connection of a renovated flat roof with a concrete roof floor without roof upstands to a façade insulated on the outside.

Checklist for the sealing works

Essential checks before starting work

- ☑ Are there any moisture problems or mould formation?
- ☑ Is the roof floor still in a good state of repair? If it is a wooden roof floor, is the gutter zone still OK? Is the roof floor still stable enough? Is the slope of the roof floor still sufficient (limited water stagnation)?
- ☑ Are additional functions provided on the roof (e.g. green roof or solar panels)?
- ☑ Is there any insulation already present in or on the roof floor and can it stay (in a good state of repair, not damp...)? If it remains with a wooden roof floor, then you cannot take it into account for the thermal resistance (R value) of the roof.
- ☑ Are openings created in the cold roof by removing the ventilation pipes? If so, they must be sealed.
- ☑ Can the current roof seal serve as damp proofing?
- ☑ What is the position and state of the drainage on the roof?
- ☑ What is the state and quality of the brickwork of the roof upstand?
- ☑ Is there sufficient upstand height after additional insulation? This should preferably be at least 15 cm. In the case of roofs with a slope of between 5 and 10%, according to TIN 244 that upstand height may be restricted to 2.5 cm at the highest points of the roof and in the case of a slope of more than 10% to 0 cm.
- ☑ Is the capstone stable enough for it to be retained? Should overhangs of the capstone be ground off?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ Determine the thickness of the insulation against and on the upstands (minimum R value of 2 m^2·K/W, or a thickness of 5 to 8 cm depending on the type of insulation) in order to ensure the continuity of the layers of insulation. It may be necessary to apply extra thickness to the upstands in order to achieve the desired upstand height.
- ☑ Provide the necessary overhang of the roof edge depending on the insulation thickness and façade finish applied later (no. 10).
- ☑ If the current roof seal is kept as damp proofing, verify that it is still fully continuous (e.g. when ventilation pipes are removed, it will need to be sealed at the location of the openings previously made). You should also check around the roof upstands to make sure that this seal does not need to be extended higher.
- ☑ Use wooden elements or steel L-profiles to support the moisture-resistant sheet material that is used under the roof seal.
- ☑ Protect the front of the overhang insulation by extending the damp proofing (see diagram 2, no. 11, p. 16).
- ☑ Finish the edges of the moisture-resistant sheet material to prevent leaching and run-off.
- ☑ Let the drainage from the flat roof protrude far enough beyond the upstand to enable the insulation of the façade and subsequent connection to the drainpipe for the guttering to be carried out.

Essential elements in a quotation

- ☑ Insulate the roof upstands (minimum R value of 2 m^2·K/W), if necessary using wooden elements or steel L-profiles to support the projection of the moisture-resistant sheet material.
- ☑ Protect the front of the eaves insulation (see diagrams 1, p. 14-15, and 2, no. 11, p. 16).
- ☑ Remove the capstone or insulate it if it is going to stay (possibly also grind off the overhangs).
- ☑ When the capstone is removed (see diagrams 1B and 1D, p. 15), it may be necessary to repair the brickwork.
- ☑ Adjust the drainage, i.e. set it higher and, if it dissects the roof upstand, let it protrude far enough in relation to the façade and connect it to the existing drainpipes against the façade.
- ☑ Verify whether overflows (emergency outlets) need to be provided, especially for flat roofs with a single drainage facility.

Checklist for the façade works

Essential checks before starting work

- ☑ Is the façade brickwork to be kept or removed? In the case of the latter, it must be taken into account that the substrate may not be smooth enough to apply insulation with façade cladding.
- ☑ What state is the façade brickwork or the solid brickwork in?
- ☑ Is cavity insulation already present?
- ☑ Has the sealing worker taken the necessary steps for connecting the façade insulation and finish to the roof insulation? How much overhang of the roof upstand was provided?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ It is recommended to fill-insulate the cavity wall before starting the façade works.
- ☑ Connect the ETICS as far as the roof edge finish using suitable sealing tapes (swellable sealing tapes).

Essential elements in a quotation

- ☑ Adapt the substrate if it does not meet the requirements to enable the application of the façade finish.
- ☑ Connect the ETICS to the roof edge finish using the necessary sealing tapes and sealant.
- ☑ Move and connect the drainage (do not incorporate in the layer of insulation).

Façade-joinery: cavity wall or solid wall?

When carrying out the energy renovation of the building envelope, connecting to the joinery is not always easy due to the characteristics of the window opening. The thermal insulation of the façade can be carried out in phases. We assume the first phase will include the judicious replacement of the windows that allows for finishing with an insulating shell in a second phase. Here, it is of course necessary for the building envelope to continue to fulfil its essential performance functions after the first phase.

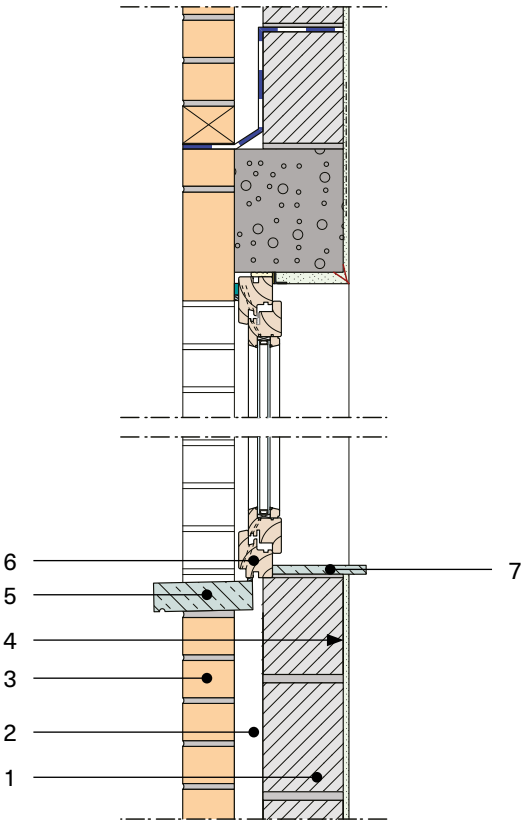
F. Caluwaerts, Buildwise

Uninsulated cavity wall

The first detail that we will look at is the existing uninsulated cavity wall of a home from the '70s/'80s that is insulated with an ETICS (rendering on external insulation) (see also Construction Details Sheet 1529). Homes of this type are characterised by:

- the concrete beams supporting both the internal and external skin of the cavity wall or the cast in-situ concrete beams
- the metal lintels supporting the façade skin of the cavity wall
- the often limited cavity width
- the supporting of the windowsill by the load-bearing brickwork.

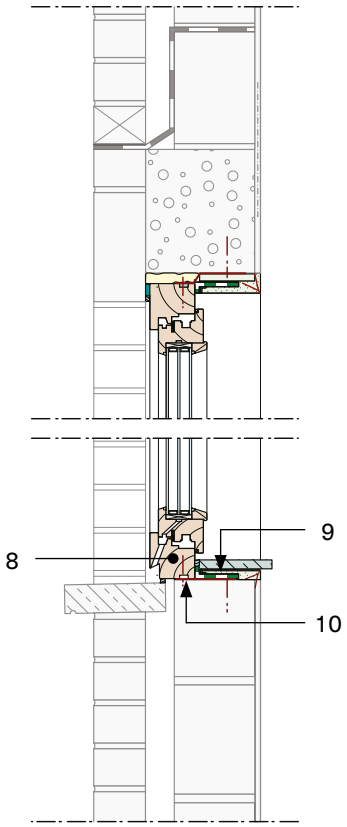
A. Existing situation



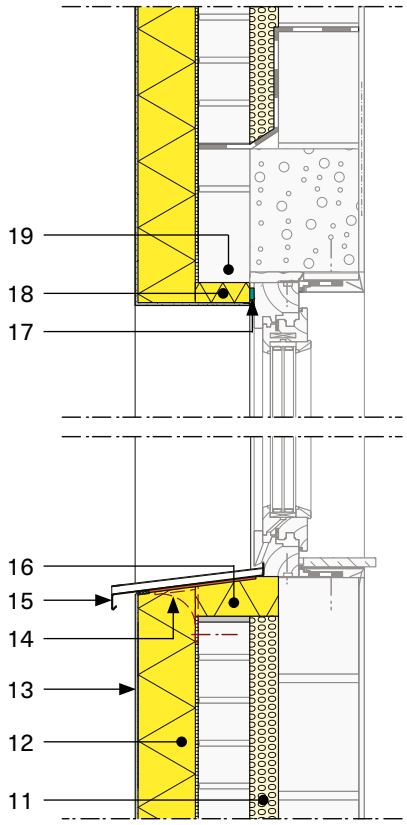
1. Supporting brickwork
2. Cavity (unfilled)
3. Façade brickwork
4. Interior plasterwork
5. Windowsill
6. Existing joinery
7. Windowsill

1 Replacement of the joinery and subsequent connection to render on external insulation of an existing uninsulated cavity wall (continued on the next page).

B. Phase 1:
renovated intermediate situation



C. Phase 2:
renovated final situation



8. New joinery
9. Airtightness membrane
10. Supporting anchoring
11. Possible fill-insulation of the cavity
12. Layer of insulation (ETICS)
13. Finish (ETICS)
14. Sill support
15. New aluminium sill
16. Intermediate insulation
17. Connection profile with swellable sealing tape
18. Reveal insulation (ETICS)
19. Adjusted stroke to the post and lintel of the façade brickwork

Replacement of the joinery

- Removal of the window-sill
- Installation of the joinery with fixing and support regardless of the sill
- Guaranteeing of airtightness (e.g. through the use of membranes)
- Application of flexible façade joints to the sill-window and window-brickwork connection

Adjustment of the rough structure

- Possible fill-insulation of the cavity even if it does not meet all the conditions for a façade exposed to the elements (according to TIN 246)
- Grinding of the reveals at the top and side
- Removal of the sill

Installation of the sill

- Addition of insulation (16) in the form of custom solid insulation or spray foam insulation
- Fixing of the watertight sill with end walls and sufficiently deep connecting rubber with suitable drip groove

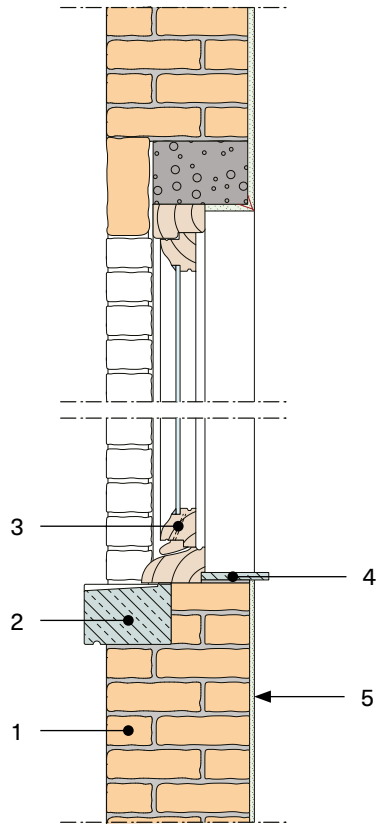
Execution of the façade works

- Installation of connection profiles and swellable tapes that ensure watertightness
- Pay special attention to the openings between the end walls and the joinery

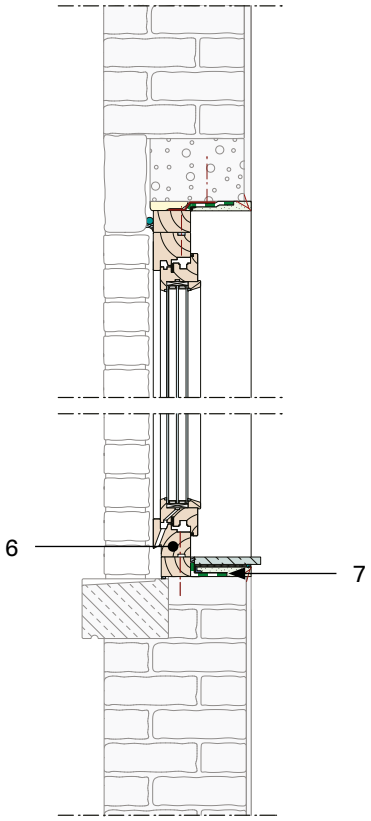
Solid façade with ventilated façade cladding

The second detail relates to a solid external wall of the interbellum insulated with ventilated façade cladding with an insulating shell. Some of the characteristics of this include:
- the solid, load-bearing windowsills
- the need to provide a sufficiently thick reveal finish.

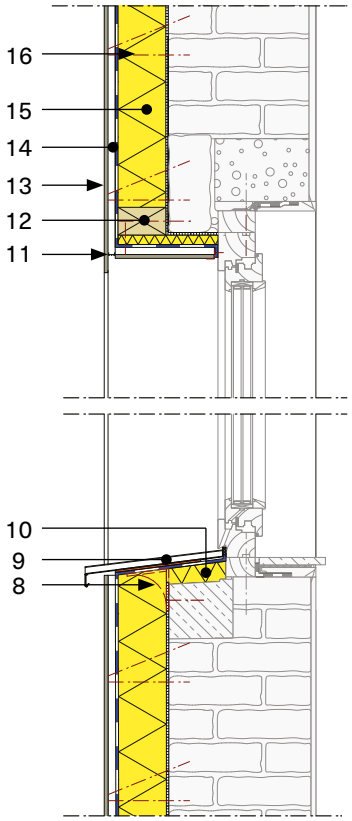
A. Existing situation



B. Phase 1: renovated intermediate situation



C. Phase 2: renovated final situation



1. External wall in solid brickwork
2. Solid natural stone sill
3. Existing joinery
4. Windowsill
5. Interior plasterwork
6. New joinery
7. Airtightness membrane
8. Sill support
9. New aluminium sill
10. Intermediate insulation
11. Insect grille
12. Frame structure in the window opening insulation
13. Façade cladding
14. Lath work and air cavity
15. External insulating shell
16. Lath work fixing

2 Connection of the joinery to external insulation with façade cladding from a previous uninsulated solid external wall.

Replacement of the joinery	Adjustment of the rough structure	Adjustment of the joinery	Execution of the façade works
• Retention of the windowsill and the interior finish • Installation of the joinery with lateral fixing and support provided by the solid sill • Application of a widening frame around the window frame • Application of flexible façade joints to the sill-window and window-brickwork connection	• Grinding of the reveals at the top and side • Tailoring of the sill to the front of the external façade	• Adding of solid insulation tailored to the natural stone sill • Fixing of the sill with end walls and sufficiently deep connecting rubber with suitable drip groove	• Two-layer insulation for a façade with ornamental details or other deviations in the façade • Provision of sufficient reveal depth for the insulation, air cavity and façade cladding (approximately 50 mm) • Installation of ventilation openings with insect grilles for optimum ventilation of the air cavity, to the window opening too

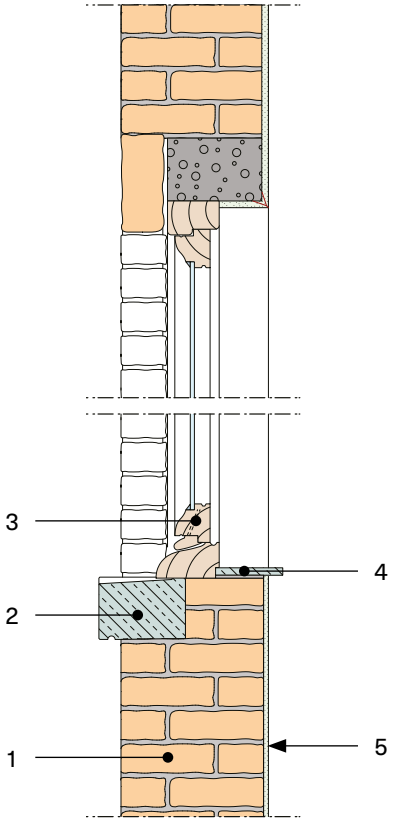
Solid façade with internal insulation

The third detail describes the energy renovation of a solid external wall of the interbellum where external insulation is not an option and therefore it is insulated on the inside (see also Construction Details Sheets 1426).

1. External wall in solid brickwork
2. Solid natural stone sill
3. Existing joinery
4. Windowsill
5. Interior plasterwork

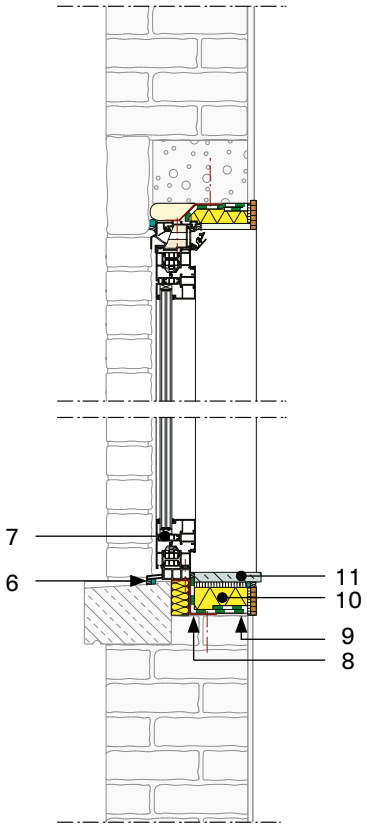
Shutterstock

A. Existing situation

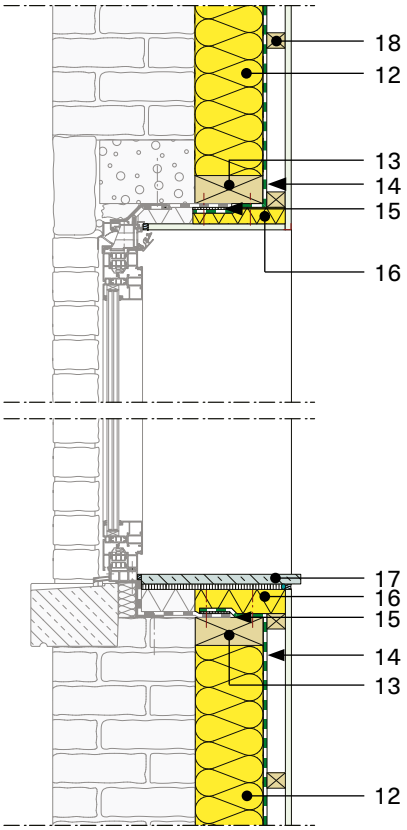


3 Connection of the joinery to the internal insulation of an existing uninsulated solid wall (continued on the next page).

B. Phase 1:
renovated intermediate situation



C. Phase 2:
renovated final situation



6. Renovation profile of the window frame
7. New joinery
8. Possible supporting anchoring
9. Airtightness membrane with folded-up extension
10. Temporary reveal insulation
11. Temporary windowsill
12. Internal insulating shell
13. Frame structure of the internal insulating shell
14. Airtightness membrane of the internal insulation
15. Connection with overlapping and adhering of the airtightness membrane of the window and the internal insulation
16. Additional reveal insulation
17. New windowsill
18. Lath work of the technical cavity

Replacement of the joinery

- Removal of the windowsill and increasing of the stroke behind the sill
- Installation of the metal joinery and fixing with window dowels
- Foaming of the joinery
- Provision of airtightness membranes with folded-up extra width for later connection
- Installation of temporary insulation and temporary windowsill
- Implementation of flexible joints at the sill-window and window-brickwork connection

Implementation of the internal finish with internal insulation

- Unfolding of the holding membrane and connection to the airtightness membrane on the warm side of the internal insulation shell
- Installation of a new wider windowsill and additional insulation underneath

Checklist for joinery

Essential checks before starting work

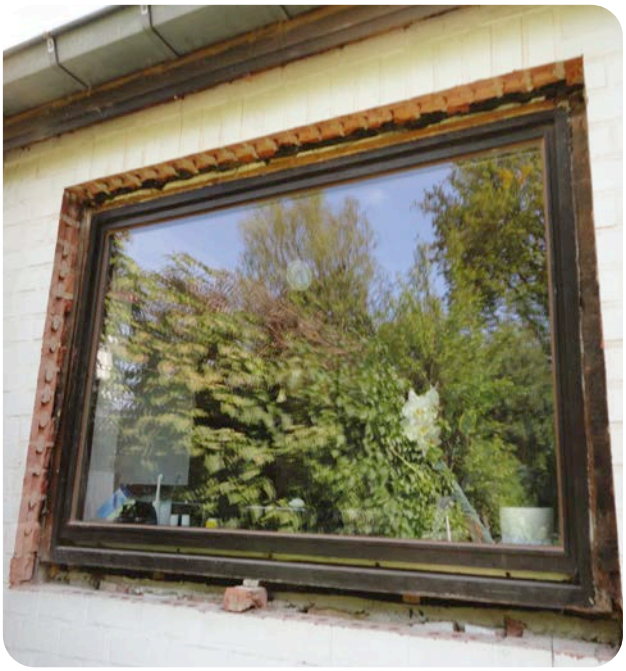
- ☑ Are there any signs of instability in respect of the load-bearing walls and the existing sill? Are there any visible cracks? Has the soldier course above the window become dislodged in places?
- ☑ Is there a moisture problem around the windows? Should the client be informed that simply replacing the joinery is not enough?
- ☑ Can the beam above the window be adjusted or is a wider window frame or widening frame required?
- ☑ Is increasing the stroke on the inside required for windows with a thermal break? To do this, a connection to insulation must be made laterally in relation to the thermal break (see diagram 3, p. 23-24).
- ☑ Is the protection height of the existing parapet wall sufficient?
- ☑ Should openings be provided for the ventilation of the building where the joinery is located?
- ☑ Is sun protection necessary to prevent overheating?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to guarantee the safety of employees (e.g. windowsill, façade joints between joinery and rough structure...).
- ☑ Under the window line, carry out profiling so that a sill can be added at a later date (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ Choose the sill depth according to the subsequent insulation and façade finish (protruding 3 cm beyond the final façade) (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ For a sill of increasing width which rests on insulation across its width, add additional support (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ Especially for an ETICS, realise a watertight sill (incl. end walls) and sill-joinery connection (see diagram 1, p. 20-21).
- ☑ Provide sufficient thickness for the intermediate insulation under the sill (see Buildwise Article 2024/06.01) (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ Install airtightness membranes that, due to their extra width, allow connection to the airtightness membrane of the internal insulation later on (see diagram 3, p. 23-24).

Essential elements in a quotation

- ☑ Provide extra widening frame if the stroke cannot be adjusted.
- ☑ Specify the insulation characteristics of the joinery and the glazing (U value/R value).
- ☑ Specify the glass characteristics required for safety (detection of an excessively low protective field), acoustics, energy and solar gain.
- ☑ Provide support for the window apart from the windowsill (see diagram 1, p. 20-21).
- ☑ Provide an extended airtightness membrane (see diagram 3, p. 23-24).
- ☑ Provide extra (temporary) reveal finish.
- ☑ Install insulation under the sill (see diagram 1, p. 20-21).



Checklist for the finishes

Essential checks before starting work

- ☑ Are there any signs of instability or excessive dimensional deviations (crack formation, out of plumb...) in the façade brickwork or the load-bearing wall?
- ☑ Is there a visible moisture problem on the façade or on the inside of the building envelope?
- ☑ Does the cavity wall create a flow of air behind the façade insulation to be added? If so, can it be fill-insulated (see diagram 1, p. 20-21)?
- ☑ Is there any dirt on the façade that would interfere with the adhesive bonding of the ETICS insulation? Should this be removed (algicide or high pressure) (see diagram 1, p. 20-21)?
- ☑ What are the characteristics of the existing façade finish that must be bonded to?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees (e.g. windowsill, façade joints between joinery and rough structure...).
- ☑ Fill-insulate the existing uninsulated cavity wall before the façade works if preventing air circulation behind the insulation is difficult. If that is not possible, the cavity opening must be sealed off (see diagram 1, p. 20-21).
- ☑ Provide sufficiently thick reveal insulation (preferably 3 cm and at least 2 cm of insulation) (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ The ETICS is to be connected to the windows and sills using suitable sealing tapes (swellable tapes), paying special attention to openings at the end walls of the sills (see diagram 1, p. 20-21).
- ☑ Carry out the connection of the rain screen to the joinery carefully (see diagram 2, p. 22).
- ☑ Prevent air flows between the internal insulation and the outside wall (see diagram 3, p. 23-24).

Essential elements in a quotation

- ☑ Level the substrate if it is not flat enough (see diagram 1, p. 20-21).
- ☑ Provide the insulation thickness required for the reveals (see diagrams 1, p. 20-21, and 2, p. 22).
- ☑ Close the ventilated air cavity (see diagram 1, p. 20-21).

Checklist for the rough structure works

Essential checks before starting work

- ☑ Are there indications that the stability of the façade brickwork needs to be looked at more closely?
- ☑ Are the beams above the window openings sagging excessively and is local reinforcement required?
- ☑ If a separate lintel was used for the façade brickwork, there is ample support so that grinding of the reveals is possible and after adjustment, approximately 100 mm of support is left (see TIN 271)?
- ☑ Is it possible to fill-insulate the cavity wall before carrying out the façade works? In other words, have all the conditions for fill-insulating a cavity wall exposed to rain been met so that these works can be considered without the façade being watertight (see diagram 1, p. 20-21)?

! Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to guarantee the safety of employees (e.g. windowsill, façade joints between joinery and rough structure...).
- ☑ Ensure that the reveal is wide enough to provide a sufficient overlap with the joinery, insulation and finish on the inside (see diagram 3, p. 23-24).

Essential elements in a quotation

- ☑ Remove the sills (see diagram 1, p. 20-21).
- ☑ Grind off the part of the sill protruding from the façade (see diagram 2, p. 22).
- ☑ If possible and required, grind off the reveals and the post and lintel.

Foundation base-floor: light or heavy floor?

Whether the façade consists of a cavity wall or a solid wall, the improvement of thermal insulation at the connection with the floor mainly depends on whether the façade is insulated on the outside – the recommended solution – or on the inside and on the type of floor. The details that correspond to this thermal bridge are available on various sheets from our Construction Details database and in this article.

Y. Grégoire, Buildwise

The table below provides an overview of the various possible connection combinations and refers to the relevant diagrams. The checklists on pages 32 to 34 relate to the three connections illustrated in this article (see diagrams 1, 2 and 3, p. 29-31).

If the façade is insulated on the outside, the foundation base must be implemented in accordance with the recommendations in TIN 250 and the type solutions described in TINs 243, 257, 274 or 279. It is also recommended to follow the technical specifications of the manufacturers of external façade insulation systems (such as ETICS).

For the works to be carried out correctly, we recommend consulting TINs 243, 257 and 279 as well as the future TIN on internal insulation.

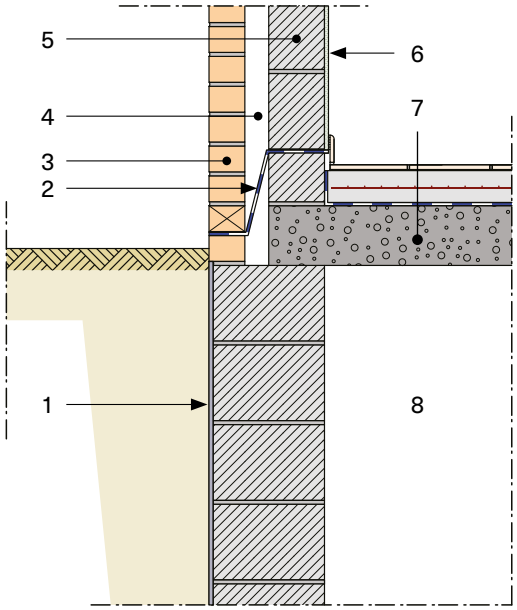
A Overview of the possible combinations between a façade and a floor, depending on the installation of the façade insulation and the type of floor.

Type of floor / Façade insulation		On the outside (solution to be chosen if possible)	On the inside (if not possible to insulate on the outside)
Heavy floor (e.g. concrete)	On solid ground	See Construction Details Sheet 1530	See Construction Details Sheet 1423 or 1425
	Above a basement or ventilated crawl space	See diagram 1 (p. 29)	See Construction Details Sheet 1424
Wooden floor	Above a basement	See diagram 2 (p. 30)	See diagram 3 (p. 31)

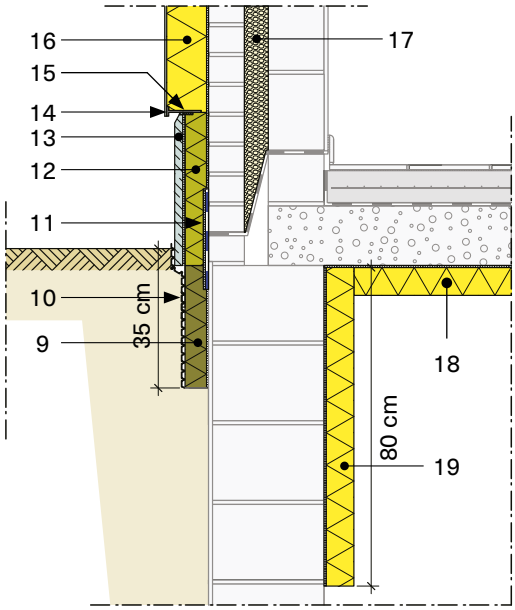
Façade insulated on the outside and heavy floor above a basement

In this case, the order of the works does not affect the interventions or technical solutions.

A. Existing situation



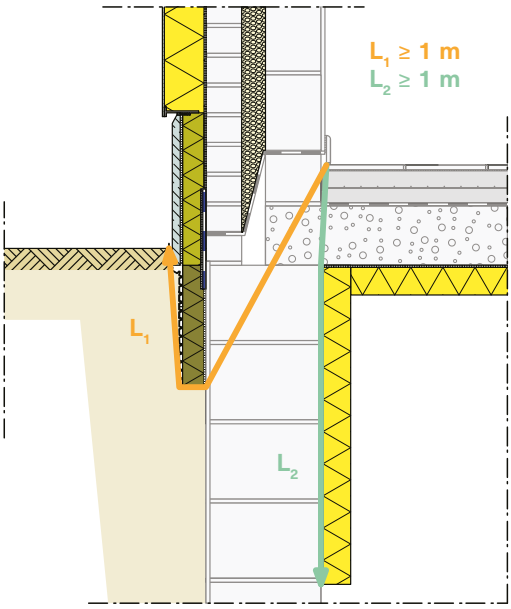
B. Situation after renovation



1. Watertight plastering
2. Draining water screen and damp proofing
3. Façade brickwork
4. Cavity (hollow)
5. Supporting brickwork
6. Interior plasterwork
7. Heavy floor
8. Unoccupied basement
9. Slightly buried insulation
10. Blister padding
11. Possible seal
12. Insulation of the plinth course
13. Plinth course
14. Starting profile
15. Sealing tape
16. External insulation of the façade
17. Cavity insulation
18. Insulation of the basement ceiling
19. Insulation of the basement wall

Note: in the case of new-build projects, a drain is installed in order to limit the risk of lateral infiltrations into the basement. When carrying out renovations, this measure is not necessary if no infiltrations have been identified.

C. Paths of least thermal resistance

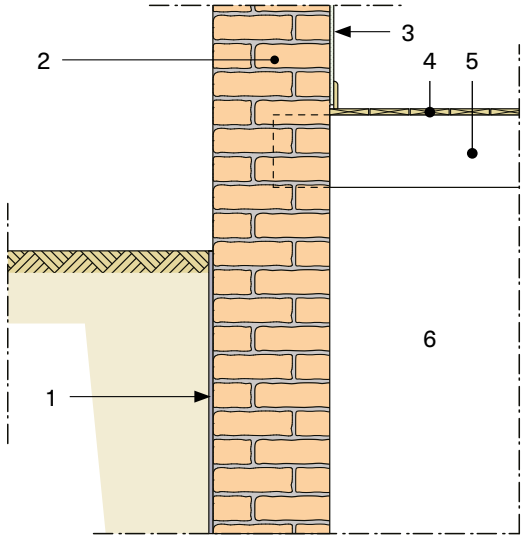


1 Renovation detail of the connection between a façade insulated on the outside and a heavy floor above a basement.

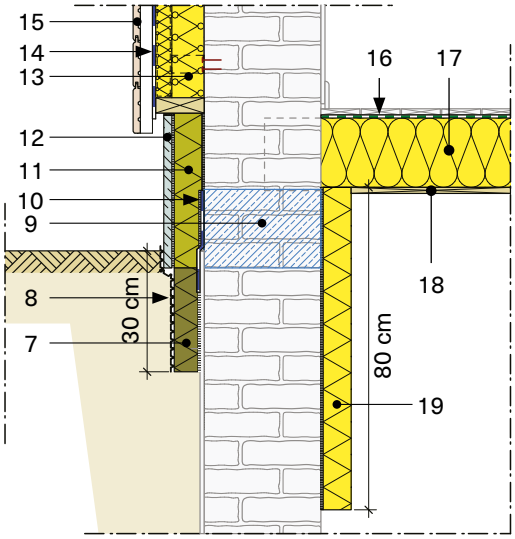
Façade insulated on the outside and light floor above a basement

In this case too, the order of the works does not affect the interventions or technical solutions.

A. Existing situation



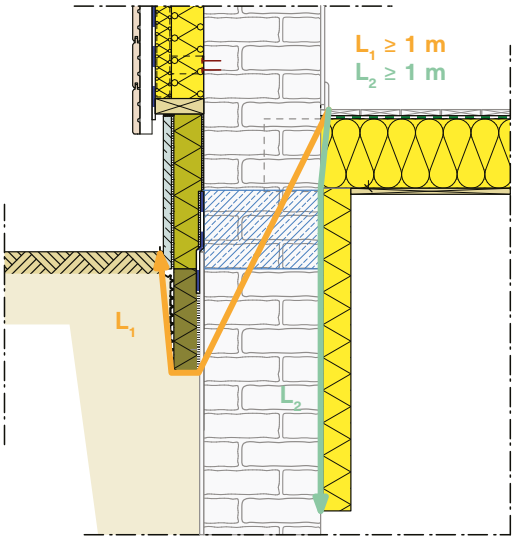
B. Situation after renovation



1. Watertight plastering
2. Solid brick wall
3. Interior plasterwork
4. Flooring (wooden laths)
5. Load-bearing wooden beam
6. Unoccupied basement
7. Slightly buried insulation
8. Blister padding
9. Injection zone for a water-resistant product
10. Possible seal
11. Insulation of the plinth course
12. Plinth course
13. External insulation of the façade
14. Rain screen
15. Façade cladding
16. Air screen and damp proofing
17. Insulation of the floor between the beams
18. Possible finishing
19. Insulation of the basement wall

Note: in the case of new-build projects, a drain is installed in order to limit the risk of lateral infiltrations into the basement. When carrying out renovations, this measure is not necessary if no infiltrations have been identified.

C. Paths of least thermal resistance

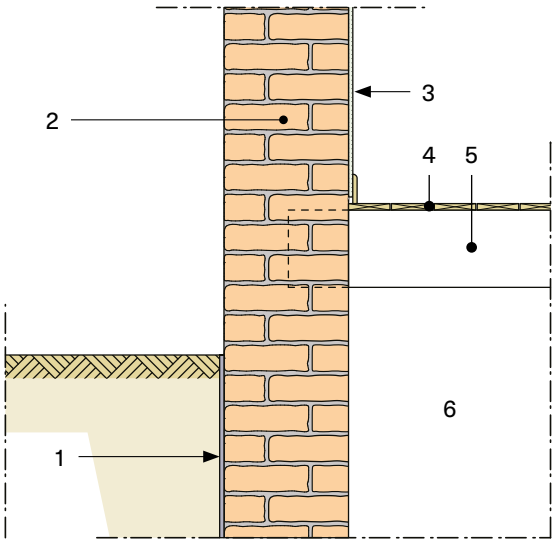


2 Renovation detail of the connection between a façade insulated on the outside and a light floor above a basement.

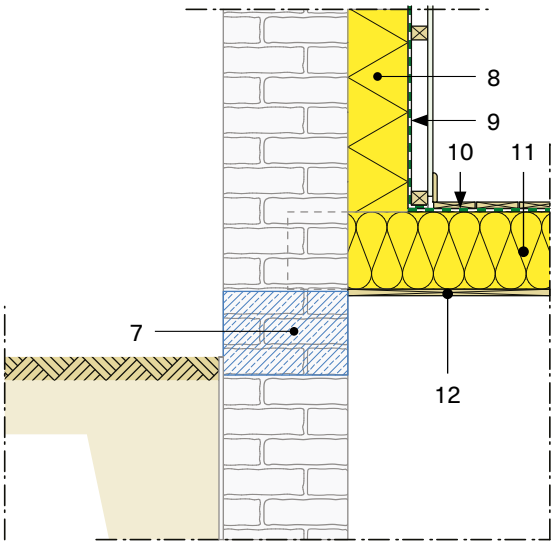
Façade insulated on the inside and light floor above a basement

The order of the works hardly affects the interventions and technical solutions. However between the two work phases, there is a greater risk of condensation at the connection between the wall and the flooring.

A. Existing situation



B. Situation after renovation



1. Watertight plastering
2. Solid brick wall
3. Interior plasterwork
4. Flooring (wooden laths)
5. Load-bearing wooden beam
6. Unoccupied basement
7. Injection zone for a water-resistant product
8. Internal insulation
9. Air screen and damp proofing of the wall
10. Air screen and damp proofing of the floor
11. Insulation of the floor between the beams
12. Possible finishing

Note: in the case of new-build projects, a drain is installed in order to limit the risk of lateral infiltrations into the basement. When carrying out renovations, this measure is not necessary if no infiltrations have been identified.

3 Renovation detail of the connection between a façade insulated on the inside and a light floor above a basement.

Checklist for the insulation works on the outside of the façade

Essential checks before starting work

- ☑ Is the wall a solid wall or a cavity wall?
- ☑ If it is a cavity wall, is the façade cladding to be retained or removed?
- ☑ Is the cavity already insulated?
- ☑ Are there any signs of instability and/or excessive dimensional deviations (crack formation, out of plumb...) in the façade cladding or wall?
- ☑ Are there any visible signs of moisture on the façade and/or in the home?
- ☑ Does the façade have efficient anti-capillary membranes above ground level?
- ☑ Is the foundation base exposed to run-off water?
- ☑ How high is the wall section that is subject to mechanical shocks?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ Excavate the soil to a depth of a few dozen centimetres (depending on the difference between the level inside and outside) and install moisture-resistant insulation.
- ☑ If possible, fill-insulate the cavity wall before the façade is insulated on the outside. If that is not possible or required, the cavity must be sealed off.
- ☑ If there is no anti-capillary membrane or if it is in a poor state of repair, inject a water-resistant product above ground level.
- ☑ Install the rainwater downpipes correctly and connect them to the sewerage system for the soil excavations along the façade.
- ☑ To prevent lateral water infiltrations, install a sealing membrane at the foundation base if the ground is exposed to run-off water or if the anti-capillary membrane is below ground level (see diagrams 1, no. 10, p. 29, and 2, no. 8, p. 30).
- ☑ Insulate the plinth course using a moisture-resistant insulation to at least 30 cm (ETICS) or 20 cm (cladding) above ground level.

Essential elements in a quotation

The elements listed should include the following:

- ☑ the injection of water-resistant products if there is no anti-capillary membrane or if it is in a poor state of repair
- ☑ the adjustment of the substrate if it does not meet certain requirements
- ☑ the implementation of an insulating plinth course
- ☑ the installation of a starting profile between the plinth course and the façade insulation (for an ETICS)
- ☑ possible adaptation of the sewerage system
- ☑ the installation of ground insulation to the required depth
- ☑ possible protection of the ground insulation using blister padding
- ☑ the supply and installation of a seal in the event of exposure to run-off water or if the anti-capillary membrane is below ground level.

Checklist for the insulation works on the inside of the façade

Essential checks before starting work

- ☑ Is the wall a solid wall or a cavity wall?
- ☑ Are there any signs of instability and/or excessive dimensional deviations (crack formation, out of plumb...) in the wall?
- ☑ Are there any visible moisture problems at the base of the façade and/or on the internal finishes at that level?
- ☑ Does the wall have efficient anti-capillary membranes above ground level?
- ☑ Are there moisture-sensitive materials in the edge zone?

! Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ If there is no anti-capillary membrane or if it is in a poor state of repair, inject a water-resistant product.
- ☑ Prevent air flows between the insulation and the wall.
- ☑ Ensure the continuity between the internal insulation of the external wall and the thermal insulation of the floor.
- ☑ Ensure the airtightness of the wall.
- ☑ Install damp proofing (unless there is a vapour-permeable hygroscopic system).
- ☑ Guarantee the continuity of airtightness by connecting the damp proofing to the membrane under the flooring.
- ☑ Anticipate the continuity of airtightness by providing a connecting tape that will remain in place under the temporary finish until the works continue.

Essential elements in a quotation

The elements listed should include the following:

- ☑ the injection of water-resistant products if there is no anti-capillary membrane or if it is in a poor state of repair
- ☑ the adjustment of the substrate if it does not meet certain requirements
- ☑ the removal of the flooring across the thickness of the wall insulation
- ☑ the installation of the plinth course
- ☑ the application of an air screen and water vapour screen (unless there is a vapour-permeable hygroscopic system) and the correct connection to the perimeter.

Checklist for the insulation works on the underside of a heavy floor

Essential checks before starting work

- ☑ Are there any signs of excessive deformation or instability in the floor?
- ☑ Are the walls and the ceiling of the basement healthy, moisture-free and suitable for insulation?
- ☑ Is the reinforcement in the concrete slab visible and corroded?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ Insulate the whole basement ceiling.
- ☑ Insulate the basement walls to a depth of at least 80 cm working downwards from the ceiling.
- ☑ Do not seal the ventilation openings.

Essential elements in a quotation

The elements listed should include the following:

- ☑ an insulation thickness that meets the requirements for obtaining grants
- ☑ possible finishing of the ceiling and the walls according to the client's requirements
- ☑ insulation sheets at least 4 cm thick and 80 cm high along the walls
- ☑ minimal ventilation of the basement.

Checklist for the insulation works on the underside of a light floor

Essential checks before starting work

- ☑ Are there visible signs of rot (especially at the supports) or mould or insect infestations on the floor beams?
- ☑ Are the beams not damaged or damp?
- ☑ Are there any signs of excessive deformation or instability in the floor?
- ☑ Is the basement wall healthy, moisture-free and suitable for insulation?

Important points for attention during implementation

- ☑ Make sure that there are no asbestos-containing materials that require a specific method of implementation in order to be able to guarantee the safety of employees.
- ☑ Insulate the whole basement ceiling between the beams and across the whole thickness.
- ☑ Install a suitable air screen and damp proofing along the warm side of the insulation (i.e. the inside). The old flooring can be kept as the substrate. Special attention should be paid to the connections to the supporting wall.
- ☑ Provide new flooring (e.g. a floating floor).
- ☑ If the façade is insulated on the outside, install insulation on the basement walls to a depth of at least 80 cm working downwards from the ceiling.
- ☑ Do not seal the ventilation openings.

Essential elements in a quotation

The elements listed should include the following:

- ☑ the supply and installation of new flooring and skirting boards
- ☑ finishing of the ceiling and wall insulation (if insulation of the façade on the outside is planned), according to the client's requirements
- ☑ the supply and installation of an air screen and damp proofing on the warm side of the insulation, with connection to the façades and internal walls.

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